

**Supply, Supervision of Erection and Commissioning of MAIN MECHANICAL VENTILATION FAN along with 3.3KV VFD panel, 3.3 KV FLP Squirrel cage Induction Motor.**

**Quantity: 1 No.**

**Specification: 12000 M<sup>3</sup> / Min ( 200 m<sup>3</sup> / Sec) MAIN MECHANICAL VENTILATION FAN.**

**1) Mechanicals:**

<b>Sl. No.</b>	<b>Description</b>	<b>Details</b>
<b>1.0</b>	<b>Duty Parameters under which the fan will be required to work.</b>	
1.1	Type	Axial Flow
1.2	Discharge capacity at Duty point	200 m <sup>3</sup> / Sec at 2.5 ± 0.2 kPa Static pressure
1.3	Operating range against which the fan has to deliver air are	200-300 m <sup>3</sup> /Sec at 2.5 to 1.5 kPa Static pressure. (shall be capable to operate at 3.0 kPa and deliver about 180 m <sup>3</sup> /s)
1.4	Nature of Air to be exhausted:	Dust laden humid air from underground coal mine.
1.5	Ambient Température :	10 <sup>0</sup> C Min. & 55 <sup>0</sup> C
1.6	Relative Humidity:	98 % max
1.7	Orientation & Mounting of Fan.	Fan shall be installed on surface in horizontal position.
1.8	Connecting Suction side of the fan with Fan drift	It shall be connected to RCC structure of the fan drift (having Height - 4m and Width - 4m)
1.9	Working hours per year	24 Hrs. a day & 365 days in a year ( 8760 Hrs). Non stop throughout the year.
1.10	Noise level at the exit of fan evassee (diffuser):	Below 85 dB.
1.11	The fan shall have provision for adjustment of blade range to vary rated capacity by	±20 %
1.12	The design of fan should have provision for reverse rotation in emergency.	To be complied
1.13	The discharge capacity of fan in reverse rotation	shall be at least 40% of the normal value.
1.14	Fan shall be provided with stall protection during operation.	To be complied

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## 2) Details of Fan:

Sl. No.	Description	Tenderer Response
2.1	Make	To be furnished by tenderer
2.2	Model	-do-
2.3	Diameter of Impeller in mm	-do-
2.4	Speed of Impeller in RPM	-do-
2.5	Efficiency required at duty point .	85% minimum
2.6	Air Power at duty point (PXQ/1000)	To be furnished by tenderer
2.7	Brake (Shaft) power	-do-
2.8	Input Power to motor at duty point	-do-
2.9	Overall efficiency required at duty point	80% Minimum
2.10	Recommended Motor power in KW	To be furnished by tenderer. Tenderer has to furnish the detailed calculations sheet along with offer.
2.11	Motor RPM	-do-
2.12	Factor of safety considered in design of blades	-do-
2.13	Type of drive	VFD
2.14	Total Weight of fan mechanicals.	To be furnished by tenderer
2.15	No of blades	-do-
2.16	Blade Angle setting at duty point should be informed along with Fan after testing.	-do-
2.17	Range of blade angle	+20° to -20° from duty point of blade angle (duty point blade angle should be mentioned)
2.18	Specific energy consumption for one cubic meter air discharge at duty point . App.Power consumption in kWh /Hour at duty point. Calculations to be furnished separately.	To be furnished by tenderer
2.19	Drive arrangement to impeller with Motor. (Necessary GA Drawings should be submitted) Impeller directly mounted on motor shaft. Or coupled.	To be furnished by tenderer.

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**3) Material Specifications for FAN components:**

