

# THE ORIGINAL ENERGY SAVING MAKE-UP AIR SYSTEM

### RECLAIMS WASTED BUILDING HEAT



# ACME FAN-JET® MAKE-UP AIR SYSTEM

The FAN JET" make up air system is a new ventilating concept. It utilizes some basic aerodynamic principles for supplying, tempering and distributing make-up air for buildings in cold weather. It offers more efficiency. economy and comfort than most conventional makeup air units.

The FAN-JET\* Unit consists of a specially designed air supply fan, a housing and a motorized air inlet shutter. A long length of special polyethylene tubing attached to the unit completes the system. The tubing has precision holes punched on both sides at specific intervals along its length and has one end closed off.

Each fan, housing and inlet shutter is mounted to an opening in the upper building wall or is connected to a roof mounted air inlet ventilator. The polyethylene tubing is attached to the discharge end of the supply fan, and extends horizontally throughout the upper region of the building supported from a wire.

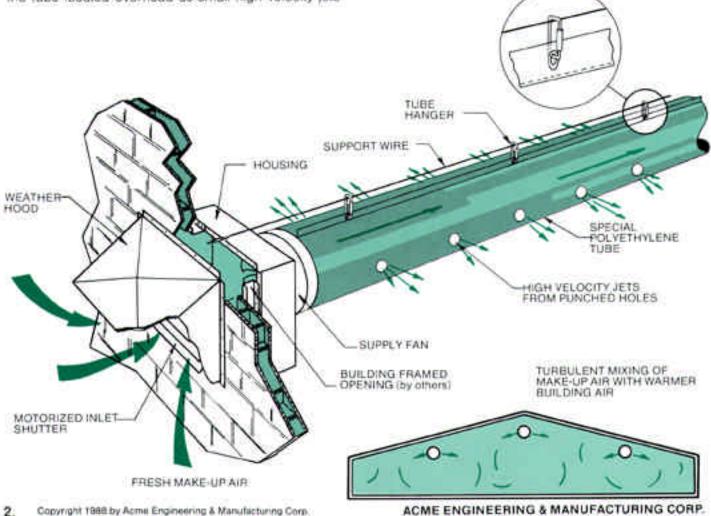
When make up air is needed, the motorized inlet shutter opens, the supply fan turns on and draws in fresh air, blowing it down the tube inflating it for its full length. The air discharges from the punched holes in the tube located overhead as small high velocity jets

which create turbulent mixing with the warmer building air. The resulting throw of air from the jets combined with the mixing action effectively tempers the make-up air long before it reaches the worker occupancy level to produce a uniformly distributed draft free make-up air system.

Normally several FAN-JET\* systems are required for a building. The number will depend on the amount of make up air required, the size of the models selected and the size of the area to be supplied.

Supplementary heat, when needed to temper the make-up air, may be furnished from existing or by some additional conventional type space unit heaters positioned at convenient locations in the general area of the tubes.

When no fresh air supply is needed, the fan is stopped and the motorized inlet shutter closes to prevent the entrance of cold air into or the loss of warm air from the building. The deflated polyethylene tube hangs from the support wire ready for use again when needed.



# UNIQUE ADVANTAGES OF THE FAN-JET® SYSTEM OVER CONVENTIONAL

# MAKE-UP AIR UNITS

- Offers greater savings in initial purchase and in operating costs compared to conventional make-up air units
- Provides a gentle and uniform air distribution along entire length of the tubes rather than blasting air from a single source outlet. Will not produce cold drafts nor hot blasts of air.
- Supplies more make up air with less horsepower than conventional make up air units. The triction loss of blowing air through a heat transfer system is completely eliminated
- 4. Easier and less costly to install. The FAN-JET\* Unit is relatively light in weight and the tubing can be installed in a fraction of the time normally required for conventional ducts when used.

