SRI LANKA STANDARD 727 : PART 3 : 1986

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CODE OF SAFETY FOR
WELDING AND CUTTING
PART 3 - FIRE PREVENTION ANT PROTECTION

SRI LANKA STANDARDS INSTITUTION

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SLS 727:Part 3:1986

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SRI LANKA STANDARDS INSTITUTION
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Sri Lanka.

SRI LANKA STANDARD

CODE OF SAFETY FOR WELDING AND CUTTING
PART 3 : FIRE PREVENTION AND PROTECTION

FOREWORD

This Sri Lanka Standard was authorized for adoption and publication by the Council of the Sri Lanka Standards Institution on 1986-01-15, after the draft, finalized by the Drafting Committee on Code of Safety for Welding and Cutting, had been approved by the Mechanical Engineering Divisional Committee.

The existence of proper safety regulations and their use are the most important steps in any programme of safety and accident prevention.

This standard is presented in the hope that adherence to the safety requirements contained herein will result in the elimination of possible hazards due to welding and cutting; hence elimination of avoidable accidents and property damage.

This standard includes provisions for prevention and protection of fires that can be caused by welding and cutting operations.

A majority of fires where cutting and welding is a factor have been caused by sparks. These globules of molten metal have scattered horizontally as far as 11 metres, setting fire to all kinds of combustible materials. They have also fallen through cracks, pipe holes or other small openings in floors and partitions starting fires which have reached serious proportions before being noticed.

Anything which is combustible or flammable is susceptible to ignition by the cutting and welding. The most common materials likely to become involved in fire are combustible building construction such as floors, partitions, and roofs; combustible contents such as wood, paper, textiles, plastics, chemicals, and flammable liquids and gases; and combustible ground cover such as grass and brush.

This standard does not cover the provisions for cleaning of tanks, containers, etc. that have held combustibles, prior to welding or cutting. This will be the scope of a standard that is expected to be developed in future.

Prevention of cutting and welding fires can best be achieved by separating the combustibles from ignition sources or by shielding the combustibles.

This standard will be published in four parts: other parts being;

Part 1 Oxygen-fuel gas systems for welding and cutting.

Part 2 Arc welding cutting and resistance welding equipment.

Part 4 Protection of personnel and health.

The assistance derived from the publications of the American National Standards Institution in the preparation of this standard is gratefully acknowledged.

1 SCOPE

This code covers provisions to prevent loss of life and property by the safe use of oxy-fuel and arc cutting and welding equipment when used only for cutting and welding to prevent loss of life and property from fire.

2 RESPONSIBILITY FOR CUTTING AND WELDING

Although the cutter or welder has the best opportunity to avoid fire or injury by proper control of the equipment he is using, there are many circumstances where fires, explosions, or severe injuries would be inevitable if the oxy-fuel gas torch or the electrode were to be used. Such circumstances can arise where the cutter or welder may not be aware of;

a) the proximity or the flammable nature of nearby combustible solids, liquids or dusts;

b) the presence or development of possibly explosive mixtures of flammable gases or vapours and air; or

c) the presence or nature of an oxygen-enriched atmosphere in the location where the work is to be performed.

The precautions taken by a cutter or welder will often be governed by the desire of others for speed or economy in his work or by the failure of management to emphasize the possible extent or seriousness of a fire in the work area. Therefore, the cutter or welder, his supervisor, and management share full responsibility for the safe use of cutting or welding equipment. Specific responsibilities of each are cited in 2.1, 2.2 and 2.3.

2.1 Responsibility of management

Management shall recognize its responsibility for the safe use of cutting and welding equipment in its property and, the following shall be complied with:

2.1.1 Based on fire potentials, establish approved areas for cutting and welding or establish procedure for approving cutting and welding.

2.1.2 Designate an individual responsible for authorizing cutting and welding operations in areas not specifically designed or approved for such purposes. The individual shall be aware of the fire hazards involved and be familiar with the provisions of this standard, and may delegate this responsibility to the supervisors (see 2.2).

2.1.3 Insist that all apparatus, such as torches, manifolds regulators or pressure reducing valves, and acetylene generators, be approved as fit before use.

2.1.4 Insist that cutters or welders and their supervisors are suitably trained in the safe operation of their equipment, the safe use of the process, and emergency procedures in the event of a fire.

