

**Shell Oil Company**
Interoffice Memorandum

SEPTEMBER 14, 1984

FROM: MANAGER, HEALTH & SAFETY, MANUFACTURING & TECHNICAL
TO: SEE ATTACHED DISTRIBUTION LIST
SUBJECT: ASBESTOS VS. NON-ASBESTOS GASKETS

The attached memo from R. E. Nordstrom conveys information on the evaluation of non-asbestos gasket and valve-stem packing materials as potential replacements for comparable asbestos containing materials. Acceptable performance is available for some but not all applications. Most of these have a cost penalty -- ranging from very small to substantial. Specific recommendations are included where reasonable cost/performance is available.

Asbestos in gaskets and valve-stem packing is generally well "bound" or encapsulated. Therefore employee exposure, under normal work conditions, is not a driving force to change to non-asbestos materials. However, some residual exposure potential may exist and disposal of asbestos-containing materials may require special attention to ensure full regulatory compliance (if they would be considered "friable" -- see attached 4/12/84 memo "Amendments to NESHA for Asbestos").

We will continue to support the evaluation of substitute non-asbestos materials in applications such as these in the workplace. This is a prudent and positive step in the health arena (beyond current regulatory requirements). However, it should be recognized that these materials present an extremely low risk health exposure and a greater concern should be the potential for introducing materials which render our piping systems less safe.

J. S. Szymanowski

KCC:bjd

Attachment

cc w/o attachment

W. C. Bluhm
R. H. Brown
W. A. Gabig
H. L. Kusnetz
W. L. Tanner

cc w/attachment

J. D. Harris
C. F. Phillips
J. L. Rivard

LAM 001288

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Shell Oil Company
Interoffice Memorandum

US	KOC	JCR	PJW	BJD
HEALTH & SAFETY MANUFACTURING & TECHNICAL				
SEP 10 1984				
CU for Date:			File No:	

SEPTEMBER 4, 1984

PRIVATE AND CONFIDENTIAL

FROM: R. E. NORDSTROM, MANAGER, PRESSURE EQUIPMENT, ENGINEERING
CONSTRUCTION & SERVICES, ENGINEERING, HEAD OFFICE

TO: DISTRIBUTION

SUBJECT: ASBESTOS-CONTAINING VS. NON-ASBESTOS-CONTAINING VALVE STEM
PACKINGS AND FLANGE GASKETS

On several occasions over the last few years Engineering Services has been asked to review the technical and commercial aspects of changing from asbestos-containing stem packings and flange gaskets to non-asbestos-containing materials. The attached report is being sent to you for your information as we believe it will be of interest to you and to members of your staff who are involved with this issue.

R. E. Nordstrom

R. E. Nordstrom

RWR:cdr

Attachment

cc: W. L. Tanner, Manager, Engineering Construction & Services,
Engineering
R. H. Brown, Manager, Maintenance Support, Manufacturing
W. A. Gabig, Manager, Construction Relations & Engineering
Standards
J. S. Szymanowski, Manager, Health & Safety
W. C. Bluhm, Consulting Engineer, Health & Safety

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G. A. PHILLIPS, TECHNICAL MANAGER-ENGINEERING, WOODBURY

LAM 001291



Shell Oil Company
Interoffice Memorandum

AUGUST 27, 1984

PRIVATE AND CONFIDENTIAL

FROM: R. W. RAPP

TO: R. E. NORDSTROM

SUBJECT: ASBESTOS-CONTAINING VS. NON-ASBESTOS-CONTAINING VALVE STEM
PACKINGS AND FLANGE GASKETS

On several occasions over the last few years Engineering Services has been asked to review the technical and commercial aspects of changing from asbestos-containing valve stem packings and flange gaskets to non-asbestos-containing valve stem packings and flange gaskets in Shell Oil.

SHELL EGS SPECIFICATIONS

For a large majority of our piping services our current piping EGS recommend (1) for valve steam packing, braided asbestos with Inconel wire insert around resilient asbestos core, graphite impregnated (John Crane 187-I is basically the industry standard); (2) for gaskets in Classes 150 and 300 flanged piping systems, compressed sheet asbestos; and (3) for gaskets in Classes 600 and higher flanged piping systems, stainless steel spiral wound gaskets with asbestos filler. These materials are specified because they are widely available, are generally satisfactory for the intended services, and are cost effective.

ENGINEERING SERVICES' POSITION

With regard to the concerns about the continued use of asbestos-containing products that has surfaced in recent years, Engineering Services has taken the position that we will continue to use asbestos-containing stem packings and asbestos-containing flange gaskets as long as these products meet the following criteria: (1) they can be safely handled; (2) they are legally available; (3) they are satisfactory for the intended service; and (4) they are cost effective. Also, we have stated that if we can find non-asbestos-containing alternatives to the above asbestos-containing products that (1) are as effective as the equivalent asbestos-containing products at no significant cost increase to Shell or (2) are so demonstrably superior to the asbestos-containing products that a significant cost increase to Shell can be justified, then we would make the switch to non-asbestos-containing products.

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BQFR84235

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In light of the above we have again reviewed the availability of non-asbestos-containing valve steam packings and flange gaskets in the market place and Shell's experience with these products. The results are as follows:

SPIRAL WOUND GASKETS

With respect to spiral wound gaskets, Flexitallic Gasket Company, Lamons Metal Gasket Company, and Sepco Metallic Gasket Corporation have spiral wound gaskets with non-asbestos-containing filler on the market. Flexitallic's trade name for its spiral wound gasket with non-asbestos-containing filler is "Flexite Super" and the filler is chlorite mineral paper with 30% graphite (Attachment 1). Lamons uses a mica filler in its non-asbestos-containing spiral wound gasket. Sepco's trade name for its spiral wound gasket with non-asbestos-containing filler is "Verdi Flex" and the filler is mica (Attachment 2).