- 5 Eliminates coil freeze-up problems. Permits the use of conventional type space unit heaters positioned at convenient locations within the building when needed for supplementary heat to temper the makeup air.
- 6. Allows cold make-up air to mix with warm stratified air trapped in upper regions thereby reclaiming overhead heat wasted in most buildings. This reclaimed heat can supply as much as 50% of the make-up air heat load requirement—and often more.
- Quieter than most conventional make-up air systems. Produces less than 20 Fan Sones
- Offers a wide range of capacities to match the makeup air requirements. This is achieved by running only the required number of FAN-JET\* Units needed to supply the air required for operated exhaust systems.
- Provides a more comfortable environment for employees by maintaining gentle air flow and uniform temperatures throughout.

#### TURBULENT JET FLOW AND TEMPERING ACTION

The rapid flow of air from a hole into an open space produces a relatively high velocity jet. The flow is extremely turbulent with the air particles swirling about as they travel in the jet stream.

This turbulent jet flow expands resulting in rapid entrainment and mixing action with the surrounding air. At a distance of only 20 diameters from the hole in the tube, the jet will slow down to a centerline velocity of about 20% of its original outlet velocity and will be 90% mixed and tempered with the surrounding building air as shown in the two diagrams below.

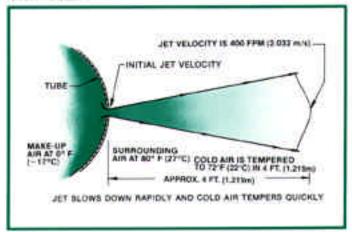
DEVELOPED VELOCITY PROFILE IS
20% OF ORIGINAL AT 20 0

UNIFORM JET
VELOCITY PROFILE

THROW AND MIXING ACTION OF A JET

For example, the jet of air flowing from the hole in the tube will slow down to approximately 400 fpm (2.032 m/s) within a distance of only 4 ft. (1.219 m). The air continues to slow down in direct proportion to its distance from the tube, at 8 ft. (2.438 m) will have a velocity of 200 fpm (1.016 m/s) and at 16 ft. (4.877 m) a velocity of 100 fpm (0.508 m/s).

Effective tempering of cold make-up air is quickly achieved. Air at 0° jetting from the tube into surrounding building air at 80°F (27°C) will warm up to 72°F (22°C) within a distance of only 4 ft. (1.219 m) from the tubes. Further tempering will continue as long as the reservoir of stratified heat is maintained, with the final temperature in the space being controlled by the setting of the room thermostat.



The FAN-JET® Unit consists of a housing, a special propeller fan with an extended streamlined orifice and a motorized inlet shutter.



#### PERSONAL ATTENTION TO HIGH QUALITY

All FAN-JETS\* are fully assembled with motor and belt drive mounted, aligned and adjusted at factory. All FAN-JETS\* are test run and inspected before shipped as further assurance of superior quality of Acme products.



Acme FAN-JET\* Units are listed by Canadian Standards Association Testing Laboratory as approved.

#### HOUSING

Constructed of heavy gauge steel. Comes assembled with fan bolted in place and ready for installation. Has mounting flanges for attachment to a framed opening in building wall. Removable bottom panel for access to fan motor and drive.

#### FAN

All welded six blade propeller with streamlined orifice extension fitted with discharge stator vanes to improve performance and efficiency of fan.

Belt driven models have pre-lubricated oversize fan shaft ball bearings. Belts are super duty type for longer service life.

FAN-JETS\* are relatively quiet and are rated in Fan Sones for more convenient specification reference.

#### MOTOR

Motor is heavy-duty totally enclosed type with ball bearings and designed for continuous operation. Built-in thermal overload is standard on single phase types.

#### FINISH

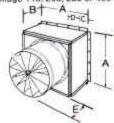
Entire fan is coated with Acrylic Epoxy over baked on epoxy primer for a touch and durable finish. All components are iron phosphate processed prior to painting for superior corrosion protection and bonding of finish. Housing is galvanized steel.

#### FACTORY WIRED

Factory wiring offers big savings in installation time and costs. Fan motor is factory wired with flexible metal conduit to junction box and disconnect switch mounted on exterior of fan housing. Similar wiring extension is furnished from the junction box ready for field connection to the shutter damper motor. Wiring complies with the National Electric Code and NBFU Standards.

