PLAINTIFF'S EXHIBIT
UC-4156

Recommended Work Practice Procedures for Asbestos-Cement Sheet

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Shortly after the promulgation of the original asbestos standard in 1972, the Johns-Manville (J-M) Corporation actively began pursuing the development of local exhaust systems for use with portable power tools used in the field fabrication of A/C sheets. Initial attempts to interest tool manufacturers to market a product that was equipped with a hood and suitable for attachment to a vacuum source met with little success. This setback was partially due to the fact that the demand for such specialized equipment had not evolved as rapidly as the development of the exposure standard. Additionally, portable vacuum systems, meeting the efficiency necessary to filter asbestos dust, were also not available.

During the period between 1973 and 1975, two new vacuum systems were introduced. One was a semi-portable, high efficiency system developed by the Hoffman Company; the other, a much smaller but equally efficient unit, was developed by the Niefisk Company of Sweden. With these advances, J-M undertook an in-house tool development program. Several prototypes were examined and tested, ranging from retrofitted enclosures to systems designed specifically for individual tools. A suitable system was eventually developed in 1975. J-M approached tool manufacturers with their new designs and again, was told there was no interest in marketing such a product line.

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Union Carbide trial exhibit UC-4156: Recommended Work Practice Procedures for Asbestos-Cement Sheet, Excerp... Published by AsbestosClaims.Law
ACL Doc 18760 · Page 2 of 20 asbestosclaims.law/library/18760/2

The tool designs, as well as the vacuum specifications necessary for efficient operation, were first made available by J-M in 1975. AIA/NA subsequently released a pamphlet on A/C sheet illustrating the use of these systems a year later.

Although considered effective, the exhaust system designed for the circular saw was somewhat awkward, i.e., a separate vacuum box collected dust from the bottom of the sheet during cutting operations. In 1977, J-M began development of an improved system. This continued through 1978 and eventually led to the development of a new hood design; one that enclosed the entire saw and eliminated the need for a vacuum box. This design was further refined in early 1979. The Pilot Tool Manufacturing Company (manufacturers of A/C pipe tools) was approached by J-M in early 1979 and agreed to purchase portable tools and equip them with the hoods designed by J-M. Subsequently, the J-M designs were further improved under Pilot's direction.

Through the diligent and persistent effort of J-M, portable power tools equipped with a high velocity/low volume exhaust system are now available for use with A/C sheet.

Air monitoring tests were conducted by J-M on operations involving the use of a circular saw and drill equipped with the newly designed system. The results of these tests are reported in Table XV below.

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Table XV

Air Monitoring Test Results Using Circular Saw and Drill

Equipment	Test Conditions*	Test Duration	Material Fabricated			Dust Concentration
			Type	Quantity	Quantity/ Minute	(personal)
Drill with dust pickup shroud	1/4 inch masonary bit, operated at full speed. Drilled downward through horizontal board	40 min	1/4 inch flat A/C sheet	163 holes	4.08 holes	< 0.1
Circular saw with dust pick-up shroud	Totally enclosed shroud masonary blade	40 min	1/4 inch flat A/C sheet	720 inch	18 inch	0.0

Based on these results, as well as the results from other testing (e.g., saber saws), a work practice manual was developed. Its primary purpose is to inform the users of A/C sheet products of the proper tool selection and work practices which would permit the field fabrication of asbestos-cement sheets in an acceptably dust-free manner. Excerpts from this manual, entitled "Recommended Work Practices for A/C Sheet," are reproduced below.

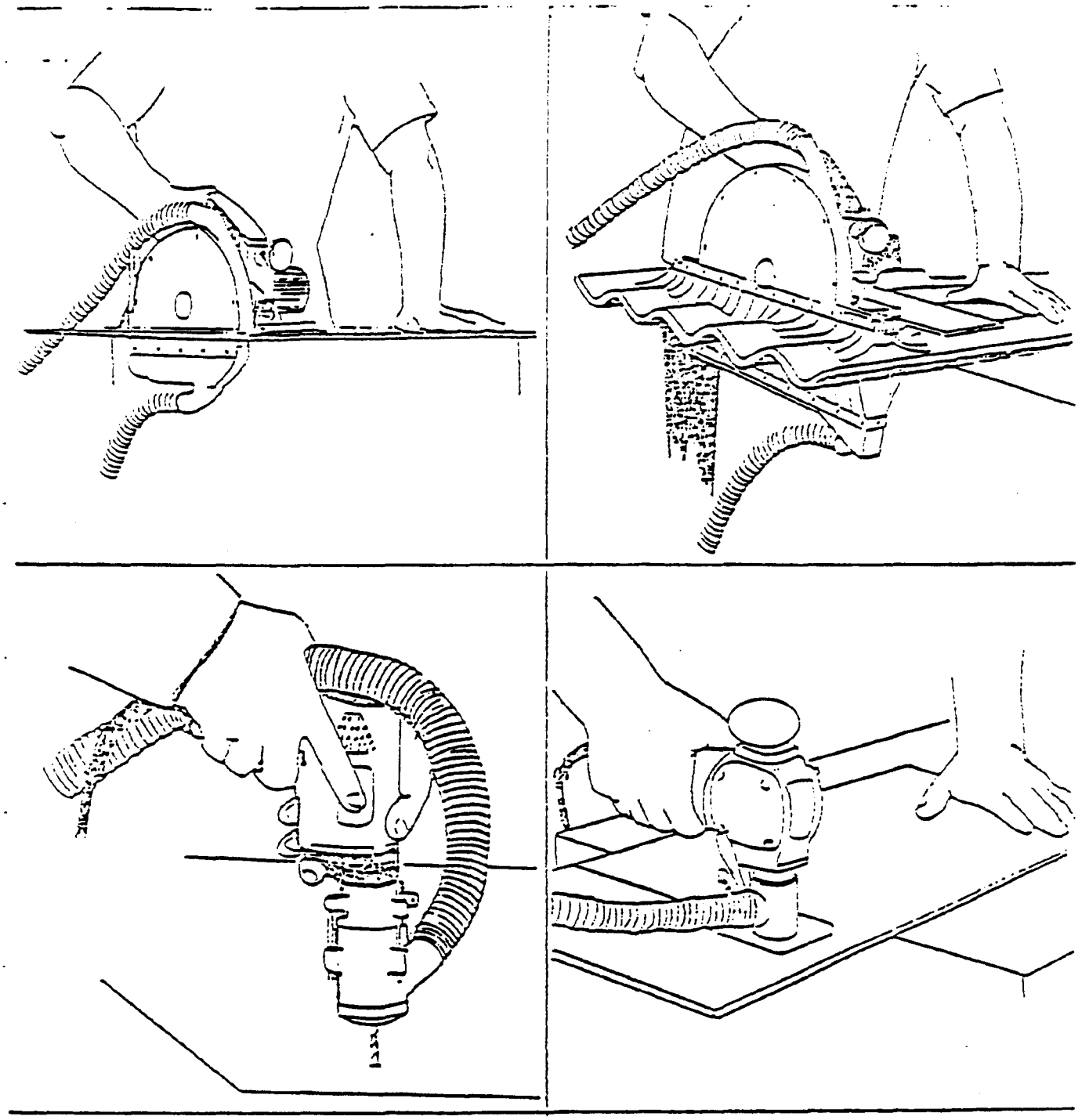
* All tests conducted in an open room.

