TABLE 12.—FEASIBILITY SUMMARY TABLE FOR CONSTRUCTION: PROJECTION OF WORKERS EXPOSED BELOW AND ABOVE 0.2 F/CC FOLLOWING THE PROMULGATION OF THE STANDARD AND THE ADOPTION OF ENGINEERING CONTROLS AND WORK PRACTICES

| Industry sector | Total No. of asbestos-exposed workers [1] | Projected No. of workers exposed to asbestos levels below 0.2 f/cc | Projected No. of workers exposed to asbestos levels above 0.2 f/cc [1] |
|---|---|---|---|
| New construction | 29,320 | 27,115 | 2,205 |
| Abatement | 61,365 | 13,560 | 87,805 |
| Demolition | 24,455 | 3,980 | 20,475 |
| Renovation | 133,700 | 51,300 | 82,400 |
| Routine maintenance in commercial/residential building | 217,745 | 124,155 | 93,590 |
| Routine maintenance in general industry | 259,643 | 175,053 | 84,590 |
| Total | 764,228 | 395,163 | 351,065 |

[1] Excludes small short duration jobs with negligible exposures.

Source: U.S. Department of Labor, OSHA, Office of Regulatory Analysis.

### Primary Manufacturing

The production of the primary asbestos products can be divided into receiving (unloading, transporting, and storing the raw asbestos fiber), fiber introduction, and processing (mixing, drying, and finishing). The best available control technology consists of a combination of extensive local exhaust ventilation and a diligently enforced, comprehensive program of work practices and housekeeping. The automatic bag opening equipment, which is used in some sectors, is an example of the technology currently available to minimize asbestos exposures during fiber introduction. In several sectors, some finishing processes are completed with the use of water spray to reduce airborne levels of asbestos.

Two manufacturing steps that all primary asbestos product manufacturers have in common are the receipt of asbestos shipments and the introduction of asbestos fiber into the process. Due to the universal use of these steps throughout the industry as well as the large potential for release of asbestos fibers, a qualitative discussion of these steps is presented below.

Raw asbestos is shipped to manufacturers via railcar or truck. Manufacturers usually receive from 25 to 50 bundles of 100-pound bags of raw asbestos fibers. The packaging of the asbestos varies, but loose fibers or fibers pressed into bricks are usually wrapped in plastic or Kraft (TM) paper bags. These bags are transported on pallets that are constructed with high shear-resistant glue to prevent movement during shipping and handling. The entire bundle of asbestos bags is often shrink-wrapped with plastic to further reduce the potential for fiber release.

When trucks or railcars arrive at the plant, they are opened and examined for damaged bags. If any major damage is found, the entire shipment is returned to the supplier. Any minor damage is repaired by vacuuming the spilled fiber and sealing the broken bag with tape. The pallets are removed from the railcar or trailer by forklift and are stacked in the storage area [Exhibit 335].

Due to prudent work practices and recent improvements in the packaging of asbestos fibers, OSHA has determined that it is feasible for primary manufacturers of asbestos products to receive and store shipments of asbestos without experiencing exposures above the PEL of 0.2 f/cc. According to Marsden Hutchins of Quin-T Corporation:

> . . . fiber as now received lends itself to dust-free storage. Care in handling to avoid and/or clean up after accidental bag breaks makes this a relatively trouble-free area. [Exhibit 91-16, Section J, p. 17.]

Data provided in Dr. Gordon Bragg's feasibility report [Exhibit 235-A, Table III] indicate that an A/C pipe manufacturing plant with the best available technology and stringent work practices experienced a mean TWA of 0.03 f/cc during the reception and storage of asbestos shipments.

In addition to receiving and storing asbestos fibers, all primary manufacturers of asbestos products share the fiber introduction step. OSHA has concluded that it is feasible for this processing step to be completed with exposures below 0.2 f/cc. This conclusion is supported by data presented by the Research Triangle Institute (RTI) from its 1984 industry survey. In the RTI survey, exposures during fiber introduction ranged from 0.07 f/cc to 0.2 f/cc [see Appendix C of the Regulatory Impact Analysis].

The introduction of asbestos fibers to the manufacturing process begins with the transportation by forklift of the pallets of asbestos bags to the head of the production line. There, depending on the product line, the bags are sent either unopened to the mixing stage or are cut open and the asbestos is dumped onto a conveyor to be carried to the mixing stage. When unopened bags of asbestos enter into the process, exposure levels are not a problem in the introduction step. In written testimony, Mr. Hutchins indicated that only 5 percent of Quin-T Corporation's production of asbestos paper and gaskets required the asbestos paper bags to be opened prior to mixing [Exhibit No. 91-16, Section J, p. 5]. Asbestos bags packaged in polyethylene are not always opened in the production of asbestos/vinyl flooring or asbestos-reinforced plastics.

When the bags must be opened, either automated or manual debagging operations are used. Exposures at automated debagging stations have been measured to be less than 0.2 f/cc [Exhibit 235A, p. 101]. It has also been demonstrated that manual debagging operations have had exposures below the proposed PEL of 0.2 f/cc. Dr. Bragg reported an 8-hour exposure of 0.07 f/cc for the operator at a manual debagging station. He also cited an article by First and Love in which exposures at a manual debagging operation were measured to be 0.047 f/cc or lower for seven samples [Exhibit 235-A, p. 101]. Thus, OSHA has determined that it is feasible for both manual and automated debagging operations to reach exposures below the proposed PEL.

### Asbestos-Cement Pipe

Data submitted to the record indicate the ability of most work stations at well-controlled A/C pipe plants to reach levels below the PEL of 0.2 f/cc except during the coupling cut-off operations. The basic steps in the manufacture of A/C pipe are fiber introduction, materials mixing, pipe forming, curing, and finishing. To reduce exposures throughout the A/C pipe manufacturing process, work practices and engineering controls have been applied to work stations as described below.

Following fiber introduction, the asbestos is carried through various processing steps by conveyor belt. The use of pneumatic conveying systems kept under negative pressure, along with local hood exhaust dust-control systems, has virtually eliminated the possibility of exposure at this stage of processing.

While being conveyed through the processing steps, the fiber is fluffed and blended and then thoroughly mixed with specific amounts of Portland cement, silica sand, and reprocessed scrap. The processing and dry mixing of the ingredients take place automatically in closed blending tanks which are maintained under a slight negative pressure by local exhaust ventilation to minimize worker exposure.

Following the dry mixing process, water is added and the resultant slurry is processed through a pipe making machine known as a "wet machine." The wet machine deposits a homogeneous mixture of the slurry in the form of a thin lamination onto a conveyor. The layer of wet asbestos cement is then conveyed to the press