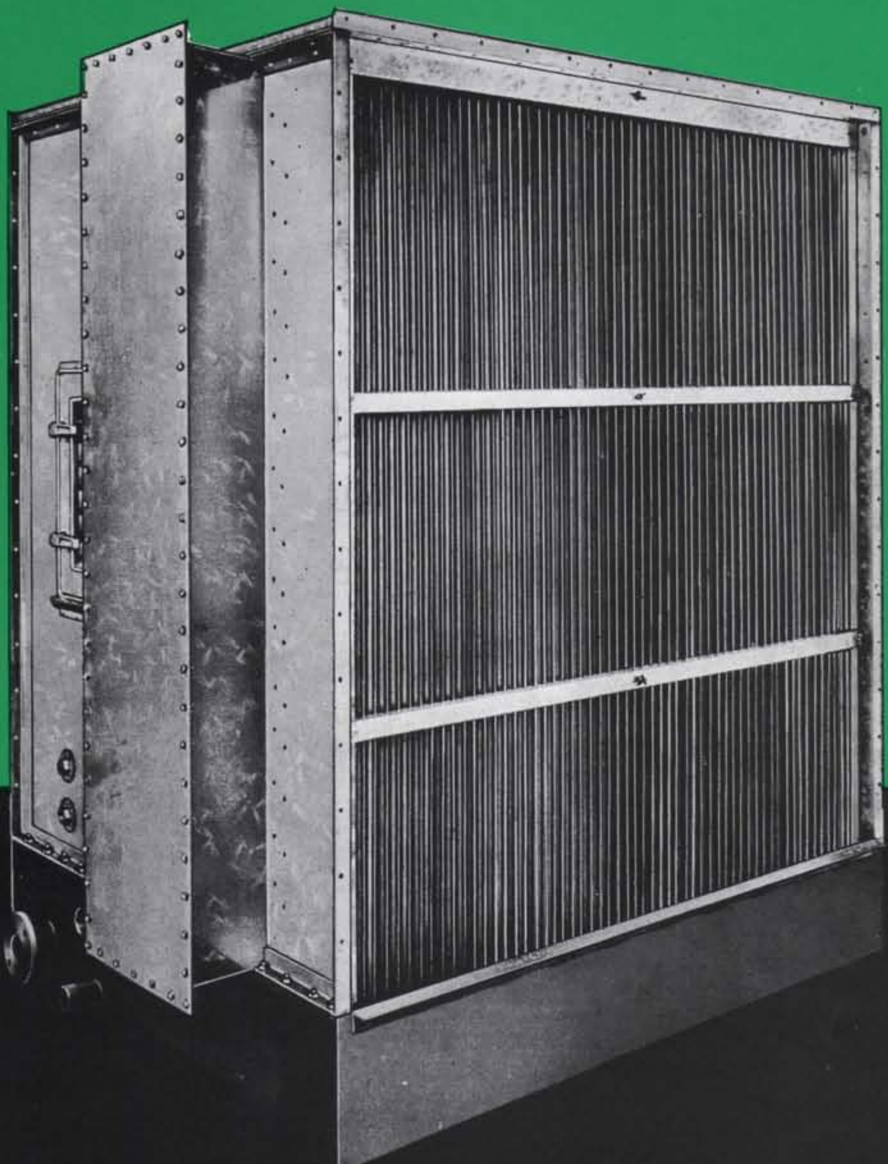
SHELDONS

Sprayed Coil DEHUMIDIFIERS



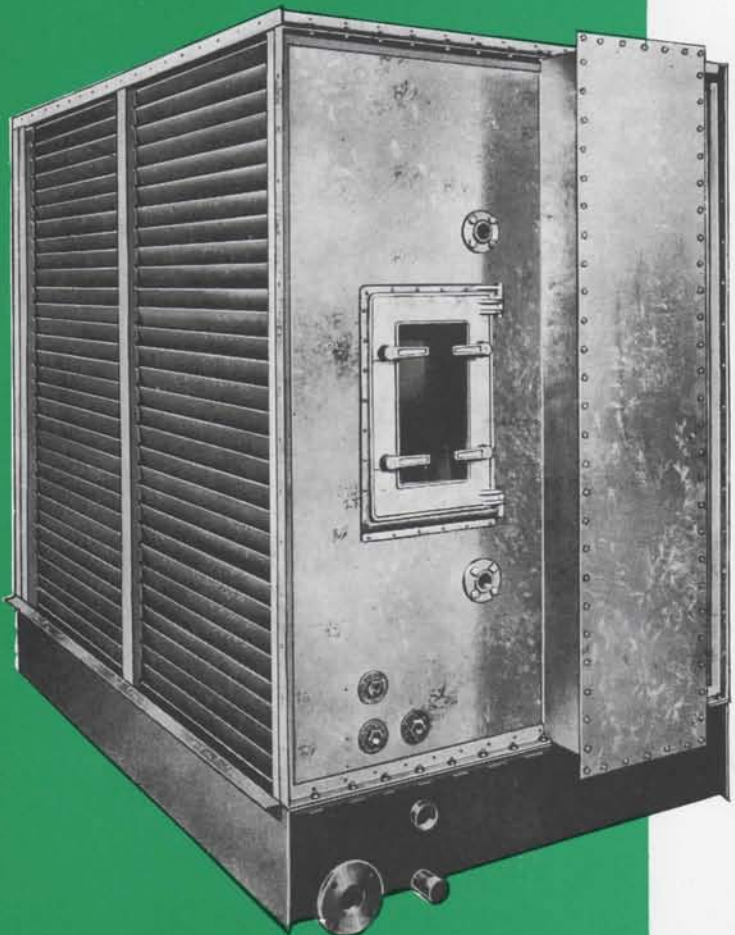
LOW PRESSURE up to 3"wg.
DRAW-THROUGH
BLOW-THROUGH

HIGH PRESSURE up to 9"wg.
BLOW-THROUGH

Catalogue 1026

SHELDONS ENGINEERING LIMITED
CAMBRIDGE, ONTARIO CANADA

Sprayed Coil DEHUMIDIFIERS



GENERAL INFORMATION

Sheldon Sprayed Coil Dehumidifiers provide another useful addition to our line of air-conditioning products for the further application of air-conditioning to the needs of large and small industries, offices, and hospitals. The main advantage of using Sprayed Coil Dehumidifiers instead of cooling coils alone when air-conditioning is being considered, is that practically saturated air can be obtained with this equipment.

Sprayed Coil Dehumidifiers consist essentially of a casing containing spray headers from which water is sprayed continuously on to a bank of cooling coils, a tank for the recirculated water, and eliminators at the leaving side of the unit to prevent any water carry-over from the unit. By directing the spray water against the cooling coils in the direction of airflow, the water is carried through the coils, wetting their entire exposed surface. In this way, it is possible to utilize the evaporative effect of the water from the exposed fin surface to obtain nearly saturated air conditions at the outlet. By combining the effects of cooling coils and evaporative cooling, close control of conditioned air can be maintained, with the further advantage that the air is cleansed and the coils are kept clean from dust and dirt accumulations.

Primarily intended for dehumidifying and summer cooling, dehumidifiers can also be employed to provide winter humidification by spraying warm water on to the uncooled coil surface, and in this way using the large surface area exposed by the coil fins to evaporate the spray water. Tempering coils should be installed in the inlet duct when necessary, to ensure entering air is above freezing point.

Sheldons' new design of Sprayed Coil Dehumidifiers now offers a complete range of units with 127 standard sizes to meet the requirements of all types of air-conditioning systems. These new designs offer the following three basic classes of Sprayed Coil Dehumidifiers to suit all applications.

- **Low Pressure Draw-through Units . . . For system pressures to 3" wg.**
- **Low Pressure Blow-through Units . . . For system pressures to 3" wg.**
- **High Pressure Blow-through Units . . . For system pressures from 3"-9" wg.**

127 Sizes — up to 46,000 CFM.

DETAILS OF CONSTRUCTION

CASING

All draw-through dehumidifier casings are fabricated from 18 ga. galvanized steel sheets with galvanized angles rivetted on the outside to provide stiffness, and with solder applied to the rivet heads to prevent water leaking through seams. Where the unit is flanged together for assembly in the field, prepunched soft rubber gaskets are provided to eliminate water leakage. Angle flanges are provided at the inlet and outlet with closely set punched holes for connection of duct work.

Sheldon blow-through units suitable for static pressures up to 9″ wg. are designed with heavier gauge casings as shown in Table 1, and with extra external galvanized angle stiffeners to provide equipment free from deformation or bending under pressure. On high pressure units, particular attention has been paid to ensuring air and water-tight construction. Access doors are made air and water-tight with wedge-action locking levers.

TABLE No. 1

System Pressure Inches wg.	Type of Unit	Gauge of Casing
Up to 3"	Draw-through	18 ga.
Up to 3" 3 1/8" - 6" 6 1/8" - 9"	Blow-through Blow-through Blow-through	16 ga. 14 ga. 12 ga.

TANK

The 12″ deep tank is fabricated of 3/16″ steelplate with all welded construction to ensure water-tightness. To prevent corrosion, the inside of the tank is coated with 1/8″ thick asphalt type coating, and is painted on the exterior with a rust inhibiting primer. Note that the tank must be raised sufficiently to allow the drain connections to clear the floor.

Suction strainers provided at the suction connection prevent any accumulated dirt from being recirculated to the pump and spray assembly. Strainers are made from fine brass mesh and are easily removed for cleaning. Each strainer has an anti-cavitation hood which prevents air being sucked in from the water surface through the formation of a vortex at the suction inlet.

WATER CONNECTIONS

A 3/4″ quickfill connection is provided for fresh water supply for filling the tank after normal periodic cleaning. A 3/4″ make-up water connection with an automatic adjustable ball float valve is also provided to maintain the water level at 9″ in the tank. The float valve can be field adjusted on site to permit selection of water level. A 1/2″ dilution connection is furnished on all dehumidifiers to provide a bleed-in of fresh water for the dilution of any impurities in the recirculated water.

ELIMINATORS

Efficient moisture removal is ensured by the use of two surface, two hook eliminators located in notched angles at the top and bottom of the unit. All eliminators are positioned closely on 2-1/4″ centres, and are individually removable without disturbing the dehumidifier casing. On larger sizes, intermediate horizontal support bars are provided with the inside face coated with soft rubber. This rubber is forced into contact with the edge of the eliminators to prevent them whipping and rattling in the airstream. For efficient water removal and to prevent water carryover, it is recommended that air velocities be kept below 600 fpm through the coils.

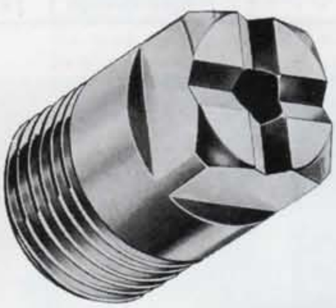
Standard eliminators are fabricated from galvanized sheet steel, but stainless steel, copper or aluminum eliminators can also be furnished. Plastic eliminators of rigid PVC can also be provided where necessary to meet specific requirements.

DRAIN TROUGHS

Flooding of the lower coils is prevented and efficiency maintained by providing drain troughs at both the air entering and leaving sides of the coils. Run-off water from the upper coils is caught in these troughs and returned to the tank via down-spouts located at each end of the coil. Each trough is located on the coil case flanges of the lower coil and is adequately sized to carry away the run-off water.

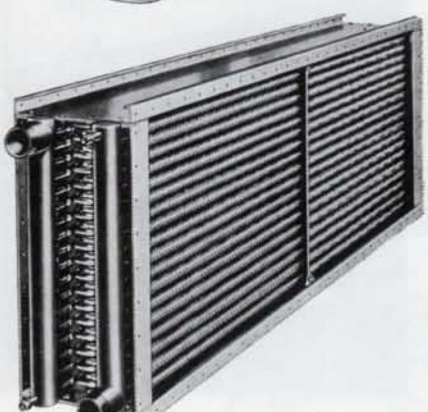
FACE AND BYPASS DAMPERS

Face and bypass dampers may be furnished as an optional extra on Draw-through units only. Dampers are supplied in a 6″ deep frame bolted to the leaving end of the unit. The bypass section bolted to the top of the standard Sprayed Coil Dehumidifier is also furnished with the damper section. The heavy duty damper blades are formed from galvanized steel sheet and have an inter-connected linkage to provide operation of all damper blades by a damper motor. The damper motor and connecting linkage is normally supplied and mounted by the control contractor.



NOZZLES

Nozzles are of bronze and are arranged on headers positioned to give uniform coverage over the coil face area. Each nozzle used is of a special construction developed to provide a square spray pattern to ensure even water distribution over the entire cooling coil face. Nozzles are so arranged that a flow of 1.1 USgpm per sq. ft. of coil face area is sufficient to completely and uniformly cover all of the tubes in the coil with water. The concurrent air and water flow ensures that the coil is thoroughly wetted with spray water.



