

Attention Tom Lindsey
68 Church Street
RA8 1K7

EXHIBIT

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FOR I.D.

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~~XXXX~~
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Mr. Ted Hewitt
202-143 Main Street
Flin Flon, MB
RA8 1K2

Exhibit #72

Dear Sir,

Please find enclosed a copy of our report on the explosion of the HBM&S Smelter Reverb Furnace on the August 8, 2000. The report makes reference to being a "Joint" report but it is a report by the Union Members of the Workplace Safety and Health Committee. Every effort was made to produce a joint report, however management representatives of the Joint Committee chose not to co-sign this report. The effort to produce a joint report with HBM&S management was extremely difficult. The lack of involvement from the Management Co-chair until the end of the writing of the report may have set us up for failure at being able to produce a joint report.

It is our belief that the recommendations contained in this report, if properly implemented, will prevent an accident of this nature from happening ever again. We look forward to the assistance of the Mines Branch and HBM&S in the implementation of these recommendations.

Sincerely yours,



Rob Bayson IAM 1849

Robert Allen IAM 828

Jim Kesselman IAM 1945

D Anderson

December 8, 2000

The Smelter/Powerhouse Joint Workplace Safety and Health Committee report on the fatality of Steven R. Ewing and Injuries to other Employees, as a result of explosions in the Reverb Furnace of Hudson Bay Mining & Smelting Co. Ltd. on August 8, 2000.

On August 08, 2000 between 1:40 am and 1:45 am a series of explosions occurred in the Smelter Reverb Furnace. The explosions occurred during the wash down of the reverb furnace as part of the 2000 Smelter Shutdown.

As a result of the explosions thirteen employees (eleven from HBM&S, one from Derrick Concrete, and one from United Rentals) suffered injuries requiring them to be sent to the Flin Flon General Hospital after receiving first aid on site. Six employees were hospitalized while the other seven were treated and released. Of those hospitalized four workers were transported by Air Ambulance to burn units at hospitals in Winnipeg, Regina and Edmonton. Another one of those initially hospitalized in Flin Flon was later transported to the hospital in Winnipeg. There were also a number of employees who received first aid on site and at least one other who was later seen by his own doctor.

Steven R. Ewing, age 33, died of his injuries at the Health Sciences Centre, Winnipeg, eight days later.

As well as those suffering physical injury, there were a number of employees, including a number who were not on shift that night, who suffered psychological trauma. Forty-three filed WCB claims for stress and twenty-eight lost time from work.

Investigations were conducted into the explosion by the Mines Inspection Branch, R.C.M.P. (Creighton detachment) and the Smelter/Powerhouse Joint Workplace Safety and Health Committee. There were also investigations conducted by technical experts retained by H.B.M.&S. and the Mines Inspection Branch. The following is the report of the Smelter / Powerhouse Joint Workplace Safety & Health Committee.

The following events occurred on August 7, 2000 and the early hours of August 8, 2000.

- **The last slag had been tapped from the reverb furnace between 1:00 am and 2:00 am on August 7, 2000.**
- **Roaster feed hoppers were empty at 5:00 am on August 7, 2000.**
- **The last trip of calcine was hauled to the furnace at 6:10 am on August 7, 2000.**
- **The uptake burner (# 1 burner) was shut off at 12:30 am on August 7, 2000.**
- **The jog burner (# 4 burner) was shut off at 7:00 am on August 7, 2000.**
- **Turned reverb burners up at 7:30 am . # 2 to 3000 litres/hour, # 3 to 2600 liters/hour for a four hour period to smelt walls and heat slag. At 12:30 pm both burners were turned down to 2000 litres/hour until 5:30 pm. From 5:30 pm until 10:50 pm # 2 and # 3 burners operated at approximately 1700 litres/hour.**
- **At approximately 2:00 pm on August 7, 2000 the removal of floor plates and hopper covers began using the bobcat and helpers. At the end of dayshift there was only four or five hopper covers left to remove.**
- **Between 7:00 pm and 8:00 pm the remainder of calcine hopper covers were removed by the night shift bobcat operator.**
- **At 7:00 pm on August 7, 2000 a safety meeting had been conducted in the Smelter meeting room. Not everyone was in attendance due to the ongoing tapping of the furnace.**
- **Between 7:30 pm and 9:30 pm the north and south slag launders were removed from the east end of the furnace.**
- **Between 10:15 pm - 10:45 pm removal of wall bracing on the north side started. Lunch break occurred and at approximately 11:30 to 11:45 pm the work continued on removing wall bracing on both sides of the furnace and the burning of bolts off the drop pipes on the feed floor until 1:30 am.**
- **Converter slag launder was removed between 9:00 pm and 10:45 pm .**
- **Molten material continued to be tapped from the matte holes during the dayshift on August 7, 2000 and in to nightshift.**
- **The final molten material from the furnace was tapped from the matte holes and the holes shut off at 10:45 pm on August 7, 2000.**
- **At 10:50 pm # 2 burner was shut off and at 11:00 pm # 3 burner was shut off. 250 Brokk (larger of the two mechanized jackhammers) broke hole in north wall, 3 to 5 feet by 3 feet, at approximately 11:00 pm.**
- **Between 11:00pm and 11:10 pm reverb furnace preheater was shut down, along with the circulating fan, combustion fan, and the primary air fan.**

