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JM Johns-Manville
Research and Development Center

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Report No. E411-T-379

Date March 16, 1979

Title: FIELD EVALUATION OF CORRUGATED SHEET SAW

SUMMARY

A circular saw for the dust free fabrication of corrugated asbestos cement was evaluated on the job site, February 26, 1979, at the Johns-Manville Research Center in Denver, Colorado. This trial was done to generate field dust counts and record workman's reaction and comments to the tool.

The saw was used by Mike Geyer, of Centennial Air Conditioning, who was refinishing the cooling tower at Denver Research. Fabrication consisted of cutting four, one foot by four foot panels, for a total cutting of sixteen linear feet. All work was done outside and personal samplers were worn by Mike Geyer and the author with one area sample taken. The asbestos counts taken by Stella Gaburo of J-M Health, Safety and Environmental Department, were 0.0 f/cc, 0.05 f/cc, and 0.0 f/cc respectively. The samples taken were peak samples and are to be compared to an OSHA peak standard of 10 f/cc.

Performance of the corrugated sheet saw and Nilfisk GA-73 vacuum was judged to be excellent by Mr. Geyer. He suggested all sites cutting asbestos containing materials should be equipped with tools of this type. His belief was that the workmen acceptance of these tools would be good.

It is recommended that a job with more severe conditions be found and samples taken even though counts from this trial were well within acceptable limits.

Contents: Summary only.

Reported by G. R. Bauman
Asbestos & Mineral Technology

Approved by W. C. Streib
Director,
Mineral & Filtration Technology

lkh

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Keywords
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Asbestos Cement
Dust
Dust Collection
Fabrication
Environmental Health

AIA Tech

Johns-Manville
Research and Development Center

Memorandum M411-821

Date October 16, 1978

TRIP REPORT - DANSK ETERNIT, FISKER AND NIELSON, GERMAN ETERNIT, ASBESTOS INFORMATION CENTER, ASBESTOS INTERNATIONAL ASSOCIATION, WEMBLEY ROOFING COMPANY (UK), and CAPE BOARDS and PANELS LIMITED.

The primary purpose of this trip by D. M. Kelleher and F. Bodycomb was to gather information concerning the development of tools for the field fabrication of asbestos cement products. Information is also included relating to asbestos usage and asbestos cement production.

Dansk Eternit (Aalborg, Denmark) -

Mr. Axel Schonnemann - Managing Director
Mr. K. Thiele - Head, Department of Industrial Relations
Mr. Tage Lilholt - Manager, Sales Service Department
Mr. Paul Hanson - Environmental Control Group

Tool Development -

Most of their production is corrugated sheet, and is used primarily as roofing for all types of buildings, although some flat and corrugated sheets are used as siding or facades, both interior and exterior. Dansk Eternit maintain their own facilities for making dust counts (membrane filter method), and all stations in their factory are within the legal TLV of 2.0 f/cc (8 hour TWA). It is expected that the TLV will be lowered to 1.0 f/cc later this year.

Visits were made to a number of job sites, including barns, apartments, single family homes, a hospital, brewery, municipal incinerator, sports arena and commercial buildings. The standard cutting tool for asbestos cement is the offset head grinder with an abrasive disc blade, used with no dust collection. It generates copious amounts of dust. The primary on-site cutting requirements are to miter corners, where they overlap on a roof. This is generally done on the ground, by cutting 4 to 6 sheets at a time while still on a pallet. A second problem area is to trim along a roof edge, where roof sections of different pitch meet in a "valley". This is done on the roof, and two thicknesses of sheet must be cut simultaneously. In addition to these situations, entire sheets must occassionally be sawed and cutouts around

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Keywords
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Asbestos Cement
Dust-Free
Environmental Health
Fabrication

beams, etc. must sometimes be made. Tools for asbestos cement fabrication which we were shown are listed in Table 1.

Dansk has modified 3 magnani machines to precut (miter) corners, and plans to have all their machines with this capability in 2 years. This should alleviate this specific job-site problem, although some mitering will probably always be necessary. Installers in Denmark work on an incentive basis, and will not use any tools which decrease their productivity. Specifically, it was stated they would not use a ventilated tool with attached hoses on a roof. Proposed development work to solve specific problems are as follows:

1. Evaluate "Sawzall" and sabre saw, with various blades and at different speeds, to produce coarse (non-airborne) dust only, without dust collection. Such tools have been developed in Germany. If satisfactory, they could be used for working on roofs or on the ground, for miters, edge trimming in "valleys", or cutouts, virtually all required operations.

2. For small contractors and "do-it-yourselfers", a hand powered tool for use on the roof might be acceptable if it could cut rapidly.

3. A circular saw is being built, with shield to be used with a vacuum source, which may be acceptable for use on the ground by large contractors.

Dansk have done little tool development work in the past 2 years, but are concerned about the effect of dust during installation on their product sales. They state that their primary problem with tools is their lack of acceptance by workmen in the field. The best solution to this problem is thought to be the development of tools which operate faster and are more convenient to use.

Asbestos and Asbestos Cement Production -

The following are miscellaneous observations concerning asbestos and asbestos cement manufacture by Dansk, made during a plant tour and various conversations.

Dansk Eternit has 6 magnani and 5 hatschek machines, and are building one additional magnani, which produce 200,000 to 250,000 tpy. Their plant is immaculate, with only a slight amount of fiber in evidence in the warehouse and at the bag opening station.

Potentially, the most important item was that Dansk Eternit has developed an asbestos-free sheet product containing cellulose and a "special" polypropylene, which can be made on standard magnani and hatschek machines. It was stated that this is a Danish development and it is therefore presumed not to be the same material being marketed by Norcem. The material is still being tested, and we will be advised of further details when their patent position is established. This product was carefully and deliberately presented to us by Mr. Schonnemann as a development very important to Dansk Eternit.

Mr. Schonnemann discussed J-M fiber deliveries, as follows:

S6D30 - MR_A is satisfactory, but filtration is poor.
S5K30 - Three shipments have been received this year. The first had poor filtration and low MR_A, but the last shipment was satisfactory.
S4T30 - Impact strength was OK, but filtration and MR_A were inadequate.

He is dissatisfied with the quality frequently being poorer than that which the "specifications" call for, and the variation in quality from shipment to shipment. He stressed very strongly that he wants Mert Webb to visit their plant to learn and observe their test methods, and to establish a close working relationship with Jeffrey Mine personnel. At the time of our visit, an Asbestos Corporation representative was in Aalborg observing the Dansk Eternit test methods. The implication is that Dansk has problems with Asbestos Corporation similar to those stated to us concerning J-M fiber. To present an image at least equal to Asbestos Corporation, we should arrange for a visit to Dansk Eternit by Mine personnel in the very near future.

Fibers warehoused by Dansk Eternit were J-M S6D30, S5K30, S4T30, and 7F19 (for ACE); Nordenham N-550-6D and NH 470; BC4T, BC 5595 Cassiar CY, HVL5, Cyprus HSH, and Cyprus 33. Cape S33 and S44 amosites are used only for "Navilite", a low density calcium silicate insulation board shipped to Communist countries. All other Navilite production is asbestos free, composed of glass fiber, mineral wool, CELITE and lime. All Navilite will soon be asbestos-free, and purchases of amosite will then cease. A few high density blocks of S5K30 were on hand. Their only comment was that they prefer no tape on the packages, and water soluble glue should be used to facilitate bag repulping.

"Internit", a relatively low density insulation board made from portland cement, 8 percent asbestos and 15 percent cellulose, has been banned from use in Denmark due to dust created by on-site fabrication. This is a good example of the need for dust-free fabricating tools which will be used by workmen on the job.

One magnani is used only to make Navilite. Edge trimming is done with a high pressure water jet. Dansk personnel state that a mechanical slitter with the green, wet product gave fiber counts of 10 f/cc.

Two Bell-Tyne bag openers are in use. Dansk personnel are somewhat dissatisfied with them. The bag slitting knife must be strengthened and the spiked roll which removes the bag does not release them. Changes in its design are planned. All bags, both plastic and paper, are shredded in a machine built by Plastic Processing Equipment Company, and used in the sheet furnish.

After the bag opener, the fiber and 25 percent water are mixed and sent to a rod mill. Flow through the mill is continuous, and residence time is about 6 minutes. The fiber emerges from the mill feeling quite dry, and does not appear to be extremely open. The only wads are small and flat (1/4-in. maximum diameter), and very friable. No vigorous mixing is necessary for dispersion. The fiber is blended with cement and water in a gentle paddle mixer before being sent to the machines.

Cured scrap is crushed in a hammermill and fed to a ball mill with gypsum and cement clinker in the adjacent Aalborg Portland Cement Company (owners of Dansk Eternit) plant. All cement from the plant is used for asbestos cement production.

Fisker and Nielson- Copenhagen

Mr. Johannson - Engineering Department

This company produces the Nilfisk vacuum cleaner. We briefly discussed the feasibility of building a device into their machines which would sound an audible warning when the filter required cleaning. Mr. Johannson was adament in his refusal to consider such a change. A valve arrangement will be built into the machines to allow the ingress of outside air to cool the motors when they overheat. Data were presented that showed the suction power of the GA73 machine would be reduced a maximum of 4 percent with all valves open.

We have done very little in the comparison of vacuum cleaners, and such an investigation may be warranted.

Asbestos Institute- German Eternit (Neuss, Germany)

Mr. R. W. Dorner - Managing Director -
Amiantus Asbestos Division S. A.
Mr. H. Schwermer -
Dr. K. Robock - Director - Asbestos Institute
Mr. U. Teichert - Asbestos Institute
Mr. K. Eisleben - Asbestos Institute
Mr. Ikes - Neuss Plant Manager

Tool Development

Eternit produces a wide variety of corrugated and flat sheet products used for roofing and siding on many types of buildings. The environmental cleanup effort of the company has "Number 1 Priority". All company plants worldwide, whether required by law or not, are expected to be within a 2.0 f/cc TLV in 6 months. The emphasis placed on the development of tools for the dust-free field fabrication of asbestos cement is indicated by the fact that Karl Eisleben, previous manager of the Neuss plant, was temporarily assigned the fulltime task of tool development.

The Asbestos Institute has very modern facilities for membrane filter dust count measurements, including an automatic, computerized counting device which they are currently "debugging", and an electron microscope.

The standard tool for cutting asbestos cement in Germany, as in Denmark, is the offset head abrasive disc grinder. The primary tool development effort of Mr. Eisleben has been implements with no dust collectors which produce coarse, non-airborne debris. This results in undesirable quantities of cuttings on the floor of the work area, but in many situations and countries this may be acceptable. Mr. Eisleben stated however, that dust counts with all such tools were below 2.0 f/cc, measured as they do over a 2 minute time span of peak activity, and not a time weighted average. Tools we were shown are described in Table 2. They have done a tremendous amount of work on tool development, but the main emphasis now seems to be the reintroduction of the use of the scoring knife.

The problem of corner cutting has been undertaken in the factory by Eternit. In Austria, they cut corners before curing. The Swiss pre-score corners so they may be broken off or left intact as desired. It was stated that, in practice, they all break off. At Neuss, the corners are cut after curing for the 2 foot sheets only. Eternit is introducing a system whereby the sheets are butted with a covering cap, instead of overlapping, which eliminates the need for corner cutting.

It is proposed that J-M evaluate the unshielded sabre saw, at low speed and with coarse blade, for cutting corrugated sheet. A Draenert clipper has been ordered and will be redesigned for use with 8 mm corrugated sheet.

Asbestos, and Asbestos Cement Production

Eternit has 5 factories in Germany of which Neuss is the smallest. It has 3 Hatschek machines, and produces a maximum of 300 TPD with 150 employees.

They have a large stock of asbestos, some being stored outdoors. Fibers on hand include the following:

J-M 6D30
Advocate A25 and A35
Cassiar AX
Nordenham NH 450 and 470
JPT 50 and 60
Russian P5-50

They state that the Russian fiber is brought to Germany by ship in loose bags, which are frequently broken. Eternit must then palletize, strap and shrink wrap at their expense before shipping to Neuss. It was stated that Eternit likes paper bags so they may be recycled. Plastic bag disposal is a problem.

Fiber is passed through a fluffer (similar to a Vanco) at the bag opening station, Kollerganged 45 to 50 minutes with 30 percent water, and then goes to a 6 foot diameter pulper. The impeller in the pulper is toothed, approximately 18-inches in diameter, and similar to a Cowles mixer. It is guessed that this pulper would have high shear action and substantially open and probably shorten the fiber. Cement is then added to the slurry in a vigorous paddle mixer, and is fed to the machines. All production is normal cured except their low density insulation board.

The factory is very clean with no dusty areas in evidence.

<u>Asbestos</u> <u>Information</u> <u>Centre</u>- London

Mr. W. Penney - Secretary General

A general discussion was held concerning environmental problems associated with field fabrication of asbestos cement. He stated that the TLV, now at 2.0 f/cc, is expected to go to 1.0 f/cc in the near future. Fabrication of corrugated sheet is apparently the primary problem in the field. The offset-head ("angle") grinder is mainly used for field fabrication of this product in the UK.

Asbestos International Association- London

Dr. R. Gaze - Chairman,
Excecutive Committee
Sir Neville Stack -
Director General
Mr. L. A. Van Rosse -
Assistant to the
Director General

A general discussion was held concerning tools for the field fabrication of asbestos cement. They agreed to either set up a new AIA committee to consider this problem, or assign the subject to an existing committee.

The primary usefulness of such action will probably be to collect and disseminate information on the subject to various interested parties, thus making companies aware of what has been done and what is available in the area of fabricating tools.

Wembley Roofing/Ceilings Limited- London

Mr. J. J. Shanahan, Director

The company has 700 employees and its main business is industrial roofing, both metal and corrugated asbestos cement. Discussions were held with Mr. Shanahan, and a visit was made to a factory roof being installed. It was stated that 80 percent of all cuts are made on the roof, including mitering corners and cutting along gutters and roof edges. The angle grinder is the primary cutting tool. Men work on an incentive basis and probably would not use a scoring knife except for the odd small cut. A tool producing coarse, non-airborne debris might be acceptable, but it is questionable whether a vacuum cleaner would be usable on the roof. Wet cutting on a roof would be totally unacceptable.

Mr. Shanahan considers the field fabrication of asbestos cement a threat to the continued use of the product, and is very interested in any tools that may be developed. A roofing association with 400 member companies is being formed, and could be the vehi[illegible] introducing new tools into the U.K. work place.

Cape Boards and Panels Limited- London

Mr. A. S. Crook - Manager,
Technical Services
Mr. Ken Millest - Environmental
Engineer

Cape has developed several dust controlled tools, primarily for use with calcium silicate insulation boards. (See Table 3) Workers' acceptance of the tools has evidently been somewhat less than overwhelming. Cape markets an asbestos-free board, which now constitutes approximately 50 percent of their sales. They give the impression that they therefore are indifferent to whether or not tools are used for field fabrication of their asbestos containing boards. They simply offer their asbestos-free material if there is any question of compliance with environmental controls.

Conclusions

There is a high level of interest among those parties we visited who are involved in the asbestos cement business, concerning tools for field fabrication of the product. The problem of dust generation during product installation is generally viewed as a threat to the asbestos cement industry, and there was general agreement that inter-company, international cooperation is required to find the solution.

There clearly are successful programs underway to develop asbestos-free substitutions for various board products. Efforts to develop installation methods that are environmentally trouble-free, while still being acceptable to the workmen in the field, would seem a worthwhile method of keeping asbestos cement a cost-effective building material.

Reported by F. M. B
F. M. Bodycomb
Asbestos & Mineral Technology

TABLE 1
TOOLS OBSERVED AT DANSK ETERNIT

KwiKrip- Hand powered shear usable for thin flat sheet only.

Circular Saw- Equipped with an "open type" shroud, and must be used on a vacuum table. Therefore, it must be used in a shop or central stationary location. No saws have been sold by Dansk.

Nibbler (Danklip)- This has been evaluated by J-M without dust collection. It produces only coarse debris. Slightly awkward to handle, it was designed for use on corrugated sheet. Its main drawback is that it can cut only one (8mm) sheet at a time, and this apparently is the reason it is not widely used. Approximately 50 to 60 have been sold to Danish contractors.

Shear- Attached to an electric drill, it makes a smooth cut on flat sheet to 12 mm in thickness.

Nibblertine- An English nibbler, mounted in a "table saw" type frame, it costs about $3000. It cuts asbestos cement poorly, but is more effective with low density insulation board. Usable only as a shop tool.

Hand Clippers- Evaluated by J-M, this tool can cut flat sheet to 6 mm thickness.

Scoring Knife- Evaluated by J-M, it has not been accepted by workmen as a replacement for the power abrasive disc grinder.

Vacuum Cleaner- In 1972, Dansk evaluated 14 different vacuum cleaners, and concluded that the best for their purposes was the Swedish Pullman Model JB503. They expressed satisfaction with this unit, however it was noted that they directed the exhaust air from the vacuum out a window via a hose, and are actively trying to develop a better machine "from scratch" in a cooperative program with Prima-Vent A/S, a vacuum cleaner manufacturer.

TABLE 2
TOOLS OBSERVED AT THE ASBESTOS INSTITUTE

Pipe Fabricating Tools

Single Point Scoring Tool - (Pipe up to 500 mm) - Hand powered, it clamps to the pipe exterior.

Fein Power Hacksaw- Clamps to pipe. Small unit cuts pipe to 15-in. diameter, larger version to 25-in. diameter. Variable speed drive allows cutting up to 350 cycles/min. Blade tooth spacing is approximately 1/2-in.

Field Lathe- Hand or power operated.

Hole Cutters-

Single Point Cutter- can be hand or power operated. Pneumatic impact drill cuts groove in pipe. This produced visible, fine, air-borne dust, and it is questionable whether a 2.0 f/cc level is actually attained.

Hole Saw- Electrically powered, it operates at 100rpm. With a gasoline engine, at 600 rpm, much dust is generated, even with the use of a water spray on the blade. Tooth spacing on the blade is approximately 1-1/2-in.

Pipe Saw & Lathe- A rather complex machine for use with large diameter (700 to 2500 mm) pipe is being developed. Operated by 2 motors, the machine cuts the pipe (blade at 100 rpm) from the interior. After cutting, a lathe attachment is installed and the pipe is machined.

Single Point Pipe Cutter- Usable with pipe from 50 to 200 m diameter, the unit can be operated either by hand or with a electric drill attachment. The cutting area is inside a sheet metal enclosure. The unit cuts fast, but fine dust is emitted.

<u>Sheet Fabricating Tools</u>

<u>Handsaw</u>- A keyhole type, it cuts quite rapidly.

<u>Scoring Knife</u>- Use of the tool is considered a "step backward" by workers in the field. New designs are being made to give the appearance of a "modern" tool, and thus gain worker acceptance. With practice, the tool works very well for corner and longitudinal cuts, but is not acceptable for cutting across corrugated sheets. The company is trying to reintroduce the tool in the field for widespread use.

<u>Brace and Bit</u>- This hand powered tool is recommended for use in drilling holes.

<u>Sabre Saw</u>- The tool has been fitted with a small bracket along the blade, which contacts the board and allows cutting along the contours of a corrugated sheet. Operated without dust collection, at 1600 rpm and with a coarse blade, the debris generated reportedly does not become airborne and gives a dust count of 0.8 f/cc. Considerable dust was observed, however, being blown about by the motor cooling air. Equipped with a bed plate, and vacuum pickup only above the plate, the tool is used for flat sheet.

<u>Festo Saw</u>- With a diamond blade and vacuum pickup, it is used to cut flat sheet. Their tests with the machine gave 1.0 f/cc, but a J-M evaluation resulted in 4.5 f/cc.

<u>Mafell</u>- A circular saw, with vacuum attachment above the bed plate, it must be used over a vacuum table. This is a shop tool, usable only in a fixed location.

<u>Draenert Shears</u>- Designed for cutting sheet metal, it can be used for cutting flat sheet to 5 mm thickness. Only coarse debris is generated, and no vacuum pickup is used. J-M will attempt to modify the tool for use on 8 mm corrugated sheet.

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Cape Drill Shield- Eternit recommended use of this tool, as does J-M.

Bosch Drill- Used with vacuum pickup, the tool is somewhat awkward to use.

Single Point Hole Cutter- The tool is used without dust collection. It is difficult to use, makes a poor quality cut (rough edges), and creates considerable fine dust.

Offset Head Grinder- Equipped with a carbide-tipped blade with a dust collection shield only above the board, the tool reportedly gave 2.0 f/cc. Visually, it is guessed that fiber counts would be higher.

Festo Orbital Sander (2 models)- Vacuum pickup is through holes around the edge of the sanding head. The units, exactly as received from the manufacturer, work very well, but could be improved by redirecting the motor cooling air which blows dust from the board into the air. The performance of these tools was impressive.

Festo Belt Sander- As received from the manufacturer, the tool has vacuum pickup at the back of the belt only. There was some visible dust, but it worked surprisingly well.

Rockwell Sawzall- They evaluated the tool but found it gave an unsatisfactorily rough cut.

Fein Saw- Eternit is experimenting with this tool, which is similar to the Sawzall.

Danklip Nibbler- This Danish tool has been evaluated, and is recommended by Eternit. They consider the quality of the cut it makes to be poor, however.

Vacuum Cleaner- Eternit uses the "WAP Turbo", made by Guido Oberdarfer Maschinen, D 7919 Bellenberg, West Germany. It has a paper bag filter and an exhaust filter, reportedly can be used wet or dry, and pulls 300 cu m/hr air. Vacuum cleaners used with asbestos in Germany must be approved by the government "Social Insurance" group. Eternit has not undertaken any program to compare vacuum cleaners.

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TABLE 3

TOOLS OBSERVED AT CAPE BOARDS AND PANELS, LIMITED

Circular Saw-	A plastic shield, with vacuum pickup, fits over the upper half of the blade. The saw must be used with a wooden backing strip under the board being cut to prevent dust emission from the lower part of the blade. This would appear to limit its utility in the field.
Sabre Saw-	A saw made by Bosch is equipped with a dust collection shield, only on the upper part of the unit.
Drill Shield-	This is an excellent dust collection shield, and is recommended for use by J-M.
Orbital Sander-	The dust collection area surrounds the paper on the vibrating foot. We did not see the tool in use, but based on the results with the Eternit sanders, this tool would probably work well.
Vacuum Cleaner-	Cape prefers the BVC Limited model TH6 unit, with suction of 240 cfm.

