## TYPICAL LETTER SYMBOLS USED FOR IDENTIFYING INSTRUMENTS & INSTRUMENT COMPONENTS

| FIRST LETTER | INITIATING OR MEASURED VARIABLE | CONTROLLERS | | | | READOUT DEVICE | | SWITCHES AND ALARM DEVICES | | | TRANSMITTERS | | | MISCELLANEOUS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | RECORD | INDICATE | BLIND | SELF ACTIVATED | RECORD | INDICATE | HIGH | LOW | COMB | RECORD | INDICATE | BLIND | SOLENOIDS RELAYS COMPUTE DEVICES | PRIMARY ELEMENTS | TEST POINTS | WELL OR PROBE | VIEW GLASS | SAFETY DEVICES | FINAL ELEMENT |
| A | ANALYSIS | ARC | AIC | AC | | AR | AI | ASH | ASL | ASHL | ART | AIT | AT | AY | AE | AP | AW | | | AV |
| B | BURNER/COMBUSTION | BRC | BIC | BC | | BR | BI | BSH | BSL | BSHL | BRT | BIT | BT | BY | BE | | BW | BG | | BZ |
| C | USER'S CHOICE | | | | | | | | | | | | | | | | | | | |
| D | USER'S CHOICE | | | | | | | | | | | | | | | | | | | |
| E | VOLTAGE (EMF) | ERC | EIC | EC | | ER | EI | ESH | ESL | ESHL | ERT | EIT | ET | EY | EE | | | | | EZ |
| F | FLOW RATE | FRC | FIC | FC | FCV | FR | FI | FSH | FSL | FSHL | FRT | FIT | FT | FY | FE | FP | | FG | | FY |
| FQ | FLOW QUANTITY | FQRC | FQIC | | | FQR | FQI | FQSH | FQSL | | | FQIT | FQT | FQY | FQE | | | | | FQV |
| FF | FLOW RATIO | FFRC | FFIC | FFC | | FFR | FFI | FFSH | FFSL | | | | | | FFE | | | | | FV |
| G | USER'S CHOICE | | | | | | | | | | | | | | | | | | | |
| H | HAND (MANUALLY ACTIVATED) | | HIC | HC | | | | | | HS | | | | | | | | | | HV |
| I | CURRENT (ELECTRICAL) | IRC | IIC | | | IR | II | ISH | ISL | ISHL | IRT | IIT | IT | IY | IE | | | | | IZ |
| J | POWER (ELECTRICAL) | JRC | JIC | | | JR | JI | JSH | JSL | JSHL | JRT | JIT | JT | JY | JE | | | | | JV |
| K | TIME | KRC | KIC | KC | KCV | KR | KI | KSH | KSL | KSHL | KRT | KIT | KT | KY | KE | | | | | KV |
| L | LEVEL | LRC | LIC | LC | LCV | LR | LI | LSH | LSL | LSHL | LRT | LIT | LT | LY | LE | | LW | LG | | LV |
| M | USER'S CHOICE | | | | | | | | | | | | | | | | | | | |
| N | USER'S CHOICE | | | | | | | | | | | | | | | | | | | |
| O | USER'S CHOICE | | | | | | | | | | | | | | | | | | | |
| P | PRESSURE/VACUUM | PRC | PIC | PC | PCV | PR | PI | PSH | PSL | PSHL | PRT | PIT | PT | PY | PE | PP | | | PSY/PSE | PV |
| PD | PRESSURE DIFFERENTIAL | PDRC | PDIC | PDC | PDCV | PDR | PDI | PDSH | PDSL | | PDRT | PDIT | PDT | PDY | PE | PP | | | | PDV |
| Q | QUANTITY | QRC | QIC | | | QR | QI | QSH | QSL | QSHL | QRT | QIT | QT | QY | QE | | | | | QZ |
| R | RADIATION | RRC | RIC | RC | | RR | RI | RSH | RSL | RSHL | RRT | RIT | RT | RY | RE | | RW | | | RZ |
| S | SPEED/FREQUENCY | SRC | SIC | SC | SCV | SR | SI | SSH | SSL | SSHL | SRT | SIT | ST | SY | SE | | | | | SV |
| T | TEMPERATURE | TRC | TIC | TC | TCV | TR | TI | TSH | TSL | TSHL | TRT | TIT | TT | TY | TE | TP | TW | | TSE | TV |
| TD | TEMPERATURE DIFFERENTIAL | TDRC | TDIC | TDC | TDCV | TDR | TDI | TDSH | TDSL | | TDRT | TDIT | TDT | TDY | TE | TP | TW | | | TDV |
| U | MULTIVARIABLE | | | | | UR | UI | | | | | | | UY | | | | | | UV |
| V | VIBRATION, MACHINERY ANALYSIS | | | | | VR | VI | VSH | VSL | VSHL | VRT | VIT | VT | VY | VE | | | | | VZ |
| W | WEIGHT/FORCE | WRC | WIC | WC | WCV | WR | WI | WSH | WSL | WSHL | WRT | WIT | WT | WY | WE | | | | | WZ |
| WD | WEIGHT/FORCE DIFFERENTIAL | WDRC | WDIC | WDC | WDCV | WDR | WDI | WDSH | WDSL | | WDRT | WDIT | WDT | WDY | WE | | | | | WDZ |
| X | UNCLASSIFIED | | | | | | | | | | | | | | | | | | | |
| Y | EVENT, STATE, PRESENCE | | YIC | YC | | YR | YI | YSH | YSL | | | | YT | YY | YE | | | | | YZ |
| Z | POSITION, DIMENSION | ZRC | ZIC | ZC | ZCV | ZR | ZR | ZSH | ZSL | ZSHL | ZRT | ZIT | ZT | ZY | ZE | | | | | ZV |
| ZD | GAUGING, DEVIATION | ZDRC | ZDIC | ZDC | ZDCV | ZDR | ZDI | ZDSH | ZDSL | | ZDRT | ZDIT | ZDT | ZDY | ZDE | | | | | ZDV |

## INSTRUMENT IDENTIFICATION

| UPPER CASE LETTERS | FIRST LETTER: MEASURED OR INITIATING VARIABLE | FIRST LETTER: MODIFIER | SUCCEEDING LETTERS: READOUT OR PASSIVE FUNCTION | SUCCEEDING LETTERS: OUTPUT FUNCTION | SUCCEEDING LETTERS: MODIFIER |
|---|---|---|---|---|---|
| A | ANALYSIS | | ALARM | | |
| B | BURNER/COMBUSTION | | USERS CHOICE | USERS CHOICE | USERS CHOICE |
| C | USERS CHOICE | | | CONTROL | |
| D | USERS CHOICE | DIFFERENTIAL | | | |
| E | VOLTAGE (EMF) | | SENSOR (PRIMARY ELEMENT) | | |
| F | FLOW RATE | RATIO (FRACTION) | | | |
| G | USERS CHOICE | | GLASS (VIEWING DEVICE) | | |
| H | HAND (MANUALLY INITIATED | | | | HIGH |
| I | CURRENT (ELECTRICAL) | | INDICATE | | |
| J | POWER | SCAN | | | |
| K | TIME OR TIME SCHEDULE | TIME RATE OF CHANGE | | CONTROL STATION | |
| L | LEVEL | | LIGHT | | LOW |
| M | USERS CHOICE | MOMENTARY | | | MIDDLE OR INTERMEDIATE |
| N | USERS CHOICE | | USERS CHOICE | USERS CHOICE | USERS CHOICE |
| O | USERS CHOICE | | ORIFICE (RESTRICTION) | | |
| P | PRESSURE OR VACUUM | | POINT (TEST CONNECTION) | | |
| Q | QUANTITY | INTEGRATE OR TOTALIZE | | | |
| R | RADIOACTIVITY | | RECORD | | |
| S | SPEED OR FREQUENCY | SAFETY | | SWITCH | |
| T | TEMPERATURE | | | TRANSMIT | |
| U | MULTIVARIABLE | | MULTIFUNCTION | MULTIFUNCTION | MULTIFUNCTION |
| V | VIBRATION, MECHANICAL ANALYSIS | | | VALVE DAMPER OR LOUVER | |
| W | WEIGHT OR FORCE | | WELL | | |
| X | UNCLASSIFIED | X-AXIS | UNCLASSIFIED | UNCLASSIFIED | UNCLASSIFIED |
| Y | EVENT, STATE OR PRESENCE | Y-AXIS | | RELAY, COMPUTE, CONVERT | |
| Z | POSITION | Z-AXIS | | | |

### CONTROL FUNCTION SYMBOLS

- Σ SUMMING
- Σ/n AVERAGING
- △ DIFFERENCE
- K PROPORTIONAL
- 1:1 2:1
- ∫ INTEGRAL
- d/dt DERIVATIVE
- X MULTIPLY
- ÷ DIVIDE
- ⁿ√ ROOT EXTRACTION
- x^n EXPONENTIAL
- f(x) NON-LINEAR OR UNSPECIFIED FUNCTION
- f(t) TIME FUNCTION
- > HIGH SELECT
- < LOW SELECT
- HIGH LIMITING
- LOW LIMITING
- -K REVERSE PROPORTIONAL
- VELOCITY LIMITOR
- + − ± BIAS
- CONTROL/LOGIC INTERLOCK
- CONVERT

A - ANALOG C - CURRENT
D - DIGITAL O - ELECTROMAGNETIC
E - VOLTAGE P - PNEUMATIC
H - HYDRAULIC R - RESISTANCE

AI 1-2
A(: ANALOG INPUT
AO: ANALOG OUTPUT
DI: DIGITAL INPUT
DO: DIGITAL OUTPUT
HSC: HIGH SPEED COUNTER
CHANNEL NUMBER
SLOT NUMBER

## GENERAL INSTRUMENT OR FUNCTION SYMBOLS

| | DISCRETE INSTRUMENTS | SHARED DISPLAY SHARED CONTROL | COMPUTER FUNCTIN | PROGRAMMABLE LOGIC CONTROL |
|---|---|---|---|---|
| FIELD MOUNTED | ○ | □ | ⬡ | ◇ |
| PRIMARY LOCATION (NORMALLY ACCESSIBLE TO OPERATOR) | ⊖ | ⊟ | ⬡ | ◇ |
| AUXILIARY LOCATION (NORMALLY ACCESSIBLE TO OPERATOR) | ⊖ | ⊟ | ⬡ | ◇ |
| PRIMARY LOCATION (NORMALLY INACCESSIBLE TO OPERATOR) | ⊖ | ⊟ | ⬡ | ◇ |
| AUXILIARY LOCATION (NORMALLY INACCESSIBLE TO OPERATOR) | ⊖ | ⊟ | ⬡ | ◇ |

### LINE LEGEND

- MAJOR FLOW LINE
- OBJECT OR MINOR FLOW LINE
- MATCH LINE, SKID OUTLINE OR BOUNDARY LIMITS
- MECHANICAL LINK
- ELECTRICAL SIGNAL
- INTERNAL, SOFTWARE OR DATA LINK
- PNEUMATIC SIGNAL
- HYDRAULIC SIGNAL
- CAPILLARY TUBE
- ELECTROMAGNETIC OR SONIC SIGNAL
- TUBING LINE
- 1" INSULATION W/ THICKNESS AS SPECIFIED
- 1" ET INSULATION W/ ELECTRIC HEAT TRACE
- 1" ST INSULATION W/ STEAM HEAT TRACE
- 1" P PERSONNEL PROTECTION
- LINE CONTINUATION BOX WITH I D AND DWG NO

### EQUIPMENT PREFIXES

| | |
|---|---|
| AF | FLAME ARRESTOR |
| AH | ALARM HORN |
| BL | BLOWER |
| B | BOILER |
| BDV | BLOWDOWN VALVE |
| C | COMPRESSOR |
| CR | CONDENSATE RETURN EQUIP |
| CU | CONDENSING UNIT |
| CV | CHECK VALVE |
| E | EXCHANGER |
| F(L | FILTER OR FILTER/SEPARATOR |
| FA | FABRICATED ASSEMBLY |
| FL | FLARE |
| FM | FLOW METER |
| G | GENERATOR |
| H | HEATER |
| HS | HAND SWITCH |
| HY | HYDRANT |
| IC | INSPECTION CLOSURE |
| LB | LAUNCHER BARREL |
| M | MOTOR |
| MCC | MOTOR CONTROL CENTER |
| ME | MISCELLANEOUS EQUIP |
| MLV | MAINLINE VALVE |
| MOV | MOTOR OPERATED VALVE |
| OP | OPERATORS FOR VALVES |
| P | PUMPS |
| PF | PIPE FITTINGS (SPECIAL) |
| PNL | PANEL |
| PR | METER PROVER |
| PS | PIG SIGNAL |
| PSV | PRESSURE SAFETY VALVE |
| PVSV | PRESSURE VACUUM SAFETY VALVE |
| R | REACTOR |
| RB | RECEIVER BARREL |
| RO | RESTRICTION ORIFICE |
| ROV | REMOTE OPERATED VALVE |
| RTU | REMOTE TERMINAL UNIT |
| S | STRAINER |
| SCV | SURGE CONTROL VALVE |
| SDV | SHUTDOWN VALVE |
| ST | STEAM TRAP |
| STK | STACK |
| T | TANK (ATM) |
| TS | TEMPORARY STRAINER |
| V | VESSEL (PRESSURE) |
| VF | VENT FAN |
| VT | VENT TRAP |
| VPRV | VACUUM PRESSURE RELIEF VALVE |
| XSV | SOLENOID VALVE |
| ZSC | POSITION SWITCH-CLOSED |
| ZSO | POSITION SWITCH-OPEN |

### ABBREVIATIONS

| | |
|---|---|
| AC | AIR TO CLOSE |
| AG | ABOVE GROUND |
| AO | AIR TO OPEN |
| AS | AIR SUPPLY |
| ATM | ATMOSPHERE |
| BF | BLIND FLANGE |
| BV | BLOCK VALVE |
| BW | BUTT WELD |
| CSC | CAR SEAL CLOSED |
| CSO | CAR SEAL OPEN |
| CSD | COMPRESSOR SHUTDOWN |
| CO | CLEAN OUT |
| DA | DIRECT ACTING |
| DE | DENERGIZE |
| DV | DISCHARGE VALVE |
| E/P | VOLTAGE TO PRESSURE CONVERTER |
| EN | ENERGIZE |
| ES | ELECTRICAL SUPPLY |
| ESD | EMERGENCY SHUTDOWN |
| FB | FULL BORE |
| FC | FAIL CLOSE |
| FL | FAIL LAST POSITION |
| FLG | FLANGE OR FLANGED |
| FO | FAIL OPEN |
| GFC | GAS FLOW COMPUTER |
| GS | GAS SUPPLY |
| HE | HEATING ELEMENT |
| HS | HYDRAULIC SUPPLY |
| I/P | CURRENT TO PRESSURE CONVERTER |
| LC | LOCKED CLOSED |
| LO | LOCKED OPEN |
| LUB | LUBRICATOR |
| MW | MANWAY |
| NC | NORMALLY CLOSED |
| NO | NORMALLY OPEN |
| NS | NITROGEN SUPPLY |
| OL | OVERLOAD |
| PA | PLANT AIR |
| PG | POWER GAS |
| P/I | PRESSURE TO CURRENT CONVERTER |
| RA | REVERSE ACTING |
| RB | REDUCED BORE |
| REV | REVERSE IR INVERT |
| RF | RAISED FACE |
| RJ | RING JOINT |
| RTD | RESISTANCE TEMPERATURE DETECTOR |
| S | STATION |
| SC | SAMPLE CONNECTION |
| SCRD | SCREWED |
| SN | SPRAY NOZZLE |
| SP | SET POINT |
| SS | STEAM SUPPLY |
| SV | SUCTION VALVE |
| SW | SOCKET WELD |
| TS | TEMPORARY STRAINER |
| TW | THERMOWELL |
| UA | UTILITY AIR |
| UC | UTILITY CONNECTION |
| UG | UNDER GROUND |
| WS | WATER SUPPLY |

### CONTROL VALVES

- FC DIAPHRAGM ACTUATED CONTROL VALVE W/ FAIL POSITION DESIGNATION()
- PRESSURE REGULATOR (SELF CONTAINED)
- PISTON ACTUATED VALVE
- M ELECTRIC MOTOR ACTUATED VALVE
- E/H ELECTRIC-HYDRAULIC ACTUATED VALVE
- DIAPHRAGM PRESSURE BALANCED VALVE
- DIAPHRAGM ACTUATED VALVE WITH POSITIONER
- ACTUATED VALVE W/ MANUAL OVER-RIDE
- R LATCH TYPE ACTUATED VALVE W/ MANUAL RESET
- S SOLENOID ACTUATED VALVE
- G/H GAS/HYDRAULIC ROTARY ACTUATED VALVE

### VALVE END CONNECTION DESIGNATION

- THREADED OR WELDED ENDS
- FLANGED ENDS

### VALVE LEGEND

| ≥2" | | <2" |
|---|---|---|
| | GATE VALVE | |
| | BALL VALVE | |
| | GLOBE VALVE | |
| | PLUG VALVE | |
| | BUTTERFLY VALVE | |
| | CHECK VALVE | |
| | NEEDLE VALVE | |
| | DIAPHRAGM VALVE | |
| | 3-WAY VALVE | |
| | 4-WAY VALVE | |
| | ANGLE VALVE | |
| | PRESSURE SAFETY VALVE SPRING OPERATED | |
| P | PRESSURE SAFETY VALVE PILOT OPERATED | P |
| EFV | EXCESS FLOW CHECK VALVE | EFV |

### GENERAL PIPING SYMBOLS

- DIAPHRAGM SEAL
- RUPTURE DISC
- T STEAM TRAP
- Y-STRAINER
- BASKET TYPE FILTER OR STRAINER
- FILTER
- TS TEMPORARY STRAINER
- BLIND FLANGE
- IN LINE PIPE FLANGES
- INS INSULATING SET
- INS INSULATING UNION
- RESTRICTION ORIFICE/ ORIFICE FLANGE SET W/ PLATE
- OPEN SPECTACLE BLIND
- CLOSED SPECTACLE BLIND
- FLOW STRAIGHTENING VANE
- RESTRICTION ORIFICE IN QUICK CHANGE FITTING
- IN LINE RESTRICTION ORIFICE
- PITOT TUBE
- TURBINE METER
- ULTRASONIC METER
- FLEXIBLE CONNECTION
- EXPANSION JOINT
- PIG SIGNAL
- FLAME ARRESTOR
- TEST RING (BLEED) W/ VALVE
- WELD CAP
- SCREWED CAP
- HOSE CONNECTION
- THREADED CLOSURE
- LINE SPEC CHANGE
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- SWAGE
- CONCENTRIC SWAGE