- **A fire hose was put in use on the converter slag launder area at 11:00 pm.**
- **Boiler ash removal, using the Bobcat, took place between 11:00 pm and midnight.**
- **Between 11:20 pm and 11:30 pm fire hoses were turned on for the washdown of the calcine floor and arch. At that time there were two fire hoses operating on the calcine floor and one operating on the north feed slope.**
- **At approximately 11:20 pm a crack was noticed forming from the north west side running towards the matte as viewed from the north feed floor.**
- **Between 12:00 am and 12:15 am it was observed by a number of people that there was water inside of the furnace anywhere from one inch to twelve inches deep.**
- **At 12:10 am the 988 loader began removing the dope pile from in front of the reverb furnace. At this time the west side access door to reverb was locked as per previously developed procedure for removal of converter pit dope. Dope removal continued until the time of the explosion.**
- **At 12:15 am two large cracks were observed from the north feed floor between the jog and dust section.**
- **Between 1:00 am and 1:15 am several workers saw various amounts of water inside the furnace. It was described as being anything from puddles to a swimming pool.**
- **From 1:00 am to 1:30 am six or seven rows of brick were removed along the north side of the arch from the west end to the jog. Wall tiles on the north side were also knocked in as the brick was being removed.**
- **At approximately 1:00 am two additional hoses were added. One was laid out to the north feed floor and one laid out to the north calcine floor.**
- **At approximately 1:30 am a crack was noticed opening in the crust of the furnace bath as viewed from the front of the furnace where the converter slag launder enters the furnace.**
- **At 1:30 am water was observed covering as much of the furnace bottom as could be seen from a vantage point over the matte holes.**
- **Wash down continued until the time of the explosion.**
- **At some point between 1:40 am and 1:45 am a series of explosions, escalating in intensity, occurred inside of the reverb furnace.**
- **At 1:45 am the initial call requesting the fire department and ambulance was received at the main gate.**

SLAG TAPPING

- Between 1:00 am and 2:00 am on August 7, 2000 the slag holes were shut off for the final time.
- The slag holes were shut off with mud and the mud was still in place after the explosion.

MATTE TAPPING

- From 2:00 am on August 7, 2000 until 10:45 pm on August 7, 2000 the molten material in the furnace was tapped out through the matte holes only .
- Matte tapping was interrupted on day shift for a three hour period due to the train being used for removing copper slag from the converter pit.
- Tapping from the west hole had to be interrupted at least once to repair a leaking launder.
- The tappers had been alternating from tapping one hole to tapping two holes throughout dayshift and in to nightshift.
- The slag train was parked outside the converter pit while electrical cables were strung for the Brokks.
- At 10:00 pm on August 7, 2000 the last overall bath level, as indicated by the measure from the measuring hole was 10 to 12 inches above the matte hole. After the explosion, as identified by elevations taken, the bath level in the furnace at this time was about one foot above the matte hole. **NOTE:** a bath exists below the matte holes (as per furnace bottom measures).
- At the time the holes were finally shut off the molten material was running slow, but still running out both holes, as indicated by a tapper.
- It was indicated that there was a gap between the top of the hole and the molten material flow. It was also indicated the molten material was smoking hot.
- The last pot of molten material was half full.
- At 10:40 pm to 10:45 pm the matte holes were shut off for the final time by plugging them with mud.