Two examples of Aerofin Coils. Above, an Aerofin Type "C" Chilled Water Coil, full circuit, with supply and return connections at the same end. Below, an Aerofin Type "DP" Direct Expansion Coil, with two suction connections provided. Note: Only the suction connection at the bottom of the coil should be used after installation.

COOLING COILS

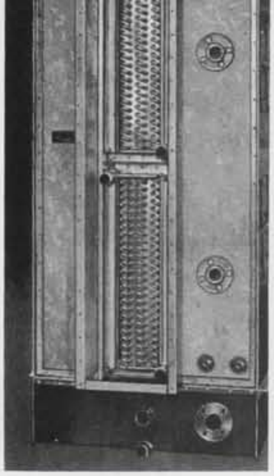
Standard cooling coils supplied with Sheldon Sprayed Coil Dehumidifiers are fabricated of 5/8″ O.D. copper tubing with eight copper fins per inch, which are of the spiral-formed extended surface type. Coils can either be supplied of the type having fins spiral-wound on to the copper tube and solder coated to give a strong metallic and mechanical bond, or the type having spiral copper fins extruded integrally from the copper tube.*

Coils casings are made from heavy galvanized steel. The tubes are brazed into the steel supply and return headers and all coils are tested under pressure before being shipped. Cooling coils can either be direct expansion type employing a liquid refrigerant, or the type employing chilled water as the cooling medium. Direct expansion coils and chilled water coils are furnished up to eight rows deep in direction of airflow.

* Spiral-wrapped aluminum fins on copper tubes are not normally used with water spray systems due to the galvanic corrosion started between the two dissimilar metals in the presence of water. However, it is possible to overcome this by utilizing coils having aluminum fins formed integrally from aluminum tube stock over an inner copper tube, with the exposed copper tubes at the header connections covered with metallized aluminum, thus avoiding the corrosion problem. The coil casing can also be made from aluminum, if necessary. Use of this aluminum finned tubing often results in lower coil costs.

COIL CONNECTION BOXES

To permit the removal of the cooling coils from the unit and to provide adequate sealing, a coil connection box is provided on one side of the unit, having a rubber gasketed flange to ensure air and water-tightness. Condensation dripping from the supply header coil connections is fed back into the tank, allowing a neater more compact design without the need for insulation of coil headers. All coil connections, including vent and drain on water coils, are accessible by removing the cover plate on the coil connection box. Sufficient clearance is provided inside the connection box to permit standard elbow connections to supply and return headers, thus enabling the piping to be brought out through the side of the coil connection box, where it can be sealed by slipping under-sized soft rubber washers over the piping and then bolting to casing. In this way, the cover plate is removable at all times without disturbing the coil piping.



INLET LOUVRES

Sheldon Sprayed Coil Dehumidifiers are provided with individually removable inlet louvres as standard equipment on all Draw-through and Blow-through units, both high pressure and low pressure. Standard inlet louvres are made of galvanized steel sheet, but stainless steel, copper or aluminum louvres can also be furnished. Plastic inlet louvres of rigid PVC can also be provided where necessary to meet specific requirements. The framework holding the louvres is built as an integral part of the unit casing to provide a solid mounting assembly for easy servicing.

PUMPS

Recirculating spray pumps supplied for Sheldon Dehumidifiers should be selected for capacities as listed in Table 2, page 11, and for approximately 20 ft. head at the spray nozzle. The lift to the top nozzles plus an allowance for pipe friction must be added to the above figure. Pumps should be mounted close to the dehumidifier on a suitable base.

ACCESS DOORS

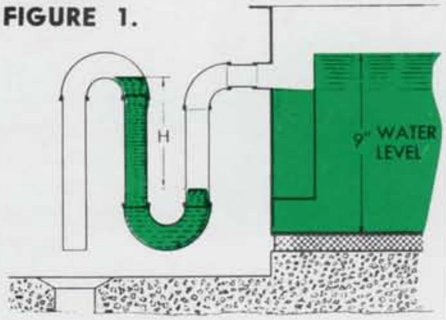
Access doors can be provided as an optional extra if desired. The addition of an access door increases the length of the unit by 22". Access doors are hot-dipped galvanized iron with an inset rubber gasket that compresses on closing. Wedge-action door locking levers ensure that the door is both air and water-tight. Doors are also fitted with an inset glass window for observing the sprays in action. A marine light located in the ceiling of the unit for providing the necessary illumination for inspection can be supplied as an optional extra. Where a standard dehumidifier is used without an access door, it is necessary to provide access doors in the duct-work at both entering and leaving ends of the unit to permit proper servicing.

OVERFLOW CONNECTION

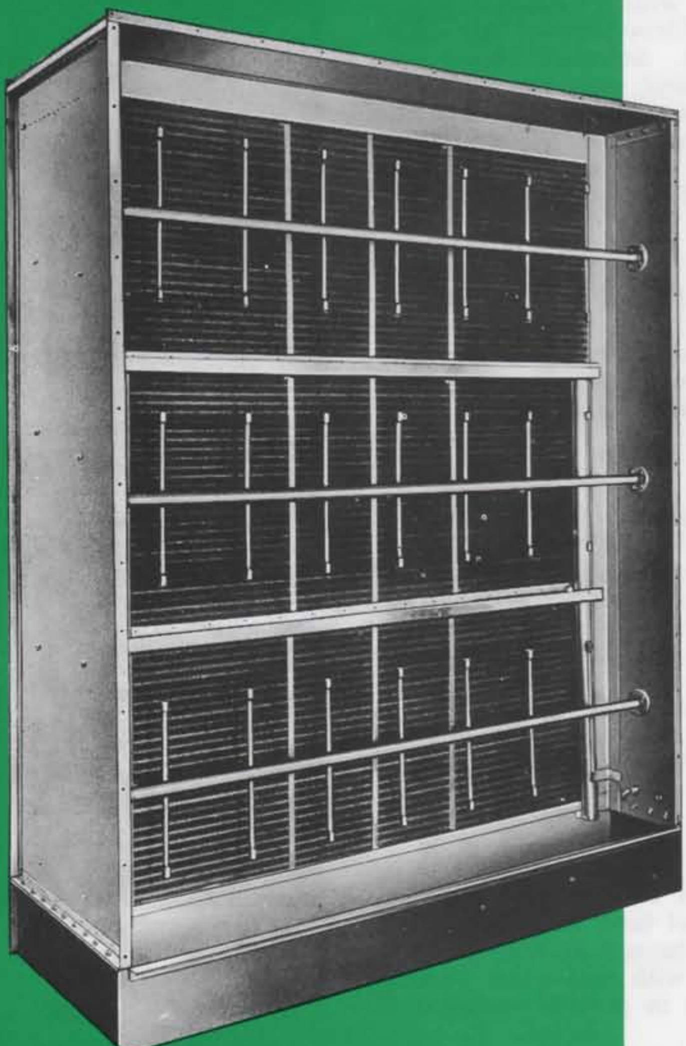
On Draw-through units, a combined overflow and water seal is provided as an integral part of the unit. See photograph of tank on page 3. The water seal prevents air being constantly drawn in through an open overflow pipe which would thus prevent the escape of water with consequent possible danger of flooding. The water seal is adjustable to provide variation in water level in the tank.

However, when using high pressure Blow-through Sprayed Coil Dehumidifiers, it is essential to provide an adequate size water seal external to the tank to prevent the static pressure in the unit from blowing all the water out of the seal. The Sheldon combined water seal and overflow, supplied internally on low pressure Draw-through units, has insufficient head to accommodate high pressures. Fig. 1 shows a recommended arrangement. The dimension "H" indicates the pressure in the unit and, hence, the trap must be adequate for this dimension.

FIGURE 1.



GENERAL NOTES



This illustration shows a view of a Sprayed Coil Dehumidifier before the assembly of the inlet louvres. Note the arrangement of the cooling coils in banks and the location of the spray nozzles.

UNIT SIZE

Sheldon Sprayed Coil Dehumidifier sizes are determined by the size of the cooling coils used. The first two figures in the unit size indicate the number of tubes in the coil face and the last three figures the tube length in inches. For example, a 48096 unit has 48 tubes (2 - 24 tube face coils) in the face with tubes 96″ long.

The use of either chilled water or direct expansion type coils does not alter the nomenclature of the unit, nor does it affect the overall size.

HAND OF DEHUMIDIFIER

The hand of the Sprayed Coil Dehumidifier is obtained by facing the spray header connections and noting the direction of airflow. With the direction of airflow to the RIGHT, then the unit is RIGHT-HAND. With the direction of airflow to the LEFT, then the unit is LEFT-HAND. Page 2 illustrates a RIGHT-HAND unit.

AIR QUANTITY

All unit capacities shown in Table 2 on page 11 are rated at a face velocity of 550 fpm through the coils based on standard air at 70°F and 29.92″ Hg. In general, it is not necessary to correct the air quantity handled by the unit to the equivalent volume of standard air prior to selecting the size of the unit required, since the change of volume is slight.

COIL SELECTION

All necessary data for the selection of either chilled water or direct expansion coils is contained in this catalogue together with the engineering data for determining the performance of Sheldon Sprayed Coil Dehumidifiers.

ERECTION

On larger dehumidifiers, the casings are shipped knocked down but are well matchmarked to facilitate speedy erection. Detailed and comprehensive assembly instructions, together with drawings, are supplied with the unit when it is shipped from our factory to facilitate field assembly by the erection contractors. Pre-punched rubber gaskets are provided for sealing the unit at the assembly flanges, and a liberal supply of gasket sealing compound is also furnished with each unit for the effective sealing of coil fixtures during field assembly.

APPLICATION DATA

A Sprayed Coil Dehumidifier is indicated where considerable moisture removal from the room air is required. It is particularly adapted where close control of humidity is of importance. Applications of this equipment are found in public and commercial buildings with a large number of occupants, textile mills, in the printing and paper business, hospitals, and precision manufacturing.

Units of this type have tended to supersede the use of the conventional type of airwasher, since the use of the large area of finned coil surface to evaporate moisture avoids the necessity of using long flow paths to ensure adequate evaporation of moisture. In a Sprayed Coil Dehumidifier, the spray section adds very little additional length to the unit and this item is a major feature in installations where space is at a premium.

The use of sprayed cooling coils in the Sprayed Coil Dehumidifiers will produce almost saturated air when using coils with more than 3 rows deep. The exact amount of saturation is dependent upon air quantity, the type and temperature of refrigerant, number of rows deep, entering air conditions, and the amount of air cooling required. For the majority of cases involving comfort cooling, the refrigerant temperature will be approximately 40° F and the sprayed coil usually 4 to 6 rows deep at a face velocity of about 550 fpm. With the cooling coil in operation, the unit cools and dehumidifies during the summer season. In the heating season, the Sprayed Coil Dehumidifier may be used for humidification. At times when outside conditions are suitable, it may be used as an evaporative cooler. If the sprays are operated during the heating season, provision should be made to preheat the outside air above 32° F to avoid the freezing of the spray water. At all times, the unit washes the coil free of accumulations of dust and dirt.

In the selection of equipment from the data contained in this catalogue, it is important to bear in mind that certain limitations may apply. In applications where the dew-point of the incoming air is reasonably low, light load conditions do not pose a problem for the coil, but when the initial dew-point is high or on days when the wet bulb temperature approaches the dry bulb, the load condition has a higher proportion of latent heat and a much smaller proportion of sensible heat. The conditions for light loads on the coil should be checked as carefully as the maximum loads in order to ensure that the coil will perform over the entire range.

The following paragraphs indicate the features to be noted in selecting Sprayed Coil Dehumidifiers.

COOLING LOADS

For instance, with direct expansion coils, the minimum cooling load per coil should not be less than the value shown in Table 17 on page 21. Also to ensure good distribution of the refrigerant, the maximum load for each header should not exceed the value given in Table 18 on page 21. Note that on 24-tube face direct expansion coils, two headers and two distributors with two suction connections are provided in order to ensure more uniform distribution of the refrigerant to the coil face (see table of connection sizes on page 20).

CHILLED WATER COILS

When selecting cooling coils employing chilled water, it is good practice to maintain about 3 to 4 fps through the tubes. In general, full circuit coils are used in order to keep the water friction as low as possible. However, in some cases, it may be desirable to go to half circuit coils in order to obtain a higher heat transfer coefficient, in which case the advantage of smaller coils may outweigh the higher water friction obtained. Chilled water coils are designed for a working pressure of 200 psi. On applications where sediment may deposit out of the circulating water, cooling coils with removable headers can be supplied for cleaning and inspecting the tubes. On these coils, the working pressure is limited to 100 psi.