S.No	Description	Remarks
3.1	<b>Diffuser / Evasee:</b> Shall be made Robust enough from Rolled steel plates of not less than 8 mm thick. The evasee shall be fabricated in pieces for easy transport and repairs. It shall be reinforced with flanges and brackets and shall be assembled at site easily. The diffuser/evasee shall be designed for minimum dynamic pressure losses so that overall efficiency of fan is improved and keep sound level below 85 dB.	
3.2	<b>Fan Casing:</b> Shall be made sturdy from rolled steel plates of min 8.0 mm thick. Shall be fabricated in two halves reinforced with flanges & horizontally split brackets suitably. The top half should have provision for lifting while repairs, the bottom half should have provision for grouting.	
3.3	<b>Blades:</b> The fan blades shall be made of suitable Aluminum alloy (LM-18/LM-9WP) duly heat treated and ultrasonically tested. The blade angles shall be clearly marked permanently. Ultrasonic test certificate shall be submitted along with fan supply.	
3.4	<b>Rotor Boss(Hub):</b> It shall be cast Aluminium alloy (LM-6 or equivalent) with mild steel insert at the center. The blade angles shall be marked clearly on the boss permanently. The boss shall be duly heat treated and machined as required. The rotor boss shall be statically and dynamically balanced at fan speed.	
3.5	<p><b>Rotor Assembly (Impeller):</b></p> <p>a) The outside diameter of impeller assembly (Rotor hub fitted with blades) shall be machined.</p> <p>b) There should be provision for locking the blade on the rotor boss and desired angle</p> <p>c) The impeller assembly shall be statically and dynamically balanced.</p> <p>d) Submit the certificate for dynamic balancing along with fan supply.</p>	
3.6	Real time data analyzer shall be provided for monitoring fan parameters and shall be compatible for RS /RJ 485 ports.	
3.7	<b>Painting:</b> Considering the dust laden humid Air being exhausted, the fan housing evasee, inlet cone, outlet guide vanes shall be galvanised and painted with 2 coats of Acrylic Polyurethane paints on both sides. The cast Aluminum impeller (Hub & Blades) also shall be painted with 2 coats of Acrylic Polyurethane.	
3.8	Provide Suitable guards where ever required.	
3.9	U-tube manometer is to be installed to monitor the fan pressure at suitable location	

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**4) Supply the following along with Fan assembly.**

Sl. No	Description	Remarks
4.1	Supply 3 sets of operation, maintenance & spares manual along with each fan to Mine and one set to GM (E&M) /UGM.	
4.2	Technical data & drawings along with fans.	
4.3	The firm shall submit the following drawings for approval in case of order placement. a) The Foundation drawings and the dimensions of civil foundation works shall be submitted within 4 weeks to GM, MM Area and Agent Shanthi Khani Group, MM Area from the date of receipt of Purchase Order. b) Fan housing drawings for approval c) GA Drawings of Electricals. ( Motor & VFD Panel)	
4.4	The performance, fan characteristic curves, noise level and specific energy consumption should be demonstrated and confirmed as per NIT during installation and commissioning.	
4.5	The offered fan shall be installed in one of the existing fan-drifts of 300hp Fan at Shanthikhani mine. Dimensional drawings of the existing fan-drift & fan house are attached herewith for reference. Suitable modifications if any for accommodating the offered fan may be suggested by the firm and accordingly modifications and foundation works will be taken up by the SCCL.  Firms may please visit the site prior to submission of quote. Contact Phone Nos of SCCL officials are a) Mr. K. Venkateswarlu, Project Officer, Shanthikhani Mine, Mandamarri Area – 9491144200 b) Mr B.Chandra Sekhara Reddy, DGM (E&M), Shanthikhani Group, Mandamarri Area – 9491144489	
4.6	SCCL may send their team of Engineers for the inspection of offered Ventillation Fan before dispatch and the firm has to intimate accordingly.	

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**SPECIFICATION FOR NFLP VARIABLE SPEED DRIVE (STARTER) FOR 3300 V  
MOTOR OF MAIN VENTILATION FAN.**

Sl. No.	Description	Remarks
1	<p>The NFLP Drive panel (free standing panel) is to be fitted in a sheet steel enclosure of 12 gauge thick having two or more compartments. Upper compartment is for FORWARD &amp; REVERSE ISOLATOR and the lower for the drive &amp; Control components.</p> <p>In isolator OFF condition, provision should be made for Locking of Isolator with a pad lock. After locking of Isolator by pad lock it shall not be possible for any person to switch on the power unless pad lock is removed.</p>	
II.1.	<p>The inverter system is to be of the voltage sourced type with insulated Gate by polar Transistor (IGBTs) by providing the active switching components for the synthesized 3 phase output. The inverter should feed variable voltage, variable frequency AC supply to the motor.</p>	
2	<p>Motor speed may be adjusted by using the interface key pad on the enclosure door or via a remotely operated analogue device/Potentiometer depending on load.</p>	
3	<p>Drive should be built of unit construction where all components may be removed / replaced on site within minimum of disturbance and down time.</p>	
4	<p>The components should have proven reliability and operational record. All components should be tested at your works and test report shall be submitted</p>	
5	<p>Protection systems have to be sensitive enough to detect low values of leakage current and to monitor insulation systems to ensure that the inverter is prevented to switch on to a unbalanced/low resistance motor/cable system</p>	
6	<p>System to be designed to reduce/eliminate circulating currents within the earth return system connecting to the motor inverter and control transformer secondary supply.</p>	
7	<p>VSD Drive to be designed as a compact unit. Dimensional GA Drawings and schematic wiring drawing to be approved by SCCL before supply.</p>	
8	<p>Incoming and outgoing cable sealing boxes suitable for compound filling with two inner brass conical glands and one outer C.I. gland for gripping of the armour of the PVC DWA cable as per IS.4821 to be supplied for connecting to the terminal boxes. <b>The Cable glands shall be as per SCCL drawing (Enclosed).</b></p> <p>Incoming and outgoing cable entry boxes shall be legibly marked.</p>	