REVERB BURNERS

- Oxygen to the burners was shut off on Monday August 7, 2000 at 5:00 am.
- Oxygen lances were still in place in # 2 and # 3 burners after the explosion.
- Between 12:00 am and 12:30 am on August 8, 2000 the reverb operator attempted to remove the reverb burners but could not because the catwalk, at the front of the furnace, was taped off as cleaning of the slag launder area was in progress. # 2 and # 3 burner guns remained in position, with some steam on, until after the explosion.

PREHEATER

- Shut off fire on preheater between 11:00 pm and 11:10 pm on August 7, 2000. Primary air fan, circulating fan, and combustion air fan were shut off at this time.
- Reverb operator took twenty to forty minutes to remove the preheater gun then went to remove reverb burners.
- Mechanics started removing doors between 12:00 am and 1:00 am on August 8, 2000.
- On August 8, 2000 at 12:50 am the preheater was completely shut off by a supervisor.

EAST END OF REVERB FURNACE

- The north and south slag launders were removed by 9:30 pm August 7, 2000. In an effort to save time the launders were dropped into the slag tunnel to be removed later by the loader.
- Pipefitters were working above and around the slag launders until the time of the explosion.
- Operations personnel were removing the slag launder supports, while working around the pipefitters.
- The boilers were being taken off line starting at 11:00 pm August 7, 2000.
- Powerhouse employees were working in the area of the boiler ash chambers locking the ash doors open at the time of the explosion.
- The 250 Brokk was moved to the east end of the furnace and parked in front of the north boiler ash doors between 1:00 am and 1:30 am August 8, 2000.
- The 150 Brokk was moved into place at the north west corner of the furnace to enlarge the hole started by the 250 Brokk.

WASHDOWN

- At the start of shutdown there was a procedure for the washdown in the procedures manual and marked as complete in the Reverb team minutes.
- While the furnace was still operating fire hoses were placed in the following locations for the start of washdown:
 - One hose located at the converter slag launder area and turned on at 11:00 pm.
 - One hose located on the catwalk on the calcine floor and turned on between 11:20 pm and 11:30 pm.
 - One hose located on the south east side of the calcine floor and turned on between 11:20 pm and 11:30 pm.
- Two groups were assigned to wash down the furnace switching off at one half hour intervals. Another group was assigned to wash off the slag launder area.

- **At approximately 11:30 pm an employee was photographed spraying onto the front of the arch with a fire hose, from the north side of the slag launder.**
- **It was noted by several workers and supervisors that water was accumulating inside the furnace during the washdown, as early as 12:00 am, up until the time of the explosion.**
- **Between 12:30 am and 12:45 am some supervisors met in the Reverb supervisors office and decided that more hoses were required to speed up the washdown.**
- **At approximately 1:00 am two additional hoses were installed:**
 - **One hose attached to the hydrant on the north west landing was run to the north side of the calcine floor.**
 - **One hose attached to the hydrant on the north wall was run up to the north feed floor.**
- **The second last group to wash down prior to the explosion were using:**
 - **One fire hose at the south/east corner of the calcine floor**
 - **One fire hose on the catwalk above the arch**
 - **One fire hose was being used on the slag launder area.**
 - **One, one inch hose was also being used in the converter slag launder area to wash down the beams and the arch.**
 - **Another one inch pipe, that had been disconnected from a water jacket was spraying water on to the arch.**
- **Just prior to the explosion, the last group to wash down were using:**
 - **One fire hose at the north/east corner of the calcine floor**
 - **One fire hose at the south/east corner of the calcine floor**
 - **One fire hose on the catwalk above the arch**
 - **On the converter slag launder landing there was one fire hose washing off the slag launder area.**
 - **One, one inch hose was also being used in the converter slag launder area to wash down the beams and the arch.**
 - **Another one inch pipe, that had been disconnected from a water jacket was spraying water on to the arch.**
- **A fifth fire hose was charged and laying on the north feed floor. It could not be ascertained if this fire hose had been in use or not.**
- **Two, one inch diameter water nipples, off the supply header, were spraying onto the arch or into the furnace after the explosion. It could not be determined when or how they got turned on.**
- **An undetermined amount of water was running down the outside of the slag cooling blocks at the east end of the reverb furnace prior to and after the explosion.**