Asb-Cement Sheets

JM Johns-Manville

Internal Correspondence

To P. Kotin, M.D. - 1-06
D. H. Markusson - 2-18

Date August 17, 1978

From E. M. Fenner - 1-06

Copies. J. V. Magee

Subject ASBESTOS CAUTION LABELS
ASBESTOS-CEMENT PRODUCTS

I enclose a copy of a letter from J. V. Magee that indicates that Nashua and Waukegan will label each full sheet of asbestos-cement material shipped from those plants.

You will note in the second paragraph of his letter that Magee questions the need for labeling cut pieces and samples. My own inclination is to say that such pieces where we know that further fabrication will not be performed by the purchaser need not be labeled. Conversely, where we know or suspect that additional fabrication will be done then the sheet should be labeled.

May I please have your comments.

E. M. Fenner

EMF:jh
Encl.

2/30

A SERVICE FOR ARCHITECTS

In the developing and perfecting of their building materials, Johns-Manville has acquired, during the last seventy years, an experience in, and a knowledge of, building construction which is placed gratis at the service of Architects and Engineers who desire to make use of it.

At your request, a representative of Johns-Manville's Architectural Service Department will be glad to consult with you in connection with the use or consideration of any Johns-Manville product. Among the products which we offer Architects in connection with this service are

Acoustical Treatment

Proper acoustical conditions imposing no limitations upon the Architect either in form or decoration may be secured in new and existing buildings by the use of Johns-Manville Nashkote, Sanacoustic Tile or Nashtile types of Acoustical Treatment applied under the supervision of our Acoustical Engineers.

Rigid Asbestos Shingles

Various types of roof shingles in colors, textures, widths and thicknesses that will adapt themselves to different architectural treatments and assure you of a roof that is proof against fire and severe weather conditions.

Asphalt Shingles

Quality roofing materials at a moderate price finished in colors and blends that are pleasing and effective.

Asbestos and Rag Felt Roll Roofings

Roofings of various weights and colors for use as finished roofs or for use under Asbestos shingles, slate or tile.

Asbestos and Rag Felt Built-Up Roofing

A complete line of smooth and slag surfaced bonded roofings. See Architectural Service Bulletin No. 1.

Transite Sheets—Flat or Corrugated

Composed of Asbestos fibres and Portland cement formed under hydraulic pressure into monolithic sheets of great strength and rigidity. Transite is fireproof and will resist the action of rot, rust and corrosion.

Floridene Stone

This is a natural stone quarried in Florida having unusual color and interesting texture. It is adaptable to interior and exterior wall treatments as well as flooring.

Cold Mastic Flooring

Johns-Manville Cold Mastic Flooring is a composition of asbestos fibres, mineral pigments and special mineral gums which is furnished in plastic consistency to be troweled over smooth, firm surfaces. This flooring is practical wherever a durable, comfortable wearing surface of moderate cost is required. It is available in Red, Brown, Tan, Green and Black colors.

J-M Tile Flooring—Type A

A decorative flooring of great durability which is fire-resistant, waterproof, stainproof, resilient and comfortable. It is available in Red, Mahogany, Tan, Ivy Green, Olive Green, Blue, Gray and Black tiles with which various pleasing effects may be secured.

Industrial Flooring

An asphaltic mastic flooring prepared to meet the particular conditions encountered on each individual project. It is applied while hot and is designed to stand heavy trucking and other severe conditions found in factories, machine shops, laboratories, etc.

Waterproofing and Dampproofing

J-M Treatment for Waterproofing — where the presence of water is due to hydrostatic pressure—and Dampproofing—where moisture is due to capillarity or absorption—are designed to meet the conditions found on each individual project.

Insulations for All Temperature Conditions

Johns-Manville's long experience in the field of insulations has enabled us to develop materials to meet all conditions of service and all temperatures from the highest furnace ranges to the lowest sub-zero service. Information on materials not described in this Bulletin (No. 2 Part A) available on request.

Underground System of Insulation

A highly efficient system of insulation for underground steam distribution lines, miscellaneous pipes, ducts, etc.

Structural Insulation

Johns-Manville Insulating Board, Plaster Lath and Roofinsul are composed of wood fibres compressed into boards of efficient insulating qualities combined with structural strength. Insulating Board is used as sheathing or as a base for plastic paint and painted treatments. Plaster Lath is used as a plaster base. Roofinsul is used under roofing materials.

Home Insulation

Johns-Manville Home Insulation is forced under pneumatic pressure between the wall studding of new and existing buildings, thus forming a complete blanket of efficient insulation around the entire building. The insulating material is Rock Wool which is fire and vermin proof and will not disintegrate. This is the most efficient type of house insulation.

Asbestos Ebony

Asbestos Ebony is a highly developed electrical insulator, impervious to moisture and possessing high dielectric strength. It is particularly suitable for switch and panel boards, etc.

Celite for Concrete

A special grade of diatomaceous silica of high purity and extreme fineness. The addition of Johns-Manville Celite for Concrete greatly improves the workability, uniformity and general quality of mortar, stucco and concrete mixes.

FLAT TRANSITE

Manufactured 1930-date Manufacturing Plant: Nashua, NH

Met following specs: GE # D16E1-S7
Westinghouse #PD17112-A
U. S. Coast Guard Certificate of Approval #164.009/13/0

% Asbestos 36-48

Labeling began 7/1/70

CORRUGATED TRANSITE

Manufactured 1940-April 1975 Manufacturing Plants: Manville, Wauke & Nashua until approximately 1950 wh Nashua omitted. In 1953 added Pittsburg, CA. 1964 eliminated Manville. 1965 eliminated Waukegan & Nashua, & only manufactured in Pittsburg ***

Met following specs: Navy #7YG(I)
Federal #SSB750
ASTM #22155 and C22161

*** Bill Diedrich at JM Sales advises me that the Corrugated TRANSITE manufactured at Pittsburg, CA was a laminated version available only on the West Coast and that all other corrugated was purchased from National Gypsum from approx. 1965-1970 and from GAF (formerly Ruberoid) in St. Louis from 1970 until 1975.

Labeled approx. 1970

ACOUSTICAL PANELS

Manufactured April 1939-1/75 Manufacturing Plant: Nashua, NH

Met following specs: Federal #SS-S-118
Class A - Incombustible under Federal Spec. #SS-A-118b

Labeling began approx. 1970

Product Performance Testing on above done by Materials Evaluation Section of Research & Development Dept.

TRANSITE panels were used for both interior and exterxior building.
The Product Directory gives the following characteristics: xxxxx
resists vermin, will not rot or rust, noncombustible and will not
corrode, ~~it-was-ideal-for-fxxx-flame-barriers-and~~ actually
becomes stronger and tougher with age, requiring no preservative treatment and is one of the most enduring building materials ever developed.

Transite

Chrysotile Chrysotile Chrysotile Asbestos Fiber Technical Bulletin

Asbestos-Cement Sheet

Asbestos-cement products represent the largest market for the world's supply of asbestos. Sheet products have found a variety of uses in the building field including roofing, siding, and bulkheads, curtain wall, cooling tower fill, industrial insulating board, and decorative trim. They are available in flat or corrugated sheets. The shingle and siding products are usually textured and painted but they may also be integrally colored. Sizes range from a small shingle, 12-inches x 24-inches to sheets 4 feet x 12 feet. Thickness of asbestos cement sheet products usually vary from $^{3}/_{32}$-inches to $^{3}/_{16}$-inches.

Purpose of Asbestos

The addition of asbestos to cement products imparts flexural properties much greater than those of unreinforced concrete. Because asbestos is inorganic and inert it contributes to the durability and fire resistance of these products. Asbestos-cement products are virtually unaffected by the atmospheric environment.

Formulations

Asbestos-cement products can be cured in a short period of time in an autoclave or over several weeks in a moist atmosphere. For autoclave curing silica is used in the formulation to react with the free lime formed.

	Autoclave Cure	Normal
Asbestos	—12-25%	12-25%
Cement	—45-54%	75-88%
Silica	—30-34%	—

Manufacturing Process

WET PROCESS

The wet process which represents the major production method for asbestos-cement sheet is used to produce both flat sheet and corrugated sheet. The asbestos fiber is usually opened dry in some version of a hammer mill or wet (damp) in a rod mill or Kollergang. It is mixed with the cement (and silica) and water is added for wet mixing. The slurry with a solids content of 5-7 percent flows into the vats and is picked up on the screened surface of the rotating partially submerged cylinder molds. As the molds emerge from the slurry a layer of wet asbestos-cement is left on the screened surface. This is transferred to a felt passing over the top of the molds and additional water is squeezed out by a couch roll. Usually 2 to 4 vats will be in series and successive layers of the asbestos-cement stock are transferred to the felt. Suction boxes are used to remove more water from the felt and stock and transfer is made to a large accumulator roll. The width of the vats determines the width of the sheet but the diameter of the accumulator roll determines the length of the sheet. Accumulator rolls are rarely more than 4-ft in diameter to give a 12-ft sheet. Several layers are formed on this roll to give the required thickness. A cut is made across the width and the sheet is manually stripped off the rotating roll onto a transfer roll conveyor.

The sheet may be partially dried by passing under heaters and then through embossing rolls and trimming and cutting wheels. To make small shingles and the like, dye cutting may be used. If corrugating or repressing is to be done it is at this time prior to autoclave or normal cure.

Another wet process makes use of a mold and a hydraulic press. The same type of slurry is made up and discharged into a mold. The bottom of the mold and sometimes the top also will have a screen through which water can pass. As the mold is closed, water is squeezed out of the slurry and through the screen. When the sheet is ejected from the mold, it has the required density and is ready for the cement curing cycle. These sheets are molded in thicknesses up to 1-inch and are given a final surface grind to provide a smooth finish.

Autoclave cure is usually at 125-150 psi saturated steam for 16 hours and normal cure is for a minimum of two weeks under saturated moisture conditions. After drying the product may be painted.

DRY PROCESS

The dry process is used to make some shingle type products. The asbestos fiber is opened in a hammer mill or similar device and dry mixed with cement (and silica). The dry mixture is metered onto a moving, wetted belt and passed under perforated compression rollers to remove much of the air. Water is sprayed on the material and it is more fully compressed under rolls. If surface granules are to be used they are added before this last compression. The last operation prior to rough trimming and cutting to size is to pass under an embossing roll.

After air curing for a few days nail holes are punched in the shingles and they are cut to exact size. Final curing then takes place. After drying paint is applied by spray techniques.

Recommended Fiber Grades

4T30
5K30
6D30
S6D30
6D24
6D20
S6D20
7M13

Crudy grades of fiber which are moderately fast filtering are best suited for use in the wet process. Group 4 and 5 fibers are usually used in corrugated sheet while Group 5 and 6 fibers are used in flat sheet. "S" treated fibers are treated for improved drainage.

CAUTION

Contains Asbestos Fibers — Avoid Creating Dust — Breathing Asbestos Dust May Cause Serious Bodily Harm

The physical (or chemical) properties of Johns-Manville Chrysotile Asbestos Fiber represent typical average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations They are supplied as a technical service and are subject to change without notice Check the Johns-Manville district office to assure current information

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Johns-Manville JM
Asbestos Fiber Sales • P O Box 5108 • Denver, Colo 80217 • (303) 770-1000
Canadian Johns-Manville Co., Ltd • Asbestos Fiber Division • P O Box 1500 • Asbestos, Quebec, Canada JIT 3N2 (819) 879-5433

AF-120 Litho in USA
AF-109A

General statement of disclosure re specific manufacturer

AIA Tech

11/28/78

JJP COPY -
COMMENT TO ED FENNER

Passed 12/7/78

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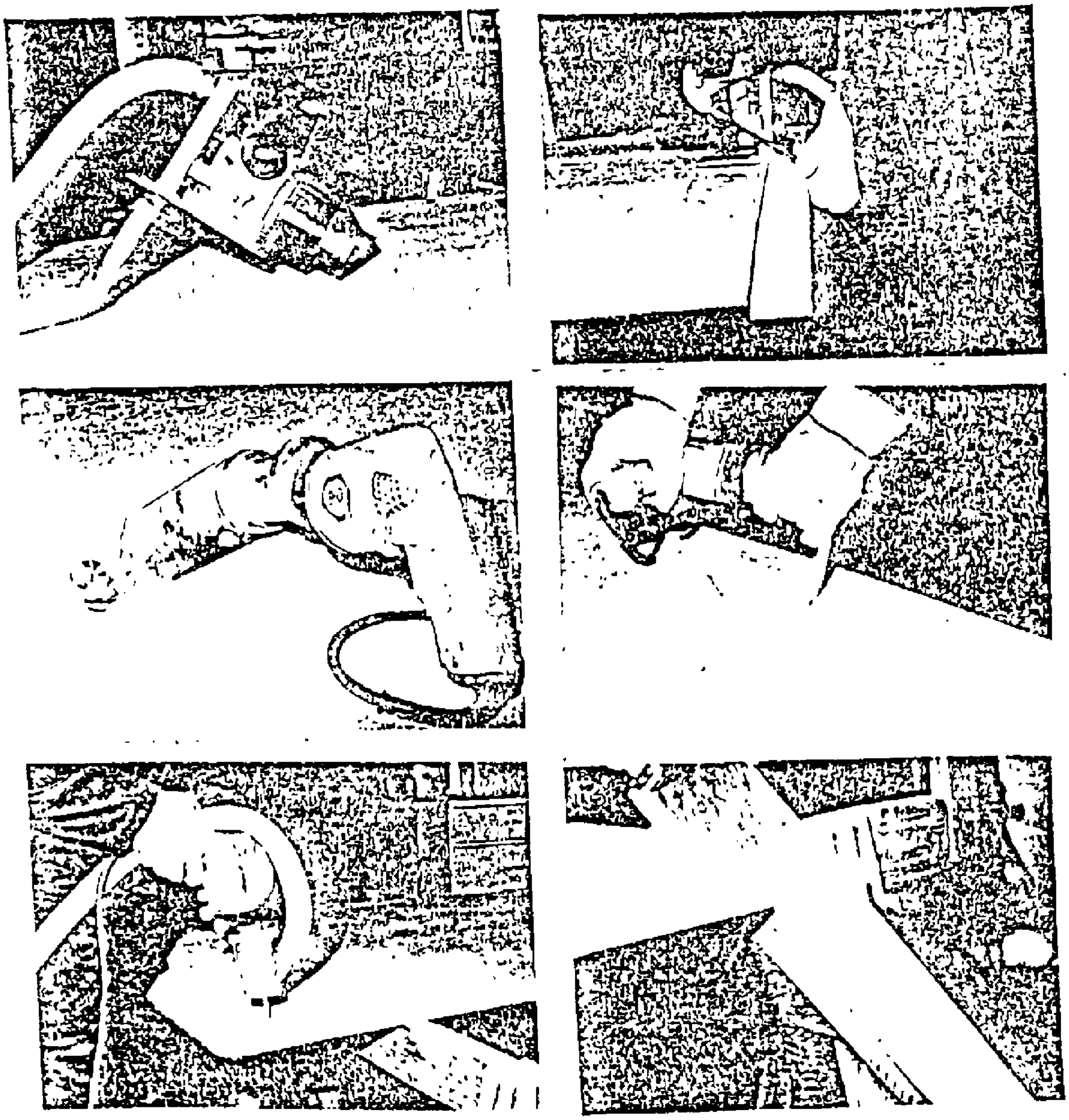
RECOMMENDED WORK PRACTICES

FIELD FABRICATION OF ASBESTOS-CEMENT SHEET PRODUCTS



AIA
North America

Asbestos Information Association

Contents Page

Introduction

The Occupational Safety and Health Act in the United States and similar laws in Canada and other countries were enacted to ensure, so far as possible, every worker a safe and healthy work place. This legislation is far-reaching. It covers millions of employees and nearly every employer.

To assist in assuring compliance with these laws, the asbestos-cement industry is disseminating information regarding the potential hazards of exposure to airborne asbestos and the means of reducing such potential hazards through good work practices.

Good work practices is what this booklet is about. The recommendations that appear on the following pages were developed through study and field testing. They are intended as general guides to achieve safe and healthful job site conditions when working with asbestos-cement (A/C) sheet products. Since field conditions will vary, adherence to these work practices will not necessarily guarantee compliance with national, state or local regulations. Questions relating to compliance should be directed to appropriate regulatory agencies.

The Asbestos Information Association believes this booklet will help engineers, superintendents, contractors, foremen and crews to understand and explain procedures for the safe handling of A/C sheet products.

Asbestos and Health

[As you are aware,] Airborne asbestos fiber has been identified as a possible health hazard. But like the automobile, electricity and x-rays, there are non-harmful ways to use potentially harmful things.

Generally, asbestos-cement (A/C) sheet products contain less than 40% asbestos. The asbestos fibers are not free, but encapsulated or "locked-in" the cement binder, like reinforcing rods in concrete. The distinction between "free" and "bound" asbestos is extremely important. First of all, it determines the probability of fiber release, which in turn, directly relates to the probability of risk. More importantly, it explains clearly and simply why A/C sheet is a non-harmful use of asbestos.

Experience has shown that minimizing exposure to airborne asbestos just is the only effective method of preventing asbestos-related diseases. During the use and handling of A/C sheet the only time that fibers may be released in significant quantities from a health standpoint, is during fabricating operations when sufficient mechanical energy is applied to the product to literally "tear" the fibers from the cement binder. Recommended work practices are the best assurance for controlling airborne fiber generation and thus provide exposure safeguards for yourself and your employees.

Summary of OSHA Asbestos Standard

Under the current OSHA standard for occupational exposures to asbestos, it is the employer's responsibility to assure that exposure of employees to airborne concentrations of asbestos fibers does not exceed the following "permissible exposure levels":

a. Eight-hour time-weighted average: Two fibers, longer than 5 micrometers, per cubic centimeter.

b. Ceiling concentrations: Ten fibers, longer than 5 micrometers, per cubic centimeter.

In October, 1975, OSHA proposed a revision to the current standard which would reduce the eight hour time weighted average exposure to 0.5 fibers per cubic centimeter of air and ceiling concentrations to 5.0 fibers per cubic centimeter. OSHA specifically excluded the construction industry from coverage within that proposal. In their notice, OSHA stated that a separate standard would be proposed to cover workers who handle asbestos-containing products in the construction industry.

The work practices recommended in this booklet are based on data for "peak dust concentrations" representing short time periods of maximum exposure. Field fabricating operations involve A/C sheet are noramlly infrequent and of short duration. Using these recommended work practices, which will maintain fiber levels below allowable ceiling concentrations, it is improbable that field personnel would be exposed in a typical working day to levels exceeding the current OSHA eight-hour time-weighted average permissible exposure limit.

Products and Operations

The following work practices are applicable to flat and corrugated A/C sheet products.

Operations to which these work practices apply include:

Shipping, Receiving and Handling
Cutting
Drilling
Hole Cutting and Cutouts
Housekeeping and Waste Disposal

7. Equipment used with these work practices is available from the sources shown in theequipment list (page 20) or through the AIA/NA.

Shipping, Receiving, Handling and Assembly

A/C sheet is shipped clean from the factory, generally in pallet loads, using shipping methods acceptable to the producer and the customer.

All unloading operations should be carefully performed to avoid sheet damage. Pallet loads are normally unloaded by fork truck. Small shipments may require manual unloading

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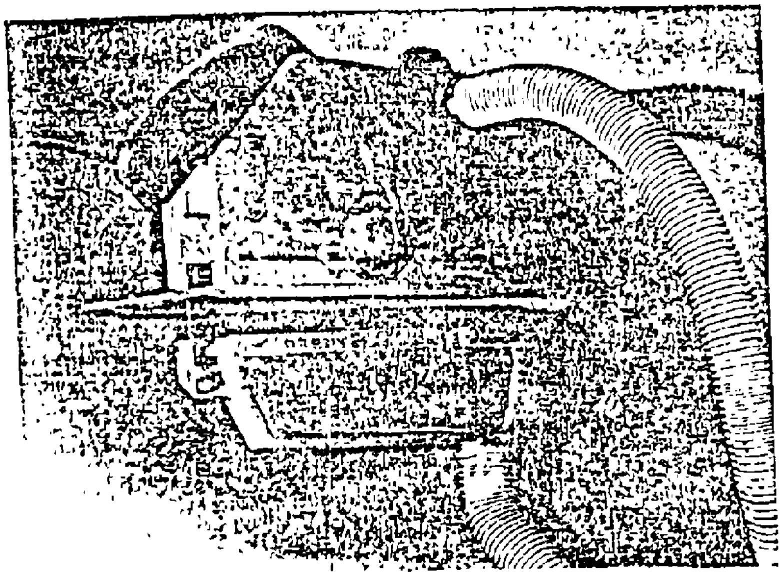
Cutting - Flat Sheets
Circular Saw



Circular Saw With Dust Collection Hood

Circular saws should be used only when equipped with the specific dust collection hood pictured above. Exhaust ventilation and dust collection is provided by the vacuum cleaner described in the equipment list (page 19) or by an equivalent unit with similar performance and filtration characteristics.

The combination of hood and vacuum source is highly effective in capturing and collecting the particles and fibers generated by the cutting operation. Saw operating techniques are those normally employed. No special procedures are required except adjustment of the lower hood section to suit thickness of sheet being cut. Hood design requires the use of abrasive discs (masonry blades) with the saw.

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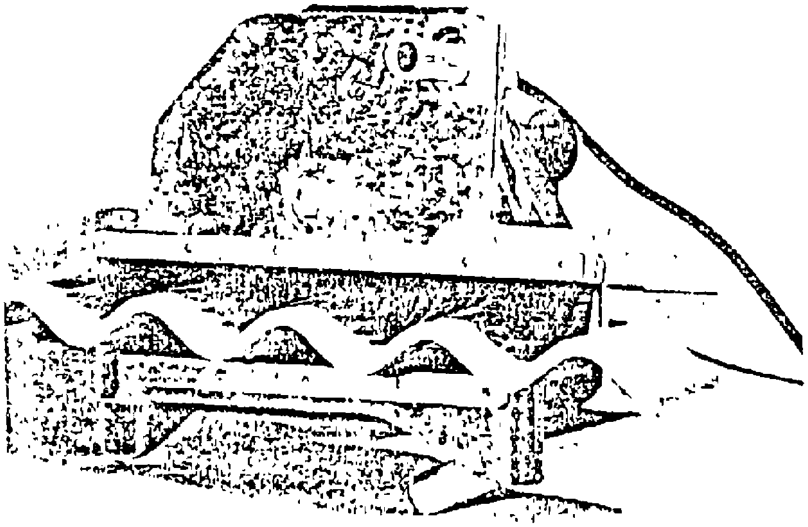
Cutting - Corrugated Sheets
Circular Saw



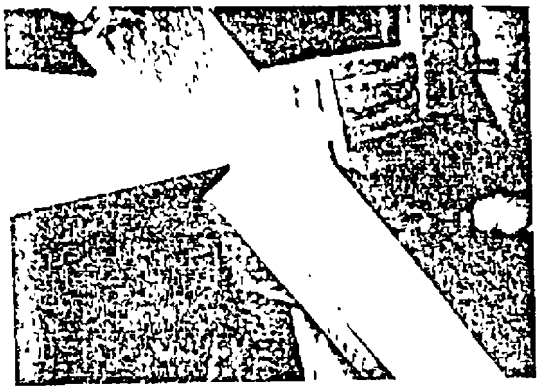
Circular Saw With Dust Collection Hood

Circular saws should be used only when equipped with the specific dust collection hood pictured above. Exhaust ventilation and dust collection is provided by the vacuum cleaner described in the equipment list (page 19) or by an equivalent unit with similar performance and filtration characteristics.

