



HSEtoolbox

Fire Prevention & Control Procedure

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2 PURPOSE

- 2.1.1.1 To detail the requirement for fire prevention & control throughout the organization
- 2.1.1.2 This document defines the minimum standard requirements for fire prevention & control. Additional client or authority requirements will be complied to and will be addressed in area/task specific procedures, method statements and risk assessments

3 TERMS & DEFINITIONS

- 3.1.1.1 Worksite shall refer to any facility under the organization's management such as project, workshop, warehouse, accommodation facility, etc.
- 3.1.1.2 Worksite Manager shall refer to the highest line manager responsible and accountable for the operations and safety of that specific worksite

4 RESPONSIBILITY

- 4.1.1.1 Corporate QHSE Manager is responsible for ensuring that this procedure is suitable to be implemented across the organization
- 4.1.1.2 Worksite Manager (Project Manager / Department Head) is responsible for ensuring the procedure is implemented in their worksites (offices / projects / workshops / stores)
- 4.1.1.3 HSE Lead is responsible for providing the necessary support to ensure this procedure is implemented
- 4.1.1.4 All employees shall be empowered to STOP any unsafe or non-complying activity



4.2 Worksite Manager (Project Manager / Department Head)

- 4.2.1.1 Accountable for the operational planning, and implementation of this procedure in their worksite
- 4.2.1.2 Shall ensure that their worksite is assigned with the appropriate resources to fulfill this plan (number of Fire Wardens, First Aiders, Security Guards, etc.)
- 4.2.1.3 Shall establish and maintain a direct line of communication with the HSE Lead
- 4.2.1.4 Shall monitor the site operation to ensure they are conducted in accordance with this procedure and take urgent and appropriate action to prevent unsafe working practices or other infringements

4.3 Construction Manager, Project Engineer & Site Engineer

- 4.3.1.1 Shall ensure that everyone, including subcontractors, comply with the requirements of this procedure
- 4.3.1.2 Shall ensure all-necessary work procedures, method statements and work instructions are prepared, reviewed, and issued
- 4.3.1.3 Shall monitor the site operation to ensure they are conducted in accordance with this procedure and take urgent and appropriate action to prevent unsafe working practices or other infringements.
- 4.3.1.4 Shall establish and maintain a direct line of communication with the Project HSE Lead
- 4.3.1.5 Shall ensure all hot work conducted is authorized by the appropriate permits



4.4 Foreman & Group Leader

- 4.4.1.1 Shall be familiar with the safety requirements stated in this procedure
- 4.4.1.2 Shall ensure that their crew receive clear instructions relating to the work that they are carrying out by conducting pre-task briefings
- 4.4.1.3 Shall ensure that the workplace is maintained in a safe and tidy condition
- 4.4.1.4 Shall deliver toolbox talks
- 4.4.1.5 Shall take prompt action to rectify unsafe conditions
- 4.4.1.6 Shall provide full co-operation to the HSE staff and comply with their recommendations
- 4.4.1.7 Shall only conduct hot work under the authority of the appropriate permit

4.5 Fire Warden

- 4.5.1.1 Ensure that everyone evacuates the area when a fire alarm is activated



4.6 HSE Lead

- 4.6.1.1 Shall conduct site visits, inspections and audits to monitor compliance of this procedure
- 4.6.1.2 Shall prepare and deliver training programs
- 4.6.1.3 Shall prepare and update the emergency response plans and emergency response drills
- 4.6.1.4 Shall check all work procedures and method statements before the activity is commenced to ensure that HSE risks / hazards of the operation are covered
- 4.6.1.5 Shall issue non-conformance reports for serious irregularities observed on site
- 4.6.1.6 Shall notify the Worksite Manager of any unsafe acts or conditions that may lead to incident
- 4.6.1.7 Assume responsibilities of the Fire Program Manager
- 4.6.1.8 Shall ensure that a written fire safety plan is prepared and distributed to all relevant stakeholders, including subcontractors
- 4.6.1.9 Ensure that all project employees are trained in basic firefighting awareness
- 4.6.1.10 Ensure that enough employees are trained on firefighting techniques by an approved third-party training provider
- 4.6.1.11 Ensure that enough employees are trained in First Aid by an approved third-party training provider
- 4.6.1.12 Ensure that proper training in the use of protection equipment is provided
- 4.6.1.13 Ensure that an adequate number and type of fire protection devices and appliances are available, and that they are being properly maintained
- 4.6.1.14 Ensure that the permit system is operational for all hot works
- 4.6.1.15 Ensure that an inspection program is implemented and that an inspection is conducted at least once a week
- 4.6.1.16 Shall be the only person authorized to allow the impairment / bypass to the fire protection systems, alarms, detection, or communication systems
- 4.6.1.17 Ensure that any temporary coverings used on fire protection devices during renovations, such as painting, shall be removed promptly when works has been completed in the area



4.7 HSE Advisors

- 4.7.1.1 Report to the HSE Lead
- 4.7.1.2 Shall identify and record unsafe acts and conditions hazards while monitoring their closeout
- 4.7.1.3 Shall deliver training programs
- 4.7.1.4 Shall carry out audits to ensure the effective implementation of this procedure
- 4.7.1.5 Shall conduct emergency response drills
- 4.7.1.6 Shall check all work procedures and method statements before the activity is commenced to ensure that HSE risks/hazards of the operations are covered
- 4.7.1.7 Shall issue non-conformance reports for serious irregularities observed on site
- 4.7.1.8 Shall notify to the HSE Lead any unsafe acts or conditions that may lead to incident

4.8 All Personnel / Workers

- 4.8.1.1 Every person employed on the project is legally required to take reasonable care for the health and safety of themselves and others that may be affected by their actions or omissions at work
- 4.8.1.2 Co-operate with their employer to enable them to comply with the requirements of the project
- 4.8.1.3 No person shall intentionally or recklessly interfere with or misuse anything provided for safety, health or welfare under the relevant statutory provisions
- 4.8.1.4 All personnel shall wear or use the appropriate safety equipment or clothing and use the appropriate safety devices
- 4.8.1.5 All personnel shall be familiar with the relevant parts of this procedure that are relevant to their scope
- 4.8.1.6 All personnel shall report any accidents and damage to property or equipment to their immediate supervisor, irrespective of whether persons are injured
- 4.8.1.7 All personnel are encouraged to make suggestions to improve health and safety to their supervisor and the HSE staff



5 COMPETENCE & TRAINING

5.1.1 All Employees

5.1.1.1 All employees will be trained on fire protection and control measures as part of the worksite induction

5.1.1.2 The minimum information to be included in the induction includes:

- Emergency assembly point
- Emergency evacuation procedure
- Different classes of fire extinguishers
- How to operate a fire extinguisher

5.1.2 Fire Wardens

5.1.2.1 Must trained in the use of fire extinguishing equipment from an authority approved third party agency

5.1.2.2 Must have valid First Aider training from an authority approved third party agency

5.1.2.3 Must have basic reading and writing skills (any language)

5.1.3 Fire Watcher

5.1.3.1 Must trained in the use of fire extinguishing equipment from an authority approved third party agency

5.1.3.2 Must have valid First Aider training from an authority approved third party agency

5.1.3.3 Must have basic reading and writing skills (any language)



5.1.4 Security Guards

- 5.1.4.1 Must be trained in the use of fire extinguishing equipment from an authority approved third party agency
- 5.1.4.2 Must have valid First Aider training from an authority approved third party agency
- 5.1.4.3 Must have basic reading and writing skills (any language)
- 5.1.4.4 Shall be trained on the following:
 - Notification procedures that include calling the Fire Department, HSE Lead and emergency contact persons in case of a fire emergency
 - Usage of fire alarm and fire protection equipment
 - Knowledge of various fire hazards
 - Usage of construction elevators

6 GENERAL REQUIREMENTS

- 6.1.1.1 No activity shall be assumed small scale or low risk. All activities shall comply to the requirements of this procedure

6.2 Fire Protection and Prevention Plan

- 6.2.1.1 All worksites shall have a Fire Protection and Prevention Plan
- 6.2.1.2 The Fire Protection and Prevention Plan shall be live:
 - For construction projects: prior to proceeding past foundation work
 - For modification or alteration projects: prior to commencement of demolition works
 - For fixed facilities (stores, offices, warehouses): before employees occupy the premises
- 6.2.1.3 The Fire Protection and Prevention Plan shall cover as a minimum:
 - Safe work practices that complement fire safety
 - Minimizing hazardous and flammable storage on the worksite
 - Maintaining robust housekeeping practices to keep the site free from combustibles and flammable rubbish
 - Procedures for hot work operations
 - Management of hazardous materials
 - Fire Prevention & Control Map
 - Site security provisions or reference to the Site Security Plan



- Formation and training of an on-site, in-house fire brigade (as first responders)
- Name and contact phone number of person(s) responsible for compliance with the Fire Protection and Prevention Plan including after-hours contact numbers
- Procedures for reporting emergencies to the relevant authority
- Procedures for emergency notification, evacuation and/or relocation of all persons in the building under construction and on site
- Installation of temporary and new fire protection systems as construction work progresses
- Preservation of existing fire systems in their good working condition during building alteration

