

Fumes and Welding Guide

Safe working with thick-walled steel tube

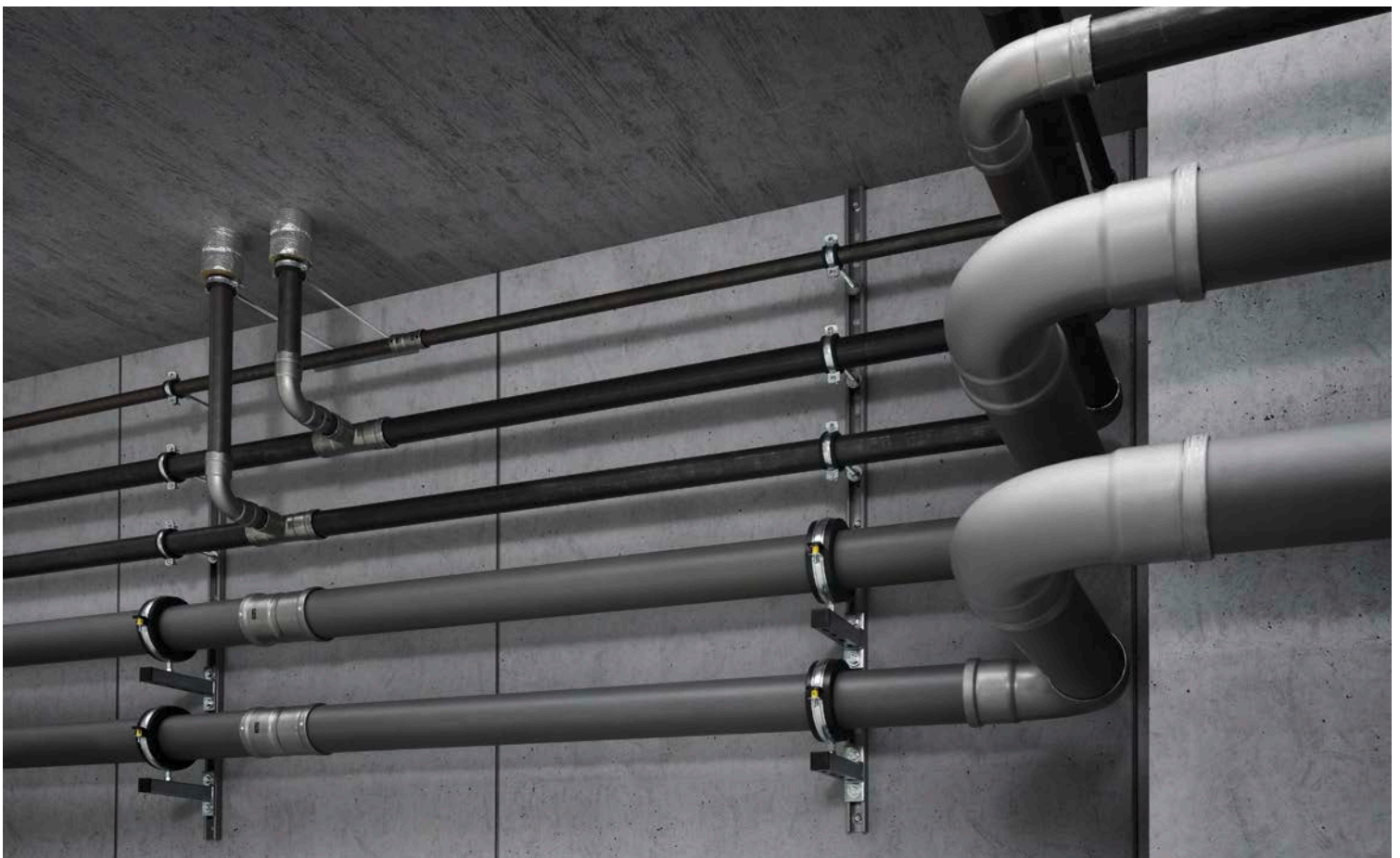
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SAFE WORKING WITH THICK-WALLED STEEL TUBE

The pipework connection methods that have traditionally been preferred, such as welding can present a number of safety issues, especially in light of new evidence that confirms a link between exposure to welding fumes and cancer. This guide outlines the changes in the regulations and what is now required where welding is carried out. It also looks at how this hazard can be eliminated.



There are a number of applications where thick-walled steel tube is the preferred material due to its enhanced durability. In public sector environments such as educational and healthcare facilities, the robust 2.6 to 5.4 mm wall thickness of the tube is considered an important benefit for heating and cooling systems. Similarly, the longer system life expectancy is crucial for heritage properties where any leaks in the system have the potential to cause serious and costly damage. Heavyweight steel tube is also

frequently preferred for fire suppression applications to help ensure the integrity of sprinkler systems.

However, installation using traditional methods such as welding and threading is time consuming and can present a number of challenges. This is particularly true with regard to health and safety. Adding a thread to the tube often involves machinery that can present a hazard as well as the need to use lubricating oil in the process that

must be managed correctly to prevent accidents.