UNUSUAL AIR INLET CONDITIONS

One of the frequent problems encountered with Sprayed Coil Dehumidifiers is that of preventing spray water from being carried back at the inlet, due to air eddies and partial recirculation caused by unusual air inlet conditions. This problem can result in water leaking back along the inlet duct seams where provision is not normally made for such contingencies. This problem can occur on both Draw-through and Blow-through units, although it is usually more prevalent on high pressure Blow-through systems.

Sheldon Sprayed Coil Dehumidifiers overcome this serious problem by providing inlet louvres as standard equipment on all Draw-through and Blow-through units for high and low pressure applications. Furthermore, the uniform air distribution provided by the inlet louvres adds to the efficient functioning of the cooling coils.

WATER HARDNESS

The formation of lime on cooling coil fins will seriously affect the cooling efficiency of the coils and also reduce airflow. It is recommended that where water supply is "hard" information be obtained from companies specializing in water treatment for their recommendations to suit the particular application.

RATINGS

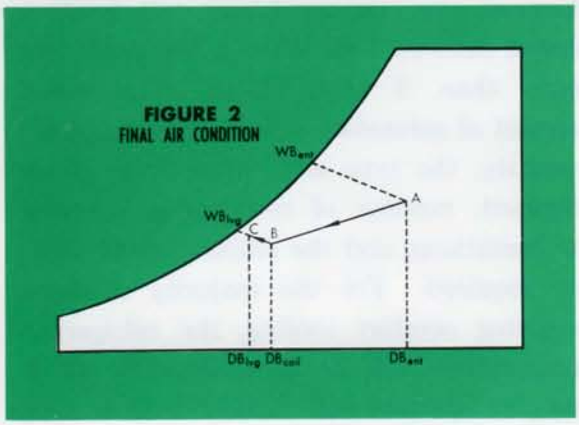
The selection of direct expansion cooling coils from the data given in this catalogue is entirely satisfactory for all lengths of 4-row and 6-row coils, and for 8-row coils up to 90" tube length. However, caution should be used when applying these ratings to 8-row direct expansion coils with a tube length greater than 90" because of the circuit length. Any direct expansion coil with a circuit length of 60 ft. or more should be given special consideration. Refer to Head Office for further details.

FINAL AIR CONDITIONS

The condition of the air leaving the Sprayed Coil Dehumidifier is best understood by breaking the process down into two separate stages.

In Fig. 2 is shown a skeleton psychrometric chart. Point A indicates the condition of the air entering the unit and point C the final condition of the air leaving the unit. The first stage could be considered as the cooling of the air from point A to point B produced by the cooling coils, assuming that the sprays are not in operation.

The second stage occurs when this cooled air is saturated by the sprays, and point B then moves along a constant wet bulb temperature line to point C. This final movement is determined by the adiabatic saturation efficiency of the sprays operating on the finned coil surface, and is mainly dependent on the number of rows deep in the coil.



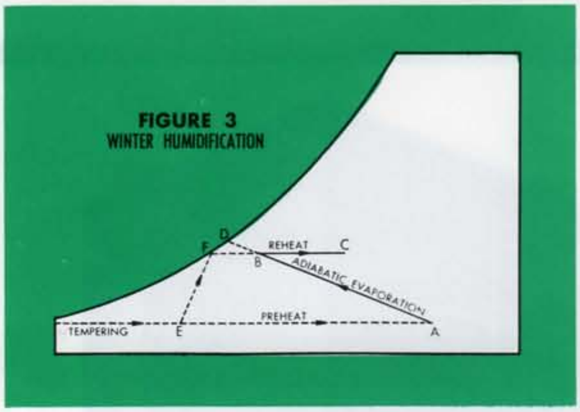
Of course in an actual unit, the two processes indicated above occur simultaneously, but by separating them into two stages in this way, the usual method of coil selection for unsprayed coils may be used. It is necessary for this coil selection that the dry bulb temperature leaving an assumed unsprayed coil (designated as DB coil) be determined. See example method on page 13.

WINTER HUMIDIFICATION

To provide for the high humidification required in winter operation, the sprayed surface of the cooling coils can be used to increase the water vapour content of the air as shown in Fig. 3. Heat must be added to evaporate the water vapour and it can be done in either one of two ways: 1—By preheating the air entering the unit or: 2—By heating the spray water.

(1) Preheating the Air

Entering air is preheated so that it enters the Sprayed Coil Dehumidifier at point A. It is then cooled adiabatically along the constant wet bulb line, using recirculated spray water to point B. The final position of point B along the wet bulb line will be determined by the saturation efficiency obtainable with the number of rows deep of the cooling coil. This saturation efficiency can be shown on the chart as the ratio of AB/AD. A table of saturation efficiencies obtainable from different coil depths is shown on page 18. The temperature to which the entering air is heated will depend on the required final conditions leaving the unit, and this in turn is governed by the degree of humidity required in the conditioned space.



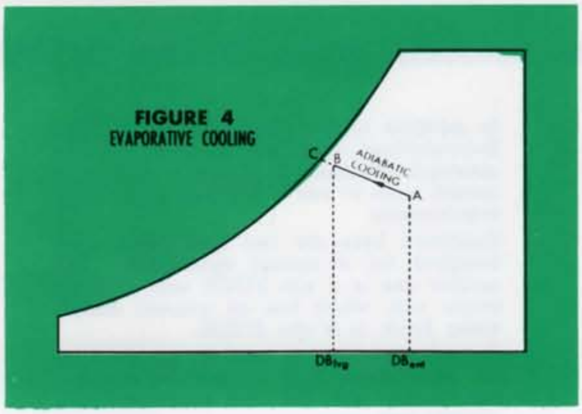
(2) Heating the Spray Water

By heating the spray water, no excessive preheating of the air is required. However, the entering air should be tempered to about 45° F, either by mixing with return air or by using tempering coils, so that the freezing air does not meet the spray water. Air enters the Sprayed Coil Dehumidifier at point E and its temperature and humidity raised to point F on the saturation curve as it passes over the sprayed coils. The heat to be added to the spray water is obtained from the difference in total heat between points F and E, plus the heat losses from the unit casing, which arbitrarily is suggested at about 20% of the theoretical total heat required. The spray water temperature leaving unit is assumed to be the same as the air leaving temperature: i.e. point F. See example on page 14.

In both methods of humidification mentioned above, it is necessary that the humidified air leaving the unit at points B or F be reheated by heating coils located elsewhere in the system to a dry bulb temperature at some point C, such that it is suitable for distribution to the conditioned area.

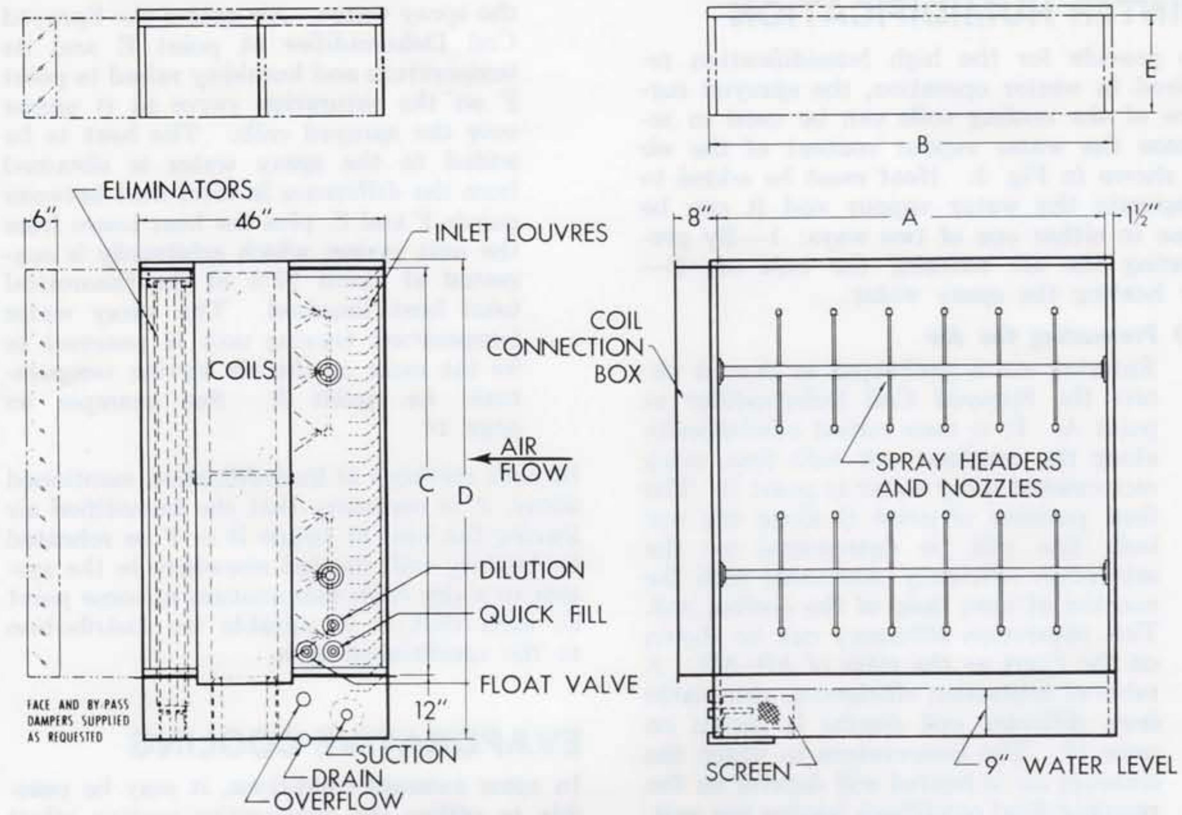
EVAPORATIVE COOLING

In some summer conditions, it may be possible to utilize the evaporative cooling effect of recirculated water sprayed on to the coils without any cooling being supplied to the coils.



The evaporative cooling effect as shown on Fig. 4 is dependent on the saturation efficiency obtained from the given number of rows in the coils, which have previously been calculated from the maximum summer design conditions. The ratio of the length of the lines AB/AC is also the value of the saturation efficiency for the given coil depth.

DIMENSIONS OF UNITS



DRAW-THROUGH AND BLOW-THROUGH UNITS
For Both High and Low Pressure Applications

Coil connection box is identical for both direct expansion and water coils. NOTE: If an access door is required, then an extra 22" must be added to the 46" depth of the unit, i.e. 68" total depth. Access doors are placed in the unit between cooling coils and the inlet louvres.

In addition to the Standard Sprayed Coil Dehumidifiers described in detail in this catalogue, Sheldons Engineering often make special units to suit a customer's particular requirements.

Illustrated here are two such units, each designed for a special application. The smaller one is a size #18030 unit, and the larger unit, which has an unusual double spray bank, is a size #72120.

Each Sheldon unit is carefully designed by our Engineering Staff to meet the required performance with the most economical and reliable unit.