6.2.1.4 Each Fire Protection and Prevention Plan shall include a Fire Prevention & Control Map which has the following information:

- Firefighting equipment location
- Rescue entries
- Emergency exits
- Means of egress
- Assembly points
- Access to all required firefighting equipment and apparatus
- Fire hydrants (if any)
- Access roadways

6.3 Emergency Situations

6.3.1 Fire Evacuation Plan

6.3.1.1 Fire evacuation plan shall be prepared and be live before work starts

6.3.1.2 The Fire Evacuation Plan shall be communicated to all employees, subcontractors, visitors and other stakeholders that will be present on the project

6.3.1.3 The plan shall include:

- Procedures for reporting emergencies to the relevant authorities
- Procedures for emergency notification, evacuation and/or relocation of all persons in the building under construction and on the site
- Procedure for hot work operations, management of hazardous materials and removal of combustible debris and maintenance of emergency access roads
- Fire Prevention & Control Map



- Name and contact phone number of person(s) responsible for compliance with the Fire Protection and Prevention Plan including after-hours contact numbers
- Names of the fire warden(s)
- Evacuation plans for adjacent areas when they impact the evacuation of our work area (for example the evacuation plan of an already occupied portion of the building)

6.3.1.4 The Fire Evacuation Plan shall include a Fire Prevention & Control Map which has the following information:

- Firefighting equipment location
- Rescue entries
- Emergency exits
- Means of egress
- Assembly points
- Access to all required firefighting equipment and apparatus
- Fire hydrants (if any)
- Access roadways

6.3.2 Emergency Evacuation Instructions

6.3.2.1 Emergency evacuation instructions shall be displayed at entrances, exits and near telephone sets

6.3.2.2 Emergency evacuation instructions shall be written in English and other languages that are most used on the worksite

6.3.2.3 Displayed emergency procedures shall include important telephone numbers and how to evacuate the facility correctly



6.3.3 Evacuation Drills

- 6.3.3.1 Fire emergency evacuation drills shall be conducted at a frequency of at least once per year
- 6.3.3.2 Projects shall conduct evacuation drills at least every 6 months
- 6.3.3.3 Project records of fire emergency evacuation drills shall be maintained in soft copy and retained for one (1) year after TOC date
- 6.3.3.4 Fixed worksites (offices, warehouses, stores, workshop) shall maintain records of fire evacuation drills for 3 years

6.3.4 Post Fire Assessment

- 6.3.4.1 After a fire takes place in a building or structure under construction, a comprehensive assessment shall be carried out that tests the structure to ensure it is safe and the extent of damage caused by the fire

6.4 Inspection & Testing

- 6.4.1.1 All firefighting equipment shall be inspected at a frequency that meets authority requirements
- 6.4.1.2 Should there be no authority requirements, the following shall be followed as a minimum

6.4.2 Inspection Table

Type of Equipment	Inspection Frequency	Inspected By
Fire Extinguisher	Daily	Internal HSE Advisor
Fire Extinguisher	Monthly	Internal HSE Advisor
Fire Extinguisher	6 Months	External Approved Agency
Fire Alarm	Monthly	Internal HSE Advisor
Firewater Pump	Monthly	Internal HSE Advisor
Fire hoses	Monthly	Internal HSE Advisor
Water Fire Systems	Monthly	Internal HSE Advisor
Fire Ladders and other tools	Monthly	Internal HSE Advisor
Fire Hoses (Hydrostatic)	Yearly	External Approved Agency
All Firefighting Equipment	6 months	External Approved Agency



6.4.3 Testing Table

Type of Equipment	Testing Frequency	Tested By
Manual Rotating Siren	Monthly	Internal HSE Advisor
Conductivity Test for Carbon Dioxide Hoses	Annual	External Approved Agency

6.4.4 Fire Extinguishers

6.4.4.1 Daily check shall be conducted to ensure:

- Location and presence of appropriate extinguishers are as per the Fire Prevention & Control Map
- Pressure gauges are in the acceptable range

6.4.4.2 No record is required for the daily checks

6.4.4.3 Monthly check shall be conducted to ensure:

- Location and presence of appropriate extinguishers are as per the Fire Prevention & Control Map
- Pressure gauges are in the acceptable range
- Safety seals are not broken
- No damages, dents, or any unusual conditions

6.4.4.4 Records must be maintained for the monthly inspections

6.4.4.5 Stored-pressure types containing a loaded stream agent shall be disassembled on an annual basis and subjected to complete maintenance. Prior to disassembly, the fire extinguisher shall be fully discharged to check the operation of the discharged valve and pressure gauge. The loaded stream charge shall be permitted to be recovered and re-used, provided it is subjected to agent analysis in accordance with manufacturers instruction

6.4.4.6 A conductivity test shall be conducted annually on all carbon dioxide hose assemblies. Hose assemblies found to be nonconductive shall be replaced. Carbon dioxide hose assemblies that pass a conductivity test shall have the test information recorded on suitable metallic label or equally durable material



6.5 Maintenance

- 6.5.1.1 All firefighting equipment shall be maintained at a frequency that meets authority requirements

Type of Equipment	Maintenance Frequency	Maintained By
Fire Extinguisher (cleaning)	Yearly	Internal Team
Fire Extinguisher	Yearly	External Approved Agency

6.6 Fire Extinguishers

- 6.6.1.1 Fire extinguishers shall be maintained every 6 months by an external agency inspecting the mechanical parts and the amount of charge agent
- 6.6.1.2 Fire extinguishers shall be cleaned monthly
- 6.6.1.3 Fire Extinguishers shall be in charged condition as per manufacturer's specification
- 6.6.1.4 All mechanical parts shall be inspected for smooth operation
- 6.6.1.5 Hydrostatic tests shall be conducted, or extinguishers shall be replaced if there are signs of corrosion, mechanical damage, denting or abrasion
- 6.6.1.6 Damaged threads, damaged gauges, damaged seals and locks etc. shall be replaced
- 6.6.1.7 Deformed nozzles, clogged nozzles, blocked nozzles shall be replaced/cleaned and ensured that it is in good working condition
- 6.6.1.8 Damaged, cracked or torn hose assemblies shall be replaced
- 6.6.1.9 Valves, gauges, pressure indicating devices shall be free of damage. If damaged, they shall be replaced
- 6.6.1.10 If puncture mechanism is damaged, dull, shall be replaced
- 6.6.1.11 Corroded, damaged carriage for trolley type extinguishers, shall be repaired or replaced
- 6.6.1.12 Damaged, wheels, spokes, jammed wheels shall be replaced in wheel type extinguishers
- 6.6.1.13 Damaged gaskets, "O" rings and seals shall be replaced
- 6.6.1.14 Corroded, damaged gas tubes, siphon or pickup tubes shall be replaced



6.6.2 Extinguishing Agent

- 6.6.2.1 Water: will be refilled if at the improper fill level
- 6.6.2.2 Foam: will be emptied, cleaned and recharged at the recharge date
- 6.6.2.3 CO2: will be recharged to the proper weight if the weight is not proper
- 6.6.2.4 Dry Chemical / Dry Powder: If agent is contaminated or caking, empty, clean and refill. If improper weight, refill to specifications. If cartridge is damaged, tampered or punctured, replace the cartridge
- 6.6.2.5 Wet Chemical: If improper weight, empty, clean and refill. If pressure is not in acceptable range, re-pressurize

6.7 Meetings

- 6.7.1.1 Project shall conduct a weekly HSE meeting in which Fire Safety shall make part of the agenda
- 6.7.1.2 Records of HSE Meetings shall be maintained in soft copy and retained for 1 year after TOC date

6.8 Work Permits

- 6.8.1.1 Permits are mandatory for any hot work (activity capable of initiating fires or explosions, including cutting, welding, brazing, soldering, grinding, thermal spraying, thawing pipe, torch applied roofing or any similar activity)
- 6.8.1.2 Permits shall mandate the requirement for activity pre-inspection, fire watch and activity post inspection
- 6.8.1.3 Hot work permits shall be issued daily
- 6.8.1.4 Activity pre-inspection shall include
 - Hot work site is clear of combustibles or that combustibles are protected
 - Exposed construction is of non-combustible material or that combustibles are protected
 - Openings are to be protected
 - There are no exposed combustibles on the opposite side of the partitions, walls, ceilings, floors, etc.
 - Fire extinguishers are available, fully charged, and operable
 - Fire watch personnel are assigned, equipped and trained



6.8.1.5 Work permit culture shall be strictly followed

6.9 Fire Watch

- 6.9.1.1 The sole duty of fire watch personnel shall be to watch for occurrence of fire during and after hot work operations
- 6.9.1.2 Individuals designated to fire watch duty shall have fire extinguishing equipment readily available
- 6.9.1.3 Individuals designated to fire watch shall be trained in the use of fire extinguishing equipment
- 6.9.1.4 Personnel assigned to fire watch shall be responsible for extinguishing spot fires and communicating an alarm
- 6.9.1.5 Fire watch shall be maintained a minimum of 30 minutes after conclusion of the work to look out for leftover sparks, slag or smoldering combustibles

