

MOLTEN MATERIAL MANAGEMENT

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13 MOLTEN MATERIAL MANAGEMENT

Intent

The intent of this Protocol is to eliminate or minimise the potential for fatalities, injuries and incidents arising from risks associated with the processing or handling of molten material inclusive of tapping, transportation and smelting operations.

Related Life-Saving Behaviours

1. Always come to work drug and alcohol free.
2. Always use or wear critical safety equipment.
6. Never modify or override critical safety equipment without approval.
8. Never enter danger zones without approval.
9. Always report injuries and HPRIs.

Key actions

1. Review all the requirements of this protocol.
2. Identify the requirements that are applicable to your molten material handling and processing facilities.
3. For each applicable requirement, identify the related business and operational processes as well as the expected outcomes.
4. Confirm that the processes and outcomes meet business needs and comply with the requirements of this protocol.
5. Assign accountabilities for maintaining and, if necessary, improving these processes.
6. Monitor the processes to ensure they continually produce the required outcomes.

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13.1 Design

- 13.1.1 The design specifications of new or modified facilities must be the object of a risk assessment and the hierarchy of controls should be applied with administrative controls considered as last resort.
- 13.1.2 The design of molten material facilities must be subject to formal and periodic reviews using recognised risk assessment techniques (e.g. hazard and operability study - HAZOP). The outcomes of these reviews together with recommendations must be documented and communicated as appropriate.
- 13.1.3 The facilities' design and layout must minimise the likelihood of credible emergencies and/or their consequences. This is achieved by integrating prevention, detection, control and mitigation measures such as:
- a) Use of appropriate construction materials;
 - b) Bypass systems;
 - c) Containment areas;
 - d) Refuge stations;
 - e) Monitoring systems and equipment;
 - f) Alarms and early warning systems;
 - g) Firefighting systems; and
 - h) Water management systems.
- 13.1.4 Molten material handling and processing equipment must be designed to "fail-to-safe" in the event of power failures and interruptions.

13.2 Handling and Processing

- 13.2.1 Only authorised persons should be allowed in handling and processing areas and access to these must be monitored and controlled. Where possible, a well-defined process must be used to monitor and control access.
- 13.2.2 Water supplies to handling and processing facilities must be dedicated systems (e.g. jacket cooling) and, where possible, access to water tapping points must be restricted or eliminated. Water system should be monitored to identify leakages.
- 13.2.3 Processing and handling areas must be designed to contain any spillage that may occur and to allow safe clean up and disposal.
- 13.2.4 All surfaces that contact molten material must be coated, prepared or be of a composition that prevents exothermic reactions.
- 13.2.5 Barriers, safeguards and signage must be installed to prevent personnel getting into contact with molten material and hot surfaces.
- 13.2.6 To prevent explosions, contamination or other harmful reactions, procedures must be established and maintained to:
- a) Receive, segregate and store charge materials;

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- b) Assess charge materials adequacy and/or quality and identify inappropriate and/or wet charge materials;
 - c) Feed the furnaces; and
 - d) Dry and remove water remnants from pots and ladles.
- 13.2.7 Programmed maintenance systems for handling and processing equipment and facilities must be developed, implemented and maintained.
- 13.2.8 Monitoring systems must be maintained to ensure that operating status and conditions are known at all times.
- 13.2.9 All processing and handling activities must be subject to a risk assessment.
- 13.2.10 Management of change must specifically address the implications for the processing and handling of molten material.
- 13.2.11 Changes and/or modifications to facility structures, plant, equipment and materials, and associated protective systems must be subject to formal management of change processes.
- 13.2.12 The safe operating parameters for molten materials processing and handling must be defined by competent persons and understood by all relevant personnel. Physical and system indicators as well as limit values for safe operation must be established and communicated as appropriate.
- 13.2.13 Accurate and up-to-date drawings of handling and processing facilities must be kept and be accessible to all relevant personnel.
- 13.2.14 Handling and processing facilities must be equipped with ventilation, fume extraction and emergency venting systems to reduce personnel exposure to dust, fumes and gases.

13.3 Emergency Response

- 13.3.1 Emergency response plans must be maintained and an annual simulation exercise conducted.
- 13.3.2 Emergency response facilities must include specialised first-aid and pre-hospitalisation trauma care equipment.
- 13.3.3 There must be at least two separate emergency exit points in all molten material processing areas. Where this is not possible, sufficient protection measures must be implemented to keep personnel safe in the event of an emergency.

13.4 Critical Equipment

- 13.4.1 Critical components and their maintenance needs must be clearly defined and documented.
- 13.4.2 Remote and automatic systems to shut down plants must be in place to avoid operators' exposure to harmful substances or other risks that may exist in the processing area.
- 13.4.3 Dedicated and clearly demarcated roads and rail systems must be used to transport molten material.
- 13.4.4 Tapping and casting processes must be remotely controlled and operated. When this is not feasible, a risk assessment must be carried out to define appropriate operating conditions, practices and measures to control risk.

