**WORK INSTRUCTIONS FOR FURNACE COOLING MEMBERS (BF1 & BF2)**

**Responsibility**: Furnace In charge

**1. SHELL COOLING**

**Identified Hazards:**

1. Contact with hot water Casing burns
2. Mech. Pressure in the pipeline
3. Water in the pump panel
4. Pipe bursting/puncture

Human Hazards

1. Arresting gas leakages without wearing gas mask

2. False/wrong operation of valves

3. Nonuse of PPE, WI

4. Not carrying CO detector

Significant Aspect:

1. Water consumption
2. Mind your head before entering the trough area.

1. Unauthorized operation or repair of any equipment is a punishable offence.

2. Cleaning the return water trough screens every shift and are to be repaired / replaced immediately if found punctured.

2(a) Use small handy poking rod to lift trough screen before removing.

3. Close supervision of shell cooling and regulate the water flow evenly on the shell so that water does not splash around

4. Ensure sufficient cooling of shell to avoid steaming.

5. Shell plate temperature should not exceed temperature of 100 deg C in any area under any circumstances. Raytec gun to be used for temperature checking. It should be checked in ShiftWise.

5(a) Water sprays to be provided to the area where found increase in temperature.

6. If any leakage/splashing in the pipeline is observed, it has to be rectified with the help of mechanical dept. with proper safety measures (use of compressed air gas mask, portable gas breathing apparatus etc.)

7. Temperatures of the blow pipe and expansion bellow to be monitored shift wise and recorded

8. Lower stack trough to be cleaned during planned shutdown to prevent steaming of lower stack shell.

**2. CHECKING OF COOLING PLATE OUTLET WATER FLOW / TEMPERATURE FOR MAINTENANCE JOB AT BOSH PLATFORM**

Identified Hazards:

1. Contact with hot water

2. Mech. Pressure in the pipeline

3. Gas poisoning

4. Water starvation to cooling member

5. Contact with hot surface

Human Hazards

1. Arresting/checking gas leakages without wearing gas mask

2. False/wrong operation of valves

Significant Aspect:

1. Water consumption

1. Unauthorized operation or repair of any equipment is a punishable offence.

2. Ensure that the entrance to the bosh platform is restricted /locked and keys are kept in Blast furnace control room

2(a). Bosh platform key to be given to the person working there in consultation with furnace in charge.

2(b) Check bosh platform before carrying job for any damage, mud saturation sleepy condition etc.

3. Furnace In charge should check the CO presence in a shift & recorded in the furnace logbook. If the gas presence is detected, the cooling plate flanges are to be lighted with the help of torch

4. The checking for presence of gas should be done using Gas mask.

5. Any inspection of cooling plates /maintenance job to be carried out with proper work permit

6. CO presence to be checked with the help of CO detector, work should not be started if the CO presence is beyond the permissible limit.

7. While doing any maintenance /Inspection use of gas mask is a must.

8. Single person entry is not allowed; minimum two persons should go to the platform in case of any inspection or maintenance. While one person doing the Maintenance/inspection & the other person will be an observer

9. Ensure that there is no water spillage outside the trough.

10. Furnace bottom trough to be cleaned during planned shutdown to prevent water overflow.

11. Ensure the auto Valve operation from O/H is in healthy condition

**3. BACK FLUSHING TUYERE & TUYERE COOLER**

Identified Hazards:

1. Contact with hot water/steam

2. Pressure in the water line

3. Water starvation to cooling member

4. Bursting of tuyere

5. Contact with hot surface

Human Hazards

Nonuse of WI, PPE

False operation of valves

Use of non-standard tools

Significant Aspect:

1. Water consumption

Responsibility: Furnace Incharge/Mechanical engineer

If the water flow is less in the tuyere & cooler is noticed, the following procedure is to be followed in coordination with the mechanical engineer.

1. Unauthorized operation or repair of any equipment is a punishable offence.

2. Reduce the wind volume to minimum (0.3 Kg/cm2) or shutdown to be taken

3. Flush and keep open stand by water header drain valve with inlet valve slightly open.

4. Connect outlet of tuyere or tuyere cooler which is to be back flushed to the standby water hose line allowing water to pass through drain valve

5. In a coordinated action by two persons simultaneously open outlet valve of the standby water line, close the drain valve and other person will close the inlet valve & open inlet drain valve of the original header.

6. Ensure proper clamping before operating the valves also the people are not affected with hot water or hose are not disconnected during black flushing.

7. Do not carry out the above operation more than 5 minutes

8. Check outlet water temperatures and flow.

9. In a coordinated action by two persons reverse the water connections i.e. open the inlet valve of the original header, close the drain valve and other person will open the drain valve of the standby line, close the inlet valve. Hereby normalizing the water connection.

10. Disconnect the water hose from the outlet.

11. Check the temperature of outlet water and flow.

12. Slowly Increase the wind volume to full blast

13. Ensure that the water is not falling outside the trough

**4. GUIDELINE FOR REMOVAL OF BURNT COOLING PLATE**

Identified Hazards:

1. Fire & Explosion
2. Contact with hot water /steam
3. BF Gas poisoning
4. Fall of a person from top
5. Contact with hot surface

Significant Aspect:

1. Fire & Explosion

1. Unauthorized operation or repair of any equipment is a punishable offence.

2. Ensure that all personnel involved in the activity are aware of hazards

3. Ensure that all persons involved in the activity wear all safety appliances including face shield, safety coat.

4. Shut down the furnace as per the procedure VL/IMS/PID1/PROD/WI/06A&B

5. Reduce the inlet water of the damaged set of cooling plates to the minimum possible.

6. Check for any external water leakage on the suspected set of cooling plates or for any hot spot in pipe

7. Back flush the suspected cooling member & identify the damaged cooling member by opening the outlet pipe one after another for less flow.

8. Once identified, burnt cooler to be removed & re-fix with the new cooler of smaller size. In replacing a burnt-out cooling plate with a new one it is necessary to have water flowing through it when being inserted

9. In extreme case the area to be plugged with refractory brick. & shell /cooler opening has to be welded.

**Taphole Jacket cooling**

Ensure taphole jacket overflow water is coming through overflow pipe

Identified Hazards:

1. Contact with hot water causing burns
2. Nonuse of PPE
3. Improper house keeping
4. Crowding at the job site
5. Fall in main runner

Human Hazards

1. Non-Use of PPE

2. False/wrong operation of valves

Significant Aspect:

Water consumption

1. Unauthorized operation or repair of any equipment is a punishable offence

2. Close observation of Taphole Jacket water overflow is to be ensured Responsibility Furnace In charge

3. Avoid excess water splash around.

4. Flush taphole jacket by opening below valve in every 1st shift.

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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: **15.07.2022** | Date: **15.07.2022** | Date: **15.07.2022** |

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| **Amendment Record** | | | |
| **Revision date** | **Manual Section ref. and para** | **Brief details of revision** | **New Revision No.** |
| 12.07.2021 | Procedure for furnace cooling members (BF1&BF2) | Point no taphole jacket cooling | 11 |
| 15.07.2022 | Shell cooling | Point no.8 | 12 |
| 15.07.2022 | Checking of cooling plate outlet flow/ temperature for maintenance job at Bosh Platform | Point no. 10 | 12 |