

SPECIFICATIONS:-				
2	Configuration of machine's axes suitable for grinding of blades of exotic material as mentioned in clause 1.1 with varying sizes of length & thickness of the blade.		Vendor to confirm.	
2.1	POWER :			
2.1.1	Main motor - Min. 5.5 kW		Vendor to inform their parameter.	
2.1.2	Coolant pump motor - Min. 0.3 kW		Vendor to inform their parameter.	
2.1.3	Discharge of the coolant pump at Max. height of spindle face (Lit/Min): Min. 50 Liter/Minute		Vendor to inform their parameter.	
2.2	HORIZONTAL TABLE:			
2.2.1	Size of Machine Table (Length * Width) - Min.600*290 mm (Machine table size should be suitable for clamping Electro-Magnetic table of size 500 * 250 mm with suitable Sine Table)		Vendor to inform table size.	
2.2.2	Number of T- Slots : Minimum 2 Nos.		Vendor to confirm & specify.	
2.2.3	The machine shall be supplied with suitable Sine table of reputed make. Make of the sine Table shall be informed by the Vendor. The Sine Table Shall be mounted on the Machine Table. Mechanism to clamp and set the sine table to be provided. Arrangement for setting the sine table should be as shown in Picture- A at Annexure-1.		Vendor to specify.	
2.2.4	The machine shall be supplied with suitable Electro-Magnetic table of reputed make. Make of the Electro-Magnetic table shall be informed by the Vendor. The Electro- Magnetic table of size 500 * 250 mm shall be mounted on the Sine Table.		Vendor to specify.	
2.2.5	Suitable clamping system / Fixture for clamping of non-magnetic blades as mentioned in point no. 1.1 to be offered by vendor.		Vendor to offer.	
2.2.6	The Electro-Magnetic Table shall have the provision of magnetizing and demagnetizing. The magnetizing power of the magnetic table should be sufficient to hold the Turbine blades during grinding while taking heavier cuts. In case of sudden power failure, sufficient time lapse should be available before demagnetization of the table takes places. Suitable safety guards should be provided all around the machine table.		Vendor to confirm & specify.	
2.2.7	During grinding operation, the depth of cut shall be given by vertical movement of the machine table. The maximum depth of cut for rough grinding to be taken by machine to be specified by the vendor		Vendor to confirm & specify.	
2.2.8	Min. possible vertical movement of the machine table shall be 0.005 mm through manual feed only.		Vendor to confirm.	
2.2.9	Max safe weight on table to be informed by the supplier.		Vendor to inform.	
2.3	GRINDING SPINDLE WITH VERTICAL AXIS:		Vendor to confirm.	
2.3.1	Surface speed of grinding wheel: 24 m /sec or more.		Vendor to confirm & specify.	
2.3.2	Grinding wheel Diameter: 300 mm or more.		Vendor to confirm & specify.	
2.3.3	The Grinding Wheel shall be segmental type having 14 grinding segments around the periphery. Vendor may also suggest the no. of segments as per our requirement for grinding on exotic material as mentioned in clause 1.1		Vendor to confirm & specify.	
2.3.4	The Grinding segments shall have Aluminum root with hexagonal nut, size 32/64 * 48.4 * 50 & Grade 30 A24 - 1D18V4. Vendor may also suggest grinding segments as per our requirement for grinding on exotic material as mentioned in clause 1.		Vendor to confirm & specify.	
2.3.5	Swivel of Grinding head shall be manual only. Suitable handle to be provided on the grinding head arm to swivel the grinding wheel over the surface of the magnetic table.		Vendor to confirm & specify.	