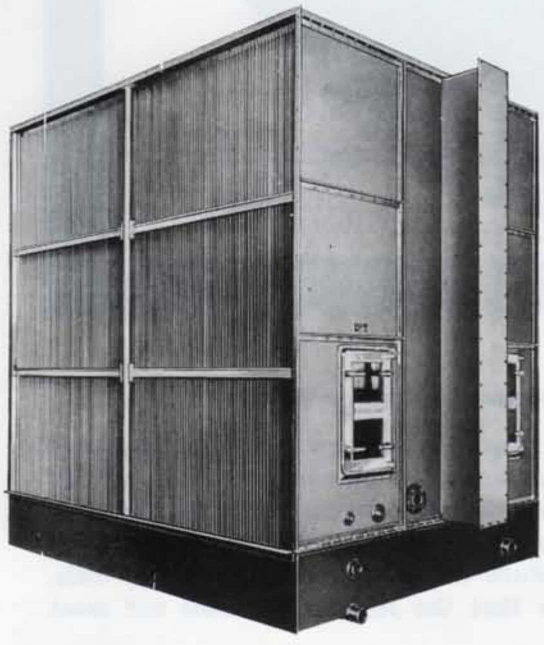


TABLE No. 2

SPRAYED COIL DEHUMIDIFIERS — Dimensions and Data

SIZE	CFM at 550 fpm	COIL FACE AREA Sq. Ft.	COIL ARR.	Spray Water US gpm	Inside Wth. in. A	O'all Wth. in. B	Inside Ht. in. C	O'all Ht. in. D	By-pass Ht. in. E
18024	2200	4.0	1-18 TUBE FACE COIL	4.4	30½	33½	29⅜	42⅞	8
18030	2810	5.1		6.6	36½	39½			
18036	3350	6.1		6.6	42½	45½			
18042	3960	7.2		8.8	48½	51½			
18048	4520	8.2		8.8	54½	57½			
18054	5060	9.2		11.0	60½	63½			
18060	5670	10.3		11.0	66½	69½			
18066	6220	11.3		13.2	72½	75½			
18072	6830	12.4		13.2	78½	81½			
24024	2920	5.3	1-24 TUBE FACE COIL	6.6	30½	33½	37⅞	51⅜	14
24030	3680	6.7		9.9	36½	39½			
24036	4460	8.1		9.9	42½	45½			
24042	5230	9.5		13.2	48½	51½			
24048	6000	10.9		13.2	54½	57½			
24054	6760	12.3		16.5	60½	63½			
24060	7550	13.7		16.5	66½	69½			
24066	8310	15.1		19.8	72½	75½			
24072	9070	16.5		19.8	78½	81½			
24078	9850	17.9		23.1	84½	87½			
24084	10620	19.3		23.1	90½	93½			
36024	4400	8.0	2-18 TUBE FACE COILS	8.8	30½	33½	58⅝	72⅛	14
36030	5620	10.2		13.2	36½	39½			
36036	6720	12.2		13.2	42½	45½			
36042	7920	14.4		17.6	48½	51½			
36048	9030	16.4		17.6	54½	57½			
36054	10130	18.4		22.0	60½	63½			
36060	11300	20.6		22.0	66½	69½			
36066	12400	22.6		26.4	72½	75½			
36072	13630	24.8		26.4	78½	81½			
36078	14850	27.0		30.8	84½	87½			
36084	15950	29.0		30.8	90½	93½			
36090	17050	31.0		35.2	96½	99½			
36096	18250	33.2		35.2	102½	105½			
36102	19450	35.3		39.6	108½	111½			
36108	20550	37.4		39.6	114½	117½			
36114	21700	39.5		44.0	120½	123½			
36120	22900	41.6		44.0	126½	129½			
42024	5130	9.3	1-18 and 1-24 TUBE FACE COIL	11.0	30½	33½	67	80½	14
42030	6500	11.8		16.5	36½	39½			
42036	7820	14.2		16.5	42½	45½			
42042	9200	16.7		22.0	48½	51½			
42048	10500	19.1		22.0	54½	57½			
42054	11800	21.5		27.5	60½	63½			
42060	13200	24.0		27.5	66½	69½			
42066	14500	26.4		33.0	72½	75½			
42072	15900	28.9		33.0	78½	81½			
42078	17250	31.4		38.5	84½	87½			
42084	18600	33.8		38.5	90½	93½			
42090	20000	36.3		44.0	96½	99½			
42096	21300	38.7		44.0	102½	105½			
42102	22700	41.2		49.5	108½	111½			
42108	24000	43.6		49.5	114½	117½			
42114	25400	46.1		55.0	120½	123½			
42120	26700	48.6		55.0	126½	129½			
48024	5850	10.6	2-24 TUBE FACE COILS	13.2	30½	33½	75½	89	20
48030	7380	13.4		19.8	36½	39½			
48036	8910	16.2		19.8	42½	45½			
48042	10450	19.0		26.4	48½	51½			
48048	12000	21.8		26.4	54½	57½			
48054	13550	24.6		33.0	60½	63½			
48060	15050	27.4		33.0	66½	69½			
48066	16600	30.2		39.6	72½	75½			
48072	18150	33.0		39.6	78½	81½			
48078	19700	35.8		46.2	84½	87½			
48084	21200	38.6	2-24 TUBE FACE COILS Cont.	46.2	90½	93½	75½	89	20
48090	22700	41.4		52.8	96½	99½			
48096	24300	44.2		52.8	102½	105½			
48102	25800	47.0		59.4	108½	111½			
48108	27400	49.8		59.4	114½	117½			
48114	28800	52.6		66.0	120½	123½			
48120	30500	55.5		66.0	126½	129½			
54036	10100	18.3	3-18 TUBE FACE COILS	19.8	42½	45½	87¾	101¼	20
54042	11850	21.6		26.4	48½	51½			
54048	13550	24.6		26.4	54½	57½			
54054	15200	27.6		33.0	60½	63½			
54060	16950	30.9		33.0	66½	69½			
54066	18600	33.9		39.6	72½	75½			
54072	20500	37.2		39.6	78½	81½			
54078	22200	40.4		46.2	84½	87½			
54084	23900	43.4		46.2	90½	93½			
54090	25500	46.4		52.8	96½	99½			
54096	27400	49.8		52.8	102½	105½			
54102	29100	53.0		59.4	108½	111½			
54108	30800	56.1		59.4	114½	117½			
54114	32600	59.3		66.0	120½	123½			
54120	34300	62.5		66.0	126½	129½			
60036	11150	20.3	1-24 and 2-18 TUBE FACE COILS	23.1	42½	45½	96¼	109¾	20
60042	13150	23.9		30.8	48½	51½			
60048	15000	27.3		30.8	54½	57½			
60054	16900	30.7		38.5	60½	63½			
60060	18850	34.3		38.5	66½	69½			
60066	20700	37.7		46.2	72½	75½			
60072	22700	41.3		46.2	78½	81½			
60078	24700	44.9		53.9	84½	87½			
60084	26500	48.3		53.9	90½	93½			
60090	28500	51.7		61.6	96½	99½			
60096	30500	55.3		61.6	102½	105½			
60102	32400	58.8		69.3	108½	111½			
60108	34300	62.3		69.3	114½	117½			
60114	36200	65.8		77.0	120½	123½			
60120	38200	69.4		77.0	126½	129½			
66048	16500	30.0	1-18 and 2-24 TUBE FACE COILS	35.2	54½	57½	104⅝	118⅛	20
66054	18600	33.8		44.0	60½	63½			
66060	20700	37.7		44.0	66½	69½			
66066	22600	41.5		52.8	72½	75½			
66072	25000	45.4		52.8	78½	81½			
66078	27400	49.3		61.6	84½	87½			
66084	29200	53.1		61.6	90½	93½			
66090	31400	57.0		70.4	96½	99½			
66096	33500	60.8		70.4	102½	105½			
66102	35600	64.7		79.2	108½	111½			
66108	37700	68.5		79.2	114½	117½			
66114	39800	72.4		88.0	120½	123½			
66120	42000	76.3		88.0	126½	129½			
72048	18100	32.8	3-24 TUBE FACE COILS	39.6	54½	57½	113⅛	126⅝	20
72054	20300	36.9		49.5	60½	63½			
72060	22700	41.2		49.5	66½	69½			
72066	24900	45.3		59.4	72½	75½			
72072	27200	49.5		59.4	78½	81½			
72078	29500	53.7		69.3	84½	87½			
72084	31800	57.9		69.3	90½	93½			
72090	34200	62.2		79.2	96½	99½			
72096	36500	66.4		79.2	102½	105½			
72102	38900	70.7		89.1	108½	111½			
72108	41000	74.7		89.1	114½	117½			
72114	43400	79.0		99.0	120½	123½			
72120	45800	83.3		99.0	126½	129½			

ENGINEERING AND SELECTION DATA

DEFINITION OF SYMBOLS

DB ent = Entering air dry bulb temperature °F
DB lvg = Leaving air dry bulb temperature °F
DB coil = Final air dry bulb temperature produced by unsprayed coil °F
WB ent = Entering air wet bulb temperature °F
WB lvg = Leaving air wet bulb temperature °F
E s = Saturation efficiency per cent
cfm = Cubic feet of standard air per minute
fpm = Air velocity, feet per minute
fps = Water velocity, feet per second
USgpm = Water flow, US gallons per minute (1 US gal. = .833 Imp. Gal.)
FA = Face area of coil, sq. ft.
h ent = Enthalpy of air at WB ent BTU/lb.
h lvg = Enthalpy of air at WB lvg BTU/lb.
SH = Sensible heat load BTU per hour
TH = Total heat load BTU per hour
R = Ratio of sensible to total heat for unsprayed coil
T ent = Water temperature entering chilled water coil °F
T lvg = Water temperature leaving water coil °F
T_R = Refrigerant temperature at suction outlet °F (Freon 12)
T in = Temperature of spray water entering sprays °F
T out = Temperature of spray water leaving unit °F

FORMULAE

$TH = cfm \times 4.5 \times (\mathbf{h}\ ent - \mathbf{h}\ lvg)$ .... for cooling
$= cfm \times 1.08 \times (DB\ ent - DB\ lvg)$ .... for heating

$$R = 0.24 \frac{(DB\ ent - DB\ coil)}{(\mathbf{h}\ ent - \mathbf{h}\ lvg)}$$

EVAPORATIVE COOLING BY SPRAYS

$$DB\ lvg = DB\ coil - E\ s\ (DB\ coil - WB\ lvg)$$

$$E\ s = \frac{DB\ ent - DB\ lvg}{DB\ ent - WB\ lvg}$$

CHILLED WATER COOLING

$$T\ lvg = T\ ent + \frac{TH}{USgpm \times 500}$$

$$USgpm = \frac{TH}{500 \times (T\ lvg - T\ ent)}$$

$$\text{Water Velocity fps} = \frac{USgpm}{\text{No. of Circuits}} \times 1.235$$

HUMIDIFYING WITH SPRAY WATER

$$T\ in = T\ out + \frac{TH}{500 \times (T\ lvg - T\ ent)}$$

EVAPORATIVE COOLING FOR WINTER HUMIDIFICATION

$$DB\ lvg = DB\ ent - E\ s\ (DB\ ent - WB\ lvg)$$

EXAMPLE OF SELECTION METHOD

COOLING & DEHUMIDIFYING

As mentioned previously under Final Air Conditions, page 8, coil performance is initially calculated on the assumption that the coils are not sprayed. The method of selecting cooling coils outlined in this catalogue eliminates the need to refer to a psychometric chart. It is based on the fact that the difference between the dry bulb and wet bulb temperature leaving the unsprayed coil can be very closely given by a ratio of the difference between the dry bulb and wet bulb temperatures entering the coil. See Table 6, page 18. Using this fact, the dry bulb temperature produced by an unsprayed coil (DB coil) can be determined.

In using this method for chilled water coils, however, it is necessary to assume the number of rows required and to proceed from there. If the final calculated number of rows deep does not agree with the original estimate, then a new assumption must be made and the calculation repeated. For calculating direct expansion coils, DB coil must be known in order to determine the dry bulb temperature leaving the unit (DB lvg).

METHOD	CALCULATION
The nature of the job determines required design conditions. Assume design conditions are:	Air = 26,000 cfm DB ent = 83° F WB ent = 70° F DB lvg = 58° F WB lvg = 57° F TH = 1.125,000 BTU/hr. CHILLED WATER 140 USgpm through coil T ent = 40° F T lvg = ? DIRECT EXPANSION REFRIGERANT Freon 12 at T_R = 45° F
1. Select the most convenient sized sprayed coil dehumidifier for the application, based on cfm from Table 2, on page 11.	Assume that a #48102 is the size that is most suitable to fit existing space requirements. FA = 47 sq. ft.

METHOD	CALCULATION
2. Calculate actual face velocity through the coil.	Air Velocity $= \frac{26{,}000}{47} = 552$ fpm.
COIL SELECTION — USING CHILLED WATER COILS	
3. Determine DB coil by assuming rows deep and then add temperature difference (DB coil — WB lvg) from Table 6, page 18, to WB lvg.	Assume a 4-row coil. (DB ent — WB ent) = 83 — 70 = 13° (DB coil — WB lvg) = 2.2°F (4R at 552 fpm) .:. DB coil = 57 + 2.2 = 59.2°F
4. Calculate Sensible/Total heat ratio, R, from formula on page 12, using DB coil from above and enthalpies at entry and leaving wet bulb temperatures from Table 14, P. 20.	$R = .24 \frac{(83 - 59.2)}{34.09 - 24.48} = .595$
5. Calculate final temp. (T lvg) of cooling water leaving coil from formula on page 12.	$T\ lvg = 40 + \frac{1{,}125{,}000}{140 \times 500} = 56.1°\ F$
6. Calculate water velocity in coil from formula, page 12. Circuits are equal to total tube face in unit. See also Table 16, page 21.	Number of circuits = 48 Water velocity $= \frac{140 \times 1.235}{48} = 3.6$ fps
7. Obtain heat transfer factor K from chart on page 16. Enter at air velocity and appropriate R factor, then drop to given water velocity . Read off K value on left.	Air Velocity = 552 fpm R Factor = .595 Water Velocity = 3.6 fps .·. K = 280
8. Determine mean effective temperature difference, MED, from Chart on page 15, using T lvg from 5 above.	Greatest temperature difference = (DB ent — T lvg) = 83 — 56.1° = 26.9° F Least temperature difference = (DB coil — T ent) = 59.2 — 40° = 19.2° F .·. MED from chart = 22.5° F
9. Rows deep of coils is given by $Rows = \frac{TH}{K \times FA \times MED}$ If the calculated rows are larger than the assumed rows, then make a new assumption and rework the calculation.	$Rows = \frac{1{,}125{,}000}{280 \times 47 \times 22.5°F} = 3.79$ This confirms the original estimate of a 4-row coil.
10. Find the head loss due to water friction in coils from Chart 3, page 18.	Water friction at 3.6 fps for 4-row coil and 102" tube length = 7.6 ft.
11. Find air friction of unit from Table 8, on page 18.	Air friction at 552 fpm Eliminators and sprays = .50" wg Sprayed 4-row coil = .49" wg .99" wg
12. Having calculated DB coil, it is now necessary to calculate leaving air dry bulb temperature. See formula on page 12, and value of E s on page 18.	E s = 81.6% for 4-row coil DB lvg = 59.2 — .816 (59.2 — 57) = 57.4° F This is satisfactory since 58°F was specified.
COIL SELECTION — USING DIRECT EXPANSION COILS	
13. With the calculated air velocity and refrigerant temperature, T_R, obtain the rows deep required to produce the WB lvg at specified WB ent from Tables on page 17 for direct expansion coils.	WB ent = 70° F Air Velocity = 552 fpm Refrig. Temp. = 45° F A 4-row coil gives WB lvg = 59.6° F This is not low enough since 57° WB lvg is required. Use a 6-row coil which gives WB lvg = 56.3° F
14. Determine DB coil using Table 6 on page 18 as Step 3 above.	(DB ent — WB ent) = 83 — 70° = 13°F (DB coil — WB lvg) = .9°F .·. DB coil = 57 + .9 = 57.9° F
15. Calculate leaving air dry bulb temperature provided by unit, using DB coil and saturation efficiency, E s, from Table 7 on page 18.	E s = 92.5% for 6-row coil .·. DB lvg = 57.9 — .925 (57.9 — 57) = 57.1° F This is satisfactory since 58° F was specified.

