RETROFITTING OF DRIVES WITH EXISTING 3.3 KV SLIP RING INDUCTION MOTOR ON BOTH WINDING ENGINES OF PVK 5 & VK 7 INCLINES, KOTHAGUDEM AREA OF SCCL.

INTRODUCTION:

The Singareni Collieries Company Limited (SCCL) is a Government coal mining company jointly owned by the Government of Telangana and Government of India on a 51:49 equity basis. The Singareni coal reserves stretch across 350 Km of the Pranahita – Godavari Valley of Telangana with a proven geological reserves aggregating to whopping 8791 million tonnes. The administrative control being with Govt. of Telangana state. SCCL has its mining operations spread over 4 districts of Telangana namely, Adilabad, Karimnagar, Warangal and Khammam.

SCCL is currently operating 16 opencast and 30 underground mines in 4 districts of Telangana with manpower of around 58,837.

LOCATION & COMMUNICATION:

PVK No.5 Incline.

PVK No.5 Incline is located approximately about 8 Kms. South East of Bhadrachalam Road Railway Station of south Central Railway and is from a distance of 295 kms from Hyderabad. Shamshabad Airport of Hyderabad is the nearest air terminal for the Block. The nearest railway station, Bhadrachalam Road, on branch line from Dornakal to Manugur in Kazipet – Vijayawada section of the South Central railway. It falls in Kothagudem Mandal of Khammam District, Andhra Pradesh. By road it is about 90Kms. from the district head quarters Khammam, and 295Kms. from Hyderabad, the state capital.

PVK No.5 Incline is located approximately between North latitude 17^{O} 29' 13" to 17^{O} 30' 35" and East longitude 80^{O} 39' 28" to 80^{O} 41' 00" and is covered under survey of India Topo sheet No.65-C/11

VK-7 Incline

VK-7 Incline is located approximately about 10 Kms. South East of Bhadrachalam Road Railway Station of south Central Railway and is from a distance of 297 kms from Hyderabad. Shamshabad Airport of Hyderabad is the nearest air terminal for the Block. The nearest railway station, Bhadrachalam Road, on branch line from Dornakal to Manugur in Kazipet – Vijayawada section of the South Central railway, is about 10 kms away from the mine. By road it is about 92 Kms. from the district head quarters Khammam,

The Mine is situated between north latitude 17^{O} 27' 07" to 17^{O} 30'' 24" and east longitude 80^{O} 40' 00" to 80^{O} 41' 30" as covered in Survey of India topo sheet No.: 65C / 10 & 11 of Khammam district in Telangana State.

Both these Mines are around 5 KM apart and are under the control of same General Manager and Agent.

Good motorable road is connecting both these mines.

Both these mines are working mines and round the clock these Winding engines are utilized for the purpose of Men and material conveyance.

Background:

SCCL has 2 nos., 285/429 KW, 3.20M Drum winder of M/s. NIKEX, Hungary make Double drum Winding engine (Electrical drive is from Elen, Austria and Winder Mechanicals are supplied by M/s. NIKEX, Hungarian Trading Co. Budapest, Hungary) is catering the purpose of Men and material conveyance at the new shaft located at PVK-5B & VK-7 Incline premises of Kothagudem Area, SCCL. These Man winding systems are working for more than 40 years.

Double drum winding engine at PVK-5B & VK-7 Incline has been fitted with electrically driven 3.3KV, 285/420 kW Slip ring Motor operated on Mains with Liquid Resistance Starter (LRS).Only Manual Control exercised by customer to Start and Stop using external Brake.

Following Disadvantages are presently experienced in the existing system;

- The direct short circuiting by high voltage in control is not having smooth start safety.
- The Motor draws huge current at the start of the winding engine.
- The control liquid resistance and space required for cooling etc. Occupy huge space.
- Separate safety circuit is required through additional panel.
- No acceleration & de-acceleration ramp while lowering & hoisting of man & materials
- Brake is used for banking.
- Auto slow banking and other safe interlocks was not possible.

These man winders, since its inception were not provided with certain critical safety requisites required under CMR 1957 and other relevant DGMS circulars, such as 'ON' type Brakes, 'ON' type Keps, Swivel type guide rope anchoring arrangements, emergency tripping, emergency evacuation arrangements, safety inter locks, etc.

Taking into consideration of all the above and more importantly the safety of persons traveling in the cages and to the stability of the equipment and structure, all these violations were complied during the refurbishing and re-installation period.

However, even after refurbishment, the speed control has to be monitored by liquid controller resistance only. Because of the excess exertion required for operating the control handle, the operators try to control the speed with brake lever which gives jerk to cages while in motion. Further, during operation, the Winding Engine operators, seldom removes their finger from the push button dead man micro switch and some times the winder is tripped due to over speed protection which also gives a jerk to cages due to sudden stoppage.

The sudden stoppage of the winder due to such tripping, while persons are traveling in the cages gives them discomfort and panic.

Since the winding engine operators were not acquainted with operation of 'ON' type braking system, controlling the speed with the liquid starter control and with additional incorporation of safety features and other safe interlocks which was incorporated during the time of refurbishment. Even after a couple of months training and operation, they were finding it very difficult to operate the winding engine smoothly and steadily. This was resulting in tripping of the winding engine during man winding at speed in the mid shaft. In addition to this, there were sudden jerks due to inappropriate handling of speed by the winder operators several times. Due to the above operational difficulties the persons traveling in the cages were becoming panic and subsequently their morale and enthusiasm decreased gradually. This also resulted in loss of productivity due to IR problems in the mine particularly and fear in the public generally.

Taking into consideration of all the above, it was proposed to explore the possibility of operating the winding engine smoothly and safely by retrofitting with VFD's of the existing drives and controls on both the man winders of PVK 5B & VK 7 Inclines so as to ensure smooth, jerk free operation and with auto slow banking arrangements.

Condition of available safety features and other safety interlocks provided on Winding Engines

Sl.No	Safety Features	PVK-5 Incline	VK-7 Incline
1	ON type Keps with indication to operator and Banksman. (The design and specifications of the keps for mine cages will confirm to IS 10970 of 1984)	Yes	Yes
2	At Mid Landing folding platforms with signal interlocking.	Not provided.	Not provided.
3	At Mid Landing where folding platforms are provided availability of auto slow Banking with interlocking.	Not provided.	Not provided.
4	Over wind limit switches provided at three places with a span of 1 meter through Heavy duty Limit switches, Magnetic sensor switches and proximity switches.	Not provided.	Not provided.
5	Q Gate, Horizontal sliding gates and vertical sliding gates.	Yes	Not provided.
6	Banksman Cabin with signaling and communication arrangements	Yes	Not provided.
7	The lightening arrester provided on the head gear will be earthed separately.	Yes	Yes
8	The aviation lamp also will be provided on top of the head gear structure.	Yes	Yes
9	In the shaft below collar, i.e., the slow banking zone will be provided with magnetic sensor switches /proximity switches for speed control.	Not provided.	Not provided.
10	Illumination on Head Gear structure with 110 V AC supply	Not provided.	Not provided.
11	In the shaft: Signaling and communication arrangements etc.	Partially Provided.	Not provided.
At Winding Engine Shed:			
12	DGMS approved ON type Hydraulic Power brake which will function as service brake.	Provided.	Provided.
13	Emergency brake	Provided.	Provided.
14	DGMS approved Automatic Contrivance.	Provided.	Provided.
15	DGMS approved Speed Chart Recorder.	Provided.	Provided.
16	Emergency Trip Switches on operator's desk also will be provided both with Banksman and On Setter.	Provided.	Not Provided.
17	Depth indicator with warning bell, overwind and underwind limit switches.	Provided.	Provided.

18	Clutch interlocking arrangements.	Provided but to be modified.	Provided but to be modified.
19	Slack rope protection & tripping arrangements.	Provided.	Not provided.
20	Arrangement for cage movement /brake operation during emergency such as power failure, etc.	Provided.	Provided.
21	Keps operation inter locking	Provided.	Not Provided.
The other safety inter locks to ensure safe operation of Man Winding system are			
22	Safety Circuit provided for the winder operation comes in to operation when; a) The voltage of one system goes below a particular level. b) Motor is overloaded. c) In case of short circuit in motor d) Earth fault. e) Over speed occurs. f) Over Winding Occurs g) Oil pressure, oil temperature and oil level changes h) In case of emergency, tripping with push button switch i) In case of emergency brake is applied j) In case of interruption of power supply. k) In case of central lubrication pump fails, warning bell comes into operation. l) In case of emergency, tripping with push button switch and the brake is applied instantly. m) In case of interruption of power supply the brake is applied instantly. n) signal interlocking system provided at Banksmen, Mid-set and Bottom landing positions (with on-setters) o) Power brakes interlocking p) Clutch interlocking q) Over wind and under wind tripping arrangements on r) mechanical depth indicator s) Slack rope protection system t) Deadman switch at man winding engine operator u) Emergency tripping arrangements at operator room, banksman and onsetter v) Drum tacho and motor tacho for speed protection w) Cage gates interlocking at	Provided.	Provided.

	banksman and onsetter.		
23	signal interlocking system provided at Banksmen, Mid-set and Bottom landing positions (with on-setters)	Not Provided.	Not Provided.
24	Auto Slow Banking Arrangements: In the shaft below collar, i.e., at the slow banking zone is provided with magnetic sensor switches /proximity switches for speed control. (0%,25%,50% and 100% of normal speed)	Not Provided.	Not Provided.
25	AC VFD with Braking Provision	Not Provided.	Not Provided.
26	Pulse encoder with over speed devise	Not Provided.	Not Provided.
27	Control Lever with dead man switch	Not Provided.	Not Provided.
28	Brake inter Locking through shaft signaling and selection mode.	Not Provided.	Not Provided.
29	Slack rope protection & tripping arrangements.	Not Provided.	Not Provided.
30	Rope Slip Monitoring	Not Provided.	Not Provided.

The firms are requested to inspect both the winding engines and ascertain SCCL's requirements before submitting their quotation and make necessary arrangements for providing all the safety features which are not provided earlier and also to ensure that the existing safety features as mentioned above are in operative condition.

OEM Design Details of existing Motor which requires VFD AC Drive Retrofit: A Budapest Double drum Winding engine design has been in operation which data provides Power Requirement and Torque Conditions being met for the operation with existing slipring LRS motor of rating 3.3kV, 285/420 kW. The requisite nameplate details are as below;

Motor Type	Slip Ring Induction Motor
Voltage	3300 / 3300
Power	Delta 285kW / Star 420kW
Rotation	368 / 735
Current	81 / 90 A

The Double drum Winding engines are designed to traverse up to 400 m depth. Direct Mains Online Start draws Peak Power – 608 kW at start and it comes down during steady state conditions. Friction power in form of mechanical Braking is used to stop the Manwinder by disconnecting the mains supply.

Details of existing Man winding System:

PVK-5 Incline:

General

(i)	**Name & Address of the Mine**	*PVK No.5 Incline, Kothagudem Area PO: Rudrampur, MD: Kothagudem, DT: Khammam, A.P – 507 119.*
(ii)	Name of the Mineral	*Coal*
(i)	Name & Other particulars	*PVK.No.5B Man Winding Shaft*
(ii)	Dimension	*6.50m (finished) dia/ Vertical*

(iii)	Depth to which it is working	*282m (upto King seam)*
(iv)	Thickness of alluvium cover and its nature	*Upto 14.8 Meter Morum, soft soil & clay/shale*
(v)	Particulars of shaft walling	*0.30 m thick PCC M20 grade Monolithic concrete lining.*
(vi)	Particulars about insets	*Double sided with bypass and totally lined* *Mid landing at 235 m (Top seam)* *Pit Bottom landing at 282 m (King seam)*
(vii)	Overrun space at Bottom	*11.0m*
b) Shaft Fittings etc.		
(i)	Particulars of Keps (including those at insets)	*ON type Keps* *Folding platform at Mid landing.* *Cage Landing platform at King seam*
(ii)	Other arrangements at insets	*Cage landing platform, Gates & fencing with safety inter locking.*
(iii)	Particulars of Protective roofing	*Provided on both sides of the insets above the cage landing.*
(iv)	Particulars of signalling equipments	*2 Way communication system both electrical & mechanical, Telephone communication.*
(v)	Guide Rope or Rigid guides	*Guide Ropes*
	Number	*8*
	Maker"s Name & Address (also give challan No.)	*Usha martin-*
	Type	*Half locked coil*
	Size	*38mm dia*
	Clamps or cheese weights	*Cheese weights @ 1.2 MT/100 mtrs. Depth.*
	Particulars of Sump	*Free from materials and water.* *Connected with drainage gallery*
c) Head Gear		
	height	23.50 m
(ii)	Size of Members	*ISMB 600, 450, 300, ISMC 300, 250, 150*
(iii)	Weight of Headgear	*90 Tons*
(iv)	Details of foundation	*RCC M20*
(v)	Fleet angle of the winding rope	*Inner- 1Deg 16 Min 38 Sec* *Outer - 1Deg 13 Min 50 Sec*
	Pulley -	*Type B,*
	Construction (one piece or other type)	*Two Halves*
	Materials	*Cast Steel IS: 9239 - 1979*
	Diameter (over flanges and over rope tread)	*3440mm,* *3200mm*
	Depth	*115mm*
(vii)	Pulley shaft Diameter	*200mm*
	Manner of attachment to the pulley	*Type B with Groove and sleeves*
(ix)	Particulars about dogs or similar devices under Reg.83(3)	*Spring loaded (5 Dogs/row & 4 Rows/Cage, i.e. 2 on both sides of the cage)*
(x)	Clearance between safety hook and detaching bell or plate when the cage or other conveyance is at the top of the shaft	*14 meters*

2. WINDING ENGINE:

(a) Drive		*Electric drive with double drum hoisting*
(i)	Maker"s Name & Address (also give challan No.)	*Elin, Austria, KC-1516, dt.18.12.64.*
(iii)	If Electric	
	Type - DC Induction Motor	*Slip Ring Induction of pole changing type*
	Voltage – 400V	*3000/3300V, 3 Phase*
	BHP	*285/420KW*
	RPM	*425/765*
	Cycles	*50 Hz*
	Sl No	*1094922*

