**WORK INSTRUCTIONS FOR HBS CHECKER CLEANING**

* Objective : - Checker bricks replacement and holes cleaning for getting

optimum performance of stoves.

* Scope : - Hot Blast Stoves
* Ref. : - Checker drawings, HBS drawings, Manuals
* Responsibility : - Operation Head, Engineer, supervisor & workmen on the job

**PPE to be used :** Helmet, safety shoes, hand gloves, safety belt, and complete sealed goggles, CO monitor, Oxygen Monitor, dust musk and ear plug.

* **Activity No 1 : - Shifting of checker bricks on top of stoves**
* **Activity No 2 : - Dismantling, Inspection, Cleaning and Erection of Checkers**

**Aspect – impact**

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| Dust generation | Air pollution |
| Scrap generation | Resource depletion |
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| Oil spillage | Land contamination & Resource Depletion |

**Hazards identified**

**Mechanical**

1. Fall of bricks, steel, hammer, etc on human body from dome platform to ground
2. Trapping in between objects
3. Impact due to object
4. Tripping of person with compressed air hoses
5. Fall of person from platform, staircase
6. Fall of person from manhole onto checker bed
7. Failure of platform due to overloading

**Physical**

1. Dust Inhalation
2. Gas Exposure
3. Burn injury from hot refractory/ plates
4. Burn injury from hot duct
5. Noise
6. Darkness/less illumination
7. Congestion
8. Suffocation
9. Back pain due to sudden lifting of heavy objects

**Electrical**

1. Electrical shock from welding machine.
2. Electrical shock from punctured cable

**Behavioral Hazard:**

1. Workmen under influence of alcohol
2. Violation of procedure
3. Not wearing PPE’s
4. Not concentrating while operating crane
5. Over Exertion

**Activity No 1: Shifting of checker bricks on top of stove**

1. Initially materials to be stacked on flat ground near stoves area. This area to be barricaded (1mts outside stacking area).
2. Small quantity materials like mortar, castable, hoses, poker rods, insulating bricks, dense bricks for inspection door, plumber and lancing pipe chain etc will be shifted near inspection door platform before opening of inspection door.
3. New Checker bricks will be shifted in secured steel cage by using HBS 5T hoist crane. Similarly old checker bricks to be shifted down using crane.
4. For manually shifting, each helper should carry single brick at a time (weight of each brick 5-6 kg).
5. Stove area below the working platform should be barricaded while lifting of materials.
6. Ensure that bricks shifted being uniformly placed over the platform and not exceeding a weight of 200kg/m2, height of stacking should be 700 mm maximum.