WINTER HUMIDIFICATION

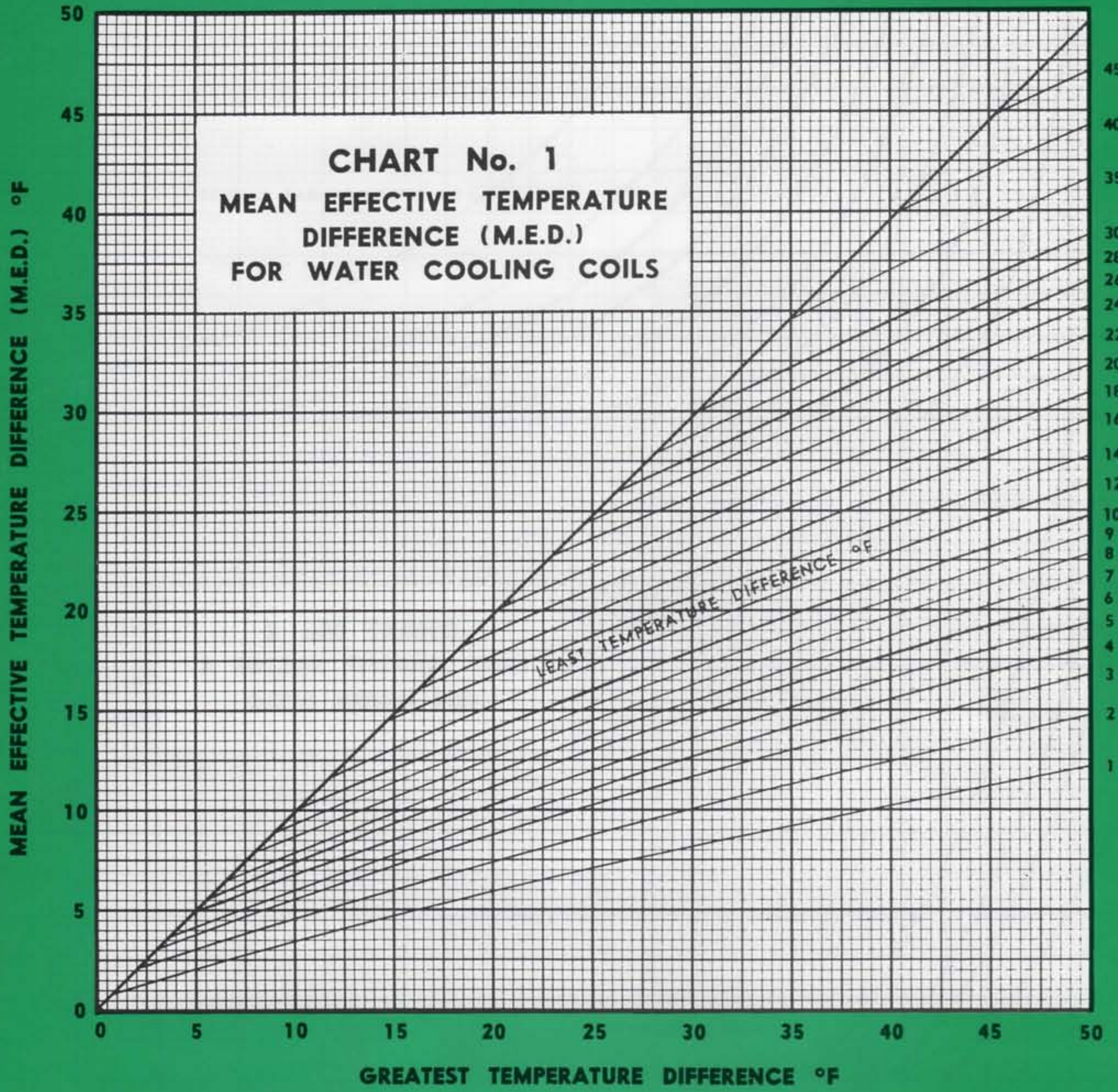
One major advantage of a Sprayed Coil Dehumidifier is that the large surface area exposed by the coil fins can be used to evaporate warm spray water to provide winter humidification. Two methods of calculating humidification are shown below.

METHOD	CALCULATION
EXAMPLE A — With Preheated Air	
1. Air is preheated before entering unit to a temperature such that after humidification, air can be reheated to give desired relative humidity in conditioned space.	Air preheated to DB ent = 80° F 15% RH WB ent = 54° F Use #48102 Sprayed Coil Dehumidifier FA = 47 sq. ft. Water Capacity of Sprays = 59.4 USgpm Air = 26,000 cfm
2. Air entering sprayed coil dehumidifiers is adiabatically evaporated along constant WB. Find DB lvg unit using E s from Table 7 on page 18.	E s = 92.5% for existing 6-row cooling coil DB lvg = DB ent — E s (DB ent — WB lvg) 80 — .925 (80 — 54) 56° F This gives a relative humidity of 88%.
3. Note that air must be reheated at constant dew point to provide correct humidity for conditioned space.	Air could be reheated to about 72°F, giving about 50% Relative Humidity, for the conditioned space.
EXAMPLE B — With Heated Spray Water	
4. Air conditions are determined from job requirements. Entering air preheated to about 45°F to prevent freezing up of sprays.	Air quantity = 26,000 cfm. #48102 sprayed coil dehumidifier. FA = 47 sq. ft. Spray water quantity = 59.4 USgpm. DB ent = 45° F WB ent = 38° F DB lvg = WB lvg = 52° F
5. Water temperature leaving the unit is assumed to be the same as final air temperature.	T out = WB lvg = 52° F
6. Find total heat load from formula on page 12.	TH = 26,000 × 4.5 (21.44 — 14.32). = 833.00 BTU/hr.
7. Determine initial spray water temperature from formula on page 12.	$T\,in = 52 + \frac{833{,}000}{59.4 \times 500} = 80°\,F$
8. NOTE: Provisions must be made for heat losses from unit when selecting water heater for above capacities. It is suggested that an extra 20% of total heat be added in to allow for these losses.	Select water heater for 1.2 × 833,000 = 1,010,000 BTU/hr., 59.4 USgpm and 52° inlet water temperature.

EVAPORATIVE COOLING — Without Refrigeration

In spring and fall, evaporative cooling using the recirculated spray water could be a means of providing cooling without using chilled water in the coils.

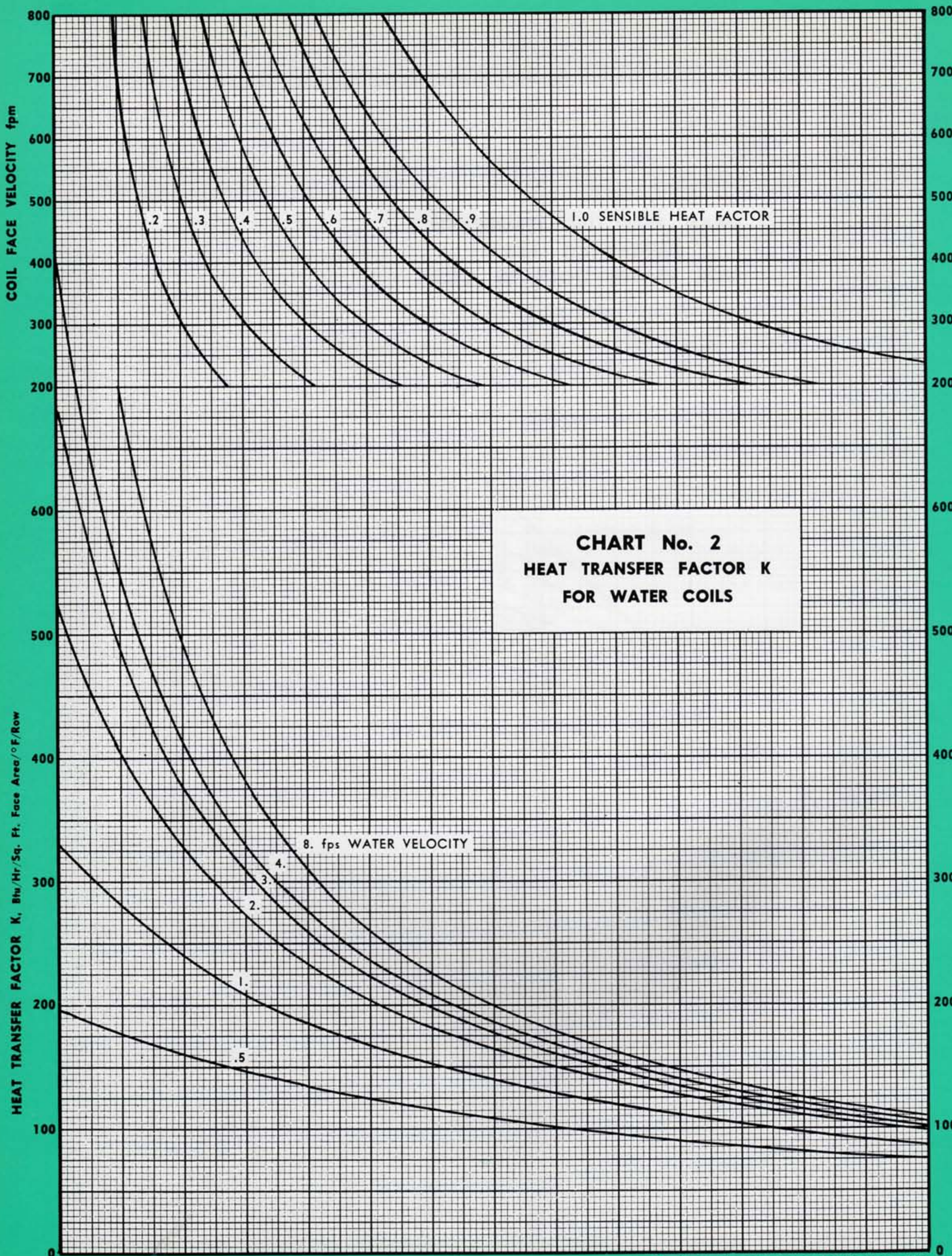
METHOD	CALCULATION
1. From consideration of other design conditions, the unit has been selected with a 6-row coil.	Air quantity = 26,000 cfm. #48102 sprayed coil dehumidifier. WB ent = 83° F DB ent = 70° F Unit has a 6-row coil.
2. From Table 7 on page 18 find E s for 6-row coil. Air is cooled by adiabatic evaporation along constant wet bulb line. Calculate DB lvg.	E s = .925 for a 6-row coil DB lvg = 83 — .925 (83 — 70) = 71° F



The mean effective temperature difference (MED) is obtained from the inlet and outlet air and water temperatures as follows:

1. Obtain the greatest temperature difference = DB ent—T lvg .... A
2. Obtain the least temperature difference = DB lvg—T ent .... B
3. Using the two values A and B above, read off the MED from the chart.

NOTE: If the values of A and B are greater than the scale of the chart, it is only necessary to divide each value by a suitable common factor and then to use these new values to obtain an MED from the chart, which must then be multiplied by the same factor to give the actual MED.



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DIRECT EXPANSION COOLING COIL PERFORMANCE

35°F
REFRIG. TEMP.