Stator Control gear	Speed control gear	Reversing gear	Auxiliary Transformer
Makers Name: Villamas, Budapest,		Liquid Starter, Resistance,	3300/440V
Type : S/R Control Panel			
Speed : 368/735 RPM		By Operating Mechanical Lever	3300/110V
Capacity : 285/420KW		Gear Ratio: 15.6:1	440/110V
Current Rating: 81A/90			75KVA T/F
Make ECC, 3.3KV/400V			
Voltage Rating: 3300V			
Voltage Ratio: 3300V/110V			
No. MSZ 1585			

(v)	State whether the drive is directly coupled to the drum or through gears etc.	*Through Gears*
	Type of Gear	*Totally enclosed Double reduction double helical gear box, oil Pressure lubricated.*
	Gear Ratio	*15.6:1*
(vi)	Capacity to lift maximum unbalanced load	*3900 Kgs*
(b) Drum:		
	Drawing should be attached	*Drum with shaft assembly drawing attached herewith.*
(i)	Maker's Name & Address (also give challan No.)	*M/s.Nikex Hungarian Trading Co. Budapest, Hungary.*
(ii)	Type of Drum	*Cylindrical double drum mounted on the drum shaft.*
(iii)	Size of the Drum	*3200mm x 1200mm*
(iv)	Flanges or horns on the Drum	*170mm*
(v)	Drum shaft Diameter	*380mm*
	Manner of attachment to pulley (also mention whether free or fixed)	*Double drum consists one drum, Fixed drum directly keyed to the shaft and the loose drum is be kept locked by clutch mechanism.*
(vi)	Method of securing rope ends	*by clamps*
(vii)	Number of idle coils of rope on drum when the cage is at the bottom of the wind	*5 Nos of coils.*

(viii)	Diameter and width of the brake race	*3400mm, 170mm.*

©© Brake:

If more than one, give the following particulars of each brake)

(i)	Maker's Name & Address (also give challan No.)	*M/s.Nikex Hungarian Trading Co. (For Production of Heavy Industry), Budapest, Hungary.*
(ii)	Type	*Post type double brakes holding the drum flanges and intermediate brake holding the motor coupling.*
(iii)	Power operated / Automatic or not Yes/No	*Yes, Power operated /automatic*
(i)	Maker's Name & Address (also give challan No.)	*M/s MINE-TECH Bangalore, Approval no. Mech(HQ)/Mine-Tech/Fld.trail/1185 dated 22/12/2011*
(ii)	Type	ON Type , *Hydraulic operated.*
(iii)	Power operated/ Automatic or not Yes/No.	*Yes*
(iv)	In what position does it normally remain (Reg.74 (2) (b)	*ON position except when the engine is operated*
(v)	Maximum slip with double the normal weight on un-clutched drum	***800 mm***

(d) General:

	In each case give Maker's Name & address with challan No.)	
(i)	Depth indicator (mention if caution bell is provided)	*Yes. Provided by M/s. Nikex,Hungarian Trading Co. (For Production of Heavy Industry) Budapest, Hungary.*
(ii)	Speed Indicator / Speed recorder	*DGMS approved Automatic contrivance and automatically recording speed indicators provided*
(iii)	Particulars of Automatic contrivance (Reg.76)	*DGMS approved Automatic contrivance provided.*
(iv)	Any other fitting	*Safety Circuit provided for the winder operation comes in to operation when;* *a) the voltage of one system goes below a particular level.* *b) Motor is overloaded* *c) In case of short circuit in motor* *d) Earth fault* *e) Over speed occurs* *f) Over Winding Occurs* *g) Air pressure falling in the receiver* *h) In case emergency, tripping with push button switch* *i) In case of safety break applied* *j) In case of interruption of power supply.* *k) In case of central lubrication pump fails warning bell comes into operation.* *2. signal interlocking system provided at Banksmen, Mid-set and Bottom landing positions (with on-setters)*

3. SUSPENSION GEAR :

(a) Winding rope etc.

(i)	Maker's Name & Address (also give challan No.)	*M/s. Usha Martin Ltd, Ranchi, Jharkhand*
(ii)	Construction	*Full locked Right Hand lay galvinised 32mm dia*
(iii)	Breaking load	*834 KN (85.01 Tons)*
(iv)	Date of purchase (give reference	
(v)	Maximum speed of rope	4 Mtr/Sec
(b)	Man winding when/if winding men & materials	4 Mtr/Sec Man Winding,
(i)	Weight of cage and attachment	4150 Kgs
(ii)	Weight of materials	2500
(iii)	Weight of rope @ 5.719 Kgs./Mtr. x 282 Mtrs.	1612.75 Kgs
(iv)	Factor of safety	10.30 Times
©©	When/if man winding	
(i)	Weight of cage	4150 Kgs
(ii)	Weight of men	2590 Kgs (37men*70kgs)
(iii)	Weight of rope @ 5.719 Kgs./Mtr. for 282 Mtr.	1612.75 Kgs
(iv)	Factor of safety	10.20 Times
(h)	**Cage/Means of conveyance**	
(i)	Type & No.of Decks	*Single deck, Tandem cage.*
(ii)	Floor area	*7.50 Sq.m*
(iii)	Number of persons intended to be carried (Ref.Reg.76(ii)	*37 persons*
(iv)	Type of Gates	*Vertical sliding gates*
(v)	Other particulars	Nil

Winding Engine Details of VK-7 (Shaft) Mine

1. GENERAL :

(i)	**Name & Address of the Mine**	*VK No.7 Incline, Kothagudem Area PO: Rudrampur, MD: Kothagudem, DT: Khammam, T.S – 507 119.*
a) Shaft		
(i)	Name & Other particulars	*VK.No.7Incline Man Winding Shaft*
(ii)	Dimension	*6.06m*
(iii)	Depth to which it is working	*245.2m (up to King seam)*
(iv)	Thickness of alluvium cover and its nature	*Up to 14.8m of soft soil and clay/shale*
(v)	Particulars of shaft walling	*Concrete blocks in cement mortar*
(vi)	Particulars about insets	*Double sided with bypass and totally lined Mid landing at 199 m (Top seam) Pit Bottom landing at 245.2 m (Reds Landing)*

(vii)	Overrun space at Bottom	*23.19 m*

b) Shaft Fittings etc.

(i)	Particulars of Keps (including those at insets)	*ON type Keps* *Folding platform at Mid landing.* *Cage Landing platform at King seam*
(ii)	Other arrangements at insets	*Folding Platform interlocking provided with signaling bell cut off between Banksmen and Midland Onsetter.*
(iii)	Particulars of Protective roofing	*Provided on one side of the insets above the cage landing.*
(iv)	Particulars of signalling equipments	*2 Way communication system both electrical & mechanical, Telephone communication.*

2. WINDING ENGINE:

(a) Drive		*Electric drive with double drum hoisting*
(i)	Maker"s Name & Address (also give challan No.)	*Elin, Austria, KC-1516, dt.18.12.64.*
(ii)	If steam / compressed air	*NA*
	Size and number of cylinders	*NA*
	Working pressure	*NA*
	Number of strokes	*NA*
(iii)	If Electric	
	Type – Induction Motor	*Slip Ring Induction of pole changing type*
	Voltage	*3000/3300V, 3 Phase*
	BHP	*285/420KW*
	RPM	*368/735*
	Cycles	*50 Hz*
	Sl No	*1094923 TR*

Stator Control gear	Speed control gear	Reversing gear	Auxiliary Transformer
Makers Name : Villamas, Budapest Type : S/R Control Panel Capacity : 285/420KW Current Rating: 81A/90A ECC, 3.3KV/400V Voltage Rating: 3300V Voltage Ratio: 3300V/110V No. MSZ 1585	Liquid Starter, Resistance, Speed : 368/735 RPM G. Ratio: 15.6:1	By Operating Mech Lever	3300/440V 3300/110V 440/110V 75KVA T/F Make

(iv)	If diesel, Size & No.of cylinders Number of strokes/HP	*NA* *NA*
(v)	State whether the drive is directly coupled to the drum or through gears etc. Type of Gear Gear Ratio	*Through Gears* *Totally enclosed Double reduction double helical gear box, Oil Pressure lubricated.* *15.6:1*
(vi)	Capacity to lift maximum unbalanced load	*3900 Kgs*

(b) Drum:

	Drawing should be attached	*Drum with shaft assembly drawing attached herewith.*
(i)	Maker's Name & Address (also give challan No.)	*M/s.Nikex Hungarian Trading Co.* *Budapest, Hungary.*
(ii)	Type of Drum	*Cylindrical double drum mounted on the drum shaft.*
(iii)	Size of the Drum	*3200mm x 1200mm*
(iv)	Flanges or horns on the Drum	*170mm*
(v)	Drum shaft Diameter Manner of attachment to pulley (also mention whether free or fixed)	*380mm* *Double drum consists one drum, Fixed drum directly keyed to the shaft and the loose drum is being kept locked by clutch mechanism.*

©© General:

	In each case give Maker's Name & address with challan No.)	
(i)	Depth indicator (mention if caution bell is provided)	*Yes.* *Provided by M/s. Nikex, Hungarian Trading Co. (For Production of Heavy Industry) Budapest, Hungary.*
(ii)	Speed Indicator / Speed recorder	*Purchase procedures are in the advance stage for procurement of DGMS approved Automatic contrivance and automatically recording speed indicators.*
(iii)	Particulars of Automatic contrivance (Reg.76)	*The same will be installed, commissioned & the details will be submitted before commencement of man winding operations.*
(iv)	Any other fitting	*Safety Circuit provided for the winder operation comes in to operation when;* *Over wind tripping limit switches at Cage gate.* *Another over wind tripping at depth indicator.* *Slow Banking speed tripping by automatic contrivance.* *Over speed tripping by speed Governor.* *When keps are on position control will be one side Forward/Backward which cage on keps) neutral.* *Overspeed indication with buzzer alarm and tripping electrically.* *Emergency stop buttons provided in 3 different places*

(Banksmen, Bottom seam Onsetter and Midland Onsetter).
Folding Platform interlocking provided with signaling bell cut off between Banksmen and Midland Onsetter.
Overload protection for Electrical motor.
Earth fault and Earth Leakage protection.
When oil lubrication pump and water cooling pump not in operation, warning bell will comes(Interlocked with control lever operation).
Lightening arrestor provided on Head Gear.
Hydraulic pressure switch at Hydraulic pump.
Temperature tripping (hydraulic oil).
Hydraulic pump Oil level tripping.
In case of central lubrication pump fails warning bell comes into operation.

(a) Winding rope etc.

(i)	Maker's Name & Address (also give challan No.)	*M/s. Usha Martin Ltd, Ranchi, Jharkhand*
(ii)	Construction	*Full locked Right Hand lay galvinised 32mm dia*
(iii)	Breaking load	*967 KN (91.22 Tons)*
(iv)	Date of purchase (give reference	
(v)	Maximum speed of rope	4 Mtr/Sec
(b)	Man winding when/if winding men and materials	4 Mtr/Sec Man Winding,
(i)	Weight of cage and attachment	3800 Kgs
(ii)	Weight of materials	3000 Kgs
(iii)	Weight of rope @ 5.719 Kgs./Mtr. x 243 Mtrs.	1389.717 Kgs
(iv)	Factor of safety	11.12 Times
©©	When/if man winding	
(i)	Weight of cage	3800 Kgs
(ii)	Weight of men	1540 Kgs (22men*70kgs)
(iii)	Weight of rope @ 5.719 Kgs./Mtr. for 243 Mtr.	1389.717 Kgs
(iv)	Factor of safety	13.41 Times

(d) Cage/Means of conveyance

(i)	Type & No. of Decks	*Single deck, Tandem cage.*
(ii)	Floor area	*4.725 Sq.m (3.50mx1.35m)*
(iii)	Number of persons intended to be carried (Ref.Reg.76(ii)	*22 persons*
(iv)	Type of Gates	*Vertical sliding gates*

(v) Other particulars Nil

SCCL Requirement:

Retrofitting of Variable frequency drives for existing Slip Ring Induction Motor which is at present operated by Liquid Resistance Starter incorporating other modifications given below.

To design, supply, install and commission the AC Variable Frequency Drive (VFD) for 3.3 KV 285/425KW 3 Phase Slip Ring Induction Motor on existing winding engines of PVK 5 B & VK 7 inclines for achieving Smooth Start / Stop of the Shaft Man winder.

- To Reduce Jerky Movement experienced by persons inside the cage during man winding operations.
- Additionally achieve Energy Savings by using VFD for having Unity PF over numerous Start / Stop operations per day.
- Incorporation of auto slow Banking arrangement.
- All Existing safety features, safe interlocks etc. need to be continued.
- Additional safety features as detailed in various pages of NIT shall be incorporated.
- Incorporating all safety features and other safety inter locks so as to comply all the contraventions and violations/suggestions pointed out by DGMS authorities and other Law enforcing agencies.
- Design, Supply, erection and commissioning of required electricals for execution of the above works.
- Design, Supply, construction of required civil and structural works for execution of the above works.
- AMC for a period of 7 years after successful completion of one year warranty period.
- Air conditioned chamber for operator's cabin, winder controls, and electronics at winding shed.
- 230 V 18" pedestal fans - 2 Nos for cooling of Slip Ring Induction Motors.
- Banksman cabin with signal board etc. at pit top.
- SCCL electrical team (To know how the details, one Electrical Engineer, one electrical supervisor & Electricians- 2 Nos) will be associated while executing the total retrofit works.
- In house training of the above team.
- Availability of all critical spares for at least 10 years from the date of commissioning within the vicinity of around 500 Kms.
- Design Engineering, documentation and supply of drawings etc.

The firms are requested for arrangement/providing all the safety features which are not provided earlier (as furnished at page 3 to 5) and also to ensure that the existing safety features as mentioned above are in operative condition.

