

6070955

NOTES:

- STEAM INLET, EXTRACTION, AND EXHAUST PIPING MUST BE PROPERLY SUPPORTED SO AS NOT TO EXCEED ALLOWABLE FORCES AND MOMENTS GIVEN.
- EXPOSED STEAM PIPING ABOVE 140' SHOULD BE FIELD INSULATED BY CUSTOMER.
- INLET CONNECTION CONFORMS TO ANSI B16.5 FOR FACING AND DRILLING REQUIREMENTS.
- CIRCULAR FLANGES THRU 24 INCH CONFORM TO ANSI B16.5. CIRCULAR FLANGES 26 INCH THRU 60 INCH CONFORM TO ASME B16.47, 1990 SERIES B.
- ALL FLANGE FACES ARE TO HAVE 125-250 RMS FINISH.
- ALL BOLT HOLES IN FLANGES TO STRADDLE HORIZONTAL AND VERTICAL CENTERLINES UNLESS OTHERWISE SPECIFIED.
- ALL PIPING CONNECTIONS WILL BE LOCATED PER DRESSER-RAND WELLSVILLE SHOP SPEC SS-4000.29.
- DISTANCE REQUIRED TO DISASSEMBLE T&T VALVE.
- DISTANCE REQUIRED TO REMOVE T&T VALVE COVER WITH STRAINER.
- 8 SLOTS Ø.89 THRU FOR SPRING SUPPORT HOLD DOWN BOLTS. 2 SUPPORTS REQ'D - 4 SLOTS EACH SUPPORT.
- INSTALLED HEIGHT OF T&T VALVE SPRING SUPPORT.
- CUSTOMER TO PROVIDE ADEQUATE SUPPORT AT THIS POINT.
- TWO 4"-600 LB. EXTRACTION NON-RETURN VALVES OF SUFFICIENT SIZE TO EACH PASS 31,800 LBS PER HOUR TO BE FURNISHED FOR THIS LINE BY DRESSER-RAND WELLSVILLE. ONE VALVE TO BE SHIPPED LOOSE AND ONE VALVE TO BE SHIPPED ASSEMBLED TO TURBINE UNIT. SEE P&I DRAWING 6071073.
- NON-RETURN VALVES ARE TO BE LOCATED WITH NO MORE THAN THIRTY FEET OF EQUIVALENT PIPE SIZE VOLUME, INCLUDING RELIEF VALVE PIPING FROM TURBINE EXTRACTION CONNECTION. IF VALVES CANNOT BE LOCATED WITHIN THIS REQUIREMENT, CONSULT DRESSER-RAND WELLSVILLE.
- ONE 4"-600 LB. EXTRACTION PRESSURE SENSING VALVE OF SUFFICIENT SIZE TO PASS 28,300 LBS PER HOUR TO BE FURNISHED BY DRESSER-RAND WELLSVILLE. VALVE TO BE SUPPLIED ASSEMBLED TO TURBINE UNIT. SEE P&I DRAWING 6071073.
- AN EXHAUST RELIEF VALVE OF SUFFICIENT SIZE TO PASS 538,520 LBS PER HOUR WITH A MAXIMUM PRESSURE OF 275 PSIG AND SET TO OPEN AT 250 PSIG SHOULD BE PLACED IN EXHAUST LINE AND SUPPLIED BY OTHERS. NO SHUT-OFF VALVE SHOULD BE PLACED BETWEEN RELIEF VALVE AND TURBINE. SEE P&I DRAWING 6071073.
- STEAM END SUPPORTS TO BE DOWELED TO SOLEPLATE AFTER FINAL ALIGNMENT IN FIELD. 2-#10 P&W TAPER DOWELS EACH SUPPORT FURNISHED BY DRESSER-RAND WELLSVILLE.
- EXHAUST END SUPPORTS TO BE DOWELED TO BASEPLATE AFTER FINAL ALIGNMENT IN FIELD. 2-#10 P&W TAPER DOWELS FURNISHED BY DRESSER-RAND WELLSVILLE.
- STEAM END SOLEPLATE TO BE DOWELED TO BASEPLATE AFTER FINAL ALIGNMENT IN FIELD. 2-#10 P&W TAPER DOWELS FURNISHED BY DRESSER-RAND WELLSVILLE.
- STAINLESS STEEL SHIMS UNDER TURBINE FEET FURNISHED BY DRESSER-RAND WELLSVILLE.
- 10 HOLES Ø1"-8 UNC-3B TAP FOR VERTICAL POSITIONING. 4 HOLES 12 EACH STEAM END SUPPORT) & 6 HOLES IN EXHAUST END SUPPORT. SCREWS FURNISHED BY DRESSER-RAND WELLSVILLE.
- 12 SOLEPLATES GROUDED DIRECTLY TO FOUNDATION FURNISHED BY DRESSER-RAND WELLSVILLE.
- 36 HOLES (3 EACH SOLEPLATE) Ø5/16 THRU 3/8-16 UNC TAP X 2-1/2" LG SETSCREWS FOR LEVELING SOLEPLATES; Ø7/16 T-50 FOR EYEBOLTS WHEN HANDLING SOLEPLATE. FASTENERS SUPPLIED BY DRESSER-RAND.
- 12 HOLES Ø1.25 THRU LOWER BASEPLATE FLANGE, MOUNTING PAD AND SOLEPLATES FOR Ø1.00 FOUNDATION BOLTS. FASTENERS FURNISHED BY OTHERS.
- 12 HOLES FOR 1-8" TAP LEVELING OF BASEPLATE. SCREWS FURNISHED BY DRESSER-RAND.
- 24 PROVISIONS FOR HORIZONTAL POSITIONING. 8 AT STEAM END SOLEPLATE. 8 PROVISIONS AT EXHAUST END SUPPORT. 8 AT GEAR. 4 REMOVABLE BLOCKS WITH Ø1"-8 UNC SCREWS FURNISHED BY DRESSER-RAND WELLSVILLE.
- DRESSER-RAND WELLSVILLE TO FURNISH EYEBOLTS, JACKING BOLTS, CASE GUIDE PINS, WRENCHES, SPECIAL WRENCHES AND TOOLS FOR TURBINE MOUNTING.
- FOUNDATION BOLTS, WASHERS, NUTS, AND SLEEVES FURNISHED BY OTHERS.
- ALL FOUNDATION BOLTS SHOULD NOT BE RIGIDLY LOCATED UNTIL UNIT IS IN PLACE ON FOUNDATION AS BOLT HOLES IN BASEPLATE MAY VARY .25 IN ANY DIRECTION.
- THIS SURFACE MACHINED.
- CUSTOMER MUST PROVIDE ADEQUATE SUPPORT ALONG ALL BEAMS OR FOUNDATION TO BE SO BUILT AS TO SUPPORT ALL BEAMS.

- TURBINE MUST BE ALIGNED PRIOR TO START-UP.
- THIS DIMENSION INCREASES BY 40.00 WHEN REMOVING UPPER HALF OF TURBINE CASE.
- APPROXIMATE CENTER OF GRAVITY INCLUDES: TURBINE, GEARBOX, BASEPLATE, & PIPING.
- TWO BOROSCOPE OPENINGS PROVIDED TO VIEW FIRST STAGE AND EXHAUST.
- REMOVABLE BLANKET INSULATION TO BE FITTED ON THE TURBINE STEAM END, BARREL, EXHAUST END AND T&T VALVE SURFACES WITH OPERATING TEMPERATURES GREATER THAN 130°F. ACOUSTIC INSULATION CAN BE PROVIDED TO MEET PROJECT SOUND LEVELS OF 65 dBA IF REQUIRED.
- PIPE CONNECTIONS TO EXTEND A MINIMUM OF 3.00" BEYOND INSULATION.
- 4 LIFTING LUGS PROVIDED. LUGS MUST BE USED FOR LIFTING UNIT.
- GAUGEBOARD - SEE "LIST OF GAUGES".
- 12 HOLES Ø1/2-13 14REQ'D. FOR GAUGEBOARD HOLLOW BOLTS & 18) REQ'D. FOR JUNCTION BOX PANEL. BOLTS FURNISHED BY DRESSER-RAND.
- SEE SHAFT END DETAIL.
- HIGH SPEED COUPLING.
- LOW SPEED COUPLING.
- DISTANCE BETWEEN SHAFT ENDS.
- HIGH SPEED COUPLING GUARD.
- LOW SPEED COUPLING GUARD.
- NON-SPARKING COUPLING GUARDS PROVIDED BY DRESSER-RAND.
- HIGH SPEED COUPLING GUARD ADAPTER FLANGE.
- 24 HOLES Ø3/8-16 UNC-3B TAP THRU. EQUALLY SPACED AS SHOWN. SEE NOTE 48.
- LOW SPEED COUPLING GUARD ADAPTER FLANGE FURNISHED BY LUFKIN.
- 16 HOLES Ø1/2-13 NC TAP THRU. EQUALLY SPACED AS SHOWN. SEE NOTE 50.
- 24 HOLES Ø.4395/.4405 THRU 1/2" Ø1.000 ±.015/.000 TO DIMENSIONS SHOWN. COUPLING BOLTS AND NUTS SUPPLIED BY COUPLING VENDOR. SEE NOTE 53.
- LENGTH OF COUPLING BOLTS FOR THE TURBINE SHAFT END AND THE COMPRESSED SHAFT END IS TO BE DETERMINED BY ADDING THE TURBINE SHAFT INTEGRAL FLANGE THICKNESS PLUS THE COUPLING FLANGE THICKNESS.
- CALCULATED THERMAL MOVEMENTS BASED ON A TRANSITION TO FULL LOAD WITH MAXIMUM INLET TEMPERATURE FROM A COLD START AT 70°F/21.1°C.
- ROTOR VERTICAL POSITION IS THE SUM OF TURBINE SUPPORT THERMAL GROWTH AND HYDRODYNAMIC LIFT OF THE JOURNAL BEARING, AS THE ROTOR GOES FROM 70°F AND ZERO SPEED TO OPERATING SPEED AT NORMAL OPERATING TEMPERATURES.
- LOCATION OF JOURNAL BEARING CENTERLINES.
- THE VALUE SHOWN FOR EXTRACTION THERMAL MOVEMENT, CONNECTION "C", IS BASED ON ALL FLOW FROM 4TH STAGE EXIT, TURBINE AT FULL LOAD. THE VALUE IN PARENTHESES, IS ALL FLOW FROM FIRST STAGE EXIT, TURBINE AT 75% LOAD.
- GENERATOR SOLEPLATES, SHIMS, LEVELING PLATES AND LEVELING SCREWS FURNISHED BY GENERATOR MANUFACTURER.
- GENERATOR MAIN TERMINAL BOX - NEUTRAL SIDE.
- GENERATOR MAIN TERMINAL BOX - LINE SIDE.
- CUSTOMER TO SUPPORT GENERATOR MAIN TERMINAL BOX.
- DISTANCE REQUIRED TO REMOVE GENERATOR COOLER.
- DISTANCE REQUIRED TO REMOVE GENERATOR ROTOR.
- PROVISION FOR LIFTING UPPER HALF OF GEAR CASE ONLY.
- THIS DIMENSION INCREASES A MINIMUM OF 22.63 WHEN REMOVING UPPER HALF OF GEAR CASE.
- INSTALLED HEIGHT OF NON-RETURN VALVE SPRING SUPPORT.
- EXHAUST CONNECTION STUDS, NUTS, AND WASHERS FURNISHED BY OTHERS.
- GEAR TO BE DOWELED TO BASEPLATE AFTER FINAL ALIGNMENT IN FIELD. 2-#10 TAPER DOWELS FURNISHED BY LUFKIN.
- 4 HOLES Ø1"-8 TAP FOR VERTICAL POSITIONING OF GEAR. SCREWS FURNISHED BY LUFKIN.
- FLANGE CONNECTIONS WITHOUT A SIZE, RATING, OR DIMENSIONAL LOCATION DESIGNATED ARE NOT CLIENT CONNECTIONS.

