Tata Steel Strip Products UK

Standard Document

A Standard for the Management of Exposure to Welding and Cutting Fume

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THE MANAGEMENT OF EXPOSURE TO WELDING & CUTTING FUME

POLICY

1. Introduction

Tata Steel Strip Products (UK) Safety Health and Environment (SHE) Department is committed to providing all employees and contractors with effective health and safety advice and guidance in relation to business standards, codes of practice and legislative requirements.

The purpose of this Standard is to set out a clear direction for Tata Steel Strip Products (UK) (TSSP UK) to follow on the risk of exposure to welding and cutting fume and its control, in response to recent enforcement changes announced by the Health & Safety Executive (HSE).

This Standard sets out actions that are required on TSSP UK sites in order to protect the health of our welders and co-workers, by the best means possible and to raise our standards to meet the HSE's expectations.

Tables 1 & 2 of this Standard depict a quick reference, ready reckoner for the requirements of indoor and outdoor welding activities, respectively.

1.1 IARC Reclassification

As a result of the International Agency for Research Into Cancer (IARC) concluding that there is sufficient new evidence to declare that all forms of welding fume (including stainless steel and mild steel) can cause cancer, welding fumes has been reclassified as a Group 1 human carcinogen.

1.2 HSE Safety Alert Bulletin

In February 2019, the Health & Safety Executive (HSE) issued a Safety Alert bulletin to inform industry that there will be a strengthening of their enforcement action, under those provisions for carcinogens in COSHH Regulation 7, with immediate effect. As there is no safe level of exposure, this enhanced enforcement means that any welding undertaken without suitable exposure control measures is no longer acceptable, regardless of welding duration.

The bulletin states that natural ventilation in workshops, production bays and even outdoors cannot achieve the necessary level of control and Local Exhaust Ventilation (LEV) is required to be used for ***all*** indoor welding tasks. Where such LEV does not effectively capture all fume, suitable and adequate Respiratory Protective Equipment (RPE) is ***also required*** to protect against residual fume. RPE is ***required*** *for all* outdoor welding.

2. Scope

The IARC classification and HSE's enforcement protocol covers all types of welding fume. Allied processes such as cutting are not included in the IARC reclassification. However, the HSE have deemed that such processes present similar risks and as a consequence, demand similar controls and subsequently, are subject to similar enforcement. Therefore, as a prudent assumption of risk and in anticipation of similar enforcement, this Standard has been extended to include all welding and allied processes (including cutting) which generate fume for dispersal into the breathing zone of the operator and into the workplace atmosphere.

3. Welding & Allied Processes

Welding is the joining of metals by heat or by pressure or both. It is normally achieved using an air/fuel gas or oxygen/fuel gas flame or an electric arc. The term is generally accepted to mean electric arc processes - manual metal arc welding (MMA), metal inert gas (MIG) welding, tungsten inert gas (TIG) welding.

3.1 Allied Processes

Gas or oxy-fuel welding applies a flame from burning a gas to the metal at a joint to be welded. Brazing (or gas welding), soldering, laser cutting, flame cutting, gas cutting are allied processes that are also included in this Standard. The HSE have deemed that such processes such as cutting, present similar risks and as a consequence demand similar controls and subsequently, are subject to similar enforcement.