Welding poses a risk not only from the welding equipment itself but from the heated metal once the weld is complete. In addition, while welding fumes have long been understood to be dangerous, new evidence has revealed the full extent of the health and safety risks, including the potential carcinogenic effects.

Carcinogenic impact of welding fumes

The International Agency for Research on Cancer (IARC) has found evidence that welding fumes from metals including mild, stainless and galvanised steel can cause lung cancer and may also be linked to kidney cancer. As such welding fumes have been reclassified as a human carcinogen and the Health and Safety Executive (HSE) has released new guidance on safe working practices. It has also strengthened its enforcement expectation anywhere welding is carried out.



Before the regulations changed, businesses had to evaluate the risk to their employees and determine the correct method of mitigating the hazard. It was the duty of the person responsible for the health and safety to assess the risk based on factors such as the type and concentration of the welding fumes, the length of exposure and the environment in which the work was taking place. They would then determine the necessary control measures and how they should be implemented.

However, with the fumes classified as carcinogenic the updated regulations state that there is no safe level of exposure to the fumes. Therefore, anyone welding or in the area of welding needs to be fully protected regardless of the duration. The regulations require suitable engineering controls, such as Local Extract Ventilation (LEV), to be implemented and supplemented with Respiratory Protective Equipment (RPE) where the engineering controls do not adequately control exposure. This includes welding outdoors where RPE must now always be used.

What are the risks?

Welding fumes contain a combination of different gases and particles that enter the air as a result of heating the metal and vaporising a small amount of the material. The type of metal as well as the coating or treatment applied to it will influence the specific compounds and chemicals that the user is exposed to.

The wide ranging health impacts of exposure to welding fumes is well established. The immediate effects include irritation of the throat and lungs as well as the flu-like symptoms of the condition known as metal fume fever, which is caused by the inhalation of gases from hot metal processes. Those who are exposed to the fumes frequently or for longer periods of time can experience reduced lung function and are more susceptible to respiratory infections and developing asthma. Manganese is also present in the welding fumes from mild-steel. Excessive exposure to manganese can cause permanent neurological effects that present in a similar way to Parkinson's disease with tremors and movement issues.

There has also been growing evidence of the link between welding fumes and cancer, especially of the lungs and throat. This has been confirmed by the International Agency for Research on Cancer's study and led directly to the update in HSE guidance and the requirement for more robust protection for those welding in the course of their work.

Employers responsibilities

Following the change in the regulations, general ventilation is no longer acceptable as a control method for welding fumes, regardless of circumstances. Where any welding is carried out there must be engineering controls such as LEV in place. This is most commonly in the form of on-tool extraction, a capture hood or high

vacuum nozzle, all of which create an airflow that extracts the fumes from the source to prevent inhalation. This should also be supplemented by the use of RPE to protect the user from the residual fumes. All RPE is given an Assigned Protection Factor (APF) that indicates the level of protection it provides when used correctly. The number indicates the factor reduction in the user's exposure. Based on the nature of the materials in welding fumes the HSE stipulates a minimum APF of 20 for RPE.

This means employers, regardless of size or sector, must ensure that a suitable engineering control (LEV) is in place and provide the correct RPE where this is not sufficient ventilation. Employees must also be fully trained in the correct use of the LEV and RPE and understand the importance of doing so. It is down to the business to ensure that the measures they put in place are adequate to protect their employees. A failure to do so could result in enforcement action by the HSE. For plumbing and building service businesses this means that mobile LEV units have to be utilised throughout the installation when welding is the preferred pipework connection method. This can be extremely challenging in installation areas where space is limited or access is difficult, especially as the fumes must be vented outside of the building envelope. In these situations, a higher grade of RPE must be used by the operative and anyone in the area to ensure the necessary level of protection is achieved.

Eliminating the risk

The new evidence on the impact of the fumes and the resulting changes in the HSE guidance has ensured greater protection and made work safer where welding is required. However, looking for a way to eliminate this risk wherever possible can help to improve safety further. Removing the hazard also means that the cost of additional safety equipment and the time consuming setup is also no longer necessary.

Changing the installation method is a simple way to do this. Advances in press connection systems mean that it is a suitable alternative to welded and threaded tube, even on larger diameter pipe up to four inches. Press connections do not require a heat source or the use of oils or chemicals during installation. Installers simply need to cut the tube to size, deburr the cut surface, slide the press fitting onto the tube and press the connection. Not only does this remove the health hazards of heat, fumes and chemicals but also reduces the risk of fire or accidental damage. Installation is also quicker compared to both welding and threading tube. Press connections can achieve a up to 60% reduction in installation time for sizes up to two inches and as much as 80% for larger diameter tube. In a test conducted by BSRIA that included various sizes of tube and connection methods, Viega's Megapress delivered the fastest installation and achieved a 78% time saving compared with welding.



The growing evidence of the dangers of inhaling welding fumes means that increasingly robust methods are required to protect human health. While the hazards of using welding for pipework installation have always been managed, press connections now provide an alternative that eliminates the commonly accepted risks while improving productivity and lowering costs.

To find out more about press connection technology, including Viega's Megapress range visit www.viega.co.uk.



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