FRAME 1THB3HB2 MULTI-STAGE STEAM TURBINE WITH EXTERNALLY CONTROLLED EXTRACTION AND LUFKIN GEAR N2700C DRIVING 15,808 KW, 18,598 KVA, 13,800 VOLTS, 3-PHASE, 4 POLE, .85 PF, 60 HZ GENERATOR WITH BRUSHLESS EXCITER

| STEAM OPERATING CONDITIONS | | | | |
|---------------------------------------|-----------|-------------------------|--------------------|-----------------|
| NORMAL GUARANTEE OPERATING CONDITIONS | | NORMAL STEAM CONDITIONS | | |
| EKW | SPEED RPM | INLET PSIG/°F | EXTRACTION PSIG/°F | EXHAUST PSIG/°F |
| 15560 | 3632/1800 | 925 / 749' | 354.54 / 547.2' | 235 / 476.67' |

APPROXIMATE WEIGHTS

| | LBS. |
|---|--------|
| TURBINE (INCLUDING SOLEPLATE & BASEPLATE) | 64,750 |
| ACCESSORIES | 9,000 |
| MISC | 3,000 |
| APPROX. TOTAL WEIGHT | 76,750 |
| GENERATOR | |
| GENERATOR STATOR | 50,710 |
| GENERATOR ROTOR & COOLER | 35,362 |
| GENERATOR TERMINAL BOXES | 2,645 |
| GENERATOR MISC | 570 |
| APPROX. TOTAL WEIGHT | 89,268 |
| GEAR (INCLUDING TURNING GEAR) | 15,300 |
| TURBINE CASE (UPPER HALF) | 16,600 |
| TURBINE ROTOR | 4,300 |
| BASEPLATE | 23,500 |
| T&T VALVE | 5,800 |

| CUSTOMER'S MAJOR CONNECTIONS (DIM'S IN INCHES) | | | | | | | | | | |
|--|-----------------------|--------|------|-------|-------|-----------|------------|-------------------|-------------|--------------------------------|
| CONNECTION | SIZE | RATING | I.D. | O.D. | B.C. | NO. HOLES | DIA. HOLES | NOMINAL THICKNESS | RAISED FACE | REMARKS |
| A | TURBINE INLET | 12 | 900 | 11.12 | 24.00 | 21.00 | 20 | 1.50 | 3.12 | .25 X Ø15.00 NOTES 1,2,3,4,6,7 |
| B | TURBINE EXHAUST | 24 | 300 | 23.00 | 36.00 | 32.00 | 24 | 1.62 | 2.75 | .06 X Ø27.25 NOTES 1,2,5 |
| C | CONTROLLED EXTRACTION | 4 | 600 | 3.83 | 10.75 | 8.50 | 8 | 1.00 | 1.50 | .25 X Ø6.19 NOTES 1,2,6,7 |

| JOURNAL BEARING THERMAL & HYDRODYNAMIC MOVEMENT | | |
|---|-------|-------|
| BEARINGS LOCATION (NOTE 56) | EEJB | 1EJB |
| VERTICAL THERMAL RISE (NOTE 55) (INCHES) | .015 | .023 |
| VERTICAL DYNAMIC RISE (NOTE 55) (INCHES) | .0071 | .0046 |

D - INFORMATION ONLY FLUOR.
 Receipt acknowledged. Notification of receipt of data does not constitute acceptance nor relieve Contractor/Seller of any liability. Acceptance is accomplished under the terms of the Contract Purchase Order.
 By nev35601 at 7:38 am, Jan 27, 2010

IMPORTANT!
 THIS DRAWING HAS BEEN RELEASED FOR PRODUCTION. ANY CHANGES MAY AFFECT PRICE AND DELIVERY.

FLUOR CONTRACT NO.: A4AN
P.O. NUMBER: A4AN-4-0302-01
RECEIVED DATE: 27-JAN-2010
FLUOR CONTROL NUMBER: A4AN-4-0302-01-00005-7
EQUIP/TAG NUMBER T-0522

ALL DIMENSIONS ARE IN INCHES

FLUOR CONTRACT NO.: A4AN
 FLUOR P.O. NO.: A4AN-4-0302-01/A4AN100196
 EQUIPMENT TAG NO.: T-0522

THIS PRINT IS CERTIFIED CORRECT FOR:
FLUOR FOR TESORO - L.A. REFINERY
 CUSTOMER'S ORDER NO.: A4AN-4-0302-01/A4AN100196
 BRANCH OFFICE: CALIFORNIA
 WORK ORDER NO.: C-33306
 THE CONSTRUCTION SHOWN IS STANDARD FOR THIS MACHINE. ANY DEVIATION FROM STANDARDS MAY INVOLVE ADDITIONAL COST. A CORRESPONDING INCREASE IN SELLING PRICE AND DELAY IN SHIPMENT. IF CHANGES ARE NECESSARY INDICATE THEM CAREFULLY AND IN DETAIL ON THIS PRINT AND RETURN TO DRESSER-RAND. YOU WILL BE ADVISED PROMPTLY AS TO THE ADDITIONAL PRICE. MEANWHILE THOSE DETAILS INVOLVED WILL BE HELD UP UNTIL YOUR AUTHORIZATION TO PROCEED IS RECEIVED.
 ENERGY SYSTEMS

THIS DRAWING CONTAINS CONFIDENTIAL AND TRADE SECRET INFORMATION. IT IS THE PROPERTY OF DRESSER-RAND COMPANY, AND IS PROVIDED TO THE RECIPIENT IN CONFIDENCE. THE RECIPIENT'S RETENTION OF THE DRAWING AGREES TO TREAT THE DRAWING AND THE INFORMATION THEREIN AS SECRET AND CONFIDENTIAL, AND UPON DEMAND TO RETURN THE DRAWING AND ALL COPIES THEREOF IN ANY FORM.

| | | | | | | | |
|--|----------------------------|---|---------------------------|---|--|---|--------------------------|
| ADDED NOTE B2- PER REQUEST OF PROJECT ENG. | AS BUILT DAG. SEE SHEET 3. | UPDATED FOR CPLG, GUARD & ADAPTER INFO. 79,80,81. | ADDED NOTES 75, 76, & 77. | PER GENERATOR DR. REV #02, ROTOR & COOLER ASST. HAS 35290 LB. ACCO. GEN. TERMINAL BOX & MISC #915. GEN. TOTAL WT. HAS BUZZER LBIF 11. PER CUSTOMER REQUEST (SERIAL REV. A4AN-4-0302-01-0005-3.81). ACCO. P&I DAG. NO. TO NOTES 13,15, & 16. | UPDATED NOTES 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100. | CREATED SHEET TO P&I OPERATING CONDITIONS, CLIENT CONNECTION BLOCK, NOTES, & JOURNAL P&I INFO. UPDATED WEIGHTS. | DRWN IN US CAD IDI CW300 |
| J KVA 19DEC09 at 12/21 | H KVA 09DEC09 at 12/9 | G KVA 31AUG09 at 9/1 | F KVA 18JUN09 at 6/18 | E KVA 10FEB09 at 2/27 | D KVA 10FEB09 at 2/12/09 | C KVA 18JUN09 at 6/11/09 | DRWN IN US CAD IDI CW300 |