The combination of hood and vacuum source is highly effective in capturing and collecting the particles and fibers generated by the cutting operation. Saw operating techniques are those normally employed. The use of an abrasive disc should be satisfactory for normal cured sheet; however, a diamond blade is recommended for autoclaved sheets.

The hood design depends on rubber "fingers" to seal the cutting zone. For sheets with exceptionally deep or irregular shaped corrugations, the "finger" configuration may have to be modified.

Cutting - Handsaw

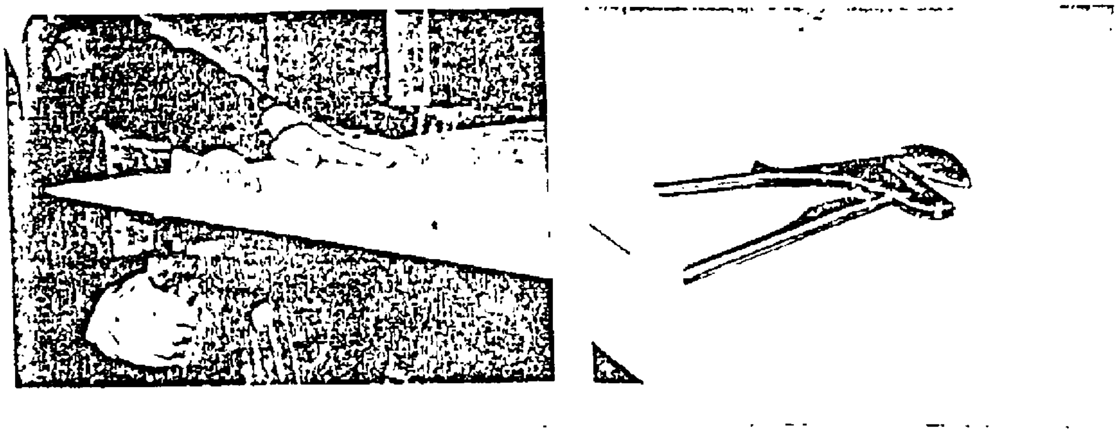


Norcem Handtools
Handsaw

This is a handsaw equipped with a carbide blade designed for cutting asbestos-cement sheet. Practical use of this saw is limited by its slow cutting speed. It is most useful in operations where cutting is infrequent and of short duration.

Because of the slow cutting speed, saw operation generates coarse particles with few airborne fibers. Its use does not require dust collection equipment for compliance with present exposure limits.

Cutting - Flat Sheets
Hand Clippers

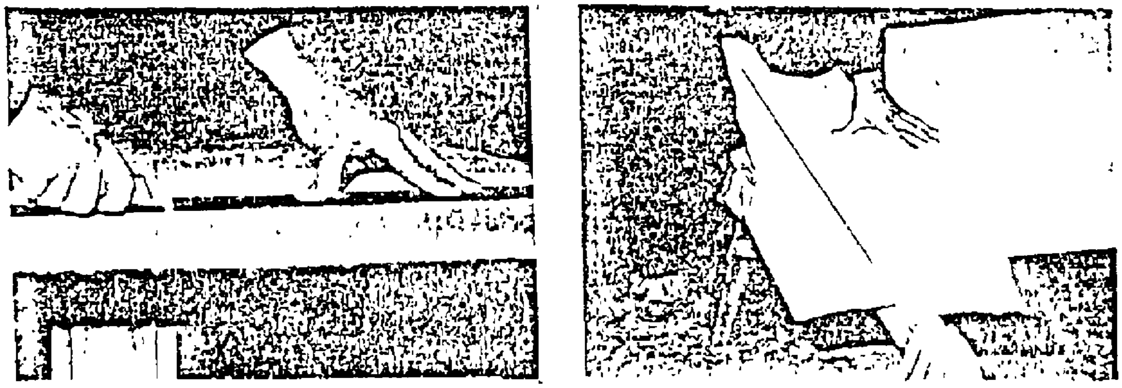


Norcem Handtools
Hand Clippers

These hand clippers are designed for cutting sheet material up to 1/4" in thickness. Practical use is limited by slow cutting speed. It is most useful in operations where cutting is infrequent and of short duration.

The clipper cutting action generates coarse particles with few airborne fibers. Its use does not require dust collection equipment for compliance with present exposure limits.

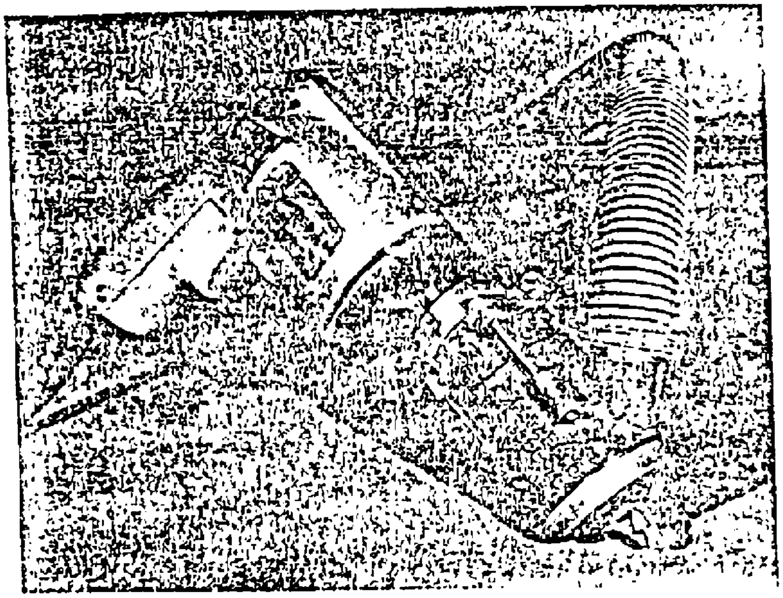
Cutting - Flat Sheets
Score & Snap Knife



Norcem Handtools
Scoring Knife

The scoring knife can be used with sheets up to 1/4" in thickness. However, it performs best with sheets 1/8" and 3/16" thick. The sheet is clamped in place between upper and lower guide bars on a work table or saw horses, and scored repeatedly using the upper bar as a guide for the knife. After scoring the sheet is hand snapped along the score line. This cutting procedure generates little dust and few airborne fibers. Its use does not require dust collection equipment for compliance with present exposure limits.

Drilling - Shrouded Power Drill



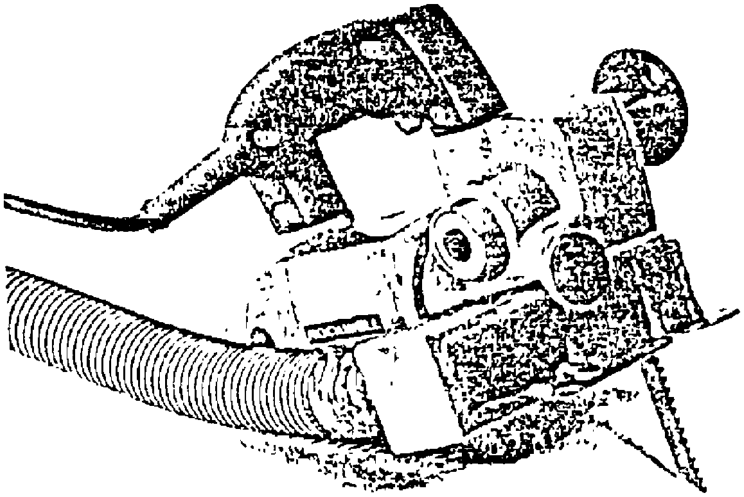
Drill with Dust Collection Hood

Drilling of small holes (1/4" or less) on vertical surfaces, or downward can be done without dust collection equipment and in compliance with present exposure limits.

Drilling of larger holes, and drilling overhead, requires dust collection equipment on the drill in order to achieve compliance. Equipment includes a hood (Cape Universal Building Products, Ltd.) and vacuum cleaner to provide exhaust ventilation and dust collection. Vacuum cleaner should be unit described in equipment list (page) or equivalent with similar performance and filtration characteristics.

Drilling techniques are those normally employed. No special procedures are required.

Hole Cutting and Cutouts - Flat Sheets
Sabre Saw



Sabre Saw with Dust Collection Hood

Sabre saws should be used only when equipped with the specific dust collection hood pictured above. Exhaust ventilation and dust collection is provided by the vacuum cleaner described in the equipment list (page 19) or by an equivalent unit with similar performance and filtration characteristics.

Saw operating techniques are those normally employed. No special procedures are required.

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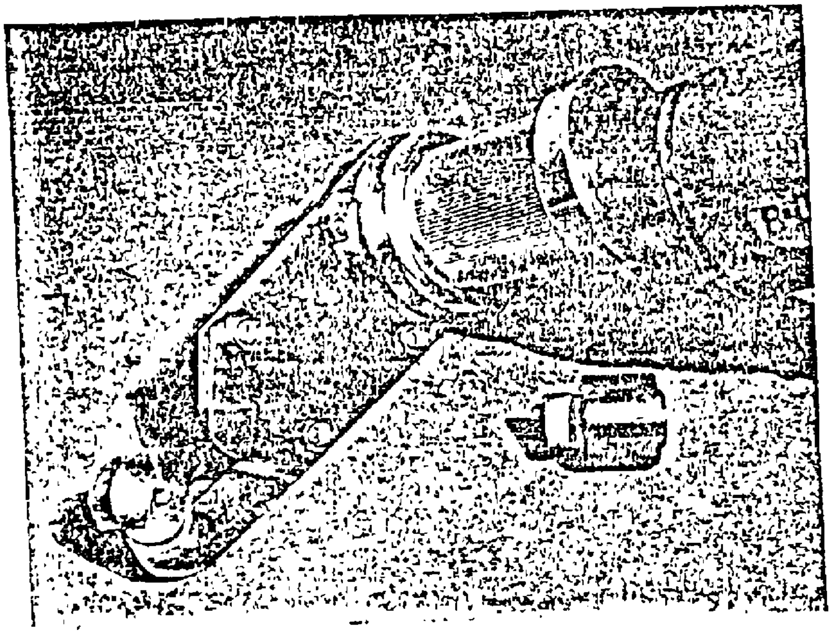
Hole Cutting and Cutouts - "Nibbler"



Norcem "Nibbler" with U.S. Adapter (Detached)

This tool attaches to a hand power drill, and cuts by breaking (nibbling) relatively large pieces from the sheet. The "nibbler" cutting action generates coarse particles with few airborne fibers. Its use does not require dust collection equipment for compliance with present exposure limits.

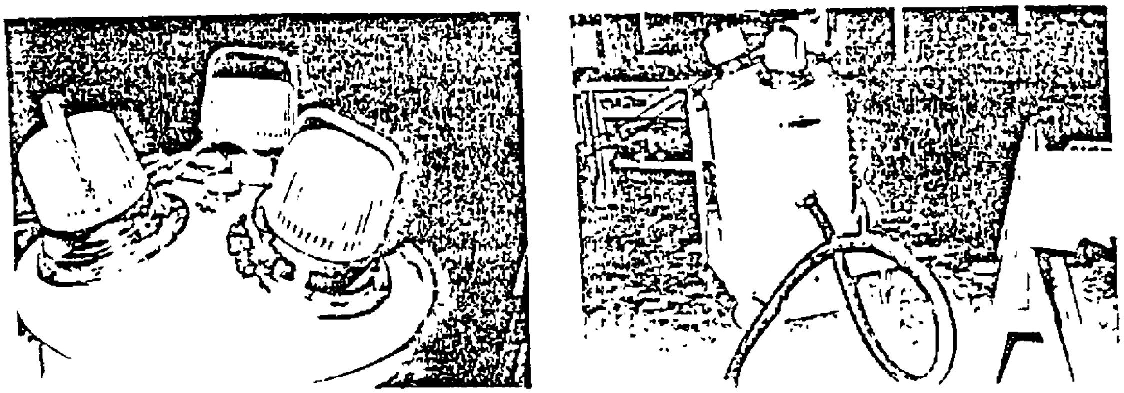
The "nibbler" may be used for cutting A/C sheet materials up to 3/8" thickness.

Hole Cutting and Cutouts - Drill and Rasp

A simple method of making cutouts is to drill small holes around the edge of the opening to be cut and knocking out the material to be removed with a hammer. A rasp is used to dress or bevel edges of the cut.

This procedure does not require dust collection equipment for compliance with present exposure limits.

Vacuum Cleaners



Nilfisk GA-73 Vacuum Cleaner

A suitable vacuum cleaner with proper performance and filtration characteristics must be used. Requirements are:

Vacuum: 60" W.G.
Airflow: 180 CFM
Filtration system: Recommended by the manufacturer for use with asbestos-containing dusts.

The AIA/NA can provide a list of manufacturers who claim that their unit is designed for use with asbestos dusts.

Housekeeping and Waste Disposal

Housekeeping is an essential part of any safe construction operation. It is even more essential when airborne dust created by the lack of good housekeeping has the potential for harm to employees and others.

EQUIPMENT: All external survaces of equipment should be maintained free of dust accumulations that might, if dispersed, create asbestos fiber concentrations above permissible exposure limits.

WASTE DISPOSAL: Asbestos-cement dust chips and cuttings from the field operations described in this booklet must be collected in a manner that will not contribute airborne asbestos dust to the atmosphere. *Loose material should never be dry swept.* When vacuum equipment is available, it should be used. Water or other dust suppressants should be applied in those circumstances where sweeping is unavoidable. DO NOT BLOW WASTE MATERIAL WITH COMPRESSED AIR.

No visible emissions to the atmosphere may result from the collection, processing, packaging, transporting or deposition of any asbestos-containing material. Wastes must be collected and disposed in accordance with the requirements of the ~~Federal~~ Environmental Protection Agency.*

---

*Copy of regulations available from AIA/NA.

Tools for the Fabrication of A/C Sheet

Abrasive Disc Saw	8-1/4-inch Rockwell Model 368-1 or equivalent; use only with hood.
Sabre Saw	Rockwell Model 548 Bayonet Saw with Carbide Blades - Rockwell Type 6T (No. 12390) or equivalent; use only with hood.
Drill	1/4-inch Rockwell Model 7501, or equivalent; use with Cape Universal Building Products Ltd. "Portable Drill Nozzle Kit - Pat. App. 59390"
Vacuum Cleaner	Nilfisk Model GA73 with: Nilfisk 10-foot (2-inch Ø) hose No. 106298 Nilfisk 10-foot (2-inch Ø) hose ext. No. 106297 Nilfisk (3) microfilters No. 613274 Nilfisk (3) HEPA filters No. 115120 Nilfisk Container Frame No. 017101 Hose Adapter - 2-in. X 1-in. X 1-in. 1-inch ID hose - Kana Flex (150 cl), or equivalent
Nibbler (use with power drill)	Norcem "DanKlip" No. 80847, use with drill adapter
Handsaw	Norcem Eclipse Saw -"Eternit Sag" No. 80810 Blades - Norcem "Ekstra Sagblad" No. 80811, Type 56-10
Scoring Knife	Norcem "Eternit Risse Kniv" No. 80800 or equivalent
Hand Clippers	Norcem "Eternit Saks" No. 80805
Hand Rasp	Many types are available in all local areas.

Equipment Suppliers

Circular Saw Drill Sabre Saw Hose Scoring Knife	Local Supplier
Vacuum Cleaner	Nilfisk of America 201 King Manor Drive King of Prussia, PA 19406 or Other vendor of suitable equipment
Circular Saw Hood Drill Hood Nibbler & Adapter Hand Saw Hand Clippers Hose Adapter	XYZ Co. →

Prepared by

AIA

North America

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Arlington, VA 22202
(703) 979-1150

A) 1 A) TECH

Johns-Manville

Internal Correspondence

To D. R. Lucy - 2-12

Date November 10, 1977

From M. F. Trosper - R&D

Copies See end of correspondence

Subject BUILDING SYSTEMS DIVISION
MINERAL PANEL WALL PRODUCTS
INSTALLATION DETAILS AND TECHNICAL DATA

Attached please find the draft for the Fabrication and Installation of Asbestos Cement sheets per your request. It will undoubtly require editing for use in the literature, therefore, it is supplied in double space format.

M. F. Trosper

dlf

cc:

R. H. Bengtson	- 2-12
G. T. Edmonds	- 2-12
J. V. Magee	- 2-12
R. G. Ducey	- 2-12
E. M. Fenner	- 1-06
R. Carter	- 1-06
J. Lee	- 2-12
D. Kelleher	- 2-16
J. Reis	- 2-16
N. Walters	- 1-04
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F. Bodycomb	- R&D
A. Musz	- R&D
J. Hoehler	- R&D

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FABRICATION AND INSTALLATION OF ASBESTOS CEMENT SHEETS

INTRODUCTION

The construction Industry has experienced in recent years many health and safety standards effecting vertically all phases of the job site. In addition to the electrical the scaffolding, the ladder and the personnel equipment standards; has come another standard: exposure to free asbestos fiber.

Construction and manufacturing operations which produce significant amounts of dust are all being investigated one at a time. Asbestos laden dust was one of the first with coal dust its predicessor. In the future, silica containing proudcts will undoubtly be controlled with some type of standard.

It has been shown that any dust in the respirable size range (5-50μ) has detrimental effects on the human body and fibrous bodies in this size range lead to infections of various lung tissues which can, with long latent periods, develop cancerous tissues. It should be noted that smoking which breaks down certain biological defense mechanisms will increase the possibility of pulmoncosis (lung infection).

Having become aware of the above situation, Industry has developed various tools and techniques which when properly implemented, significantly lower employee exposure to construction dust.

While the fabrication of many asbestos fiber reinforced products will release sizable quantities of free asbestos fiber, it must be noted that proudcts and processes which "lock in" or bind the asbestos fiber and prevent it from being inhaled or ingested do not present a health hazard. Since asbestos cement sheets, asbestos reinforced plastics and asbestos containing fluids all physically "hold" on to the fiber; handling such materials presents no health hazard.

It is not the handling of asbestos containing products which we wish to examine but rather the fabrication question.

FABRICATION OF ASBESTOS CONTAINING PRODUCTS

First may we consider some basic rules and concepts about the fabrication of asbestos containing products:

1. Keep visible dust at a minimum
2. Remove or abrade away the least material possible (i.e. usage of a 1/8 in. thick dry diamond blade physically removes one hald of the material a 1/4 in. masonary blade abrades).
3. With thin sheets (3/16 in. and less in thickness)

score and break the panels using a 2 in. x 4 in. restraint (see Appendix)

4. With thin sheets certain types of nibblers are available for sizing the sheets (see Appendix)
5. Wet fabrication has many advantages from a dust control standpoint but effective removal of the "sludge" produced must be considered.
6. Vacuum systems must be rated dynomically rather than statistically and after a reasonable amount of residue has "loaded" the filter media.
7. When possible, fabrication should be performed which results in "chips" of material rather than dust being produced.
8. In general, all tools must be designed that one man can effectively work with it; that one man can transport the unit and that the power requirements should be no greater than 110 VAC and 30 AMP. Wet cutting will be considered reportly as a portable plant.

We could continue this list in greater detail but may we consider each operation seperately as follows:

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DRILLING OF ASBESTOS CEMENT SHEETS

Drilling attachment holes is the most common operation performed on asbestos cement sheets. As such, there are several general concepts which can be noted:

1. Sheets should be drilled flat with allowances for dust collection (see below).
2. Depending on the number of holes to be drilled, several types of drill-bits are available.
   a. Carbide tipped drills -
      Advantages: Long-life, durability
      Disadvantages: Produce fine dust. Tip and shonk diameters are often different.
   b. High speed - split point drills.
      Advantages: Produces chips at low speeds faster penetration, accurate holes.
      Disadvantages: Limited life (however field use of a file extends life).

In general, when ever possible, the use of the split - point drills is suggested in conjunction with a drill capable of 50-100 rpm. This combinaiton results in reduced dust levels and faster production of mroe accurate attachment holes.

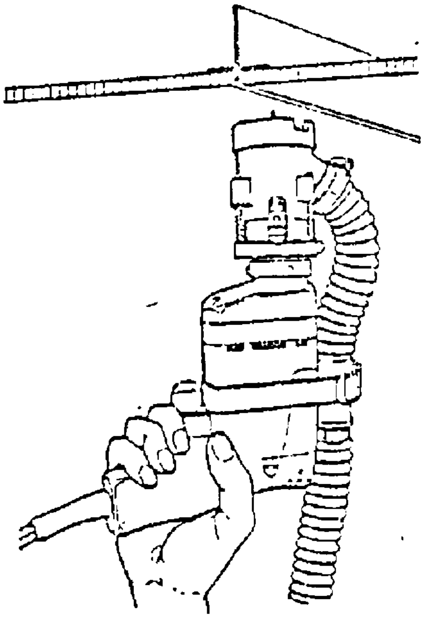
Drilling must not be performed without the use of an acceptable vacuum system or a wet-fabrication system. For vacuum protection, use of a Cape Universal drill shroud or similar with a vacuum unit capable of 3/4 in. to 1 in. of Hg pressure dynamically measured at the end of a 20 ft hose with a 5/8 sq in. orfice at the end of the hose. Provision should also be made for the vacuum removal of any residue produced under the sheet being fabricated. One possible solution is the use of a vacuum trough below the drilling systems, proper collection, filtration and disposal techniques must be used. For decorative sheets adequate rinse and cleaning of the fabrication site must be allowed for in order that staining of the sheets does not occur.