FAN-JET* PERFORMANCE AND SPECIFICATION DATA									
Size	Model	System CFM	HP	Electrical Characteristics	Fan Sones 5 Ft.	Drive	RPM	*Motorized Shutter Model	Est. Ship Wt.
18"	RR18E6	3,120	W.	115/230 1 PH	14	Direct	1160	WAGC2626MT	126
24"	RR24H	6,960	*	115/230 1 PH 200/230/460 3 PH	18	Belt	949	WAGC3333MT	17-4
30"	RR30J	10,600	31	115/230 1 PH 200/230/460 3 PH	19	Belt	757	WAGC4040MT	231

<sup>\*</sup>Specify Operating Line Voltage 115, 200, 230 or 460 Volt



FAN-JET® UNIT DIMENSIONS							
	A	В	C	D	E		
RR18	23.19	15.06	3.06	17.00	10.00		
RR24	30,19	15.13	3.06	24.00	14.50		
RR30	37,19	16.63	3.06	15.50	15.25		

## FAN-JET® ACCESSORIES

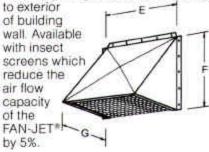
#### SHUTTER

The motorized fresh air inlet shutter is used to prevent entrance of cold air or loss of warm air when the FAN-JET® system is not in use.

· A heavy duty single phase line voltage damper motor holds shutter in open position against the spring action on shutter closing. Motor draws only 11 watts.

#### WEATHER HOOD

Optional weather hood offers extra protection against blowing rain or snow entering the FAN-JET® system. Constructed of galvanized steel and furnished with bird screen. Has mounting flanges for easy fastening



WEATHER HOOD DIMENSIONS						
MODEL	E	F	G			
WHR18	39.00	33,50	28.00			
WHR24	51.00	44,50	36.50			
WHR30	63.00	53.00	45.00			

#### JETEX AIR DISTRIBUTION TUBE WITH FIRE RETARDANT

Jetex supply air tubing manufactured by Acme is designed specifically for use with FAN-JET\* systems. The Jetex fabric is a heavy duty, industrial grade, polyethylene, 7 mils thick, 3 ply, woven 8x8 yarns per inch having a tensile strength of 114 pounds (51.71 Kg) warp and 83 pounds (37.65 Kg) fill per ASTMD 1682-64. Jetex fabric is coated with fire retardant and complies with non-flammability specifications of the National Fire Protection Association Bulletin NFPA 701 (large scale). The tubing is formed with two sewn seams, double stitched with polyester thread.

Each tube is custom punched to match the selected FAN-JET\* with required tube length. When ordering tubing determine the tube length and hole punching pattern desired from the accompanying charts. Select proper "letter" model and add hole location as suffix. As an example, 30" (762 mm) tubing 100 ft. (30.48 m) long having a top hole discharge of 24° would be entered as WHS24T.



#### UNIQUE TUBE HANGING SYSTEM

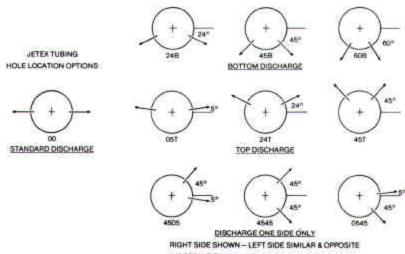
Jetex tubing is furnished with built-in grommets spaced every 6 ft. (1,829 m) in top seam. Quick and easy hanging of tubing is possible by simply slipping the snap ring through the grommet and attaching to the support wire. All components are factory furnished with the FAN-JET® package.

A wire support kit is available to support the tubing. It consists of heavy gauge galvanized wire, take-up turn buckles and securing clips.

