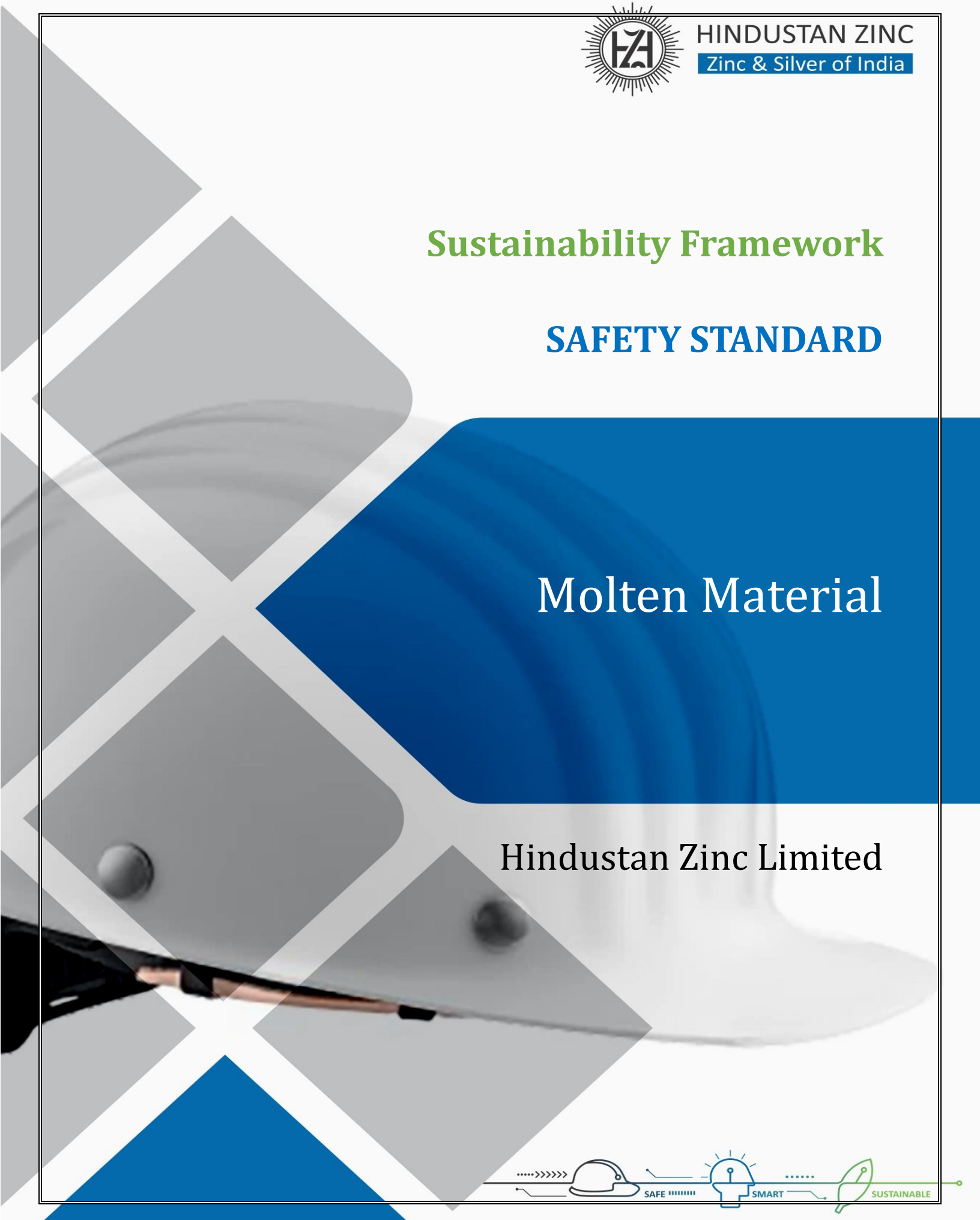
HINDUSTAN ZINC
Zinc & Silver of India

Sustainability Framework

SAFETY STANDARD

Molten Material

Hindustan Zinc Limited



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Molten Material	Revision No.	01
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Document Control Details

