



**WORTHINGTON**  
CONTINENTAL OIL COMPANY  
ELYTHEVILLE, ARKANSAS

INSTRUCTIONS FOR

~~CONDENSING STEAM TURBINE~~

CONDENSING STEAM TURBINE  
TURBINE SERIAL NUMBER 25084  
WELLSVILLE WORKS ORDER NUMBER U - 14350

AIR COMPRESSOR DRIVE  
CLARK BROS. CONTRACT NO. CT-9650-C  
BECHTEL CORPORATION IKT-101  
IKT-101  
RWR

WORTHINGTON CORPORATION  
TURBINE DIVISION  
WELLSVILLE, NEW YORK

K-101

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TURBINE DATA SHEET

U - 14350

Purchaser - Clark Brothers Company

User - Continental Oil Corporation

Location - Blytheville, Arkansas

Shop Order Number - U - 14350

Serial Number - 25084

Turbine Frame - ~~247220012~~

Number of Turbine Stages - ~~5~~ ~~Revised to 710747 and 507 Stages~~

Driven Machine - Centrifugal Air Compressor

Turbine Rating - ~~9000~~ ~~HP~~ ~~at 650 R.P.M.~~

Turbine Rotation - Right Hand (CW) Facing Governor End

Inlet Steam Conditions - ~~500 psig, 500 deg F, 2000 GPM~~

Exhaust Condition - 4" Hg. Abs.

Casing Material - Cast Steel Steam End; Fabricated Steel Exhaust End

Shaft Packing - Labyrinth Rings; Steam End Packing Case - 5 Rings

Exhaust End Packing Case - 3 Rings

Speed Governor - Woodward P-G-PL (Air Head)

Lubrication - Pressure

Emergency Overspeed Trip Setting - ~~4.5~~ 6210 R. P. M.

Low Oil Pressure Trip To Trip At - ~~10~~ 11 psig. - Reset with 11 psig. Bearing Oil Pressure

Trip and Throttle Valve To Trip At - 25 psig. - Reset with 35 psig. Governor Oil Pressure

Solenoid Dump Valve To Trip Turbine Out When - De-Energized

Sentinel Warning Valve Set To Open At - 15 psig.

Number of Steam Inlet Valves - 3 Automatic Venturi

Bearing Oil Pressure - 20 psig.

Governor Oil Pressure - 80 psig.

TURBINE DATA SHEET

U - 14350

Quantity of Cooling Water Required For:

Gland Condenser - 35 G. P. M. of Fresh Water at 85°F.

Main Bearing Clearance: Turbine - .006" to .012"

Total Thrust Bearing Float - .010" Minimum to .015" Maximum

Maximum Allowable Wear on Thrust Shoes Before Replacement is Necessary - .006"

CRITICAL SPEED - 3395 R. P. M.

GOVERNOR AIR SIGNAL - TURBINE SPEED RELATIONSHIP

15 psig. - 5650 R. P. M. INCLASH .009  
3 psig. - 4300 R. P. M.

STEAM INLET VALVE DATA:

Valve Number - 3 - 4 - 2 - 1 - 5

Opening Order - 1 - 2 - 3 - Plugged - Plugged

Lead (Inches) - .474 - .478 - .408 Min. Lift

APPROXIMATE WEIGHTS

POUNDS

Turbine (Including T&T Valve, Oil Piping and Lagging)