RR18E6		RR24H		RR30J	
18"		24"		30"	
Tube Model WKN WJN WHN WHN WDN WCN WBN WKA WJA WHA WHA WDA WCA WBA WKE WJE WHE WFE	Tube Length 27 -30' 30'-33' 33'-36' 36'-40' 40'-45' 45'-50' 50'-55' 55'-61' 61'-68' 68'-76' 76'-85' 85'-98' 96'-108' 108'-121' 121'-138' 138'-154' 154'-177' 177'-205'	Tube Model *WKX *WKX *WHX *WHX *WEX *WEX *WEX *WEX *WEX *WEX *WEX *WE	Tube Length 24'-27' 27'-30' 30'-33' 33'-37' 37'-41' 41'-45' 45'-58' 48'-53' 53'-59' 59'-66' 66'-73' 73'-81' 81'-90' 90'-101' 101'-112' 112'-126' 126'-142' 142'-160' 160'-182' 182'-206' 206'-233' 233'-269' 269'-311' 311''-360'	Tube Model *WKT *WJT *WHT *WFT *WDT *WCT *WBT WKS WJS WHS WFS WDS WCS WBS WCS WBS WCS WBS WCS WBS WKU WJU WHU WFU	Tube Length 39'-42' 42'-47' 47'-52' 52'-58' 58'-66' 66'-77' 70'-77' 77'-84' 84'-94' 104'-116' 116'-129' 129'-145' 145'-163' 163'-183' 183'-206' 206'-232' 232'-263' 305'-348' 348'-405'

HEAVY LINE INDICATES MAX LENGTH AVAILABLE FOR ONE CONTINUOUS PIECE

\*Short length tubing is available where building size or interference will not accommodate longer lengths. Caution is advised to assure there is sufficient stratified residual heat available to temper the incoming air . over the shorter length.



IMPORTANT Right and left side always viewed looking into fan discharge.

#### RECOMMENDATIONS FOR SELECTING AND INSTALLING FAN-JET\* SYSTEMS

The total capacity of the FAN-JET® systems should approximately match the combined capacity of the exhaust systems employed.

Normally selection of the largest size FAN-JET\* Units fulfilling the total make-up air requirements will provide the most economical installation and achieve satisfactory distribution.

The storage of merchandise, raw materials and equipment, or locations of partitions that may obstruct the passage of air into certain areas should be considered when determining the locations for FAN-JET® systems.

The FAN-JETS" and tubes should be installed as high as conveniently possible to utilize trapped overhead heat for tempering and to provide required head clearance.

Tubes may be bent at small angles to clear obstacles or to provide head clearance. Abrupt turns will impair good air flow capacity and should be avoided.

Select tubes of sufficient length to extend over the area being supplied to obtain good distribution.

Avoid having tubes subjected to temperatures above 140°F (60°C) or to the direct blasts of air from blowers and space heaters. Keep tubes clear of structurals, pipes, etc., to prevent the wearing or tearing of tubing.

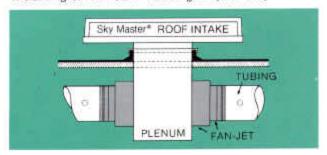
When required, supplementary heat for tempering cold make-up air may be furnished by conventional type space unit heaters. Their exact location is usually not critical but they should be in the general area of the tubes and positioned to provide reasonable heat distribution.

The heat required for tempering make-up air in BTU's per hour =  $1.08 \times \text{CFM} \times \Delta \text{T}^{\circ}\text{F}$ . (CFM is cubic feet of air per minute;  $\Delta \text{T}^{\circ}\text{F}$  is the indoor-outdoor temperature difference.)

# ROOF TYPE FAN-JET® INSTALLATIONS

#### SKYMASTER® TRIMLINE AIR INTAKE VENTILATORS

Roof mounted ventilators are used when lack of wall space or obstacles prevent mounting FAN-JETS\* in building walls. Sky Master\* intake vents are sturdy, all aluminum construction with hinged hoods and perimeter opening twice the throat area. This type of installation requires a plenum chamber extending down through the roof opening to the attached FAN-JET\* housings. For single roof intakes, using two or more FAN-JETS\*, tubing may run parallel or opposite. When parallel, a special hole punching will be required and should be so noted on the order. (See drawing for suggested mounting of FAN-JET\* housings in plenum.)



