1. **Scope of Work**

Pot Relining

1 Ramming of pot

I) Preheating of carbon blocks to be done before seams ramming depending upon the paste quality. Pre- heating electrical heaters will be provided by BALCO. Necessary manpower for placement and removal of heater is in contractor scope.

II) Seams and peripheral ramming to be done with ramming paste. The layer thickness and no of layers will be provided by engineer in-charge. Spray of carbon glue may be required in case of partial ramming as per the recommendations of engineer in charge. Carbon glue will be provided by BALCO. Rammer (Fuji) and spares for rammers will be arranged by contractor as per the recommendation of engineer in charge.

III) Ramming shall be carried out by the contactors personnel as per the instruction of engineer in-charge. BALCO sop compliance, safety, housekeeping before, during and after the ramming are sole responsibility of contractor. All records and checklists are to be filled by contractor supervisor/ site in charge.

iv) Ramming of pot is to be carried out continuously without break. If any break for breakfast/lunch/dinner for labors is required it can be provided only after completion of ramming.

V) 4 person must be present in the pot (1 for each group) for measurement.

2 Bath digging of pot:

Forced air cooling of cut out pot to be done by installation of two fans, followed by controlled water cooling. Fans, water pump and pipes will be in the scope of the contractor. All the safety PPE's including metal splash proof suit will be in contractor's scope. Continuous supervision is required at the site. Safety precautions given by BALCO must be strictly followed by contractor.

Digging of bath material, putting it in bath pallet or bins and shift it to rodding shed after weighment. Before start of digging, zero level should be cleaned to remove usable material like bath. There after no spillage of material to zero level should be there. Bath dug out from ledge and above cathode must be recovered completely and no contamination of bath should be there with other relining material else the cost of bath wasted may be recovered from bill.

3 Cutting of metal manually or by oxy lancing

I) Cut the metal pad with jackhammer and make groove in it to lift it with sling and crane or Make drill holes in three places of the metal pad as directed by the engineer in-charge so as to insert the anchor bolt. Lancing is to be done as per BALCO SOP and recommendation. For oxy lancing consumables like oxygen, DA and lancing pipes will be arranged by contractor. Preparation of the lancing pipes for the metal pad cutting

belongs to the contactor. After cutting the metal, the metal pad to be cut into 1mX1m size before it is sent to cast house for melting. This metal has to be cleaned from bath, lining material or any other foreign material. After cleaning, metal to be given to cast house after weighment at the cast house weigh bridge.

4 Digging of sidewall all and periphery:

1. Remove the Side Wall SiC Bricks and stack/ bag/ kept in bin completely segregated from bath/other dug out material and shift it to its designated place.

2. Dig out the paste layer around the pot till the collector bars get exposed, kept this dug out carbon in separate bins and transfer it to designated place. Cutting piece of collector bar to be removed with in 08 hrs after cathode block removal and should not stuck up in Bus bar/Cradle/shell.

3. Digging is to be done as per SOP and BALCO in Charge recommendation. Clean the area in and around the pot, on road and ramp both at 3 m level and 0 m level. Care should be taken to ensure that EOT cranes and vehicles are not loaded beyond safe limit as per BALCO in charge. Splitting jack is in the scope of contractor.

The description of work for dry digging of cathode cavity is as follows:

Dry digging of electrolytic pots consists of removal of solidified bath, cutting and removal of metal pad, digging of the deposit at the cathode up to the level of cathode carbon blocks completely such that no bath & metal remains stick to the cathode blocks and cleaning of the area around the perimeter as per instruction of the engineer in-charge.

Tools for digging such as jackhammer, chipping gun, chisel, hose pipes, jackhammer bit will have to be arranged by the contractor & will not be provided by BALCO. Chisels/bits are to be ground by table grinder only in the contractor's store area. Grinding on the shop floor is strictly prohibited.

All jackhammers, chisels, lifting and other tools, vehicle used must be in 100% ok condition as per guidance of engineer in charge such that no damage occurs to any BALCO property or injury to any operator. Any damage or injury will be sole responsibility of the contractor and his site in charge and repair or treatment cost will bear by him. All jackhammers operation must be free from air leakages, single hosepipe to be used. No joint should be there in the hose pipe. Suitable Penalty may be imposed for any air leakage.

In bath/metal/ periphery digging, block removal from pot and unloading to the designated place all safety measures to be taken for safe working. All safety precautions and recommendations suggested by the BALCO from last incidents and risk assessment to be complied at the site.

5. Digging by Pot Demolition machine:-

Demolition machine will be provided by BALCO. Metal pad removal, digging of the side wall, and spent lining removal to be done by the machine. Manpower for the machine operation is in the contractor's scope. Machine operator must be minimum ITI diploma holder. Any damage

during operation of the machine will be rectified by contractor free of cost, else, cost of the same will be recovered from the contractor bill with suitable penalty.
Contractor shall ensure that dug out material will be segregated into bath, carbon, DIM, Insulation brick, aluminum and steel and to be unloaded at the designated place. If any mix-up, then all extra rework and transportation will be done by contractor and if denied by contractor to do the same, then BALCO will deduct the cost of segregation and transportation from contractor bill. In all material handling and transporting activities, safety guidelines given by BALCO, to be followed by contractor. Hydra will not be used for manpower transportation.
Weighment of each spent material (bath, DIM and bricks, carbon etc.) is to be done on BALCO's weigh bridge and weighment slip of the same must be submitted to EIC for billing.

6 Rim plate cutting and collector bar cutting:

I) Cutting of rim plates by gas cutting set, collecting it in MS tray and transfer it to scrap yard after weighment.

II) Cutting of collector bars by gas cutting set. Removal of all cut collector bar pieces should be done within 8 hours and subsequently shifted to the scrap yard after weighment at the weighbridge. All clad connecting bolts should be recovered along with nuts and washers. It is to be ensured that no collector piece is in hanging position with copper clad. If any cathode flex is gets damaged due to above said condition then repair of the same will be done by contractor free of cost. If pot start up delayed due to delay in repair, suitable penalty will be charged to the contractor.

7 Taking out the spent cathode lining:

I) Contractor shall ensure that dugout material will be segregated into bath, carbonaceous material, DIM, Insulation brick, aluminum and steel and to be unloaded at the designated place. If any mix-up of the material occurs, then all extra rework and transportation will be done by contractor and if contractor denies doing the same then BALCO will deduct the cost of segregation and transportation from contractor bill. All safety precautions to be taken as per the guidelines of BALCO. Any idea related to automation of the above said process, is welcomed.

II) SPL compliance must be followed at the site.

8 Cleaning of cathode shell:

Cleaning of cathode shell and collector bar windows is to be done by wire brush. If required, then to be done by grinding wheel (AG-7). Inspection of bottom and side shell for holes, damage, bulging, sagging and erosion is to be done. Repairing of any observation/abnormality in the above said, is to be done as per instructions of BALCO in charge.

9 Collector bar pickling and grinding:

I) Acid pickling solution preparation: The acid solution for pickling of collector bars to be prepared as per the instruction of Engineer-in-charge. The washing tank and the passivation liquid tank to be prepared as per the instruction of engineer in-charge.

II) Collector bar Pickling and grinding: Collector bars received at the pot repair shop should be checked for any visual defects, surface condition, physical dimensions and should be kept in bunches of 4. For one pot 108 no's of collector bars to be

prepared. Collector bars to be grinded after removing from tank in order to remove the rust on the surface and to be certified by BALCO in charge before use.

III) As pickling is over, acid solution to be neutralized by adding Soda Ash as per the instruction of Engineer-in charge. After neutralizing, solution to be drained & left out precipitate to be cleaned from tank and to be shifted as per the instructions of BALCO engineer in charge. All the empty plastic carboys of acid and base to be sent to scrap yard.

IV) For all these activities manpower to be arranged by the contractor only.

V) All the lifting tools and tackles should be as per the guideline of BALCO. Any non-compliance will attract suitable penalty.

10 cathode block sealing, collector bar preparation:

Acid tank preparation, Collector bar pickling and grinding, cathode block sealing and collector bar polishing and protection

1) Block sealing: After unpacking the carbon blocks it should be kept in the block sealing area. Cathode Blocks to be checked for any damage and physical dimension as per drawing before use. Contractor to ensure no leakage from rammers and hose pipe.
2) If cathode block rejected during sealing or after, collector bars to be removed from Cathode blocks and all scrap block, paste, collector bar generated to be shifted as per instruction of BALCO engineer in charge.