Portable drill nozzle kit

SPEC. B-2
DETAIL 2

pat. app. 53330

Approved by the Asbestosis Research Council



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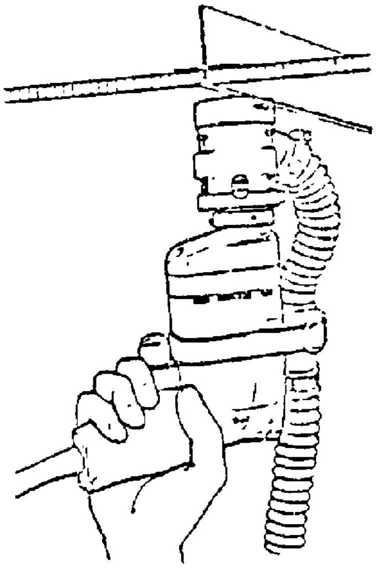

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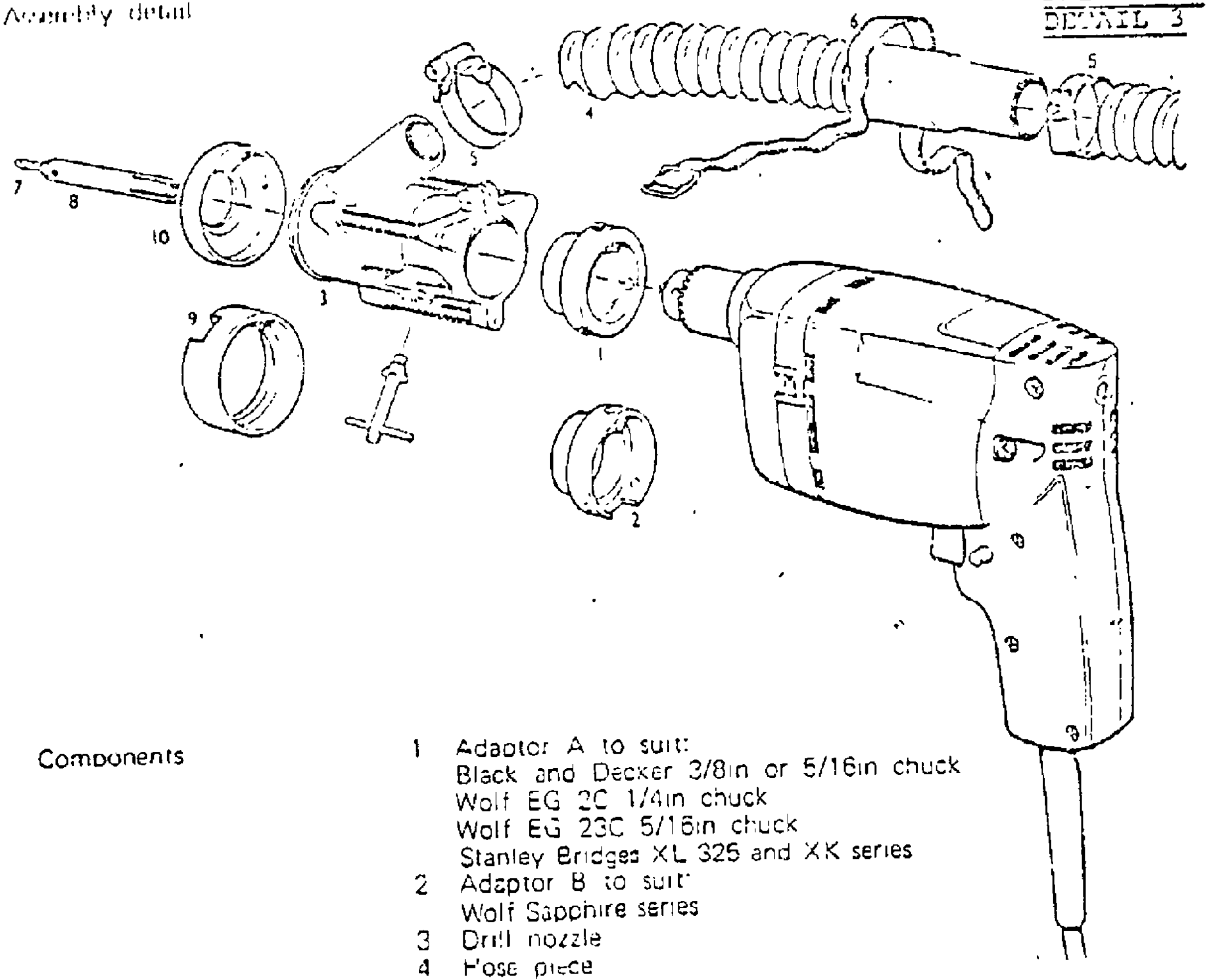
Operating instructions

Power drills adapted with the kit do not require special operating procedures. The design of the kit allows the drill bit to be accurately positioned on the surface to be drilled (1) and as drilling takes place the drill nozzle compresses to allow the drill bit to proceed (2)

The nozzle can be adapted to accommodate the Teks® screw fixing system, advice obtainable from Cape Universal Building Products Limited.

Assembly detail



Components

1 Adaptor A to suit:
Black and Decker 3/8in or 5/16in chuck
Wolf EG 2C 1/4in chuck
Wolf EG 23C 5/16in chuck
Stanley Bridges XL 325 and XK series
2 Adaptor B to suit:
Wolf Sapphire series
3 Drill nozzle
4 Hose piece
5 Jubilee clip (2 no)
6 Retaining strap with adhesive backing
7 9/64in drill bit
8 Countersink attachment
9 Open ended cap: for horizontal surfaces (ceilings)
10 Conical cap. for vertical surfaces (walls)

Assembly instructions

Select adaptor 1 or 2 to suit drill. Fit to neck of drill and secure with three grub screws
Fit drill nozzle 3 to neck of adaptor, ensure that exhaust outlet is at top and tighten flange screw
Connect hose piece 4 to exhaust outlet and secure with jubilee clip 5
Remove paper from adhesive backing of retaining strap and secure hose to drill with strap
Insert hose piece into exhaust unit hose and secure with second jubilee clip. Assemble drill and countersink attachment and fit into chuck
Tighten chuck by inserting key through aperture in nozzle. Select cap 9 or 10 and fix to nozzle using twisting action.

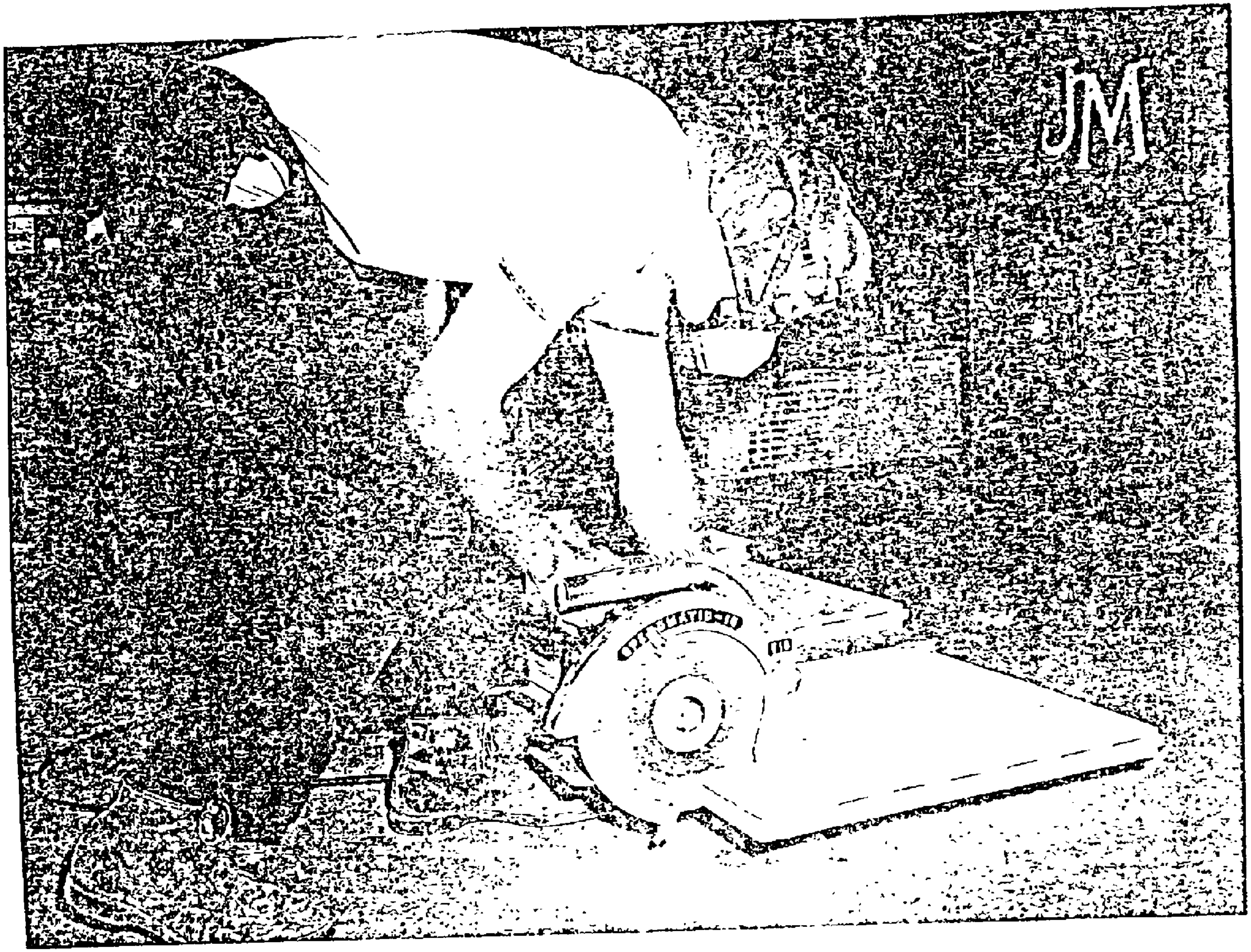
Cape Universal

Cape Universal Building Products Limited, Exchange Road, Watford WD1 7EQ
Tel Watford 34551 and 41331
A member of the Cape Asbestos group of companies

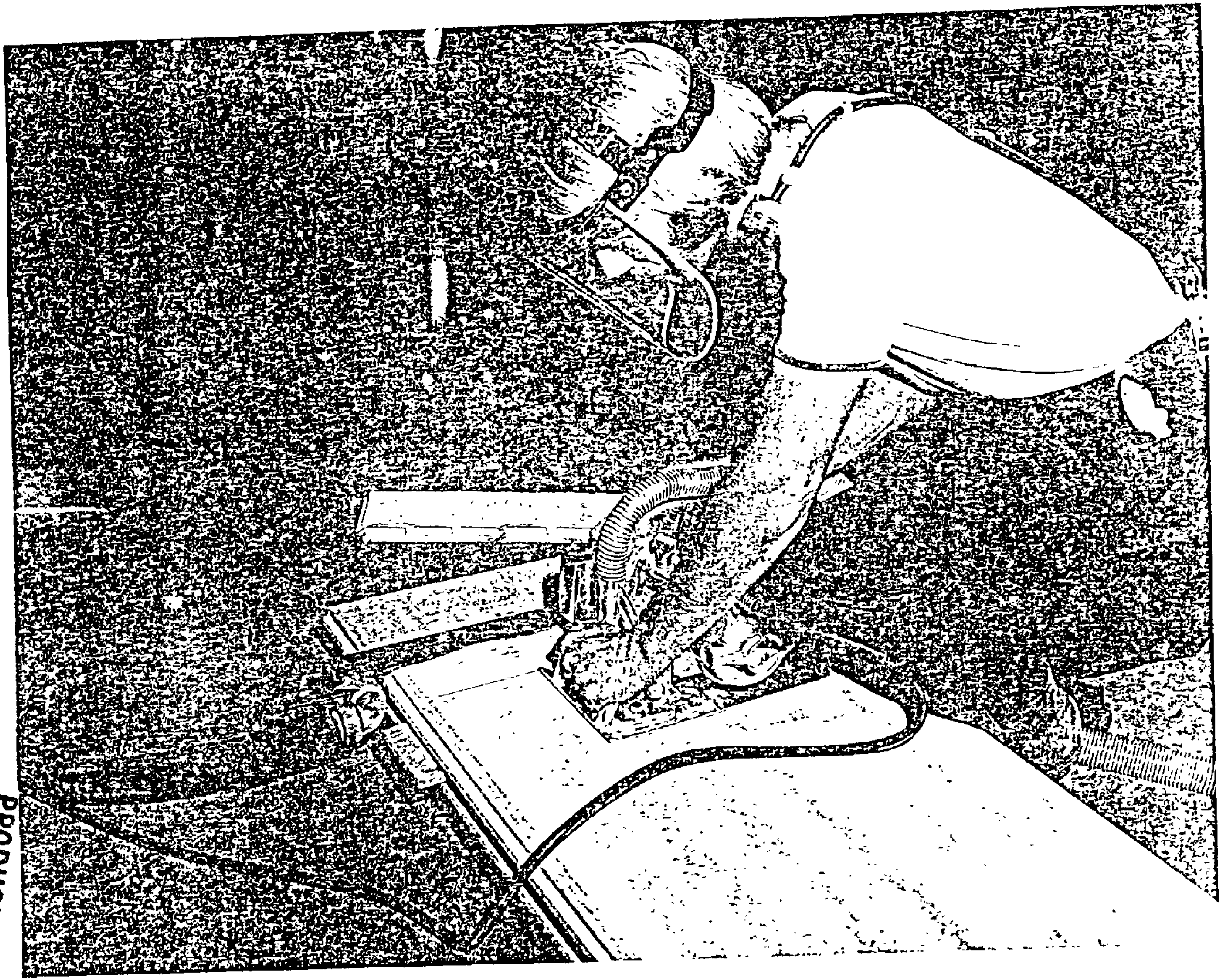
Cutting of Asbestos Cement Sheets

By frequency of job function, sizing of flat sheets of asbestos cement ranks second to drilling. Most jobs of A/C sheet are designed to minimize the number of field cuts or the sheets are ordered presized from the supplying factory. However, almost every job requires some cutting be done for various openings or to finish out a horizontal run of panels. A few jobs, rare though they are, requires for one reason or another that every sheet supplied be cut in order to complete the application.

A job with few cuts required is usually done using a silicone-carbide masonary blade installed on a 7-1/4 in. to 8-1/4 in. circular saw. A silicone-carbide blade will produce a 1/4 in. wide cut inwhich the abraded material produced is finely divided during fabrication. Control of this finely divided dust is nearly impossible if the material is allowed to escape the proximity of the saw. Capture of the dust in a concentrated form is essential if low asbestos exposures are to be acheived. High velocity - low volume (HV/LV) capture techniques are idealy suited to this situation.

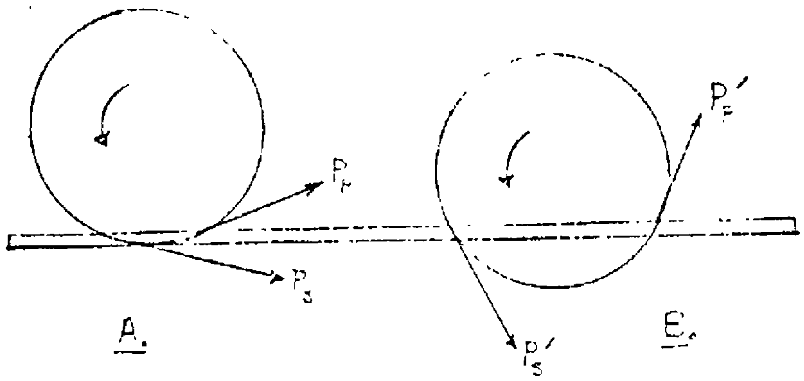


1. 26-3 Initial cut into 1-1/2" CORSPAN using a Rockwell Model 510 Masonry Saw with no vacuum source attached to the pick up.



HV/LV dust control increases insure immediate removal of asbestos laden dust as it is produced. However, care must be used in the design of the attachment points of the various orfices on and in conjunction with the now.

For example, as the depth of cut is changed, so is the particulate path above and below the sheet being fabricated.



As shown above, the angle with respect ot the sheet of the primary particulate vector Pp & P'p changes drastically for an equal diameter blade when the depth of cut is varied. The position of Pp determines the position of both a primary orfice and a secondary orfice on the saw shroud. Changes in the Ps vectors effect dust control efforts below the sheet. For effective dust control in the field, cutting position A with a sheet of plywood or low density foam acting as a deflection shield has proven desireable. This position in conjunction with a properly designed exhaust system designed along HV/LV principles has been tested repeatedly below 2F/cc. Ffibers/cubic centimeter).

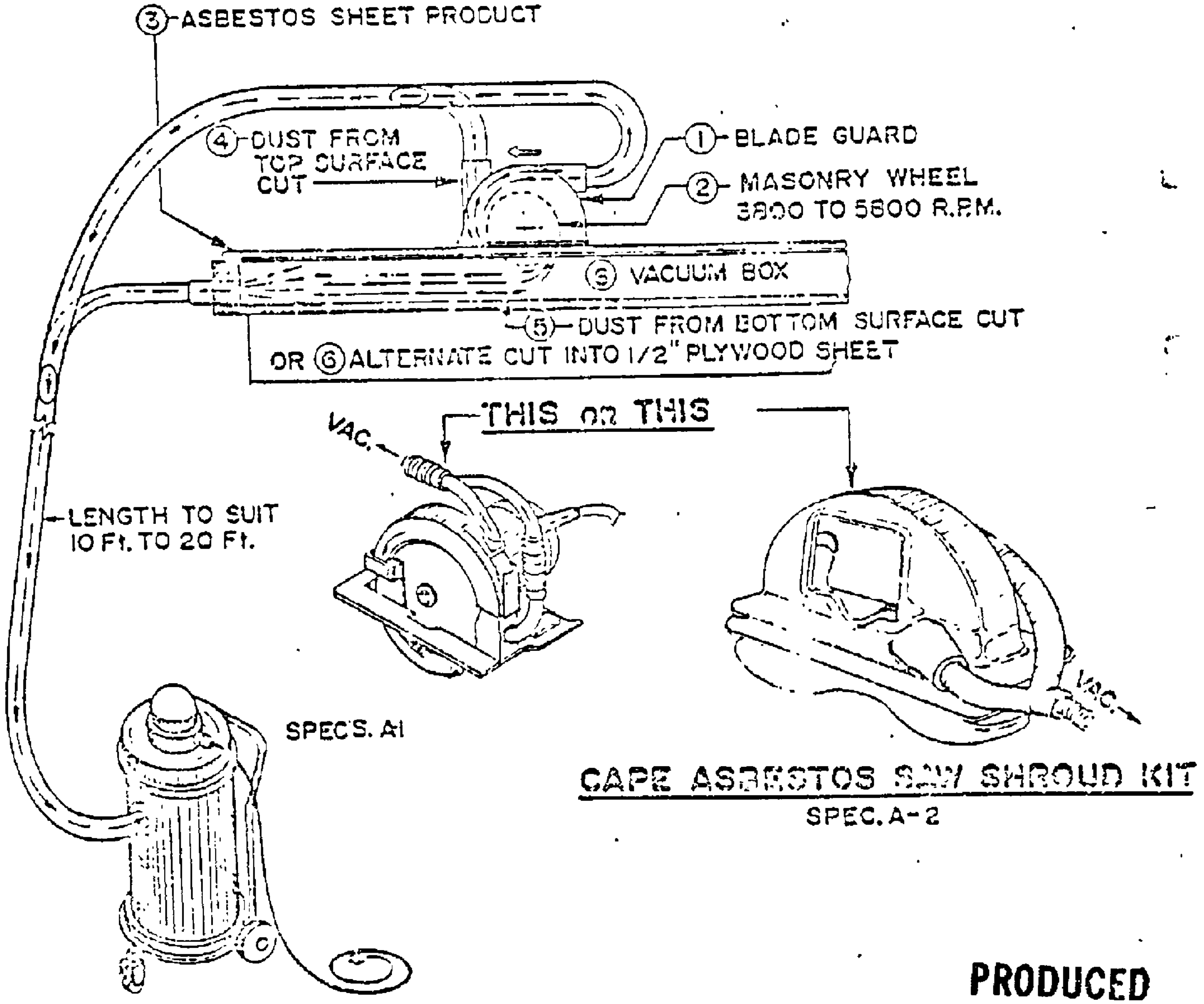
Certain saws however, are easier adapted to exhaust shrouds. For example, a vertical adjustment saw has to contend with the above situation for vertical adjustment while a tilt-type adjustment saw rotates the geometry of the exhaust shrouds. This rotation can induce drastic changes in the air envelope as shown below.

METHODS OF ENGINEERED DUST CONTROL SYSTEMS

PORTABLE ELECTRIC ROTARY POWER SAWS.

I. Use dust control systems shown below (Spec. A-1) or Cape Asbestos shroud kit. (Spec. A-2)

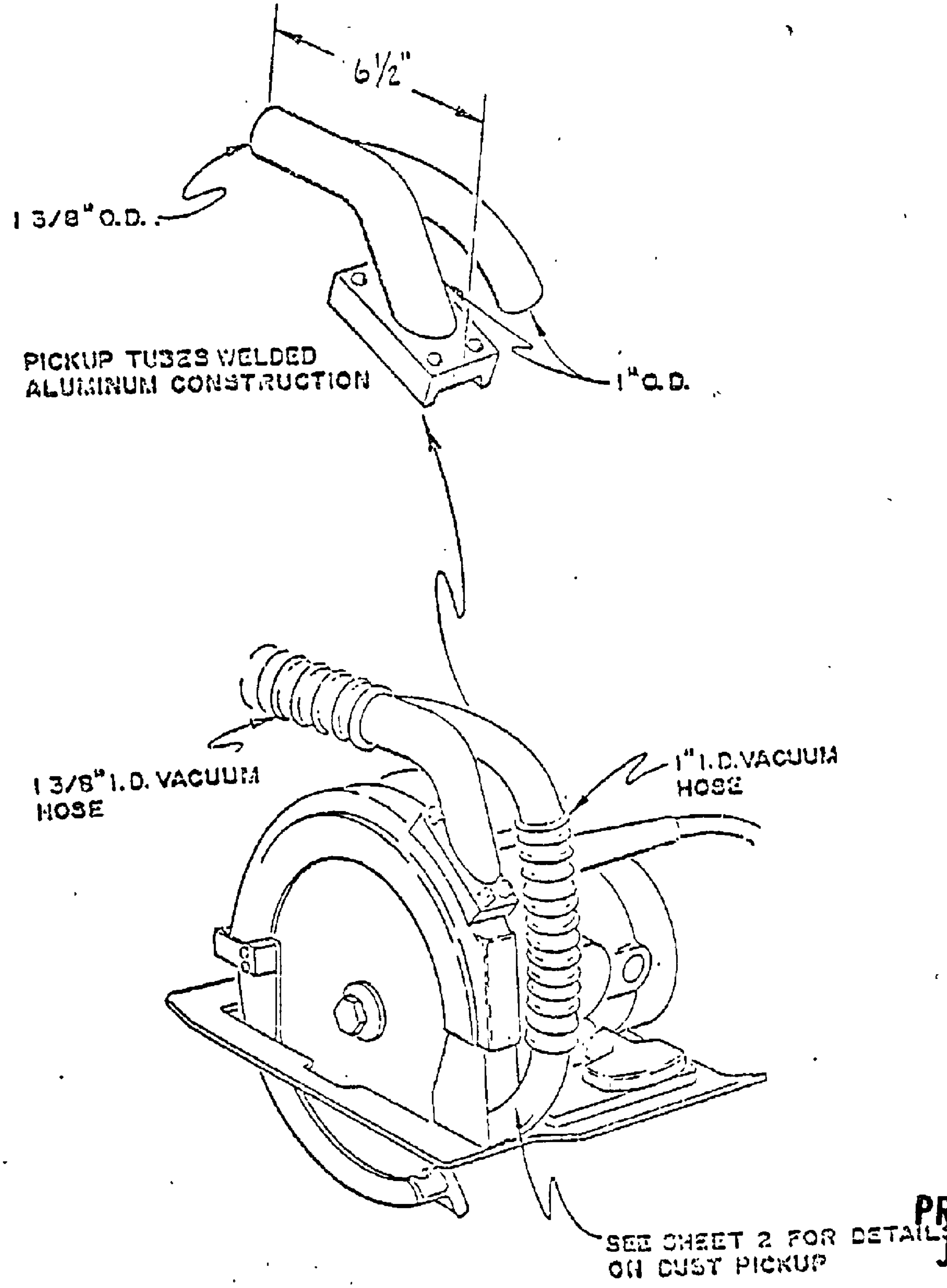
II. Do all cutting on J-M design vacuum box (6) as per Spec. No. E-1, or cut into 1/2" plywood.



