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Final Report

ECONOMIC ANALYSIS OF THE PROPOSED
REVISIONS TO THE OSHA ASBESTOS
STANDARDS FOR CONSTRUCTION AND
GENERAL INDUSTRY

Contract Number J-9-F-8-0033
Task Order 4, Option Year 1

Prepared for:

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contain an eight-hour TWA permissible exposure limit (PEL) of 0.1 f/cc (in the current rule, the PEL is 0.2 f/cc), as well as the existing requirements for engineering controls, work practices, personal protective equipment, and a variety of ancillary measures for controlling occupational exposure to asbestos.

To meet its requirements under Executive Order 12291, the Regulatory Flexibility Act, and other legislation, and to supplement the existing information regarding the nature, duration, and frequency of asbestos exposure, OSHA, prior to the promulgation of the 1986 asbestos standards, contracted for detailed analyses of asbestos exposure and of the effectiveness, technological feasibility, compliance costs, and economic and environmental effects of regulatory alternatives for controlling asbestos exposure. Separate studies were conducted for construction and asbestos removal in general industry and for primary and secondary asbestos fabrication and use. These studies were performed by CONSAD Research Corporation and Research Triangle Institute (RTI), respectively (CONSAD, 1984 and 1985; RTI, 1984 and 1985), and were used by OSHA in its regulatory impact analysis of the 1986 asbestos standard (OSHA, 1986) and in its analysis of the excursion limit requirements (53 FR 35610).

The purpose of this current study is to conduct certain necessary analyses pursuant to Executive Order 12291 and the Regulatory Flexibility Act and to prepare an economic and technological profile that examines the effectiveness, technological feasibility, compliance costs, and economic effects of OSHA's proposed revisions to the asbestos standards for

controlling asbestos exposure in primary and secondary asbestos manufacturing, in construction, and during asbestos removal projects in general industry.

Exposure to asbestos in general industry occurs during the various production phases in primary and secondary manufacturing, as well as during automotive brake and clutch repair and ship repair. Exposure to asbestos during construction work and during asbestos removal projects in general industry occur in several activities including: new construction, asbestos abatement, demolition, general building renovation and remodeling, and routine maintenance in commercial/residential buildings and in general industry.

The scope of this study covers all of these activities where exposure to asbestos can occur. More specifically, the overall study objectives were:

- o To examine the key provisions contained in OSHA's proposed asbestos standards;
- o To determine the number of affected workers in the primary and secondary asbestos manufacturing and use sectors, as well as the number of construction workers and workers in firms in selected general industry sectors affected, and the frequencies, levels, and duration of their exposures to asbestos in each of the basic activities described above;
- o To determine current control practices and analyze the technological feasibility and direct costs of compliance of the various control practices that can be used to comply with OSHA's proposed asbestos standards; and
- o To evaluate the indirect costs and economic impacts of OSHA's proposed asbestos standards on the primary and secondary asbestos manufacturing and use sectors, and the construction industry and firms in selected general industry sectors, including effects on small businesses.

Table 2.1: Consumption of Asbestos, 1980 - 1989
(thousand metric tons)

Industry Group -----	1980 ----	1984 ----	1989 ----
Construction Products			
Roofing Products	26.5	7.1	17.5
Asbestos-Cement Pipe	144.0	37.0	7.9
Asbestos-Cement Sheet	7.9	12.1	3.0
Floor Tile	90.2	46.4	0.0
Coatings and Sealants	10.9	21.6	4.3
Insulation	8.9	2.8	0.0
Subtotal	288.4	127.0	32.7
Other Products			
Friction Products	43.7	48.4	12.1
Textile Products	1.9	1.5	0.1
Gaskets and Packing	12.3	13.2	4.3
Paper Products	0.5	1.7	1.0
Plastic Products	1.5	1.1	0.5
Miscellaneous Products	10.4	33.1	1.3
Subtotal	70.3	99.0	19.3
Total Asbestos Consumption	358.7	226.0	52.0

Source: U.S. Department of Interior, 1980, 1984, and 1989
Minerals Yearbook (USDOI, 1980b, 1984b, 1990).