Source: Johns-Manville Corporation

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RECOMMENDED WORK PRACTICES

FOR

FIELD FABRICATION

OF

ASBESTOS-CEMENT SHEET

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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:

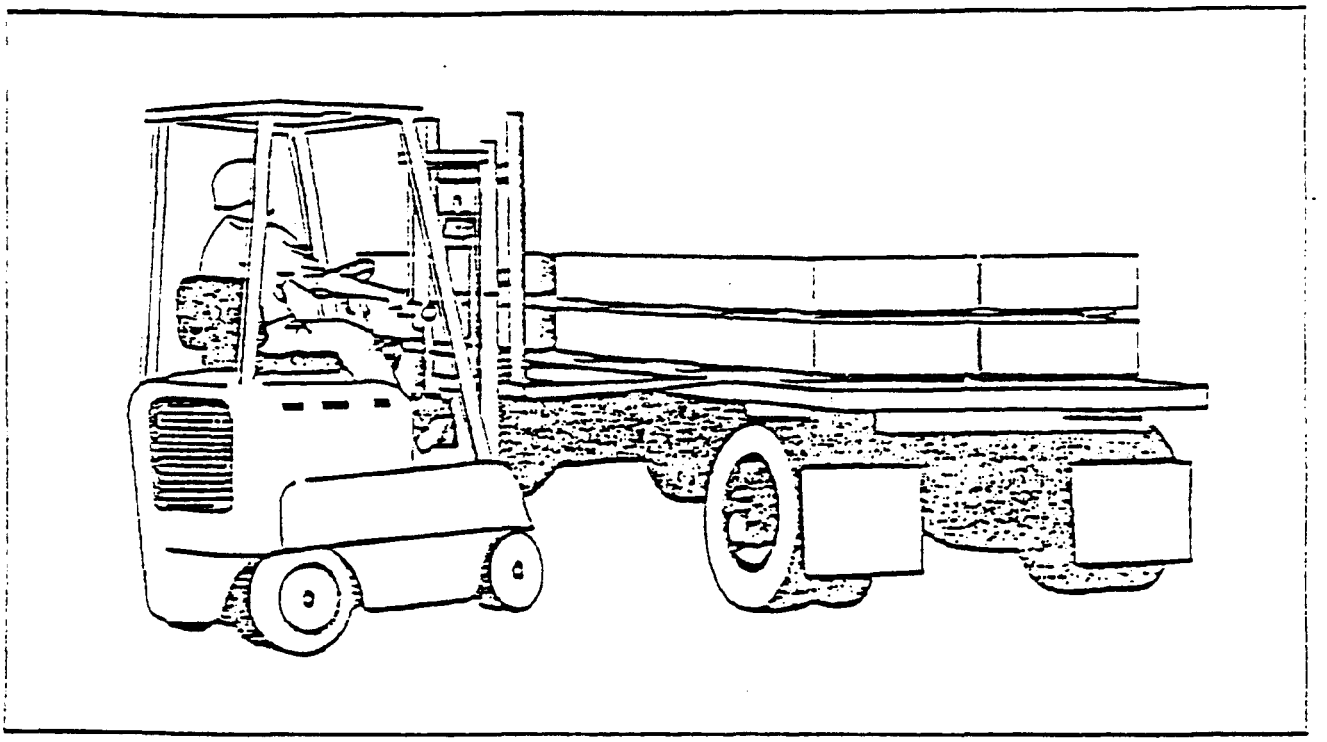
Shipping, Receiving and Handling
Cutting
Drilling
Hole Cutting and Cutouts
Housekeeping and Waste Disposal

Equipment used with these work practices is available from the sources shown in the equipment list.