LEAVING WET BULB TEMPERATURE — °F (WB lvg) TABLE No. 3

AIR VELOCITY fpm	ROWS DEEP	ENTERING WET BULB TEMPERATURE. °F (WB ent)														
		65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
400	4	50.0	50.7	51.3	52.0	52.6	53.3	54.0	54.6	55.2	55.9	56.6	57.4	58.0	58.9	59.6
	6	45.7	46.2	46.7	47.2	47.7	48.2	48.7	49.2	49.7	50.2	50.6	51.2	51.8	52.4	53.0
	8	43.2	43.6	44.0	44.4	44.8	45.2	45.6	46.0	46.4	46.8	47.2	47.6	48.0	48.4	48.8
450	4	50.7	51.4	52.0	52.7	53.4	54.0	54.7	55.4	56.1	56.8	57.5	58.3	59.0	59.7	60.5
	6	46.4	46.9	47.5	48.0	48.5	49.0	49.5	50.1	50.6	51.1	51.6	52.2	52.8	53.4	54.1
	8	43.8	44.2	44.6	45.1	45.5	45.9	46.3	46.7	47.2	47.6	48.0	48.4	48.9	49.3	49.7
500	4	51.4	52.1	52.8	53.4	54.2	54.8	55.5	56.2	57.0	57.7	58.5	59.2	60.0	60.6	61.4
	6	47.1	47.7	48.4	48.8	49.4	49.8	50.4	51.0	51.5	52.0	52.6	53.2	53.8	54.5	55.2
	8	44.5	44.9	45.3	45.8	46.2	46.6	47.1	47.5	48.0	48.4	48.9	49.3	49.8	50.2	50.6
550	4	52.0	52.7	53.4	54.0	54.8	55.7	56.2	56.9	57.7	58.4	59.2	59.9	60.6	61.3	62.1
	6	47.7	48.3	49.0	49.5	50.1	50.7	51.1	51.7	52.3	52.8	53.4	54.0	54.6	55.2	55.9
	8	45.1	48.9	46.0	46.5	46.9	47.4	47.9	48.3	48.6	49.2	49.7	50.2	50.7	51.1	51.6
600	4	52.6	53.3	54.0	54.7	55.5	56.2	56.9	57.7	58.4	59.1	59.9	60.6	61.3	62.1	62.8
	6	48.4	49.0	49.6	50.2	50.8	51.3	51.9	52.5	53.1	53.7	54.3	54.9	55.4	56.0	56.6
	8	45.7	46.2	46.7	47.2	47.7	48.2	48.7	49.2	49.6	50.1	50.6	51.1	51.6	52.1	52.6

40°F
REFRIG. TEMP.

LEAVING WET BULB TEMPERATURE — °F (WB lvg) TABLE No. 4

AIR VELOCITY fpm	ROWS DEEP	ENTERING WET BULB TEMPERATURE. °F (WB ent)														
		65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
400	4	52.5	53.1	53.8	54.4	55.0	55.6	56.2	56.9	57.5	58.3	54.0	59.6	60.3	61.0	61.8
	6	49.4	49.8	50.2	50.7	51.2	51.7	52.2	52.7	53.2	53.7	54.3	54.8	55.2	55.8	56.4
	8	46.9	47.3	47.7	48.1	48.5	48.9	49.2	49.6	50.0	50.4	50.8	51.2	51.6	52.0	52.9
450	4	53.2	53.6	54.4	54.9	55.5	56.1	56.9	57.5	58.2	59.0	54.7	60.4	61.1	61.9	62.7
	6	49.9	50.4	50.8	51.3	51.8	52.4	52.8	53.4	53.8	54.3	54.9	55.7	56.1	56.6	57.2
	8	47.5	47.9	48.3	48.7	49.1	49.5	49.9	50.3	50.7	51.1	51.5	52.0	52.4	52.8	53.5
500	4	54.0	54.2	55.0	55.5	56.1	56.7	57.6	58.2	58.9	59.7	60.5	61.2	62.0	62.8	63.6
	6	50.5	51.0	51.5	52.0	52.5	53.1	53.5	54.1	54.5	55.0	55.6	56.2	57.0	57.5	58.1
	8	48.1	48.5	49.0	49.4	49.8	50.2	50.6	51.0	51.5	51.9	52.3	52.8	53.2	53.6	54.1
550	4	54.3	54.8	55.5	56.1	56.8	57.4	58.3	58.9	59.6	60.3	61.1	61.8	62.5	63.0	64.1
	6	50.9	51.4	52.0	52.5	53.0	53.6	54.1	54.7	55.2	55.7	56.3	56.9	57.6	58.1	58.7
	8	48.6	49.0	49.5	49.9	50.3	50.8	51.2	51.6	52.1	52.5	53.0	53.4	53.9	54.3	54.8
600	4	54.7	55.4	56.1	56.8	57.5	58.2	58.9	59.6	60.3	61.0	61.7	62.4	63.1	63.8	64.5
	6	51.3	51.9	52.5	53.0	53.6	54.2	54.8	55.4	55.9	56.5	57.1	57.7	58.3	58.8	59.4
	8	49.1	49.6	50.0	50.5	50.9	51.4	51.9	52.3	52.8	53.2	53.7	54.1	54.6	55.0	55.5

45°F
REFRIG. TEMP.

LEAVING WET BULB TEMPERATURE — °F (WB lvg) TABLE No. 5

AIR VELOCITY fpm	ROWS DEEP	ENTERING WET BULB TEMPERATURE. °F (WB ent)														
		65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
400	4	55.2	55.7	56.3	57.0	57.5	58.2	58.8	59.5	60.0	60.6	61.3	62.0	62.7	63.4	64.2
	6	52.2	52.7	53.2	53.6	54.1	54.5	55.0	55.5	56.0	56.5	57.1	57.5	58.1	58.6	59.2
	8	50.7	51.1	51.5	51.8	52.2	52.6	53.0	53.3	53.7	54.0	54.4	54.8	55.2	55.6	56.0
450	4	55.6	56.1	56.7	57.5	58.0	58.6	59.3	59.9	60.5	61.6	61.9	62.6	63.3	64.1	64.8
	6	52.8	53.3	53.8	54.2	54.6	55.1	55.6	56.1	56.6	57.1	57.7	58.2	58.8	59.3	59.9
	8	51.1	51.5	51.9	52.3	52.7	53.1	53.5	53.8	54.3	54.6	55.0	55.4	55.8	56.2	56.6
500	4	56.0	56.6	57.2	58.0	58.5	59.1	59.8	60.4	61.0	61.8	62.6	63.3	64.0	64.8	65.5
	6	53.3	54.0	54.4	54.8	55.2	55.7	56.2	56.7	57.2	57.8	58.4	59.0	59.6	60.1	60.6
	8	51.6	52.0	52.4	52.8	53.2	53.6	54.0	54.4	54.9	55.3	55.7	56.1	56.5	56.8	57.2
550	4	56.4	57.0	57.7	58.4	59.0	59.6	60.3	61.0	61.6	62.4	63.1	63.8	64.5	65.3	65.9
	6	53.7	54.3	54.8	55.3	55.8	56.3	56.8	57.3	57.9	58.5	59.1	59.6	60.2	60.7	61.2
	8	52.0	52.4	52.8	53.3	53.7	54.1	54.6	55.0	55.5	55.9	56.3	56.8	57.2	57.6	58.0
600	4	56.8	57.5	58.2	58.8	59.5	60.2	60.9	61.6	62.3	63.0	63.7	64.4	65.1	65.8	66.4
	6	54.1	54.7	55.3	55.8	56.4	56.9	57.5	58.0	58.6	59.2	59.7	60.3	60.8	61.4	61.9
	8	52.4	52.8	53.3	53.8	54.2	54.7	55.2	55.6	56.1	56.6	57.0	57.5	58.0	58.4	58.9

TABLE No. 6 LEAVING AIR TEMPERATURE DIFFERENCE (DB lvg - WB lvg) °F FOR UNSPRAYED COILS

AIR VELOCITY fpm	ROWS DEEP	ENTERING AIR TEMPERATURE DIFFERENCE (DB ent — WB ent) °F																	
		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
400	4	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6
450		.2	.4	.6	.8	1.0	1.2	1.5	1.7	1.8	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7
500		.3	.5	.7	.9	1.1	1.3	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.5	3.7	3.9
550		.4	.6	.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.5	2.7	2.9	3.1	3.3	3.6	3.8	4.0
600		.4	.6	.8	1.0	1.2	1.4	1.7	1.9	2.1	2.3	2.6	2.8	3.0	3.2	3.4	3.7	3.9	4.1
400	6	—	.1	.2	.2	.3	.4	.5	.6	.7	.8	.8	1.0	1.0	1.1	1.2	1.3	1.4	1.5
450		—	.1	.2	.2	.3	.4	.5	.6	.7	.8	.9	1.0	1.0	1.1	1.2	1.3	1.4	1.5
500		—	.2	.2	.2	.3	.5	.6	.7	.8	.9	.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
550		—	.2	.2	.3	.4	.5	.6	.7	.8	.9	1.0	1.1	1.1	1.2	1.3	1.4	1.5	1.6
600		—	.2	.3	.3	.4	.5	.6	.7	.8	.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
400	8	—	—	.1	.1	.2	.2	.2	.2	.3	.3	.4	.4	.5	.5	.5	.6	.6	.6
450		—	—	.1	.1	.2	.2	.2	.2	.3	.3	.4	.4	.5	.5	.6	.6	.7	.7
500		—	—	.1	.1	.2	.2	.2	.3	.3	.4	.4	.4	.5	.6	.6	.7	.7	.7
550		—	—	.1	.1	.2	.2	.3	.3	.3	.4	.4	.5	.5	.6	.6	.7	.7	.7
600		—	—	—	.1	.2	.2	.3	.3	.3	.4	.4	.5	.5	.6	.6	.7	.7	.7

The dry bulb temperature produced by the cooling coil is not dependent on the refrigerant temperature since it is the ability of the coil to cool to the leaving wet bulb temperature that governs the value of the final dry bulb.

The dry bulb temperature produced by the cooling coil (DB coil) must be known, however, in order to determine the ratio of sensible to total heat required when selecting chilled water coils, and also to determine the final dry bulb temperature produced by the sprayed coil dehumidifier (DB lvg).

DB coil is obtained by adding the final coil temperature difference from Table 6 above to the final wet bulb temperature as indicated in the example on page 13.

TABLE No. 7 SATURATION EFFICIENCY—E_s

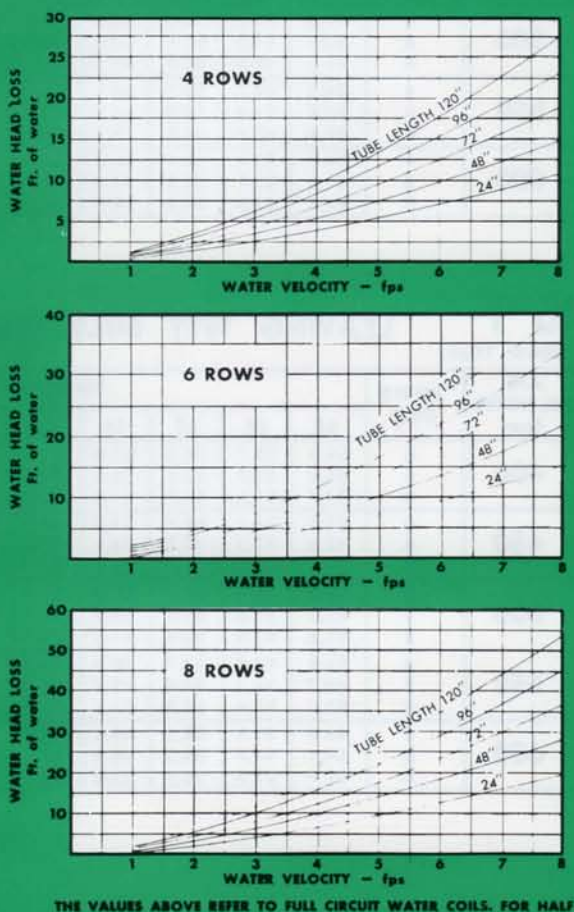
ROWS DEEP	SATURATION EFFICIENCY—%
4	81.6
6	92.5
8	97.0

Saturation efficiency varies slightly with airflow. Above figures are based on an air velocity of 550 fpm.