### MISC SYMBOLS

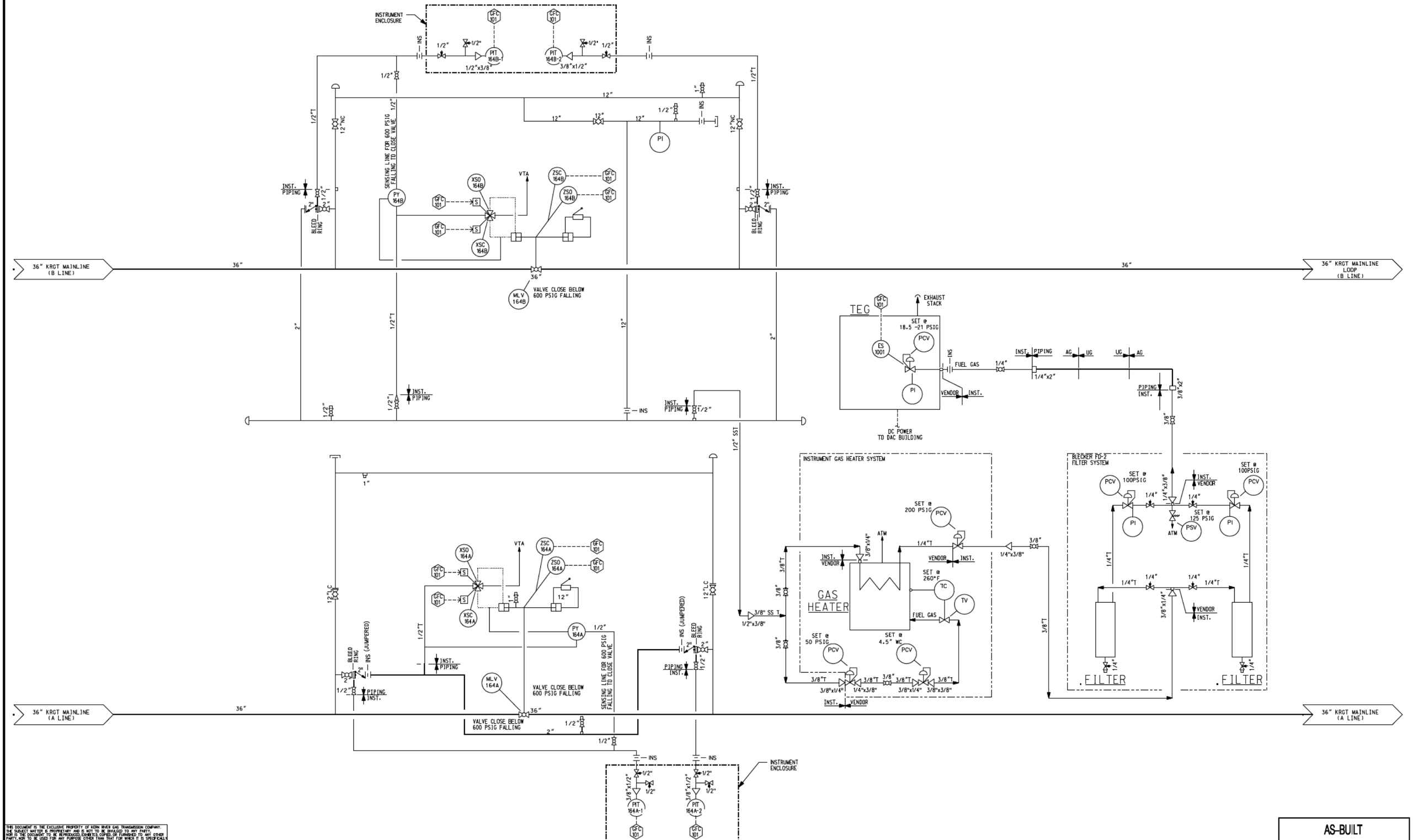
- TP # PIPING TIE-IN POINT & IDENTIFICATION #
- 2 TWO VALVE INSTRUMENT MANIFOLD
- 5 FIVE VALVE INSTRUMENT MANIFOLD
- SP XX SPECIALTY ITEM
- AIR HORN

GENERAL NOTES:

1. EXCEPT FOR VARIATIONS SHOWN ON THIS DRAWING, INSTRUMENTATION SYMBOLS AND IDENTIFICATION WILL COMPLY WITH ANSI/ISA 5.1 (LATEST VERSION.)

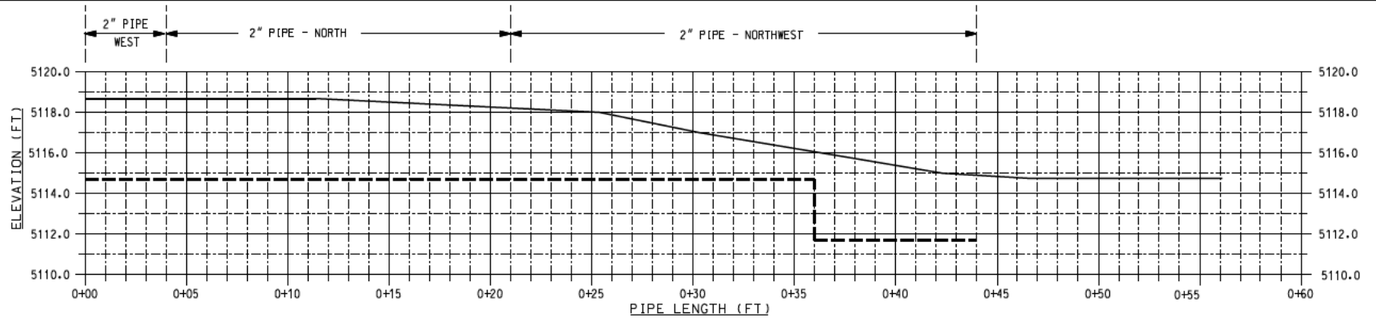
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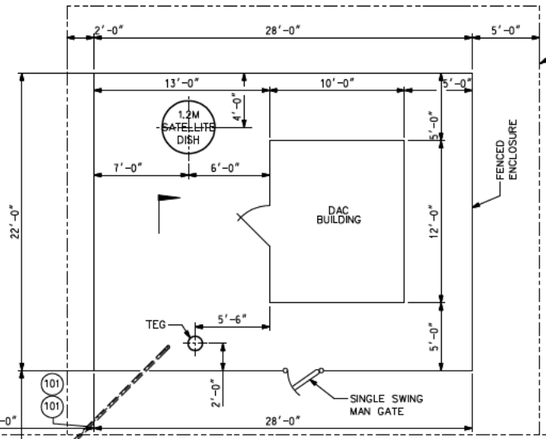

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DETAIL 1

LEGEND:
GRADE
2" PIPE



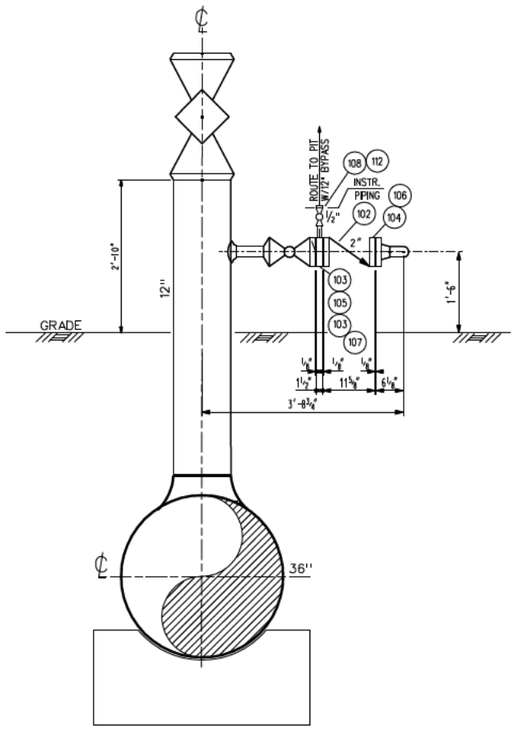

TRUE NORTH




PLAN
3/16" = 1'-0"

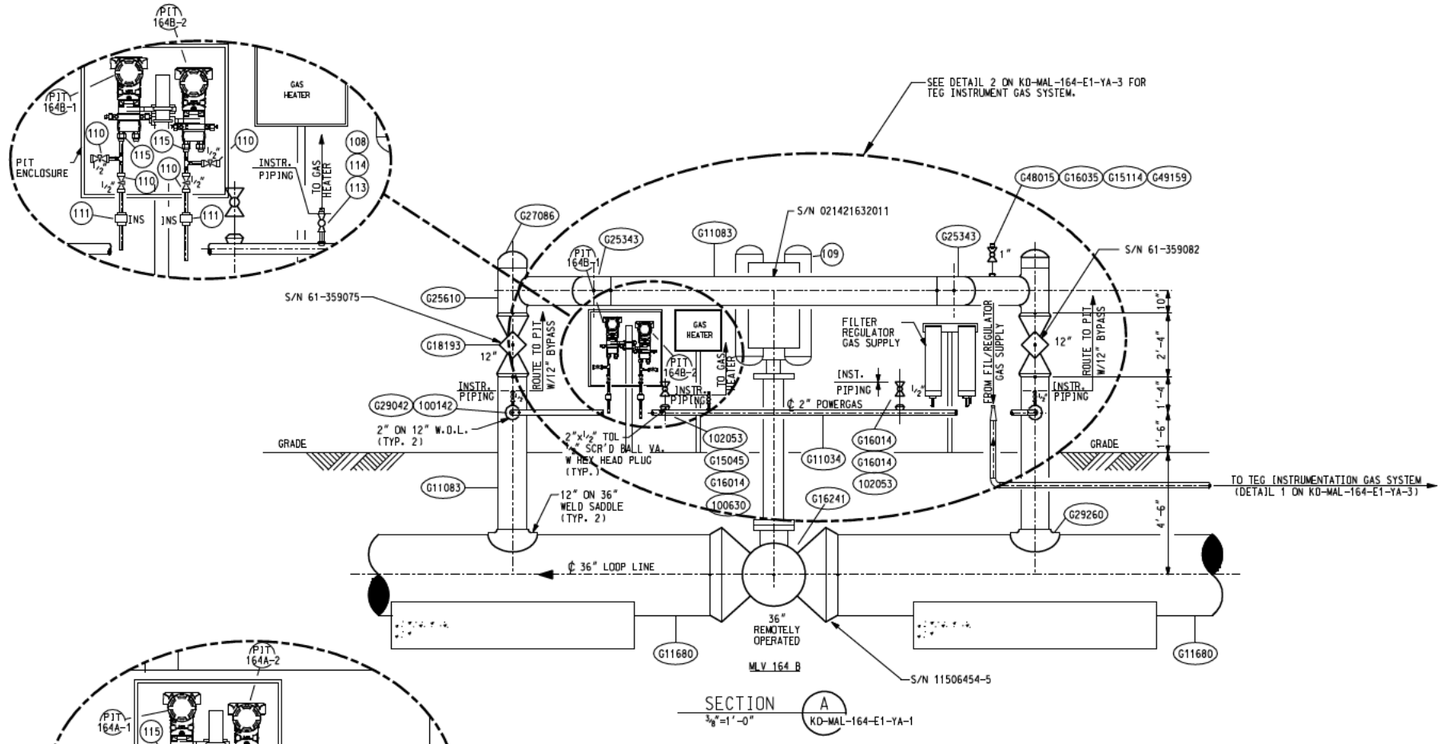
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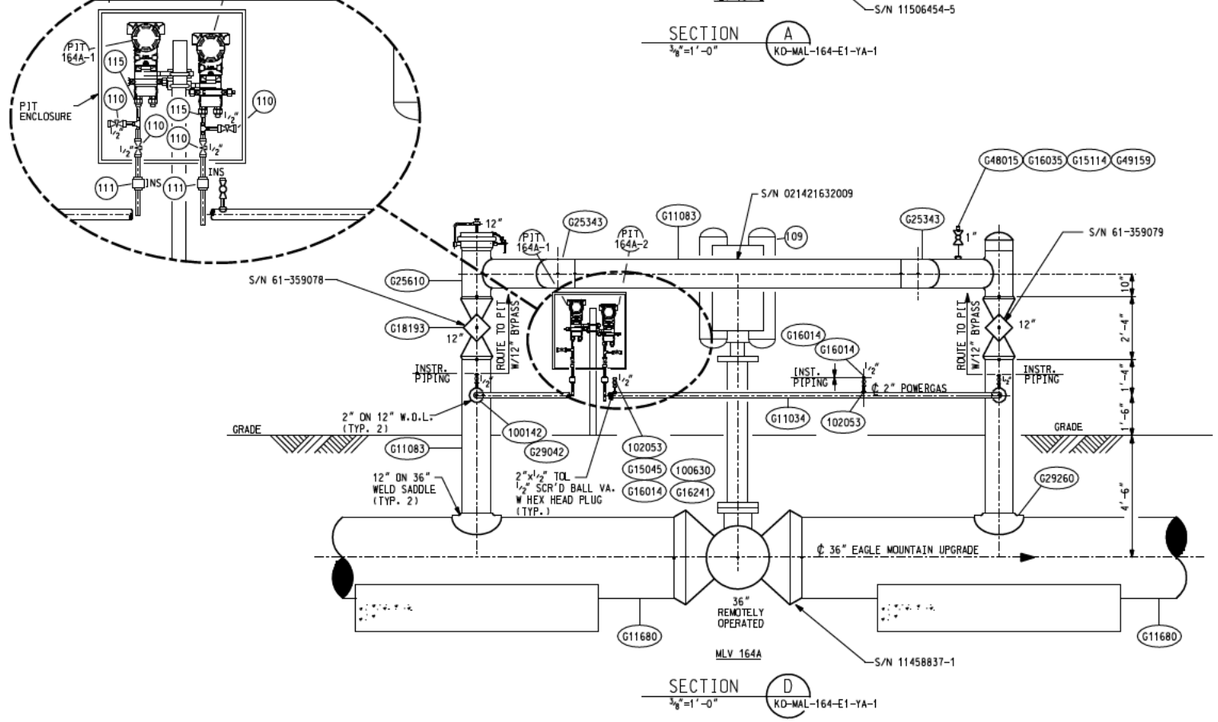



PARTIAL SECTION B
KD-MAL-164-E1-YA-1

ALL ITEMS ARE 4 PLACES
(FIELD VERIFY ALL DIMENSIONS)
SCALE: ¾" = 1'-0"




SECTION A
KD-MAL-164-E1-YA-1




SECTION D
KD-MAL-164-E1-YA-1

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# MAINLINE VALVE AT M.P. 164.15 – BILL OF MATERIALS

| REV. | PART NO. | QTY. | ITEM | SIZE | W.T. | DESCRIPTION | WGP | SPEC. |
|---|---|---|---|---|---|---|---|---|
| | G11680 | 80 | PIPE | 36" | 0.750" | CS, SAW, BE, API 5L-X60, W/14-16 MILS FBE COATING | 1250 | 35.1250.08 |
| | G11083 | 40 | PIPE | 12" | 0.375" | CS, SMLS, API 5L X-52, BE, W/14-16 MILS FBE COATING | 1250 | 35.1250.08 |
| | G11034 | 80 | PIPE | 2" | 0.218" | CS, SMLS, ASTM A106 GR. B, C/W 14-16 MILS FBE COATING | 1250 | 35.1250.08 |
| | G16241 | 1 | VALVE | 36 | BALL | ANSI 600, F.O., WE X WE (BTW 0.750" WT API 5L X-60 PIPE), CS, BCO. FOR | 1250 | 35.1250.08 |
| | | | | | | BURIED SERVICE, C/W 84" STEM EXTENSION (CENTERLINE OF VALVE TO CENTERLINE | | |
| | | | | | | OF OPERATOR) COATED W/18-25 MILS COAL TAR EPOXY | | |
| | G16167 | 2 | VALVE | 2" | BALL | ANSI 600, F.O., RFFE X WE (BTW 0.218"WT API 5L GR. B SMLS PIPE), CS, WO, | 1250 | 35.1250.08 |
| | | | | | | C/W WRENCH, SUITABLE FOR -20 DEG F. | | |
| | G16168 | 5 | VALVE | 2" | BALL | ANSI 600, F.O., API 6D, WE X WE (BTW 0.218"WT API 5L GR. B SMLS PIPE), | 1250 | 35.1250.08 |
| | | | | | | CS, WO, C/W WRENCH, SUITABLE FOR -20 DEG F. | | |
| | G16035 | 2 | VALVE | 1" | BALL | SE (FNPT X FNPT), CS, 3000 CWP, NUTRON T3-FXX-W-30B OR WATTS | 1250 | 35.1250.08 |
| | | | | | | C-7381-03-LL (WITH NYLON TRIM) | | |
| | G16014 | 8 | VALVE | 1/2" | BALL | 3000 PSI CWP, SE (FNPT X FNPT), CS, NUTRON T3-FXX-S-30B, WATTS | 1250 | 35.1250.08 |
| | | | | | | ROUGHNECK C-7380-03-LL OR WKM 310CB138-CS-03-CS-WR | | |
| | G18193 | 2 | VALVE | 12" | PLUG | ANSI 600, API 6D, WE X WE, (BTW 0.375"WT API 5L X-52 PIPE), CS, | 1250 | 35.1250.08 |
| | | | | | | REGULAR PATTERN, GO, C/W HANDWHEEL | | |
| | G35505 | 16 | BOLT | 5/8" | STUD | 5/8" DIA. X 4-1/2" LG, ASTM A320-L7 COMPLETE WITH (2) HEAVY HEX NUTS EA. | 1250 | CK-L |
| | | | | | | ASTM A194-L7 (2"-600#) | | |
| | G27086 | 2 | CLOSURE | 12" | HINGE | ANSI 600, BTW .375" WT, X52 PIPE, CAP 1" NPT CPLET OFF-CTR, BUNA-N O-RING, YALE FIG 500 | 1250 | |
| | G25343 | 2 | ELL | 12" | 0.375" | CS, BW, 45 DEGREE, LR, MSS SP-75 GR. WPHY-52 | 1250 | 35.1250.08 |
| | 100142 | 6 | ELL | 2" | 0.218" | CS, BW, 90 DEG, LR, ASTM A-234 WPB | 1250 | 35.1250.08 |
| | 101481 | 2 | FLANGE | 2" | WN | ANSI 600, RF, FS, SCH 80, ASTM A-105 | 1250 | 35.1250.08 |
| | 100973 | 2 | GASK | 2" | ANSI 600 | RF, NON-ASBESTOS, CHLORITE MINERAL WITH GRAPHITE BASE AND ACRYLIC | 1250 | 35.1250.08 |
| | | | | | | BINDER, FLEXITALIC STYLE CG FLEXITE SUPER OF EQUAL | | |
| | G15114 | 2 | NIPPLE | 1" | SCH.160 | NIPPLE, PIPE, 1" NPS X 3" LG, SCH. 160, ASTM A106 GR. B, TBE | 1250 | 35.1250.08 |
| | G15045 | 6 | NIPPLE | 1/2" | SCH.160 | NIPPLE, PIPE, 1/2" NPS X 3" LG, SCH. 160, ASTM A106 GR. B, TBE | 1250 | 35.1250.08 |
| | G48051 | 2 | PLUG | 1" | HEX | THRD, 6000# FS, ASTM A-105 | 1250 | 35.1250.08 |
| | 100630 | 4 | PLUG | 1/2" | HEX | THRD, 6000# FS, ASTM A-105 | 1250 | 35.1250.08 |
| | G29260 | 2 | SADDLE | 12" x 36" | 0.750" | REINFORCING FOR 36" 0.750"WT API 5L X-60 RUN PIPE, 12" X 0.375"WT, API | 1250 | 35.1250.08 |
| | | | | | | 5L X-52 BRANCH PIPE | | |
| | G30259 | 2 | SWAGE | 1/2" | 0.218" | 2" X 1/2" NPS, XS, ASTM A234 GR B (BLE X TSE) | 1250 | 35.1250.08 |
| | G26711 | 4 | TEE | 36" x 30" | 0.750" | 36" x 30", 0.750"WT X 0.625"WT, CS, MSS-SP75 GR.Y-60, BARRED | 1250 | 35.1250.08 |
| | G25610 | 2 | TEE | 12" | 0.375" | CS, MSS SP-75 WPHY52 | 1250 | 35.1250.08 |
| | 100338 | 3 | TEE | 2" | 0.218" | CS, ASTM A-234 WPB | 1250 | 35.1250.08 |
| | G49149 | 2 | TOL | 1" | 12" | 12" X 1", 6000# FS, ASTM A-105 | | |
| | 102060 | 2 | TOL | 1/2" | 12" | 12" X 1/2", 3000 # FS, ASTM A105 | 1250 | 35.1250.08 |
| | 102053 | 2 | TOL | 1/2" | 2" | 2" X 1/2", 3000# FS, ASTM A105 | 1250 | 35.1250.08 |
| | G29042 | 2 | WOL | 2" | 12" | 12" TO MATCH 0.375" API 5L X-52 X 2" SCH. 80 API 5L GR. B SMLS | 1250 | 35.1250.08 |