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9	The Drive should be designed to work in tropical and humid atmosphere with 95% humidity. It should be dust and vermin proof and IP 54 and of user friendly design.		
<b>III</b>	<b>Specifications</b>		
<b>1</b>	Application / duty: To control 12000 m <sup>3</sup> /minute MAIN MECHANICAL VENTILATION FAN Motor of Ventilation fan unit.		
<b>2</b>	Model and make offered :	To be furnished	
<b>3</b>	Motor Rating		To be furnished
<b>4</b>	Rated Voltage frequency	3300V, 50 Hz, 3-Phase	To comply
<b>4A</b>	System of Earthing	Solid Neutral Earthed system	To comply
<b>5</b>	Duty rating	Continuous	To comply
<b>6</b>	Inverter	Shall be micro processor based system using IGBT technology and pulse width modulation (PWM)	To comply
<b>7</b>	Control method	Voltage Vector Control Method	To comply
<b>8</b>	Ambient temperature	10 deg.C to 55 deg. C	To comply
<b>9</b>	Voltage tolerance	+ 10%, - 15%	To comply
<b>10</b>	Frequency tolerance	48 to 52 Hz	To comply
<b>11</b>	Output wave form	Sine coded PWM	To comply
<b>12</b>	Output frequency	0 – 120 Hz	To comply
<b>13</b>	Carrier frequency	Less than 10 KHZ.	To comply
<b>14</b>	Efficiency	> 97% through out speed range	To comply
<b>15</b>	Power factor	> 0.9	To comply
<b>16</b>	Motor over load range	25 – 150% FLC	To comply
<b>17</b>	Rotation of motor	Forward and Reverse	To comply
<b>18</b>	Speed control	Manual and Auto.	To comply
<b>19</b>	Starting Torque	250% FLT (Max.)	To comply
<b>20</b>	FORWARD & REVERSE Isolator rating	Suitably rated 300 Amps with copper bus bars.	To comply
<b>21</b>	The system key pad should be used for programming the parameters for a particular application with a password.		To comply
<b>22</b>	The Drive Panel should generally conform to IS. 8544 Standards		To comply
<b>23</b>	The offered model should carry full load / rated current continuously and an over load of 150% for 60 seconds, 200% for 5 seconds.		To comply
<b>24</b>	A separate remote/local control panel for use by operator having controls like motor START / RUN / STOP, Speed set, Forward / reverse selection, Display of speed, Frequency, Voltage, Current, KW, KWH, Power factor and actual motor torque with indicators for memory error, under voltage error, process error, ground fault, IGBT error. The speed of the motor shall be varied automatically with load current / manually through the knob with potential meter on local control panel.		To comply

