

# LENNOX

## DIRECT MULTIZONE SYSTEM—DMS1-275 Heating—Cooling—Ventilating with Multizone Control

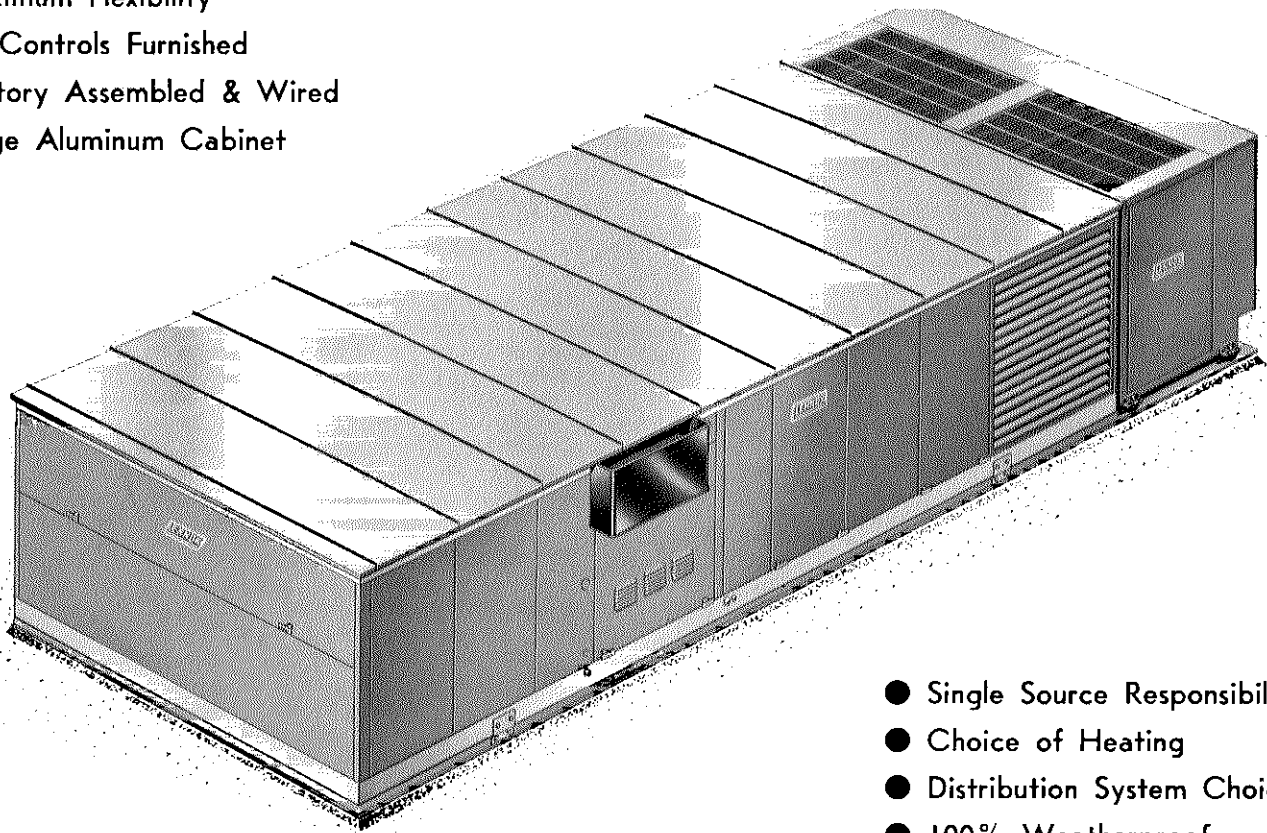
ENGINEERING DATA  
**COMBINATION UNITS**  
DIRECT MULTIZONE  
SYSTEMS

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May 1, 1965

Supersedes 10-19-64 & 2-1-65

- Maximum Flexibility
- All Controls Furnished
- Factory Assembled & Wired
- Beige Aluminum Cabinet



DMS1 275 on a rooftop

- Single Source Responsibility
- Choice of Heating
- Distribution System Choice
- 100% Weatherproof

### THE NEW CONCEPT IN MULTIZONE COMFORT CONTROL

Heretofore, in commercial buildings requiring multiple zones of simultaneous heating and/or cooling control, engineers have been forced to use hot and chilled water Multizone air handlers, large central station built-up systems consisting of components manufactured by several different companies, and controls for these individual components supplied by yet another manufacturer. Danger of freezing the hot and chilled water coils has eliminated easy methods of utilizing adequate quantities of fresh air for ventilation purposes in cold climates. Further, most central station units have water cooled condensers and in cold climates water towers must be drained to avoid freezing—thus forcing shutdown of the refrigerated cooling system during all of the winter months even though there are extensive periods of time during the winter when refrigerated cooling is needed to maintain proper temperature control in the building.

The Lennox Direct Multizone System uses direct-fired heat exchangers in parallel with direct expansion, air cooled refrigeration to provide

precise individual zone control the full year around, simultaneously, in as many separate and individual zones as can be handled with the capacity of the DMS unit. The absence of water in the system eliminates completely the danger of costly freezeups and allows Lennox engineers to make the maximum use of the cooling power available in the outside air to minimize the operating costs involved in cooling the structure.

The Lennox DMS unit is a complete factory assembly of highly engineered, integrated components in a weatherproof, attractive, low silhouette "package" including all necessary controls factory installed, factory tested, and approved by appropriate approval agencies. All internal wiring is completed including a disconnect switch and the necessary wiring harness for the adjacent condensing unit. In addition to the controls factory installed in the DMS unit, Lennox offers two thoroughly tested Zone Control Systems for the Lennox mixing dampers.

### SINGLE SOURCE FOR COMFORT RESPONSIBILITY

Thus, for the first time in the history of commercial Multizone work, it is possible for the engineer to specify and the customer to purchase an entire Multizone Comfort System from one manufacturing source. Never before has it been possible for the customer through his engineer to turn to a single source for quick, efficient and economical servicing of his mechanical equipment. All too often in the past the

customer and the engineer have had to involve themselves in attempting to determine just who, of the many manufacturers contributing parts and pieces to a mechanical system, was responsible for the comfort result. Unfortunately, in most cases no one would accept this responsibility. With DMS, Lennox, and the Lennox-trained installer are entirely to be totally responsible for the end comfort result.

### SELECTED OVER COMPETITION

So successful has the Lennox DMS unit's ability to produce accurate year-round control of simultaneous heating and/or cooling in individual zones been that it was selected over industry-wide competition for

exclusive use in 2,400,000 square feet of California school space bid under the auspices of the Ford Foundation sponsored School Construction Systems Development Group in Palo Alto, Calif.

NOTE—Specifications, ratings and dimensions subject to change without notice.

Litho U.S.A.

## MAXIMUM FLEXIBILITY IN A COMPLETELY FACTORY-TESTED PACKAGE

The concept of a complete factory assembled, wired, controlled, and tested package by no means limits design flexibility.

**HEATING**—Choices of gas-fired heat exchangers, straight electric heating elements, or hot water coils are available.

**Gas Heating**—Gas fired heat exchangers incorporate the exclusive Lennox Duracurve principle which provides accurate combustion control through a constant internal configuration without restricting the metal's freedom to "breathe" on heating and cooling, thus eliminating completely the danger of fatigue failure which can often occur in standard direct-fired, clam shell heat exchangers. Heat exchangers are available in 490,000 Btuh input and 350,000 Btuh input. Two-stage, 50%—100% control is standard as is 6,000V spark ignition, forced draft combustion, electronic flame detection on the 490 and thermocouple flame detection in the 350. Electronic flame detection is optional on the 350,000 Btuh heat exchanger. Both heat exchangers carry a complete A.G.A. Approval for outdoor use in the DMS unit and all controls are factory installed, piped and wired and the unit is fire tested. Pre-purge and post-purge cycle is standard on both heat exchangers.

**Hot Water Heating**—Factory installed hot water coils have either straight 3-way modulating valve control or primary-secondary control with a factory installed, wired, and plumbed pump to give a possible range of 100,000 to 700,000 Btuh.

**Electric Heating**—Electric resistance elements are available in 15 kw increments from 45 kw to 105 kw. Electric elements carry U. L. Approval, and are controlled by a modulating sequencer. Elements are available for 240, 440, 550 or 600V, 3ϕ use.

**POWER SAVER TO MINIMIZE COOLING COSTS**—The Standard Lennox control systems factory installed in the DMS unit minimize the operating costs involved in cooling the structure by automatically utilizing fresh outdoor air to do all of the cooling any time the temperature drops below 58°F. Above 58°F, but below 65°F, outdoor air is used to do as much cooling as possible in conjunction with running the refrigeration equipment. Above 65° the refrigeration equipment does all of the cooling. However, a substantial portion of the cooling season in commercial structures exists while outdoor temperatures are below 65°, resulting in a great saving in operating costs (as much as 70% in some cases) over the old-fashioned central station system that ran 100% of the time.

**COOLING**—15 or 22 tons of direct expansion, air cooled refrigeration is available. In either case all of the necessary refrigeration piping, wiring harnesses, and controls for the 4 or 6-row evaporator in the DMS unit and the companion condensing unit are supplied. Refrigeration connections are mechanical—either Rotalock or flare.

**Prepared For Air Conditioning**—The DMS unit may also be ordered less cooling, but prepared for future air conditioning. A perforated

pressure plate is substituted for the direct expansion evaporator and all of the necessary wiring harnesses, controls, and refrigeration piping will be installed in the DMS unit during its construction. Cooling can then be added at a later date by simple removal of the pressure plate, installation of the direct expansion cooling coil, and connection to the companion condensing unit. Thus, it is possible for a school district, a commercial building, hospital, clinic, etc. to enjoy sophisticated heating and ventilating during initial use and later easily upgrade the system to include cooling for a true year-round comfort system.

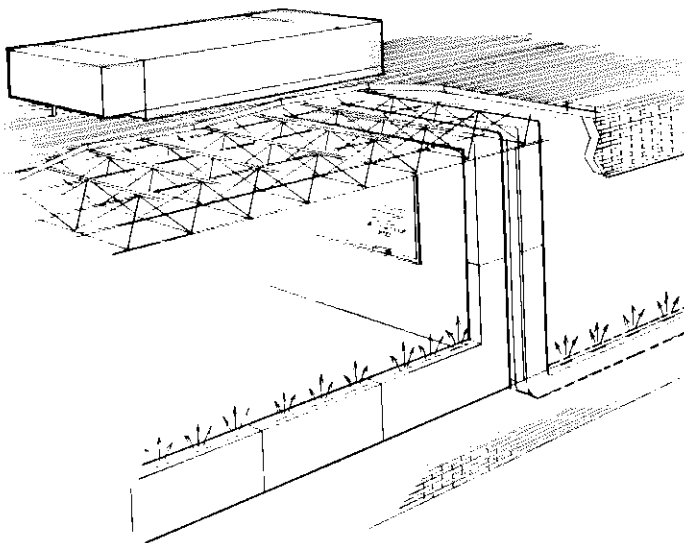
**ZONE DAMPERS WHERE DESIRED**—A choice of 8 or 12 zone dampers mounted in the DMS unit is available. These may be used in any combination—for instance one damper motor driving 4 zone mixing dampers feeding one zone. Full capacity of the DMS unit can be handled through as few as 9 of the 12-damper set and as few as 6 of the 8-damper set if so desired. The mixing dampers incorporate a bypass feature whereby 30% of the air is always bypassed through the cold duct side of the unit. Further sophisticated construction and tight sealing reduce leakage to less than 1% through the closed warm air dampers.

For applications where more than 12 zones per DMS unit exist or where it becomes more practical and economical to run dual hot and cold ducts the length of a building, mixing boxes are available for application in or near each zone requiring individual room control. These mixing boxes handle from 150 cfm to a maximum 2200 cfm each. CAUTION: Lennox mixing boxes for dual duct application and mixing dampers mounted in the unit are carefully sized to cooperate with the internal air handling characteristics of the DMS unit and, therefore, for optimum, service-free application, the Lennox DMS unit should not be used with other, job-constructed mixing dampers.

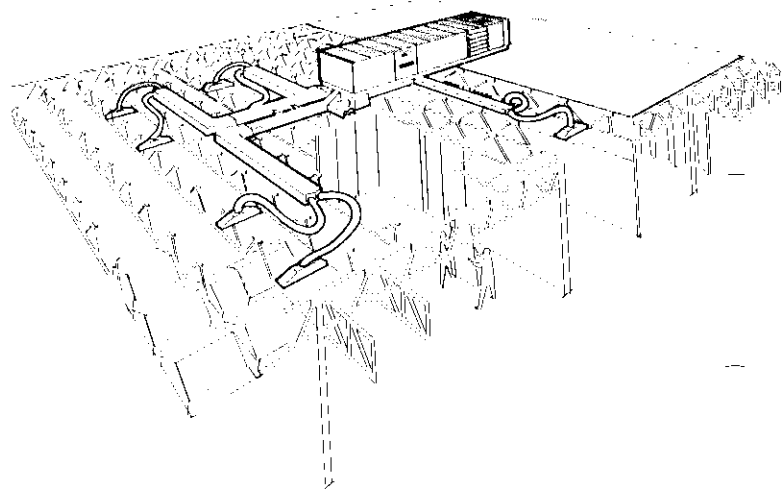
**AIR FILTERING**—Generous filter area consisting of 1" thick, 10 pores per inch Scottfoam in rugged, individual galvanized metal frames with face velocities below 300 ft. per minute in most applications is supplied as standard with the Lennox DMS unit. The upstream face is exposed (not confined by wire fencing) for convenient vacuum cleaning in place utilizing the 120V convenience outlet inside the DMS unit. The multiple metal framed filters are sized for convenient removal if it is desired to clean the filters some place else. The dry DMS filters are more efficient than most so called "permanent washable" filters which must be coated with filter oil. Further, the high holding capacity and large face area of the DMS filters mean less frequent servicing than is required with filters in other commercial installations. The DMS filter racks are 3" thick providing room for 2" of additional filtering material—such as activated charcoal—down-stream from the standard filters.

**CHOICE OF BLOWER DRIVES**—A wide range of blower motor horsepower and drives for the two 15 x 15 blowers is available to provide a cfm range varying from 5,000 cfm to 10,500 cfm against external static pressures varying from 0 to 1.0" water gauge.

