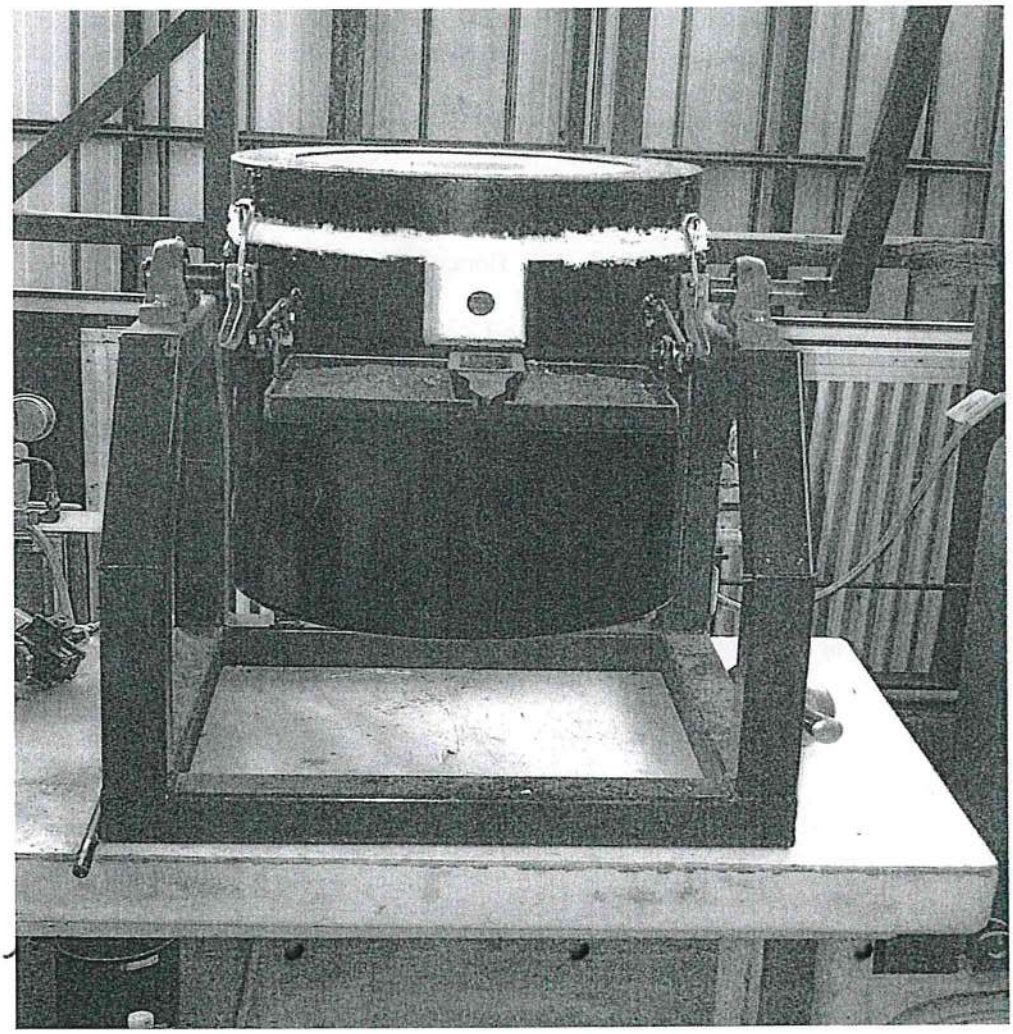
MINING ENGINEERING DEPARTMENT

Standard Work Procedures.

Operating the Tilting Furnace.

Area: **Mineral Processing Laboratory – Kaindi.**

Tilting Furnace



Purpose: The purpose of this manual is to equip the operator of the Tilting Furnace with Safe and efficient work methods and also introduce risks and hazards associated with the use of this equipment.

Hazards:

- ***Molten Metal and Slags*** – Burns from pouring molten metal and slag.
- ***Radiant Heat*** – High temperature can cause burns without contact with furnace surface or contact with molten metal.
- ***Ergonomics*** – Improper stance during pouring may cause muscle strain.

Tools, Equipment & Materials Required:

- Moulds.
- Fluxing Reagents – Soda Ash, Borax, Silica Flour, Sodium Nitrate.
- LP Gas supply.
- Mould release agent – grease, oil, soot (acetylene), etc.
- Metal Scoop.

Personal Protective Equipment (PPE)

- Heat resistant gloves – Aluminised, Kevlar or similar.
- Face shield
- Safety glasses
- Safety boots with steel toe cap.
- Heat resistant coat, aluminised.