DRESSER-RAND ENERGY SYSTEMS WELLSVILLE, NY 14895

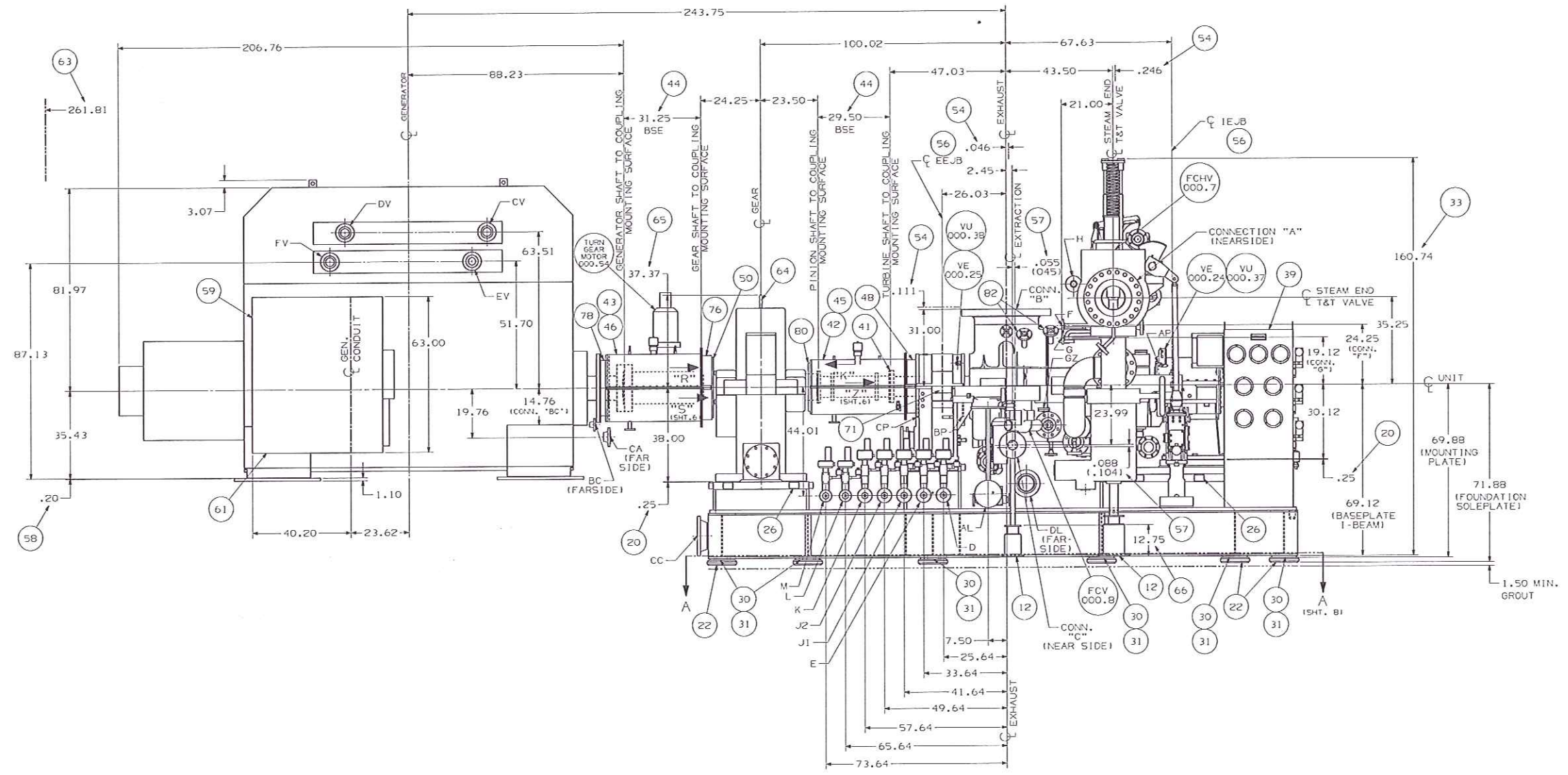
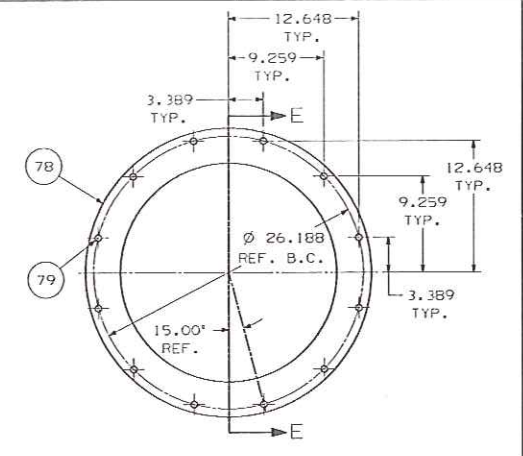
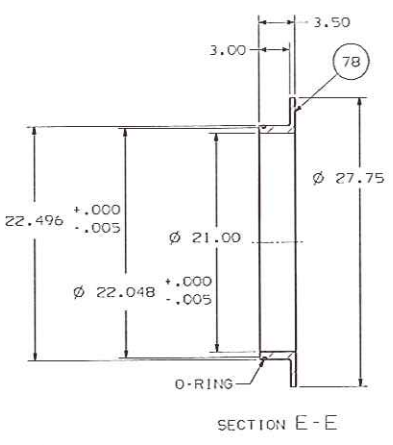
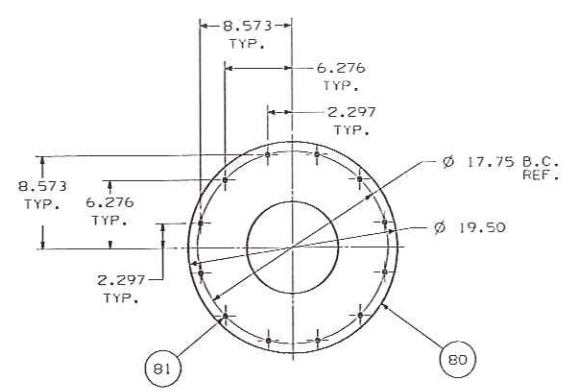
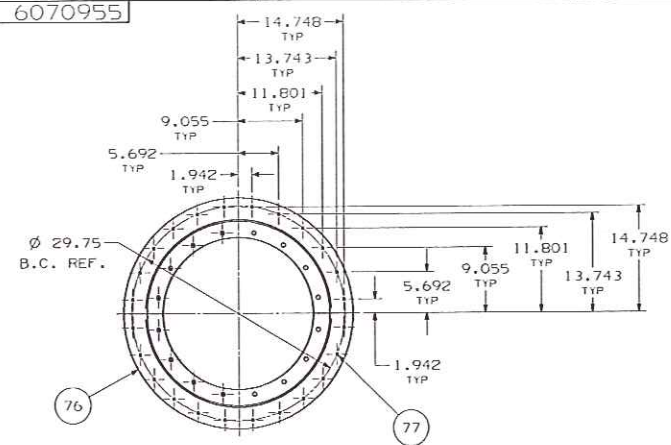
OUTLINE

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SEE ABOVE

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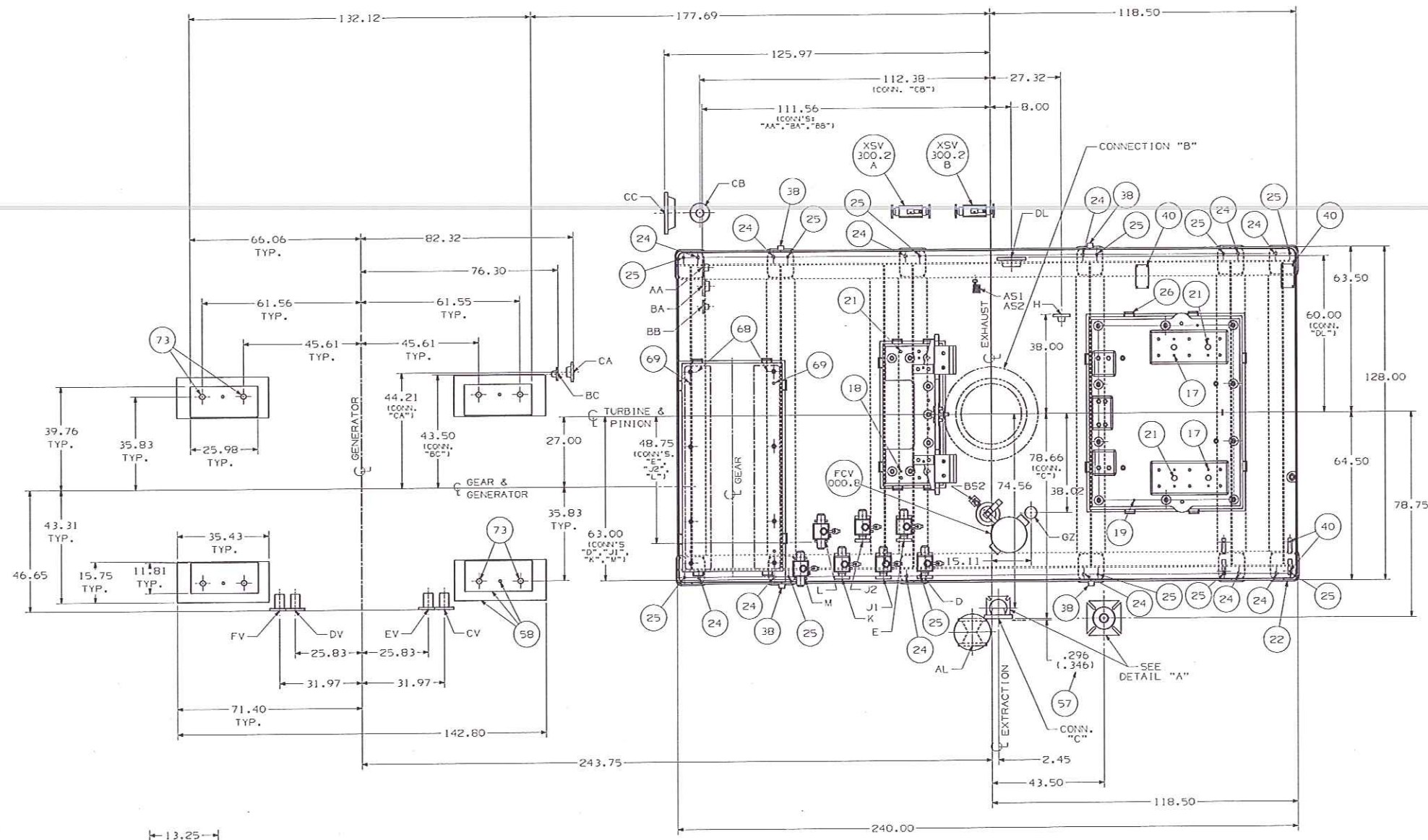


