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DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Parts 1910 and 1926

[Docket Number H-033-e]

RIN 1218-AB25

Occupational Exposure to Asbestos, Tremolite, Anthophyllite and Actinolite

AGENCY: Occupational Safety and Health Administration, Department of Labor.

ACTION: Notice of proposed rulemaking and notice of hearing.

SUMMARY: The Occupational Safety and Health Administration (OSHA) is conducting supplemental rulemaking on its standards issued June 17, 1986 (51 FR 22612, June 20, 1986) for occupational exposure to asbestos, tremolite, anthophyllite and actinolite in general industry, 29 CFR 1910.1001, and in the construction industry, 29 CFR 1926.58. These standards revised the 1972 asbestos standard, reduced the permissible exposure limit (PEL) from 2.0 to 0.2 fibers per cubic centimeter (f/cc) time-weighted average (TWA) and updated other requirements. On February 2, 1988 the United States Court of Appeals for the District of Columbia Circuit upheld most aspects of the standard but remanded the case to OSHA on several issues, *Building and Construction Trades Department v. Brock*, 838 F.2d 1258, (DC Cir 1988). As a part of its response to this decision, on September 14, 1988, OSHA issued a short term excursion limit (STEL) for asbestos of 1.0 f/cc averaged over a 30 minute sampling period (53 FR 35610).

In June and July 1989, the Building and Construction Trades Department (BCTD) of the AFL-CIO and the AFL-CIO petitioned the Court to order OSHA to resolve all remand issues on the record of the 1988 rulemaking proceeding. The Court, on October 30, 1989, ordered OSHA to take action on three of the remand issues by December 14, 1989, three other issues by January 28, 1990, and the remaining issues by February 27, 1990. OSHA issued its response on the first three remand issues on December 14, 1989 (54 FR 52024, December 20, 1989). These included: Removing the ban on spraying of asbestos containing materials; changing the regulatory text to clarify when construction employers must resume periodic monitoring; and explaining that the clarification of the exemption for "small-scale, short-duration" operations in the construction

industry will require OSHA to institute rulemaking.

OSHA published its resolution of three additional issues on February 5, 1990 (55 FR 3724). These included: Expanding its ban on workplace smoking and adding training requirements covering the availability of smoking control programs; explaining how and why OSHA's respiratory requirements will result in risk being reduced below that remaining at the PEL; adding a requirement that employers assure that employees working in or contiguous to regulated areas comprehend required warning signs and labels.

OSHA has determined that four remanded issues cannot be resolved on the existing record and that their resolution will require new rulemaking. These issues which are addressed in this proposal are: The establishment of operation-specific permissible exposure limits; the extension of reporting and information transfer requirements; the expansion of the competent person requirement to all workers engaged in any kind of construction work; and the clarification of the exemption for "small-scale, short duration operations" which was deferred from the Agency's December 20, 1989 response (54 FR 52024).

OSHA is proposing the following regulatory approaches to resolve these issues: Lowering the PEL to 0.1 f/cc for all employees, specifying work practices to reduce exposures in brake and clutch repair and service; requiring additional communication of asbestos hazards among building owners, employers and employees and requiring notification of OSHA prior to removal, demolition, or renovation operations; requiring oversight of all construction operations by a competent person and of small-scale, short duration operations by a specifically trained competent person; and more explicitly defining the small-scale, short duration and other exemptions from the negative-pressure enclosure requirement.

DATES: Comments concerning this notice and notices of intention to appear at the public hearing must be postmarked on or before September 25, 1990. Parties requesting more than 10 minutes for their presentation at the hearing, and parties planning to present documentary evidence at the hearing must submit the full text of their testimony and all documentary evidence not later than September 25, 1990. The hearing will take place in Washington, DC and will begin at 9:30 a.m. on October 23, 1990.

ADDRESSES: Comments should be submitted in quadruplicate to the docket

Officer, Docket H-033-e, Occupational Safety and Health Administration, 200 Constitution Avenue NW., room N2625, Washington, DC 20210; telephone (202)-523-7894.

Notices of intention to appear at the hearing, testimony, and documentary evidence should be submitted in quadruplicate to Mr. Tom Hall, Division of Consumer Affairs, Docket H-033-e, Occupational Safety and Health Administration, 200 Constitution Avenue NW., room N3647, Washington, DC 20210; telephone (202)-523-8615.

All written materials received and notices of intention to appear will be available for inspection and copying in the Docket Office, room N2625 at the above address.

The informal public hearing will begin at 9:30 a.m. on October 23, 1990 at the following location: Auditorium, U.S. Department of Labor, Frances Perkins Building, 200 Constitution Avenue NW., Washington, DC 20210.

Submission of Comments to the Docket: OSHA has established Docket H-033 for asbestos rulemaking evidence. Although the final decisions regarding the issues considered in this rulemaking will be based on the entire H-033 docket, OSHA has established a subcategory, H-033-e for purposes of referencing evidence specifically related to this proceeding on certain rulemaking issues remanded for reconsideration. The list of asbestos rulemaking subcategories is as follows:

H-033a.....	1972 Rulemaking
H-033b.....	1975 Rulemaking
H-033c.....	1986 Rulemaking
H-033d.....	Non-asbestiform minerals issues
H-033e.....	Court remand issues.

FOR FURTHER INFORMATION CONTACT: James F. Foster, Director of Information and Consumer Affairs, Occupational Safety and Health Administration, U.S. Department of Labor, room N3649, 200 Constitution Avenue, NW., Washington, DC 20210.

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I. Regulatory History

On June 17, 1986, OSHA issued revised standards governing occupational exposure to asbestos,

tremolite, anthophyllite and actinolite for general industry and construction (51 FR 22612 et seq., June 20, 1986). Effective July 21, 1986, the revised standards amended OSHA's previous asbestos standard issued in 1972.

On October 17, 1986, OSHA published a partial stay of the revised standards insofar as they apply to occupational exposure to non-asbestiform tremolite, anthophyllite and actinolite (51 FR 37002), which were included in the scope of the 1986 standards. The stay has been extended to November 30, 1990 (see 54 FR 30704), to enable OSHA to complete rulemaking on these non-asbestiform minerals. The partial stay continues to apply to the 1986 standards and all amendments thereto, including the amendments proposed in this notice. On February 12, 1990 (55 FR 4938) OSHA published a Notice of Proposed Rulemaking in which OSHA proposed to delete non-asbestiform tremolite, anthophyllite and actinolite from the scope of the asbestos standard and is considering alternative approaches to regulation of these non-asbestiform minerals. OSHA is not considering in this proceeding the issues of economic and/or technical feasibility of these proposed revisions as they would apply to industries using non-asbestiform minerals. Extension of these revisions to non-asbestiform minerals would require determination of these issues in a further proceeding. Therefore OSHA does not intend to apply the proposed revisions to the asbestos standards to the regulation of the non-asbestiform minerals at the end of this proceeding.

In the proposed regulatory text to the asbestos standards, OSHA is treating the referencing of the non-asbestiform minerals in two ways. One, it is excluding them from the text of the provisions reducing the TWA PEL; and from new provisions for which there are not now counterparts, such as requiring notification to OSHA for large-scale construction projects, and mandatory work practices for brake repair in the general industry. Two, it is continuing to reference the non-asbestiform minerals in the regulatory text of provisions which are revised versions of current provisions which include specific mention of non-asbestiform minerals. The reason for the continued reference in the revised provisions is to avoid confusion if OSHA presented both the old and new text, each version applicable to separate minerals. At the conclusion of the separate rulemaking relating to regulation of these non-asbestiform minerals (Docket H-033d), OSHA will make appropriate changes in the entire regulatory text of the revised

asbestos standards to reflect the outcome of that proceeding and thus to remove reference of the non-asbestiforms, if appropriate.

Separate comprehensive standards for general industry and construction were issued in 1986 which shared the same permissible exposure limit (PEL) and most ancillary requirements. The standards reduced the 8-hour time weighted average (TWA) PEL tenfold to 0.2 f/cc from the previous 2 f/cc limit. Specific provisions were added in the construction standard to cover unique hazards relating to asbestos abatement and demolition jobs.

Several major participants in the rulemaking proceeding including the AFL-CIO, the Building and Construction Trades Department (BCTD) of the AFL-CIO, and the Asbestos Information Association (AIA), challenged various provisions of the revised standards. On February 2, 1988, the U.S. Court of Appeals for the District of Columbia issued its decision upholding most major challenged provisions, but remanding certain issues to OSHA for reconsideration (*BCTD, AFL-CIO v. Brock*, 838 F.2d 1258). The Court held that where rulemaking participants had recommended regulatory provisions which, on the record, appeared to be feasible and to confer more than a *de minimis* benefit in reducing significant risk, OSHA must either adopt them, refute the evidence of feasibility or benefit, or more persuasively explain why OSHA did not adopt the provisions. The Court also ordered OSHA to clarify the regulatory text for two provisions and found one provision, a ban of spraying asbestos-containing products, unsupported by the record. In addition, OSHA's failure to adopt a short-term exposure limit (STEL) was ordered to be reconsidered within 60 days of the Court's mandate. In partial response, OSHA issued a STEL of 1 f/cc measured over a 30-minute sampling period, on September 14, 1988 (53 FR 35610).

On June 10 and July 18, 1989, BCTD and the AFL-CIO petitioned the Court to enforce its remand order by ordering OSHA to resolve all remand issues on the record of the 1986 rulemaking proceeding within 7 to 60 days. The Court, in an October 30, 1989 order, divided the remand issues into three categories as follows. With respect to three issues, the Court ordered OSHA to take action by December 14, 1989. These issues were:

- Issue 1.* Formally delete the ban on the spraying of asbestos-containing materials;
- Issue 2.* Clarify that periodic monitoring in the construction industry must be resumed after conditions change; and

Issue 3. Clarify the exemption for "small-scale, short duration operations" from the negative-pressure enclosure requirements of the construction standard to limit the exemption to work operations where it is impractical to construct an enclosure because of the configuration of the work environment.

OSHA issued its response on these issues on December 14, 1989 (54 FR 52024, December 20, 1989). In that document OSHA (1) removed the ban on the spraying of asbestos-containing materials; (2) changed the regulatory text to clarify that construction employers must resume periodic monitoring whenever there has been a change in process, control equipment, personnel or work practices that may result in new or additional asbestos exposure; and (3) explained why OSHA was not amending the regulatory text to clarify the limited exemption for "small-scale, short-duration operations" in the construction industry standard, but instead would institute rulemaking on this issue.

With respect to the second group of issues, the Court ordered OSHA to complete its response on the existing record by January 28, 1990. These issues are:

- Issue 4.* The possibility of further regulations governing employee smoking controls;
- Issue 5.* The effectiveness levels of various respirators and OSHA's policy of requiring respirators to protect workers at only PEL level; and
- Issue 6.* The possibility of bi-lingual warnings and labels for employers with a significant number of non-English-speaking employees.

The Court stated that if OSHA determines that these issues could not be resolved on the existing record, OSHA may explain why and commence new rulemaking instead.

On January 28, 1990, OSHA issued its response on these issues (55 FR 3724, February 5, 1990). In that document, OSHA:

- (1) Prohibited workplace smoking in areas where occupational exposure to asbestos takes place; expanded training requirements to include information about available smoking cessation programs; required the distribution of self-help smoking cessation material; required a written opinion by the physician stating that the employee has been advised of the combined dangers of smoking and working with asbestos;
- (2) Explained how and why the 1986 respiratory protection standards will reduce employee risk below that remaining solely as a result of the PEL, and that the effectiveness levels of respirators are under review; and

(3) Required employers to ensure that employees working in or near regulated areas understand warning signs, and required training programs to specifically instruct employees as to the content and presence of signs and labels.

Finally, as to the third group of three remaining remand issues, the Court ordered OSHA to resolve these issues after rulemaking. These issues are:

Issue 7. The establishment of operation-specific permissible exposure limits;

Issue 8. The extension of reporting and information transfer requirements; and

Issue 9. The expansion of the competent person requirement to all employers engaged in any kind of construction work.

In addition, the Court granted OSHA's unopposed request to publish the Notice of Proposed Rulemaking on this group of issues on April 13, 1990, to allow sufficient time to consult with the Advisory Committee on Construction Safety and Health (ACCSH). Under the Construction Safety Act (40 USC 333) and regulations in 29 CFR 1911.10 and 29 CFR 1912.3, OSHA was required to consult with that committee in the formulation of regulatory proposals which would apply to employment in construction. OSHA presented the proposed regulatory text and pertinent explanatory materials to the ACCSH and consulted with them on March 14, 1990. The Committee submitted comments and suggestions which are discussed, where appropriate, throughout this narrative. The Committee's draft of a revised regulatory text and other submissions are available as Exhibit 1-128.

The Court, on May 2, 1990 granted OSHA's further motion and extended the time to issue the proposal until July 12, 1990, in order to allow coordination of the proposal with other regulatory agencies, in particular EPA.

II. Pertinent Legal Authority

Authority for issuance of this standard is found primarily in sections 4(b)(2), 6(b), 8(c), and 8(g)(2) of the Occupational Safety and Health Act of 1970 (the Act), 29 U.S.C. 643(b)(2), 655(b), 657(c), and 657(g)(2) and in the Construction Safety Act, 40 U.S.C. 333. Section 6(b)(5) governs the issuance of occupational safety and health standards dealing with toxic materials or harmful physical agents. Section 3(8) of the Act defines an occupational safety and health standard as:

... a standard which requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment.

The Supreme Court has said that section 3(8) applies to all permanent standards promulgated under the Act and requires the Secretary, before issuing any standard, to determine that it is reasonably necessary and appropriate to remedy a significant risk of material health impairment. *Industrial Union Department v. American Petroleum Institute*, 448 U.S. 607 (1980).

The "significant risk" determination constitutes a finding that, absent the change in practices mandated by the standard, the workplaces in question would be "unsafe" in the sense that workers would be threatened with a significant risk of harm. *Id.* at 642. A significant risk finding, however, does not require mathematical precision or anything approaching scientific certainty if the "best available evidence" does not warrant that degree of proof. *Id.* at 655-656; 29 U.S. 655(b)(5). Rather, the Agency may base its finding largely on policy considerations and has considerable leeway with the kinds of assumptions it applies in interpreting the data supporting it, *Id.* 655-656; 29 U.S. 655(b)(5). The Court's opinion indicates that risk assessments, which may involve mathematical estimates with some inherent uncertainties, are a means of demonstrating the existence of significant risk.

OSHA believes that compliance with proposed amendments to reduce the PEL to 0.1 f/cc as a time-weighted average measured over 8 hours would further reduce a significant health risk which exists after imposing a 0.2 f/cc PEL. OSHA's risk assessment showed that lowering the TWA PEL from 2 f/cc to 0.2 f/cc reduces the asbestos cancer mortality risk from lifetime exposure from 64 deaths per 1,000 workers to 7 deaths per 1,000 workers. OSHA estimated that the incidence of asbestosis would be 5 cases per 1,000 workers exposed for a working lifetime under the TWA PEL of 0.2 f/cc. Counterpart risk figures for 20 years of exposure are excess cancer risks of 4.5 per 1,000 workers and an estimated asbestosis incidence of 2 cases per 1,000 workers.

OSHA's risk assessment also showed the persistence of a significant risk at the 0.1 f/cc action level. The excess cancer risk remaining at that level is a lifetime risk of 3.4 per 1,000 workers and a 20 year exposure risk of 2.3 per 1,000 workers. OSHA concludes therefore that continued exposure to asbestos at the TWA permitted level and action level presents residual risks to employees which are still significant.

The DC Circuit Court of Appeals affirmed OSHA's conclusion that the excess risk stemming from average

exposures of 0.1 f/cc "could well be found significant." *BCTD v. Brock*, 838 F.2d at 1266.