## TYPICAL APPLICATIONS

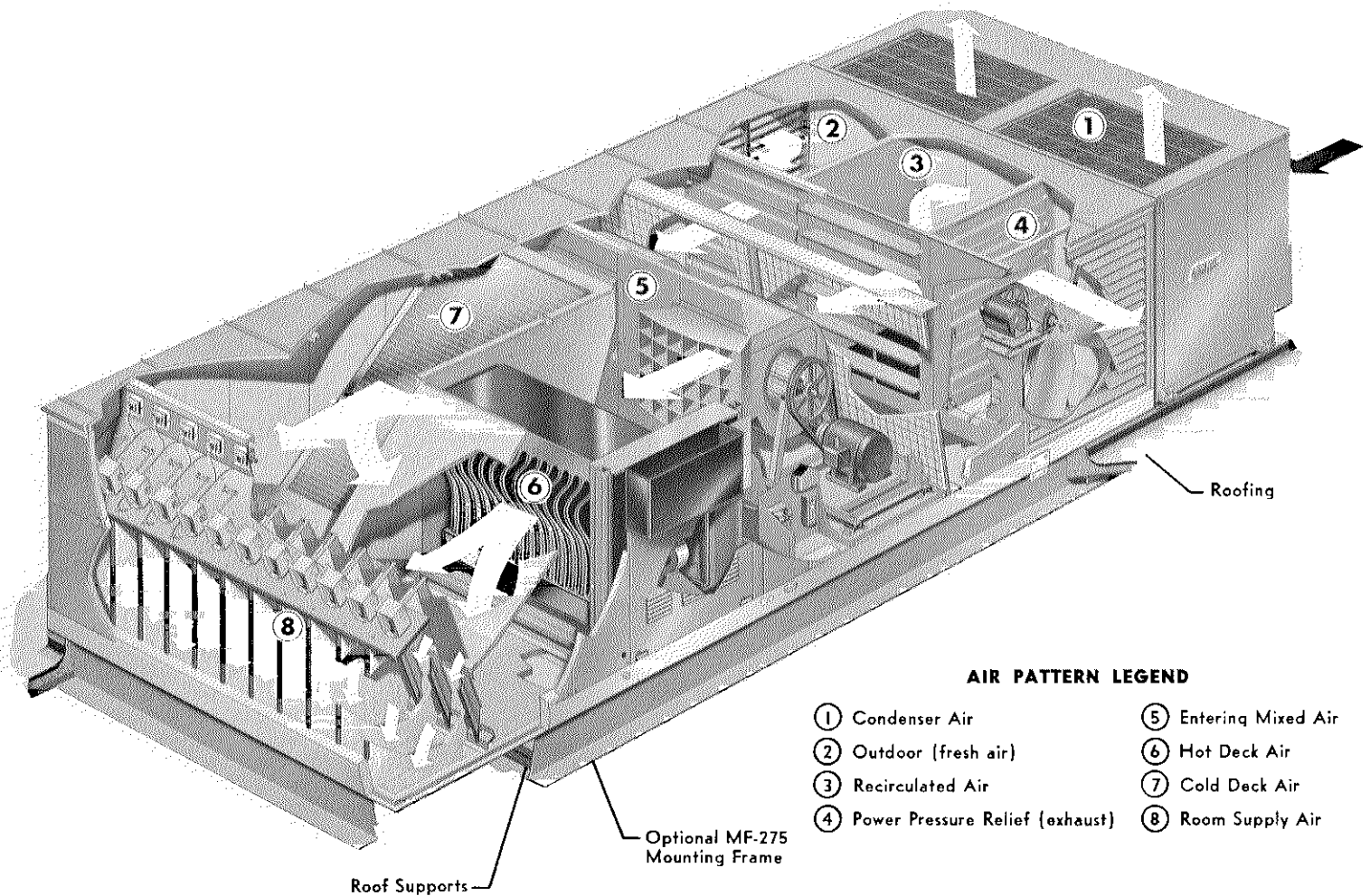


Floor diffusers or Lennox COMFORT CURTAIN duct distribution system.



Ceiling distribution system

## DMS1-275 CUTAWAY SHOWING AIR PATTERN



### AIR PATTERN LEGEND

- |                                   |                      |
|-----------------------------------|----------------------|
| ① Condenser Air                   | ⑤ Entering Mixed Air |
| ② Outdoor (fresh air)             | ⑥ Hot Deck Air       |
| ③ Recirculated Air                | ⑦ Cold Deck Air      |
| ④ Power Pressure Relief (exhaust) | ⑧ Room Supply Air    |

## DETAILED ENGINEERING DESCRIPTION

**FEATHERWEIGHT WEATHERPROOF CABINET**—Although designed for installation anywhere outdoors, the 42" high, low silhouette, light weight aluminum construction of the DMS unit makes it ideal for rooftop application with a roof loading factor in its heaviest configuration of less than 25 lbs. per square foot. Rugged highly specialized aluminum extrusions used for the base frame, transverse members, filter rack, etc. are MIG welded into an extremely rugged basic structure. The "roof" and sides of the structure are aluminum panels carefully formed and assembled with standing seams, built in flashing and counter-flashing to provide complete weather sealing. These aluminum side panels are mill finished with an accurately roller coated, high-grade, baked enamel beige finish of the highest quality commercially available today. The result is a most durable outside material which is capable of withstanding any kind of outdoor atmosphere.

The aluminum roof of the DMS is bowed slightly to prevent water puddling and the welded extruded aluminum structure provides strength enough to carry a load equivalent to 8.2 ft. of snow at 20°F.

**NONHYGROSCOPIC POLYURETHANE INSULATION**—All of the aluminum side panels are insulated with 1½" of foamed-in-place, Freon filled, polyurethane foam which gives an over-all factor of .08 Btuh per sq. ft. per 1° TD; acts as its own vapor barrier against moisture either on the inside or on the outside of the unit; and very effectively "deadens" all panels contributing substantially to the extreme quietness of the unit. The foamed-in-place insulation in the bottom of the unit is shaped to provide auxiliary drain pans so that snow or water pulled in the fresh air opening will drain to the outside and, if the regular drain pan should overflow for any reason, the insulation, under the evaporator provides an auxiliary drain pan.

**MINIMUM INSTALLATION LABOR**—Installation labor has been reduced to a minimum. An optional steel roof mounting frame which exactly fits the perimeter of the DMS unit is available. This can be

easily flashed into the roof before the DMS equipment arrives on the job. The base frame extrusion on the DMS unit incorporates a neoprene sponge gasket which, when the DMS unit is set on the optional roof mounting frame, provides a weather seal in addition to resilient isolation. No extra labor required for flashing. Supply and return air openings are out the bottom of the DMS unit inside the weather sealed mounting frame, and, consequently, no costly flashing of multiple duct openings through the roof is necessary. Control wiring in the field is limited to running low voltage wires from the zone thermostats to the zone mixing dampers. In some cases it may be necessary to mount the zone damper motors in pre-punched, factory located holes in the mixing damper section of the DMS unit, but the only necessary field control wiring is 3 wire, 24 volt. The electrician must pull 120V and 3 $\phi$  power to the factory-supplied disconnect switches in the DMS unit. The unit must, of course, have gas piping or hot water piping run to the heating section. If electric heat is used separate 3 $\phi$  power must be pulled to it.

**TOTAL SERVICEABILITY**—Total serviceability has been one of the important design criteria for the DMS unit. All exterior panels which must be removed during normal servicing (filter cleaning, for instance) are easily removable with rugged Lennox quarter-turn access handles. A 120V convenience outlet is located inside the unit next to the filter rack to allow the filters to be vacuumed in place. A control center is conveniently located on the side of the unit for all electrical makeup work, overload resetting or system shutdown which might be required.

**FOUR FACTORY-SUPPLIED INTEGRATED CONTROL SYSTEMS**—The standard factory assembled DMS unit includes three separate, but carefully integrated control systems—the Hot Deck Control System, the Cold Deck Control System and the Inlet Return Air-Fresh Air Control System. Due to varying building and zone requirements the Zone Control Systems must be ordered separately.

**THE INLET FRESH AIR, RETURN AIR CONTROL SYSTEM—**

The inlet end of the DMS unit has three separate sets of fresh air, return air, and exhaust dampers mechanically interconnected and actuated by an electric Honeywell series 90 modulating damper motor. The damper motor is commanded by a mixed air temperature controller set to maintain a 60°F mixed air temperature downstream from the blowers whenever the outdoor temperature is 60° or lower. As the outdoor temperature rises toward 60°, the fresh air dampers modulate open and the return dampers close. When the fresh air dampers open to the 30% position, the exhaust dampers start to open and the Power Pressure Relief fan starts to exhaust return air from the building. The exact position at which the exhaust dampers open and the Power Pressure Relief fan starts is field adjustable and should be set to maintain a slight positive pressure in the building.

When the outdoor temperature is between 60° and 65° the control system introduces 100% fresh air into the system. At temperatures above 65° the temperature controller returns the modulating damper motor to the minimum air position required for proper ventilation (this position is adjustable in the field).

**HEATING CONTROLS—**The function of these controls is to have warm air available on the warm side of the system whenever needed and at a temperature appropriate for the outside weather conditions. To accomplish this an outside-inside, one to one, reset type of duct stat control with a 120" long capillary sensing element serpentine across the warm duct section downstream from the heating unit senses the average temperature of the warm duct. With an outdoor temperature of 70° the duct stat heating controller will maintain approximately 85° (adjustable) average warm air temperature continuously available in the warm air duct. At 40° outside the warm air duct temperature will rise at 115°; if the outdoor temperature rises to 80°, the duct stat resets to 75° and, if the outdoor temperature continues to rise, the duct stat will, of course, shut the heater off completely.

**GAS HEAT CONTROL—**For gas direct-fired heat exchangers this duct stat is 2-stage with the stages about 3° apart. The heater will cycle on and off the 50% low stage fire very frequently until this 50% rate is not enough to maintain the average warm air temperature called for. At this point the second, 100% high fire rate begins to cycle. The net effect is to produce modulation in warm air temperature without the problems involved in modulating a gas fired heat exchanger. Anytime a gas fired heat exchanger is modulated much below the 50% rate, excessive condensation will develop inside the heat exchanger. This will not affect the Lennox Duraglass porcelain enameled heat exchanger, but draining the condensate away safely and adequately in subfreezing weather often produces field difficulties.

**HOT WATER CONTROL—**For hot water heat, the duct stat is of the modulating type commanding a Series 90 Honeywell modulating 3-way water valve regardless of whether straight valve control or primary-secondary pumping control is used.

**ELECTRIC HEAT CONTROL—**For electric heat the same modulating reset duct stat used for hot water commands a Series 90 Honeywell modulating sequencer to bring on just the number of electric stages required to maintain the average warm air temperature called for.

**COOLING CONTROL—**The Lennox control system is carefully engineered to provide accurate control for the direct expansion evaporator and its air cooled condensing unit operating in ambients varying from 58° to well above 115°F and with air volumes varying from a minimum of 30% of the total air to a maximum of 100% of the total air circulated by the system.

The Lennox condensing units used with DMS are designed specifically for that use and use two L2 series Lennox compressors in separate refrigeration circuits. The high stage compressor cycles on and off but is protected against too frequent cycling with the exclusive Lennox timed off cycle control. Until L2 series Lennox compressors are available in sufficient quantity, the 15-ton DMS condensing unit will use a single 15-ton compressor with cylinder unloading for control of the high stage.

Refrigeration suction pressure in the low stage refrigeration circuit is the major influence in commanding compressor activity. The high stage compressor cycles on and off under timed off cycle protection to maintain suction pressure no lower than 35°. In the case of the single compressor condensing unit the 1/3 cylinder unloading cycles on and off to maintain a suction temperature no lower than 35°. If there is so little air or so little load on the evaporator that even the low stage compressor will cause suction temperature to drop below

35°, a modulating valve will begin to open, sending discharge gas into the distributor downstream from the expansion valve to thoroughly modulate refrigeration capacity to exactly fit the needs of the system. In addition a duct stat sensing average cold air temperature downstream from the evaporator is used primarily as a limit control to prevent cold air temperatures dropping below 45°. Below 58° the cooling control system is deactivated and the condensing unit is shut off, since the 60° mixed air temperature controlled by the Inlet Control System will almost always have adequate cooling capacity for the full cooling need without further refrigeration when ambients are below 58°F.

**ANY CONTROL CHOICE?—**Fully 90% of the total control function complexity is covered by the factory installed, wired, and tested inlet, Heating, and Cooling Control Systems. The full complement of factory installed heating, cooling, and ventilating controls are accurately described in the A.G.A. and/or U. L. Approvals covering the DMS unit and hence Lennox cannot offer any change, substitution, or modification of its control systems without voiding the appropriate approval.

**ZONE TEMPERATURE CONTROLS—**This fourth DMS control system, the Zone Control System, is not electrically interconnected with the unit, and is the only control system which requires any field wiring. The DMS unit and its three integrated control systems continuously provide to the zone mixing dampers a supply of warm air and cool air at levels automatically modulated in accordance with outdoor ambient and internal loads. The zone control system then has the simple task of mixing these two air supplies to provide a constant volume of air with temperature adjusted for the particular zone.

**STANDARD ZONE CONTROL SYSTEM—**The standard Lennox Zone Control System consists of a special Honeywell 2-mercury bulb, wall mounted thermostat and a Lennox 3-position, 24V damper motor which produces 3-stage operation—full heating, 50-50 mix of warm and cold air, or full cooling. The Lennox damper motor is an extremely rugged 3-position, spring return highly durable motor with the entire gear train and motor submerged in nontemperature sensitive oil sealed in the die cast case. It provides simple, understandable and almost completely noiseless operation. Internal switches enable slaving of a second damper motor with one thermostat, with a third motor slaved to the second, etc. Of the Zone Control Systems tested in the Lennox Laboratory, this combination of thermostat and damper motor gave the most accurate and constant control of zone temperature and accommodated itself to changes in loads quicker than any other type.

**OPTIONAL ZONE CONTROL SYSTEM—**For those who insist on modulating zone controls, Lennox has available a Honeywell Series 90 modulating damper motor with the appropriate "slide wire" type of wall mount thermostat to actuate it. This type of thermostat and its modulating motor gives reasonably accurate temperature control but does not follow rapid changes in load, which can occur in almost all commercial buildings, as well as the standard Lennox control system.

**OTHER ZONE CONTROL SYSTEMS TESTED—**Pneumatic and solid state modulating control systems have also been tested, but found seriously lacking in several important respects. The solid state modulating control has the serious defect of being extremely complicated to understand and hence difficult to service and adjust in the field. Pneumatic controls are not available to Lennox or any manufacturer on an O.E.M. basis, and, hence, Lennox is unable to sell or supervise installation of them. If pneumatic controls are used with DMS units, Lennox cannot accept responsibility for the end comfort result.

**INTERNAL AIR HANDLING—**Careful attention to detail, thorough isolation of all internal moving parts and maintaining relatively low internal air velocities has allowed Lennox to create the quietest Multi-zone air handler on the market. External vibration measurement showed that the amplitude effect of moderate breezes were greater than the vibratory amplitudes of the DMS and its companion condensing unit which were transmitted to the roof and building structure.