	Issued by	Approved by
Name	Mr. Murugan Mani Chairman – Molten Material	Mr. C Chandru Chairman - SRP Sub Committee
Sign.		
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Abbreviations

- CSRP Corporate Standards, Rules and Procedure Subcommittee
- HZL Hindustan Zinc Limited
- HSE Health, Safety and Environment
- IMS Integrated Management System
- LOTO Lockout Tagout
- CSC Corporate Safety Council
- UIC Unit Implementation Committee
- ZSC Zone Safety Committee
- SRPSC Standards, Rules & Procedure Subcommittee
- PPE - Personal Protective Equipment
- EOHS _ Environment Occupational Health & Safety
- HR - Human Resources
- FAI - First Aid Injury
- MTI - Medical Treatment Injury
- LTI - Lost Time Injury
- SPI - Serious Process Incident
- OTJ - Off the Job
- S&FS Safety & Fire Services
- HIRA Hazard Identification and Risk Assessment
- SOP Standard Operating Procedure
- WI Work Instruction
- PTW Permit To Work (also known as Work Permit)

Table of Contents

1. Introduction

This standard is to prevent incidents from the unexpected splash, explosion, direct contact, spillages, leakages of molten material during smelting operation & maintenance which includes melting, casting, handling, transfer, transportation, drossing, skimming, Oxylancing, slagging, tapping, storage, scrap handling/charging & other associated activities. This will be achieved through defining engineering controls, authorization to operation & maintenance team, healthiness of tools & Tackles, equipment's integrity, risk assessment and operating procedures, inspection of raw material, emergency control, training and Personal protective equipment's.

1.1. Intent and Purpose

The intent of the standard is to develop Safe Operating Procedure & Guidelines for handling molten material and it will help HZL operation to prevent incidents while dealing with molten material.

This standard has been developed by cross functional teams from all Zones of HZL. The requirements which have been identified here are equally applicable across all Zones/ sites of HZL. This will also help in bringing about a consistency in the process used across all locations.
The Standard will help to provide a new impetus towards achieving the best in class safety standards. This standard is formulated based on best practices, HZL molten material handling standard, current practices within the group, past incidents learnings and risk perception of team involved.

2. Scope

This standard applies to all Hindustan Zinc Limited (HZL) business units and incorporates all of the requirements of the HZL Molten Material handling Standard. It is applicable to all HZL smelting operations. during exploration, through all development phases and construction, operation to closure and, where applicable, for post closure management. National regulations shall be used in conjunction with this standard.

3. References

3.1. Corporate Policy

3.1.1. HZL HSE Principles and Policy

3.2. Corporate Standards

3.2.1. HZL Molten Material Standard
3.2.2. HZL LOTO Standard
3.2.3. HZL PTW Standard
3.2.4. HZL ERCP Standard
3.2.5. HZL PPE Standard

3.2.6. HZL EOT Standard
3.2.7. HZL Lifting & Shifting Standard
3.2.8. The Factories Act – India and Rajasthan & Uttarakhand Factories Rules,
3.2.9. Molten Material Handling procedure of Group Company SIIL Tuticorin

4. Management Responsibilities

Line management has the responsibility to implement this standard.

5. Definitions

All the definition

Factory Manager/Project Head - A person who is legally notified and authorized by Occupier to discharge his duties.
Who is the overall custodian for this standard at their respective location.
Authorized Person (AP) – a person who is authorized to sign work permit on the behalf of Factory Manager/ Mines Manager/ Project Head and is authorized by Unit Head/ Operation Head/ Engineering Head/ Project Head or In-charge. Such person has good knowledge of the system / equipment / plant and knows the potential sources of hazards and the isolation points to control / isolate the hazard. Such person is competent to maintain safe working conditions/environment at work, to authorize the work to be carried out and to cancel the permit.

Certification – a verification process, which documents that a person has the necessary training, skill, competency, experience and the ability to perform designated roles and tasks.

Isolation Officer – Whenever equipment, plant or a section of plant is to be isolated, there must be a person designated to carry out the isolation procedure. That person is referred to as the Isolation Officer. No person may be designated as the Isolation Officer for a piece of equipment unless s/he has been trained, assessed and authorized by the respective business unit as competent to carry out the isolation procedure for that piece of plant or equipment.