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2.3.6	The distance between front face of grinding wheel and surface of machine table shall be adjustable from 0 to 325 mm. Or this range to be chosen by manufacturer to fulfill the requirement of clause 2.3.8 (Refer Picture -B at Annexure - 1)	Vendor to confirm & specify.	
2.3.7	The distance between the front face of grinding wheel and Magnetic table surface shall be 150 mm or more when the machine table is at maximum distance from grinding wheel. (Refer Picture -B at Annexure - 1)	Vendor to confirm & specify.	
2.3.8	Suitable arrangement for changing of Grinding wheel and Segments to be provided.	Vendor to confirm & specify.	
2.3.9	Swivel arm should have a balanced smooth jerk free movement on its axis.	Vendor to confirm & specify.	
2.3.10	Swivel arm should have a locking arrangement suitable for frequent locking and unlocking of arm while grinding arm is in its extreme right position during setting of job on magnetic table. (Refer Picture - C at Annexure - 1).	Vendor to confirm & specify.	
2.3.11	Diameter of the Wheel for Up/Down movement of machine table should be such that the operator should be able to turn the wheel in standing position (with minimum bending) even when the machine table is in its lowest position. (Refer Picture- D at Annexure-1).	Vendor to confirm & specify.	
2.3.12	The machine shall be supplied fitted with the grinding wheel & segments.	Vendor to specify.	
2.3.13	Suitable Wheel dresser to be provided at suitable location.	Vendor to confirm & specify.	
3	ESSENTIAL FEATURES / REQUIREMENT :-		
3.1	The basic machine shall have a robust and vibration free construction and high power rating to ensure accurate grinding of the blades of exotic material as mentioned in point 1.	Vendor to confirm.	
3.2	Main motor should be of reputed make i.e. Siemens, ABB, Compton Greaves, Baldor & Kirloskar. Main motor starting should be through Star -Delta through contactor -timer logic incorporated in the control panel.	Vendor to confirm.	
3.3	The Electrical panel should be protected against over-heating. MPCB (Motor Protection Circuit Breaker) having single phase protection should be provided for all motors.	Vendor to confirm.	
3.4	In electrical panel all the accessories should be of reputed make i.e. Siemens, ABB, Telemecanique, Control & Switchgear and L&T.	Vendor to confirm.	
3.5	The machine should have working light at suitable location with on-off switch.	Vendor to confirm.	
3.6	The electrical control panel should be dust and vermin proof and located at suitable place for maintenance. The control voltage should be 110 V AC.	Vendor to confirm.	
3.7	All the pipes, cables etc. on the machine should be well supported & protected in conduits. These should not create any hindrance to machine operator's movement for effective use of machine.	Vendor to confirm.	
3.8	Machine should have push-buttons controlling the different functions of machine. Devices should be protected against short - circuiting with proper safety measures.	Vendor to confirm.	
3.9	The coolant recirculation /recovery system should have a sump at a suitable location in the machine. The coolant pump should start and stop along with spindle. However separate switch to be provided to switch off the coolant pump independently also the machine should have suitable dust separator to extract dust from coolant.	Vendor to confirm.	
3.10	Guards around the working area of the machine shall be provided to ensure that undue coolant does not drench the operator during operation. Guards shall have good strength to protect the operator in case of any accidental fly off of job or wheel segments during operation.	Vendor to confirm.	
3.11	Suitable lubrication system in the machine to be provided.	Vendor to confirm.	

3.12	One set of standard & Special tools for normal operation, maintenance and service tools shall be supplied along with the machine like Spanners, Diamond Dresser and allen keys etc.	Vendor to confirm.		
3.13	The machine shall be supplied with complete electrical equipment ready for connection to the power mains. 20 meter armored 4-core Power supply cable for connection from the machine to the power mains switch to be provided by the vendor.	Vendor to confirm.		
3.14	Schematic diagram / photo of the proposed machine showing different movements / traverses symbolically, to be submitted along with the offer.	Vendor to provide.		
3.15	First filling of all required Oils, lubricants & Grease etc. for the machine and auxiliary system to be supplied by vendor. Indigenous (Indian) source or Indian equivalent and specifications of oils/ greases are also to be provided by the vendor.	Vendor to confirm.		
3.16	The machine should be fitted with one 10 Amp, single phase 220 V AC and one 30 Amp, three phase 415 V AC MCB box with socket and plug.	Vendor to confirm.		
3.17	Identification tags should be provided on all components/switchgear elements on the machine & in the electrical panel. All wiring in the machine/panel should have identification ferrules & the same should be incorporated in the electrical drawing also.	Vendor to confirm.		
3.18	Compliance with standard safety norms (IS standard) must be followed.	Vendor to confirm.		
3.19	Geometrical accuracies as per applicable Indian/International standard. Copy of standard (in English language) showing different tests to be done & the accuracies to be achieved on the machine, to be submitted by the vendor.	Vendor to specify & provide copy of standard with offer.		
3.20	Vendor may also propose / suggest any other requirement if necessarily required for carrying out operation successfully as per clause 1.	Vendor to confirm & specify.		
4	TOOLINGS:			
4.1	One set of grinding segment mounted on wheel of machine and 10 sets of spare grinding segments should be supplied along with machine.	Vendor to confirm & specify.		
5	PAINT & PACKING:			
5.1	Color of the machine & other supplied items shall be Apple Green according to RAL6011 Epoxy Polyurethane paint.	Vendor to confirm.		
5.2	Packing should be roadworthy, seaworthy (if applicable) and rigid for complete machine & all other supplied items.	Vendor to confirm.		
5.3	Vendor to provide the dimension, gross weight /net weight and lifting centre marks on all the packages. The packing list to be provided along with the dispatch documents.	Vendor to confirm & provide.		
6	PRE-DISPATCH INSPECTION:- Following activities shall be carried out by vendor at their works on the machine before dispatch in presence of BHEL's team during their PDI. Report of the PDI shall be submitted to BHEL by vendor. Indigenous vendors should give Pre-Dispatch Inspection (PDI) call at least 3 weeks and foreign vendors should give PDI call at least 45 days before that scheduled start date of PDI. Preparedness for PDI and availability of all supplies at vendor's works should be ensured by vendor prior to call for PDI. Actual photographs of the machine manufactured as per our specifications, showing preparedness, should be sent by vendor, with PDI call.	Vendor to confirm.		