Highly sophisticated and detailed engineering allows the Lennox DMS unit to handle maximum cfm at exceedingly low internal resistances regardless of the position of the mixing dampers. The normal external duct system used with the DMS system will have a relatively much higher static drop than the internal resistance of the DMS unit and, hence, the small changes in static drop produced by the different positions of the mixing damper becomes a negligible part of the total static pressure experienced by the air movers. Hence, an almost constant cfm is supplied to each zone regardless of the position of the Lennox supplied mixing dampers.

**VELOCITY PRESSURE CONVERTERS**—Lennox developed, patent applied for, Velocity Pressure Converters, which are essentially highly sophisticated diverging nozzles, in front of each blower, convert the kinetic energy of the high velocity blower discharge to static pressure to produce nearly laminar air flow within the unit. Laminar air flow not only saves power but also insures excellent air distribution over the evaporator which eliminates erratic hunting of the expansion valves. Also, when Velocity Pressure Converters are not used high velocity air impingement forces air partially through the heat exchanger which then recirculates back to the cooling side adding substantially to the cooling load.

**INTERNAL VIBRATION ISOLATION**—All moving parts within the DMS unit—the motor, blower wheels, shafting, and drive are mounted in a rugged steel subassembly which is then resiliently suspended in the structure of the cabinet. This is the most complete and efficient method of isolating the energy of the blower assembly that has ever been used in the air conditioning industry. Belt tension is easily adjusted by loosening one nut and jacking the hinged motor mounting base up or down and locking it again with the one nut. The foamed-in-place insulation in the cabinet contributes to deadening

**ROOF MOUNTING FRAME**—An optional roof mounting frame which exactly fits the perimeter of the DMS unit is also available. This simplifies installation making it easier for the roofer to flash in the frame. The DMS unit then sits on top of this frame and a neoprene sponge gasket in the extruded aluminum base completes the sealing and weather-proofing job.

**NIGHT OPERATION**—In mild climates a "system switch" turns off the entire unit at night. For colder climates a "night protection thermostat" located in an average zone is used. If the night temperature drops below the setting of this thermostat, the system will operate normally until the temperature is satisfied and the system again turns off completely. A skip-day clock to program this unit automatically is also available. A spring powered carry over feature keeps this timer going in spite of power interruptions of reasonable duration.

**IS SPECIAL DUCT WORK REQUIRED?**—Principles of duct design applied to DMS units are exactly the same as principles used with any other air conditioning system. Distribution of the supply air from the DMS should be designed on the basis of good engineering principles applied with any commercial system. If the climate is fairly warm, so that the major work is cooling, ceiling or high side wall supplies should suffice. If the climate is cold and/or the building construction poor, perimeter distribution is preferred.

Lennox recommends that main trunk velocity be kept within a maximum of about 1500 feet per minute with the DMS unit.

the panels producing an extremely quiet unit. All dampers are mounted in self lubricating, non rattling nylon or delrin bearings. Lennox compressors are the quietest in the industry. Moving parts are thoroughly floated within the hermetic shell. The condenser fans are floated. There is practically no vibration on the roof.

**HUMIDITY CONTROL**—A surprising amount of humidity control has been designed into the standard DMS control systems. The cool side always bypasses a minimum of 30% which means that even if every zone is calling for full heating 70% of the air will go through the heating section and 30% through the cooling section. Below 58° the compressors are off. Even though the outdoor air is saturated at this temperature it will be comparatively dry when raised to indoor temperatures of around 75°. Above 58° the compressors function to maintain a cold coil constantly on the cool side and, with a minimum of 30% over this coil, you dehumidify this air and then reheat it by mixing it with warm air for those zones calling for heating.

For humidification Lennox offers an electrically operated humidifier of considerable capacity that fits in the warm air chamber downstream from the heating section. When humidification is ordered it is controlled by a factory installed humidistat in the return air section.

## ACCESSORIES

**STEP DOWN TRANSFORMER**—In areas where 120 volt power is not readily available a special transformer is available to step down the power supply to obtain 120 volt control power.

**APPROVALS**—When equipped with our Lennox GX1 Duracurve-Duraglas direct-fired gas heat exchanger, the entire DMS unit carries an A.G.A. approval for outdoor use.

When equipped with an electric heating section, the electric duct heater itself is U. L. listed for use in this environment. When supplied with a hot water coil, there is no applicable approval, but the unit will be identical to the A.G.A. approved gas model except for omission of the gas heater and substitution of the hot water coil. All electrical components have a general (white card) listing.

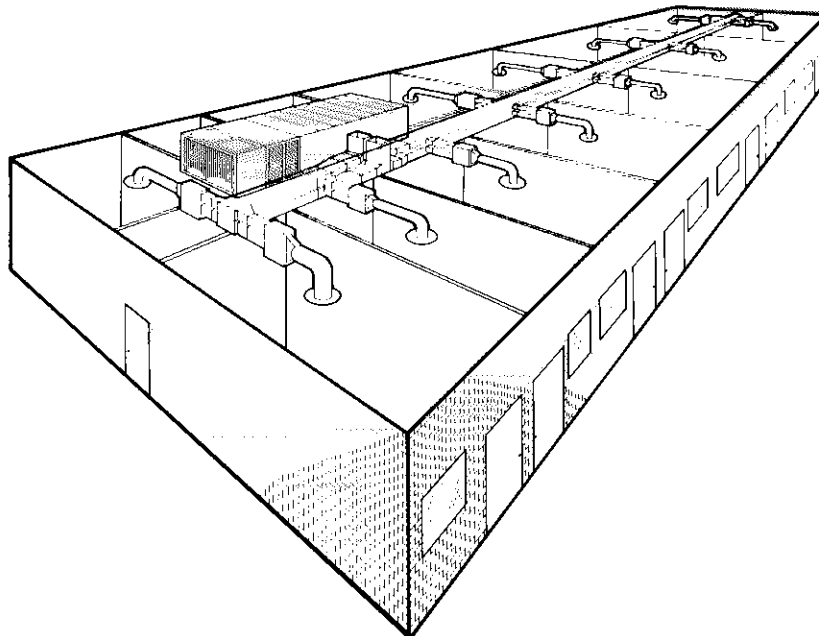
The appropriate condensing units carry U. L. listing.

All of the internal wiring, is in strict compliance with the National Electric Code, including the local interpretations of which Lennox is aware.

In addition to the wiring requirements by A.G.A. covered in the A.G.A. approval, the following Underwriters Laboratories standards are adhered to:

- Air Conditioners, central cooling (UL 465)
- Condensing Units, refrigeration (UL 303)
- Gas Heating Equipment, commercial-industrial (UL 795)
- Temperature Indicating and Regulating Equipment (UL 873)

## TYPICAL DOUBLE DUCT APPLICATION



## DMS1 RATINGS AND SPECIFICATIONS

Model Number <span style="font-size: small;">➔</span>		DMS1-275	
*Cooling capacity (Btuh)/S/T Ratio/Compressor watts At ARI standard 210 conditions	4 row evaporator—HS6-1853V Condensing Unit	188,000/.74/17,500	
	6 row evaporator—HS6-1853V Condensing Unit	205,000/.90/18,300	
	6 row evaporator—HSM1-2753V Condensing Unit	275,000/.76/25,050	
Gas heating capacity (Btuh)	GX1-350	Minimum input	175,000
		Maximum input	350,000
	GX1-490	Minimum input	245,000
		Maximum input	490,000
‡Electric heating capacity (Kw)	Minimum	45	
	Maximum	105	
**Hot water coil heating capacity (Btuh)	Minimum	100,000	
	Maximum	700,000	
Gas piping size (in.)	Natural	1	
	LPG	3/4	
Hot water coil connections (in. copper)	Minimum	1/2	
	Maximum	1 1/2	
Free Filter area (sq. ft.)		24.4	
Blower motor hp	Minimum	1 1/2	
	Maximum	5	
Blower wheel nominal diam. x width (in.)		(2) 15 x 15	
Evaporator Coil EYMS1-185V-4 row EYMS1-275V-6 row	Net face area (sq. ft.)	14.1	
	Tube diameter (in.)	1/2	
	Fins per inch	13	
Condensate drain connections I.P.M. (in.)		3/4	

\*See condensing unit curves and evaporator curves for Btuh capacity range at varying conditions.  
 ‡Electric heat capacities between minimum and maximum are available in 15 Kw increments.

\*\*See hot water capacity curve for Btuh capacity range at varying conditions.

### SHIPPING WEIGHTS (lbs)

DMS1-275 Without Coils Heating Sections or Blower Drives	To arrive at gross weight of a complete DMS unit, total the weights of the required components listed below and add this weight to the DMS weight in left hand column															
	GX1-350 Gas Heat Section	GX1-490 Gas Heat Section	3 Row Hot Water Coil	4 Row DX Coil	6 Row DX Coil	Electric Heat Sections					Motor & Drives			Distribution System		
						45 Kw	60 Kw	75 Kw	90 Kw	105 Kw	1 1/2 Hp	3 Hp	5 Hp	8 Zone	12 Zone	Double Duct
1458	433	536	147	233	268	173	182	192	200	211	74	103	110	*360	*415	46

\*Based on one damper motor per each zone. Note—See condensing unit specifications for condensing unit weight.

### ELECTRIC HEAT DATA

Model No.	No. of Steps	Volts Input	Kw Input	Btuh Output	Amps	*AWG Wire Size	Disconnect Size (amps)	Fuse Size (amps)
EX1-1533 45 KW	3	208	34	116,000	95	3	200	100
		240	45	153,500	109	2	200	125
		440	38	129,500	89	3	100	100
		480	45	153,500	54	6	60	60
		550	38	129,500	40	8	60	45
		600	45	153,500	46	6	60	50
EX1-2223 60 KW	4	208	45	153,500	125	1	200	150
		240	60	222,000	145	0	200	175
		440	49	167,000	65	6	100	80
		480	60	222,000	72	4	100	80
		550	49	167,000	52	6	60	60
		600	60	222,000	58	6	100	70
EX1-2563 75 KW	5	208	56	191,000	155	00	200	175
		240	75	256,000	180	000	200	200
		440	63	215,000	83	4	100	90
		480	75	256,000	63	6	100	70
		550	63	215,000	66	4	100	80
		600	75	256,000	72	4	100	80
EX1-3123 90 KW	6	208	68	232,000	189	000	200	200
		240	90	312,000	218	0000	400	250
		440	76	259,000	100	3	200	110
		480	90	312,000	109	2	200	125
		550	76	259,000	84	4	100	100
		600	90	312,000	87	3	100	100
EX1-3583 105 KW	7	208	79	259,000	220	0000	400	250
		240	105	358,000	254	250M	400	300
		440	88	300,000	116	1	200	125
		480	105	358,000	127	1	200	150
		550	88	300,000	97	3	200	110
		600	105	358,000	101	2	200	110

\*Up to 100' of run. Local codes take precedence. Use wire suitable for at least 75°C (167°F).



## ELECTRICAL DATA

### DMS1-275 With HS6-1853V Condensing Unit

Supply Voltage—3 $\phi$ , 60 Cycle		208	220/240	440/480	550/660	
Unit operating range (volts)		187-229	198-264	396-528	495-660	
Compressor	‡FLA/LRA	63.5/266	57.2/240	28.6/120	22.8/96	
	Power factor	6.8/45	.88	.88	.88	
Condensing unit fan	‡FLA/LRA	.88	6.2/41	3.1/20.5	2.5/16.4	
DMS1-275 Blower	1½ hp	‡FLA/LRA	5.0/31	4.8/30	2.4/15	1.9/11
	3hp	‡FLA/LRA	9.9/55	9.0/50	4.5/25	3.6/20
	5 hp	‡FLA/LRA	16.5/83.6	15/76	7.5/38	6/32
Power pressure relief fan	FLA/LRA	7.8/33.4	7.8/33.4	7.8/33.4	7.8/33.4	
AWG Wire Size For Various Lengths of Run	10 ft.	*2	*2	6	8	
	50 ft.	*2	*2	6	8	
	100 ft.	*2	*2	6	8	
	200 ft.	1	1	4	6	
Non fused disconnect size		100 amp	100 amp	60 amp	60 amp	

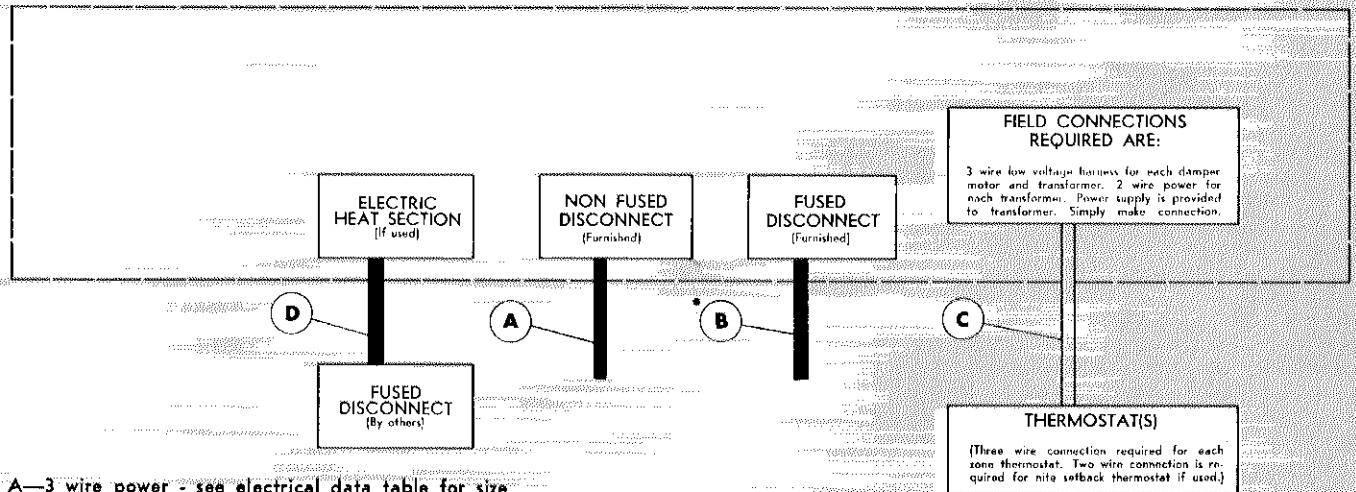
### DMS1-275 With HSM1-2753V Condensing Unit

Supply Voltage—3 $\phi$ , 60 Cycle		208/240	440/480	550	
Unit operating range (volts)		187-264	396-506	495-605	
Compressor	‡FLA/LRA	42.4/197	20.1/98.5	16.5/78.8	
	Power factor	.88	.88	.88	
Condensing unit fan (2)	‡FLA/LRA	9/50	4.5/25	3.6/20	
DMS1-275 Blower	1½ hp	‡FLA/LRA	4.8/30	2.4/15	1.9/11
	3 hp	‡FLA/LRA	9.0/50	4.5/25	3.6/20
	5 hp	‡FLA/LRA	15/76	7.5/38	6.0/32
Power pressure relief fan	FLA/LRA	7.8/33.4	7.8/33.4	7.8/33.4	
AWG Wire Size For Various Lengths of Run	10 ft.	0	4	6	
	50 ft.	0	4	6	
	100 ft.	0	4	6	
	200 ft.	00	3	4	
Non fused disconnect size		200 amp	100 amp	60 amp	

\*Increase to next size larger wire when 5 hp blower motor is used.

