Title	**Describe safety practices while working with hot and molten metals**		
Level	**3**	**Credits**	**3**

Purpose	This unit standard is intended primarily for use in the training of personnel in the metal forming industry. People credited with this unit standard are able to: describe causes of hazards and risks, and their mitigation and management techniques in a metal forming environment; describe possible volatile and explosive substances in a metal forming environment; describe possible effects and causes of spills and projectiles, and their management, control, and minimisation techniques; and describe safety when working with furnaces.

Classification	Mechanical Engineering > Metal Forming

Available grade	Achieved

Prerequisite	Unit 29652, *Demonstrate knowledge of safety, health, risk assessment, and hazard ID and control on an engineering worksite,* or demonstrate equivalent knowledge and skills.

Guidance Information

1 Legislation
Health and Safety at Work Act 2015 and supporting regulations.
Hazardous Substances and New Organisms Act 1996.

2 Definitions
Accepted industry practice refers to approved codes of practice and standardised procedures accepted by the metal forming industry sector as examples of best practice.
Metal forming refers to the metalworking process of creating metal parts and objects through, for example sand casting, die casting, investment casting, continuous casting, centrifugal casting, forging, extrusion, three-dimensional additive metal manufacturing.
Workplace procedures refer to documented policies and procedures set by the organisation carrying out the work, and to documented or other directions provided to staff, and applicable to the tasks being carried out. They may include but are not limited to – standard operating procedures, site specific procedures, site safety procedures, equipment operating procedures, codes of practice, quality assurance procedures, product quality specifications, references, Approved Codes of Practice, housekeeping standards, environmental considerations, and procedures to comply

with legislative and local body requirements relevant to the industry sector.

3 Range
Examples of the main generic processes in foundries – pattern/tool making, mould preparation, metal preparation, metal melting, casting, removal of castings, fettling and finishing, heat treatment, plant maintenance, waste disposal, material handling and packaging.
Examples of conditions that create potential risks – hot metals; exposure to gases, vapours, fumes, and dusts; corrosive and sensitising chemicals; radiation, metal fragments, hot working conditions; manual and mechanical handling; machinery and equipment; vibration; noise; ultra-violet radiation; slips and falls; fuel or power source such as propane and electricity; hot mould material; disposal of mould material; hot material appearing cold.
Examples of safety wear – leather shoes/boots, fireproof apron, foot and leg protection, high temperature gloves, wire mesh face shield, safety glasses, foundry hat, flame resistant clothing, long sleeve cotton shirt.

4 Assessment information
- a All activities must comply with relevant legislative and/or regulatory requirements.
- b All activities must comply with applicable workplace procedures and must be consistent with accepted industry practice.

Outcomes and performance criteria

Outcome 1

Describe causes of hazards and risks, and their mitigation and management techniques in a metal forming environment.

Performance criteria

1.1 Heat sources that could cause harm in a metal forming environment are described.

Range ladles, furnaces, molten metal, castings, materials, tools, and equipment.

1.2 Primary causes of metal splash and furnace eruptions, their minimisation, and protection from them are described.

1.3 Symptoms and consequences of heat fatigue, and risk mitigation and control measures are described.

1.4 Type, quality, and condition of personal protective equipment for people working with or around molten metals in a furnace, ladle and/or mould is described considering the operating conditions.

Range examples of operating conditions – amount and type of molten metal, the level of the metal and area of the body that could be impacted by a splash, runout, spark, or hot surface; closeness of worker to the molten metal and hot surfaces; release of airborne contaminants such as gases, vapours, and dust.

Outcome 2

Describe possible volatile and explosive substances in a metal forming environment.

Performance criteria

2.1 Causes of explosions when working with molten metal are identified and described.

2.2 Effects of explosions on humans and equipment are described, including a description of how explosions could be hazards.

2.3 Control and management systems to prevent explosions are described.

2.4 Volatile and explosive substances in a metal forming environment are identified and described in terms of why and how they become volatile and explosive.

Outcome 3

Describe possible effects and causes of spills and projectiles, and their management, control, and minimisation techniques.

Performance criteria

3.1 Possible effects and causes of molten metal run-out, and its management and prevention are described.

3.2 Possible effects and causes of projectiles, and its management and prevention are described.

3.3 Factors to be considered when choosing refractory lining material is described.

3.4 Spill containment procedure is described.

3.5 Run out containment procedure is described.

Outcome 4

Describe safety when working with furnaces.

Performance criteria

4.1 Signs of potential problems with combustion and electric furnace operations are described.

Range includes but is not limited to – condition of lining or crucible, signs of old runout, leaks in cooling water system, old splash beads of metal touching coil, leaking gas line, leaking hydraulic system, worn insulation (electrical or thermal), oil spills or accumulated combustible material around the furnace area or coil, missing guards, sparking of stray induction loops, condition of lifting equipment.

4.2 Hazardous properties of fuel are described.

Range gas, electricity, diesel.

4.3 Hazards associated with incorrect operation of furnaces are described.

Range includes but is not limited to – overfull furnace or ladle, use of incorrect hydraulic fluid, poor temperature monitoring, bridging of charge, charge penetrating lining or crucible, slag incompatible with lining, overfeeding the furnace.

Planned review date	31 December 2024

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	22 August 2019	N/A

Consent and Moderation Requirements (CMR) reference	0013

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

Comments on this unit standard

Please contact Competenz qualifications@competenz.org.nz if you wish to suggest changes to the content of this unit standard.