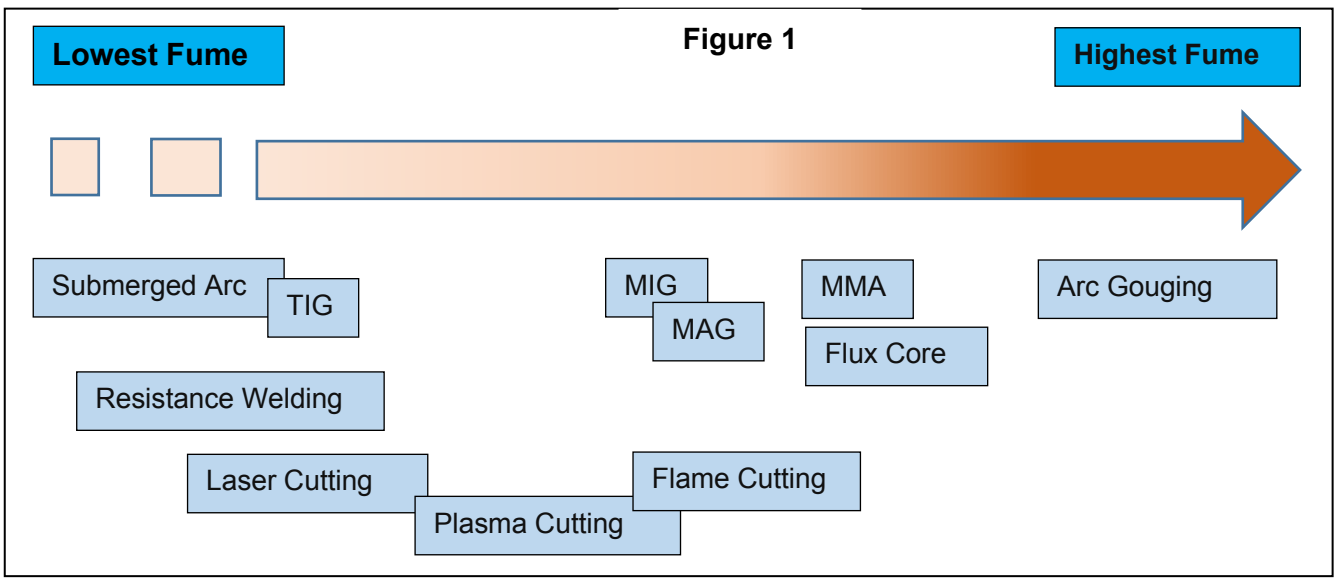
4. Welding Fume

Welding fume is the fume given off by welding and allied processes. It is a complex mixture of very fine particulate and gases. The most visible part of the fume consists mainly of particles of condensed metals/metal oxides derived from the substrate material, any coating it may have, the consumable used and flux (if used).

Welding Type – Metallic and Other Elements Present in Fume as Oxides			
MMA (mild steel)	MMA (stainless steel)	MIG (mild steel)	MIG (stainless steel)
Fe	Fe	Fe	Fe
Mn Co	Mn Co	Mn Co	Mn Co
Si Na K	Ca Na K		Cr Ni
Al Mg	Al Mg		
Ca	F		
F	Cr Ni		

Gases that may be present in welding fume are nitrous oxides (NO_x) - including nitrogen dioxide (NO_2) and nitrous oxide (NO) - carbon dioxide (CO_2) carbon monoxide (CO), shielding gases argon (Ar), Helium (He) and Ozone (O_3) formed between oxygen and the arc.

Figure 1 below illustrates the increasing order of fume generated by the various types of welding and allied processes.



Welding of galvanised material contains large amounts of zinc oxide in the fume – as much as 50-70% of the total.

In allied processes, it is mainly the particulate fume which is the greater hazard as the gaseous component is not normally present in significant amounts. Particulate fume is emitted as metal oxides of varying composition, depending on materials used, surface contamination debris and surface coatings.

Gas cutting or oxy-fuel cutting – is often considered less hazardous than traditional welding. However, most or all of the hazards of welding still exist. The originating plume may be more dispersed making fume capture a greater challenge.

5. Health Hazards Associated with Welding Fume

It has long been understood that inhalation of welding fume can cause a range of respiratory ill-health effects, even before the most recent IARC reclassification. In the short-term, welders may experience flu like symptoms (metal fume fever) after welding galvanised metals, as well as mild steel.

Longer term, welders are more prone to lung infections (that can, in some cases lead to pneumonia), irritation of the whole respiratory system and reduced lung function in the form of chronic obstructive pulmonary disease (COPD).

Adverse health effects from prolonged and repeated exposure to manganese (present in mild steel welding fume) may include neurological effects similar to Parkinson's disease. A recent reduction in the Workplace Exposure Limits (WEL) for manganese is likely to be an additional driver for control of welding fume, due to the requirement to reduce exposure to as low as reasonably practicable.

Welding stainless steel in particular can produce hexavalent chromium which is a lung carcinogen. Stainless steel fume may also contain chromium oxide and nickel oxide – both of which can cause asthma. Iron is present in most forms of welding fume and may cause siderosis, which is the benign deposition of iron oxides in lung tissue.

6. Risk Factors

The risk of exposure to the hazardous fume generated by welding and allied processes depends upon certain factors:

- The type of welding or allied process undertaken;
- The voltage and currents used;
- The concentration and composition of the fume;
- The substrate metal being worked on and the consumable composition;
- The frequency and duration of welding – torch time;
- The level of training and experience possessed by the welder;
- The location of welding point in relation to natural or local exhaust ventilation;
- The arrangement of the workpiece and restriction of work space;
- The proximity of the welder to the arc and the breathing zone to the rising plume;
- The existence and effectiveness of existing control measures in place, in particular LEV and RPE.

