**Safe Work Requirement**

Welding and Cutting Procedure

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| Summary Welding and cutting involves using a naked flame, welding rod, MIG/TIG which provides an ignition source and will almost always ignite a flammable mixture in the ‘right conditions’. This can be extremely dangerous and you must only carry out welding and cutting on a live plant when there is no other way of carrying out a task.  This Welding and Cutting procedure has been written to make sure that all staff involved in welding and cutting work are aware of all the precautions and preparations they must take before, during and after welding and cutting work.  All ECDC staff involved in welding and cutting work must understand and follow this procedure. Introduction Many hazards are associated with welding and cutting, but as in other hazardous operations you can control them by taking appropriate precautions and control measures. Failure to take appropriate control measures can lead to dangerous situations causing personal injury or damage to equipment.  Some typical examples of dangerous situations and the resulting injuries are:-   1. Exposure to the brilliant light of a welding arc resulting in eye injuries 2. The heat of a welding arc, molten metal, sparks, and hot objects which can result in burns, fires and/or explosions 3. Toxic fumes released during the welding and cutting process can result in breathing difficulties 4. Electrical hazards can result in electrical burns and electrocution 5. Mishandling gas cylinders can result in muscle or joint injuries   Purpose The purpose of this procedure is to describe the process of planning, carrying out, auditing and reviewing welding and cutting work and the safe practices that should be used. It also describes the responsibilities of staff involved in planning or carrying out welding and cutting work.  This procedure has been written to:-   1. Provide a safe and controlled working environment and to protect staff, plant and equipment in areas where welding and burning work is being carried out 2. Reduce the risk of damage to structures and facilities during welding and cutting work  Application This procedure applies to all staff and contractors working in or on ECDC facilities. It has been written to protect the safety of our staff and to make sure that they follow the correct procedures to carry out welding and cutting work safely on the facilities. Definitions  1. **Welding techniques**   There are a number of different welding techniques which may use on ECDC facilities.     1. **Tungsten Inert Gas welding**   Tungsten Inert Gas (TIG) welding is a process of welding that uses a tip & filler wire electrode and inert (chemically inactive) gas, usually argon. The inert gas is used as a shield to prevent the air from contaminating the weld during the welding process. Exotic metals require argon purge within the pipe.  Argon, like Nitrogen is an asphyxiant and can build up in enclosed spaces and pipelines. Breathing Argon can cause severe injury or death. Suitable and adequate ventilation is required where Argon is used or stored.  Tungsten Inert Gas welding is used for welding sections of light metals such as magnesium, aluminium, corrosion resistant alloys of steel (CRA) and alloys of copper.   1. **Metal Inert Gas welding**   Metal Inert Gas (MIG) welding is an arc welding process in which a continuous and disposable wire electrode and inert gas are fed through a welding gun. Metal Inert Gas welding deposits the liquefied metal on the metals to be joined quicker than Tungsten Inert Gas welding and it is also used to weld on thicker metals.   1. **Manual Metal Arc welding**   Manual Metal Arc (MMA) welding or “stick” welding uses a disposable electrode. An electric current from a welding supply socket or welding machine is used to form an electric arc between the electrode and the metals to be joined. As the weld is laid, the flux coating of the electrode disintegrates giving off vapours that serve as a shielding gas and providing a layer of slag, both of which protect the weld area from being contaminated with air. MIG can use inert gas as a means of shielding the weld from air contamination.   1. **Simultaneous operations**   Simultaneous Operations (SIMOPS) are when two or more separate activities take place in the same area that might conflict with one another in normal or emergency situations.  For the purpose of this document Simultaneous Operations are:-   1. Welding in the same area as breaking pipeline containment 2. Welding or cutting near a confined space 3. **Sentry monitoring**   Portable gas monitors should be used for sentry monitoring during spark potential and naked flame work. It is preferable that personnel who use them are Authorised Gas Testers Level 2. Responsibilities    Rig Manager The Rig Manager is responsible for the location where the welding and cutting work is to take place. The Rig Manager will ensure that all hazards have been identified and will make recommendations for the implementation of various measures to reduce the risks to as low as reasonably practicable.  