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Shipping, Receiving and Handling

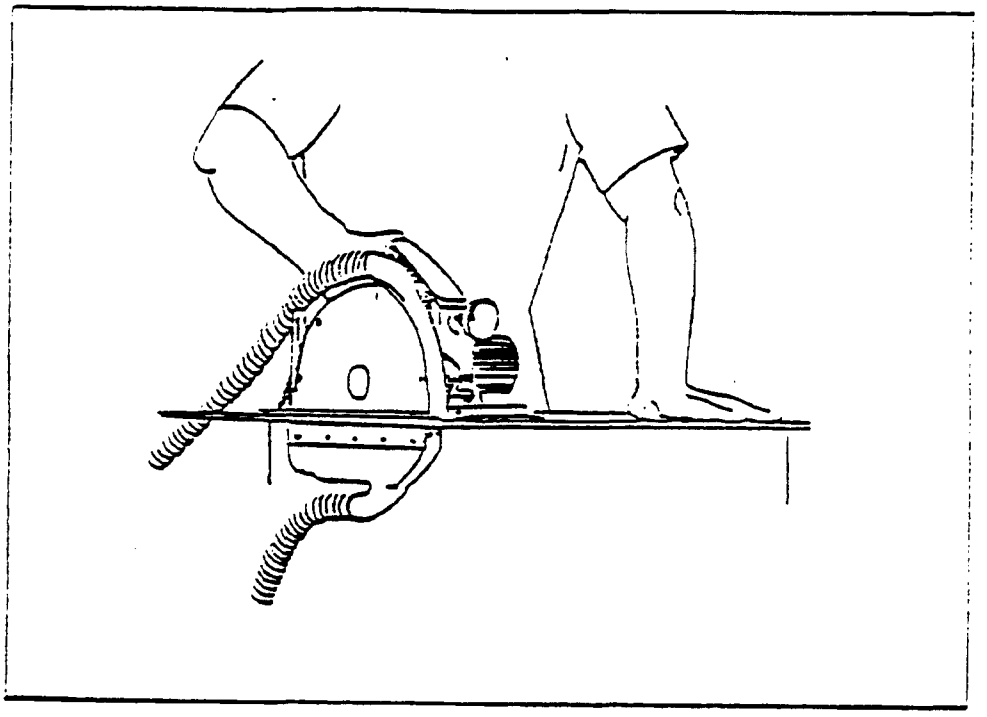


A/C sheet is shipped from the factory with clean surfaces, generally in pallet loads, using shipping methods acceptable to the producer and the customer.

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 for cutting flat sheets should be used only when equipped with the specific dust collection hoods pictured above. Exhaust ventilation and dust collection is provided by a vacuum cleaner as described in the specifications (page 15).

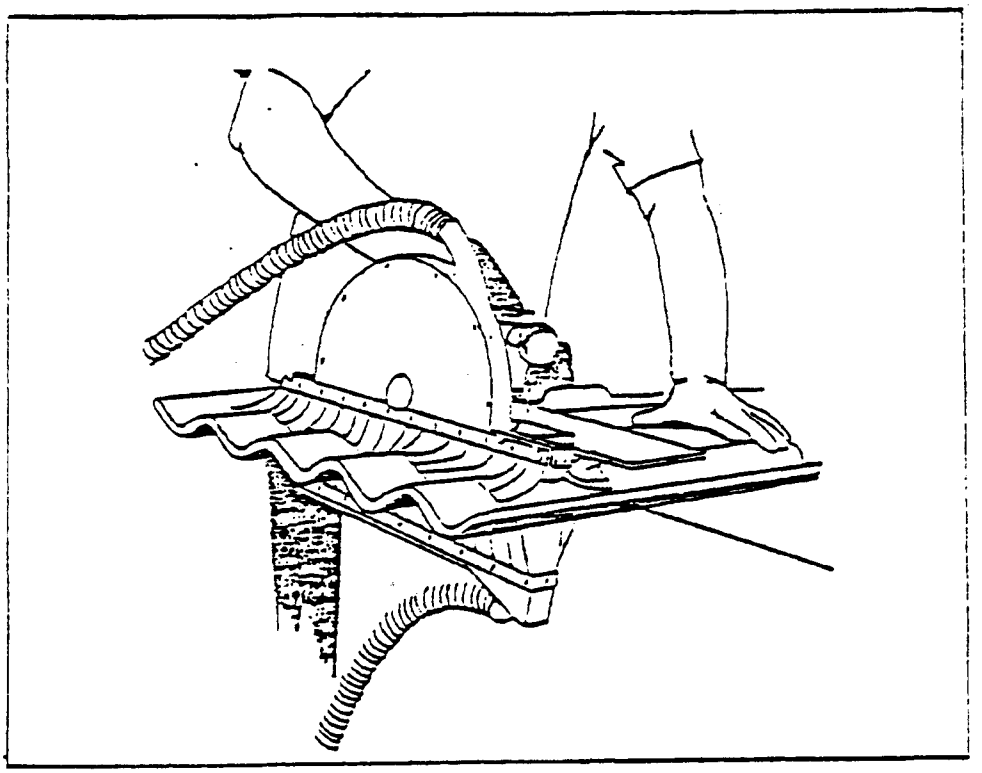
A circular saw cuts by a "pulverizing" action which releases asbestos fibers and fine particulate. The combination of hood and vacuum source is highly effective in capturing and collecting these particles and fibers. Saw operating techniques are those normally employed. No special procedures are required except adjustment of the lower hood section to suit thickness of sheet being cut. Saw design requires the use of blades recommended by the tool supplier (abrasive disc or diamond).

For additional information on saw operation, refer to the supplier's instructions in Appendix A.