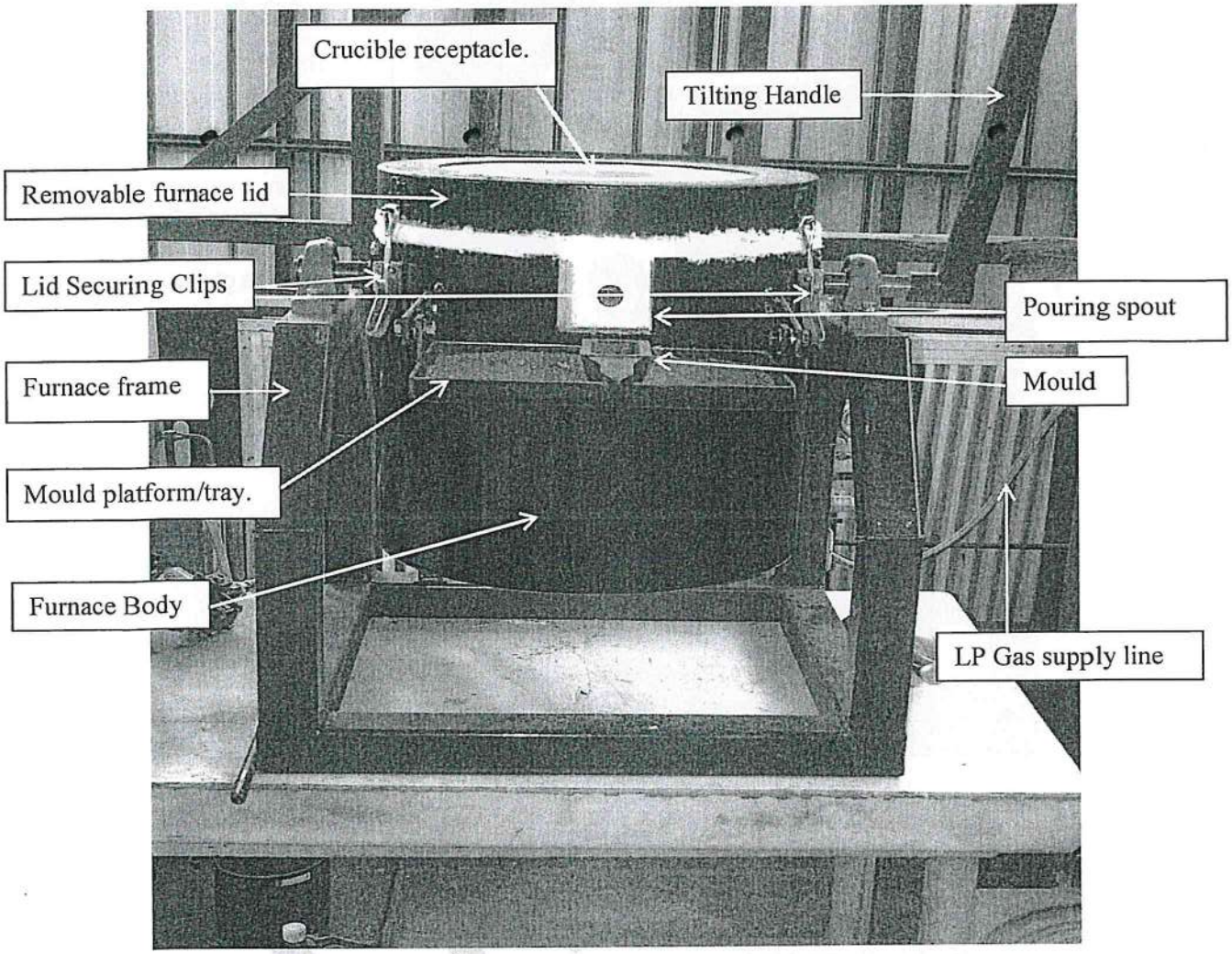
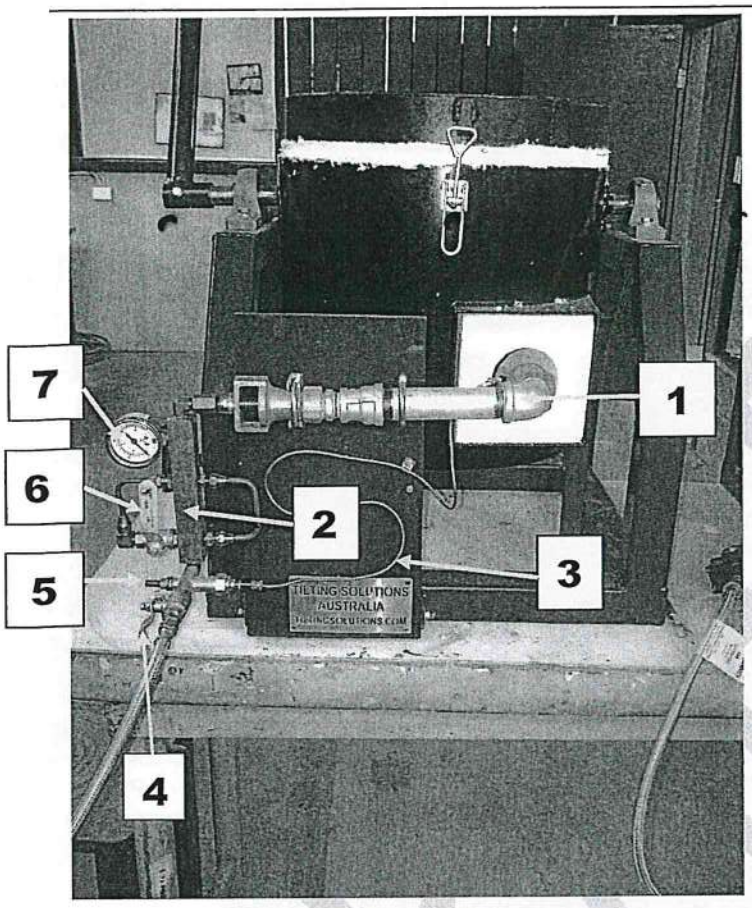