## MATERIAL LIST

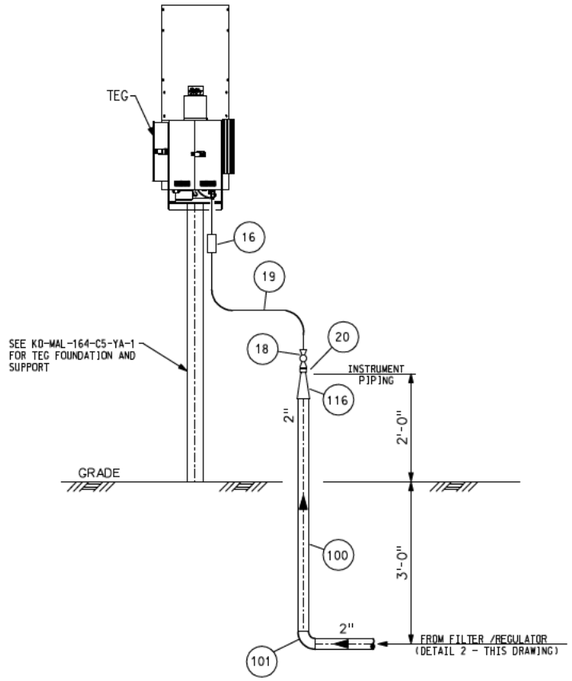
| QUANTITY | UNITS | DESCRIPTION | ITEM NBR |
|---|---|---|---|
| 100 | FT | PIPE, 2.375 IN OD X .218 IN WT, SCH. 80 , BE, ASTM A-106 GR. B, CS SMLS ( FBE COATED) | 100 |
| 5.0 | EA | ELL, 2.375 IN OD X .218 IN WT, 90 DEG. WELD, LR, SCH. 80, ASTM A-234 WPB ( FBE COATED) | 101 |
| *4.0 | EA | VALVE, CHECK, 2 IN RFFE, ANSI CLASS 600#, SWING CHECK, STEEL BODY, BOLTED TOP, REMOVABLE SEATS PER TOM WHEATLEY FIG. 55. | 102 |
| 8.0 | EA | GASKET, 2 IN, 600#, 1/8 IN THICK, SPIRAL WOUND 304 SS AND CHLORITE (MICA) / GRAPHITE FILLER, PROTECTIVE COATED CS CENTERING RING. FLEXITALIC CG OR EQUAL | 103 |
| 4.0 | EA | ISOLATING FLANGE ASSEMBLY, 2 IN FLANGE, 1440 PSIG: ONE 1/8 IN THK, GRE LAMINATED G-10 RETAINER WITH VITON SEAL MTL, (8) GRE TUBING BOLT SLEEVES, 16-1/8 IN THK., GRE WASHERS, AND 16- 1/8 IN THK. ZINC PLATED WASHERS, PIKOTEK 2-600-PGE\E-V/G | 104 |
| 4.0 | SET | STUD BOLT, 2 IN 600#, 5/8 IN X 5.875 IN LG, XYLON COATED, ASTM A 193 GR. B7, W/2 HEAVY HEX NUTS EACH BOLT (8 BOLTS PER SET) | 105 |
| 4.0 | SET | STUD BOLT, 2 IN 600#, 5/8 IN X 4.75 IN LG, XYLON COATED, ASTM A 193 GR. B7, W/2 HEAVY HEX NUTS EACH BOLT (8 BOLTS PER SET) | 106 |
| 4.0 | EA | BLEED RING, 2 IN, 600# WEAMCO TYPE 6 W/ONE 1/2 IN NPT PORT A 516, GR. 70 | 107 |
| 5.0 | EA | VALVE, BALL, 1/2 IN, SCRD, FNPTXFNPT, CS, JAMESBURY HP22GT, 4500 CWP | 108 |
| *2.0 | EA | OPERATOR, VALVE, GIG DIRECT GAS, LOCAL AND REMOTE CONTROL " LOW PRESSURE SHUTOFF" TO CLOSE PER BIFFI, SCHEMATIC LR-LP-CL-011, TYPE 33, FOR 36 IN ANSI CLASS 600# BALL VALVE W/STEM IN VERT POSITION - MATCH ITEM 306 ABOVE. VALVE AUTOMATION KIT: POPPET WESTLOCK W/ 24 VDC COILS -191886 JUNCTION BOX 26927 2 SPDT WESTLOCK LIMIT SWITCH INCL. MOUNTING BRACKET. | 109 |
| 8.0 | EA | VALVE, NEEDLE, 1/2 IN MNPT X 1/2 IN FNPT, 6000 CWP, ANDERSON GREENWOOD H1-VVS- 4Q-AL | 110 |
| 4.0 | EA | TUBE FITTING, DIELECTRIC CONNECTOR, 1/2 IN T SWAGELOK SS-8-DE-6 | 111 |
| 4.0 | EA | NIPPLE , 1/2 IN X 3 IN L, SCH. 160, ASTM A-106 GR. B., TBE | 112 |
| 1.0 | EA | NIPPLE , 1/2 IN X 3 IN L, SCH. 160, ASTM A-106 GR. B., TOE | 113 |
| 1.0 | EA | SOCKOLET, 2 IN HDR, 1/2 IN BRANCH, 6000#, ASTM A-105 | 114 |
| 4.0 | EA | TUBE FITTING, MALE CONNECTOR, 3/8 IN MNPT X 1/2 IN T, SWAGELOK SS-810-1-6. | 115 |
| 2.0 | EA | CONCENTRIC SWAGE NIPPLE. 2 IN X 3/8 IN, SCH. 80 , ASTM A-234 GR. B., BLE/TSE (NPT) | 116 |
| 1.0 | EA | ELL, 2.375 IN OD X .218 IN WT, 45 DEG. WELD, LR, SCH. 80, ASTM A-234 WPB ( FBE COATED) | 117 |

LEGEND

(PART #) PART # FROM BILL OF MATERIALS

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AS-BUILT



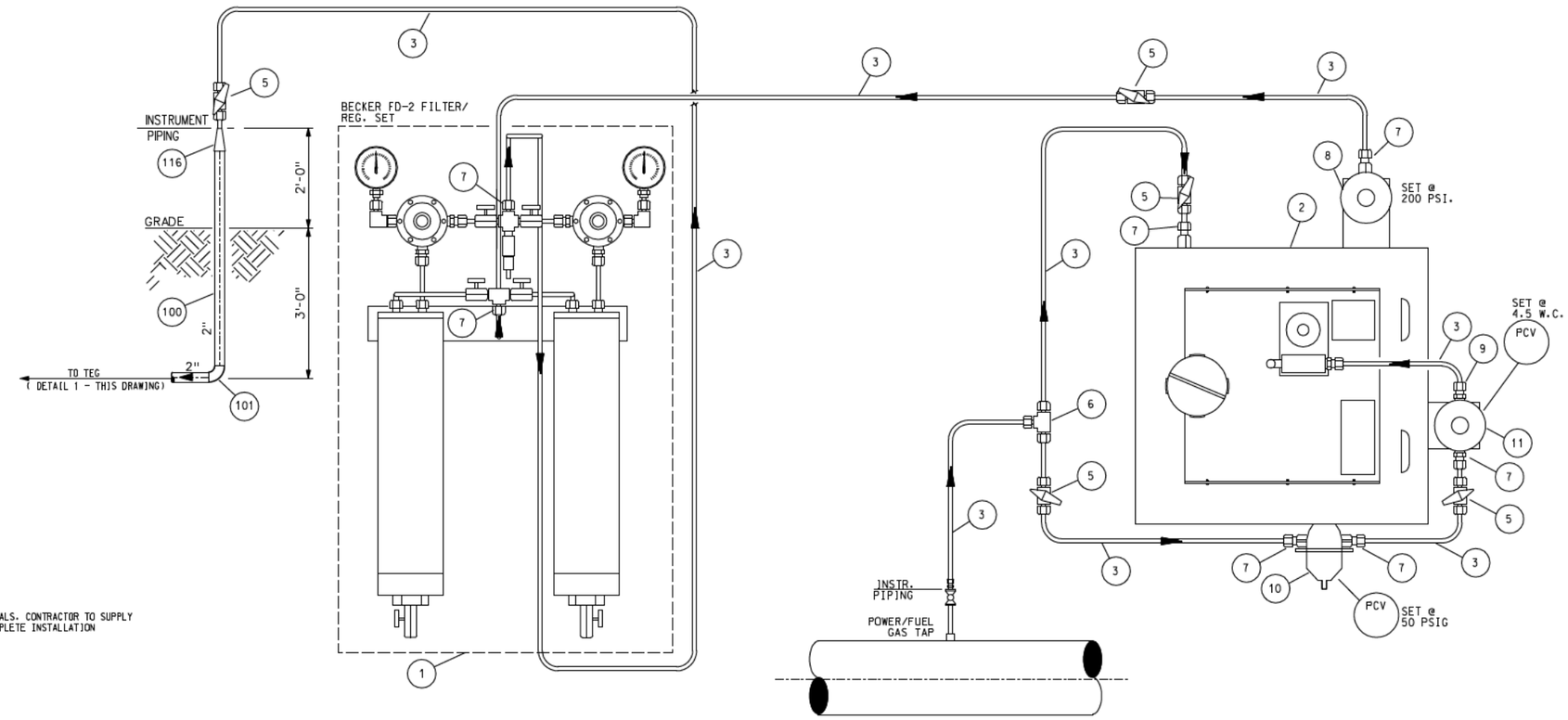

DETAIL 1
KD-MAL-164-E1-YA-1
SCALE: NONE

## BILL OF MATERIAL
(FOR TEG INSTRUMENT GAS SYSTEM ONLY)

| ITEM | QTY. | DESCRIPTION |
|---|---|---|
| *1 | 1 | FILTER /REGULATOR GAS SUPPLY SYSTEM ASSEMBLY, BECKER FD-2. |
| *2 | 1 | CATA-DYNE CATALYTIC GAS HEATER, MODEL AC-HE-IGP-01 |
| 3 | A/R | TUBING, STAINLESS STEEL, 3/8" OD X .035" W.T., AST MA B210, DRAWN, SMLS |
| 4 | A/R | TUBING, STAINLESS STEEL, 1/2" OD X .049" W.T., AST MA B210, DRAWN, SMLS |
| 5 | 5 | VALVE, BALL, 3/8" NPT, 3000 PSI, SWAGELOK SS-43GES6 |
| 6 | 1 | TUBING FITTING, UNION TEE, 3/8" X 3/8", SWAGELOK SS-600-3 |
| 7 | 7 | TUBING FITTING, MALE CONNECTOR, 3/8"T X 1/4"MNPT, SWAGELOK SS-600-1-4 |
| *8 | 1 | PRESSURE REGULATOR, FISHER 1301T, SET AT 200 PSIG. |
| 9 | 1 | TUBING FITTING, MALE CONNECTOR, 3/8" T X 3/8" MNPT, SWAGELOK SS-600-1-6 |
| *10 | 1 | PRESSURE REGULATOR, 1/4" NPT, CATADYNE MODEL AC-R-1301F, SET AT 50 PSIG |
| *11 | 1 | PRESSURE REGULATOR, 1/4" NPT, CATADYNE MODEL AC-R-912-4.5 SET AT 4.5" WC |
| 12 | _ | NOT NEEDED |
| 13 | _ | NOT NEEDED |
| 14 | – | NOT NEEDED |
| 15 | _ | NOT NEEDED |
| 16 | 1 | TUBE FITTING, DIELECTRIC CONNECTOR, 1/4" T SWAGELOK SS-4-DE-6 |
| 17 | _ | NOT NEEDED |
| 18 | 1 | VALVE, BALL, 1/4" NPT, 3000 PSI, SWAGELOK SS-43GS4 |
| 19 | A/R | TUBING, STAINLESS STEEL, 1/4" x 0.035" W.T., AST MA B210, DRAWN, SMLS |
| 20 | 1 | TUBE FITTING, FEMALE CONNECTOR, 3/8"FNPT x 1/4"T, SWAGELOK SS-400-7-6 |

## NOTES

1. * INDICATES KRGT SUPPLIED MATERIALS. CONTRACTOR TO SUPPLY ALL OTHER MATERIAL NECESSARY TO COMPLETE INSTALLATION




DETAIL 2
TEG INSTRUMENT GAS SYSTEM
SCALE: NONE

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AS-BUILT

## ANALOG AND DIGITAL SIGNAL CONDUIT CHART

| NUMBER | SIZE | CABLE | WIRE | TYPE |
|---|---|---|---|---|
| CC-001 | 1 1/2" | 02<br>A1,A2<br>DP2 | 9/C#14<br>& 2-CAT 5<br>3C#14 | TRAIN A - MLV-164A JB<br>PIT-164A-1 & PIT-164A-2<br>ENCLOSURE HEATER |
| CC-002 | 1 1/2" | 03<br>A3,A4<br>DP6 | 9/C#14<br>& 2-CAT 5<br>3C#14 | TRAIN B - MLV-164B JB<br>PIT-164B-1 & PIT-164B-2<br>ENCLOSURE HEATER |
| CC-003 | 1" | DP1<br>01 | 3C#10<br>2/C#16 | TEG DC POWER<br>DIGITAL SIGNAL |
| CC-004 | 2" | C1 | 2-COAX | SAT. COMM |
| CC-005 | 1" | 02 | 9/C#14 | TRAIN A - MLV-164A JB |
| CC-006 | 1" | 03 | 9/C#14 | TRAIN B - MLV-164B JB |
| CC-007 | 1" | AP1 | 3C#14 | POWER GAS HEATER |

## ANALOG CABLE CHART

| CABLE | WIRE TYPE | O.D. | MAKE | PART NUMBER | CABLE PURPOSE |
|---|---|---|---|---|---|
| A1 | TSPr#18 | 0.278" | BELDEN | 3088A | TRAIN A UPSTREAM - PIT |
| A2 | TSPr#18 | 0.278" | BELDEN | 3088A | TRAIN A DOWNSTREAM - PIT |
| A3 | TSPr#18 | 0.278" | BELDEN | 3088A | TRAIN B UPSTREAM - PIT |
| A4 | TSPr#18 | 0.278" | BELDEN | 3088A | TRAIN B DOWNSTREAM - PIT |

## DIGITAL CABLE CHART

| CABLE | WIRE TYPE | O.D. | MAKE | PART NUMBER | CABLE PURPOSE |
|---|---|---|---|---|---|
| 01 | 2C#16 | 0.330" | ANIXTER | 2A-1602 | TEG COMMON ALARM SIGNAL |
| 02 | 9C#14 | 0.50" | BELDEN | 27087A | MLV-164A DI/DO SIGNALS |
| 03 | 9C#14 | 0.50" | BELDEN | 27087A | MLV-164B DI/DO SIGNALS |
| 04 | 2C#16 | 0.330" | ANIXTER | 2A-1602 | DOOR ALARM SWITCH |

## DC POWER CABLE CHART

| CABLE | WIRE TYPE | O.D. | MAKE | PART NUMBER | CABLE PURPOSE |
|---|---|---|---|---|---|
| DP1 | 3C#10 | 0.456" | ANIXTER | 2A-1003 | TEG OUTPUT POWER 24VDC |
| DP2 | 3C#14 | 0.340" | ANIXTER | 2A-1403 | ENCLOSURE HEATER - BANK A |
| DP3 | 3C#14 | 0.340" | ANIXTER | 2A-1403 | 24VDC OAC BUILDING LIGHTS - BANK A |
| DP4 | 3C#14 | 0.340" | ANIXTER | 2A-1403 | 24VDC OAC BUILDING LIGHTS - BANK B |
| DP6 | 3C#14 | 0.340" | ANIXTER | 2A-1403 | ENCLOSURE HEATER - BANK B |

## AC POWER CABLE CHART

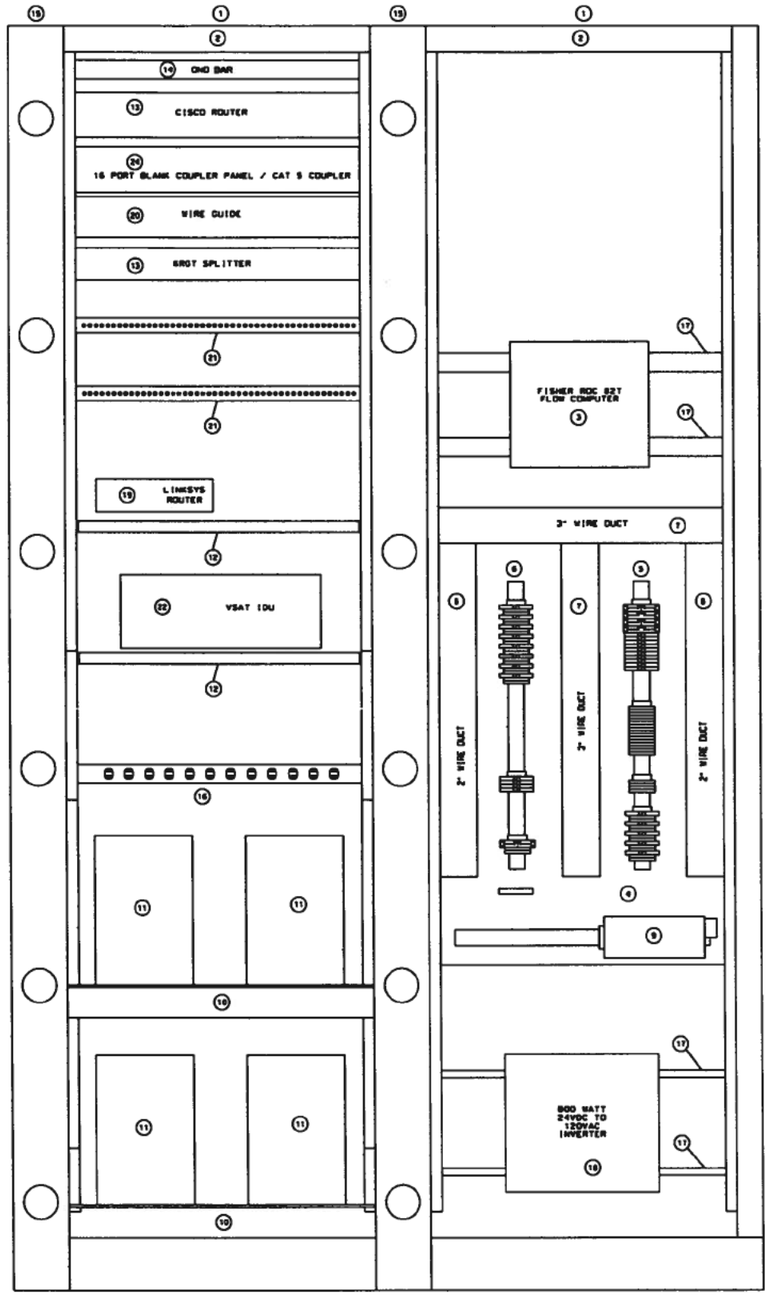
| | | | | | |
|---|---|---|---|---|---|
| AP1 | 3C#14 | 0.340" | ANIXTER | 2A-1403 | POWER TO GAS HEATER 120VAC |

