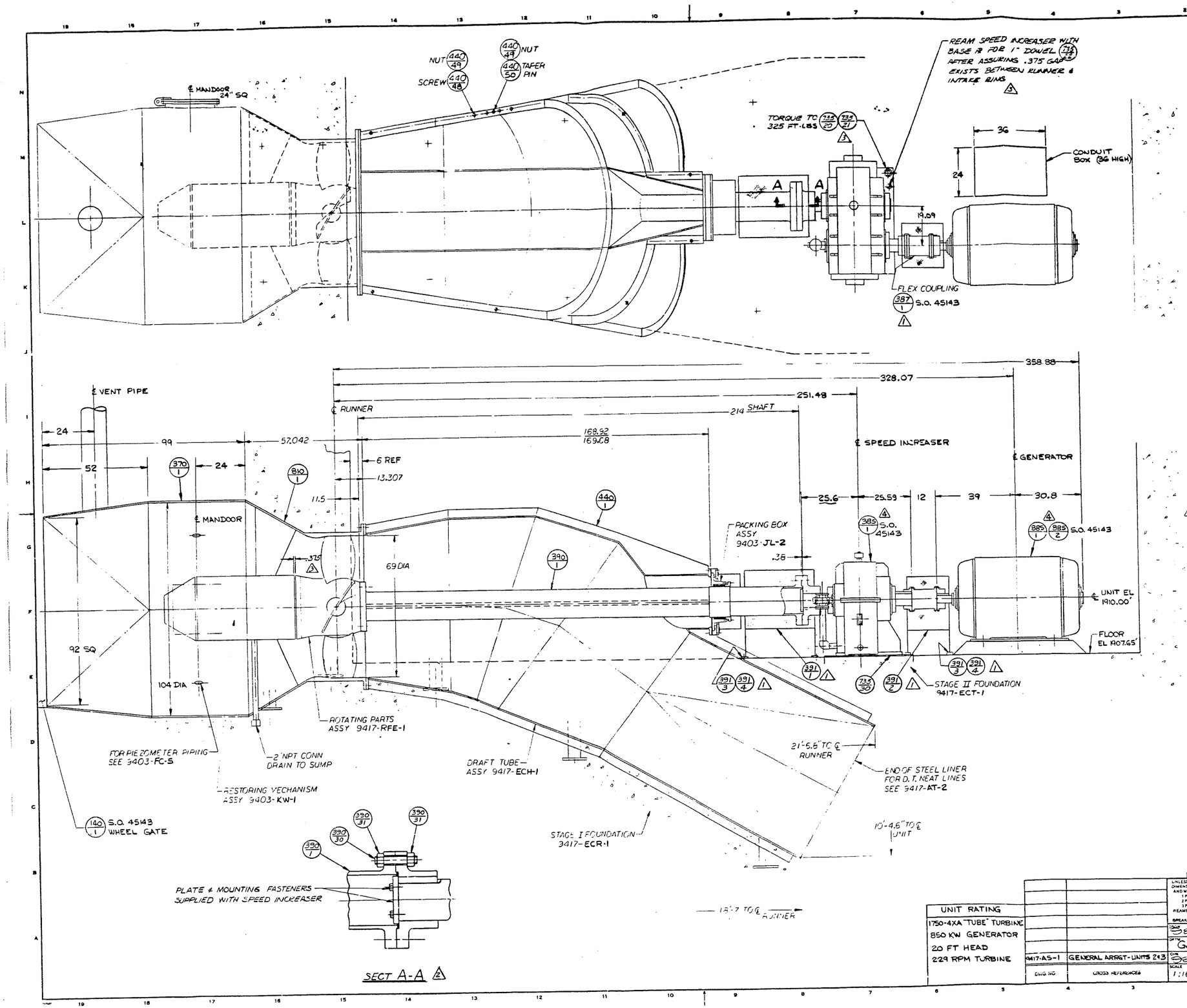
TITLE	DRAWING NO.
General Arrangement - Adjustable Blade Unit	9417-AR-1
General Arrangement - Fixed Blade Units	9417-AS-1
Device Symbol Legend	4570-VQ-2
Assembly Notes	9401-KW-4
Bonding Procedure	9401-DAQ-4
Single Line Diagram	9402-XY-2
Turbine Schematic (Fixed Blade Unit)	9402-XX-2
Start-Stop Sequence	9402-XZ-2
Hydraulic Power Unit	9402-YA-2
Instrumentation and Device List	9402-YB-3
Interconnection Diagram	9402-YC-2
Turbine Schematic (Adj. Blade Unit)	9402-YS-2
Typical Piezometer Piping	9403-FC-5
Shaft Alignment Tolerances and Procedure	9403-HO-2
Packing Box Assembly	9403-JL-2
Packing Box Cover Assembly	9403-LR-2
Restoring Mechanism & Hydraulic/Electric Connections	9403-QO-1
Restoring Mechanism & Hydraulic/Electric Connection Details	9403-QP-1
Turbine Room Hydraulic/Electric Connection Details	9403-QQ-1
Outboard Bearing Mounting Instructions	9403-RS-4
Water Passage Neat Lines	9417-AT-2
Outboard Bearing and Seal Assembly	9417-CCV-1
Mandoor Assembly	9417-CBU-1
Draft Tube	9417-ECH-1
Intake Ring	9417-ECN-1
Intake Ring	9417-ECO-1
Stage I Foundation	9417-ECR-1
2nd Stage Foundation	9417-ECT-1
Turbine Shaft	9417-RFA-1
Stub Shaft	9417-RFC-1
Rotating Parts Assembly (Adj. Blade)	9417-RFE-1
Rotating Parts Assembly (Fixed Blade)	9417-RFF-1
Fixed Blade Runner	9417-RFG-1
Grease and Oil Specifications	
Grease Specification (NLGI #1)	9401-CAN-4
Hydraulic Oil Specification (ISA 68)	9401-CAX-4
Grease Specification (NLGI #2)	9401-CBE-4
Circulation Oil Specification (ISO 68)	9401-CBH-4



REVISIONS
(F-6) MSI # 387 WAS 381 (E-3)(E-7)(E-8)(E-9) ADDED ITEM No. 3 GAK 8-7-85
(A-5)(L-8) ADDED SECT A-A GAK 8-22-85
(F-15) ADDED .375 DIM. (M-7) ADDED ITEMS (N-5) ADDED NOTE GAK 8-22-85
(G-4) ADDED ITEM NOS. (G-7) ADDED ITEM NO. (G-2) ADDED NOTE 1 GAK 10-24-85

UNIT RATING
1750-4XA "TUBE" TURBINE
850 KW GENERATOR
20 FT HEAD
229 RPM TURBINE

DWG. NO.	CROSS REFERENCES
9417-AS-1	GENERAL ARRGT - UNITS 2 & 3

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL ARE.
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL + .015 — .005
BREAK ALL CORNERS — .015

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GENERAL ARRANGEMENT
CRAGGY DAM UNIT #1

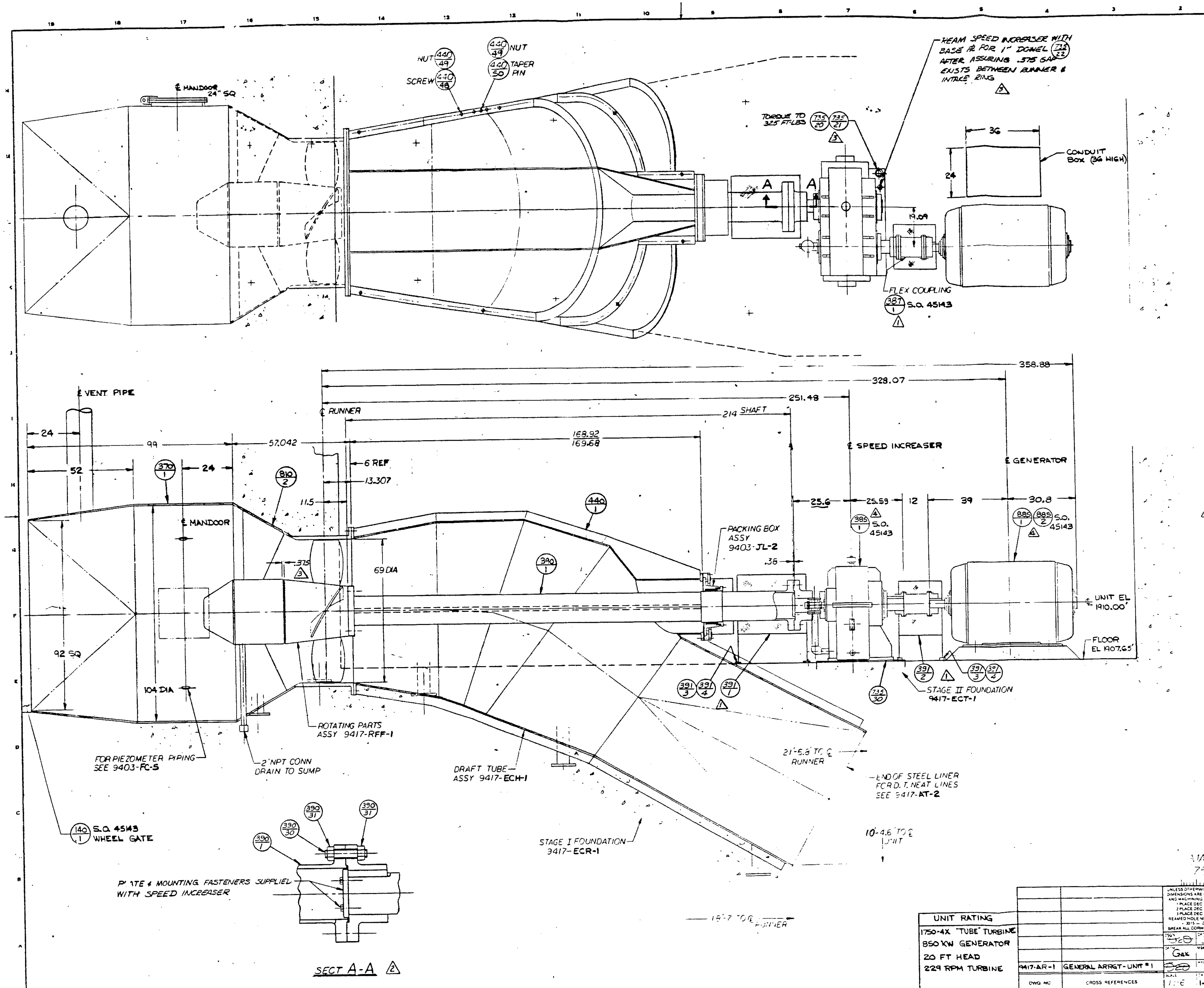
DRAWN GAK 8-7-85 | DES'D APPD Stark | CHK'D APPD KDS | MFG ENG APPD | WT # | MATERIAL | SIMILAR TO | MATERIAL SPEC

SCALE 1:16 | DATE 1-22-85

9417-AR - 1 SH 04

FIRST USED ON S.O. 45141

VAST C03
1750-4XA



REVISIONS

(J-6) WAS 387 WAS 381
(E5XE-5) ADDED ITEM NO.'S
01 8-7-85

(A-15)(L-8) ADDED SECT A-A
02 8-22-85

(F-15) ADDED .375 DIM.
(M-7) ADDED ITEMS
(M-5) ADDED NOTE
03 8-29-85

(G-4) ADDED ITEM NOS.
(G-7) ADDED ITEM NO.
(G-2) ADDED NOTE 1
GAK
04 10-24-85

NOTES:

1. ITEMS ALSO INCLUDED BUT NOT SHOWN ARE:
S.O. 45141 760/5 760/2 760/3 760/4
RATING PLATE, TRADEMARK, PATENT PLATE
S.O. 45143 175/1 175/2 175/3 175/4 175/5
SWITCHGEAR AND CONTROL SYSTEM
405/1 HYDRAULIC POWER UNIT

UNIT RATING
1750-4X "TUBE" TURBINE
850 KW GENERATOR
20 FT HEAD
229 RPM TURBINE

DWG NO	CROSS REFERENCES
9417-AR-1	GENERAL ARRGT - UNIT #1

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL ARE 1 PLACE DEC ± .030, 2 PLACE DEC ± .030, 3 PLACE DEC ± .010, REAMED HOLE MACH TOL +.0015 — .0005, BREAK ALL CORNERS — .015

FIRST USED ON S.O. 45141

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GENERAL ARRANGEMENT
CRAGGY DAM UNITS #2 & 3

DSGN / DFTG APPD / DFTM GAK / HYD ENG APPD

DATE 1-22-85

9417-AS-1 04

WAST 003 750-1

PREFIX NUMBERS

2. GOVERNOR/POSITIONER PRESSURE SYSTEM
3. GATE MECHANISM
4. THRUST BEARING
5. TURBINE GUIDE BEARING
6. SPIRAL CASE
7. PACKING BOX
8. RUNNER
9. HEAD COVER
10. DRAFT TUBE
11. LOWER/COUPLING END GENERATOR GUIDE BEARING
12. SHAFT
13. SPHERICAL VALVE
14. TAILWATER DEPRESSION SYSTEM
15. GENERATOR
16. OIL HEAD (KAPLAN)
17. OIL CATCHER (KAPLAN)
18. HOWELL-BUNGER VALVE
19. UPPER/OUTBOARD GENERATOR GUIDE BEARING
20. POWERHOUSE WATER SYSTEM
21. DRAINAGE SYSTEM
22. DEWATERING SYSTEM
24. RAPID DRAINAGE SYSTEM
25. POWERHOUSE AIR SYSTEM
26. FIRE PROTECTION EQUIPMENT
27. STEAMGUARD (BUTTERFLY) VALVE
28. HOIST/TELPHER
29. SPEED INCREASER
30. WHEEL GATE
31. GENERATOR SWITCHGEAR
32. GENERATOR EXCITATION
33. TURBINE/GENERATOR CONTROLS
34. HEADWATER/TRASHRACK LEVEL SENSOR
35. TAILWATER LEVEL SENSOR
36. BATTERY SYSTEM
37. SWITCH YARD (TRANSFORMER, DISCONNECT)

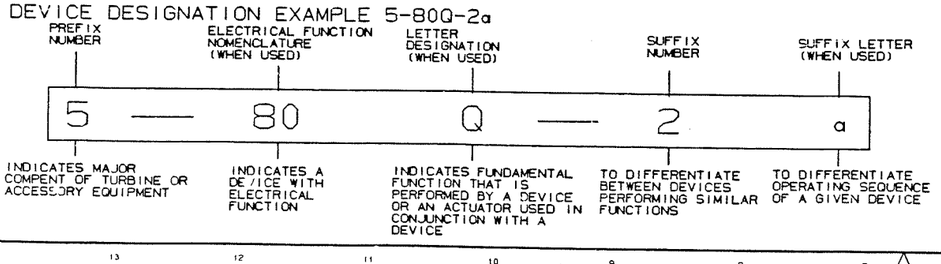
ELECTRICAL FUNCTION NOMENCLATURE

2. TIME DELAY STARTING RELAY
4. MASTER CONTROL CONTACTOR
5. STOPPING DEVICE
6. STARTING CIRCUIT
8. CONTROL SUPPLY DISCONNECT SWITCH/CONTROL CURCUIT BREAKER
9. REVERSING STARTER
10. SEQUENCE SELECTOR SWITCH
12. OVERSPEED DEVICE
13. SYNCRONOUS DEVICE
14. UNDERSPEED DEVICE
19. REDUCED VOLTAGE MOTOR STARTER(AC OR DC)
20. ELECTRIC SOLENOID VALVE
21. DISTANCE RELAY
23. THERMOSTAT CONTROL FOR HEATER/COOLER
25. SYNCHRONIZING CHECK DEVICE
26. TEMPERATURE SENSING DEVICE
27. UNDER VOLTAGE DEVICE
30. LATCHING RELAY
32. DIPECTIONAL POWER RELAY
33. POSITION SWITCH
34. MASTER SEQUENCE DEVICE
37. UNDER CURRENT OR UNDER POWER RELAY
38. BEARING PROTECTIVE DEVICE
39. MECHANICAL CONDITION MONITOR
40. FIELD FAILURE RELAY
41. FIELD CIRCUIT BREAKER
42. RUNNING CIRCUIT BREAKER
43. SELECTOR SWITCH
46. REVERSE PHASE OR PHASE BALANCE CURRENT RELAY
47. PHASE SEQUENCE VOLTAGE RELAY
48. INCOMPLETE SEQUENCE RELAY
49. MOTOR STARTER OVERLOAD DEVICE (AC OR DC)
50. INSTANTANEOUS OVERCURRENT OR RATE RISE RELAY
51. AC TIME OVERCURRENT RELAY
52. AC POWER CIRCUIT BREAKER
59. OVER VOLTAGE RELAY
60. VOLTAGE OR CURRENT BALANCE RELAY
62. TIME DELAY STOPPING OR OPENING RELAY
63. PRESSURE SWITCH
64. GROUND PROTECTIVE RELAY
65. GOVERNOR
66. JOG SWITCH
67. AC DIRECTIONAL OVERCURRENT RELAY
69. PERMISSIVE CONTROL DEVICE
70. RHEOSTAT(VARIABLE RESISTOR)
71. LEVEL SWITCH
72. DC POWER CIRCUIT BREAKER
74. ALARM RELAY
77. PULSE TRANSMITTER
80. FLOW SWITCH OR FLOWMETER WITH CONTACTS
81. FREQUENCY RELAY
83. CONTROL RELAY
86. LOCKING-OUT RELAY
87. DIFFERENTIAL PROTECTIVE RELAY
88. ELECTRIC MOTOR
89. LINE SWITCH
90. REGULATING DEVICE
94. TRIP FREE RELAY

LETTER DESIGNATION

A -AIR
AM -AMMETER
AMS-AMMETER SWITCH
AVR-AUTOMATIC VOLTAGE REGULATOR
BA -BLADE ANGLE
BK -BRAKE
BOV-BLOW OFF VALVE
BP -BLADE POSITION
BS -BLADE SETTING
C -CAPACITOR
CT -CURRENT TRANSFORMER
CV -CONTROL VALVE
DV -DRAIN VALVE
ETM-ELAPSED TIME METER
F -FILTER
FCV-FLOW CONTROL VALVE
FR -FILTER-REGULATOR
FS -FILTER SEPERATOR
GA -GATE ANGLE
GEN-GENERATOR
GL -GATE LOCK
GP -GATE POSITION
GPM-GALLONS PER MINUTE
GS -GATE SETTING
HE -HEAT EXCHANGER
HP -HORSEPOWER
HTR-HEATER
HWL-HEADWATER LEVEL
Hz -HERTZ
IG -INDICATING GAUGE
JE -JET EJECTOR
KW -KILOWATT METER
KWH-KILOWATT HOUR METER
LA -LIGHTNING ARRESTOR
LC -LOAD CELL
μ -MICRON
M -MOTOR
ma -MILLIAMP
MET-METAL (BEARING)
N -NEUTRAL
PC -PROGRAMMABLE CONTROLLER
PF -POWER FACTOR METER
PR -PRESSURE REDUCER
PT -POTENTIAL TRANSFORMER
PV -PROPORTIONAL VALVE
Q -OIL
RDV-RUNNER DRAIN VALVE
RP -REGULATOR-(PRESSURE)
RPM-REVOLUTIONS PER MINUTE
RT -REGULATOR-(TEMPERATURE)
RTD-RESISTANCE TEMPERATURE DETECTOR
RV -RELIEF VALVE
S -STRAINER
SA -SURGE ARRESTOR
SD -SHUTDOWN
SFI-SIGHT FLOW INDICATOR
SI -SIGHT INDICATOR
SP -SPEED
SPF-SHEAR PIN FAILURE
SV -SERVO VALVE
T -TRANSFORMER
TR -TEMPERATURE RELAY
TRL-TRASH RACK LEVEL
TS -TEST SWITCH
TWL-TAILWATER LEVEL
V -VOLTS
VIB-VIBRATION
VAR-VOLT AMP REACTIVE METER
VS -VOLT SWITCH
W -WATER
WTD-WATT TRANSDUCER
X -AUXILIARY
XD -TRANSDUCER
XT -TRANSMITTER

DEVICE DESIGNATION EXAMPLE 5-80Q-2a



REVISIONS
ADDED NOS. 42 & 69 & LETTERS RDV
01 5-20-77 RCM CWS RDS
REDRAWN & UPDATED
02 5-2-79 CAD CWS
ADDED LINE 26
03 6-13-79 SED CAD CWS
ADDED NOS. 21 & 22 & LETTERS RT & RP
04 5-12-80 SED CAD RDS
REDRAWN & UPDATED
05 3-3-82 MLS JEH CWS
ADDED NOS. 24,25 & 26
06 4-6-82 MLS JEH CWS
ADDED PREFIX 27
07 5-19-82 MLS JEH CWS
ADDED PREFIX 27
08 6-15-82 MLS JEH CWS
REDRAWN & UPDATED
09 4-4-85 RHJ BAZ CWS
REVISED & UPDATED
10 8-9-85 RHJ
ADDED LETTER RV
11 10-23-85 MLS CWS
ADDED PREFIX 37 & LETTERS BK & GL
12 CAD 1-6-86 BJZ CWS

CAD DRAWING-
NO MANUAL REVISIONS

FIRST USED ON S.O.

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC .010
REAMED HOLE MACH. TOL. +.0015 -.0005
BREAK ALL CORNERS-.015

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ALLIS-CHALMERS CORP.
YORK PLANT YORK, PA.

LEGEND, STANDARD, ELECTRICAL & FLUID POWER SCHEMATICS

DRWN	ENGR APPD	FINISH	MATERIAL
RCM	GAK		
DFTN	MECH ENG APPD	R ET	MATERIAL
RCM	CWS		
CHK	ELEC ENG APPD	SIMILAR TO	MATERIAL SPEC
RCM			
SCALE	DATE		
NTS	3-23-77	4570-VQ-2	REV 12

1. With crosshead (015/016) bottomed against hub, at shop assembly, adjust blade linkage with shim (015/036) to obtain maximum blade tilt. Spare shims (015/036) provided.

2. At shop assembly check for clearance of the blade linkage with the hub I.D. and for proper fit of the crosshead key (015/050) as the blades are moved through their full rotation.

3. Install stub shaft and lifting devices (240/001) and 240/002) at shop assembly and staticially balance assembly. Balance runner assembly to ISO G 16 balance quality for 300 RPM.

4. Cut and Bond to Suit at shop assembly in accordance with 9401-DAQ-4. Use (015/049) zip bond cement.

5. Matchmark all hub internal parts at shop assembly.

6. Stamp palm of blade "A" and stamp trunnion "A" seal ring (015/026) at shop assembly to indicate minimum, mid, and maximum blade tilt position.

7. Rotating parts assembly (015/400) to be pressure tested per the pressure test check sheet at shop assembly.

8. Tack weld lock bar after pressure test, typ 3 sides. Locate inside bolt circle at shop assembly, typ 8 plcs. Weld remaining lock bars at field assembly after lifting plates (240/001) have been removed.

9. See turbine outboard bearing mounting instructions drawing 9403-RS-4.

10.

11. Hub and servomotor to be filled with one (1) gallon each of shop hydraulic oil for shipment. Oil to be drained at field installation and refilled with the recommended oils (see instruction manual for oils).

12.

13.

FIRST USED ON S.O. 45121	REVISIONS TO BE MADE ONLY ON IBM 5253 WORD PROCESSOR				
REVISIONS	UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL ARE: 1 PLACE DEC ±.060 2 PLACE DEC ±.030 3 PLACE DEC ±.010 REAMED HOLE MACH. TOL. +.0015 — .0005 BREAK ALL CORNERS — .015		CONFIDENTIAL — PROPERTY OF **ALLIS - CHALMERS CORP.** YORK PLANT YORK, PA.		
Deleted Notes, 10, 12, 13 & 14. Added Note 22: 01 7/25/85 DED			ROTATING PARTS ASSEMBLY NOTES		
Deleted Note 13, not previously deleted in Rev. 01 02 9/17/85 DED	DSGN DED	DFTG APPD GAK			
Revised Note 9. 03 10/4/85 DED	DFTM ly	MECH ENG APPD RDS	WT R F	MATERIAL	
	CHK	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC	
	SCALE ~	DATE 12/26/84	9401-KW-4 Sheet 1 of 2		REV NO 03

14.

15. Clean and paint in accordance with A-C paint manual, mark numbers shown.

16. Servomotor design pressure is 1,000 psi.

17. Apply loctite 271, (050/025) at shop assembly.

18. Apply loctite 271, (050/025) at field assembly.

19. Lock screws with wire, (050/024) at shop assembly.

20. Apply loctite 242, (015/045) at shop assembly.

21. Apply loctite 242, (015/045) at field assembly.

22. Lubricate bearing @ field assembly with 8 oz. of NLGI #1 lithium base grease prior to rotation. Thereafter lubricate @ 3 month intervals while unit is rotating.

FIRST USED ON S.O. 45121	REVISIONS TO BE MADE ONLY ON IBM 5253 WORD PROCESSOR		
REVISIONS	UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL ARE: 1 PLACE DEC ± .060 2 PLACE DEC ± .030 3 PLACE DEC ± .010 REAMED HOLE MACH. TOL. +.0015 — .0005 BREAK ALL CORNERS — .015	CONFIDENTIAL — PROPERTY OF ALLIS - CHALMERS CORP. YORK PLANT YORK, PA.	
		ROTATING PARTS ASSEMBLY NOTES	
	DSGN DED / DFTG APPD GAK		
	DFTM ly / MECH ENG APPD RDS	WT R F	MATERIAL
	CHK / HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
	SCALE / DATE 12/26/84	9401-KW-4 Sheet 2 of 2	REV NO 03

BONDED O-RINGS AND "QUAD" SEALS SHALL BE CEMENTED USING THE FOLLOWING PROCEDURE:

1. Determine required length of O-ring or "Quad" seals.

2. Cut ends to be joined. Square with a clean sharp tool being sure to leave a uniform surface.

3. Clean ends thoroughly using an appropriate commercial solvent such as acetone.

4. Apply one drop of zip bond cement to one surface, only of ends to be bonded. Use only minimum quantity. One drop per square inch of surface.

5. Do not spread adhesive, but leave in droplet form - quickly mate surfaces and align properly.

6. Apply slight finger pressure on the joined materials for approximately 30 seconds full bond strength delveops in 12 hours.

CAUTION:

Zip bond cement quickly adheres to skin. Exercise care to avoid skin contact. If skin contact occurs, avoid vigorous attempts to remove and apply acetone or nitromethane to the bonded areas and gradually remove the cement.

In case of eye contact, immediately flush with plenty of water and call a doctor.

This cement is non-toxic. However, it should be used with adequate ventilation.

STORAGE:

Zip bond cement should be stored in a cool (below 50 degrees F.) dry location - with low humidity - preferably in a refrigerator. Keep cap in place and avoid unnecessary exposure to air.

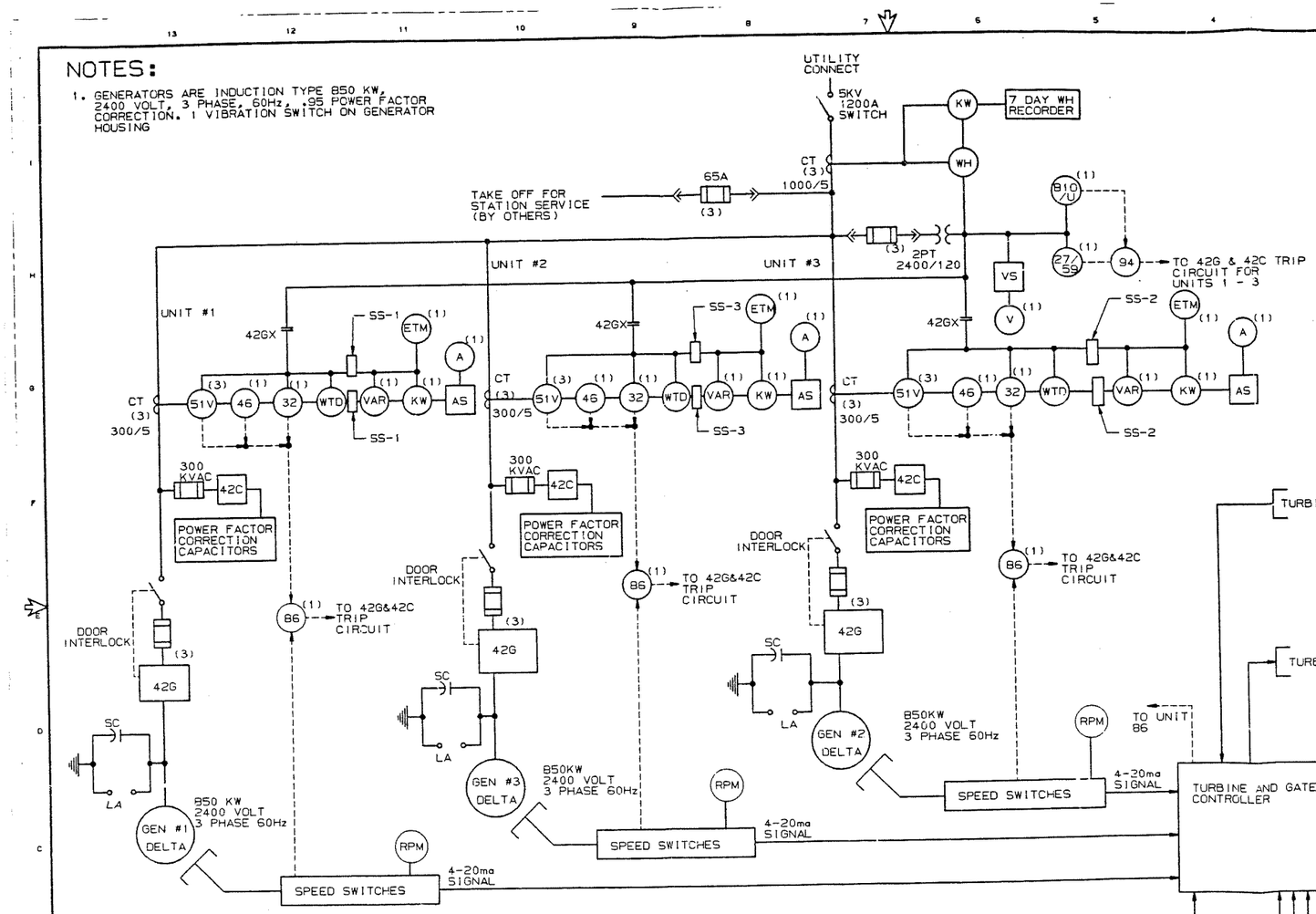
Exposure to direct sunlight should also be avoided.

The normal "Zip Bond" shelf life of 3 - 4 months at room temperature can be extended by storing in a refrigerator at 40°F - 45°F.

FIRST USED ON S.O. 20913			
REVISIONS	UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE: 1 PLACE DEC ±.060 2 PLACE DEC ±.030 3 PLACE DEC ±.010 REAMED HOLE MACH. TOL. +.0015 — .0005 BREAK ALL CORNERS —.015	CONFIDENTIAL — PROPERTY OF **ALLIS - CHALMERS CORP.** YORK PLANT YORK, PA.	
	DSGN KEM / DFTG APPD	BONDING PROCEDURE FOR O-RINGS AND QUAD SEALS	
	DFTM JB / MECH ENG APPD GRB	WT R F / MATERIAL	
	CHK KEM / HYD ENG APPD	SIMILAR TO / MATERIAL SPEC	
	SCALE N-A / DATE 05-28-82	9401-DAQ-4 Sht. 1 of 1	REV NO 00

NOTES:

1. GENERATORS ARE INDUCTION TYPE 850 KW, 2400 VOLT, 3 PHASE, 60Hz, .95 POWER FACTOR CORRECTION. 1 VIBRATION SWITCH ON GENERATOR HOUSING



DEVICE NUMBER LEGEND

27	UNDERVOLTAGE RELAY
32	DIRECTIONAL POWER RELAY
42C	CAPACITOR CONTACTOR
42G	GENERATOR CONTACTOR
46	REVERSE PHASE RELAY
51V	OVERCURRENT RELAY
59	OVER VOLTAGE RELAY
810	OVER FREQUENCE RELAY
80U	UNDER FREQUENCE RELAY
86	LOCK OUT RELAY
94	TRIPPING RELAY (NON-LOCK)

DEVICE DESIGNATION LEGEND

A	AMMETER
AS	AMMETER SWITCH
ETM	ELAPSED TIME METER
KVAC	KILOVOLT A.C.
KW	KILOWATT
LA	LIGHTNING ARRESTOR
PT	POTENTIAL TRANSFORMER
RPM	REVOLUTIONS PER MINUTE
RTD	RESISTANCE TEMPERATURE DETECTOR
SC	SURGE CAPACITOR
SS-X	SELECTOR SWITCH(METER ISOLATION)
V	VOLT METER
VAR	VAR METER
VS	VOLT METER SWITCH
WH	WATT HOUR METER
XDCR	TRANSDUCER

REVISIONS

MOVED CORRECTION CAPACITORS OUT TO GRID SIDE ELIMINATED WATT TRANSMITTER ADDED STATION SERVICE TAKE-OFF FUSE

01 5-1-85 RHJ

MOVED WTD'S & 42C ADDED CT RATIO'S

02 CAD 12-2-85 GaK CK

CAD DRAWING- NO MANUAL REVISIONS

FIRST USED ON S.O. 45143

UNLESS OTHERWISE NOTED STANDARD SHOP TOLERANCES ARE IN INCHES AND MACHINING TOL. ARE: 1 PLACE DEC ± .060; 2 PLACE DEC ± .030; 3 PLACE DEC ± .010; REAMED HOLE MACH. TOL. +.015 -.000; BREAK ALL CORNERS-.015

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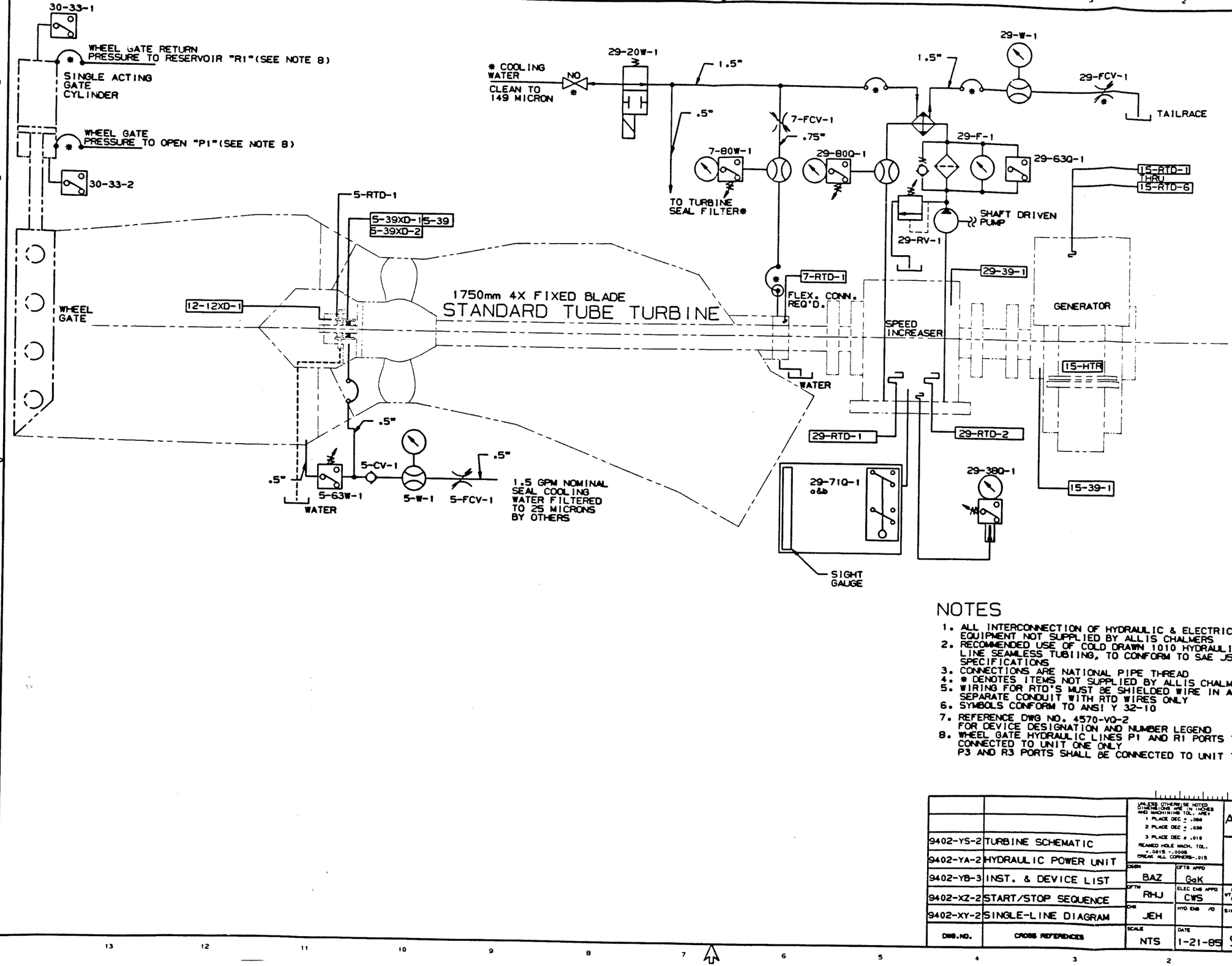
SINGLE - LINE DIAGRAM CRAGGY DAM PROJECT

DSGN	CHTD APPD
BAZ	GaK
DFTH RHJ	ELEC ENG APPD CWS
CHK LLS	HYD ENG APPD
SCALE NTS	DATE 1-29-85

SIMILAR TO | MATERIAL | MATERIAL SPEC

9402-XY-2 REV NO 02



NOTES

1. ALL INTERCONNECTION OF HYDRAULIC & ELECTRICAL EQUIPMENT NOT SUPPLIED BY ALLIS CHALMERS
2. RECOMMENDED USE OF COLD DRAWN 1010 HYDRAULIC FLUID LINE SEAMLESS TUBING, TO CONFORM TO SAE J524 SPECIFICATIONS
3. CONNECTIONS ARE NATIONAL PIPE THREAD
4. # DENOTES ITEMS NOT SUPPLIED BY ALLIS CHALMERS
5. WIRING FOR RTD'S MUST BE SHIELDED WIRE IN A SEPARATE CONDUIT WITH RTD WIRES ONLY
6. SYMBOLS CONFORM TO ANSI Y 32-10
7. REFERENCE DWG NO. 4570-VQ-2 FOR DEVICE DESIGNATION AND NUMBER LEGEND
8. WHEEL GATE HYDRAULIC LINES P1 AND R1 PORTS TO BE CONNECTED TO UNIT ONE ONLY
   P3 AND R3 PORTS SHALL BE CONNECTED TO UNIT THREE

REVISIONS

ADDED
PIPE SIZES
5-39,5-39XD-2
5-12XD-1,7-FCV-1
5-63W-1,5-FCV-1
REQUIREMENTS FOR
SHAFT SEAL
COOLING WATER
1.5 GPM NOMINAL
MOVED
COOLING WATER
HX THROTTLE VALVE
CHANGED
HYDRAULIC PORT
DESIGNATION UNIT#1
AND #3 (FIXED UNITS
ONLY) ALL RTD'S
DESIGNATION RTD
SYMBOL
BAZ

01 8-5-85 RHJ

(H-4) 29-63Q-1 WAS GAUGE

02 CAD BAZ 11-26-85 CWS

(H-4) ADDED GAUGE TO 29-F-1

03 CAD CWS 5-20-86

(I-3)LABLED 29-FCV-1

04 4-7-88 MLS

CAD DRAWING-
NO MANUAL REVISIONS

FIRST USED ON S.O. 45143

DWG. NO.	CROSS REFERENCES
9402-YS-2	TURBINE SCHEMATIC
9402-YA-2	HYDRAULIC POWER UNIT
9402-YB-3	INST. & DEVICE LIST
9402-XZ-2	START/STOP SEQUENCE
9402-XY-2	SINGLE-LINE DIAGRAM

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. SPEC
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL. +.0015 -.0005
BREAK ALL CORNERS-.015

DSGN	BAZ	DFTG APPD	GaK
DFTM	RHJ	ELEC ENG APPD	CWS
CHK	JEH	HYD ENG APPD	
SCALE	NTS	DATE	1-21-85

CONFIDENTIAL-PROPERTY OF
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YORK PLANT YORK, PA.