OSHA also finds, following the analysis suggested by the DC Court of Appeals that "implied real exposures" triggered by a 0.1 f/cc PEL, would still present a significant risk. The Court noted that "there is no legal basis for totally disregarding a gap between real-world average exposures and nominal legal ceilings" in assessing the significance of a risk at that nominal limit (838 F.2d at 1266).

OSHA found in the preamble to the 1986 standards that a ratio of about 2 to 1 between a PEL and a resulting average exposure level was exaggerated, because there is significant controllable exposure level fluctuation, which such a prediction ignores (51 FR at 22653). In its preamble to the asbestos "ban" regulation, EPA noted that OSHA's own inspection data do not support the assertion that current exposures are significantly below the PEL (54 FR at 29474, July 12, 1989). Thus OSHA concludes that measured exposures for asbestos-exposed workers where employers are attempting compliance with a 0.1 f/cc TWA limit, would most likely on the average be no less than 0.075 f/cc. Using linear proportionality to previously calculated risks, these predictions are a lifetime (45 year) excess risk of about 2.5 per 1,000 workers, and an excess cancer risk for 20 years of more than 1.5 per 1,000 workers. OSHA believes these risks are clearly not insignificant. Further, OSHA does not issue citations unless the PEL, plus an allowance for variability, is exceeded.

After OSHA has determined that a significant risk exists and that such risk can be reduced or eliminated by the proposed standard, it must set the standard "which most adequately assures, to the extent feasible on the basis of the best available evidence, that no employee will suffer material impairment of health * * *," section 6(b)(5) of the Act. The Supreme Court has interpreted this section to mean that OSHA must enact the most protective standard necessary to eliminate a significant risk of material health impairment, subject to the constraints of technological and economic feasibility. *American Textile Manufacturers Institute, Inc. v. Donovan*, 452 U.S. 490 (1981). The Court held that "cost benefit analysis is not required by the statute because feasibility analysis is." *Id.* at 509.

Authority to issue this standard is also found in section 8(c) of the Act. In general, this section gives the Secretary

authority to require employers to make, keep, and preserve records regarding activities related to the Act. In particular, section 8(c)(3) gives the Secretary authority to require employers to "maintain accurate records of employee exposures to potentially toxic materials or harmful physical agents which are required to be monitored or measured under section 6." Provisions of OSHA standards which require the making and maintenance of records of medical examinations, exposure monitoring, and the like are issued pursuant to section 8(c) of the Act.

The Secretary's authority to issue this proposed standard is further supported by the general rulemaking authority granted in section 8(g)(2) of the Act.

Because the Asbestos Standard is reasonably related to these statutory goals, the Secretary finds that this standard is necessary and appropriate to carry out her responsibilities under the Act.

In addition, section 4(b)(2) of the Act provides for OSHA standards to apply to construction and other workplaces as well as in general industry.

IV. Summary and Explanation of the Proposed Amendments

This document constitutes OSHA's response on the third group of remand issues and on the issue of exemption of "small-scale, short duration operations" from the negative-pressure enclosure and other requirements, deferred from the December 20, 1989 response. In this proposal OSHA is defining the term "small-scale, short term operations" differently, limiting conditions for the exemption to specific situations and limiting the exemption to the negative-pressure enclosure requirement. OSHA is also proposing narrowly-focused exemptions for roofing operations, floor tile removal operations, and where erection of an enclosure is infeasible. OSHA is clarifying the regulatory text such that aside from the specific exemptions just mentioned, all employers engaged in demolition, renovation, and removal operations must establish a negative-pressure enclosure for that operation, regardless of exposure levels at the site. This requirement will also respond to the Court remand issue 7 by requiring operation-specific controls to reduce risk.

On issue 7, the establishment of operation-specific permissible exposure limits, OSHA is proposing to lower the permissible exposure limit for the construction industry and general industry to 0.1 f/cc as an 8-hour time-weighted average. OSHA is adding specific control and work practices

applicable to certain operations that will apply regardless of the exposure level, thus further reducing worker exposure. OSHA believes that the 0.1 f/cc PEL is feasible and can be achieved using engineering controls and work practices specified in the proposed standard.

On issue 8, the extension of reporting and information transfer requirements, OSHA is expanding the communication provisions in the standards to require owners of buildings to communicate known information concerning the location of asbestos to occupants of the building when contemplating asbestos-related work. Employers conducting major construction activities which disturb asbestos are also to communicate information regarding asbestos hazards and steps being taken to reduce exposure risks to employees and employers likely to be exposed. OSHA is also proposing a requirement that all employers engaged in non-small-scale, short-term demolition, renovation, and removal operations notify OSHA prior to commencement of work.

On issue 9, OSHA is clarifying that a competent person will be required on sites which are exempted from the negative-pressure enclosure requirement. In addition, the duties of the competent person and the attendant training requirements must be matched to the unique nature of the hazards and protective measures at each site.

A. Proposed Requirement for Establishing a Negative-Pressure Enclosure

The issue of when a negative-pressure enclosure must be established for removal, renovation, and demolition operations was originally remanded to OSHA by the Court of Appeals, for Agency clarification based on the earlier rulemaking record (*BCTD at 1279*). OSHA responded in its December 20, 1989 notice that additional rulemaking was required to evaluate the effectiveness and drawbacks of negative-pressure enclosures, and technological advances in these controls (54 FR at 52067). This rulemaking will also allow OSHA to examine the experience with alternatives, such as glove bags and negative-pressure glove boxes, which were either unavailable or had limited performance data in 1986.

Based on its preliminary review of the 1986 record, relevant policy considerations, and the still limited data concerning the effectiveness of the control systems mentioned above, OSHA is proposing clarifying revisions to paragraph (e)(6) of the construction standard, § 1926.58. They will require employers to establish negative-pressure enclosures before commencing

any asbestos removal, demolition, and renovation operation, regardless of the exposure level, unless specifically exempted. OSHA is also proposing to clarify the exemptions from this requirement as follows: Small-scale, short-duration operations which meet newly proposed specification criteria; operations where the erection of negative-pressure enclosures are infeasible; and roofing and floor tile removal jobs. Unlike the 1986 standards, however, OSHA is proposing to separately require that "competent persons" supervise all removal, renovation, and demolition jobs, even if they are exempt from the negative-pressure enclosure requirement.

The basis for the 1986 requirement for negative-pressure enclosures for asbestos removal, demolition, and renovation was conclusive record evidence that asbestos presents a significant risk even at levels well below the permissible exposure limit. Since asbestos disturbed during abatement and renovation activities likely would spread beyond the point where the asbestos is handled to pose a risk to other workers engaged on the worksite, containment and other precautions would be needed if the risk to bystanders is determined to be significant. For typical renovation, removal, and demolition jobs, the amount of asbestos requiring containment is substantial. The application of negative-pressure ensures that asbestos fibers remain inside even if a leak develops in the enclosure shell. In 1986, OSHA believed, based on limited reports of experience using such enclosures for asbestos work, that the full enclosure, which encloses the work and the workers and limits access, would be effective in containing asbestos. In addition, change rooms attached to the full enclosure for removal of contaminated clothing and equipment were expected to further reduce the spread of contamination. The negative-pressure system draws the contaminated air into a filter prior to venting to the outside, which might reduce exposures to employees within the enclosure to some as yet unquantified degree.

For the same reasons as in 1986, this proposal continues the requirement that renovation, removal, and demolition jobs be conducted within a full negative-pressure enclosure. Additionally, the regulatory text makes explicit that a full negative-pressure enclosure must be established regardless of measured asbestos levels. OSHA notes that removal jobs generate highly variable amounts of asbestos, reducing the

predictability of exposure levels from one monitoring event to the next. Moreover, measured asbestos levels cannot be used to determine the need for a full negative-pressure enclosure, because of the time required by the testing laboratory to complete the test and report the results.

As stated above, renovation, removal, and demolition jobs typically involve handling substantial quantities of asbestos. General contamination of the workplace has resulted from failure to confine asbestos using strict regulated area procedures, and asbestos-related diseases have been found in workers of a different trade exposed to asbestos contamination from the activities of asbestos workers. Negative-pressure enclosures, when used properly, limited this exposure. OSHA believes that installing negative-pressure enclosures in asbestos abatement work is now recognized as prudent practice by the asbestos abatement industry, and is generally done by abatement contractors, even where jobs are not covered by OSHA's standard. Is this proposal targeted to those situations where these contractors believe negative-pressure enclosures are appropriate?

Most importantly, as noted above and by the Court, significant risk exists at levels below the PEL. Therefore requiring that the spread of asbestos be contained where it is likely, even if not certain, that the PEL would be exceeded is both appropriate and necessary to reduce still significant risk to bystander employees. Therefore, this specification also partially responds to remand issue 7 which calls for establishing operation-specific PELs. Although a separate PEL is not proposed for removal, demolition, and renovation, the regulated area controls are proposed to apply even when exposures may be less than the newly proposed PEL of 0.1 f/cc. OSHA believes that the nature of all asbestos removal projects, e.g., scraping away asbestos from solid surfaces, results in substantial asbestos fiber release, and regulated area controls found in the asbestos standard and this proposed modification are necessary.

Information submitted to the 1986 rulemaking and the Agency's subsequent enforcement experience, study results, and public comment show that asbestos fiber contamination occurs outside the immediate area of abatement unless means are provided to contain the abatement activity. In 1986, testimony was presented that there was significant secondary contamination of work areas adjacent to asbestos removal operations. (Tr. June 28, 1984 at

341 et seq). However OSHA has not yet been able to estimate the risk to bystander employees. OSHA recognizes that the above information is not necessarily representative of bystander employee exposures and requests comment on: (1) Level of exposure to bystander employees; (2) the number of affected employees; and, (3) frequency of exposure of any given employee.

In an EPA study described by Breen et al (Exh. 1-23) in 1986, elevated levels of asbestos fibers (up to 16 f/cc by TEM) were detected immediately outside some of the barriers which separated the asbestos removal work area from the remainder of the school.

In a submission to OSHA of the Asbestos Abatement Council-AWCI (Exh. 1-142), monitoring data from a large number of abatement projects were presented. These data consistently indicated that exposures outside the negative-pressure enclosures were much lower than inside, with exposures in the decontamination areas being intermediate. For example, during a removal operation within a sub-basement, the personal samples ranged from 0.03 to 0.07 f/cc; while the area samples within the enclosure were between 0.12 and 0.15 f/cc; the decontamination chamber level was less than 0.01 f/cc; the bag load-out chamber, 0.01 f/cc, and the sample taken at the negative air exhaust was less than 0.01 f/cc.

Much abatement work is undertaken in basement areas of commercial buildings. Large numbers of janitorial workers work in such areas during and after removal activities. Large-scale renovation of commercial buildings exposes many adjacent workers to asbestos contamination including other workers in construction trades, such as electricians, carpenters, drywallers, as well as employees working in adjacent office or commercial space and communication workers (see e.g. docket H-033c, Tr. June 28, 1984 at 346 et seq).

OSHA seeks comment on applying the requirements for negative pressure enclosure for all removal, demolition and renovation jobs which involve asbestos. OSHA also seeks comments on whether any additional controls, such as respirator use, should also be a specification for employees performing these operations.

Since the revised asbestos standards were issued in 1986, OSHA has been contacted informally by various asbestos abatement contractors who have asked the Agency to comment on the patentability of a system to establish required negative-pressure enclosures. OSHA believes that the issue of

patentability should be appropriately determined by the U.S. Patent Office, and through other administrative or judicial proceedings where any such claim would be formally reviewed.

The Agency adopted the requirement to erect negative-pressure enclosures in 1986, in part because of the Agency's institutional knowledge that the application of the general principles of negative-pressure would assure that asbestos fibers would tend to remain in an enclosure placed under negative-pressure, if that enclosure were damaged. Neither in the 1986 requirement, nor in this proposal, did or does the Agency intend that the negative-pressure enclosure requirement be met by any specific combination or configuration of barriers, fans, exhaust systems, or entry/egress ways. The illustrations and explanatory text in non-mandatory appendix F are illustrative only. Different devices, systems, and materials and configurations may be used to create enclosures, to establish negative-pressure, and to erect attached decontamination facilities.

OSHA is interested in information, comments and data on whether the costs of erecting required enclosures, or of any other asbestos abatement technology, are affected by the existence of patents and, if so, how such additional costs affect the feasibility of the standards.

1. Other Controls

OSHA is also considering whether alternative control methods should be allowed for renovation, removal and demolition operations in lieu of negative-pressure enclosures. These include:

a. *Glove bags.* OSHA is proposing to require negative-pressure walk-in enclosures unless specific exemption criteria are met because other, more limited, containment systems do not yet appear to be equally effective in protecting removal and bystander employees. OSHA has received inquiries and faced enforcement situations where employers were using glove bags instead of walk-in enclosures for removal operations where negative-pressure enclosures appeared feasible.

Glove bags are sealed compartments with attached inner gloves used for handling certain materials containing asbestos, such as insulated piping and valves with asbestos gaskets. The glove bag also relies on the principle of containment. Tools and wetting agents are enclosed in the bag which is then sealed around the pipe or other fixture. After completion of the task, the bag is

collapsed and properly disposed of. OSHA notes that there are cost advantages to the employer in avoiding erecting a full enclosure where a glove bag can be installed. There are also potential advantages to the employee if the bag is properly designed, installed and used, since unlike the full enclosure which contains both the worker and the asbestos, the glove bag separates the worker from the contamination.

Available data indicates that glove bags in use may not always provide adequate protection. For example, NIOSH Health Hazard Evaluations on glove bags confirm the fact that, if improperly used, an employee can puncture the bag with tools or sharp debris thereby generating high exposures in the employee's breathing zone (Ex. 1-1, 1-2, 1-20, 1-22). While NIOSH has also shown that employees can improve their performance using glove bags over time, the potential for damage to the plastic containment remains high. OSHA shares NIOSH's concern about the poor performance of glove bags in containing asbestos in the hands of poorly trained or infrequent users.

b. *Glove boxes.* A promising refinement of the glove bag is the glove box or rigid glove bag that can be subjected to negative-pressure without collapsing, as is the case with glove bags composed of flexible plastic materials. This type of equipment appears to combine the advantages of removal of the worker from the asbestos and protection from asbestos which may be expelled through a puncture. At this time, however, OSHA is unaware of any published studies of experience with this equipment, including potential exposures during dismantling and disposal of removed asbestos.

Because the current data concerning the performance of glove boxes and bags in controlling asbestos exposure are limited and inconclusive, OSHA believes that the general requirement that full negative-pressure enclosures must be provided to protect workers from asbestos exposure in activities covered by this standard continues to be necessary. As described below, there are limited situations where glove bags must be used in addition to the protection afforded by full enclosures or as a substitute where no feasible alternative exists. Nevertheless, in light of the known limitations of glove bags, these exemptions have been narrowly drawn. OSHA seeks additional comment and data on this preliminary determination including any proven improvements to glove bag/box design

and/or construction which might minimize breakage and leakage.

c. *New technologies.* Various manufacturers have informed OSHA of the development of innovative asbestos removal techniques. In particular, one technique utilizes a rectangular frame, placed around a pipe section, which encloses and provides water to be sprayed on four planes completely surrounding the pipework. Claims that worker exposures are dramatically reduced have been made. Information concerning this system, which has been used abroad, has been placed in the record (Exh. 1-138); however, exposure data has not yet been submitted. OSHA is interested in receiving all information and data concerning this and other new techniques for removing asbestos. Data concerning direct and indirect worker exposures and area exposures should also be submitted. Since the Agency now does not have adequate data to evaluate the effectiveness or feasibility of these new techniques, this proposal does not include them. The Agency will consider providing for new technology in the final standard to the extent supported by the record developed in this rulemaking.