In addition to the above the following shall also to be taken up.

1. Study and analyzing the present system of operation of winder.

2. Development of control system with VFD and other electricals compatible for existing motor and present winder operations, M/s. SCCL's requirements and relevant DGMS regulations, complete with layout drawings taking into consideration space limitations, etc.

3. Erection, Supervision, testing and commissioning of low THD (Total harmonic distortion), low electromagnetic noise, IGBT supply unit, high power factor, heavy duty rating, and high starting torque VFD.

4. Design and supply of Operator's Control Desk, inclusive of relevant GA drawings and wiring diagrams. The control desk dimensions have to match with the available space in the operator's cabin.

5. Study of Cable layout, Supply and commissioning of required cables and connections.

6. Design erection & commissioning of PLC, Software development, testing and commissioning.

7. Design, supply, erection & commissioning of MCC Panel.

8. Ensuring effective functioning of brakes after Retrofitting works.

9. All other items required for commissioning of VFD, Incorporation of all safety features and other safety inter locks so as to comply all the contraventions and violations pointed out by DGMS authorities and other Law enforcing agencies shall be in the scope of firm.

10. Deputation of engineers, supervisory staff, electricians, fitters, etc. and other persons in sufficient numbers during erection/commissioning by the firm.

11. In depth training for SCCL team, in both places (PVK-5 & VK-7 Incline), on operational and application programming aspects of Drive, PLC and SCADA, trouble shooting and preventive maintenance at the supplier's works. The supplier shall draw out a comprehensive training program for the purpose.

12. Start up assistance as may be necessary, for at least ten complete days, after commissioning and resumption of production. Personnel from supplier will be available at site during that duration. He has to assist in operation during that period and impart on site training to departmental staff for normal operation, basic familiarization, and trouble shooting and general features of the installed system during that period.

13. The supplier shall provide valid license/authorization for use of the Drive and PLC software and one set of backup software in hard discs.

14. Three sets of all relevant documentation of hardware, software, wiring details, panel layout, drawings, Technical literature of hardware supplied, indenting specifications/part nos. of spares etc. to be provided by supplier. The document should also include information required for operation, programming, maintenance and troubleshooting.

15. **Firm has to obtain DGMS approval for the HT equipment (3.3KV HT VCB & 3.3KV VFD Starter etc.) supplied and commissioned by them.**

16. **The total works for retrofitting of drives from design to final commissioning of the man winders shall be completed within 10 months after awarding contract.. However, the winding engine will be under total shut down for a maximum of 01 week inclusive of weekly holidays to carry out above works. Simultaneously some of the works which will not effect the working of winder can be taken up during normal operation of winder, to minimize the above shut down time. As the winder is required for men transportation, firms are requested to complete the job as early as possible.**

Detailed scope of work is furnished here under.

DESIGN AND DOCUMENTATION:

1. System General Arrangement

Preparation of General Arrangement and detailed drawings of the total NEW Supply electrical system indicating all the Electrical & Electronic Circuit Diagrams connected with operation of Winding Engine and other required Man winding fittings. The Winding Engine room for the Winding Engine, Air conditioned chamber for Electronics, software and its accessories is to be proposed in a detailed Layout Diagram by the Tenderer. The successful bidder shall construct the same as per the basic design Layout provided by the Tenderer and approved by SCCL.

The successful tenderer shall submit general arrangement Drawing of the total System offered to GM (E&M) UGM, Corporate, Kothagudem for scrutiny and approval.

2. General arrangement drawings:

I) Winder NEW Electrical System Supply:

Design and preparation of NEW Electrical Supplies with detailed Fabrication / Manufacturing and Assembly (with respect to existing and new electricals and electronics).

Review Existing Detailed Design and load Calculation of Winding Engine and to submit new Supply Electricals and safety items.

Review Existing Design, Preparation of detailed Location, Construction and Assembly Drawings of controls etc. in the Operator's AC Cabin.

Preparation of Line diagrams of the Control Panels, Equipments, Cabling Schedule, Wiring Schedule of Control Panels, Operation Manuals, Test Certificates, etc.,

Note: The NEW Electrical Supplies shall be accommodated in the existing winding engine shed. Firms are requested to inspect both the winding engines before they quote.

Detailed drawings of NEW Electrical System Supply

The successful tenderer should submit copy of design details, drawings to GM (E&M), UG Mines, Corporate, KGM. for approval. After obtaining approval from SCCL, firm has to submit 10 sets of the above design details, drawings, before supplying of the required items and one set of reproducible tracing of all the above drawings and complete documentation of the system. Further, the successful bidder shall submit 10 sets of manuals pertaining to maintenance schedule, do's and don'ts, trouble shooting, check lists for effective & safe operations of man winding. (Both hard and soft copy for all the above)

N O T E:

All Dimensions provided in the tender document are approximate.
The successful bidder shall visit the site and collect the required data before designing and fabrication where ever required.

3. WINDER & ELECTRICALS:

The subject Winders are used in mine shafts for conveyance of men and materials.
One end of rope attached to cage and other end anchored to the drum.
The Existing Double Drum Winders shall be provided with NEW Electricals consisting of the following;

a. Variable frequency Drive panel compatible with the existing 3.3KV AC motor for VFD operation with a 150% overload for 1 minute, PLC for interlock and signaling system along with SCADA. with all protections as detailed.

b. Driver Control Desk with Brake Controller, non-contact type Joystick Speed Controller, with Dead-man Switch, Telephone sets and Bell Signals etc.

c. Speed indicator-cum-automatic contrivance (Electronic type) with built in over wind, over speed and slow banking protections with speed recorder and total interlocking to the winding system with electrical braking provision.

d. SCADA to provide Speed indicator-cum-automatic contrivance (Electronic type) with built in over wind, over speed and slow banking protections with speed recorder and total interlocking to the winding system with braking.

e. MOTOR CONTROL CENTER (MCC)

f. The successful bidder shall provide Fail Safe Interlocking arrangement to act upon in case of failure of **Pulse Tacho coupling**.

g. The winder shall have to be controlled from the main operator desk through the main PLC (Reputed make). Winder operations, winder interlocking, external devices, supervision of fault, etc; shall be controlled by the PLC which is connected to the Field Bus like PROFIBUS / PROFINET as per the PLC Configuration diagram.

Note: The position of Cage throughout its travel in the shaft shall be shown on PC based depth indicator on PC screen located in the main operator control desk.

Specifications of MOTOR CONTROL CENTER (MCC)

MCC should have the following:

440V, 3 phase AC motors and other auxiliary 440V/240V/110V supply feeders are controlled from MCC. MCC is a free standing, floor mounted, single front, non draw out type suit of metal clad panels. Manually operated, fixed type MCCB with earth leakage relay, voltage/current meters and RYB indicating lamps are the components in the incomer. Out going feeders comprise DOL starters for AC motors and supply feeders for other electrical equipment's like UPS, lighting etc.

OPERATOR (DRIVER) CABIN:

The operator's cabin shall be of airtight, sound proof, fully air conditioned. The required partition, providing air conditioners, high standard furnishing to the roof, floor and sides are in the scope of the Tenderer. The Operator cabin shall be equipped with Main Control Desk, Control Lever, Brake Lever and Control Pedestal with SCADA. All these equipments shall be interfaced with PLC/Drive cabinet. The main Control Desk is provided with 2 sets of window annunciator indicating the status of various sensors, equipment ON/OFF switching status, speed selection etc. The window facia lamps shall be energized by the PLC.

a. The operator should have Emergency Stop Push Button (PB) and Safety Tripping system on his desk to trip the safety circuit in case of emergency and Winder operator control desk along with control lever with dead man switch, control pedestal, brake pedestal with brake control lever and Human Machine interface are the part of operator stations.

b. Signalling and communication system include Master banks man board, Winder driver board, indication board at required Seams, Keps boxes at required Seams and telephone communication between master banks man and winder driver and banksman to different landing stations.

c. Specific signaling system should be provided such that signals received from different landings should be different from each other. Whenever cage is operated from one landing level then the other landing level signals should not work, even if they are operated that should give buzzing sound only.

WINDOW ANNUNCIATOR ON MAIN CONTROL DESK SHOULD HAVE THE FOLLOWING:

Various equipment/drive system status shall be indicated through window facia lamps energized by Main PLC. These shall be as follows.

Annunciator 1

a. AC Contactor ON/OFF
b. KEPS IN/OUT
c. Safety Circuit Healthy/Trip/Ready to close
d. Auto Start Locking OK
e. Gate Open/Close
f. Brake on/off
g. Hydraulic Pump On/Off/ pressure OK
h. Emergency Stop indication

Tacho function:

i. Tacho by-pass Etc.,

Annunciator 2

1. Left Clutch in/out
2. Right Clutch in/out
3. Loading/Unloading completed
4. Auto/Manual mode selection lamps
5. Men/Rope Inspection/Shaft Inspection
6. Over Hoist/Over Wind taken place
7. Winder Locked condition
8. Automatic contrivance's testing facility.
9. Other required various equipment/drive system status if any.

START OF WINDING (OPERATIONS)

CAGE WINDING

In the Cage Winder the Manual and Auto operation shall be as follows:

a) MANUAL MODE:

1. Operator / Banksman receive signals from different levels from the shaft for the demand of cage through indicating lamps.
2. The Operator brings the cage to the required destination by moving the control lever up or down and releasing the brake with the help of the brake lever. In case cage is moving on one particular direction, it will continue to do so if the demand of conveyance is there from the levels in that direction.
3. When the cage reaches the requested level the cage is stopped, “Cage Bottom flushed” lamp glows. Operator applies brake and brings both the control and brake lever in Zero position.
4. When the cage reaches the destination, “Winder Locked” indicating lamp glows indicating that the winder is locked by the cage man / Banksman for permitting men or material into or out of the Cage.

b) AUTO MODE

In case of Auto mode, the Cage movement should be automatic as mentioned for cage winding. The conveyance moves up or down when the Cage man unblock the winder. In case, the bottom or the top is to be flushed with the level floor, the automatic operations allow the Cage man / on setter to move the Cage up or down by ““slow up”” and ““slow down”” push buttons provided on the Level box.

For Cage , the indicating lamps for end region shaft switches operated at 75% , 50% , 25% speed are to be energised when the conveyance reaches the corresponding position.
Also in the end shaft region, ““Fast braking zone”” lamp glows indicating fast braking position of hydraulic brakes / Disc brakes.

In case of any trouble, the main operator should be stop the winder by pressing ““Safety TRIP”” PB or ““Emergency STOP”” PB.

The indicating lamps for the above stoppages shall glow on the Operator’s/ banksman desk.

The Emergency PB’s are also to be provided at various locations for the local individual to stop the winder under emergency.

To restart the winder after emergency stop is to be pressed the operator/ Banksman reset the circuit by pressing ““RESET PB”” for Emergency stop.

WINDER DRIVE MOTOR:

The winding drums are driven by an Existing AC 3300 V, 285/420 kW, 368/735 RPM. The motor shall have the winding connections brought out to a terminal chamber for testing purposes.

Motor:

Make : ELIN, Type : R-120 16N/8N, Austria
Delta/Double Star,
Capacity : 285/420 KW, Voltage : 3300/3300, Amps : 81/90
RV : 511/536, RA: 345/486
Rotation: 368/735 rpm

Control Panel

Isolator:

Make : Villamos Allamoszerello Vallalat (VAV), Budapest, Hungary
Type : T1 Pus – S1/11/6/600
Voltage: 6.0 KV, Amps : 600
Main Fuse : 400A, 3.4KV (2X 200 A)

Circuit Breaker:

Make: BHEL, Bhopal

Type: B 591 C 300B, Sl.No. VC 12
Rating : 3300V, 300 Amps,
Vacuum contactor.

HT Panel Main Contactor

Make: Siemens

Type : K 926 M-6/1 So Tr
Nv S 30 575 932 - 80 A
Sp Spg 420V, 50 Hz - 6000V

Rotor Panel Main Contactor

Make: Siemens

Type: K-915/III/1.4, Klima – 630A

K-915/III/1.4, Gekaps – 550A,

	125	220	380	500	Volts
650A	110	190	325	430	KW
550A	95	165	285	375	KW

Electrical Design	
Power Supply	Firm has to design VFD panel suitable to drive the existing 3.3KV Motor. Variable Speed, fed from VFDs/ Multi level inverters. Motor to be suitably de- rated for associated harmonics. Insulation to be suitable for high switching PWM.
Over speed capability	120 % for 2 minutes
Pulse encoders	Speed sensor for motor

DIGITAL TACHO GENERATOR TO BE PROVIDED ON MOTOR

A typical specification of Tachometer is given below as reference. However the specification should match with design parameters of selected motor for mounting on shaft, as well as for generating pulses.

Type : Digital type Tacho Generator

Make : HUBNER; ELEKTROMASCHINENAG, BERLIN , Leine and Linde , Baumer (formerly Huebner)z

Hmax = 1000 PPR Enclosure : IP 55

Since the motor is designed for winder duty, special precaution is needed in selecting the Tachometer according to the shaft diameter of motor. The basic purpose of the Tachometer will be to generate digital signal for sensing speed for automation & control.

The level positioning of Cage at various levels throughout its travel in the shaft shall be monitored through a pulse tacho mounted on the drum. The tacho shall be connected to the dedicated Winder Controller Technology Board mounted in the drive cabinet. The winder supervisory functions are also carried out in this board. Cage position monitoring in the end regions and stopping regions is through mono stable magnetic switches.

DESIGN

AC drive unit shall be equipped with a user friendly operator panel to be mounted on the door. The panel shall consist of minimum five-digit, seven-segment display, and suitable number of LED's as status indicators and parameterization keys. The Parameterization Unit shall have connector with suitable interface in accordance with Standard man winding system.

The user friendly operator's panel should feature an LED with minimum 4 x 16 characters for displaying parameter names in plain text in English. It should be capable of storing parameter sets for easy downloading to other devices.