The Rig Manager must personally inspect the work site along with the task leader and ensure it is returned to service in good order at completion of welding and cutting work.  The Rig Manager will sign the Work Permit authorizing welding and cutting work to commence and maintain an overview of all permitted work carried out in this area by:-   1. Ensuring that an appropriately detailed hazard identification and task risk assessment has been carried out for the task 2. Carrying out a detailed safety briefing with the Performing Authority during the work planning stage to ensure that all hazards have been identified 3. Ensuring that the Performing Authority has a detailed understanding of the task, the work location and its inherent hazards, and the equipment to be worked on 4. Ensuring that the Performing Authority is aware of any expected actions/responsibilities to be adopted in the event of an emergency 5. Authorizing the task to begin by signing the Permit at the work site at first issue and thereafter at every re-issue of the Permit  HSE Supervisor The HSE Supervisor is responsible for ensuring that all welding and cutting work carried out under a hot work naked flame Permit are in compliance with this procedure. The HSE Supervisor responsibilities include, but may not be limited to the following:-   1. The correct issue, suspension and cancellation of all hazard identification and task risk assessment, Certificates and Permits 2. Ensuring that the lessons learnt are captured and disseminated 3. Reviewing with the rig manager the welding and cutting work can proceed safely with no significant impact to/from simultaneous operations 4. Confirm the security of isolation lock keys and tags 5. Monitoring the safety of all working practices 6. Providing rescue should it become necessary 7. Monitoring the effective use of PPE 8. Assuring requirements of the Permit and certificates are being met 9. Level 1 or 2 AGT  Task Leader A task leader is the individual responsible for performance of the work activity and is the person who is in charge of the work at the work site.  The task leader must personally inspect the work site along with the Rig Manager and ensure it is returned in good order at the completion of work. They will also return the Permit to the HSE Supervisor at completion of work.  The Task Leader will hold a Toolbox Talk prior to welding and cutting work commencing and ensure that all members of the work party have a clear understanding of the scope of the work, the risks in carrying out the work and the controls implemented to reduce the risk.  The task leader is also responsible for:-   1. Being fully conversant with the work, the potential hazards and associated controls 2. Carrying out the safe execution of assigned work as described on the hazard identification and task risk assessment, PTW and Certificates 3. Ensuring that the Permit, Hazard Identification and Task Risk Assessment and any other associated documentation is displayed at the work site, wherever practicable 4. Ensuring the work site is left in a safe and tidy condition at the suspension or completion of work activities 5. Returning the Permit to the PTW Centre at the end of each shift or completion of work 6. Insuring that members of the work team are trained and competent to perform their assigned duties  Work Party Members of the Work Party is anyone who carries out work under the direction of the task leader. They are responsible for:-   1. Signing the Toolbox Talk form to acknowledge they have received and understood a suitable Toolbox Talk 2. Reporting all work site problems immediately to the Performing Authority  Fire Watch The Fire Watch is a member of the Work Party who has been trained in the use of gas monitors for detection of flammable gases, and the use of portable fire extinguishers. He will be responsible for maintaining a fire watch during the thirty-minute period after the shift where any naked flame work has ceased, to ensure that no combustible materials have ignited during the final stages of the work. He must know how to raise an alarm, and what to do in the event of an alarm sounding. He is also responsible for alerting the person carrying out the work if there are alarms or any other hazards which may affect his safety. The Fire Watch should have no other assigned duties while welding and cutting operations are being carried out. Authorised Gas Tester The Authorized Gas Tester is a person who is suitably trained and authorized to test for the presence of flammable vapors, toxic gases and oxygen prior to and for the purposes of welding and cutting work.  The Authorized Gas Tester is responsible for: -   1. Performing thorough gas tests, including surveying in the correct places for the relevant gasses 2. Maintaining the integrity of the test equipment at all times 3. The safety of themselves and others involved in the gas test 4. The validity of the reported outcome of a gas test   Authorized Gas Testers are authorized to two levels: -   1. Level 1 Authorized Gas Testers are authorized to test atmospheres for confined space entry tasks and hot work tasks 2. Level 2 Authorized Gas Testers are authorized to test atmospheres for hot work tasks  General considerations    Pressurised habitat ECDC would like to reduce or eliminate the use of naked flame welding and cutting in areas where flammable vapors or combustible materials are or could be present. However, this may not always be possible.  