EXPLOSIONS

- **At some point between 1:40 am and 1:45 am on August 8, 2000 there was a small pop followed by a series of explosions escalating in intensity inside the furnace.**
- **As the explosions happened some employees were thrown across and to the floor by the concussion. Several had their respirators, hard hats and glasses ripped off from the force of the blast.**
- **The concussion from every explosion threw more hot dust, steam, molten material and other debris into the air. There was intense heat in the area, a lack of visibility as well as confusion and disorientation which hampered their escape. One of the contractors was further hampered in his escape as he was tethered to the 150 Brokk machine by the wired remote control.**
- **The injured who made it to the west Reverb exit found it locked.**
- **Location of employees at the time of the explosion**
 - **On the calcine track floor, two employees were on the catwalk above the arch and one on the north east side.**
 - **On the converter slag launder area, at the west end of the furnace, there were two employees, one on each side of where the converter slag launder had been.**
 - **On the north side of the main floor, of the reverb furnace, three HBM&S employees and two contractors were standing in the vicinity of the 150 Brokk, that was located on the east side of the oil control room.**
 - **At the east end of the furnace, four pipefitters were working, one on the main floor and three working on the landing above the slag holes.**
 - **At the east end of the furnace, three Powerhouse employees were in the area of the south boiler ash chamber.**
 - **There were other employees who were not in the immediate area of the furnace at the time of the explosion.**
- **Powerhouse employees exited the area by way of the Reverb brick shed (Heine Boiler Room), through the Spill Gas Project area, to the Powerhouse.**
- **Three pipe fitters made their way to the reverb lunchroom. The fourth joined them soon after.**
- **Of the three HBM&S employees and the two contractors in the area of the 150 Brokk, the two contractors and one HBM&S employee exited by way of the west stairs through the elevator shaft gates (because the west reverb exit door was locked). The other two HBM&S employees (smelter supervision) met at the new sliding door, on the west wall (by the elevator). As visibility improved they assisted some of the injured in evacuating the area.**

- Of the two employees on the converter slag launder area, one employee hung over a railing and dropped to the landing below. The other employee exited using the north west stairs from the feed floor. They exited down the west stairs and through the elevator shaft by climbing over the gates.
- The employee at the north east uptake, on the calcine floor, exited east and north through the fuming plant to the reverb lunchroom. From there he received assistance through the mechanic shop to the warehouse for first aid.
- The center catwalk, above the arch, had only one exit which was to the west end. The two employees were at the east end and had to run across the length of the catwalk above the exploding furnace to exit the catwalk. Escape route to the east was not an option because the floor plates were removed. They exited the area by using the stairs on the north/west corner of the reverb furnace down the west stairs and out through the elevator shaft gates.

EVENTS AFTER THE EXPLOSION

- First aid was administered to the injured, after they escaped the Reverb area, by other smelter employees. First aid was hindered by "Tye-wraps" on some of the zippers on the burn gel blanket bags.
- A sweep of the furnace and a head count were conducted after the explosion by smelter supervision.
- Some other contractors returned from their lunch trailer to the boiler and precipitator areas unaware of what had happened. Some were not notified for up to an hour.
- When the injured were accounted for, employees were instructed to evacuate to the warehouse. Some of the employees exited via the walkway along the north side of the furnace through the west reverb stretcher door, while others exited through the mechanics shop. At some time the main exit door was unlocked and some of the employees exited through it.
- Water from the hydrants and one inch lines at the front of the furnace were turned off immediately following the explosion.
- Ambulances began arriving to transport injured to the hospital.
- Fire department took control of the scene, extinguished resulting minor fires, made a sweep of the area and contacted supervisors to verify the head count. Two one inch water lines at the rear of the furnace were also shut off by the fire department.
- There was a sprinkler head in the old Maxon valve room on the north feed floor that was activated by the intense heat from the explosion. The sprinkler activated when the temperature in the area reached 165 degrees Fahrenheit or above. The other sprinkler heads in the same room that are set to activate at 212 Fahrenheit or above were not activated.

- **The senior HBM&S staff , the full time Safety and Health Representative, and the Mines Inspector were notified. Not all Safety and Health Co-chairs were notified after the explosion.**

PLANNING

The overhaul of the reverb furnace was tied in with the Gas Handling Project. The planning for the shutdown began eleven months before shutdown with the creation of a number of sub-teams reporting to a shutdown core team. The teams were made up of salaried and hourly employees. There were also some changes in smelter management responsibilities, to accommodate the planning process including the creation of the full-time shutdown planning coordinator.

Additional information for the development of the shutdown plan was acquired from previous shutdown documentation (i.e. GANTT charts, work assignments, past experience, personal notes). As well, new methods and technology were implemented.