Deer Park has purchased some \$55,000 worth of "Flexite Super" gaskets for installation in various services and has reported that the "Flexite Super" gaskets are superior in sealing ability to the asbestos-filled spiral wound gaskets and have replaced more expensive 100% graphite-filled spiral wound gaskets in certain services. Geismar has recently standardized on the "Flexite Super" gasket for stock (Attachment 3). Also the "Flexite Super" gasket has been incorporated into the piping specifications for the cumene project at Deer Park.

The only concern about the new "Flexite Super" gaskets was the question of possible galvanic attack between the stainless steel windings and the graphite in the non-asbestos-containing filler in aqueous solutions. Westhollow Research Center has recently run tests on this for Deer Park and determined that this is not a problem (Attachment 4).

We are not aware of any significant Shell experience with the mica-filled spiral wound gaskets from Lamons and Sepco. Lamons' local representative has stated that he does not know of any refinery users of his mica-filled spiral wound gasket. Lamon's mica-filled spiral wound gasket costs about 12.5% more than their asbestos-filled spiral wound gasket. Sepco's mica-filled spiral wound gasket costs about 16% more than their asbestos-filled spiral wound gasket.

On the basis of the Deer Park experience and in light of our stated position above, we recommend changing our piping EGS recommendation to include spiral wound gaskets with non-asbestos-containing filler, "Flexite Super" or equal, in addition to asbestos-filled spiral wound gaskets for most piping services in pressure Classes 600 and above. At this time we have no proven equal to the "Flexite Super" gasket.

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The cost to make this change varies with location. Norco and Wood River have blanket MRO orders with Flexitallic distributors. Therefore, since the cost of the "Flexite Super" is the same as the standard Flexitallic asbestos-filled spiral wound gasket, there would be no cost adder to make this change at these two locations. Deer Park has blanket MRO orders with Lamons and Sepco which are 35% and 30% respectively below Flexitallic (Attachment 5). The cost to upgrade the Lamons and Sepco asbestos-filled spiral wound gaskets to non-asbestos filled Lamons or Sepco spiral wound gaskets (which are not proven by Shell experience) would be 12-to-15% and would be 30-to-35% to upgrade to the "Flexite Super" gasket. In the past twelve months Deer Park has purchased about \$160,000 worth of asbestos-filled spiral wound gaskets from Lamons (\$90M) and Sepco (\$70M) and about \$55,000 worth of "Flexite Super" spiral wound gaskets from Flexitallic. Martinez has its blanket MRO order with Lamons for spiral wound gaskets which are about 10% lower in cost than Flexitallic. Martinez has purchased about \$40,000 worth of spiral wound gaskets in the last 12 months. Wilmington has its blanket MRO purchase order for spiral wound gaskets with Lamons. At Wilmington the price of Lamons gaskets was about the same as Flexitallic the last time the blanket order was bid. In the last twelve months Wilmington has purchased about \$84,000 worth of spiral wound gaskets.

COMPRESSED SHEET GASKETS

With respect to compressed sheet gaskets, we do not have an acceptable across-the-board alternative to compressed sheet asbestos gaskets at this time unless we want to go to all spiral wound gaskets with non-asbestos-containing filler. This change would be perhaps three times more expensive than using compressed sheet asbestos gaskets. Wood River and Deer Park have some experience with Garlock's non-asbestos-containing sheet gaskets (trade name "Blue Gard"). Wood River's experience is limited but good. Deer Park's experience is somewhat more extensive, but the results are somewhat mixed and documentation of results is not very good. Also, Garlock's non-asbestos-containing sheet gasket is more expensive than the compressed sheet asbestos gasket (Attachment 6). Per Garlock's local salesman, the Garlock Blue Gard 3400 still carries a 100% price premium over the Garlock 7021 compressed sheet asbestos gasket in the Houston area.

Without additional test data and documentation on the use of compressed non-asbestos-containing sheet gaskets, we recommend no change be made at this time in the piping EGS with respect to the use of compressed sheet asbestos gaskets.

VALVE STEM PACKINGS

Deer Park has considerable and very good experience with premium priced non-asbestos-containing valve stem packings. Deer Park has repacked many valves in which the asbestos-containing John Crane 187-I stem packing did not give good service life with a combination Garlock 98 carbon rings and

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flexible graphite rings. Deer Park has also ordered new valves with this stem packing arrangement for high pressure hydrogen service, for some high pressure-high temperature process services, and high pressure steam service.

As seen on the attached price comparison chart (Attachment 7), the straight Garlock 98 stem packing rings or the combination Garlock 98 and flexible graphite stem packing sets carry significant price premiums over the standard John Crane 187-I stem packing. Because of the significant price premiums, use of the Garlock 98 or Garlock 98 and flexible graphite stem packings can only be justified in very hard-to-hold service valves or in critical service valves at this time.

Vogt Valve Company has tested a number of non-asbestos-containing stem packings and has found that a combination of flexible graphite rings and non-asbestos braided rings to be the most service effective and cost effective stem packing substitute for the standard asbestos-containing John Crane 187-I valve stem packing (Attachment 8). Price adders per valve which include the Shell discount) for Class 800 bolted bonnet gate valves with the new non-asbestos-containing stem packing and non-asbestos-containing bonnet gasket range from \$4.40 for 1/2" valves to \$11.20 for 2" valves. Price adders per valve (which include the Shell discount) for Class 800 welded bonnet valves with the non-asbestos-containing stem packing range from \$1.60 for 1/2" valves to \$4.80 for 2" valves (Attachment 9). Price adders for Smith Valves with the same type of non-asbestos-containing stem packing and bonnet gaskets are about the same as Vogt (Attachment 10).