TURBINE SCHEMATIC
CRAGGY DAM

MATERIAL
SIMILAR TO
MATERIAL SPEC

9402-XX-2

REV BY 04

ADJUSTABLE BLADED UNIT

43-3

OWNER'S COMPUTER

43-1

43-4ST

43-4ST

SHEETS
1-6
7-11

UNIT "OFF"

UNIT "ON"

unit breaker closed

unit "ON"

no

yes

shutdown sequence sheet 4

t>t5

local/ remote

local

remote

start signal

auto/ manual

manual

auto

start button depressed

auto

start/ stop

remote

start/ stop

head level above turbine start set point

start button depressed

start/ stop

initiate time supervision t=t1

1

2

NOTE:

ADJUSTABLE BLADE START/STOP LOGIC(UNIT 2)

FIXED BLADED START/STOP LOGIC(UNIT1&3)
(HYDRAULIC DIRECTIONAL CONTROL VALVES'
DESIGNATION SHOWN FOR UNIT#1 ONLY)

REVISIONS
SHEET 2 (F-12)ADDED VIBRATION SWITCHES (I-9)43-L,43-R WAS 43-3L,43-3R SHEET 4 TYPE 3 FAULTS, DELETED PC INPUT SIGNAL FAILURE SHEET 7 (C-10)local WAS local-auto SHEET 11 (F-5)ADDED VIBRATION SWITCHES
01 4-7-88 MLS

CAD DRAWING-
NO MANUAL REVISIONS

FIRST USED ON S.O. 45146

DWG.NO.	CROSS REFERENCES	SCALE NTS	DATE 5-23-85

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE:
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL. +.0010 -.0005
BREAK ALL CORNERS-.015

DSGN BAZ	DFTS APPD
DFTM RHJ	ELEC ENG APPD CP
CHK RWL	HYD ENG APPD

CONFIDENTIAL-PROPERTY OF
ALLIS-CHALMERS CORP.
YORK PLANT YORK,PA.

START-STOP SEQUENCE

R ST F	MATERIAL		
SIMILAR TO	MATERIAL SPEC		

9402-XZ-2 SHEET 1 OF 11 REV NO 01

(2)

start relay 4	energize
unit generator heaters	OFF
cooling water	ON
disable vibration switches	energize
gate positon	closed
blade control signal	normal
fault type 1	OFF
fault type 2	OFF
fault type 3	OFF
fault type 4	OFF
unit breaker	open
control oil pressure	start permissive
enable annunciator alarm	
shutdown blade solenoids valves	energize
operating mode selector 43-1	
set blades at start position 6 to 10 degrees	
blade servo valves	±15ma analog input
open wheel gate	
wheel gate hydraulic valve	energize
set and maintain blades at start position 10° ±1/2°	
blades at start position	
gate raise slow up rate	energize and hold
turbine speed	227 RPM
close unit breaker close apacitor breaker	
unit breaker capacitor breaker closed	
raise wheel gate up at normal rate	energize and hold

15-HTR-1	
29-20W-1	
15-39-1	
29-39-1	
30-33-2	
16-70XD-1	
42G	
2-63-2	
7-80W-1	
5-63W-1	
2-630-1a	
2-20CV-1	
2-20CV-2	
43-1	
43-L/43-R	
2-20PV-1	
43-2	
2-20CV-21	
2-20PV-1	
16-70XD-1	
2-20CV-21	
5-12-1	
42G 42C	
42G 42C	
2-20CV-20 & 2-20CV-22	

(1) start conditions — enable blade servo hydraulics — manual / auto — blades raise lower — raise gate — open unit#2 wheel gate — (3)

REVISIONS

CAD DRAWING-
NO MANUAL REVISIONS

FIRST USED ON S.O. 45146

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2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL. +.0015 -.0005
BREAK ALL CORNERS-.015

CONFIDENTIAL-PROPERTY OF ALLIS-CHALMERS CORP. YORK PLANT YORK, PA.

START-STOP SEQUENCE

DRWN BAZ	CHK'D APPD			
DES RHJ	ELEC ENG APPD	R / ST	MATERIAL	
ENG RWL	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC	
SCALE NTS	DATE 5-23-85	9402-XZ-2	SHEET 2 OF 11	REV NO 01

annunciator alarms protective relaying	enable ON	29-39-1 15-39-1 5-39 29-800-1 51V,46,&32
wheel gate fully open	switch closed	30-33-1
wheel gate fully open		
wheel gate hyd system to normal operation	de-energize	2-20CV-20 & 2-20CV-22
		43-1
unit loading on head level control		
manual blade adjustment	raise or lower	43-3R 43-3L
		43-1
manual to auto transfer ramp logic		
maintain blade position ±1/2° from required position	analog input ±15ma	2-20PV-1

turbine running

wheel gate open

initiate time supervision t = t2

t < t2

yes

no

UNIT RUNNING

auto

manual

transfer to manual

auto/manual

maintain auto

maintain manual

transfer to auto

t < t1

yes

no

REVISIONS

CAD DRAWING-
NO MANUAL REVISIONS

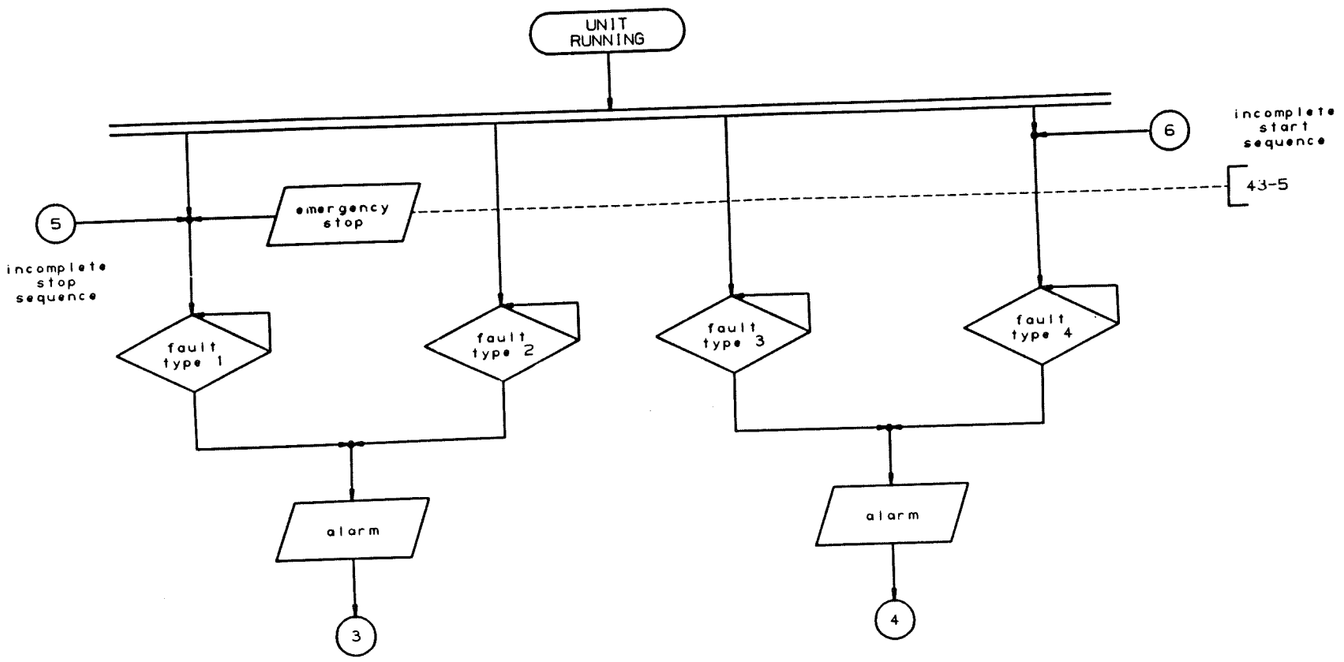
FIRST USED ON S.O. 45146

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL. +.7015 -.0005
BREAK ALL CORNERS-.015

CONFIDENTIAL-PROPERTY OF
ALLIS-CHALMERS CORP.
YORK PLANT YORK, PA.

START-STOP SEQUENCE

DSGN	OPTN APPD		
BAZ			
DFTM	ELEC ENG APPD	MATERIAL	
RHJ	CF	ST_F^R	
CHK	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
RWL			
SCALE	DATE		
NTS	5-23-85	9402-XZ-2	SHEET 3 OF 11 REV 01



TYPE 1 FAULT (EMERGENCY SHUTDOWN WITH LOCKOUT)

1. TRIP UNIT BREAKER AND CAPCITOR CONTACTOR IMMEDIATELY
2. DE-ENERGIZE MASTER 4 RELAY AND SHUTDOWN SOLENOIDS
3. TRIP LOCK-OUT (86) RELAY
4. FAULTS:
   - GENERATOR OVERCURRENT (51V)
   - GENERATOR REVERSE POWER (32)
   - PHASE BALANCE (46)
   - EXCESSIVE TIME TO STOP
   - EMERGENCY STOP PUSHBUTTON
   - PC FAILURE

TYPE 2 FAULT (EMERGENCY SHUTDOWN WITHOUT LOCKOUT)

1. TRIP 94 RELAY
2. TRIP UNIT BREAKER AND CAPACITOR CONTACTOR IMMEDIATELY
3. DE-ENERGIZE MASTER 4 RELAY AND SHUTDOWN SOLENOIDS
4. RESTART POSSIBLE AFTER TIME DELAY AND FAULT CLEARANCE (T5)
5. FAULTS:
   - BUS UNDERVOLTAGE (27)
   - BUS OVERVOLTAGE (59)
   - BUS UNDER FREQUENCY (81U)
   - BUS OVER FREQUENCY (81O)
   - LOSS OF A.C. CONTROL VOLTAGE
   - UNIT OVER SPEED

TYPE 3 FAULT (NORMAL CONTROLLED SHUTDOWN WITH LOCKOUT)

1. NORMAL SHUTDOWN SEQUENCE
2. TRIP BREAKER AFTER UNLOADING
3. TRIP LOCK-OUT (86) RELAY AFTER BREAKER TRIP
4. FAULTS:
   - HPU RESERVOIR LOW OIL LEVEL
   - HPU LOW-LOW OIL PRESSURE
   - TURBINE SHAFT SEAL COOLING WATER SYSTEM LOW DIFFERENTIAL PRESSURE
   - TURBINE BEARING TEMPERATURE
   - OIL HEAD HIGH TEMPERATURE
   - SPEED INCREASER THRUST BEARING HIGH TEMPERATURE
   - SPEED INCREASER GUIDE BEARING HIGH TEMPERATURE
   - GENERATOR WINDING HIGH TEMPERATURE
   - GENERATOR VIBRATION
   - SPEED INCREASER VIBRATION
   - TURBINE SHAFT VIBRATION
   - SPEED INCREASER RESERVOIR OIL LEVEL
   - SPEED INCREASER LUBE OIL LOW FLOW
   - TURBINE PACKING BOX TEMPERATURE HIGH
   - BLADE FEEDBACK TRANSDUCER FAILURE
   - LOSS OF SHAFT SPEED SIGNAL
   - TRASH RACK DIFFERENTIAL HIGH

TYPE 4 FAULT (NORMAL CONTROLLED SHUTDOWN WITHOUT LOCKOUT)

1. NORMAL SHUTDOWN SEQUENCE
2. TRIP BREAKER AFTER UNLOADING
3. RESTART POSSIBLE AFTER TIME DELAY (T5) AND FAULT CLEARANCE
4. FAULTS: (CONDITIONS)
   - INCOMPLETE START
   - LOW UPSTREAM POND LEVEL

TIME FUNCTIONS

T1	INCOMPLETE START TIME	240 SEC
T2	INCOMPLETE GATE OPENING TIME	240 SEC
T3	INCOMPLETE STOP TIME	360 SEC
T4	AUXILIARY SHUTDOWN TIME	160 SEC
T5	UNIT AUTOMATIC RESTART TIME	240 SEC

SCALE	NTS
DRN	RWL
DSGN	BAZ
DATE	5-23-85
PROJ ENG	CP
DWG NO	9402-XZ-2
SHEET	4 OF 11
REV	01

START-STOP SEQUENCE

ALLIS-CHALMERS CORP.

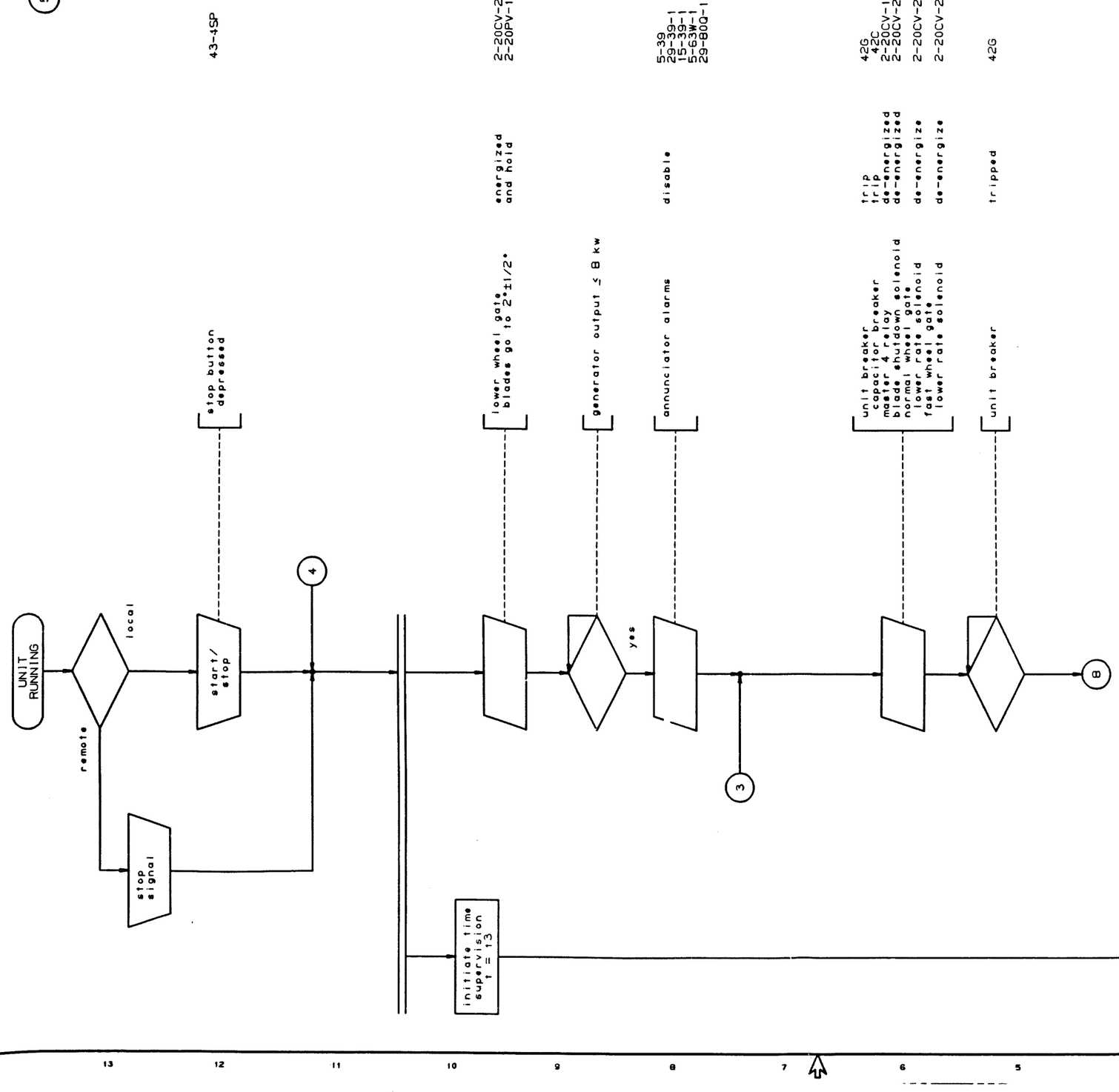
FIRST USED ON S.O. 45146

NO MANUAL REVISIONS

CAD DRAWING

REVISIONS

REVISIONS



CAD DRAWING-
NO MANUAL REVISIONS

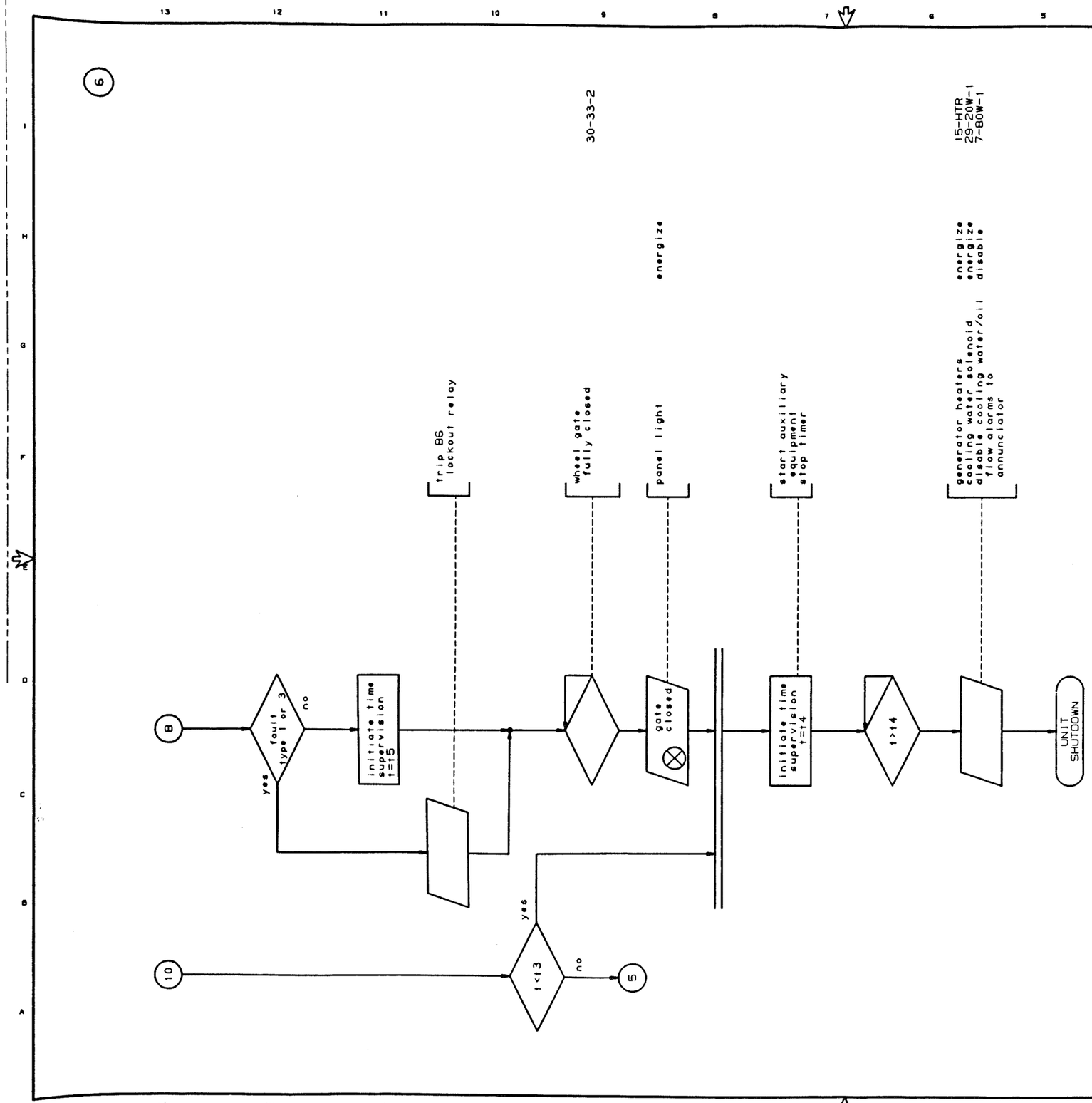
FIRST USED ON S.O. 45146

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE:
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL. +.0015 -.0005
BREAK ALL CORNERS-.015

CONFIDENTIAL-PROPERTY OF
ALLIS-CHALMERS CORP.
YORK PLANT YORK, PA.

START-STOP SEQUENCE

DESIGN BAZ	QFTS APPD		
DFTM RHJ	ELEC ENG APPD CP	MATERIAL	
CHK RWL	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
SCALE NTS	DATE 5-23-85	9402-XZ-2	SHEET 5 OF 11 REV 01



REVISIONS

CAD DRAWING-
NO MANUAL REVISIONS

FIRST USED ON S.O. 45146

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE
1 PLACE DEC ± .090
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL. +.0015 -.0005
BREAK ALL CORNERS-.015

CONFIDENTIAL-PROPERTY OF
ALLIS-CHALMERS CORP.
YORK PLANT YORK, PA.

START-STOP SEQUENCE

DSGN BAZ	QFTB APPD		
DFTM RHJ	ELEC ENG APPD CP	R MATERIAL	
CHK RWL	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
SCALE NTS	DATE 5-23-85	9402-XZ-2	SHEET 6 OF 11 REV NO 01

FIXED BLADE UNIT

(7)

unit breaker closed

43-3

owner's computer

43-4ST

owner's RS232-C computor input input requests start

start signal

head level above turbine start set point

start button depressed

start relay 4

energize

unit generator heater off cooling water on

de-energize
de-energize

15-HTR-1
29-20W-1

wheel gate position
fault type 1
fault type 2
fault type 3
fault type 4
unit breaker
control oil pressure

enable annunciator alarms

closed
off
off
off
off
open
start permissive

30-33-2

426
2-630-2

7-80W-1
5-63W-1

UNIT RUNNING

UNIT RUNNING

unit on

no

yes

shutdown sequence sheet 9

t > t5

local/ remote

local

remote

remote

start/ stop

start/ stop

start/ stop

initiation time supervision t2-t1

A1

A2

REVISIONS

CAD DRAWING-
NO MANUAL REVISIONS

FIRST USED ON S.O. 45146

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE:
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL. +.0015 -.0005
BREAK ALL CORNERS-.015

CONFIDENTIAL-PROPERTY OF
ALLIS-CHALMERS CORP.
YORK PLANT YORK, PA.

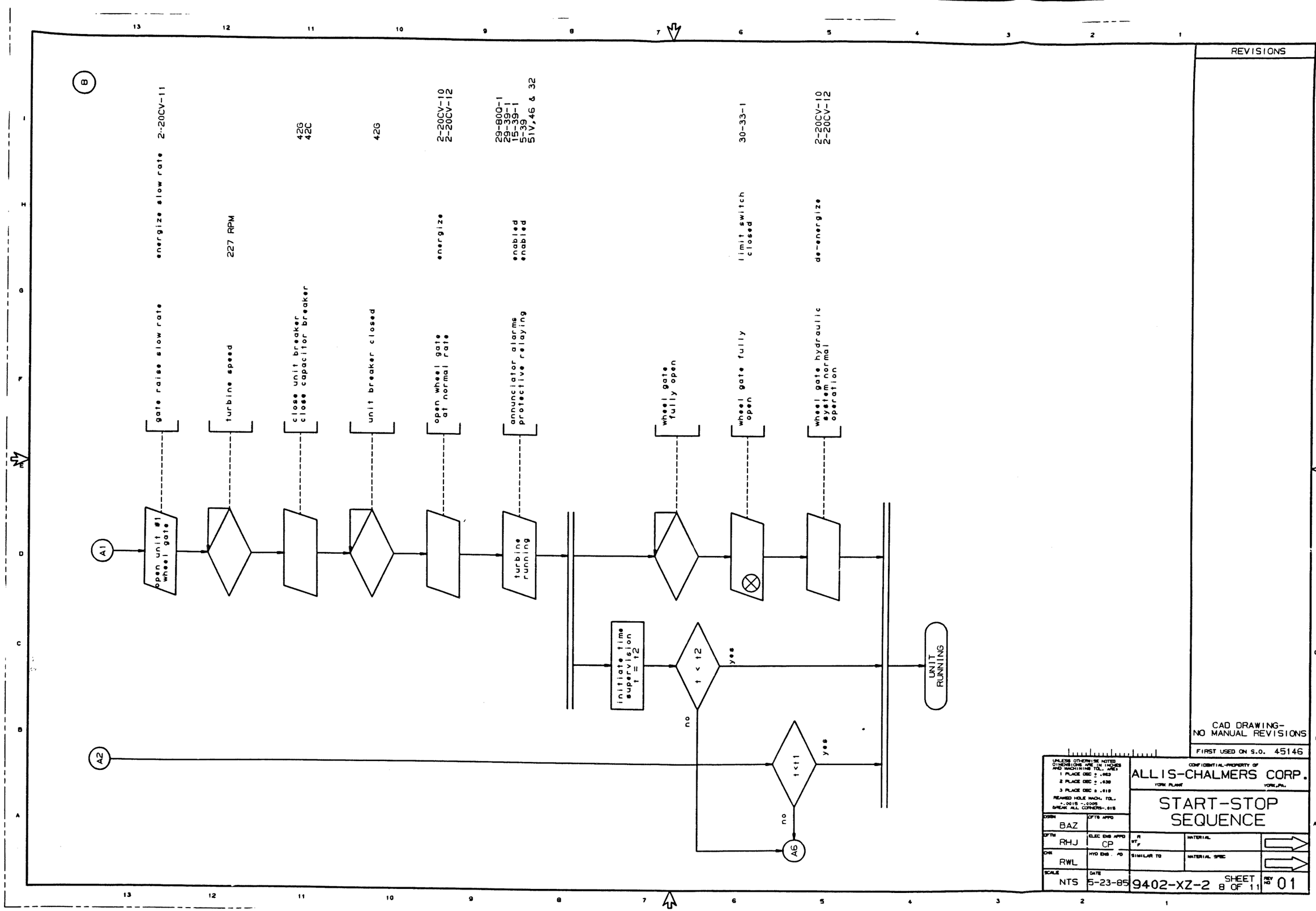
START-STOP SEQUENCE

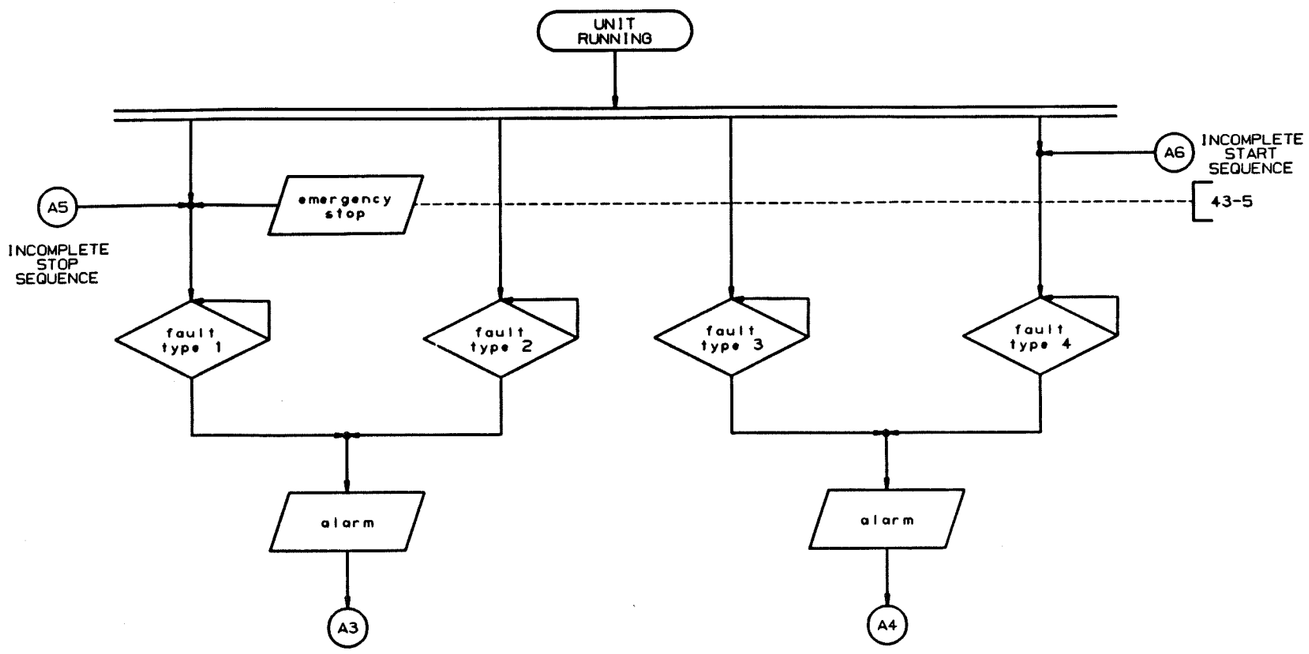
DRWN	DFTG APPD
BAZ	
DFTG	ELEC ENG APPD
RHJ	CP
CHK	HYD ENG APPD
RWL	
SCALE	DATE
NTS	5-23-85

R
MATERIAL
SIMILAR TO
MATERIAL SPEC

9402-XZ-2 SHEET 7 OF 11

REV NO 01


gate raise slow rate
energize slow rate
2-20CV-11
turbine speed
227 RPM
close unit breaker
close capacitor breaker
42G
42C
unit breaker closed
42G
open wheel gate
at normal rate
energize
2-20CV-10
2-20CV-12
annunciator alarms
protective relaying
enabled
enabled
29-800-1
29-39-1
15-39
51V,46 & 32
wheel gate
fully open
limit switch
closed
30-33-1
wheel gate
open
wheel gate hydraulic
system normal
operation
de-energize
2-20CV-10
2-20CV-12
A1
open unit #1
wheel gate
turbine
running
initiate time
supervision
t = 12
t < 12
yes
no
UNIT
RUNNING
A2
t <11
yes
no
A6
REVISIONS
CAD DRAWING-
NO MANUAL REVISIONS
FIRST USED ON S.O. 45146
CONFIDENTIAL-PROPERTY OF
ALLIS-CHALMERS CORP.
YORK PLANT
YORK, PA.
START-STOP
SEQUENCE
DSGN BAZ
DFTG
DFTM RHJ
CHK RWL
SCALE NTS
DATE 5-23-85
9402-XZ-2
SHEET 8 OF 11
REV NO 01



TYPE 1 FAULT (EMERGENCY SHUTDOWN WITH LOCKOUT)

1. TRIP UNIT BREAKER AND CAPCITOR CONTACTOR IMMEDIATELY
2. DE-ENERGIZE MASTER 4 RELAY SHUTDOWN SOLENOIDS
3. TRIP LOCK-OUT (86) RELAY
4. FAULTS:

   GENERATOR OVERCURRENT (51V)
   GENERATOR REVERSE POWER (32)
   PHASE BALANCE (46)
   INCOMPLETE STOP SEQUENCE
   EMERGENCY STOP PUSHBUTTON
   PC FAILURE

TYPE 2 FAULT (EMERGENCY SHUTDOWN WITHOUT LOCKOUT)

1. TRIP 94 RELAY
2. TRIP UNIT BREAKER AND CAPACITOR CONTACTOR IMMEDIATELY
3. DE-ENERGIZE MASTER 4 RELAY AND SHUTDOWN SOLENOIDS
4. RESTART POSSIBLE AFTER TIME DELAY AND FAULT CLEARANCE
5. FAULTS:
   BUS UNDERVOLTAGE (27)
   BUS OVERVOLTAGE (59)
   BUS UNDER FREQUENCY (81U)
   BUS OVER FREQUENCY (81O)
   LOSS OF A.C. CONTROL VOLTAGE
   UNIT OVERSPEED

TYPE 3 FAULT (NORMAL CONTROLLED SHUTDOWN WITH LOCKOUT)

1. NORMAL SHUTDOWN SEQUENCE
2. TRIP BREAKER AFTER UNLOADING
3. TRIP LOCK-OUT (86) RELAY AFTER BREAKER TRIP
4. FAULTS:

   HPU RESERVOIR LOW OIL LEVEL
   HPU LOW-LOW OIL PRESSURE
   TURBINE SHAFT SEAL COOLING WATER SYSTEM DIFFERENTIAL PRESSURE
   TURBINE BEARING TEMPERATURE
   SPEED INCREASER THRUST BEARING HIGH TEMPERATURE
   SPEED INCREASER GUIDE BEARING HIGH TEMPERATURE
   GENERATOR WINDING HIGH TEMPERATURE
   GENERATOR VIBRATION
   SPEED INCREASER VIBRATION
   TURBINE SHAFT VIBRATION
   SPEED INCREASER RESERVOIR OIL LEVEL
   SPEED INCREASER LUBE OIL LOW FLOW
   TURBINE PACKING BOX TEMPERATURE HIGH
   TRASH RACK DIFFERENTIAL PRESSURE
   LOSS OF SPEED SHAFT SIGNAL
   PC SIGNAL FAILURE

TYPE 4 FAULT (NORMAL CONTROLLED SHUTDOWN WITHOUT LOCKOUT)

1. NORMAL SHUTDOWN SEQUENCE
2. TRIP BREAKER AFTER UNLOADING
3. RESTART POSSIBLE AFTER TIME DELAY(T5) AND FAULT CLEARANCE
4. FAULTS: (CONDITIONS)

   INCOMPLETE START SEQUENCE
   LOW UPSTREAM POND LEVEL

TIME FUNCTIONS

T1	INCOMPLETE START TIME	240 SEC
T2	INCOMPLETE GATE OPENING TIME	240 SEC
T3	INCOMPLETE STOP TIME	360 SEC
T4	AUXILIARY SHUTDOWN TIME	160 SEC
T5	UNIT AUTOMATIC RESTART TIME	240 SEC

ALLIS-CHALMERS CORP.
YORK, PA.
START-STOP SEQUENCE
9402-XZ-2
SHEET 9 OF 11
REV 01
SCALE NTS
DATE 5-23-85
DRN RWL
DES RHJ
CHK BAZ
CP
FIRST USED ON S.O. 45146
CAD DRAWING-NO MANUAL REVISIONS
REVISIONS

(10)

OWNER'S COMPUTER

43-4SP

2-20CV-10

5-39
29-39-1
15-39-1

42G
42C
2-20CV-10
2-20CV-11

42G

stop button depressed

lower wheel gate — energize

generator output ≤ 8kw

annunciator alarms — disable

unit breaker — trip
capacitor breaker — trip
master relay 4 — de-energize
normal wheel gate down solenoid — de-energize
fast "wheel gate" lower — de-energize

unit breaker — tripped

UNIT RUNNING

local

remote

start / stop

stop signal

A4

A3

A9

A10

initiate time supervision t = t3

REVISIONS

CAD DRAWING-
NO MANUAL REVISIONS

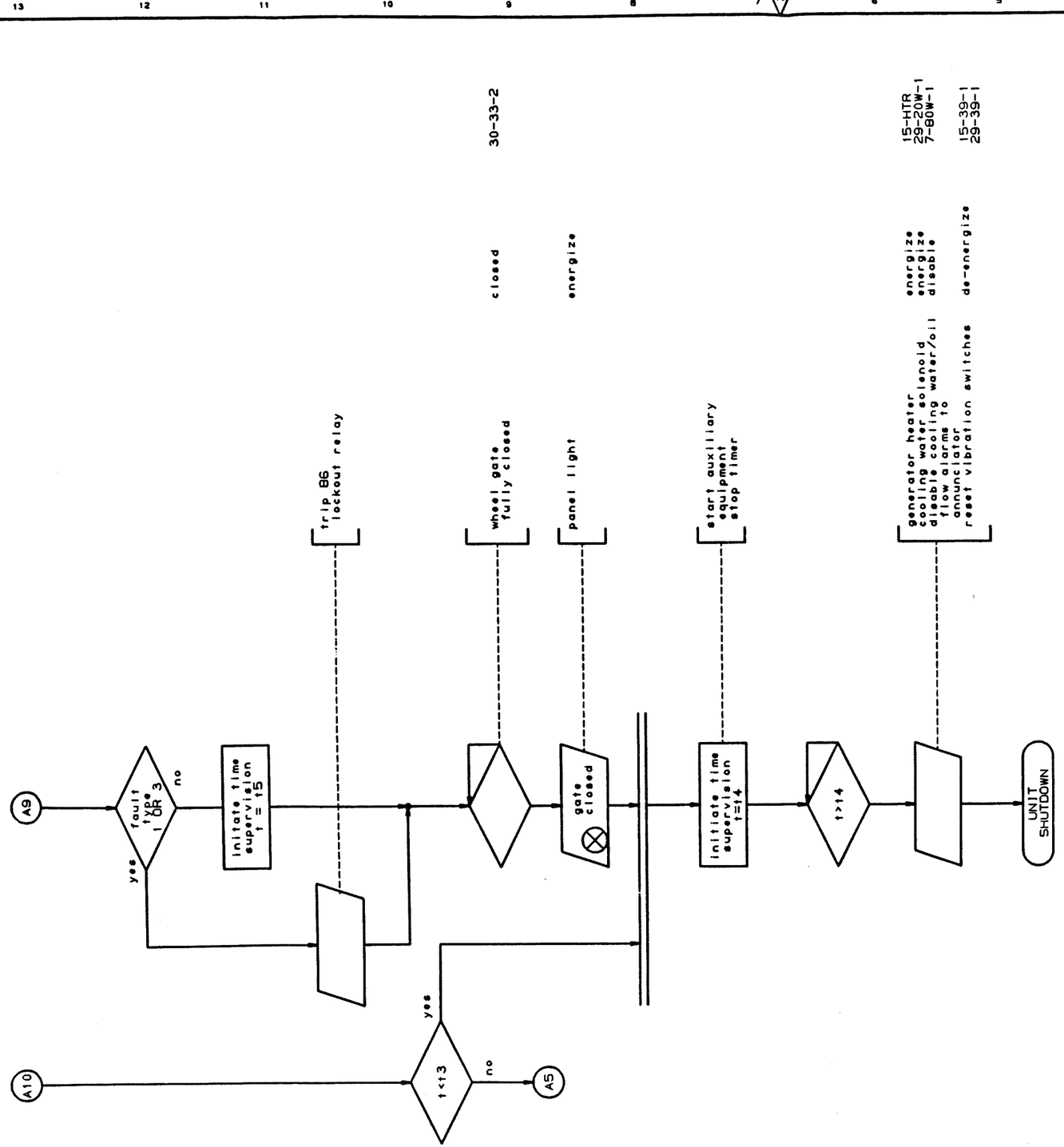
FIRST USED ON S.O. 45146

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINED SURFACE AREAS
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL. +.0015 −.0005
BREAK ALL CORNERS −.015

CONFIDENTIAL-PROPERTY OF
ALLIS-CHALMERS CORP.
YORK PLANT YORK, PA.