This shutdown planning process generated a number of actions and documents. These included Gantt charts, the procedures manual, the work assignment sheet and the reverb shutdown task list.

INCIDENT FROM 1997 SHUTDOWN

The committee investigated the possible explosion during the 1997 shutdown. From interviews the committee believes there was an explosion inside the furnace, as a result of water being applied, but on a much smaller scale than the August 8, 2000 explosion. It was never documented and so as with other shutdown issues from the past it is based solely on people's memory from over three years ago.

CONCLUSIONS

- **A bath of molten material existed in the furnace.**
- **There is no one method to determine if the furnace is drained or when to cease tapping.**
- **There was a discrepancy between those interviewed as to whether or not the slag holes should be shut off or left open. It was stated that holes have been shut off or left open at other shutdowns.**
- **There was a discrepancy between those interviewed as to whether or not shutting the matte holes off with mud or leaving them open made any difference. It was stated that in the past the holes have been left open to drain and other shutdowns the matte holes have been shut off using mud.**
- **Washdown of the furnace was almost continual from the start, where as in the past, intentional or other wise, breaks were taken.**
- **It could not be determined why a number of one-inch pipes were spraying water on the furnace which contributed to the build up of water inside the furnace. The valves were not turned off until after the explosion.**
- **Supervisors or foremen during the washdown phase did not monitor or control water accumulating in the furnace as had been done in past shutdowns.**
- **There was a lack of experience in supervision and the washdown crew during the wash down phase.**
- **The procedure for washdown was not reviewed with the crew doing the job and it is now evident that this was an incomplete procedure. The wash down did not proceed as per the procedure outlined in the procedures manual.**
- **Several of the supervisors had little or no knowledge of their assigned tasks and incomplete job procedures for those tasks gave them nothing for reference.**
- **It has become apparent there was a rush or underlying sense of being behind.**
- **Workers had little knowledge of what the plans were that night. They simply did as they were told and depended on their supervisors to direct them on how to do the tasks safely.**
- **The planning process was flawed and the plans were incomplete.**
 - **There was little involvement from hourly employees in the planning process. The involvement of certain employees was at times hampered because of manpower restrictions (holiday & shift coverage), meeting overlaps, and direction of certain teams.**
 - **There were several documents which may have formed a partial plan but there was in fact no clear plan to follow that night.**

- **The Gantt chart was perceived to be the plan of shutdown by the workers and some supervisors. Senior management intended the Gantt chart to be a daily updated reference of how shutdown was proceeding but this was not communicated effectively.**
- **The work assignment sheet was to tell who was to supervise who, but it was stated by a number of supervisors that it was just a guideline and did not have to be followed. Many of those assigned to washdown did not participate in it including the assigned supervisor.**
- **The assignment sheet was developed to better control task and employee allocation but was deviated from the first night. No mechanism was in place to ensure that past experience was considered for certain task assignments.**
- **The reverb shutdown procedure manual was an attempt to document all the procedures of shutdown and startup for this and future shutdowns. Several procedures may have been completely developed but there was a conflicting view between supervisors as to whether they were meant to be used this shutdown. It was also stated the procedures manual was only a guideline and considered a work in progress.**
- **A task list was developed to be used by supervision to keep track of jobs that were completed by each shift and what needed to be done for the next shift. There was no sequence to the jobs listed.**
- **There was no fundamental review of shutdown activities in terms of task analysis and risk analysis. Planning was based on past shutdowns. The importance of sequencing of tasks was not clearly identified.**
- **In the planning stages more emphasis was placed on rebuild and start up rather than shutdown and demolition of the furnace. A senior reverb supervisor stated at the early stages of shutdown planning that it's more important to shut it down properly.**
- **There was more experience available to help plan and implement shut down (retirees, senior employees, and supervisors), for various reasons it was not utilized although it was requested.**

The documentation process for capturing the events of shutdown was not adequate for this and past shutdowns. There are conflicting views as to what washdown includes. In previous shutdowns other tasks were part of the wash down procedure, such as laying out hoses, removing calcine floor plates, and breaks prior to water on.