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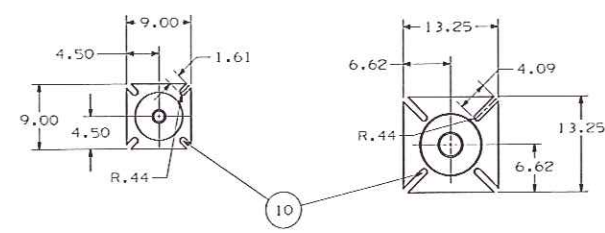
| | | | | | | | | |
|---|----------------------------|---|--|---|---|----------------------|--|---------|
| ADDED ITEM B2 (ID-4), PER REQUEST OF PROJECT ENG. | AS BUILT DAG. SEE SHEET 3. | ADDED VIEW AT ARROW "R" (ID-5); L.S. COUPLING GUARD SUPPORT FLG. (ID-5) & SECT E-1 (ID-5). ADDED ITEM #78, (ID-5) | ADDED DIM'S TO GENERATOR: 23.62 (ID-4) AND 87.13 (ID-4). ADDED ITEM 76 (ID-4). ITEM 50 HAS #51 (ID-4). VIEW AT ARROW "R" UPDATED (ID-4). | ADDED VIEW AT ARROW "K" (ID-4) PER GENERATOR ENG. REV. #2. DIM. 207.08 HAS 205.08 (ID-4). | POINTED INS & LS COUPLINGS (ID-4, ID-5) REVISED CONSP. REV. & DV LOCATIONS (ID-4, ID-5). LOCATED VTL OF GENERATOR CONDUIT (ID-4, ID-5). ADDED CONN. (ID-4) & FOUNDATION SOLEPLATES. | PRELIMINARY OUTLINE. | UPDATED GEAR OFFSET; ADDED GEN OIL & COOLER (ID-4) & EXHAUST CONN. TO LEFT; CHANGED FL. TO BOTTOM OF BASE. TO 69.12. | |
| J 12/21 | H 12/09 | G 12/21 | F 12/21 | E 12/27 | D 12/09 | C 11/19 | B 12/17 | A 12/12 |

| | | |
|-----------------|-------------------|-----------------------------|
| TOLERANCES | DRWN BY CAVANAUGH | DRESSER-RAND ENERGY SYSTEMS |
| X.X | DATE: 06/13/08 | YELLSVILLE, NY 14886 |
| X.XX | CHECKED: 06/14/08 | |
| X.XXX | SUPV: 06/14/08 | |
| NO. | FRW: 11H3332 | |
| | SD: C33305 | |
| E 6056900 | | 6070955 |
| DRWN IN LO | CD 101 | CM 300 |
| SCALE: AS SHOWN | | PAGE 2 OF 8 |

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PLAN VIEW
(TURBINE, GEAR, GENERATOR
REMOVED FOR CLARITY)

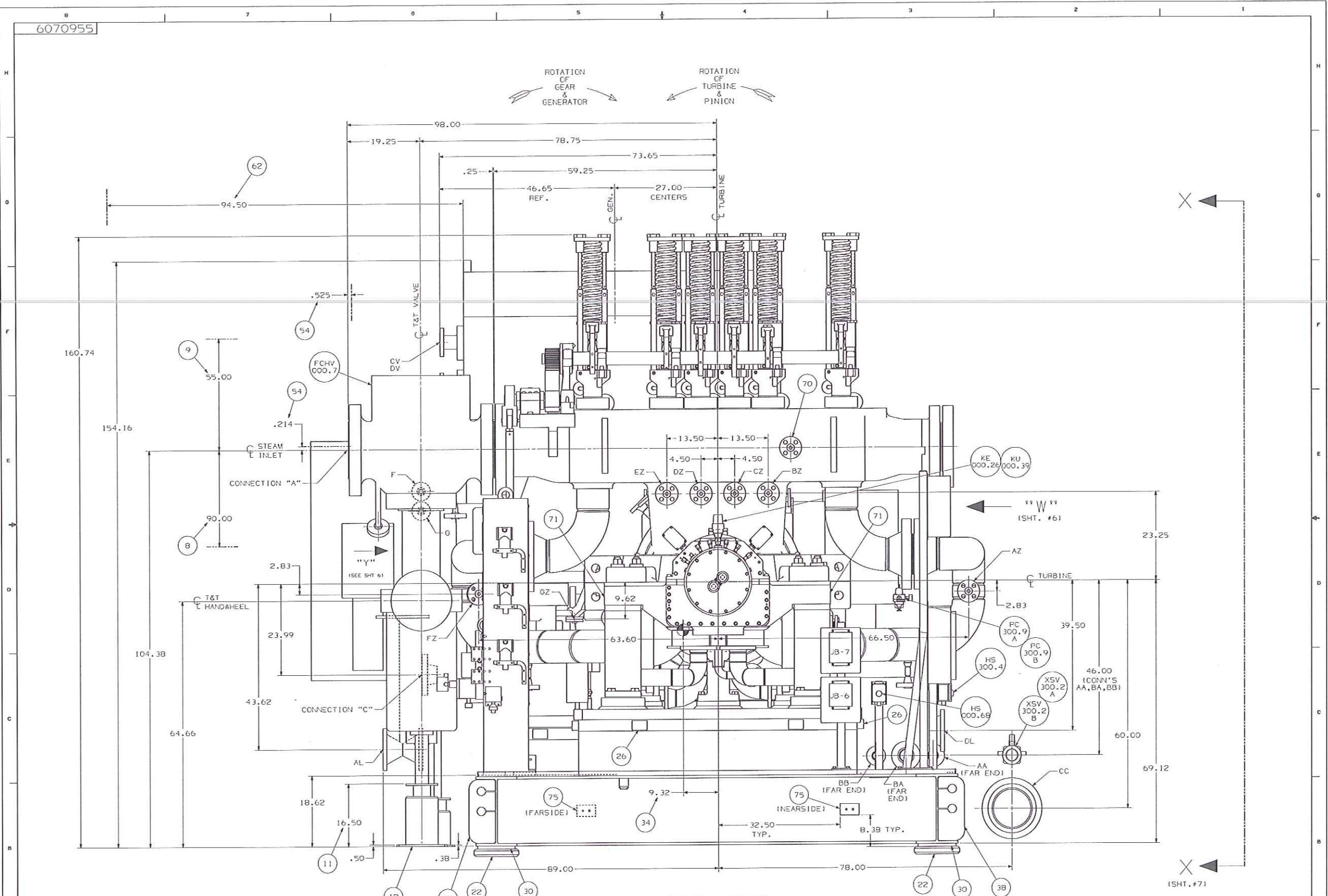


DETAIL "A"
(SPRING SUPPORT FOOTPRINT)

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| | | | | | | | | |
|---|---|--|---|---|--|---|--------------------------|---------------|
| FOR REVISION, SEE SHEETS #1 & #2. | AS BUILT DAG, FLIPPED AUTO DRAIN VALVES 180° DIM 48.75 MAS 54.00IES1. | SEE SHEETS 1,2, 3, & 7 FOR REVISION. | ADDED R.44, 1.61 & 4.09 DIM'S (B7). | CONN. "CC" DIM. 76.30 MAS 69.36 (F5). ADDED DIM'S 38.02 & 15.11 (D3) TO LOCATE CONN. "C2". | ADDED DIM. 43.50 (C3). ADDED CONNS: CV, DV, EV, INFO. & CONN. "C" FVID51. ADDED GEN. LOCATION. HOLEYIN, B21 LOCATIONS & ITEM 73. | UPDATED TO INCLUDE PIPING INFO. & CONN. "C" | PRELIMINARY OUTLINE. | SEE SHEET 2. |
| J KUB 15DEC09 9/12/21 | H KUB 09DEC09 9/12/9 | G KUB 31AUG09 9/1 | F KUB 18JAN09 9/16/18 | E KUB 20MAR09 9/12/27 | D KUB 10FEB09 9/12/29 | C KUB 18NOV08 9/11/19 | B KUB 17JUL08 9/17/17 | A KAC 6/17/08 |

| | | |
|-----------------------|------------------|---|
| TOLERANCES | DRWN BY CAVANUGH | DRESSER-RAND ENERGY SYSTEMS YELLSVILLE, NY 14905 |
| X.X DATE 06/13/08 | | |
| X.XX CHECKED 06/14/08 | | |
| X.XXX SUPERV 06/14/08 | | |
| NO. DRAWN 11H33-32 | | |
| SDS C33305 | | |
| E 6056900 6070955 | | |
| DRWN IN LG | NO 101 | CM300 |
| SCALE .05 | | |
| PAGE 3 OF 8 | | |



END VIEW
(STANDING AT INLET END
LOOKING DOWNSTREAM
TOWARDS GEAR/GENERATOR)

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| | | | | | | | | |
|-----------------------------------|----------------------------|--|--|---|-----------------------|---|----------------------|---------------|
| FOR REVISION, SEE SHEETS #1 & #2. | AS BUILT DRG. SEE SHEET 3. | SEE SHEETS 1, 2, 3, & 7 FOR REVISIONS. | ADDED ITEM 75 & LOCATING DIM'S 32.50 AND B. 38 (183.85). ADDED REFERENCE DIM. 46.65 (105). LOCATIONS AND PUSHBUTTON P&I SYMBOLS: HS-000.68 & HS-300.4 (C31). ADDED .38 & .50 DIM'S, 1861 | ADDED DIM. 9.62 TO LOCATE CORR. (92*105). | ADDED CORR. GZ (105). | REVISED TO ADD SIPPING CONN'S. SOLE PLATES FOR FOUNDATION ADDED BASEP. UPDATED. | PRELIMINARY OUTLINE. | SEE SHEET 2. |
| J KUB 1305009 9/12/21 | H KUB 0905009 9/12/9 | G KUB 3114009 9/1/9 | F KUB 1814009 6/18 | E KUB 2048009 3/27 | D KUB 1078009 2/10/09 | C KUB 1814009 11/19 | B KUB 1714009 7/17 | A RAC 6/17/08 |

| | | |
|------------|-------------------|-----------------------------|
| TOLEANCES | DRWN BY CAVANAUGH | DRESSER-RAND ENERGY SYSTEMS |
| X.X | DATE: 06/13/08 | WELLSVILLE, NY 14696 |
| X.XX | CHECKED: 06/14/08 | |
| X.XXX | SUPERV: 06/14/08 | |
| NO. | PRJCT: 11H3J-S2 | |
| | SO: C33306 | |
| OUTLINE | | |
| E 6056900 | 6070955 | |
| DRWN IN LO | CAD 101 | CM300 |
| P&I .05 | | 4 OF 8 |