‡FLA—Full load amps. LRA—Locked rotor amps.

## FIELD WIRING



A—3 wire power - see electrical data table for size

\*B—2 wire 115V power—14 ga. minimum

C—38 wire low voltage—18 ga. minimum - furnished 18" external to DMS1 unit. Each 3 wire low voltage thermostat cable to each thermostat is furnished by the installer. When the nite setback thermostat is used the two wire cable to it is also furnished by the installer.

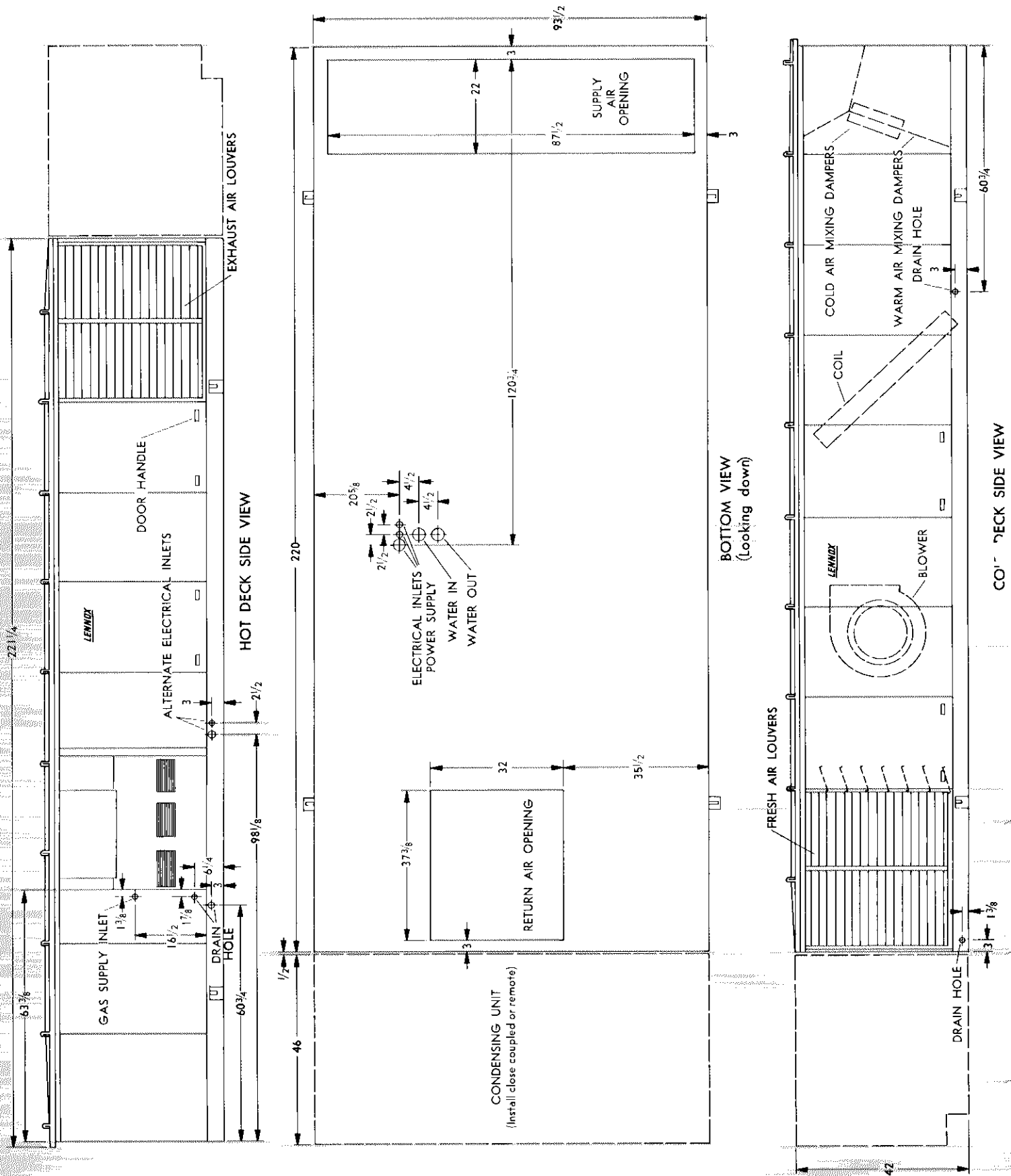
D—3 wire power - see electric heat data for size.

\*2 wire power can be eliminated by ordering unit equipped with the optional 1½ KVA transformer.

## CONDENSING UNIT SPECIFICATIONS

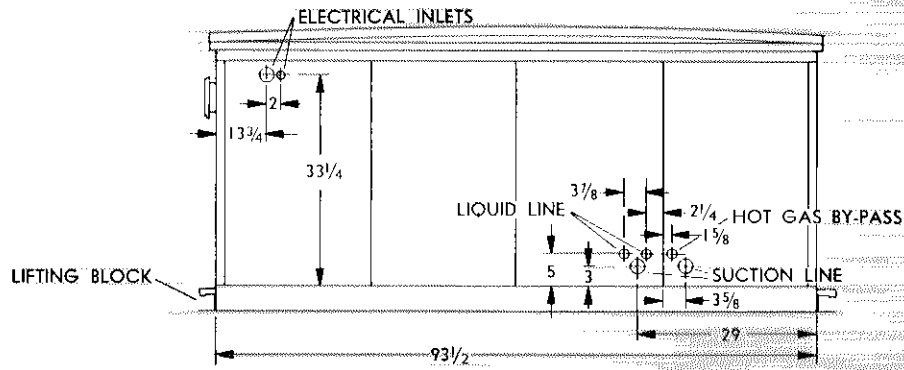
Model Number →		HS6-1853V	HSM1-2753V
Condenser	Net face area (sq. ft.)	22.4	23.9
	Tube diam. (in.) & No. of rows	½—4	½—6
	Fins per inch	13	13
Condenser Fans (2)	Diam. (in.) & No. of blades	36—4	36—4
	Motor hp	2	3
	Air volume (cfm) factory setting	11,500	13,000
	Fan speed (rpm) factory setting	610	700
	Motor watts input factory setting	1725	3000
Refrigerant-22 charge furnished		Holding charge only	Holding charge only
Refrigerant-22 charge required (lbs)	4 row evaporator	50	
	6 row evaporator	55	36 each system
Approximate shipping weight (lbs)—1 pkg.		1360	1815

# DIMENSIONS (in.)

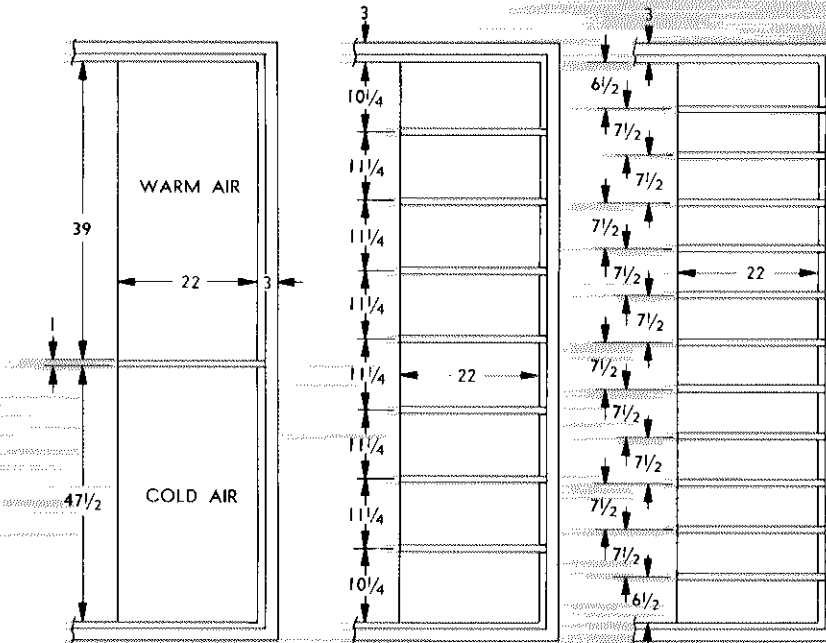




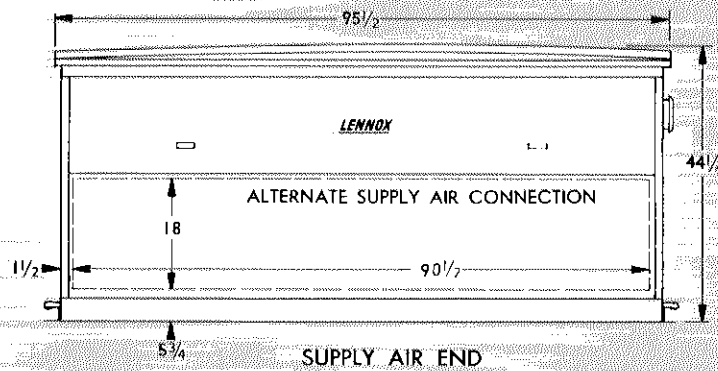
# DIMENSIONS (in.)



## RETURN AIR END



**SUPPLY AIR CONNECTIONS FOR DOUBLE DUCT APPLICATIONS**    
 **SUPPLY AIR CONNECTIONS FOR 8 OR LESS ZONES**    
 **SUPPLY AIR CONNECTIONS FOR 12 OR LESS ZONES**



# BLOWER DATA

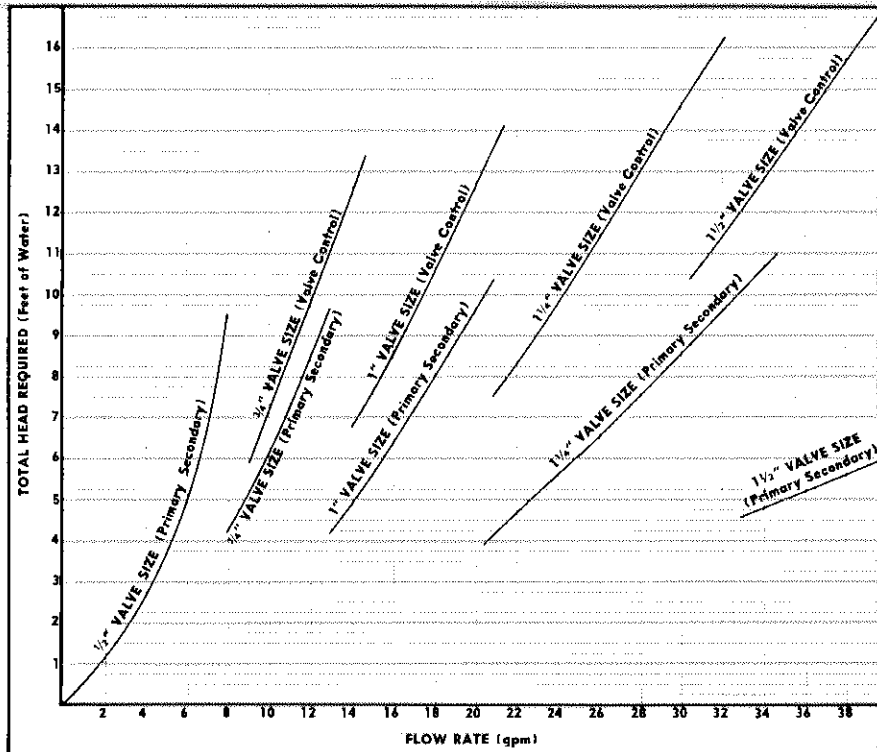
## DMS1-275 BLOWER PERFORMANCE

Air Volume (cfm)	STATIC PRESSURE EXTERNAL TO UNIT—Inches Water Gauge																					
	0		.10		.20		.30		.40		.50		.60		.70		.80		.90		1.00	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
5000	340	0.6	390	0.7	435	0.8	475	0.9	520	1.0	550	1.1	585	1.2	625	1.3	650	1.4	675	1.5	710	1.6
5500	380	0.7	430	0.8	475	0.9	510	1.0	545	1.1	575	1.3	620	1.4	645	1.5	675	1.6	700	1.7	735	1.8
6000	430	0.9	475	1.1	510	1.2	540	1.3	575	1.4	615	1.5	640	1.6	670	1.7	700	1.8	725	1.9	760	2.0
6500	465	1.2	515	1.3	540	1.4	570	1.6	615	1.7	640	1.7	660	1.8	695	1.9	720	2.1	750	2.1	780	2.2
7000	510	1.4	540	1.6	570	1.7	610	1.8	640	1.9	660	1.9	690	2.1	725	2.2	750	2.4	775	2.4	800	2.6
7500	550	1.7	580	1.8	610	1.9	640	2.1	660	2.2	690	2.2	725	2.5	750	2.6	775	2.7	800	2.8	820	3.1
8000	575	2.0	610	2.1	640	2.3	670	2.4	690	2.5	725	2.7	750	2.9	775	3.0	800	3.2	825	3.3	850	3.6
8500	620	2.4	640	2.5	670	2.6	700	2.8	725	3.0	750	3.2	780	3.4	805	3.5	825	3.7	850	3.8	875	4.1
9000	645	2.7	670	2.8	700	3.1	735	3.3	760	3.4	780	3.6	815	3.9	830	4.1	850	4.2	875	4.3	900	4.6
9500	680	3.2	705	3.4	735	3.6	760	3.8	780	3.8	815	4.3	840	4.4	855	4.6	880	4.7	900	4.9	925	5.2
10,000	715	3.7	745	3.9	775	4.2	790	4.3	825	4.5	840	4.7	870	5.0	885	5.2	905	5.4	930	5.6		
10,500	750	4.3	775	4.6	810	4.9	830	5.1	850	5.2	870	5.4	890	5.5	910	5.7						

