

## PRODUCT DATA

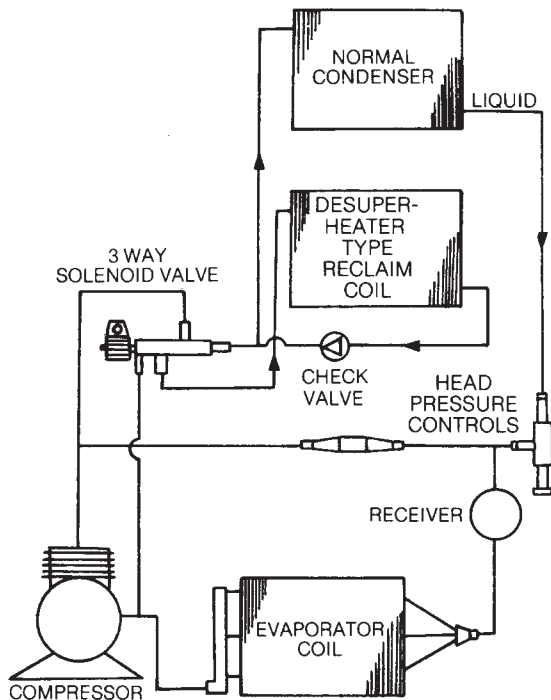
Bulletin K70-KHR-PDS-11

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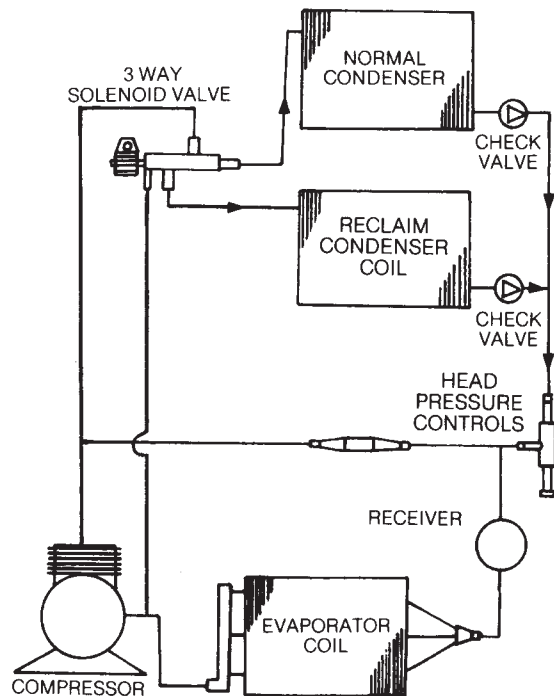
### TYPICAL REFRIGERANT HEAT RECLAIM SYSTEMS



**FIG. 1 SERIES CONDENSER**

**General;** There are basically two types of heat reclaim coils used for refrigeration jobs:- 1. The heat reclaim coil in series with an outside condenser. 2. The heat reclaim coil in parallel with the outside condenser.

**System 1** Usually this type of coil is designed to recover a maximum of 50% of the total heat of rejection, the balance then being handled by the outside condenser. Because the heat reclaim coil is in series with the outside condenser, the refrigerant pressure drop through the coil must be kept to a minimum. It is desirable to feed as many face tubes on the coil as possible to obtain this low pressure drop. Self-draining circuiting is also desirable when using this arrangement. When used in a series condensing system this type of heat reclaim coil is referred to by KeepRite Refrigeration as a "Desuperheater type coil", although some condensing may also take place. A typical series system is shown in Fig 1.



**FIG. 2 PARALLEL CONDENSERS**

**System 2** This type of system will require the heat reclaim coil to handle 100% of the total heat of rejection. Coil will perform as the main condenser when heat is required. When there is no heat demand the total heat of rejection will be directed to the outside unit. This application of heat reclaim is known as a "Condenser type" and will be circuited in the same manner as any condenser. A typical parallel system is shown in Fig. 2. A parallel system may also utilize less than 100% of Total Heat of Rejection, by installing a by pass line to the main condenser.

### GENERAL INFORMATION

Tables 1 and 2 may be used to select the coil sizes compatible with specific KeepRite air handling units. Table 1 indicates the sizes and face areas of Type HR insert type coils as used in KLS and KHD units. Table 2 indicates the coil sizes and face areas of type KC coils bolted to the KHF fan head.

## GENERAL INFORMATION (cont'd.)

It must be remembered that in models KLS 237 thru 164 air handlers, two cooling coils are used. It is therefore possible that the centre two tubes of a single H.R. heat reclaim coil mounted against the two cooling coils may not receive the full air flow. (See Bulletin AC4.7-SB1-2 Central Station Air Handlers).

Table 3 indicates the standard type of KC coil that may be used for mounting in ductwork.

## HEAT RECLAIM SELECTION FORM

To assist in the selection of heat reclaim coils, the KeepRite Condenser Heat Reclaim Coil Selection Sheet may be used. (See back cover.) For multiple compressor applications, the BTU/Hour capacity for each unit may be tabulated. Correction factors for Total Heat of Rejection should be applied from Chart 6. Actual tubes required to handle the heat of rejection of each compressor may also be calculated and listed. It should be noted when using 3 or 4 Row coils as Desuperheater type coils on a series system that there will be one less tube in the face due to the free drainage circuiting. A typical calculation is shown on Page 7.

## SELECTING A TYPICAL HR HEAT RECLAIM COIL

Given: An insert type heat reclaim coil is to be used in a KeepRite KLS222 air handler. Coil will be operating with an air face velocity of 500 F.P.M., and is used on a series type

condensing system. Total heat of rejection is 800,000 BTU/hr., 400,000 BTU/hr will be used for heat reclaim. Condensing temperature is 110 °F, entering air is 65°F.

STEP 1. Coil size is 36" x 84-1/2" and air quantity circulated is 10,600 C.F.M. (See Table 1).