START-STOP SEQUENCE

DSGN BAZ	CPTS APPD		
DFTM RHJ	ELEC ENG APPD CP	R ST_F	MATERIAL
CHK RWL	MFG ENG APP	SIMILAR TO	MATERIAL SPEC
SCALE NTS	DATE 5-23-85	9402-XZ-2	SHEET 10 OF 11
			REV NO 01



REVISIONS

CAD DRAWING-
NO MANUAL REVISIONS

FIRST USED ON S.O. 45146

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE:
1 PLACE DEC ± .100
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL. +.0015 -.0005
BREAK ALL CORNERS-.015

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ALLIS-CHALMERS CORP.
YORK PLANT YORK, PA.

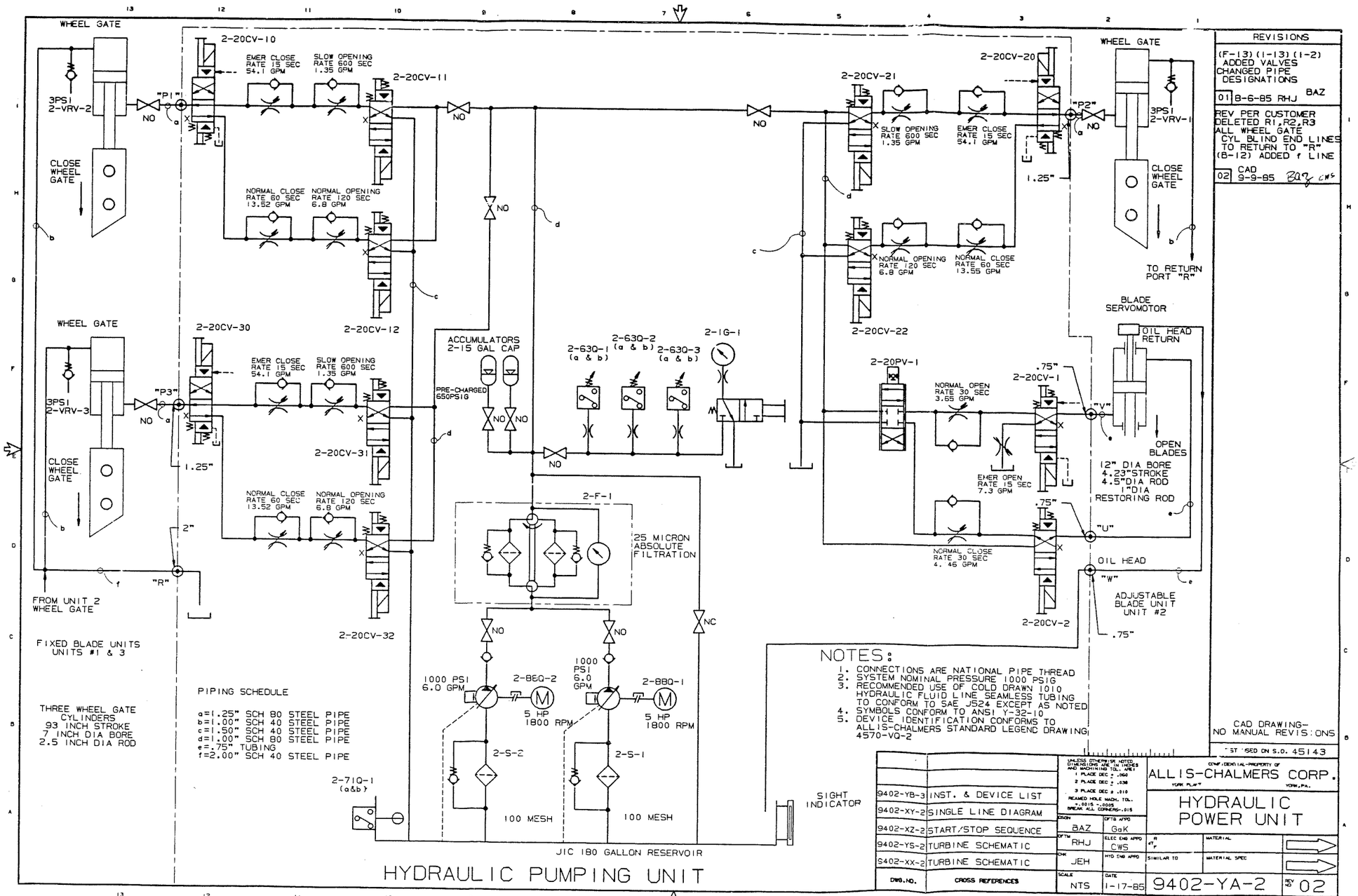
START-STOP
SEQUENCE

DESIGN	APPR
BAZ	
DRAWN	ELEC ENG APVD
RHJ	CP
CHKD	MFG ENG APPR
RWL	
SCALE	DATE
NTS	5-23-85

MATERIAL
SIMILAR TO
MATERIAL SPEC

9402-XZ-211 SHEET 11 OF 11

REV NO 01



REVISIONS
(F-13) (I-13) (I-2) ADDED VALVES CHANGED PIPE DESIGNATIONS BAZ
01 8-6-85 RHJ
REV PER CUSTOMER DELETED R1, R2, R3 ALL WHEEL GATE CYL BLIND END LINES TO RETURN TO "R" (B-12) ADDED f LINE
02 CAD 9-9-85 BAZ CWS

CAD DRAWING-
NO MANUAL REVISIONS

DWG. NO.	CROSS REFERENCES
9402-YB-3	INST. & DEVICE LIST
9402-XY-2	SINGLE LINE DIAGRAM
9402-XZ-2	START/STOP SEQUENCE
9402-YS-2	TURBINE SCHEMATIC
9402-XX-2	TURBINE SCHEMATIC

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE: 1 PLACE DEC ± .060, 2 PLACE DEC ± .030, 3 PLACE DEC ± .010, REAMED HOLE MACH. TOL. +.015 -.000, BREAK ALL CORNERS-.015

DSGN: BAZ; DFTG APPD: GaK; DFTM: RHJ; ELEC ENG APPD: CWS; CHK: JEH; HYD ENG APPD:

SCALE: NTS; DATE: 1-17-85

CONFIDENTIAL-PROPERTY OF ALLIS-CHALMERS CORP. YORK PLANT, YORK, PA.

HYDRAULIC POWER UNIT

MATERIAL; MATERIAL SPEC; SIMILAR TO

9402-YA-2 REV 02

1ST ISSUED ON S.O. 45143

INSTRUMENTATION AND DEVICE LIST

CONDUCTOR SCHEDULE DESIGNATIONS

CC - CONTROL CABINET
STD - STANDARD WIRE (THW, THWN, ETC.)
STP - SHIELDED TWISTED PAIR
STT - SHIELDED TWISTED TRIPLE

NOTES:

1. GROUNDING IS NOT INCLUDED IN CONDUCTOR SCHEDULE. CONDUCTORS ARE FURNISHED BY INSTALLING CONTRACTOR. TYPES OF CONDUCTORS ARE RECOMMENDED ONLY.
2. THE NUMBER OF WIRES INDICATED ARE INTENDED TO GIVE AN APPROXIMATION OF TOTAL WIRING REQUIRED FOR PROJECT. DEVICE & LOGIC CHANGES DURING DESIGN MAY ALTER THIS TOTAL.
3. THIS LIST INCLUDES EQUIPMENT SUPPLIED AS PART OF THE GENERATING EQUIPMENT PACKAGE ONLY AND DOES NOT INCLUDE POWERHOUSE WIRING REQUIREMENTS SUCH AS WIRING FOR LIGHTING, HVAC, SUMP PUMPS, COOLING WATER FILTRATION SYSTEM, ETC.
4. ALL ELECTRICAL COMPONENTS ON THE HYDRAULIC POWER UNIT AND SPEED INCREASER WILL BE WIRED INTO A NEMA 12 TERMINAL BOX. ALL WIRES WILL BE CONNECTED TO HEAVY DUTY 600 V SCREW TYPE TERMINALS.
5. SHIELDED WIRE TWISTED PAIR RECOMMENDED FOR ALL 4-20 MA DC ANALOG SIGNALS.
6. ALL RTD LEADS SHOULD BE RUN IN SEPARATE CONDUIT.
7. DEVICE SYMBOL LEGEND REFERENCE DRAWING 4570-VQ-2.

* PURCHASED UNDER TURBINE S.O. 45141
** TO BE USED ON TURBINES WITH ADJUSTABLE BLADES ONLY

REVISIONS

SHEET 3 ADDED SOLENOID VALVES, MANUFACTURERS & MODEL NOS
SHEET 5 ADDED 5-W-1, 5-39 5-39XD-2, & 5-63W-1
SHEET 6 ADDED 5-CV-1 & 5-FCV-1
SHEET 7 ADDED 7-FCV-1, & 12-12XD-1
ADDED SIZE OF GENERATERS
CHANGED ALL RTD DESIGNATIONS & 2-63Q-2 a & b REQUIREMENTS
ELIMINATED 5-71Q-1&2

01 8-9-85 RHJ BAZ

SHEET 4 170/049 WAS 405/002 ADDED SPEC.
SHEET 6 3/4" WAS 1"
SHEET 7 7-FCV-1 WAS ITEM 034
SHEET 9 16-70XD-1 ADDED SPEC.
SHEET 10 ADDED 29-63Q-1

02 CAD 11-20-85 BAZ CP

SHEET 2
2-88Q-1 & 2, ADDED MFG.
2-63Q-2, FUNCTION WAS LEAD/LAG PUMP #1 CONTROL 2-88Q-1, a. WAS PERMISSIVE, b. WAS SPARE & 3/STD WAS 4/STD
2-63Q-3, FUNCTION WAS LEAD/LAG PUMP #2 CONTROL 2-88Q-2, a. WAS LAG PUMP START, b. WAS LAG PUMP STOP, b. 990 PSI WAS 950, 2/STD WAS 3/STD
CONT'

FIRST USED ON S.O. 45143

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE:
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL. +.0015 -.0005
BREAK ALL CORNERS -.015

CONFIDENTIAL-PROPERTY OF
ALLIS-CHALMERS CORP.
YORK PLANT YORK, PA.

INSTRUMENTATION & DEVICE LIST

DSGN	DFTG APPD
BAZ	GaK
DFTM	ELEC ENG APPD
RHJ	CWS
CHK	HYD ENG APPD
JEH	
SCALE	DATE
NTS	1-17-85

R	MATERIAL
SIMILAR TO	MATERIAL SPEC

9402-YB-3 SHEET 1 OF 11 REV NO 03

HYDRAULIC POWER UNIT

SYMBOL	MASTER/ ITEM	DESCRIPTION	FUNCTION	MANUFACTURER MODEL NO.	COMMENTS	CONDUCTOR SCHEDULE QTY/TYPE/WIRE TO
2-88Q-1 (**)	405/ 001	INDUCTION MOTOR	DRIVES PUMP #1	LINCOLN	5 HP, 1800 RPM 460 VAC, 3 PH, 60Hz	3/STD/CC
2-88Q-2 (**)	405/ 001	INDUCTION MOTOR	DRIVES PUMP #2	LINCOLN	5 HP, 1800 RPM 460 VAC, 3 PH, 60Hz	3/STD/CC
2-63Q-1 (a&b) (**)	405/ 001	PRESSURE SWITCH	MONITOR OIL PRESSURE	BARKSDALE B2T-M12SS	a.(1) SPDT SWITCH LOW OIL PRESSURE ALARM 825 PSI(DEC) b.(1) SPDT SWITCH LOW PRESSURE SHUTDOWN 800 PSI(DEC) RATED CONTACTS 125VDC 0.5 AMP	4/STD/CC
2-63Q-2 (a&b) (**)	405/ 001	PRESSURE SWITCH	LEAD/LAG PUMP CONTROL	BARKSDALE B2T-M12SS	a.(1)SPDT SWITCH LAG PUMP START 850 PSI(DEC) b.(1)SPDT SWITCH LAG PUMP STOP RATED CONTACTS 125VDC 0.5 AMP 990 PSI(INC)	3/STD/CC
2-63Q-3 (a&b)	405/ 001	PRESSURE SWITCH	START PERMISSIVE	BARKSDALE B2T-M12SS	a.(1)SPDT SWITCH PERMISSIVE START 975 PSI(INC) b.(1)SPDT SWITCH SPARE	2/STD/CC

REVISIONS

SHEET 3
2-71Q-1 & 2-1G-1, ADDED MFG & MODEL
2-71Q-1 2/STD/ WAS 4/STD
REVISED PARKER MODEL #'S

SHEET 4
ADDED 2-F-1, 2-S-1 & 2
REVISED PARKER MODEL #'S

SHEET 5
ADDED (*)
5-RTD-1, A WAS 6", B WAS 36", C WAS 12"
5-[illegible]9, ADDED 2/STD/CC POWER

SHEET 6
ADDED (*)

SHEET 7
ADDED (*)
7-RTD-1, A WAS 6"
12-12XD-1, ADDED ITEMS 020 & 021

SHEET 10
ADDED 29-FCV-1
29-80Q-1, 29-38Q-1, 29-71Q-1, 29-RTD-1 & 2, ADDED MFG & MODEL
29-RTD-1 & 2, ADDED ALARM & SHUTDOWN
29-20W-1, ADDED(*)
29-39-1, 6/STD WAS 4/STD
29-63Q-1, ITEM 21 WAS 1

SHEET 11
ADDED MFG & MODEL
30-33-2, 2/STD WAS 4/STD

03 4-7-88 MLS

CAD DRAWING-
NO MANUAL REVISIONS

FIRST USED ON S.O. 45143

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REAMED HOLE MACH. TOL. +.0015 -.0005
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INSTRUMENTATION & DEVICE LIST

DSGN BAZ	DFTG APPD GaK		
DFTM RHJ	ELEC ENG APPD CWS	R MFT	MATERIAL
CHK JEH	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
SCALE NTS	DATE 1-17-85	9402-YB-3 SHEET 2 OF 11	REV NO 03

HYDRAULIC POWER UNIT

SYMBOL	MASTER/ ITEM	DESCRIPTION	FUNCTION	MANUFACTURER MODEL NO.	COMMENTS	CONDUCTOR SCHEDULE QTY/TYPE/WIRE TO
2-71Q-1 (a & b) (**)	405/ 001	LEVEL SWITCH	HPU LOW RESERVOIR OIL ALARM AND SHUTDOWN	OILGEAR BALL PRODUCTS #SHM150A DPDT	(1) DPDT SWITCH RATED CONTACTS 120 VAC, 10 AMPS	2/STD/CC
2-1G-1 (**)	405/ 001	PRESSURE GAUGE	MONITOR OIL SYSTEM PRESSURE	GENERAL INSTRUMENT 7218-4 (0-2000)	RANGE 0-2000 PSIG	NONE
2-20CV-1	405/ 001	SOLENOID VALVE	UNIT#1 BLADE SHUTDOWN SOLENOID	PARKER D61VW1H2Y40-X4065	DE-ENERGIZED TO OPEN BLADES 120VAC COIL 1.8AMP IN RUSH 0.43AMP HOLD	2/STD/CC
2-20CV-2	405/ 001	SOLENOID VALVE	UNIT#1 BLADE SHUTDOWN SOLENOID	PARKER D61VW1H4Y40-X4065	DE-ENERGIZED TO OPEN BLADES 120VAC COIL 1.8AMP IN RUSH 0.43AMP HOLD	2/STD/CC
2-20CV-11	405/ 001	SOLENOID VALVE	UNIT#1 GATE SHUTDOWN SOLENOID	PARKER D61VW1H4Y40-X4065	120VAC COIL 1.8AMP IN RUSH 0.43AMP HOLD	2/STD/CC
2-20CV-21	405/ 001	SOLENOID VALVE	UNIT#2 GATE SHUTDOWN SOLENOID	PARKER D61VW1H4Y40-X4065	120VAC COIL 1.8AMP IN RUSH 0.43AMP HOLD	2/STD/CC
2-20CV-31	405/ 001	SOLENOID VALVE	UNIT#3 GATE SHUTDOWN SOLENOID	PARKER D61VW1H4Y40-X4065	120VAC COIL 1.8AMP IN RUSH 0.43AMP HOLD	2/STD/CC

REVISIONS

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DSGN BAZ	DFTG APPD GaK		
DFTM RHJ	ELEC ENG APPD CWS	R WT/F	MATERIAL
CHK JEH	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
SCALE NTS	DATE 1-17-85	9402-YB-3 SHEET 3 OF 11	REV NO 03

HYDRAULIC POWER UNIT

SYMBOL	MASTER/ ITEM	DESCRIPTION	FUNCTION	MANUFACTURER MODEL NO.	COMMENTS	CONDUCTOR SCHEDULE QTY/TYPE/WIRE TO
2-20PV-1	405/ 001	PROPORTIONAL VALVE	UNIT#1 BLADE POSITIONER	PARKER EHD61V1C14	±15ma	2/STP/CC
2-20CV-10	405/ 001	SOLENOID VALVE	UNIT#1 GATE TRANSFER CONTROL VALVE	PARKER D61VW1B2Y40-X4065	120VAC COIL 1.8AMP IN RUSH 0.43AMP HOLD	2/STD/CC
2-20CV-20	405/ 001	SOLENOID VALVE	UNIT#2 GATE TRANSFER CONTROL VALVE	PARKER D61VW1B2Y40-X4065	120VAC COIL 1.8AMP IN RUSH 0.43AMP HOLD	2/STD/CC
2-20CV-30	405/ 001	SOLENOID VALVE	UNIT#3 GATE TRANSFER CONTROL VALVE	PARKER D61VW1B2Y40-X4065	120VAC COIL 1.8AMP IN RUSH 0.43AMP HOLD	2/STD/CC
2-20CV-12	405/ 001	SOLENOID VALVE	UNIT#1 GATE NORMAL OPERATION CONTROL VALVE	PARKER D61VW1H4Y40-X4065	120VAC COIL 1.8AMP IN RUSH 0.43AMP HOLD	2/STD/CC
2-20CV-22	405/ 001	SOLENOID VALVE	UNIT#2 GATE NORMAL OPERATION CONTROL VALVE	PARKER D61VW1H4Y40-X4065	120VAC COIL 1.8AMP IN RUSH 0.43AMP HOLD	2/STD/CC
2-20CV-32	405/ 001	SOLENOID VALVE	UNIT#3 GATE NORMAL OPERATION CONTROL VALVE	PARKER D61VW1H4Y40-X4065	120VAC COIL 1.8AMP IN RUSH 0.43AMP HOLD	2/STD/CC
2-VRV-1, 2,&3	170/ 049	VACUUM RELIEF VALVE (NON ELECTRICAL)	TO PREVENT VACUUM BUILD-UP ON THE BLIND END OF THE WHEEL GATE CYLINDER	9401-ST1-4	3 PSI VACUUM PRIOR TO OPENING	
2-F-1	405/ 001	DUPLEX FILTER (NON ELECTRIC)	CLEAN SUPPLY PRESSURE	PARKER 51P-1-10C-MI 35-PP-1	25 MICRON ABSOLUTE	
2-S-1	405/ 001	STRAINER (NON ELECTRIC)	SUCTION STRAINER FOR 2-88Q-1	CANFLOW CFSE10-100-3	100 MESH	
2-S-2	405/ 001	STRAINER (NON ELECTRIC)	SUCTION STRAINER FOR 2-88Q-2	CANFLOW CFSE10-100-3	100 MESH	

REVISIONS

CAD DRAWING-
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INSTRUMENTATION & DEVICE LIST

DSGN	DFTG APPD		
BAZ	GaK		
DFTM	MECH ENG APPD	WT. R	MATERIAL
RHJ	CWS		
CHK	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
JEH			
SCALE	DATE		
NTS	1-17-85	9402-YB-3	SHEET 4 OF 11

REV NO 03

TURBINE

SYMBOL	MASTER/ ITEM	DESCRIPTION	FUNCTION	MANUFACTURER MODEL NO.	COMMENTS	CONDUCTOR SCHEDULE QTY/TYPE/WIRE TO
5-RTD-1 (*)	170/ 001	RESISTANCE TEMPERATURE DETECTOR	MONITOR TURBINE GUIDE BEARING OIL TEMPERATURE	AC SPEC 9401-MJ-3 MK002 A=4" B=300" C=6"	10 OHM AT 25°C COPPER 3 LEAD	3/STT/CC
5-39XD-1&2 (*)	170/ 018	EDDY CURRENT PROXIMITY PROBE	SENSE X-Y RADIAL VIBRATION OF TURBINE SHAFT	BENTLY NEVADA AC SPEC 9401-LU-4 SHEETS 1&2	300 MIL PROBE 1.5" LENGTH CASE LINEAR RANGE 50 MILES -18VDC AT 8.0ma NOMINAL	50 OHM CABLE (1) WITH 17' OF EXTENSION CABLE TO 5-39
5-39 (*)	170/ 017	VIBRATION MONITOR	CONDITION 5-39XD-1 +2 EDDY CURRENT PROBE'S SIGNAL AND SHUTDOWN FOR HIGH TURBINE VIBRATION LEVEL	BENTLY NEVADA AC SPEC 9401-LU-4 SHEETS 1&2	95-125VAC 60Hz SINGLE PHASE HOUSED IN NEMA 3 ENCLOSURE FOR WALL MOUNTING	2/STD/CC ALARM NON LATCHING 2/STD/CC POWER
5-63W-1 (*)	170/ 030	DIFFERENTIAL PRESSURE	SENSE DIFFERENTIAL WATER PRESSURE ACROSS BEARING SEAL	BARKSDALE DPD2T-M18 1/8" FPT(2) BERYLLIUM COPPER DIAPHRAGM RESET DEADBAND 0.10 TO 0.25 PSI 60 PSIG MAX DIFF PROOF PRES	2 SPDT SWITCHES RATED FOR 125VDC, .5 AMP IND BOTH SWITCHES TO BE SET AT 2 PSI DEC	2/STD/CC SHUTDOWN
5-W-1 (*)	170/ 031	FLOW INDICATOR	COOLING WATER FLOW RATE INDICATOR	HEDLAND MODEL NO 623-007 1 INCH MPT	1.0 TO 7.0 GPM	NON ELECTRICAL

(1) THE VIBRATION MONITOR HAS BEEN CALIBRATED WITH THE SUPPLIED 50 OHM CABLE TO CONNECT THE EDDY CURRENT PROBES TO THE MONITOR (5-39). DO NOT CUT THE SUPPLIED INTERCONNECTING SIGNAL CABLE.

REVISIONS

CAD DRAWING-
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INSTRUMENTATION & DEVICE LIST

DSGN	DFTG APPD		
BAZ	GaK		
DFTM	ELEC ENG APPD	R / WT / P	MATERIAL
RHJ	CWS		
CHK	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
JEH			
SCALE	DATE		
NTS	1-17-85	9402-YB-3 SHEET 5 OF 11	REV NO. 03

SYMBOL	MASTER/ ITEM	DESCRIPTION	FUNCTION	MANUFACTURER MODEL NO.	COMMENTS	CONDUCTOR SCHEDULE QTY/TYPE/WIRE TO
5-CV-1 (*)	127/ 032	CHECK VALVE	PREVENT RIVER WATER TO BACK FLOW THRU COOLING WATER SUPPLY	WALWORTH CO OR EQUAL BRONZE SWING CHECK VALVE 125 PSI WOG	3/4" DIA FPT PORTS	NON ELECTRICAL
5-FCV-1 (*)	170/ 033	GLOBE VALVE	THROTTLE COOLING WATER THRU TURBINE BEARING SYSTEM	BRONZE 125PSI WOG	3/4" DIA FPT PORTS	NON ELECTRICAL

REVISIONS

CAD DRAWING-
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FIRST USED ON S.O. 45143

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INSTRUMENTATION & DEVICE LIST

DSGN	DFTG APPD		
BAZ	GaK		
DFTM	MECH ENG APPD	R WT	MATERIAL
RHJ	CWS		
CHK	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
JEH			
SCALE	DATE		
NTS	1-17-85	9402-YB-3	SHEET 6 OF 11

REV NO 03

PACKING BOX

SYMBOL	MASTER/ ITEM	DESCRIPTION	FUNCTION	MANUFACTURER MODEL NO.	COMMENTS	CONDUCTOR SCHEDULE QTY/TYPE/WIRE TO
7-RTD-1 (*)	170/ 010	RESISTANCE TEMPERATURE DETECTOR	MONITOR PACKING BOX TEMPERATURE	AC SPEC 9401-1Q-3 MK 002 LENGTH OF DIAMETER 12.0" WITH DETECTOR AND HOLDER	10 OHM @ 25°C COPPER 3 LEAD -45°C TOT 149°C	3/STT/CC
7-80W-1 (*)	170/ 011	FLOW METER	MONITOR COOLING WATER FLOW TO PACKING BOX	HEDLAND 1/2" SERIES 68-35-05	(1) SPDT SWITCH RATED CONTACT 125VDC 0.5 AMP. SET AT .5 GPM (DEC)	2/STD/CC
7-FCV-1 (*)	170/ 039	GLOBE VALVE	THROTTLE COOLING WATER THRU PACKING BOX	125 PSI WOG BRONZE	.75" FPT	NON ELECTRICAL

TURBINE SHAFT

12-12XD-1 (*)	170/ 006, 020 & 021	PROXIMITY PROBE	SENSE TURBINE SHAFT SPEED	AIRPAX ZERO-VELOCITY SENSOR MODEL#087-304-0001 TO BE USED WITH AIR PAX GEAR MODEL #085-202-0004	SPEED SWITCH MOUNTED IN CONTROLS CABINET a.SYNCHRONOUS SPEED b.OVERSPEED SUPPLY VOLTAGE +12VDC +2VDC	3/STT/CC

REVISIONS

CAD DRAWING-
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INSTRUMENTATION & DEVICE LIST

DSGN BAZ	DFTG APPD GaK			
DFTM RHJ	ELEC ENG APPD CWS	R WT, r	MATERIAL	
CHK JEH	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC	
SCALE NTS	DATE 1-17-85	9402-YB-3	SHEET 7 OF 11	REV NO 03

GENERATOR

SYMBOL	MASTER/ ITEM	DESCRIPTION	FUNCTION	MANUFACTURER MODEL NO.	COMMENTS	CONDUCTOR SCHEDULE QTY/TYPE/WIRE TO
15-GEN	885/ 002	GENERATOR TERMINAL BOX	CONNECTIONS FOR MAIN POWER LEADS, CT'S, PT'S ETC.		REFER TO S/A CONTROL WIRING DIAGRAM 05-417-682-417	REFERENCE S/A DRAWING
15-HTR	885/ 001	GENERATOR HEATERS	PREVENT CONDENSATION IN GENERATOR		115 VAC, 1 PH 600 WATTS	2/STD/CC
15-RTD-1 THRU 15-RTD-6	885/ 001	RESISTANCE TEMPERATURE DETECTOR	MONITOR TEMPERATURE OF GENERATOR STATOR WINDINGS		10 OHM @ 25°C COPPER 3 LEAD	18/STT/CTMU
15-39	885/ 001	VIBRATION SWITCH	MONITOR VIBRATION OF GENERATOR	ROBERTSHAW 366-A-8	RESET COIL TO (1)SPDT SWITCH RATED CONTACT 120VAC 5 AMP RESET COIL 120VAC ENERGIZE COIL TO RESET SWITCH	4/STD/CC

REVISIONS

CAD DRAWING-
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INSTRUMENTATION & DEVICE LIST

DSGN BAZ	DFTG APPD GaK			
DFTM RHJ	ELEC ENG APPD CWS	R WT r	MATERIAL	
CHK JEH	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC	
SCALE NTS	DATE 1-17-85	9402-YB-3	SHEET 8 OF 11	REV NO 03

OIL HEAD

SYMBOL	MASTER/ ITEM	DESCRIPTION	FUNCTION	MANUFACTURER MODEL NO.	COMMENTS	CONDUCTOR SCHEDULE QTY/TYPE/WIRE TO
16-RTD-1 (*)(**)	170/ 005	RESISTANCE TEMPERATURE DETECTOR	MONITOR TURBINE OIL HEAD TEMPERATURE	AC SPEC 9401-1Q-3 MK 002 LENGTH OF DETECTOR 6.0" WITH DETECTOR HEAD AND HOLDER	10 OHM @ 25°C COPPER 3 LEAD	3/STT/CC
16-70XD-1 (*)(**)	170/ 015	POTENTIOMETER	BLADE POSITION INDICATION	MAUREY TYPE P1991-5-102 5" ELECTRICAL TRAVEL AC SPEC 9401-LT-4 MK 005	0-1K OHM FOR 5" STROKE ACTUAL STROKE 0-845 OHM 4.226 INCH SERVO MOTOR STROKE	3/STT/CC

REVISIONS

CAD DRAWING-
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INSTRUMENTATION & DEVICE LIST

DSGN	DFTG APPD		
BAZ	GaK		
DFTM	ELEC ENG APPD	R MT r	MATERIAL
RHJ	CWS		
CHK	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
JEH			
SCALE	DATE		
NTS	1-17-85	9402-YB-3	SHEET 9 OF 11

REV NO. 03

SPEED INCREASER

SYMBOL	MASTER/ ITEM	DESCRIPTION	FUNCTION	MANUFACTURER MODEL NO.	COMMENTS	CONDUCTOR SCHEDULE QTY/TYPE/WIRE TO
29-80Q-1	385/ 001	FLOW METER	MONITOR SPEED INCREASER OIL FLOW	TAIYO VALVE FC-FRGU-32A	(1)SPDT SWITCH RATED CONTACTS 120VAC 5 AMPS TRIP AT 8.2 GPM	2/STD/CC
29-38Q-1	385/ 001	THERMOMETER	MONITOR SPEED INCREASER OIL TEMPERATURE	SAGINOMIYA TNS-C1070CW	(1)SPDT SWITCH RATED CONTACTS 120VAC 5 AMPS	2/STD/CC
29-71Q-1 (a&b)	385/ 001	FLOAT SWITCH	MONITOR SPEED INCREASER OIL LEVEL	NOHKEN HM-100	a.(1)SPDT SWITCH HIGH OIL LEVEL b.(1)SPDT SWITCH LOW OIL LEVEL RATED CONTACTS 120VAC 5 AMPS	4/STD/CC
29-RTD-1	385/ 001	RESISTANCE TEMPERATURE DETECTOR	MONITOR SPEED INCREASER THRUST BEARING TEMPERATURE	OKAZAKI RESIOPAK R96U	10 OHM @ 25°C COPPER 3 LEAD ALARM - 77°C SHUTDONN - 82°C	3/STT/CC
29-RTD-2	385/ 001	RESISTANCE TEMPERATURE DETECTOR	MONITOR SPEED INCREASER GUIDE BEARING TEMPERATURE	OKAZAKI RESIOPAK R96U	10 OHM @ 25°C COPPER 3 LEAD ALARM - 77°C SHUTDFNN - 82°C	3/STT/CC
29-20W-1 (*)	170/ 012	DIRECTIONAL CONTROL VALVE	CONTROL COOLING WATER FLOW TO SPEED INCREASER	ASCO MODEL #J8210859 1.5 PIPE SIZE	DE-ENERGIZE TO PASS WATER 120 VAC 43 VA HOLDING, 240 VA INRUSH	2/STD/CC
29-39-1	385/ 001	VIBRATION SWITCH	MONITOR VIBRATION OF SPEED INCREASER	ROBERTSHAW 366-A-8	(1)SPDT SWITCH RATED CONTACT 120VAC 5 AMP RESET COIL 120VAC	6/STD/CC
29-63Q-1	385/ 021	DIFFERENTIAL PRESS SWITCH	ALARM ON HIGH PRESS DIFF. ACROSS SPEED INCR. LUBE OIL FILTER	BARKSDALE #DPD1T-A80	1 SPDT	2/STD/CC
29-W-1	170/ 013	FLOW METER (NON ELECT.)	INDICATE RATE OF FLOW OF COOLING WATER THRU THE SPEED INCREASER	HEDLAND MODEL# 623-018	RANGE 2 TO 18 GPM 4.4 PSI FOR 13 GPM FLOW	
29-RV-1	385/ 001	RELIEF VALVE (NON ELECT.)	CONTROL LUBE OIL PRESSURE			
29-F-1	385/ 001	OIL FILTER (NON ELECT)	FILTER SPEED INCREASER OIL			
29-FCV-1	OWNER SUPPLIED	FLOW CONTROL VALVE (NON ELECTRIC)	CONTROL FLOW RATE OF COOLING WATER			