CAPE ASBESTOS SAW SHROUD KIT
SPEC. A-2

VACUUM UNIT
LOW VOLUME & HIGH VELOCITY
SPEC. SERIES G

SPEC. A-1
DETAIL 3



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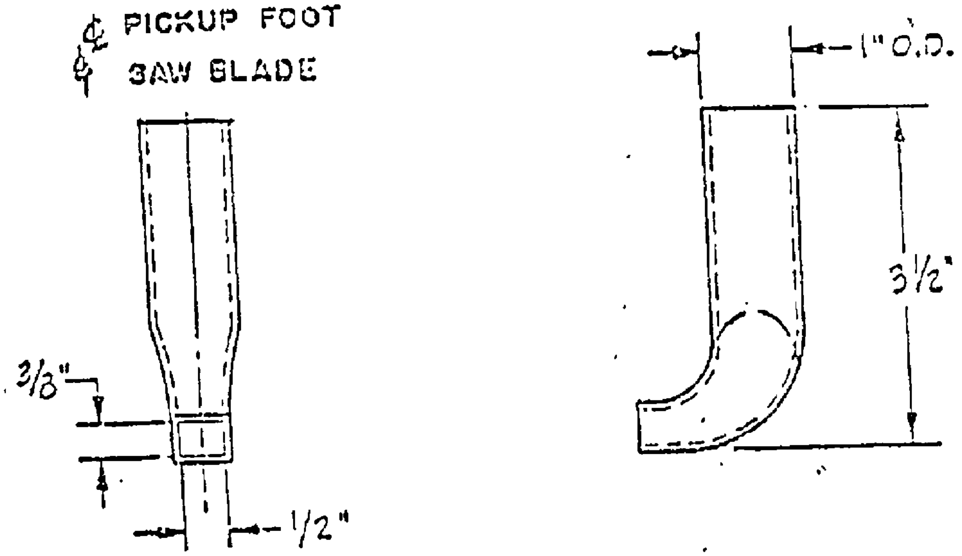
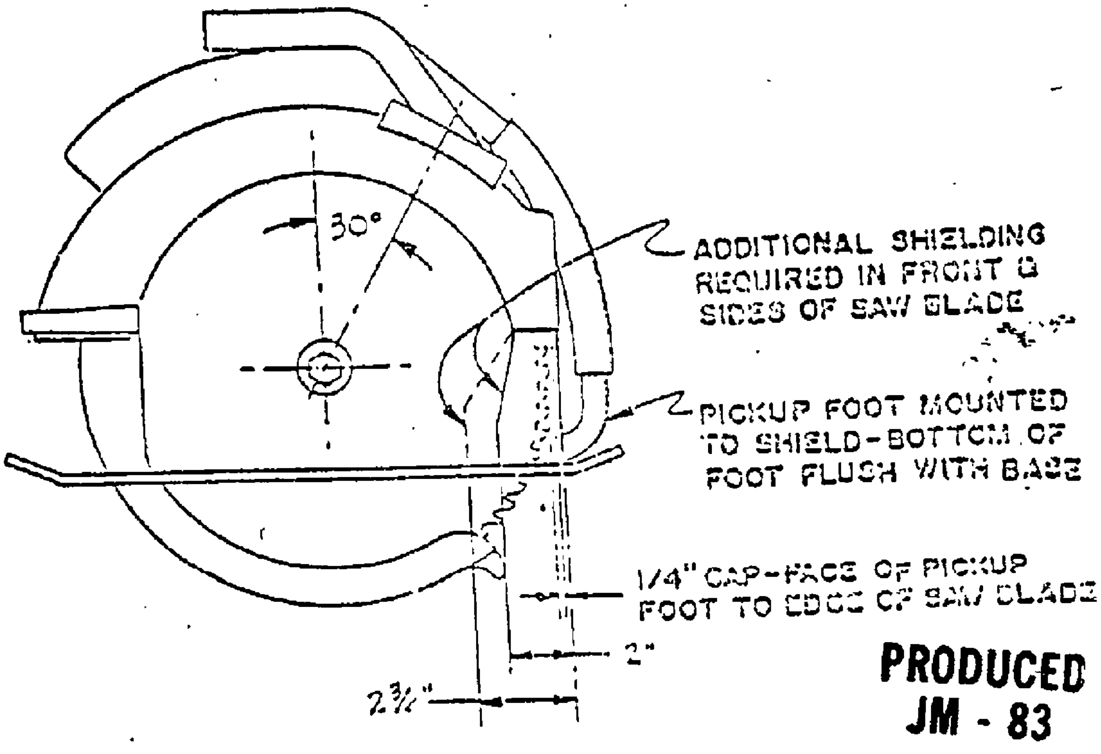
DUST EXTRACTOR - PORTABLE SAW - 7 1/4" DIA. BLADE

SPEC. A-1
DETAIL 4



PICKUP FOOT-WELDED TO SHIELDING



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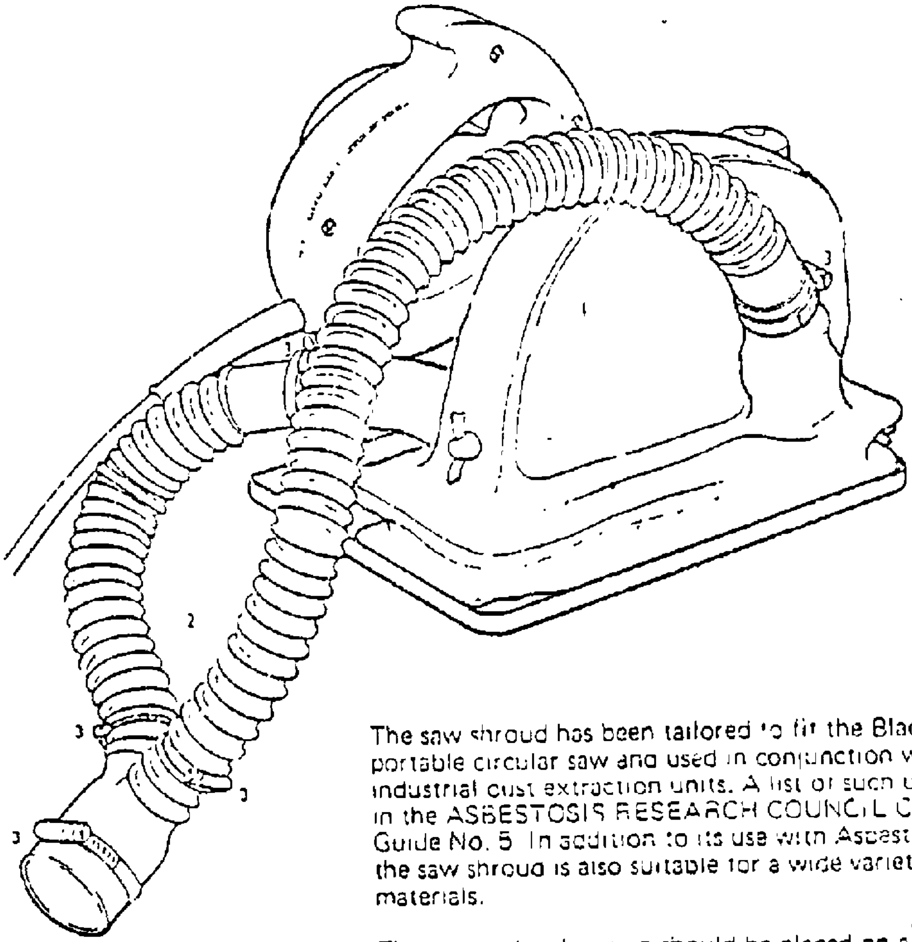
DUST EXTRACTION - PORTABLE SAW - 7 1/4" [illegible] BLADE

Cape Universal

Dust extraction shroud kit for the HD1215 portable saw

Approved by the Asbestosis Research Council

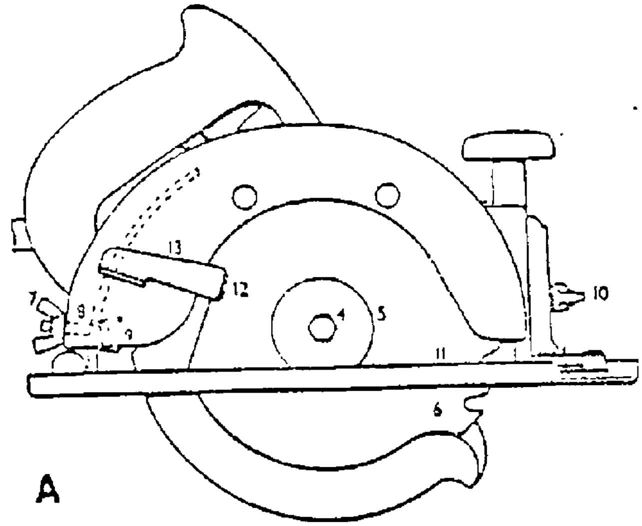


The saw shroud has been tailored to fit the Black and Decker 9¼" portable circular saw and used in conjunction with approved industrial dust extraction units. A list of such units is included in the ASBESTOSIS RESEARCH COUNCIL Control and Safety Guide No. 5 In addition to its use with Asbestos based materials the saw shroud is also suitable for a wide variety of other materials.

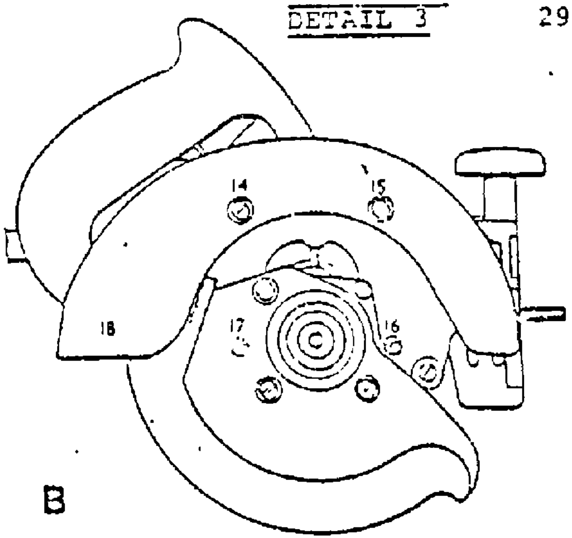
Operating instructions

The material to be sawn should be placed on a wooden base (preferably ¾" plywood if considerable cutting is to be done) spanning the whole length of the saw cut and the blade depth adjusted so that it cuts through the material with minimum cut into base board. This prevents dust from falling below the saw cut and concentrates the extraction to the shroud enclosing the upper part of the blade where the dust is drawn off via lightweight hose to the exhaust unit.

If the saw and shroud is to be used above 1½" depth of cut, care should be taken to ensure the shroud [illegible] foul the



A



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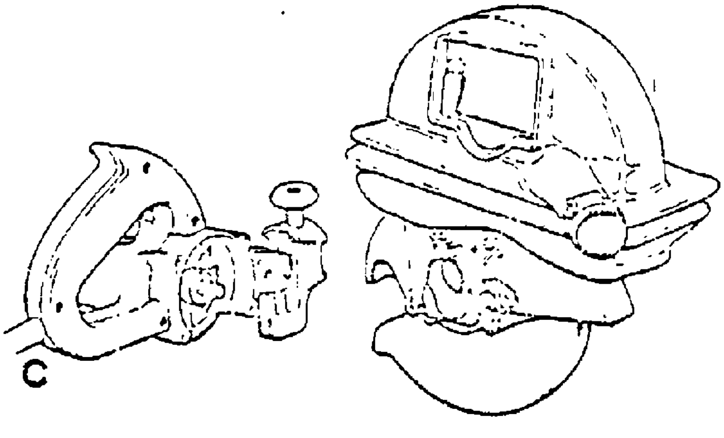
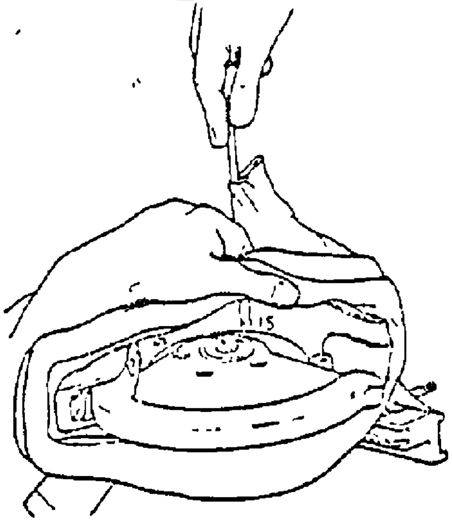


C



D

Components
(illustrated overleaf)

1 Shroud

2 Hose harness, comprising two hose pieces and 'Y' connector

3 Jubilee clips (4 of No 1 and 1 of No 2)

Dismantling saw

Remove bolt 4, outer clamp washer 5, saw blade 6, inner clamp washer, wing nut 7, bolt 8, guard stop 9, wing nut 10, shoe 11, two retaining screws 12, lever arm 13, screws 14 15 16 17 and finally main guard 18 by carefully tapping free with hide faced hammer. Should motor unit also be withdrawn, ensure carbon brushes are correctly re-positioned before reassembly

Reassembly with shroud

Fit saw shroud 1 to guard 18 and reassemble in reverse order ensuring that all screws are fully tightened. Omit lever arm 13 and retaining screws 12. Where necessary lift shroud to gain access to screws. To tighten screw 15 insert screwdriver as shown in drawing D. Ensure that shroud is fitted inside lip of shoe when replacing saw blade. Connect hose harness to shroud. Connect hoses to Y piece, secure all connections with Jubilee clips. An additional clip is included for coupling the unit to the dust extraction hose.

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Pat. app. No. 56586/70

Vacuum Units and Systems

A discussion on dust collection techniques would be incomplete without considering the vacuum producing unit. Many units have been examined resulting in the following minimum specifications: For circular saws (7-1/4 in. - 8-1/4 in. blade diameter).

Capability of producing 2 in. Hg (27.2 in. H_2O) dynamic pressure differential at the end of a 2 in. diameter hose 20 ft long with a 5/8 in. diameter orfice in a plug. For drills.

Capability of producing 1 in. Hg (13.6 in. H_2O) dynamic pressure differential at the end of a 1-1/2 in. diameter hose 20 ft long with a 1/2 in. diameter orfice in a plug.

Of course the vacuum specifications should not be measured without first loading the filter network by cutting at least 12 linear ft of 1/4 in. board with an abrasive disc or drilling 50 holes of 1/4 in. diameter in 1/2 in. board using a carbide bit. In addition, the vacuum unit should be capable of capturing 0.5 micron particles at the final filter. Power requirements in excess of 110 VAC and 30 Amps are unacceptalbe in the field.

Johns-Manville
Research and Development Center

Report No. E411-T-379

Date March 16, 1979

Title: FIELD EVALUATION OF CORRUGATED SHEET SAW

SUMMARY

A circular saw for the dust free fabrication of corrugated asbestos cement was evaluated on the job site, February 26, 1979, at the Johns-Manville Research Center in Denver, Colorado. This trial was done to generate field dust counts and record workman's reaction and comments to the tool.

The saw was used by Mike Geyer, of Centennial Air Conditioning, who was refinishing the cooling tower at Denver Research. Fabrication consisted of cutting four, one foot by four foot panels, for a total cutting of sixteen linear feet. All work was done outside and personal samplers were worn by Mike Geyer and the author with one area sample taken. The asbestos counts taken by Stella Gaburo of J-M Health, Safety and Environmental Department, were 0.0 f/cc, 0.05 f/cc, and 0.0 f/cc respectively. The samples taken were peak samples and are to be compared to an OSHA peak standard of 10 f/cc.

Performance of the corrugated sheet saw and Nilfisk GA-73 vacuum was judged to be excellent by Mr. Geyer. He suggested all sites cutting asbestos containing materials should be equipped with tools of this type. His belief was that the workmen acceptance of these tools would be good.

It is recommended that a job with more severe conditions be found and samples taken even though counts from this trial were well within acceptable limits.

Contents: Summary only.

Reported by G R Bauman
G. R. Bauman
Asbestos & Mineral Technology

Approved by
W. C. Streib
Director,
Mineral & Filtration Technology

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Research and Development Center

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Keywords
Asbestos
Asbestos Cement
Dust
Dust Collection
Fabrication
Environmental Health

TOOLS
FOR JOBSITE CUTTING
OF
ASBESTOS CEMENT
SHEET

JOHNS-MANVILLE

September 1978

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JM Johns-Manville
Research and Development Center

Memorandum M411-819

Date 7/26/78

A.F.D. Research Review - July 6, 1978 - At Asbestos

I. Dust Suppression of Asbestos Products

Objective - To develop techniques that allow for the safe handling of asbestos products.

Status -

a. General - Since cement and paper products comprise 73 percent of the dollar volume of J-M fiber sales, work is being concentrated in these two areas.

To insure the safety of the personnel doing the work, a "Dust Chamber" was designed and fabricated. The chamber is 10-foot X 2.5-foot X 2.5-foot, open at the end to allow for air flow through the unit, and attached at the other end to the R&D Dust System. Air flow rates can be varied and are measured by a pitot tube manometer set-up. Operator entry to the chamber is accomplished via a glove box arrangement. Dust moniters can be placed at any desired location in the unit. Tests have demonstrated that dust counts in the unit relate to real world conditions with no exposure to the operator.

b. Asbestos Cement - Dust control during field fabrication of cement products is being accomplished by:

1. evaluation of existing tools and
2. the design of tools where existing equipment does not meet emission standards.

Hand-powered tools evaluated include a saw, knife and clippers. Dust counts with these tools were below the 2f/cc level.

Electric-powered tools evaluated were a shrouded drill, a Norcem Nibbler, and a Festo Shrouded Saw. The vacuum service used is a Nelfisk vacuum cleaner with an air flow of 330 cfm. Of these tools, only the Festo shrouded saw had dust counts in excess of 2 f/cc. A saw shroud was designed and fabricated at R&D. The R&D shroud when used on a Black and Decker saw gave dust counts of 0 f/cc.

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The above equipment has been field evaluated in Utah. Composite dust counts (e.g., not enough material was being fabricated to obtain counts on each individual piece of equipment) were well below the two fiber level. Operator acceptance of the equipment was also good. Another field evaluation will be set-up where each individual piece of equipment can be evaluated seperately. Acceptable results with the second evaluation would allow for endorsement of a "Safe Work Practice Manual".

In addition to the aforementioned, R&D is currently working on developing tools for cutting corrugated sheet and pipe.

c. Asbestos Paper and Board - Dust counts taken at J-M paper and board manufacturing locations indicate compliance with existing standards Therefore, no work is being done in this area. Dust counts taken during the unloading of asbestos roofing felt box cars show occasional readings above 2 f/cc Dust Chamber values, indicate that dust counts above the 2 fiber level are possible when paper and board products are handled (e.g., cut and sawed). Therefore, work on paper and baord is centered on the control of dust during shipping and handling.

Internal additives (e.g., latex) are being evaluated as a technique for "locking the fiber in" these products. Results indicate that 1½-3 percent latex will control the dusting of asbestos paper 25 mils or less in thickness. Thicker products, such as millboard, were not effectively dust suppressed even at latex levels of 5 percent.

Future Work -

a. Asbestos Cement -

1. Second field trial.
2. Tools for Corrugated and pipe.
3. Work Practice Manual.

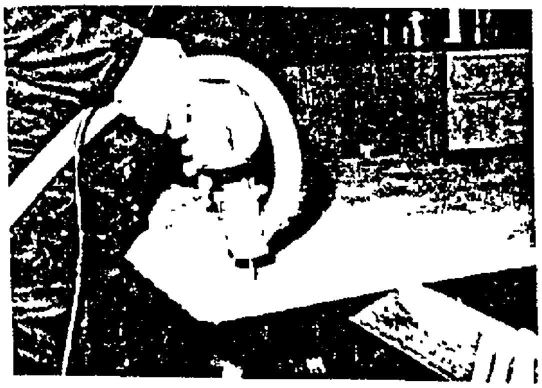
b. Paper and Board -

1. Moniter roofing felt box cars for dust.
2. Evaluate additives.
3. Evaluate coating of Board.
4. Employ dust tools developed for A.C.
5. Plant trials.
6. Field evaluation.