2. Proposed Exemptions from the Negative-pressure Enclosure Requirement

In addition to clarifying the negative-pressure enclosure requirement in paragraph (e)(6), OSHA is proposing four sets of circumstances where employers engaged in asbestos demolition, renovation, and removal operations are exempted from that requirement. These proposed exemptions are for: small-scale, short-duration operations, roofing operations, floor tile removal operations, and operations where establishment of full size negative-pressure enclosures is infeasible. These exemptions were included in the original negative-pressure enclosure requirement or in the original definition of small-scale, short-duration operations. The proposal specifies more clearly the conditions an employer must meet to qualify for an exemption. Since the exemptions would be conditioned on compliance with newly required protective measures, such as local containment and work practices, OSHA believes that employees who work on or near exempt operations will be protected from significant asbestos exposure. OSHA also believes that the proposed specific exemption provisions represent a narrowing of the 1986, more general exemptive regulatory language. Therefore fewer removal employees are expected to work without negative

pressure enclosures than was the case under the 1986 regulations.

OSHA provided a general discussion of the justification for some exemptions from negative pressure enclosures in its December 20, 1989 Federal Register notice. There OSHA explained why it would propose a new definition of the small-scale, short-duration exemption and initiate rulemaking, rather than limiting the exemption to operations where it is impractical to construct a negative-pressure enclosure because of the configuration of the work environment.

First, the Agency stated its belief, based on its experience in enforcing the construction standard, that limiting the exemption only to situations where negative-pressure enclosures are impractical might not reduce employee risk from asbestos exposure. Second, OSHA described the practical limits placed on the scope of the existing small-scale, short-duration exemption by administrative interpretations. OSHA believes that, in light of the evidence existing in the record, the proposed exemptions should be narrowly defined to isolate those cases where negative-pressure enclosures do not appear likely to add more than a *de minimis* increment to employee or bystander worker protection. They represent cases where practicality or limited exposure suggests that steps other than erection of a walk-in enclosure be taken to protect workers from the risks of asbestos.

a. *Clarification of the Small-Scale, Short Duration Exemption.* OSHA is proposing to clarify and modify the exemption from the requirements of paragraph (e)(6) in the case of small-scale, short duration operations. The Agency is both providing general criteria and specifically identifying certain operations which will not require negative pressure walk-in enclosures. The proposed definition states that these operations include "only those demolition, renovation, repair, maintenance, and removal operations which affect small surfaces or volumes of material containing asbestos, tremolite, anthophyllite, or actinolite" and which are unlikely to expose bystander workers to significant amounts of asbestos, and which will be completed within one work shift. OSHA is identifying in the regulatory text, individual tasks which would be deemed to be exempt. The definition lists such tasks, modified by cut-offs for time required for completion, and/or amount of asbestos disturbed or area of operations. Thus the proposed text of the new definition would exempt:

* * * repair of asbestos on piping that is less than 21 linear feet; repair or removal of asbestos panel that is less than 9 square feet; pipe valve repair or replacement of pipe valves containing asbestos gaskets or electrical work that disturbs asbestos that is completed by one worker in less than four hours; removal of drywall which is completed for the facility within an eight-hour workday; renovation projects involving endcapping of pipes and tile removal that is completed in less than four hours; and installation of conduits that is completed within an eight hour work shift.

The Agency bases the above definition on both specific suggestions in the record from its field personnel who have observed asbestos operations, and its general enforcement and consultative experience with the 1986 and 1972 asbestos standards. The proposed criteria are intended to reflect realistic workplace operations. There is no attempt to define operations which rarely exist.

Several additional suggestions and observations were received from field personnel relating to the proposed definition of small scale, short duration operations. Comment and additional information and data are sought by OSHA on these suggestions. They are as follows:

(1) Removal of transite panels should be exempt from the negative-pressure enclosure requirement as long as the transite is removed without cutting or otherwise abrading the material;

(2) Inclusion of size or square footage criterion in the definition of small-scale, short duration operations renders it too inflexible, not allowing adequate use of professional judgment;

(3) There should be no linear footage limit for removal of asbestos insulation on pipe as long as proper glove bag techniques are used;

(4) Adopt the NESHAP reporting criteria as the cutoff for OSHA's small-scale, short duration operations;

(5) Remove exemptions and require negative-pressure enclosures on all projects;

(6) Mini-enclosures should not be included as a suggested method for use in small-scale, short duration jobs; and

(7) OSHA should require area monitoring to assess the success of containment and the extent of clean-up.

In addition, OSHA is considering extending the exemption to other operations which are truly small-scale, short-term, even though they may not be listed in the proposed standard. For example, the employer should be able to demonstrate that the claimed exemption applies to a non-recurring operation which does not expose bystander employees to asbestos and which is completed in less than a day by not

more than 1 person, or in less than 4 hours by not more than 2 employees and which is not expected to release asbestos in excess of the PEL. OSHA seeks comment on these general criteria and whether they should be included in the regulatory text.

This proposed definition replaces a similar, but more general definition by example in current 29 CFR 1926.58, which appeared to consider all operations such as pipe repair, valve replacement, installing electrical conduits, installing or removing drywall, roofing, and other general building maintenance or renovation as "small-scale, short duration". The Court of Appeals stated that OSHA had not drawn the parameters of the exemption with enough specificity. The new definition attempts to add greater specificity for many of the operations originally defined as operations involving small-scale, short-duration exposures.

The Agency believes that the amount of asbestos contamination released during repair and maintenance activities is often of the same magnitude as other "renovation" or removal jobs. The work operations too are similar, calling for identical work practices, isolation techniques or local ventilation controls.

Based on its experience, the Agency cannot now define a cutoff, either in temporal, spatial, or other terms, which can be classified as always assuring *de minimis* exposure potential. Thus, the proposal considers all repair and maintenance which will disturb asbestos-containing material as requiring appropriate work practices and other controls to protect the worker. In addition, OSHA believes the proposed expansion of the competent person requirement to include oversight of small-scale, short duration operations will also enhance protection of repair and maintenance workers. OSHA seeks comment on the inclusion of these activities as small-scale, short duration operations.

OSHA also solicits information and comment on the validity of listing specific operations and how well the listed criteria correlate with actual practice. For example, is it usual, or even possible, for one worker to perform electrical work which disturbs asbestos in four hours, or are two workers or more time commonly needed for small jobs? Should four hours of floor tile or ceiling tile removal qualify as a small-scale, short duration job? Are other repair, renovation or maintenance jobs which are unlisted, capable of being identified in terms of time, manpower and/or area of disturbance? Should they too be earmarked for an exemption from

the negative pressure requirement? Are the general criteria under consideration for additional small-scale, short duration operations appropriate and sufficiently detailed?

In addition, OSHA seeks comment on whether a volume amount of asbestos should be specified in the new definition of small-scale, short duration operations. What difficulties in volume determination would likely be encountered? OSHA also requests comments on the ACCSH recommendation, described below, that OSHA define small-scale, short-term operations primarily in terms of the amount of asbestos disturbed, rather than the surface area of the structural members from which the asbestos is removed. The Agency believes that this suggestion deserves consideration as an alternative to the proposed regulatory text.

In its enforcement of the 1986 standards, OSHA has observed that some employers have divided large-scale asbestos abatement jobs into a series of smaller jobs so as to claim an exemption from the negative pressure enclosure requirement. In order to make clear that the exemption does not apply in such circumstances, the proposal identifies qualifying jobs as those that are completed within stated timeframes and specifically requires that jobs must be "non-repetitive" to qualify as "small-scale, short duration."

OSHA is, nonetheless, requesting comments on this potential problem and the desirability of including specific alternative language in the definition of small-scale, short-duration operations to address these concerns.

In order to assure that workers engaged in small-scale, short-duration operations receive adequate protection from significant asbestos exposure, OSHA has proposed to require alternative protective strategies. The proposed provision for small-scale, short-duration operations requires that the employer use a feasible containment or enclosure method, where appropriate, such as glove bags, including negative-pressure glove boxes, mini-enclosures, or wet methods to reduce worker exposure to asbestos and to minimize any spread of contamination beyond the immediate work area. For some of the operations identified in the definition, additional protection should be easily employed; for example, glove bags can be used in pipe removal and valve replacement. In addition, this proposal specifically would newly require that appropriately trained competent persons supervise small-scale, short duration operations. As discussed below, OSHA

is proposing that a competent person specially trained for small-scale, short-duration operations must be present at the work site to assure that workers engaged in these jobs are protected from hazards of asbestos.

In its March 14, 1990 recommendation, ACCSH offered two alternatives as definitions for small-scale, short duration operations. These are as follows:

Small scale, short-duration operation means an operation which meets all of the following requirements:

(1) A maintenance, repair, or renovation task where the removal, handling or treatment of asbestos is not the primary goal of the job.

(2) An activity where employees' exposures to asbestos can be kept below the action level via worker isolation techniques and methods described in Appendix G.

(3) An operation which has been included in the employer's or building owner's asbestos maintenance program, as required in Appendix G.

(4) The operation is non-repetitive, i.e. not one of a series of small-scale or short-duration jobs which if performed at one time would not constitute a small-scale short-duration operation.

(5) Where the operation results in the removal or disturbance of asbestos or asbestos-containing material, the amount of asbestos or asbestos-containing material may not exceed _____ cubic feet, i.e. the amount of asbestos or asbestos-containing material that would be contained in a _____ gallon sealed drum.

The second definition suggested by ACCSH contains the same language as the first except that (5) is replaced with the following:

(5) Where the operation results in the removal of asbestos or asbestos-containing material, the amount of asbestos or asbestos-containing material shall not exceed that which can be contained in a single glove bag containing not more than two sets of gloves.

OSHA expects that the removal and renovation operations that qualify for the exemption typically will be secondary to the normal business conducted on the premises or by the employer.

Demolition work is not expected to be exempt under the small-scale, short duration definition. However, some demolition work may be exempt under the proposed provisions covering the configuration of the work environment which make the erection of an enclosure infeasible. OSHA notes that to the extent that stripping of asbestos is required prior to demolition, such activity is considered removal work under OSHA's standard and must be contained in a negative-pressure enclosure, unless a specific exemption applies.

The Agency requests comments on the relative merits of the proposed definition of small-scale, short-duration operations, and those of ACCSH, and on its application of the definition to removal, renovation and demolition operations. In particular, the Agency encourages comment on individual elements of the definition and requests submission of any data on the exposures potentially associated with any of these operations.

b. Other Proposed Exemptions to the Negative-Pressure Enclosure Requirement.

OSHA is also proposing a second exemption from the negative-pressure enclosure requirement, for roofing operations. This would apply almost entirely to the removal of asbestos-containing roofing material. OSHA does not believe that requiring negative-pressure enclosures will result in more than a *de minimis* benefit to workers removing roofing or to other employees in their vicinity. Such installation might pose safety hazards to workers stationed on roofs or scaffolding; thus it is unlikely that there will be any potential net safety and health benefit from the use of such enclosures. OSHA is proposing that employers engaged in roofing operations take specific additional steps to reduce employee exposure to asbestos. These include use of airtight chutes to lower debris from the roof to the ground, or immediate bagging and lowering of debris rather than dumping it from a height. Wetting would be required where feasible to reduce contamination. These methods have been shown to successfully reduce employee and bystander worker exposures.

OSHA notes that roofing materials often contain a high percentage of asbestos and if severely weathered, can be quite friable and fibers potentially airborne. Therefore, it is essential that all other feasible methods be employed to protect workers from asbestos exposure during roofing operations.

ACCSH suggested the addition of the following to the regulatory text describing the exemption of roofing operations from the negative-pressure enclosure requirement:

In roofing operations, where the employer shall institute all feasible controls to minimize exposures including:

1. Establishing the entire roof as a regulated area;
2. Using wet methods prior to and during the cutting and handling of asbestos-containing roofing material (ACRM);
3. Cutting or removing ACRM using hand methods whenever possible;
4. Equipping all powered tools with a HEPA vacuum system or a misting device;
5. HEPA vacuuming all loose dust left by the sawing operation;

6. Double bagging, wrapping in two layers of 6 mil polyethylene, or containerizing all waste material, and requiring all bags, wrapped material and drums be lowered to the ground using a hoist or crane;

7. Isolating all roof level air intake and discharge sources or shutting down all mechanical systems and sealing off all outside vents using two layers of 6 mil polyethylene.

OSHA invites comments on whether it should require employers to adopt all the above provisions, and whether they are feasible in roofing removal operations.

Additionally OSHA is proposing to exempt removal of asbestos containing floor tile from the negative-pressure enclosure requirement. In the preamble to the 1986 standards, OSHA stated that: "data obtained * * * indicate that when the recommendations of the Resilient Floor Covering Institute (e.g., wet sweeping and handling, and prohibiting powersanding and blowing asbestos dust) were followed average TWA airborne fiber concentration were below the 0.2 f/cc PEL during the removal of the old floor." In a recent submission to OSHA from Environ Corporation on behalf of the Resilient Floor Covering Institute and other, mean exposures were between 0.0045 and 0.03 f/cc for workers performing floor tile removal, removal of resilient sheet flooring, or removal of cutback adhesive. These measurements were made during removals which employed work practices recommended by the Resilient Floor Covering Institute. These practices included a prohibition of sanding of floor or residual felt backing, use of a HEPA vacuum cleaner before and after removal, prohibition of dry sweeping, application of new material over old tiles without removal if possible, wet removal of residual felt, and bagging and disposal of waste in 6 mil plastic containers. Further, the Resilient Floor Covering Institute recommends that unless absolutely positive that a floor is a non-asbestos product, assume it contains asbestos and treat it in the manner prescribed. OSHA is not proposing to include this requirement in this proposal, however, OSHA requests information and data regarding this issue, including any information on the use of the date of installation or manufacture of the floor material in determining whether or not it is likely to contain asbestos. OSHA also seeks information as to safe, effective methods for removal of adherent floor tiles.

In the studies submitted to OSHA, measurements were made of the exposures of bystanders—industrial

hygienists and supervisory personnel. Their 8 hour TWA were even lower than those of the workers performing the removals, with means in the three operations ranging from 0.0043 to 0.023 f/cc. Therefore, OSHA is proposing to exempt such removals from the requirement to establish a negative-pressure enclosure. As in the case of roofing operations OSHA does not feel that requiring enclosures will offer more than a *de minimis* benefit to workers performing floor tile removal nor to bystander employees. OSHA proposes to require that employers engaged in these operations must follow the work practices described by the Resilient Floor Covering Institute to reduce employee exposure to asbestos.

OSHA is also mindful of the potential that deteriorated asbestos containing flooring, backing and adhesives might have for release of asbestos fibers. OSHA requests information on the level of this exposure and comment on the necessity for negative-pressure enclosure and hygiene facilities in instances of flooring removals in which the material is likely to release a significant amount of asbestos fibers. OSHA also solicits comment on the adequacy of the work practices of the Resilient Floor Covering Institute to control worker exposure. OSHA seeks information as to any additional measures to be taken to assure employee safety while performing these operations.

A fourth exemption from the negative-pressure enclosure requirement proposed by OSHA would be wherever an employer demonstrates that such a measure is infeasible. This exception was included in the 1986 standard and is restated in this proposal to make clear that OSHA standards promulgated under section 6(b)(5) of the Occupational Safety and Health Act must be "feasible," as defined by the courts. OSHA's feasibility analysis indicates that very few activities will qualify for this exemption. OSHA seeks comments on factors other than work configuration which might render the establishment of negative pressure walk-in enclosures infeasible.

OSHA is narrowly defining and qualifying these exemptions in order to clarify the conditions under which negative-pressure enclosures are not required to provide significant worker protection. In these narrowly-drawn circumstances, localized containment methods and work practices, if conscientiously used, should reduce exposure to levels equivalent to those achieved with negative pressure enclosures and associated ventilation

systems. OSHA notes here, as it advised the Court of Appeals, that it is using this rulemaking to discuss the effectiveness and drawbacks of negative-pressure enclosures, glove bags, and alternative control systems; and to specify more clearly under what circumstances various control systems may be used. Also, OSHA is considering new technology unavailable in 1986, such as negative-pressure glove bags, which appear to offer improved employee protection in certain circumstances either as an alternative to walk-in enclosures, or as required in lieu of conventional "glove bags". These data along with evidence on experience with these systems may limit rather than expand the walk-in enclosure requirement, provide further justification for the proposed exemptions, or provide a basis for expanding the scope or number of exemptions. OSHA also requests information and data on work practices and installation techniques to improve the performance of glove bags and similar equipment. Additional OSHA is concerned about potential electrical and slipping hazards which may result from use of wet methods and seeks comment and information regarding these potential hazards.