Permit Requester – The person who is competent in carrying out a specific work on any equipment / machinery/ system and is responsible for ensuring the whereabouts of the affected persons who are working under his supervision and control.

Affected Person – any person whose job requires him/her to operate or use a machine or piece of equipment on which servicing / maintenance is being performed under Lockout / Tagout, or whose job requires him/her to work in an area in which the servicing/ maintenance is being performed.

Operator – any person who directly or indirectly controls any equipment (mobile / static) which has the potential energy

Visitor – any third party person who has not been inducted under HZL safety policy. Such person may be a subject expert/consultant/ OEM/Supplier from another organization.

Work Permit– (also known as Permit To Work – PTW) the written or printed document that is issued to administratively control and authorize all kinds of energy isolation activities.

Lockout– The placement of a Lockout device on an energy isolating device in accordance with an established procedure ensuring that the energy isolating device and the equipment being controlled cannot be operated until the Lockout device is removed.

Lockout Device – A device that uses a positive means such as a lock to hold an energy isolating device in the safe position and prevent the energising of a machine / equipment. Included are blank flanges and bolted slip blinds.

Tagout – The placement of a Tagout device on an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the Tagout device is removed.

Tagout Device – A prominent warning device, such as the Tag and a means of an attachment which can be fastened securely to an energy isolating device in accordance with an established procedure, it indicated that the energy isolating device and the equipment being controlled may not be operated until the Tagout device is removed.

Master Lock – A Lockout device which will be placed by an Isolation Officer on the isolation point of any energy source.

Personal Lock – A Lockout device which is specifically issued to all Affected Person to apply over a Site Lock Box (when multiple persons are involved) or Master Lock Box (only single person involved). Sharing of Personal Locks should be strictly prohibited and shall be differentiated from Master Lock.

Master Lock Box (MLB) – A centralised lock box that is kept under control in a centralized predetermined place and contains all the master locks as directed by the Issuing Authority with respect to the job specified by the Requester on Work Permit. Also, it will be locked by the Issuing Authority along with the Permit Requester(s).

Site Lock Box (SLB)-Agency specific lock box is available with all Permit Requesters and shall be used to hold the requester's key and Personal Locks of affected persons involved in specific Job. Permit Requester shall exercise control over this box.

Risk Assessment -The formal process of identifying, assessing and evaluating the safety, health and environmental risks that may be associated with a hazard. For example: Hazard Identification Risk Analysis (HIRA), Job Safety Analysis (JSA), etc.

6. **Roles and Responsibilities:**

The responsibility to implement the standard lies with the respective Unit Head and Line management who shall be assisted by site molten material champion.

7. **Authorization:**

- Forklift / mobile equipment drivers operating in molten material handling area shall be trained in vehicle driving standard by standard champion and must meet minimum competence criteria as per VDS and Motor vehicles act.
- EOT operators shall be trained in EOT standard by standard champion and basic rigging & signalling techniques and must meet minimum competence criteria as per EOT standard.
- Visitor/ Consultant/Service engineer/ Auditors /any other unauthorised persons shall be accompanied by authorized person in molten material handling area after communicating the hazard and basic familiarization of the area with mandatory PPE only.

8. Man, machine Interfacing:

- All conveyors should have machine guarding as per machine guarding standard. If any activities required to have access to hot metal and rotating/moving machine, shall be approved by Unit head with SOP/HIRA and persons should have mandatory PPE and suitably trained. Caution/warning board should be displayed near those area with related Hazards
- All open launders, tundish, bath area should have distance hand railing /fencing to prevent contact with molten metal.
- Molten material transfer area should have defined pathway with necessary signage, posters, warning indicators and barricades to avoid man machine interaction
- Molten material transport roads/rail must have a risk analysis to identify and control hazards of metal spillage.
- Traffic rules for molten material transport vehicles must be developed and rigorously enforced for compliance.

Molten material transport vehicles must be segregated from other vehicles and pedestrians unless effective risk controls have been established and implemented.