Norco Manufacturing Complex has standardized on the combination graphite rings/non-asbestos braided rings stem packing system for all API 602 welded bonnet valves (Attachment 11). Welded bonnet valves are used mainly for steam service and Norco favors this combination stem packing system for steam service. Rather than order this packing system for steam service valves and the less expensive standard packing system for welded bonnet valves used in other services, Norco has decided to order only the combination graphite rings/non-asbestos braided rings stem packing system in all API 602 welded bonnet valves to avoid double stocking.

Within the last six months John Crane Packing Company has announced the availability of a new non-asbestos-containing valve stem packing (brand name John Crane 187-IG) which Crane claims is a totally compatible substitute across-the-board for the asbestos-containing John Crane 187-I stem packing (Attachment 12). The new non-asbestos-containing 187-IG stem packing carries a 15% cost premium over the standard 187-I stem packing. Assuming that Crane's claims for the 187-IG stem packing can be substantiated, this cost premium would not be significant when the total cost of a new valves is considered or in the cost to repack an existing valve or in the total cost to recondition a valve. Smith Valves has said that they would offer the John Crane 187-IG packing in their valves at no cost increase over the regular John Crane 187-I packing.

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Crane does not know of any refiner who is extensively using the 187-IG stem packing at this time. Commonwealth Edison reports good service with the 187-IG packing in 2100 psig/1050°F steam service after five weeks service. Previously they were getting only one week's service life from Garlock's non-asbestos-containing 127-AFP stem packing in the same service. However, Commonwealth plans to test flexible graphite packing in this service in the future.

Garlock also has a non-asbestos-containing valve stem packing (trade name 127-AFP) which Garlock claims is equal to 187-I but it carries a 100% price premium over the 187-I stem packing. This product has been on the market for a couple of years. Deer Park is currently testing some of this material but no results are currently available. One valve reconditioning shop and one plant turnaround contractor have reported that some of their customers who have used the 127-AFP stem packing material have reported problems with it in high temperature service. Also, one valve manufacturer has tested the 127-AFP packing in its manufacturing facility and did not find it to be very satisfactory.

We believe that the John Crane 187-IG stem packing has the potential to be a cost effective replacement across-the-board for asbestos-containing valve stem packings if we can substantiate Crane's claims for the 187-IG stem packing. However, since we cannot presently substantiate Crane's claims for the 187-IG stem packing, we cannot recommend changing our EGS at this time to permit its use across-the-board in valves. We encourage field locations to use the 187-IG stem packing in order to demonstrate the effectiveness of the 187-IG stem packing. Meanwhile, we will continue to monitor the industry use and acceptance of 187-IG stem packing through our contacts at the API, with our competitors, and with valve manufacturers.

If the John Crane 187-IG does not prove to be effective, we will not have a cost effective, across-the-board replacement for asbestos-containing stem packing. We estimate that a switch to the combination graphite rings/non-asbestos braided rings stem packing system in API 602 valves at Deer Park alone might cost about \$75,000 a year (Attachment 13).

COMPETITORS' FINDINGS AND VALVE MANUFACTURERS' OUTLOOK

Per discussions with a number of our competitors, engineering contractors, valve manufacturers, gasket manufacturers and packing manufacturers, all of the major users are experimenting with non-asbestos-containing valve stem packings and gasket materials. Some of the end users, such as Celenese, Diamond Shamrock, Arco, and Rohm and Haas, are actively phasing out the use of asbestos-containing products throughout their facilities. Others, such as Exxon, are phasing out some of the asbestos-containing products in individual units within their manufacturing complexes, i.e., the olefin unit at Exxon's Baytown Complex is phasing out asbestos-containing sheet gaskets in pump cases and heat exchangers.

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With respect to valve stem packings and sheet gaskets, none of our refinery competitors (Exxon, Gulf, Amoco, Conoco, Texaco) have found satisfactory, cost effective across-the-board replacements for John Crane 187-I stem packing and asbestos sheet gaskets.

The attached memo from MCC Pacific Valves is probably typical of the valve industry's outlook on the use of asbestos-containing stem packing (Attachment 14). Unless the customer requests otherwise, Pacific will continue to supply valves with asbestos-containing stem packing as long as it is legal to do so because asbestos-containing packing is cost effective and is not considered by Pacific to be a health or safety hazard in the form used in valve stem packing.

Recognizing the concerns and uncertainties about the continued use of asbestos-containing products, the API Subcommittee on Piping has gone on record that it will approach the API Committee on Refinery Equipment for funding for a non-asbestos-containing gasket test program in the near future.

CONCLUSION

Discounting those companies that have switched to non-asbestos-containing products by edict, it appears that the cost of the non-asbestos-containing substitutes for valve stem packings and gaskets is a major factor in changing from asbestos-containing materials to non-asbestos-containing materials. Where a non-asbestos-containing product is available which does the job as well as the asbestos-containing product and does not cost a significant premium, then the change to the non-asbestos-containing product is readily acceptable, witness the wide spread acceptance of the Flexitallic's "Flexite Super" spiral wound gasket in one year's time. Where the cost of the non-asbestos-containing product is significantly more than the asbestos-containing product, the switch to the non-asbestos-containing product has generally been on a more selective basis, witness the use of Garlock's Blue Gard and other manufacturers' non-asbestos-containing sheet gaskets and Garlock's 98 style and other manufacturers' flexible graphite valve stem packings.

SUMMARY

Legally, there are no current regulations barring the use of asbestos-containing valve stem packings and flange gaskets. Technically, we have found some non-asbestos-containing products that are equal to or superior than their equivalent asbestos-containing products, i.e., spiral wound gaskets and valve stem packings. In sheet gaskets we have not yet found a technically acceptable equivalent across-the-board substitute for asbestos sheet gaskets. Commercially, the cost to change to non-asbestos-containing products to proven non-asbestos-containing valve stem packings and flange gaskets is generally high.