## COMMUNICATION CABLE CHART

| CABLE | WIRE TYPE | O.D. | MAKE | PART NUMBER | CABLE PURPOSE |
|---|---|---|---|---|---|
| C1 | 2-COAXIAL | | NOTE 1 | | VSAT TO RADIO |
| C2 | 4PR#24 CAT.5E SHLD | 0.301" | BELDEN | 7922A | RADIO TO CISCO ROUTER |
| C3 | 4PR#24 CAT.5E SHLD | 0.301" | BELDEN | 7922A | ROC PLC TO LINKSYS SWITCH |
| C4 | 4PR#24 CAT.5E SHLD | 0.301" | BELDEN | 7922A | CISCO ROUTER TO ROC PLC |
| C5 | 4PR#24 CAT.5E SHLD | 0.301" | BELDEN | 7922A | LINKSYS SWITCH TO TECH PORT |

NOTE:
1. PROVIDED WITH RADIO

AS BUILT




BILL OF MATERIAL

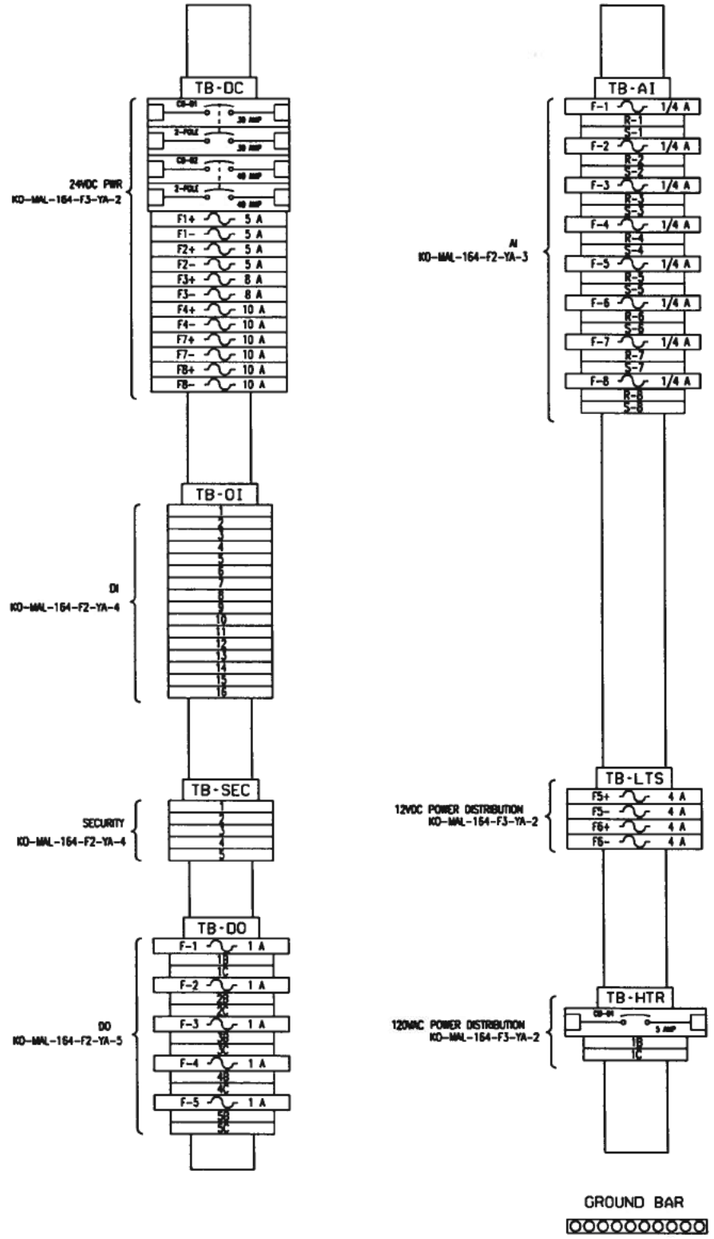
| ITEM | QTY. | DESCRIPTION |
|---|---|---|
| 1 | 2 | 19" RACK, CPI #55053-703 |
| 2 | 2 | CABLE RUNWAY MOUNTING PLATE, CPI #10595-712 |
| * 3 | 1 | FISHER ROC 827 FLOW COMPUTER WITH:<br>1 - RS232 COMMUNICATION MODULE<br>1 - 4 CHANNEL ANALOG INPUT MODULES<br>1 - 8 CHANNEL DISCRETE INPUT MODULE<br>1 - 5 CHANNEL DISCRETE OUTPUT RELAY MODULE |
| *** NOTE: | | ITEM 3 BY KERN RIVER MEASUREMENT DEPARTMENT |
| 4 | 1 | ALUMINUM PANEL, 20" X 36" X 1/8" |
| 5 | 1 | TB-DC, TB-DI, TB-DO, TB-SEC SEE KO-MAL-164-F2-YA-2 |
| 6 | 1 | TB-AI, TB-LTS, SEE KO-MAL-164-F2-YA-2 |
| 7 | A/R | 3" PANEL WIRING DUCT, PANDUIT F3X3LG6 |
| 8 | A/R | 2" PANEL WIRING DUCT, PANDUIT F2X3LG6 |
| 9 | 1 | ACOPIAN 24VDC/12VDC DC/DC 13.7AMP CONVERTER #18-75C12NT1370 |
| 10 | 2 | RACK SHELF, HEAVY DUTY, CPI # 11164-719 |
| 11 | 4 | 105AH 12VDC BATTERY |
| 12 | 2 | RACK SHELF, STANDARD, CPI # 11294-519 |
| * 13 | | COMMUNICATIONS EQUIPMENT<br>1 - CISCO ROUTER #1841<br>1 - KRGT SPLITTER |
| *** NOTE: | | ITEM 13 (COMMS PANEL) SUPPLIED BY KERN RIVER COMMS DEPARTMENT |
| 14 | 2 | GROUND BAR, CPI # 10610-019 |
| 15 | 2 | VERTICAL CABLE MANAGEMENT SECTION, CPI # 11729-503 |
| 16 | 1 | 12 OUTLET SURGE SUPPRESSOR RACK ASSEMBLY, CPI TRIPP LITE IBAR12 |
| 17 | 4 | BAR RACK BLOCK MOUNTING ANGLE STEEL, CPI # 30013-700 |
| 18 | 1 | 800 WATT, 24VDC TO 120 VAC INVERTER, PROWATT 800/24 |
| * 19 | 1 | LINKSYS ROUTER, WITH 8 PORT SWITCH, CDW #246418 |
| *** NOTE: | | ITEM 19 SUPPLIED BY KERN RIVER COMMS DEPARTMENT |
| 20 | 1 | WIRE GUIDE - ORTRONICS, 808004759 |
| 21 | 2 | BAR RACK MOUNTING, CPI 30013-700 |
| * 22 | 1 | VSat IDU - STRATOS, STV-70000354 |
| 23 | 5 | STAND OFF BRACKET - CPI # 100001-001<br>@ RACK NO'S: 21,27,33,39,45 |
| 24 | | COMMUNICATIONS EQUIPMENT<br>1 - 16 PORT BLANK COUPLER PANEL - ALLEN TEL, ATPNL-16<br>16 - CAT 5 COUPLIER - ALLEN TEL, AT55C-00 |

MATERIAL NOTES:

1. ALL PARTS LISTED ABOVE WITH AN "*" TO BE SUPPLIED AND INSTALLED BY KERN RIVER.
2. CONTRACTOR TO SUPPLY ALL OTHER ITEMS NOT LISTED BUT NEEDED TO COMPLETE INSTALLATION

| BASE | | EXP1 | |
|---|---|---|---|
| PM-24 POWER SUPPLY FSBPS-2 | MODULE 1 RS-232 (COMM) FSBCM-1 | MODULE 4 AI 4 CHANNEL FSAI-1 | MODULE 7 DI 8 POINT FSBDI-1 |
| CPU COMMS LOCAL PORT (RS-232D) | MODULE 2 BLANK | MODULE 5 BLANK | MODULE 8 DOR 5 CHANNEL FSDO-2 |
| ETHERNET (COMM1) RS-232 (COMM2) | MODULE 3 BLANK | MODULE 6 BLANK | MODULE 9 BLANK |

FISHER ROC 827 FLOW COMPUTER

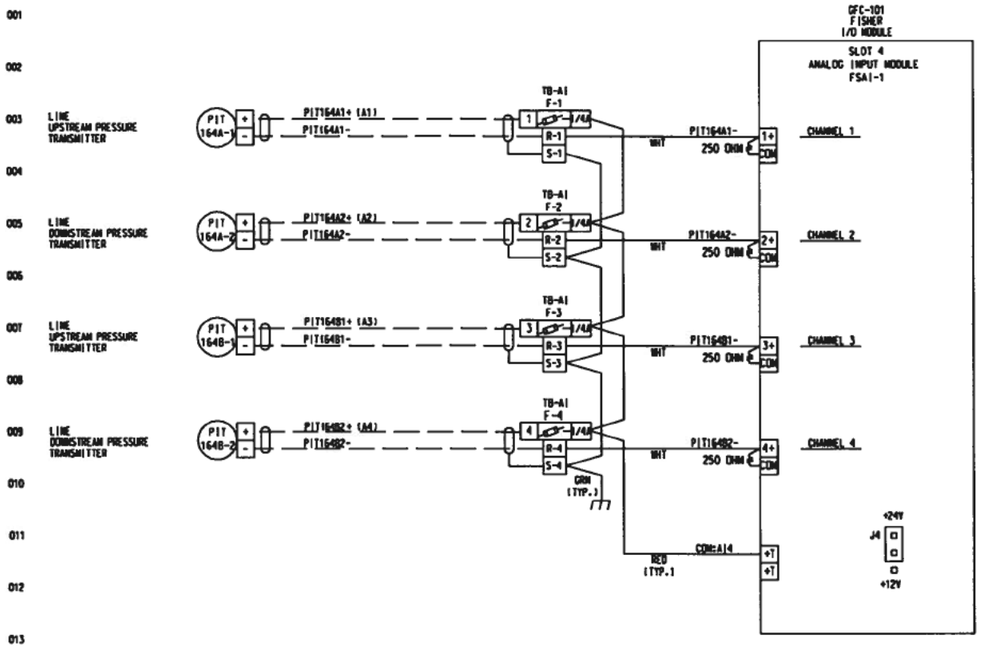


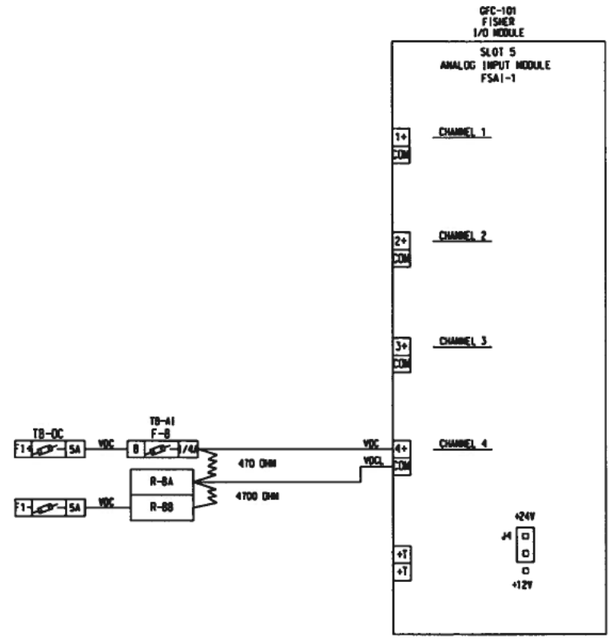

BILL OF MATERIALS

| ITEM | QTY | DESCRIPTION |
|---|---|---|
| 1 | | TERMINAL BLOCK TB-DC |
| | 1 | DIN RAIL, ALLEN BRADLEY, 199-DR1 |
| | 1 | INDIVIDUAL MARKER TAB, ALLEN BRADLEY, 1492-CM35 |
| | 1 | CIRCUIT BREAKER, 2-POLE, 30 AMP, ALLEN BRADLEY, 1489-A2-C-300 |
| | 1 | CIRCUIT BREAKER, 2-POLE, 40 AMP, ALLEN BRADLEY, 1489-A2-C-400 |
| | 12 | FUSE TERMINAL BLOCK, ALLEN BRADLEY 1492-H5 |
| | 4 | FUSE, 5 AMP, 5X20, BUSSMANN GMA5A |
| | 2 | FUSE, 8 AMP, 5X20, BUSSMANN GMA8 |
| | 6 | FUSE, 10 AMP, 5X20, BUSSMANN GMA10 |
| | A/R | TERMINAL BLOCK MARKING |
| 2 | | TERMINAL BLOCK TB-DI |
| | 1 | DIN RAIL, ALLEN BRADLEY, 199-DR1 |
| | 1 | INDIVIDUAL MARKER TAB, ALLEN BRADLEY, 1492-CM35 |
| | 16 | TERMINAL BLOCK, 30 AMP, ALLEN BRADLEY, 1492-J4 |
| | A/R | TERMINAL BLOCK MARKING |
| 3 | | TERMINAL BLOCK TB-SEC |
| | 1 | DIN RAIL, ALLEN BRADLEY, 199-DR1 |
| | 1 | INDIVIDUAL MARKER TAB, ALLEN BRADLEY, 1492-CM35 |
| | 4 | TERMINAL BLOCK, 30 AMP, ALLEN BRADLEY, 1492-J4 |
| | A/R | TERMINAL BLOCK MARKING |
| 4 | | TERMINAL BLOCK TB-DO |
| | 1 | DIN RAIL, ALLEN BRADLEY, 199-DR1 |
| | 1 | INDIVIDUAL MARKER TAB, ALLEN BRADLEY, 1492-CM35 |
| | 10 | TERMINAL BLOCK, 30 AMP, ALLEN BRADLEY, 1492-J4 |
| | 5 | FUSE TERMINAL BLOCK, ALLEN BRADLEY 1492-H5 |
| | 5 | FUSE, 1 AMP, 5X20, BUSSMANN GMA1 |
| | A/R | TERMINAL BLOCK MARKING |
| 5 | | TERMINAL BLOCK TB-AI |
| | 1 | DIN RAIL, ALLEN BRADLEY, 199-DR1 |
| | 1 | INDIVIDUAL MARKER TAB, ALLEN BRADLEY, 1492-CM35 |
| | 8 | TERMINAL BLOCK, 30 AMP, ALLEN BRADLEY, 1492-J4 |
| | 8 | TERMINAL BLOCK, GROUNDING, 30 AMP, ALLEN BRADLEY, 1492-JG4 |
| | 8 | FUSE TERMINAL BLOCK, ALLEN BRADLEY 1492-H5 |
| | 8 | FUSE, 1/4 AMP, 5X20, BUSSMANN GMA250MA |
| | A/R | TERMINAL BLOCK MARKING |
| 6 | | TERMINAL BLOCK TB-LTS |
| | 1 | DIN RAIL, ALLEN BRADLEY, 199-DR1 |
| | 1 | INDIVIDUAL MARKER TAB, ALLEN BRADLEY, 1492-CM35 |
| | 4 | FUSE TERMINAL BLOCK, ALLEN BRADLEY 1492-H5 |
| | 4 | FUSE, 4 AMP, 5X20, BUSSMANN GMA4 |
| | A/R | TERMINAL BLOCK MARKING |
| 7 | | GROUND BAR |
| 8 | | TERMINAL BLOCK TB-HTR |
| | 1 | DIN RAIL, ALLEN BRADLEY, 199-DR1 |
| | 1 | INDIVIDUAL MARKER TAB, ALLEN BRADLEY, 1492-CM35 |
| | 1 | CIRCUIT BREAKER, 1-POLE, 5 AMP, ALLEN BRADLEY, 1489-A1-C-050 |
| | A/R | TERMINAL BLOCK MARKING |
| | 1 | TERMINAL BLOCK, 30 AMP, ALLEN BRADLEY, 1492-J4 |
| | 1 | TERMINAL BLOCK, GROUNDING, 30 AMP, ALLEN BRADLEY, 1492-JG4 |

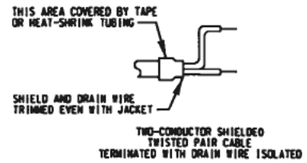
MATERIAL NOTES:

1. ALL PARTS ARE AS CALLED OUT OR APPROVED EQUAL.

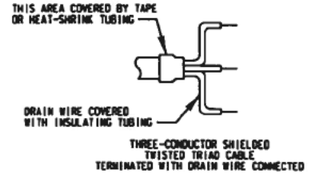



SHIELDED TWISTED PAIR INSTALLATION DETAILS:




TWO-CONDUCTOR SHIELDED
TWISTED PAIR CABLE
TERMINATED WITH DRAIN WIRE ISOLATED




THREE-CONDUCTOR SHIELDED
TWISTED TRIAD CABLE
TERMINATED WITH DRAIN WIRE CONNECTED

LEGEND:

GROUND SYMBOLS:

SIGNAL GROUND | CHASSIS GROUND | POWER GROUND

TERMINALS:

TERMINAL BLOCK

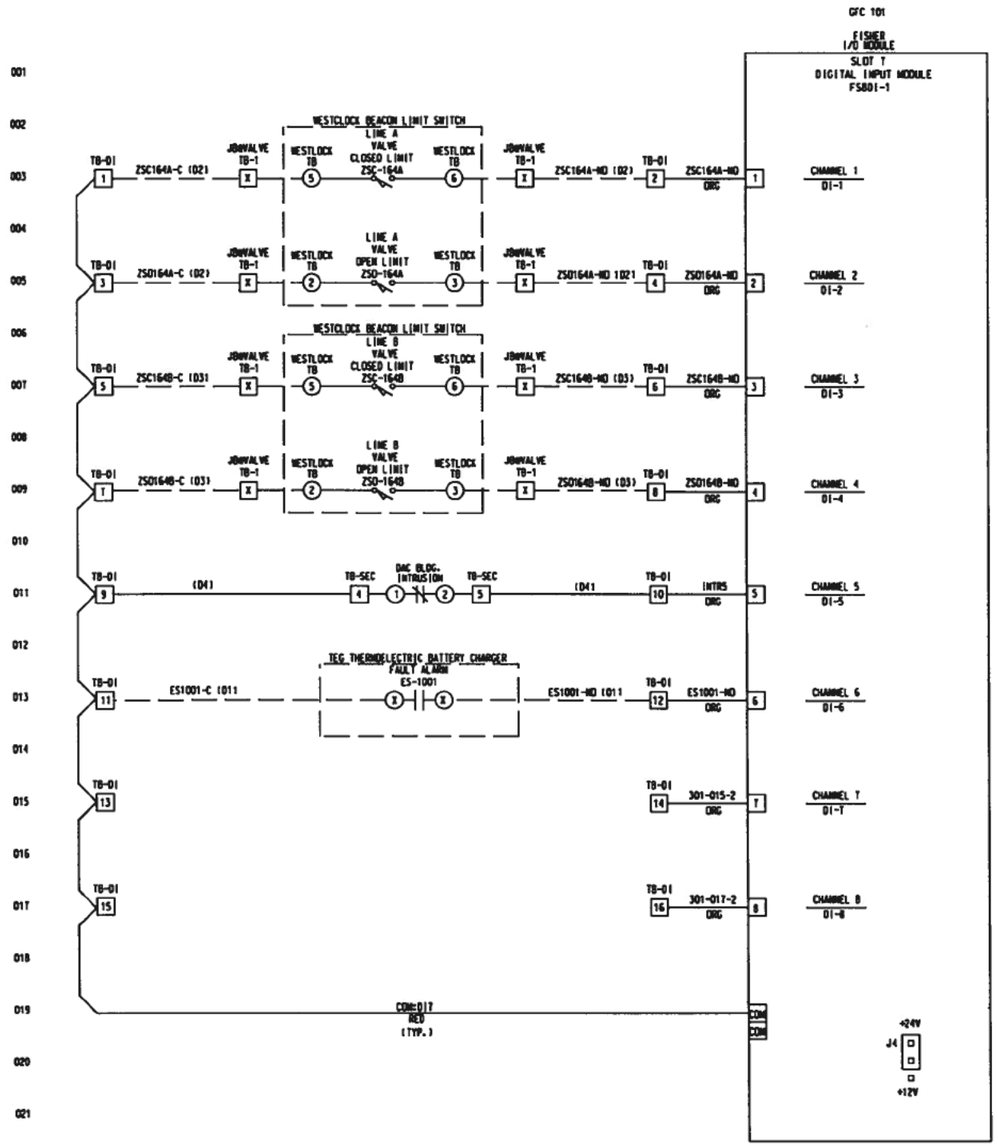
1 — SINGLE LEVEL TERMINAL (ALLEN BRADLEY 1492-J4)

1 | 5A — SINGLE LEVEL FUSED TERMINAL (ALLEN BRADLEY 1492-H5)
(5A INDICATES 5 AMP FUSE)

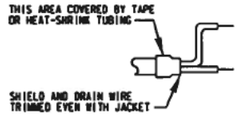
XXXX (YY)

XXXX - WIRE TAG
(YY) - CABLE NUMBER

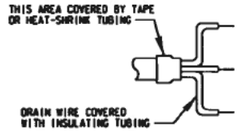
1. SOLID LINES INDICATE BUILDING FABRICATOR.
2. DASHED LINES INDICATE FIELD WIRING.




