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MODULE K
Safety in welding arc

Work safety during arc welding

Work safety when welding coated electrodes for manual arc welding

- When welding coated electrodes arc welders must and all staff coming into contact with the technology to observe safety regulations contained in CSN 05 0630 and in Decree 87/2000 Coll.

Welding electrocution

- §7 (1) Is of electrical conductors are placed on the non-flammable insulating substrate.
- §7 (2) Replacing the electric wires and welding the terminals other than those specified or approved leads and terminals (e.g. various metal objects, parts, constructions, chains, ropes) is not permitted.
- §7 (3) The arc welding in a hazardous area with subsequent fire, the electrical power sources are placed outside this environment, unless the manufacturer or importer possible otherwise.
- § 7 (4) In the arc welding electrode holder with delay in order to prevent accidental arcing and splashing molten metal.

Vyhláška Ministerstva vnitra č. 87/2000 Sb., kterou se stanoví podmínky požární bezpečnosti při svařování a nahřívání živic v tavných nádobách. Praha: 2000.
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Welding electrocution

- §7 (5) Butts electrodes are deposited on a designated safe place (e.g. into a fireproof container with sand).
- §7 (6) The welded item must be provided so that when an electric current passes through the welding other than the designated routes and for other than the designated subjects. These paths and objects should be determined so as to avoid the possibility of fire.
- §7 (7) After the welding is to be disconnected from the welding power source.

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By welding work
CSN 05 0600 and Decree 87/2000 Coll.

- *Section 5 Welding work*
- *Section 5 (1) Welding work intended for welding project documentation is considered stable welding work; others are considered temporary welding work.*
- *Section 5 (2) Welding work is secure so as to avoid especially*
  - *a) Formation fire or explosion followed by fire and fire spread.*
  - *b) Creation obstacles that impede or prevent the escape of persons.*
  - *c) Threat lives and health of people the fundamental and specific risks.*
- *These requirements also apply to adjacent spaces.*

Vyhláška Ministerstva vnitra č. 87/2000 Sb., kterou se stanoví podmínky požární bezpečnosti při svařování a nahřívání živic v tavných nádobách. Praha: 2000.
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By welding work
CSN 05 0600 and Decree 87/2000 Coll.

- §5 (3) Parts and materials of the welding work are deployed so as to retain the possibility of free passage and confined and avoid collision points. Welding equipment to ensure, so as to prevent movement or the movement of their parts, and the damage that would lead to the emergence or spread of fire or explosion followed by a fire with a possible aggravation of the conditions for the escape of persons.
- §5 (4) The weld material is deposited on the work so as to prevent movement or moving parts, the system which may cause damage to the welding device, in particular damage to moving parts of the conductors and electrical welding equipment, gas piping, hoses, damage could lead to the emergence or spread of fire or explosion and the subsequent fire.

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By welding work
CSN 05 0600 and Decree 87/2000 Coll.

- Section 5 (5) Transitional welding workplaces are equipped with appropriate fire extinguishers and other extinguishing agents under special legislation. Besides these extinguishers are still fitted with at least two portable fire extinguishers with a suitable filling, of which one portable fire extinguisher powder extinguishing agent with a weight of 5 kg. In the case of welding in the flat with respect to the type of welding, unless they are directly threatened by the other areas is minimal equipment one portable fire extinguisher powder extinguishing agents, weighing less than 5 kg.
- Section 5 (6) of fixed welding workstations can not save or store flammable and combustible supporting substances unless they are part of the technology. In the event that such matters in the technology necessary to determine the fire safety measures to prevent the possibility of occurrence and spread of fire or explosion followed by fire and ensure the containment and evacuation.

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By welding work
CSN 05 0600 and Decree 87/2000 Coll.

- Section 5 (7) commands and prohibitions, or other important information on the welding workplace and on devices characterized by safety markings. Warning and table specifying the type and quantity of gas cylinders are placed also at the entrance to the facility where they are placed.
- Section 5 (8) When welding in areas from 2 m height over the places to be protected from the effects of these works, in terms of fire protection department provides protection zones. The band lays down the minimum distance from which prior to the commencement of welding remove flammable materials and ensure their safe isolation, or to implement other effective measures, especially against the effects of hot particles. Protective zones in terms of fire protection set individually with regard to the technology used and the welding process so that the center of the protection zone is always the point of welding minimum is determined by a circle with a radius of 10 m in the horizontal plane. When welding at altitudes in excess of 2 m for each additional 1 m in height extending protection zone of at least 0.3 m to 7 m in height; for each additional 1 m in height extending guard band of 0.1 m up to 20 m. These increments are added to the radius. Protective zones for welding performed at heights exceeding 20 m are set individually. When applying the technology using compressed gas (e.g. oxygen cutting) and the interaction of the airflow with the air velocity exceeding 1 m.sec-1 protection distance extending into the area defined by an ellipse and a distance of 20 m according to an individual assessment of the fire hazard.