3) Slings for lifting cathode, collector bar, and hose pipes for block sealing to be provided by the contractor only. Frames and guide plates for sealing to be fabricated by the contractor as per drawing and instruction given by BALCO in charge. All ramming bits must be made of SS and to be arranged by contractor.

4) For all these activities manpower to be arranged by the contractor only.

5) If any cathode block or any material (provided by BALCO) gets damaged during shifting from stores to PRS, during block sealing or shifting from PRS to Pot, cost of the same will be deducted from the contractor bill.

6) All the lifting tools and tackles should be standard and as per the guideline of BALCO. Any non-compliance will attract suitable penalty.

Magnetic lifter to be used for lifting of collector bars.

11 Collector bar polishing and protection:

Collector bar ends where the clad will get fixed should be grinded and polished using the emery paper and should be protected by wrapping a craft paper around the machined surface. If cathode block rejected during sealing or after, collector bars to be removed from Cathode blocks and all scrap block, paste, collector bar generated to be shifted as per instruction of BALCO engineer in charge. Slings for lifting cathode & collector bar, hose pipes for block sealing are to be provided by the contractor only.

12 One layer of CaSio3:

Lining is to be done as per SOP. Dressing/cutting of bricks wherever necessary is in contractor scope. Transportation of necessary refractory and other materials required for lining from stores to the job site is in the scope of the contractor.

13 Three layer of insulation bricks:

Three layers of HSIB to be placed in pot shell over CaSio3 layer as per the BALCO guidelines. Dressing/cutting of bricks wherever necessary is in contractor scope. Transportation of necessary refractory and other materials required for lining from stores to the job site will also be in contractor scope. Lining design might be changed for some pots for taking trials.

14 Dry Impervious Material compaction and leveling:

Dry impervious material is to be filled in the pot shell over HSIB and leveled to the recommended height provided by BALCO personal. After that tarpaulin is to be spread over it followed by MS sheet. Then, DIM is to be compacted using the vibro-compactors of recommended rpm in two or one layer as per SOP. Vibro-compactor and tarpaulin will be in contractor scope and MS sheet will be given by BALCO. Necessary cable with required length, panel box with RCCB must be provided by contractor. Completion of the compaction will be checked by BALCO personal and after confirmation, final leveling to be done. Bags of dry impervious material to be return back to BALCO in usable condition by the contractor, if bags are bottom spout opening.

15 Blocks placement and adjustment:

Placing of Cathode blocks assembly over the dry impervious layer as per SOP. Tilting and transportation of sealed cathode block must be done with proper care so that cathode block must not be damaged. If damage occurs then cost of damage will be deducted from contractor bill. While placement of cathode block care must be taken during entering in the pot window. During adjustment of cathode block or during placement if damage occurs then also cost of damage will be deducted from contractor bill. All the tools and tackles for block placement and adjustment will be in contractor scope.

All the lifting tools and tackles should be as per the guideline of BALCO. Any non-compliance will attract suitable penalty.

16 Putty applications inside and outside the pot:

After Leveling of blocks, putty (mixture of asbestos fiber, mica powder and sodium silicate as per SOP) to be applied on both inside and outside of the collector bar window with window steel plate.

17 Low strength insulation brick lying:

After putty work, low strength insulation brick should be laid as per the drawing on dry setting basis. Dressing/cutting of bricks wherever necessary is in contractor scope. Casting frames to be placed in short side and long side. Casting frames before placement to be straightened, checked and repaired if required, by the contractor. Fabrication of new casting frames will be in the contractor scope.

18 Light pouring refractory and high strength:

The pan paddle mixer machine will be in the contractor scope. Water tank must be filled with water pipe from section lounge room. This water pipe must be laid outside of front column so that water should not spill over shop floor of smelter. After casting completion as per SOP, surface of castable must be observed in interval of 1 hr and as castable started warming up; lay wet jute bag over whole length of cast able till cast able surface feels cold. Pipe, vibrator with needle, spade for leveling, Cable of required length (depending upon position of pots and switch board) and DOL starter must be provided by contractor.

19 Refractory brick laying & Carbon and Silicon carbide laying:

Refractory brick should be laid in one, two or three (as per instruction) layers in the periphery of the shell over the casting followed by fixing of side composite/ single SiC blocks. Mixer machine for the preparation of mortars is in contractor scope. All the sidewall carbon/lining material is to be shifted to work spot by the contractor from stores. During refractory work tarpaulin to be laid of size 16*5 mtr on the carbon blocks to prevent dust particles going inside the seams gap which is to be provided by contractor.

20 Shifting of all raw materials required for relining:

Raw materials such as Carbon blocks, Carbon side wall bricks, refractory bricks, Dry impervious material, sodium silicate etc will be provided by BALCO. Material issuing from stores is in contractor scope and has to be kept in designated area. Area is to be cleaned by contractor after material shifting.

21 Rim plate welding:

Shape and other to be follow as per SOP. Straightening and grinding of the plates should not be done on the shop floor. All the welding machines and cutting sets should full fill the criteria required by the HSE department.

22 Cathode clad bolting and tightening:

Work must be executed as per BALCO SOP. Zero level access control system must be followed by contractor. Cathode clad bolting and tightening to be done as per SOP. All the tools should be well insulated and made of stainless steel (304) preferably. Workers should wear double insulation gloves while working. Rubber mat as per IS 15652 to be used for zero level job and same will be in the contractor's scope. While cathode clad bolt removal and fixing, all bus bar and catwalk angle of pot and adjacent pot cleaning is in scope of contractor. Catwalk must be aligned properly after bolting work completed.

23 Bath addition in pots for bath making & Pot Start Up work

I) Buffing of shunt surface, wrapping craft paper, keep it safely in shunt stand. Repair shunt, if it got damage during transportation, handling or during pot power on. Modification of shunt or shunt stand is in scope of contractor as per guidance of BALCO in charge.

II) Buffing of Flexible surface, wrapping of craft paper, keep it safely in flexible box or MS tray. Repair flexible if it is getting damage during transportation, handling or during pot power on. Modification of flexible or flexible box is in scope of contractor as per guidance of BALCO in charge.

III) Arrange workers, wire mesh or plate mesh, coke screening stand and shift it to GAP for screening of coke between +8mm to 12 mm weighing around 2-3 Ton. Transport and keep it at designated place in PRS after weighment. Screening must be such that more than 96% of coke will be within range of +8 to 12 mm. Sample of screened coke will be send to lab for analysis and if size not found within range then rescreening will be done by contractor till coke size come within range. For every pot, sample will be send from screened lot and every time if size not found within range then rescreening will be done by contractor till coke size come within range. Repair of damage mesh or fabrication of wire mesh is in scope of contractor. Sampling will be done on random basis.

IV) Fuse mounting/demounting: Any damage cost during transportation, handling or mounting and demounting will be deducted from contractor bill. Fuse and riser pitting need to be filled with aluminium welding in its hole after suitable grinding and buffing of surface by contractor. After demounting, fuse must be shifted to its designated place. All necessary m/c and consumable is in scope of contractor. Contractor will be responsible for any theft of fuse block or flexible. Lose due to theft will be deducted from contractor bill. Safety PPE's Helmet, Safety shoe, rubber gloves, rubber pad and wooden palate will be in scope of contractor.

V) Anode chamfering: Anode chamfering will be done as per instruction of BALCO in charge. Tool (hammer) will be in scope of contractor.

VI) Anode stem grinding: Grinding of all anodes for startup and restart pot will be done for every pot. All equipment like grinding machine, cable, and grinding wheel should be provided by contractor. Penalty will be imposed due to delay of anode grinding regarding power on.

VII) Coke lying: All material chalk, plumb drop, scale, wooden grating, grating and thread will be in scope of contractor. Contractor will ensure that coke was free from foreign material, marking and coke spreading will be done as per instruction of BALCO in charge. Shifting of coke/graphite from pot repair shop to pot and from pot to pot repair shop will be in scope of contractor.

VIII) Flexible mounting/demounting with C-clamp: Buffing of beam to be done at the place where Anode flexible to be tightened. Flexible and C clamp should be fully tight and have proper contact surface with and should be retightened before power on. Flexible and C clamp modification and repairing will be in scope of contractor.

IX) Material loading + Leveling: Must be done manually or by crane depending on the condition. Contractor must ready for both condition without delay.