6.1	Demonstration of offered geometrical accuracies as per test chart/standard (Refer pt.no. 3.19 of specification).	Vendor to confirm.		
6.2	Demonstration of all features & requirements of the machine & accessories ensuring compliance to Specification & requirements.	Vendor to confirm.		
6.3	Verification of availability of all supplies as per Specification prior to dispatch.	Vendor to confirm.		
6.4	Demonstration of grinding on 2 nos. blades / test piece of each material grade X12 and Nimonic 80A complying accuracy requirement mentioned at clause 1.1. Blades / Test pieces shall be provided by BHEL but, to & fro transportation of Blades / Test pieces from BHEL Hardwar to Machine Supplier's works and back to BHEL Hardwar shall be responsibility of Machine Supplier at their cost.	Vendor to confirm.		
6.5	Vendor shall be responsible for any deviation/rejection in proveout component due to improper recommended grinding segments or malfunctioning of the machine during proveout. Any change in tooling during proveout shall be at the responsibility and cost of the vendor. The vendor shall supply the toolings changed at proveout stage for the quantity as mentioned in clause 4.1 under the heading of 'Tooling'.	Vendor to confirm.		
6.6	Note: Grinding segments, Inspection instruments & gauges required for demonstration of grinding / inspection of above-mentioned details shall be arranged by vendor and the Grinding segments to be used during demonstration shall not be consumed from the tooling package to be supplied as per clause 4.1.	Vendor to confirm.		
6.7	Acceptance of the machine for dispatch shall be subject to satisfactory completion of specified Pre-despatch Inspection activities.	Vendor to confirm.		
7	COMMISSIONING AND FINAL ACCEPTANCE :-			
7.1	Following activities shall be carried out by vendor at BHEL Haridwar for commissioning of the machine.	Vendor to confirm.		
7.1	Demonstration of offered geometrical accuracies as per recommendation of vendor.	Vendor to confirm.		
7.2	Demonstration of all features & requirements of the machine & accessories ensuring compliance to Specifications & requirements.	Vendor to confirm.		
7.3	Verification of receipt of all supplies as per Specification at BHEL Haridwar.	Vendor to confirm.		
7.4	Demonstration of grinding on 5 nos. blades / test piece of each material grade X12 and Nimonic 80A complying accuracy requirement mentioned at clause 1.1. Blades / Test pieces shall be provided by BHEL.	Vendor to confirm.		
7.5	Training of BHEL personnel (Operators & Engineers) for operation & maintenance of machine during commissioning.	Vendor to confirm.		
7.6	Any spare item required during commissioning period (before final acceptance of the machine) shall have to be arranged by the vendor free of cost and duty levied have to be borne by the vendor.	Vendor to confirm.		
7.7	Tools, Tackles, Test Mandrels, instruments and other necessary equipment not covered in specifications/scope but required to carry out for the Geometrical accuracy Test and commissioning activities should be arranged by the vendor and shall not be taken back.	Vendor to confirm.		
7.8	It shall be the sole responsibility of the supplier to rectify any shortcomings in the design or operation of the machine observed during commissioning, without any cost implication to BHEL.	Vendor to confirm.		

