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July 7, 2009

Marble Institute of America  
28901 Clemens Road, Suite 100  
Cleveland, OH 44145  
Attention: Guido Gliori, President

**RE: Conference of Radiation Control Program Directors Letter**

Dear Mr. Gliori:

At your request, we have reviewed the communiqué (the Letter) issued by the Conference of Radiation Control Program Directors (CRCPD) titled, "Potential Occupational Exposure, Fabrication of Granite Countertops", dated June 10, 2009, and signed by Dave Bernhardt, CHP. There are many serious issues with the science described in the Letter (to be described below). First; however, a brief history of the topic warrants discussion. The Letter addresses a topic that has been known and worked on by governmental and non-governmental groups for many years. For example, U.S. Occupational Safety and Health Administration (OSHA) established occupational exposure limits for Uranium when its regulations went in to effect in 1972.<sup>1</sup> The National Institute for Occupational Safety and Health has a recommended exposure limit listed in its Pocket Guide to Chemical Hazards,<sup>2</sup> and The American Conference of Governmental Industrial Hygienists also established exposure limits starting in 1953<sup>3</sup> for occupational exposure to Uranium. These exposure limits apply to workers working full-time, 40 hours per week for a working lifetime and have been established after considering both toxicological as well as radiological effects.<sup>4</sup>

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<sup>1</sup> OSHA, 2009, Occupational Safety and Health Guideline for Uranium and insoluble compounds, <http://www.osha.gov/SLTC/healthguidelines/Uraniuminsolublecompounds/recognition.html>, accessed July 4, 2009

<sup>2</sup> NIOSH. 2005. *NIOSH Pocket Guide to Chemical Hazards*. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. <http://www.cdc.gov/niosh/npg/npgd0650.html>, accessed July 4, 2009.

<sup>3</sup> ACGIH, 2001, Documentation for the TLVs, Uranium (Natural) and its soluble and insoluble compounds, American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

<sup>4</sup> OSHA, 2009, Occupational Safety and Health Guideline for Uranium and insoluble compounds, <http://www.osha.gov/SLTC/healthguidelines/Uraniuminsolublecompounds/recognition.html>, accessed July 4, 2009

All of these exposure limits apply to worker exposure working full time (40 hours per week, 2,000 hours per year) for a working lifetime (commonly estimated at 45 years). Therefore, to compare a sampling result to these exposure limits, one must collect samples in a manner that allows for a valid estimate of the worker's exposure.

It is well established in the field of industrial hygiene, both in the regulatory environment (OSHA) and in the field of industrial hygiene around the world, that exposure assessments of workers are based on personal sampling data.<sup>5</sup> Personal samples are samples taken on the worker in the breathing zone of the worker. A sample not taken in the breathing zone of the worker is an area sample, not a personal sample. Below is the language directly from OSHA's Technical manual regarding air sampling:

“Attach the collection device (filter cassette, charcoal tube, etc.) to the shirt collar or as close as practical to the nose and mouth of the employee's breathing zone (i.e., in a hemisphere forward of the shoulders within a radius of approximately nine inches).”

Contrary to acceptable science and standard practice in industrial hygiene, the data used in the Letter to make dose estimates came from sampling devices “3 – 4 feet” from the worker's breathing zone. A picture shown on the website of Linda Kincaid, the person reported to have obtained the samples, shows air samples being collected at the work surface directly across from the hand grinding operation (see Photograph 1).

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<sup>5</sup> AIHA, 2003, The Occupational Environment: Its Evaluation, Control and Management, American Industrial Hygiene Association, Fairfax, CVA, Chapter 7, Principles of Evaluating Worker Exposure; NIOSH, 1977, Occupational Exposure Sampling Strategy Manual, National Institute for Occupational Safety and Health, Cincinnati, OH, Page 37.



**Photograph 1** Picture from Website Depicting Sampling Method Used for Dose Assessment in Conference of Radiation Control Program Directors' Letter.<sup>6</sup>

As shown in Photograph 1, the sampling device is located level with the grinder on the work surface, not in the workers' breathing zone. The particle size distribution at the level of the grinder (a very important input to the radiation calculations performed by Mr. Bernhardt) and at the breathing zone would clearly be expected to be different.<sup>7</sup> It is essential that Mr. Bernhardt know the aerodynamic diameter of the particles that the individual is exposed to and which size particles the radioactivity is contained in;<sup>8</sup> yet, these two critical factors are not accounted for or discussed. It is also well established in the field of industrial hygiene air sampling that there is a need to protect against gross contamination of the sample being collected from particles that can settle or be thrown into or at the sampling device.<sup>9</sup> In Photograph 1, it is clear that this issue was not dealt with effectively when the area samples used in the dose estimates were collected. The measurements taken in this manner do not represent worker exposure. Notice, too, that the

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<sup>6</sup> Photograph reproduced from <http://www.examiner.com/x-5101-San-Jose-Environmental-Health-Examiner~y2009m6d26-Nationwide-warning-about-radioactive-granite-dust>

<sup>7</sup> AIHA, 2003, The Occupational Environment: Its Evaluation, Control and Management, American Industrial Hygiene Association, Fairfax, CVA, Chapter 12.