6.10 Site Security

- 6.10.1.1 Security guard(s) shall be provided to the construction site to safeguard the construction premises from arson, vandalism, unauthorized entry, uninformed people using equipment and tools which all can comprise construction activity safety and could be the cause of fire accidents
- 6.10.1.2 Security guards shall be clearly instructed on their work duties, specifically their patrol routes and frequency of patrol. This shall be provided in writing and a record shall be maintained
- 6.10.1.3 Security guards shall be informed about any emergency equipment or hazards specific to that worksite
- 6.10.1.4 Security fences shall be provided where required
- 6.10.1.5 Entrances (e.g., doors and windows) to the structure under construction, alteration or demolition shall be secured
- 6.10.1.6 Provision of CCTV systems should be considered to assist security guards and enhance overall security



7 CONTROLS

7.1 General

7.1.1 Access

- 7.1.1.1 Access to all firefighting equipment shall be kept free from any obstruction
- 7.1.1.2 Gangways, doors, and stairs shall always be free of any obstructions
- 7.1.1.3 In view of the changing nature of construction operations, escape routes shall be frequently inspected
- 7.1.1.4 Exit routes in worksites shall be properly protected and free of debris and obstacles. In case of any of these exits are closed, an alternative exit shall be provided
- 7.1.1.5 Emergency exits shall be provided in every building under construction according to the number of employees in the building, however this shall not be less than two (2) emergency exits on each floor above the ground floor
- 7.1.1.6 All construction sites shall be accessible by Fire Department equipment by means of roadways having an all-weather driving service of not less than 6 meters of unobstructed width
- 7.1.1.7 The roads shall have the ability to withstand the live loads of fire equipment. 80 tons of distributed load shall be considered while having a minimum of 4.5 m of vertical clearance
- 7.1.1.8 Fire access shall not be through basements or building underpasses that are under construction
- 7.1.1.9 Dead end fire access roads in excess of 45 m in length shall be provided with approved turnarounds
- 7.1.1.10 A suitable location at the site shall be designated as a command center and provided with plans, emergency information, keys, communications, and equipment as needed
- 7.1.1.11 The person in charge of fire protection shall respond to the location command center whenever a fire occurs
- 7.1.1.12 Where access to or within a structure or an area is unduly difficult because of secured openings or where immediate access is necessary for lifesaving or firefighting purposes, the Fire Department personnel shall be permitted to require a key box to be installed in an accessible location



- 7.1.1.13 Access for use of Fire Department equipment shall be provided to the immediate job site at the start of the project and maintained until completion
- 7.1.1.14 The required width of access roadways shall not be obstructed in any manner, including obstruction by parked vehicles, storage material and assembly points
- 7.1.1.15 Signs or other appropriate notices, or both, prohibiting obstruction shall be installed and shall be maintained
- 7.1.1.16 The access roadway shall be extended to within 46 m of all portions of the exterior walls of the first story of any building under construction
- 7.1.1.17 Where an access roadway cannot be provided, an approved fire protection system or systems shall be provided and approved by the authority
- 7.1.1.18 Where a bridge is required to be used as access, it shall be constructed and maintained using design live loading sufficient to carry the imposed loads of the fire equipment



7.1.2 Egress

- 7.1.2.1 All new buildings under construction shall have at least two unobstructed exits. All exits shall be identified in the Fire Prevention & Control Map
- 7.1.2.2 Where stairs and exit routes of the building are under construction, exterior temporary steel stairs and exits shall be provided which lead directly to the ground floor and to outside the building
- 7.1.2.3 In multi-story constructions, each level above the first story shall be provided with at least two usable exit stairs after the floor decking is installed. The stairways shall be continuous and discharge to grade level
- 7.1.2.4 Stairways serving more than two floor levels shall be enclosed (with openings adequately protected) after exterior walls/windows are in place
- 7.1.2.5 Exit stairs shall be lighted and maintained clear of debris and construction materials at all times except when one of the required exit stairs is under construction (i.e. installation of gypsum board, paintings, flooring, etc.), but no more than two continuous floors
- 7.1.2.6 All exit stairs shall be provided with stair identification signs to include the floor level, stair designation, and exit path direction as required to provide for safe egress
- 7.1.2.7 Night-time construction work shall not be performed without adequate lighting in exits, exit stairs, and escape routes to outside the building
- 7.1.2.8 Where hoists and elevators provide the only efficient means of transporting hose and other cumbersome fire-fighting equipment to upper floors, they shall be made available to the Fire Department at all times

7.1.3 Assembly Points

- 7.1.3.1 Designated exterior assembly points shall be established for all personnel to relocate to upon evacuation. The assembly points shall also be identified in the Fire Prevention & Control Map

7.1.4 Illumination

- 7.1.4.1 Illumination intensity shall not be less than 50 lux especially near emergency exits



7.1.5 Signage

- 7.1.5.1 Adequate signs shall be provided to direct escape routes in emergency situations to reach the assembly points
- 7.1.5.2 Building floors shall be numbered from inside and outside the building to facilitate their recognition in emergency situations

7.1.6 Ignition Hazards

- 7.1.6.1 Electrical wiring and electrical equipment used for light or power purposes shall be installed by a competent person
- 7.1.6.2 Internal combustion engine powered equipment shall be located so that the exhausts are away from combustible material. When exhausts are piped away from structures under construction, a clearance of at least 15 cm shall be maintained between the piping and combustible materials
- 7.1.6.3 Hot work activities (welding, cutting, heating, burning) shall only be performed under the authority of a hot work permit
- 7.1.6.4 Portable battery powered lighting equipment used in connection with the storage, handling or use of flammable gases or liquids shall be of an intrinsically safe design
- 7.1.6.5 Appropriate measures to discharge any static electricity from the nozzles of air, inert gas, and steam lines or hoses when used in cleaning or ventilation, tanks or containers including hazardous concentrations of flammable gases/vapours

7.1.7 Combustible Materials

- 7.1.7.1 Combustible construction materials shall be stored a minimum of 6 m from buildings under construction or undergoing remodel, except for:
 - Materials that are staged for installation on a floor level
 - When approved by the Fire Department, materials may be stored in parking garages of Type I construction if the automatic fire sprinkler system is in service and vertical openings are protected
- 7.1.7.2 Wood, cardboard, packing material, forms, lumber, and similar combustible debris shall not be accumulated in buildings. Such debris, rubbish and waste material shall be removed from buildings daily



7.1.8 Scaffolding, Shoring and Forms

- 7.1.8.1 Accumulation of unnecessary combustible forms or form lumber shall be prohibited
- 7.1.8.2 Combustible forms or form lumber shall be brought into the structure only when needed
- 7.1.8.3 Combustible forms or form lumber shall be removed from any structure as soon as it is no longer required
- 7.1.8.4 Those portions of the structure where combustible forms are present shall not be used for the storage of other combustible building materials
- 7.1.8.5 During forming and stripping operations, portable fire extinguishers or charged hose lines shall be provided to protect the additional combustible loading adequately
- 7.1.8.6 Yard storage of equipment to be installed or combustible construction materials shall not be stored closer than 9 m from the structure under construction or alteration

7.1.9 Smoking

- 7.1.9.1 Smoking shall only be permitted in designated areas away from storage, construction activity, garbage disposal areas and flammable materials
- 7.1.9.2 "NO SMOKINGs signs shall be posted in all areas where smoking is prohibited which includes areas in the vicinity of hazardous operations or combustible/flammable materials
- 7.1.9.3 Where smoking is permitted, safe receptacles for smoking materials shall be provided
- 7.1.9.4 Appropriate cigarette butt disposal ash trays, sand cans shall be provided at the designated smoking areas
- 7.1.9.5 Cigarette butt disposal units shall not be made of wood
- 7.1.9.6 Garbage cans shall not be used to dispose of cigarette butts



7.1.10 Waste Disposal

- 7.1.10.1 Accumulation of combustible waste material, dust, and debris shall be removed from the work area and its immediate vicinity at the end of each work shift or more frequently as necessary
- 7.1.10.2 Rubbish shall never be burned at the worksite
- 7.1.10.3 Materials susceptible to spontaneous ignition such as oily rags shall be stored in a special disposal container
- 7.1.10.4 Trash chutes shall be used responsibly and for the purpose intended
- 7.1.10.5 Reactive materials, reactive chemicals, oxidizers shall not be disposed into trash chutes

7.1.11 Construction Materials

- 7.1.11.1 Construction material (drop clothes, tarps, etc) shall be non-combustible or fire retardant with a maximum flame spread of 25, as tested in accordance with ASTM E-84 or UL 723
- 7.1.11.2 Plastic sheeting shall be fire retardant type
- 7.1.11.3 Wood used in temporary or permanent construction shall be fire retardant pressure impregnated