STEP 2. Determine the required coil performance in BTU/hr. /C.F.M. from Total Load BTU/hr.  
C.F.M.

$$= \frac{400,000}{10,600} = 37.73 \text{ BTU/hr/C.F.M.}$$

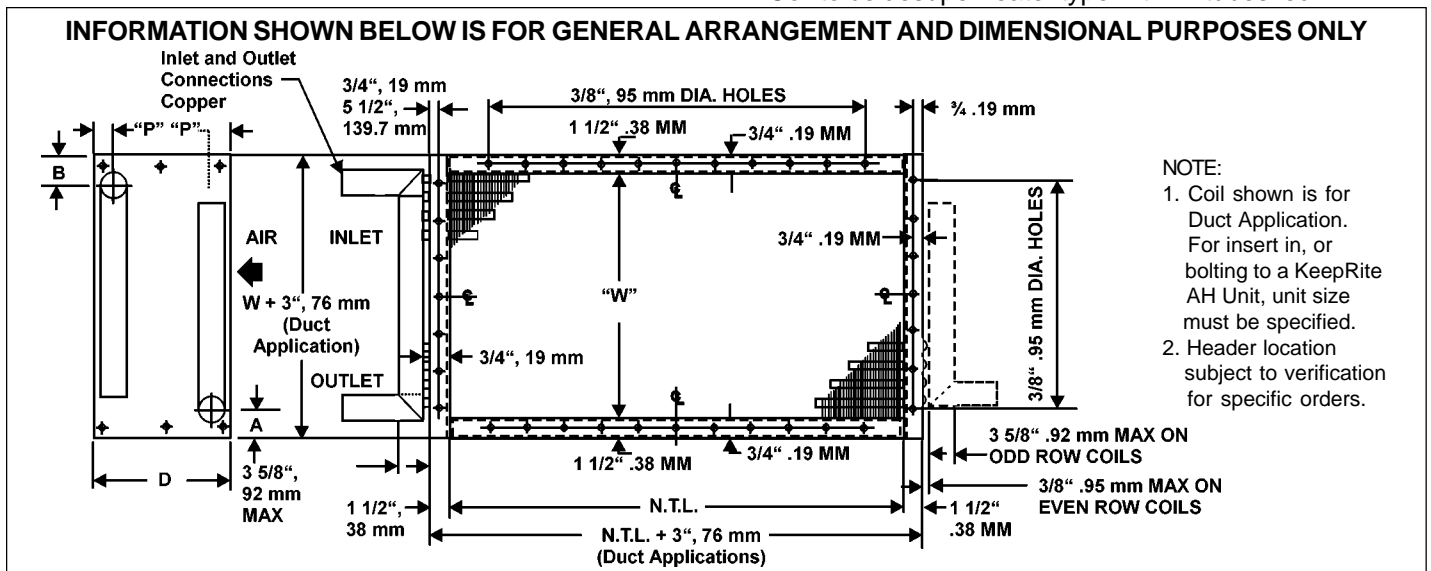
STEP 3. Temperature difference is 45°F. (Cond. Temp. minus ent. air temp.). Refer to Chart 2. Using a 6 Row Coil, 10 F.P.I. at 500 F.P.M. note that the available capacity is 38.3 BTU/hr./C.F.M. This is close to the required capacity and will be satisfactory.

STEP 4. Final T.D. will be as follows:

$$\frac{\text{Performance Required (Step 2)}}{\text{Performance Obtained (Step 3)}} \times 45^\circ\text{F.}$$

$$= \frac{37.73}{38.3} \times 45^\circ\text{F.} = 44.3^\circ\text{F., T.D.}$$

STEP 5. Coil selection is 1 - H R heat reclaim coil 10 F.P.I., 6 rows - 36" X 84 1/2" for use in a KeepRite KLS 222 Air handling unit. Unit air volume 10,600 C.F.M. Coil to be desuperheater type with 24 tubes fed.



### Multiple Circuit Connection Sizes\* and header Dimensions

TOTAL HEAT TONS		3-9	9 1/2-12	13-16	17-22	23-34	35-42	43-52	53-68	69-77
HOT GAS INLET, O.D.S.	mm	28.57	34.92	34.92	41.27	53.97	53.97	66.67	66.67	79.37
	ins	1 1/8	1 3/8	1 3/8	1 5/8	2 1/8	2 1/8	2 5/8	2 5/8	3 1/8
LIQUID OUTLET, O.D.S.	mm	22.22	22.22	28.57	28.57	34.92	41.27	41.27	53.97	53.97
	ins	7/8	7/8	1 1/8	1 1/8	1 3/8	1 5/8	1 5/8	2 1/8	2 1/8
HEADER DIM. "A"	mm	47.62	47.62	47.62	47.62	47.62	47.62	47.62	52.38	52.38
	ins	1 7/8	1 7/8	1 7/8	1 7/8	1 7/8	1 7/8	1 7/8	2 1/16	2 1/16
HEADER DIM. "B"	mm	47.62	47.62	47.62	47.62	52.38	52.38	58.73	58.73	65.08
	ins	1 7/8	1 7/8	1 7/8	1 7/8	2 1/16	2 1/16	2 5/16	2 5/16	2 9/16

### Dimension data

ROW		2	3	4	6
DIM. D	mm	127.0	152.4	190.5	266.7
	ins	5	6	7 1/2	10 1/2
DIM. P	mm	47.62	41.27	43.31	50.8
	ins	1 7/8	1 5/8	1 3/4	2

NOTE: HEADERS MAY EXTEND BEYOND DIMENSION "D"  
\* When used as Desuperheater, inlet and outlet connections will be the same size and based on Hot Gas sizing. Every face tube is fed on Desuperheater applications.  
\* For circuit loading less than 3 tons on R502 and R22, and less than 1.7 tons on R12, no headers will be supplied. Hot gas inlet and outlet will be 1/2" (13 mm) O.D.

