**Work Instruction for Operation of Air Preheater & BF gas preheater**

* Objective : - Safe operation of Gas & Air pre-heater Scope
* Scope : - BF#1 - Hot blast stove.
* Ref. : - APH, GPH Drawings.
* Responsibility : - Stoves-in-charge.
* Frequency : -Continuous.

**PPE to be used** : 2 no’s of CO monitors, Helmet, safety shoes, hand gloves, goggles etc.

**Aspect**:

1. Explosions.
2. Gas leakages.

**Impacts**:

1. Air Pollution
2. Health Impacts
3. Work Environment

**Identified Hazards**:

1. BF Gas poisoning.
2. Fire & explosion.
3. Contact with hot surface.
4. BF Gas leakage through ID duct and all flanges in the system.
5. GPH tubes gets puncturing

**OPERATION OF APH AND GPH**:

1. **Mandatory**:
2. All persons should wear PPE viz. helmets, safety shoes, goggles etc.
3. Unauthorized operation or repair of any equipment is a punishable offence.
4. Ensure HBS including pre-heater area is barricaded and entry gates are locked.
5. Take two CO monitors from control room after entering in the register.
6. Ensure HBS including pre-heater area is barricaded and entry gates are locked.
7. **Taking APH, GPH in line**:
8. Ensure flue gas bypass to APH, BFGPH is blanked.
9. Ensure bypass line of BFG, CA line are closed.
10. Ensure the flanges in APH, GPH are closed.
11. Take two CO monitors from control room after entering in the register.
12. Purge the gas line before taking the GPH in line through gas HBS gas bleeders by partially opening the Gas safety shut off valve.
13. Ensure all the relief valves in the gas lines are closed, after purging with steam.
14. Ensure ID fan, combustion air fan are running.
15. Ensure negative draught of –‘ve 10 mm WC min. in flue gas main.
16. In BF1 open the manual Inlet/Outlet gas valves
17. Break the water seal of the gas line to GPH before stove taking on to on gas.
18. Take air and gas in stoves.
19. **Operation and monitoring**:
20. Ensure negative draught of –‘ve 8 to 10 mm WC min. in flue gas main.
21. Check pressure drop across the preheater in flue gas duct. As per design it shouldn’t be more than 42mm.
22. Soot blowing should be done every shift with help of soot blowers for 5~10 minutes.
23. Monitor pressure drop across GPH.As per design, it shouldn’t be more than 100 mmWC.
24. Check and monitor temperatures across APH, GPH and HBS.
25. Area in charge should make minimum two rounds in shift to check for any gas leakages and healthiness of the equipment.
26. Monitor the temperature of the flue gas line. If any gas leakages are there in tubes, outlet temperature of flue gas drops, ID efficiency drops. If GPH is leaking, inform HOD for further action to bypass the APH, BFGPH line by opening the BF gas line bypass line and Flue gas bypass line.
27. **Shutdown, water sealing and cleaning**:
28. Isolation:
    1. After taking shutdown of the furnace & withdrawing stoves from gas and blast, water seal the stove,
29. Purging:
    1. Run the ID for at least 15 minutes for purging with air in flue gas side (By opening the main flange of flue gas main)
    2. **Steam purging the GPH line:**
       1. For purging open the steam above the water seal, open the relief valve above the outlet of the GPH.
       2. After observing steam from the GPH outlet, close the GPH outlet relief valve and open the relief valve in gas header nearer stove stack. After observing the steams from that relief valve close that relief valve.
       3. Repeat the same procedure for all three stoves by opening bleeder valves manually (for opening these bleeder valves, gas regulating valves to be opened, gas safety shutoff valves to be opened partially) by one by one in the sequence of stove no: 3, 2, 1.
       4. At the end of the steam purging keep all stove individual bleeder valves in open condition for better ventilation.
30. Cleaning of GPH and APH:
    1. **Cleaning of GPH:**
       1. Blank the gas line at above the water seal.
       2. Ensure the chimney valves are closed, ID fan, CA fan is stopped & electrical shutdown taken.
       3. Open all the inspection flanges in flue gas main.
       4. Open the flanges in GPH side flanges after steam purging. Ensure gas line is blanked for cleaning the gas chamber and ensure that all three stove bleeder valves are kept in open condition only (for opening these bleeder valves, gas regulating valves to be opened, gas safety shutoff valves to be opened partially).
       5. Open the flanges of GPH for entering the gas chamber.
       6. Check the temperature and CO inside the chamber by standing outside the chamber (for checking the temperature use Ray tech).
       7. The person who is entering the GPH shall be wearing goggle, dust mask, gas mask and hand gloves. Ensure CO presence in the GPH chamber is nil before entering the GPH. He continuously monitors CO presence in GPH during cleaning activity.
       8. Use high pressure water jet pump (Max pressure 200bar) for cleaning of GPH tubes from inside & outside.
       9. Compressor air cleaning can be done in case of unavailability high pressure water pump.
       10. Ensure the air pressure should not be more than 3 kg/cm2 and hose is hold properly and one person should be present at the discharge valve of compressor air. He has to continuously monitor the person who is working inside the chamber. If any abnormalities the person should stop the compressed air immediately.
    2. **Cleaning of APH:**
       1. Blank the gas line at above the water seal.
       2. Ensure the chimney valves are closed, ID fan, CA fan is stopped & electrical shutdown taken.
       3. Open all the inspection flanges in flue gas main.
       4. Open the flanges in GPH side flanges after steam purging. Ensure gas line is blanked for cleaning the gas chamber and ensure that all three stove bleeder valves are kept in open condition only (for opening these bleeder valves, gas regulating valves to be opened, gas safety shutoff valves to be opened partially).
       5. Open the flanges of APH for entering the Flue gas chamber after purging with ID.
       6. Check the temperature and CO inside the chamber by standing outside the chamber (for checking the temperature use Ray tech).
       7. The person who is entering the APH shall be wearing goggle, dust mask and hand gloves. Ensure CO presence in the APH chamber is nil before entering the APH. He continuously monitors CO presence in APH during cleaning activity.
       8. Use high pressure water jet pump(Max pressure 200 bar) for cleaning of GPH tubes from inside and outside.
       9. Compressor air cleaning can be done in case of unavailability high pressure water pump
       10. Ensure the air pressure should not be more than 3 kg/cm2 and hose is hold properly and one person should be present at the discharge valve of compressor air. He has to continuously monitor the person who is working inside the chamber. If any abnormalities the person should stop the compressed air immediately.
31. Normalizing After cleaning:
32. Come out of the GPH / APH chamber.
33. Ensure there is no foreign material / persons inside the chamber (APH/GPH).
34. Give clearance to Mechanical to close the all the flanges.
35. After closing all the flanges, close all the relief valves and stove bleeder valves (if nobody are working on gas line or GPH).
36. Clear the electrical shutdown of chimney valves, ID, CA fans.
37. Give clearance to mechanical for removing blank above the water seal.
38. Close the HBS area after evacuating the HBS area.



Inspection door in flue gas side

**Emergency: In case of any power failure, do not allow gas line charged more than 15 minutes. Isolate the stove and water seal the gas line.**



Flanges in BFG side.

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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.** |
| **15.07.2022** | **Taking APH, GPH in line** | **Point 9** | **01** |