6070955

PIPING CALCULATIONS

(TWO TIMES NEMA SM 24-1991
EXCEPTION: EXTRACTION IS ONE TIMES NEMA)

1. THE TOTAL RESULTANT FORCE AND TOTAL RESULTANT MOMENT IMPOSED ON THE TURBINE AT ANY CONNECTION MUST NOT EXCEED THE FOLLOWING:

| FLANGE | |
|--------|------------------|
| 9333 | INLET |
| 13333 | EXHAUST |
| 2000 | EXTRACTION CONN. |

$$3F_R + M_R \leq$$

F_R = RESULTANT FORCE (POUNDS) AT THE CONNECTION. THIS INCLUDES PRESSURE FORCES WHERE UNRESTRAINED EXPANSION JOINTS ARE USED.

$$F_R = \sqrt{F_x^2 + F_y^2 + F_z^2}$$

M_R = RESULTANT MOMENT (FOOT-POUNDS) AT THE CONNECTION.

$$M_R = \sqrt{M_x^2 + M_y^2 + M_z^2}$$

2. THE COMBINED RESULTANTS OF THE FORCES AND MOMENTS OF THE INLET AND EXHAUST CONNECTIONS, RESOLVED AT THE CENTERLINES OF THE EXHAUST CONNECTION, MUST NOT EXCEED THE FOLLOWING TWO CONDITIONS:

A. THESE RESULTANTS MUST NOT EXCEED: $2F_c + M_c \leq 7522$ WHERE:

F_c = COMBINED RESULTANT OF INLET AND EXHAUST FORCES IN POUNDS.

M_c = COMBINED RESULTANT OF INLET AND EXHAUST MOMENTS AND RESULTING FROM FORCES, IN POUND-FEET.

B. THE COMPONENTS OF THESE RESULTANTS SHALL NOT EXCEED:

F_x = 1504 POUNDS M_x = 7522 POUND-FEET
 F_y = 3761 POUNDS M_y = 3761 POUND-FEET
 F_z = 3009 POUNDS M_z = 3761 POUND-FEET

THE COMPONENTS ARE AS FOLLOWS:

F_x = HORIZONTAL COMPONENT OF F_c PARALLEL TO TURBINE SHAFT.

F_y = VERTICAL COMPONENT OF F_c .

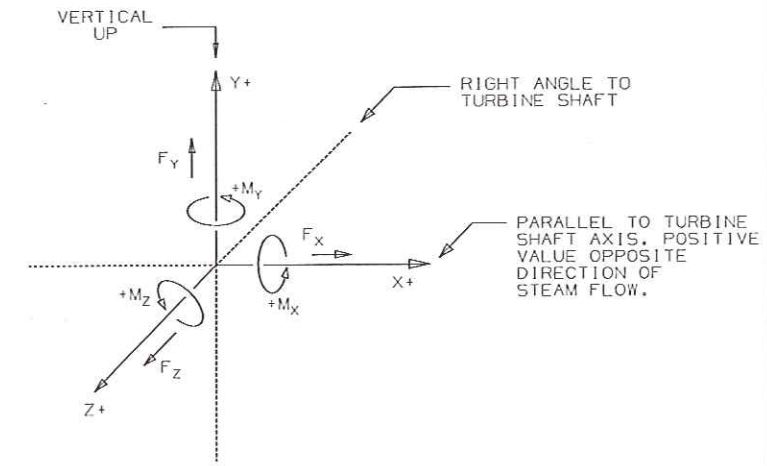
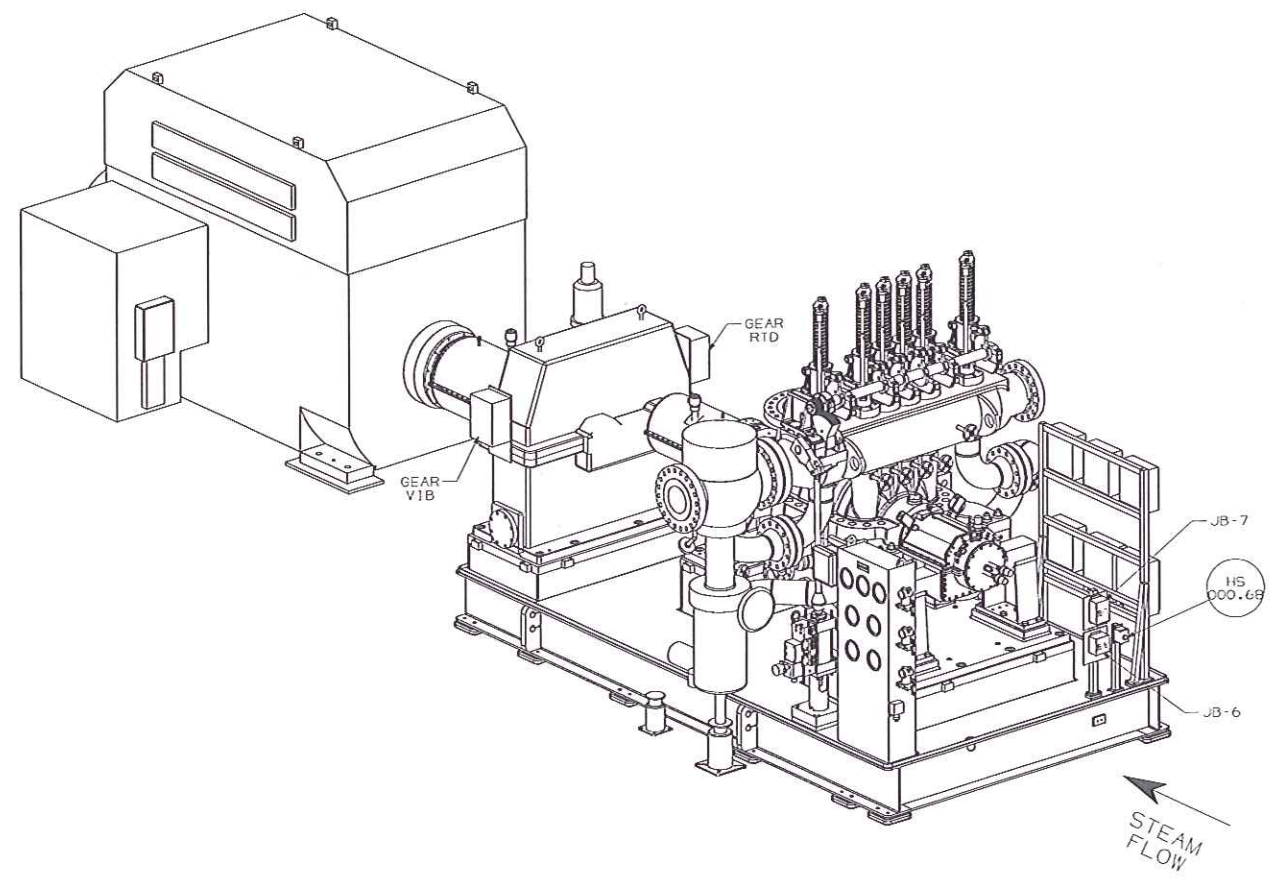
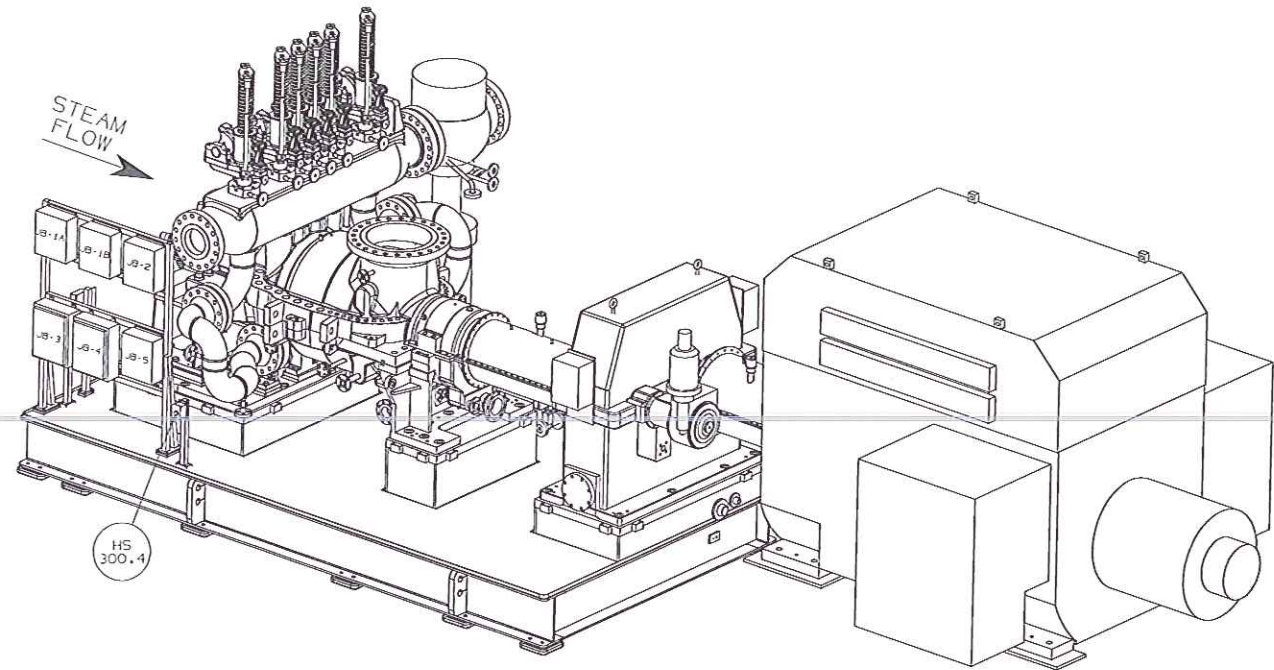
F_z = HORIZONTAL COMPONENT OF F_c AT RIGHT ANGLES TO TURBINE SHAFT.