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7.9	Final Acceptance of the machine shall be subject to satisfactory completion of above specified Erection, Prove-out & commissioning activities. Achieving specified accuracy and surface finish on the test job shall also be part of successful commissioning.	Vendor to confirm.		
8	LEVELING & ANCHORING SYSTEM			
8.1	Complete set of anchoring materials including foundation bolts, nuts, washers, fixators, leveling shoes etc for alignment and fixing of the machine on the floor should be supplied. Details to be submitted.	Vendor to confirm, offer and submit details		
9	FOUNDATION			
9.1	Vendor shall submit the preliminary layout drawing for getting BHEL's approval within one month from the date of Letter of Intent (LOI) or Purchase Order, whichever is earlier. Complete Foundation Design including details viz. static / dynamic load details etc. and final layout drawings shall be submitted by the supplier within one month after getting BHEL's approval for Preliminary layout Drgs. The layout should consist of all requirements pertaining to complete machine & all other accessories/offered items. BHEL shall construct complete foundation for the machine under supervision of supplier and at supplier's responsibility. Vendor should arrange equipments required for the testing of foundation, if required by the vendor. The vendor shall also indicate detailed specifications of grouting compound and grouting procedure etc. for foundation bolts of the machine.	Vendor to accept & offer.		
9.2	Soil condition at BHEL, Haridwar is mentioned below : (a) Soil strata : Silty sand up to 2.5 meter depth (b) Average density of soil = 1.8 T/m ³ (c) Angle of internal friction = 35° (up to 3.0 m depth) (d) Coefficient of elastic uniform compression "Cu" = 3.0 Kg/cm ² (at 7m depth for 10m ² base area and 1.0 Kg/cm ² confining pressure) (e) Bearing capacity at 1.5 meter depth = 10T/m ² (f) Water table = 25 meter below ground level	For vendor's information.		
10	SPARE PARTS:-			
10.1	Note: - Item wise price of the spares to be quoted by vendor. MECHANICAL SPARES (As used on the offered machine):			
10.1.1	Lead screw and nuts. - 1 set	Vendor to confirm & offer.		
10.1.2	Grinding spindle bearings. - 1 set each type	Vendor to confirm & offer.		
10.1.3	Drive-Belts. - 1 set each type	Vendor to confirm & offer.		
10.1.4	Swivel Arm Head Bearings. - 1 set each type	Vendor to confirm & offer.		
10.2	ELECTRICAL & ELECTRONICS SPARES (As used on the offered machine):			
10.2.1	Main Motor. - 1 No.	Vendor to confirm & offer.		
10.2.2	Coolant Motor with Pump. - 1 No.	Vendor to confirm & offer.		
10.2.3	Push Button. - 5 No. each type	Vendor to confirm & offer.		
10.2.4	Selector Switch. - 5 No. each type	Vendor to confirm & offer.		
10.2.5	Contact / Relay. - 2 No. each type	Vendor to confirm & offer.		
10.2.6	MCB /MPCB.. - 2 No. each type	Vendor to confirm & offer.		
10.2.7	Mag.-Demag. Controller Unit. - 1 No.	Vendor to confirm & offer.		
10.2.8	Mag.-Demag. Controller Unit Remote Pendant switch. - 1 No.	Vendor to confirm & offer.		





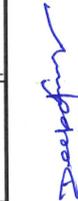
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10.2.9	Electro -Magnetic Table (size 500 * 250 mm).	- 1 No.	Vendor to confirm & offer.		
10.2.10	Timer.	- 5 No. each type	Vendor to confirm & offer.		
11	DOCUMENTS:-				
	5 Sets (hard copies in hard cover file folder)) of following documents in English language are to be offered:		Vendor to confirm.		
11.1	Operation and maintenance (O&M) manuals for complete machine and its accessories including Sine table and Magnetizing and Demagnetizing control unit.		Vendor to confirm.		
11.2	Complete list of parts / items (Bill of material) used in the machine in English language.		Vendor to confirm.		
11.3	Electrical schematic diagrams, wiring diagrams, junction box layout, connector diagrams and cable layout of the Complete Machine including Magnetizing and Demagnetizing control unit in English.		Vendor to confirm.		
11.4	Drawing of machine assemblies including pneumatics /coolant / hydraulic circuit diagrams. All assembly /sub assembly drawing shall be supplied with the part list marked on it in English.		Vendor to confirm.		
11.5	The soft copy of all above set of documents to be provided by vendor in Pen drive(s) along with machine.		Vendor to confirm.		
12	WARRANTY:-		Vendor to confirm.		
	Warranty for complete machine and all supplied accessories / equipment's for 24 months from the date of acceptance of the machine.				
13	OPERATING CONDITIONS & THERMAL STABILITY :-		Vendor to confirm.		
	Total machine including all supplied items should work trouble free and should give specified accuracies under existing power supply and ambient operating conditions, as mentioned below.				
13.1	Power supply 3-Phase AC supply (3 wire system without neutral), voltage=415 ±10% of fluctuations, frequency=50 ±3% Hz. Power Supply will be provided by BHEL at a single point near the machine, as per layout recommended by Vendor. All types of cables, connections, circuit breakers etc. required for connecting BHEL's power supply point to different parts of the machine/ control cabinets, shall be the responsibility of vendor. Requirement of grounding/ earthing with required material details is to be informed by vendor well in advance with foundation design/ drawings or machine layout so that the same could be incorporated during construction of foundation. The vendor can take earthing connection from the nearest column/earth point of the production shop. In case above electrical parameters are not sufficient for the machine ,voltage stabilizer &/or transformer of suitable capacity shall be in the scope of vendor and should be included in the offer.		Vendor to confirm.		
13.2	ENVIRONMENT- Ambient operating conditions Temperature= 3 to 45 degree Celsius and relative humidity= 95% max. Weather conditions are tropical, atmosphere may be dust laden during some part of the year. Machine shall be kept in normal shop floor condition without any temperature controlled enclosure/shop max temp. variation is 25 degree Celsius in 24 hours.		Vendor to confirm.		
14	ADDITIONAL INFORMATION REQUIRED:				
	Following information shall be supplied with the offer:				