The AC drive VFD should have capability to set parameters through standard PC with appropriate software connected to the serial interface on the basic unit. This PC interface can be used during start-up, for maintenance during shutdown and for diagnosis in operation. Further, converter software upgrades can be loaded via this interface for storage in a Flash memory.

Specifications for 3.3KV controlling panel consisting of HT VCB & VFD:

The offered 3.3KV VFD shall be designed to work with the existing Slip Ring Induction Motor.

The offered VFD panel shall be provided with 3.3KV 100A HT VCB and VFD drive Panel and as one integral unit.

The HT VCB shall be provided with Isolator, Vacuum Breaker unit, Earth Leakage Relay, Over Load relay etc., The output from HT VCB shall be connected to incoming of 3.3KV VFD.

Detailed specifications for 3.3 KV VFD & HT VCB are furnished below.

ITEM	3.3KV controlling panel consisting of HT VCB & VFD
MECHANICAL PARAMETERS	
Design	Dust and Vermin proof with hinged doors.
Mounting	Floor mounted, free standing with base channel for fixing on floor insert.
Lifting facility	Lifting hooks shall be provided on four sides of panel. For each transport section. Removable type.
Protection class	IP- 54 or better
Cooling	Forced Air Cooling inbuilt for power devices in chassis unit
Cubicle make	Rittal / Siemens / ABB / Parker or any reputed make .
Cable entry	Incoming cable from left side of the panel with double compression Cable glands shall be provided.
Operating height	Between 450- 2000 mm preferable
Earth Bus Bar	Horizontal at the bottom of the panel.
Power Terminals	Suitable for PVC DWA Copper cables
Control Terminals	suitable size with visible physical barriers for different voltage grades
Spare Terminal	20 % for control terminals
ELECTRICAL PARAMETERS	
Converter type	AC to AC conversion with provision for Braking
Output rated power of converter / inverter	As per shaft Manwinder existing load requirements.

ITEM	3.3KV controlling panel consisting of HT VCB & VFD
Drive ratings	Shall be selected taking care of the load cycle and the overloads as per OEM Design.
Devices	Shall be IGBT
Control voltage	240 V AC or 110V AC or DC 24 V DC
Converter/Inverter Efficiency	> 98 %
Power factor of drive	Minimum 0.95 or higher
Overloads	To suit motor overloads
THD of Drive system	Will be as per IEC-519 or better
Software	Any special application program, if developed for a drive, will also be provided

DRIVE SHOULD DISPLAY THE FOLLOWING

1. Fault messages
2. General information about faults
3. List of fault messages
4. Supply faults
5. Interface error
6. Fault messages from motor sensors
7. Drive faults
8. Start-up faults
9. External faults
10. Hardware faults
11. Internal faults
12. Communication errors with supplementary boards
13. Fault messages from supplementary boards

Alarms : For the above faults alarm should actuate.

EARTHING SYSTEM: Suitable earthing system shall be provided for total electrical equipment / system as per CEAR 2010.

GENERAL SPECIFICATIONS OF THE DRIVE

Specification

High Performance Adjustable Speed Drives

A. This specification describes an AC variable speed/torque Direct Torque Control™ (DTC™)/or Vector control Drive used to control the speed/torque of an induction motor. The drive must also provide an optional operational mode for scalar or V/Hz operation.

B. The Variable Frequency Drive Unit shall be manufactured by a firm with at least ten (10) years experience in the production of this type of equipment.

Quality Assurance

A. The Drive manufacturing facility shall be ISO 9001 certified.

B. The Drive shall be UL listed, or Canadian UL listed, or CSA listed and comply with EMC Directive 89/336 EEC, Low Voltage Directive 73/23 EEC and Machinery Directive 98/37 EC in accordance with the European Union's CE directive.

C. All printed circuit boards shall be completely tested and burned-in before being assembled into the completed Drive. The Drive shall then be subjected to a preliminary functional test, minimum one (1) hour burn-in and computerized final test. The burn-in shall be at 104F (40C), at full rated load, or cycled load. Drive input power shall be continuously cycled for maximum stress and thermal variation.

D. The Drive shall utilize efficient IGBT technology throughout the entire Drive manufacturer's Power and Voltage range.

E. The Drive shall utilize the same communications architecture, utilizing plug-in communications cards, for high-speed noise immune connectivity throughout the entire Drive manufacturer's Power range.

F. The Drive manufacturer shall have an analysis laboratory to evaluate the failure of any component. The failure analysis lab shall allow the manufacturer to perform complete electrical testing, x-ray components, and decap or delaminate components and analyze failures within the component.

G. The Drive shall utilize surface mount technology in the manufacturing of internal printed circuit boards and electronics, for maximum performance and reliability.

Part 2- Products

2.1 **Adjustable Frequency Drives**

A. The Drive shall be solid state, with a Pulse Width Modulated (PWM) output. The drive shall be a Direct Torque Control (DTC)/ or Vector control AC to AC converter utilizing the latest isolated gate bipolar transistor (IGBT) technology.

The Drive shall employ Direct Torque Control (DTC) inner loop torque control strategy that mathematically determines motor torque and flux every 25 microseconds (µs) (40,000 times per second). The drive must also provide an optional operational mode for scalar or V/Hz operation.

B. **Ratings**

1. The Drive shall be rated to operate from 3-phase power at 3300 V AC , 48Hz to 52.5Hz. The Drive shall employ a full wave rectifier to prevent input line notching and operate at a fundamental (displacement) input power factor of 0.97 at all speeds and loads. The Drive efficiency shall be 98% or better at full speed and load. An internally mounted AC line reactor or DC choke shall be provided to reduce input current harmonic content, provide protection from power line transients such as utility power factor correction capacitor switching transients and reduce RFI emissions.

2. The over voltage trip level shall be a minimum of 40% over nominal, and the undervoltage trip level shall be a minimum 35% under the nominal voltage.

3. Output voltage and current ratings shall match the adjustable frequency operating requirements of standard 3300V, 3ph, 50Hz AC Slip Ring induction motor. Output frequency shall be adjustable between 0Hz and 300Hz. Operation above motor nameplate shall require programming changes to prevent inadvertent high- speed operation. The drive's switching pattern shall be continually adjusted to provide optimum motor flux and avoid the high-pitched audible noise produced by motors energized by conventional PWM drives. The drive shall be furnished in an IP54 enclosure rated for operation at ambient temperatures between 0 and 40C at an altitude not exceeding 3300 feet, with relative humidity less than 95% and no condensation allowed. The drive shall be protected from atmospheric contamination by chemical gasses and solid particles pre IEC 721-3-3, classes 3C2 and 3S2. The drive shall be protected from vibration per IEC

68-2-6 (max. sinusoidal displacement 1 mm, 5Hz to 13.2Hz and max. acceleration 7m/s2, 13.2Hz to 100Hz).

VFD greater than 400 kW should have separate rectifier and inverter module. Modules shall be draw out type with individual wheel and handle. Entire power range should have two variants of rectifier and inverter modules.ie only these variants should only be used to achieve higher power VFD's. Input & output choke should be integral to rectifier/inverter modules

Rectifier section should be of IGBT based regenerative Unit with 4Q operation.
Drive system is of Unity power factor,
Compartmental construction at rectifier section and inverter section.
IGBT based Converter and IGBT based Inverter.

C. Control Functions and Adjustments

1. An intelligent start-up assistant shall be provided as standard. The Start-up assistant will guide the user through all necessary adjustments to optimize operation and will include "plug and produce" operation, which recognizes the addition of options/field bus adapters and provides the necessary adjustment assistance.
2. Start-up data entries shall include motor nameplate power, speed, voltage, frequency and current.
3. A motor parameter ID function shall automatically define the motor equivalent circuit used by the sensorless vector torque controller.
4. A PID speed/torque loop regulator shall be provided with an autotune function as well as manual adjustments.
5. A selection of six (6) preprogrammed application macro parameter sets shall be provided to minimize the number of different parameters to be set during start-up. Macros included as standard are as follows: Factory Default, Hand/Auto, PID Control, Sequential Control, and Torque Control. A selection of two (2) user defined macros shall are also be available.
6. Start/Stop control functions shall include two (2) or three-(3) wire start/stop, coast/ramp stop selections, optional electrical braking.
7. The VFD shall be capable of starting into a rotating load (forward or reverse) and accelerate or decelerate to reference without safety tripping or component damage (flying start). The VFD shall also be capable of electrical braking at start to stop a reverse spinning motor prior to ramp.
8. The VFD shall have the ability to automatically restart after an overcurrent, overvoltage, undervoltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between reset attempts shall be programmable.
9. Accel/Decel control functions shall include two (2) sets of ramp time adjustments with linear and three (3) s-curve ramp selections.
10. **Speed/Torque control functions shall include:**
    a. Adjustable min. /max. speed and/or torque limits Selection of up to 15 preset speed settings or external speed control
    b. Three (3) sets of critical speed lockout adjustments.
    c. A built-in PID controller to control a process variable such as pressure, flow or fluid level.
    d. Reference signal processing shall include increase/decrease floating point control and control of both speed/torque.
    Two (2) analog inputs shall be programmable to form a reference by addition, subtraction, multiplication, minimum selection or maximum selection.
11. Output control functions shall include:

a. Flux optimization to limit the audible noise produced by the motor and to maximize efficiency by providing the optimum magnetic flux for any given speed/torque operating point.
b. Current and torque limit adjustments to limit the maximum Drive output current and the maximum torque produced by the motor. These limits shall govern the inner loop torque regulator to provide tight conformance with the limits with minimum overshoot.
c. A torque regulated operating mode with adjustable torque ramp up/down and speed/torque limits.

12. The Drive shall be capable of sensing a loss of load (broken belt / broken coupling) and signal the loss of load condition. The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus. Relay output shall include programmable time delays that will allow for drive acceleration from zero speed without signaling a false under load condition.
13. The Drive shall have programmable "Sleep" and "Wake up" functions to allow the drive to be started and stopped from the level of a process feedback signal.
14. Two (2) programmable critical frequency lockout ranges to prevent the AFD from operating the load continuously at an unstable speed.

D. Static and Dynamic Performance

1. Open loop static speed regulation shall be 0.1% to 0.3% (10% of motor slip). When motor speed feedback is provided from a suitable encoder, closed loop speed regulation shall be 0.01% or better. Dynamic speed accuracy shall be 0.3-0.4 %-sec or better open loop and 0.1-0.2 %-sec or better-closed loop.
2. Torque response time shall be 5ms or less. In the torque regulating mode, torque regulating accuracy shall be 4% or better.

E. Operator Control Panel (Keypad)

1. Each Drive shall be equipped with a front mounted operator control panel (keypad) consisting of a four-(4-) line by 20-character back-lit alphanumeric display and a keypad with keys for Run/Stop, Local/Remote, Increase/Decrease, reset, menu navigation and parameter select/save.
2. All parameter names, fault messages, warnings and other information shall be displayed in complete English words or standard English abbreviations to allow the user to understand what is being displayed without the use of a manual or cross-reference table.
3. The Display shall have contrast adjustment provisions to optimize viewing at any angle.
4. The control panel shall include a feature for uploading parameter settings to control panel memory and downloading from the control panel to the same drive or to another drive.
5. All Drives throughout the entire power range shall have the same customer interface, including digital display, and keypad, regardless of kilowatt rating.
6. The keypad is to be used for local control, for setting all parameters, and for stepping through the displays and menus.
7. The keypad shall be removable and insertable under drive power, capable of remote mounting, and shall have its own non-volatile memory.
8. During normal operation, one (1) line of the control panel shall display the speed reference, and run/stop forward/reverse and local/remote status. The remaining three (3) lines of the display shall be programmable to display the values of any three (3) operating parameters. At least 26 selections shall be available including the following:

    a. Speed/torque in percent (%), RPM or user-scaled units
    b. Output frequency, voltage, current and torque
    c. Input voltage, power and kilowatt hours
    d. Heatsink temperature and DC bus voltage
    e. Status of discrete inputs and outputs

f. Values of analog input and output signals
g. Values of PID controller reference, feedback and error signals
h. Control interface inputs and outputs shall include:

F. I/O Capabilities

1. Six (6) discrete inputs, all independently programmable with at least 25 input function selections. Inputs shall be designed for “dry contact” inputs used with either an internal or external 24 VDC source.

2. Three (3) form C relay contact outputs, all independently programmable with at least 30 output function selections. Relay contacts shall be rated to switch 2 Amps at 24VDC or 115/230VAC. Function selections shall include indications that the drive is ready, running, reversed and at set speed/torque. General and specific warning and fault indications shall be available. Adjustable supervision limit indications shall be available to indicate programmed values of operating speed, speed reference, current, torque and PID feedback.

3. Three (3) analog inputs, one (1) +/- 0VAC - 10VAC and two (2) 4mA - 20mA, all independently programmable with at least ten (10) input function selections. A differential input isolation amplifier shall be provided for each input. Analog input signal processing functions shall include scaling adjustments, adjustable filtering and signal inversion. If the input reference (4-20mA or 2-10V) is lost, the AFD shall give the user the option of the following: (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the AFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user. The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus.

4. Two (2) analog outputs providing 4mA to 20mA signals. Outputs shall be independently programmable to provide signals proportional to at least 12 output function selections including output speed, frequency, voltage, current and power.

G. Serial communications

1. Serial communication interface modules are available for a wide selection of communication protocols. Available adapters are as follows: Modbus, Modbus Plus, Profibus DeviceNet, Interbus S, CANopen, ControlNet, LonWorks and CS 31. Communications modules shall be connected to the drive by fiber optic cables. I/O shall be accessible through the serial communications adapter.

2. Serial communication capabilities shall include, but not be limited to, run-stop control; speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, and accel/decel time adjustments. The drive shall have the capability of allowing the Distributed Drive Controller (DDC) to monitor feedback such as process variable feedback, output speed/frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), relay outputs, and diagnostic warning and fault information. Additionally, remote Local Area Network (LAN) VFD fault reset shall be possible. A minimum of 15 field parameters shall be capable of being monitored. The DDC system shall be able to monitor if the motor is running in the AFD mode or bypass mode (if bypass is specified) over serial communications.

