Incident Investigation Report

1. Location & Date of Incident: Amarillo, TX – July 7, 2015

2. Personnel involved: David Smith, Paul Monismith, Todd Zantene, Jie Chen, Paul Devera

3. Incident as reported: Crew began drilling into doghouse sidewall to start the drain at around 9am. The charging ports had been blocked with insulation board and/or like materials. The type of glass in the furnace was fiber and the plant thermocouples showed 2640°F in the top and 2560°F at the bottom. The sidewall was made of chrome material, which crumbles when being drilled, so as David drilled through the wall, he would pull back the drill from time to time and Paul Monismith would clean out the crumbled pieces from the drill bit. The drilling process took about 45 minutes with lots of cooling water being consistently applied through the drill.

   Upon the drill bit breaking through the wall and into the furnace, the body of glass inside the tank began to form giant moving waves and jumping projectiles, which pushed 5" pieces of charger blocks 8' out from where they were sitting above and to the right of the tap hole, as well as pushing several pieces out of the back wall. These glass waves also displaced the fiber board and pushed themselves out of the charger ports. Glass was projected as far as 21' to the right of the tap site, burning two gear bags that technician's had set there before drilling began.

   David backed the drill up in the hole slightly and then ran back out of the way and turned the water to the drill off at the water tree. As soon as the water was turned off, the glass movement in the tank ceased (later, David said that the glass continued to move violently for approximately two minutes after the water was turned off, but this is counter to the initial accounts from him and others present – it is unclear which account is accurate). When David went back up the hole and attempted to back the drill up further, he was unable to do so as the bit was frozen in place at this point by the cold glass in front of it and the 1.5" of core estimated to still be in the bit.

   As the result of meetings with plant personnel, the charging ports and all other openings in the furnace with the exception of the peep site on the right side and a small opening on the sidewall above the tap site were bricked up with a thin layer of metal welding over top of the brick.

   At approximately 12:10pm on the following day, David inserted a water lance into the small opening above the tap site in an attempt to the freeze the glass surrounding the tap site to be able to remove the drill bit, but as soon as he inserted the water lance, the same violent glass movement began again, and glass forced itself out of the peep site on the right side. It had been decided in an earlier meeting that if any glass came out of the tank

during this attempt, the water should be turned off immediately, so David turned off the water lance.

4. Injuries: None

5. Property damaged: Drill bit totaled, minor refractory brick damage, technician personal possessions scorched and destroyed.

6. Remedial Action: On July 9th a second hole was drilled several feet to the left of the original hole. Knowing the sidewall to be approximately 9" thick based on the drilling of the first hole, the crew drilled approximately 7 ½" and then pulled the drill back. They then pushed a long piece of metal through the hole, and as David placed the end at various points on the sidewall around the perimeter of the hole, Demetrius hit the other end with a hammer, causing the metal to break into the furnace after 10-15 hits. The glass began to flow without incident, and the drain proceeded as originally planned.

7. Prospective Long Term Solution/ Procedural Change:

   a. All furnace openings in the immediate area of where we are drilling are to be properly sealed with either hard brick or fiber board supported/backed up with steel. The steel is to be welded. NO EXCEPTIONS!
      i. This message was conveyed to all Hotwork personnel companywide via email.
      ii. This message will now be added to Hotwork's Client Responsibility Drain Lists, which 1) the Glass Industry Manager will talk over with the client in the planning phase of each drain, 2) will be included in all drain crew folders, and 3) the Lead Drain Technician will show to the site contact on the first day of setup and ensure that all items have been fulfilled.
      iii. A Hotwork technician meeting will be held in Lexington, KY on August 25th where this incident will be discussed in detail to 1) gain as much insight from each technician as possible as to the cause and appropriate hazard mitigation practices concerning this type of incident, and 2) to educate all technicians on the severity of this type of event and the measures required to safely plan for a similar eruption in the future.

8. Reported by:

Kari Evely, July 21, 2015,

Printed Name, Date & Signature

9. Attachments: (Pictures)