It is ECDC policy that activities involving a naked flame such as burning or welding in dangerous areas should, if possible, are carried out when the facility is shut down.  If this is not possible, consider using pressurized habitats but only after checking that alternative cold work methods such as clamping and bolting are not possible.  A pressurized habitat (Figure 1) is normally a flexible, modular enclosure which creates an environment which is above normal pressure. The enclosure acts as a physical barrier between an ignition source and a hydrocarbon gas.  If you are considering using pressurized habitats, there must be detailed procedures in place which cover all aspects of the task including: -   1. Details of locations where the use of pressurized habitats would be considered 2. Technical specification for the pressurized habitat 3. Type of construction material that will be used 4. Fire-rating requirements 5. The type of door that will be used, preferably self-closing or air lock 6. The type of ducting material that will be used 7. The safety signs that are required 8. A supply fan located in area to provide uncontaminated air and exhaust fan specification and earthling requirements 9. Emergency exit requirements 10. Lighting requirements and specification 11. Window requirements 12. Any Confined Space requirements   Pressurized habitats will be built from fire retardant sheeting and will need extra protection such as fire blankets in the hot work area, which includes the floor and in some cases the walls and ceilings.  Description: C:\Users\USER\AppData\Roaming\Tencent\Users\1045450198\QQ\WinTemp\RichOle\RVG56238I@LQYLD_T$GVZTI.png  **Figure 1: Pressurized habitat** Fume hazards **Note**: Welding carried out in a confined space must be undertaken in accordance with the ECDC Confined Space Entry procedure.  Welding rods and/or MIG wire are not considered hazardous until they are actually used for welding. During welding the process generates a release of fumes and gases. The ingredients of the fumes and gases generated in welding operations depends on the filler metal alloy, base metal, flux and the specific process being used. Fumes and gases produced may include metals, metal oxides, chromates, fluorides, carbon monoxide, ozone and oxides of nitrogen.  In general, the Occupational Exposure Limit (OEL) for welding fumes is 5 milligrams per cubic meter (mg/m³) over a period of 8 hours. However, for certain elements, for example, cadmium, which may be present in welding fumes, lower limits are set and specialist advice should be sought from the Industrial Hygiene team.  Examples of methods of controlling welding fumes are given in Table 1.  Toxic gases and fumes produced in welding operations create serious hazards:-   1. Fumes can be produced from the welding of greasy materials. All such materials must be thoroughly de-greased and dried before welding 2. Harmful lead fumes (Figure 2) can be produced when welding or cutting material coated with lead-based paint 3. Inhalation of fumes from welding or cutting zinc galvanized metal may result in “Metal Fume Fever”. This is characterized by flu-like symptoms including a raised temperature, aching muscles, shivering and sweating. The symptoms develop a few hours after exposure to the fumes and can persist for approximately 24 hours 4. Air-line masks or high efficiency respirators should be worn in those cases where galvanized, painted, lead or cadmium-coated materials are being cut or welded (MSDS/COSHH Risk Assessment will identify what RPE should be used) 5. Nitrous fumes may be produced when an oxy-propane flame impinges on a large mass of metal for long periods. A deficiency of air during such work may also produce carbon monoxide 6. Arc welding of iron or steel is accompanied by the evolution of considerable quantities of fumes consisting of very fine particles of iron oxide 7. Welding of brass, bronze and manganese steel generates large quantities of carbon monoxide and carbon dioxide gases. Adequate ventilation must therefore be provided or suitable apparatus should be worn to give effective nasal/oral protection 8. Where hardened deposits are found on the equipment, welding or cutting must not be started until the general nature of the deposits are established   Description: C:\Users\USER\AppData\Roaming\Tencent\Users\1045450198\QQ\WinTemp\RichOle\DYXO_C[R37B2NGR7I_~EK03.png  **Figure 2: Welding fumes**  Description: C:\Users\USER\AppData\Roaming\Tencent\Users\1045450198\QQ\WinTemp\RichOle\7G9VC)R4QOUQLKTX9@@F[_G.png  Description: C:\Users\USER\AppData\Roaming\Tencent\Users\1045450198\QQ\WinTemp\RichOle\3@)]P2K{D@KQ$QG7AIK5Q$E.png  **Table 1: Methods of controlling welding fumes** Fire and explosion hazards No welding or cutting may be carried out without a Hot Work Naked Flame Permit other than in designated areas such as in a workshop. The conditions detailed in the HITRA and Permit must be strictly observed.   