7.1.12 Site Offices and Temporary Structures

- 7.1.12.1 Drawings for temporary offices, accommodation sheds, etc. shall be as per the Fire Department regulations
- 7.1.12.2 Drawing submission and approval requirements to Fire Department for temporary site offices shall be as per any other project
- 7.1.12.3 Separation distances between structures under construction and construction-related structures such as site offices, sheds, and other facilities for the storage of tools and materials of combustible nature shall be in accordance to below table:

Temporary Structure Exposed Wall Length	Minimum Separation Distance from Structure Under Construction
Up to 6 m	9 m
9 m	11 m
12 m	12 m



15 m	14 m
18 m	15 m
More than 18 m	18 m

- 7.1.12.4 Adequate detachments from temporary structures shall be provided to minimize the spread of fire
- 7.1.12.5 Adequate temporary fire detection, fixed fire protection systems and portable firefighting equipment shall be provided as required by the Fire Department approved layout
- 7.1.12.6 Only safely installed and Fire Department approved cooking appliances and method shall be used in temporary offices and sheds
- 7.1.12.7 Clearance shall be provided around stoves, heaters, and all chimneys and vent connectors to prevent ignition of adjacent combustible material
- 7.1.12.8 Erecting temporary structures from plywood is completely forbidden
- 7.1.12.9 No temporary buildings shall be erected where it will adversely affect the access or egress of other areas
- 7.1.12.10 Temporary buildings, when located within another building or structure, shall be of either non-combustible materials or of combustible materials having a fire resistance of not less than one hour
- 7.1.12.11 Temporary buildings shall be located at not less than 3 meters from any other adjacent buildings or structures.
- 7.1.12.12 Temporary buildings divided into rooms shall be provided with doors to help contain the spread of fire
- 7.1.13 Vehicle Parking**
- 7.1.13.1 All vehicles shall be parked a minimum of 6 m from new structures under construction with the following exceptions:
- Vehicles that are parked temporarily for loading/unloading or other construction related operations, however such vehicles shall not be left unattended
 - Private vehicles may be parked in parking garages of construction sites if the automatic fire sprinkler system and vertical openings are protected



7.1.14 Temporary Enclosures (rest areas, equipment enclosures)

- 7.1.14.1 Only non-combustible panels, flame-resistant tarpaulins or approved materials of equivalent fire-retardant characteristics shall be used
- 7.1.14.2 Any other fabrics or plastic films used shall be certified as conforming to the requirements of Test Method #2 contained in NFPA 701, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films
- 7.1.14.3 Materials used for enclosing shall be fastened securely or guarded so that it cannot be blown by the wind and contact heaters or other ignition sources
- 7.1.14.4 Temporary enclosures shall be equipped with at least one fire extinguisher suitable for all classes of fire that are expected in that enclosure

7.1.15 Open Yard Storage

- 7.1.15.1 Combustible materials shall be stacked with due regard to the stability of stacks and in no case higher than 3 meters if stacked manually and not higher than 4.5 meters if mechanically stacked
- 7.1.15.2 Driving lanes between and around combustible material storage areas shall be at least 4 meters wide and maintained free from the accumulation of rubbish, equipment, or any other materials
- 7.1.15.3 The entire storage site shall be kept free from the accumulation of unnecessary combustible materials. Weeds and grass shall be kept down and a regular procedure provided for the periodic clean-up of the entire area
- 7.1.15.4 Portable fire extinguishers, suitable for the fire hazard involved, shall be provided at convenient, accessible locations in the yard area. The portable fire extinguishers shall be placed so that maximum travel distance to the nearest unit shall not exceed 15 meters



7.1.16 Indoor Storage

- 7.1.16.1 Storage shall not obstruct, or adversely affect, means of exit. Materials shall not be stored within one meter of a fire door opening
- 7.1.16.2 All materials shall be stored, handled, and stacked with due regard for their fire characteristics
- 7.1.16.3 Incompatible materials which may create a fire hazard shall be segregated by a barrier having a fire resistance of at least one hour
- 7.1.16.4 Materials shall be stored to minimize the spread of fire internally and to permit convenient access to firefighting personnel
- 7.1.16.5 Clearance shall be maintained around lights and heating surfaces to prevent ignition of combustible materials
- 7.1.16.6 All aisles leading to firefighting equipment shall always be kept free from any obstruction
- 7.1.16.7 All construction sites shall be accessible to permit the entry of firefighting vehicles / equipment through an accessway that is not less than 6-meters wide and capable of withstanding heavy loads

7.1.17 Combustible Material Storage

- 7.1.17.1 Construction combustible materials shall be stored more than 6 meters from any structure under-construction
- 7.1.17.2 Material to be used for a floor under construction can be stored on the floor itself
- 7.1.17.3 Material can be stored in car parking areas if these areas are equipped with automatic fire sprinklers and vertical protected openings
- 7.1.17.4 Combustible material such as wood, carton and packaging shall not be accumulated inside any structure under construction and shall be disposed of frequently



7.1.18 Fire Detection and Alarm System During Construction

- 7.1.18.1 Temporary fire detection and alarm system, with the same features as the permanent fire detection and alarm system to cover the floors that have been constructed is highly recommended
- 7.1.18.2 Manual fire detection and alarm systems shall be permitted
- 7.1.18.3 Wireless / Low powered radio frequency-based fire detection and alarm system shall be permitted and shall communicate with 24x7 signalling of Fire Department, where available
- 7.1.18.4 Wireless / Low powered radio frequency-based fire detection and alarm system are best suited for construction sites, as they can be installed on temporary basis without wiring
- 7.1.18.5 Alarm notification shall be such that affected area construction site shall be notified with sound and visual devices. Audio devices shall have sound levels of 15dB more than that of the ambient sound level

7.1.19 Fire Detection and Alarm System During Alteration or Modification

- 7.1.19.1 Fire alarm systems shall always remain operational during building alterations. When an alteration requires modification to a portion of the fire alarm system, the portion of the system requiring work shall be isolated and the remainder of the system shall be kept in service whenever practical
- 7.1.19.2 When it is necessary to shut down an entire fire alarm system, a fire watch or other mitigation approved by the Fire Department shall be implemented until the system is returned to full service
- 7.1.19.3 Where the automatic Fire Detection and Alarm System is regularly turned off and on to facilitate connection of newly completed segments, the system shall be checked at the end of each work shift to ascertain that the system is operational



7.1.20 Buildings / Structures Under Construction

- 7.1.20.1 No modifications, alterations, extensions and change of usage to a building or structure shall be carried out unless such proposals have been approved by the necessary authorities, where required
- 7.1.20.2 No under-construction building or structures shall be occupied in whole or in part unless they have been designed, approved, inspected and completion certificate issued by the relevant authorities

7.2 Firefighting Equipment

- 7.2.1.1 Firefighting equipment shall conform to the requirements of the Fire Department
- 7.2.1.2 Firefighting equipment shall be in designated areas that are always visible and easily accessible
- 7.2.1.3 Fire Department personnel shall be able to access all connections, locations, guiding valves, and all external fire protection system components
- 7.2.1.4 Signs to guide the location of firefighting equipment shall be arranged when it is difficult to see them
- 7.2.1.5 For demolition operations which include flammable materials, hydrants with fire hoses and water tankers equipped with pumps shall be provided
- 7.2.1.6 Firefighting equipment and tools shall be used for their intended purposes only
- 7.2.1.7 Where construction site fire protection systems are provided and building is equipped with sprinklers, the sprinkler protection shall be retained in service if the condition requiring the use of sprinklers exist
- 7.2.1.8 The operation of sprinkler control valves shall be permitted only by properly authorized personnel and shall be accompanied by the notification of designated parties
- 7.2.1.9 Where the sprinkler protection is regularly turned off and on to facilitate removal and capping of segments, the sprinkler control valves shall be checked at the end of each work shift to ascertain that protection is in service
- 7.2.1.10 Standpipes shall be maintained in conformity with the progress of construction activity in such a manner that they are always ready for fire department use



7.2.2 Fire Extinguishers

- 7.2.2.1 The maximum travel distance from any point to the nearest fire extinguisher shall not exceed 15 meters
- 7.2.2.2 Portable fire extinguishers shall be provided and shall be mounted on a wall or post at each usable stairway, such that the travel distance to any extinguisher does not exceed 23 m
- 7.2.2.3 Mounting height to the top of the extinguisher shall not exceed 1.5 m.
- 7.2.2.4 Extinguishers shall not have a rating less than 2A10BC
- 7.2.2.5 Wherever a tool house, storeroom, or other shanty is adjacent to the building under construction or demolition or where a room or space within that building is used for storage, a dressing room or workshop, at least one approved extinguisher shall be provided and maintained in an accessible location
- 7.2.2.6 At least one approved fire extinguisher shall be provided in plain sight on each floor at each usable stairway as soon as combustible material accumulates
- 7.2.2.7 Suitable fire extinguishers shall be provided on self-propelled equipment
- 7.2.2.8
- 7.2.2.9 Fire extinguishers shall be in visible locations, in the normal path of travel and shall be easily and readily accessible
- 7.2.2.10 Fire extinguishers shall be identified as per the local identification scheme
- 7.2.2.11 If the local authority does not specify an identification scheme, the fire extinguisher will be identified with an appropriately sized red square fixed above each extinguisher
- 7.2.2.12 The wall behind the fire extinguisher shall be painted red where possible
- 7.2.2.13 In places where fire extinguishers cannot be visible due to partitions, the extinguishers place shall be designated by a distinct sign fixed on an appropriate height which refers to the extinguisher's location



