

mining and approaches that for construction, but still clearly exceeds

the risk in lower-risk industries such as manufacturing.

**Table VII-2: Fatal Injuries per 1000 Employees, by Industry**

	over 1 year	over 20 years	over 45 years
All Private Industry:	0.06	1.1	2.5
Coal Mining:	0.41	8.3	18.6
Mining (General):	0.27	5.5	12.3
Construction:	0.19	3.9	8.7
Manufacturing:	0.04	0.8	1.8
Wholesale Trade:	0.04	0.8	1.7
Retail Trade:	0.03	0.6	1.4
Finance, Insurance, and Real Estate:	0.02	0.3	0.7
Health Services:	0.01	0.2	0.4

Because there is little available information on the incidence of occupational cancer, risk from Cr(VI) exposure cannot be compared with overall risk from other workplace carcinogens. However, OSHA's previous risk assessments provide estimates of

risk from exposure to certain carcinogens. These risk assessments, like the current assessment for Cr(VI), were based on animal or human data of reasonable or high quality and used the best information then available. Table VII-3 shows the Agency's best estimates

of cancer risk from 45 years' occupational exposure to several carcinogens, as published in the preambles to final rules promulgated since the benzene decision in 1980.

**Table VII-3: Selected OSHA Risk Estimates (Excess Cancers per 1000 Workers)**

Standard	Risk at prior PEL	Risk at new PEL	Federal Register date
Ethylene Oxide	63 - 109 per 1000	1.2 - 2.3 per 1000	June 22, 1984
Asbestos	64 per 1000	6.7 per 1000	June 20, 1986
Benzene	95 per 1000	10 per 1000	September 11, 1987
Formaldehyde	0.43 - 18.9 per 1000*	.0056 - 2.64 per 1000*	December 4, 1987
Methylenedianiline	6 - 30 per 1000**	0.8 per 1000	August 10, 1992
Cadmium	58 - 157 per 1000	3 - 15 per 1000	September 14, 1992
1,3-Butadiene	11.2 - 59.4 per 1000	1.3 - 8.1 per 1000	November 4, 1996
Methylene Chloride	126 per 1000	3.6 per 1000	January 10, 1997
Chromium VI	101 - 351 per 1000	10 - 45 per 1000	2006

\* range is based on maximum likelihood estimate (0.43, .0056) and upper 95% confidence limit (18.9, 2.64)

\*\* no prior standard; reported risk is based on estimated exposures at the time of the rulemaking

The Cr(VI) risk estimate at the previous PEL is higher than many risks the Agency has found to be significant in previous rules (Table VII-3, "Risk at Previous PEL"). The estimated risk from lifetime occupational exposure to Cr(VI) at the new PEL is 10-45 excess lung cancer deaths per 1000 workers, a range which overlaps the estimated risks from exposure at the current PELs for benzene and cadmium (Table VII-3, "Risk at new PEL").

Based on the results of the quantitative risk assessment, the Supreme Court's guidance on acceptable risk, comparison with rates of occupational fatality in various industries, and comparison with cancer risk estimates developed in previous rules, OSHA finds that the risk of lung

cancer posed to workers under the previous permissible level of occupational Cr(VI) exposure is significant. The new PEL of 5 is expected to reduce risks to workers in Cr(VI)-exposed occupations substantially (by about 8- to 10-fold). OSHA additionally finds that nasal tissue ulceration and septum perforation can occur under exposure conditions allowed by the previous PEL leading to an additional health risk beyond the significant lung cancer risk present. The reduction of the Cr(VI) PEL from 52 µg/m<sup>3</sup> to 5 µg/m<sup>3</sup> is expected to substantially reduce workers' risk of nasal tissue damage. With regard to dermal effects from Cr(VI) exposure, OSHA believes that provision of appropriate protective clothing and

adherence to prescribed hygiene practices will serve to protect workers from the risk of Cr(VI)-induced skin impairment.

## VIII. Summary of the Final Economic and Regulatory Flexibility Analysis

### A. Introduction

OSHA's Final Economic and Regulatory Flexibility Analysis (FEA) addresses issues related to the costs, benefits, technological and economic feasibility, and economic impacts (including small business impacts) of the Agency's Occupational Exposure to Hexavalent Chromium rule. The full Final Economic and Regulatory Flexibility Analysis has been placed in the docket as Ex. 49. The analysis also evaluates alternatives that were