2.1.5 Select contractors to perform cutting or welding who have suitably trained personnel and who have an awareness of the magnitude of the risks involved.

2.1.6 Advise all contractors about flammable materials or hazardous conditions of which they may not be aware.

2.2 Responsibility of supervisor

The supervisor of cutting and welding operations in areas not designated or approved for such processes may be the officer in charge of cutting and welding operations or any other officer to whom, the authority for supervision of such work is delegated by the officer in charge.

2.2.1 The supervisor shall be responsible for the safe handling of the cutting or welding equipment and for the safe use of the cutting or welding process.

2.2.2 The supervisor shall determine the combustible materials and hazardous areas present or likely to be present in the work location.

2.2.3 The supervisor shall protect combustibles from ignition by adopting the following precautionary measures:

2.2.3.1 Have the work moved to a location free from dangerous combustibles.

2.2.3.2 If the work cannot be moved, have the combustibles moved to a safe distance from the work or have the combustible properly shielded against ignition.

2.2.3.3 See that cutting and welding are so scheduled that operations that might expose combustibles to ignition are not started during cutting or welding.

2.2.4 The supervisor shall secure authorization for the cutting or welding operations from the designated management representative. (see 2.1.2).

2.2.5 The supervisor shall determine that the cutter or welder secures approval that conditions are safe before going ahead.

2.2.6 The supervisor shall determine that fire protection and extinguishing equipment are properly located at the site.

2.2.7 Where fire watchers are required (see 3.3), the supervisor shall see that they are available at the site.

2.2.8 Where a fire watcher is not required, a final check-up shall be made by the supervisor one-half hour after the completion of cutting or welding operations to detect and extinguish possible smouldering fires.

2.3 Responsibility of cutter or welder

The cutter or welder shall handle the equipment safely and use it so as not to endanger lives and property, by adopting the following precautionary measures:

2.3.1 Have approval by the supervisor before starting to cut or weld.

2.3.2 Cut or weld only where conditions are safe.

2.3.3 Continue to cut or weld only so long as conditions are unchanged from those under which approval was granted.

2.3.4 In case of fire or emergency the cutter or welder shall cut-off supply of electricity or isolate the supply of fuel-gas and oxygen from the source/emergency shut-off valve.

3 FIRE PREVENTION PRECAUTIONS

Cutting or welding shall be permitted only in areas that are or have been made firesafe (see 3.2). Within the confines of an operating plant or building, cutting and welding shall be done in either

a) a specific area designed or approved for such work, such as maintenance shop or a detached outside location which shall be of non-combustible or fire-resistive construction, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas; or

b) when work cannot be moved practically, as in most construction work, the area shall be made firesafe by removing combustibles or protecting combustibles from ignition sources.

3.1 Situations not permitted for cutting and welding

Cutting or welding shall not be permitted in the following situations:

3.1.1 In areas not authorized by management.

3.1.2 In sprinklered buildings while such protection is impaired.

3.1.3 In the presence of explosive atmosphere (mixtures of flammable gases, vapours, liquids, or dusts with air), or explosive atmosphere that may develop inside uncleaned or improperly prepared drums, tanks or other containers, and equipment which have previously contained such materials, or that may develop in areas with an accumulation of combustible dusts.

NOTE - For cutting and welding of containers that have held combustible special precautions, which are not dealt with in this standard may be necessary. (also see Foreword).

3.1.4 In areas near the storage of large quantities of exposed, readily ignitible materials such as bulk sulfur, baled paper or cotton.

3.2 Authorization of work

Before cutting or welding is permitted, the area shall be inspected by the individual responsible for authorizing cutting and welding operations (see **2.1.2**) to ensure that it is a firesafe area. This individual shall designate precautions to be followed in granting authorization to proceed, preferably in the form of a written permit, (see Appendix A). This individual shall sign the permit or otherwise authorize the work, and shall verify the following:

3.2.1 Cutting and welding equipment to be used shall be in satisfactory operating condition and in good repair.

3.2.2 Where combustible materials such as paper clippings, wood shavings or textile fibres are on the floor, the floor shall be swept clean within a radius of 11 metres. Combustible floors (except wood on concrete) shall be kept wet, covered with damp sand or protected by fire-resistant shields. Where floors have been wet down, personnel operating arc welding or cutting equipment shall be protected from possible shock.