- It should be preferred to use elevated platforms in Molten Material handling areas to protect the operator from line of fire in case of fall of metal/Ladle Splashes/Failure of Ladle handling equipment.
- Any operation involving the carrying by hand of a container holding molten metal shall be performed on a floor on same level, provided with a safe means of access from the floor for any person while engaged in the operation. (Section 27 Operation in Foundries: Factory Act).

9. Operating Procedure & HIRA Guidelines:

- Standard operating procedure (SOP) for Molten Material handling shall adequately include all mitigating controls of Hazard identification and Risk assessment.
- Standard operating procedure training to be imparted to all working person in Molten Material area.
- Operating procedures shall include emergency scenario like Furnace breakout, Power failure, Molten metal splashes, Fire, etc.
- Emergency response and evacuation plan should be in place and all working personal in Molten Material area must have the awareness for same.
- Site shall regularly train Operators and maintenance personnel on SOP/SMP/ERCP/HIRA at least once in a year.

Operating Procedures /Maintenance procedures/HIRA/ERCP shall be regularly reviewed and updated at least once a year or else upon change of process, technological changes, Incident investigation recommendations, new machine installation and other similar scenarios.

- The operating temperature of Molten Materials shall be kept within defined limits; safe temperature ranges should be established; and a system for identifying, recording, and managing any deviations is in place.

Furnaces/kettle or any type of holding/processing Molten Material must be operated within safe operating limits, and this must be monitored at regular intervals.

Hazard analysis is done for all Molten Material processes, considering emergency situations Inclusive of abnormal scenario.

Operators shall always remain at least 3 meters away from line of fire i.e. Hot metal Ladle, hanging load, etc. which has potential to cause injury.

Do and related to critical controls shall be displayed at shop floor.

CRM checklist and regular audit shall be in place for all Molten Material handling Processes.

Dross and skimming removed from molten metal or taken from a furnace shall be placed forthwith in suitable receptacles. If we are using vehicle, it must be protective heat shield equipped

10. Equipment's:

- Equipment and machinery involved in molten metal handling shall be of Fail-Safe design to avoid any undue incident in the event of failure of a component, for e.g., Brake shall be applied on failure of Power supply, In event of failure of Hydraulic Cylinder seals equipment shall be back to its home position.
- Lifting Machinery related to molten metal handling specifically Hoisting Mechanism of EOT/Hoist, Ladle Tilting/Tripler, Forklift Lifting system, Furnace tilting mechanism should have very comprehensive Preventive maintenance program to avoid any failure during Hot metal handling and shall be reviewed frequently for PM Compliances and effectiveness through management controls.
- Wire ropes of EOT Cranes/Hoist shall be regularly inspected based on HZL EOT Standard and replacement schedule shall be followed. Molten metal handling cranes wire ropes should be changed once in 6 months. All Molten Metal Handling Cranes shall be equipped with Safe Load Indicator.
- Site should have a procedure for Annual NDT Inspection {specifically UT (Ultrasonic testing) and MPT (Magnetic Particle test)} of Lifting Hooks installed in Cranes/Hoists, Ladle Bell arm, Lifting Pin of Ladle, Lifting Hooks, Lifting Beams and other lifting arrangements for Molten Metal equipment.

- All Molten metal handling equipment /holding vessels, Ladle, Kettle, Lifting Tools and tackles shall be procured only after following required Quality assurance process.
- All water-cooled casting equipment, water cooled furnaces and water-cooled access or transfer equipment that require a continuous water flow for safe operation, must have an assured water supply in the event of power failure, equipment breakdown or other emergency. Procedures for reestablishment of cooling water after an outage must be established.
- Site should have maintenance program to check Healthiness of Critical Interlocks of Furnace/Transfer equipment/EOT Cranes/other associated equipment at a defined frequency and any deviations shall be immediately addressed upon observation or else shall from part of Interlock By-pass register. Interlocks shall be as per OEM guideline and in case of any change MOC procedure shall be in place.
- Regular updating shall be carried out based on past Incident learnings and horizontal deployment of actions through MOC-T procedure.
- All Molten Metal handling area should be equipped with Fixed /PTZ (Pan tilt Zoom) Cameras for monitoring of molten metal handling activities and back up record of minimum 30 days.
- Operator control positions/rooms shall be located outside high impact zones in the case of a release/explosion in Metal holding furnaces.
- Operators Cabin it should be equipped with required Heat shield protection glass and air-cooling system to ensure a healthy environment.
- Operating stations and Control Devices used for Molten material handling shall be ergonomically designed.