57,930

Soleplates

4,300

Accessories

770

Total Approximate Weight

63,000

Upper Half of Turbine Casing

19,310

Turbine Rotor

4,500



PLANT EQUIPMENT NO.		SERVICE-DRIVEN EQUIPMENT	
DUTY		HRS PER DAY	CONTR
ACTUAL LOAD		HP	4862
PEAK LOAD		HP	4862
- FREQUENCY		IN-LBS	
- DURATION			
DRIVER-(ELECT. MOTOR) (OTHER)			COMP
DRIVEN MACHINE-(PUMP) (COMP) (ETC)			COMP
- TYPE (CENT) (RECIP) (ROTARY)			CENT.
INPUT SHAFT - SPEED		RPM	3580
- VERTICAL OR HORIZ.			HORIZ
- ROTATION (FROM DRIVER)			CW
- COUPLING, PULLEY			CPLG
OUTPUT SHAFT - SPEED		RPM	4612
- VERTICAL OR HORIZ.			HORIZ
- ROTATION (FROM DRIVER)			CW
- COUPLING, PULLEY			CPLG
OVER-HUNG LOAD-INPUT SHAFT		LBS	
- OUTPUT SHAFT		LBS	
LOCATION-INDOORS			YES
- OUTDOORS-PROTECTED			UNPROTECTED
SERVICE FACTOR-		AGMA	1.3
REQUIRED EQUIV. RATING-		HP	
SPEED RATIO		IN-LBS	1.098014214
MANUFACTURER			G.E. CO.
MANUFACTURER'S DESIGNATION			S-234-BG
THERMAL HORSEPOWER		HP	54
COOLING REQUIRED			YES
RATING-UNCOOLED		HP	
BEARING TYPE-PINION SHAFT			SCAFFOLD
- GEAR SHAFT			"
NOTES:			
REV.			
7/2/65 ISSUED FOR CONSTRUCTION			
10/21/65 1st REVISION			
11/11/65 2nd REVISION			
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MANUFACTURER: 1000 TID AMMONIA PLANT  
 COMPRESSOR FOR: CONTINENTAL OIL Co PROJECT

CENTRIFUGAL OR AXIAL COMPRESSOR DATA SHEET  
 LOCATION: BAKING VILLAGE ARKANSAS  
 ELEVATION: \_\_\_\_\_ FT. ATMOS. PRESSURE: \_\_\_\_\_ PSIA