## FULL-FACE AREA HEAT RECLAIM COILS INSERTED IN KEEPWRITE REFRIGERATION CENTRAL STATION KLS & KHD AIR HANDLERS

**Table 1** **SIZE AND FACE AREA TYPE HR**

FACE TUBES		AIR HANDLER SIZE												
2 & 6 ROW	3 & 4 ROW	103	104	106	108	111	214	217	222	228	237	141	150	164
10	9	15x21 1/2 2.3 sq. ft.												
12	11		18x27 1/2 3.5 sq. ft.											
14	13			21x37 1/2 5.5 sq. ft.										
20	19				30x35 1/2 7.4 sq. ft.	30x50 1/2 10.6 sq. ft.	33x65 1/2 13.7 sq. ft.	30x80 1/2 16.8 sq. ft.						
24	23								36x84 1/2 21.2 sq. ft.	36x107 1/2 26.9 sq. ft.				
32	31										48x107 1/2 35.9 sq. ft.			
36	35											54x107 1/2 40.4 sq. ft.		
44	43												66x107 1/2 49.3 sq. ft.	
56	55													84x107 1/2 62.8 sq. ft.
C.F.M. AT 500 F.P.M.		1150	1750	2750	3700	5300	6850	8400	10,600	13,450	17,950	20,200	24,650	31,400
C.F.M. AT 600 F.P.M.		1380	2100	3300	4440	6360	8220	10,080	12,720	16,140	21,540	24,240	29,580	37,680

## HEAT RECLAIM COILS BOLTED DIRECTLY TO KHF FAN HEADS

**Table 2** **SIZE AND FACE AREA TYPE KC**

FACE TUBES		AIR HANDLER SIZE												
2 & 6 ROW	3 & 4 ROW	103	104	106	108	111	214	217	222	228	237	141	150	164
12	11	18 x 30 3.75 sq. ft.												
14	13		21 x 36 5.25 sq. ft.											
16	15			24 x 45 7.5 sq. ft.										
22	21				33 x 44 10.0 sq. ft.	33 x 58 13.3 sq. ft.	33 x 74 16.9 sq. ft.	33 x 88 20 sq. ft.						
26	25								39 x 92 24.9 sq. ft.	39 x 116 31.4 sq. ft.				
34	33										51 x 116 41.0 sq. ft.			
40	39											60 x 116 48.3 sq. ft.		
46	45												69 x 116 55.6 sq. ft.	
58	57													87 x 116 70.0 sq. ft.
C.F.M. @ 500 F.P.M.		1875	2625	3750	5000	6650	8450	10,000	12,450	15,700	20,500	24,150	27,800	35,000
C.F.M. @ 600 F.P.M.			3150	4500	6000	7980	10,140	12,000	14,940	18,840	24,600	28,980	33,360	42,000
C.F.M. @ 700 F.P.M.					7000	9310	11,830	14,000	17,430	21,980	28,700	33,810	38,920	49,000

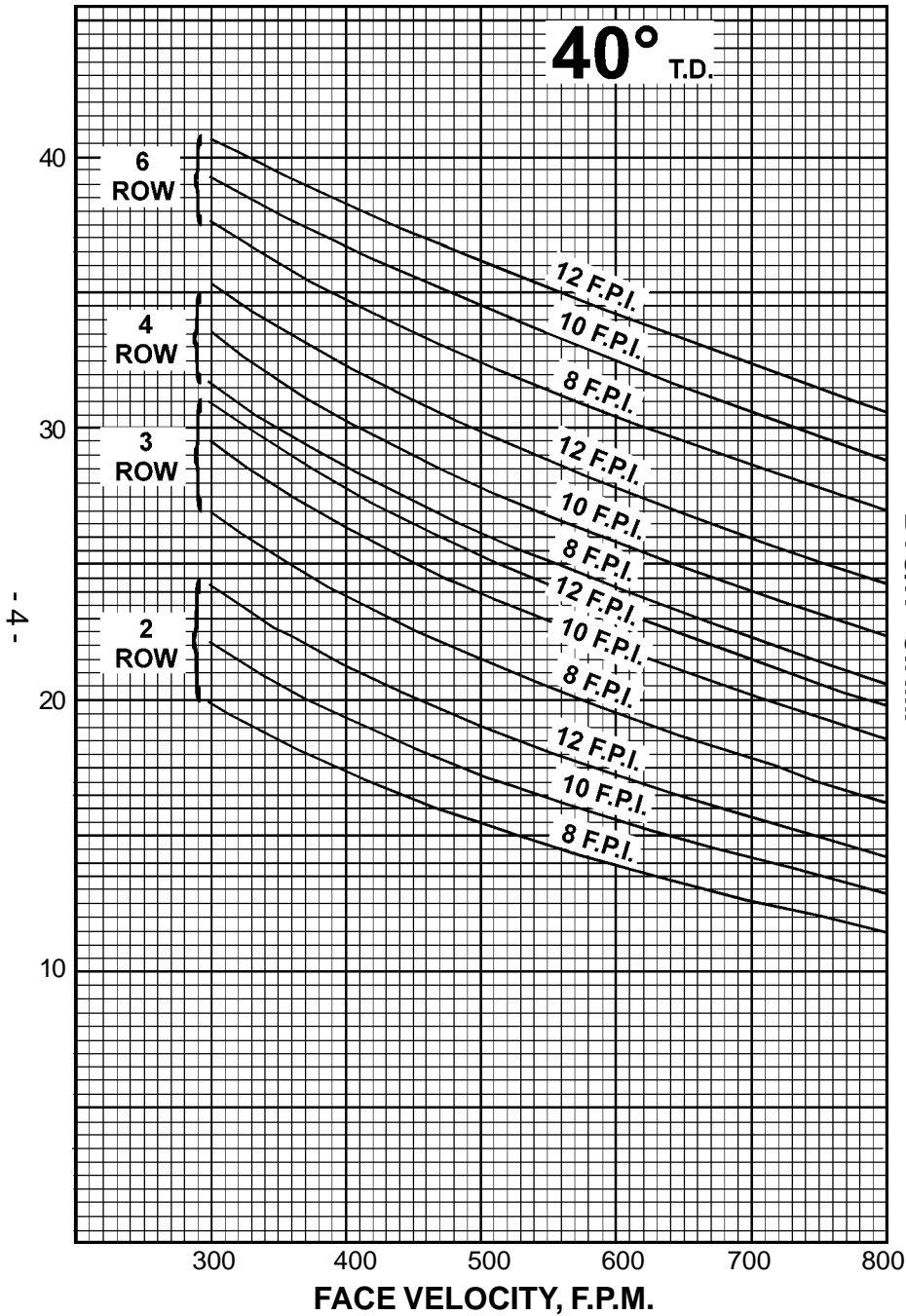
\* Use the Face Tubes shown for "Desuperheater Type" coils only.  
For "Condenser Type" coils, 3 & 4 Row Face tubes will be the same as 2 & 6 Row Coils.