X) Shunt mounting/demounting. Buffing of beam and Riser/beam of next pot must done where shunt to be tightened. Shunt and C clamp should be fully tight and have proper contact surface with and should be retightened before power on.

XI) Power on: Minimum 15 manpower will be provided by contractor, contractor will ensure all anode clamps, flexible, C clamp and shunt tightening before power on. Power on tool box, cooling distributor and wooden board modification and repairing will be in contractor scope. Pneumatic wrench will be provided by contractor (5 wrenches for 5 risers and 1 stand by).

Fabrication and maintenance of cut in tool box is in the scope of contractor.

XII) Flexible correction: Flexible correction will be done once in a shift, voltage drop across the flexible and anode stem and flexible and beam should be below 20 mv and in case if flexible drop is more than 20 mV, it must be corrected.
XIII) Anode clamp tightening: Before tightening anode clamp, contractor should ensure removal of wooden pieces and bamboos and blowing of air to remove dust between anode stem and beam. Anode clamp oiling and tightening will be in scope of contractor.
XIV)Bath pouring, material pushing and addition: Minimum 10 manpower should be at the time of bath pouring, safety PPE's safety helmet, safety shoe, face shield, cartridge mask, heat resistance gloves, leg guard will be in contractor scope, if any safety PPE's provided by BALCO than cost will be deducted from contractor bill.
XV) Coke skimming- Coke skimming must be topmost priority after bath up till pot handover. Rigorous coke skimming must be done till 8 hours after metal pouring from all around of pot. Minimum 14 trolley coke must be skimmed by contractor.
XVI) Metal pouring and manual covering- After metal pouring and coke skimming done from long side of pot, anode covering must start as per instruction of shift in charge.
XVII) Flexible pitting
XVIII) Shunt clamp, flexible stud, C- clamp stud oiling and sending back to Pot repair shop.
XIX) Bath shifting from bath storage area to site as per instruction of shift in charge is in scope of contractor.
XX) Per pot 8 MT of covering material shifting from rodding area to site as per instruction of shift in charge is in scope of contractor.
XXI) All start up tools, shunts, Anode flexible, C-clamps, Flexible stud, shunt clamps, hoods, anode clamps, rockwool to be transferred by the contractor from specified place to Pot preparation site.
XXII) All start up tools, shunts, Anode flexible, C-clamps, Flexible stud, shunt clamps are to be repaired and maintained by the contractor throughout the delivery period of the contract. Shunt pitting repair and grinding as when required.
All Start up work is to be executed as per the guidelines of BALCO personal and contractor have to adhere the instructions if any modification or change is done in between.

24 Shifting of Coke from GAP to site.:
Screen and shift the coke from GAP site to potroom as per BALCO in charge instruction. Mesh size and particle size as per BALCO specification.

25 Breaking of Cathode Block into 300X300:
Spent cathodes are to be cut by jack hammers or by JCB breaker in the size of 300*300mm.

b) Disposal to be done at designated place.

c) For Spent pot lining if size not maintained as per mentioned then rework cost and transportation cost will be charged to contractor.

All guidelines related to SPL management, have to be followed.

26 Shifting of Collector Bar to Scrap Yard:

Collector bar taken out of cathode has to be kept in proper stand for safe handling. Stand to be fabricated by the contractor and material will be provided by BALCO. Collector bar must be shifted to scrap yard with proper MRV and weighment slip.

27 Shifting of Non Hazardous materials to designated place:

Shift all nonhazardous waste in dump yard as per BALCO instruction.

28 Dismantling and re erection of PSS:

Red oxide painting work of pot super structure & pot shell: Grey painting, duct pipe, air slide, beam raising channel, conduit pipe, hoppers, electric motors, gear box and motor shaft painting work of pot. Start up & stop date with red paint on risers with name of cathode block supplier along with the pot number.

1) Slings/lifting tools for Pot super structure removal to be provided by contractor. 40 mm sling to be used and same will not be used after 20 Pots. All lifting tools must be as per Vedanta guidelines.

2) All inspection and checking activities to be carried out by the contractor as per BALCO checklist and to be recorded. Repair and corrective action should be taken, if any deviation found, as per instruction of BALCO in charge and record to be kept.

3) Any damage in PSS done by contractor will be rectified by contractor with free replacement of parts and if contactor not able to do then BALCO will arrange to do correction and necessary cost will be deducted from contractor bill. All scraps generated during repair have to be removed and disposed to scrap yard.

If any abnormality is found after pot start up due to poor workmanship then penalty will be imposed according to the seriousness of the incident.

29 Emptying out the Alumina hopper:

Alumina and Alf3 recovered from Pot Super structure to be bagged separately without mixing and to be transported to the specified place and receiving to be taken from Alumina handling person. If at any point of time, noncompliance is found then cost of alumina and alf3 will be recovered from the bill. All hoppers for Alf3 & Alumina to be checked for holes and minor repair by Arc welding to be done when require as per instruction of BALCO in charge. Hatches to be cut in alumina hoppers and welding to be done of the same.

30 Removal of breakers and fitting it back:

Removal and placement of all breakers, feeders, all air slides and all hopper covers as per SOP will be done. Replacement of Pneumatic pipe, pneumatic hose pipes and ball valve of breaker and feeder as per damage identified. Making of threads in pneumatic pipe for fitting is in contractor scope. Base bolt of breakers and feeders to be retightened after bath up and metal pouring without fail.

31 Removal of feeders and fitting it back:

Removal and placement of all breakers, feeders, all air slides and all hopper covers as per SOP will be done. Replacement of Pneumatic pipe, pneumatic hose pipes and ball valve of breaker and feeder as per damage identified. Making of threads in pneumatic pipe for fitting is in contractor scope. Base bolt of breakers and feeders to be retightened after bath up and metal pouring without fail.

32 Bus bar pitting removal work:

I. Anode Beam pitting removal work. Anode beam must be clean from dust then grinded after J hook removal. Do 1st round filling of voids by aluminium welding then buffing must be done on bus bar surface. Recheck for further voids and do 2nd round welding. This buffing and welding must go on till bus bar surface getting smooth. This bus bar surface must be check for blue matching. This blue matching must be at least cover 80% of anode beam surface.

II. Fuse blocks pitting to be done before welding of flexes to the block. Fuse Block surface, riser surface grinding and buffing to be done before fixing fuse. After fixing fuse with turnbuckle gap between riser shunt and fuse block must be packed with aluminium sheet/foil.

III. Changing of anode beam is in contractor scope, if required. Anode beam will be provided by BALCO.

33 Checking of insulation and changing:

I. Checking for burn out, damage and low insulation value insulating materials and replacing. Following insulation need to check and replace

1) Insulation between I beam and concrete Column.
2) Insulation between cradle and shell Bottom.
3) Insulation between Compensating Bus bar and Bus bar support.
4) Insulation between Side Bus bar.
5) Insulation between catwalk support and catwalk angle.
6) Insulation between PSS leg and pot shell.
7) Breaker Insulation bricks and Breaker bolting insulation.
8) Feeder Gasket and insulation.
9) All Air slide Insulation.
10) All Hopper Insulation.
11) Anode shafts Insulation.
12) Anode Beam roller insulation.
13) Duct Insulation.

34 J-hook removals and fitting it back:

All J Hook must be removed, check for damage and replace as per instruction of BALCO in charge and SOP.

35. Segregation of bath & alumina:

Segregation of bath (from zero level) and transportation. Contractor should keep the Weighment slip. Segregated bath to be sent proper designated place as per BALCO instruction. Alumina and Alf3 recovered from Pot Super structure to be bagged separately without mixing and to be transported to the specified place and receiving to be taken from Alumina handling person. If at any point of time, noncompliance is found then cost of alumina and alf3 will be recovered from the bill.

36. Shifting of bath:
Shifting of bath from bath shed or any other designated to place to pot room or other place as per Balco In Charge. Contractor should keep the Weighment slip

37 Fabrication of Fuse block with and welding:
Fabricate fuse block as per required dimension and size and welding of the same as per requirement of BALCO in charge.

38 Carbofrax filling after rim plate welding:
Carbofrax mixture will be prepared by contractor. Rammer machine will be used for proper filling. Arrangement of tools which will be used for carbofrax filling are under the contractor scope. Penalty will be imposed if any material wastage or broken tools used in pot.