REVISIONS

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INSTRUMENTATION & DEVICE LIST

DSGN	QFTG APPD
BAZ	GaK
DFTN	ELEC ENG APPD
RHJ	CWS
CHK	HYD ENG APPD
JEH	
SCALE	DATE
NTS	1-17-85

R / WT F	MATERIAL
SIMILAR TO	MATERIAL SPEC

9402-YB-3 SHEET 10 OF 11 REV NO 03

WHEEL GATE

SYMBOL	MASTER/ ITEM	DESCRIPTION	FUNCTION	MANUFACTURER MODEL NO.	COMMENTS	CONDUCTOR SCHEDULE QTY/TYPE/WIRE TO
30-33-1	140/ 001	LIMIT SWITCH WITH LEVER	INDICATE WHEEL GATE FULL OPEN	ALLEN BRADLEY #802T-HIP W/ LEVER #802-W2B	(1)SPDT SWITCH RATED CONTACTS 120VAC 5 AMPS	2/STD/CC
30-33-2	140/ 001	LIMIT SWITCH WITH LEVER	INDICATE WHEEL GATE FULL CLOSE	ALLEN BRADLEY #802T-HIP W/ LEVER #802-W2B	(1)SPDT SWITCH RATED CONTACTS 120VAC 5 AMPS	2/STD/CC

REVISIONS

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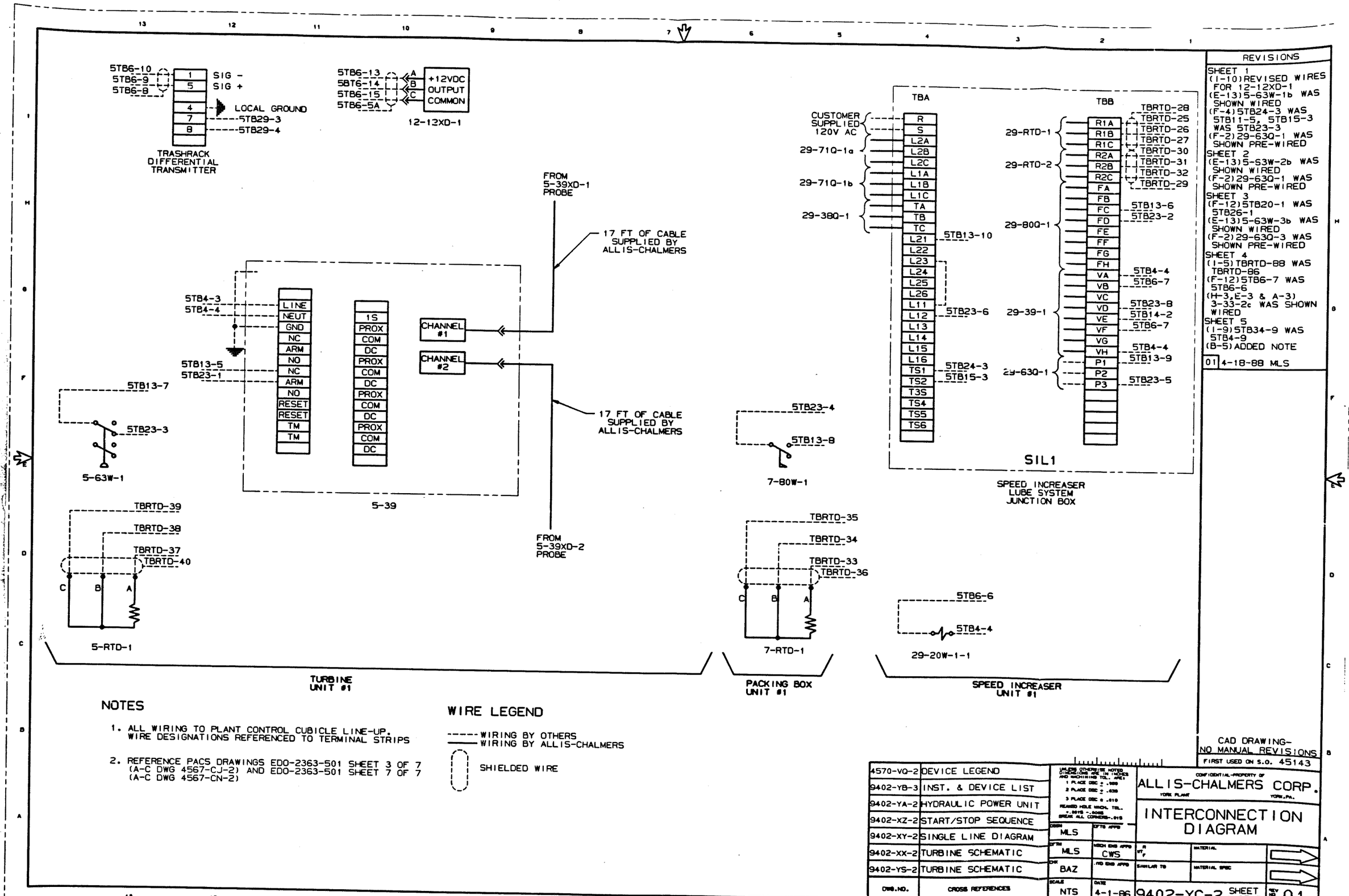
INSTRUMENTATION & DEVICE LIST

DSGN	DFTG APPD		
BAZ	GaK		
DFTM	ELEC ENG APPD	R / ST / F	MATERIAL
RHJ	CWS		
CHK	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
JEH			
SCALE	DATE		
NTS	1-17-85	9402-YB-3	SHEET 11 OF 11

REV NO 03



NOTES

1. ALL WIRING TO PLANT CONTROL CUBICLE LINE-UP. WIRE DESIGNATIONS REFERENCED TO TERMINAL STRIPS
2. REFERENCE PACS DRAWINGS EDO-2363-501 SHEET 3 OF 7 (A-C DWG 4567-CJ-2) AND EDO-2363-501 SHEET 7 OF 7 (A-C DWG 4567-CN-2)

WIRE LEGEND

- ----- WIRING BY OTHERS
- ——— WIRING BY ALLIS-CHALMERS
- SHIELDED WIRE

REVISIONS

SHEET 1
(I-10) REVISED WIRES FOR 12-12XD-1
(E-13) 5-63W-1b WAS SHOWN WIRED
(F-4) 5TB24-3 WAS 5TB11-5, 5TB15-3 WAS 5TB23-3
(F-2) 29-63Q-1 WAS SHOWN PRE-WIRED
SHEET 2
(E-13) 5-53W-2b WAS SHOWN WIRED
(F-2) 29-63Q-1 WAS SHOWN PRE-WIRED
SHEET 3
(F-12) 5TB20-1 WAS 5TB26-1
(E-13) 5-63W-3b WAS SHOWN WIRED
(F-2) 29-63Q-3 WAS SHOWN PRE-WIRED
SHEET 4
(I-5) TBRTD-88 WAS TBRTD-86
(F-12) 5TB6-7 WAS 5TB6-6
(H-3, E-3 & A-3) 3-33-2c WAS SHOWN WIRED
SHEET 5
(I-9) 5TB34-9 WAS 5TB4-9
(B-5) ADDED NOTE

01 4-18-88 MLS

4570-VQ-2	DEVICE LEGEND
9402-YB-3	INST. & DEVICE LIST
9402-YA-2	HYDRAULIC POWER UNIT
9402-XZ-2	START/STOP SEQUENCE
9402-XY-2	SINGLE LINE DIAGRAM
9402-XX-2	TURBINE SCHEMATIC
9402-YS-2	TURBINE SCHEMATIC
DWG. NO.	CROSS REFERENCES

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE:
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL. +.0015 -.0005
BREAK ALL CORNERS-.015

DESN	MLS	DFTG APPD	
DFTM	MLS	MECH ENG APPD	CWS
CHK	BAZ	..ND ENG APPD	
SCALE	NTS	DATE	4-1-86

CONFIDENTIAL-PROPERTY OF ALLIS-CHALMERS CORP. YORK PLANT YORK, PA.

INTERCONNECTION DIAGRAM

R — WT. — MATERIAL
SIMILAR TO — MATERIAL SPEC

9402-YC-2 SHEET 1 OF 5 REV NO 01

CAD DRAWING-
NO MANUAL REVISIONS
FIRST USED ON S.O. 45143

:6-70XD-1

RETRACTED END — A — B — C — EXTENDED END

5TB8-6 5TB8-8 5TB8-7 5TB8-9

TBRTD-44
TBRTD-43
TBRTD-42
TBRTD-41

C B A

16-RTD-1

5TB24-9

5TB16-10

5-63W-2

5TB8-4
5TB8-3

LINE
NEUT
GND
NC
ARM
NO
NC
ARM
NO
RESET
RESET
TM
TM

5TB24-7
5TB16-8

1S
PROX
COM
DC
PROX
COM
DC
PROX
COM
DC
PROX
COM
DC

CHANNEL #1

CHANNEL #2

5-39

5TB9-8
5TB9-7
5TB9-6

1 — SIG -
5 — SIG +
4 — LOCAL GROUND
7 — 5TB29-3
8 — 5TB29-4

TRASHRACK DIFFERENTIAL TRANSMITTER

5TB7-6
5TB7-7
5TB7-8
5TB7-5A

A +12VDC
B OUTPUT
C COMMON

12-12XD-1

FROM 5-39XD-1 PROBE

17 FT OF CABLE SUPPLIED BY ALLIS-CHALMERS

17 FT OF CABLE SUPPLIED BY ALLIS-CHALMERS

FROM 5-39XD-2 PROBE

5TB24-10

5TB17-1

7-80W-2

TBRTD-83
TBRTD-82
TBRTD-81
TBRTD-84

C B A

5-RTD-1

TURBINE UNIT #2

TBRTD-79
TBRTD-78
TBRTD-77
TBRTD-80

C B A

7-RTD-1

PACKING BOX UNIT #2

5TB8-1

5TB8-3

29-20W-1-2

SPEED INCREASER UNIT #2

TBA

CUSTOMER SUPPLIED 120V AC
29-71Q-2a
29-71Q-2b
29-38Q-2

R
S
L2A
L2B
L2C
L1A
L1B
L1C
TA
TB
TC
L21
L22
L23
L24
L25
L26
L11
L12
L13
L14
L15
L16
TS1
TS2
T3S
TS4
TS5
TS6

5TB17-3

5TB25-2

5TB18-5
5TB26-1

TBB

29-RTD-1
29-RTD-2
29-80Q-2
29-39-2
29-63Q-1

R1A
R1B
R1C
R2A
R2B
R2C
FA
FB
FC
FD
FE
FF
FG
FH
VA
VB
VC
VD
VE
VF
VG
VH
P1
P2
P3

TBRTD-72
TBRTD-69
TBRTD-70
TBRTD-71
TBRTD-74
TBRTD-75
TBRTD-76
TBRTD-73

5TB16-9
5TB24-8
5TB8-3
5TB8-2
5TB25-4
5TB17-5
5TB8-2
5TB8-3
5TB17-2
5TB25-1

SIL2

SPEED INCREASER LUBE SYSTEM JUNCTION BOX

REVISIONS

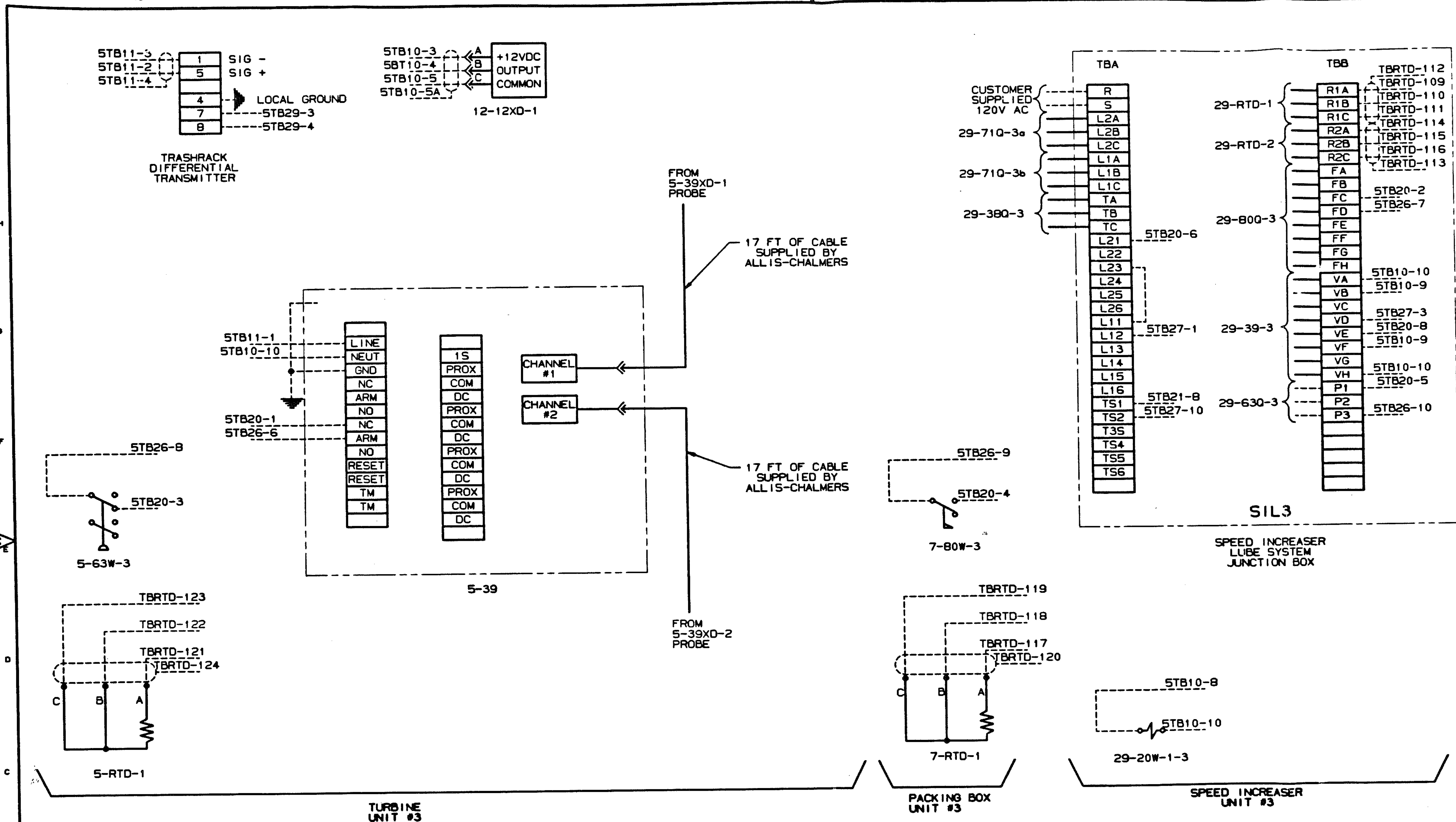
CAD DRAWING-
NO MANUAL REVISIONS
FIRST USED ON S.O. 45143

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE:
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL. +.005 -.000
BREAK ALL CORNERS-.015

CONFIDENTIAL-PROPERTY OF
ALLIS-CHALMERS CORP.
YORK PLANT YORK, PA.

INTERCONNECTION DIAGRAM

DSGN MLS	DFTG APPD		
DFTG MLS	MECH ENG APPD CWS	MATERIAL	
CHK BAZ	PROJ ENG APPD	SIMILAR TO	MATERIAL SPEC
SCALE NTS	DATE 4-1-86	9402-YC-2 SHEET 2 OF 5	REV NO 01


5TB11-3
5TB11-2
5TB11-4
1 SIG -
5 SIG +
4 LOCAL GROUND
7 5TB29-3
8 5TB29-4
TRASHRACK DIFFERENTIAL TRANSMITTER
5TB10-3
5BT10-4
5TB10-5
5TB10-5A
A B C
+12VDC
OUTPUT
COMMON
12-12XD-1
FROM 5-39XD-1 PROBE
17 FT OF CABLE SUPPLIED BY ALLIS-CHALMERS
5TB11-1
5TB10-10
5TB20-1
5TB26-6
LINE
NEUT
GND
NC
ARM
NO
NC
ARM
NO
RESET
RESET
TM
TM
1S
PROX
COM
DC
PROX
COM
DC
PROX
COM
DC
PROX
COM
DC
CHANNEL #1
CHANNEL #2
17 FT OF CABLE SUPPLIED BY ALLIS-CHALMERS
5-39
FROM 5-39XD-2 PROBE
5TB26-8
5TB20-3
5-63W-3
TBRTD-123
TBRTD-122
TBRTD-121
TBRTD-124
C B A
5-RTD-1
TURBINE UNIT #3
5TB26-9
5TB20-4
7-80W-3
TBRTD-119
TBRTD-118
TBRTD-117
TBRTD-120
C B A
7-RTD-1
PACKING BOX UNIT #3
TBA
TBB
CUSTOMER SUPPLIED 120V AC
29-71Q-3a
29-71Q-3b
29-38Q-3
R
S
L2A
L2B
L2C
L1A
L1B
L1C
TA
TB
TC
L21
L22
L23
L24
L25
L26
L11
L12
L13
L14
L15
L16
TS1
TS2
TS3
TS4
TS5
TS6
5TB20-6
5TB27-1
5TB21-8
5TB27-10
29-RTD-1
29-RTD-2
29-80Q-3
29-39-3
29-63Q-3
R1A
R1B
R1C
R2A
R2B
R2C
FA
FB
FC
FD
FE
FF
FG
FH
VA
VB
VC
VD
VE
VF
VG
VH
P1
P2
P3
TBRTD-112
TBRTD-109
TBRTD-110
TBRTD-111
TBRTD-114
TBRTD-115
TBRTD-116
TBRTD-113
5TB20-2
5TB26-7
5TB10-10
5TB10-9
5TB27-3
5TB20-8
5TB10-9
5TB10-10
5TB20-5
5TB26-10
SIL3
SPEED INCREASER LUBE SYSTEM JUNCTION BOX
5TB10-8
5TB10-10
29-20W-1-3
SPEED INCREASER UNIT #3

REVISIONS

CAD DRAWING-
NO MANUAL REVISIONS

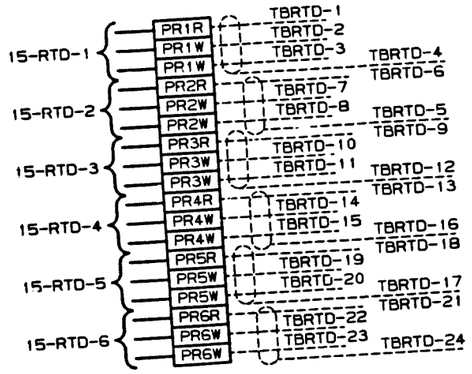
FIRST USED ON S.O. 45143

ALLIS-CHALMERS CORP.
YORK PLANT YORK, PA.

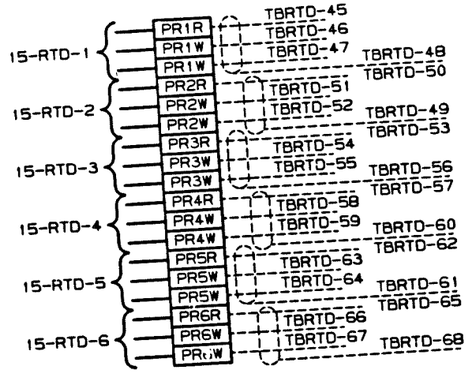
INTERCONNECTION DIAGRAM

DSGN	MLS
DFTM	MLS
MECH ENG	CWS
CHK	BAZ
SCALE	NTS
DATE	4-1-86

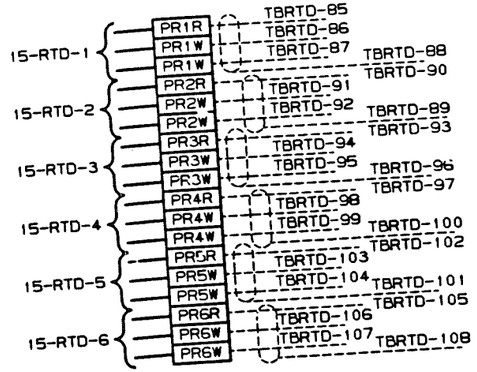
9402-YC-2 SHEET 3 OF 5 REV NO 01



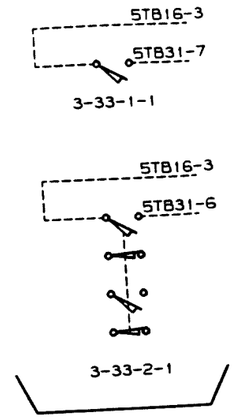
GENERATOR JUNCTION BOX #1



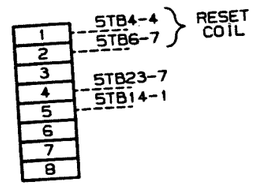
GENERATOR JUNCTION BOX #2



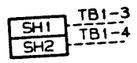
GENERATOR JUNCTION BOX #3



UNIT #1 WHEEL GATE

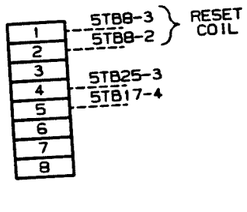


15-39-1



15-HTR-1-1

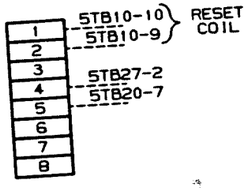
UNIT #1 GENERATOR ACCESSORY PANEL



15-39-2

15-HTR-1-2

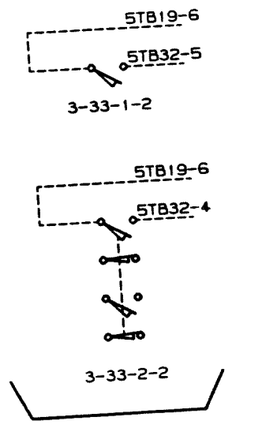
UNIT #2 GENERATOR ACCESSORY PANEL



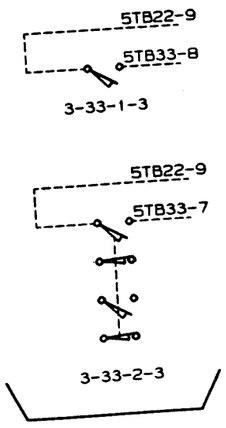
15-39-3

15-HTR-1-3

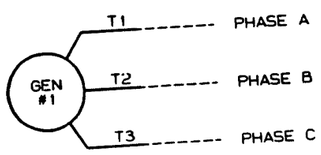
UNIT #3 GENERATOR ACCESSORY PANEL

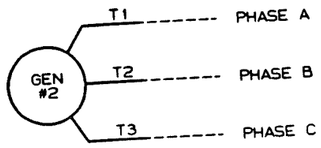


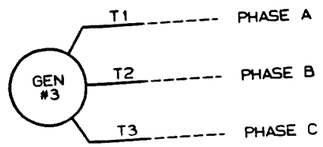
UNIT #2 WHEEL GATE



UNIT #3 WHEEL GATE







REVISIONS

CAD DRAWING- NO MANUAL REVISIONS

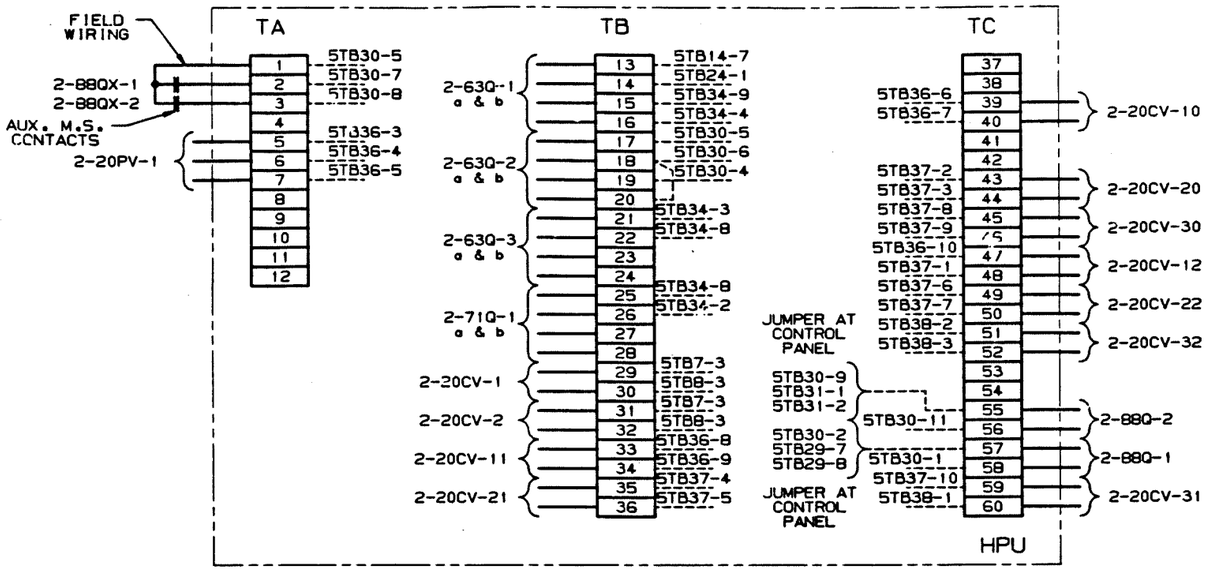
FIRST USED ON S.O. 45143

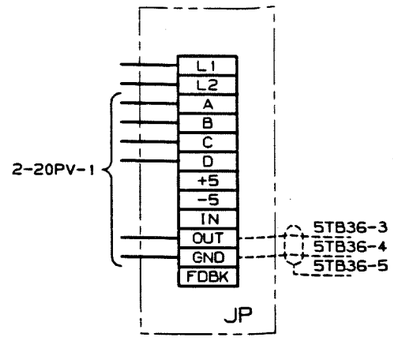
CONFIDENTIAL-PROPERTY OF
ALLIS-CHALMERS CORP.
YORK PLANT YORK, PA.

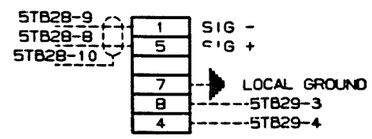
INTERCONNECTION DIAGRAM

DRAWN MLS	CHK'D APPD		
DES'N MLS	MECH ENG APPD CWS	MATERIAL	
CHK BAZ	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
SCALE NTS	DATE 4-1-86	9402-YC-2	SHEET 4 OF 5

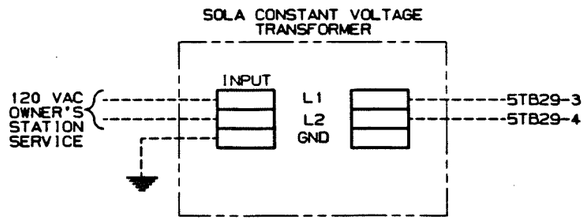
REV NO 01

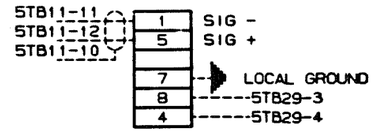






HEAD WATER LEVEL TRANSMITTER VIATRAN 503-115





TAIL WATER LEVEL TRANSMITTER VIATRAN 511-115

NOTE:
ALL EQUIPMENT SHOWN ON THIS SHEET ARE USED ON UNIT #2 ONLY

REVISIONS

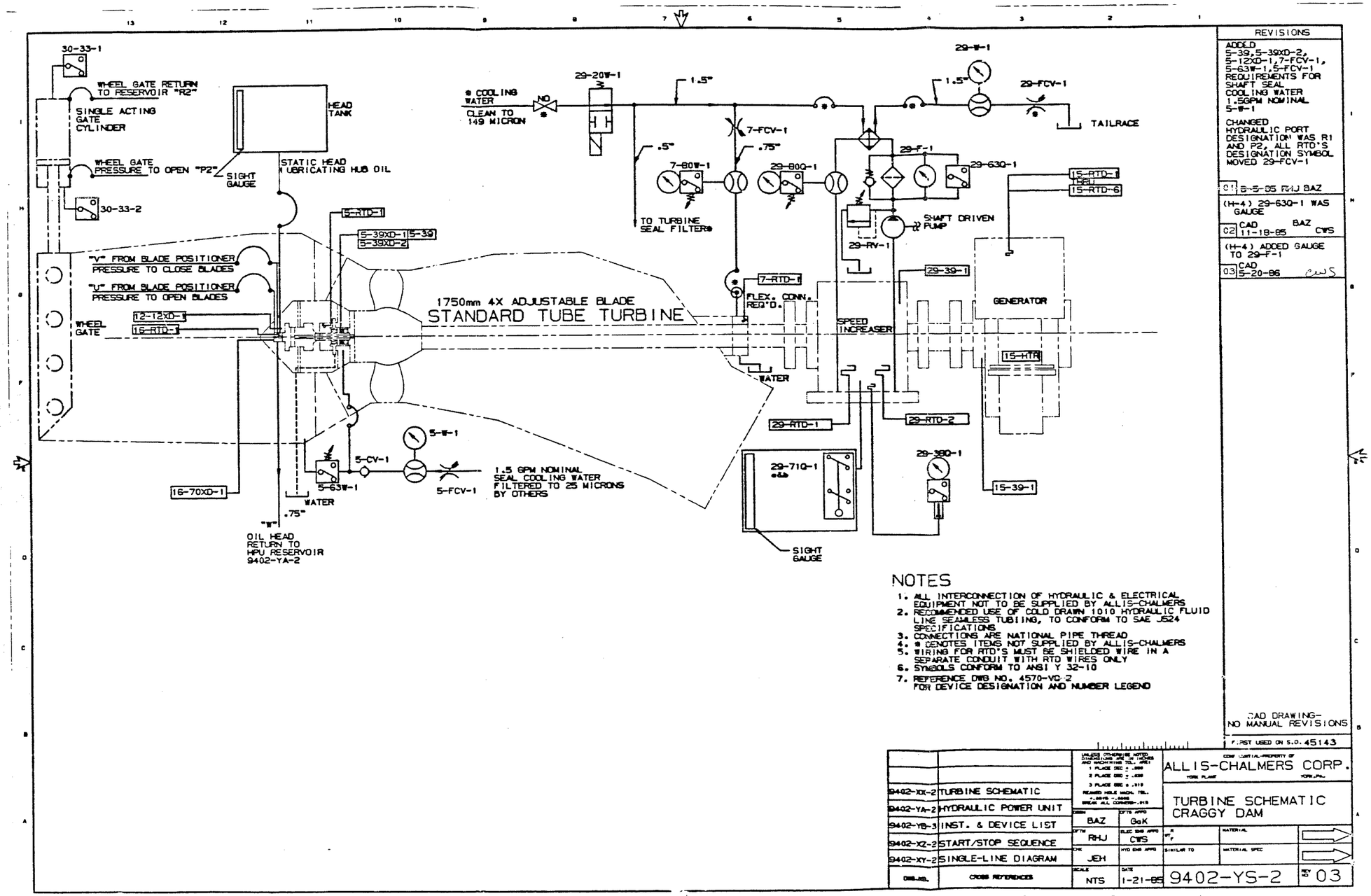
CAD DRAWING-
NO MANUAL REVISIONS

FIRST USED ON S.O. 45143

CONFIDENTIAL-PROPERTY OF
ALLIS-CHALMERS CORP.
YORK PLANT YORK, PA.

INTERCONNECTION DIAGRAM

DESIGN MLS	DFTG APPD		
DFTG MLS	MECH ENG APD CWS	WT.	MATERIAL
CHK BAZ	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
SCALE NTS	DATE 4-1-86	9402-YC-2	SHEET 5 OF 5 REV 01



NOTES

1. ALL INTERCONNECTION OF HYDRAULIC & ELECTRICAL EQUIPMENT NOT TO BE SUPPLIED BY ALLIS-CHALMERS
2. RECOMMENDED USE OF COLD DRAWN 1010 HYDRAULIC FLUID LINE SEAMLESS TUBING, TO CONFORM TO SAE J524 SPECIFICATIONS
3. CONNECTIONS ARE NATIONAL PIPE THREAD
4. * DENOTES ITEMS NOT SUPPLIED BY ALLIS-CHALMERS
5. WIRING FOR RTD'S MUST BE SHIELDED WIRE IN A SEPARATE CONDUIT WITH RTD WIRES ONLY
6. SYMBOLS CONFORM TO ANSI Y 32-10
7. REFERENCE DWG NO. 4570-VC-2 FOR DEVICE DESIGNATION AND NUMBER LEGEND

REVISIONS

ADDED 5-39,5-39XD-2, 5-12XD-1,7-FCV-1, 5-63W-1,5-FCV-1 REQUIREMENTS FOR SHAFT SEAL COOLING WATER 1.5GPM NOMINAL 5-W-1

CHANGED HYDRAULIC PORT DESIGNATION WAS R1 AND P2, ALL RTD'S DESIGNATION SYMBOL MOVED 29-FCV-1

01 8-5-85 RHJ BAZ

(H-4) 29-630-1 WAS GAUGE

02 CAD 11-18-85 BAZ CWS

(H-4) ADDED GAUGE TO 29-F-1

03 CAD 5-20-86 CWS

CAD DRAWING— NO MANUAL REVISIONS

FIRST USED ON S.O. 45143

9402-XQ-2	TURBINE SCHEMATIC
9402-YA-2	HYDRAULIC POWER UNIT
9402-YB-3	INST. & DEVICE LIST
9402-XZ-2	START/STOP SEQUENCE
9402-XY-2	SINGLE-LINE DIAGRAM
DWG.NO.	CROSS REFERENCES

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. APPLY
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL. ± .0005
* MAYS ± .0005 BRAKE ALL CORNERS-.015

DRWN BAZ — DATE CHK'D GaK
DSN'R RHJ — ELEC ENG APPR CWS
CHK JEH — HYD ENG APPR
SCALE NTS — DATE 1-21-85

ALLIS-CHALMERS CORP. YORK PLANT, YORK, PA.