3. The VFD shall allow the DDC to control the drive’s digital and analog outputs via the serial interface. The serial communications interface shall allow for Digital Output DO (relay) control and Analog Output (AO) control. This control shall be independent of any AFD function. Examples of possible DO usage are as follows: Opening check valves, opening discharge valves, starting auxiliary equipment, etc. In addition, the status of the

DO's is available over the communications link. Examples of possible AO usage are as follows: Controlling a bypass valve position, throttling valve position, etc. In addition, the status of the AO's is available over the communications link.

4. The VFD shall have built-in to its logic fifteen (15) blocks of adaptive programming capable of twenty (20) different functions. These blocks shall be connectable to drive actual signals and functions allowing the user to tailor the drive to the specific application requirements without additional hardware. These blocks shall be programmable through the standard operator panel and through the use of a Drive*AP* Microsoft Windows-based software.

H. A fiber optic communication port shall also be provided for personal computer interface. Microsoft Windows-based software shall be available for drive setup, diagnostic analysis, monitoring and control. The software shall provide real time graphical displays of drive performance.

I. Protective Functions

1. For each programmed warning and fault protection function, the drive shall display a message in complete English words or Standard English abbreviations. The five (5) most recent fault messages and times shall be stored in the drive's fault history.
2. The drive shall include internal MOV's for phase to phase and phase to ground line voltage transient protection.
3. Output short circuit and ground fault protection rated for 65,000 amps shall be provided per UL508C without relying on line fuses. Motor phase loss protection shall be provided.
4. The drive shall provide electronic motor overload protection qualified per UL508C.
5. Protection shall be provided for AC line or DC bus overvoltage at 130% of maximum rated voltage or under voltage at 65% of min. rated voltage and input phase loss.
6. A power loss ride through feature will allow the drive to remain fully operational after losing power as long as kinetic energy can be recovered from the rotating mass of the motor and load.
7. Stall protection shall be programmable to provide a warning or stop the drive after the motor has operated above a programmed torque level for a programmed time limit.
8. Under load protection shall be programmable to provide a warning or stop the drive after the motor has operated below a selected under load curve for a programmed time limit.
9. Over-temperature protection shall provide a warning if the power module temperature is less than 5 ° C below the over-temperature trip level.
10. Input terminals shall be provided for connecting a motor thermistor (PTC type) to the drive's protective monitoring circuitry. An input shall also be programmable to monitor an external relay or switch contact.

Specifications of NFLP VCB 3.3KV 100 A	
S.No	SPECIFICATIONS
1	TECHNICAL SPECIFICATIONS NFLP VCB 3.3KV 100 A
2	800 Amps manually operated trip free Vacuum Circuit Breaker suitable for operation on 3.3KV, 3 Phase, 50 Hz system rupturing capacity suitable for solid earthed neutral system and body of the equipment earthed as per CENTRAL ELECTRICITY AUTHORITY (MEASURES RELATING TO SAFETY AND ELECTRIC SUPPLY) REGULATIONS, 2010 for Electrical distribution purpose for use in tropical and humid atmosphere with an ambient temperature of 50^0 C.
2.1	**The circuit breaker shall conform to the following IS standards**: IS/IEC: 62271 – 100 : 2008 High Voltage Switchgear and Control Gear Part 100 Alternating current circuit Breakers - for general specification & Testing. IS:4821 / 1968 : for cable sealing terminal boxes with glands
2.2	The circuit breaker shall further comprise of the following:
2.3	**Enclosure** : i).Shall be made of 10 SWG M.S .Sheet out side and 14 SWG MS Sheet inside. ii).Degree of protection : IP-54 iii). Enclosure shall undergo a process of metal treatment comprising of degreasing, pickling, phosphating with latest treatment process and panel interior should be painted with white shade and exterior should be painted with light grey shade. iv) Lifting hooks: shall be provided. v) In Breaker isolated condition, provision should be made for Locking of Breaker with a pad lock. After locking of breaker by pad lock it shall not be possible to any person to switch on the power unless pad lock is removed. vi) Incoming & Out going shall be indicated on cable entry boxes.
2.4	1 – Set, through-going PVC insulated copper bus bar rated for 800A with proper bolting arrangement in a separate bus bar chamber. The connecting bars from Bus Bar to Breaker and Breaker to out going terminal shall not be less than 800 A current carrying capacity.
2.5	**Vacuum circuit breaker :** **Operating Voltage of VCB : 3.3KV** **Rated Voltage of offered Circuit Breaker: 7.2 kV or more**

	Rated Short Circuit Current : 25 KA or more **Current Rating of VCB : 800 A or more** Spring charged manually, fully draw-out type (Horizontal / vertical isolation) vacuum circuit breaker, closing & opening by manual / electrical in dust and vermin proof, heavy duty, metal clad enclosure, suitably for solid earthed neutral system. The circuit breaker should have mechanically & Electrically ON / OFF indication. O/C Trip indication and E/F trip indication shall be provided on the panel. Trip –Neutral – Close switch shall be provided on the panel. VCB mechanism shall be provided with OUT OF SERVICE / SERVICE indications When Breaker is in draw out condition Bus terminals and out going terminal shall be covered with auto closing Insulated shutters (flaps) The offered VCB shall be fully Type tested for all duty parameters (Test duty No: 1 to 5) conforming to IS / IEC 62271-100. The vacuum interrupters of the VCB shall be the same make & model as mentioned in the test reports submitted with offer of CPRI or CIMFR / /ERTL / ISM / or test house accredited by NABL at the time of supply.
2.6	Closing coil, Trip coil of the VCB shall be operated at voltage tapped from secondary of P.T through rectifier, capacitor circuit to make a D.C Circuit from the power of the PT secondary.
2.7	One set of Surge Arrestor with dis connectors to be provided.
2.8	**Overload relay:** Combined 3 Over current + 1 Earth Fault draw out type IDMTL Non-directional static type overload relay with setting range of 50% to 200% insteps of 10%, instantaneous high set element for short circuit protection is to be incorporated, to be able to set at 400% to 1000% insteps of 200% of the rated current. Make of relays : Megawin / L&T / ABB / C&S / JVS / Siemens
2.9	**Earth Leakage Relay:** 1 – Core balance transformer type earth leakage relay to operate at a primary leakage current of 2 Amps (adjustable in steps of 0.5, 1.0, 1.5 & 2.0 A), with time delay 0 to 1 Sec in steps of 100 milli seconds, with visual indication and a test circuit testing device, resetting device, and locking device shall be provided on the front door of the panel. The visual indication should be mechanically actuated. The earth leakage relay should be direct acting type and independent of overload relay and shunt trip device. The earth leakage relay shall not be of self re-setting type in all cases.

2.10	**Current Transformers:** 3 Nos., 2 - core, 3.3 KV class, Air Cooled Resin cast CTs having suitable burden and accuracy for protection and metering and shall comply to relevant IS. C.T Ratios : 100A / 5 – 5 , Burden : 15 VA Class of accuracy : Core- 1 : 5P10 for protection Core–2 : 0.5 for metering
2.11	**Potential Transformer:** 1 No. Draw out type, Resin cast, Three phase Potential Transformer with HT & LT fuses and of suitable burden 500 VA. And shall comply to relevant IS. PT Ratio : 3.3 KV / 110 V √3 √3 Accuracy class : 0.5 for instrumentation
2.12	**Meters to be Provided :** i). Ammeter (Size 144mmx 144 mm) suitable scaled to read twice full load current with selector switch for incoming of VCB and out going of VFD shall be provided. ii). Suitable Voltmeter (size : 144mmx144 mm) with selector switch for incoming of VCB and out going of VFD shall be provided. iii).Make of Voltmeter and Ammeter shall be AE / MECO / RISHAB / NIPPON iv) Digital Trivector Meter: class of accuracy: 0.5 preferred make: L&T / Crompton greaves / Meco
2.13	25 mm x 6 m copper Earthing bus shall be provided in side the breaker. So that all breakers are internally earthed when coupled the panels to form multi panel
2.14	**Mounting** : Floor mounted. The panels should be free standing and should have minimum possible height with 6” ground clearance.
2.15	**Terminal Boxes:** Suitable capacity of Terminal studs shall be provided in the In coming and Out going terminal chambers. Incoming cable terminal box with detachable sealing box should be suitable for compound filling shall be provided on the one side VCB panel . Out going cable terminal box with detachable sealing box suitable for

	compound filling shall be provided on the rear side VCB panel Cable terminal box and sealing box should be generally conforming to IS: 4821/1968. Each Incoming cable sealing box should be fitted with two nos double conical cable glands having two inner brass cones [one cone having provision for earthling] with an outer CI gland for armour clamping and suitable to receive 3.3 KV grade PVCDWA cable, 3 core, 95 sq. mm. section of copper conductor for incoming cable. Out going cable terminal box, sealing box should be fitted with two no,s double conical cable glands having two inner brass cones [one cone having provision for earthling] with an outer CI gland for armour clamping and suitable to receive 3.3 KV grade PVCDWA cable, 3 core, 95 sq. mm. section of copper conductor. Note : The cable glands should be as per SCCL drawing which is enclosed here with.
2.16	**The following are to be submitted along with offer :** a) Copy of Type test reports of VCB conforming to IS / IEC: 62271- 100 issued by Government approved laboratories/ CIMFR / CPRI /ERTL / ISM / or test house accredited by NABL. i) Dielectric tests - Dry power frequency test & Lightning impulse voltage with stand test. ii) Measurement of the Resistance of the main circuit iii) Temperature-rise tests iv) Short-time withstand current and peak withstand current v) Additional tests on auxiliary and control circuits vi) Mechanical operation test at ambient temperature vii) Short-circuit current making and breaking tests (test duty 1 to 5) b) Electrical schematic wiring diagram c) Make & model of Vacuum interrupters
2.17	Out going of HT VCB should be for the control of 3.3 KV VFD unit. Note: When Isolator of VCB is switched off there should not any power in VFD panel.
3.0	**NOTE :**
3.1	Provision should be made to prevent unauthorized persons opening the cover without the use of special tool or key.
3.2	All bare copper bus bars and conductors wherever air insulated should be epoxy coated or insulated to prevent flashover in adverse mining conditions.
3.3	All coils or relays and meters should be copper wound.
3.4	Schematic wiring diagram should be pasted inside the front cover.

3.5	Installation and maintenance manual should be supplied along with circuit breaker.
3.6	The circuit breaker should not become hot while in continuous operation at rated load.
3.7	Core balance transformer, current transformer, over load protection arrangement should be provided in the outgoing side of the circuit breaker.
3.8	**Then following should be supplied along with supplies**.
3.9	Dimensional G.A Drawing of panel and Electrical wiring diagram (both HT VCB & VFD) to be enclosed with each consignment.
3.10	Three sets of Routine test reports of panel shall be submitted along with supplies.
3.11	Technical Leaflet & Maintenance Manuals and spare parts catalogue should be sent along with each Unit.

WINDER MOTOR CONTROL:

PLC PANEL

PLC panel with relays shall be provided for digital I/P and digital O/P, analogue input / analogue output PLCs, CPU along with power supply unit suitable DIN channel. At least one power supply unit of suitable capacity shall be spare. The relays provided shall be of proper rating depending on load. As far as possible all the output of PLC shall be provided with relays. All the signals coming to PLC panel shall be through Profibus / Modbus / Ethernet / Profinet drop cables within ECR / rooms or by optical fibre cable intra premises only. In case if the sensors are connected using control cable the same shall be terminated at a convenient location in a junction box and the signal shall be communicated using distributed I/Os only. There are certain signals from loading point which will be required to communicate with relay panel. In these cases proper design shall be made so that slave PLC is not required and communication can be carried out if required using distributed I/O. Complete licensed software with run time shall be provided along with generation of various alarms, graphs as per requirement, reports etc. in excel format to be stored for at least 40 days. While designing, provision for at least 30% extra digital I/P and digital O/P shall be made. Care must be taken to provide analogue input and digital output PLCs for operation of winder.

SCADA PACKAGE

The SCADA package shall be provided for operation of winder. A Touch screen monitor kept in front of operator shall display continuously the position of cage with various faults e.g. over wind, over hoist, gate close, gate open, Keps In , Keps Out, speed of winder, levels, date real time. The SCADA shall display alarms and loggings of winder. The SCADA shall be receiving various faults of drive and the same shall be displayed in monitor as faults and initiate alarms. The Supply voltage and current shall be displayed and recorded. It shall record the total operating time in each shift with number of cages hauled. The daily consolidated report shall be stored for 40 days for analysis. The SCADA package shall provide Speed versus time, current versus time, voltage versus time, voltage versus current graphs and shall store the same for further analysis. The energy consumed daily, shall be logged and record shall be made available for monthly unit consumption against operating hours. All necessary required software with license shall be handed over to company after commissioning of winder, which will be property of company.

AUTOMATIC CONTRIVANCES, SAFETY DEVICES FOR WINDER USING VARIOUS SENSORS

The hoist shall be protected from over travel/over wind (Travel of a conveyance past the planned/programmed stopping) and over speed (speed more than that required or programmed for any particular point at the travel in the shaft). Over travel and over speed can cause serious/fatal injury to men and damage to equipment. Hoist controller (automatic contrivances) provides for the following controls:

i) To prevent over speeding in hoisting and lowering;
ii) To sound an alarm and shut off the motor when normal speed is exceeded;
iii) To initiate brake application if the winder speeds at any point of the wind exceeds the designed cycle speed, i.e. shadowing the winding cycle;
iv) To warn the driver when to commence retarding the hoist and stop it if the warning is not heeded;
v) To give warning followed by brake application if the predetermined retardation rate is not conducted;
vi) To prevent the conveyance from using hoist beyond limits, for which the controller is adjusted;
vii) To cut off the power supply and apply the brake if the hoist is started in a wrong direction;
viii) To prevent the conveyance from being landed at a speed greater than 0.5 m/s.

OVER SPEED AND OVER TRAVEL PROTECTION

Conveyance speed shall be monitored throughout the shaft travel by way of continuous supervision of speed, over speed, current and reverse run supervision.