**Work No 2: Isolation, Cooling of stoves, Dismantling, inspection, Cleaning and erection of checker bricks**

1. Isolate the stove whose checker cleaning to be taken up. Start cooling of the stove till dome temperature reaches <45 ⁰C.
2. Initial cooling can be taken up by taking stoves parallelly on blast to other stoves. Don’t let avg HBT go below 875⁰C. Further stove to be cooled with combustion air only while maintaining maximum chimney temperature 370⁰C.
3. When Dome temperature is around 250- 270 ⁰C cooling of stove to be carried out with forced Draft by putting ID fans.
4. BF gas line to particular stove (which is to be cleaned) to be isolated by putting Gas line blank. Clearance for putting gas line blank to be given only after ensuring thorough steam purging.
5. Electrical shutdown of all valves (CV, CARV, GRV, GSV, CBV, CBBV, CASV, GSSV, HBV) of stove to be taken. Mechanical locking to be ensured for all Hydraulic valves (CV, CBV, CBBV, CASV, GSSV, HBV).
6. Open flange for Dome manhole. Remove GSV valve. Place ID fan in position. Carefully Remove insulation bricks at Dome manhole. While dismantling manhole bricks, special care to be taken for not damaging the arch/ ring bricks. Only trained personnel to carry out this activity ensuring compliance to all PPE’S (Safety goggles, Helmet, Shoes, leather hand gloves, Face shield, Overcoat).Start ID fan (combustion chamber side). Verify current and direction of rotation ID fan. Fan should take out hot air away. Can use cloth flag to verify direction also.
7. Open flange for manhole at bottom of checkers grid chamber towards chimney valve side. Remove insulating, dense bricks. valve. Place ID fan in position. Carefully Remove insulation bricks at Dome manhole. While dismantling manhole bricks, special care to be taken for not damaging the arch/ ring bricks. Only trained personnel to carry out this activity ensuring compliance to all PPE’S (Safety goggles, Helmet, Shoes, leather hand gloves, Face shield, Overcoat). Place second ID fan at this manhole. Start ID fan (combustion chamber side). Verify current and direction of rotation ID fan. Fan should take out hot air away. Can use cloth flag to verify direction also.
8. Ensure both ID fans should run uninterruptedly. Stove should be in negative draft. In case of ID fan tripping alarm/sirens is generated at Dome manhole platform (near entry point). Manpower identified and trained for confine space work with standby officers. For more details refer confined space entry SOP- VL/IMS/VAB/SP44Y. Ensure confined space work permit compliance mandatorily. IN/OUT records to be maintained.
9. Physical condition shall be checked for all junction areas blocks/ bricks/ dome/ wall/ checker stack before proceeding further.
10. Temperature is to be measure with Raytek gun across Dome, checkers and combustion chamber side.
11. Once the inside environment is acceptable **(**for O2 between 19.5 and 23.5, CO - zero, temp <45 ⁰C, visual inspection clearance, both ID fans running) Temporary scaffold shall be erected inside. Service department identified persons shall enter inside wearing safety harness, with two CO & one O2 monitor & 24 V hand lamp for covering the combustion chamber by putting scaffold arrangement. Ensure scaffold is properly strengthened.
12. All the loosen bricks at surrounding shall be taken out from dome manhole.
13. One electrician should be deputed round the clock at the bottom grid fan to ensure functioning of bottom grid fan and communicate to observer/ standby officer at top dome platform once the fan trip. Standby officer shall evacuate persons from stove inside, and job shall be resumed only after ensuring working of the fan and negative draft inside stove.
14. If everything found in line, persons shall enter inside and start further activities.
15. Damaged port areas to be repaired as per site condition. Necessary scaffolding to be erected as per site condition.
16. If bricks work is not possible manual gunning to be carried out for strengthening or filling of gaps.
17. Entire checker stack to be covered with silpaulin or jumbo bags to arrest the rebound from gunning.
18. Work sequence to be decided after assessment of inside refractory condition.
19. Remove fused checker till the checker in good condition.
20. Clean the checker holes by compress air hose.
21. During this activity no person should stand on combustion chamber
22. After inspection and clearing of checkers for damages, melting, depositions and jamming; erection job will be started.
23. If any damage found in dome/ manhole arch, repairing to be done.
24. All bricks should seat accurately on lower layer, otherwise defected one should be replaced.
25. No mortar is to be used for laying the checkers.
26. 3-4 mm gap to be allowed in between checker bricks.
27. Min ½ holes to be kept in checker in case of cut bricks in the peripheral wall.
28. Once top checker bricks work is completed remove all persons from inside the dome.
29. Allow the men to enter below grid area for cleaning deposited dust.
30. Scaffolding provided to cover combustion chamber to be taken out. trained personnel to carry out this activity wearing all safety PPE’s along with safety harness mandatorily.
31. Dome manhole to be closed with bricks & Dome manhole flange to be put.
32. Stop and remove ID Fan towards grid bottom side. Close the Manhole with the bricks, flange to be put.
33. Stop and remove combustion chamber side ID fan. Remove any accumulated dust/debris. Put back GSV.
34. Water seal and steam purge GPH/ HBS gas line. Give clearance for Gas line blank removal

**DO**

1. Follow Vedanta Safety Procedure for Confine Space work
2. Follow Work at Height procedure
3. Use 2 CO monitors every time. Use Oxygen level monitor inside
4. Maintain good housekeeping at all platforms
5. Use only certified equipments, tools & tackles

**DO NOT**

1. Throw bricks/ other items down
2. Overload the platform / Crane
3. Use damage jumbo bags or pallets for lifting

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| **Prepared By:**  Head – Production PID I | **Reviewed & Issued By:**  Management Representative | **Approved By:**  Head – Pig Iron Division |
| **Signature:** | **Signature:** | **Signature:** |
| **Date: 10.07.2023** | **Date: 10.07.2023** | **Date: 10.07.2023** |

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