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Cutting - Corrugated Sheets
Circular Saw



Circular Saw With Dust Collection Hood

Circular saws for cutting corrugated sheets should be used only when equipped with the specific dust collection hood pictured above. Exhaust ventilation and dust collection is provided by a vacuum cleaner as described in the specifications (page 15).

A circular saw cuts by a "pulverizing" action which releases asbestos fibers and fine particulate. The combination of hood and vacuum source is highly effective in capturing and collecting these particles and fibers. Saw operating techniques are those normally employed. Saw design requires the use of blades recommended by the tool supplier (abrasive disc or diamond).

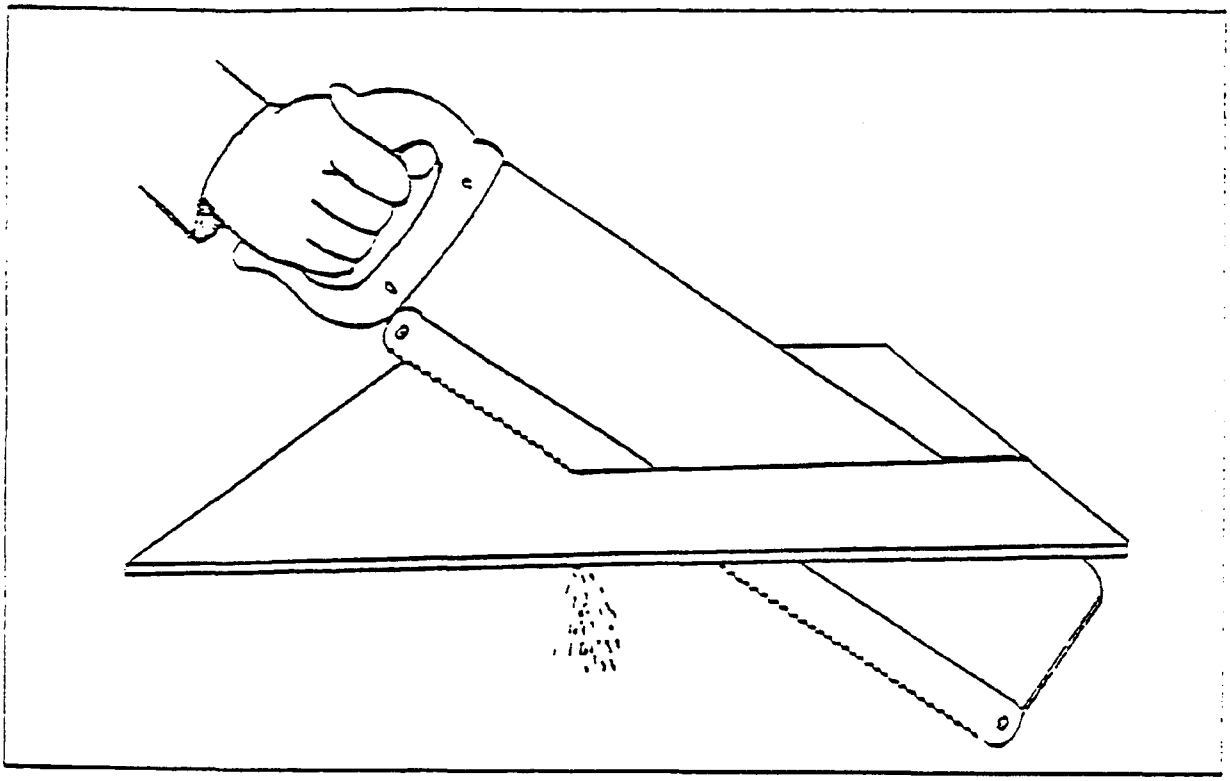
This tool depends on pliable "fingers" to seal the cutting zone and is designed for use on sheets with 1 1/2" deep corrugations. For cutting sheets with deeper or irregular corrugations, consult the tool supplier.

For additional information on saw operation, refer to the supplier's instructions in Appendix A.

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Cutting - Handsaw



Handtools
Handsaw

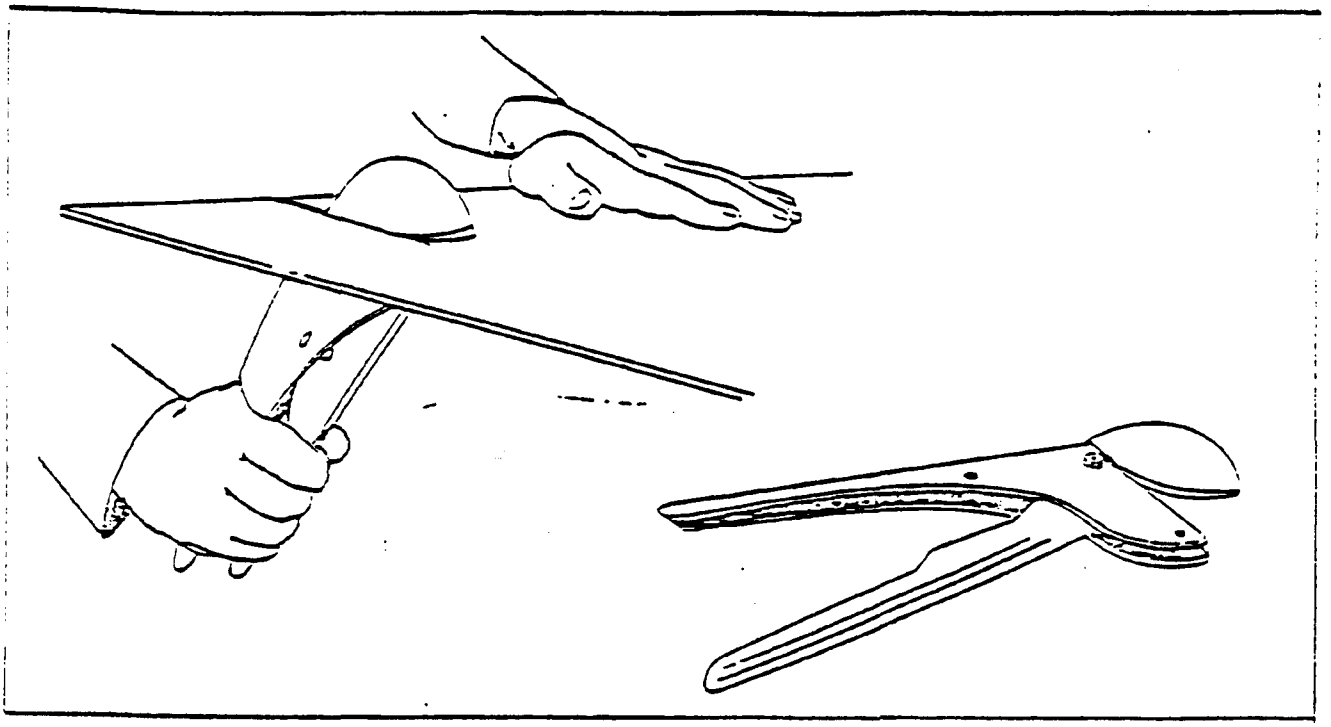
This is a handsaw equipped with a carbide blade designed for cutting asbestos-cement sheet. Practical use of this saw is limited by its slow cutting speed. It is most useful in operations where cutting is infrequent and of short duration.

