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LABOR PROTECTION MEASURES AT THE WELDING SITE

Annotation. Welding production is harmful to the human body, as accompanied by the release of heat energy release into the air of dust and gas.

Most harmful substances during welding work – it oxides of manganese and silicon containing 40% and 18% of all of the dust, respectively. Once in the body, a manganese compound can disrupt the lung, the liver and the blood system. Silicon oxides, respirable man also violate all the work of many organs and harmful chromium compounds and zinc evolved, albeit in smaller quantities during welding.

Fight dust can be by continuous ventilation rooms where welding, use and specialized protective equipment. But harmful substances during welding, which can not cope airing.

Effectively deal with harmful substances during welding work can be just the right organization of the working process. You must use all modern means of individual protection and the right to organize the industrial process.

Personal protective equipment should always be used along with the general means of protection and safety measures, not instead of them. Means to protect your face and eyes. Each welder when welding to protect your face and eyes from the action of light radiation of the arc, heat, ultraviolet rays should be provided with a mask or shield, preferably with automatic anti-dazzle screen LCD or conventional filter. Avoid falling slag and other small particles in the eye welder can, if it is to remove shield, mask or goggles while leaning forward, eyes closed.

Keywords: welding production, harmful substances, ventilation, air exchange, aerosol, personal protective equipments, industrials dust, volume of atmosphere air, maximum permissible concentration.

Тірек сөздер: дәнекерлеу өндірісі, зиянды заттар, желдету, ауа алмасу, аэрозоль, жеке қорғаныс құралдары, өндірістік шаң, атмосфералық ауа көлемі, шекті рұқсат етілген концентрация.

Ключевые слова: сварочное производство, вредные вещества, вентиляция, обмен воздуха, аэрозоль, средства индивидуальной защиты, объем атмосферного воздуха, предельно-допустимая концентрация.

Introduction. Welding works are accompanied by air pollution of the working area of welding fumes, which consists of various metal oxides and gases that are harmful to the human body. Manganese oxides formed during arc welding and surfacing of steels containing manganese or performing these works manganese containing materials. Entering the human body through the respiratory or digestive system, cause chronic manganese oxides and at high concentrations - and acute poisoning affects the central nervous system, causing changes in the lungs and liver.

Welding production is harmful to the human body, as accompanied by the release of heat energy release into the air of dust and gas.

Most harmful substances during welding work – it oxides of manganese and silicon containing 40% and 18% of all of the dust, respectively. Once in the body, a manganese compound can disrupt the lung, the liver and the blood system. Silicon oxides, respirable man also violate all the work of many organs and harmful chromium compounds and zinc evolved, albeit in smaller quantities during welding.

Characteristic symptoms of poisoning: headache, dizziness, heartburn, pain in the limbs. Chromium oxides formed during arc welding and surfacing of austenitic steel welding electrodes. In low concentrations of chromium oxides irritate the mucous membranes of the nose, causing a runny nose, slight bleeding; with increasing concentration observed necrosis of individual sections of the nasal mucosa, its expression of cartilage and even perforation of the nasal septum. Poisoning usually characterized by headaches, general weakness, a tendency to inflammation of the gastrointestinal tract, toxic jaundice.

The silica is in substantial quantities in the aerosol of arc spray, due to the presence of silicon and its compounds in the electrode coating in the applied flux, etc. Silica has a detrimental effect on the respiratory system, causing a specific disease - silicosis. The most characteristic symptoms of silicosis - shortness of breath, chest pain, dry cough.

Gassed and fumes. Fume released during welding - a mixture of very small particles and gases. Most components of the smoke produced during welding: chromium, nickel, arsenic, asbestos, manganese,

silicon, beryllium, cadmium, oxides of nitrogen, fluorine compounds, carbon monoxide, cobalt, copper, lead, ozone, selenium, and zinc are be extremely toxic.

Fumes and gases during welding consist of the following components:

– particles welded base material or filler metal used;

– particle coatings and paints for the welded metal products, or coating of electrodes;

– shielding gases; products of chemical reactions due to exposure to ultraviolet radiation arc and the heat released;

– components used consumables;

– contaminants in the air, for example a pair of cleaning and degreasing agents excessive smokiness can cause short-term and long-term negative impact on the health of workers.