- **The use of new methods and technology led to the compression of the traditional amount of time to get to the stage of actually using water on the furnace.**
- **Some tasks that were previously done after fire off were done in advance this time.**

- **There was no documentation in any of the planning for a cool down period of the furnace after fire off.**
- **Proper reporting and documentation of the explosion in the furnace in the 1997 shutdown may have identified the potential hazards of washdown in the planning stages of 2000 shutdown. Again an accident/incident form has not been filled out for the August 8, 2000 explosions. If a form has been completed this committee has not received it for review.**
- **There is no clearly defined start point for shutdown.**
- **The Smelter/Powerhouse Safety and Health Co-Chairs for the unions were not notified promptly.**
- **There may have been an event which occurred between the uptakes at the time of the explosion. The Mines Inspection Branch may have information regarding this event which has not been shared with this committee.**

After a long and extensive investigation, which included interviewing seventy-eight employees (some of whom were former employees) and discussions with a number of technical experts, as well as gathering a large compilation of documentation we have come to these conclusions. There was a large buildup of water inside the reverb furnace. There was an amount of molten material remaining inside the furnace. It is concluded that the cause of the explosions on August 8, 2000 was this water coming into contact with this molten material.

The resulting explosions and subsequent release of large amounts of steam, heat, and ejected material caused the injuries to the employees and also led to the death of Steven R. Ewing.

Other possibilities the committee considered were dust, hydrogen sulfides, hydrocarbons and oxygen as ignition, accelerants or contributing factors to the explosion. We have found no evidence to support these as factors.

RECOMMENDATIONS

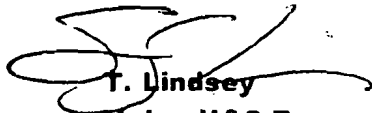
- **No water be used at shut down for cleaning or cooling the furnace. The practice of using fire hoses to wash down beams, arch and launder area must be discontinued.**
- **There should be a safe cool down period after the tapping is finished and the fire is off. A list of tasks that can be safely carried out during this cool down period shall be developed.**
- **The elimination, control, and cleanup of dust buildup must be investigated.**
 - **Dust control systems**
 - **Purchase of a vacuum truck**
 - **Re-evaluate existing dust control systems and procedures**
- **The use of water to assist with the slag launder clean up during normal operations must be discontinued.**
- **Potential water hazards in hot metal areas must be investigated and eliminated, i.e. Water under converters, wet moulds in anode casting, water in slag tunnel, water in matte tunnel, surge tanks that may overflow into an area, holes in roof, wet material dumped into converter pit, etc. Any time water is detected in a hot metal area where it should not be, all work that is not a part of the elimination of the hazard, must cease until the water is eliminated or an approved plan is in place. Any occurrence of water in a hot metal area must be reported promptly to the Safety Committee, the Health and Safety Representative and the Mines Inspector.**
- **A proper Risk Assessment and Safe Job Procedure should be developed for the containment of molten materials in case of breakouts. The use of water as a means of containment must cease. Other options must be explored such as but not limited to shutting burners off, tapping furnace down, use of air horns/lines to cool. A means of containment should be investigated which is in place and encircles the furnace to prevent molten material from coming into contact with people, water or flammable building materials.**
- **Reassess all access ways within the smelter:**
 - **Investigate possible relocation and design of west reverb stairway and entrance/exit.**
 - **Doors, which may be used for escape or to allow rescue, must not be locked or otherwise blocked to impede egress in event of emergency.**
 - **All smelter external exit doors should open outwards.**
 - **All exits must be clearly marked with luminous paint or suitable markings.**
 - **The locking hasp must be removed from the reverb access door immediately.**