39. Removal and shifting of hoods:
Cutout pot hoods to be removed before butt removal. Arrange the hoods in proper manner and shift them to designated place

40. Removal of anode clamps and stacking
I) Collecting anode clamps in MS tray and transfers it to designated place via fork lift/pickup and kept inside designated container. Oiling of the anode clamps should be done on the shop floor.

41 Clamping and Removal of Bus bar connector or plate welding in bus bars
Bus bar connecting flexible and clamp fabrication must be done by contractor as per drawing on the basis of requirement but placement of this flexible in every pot is must, such like pot voltage goes below 0.25 volt on average (after pot cutout to pot power on). Placement should be done within 12 hours of pot cut out, else, payment for same will not be done and penalty will be deducted as 1000INR/8 hr shift.
Plates welding may also be done as per the guidelines of Balco in charge.

42 Clit welding between cradle bottoms:
After pot cutout welding need to done in-between shell and cradle, It is a type of locking which will prevent the shell bulge.

43 Beam leveling measurement and leveling:
Alignment of anode beam & PSS as per BALCO instruction.

VARIOUS JOBS

1 Overhauling of jacks and dismantling of motors:

I. All jacks to be overhauled and the worn-out parts to be replaced as per instruction of BALCO In charge. Spare parts will be provided by BALCO. Oil filling in the gearboxes after erection. Motor decoupling and shifting it to electrical workshop and fitting it back after servicing as per instruction of BALCO In charge.

2 Cathode shell repair work minor (Arc welding)

Cathode shell repair, which includes the cutting of worn out part of shell, fitting of new plate and quality welding of plate joint, filling of small eroded part of shell by fusion of electrodes as per instruction and quality check by BALCO In charge. Gas cutting set trolley should be as per new design provided by BALCO.

3 Cathode shell repair work major with CO2

Cathode shell repair, which includes the cutting of worn out part of shell, fitting of new plate and quality welding of plate joint, filling of small eroded part of shell by fusion of electrodes as per instruction and quality check by BALCO In charge

4 Bulging removal:

Channel and tools require for bulge removal to be kept by contractor. The uneven surface of bottom shell of pot is to be repair as per SOP & BALCO in charge instruction.

5 Retightening of cradle bolts:

Whenever the shell removal and placement work done the cradle to be retighten after metal pouring. If any cradle bolt loose fitting found, cradle bolt to be tight as per instruction.

6 Inspection and welding of beam to beam plates between anode beams:

Inspection of beam to beam plates by dye penetration test, if required. DPT kit will be provided by contractor. Damaged plates are to be cut out after confirmation of BALCO personal and new plates will be welded as per the SOP.

All tools required for welding to be arranged by contractor, cleaning of V of every plate by removing oil, dust & dirt etc to be done prior to start welding.

Safety precaution must be taken during welding. Welding to be done as per planning by BALCO.

If beam to beam drop is found higher after plate welding then penalty will be imposed.

8 Dismantling of pot shell and re erection:

I) Cathode shell repair, which includes the cutting of worn out part of shell, fitting of new plate and quality welding of plate joint, filling of small eroded part of shell by fusion of electrodes as per instruction and quality check by BALCO In charge and bulging removal, tightening of cradle bolts. Normally all welding must done by MIG welding but can also done by arc welding as per decision making by BALCO In

charge.

II) Cathode shells which are beyond the repairable condition at site, to be taken out and repair outside. For shell removal trailer is be in scope of BALCO. If any time BALCO trailer got any breakdown then alternative arrangement is in scope of contractor. 11mtX 40 mm slings for shell removal must be provided by contractor. Shell to be bringing inside pot room via trailer, place and aligned to its position as per the instruction and SOP.

9 cutting of leak metal & transportation:

Leaked metal cutting in zero level, if any, is to be carried out with 100% safety and as per SOP. Metal to be cut in 1m* 1m piece and after taking out outside the zero level, metal must be shifted to cast house after cleaning.

10 Damage Bellow Replacement:

Contractor must identify the bellow damage while remove the duct. Bellow to be provided by BALCO. Damage must be repair. If any damage occurs due to contractor the cost will be deducted from contractor.

11 I beam repair and replacement

Damaged I beam to be cut as per size given by BALCO in charge and fabricated new one. Repair work to be carried out as per instruction of BALCO in charge. All tools, welding machines, Hydraulic jack, Stools required for repair to be provided by the contractor. Zero level safety protocol must be followed during the work.

12 Repair of cradle if damaged as per draw

Cradle Repair: Damaged portion to be cut, new portion as per BALCO drawing to be fabricated and then to be joined. All work is to be carried out as per instruction of BALCO in charge.

13 Miscellaneous fabrication and modification

Miscellaneous fabrication and modification work: As per BALCO instruction fabrication to be done as per drawing given by BALCO in charge.

14 Riser flexible connecting plate welding:

The buffing, fixing, bolt tightening and riser connecting plate fitting and welding must be such like that drop between block joints must be below 5 mV.

15 Acid pickling solution preparations:

Acid pickling solution to be prepare as per BALCO instruction. HCL acid and base solution need is to be prepared as per instruction of BALCO personal. Before that the tank must be clear properly. Tools require for safe handling and access need to fabricate by contractor. All preparation should be done in front of a competent contractor or BALCO person. All specific PPE’s must be worn on the site and provided by contractor.

16 Cathode flexible welding as per requirement:

Cathode Flexible welding with bus bar and clad. Welding drop must be below 4mv.

17 Partial Lining:

Partial lining to be done as per the guidelines of BALCO In Charge.

18 Emergency manpower supplies for pot room:

Manpower will be supplied to pot room in case of emergency, as desired by BALCO personal.

Insurance

i You have to obtain group accidental insurance for all your staffs deployed at site.

ii. You have to obtain employee state insurance cover for all your workmen deployed at the site.

Governing terms & Conditions:-

1) The turnaround time shall not be hampered in any normal circumstances.

2) The penalty and Bonus Clause will stand effective as per the existing contract. The Maximum number of pots to be done parallel will be 4 pots, Either 4 pot in relining or 4 pots in startup at a time, These 4 pots are not in combination of relining and start up. The waiver on Penalty clause can only be considered over and above 4 pots at a time.

3) The agreed prices are going to be firm in the course of the contract and there will be no pressure for amendment in the price during the normal course of action. Any increase can be accorded in case of abnormal increase in the minimum wages by the State Government other than April and October.

4) 14 Manpower to be deployed in PRS on daily basis in general shift.

5) Rammer to be provided by contractor from the first pot of contract (preferable make – Fuji)

6) Bank deposit of Rs.15 lakhs to be deposited as guarantee (Bank Guarantee).

7) At any time if the performance is found unsatisfactory the contract will be terminated.

8) After 3 month of contract start BALCO will evaluate the deliverable of contractors and if it found satisfactory then only this contract will be sustain for its whole period otherwise contract will be terminated. Other than this, valuation of your deliverable will be done in every quarter

<u>Support for Various Emergency jobs at Potroom as listed below:-</u>

1. Material addition in pot like bath, scrap etc.
2. Manual covering in pot.
3. Coke skimming and skimmed coke bagging.
4. Bath breaking and bagging of bath or loose material.
5. B-200 air slide hammering and pot air slide hammering.

6. Manual alumina pushing in silo.

Special terms and conditions:-

1. To carry out the above emergency jobs contractor has to deploy manpower as per requirement of BALCO (information given by EIC before 8 hrs. of deployment). Maximum deployment per day is 80 mandays.
2. All safety PPEs i.e. helmet, safety shoes, hand gloves, face shield, goggles, cartridge mask etc. will be provided by contractor.
3. Contractor has to ensure that relieving system to be followed by all labour also duty reporting time would not be exceeded more than 20 minutes from beginning of shift and would not leave work area before end of the shift. If any person is not available or not complete working hour, penalty will be imposed based upon actual hours of person.
4. For any delay or stoppage of work penalty will be imposed for RS.10000/hr.
6. Contractor has to maintain discipline at work area. He has to keep the area neat and clean, if contractor will not follow the 5S, penalty may be put by BALCO @ Rs 10000/- per incidence.