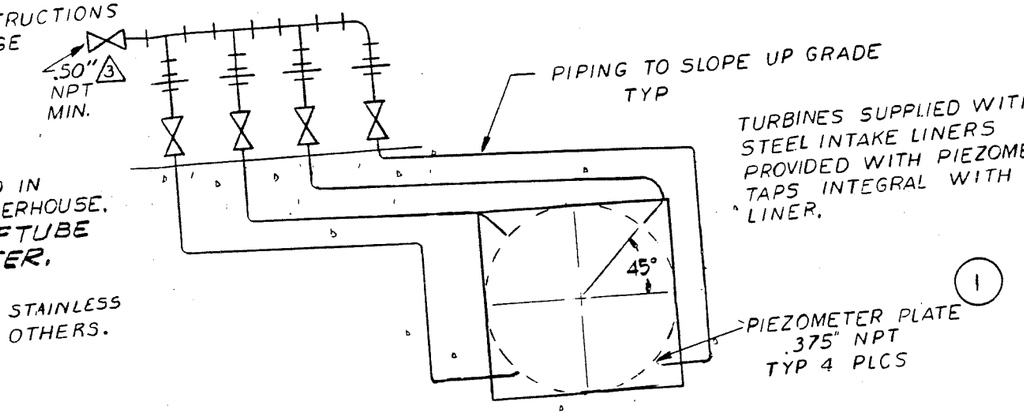
TURBINE SCHEMATIC CRAGGY DAM

R — WT — MATERIAL
SIMILAR TO — MATERIAL SPEC

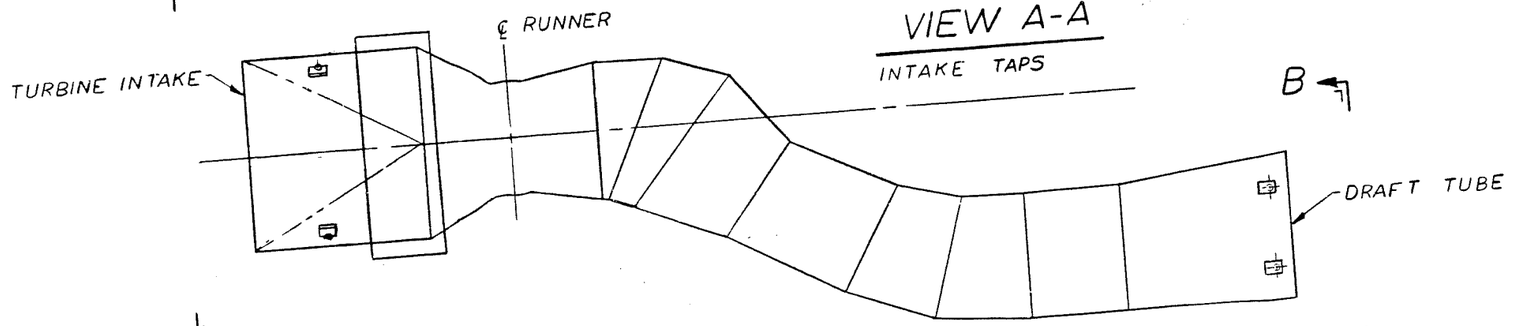
9402-YS-2 — SIZE D — NO. 03

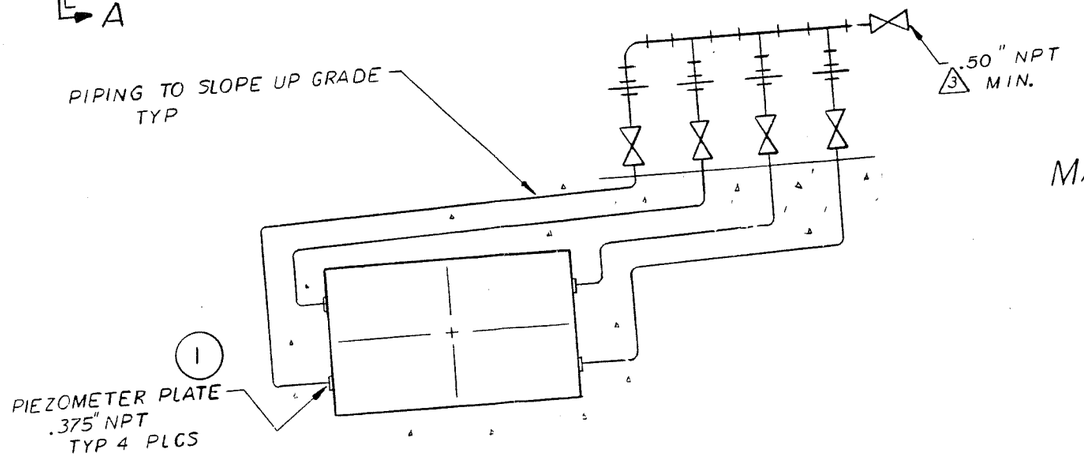
NOTES:

1. LOCATE PIEZOMETER PLATES PER INSTRUCTIONS FROM A-C OR THE A-C WATERPASSAGE NEATLINE DRAWING.
2. PIPING, VALVES, AND FITTINGS TO BE CORROSION RESISTANT, BY OTHERS.
3. LOCATE EACH PIEZOMETER MANIFOLD IN CONVENIENT LOCATION WITHIN POWERHOUSE. WHENEVER POSSIBLE LOC DRAFTUBE MANIFOLD BELOW MIN TAILWATER.
4. ALL PIPING TO BE .50" SCHEDULE 30, STAINLESS (3) STEEL OR RED BRASS, MINIMUM, BY OTHERS.



VIEW A-A





VIEW B-B

MASTER 535

REVISIONS
GEN'L REVISION 10-21-85 01 RJS
WAS STAGE I FOUNDATN 10-22-85 02 RJS QH
(B-3)(F-6).50 WAS .375 (E-8) REVISED NOTE QH 03 CAW MDG 1-17-86

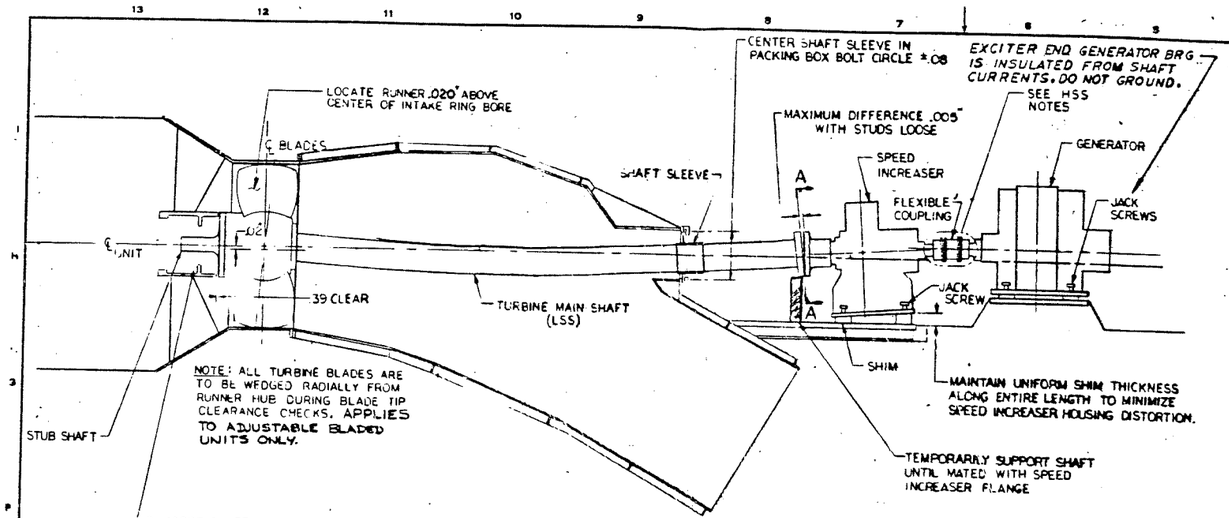
FIRST USED ON S.O. 20913

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL ARE:
1 PLACE DEC ±.060
2 PLACE DEC ±.030
3 PLACE DEC ±.010
REAMED HOLE MACH. TOL +.0015 — .0005
BREAK ALL CORNERS — .015

CONFIDENTIAL — PROPERTY OF ALLIS-CHALMERS CORP. YORK PLANT YORK, PA.

TYPICAL PIEZOMETER PIPING ARRANGEMENT

DSGN KEM	DFTG APPD		
DFTM DBK	MECH ENG APPD GRB	WT R F	MATERIAL
CHK KEM	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
SCALE NONE	DATE 4-28-83	9403-FC-5	REV NO 03



Low Speed Shaft (LSS) Alignment

1) Establish unit centerlines by locating the runner in the intake ring bore and the turbine shaft sleeve in the packing box bolt circle. Shaft need not be horizontal.

2. Engage turbine shaft and speed increaser LSS spigots and snug coupling studs to draw flange faces together, then loosen nuts a minimum of 1/4 turn. Measure flange face clearance at four 90° intervals (Top, R, Bottom, L). See Section A-A. The difference in minimum and maximum clearance measurements shall not exceed .005".

3. Rotate shaft 90°, and repeat Step 2.

4. Repeat Step 3, three more times. At each 90° rotation, the maximum allowable difference in clearance measurements is .005". The readings at 0° and 360° should be identical.

5. Adjust speed increaser by packing as necessary to obtain required parallelism. Shim speed increaser base and torque holddown screws.

6. Recheck flange face parallelism, and record values in the table under cold alignment. Torque flange studs.

7. Use the speed increaser manufacturer's instructions to check for speed increaser base distortion.

LSS

COLD ALIGNMENT (PRIOR TO START-UP)

	0°	90°	180°	270°	360°
TOP					
R					
BOT					
L					

HSS

COLD ALIGNMENT (PRIOR TO START-UP)

	0°	90°	180°	270°	360°
OFFSET ALIGNMENT (T.I.R.)					
ANGULARITY ALIGNMENT (T.I.R.)					

LSS

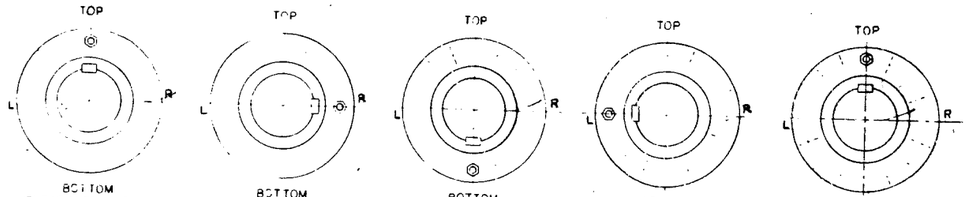
HOT ALIGNMENT (AFTER 12 HRS CONT OPERATION)

	0°	90°	180°	270°	360°
TOP					
R					
BOT					
L					

HSS

HOT ALIGNMENT (AFTER 12 HRS CONT OPERATION)

	0°	90°	180°	270°	360°
OFFSET ALIGNMENT (T.I.R.)					
ANGULARITY ALIGNMENT (T.I.R.)					



SECTION A-A (FACING SPEED INCREASER)

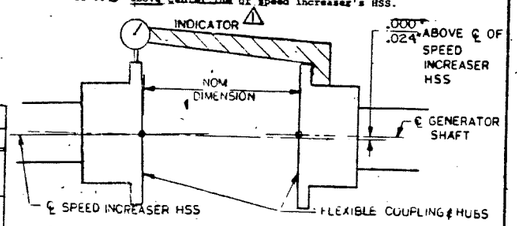
GENERAL NOTES

1. Do Not weld, arc, chip, or grind on or in the vicinity of any shaft or rotating part other than to weld the nut lockbars. When welding lockbars to shaft, do not ground shaft thru the bearings.
2. Use only fabric slings to lift rotating parts.
3. Paint runner and turbine shaft after installation with red lead Type II primer (by others).
4. Recheck all shaft (LSS AND HSS) alignments after the first 12 hours of continuous unit operation. Load rejection tests are to be performed prior to this alignment check if possible. Unit to be at operating temperature during alignment recheck.
5. It is good practice to check alignment once more after operating under load for two or three weeks.
6. It is good practice to change all lubricating oils and take samples of each for analysis after two or three weeks of operation.
7. Follow the speed increaser and generator manufacturer's recommendations for start-up instructions.

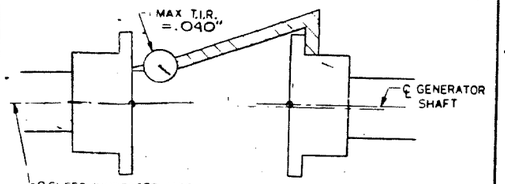
High Speed Shaft (HSS) Alignment

Note: See Falk Company Service Manual for detailed instructions for aligning shafts.

1. Align generator .000/.024" (lateral offset ±.012") above the centerline of the speed increaser's HSS. Check offset alignment using a dial indicator against O.D. of speed increaser's coupling hub, as shown. Sweep O.D. of coupling by rotating the GENERATOR shaft and record values of T.I.R. at 90° intervals. Maximum allowable T.I.R. is .048" above centerline of speed increaser's HSS.



2. Check the angular alignment using a dial indicator against the face of the speed increaser's coupling hub, as shown. Sweep face of coupling by rotating the GENERATOR SHAFT and record values of T.I.R. at 90° intervals. Maximum allowable T.I.R. is .040".



3. Adjust generator as necessary to obtain the required alignment. Torque generator's holddown screws and repeat steps 1 and 2.
4. Reposition dial indicator onto the speed increaser's HSS and recheck alignments by indicating on face and O.D. of generator's coupling hub.
5. Pack coupling teeth with grease and assemble coupling. Lubricate after assembly.
6. Upon completion of LSS and HSS alignments, dowel the outboard bearing housing, speed increaser, and generator per their respective assembly drawings.
7. Record values of T.I.R. in table provided.

REVISIONS

(A-1) ADDED 1040 & 1050 TO 1045
(D-1) GEN SHAFT WAS SPEED INCREASER
(G-3) GEN. WAS SPEED INCREASER'S
01 9-24-84 KEM CER

FIRST USED ON S.O.

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL ARE: 1 PLACE DEC ± .060, 2 PLACE DEC ± .030, 3 PLACE DEC ± .010, REAMED HOLE MACH. TOL. + .0015 — .0005, BREAK ALL CORNERS — .015

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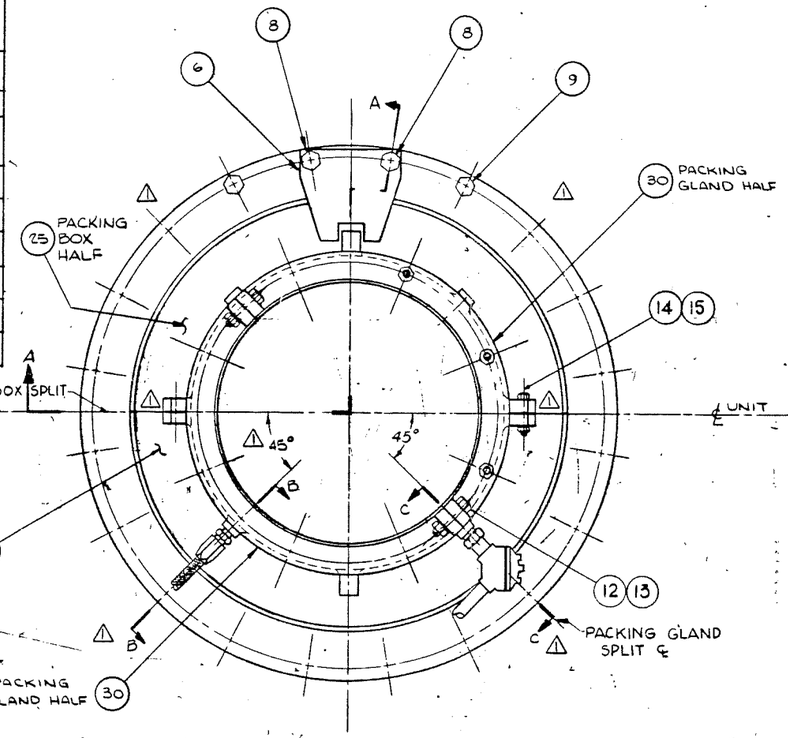
SHAFT ALIGNMENT TOLERANCES & PROCEDURE (1040, 1045 & 1050 FLEX. COUPLING)

DRAWN KEM	DATE APPD	WT	MATERIAL
DFTM GAK	MECH ENG APPD	SIZE A	
CHK KEM	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
SCALE NTS	DATE 8-10-83	9403-HO-2	01

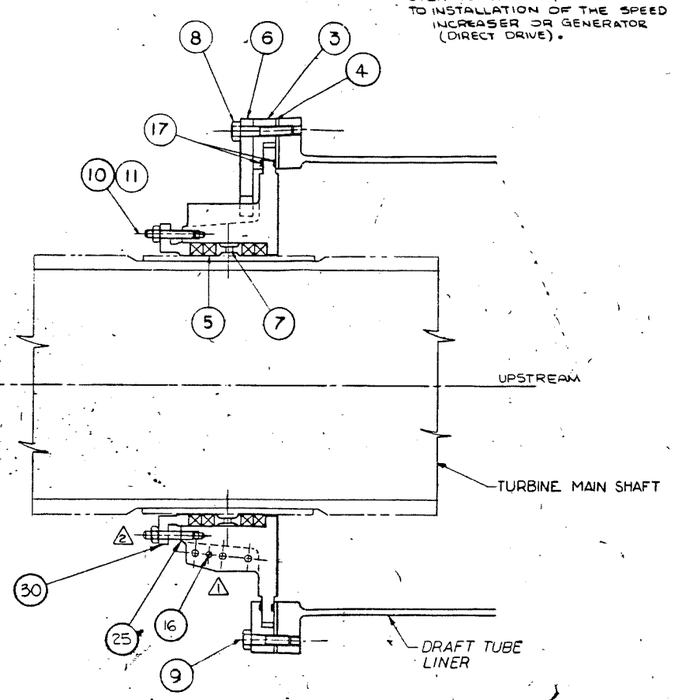
LIST OF MATERIAL	
ITEM NO	MATERIAL
3,6	PLATE STEEL A516-60, A283-B OR A-36
4	SST TYPE 304
5,19,20 & 21	COML.
7	GLASS FILLED TEFLON
8,9,12,13,14 & 15	STEEL A-307
10	SST 300 SERIES
11	SST 400 SERIES
16	STEEL COML
17	NITRILE 60-70 DURO
25,26 & 30	CAST ALUM. B26,1319-F

NOTES: 1. USE LOCTITE #242 TO SECURE ALL FASTENERS

2. ITEMS 3 & 4 MUST BE INSTALLED OVER TURBINE MAIN SHAFT PRIOR TO INSTALLATION OF THE SPEED INCREASER OR GENERATOR (DIRECT DRIVE).



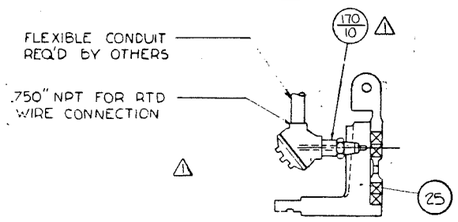
△ VIEW LOOKING UPSTREAM



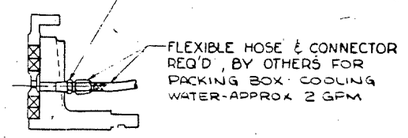
SECTION A-A

THIS PACKING BOX IS OF THE FLOATING TYPE. IT IS DESIGNED TO ACCOMODATE STATIC AND DYNAMIC DISPLACEMENTS INHERENT WITH A HORIZONTAL SHAFT.

TOTAL RADIAL CLEARANCE = ±.38
AT SETUP, CENTER WITHIN = ±.19
DYNAMIC DISPLACEMENT = ±.19



SECTION C-C



SECTION B-B

MASTER #360

REVISIONS
(G-11) ROTATED SECT C-C & 170/10 180° TO (D-8)
(G-8) ROTATED SECT B-B & FLEX. HOSE 180° TO (E-11)
(F-10) ADDED 45° ANGLE
(C-10) ADDED VIEW LOOKING UPSTREAM
(C-11) 170/10 WAS ITEM 20
(C-12) DELETED ITEM 19
(D-12) DELETED ITEM 21
(E-9, F-8, F-11) REVISED SPLIT FLANGE OF PACKING BOX ITEM 25
01 4-24-84 DBB
E-9 REVISED PICTURE
02 DBB CAW 12-12-85

JC NO. 14690.01
P.O. NO. 14690-H101U

FIRST USED ON S.O. 45049

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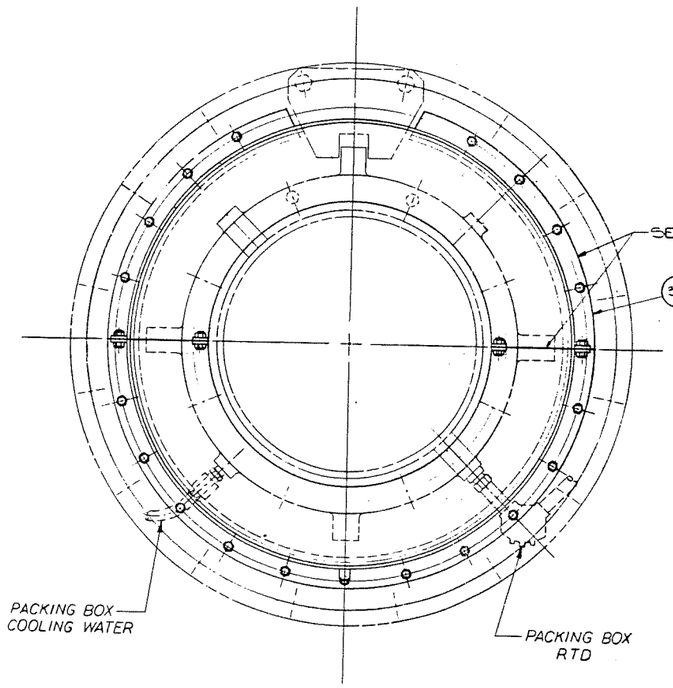
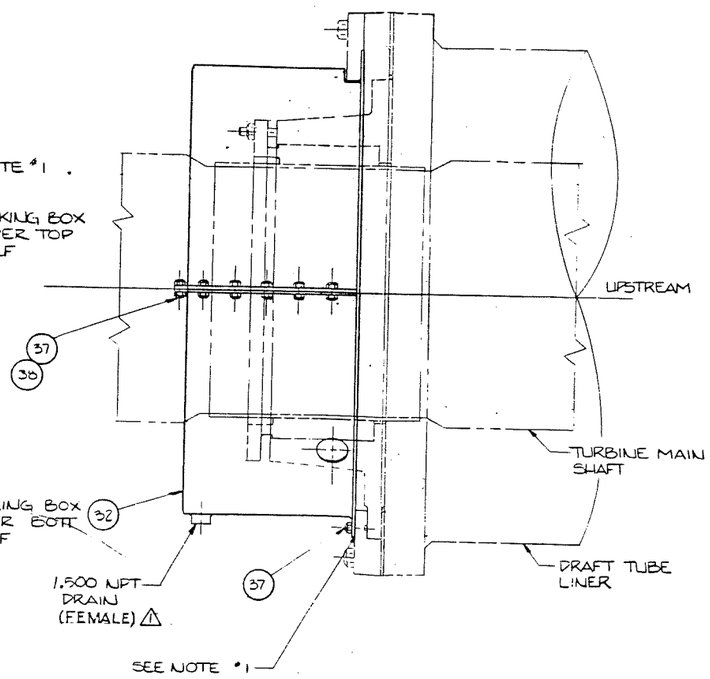
PACKING BOX ASSEMBLY

DRAWN DBB	DETD APPD		
DFTM	MACH ENG APPD	WT.	MATERIAL
CHK CAFD	HYD ENG APPD	SIMILAR TO 9403 EN-2	MATERIAL SPEC
SCALE NTS	DATE 12-20-84	9403-JL-2	REV NO 02

LIST OF MATERIAL	
ITEM NO	MATERIAL
31, 32	CRS ASTM A366 LOW CARBON
37, 38	STL COML

NOTE:
1. SEAL FLANGES WITH LOCTITE GASKET ELIMINATOR 504 . PRIOR TO ASSEMBLY.





REVISIONS		
(C-5) ADDED "FEMALE"		
01	CAW	12-12-85

MASTER #360

JOB NO. 14590.01
P.O. NO. 14590-H101U

FIRST USED ON S.O. 45099

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE:
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL.
+ .0015 — .0005
BREAK ALL CORNERS — .015

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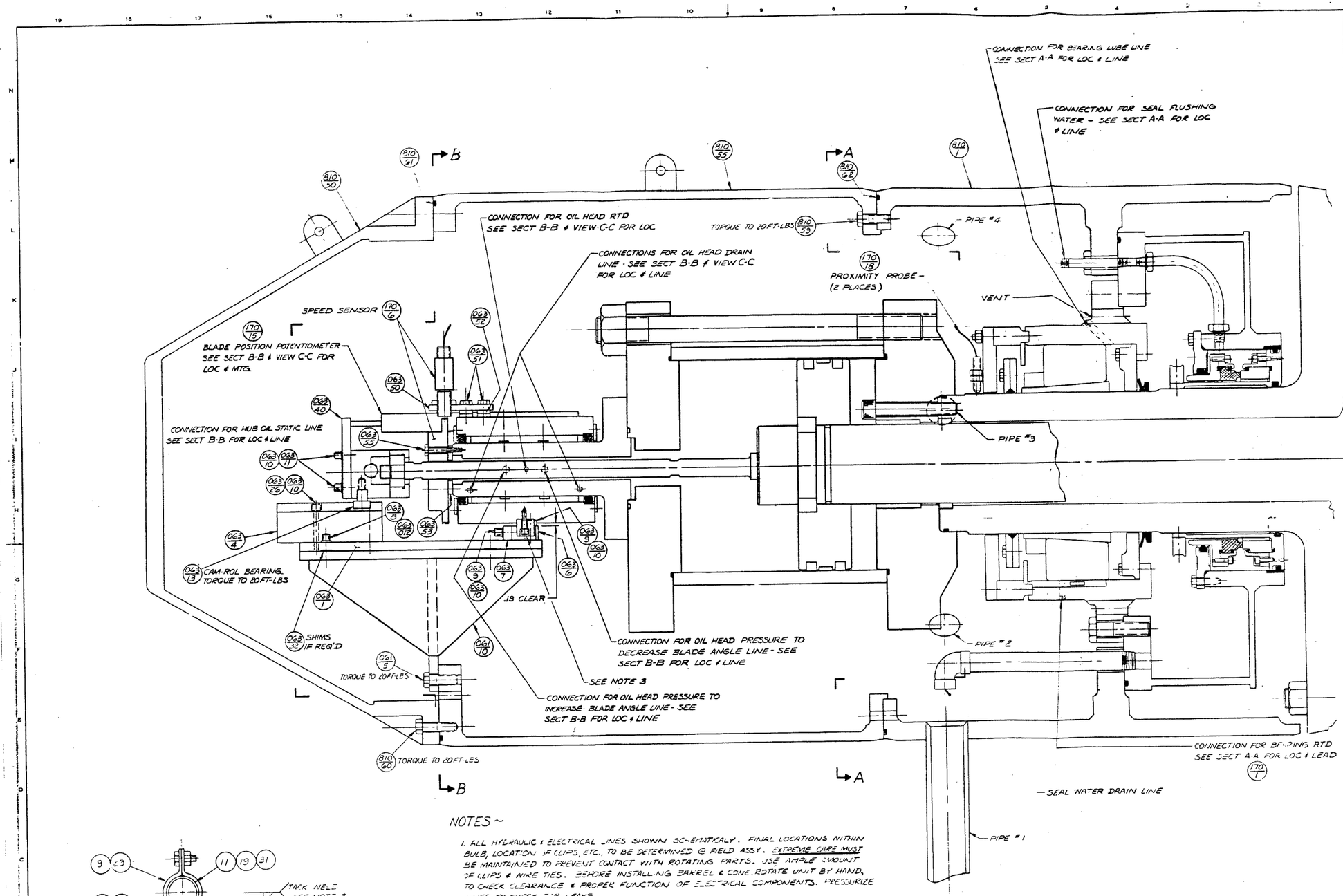
YORK PLANT YORK, PA.

PACKING BOX COVER ASS'Y

DSGN RS	DFTG APPD		
DFTM MAR	MECH ENG APPD	WT: R / F	MATERIAL
CHK RJS	HYD ENG APPD	SIMILAR TO 9403-KU-2	MATERIAL SPEC
SCALE 1:4	DATE 6-18-64	9403-L R-2	REV NO 01



TYP CLIP DETAIL
NTS

NOTES ~

1. ALL HYDRAULIC & ELECTRICAL LINES SHOWN SCHEMTKALY. FINAL LOCATIONS WITHIN BULB, LOCATION OF CLIPS, ETC., TO BE DETERMINED @ FIELD ASST. EXTREME CARE MUST BE MAINTAINED TO PREVENT CONTACT WITH ROTATING PARTS. USE AMPLE AMOUNT OF CLIPS & WIRE TIES. BEFORE INSTALLING BARREL & CONE, ROTATE UNIT BY HAND, TO CHECK CLEARANCE & PROPER FUNCTION OF ELECTRICAL COMPONENTS. PRESSURIZE LINES TO CHECK FOR LEAKS.

2. WHEN WELDING CLIPS TO BARREL & INTAKE RING, GROUND WELDING MACHINE TO PIECE BEING WELDED, TO PREVENT DAMAGE TO ROLLER BEARINGS.

3. OIL HEAD KEY SHOULD HAVE A MINIMUM OF .03 CLEARANCE ON A SIDE, ALLOWING FLOATATION BUT RESTRICTING ROTATION.

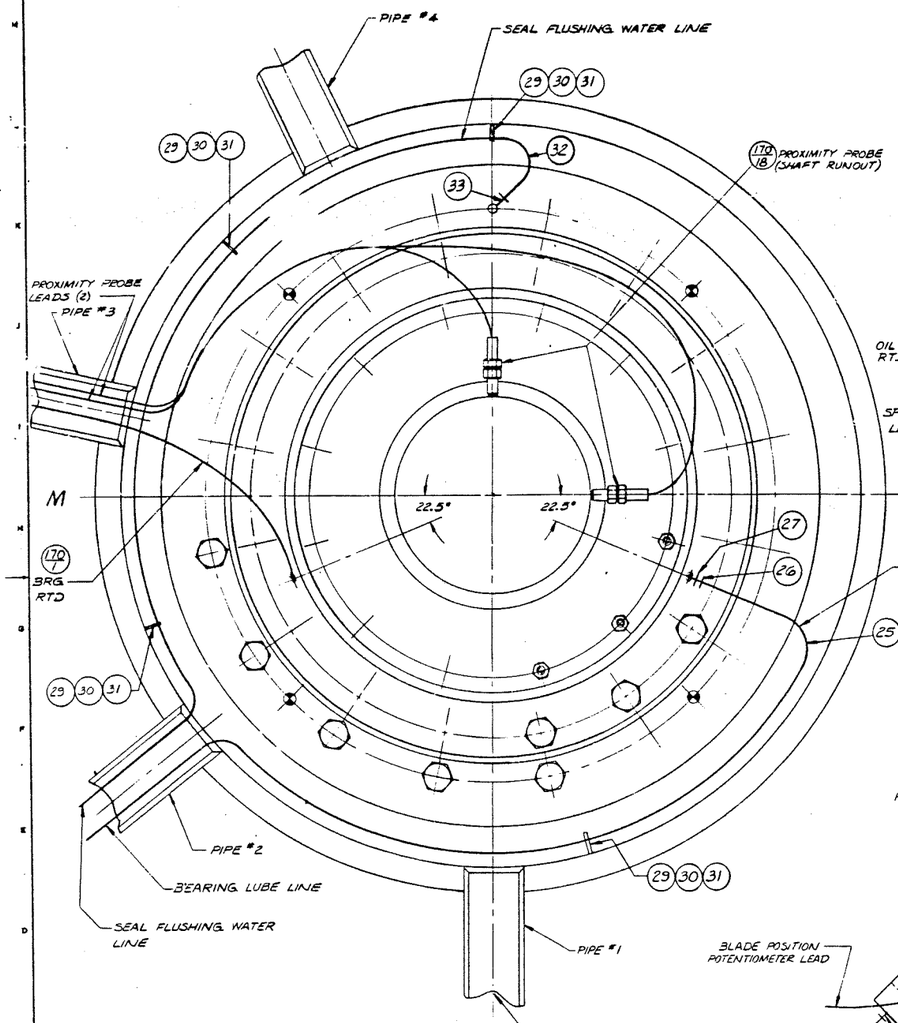
4. LUBRICATE ALL GREASE FITTINGS PRIOR TO INITIAL OPERATION.

MASTER #420
UNLESS SPECIFIED OTHERWISE

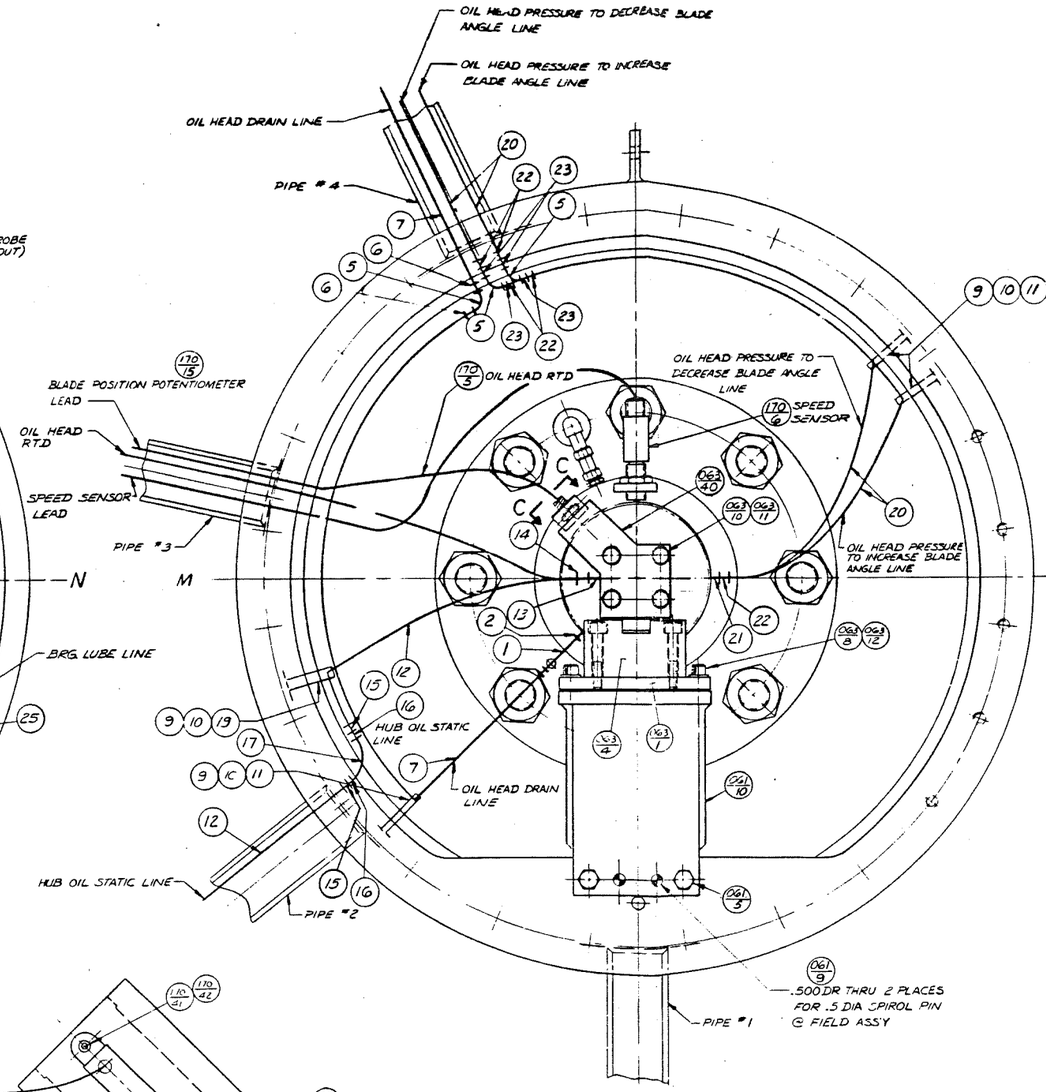
FIRST USED ON SO 45141

9403-QP-1	RESTORING MECH'M/DIELECT CONN	UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL ARE 1 PLACE DEC ± .060 2 PLACE DEC ± .030 3 PLACE DEC ± .010 REAMED HOLE MACH TOL +.0015 −.0005 BREAK ALL CORNERS — .015	CONFIDENTIAL — PROPERTY OF ALLIS-CHALMERS CORP. YORK PLANT: YORK, PA.
9417-RFE-1	ROTATING PARTS ASSY (4X)		
9417-CCV-1	OUTBOARD BRG/SEAL ASSY (4X)		RESTORING MECHANISM & HYDRAULIC/ELECTRICAL CONNECTIONS
9417-QQ-1	TURBINE ROOM MD/ELECT CONN	DRAWN DED	
9417-RFF-1	ROTATING PARTS ASSY (4X)	CHECKED DED	
		MECHANICAL SPEC	MATERIAL
		ELECTRICAL SPEC	MATERIAL SPEC

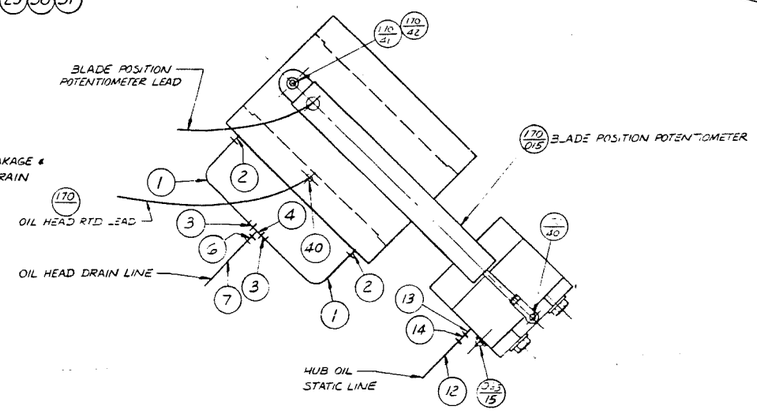
REVISIONS



SECT A-A



SECT B-B



VIEW C-C

MASTER #420
UNLESS SPECIFIED OTHERWISE

FIRST USED ON SO 45141

9403-QQ-1	RESTORING MECH & HYD/ELECT CONN
9403-QQ-1	TURBINE ROOM & D/ELECT CON

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL ARE
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH TOL .7513 — .7505
BREAK ALL CORNERS — .015

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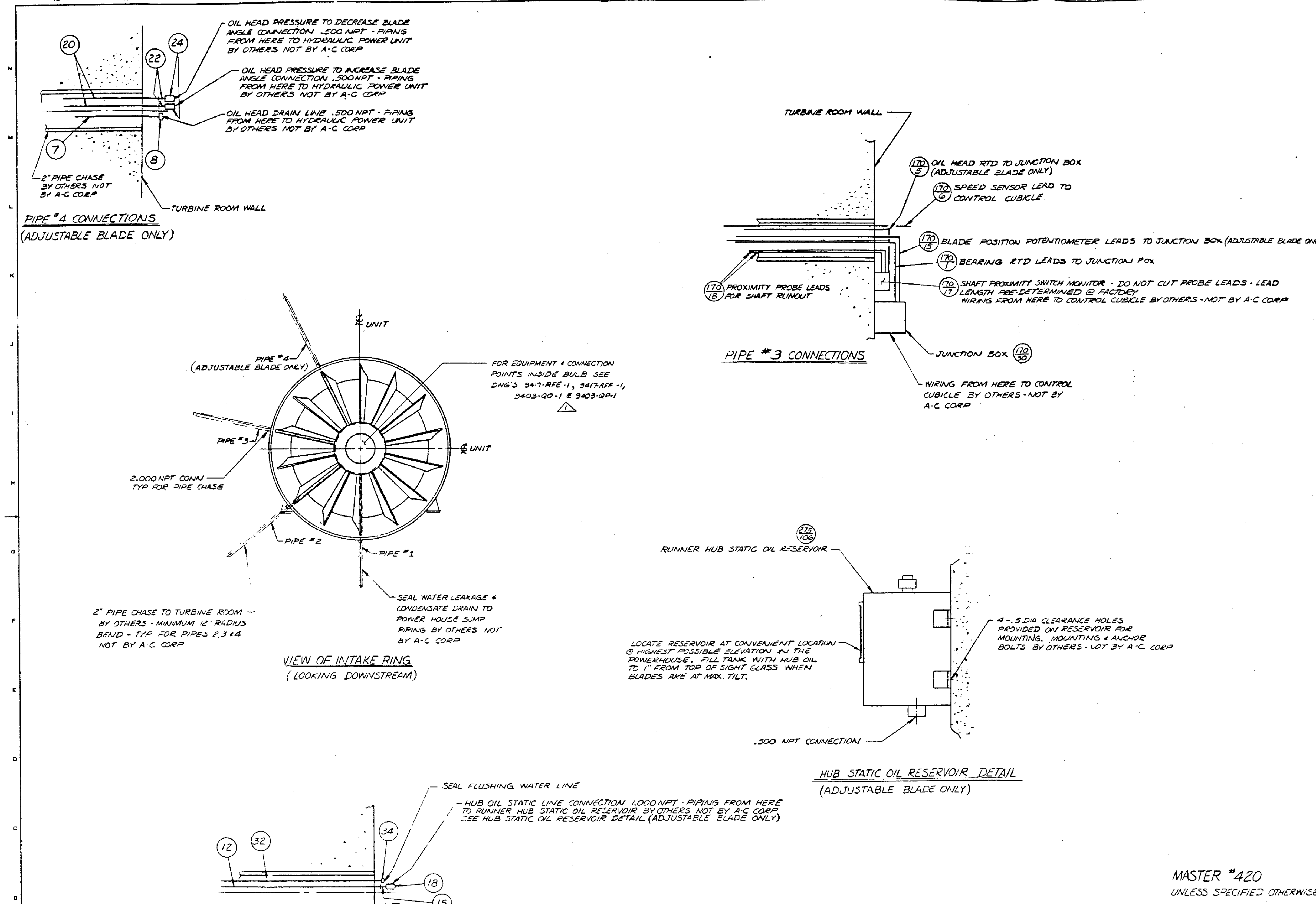
YORK PLANT YORK, PA

RESTORING MECHANISM & HYDRAULIC ELECTRICAL CONNECTIONS DETAILS

DSGN	LED	APPD	
DRN	LED	WEIGHING APPD	LDS
CHK	400	ENGINEERING APPD	
SCALE	1:2	DATE	8-16-85
SIMILAR TO			
M'L		MATERIAL	
M'L SPEC		MATERIAL SPEC	

DWG NO 9403-QP-1 REV NO 00

CROSS REFERENCES



REVISIONS

(1-12) REF DWGS HERE 9417-REU-1, 9403-NW-1, & 9403-NX-1.