REV. NO. 1K-1  
 SPEC. NO. \_\_\_\_\_

1K-101  
 AIR

MACHINE NO.	FLOW SHEET NO.	PLANT EQUIP. NO.	1K-101	2	3	4
<b>A-SERVICE</b> Process Air						
NUMBER OF UNITS REQUIRED	1	2	3	4		
GAS HANDLED	AIR					
QUANTITY, SCFM @ 60°F & 14.7 PSIA	1674	1660	1654	1650		
ACTUAL CFM AT SUCTION CONDITIONS (49°F)	1674	1660	1654	1650		
SUCTION PRESSURE	14.07	14.04	14.07	14.13		
DISCHARGE PRESSURE	42.9	42.7	42.7	43.0		
RATIO OF COMPRESSION	3.05	3.02	3.02	3.02		
SUCTION TEMPERATURE	9°F	10.0	10.0	10.0		
DISCHARGE	374	374	374	374		
SHAFT HORSEPOWER	BHP	8920				
COMPRESSION EFFICIENCY (ADJ. ADIABATIC POLYTROPIC)						
<b>B-GAS CHARACTERISTICS</b>						
COMPOSITION (MOL %)						
<b>C-COMPRESSOR DETAILS</b>						
MFRS DESIGNATION, STYLE, SIZE, ETC.	4M9-7	2M8-6				
TYPE (CENTRIFUGAL, AXIAL, ETC.)	CENT	CENT				
NO. OF STAGES	7	6				
ADIABATIC HEAD PER STAGE, FT.						
COMPRESSION RATIO PER STAGE	5.38	10.211				
SPEED	RPM	3600				
ROTATION FROM DRIVER END	CW	CW				
IMPELLER DIAMETER FOR SPECIFIED SERVICE, IN.	32	18				
PERIPHERAL VELOCITY, FT/SEC	750	804				
MAXIMUM CAPACITY, CFM AT SUCTION	6000	6521.7				
MINIMUM CAPACITY (PUMPING LIMIT)	"	"				
MAXIMUM SAFE SPEED, RPM	5650	10.710				
CRITICAL SPEEDS	2070	6400				
NOISE, PREDDM-FREQUENCY AT RATED SPEED						
EQUIV. AVERAGE DEGBELS ABOVE 10" WATTS/CM <sup>2</sup>	32	19				
MAXIMUM POSSIBLE IMPELLER DIAMETER	32	16				
MINIMUM PRACTICAL IMPELLER DIAMETER	120/75	650				
MAX. CASE WORKING PRESSURE						
TEMPERATURE	450	450				
<b>D-DRIVE</b>						
MACHINE NO.	1K-101					
FLOW SHEET NO.	1K-101					
PLANT EQUIP. NO.						
TYPE OF DRIVER (MOTOR/TURBINE)	STEAM TURBINE					
DRIVER HP	9812					
DRIVER SPEED, RPM	5650					
MOTOR OR TURBINE DATA SHEET DRWG. NO.						
TYPE & MAKE OF GEAR (IF ANY)	GE					
GEAR SIZE OR DESIGNATION	S-234					
SPEED RATIO	720/1024					
THERMAL BAL. BALANCE SYMBOLS	8.3 @ 1540 PSIG @ 700°F					
METHOD OF CAPACITY CONTROL	4" 83V					
(SPEED/INLET VANES/INTERSTAGE VANES/BI-PASS)	3400					
<b>E-CONTROL</b>						
COOLING WATER (GPM-TOTAL)	157	220	350			
COOLING WATER AVAILABLE AT _____ °F	85	85	85			
INTERCOOLER (EXTERNAL)	GPM	680	575	638		
DIAPHRAGMS	GPM					
BEARINGS OR OIL SYSTEM	TOTAL GPM	104				
SEALS OR PACKING						
<b>F-COOLING WATER (GPM-TOTAL)</b>						
SEAL LEAKS AIR INTO COMPRESSOR	✓					
IF DUAL FLOW TO EVAPORATOR, WHERE DISCHARGED						
<b>G-SEALS-TYPE (RING/LABYRINTH/OIL FILM/ETC.)</b>						
TYPE - THRUST	MICHEL					
LUBRICATION - RADIAL	FORDCO FEED					
INTEGRAL OR SEPARATE OIL PUMP	FORDCO FEED					
OIL COOLER, TYPE, SIZE	SEP					
<b>H-BEARING - TYPE - RADIAL</b>						
TYPE - THRUST	Michell					
LUBRICATION - RADIAL	Fordco Feed					
INTEGRAL OR SEPARATE OIL PUMP	Fordco Feed					
OIL COOLER, TYPE, SIZE	SEP					
<b>I-CONNECTIONS</b>						
SUCTION, SIZE	4M9-7	2M8-6				
RATING & TYPE OF FAGING	50/10	11/15				
LOCATION	120/75	300/100				
DISCHARGE, SIZE	42	40				
RATING & TYPE OF FAGING	20/20	10/18				
LOCATION	250/50	300/100				
<b>J-CONSTRUCTION</b>						
MACHINE NO.	1K-101					
FLOW SHEET NO.	1K-101					
PLANT EQUIP. NO.						
DIAPHRAGMS	C1	C5				
DIFFUSERS	C1	C1				
GUIDE VANES (OR STATIONARY BLADES)	C1	C1				
SHAFT SLEEVES	STL 1046	STL 1046				
IMPELLER HUBS	STL 1046	STL 1046				
IMPELLER BLADES	"	"				
STAGE PIECES	"	"				
BALANCE DRUM OR DISC	STL 1046	STL 1046				
CASE STUDS	STL	STL				
CASE GASKET	"	"				
COUPLING, TYPE & SIZE	WALDRON HAS 5/16 HAS 5/16	STL 1046				
BASE	"	"				
COUPLING GUARD	"	"				
<b>K-GENERAL</b>						
PRICES ARE: (FOB) (FAS) (FRT ALLOWED)						
PRICE OF COMPRESSOR ONLY						
ADD FOR: DRIVE, GEAR, ETC.						
PRICE FOR DRIVER (IF FURNISHED)						
TOTAL PRICE						
SHIPPING POINT	CLEAV	ANY				
WT OF COMPRESSOR & BASE	77000					
" " ACCESSORIES	2500					
" " GEAR	65000					
" " DRIVER						
SHIPMENT: WKS FROM RECPY OF ORDER						