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

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Cutting - Flat Sheets
Hand Clippers



Handtools
Hand Clippers

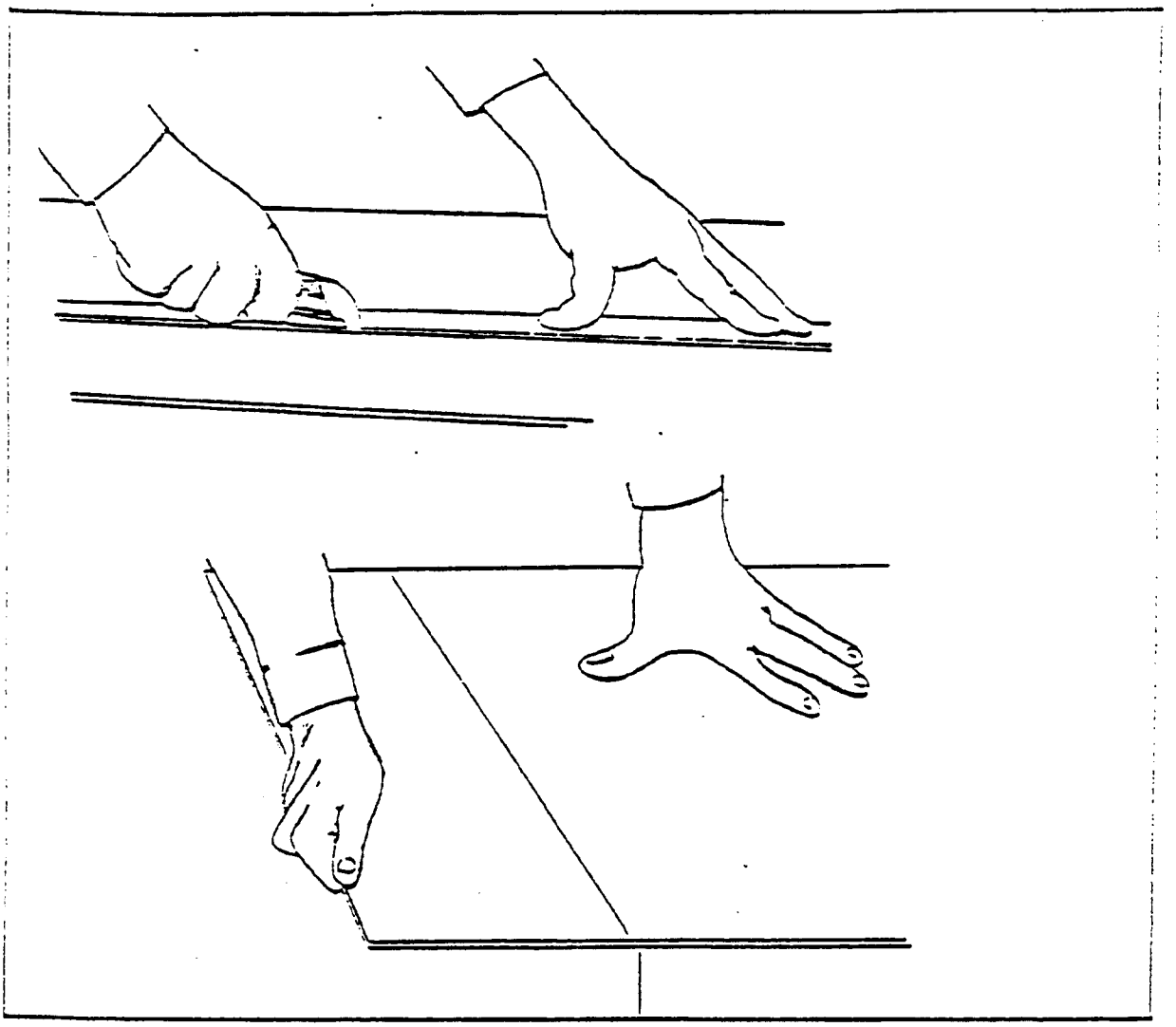
These hand clippers are designed for cutting sheet material up to 1/4" in thickness. Practical use is limited by slow cutting speed. It is most useful in operations where cutting is infrequent and of short duration.

