Best Practice # 38  
8/13/05

FACILITY: BNFL Inc. (Big Rock Point Major Component Removal Project)

BEST PRACTICE TITLE: Worker Protection from Carbon Monoxide (CO) Production from Plasma Arc Torch Cutting of Stainless Steel in Confined Space

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BRIEF DESCRIPTION OF BEST PRACTICE:

During the planning phase of a Plasma Arc cutting task, the potential for carbon monoxide production and collection was identified. Selecting the proper combination of engineering and administrative controls, combined with proper personnel protective equipment (PPE) resulted in this work being performed without incident.

WHY THE BEST PRACTICE WAS USED:

BNFL Inc. used plasma arc cutting torches to cut up and remove up to ½-inch thick stainless steel plate inside a Permit Required Confined Space (PRCS) as part of decommissioning activities. A job hazard analysis identified that carbon monoxide (CO) production was likely at levels requiring engineering controls, administrative controls, and PPE. Air monitoring during initial cutting operations confirmed that CO was present at elevated levels. The engineering controls implemented included the use of up to seven (7) 2,000-cfm HEPA filtered air handlers to provide both local exhaust ventilation and work area dilution ventilation. The administrative controls implemented were to stop cutting operations when CO levels approached 150 ppm (this administrative level was selected to ensure that the workers inside the PRCS would not exceed the local regulatory ceiling limit of 200 ppm in the event that they had to exit the PRCS without their respirator). The PPE used included 1) a full face supplied air respirator using Grade D breathing air, 2) the appropriate shade welding lens for the radiant energy produced by the plasma arc cutting torch, and 3) fire-retardant radiological anti-contamination outer clothing. All exposed skin was also covered to prevent ultraviolet ray exposure from the operation of the plasma arc cutting torch. CO monitoring was performed using a personal CO monitor with an adjustable alarm setpoint and a data-logging CO monitor to provide a historical record of monitoring activities.

WHAT ARE THE BENEFITS OF THE BEST PRACTICE:

The best practices benefits are: 1) the proper placement of air handler exhaust hoses are essential in the capture and removal of as much CO as possible from the PRCS in the shortest time period, 2) by maintaining the exhaust hose as close as possible to the point of operation the majority of CO generated can be removed before it disperses throughout the PRCS, 3) periodic relocation of exhaust ventilation hoses is essential to maximizing CO removal as the location of cutting is constantly moving, 4) the ideal location of the exhaust ventilation can be estimated by performing calculations prior to the start of cutting however, air monitoring will identify optimum placement of hoses, usually by trial and error, 5) the use of smoke tubes are essential in determining ventilation flow prior to starting the cutting operations, 6) CO monitoring is essential in adjacent work areas to ensure that CO removed from the PRCS does not create a hazardous condition elsewhere, 7) double open-ended 12-inch diameter hoses allowed additional fresh air to be brought down into the PRCS to replace the air removed from the PRCS by the air handler when one open
end was placed outside the PRCS in ambient conditions while the other open end is located inside the PRCS, 8) the use of CO monitors with adjustable alarm setpoints allow for working in higher CO levels due to the increased personal protection factor provided by the full face supplied air respirator while still retaining an alarm capability at higher CO levels, and 9) the use of a data logging CO monitor allows for creating a graphical display of CO concentrations throughout the work period. This also allows for graphical review with the work crew to ensure CO control and/or reduction in CO production has occurred.

WHAT PROBLEMS/ISSUES WERE ASSOCIATED WITH THE BEST PRACTICE:

None

HOW THE SUCCESS OF THE BEST PRACTICE WAS MEASURED:

The work was completed without incident due to the correct combination of engineering and administrative controls and proper PPE.

DESCRIPTION OF PROCESS EXPERIENCE USING THE BEST PRACTICE:

See “Success” and “Benefits” sections above.

Cutting in confined space with ventilation and air monitoring

Confined space in basement room with stainless steel cutting and CO production

ISM Core Functions and Principles

CF-3 Develop and implement hazard controls
P-6 Hazard controls tailored to the work being performed
CF-4 Perform work within controls
P-3 Competence commensurate with responsibilities