Short-term (acute pronounced) negative impact on the health of staff. Some fume components (zinc, magnesium, copper and copper oxide) may cause fever. The main symptoms of fever, including fever, thirst, fever, muscle pain and chest, coughing, shortness of breath, fatigue, nausea, and a metallic taste in the mouth may occur after 4012 hours of exposure.

Fume also irritates the eyes, nasal mucosa, respiratory tract, causing coughing, wheezing, bronchitis, pulmonary edema (fluid accumulation in the lungs) and pneumonitis (lung inflammation). Gastro-intestinal disorders: nausea, loss of appetite, vomiting, cramps, and slow digestion also associated with welding.

Gases released during welding can also be extremely dangerous. For example, as a result of exposure to ultraviolet radiation arc oxygen and nitrogen in the air, react chemically to form ozone and nitrogen oxides. These gases are lethal in large doses, but in small can cause irritation of the mucous membranes of the nose and throat and severe respiratory, pulmonary diseases.

Calculation of necessary air for the welding production

Calculation 1. Consider necessary air for welding. The welding portion is made of welded parts potholder semiautomatic without gas protection and automatic welding in CO; We are calculating the airflow for general ventilation for 1 kg of consumable welding materials and the entire volume of welding, if the area of welding materials consumed 1 kg/h at tack and 20 kg/h of welding. Specific emissions of harmful impurities in the table.

The release of harmful substances during welding (g of substance per 1 kg of consumables materials)

Kind of welding	Welding aerosol						
	Total	Including					
		Mn oxides	Cr oxides	SiO_2	CO	HF (hydrogen fluoride)	$N0_2$
Automatic and semi-automatic welding steel with no protection	7.5-14.4	0.2-2.2	–	–	–	0.1-2.7	0.8
In media CO_2	4.4-15.0	0.14-0.8	0.02-1.0	1.9	2-14	–	0.8

Decision

1. Because of the aerosol includes iron oxide doped with manganese and fluoride accept, according to GOST 12.1.005-88 $MPC_1 = 4$ mg/m^3, hazard class - 4.

2. Necessary air for 1 kg of consumables on tack:

$$L_1 = \frac{G \cdot 1000}{MPC_1} = \frac{14.4 \cdot 1000}{4} = 3600 m^3 / kg$$

Check for nitrogen dioxide (MPC = 5 mg/m^3):

$$L_{NO2} = \frac{G_{NO2} \cdot 1000}{MPC} = \frac{0.8 \cdot 1000}{5} = 160 m^3 / kg$$

Accept air exchange by aerosol.

3. Calculation of air exchange per 1 kg of consumable welding materials. Necessary air exchange for aerosol iron oxide doped with manganese compounds ($MPC_2 = 6$ mg/m^3):

$$L_2 = \frac{G \cdot 1000}{MPC_2} = \frac{15.0 \cdot 1000}{6} = 2500 m^3 / kg$$

Verify air exchange on silica (MPC = 1 mg/m^3) and carbon monoxide (MPC$_3$ = 20 mg/m^3):

$$L_{SiO2} = \frac{G_{SiO2} \cdot 1000}{MPC} = \frac{1.9 \cdot 1000}{1} = 1900 m^3 / kg$$

$$L_{CO} = \frac{G_{CO} \cdot 1000}{MPC_3} = \frac{1.4 \cdot 1000}{20} = 700 m^3 / kg$$

Assume for air exchange aerosol 2500 m^3/kg. If consumed on a plot of 1 kg/h materials tack and 20 kg/h by welding necessary air:

$$L = L_1 \cdot 1 + L_2 \cdot 20 = 3600 \cdot 1 + 2500 \cdot 20 = 53600 m^3 / h$$

4. Amount of aerosol is emitted into the atmosphere with the ventilation air for a shifts, i.e. 8:00 hours:

$$G_a = (L_1 \cdot MPC_1 + L_2 \cdot 20 \cdot MPC_2) \cdot 8 = (3600 \cdot 4 + 2500 \cdot 20 \cdot 6) \cdot 8 = 2515200 mg = 2.515 kg$$

5. The volume of atmosphere air polluting aerosol specified:

$$L_a = \frac{G_a}{MPC_{md}} = \frac{2515200}{0.15} = 16\ 768\ 000\ \text{m}^3,$$

where MPC – maximum permissible medium daily concentration of non-toxic dust in the air settlements MPC$_{md}$ = 0.15 mg/m^3.