7. General Legislation

The general duties in current health and safety legislation, which are relevant to the health risks associated welding fume, include the:-

- Health and Safety at Work etc Act 1974;
- Control of Substances Hazardous to Health (COSHH) Regulations 2002 (as amended);
- Control of Lead at Work (CLAW) Regulations 2002;
- Management of Health and Safety at Work Regulations 1999;
- Workplace (Health, Safety and Welfare) Regulations 1992;
- Personal Protective Equipment (Enforcement) Regulations 2018.

ORGANISATION

8. Responsibilities Within Tata Steel Strip Products (UK)

8.1 Works Manager (or equivalent)

The overall responsibility for securing compliance with this Standard and implementation with those requirements outlined for the specified welding scenarios, rests with the Works Manager (or equivalent). This responsibility involves ensuring that:-

- the extent of welding fume exposure is established in their area by identifying welding operations undertaken by Tata Steel employees and relevant contractors;
- a suitable and sufficient assessment of the risk of welding fume exposure is undertaken, in accordance with the COSHH Regulation 2002 (as amended);
- the application of exposure reduction is prioritised by applying the hierarchy of control;
- action plans are drawn up to control and monitor risks by implementing measures which reduce the levels of welding fume to as low as is reasonably practicable;
- relevant information, instruction and training is provided to all Tata Steel employees and relevant contractors in their area;
- the Occupational Health Department is notified of persons identified as being exposed to welding fume and arranging for suitable health surveillance to be carried out;
- relevant welding processes where Biological Monitoring is appropriate are identified;
- exposure risks are reviewed on an regular basis as governed by the COSHH process.

8.2 Head of Health, Safety & Environment (SHE), TSSP UK

The Head of Health, Safety & Environment (SHE), TSSP UK will be responsible for:-

- ensuring the necessary competence when detailed Industrial Hygiene monitoring is requisite, as specified by a suitable and sufficient assessment;
- providing guidance on the implementation control measures, including RPE;
- maintaining a competent resource for the provision of Face Fit Testing of individuals for those occasions when face-seal RPE needs to be worn.

The Health and Safety Department will also keep abreast of developments in legislation and HSE Guidance and inform others, with responsibilities outlined in this Standard, of those developments.

8.3 Industrial Hygiene & Workplace Assessment Department

The Industrial Hygiene & Workplace Department is responsible for:

- detailed assessment involving exposure measurement when deemed requisite by suitable and sufficient risk assessments;
- competent guidance on appropriate control measures and;
- Face Fit Testing of individuals for those occasions when face-seal RPE needs to be worn.

8.4 Occupational Health Department

The Occupational Health Department will be responsible for:

- implementing the health surveillance programme;
- undertaking the Biological Monitoring process as deemed relevant;
- feeding back the results of health surveillance and biological monitoring to employees and managers.

8.5 Team Leaders and other Supervisory Roles

When required, Team Leaders and those in supervisory capacities are required to deliver a Welding Fume Toolbox Talk to all Tata Steel employees and relevant contractors identified as potentially at risk in their area of responsibility. The Toolbox Talk will provide information on the control systems available for welders and associated workers and how using them will help manage their exposure.

8.6 Tata Steel Employees and Contractors

Employees and contractors have a duty to:-

- take care of their own health and safety and the health and safety of others;
- be involved in the assessment and selection of control measures;
- carry out welding and associated tasks in accordance with the Safe Working Procedures;
- comply with health surveillance requirements;
- respect and utilise control measures designed to reduce exposure to welding fume;
- reporting any defects to the LEV systems deployed, RPE issued and any conditions or events which may result in a risk to health.

PLANNING

9. Risk Assessment

Tata Steel Strip Products (UK) shall assess the risk of exposure to welding fume as required by the COSHH Regulations and implement controls as appropriate to those Regulations and the requirements outlined in this Standard.

10. Required Actions for Compliance on TSSP UK Sites

In order to protect the health of our welders and co-workers, by the best means possible and to raise our standards to meet the HSE's expectations, the following actions are required on Tata Steel Strip Products (TSP) sites:-

- In all cases of welding, it should be ensured that the hierarchy of control is followed in conjunction with application of the new enforcement requirements;
- It should be ensured that appropriate controls are provided and used for ***all*** welding activities, irrelevant of duration, ***including*** outdoor welding;
- Where control facilities are lacking, or being introduced in response to this Standard, the hierarchy of control, in conjunction with the processes outlined in figure 1, should be used to ensure that those frequently used, high risk process are prioritised;
- Application of the control principles outline below, allows workers occupying common areas of the workshop or indoor production bays, to operate at a low level of exposure risk, without the need for RPE.