1. In all welding and cutting operations, a portable fire extinguisher of the correct class must be readily accessible near the work 2. The work area must be suitably screened to prevent sparks and hot metal from flying outside the immediate work area 3. Fire blankets are to be used to screen any nearby items of equipment or plant areas 4. Welding booths and screens must:- 5. Be non-combustible 6. Have interior surfaces that minimize the reflection of dangerous radiation 7. Allow thorough ventilation 8. Welding earth cables should be fixed at the work site, or if this is not practical, they should be fixed within 3 meters of the work site. Bolted steel structures or flanged pipelines should not be used for current return leads since:- 9. The paint between bolted connections will give high resistance resulting in a poor weld 10. Sparks may be produced in an area away from the immediate vicinity of the weld which may not be covered by the Work Permit and may not be gas-free 11. Welders must never coil hoses or cables around their body when burning or welding. 12. Torches and hoses must not be left in vessels or enclosed spaces when they are not in use. For example, after use, during meal breaks or overnight. Even a very small gas leak, particularly propane from a torch over such a period, can result in a dangerous atmosphere in the confined space. 13. Cutting into any cladding covering polyurethane foam insulation must only be undertaken using a cold cutting method. 14. If hot cutting is unavoidable, the HSE Supervisor must be consulted prior to commencement of operations to allow additional precautions, for example, breathing apparatus or air-line equipment.  Welding and cutting pre-operation checks Prior to starting welding or cutting work, the following must be confirmed:-   1. That a hazard identification and task risk assessment and Hot Work Permit has been raised 2. That all tanks, vessels and equipment, on which welding, cutting, burning, brazing or soldering work is to be carried out, are free from flammable gases and vapors, oil and sludge and the possible ingress of such gas and vapors during the work. Use of positive isolations is required.   Note: If welding is on one side of a vessel wall or surface, check that there are no flammable materials, gases or mixtures on the other side prior to beginning and during welding and cutting.   1. If intending to work inside a vessel ensure that a Confined Space Entry Certificate has been raised (see ECDC Confined Space Entry procedure) 2. The space between double plates, or weir plates, where flammable material may be found have been inspected before welding or burning operations begin 3. Minimum ventilation requirements for each welder inside a confined space have been addressed in the hazard identification and task risk assessment and Method Statement 4. Test holes are drilled and gas tests taken before cutting the bottom plates of any tank floor   **Do not under any circumstances use compressed oxygen for ventilation, or to blow through propane hoses as this will result in an explosive atmosphere** Work site checks At the work site, the following checks must be made:-   1. That welding and burning equipment is properly maintained and well located with proper lighting 2. Ventilation is adequate 3. The work area is tidy and remains so throughout the welding operation 4. Old barrels or drums are not being used to support work material as they may contain explosive gases and can be unstable 5. Only approved flint guns are supplied for the purpose to ignite oxy-propane or oxy-acetylene flames  Ventilation and respiratory protection When the outside of the vessels and tanks are being welded or burned, there is a danger of toxic or flammable gases collecting inside. The heat from outside a tank can ignite an explosive mixture inside the tank.  Therefore, care must be taken to ensure there is adequate ventilation and/or respiratory protection (Figure 3). This is especially relevant in confined spaces, or where toxic or noxious vapors may result from cutting or burning pipe which may have special coatings.  Description: C:\Users\USER\AppData\Roaming\Tencent\Users\1045450198\QQ\WinTemp\RichOle\1}RI_T(KHS{GZKD9403Z3~G.png  **Figure 3: Welding hood for use in confined space** Personal Protective Equipment    Personal Protective Equipment - general Personal Protective Equipment (PPE) is an essential component in protecting employees from on-the-job injuries All PPE must meet standards established by recognized governmental and/or industry groups and as described in the ECDC PPE procedure.  