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13.5 Procedures

13.5.1 Procedures must be developed and maintained for all molten material processing, handling and disposal activities and/or operations. They should cover:

- a) Response to loss of containment;
- b) Safeguarding mobile equipment;
- c) Tapping molten material from furnaces;
- d) Cooling and use of water;
- e) Specification and provision of personal protective equipment (PPE);
- f) Control of charge material;
- g) Defining competency standards and skill requirements;
- h) Transfer of molten material;
- i) Storage and preheating of charge material and tools;
- j) Operation of casting machines;
- k) Operation and maintenance of launders;
- l) Operation and maintenance of molten material ladles;
- m) Operation and maintenance of granulation facilities;
- n) Operation and maintenance of disposal sites;
- o) Operation and maintenance of furnaces;
- p) Use of liquid and gaseous fuels and furnaces and ladles;
- q) Repairs on an operating furnace;
- r) Housekeeping;
- s) Emergency isolation of services;
- t) Blasting in an operating furnace;
- u) Operation of overhead cranes;
- v) Response to a power failure event; and
- w) Firing-up and shutting-down furnaces.

13.5.2 Where the systems used to transport molten material are shared with other activities, the risks (e.g. collision and spillage) must be assessed and controls established.

13.5.3 A formal communication process (e.g. GCOM) must be used to share and pass relevant technical and safety related information, including changes in operation status, between shifts.

13.6 Responsibilities and Training

13.6.1 Competency standards and responsibilities for relevant roles (employees and contractors) must be defined, documented and assigned.

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- 13.6.2 A competency-based training and assessment programme including clear learning outcomes must be developed, maintained and implemented. Before being involved in or exposed to molten material handling and/or processing, operational and maintenance personnel must have been assessed as being competent.
- 13.6.3 Refresher training and/or an awareness programme on the risks associated with molten material handling and processing and their management should be provided for.
- 13.6.4 Everyone (employees and contractors) must follow training on emergencies and be capable of responding and fulfilling their responsibilities competently in the case of an emergency.
- 13.6.5 The above programmes together with the competency standards, leaning outcomes and training needs must be reviewed on a periodic basis and updated as necessary.
- 13.6.6 To ensure PPE provides the best possible protection, they must be selected by ways of a risk-based approach and their maintenance and use must be managed.
- 13.6.7 The workplace observation programme must include operations of molten material equipment and systems.
- 13.6.8 All relevant personnel must follow training on the health hazards associated with their work environment.
- 13.6.9 The asset management team must maintain a fitness for work policy and a programme addressing the use of drug and alcohol, fatigue and heat stress.

13.7 Additional Requirements for Catastrophic (PMC 5) Situations

- 13.7.1 Whenever an operation involving molten material induces a risk exposure to catastrophic consequences (i.e. five or more fatalities):
 - a) An assessment must be conducted to identify the specific risks and the associated controls; and
 - b) Critical controls must be identified and subject to monitoring and verification processes.

13.8 Definitions

Management plan

Formal process for management of a particular activity, task or area of the business, which articulates management activities and roles and responsibilities.

Molten Material

Metal or slag in a liquid state.

Procedure

Documented process detailing the requirements for conducting an activity or task.

Training

Refers to the initial training to verify competence and subsequent refresher training to verify that the competencies have been retained.

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Risk of Exposure

The measure of potential future loss resulting from a specific activity or event.

Tools

- [Molten Metal Workshop \(Best Practice Portal\)](#)
- FHP Self-Assessment Workbook (HSEC Portal).
- FHP Third Party Audit Workbook 13 Molten Material Management (HSEC Portal).

Note: The application of this Protocol must also comply with the General Mandatory Requirements outlined in Section II of the Glencore Life-Saving Behaviours and Fatal Hazard Protocols publication.

13.9 References

None.

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13.10 Accountabilities

Team	Accountabilities
Glencore Corporate	<ul style="list-style-type: none"> Maintain and update this protocol. Use this protocol for audit purposes.
Department	<ul style="list-style-type: none"> Oversee the implementation of this protocol within the department and apply assurance processes.
Asset management	<ul style="list-style-type: none"> Apply the requirements of this protocol.
All employees/contractors	<ul style="list-style-type: none"> Comply with relevant requirements of this protocol. Report hazards and incidents related to molten material.

13.11 Control and Revision History

13.11.1 Document Information

Property	Value
Approved by:	Lucy Roberts
Document owner:	David Mellows
Effective date:	20/08/2020

13.11.2 Revision

Version	Date Reviewed	Review Team	Nature of Amendment(s)
1-0	24/11/2014	Corporate and Alloys HSEC Leads.	First published version.
2-0	09/06/2020	Alloys coordinated molten materials review team led by Chantelle Koekemoer	Consolidation into a single implementation phase protocol. Team review additions