BECHTEL CORPORATION  
 SAN FRANCISCO

CONTINENTAL OIL COMPANY  
 1000 TID AMMONIA PLANT  
 BLYTHEVILLE ARKANSAS

JOB NO. 4915  
 DS-1K-101  
 REV. 2



MANUFACTURER: 1000 TID AMMONIA PLANT PROJECT: ARKANSAS SPEC. NO. 1K-101  
 COMPRESSOR FOR: CONTINENTAL OIL CO. LOCATION: ARKANSAS ELEVATION: FT. ATMOS. PRESSURE: PSIA REC'D. NO. 1K-1

MACHINE NO.	FLOW SHEET NO.	PLANT EQUIP. NO.	PLANT	PROJECT	ELEVATION	FT.	ATMOS. PRESSURE	PSIA	SPEC. NO.	REC'D. NO.
18-1-1	1	1K-101	1000 TID AMMONIA PLANT	ARKANSAS					1K-101	1K-1
<b>A - SERVICE</b>										
QUANTITY, SCFM @ 60°F & 14.7 PSIA	1672	1672	1656	1650						
ACTUAL CFM AT SUCTION CONDITIONS	1607	1607	1607	1607						
SUCTION PRESSURE	16.07	16.07	16.07	16.07						
DISCHARGE PRESSURE	42.9	42.9	42.9	42.9						
RATIO OF COMPRESSION	3.05	3.05	3.05	3.05						
SUCTION TEMPERATURE	100	100	100	100						
DISCHARGE TEMPERATURE	174	174	174	174						
SHAFT HORSEPOWER	8920	8920	8920	8920						
<b>B - GAS CHARACTERISTICS</b>										
COMPRESSION EFFICIENCY (ADIABATIC/POLYTROPIC)										
COMPOSITION (MOLE %)										
<b>C - COMPRESSOR DETAILS</b>										
MFRS DESIGNATION, STYLE, SIZE, ETC.	CONT	CONT	CONT	CONT						
NO. OF STAGES	7	7	7	7						
ADIABATIC HEAD PER STAGE, FT.										
COMPRESSION RATIO PER STAGE										
SPEED, RPM	600	600	600	600						
IMPELLER DIAMETER FOR SPECIFIED SERVICE, IN	32	32	32	32						
PERIPHERAL VELOCITY, FT/SEC	750	750	750	750						
MAXIMUM CAPACITY, CFM AT SUCTION	1672	1672	1672	1672						
MINIMUM CAPACITY (PUMPING LIMIT)										
MAXIMUM SAFE SPEED, RPM	3650	3650	3650	3650						
CRITICAL SPEEDS										
NOISE, PREDOM. FREQUENCY AT RATED SPEED										
EQUIV. AVERAGE RESIST. ABOVE 10° WATTS/CM <sup>2</sup>										
MAXIMUM POSSIBLE IMPELLER DIAMETER	32	32	32	32						
MINIMUM PRACTICAL IMPELLER DIAMETER	13.0/12.5	13.0/12.5	13.0/12.5	13.0/12.5						
MAX. CASE WORKING PRESSURE	450	450	450	450						
TEMPERATURE										
<b>D - DRIVE</b>										
TYPE OF DRIVER (MOTOR/TURBINE)	STEAM TURBINE	STEAM TURBINE	STEAM TURBINE	STEAM TURBINE						
DRIVER HP	9812	9812	9812	9812						
MOTOR OR TURBINE DATA SHEET DRAW. NO.										
TYPE & MAKE OF GEAR (IF ANY)	GE	GE	GE	GE						
GEAR SIZE OR DESIGNATION	S-234	S-234	S-234	S-234						