### DRIVE SELECTION

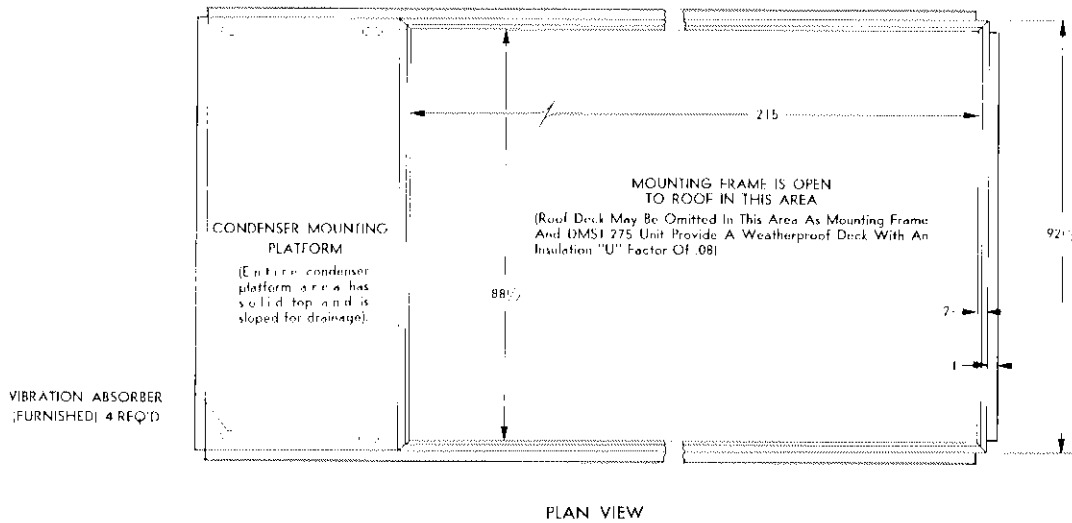
Nominal Motor Hp.	Maximum Usable Hp.	Blower Pulley Bore x Diam. (in.)	Adjustable Motor Pulley Bore x Diam. (in.)	Belt Length (In.) & Section	Rpm Range With Drives Furnished
1½	1.72	1¾ x 12.4	1⅛ x 4.75	1-50-"B"	508—648
3	3.45	1¾ x 12.4	1⅛ x 5.375	2-50-"B"	593—750
5	5.75	1¾ x 12.4	1⅛ x 6.75	2-53-"B"	760—932

### WATER COIL PRESSURE DROP

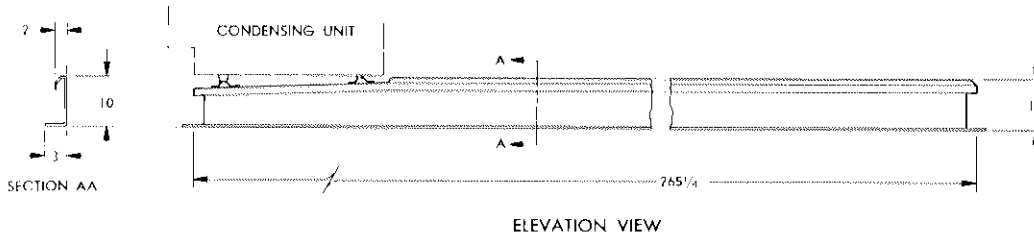


# MOUNTING DETAILS

## MF-275 MOUNTING FRAME

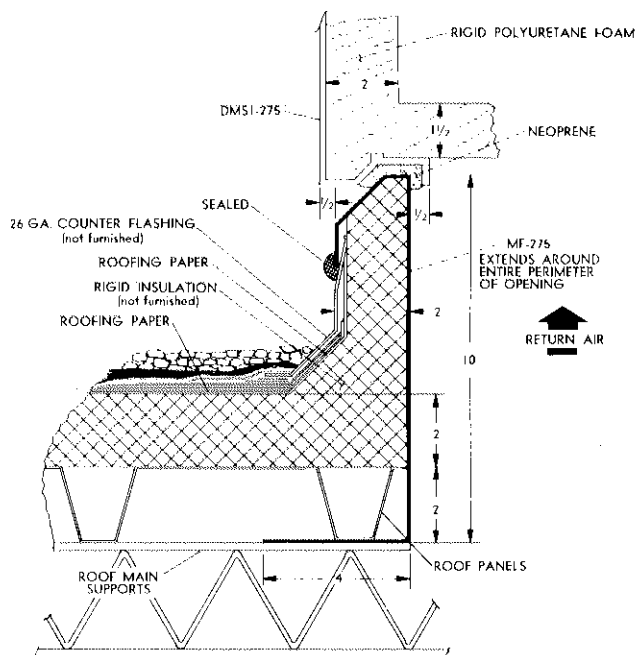


**RUGGED AND PRACTICAL**  
Makes a perfect mounting curb to receive the direct multizone unit. It is built into the roof structure during building construction. When installed as recommended below it is completely weatherproof and water proof. No additional curbing materials are required.

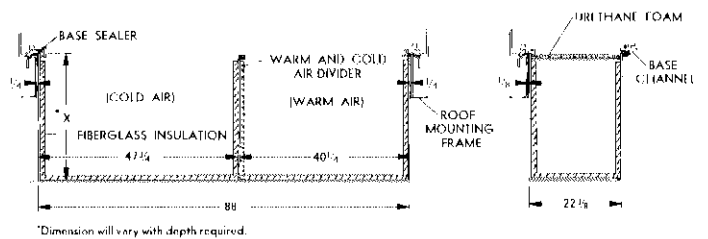


SEE MOUNTING  
DETAIL BELOW

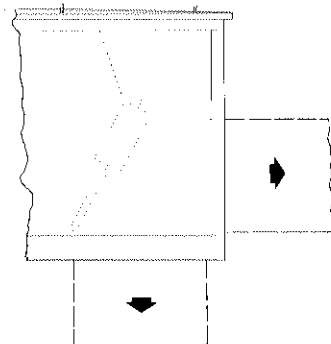
### RECOMMENDED FLASHING FOR MF-275 MOUNTING FRAME



### DOUBLE DUCT PLENUM



### ZONE DAMPER ASSEMBLY

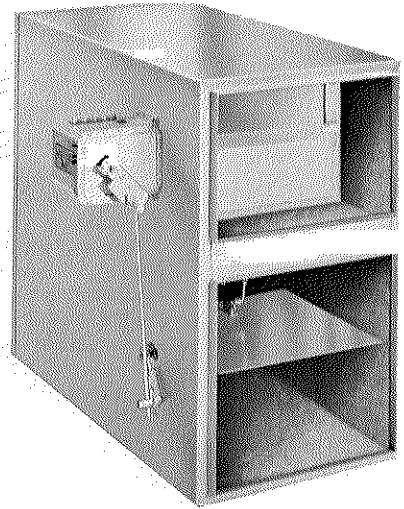


Supply ducts connect to end or bottom of zone damper assembly

## MIXING BOXES

Compact mixing damper boxes for double duct applications easily fit into false ceiling space, tunnel in a slab or any convenient indoor location that lends itself to proper air distribution. Damper motor and linkage are factory installed for horizontal applications. If up-flo or down-flo air pattern is desired, the damper motor must be repositioned, keeping the motor shaft horizontal. (See drawings below). ZD1 Series mixing boxes use the Len-

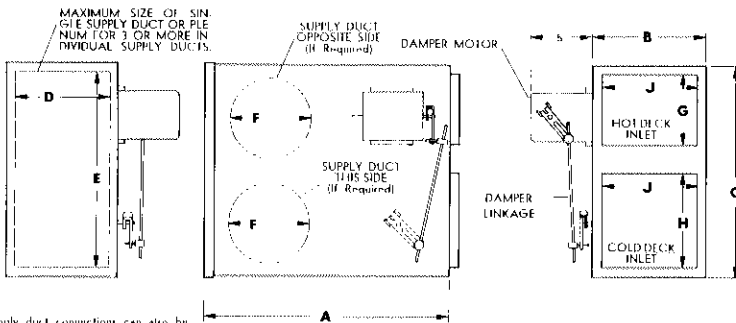
nox 3-position damper motor. The ZD2 Series boxes use an M-H modulating damper motor. Damper blades ride in Delrin bearings. Cold deck damper has built in bypass. Interior of damper box is lined with 1/2" thick neoprene coated fiberglass insulation. Supply duct connections can be made in several different locations. See dimension drawings. Flanges are provided for hot and cold deck duct connections.



### SPECIFICATIONS

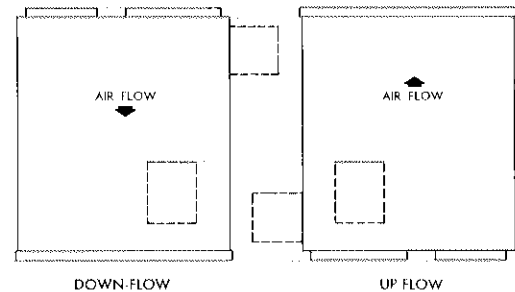
Model No.	Air Volume Range (cfm)	Resistance (in. w.g.)		Approx. Shipping Weight (lbs)
		Min (cfm)	Max (cfm)	
ZD1-250	150-250	.10	.22	36
ZD2-250	150-250	.10	.22	38
ZD1-400	250-400	.10	.22	39
ZD2-400	250-400	.10	.22	41
ZD1-700	400-700	.07	.21	42
ZD2-700	400-700	.07	.21	44
ZD1-1000	700-1000	.11	.22	49
ZD2-1000	700-1000	.11	.22	51
ZD1-1500	1000-1500	.09	.21	64
ZD2-1500	1000-1500	.09	.21	66
ZD1-2200	1500-2200	.11	.24	79
ZD2-2200	1500-2200	.11	.24	81

### DIMENSIONS (in.)

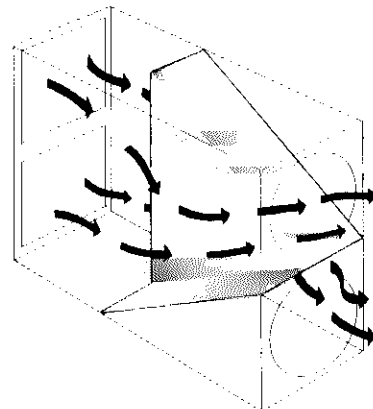


NOTE: Supply duct connections can also be made at top or bottom of damper box.