**Table 3** **SIZE AND FACE AREA TYPE KC**

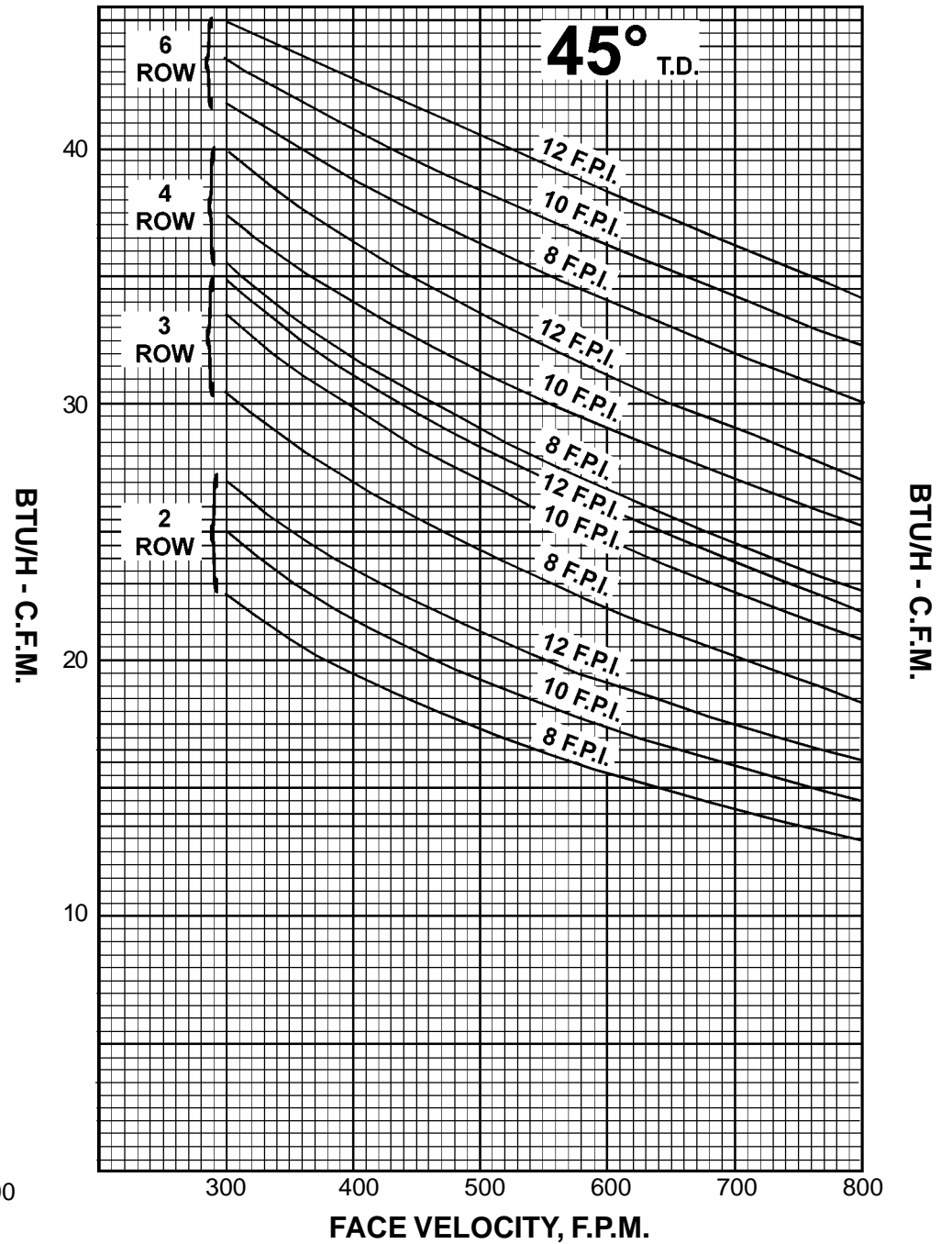
"W" INCHES	NOMINAL TUBE LENGTH - NTL - (INCHES)																						
	12	15	18	21	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120		
6	.50	.62	.75	.87	1.00	1.25	1.50	1.75	2.0	2.2	2.5	2.7	3.0										
9	.75	.94	1.12	1.31	1.50	1.87	2.25	2.62	3.0	3.4	3.7	4.1	4.5										
12	1.00	1.25	1.50	1.75	2.00	2.50	3.00	3.50	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0		
15		1.56	1.87	2.19	2.50	3.12	3.75	4.37	5.0	5.6	6.2	6.9	7.5	8.1	8.7	9.4	10.0	10.6	11.2	11.9	12.5		
18			2.25	2.62	3.00	3.75	4.50	5.25	6.0	6.7	7.5	8.2	9.0	9.7	10.5	11.2	12.0	12.7	13.5	14.2	15.0		
21				3.06	3.50	4.37	5.25	6.12	7.0	7.9	8.7	9.6	10.5	11.4	12.2	13.1	14.0	14.9	15.7	16.6	17.5		
24					4.00	5.00	6.00	7.00	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0		
27						5.62	6.75	7.87	9.0	10.1	11.2	12.4	13.5	14.6	15.7	16.9	18.0	19.1	20.2	21.4	22.5		
30						6.25	7.50	8.75	10.0	11.2	12.5	13.7	15.0	16.2	17.5	18.7	20.0	21.2	22.5	23.7	25.0		
33							8.25	9.62	11.0	12.4	13.7	15.1	16.5	17.9	19.2	20.6	22.0	23.4	24.7	26.1	27.5		
36								9.00	10.50	12.0	13.5	15.0	16.5	18.0	19.5	21.0	22.5	24.0	25.5	27.0	28.5	30.0	
39									11.37	13.0	14.6	16.2	17.9	19.5	20.1	22.7	24.4	26.0	27.6	29.2	30.9	32.5	
42										12.25	14.0	15.7	17.5	19.2	21.0	22.7	24.5	26.2	28.0	29.7	31.5	33.2	35.0