SHIELDED TWISTED PAIR INSTALLATION DETAILS:




TWO-CONDUCTOR SHIELDED TWISTED PAIR CABLE TERMINATED WITH DRAIN WIRE ISOLATED




THREE-CONDUCTOR SHIELDED TWISTED TRIAD CABLE TERMINATED WITH DRAIN WIRE CONNECTED

LEGEND:

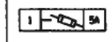
GROUND SYMBOLS:




TERMINALS:




SINGLE LEVEL TERMINAL (ALLEN BRADLEY 1492-J4)

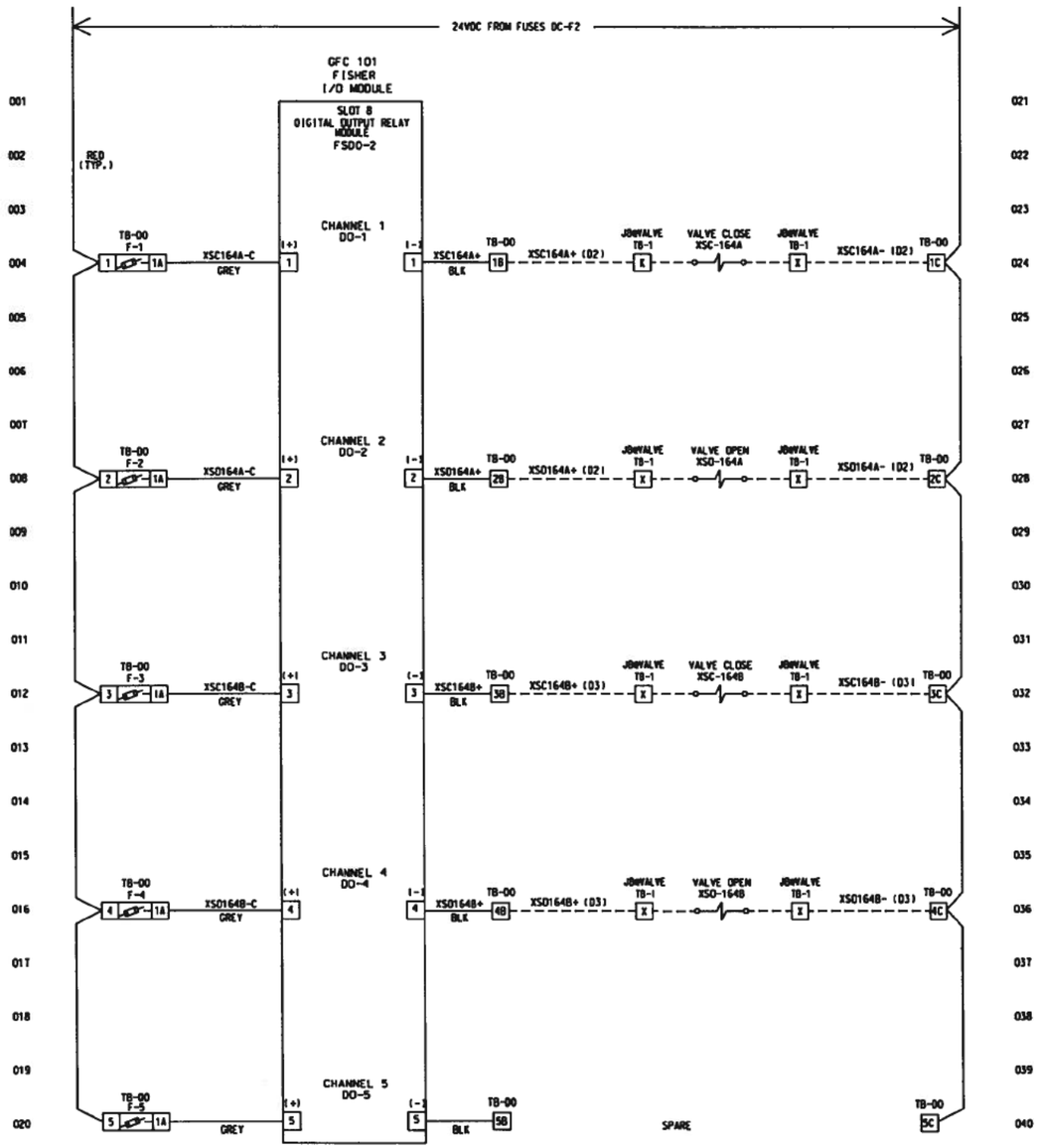



SINGLE LEVEL FUSED TERMINAL (ALLEN BRADLEY 1492-H5)
15A INDICATES 5 AMP FUSE)

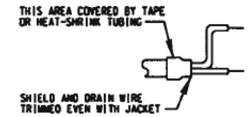
XXXX 1YY)

XXXX - WIRE TAG
1YY) - CABLE NUMBER

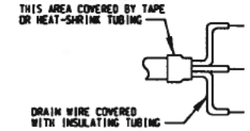
1. SOLID LINES INDICATE BUILDING FABRICATOR.
2. DASHED LINES INDICATE FIELD WIRING.




SHIELDED TWISTED PAIR INSTALLATION DETAILS:




TWO-CONDUCTOR SHIELDED
TWISTED PAIR CABLE
TERMINATED WITH DRAIN WIRE ISOLATED




THREE-CONDUCTOR SHIELDED
TWISTED TRIAD CABLE
TERMINATED WITH DRAIN WIRE CONNECTED

LEGEND:

GROUND SYMBOLS:




TERMINALS:




SINGLE LEVEL TERMINAL (ALLEN BRADLEY 1492-J4)

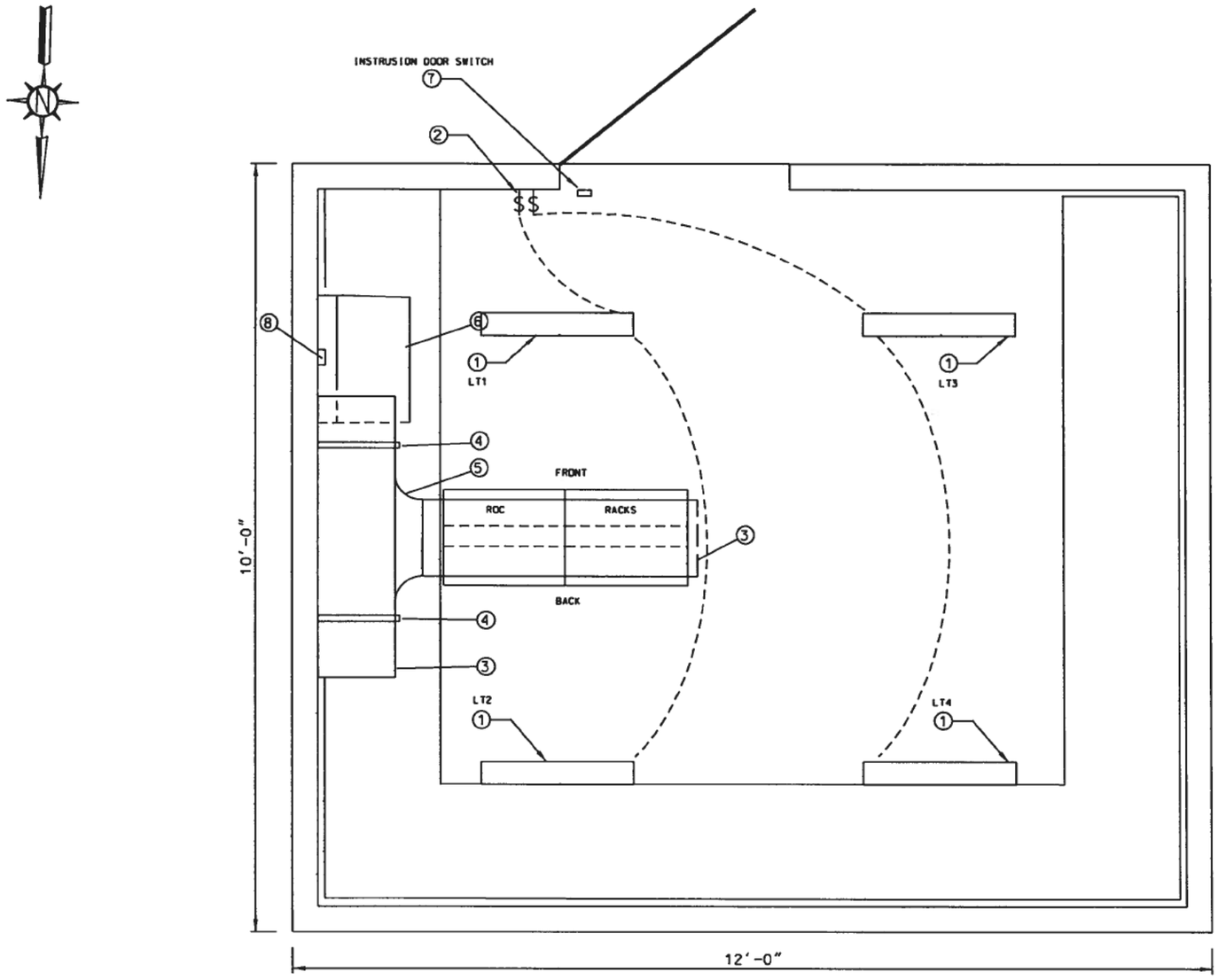



SINGLE LEVEL FUSED TERMINAL (ALLEN BRADLEY 1492-H5)
(5A INDICATES 5 AMP FUSE)

XXXX (YY)

XXXX - WIRE TAG
(YY) - CABLE NUMBER

1. SOLID LINES INDICATE BUILDING FABRICATOR.
2. DASHED LINES INDICATE FIELD WIRING.



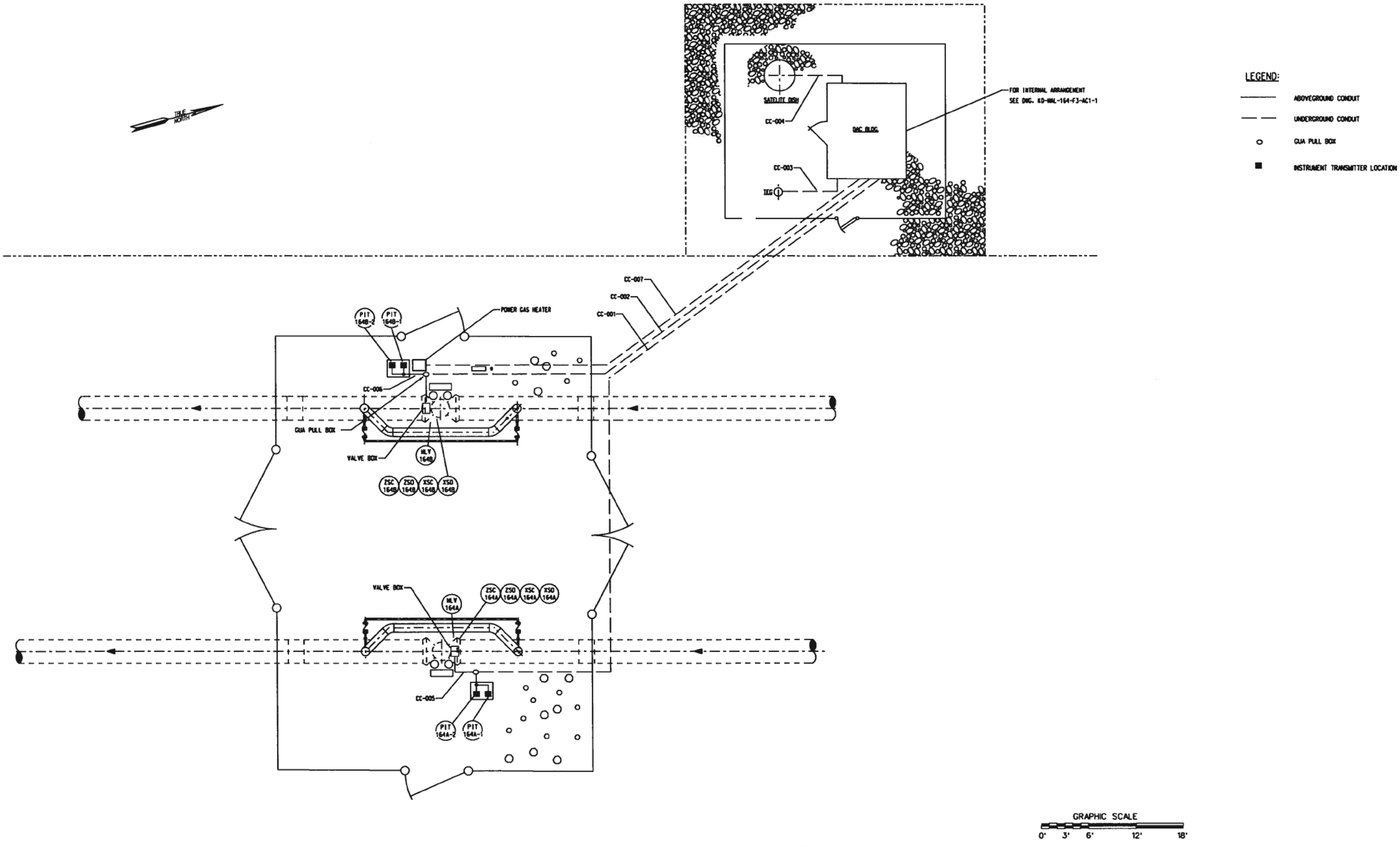

PLAN VIEW

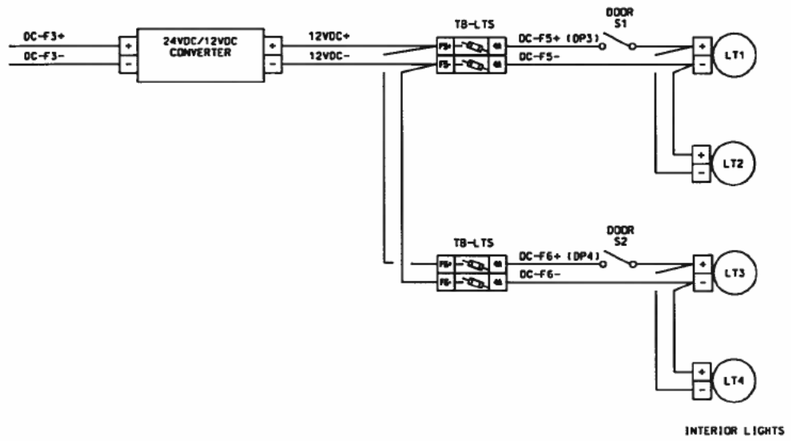
## BILL OF MATERIALS

| ITEM | QTY. | DESCRIPTION |
|---|---|---|
| 1 | 4 | SIERRA SOLAR SYSTEMS, THIN-LITE 181, 20W FIXTURE, 066-02435 |
| 2 | 2 | BACKWOOD SOLAR ELECTRIC, AC/DC LIGHTSWITCH TIMER, 60 MINUTES, 4 AMP |
| 3 | 2 | LADDER RACKCABLE RUNWAY, 12" W X 9'-11.5" L CPI # 10250-712 |
| 4 | 3 | WALL ANGLE SUPPORT KIT, CPI # 11421-712 |
| 5 | 2 | JUNCTION SPLICE KIT FOR CABLE RUNWAY, CPI # 11302-701 |
| 6 | 1 | OMNIMEDBEAM STANDARD WALL DESK #291501 |
| 7 | 1 | MICRO LSA1 SPDT RTRY LIMIT SWITCH W/ MICRO LSZ651A LIMIT SWITCH ARM |
| 8 | 1 | NETWORK PORT |

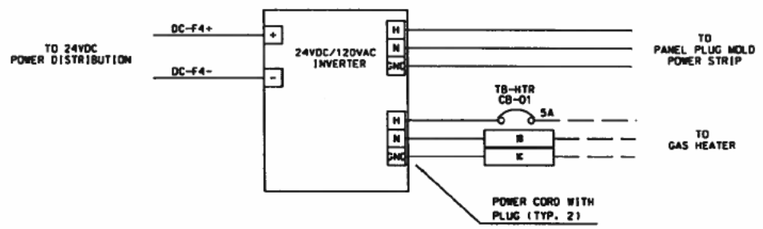
THE DESIGNS & THE DRAWING PROPERTY OF (ADD SHOP) AND SHALL NOT BE REPRODUCED, COPIED, OR EXHIBITED WITHOUT THE WRITTEN PERMISSION OF (ADD SHOP) AND IT MUST BE RETURNED ON DEMAND.