01 10-29-85

MASTER #420

UNLESS SPECIFIED OTHERWISE

FIRST USED ON S.O. 45141

9403-QO-1	RESTORING MECH & HYD/ELECT CONN
9403-QP-1	RESTORING MECH & HYD/ELECT DETAILS

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE: 1 PLACE DEC ± .080, 2 PLACE DEC ± .030, 3 PLACE DEC ± .010, REAMED HOLE MACH. TOL. + .0015 — .0005, BREAK ALL CORNERS — .015

DSGN DED — DFTM DED

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YORK PLANT YORK, PA.

TURBINE ROOM HYDRAULIC/ELECTRICAL CONNECTION DETAILS

WT. — MATERIAL — SIMILAR TO — MATERIAL SPEC

I. General

1. The bearing is to remain in its factory packaging until immediately prior to its installation into the turbine assembly. Open the packaged bearing only when ready to install bearing.

2. The bearing is to be protected from contamination at all times once removed from its factory packaging.

3. The bearing is factory preserved with lubricant and need not be cleaned unless contaminated.

4. The work area in the vicinity of an unwrapped bearing and the bearing assembly is to be clean and free of dirt and other foreign matter.

5. Persons handling the bearing are to have clean hands.

6. A dirty bearing is to be cleaned with a petroleum solvent or flushing oil. Solvents or flushing oils, pails, and rags are to be unused, clean, and dirt and lint free. Flushing oil is the preferred cleaning fluid. Bearings should be cleaned only when necessary.

7. Cover bearing assembly with clean rags to prevent bearing contamination.

8. Refer to bearing manufacturer literature found in the unit instruction manual for more information.

Ref: FAG Publication No. 80100 ED
SKF Publication No. 104-110

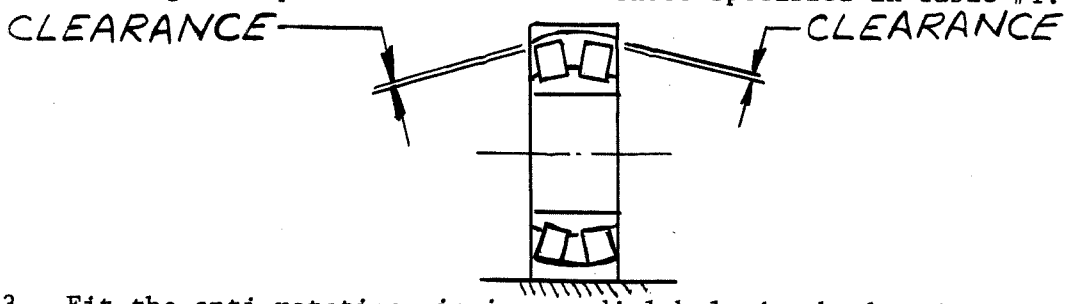
II. Shop Assembly of Turbine Outboard Bearing

The following procedure is to be used by A-C personnel for the shop installation of a tapered bore spherical roller bearing into the rotating parts assembly. This procedure presumes that the rotating parts is assembled in the vertical position and that the bearing housing is assembled with the shaft. The bore of the bearing housing and turn of the shaft are to have been cleaned and deburred prior to their assembly. The bearing housing must be in the correct axial position with respect to the shaft.

FIRST USED ON S.O. 45121	REVISIONS TO BE MADE ONLY ON IBM 5253 WORD PROCESSOR		
REVISIONS	UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE: 1 PLACE DEC ±.060 2 PLACE DEC ±.030 3 PLACE DEC ±.010 REAMED HOLE MACH. TOL. +.0015 — .0005 BREAK ALL CORNERS —.015	CONFIDENTIAL — PROPERTY OF ALLIS - CHALMERS CORP. YORK PLANT YORK, PA.	
		TURBINE OUTBOARD BEARING MOUNTING INSTRUCTIONS	
	DSGN DED / DFTG APPD		
	DFTM ly / MECH ENG APPD	WT R F / MATERIAL	
	CHK / HYD ENG APPD MF	SIMILAR TO / MATERIAL SPEC	
	SCALE — / DATE 10/4/85	9403-RS-4 Sheet 1 of 6	REV NO 00

1. Remove bearing from package and inspect for damage and contamination. See Section I.

2. Place bearing on end and measure the unmounted radial internal clearance of the bearing. The clearance is measured by inserting a progressively larger thickness gauge between the most vertical unloaded rollers and the spherical bore of the outer race. The clearance must be measured simultaneously over both rows of rollers. Do not roll the thickness gauge through the clearance, slide it through. Record the thickness of the largest thickness gauge which will pass through the bearing. Compare this value with those specified in Table #1.



3. Fit the anti-rotation pin in a radial hole in the bearings outer race. Inspect this assembly to be sure that the pin does not project into the spherical bore of the bearing race and that the large diameter of the pin shoulders on the bearings outer race.

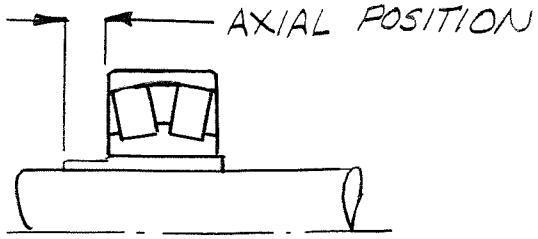
4. Apply a thin film of light machine oil (SAE 10 or lighter) to the shaft turn, adapter sleeve outer diameter, bearing housing bore, and face of locknut.

5. Install the tapered adapter sleeve on the shaft.

6. Install bearing with anti-rotation pin in the bore of bearing housing and adjust for correct axial position. Axial position is to be controlled either by a dimension on the assembly drawing

7. Pull the adapter sleeve between the shaft and the bearing bore until the bearing is snug on the adapter sleeve. Check that the bearing remains in the correct axial position as shown on assembly drawing Measure the axial distance between the end of the adapter sleeve and the face of the bearings inner race. See the figure below. Record this measurement.

FIRST USED ON S.O. 45121	REVISIONS TO BE MADE ONLY ON IBM 5253 WORD PROCESSOR		
REVISIONS	UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL ARE: 1 PLACE DEC ±.060 2 PLACE DEC ±.030 3 PLACE DEC ±.010 REAMED HOLE MACH. TOL. +.0015 — .0005 BREAK ALL CORNERS — .015	CONFIDENTIAL — PROPERTY OF ALLIS - CHALMERS CORP. YORK PLANT YORK, PA.	
	DSGN DED / DFTG APPD	TURBINE OUTBOARD BEARING MOUNTING INSTRUCTIONS	
	DFTM ly / MECH ENG APPD	WT R F / MATERIAL	
	CHK / HYD ENG APPD MF	SIMILAR TO / MATERIAL SPEC	
	SCALE — / DATE 10/4/85	9403-RS-4 Sheet 2 of 6	REV NO 00



8. Apply an anti-seize compound to the threads of the adapter sleeve.

9. Install the locknut on the adapter sleeve and rotate the locknut on the sleeve until the bearing is displaced axially relative to the sleeve by the amount specified on Table #1. Without exceeding the specified axial displacement tolerance the locknut must be rotated on the sleeve to allow locking of either the supplied lockwasher or lockplate. Do not over reduce the internal clearance of the bearing. Do not install lockwasher to assembly until the bearing is mounted because the drive up procedure may damage lockwasher.

10. A spanner wrench is provided for torquing the locknut on the adapter sleeve.

III. Field Verification of Shop Assembled Turbine Outboard Bearing

The following procedure is to be used by the field installer of the turbine rotating parts assembly, preferably by or under the supervision of an A-C Field Representative to verify that the bearing is properly mounted on the shaft. This procedure presumes that the rotating parts assembly has been properly bolted with the turbine main shaft, correctly positioned with respect to the stationary turbine components, and supported by temporary supports positioned under the runner hub and shaft.

1. Remove the cover from the bearing housing.

2. Position the bearing housing so that the outer race of the bearing housing is unloaded.

3. Measure the radial internal clearance between the vertical most unloaded roller and the spherical bore of the outer race. See Section II, Paragraph 2.

FIRST USED ON S.O. 45121	REVISIONS TO BE MADE ONLY ON IBM 5253 WORD PROCESSOR		
REVISIONS	UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE: 1 PLACE DEC ± .060 2 PLACE DEC ± .030 3 PLACE DEC ± .010 REAMED HOLE MACH. TOL. +.0015 — .0005 BREAK ALL CORNERS — .015	CONFIDENTIAL — PROPERTY OF ALLIS - CHALMERS CORP. YORK PLANT YORK, PA.	
		TURBINE OUTBOARD BEARING MOUNTING INSTRUCTIONS	
	DSGN DED / DFTG APPD		
	DFTM ly / MECH ENG APPD	WT R F / MATERIAL	
	CHK / HYD ENG APPD	SIMILAR TO / MATERIAL SPEC	
	SCALE — / DATE 10/4/85	9403-RS-4 Sheet 3 of 6	REV NO 00

4. The clearance should be within the permissible radial clearance for a mounted bearing as specified on Table #1.

5. If the internal clearance is not within the specified tolerance, adjust the bearing mounting as required by further mounting or dismounting the bearing to obtain the required permissible radial clearance.

6. Torque the bearing housing flange screws to the value specified on the assembly drawing.

IV. Field Mounting of Turbine Outboard Bearing

The following procedure is to be used by the field installer of the turbine outboard bearing, preferably by or under the supervision of an A-C Field Representative. This procedure presumes that the outboard bearing housing, seal housing with seals, and runner with stub shaft are properly assembled in the stationary turbine components.

1. Adjust the bore of the bearing housing to be concentric with the turn of the shaft. Bolt the housing to it's flange.

2. Follow the procedures outlined in Section II, Paragraph 1, 2, 3, 4, 5, 6, and 7.

3. Apply an anti-seize compound to the threads of the adapter sleeve and to the face of the locknut where it contacts the bearing inner race.

4. Install the locknut on the adapter sleeve and tighten the nut against the bearing until the bearing is snug on the sleeve. Check that the bearing is supporting no shaft weight by measuring clearance between the bore of the housing and the bearing outer race at the bottom position. Do not attempt to drive the bearing up the adapter sleeve while the bearing is supporting weight. If the adapter sleeve is provided with a lockwasher, do not install it at this time as it might be damaged during the next operation.

FIRST USED ON S.O. 45121	REVISIONS TO BE MADE ONLY ON IBM 5253 WORD PROCESSOR		
REVISIONS	UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE: 1 PLACE DEC ±.060, 2 PLACE DEC ±.030, 3 PLACE DEC ±.010, REAMED HOLE MACH. TOL. +.0015 — .0005, BREAK ALL CORNERS — .015	CONFIDENTIAL — PROPERTY OF ALLIS - CHALMERS CORP. YORK PLANT YORK, PA.	
		TURBINE OUTBOARD BEARING MOUNTING INSTRUCTIONS	
	DSGN DED / DFTG APPD		
	DFTM ly / MECH ENG APPD	WT R F	MATERIAL
	CHK DAD / HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
	SCALE — / DATE 10/4/85	9403-RS-4 Sheet 4 of 6	REV NO 00

5. Using the spanner wrench provided and a sledge hammer, drive the bearing onto the adapter sleeve. The bearing is to be driven up the sleeve until the internal clearance is reduced by the amount specified on table # 1 or until the internal clearance is within the permissible range for a mounted bearing as specified on table #1. To measure the internal clearance the bearing must be lowered to rest in the bearing housing. Do not overtighten the bearing on the sleeve. The clearance is to be measured at the top most unloaded roller.

6. If the bearing is mounted on the stub shaft outside of the water passage with the rotating parts assembly supported horizontally in blocking, provisions must be made to raise the bearing and bearing housing so that the internal clearance of the bearing can be made at the top of the bearing.

7. Without exceeding the permissible internal clearance tolerance, the locknut must be rotated on the sleeve to allow locking of either the supplied lockwasher or lockplate. The lockwasher should be installed at this time on units so equiped.

FIRST USED ON S.O. 45121	REVISIONS TO BE MADE ONLY ON IBM 5253 WORD PROCESSOR		
REVISIONS	UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL ARE: 1 PLACE DEC ±.060 2 PLACE DEC ±.030 3 PLACE DEC ±.010 REAMED HOLE MACH. TOL. +.0015 — .0005 BREAK ALL CORNERS —.015	CONFIDENTIAL — PROPERTY OF ALLIS - CHALMERS CORP. YORK PLANT YORK, PA.	
		TURBINE OUTBOARD BEARING MOUNTING INSTRUCTIONS	
	DSGN DED / DFTG APPD		
	DFTM ly / MECH ENG APPD	WT R F / MATERIAL	
	CHK / HYD ENG APPD	SIMILAR TO / MATERIAL SPEC	
	SCALE ~ / DATE 10/4/85	9403-RS-4 Sheet 5 of 6	REV NO 00

TAPERED SPHERICAL ROLLER BEARINGS

TABLE #1

BEARING NUMBER	UNMOUNTED BEARING CLEARANCE (in.)	REDUCTION IN INTERNAL CLEAR FOR MOUNTING (in.)	AXIAL DISPLACEMENT FOR MOUNTING (in.)	PERMISSIBLE RADIAL CLEARANCE FOR MOUNTED BEARING (in.)
23030 K	.0051 / .0071	.003 / .004	.051 / .067	.0022 / .0031*
23044 K	.0071 / .0099	.004 / .0055	.067 / .094	.003 / .0059*
23052 K	.0087 / .0118	.0045 / .0065	.078 / .114	.0040 / .0073*
23060 K	.0094 / .013	.005 / .0075	.087 / .126	.0043 / .008 *
23064 K	.0106 / .0142	.006 / .0085	.102 / .141	.0047 / .0082*
23080 K	.0118 / .0157	.0065 / .0090	.134 / .173	.005 / .0092*

* = Maximum Normal Clearance - Minimum Reduction in Internal Clearance. All other Values from SKF and FAG Literature.

FIRST USED ON S.O. 45121

REVISIONS TO BE MADE ONLY ON IBM 5253 WORD PROCESSOR

REVISIONS

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL ARE:
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL. +.0015 — .0005
BREAK ALL CORNERS — .015

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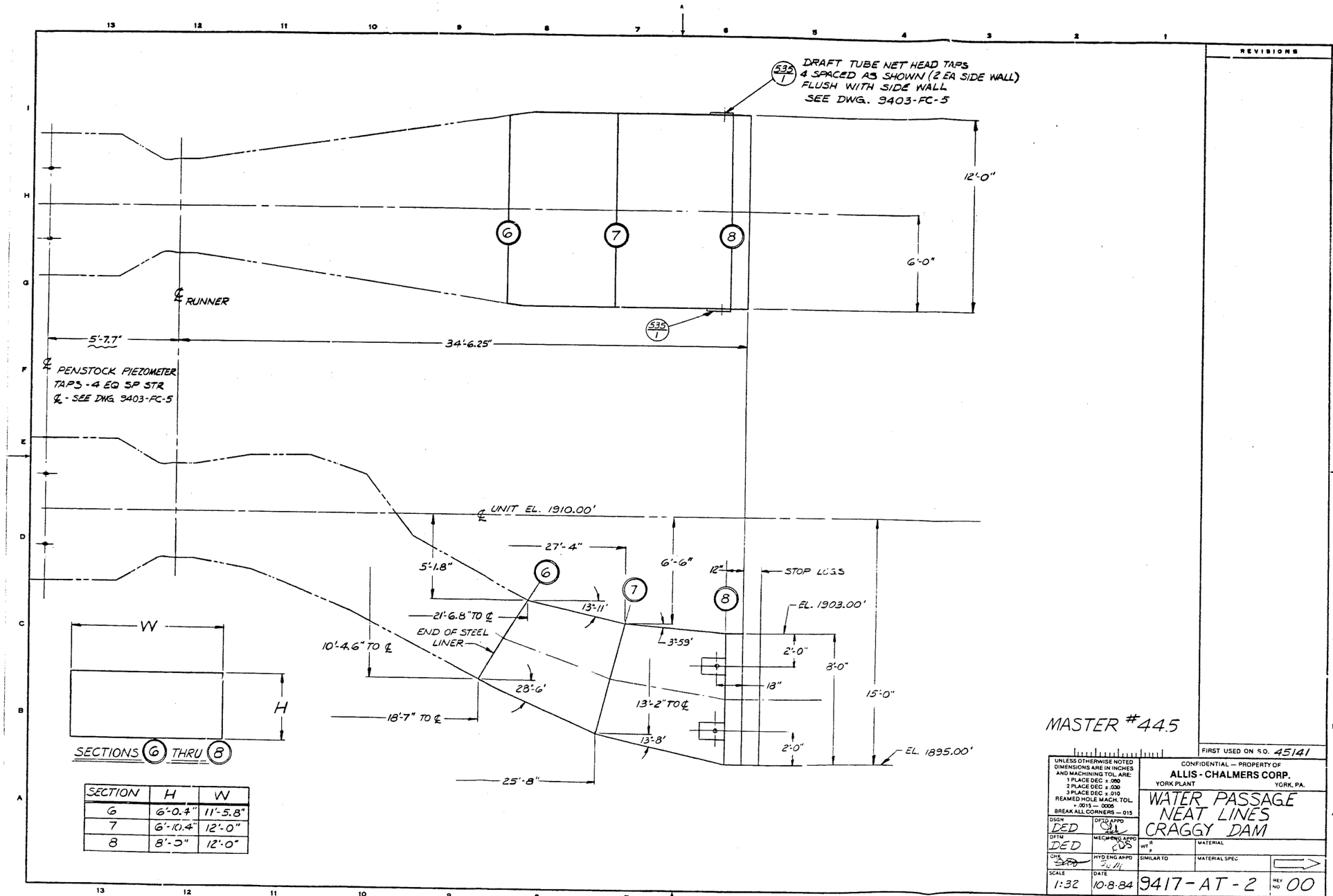
YORK PLANT YORK, PA.

TURBINE OUTBOARD BEARING MOUNTING INSTRUCTIONS

DSGN	DFTG APPD	WT R / F	MATERIAL
DED			
DFTM	MECH ENG APPD		
ly			
CHK	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
	MF		
SCALE	DATE	9403-RS-4 Sheet 6 of 6	REV NO 00
	10/4/85		



SECTION	H	W
6	6'-0.4"	11'-5.8"
7	6'-10.4"	12'-0"
8	8'-3"	12'-0"

REVISIONS

MASTER #44.5

FIRST USED ON S.O. 45141

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL ARE:
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH. TOL. +.015 — .000
BREAK ALL CORNERS — .015

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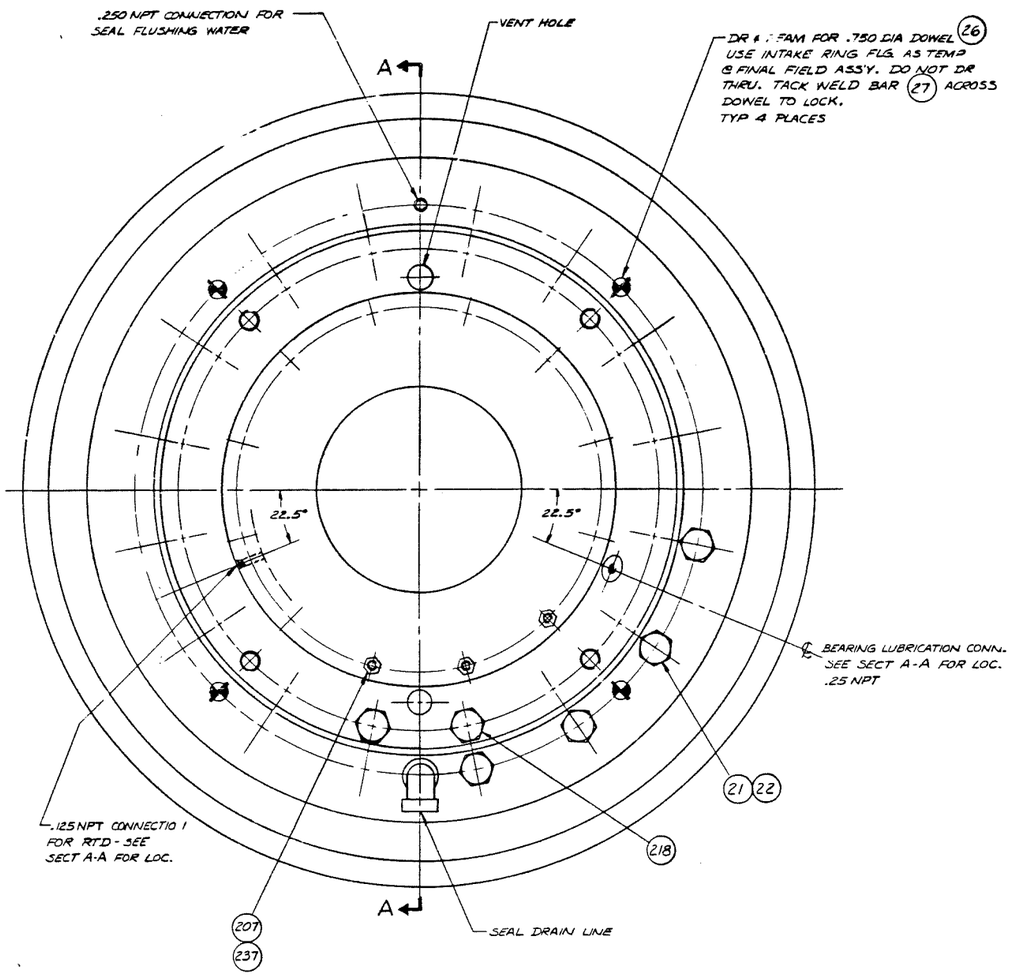
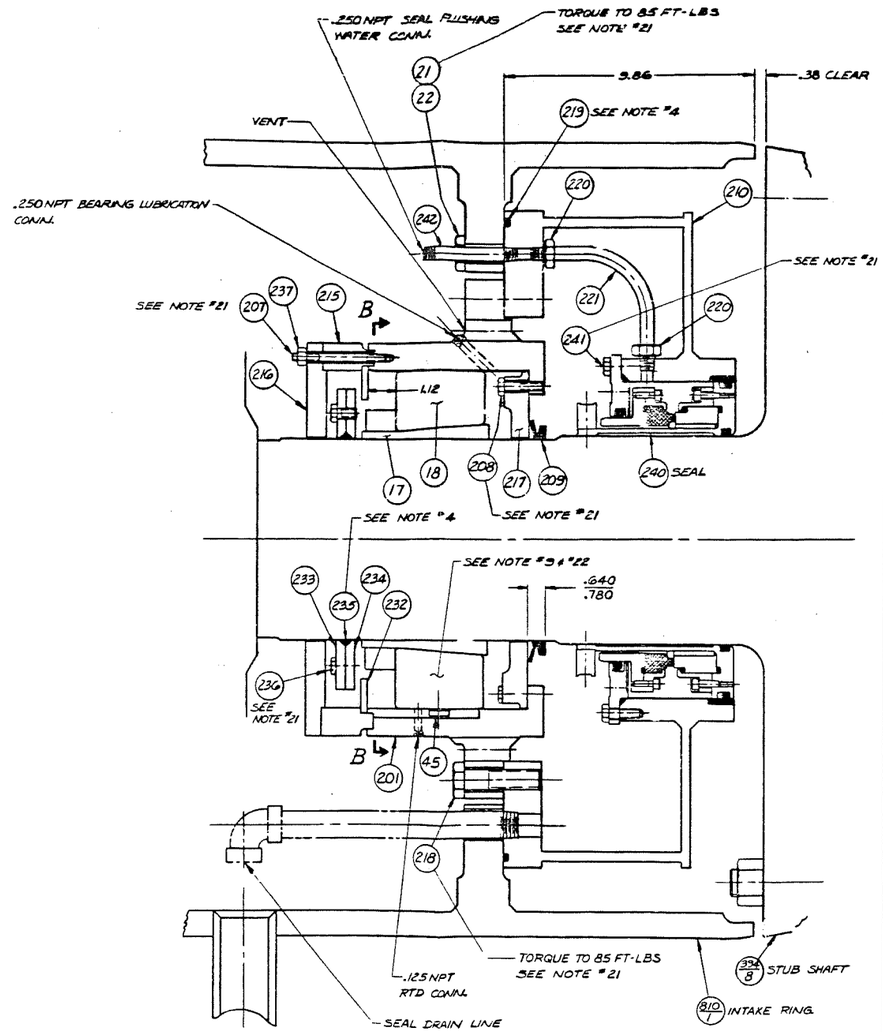
YORK PLANT YORK, PA.

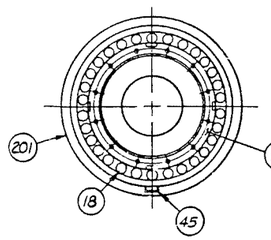
WATER PASSAGE
NEAT LINES
CRAGGY DAM

DSGN DED	OPTG APPD		
DFTM DED	MECH ENG APPD EJS	WT A / F	MATERIAL
CHK	HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
SCALE 1:32	DATE 10-8-84	9417-AT-2	REV NO 00





SECT A-A



SECT B-B

17 LOCKNUT & ADAPTER SLEEVE
REDUCTION IN BEARING
RADIAL CLEARANCE = .0039/.0055
MIN. RADIAL CLEARANCE = .0031

MAST # 275

FIRST USED ON S.O. 45121

9401-KW-4	ASSEMBLY NOTES	DRN DED	WT #
9417-REV-1	4XA ROTATING PARTS ASSY	DES DED	SIMILAR TO
DWG. NO.	CROSS REFERENCES	SCALE 1:2	DATE 7-25-85

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE. 1 PLACE DEC ± .060, 2 PLACE DEC ± .030, 3 PLACE DEC ± .010, REAMED HOLE MACH. TOL. +.0015 — .0005, BREAK ALL CORNERS — .015

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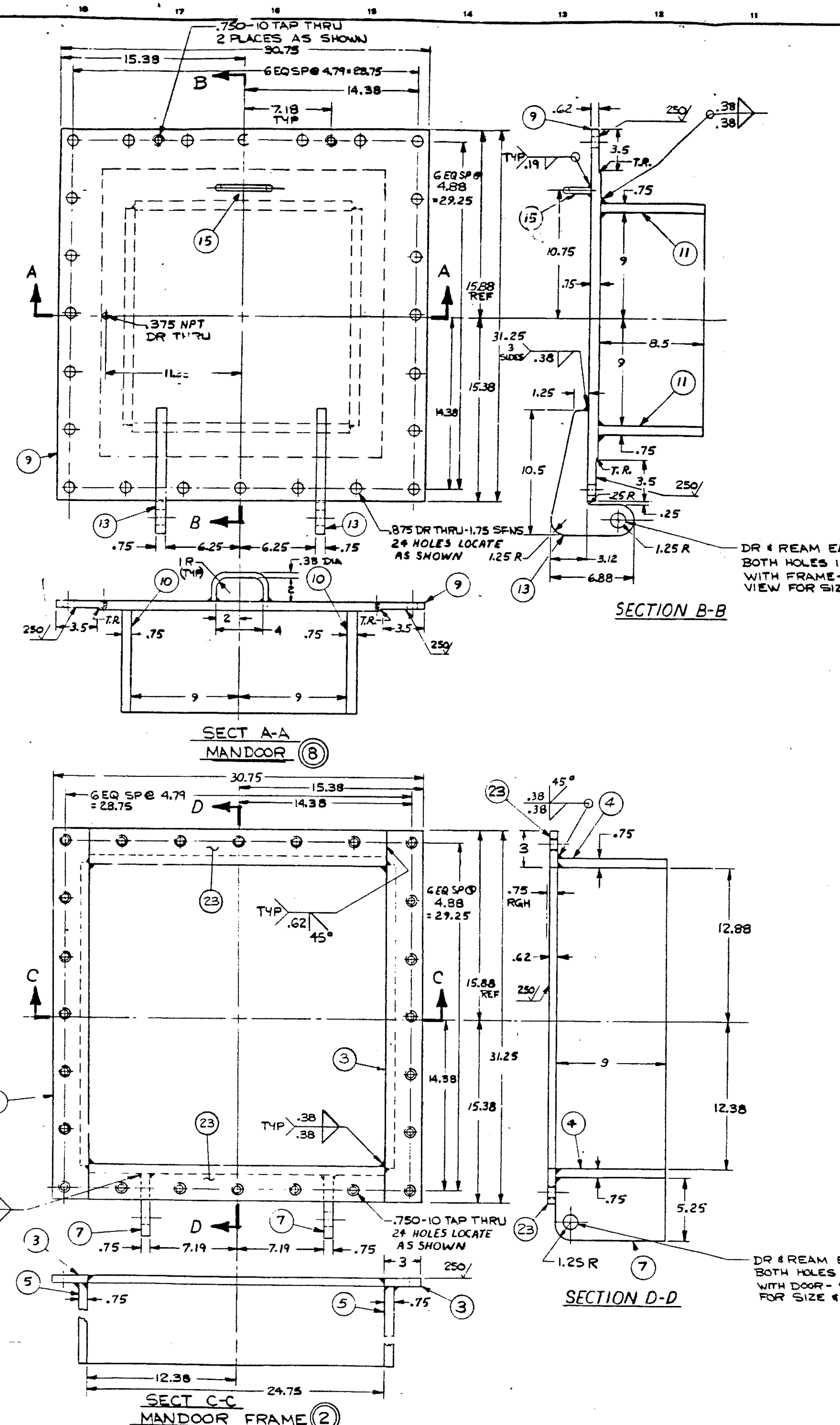
OUTBOARD BEARING AND SEAL ASSEMBLY

MATERIAL

MATERIAL SPEC

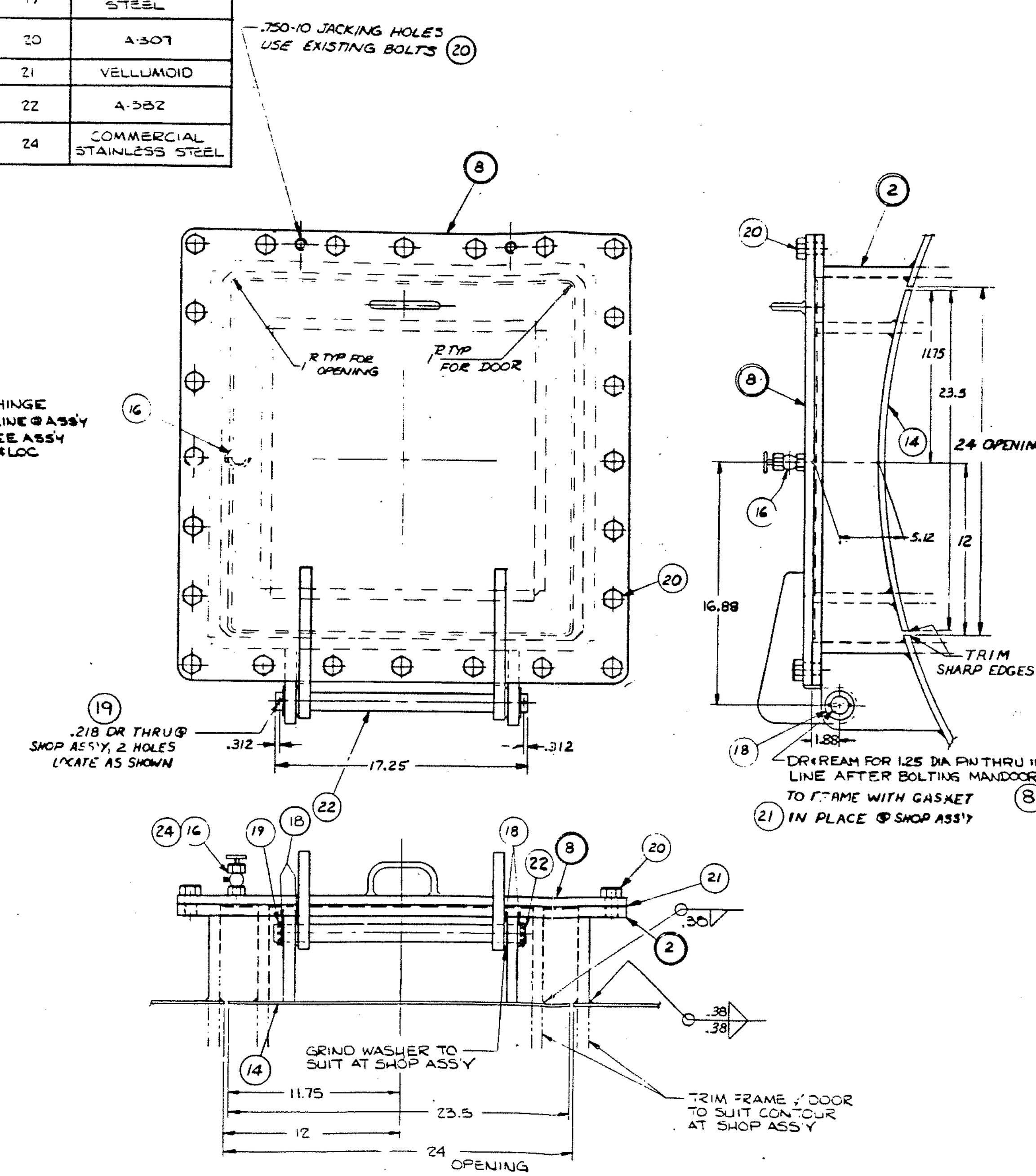
9417-CCV-1 REV 00



LIST OF MATERIAL	
ITEM NO.	MATERIAL
3,15 / 23	A575 M1015 / 1020
4,5,7,9,10, 11,13 / 14	A283-B, A36 OR A516-60
16	COMMERCIAL BRONZE
18	COMMERCIAL BRASS
19	COMMERCIAL STEEL
20	A-307
21	VELLUMOID
22	A-382
24	COMMERCIAL STAINLESS STEEL

NOTE: 1. CLEAN & PAINT AS FOLLOWS:
- a) EXTERIOR SURFACES MK 018
- b) WATER PASSAGES (INTERIOR) MK 054
- c) MACHINE SURFACES MK 008

ACCEPTANCE OF PAINT MK 054 IN ACCORDANCE WITH DWG. 9-01-18-4.