In roofing operations and situations where establishment of a negative-pressure enclosure is determined to be infeasible, the hazard that asbestos exposure always presents to employees and bystander workers remains. Therefore, these operations are exempt only from the requirement to establish the walk-in negative-pressure enclosure and not from other worker protective requirements, such as training, work practices, decontamination, showers, clean room, and equipment room. OSHA seeks comment as to the extent to which these requirements should apply to short-term, small-scale operations.

Under the 1986 standards, an employer exempted from the negative-pressure enclosure requirement on the basis that the operation qualified as a small-scale, short-duration operation was also exempted from the competent person requirement. As described more fully below, OSHA is proposing revisions to the construction standard which will require the presence of competent persons on all construction sites subject to this standard. Thus, none of the proposed limited exemptions from the negative-pressure enclosure requirement would exempt employers from the newly clarified and expanded competent person requirements.

B. Proposed Lowering of Permissible Exposure Limit

The Court of Appeals in *BCTD, AFL-CIO v. Brock* remanded for reconsideration the issue of whether a permissible exposure limit lower than 0.2 f/cc was warranted in those industries where evidence in the record demonstrated general feasibility of attaining a lower level. The Court was interested in better understanding the Agency's rationale for determining that 0.2 f/cc PEL should be applied across all industry lines, including the weight given to such factors as administrative difficulty of excessive disaggregation or excessive random fluctuations in exposure levels represented in the data. In response, OSHA is proposing a two-part revision. It is reducing across the board the time-weighted average permissible exposure limit to 0.1 f/cc, and is also proposing operation-specific work practices and controls which must be employed, regardless of exposure levels achieved. The basis for the reduced PEL of 0.1 f/cc is OSHA's review of compliance data, new studies available since 1986, and supervening events such as the refinement and development of control methods. OSHA believes that it is feasible for most industry sectors to reach the reduced PEL. The proposed required operation-specific work practices are for certain industry sectors where evidence now points to the success of such practices in reducing exposures, and thus, risk. OSHA believes combining a general performance approach of exposure reduction along with specifying proven control strategies will yield maximum benefit to all employees who may be exposed to asbestos and will avoid administrative and policy concerns relating to enforcing different PELs in different sectors. OSHA also notes the observation that a significant proportion of the personal (8-hour TWA) monitoring samples in its IMIS compliance data since 1986 (Exh. 4) fell within the range of 0.1 to 0.2 f/cc; for example, in asbestos product manufacturing (SIC 3292), approximately 20% were within this range and 22% of those within SIC 1799 (special trade contractors) also were.

In its risk assessment described in the 1986 Asbestos Standard, OSHA found that lifetime exposure at 0.2 f/cc (8-hr TWA) resulted in 7 excess deaths due to cancer per 1,000 workers. Reduction to a 0.1 f/cc PEL reduces this estimate to 3 excess cancer deaths per 1,000 workers. Although this is a substantial reduction, significant risk would remain even at the new PEL. Thus, the newly required

work practices target those operations where they may reduce exposures below the new PEL as well.

Recently, EPA prohibited, at three staged intervals from August 1990 to August 1996, the future manufacture, importation, processing and distribution in commerce of asbestos in almost all products (54 FR at 29460, July 12, 1989). However, the ban would not affect abatement activities involving asbestos or the servicing of asbestos brake and clutch. OSHA requests comment on the proposed reduction in the PEL in light of this ban. OSHA is concerned that the reduction of the PEL would require in some cases, installation of major control systems whose costs would accelerate EPA's scheduled phase-out of various asbestos-producing sectors. Therefore, OSHA is proposing allowing the reduced PEL to be met through the use of respiratory protection for all primary and secondary manufacturing sectors until the dates schedules for phase-out for each sector when engineering controls would be required. In this way, the reduced PEL would not impose engineering control costs on any general industry sector in a way that would change EPA's scheduled phase-out. Either an industry sector would shut down on or before the effective date of the ban, so the engineering control requirement would be irrelevant, or the ban's effective date would have been stayed or lifted, in which case the phase-out schedule would have been changed by supervening events, outside OSHA's purview.

The dates when engineering controls would be required which correspond with the EPA schedules ban are as follows:

Stage 1, August 27, 1990:

- flooring felt
- roofing felt
- pipeline wrap
- asbestos/cement (A/C) flat sheet
- A/C corrugated sheet
- vinyl/asbestos floor tile
- asbestos clothing
- new asbestos products

Stage 2, August 25, 1993:

- beater-add gaskets (except specialty industrial gaskets)
- sheet gaskets (except specialty industrial gaskets)
- clutch facings
- automatic transmission components
- commercial and industrial friction products
- drum brake linings (original equipment market)
- disc brake pads for light- and medium-weight vehicles

Stage 3, August 26, 1996:

- A/C pipe
- commercial paper
- corrugated paper
- rollboard
- millboard

- A/C shingle
- specialty paper
- roof coatings
- non-roof coatings
- brake blocks
- drum brake linings (aftermarket)
- disc brake pads (aftermarket)

OSHA notes that other revised requirements of the standards will become effective in all industries on the effective date for all revisions of the standards.

OSHA requests information and comment on this approach, especially concerning costs of additional respirator programs that a lower PEL would trigger and whether such costs are feasible for sectors schedules for banning. In addition to the proposed requirement for respirator use in general industry just discussed, OSHA is considering whether it should require employers in designated construction operations to use respiratory protection regardless of measured exposures, because variability in exposures is a particular concern and/or because the controls primarily utilized are not considered sufficiently reliable. For example, in construction should OSHA as proposed in mandatory appendix G, require employees working with glove bags always to use respirators because of the possibility of bag leakage? Should employees removing large amounts of asbestos-containing materials wear respirators because exposure levels are expected to vary so that one day's measurements cannot be considered predictive of future exposures?

The Agency seeks comments on expanding the operations in the general industry and construction standards for which respirators should be required, based on the nature of the operation. Commentors should consider whether also requiring respirators, in addition to engineering and work practice controls, would undercut the incentives for employers and employees to install and conscientiously apply such controls. Would employers and employees tend to rely instead on respirators as their major source of protection? OSHA stated in its February 5, 1990 response (55 FR at 3724), that:

In addition to the problematic nature of respirator use, reliance on engineering and work practice controls for asbestos is preferable because they measurably reduce exposures of employees directly involved in asbestos producing operations, reduce or eliminate bystander exposures, avoid the deposit of asbestos dust on work surfaces and employee clothing which results in further exposures, and include methods of controls such as substitution, or fully bonded asbestos-containing materials which will eliminate or reduce future asbestos exposures.

The Agency will consider requiring additional respirator use, in light of these concerns.

In the case of general industry standards, the affected industries can be divided into two general categories: (1) The asbestos brake and clutch repair and service sector, which employs well over 90% of general industry employees covered by the standard, and (2) numerous processing and manufacturing sectors, which account for relatively few workers and are declining in product volume and employee populations. For the former sector, as described below, employers must use one of several combinations of engineering controls and work practices which are set out in the standard, to reduce exposures below the proposed permissible exposure limit. For the latter group of industries, in general, OSHA believes that those that continue in operation will be able to achieve the proposed PEL using existing engineering controls and work practices.

OSHA also believes that most construction operations will be increasingly able to achieve the proposed reduced PEL, if they conscientiously follow the work practices required in the proposal. As noted above, OSHA acknowledges that in the largest construction sector, abatement operations, variability in exposures because of changing conditions make exposure predictions uncertain. Routine maintenance work may achieve compliance with the proposed reduced PEL where deterioration of asbestos materials is limited and where the work practices in appendix G are followed (Docket H-033c, Exh. 3 at 32-33). Although OSHA is proposing a reduced PEL for this sector, OSHA believes that additional specifications for required work practices will be equally important to assure reduced exposures. OSHA notes that the 1986 record contains data showing reduced exposures during abatement activities and subsequent comment contends that exposure below 0.1 f/cc can be routinely obtained during some major renovation projects (Exh 3-6 and Exh. 84-474, Table A.11) and that "minor" removal activities would be able to comply with 0.1 f/cc on a TWA basis, Docket H-033c, Exh. 84-474, Table 3.10. OSHA is interested in exploring which control devices and work practices demonstrate such reductions in exposure and the conditions of the worksites where low levels were consistently achieved.

Installation of new asbestos-containing construction materials, based on OSHA's enforcement data, and data in the 1986 record is predicted to be able

to easily meet the new exposure limit of 0.1 f/cc (see 51 FR 22662-22663).

In the 1986 asbestos standards, an action level of 0.1 f/cc, half the PEL, triggers monitoring, medical surveillance and training. The Court instructed OSHA to consider reducing the action level to 0.05 f/cc, should the PEL be reduced to 0.1 f/cc. ACCSH, too, has recommended an action level of 0.05 f/cc. However, for two reasons OSHA is not here proposing a reduced action level. First, one technical issue that OSHA must address in resolving this question is whether the variability of sampling would render such measurements unreliable for triggering requirements at an action level of 0.05 f/cc. OSHA believes that especially at the infrequent intervals dictated in the OSHA standard, measurements at such low levels would not be sufficiently reproducible to be readily enforceable. OSHA noted in its STEL notice (53 FR 35610, September 14, 1988) that the excursion limit promulgated, 1 f/cc measured over 30 minutes which corresponded to a time-weighted average of 0.083 f/cc, was the lowest reliable level of detection. The second reason is that OSHA does not believe that more than a *de minimis* benefit would result from a 0.05 f/cc action level which would effectively require only medical surveillance and monitoring to be instituted at that level. In regard to training, OSHA believes that in the two largest employee sectors, brake repair in the general industry standard and abatement work in the construction standard, actual training would not be significantly affected by a reduced action level. First, OSHA believes many removal, renovation and demolition workers are now required to be trained because they are being exposed at or above the current action level. The enhancement of supervisory training in this proposal will additionally protect these employees. Secondly, OSHA does not believe that a reduction of the action level would lead to an expansion of training for brake repair workers, because based on OSHA's data, most such workers have exposures below 0.05 f/cc. In its rule, Asbestos-Containing Materials in Schools (52 FR at 41826, October 30, 1987), EPA noted that the limit of reliable quantitation of the PCM method is 0.01 f/cc. However, at least five samples are required for clearance and all must be below this limit. OSHA feels that for a single workplace monitoring sample, the limit of reliability for the method is substantially above 0.01 f/cc. Comment on this issue is requested.

OSHA is seeking comment on the reduction of the PEL to 0.1 f/cc in all industries and omitting the action level of one-half the PEL from the requirements. OSHA additionally requests comment on the alternative of setting operation-specific PELs rather than lowering the PEL to 0.1 f/cc across the board and prescribing operation-specific work practices. In addition, OSHA seeks information regarding improvement of the methodology for measuring airborne asbestos levels, specifically whether it has advanced sufficiently to allow reliable and reproducible measurements at an action level of 0.05 f/cc. In addition, OSHA seeks comments on the ACCSH proposal that the STEL be lowered to 0.5 f/cc measured over a 30 minute period.

OSHA is considering some minor modifications to existing laboratory methods of asbestos fiber measurement and a new description, OSHA lab method ID 160, which will provide a safer method and a more complete procedure to follow. These are in the Docket (H033e) as Exhibit 1-129.

1. The Proposed Standard for the Automotive Brake and Clutch Service Industry

As noted above, OSHA is proposing, to lower the permissible exposure level for all general industry including the automotive brake and clutch service and repair sectors to 0.1 f/cc as an 8-hour time weighted average. Evidence in the 1986 record demonstrates that exposures below 0.1 f/cc can be achieved using one or more combinations of currently available engineering controls and work practices now included in non-mandatory appendix F to the existing standard. OSHA is now proposing to make three methods, as an alternative and in a revised formulation, mandatory requirements. In addition, OSHA proposes to allow the use of equivalent engineering controls or work practices if the employer can demonstrate that the use of such methods will reduce employee exposure to the same level as the use of the specified methods. Since OSHA believes that the available evidence shows that either of the three methods can reliably reduce exposures to or below 0.05 f/cc, the employer must demonstrate that alternate methods can achieve at least the same level of performance. Use of these or equivalent methods will significantly reduce the risks of asbestos exposure for employees in this largest of the general industry sectors which use materials containing asbestos, tremolite, anthophyllite, or actinolite.

The rationale for this proposal is as follows. In 1986, OSHA established a uniform PEL of 0.2 f/cc for all general industry sectors. The Agency found that brake and clutch repair could achieve exposure levels below 0.2 f/cc by utilizing solvent-spray and HEPA-vacuum methods. The Court asked OSHA to re-examine its PEL for this industry in light of the 1986 record. In re-examining the feasibility data in the record at the time of its original determination and a subsequent study by the National Institute for Occupational Safety and Health (NIOSH) on the exposure levels that can be consistently achieved in brake and clutch repair operations, the Agency believes that the previously recommended combinations of engineering controls and work practices must be made mandatory in order to reduce the significant risk posed by asbestos, in addition to reducing the PEL for this sector. OSHA is adding the wet brush-recycle method to the two recommended work practices, based on the findings in the NIOSH study that this wet method can also reduce asbestos exposures.

Brake repair workers are the largest group of workers occupationally exposed to asbestos in general industry. Data in the National Occupational Hazard Survey by NIOSH estimates that 150,000 brake mechanics and garage workers in the United States are potentially exposed to asbestos during brake servicing operations. (The difference between this and OSHA's estimate of the number of employees at 526,998 may be that OSHA did not convert the number of brake repair workers to full-time equivalents. The OSHA estimates included all potentially exposed auto repair workers, both clutch and brake repair workers.) Workers who repair brakes and clutches made with asbestos are exposed to asbestos fibers because as brakes and clutches deteriorate with wear, asbestos fibers become airborne as asbestos dust. Asbestos dust on automotive brake and clutch parts is easily disturbed during servicing.

Based on the 1986 rulemaking record and additional data, OSHA believes that it is feasible for the automotive brake and clutch service industry to reduce exposures to below 0.1 f/cc by using engineering controls and work practices specified in the proposed standard. This determination is based in part on data obtained from the OSHA IMIS compliance data base and from a November 22, 1982 study by NIOSH used to determine the feasibility of the 1986 standard's general industry PEL of

0.2 f/cc. The OSHA data contained 47 observations of asbestos fiber release resulting from brake servicing operations with a mean 8-hour TWA exposure of 0.03 f/cc, during the period 1979 through 1984. Analysis of OSHA compliance data collected from 1986 through 1989 yielded a mean of 0.012 f/cc as 8-hour TWA in those samples in which any fiber was detected. The NIOSH study demonstrated that average exposures were below 0.1 f/cc when using either the solvent mist/spray can method, the HEPA-filter vacuum system methods or the wet brush-recycle method.

In addition, a December 1989 article entitled "Control of Asbestos Exposure During Brake Drum Service" (Ex. 1-112) reports the results of a NIOSH study quantifying the level of mechanics' exposure to asbestos during brake drum servicing operations using several different control techniques, including the HEPA-filter vacuum system, the solvent mist/spray can system, and the wet brush-recycle method. The study examined the application of the control techniques to a range of vehicle brake repair operations. Eighty-three samples of airborne asbestos fibers from the mechanics' personal breathing zones were collected during the brake servicing operations and analyzed using both phase contrast microscopy (PCM) and transmission electron microscopy (TEM). The concentrations measured ranged from less than 0.013 f/cc to 0.052 f/cc using TEM for all control methods. TEM yields consistently higher exposure estimates than PCM. The results of the study demonstrated that the proposed PEL of 0.1 f/cc can be met using feasible engineering control and work practice methods. OSHA acknowledges that the record may also support the feasible reduction of exposures in this industry to 0.05 f/cc using the proposed work practices and therefore proposes to add mandatory work practice requirements in this sector. Rather than reducing the PEL for this sector to 0.05 f/cc, OSHA has chosen to specify the work practices and controls which appear to be most effective in reducing exposures and will in fact have that effect. The advantages of this approach are the relative administrative ease in enforcing a specification standard and OSHA's belief that reliance on measurements at widely spaced intervals and of doubtful reliability at lower levels would not give employers and employees significant information or protection over the proposed approach.