If the specified aerosol spread in a layer up to 15 m, i.e., up to a height of aeration lanterns, it will occupy square:

$$F = \frac{L_a}{H} = \frac{16768000}{15} = 1117867 m^2 = 1.1 km^2$$

If aerosol spread downwind strip B = 100m, in this band will be contaminated atmosphere to the MPC at a distance from the welding area:

$$L = \frac{F}{B} = \frac{1.1}{0.1} = 11 km$$

Calculation 2. We were calculated the amount of air needed for transporting shavings in dust shavings sucking off device. Workpiece material - iron; number of shavings generated from the workpiece, G$_s$ = 10 kg/h, the temperature of the mixture conveyed t = 20°C.

Decision

1. The amount of air required for the continuous removal of the dust and shavings from the cutting tool:

$$G_a = \frac{G_s}{\mu} = \frac{10}{1} = 10 kg / h$$

where μ – mass concentration of the mixture, take μ = 1 kg/kg of air.

2. Necessary for transporting shavings air volume:

$$L_a = \frac{G_a}{\rho_a} = \frac{10}{1.2} = 8.33 m^3 / h$$

where ρ$_a$ – air density at t = 20°C, take ρ$_a$ = 1.2 kg/m^3.

Discussion. Any dust emissions (transportation, enterprises, wind blowing the dust) will lead to an increase in dust content in this band above permissible concentrations.

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Резюме

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ДӘНЕКЕРЛЕУ ОРЫНДАРЫНДАҒЫ ЕҢБЕК ҚОРҒАУ БОЙЫНША ІС-ШАРАЛАР

Дәнекерлеу жұмыстары кезіндегі ең зиянды заттар қатарына – шаңның барлық бөлшектерінің 40% және 18% құрайтын марганец тотықтары және кремний жатады.

Марганец ағзаға ену арқылы тыныс жолдарын, өкпе жолдары, бауыр және қантамырлары жүйесінің жұмысын бұзуы мүмкін. Тыныс жолдарымен жұтылған кремний тотықтары адамның барлық ағзасының жұмысын нашарлатады, сонымен қатар дәнекерлеу кезінде аз шамада бөлінетін хром және цинк қосылыстары да зиянды болып табылады.

Жұмыста дәнекерлеу жұмыстары кезіндегі еңбек қорғау мәселелері қарастырылды. Жұмысшылардың жұмысқа деген қабілеттіліктерін арттыру мақсатында еңбек қорғау бойынша негізгі іс-шаралар ұсынылды, сонымен қатар жұмыс аймағында ауа алмасу (желдету жұмыстары) бойынша инженерлік есептер келтірілген.

Тірек сөздер: дәнекерлеу өндірісі, зиянды заттар, желдету, ауа алмасу, аэрозоль, жеке қорғаныс құралдары, өндірістік шаң, атмосфералық ауа көлемі, шекті рұқсат етілген концентрация.

Резюме

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МЕРОПРИЯТИЯ ПО ОХРАНЕ ТРУДА НА СВАРОЧНОМ УЧАСТКЕ

Самые вредные вещества при сварочных работах – это оксиды марганца и кремния, составляющие 40% и 18% от всей части пыли соответственно. Попадая в организм, соединения марганца способны вызывать поражение ЦНС, нарушить работу легких, печени и кровеносной системы. Оксиды кремния, вдыхаемые человеком, также нарушают работу всех многих органов, вредны и соединения хрома и цинка, выделяющиеся, правда, в меньших количествах при сварке.

В работе рассмотрены вопросы по охране труда при сварочных работах. Представлены основные мероприятия по охране труда для улучшения работоспособности работников, а также приведены некоторые инженерные расчеты по воздухообмену (вентиляционные работы) на рабочем зоне.

Ключевые слова: сварочное производство, вредные вещества, вентиляция, обмен воздуха, аэрозоль, средства индивидуальной защиты, объем атмосферного воздуха, предельно-допустимая концентрация.

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