Face Tubes in Condenser Type Duct Coils = ( $\frac{W}{3}$  x 2) 3 & 4 Row Desuperheater Type Coils have one Face Tube less than Condenser Coils.

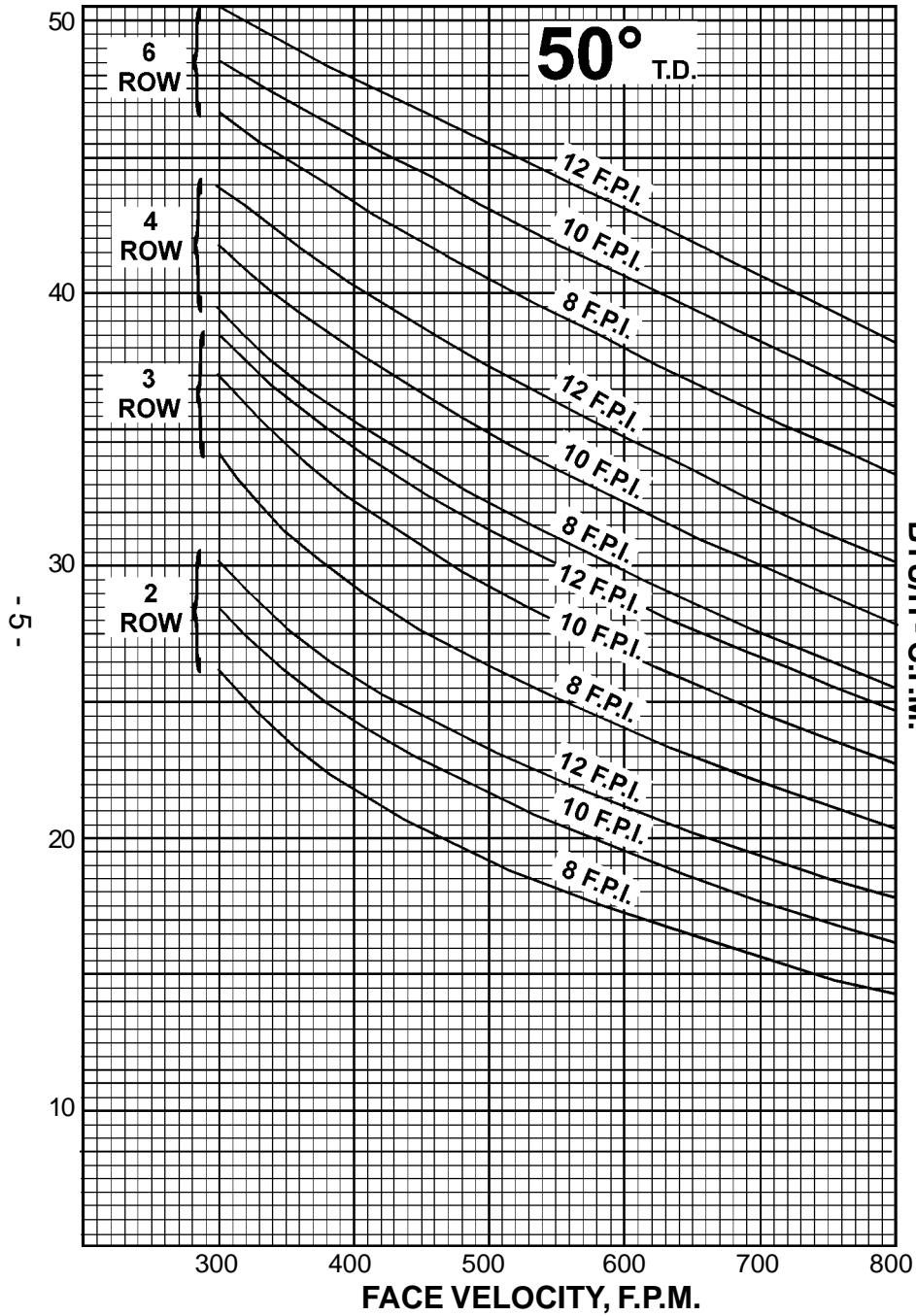
HEAT RECLAIM COIL PERFORMANCE 1/2" O.D. TUBE  
CHART 1