10.1 Workshop Welding

- Workshops where high-intensity welding is routinely carried out, should be equipped with sufficient LEV systems to capture fume at source, in all welding activities. LEV options, in order of preference, are on-torch systems, backdraft/down draft booths, fixed station flexi-arm systems and transportable flexi-arm units;
- Welding areas should be surrounded with appropriate screens in order to designate an exclusion zone which restricts unauthorised entry for unprotected workshop co-workers. Where possible, such screens should be positioned so as to present an exclusion zone of at least 3 metres from the welding fume sources. RPE is required within the exclusion zone.
- Welding workpieces should be cleaned of any surface contamination and coating that could potentially increase exposure to toxic emissions, prior to entering the welding workshop;
- Although generating fume at the lower end of the scale (figure 1), submerged arc welding machines should be retro-fitted with suitable LEV extraction units in order to comply, within a reasonable timescale;
- LEV should be selected and positioned for optimum capture at all times. Where LEV alone is unable to effectively capture all fume, or cannot be correctly positioned to obtain complete capture, suitable and adequate RPE is required to be provided to welders and is required to be worn, even for short durations of welding;
- The preferred RPE option, for all undertakings, is a powered welding helmet/visor/RPE combination unit and it should be ensured that sufficient sets are available for the undertaking of all workshop welding tasks. A face-fit test is ***not*** required for this type of RPE.
- Non-welding co-workers, with authority to enter an exclusion zone, should be provided with at least the protection afforded by a P3 type filtering face-piece respirator. A face-fit test is required for all wearers of face-seal RPE - specifically for the make/model and size worn. The conditions under which that test was passed are required to be adhered to, on every occasion of use. This includes being clean-shaven.

10.2 On Site Welding in Production Bays

- The HSEs enhanced enforcement bulletin clearly states that appropriate LEV systems are required to be used in ***all*** indoor welding activities;
- On-site locations, in which welding routinely takes place for more than a few minutes (daily or up to once per week), should either be equipped with LEV units, or use made of light portable LEV units, as part of the welding equipment transported to site;
- Where LEV alone is unable to effectively capture all fume, or cannot be correctly positioned to obtain complete capture, suitable and adequate RPE ***is also required*** to be provided to welders and is required to be worn;
- An exclusion zone of at least 3 metres should be established around the welding operation to restrict potential access to the welding plume for unprotected individuals;
- Sporadic or Ad-hoc welding, or welding in areas impracticable for LEV access - for example where power is unavailable, access is encumbered by flights of stairs or in enclosed/restricted workspaces – should be treated as outdoor welding. These areas include production bays or mill areas which have copious volume and air-movement sufficient to provide ample dispersion of welding fume. Under these circumstances, the welding task should be broken down into multiple, shorter durations to reduce local fume accumulation. Full use of natural air movement or in-bay ventilation should be made and suitable and adequate RPE is required to be worn throughout, by all in the zoned area;
- For welders, the preferred powered helmet/visor/RPE combination units should be made available and transported to site locations, as part of the standard welding equipment. A face-fit test is **not** required for this type of RPE;
- For accompanying workers, operating within an exclusion zone and in exceptional circumstances for designated welders, a tight-fitting, reusable or disposable P3 respirator (minimum APF 20) may be used where the welding activity is restricted to a few minutes per hour in duration, or less than one hour in total for the working day;
- A face-fit test is required for all wearers of face-seal RPE - specifically for the make/model and size worn. The conditions under which that test was passed are required to be adhered to, on every occasion of use. This includes being clean-shaven.

10.2.1 Continuous Production Line Strip Welding

- In-line, automatic welding on continuous production processes occurs for a short duration, with varying frequency dictated by production parameters such as strip gauge and line speed. Line operators are usually remote from the process and any fume is dispersed, usually into a high volume production bay;
- Under these circumstances, production departments are required to demonstrate that an Industrial Hygiene Assessment has been carried out to evaluate the exposure risk and the need for further control measures. Such an assessment should encompass the conditions which produce the worst-case scenario – high throughput, in combination with heavy gauge material and high line-speed.