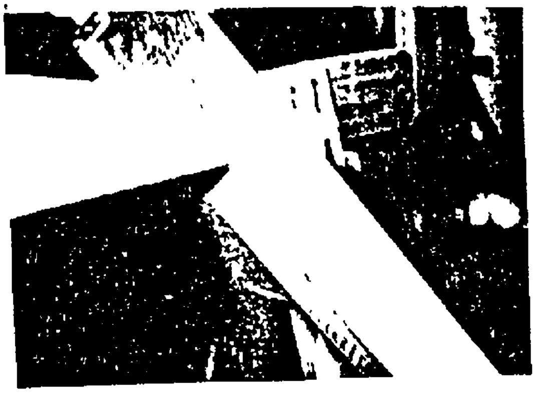
TOOLS

CIRCULAR SAW SHIELD

STAPLER



CAGE SHIELD



HAND SAW

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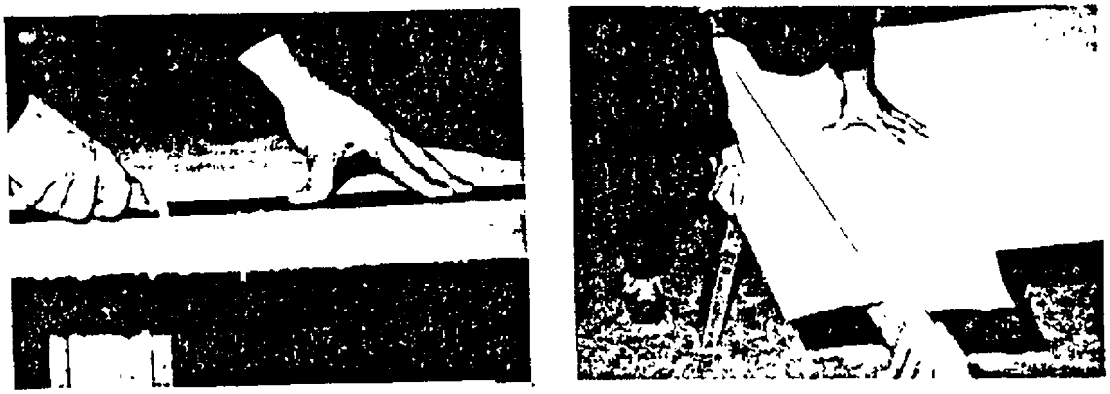
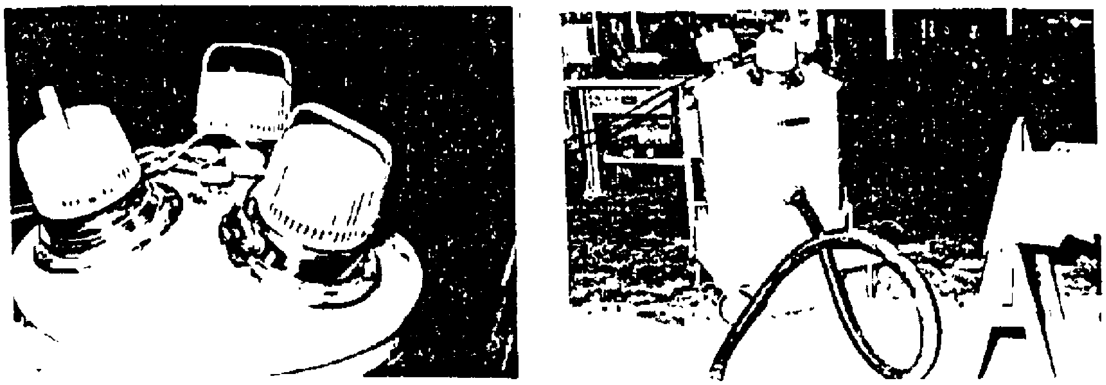
TOOLS

HAND CLIPPERS

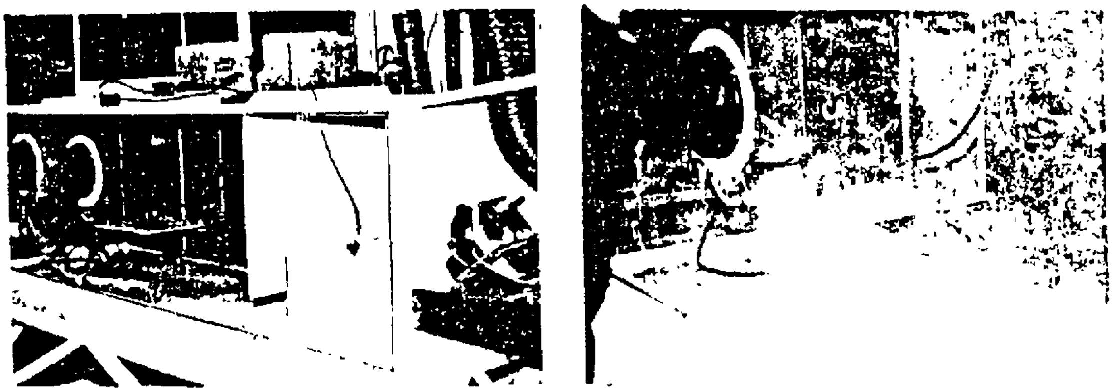


SCORING KNIFE

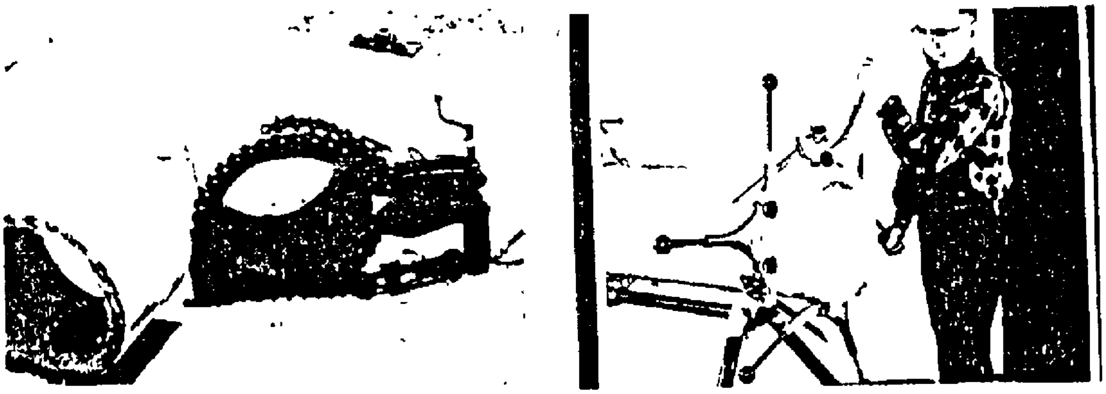


NILFISK VACUUM

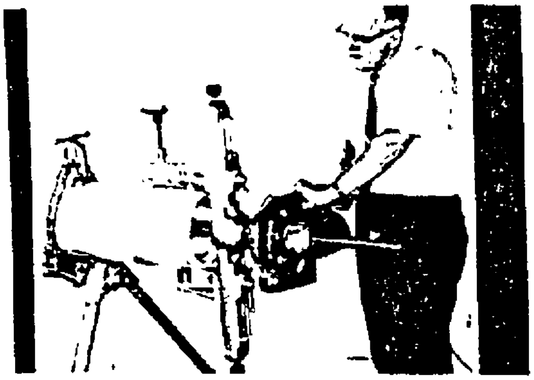
TOOLS



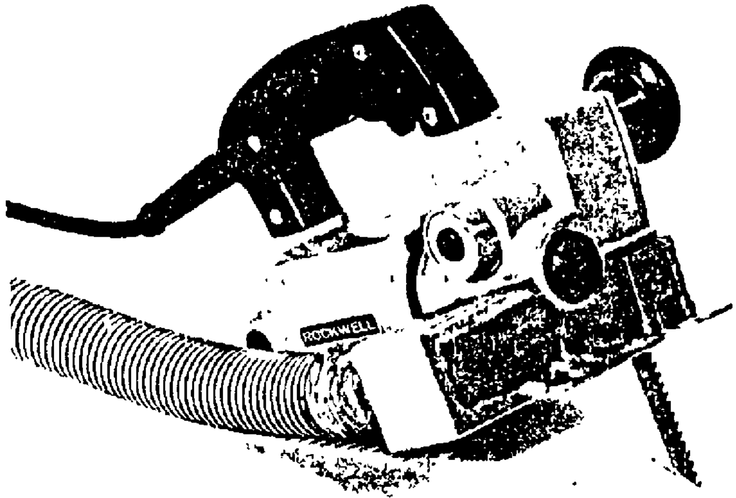
TEST CHAMBER

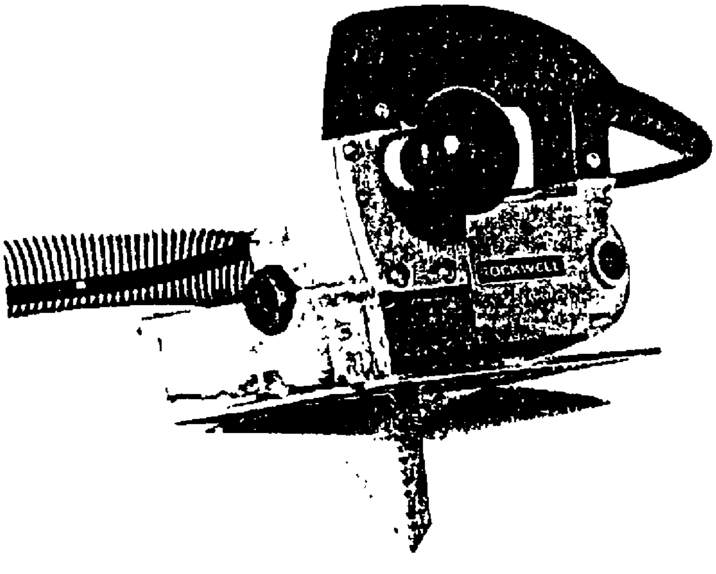


PIPE CUTTERS



PIPE FIELD LATHE





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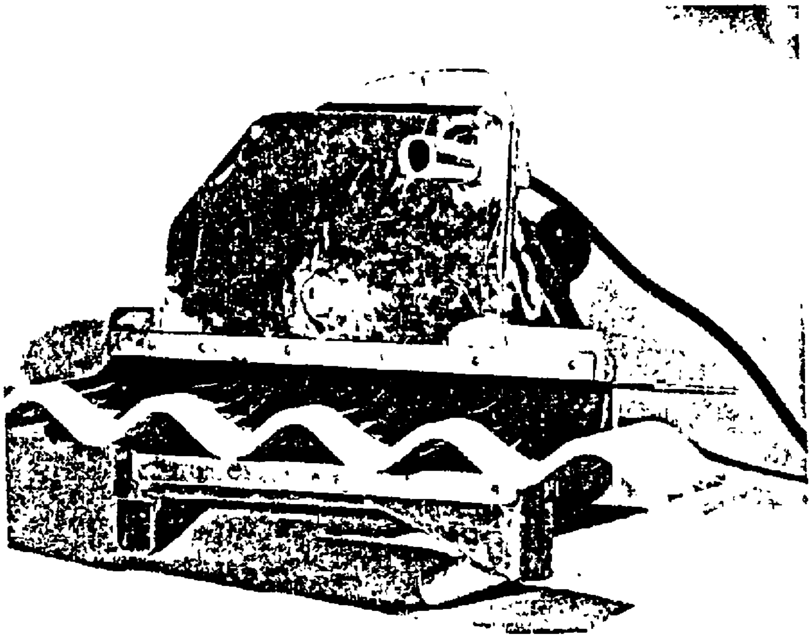
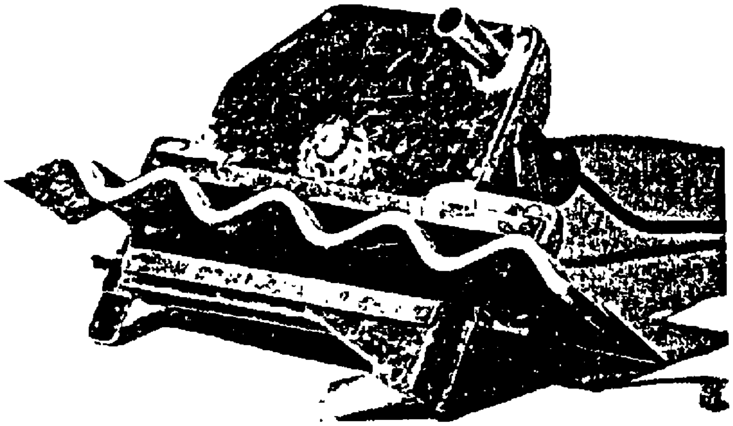
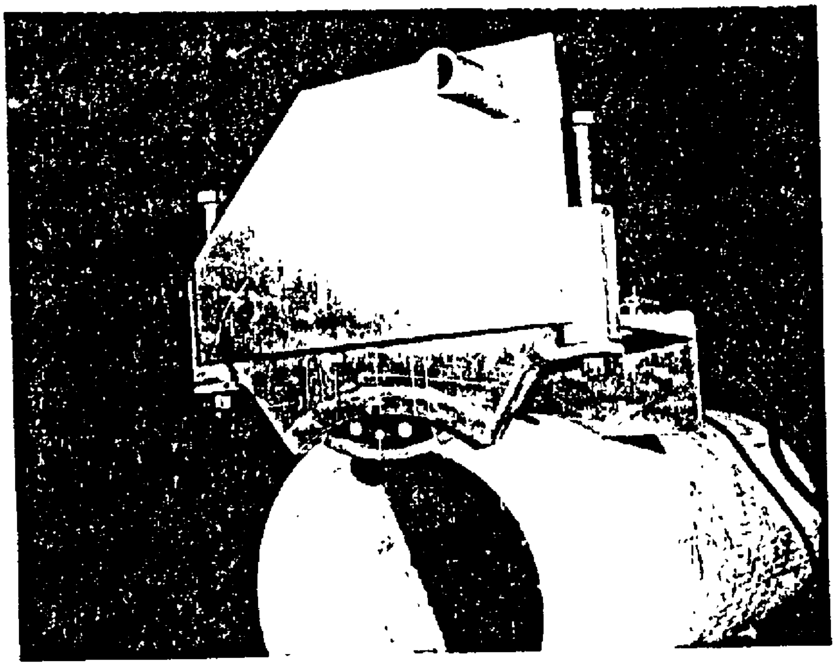
CIRCULAR SAW FOR CUTTING CORRUGATED A/C SHEET







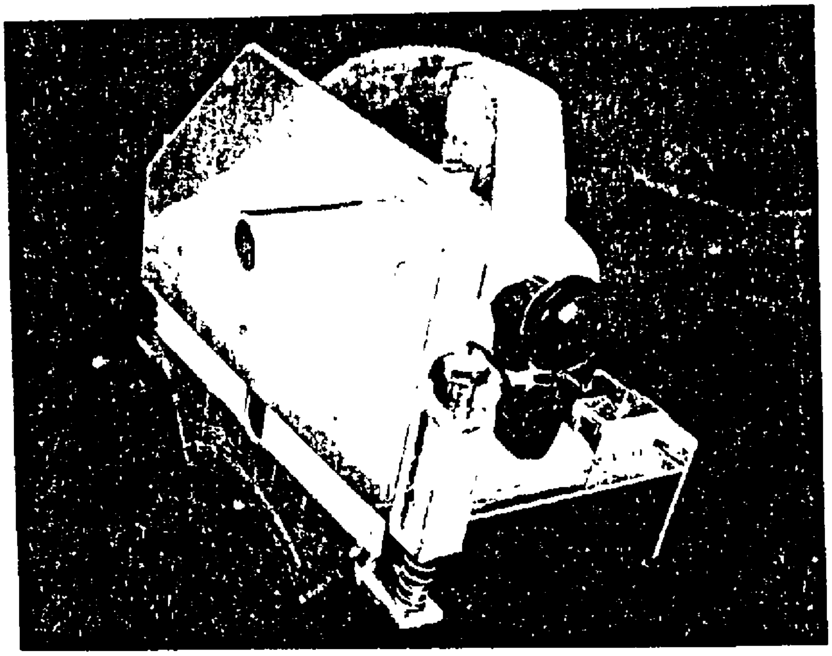


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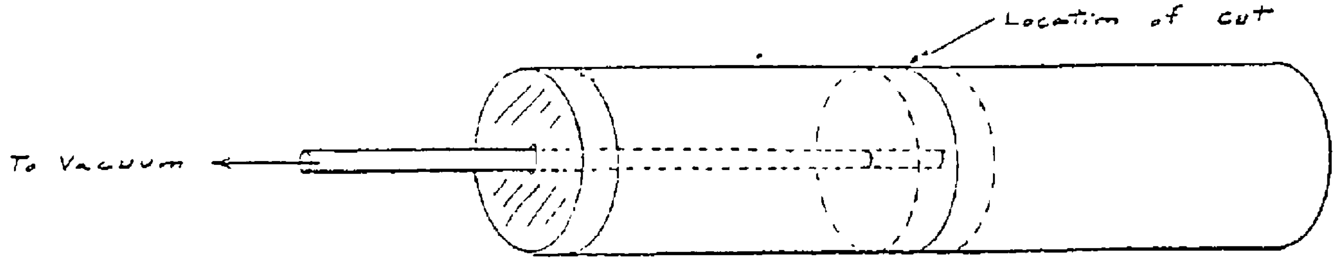
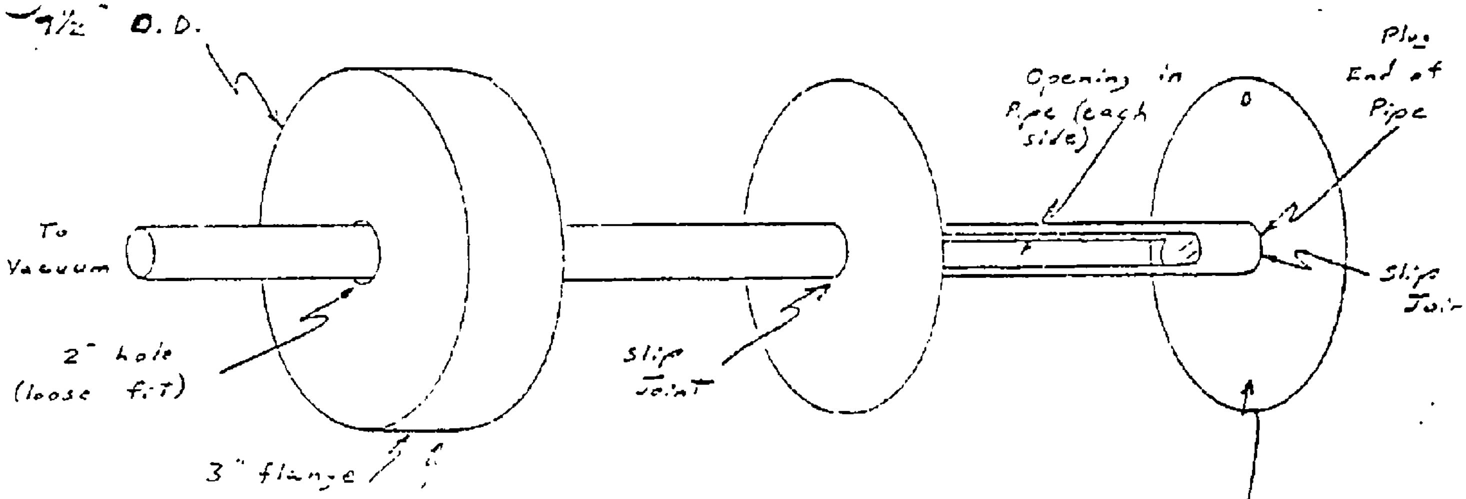
Figure 2
Pipe Saw

Dust Collection From Pipe Interior
(8" Pipe)



General Arrangement



Fits inside pipe
to center &
stabilize vacuum
line

¼" plywood x 7½" ɸ
⅛" rubber x 8¼" ɸ
(each baffle)
(3" between baffles

Detail

Scale: schematic

TOOLS FOR ASBESTOS-CEMENT FABRICATION

OPEN ROOM (1/4-INCH FLEXBOARD)

Tool Description	Test Conditions	Test Duration (min)	Work Done	Dust Count (f/cc) Area	Dust Count (f/cc) Pers.	Remarks
Power Drill (1/4-inch)	Cape Shield. Nilfisk vacuum	40	163 holes	0.0	<0.1	
"Nibbler" (DanKlip No. 30647)	No vacuum pickup	40	450-inches	0.0	<0.1	Some debris
Rockwell Circ. Saw (masonry blade)	J-M shield, Nilfisk vacuum	40	720-inches	---	0.0	
Rockwell Sabre Saw	J-M shield, Nilfisk vacuum	40	480-inches	0.1	0.1	Slight debris
Handsaw (Eternit Sag No. 80810)	No vacuum pickup	15	53.5-inches	---	0.2	Much debris
Hand Clippers (Eternit Saks No. 80805)	No vacuum pickup	15	270-inches	0.0	0.3	(1/8-inch A/C)
Scoring Knife (Eternit RisseKniv No. 30800)	No vacuum pickup	15	272-inches	---	0.8	(1/8-inch A/C)
Hand rasp	No vacuum pickup	40	600 strokes	0.1	0.1	Much debris

TOOLS FOR ASBESTOS CEMENT FABRICATION
TEST CHAMBER (1/4-INCH FLEXBOARD)

Tool Description	Test Conditions	Test Duration (min)	Work Done	Material Pulverized (gm)	Pulverized Mat'l Captured (percent)[1]	Dust Count (f/cc)	Remarks
Power Drill (1/4-inch)	No shield, no vacuum pickup	40	163 holes	75	13	0.9	Visible Dus
Power Drill (1/4-inch)	Cape shield, Nilfisk vacuum	40	163 holes	77	87	0.2	No visible dust
"Nibbler" (DonKilp No. 80847)	No vacuum pickup	40	450-inches	(?)[2]	(?)[2]	1.0	Much debri
Festo circ. saw (diamond blade)	With shield, Nilfisk vacuum	40	665-inches	481	97	4.5	Slight visi dust
Rockwell circ saw (diamond blade)	Cape shield, wood backing, Nilfisk vacuum	15	270-inches	249	90	7.4	Much dust on board
Rockwell circ saw (masonry blade)	No shield, no vacuum pickup	15	270-inches	325	39	21.0	Very dusty
Rockwell circ saw (masonry blade)	J-M shield, Nilfisk vacuum	15	270-inches	338	99	0.0	No visible dust

---

Fine material captured by bag house and/or vacuum cleaner as a percentage of total material pulveri

Not measureable. Tool shattered strip being cut off.