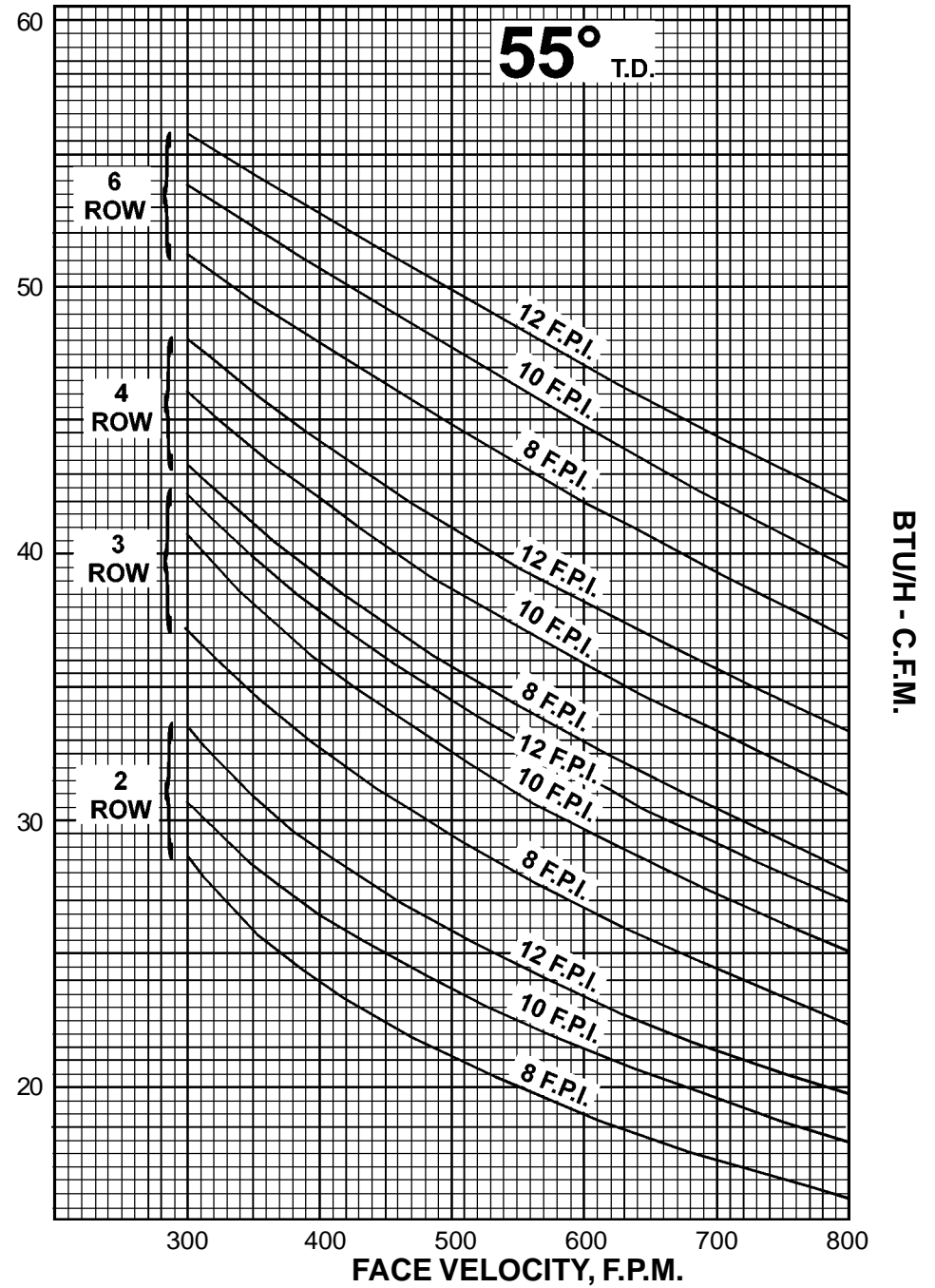
HEAT RECLAIM COIL PERFORMANCE 1/2" O.D. TUBE  
CHART 2



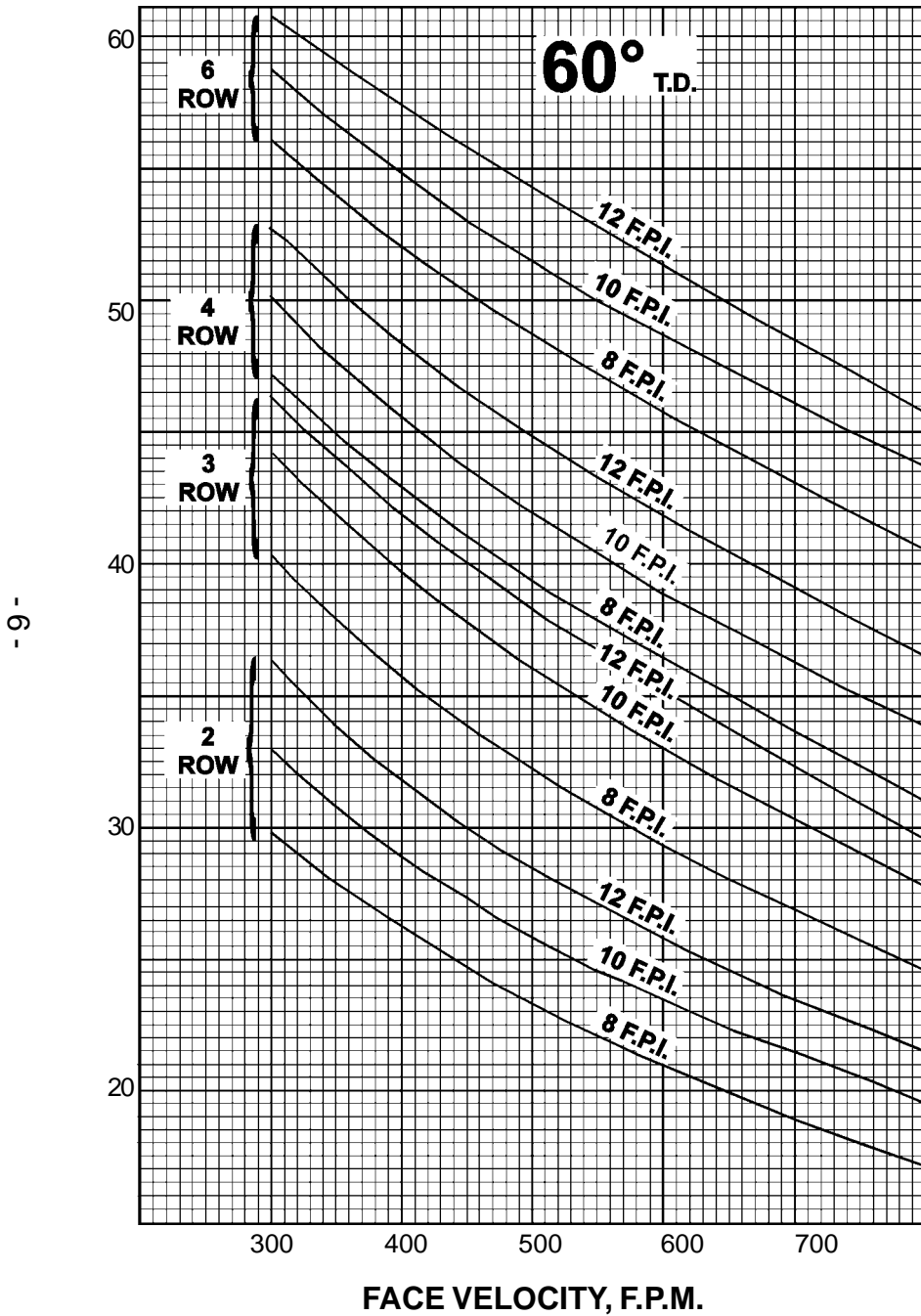
HEAT RECLAIM COIL PERFORMANCE 1/2" O.D. TUBE  
CHART 3