10.3 Outdoor Welding

- An exclusion zone of at least 3 metres should be established around the welding operation to restrict potential access to the welding plume for unprotected individuals;

- Full use of natural air movement should be made when welding outdoors, with the welder, fire-watch and any other essential personnel, working upwind of the welding plume;
- LEV is unlikely to be feasible for outside work. Consequently, RPE is required for ***all*** outdoor welding as part of the HSE's enhanced enforcement, regardless of duration;
- Powered helmet/visor RPE combination units should be made available to welders and transported to outdoor locations, as part of the standard welding equipment. A face-fit test is not required for this type of RPE;
- A tight-fitting re-usable or disposable P3 respirator may be used by the welder in sporadic or occasional outdoor welding activities, that are less than a few minutes duration per hour, or less than one hour in total for the working day;
- Non-welders operating within the exclusion zone are required to wear, as a minimum, a re-usable or disposable P3 respirator;
- A face-fit test is required for all wearers of face-seal RPE - specifically for the make/model and size worn. The conditions under which that test was passed are required to be adhered to, on every occasion of use. This includes being clean-shaven.

10.4 General Required Actions for Compliance with the COSHH Regulations

- COSHH assessments relating to welding fume exposure should be reviewed to reflect the enhanced enforcement action and changes to expected control measures;
- ***All*** LEV systems are required under those regulations to be checked weekly for effective operation, maintained and thoroughly examined every 14 months by a competent and qualified engineer;
- All welders should be suitably informed so that they understand the hazards associated with welding fume and are trained in the use of existing or newly installed controls;
- It should be made clear that employees have a duty to co-operate by using, looking after and reporting defects to control measures designed to protect them from excessive exposure;
- A RPE programme should be introduced in all works areas where welders are employed;
- Due to the potential to cause lung disease and an increased risk of COPD, asthma and cancer, statutory Health Surveillance for the welding professions, is appropriate. All employees that are required to undertake welding as part of their occupational designation, should be placed in the works area Health Surveillance programme. Employees also have a duty to attend Health Surveillance appointments.

11. Controlling Exposure to Welding Fume

11.1 Hierarchy of Control

HSEs enhanced enforcement is without prejudice to the hierarchy of the control, which focuses on prevention by elimination and reducing exposure by substitution of materials or welding techniques. Applying the hierarchy of control and taking steps to optimise, or minimise those risk factors reduces the challenge presented to any LEV or RPE combination employed for control. This may involve:-

- restricting occupancy to all but essential operators inside a designated exclusion zone during extensive welding operations;
- examining the job to design or modify processes so that there is less welding, gouging or manual flame/plasma cutting;
- using the most appropriate welding technique which generates less fume in accordance with figure 1;
- ensuring that welders are using the optimum set up;
- avoiding excessive currents and long duty cycles which tend to generate excess fume and affect weld quality,
- optimising shielding gases to ensure minimal generation of fume;
- planning welding sequences differently to allow welders more freedom of movement with their breathing zone in relation to the plume;
- minimising welding in enclosed or restricted spaces. When unavoidable and where LEV is inaccessible, using forced ventilation to disperse fume in such areas.

11.2 Welding Exclusion Zones

An exclusion zone is a designated, demarcated area where exposure to the welding fume plume may reasonably be expected. The primary purpose of is to prevent the entry of unprotected co-workers where welding fume is present. RPE is required to be worn within the designated exclusion zone. In welding workshops, the screened-off area designed to prevent accidental viewing of the welding process provides a natural exclusion zone for protection against unprotected fume exposure. Exclusion zones should be established at least 3 metres from welding operations (point of fume generation). In on-site, production bay and outdoor welding scenarios, where screening may not be available, physical zoning is preferable, achieved by A-frame signage and/or flame retardant bunting.

Non-welding co-workers, with authority to enter an exclusion zone, should be provided with at least the protection afforded by a P3 type filtering face-piece respirator.

11.3 Local Exhaust Ventilation (LEV)

LEV is ***required*** for all indoor welding activities in order protect the welder and also to protect the workplace atmosphere from contamination with potentially carcinogenic emissions. LEV should be selected and positioned so that optimum capture is achieved at all times. This reduces significantly the amount of fume entering the breathing zone of the welder and into the workplace atmosphere. This also enables co-workers occupying the common work areas, outside of the exclusion zone, to operate with a low level of exposure and without the need for RPE.

On-torch LEV

LEV is unlikely to be feasible for inaccessible indoor areas and outdoor work, although the practicalities of its use should be considered and assessed on a case-by-case basis.

LEV systems must not vent exhausted air back into the workplace unfiltered.

11.3.1 On-Torch Extraction

With on-torch extraction, fumes are captured using a welding torch with a built-in exhausting nozzle connected to a high vacuum unit. Extraction is always on when welding and the operator does not need to continually re-position an extraction arm in order to get optimal extraction. It is ideal for welding in a confined environment or other scenarios which are difficult to access by standard LEV methods. Fume does not travel further than the tip of the torch, giving maximum visibility when welding. Supplimentary RPE is unlikely to be required with properly maintained and effective on-torch extraction.