SPEED RATIO	720/1024	720/1024	720/1024	720/1024						
METHOD OF CONTROL	MANUAL	MANUAL	MANUAL	MANUAL						
<b>E - CONTROL</b>										
METHOD OF CAPACITY CONTROL	50503	50503	50503	50503						
(SPEED/INLET VANES/INTERSTAGE VANES/SHUTTERS)										
<b>F - COOLING WATER (GPM-TOTAL)</b>										
COOLING WATER AVAILABLE AT	157	157	157	157						
INTERCOOLER (EXTERNAL)	85	85	85	85						
DIAPHRAGMS	680	680	680	680						
CASE										
BEARINGS OR OIL SYSTEM										
SEALS OR PACKING										
<b>G - SEALS - TYPE (NON/LUBRIM/OIL FILM/ETC.)</b>										
SEAL LEAKS: AIR INTO COMPRESSOR										
IF DUAL FLOW TO EXHAUST, WHERE DISCHARGED										
<b>H - BEARING - TYPE - RADIAL</b>										
LUBRICATION - RADIAL	MILICOR	MILICOR	MILICOR	MILICOR						
INTERNAL OR SEPARATE OIL PUMP	5EP	5EP	5EP	5EP						
OIL COOLER, TYPE, SIZE	REF-2-3781-140-17	REF-2-3781-140-17	REF-2-3781-140-17	REF-2-3781-140-17						
<b>I - CONNECTIONS</b>										
SUCTION, SIZE	24-1/2	24-1/2	24-1/2	24-1/2						
RATING & TYPE OF PACKING	UP	UP	UP	UP						
DISCHARGE, SIZE	24-1/2	24-1/2	24-1/2	24-1/2						
RATING & TYPE OF PACKING	UP	UP	UP	UP						
<b>J - CONSTRUCTION - (VERTICAL/HORIZONTAL)</b>										
CASE MATERIAL	CS	CS	CS	CS						
DIFFUSERS	CS	CS	CS	CS						
GUIDE VANES (OR STATIONARY BLADES)	CS	CS	CS	CS						
CASE WEAR RINGS	CS	CS	CS	CS						
SHAFT SLEEVES	STL	STL	STL	STL						
IMPELLER HUBS	STL	STL	STL	STL						
IMPELLER BLADES	STL	STL	STL	STL						
STAGE PIECES	STL	STL	STL	STL						
BALANCE DRUM OR DISC	STL	STL	STL	STL						
CASE STUDS	STL	STL	STL	STL						
GASKET	STL	STL	STL	STL						
COUPLING, TYPE & SIZE	STL	STL	STL	STL						
BASE	STL	STL	STL	STL						
COUPLING GUARD	STL	STL	STL	STL						
<b>K - GENERAL</b>										
PRICES ARE: (FOB) (FAS) (FRT ALLOWED)										
ADD FOR: PRICE OF COMPRESSOR ONLY										
PRICE FOR DRIVE, GEAR, ETC.										
PRICE FOR DRIVER (IF FURNISHED)										
TOTAL PRICE										
SHIPPING POINT	ST. LOUIS, MO.	ST. LOUIS, MO.	ST. LOUIS, MO.	ST. LOUIS, MO.						
WT OF COMPRESSOR & BASE	77,000	77,000	77,000	77,000						
" " ACCESSORIES	2500	2500	2500	2500						
" " GEAR	65,000	65,000	65,000	65,000						
" " DRIVER										
SHIPMENT: WKS FROM RECPT OF ORDER										