For New Projects/Facility Upgradation it is recommended to install EOT Cranes with guided mast and Hook Rotation arrangement for Ladle handling to eliminate swinging and manual intervention for Ladle positioning on ladle Tripler & Transfer car.

- All MMH areas (Molten Material Handling areas) shall have Emergency lighting with suitable power back up in blackout scenarios for handling any emergencies. Monthly testing frequency has to be ensured
- Compressed Air shall be free from moisture and suitable preventive maintenance practices shall be in place for Drier /Moisture separator/Auto drain valves used for Moisture removal.
- During movement of Mobile Equipment, a warning device (a Bell, Horn, Siren or a flashing light) should be automatically activated during Long Traverse & Cross Traverse movement.
- Emergency stop shall be provided in Pendant/ remote & shall be linked with main Contactor of the electrical circuit to avoid any mishap in the event of contactor failure.
- Gravity Limit switch of Hoisting machinery shall be in place and to be interlocked with main Power contactor of electrical circuit to avoid any mishap in the event of contactor failure.

Long traverse and cross traverse motion shall be equipped with soft start devices like variable frequency drives and inverter-controlled brake/electrohydraulic booster to avoid sudden jerk during acceleration and deacceleration.

- Molten materials handling EOT cranes greater than 15 T capacity shall be equipped with safety brake in addition to conventional brake.
- Molten materials handling EOT cranes greater than 15 T capacity shall be equipped with digital Safe Load Indicator and possibility shall be explored for interlocking to prevent overloading of Hoisting machinery. All Pendant Stations/Remote Control devices shall be kept in Biometric access control to avoid usage by an unauthorized personal and its recommended to use Biometric enabled remote control to eliminate the possibility of any unauthorized usage.

- All vessels and equipment used for handling molten materials shall be designed as per OEM recommendation and must be certified by a competent engineer in case of any alteration thereof.
- During any indigenous development of spares for a molten metal handling equipment, Molten metal application and applicable codes as per good engineering practices shall be considered.
- Critical Cables in molten metal handling area shall be equipped with capacity to withstand the High temperature, Molten metal splashes and harsh environment.
- Electrical systems, control systems, fuel systems, and oxygen systems are located where contact with molten material is unlikely or protected by suitable heat resistant barriers and diversions.
- In Primary Smelting Furnaces Slag Granulation water supply systems shall be designed with automatically acting power back up supply in the event of failure of the water supply.

Display of test date and due date with capacity (SWL- Safe working load) on applicable equipment shall be there and Annual/Six monthly inspection shall be carried out by Govt approved Inspector as per applicable laws.

- Forklift/Excavator/Other mobile equipment used for molten metal handling should be equipped with Heat Shield Protection Glass.
- Forklifts shall be equipped with top cover to protect the Operator from molten metal splash, top cover shall be made from a non-flammable material for e.g. GI Sheet/SS Sheet.
- Ladle Transfer Car shall be equipped with remote control device, during movement a warning device (a Bell, Horn, Siren or a flashing light) should be automatically activated.
- Emergency stop shall be provided in transfer Car remote & shall be linked with main Contactor of the electrical circuit to prevent any mishap in event of Contactor failure.
- Molten Metal Ladle Transfer Car Track should have limit switches & mechanical stopper at the extremities based on good engineering practices and applicable standards.
- Ladle Transfer track shall be guarded as per Machine guarding standard of HZL.
- All molten metal transfer pumps including delivery pipe used shall have PMI (Preventive Maintenance Inspection) schedule and shall be monitored for mechanical integrity and conditionbased replacement.
- Equipment used in Pyro refining process like Mixer, Agitator, De-dresser shall be equipped with Machine Guards and should have defined PMI (Preventive Maintenance Inspection) schedule.
- Repair area for all molten material handling equipment shall be located at a Safe distance from the Molten metal handling area.
- Zinc and Lead Slab Casting Line Conveyors shall be guarded as per machine guarding standard.
- Skimming activity and Layer Conveyor operation in Casting lines shall have mitigating controls in place to avoid any man-machine interaction.
- Oxygen lancing set up shall have Oxygen duty hoses, Lance holders of reputed make like WITT Gas & BEDA Oxygen Technik or equivalent.
- Lancing set up shall be equipped with Flash back arrestor, Non-return valve, Pressure regulators, for an efficient, steady and safe oxygen feed
- Adequate indicators and alarms shall be available for abnormal/emergency operational and maintenance situations to alert the Operators.
- Hydraulic Oils used in the Molten Material handling equipment shall be Flame proof to avoid escalation of fire in case of any undue incident.