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25.	Protective features to be incorporated in the drive panel: a) Over current, over load, b) Over voltage, under voltage c) Winding temperature protection relay. d) Bearing temperature protection relay. e) Short circuit. f) Earth leakage protection through a sensitive CBT and E/L relay set to trip at 2 - 5 Amps. g) Input & Output phase failure. h) Emergency Stop, Excessive Ambient Temperature i) Inter lock drive j) When the isolator is in "ON" position, the front cover should not be opened.	To comply
26	Built in DC link filter for entire power range for suppression of Harmonics.	
27	Full compensation for mains fluctuation $\pm 10\%$	
28	Transducers should be provided in control system to regulate the fan speed automatically with respect to Load.	
29	<b>Note:</b> The following shall be provided by SCCL.	
30	a) 3.3KV VCB of suitable rating as controlling main to VFD Panel.	
31	b) 3.3KV PVC DWA Power Cables of suitable rating (from 3.3KV VCB to VFD Panel & From VFD Panel to SCI Motor.)	
32	All the other necessary control Cables shall be supplied by Tenderer.	
33	<b>Air Conditioned Cabin for Panels:</b> a) One suitable Cabin for 2 Nos of VFD Panels & Real Time Data Analyzer. The firm has to fabricate and supply. b) 2 Nos of 230 V 1.5 T Split Air Conditioner units of 5 Star rating shall be provided in the cabin by the firm with necessary wiring. c) Sufficient illumination with LED fittings with controlling switch in the cabin. d) 230 V AC supply shall be provided by SCCL. e) Erection and commissioning of Air conditioner is in the scope of the firm.	
31	The indigenous items delivery should match the arrival of imported items at site.	
32	The payments shall be made after receipt of complete material at site.	
33	The Firms should able to supply the spares (Imported & Indigenous ) at free of cost during warranty and on chargeable basis during life time of equipment	
34	Exclusions: i) Civil works ii) Material handling.	
35	<b>Note:</b> The firm has to supply one additional VFD panel complete as spare and shall be connected readily in the circuit	

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	for change over immediately in case of failure of working VFD.	
35	<b>Training:</b> The successful bidder has to impart hands on training to SCCL personnel on VFD and Fan Mechanicals at site i.e at Mandamarri. The number of persons for training will be approximately 20 Nos. No. of Batches: Two Each batch consisting of 10 persons.	
36	The firm has to provide after sales service and the service Engineer shall inspect both Mechanicals and Electricals of the supplied items during warranty period and rectify problems if any.	
37	The firm shall submit previous purchase order copies along with performance reports for similar direct mounted fans, VFD Controlled for at least 400KW or above for Mining sector in Govt. organizations.	

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**Submit the item wise price break up for the following items.**

<b>S.No</b>	<b>Item Description</b>	<b>Qty.</b>	<b>Price</b>
a)	Main Ventilation Fan Mechanicals.	1 No	
b)	3.3KV FLP Motor	2 Nos	
c)	Acoustic diffuser /Sound Attenuator	1 No	
d)	Connection Piece.	1 No	
e)	3.3KV NFLP VFD Panel	2 Nos	
f)	Control & Monitoring Equipment ,	1 No	
g)	Real Time Data Analyzer	1 No	
h)	Supervision, Erection & Commissioning and Training etc	Lumpsum	
	<b>TOTAL</b>		

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**Specification for 3.3KV 3 Phase FLP SQUIRREL CAGE INDUCTION MOTORS**

Sl. No.	Description	Remarks
01	<b>Specification for FLP SQUIRREL CAGE INDUCTION MOTOR.</b>	
02	Suitable Capacity 3.3KV 3 Phase FLP SQUIRREL CAGE INDUCTION MOTOR to run MAIN MECHANICAL VENTILATION FAN of 12000 M <sup>3</sup> / Min ( 200 m <sup>3</sup> / Sec).	
03	RATED VOLTAGE : 3300 V	
04	NO. OF PHASES : 3 Phases	
05	FREQUENCY IN Hz : 50	
06	FRAME SIZE : To be furnished.	
07	SPEED IN REVOLUTION /Min. : To be furnished.	
08	SITE & OPERATING CONDITIONS: For tropical and humid atmosphere for operation in Coal mine with dust, moisture, humidity and gassy atmosphere. The offered motor shall be mounted to the fan directly and exposed mine return air.	
09	REF. TO IS SPECIFICATION: The motor shall conform to the latest issue of the following IS Specifications except where expressly stated other-wise.	
10	IS.325 & 4722: For Performance.	
11	IS.8223-1999 & IS: 1231-1974: For dimensions.	
12	IS.1271 : For Classification of Insulating Materials	
13	IS.2253 : For Type of Construction & Mounting.	
14	IS.3043 : For Earthing	
15	IS.4029 : For Testing.	
16	IS.4691 : For Degree of Protection.	
17	IS.4728 : For Terminal Markings.	
18	IS.4821 : For Cable Glands and Cable Sealing Box.	
19	IS.4889 : For Efficiency. & IS 2148/2004, IS/IEC 60079-1:2007 : For flame proof construction	
20	TYPE OF ENCLOSURE: TEFC with Hose Proof Protection IP.55 to IS.4691 and rust inhibitive and anti-corrosive paint should be provided.	
21	TYPE OF DUTY :	
22	a) Continuously rated suitable for driving Ventilation fan coupled directly. b) class of duty S1 as per IS:4722	
23	c) Thermal withstand characteristic should be suitable for long starting time.	
24	CLASS OF INSULATION: The winding of the motor shall be suitable for tropical and humid coal mine atmosphere with class 'F' insulation.	
25	DIRECTION OF ROTATION: Bi-directional.	
26	THE MAX. COOLING AIR TEMPERATURE IN WHICH THE MOTOR IS INTENDED TO WORK : 45 Deg. C	