Tool Description	Test Conditions	Test Duration (min)	Work Done	Material Pulverized (gm)	Pulverized Mat'l Captured[1] (percent)	Dust Count (f/cc)	Remarks
Rockwell Sabre Saw	No shield, no vacuum pickup	15	180-inches	80	16	9.8	Very dusty
Rockwell Sabre Saw	J-M shield, Nilfisk vacuum	15	180-inches	95	91	0.6	Slight debr
Handsaw (Eternit Sag No. 30810)	No vacuum pickup	15	53.5-inches	31	6	0.3	Much debris laborious
Hand rasp	No vacuum pickup	15	225 strokes	17	18	0.8	Much debris

---

[1] Fine material captured by bag house and/or vacuum cleaner as a percentage of total material pulver

APPENDIX

TABLE 1. RESULTS OF DUST TESTS

	Test Conditions[1]	Test Duration (min)	Material Pulverized by Tool				Percent Pulverized Material Captured	Dust Count f/cc	Remarks
			No Holes	Holes/Min	Material Pulverized				
					Total gm	gm/min			
Drill - Black & Decker 1/8-inch Carbide Tipped Masonry Bit (#1405-0)	No dust control	15	60	4.0	10	0.67	40.0	1.8	Visible Dust
Drill - Black & Decker 1/8-inch No. 725 Carbide Tipped Cleveland Twist Drill (#27-EDP-08847)	No dust collection	15	60	4.0	9	0.6	16.67	0.1	Visible Dust
Drill - Black & Decker 7/8-inch No. 725 Carbide Tipped Cleveland Twist Drill (#25-6021-01491)	No dust collection	15	60	4.0	8	0.53	25.0	0.6	Visible Dust
Drill - Black & Decker 9/16-inch Carbide Tipped Masonry Bit (#1445-0)	No dust collection	15	20	1.3	46	3.07	6.52	0.6	Visible Coarse Dust Fell to Bottom of Chamber
Drill - Black & Decker 1/4-inch Masonry Bit Pilot Cleveland Carbon steel center to 9/16-inch (#132 H)	No dust collection	15	20	1.3	47	3.13	6.38	0.6	Much Fine Dust Fell to Bottom of Chamber

---

[1] Test conditions - Air velocity pressure through chamber (measured in down stream duct) 0.6 inch H_2O

Note - Material being fabricated is flat asbestos-cement sheet, 1/4-inch thick

APPENDIX I

TABLE 1. DUST TESTS WITH PIPE SAW
(8 IN. - 150 PIPE)

	Test Duration (min.)	Fibers/cc
Dust Chamber		
Rockwell Saw - No dust collection (as rec'd. from mfgr.)	5	191
J.M. Shield - No dust collection on pipe interior	15	64.9
J.M. Shield - Pipe ends plugged - dust collection from entire pipe interior	15	0.9
J.M. Shield - Baffles in pipe to isolate cutting zone, with dust collection only from isolated area.	15	0.3
Open Room		
J.M. Shield - Baffles in pipe to isolate cutting zone, with dust collection only from isolated area.	40	personal-0.2 area - <0.1

APPENDIX

TABLE 1
Dust Test Results
(Membrane Filter Method)

Dust Test Chamber[1]

1.	No shield, no vacuum pickup. Cutting across corrugations. (Saw as received from manufacturer). Cut 2.0 linear feet, 5 minutes	60.4 f/cc
2.	Shield and vacuum in use. No rubber skirts on shield. Cutting across corrugations. Cut 7.0 linear feet.	2.0 f/cc
3.	Shield with skirts and vacuum in use. Cutting across corrugations. Cut 7.0 linear feet.	0.0 f/cc
4.	Shield with skirts and vacuum in use. Cutting with corrugations. Cut 8.0 linear feet.	0.3 f/cc
5.	Shield with skirts and vacuum in use. Cutting diagonal to corrugations. Cut 8.75 linear feet.	0.6 f/cc

Open Room[2]

1. Shield with skirts and vacuum in use. Cutting across, with and diagonal to corrugations. Cut 45.2 linear feet.

Personal - <0.1 f/cc
Area - 0.0 f/cc

---

[1] Cut 3/8-inch corrugated sheet, 15 min test duration, with common masonry blade.

[2] Same as tests in dust chamber, but 40 min test duration.

Tools for the Fabrication of A/C

Abrasive Disc Saw	8-1/4-inch Rockwell Model 368-1 (Use with J-M shroud)
Sabre Saw	Rockwell Model 548 Bayonet Saw Carbide Blades - Rockwell Type 6T (No. 12390) (or equivalent) (Use with J-M shroud)
Drill	1/4-inch Rockwell Model 7501 (Use with Cape Universal Building Products Ltd. "Portable Drill Nozzle Kit - Pat. App. 59390")
Vacuum Cleaner	Nilfisk Model GA73 with: Nilfisk 10-foot (2-inch Ø) hose No. 106298 Nilfisk 10-foot (2-inch Ø) hose ext. No. 106297 Nilfisk (3) microfilters No. 613274 Nilfisk (3) HEPA filters No. 115120 Nilfisk Container Frame No. 017101 Hose Adapter - 2-in. X 1-in. X 1-in (available from J-M) 1-inch ID hose - (Central States Ho Company) - Kana Flex (150 cl) (or equivalent)
Nibbler (use with Rockwell Drill) (For use on sheet to 3/8-inch thickness)	Norcem "PanKlip" No. 80847 (Use with drill adapter available from J-M)
Handsaw (For use where a limited amount of cutting is required)	Norcem Eclipse Saw- "Eternit Sag" No. 80810 Blades - Norcem "Ekstra Sagblad" No. 80811, Type 56-10.
Scoring Knife (For use on sheet to 1/4-inch thickness)	Norcem "Eternit Risse Kniv" No. 808
Hand Clippers (For use on sheet to 3/16-inch thickness)	Norcem "Eternit Saks" No. 80805
Hand Rasp (For limited use only)	Many types are available in all loc areas.

Suppliers

Disc and Sabre Saws, Drills	Rockwell International - Dealers are located in most local areas.
Drill Shroud	Cape Universal Building Products, Ltd. Register Office, PO Box 165, Exchange Road, Watford, England Telex 262744 Telephone WATFORD 34551
Vacuum Cleaner and Attachments	Nilfisk of America Inc. 201 King Manor Drive King of Prussia, Pennsylvania 1940 Telephone (215)-277-3900
Nibbler, Handsaw, Scoring Knife, Hand Clippers	Norcem, 3470 Slemmestad Oslo, Norway Telephone (02)-78-03-60
1-inch Hose	Central States Hose Company 5175b Stapleton Drive Denver, Colorado (Equivalent material is locally available in other areas.)
Disc saw shroud, sabre saw shroud, hose adapter (2X1X1 Y), Nibbler adapter	At the present time these items must be ordered from Johns-Manvil

JM Johns-Manville
Research and Development Center

E

Report No. E411-1063

Date November 9, 1978

Title: CIRCULAR SAW FOR DRY-CUTTING CORRUGATED A/C SHEET

SUMMARY

A shield has been developed for a standard portable circular saw (Rockwell Model 368-1), which allows corrugated asbestos-cement sheet to be cut dry in an acceptably dust free manner. The shield, illustrated in the Appendix, consists of upper and lower cases which enclose the blade and cutting zone. Each case is connected to a vacuum source (Nilfisk GA73 vacuum cleaner) by 1-inch hoses. The shield works on the principle of near-total enclosure of the cutting zone, to maximize the use of the available vacuum to retain dust within the enclosure and thus allow its removal.

The difficulty in enclosing the cutting zone when cutting corrugated, compared to flat sheet, is that the undulating surface presented to the blade is constantly changing. To achieve enclosure of the cutting zone, the "valleys" between corrugation crests must be blocked off to minimize air ingress, both above and below the sheet. However, the structure which blocks the "valleys" must be able to rise out of the depressions and over the crests. Additionally, the saw must be easy to use, i.e., the shield cannot "drag" on the sheet and require excessive force to operate. To solve these problems, overlapping rubber strips were placed on each side of the upper and lower cases. As the saw moves across the sheet, the strips extend into the "valleys" and effectively fill them to exclude air from the shield. They fold outward when a crest is encountered.

Tests using a common masonry blade (Table 1) in the "dust chamber" show that with no shield or dust collection, the dust count was 60.4 f/cc. With the shield, but with no rubber skirt, the count was 2.0 f/cc. There were substantial visible emmissions of dust during this test, and this fiber count is questionnably low. With the skirt, counts of 0.0 to 0.6 f/cc were attained, illustrating the effect of the device. Tested in an open room, the maximum fiber count was <0.1 f/cc.

It is concluded that this shield allows the cutting of corrugated asbestos-cement sheet with a circular saw, equipped with a common masonry blade, with fiber counts well under the 2.0 f/cc TLV. Cutting may be done across, with, or diagonal to the corrugations. It is believed that this device will be particularly useful to the medium and large contractor, on jobs where a substantial amount of cutting or trimming is required.

Contents: Summary, Appendix

Reported by ____________________
F. M. Bodycomb
Asbestos & Mineral Technology

Reported by G R Bauman
G. R. Bauman
Asbestos & Mineral Technology

lkh

F. L. Pundsack	- 1-03 (S)
C. J. DeBiase	- 3-15 (S)
M. Harris	- 2-12 (S)
D. Poutiatine	- 2-14
J. Connor	- 2-14
J. Reis.	- 2-14
D. Kelleher	- 2-14
R. M. Krone	- 2-20
L. Siebert	- 2-14
E. M. Fenner	- 1-06
W. B. Reitze	- 1-06
G. L. Swallow	- 1-06
J. V. Magee	- 2-10
J. W. McLain	- 2-20
J. P. Leinweber	- 1-06
R. Kotin	- 1-06
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J. Laipenieks	- 1-05
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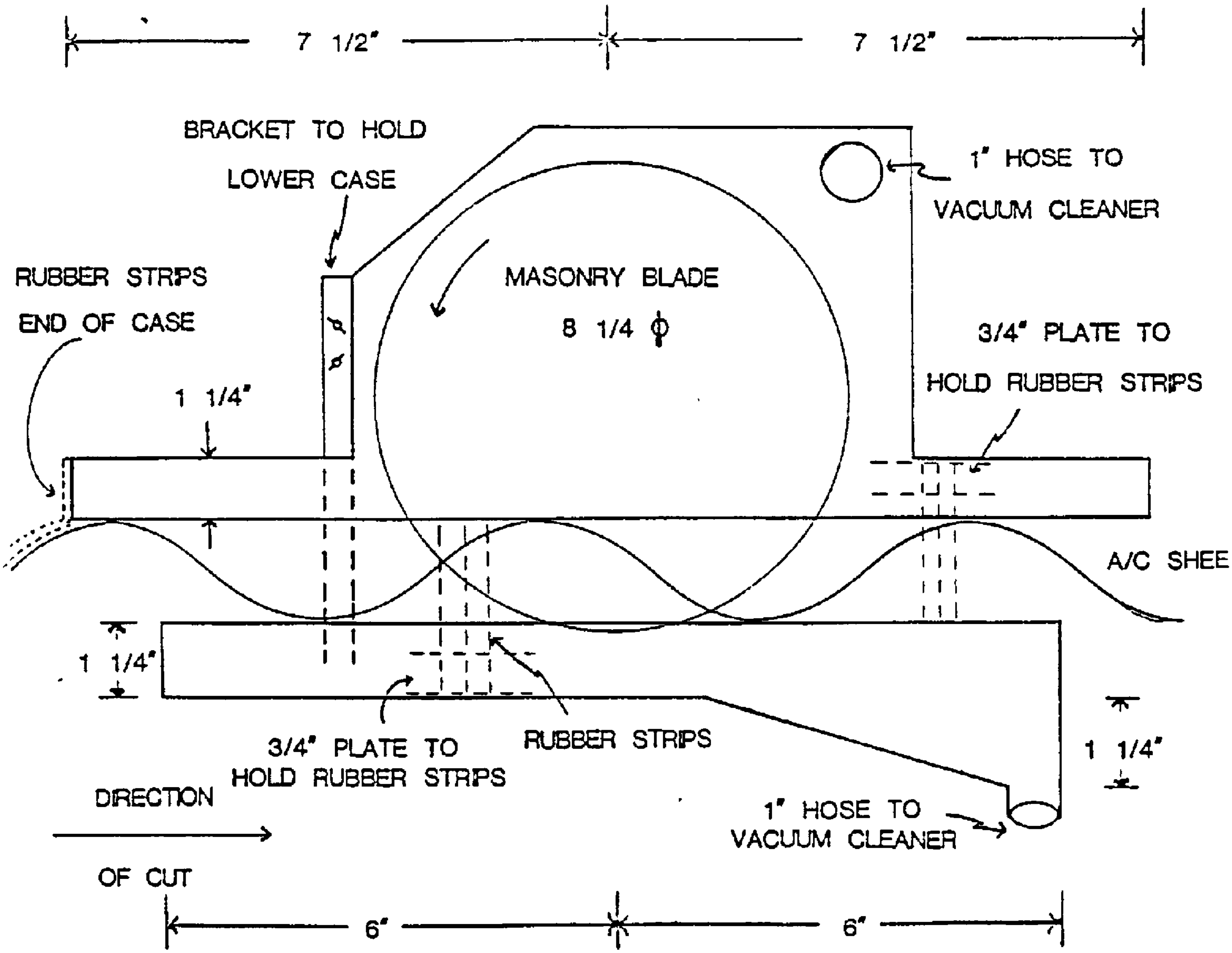
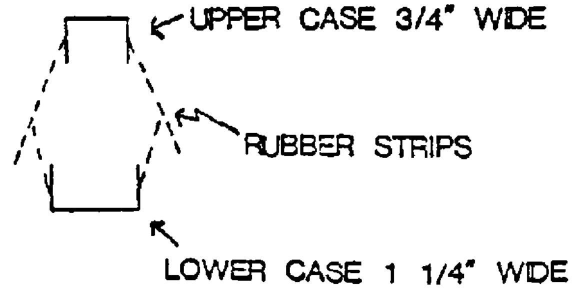
KEYWORDS
Asbestos
Asbestos-Cement
Fabrication
Dust
Dust Collection
Environmental Health

SAW & SHIELD FOR CORRUGATED A/C





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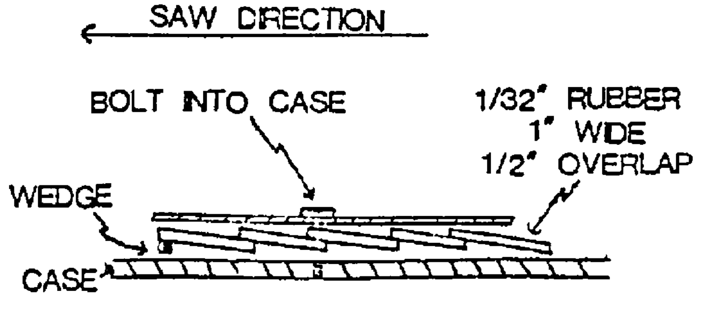
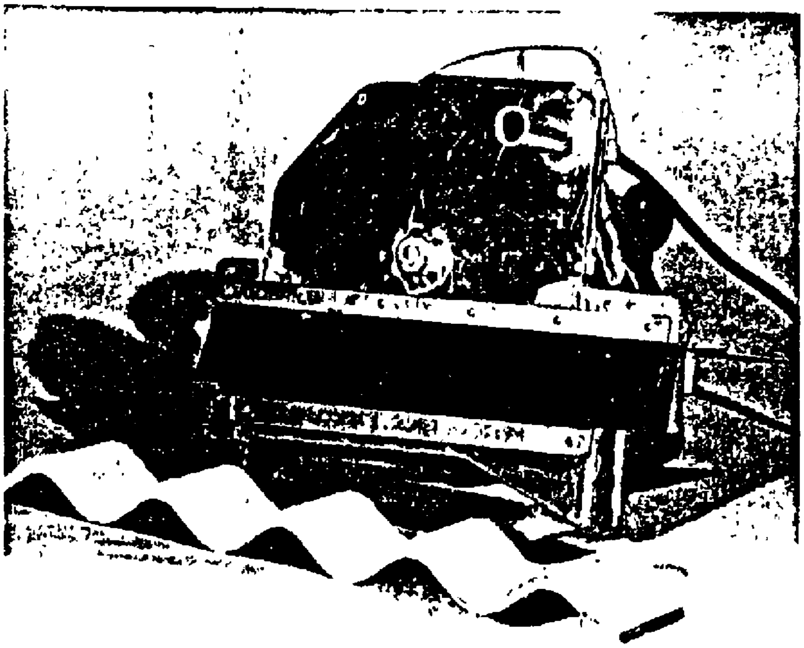


DETAIL: RUBBER STRIPS

PRODUCED JM - 83

SCALE: SCHEMATIC

APPENDIX
FIGURE 1
CIRCULAR SAW FOR CUTTING CORRUGATED A/C SHEET

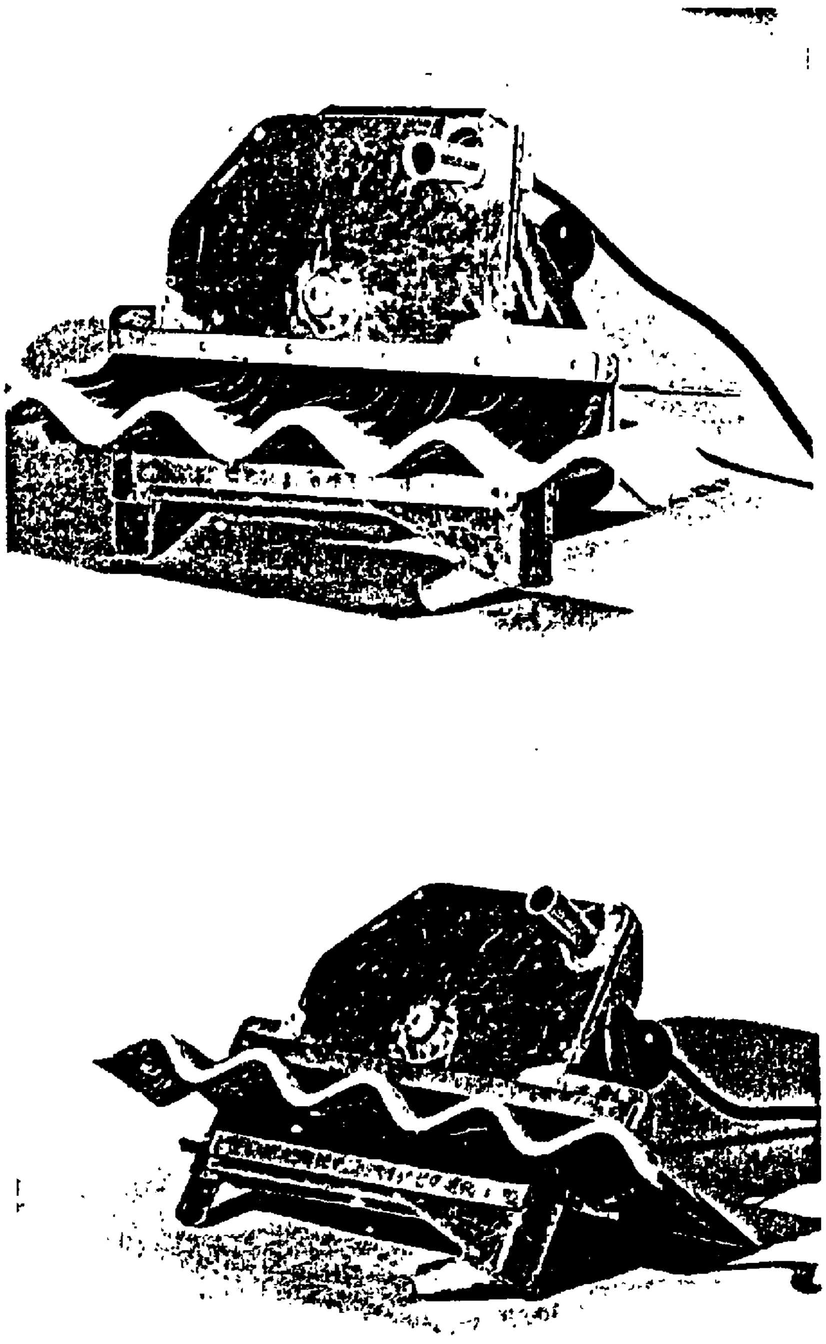


Vacuum Source - Nilfisk GA 73

Vacuum: 60" W.G.
Airflow: 180 CFM
Filtration: 3 stage

APPENDIX
FIGURE 2

CIRCULAR SAW FOR CUTTING CORRUGATED A/C SHEET



JOHNS-MANVILLE RESEARCH
AND ENGINEERING CENTER

Report No.

Date

Title: EFFECT OF WEATHERING ON ASBESTOS-CEMENT PANELS

SUMMARY

Corrugated and Flat TRANSITE panels, which had been normal cured, were removed for examination from the roof and the east and north walls of the Johns-Manville Nashua, New Hampshire plant after 42 to 45 years installation. COLORLITH, a steam cured product, was also removed from a vertical weathering deck with a southern exposure after 12 years exposure in Finderne, New Jersey.

These panels were examined visually and measured for decrease in thickness, as compared to unexposed areas protected by overlaps or battens.

Results were as follows:

Product	Location	Decrease in Thickness Inches	Decrease in Thickness Inches per Year
Corrugated TRANSITE	Nashua, NH West Roof	0.002	0.00005
Corrugated TRANSITE	Nashua, NH East Wall	0.014	0.00033
Flat TRANSITE	Nashua, NH North Wall	0.012	0.00027
COLORLITH	Finderne, NJ Southern Exposure		
	Cameo Brown	0.0025	0.00021
	Surf Green	0.0017	0.00014

Visual examination of the Corrugated and Flat TRANSITE revealed an eroded appearance with some asbestos fiber protruding from the surface.

The only change noted for the COLORLITH was some color lightening.

It is concluded that these asbestos-cement products are subject to very little surface erosion, perhaps a maximum of 0.0003 inches per year.

Contents: Summary, Introduction, and Discussion

Reported by: ______________________
R. H. Neisel

kjm

Notebook: 3572, pp. 1-11

INTRODUCTION

The data presented in this report was abstracted from a confidential Johns-Manville Report, No. 422-INT-350, prepared March 6, 1970 by Osborn Ayers. That report contained much additional data on other products with no pertinence to the present question of erosion of uncoated surface asbestos-cement products.

The TRANSITE panels were removed from the Nashua plant buildings in November 1966. The buildings were 42 to 45 years old at the time and the panels were installed when the buildings were first erected in 1921 to 1924. In order to accumulate this data, the selected panels were removed and forwarded to the Johns-Manville Research Center in Finderne, New Jersey where the examination was conducted. The panels were still structurally sound and the remainder of the installation was still functioning as the weather protective surface of the buildings.

DISCUSSION

The materials removed were as follows with the indicated observations and measurements. Material which had been covered by laps or battens was compared to exposed material.