11. **Emergency response and control plan:**

- All persons working in molten material handling area shall be trained in Emergency response and control plan
- Molten material handling area should have all the emergency provisions such as eye shower, fire extinguisher, first aid box and fire hydrant line, emergency light
- Molten material handling area should have display of emergency evacuation plan mentioning location of eye shower, fire extinguisher, emergency exit and safe assembly point
- Molten material handling area should have display of communication chart during emergency and display of emergency exit for guiding safe evacuation to safe assembly points
- Molten material handling area should have site specific emergency procedure included in operating procedure.
- Fire load assessment shall be carried out for Molten metal handling areas and necessary Fire Fighting equipment's shall be in place.
- In Molten Material handling areas regular Mock-Drills shall be carried out (at least twice in a year)to assess the as is status and improvement actions.

12. Raw material Inspection Guidelines:

- List of all charging material is to be incorporated in site specific procedure.
- Designated place of each charged material must be there and same should be in-built in SOP/SSP
- Pre-heating methodology and material charging process shall be clearly defined in Standard operating procedure to avoid any chances of explosion/splashes due to lack of skills.
- Charged material storage facility and location must be free from any roof leakage, exposed to moistures environment or near to any water drains and pits.
- Segregation procedure for all material which is coming from other units (Outside plant control) must be defined and effective management controls shall prevail.
- Any new raw materials, WIP, Scrap introduction in process shall proceed only after due process of Management of Change -Technology as per process safety management.
- Size, physical condition, moisture limits for each charging material must be specified in SOP.
- All associated risks with each charging material must be incorporated in plant HIRA.
- There must be a system to ensure bottles, cans /combustible materials debris are not charged to furnaces and ladles and regular housekeeping shall be maintained in the Molten material handling area to prevent such practices.

13. Personal Protective Equipment's:

- To assess the requirements of personal protective equipment's and to safeguard the person from molten material exposure, All PPE should be as per ISO 11612 the following arrangements needs to be done.
- Hazard analysis of the process, area and equipment's shall be done to identify where special molten material PPE is required.

- Fire retardant clothing shall be provided as a mandatory requirement for any person including visitor, service engineer, consultant, auditors entering an area where there is a potential for exposure to molten materials.
- A Fire retardant suit made up of jacket and trousers should be the preferred option. Coveralls (Dangri) should not normally be provided because:
    a. Coveralls are not easy to remove quickly in emergency.
    b. Cut of a coverall can lead to pockets being created in which molten metal may become trapped

- Clothing should be designed to eliminate trapping points or areas where molten metal can build
- up.
- Clothes shall have overlapping seams on the outside of the clothes, facing downward and lockstitched
- Jackets should be long enough to cover the tops of trousers - even when the wearer bends down - and should fasten up to the neck where they should be close-fitting.
- Quick-release fastenings should be fitted to outer garments to enable their fast removal in emergencies
- Trouser bottoms should not have turn-ups and should be wide and long enough to overlap the top of footwear
- Metal fasteners on the outside of garments should be covered or treated to prevent molten metal from sticking