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By welding work CSN 05 0600 and Decree 87/2000 Coll.

- *§5 (9) Fixed welding workplaces with a distinct demarcation method characterized*
  - *a) Fire safe distance, if the definition provided in the documentation for the device, or,*
  - *b) Protection band.*
- *§5 (10), Current leads and gas distribution tube for welding device are passed and stored so as to avoid damage sharp folds, the material, grease, chemicals, the effects of the welding process and the like. In case of danger of mechanical damage, the device protects the hard cover .*
- *§ 5 (11) If any part is damaged welding equipment, welding can not start or to continue.*
- *§5 (12) For welding with a hydraulic drive device that utilizes flammable working fluids are a possible leakage place combustible media protected housings similarly as in the presence of flammable substances.*

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By welding work
CSN 05 0600 and Decree 87/2000 Coll.

- *§5 (13) Welding machines and equipment in the space in which can cause dangerous concentrations can only be made on machines and equipment that can not be removed from the compartment. From space machinery it is necessary to remove the combustible dust, to prevent dust escaping into the space in machinery and equipment, and measure the concentration of explosive dust in the air before the start of welding and during.*
- *§5 (14) The welding can be performed only on machines and equipment that are blocked against unwanted actuation.*
- *§5 (15) The replacement of fresh air supply of oxygen is unacceptable.*

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By welding work CSN 05 0600 and Decree 87/2000 Coll.

- §5 (16) In areas where there may be flammable gases, vapors or dusts are not placed gas cylinder for welding or acetylene, and the current source of electrical energy to the welding work. At each exit of these spaces are removed from spaces burners and gas supply hose for welding.
- § 5 (17) Containers, pipes and devices, which can not reliably determine whether their contents are not dangerous fire, proceed as if the fire was dangerous.
- §5 (18) There is a risk withdrawal of the welding wire or hoses attach these to the fixed structure or to any other suitable solid device.
- § 5 (19) As subscription welding more persons determined to advance the way of mutual communication.
- § 5 (20) Instructs the welder to turn on the power source or circuit once it is ready to begin work and took up work position.

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General principles of safety according to CSN 05 0601 and Decree 87/2000 Coll.

- Applies to all welding methods
- Permission welding
- Welding services can perform:
  - Persons who have a valid welding certificate or a certificate of welding worker, the appropriate type of course and scope of approval according to CSN 05 0705 (possibly by a series EN 287, EN 1418, CSN 05 0710).
  - Persons who are training in welding under the direct supervision of a professional instructor of welding

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Welding work may do:

- Pupils at secondary vocational schools and centers of practical training (under 18 years) who have completed basic training welding and perform welding work under the direct supervision of the master of training.
- Persons with higher professional education on research and development tasks of welding with written authorization of the employer as evidence of knowledge of safety regulations (CSN 05 0601, CSN 05 0610, CSN 05 0630, etc.) That is not older than two years. (Knowledge of safety regulations verifies a person with higher qualifications in welding, for example. Welding Technologist).
- When welding on mechanized and automated welding establishments that carry their programming and configuration and performance have included work in the employment contract by the employer. (These persons must demonstrably control the operation of the welding equipment.)