The proposed standard for the automotive brake and service industry specifies that the employer shall

institute the enclosed cylinder/HEPA-filter vacuum system method, a solvent mist/spray can system method, a wet brush-recycle method or any equivalent method of engineering control and work practices which will prevent worker exposure in excess of 0.05 f/cc during brake and clutch servicing operations. Each method consists of engineering controls which must be installed and maintained, and work practices which must be closely followed if the full protection of the control method is to be achieved. As the NIOSH study describes in detail, workers can inadvertently circumvent the protection provided using even those methods that rely most on engineering controls (e.g. the enclosed cylinder/HEPA-filter vacuum method) if certain work practices are not scrupulously applied. The proposed revision to the standard includes the addition of a mandatory appendix which sets out required engineering controls and work practices which must be followed when performing brake and clutch repair operations using the specified methods.

OSHA notes that NIOSH has recommended that while removing, containing and disposing of HEPA filters used during these methods of brake repair, employees wear respirators. OSHA is not adopting that recommendation in this proposal. We note that filter changes occur infrequently (from monthly to more than yearly intervals) and there is no reported data in the record demonstrating that exposures during these operations approach the PEL and/or excursion levels. OSHA notes that requiring respirators triggers other protective provisions of the standard. OSHA does not believe that requiring the regulatory package of respirator-based requirements during these operations would confer any significant benefit. Instead, OSHA requests information concerning recommended work practices employed during filter changes to assure that employees handling asbestos contaminated filters in brake repair and in other operations are not unnecessarily exposed to asbestos.

OSHA has specified three methods that employers may use to achieve compliance, the HEPA-filter vacuum system, the solvent mist/spray can, and the wet brush-recycle method. These three methods have been used successfully for several years and have been studied by NIOSH and private researchers, as indicated in the record [Ex. 84-263, Ex. 90-148]. The enclosed cylinder/HEPA-filter vacuum method and wet brush-recycle method are

commercially available, while the solvent mist/spray can system is easily and inexpensively installed. Other methods, as described below, may be acceptable controls, if used according to the specifications in the appendix, to bring exposures of employees engaged in brake and clutch repair to below the proposed PEL. If the rulemaking record provides sufficient supporting evidence, such additional equivalent performance methods may be specified in the final rule as well.

a. *Enclosed cylinder/HEPA vacuum system method.* Paragraph (f)(1)(x) of the proposed standard instructs an employer to comply with the standard through the use of the enclosed cylinder/HEPA-filter vacuum system specified in the proposed appendix. This control method consists of a cylinder designed to enclose the brake or clutch parts during the servicing of the parts. The cylinder must also be designed to prevent the release of asbestos fibers into the worker's breathing zone. The cylinder must have viewing ports and impermeable sleeves through which the worker can handle the brake and clutch servicing. An HEPA-filter vacuum is fitted onto a connection inside the cylinder. A compressed air hose with a nozzle is fitted onto the cylinder and compressed air is used to loosen asbestos dust from the parts. The vacuum is used to remove and contain the loosened material apart from the parts and the cylinder.

A steel cylinder/vacuum enclosure system was one of the five control methods used in the NIOSH study. The steel cylinder/HEPA-filter vacuum enclosure consisted of, besides the steel cylinder, a single glove at one end of the cylinder and an adjustable seal on the other end. While using the steel cylinder/vacuum enclosure in a brake drum servicing operation, the arithmetic mean concentration of airborne asbestos fibers, resulting from the servicing operation, in the personal samples was less than 0.044 f/cc using TEM detection. The study reported that brake dust was observed escaping from the seal of the steel cylinder during the cleaning of the brake parts with compressed air. The problem of scraping asbestos dust from the seals of the steel cylinder would be mitigated by the use of respiratory equipment as specified in the appendix or greater care when directing the spray of compressed air.

An unpublished study of a cylinder held under negative-pressure and the equivalent method described by NIOSH below indicate promising results for reduction of employee exposures in this operation. Since the type of cylinder

which has already been in wide use demonstrates successful achievement of levels below the permissible exposure limit, OSHA is not proposing at this time that negative-pressure cylinders be required.

b. Solvent/spray can system method. Paragraph (f)(1)(x) of the proposal allows an employer to comply with the proposed standard through the use of a solvent mist/spray can system as specified in appendix F, as a control method. This system consists of an aerosol or pump spray can filled with a solvent or solvent solution. The spray can is used to dispense the solvent or solvent solution in order to wet the brake or clutch parts. The wetted parts are wiped clean with a cloth which is disposed of according to ways specified in paragraph (k) of the standard or laundered in a way to prevent the release of asbestos fibers in excess of the 0.1 f/cc PEL. The solvent mist/spray can system can be used concurrently with a local exhaust ventilation system to limit the escape of airborne asbestos fibers into the ambient air, but since the method achieves levels well below the PEL without using local exhaust ventilation, OSHA is not proposing to require engineering controls for what appears to be a *de minimis* reduction in exposure over the basic approach.

In the NIOSH study, the aerosol solvent mist/spray can system consisted of the spray can filled with solvent without the use of a ventilation system. The wetted parts were wiped clean by some mechanics using this control method and washed with the aerosol solvent by other mechanics. The use of the aerosol spray can yielded the highest concentrations of ambient asbestos fibers of the four other control methods used in the study. The use of the aerosol spray can method in the study yielded arithmetic mean asbestos fiber concentrations of 0.052 f/cc using TEM detection. The principal advantages of the solvent mist/spray can method are its low cost and the capability to use it on all sizes of brake drums; therefore it is a recommended control method. The problem with the system is that too much force from the solvent spray may cause the suspension of asbestos dust in the air. While the use of a local exhaust ventilation system would catch the suspended dust, OSHA believes that work practices are a practical and immediately applicable substitute.

c. Wet brush-recycle method. The wet brush/recycle method used in the NIOSH study consists of a fluid reservoir, a pump, a delivery system (either a low velocity nozzle or a brush

attached to a nozzle), and a catch basin. An aqueous solution containing an organic solvent is pumped out of the nozzle or the bristles of the brush and the fluid and brush are used to wash down the dust in the brake assembly into a catch basin. The fluid in the catch basin is returned to a reservoir and recirculated. Using TEM detection, the arithmetic mean concentration of asbestos fibers in the personal samples was less than 0.013 f/cc. The wet brush/recycle system can be used on all sizes of brake systems and limited wetting can be done with the brake drum in place. The wetted brake dust is rinsed down into the catch basin which yields better control of asbestos fibers when the brake drum is removed for further cleaning and servicing. The problem with this system is that the method involves a more problematic cleanup and disposal. The aqueous asbestos contaminated waste must be disposed of in a way which does not violate any OSHA waste disposal or EPA hazardous waste disposal standards. The article recommends that any spill of the contaminated solution be cleaned up using an HEPA filter vacuum or thorough wet mopping and re-mopping. The use of this control method resulted in the lowest concentrations of airborne asbestos fibers among all the control methods used in the NIOSH study.

d. Equivalent methods: OSHA has information about potential "equivalent" methods. The NIOSH study describes two alternate engineering controls (a glove box/ vacuum enclosure method, and a HEPA-filter vacuum without enclosure), which may qualify as suitable equivalent methods. Results of the study demonstrated that these control methods are capable of keeping the mechanics' asbestos exposure level to less than 0.05 f/cc. These methods and their characteristics are described below.

The glove box/vacuum enclosure method consists of an adjustable-height, clear plastic, two-glove box with an overlapping neoprene seal; a double motor HEPA filter-equipped vacuum unit; and connections inside the box for an air hose and a vacuum hose. In the study, the glove box was fitted over the brake drum and backing plate on all vehicles except a large truck. Using TEM detection, the arithmetic mean concentration of personal samples was 0.021 f/cc. The article notes the glove box/vacuum enclosure as a superior control method because the two gloves of the system allow both hands to manipulate parts and tools within the enclosure. The primary problem with this control method is the potential for

exposure when maintaining and replacing the vacuum filter and when cleaning the enclosure. Care must be taken, through the use of work practices specified in the appendix, to prevent exposures maintenance and replacement of the system parts. Another problem of the system is that it may not be used on all larger brake systems.

The HEPA-filter equipped vacuum cleaner method is used to vacuum dust from inside the brake drum and from around the brake assembly, before and during servicing, as well as dust that falls to the floor and work area. No enclosure, compressed air, or wet methods are used in this control method. The use of this control method resulted in an arithmetic mean concentration of asbestos fibers in personal samples of 0.022 f/cc using TEM detection. One problem with this method is that in order to use the vacuum the drums must be removed before cleaning and this presents a potential for release of asbestos fibers. There is also the potential for exposure during the maintenance and replacement of the vacuum filter and parts. The vacuum cleaner does not use compressed air nor does it generate dust that would need to be contained, as in the vacuum enclosure systems. The vacuum cleaners can be used on brake drums of any size.

In addition to the preferred methods, OSHA is proposing to allow employers to achieve compliance using any other methods equivalent to the solvent spray, wet brush-recycle, and/or HEPA filter vacuum methods, and any other preferred method specified in the final standard. Appendix F also requires that the equivalent method of engineering control and work practices comply with housekeeping standards of paragraph (k) of the standard and labeling requirements of paragraph (j)(2)(ii) of the standard.

Unlike the use of the three specified methods, the employer must demonstrate that the equivalent method reduces employee exposures in that work place to levels approximating the expected reduction achieved through the preferred methods. OSHA is not proposing to use the PEL as the benchmark for equivalency since, as noted above, the reference methods and likely available substitute methods reduce asbestos concentration levels to below the PEL. Based on the evidence available to it, the Agency believes that these reference methods can routinely reduce exposures to or below 0.05 f/cc. OSHA therefore has proposed to require that the employers proof of "equivalency" demonstrate that the

method is capable of routinely achieving such exposure levels. The proposed standard would require that "Such demonstration shall include monitoring data conducted under workplace conditions closely resembling the process, type of asbestos containing materials, control method, work practices and environmental conditions when the equivalent method will be used * * * Further, the method must be reproducible and the number of measurements should be adequate to be valid. Also it must be demonstrated that the "equivalent" method results in exposures which are "equal to or less than the exposures resulting from the use of Method A, the Enclosed Cylinder/HEPA Vacuum System Method, as set for in Ex. 1-112 (Sheehy, J.W., T.C. Cooper, D.M. O'Brien. 1989. Control of Asbestos Exposures During Brake Drum Service. Appl. Ind. Hyg. 4:313-319) In addition, an equivalent method must be used according to manufacturer specifications, the employer must instruct employees in work practices and provide the method in written form to the employee to ensure its correct use, and employ appropriate housekeeping methods. OSHA also is considering whether the employer should be required to request a variance pursuant to section 6(d) in the Act, in order to prove that this method is "equivalent", OSHA seeks information as to what criteria should be included in the standard to ensure that a method meets these tests. Comment on this is sought.

The Agency is requesting comments on each of the methods described as a preferred control method for brake and clutch repair operations. OSHA requests information on any experiences in use of techniques which should be added to the specifications for engineering controls or work practices. In particular, OSHA is asking for comments on the need for local exhaust ventilation during use of the solvent spray can method. Additionally, OSHA is requesting comments on the utility of specifying the described equivalent methods as designated control methods. OSHA seeks comment on whether there are additional work practices OSHA should require which would effectively reduce asbestos exposure. Further, OSHA requests comment on the appropriateness of lowering the permissible exposure limit in brake and clutch repair to 0.05 f/cc.

d. Additional housekeeping requirements. Housekeeping practices have been shown to be effective means of reducing employee exposure to asbestos, tremolite, actinolite and

anthophyllite. Consequently, OSHA is proposing to specify that the now required cleaning of floors and surfaces on which dust containing asbestos can accumulate be performed at least once per shift in primary and secondary manufacturing. In addition to the current requirement that a vacuum containing a HEPA-filter must be used, OSHA is proposing that where feasible, wet methods must also be used for clean-up. Once asbestos dust is entrained, it can accumulate on surfaces leading to potentially substantial levels of exposure. Routine removal of dust can greatly reduce these accumulations and the risks that they pose.

e. Sanding requirements. OSHA is proposing new §§ 1926.58(g)(2)(iv) and 1910.1001(f)(1)(xi), which would prohibit the sanding and/or buffing of floor tiles containing asbestos with high-speed sanders(buffers). In accordance with EPA recommendations (Exhibit 1-108), only low abrasion pads may be used at speeds lower than 190 rpm in these operations. OSHA believes that without such restrictions this type of mechanized activity may result in the release of levels of asbestos fibers into the air, which may pose a significant risk to workers and to bystander employees. OSHA is also requiring that employers inform employees that high-speed floor buffing may expose them to asbestos.

In October 1989, A.F. Meyer and Associates, Inc., an occupational health and safety consultant, conducted a study on the presence and amount of asbestos fiber released from routine buffing (with standard red buffing pad and standard buffing solution) and stripping, two methods: (1) With standard stripping mixture mopped on and standard black stripping pad, and (2) with mist spray of stripper solution and standard black stripping pad) of vinyl asbestos floor tiles in a Maryland public school. The tests conducted before, during, and after these buffing and stripping operations indicated the following results, published in "Vinyl Asbestos Floor Tile Study—Routine Buffing and Stripping Operations for WRC-TV Washington". Air samples collected in the test classroom before any buffing or stripping were performed detected airborne fiber densities of 30.5 and 45.8 structures per mm³ (0.01 and 0.015 structures per cc). Asbestos densities of air samples collected inside the work area during the first stripping operation were 91.6 and 229.0 structures per mm³ (0.029 and 0.072 structures per cc). Air samples collected during the second stripping operation indicated airborne fiber densities of 236,167.6 and 278,316.1 structures per mm³ (77.5 and

89.2 structures per cc). Air samples collected after the final stripping operation indicated airborne fiber densities of 137.4 and 183.2 per mm³ (0.045 and 0.06 structures per cc).

On January 25, 1990, in response to the A.F. Meyer study, EPA published a "Recommended Interim Guidance for Maintenance of Asbestos-Containing Floor Coverings," (Ex. 1-108) outlining its analysis of the Meyer's findings. The Agency concluded that, although there was "no clear evidence" that "routine" stripping significantly elevated levels of asbestos fibers, it observed that higher levels did occur after a stripping machine was used on a relatively dry, unwaxed floor.

Work practices recommended by EPA in the same guidance memo ensure that the least abrasive pad available is used to strip wax or finish coat from asbestos-containing floors. EPA also suggests that sanding equipment be operated infrequently and at slow speeds (e.g., 175-190 rpm) to prevent a sudden violent disturbance of asbestos fibers.