3.2.3 Where practicable, all combustibles shall be relocated at least 11 metres horizontally away from the work site. Where relocation is impracticable combustibles shall be protected with flame-proofed covers or otherwise shielded with metal or asbestos guard or curtains. Edges of covers at the floor shall be tight to prevent sparks from going under them. This precaution is also important at overlaps where several covers are used to protect a large pile.

3.2.4 Opening or cracks in walls, floors or ducts within 11 metres of the site shall be tightly covered to prevent the passage of sparks to adjacent areas.

3.2.5 Conveyor systems that might carry sparks to distant combustibles shall be suitably protected.

3.2.6 Where cutting or welding is done near walls, partitions, ceilings or roof of combustible construction, fire-resistant shields or guards shall be provided to prevent ignition. If welding is to be done on a metal wall, partition, ceiling or roof, precautions shall be taken to prevent ignition of combustibles on the other side, due to conduction or radiation, preferably by relocating combustibles. Where combustibles are not relocated, a fire watch on the opposite side from the work shall be provided. Welding shall neither be attempted on a metal partition, wall, ceiling or roof having a combustible covering nor on walls or partitions of combustible sandwich-type panel construction.

3.2.7 Cutting or welding on pipes or other metal in contact with combustible walls, partitions, ceilings or roofs shall not be undertaken if the work is close enough to cause ignition by conduction.

3.2.8 Fully charged and operable fire extinguishers, appropriate for the type of possible fire, shall be available at the work area. Where hose lines are available, they shall be connected and ready for service.

3.2.9 Nearby personnel shall be suitably protected against heat, sparks, slag, etc.

3.3 Employing fire watchers

3.3.1 Fire watchers shall be employed by the individual responsible for authorizing cutting and welding (see 2.1.2) whenever cutting or welding is performed in locations where other than a minor fire might develop, or any of the following conditions exist:

3.3.1.1 Appreciable combustible material in building construction or contents closer than 11 metres to the point of operation.

3.3.1.2 Appreciable combustibles are more than 11 metres away but are easily ignited by sparks.

3.3.1.3 Wall or floor openings within a 11-metre radius expose combustible material in adjacent areas including concealed spaces in walls or floors.

3.3.1.4 Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation.

3.3.2 Fire watchers shall have fire extinguishing equipment readily available and be trained in its use, including practice on test fires.

3.3.3 Fire watchers shall be familiar with facilities and procedures for sounding an alarm in the event of a fire.

3.3.4 Fire watchers shall watch for fires in all exposed areas, and try to extinguish them first only when obviously within the capacity of the equipment available, or otherwise sound the alarm immediately.

3.3.5 A fire watch shall be maintained for at least a half hour after completion of cutting or welding operations to detect and extinguish possible smouldering fires.

3.4 Hot tapping

Hot tapping or other cutting and welding on a flammable gas or liquid transmission or distribution utility pipeline shall be performed by a crew qualified to make hot taps.

4 PUBLIC EXHIBITIONS AND DEMONSTRATIONS

4.1 Application

The following provisions apply to oxygen-fuel gas welding and cutting operations at public exhibitions, demonstrations, displays, and trade shows (referred to hereinafter as the *site*) in order to promote the safe usage of compressed gases in public gatherings.

4.2 Supervision

Installation and operation of welding, cutting and related equipment shall be done by, or under the supervision of a competent operator to ensure the protection of viewers and demonstrators as well as the protection from fire of materials in and around the site and building itself.

4.3 Site

4.3.1 Site involving the use and storage of compressed gases shall be located so as not to interfere with the egress of people during an emergency.

4.3.2 The site shall be constructed, equipped, and operated in such a manner that the demonstration will be carried out so as to minimize the possibility of injury to viewers.

4.4 Fire protection

4.4.1 Each site shall be provided with a portable fire extinguisher of appropriate size and type and with a pail of water.

4.4.2 The public, combustible materials, and compressed gas cylinders at the site shall be protected from flames, sparks and molten metal.

4.4.3 The fire department shall be notified in advance of such use of the site.

4.5 Cylinders

4.5.1 Cylinders of non-liquefied gases such as acytelene shall be charged to gauge pressure not exceeding half of their maximum permissible capacity. Cylinders of liquefied gases shall be charged to not more than one-half the maximum permissible capacity in kilograms.