14.1	Machine Model No. of offered machine.		Vendor to inform	
14.2	Total connected load (KVA).		Vendor to inform	
14.3	Space required (Length, Width, Height) for complete machine & accessories (Including all possible movements and adjustments).		Vendor to inform	
14.4	Catalogue of the machine.		Vendor to submit	
14.5	Total weight of the machine.		Vendor to inform	
14.6	Weight of heaviest part /assembly / sub-assembly of the machine.		Vendor to inform	
14.7	Dimensions of largest part/ sub-assembly/ assembly of the machine.		Vendor to inform	
15	This is special purpose machine. Some Photographs of the existing machine are attached for reference only (Refer Annexure-2).		Vendor to note.	
16	QUALIFYING CONDITIONS :			
16.1	Only those Original Equipment Manufacturers (OEMs) of Swivel Arm Segmental Disc Grinding Machine (as per clause no.2), should quote and will be considered for this tender who have manufactured and supplied at least one number of Swivel Arm Segmental Disc Grinding Machine in the past 15 years from the date of opening of this Tender. Authorized dealers/ partners/associates of above OEMs may also quote on behalf of their OEM. In such case, duly signed valid Authorization Certificate issued by OEM is to be furnished along with the offer.		Vendor to confirm and submit details.	
16.2	The following information should be submitted by the vendor about the company(ies) where the referred machine(s) have been supplied. This is required from all the vendors for qualification of their offer.		Vendor to accept.	
16.2.1	Copy of purchase order or commissioning reports or commissioning certificate of any one customer for supply of referred Swivel Arm Segmental Disc Grinding Machine as per clause no. 16.1. However in the submitted PO copy, offered price may be concealed by suitable means.		Vendor to submit the details.	
16.2.2	Contact details of the referred customer or company (Phone no, email address, address etc.).		Vendor to submit.	
16.2.3	Month & Year of supply / commissioning of the machine is to be informed.		Vendor to submit.	
16.2.4	Details of machine / Specification and Photographs / Schematic diagram of the referred supplied machine to their customer.		Vendor to submit.	
16.3	Product catalogue or Certificates/documents showing OEM status.		Vendor to submit.	
16.4	BHEL reserves the right to verify the information provided by the Vendor for the referred machine at their referred customer's works. It shall be the responsibility of the vendor to facilitate the visit of BHEL's team at their referred customer works if required. The Travel and Boarding expenses for BHEL Personnel shall be borne by BHEL. In case the information provided by vendor is found to be false/ incorrect, the offer shall be rejected.		Vendor to accept & confirm.	


Deepak Kumar
Dy. Mgr. (ITX)


Deepak Gupta
Dy. Mgr. (WE&S- CNC-TUM & EM Turbine)