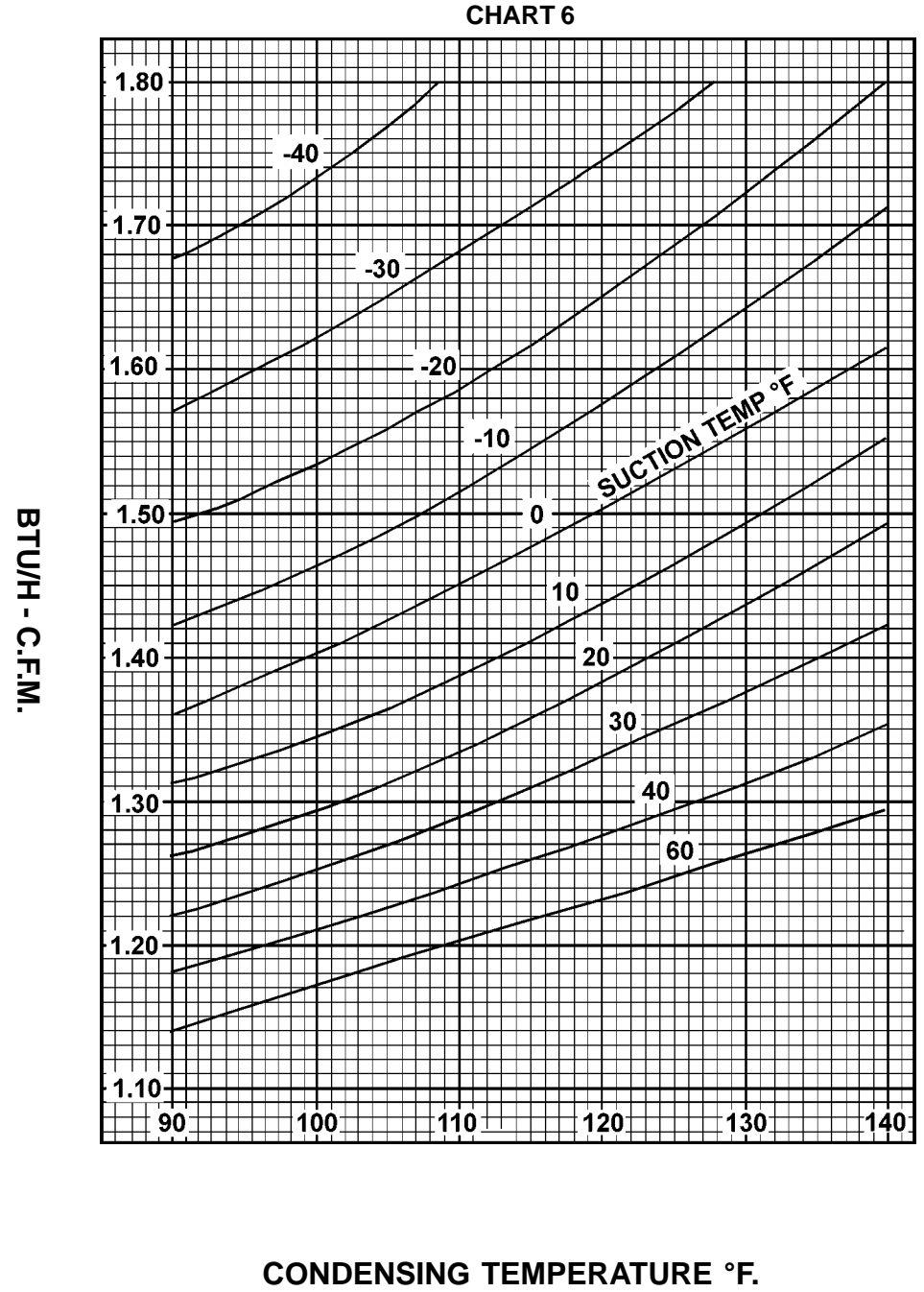
HEAT RECLAIM COIL PERFORMANCE 1/2" O.D. TUBE  
CHART 4