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27	MAX. PERMISSIBLE TEMP. RISE OF MOTOR REQUIRED, IF DIFFERENT FROM THIS STANDARD: Shall not exceed 70 Deg.C. by thermometer over an ambient temp. of 45 Deg.C.	
28	THE ALTITUDE OF THE PLACE IN WHICH MOTOR IS INTENDED TO WORK IN ORDINARY SERVICE : Does not exceed 1000 mtrs. (In Under Ground Coal mines).	
29	IF A MOTOR IS REQUIRED TO OPERATE BETWEEN VARIOUS LIMITS OF VOLTAGE AND FREQUENCY THE CORRESPONDING VALUES OF VOLTAGE AND FREQUENCY RESPECTIVELY.	
30	Voltage +/- 10%	
31	Frequency $\pm$ 3%.	
32	SYSTEM OF EARTHING, IF ANY TO BE ADOPTED : Solidly earthed system. Equipment to be earthed as per CENTRAL ELECTRICITY AUTHORITY REGULATIONS.	
33	PARTICULARS OF TESTS REQUIRED AND WHEN THEY ARE CARRIED OUT : All Type & routine Tests as per IS before despatch/ at the time of supply.	
34	ROTOR WHETHER SQUIRREL CAGE OR SLIPRING : Squirrel cage Induction Motor	
35	STATOR CONNECTION : DELTA.	
36	MOUNTING DETAILS: Horizontal Foot Mounting.	
37	DETAILS OF DRIVE: Direct drive	
38	METHOD OF STARTING : VFD starter.	
39	STARTING TORQUE AS PERCENTAGE OF FULL LOAD TORQUE: 200%.	
40	PULLOUT TORQUE AS PERCENTAGE OF FLT: 300%.	
41	<b>FLP Plug and Socket arrangement:</b> Suitable Flame Proof Plug and Socket arrangement for connecting Motor shall be provided. (Suitable for PVC Insulated, DWA of 3.3 KV Grade, 3 Core 70 Sq. mm. Mining Type Cable)	
42	SPECIAL FEATURES TO BE PROVIDED	
43	a. Winding Temperature Detectors with Control Cable.	
44	b. Bearing Temperature Detectors with Control Cable.	
45	BEARINGS: Heavy duty roller on drive end and ball bearings on non drive end should be mounted preferably in Catridge Type Housings.(sizes of the bearings should be marked on bearing cover)	
46	COOLING: The motor should be provided with a) Internal fan mounted on rotor shaft for cooling. b) Suitable external fan on body of motor, if required.	
47	Efficiency at Full Load: around 94 %.	
48	No load current.	To be furnished
49	Full load current	To be furnished
50	Power factor at full load .	To be furnished
51	Sizes of bearings (D.E and N.D.E)	To be furnished
52	Time required to attain full speed with 80% of designed voltage.	To be furnished.
53	No. of Hot / Cold starts per hour - 3 HOT 4 COLD	
54	Lifting Lugs - 2 Nos.	

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55	Firm should enclose the following along with their supplies: a) General arrangement drawing of Motor b) The Operation / Maintenance Manuals along with the Spare Parts List.	
56	<b>Note: The firm has to supply one additional Motor as standby.</b>	
57	The successful bidder has to submit DGMS approval for offered SCI Motor along with the supplies. In case the firm does not have DGMS approval, the firm has to get DGMS field trial approval for offered SCI Motor and submit the same along with supplies. In case the firm submits DGMS field trial approval for offered Motor, then the firm has to submit the DGMS approval within one year of commissioning and successful operation of the same.	
58	The successful bidder shall assist in obtaining approvals for electrical equipment by DGMS Authorities wherever necessary under the law.	