The speed reference value assigned to each shaft switch mounted at a particular depth compare with actual speed value thus giving the point by point speed supervision.

All the levels should provide with mono-stable magnetic switches for sensing the cage position. Magnetic switches shall be provided at over-wind position to operate for instantaneous hydraulic brake / Disc brake in case of over travel.

The winder controller should also trips the safety brake on sensing the over travel of the cage thro counting the pulses and comparing with the designed & set reference number of Pulses.

Provision shall be made for testing of over speed, over winder as required under various regulations of CMR-1957.

Supervision of Shaft Switches:-

All the shaft switches mounted on the cage side must be supervised to avoid the false operation, when cage is coming up, all the shaft switches of cage side must work in correct sequence and vice versa for down direction. The false operation of any of the shaft switches for selected direction should generate shaft supervision fault.

The automatic contrivance shall be designed based on PLC & robust & rugged field sensors, exactly functioning like a Lilly Hoist Controller shall be used. Its principle of operation is based on the coordinated movements of governors and cams – The governor following the hoist speed and the cams following the relative position of the mine cage. The system will incorporate disk operated signal generator with multi holes to give accuracy of the order of 0.10 mm. It will be programmed in such a way to closely monitor the positioning of cages in shaft; position at landing levels/required places, slow banking zone & acceleration zone with respect to time. The position shall be displayed on SCADA mimic to driver. Hoists handling both men and material are to be provided with automatic safety equipment arranged to function at will, for men or material. “Man safety equipment” ensures safe permissible man riding speed and stipulated acceleration/ retardation (less than or equal to 0.75 m/s/s), and hoisting up to man landing station which may be other than the material dumping level. This unit usually is engaged and disengaged by a hand lever placed within the reach of the hoist man. The winder is provided with clutch for both drums.

It means both the clutch units have proper interlocking provision with brakes. The clutches must be always interlocked to prevent brake release and the clutch release simultaneously. Declutching should be only possible when the brake is in 'ON' position (To fulfill DGMS guidelines) Interlocking provision shall be provided in winding system so that the winder will start only when:

a) The keps are withdrawn from all the levels

b) The gates of shaft top and bottom are in closed condition.

A field sensing device shall be incorporated to monitor and give warning due to slack rope and rope slip to the winding engine man and effect tripping. (may be due to non withdrawal of keps, folding platforms or due to other obstruction in a shaft). Ultimately all such signals from field shall constitute input for PLC & logic shall be developed through program to suit our requirements. Winding system shall be provided with suitable buffers accept a cage fully loaded with men striking them at a speed not less than 1.6 m/s up to 3 m/s and to retard the cage at a maximum retardation rate of 1g, (i.e.9.81 m/s/s) and a peak rate which at no point will exceed 2.5 g. The ascending cage is protected by the detaching hook. The winder should be brought to rest by safety devices when movement of the conveyance does not coincide with the drum or sheave. In the field of shaft signaling provision should be made to enable shaft's men to transmit signals efficiently from a conveyance to the surface from all positions in the shaft. Shaft signaling system should be provided with visual indication of "stop – false signal" to cater for the receipt of a signal by the engine driver which has not been transmitted by operation of either the banks man or setter's signaling apparatus. Rope speed indicator, head frame mounted limit switch & proximity switches or induction sensors, operated directly by conveyance, over wind catches in the head frame, brakes inter locking, and shaft signal and communication etc. are part and parcel of the safety devices with winding systems.

EMERGENCY SIGNALLING- CAGE WINDER

Similar to cage emergency signaling, each level box is to be equipped with an emergency stop PB and an emergency lamp indication. On pressing the emergency stop PB the emergency hooter starts sounding and the winding is terminated. Under the emergency signaling, auto winding and signaling system doesn't work and the winder is operated manually

FIELD INPUTS REQUIRED FOR PLC PANEL

Various field inputs required have been described under the heading of automatic safety contrivance. However to streamline, the various control signals required for smooth operation & safety of winder have been narrated with further details as under:

i) Over hoist signal for left & right drum through heavy duty limit switch of normally closed type. A separate provision through proximity switch shall be provided in addition to limit switch. Separate control cable of 2.5 sq. mm /required size shall be laid for left & right limit switches up to Junction Box. It shall be integrated with signal generator to sense accurately over hoist position & to trip the system.
ii) Over wind signal for left & right drum through heavy duty, normally closed type proximity switch shall be provided in addition to limit switch. Separate control cable of 2.5 sq. mm/required size shall be laid for left & right limit switches up to PLCs. It shall be integrated with signal generator to sense accurately over hoist position & to trip the system.
iii) In the event of either over wind or over hoist, PLC shall be programmed in such a way that direction of travel automatically reverses irrespective of driver's selection of forward or reverse.
iv) Since over winding signal will be received through signal generator/shaft encoder, logic shall be developed, to bypass the system so that driver can clear over wind.
v) In case of over hoist, which will be set at a higher level than over wind, the motor should trip & shall not be operable until & unless pass word is entered through PLC.

vi) Speed of the winder shall be continuously monitored through encoder / tachometer, and centrifugal switch. In the event of high speed, system should trip automatically. However it should provide audio visual alarm at required setting to indicate higher speed before tripping.
vii) Inputs from hydraulic system, solenoid valves etc. shall be taken to PLC to provide drive command if the system is healthy.
viii) Field sensors shall be utilized to sense the actual physical contact of brake band with brake drum. In case, if the brakes have been applied but brake shoes have physically not actuated, the system will automatically apply the electrical brake, holding the loaded cage.
ix) Both the clutch units shall be provided with suitable interlocking.
x) Transition of speed from slow banking zone to acceleration zone and acceleration zone to slow banking zone shall be smooth.
xi) Provision of properly designed thruster brake shall be done to operate in emergency in conjunction with electrical braking. The system & logic shall be designed in such a way that in the event of failure of mechanical brake, thruster brake will be applied immediately..
xii) Proper parameterization shall be done while commissioning the cage so that there is no tendency of the loaded cage side to travel downward, while releasing the brake.
xiii) Inputs from all the field devices shall be brought to PLC using PROFIBUS / MODBUS / ETHERNET CABLE to facilitate programming as per requirement.
xiv) Inputs for recording speed versus time, trips versus time, load hauled versus time shall be connected to PLC, so that it can be integrated to software for generation of report & meeting statutory provisions.

The winder motor control unit shall comprise of speed regulator system. The speed of the winder motor shall be controlled through this speed regulator. The speed regulator system shall be capable of regulating the changing torque of the motor by adjusting the frequency of the motor operating the winder. The adjustment of frequency shall be done as per the requirement of motor torque through VFD controller. The control unit shall also sense accurately the commencement of winder operating cycles.

WINDER INTERLOCKING

GENERAL

Interlocks required for Manual/Auto operations of winder should be done in winder interlocking. This shall cover the following.

- Auto selection / Manual selection
- Men winding / material winding / shaft Inspection / rope inspection selection
- Auto start ready conditions, auto start command
- Conveyance up reference
- Brake close / open conditions
- Brake auto command / Brake manual command
- Enabling speed regulator, current regulator

MODE OF OPERATIONS

The operator shall select mode of operations and winding type using the following selector switches mounted on the control desk.

Auto / Manual selector switch : For selecting mode of operation
Men / Rope inspection / shaft : For selecting type of winding inspection selector switch
Normal / Emergency selector switch : This switch is put in normal mode for hoisting.

Over speed operation for testing purpose:

Selection should be done only if the following pre-conditions should also to be satisfied.

- Control lever shall be in applied position
- Brake shall be applied
- Winder shall be at zero speed

For auto winding selection, the following additional conditions should also to be satisfied.

- Auto mode shall be selected in the operator desk
- The Conveyances shall be at loading / unloading station.
- Emergency operation shall not be selected
- Back out PB shall not be pressed

Winding is to be done in manual mode if manual mode to be selected in the operator desk.

Selected mode shall remain latched until the other mode is selected even if initial conditions change. Rope inspection and shaft inspection shall be done only in manual mode. Rope inspection and shaft inspection shall be done when the selector switch is in corresponding position only in manual mode. Mode and winding type selected shall have to be indicated on the operator desk.

PRE-START CONDITIONS

Following conditions shall have to be met before AUTO/MANUAL START of Cage is commenced.

- Safety circuit shall be healthy.
- Hydraulic pump shall be in running condition / Hydraulic Pressure shall be OK.
- Type of winding
- AUTO/MANUAL mode is selected.

CAGE OPERATION IN AUTO MODE

A. In the Automatic operation mode, the start command from any level should be possible when following conditions are fulfilled.

1. Pre-start conditions OK
2. Auto Start Locking circuit is ready
3. Men winding is selected.
4. Level gates are closed and winder is not locked.
5. Cage direction of movement is registered.

B. Cage Direction of movement

The Cage direction is to be based on whether the Cage is stationed at top most level or bottom most level. The direction signal shall have to be registered when following conditions are OK.

> Auto Mode is selected.
> Safety trip push button is not pressed.
> Brakes are ON.
> Destination signal from any level is given.

The direction of Cage movement is to be selected in the software based on the different requests from various levels. The direction signal is to be given to drive regulation for speed direction.

C. Auto Brake Open/Close Command

Brake Auto command for Open / Close shall have to be effective when

1. Brake hydraulic pump is ON / hydraulic pressure OK.
2. Auto mode selected.
3. No emergency signaling.

The brake open reference in Auto mode shall have to be released with the above command and with the following conditions.

Auto signaling from cage operator is received.

Auto Start locking conditions are fulfilled and Auto Start command is given.

Brake is applied (Brake ON monitor switch).

The Brake open command remains latched unless the conveyance reaches the other level.

Or emergency signal is ON

Or Safety circuit is OFF, provided the winder speed is zero.

If any of the above conditions occur, the brake close command shall be effective.

D. Auto Speed & Current Regulator Deblocking / Blocking.

a) Speed regulator enable command in Auto mode is to be given to the drive regulation when auto Brake open command is ON and also Safety circuit is ON.

b) Current regulator enable command shall be given to Drive regulation with time delay after Speed regulator is deblocked provided AC contactor is ON. Speed regulator is blocked if

1. Safety relay has tripped and
2. Or Brake close command is ON.

MANUAL OPERATION OF WINDER

a) In manual mode, the operator shall operate the winder through control lever situated on the right pedestal.
b) In manual operation, following sequence and interlocking shall follow.

1. Type of winding is selected.-Men/Material/Rope/Shaft inspection.
2. Manual mode is selected.

c) With the above selections speed reference in manual mode for men winding, material winding, rope or shaft inspection shall be formed in drive regulation.

A. Brake manual command

This signal shall release the Brake lever in manual mode. The signal shall be obtained when following conditions are fulfilled

i) Hydraulic pump is ON / hydraulic pressure OK.
ii) Winder is not locked.
iii) Gates are closed.

The above lock out conditions should be fulfilled before each start of the wind. When the above conditions are OK the Brake lever is to be released. The initial conditions are bypassed when the Brake pressure is high (Brake OFF).

B. Speed Regulator Release

In manual mode, the speed regulator is to be enabled when

1. Safety circuit is healthy.
2. Manual mode is selected.

Brake lever is in released position
Current regulator is to be enabled with time delay (similar to Auto operation).
The Regulator shall be blocked if safety circuit is tripped. The current regulator is released / blocked as explained for auto operation.

Speed Reference.

The control lever is also to be moved by the engine driver as the brake lever is to be released. The output of the control lever provides the speed reference which is limited to the preset speed reference based on selection or type of winding i.e. men winding, rope /shaft inspection.

The Operator watches the ""requests for cage"" requested from various levels / Banksman in the HMI provided on the desk, and he operates the lever forward or reverse for UP and DOWN direction of the Cage.

Blocking device

The speed regulator shall be equipped with a suitable blocking device as per the requirement of winder duty cycle. The blocking device shall be operative at the time of braking action of the winder or any fault either electrical or mechanical type during the winder operating cycles.

Electrical Braking

The winder braking action shall be through a suitable system as dual control, Zero speed full torque and stationery thruster braking system provision.

Drive Protections:

a. Over speed protection of the motor
b. Over temperature protection
c. Protection required for the motor during regenerative operation
d. phase loss protection

EXISTING SIGNALLING & COMMUNICATION:

- There is two independent distinctive and definite means of transmitting signals between top of the shaft and the landings in the shaft. The Electrical Signaling Bell confirming to DGMS Stipulations, shall be interlocked between the landing level and mid landing to avoid confusion and bell collusion, if any, and shall consist of :

- Audio-visual and telephonic communication between the on setter at insets, banksman, pit bottom and the winding engine operator should be provided. Signaling system for cage hoisting should ensure sending and receiving of audible and visual signals during transportation process.

- All signaling and communication equipment should be certified to meet the stringent safety requirement applicable to coal mines and should be sufficiently rugged, reliable and damp proof.

- Dust proof communication and signaling system should be provided.

- System should be modular in construction.

- Provision of telephone communication also should be retained.

Cables to be utilized should be matched with requirement of the system and shall be suitable to be used in underground coal mines. Further, there shall be left with additional spare cores in equal numbers for future requirements.

The existing signaling system do not fulfill most of the above requisites.

The bidders are requested to fulfill all the above requisites by incorporating the missing links.

SIGNALLING SYSTEM

The signaling system for communication between master banks man, banks man at different levels & winding engine driver shall be provided. The system should be capable of providing signal for 5 different levels including surface. A brief out line of system has been given below.