Sample sign to indicate location of Fire Extinguisher

- 7.2.2.14 All extinguishers shall have clear class-identification for easy selection of appropriate extinguisher class in case of fires
- 7.2.2.15 All portable fire extinguishers shall be fixed on holders, special boxes or on shelves except for wheeled extinguishers
- 7.2.2.16 All portable extinguishers shall be mounted on walls with heights:
- Fire extinguisher handle shall be 1.5 meters high off the ground for extinguishers having a gross weight of 18 kgs or less
 - Fire extinguisher handle shall be 1 meter high off the ground for extinguishers having a gross weight of more than 18 kgs
- 7.2.2.17 Fire extinguishers shall be mounted on walls with the operating instruction facing outwards
- 7.2.2.18 Different types, capacity and classes of fire extinguishers shall be selected to protect the areas based on the type of flammable and combustible materials at the location
- 7.2.2.19 A sticker or card shall be fixed on each extinguisher which will indicate:
- Date of recharging / maintenance
 - Name and signature of person conducting maintenance
 - Name and signature of person doing the inspection



- 7.2.2.20 At least one portable fire extinguisher according to the class and capacity shall be located no less than 8 meters and no more than 15 meters from the storage area of flammable liquids
- 7.2.2.21 Fire extinguishers shall be provided in each floor of multi-story buildings in addition to one being adjacent to the stairways
- 7.2.2.22 Wheeled and portable fire extinguishers located in open areas shall be protected against direct sunlight or surrounding atmospheric conditions by using appropriate covers
- 7.2.2.23 In case a fire extinguisher is used, it shall be refilled and returned to its designated place immediately
- 7.2.2.24 Each location shall always keep 5% of their total number of extinguishers as additional spare



7.2.3 Fixed Systems

- 7.2.3.1 Fixed firefighting systems for multistorey buildings and towers shall be provided in accordance with Fire Department requirements. Priority shall be made for early installation of permanent systems
- 7.2.3.2 Dry riser mains shall be provided and installed at each level of the buildings under construction when the height of the same exceeds 18 meters to 30 meters height and shall be equipped with controllable outlets on each level to be used by connecting fire hoses or hose reels. These risers shall be equipped with proper inlet at the ground level for water supply by fire brigades from outside the building
- 7.2.3.3 Wet riser mains shall be installed in the buildings that exceed 30 meters in height
- 7.2.3.4 Wet risers shall be supplied with enough water through tanks and movable pumps installed on different floor levels in accordance with the design by a competent organization authorized by the Fire Department
- 7.2.3.5 The design shall take into consideration the building area, number of risers, flammable and combustible material types, and the appropriate water amount to extinguish the fires
- 7.2.3.6 In the case that some floors are used for the storage of flammable and combustible materials, additional firefighting systems shall be provided such as automatic water sprinklers or water mist units. The additional firefighting systems shall be appropriate for the storage amounts and types of stored materials
- 7.2.3.7 Sufficient water supply for adequate operation of the firefighting equipment and systems shall be made available
- 7.2.3.8 The firefighting equipment and systems shall be periodically inspected and maintained to ensure they are operating properly
- 7.2.3.9 Existing buildings or structures in which construction works are performed (maintenance, décor, partial demolition, additions, etc.) and in which works requires the partial or total disconnection of the fixed firefighting systems will require that the system be kept on standby and ready for reconnection at the end of each working day. It shall be inspected by a qualified competent person to ensure their return to operation. In all cases, adequate temporary alternative systems shall be provided when the system is offline



7.2.4 Fixed Fire Hoses

- 7.2.4.1 Hose shall be provided with their special keys and nozzles and other necessary equipment and tools fixed in the fire hose box
- 7.2.4.2 Fixed firewater pumps shall be operated for a few minutes every seven (7) days
- 7.2.4.3 Water fire systems shall be emptied from water and inspected at least every month
- 7.2.4.4 All fire hoses shall be inspected monthly to ensure they are free of any rottenness
- 7.2.4.5 Manual equipment, ladders and other additional tools shall be inspected at least every six (6) months to ensure they are available as per the Fire Prevention & Control Map and that they are in good working condition
- 7.2.4.6 Each hose shall be individually inspected (hydrostatically) on the highest pressure of the pump at least 3 minutes annually
- 7.2.4.7 Hoses shall be carefully dried after each inspection or use and returned to their designated location (some hoses may not need drying)



7.2.5 Yard Hydrant System

- 7.2.5.1 Where the structure under construction requires Yard Fire Hydrants as per the drawings, the hydrants either temporary or part of the permanent hydrant network shall be installed based on hazard evaluation of the construction site
- 7.2.5.2 Fire pump and water tanks are permitted to be non listed with the authority when they are temporarily installed to safeguard the construction activities
- 7.2.5.3 Temporary fire pump capacity shall be permitted to be 500 gpm
- 7.2.5.4 Permanent fire pump capacity shall be as per authority approved drawings
- 7.2.5.5 Temporary fire water tanks shall be permitted to be of a 60 minute duration
- 7.2.5.6 Permanent fire water tank shall be as per authority approved drawings
- 7.2.5.7 Free access from the street to fire hydrants and to outside connections for standpipes, sprinklers, or other fire extinguishing equipment, whether permanent or temporary, shall be provided and maintained
- 7.2.5.8 Protective pedestrian walkways shall be constructed such that they do not impede access to hydrants
- 7.2.5.9 No stored material, debris, or construction activity shall interfere with access to hydrants, Siamese connections, or fire extinguishing equipment



7.2.6 Wet / Dry Riser System

- 7.2.6.1 Where the design requires dry risers with hose reel system for the completed building, the building under construction shall be provided with temporary dry risers with hose reel system
- 7.2.6.2 Where the design requires wet risers for the completed building, the temporary Wet riser shall be installed when the progress of construction is not more than 10.7m in height above the lowest level of Fire Department access
- 7.2.6.3 Fire pump and water tanks are permitted to be non listed when they are temporarily installed to safeguard construction activity, when building height is less than 23 m from the fire access level
- 7.2.6.4 Temporary fire pump capacity for wet risers shall be permitted to be 500 gpm with single wet riser serving two hose outlets located near the exit stair
- 7.2.6.5 Temporary fire water tank shall be permitted to be 60 minute duration
- 7.2.6.6 When the under construction building height crosses 23 m, permanent wet riser system, as per the approved drawing, shall be in place and in working condition
- 7.2.6.7 Permanent fire pump capacity and number of wet risers shall be as per authority requirements
- 7.2.6.8 Permanent fire water tank shall be as per authority requirements
- 7.2.6.9 Standpipes shall be provided with breeching inlets, Fire Department hose connections, and outlets at accessible locations adjacent to usable stairs
- 7.2.6.10 The standpipe system shall be extended as construction progresses to within one floor of the highest point of construction having secured decking or flooring
- 7.2.6.11 Each floor shall be provided with a 64mm valve outlet for Fire Department use
- 7.2.6.12 In all new buildings in which standpipes are required or where standpipes exist in buildings being altered or demolished, such standpipes shall be maintained in conformity with the progress of building construction in such a manner that they are always ready for use



7.2.7 Automatic Sprinkler Systems

- 7.2.7.1 Where temporary automatic sprinkler systems are considered to be provided for under construction buildings, 500 gpm temporary fire pump with 30 minutes operation fire water tank shall be permitted
- 7.2.7.2 Where permanent automatic Fire Sprinkler systems are required to be installed in new buildings as per approved drawings, the system shall be placed in service as soon as it is feasible and before interior finish work commences
- 7.2.7.3 Immediately upon the completion of sprinkler pipe installation on each floor level, the piping shall be hydrostatically tested and inspected. After inspection approval from the Fire Department, each floor level sprinkler piping shall be connected to the system supply riser and placed into service
- 7.2.7.4 For system activation notification, an exterior alarm bell can be installed and connected to the sprinkler water flow device prior to installation of the monitoring system
- 7.2.7.5 For buildings equipped with fire sprinkler systems that are undergoing alterations, the sprinkler system shall remain in service at all times except when system modifications are necessary
- 7.2.7.6 Fire sprinkler systems undergoing modifications shall be returned to service at the end of each workday unless otherwise approved by the Fire Department
- 7.2.7.7 The sprinkler control valve(s) shall be checked at the end of each work day to confirm that the system has been restored to service
- 7.2.7.8 New buildings, or buildings undergoing modifications shall not be occupied until the sprinkler installation has been entirely completed, tested and in service