MANDOOR ASS'Y (1)
MASTER 441

JOB NO. 4690.01
PO NO. 4690-H1010
FIRST USED ON S.O. 25044

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE: 1 PLACE DEC ± .030 2 PLACE DEC ± .030 3 PLACE DEC ± .010 REAMED HOLE MACH. TOL. + .0015 — .0005 BREAK ALL CORNERS — .015

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YORK PLANT YORK, PA.

24 × 24 HINGED MANDOOR

DSGN	DFTG APPD
DFTM	MECH ENG APPD RS
CHK	HYD ENG APPD
WT 800#	MATERIAL
SIMILAR TO 9417-EAG-1	MATERIAL SPEC
SCALE 1:4	DATE 4-24-64
DWG. NO. 9417-CBU-1	REV NO. 00

DWG. NO. | CROSS REFERENCES

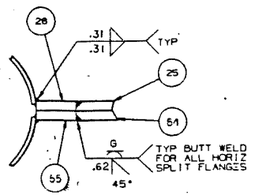
NOTES:

1. CLEAN & PAINT PER A-C PAINT MANUAL AS FOLLOWS:
   ALL EXTERIOR SURFACES ABOVE EMBEDMENT LINE MK002
   ALL INTERIOR SURFACES (WATER PASSAGE) MK002
   ALL EXTERIOR SURFACES BELOW EMBEDMENT LINE MK001
   ALL FLANGE FACES MK003
   △ ALL SPOTFACES MAY BE BLASTED & PAINTED
2. SHOP BRACING TO BE LEFT IN PLACE FOR FIELD HANDLING. (44)
3. ALL SHELL DIMS ARE INSIDE DIM'S
4. ALL BARS 12" LONG & LESS TO BE CUT FROM (45) @ SHOP ASSY.
5. DISTRIBUTE NELSON NUTS (99) EVENLY BELOW EMBEDMENT LINE OF SEGMENT (2). DO NOT PLACE ANY NUTS WITHIN 10" OF EMBEDMENT LINE.

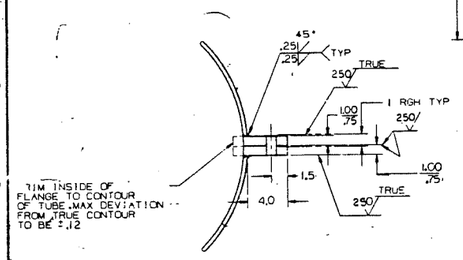
REVISIONS

(N-5)(K-9)(E-6) (51) WAS (29)
(N-8)(K-8) (56) WAS (31)
(M-8) ADDED (58)
(J-10) ADDED (33) (60)
(E-7) (56) WAS (36)
(D-5) ADDED (57)
(D-13) ADDED (22)
(I-6) 23.03 WAS 23.07
01 DEH 7-30-84
(J-10) DELETED ITEM (59) & (60)
02 9-10-84
(E-9) 26 O.D. WAS 28.31 I.D.
(F-8) 24.5 DIA WAS 27.2 E 32 DIA WAS 35.6
(F-5) 30.5 DIA B C WAS 33.63 E .625-11 TAP WAS .750-10 E 5.950 WAS 6.561 E 2.989 WAS 3.296
03 9-17-84 MAR
(G-16) BOXED NOTE. ADDED NOTE.
04 10-26-84
(N-3) ADDED NOTE
05 3-8-85
(G-16) DELETED 225 SF
06 4-4-85

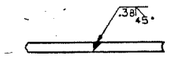
SECTION C-C



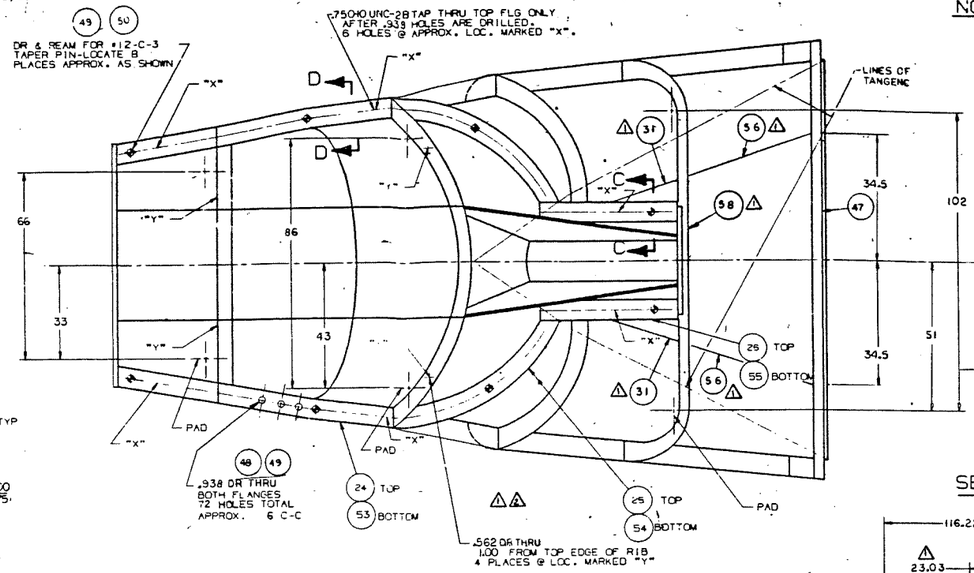
SECTION D-D



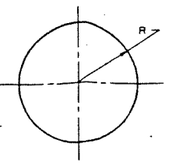
TYP BUTT WELD FOR RIBS



PLAN

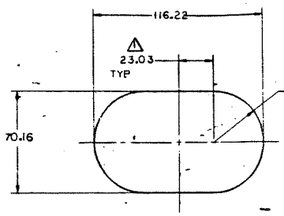


SECT 1, 2, 3 & 4

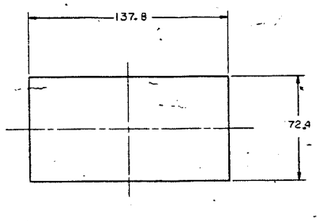


SECT	R
1	34.53
2	41.65
3	46.69
4	49.88

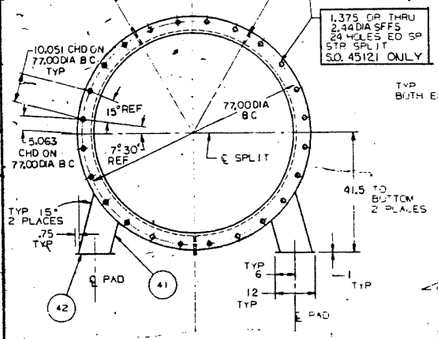
SECT 5



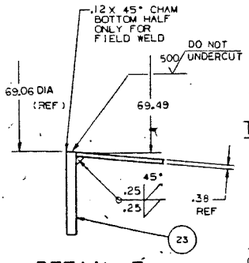
SECT 6



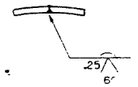
VIEW A-A



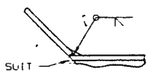
DETAIL F



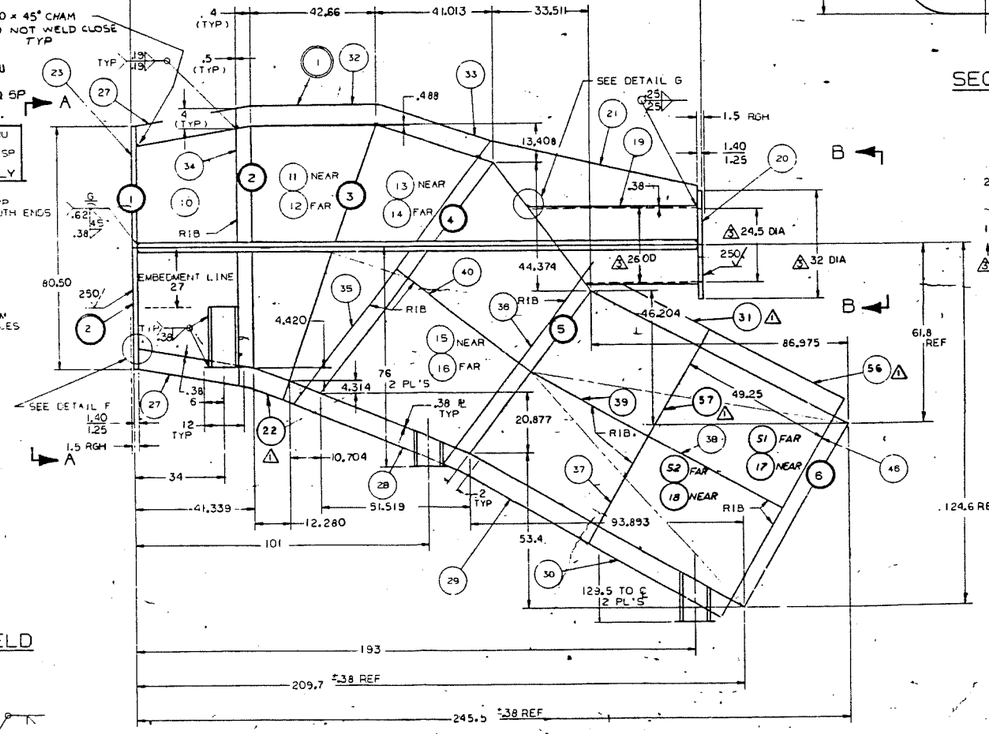
TYP BUTT WELD .38 R



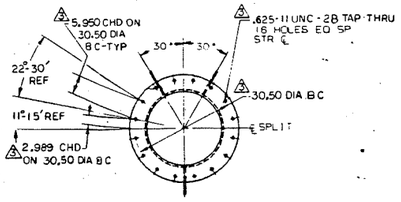
DETAIL G



ELEV.



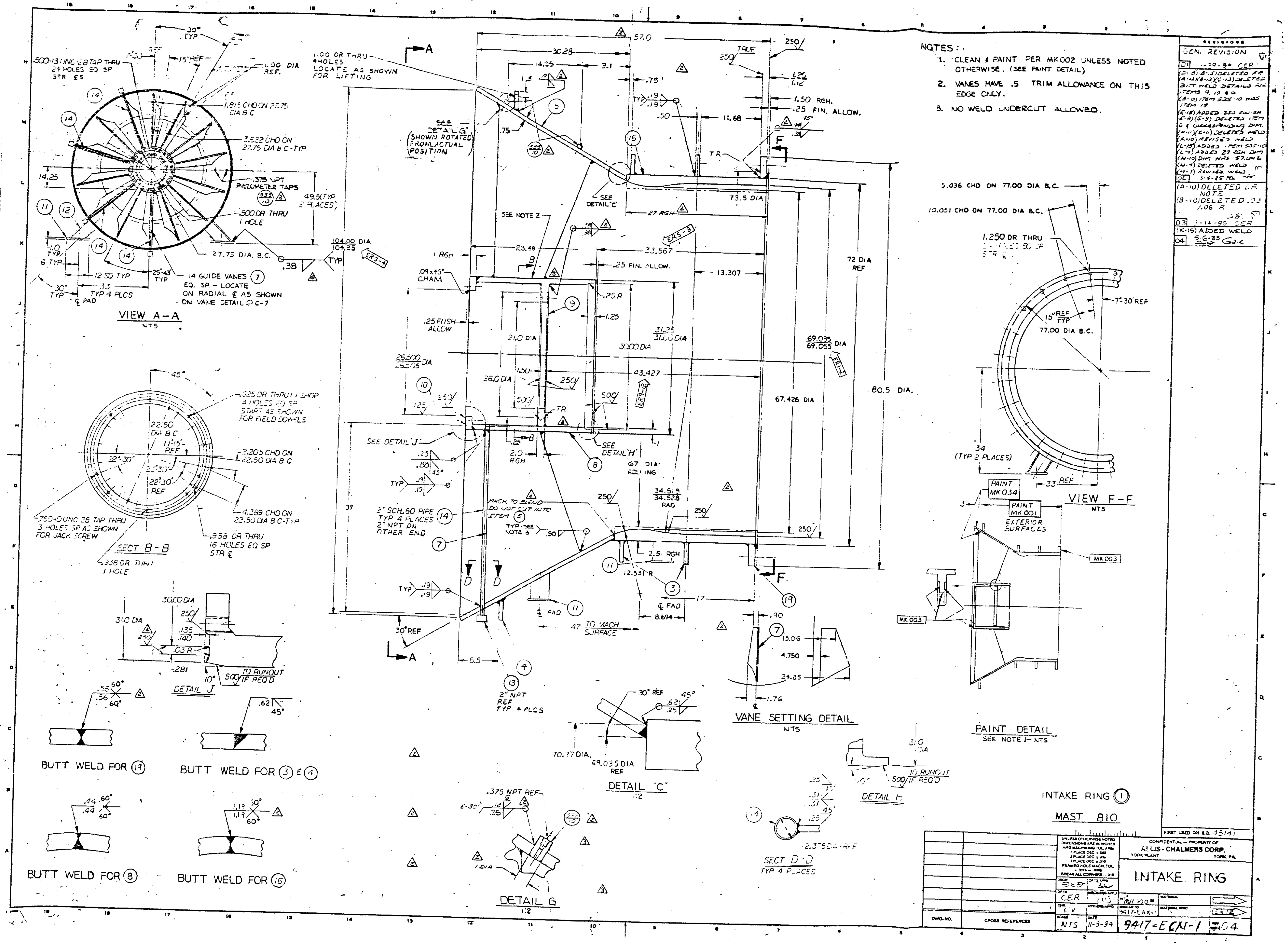
VIEW B-B



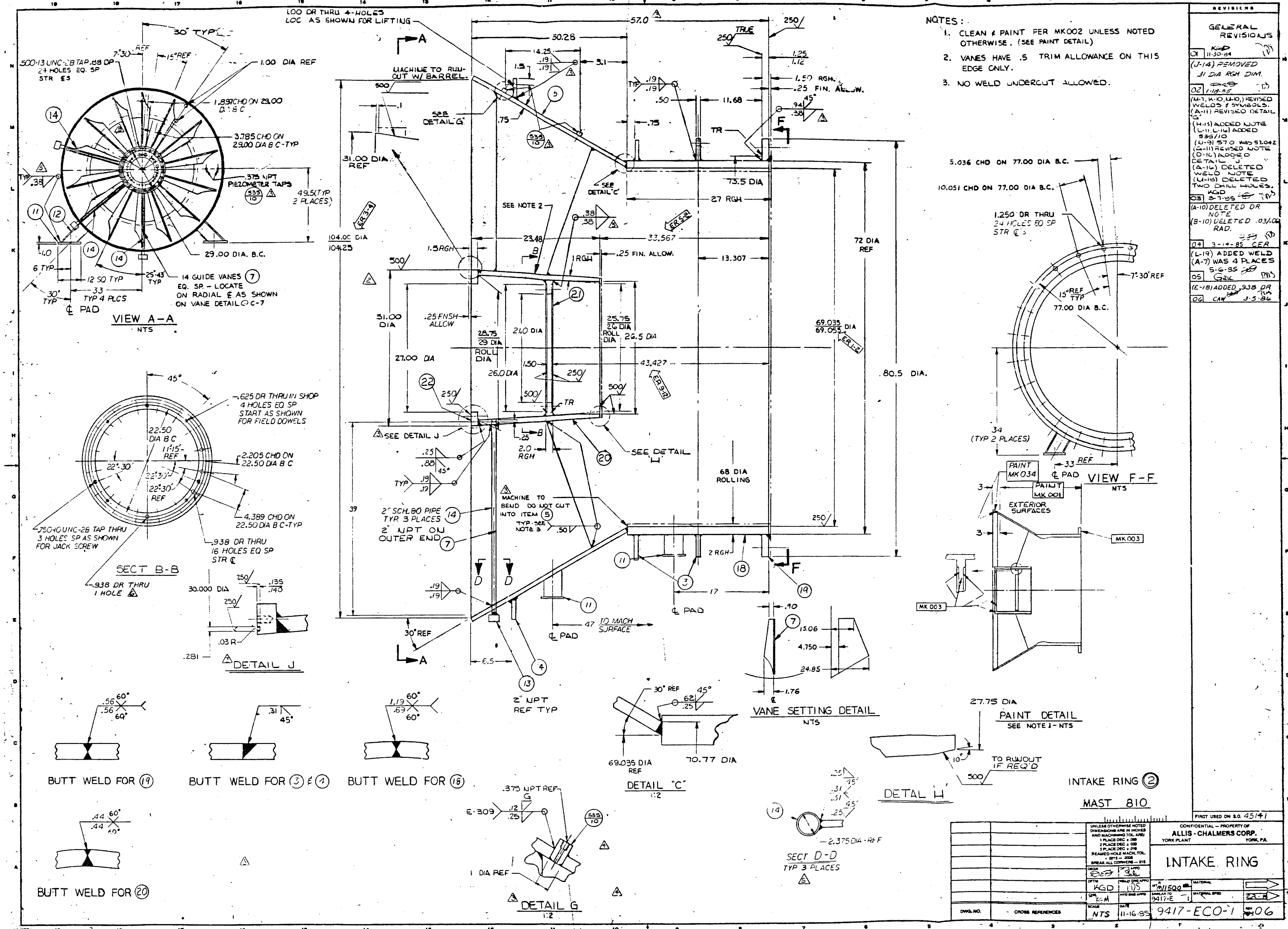
ITEM # 150
MASTER # 440

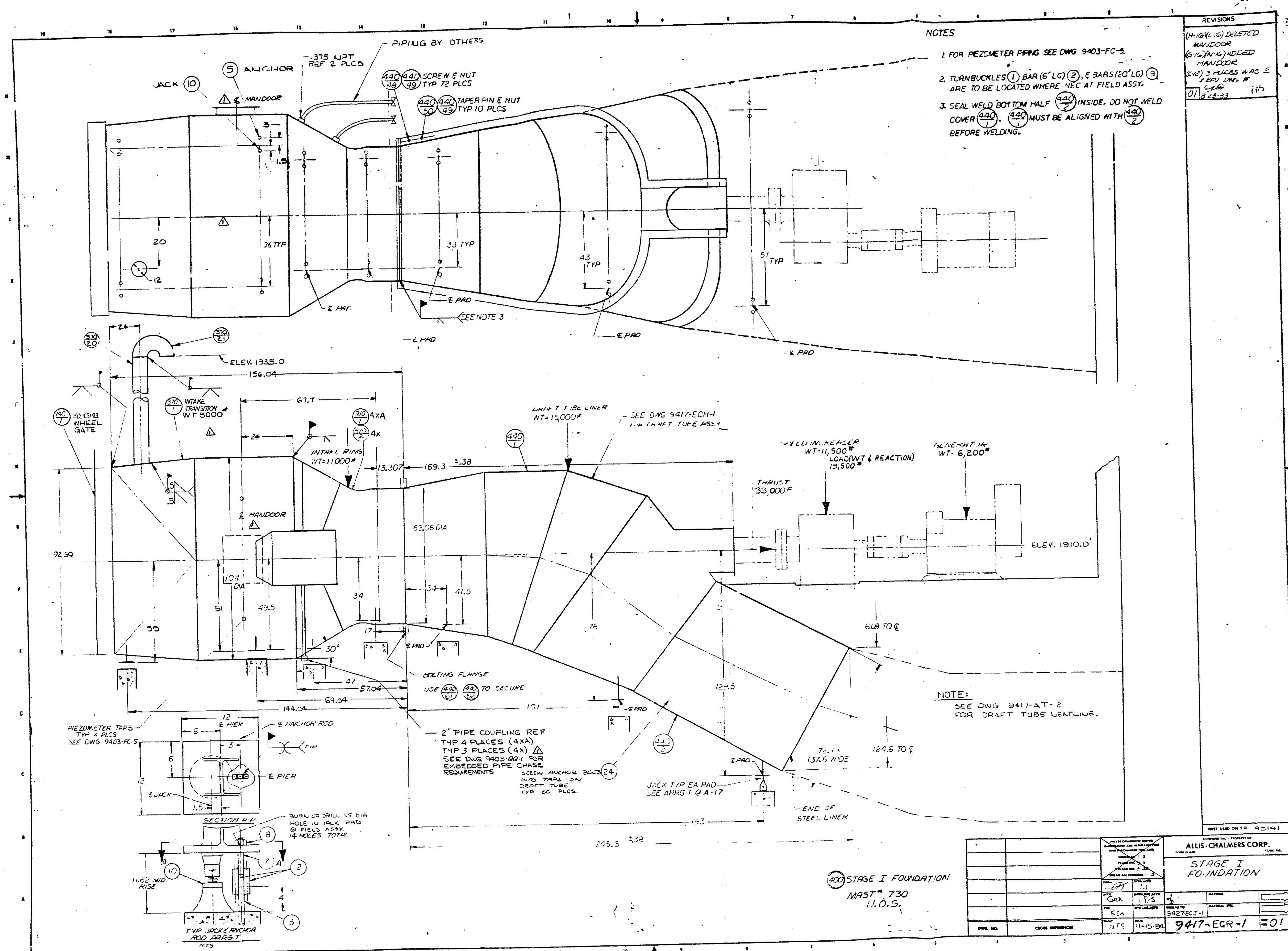
FIRST USED ON P.O. 45121

ALLIS-CHALMERS CORP.			
1750 MM DRAFT TUBE PLAN & ELEV			
WRK	3/4		
MAR	LTS	1:15.000	
WRK		9417-EO-1	
NTS	5-30-84	9417-ECH-1	06



NOTES:
1. CLEAN & PAINT PER MK002 UNLESS NOTED OTHERWISE. (SEE PAINT DETAIL)
2. VANES HAVE .5 TRIM ALLOWANCE ON THIS EDGE ONLY.
3. NO WELD UNDERCUT ALLOWED.
REVISIONS
GEN. REVISION
VIEW A-A
NTS
14 GUIDE VANES (7) EQ. SP. - LOCATE ON RADIAL ℄ AS SHOWN ON VANE DETAIL @ C-7
.500-13 UNC-2B TAP THRU 24 HOLES EQ SP STR ℄S
27.75 DIA. B.C.
.375 NPT PIEZOMETER TAPS
1.00 OR THRU 4 HOLES LOCATE AS SHOWN FOR LIFTING
SEE DETAIL 'G' (SHOWN ROTATED FROM ACTUAL POSITION)
SEE DETAIL 'C'
SEE NOTE 2
SEE DETAIL 'J'
SEE DETAIL 'H'
73.5 DIA
72 DIA REF
80.5 DIA.
67.426 DIA
69.035 / 69.055 DIA
30.00 DIA
24.0 DIA
26.0 DIA
67 DIA ROLLING
2" SCH.80 PIPE TYP 4 PLACES 2" NPT ON OTHER END
MACH. TO BLEND DO NOT CUT INTO ITEM (5)
47 TO MACH SURFACE
30° REF
SECT B-B
.750-10 UNC-2B TAP THRU 3 HOLES SP AS SHOWN FOR JACK SCREW
.625 DR THRU & SHOP 4 HOLES EQ SP START AS SHOWN FOR FIELD DOWELS
.938 DR THRU 16 HOLES EQ SP STR ℄
.338 DR THRU 1 HOLE
22.50 DIA B C
DETAIL J
TO RUNOUT IF REQ'D
BUTT WELD FOR (19)
BUTT WELD FOR (3) & (4)
BUTT WELD FOR (8)
BUTT WELD FOR (16)
DETAIL G
1:2
DETAIL "C"
1:2
70.77 DIA.
69.035 DIA REF
VANE SETTING DETAIL
NTS
SECT D-D
TYP 4 PLACES
DETAIL H
5.036 CHD ON 77.00 DIA B.C.
10.051 CHD ON 77.00 DIA B.C.
1.250 DR THRU
77.00 DIA B.C.
VIEW F-F
NTS
PAINT MK034
PAINT MK001 EXTERIOR SURFACES
MK003
PAINT DETAIL
SEE NOTE 1 - NTS
INTAKE RING (1)
MAST 810
FIRST USED ON S.O. 45141
CONFIDENTIAL - PROPERTY OF ALLIS-CHALMERS CORP.
YORK PLANT YORK PA.
INTAKE RING
SCALE NTS
DATE 11-8-84
9417-EAX-1
9417-ECN-1


NOTES:
1. CLEAN & PAINT PER MK002 UNLESS NOTED OTHERWISE. (SEE PAINT DETAIL)
2. VANES HAVE .5 TRIM ALLOWANCE ON THIS EDGE ONLY.
3. NO WELD UNDERCUT ALLOWED.
REVISIONS
GENERAL REVISIONS
01 11-30-84
(J-14) REMOVED 31 DIA RGH DIM.
02 1-18-85
03 3-7-85
04 3-14-85 CER
(L-19) ADDED WELD (A-7) WAS 4 PLACES
05 5-6-85
(E-18) ADDED .938 DR THRU
06 3-5-86
1.00 DR THRU 4-HOLES LOC AS SHOWN FOR LIFTING
MACHINE TO RUN-OUT W/ BARREL.
SEE DETAIL G
SEE DETAIL C
SEE NOTE 2
SEE DETAIL J
SEE DETAIL H
VIEW A-A
NTS
14 GUIDE VANES 7
29.00 DIA. B.C.
.375 NPT PIEZOMETER TAPS
SECT B-B
.625 DR THRU IN SHOP 4 HOLES EQ SP START AS SHOWN FOR FIELD DOWELS
.750-10 UNC-2B TAP THRU 3 HOLES SP AS SHOWN FOR JACK SCREW
.938 DR THRU 16 HOLES EQ SP STR ℄
.938 DR THRU 1 HOLE
DETAIL J
2" SCH.80 PIPE TYP 3 PLACES
2" NPT ON OUTER END
MACHINE TO BEND DO NOT CUT INTO ITEM 5
10 MACH SURFACE
℄ PAD
2" NPT REF TYP
72 DIA REF
80.5 DIA.
68 DIA ROLLING
73.5 DIA
27 RGH
5.036 CHD ON 77.00 DIA B.C.
10.051 CHD ON 77.00 DIA B.C.
1.250 DR THRU 24 HOLES EQ SP STR ℄
77.00 DIA B.C.
VIEW F-F
NTS
PAINT MK034
PAINT MK001
EXTERIOR SURFACES
MK003
PAINT DETAIL
SEE NOTE 1 - NTS
VANE SETTING DETAIL
NTS
DETAIL "C"
1:2
DETAIL H
DETAIL G
1:2
SECT D-D
TYP 3 PLACES
BUTT WELD FOR 19
BUTT WELD FOR 3 & 4
BUTT WELD FOR 16
BUTT WELD FOR 20
TO RUNOUT IF REQ'D
INTAKE RING 2
MAST 810
FIRST USED ON S.O. 45141
CONFIDENTIAL — PROPERTY OF
ALLIS-CHALMERS CORP.
YORK PLANT YORK, PA.
INTAKE RING
KGD
NTS
11-16-85
9417-E
9417-ECO-1
06
DWG. NO.
CROSS REFERENCES

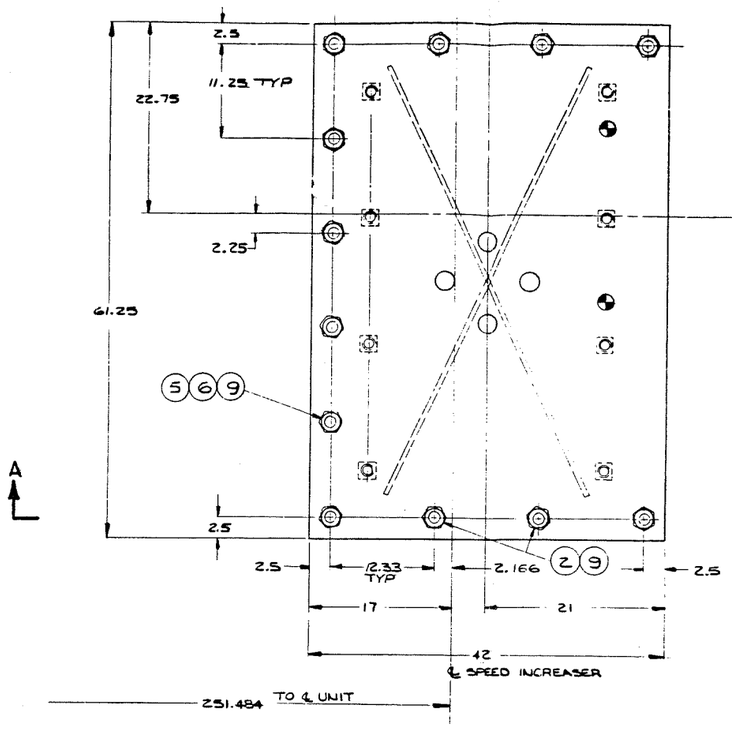

NOTES
1. FOR PIEZOMETER PIPING SEE DWG 9403-FC-5
2. TURNBUCKLES (1), BAR (6' LG) (2), & BARS (20' LG) (9) ARE TO BE LOCATED WHERE NEC AT FIELD ASSY.
3. SEAL WELD BOTTOM HALF (440/2) INSIDE. DO NOT WELD COVER (440/1). (440/1) MUST BE ALIGNED WITH (440/2) BEFORE WELDING.
REVISIONS
(H-16)(L-16) DELETED MANDOOR
(G-16)(N-16) ADDED MANDOOR
(C-12) 3 PLACES WAS 2
PIPING BY OTHERS
JACK (10)
(5) ANCHOR
.375 NPT REF 2 PLCS
MANDOOR
(440/48) (440/49) SCREW & NUT TYP 72 PLCS
(440/50) (440/49) TAPER PIN & NUT TYP 10 PLCS
36 TYP
33 TYP
43 TYP
51 TYP
SEE NOTE 3
ELEV. 1935.0
156.04
67.7
(190/1) 50.45/93 WHEEL GATE
(370/1) INTAKE TRANSITION WT 5000
(310/1) 4XA
INTAKE RING WT=11,000#
13.307
169.3 ±.38
WT=15,000#
SEE DWG 9417-ECH-1
WT=11,500#
LOAD(WT & REACTION) 19,500#
WT 6,200#
THRUST 33,000#
ELEV. 1910.0'
92 SQ
104 DIA
69.06 DIA
& MANDOOR
618 TO ℄
124.6 TO ℄
BOLTING FLANGE
47
57.04
69.04
144.04
101
193
245.5 ±.38
NOTE:
SEE DWG 9417-AT-2 FOR DRAFT TUBE HEATLINE.
PIEZOMETER TAPS TYP 4 PLCS SEE DWG 9403-FC-5
2" PIPE COUPLING REF TYP 4 PLACES (4XA) TYP 3 PLACES (4X) SEE DWG 9403-QQ-1 FOR EMBEDDED PIPE CHASE REQUIREMENTS
SCREW ANCHOR BOLTS (24) INTO TAPS ON DRAFT TUBE TYP 60 PLCS.
JACK TIP EA PAD SEE ARRG'T @ A-17
END OF STEEL LINER
SECTION A-A
BURN OR DRILL 1.5 DIA HOLE IN JACK PAD @ FIELD ASSY. 14 HOLES TOTAL
11.62 MID RISE
TYP JACK & ANCHOR ROD ARRG'T NTS
(400) STAGE I FOUNDATION
MAST # 730 U.O.S.
ALLIS-CHALMERS CORP.
STAGE I FOUNDATION
9417-ECR-1
01
11-15-84
NTS

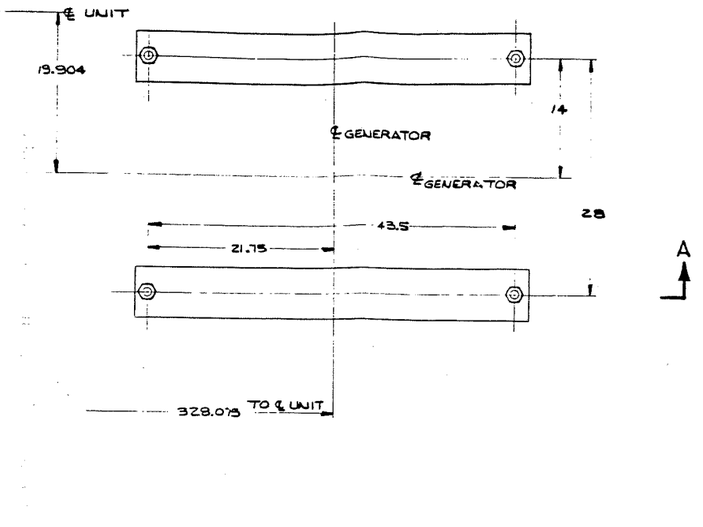
BASEPLATE EMBEDMENT PROCEDURE

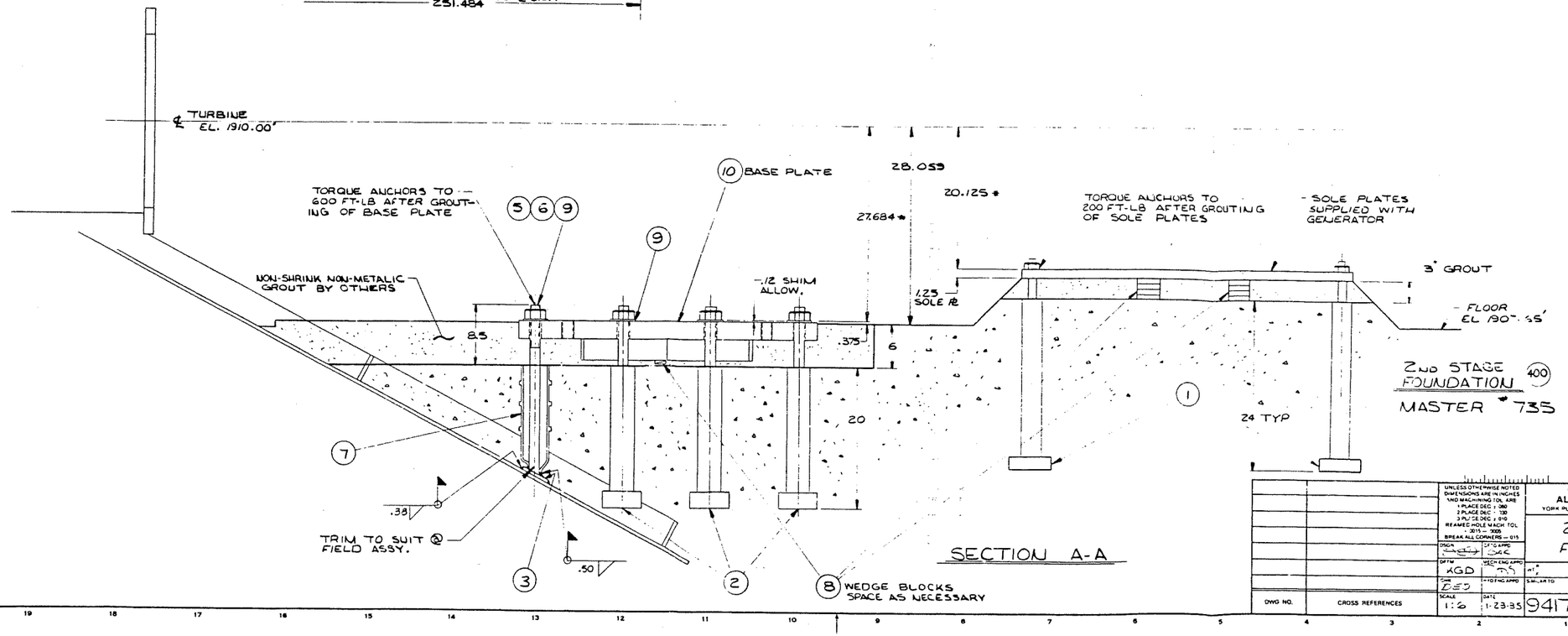
1. SET ANCOR RODS & EMBED IN CONCRETE. DO NOT POUR CONCRETE INTO SLEEVE AROUND RODS.
2. SET BASEPLATES ON WEDGE BLOCKS LEVEL & TIE DOWN WITH ANCHOR BOLTS.
3. GROUT BASEPLATE WITH NON-METALIC NON-SHRINK GROUT (NOT SUPPLIED BY A-C).
4. AFTER GROUT HAS SET CHECK ANCHOR BOLTS & TIGHTEN IF NECESSARILY.