Other ventilator sizes having equivalent throat and hood areas may be substituted for selections shown in table at right.

For more complete information on construction and available sizes request Catalog C18

#### **ACCESSORIES**

- Motorized Back Draft Shutters are recommended to prevent entrance of cold air when FAN-JET\* is not operating. Shutters having horizontal air flow attached to FAN-JET\* housings recommended and offered as standard. Optional motorized shutters mounted in the throat of the ventilator (vertical air flow) are available on special order.
- Prefabricated Curbs, 16" (406 mm) high are available for easy mounting of ventilators over roof openings. Fabricated of galvanized steel, curbs are all welded, thermally insulated, with cant strip for roofed over flashing.
- Insect Screens are available, attached to bird screens for support. Reduces air flow capacity by 5%.
- Anti-Condensate Protection: A heavy coating of asphaltic base mastic compound containing cork is sprayed on underside of hood and base.
- Filter holders are available for 1"(25mm) or 2"(51mm) thick filters fitted into perimeter of hood. Also offers extra protection against blowing rain or snow. Filters to be furnished by others.

	PERFO	RMANCI	E & SPEC	IFIC.	AT	ON DATA	
FAN-JET*	System	Sky Maste Roof Opening	r Roof Vent Hood Size	Far Moto No. I	ors	Motorized Shutters Model	Ship Wt Lbs.
1RF18E6 1RF24H 1RF30J 2RF24H 2RF30J 3RF30J 4RF30J	3120 6960 10600 13920 21200 31800 42400	24 x 30 36 x 42 36 x 60 30 x 96 36 x 108 48 x 120 60 x 120	46 x 56 68 x 75 70 x 104 73 x 132 88 x 144 127 x 142 144 x 142	1112234	1000 NO NEW	WAGC2626MT WAGC3333MT WAGC4040MT WAGC3333MT WAGC4040MT WAGC4040MT WAGC4040MT	303 441 605 828 1048 1380 1703

# TYPICAL LAYOUTS OF VARIOUS FAN-JET® MAKE-UP AIR SYSTEMS

#### SIDEWALL INSTALLATION

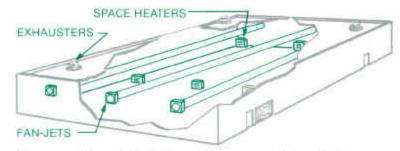
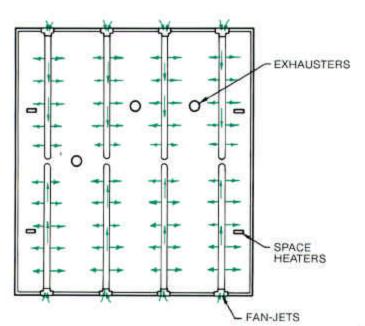


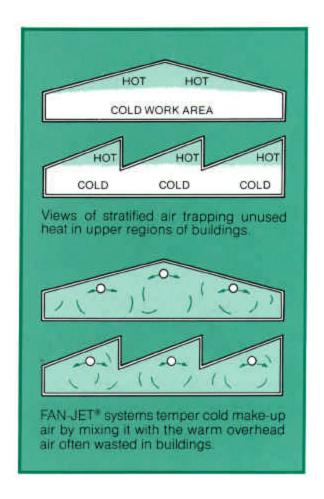
Diagram of three FAN-JET<sup>®</sup> systems uniformly distributing make-up air over a relatively wide area.



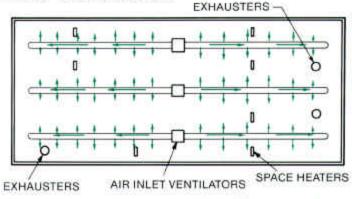
End view shows the jet throw and mixing action of makeup air jetting from holes in the tubes.

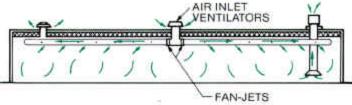


Plan view of FAN-JETS\* installed in opposite end of a larger building with tubes extending toward midpoint of building.