AS BUILT

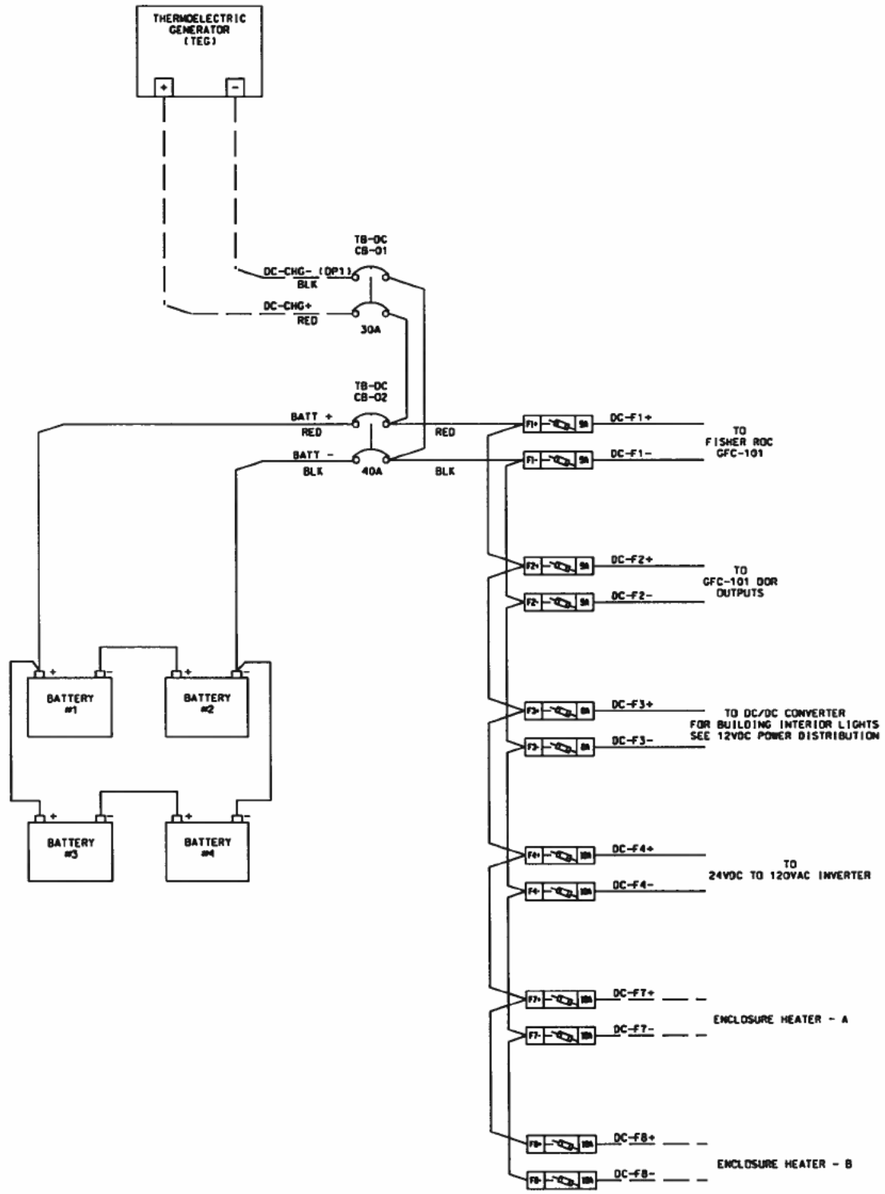

TRUE NORTH
SATELITE DISH
CC-004
DAC BLDG.
CC-003
IEG
FOR INTERNAL ARRANGEMENT
SEE DWG. KO-MAL-164-F3-AC1-1
CC-007
CC-002
CC-001
PIT 164B-2
PIT 164B-1
POWER GAS HEATER
CC-006
GUA PULL BOX
VALVE BOX
MLV 164B
ZSC 164B
ZSO 164B
XSC 164B
XSO 164B
VALVE BOX
MLV 164A
ZSC 164A
ZSO 164A
XSC 164A
XSO 164A
CC-005
PIT 164A-2
PIT 164A-1
LEGEND:
ABOVEGROUND CONDUIT
UNDERGROUND CONDUIT
GUA PULL BOX
INSTRUMENT TRANSMITTER LOCATION
GRAPHIC SCALE
0'
3'
6'
12'
18'




## 12VDC POWER DISTRIBUTION

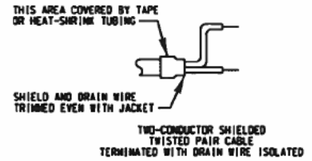


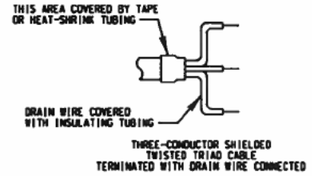

## 120VAC POWER DISTRIBUTION




## 24VDC POWER DISTRIBUTION

### SHIELDED TWISTED PAIR INSTALLATION DETAILS:




LEGEND:

GROUND SYMBOLS:




TERMINALS:

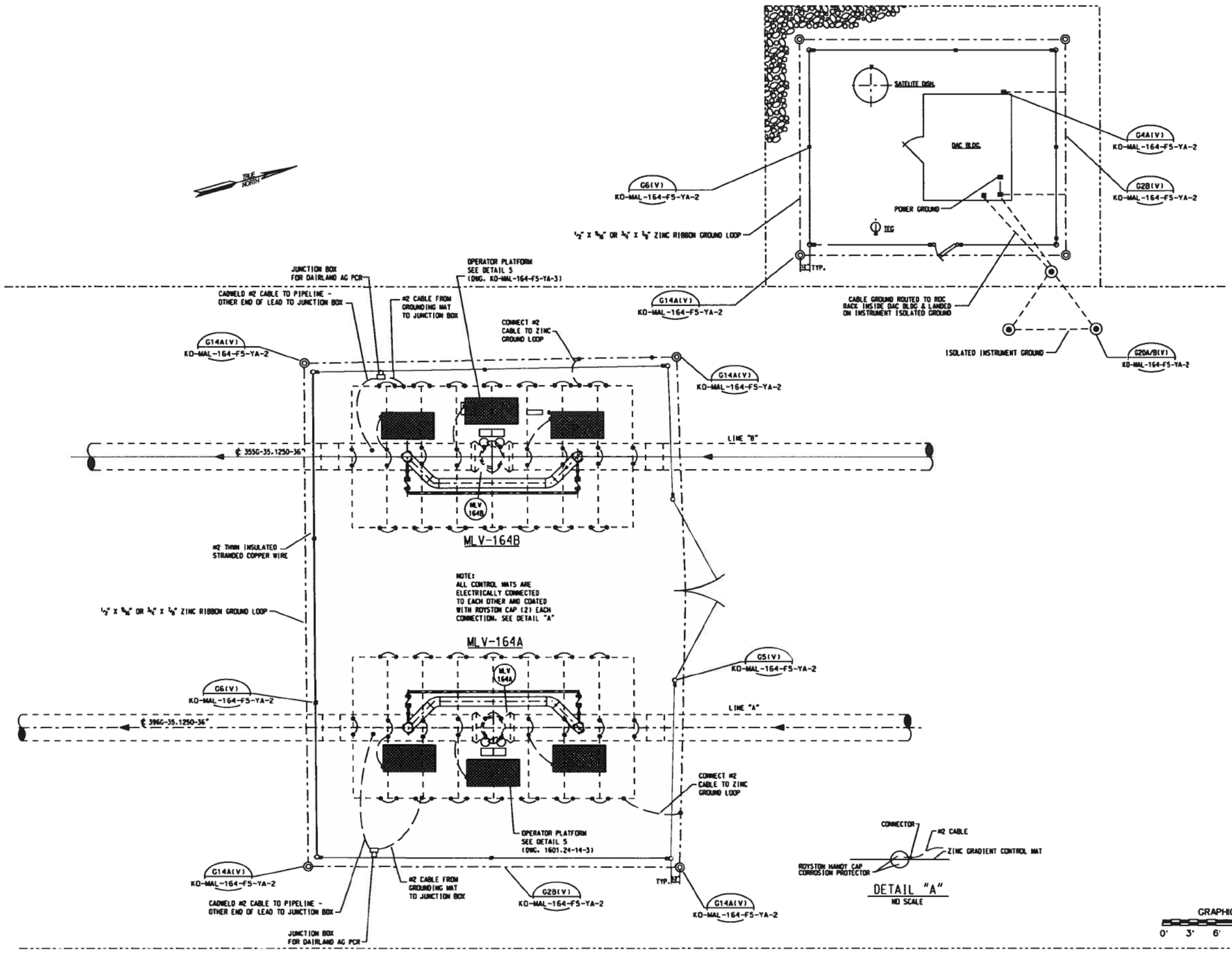



SINGLE LEVEL TERMINAL (ALLEN BRADLEY 1492-J4)




SINGLE LEVEL FUSED TERMINAL (ALLEN BRADLEY 1492-H5)
(5A INDICATES 5 AMP FUSE)

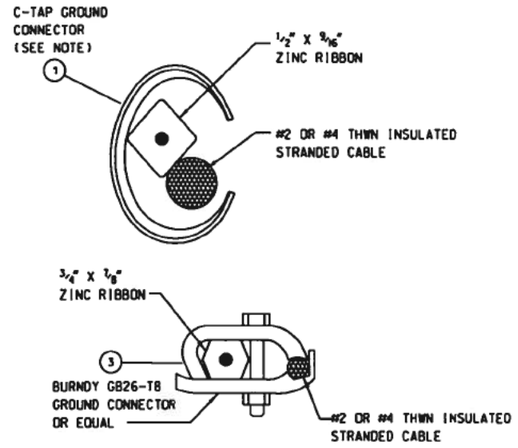
1. SOLID LINES INDICATE BUILDING FABRICATOR.
2. DASHED LINES INDICATE FIELD WIRING.




PLAN

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AS BUILT

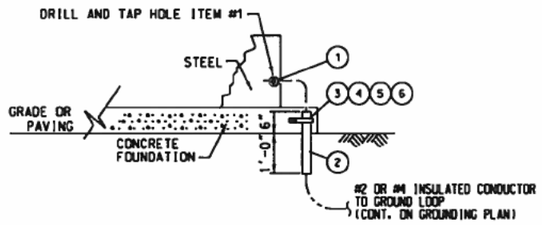



| ITEM | DESCRIPTION |
|---|---|
| 1 | GROUND CONNECTOR C-TAP #54750 |
| 2 | GROUND CONNECTOR. BURNDY GB26-T8 |
| 3 | SPLICE KIT CAST 90-81 3M SCOTCHKOTE |

NOTE:

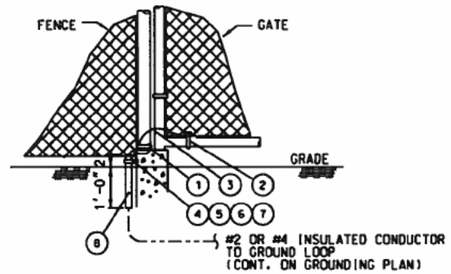
WHEN USING 3/4" X 1/8" ZINC RIBBON. USE BURNDY GB26-T8 SPLIT BOLT CONNECTOR OR EQUAL.

DETAIL "G2B" (V)
GROUND CONNECTOR FOR ZINC RIBBON



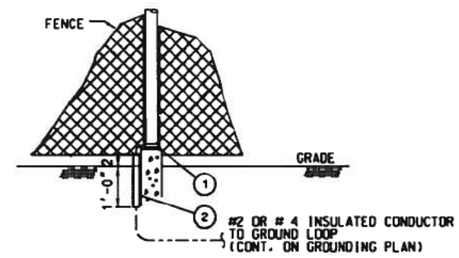

| ITEM | DESCRIPTION |
|---|---|
| 1 | CONN., SERVIT POST. #8-#2. 3/8"-16 x 1 1/8" STUD BURNDY #KC23B1 |
| 2 | CONDUIT. PVC. 3/4" x 1'-6" LONG |
| 3 | CONDUIT CLAMP. ONE HOLE. 3/4". UNISTRUT#P2016 |
| 4 | ANCHOR EXPANSION SLEEVE. 1/4"x1/8". RAWL#9320 |
| 5 | BOLT. 1/4"-20 x 1". HOT DIP GALVANIZED |
| 6 | SHAKEPROOF LOCKWASHER. 1/4". HOT DIP GALVANIZED |

DETAIL "G4A (V)
BUILDING OR EQUIPMENT GROUNDING



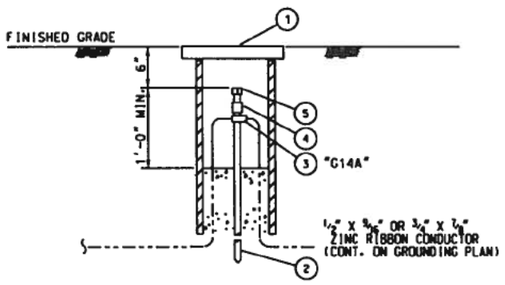

| ITEM | DESCRIPTION |
|---|---|
| 1 | GROUND CONNECTOR BURNDY #GD1926 |
| 2 | GROUND CONNECTOR BURNDY #GG18-1 |
| 3 | FLEXIBLE COPPER BRAID BURNDY #BD12 |
| 4 | CONDUIT CLAMP. ONE HOLE. 3/4". UNISTRUT#P2016 |
| 5 | ANCHOR EXPANSION SLEEVE. 1/4"x1/8". RAWL#9320 |
| 6 | BOLT. 1/4"-20 x 1". HOT DIP GALVANIZED |
| 7 | SHAKEPROOF LOCKWASHER. 1/4". HOT DIP GALVANIZED |
| 8 | CONDUIT. PVC. 3/4" x 1'-6" LG. |

DETAIL "G5" (V)
FENCE & GATE GROUNDING



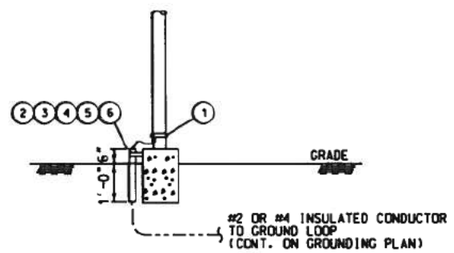

| ITEM | DESCRIPTION |
|---|---|
| 1 | GROUND CONNECTOR BURNDY #GD1926 |
| 2 | CONDUIT. PVC. 3/4" x 1'-6" LG. |

DETAIL "G6" (V)
FENCE GROUNDING



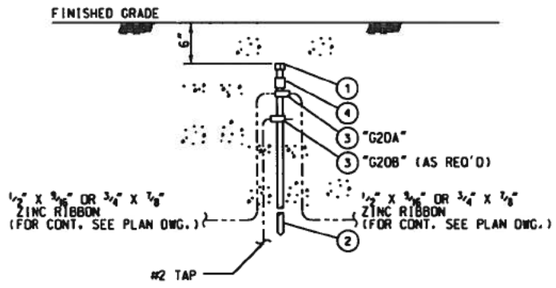

| ITEM | DESCRIPTION |
|---|---|
| 1 | INSPECTION BOX. CONCRETE. CHRISTY#G8 |
| 2 | GALV. GROUND ROD. 5/8" x 10'-0" LONG |
| 3 | GROUND CONNECTOR. BURNDY #GAR6426. #4-#2/0 |
| 4 | 5/8" COUPLING. |
| 5 | DRIVING STUD. |

DETAIL "G14A" (V)
TEST WELL



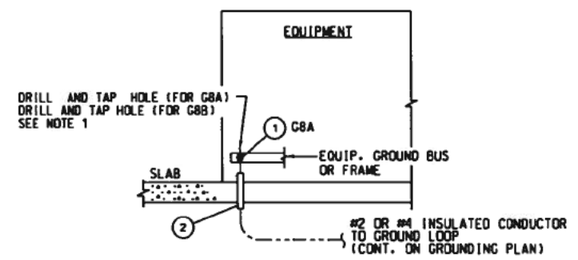

| ITEM | DESCRIPTION |
|---|---|
| 1 | GROUND CONNECTOR BURNDY #GAR1826 |
| 2 | CONDUIT. PVC. 3/4" x 1'-6" LONG |
| 3 | CONDUIT CLAMP. ONE HOLE. 3/4". UNISTRUT#P2016 |
| 4 | ANCHOR EXPANSION SLEEVE. 1/4"x1/8". RAWL#9320 |
| 5 | BOLT. 1/4"-20 x 1". HOT DIP GALVANIZED |
| 6 | SHAKEPROOF LOCKWASHER. 1/4". HOT DIP GALVANIZED |

DETAIL "G17" (V)
2" PIPE EQUIPMENT STAND GROUNDING




| ITEM | DESCRIPTION |
|---|---|
| 1 | DRIVING STUD. |
| 2 | GALV. GROUND ROD. 5/8" x 10'-0" LONG |
| 3 | GROUND CONNECTOR. BURNDY #GAR6426. #4-#2/0 |
| 4 | 5/8" COUPLING. |

DETAIL "G20A", "G20B" (V)
GROUND ROD




NOTE:

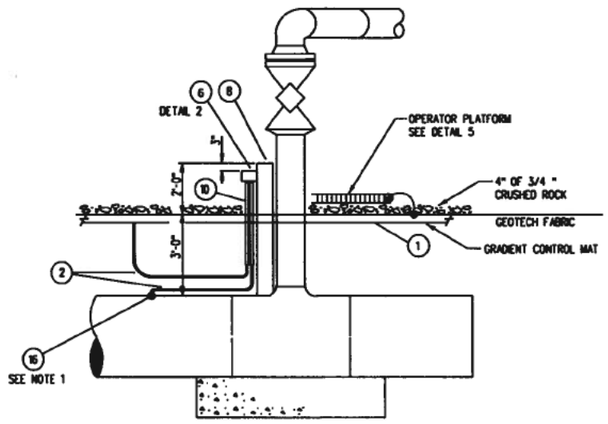
1. CONTRACTOR TO COLD GALVANIZE ALL FIELD PENETRATIONS.

| ITEM | DESCRIPTION |
|---|---|
| 1 | CONNECTOR. SERVIT POST. #8-2. 3/8"-16 x 5/8" STUD BURNDY#K2C23 |
| 2 | CONDUIT. PVC. 3/4" x 1'-6" LONG |

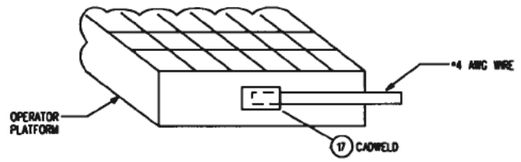
DETAIL "G8A" (V)
EQUIPMENT GROUND ASSEMBLY TO GROUND BUS OR FRAME

# MATERIAL LIST

| SUPPLIER CODE | QUANTITY | UNITS | DESCRIPTION | ITEM NBR |
|---|---|---|---|---|
| | 40.0 | EA | 4'x8' ZINC GRADIENT CONTROL MAT | 001 |
| | 200.0 | FT | WIRE, I/C #2 OR #4 AWG THWN STRANDED COPPER, INSULATED | 002 |
| | 3.0 | EA | OPERATOR PLATFORM | 004 |
| | 1.0 | EA | 6" X 6" X 4" FRP HOFFMAN JUNCTION BOX (06250 67W30100) (062500003) | 006 |
| C | 4.0 | EA | HARDWARE, DESCRIBED AS FOLLOWS: BOLT, WOOD, LAG, 1 1/2" LONG. (10999 ) (109990009) | 007 |
| C | 5.0 | FT | LUMBER AND BUILDING SUPPLIES AS DESCRIBED BELOW, 1 POST, PRESSURE TREATED WOOD, 4" X 4" X 5' LONG (01999 ) (019990009) | 008 |
| C | 2.0 | EA | BUSHING, CONDUIT, INSULATED, 1 IN. (05101 0212 ) (051010014) | 009 |
| C | 12.0 | FT | CONDUIT, 1 IN PVC HEAVY WALL (050040 0212 ) (050400017) | 010 |
| C | 4.0 | EA | HARDWARE, DESCRIBED AS FOLLOWS: #4 RING TONGUE TERMINALS, NONINSLULATED | 011 |
| C | | EA | | 012 |
| C | 1.0 | EA | CADWELDING SUPPLIES AS SPECIFIED BELOW: (2) CADWELD METAL, STANDARD NO. CA15 (1) CADWELD MOLD NO. CAHAA-1L (03045 ) (030450009) | 016 |
| C | 1.0 | EA | CADWELDING SUPPLIES AS SPECIFIED BELOW: (1) CADWELD MOLD NO. HAA-1L | 017 |
| | | EA | | 019 |
| | 1.0 | EA | 60 HZ PCR-3.7KA | 020 |
| | 300.0 | FT | 1/2" X 9/16" OR 3/4"X7/8" ZINC RIBBON | 022 |

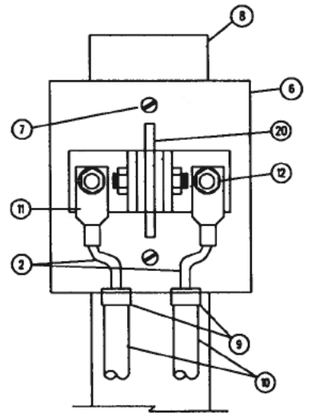



DETAIL 1
PIPE TO GROUND MAT
TO PCR JUNCTION BOX

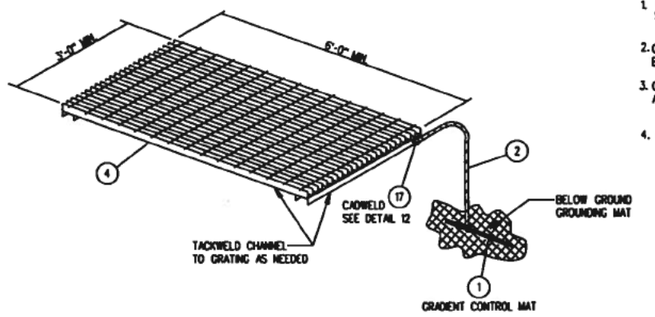



CADWELD MOLD: HAA-1L
CADWELD METAL: STANDARD NO. 15

DETAIL 12




DETAIL 4 - JUNCTION BOX W/PCR




DETAIL 5 - OPERATOR PLATFORM
(TO BE SUPPLIED BY VENDOR)

NOTES:

1. THE GROUND CONNECTION TO THE PIPELINE SHALL BE MADE WITH #4 OR #2 INSULATED STRANDED COPPER CABLE, CADWELDED TO PIPELINE.
2. OPERATING PLATFORMS SHALL BE GALVANIZED STEEL WITH 1 1/2 " X 3/16 " BARS, 1 1/8 " BETWEEN BARS.
3. COMPANY SHALL FURNISH ITEMS 1, 2, 4, 6, 20, AND 22. CONTRACTOR SHALL FURNISH ALL OTHER MATERIALS REQUIRED TO PROVIDE THE COMPLETE GROUND INSTALLATION.
4. WIRE ATTACHMENT PROCEDURE.