Table 2.7: Current Occupational Exposure to Asbestos During Routine Maintenance Work in General Industry, by Activity

Construction Activity	Estimated Annual Number of Workers Potentially Exposed**	Estimated Annual Full-Time Equivalent Person-Years of Exposure	Fiber Exposure Without Respiratory Protection***	Current Effective Fiber Exposure Levels for a PEL of 0.2 f/cc*		
				With Minimal Respiratory Protection	With Supplied Air	Respirators
All Activities	183,602-426,474	1,497-2,619				
Remove/Install Gaskets (Small)****						
Remove/Repair Boiler Insulation (Small)	58,875-55,600	363-130	0.08	0.044	0.040	
Remove/Repair Pipe Insulation (Small)	25,043-21,242	163-51	1.23	0.025	0.012	
Miscellaneous Routine Maintenance Activities (Small)	25,043-21,242	163-51	0.011	0.011	0.011	
Remove/Install Gaskets (Large)****	47,717-42,669	300-100	0.18	0.004	0.002	
Remove/Repair Boiler Insulation (Large)	10,770-105,354	203-855	0.08	0.044	0.040	
Remove/Repair Pipe Insulation (Large)	4,039-47,000	76-371	1.23	0.025	0.012	
Miscellaneous Routine Maintenance Activities (Large)	4,039-47,000	76-371	0.011	0.011	0.011	
	8,077-86,369	153-691	0.18	0.004	0.002	

* Represents resultant exposure levels when respiratory protection is necessary.

** These estimates of the numbers of workers potentially exposed to asbestos do not include those workers estimated by OSHA in its regulatory impact analysis (OSHA, 1986) to be negligibly exposed during very small-scale, short-duration jobs.

*** Estimated arithmetic mean eight-hour time weighted average (TWA) fiber exposure level (in f/cc).

**** Current effective fiber exposure levels reflect use of respiratory protection, necessary for compliance with the excursion limit, by 50 percent of the exposed workers.

Source: CONRAD (1985, Sections 5.1-5.6) and Section 2.4 of this report.

Table 2.8: Summary of Representative Exposure Levels, Absent Respiratory Protection, by Construction Activity

<u>Construction Activity</u>	<u>Representative TWA Exposure Levels, Absent Respiratory Protection (Fibers/Cubic Centimeter)</u>
<u>New Construction</u>	
A/C Pipe Installation	0.02 to 0.06
A/C Sheet Installation	< 0.15
Roofing Felt Installation	N.D. to 0.6
<u>Asbestos Abatement and Demolition</u>	
Removal	< 0.01 to < 8 (pipe insulation) < 0.01 to < 25 (spray-applied)
Encapsulation	0.03 to 0.28
Demolition	< 0.01 to 11
<u>Renovation/Remodeling</u>	
Drywall Demolition	0.15 to 11
Remove Built-Up Roofing	N.D. to 0.2
Remove Flooring Products	0.02 to 0.04
<u>Routine Maintenance: Commercial/Residential</u>	
Remove/Repair/Replace Ceiling Tiles	0.02 to 1.4
Repair HVAC or Lighting	0.01 to 2.8
Other Work Above Drop Ceiling	0.01 to 2.8
Repair Boilers	0.04 to 0.53
Repair Plumbing	0.04 to < 0.1
Repair Roofing	N.D. to 0.3
Repair Drywall	0.02 to 1.4
Repair Flooring	0.02 to 0.04
<u>Routine Maintenance: General Industry</u>	
Gasket Removal and Installation	< 0.1
Removal/Repair of Boiler Insulation	< 0.01 to 8
Removal/Repair of Pipe Insulation	< 0.01 to < 0.1
Miscellaneous Maintenance Activities	< 0.01 to 2.8

N.D. = Not detectable.

Source: CONSAD (1984, Chapter 3; and 1985, Chapter 4).

installation and pipe insulation repair) if no longer classified as small-scale, short-duration projects, will also now require the use of half-mask supplied air respirators (again assuming employers will choose the most cost-effective approach).³ Moreover, demolition projects and drywall removal renovation projects will now require full facepiece supplied air respirators rather than half-mask supplied air respirators. Table 2.9 summarizes the projected number of workers exposed to asbestos levels below and above 0.1 f/cc without the use of respiratory protection.

In sum, most construction activities will generally require respiratory protection in order to comply with the 0.1 f/cc PEL. Exceptions include: A/C pipe installation projects; plumbing repairs in commercial/residential buildings; floor repairs (including floor maintenance activities) in commercial/residential buildings; and pipe insulation repair and gasket removal and installation projects in general industry if classified as small-scale, short-duration projects.