TABLE No. 8 AIR FRICTION

FACE VELOCITY fpm	AIR FRICTION — INCHES OF WATER			
	Eliminators and Sprays	SPRAYED COOLING COILS		
		4 Row	6 Row	8 Row
400	.24	.27	.38	.51
425	.29	.30	.43	.57
450	.33	.33	.48	.63
475	.37	.37	.54	.70
500	.41	.40	.59	.78
525	.45	.44	.64	.85
550	.50	.49	.70	.93
575	.54	.52	.76	1.02
600	.58	.57	.84	1.10

CHART No. 3 — WATER FRICTION FOR WATER COOLING COILS



THE VALUES ABOVE REFER TO FULL CIRCUIT WATER COILS. FOR HALF CIRCUIT COILS, MULTIPLY THE VALUES OBTAINED ABOVE BY 1.85

TABLE No. 9

NET WEIGHT, LESS COILS, OF SPRAYED COIL DEHUMIDIFIERS IN POUNDS

TOTAL TUBE FACE	TUBE LENGTH — INCHES																
	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
18	540	590	650	700	760	810	870	920	980	—	—	—	—	—	—	—	—
24	580	640	710	770	830	890	960	1030	1080	1140	1200	—	—	—	—	—	—
36	705	790	870	950	1030	1110	1190	1270	1360	1430	1510	1660	1670	1760	1830	1910	1990
42	775	860	940	1030	1120	1200	1290	1370	1460	1540	1630	1720	1800	1880	1970	2050	2140
48	815	910	1000	1090	1180	1270	1370	1460	1550	1640	1730	1820	1910	2000	2090	2180	2270
54	—	—	1090	1190	1300	1400	1500	1610	1710	1810	1910	2010	2110	2210	2310	2420	2520
60	—	—	1140	1250	1360	1470	1580	1690	1800	1910	2020	2130	2240	2350	2460	2560	2670
66	—	—	—	—	1450	1560	1610	1790	1900	2020	2120	2240	2350	2470	2580	2690	2800
72	—	—	—	—	1540	1640	1760	1870	1990	2110	2220	2340	2460	2580	2700	2820	2940

The above weights are based on low pressure Draw-through units with an 18 ga. casing and do not include the weight of the coils or the water in the tank. Add in weight of coils from Table 10 below, and add weight of water held in tank at a level of 9″. Density of water 62.3#/cu. ft.

For the approximate weight of the Blow-through Sprayed Coil Dehumidifiers used with system pressures up to 3″ add 15% to the above weights. For system pressures from 3″ to 6″ add 30% to the above weights and for system pressures from 6″ to 9″ add 60% to the above weights.

TABLE No. 10

NET WEIGHT OF COILS — POUNDS

TUBE LENGTH — INCHES	18 TUBE FACE			24 TUBE FACE		
	4 Rows	6 Rows	8 Rows	4 Rows	6 Rows	8 Rows
24	172	211	257	222	275	336
30	198	251	302	255	320	392
36	224	289	346	290	367	452
42	250	327	392	323	413	511
48	281	357	442	359	462	573
54	309	394	490	400	514	640
60	337	432	536	434	562	701
66	364	468	583	469	609	760
72	391	506	630	504	658	822
78	418	541	676	540	706	883
84	445	579	724	574	754	944
90	474	616	772	609	801	1000
96	500	652	817	644	850	1070
102	540	702	877	690	907	1140
108	566	736	921	724	954	1200
114	594	773	969	757	1000	1260
120	621	811	1020	793	1050	1320

Weights listed are for both chilled water and direct expansion coils with copper tubes and copper fins. If aluminum finned coils are used, multiply weights by .77.

TABLE No. 11

WEIGHT OF REFRIGERANT CHARGE (Freon 12) FOR DIRECT EXPANSION COILS — Pounds Per Row

TOTAL TUBE FACE	TUBE LENGTH — INCHES																
	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
18	1.4	1.7	2.1	2.4	2.7	3.1	3.4	3.8	4.1	4.5	4.8	5.2	5.5	5.8	6.2	6.5	6.9
24	1.8	2.3	2.8	3.2	3.7	4.1	4.6	5.0	5.5	6.0	6.4	6.9	7.3	7.8	8.3	8.7	9.2

The weight of charge given in table above is for ONE row only. These figures must be multiplied by the number of rows in each coil and number of coils in the unit. To obtain the volume of refrigerant in cubic feet per row divide the table value by a factor of 86.

COIL CONNECTION DATA

TABLE No. 12

CHILLED WATER COILS

TUBE FACE	STD. PIPE CONN.—MALE Supply	STD. PIPE CONN.—MALE Return
18	2"	2"
24	2"	2"

TABLE No. 13 DIRECT EXPANSION COILS

LIQUID CONNECTIONS — MALE, SOLDER				Suction Conn. Male, Solder
ROWS DEEP	TUBE LENGTH	18 T.F.	24 T.F.	
4	12" to 30" 36" only 42" to 120"	7/8" 1 3/8" 1 5/8"	2 @ 7/8" 2 @ 7/8" 2 @ 1 3/8"	2 1/8" O.D. For all Tube Faces and Tube Lengths
6 and 8	12" to 30" 36" to 120"	7/8" 1 5/8"	2 @ 7/8" 2 @ 1 3/8"*	

* Special consideration may have to be given to the connection sizes on 8-row coils over 7'-6" tube length. Refer to Head Office for further details.

ENTHALPY BTU/LB. DRY AIR:

TABLE No. 14 Enthalpy is the Total Heat of Dry Air, Water Vapour and Liquid

Wet Bulb Temp. Deg. F.	TENTHS .0	.1	.2	.3	.4	.5	.6	.7	.8	.9
35	13.01	13.05	13.09	13.13	13.17	13.21	13.25	13.29	13.34	13.38
36	13.44	13.48	13.52	13.57	13.61	13.65	13.69	13.74	13.78	13.84
37	13.87	13.91	13.96	14.00	14.05	14.09	14.14	14.18	14.23	14.27
38	14.32	14.36	14.41	14.45	14.50	14.54	14.59	14.63	14.68	14.72
39	14.77	14.81	14.86	14.90	14.95	14.99	15.04	15.08	15.13	15.18
40	15.23	15.28	15.32	15.37	15.42	15.46	15.51	15.56	15.60	15.65
41	15.70	15.74	15.79	15.84	15.89	15.93	15.98	16.03	16.08	16.12
42	16.17	16.22	16.27	16.32	16.37	16.41	16.46	16.51	16.56	16.61
43	16.66	16.71	16.76	16.80	16.85	16.90	16.95	17.00	17.05	17.10
44	17.15	17.20	17.25	17.30	17.35	17.40	17.45	17.50	17.55	17.60
45	17.65	17.70	17.75	17.80	17.85	17.91	17.96	18.01	18.06	18.11
46	18.16	18.21	18.26	18.32	18.37	18.42	18.47	18.52	18.58	18.63
47	18.68	18.73	18.79	18.84	18.89	18.95	19.00	19.05	19.10	19.16
48	19.21	19.27	19.32	19.37	19.42	19.48	19.54	19.58	19.64	19.70
49	19.75	19.81	19.86	19.92	19.97	20.03	20.08	20.14	20.19	20.25
50	20.30	20.36	20.41	20.47	20.53	20.58	20.64	20.69	20.75	20.81
51	20.86	20.92	20.98	21.03	21.09	21.15	21.21	21.26	21.32	21.38
52	21.44	21.49	21.55	21.61	21.67	21.73	21.79	21.84	21.90	21.96
53	22.02	22.08	22.14	22.20	22.26	22.32	22.38	22.44	22.50	22.56
54	22.62	22.68	22.74	22.80	22.86	22.92	22.98	23.04	23.10	23.16
55	23.22	23.28	23.34	23.41	23.47	23.53	23.59	23.65	23.72	23.78
56	23.84	23.90	23.97	24.03	24.10	24.16	24.22	24.29	24.35	24.42
57	24.48	24.54	24.61	24.67	24.74	24.80	24.86	24.93	24.99	25.06
58	25.12	25.18	25.25	25.32	25.38	25.45	25.51	25.58	25.64	25.71
59	25.78	25.84	25.92	25.98	26.05	26.12	26.19	26.26	26.32	26.39
60	26.46	26.53	26.60	26.67	26.74	26.81	26.87	26.94	27.01	27.08
61	27.15	27.22	27.29	27.36	27.43	27.50	27.57	27.64	27.71	27.78
62	27.85	27.92	27.99	28.07	28.14	28.21	28.28	28.35	28.43	28.50
63	28.57	28.64	28.72	28.80	28.87	28.94	29.01	29.09	29.16	29.24
64	29.31	29.39	29.46	29.54	29.61	29.68	29.76	29.84	29.91	29.99
65	30.06	30.14	30.21	30.29	30.37	30.44	30.52	30.60	30.68	30.75
66	30.83	30.91	30.99	31.07	31.15	31.23	31.30	31.38	31.46	31.54
67	31.62	31.70	31.78	31.86	31.94	32.02	32.10	32.18	32.26	32.34
68	32.42	32.50	32.58	32.67	32.75	32.84	32.92	33.00	33.08	33.17
69	33.25	33.33	33.42	33.50	33.59	33.67	33.75	33.84	33.92	34.00
70	34.09	34.18	34.26	34.35	34.43	34.52	34.61	34.69	34.78	34.86
71	34.95	35.03	35.13	35.21	35.30	35.39	35.48	35.57	35.65	35.74
72	35.83	35.92	36.01	36.10	36.19	36.28	36.38	36.47	36.56	36.65
73	36.74	36.83	36.92	37.02	37.11	37.20	37.30	37.38	37.47	37.57
74	37.66	37.76	37.85	37.94	38.04	38.14	38.23	38.32	38.42	38.51
75	38.61	38.71	38.80	38.90	38.99	39.09	39.19	39.28	39.38	39.47
76	39.57	39.67	39.77	39.87	39.97	40.07	40.17	40.27	40.37	40.47
77	40.57	40.67	40.77	40.87	40.97	41.08	41.18	41.28	41.38	41.48
78	41.58	41.68	41.79	41.89	42.00	42.10	42.20	42.31	42.41	42.52
79	42.62	42.72	42.83	42.94	43.04	43.16	43.26	43.37	43.48	43.58
80	43.69	43.80	43.91	44.02	44.13	44.24	44.34	44.45	44.56	44.67
81	44.78	44.90	45.02	45.14	45.26	45.38	45.50	45.62	45.75	45.87
82	45.90	46.01	46.12	46.23	46.34	46.45	46.56	46.67	46.78	46.89
83	47.04	47.16	47.28	47.39	48.51	48.63	48.75	48.87	48.99	49.11
84	48.22	48.34	48.46	48.58	48.70	48.82	48.94	49.06	49.18	49.31

Abstracted by permission from Heating, Ventilating and Air-Conditioning Guide, 1957, Chapter 3.
Original data compiled by John A. Goff and S. Gratch.

TABLE No. 15

PRESSURE DROP THROUGH DIRECT EXPANSION COIL DISTRIBUTORS

REFRIGERANT	DISTRIBUTOR PRESSURE DROP	MAXIMUM COIL PRESSURE DROP
Freon 12	25 psig	12 psig
Freon 22	35 psig	12 psig

Improved performance on direct expansion coils has been obtained by the recent development of a pressure type distributor, having an internal interchangeable nozzle. This nozzle is selected by the coil manufacturer to suit the cooling load, type of refrigerant employed, and the refrigerant temperature. Typical pressure drops across distributor and coil when the appropriate nozzle is used are given in Table 15 above.

TABLE No. 16

CIRCUITS AND PASSES AVAILABLE FOR WATER COOLING COILS

CIRCUITS	Tube 18	Face 24	PASSES			CONNECTION
			4 Row	6 Row	8 Row	
Full Circuit	18	24	4	6	8	See Note Below
Half Circuit	9	12	8	12	16	All Same End

Sprayed Coil Dehumidifiers are arranged so that only coils having inlet and outlet connections at the same end can be used. In general, this limits coils to an even number of rows, as indicated above, although provision can be made to have the connections of odd row coils at the same end by providing an extra row of unfinned tubing to bring the return header to the supply side.

Full circuit coils are normally used, but half circuit coils are available if it is necessary to increase the water velocity in the coil in order to obtain a better heat transfer factor. However, the latter is obtained at the expense of water friction loss in coil. (See Chart 3, page 18.)

TABLE No. 17

MINIMUM COOLING LOAD PER COIL — TONS, FOR DIRECT EXPANSION COILS

TUBE LENGTH FEET	4-ROW		6-ROW		8-ROW	
	18 TF	24 TF	18 TF	24 TF	18 TF	24 TF
Up to 2'-6"	3	4	3	4	4.5	6
3'-0"	4.5	6	9	12	9	12
3'-6" to 10'-0"	9	12	9	12	9	12

These minimum coil loads are necessary in order to achieve the ratings given in this catalogue.