On the basis of these and other data, OSHA believes that sanding vinyl floor tiles would likely release high levels of asbestos and, in some cases, asbestos fibers in concentrations in excess of the OSHA proposed permissible exposure limit of 0.1 f/cc. Therefore, OSHA is proposing this prohibition of high-speed sanding. The data indicate that low-speed sanding (i.e., less than 190 rpm) or buffing would not result in levels of airborne asbestos that pose significant exposure risks to employees involved in routine operations, maintenance and repair activities. OSHA's proposed action would reduce the risk from exposure to airborne asbestos fibers with only minimal losses in benefits (i.e., dirtier floors and/or longer cleaning times by hand). OSHA also notes that ACCSH recommended these restrictions, as well as more specific work practices. These recommendations are as follows:

The stripping of wax or finish coat from asbestos-containing floor coverings shall be performed as infrequently as possible. When this operation is performed, the floor shall be kept adequately wet during the entire operation. Prior to machine operation, an emulsion of chemical stripper in water shall be applied to the floor with a mop to soften the wax or finish coat. Following stripping and prior to application of the new wax or finish coat, the floor shall be thoroughly clean, while wet. The machine shall be equipped with the least abrasive pad possible for the operation, and shall be run at speeds no greater than 190 rpm. Stripping shall cease when the old surface coat is removed so as to prevent overstripping. Machines with an

abrasive pad shall not be used on unwaxed or unfinished floors.

Comments on this suggested expansion of the provisions are requested.

C. The Proposed Expansion of the Competent Person Requirement

A competent person is defined in the current asbestos construction standard (29 CFR 1926.58 (b)) as " * * * one who is capable of identifying existing asbestos * * * hazards in the workplace, and has the authority to take prompt corrective measures to eliminate them * * * ". The current standard requires employers to designate competent persons to oversee large-scale removal, demolition, and renovation operations; such operations occur at job sites at which employers are also required to establish negative-pressure enclosures. Specially designated training is required for such "competent persons". Exempt from competent person requirements are small-scale, short-duration removal, renovation and demolition operations where negative-pressure enclosures are not erected. In *Building and Construction Trades Department, AFL-CIO v. Brock* (DC Cir. Feb 2, 1988), the Court remanded to OSHA the question of whether employers engaged in any kind of asbestos related construction work should be required to designate "competent persons" to oversee safety measures.

OSHA agrees that all construction site employees would benefit from the presence of a competent person to oversee asbestos-related work. Therefore, OSHA is proposing to expand the competent person requirements to require supervision of all asbestos construction work sites by a "competent person" whose qualifications are keyed to the kind of asbestos operation.

First, the proposed revisions in this asbestos rulemaking clarify the general responsibilities of the competent person by referencing the General Provisions for Safety and Health. Currently, the General Safety and Health Provisions for Construction (29 CFR 1926.20 et seq.) require employers to designate a competent person to ensure compliance with general safety and health requirements at every construction job site. The competent person's duties in this regard include prohibiting the use of machinery or tools not in compliance with safety standards, identifying and removing all machinery or tools not in compliance with safety standards, allowing only trained or otherwise qualified employees to operate equipment and machinery, and

instructing employees in how to recognize and avoid unsafe conditions and making them aware of the safety and health regulations applicable to their work. OSHA has determined that these general safety and health-related duties apply to all job sites where worker exposure to asbestos occurs. Therefore, at every construction asbestos job site, an employer must comply with these worker protection requirements. The proposed revisions in this asbestos rulemaking clarify the general responsibilities of the competent person by referencing the General Provisions for Safety and Health.

In addition, the 1988 rulemaking record documented the need to specify the prerequisite training necessary for competent persons who will be working at those sites where there is likely to be substantial exposure to asbestos. Thus as noted above, in addition to the general competent person required at all job sites, the current standard requires employers to designate a competent person specifically for asbestos removal, demolition, and renovation work except for small-scale, short term jobs. The duties of the competent person who will oversee asbestos-related jobs include setting up a regulated area, enclosure, or appropriate containment, ensuring the integrity of the enclosure or containment, controlling entry to and exit from the enclosure, and supervising compliance with this standard. The competent person must also be trained in how to identify, recognize, handle, and remove asbestos, in a comprehensive course such as the one conducted by an EPA Asbestos Training Center, a 5-day course (29 CFR 1926.58 (e)(6)(iii)). OSHA notes that ACCSH recommended that a comparably trained competent person be assigned to every construction work site, not just abatement operations, and that installation of new asbestos-containing materials requires the presence of a trained competent person.

OSHA is proposing to expand the current competent person provisions of the asbestos standard to require the designation of a specially trained competent person at all renovation, removal and demolition operations covered by the standard. The proposed revisions also clarify the responsibilities of competent persons at such sites and specify the training and qualifications required to equip a competent person to fulfill these duties. The proposed revisions tier the training requirements. Competent persons for small-scale, short-duration operations need not receive the same training as those for large-scale asbestos operations; however, some competent persons who

will be overseeing small-scale, short-duration operations may find the additional training useful. Thus, training for small-scale, short-duration operations need not include setting up large-scale enclosures or containment, large-scale removal, demolition, and repair techniques, or other topics applicable only to large-scale operations.

To ensure that competent persons receive training, prospective competent persons will be required to complete a comprehensive training course. OSHA is not proposing at this time to require specific curricula or OSHA accreditation for these training courses. Numerous sources currently offer courses that cover the topics listed above; for example, those courses designed to meet the requirements of EPA's Asbestos Containing Materials in Schools Standard (40 CFR part 763). EPA's Model Accreditation Plan specifies curricula for courses directed at asbestos inspectors, management planners, project designers, abatement contractors, supervisors, workers, and operations and maintenance personnel. The Model Plan specifies the required length of each course and the minimum criteria the course must satisfy in order to receive EPA accreditation. Specifically EPA has stated the following:

* * * inspectors must take a 3-day training course; management planners must take the inspection course plus an additional 2 days devoted to management planning; and abatement project designers are required to have at least 3 days of training. In addition, asbestos abatement contractors and supervisors must take a 4-day training course and asbestos abatement workers are required to take a 3-day training course. For all disciplines, persons seeking accreditation must also pass an examination and participate in annual re-training courses. A complete description of accreditation requirements can be found in the Model Accreditation Plan at 40 CFR part 763, subpart E, appendix C.I.1.A. through E. (54 FR November 29, 1989 at 49190).

EPA, up until October 15, 1989, required accreditation for training programs offered to meet the requirements of 40 CFR part 763. By that time, EPA had accredited 1,362 courses. States will continue to certify courses with assistance from EPA.

Courses designed to train asbestos abatement supervisors and operations and maintenance personnel are likely to be sufficient training for competent persons. Courses for supervisory

personnel generally last from 4 to 5 days, whereas those for operations and maintenance personnel last about 2 days. The supervisory courses cover all aspects of employee health and safety, use of protective equipment, recognition and handling of asbestos, and emergency procedures. These courses may be sufficient for competent persons overseeing large-scale asbestos operations. Operations and maintenance courses generally cover recognition and identification of asbestos, small-scale removal techniques, employee safety and health, emergency procedures, and glove-bag techniques. These courses may be sufficient for training competent persons to oversee small-scale, short-duration asbestos operations. Some asbestos training programs also offer courses specifically for small-scale, short-duration operations or restricted-handler operations. These courses cover issues specific to small-scale and short-duration removal operations as well as general employee safety techniques. Some asbestos training facilities also offer training that is custom-designed for specific job sites or types of operations.

As a more extensive alternative, ACCSH submitted the following recommendations for training of competent persons:

- (i) Prior to performing or supervising any work covered by this section, the competent person shall be trained, examined and certified in accordance with the requirements for the training, examination, and certification of employers set forth in paragraph (k)(3)(iii) of this standard.
- (ii) For small-scale, short-duration operations, the competent person shall be trained, examined and certified in all aspects of asbestos work applicable to small-scale short-duration operations, including the contents of this standard, subpart C of part 1926, and section 59 of part 1926 (Hazard Communication Standard), the identification of asbestos, the ability to determine whether an operation meets the requirements of this section for designation as a small-scale, short-duration operation, procedures for setting up and use of glove bags and mini-enclosures, use of wet methods, and all other controls, techniques, work practices and other requirements of appendix G of this Standard.

The ACCSH further recommended the following regarding the training, examination, and certification of employers:

- (1) This paragraph applies to all competent persons engaged in, or supervising, work covered by this section. The training, examination and certification of all of the employer's competent persons shall constitute compliance by that employer with the requirements of this paragraph.
- (2) Prior to engaging in any work covered by this section, employers shall be trained, examined, and certified in all of the subjects

set forth in paragraph (k)(3)(iii) and (iv) of this section as well as in the following:

- (i) Assessing the estimated level of potential asbestos exposure through a knowledge of percentage weight of asbestos in asbestos-containing material, friability, age, deterioration and location.
- (ii) Personal air monitoring requirements and procedures, and the knowledge of PEL and action levels.
- (iii) The degree of protection afforded by different types of respirators, and the feasibility of different types of respirators for different asbestos-related operations.
- (iv) Preparing a work area for asbestos work, including defining the regulated areas, constructing negative-pressure enclosures, otherwise isolating work areas to prevent employee, bystander or public exposure, establishing decontamination areas, and preparing work areas after completion of work.
- (v) Employee and employer training, examination and certification requirements and procedures, and qualification requirements for instructors.
- (vi) Bonding and insurance requirements for employers engaged in asbestos work.
- (vii) Reporting, recordkeeping and record transfer requirements.
- (viii) Supervisory techniques and procedures.
- (ix) Contract specifications.
- (x) Requirements and procedures for providing information to employees and their designated representatives.
- (xi) All other duties and functions of competent persons contained in this Standard.

(2) The training required by this paragraph shall include both classroom-type training and hands-on performance-type training.

(3) Examination and Certification. (i) Prior to engaging in any work covered by this section, employers shall be examined by qualified instructors not employed by such employer or by any company affiliated with such employer, on all subjects as to which training is required by this paragraph. The examination shall include both written questions and answers and hands-on proficiency evaluation.

(ii) Certifications issued to employers by qualified instructors shall contain the name, address and telephone number of the employer so certified, the name, address and telephone number, and certification dates and numbers, of all competent persons employed by the employer, the name, address and telephone number of the instructors who provided the employer training and examinations and who issued the certification, the date of issuance of certification, and statement that the certification is valid for one year only.

(4) Access to Training Materials. The employer shall make readily available to affected employees and their designated representatives, without cost, all written materials related to the employer training program and a copy of the employer's current certification.

Although not specifically an issue in the Court remand, OSHA is presenting the following ACCSH recommendations

regarding the qualification and certification of employers and employees:

(1) All training of employees and employers, required by paragraphs (k) and (l), shall be provided by individuals knowledgeable and experienced in the construction trade involved, possessing academic credentials and/or field experience in asbestos work, trained in teaching skills, and certified as meeting all such qualifications. Instructors providing training of employees and employers engaged in asbestos removal, renovation or demolition shall be accredited as meeting requirements no less stringent than those contained in the EPA model contractor accreditation plan (52 FR 15876, 1987).

(2) Instructors providing training in air monitoring requirements and procedures must be certified industrial hygienists. Instructors providing instruction on the health effects of asbestos and on medical surveillance program requirements and procedures must be either industrial hygienists or certified health professionals.

Finally, the Committee also described its proposed OSHA oversight of training programs, examinations and certification:

(1) Employee and employer training programs, including training materials, course curricula, course outlines and manuals, description of teaching methods and of hands-on facilities, examinations and examination procedures, and certifications and certification procedures, as well as the names, telephone numbers and addresses of the employer's competent persons and of instructors of employee and employer training, shall be provided to OSHA upon request. OSHA may require changes in any of these items for the purpose of assuring that employees, employers and instructors possess the qualifications set forth in this section.

OSHA believes that the recommendations of ACCSH pertaining to the competent person and training and certification requirements deserve careful consideration. Therefore, OSHA requests comment on these recommendations.

Additionally, OSHA requests comments, including suggested alternatives, on several questions related to training: Are courses available that are sufficient to cover the requirements for specially tailored competent persons? Is the training offered in courses adaptable to small-scale, short-duration operations? Should OSHA supply model curricula for training? Do existing competent person training curricula and requirements need to be updated by incorporating training in new technologies? Should OSHA require certification of training courses? Could OSHA's required training be effectively incorporated into training

that meets current EPA asbestos training requirements? Should training be required for employees in all asbestos removal, demolition and/or removal operations? OSHA additionally requests comment on all aspects of its proposed competent person requirement.

OSHA believes that expanding the competent person requirement raises no feasibility issue. The general construction "competent person" requirement requires no special training. As noted, requiring additional training for supervisors of small-scale, short duration operations would entail a 16-hour asbestos-control course. OSHA believes that demands for this training can be met either by existing resources or by training resources expanded to meet any demands created by this amendment. Comment on this is requested.

In addition to its recommendations for training of competent persons, ACCSH has recommended the following regarding training of *all* exposed workers:

(3) Employee Information and Training. (i) The employer shall institute a training program for all employees exposed to airborne concentrations of asbestos, and shall ensure their participating in the program. The training program shall include examination and certification components. The employer shall not allow any non-certified employee to perform work covered by this section. To be certified, employees must be trained and examined as provided below.

(ii) Training, examination and certification shall be provided by a qualified instructor prior to the time of initial assignment by the employer unless the employee has been provided equivalent training, examination and certification within the preceding 12 months, and at least annually thereafter.

(iii) The training program shall be conducted in a manner that the employee is able to understand. The employer shall ensure that each employee is trained and examined in the following:

(A) Methods for recognizing asbestos, and physical characteristics of asbestos and asbestos-containing material.

(B) The health effects associated with asbestos.

(C) The relationship between smoking and asbestos in producing lung cancer.

(D) The names, addresses, and telephone numbers of public health organizations which provide information, materials and/or conduct programs concerning smoking cessation. The employer may distribute the list of such organizations contained in appendix J to comply with this requirement.

(E) The nature of operations that could result in harmful exposures to asbestos, and the importance of controls to minimize such exposures, including engineering controls, work practices, protective equipment including respirators and protective clothing, housekeeping procedures, hygiene facilities,

decontamination procedures, emergency procedures, and waste disposal procedures, and all necessary instruction in the use of these controls and procedures.

(F) The purpose, selection, fitting, testing, maintenance and cleaning, and limitations of respirators.

(G) Medical surveillance program requirements.

(H) the contents of this standard, including appendices, and of 1926.59 (Hazard Communication Standard), subpart C of part 1926 (General construction Safety and Health Standards), and 1910.20 (Employee Access to Exposure Records and Employee Medical Records).

(iv) Notwithstanding paragraph (k)(3)(ii), in addition to the requirements in paragraph (k)(3)(iii), prior to commencing asbestos work at any project or building, every employee shall be trained by the employer in all proper and applicable job-specific work practices including respiratory protection, work area preparation, decontamination, spill and emergency, and waste disposal procedures. Employers shall not allow any employee to perform work at the project or building unless the employee has received such job-specific training.

(v) The training required by paragraphs (k)(3)(iii) and (iv) shall include both classroom-type training and hands-on performance-type training.

(4) Examination and Certification. (i) The examination required by paragraph (k)(3) shall include both written questions and answers and hands-on proficiency evaluation.

(ii) Certifications issued to employees by qualified instructors shall contain the name, address and telephone number of the employee, the name, address and telephone number of the employer, the type of asbestos work in which the employer is engaged, the date of issuance of the certification, the name, address and telephone number of the instructors who provided the training and examination and issued the certification, and a statement that the certification is valid for one year only, and that job-specific training must be provided by the employee's employers at every project and building during the year the certification is in effect.

(5) Access to Training Materials. (i) The employer shall make readily available to all affected employees, and their designated representatives, without cost, all written materials relating to the employee training program.

(ii) Employees shall have access to copies of examinations they have taken, including examination grades and instructor comments. Designated employee representatives shall have access to such information, except for individually identifiable exam results which shall be made available only with the employee's authorization.

(6) Employee Retesting. The employer shall allow trainees to be retested at reasonable intervals and shall adopt written procedures for this purpose which shall be made available to trainees and their designated representatives.

OSHA invites comments on these proposed expansions of the training

requirements for asbestos-exposed workers.