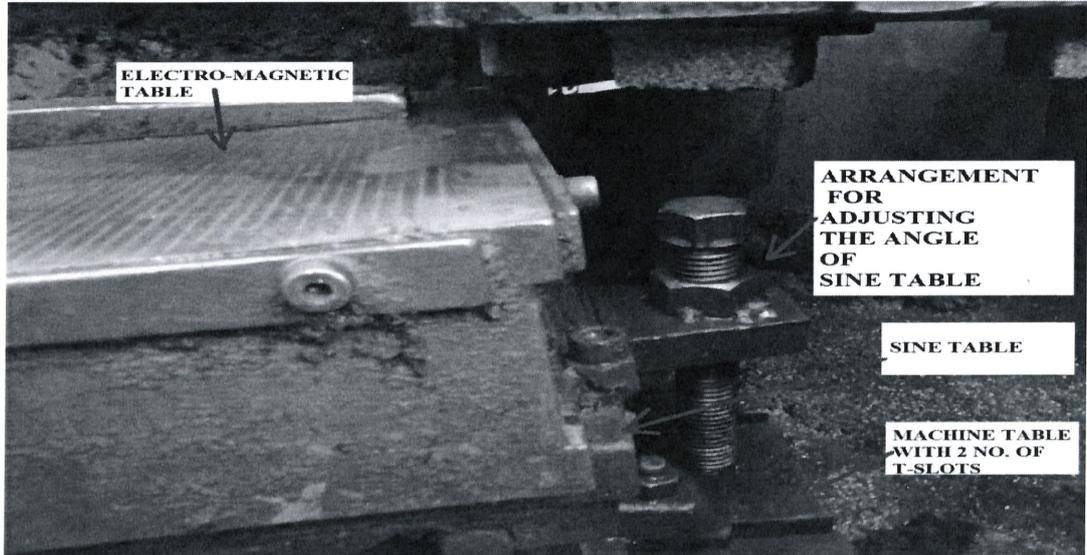

Ravikant Singh
Dy. Mgr. (Mech. Maint. BI-3)


Deepak Kant
Mgr. (TUM-Blading)

TECHNICAL SPECIFICATION ANNEXURE - 1

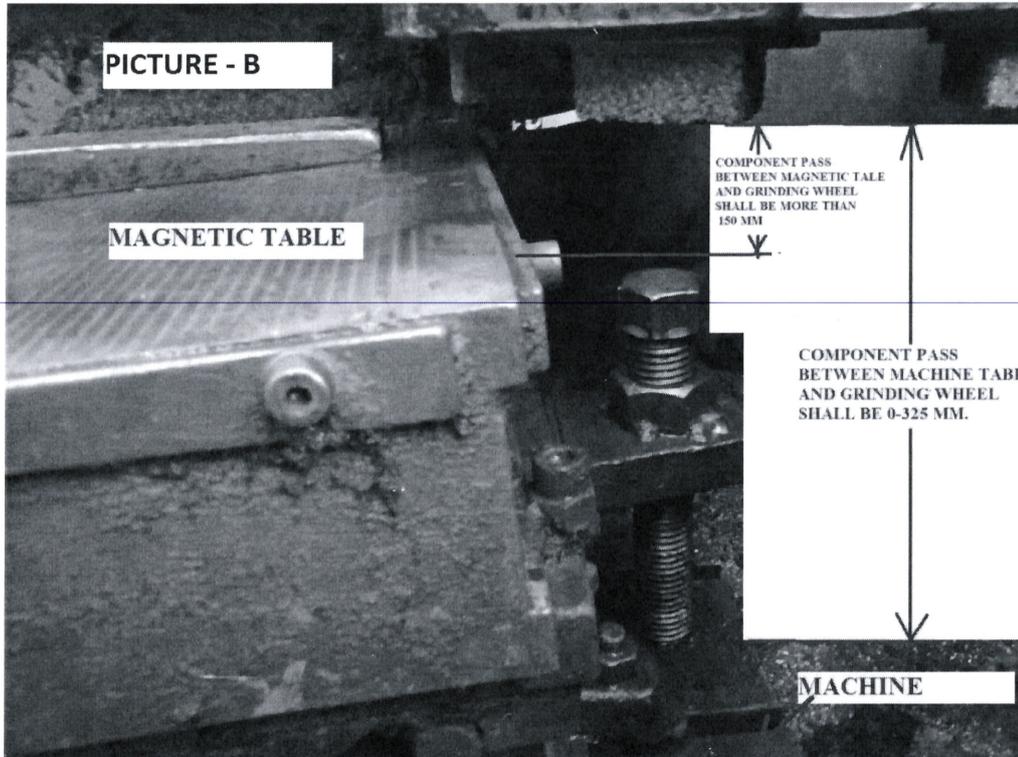
SWIVEL ARM SEGMENTAL DISC GRINDING MACHINE

- Arrangement for setting the sine table should be as shown in **picture A**.