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RECOMMENDATIONS

1. Do not arbitrarily ban the use of asbestos-containing valve stem packing and flange gaskets as long as these products meet the position set out earlier in this report.
2. Encourage locations to use John Crane's 187-IG non-asbestos-containing packing to determine that it is a cost effective alternative to the valve industry standard asbestos-containing 187-I stem packing.
3. Revise the piping EGS to permit the use of "Flexite Super" spiral wound gaskets.
4. Encourage the use of "Flexite Super" gaskets where economical to do so.

R. W. Rapp

R. W. Rapp

RWR:cdr

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BQFR84235

DPMC-16996



Shell Oil Company
Interoffice Memorandum

APRIL 12, 1984

FROM: MANAGER ENVIRONMENTAL CONSERVATION - MANUFACTURING & TECHNICAL
TO: DISTRIBUTION
SUBJECT: AMENDMENTS TO NESHP FOR ASBESTOS

On April 5, 1984, the EPA promulgated amendments to the National Emission Standards for Hazardous Air Pollutants (NESHP) for asbestos. The primary purpose of these amendments is to reinstate the work practice and equipment provisions in the original regulation which were declared invalid by the Supreme Court in 1978.

While these portions of the regulation have not been enforceable since the court decision, we suggest you review your asbestos handling practices to ensure continued compliance. In some recent Environmental Reviews, the review team has noted and commented on lax labeling of containers of scrap insulation. In some instances, unlabeled bags of asbestos were identified. We suggest that you adopt the practice of labeling each container as to its contents, e.g., "Asbestos" or "Not Asbestos," to preclude any improper disposal of asbestos.

Also, in this amendment, minor changes have been made in the reporting of demolition and renovation requirements which you should review.

A copy of the revised regulation is attached.

A handwritten signature in cursive script, appearing to read "T. R. Williams".

T. R. Williams

JAM:RS

Attachment

LAM 001299

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Superintendent Environmental Conservation/Utilities - Wood River

Superintendent Operations - Odessa

Manager Technical

El Paso
Taft

Environmental Manager Marketing Engineering-Marketing - Refining & Marketing

Superintendent Terminal Operations-Crude Oil-Domestic Raw Materials
Supply-Raw Materials Supply-Supply & Transportation - Refining & Marketing

HS&ES-IS(2)

61.09, 61.10, 61.146, 61.148, and 61.155] have been approved by the Office of Management and Budget (OMB) under the provisions of the Paperwork Reduction Act of 1980, 44 U.S.C. 3501 *et seq.* and have been assigned OMB control number 2000-0264.

This regulation was submitted to the Office of Management and Budget (OMB) for review as required by E.O. 12291.

Pursuant to the provisions of 5 U.S.C. 605(b), I hereby certify that this rule, if promulgated, will not have a significant economic impact on any small entities.

List of Subjects in 40 CFR Part 61

Air pollution control, Asbestos, Beryllium, Hazardous materials, Mercury, Vinyl chloride.

Dated: March 30, 1984.

William D. Ruckelshaus,

Administrator.

PART 61—[AMENDED]

40 CFR Part 61 is amended by redesignating Subpart B (§§ 61.20–61.25) as Subpart M and revising the new Subpart M to read as follows:

Subpart M—National Emission Standard for Asbestos

- Sec.
- 61.140 Applicability.
 - 61.141 Definitions.
 - 61.142 Standard for asbestos mills.
 - 61.143 Standard for roadways.
 - 61.144 Standard for manufacturing.
 - 61.145 Standard for demolition and renovation: Applicability.
 - 61.146 Standard for demolition and renovation: Notification requirements.
 - 61.147 Standard for demolition and renovation: Procedures for asbestos emission control.
 - 61.148 Standard for spraying.
 - 61.149 Standard for fabricating.
 - 61.150 Standard for insulating materials.
 - 61.151 Standard for waste disposal for asbestos mills.
 - 61.152 Standard for waste disposal for manufacturing, demolition, renovation, spraying, and fabricating operations.
 - 61.153 Standard for inactive waste disposal sites for asbestos mills and manufacturing and fabricating operations.
 - 61.154 Air-cleaning.
 - 61.155 Reporting.
 - 61.156 Active waste disposal sites.

Authority: Secs. 112 and 301(a) of the Clean Air Act, as amended (42 U.S.C. 7412, 7601(a)), and additional authority as noted below.

Subpart M—National Emission Standard for Asbestos

§ 61.140 Applicability.

The provisions of this subpart are applicable to those sources specified in §§ 61.142 through 61.153.

§ 61.141 Definitions.

All terms that are used in this subpart and are not defined below are given the same meaning as in the Act and in Subpart A of this part.

Active waste disposal site means any disposal site other than an inactive site.

Adequately wetted means sufficiently mixed or coated with water or an aqueous solution to prevent dust emissions.

Asbestos means the asbestiform varieties of serpentinite (chrysotile), riebeckite, (crocidolite), cummingtonite-grunerite, anthophyllite, and actinolite-tremolite.

Asbestos-containing waste materials means any waste that contains commercial asbestos and is generated by a source subject to the provisions of this subpart. This term includes asbestos mill tailings, asbestos waste from control devices, friable asbestos waste material, and bags or containers that previously contained commercial asbestos. However, as applied to demolition and renovation operations, this term includes only friable asbestos waste and asbestos waste from control devices.

Asbestos material means asbestos or any material containing asbestos.

Asbestos mill means any facility engaged in converting, or in any intermediate step in converting, asbestos ore into commercial asbestos. Outside storage of asbestos material is not considered a part of the asbestos mill.

Asbestos tailings means any solid waste that contains asbestos and is a product of asbestos mining or milling operations.

Asbestos waste from control devices means any waste material that contains asbestos and is collected in a pollution control device.

Commercial asbestos means any asbestos that is extracted from asbestos ore.

Demolition means the wrecking or taking out of any load-supporting structural member of a facility together with any related handling operations.

Emergency renovation operations means a renovation operation that was not planned but results from a sudden, unexpected event. This term includes operations necessitated by nonroutine failures of equipment.