M_x = COMPONENT OF M_c AROUND THE HORIZONTAL AXIS PARALLEL TO TURBINE SHAFT.

M_y = COMPONENT OF M_c AROUND THE VERTICAL AXIS.

M_z = COMPONENT OF M_c AROUND THE HORIZONTAL AXIS AT RIGHT ANGLES TO TURBINE SHAFT.

3. THESE VALUES OF ALLOWABLE FORCES AND MOMENTS PERTAIN TO THE TURBINE STRUCTURE ONLY. THEY DO NOT PERTAIN TO THE FORCES AND MOMENTS IN THE CONNECTING PIPING, FLANGES AND FLANGE BOLTING, WHICH SHOULD NOT EXCEED ALLOWABLE STRESS AS DEFINED BY APPLICABLE CODES AND REGULATORY BODIES.



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| REV | DATE | BY | DESCRIPTION |
|-----|----------|-----|---|
| J | 12/21/91 | KyB | FOR REVISION, SEE SHEETS #1 & #2. |
| H | 12/9/91 | KyB | AS BUILT DAG. SEE SHEET 3. |
| G | 9/1/91 | KyB | REVISED JOB CALLOUTS (68), SEE SHEETS 1, 2, 7 FOR REVISION. |
| F | 6/18/91 | KyB | ADDED JUNCTION BOXES JB-6 & JB-7 (B5). ADDED PUSH-BUTTONS (B5, F7). GEAR CALL-OUTS ADDED PER MARKUP (IC-6). |
| E | 3/27/91 | KyB | NO CHANGE. |
| D | 2/12/09 | KyB | NO CHANGE. |
| C | 11/19/91 | KyB | ISSUED SHEET TO INCLUDE 30-150 VIEWS OF UNIT. |

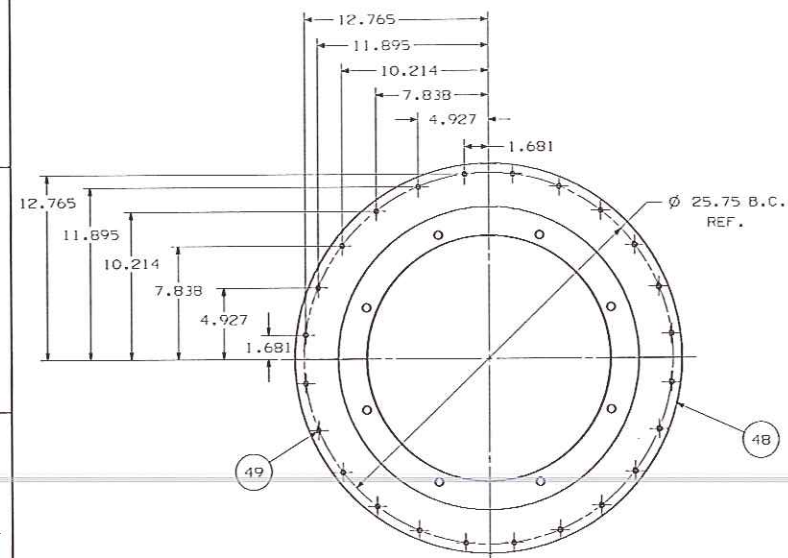
| TOLERANCES | DRWN BY | DATE | DATE |
|------------|-----------|----------|----------|
| X.X | CAVANAUGH | 06/13/08 | 06/14/91 |
| X.XX | | 06/14/91 | |
| X.XXX | | 06/14/91 | |
| NO. | FRMT | 11H33-B2 | |
| | SDI | C33305 | |

DRESSER-RAND ENERGY SYSTEMS
WELLSVILLE, NY 14895

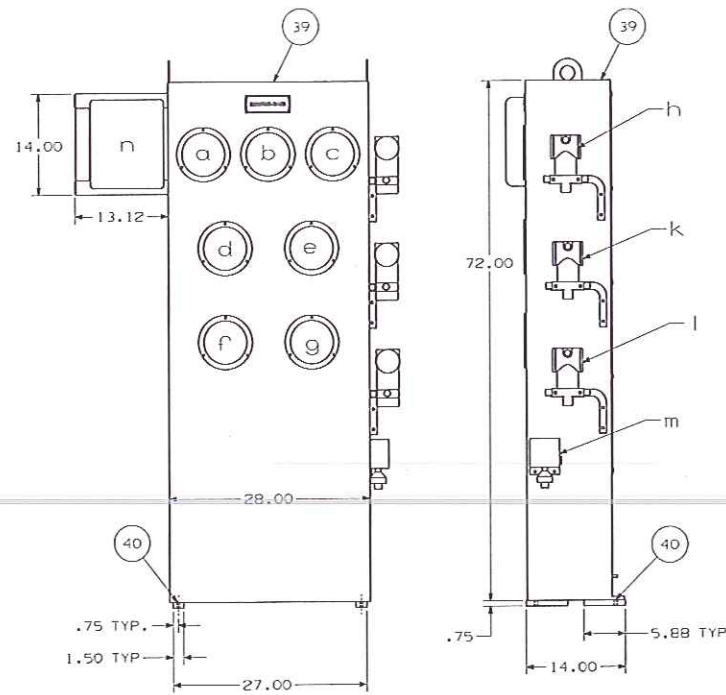
OUTLINE

E 6056900 6070955
DRWN IN LBS CO 10: CM300 PLS .CS 5 OF 8

6070955



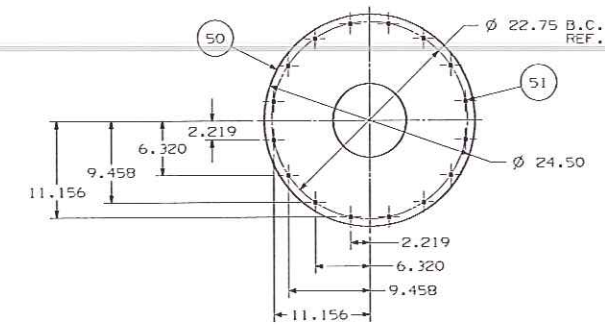
VIEW AT ARROW "Z"
(IHS COUPLING GUARD ADAPTER FLANGE)
(SEE SHT 2)



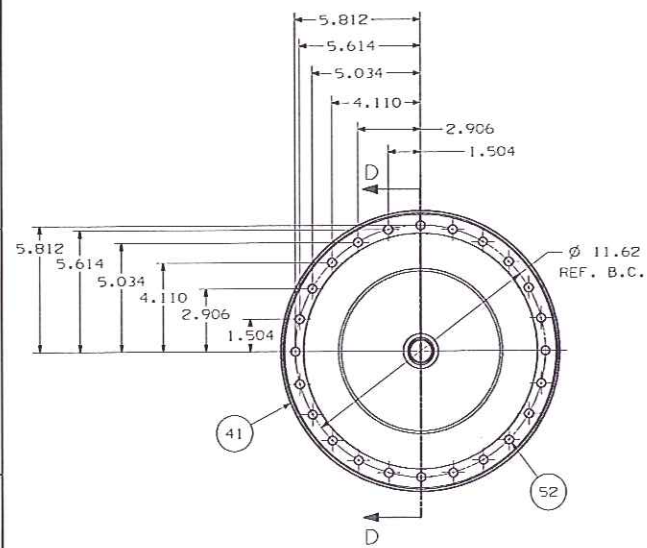
VIEW AT ARROW "Y"
(SEE SHT 4)

LIST OF GAUGES

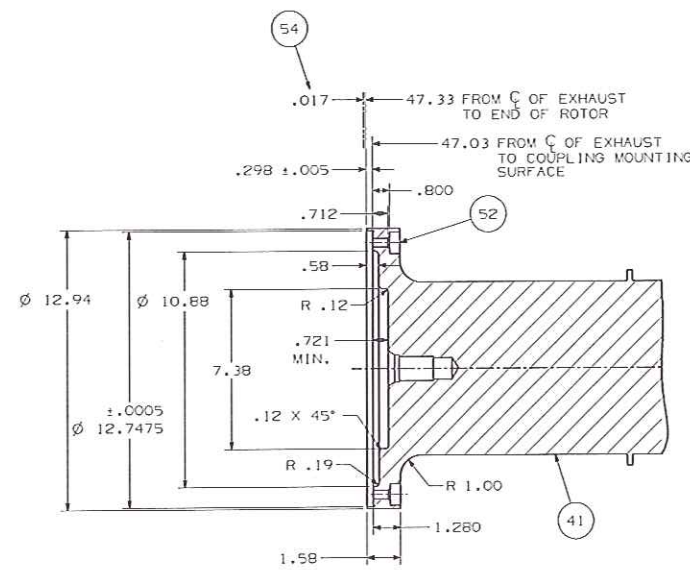
| GAUGE | SIZE | DESCRIPTION OF GAUGE | P&I NUMBER |
|-------|------|--------------------------------|--------------|
| a | 6.00 | INITIAL PRESSURE | P1-000.49 |
| b | 6.00 | FIRST STAGE PRESSURE | P1-000.50 |
| c | 6.00 | MEDIUM EXTRACTION PRESSURE | P1-000.51-A |
| d | 6.00 | LOW EXTRACTION PRESSURE | P1-000.51-B |
| e | 6.00 | EXHAUST PRESSURE | P1-000.52-A |
| f | 6.00 | LUBE OIL PRESSURE | P1-400.6-A |
| g | 6.00 | CONTROL OIL PRESSURE | P1-200.8 |
| h | | EXHAUST PRESSURE TRANSMITTER | PIT-000.52-B |
| k | | LUBE OIL PRESS. TRANSMITTER | PIT-400.6-B |
| l | | CONTROL OIL PRESS. TRANSMITTER | PIT-200.7 |
| m | | EMERGENCY OIL PUMP START | PS-200.9 |
| n | | TACHOMETER | SIU-000.5 |