- Correct and job /area specific Personal Protective Equipment usage shall be mandatory for molten material activities and may include helmet, face shield, leather gloves, balaclava, Leg guard, high ankle safety shoes and full body fire retardant clothing and respirator.
- All employees engaged in the process and maintenance activities of molten material shall be trained on wearing, inspection, and care of PPE's.
- All PPE complies with regulatory requirements or international standards as per the nature and hazard of the molten material to be handled.
- The PPE Matrix shall be displayed at prominent places at molten material handling area, preferable at the entrance of .
- Effective screens or suitable goggles shall be provided to workers with Eye exposure to excessive light or infrared or ultra-violet radiations. For e.g. Process such as rolling, casting or forging and working in Furnaces.
- Respirators shall be mandatory for areas wherein toxic fumes /dust emission possibilities exist and it should be replaced at defined frequency as per Site Specific guidelines.
- Training related to usage of PPE shall be conducted to facilitate and improve the effectiveness of

14. **Storage & Infrastructure:**

- Keep storage area free from accumulated materials that cause tripping, fire, explosions
-

Charging materials for furnace/kettles/any other melting arrangement shall be kept inside shed/buildings that are well constructed, rain proof.

- Roof sheets over furnaces/kettles/ladles/casting lines/charging material storage area must be in healthy condition. If found damaged immediate replacement to be done
- Drain outside the storage yard/molten material area should always be cleaned at defined frequency and all drains must be covered appropriately.
- Molten material area should have provisions of dykes/pits for secondary containments and must always be cleaned.

Proper illumination & lux level to be ensured in storage yards over furnaces/kettles area as per Factory act /applicable standards.

15. **Furnaces, ladles, tools and tackles Specific guidelines:**

- Molten material handling furnaces, vessels shall be designed as per the OEM recommendation and certified the business.
- Molten material handling furnaces must be operated with in design limits and must be monitored at regular intervals.
- Metal should not be over heated in furnaces/kettles and temperature control devices should be inspected regularly. alloying /charging into furnaces/kettles with molten metal above 800 Degree C should be avoided.
- The maximum level of molten material in furnaces, ladles and other vessels shall be clearly defined and any deviation shall have an effective control mechanism.
- Direct water-cooled furnaces, casting equipment and water-cooled access or transfer equipment that require a continuous water flow for safe operation, must have an assured water supply in the event of power failure, equipment breakdown or other emergency.
- The lining of furnaces must be in good condition and periodical inspections to be done.
- Furnaces should have a reservoir to receive run-outs of molten material in case of refractory failure. All these reservoirs should be kept clean and dry.
- Barriers should be in place to prevent physical contact in case of hot furnaces.
- Preheating and inspection of ladles for any moisture shall be done before handling molten materials.
- Preheating procedure to be followed before using newly relined launders, ladles.
- Pre-operational checks shall be followed before handling molten material through launders, moulds, ladles.
- Ladle Inspection checklist shall be filled before every use and shall include both In Process and Pre use Checks.
- Shell temperatures/Hot Spot shall be regularly monitored for ladle /launders during molten metal transfer.

- A detailed Pre-start Up checklist shall be used before taking Ladle back to service after relining /repair activity.
- All the tools and tackles used for molten material handling should be identified, listed and should be of good construction, sound material, adequate strength and ergonomically designed.
- All the tools and tackles used for molten material handling must be periodically inspected and certified.
- All the tools and tackles which are directly contacting molten material should be completely dry, clean, free from rust and preheated before use.
- Dross collection pans/skips, skimming collection pans must be clean and dry.
- All the tools and tackles must have a designated storage at operating areas.
- All ventilation plant used for extracting, suppressing or controlling dust or fumes shall be properly maintained.
- All ventilating plant used for extracting, suppressing or controlling dust or fumes shall be examined and inspected once every week by a responsible person. It shall be thoroughly examined and tested by a competent person at least once in every year,such examination and test shall be entered in an approved register which shall be available for inspection by an Inspector and all such records shall be available with the Operations team.