### ALTERNATE MOTOR POSITION

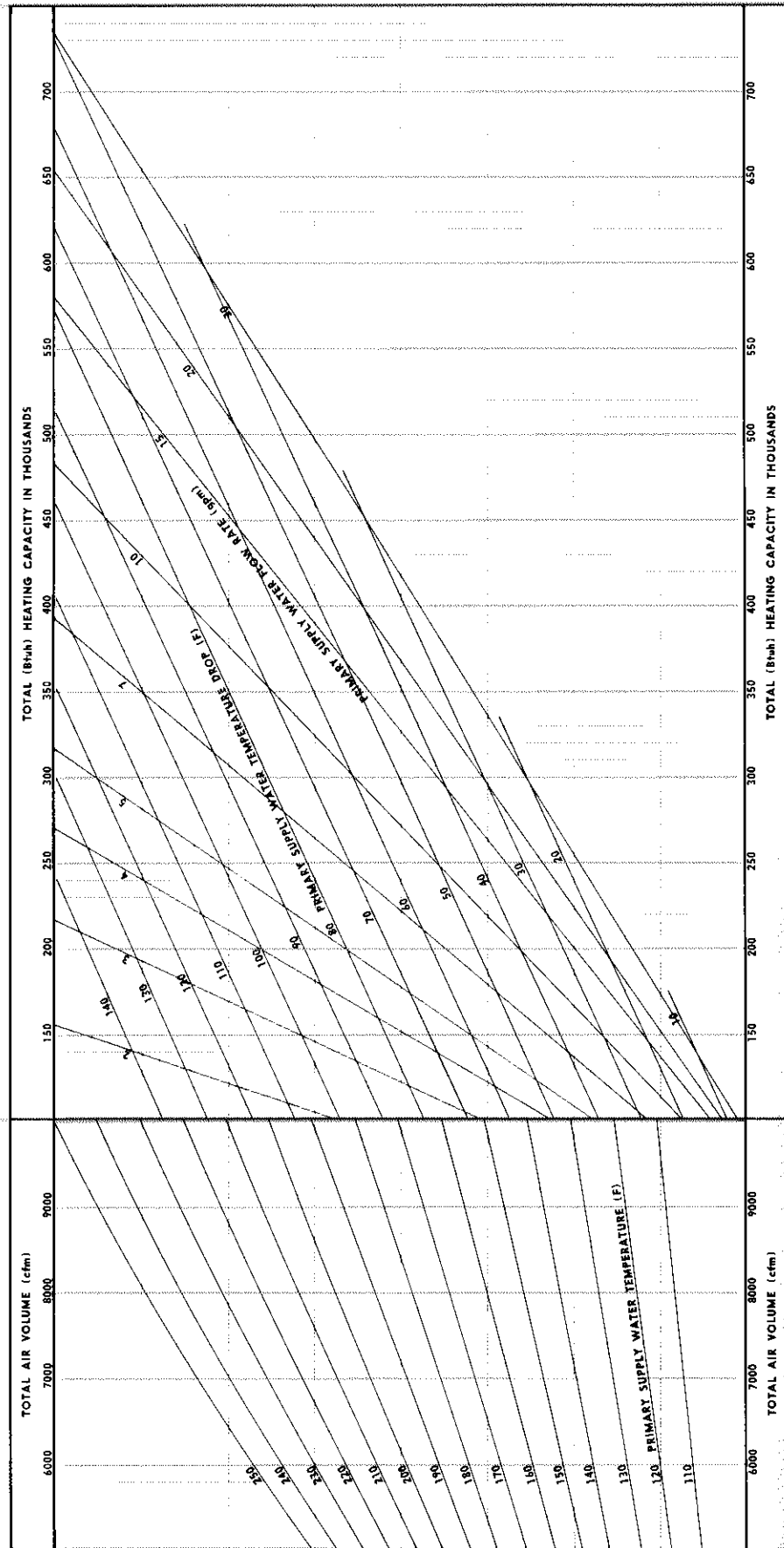


### AIR PATTERN DETAIL

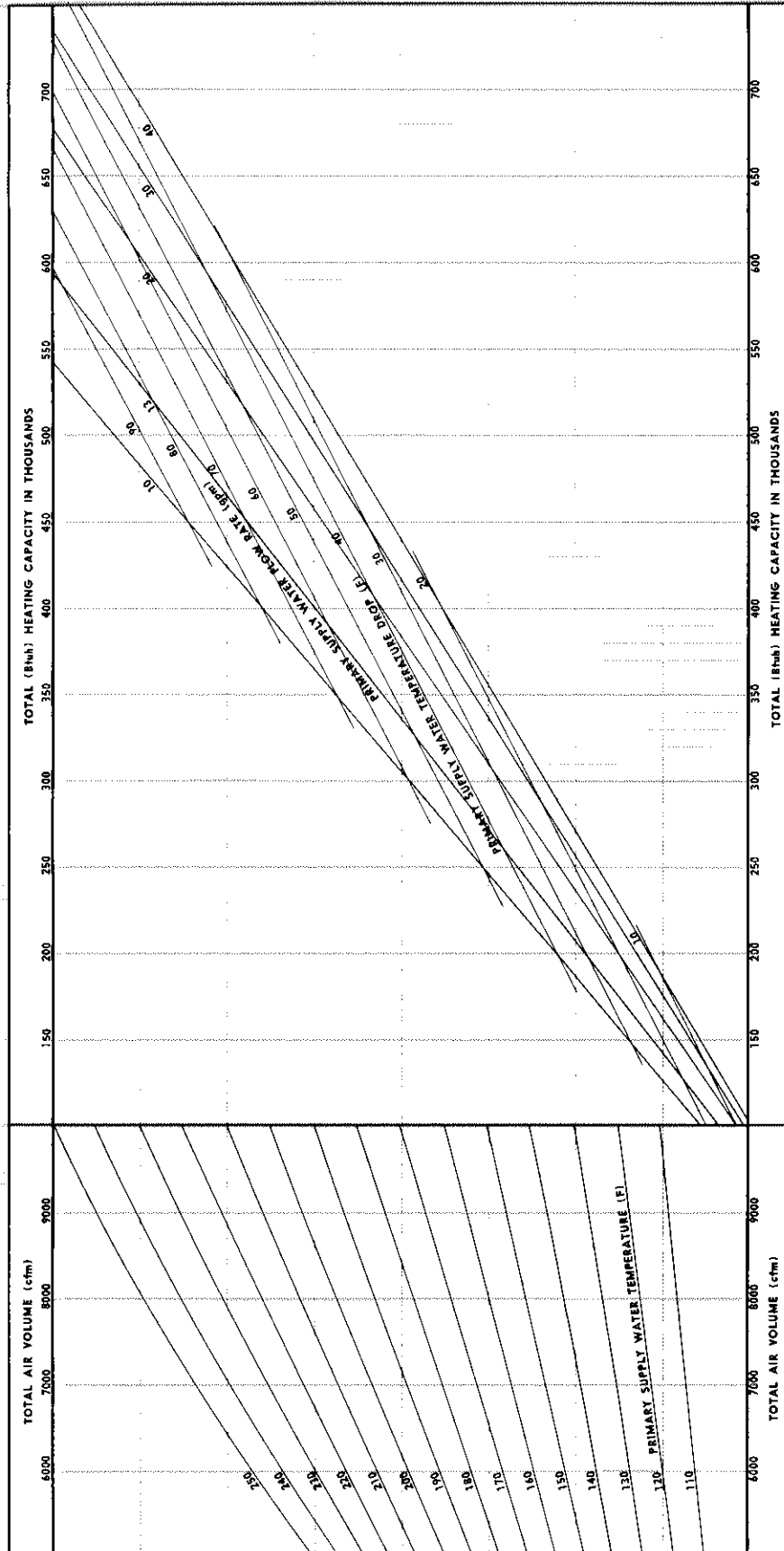


Model No.	A	B	C	D	E	F	G	H	J
ZD1 & ZD2-250	16	8	16	7	15	6	5 1/2	7	7
ZD1 & ZD2-400	20	9 1/4	17 1/4	8	16	7	6	8	8
ZD1 & ZD2-700	24	11 1/4	20 3/4	10	18	9	7 1/2	10	10
ZD1 & ZD2-1000	27 1/2	13 1/4	23 3/4	12	22	10	8 1/2	12	12
ZD1 & ZD2-1500	31 1/2	15 1/4	27 1/4	14	26	12	10	14	14
ZD1 & ZD2-2200	36	17 1/4	31 1/4	16	30	14	12	16	16

# DMSI-275 THREE ROW HOT WATER COIL HEATING CAPACITY Primary-Secondary System



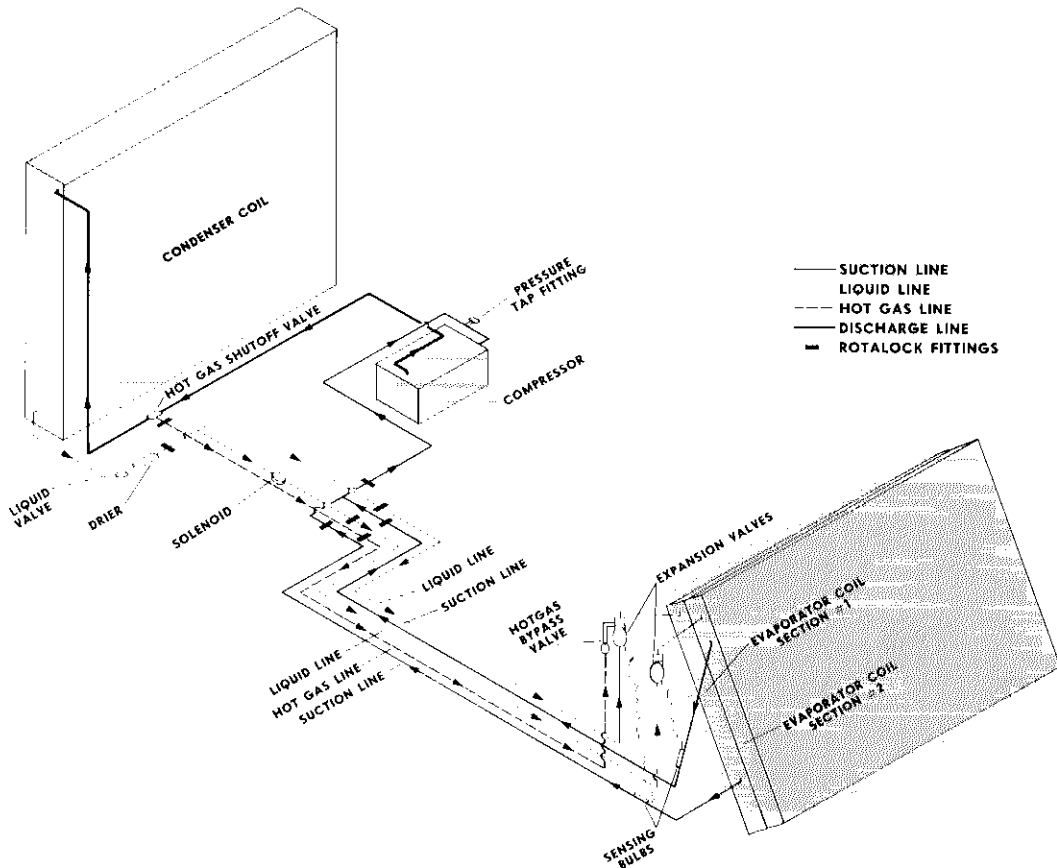
# DMSI-275 THREE ROW HOT WATER COIL HEATING CAPACITY Valve Control System