All the signals generated from underground as well as loading station shall be received by master banks man on surface. In turn, master banks man will give signal to driver to raise /lower the cage as per requirement. Master Banks man control desk will be provided with LED/LCD display in Alphanumeric along with visual indication. The master banks man has the option to choose a particular level from which he wants to communicate. The moment he chooses a particular level for communication, all the incoming audio signals are received from a bell. Audio Signals from other levels are received through buzzer. Visual indication has been provided for all the levels. Master

Banks man passes the signal to Winder driver through no. of raps of bell. Winding engine driver shall also have audio visual panel to receive signals from different levels through Master Banks man. The visual indication at both the panels can be reset. The driver panel has indication for KEPS “ON” and “OFF” indication for all the levels. In case, if any of the KEPS is in “ON” position the lamp of that particular location shall glow indicating that it is dangerous to operate winder. However in case of Master Banks man he can only see whether any of KEPS is in “ON” position. The wiring shall be done in parallel so that even if one the KEPS is on condition, the KEPS “ON”, indication will glow indicating a danger.

The system shall be designed operationally as mentioned above (The bidders shall alternatively but shall not interfere with any of the safety requirements). However the LED/LCD visual display should be available for all the levels in alphanumeric form. The display will be in the form of no. of raps such as 3-1 (three raps and then pause & one rap) along with appropriate message such as “LOWER FOR MATERIAL HANDLING” etc. Each rap has different message such as rap 1 means “STOP” etc (code of signals).

Each level shall be provided with signaling box of suitable size to generate signal to Banks Man from each level including surface. These boxes shall be provided with push button to generate signal, electronic bell, and selector switch to select a particular level if a miner wants to visit. Since complete signaling system shall be through distributed PLC all other signaling cables from gate open close, Keps on / Keps off shall also be terminated in the box. Enclosure for generating signaling and selection of particular level shall be enclosed in a separate box. Distributed I/Os and termination of cable for gate and Keps shall be enclosed in a separate box. These boxes shall be IP 67 protected.

The existing signaling system between Banksmen and Onsetters do not fulfill most of the above requisites.

The bidders are requested to fulfill all the above requisites by incorporating the missing links.

CONTROL DESK:

The controlling of the winder shall be effected by the Winding Engine operator from a desk which shall be provided with following facilities to the driver:

- A clear view of stopping marks on the drum or winding rope and of the depth indicator.
- Indication of rope speed and winder motor current
- Indication of the state of switchgear and other safety circuits etc.
- Emergency stop.
- Resetting the winder after emergency trip.
- Manual / Automatic control of the winder speed and mechanical brakes.
- Remote control of the switchgear.

SPECIFICATION OF CONTROL DESK FOR WINDING ENGINE DRIVER

i) Control desk shall be designed ergonomically.
ii) Modern rugged contact less Multi axis Joy stick from Gessmann, model no. VV6/ Reputed make.
iii) It should have auto /manual mode of operation.
iv) The panel will be provided with bright lit coloured digital panel meters for stator current, stator voltage, digital rope speed indicator, etc.,. All the panel meters will be 96 x96 mm size.
v) Audio visual alarm for high speed indication.
vi) Distinctly different audio visual alarm signal for slow banking.
vii) Push buttons to start & Stop Hydraulic Pumps with interlocking arrangement so that if one pump fails the other pump shall be automatically switched on.
viii) Drive on command.
ix) Over hoist indication.
x) Over wind indication
xi) Foot operated switch to bypass over wind during testing.
xii) Hydraulic pressure on indication.
xiii) Drive trip under over load indication
xiv) Drive under electrical braking indication
xv) Thruster brake ON indication
xvi) Drive “ON” / “OFF” glow type push switches
xvii) Emergency Push Button switch
xviii) Speed selector switch
xix) Forward /Reverse switch
xx) Speed control lever
xxi) MCBs for light /fan control
xxii) Touch screen Monitor based mimic screen displaying exact positioning of both cage with distance in respect to surface & Weight of loaded Cage.
xxiii) Communication terminal with a hand set as well as head set.
xxiv) Testing arrangement to test winder for tripping after applying left hand brake band, right hand brake band, the brake band, tripping due to over speed, over hoist, over wind, both and individual brakes, testing for single phasing etc.
xxv) Lamps indicating “KEPS IN “ / “KEPS OUT” / “GATE OPEN” / “GATE CLOSE” for all the levels. Display for maneuvering cage at different level after receipt of audio visual signal from master banks man. All the levels where cage has to be taken will be represented by a LED lamp for UP as well as DOWN movement, indicating clearly the level where winding engine operator has to stop the cage. A separate push button shall be provided for communicating with Master Banks man and push button for resetting the LED lamps for level where cage has been already attended.
xxvi) Any other indication necessary for safe operation.

The existing system on the control desk of Banksmen do not fulfill most of the above requisites.

The bidders are requested to fulfill all the above requisites.

LT SWITCH BOARD AND OUTGOING CONTROL PANEL:

A suitable LT switchboard with control panels, indoor type for operating the winder shall be included in the interfacing of NEW PLC system. The switchboard is provided with Air circuit breaker panels. The panels are made of steel sheet fabrication 10 SWG, dust and vermin proof, free standing and floor-mounted type. There exist sufficient reinforcement to have level surfaces resistance to vibration, rigidity during transportation and installation. The panels are designed to withstand stresses that may set up in dealing with short circuit conditions. The panel board are sectionalized and extensible on other side.

TESTS:

All tests for the electrical equipment should be as per relevant Indian Standard Specification (ISS) electricity rules or its equivalent and necessary certificates shall be enclosed.

I. SAFETY FEATURES: Following safety features which are already incorporated in the system shall be tested and confirmed for its effective functioning and should be retained and interfaced with NEW PLC system:

In case if the same is not provided or not functioning effectively the same need to be incorporated and interfaced with NEW PLC system.

i) Speed indicators
ii) Speed recorder
iii) Independent indicators showing the position of each cage in the shaft.
iv) Automatic contrivance to prevent over-winding, over-speed, for power supply failure, emergency stop, low brake oil pressure and to ensure slow banking
v) Men & material winding-The indicators and settings are to be provided in the contrivance for men, material winding and Inspection mode.
vi) Limit switches are to be provided in the contrivance and the headgear to prevent over winding.
vii) Protective arrangements to prevent the winder from being started in a wrong direction.
viii) Audible signal to indicate when the cage is at a distance of not less than two revolutions of the drum from the banking position.
ix) INTER-LOCKS:
    a) Inter-locks between gates at the banking level
    b) Keps inter-locks to prevent winder being started without withdrawing keps.
    c) The brakes and the gear clutch of the floating drum.
    d) Service and emergency brake.

II. Brakes:

i) Service Brakes and safety brakes operated by hydraulic system.
ii) In addition a brake on the motor coupling should be provided.
iii) The deceleration caused by the application of the safety brakes should not be less than 1.5 m/sec^2 or more than 4.5 m/sec^2
iv) Drive braking feature should also be provided.
v) Braking system should be capable of dealing with situations like:
    1. At the time of rope changing.
    2. Raising loaded cage above banking level while the other cage is resting at the pit bottom staging.

    At the time of disengaging the gear clutch of the floating drum.
vi) Brake path wear: Limit indicator and inter-lock to prevent release of brakes in case of excessive wear of brake lining.
vii) Emergency Brake:

In the following cases, emergency stop need to be achieved by the automatic action of the main brake and/or the auxiliary brake to bring the winder to a safe and accurate stop.

a) Over-winding and under winding
b) Over-speed
c) Over-load
d) Trouble of electric power or other electrical trouble
e) When winder does not decelerate at the point it should
f) Pressure drop of brakes power oil
g) Wear of brake shoe/liner beyond the permissible limit

III. Guards:

Necessary guards shall be provided for all moving parts. Easy approach must be available for inspection and maintenance purpose (Safety inter locks shall also be incorporated for any mishandling or inadvertent entry).

CABLES

Power cables, control cables, screen cables and profibus communication cables for the complete project are to be procured and provided by the successful bidder as per the cable scheduling. The actual lengths of the cable are to be calculated jointly by the successful bidder as per the equipment layout and routing of cables. Power cable, control and screen cables are to be laid in separate trays. Communication cables are to be laid in metallic conduits. These should be executed as per relevant IS standards, Electrical Rules, Act & Relevant DGMS requirements.

OTHER CONDITIONS:

i) The winder must confirm to all the requirements of the coal Mines Regulations, relevant DGMS circulars and other statutory requirements as applicable to Indian coal mines.

ii) The equipment shall be of robust construction and manufactured as per up to date engineering practices duly complying with relevant Indian Standard or equivalent International Standard. It will have inherent design features so as to give satisfactory performance in adverse loading conditions also.

iii) Painting/Coating:

Two coats of preventive/ anti-corrosive, & two coats of finish painting shall be given. Colour of the finish painting shall be as per customer's choice. During installation, any abrasion in shop coat shall be touched up with the same quality of paint as the original coat.

iv) Compliance with Standards:

All components, material and equipment used will comply in general, with relevant Indian or equivalent International Standards and in particular to the specifications furnished.

Speed Chart recorder:

This shall be provided in SCADA monitor with the following;

1. Digital recording of the speed of winding engine at every second.
2. The speed indicator shall indicate the speed continuously.
3. The equipment shall be provided with a 5KVA UPS such that there is no interruption during failure of regular power. In addition to this alternative power supply arrangement is provided to the Winding Engine control including to the Speed Chart Recorder. In this unit the clock circuit shall sustain for minimum 10 years(8 hours operation per day).
4. Scanning and recording of the stored data in minimum time shall be ensured.
5. The instrument shall be designed on an indoor instrumentation panel for use.
6. This shall confirm to international safety standards with safety class-1 with protective conductor terminal, over voltage category-II, and pollution degree-2.
7. This shall be electronic point by point speed supervision, mutual supervision of actual speed transmitters, with fast variable signals (Transient) with fast response and continuous writing type of recorder and absolute value detector.
8. This shall be provided with indication and recording of maximum speed.
9. The working voltage shall be universal, AC, 50Hz.
10. The equipment shall be provided along with instructions regarding proper use, care, operation & Maintenance manual.
11. In case the instrument is of foreign make, either DGMS approval /exemption/fulfilling DGMS stipulations shall be obtained by the firm and submitted to SCCL.

Existing Power brakes Information.

A. The existing service brakes have the following features.
B. The service brakes provided on both the drum flanges is of caliper brakes and designed to remain 'ON' and are released only on operation (hydraulically operated with power packs).

C. A suitable power pack for supply of required hydraulic pressure is provided for smooth operation of the brakes.
D. Solenoid valves are provided as an electrical interlocking for the brake operation. The Solenoid valves also acts as an emergency stop valve to cut off the Hydraulic power supply to the brake in emergency such that the brake falls to 'ON' position during power failure, tripping due to any circuit fault etc. & is interlocked with the automatic contrivance and clutch interlocking
E. The brake engine controlling valves are operated with hydraulic power packs.
F. The emergency brake provided on the motor and gearbox shaft input couplings are arranged in such a way that the brake is applied automatically & smoothly at all times when the power supply fails or put off.
G. When the cage reaches top / bottom most landing, brakes shall apply automatically. The electrical braking circuit is to be incorporated accordingly in the winder circuit.

All the levels are to be provided with mono-stable magnetic switches for sensing the cage position. Magnetic switches are provided at over-wind position to operate for instantaneous brake in case of over travel. The winder controller also trips the safety brake on sensing the over travel of the cage thro counting the pulses and comparing with the designed & set reference number of Pulses.

Automatic Contrivance:

The Automatic Contrivance to be provided as an in-built package along with the winder control system shall have the following features to safeguard over-speed, over-wind and for slow banking.

1) Adjustable over-winding protection on the Headgear, Depth indicator and also in the programmable Logic Controller (PLC).
2) Speed selection mode for shaft inspection, rope inspection, Over speed testing mode and normal mode.
3) Slow banking activation through Magnetic Sensors provided at 4 places below the Shaft collar from certain depth to reduce the speed to 75%, 50%, 25% and Zero% i.e., while the ascending cage approaches up to certain depth from the platform, a warning bell shall ring and the rope speed shall be reduced to 75% of the set speed and further reduced to 50%, 25% and finally to zero speed in stages before it reaches to the top landing, i.e. the winder speed shall be nil at '0' level platform.

This Auto slow banking shall be smooth, jerk free and failsafe.

4) Inching (creeping) up to 30cms above '0' level shall be provided to accommodate seating of the cages on the keps. Programming shall be done in the PLC for only 30cms, inching. Beyond this point the cage will not go up. Even in case if the cage goes up beyond this point, the magnetic sensor switch provided on the headgear at such a distance, i.e. 1mtr above the top of the cage while the cages are at '0' level, shall sense the presence of cage at that level and shall trip the winder circuit thus stopping the winder movement instantly. This shall be an additional software protection provided.
5) The speed of the winder motor shall be controlled in automatic mode as well as in manual mode
6) The actual motor speed feedback signal shall be obtained from the Pulse Encoder (Pulse Tacho) mounted on the motor shaft and compared with the speed reference in the speed regulator.
7) During Automatic contrivance operation, the motor speed reference shall be derived from Digital mine winder controller. Mine winder controller shall give reference value and reduces it in decelerating zone to stop the motor smoothly at desired level or at end positions.

8) Reversible arrangements provided in the winder controls shall help the operator to run in reverse direction and to stop the motor with the help of electrical braking. Motor torque reference shall be modified automatically depending up on the requirement of torque at that movement.
9) Conveyance speed shall be monitored throughout the shaft travel by way of continuous supervision of continuous speed, over speed, current, and reverse run supervision.
10) All the landing levels shall be provided with mono-stable magnetic switches for sensing the cage position. Magnetic switches shall also be provided at over-wind position to operate for instantaneous brake in case of over travel. The winder controller shall also trip the safety brake on sensing the over travel of the cage through counting the pulses and comparing with the designed & set reference number of Pulses.
11) Over speed protection with either T 400 cord/ or suitable arrangement through pulse Encoder (Digital Pulse Tacho) provided on the Drum Shaft and the Motor Shaft or any other means.
12) Once the cage reaches the slow banking zone, the warning bell provided on the Operator's Desk shall activate for 5 seconds loudly.
13) Provision shall be made for resetting after the stopping/Tripping.
14) Over wind & Over speed trippings shall be incorporated in the safety circuit interlocking with both service brakes & Emergency brake and there shall be foolproof testing arrangements as required under CMR 1957.
15) During tripping due to over speed and over-winding, the hydraulic circuit and electric power shall be cut off and the brake on the drum and motor gearbox coupling shall be energized instantly and automatically.
16) The speed Regulations at various zones shall be incorporated as per the provisions of Reg.No.76 (7) of CMR 1957.
17) The solenoid valves shall be provided to stop/flush the hydraulic oil/ feed and smooth braking shall be totally protected.
18) Digital Displays shall be provided in the Operator's panel for displaying speed, Depth, Position of Magnetic Sensors, Automatic & Field current details.
19) The Winder Operation / Brake release shall be interlocked with cage gate operation, Keps Operation, Transformer condition, Drive regulator, mode selection, Registering the Cage direction, signal transmission, hydraulic pressure, motor protection, Clutch interlocking etc.
20) The electrical brake incorporated in the winder circuit shall apply automatically as and when required.
21) The equipment shall have the required testing facilities for Over wind & Over speed as per various Coal Mines Regulations of DGMS.