Fabricating means any processing of a manufactured product that contains commercial asbestos, with the exception of processing at temporary sites for the construction or restoration of facilities.

Facility means any institutional, commercial, or industrial structure, installation, or building (excluding

apartment buildings having no more than four dwelling units).

Facility component means any pipe, duct, boiler, tank, reactor, turbine, or furnace at or in a facility; or any structural member of a facility.

Friable asbestos material means any material containing more than 1 percent asbestos by weight that hand pressure can crumble, pulverize, or reduce to powder when dry.

Inactive waste disposal site means any disposal site or portion of it where additional asbestos-containing waste material will not be deposited and where the surface is not disturbed by vehicular traffic.

Manufacturing means the combining of commercial asbestos—or, in the case of woven friction products, the combining of textiles containing commercial asbestos—with any other material(s), including commercial asbestos, and the processing of this combination into a product.

Outside air means the air outside buildings and structures.

Particulate asbestos material means finely divided particles of asbestos material.

Planned renovation operations means a renovation operation, or a number of such operations, in which the amount of friable asbestos material that will be removed or stripped within a given period of time can be predicted. Individual nonscheduled operations are included if a number of such operations can be predicted to occur during a given period of time based on operating experience.

Remove means to take out friable asbestos materials from any facility.

Renovation means altering in any way one or more facility components.

Operations in which load-supporting structural members are wrecked or taken out are excluded.

Roadways means surfaces on which motor vehicles travel. This term includes highways, roads, streets, parking areas, and driveways.

Strip means to take off friable asbestos materials from any part of facility.

Structural member means any load-supporting member of a facility, such as beams and load supporting walls; or any nonload-supporting member, such as ceilings and nonload-supporting walls.

Visible emissions means any emissions containing particulate asbestos material that are visually detectable without the aid of instruments. This does not include condensed uncombined water vapor.

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§ 61.142 Standard for asbestos mills.

Each owner or operator of an asbestos mill shall either discharge no visible emissions to the outside air from that asbestos mill or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.

§ 61.143 Standard for roadways.

No owner or operator of a roadway may deposit asbestos tailings or asbestos-containing waste material on that roadway, unless it is a temporary roadway on an area of asbestos ore deposits.

§ 61.144 Standard for manufacturing.

(a) *Applicability:* This section applies to the following manufacturing operations using commercial asbestos.

(1) The manufacture of cloth, cord, wicks, tubing, tape, twine, rope, thread, yarn, roving, lap, or other textile materials.

(2) The manufacture of cement products.

(3) The manufacture of fireproofing and insulating materials.

(4) The manufacture of friction products.

(5) The manufacture of paper, millboard, and felt.

(6) The manufacture of floor tile.

(7) The manufacture of paints, coatings, caulks, adhesives, and sealants.

(8) The manufacture of plastics and rubber materials.

(9) The manufacture of chlorine.

(10) The manufacture of shotgun shell wads.

(11) The manufacture of asphalt concrete.

(b) *Standard:* Each owner or operator of any of the manufacturing operations to which this section applies shall either:

(1) Discharge no visible emissions to the outside air from these operations or from any building or structure in which they are conducted; or

(2) Use the methods specified by § 61.154 to clean emissions from these operations containing particulate asbestos material before they escape to, or are vented to, the outside air.

§ 61.145 Standard for demolition and renovation: Applicability.

The requirements of §§ 61.146 and 61.147 apply to each owner or operator of a demolition or renovation operation as follows:

(a) If the amount of friable asbestos materials in a facility being demolished is at least 80 linear meters (260 linear feet) on pipes or at least 15 square meters (160 square feet) on other facility

components, all the requirements of §§ 61.146 and 61.147 apply, except as provided in paragraph (c) of this section.

(b) If the amount of friable asbestos materials in a facility being demolished is less than 80 linear meters (260 linear feet) on pipes and less than 15 square meters (160 square feet) on other facility components, only the notification requirements of paragraphs (a), (b), and (c) (1), (2), (3), (4), and (5) of § 61.146 apply.

(c) If the facility is being demolished under an order of a State or local governmental agency, issued because the facility is structurally unsound and in danger of imminent collapse, only the requirements in § 61.146 and in paragraphs (d), (e), (f), and (g) of § 61.147 apply.

(d) If at least 80 linear meters (260 linear feet) of friable asbestos materials on pipes or at least 15 square meters (160 square feet) of friable asbestos materials on other facility components are stripped or removed at a facility being renovated, all the requirements of §§ 61.146 and 61.147 apply.

(1) To determine whether paragraph (d) of this section applies to planned renovation operations involving individual nonscheduled operations, predict the additive amount of friable asbestos materials to be removed or stripped over the maximum period of time a prediction can be made, not to exceed 1 year.

(2) To determine whether paragraph (d) of this section applies to emergency renovation operations, estimate the amount of friable asbestos materials to be removed or stripped as a result of the sudden, unexpected event that necessitated the renovation.

(e) Owners or operators of demolition and renovation operations are exempt from the requirements of §§ 61.05(a), 61.07, and 61.09.

§ 61.146 Standard for demolition and renovation: Notification requirements.

Each owner or operator to which this section applies shall:

(a) Provide the Administrator with written notice of intention to demolish or renovate.

(b) Postmark or deliver the notice as follows:

(1) At least 10 days before demolition begins if the operation is described in § 61.145(a);

(2) At least 20 days before demolition begins if the operation is described in § 61.145(b);

(3) As early as possible before demolition begins if the operation is described in § 61.145(c);

(4) As early as possible before renovation begins.

(c) Include the following information in the notice:

(1) Name and address of owner or operator.

(2) Description of the facility being demolished or renovated, including the size, age, and prior use of the facility.

(3) Estimate of the approximate amount of friable asbestos material present in the facility. For facilities described in § 61.145(b), explain techniques of estimation.