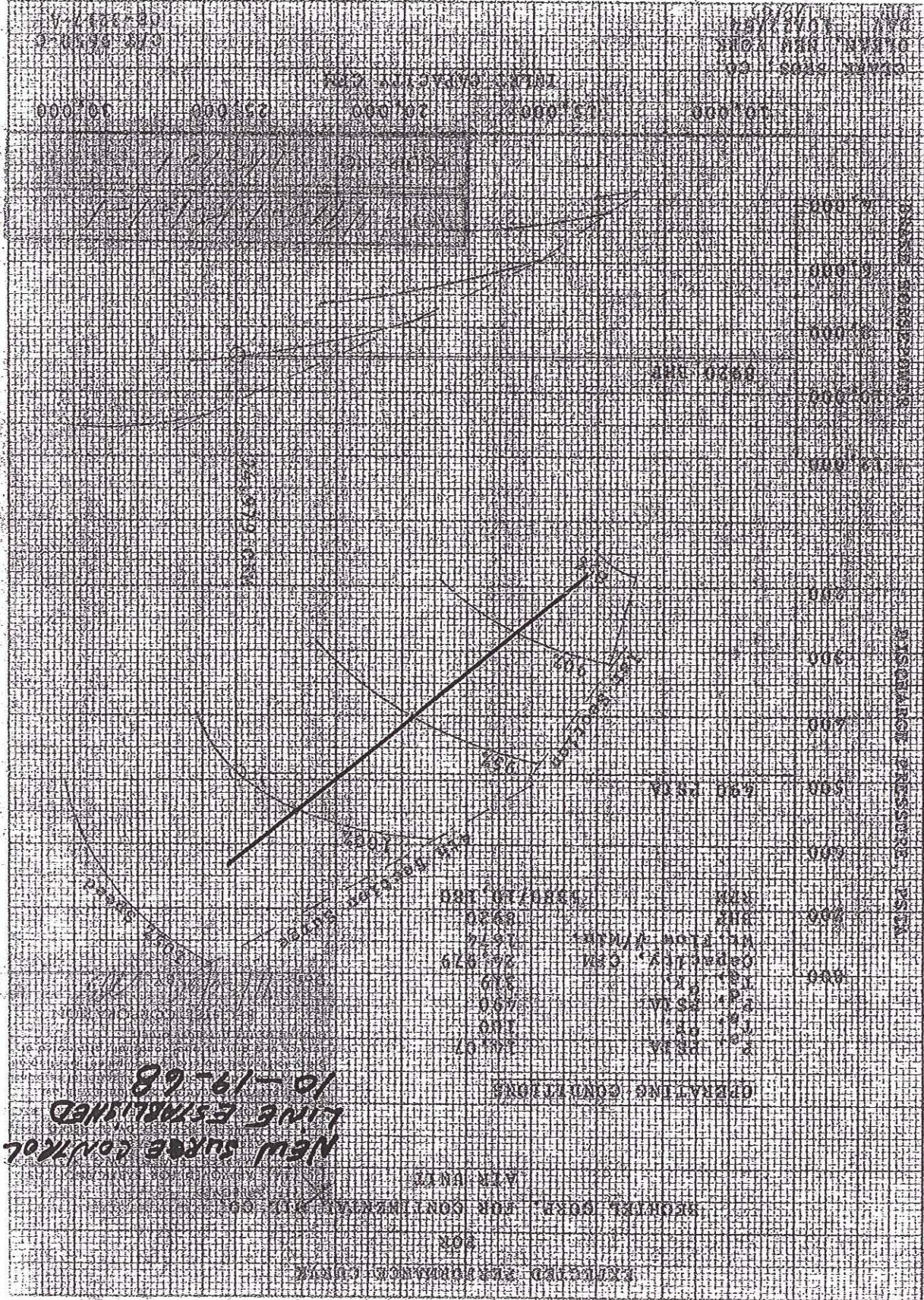
BECHTEL CORPORATION  
 SAN FRANCISCO

1000 TID AMMONIA PLANT  
 ELYTHEVILLE, ARKANSAS

JOB NO. 4915  