Picture - A

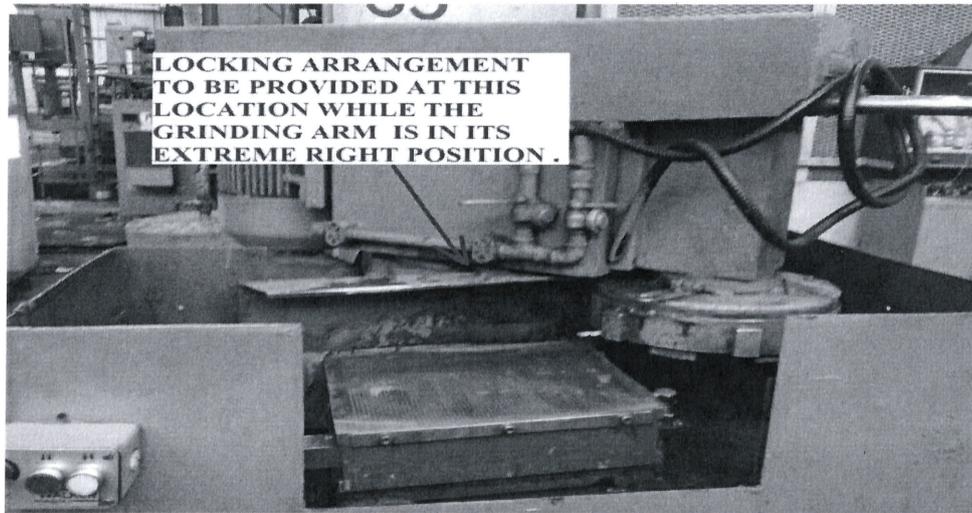
- Component pass between the grinding wheel and Magnetic table surface shown in **Picture-B**.



Picture - B

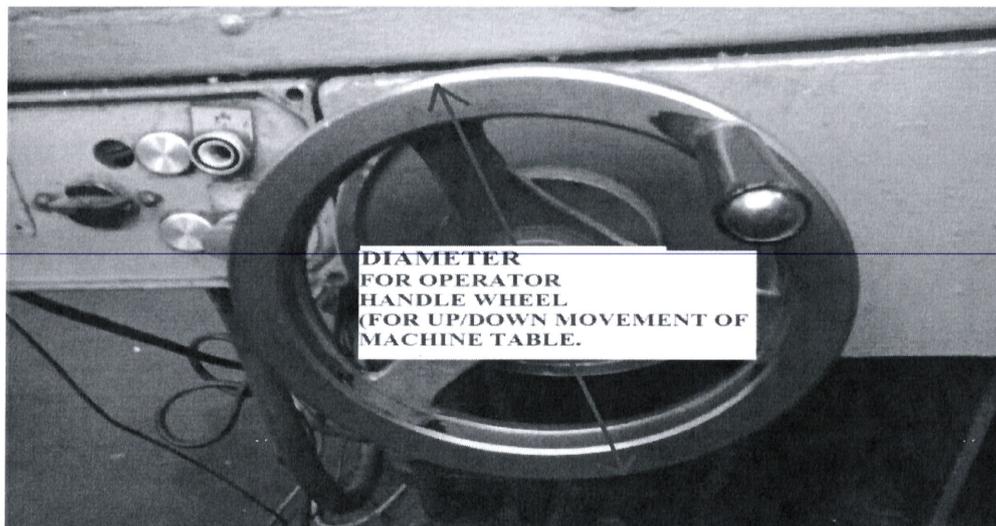
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- Swivel arm locking arrangement suitable for frequent locking and unlocking of arm while grinding arm is in its extreme right position during setting of job on magnetic table as shown in **Picture-C**.



Picture - C

- Position of the Wheel for Up/Down movement of machine table should be Such that the operator should be able to turn the wheel in standing position (with minimum bending) even when the machine table is in its lowest position. (Refer **Picture - D**).