<sup>8</sup> Characterization of Enriched Uranium Dioxide Particles from a Uranium Handling Facility Hoover et al. *Radiat Prot Dosimetry*.1998; 79: 57-62

<sup>9</sup> OSHA, 2009, OSHA Technical Manual, General Monitoring Requirements and Guidelines, OSHA, Salt Lake City, Technical Center, [http://www.osha.gov/dts/osta/otm/otm\\_ii/otm\\_ii\\_1.html#introduction](http://www.osha.gov/dts/osta/otm/otm_ii/otm_ii_1.html#introduction), accessed July 4, 2009.

worker is mobile but the sampling device is stationary: this is just one of the more obvious problems using area samples to represent the exposure of the worker.

Perhaps most egregious, in the Letter prepared by Mr. Bernhardt, it is reported that the air samples taken by Ms. Kincaid were “short-term” air samples. One of the tenets of industrial hygiene and occupational exposure assessment is that results from full-shift samples are required for estimating full-shift exposures.<sup>10</sup> These were not full-shift samples yet they were used to estimate not only full-shift exposures but lifetime work at 40 hours per week and 2,000 hours per year.

## CONCLUSIONS

The result of these exposure assessment errors is an estimate of a worker’s exposure to Uranium (and other progeny) that is based on:

- Area samples (not personal samples)
- Samples collected on the work surface not where the worker was located
- Samples collected very close to an operating hand grinder
- Short-term samples (not full-shift)
- An unknown activity particle size distribution

These short-term, non-personal samples with unknown activity particle size distribution collected under artificial work conditions were used to calculate a worker’s radiation dose for an entire working lifetime. These results were then extrapolated to make recommendations regarding the need for controls to be applied to granite workers in general.

Along with the major flaws identified above, the authors do not provide normally supplied supporting documentation such as:

- Representativeness of fabrication method (e.g., dry cutting).
- Representativeness of the work practices used.

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<sup>10</sup> AIHA, 2003, The Occupational Environment: Its Evaluation, Control and Management, American Industrial Hygiene Association, Fairfax, CVA, Chapter 7, Principles of Evaluating Worker Exposure; NIOSH, 1977, Occupational Exposure Sampling Strategy Manual, National Institute for Occupational Safety and Health, Cincinnati, OH.

- Representativeness of granite sample used (e.g., market share of the stones tested).
- Ventilation conditions.
- Duration and number of the short-term samples.
- Sample flow rates and calibration data.
- Laboratory reports and correspondence.
- Quality assurance measures.
- Collection of field and method blanks.
- Chain of custody documents showing proper procedures were followed.
- A description of the actual sampling and analytical methods used. The sampling and analytical methods are particularly important because the methods for sampling and analyzing silica (the initial reason for taking the samples) and Uranium are different.

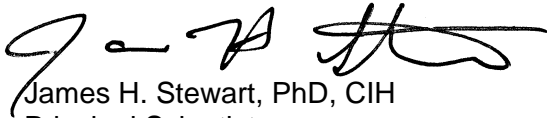
There are so many clear and significant scientific errors in the work reported in the Letter; it is inconceivable that the data have been relied upon to make any type of decisions and recommendations or were passed on to others. Whether intended or not, this use of poor science to alarm a specific population of workers is not part of industrial hygiene and exposure assessment as we know it and see it practiced.

We strongly recommend that you contact CRCPD immediately to notify them of these scientific issues and concerns and to request that the CRCPD retract the Letter that was distributed to its members and contacts.

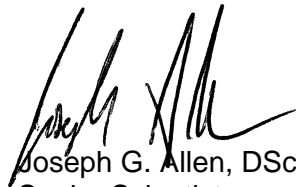
We also ask that you request that the CRCPD obtain the supporting sampling data described above from the industrial hygienist who took the measurements that form the basis for the dose assessment. In addition, please request/obtain all of the inputs and outputs used in the dose modeling conducted by Mr. Bernhardt. In any exposure assessment there is uncertainty and variability that is analyzed and dealt with as a normal part of the practice of exposure assessment. Mr. Bernhardt's supporting documentation demonstrating how he dealt with uncertainty, and consequently how the inputs and outputs from the modeling exercise, were determined will allow us to perform further investigation, provide additional recommendations, and assess the strengths and weaknesses of the work described in the Letter.

If you have any questions please do not hesitate to contact either of us at 1-800 TALK EHE (1-800-825-5343).

Sincerely,



James H. Stewart, PhD, CIH  
Principal Scientist  
Instructor, Harvard School of Public Health



Joseph G. Allen, DSc, MPH  
Senior Scientist