Recently, OSHA learned that Congress is considering extending the training requirements of EPA's rule pertaining to Asbestos-Containing Materials in Schools (52 FR 41826, October 30, 1987) pursuant to the Asbestos Hazard Response Act (AHRA) to public and commercial buildings. The EPA rule requires maintenance and custodial staff to receive at least 2 hours of awareness training and that staff which will disturb asbestos-containing building materials receive an additional 14 hours of training. Further, it requires accreditation of persons who inspect for ACM in school buildings; who prepare management plans for such schools; and/or who design or conduct response actions. Accreditation is gained from a State that has instituted a program at least as stringent as the requirements of the EPA's Model Plan (52 FR 15875, April 30, 1987) or by passing an EPA-approved training course an examination consistent with the Model Plan. The Plan requires persons seeking accreditation to take an initial course, pass an examination and participate in continuing education.

OSHA realizes that, if adopted, these requirements will likely impact the training of workers covered under the OSHA standard and wishes to reconcile any differences or inconsistencies in the training requirements for asbestos workers which might lead to confusion or misunderstanding. Therefore, OSHA seeks comment as to how to best apply the training requirements to ensure worker protection and coordinate them with those of other agencies. OSHA seeks comment on the question of whether OSHA should adopt similar training requirements for asbestos workers covered under its standard as those specified in AHRA.

Training programs required in the asbestos standards are to be provided by the employers, who also must ensure the participation of affected employees. As discussed above, most major elements of the required OSHA training program are covered by an asbestos-worker training program required under AHRA. However, the AHRA-required training exceeds in breadth and length of training sessions, the OSHA requirements. Above, OSHA has asked for comments on whether the AHRA worker training and certification should be required also by OSHA.

OSHA now requires that employers provide all training except for initial training under the construction standard if an employee has received "equivalent

training within the previous 12 months." (29 CFR § 1926.58(k)(3)(ii)). This is in recognition of the fact that many abatement workers change employers frequently. Thus, requiring duplicate training from each new employer at each new job would be of *de minimis* benefit to employees. The intent however, of this exception was not to shift to the employee the cost of required OSHA training, nor to encourage him/her to obtain, at employee expense AHERA certification within 12 months of applying for work covered by the OSHA standards.

OSHA has been informed that in certain regions employers are requiring AHERA certification as a condition of employment for abatement work covered by OSHA standards. The Agency is interested in comments and information concerning how widespread such a practice is; whether the reason is to shift the OSHA training cost to employees, or whether there are other reasons; whether such a practice results in little or no job site training; and if so, how employee health and safety are affected.

D. Proposed Extension of Reporting and Information Transfer Requirements

1. Notification and Reporting Requirements

OSHA is proposing expanded notification and reporting provisions in the construction standard to respond to the Court of Appeals remand order and to incorporate some recommendations of the Advisory Committee on Construction (Exhibit 1-126).

The Court's decision dealt with two notification and reporting issues. First BCTD has asked OSHA to require employers contracting asbestos-related work to establish, maintain and transfer to building owners written records of the presence and locations of asbestos or asbestos products, in order to facilitate identification and prevention of asbestos hazards. The Court remanded this issue so that the Agency reach "its own judgment on the issue" of whether it was legally empowered to adopt such a requirement (See *BCTD v. Brock*, *supra* at 1278).

The second issue is whether OSHA should require all construction industry employers to file reports with it prior to engaging in any asbestos work, as maintained by BCTD. The Court remanded the issue for consideration on remand, after finding that the record contains "uncontradicted (and unanalyzed) evidence of non-*de minimis* benefits" (*Id.*).

The following discussion explains OSHA's proposal as it pertains to

certain of these issues. First, OSHA discusses its expanded provisions dealing with notification by and between employers and building owners in order to facilitate identification of and protection from asbestos in buildings. Second, OSHA discusses proposed provisions requiring some construction employers to report asbestos-related work to the Agency before it is begun.

2. Communication Among Employers, Employees and Building Owners

a. Notification to and from building owners. Current regulations, in paragraph (d), require employers to notify other employers in the building of the existence and location of asbestos work. However, the Agency had applied a narrower definition to the term "employer" based on its concern that building owners were "outside the domain of the OSH Act." (OSHA Brief at 96). As noted above, the Court remanded this issue to OSHA for further consideration in light of the statutory prescription that standards are to require conditions, or the adoption or use of one or more practices, means, methods, operations, or processes reasonably necessary or appropriate to provide safe or healthful employments and places of employment" (29 U.S.C. 652(8)). Upon further analysis, the Agency believes that it has authority to require building owners who are statutory employers to take necessary and appropriate remedial action such as notifying other employers, to protect employees other than their own. In other standards OSHA has required building owners and other employers who are not the direct employers of the employees exposed to a particular hazard, to warn of defects, take remedial action or provide information to the directly employing employer. For instance, the Hazard Communication standard requires that manufacturers provide information to downstream employers to protect their employees (29 CFR 1910.1200). The powered platform standard, promulgated in 1989, (54 FR 31408, July 28, 1989, at 341412-3) requires the building owner to assure the contract employer that the building and equipment conform to specified design criteria.

Because it is evident that the building or project owner is the best and often the only source of information concerning the location of asbestos installed in structures, OSHA believes it is appropriate to require the owner to receive, maintain, and communicate knowledge of the location and amount of asbestos-containing materials, to

employers of employees who may be exposed.

b. Communication provisions. OSHA is proposing a comprehensive notification scheme for affected parties—building owners, contract employers and employees, to assure that information concerning the presence, location and quantity of asbestos-containing material in buildings is communicated appropriately and in a timely manner to protect employees who will work with or in the vicinity of such materials. OSHA has reviewed and incorporated in the regulatory text many suggestions recommended by ACCSH at its March 14, 1990 meeting.

The highlights of the proposed notification scheme are as follows. Before non-small-scale, short duration renovation, removal or demolition operations take place, building and/or project owners must notify their own employees and employers whose employees may work in or contiguous to the areas of such operations, of the quantity and location of asbestos-containing materials present in such areas. Employers who have not received notice from the building owner of impending asbestos-related activity, must notify the building owner if the employer is planning any such covered activity and of the location and quantity of asbestos material known or later discovered. The building owner must keep record of all information received through this notification scheme, or through other means, which relates to the presence, location and quantity of asbestos-containing materials in his/her building and must transfer all such information to successive owners.

Other employers may not normally be aware of projects going on in other parts of the building, including regulated areas. Staff and crews not working directly with asbestos, tremolite, anthophyllite, or actinolite may nevertheless come into proximity with the regulated areas, and these staff are unlikely to be aware of the hazards of these substances and of appropriate protection measures. Because the safety and health of his or her employees in the workplace is the responsibility of the building owner, the Agency believes that the building owner must also notify his/her employees who may work near where the work with asbestos is being done. OSHA believes that the employee's presence in the workplace places him at increased risk from asbestos exposure regardless of whether he/she is actually working with asbestos.

Additionally, the proposal expands OSHA's current employer notification

requirements which apply only to multi-employer worksites. Any employer planning to perform work which will be in a regulated area, before starting, must notify the building owner of the location of asbestos and protective measures taken; (Paragraph (d)(2)(i)); upon discovering unexpected asbestos, must immediately provide similar notification ((d)(2)(iii)); and, upon work completion must provide to the owner a written record of the remaining asbestos at the site ((d)(2)(iv)).

To provide notification in small-scale, short-term operations and to make this notification scheme effective, OSHA is building upon its requirement to post regulated areas to encourage posting of small-scale, short duration operations. Thus, notification requirements for these operations will be met if appropriate signs which inform about the fact that asbestos exposing activities are present are posted. OSHA considers site posting to be a particularly effective means to alert employees of hazardous areas. Because, by definition, small-scale, short-term activities present greatly reduced hazard potential, OSHA believes that site posting will adequately notify potentially affected employees who are not working on the operation.

The expanded notification provisions are limited to the construction standard because the primary purpose of the proposed expanded notification provisions is to protect employees from asbestos exposure resulting from construction activities which disturb previously installed asbestos-containing materials in structures and buildings. The ACCSH identified employees who perform security services as requiring notification of in-place asbestos-containing materials. OSHA has no information indicating that such employees face increased hazards from asbestos exposures in buildings, above those faced by other building occupants. Therefore OSHA has not included these employees in its notification scheme. Comments are requested on this approach. However employees who buff asbestos-containing floor tile, as part of a removal activity, would be performing a construction operation, and as a housekeeping function, would be performing a general industry operation. Thus, OSHA has prohibited high-speed buffing of asbestos-containing floor tile in both standards. The newly proposed prohibitions cannot be sufficiently protective unless employees know that the floor is asbestos-containing. Therefore, OSHA has included in the provisions prohibiting high-speed buffing, an additional element that

employees must be informed of the reason for the prohibition, i.e. that high-speed buffing may release asbestos fibers.

OSHA requests comments on the proposed notification requirements. In addition, OSHA invites comments on setting a cutoff for asbestos-containing material with minimal asbestos content. For example, is 0.1% asbestos minimum, as provided in the Hazard Communication Standard, appropriate to this standard? In addition, OSHA seeks comment on whether the Agency should require building owners to determine the presence, location and amount of asbestos within their buildings. OSHA requests information on experience and costs involved in such a requirement.

3. Proposed Requirements for Notifying OSHA of Demolition, Renovation, or Removal Operations

OSHA is proposing to add a new provision to the standards that will require employers to provide OSHA with written notification prior to engaging in any building demolition, renovation, and removal operations which involve materials containing asbestos, tremolite, anthophyllite, or actinolite. Operations which meet the proposed definition of small-scale, short duration operations are exempt from this notification requirement.

The Building and Construction Trades Department (BCTD), AFL-CIO, suggested that OSHA should require all construction industry employers to file reports concerning any building demolition, renovation or removal project involving asbestos prior to beginning such project. BCTD believed that information generated by such reports would enable the Agency to more efficiently enforce the regulations, which would have the effect of increasing employer compliance and decreasing the risk to workers. BCTD also pointed out that workplace standards for acrylonitrile and inorganic arsenic require employers to supply the address of their workplace, report the number of employees working within the regulated area, and describe each operation that will cause employees to be exposed to the regulated substances.

The Court remanded the notification issue to OSHA for it to reconsider whether a notification requirement would increase compliance by generating better information for targeting inspections and by increasing self-policing among employers who must submit reports. OSHA is proposing to institute a notification requirement, based on its preliminary conclusion that a notification requirement can be

designed in such a way that it will improve the targeting of inspections and heighten employer awareness of applicable requirements without imposing unwarranted burdens on employers or strains on limited Agency enforcement resources. OSHA concludes that such provisions will substantially improve worker protection.

Consistent with the proposed NESHAP revision (54 FR at 912, January 10, 1989), in which EPA proposed a uniform 10-day period for written notification, OSHA is similarly proposing a 10-day requirement. The written notification supplied to OSHA must include the name, address, and telephone number of the employer; the location of the facility where the operation will occur; the scheduled start and completion dates of the operation; a description of the facility on which the operation is to occur, including its size, age, number of floors, how the facility is used at present and was used in the past; the procedure used to detect the presence of asbestos material in the facility; the estimated amount of materials containing asbestos; a description of the planned operation, including methods that will be used to perform the demolition, renovation, or removal activity; a description of work practices and engineering controls to be used to comply with the OSHA worker protection standards for the construction industry; certification that a competent person as required by paragraph (c) of this section will supervise the operation described in the notification.

Given the complexity of some building demolitions and renovation work, it is possible that some asbestos may not be discovered until after the work has begun; therefore, OSHA is considering whether notification should also include a description of the procedures to be used in the event that unexpected amounts of asbestos are discovered during the operation. Written notification of such a contingency plan would enable the OSHA area office to evaluate whether the employer is prepared to adequately handle such a situation. OSHA seeks comment on this matter.

OSHA believes that employer notification would act as an incentive for employers to comply with the worker protection standards and better enable them to police their workplace for hazards. OSHA's objective in proposing these new notification standards is to encourage compliance and to better enforce compliance with health and safety standards through inspections and monitoring. Notification assists

OSHA in locating sites where asbestos projects are scheduled to occur so that OSHA can inspect and monitor the site for compliance with the regulations. Scheduled inspections can be prioritized according to relative risk to workers, based on the information provided in the notification. The notification will also assist OSHA in assessing the success of its regulation and the status of compliance among its local regulated community.

The proposed OSHA notification standard requires that the employer provide notice of an asbestos project in connection with an impending demolition, renovation or removal operation 10 days prior to beginning such an operation; thus, prior notice gives OSHA the opportunity to evaluate compliance efforts before the regulated activity actually begins and thus provides the opportunity for preventive action as opposed to just corrective action. The information included in the notification would also provide OSHA with written indication of how successful the regulations are in achieving compliance among the regulated parties.

The proposed notification is modeled after the notification requirement concerning asbestos abatement projects that occur in conjunction with building demolition and renovation operations as contained in the National Emissions Standards for Hazardous Air Pollutants (NESHAP) (40 CFR part 61.146). Employers in all building demolition operations, and in renovation operations involving amounts of asbestos at least 260 linear feet on pipes and 160 square feet on other facility components must provide notice of these operations to the EPA. One of the purposes of the notification of EPA is to assist the Agency in enforcing its regulations. EPA is in the process of revising its rule to clarify its notification requirements.

Employers can satisfy the OSHA notification requirement simply by forwarding a copy of the EPA form to the OSHA area office when complying with EPA's asbestos NESHAP. The individual items of information requested in the proposed OSHA notification standard parallel the information requested in the Asbestos NESHAP notification requirements. OSHA recognizes that there are minor differences in the content of the OSHA notification and the NESHAP notification but does not believe that these differences will impede the achievement of OSHA's objective in promulgating the notification requirements, that is, to encourage compliance among employers and to

facilitate inspection and monitoring. Comment on the proposed method of notification of OSHA is requested.

In its proposed NESHAP revision (54 FR 912, January 10, 1989), EPA proposed to require additional notification if the demolition or removal operation will begin on a date other than the one specified in the original notification. OSHA requests comment as to whether its proposed notification requirements should be similarly modified.

EPA has expressed the belief that the revision of the Asbestos NESHAP to include more stringent notification requirements will serve to improve compliance within the regulated community and to improve enforcement of the regulations (54 FR 915, January 10, 1989). EPA has increased enforcement against employers who fail to comply with notification requirements; such failure is a clear violation that can be cited even if the operation has been completed by the time the inspector arrives. The number of notification submissions has increased substantially during the past few years, from 23,022 to 52,571 between 1985 and 1988. EPA expects to receive an estimated 60,000 notifications in 1989. EPA attributes this increase in notification submissions to increasing employer familiarity with the NESHAP rather than to merely increased numbers of abatement actions. Given the number of notifications that the EPA receives each year, OSHA can expect that its offices would receive as many or more. Such a large number of responses could strain OSHA's administrative resources; therefore, OSHA may share enforcement information with EPA. Information concerning current requirements of local jurisdictions concerning reporting of asbestos-work is requested.

EPA extended the major provisions of the 1986 asbestos standard to state and local government employees not covered by the OSHA standards in its worker protection rule (52 FR 5618, February 25, 1987). Among the few differences between the EPA rule and the OSHA standard is the requirement that EPA be notified 10 days before the start of an abatement project involving more than 3 linear feet or 3 square feet of friable asbestos. No notification is required however, for jobs which do not involve friable asbestos. Comment is requested on this cut-off, as well that the NESHAP cutoff notes above, for the amount of asbestos for exemption from the notification requirements of this proposal.

As noted above, employers involved in operations defined as small scale,

short duration are exempt from this requirement to notify OSHA. There are a large number of small-scale, short-duration projects, and such projects are typically completed very quickly. It is anticipated that many notifications reported to OSHA will involve those operations whose size falls between the OSHA-defined small-scale, short duration operation and EPA's minimum for notification, as well as those larger operations which involve asbestos, but for which notification of EPA is not required.