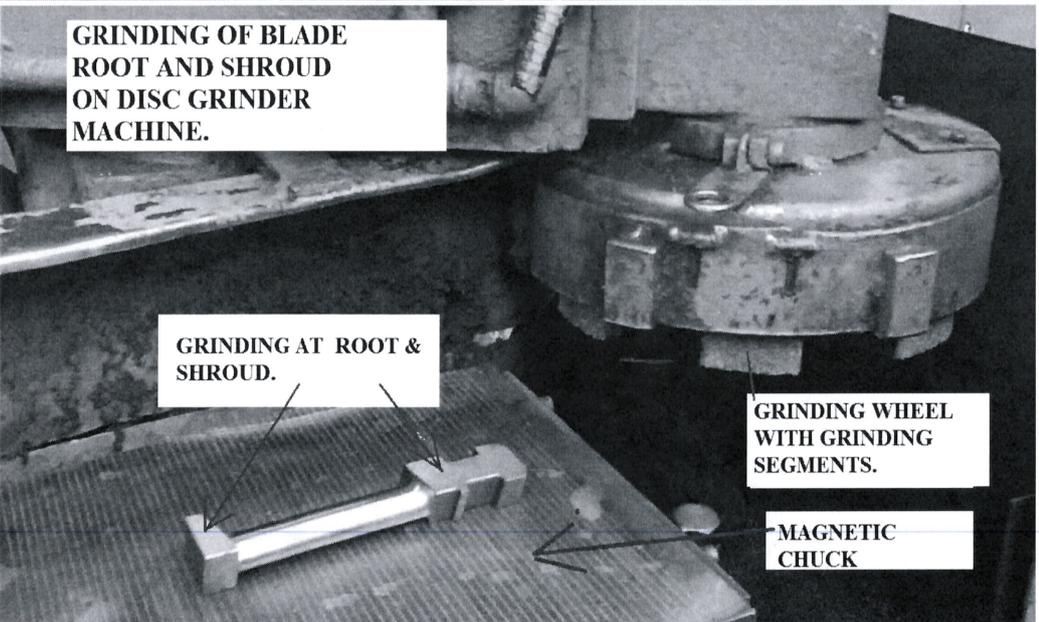
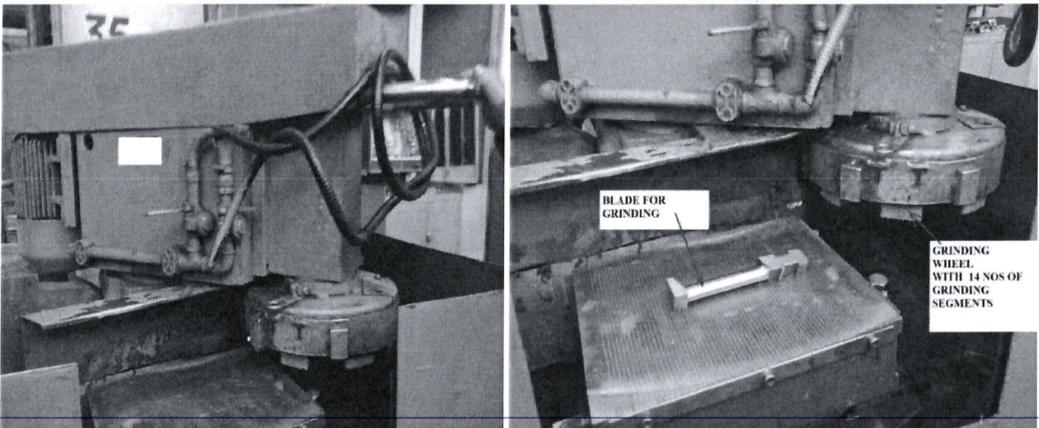
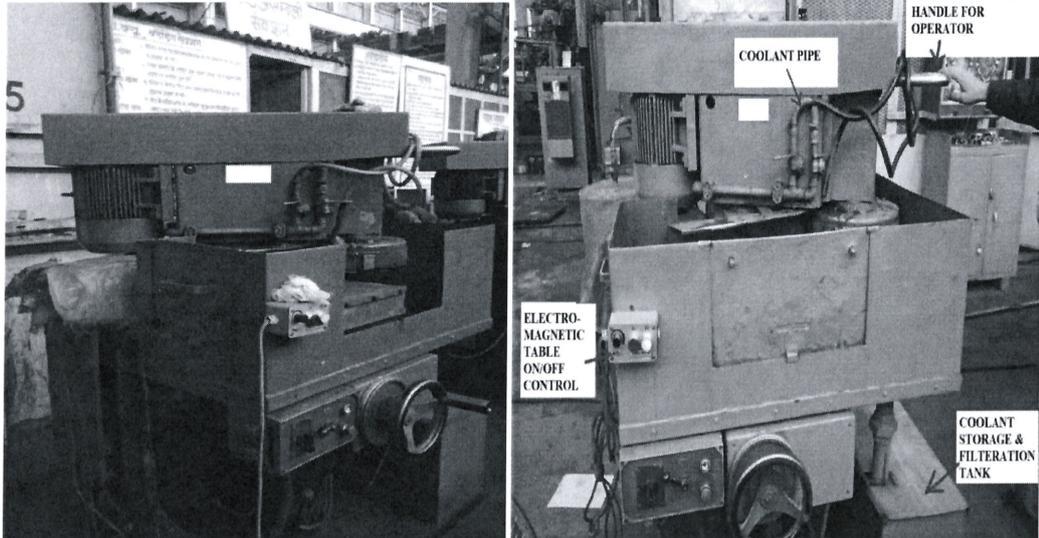
Picture - D

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D. K. S. / S. K. L. / S. K. P. / S. M. A.

TECHNICAL SPECIFICATIONS ANNEXURE-2

SWIVEL ARM SEGMENTAL DISC GRINDING MACHINE

Some Photographs of the existing machine for reference only.



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