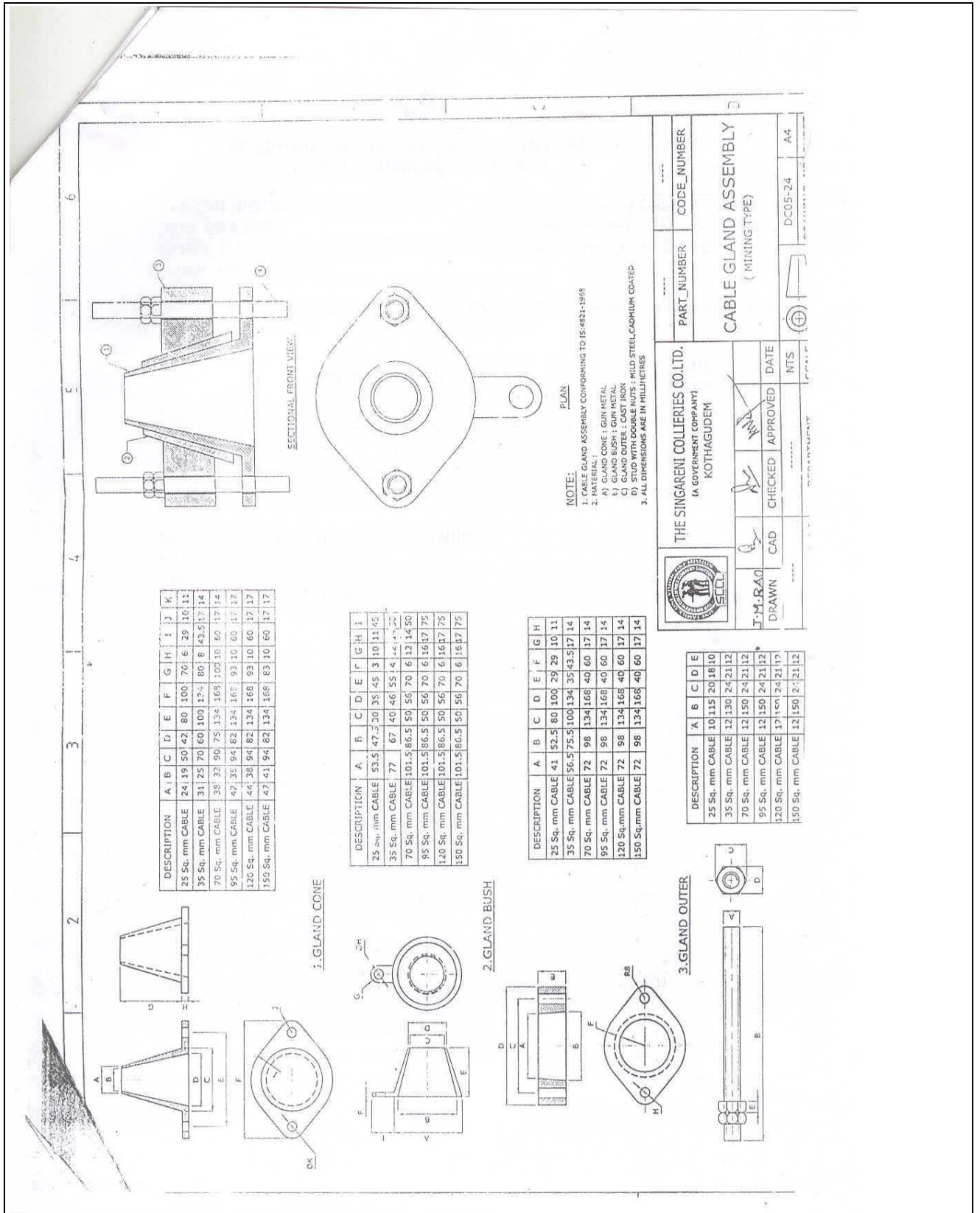
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**THE SINGARENI COLLIERIES CO. LTD.**  
 (A GOVERNMENT COMPANY)  
 KOTHAGUDEM

**CABLE GLAND ASSEMBLY**  
 (MINING TYPE)

PART\_NUMBER: ..... CODE\_NUMBER: .....  
 DRAWN: T-MURAO CAD CHECKED: APPROVED DATE: NTS: DC05-24 A4

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