16.0 RACI chart: The roles and responsibilities to implement this standard are outlined below:

Activity Description	Area Supervisor/ Shift In charge	Line Organization	S & FS	Zone Apex	CSC
Identify people and their authorization	R	A	C	-	-
Identify the hazard and development of OP & HIRA	R	A	C	-	-
Assign responsibility for inspection of Equipment's, tools and tackles, Furnace and ladle	R	A	C	-	-
Assign responsibility for inspection of storage location and infrastructure and implementation	R	A	C	-	-
Implementation of PPE Matrix	R	R / A	C	-	-
Training and Competency	-	R / A	C	I	-

Audit/Inspection and monitoring for compliance of implementation	-	A	A/R	C/I	I
Relevant risk assessment before execution of job	R	A	C	-	-

R : **Responsible**

People who are expected to actively participate in the activity and contribute to the best of their abilities.

A: Accountable

The person who is ultimately responsible for the results.

C: Consulted

People who have the specific expertise and can contribute to decision making.

I : Informed

People who are kept informed, but do not necessarily participate in the effort.

17. **Management Systems**

17.1 Support Resources

Location head /Unit head / CSC/ Corporate EOHS/ S&FS is available to assist with implementation of this standard

17.2 Audit Requirements

Each location shall audit compliance with this standard as part of its Safety audit program.

17.3 Standard Renewal Process

This standard shall be reviewed and revised as necessary and, at a minimum, not later than three years from the date of the last revision.

17.4 Deviation Process

Deviations from this standard must be authorized by the CSC after consultation with the APEX. Deviations must be documented and documentation must indicate causes of deviation with safety plan. Deviation authorization must be renewed periodically and no less frequently than every three years.

17.5 Training and Communication Requirements

- Each Zone or location must be familiar with this standard to carry out its responsibilities. Training is the responsibility of each Zone / location.
- All personnel working near molten material shall be trained and tested for competence, and refresher trained every three years.

17.6 Contact

If interpretation or clarification is needed, questions shall be directed to the Safety & Fire Services Head and Zone/ Corporate SRP Subcommittee.

18. **Standard Renewal Process**

This standard shall be reviewed and revised as necessary and, at a minimum, not later than two years from the date of the last revision.

19. **Annexures:**

Annexure-1 - Ladle Inspection Checklist

Ladle Check List		Tapping Serial No.
S. No.	Check Point	

		Ladle no	Ladle no	Ladle no
1	Is ladle are clear from slag / accretion /Moisture			
2	Locking bolts condition (Mention if any bend / damage / rusted/Bolt should be M20 and 2 No's washer- one in bolt head side and second in Nut side)			
3	Locking bolts block condition (Mention if any crack/ bend/ chock)			
4	Arm plate condition (Mention if any crack/ bend / chock / damage)			
5	Collar plate condition (Mention if any crack/ bend / damage)			
6	Refractory condition (mention if any visible anchor / ref damage)			
7	Maximum ladle temp before tapping (It should be < 250^0C)			
8	Maximum ladle temp after tapping (It should be < 250^0C)			
9	Any metal leak after tapping / red spot			
10	Is preheating done (for new ladle before taking in line)			

Annexure 2 - Furnace Inspection Checklist:

Quarterly Checklist for Furnace Health				
S NO.	*Parameter to be checked*	Yes	No	Remarks

1	*Any Signs of damage and corrosion in the furnace body*			
2	*Any Bulging or metal leak in the furnace shell*			
3	*All Air/Oxygen inlets are in good condition and are free of leaks*			
4	*Water jacket is in good condition and water pipes are not blocked*			
5	*All relevant instrument are present and are periodically calibrated*			
6	*Burner are working properly and are providing required flame.*			
7	*Any other external cooling is provided other than the design*			
8	*Fuel oil line is in good health and is free of leakage.*			
9	*All process parameter affecting the refractory life are in required limits*			
10	*Critical water supplies have a backup supply in the event of failure of the primary water supply*			
11	*Furnace charging area is properly barricaded and prevents entry of any foreign material*			
12	*Furnace is always operated within design limits and is monitored at regular intervals*			
13	Check for any signs of refractory damage through peek holes.			
14	All safety valves/interlocks are inline and checked periodically			
15	Fail safe is available for any event of any power or energy source failure			
16	Temperature data is continuously monitored and maintained			
17	All vent pipes are in good condition			
18	All flue gases parameters are in required limits			
19	Proper restriction for entry for water in the furnace			

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