7.2.8 Telephone and Communication Systems

- 7.2.8.1 There shall be a readily available public fire alarm box near the premises, telephone service to the responding Fire Department, or equivalent communications facilities
- 7.2.8.2 Instructions shall be issued for the immediate notification of the Fire Department in case of a fire emergency
- 7.2.8.3 Where the telephone service is employed, the Fire Department number and site address shall be conspicuously posted near each telephone



7.3 Electrical Safety

7.3.1 Electrical Devices

- 7.3.1.1 All construction-operational electrical wiring and equipment for light, heat or power purposes shall be in accordance with the applicable provisions of NFPA 70, National Electrical Code
- 7.3.1.2 Electrical devices shall be maintained in a safe condition
- 7.3.1.3 Extension cords shall be maintained free from damage
- 7.3.1.4 Damaged equipment and cords shall be removed from service until rendered safe

7.3.2 Wiring

- 7.3.2.1 All branch circuits shall originate in an approved power outlet or panel board
- 7.3.2.2 Conductors shall be permitted within multiconductor cords or cable assemblies or as open conductors
- 7.3.2.3 All conductors shall be protected by overcurrent devices rated for the ampacity of the conductors
- 7.3.2.4 Runs of open conductors shall be located where the conductors are not subject to physical damage, and the conductors shall be fastened at intervals not exceeding 3 m
- 7.3.2.5 Each branch circuit that supplies receptacles or fixed equipment shall contain a separate equipment grounding conductor where run as an open conductor
- 7.3.2.6 Wiring, junction boxes, electrical devices, electrical equipment, panel boards, etc. shall not be located where water flooding is a possibility



7.3.3 Lighting

- 7.3.3.1 Temporary lights shall be equipped with guards to prevent accidental contact with the bulb unless the construction of the reflector is such that the bulb is deeply recessed
- 7.3.3.2 Temporary lighting fixtures, such as quartz, that operate at temperatures capable of igniting ordinary combustibles shall be fastened securely so that the possibility of their contacting combustibles is eliminated
- 7.3.3.3 Temporary lights shall be equipped with heavy-duty electrical cords with connections and insulation maintained in safe condition
- 7.3.3.4 Temporary lights shall not be suspended by their electrical cords unless such chords and lights have been designed for that purpose
- 7.3.3.5 Splices shall have insulation equivalent to that of the cable
- 7.3.3.6 Temporary wiring shall be removed immediately upon the completion of the construction or purpose for which the wiring was installed



7.4 Flammable and Combustible Liquids & Gases

7.4.1 General Requirements

- 7.4.1.1 Only containers and portable tanks made of material suitable for storage and handling of flammable combustible liquids shall be used
- 7.4.1.2 Fixed storage tanks having a capacity greater than 270 Liters require plans for installation to be submitted to the Fire Department for review and approval
- 7.4.1.3 Flammable or combustible liquids shall not be stored in areas used for exits, stairway or normally used for the safe passage of people
- 7.4.1.4 No more than 38 liters of paints and flammable/combustible liquids shall be stored within 15 meters of occupied structures unless it is stored in an approved flammable liquid storage cabinet in a designated area
- 7.4.1.5 Flammable liquids shall be kept in appropriate safe closed containers and stored in a well-ventilated storage room constructed of fire-resistant concrete, masonry, or metal
- 7.4.1.6 Wherever flammable liquids are stored, all reasonably practicable steps shall be taken to ensure that any flammable liquid which leaks is contained and immediately drained off to a suitable container or to a safe place or otherwise treated to make it safe
- 7.4.1.7 Outdoor portable tanks shall not be nearer than 3 meters from any building. Each tank shall be surrounded by bunding with at least 110% volume of the total gross capacity of the tank in a manner to contain any leakage and prevent the accumulation of spilled flammable liquids to prevent fire.
- 7.4.1.8 Every two (2) or more portable tanks shall be separated by at least 1.5 meter-clear area
- 7.4.1.9 Containers and tanks shall be labeled with the product/material name and the text <<FLAMMABLE – KEEP FIRE AND FLAME AWAY>>.
- 7.4.1.10 Containers more than 60 gallons shall be labeled with <<KEEP 15 meters FROM BUILDINGS>>
- 7.4.1.11 For all portable tank of flammable liquids, there shall be a 5-meter-wide access way to permit approach of firefighting equipment
- 7.4.1.12 Storage areas shall be kept free of weeds, debris, and other combustible materials not necessary to the storage
- 7.4.1.13 At least one portable fire extinguisher of the type and capacity suitable for the flammable or combustible liquid being stored, shall be located outside of, but not more than 3 meters from the door into any room used for storage of flammable or combustible liquids



- 7.4.1.14 At least one portable fire extinguisher of the type and capacity suitable for the flammable or combustible liquid being stored, shall be located not less than eight (8) meters and not more than fifteen (15) meters from any flammable liquid storage area
- 7.4.1.15 Appropriate warning signs shall be posted near flammable liquids storage area
- 7.4.1.16 Class I and Class II liquids shall be kept in approved safety containers
- 7.4.1.17 Metal containers for Class I or Class II liquids shall be in accordance with NFPA 30, 30A requirements or shall be of an approved design
- 7.4.1.18 Discharge devices shall not cause an internal pressure on the container
- 7.4.1.19 Individual containers shall not be interconnected and shall be kept closed when not in use
- 7.4.1.20 Class I liquids shall be dispensed only where there are no open flames or other sources of ignition within the possible path of vapor travel



7.4.2 Liquified Petroleum Gasses (LPG)

- 7.4.2.1 LPG cylinders shall be kept on ground level and be readily accessible
- 7.4.2.2 LPG cylinders shall be kept in open air, protected from unauthorized access by a fence not less than two (2) meters high
- 7.4.2.3 LPG cylinders shall be stored in an upright position and tightly tied to prevent fall hazards
- 7.4.2.4 LPG cylinders shall be adequately sheltered to be protected against sunrays
- 7.4.2.5 LPG cylinders shall be kept away from all flammable or combustible materials
- 7.4.2.6 LPG cylinders shall be tagged with <<LPG – Highly Flammable>> and <<No Smoking or Naked Flame>>
- 7.4.2.7 Regulators shall be examined and appropriately designed to withstand an operational pressure of more than 250 psi
- 7.4.2.8 Fittings shall also be designed to withstand 250 psi
- 7.4.2.9 Cylinder hoses shall be examined to withstand operational pressures not less than 350 psi, the hose length shall not exceed 1.8 m
- 7.4.2.10 A safe separated distance not less than 6 meters (20 feet) shall be maintained between LPG cylinders and other gas cylinder such as oxygen, chlorine or ammonia. If this space cannot be provided, a partition of not less than 1.5 meters in height shall be erected. The partition will have a fire resistance of not less than 30 minutes
- 7.4.2.11 LPG storage locations shall be provided with the appropriate firefighting extinguishers
- 7.4.2.12 All installations and maintenance shall be performed by trained LPG fitters. All LPG pipelines and hoses shall be tested
- 7.4.2.13 Heating elements (other than integral heater-container units) shall be located at least 1.8 m from any LP-Gas container
- 7.4.2.14 Integral heater-container units specifically designed for the attachment of the heater to the container, or to a supporting standard attached to the container maybe used provided they are designed and installed so as to prevent direct or radiant heat application to the LP-Gas container
- 7.4.2.15 Blower and radiant type units shall not be directed toward any LP-Gas container within 6 m
- 7.4.2.16 Heat producing equipment shall be installed with clearance to the combustible in accordance with the manufacturer's installation instructions



7.4.3 Compressed Gases

- 7.4.3.1 Combustible materials shall be kept a minimum of 3 m from gas cylinders
- 7.4.3.2 Gas cylinders shall be protected from physical damage
- 7.4.3.3 Gas cylinders shall be stored upright and secured to prevent falling
- 7.4.3.4 Gas cylinders shall not be placed in areas where they may be damaged by falling objects
- 7.4.3.5 Gas cylinders shall not be placed near elevators, unprotected platform edges or other areas where they drop more than 0.6m
- 7.4.3.6 When cylinders are not in use, valve protective caps shall be in place
- 7.4.3.7 Ropes, chains or slings shall not be used to suspend gas cylinders, unless the cylinder was manufactured with appropriate lifting attachments
- 7.4.3.8 When stored, gas cylinders shall be separated from each other based on their hazard classes
- 7.4.3.9 Gas cylinders shall be marked with the name of the contents

7.4.4 Installation of LPG and Natural Gas Piping

- 7.4.4.1 The installation of gas piping for construction purposes, or modifications to existing gas piping, gas utilization equipment, or accessories, shall be performed only by a qualified company with certified people
- 7.4.4.2 All such work shall be in accordance with NFPA 58 Liquefied Petroleum Gas Code and NFPA 54 National Fuel Code
- 7.4.4.3 All modifications to existing gas piping systems shall be performed with the gas turned off
- 7.4.4.4 Hot taps shall be permitted to be made, provided they are installed by a trained and experienced crew utilizing equipment specifically designed for such purpose