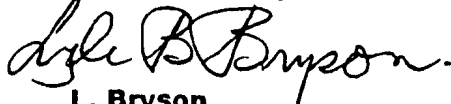
- **The catwalk on top of the furnace, on the Calcine Floor, should have a second means of egress to the east. Also, all other exit routes be clearly known before any dangerous work begins.**
- **Floor plates and hopper covers must not be removed prior to fire off during a shutdown. There shall be procedures developed for the safe removal of a limited number of floor plates or hopper covers during normal operations to allow for furnace maintenance.**
- **Procedures for operation of heavy equipment in the smelter that may impact entrances and exits must be reviewed and/or established and agreed to by the Safety and Health Committee.**
- **A starting point/zero hour for shutdown must be clearly specified and communicated.**
- **Risk Assessments and Safe Job Procedures must be completed for all shutdown tasks. This process must start immediately.**
 - **These procedures need to be developed and reviewed by the appropriate people.**
 - **Enough people with adequate resources must be committed by HBM&S to developing and reviewing these procedures to ensure completion prior to the next shutdown and will be reviewed by the Joint Workplace Safety and Health Committee.**
 - **Prior to the tasks being carried out the job procedure must be reviewed with the supervisor and crew assigned to that task.**
 - **This process should also cover the impact of new technologies and new work methods on furnace shutdowns.**
- **The safe job procedures must include clear criteria, including specified sign-off by the tappers, furnace operator and supervision, on the following activities:**
 - **Shut-off of slag holes**
 - **Determination of when furnace is drained**
 - **When and if matte holes are shut-off**
- **Job procedures for all critical tasks during shutdown shall have specified sign-off.**
- **Risk Assessment should be done for all non-routine jobs in the smelter prior to them being done. Where required Safe Job Procedures should be developed and reviewed prior to any work taking place. These procedures will accompany the work assignment where appropriate.**
- **There should be an ongoing process of risk assessment of job procedures for all tasks performed.**
- **A Critical Path should be developed for next Smelter Shutdown. It should be followed! Any deviations from this critical path must be approved by the Safety Committee and workers only after full and careful consideration of the consequences of changing the plan. The Critical Path must be more concerned with sequence rather than times. This Path should set out every step to be followed and the sequence in**


which it should be followed. Moving jobs on the path solely in the interest of saving time must not be allowed.

- Investigate other mechanized methods of furnace demolition to eliminate the exposure of employees to possibly dangerous situations.
- A system should be developed to capture the events more accurately and efficiently for future shutdown planning. Some options are:
 - Sign off check list for tasks
 - Supervisor journals
 - Employee comment forms
- Safety/ Loss control supervisors or designates must have clearly communicated authority over production/ maintenance supervision to safely control all work.
- "Right To Refuse" training should be mandatory training for all workers in the Smelter. This education should be presented by the Joint Workplace Safety and Health Committee. This recommendation should be considered by all departments of HBM&S.
- Safe operating procedures from other operations should be reviewed and where appropriate incorporated into not just shutdown but all operating practices in this smelter.
- Information which may aid in the investigation of accidents should not be withheld from the Joint Workplace Safety and Health Committee, nor should there be attempts made to restrict how the committee uses said information in the course of the investigation.
- Full and proper reporting and investigation of all accidents must be done by those knowledgeable in accident investigation. The Smelter must provide this training to all Joint Workplace Safety and Health Committee members and supervisors. This education should be developed and presented by joint management and union personnel who are qualified as trainers. This recommendation should be considered by all departments of HBM&S.
- Any and all accident scenes that require investigation must be preserved as per regulations until investigations by Mines Inspection, RCMP; Joint Workplace Safety and Health Committee are conducted. Accident scenes should be guarded by some means developed with Plant Protection until released by all parties conducting the investigations.
- Review the procedure for notifying the Joint Workplace Safety and Health Committee Members and Full Time Representative in the event of accidents.
- There should be a system in place that spouses or designated people are notified in the event of an employees serious injury.
- Make more use of independent engineering inspections. There shall be communication of those inspections to the Joint Workplace Safety and Health Committee.

- **HBM&S immediately cease the practice of assigning supervisors in molten metal areas who have no experience or knowledge of molten metal. The Joint Safety and Health Committee should help develop the supervisor training criteria in all molten metal areas.**
- **There should be full time hourly Health and Safety Representative in all molten metal departments. Workers in these positions should be selected by the Joint Safety and Health Committee.**
- **All remote control equipment in use at HBM&S should be of a wireless design. If this is not possible then at the very least the operator must be in no way tethered to the equipment. This recommendation should be forwarded to the Standing Committee of Mines Regulations for possible inclusion into regulations and should be disseminated to other jurisdictions.**
- **The Mines Inspection Branch should become more familiar with safe operating practices in hot metal industries.**
- **The Smelter Joint Workplace Safety and Health Committee recommends the Standing Committee of Mines Regulations review the effectiveness of existing regulations dealing with molten material.**
- **The Smelter Joint Safety and Health Committee very strongly recommends the Standing Committee of Mines Regulations drafts very clear language around the definition of qualified, competent supervisors.**
- **Mines Inspection Branch confirm, from their investigation, that the event between the uptakes at the time of the explosion is not a ongoing potential hazard during any operation of the furnace.**
- **The concern for lost production must not override the concern for worker SAFETY at any time.**


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