TABLE No. 18

MAXIMUM COOLING LOAD PER COIL — TONS, FOR DIRECT EXPANSION COILS

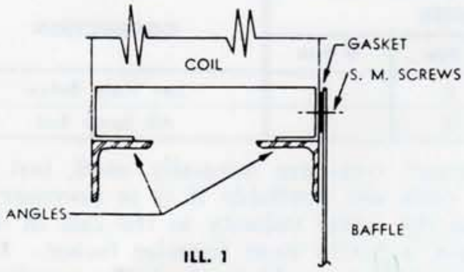
TUBE FACE	MAXIMUM LOAD — TONS
18	31
24	42

ERECTION PROCEDURE

All Sheldon Sprayed Coil Dehumidifiers are assembled at the factory and checked for correct alignment and location of the various components, before being knocked down and crated for shipment. Each part is match-marked so that parts with corresponding symbols can be readily identified for easier field assembly.

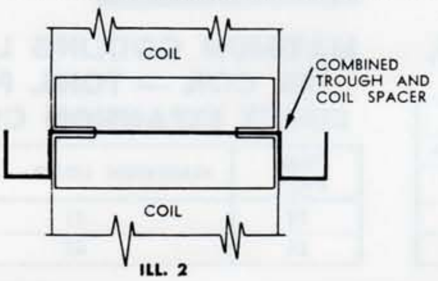
A set of detailed installation and erection instructions is supplied with each Sprayed Coil Dehumidifier.

1. Place tank on a solid level base, ensuring that the water connections are in their proper location. Suitable insulating material such as compressed cork, should be placed between the tank and the base. Note that there should be sufficient height provided to ensure that the suction inlet to the pump is below the water level so that the pump is primed at all times, and to ensure that the drain connection is clear of the floor.



ILL. 1

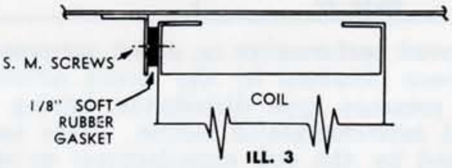
2. Connect drain and overflow piping. Fill tank with water and test for leaks. After testing, empty the tank of water to facilitate assembly.
3. Place lower coil in position on support angles in tank, making sure that sponge rubber gasket is fastened to baffle plate. Fasten baffle to coil with sheet metal screws. See Ill. 1.
4. Place combined trough and coil spacer in position on top of coil casing and stack next coil on top as in Ill. 2. Repeat for third coil if necessary. At this stage, it will be necessary to brace the coils in this position until the side and top sheets are in place. When two or more coils are supplied, the smaller face area coils are always placed in the upper position.



ILL. 2

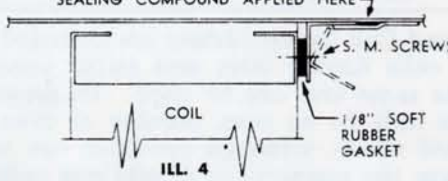
5. Apply rubber sealing gasket to the tank flanges and erect side panels. Secure to tank with sufficient bolts to hold firmly in place. Temporary bracing will be necessary to hold the side panels in position until top panel is located.
6. Locate top panel in position with its rubber gasket and square up casing before tightening all bolts. Note that when the bypass is supplied it is an integral part of the top panel.
7. Fasten entering-side baffles to coil top and side casings with sheet metal screws after ensuring that sponge rubber gaskets are in place. See Ill. 3.
8. Apply sealing compound supplied with Sprayed Coil Dehumidifier to inside of holding clips provided for the leaving-side baffles. Cement soft rubber gasket to coil casing flange. Position baffle plates as shown in sketch and fasten with sheet metal screws to coil casings. See Ill. 4.
9. Fasten down-spouts to drain troughs with sheet metal screws.

10. Insert top and bottom sections of coil connection box and fasten with sheet metal screws. Seal joints with sealing compound provided.



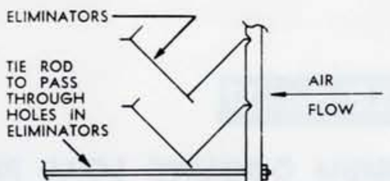
ILL. 3

11. Install spray headers with nozzles directed at coils. Square pattern spray nozzles should have grooves set at 45° to horizontal.
12. Fasten inner eliminator support channels in position with wing nuts. Bolt one end of tie-rod to this channel where required.
13. Install eliminator plates in position, starting from each end and working towards the centre. Place the eliminator in lower notch and swing up into corresponding notch in upper support bar. When nearing centre, do not swing eliminators into top notch until final eliminator has been placed in lower notch. Make sure that top rubber sealing strip lays on edge of eliminators and that eliminators with pass holes are in a position to pass over the tie-rods. Note that eliminators are installed with the lips towards the air-leaving side of the unit. See Ill. 5.



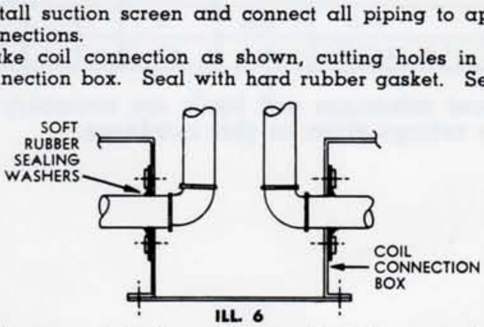
ILL. 4

14. When all eliminators are in position, secure the top guide angle in position.
15. Fasten eliminator outer support channel in position and even up the pitch of the eliminators.



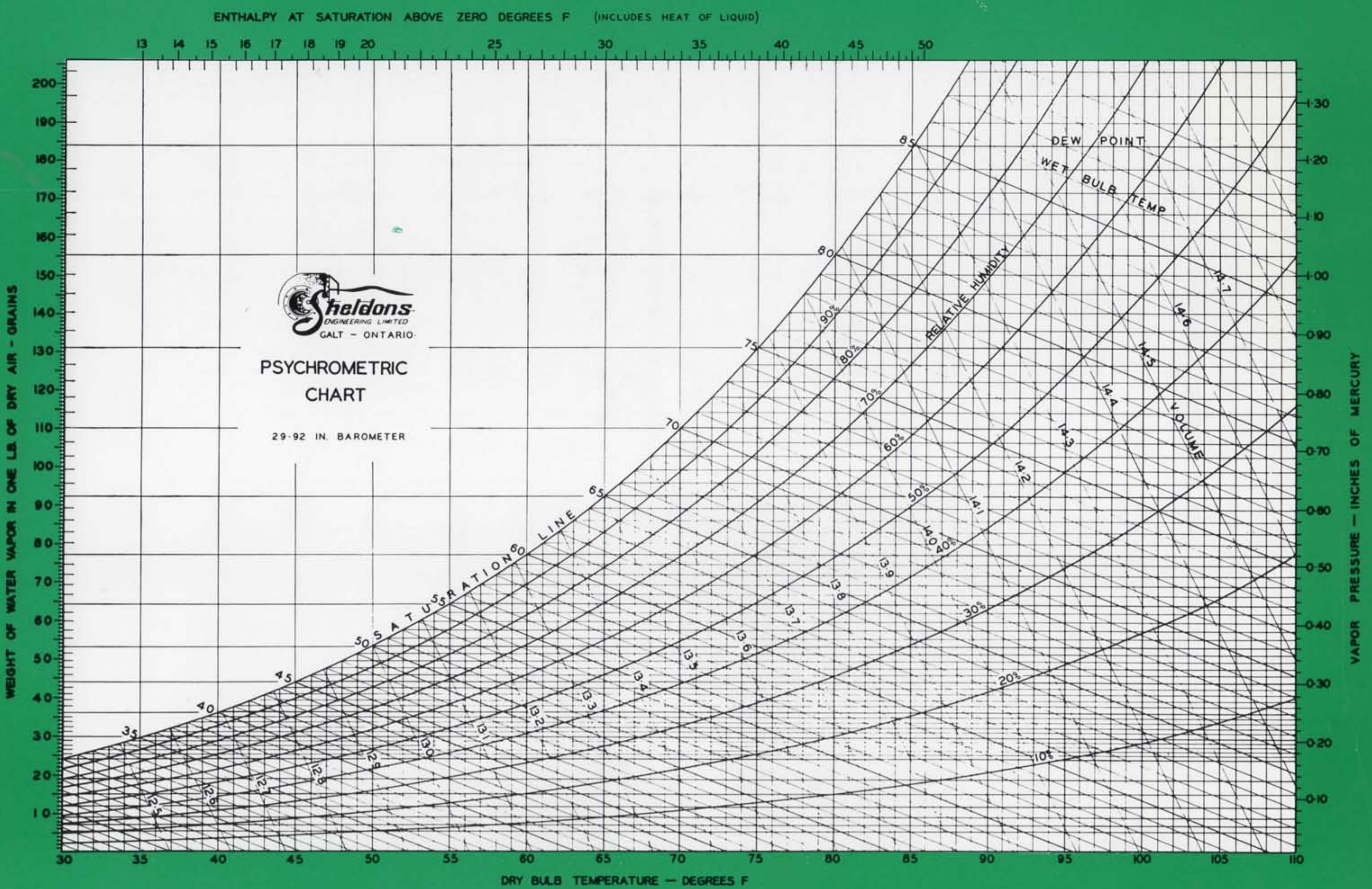
ILL. 5

16. Bolt entry baffle channel assembly into position on air entry side of unit.
17. Install entry baffles in frame by sliding into frame and setting edge into inner notch. Compress blade to spring into outer notch.
18. Install suction screen and connect all piping to appropriate connections.
19. Make coil connection as shown, cutting holes in side of coil connection box. Seal with hard rubber gasket. See Ill. 6.



ILL. 6

20. Bolt cover plate to coil connection box, ensuring that sponge rubber seal is in place.
21. When all piping is completed, fill tank and adjust float valve to give 9" depth of water.
22. When face and bypass dampers are supplied, bolt to flanges on air-leaving side of the Sprayed Coil Dehumidifier.



ENTHALPY AT SATURATION ABOVE ZERO DEGREES F (INCLUDES HEAT OF LIQUID)
Sheldons
ENGINEERING LIMITED
GALT - ONTARIO
PSYCHROMETRIC
CHART
29·92 IN. BAROMETER
DEW POINT
WET BULB TEMP
RELATIVE HUMIDITY
VOLUME
SATURATION LINE
WEIGHT OF WATER VAPOR IN ONE LB. OF DRY AIR - GRAINS
VAPOR PRESSURE — INCHES OF MERCURY
DRY BULB TEMPERATURE — DEGREES F

Some further examples of Sheldons Air Conditioning equipment are shown below:

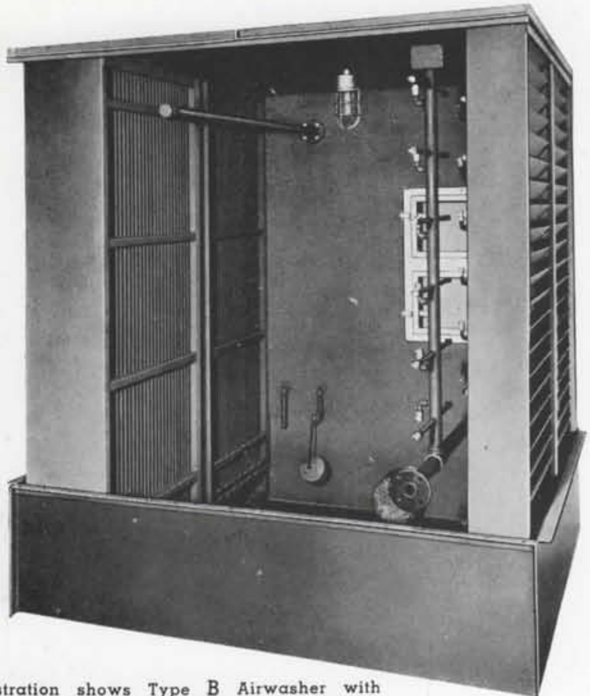


Illustration shows Type B Airwasher with one side removed to provide view of interior.

SHELDONS AIRWASHERS
Types A, B and C

Sheldon Airwashers are an efficient, economical method of removing dust and dirt from air. They also perform such necessary heat transfer functions as humidification, cooling and dehumidification.

The Type A heavy-duty unit provides maximum humidification. Two opposed banks of sprays. Continuously washed eliminators.

Type B for general cleaning and humidifying. One spray bank. One set of flooding nozzles.

Type C, smallest, most economical model. Has wide spray nozzles for maximum wet surface.

CAPILLARY AIRWASHERS

Capillary Airwashers are ideally suited to systems involving the cleaning and humidification of large quantities of air as in textile mills, hospital operating theatres, laboratories, and many industrial applications.

Saturation efficiencies as high as 97% can be obtained with Capillary Airwashers with low pumping heads.

For further information of the application of these units, apply to any of the Sales Offices listed below.

LEADERS IN FAN TECHNOLOGY
THE SHELDONS GROUP OF COMPANIES

Sheldons Manufacturing Corp.
Elgin, Ill.

Sheldons Engineering Limited
Cambridge, Ont.

Sheldons Manufacturing Limited
Edmonton, Alta.

Sales Representation in All Principal Cities

500-81-G.P.