**HEAT RECLAIM COIL PERFORMANCE 1/2" O.D. TUBE**  
**CHART 5**

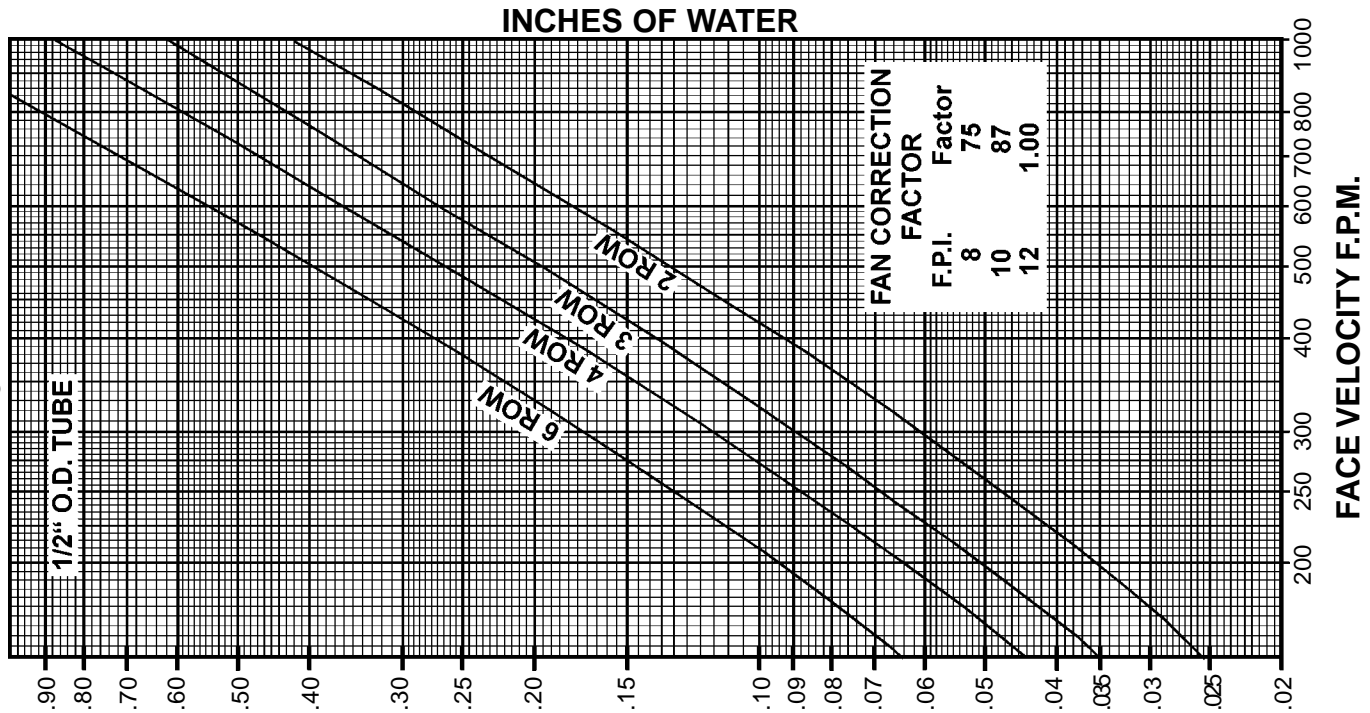


**HEAT REJECTION FACTORS SUCTION COOLED**  
**SEMI-HERMATIC COMPRESSORS**  
**CHART 6**



COIL AIR SIDE PRESSURE LOSS

CHART 7



TYPICAL REFRIGERATION HEAT RECLAIM CALCULATION

**CONDENSER HEAT RECLAIM COIL SELECTION**

NOTE: For Multi Circuit Applications Enter Columns (1) through (6). Then enter total under (7) and follow items (8) through (17). For single circuit applications enter total load under (7) and then follow items (8) through (13).

Customer John Doe Project Food Store Date \_\_\_\_\_  
 Coil \_\_\_\_\_ Air Handler Size \_\_\_\_\_ Coil \_\_\_\_\_  
 Type: H.R. Insert  and Type LS 237 Application: Desuperheater   
 K.C. Bolt-On  Condenser   
 K.C. Duct  Coil size 48" x 107 1/2" Face Area 35.9 sq. ft.  
 Total C.F.M. 21,540 Ent. Air temp. 65 °F Design T.D. 45 °F.

(1)	(2)	(3)	(4)	(5)	(6)	(15)	(16)	(17)
Comp. No.	Suct. Temp. F.	Ref. Type	BTU/hr. Capacity	Factor (Chart 6)	BTU/hr. Heat Reclaim	BTU/hr. Per Face Tube	Face Tubes Req'd.	Face Tubes Used
1	+20	12	60,000	1.33	79,800	11,712	6.81	7
2	+10	12	37,500	1.34	52,125	11,712	4.45	5
3	+35	12	55,000	1.26	69,300	11,712	5.92	6
4	-20	502	30,000	1.59	47,700	11,712	4.07	4
5	-20	502	37,500	1.59	59,625	11,712	5.09	5
6	-20	502	35,000	1.59	55,650	11,712	4.75	5
Total Heat (7) Reclaim =					<b>364,200</b>	Total Tubes in face (18) =		<b>32</b>

† For desuperheater type coil BTU/hr, for Heat Reclaim will be a percentage of compressor heat.

(8) Coil Face Velocity = 600 F.P.M.  
 (9) Coil Performance req'd. =  $\frac{\text{Total Heat reclaim (7)}}{\text{C.F.M.}} = \frac{364,200}{21,540} = \underline{16.9}$  BTUhr/C.F.M.  
 (10) Select from performance Charts at design T.D. coil nearest to (9) above = Rows: 2 F.P.I. 10 = 17.4 BTUhr/C.F.M.  
 (11) Max. capacity of Coil =  $\text{BTUhr/C.F.M. (10)} \times \text{C.F.M.} = \underline{17.4} \times \underline{21,540} = \underline{374,796}$  BTU/hr  
 (12) Actual operating T.D. =  $\frac{\text{Performance req'd. (9)}}{\text{Performance from (10)}} \times \text{Design T.D.} = \frac{16.9}{17.4} \times 45 \text{ °F} = \underline{43.7}$  T.D.  
 (13) Determine No. of Face Tubes in coil (Tables 1 or 2) = 32 Tubes (Enter in 18 above)  
 (14) Determine Capacity per face tube =  $\frac{\text{Max. Capacity BTU hr. (11)}}{\text{No. of face tubes (13)}} = \frac{374,796}{32} = \underline{11,712}$  BTU/hr (Enter Under 15)

Now complete columns 16 & 17

Final coil selection Rows 2 F.P.I. 10 48 Ins. X 107 1/2 Ins.  
 Air side Pressure drop = .15 Inches of Water (Chart 7)