As a minimum, all personnel must wear the following approved PPE when working in operational areas:-   1. Hard hats 2. Steel-toed footwear 3. Safety glasses 4. Flame retardant coveralls  Welding protection The PPE specified on the Permit for performing welding and cutting will be dependent on the work location. The necessity for wearing protective clothing as protection against sparks and pieces of hot metal depends upon the position of the arc in relation to the welder’s body. For some classes of welding, for example, where the welder is standing at a bench, a head screen and gauntlets may provide sufficient protection. A thick leather apron, or other suitable material, may be needed if the welder is sitting at his work position and where molten metal may fall upon his thighs or legs. If the arc is above the level of his shoulders or overhead, complete protection for the head, arms and upper part of the body is necessary.  The following PPE must be considered (Figure 4) and if indicated on the Permit it must be worn:-   1. Welder’s goggles/visors with the correct filtration, the level of filtration depends on the type of welding activity performed 2. Goggles, hand screens and welding helmets, all fitted with the correct grade of arc filter must be used for all cutting, chipping and grinding operations   **Note:** The welder’s goggles/visors are to be replaced when the glass becomes damaged and vision during welding becomes distorted, or when filtration becomes reduced.   1. Leather, or some other non-ignitable material, gloves or gauntlets to shield the hands and arms from arc radiation and sparks must be worn 2. Welders to wear their coverall legs outside their safety boots rather than be tucked into their boots in order to prevent hot metal or slag from entering the boots   **Note**: Any of the work party who may be exposed to the radiation and arc flash from the welding work must also wear the stated PPE.   1. For chipping away slag covering the weld when coated electrodes are used, a helmet with a double screen shall be used   Description: C:\Users\USER\AppData\Roaming\Tencent\Users\1045450198\QQ\WinTemp\RichOle\]3PMO(HTSBYQV7N]VMA9L~D.png  **Figure 4: Welding Personal Protective Equipment** Ventilation and breathing apparatus during gas welding In locations where adequate local or general exhaust ventilation is not possible welding can be carried out safely by personnel wearing suitable respiratory protection. On demand air supply or positive air supply types of equipment are to be worn.  **Warning**: The application of an oxy-acetylene flame to sheet metal coated with metallic lead, zinc, lead paints or other injurious substances may give rise to highly toxic vapors particularly in cutting work where an excess of oxygen is required. For such work, suitable breathing apparatus, not canister respiration, must be worn.  **Caution**: Dust or fume masks do not provide adequate protection.  Unless there is good ventilation, an air-line breathing apparatus mask must be worn when carrying out oxy-propane or oxy-acetylene cutting or welding in a confined space. Air supply must be checked for any contamination that may affect the quality of the air being supplied.  Ventilation may be improved by extraction fans/air movers rather than by blowing fresh air into the confined space. Compressed oxygen must never be used for ventilating purposes and must never be blown through propane piping.  **Warning:** Welding or cutting in enclosed spaces such as tanks can seriously deplete the oxygen content of the air. Adequate ventilation is essential unless the welder is wearing an air supplied respirator. Gas welding and cutting - general    Welding and cutting - cylinders Cylinders used in welding and cutting should be stored in areas specially defined for the purpose, outdoors, away from all sources of heat and away from site exits or egress areas. See ECDC Compressed Gas Cylinders procedure for more detail.  If cylinders used in welding and cutting are stored in an exposed area they shall be:-   1. Protected against excessive temperature 2. Not in direct contact with tarpaulin or any other cover used to shield the cylinders 3. Have signs indicating “No Hot Work/No Smoking” in this vicinity displayed 4. Protected from rusting and corrosive conditions   **Warning:** Cylinders of combustible gas, such as propane or acetylene, should not be stored with other high pressure gases or with cylinders of oxygen. They shall not be stored in close proximity to open flames, areas where electrical sparks are generated, or where other sources of ignition may be present. Welding and cutting - gas cylinder handling The following guides must be followed prior to handling a compressed gas cylinder:-   1. Be aware of the identification of the compressed gas cylinder contents and the potential hazards 2. Be familiar with the appropriate Material Safety Data Sheets (MSDS) 3. Cylinders should not be dragged or physically carried 4. Transport cylinders with a hand truck designed for the transport of cylinders 5. Take care not to drop or allow cylinders to come into violent contact with each other 6. When not in use, gas cylinders shall be stored in the vertical position with valve closed and with cap securely in place 7. Fittings specific to each cylinder must be used to avoid using inappropriate hoses or regulators.  