Fig 1: Parts of the Tilting Furnace - Front.



1. Burner Head.
2. Gas valve train.
3. Thermocouple.
4. Furnace gas inlet ball valve.
5. Thermocouple start button.
6. High/Low selection ball valve.
7. Pressure gauge.

Fig 2: Parts of the Furnace – Rear.

Step 3.0. Tilting Furnace Operation.

3.1. Prestart Preparation.

3.1.1 Assemble all tools, equipment and materials in the furnace room.
3.1.2 Ensure furnace is secure by pushing locking pin on RH side of furnace to.
3.1.3 Coat the mould with release agent and place on the furnace top to warm when furnace is in operation.
3.1.4 Partly fill mould platform/tray with sand.
3.1.5 Connect 45kg LPG gas cylinder to the furnace.
3.1.6 With furnace gas inlet valve closed, open cylinder valve one full turn and close.
3.1.7 Use soapy water in a wash bottle and check for leaks at all connections.
3.1.8 Tighten connections as necessary and repeat step 3.1.3 to 3.1.4.
3.1.9 When there are no more leaks, the furnace is ready for use.

3.2. Operation of Tilting Furnace.

3.2.1. Open the gas supply valve on the gas cylinder – fully open and then one complete turn clockwise.
3.2.2 Set the High/Low ball valve on low – valve handle in vertical position.
3.2.3 Open the furnace gas inlet ball valve.
3.2.4 With a lit gas lighter held to the gas outlet of the burner head, depress the blue thermocouple start button and keep depressed for 15 seconds. This will allow thermocouple and the flame to stabilise. If start button is released too soon, the flame will extinguish.
3.2.5 Run furnace on low setting until crucible begins to glow red.
3.2.6 Shut down furnace by closing the gas inlet ball valve.
3.2.7 Using a metal scoop, pour the gold/flux mixture into the crucible. (See Method MP xxx for mixing instructions)
3.2.8 Follow steps 3.2.3 to 3.2.4 to restart the furnace.
3.2.9 Turn the High/Low ball valve to high – valve handle in the horizontal position.
3.2.10 The gold should melt within 25 minutes. Stir the charge occasionally with a wooden stick (600mm long) that is free of nails, screws or anything metal.
3.2.11 When gold has melted, place prepared mould on the platform directly below the pouring spout.
3.2.12 Turn furnace off by closing furnace gas inlet ball valve.
3.2.13 Hold furnace pouring handle with left hand and pull out locking pin with right hand. The gas valve assembly will swing back.
3.2.14 Holding furnace tilting handle with right hand and supporting mould and platform with left hand, tilt furnace forward (toward you) in one smooth consistent movement – it may be necessary to adjust position of mould to catch metal flow. Hold furnace tilted and steady until all contents are discharged and molten gold has set - about 30 seconds. If platform is moved during setting, an uneven and rough gold bar surface will result.
3.2.15 Take mould to sink, tip out gold bar and run water over it. The slag will separate from the gold bar.
3.2.16 Clean gold bar with brush and tap out persistent slag with small hammer.
3.2.17 Dry dore bar and record weight.

Step 4. <u>Complete the Job/Housekeeping.</u>

4.1. Return all tools and equipment to dedicated storage.
4.2. Check work area for any potential hazards that may have been created.
4.3. Clean Tilting Furnace - Brush off any dust and debris after furnace has cooled.

Note: Any faults or defects that are found when the Tilting Furnace is in operation must be reported to the Technical Officer as soon as practicable.