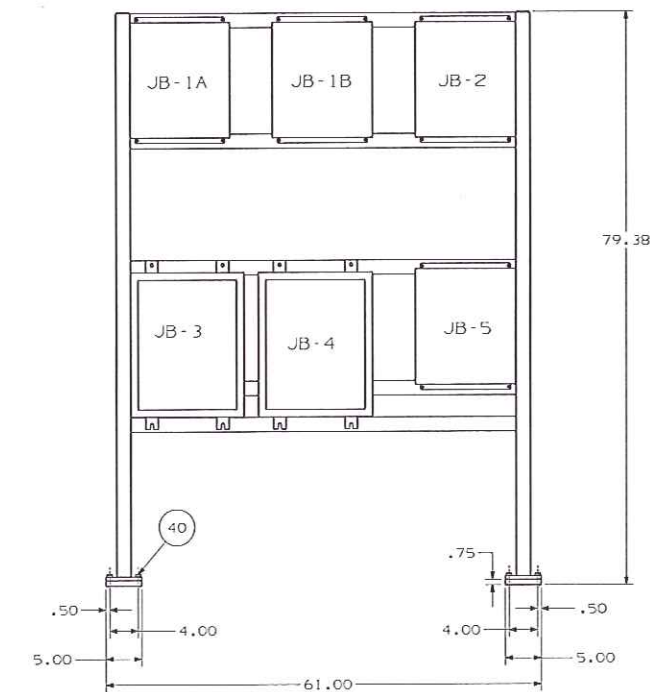
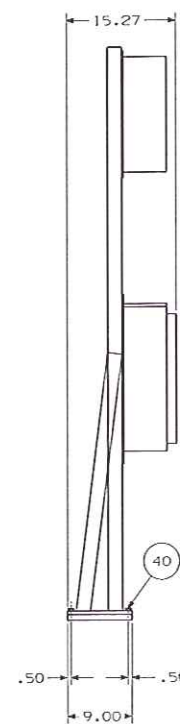
VIEW AT ARROW "S"
(I/S COUPLING GUARD ADAPTER FLANGE-BY LUFKINI)
SEE SHEET 2)



VIEW AT ARROW "Z"
(DETAIL OF ROTOR END)
(SEE SHT 2)



SECTION D-D



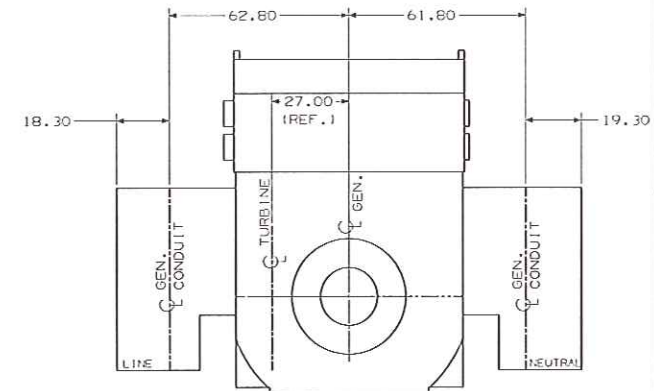
VIEW AT ARROW "W"
(JUNCTION BOX PANEL)

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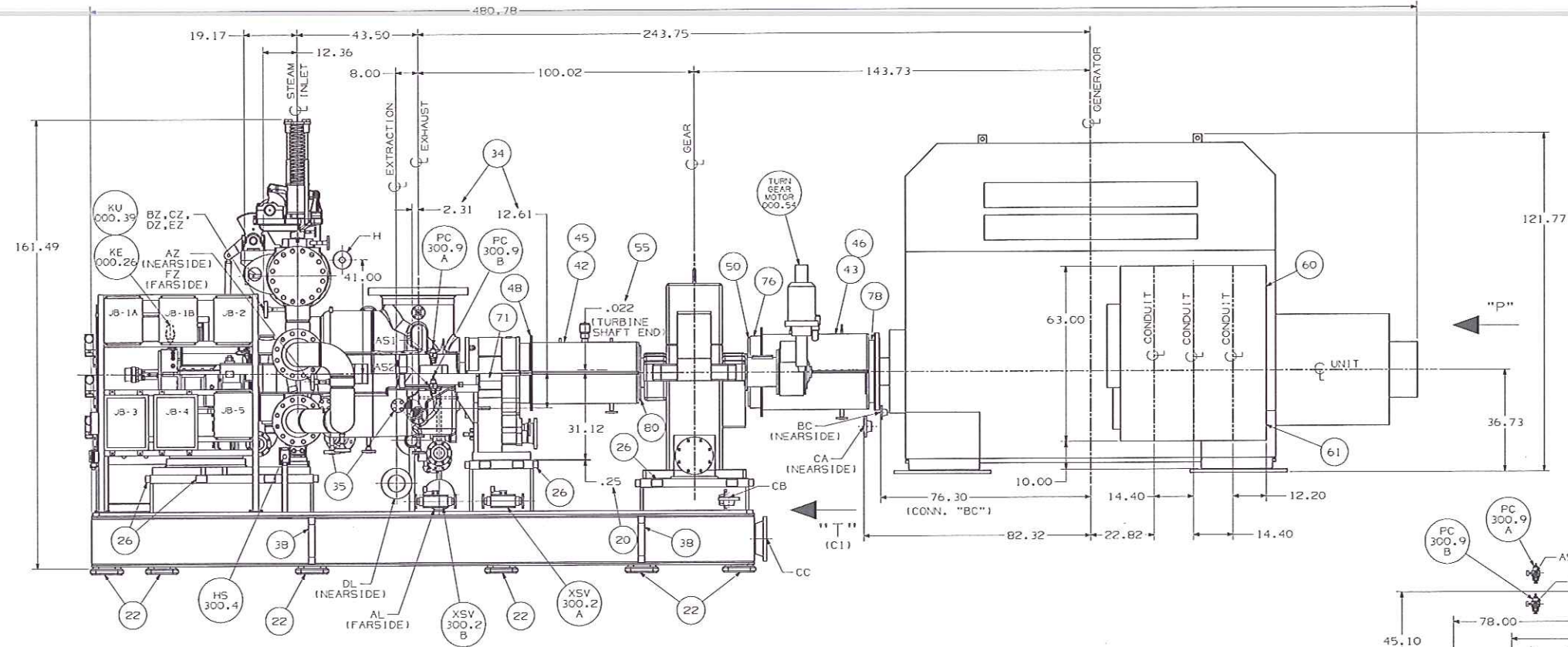
| | | | | | | |
|-----------------------------------|----------------------------|--------------------------------------|--------------------------|---|---|--|
| FOR REVISION, SEE SHEETS #1 & #2. | AS BUILT DAG. SEE SHEET 3. | SEE SHEETS 1, 2, 5 & 7 FOR REVISION. | NO CHANGE. | ADDED GAUGE "n" FOR TACH CALLOUT TO GAUGEBOARD & LIST OF GAUGES (E3, H5). | UPDATED END OF ROTOR DETAIL - SECTION DO VIEW & VIEW AT ARROW "Z" (B4-71) .BOX LABELS REVISED (C2, D2). | USED SHEET FOR DETAILS, REVISED FOR REVIEW CERTIFIED STATUS. |
| J KUB 19DEC09 gt 12/21 | H KUB 09DEC09 gt 12/9 | G KUB 31AUG09 gt 9/1 | F KUB 18JAN09 gt 5/18 | E KUB 20MAR09 gt 3/27 | D KUB 10FEB09 gt 2/12/09 | C KUB 18NOV08 gt 11/19 |

| | | | |
|------------|----------|----------|--|
| TOLERANCES | DRAWN BY | DATE | DRRESSER-RAND ENERGY SYSTEMS WELLSVILLE, NY 14885 |
| X.X | CAVANAGH | 06/13/08 | |
| X.XX | DREDDY | 06/14/08 | |
| X.XXX | SLPER | 06/14/08 | |
| ADD. | FRANK | 11H33-32 | |
| | BOI | C33306 | |
| E 6056900 | | | OUTLINE |
| 6070955 | | | 6 OF 8 |

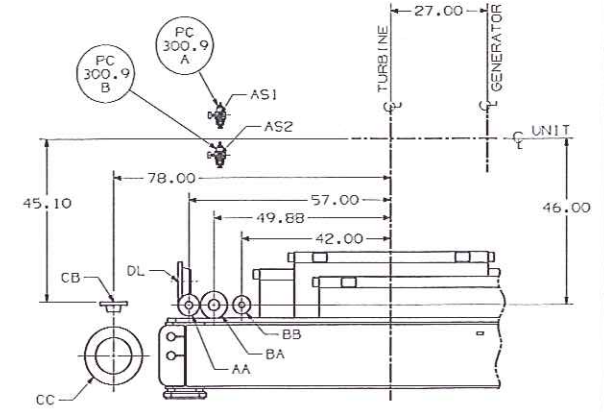
6070955



VIEW AT ARROW "P"
(VIEW FROM NON-DRIVEN END OF GENERATOR)



VIEW "X-X"
BACK VIEW OF TURBINE
(SHT. #4)