The other incremental controls necessary to comply with OSHA's proposed asbestos standard (with a PEL of 0.1 f/cc), compared to the current asbestos standard (with a PEL of 0.2 f/cc), include (depending upon the construction activity):

³The removal of asbestos flooring products and these routine maintenance projects in general industry will require respiratory protection because regulated areas are required, not because exposures are expected to be above a PEL of 0.1 f/cc.

Table 2.10: Occupational Exposure to Asbestos During Construction and Routine Maintenance Work, by Activity

Construction Activity	Estimated Annual Number of Workers Potentially Exposed ^{ee}	Estimated Annual Full-Time Equivalent Person-Years of Exposure	Fiber Exposure Without Respiratory Protection ^{eee}	Effective Fiber Exposure Levels ^e			
				PEL of 0.2 f/cc		PEL of 0.1 f/cc	
				With Minimal Respiratory Protection	With Supplied Air Respirators	With Minimal Respiratory Protection	With Supplied Air Respirators
<u>New Construction</u>	1,224-8,440	1,224					
A/C Pipe Installation	224-2,100	224	0.035	0.035	0.035	0.035	0.035
A/C Sheet Installation	270-2,160	270	0.13	0.10	0.10	0.01	0.001
Built-Up Roofing Installation	730-4,180	730	0.22	0.022	0.002	0.022	0.002
<u>Asbestos Abatement and Demolition</u>	55,101-79,361	17,144-25,446					
Asbestos Removal	44,491-66,476	13,245-19,790	3.09	0.021	0.003	0.003	0.003
Encapsulation	4,610-6,885	1,295-1,935	0.22	0.022	0.002	0.022	0.002
Demolition	6,000	2,604-3,721	0.61	0.006	0.006	0.001	0.001
<u>Renovation/Remodeling</u>	60,735-95,914	60,735					
Drywall Demolition	51,300	51,300	3.4	0.034	0.034	0.003	0.003
Built-Up Roofing Removal	2,235-19,444	2,235	0.12	0.012	0.001	0.012	0.001
Removal of Flooring Products	7,200-25,170	7,200	0.02	0.02	0.02	0.002	0.0002

^e Represents resultant exposure levels when respiratory protection is necessary.

^{ee} These estimates of the numbers of workers potentially exposed to asbestos do not include those workers estimated by OSHA in its regulatory impact analysis (OSHA, 1986) to be negligibly exposed during very small-scale, short-duration jobs.

^{eee} Estimated arithmetic mean eight-hour time weighted average (TWA) fiber exposure level (in f/cc).

Table 2.10 (continued)

Construction Activity	Estimated Annual Number of Workers Potentially Exposed**	Estimated Annual Full-Time Equivalent Person-Years of Exposure	Fiber Exposure Without Respiratory Protection***	Effective Fiber Exposure Levels*			
				With Minimal Respiratory Protection	With Supplied Air Respirators	With Minimal Respiratory Protection	With Supplied Air Respirators
<u>Routine Maintenance in Commercial/Residential Buildings</u>	129,656-739,448	25,771-40,100					
Repair/Replace Ceiling Tiles	13,686-38,650	725-1,067	0.45	0.045	0.005	0.009	0.005
Repair/Adjust HVAC/Lighting	39,434-60,793	2,091-3,285	0.31	0.006	0.003	0.006	0.003
Other Work Above Drop Ceilings	5,636-4,847	299-469	0.31	0.006	0.003	0.006	0.003
Repair Boiler	7,218-180,984	1,126-1,720	0.18	0.018	0.002	0.018	0.002
Repair Plumbing	7,218-180,984	1,126-1,720	0.011	0.011	0.011	0.011	0.011
Repair Roofing	24,040-127,621	2,404-3,740	0.12	0.012	0.001	0.012	0.001
Repair Drywall	3,576-80,231	3,576-5,662	0.75	0.075	0.008	0.015	0.008
Repair Flooring	28,848-65,338	14,424-22,437	0.02	0.02	0.02	0.02	0.02

* Represents resultant exposure levels when respiratory protection is necessary.

** These estimates of the numbers of workers potentially exposed to asbestos do not include those workers estimated by OSHA in its regulatory impact analysis (OSHA, 1986) to be negligibly exposed during very small-scale, short-duration jobs.