General Conditions:

I) Welding electrodes, plug tops and cables to be procured by the contractor wherever required for Pot Relining & Start Up.
II) The welding electrode must be procured from ESAB/L&T make only which will confirm to IS standard. (Low hydrogen content). All Plug tops and Cables must be as per required rating and conforming to IS standards. All cables must be joint less and properly insulated with insulated material coating.
III) All welding machine must be fitted with RCCB.
IV) All the cutting set should be brought inside the pot line with a trolley and must be fitted with flash back arrester at both ends.
V) All types of sling, tools and tackles necessary for the work to be arranged by the contractor. All slings, lifting tools must be load test certified and not a single strain should be damage before use. Handmade slings are not to be use.
VI) Oil for filling the gearbox will be provided by BALCO
VII) Hydra and truck for material shifting to be arranged by contractor.
VIII) Contractor has to draw all material including steel from central stores or assigned place inside the factory premises. Contractor to ensure proper handling of materials and no damage should occur during handling. If damage occurs, cost of the same will be penalized. Contractor must load, unload and shift any kind of material Other then relining material and spare like bath, Aluminum metal, bus bar, Scrap, waste, bamboo, Alf3, Soda and other miscellaneous material or structure of other area of plant and SBU as per guidance of engineer in-charge which payment will be

done on weighing basis. Tandem loading and unloading is not allowed. Only new generation hydras (TRX 1550) are allowed inside the plant. All safety compliance must be ensured by contractor, if at any point of time any non-compliance is found in vehicle, then, vehicle will be stopped immediately and penalty will be imposed according to the seriousness of the concern. Operator's checklist must be filled on shift basis. Checklists will be provided by contractor.

IX) Electrode butts to be collected in a container and disposed off immediately to avoid vehicles puncture inside the Pot room. If any vehicle of BALCO punctured due to welding electrode butt, cost of the same will be deducted from the bill.

X) Housekeeping should be carried out immediately after completion of each activity at 3m and 0m level. All tools, machines, material must be kept in systematic way in front of Pot. No material spillage on floor should be there.

XI) At PSS & Pot Repair area bins to be kept for any waste collection. Any waste must not be thrown to zero level, 3m level or FTP area. Trays/Bins to be used for keeping all nuts, bolts, washers, J Hooks, studs in PSS/Pot repair area.

XII) Contractor shall execute the jobs as per instruction of BALCO's Engineer in charge based on SOP.

XIII) Collector bar removal from rejected cathode blocks on requirement basis should be done by contractor itself.

XIV) All the cables used for different equipment (Casting machine, DIM vibro compactor, lights, fans, brick cutting machine, grinding machine) should be provided by contractors themselves with proper plug top connection and at least arrangement for 4 pots must be always ready with them at a time, failing of which will result of penalty.

XV) Wooden spades should be provided by contractor themselves.

XVI) All the start up tools (anode flexible, C clamp, stud, nuts, washer, shunt, shunt clamp) will be provided by company to the contractor one time for his entire contract period and which maintenance and on time availability is contractor's responsibility. In case of any loss and failure of on time availability contractors will be penalized.

XVII) 8 Rammers for pot ramming and 2 rammers for Cathode Block Sealing will be provided by the contractor.

XVIII) Pressure release valve must be present in all air distributors.

XIX) LPG home Cylinder cannot be used for cutting set. Pressure Gauge must be fitted in all cutting set and must be checked thoroughly before use by Contractor Site In charge/ Supervisor.

XX) Local stores provided by BALCO must be kept clean from inside and outside. Nearby area cleaning of store is also responsibility of Contractor. Every Month BALCO CFT will audit the area and if not found satisfactory suitable action will be imposed.

XXI) Contractor performance score card must be more than 90% on month basis else 0.5% of Bill will be deducted, from 4^{th} month of contract.

XXII) Training conduction on BALCO SOP, incidents investigations, Safety, 5S for supervisors, site in charge, and workmen is the responsibility of Contractor. Contractor must provide labors and supervisors for training as per training calendar. Training can be conducted inside or outside the plant with the help of BALCO in charge or by some

external faculty. Record to be maintained and to be furnish as and when required. Skill matrix is to be prepared for contract employees by the contractor and Training need is to be identified. On the basis of training needs, training calendar to be made by the contractor and compliance of the same must be ensured.

XXIII) Daily 5 minute (common and job specific) & weekly tool box talk to be done by contractor and record to be maintained.

XXIV) Any wastage/ damage to BALCO material/property due to work stoppage or any other contractor or its manpower activity will be sole responsibility of contractor and chargeable to him only.

XXV) The amount mentioned in the contract under the line item of Cooling fan installation in bus bar is for shifting of light fans only. No heavy fan shifting is to be done under this line item.

XXVI) Any welding work which is done by Arc welding will be billed under minor repair work and by CO2 under major repair. Other repair works will be billed under their respective line items.

XXVII) If extra mandays properly certified and approved by BALCO engineer in charge, is deployed for cathode surface cleaning in restart/ autopsy pot then normal wage payment for extra mandays may be done through this contract only.

XXVIII) PME to be done once in a year as per BALCO guidelines for all workers & supervisors.

XXIX) BALCO believes in reward and recognition. Contractor has to follow the BALCO's R&R policy.

XXX) BALCO is committed to optimize the assets. In this respect contractor must follow the AO guidelines of BALCO as applicable and prepare and provide data as desired.

XXXI) BALCO ensures the development of its all the employees till down the level workers and provide them a platform. Contractor has to motivate and encourage his employees to take part in quality circle and kaizen, actively.

XXXII) BALCO has a strong commitment to providing a safe and healthy workplace and protecting the environment, natural resources.

All your employees should demonstrate a commitment to Balco's zero Accident and zero harm philosophy; all your employees will be supplied with appropriate personal protective equipment (respiratory and Non respiratory) by the contractor as per our Safety Department List and tools to allow them to perform their work safely.

Contractor are requested to deploy the supervisors and workmen Interviewed and cleared by the Department.

Scope of Work: Busbar Jobs

Bus bar plate Fabrication

- Plate fabrication to be done as per given specification of BALCO. Make proper 'V' in plate; remove oil, dust & dirt etc.
- Balco will provide Aluminum plate of appropriate thickness but transportation of plate from SRS

to designated storage place and from storage place to contractor site is in scope of contractor.

- All the tools required for plate fabrication are in contractor's scope.

Bus bar Block Fabrication

I) Block fabrication to be done as per given specification of BALCO.
II) Balco will provide Aluminium bars of appropriate thickness but transportation of plate from SRS to designated storage place and from storage place to contractor site is in scope of contractor.
III) All the tools required for busbar block fabrication are in contractor's scope.

Riser and cathode Flexible and bus bar Plate Welding inside and outside of pot room

I) All tools required for welding to be arranged by contractor, cleaning of 'V' of every plate by removing oil, dust & dirt etc to be done prior to start welding. Safety precaution must be taken during welding.
II) Welding to be done as per planning by BALCO.
III) Penalty worth 1000/hr will be imposed in case of 1 hour delay in welding from planning.

Bus bar Block Chipping and Grinding

I) All tools required for chipping and grinding to be arranged by contractor.
II) Chipping and grinding to be done inside/outside of pot as per planning of BALCO, with all safety measures.
III) Penalty worth 1000/hr will be imposed in case of 1 hour delay in from planning.

Bus bar removal, Placement & Alignment

I) All the resources required for the above job to be provided by contractor. New bus bar to be placed as per instruction of EIC.
II) It includes removal of damage Busbar, cutting of Busbar and placement to the position after plate welding.
III) Penalty worth 1000/hr will be imposed in case of 1 hour delay in from planning.

Riser to riser connector fixing

I) Do the entire job according to SOP.
II) All the resources and tools required for the above job to be provided by contractor.
III) Riser connector must be shifted by tailor at center passage of section. This is in scope of contractor.
IV) Riser of both side of pot must be buffed before fixing of riser connector.
V) Riser connector must be hanged by belt (patta) while fixing on riser.
VI) Any modification required in design of riser connector must be done by contractor.
VII) Penalty worth 1000/hr will be imposed in case of 1 hour delay in from planning.

Beam to beam flexible fabrication, modification and connection

I) Beam to beam flexible to be connected within 2 hrs of intimation given by BALCO.
II) All the resources and tools required for the above job to be provided by contractor.
III) Anode beam of both side of pot must be buffed before fixing of riser flexible.
IV) Flexible must be shifted by tailor at center passage of section, which will be in scope of contractor.
V) Flexible must be hanged by belt (patta) while fixing with Anode beam.
VI) Any modification required in design of beam to beam connecting flexible must be done by contractor.
VII) After clamping clamp drop must be less than 20mv.

Online Riser & riser shunt block removal, chipping, grinding, welding, blue matching and box-up.

