

## **Hexavalent Chromium Study Sponsored by the RMC Research Foundation Executive Summary**

### ***Inhalation Exposure to Hexavalent Chromium in the U.S. Ready Mixed Concrete Industry - - Results of a Contemporary Cross-Sectional Survey***

The U.S. ready mixed concrete industry is characterized by a strong focus on worker safety and health as demonstrated by the industry's low worker injury rates compared to average worker injury rates in the U.S. (*NRMCA 2001- 2003 Industry Benchmarking Survey Data, NRMCA*). Despite this strong safety ethic, little hexavalent chromium exposure assessment data exists among member companies of NRMCA. This is the result of the long-standing knowledge that ready mixed concrete contains very little hexavalent chromium and that hexavalent chromium is not used as an additive in any ready mixed concrete product. Prior to the proposed rule, there has been little need to be concerned about the trace amounts of hexavalent chromium found in this industry as an inhalation hazard.

However, notwithstanding this historical assumption and subsequent to the publication of the OSHA Proposed Rule for Occupational Exposure to Hexavalent Chromium, a cross-sectional exposure assessment survey was conducted to gain a better understanding of the potential for worker inhalation exposure to hexavalent chromium. Four ready mix concrete facilities were selected based on their production volume (average or higher production volumes), age (five to 25 years old), and geographical location (southeast U.S. to optimize the potential for warm weather which more accurately approximates the potential for worst-case exposures based on higher dust levels in hot/warm weather). Within each location, six job titles were selected, if present, for quantitative exposure assessment: truck driver, batch operator or "batcher," utility personnel (maintenance), equipment operator, forklift operator, and quality control technician. These six job titles were judged to have the highest potential for exposure to dust-containing hexavalent chromium based on a detailed qualitative exposure assessment of the industry. Samples were collected in proportion to the anticipated overall population of each job title within the industry, e.g., the greatest number of workers in any one job title are ready mixed concrete truck drivers and represented 50% of the samples collected in the survey.

The survey was conducted using OSHA analytical method ID-215 and under the direction of a Certified Industrial Hygienist (CIH). The reported detection limit for all samples was 0.01 micrograms ( $\mu\text{g}$ ) with all samples being analyzed by one American Industrial Hygiene Association (AIHA)-accredited laboratory. All samples were collected as full-shift personal samples.

Of the 78 samples collected, 39 or 50% resulted in findings below the analytical limits of detection. For the purposes of calculating statistical summaries, truncated data were assigned a value of one-half of the limit of detection to minimize the potential for underestimation of exposure. The average exposure for the 78 samples was 0.012

ug/m<sup>3</sup> as an eight-hour time-weighted average, or less than 2% of the proposed OSHA PEL. The median concentration was 0.0089 ug/m<sup>3</sup> and the standard deviation was 0.011 ug/m<sup>3</sup>. Variation in exposures between different job titles was not significant per Table 1, although it is a reality of the industry that workers may have multiple job titles/tasks during any given workday. This is particularly true for utility personnel who conduct maintenance activities on both fixed and mobile equipment, and less true for truck drivers.

**Hexavalent chromium exposure among six common ready mixed concrete job titles**

<b>Title</b>	<b>Samples</b>	<b>Average Exposure</b>	<b>Standard Deviation</b>
Dispatcher	9	0.0056 ug/m <sup>3</sup>	0.0025 ug/m <sup>3</sup>
Equipment operator	6	0.0205 ug/m <sup>3</sup>	0.0104 ug/m <sup>3</sup>
Forklift operator	4	0.0153 ug/m <sup>3</sup>	0.0025 ug/m <sup>3</sup>
Truck driver	39	0.0105 ug/m <sup>3</sup>	0.0113 ug/m <sup>3</sup>
Maintenance	16	0.0168 ug/m <sup>3</sup>	0.0083 ug/m <sup>3</sup>
Quality control	4	0.0154 ug/m <sup>3</sup>	0.0138 ug/m <sup>3</sup>

It is also notable that the only potential source of exposure to hexavalent chromium in the ready mix concrete industry besides dry Portland cement, is welding fumes. Welding activities were included in the exposure component of the utility and maintenance personnel job titles. Welding work in this industry can include shop and mobile applications, but is uncommon in terms of frequency of daily work and is generally limited to cutting and welding on mild carbon steel and very limited volumes of stainless steel welding. Because this type of welding is so uncommon and often requires MIG and TIG welding techniques, much of this work is outsourced in the ready mixed concrete industry.

These data provide strong support for the longstanding expectation that U.S. ready mixed concrete production workers have minimal potential for inhalation exposure to hexavalent chromium in the form of dry concrete dust or welding fumes.