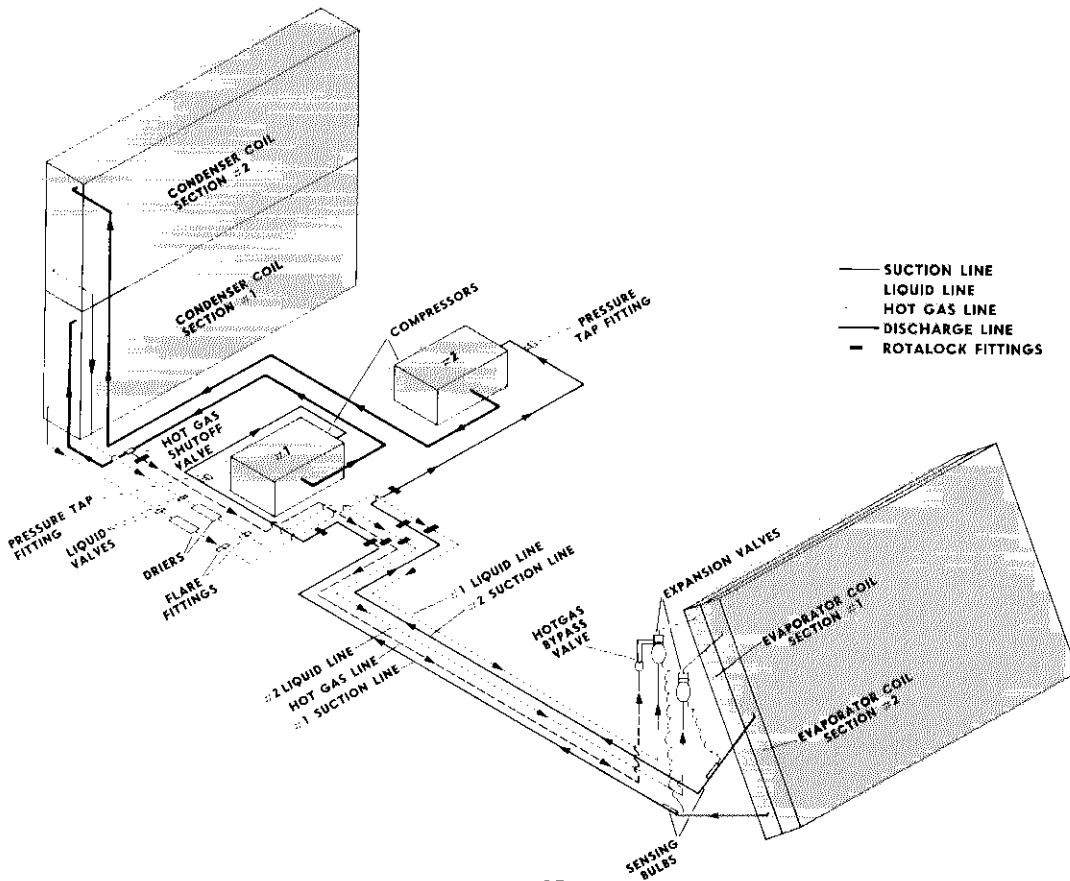


## SCHEMATIC REFRIGERANT LINE ARRANGEMENT

### DMS1-275 FOUR ROW & SIX ROW EVAPORATOR WITH HS6-1853V CONDENSING UNIT

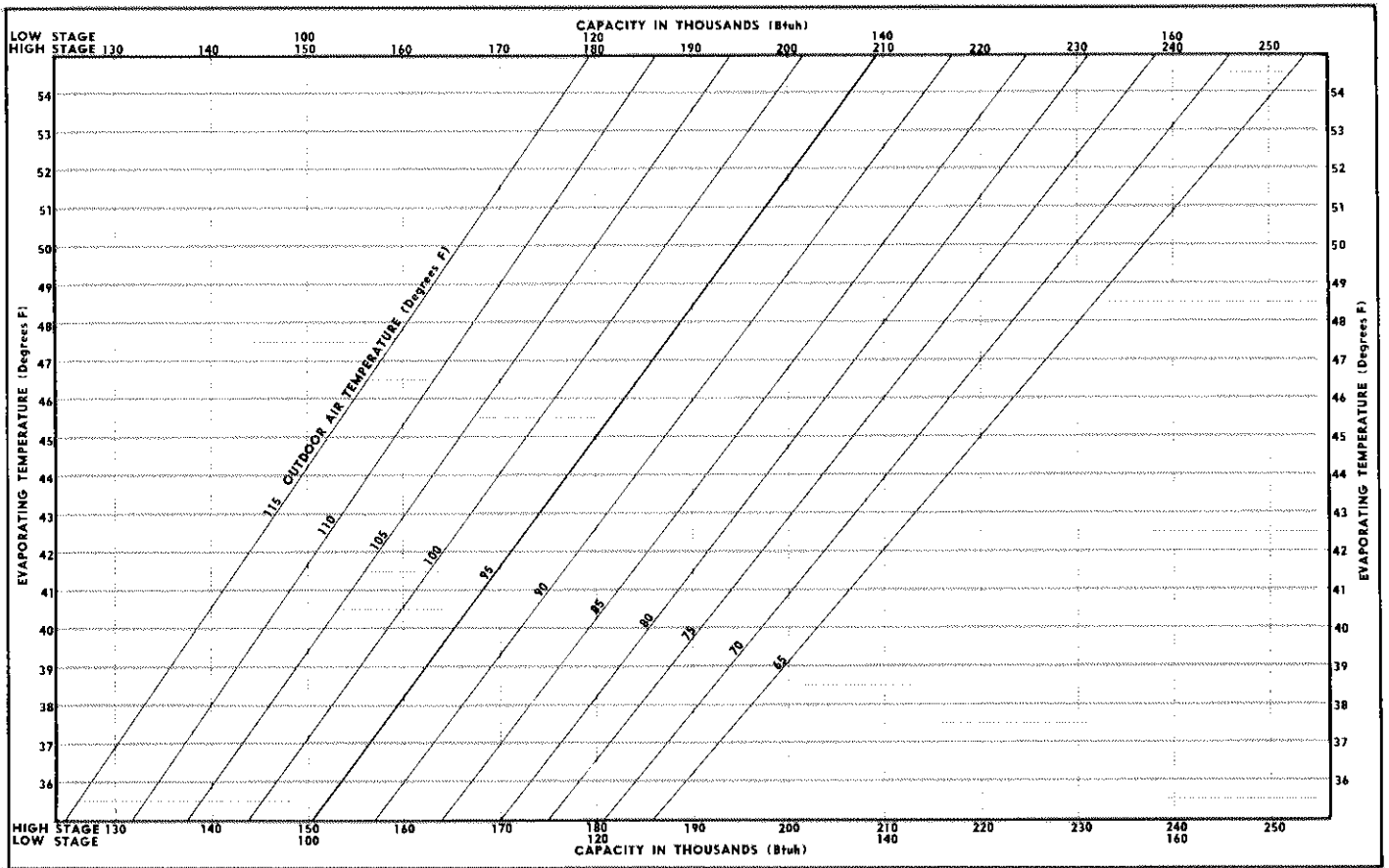


### DMS1-275 SIX ROW EVAPORATOR WITH HSM1-2753V CONDENSING UNIT

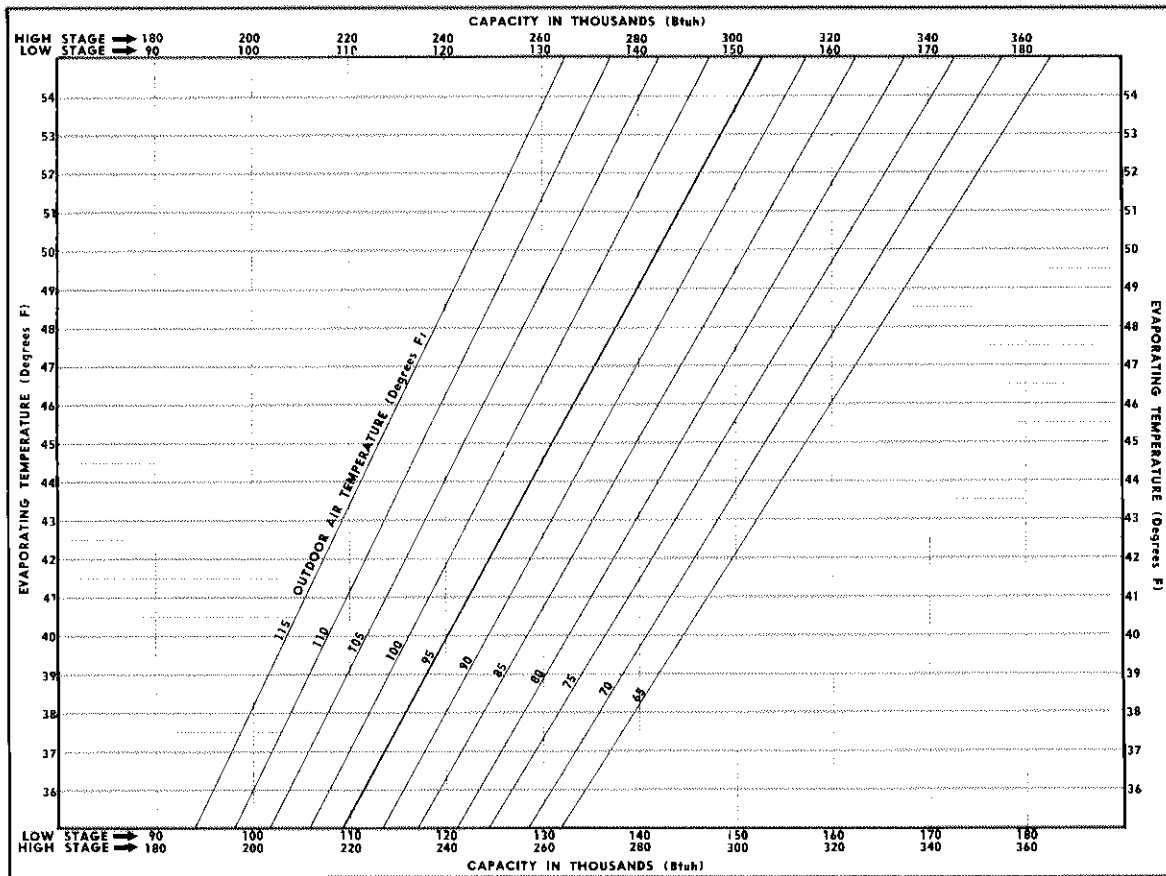


# CONDENSING UNIT CAPACITY CURVES

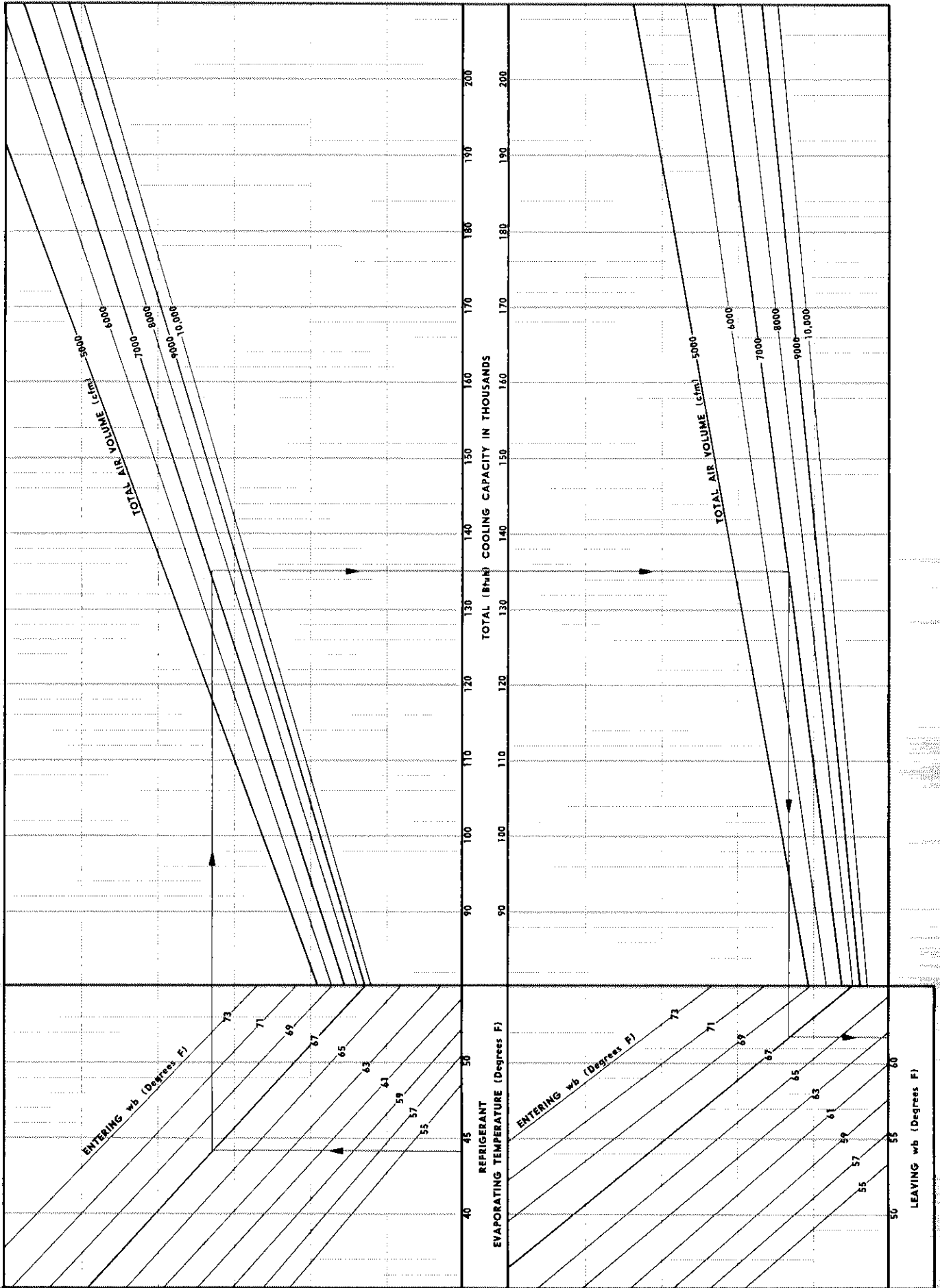
## HS6-1853V



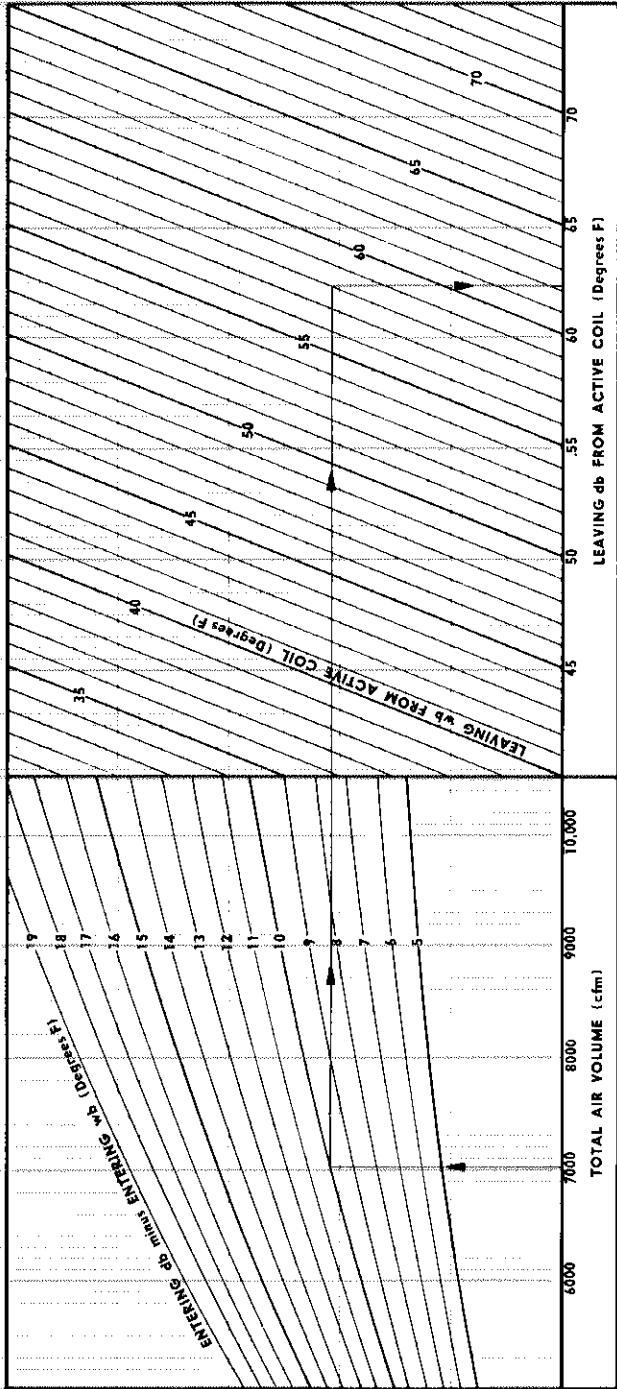
## HSM1-2753V



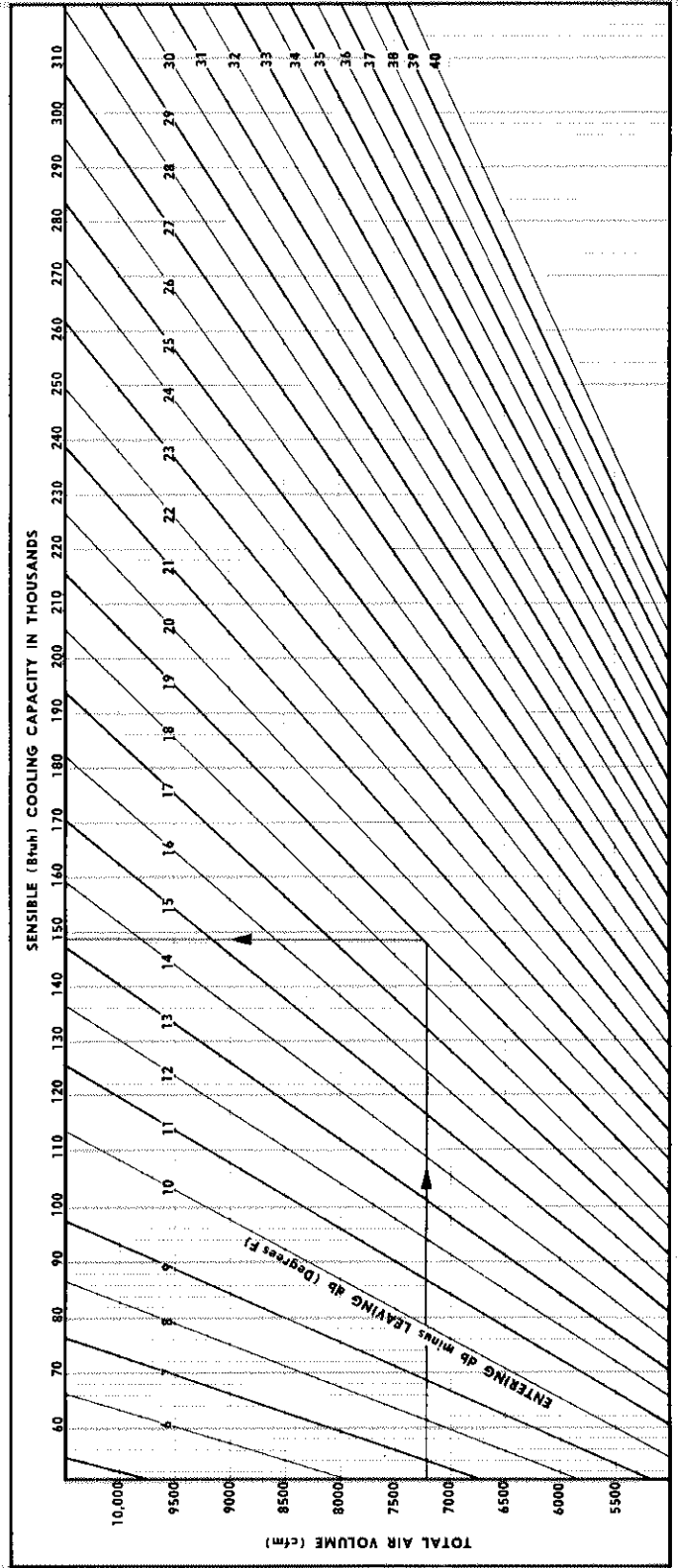
# DMS1-275 TWO ROW EVAPORATOR COIL PERFORMANCE CHART