7.5 Special Hazardous Equipment

7.5.1 Motorized Equipment / Engines

- 7.5.1.1 For work inside buildings, preference is made to equipment operated by electricity rather than fuel
- 7.5.1.2 Equipment and machinery (internal combustion engines, air compressors, hoists, derricks, generators, pumps and similar devices) shall be placed in such a way that the direction of their exhaust pipe is directed away from combustible materials
- 7.5.1.3 Where exhausts are piped outside the structure under construction, alteration or demolition, a clearance of at least 230 mm shall be maintained between the piping and any combustible material
- 7.5.1.4 When engines are used inside a building, preference shall be made for exhaust pipes to be directed outside the building
- 7.5.1.5 Equipment shall be allowed to cool down to the surrounding temperature before being refuelled
- 7.5.1.6 Refuelling of equipment is not permitted while the equipment is running
- 7.5.1.7 Service areas of equipment shall not be located within structures under construction, alteration or demolition
- 7.5.1.8 Fuel for internal combustion engines shall not be stored within structures under construction, alteration, or demolition



7.5.2 Temporary Heating Devices

- 7.5.2.1 Temporary heating devices such as LPG fuelled, oil -fired heaters, shall be installed, used and maintained in accordance with the manufacturer recommendations
- 7.5.2.2 Heating devices shall be installed away from combustible materials
- 7.5.2.3 Heating devices shall be refilled with fuel in accordance with the manufacturer recommendations
- 7.5.2.4 Heaters shall not be used in areas painted with flammable materials
- 7.5.2.5 Propane or kerosene heaters are prohibited to be used inside buildings
- 7.5.2.6 Heaters shall not be left unattended when in operation
- 7.5.2.7 Heating devices shall be located at least 1 m away from flammable materials
- 7.5.2.8 Heating devices shall be in a safe place protected from fall hazards or the possibility of overturning
- 7.5.2.9 Chimney or vent connectors, where required from direct-fired heaters, shall be maintained at least 460mm from combustibles

7.5.3 Asphalt and Bitumen Heaters

- 7.5.3.1 Bitumen or tar heaters shall be placed no less than 6 meters away from any combustible materials or combustible floors or building openings
- 7.5.3.2 A watch person shall be placed to supervise the heater during its operation
- 7.5.3.3 No obstacles shall be allowed between the watchman and the heater
- 7.5.3.4 The heater shall be provided with secure covers
- 7.5.3.5 During heating operations, at least one (1) Dry Powder 9 kg fire extinguisher shall be placed no more than 10 meters from any heater during operation
- 7.5.3.6 During coating operations, at least one (1) Dry Powder 9 kg fire extinguisher shall be placed no more than 10 meters from any coating operations, including the roof
- 7.5.3.7 Cleaning rags saturated with asphalt or bitumen shall be kept away from combustible materials to prevent fires caused by spontaneous ignition of these rags



7.5.4 Drums

- 7.5.4.1 Drums that contain flammable liquids shall be stored in vertical positions on pallets to minimize the risk of puncturing the drum side walls when being handled by forklifts

7.5.5 Thermit Welding

- 7.5.5.1 Mould shall be dried thoroughly before the charge is ignited and provided with a cover
- 7.5.5.2 Bulk storage of Thermit welding materials shall be maintained in a detached shed at least 15m away from any building
- 7.5.5.3 Storage sheds shall be maintained dry, posted with a “NO SMOKING” sign and kept locked
- 7.5.5.4 Containers for the starting material shall be closed tightly immediately after each use
- 7.5.5.5 The moulds shall not be removed until sufficient cooling has taken place in accordance with the manufacturer’s instructions
- 7.5.5.6 Smoking shall not be permitted anywhere near Thermit welding material



7.6 Roofing Operations

7.6.1 Asphalt and Tar Kettles

- 7.6.1.1 Asphalt and tar kettles shall not be located on roofs
- 7.6.1.2 A lid that can be closed by means of gravity shall be provided on all roofing kettles
- 7.6.1.3 The tops and covers of all kettles shall be close-fitting and constructed of steel having a thickness of not less than No. 14 manufacturer's standard gauge 2mm
- 7.6.1.4 Used roofing mops and rags shall be cleaned of excessive asphalt and stored away from the building and combustible materials
- 7.6.1.5 Discarded roofing mops and rags shall not be in contact with combustibles
- 7.6.1.6 Kettles shall be constantly attended when in operation by a minimum of one employee knowledgeable in the operations and hazards. The employee shall be within 7 meters of the kettle and have the kettle within sight
- 7.6.1.7 Roofing kettles shall not block exits, means of egress, gates, roadways, or entrances. In no case shall kettles be closer than 3 m from exits or means of egress

7.6.2 Single Ply and Torch Applied Roofing Systems

- 7.6.2.1 Single-ply and torch applied roofing systems shall be installed using extreme caution
- 7.6.2.2 Torches or hot-air guns used to secure roofing membranes shall be used in accordance with the manufacturer's recommendations
- 7.6.2.3 To prevent smoking or ignition of roofing membranes, they shall not be overheated



7.6.3 Working Near Openings, Penetrations and Flashings

- 7.6.3.1 Caution shall be used where working near roof openings, penetrations or flashings
- 7.6.3.2 The flame of the torch shall not come in direct contact with wood nailers, cant strips, or metal flashings
- 7.6.3.3 Small torches shall be used to heat the underside of the membrane at a distance from these areas before securement
- 7.6.3.4 Hot trowels shall be used to feather seams at laps and flashings
- 7.6.3.5 The torch shall not be used in areas where the flame impingement cannot be fully viewed
- 7.6.3.6 Open flames shall not be left unattended

7.6.4 Flame Contact Protection

- 7.6.4.1 The torch flame shall not be applied to a combustible substrate for the membrane
- 7.6.4.2 Base ply shall be used to cover wooden decks, combustible insulation (such as foam plastic, kraft-faced glass fibre, or wood fibre), small crevices, cant strips, plastic fastener plates, or any other combustible surface
- 7.6.4.3 Base ply shall be permitted to consist of either glass fibre felts or minimum 18 kg organic felts
- 7.6.4.4 Torch flames shall not come in contact with exposed plastic roofing cement



7.6.5 Equipment

- 7.6.5.1 Proper equipment shall be used to heat roofing membranes
- 7.6.5.2 Torches shall be equipped with pilot adjustment, a flame height adjustment, a minimum of 7600 mm to a maximum of 15 m of listed hose, a pressure gauge, and a regulator
- 7.6.5.3 A spark igniter shall be used
- 7.6.5.4 Torch trolleys and multiple torch head machines shall be equipped with listed safety valves
- 7.6.5.5 Equipment shall be inspected thoroughly and repaired or replaced as needed prior to use

7.6.6 Fuel Gas Cylinders

- 7.6.6.1 Fuel gas cylinders shall not be hoisted by their valves
- 7.6.6.2 Straps placed around the cylinders shall be utilized
- 7.6.6.3 Carts used shall be attached to all fuel gas cylinders and installed on the valves whenever cylinders are not in use
- 7.6.6.4 The fuel gas cylinder shall be sized for the torch used

7.6.7 Frost Build-up

- 7.6.7.1 If frost build-up occurs on fuel gas cylinders and the rate of vapor withdrawal is no longer adequate for operating conditions, the cylinder shall not be placed on its side or heated with the torch flame
- 7.6.7.2 The hose shall be disconnected, and a larger cylinder shall be used



7.6.8 Fire Extinguishers for Roofing Operations

- 7.6.8.1 There shall be at least one portable fire extinguisher having a rating of not less than 20-B no closer than 1.5 m and no more than 7.6 m of the horizontal travel distance from every kettle at all times while such kettles are in operation
- 7.6.8.2 Fire extinguishers shall be in an accessible, visible, or identified location
- 7.6.8.3 There shall be at least one multipurpose 2-A:20-B:C portable fire extinguisher on the roof being covered or repaired, or other fire protection shall be provided as determined by the authority having jurisdiction
- 7.6.8.4 There shall be at least one multipurpose 2-A:20-B:C portable fire extinguisher within 6.1 m of horizontal travel distance from torch-applied roofing equipment
- 7.6.8.5 All kettle operators and torch-applied roof installers shall be trained in the use of fire extinguishers

7.6.9 Fuel for Roofing Operations

- 7.6.9.1 Fuel containers, burners, and related appurtenances of roofing equipment in which liquefied petroleum gas is used for heating shall comply with all applicable requirements of NFPA 58, Liquefied Petroleum Gas
- 7.6.9.2 Fuel containers having capacities greater than 0.45 kg shall be located at least 3 m from the burner flame or at least 600 mm there from where properly insulated from heat or flame
- 7.6.9.3 Solid fuel or Class I liquids shall not be used as fuel for roofing kettles
- 7.6.9.4 LPG cylinders shall be secured to prevent accidental tip over
- 7.6.9.5 Where in the opinion of the authority having jurisdiction, there is danger of physical damage to the fuel containers, protection shall be provided