#### ROOF INSTALLATION





Above views show roof mounted air inlet ventilators as the source of make-up air for FAN-JETS\*. This arrangement can be used when lack of wall space or obstacles prevent mounting FAN-JETS\* in building walls.

#### ESTIMATING THE COST OF HEATING MAKE-UP AIR

Most industrial buildings today have mechanical exhaust systems and require a supply of fresh air to replace air removed by the ventilation systems. During cold weather when windows and doors are shut, often the only source of the needed make-up air is infiltration leakage through cracks and openings in windows. walls and doors. This uncontrolled influx of cold air will be heated somehow usually by the plant's existing space heaters. The results are often far less than satisfactory and yet the fuel cost just to temper this incoming air can be a big portion of the total heating bill

FAN-JET1 make-up air systems, utilizing stratified residual heat within the building. operate at a fraction of this cost with savings often exceeding 50%

The following formula can be used to estimate the annual fuel cost to temper make-up air. It is based on natural gas (1000 BTU/Cu. Ft.) and conventional space heating equipment of 80% efficiency. Formula can be used for other fuels by converting fuel rate. R into dollars per million BTU. See conversion formula above

C = 1.55 x Q x TR x R x S

Where: C = Cost for heating season of 144 days (5 work days per week)

= CFM in thousands (volume of make-up air)

TR = Temperature rise (inside design minus average winter temp)

= Gas rate \$ per thousand cu. ft. (MCF)

= Number of 8 hour shifts per day

1.06 . 8 HR. . 144 DAY FACTOR 1.55 = 1000 e 80 DAY YH.

For a plant located in the Chicago area, find the cost to heat 30,000 Example

CFM of make-up air to 65° for one season where the gas is \$4.01

MCF and plant operates on two shift basis.

= 1.55 x 30 x 28 x 4.00 x 2

 $TR = 65 - 37 = 28^{\circ}$  (from table below)

= 1.55 x 30 x 28 x 4.00 x 2 C = \$10,416 for the season

Average winter temperatures with corresponding degree days are listed below for a number of geographical locations in the U.S.A. For other locations in the areas listed data usually is close enough to be used without significant error or degree day data can be obtained from local utility.

LOCATION	WINTER TEMP®F	LOCATION	WINTER TEMP*F	LOCATION	WINTER TEMP*F
ATLANTA GA CHICAGO, IL	52 37	INDIANAPOLIS, IN KANSAS CITY, MO	39 44	PITTSBURGH, PA RICHMOND, VA	38 47
DALLAS, TX DAYTON, OH	56 40	MILWAUKEE, WI	44 33	ROCHESTER, NY SAN FRANCISCO, C	A 53
DENVER, CO. DES MOINES, IA	38	MINNEAPOLIS, MINNASHVILLE, TN	28 49	SEATTLE WA TOLEDO, OH	47 36
GRAND RAPIDS, M		OMAHA NE PHILADELPHIA PA	36	TULSA OK WORCESTER MA	48 35
The state of the s	- 200	Data f	mm ASHRAE	Handbook 1980 Systems (	Chapter 43

#### HEATING VALUES (HV) FOR OTHER FUELS

#2 Fuel Oil 142,000 BTU/GAL Propane

Electricity 3.412 BTU/KW Billuminous Coel 13.000 BTU/LB

TO CALCULATE 'R' IN DOLLARS PER MILLION BTU

R = COST PER UNIT a 10<sup>6</sup>

Example: "R" for #2 fuel oil at \$.80 per gal.

B = 80 x 104 = \$5.60 per million BTU 142,000



FAN-JET does its job near the roof, mixing cold make-up air with heated ceiling air



The Acme FAN-JET" system at work in a large industrial abrasive manufacturing plant

WARNING: Acres products are designed and manufactured to provide reliable performance, but they are not quaranteed to be 100% Nee of detects. Even reliable provide adjusted on supply and the products are used in a life support ventilation asystem where failure cools result in loss or above, the user almost provide adjusted on perfoliation, supplementary natural ventilation or failure attent system, or acknowledge willingness to accept the risk of month.