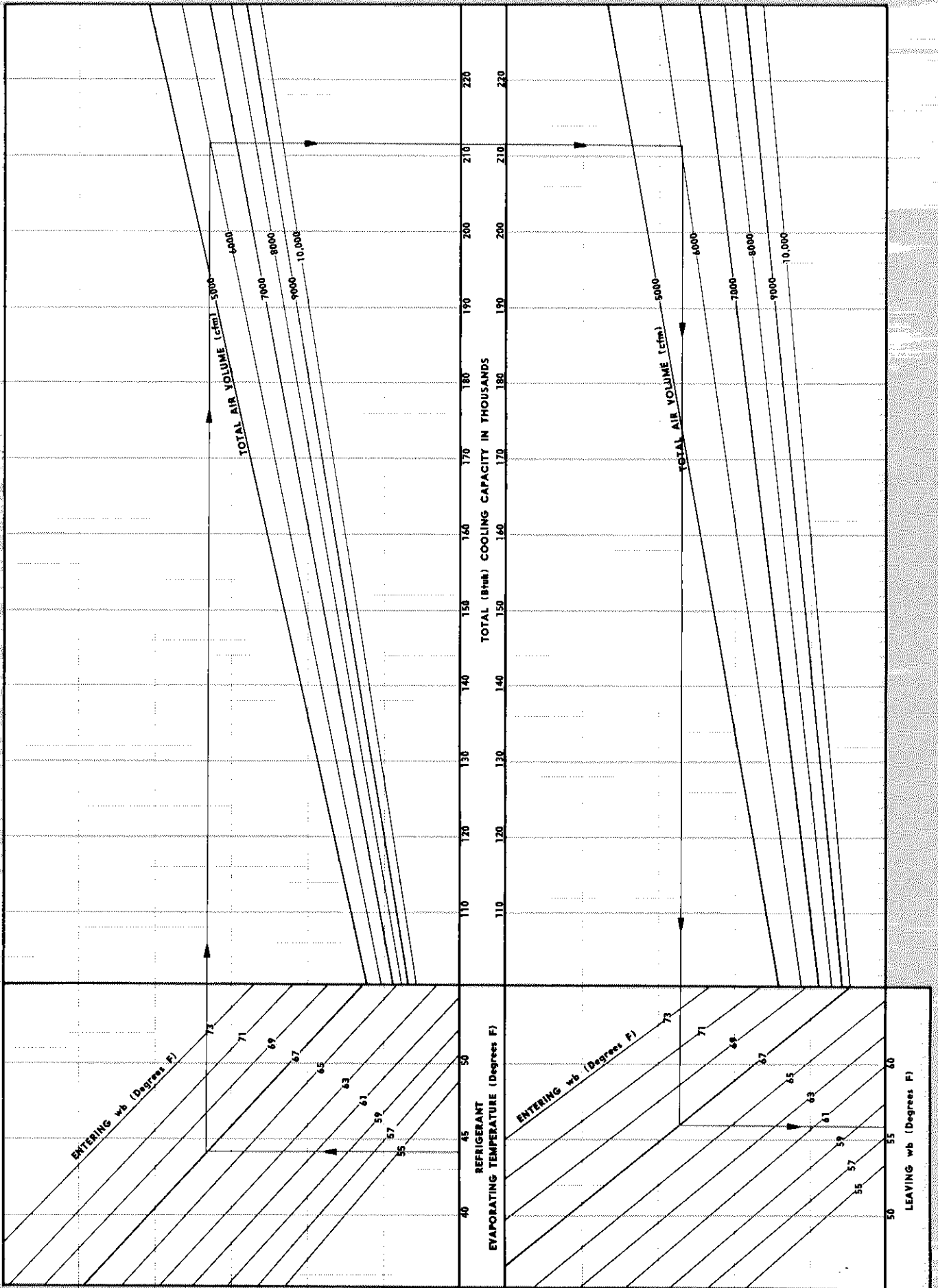
# DMS1-275 TWO ROW EVAPORATOR COIL LEAVING DRY BULB TEMPERATURE CHART



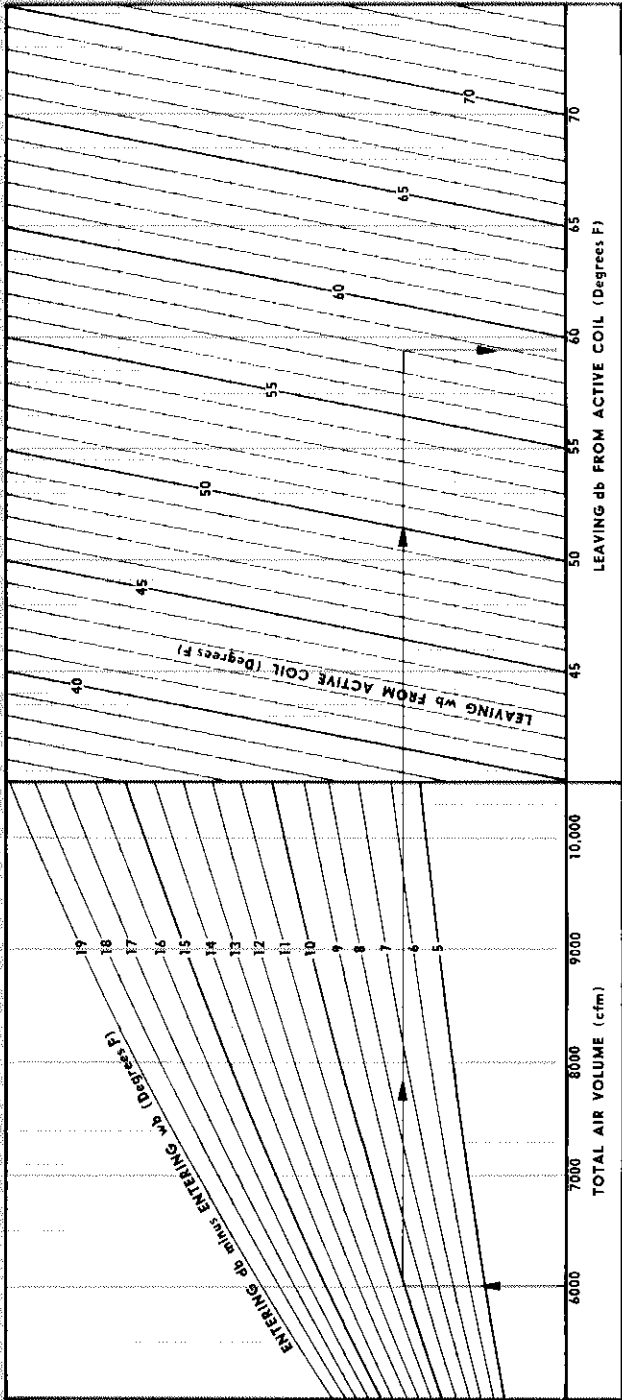
# DMS1-275 TWO ROW EVAPORATOR COIL SENSIBLE COOLING CAPACITY CHART



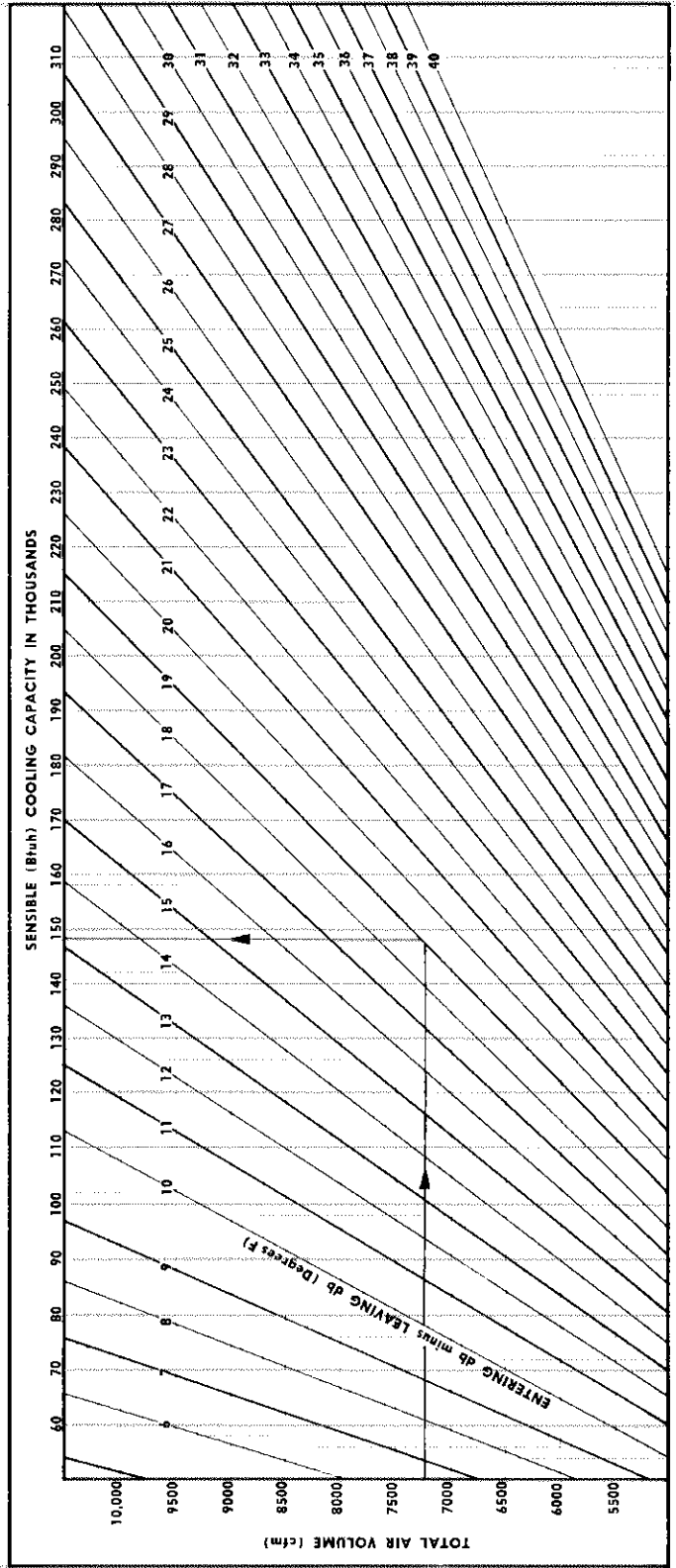
# DMS1-275 FOUR ROW EVAPORATOR COIL PERFORMANCE CHART



# DMS1-275 FOUR ROW EVAPORATOR COIL LEAVING DRY BULB TEMPERATURE CHART

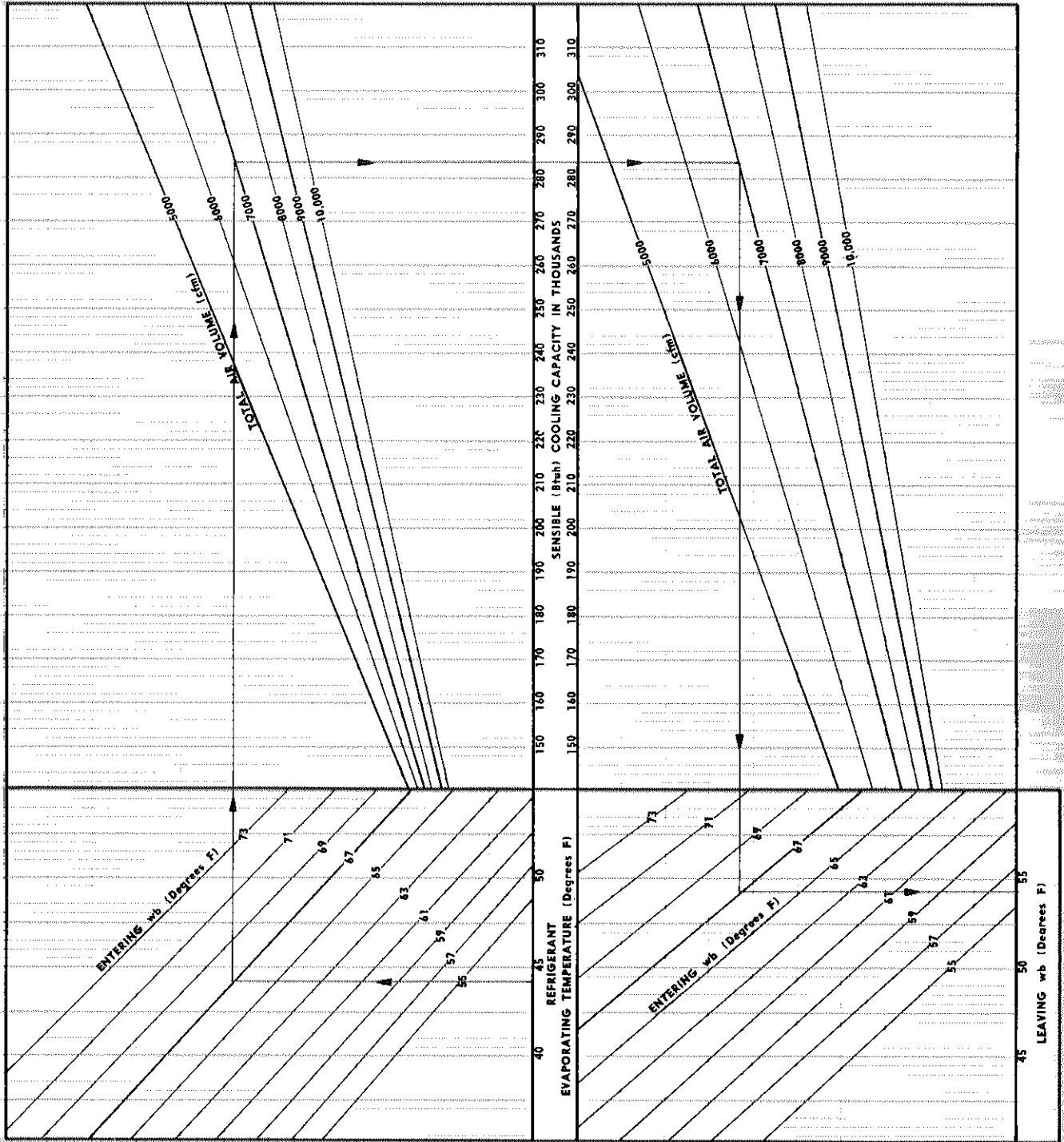


# DMS1-275 FOUR ROW EVAPORATOR COIL SENSIBLE COOLING CAPACITY CHART

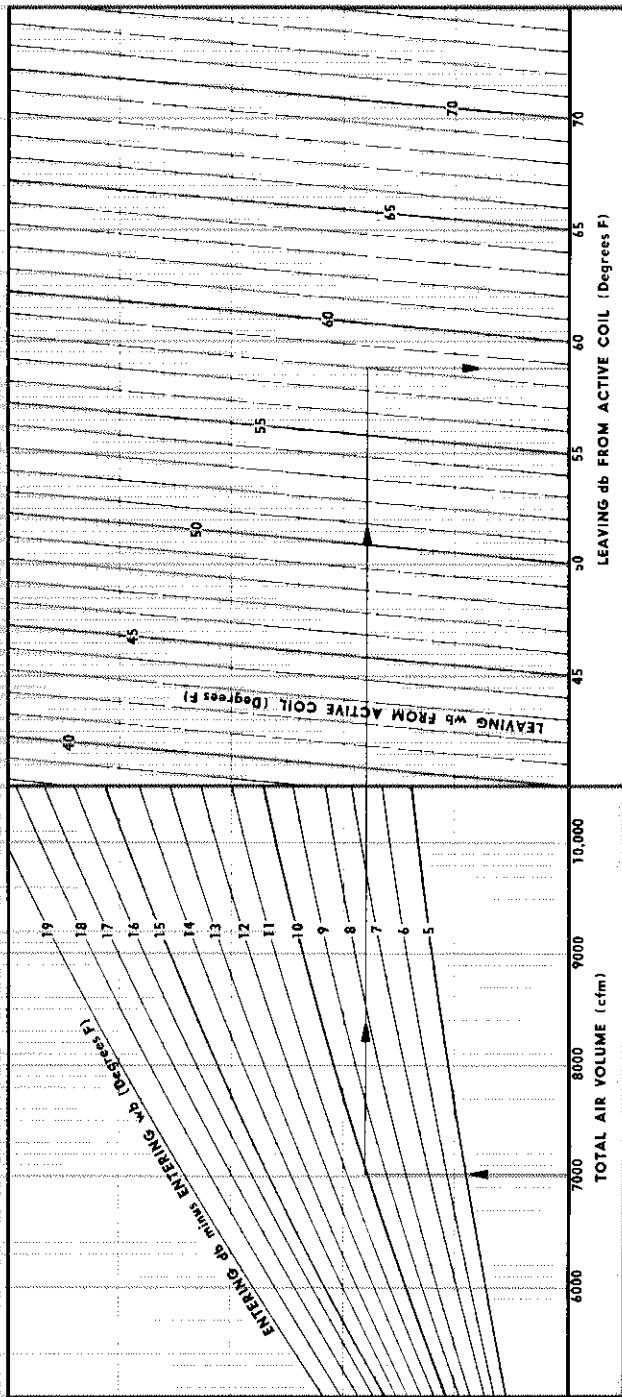




# DMS1-275 SIX ROW EVAPORATOR COIL PERFORMANCE CHART



# DMS1-275 SIX ROW EVAPORATOR COIL LEAVING DRY BULB TEMPERATURE CHART



# DMS1-275 SIX ROW EVAPORATOR COIL SENSIBLE COOLING CAPACITY CHART