(4) Location of the facility being demolished or renovated.

(5) Scheduled starting and completion dates of demolition or renovation.

(6) Nature of planned demolition or renovation and method(s) to be used.

(7) Procedures to be used to comply with the requirements of this Subpart.

(8) Name and location of the waste disposal site where the friable asbestos waste material will be deposited.

(9) For facilities described in § 61.145(c), the name, title, and authority of the State or local governmental representative who has ordered the demolition.

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§ 61.147 Standard for demolition and renovation: Procedures for asbestos emission control.

Each owner or operator to whom this section applies shall comply with the following procedures to prevent emissions of particulate asbestos material to the outside air:

(a) Remove friable asbestos materials from a facility being demolished or renovated before any wrecking or dismantling that would break up the materials or preclude access to the materials for subsequent removal. However, friable asbestos materials need not be removed before demolition if:

(1) They are on a facility component that is encased in concrete or other similar material; and

(2) These materials are adequately wetted whenever exposed during demolition.

(b) When a facility component covered or coated with friable asbestos materials is being taken out of the facility as units or in sections:

(1) Adequately wet any friable asbestos materials exposed during cutting or disjoining operations; and

(2) Carefully lower the units or sections to ground level, not dropping them or throwing them.

(c) Adequately wet friable asbestos materials when they are being stripped from facility components before the members are removed from the facility.

Emphasis is on "friable" asbestos.

In renovation operations, wetting that would unavoidably damage equipment is not required if the owner or operator:

(1) Asks the Administrator to determine whether wetting to comply with this paragraph would unavoidably damage equipment, and, before beginning to strip, supplies the Administrator with adequate information to make this determination; and

(2) When the Administrator does determine that equipment damage would be unavoidable, uses a local exhaust ventilation and collection system designed and operated to capture the particulate asbestos material produced by the stripping and removal of the friable asbestos materials. The system must exhibit no visible emissions to the outside air or be designed and operated in accordance with the requirements in § 61.154.

(d) After a facility component has been taken out of the facility as units or in sections, either:

(1) Adequately wet friable asbestos materials during stripping; or

(2) Use a local exhaust ventilation and collection system designed and operated to capture the particulate asbestos material produced by the stripping. The system must exhibit no visible emissions to the outside air or be designed and operated in accordance with the requirements in § 61.154.

(e) For friable asbestos materials that have been removed or stripped:

(1) Adequately wet the materials to ensure that they remain wet until they are collected for disposal in accordance with § 61.152; and

(2) Carefully lower the materials to the ground or a lower floor, not dropping or throwing them; and

(3) Transport the materials to the ground via dust-tight chutes or containers if they have been removed or stripped more than 50 feet above ground level and were not removed as units or in sections.

(f) When the temperature at the point of wetting is below 0°C (32°F):

(1) Comply with the requirements of paragraphs (d) and (e) of this section. The owner or operator need not comply with the other wetting requirements in this section; and

(2) Remove facility components coated or covered with friable asbestos materials as units or in sections to the maximum extent possible.

(g) For facilities described in § 61.145(c), adequately wet the portion of the facility that contains friable asbestos materials during the wrecking operation.

§ 61.148 Standard for spraying.

The owner or operator of an operation in which asbestos-containing materials are spray applied shall comply with the following requirements:

(a) Use materials that contain 1 percent asbestos or less on a dry weight basis for spray-on application on buildings, structures, pipes, and conduits, except as provided in paragraph (c) of this section.

(b) For spray-on application of materials that contain more than 1 percent asbestos on a dry weight basis on equipment and machinery, except as provided in paragraph (c) of this section:

(1) Notify the Administrator at least 20 days before beginning the spraying operation. Include the following information in the notice:

(i) Name and address of owner or operator.

(ii) Location of spraying operation.

(iii) Procedures to be followed to meet the requirements of this paragraph.

(2) Discharge no visible emissions to the outside air from the spray-on application of the asbestos-containing material or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.

(c) The requirements of paragraphs (a) and (b) of this section do not apply to the spray-on application of materials where the asbestos fibers in the materials are encapsulated with a bituminous or resinous binder during spraying and the materials are not friable after drying.

(d) Owners and operators of sources subject to this section are exempt from the requirements of §§ 61.05(a), 61.07, and 61.09.

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§ 61.149 Standard for fabricating.

(a) *Applicability.* This section applies to the following fabricating operations using commercial asbestos:

(1) The fabrication of cement building products.

(2) The fabrication of friction products, except those operations that primarily install asbestos friction materials on motor vehicles.

(3) The fabrication of cement or silicate board for ventilation hoods; ovens; electrical panels; laboratory furniture, bulkheads, partitions, and ceilings for marine construction; and flow control devices for the molten metal industry.

(b) *Standard.* Each owner or operator of any of the fabricating operations to which this section applies shall either:

(1) Discharge no visible emissions to the outside air from any of the operations or from any building or structure in which they are conducted; or

(2) Use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.

§ 61.150 Standard for insulating materials.

After the effective date of this regulation, no owner or operator of a facility may install or reinstall on a facility component any insulating materials that contain commercial asbestos if the materials are either molded and friable or wet-applied and friable after drying. The provisions of this paragraph do not apply to spray-applied insulating materials regulated under § 61.148.

§ 61.151 Standard for waste disposal for asbestos mills.

Each owner or operator of any source covered under the provisions of § 61.142 shall:

(a) Deposit all asbestos-containing waste material at waste disposal sites operated in accordance with the provisions of § 61.156; and

(b) Discharge no visible emissions to the outside air from the transfer of asbestos waste from control devices to the tailings conveyor, or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air. Dispose of the asbestos waste from control devices in accordance with § 61.152(b) or paragraph (c) of this section; and

(c) Discharge no visible emissions to the outside air during the collection, processing, packaging, transporting, or deposition of any asbestos-containing waste material, or use one of the disposal methods specified in paragraphs (c) (1) or (2) of this section, as follows:

(1) Use a wetting agent as follows:

(i) Adequately mix all asbestos-containing waste material with a wetting agent recommended by the manufacturer of the agent to effectively wet dust and tailings, before depositing the material at a waste disposal site. Use the agent as recommended for the particular dust by the manufacturer of the agent.