Gas cylinder pressure reducing regulators Regulators should be used only for the type of gas indicated by the supplier and should be of a design pressure appropriate to the pressure of the filled cylinders on which they are to be used.  Using incorrect or damaged regulators on high-pressure gas cylinders is potentially hazardous, therefore:-   1. Check that the regulator is suitable for use at the pressures in the cylinder. If not, do not use it 2. Only use the regulator with the gas for which it is designed and labelled 3. Ensure the pressure adjustment knob/screw is fully out when the regulator is not in use 4. Flash arrestor capability must be used in all applications   **Note:** There are different regulators for different applications. It is vital that only equipment designed for the particular gas should be used. Gas cylinder hoses and connections The correct hose bore size, pressure rating, length and color coding are essential for safety. European Standard EN 559 (formerly BS 5120) sets the requirements for the manufacture of hoses, including their color for different gases:-   1. Blue-oxygen 2. Red-acetylene and other fuel gases (except LPG) 3. Black-inert and non-combustible gases   Never use hoses that are longer than necessary and never use equipment while hoses are wrapped around the cylinders or trolley.    The length of the hose should be suitable for the task. The longer the hose the more likely it is to get damaged.  Only best quality hose is to be used, and must be firmly attached to the torch and other connections by clips or other suitable means (the use of Jubilee clips is prohibited).   1. Lengths of hose which are supplied for connecting to standard regulator outlets and torch inlets should be used in preference to any other hose 2. Lengths of hose must be joined by means of suitable connecting fittings when more than the standard length is required 3. Unnecessary long lengths of hose must not be used 4. Hose piping systems should be inspected for leaks on a regular basis 5. Torches must be used for the correct gas  Welding and cutting procedure    Welding and cutting - pre-work planning There is an increased risk of a fire or explosion when you introduce a high-energy source of ignition into the plant, no matter how good the preparatory work has been. Also, harmful and flammable fumes may be generated from equipment that has contained hazardous substances when heat is applied.  Therefore, Rig Manager, HSE Supervisor and Task leader must consider the following options before agreeing to issue a Hot Work Permit in a live unit area:-   1. Can the work piece be prefabricated elsewhere and brought to the plant site as a bolt on cold work operation? 2. Can the Hot Work be eliminated by using a safer alternative method such as cold work operation? 3. Can the equipment be removed to a safe area in order to carry out the open flame work? 4. Should the operating plant be shut down and gas freed in order to carry out the open flame work? 5. Are the risks associated with the open flame work on the operating plant justified? 6. Can a positive pressure habitat be erected around the naked flame work to mitigate the risk of potential ignition?  Welding and cutting - Hazard Identification and Task Risk Assessment For all naked flame work there will be a formal Hazard Identification and Task Risk Assessment (HITRA) carried out prior to the issue of the Permit. The Area Authority will access the HITRA library to determine if a previous HITRA has been carried out for this work and to assess if the findings still apply to this work. If no previous HITRA has been carried out, the Rig Manager will initiate a formal HITRA.  The HSE Supervisor and task leader and any other experts or parties that may have input will form a HITRA team.  The HITRA team leader shall consider:-   1. The specific tools to be used, for example, gas cylinders and welding equipment 2. Identify the hazards, the work location, the work itself and the tools to be used   The HITRA will identify the various controls that will be implemented, prior to the issue of the Permit to ensure that the risk is reduced to as low as reasonably practicable, that may include:-   1. Fire and gas inhibits 2. Pressurized fire hoses, run out and tested 3. Suitably positioned portable fire extinguishers 4. Continuous flammable gas monitor 5. Fire blankets covering adjacent drains 6. A Fire Watch   (See Appendix 3 - Checklist for welding and cutting) Welding and cutting - pre-start steps Prior to welding or cutting on a live plant the following steps shall be completed.  The Rig Manager and Task Leader will inspect the work site and ensure the controls, as identified from the HITRA, are completed.  The Rig Manager will ensure that any impacted fire and gas detection equipment is correctly inhibited and/or overridden. ECDC Management of Safety Critical Equipment Procedure.  Gas tests will be carried out by an Authorized Gas Tester 2 (AGT2), immediately prior to the commencement of welding or cutting work and also after any periods where the work has been suspended for any reason.  