I) Separate the riser shunt with riser with the help insulated material and put it on catwalk.
II) Wrap the riser and shunt by asbestos cloth.
III) Remove the stuck material on riser and shunt by chipping and hammering.
IV) Clear the area of riser and shunt for welding.
V) Do welding on riser and shunt.
VI) Do blue matching of riser and shunt.
VII) Box-up the shunt with riser by inserting insulation sleeve and box

Supply of MIG Welding Machine

I) MIG welding machine to be supplied within 1 day information given by BALCO and welding to be done as per the location given by EIC.

Clad Bolt connection and clad bolt drop rectification.

I) The work of Bolt drop Connection involves fixing of Collector Bar Clad after proper grinding of the Cu-CLAD with the help of grinders and sand paper. Bolt drop Value after connection should not exceed 15 mV.
II) The work of Bolt drop Rectification involves Opening and fixing of Collector Bar Clad after proper grinding of the Cu-CLAD with the help of grinders and sand paper. Bolt drop Value after connection should not exceed 15 mV.
III) Proper safety should maintain while working in ZERO LEVEL, the workers should have proper PPE's. Specifically heat resistant gloves, Goggles, Helmet, Safety Shoes as per Balco Safety Norms.
IV) The work to be done will be informed by the Balco engineer with proper Safety Work Permit. Work to be started within duration of 1hr from the time of intimation.
V) The workers should be with sound knowledge of the work, preferably experienced in the same work in Pot room.
VI) If while working in a particular pot a clad is found missing in it, the labor and the contractor will be fully responsible for it.

VII) Payment basis shall be for Pair of Clad (set of two Collector bar Clad) Connection or Rectification or Both.
VIII) One Clad Contains two bolts and Pair of Clad Contains 4 bolts in Total.
IX) In case one Clad Connection/rectification is done Payment Shall be half the Value of Pair of Clad.
X) During the work Aluminium flex and Plates should not be damaged.
XI) BALCO's SCOPE: Clad, Nut Bolts washers, if missing. Safety work permit duly signed by Pot room Services and Operations in-charge. Communication in work permits regarding Bolt to be connected.
XII) CONTRACTORS SCOPE: All tools required like Spanner, Grinder, Sand Paper, etc to execute the job. Receipts of material from stores upon receive of SIV from Balco Engineer. Suitable extension boards for Electricity connection from nearest possible Electrical Supply at zero level or Shop floor with Male Sockets as per Balco's normal procedure.

Scope of work Insulation Rectification

Replacement of Sindanio Sheet

1. Syndanio sheet, nut & bolt will be given by balco.
2. Contractor install the new syndanio sheet in place of damage/missing sheet location, given by balco EIC.
3. Tools for fixing work will be provided by contractor.
4. All safety measures to be taken during the work in zero level.

Replacement or Reassembly of I Beam Insulation.

Replacement or Reassembly of Outer Column/Intersection.

Replacement or Reassembly of Compensating Bus bar Insulation.

Replacement or reassembly of Bus bar projection Insulation.

Replacement or Reassembly of cross over and cathodic bus bar insulation

For above 5 works:

1. Insulation will be given by balco.
2. Contractor install the new insulation in place of damage/missing location, given by balco EIC or reassemble the displace insulation.
3. Tools for fixing/reassembling work will be provided by contractor.
4. All safety measures to be taken during the work in zero level.

Riser shunt insulation and riser column bottom rectification

1. Start from air blowing on insulation fail location.
2. If insulation fail location shows infinite value go to the next location
3. If insulation value not come infinite, remove the sleeve of fail location, blow air or change the sleeve if damage and reconnect the sleeve and tight the stud.
4. New insulation sleeves will be given by balco.
5. All tools will be in contractor's scope.

Replacement of Riser insulation box

1. Loose the nut of riser stud.
2. Remove the insulation box of one side and insert wooden wedge in between riser and shunt.
3. Take a new insulation box, remove the wooden wedge and insert the insulation box.
4. Tight the stud.
5. New insulation box will be given by balco.
6. All tools will be in contractor's scope.

Fixing of catwalk floor insulation in corner pot.

1. Start from air blowing on insulation.
2. If insulation fail location shows infinite value go to the next location
3. If insulation value not come infinite, remove the catwalk and then insulation, blow air or change the catwalk insulation if damage.
4. Insulation will be fixed by Micro-concrete from all side.
5. New insulation will be given by balco.
6. All tools will be in contractor's scope.

Replacement or reassembly of L Shape insulation between bus bar

1. Start from air blowing on insulation.
2. Remove the stud and then remove the damage insulation.
3. Place new insulation given by balco.
4. All tools will be in contractor's scope.

Rectification of Catwalk Insulation in pots.

1. Start from air blowing on insulation.
2. Remove the all catwalk as per SOP and then change the failed insulation.
3. New insulation will be given by balco.
4. All tools will be in contractor's scope.

Riser flex leaf cutting

1. Location and nos. will be given by balco.
2. For cutting of riser flex leaf, sheet cutting scissor will be provide by contractor.

Riser flex straightening

1. Location and nos. will be given by balco.
2. Mallet hammer will be required for straightening of riser flex to be provided by contractor.

MS bus bar support welding

1. Location and nos. will be given by balco.
2. Zero level Busbar support MS plate will be welding in damage location and fixing of new in missing location.
3. MS Material will be given by balco
4. Tools and consumables will be in contractor's scope.

Scope of work Misc Repairing

Web plate alignment

1. Location will be given by balco.
2. Tools for web plate alignment will be done as per SOP by contractor.

Replacement of missing web plate

1. Location will be given by balco.
2. Tools & welding machine for web plate welding will be done as per SOP by contractor.

Repair of door hoods MS frame

1. Location will be given by balco EIC.
2. Shifting of new door hoods will be done by contractor.
3. Consumables required for fixing of new door hood will be in contractor's scope
4.

Quantity of Relining and Start up:-

Sl No.	Item Description	Qty per pot		Unit	First Year		Second Year		Third Year	
		PL 1	PL 2		PL 1	PL 2	PL 1	PL 2	PL 1	PL 2
1	Ramming of Pot	1	1	NO	45	75	45	75	45	75
2	Bath digging of Pot	12	12	MT	540	900	540	900	540	900
3	Cutting of metal manuall or by oxy lancing	2	2	MT	90	150	90	150	90	150
4	Digging of sidewell and periphery	1	1	NO	0	75	0	75	0	75
5	Digging of side wall, periphery and cathode blocks by Pot Demolition Machine	1	1	NO	45	0	45	0	45	0
6	Rim plate cutting and collector bar cutting	60	60	Mtr	2700	4500	2700	4500	2700	4500

7	Taking out the spent cathode lining and shifting	45	45	MT	2025	3375	2025	3375	2025	3375
8	Cleaning of cathode shell	1	1	NO	45	75	45	75	45	75
9	Collector bar pickling and grinding	108	108	NO	4860	8100	4860	8100	4860	8100
10	Block sealing	27	27	NO	1215	2025	1215	2025	1215	2025
11	Collector bar polishing and protection	108	108	NO	4860	8100	4860	8100	4860	8100
12	One layer of CaSiO3	281	220	NO	12645	16500	12645	16500	12645	16500
13	Two layer of insulation bricks	5	5	MT	225	375	225	375	225	375
14	Dry impervious ramming and levelling	25	25	MT	1125	1875	1125	1875	1125	1875
15	Blocks placement and adjustment	27	27	NO	1215	2025	1215	2025	1215	2025
16	Putty aplication inside and outside the pot	108	108	NO	4860	8100	4860	8100	4860	8100
17	Low strength insulation bricks laying	0.31	0.31	MT	13.95	23.25	13.95	23.25	13.95	23.25
18	Light pouring refractory and high strength casting material	6.1	6.1	MT	274.5	457.5	274.5	457.5	274.5	457.5
19	Refractory bricks laying	484	350	NO	21780	26250	21780	26250	21780	26250
20	Carbon and Silicon carbide laying	4.75	4.75	MT	213.75	356.25	213.75	356.25	213.75	356.25
21	Shifting of all raw materials required for lining	60	60	MT	2700	4500	2700	4500	2700	4500
22	Rim plate welding	40	40	RM	1800	3000	1800	3000	1800	3000
23	Cathode clad bolting and tightening	108	108	NO	4860	8100	4860	8100	4860	8100
24	Pot startup activities	1	1	AU	45	75	45	75	45	75
25	Bath addition of pot for bath making	40	40	MT	1800	3000	1800	3000	1800	3000
26	Shifting of coke from GAP to site	0.33	0.33	MT	14.85	24.75	14.85	24.75	14.85	24.75
27	Breaking of cathode block into 300*300mm and shifting	60	60	MT	2700	4500	2700	4500	2700	4500
28	Shifting of collector bar to scrap yard	25	25	MT	1125	1875	1125	1875	1125	1875
29	Shifting of Non hazardous material to designated area	1	1	MT	45	75	45	75	45	75
30	Dismentling and reerection of PSS	1	1	NO	45	75	45	75	45	75