DISCLAIMER: Actre Engineering & Mits. Corp. has made a grayers effort to recently an electricity of the site products an thin illuminum accurately, hearten, but illuminums and decorptions are described an investment of the interest of the

Acroe Engineering & Manufacturing Corp. reserves the right to change specifications without notice

#### LIMITED WARRANTY

WARRANTY AND DISCLAMER. Acres Engineering and Manufacturing Corporation extends this firrited warranty to the original flagor and warrants flag products manufactured by Acres short be the form original defects in womenship and materials for hear grass been date of astronest, produced assets have been properly stored, installed, streamen, maintained and operated. This warranty shall see apply to products which have been affects or required without formers applying to affect its preference or indicating, for which have been appropriate to affect its preference or indicating, for which have been appropriate products or subjected to misuse, regisperce, or accident, or incorrectly specific constraints with other substances. The Bayer assumes all risks and abstitute for research of use of the products. Manufacts on participating parts, such as effective motors, and contains are limited to the terms of warranty strended by our supplier.

POLYETHYLERE TUBING: Polyethylene tubing is warranted to be free of defects in material and workman only for a period of 90 days have date of shipment provided same that been properly handled, atomi, installed serviced, maintained and operand. And hatter, our unjected to excessive host, command agents or chemicals, or recolumned abuse that may cause teaming or unded destination, on used on a system or an amount other than that for which it was designed as explained in the product illuminum.

LIMITATION OF PENEDY AND DAMAGES. As claims under this warranty must be made in writing and delivered to Acme Engineering & Manufacturing Corporation. Box 978, Missingse. Disablents 74:402, within 16 days after discovery of the select and prior to the explanation of two years tight the date of shipment by Acre of the product claimed detective, and fluyer shall be barred from any remedy it. Buyer talls to make such claim within such period.

Within 30 days after receipt of a frienty claim. Acres shall have the option either to isspect the product while in Super's presession or to request fluyer to return the product to Acres at Buyer's expense for inspection by Acres Acres shall replace, or all its option repair, free of charge, any product it determines to be defective, and it shall stip the impained or replacement product to Buyer F.O.B. point of shipment, provided, however, if electrostances are such as in Acrostic paperent to prohibit separ or implacement to remain the worknown detector, the buyer's sole and exclusive remain state be a returnly to the hayor of any part of the involce price, paid to Across, for the defective product or part

Acres is not responsible for the cost of removal of the defective product or part, damages due to removal, or any expenses incurred in chapping the product or part to or from Acres's plant, or the installation of the repaired or replaced product or part

implied wortenties, when applicable, shall commence upon the same data as the supress warranty provided Implied warranties, when applicable, shall constructe upon the same data as the supress warrant provided above, and shall, except the warranties of table, extend to by the drawnization of the congress warranty. Some states do not above furnishment in how long at implies warranty tacts, so the above limitation may not apply be you. The only remainly provided to you interest an applicable implies warranty and the express warranty shall be the intensity provided states the express warranty and the express warranty. Acree that is not be labele for incidental and consequential notices and damages under the express warranty and applicable implies warranty and damages, and the applicable state law. Some states do not allow the exclusion or installation is found to be uponformable under applicable state law. Some states do not allow the exclusion or installation in incidental or consequential damages, so the above limitation or exclusion may not caply to you. This warranty gives you seen the legal rights, and you may also have other rights which say than state to state.

No employee, agest, dealer, or other person is authorized to give any warranties us betailt of Acme or to assume for Acme any other leability in connection with any of its phydicits except in writing and signed by an officer of Acme.

TECHNICAL ADVICE AND RECOMMENDATIONS: DISCLAMER: Notwinstanding any sest practice or deal-ings or any disatan of the trade, sales shall not include the furnishing of factorical advice or assistance or system design. Any such assistance shall be at Acree's sole option and may be subject to additional charge.

Acres essures no obligation or liability or accitud of any recurrengiations, opinions, or advice as to the choice, installation or use of products. Any such recommendations, opinions or advice are given and shall be accepted at your own itsis and shall not constitute any warranty or guarantee of such products or their backlings.



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