The Rig Manager and Task Leader shall also:-   1. Confirm any isolations required are implemented with effective draining, flushing, purging and venting of the equipment 2. Agree on the job method 3. Confirm the tools and equipment required are at the site 4. Confirm with the “Fire Watch” his role and responsibilities 5. Confirm all controls stated on the Permit are in place   The Task Leader will conduct a Toolbox Talk at the work site prior to commencement of the work to all personnel in the Work Party; he will state:-   1. The scope of the work 2. The appropriate health and safety precautions implemented 3. What to do in the case of an emergency   Each member of the work party will sign the Toolbox Talk form to state that they have understood these points.  Once the initial gas test has been carried out, the Permit will be completed by the Rig Manager who will allow the work to proceed and “light-up” of the welding/cutting tool.  The original copy of the Permit will be displayed at the work site for the duration of the job or validity period of the Permit.  Continuous gas monitoring will take place whilst welding or cutting work is ongoing to ensure Permit conditions have not changed. In the event gas is detected, the work will be immediately stopped, all open flames extinguished and the Permit suspended and returned to Permit to Work Centre.  When the open flame work is suspended or at the end of the shift, the Fire Watch will tour the work site for 30 minutes to ensure that there has been no ignition of any materials in or adjacent to the work area.  On completion of the job, or if the job is not completed, at the end of the shift, the work site will be made safe and the Task Leader will return the Permit to the HSE Supervisor and the Permit will be signed off by all parties concerned. Fire watch The designated Fire Watch shall:-   1. Be at the work site at all times whilst Hot Work and area fire and gas inhibits are in place (Figure 5) 2. Not be involved in any other tasks or duties 3. Know the location of fire-fighting equipment in the proximity of the work site and how to operate it 4. Know how to isolate/shut-off welding/burning equipment 5. Be competent in the use of portable gas monitors 6. Be in radio contact with the Rig Manager   Description: C:\Users\USER\AppData\Roaming\Tencent\Users\1045450198\QQ\WinTemp\RichOle\6%D}A75)GDX7M]EU[LWO3DF.png  **Figure 5: Crowcon Detective and Portable Gas Detector** Welding or cutting - naked flame work start At the work site, the Work Party will be:-   1. Instructed on the scope of the task 2. The appropriate health and safety precautions implemented 3. What to do in the case of an emergency   This information will be communicated to the Performing Authority who will hold a Toolbox Talk at the work site prior to commencement of the welding. The points discussed in the Toolbox Talk will be recorded on the Toolbox Talk form and each member of the work party will sign to state that they have understood these points:-   1. Gas tests will be carried out by an Authorized Gas Tester 2 (AGT2), prior to the commencement of welding/cutting and also after any periods where the work has been suspended for any reason 2. Once the initial gas test has been carried out, the Area Authority will allow the work to proceed 3. Continuous gas monitoring will take place during the job to ensure Permit conditions have not changed 4. In the event gas is detected the work will be stopped, all open flames extinguished and the Permit suspended and returned to the Permit to Work Centre 5. When the open flame work is suspended or at the end of the shift, the Fire Watch will tour the work site for 30 minutes to ensure that there has been no ignition of any materials in or adjacent to the work area 6. On completion of the job, or if the job is not completed at the end of the shift, the work site will be made safe and the Performing Authority will return the Permit to the HSE Supervisor and the Permit will be signed off in the appropriate places by all parties concerned   **Warning:** In the event of an emergency or plant upset, all Permit work is suspended. The work site must be left in a safe condition, all naked flames must be extinguished and all plant and equipment made safe, until the ‘All Clear’ is announced. The Permits must be re-validated and re-issued before work is resumed, with a further gas test being done no later than 30 minutes prior to resuming work. Light-up of welding torch - procedure It is important that an adequate flow of gas is flowing from the nozzle of the torch or other apparatus before lighting up.  