*** Estimated arithmetic mean eight-hour time weighted average (TWA) fiber exposure level (in f/cc).

Table 2.10 (continued)

Construction Activity	Estimated Annual Number of Workers Potentially Exposed**	Estimated Annual Full-Time Equivalent Person-Years of Exposure	Fiber Exposure Without Respiratory Protection***	Effective Fiber Exposure Levels*			
				PEL of 0.2 f/cc		PEL of 0.1 f/cc	
				With Minimal Respiratory Protection	With Supplied Air Respirators	With Minimal Respiratory Protection	With Supplied Air Respirators
<u>Routine Maintenance in General Industry</u>	183,602-426,474	1,497-2,619					
Remove/Install Gaskets (Small)****	58,875-55,600	363-130	0.08	0.044	0.040	0.044	0.040
Remove/Repair Boiler Insulation (Small)	25,043-21,242	163-51	1.23	0.025	0.012	0.012	0.012
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Remove/Repair Pipe Insulation (Large)	4,039-47,000	76-371	0.011	0.011	0.011	0.001	0.0001
Miscellaneous Routine Maintenance Activities (Large)	8,077-86,369	153-691	0.18	0.004	0.002	0.004	0.002

* Represents resultant exposure levels when respiratory protection is necessary.

** These estimates of the numbers of workers potentially exposed to asbestos do not include those workers estimated by OSHA in its regulatory impact analysis (OSHA, 1986) to be negligibly exposed during very small-scale, short-duration jobs.

*** Estimated arithmetic mean eight-hour time weighted average (TWA) fiber exposure level (in f/cc).

**** Effective fiber exposure levels reflect use of respiratory protection, necessary for compliance with the excursion limit, by 50 percent of the exposed workers.

Source: CONRAD (1985, Sections 5.1-5.6) and Section 2.4 of this report.

4.0 REFERENCES⁴⁹

A.F. Meyer and Associates, Inc., Vinyl Asbestos Floor Tile Study - Routine Buffing and Stripping Operations, prepared for WRC-TV, Washington, DC, November 6, 1989 (Exhibit 1-109) (A.F. Meyer and Associates, 1989).

Anderson, P.H., M.A. Grant, R.G. McInnes, and W.J. Farino, Analysis of Fiber Release from Certain Asbestos Products, prepared for GCA Corporation for the Chemical Control Division, Office of Toxic Substances, U.S. Environmental Protection Agency, 1982 (Anderson, et al., 1982).

Asbestos Information Association (AIA), personal communication with Kenneth Nyquist, June 1990 (AIA, 1990).

Asbestos Information Association/North America (AIA/NA), Advance Written Testimony and Documentary Evidence regarding Proposed Standard for Occupational Exposure to Asbestos, given before the U.S. Department of Labor, Occupational Safety and Health Administration, Washington, DC (Exhibit 91-16); Tab G, Lloyd Ambler (A/C Pipe Manufacturing); Tab I, Alfred E. Netter (A/C Sheet Manufacturing); Tab J, Marsden C. Hutchins (Paper, Gasket Manufacturing); Tab K, Eric S. Wormser (Roof Coatings); Tab O, Joseph C. Jackson (A/C Pipe Installation); and Tab P, Sherrel A. Mercer (A/C Pipe Installation).

Breen, J.J., C. Stroup, E.A. Dutrow, and J. Blake, "Evaluating Asbestos Exposures in Buildings," Proceedings of an APCA International Specialty Conference, Asbestos - Its Health Risks, Analysis, Regulation and Control, Atlantic City, NJ, November 1986, pp. 71-78 (Exhibit 1-23) (Breen, et al., 1986).

CONSAD Research Corporation, Economic Analysis of the Proposed Revision to the OSHA Standard Covering Occupational Exposure to Asbestos and Nonasbestiform Fibers, Final Report, Contract Number J-9-F-0052, February 2, 1989 (CONSAD, 1989).

CONSAD Research Corporation, Economic and Technological Profile Related to OSHA's Revised Permanent Asbestos Standard for the Construction Industry and Asbestos Removal and Routine Maintenance Projects in General Industry, Final Report, Contract Number J-9-F-4-0024, December 31, 1985 (CONSAD, 1985).

⁴⁹Exhibit numbers used in this chapter of the report refer to reports contained in either the original asbestos docket (H-033C) or, if preceded with a 1 or 3, the asbestos remand docket (H-033E).