Force welding license and certificate of welding worker

- *Welding authorization is valid for a welder can perform with your employer welding work, if:*

a) *Valid according to the relevant test series EN 287, EN 1418, corporate and other regulations applicable (CD etc.), if this test is required for welding;*

b) *Confirmation authorized welding technologist (in charge of welding supervision according to EN 719) with additional training and examination of safety regulations (CSN 05 0601, CSN 05 0610, DIN 05 630, etc.) that is not older than two years;*

c) *A valid certificate of medical fitness (medical examinations are conducted at least once every five years; for persons over 50 years, at least once every three years);*

d) *Employer's confirmation that the employee received for the performance of welding works (just confirmation of the employer in welding certificate, if necessary. Welding worker in the license).*

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Danger Welding

- Protection against electric shock
- Exclude worker contact with live parts of the device, which have a higher voltage than the voltage safe. (Welder operates mostly in hazardous environments, where there may be an AC voltage into a 25 V DC to 60 V - CSN 33 2000-4-41-NK).
- In case of danger of electrocution workers must be on the welding workplace demonstrably familiar with first aid for electric shock. Workers who will be familiar, the supervisor of the operation. These workers must be able to discern the effects of electric shock. They must be able to give artificial respiration to restore cardiac activity.
- In an enclosed space using a portable tool, respectively. portable lamp only if they are supplied with safe voltage (SELV). Safety protective transformer must be outside the enclosed space.
- Do not use welding equipment with impaired sealing the cooling circuit.

SCRIGROUP. Všeobecné zásady bezpečnosti. *Scrigroup.com* [online]. ©2014 [cit. 2014-02-20]. Dostupné z: http://www.scrigroup.com/limba/ceha-slovaca/51/VEOBECN-ZSADY-BEZPENOSTI-spole53749.php

Protection against moving parts of equipment

- If the automated welding equipment in use, do not enter into the handling area.

Protection against burning

- Always use the prescribed protective equipment for welding works (see CSN 05 0601, Annex A.)
- Remove from welding workplaces flammable substances and check whether the avoidance of fire or explosion.
- Protective equipment we use always When moving weldments that are hot and include mainly gloves, pliers etc.

Protection against spatter and slag fragments

- Always use the prescribed protective equipment for welding works (See. CSN 05 0601, Annex A.)
- Eye protection is provided by glasses, possibly with side shields are used mainly during inspections of welds and cleaning.

Health hazard flue fumes

- One serious risk factors of welding smoke exhaust emission in metallurgical and physical chemical reactions taking place at high temperatures.
- Fumes are made of condensed metal vapors, aerosols and various gases and dust particles.
- Contain toxic substances during long-term inhalation leads to intoxication of the organism and various pathological changes.

The nature and amount of emitted smoke fumes depends on:

a) modify the chemical composition of the base material (metal and plastic protective coatings and protective coatings based Cr, Pb, Ni, Cd, Zn, Al)

b) The type and chemical composition of the additive material (the second wire, electrodes, solders, flux for welding and brazing)

c) Technology of welding and cutting (method of welding and thermal cutting, types of gases used)

d) Welding and cutting parameters (maximum height operating temperature).

To limit the concentration of harmful substances, various symbols have the following meanings:

- STEL - maximum allowable pollutant concentration effective for working environment during 8 hours of work time ($mg.m^{-3}$)
- NPK-H - breakpoints within 30 minutes. The concentration of pollutants must not exceed a specified value.

In foreign literature meet with other abbreviations:

- TLV-STEL - (Threshold limit value - Short term exposure limit) - pollutant concentration within 15 minutes must not exceed a specified limit.
- TLV-TWA - concentration, which may not be exceeded during 8 hours of working time during the 40-hour weekly working time. TLV-TWA is equal to the OEL. In English literature is still used and the term OEL (Occupational Exposure Limit), which is a TLV-TWA virtually identical.
- TLV - C (Threshold limit value - Ceiling) - the concentration of pollutants should not exceed the limit the whole time working.
- MAK - (Maximal Arbeitsplatzkonzentration) - the highest concentration of pollutants at the workplace.
- TRK - (Technische Richtkonzentration) - the concentration of substances with carcinogenic effect, which must not be exceeded.

Threats to health damaging effects of radiation

- During welding, the arc generated radiation infrared (heat), visible, and ultraviolet.
- All staff at the welding work must be protected OP, which is the standard CSN 05 0,601th
- People around the welding work are protected by screens, curtains, covers, curtains.
  - For disposition of screens around the welding department is responsible welder.
  - Screens are made of non-combustible material or material that is difficult to burn.
  - On we place the welding workplace noise sources outside the workplace. From the harmful effects of noise must be protected worker personal protective equipment.

Welders for the welding work protect:

- Agents against propagation of heat by radiation (e.g. screens)
- With suitable clothing.

