

FAX TRANSMITTAL SHEET

To: HARDWICK CHEMICALS  
City/State: ELGIN, S. C.  
Attn: DENNIS WEATHERFORD  
Fax No.: (803) 755-7771  
Date: 2/17/89

From: Jim RAGAINS  
Your Ref.: C890281622  
Our Ref.: 1H-2888  
Fax No. (214) 630-0662  
Total No. of Pages 2

Dennis, here is the new calculation sheet with reduced rates. The liquid turndown is quite high (28 GPM-5 GPM). Our quoted distributor cannot handle this range of rates. Typical ranges are on the order of 2 or 3 to one. (ratio of max:min). If we cannot change the rates, I will have our estimating department issue you a requote for distributors with drip tubes that can handle the range of rates. Let me know what you want to do.

*Jim Ragains*

**JEFF EAST**

**FAX # 214-630-5877**

FRI, FEB 17 1989

PACKED BED CALCULATION  
 BY  
 GLITSCH, INC.  
 DALLAS, TEXAS  
 FOR

CUST: HARDWICK CHEMICALS    USER:    JOB #: 1H-2888    PAGE: 1-1  
 TWR #:    TWR NAME: BATCH DISTILLATION    WORKED BY: JAR    DATE: 2/15/89  
 REV #1 BY:    DATE:  
 REV #2 BY:    DATE:

BED NAME		ATM	250 MMHG	25 MMHG
VAPOR RATE (LBS/HR)		35000	20000	6300
VAPOR RATE (CFS)		24.306	42.735	140.000
VAPOR DENSITY (LBS/CF)		0.4000	0.1300	0.0125
LIQUID RATE (LBS/HR)		35000	20000	6300
LIQUID RATE (GPM)		28.0	16.0	5.0
LIQUID DENSITY (LBS/CF)		156.00	156.00	156.00
LIQUID VISC. (CPS)		19.545	19.545	19.545
TOWER I.D. (INCHES)		30.00	30.00	30.00
TOWER AREA (SQFT)		4.91	4.91	4.91
PERCENT FLOOD (CONS.V/L)		81.97	78.06	75.32
PERCENT FLOOD (CONS.GPM)		80.13	76.77	74.87
C-FACTOR (@ DESIGN)		0.2510	0.2514	0.2553
F-FACTOR (@ DESIGN)		3.132	3.139	3.189
GPM/SQ. FT (@ DESIGN)		5.70	3.26	1.03
PRESS. DROP, WET (IN H2O/FT)		0.546	0.490	0.460
PRESS. DROP, WET (MM HG/FT)		1.021	0.916	0.859
SYSTEM FACTOR =	1.00			
PACKING BED HT. (INCHES)		288.0		
PACKING VOLUME (CUFT)		118.0		
PACKING TYPE		RANDOM		
PACKING MATERIAL		CERAMIC		
PACKING FACTOR		22.000		

THESE RATES HAVE A HIGH LIQUID TURNDOWN. SPECIAL RTD DISTRIBUTORS WILL BE REQUIRED.

PRELIMINARY DESIGN

THIS DESIGN IS FOR QUOTATION ONLY  
 AND WILL BE OPTIMIZED FOR FABRICATION  
 UPON RECEIPT OF PURCHASE ORDER

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