Task Leader must use the following procedures:-   1. Set regulators to the recommended working pressure 2. Confirm flash-back arrestor is fitted close to the torch, for example, within 0.5 meters 3. Keep the torch nozzle away from any source of ignition until the gas is flowing freely from the nozzle 4. Use an approved spark lighter for igniting the torch   **Note:** If the torch flashes back on lighting up, it is because the regulators are not set to the correct pressure or a light has been applied before the flow of fuel gas is properly established  If the flame snaps out when the torch is in use it is because:-   1. The regulator pressure or gas flow is incorrect and is either too high or too low 2. The nozzle has been obstructed 3. The nozzle has been held too close to the work 4. The nozzle has become overheated   In the event of overheating:-   1. Completely shut off both torch valves 2. Immerse the nozzle and torch-head into water   **Note:** Ensure that the nozzle is tight before re-lighting torch. Check the regulator setting and cylinder pressures then re-light in accordance with the above procedure. Repairs to small containers Repairs to small containers include the welding, brazing, soldering or cutting of drums or containers. For example, 40 gallon drums, fuel tanks, or vehicle fuel tanks, which have contained petroleum products, flammable or other combustible materials. Welding and cutting on such equipment should be avoided, but if required, the following guidelines apply:-  Repairs to small containers shall be conducted in a safe area away from live plant.  Before any naked flame work is carried out, the drum or container must be:-   1. Uncapped 2. Drained 3. Thoroughly steamed cleaned or submerged in boiling water 4. Kept at the boiling point for at least one hour 5. Gas free   After the steaming or boiling process, compressed air must be blown through the drum container until the vapours are removed. Ensure that the air has a free exit path to prevent build-up of pressure.  Before carrying out any hot work, the drum or container must be certified Gas Free and a valid Permit must be issued.  When burning or welding is in progress on a small vessel, un-burnt gases can collect inside and an explosive mixture can be formed.  Compressed air or steam must be passed through the vessel and care taken to ensure free and adequate exit for the air or steam.  All vessels sent to a workshop for repair must be certified Gas Free and free from corrosive chemicals. Welding/cutting completion    Planned work stoppage If welding or cutting is to be stopped for a few minutes it is permissible to close the torch valves only.  If welding or cutting is to be stopped for a longer period of time, such as during lunch, overnight, or while torches are being changed, the following procedure shall be adopted:-   1. Close oxygen and gas cylinder valves 2. Open torch valves momentarily to release all gas pressure from the hose 3. Close torch valves 4. Release pressure adjusting screws on the regulator 5. If working in a Confined Space, remove hoses from the space or disconnect the hoses from cylinders  Hot Work naked flame work completion Upon completion or suspension of Hot Work Naked Flame, the Task Leader shall:-   1. Ensure all relevant equipment is made safe 2. Depressurize oxygen/gas lines 3. Close valves, remove regulators and install protective cap 4. Stop diesel engines 5. Isolate any electrical supplies 6. Collect and dispose of redundant materials 7. Report any changes in work content or environmental conditions to the Rig Manager and ensure that safe conditions are re-established 8. Remove all welding/burning equipment to an approved area as soon as possible 9. Sign off Permit and ensure the work site has been left in a safe and tidy condition   The Rig Manager shall complete the site “Inhibit” register confirming the fire and gas inhibits have been removed. Appendix 1 - Training, competence and authorisation All ECDC and subcontract personnel directly involved with welding and cutting operations shall have received training in the practical application of this procedure.  All ECDC and subcontract personnel who perform welding and cutting operations shall be certified with appropriate welder approval qualifications.  All personnel who are liable to be involved in welding and cutting operations should: -   1. Have adequate knowledge, training and expertise in understanding the risks from welding and cutting operations 2. Know what precautions should be taken to minimise the risk to as low as reasonably practicable 3. Have the ability and the authority to collate all the necessary, relevant information 4. Have the knowledge, skills and experience to make informed decisions about the risks and precautions that are needed 5. Share knowledge and contribute towards the pre-task talk or the Toolbox Talk  Appendix 2 - Compliance and auditing Records are to be kept in order to demonstrate that the workforce has been suitably trained and have adequate knowledge and expertise in understanding the risks during welding and cutting operations.  Training courses should be audited to establish that they meet the course criteria set out in this procedure and that the syllabus has been delivered effectively.  **Auditing**  In order to ensure that these procedures are followed by all personnel, periodic audits, including audits of construction and maintenance contractors, shall be organized by the HSE department. Appendix 3 - Checklist for welding and cutting Record BSA-ECDC-HS-CL-S008-05-Welding Equipment Check v1.0 are items which need to be confirmed prior to the commencement of welding/cutting work |