Safety during arc welding of metals - CSN 05 0630

- Selection of the CSN 05 0630
- These precautions apply to the operation, setup, programming, maintenance and repair of equipment for arc welding and welding of metals, electro welding (electroslag welding does not use electric arc, but is subject to the following safety measures), gouging and heat splitting arc (eg. plasma cutting) regardless of the degree of automation, hereinafter referred to as arc welding.

SCRIGROUP. Bezpečnost při obloukovém svařování. *Scigroup.cz* [online]. ©2014 [cit. 2014-02-20]. Dostupné z: http://www.scrigroup.com/limba/ceha-slovaca/51/BEZPENOST-PI-OBLOUKOVM-SVAOVN-34482.php

The operation of welding equipment

- Connecting the welding equipment to the power grid
- Arc welding may be connected to the electricity network to connection points (sockets) designed or certified operator. Welders for connecting to the electrical system applies CSN 33 2000-4-41, ČSN 33 2000-4-46.
- Before inserting the mains plug into the socket must welder checked for socket and plug damaged, if not damaged insulation on leads and wires for welding current and their couplings that are tightened terminals on terminal arc welder that is not associated circuit between the conductors welding current, whether or not a circuit directly coupled to the housing (frame), and whether the welding is welding or sealing device is turned off.
- Before putting into operation welder welder must be inspected for damage to the insulation of the electrode holder or welding torch and welding seem clamp mounted as close as possible to the welding point.
- When you leave your workplace welder must ensure switching off the power source, or the source of disconnect from the mains.

SCRIGROUP. Bezpečnost při obloukovém svařování. *Scigroup.cz* [online]. ©2014 [cit. 2014-02-20]. Dostupné z: http://www.scrigroup.com/limba/ceha-slovaca/51/BEZPENOST-PI-OBLOUKOVM-SVAOVN-34482.php

Connection of the welding wire

- Welding equipment switched off. Another principle is to place a welding clamp close as possible to the weld.
- The welding wire must be completely electrically conductively connected with the welding object (desk, a clamp positioner).
- Welding wire must be connected in such a way to avoid accidental contact with the welding output terminals.
- Taking the replacement of the welding wire various metal objects, part of the structure, rails, rods sectional steel chains, steel cables or other conductors nepředepsanými.
- It is forbidden to cool the electrode holder in water because of the risk of an accident at work.
- Exchange electrode welder must be carried out in gloves that meet all safety precautions.

Welding wire

- Duty welder's daily inspection of welding wires - if not broken, the survey carried out by a welder before it starts to weld.
- Welding wires must be kept dry, if possible, and protect against grease and corrosive substances.
- Yippee expressly prohibited welding wires of turns around the human body.

Questions to ponder

1. What personal protective equipment used by welder for manual arc welding?
2. They weld arc pupils of secondary vocational schools or colleges?
3. How often is it necessary to carry out medical examinations for welders?
4. What radiation generated by arc welding?
5. Explain Work with increased risk.
6. Who issued the order for the execution of the work increased hazard?
7. What are the duties of a welder before welding operation?
8. What are the principles of protection against electric shock?

Recommended literature and information sources

- ČSN 05 0630 Bezpečnostní ustanovení pro obloukové svařování kovů. Praha: Český normalizační institut, 1999. Třídící znak 050630.
- ČSN EN 60974-1-ed.3. Zařízení pro obloukové svařování – Část 1: Zdroje svařovacího proudu. Praha: Český normalizační institut, 2006. Třídící znak 052205.
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Recommended literature and information sources

- CSN 05 0630 Safety requirements for arc welding. Prague: Czech Standards Institute, 1999. Sorting sign 050,630th
- IEC 60974-1-ed.3. Arc welding equipment - Part 1: Sources of welding current. Prague: Czech Standards Institute, 2006. Sorting sign 052,205th
- SCRIGROUP. Safety during arc welding. Scigroup.cz [online]. © 2014 [cit. 20.02.2014]. Available from: http://www.scrigroup.com/limba/ceha-slovaca/51/BEZPENOST-PI-OBLOUKOVM-SVAOVN-34482.php
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- Ministry of Interior Decree no. 87/2000 Coll., Laying down the conditions of fire safety in welding and heating bitumen in the melting pots. Praha: 2000. Also available from: http: //multimedia.ebozp.cz/document/get/eb2415fc20fb45e146a55d6c6e7ca9d78bff7448