(ii) Discharge no visible emissions to the outside air from the wetting operation or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material

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before they escape to, or are vented to, the outside air.

(iii) Wetting may be suspended when the ambient temperature at the waste disposal site is less than -9.5°C (15°F). Determine the ambient air temperature by an appropriate measurement method with an accuracy of $\pm 1^{\circ}\text{C}$ ($\pm 2^{\circ}\text{F}$), and record it at least hourly while the wetting operation is suspended. Keep the records for at least 2 years in a form suitable for inspection.

(2) Use an alternative disposal method that has received prior approval by the Administrator.

§ 61.152 Standard for waste disposal for manufacturing demolition, renovation, spraying, and fabricating operations.

Each owner or operator of any source covered under the provisions of §§ 61.144–61.149 shall:

(a) Deposit all asbestos-containing waste material at waste disposal sites operated in accordance with the provisions of § 61.150; and

(b) Discharge no visible emissions to the outside air during the collection, processing (including incineration), packaging, transporting, or deposition of any asbestos-containing waste material generated by the source, or use one of the disposal methods specified in paragraphs (b)(1), (2), or (3) of this section, as follows:

(1) Treat asbestos-containing waste material with water:

(i) Mix asbestos waste from control devices with water to form a slurry; adequately wet other asbestos-containing waste material; and

(ii) Discharge no visible emissions to the outside air from collection, mixing, and wetting operations, or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air; and

(iii) After wetting, seal all asbestos-containing waste material in leak-tight containers while wet; and

(iv) Label the containers specified in paragraph (b)(1)(iii) as follows:

CAUTION

Contains Asbestos—
Avoid Opening or
Breaking Container
Breathing Asbestos is hazardous
to Your Health

Alternatively, use warning labels specified by Occupational Safety and Health Standards of the Department of Labor, Occupational Safety and Health Administration (OSHA) under 29 CFR 1910.1001(g)(2)(ii).

(2) Process asbestos-containing waste material into nonfriable forms:

(i) Form all asbestos-containing waste material into nonfriable pellets or other shapes; and

(ii) Discharge no visible emissions to the outside air from collection and processing operations, or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.

(3) Use an alternative disposal method that has received prior approval by the Administrator.

§ 61.153 Standard for inactive waste disposal sites for asbestos mills and manufacturing and fabricating operations.

Each owner or operator of any inactive waste disposal site that was operated by sources covered under §§ 61.142, 61.144, or 61.149 and received deposits of asbestos-containing waste material generated by the sources, shall

(a) Comply with one of the following:

(1) Either discharge no visible emissions to the outside air from an inactive waste disposal site subject to this paragraph; or

(2) Cover the asbestos-containing waste material with at least 15 centimeters (6 inches) of compacted nonasbestos-containing material, and grow and maintain a cover of vegetation on the area adequate to prevent exposure of the asbestos-containing waste material; or

(3) Cover the asbestos-containing waste material with at least 60 centimeters (2 feet) of compacted nonasbestos-containing material, and maintain it to prevent exposure of the asbestos-containing waste; or

(4) For inactive waste disposal sites for asbestos tailings, apply a resinous or petroleum-based dust suppression agent that effectively binds dust and controls wind erosion. Use the agent as recommended for the particular asbestos tailings by the manufacturer of the dust suppression agent. Obtain prior approval of the Administrator to use other equally effective dust suppression agents. For purposes of this paragraph, waste crankcase oil is not considered a dust suppression agent.

(b) Unless a natural barrier adequately deters access by the general public, install and maintain warning signs and fencing as follows, or comply with paragraph (a)(2) or (a)(3) of this section.

(1) Display warning signs at all entrances and at intervals of 100 m (330 feet) or less along the property line of the site or along the perimeter of the sections of the site where asbestos-containing waste material was deposited. The warning signs must:

(i) Be posted in such a manner and location that a person can easily read the legend; and

(ii) Conform to the requirements for 51 cm x 36 cm (20" x 14") upright format signs specified in 29 CFR 1910.145(d)(4) and this paragraph; and

(iii) Display the following legend in the lower panel with letter sizes and styles of a visibility at least equal to those specified in this paragraph.

Legend	Notation
Asbestos Waste Disposal Site	2.5 cm (1 inch) Sans Serif, Gothic or Block
Do Not Create Dust	1.9 cm (¾ inch) Sans Serif, Gothic or Block
Breathing Asbestos is Hazardous to Your Health	14 Point Gothic

Spacing between any two lines must be at least equal to the height of the upper of the two lines.

(2) Fence the perimeter of the site in a manner adequate to deter access by the general public.

(3) Upon request and supply of appropriate information, the Administrator will determine whether a fence or a natural barrier adequately deters access by the general public.

(c) The owner or operator may use an alternative control method that has received prior approval of the Administrator rather than comply with the requirements of paragraph (a) or (b) of this section.

§ 61.154 Air-cleaning.