11.3.2 Welding Booths

In workshops where small workpieces are routinely welded, a dedicated welding booth or downdraft bench provides the most effective LEV.

An inward face velocity between 1 and 1.5 m/s into the booth and at least 2 m/s is appropriate into a downdraft extracted welding bench. Supplimentary RPE is unlikely to be needed with effective and properly maintained welding booths, as fume is normally drawn away from the breathing zone.

Welding Booth LEV

11.3.3 Fixed Flexi-Arm Extraction Units

Portable workpieces, which can be moved to multiple but consistent locations such as a dedicated welding area or series of benches, is best served by fixed extraction, flex-arm exhaust hoods.

11.3.4 Transportable & Portable Extraction Units

Larger work structures that can be positioned at various locations on the workshop floor or in production bays, require the use of transportable LEV systems. These are also suited for access


Fixed LEV


Transportable LEV


Portable LEV

to welding within structures offering restricted or confined spaces. Due to the nature of the welding process producing heavy splatter, the uneven terrain and harsh environment of on-site steelmaking locations, such units need to be the most robust available. Dual arm units are also available to service simultaneous, nearby welding processes. Trial by hire is the best initial approach to evaluate the suitability/acceptability. Nederman Filter Box 12M and Masterweld MW1900 are examples.

Even smaller, more portable and lightweight systems are available for mobile on-site tasks, meaning the welder can carry the system between jobs on site with ease. An air velocity between 5 and 10m/s into moveable flexi-arm ducts, so that at least a 0.5m/s capture zone is

assured at the point of welding. As the extraction hood needs ongoing re-positioning and cannot always be located to extract all welding fume, supplementary RPE, preferably the powered helmet/visor RPE combination type ***is required***.

With all these units, it is important that the welder keeps the extraction hood inlet positioned as close as possible to the welding point, without interfering with the gas shield and his/her head outside of the plume and residual fume capture path.

Under COSHH, all LEV systems need to be checked weekly for effective operation, maintained and thoroughly examined every 14 months by a competent and qualified engineer. The required thorough examination and check for each LEV unit should be entered into the SAP Maintenance Management System.

11.4 Respiratory Protective Equipment (RPE)

The newly enhanced enforcement action states that where LEV does not effectively capture all fume, suitable and adequate RPE is required to protect against residual fume and is also required for all outdoor welding. HSE documents (HSG53) and British Occupational Hygiene Society (BOHS) recommendations have been constulted in determining the guidance issued in terms of RPE. Effectiveness - Assigned Protection Factors (APF) – comfort, compatibility with other PPE and worker acceptance have been considered.

All welders are aware of the risks associated with arc-eye and the need for suitable eye protection. The health effect is real and manifests itself acutely, either at the time of welding or shortly after. Therefore, where the RPE supplied forms part of the welding protective visor, then it is most likely to be worn and worn correctly. Ventilated helmet, visor, or hood combinations have a fan-assisted flow of filtered air from behind the welder to provide protection. This type of respiratory protection does not require a face-fit test or depend on the worker being clean-shaven to ensure best protection. For this reason, it is a requirement that powered visor/RPE combinations be used in all forms of welding – both indoors and outdoors, in all but exceptional cases.

Powered Welding Helmet/RPE combo

This can be implemented by:

- personal issue of powered units to all trained welding operators, or;
- having a pool of units available and sufficient in number to cover all welding tasks, or;
- personal issue of individual visor headsets for attachment to a sufficient pool of powered filter units.

Tight-fitting and disposable half-mask RPE is dependent on an effective face seal and is assigned a lower Approved Protection Factor (APF 20)[#] than powered types (APF 40+)[##.] They offer no protection to those toxic gases which form part of the welding fume in many scenarios. In continuous wear, they can become uncomfortable, possibly leading to loosening or removal of the mask. These masks also require a successful face-fit test and duplication of the conditions under which that test was passed, on every occasion of use. That includes being clean shaven.

It is recommended in HSE guidance that this RPE type is restricted to tasks of duration of a few minutes per hour, or one hour's continuous wear time in well ventilated areas, after which the wearer should take a break. In situations, where RPE is required to be worn continuously for

longer periods, a powered visor/respirator combination, with a loose-fitting face-piece, is preferred.

##3M Speed glass systems are examples. #Uvex Silvair 2310 (large)/2312(small) is the current Tata Steel standard.