Corrugated TRANSITE - West Side of No. 2 Building Roof at Nashua Plant after 42 Years

1. A build-up of airborne material was on the surface of this panel. The build-up was 1/8 to 1/4-inch thick and was removed before measuring. Measurement of areas protected from the weather indicated an average thickness of 0.286 inches while thickness of the exposed area averaged 0.284 inches.
2. The thickness differential was 0.002-inch or 0.000048 inches per year. The difference was not statistically significant. Apparently the loose surface covering had protected the surface as no visual evidence of surface erosion was found.

Corrugated TRANSITE - East Wall of No. 2 Building at Nashua Plant after 42 Years

1. No build-up of surface material existed on this sheet. Measurement of weather protected areas indicated an average thickness of 0.261 inches while the exposed area averaged 0.247 inches.
2. The thickness differential was 0.014 inches or 0.00033 inches per year.

Flat TRANSITE - North Wall of No. 1 Building at Nashua Plant after 45 Years

1. No build-up of surface material. The protected area averaged 0.207 inches and the exposed area averaged 0.199 inches.

2. The thickness differential was 0.008 inches or 0.00027 inches per year.

COLORLITH - Vertical Southerly Exposure on Weather Rack at Finderne, New Jersey after 12 Years

1. One sheet measured 1.2540 inches in the protected area and 1.2515 inches in the exposed area for a difference of 0.0025 inches or 0.00021 inches per year.

2. A second sheet measured 1.2640 inches in the protected area and 1.2623 inches in the exposed area for a difference of 0.0017 inches or 0.00014 inches per year.

TRANSITE

JM Johns-Manville

Internal Correspondence

To W.B. Reitze 1-06

Date: July 18, 1980

From: D.R. Christensen R-24

Copies: D.H. Markusson 2-18
G.L. Swallow 1-06

Subject: INDUSTRIAL HYGIENE DETERMINATIONS
TRANSITE PRODUCTS - SIMULATED FIELD CUTTING

The purpose of this study was to simulate probable worker exposures to asbestos containing dust while cutting various Transite products and to conduct industrial hygiene evaluations by the method used in the United States prior to 1969, the year OSHA became effective and changed the sampling/analytical methodology. The method used for evaluation was the midget impinger which results in concentration determinations in MPPCF, or million particles per cubic foot. Sampling was also done by the current OSHA approved method for asbestos determination and results are given in F/cc, or fibers per cubic centimeter.

In the United States the Greenburg-Smith standard impinger and its midget counterpart were the most widely used instruments for obtaining dust samples for evaluation by counting prior to 1969. In the impinger, air is drawn through a nozzel and impinged against a glass plate set perpendicular to the orifice. The plate is covered with dust-free water or other suitable liquid, which serves to trap and retain the dust particles after they strike the plate. The impinger is operated by an electrically driven vacuum pump. This instrumentation is generally suitable for sampling most dusts in the 0.7 to 10 micrometer diameter range.

The actual apparatus used for these evaluations was the midget impinger filled with 10 milliliters of distilled water, aspirated at 1.0 liter per minute by a personal sampling battery operated pump. Analysis of samples was done by light-field microscope at 100X (magnification) using 10X oculars and a 10X (N.A. = 0.25) flat field achromatic objective. The microscope ocular was equipped with a Whipple graticule which is divided into 100 ruled fields of which 25 are used in the evaluation.

The concentration in MPPCF, or million particles per cubic foot is calculated using the following formula,

$$\text{Particles per Cubic Foot} = \frac{\text{Count/mm}^2 \times 4 \times 1000 \times \text{Vol. sample liquid, ml.}}{\text{Cubic Feet of Air Sampled}}$$

Cutting the Transite products was done with a Rockwell, Model 368-1, 8¼" builders power hand saw, Figure 1. The saw was equiped with a Carborundum RCC Double Reinforced Silicon Carbide Masonry Cutoff Blade, Catalog Number RCC8A.

Two work environments were sampled, one inside a 40 foot semi-trailer with doors open and approximately 10 feet inside the trailer and the second outside in the ambient environment. These two situations were chosen as those most closely representative of field conditions. Neither of these situations utilize any ventilation control. Both general area and personal or operator breathing zone samples were taken in the two work environments.

Three Johns-Manville Transite products were tested in this study.

1. Transite Pipe - 6" Pressure (Fig. 2 & 3)
2. Transite Flat Sheet - ½" (Fig. 4 & 5)
3. Transite Corrugated Sheet - 3/8" (Fig. 6 & 7)

The results of the industrial hygiene determinations are found in Table 1. Please note that the sample durations were from 10 to 15 minutes, corresponding to a peak exposure.

INDUSTRIAL HYGIENE DETERMINATIONS
TRANSITE PRODUCTS - SIMULATED FIELD CUTTING
SAMPLED WEEK OF JULY 7, 1980

TABLE 1

FIGURE NUMBER	PRODUCT	WORK ENVIRONMENT	SAMPLE TYPE	MPPCF CONC.	MPPCF TLV	F/cc CONC.	F/cc TLV
2	TRANSITE PIPE	INSIDE TRAILER	PERSONAL	371.1	5.0	18.7*	10.0
			AREA	255.9	5.0	25.0*	10.0
3	TRANSITE PIPE	OUTSIDE TRAILER	PERSONAL	6.9	5.0	5.0	10.0
			AREA	13.2	5.0	5.9	10.0
4	TRANSITE FLAT SHEET	INSIDE TRAILER	PERSONAL	174.1	5.0	67.8*	10.0
			AREA	220.7	5.0	62.2*	10.0
5	TRANSITE FLAT SHEET	OUTSIDE TRAILER	PERSONAL	92.3	5.0	71.2	10.0
			AREA	101.8	5.0	63.3	10.0
6	TRANSITE CORRUGATED SHEET	INSIDE TRAILER	PERSONAL	81.2	5.0	10.0*	10.0
			AREA	87.9	5.0	10.0*	10.0
7	TRANSITE CORRUGATED SHEET	OUTSIDE TRAILER	PERSONAL	1.2	5.0	2.9	10.0
			AREA	8.8	5.0	17.2	10.0

* = Concentration extremely heavy, number is best estimation

Major points of discussion regarding the sample results are the following.

1. Visual observations support the high concentrations found by the analytical methods.
2. No pattern exists as to personal and area samples, that of one being consistently higher than the other.
3. Inside trailer results are greater than those found outside trailer. This is to be expected due to confinement.
4. All inside trailer samples exceed respective TLV's.
5. Majority of outside trailer samples exceed respective TLV's.

The above study was conducted at the Denver - Research & Development Center by R.C. Cordova and D.R. Christensen.

D.R. Christensen

D.R. Christensen

JM Johns-Manville
Sales Corporation

Health, Safety & Environment
Rocky Mountain Area Laboratory

Denver R&D Plant
Denver, Colorado 80217

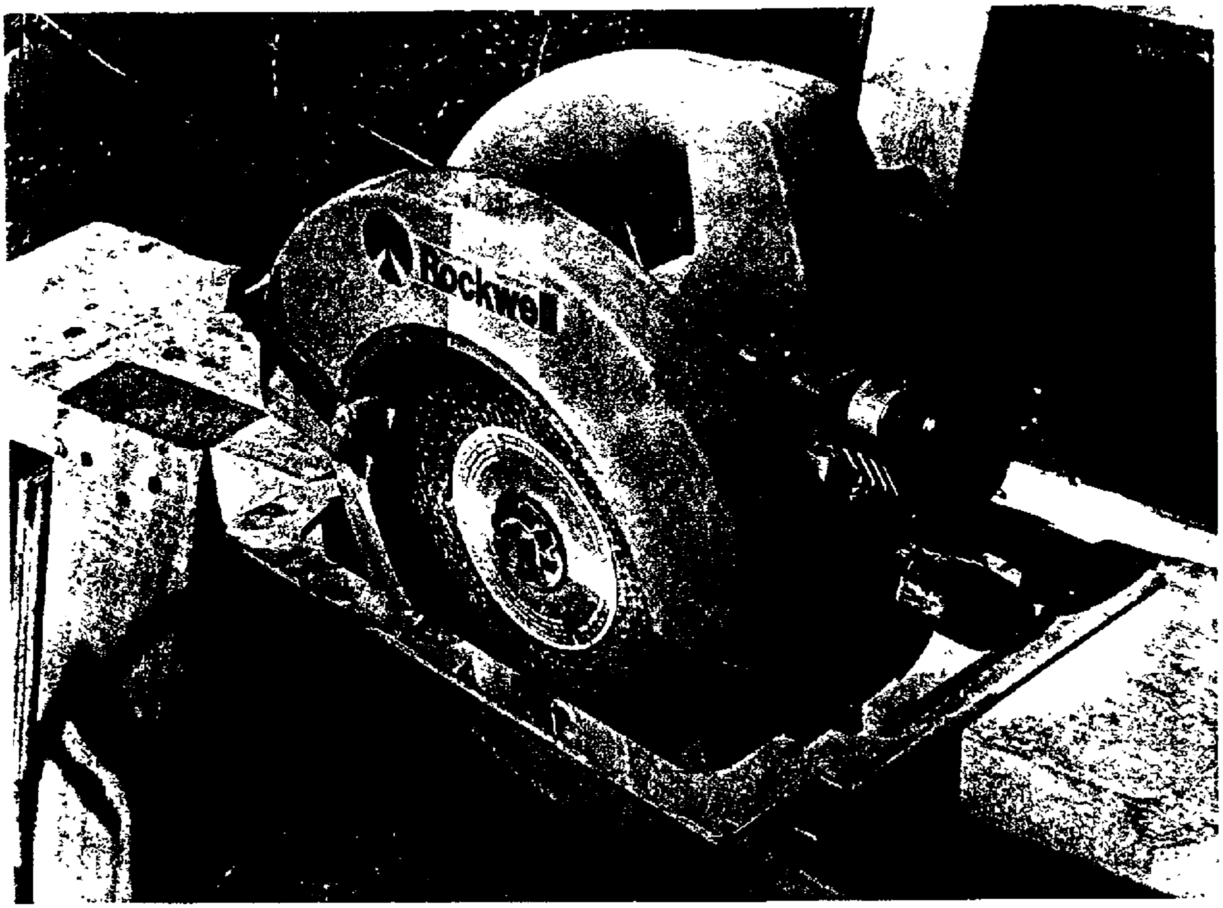


FIGURE 1

ROCKWELL
MODEL 368-1
8½" BUILDERS SAW

Johns-Manville
Sales Corporation

Health, Safety & Environment
Rocky Mountain Area Laboratory

Denver - R & D Plant
Denver Colorado 80217

FIGURE 2

TRANSITE PIPE
6" PRESSURE
INSIDE TRAILER

Johns-Manville
Sales Corporation

Health, Safety & Environment
Rocky Mountain Area Laboratory

Denver · R&D Plant
Denver, Colorado 80217

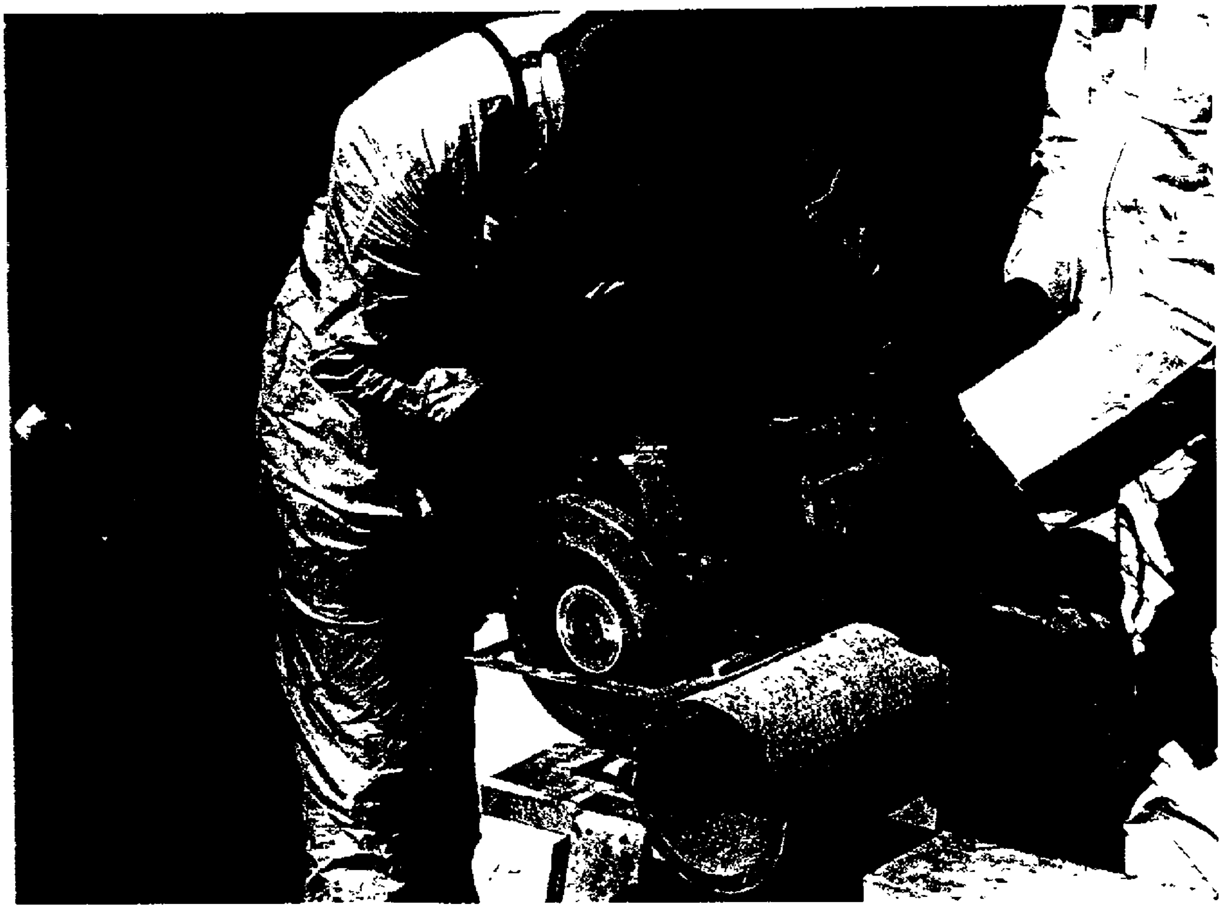


FIGURE 3

TRANSITE PIPE
6" PRESSURE
OUTSIDE TRAILER

PRODUCED
JM - 83

Johns-Manville Sales Corporation

Health, Safety & Environment
Rocky Mountain Area Laboratory

Denver · R & D Plant
Denver, Colorado 80217

FIGURE 4

TRANSITE FLAT SHEET
1/2"
INSIDE TRAILER

Johns-Manville
Sales Corporation

Health, Safety & Environment
Rocky Mountain Area Laboratory

Denver - R & D Plant
Denver Colorado 80217

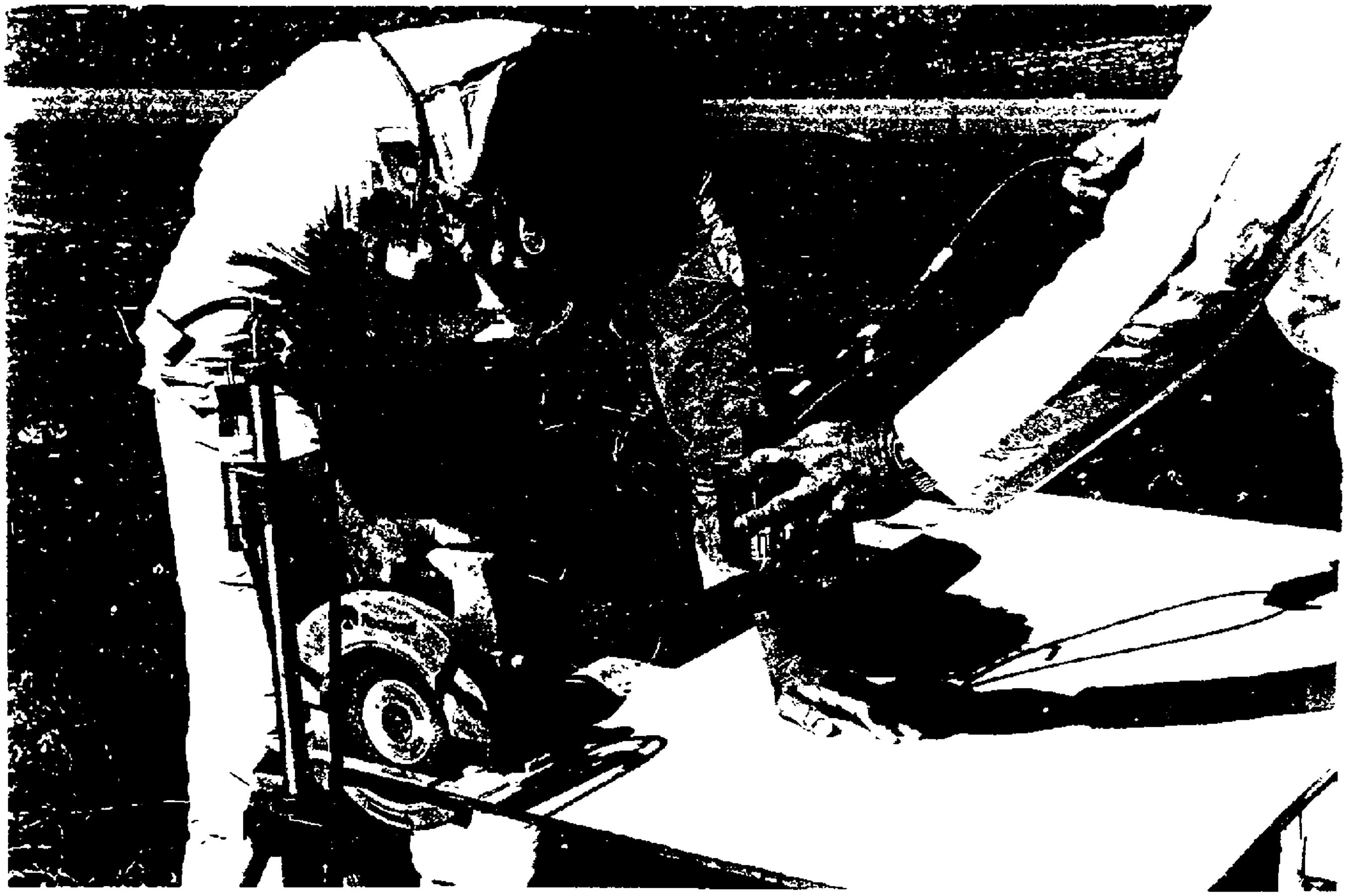


FIGURE 5

TRANSITE FLAT SHEET
1/2"
OUTSIDE TRAILER

Johns-Manville
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Health, Safety & Environment
Rocky Mountain Area Laboratory

Denver R & D Plant
Denver, Colorado 80217

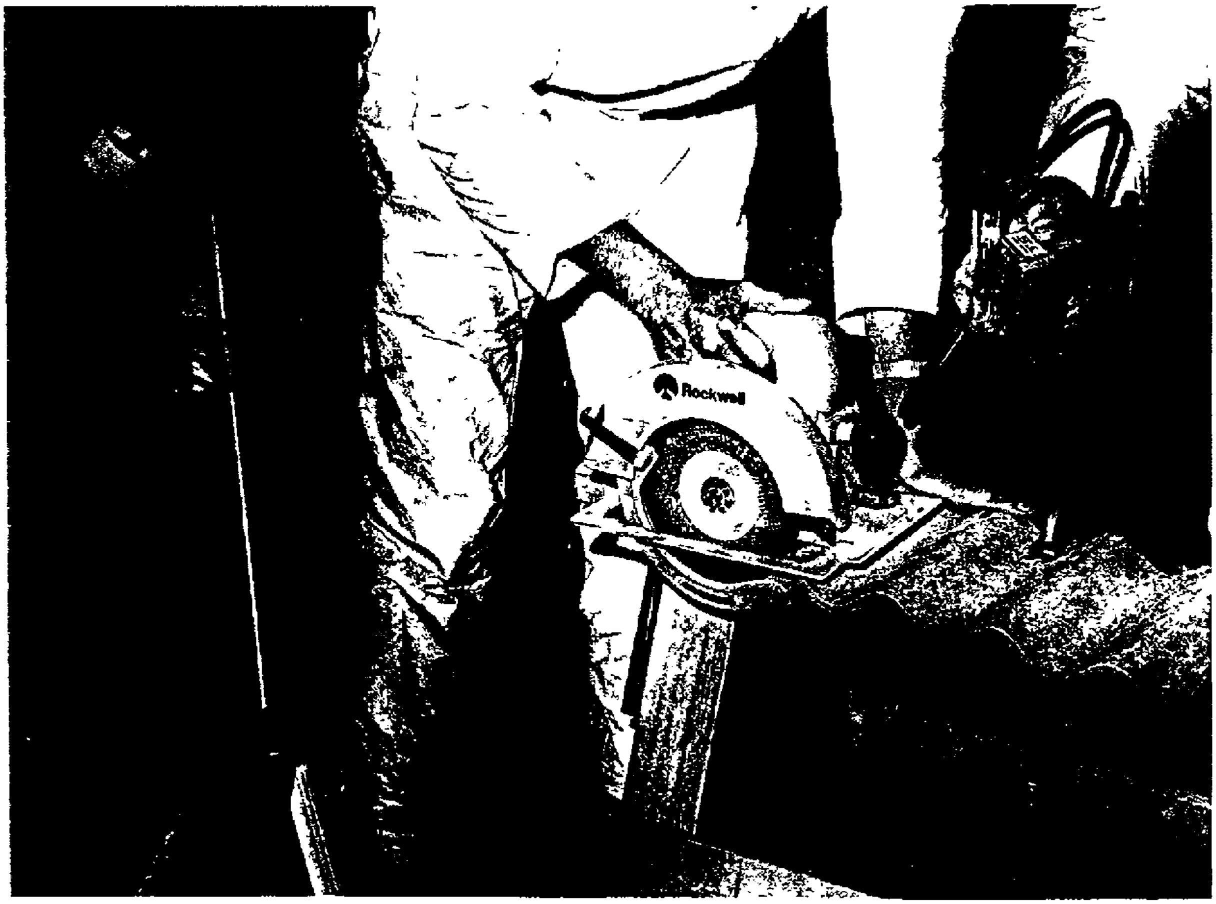

FIGURE 6

TRANSITE CORRUGATED SHEET
3/8"
INSIDE TRAILER

Johns-Manville
Sales Corporation

Health, Safety & Environment
Rocky Mountain Area Laboratory

Denver - R & D Plant
Denver, Colorado 80217

FIGURE 7

TRANSITE CORRUGATED SHEET
3/8"
OUTSIDE TRAILER