Name of SOP	Fluidized bed
Effective Date	August 03, 2010
Author	Manickaraj Jeyakumar
Reason for SOP Safety of the operator, people around and equipment	Check All that Apply: [X] Procedure/Process could cause critical injury. [X] Procedure/Process could cause occupational illness. [ ] Procedure/Process could cause environmental impairment. [ ] Procedure/Process could damage University property. [ ] Supervisor's discretion. Provide Details:
Approved by (supervisor)	Dr. Sumanth Shankar
Date reviewed by JHSC	Sept 2010

Definitions

Terms	none
Acronyms	RMM – Risk Management Manual JHSC - Joint Health and Safety Committee EOHSS - Environmental and Occupational Health Support Services EPA – Environmental Protection Act OHSA – Occupational Health and Safety Act

Requirements

Applicable OHSA regulations and / or codes of practice.

1. RMM #101 - McMaster University Risk Management System

Training and Competency

1. Training provided by Light Metal Casting Research Center (LMCRC) and graduate students who operate the facility.
2. Ladder training
3. Competency is shown by the individual after training

Description of the Task

Location and time of work	**JHE 101**
Individuals involved	Undergraduate and Graduate Students with adequate training as defined above. PDFs
Equipment and supplies required	Ladder
Personal protective equipment required	Safety glasses, coats, heat resistant leather gloves, face shield, dust mask and safety shoes

Sequential Steps to Complete the Work Safely

Sequential steps to complete the work safely.

Before using the fluidized bed, ensure that you use the appropriate protective equipments:

Note : The furnace requires several days to attain (heating) the specified temperature and cool down (cooling) to room temperature.

- Turn exhaust fan (NE corner of lab) ON

Operating procedure

- ❖ Check the alumina material (Al_2O_3) level in the fluidized bed (minimum and maximum level mark is inside the fluidized bed). Do not operate if the sand level is outside these ranges (when filling alumina sand use a dust mask)
- ❖ Check the water level in the quenching tank (water level should be just below the inlet). Do not operate if outside these ranges
- ❖ Turn ON the transformer (main power switch)
- ❖ Turn ON the air blower
- ❖ Reduce the air flow rate as per the furnace temperature graph (air flow rate vs temperature graph is in the operators manual)
- ❖ Turn ON the control power (controller box) of fluidized bed
- ❖ Turn ON the heater (controller box) of fluidized bed
- ❖ To set fluidized bed temperature, press the ▲or ▼button in the bed temperature controller. (maximum operating temperature is 600°C)
- ❖ Turn ON the water heater if needed (controller box) of quenching tank
- ❖ Turn ON the agitator if needed (controller box) of quenching tank
- ❖ To set water temperature, press the ▲or ▼button in the water heater controller.

Loading/unloading sample

- Use ladder to access the top of the furnace
- Open the hatch slowly and carefully**.**
- Carefully load/unload the samples into furnace
- Close the hatch carefully

Equipment shutdowns

- ❖ Turn OFF the agitator (controller box) of quenching tank
- ❖ Turn OFF the water heater (controller box) of quenching tank
- ❖ Turn OFF the heater (controller box) of fluidized bed
- ❖ Increase the air flow rate as per the furnace temperature (air flow rate vs temperature graph is in the manual file)
- ❖ Turn OFF the control power once the fluidized bed temperature is below 100°C (controller box)
- ❖ Turn OFF the air blower

Contingency Plan and Reporting

Equipment Malfunction

In the event of an equipment malfunction, shut down the furnace heater (if possible leave the air blower in operation) and immediately contact the Technical Staff in room JHE 205.

Important:

Shut down the air blower once the fluidized bed temperature is below 100°C

(if the correct sequence is not followed the furnace will be damaged and extensive cleaning will be required – to be done by the equipment supplier)

Accident / injury response

1. Apply first aid as required
2. Notify Mechanical Engineering technical staff and principal investigator immediately
3. For all injuries complete a "Injury/Incident Report" and provide a copy to the Chair and EOHSS
4. In case of critical injury call security (dial 88).
5. In case of critical injury notify EOHSS immediately, ext 24352
6. Notify supervisor

In the Case of Critical Injuries

1. If it is safe to leave the air blower ON, leave it in operating condition and turn OFF the furnace controller , otherwise shutdown the equipment by turning OFF the transformer and secure the area to prevent further injury
2. Immediately arrange for medical and emergency assistance by calling Security at ext. "88".
3. Apply first aid as required
4. Notify EOHSS immediately, ext 24352
5. Notify Technical Staff immediately. Ext. 24628
6. Notify supervisor

For all injuries complete a "Injury/Incident Report" and provide a copy to the Chair and EOHSS

Environmental Responsibility

Waste disposal procedures

Procedure does not require disposal

Building air quality

Procedure does not affect air quality

References

1. OHSA/ regulations
2. EPA and Municipal environmental regulations
3. RMM #100 McMaster University Environmental Health and Safety Policy
4. Material Safety Data Sheets (MSDS)
5. RMM #300 Safety Orientation and Training Program
6. RMM #301 Standard Operating Procedures
7. RMM #309 Laboratory safety manual
8. RMM #310 Eye Protection Program

Distribution

1. Faculty of Engineering JHSC (for review)
2. Technical Staff of Mechanical Engineering JHE 205 ext. 24628
3. Mechanical Engineering Archive of SOP's
4. JHE 101