11.5 RPE Programme

A robust RPE programme encapsulates all the elements that are needed to ensure that RPE is effective in protecting welders. An effective RPE programme needs to ensure that:

- RPE is selected correctly;
- Welders are trained in the correct use of the RPE units provided;
- Checks are made to ensure RPE is working correctly, before each occasion of use;
- Non-disposable RPE (in service for more than one month) - is maintained on a monthly basis, in accordance with manufacturer's instructions and the COSHH Regulations - with records kept;
- Disposable and non-disposable RPE that forms a seal with the face is face-fit tested to the user, to ensure that the type specified – manufacturer, serial number and size – fits that individual. Fit-testing must be carried out by a competent person. The Industrial Hygiene and Workplace Assessment Department are certified to carry out respirator fit testing;
- The conditions under which a wearer has achieved a successful face-fit test are reproduced on all occasions of use. This includes being clean shaven;
- RPE is stored correctly and disposed of appropriately.

This Standard document is without prejudice to the requirements of any PPE to prevent or restrict the accumulation of accidental molten metal splash and the local rules for the absence of horizontal straps and seams upon the twin-layered or MM1 clothing.

11.6 RPE Maintenance

Maintenance is a requirement for all non-disposable RPE. RPE should be checked by the wearer prior to each occasion of use. A maintenance examination and should be carried out at least once a month by a designated competent person and records should be kept for at least 5 years. Where RPE is used only occasionally, that maintenance interval should not exceed three months. Key maintenance tasks include changing replaceable filters, checking straps for damage, checking valves, cleaning the device and checking the battery charge and flow rate for powered devices.

12. Biological Monitoring

Biological monitoring gives an evaluation of metallic welding fume exposure by all routes inhalation, ingestion and skin absorption, to help assess the effectiveness of control measures being used.

Biological monitoring for routine welders, particularly those engaged in stainless steel welding or laser cladding, should include the measurement of nickel and chromium in a urine sample and this should be undertaken on an annual basis, collected at the end of the working week or shift rota pattern.

13. Health Surveillance

Health surveillance is intended to protect individual employees by the early detection of work-related, adverse health changes; to help evaluate the efficiency of control measures; and to evaluate hazards to health by data collection and analysis data. Health surveillance also enables employees to raise concerns about how work affects their health.

Due to the potential to cause lung disease and an increased risk of COPD, asthma and cancer, then statutory Health Surveillance for the welding professions in Tata Steel is appropriate.

Works Managers must arrange for employees at risk of, as identified by the risk assessment, to be provided with health surveillance.

14. Information, Instruction and Training

Where workers are exposed to welding fume, those workers and their supervisors will be provided with suitable and sufficient information, instruction and training on:-

1. The judgements made in suitable and sufficient risk assessments;
2. The level of risk they may be exposed to, how it is caused and the possible health effects, ie:
    a. how their personal daily exposures may compare with the legislated exposure action and limit values;
    b. what control measures are existing, or being put into place, to reduce exposure risks;
    c. the use of RPE;
    d. what training is available for operators, supervisors and managers in their respective roles to ensure control of exposure, eg through correct selection and use;
    e. the health surveillance that is provided, why it is important and the overall findings (in anonymous form);
3. The employees' duties, which are to:
    a. follow instructions they are given on safe working practices;
    b. report problems with their welding equipment and control measures;
    c. co-operate with the programme of control measures and health surveillance.

This training is via a local designated person via a specific Welding Fume Toolbox Talk.

MONITORING

15. Measuring Performance

Performance of the local arrangements for the management of welding fume exposure will be measured against this Standard to identify gaps and areas where action for is needed.

This shall include the following requirements, as a minimum:

a) the extent of exposure to welding fume has been established;
b) exposure risk has been assessed in accordance with the COSHH Regulations;

c) controls are appropriate in terms of this Standard and enhanced regulatory enforcement;
d) awareness training has been carried and receivers recorded;
e) health surveillance is supplied to those deemed as relevant.

AUDIT AND REVIEW

The adequacy of the arrangements for control of welding fume exposure will be reviewed in accordance with those provisions of the COSHH Regulations and will be judged by making comparisons with relevant agreed standards.