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

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Cutting - Flat Sheets
Score & Snap Knife



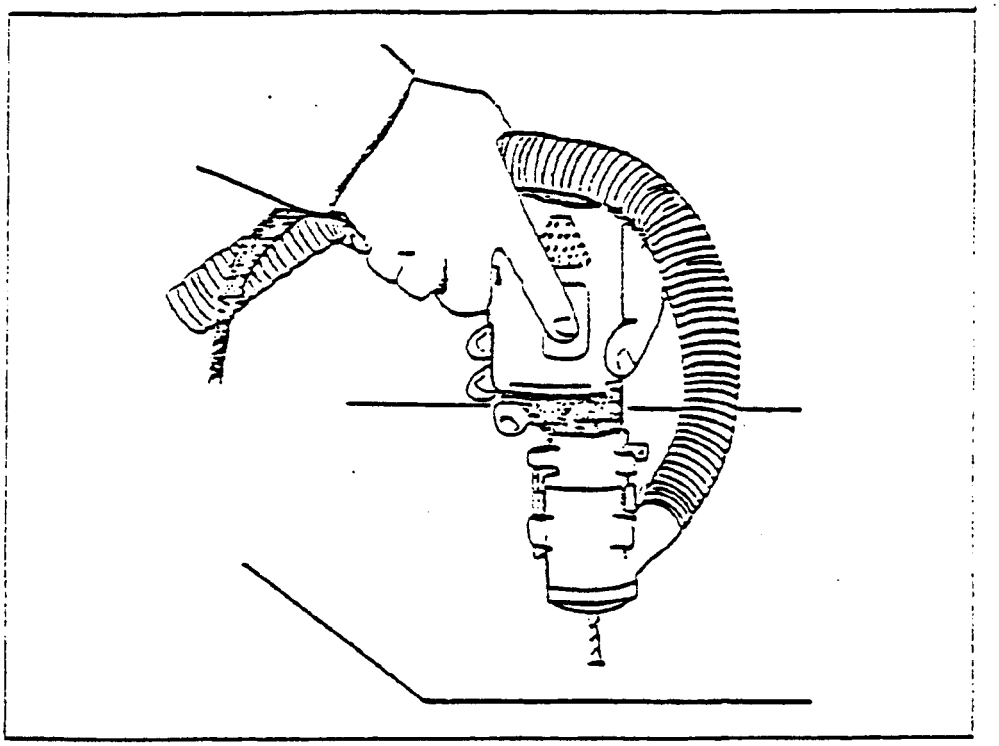
Handtools
Scoring Knife

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 placed on a worktable or saw horses. A suitable guide bar is placed or clamped along the cut line and the sheet scored repeatedly. 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.

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Drilling - Power Drill



Drill With Dust Collection Hood

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

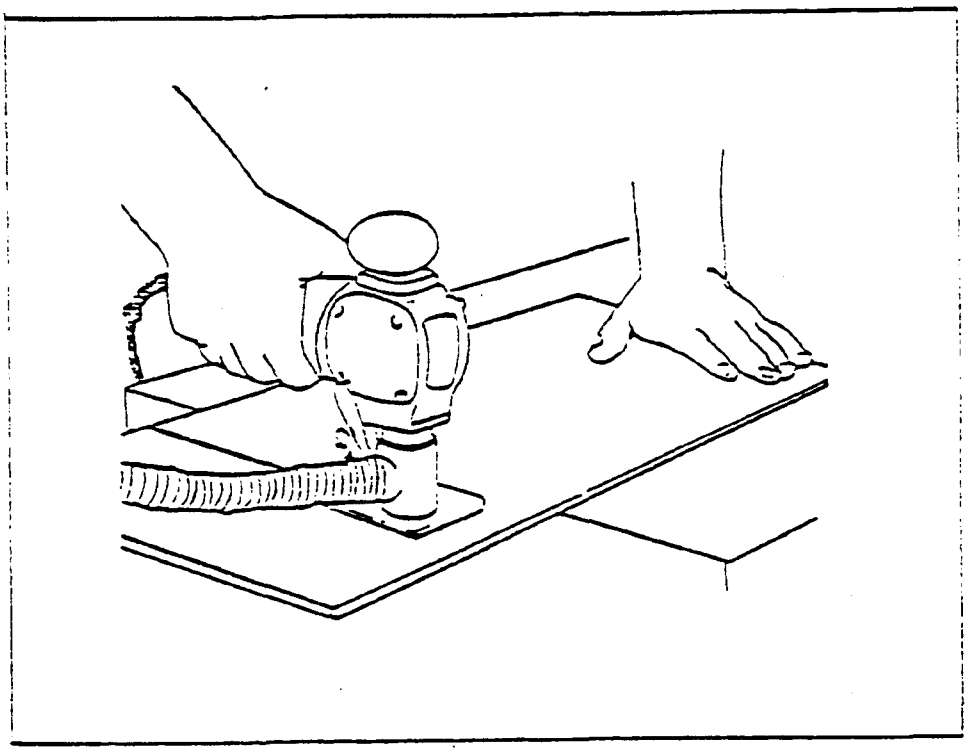
Drilling of larger holes, and drilling overhead, requires dust collection equipment on the drill in order to achieve compliance. Equipment includes a hood (Cape Universal Building Products, Ltd.) and vacuum cleaner to provide exhaust ventilation and dust collection. Vacuum cleaner should be as described in specifications (page 15).