Due to the potential for asbestos emissions in asbestos handling, EPA has proposed to clarify its definition of asbestos-containing material in its NESHAP regulation as follows:

Asbestos-containing material means friable asbestos material and non-friable asbestos material that potentially can be broken, crumbled, pulverized, or reduced to powder in the course of operations regulated by this subpart. (54 FR 925, January 10, 1989)

As a result of this change, more information will be provided to EPA and existing notification procedures improved. ACCSH agreed that OSHA should require pre-job notification from asbestos employers, but, on a broader basis. Comments are requested on ACCSH's recommended reporting requirements.

OSHA has participated in interagency initiatives to coordinate agency regulation involving communication and notification. EPA and OSHA, along with other agencies which regulate asbestos exposure, are continuing to coordinate their efforts by means of a Federal Asbestos Task Force. Minutes of some meetings of the task force are in the docket of this proceeding (Exh. 1-____). The most recent such effort was begun in 1989 when EPA established "Asbestos in Public and Commercial Building Policy Dialogue" whose purpose is to obtain input from a variety of perspectives on the problems and potential solution to problems related to asbestos in commercial and public buildings. Participants included representatives of the following:

- Realty interests
- Lenders and insurance interests
- Unions
- Asbestos manufacturers
- Public interest
- Asbestos consultants and contractors
- States

Following a series of meetings held between May 1989 and May 1990, the "Policy Dialogue" group issued a draft final report on May 31, 1990 (Ex. 1-18G). The group failed to reach a consensus on all issues, but did generally agree on

some issues. There was general agreement among the participants that the presence of asbestos should be known to building service workers. Union representatives, citizen representatives, asbestos consultants and contractors, and state officials felt that there should be a requirement to notify workers and building occupants in all circumstances in accordance with the likelihood of building workers of occupants disturbing asbestos. OSHA has recognized these general approaches in its proposed amendments.

The major area of disagreement among the participants in the Policy Dialogue Group dealt with the characterization of risk to general building occupants and office workers. Unions, public interests, and asbestos consultants and contractors held that building occupants are at risk especially when the presence of asbestos is unknown and therefore subject to inadvertent disturbance, resulting in exposure. State, union, public interest representatives, and asbestos consultants and contractors believe that available data is insufficient to allow the conclusion that building occupants are generally safe, regardless of how the asbestos is managed.

The representatives of realty, lenders, and insurance interests as well as those of asbestos manufacturers believe that the data do not show a significant health risk to general building occupants and that building occupants are generally safe, irrespective of how the asbestos in the building is managed. Further, the latter group held that only building service personnel were at potential risk from asbestos and therefore their exposure should be subject to regulation by OSHA.

Union and citizen representatives believe it to be a public health problem, and that EPA should assume the primary regulatory role.

The need for a specific federal asbestos inspection requirement was also discussed by the Policy Dialogue Group, but agreement could not be reached on this point. In the preamble to its 1986 asbestos standards, OSHA stated that it "did not explore in detail the complex area of asbestos contamination in buildings because the available evidence shows that buildings containing even disturbed asbestos expose employees (i.e. who are building occupants) to levels considerably below the action level adopted in this (the 1986) standard." OSHA seeks new information which might be available concerning the risk to building occupants presented by asbestos in buildings.

Additionally, OSHA seeks comment on the question of whether or not to include as a requirement, the operation and maintenance (O & M) program which was part of non-mandatory appendix G in the 1986 standard. This program included: Development of an inventory of all asbestos-containing materials in the facility; periodic examination of all asbestos-containing materials to detect deterioration; written procedures for handling asbestos materials during the performance of small-scale, short duration maintenance and renovation activities; written procedures for asbestos disposal and emergencies; and a training program for maintenance staff. In this rulemaking OSHA proposes to exclude this requirement from mandatory appendix G.

OSHA believes that its requirements in the construction standard, as proposed to be revised are consistent with EPA's NESHAP requirements. OSHA's requirements are directed at reducing worker exposure from all operations which disturb asbestos using effective work practices and engineering controls in order to reduce still significant risks of asbestos-related disease to exposed workers. EPA's requirements are primarily aimed at reducing asbestos emissions from large-scale renovation and demolition activities in order to reduce risk to the general public from increases in ambient levels of asbestos. Therefore some, but not all, OSHA-covered asbestos related activities would be subject to NESHAP requirements; and vice versa. Large-scale removal and renovation projects involving large quantities of asbestos-containing materials (ACM) would be covered under both regulations. However, maintenance and repair activities disturbing small quantities of ACM would not be subject to most NESHAP requirements. A large-scale renovation job subject to both regulatory schemes would, in the Agency's view, not be subject to inconsistent requirements. Thus, under OSHA's regulations, a negative pressure enclosure must be established; under NESHAP, wet methods must be used for removal; under both standards, both Agencies must be notified in advance, but OSHA would accept the EPA notification form. OSHA requests comment on whether it too should explicitly require use of wet methods for all abatement work. The Agency notes that the proposed mandatory appendix G would require that an employer must use feasible wet methods to avail himself of the small-scale, short duration operation exemption from the

requirement for establishing a negative-pressure enclosure.

OSHA recognizes the benefits of consistency with other regulatory agencies in its requirements and seeks comments and information from participants to avoid inconsistencies or conflicts. OSHA desires that the Agency's requirements be congruent with those of other agencies and minimize confusion. Comment on the proposed notification requirements is requested. In particular, OSHA seeks to learn of any difficulties or confusion encountered by contractors seeking to comply with the regulations of more than one agency.

E. Other Issues

1. Scope and Application

OSHA is proposing clarifying regulatory text to be inserted in the scope and application paragraph of the construction standard. This would unambiguously state that coverage under the construction standard is based on the nature of the work operation involving asbestos, not on the employer's primary activity (29 CFR 1926.58 (a)(7)). This position in accord with the Agency's longstanding policy on this issue, and should assure that employers are aware of the fact that construction activities trigger the requirements of the construction standard.

2. Maritime Asbestos Activities

In its 1986 rulemaking, OSHA considered maritime asbestos operations to be regulated under the general industry standard (1910.1001). Upon subsequent reconsideration, OSHA has noted that many maritime activities are construction-like in nature. Therefore, OSHA seeks information and comment as to how best to provide equivalent protection to workers engaged in maritime activities.

3. Naturally-Occurring Asbestos in Soil

In recent submissions to the asbestos docket (Exh. 3-10 and 3-11), OSHA has been informed that naturally occurring asbestos deposits are present in areas of the United States and that when disturbed, for example during earthmoving projects, mining and milling operations, drilling, blasting and rock sawing operations, the asbestos in the deposit can become airborne and expose workers performing these activities to significant levels of asbestos fibers. OSHA proposes to consider that this exposure is included under its present construction standard for asbestos and that methods of control be employed to avoid worker exposure

to naturally occurring asbestos deposits which might become airborne during disturbance of the deposits. OSHA solicits comments on this matter. Are there additional or changed requirements to the provisions in the current construction standard which should be adopted in order to protect workers engaged in these activities? Further, OSHA seeks information on the appropriate method for determination of the presence of asbestos in soil and the effectiveness of wet methods and/or other methods in controlling worker exposure. OSHA also requests information on effective decontamination methods for exposed workers.

IV. Preliminary Regulatory Impact and Regulatory Flexibility Analysis: Introduction

In this proposed revision to the standards governing occupational exposure to asbestos, tremolite, anthophyllite and actinolite, OSHA is seeking to lower the permissible exposure limit in all affected industry sectors to 0.1 f/cc as an 8-hour time-weighted average; extend reporting and transfer requirements for employers engaged in asbestos removal, renovation and demolition; expand the competent person requirement to all employers in construction; require the establishment of negative-pressure enclosures; require engineering and work-practice controls in the automotive brake and service industry; redefine small-scale, short-duration construction operations; add requirements for housekeeping in general industry; and prohibit high-speed sanding of asbestos floor tile. This preliminary regulatory impact analysis examines the population at risk and significance of risk from exposure to asbestos, the estimated costs of compliance, the projected reduction in cancer cases as a result of lower exposures, and the estimated economic impacts of the proposed rule. Much of the analysis presented below is based upon the draft final report submitted to OSHA by CONSAD Research Corporation [2].

Executive Order 12291 (46 FR 13197) requires that a regulatory impact analysis be prepared for any proposed regulation that meets the criteria for a "major rule," that is, one that would likely result in an annual impact on the economy of \$100 million or more; a major increase in cost or prices for consumers, individual industries, federal, state or local government agencies, or geographic regions; or

significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of United States-based enterprises to compete with foreign-based enterprises in domestic or export markets. In addition, the Regulatory Flexibility Act (5 U.S.C. 601, *et seq.*) requires an analysis of whether a regulation will have a significant economic impact on a substantial number of small entities.

Consistent with these requirements, OSHA has made a preliminary determination that the proposed revision will constitute a major rule. Accordingly, OSHA has prepared this Preliminary Regulatory Impact and Regulatory Flexibility Analysis to demonstrate the technological and economic feasibility of the proposed revision.

Industry Profile

Industry sectors affected by the proposed revision to the asbestos standard are found within primary manufacturing, secondary manufacturing, automotive brake and clutch repair, shipbuilding and ship repair, and construction, as identified in detail in the 1986 Regulatory Impact Analysis (RIA) [1]. The following two sections briefly profile the sectors in general industry and construction affected by the proposed revision.

General Industry

Primary manufacturers use asbestos fiber as a raw material in the production of an intermediate product to be further processed or fabricated into a finished product. The following industries within primary manufacturing will be impacted by the proposal: Asbestos/cement pipe (A/C pipe); asbestos/cement sheet (A/C sheet); asbestos friction materials; asbestos textile products; asbestos gaskets and packing; asbestos paper products; asbestos adhesives, sealants, and coatings; and asbestos-reinforced plastic products. Two processes—fiber introduction and product finishing/dry mechanical—are common to all primary manufacturing operations and have high potential for generating airborne asbestos fiber.

Secondary manufacturers modify or fabricate an asbestos product to yield a final or intermediate asbestos product. Processes that are employed to modify the product include sawing, drilling, sanding, punching, pressing, routing, milling, and beveling, all of which tend to generate high dust levels. Secondary manufacturing activities where

occupational exposures are expected to remain above the proposed 0.1 f/cc PEL without respiratory protection are in A/C sheet, friction materials and textile processing.

The general automotive repair and service sector includes establishments involved in brake and clutch repair work and maintenance. The major source of asbestos exposure in this sector occurs when compressed air is used for blowing the residual dust from the brake lining assembly. Replacement of clutch assemblies can also lead to fiber release. OSHA estimated in the 1986 RIA that approximately 285,000 automobile repair shops and garages, brake and clutch repair establishments, and motor vehicle dealers, employing 527,000 workers, are affected by the current asbestos standard. OSHA proposes to mandate specific engineering controls and work practices that represent current use or practice for much of this industry sector.

According to industry experts, the industry structure and work practices of the primary manufacturing, secondary manufacturing, and service sectors have undergone noticeable changes since 1986. [Details of these changes are forthcoming.] In the future, the Environmental Protection Agency ban of almost all asbestos products (54 FR 29460) would prohibit, at staged intervals, the manufacture, importation, processing, and distribution in commerce of asbestos, and would therefore lead to a further elimination of occupational risk to asbestos in general industry. Moreover, OSHA predicted in 1986 that asbestos production would decline as a result of the current standard. OSHA requests public comment on the current market structure within primary and secondary manufacturing and the industry outlook.

OSHA's estimates of the number of workers in general industry currently exposed to asbestos, and their exposure levels by process within each activity, are shown in Table 1. As the table indicates, approximately 568,000 workers in general industry would be affected by the proposed revision, with the overwhelming majority found in auto repair. Current exposures range from 0.007 f/cc for the wet mechanical process in plastics, to 0.15 f/cc for fiber introduction in A/C sheet. OSHA estimates that more than half of the 43 processes in general industry are below the proposed PEL of 0.1 f/cc in the absence of respiratory protection.

TABLE 1.—CURRENT OCCUPATIONAL EXPOSURE ESTIMATES FOR GENERAL INDUSTRY
(by Industry/Process Group)

Industry process groups	Number of plants in industry	Number of workers exposed	Average full time equivalent worker-years of exposure/yr	Estimated mean exposure level for current PEL of 0.2 f/cc	Number of workers exposed above 0.1 f/cc
Primary Manufacturing:					
A/C Pipe:					
All	5	512	512.00		235
Introduction	5	15	15.00	0.138	15
Wet mechanical	5	169	169.00	0.097	0
Dry mechanical	5	220	220.00	* 0.015220	* 220
Other	5	108	108.00	0.081	0
A/C Sheet:					
All	6	159	159.00		159
Introduction	6	7	7.00	0.150	7
Wet mechanical	6	21	21.00	0.139	21
Dry mechanical	6	28	28.00	0.147	28
Other	6	103	103.00	0.143	103
Friction Materials:					
All	51	4,801	4,801.00		4,801
Introduction	51	96	96.00	0.141	96
Wet mechanical	51	240	240.00	0.134	240
Dry mechanical	51	720	720.00	0.130	720
Other	51	3,745	3,745.00	0.130	3,745
Gaskets and Packings:					
All	18	306	306.00		265
Introduction	18	102	102.00	0.128	102
Wet mechanical	18	102	102.00	0.125	102
Dry mechanical	18	61	61.00	0.125	61
Other	18	41	41.00	0.097	0
Paper:					
All	22	380	380.00		58
Introduction	22	20	20.00	0.091	0
Wet mechanical	22	58	58.00	0.101	58
Dry mechanical	22	58	58.00	0.054	0
Other	22	244	244.00	0.050	0
Coatings and Sealants:					
All	78	1,327	1,327.00		1,018
Introduction	78	1,018	1,018.00	0.108	1,018
Other	78	309	309.00	0.044	0
Plastics:					
All	4	322	322.00		91
Introduction	4	53	53.00	0.048	0
Wet mechanical	4	73	73.00	0.007	0
Dry mechanical	4	91	91.00	0.145	91
Other	4	105	105.00	0.060	0
Subtotal	184	7,807	7,807		6,627
Secondary Manufacturing:					
Friction Materials: Dry mechanical	40	1,458	1,458.00	0.102	1,458
Gaskets and Packings: Dry mechanical	289	8,741	8,741.00	0.048	0
Textiles: Dry mechanical	51	170	170.00	0.137	170
Plastics: Dry mechanical	245	2,450	2,450.00	0.065	0
Auto Remanufacturing:					
All	181	4,669	4,669.00		0
Dry mechanical	181	2,054	2,054.00	0.094	0
Other	181	2,615	2,615.00	0.063	0
Subtotal	806	17,488	17,488.00		1,628
Service Sectors:					
Auto Repair: Dry mechanical	285,188	526,998	16,468.69	0.015	0
Ship Repair:					
All	400	15,000	15,000.00		15,000
Wet mechanical	400	2,251	2,251.00	* 0.042	* 2,251
Dry mechanical	400	12,450	12,450.00	* 0.016	* 12,450
Nuclear ripout	400	299	299.00	* 0.004	* 299
Subtotal	285,588	541,998	31,468.69		15,000
Industry totals	286,578	567,293	56,763.69		23,255

Source: OSHA [1, pp. V-2 and VI-7, and appendix G].

* Exposure in the Dry Mechanical process of Primary A/C Pipe Manufacturing and in the Wet Mechanical and Dry Mechanical processes in Ship Repair reflect the use of half-mask cartridge respirators to supplement engineering controls and work practices.

* Estimated exposure in Nuclear Ripout operations reflect the use of supplied-air respirators to supplement engineering controls and work practices.

Construction

The construction industry is the principal market for asbestos materials and products in the United States. The industry accounted for 50 percent of the

demand for asbestos in 1984, and for 35 percent of the demand in 1989 [2, p. 39]. Construction products include A/C sheets and pipes, tiles, papers, coatings and sealants, all used in a variety of

buildings and structures. Since the early 1970s, the overall demand for these products has declined due to the availability of effective substitutes and to increased regulatory requirements