 DS-1K-101

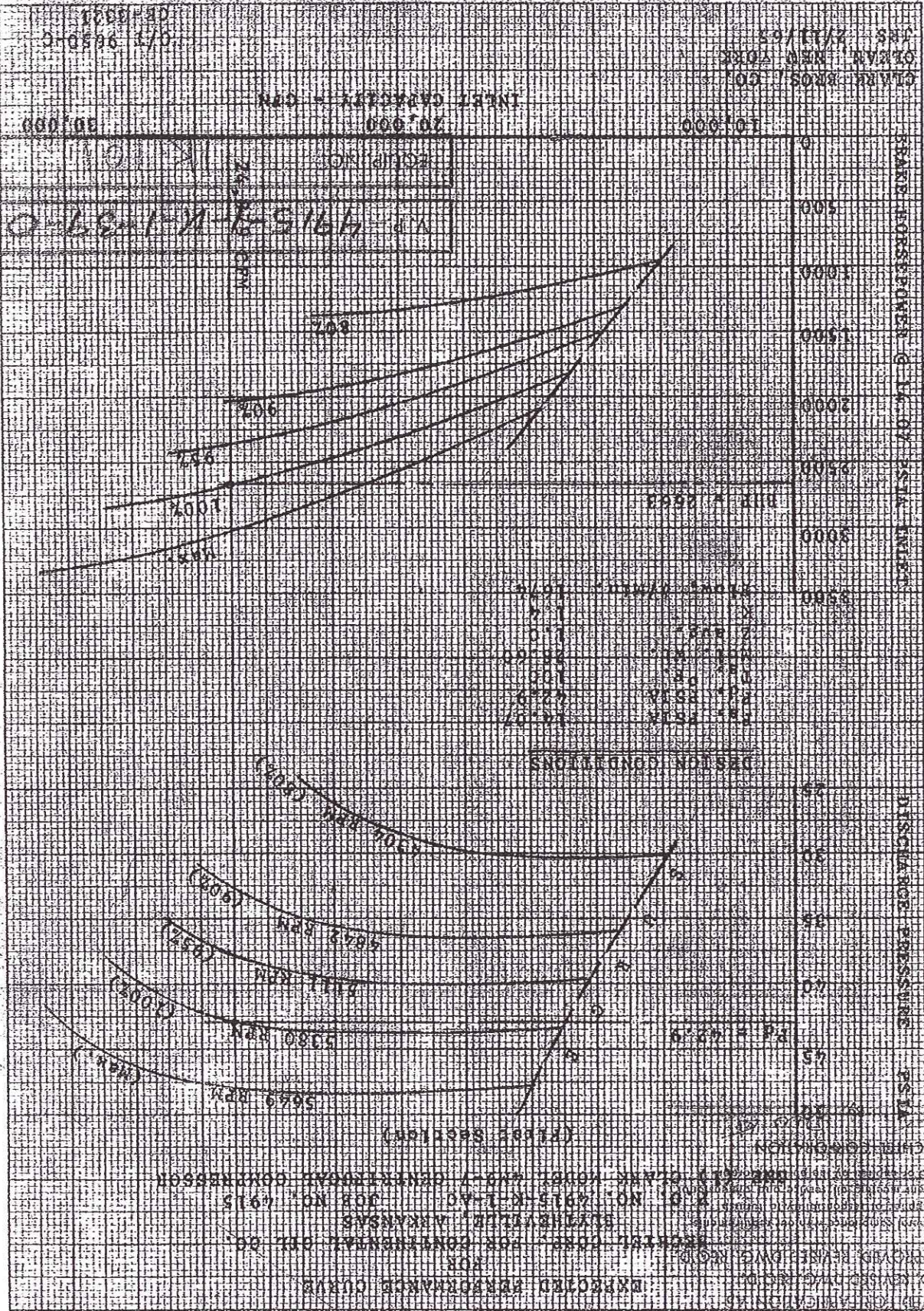
REV. 2





10 x 10 x 10 1/2 INCH 46 1923  
 MADE U.S.A.  
 KEUFFEL & ESSER CO.