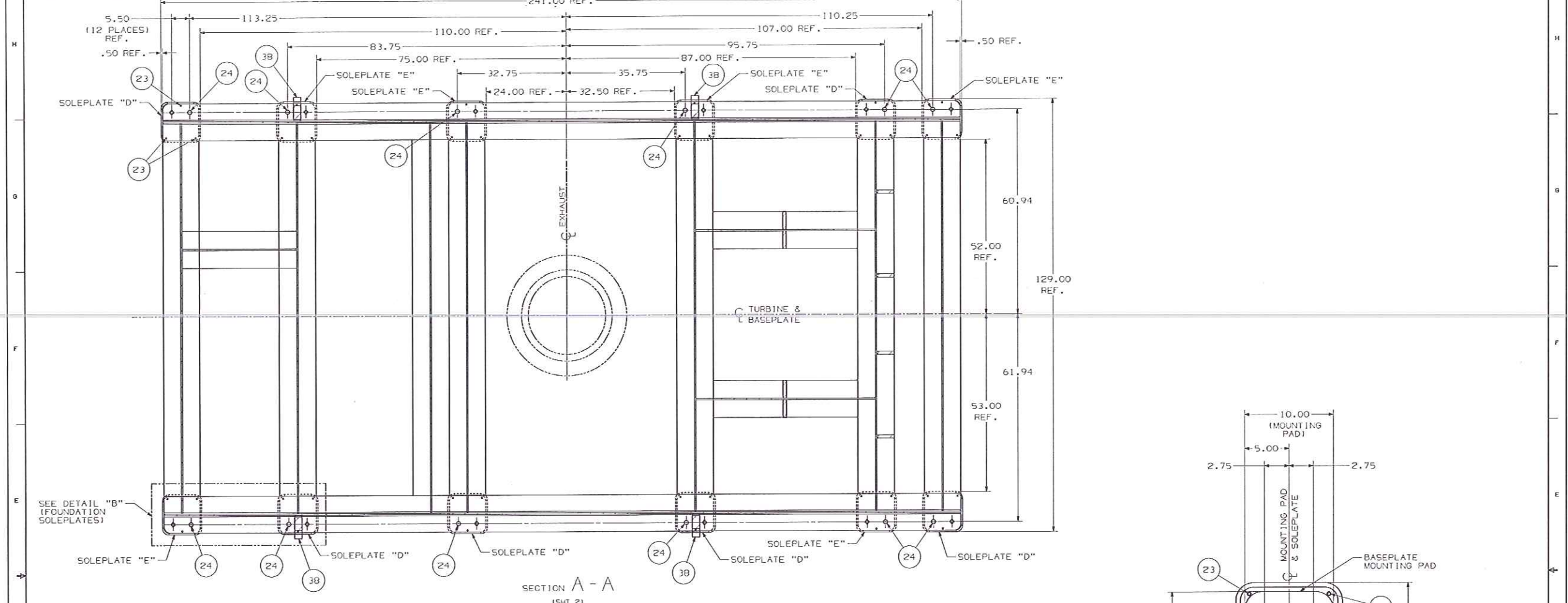
VIEW AT ARROW "T"
(C4)

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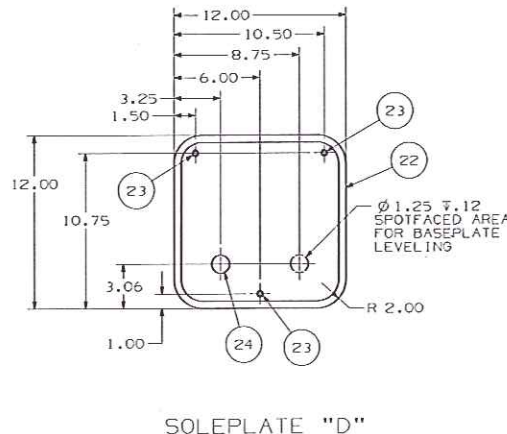
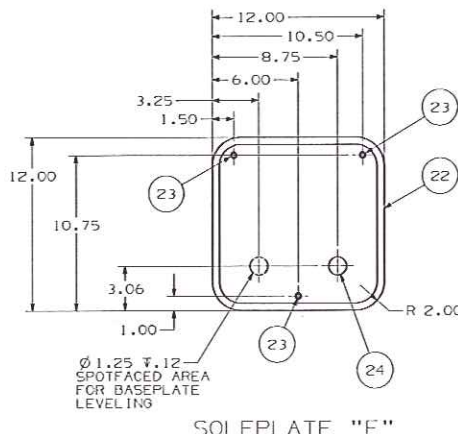
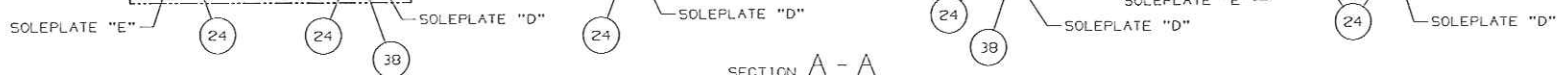
| | | | | | |
|-----------------------------------|----------------------------|--|--|--|--|
| FOR REVISION, SEE SHEETS #1 & #2. | AS BUILT Dwg. SEE SHEET 3. | ADDED ITEM # 78 (E5) & #80 (D5) (FOR PUSHBUTTON) | ADDED P&I SYMBOLS: 35-300.4(C7), 45-300.4(C7), ADDED 22.82 DIM. (C3), 41. ADDED ITEM #76 (E5). | PER GENERATOR DIM. 243.75 HAS 242.75 & 143.73 HAS 142.73 (F4). DIM. 80.38 HAS 79.36 & 82.32 HAS 81.32 (D3), DIM. VIEW AT ARROW "R" (11, 21). | ADDED SHEET FOR LOCATING PIPING CLIENT CONNS. TO BACK SIDE OF TURBINE. |
| J 01/12/21 | H 01/12/19 | G 01/9/1 | F 01/6/18 | E 01/3/27 | D 01/2/12/20 |

| | | |
|-------------|--------------------|-----------------------------|
| TOLERANCES | DRWN BY CAVALLAUGH | DRESSER-RAND ENERGY SYSTEMS |
| X.X | DATE: 06/13/08 | WELLSVILLE, NY 14905 |
| X.XX | CHECKED: 06/14/08 | |
| X.XXX | SUPER: 06/14/08 | |
| ANG. | FRWET: 11/03/02 | OUTLINE |
| | S01: C33306 | |
| | | E 6056900 6070955 |
| DRWN IN L&D | CAD 101 CM300 | REV 7 OF 8 |

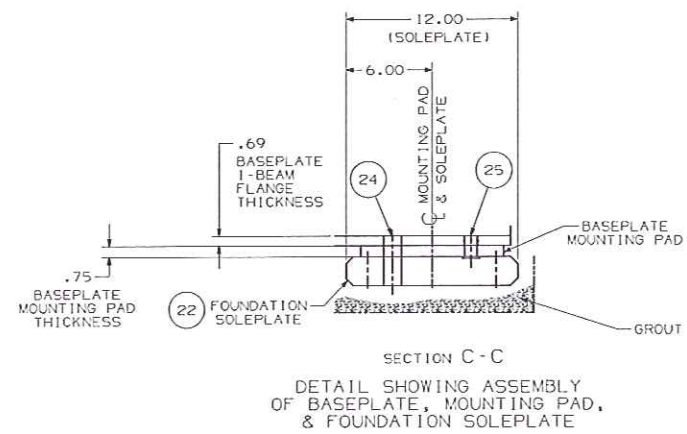
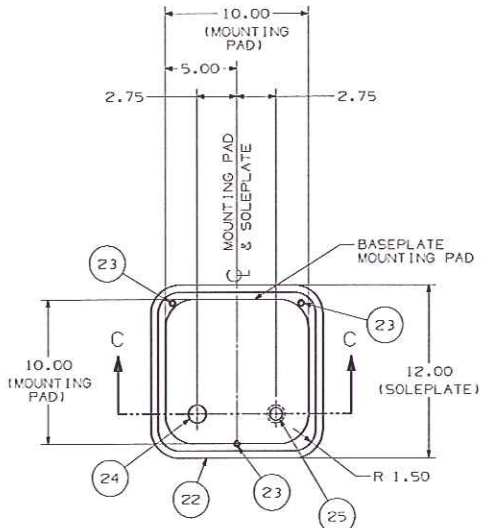
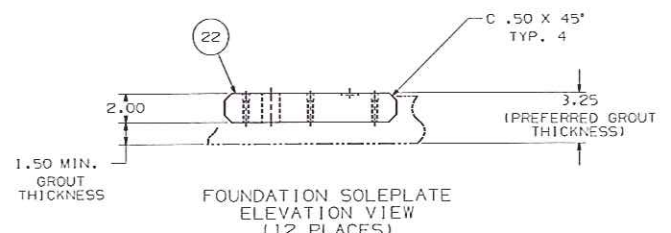
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SEE DETAIL "B" (FOUNDATION SOLEPLATES)



DETAIL B



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| | | | | | | |
|----------------------------------|----------------------------|--------------------------------------|--------------------------|--|--|--|
| FOR REVISION, SEE SHEETS #1 & 2. | AS BUILT DAG, SEE SHEET 3. | SEE SHEETS 1, 2, 5 & 7 FOR REVISION. | NO CHANGE. | SEE SHEETS 1, 2, 3, 6, & 7 FOR REVISION. | ADDED C/L & FLD. THICKNESS OF MOUNTING PAD & I-BEAM. 2-21. | ADDED SHEET TO SHOW BASEPLATE AND FOUNDATION SOLEPLATES. |
| J KLB 19DEC09 gt 12/21 | H KLB 09DEC09 gt 12/9 | G KLB 31AUG09 gt 9/1 | F KLB 18JUN09 gt 6/18 | E KLB 20MAR09 gt 2/27 | D KLB 10FEB09 gt 2/12/09 | C KLB 18NOV08 gt 11/19 |

| | | | |
|-------------|------------|----------|---|
| TOLERANCES | DRAWN BY | DATE | DRESSER-RAND ENERGY SYSTEMS YELLSVILLE, NY 14895 |
| X.X | CAVANAUGH | 06/13/08 | |
| X.XX | CHECKED | 06/14/08 | |
| X.XXX | SUPERVISED | 06/14/08 | |
| NO. | PROJECT | ITHS3182 | |
| | ISSUE | C33305 | |
| DRAWN IN US | | | SCALE: .06" = 1" |
| E 6056900 | | | 6070955 |
| SHEET | | | B OF B |

OUTLINE

6070955

B OF B