* INCLUDES .125 SHIM ALLOW.

REVISIONS







2ND STAGE FOUNDATION (400)

MASTER 735

FIRST USED ON SO 45141

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL ARE
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
REAMED HOLE MACH TOL .001 – .003
BREAK ALL CORNERS – 015

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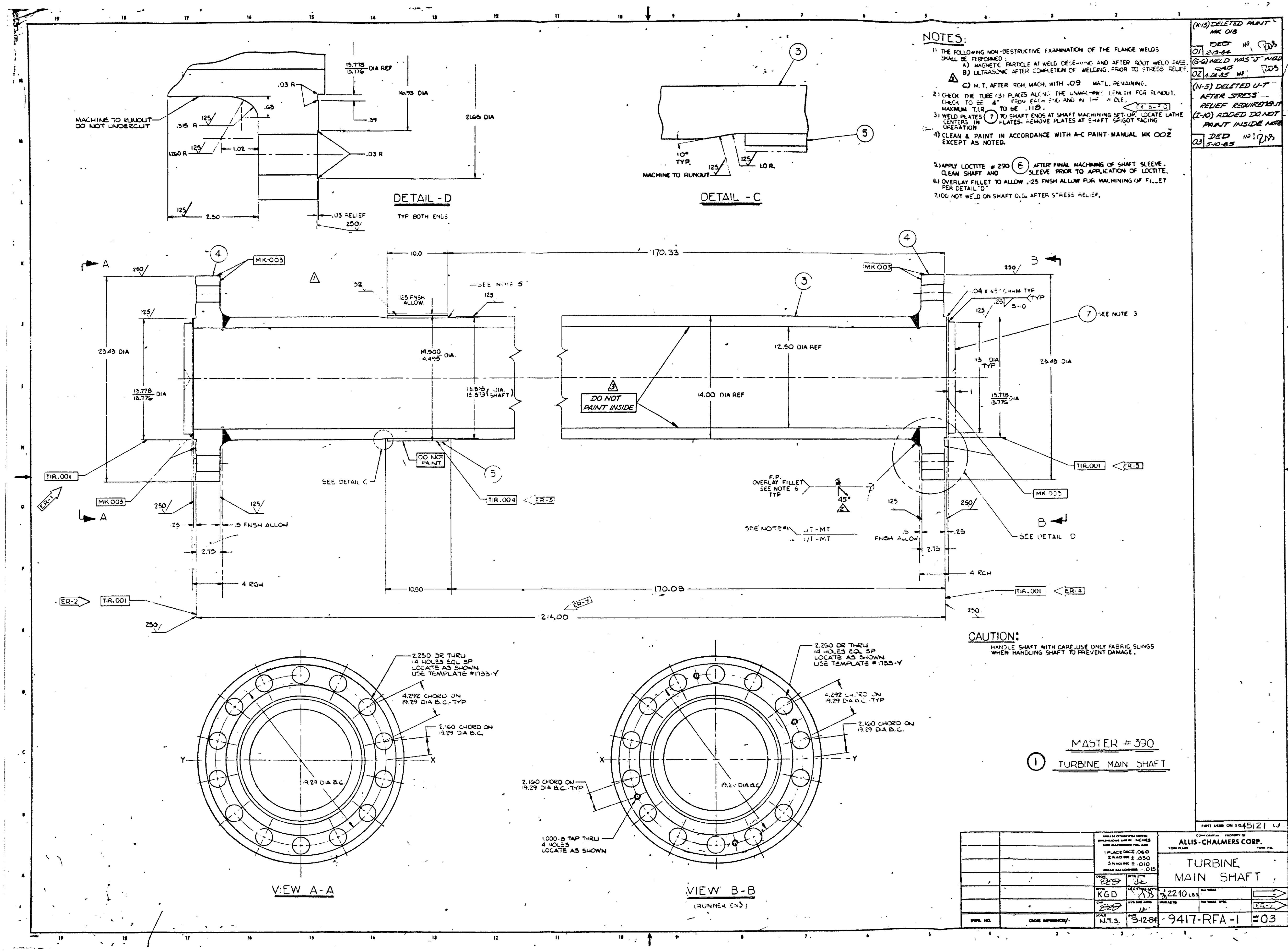
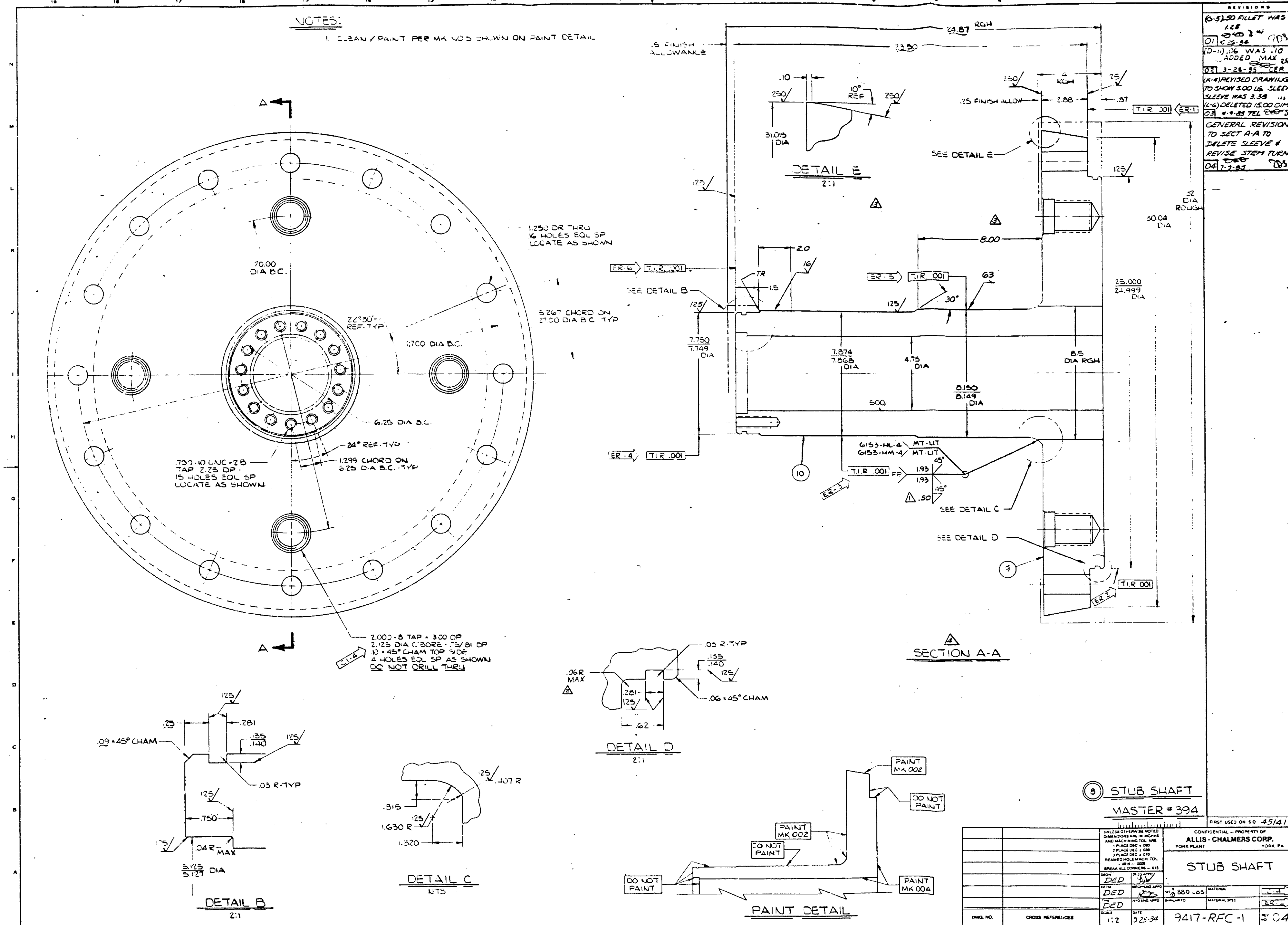
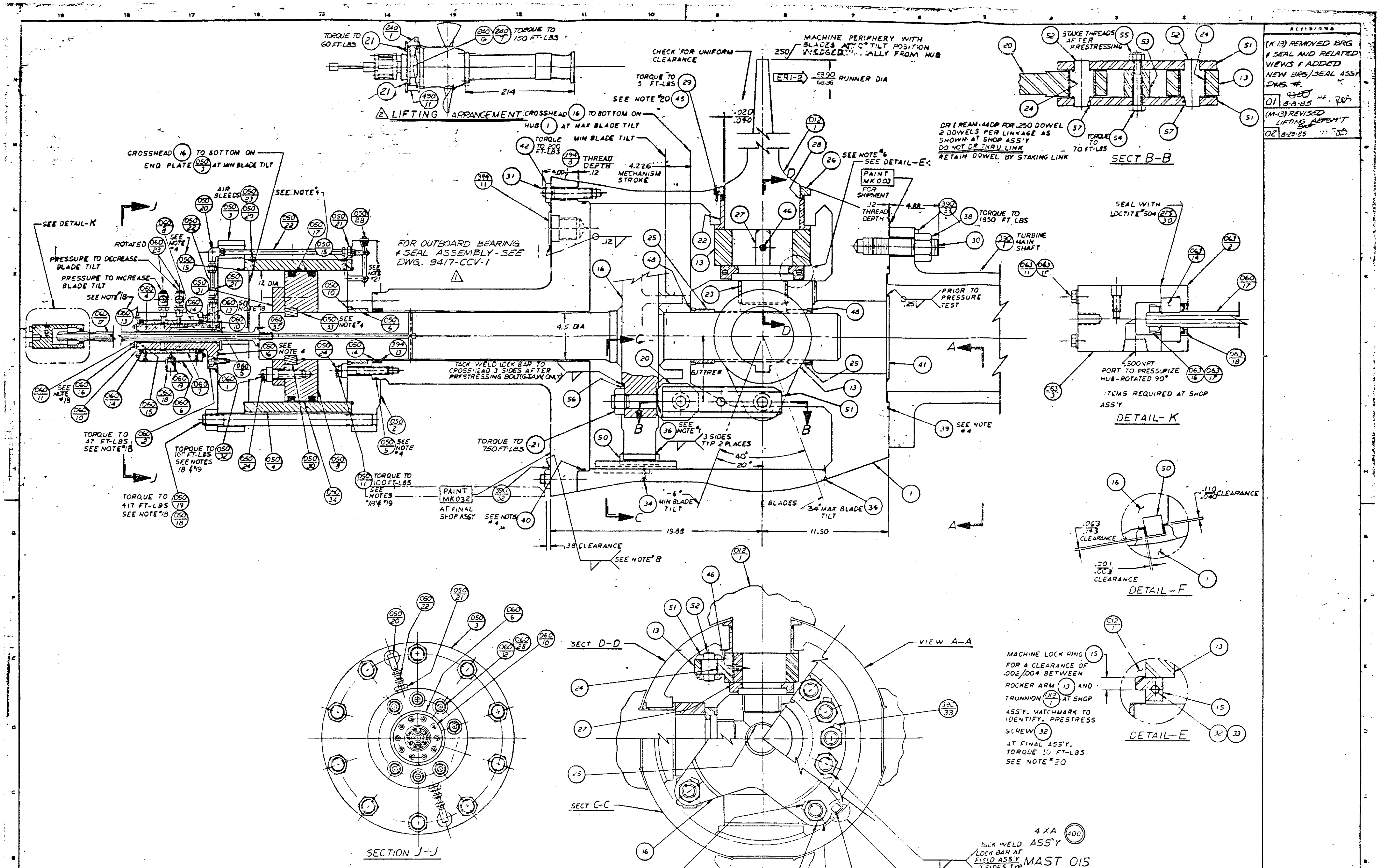
2ND STAGE FOUNDATION

DSGN	ENG APPD CMC		
DFTM KGD	MECH ENG APPD	WT.	MATERIAL
CHKD EED	PTG APPD	SIM. AR TO	MATL SPEC
SCALE 1:6	DATE 1-23-85	9417-ECT-1	REV NO 00

DWG NO. CROSS REFERENCES


NOTES:
1) THE FOLLOWING NON-DESTRUCTIVE EXAMINATION OF THE FLANGE WELDS SHALL BE PERFORMED:
A) MAGNETIC PARTICLE AT WELD DESE-VING AND AFTER ROOT WELD PASS.
B) ULTRASONIC AFTER COMPLETION OF WELDING. PRIOR TO STRESS RELIEF.
C) M. T. AFTER RGH. MACH. WITH .09 MAT'L. REMAINING.
2) CHECK THE TUBE (3) PLACES ALONG THE UNMACHINED LENGTH FOR RUNOUT. CHECK TO BE 4" FROM EACH END AND IN THE MIDDLE. MAXIMUM T.I.R. TO BE .118.
3) WELD PLATES (7) TO SHAFT ENDS AT SHAFT MACHINING SET-UP. LOCATE LATHE CENTERS IN PLATES. REMOVE PLATES AT SHAFT SPIGOT FACING OPERATION
4) CLEAN & PAINT IN ACCORDANCE WITH A-C PAINT MANUAL MK 002 EXCEPT AS NOTED.
5) APPLY LOCTITE # 290 (6) AFTER FINAL MACHINING OF SHAFT SLEEVE. CLEAN SHAFT AND SLEEVE PRIOR TO APPLICATION OF LOCTITE.
6) OVERLAY FILLET TO ALLOW .125 FNSH ALLOW FOR MACHINING OF FILLET PER DETAIL "D"
7) DO NOT WELD ON SHAFT O.D. AFTER STRESS RELIEF.
(K-15) DELETED PAINT MK 018
01 12-13-84 DED
(G-G) WELD WAS "J" WELD
02 4-24-85
(N-5) DELETED U-T AFTER STRESS RELIEF REQUIREMENT
(I-10) ADDED DO NOT PAINT INSIDE NOTE
03 5-10-85 DED
DETAIL - D
TYP BOTH ENDS
MACHINE TO RUNOUT DO NOT UNDERCUT
13.778 / 13.776 DIA REF
16.93 DIA
21.68 DIA
.03 R
.03 RELIEF
2.50
DETAIL - C
MACHINE TO RUNOUT
10° TYP.
1.0 R.
170.33
10.0
125 FNSH ALLOW.
SEE NOTE 5
23.43 DIA
14.500 / 14.495 DIA.
13.875 / 13.873 DIA. (SHAFT)
12.50 DIA REF
14.00 DIA REF
DO NOT PAINT INSIDE
DO NOT PAINT
SEE DETAIL C
MK 003
TIR .001
TIR .004
.5 FNSH ALLOW
2.75
4 RGH
10.50
170.08
214.00
F.P. OVERLAY FILLET SEE NOTE 6 TYP
SEE NOTE #1 UT-MT
SEE DETAIL D
SEE NOTE 3
.04 X 45° CHAM TYP
CAUTION:
HANDLE SHAFT WITH CARE. USE ONLY FABRIC SLINGS WHEN HANDLING SHAFT TO PREVENT DAMAGE.
2.250 DR THRU 14 HOLES EQL SP LOCATE AS SHOWN USE TEMPLATE #1733-Y
4.292 CHORD ON 19.29 DIA B.C. TYP
2.160 CHORD ON 19.29 DIA B.C.
19.29 DIA B.C.
1.000-8 TAP THRU 4 HOLES LOCATE AS SHOWN
VIEW A-A
VIEW B-B (RUNNER END)
MASTER # 390
(1) TURBINE MAIN SHAFT
FIRST USED ON 45121
ALLIS-CHALMERS CORP.
UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES
1 PLACE DEC ± .060
2 PLACE DEC ± .030
3 PLACE DEC ± .010
BREAK ALL CORNERS -.015
TURBINE MAIN SHAFT
KGD
2240 LBS
SCALE N.T.S.
9-12-84
9417-RFA-1
03


NOTES:
1. CLEAN / PAINT PER MK NO'S SHOWN ON PAINT DETAIL
REVISIONS
(G-5) .50 FILLET WAS .125
01 6-25-84
(D-11) .06 WAS .10 ADDED MAX
02 3-28-85 CER
(K-4) REVISED DRAWING TO SHOW 5.00 LG. SLEEVE SLEEVE WAS 3.38
(L-6) DELETED 15.00 DIM.
03 4-9-85 TEL
GENERAL REVISION TO SECT A-A TO DELETE SLEEVE & REVISE STEM TURNS
04 7-2-85
1.250 DR THRU
16 HOLES EQL SP
LOCATE AS SHOWN
70.00 DIA B.C.
22°30' REF TYP
17.00 DIA B.C.
5.267 CHORD ON 27.00 DIA B.C. TYP
6.25 DIA B.C.
24° REF TYP
1.299 CHORD ON 6.25 DIA B.C. TYP
.750-10 UNC-2B
TAP 2.25 DP.
15 HOLES EQL SP
LOCATE AS SHOWN
2.000-8 TAP x 3.00 DP
2.125 DIA C'BORE - .75/.81 DP
.10 x 45° CHAM TOP SIDE
4 HOLES EQL SP AS SHOWN
DO NOT DRILL THRU
DETAIL E
2:1
SEE DETAIL E
SEE DETAIL B
SEE DETAIL C
SEE DETAIL D
SECTION A-A
.25 FINISH ALLOW
.5 FINISH ALLOWANCE
24.87 RGH
23.50
52 DIA ROUGH
50.04 DIA
25.000
24.999 DIA
7.750
7.749 DIA
7.874
7.868 DIA
4.75 DIA
8.5 DIA RGH
8.150
8.149 DIA
8.00
6153-HL-4 MT-UT
6153-HM-4 MT-UT
T.I.R .001
DETAIL B
2:1
5.125
5.127 DIA
.09 x 45° CHAM
.03 R-TYP
DETAIL C
NTS
.407 R
1.630 R
DETAIL D
2:1
.06R MAX
.06 x 45° CHAM
.03 R-TYP
PAINT DETAIL
PAINT MK 002
DO NOT PAINT
PAINT MK 004
(8) STUB SHAFT
MASTER # 394
FIRST USED ON S.O. 45141
CONFIDENTIAL – PROPERTY OF
ALLIS-CHALMERS CORP.
YORK PLANT YORK PA
STUB SHAFT
DRWN DED
CHKD DED
SCALE 1:2
DATE 9-25-84
WT 880 LBS
9417-RFC-1
REV 04
DWG. NO.
CROSS REFERENCES



LIFTING ARRANGEMENT
TORQUE TO 60 FT-LBS
TORQUE TO 150 FT-LBS
CROSSHEAD (16) TO BOTTOM ON END PLATE AT MIN BLADE TILT
FOR OUTBOARD BEARING & SEAL ASSEMBLY-SEE DWG. 9417-CCV-1
SEE DETAIL-K
PRESSURE TO DECREASE BLADE TILT
PRESSURE TO INCREASE BLADE TILT
AIR BLEEDS
4.5 DIA
MECHANISM STROKE
CHECK FOR UNIFORM CLEARANCE
MACHINE PERIPHERY WITH BLADES AT 0° TILT POSITION
RUNNER DIA
SEE DETAIL-E
PAINT MK003 FOR SHIPMENT
TORQUE TO 1850 FT LBS
TURBINE MAIN SHAFT
PRIOR TO PRESSURE TEST
TACK WELD LOCK BAR TO CROSSHEAD 3 SIDES AFTER PRESTRESSING BOLT
TORQUE TO 750 FT-LBS
3 SIDES TYP 2 PLACES
MIN BLADE TILT
MAX BLADE TILT
PAINT MK032 AT FINAL SHOP ASSY
TORQUE TO 47 FT-LBS SEE NOTE 18
TORQUE TO 417 FT-LBS SEE NOTE 18
TORQUE TO 100 FT-LBS
.38 CLEARANCE
SECT B-B
STAKE THREADS AFTER PRESTRESSING
DR & REAM .44 DP FOR .250 DOWEL 2 DOWELS PER LINKAGE AS SHOWN AT SHOP ASS'Y DO NOT DR THRU LINK RETAIN DOWEL BY STAKING LINK
TORQUE TO 70 FT-LBS
SEAL WITH LOCTITE 504
.500 NPT PORT TO PRESSURIZE HUB-ROTATED 90°
ITEMS REQUIRED AT SHOP ASS'Y
DETAIL-K
DETAIL-F
CLEARANCE
MACHINE LOCK RING (15) FOR A CLEARANCE OF .002/.004 BETWEEN ROCKER ARM (13) AND TRUNNION AT SHOP ASS'Y. MATCHMARK TO IDENTIFY. PRESTRESS SCREW (32) AT FINAL ASS'Y. TORQUE 30 FT-LBS SEE NOTE 20
DETAIL-E
SECTION J-J
SECT D-D
VIEW A-A
SECT C-C
SEE DETAIL-F
TACK WELD LOCK BAR AT FIELD ASS'Y 3 SIDES TYP 14 PLCS
PRESSURIZE TO STROKE SERVO
PRESSURIZE TO STROKE SERVO. INSTALL PLUG IN OTHER PORT AT 180°
SEE NOTE 2
DETAIL VIEW OF SHOP PRESSURE TEST
(K-13) REMOVED BRG & SEAL AND RELATED VIEWS & ADDED NEW BRG/SEAL ASSY
(M-13) REVISED LIFTING ARRGM'T

4 XA ASS'Y (400)

MAST 015 UNLESS OTHERWISE NOTED

FIRST USED ON S.O. 45141

DWG NO	CROSS REFERENCES
9401-KW-4	ASSEMBLY NOTES

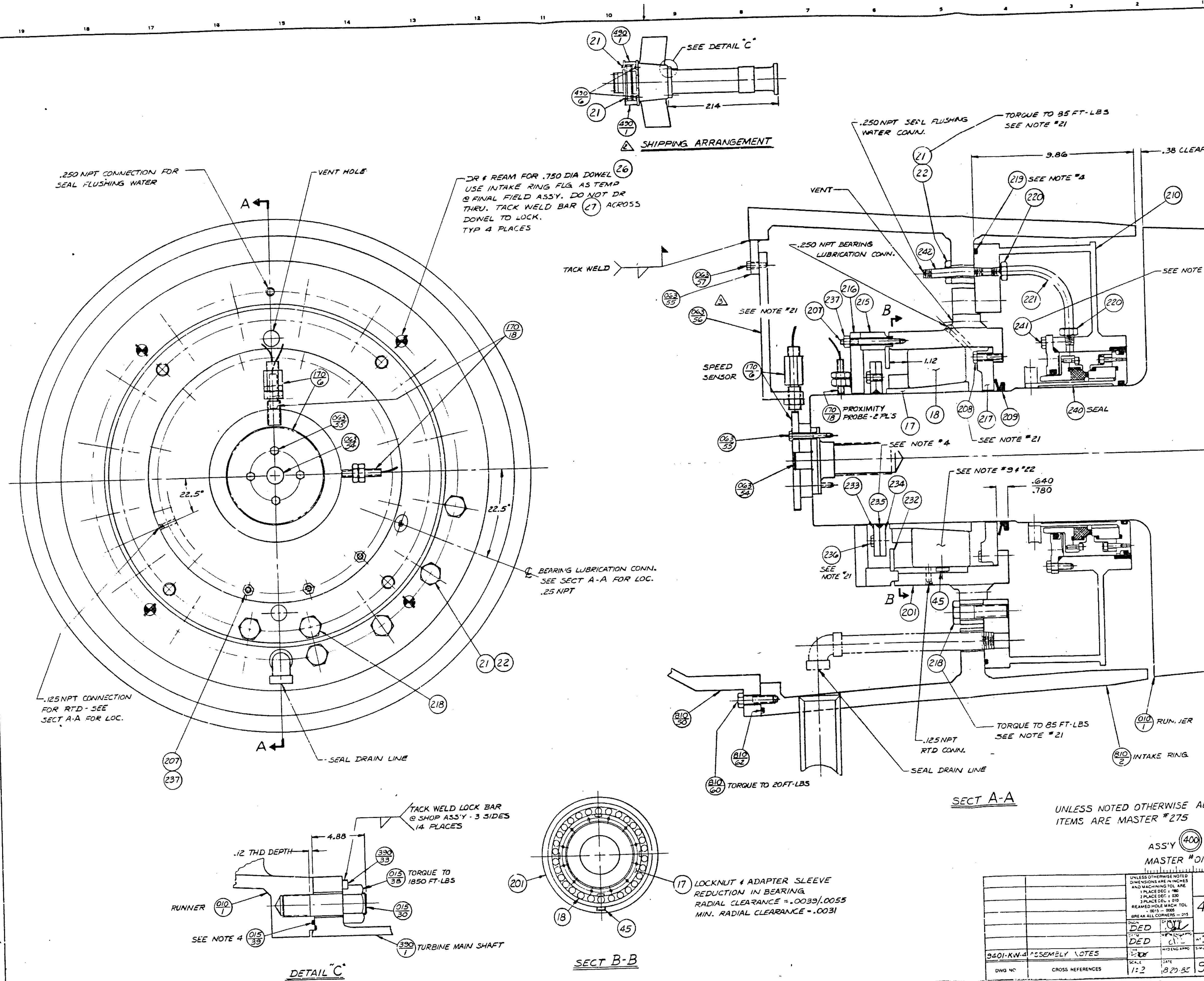
UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL ARE 1 PLACE DEC ± .080, 2 PLACE DEC ± .030, 3 PLACE DEC ± .010, REAMED HOLE MACH TOL +.0015 – .0006, BREAK ALL CORNERS — .015

CONFIDENTIAL — PROPERTY OF **ALLIS - CHALMERS CORP.** YORK PLANT YORK PA

4 XA ROTATING PARTS ASS'Y

DRAWN: DED | DFTM: KGD | CHK: DED | SCALE: NTS | DATE: 1-29-85

9417-RFE-1 REV 02



UNLESS NOTED OTHERWISE ALL ITEMS ARE MASTER #275

ASS'Y (400)
MASTER #010

REVISIONS	
01	REDRAWN, 8-13-85
02	(M-10) REVISED SHIPPING ARRGM'T, 8-29-85
03	(K-8) ADDED SPEED SENSOR MOUNTING BRACKET, 9-13-85

FIRST USED ON S.O. 45141

CONFIDENTIAL — PROPERTY OF ALLIS-CHALMERS CORP. YORK PLANT, YORK PA

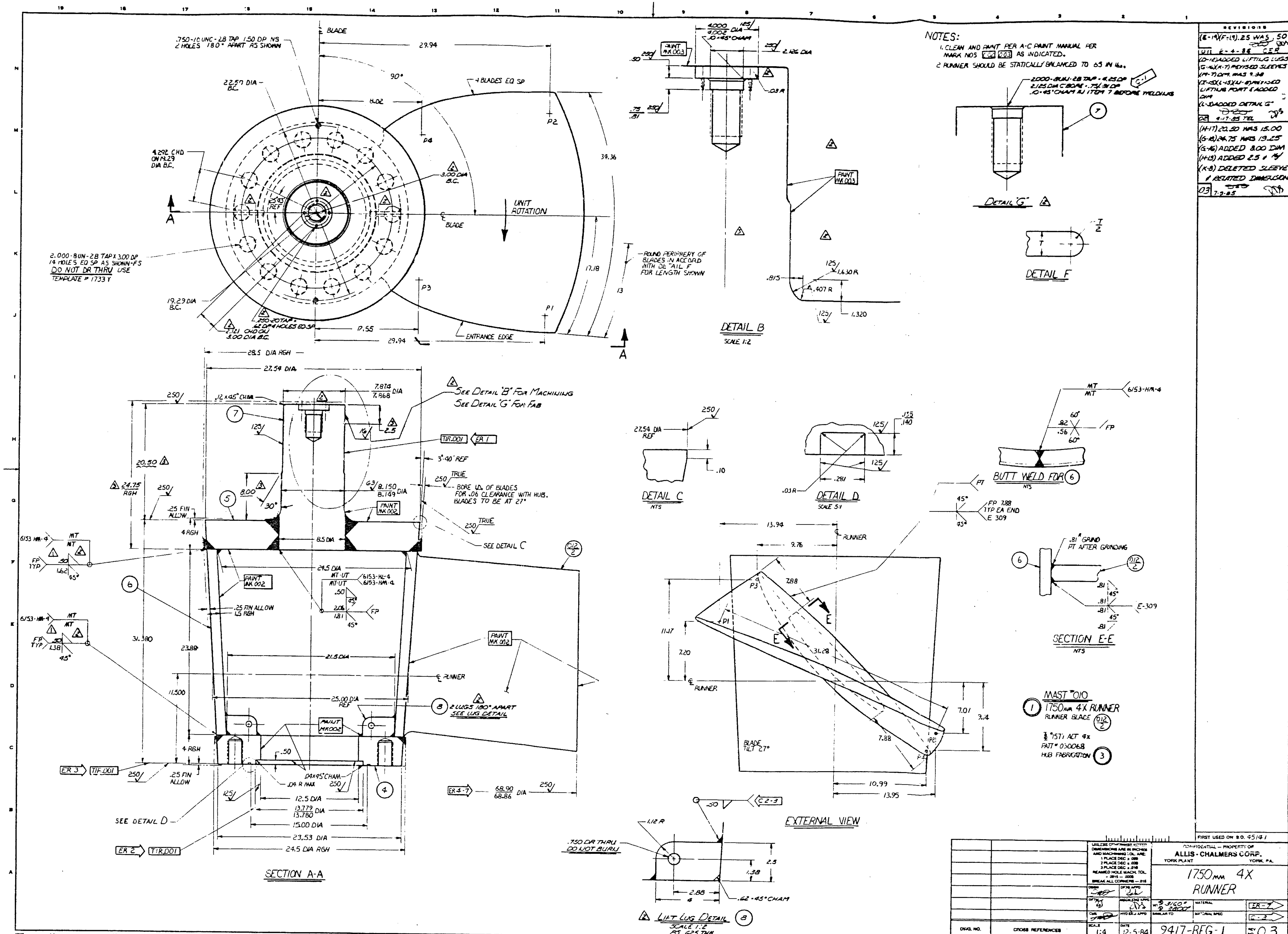
UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE 1 PLACE DEC ± .060, 2 PLACE DEC ± .030, 3 PLACE DEC ± .010, REAMED HOLE MACH TOL + .0015 – .0005, BREAK ALL CORNERS — .015

4X ROTATING PARTS ASSEMELY

DWG NO	CROSS REFERENCES
9401-KW-4	ASSEMELY NOTES

DSGN: DED — DFTM: DED — SCALE: 1:2 — DATE: 8-20-85

9417-RFF-1 — REV NO 03



NOTES:
1. CLEAN AND PAINT PER A-C PAINT MANUAL PER MARK NOS 002 003 AS INDICATED.
2. RUNNER SHOULD BE STATICALLY BALANCED TO 65 IN lbs.
SECTION A-A
DETAIL B
DETAIL C
DETAIL D
DETAIL "G"
DETAIL F
BUTT WELD FOR 6
SECTION E-E
EXTERNAL VIEW
LIFT LUG DETAIL 8
UNIT ROTATION
ENTRANCE EDGE
4 BLADES EQ SP
MAST "010
1750mm 4X RUNNER
RUNNER BLADE
FIRST USED ON S.O. 45141
CONFIDENTIAL — PROPERTY OF
ALLIS - CHALMERS CORP.
YORK PLANT
YORK, PA.
1750mm 4X
RUNNER
SCALE 1:4
DATE 12-5-84
9417-RFG-1
REV NO 03
DWG. NO.
CROSS REFERENCES

PREMIUM QUALITY MULTIPURPOSE GREASE WITH EXTREME PRESSURE ADDITIVES

MINERAL OIL 89%

VISCOSITY

750 SUS AT 100°F
75 SUS AT 210°F
143 cSt AT 40°C
13.8 cSt AT 100°C

NLGI GRADE NUMBER 1

TYPICAL SUPPLIERS:

MOBIL OIL CORP.
MOBILUX EP1

SHELL OIL COMPANY
ALVANIA EP1

FIRST USED ON S.O. 20690			METRIC	
REVISIONS		CONFIDENTIAL-PROPERTY OF ALLIS-CHALMERS CORP. YORK PLANT YORK, PA.		
CAD DRAWING- NO MANUAL REVISIONS			GREASE SPECIFICATION	
	DRWN KEM	DEPTD APPD		
	DSGN KEM	MECH ENG APPD GRB	MATERIAL	
(E-4) ADDED NOTE	CHK GRB	NTD ENG APPD	SIMILAR TO	MATERIAL SPEC
01 10-8-80 KEM	SCALE NTS	DATE 8-12-80	9401-CAN-4	REV NO 01

PREMIUM QUALITY ANTI-WEAR HYDRAULIC OIL,
WITH RUST AND OXIDATION INHIBITORS.

VISCOSITY

315/355 SUS AT 100°F
52.7 SUS AT 210°F
61.2/68.0 cSt AT 40°C
7.9 cSt AT 100°C

1 ISO VISCOSITY GRADE 68

TYPICAL SUPPLIERS:

MOBIL OIL CORP.
MOBIL D.T.E. 26

SHELL OIL COMPANY
TELLUS OIL 68

FIRST USED ON S.O. 20723

METRIC

REVISIONS

CAD DRAWING-
NO MANUAL REVISIONS

(D-4) VISCOSITY WAS
VICOSITY GRB DEE

01	1-21-81	TES

UNLESS OTHERWISE NOTED
ALL DIMENSIONS ARE IN MILLIMETERS
AND MACHINING TOL. ARE:
NOMINAL ± .2
1 PLACE DEC ± .1
2 PLACE DEC ± .25
BREAK ALL CORNERS - .8
REAMED HOLE NOM. TOL.
+.03 -.01

ALLIS-CHALMERS CORP.
YORK PLANT YORK, PA.

HYDRAULIC OIL
SPECIFICATIONS
ISO GRADE 68

DSGN KEM	DFTG APPD			
DFTM KEM	MECH ENG APPD	R WT F	MATERIAL	
CHK	HYD ENG APPD	SIMILIAR TO	MATERIAL SPEC	
SCALE NTS	DATE 10-8-80	9401-CAX-4		REV NO 01

Premium quality multipurpose grease with extreme pressure addatives:

Mineral Oil 87%

Viscosity

750 SUS at 100°F
75 SUS at 210°F
143 cST at 40°C
13.8 cST at 100°C

NLGI Grade Number 2

Typical Suppliers:

Mobile Oil Corporation
Mobilux EP2

Shell Oil Company
Alvania EP2

REVISIONS	UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE: 1 PLACE DEC ± .060, 2 PLACE DEC ± .030, 3 PLACE DEC ± .010, BREAK ALL CORNERS – .015	CONFIDENTIAL – PROPERTY OF ALLIS-CHALMERS CORP. YORK PLANT YORK, PA.
	DSGN KEM / DFTG APPD	NGLI #2 – EP GREASE SPECIFICATION
	DFTM JE / MECH ENG APPD GRB	R WT F / MATERIAL
	CHK / HYD ENG APPD	SIMILAR TO / MATERIAL SPEC
	SCALE / DATE 10-7-82	9401-CBE-4 / REV NO 00

Premium Quality [illegible] Circulation
Oil with Rust and Oxidation Inhibitors

Viscosity
315/355 SUS @ 100°F
55 SUS @ 210°F
61.2/68.0 cSt @ 40°C
8.6 cSt @ 100°C

VI, Min 100

ISO Viscosity Grade 68

Typical Supplier:
Mobil Oil Corporation
Mobil DTE Heavy Medium

Note: Oil to be filtered to 10 microns prior to use in plain or anti-friction bearings.

First Used on S.O. 20913

REVISIONS	UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES AND MACHINING TOL. ARE: 1 PLACE DEC ± .060; 2 PLACE DEC ± .030; 3 PLACE DEC ± .010; BREAK ALL CORNERS – .015	CONFIDENTIAL – PROPERTY OF ALLIS-CHALMERS CORP. YORK PLANT VALVE DIVISION YORK, PA.	
		CIRCULATION OIL SPECIFICATION ISO GRADE 68	
	DSGN KEM / DFTG APPD		
	DFTM JE / MECH ENG APPD 6/28	WT R F	MATERIAL
	CHK / HYD ENG APPD	SIMILAR TO	MATERIAL SPEC
	SCALE N/A / DATE 12-13-82	9401-CBH-4	REV NO 00

48988 A

BRUNING 40-105

1408 4 G01/je 3 2 1