WINDER – REQUIREMENTS ELECTRICALS SUPPLIER LIST

Sl no	Item	Specification	Make shall be from
1.	Winder motor	Existing Motor: 3300V, 285/420kW, 365/735 RPM 3 Phase Slip Ring Induction Motor Make : ELLEN 100% continuous load and 160% for 60 seconds.	Existing ELLEN make Motor.
2.	electrical drive for Winder--- **Variable Frequency Drive along with PLC**	3.3KV VFD – AC Drive panel to run the above Motor with Microprocessor based, CPU with sufficient digital input/digital output module and analog input and output module with required power supply, with control and current transformer, with all digital indications, PLC logics and field devises required for man winding system as per the description detailed and SCADA PACKAGE as per the description given.	**3.3KV VFD Make**: ABB/ Siemens/ Schneider/ vegan / Parker / Rittal **PLC Make**: Reputed make

Sl no	Item	Specification	Make shall be from
3.	Winder operator desk with AC cabin	Main control desk and left side and right side control desk. With windows annunciation, joy stick etc., as per the description detailed.	GESSMAN make joy stick or any other equivalent Reputed make.
4.	Power Cables for Motor / Drive	PVC DWA Copper of 3 core suitable cross section	Polycab / Universal / RPG /CCI / NICCO / NETCO /KEI/ or any other Reputed.
5.	Control/Signal Cables for PLC / Motor / Drive	SWA Copper multi-core suitable cross section as per engineering from 0.1 sq. mm to 2.5 sq. mm	MEM / Polycab / Universal / RPG /CCI / NICCO / or any other Reputed.

SINGLE LINE DIAGRAMS

a. Single line diagrams and drive configuration shall be submitted.

b. Line diagrams of the control panels, equipments, operation manuals, test certificates, cabling schedule, wiring schedule of control panels should be supplied by the successful bidder.

FACILITIES TO BE PROVIDED BY THE COMPANY.

1.0 The Company shall provide the following facilities to the Successful bidder.

a) The required Electrical power will be supplied free of cost at the work site on surface, Mid landing and at shaft bottom at single point. However, the Contractor shall make arrangements to distribute and stabilize the voltage, if necessary to counteract any fluctuations of drop on the voltage of the electricity supply.

b) Space for godowns / stores free of charge:

c) Industrial water and potable water will be supplied at free of charge on surface.

d) Unfurnished **residential housing** facilities (2 Nos. NC Type quarters or equivalent suitable for officers & 02 Nos.- T2 Type suitable for supervisors) will be provided on rental basis subjected to availability. For the above accommodations, rent, electricity and water charges along with taxes including Service Tax if any, as applicable from time to time will be levied and shall be deducted from their RA bills. The successful bidder shall maintain these residential accommodations properly and hand over back in good condition to SCCL after the contract is completed / terminated. It will be the responsibility of the contractor for making other arrangements at his cost.

Persond deployed at work site shall have vocational training at VTC and medical examination @ Rs.15/- & Rs. 2500/- per head respectively., subject to the existing practices of the S.C. Co. Limited.

The Company shall provide the following additional facilities, in addition to the above, free of charge, to the Contractor.

Cap lamps and flame safety lamps for the Contractor's workers and supervisory personnel, shift wise from the nearest mine. The number of Cap lamps and flame safety lamps to be provided to the Contractor shall be determined by the GM, KGM Area or Agent, UG Mines, KGM Area.

The Contractor shall ensure that the cap lamps are duly returned, in proper condition, to the cap lamp room at the end of each shift. For any damage to, or loss of, any cap lamp by the Contractor's men, the Contractor is liable to be charged, by the Company, at rates to be fixed by the GM, KGM Area.

Statutory supervision, such as Under Manager, Pit Engineer, Electrical supervisor, Overman/ Mining Sirdar to carry out statutory supervision wherever and whenever required shall be provided by SCCL.

Insurance against accident to workmen:

The Contractor shall, at all times during the currency of the Contract, indemnify the Company against all claims, damages or compensation in consequence of any accident or injury to any workman or other person in the employment of the Contractor/ any sub-contractor in the Contractor's employment, under the provision of the Workmen's compensation Act or any other law relating thereto and shall take out an insurance policy covering all risks, claims damages, compensation, proceedings, cost charges and expenses, whatsoever in respect thereof, payable under the same.

Provided always that in respect of any persons employed by any sub-Contractor in the contractor's employment, the Contractor's obligation to insure as aforesaid under this sub-clause shall be satisfied if the sub-contractor has insured such that all the Contractor's obligations under this clause are fulfilled.

The Company shall not be bound to contest any claim made against it under section 12, sub-section (1) of the Workmen's Compensation Act, except on the written request of the Contractor or upon his giving to the company full security for all costs for which the company might become liable, in consequence of contesting such claim.

***Eligibility criteria of the Vendor**:*

Part 1 –General

1. Supplier or his authorized system house must have execution reference in Global/Indian installation and commissioning of mine winder projects.
2. Supplier should submit following documents during submission of Tender:
   (a) Supplier should produce Purchase order of earlier executed similar work of Mine Winder of 250 KW or more with VFD control.
   (b) Performance Certificate of satisfactory working of minimum 2 years after commissioning of the winder.
   (c) Previous Customer contact details along with concerned personnel's phone numbers.
3. Considering criticality of mine winder application drive should have redundant operation facility and user friendly, easy maintenance.

The bidders must have its service center with qualified technical personnel in southern region, preferably in Telengana, AP and around Chennai / Bangalore to provide after sales service. The same should be mentioned along with address and contact numbers in the technical bid.

The bidder has to give a written undertaking to provide service and spare support through AMC after expiry of guarantee period, for next four years, at mutually agreed terms. The same will be counter guaranteed by the OEM, if applicable.

In case the bid is from a channel partner, the OEM shall provide counter guarantee in writing, for timely supply, installation and commissioning of the supplied system and also for guarantee, warranty and arrangements for supply of required spares etc. for the next 10 years.

All the above documentary evidences in the form of hard copy should reach Purchase Officer, O/o General Manager, SCCL, Rudrampur Kothagudem Area, Khammam district, Telangana State on or before the Opening Date and time of the tender as specified in the enquiry.

The interested parties should go through the given Special and General Terms and Conditions before submitting their offer on-line.

ANNUAL MAINTENANCE OF WINDING ENGINE ELECTRICAL, ELECTRONICS & SOFTWARES

Annual maintenance of the man winding system shall be for a period of 4 years.
The annual maintenance shall commence from the date of expiry of the 12 months warranty period (i.e. after 12 months from the date of successful commissioning of the system).

"Annual Maintenance of winding engine electrical, electronics & softwares" - Means maintaining the winding engine electricals, electronics, softwares & and other works carried out by firm in retrofitting of winder drives as required under various regulations, rules and circulars, pertaining to coal mines and other statutory and law enforcing agencies for the works carried out by them. During this period the firm shall thoroughly train the company's team for acquaintance of general & statutory maintenance, breakdown maintenance, testing, replacement etc. Spares required for the above works are in the scope of bidder only.

1. Annual Maintenance:

The required spares, consumables and work force excluding oils and lubricants shall be provided by the successful bidder. The firm shall quote their rates accordingly.

All the spares supplied shall be routed through SCCL Stores for proper documentation and record.

Monthly consumption of items supplied/consumed by the equipment is to be submitted to the project authorities.

Supply of Lubricants and fuel are excluded from contract.

Equipment log book indicating actual working hours per shift, breakdown hours, maintenance hours, idle hours shall be jointly maintained by the representatives of SCCL and successful tenderer. This record shall be basis of equipment availability and payment thereof.

Service support:

a) Adequate service personnel shall be posted at site

   i. To carry out AMC works.
   ii. To train Operators and Maintenance personnel.
   iii. For joint assessment of requirement of parts/Sub-assembly replacements to maintain the equipment in good working condition by carrying out works .
   iv. For assisting SCCL personnel in carrying out necessary preventive and condition monitoring of winding engine beyond the scope of firm.
   v. For proper coordination and implementation of the contract.

b) Adequate required Spares shall be kept at site for attending maintenance and break downs. .

c) SCCL will carry out all the periodical maintenance activities and replacement of subassemblies of winding engine as per the recommendations of the equipment manufacturers beyond the scope of firm.

NOTE: The successful bidder shall make his own arrangements for conveyance of men and material.

Penalty:

The firm has to attend breakdown calls as and when required in addition to the regular Maintenance activity. The firm should depute their technical personnel and rectify the problem with in 12 hrs. Otherwise, penalty @ 1% per of the contract amount of that month will be levied beyond 12 hours and up to 24 hours.

Penalty @ 2% of the contract amount of that month will be levied per every sub sequent 12 hours.

In case in any month, the cumulative penalty per month exceeds 15% of the contract value of the month, No payment shall be made for that month.

Arriving of TAL1 Status:

For arriving L1 status the total cost of retrofitting of winding engine with all required safety features **and total cost of AMC for four years of technically qualified firms bids shall be taken in to consideration.**

Item Rates for Annual Maintenance	units	Qty.		Amount in Rupees
Cost of retrofitting of winding engine For PVK 5 Incline	AU	1		A
Cost of retrofitting of winding engine For VK 7 Incline	AU	1		B
Cost of Annual maintenance / Month for the works carried out by the firm on man winding including its allied safety features at PVK 5 Incline. Proposed AMC period is 48 Months. Firm has to quote on monthly basis.	Month	48	48 X cost of AMC/Month	C
Cost of Annual maintenance / Month for the works carried out by the firm on man winding including its allied safety features at VK 7 Incline. Proposed AMC period is 48 Months. Firm has to quote on monthly basis.	Month	48	48 X cost of AMC/Month	D
Total				A+B+C+D

The period of AMC may be extended for another for another 48 Months with mutual consent with the same terms and conditions.

GENERAL REQUIREMENTS

a) The supplier shall assume single source responsibility for system assembly, including for bought out items.

b) All pushbuttons, switches and other operator devices must be sufficiently large and durable to provide dependable, long life operation.

c) All cables (with associated plugs, connectors and receptacles) requiring user field installation shall be designed for commercial use to withstand an industrial environment.

d) Upon receipt of the purchase order, but prior to the start of the manufacturing of the equipment, the supplier shall submit drawings of the complete assembled system for approval to GM (E&M) UGM, Corporate, Kothagudem, SCCL.

e) Drawings, which are returned to the supplier for correction or revision, shall be resubmitted for approval before starting fabrication of the work in question unless marked ""approved as noted"".

f) All drawings shall include page, sheet, and line numbers.

g) The first page of all drawings and schematics shall be a cover sheet consisting of a Bill of Material, purchase order number, manufacturer's job number, user's name, location, application, and shipping address.

h) The drawings shall include a mechanical layout detailing the overall external dimensions of the enclosure.

i) The supplier shall provide documentation detailing the mounting of the processor, I/O racks, and motor starters, disconnect switch, fuse blocks, wire ways, etc. All materials shall be labeled to provide easy cross-reference to the Bill of Material listing.

j) Electrical prints detailing all hardwiring, done by the supplier, to devices such as relays, motor starters, disconnect switches, fuse blocks, etc. shall be provided with individual wire numbers and relay contact cross-reference designations.

k) Sections describing inputs shall designate input modules by name, rack, module, and terminal location.

l) Each limit switch, pushbutton, or other input device shall be connected to only one individual input point.

m) Each output device shall be connected to only one individual output point.

n) The last sheet in the set shall be for terminal block designations each containing their individual terminal numbers.

N O T E:

MINIMUM SPECIFICATION:

MINIMUM SPECIFICATIONS PRESENTED ABOVE ARE AS PER THE EXPERIENCE, WISDOM AND PERSPECTIVE OF SCCL. THE BIDDER SHOULD NOT SUBMIT THE SPECIFICATIONS LOWER THAN THAT OF SPECIFICATIONS PRESCRIBED ABOVE. HOWEVER IF THE WISDOM AND PERSPECTIVE OF BIDDER SUPPORTED BY EXPLANATION AS PER ESTABLISHED SCIENTIFIC, SAFE AND ECONOMIC MINING PRACTICE, DETERMINES ANY HIGHER SPECIFICATIONS, CAN OFFER SUCH SPECIFICATIONS WHICH IN THEIR OPINION IS REQUIRED OVER AND ABOVE THE MINIMUM SPECIFICATIONS OF SCCL.

THE SAME WHETHER TO BE CONSIDERED OR NOT TO CONSIDER WILL BE AT SCCL'S OPTION AND CONSENT.

The qualified and interested bidders shall respond and submit their expression of interest at the following address and may also contact at the following address for further details:

General Manager, KGM (A)/AGENT, UGM,KGM(A)
The Singareni Collieries Company Limited,
VENKATESH KHANI (PO)
KOTHAGUDEM (MDL), Khammam (Dist),
TELANGANA STATE, India. Pin: 507103.
Phone: 08744 20521, 08744 250523
Fax : 08744 250536.
E-mail id: gm_kgm@scclmines.com**,** agt_vk7_kgm@scclmines.com
Web site: www.scclmines.com