

Use of Tungsten Welding Rods Containing Thorium

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PURPOSE

This Bulletin Provides information regarding the potential for radiological exposures associated with the use of tungsten welding rods containing thorium. Recent reviews at several DOE sites identified concerns with lack of a hazard analysis associated with use of these products. Under certain conditions the liberation of thorium particles may lead to a potential contamination and internal exposure hazard.

BACKGROUND

Tungsten welding rods, typically containing one or two percent by weight of naturally radioactive thorium oxide (hereafter referred to as thoriated tungsten welding rods), are widely used in industry. Using these welding rods can produce measurable levels of airborne radioactive material as a result of volatilizing the tip during welding, or grinding rods to put a point on the electrode prior to use.

WHAT ARE THE HAZARDS?

Certain use of these materials may result in the production of airborne radioactive material, which may result in a radiation dose to the welder or grinder. Recent studies indicate that, on average, the committed effective dose equivalent (CEDE) a full-time welder receives in a year is well below 100 millirem CEDE. However, in certain cases, it is possible to exceed this dose. Factors that could lead to such doses include; welding with alternating current absence of ventilation welding inside vessels or in orientations where the welder receives high exposure to welding fumes, or an excessive amount of electrode grinding.

Surface contamination from settled welding fumes or electrode grinding dust may also create difficulties in identifying the source of, and responding to, contamination events.

Implementation of standard accepted industrial hygiene work practices should be adequate to address any radiological concern. Relatively simple actions, such as the proper use of ventilation and the position of the individual's head while welding or grinding, can also significantly lower potential intakes. A hazard assessment, commensurate with the hazard, may include the following factors in determining the magnitude of the hazard and whether additional assessment is needed:

- The total amount of time spent welding with thoriated electrodes
- Type and adequacy of ventilation
- Amount of time grinding thoriated electrodes
- Direct current versus alternating current welding

If the hazard assessment suggests that an individual may receive elevated exposures while working with thoriated tungsten welding rods, review work place controls, e.g., local exhaust ventilation, to ensure that exposures are appropriately controlled

MINIMIZING EXPOSURE AND CONTAMINATION

The following actions are good practices as applied to all welding and grinding operations using thoriated tungsten welding rods:

- Consider the use of thorium-free tungsten electrodes or other welding techniques
- Read Material Safety Data Sheets (MSDSs) for all materials used in welding
- Make use of local ventilation to clear the breathing zone of particles and fumes while welding and grinding
- Use a face mask or helmet and position the head to minimize exposure to fumes and particles while welding and grinding
- After welding or grinding operations are completed, ensure the work area is adequately cleaned
- Ensure welders are trained in the safe and efficient operation of the welding and grinding equipment and measures to reduce surface contamination.

ADDITIONAL SOURCES OF INFORMATION

- Your Safety and Health Office
- NRC NUREG 1717
- American Welding Society
- ANSI Z 49.1

SUMMARY

- Using thoriated tungsten welding rods can result in radiation exposures.
- Perform a hazard analysis before using the thoriated tungsten welding rods to evaluate needed controls.
- Institute appropriate radiological controls to reduce potential exposure during use and clean the area after use.
- If the appropriate industrial hygiene and industrial safety controls (ISM program) are applied to this and other welding activities, then employee exposures will be minimized.

If you have any questions, please contact the Office of Worker Safety and Health Policy (301) 903-6061.

(Signed)

Glenn S. Podonsky
Chief Health, Safety and Security Officer
Office of Health, Safety and Security



PREVENT EVENTS

Learning from Industry Experience

PREVENT EVENTS is intended for use by personnel during morning meetings, pre-job briefings, and work unit meetings to communicate key industry experience.

Management:

1. Have we determined if discontinuing the use of thoriated tungsten electrodes will reduce the quality of welds in equipment used on site?
2. Have we determined the economic impact of discontinuing the use of thoriated tungsten electrodes?
3. What training have we provided our welders on working with thoriated tungsten electrodes?
4. Are hazards associated with thoriated tungsten electrodes considered in planning work involving welding operations?

The total amount of time spent welding with thoriated electrodes: The dose estimate of significantly exceeding 100 millirem CEDE for this process conservatively assumed between 1000 to 2000 hours per year. Individuals who will perform welding only a few times in a year should not receive a significant dose.

Type and adequacy of ventilation: The type, process or local systems, and adequacy of ventilation associated with welding/grinding activities can greatly influence the potential for radiation exposures.

Amount of time grinding thoriated electrodes: Airborne radioactivity levels may be higher during grinding than during welding operations. Individuals who grind a significant number of electrode tips may have the potential to receive a higher dose than those who only occasionally grind electrode tips.

Direct current versus alternating current welding: Estimated doses from welding processes that use alternating current are significantly higher than those from welding that uses direct current.

5. Is the welding shop routinely monitored for contamination around electrode grinding stations and welding benches?
6. Do shop cleanup practices minimize the accumulation and spread of electrode grinder dust and weld spatter?
7. If large quantities of rods are stored, have radiological implications been considered?
8. Have waste disposal implications of rod scrap and grinder dust been considered?
9. For estimated radiation doses from welding/grinding greater than 100 millirem CEDE in a year, has air sampling and other means of monitoring for internal dose been considered?

Supervisors and Workers:

1. Are there alternatives to thoriated tungsten electrodes for the job?
2. Has local ventilation been set up to clear the breathing zone of particles and fumes while welding and grinding?
3. Is the air in the work area being sampled to confirm an acceptable air quality for work?
4. Have surface swipes been taken to assure that the work area is clean after the welding/grinding operations have been completed?
5. Have all welders been properly trained in the use of thoriated tungsten electrodes and are they aware of measures that can reduce the potential for exposure?