   REMOVE 3 SQUARE INCHES (2" X 1 1/2 ") OF PIPE COATING FROM SIDE OF PIPE.

   FILE PIPE SURFACE TO BRIGHT, CLEAN AND DRY FINISH.

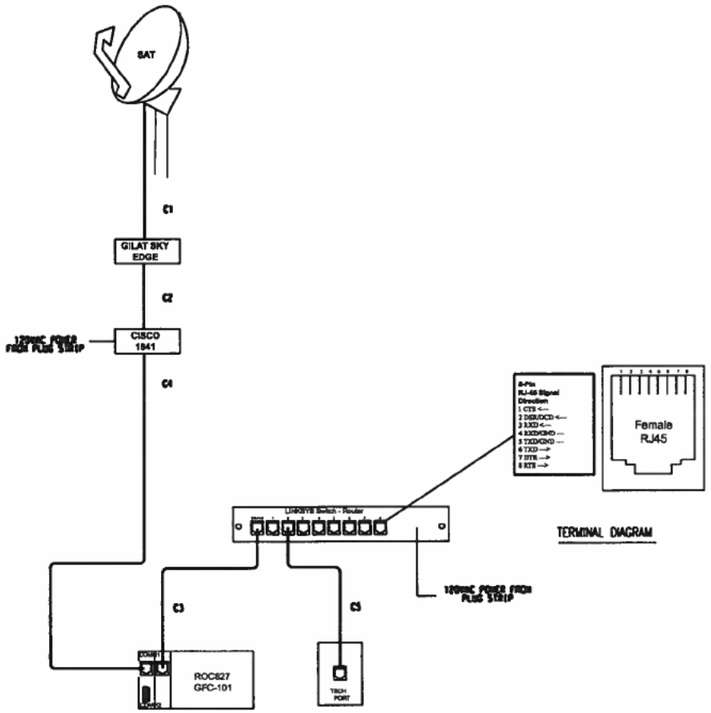
   STRIP 1" OF INSULATION FROM END OF WIRE AND CLEAN TO BRIGHT COPPER FINISH.

   CADWELD WIRE TO PIPE.

   AFTER COOLING, TEST THE WIRE ATTACHMENT BY TAPPING WITH A HAMMER.

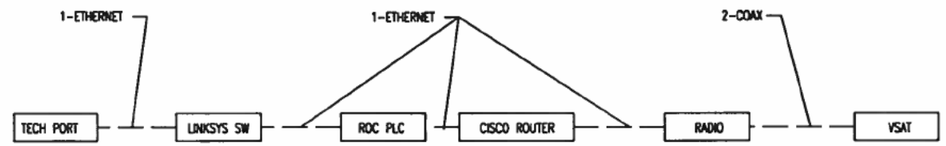
   CLEAN PIPE SURFACE.

   DRY CONNECTION AND APPLY SPC2886 COATING COMPLETELY COVERING CLEANED PIPE SURFACE AND CADWELD CONNECTION, USE APPROVED MATERIAL COMPATIBLE WITH THE PIPE COATING.
5. CONNECTION MATERIALS ARE TO BE THOSE NOTED OR EQUAL.



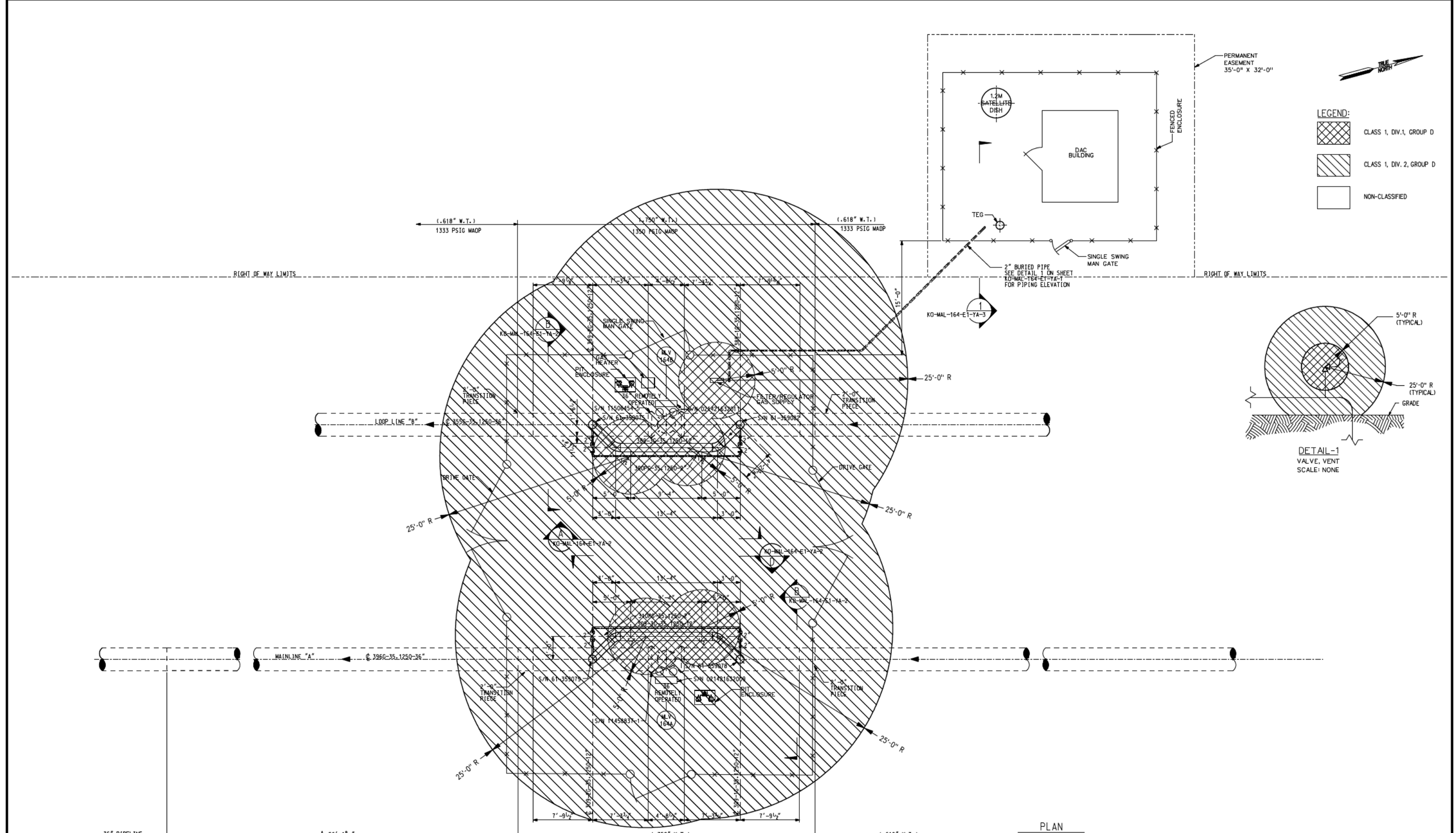

COMMUNICATIONS WIRING DIAGRAM

TERMINAL DIAGRAM




COMMUNICATIONS BLOCK DIAGRAM

AS BUILT




PLAN

3/16" = 1'-0"




DETAIL-1

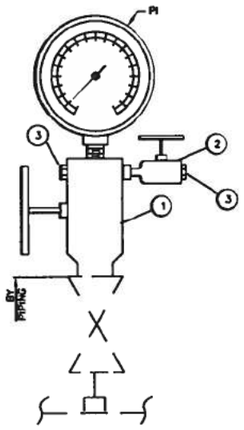
VALVE, VENT

SCALE: NONE

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AS-BUILT

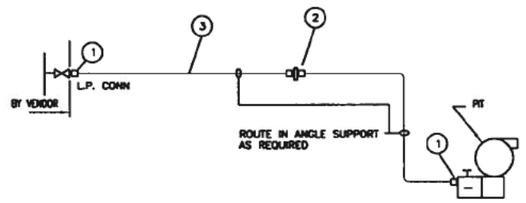
| ITEM | QTY | DESCRIPTION (ALL MANUFACTURERS ARE "OR EQUAL") |
|---|---|---|
| 1 | 1 | 1/2" PRESSURE GAGE VALVE AGCO NO. M5A-VSS-44 |
| 2 | 1 | 1/2" HAND VALVE AGCO NO. H1-VVS-440 |
| 3 | 2 | 1/2" PIPE PLUG SS |




TYPICAL PRESSURE GAGE INSTALLATION

DETAIL 1 N.T.S.

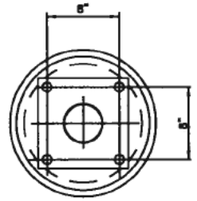
| ITEM | QTY | DESCRIPTION (ALL MANUFACTURERS ARE "OR EQUAL") |
|---|---|---|
| 1 | 2 | 1/2"MNPT X 1/2"T MALE CONNECTOR SWAGELOK NO. SS-810-1-8 |
| 2 | A/R | 1/2"T UNION SWAGELOK NO. SS-810-8 |
| 3 | A/R | 1/2"OD X 0.049"WT 304SS TUBING, SEAMLESS, ANNEALED, ASTM A269 |



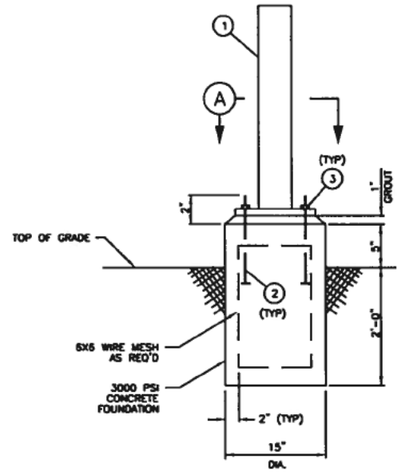

INSTRUMENT INSTALLATION DETAIL
PRESSURE TRANSMITTER

DETAIL 2 N.T.S.

| ITEM | QTY | DESCRIPTION (ALL MANUFACTURERS ARE "OR EQUAL") |
|---|---|---|
| 1 | 1 | 2" SUPPORT SEE DETAIL 7 FOR PART NUMBER |
| 2 | 4 | ANCHOR BOLT 5/8" DIA., H.H., 14" LG., GALV. |
| 3 | 4 | NUT 5/8" DIA., H.H., GALV. |

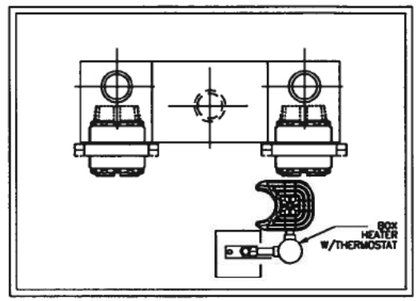



SECTION A

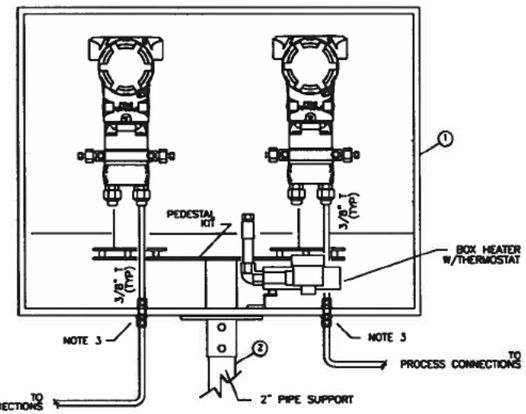



DETAIL 3 N.T.S.

| ITEM | QTY | DESCRIPTION (ALL MANUFACTURERS ARE "OR EQUAL") |
|---|---|---|
| 1 | 1 | HEATED TRANSMITTER BOX ASSEMBLY, SHALL CONSIST OF THE FOLLOWING: |
| | | 1 EACH, A STYLE VIPAK 21" W X 18.5" D X 18.5" H ENCLOSURE |
| | | 2 EACH 2" PIPE MOUNTING AND 1-PEDESTAL KIT |
| | | 2 EACH 1/2" INSTRUMENT POWER CONDUIT KIT |
| | | 1 EACH T-SERIES 24VDC, 200 WATT CLASS 1, DIVISION 2 |
| | | HEATER WITH 50 DEGREE THERMOSTAT. |
| | | O'BRIEN MODEL NO. A2T2-D7FN-IP80F12(2)-T2S3S20D2C,JS9H-1-IPK1(2)-1(2) |
| 2 | 1 | INSTRUMENT STAND, FLOOR STAND, 2" DIA X 40" TALL, 10" X 10" X 1/4" THK STEEL GUSSETED BASE PLATE, O'BRIEN SADDLE PAK, FP40. |




TOP VIEW



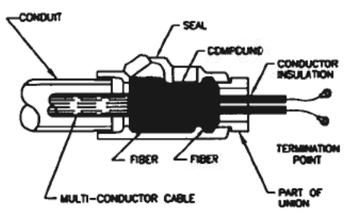

MATERIAL NOTE:

1. CONTRACTOR TO SUPPLY ALL OTHER ITEMS NOT LISTED, BUT NECESSARY TO COMPLETE INSTALLATION.

NOTES:

1. 2" PIPE MOUNTING AND PEDESTAL KIT SHALL BE MOUNTED IN THE CENTER OF THE BOX WITH THE PIPE OFFSET AS NECESSARY TO PROVIDE CLEARANCE FOR INSTALLATION.
2. TRANSMITTERS SHALL BE MOUNTED AS SHOWN AND SUPPLIED WITH ALL TUBING AND CONDUIT AS NECESSARY TO ASSEMBLE HEATER SHALL BE INSTALLED AT THE BOTTOM OF THE ENCLOSURE ON THE MOUNTING BRACKET.
3. ALL PENETRATIONS INTO THE ENCLOSURE TO BE SEALED TO PREVENT HEAT LOSS DURING COLD WEATHER.

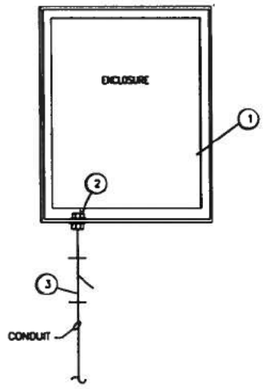
DETAIL 7 N.T.S.




TYPICAL MULTI-CONDUCTOR CABLE
SEALING METHOD
AT TERMINATION

DETAIL 4 N.T.S.

| ITEM | QTY | DESCRIPTION (ALL MANUFACTURERS ARE "OR EQUAL") |
|---|---|---|
| 1 | 1 | ENCLOSURE, BY VENDOR |
| 2 | 1 | HUB FITTING SIZE A/R, MYERS TYPE 'ST' |
| 3 | 1 | SEAL FITTING, SIZE AS REQ'D, M/F, HORIZ., CROUSE-HINDS TYPE 'EYS'. |



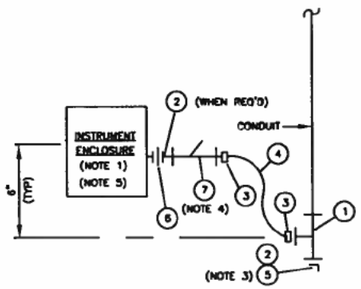

ELECTRICAL DETAIL
OUTSIDE ENCLOSURE

DETAIL 5 N.T.S.

| ITEM | QTY | DESCRIPTION (ALL MANUFACTURERS ARE "OR EQUAL") |
|---|---|---|
| 1 | 1 | "T" FITTING 3/4" W/GASKET & COVER-FERALOY, CROUSE-HINDS FORM 7 |
| 2 | A/R | REDUCING BUSHING, CROUSE-HINDS TYPE 'RE' SIZE A/R |
| 3 | 2 | LIQUIDTIGHT FLEX. CONDUIT STRAIGHT CONNECTOR 3/4", MALE MALLEABLE IRON, CROUSE-HINDS #LT75 |
| 4 | A/R | LIQUIDTIGHT FLEX. CONDUIT 3/4" |
| 5 | 1 | UNIV. BREATHER DRAIN-1/2" CROUSE-HINDS #ECD15 |
| 6 | 1 | UNION, M/F, CROUSE-HINDS TYPE "UNY", SIZE A/R |
| 7 | 1 | SEAL FITTING, M/F, HORIZ, OR VERT. CROUSE-HINDS TYPE 'EYS' SIZE AS REQ'D. |

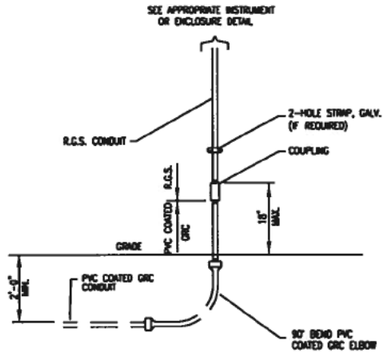
NOTES:

1—INSTRUMENT DETAIL MAY NOT REFLECT EXACT CONDUIT ENTRY ORIENTATION.
2—SUPPORT OF CONDUIT TO INSTRUMENT SHALL BE FIELD DETERMINED.
3—WHEN CONDUIT IS BOTTOM FED, OMIT DRAIN & ADD SQUARE HEAD PLUG TO TEE
4—FOR NON ARKING INSTR. OR FOR HERMETICALLY SEALED INSTR. OMIT SEAL
5—FOR INSTRUMENTS THAT HAVE PROCESS TIES LIKE PT'S, PDT'S ETC. A SEAL WILL BE REQUIRED.



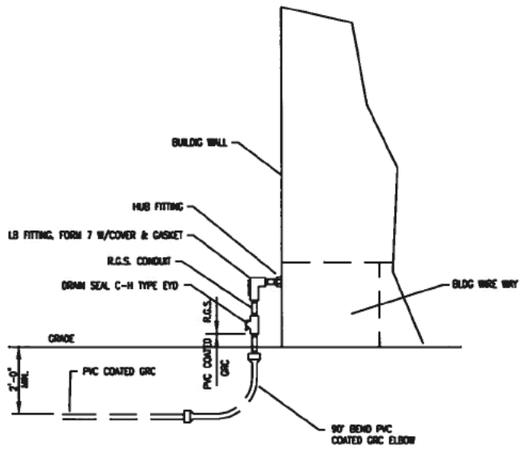

ELECTRICAL DETAIL
OUTSIDE INSTRUMENTS WITH OUT PIG-TAILS

DETAIL 6 N.T.S.




TYPICAL CONDUIT CONNECTION
FOR INSTRUMENTS AND OTHER ENCLOSURES

DETAIL 1 GENERAL
N.T.S.




TYPICAL CONDUIT TERMINATION
AT BUILDING

DETAIL 2 GENERAL
N.T.S.