4.5.2 Cylinders shall be stored in an approved storage area, preferably outdoors, but not near a building exit except those that are in use. However, cylinders required for a day's operation may be stored at site.

4.5.3 Cylinders in excess of 18 kg total mass being transported to or from the site shall be carried on a hand-operated or motorized truck.

4.5.4 Cylinders shall be kept in a vertical position and secured so that they cannot be knocked down.

4.6 Accessories

4.6.1 Hoses shall be located and protected so that they will not be physically damaged.

4.6.2 Cylinder valves shall be closed when equipment is unattended.

4.6.3 Where caps are provided for valve protection, such caps shall be in place except when the cylinders are in service or connected ready for service.

APPENDIX A

SUGGESTED FORMAT FOR PERMIT

(*see* 3.2)

PERMIT

FOR CUTTING AND WELDING

Name of the supervisor .....

Date .....

Building .....

Dept ..... Floor .....

Work to be done .....

.....

Special precautions .....

.....

Is fire watch required? .....

The location where this work is to be done has been examined necessary precautions taken, and permission is granted for this work. (see overleaf)

Validity period of the permit From ..... To .....

(Date & Time) (Date & Time)

Signed .....

(Individual responsible for authorizing welding and cutting)

Time started ..... Completed .....

FINAL CHECK-UP

Work area and all adjacent areas to which sparks and heat might have spread (including floors above and below and or opposite sides of walls) were inspected 30 minutes after the work completed and were found firesafe.

Signed .....

(Supervisor or Fire Watcher)

(Upon expiry this permit should be returned to the authorizing officer)

(Front)

ATTENTION

Before approving any cutting and welding permit, the fire safety supervisor or his appointee shall inspect the work area and confirm that precautions have been taken to pervent fire in accordance with SLS .....

PRECAUTIONS

* Sprinklers in service.
* Cutting and welding equipment in good repair.

WITHIN 11 m OF WORK

* Floors swept clean of combustibles.
* Combustibles floors wet down covered with damp sand, metal or other shields.
* No combustible material or flammable liquids.
* Combustibles and flammable liquids protected with covers, guards or metal shields.
* All wall and floor openings covered.
* Covers suspended beneath work to collect sparks.

WORK ON WALLS OR CEILINGS

* Construction noncombustible and without combustible covering.
* Combustibles moved away from opposite side of wall.

WORK ON ENCLOSED EQUIPMENT

(Tanks, containers, ducts, dust collectors, etc.)

* Equipment cleaned of all combustibles.
* Containers purged of flammable vapours.

FIRE WATCH

* To be provided during and 30 minutes after operation.
* Supplied with extinguisher and small hose.
* Trained in use of equipment and in sounding fire alarm.

FINAL CHECK-UP

* To be made 30 minutes after completion of any operation unless fire watch is provided.

Signed .....

(Supervisor)

(Rear)

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Further particulars of the terms and conditions of the permit may be obtained from the Sri *Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.*

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SRI LANKA STANDARDS INSTITUTION

The Sri Lanka Standards Institution (SLSI) is the National Standards Organization of Sri Lanka established under the Sri Lanka Standards Institution Act No. 6 of 1984 which repealed and replaced the Bureau of Ceylon Standards Act No. 38 of 1964. The Institution functions under the Ministry of Science & Technology.

The principal objects of the Institution as set out in the Act are to prepare standards and promote their adoption, to provide facilities for examination and testing of products, to operate a Certification Marks Scheme, to certify the quality of products meant for local consumption or exports and to promote standardization and quality control by educational, consultancy and research activity.

The Institution is financed by Government grants, and by the income from the sale of its publications and other services offered for Industry and Business Sector. Financial and administrative control is vested in a Council appointed in accordance with the provisions of the Act.

The development and formulation of National Standards is carried out by Technical Experts and representatives of other interest groups, assisted by the permanent officers of the Institution. These Technical Committees are appointed under the purview of the Sectoral Committees which in turn are appointed by the Council. The Sectoral Committees give the final Technical approval for the Draft National Standards prior to the approval by the Council of the SLSI.

All members of the Technical and Sectoral Committees render their services in an honorary capacity. In this process the Institution endeavours to ensure adequate representation of all view points.

In the International field the Institution represents Sri Lanka in the International Organization for Standardization (ISO), and participates in such fields of standardization as are of special interest to Sri Lanka.

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