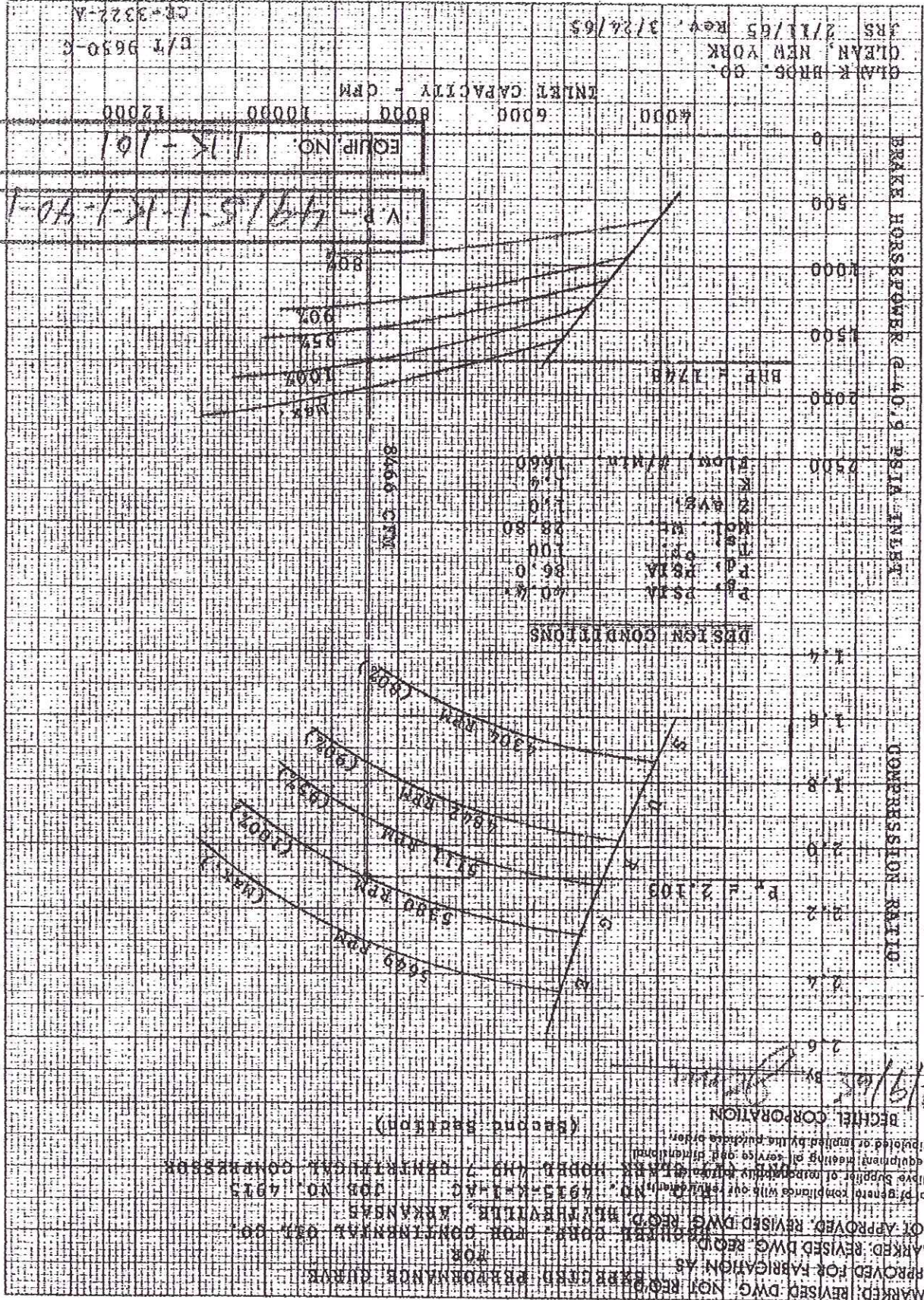




NO. 10 X 10 TO 1/2 INCH 46 1323  
 7 X 10 INCHES  
 KEUFEL & ESSER CO. MADE IN U.S.A.

1 (2) APPROX. 10% TOLERANCE  
 WANTED DEVELOPMENT OF  
 (3) NOT APPROVED BY ENGINEER





JRS 2/11/65 Rev. 3/24/65  
 GLW-K BR05-GD  
 CLEAN, NEW YORK  
 CR-3322-A  
 E/T 9650-8

(1) APPROVED  
 (1A) APPROVED FOR FABRICATION AS  
 MARKED, REVISED DWG. NOT FOR FABRICATION AS  
 (2) APPROVED FOR FABRICATION AS  
 MARKED, REVISED DWG. RECD.  
 (3) NOT APPROVED, REVISED DWG. RECD.  
 FOR GENERAL USE, FOR CONTINUED USE  
 NO. 4933-K-1-A-C, JOB NO. 4913  
 ARKANSAS  
 BECHTEL CORPORATION  
 (Second Station)  
 Date: 4/9/65 By: [Signature]

This approval is given on the condition that the purchaser will accept all conditions stipulated or implied by the purchase order.  
 BECHTEL CORPORATION  
 7000 SHILOH ROAD, HOUSTON, TEXAS 77030  
 BECHTEL CORPORATION, ARKANSAS