7.7 Demolition Operations

- 7.7.1.1 Special precautions shall be taken where demolition work is performed in areas where floors are soaked with oil or other flammable liquid; where dust accumulation is present; or where combustible insulation is present in floors, walls or ceilings/roofs where hot work is being performed. In these situations, charged fire hose lines of an adequate number shall be provided
- 7.7.1.2 Prior to demolition, gas supplies shall be turned off and capped at a point out-side of the building
- 7.7.1.3 Gas lines within the buildings shall be purged after capping

7.8 Underground Operations

7.8.1 Specific Requirements

- 7.8.1.1 Drainage systems shall be properly designed and installed to remove water from sprinkler discharge and fire hose streams
- 7.8.1.2 Fire safety for existing, operating, fixed guideway underground transportation systems undergoing alteration or renovation shall be in accordance with NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems

7.8.2 Security

- 7.8.2.1 At each aboveground entrance, underground operations shall have a check-in / check-out system, supervised by a qualified individual at all times, that provides an accurate record of each person who is underground
- 7.8.2.2 The location of the check-in / check out system shall be within 7 m of the entrance and shall be easily identifiable
- 7.8.2.3 Completed or unused sections of the underground facility shall be barricaded, properly marked and made off limits
- 7.8.2.4 Compartmentation by means of the installation of fire and smoke barriers shall be at intervals that limit the extent and severity of the fire and that provide areas of refuge for occupants



7.8.3 Water Supply

- 7.8.3.1 No minimum water supply can be specified due to the wide range of construction types, sites, and sizes. However, unless combustibles are essentially non-existent in the completed structure and occupancy, a minimum of 1893 L/min should be provided. In most instances, the required supply is greater, and the consultant's proposal shall be submitted to the authority for approval
- 7.8.3.2 The fire hose outlets shall be provided so that travel distance does not exceed 46 m

7.8.4 Evacuation Plans

- 7.8.4.1 A written fire prevention, fire suppression and emergency evacuation plan shall be developed, maintained, and kept current
- 7.8.4.2 Special attention shall be given to rescue and smoke-venting procedures, to means of ingress/egress and to training and orientation of employees and visitors
- 7.8.4.3 All personnel, including visitors, shall be trained in emergency and evacuation procedures and informed of the hazards prior to going underground

7.8.5 Emergency Drills

- 7.8.5.1 Underground operations shall conduct disaster and evacuation drills for each shift at least once at the start of underground operations and every 6 months, or more frequently as appropriate
- 7.8.5.2 A record of such drills shall be maintained

7.8.6 Safety, Fire Detection and Protection Systems

- 7.8.6.1 Fire protection extinguishing equipment applicable to the hazard shall be provided at the head, tail, drive, and take-up pulley areas of belt conveyors and at intervals along belt conveyor lines that shall not exceed 91 m
- 7.8.6.2 Belt conveyors installed in underground locations, other than belts that carry the load of the belt on low-friction metal deck without rollers, shall meet the following minimum requirements
- Conveyor belting shall be approved
 - Entrances in which belt conveyors are installed shall be kept free of accumulation such as much, debris, and combustibles



- All belt conveyors shall be equipped with an approved slippage switch system designed to shut down the belt when sliding friction develops between the drive pulley(s) and the belt
- The slippage switch system shall be tested weekly
- On each new installation, the slippage switch system shall be tested before the conveyor is issued

- 7.8.6.3 All conveyor belt systems shall be equipped with approved interlock systems that shut down belt conveyors when any conveyor in the system stops or reduces its normal speed or upon activation of any required fire protection system
- 7.8.6.4 Fixed combustible materials such as posts, cribbing, and roof supports shall be either guarded from contact by the belt using metal or located at a distance of at least $\frac{1}{2}$ the width of the belt from any idler or pulley
- An alternate method for minimizing potential frictional ignition is the use of alignment switches at intervals sufficient to prevent the belt from contacting such materials
 - Guarding for machinery in the drive area and at other points along the belt shall be of non-combustible material
- 7.8.6.5 New installations of belt conveyors shall utilize a structure that does not provide a deck between the upper and lower strands of the belt
- 7.8.6.6 Suitable fire extinguishers shall be installed so that travel distance from any one point in a tunnel does not exceed 90 meters on a horizontal plane
- 7.8.6.7 Audible and visible alarm and emergency lighting for safe evacuation shall be required
- 7.8.6.8 Two means of communications with the surface shall be available at all times from all areas of the underground facility
- 7.8.6.9 All communications systems shall be tested weekly



7.8.7 Electrical Conductors

- 7.8.7.1 Electrical cords and plugs shall be heavy duty and suitable for use in damp locations
- 7.8.7.2 Conductors shall be located or guarded so as to be protected from physical damage. Multiconductor portable cable shall be permitted to supply mobile equipment
- 7.8.7.3 An equipment grounding conductor shall be run with circuit conductors inside the metal raceway or inside the multiconductor cable jacket
- 7.8.7.4 The equipment grounding conductor shall be permitted to be insulated or bare
- 7.8.7.5 Oil-filled transformers shall only be used underground where located in a fire resistant enclosure suitably vented to the outside and surrounded by a dike to retain the contents of the transformers in the event of rupture



7.8.8 Electrical Enclosures

- 7.8.8.1 Bare terminals of transformers, switches, motor controllers, and other equipment shall be enclosed to prevent accidental contact with energized parts
- 7.8.8.2 Enclosures for use in tunnels shall be raintight, rainproof, or watertight as defined in NFPA 70, National Electrical Code, where necessitated by the environmental conditions
- 7.8.8.3 Special attention shall be given to maintaining clear access and adequate workspace around electrical equipment in accordance with NFPA 70E, Standard for Electrical Safety in the Workplace. Proper housekeeping shall be maintained to avoid fire hazards
- 7.8.8.4 All non-energized metal parts of electrical equipment and metal raceways and cable sheaths shall be effectively grounded and bonded to all metal pipes and rails at the portal and at intervals not exceeding 300 m throughout the tunnel

7.8.9 Hazardous Operations and Procedures

- 7.8.9.1 Hot work operations shall be in accordance with NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
- 7.8.9.2 A suitable fire extinguisher or other fire control device shall be ready for instant use in any location where hot work is performed
- 7.8.9.3 Acetylene, liquified petroleum gas (LPG) liquified oxygen (LOX), and methyl acetylene propadiene stabilized gas (MPS) shall be permitted to be used underground only for welding, cutting, and hot work and only if the quality of air is within permitted limits in accordance with the ACGIH Threshold Limit Values and Biological Exposures Indices 1992-1993
- 7.8.9.4 The quantity of combustible materials to be used underground shall be kept to a minimum. Advance planning shall be provided for the use of materials having the most favorable combination of high ignition points, low rates of combustion, and low emissions of smoke and harmful gases



7.8.10 Flammable and Combustible Liquids

- 7.8.10.1 Class I flammable liquids shall not be taken, stored, or used underground or within 30 m of a tunnel portal or shaft opening
- 7.8.10.2 Class II and Class III liquids shall be transported and stored in approved closed containers, safety cans, or tanks
- 7.8.10.3 Quantities shall be limited to those necessary for one work shift
- 7.8.10.4 Lubricating oils, greases, and rope dressings taken underground shall be in closed and approved containers that do not allow the contents to leak or spill
- 7.8.10.5 Oil, grease, and diesel fuel stored underground shall be kept in tightly sealed containers in fire-resistant areas located at least 30 m from shaft and inclines
- 7.8.10.6 Storage areas shall be positioned or diked so that the contents of ruptured or overturned containers cannot flow from the storage area
- 7.8.10.7 Areas within 7 m of major electrical installations and unburied tanks for storage of combustible liquids shall be free of transient combustible materials
- 7.8.10.8 No combustible structure shall be erected, and no combustible materials shall be stored within 30 m of an access shaft, shaft hoist, or other entry
- 7.8.10.9 Metal containers with self-closing lids shall be provided and used to store combustible waste and debris and shall be removed and taken to the surface daily

7.8.11 Equipment

- 7.8.11.1 Less hazardous hydraulic fluids that are listed shall be used in underground machinery and equipment unless the machinery and equipment are protected by an approved fire suppression system or by approved multipurpose fire extinguishers rated at least 4-A:40-B:C
- 7.8.11.2 Wherever self-propelled equipment is used underground, a fire suppression system or a fire extinguisher rated at least 4-A:40-B:C shall be provided on the equipment



7.8.12 Ventilation

- 7.8.12.1 Where single-entry shafts/tunnels ventilation systems are used, they shall be reversible from a location outside and in close proximity to the shaft/tunnel
- 7.8.12.2 The ventilation system shall be sufficient for the number of personnel and equipment underground
- 7.8.12.3 Air-sampling logs shall be maintained. Air tests shall be conducted before or after each shift
- 7.8.12.4 Air-sampling logs shall be available to the authority having jurisdiction
- 7.8.12.5 Fan houses, fan bulkheads for main and booster fans and air ducts connecting main fans to underground openings shall be constructed of non-combustible materials