31	Emptying out the Alumina hopper	3	3	NO	135	225	135	225	135	225
32	Removal of breakers and fitting it back	6	6	NO	270	450	270	450	270	450
33	Removal of feeders and fitting it back	6	6	NO	270	450	270	450	270	450
34	Checking of insulation and changing	10	10	NO	450	750	450	750	450	750
35	Bus bar pitting removal work	8000	8000	Cm Sq	360000	600000	360000	600000	360000	600000
36	J-hook removal and fixing it back	40	40	Set	1800	3000	1800	3000	1800	3000
37	Segregation of bath and alumina and transportion	15	15	MT	675	1125	675	1125	675	1125
38	Shifting of bath	30	30	MT	1350	2250	1350	2250	1350	2250
39	fuse block Welding	10	10	NO	450	750	450	750	450	750
40	Carbofrax filling after Rim Plate Welding	1	1	AU	45	75	45	75	45	75
41	Removal of clamps and stacking	40	40	NO	1800	3000	1800	3000	1800	3000
42	Removal of hoods and Shifting	54	54	NO	2430	4050	2430	4050	2430	4050
43	Clamping & Removal of Busbar connector	1	0	NO	45	0	45	0	45	0
44	Clit welding between cradle bottom and shell	1	1	NO	45	75	45	75	45	75
45	Beam to beam plate DPT Test	1	1	NO	45	75	45	75	45	75
46	Acid pickling solution preparation	0.5	0.5	NO	22.5	37.5	22.5	37.5	22.5	37.5
47	Over hauling of jack and dismantiling of motor	0.2	0.2	NO	9	15	9	15	9	15
48	Cathode flexible clad welding/repair	18	5	NO	810	375	810	375	810	375
49	Cathode shell repair work minor	60	25	Mtr	2700	1875	2700	1875	2700	1875
50	Cathode shell repair work major with CO2	25	10	Mtr	1125	750	1125	750	1125	750
51	Bulging removal	0.2	0.1	AU	9	7.5	9	7.5	9	7.5
52	Retightening of cradle bolt	5	2	AU	225	150	225	150	225	150
53	Chipping and welding of plates between anode beam	92	25	NO	4140	1875	4140	1875	4140	1875
54	Dismanting of pot shell and reerection	0.08	0.01	NO	3.6	0.75	3.6	0.75	3.6	0.75

55	Cutting of leak metal and transportation	3	3	MT	135	225	135	225	135	225
56	Damage below Replacement	0.5	0.5	NO	22.5	37.5	22.5	37.5	22.5	37.5
57	I beam repair and replacement	0.5	0.5	AU	22.5	37.5	22.5	37.5	22.5	37.5
58	Repair of cradle if damaged as per drawing	0.5	0.5	NO	22.5	37.5	22.5	37.5	22.5	37.5
59	Miscelleneous fabrication & modification	0.5	0.3	MT	22.5	22.5	22.5	22.5	22.5	22.5
60	Riser flexible connecting plate welding in to riser	20	20	NO	900	1500	900	1500	900	1500
61	Partial lining with few blocks removal	0.5	0.5	NO	22.5	37.5	22.5	37.5	22.5	37.5
62	Emergency Manpower	60	40	MD	2700	3000	2700	3000	2700	3000

5. **Manpower, Resource, Tools & Consumable Details**

MANPOWER DETAIL

			Existing		**To be retrenched**		**To be retained**		**Total**	
Workers	Relining	Permanent	251	343	0	0	251	329	251	329
	Hood repair & insulation rectification		14		0		14		14	
	Relining	Temporary	78		14		64		64	
Supervisor			23		0		23		23	
Safety			2		0		2		2	
Store keeper			3		0		3		3	
HR			4		0		4		4	
Brokk Operator			1		0		1		1	
Total			**376**		**14**		**362**		**362**	

Note:-

1. Existing 14 temporary gate pass in relining contract to be retrenched.
2. Manpower nos taken considering 11 pots relining/month. On increase of number of pots in relining, temporary gate passes will be issued on prorata basis.

Consumables Detail

S No	Name of Consumable	Brand	Specification	Monthly consumption	UOM
1	Diesel	India oil	For	4000	lit
2.	Hydraulic oil	India oil	For	150	lit
3.	Gear Oil	India oil	For	50	lit
4	Mobile oil	Castrol	For	150	lit
5	Oxygen cylinder	Bharat gas		300	Cylinder
6	Argon cylinder	Bharat gas		70	Cylinder
7	Co2 cylinder	Bharat gas		30	Cylinder
8.	Electrodes	ESAB		50	Packet
9	LPG Gas	Bharat gas		25	Cylinder
10	Aluminum Spool	Metalloid		30	no
11	Co2 Spool	ESAB		15	no
12	Grinding wheel (AG-7)	Bosch		450	no
13	DPT Kit			10	no
14	Chisel Flat	Editool		200	no
15	Rustolene			Min	lit
16	Buffing paper (60, 80no)	Notron		450	no
17	Buffing Paper (120 no)	Notron		450	no
18	Cup brush			50	no
19	Sling (various sizes)	Usha Martine		30	no
20	Web Sling (3 MT, 5mtr)			25	no
21	Welding cable /connection cable			30 to 40 meter for each	

Machines and Equipment Required:

S No	Name of M/C	Specification
1	Welding M/C (With inbuilt VRD)	Mig 5+1(stand by); Arc 5+1 (Stand by)
2	Drill M/C (Bosch, with push type switch)	2 Nos
3	Grinding M/C (Bosch, with push type switch)	7 AG4 and 7 AG7
4	Vibrating Needle	6 (5+1)
5	Screw Jack (	4 nos (10 MT)
6	Vacuum Cleaner	1 nos
7	Hydraulic and Hand trolley	5+6 nos
8	Hose Pipe	1 inch- 16 nos and 0.5 inch - 12 nos
9	D-shackles (Crosby)	1 MT-6 nos, 2.5 MT- 6 nos, 5 MT - 4 nos, 10 MT – 2 nos

10	Chipping Gun	5 Nos
11	Pipe Wrench	4 nos
12	Pan Paddle Mixer M/C (guarding interlock)	4 nos (500 kg each)
13	Hammers (Standard)	8 nos (5 lbs)
14	Water pump motor	2 nos (1 HP motor)
15	RCCB (Havells, Siemens)	For every welding or electrical M/C or electrical board
16	Cutting Set (with ESAB flash back arrester)	4+2 (stand By)
17	Chain Pulley Block	3 MT - 2 nos; 5 MT - 2 nos
18	Spanners (MOC-SS, make Taparia)	D+Ring (as per application)
19	Water Level	2
20	Sliding Jack	3
21	Vernier and Scales	1+5(1meter)
22	Cutting M/C	(brick, wood, Al flex cutting, SiC brick)
23	Vibrator M/C	Needle size (60mm); flexible shaft (6 meter Length); vibration (1200/minute);Power- 2 HP, single phase
24	Pneumatic Rammer, its hose and distributor, Halogen and sodium lamps, its wiring ; Helmet mounted chargeable light	12+2 (Stand By) (Fuji Make)
25	Pneumatic Angle torque wrench for bolt opening	8 nos
26	Pneumatic torque wrench for Start up	6 nos
27	Vibro compactor for DIM compaction	3 nos
28	Jack Hammer	12 (CP)
29	Circular saw	1 nos
30	Electric Panel Board	3 nos
31	Heavy duty Cooling fan	3 nos
32	Wire rope sling 40mmØ x 4.2m	8 nos (Usha martine)
33	Wire rope sling 16mmØ x 7m	6 nos (Usha martine)
34	Wire rope sling 16mmØ x 4m	4 nos (Usha martine)
35	Wire rope sling 12mmØ x 6m	3 nos (Usha martine)
36	Wire rope sling 8mmØ x 1.5m	6 nos (Usha martine)
37	Wire rope sling 40mmØ x 12m	2 nos (Usha martine)
38	Light for ramming	10+2(stand by)
39	Manual Screw Jack 25T	1
40	Transformer	3
41	Mixer machine for mortar mixing	1
42	Table grinder	(3HP)
43	Gas cylinder loading/unloading arrangement (Automated/Mechanized)	1