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

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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 a vacuum cleaner as described in the specifications (page 13).

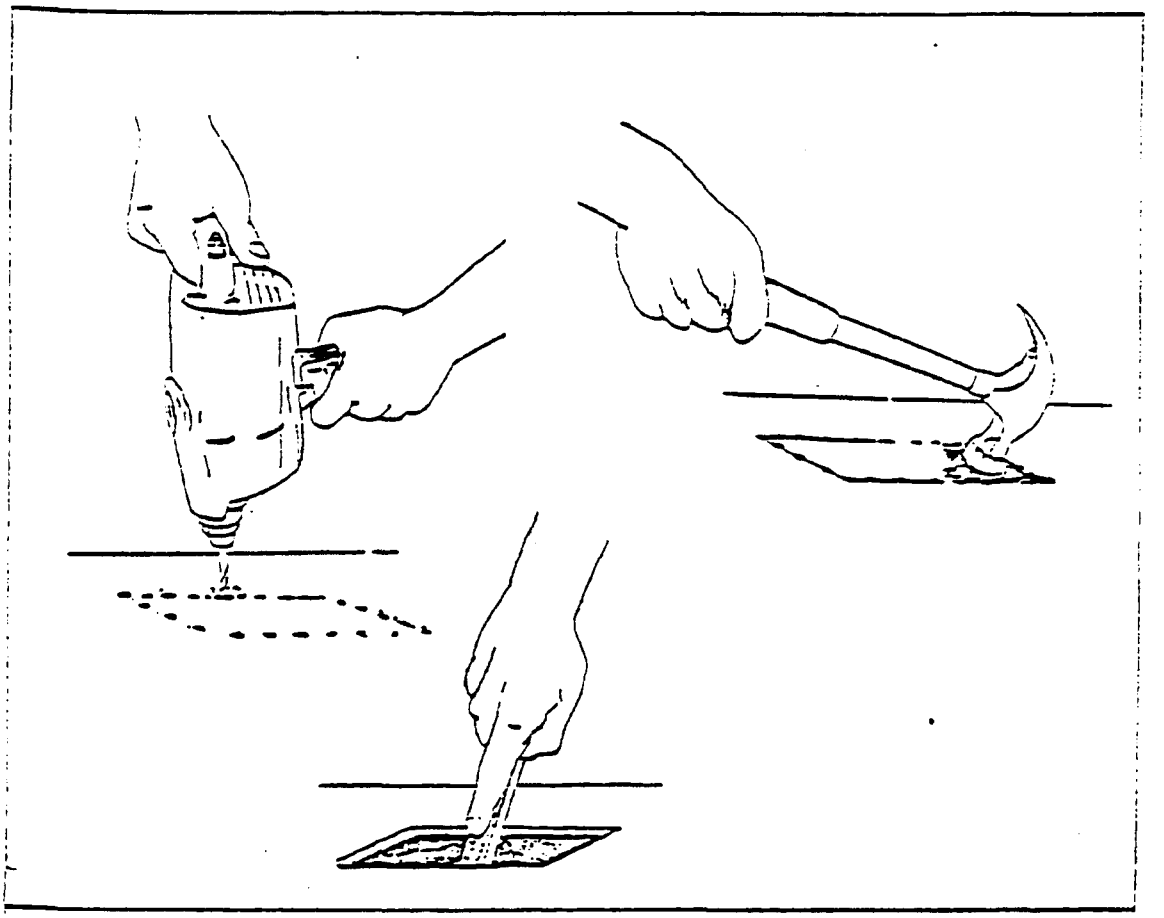
Saw operating techniques are those normally employed. No special procedures are required.

For additional information on saw operation, refer to supplier's instructions in Appendix A.

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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.

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Vacuum Cleaner Specifications

(Values shown below are minimum recommended)

Circular Saw - Flat and Corrugated Sheet Cutting

Vacuum (lift):	39" W.G. (water gage)
Airflow:	175 SCFM (standard cubic feet per minute)
Filtration System:	Multi-stage, designed for use with asbestos-containing dusts.
Dust Collection:	Unit must be provided with, or capable of using, a disposable plastic or paper bag for collecting and removing dust.

Sabre Saw and Drill

Vacuum (lift):	39" W.G.
Airflow:	65 SCFM
Filtration System:	See Above
Dust Collection:	See Above

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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 surfaces 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 are permitted 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 U.S. Environmental Protection Agency. For full text of EPA waste disposal requirements (40 CFR, Chapter 1, Part 61) refer to Appendix C.

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Equipment Suppliers

Tools shown in this pamphlet are available from:

Wheeler-Pilot International
P. O. Box 3128
20433 Earl Street
Torrance, CA 90510
(213) 371-1238

Nilfisk of America, Inc.
301 King Manor Drive
King of Prussia, PA 19406
(215) 277-3900

Suppliers claiming to have vacuum cleaning units suitable for use with asbestos-containing dusts are:

American Cleaning Equipment Corp., 111 South Route 83, Addison, IL 60101

Beamco, Inc., 707 Stierlin Road, Mountain View, CA 94040

Breuer Electric Manufacturing Co., 5100 No. Ravenswood Ave., Chicago, IL 60640

Hild Floor Machine Co., Inc., 5339 West Lake St., Chicago, IL 60644

Kent-Vac Inc., 4360 W. 127th St., Alsip, IL 60658

Nilfisk of America, 301 King Manor Drive, King of Prussia, PA 19406

Pullman/Holt Products, 10702 46th Street, Tampa, FL 33617

Vac-U-Max, 227 Main St., Belleville, NJ 07109

Wheeler-Pilot International, 20433 Earl Street, Torrance, CA 90510

Note:

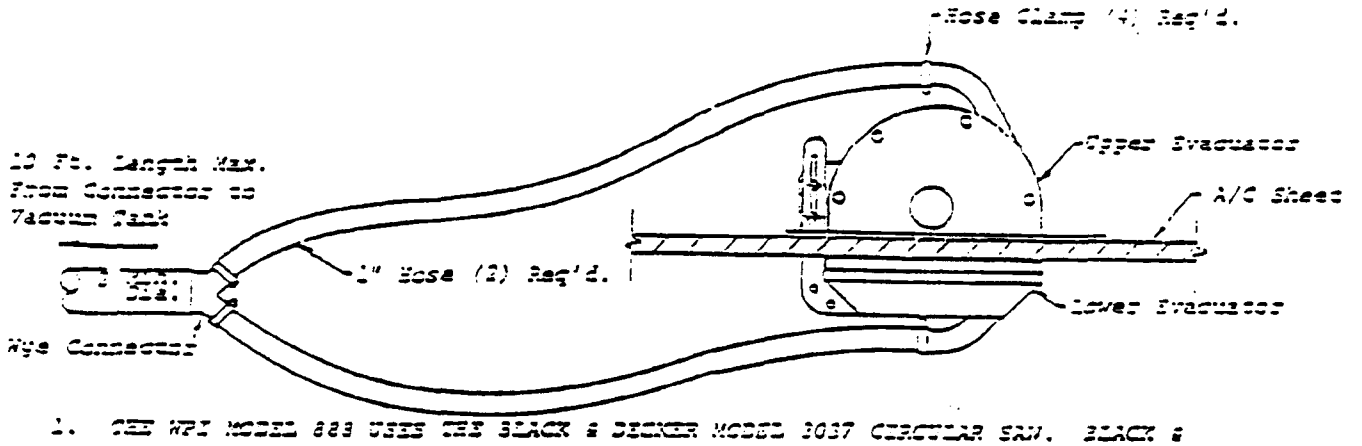
It is recognized that equipment suppliers other than those listed above may be available. Mention of any company is not to be considered an endorsement by AIA/NA.

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OPERATING INSTRUCTIONS
WHEELER-FEICO FLAT SHEET CIRCULAR SAW
MODEL 823



1. THIS WFI MODEL 823 USES THE BLACK & DECKER MODEL 3037 CIRCULAR SAW. BLACK & DECKER OPERATING INSTRUCTIONS FOR MODEL 3037 MUST BE READ AND UNDERSTOOD PRIOR TO OPERATION.

2. ONLY VACUUM CLEANERS CERTIFIED BY THE MANUFACTURER FOR USE WITH ASBESTOS DUST AND HAVING A CAPABILITY OF 175 CFM MIN. ARE TO BE USED WITH THIS TOOL. A VACUUM HOSE OF NOT LESS THAN 2 INCH DIAMETER AND NOT MORE THAN 10 FEET LONG IS TO BE USED BETWEEN THE WYE CONNECTOR AND VACUUM TANK. THE VACUUM MANUFACTURER'S OPERATING INSTRUCTIONS MUST BE READ AND UNDERSTOOD BEFORE OPERATION.

3. INSPECT ALL SYSTEM ELEMENTS FOR CRACKS, PUNCTURES OR OPENINGS, i.e. HOSE, VACUUM HOSE AND CONNECTORS. REPAIR OR REPLACE ANY FAULTY ITEM OR PART.

4. CONNECT THE VACUUM HOSES AS SHOWN, ENSURING ALL CONNECTIONS AND CLAMPS ARE TIGHT.

5. TURN ON VACUUM AND CHECK FOR ANY STOPPAGES OR AIR LEAKS IN THE VACUUM LINE OR HOOD AND ENSURE ADEQUATE AIR FLOW IN THE OPEN AREA OF THE SAW.

6. IF ANY LEAKS OR STOPPAGES ARE LOCATED, CLEARE OR REPAIR FAULTY ITEM.

7. ADJUST LOWER EVACUATOR SO THAT THE RUBBER SKIRT COVERS THE UNDERSIDE OF THE SHEET TO BE CUT.

8. CONNECT CIRCULAR SAW TO ELECTRICAL OUTLET AND FEED INTO WORK. THERE SHOULD BE VIRTUALLY NO VISIBLE DUST OR DEBRIS. IF EXCESS DUST IS VISIBLE, (a) CHECK VACUUM CLEANER BAG FOR OVERLOAD-PER MANUFACTURER'S INSTRUCTIONS, (b) CHECK LINES FOR AIR LEAKS AND (c) CHECK PROPER ADJUSTMENT OF LOWER EVACUATOR.

9. AVOID USING EXCESSIVE FORCE FEEDING SAW INTO WORK. IF GREAT FORCE IS REQUIRED, STOP AND CHECK TOOL FOR PROPER OPERATION.

BLADE REPLACEMENT
(IN ADDITION TO BLACK & DECKER OPERATING INSTRUCTIONS)

1. DISCONNECT UNIT FROM ELECTRICAL OUTLET.
2. LOWER OR REMOVE LOWER EVACUATING HOOD.
3. REMOVE (4) SCREWS AND COVER TO EXPOSE BLADE.
4. GRASP THE EXPOSED LOWER PORTION OF THE BLADE AND REMOVE HUB SCREW WITH WRENCH.
5. BLADE CAN BE REMOVED OR REPLACED (CAUTION: CARBIDE CARBIDE BLADES MUST BE MOUNTED WITH APPROPRIATE SIDE OUT, THE BLADES ARE MARKED ACCORDINGLY).

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