TABLE 1 - Welding[1] Fume Controls – Quick Reference Ready Reckoner – Indoor Welding

Welding Location	Welding Scenario	Exclusion/ Respirator Zone	LEV[7] Requirements	Natural Ventilation	RPE[8,9] Requirements
Workshop[2] Welding	**Manual Welding:**				
	Dedicated Welding Areas	Area screened Off (welding screens)	**LEV is required**. Options include – on torch, welding booth, fixed location/flexi-arm, transportable flex-arm.	Control should not depend on natural ventilation. Optimum use of LEV should be assured.	**RPE is required**. Designated Welder[4] – Personal issue visor/powered respirator unit[8]. Occasional Welder[5] – personal issue visor & personal issue powered respirator unit[8] or access to a pool of powered respirator units. Fire watch or essential in screen occupants[6] – Minimum P3 disposable type.
	Workshop floor various locations	Area screened off (welding screens)	**LEV is required**. Transportable flexi-arm.		
	Submerged Arc Welding	Auto-welding machines zoned off from workshop.	**LEV is required**. Retro-fit flexi-arm LEV unit above weld.		With ventilation controls applied – **RPE is *not* required**. For manual welding on the roller collar or journal, see requirements for manual welding.
On-Site[3] Welding	Regular Welding – various locations	Area screened Off (welding screens) or designate a 3m exclusion zone e.g. using A-frame signs and/or frame-retardant bunting.	**LEV is required**. Transportable flexi-arm.	Make use natural air movement if it does not compromise LEV performance.	**RPE is required**. Designated Welder – Personal issue visor/powered respirator unit. Occasional Welder – personal issue visor & personal issue powered respirator unit or access to pool of powered respirator units. Fire watch or essential in screen occupants – Minimum P3 disposable type.
	Welding in a large, open production bay. Occasional/Sporadic /Ad-hoc welding.	Designate a 3m exclusion zone e.g. using A-frame signs and/or frame-retardant bunting.	LEV is not usually practicable. Use transportable LEV if available & practicable.	Position welding to make full use of any natural air movement. Use bay door ventilation where possible.	**RPE is required.** Designated Welder – Personal issue visor/powered respirator unit. Occasional Welder – i) extensive welding (>1 hour duration or stainless welding) - personal issue visor & personal issue powered respirator unit or access to pool of powered respirator units. ii) short-term welding <1 hour total duration or <10 minutes per hour – Minimum P3 half mask[8,9] or disposable P3 RPE. Fire watch or essential occupants of exclusion zone – Minimum P3 disposable type[9].
	Production Line Welder Unit	Industrial Hygiene Assessment is Required to determine requirements on a case-by-case basis.			

TABLE 2 – Welding[1] Fume Controls – Quick Reference Ready Reckoner – Outdoor Welding					
Welding Location	**Welding Scenario**	**Exclusion Zone**	**LEV[7] Requirements**	**Natural Ventilation**	**RPE[8,9] Requirements**
Outdoor Welding	All welding scenarios.	Designate a 3m exclusion zone e.g. using A-frame signs and/or frame-retardant bunting.	LEV is not usually practicable.	Position welding to make use of natural air movement. Welder & essential exclusion zone occupants positioned upwind.	**RPE is required.** Designated Welder[4] – Personal issue visor/powered respirator unit. Occasional Welder[5] – i) extensive welding (>1 hour duration or stainless welding) - personal issue visor & personal issue powered respirator unit or access to pool of powered respirator units. ii) short-term welding <1 hour total duration or <10 minutes per hour – Minimum P3 half mask[8,9] or disposable P3 RPE. Fire watch or essential occupants[6] of exclusion zone – Minimum P3 disposable type[9].

1. **Welding** - All types of welding & allied processes.

2. Welding workshop - Indoor site workshop or area where high-intensity welding routinely takes place, either at dedicated locations or at various locations on the workroom floor. Employs dedicated and occasional welders.

3. On-site – Location outside of the workshop where mobile welders visit to weld, either on a regular basis, on occasions, or as a one-off.

4. Designated Welder – A worker undertaking welding routinely on all or most days of the working week, specifically as part of their designated employment.

5. Occasional Welder – A worker undertaking welding once or twice per week or a few times per month.

6. Fire Watch/Essential Occupant – A worker with essential work required, either associated with the welding or inside a welding screen or exclusion zone.

7. **All LEV systems** are required to be checked to ensure that they a functioning on each occasion of use. Weekly system checks are required to be undertaken and recorded in a log book by a locally designated person. A thorough examination and test of all LEV systems is required to be undertaken annually by a qualified engineer. This needs to be incorporated into the SAP maintenance system.

8. **All reusable RPE** must be subject to maintenance if retained for longer than a month as detailed in section 11.5 RPE programme.

9. **A face-fit test** is required for reusable and disposable RPE types (specific to make, model and size) which depend on an integral face-seal for protection. The conditions under which a successful face-fit has been achieved must be reproduced on each occasion of use. This includes being clean-shaven.