44	Hydraulic Jack (150 MT)	2 nos

Vehicles Required:

S No	Name of Vehicle	Qty	Specification
1	Trailer	4	16 MT each
2	Hywa	4	(16 MT each)
3	Hydra	3	(New generation, TRX 1550, 14 MT each)
4	Hydra	1	(New generation, TRX 2319)
5	Pick Up	2	
6	Forklift	3	3 MT

Note:-

Quantity for Bus bar work, hood and insulation rectification:-

S. No.	Item Description	Quantity					
		Y1		Y2		Y3	
		PL 1	PL 2	PL 1	PL 2	PL 1	PL 2
2	Web plate alignment	1,200	1,200	1,200	1,200	1,200	1,200
3	REPLACMENT OF MISSING WEB PLATE	180	180	180	180	180	180
5	REPAIR OF DOOR HOODS MS FRAME	1800	1800	1800	1800	1800	1800
6	Plate Fabrication	840	840	840	840	840	840
7	BUSBAR BLOCK FABRICATION	48	48	48	48	48	48
8	Plate and flexible welding inside or o	840	840	840	840	840	840
9	Bus bar Chipping, Grinding	48	48	48	48	48	48
10	Bus bar Placement & Alignment	48	48	48	48	48	48
11	Riser plate Fabrication						
12	Riser to riser connector fixing	48	48	48	48	48	48
13	Beam to beam flexible connection	48	48	48	48	48	48
14	ONLINE RISER & SHUNT BLOCK REMOVAL,	12	12	12	12	12	12
15	Supply and welding of MIG welding Machi	12	12	12	12	12	12
16	Clad Bolt connection and clad bolt drop	48	48	48	48	48	48
17	REPLACEMENT OF SINADIO SHEET	120	120	120	120	120	120
18	REPLACEMENT OF I BEAM INSU	120	120	120	120	120	120

19	REPLACEMENT OF OUTER COLUMN	120	120	120	120	120	120
20	REPLACEMENT OF COMPEN BUSBAR	120	120	120	120	120	120
21	REPLACEMENT OF PROJECTION BUSB	600	600	600	600	600	600
22	RISER SHUNT INS & RISER COLM BTM RE	1440	1440	1440	1440	1440	1440
23	REPLACEMNT OF RISER INS BOX	120	120	120	120	120	120
24	FIXING OF CATWALK	120	120	120	120	120	120
25	REPLACEMENT OF L SHAPE INS BET	600	600	600	600	600	600
26	RECTIFICATION OF CATWALK INS	288	336	288	336	288	336
27	RISER FLEX LEAF CUTTING	240	240	240	240	240	240
28	RISER FLEX STRAIGHTENING	240	240	240	240	240	240
29	MS BUSBAR SUPPORT WELDING	120	120	120	120	120	120
30	REPLACEMENT OF CROSSOVER CATHO	120	120	120	120	120	120
31	REASSEMBLY OF I BEAM INS	120	120	120	120	120	120
32	REASSEMBLY OF OUTER COLUMN	120	120	120	120	120	120
33	REASSEMBLY OF COMPSN BUSBAR	120	120	120	120	120	120
34	REASSEMBLY OF PROJECTION INS	600	600	600	600	600	600
35	REASSEMBLY OF L SHAPE	600	600	600	600	600	600
36	REASSEMBLY OF CROSS OVER	120	120	120	120	120	120

Penalty and Bonus

Penalty and Bonus will be applicable as per the KPI sheet.

I) If manpower diverted for Urgent work in Pot room by stopping relining work then this delay will not consider for evaluating bonus or penalty.

II) If contractor or contractor employee found involved in any case of theft of BALCO material and property then penalty up to Rs 10000/- will be deducted from contractor bills and also that material or property also been taken back by BALCO. Suitable action will be taken against the culprit including gate pass cancelation.

III) Contractor to ensure strict adherence to Safety COC, safety guidelines and SOP. Deviations would result in penalties as per BALCO Policy.

IV) All safety PPE's like Safety shoe, goggle, dust mask, safety helmet, heat resistance gloves, rubber gloves, cotton gloves, welding- grinding,-cutting

apron, welding face shield, white face shield, welding goggle, leg guard. Ear plug is in scope of contractor. If contractor fail to provide then BALCO will arrange and provide safety PPE's to worker and cost of same will be deducted from contractor bill of current month with suitable penalty.

V) All work considering on the basis of 8 hr shift schedule.

VI) PME to be done twice in a year as per as per form 21.

VII) Shift Supervisors and site In charge qualification must be at graduation level. Pot Demolition machine operator should be minimum ITI diploma holder.

VII) In case of any observed safety non-compliance, Penalty would be deducted as per then BALCO Policy.

VIII) In case of any violation of safety measures and or on non-compliance of safety PPE by the Contractor or his employee (s) BALCO shall penalize the contractor as follows:

If contractor continue for failing to provide the safety &/ or PPE BALCO reserves its right to terminate the contract. At any point of time safety compliance will be checked by BALCO's SAFETY department. The contractor shall immediately upon knowing of any accident, damage or losses, in which he is involved on the site, should inform the area-in-charge.
The contractor shall take all safety precautions and provide adequate supervision by competent persons in order to do the job safely and without damage to plant, personnel, equipment, and the environment. Any accident causing fatal or non-fatal injury to the employee(s) of the contractor shall be the exclusive responsibility of the contractor. In the event BALCO and /or its employee(s) are prosecuted by any other authority under law for accident causing fatal or non-fatal accident, the contractor undertakes to reimburse BALCO all fines, penalties and expenditure incurred in connection with defending such prosecution by BALCO and towards this the contractor irrevocably agrees to BALCO deducting such amounts from its pending bills.

10. SAFETY PPE &APPLIANCES:

- *Leather gloves (12 inch) shall be used where heat resistant gloves not practical to use.
- **Full body double lanyard safety belt with life line shall be used as per the site condition. Incase proper access not available, fall arrester shall be used.
- Fume gas mask to be issued to workers of pot room
- Under guard to be issued to worker of pot room (2 sets in a year).

S.No.	PPEs	Frequency	QTY/Year	Brand	No of Manpower
1	Safety Helmet	Yearly	1	Udyogi, Karam (ISI)	315
2	Safety Shoes (Nitrile Sole, Fiber Toe, Full Ankle)	Half Yearly	2	Midas, Frontier, Bata, Udyogi, Atlas	315
3	Safety Goggles	Half Yearly	2	Unicare (Same as Balco)	315
4	Dust/ Pitch Fume Mask	Weekly	48	3M, Venus,	30
5	Mouth Piece	Yearly	1	3M, Venus	248
6	Cartridge	Half Yearly	2	3M, Venus	248
7	Hand Gloves – Nitril	Weekly	48	Atlas, Udyogi, Mallcom	88
8	Hand Gloves - Leather	Fortnightly	24	Atlas, Udyogi, Mallcom	130
9	Hand Gloves - Heat Resistance	Weekly	48	Atlas, Udyogi, Mallcom	160
10	Earplug	Fortnightly	24	3M, Venus	315
11	Ear Muff	Quarterly	4	3M, Venus	52
12	Leather Apron for welder	Monthly	12	Atlas, Udyogi	90
13	Leather Leg & Arm Guard	Monthly	12	Atlas, Udyogi	130
14	Face Shield	Bi- Monthly	6		90
16	Reflective Jacket	Monthly	12	VIZ-WEAR, Karam	315
17	Uniform	Half Yearly	2		315
18	Rain Coat	1 in 2 Year	0.5	Duckback	315
19	Inner guard	Half Yearly	2		250
20	Helmet (Inner Head Band)	Half Yearly	2		315
	IR Related Item				
	Lux		4	100 Gram each	315
	Rin		4	100 Gram each	315
	Gur		2.6 Kg		315
	Gamcha		12	Monthly	315

Note – PPE distribution frequency mention is a change compulsion. In case, if it gets damage early, it is to be replaced immediately.

- **PME of all workers to be done in every 6 months and form 21 to be submitted.**