(a) The owner or operator who elects to use air-cleaning, as permitted by §§ 61.142, 61.144, 61.147(c)(2), 61.147(d)(2), 61.148(b)(2), 61.149(b), 61.152(b)(1)(iii), and 61.152(b)(2) shall:

(1) Use fabric filter collection devices, except as noted in paragraph (b) of this section, doing all of the following:

(i) Operating the fabric filter collection devices at a pressure drop of no more than 4 inches water gage, as measured across the filter fabric; and

(ii) Ensuring that the airflow permeability, as determined by ASTM Method D737-75, does not exceed $9 \text{ m}^3/\text{min}/\text{m}^2$ ($30 \text{ ft}^3/\text{min}/\text{ft}^2$) for woven fabrics or $11 \text{ m}^3/\text{min}/\text{m}^2$ ($35 \text{ ft}^3/\text{min}/\text{ft}^2$) for felted fabrics, except that $12 \text{ m}^3/\text{min}/\text{m}^2$ ($40 \text{ ft}^3/\text{min}/\text{ft}^2$) for woven and $14 \text{ m}^3/\text{min}/\text{m}^2$ ($45 \text{ ft}^3/\text{min}/\text{ft}^2$) for felted fabrics is allowed for filtering air from asbestos ore dryers; and

(iii) Ensuring that felted fabric weighs at least 475 grams per square meter (14 ounces per square yard) and is at least 1.6 millimeters (one-sixteenth inch) thick throughout; and

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(iv) Avoiding the use of synthetic fabrics that contain fill yarn other than that which is spun.

(2) Properly install, use, operate, and maintain all air-cleaning equipment authorized by this section. Bypass devices may be used only during upset or emergency conditions and then only for so long as it takes to shut down the operation generating the particulate asbestos material.

(b) There are the following exceptions to paragraph (a)(1):

(1) If the use of fabric creates a fire or explosion hazard, the Administrator may authorize as a substitute the use of wet collectors designed to operate with a unit contacting energy of at least 9.95 kilopascals (40 inches water gage pressure).

(2) The Administrator may authorize the use of filtering equipment other than that described in paragraphs (a)(1) and (b)(1) of this section if the owner or operator demonstrates to the Administrator's satisfaction that it is equivalent to the described equipment in filtering particulate asbestos material.

§ 61.155 Reporting.

(a) Within 90 days after the effective date of this subpart, each owner or operator of any existing source to which this subpart applies shall provide the following information to the Administrator, except that any owner or operator who provided this information prior to April 5, 1984 in order to comply with § 61.24 (which this section replaces) is not required to resubmit it.

(1) A description of the emission control equipment used for each process; and

(2) If a fabric filter device is used to control emissions, the pressure drop across the fabric filter in inches water gage; and

(i) If the fabric device uses a woven fabric, the airflow permeability in $m^3/min/m^2$ and; if the fabric is synthetic, whether the fill yarn is spun or not spun; and

(ii) If the fabric filter device uses a felted fabric, the density in g/m^2 , the minimum thickness in inches, and the airflow permeability in $m^3/min/m^2$.

(3) For sources subject to §§ 61.151 and 61.152:

(i) A brief description of each process that generates asbestos-containing waste material; and

(ii) The average weight of asbestos-containing waste material disposed of, measured in kg/day; and

(iii) The emission control methods used in all stages of waste disposal; and

(iv) The type of disposal site or incineration site used for ultimate disposal, the name of the site operator, and the name and location of the disposal site.

(4) For sources subject to § 61.153:

(i) A brief description of the site; and

(ii) The method or methods used to comply with the standard, or alternative procedures to be used.

(b) The information required by paragraph (a) of this section must accompany the information required by § 61.10. The information described in this section must be reported using the format of Appendix A of this part.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414)).

(Approved by this Office of Management and Budget under control number 2000-0264)

§ 61.156 Active waste disposal sites.

To be an acceptable site for disposal of asbestos-containing waste material under §§ 61.151 and 61.152, an active waste disposal site must meet the requirements of this section.

(a) Either there must be no visible emissions to the outside air from any active waste disposal site where asbestos-containing waste material has been deposited, or the requirements of paragraph (c) or (d) of this section must be met.

(b) Unless a natural barrier adequately deters access by the general public, either warning signs and fencing must be installed and maintained as follows, or the requirements of paragraph (c)(1) of this section must be met.

(1) Warning signs must be displayed at all entrances and at intervals of 100 m (330 ft) or less along the property line of the site or along the perimeter of the sections of the site where asbestos-containing waste material is deposited. The warning signs must:

(i) Be posted in such a manner and location that a person can easily read the legend; and

(ii) Conform to the requirements of 51 cm × 36 cm (20" × 14") upright format signs specified in 29 CFR 1910.145(d)(4) and this paragraph; and

(iii) Display the following legend in the lower panel with letter sizes and

styles of a visibility at least equal to those specified in this paragraph.

Legend	Notation
Asbestos Waste Disposal Site.	2.5 cm (1 inch) Sans Serif, Gothic or Block.
Do Not Create Dust.	1.9 cm (¾ inch) Sans Serif, Gothic or Block.
Breathing Asbestos is Hazardous to Your Health.	14 Point Gothic.

Spacing between any two lines must be at least equal to the height of the upper of the two lines.

(2) The perimeter of the disposal site must be fenced in a manner adequate to deter access by the general public.

(3) Upon request and supply of appropriate information, the Administrator will determine whether a fence or a natural barrier adequately deters access by the general public.

(c) Rather than meet the no visible emission requirement of paragraph (a) of this section, an active waste disposal site would be an acceptable site if at the end of each operating day, or at least once every 24-hour period while the site is in continuous operation, the asbestos-containing waste material which was deposited at the site during the operating day or previous 24-hour period is covered with either:

(1) At least 15 centimeters (6 inches) of compacted nonasbestos-containing material, or

(2) A resinous or petroleum-based dust suppression agent that effectively binds dust and controls wind erosion. This agent must be used as recommended for the particular dust by the manufacturer of the dust suppression agent. Other equally effective dust suppression agents may be used upon prior approval by the Administrator. For purposes of this paragraph, waste crankcase oil is not considered a dust suppression agent.

(d) Rather than meet the no visible emission requirement of paragraph (a) of this section, an active waste disposal site would be an acceptable site if an alternative control method for emissions that has received prior approval by the Administrator is used.

(Secs. 112 and 301(a) of the Clean Air Act as amended (42 U.S.C. 7412, 7601(a))

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