## GENERAL NOTES - SITE WORK

1. THE EXISTING SOIL SURFACE, BENEATH THE TOPSOIL, WHICH WILL RECEIVE STRUCTURAL FILL, GRAVEL, CONCRETE SLABS, FOOTINGS, SIDEWALKS OR CURBS, SHALL BE COMPACTED TO A MINIMUM OF 90% OF STANDARD DENSITY FOR A DEPTH OF 6" UNLESS OTHERWISE NOTED ON PLANS. SUBSEQUENT TO STRIPPING AND PRIOR TO PLACEMENT OF STRUCTURAL SITE GRADING FILL, PAVEMENTS, AND FLOOR SLABS, THE NATURAL SUBGRADE SHOULD BE PROOFROLLED BY PASSING MODERATELY LOADED, RUBBER TIRE-MOUNTED, CONSTRUCTION EQUIPMENT OVER THE SURFACE TWICE. IF EXCESSIVELY SOFT OR LOOSE SOILS ARE ENCOUNTERED DURING SITE PREPARATION, THEY SHOULD BE REMOVED TO A MAXIMUM DEPTH OF TWO FEET AND REPLACED WITH STRUCTURAL FILL.

2. ANY SOIL EMBANKMENT WHICH WILL RECEIVE GRAVEL BASE COURSE, CONCRETE SLABS, FOOTINGS, SIDEWALKS OR CURBS SHALL BE STRUCTURAL FILL. MINIMUM COMPACTION OF STRUCTURAL FILL SHALL BE 90% OF STANDARD DENSITY THROUGHOUT THE DEPTH OF THE FILL UNLESS OTHERWISE NOTED ON THE PLANS.

3. ALL BRUSH & STUMPS WITHIN THE LIMITS OF CUT & FILL LINE SHOWN ON THE GRADING PLAN SHALL BE REMOVED AND DISPOSED.

4. EXCAVATED SOIL NOT USED AS STRUCTURAL FILL AND ALL TOPSOIL SHALL BE DISPOSED OF WITHIN THE SITE R/W IN THE EAST PORTION OF THE SITE AS DIRECTED BY KRGT ENGINEER. THE MATERIAL SHALL BE EVENLY SPREAD, SLOPED AND WHEEL ROLLED IN A MANNER WHICH WILL PROVIDE ADEQUATE DRAINAGE OF RAIN WATER.

5. THE SLOPES OF ALL CUTS, DITCHES AND EMBANKMENTS SHALL BE COMPACTED TO 90 PERCENT STANDARD DENSITY FOR A MINIMUM DEPTH OF 6" AND DRESSED SMOOTH TO PREVENT CHANNELING AND EROSION BY RAIN WATER.

6. THE GEOTEXTILE FABRIC SHALL BE "EXXON GTF-2000" OR EQUAL AND SHALL BE APPROVED BY THE ENGINEER. ALL EDGES SHALL OVERLAP 6".

7. GRAVEL BASE COURSE AND ASPHALT PAVEMENT SHALL BE PLACED IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATIONS.

8. AGGREGATE FOR GRAVEL BASE COURSE SHALL BE $1\frac{1}{2}$" MAXIMUM SIZE PER THE CONST. SPEC. AND SHALL HAVE LESS THAN 15 PERCENT FLAT OR ELONGATED PIECES (LENGTH IS GREATER THAN 5 TIMES THE AVERAGE THICKNESS). THE PORTION OF AGGREGATE RETAINED ON THE NO. 4 SIEVE SHALL HAVE 75% COMPOSED OF UNIFORMLY GRADED CRUSHED PARTICLES (PIECES OF AGGREGATE WITH ONE OR MORE FRACTURED FACES RESULTING FROM MECHANICAL CRUSHING). THE FINE AGGREGATE PORTION (MATERIAL PASSING THE NO. 10 SIEVE) SHALL BE SAND, STONE DUST OR OTHER INERT FINELY DIVIDED MINERAL MATTER AND CONTAIN LESS THAN 10% MATERIAL PASSING THE #200 SIEVE.

9. CRUSHED ROCK SHALL CONSIST OF CRUSHED AND SCREENED TO OBTAIN A MINIMUM SIZE OF 3/8 INCH AND A MAXIMUM SIZE OF 3/4 INCH OR AS APPROVED BY COMPANY. THE STONE SHALL MATCH THE EXISTING STONE IN ADJOINING AREAS. THE CRUSHED STONE SHALL BE FURNISHED AND PLACED BY CONTRACTOR.

10. SIDEWALK SHALL HAVE 3000 PSI CONCRETE & 60 KSI STEEL REINFORCING. ALL EXPOSED CORNERS TO BE ROUNDED TO $\frac{1}{2}$" RADIUS. A CONCRETE CURING AGENT SHALL BE APPLIED TO ALL EXPOSED SURFACES IMMEDIATELY AFTER FINISHING. HAIRLINE CRACKS OR WIND CHECKED SURFACES WILL NOT BE ACCEPTED. THE CURING AGENT SHALL BE LIQUID MEMBRANE FORMING COMPOUNDS WHICH CONFORMS TO AASHTO M 148 AND SHALL PROVIDE A WATER RETENTION OF AT LEAST 90 PERCENT. EXPANSION JOINTS SHALL BE PREFORMED EXPANSION JOINT FILLER WHICH CONFORM TO AASHTO M 153 OR AASHTO M 213 AND WHICH IS COMPATIBLE WITH COLD POURED JOINT SEALER. CONTRACTION JOINTS SHALL BE SAW CUT AND ALL CONTRACTION AND EXPANSION JOINTS SHALL BE SEALED WITH PHILLYBOND NO. 7C FLEXIBLE SEAM SEALANT. A MINIMUM VERTICAL THICKNESS OF 1" OF JOINT SEALER SHALL BE APPLIED PER MANUFACTURER'S RECOMMENDATIONS.

11. PERIMETER FENCE SHALL BE INSTALLED INSIDE THE PROPERTY LINE, AS SHOWN ON THE PLANS, AND CONFORM TO CONSTRUCTION SPECIFICATION.

12. PERIMETER FENCE SHALL HAVE A VEHICLE ENTRANCE/EXIT GATE WITH A 20'5" WIDE OPENING AS SHOWN ON DRAWINGS.

13. CONCRETE FOR FENCE POSTS SHALL HAVE 3000 PSI, 28 DAY COMPRESSIVE STRENGTH.

14. CONCRETE EXPANSION AND CONTRACTION JOINT SEALANT SHALL BE "BRUTIUM 92" OR EQUAL AS APPROVED BY THE ENGINEER.

15. OFF-SITE BORROW SHALL CONSIST OF SOIL OBTAINED BY THE CONTRACTOR FROM A LOCATION OUTSIDE THE SITE RIGHT-OF-WAY. THE MATERIAL SHALL CONFORM TO CONSTRUCTION SPECIFICATIONS AND HAVE THE FOLLOWING GRADATION AND SOIL CONSTANTS:

| U.S. STD. SQ. MESH SIEVE | PERCENT BY WEIGHT PASSING |
|---|---|
| 3" | 100 |
| 2" | 90-100 |
| $1\frac{1}{2}$" | 60-100 |
| $\frac{3}{8}$" | 30-70 |
| NO.10 | 15-50 |
| NO.40 | 8-35 |
| NO.200 | 3-20 |

THE FRACTION PASSING THE NO. 200 SIEVE SHALL NOT BE GREATER THAN 70% OF THE FRACTION PASSING THE NO. 40 SIEVE. THE CONTRACTOR SHALL MAKE HIS OWN ARRANGEMENTS FOR OBTAINING BORROW AND SHALL PAY ALL COSTS INVOLVED. THE CONTRACTOR SHALL NOTIFY THE ENGINEER SUFFICIENTLY IN ADVANCE OF OPENING ANY BORROW AREAS, SO THAT ANY NECESSARY REQUIRED TESTS, MAY BE MADE. BORROW SITE SHALL BE ABANDONED IN FULL COMPLIANCE WITH ALL APPLICABLE STATE AND FEDERAL LAWS.

16. ASPHALTIC CONCRETE PAVEMENT WHERE NOTED ON DRAWINGS SHALL CONFORM TO CONSTRUCTION SPECIFICATION.

## GENERAL NOTES - INSTALLATION

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL ELEVATIONS AND DIMENSIONS ON DRAWINGS.

## GENERAL NOTES - CONCRETE

1. AMERICAN CONCRETE INSTITUTE (ACI) AND ALL PUBLICATIONS AS LISTED IN THE CONSTRUCTION SPECIFICATIONS SHALL GOVERN.

2. CONCRETE SHALL HAVE A 28-DAY STRENGTH OF 3000 OR 4000 PSI WHERE NOTED. CEMENT SHALL CONFORM TO ASTM C150 STANDARD SPECIFICATION FOR PORTLAND CEMENT, TYPE II.

3. REINFORCEMENT BARS SHALL BE BILLET STEEL AND CONFORM TO ASTM SPECIFICATION A-615 GR 60. WELDED WIRE FABRIC SHALL MEET THE MINIMUM REQUIREMENTS OF ASTM A82 AND A185.

4. ANCHOR BOLTS SHALL BE ASTM SPECIFICATION A-307, GRD B. AND ASTM A-320, OR AS NOTED ON DRAWING AS REQUIRED.

5. CHAMFER ALL EXPOSED EDGES $\frac{3}{4}$".

6. GROUT SHALL BE SAND-CEMENT TYPE DRY-PACK GROUT MIXTURE EXCEPT AS NOTED ON THE DRAWINGS.

   DRY-PACK GROUT, SHALL CONSIST OF ONE PART PORTLAND CEMENT AND NOT MORE THAN TWO PARTS OF FINE AGGREGATE WITH WATER TO PRODUCE A DAMP MOLDABLE MASS WITHOUT FREE WATER THAT WILL NOT CRUMBLE WHEN SAMPLE IS SQUEEZED BY HAND AND BROKEN.

   A. PORTLAND CEMENT SHALL CONFORM TO ASTM C150, TYPE II.

   B. FINE AGGREGATE SHALL CONFORM TO THE REQUIREMENTS OF ASTM C404 AND SHALL BE A NATURAL FINE AGGREGATE, SIZE NO. 2. ALTERNATE FINENESS MAY BE USED WITH THE THE ENGINEER APPROVAL.

   C. DRY-PACK GROUT SHALL BE KEPT MOIST AND MAINTAINED AT TEMPERATURES OF AT LEAST 50° F FOR 7 DAYS AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI AT 28 DAYS.

7. GRADE BEAMS SHALL BE FORMED FOR THE FULL HEIGHT.

8. CONCRETE SURFACES SHALL BE FINISHED ACCORDING TO THE CONSTRUCTION SPECIFICATION.

9. EXPANSION JOINT MATERIAL SHALL BE OF THE BITUMINOUS TYPE, ASTM D1751, SIZE AS NOTED ON THE DRAWINGS.

10. JOINT SEALANT SHALL BE PHILLYBOND 7C.

11. AIR ENTRAINMENT IS REQUIRED FOR SIDEWALKS.

12. ALL ANCHOR BOLTS SHALL BE FURNISHED WITH HARDENED WASHERS.

13. CONCRETE FINISHES DESIGNATION:

   S1. INTERIOR FLOOR SURFACES WHICH REMAIN EXPOSED TO VIEW IN THE FINISHED WORK SHALL BE GIVEN A DOUBLE STEEL TROWELED FINISH.

   S2. EXTERIOR SLABS OR WHERE INDICATED SHALL BE GIVEN A BROOM FINISH. THE STRIATIONS SHALL BE UNIFORM IN CHARACTER AND WIDTH, NOT MORE THAN 1/16 INCH DEEP AND NORMAL TO THE MOVEMENT OF TRAFFIC.

   S3. FLOOR SLABS TO RECEIVE TILE OR OTHER OVERLAYMENT SHALL BE GIVEN A SINGLE STEEL TROWELED FINISH.

   S4. SURFACES WHICH WILL SUBSEQUENTLY BE GROUTED FOR THE SUPPORT OF EQUIPMENT SHALL BE GIVEN A FLOAT FINISH.

   S5. UNFORMED SURFACES OF FOUNDATIONS WHICH WILL BE BACKFILLED AND NOT EXPOSED TO VIEW IN THE FINISHED WORK SHALL BE FINISHED BY DARBY OR BULL FLOAT. SURFACE CRACKING OCCURRING PRIOR TO SET OF THE CONCRETE SHALL BE CLOSED BY HAND FLOAT.

   S6. UNFORMED CONCRETE SURFACES OTHER THAN SLABS OR FLOORS, WHICH REMAIN EXPOSED TO VIEW IN THE FINISHED WORK SHALL BE GIVEN A SINGLE STEEL TROWELED FINISH.

14. THE INSTALLATION OF DRILLED PIERS SHALL FOLLOW THE ADDITIONAL SPECIAL REQUIREMENTS:

   A. CONCRETE SHALL BE PLACED USING A FLEXIBLE OR ARTICULATED DROPCHUTE SUCH THAT CONCRETE DOES NOT FREE FALL MORE THAN FOUR (4) FEET.

   B. REBAR CAGES SHALL BE SECURELY AND ACCURATELY HELD IN PLACE AT THE TOP DURING CONCRETE PLACEMENT.

   C. AT THE TIME CONCRETE PLACEMENT IS STARTED, EACH HOLE SHALL BE FREE FROM LOOSE MATERIAL AND STANDING WATER. CONCRETE SHALL BE PLACED AS SOON AS POSSIBLE FOLLOWING APPROVAL OF THE DRILLED HOLE BY KRGT'S AUTHORIZED REPRESENTATIVE, BUT IN NO EVENT SHALL THE HOLE REMAIN UNFILLED WITH CONCRETE MORE THAN ONE NIGHT. IF COMPLETED PIER HOLES ARE ALLOWED TO STAND EMPTY OVERNIGHT, THEY SHALL BE RECLEANED, IF REQUIRED AND REINSPECTED JUST PRIOR TO PLACING CONCRETE.

   D. DEWATERING OPERATIONS REQUIRED TO MAINTAIN ALL DRILLED HOLES FREE FROM WATER ACCUMULATIONS SHALL BE PERFORMED AT THE EXPENSE OF THE CONTRACTOR. EACH DRILLED HOLE SHALL BE PROTECTED AGAINST ENTRY OF WATER AND SHALL BE KEPT COVERED UNTIL FILLED WITH CONCRETE, UNLESS CLEAN-OUT, INSPECTION OR OTHER WORK IS IN PROGRESS IN THE HOLE.

   E. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING HOLES SAFELY COVERED TO ENSURE THAT A PERSON CANNOT FALL OR STEP INTO ONE.

   F. IF UNSTABLE SOIL OR GROUND WATER HAS BEEN ENCOUNTERED, A TEMPORARY CASING WILL HAVE BEEN SEATED INTO BEDROCK UNTIL PLACEMENT OF CONCRETE BEGINS; THE CASING SHALL BE SLOWLY RAISED AS CONCRETE IS BEING PLACED, MAINTAINING INTERIOR CONCRETE SURFACE AT OR ABOVE THE GROUND WATER LEVEL UNTIL NO MORE UNSTABLE SOIL OR GROUND WATER IS ENCOUNTERED. THIS PROCEDURE WILL BE COORDINATED BY THE ENGINEER.

   G. VIBRATION OF CONCRETE SHALL NOT BE DONE INSIDE A TEMPORARY CASING.

15. COMPACTION OF STRUCTURAL FILL:
   STRUCTURAL FILL (PLASTICITY INDEX OF LESS THAN 12 AND AT LEAST 30% FINES) SHALL BE PLACED IN 8" LIFTS AND COMPACTED TO A MINIMUM OF 90% OF MAXIMUM DRY DENSITY AS DETERMINED BY AASHTO T-180 (ASTM D-1557).

16. BACKFILL AT GRADE BEAMS:
   BACKFILL SHALL BE AT APPROXIMATELY EQUAL HEIGHT ON BOTH SIDES OF GRADE BEAMS.

17. UNLESS OTHERWISE SHOWN, ALL REINFORCING STEEL SHALL HAVE THE FOLLOWING CLEAR CONCRETE COVER:
   (A) THREE (3) INCHES FROM THE BOTTOM OF FOOTINGS, BASES, WALL GRADE BEAMS, AND CONCRETE CAST AGAINST EARTH;
   (B) TWO (2) INCHES FOR ALL OTHER CONCRETE REGARDLESS OF BAR SIZE.

## GENERAL NOTES - STRUCTURAL STEEL

1. GOVERNING SPECIFICATIONS ARE AS FOLLOWS:

   A. AMERICAN INSTITUTE OF STEEL CONSTRUCTION MANUAL LATEST EDITION INCLUDING ALL SPECIFICATIONS CONTAINED THEREIN (LATEST EDITIONS AND SUPPLEMENTS).

   B. AMERICAN WELDING SOCIETY D1.1-84.

   C. AMERICAN SOCIETY FOR TESTING AND MATERIALS SPECIFICATIONS AS LISTED BELOW:

   - ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM A36.
   - PLATE SHALL CONFORM TO ASTM A36 UNLESS NOTED ON THE DESIGN DRAWINGS.
   - HIGH STRENGTH BOLTS, NUTS AND WASHERS SHALL CONFORM TO ASTM A325.
   - MACHINE BOLTS SHALL CONFORM TO ASTM A307.
   - WELDING SHALL BE PERFORMED WITH E70 SERIES ELECTRODES.

2. ALL GUSSET PLATES WHERE NOTED ON DRAWINGS TO BE A MINIMUM THICKNESS OF $\frac{3}{8}$".

3. CONNECTIONS SHALL BE SIMPLE BEAM CONNECTIONS UNLESS NOTED OTHERWISE ON THE DRAWINGS. ALL BOLTS SHALL BE $\frac{3}{4}$" DIAMETER A-325 UNLESS NOTED.

4. SHOP PAINT AND FIELD PAINT SHALL CONFORM TO THE KERN RIVER COATING SPECIFICATION. ALL STRUCTURAL STEEL SHALL BE SHOP PRIMED WITH A PRIME COAT. BOLTS, NUTS AND WASHERS SHALL BE MECHANICALLY GALVANIZED.

5. MINIMUM FILLET WELD SHALL BE $\frac{3}{16}$". ALL FILLET WELDS SHALL BE SEAL WELDS, NO STITCH WELDING WILL BE ALLOWED.

## GALVANIZING NOTES

A. BOLTS

HOT-DIP GALVANIZING SHALL BE DONE IN STRICT ACCORDANCE WITH THE LATEST EDITION OF ASTM DESIGNATION A-153 "STANDARD SPECIFICATION FOR ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE" AND A-385 "STANDARD PRACTICE FOR PROVIDING HIGH QUALITY ZINC COATINGS (HOT-DIP)".

ALL THREADS SHALL BE CLEANED WITH A THREAD CHASER AFTER GALVANIZING.

B. FABRICATED ASSEMBLIES

FABRICATION WELDS SHALL BE SAND BLASTED TO "WHITE METAL" SP-5 (NACE #1) PRIOR TO GALVANIZING.

HOT-DIP GALVANIZING SHALL BE DONE IN STRICT ACCORDANCE WITH THE LATEST EDITION OF ASTM DESIGNATION A-123 "STANDARD SPECIFICATIONS FOR ZINC (HOT-GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS" AND A-385 "STANDARD RECOMMENDED PRACTICE FOR PROVIDING HIGH QUALITY ZINC COATINGS (HOT-DIP)".

ALL FIELD WELDS MADE ON GALVANIZED MATERIALS SHALL BE CLEANED TO "WHITE METAL" AND COATED WITH 3 MILS OF "COLD-GALV" (PRESSURIZED SPRAY CONTAINER).

## EPOXY COATING NOTES

1. REBAR

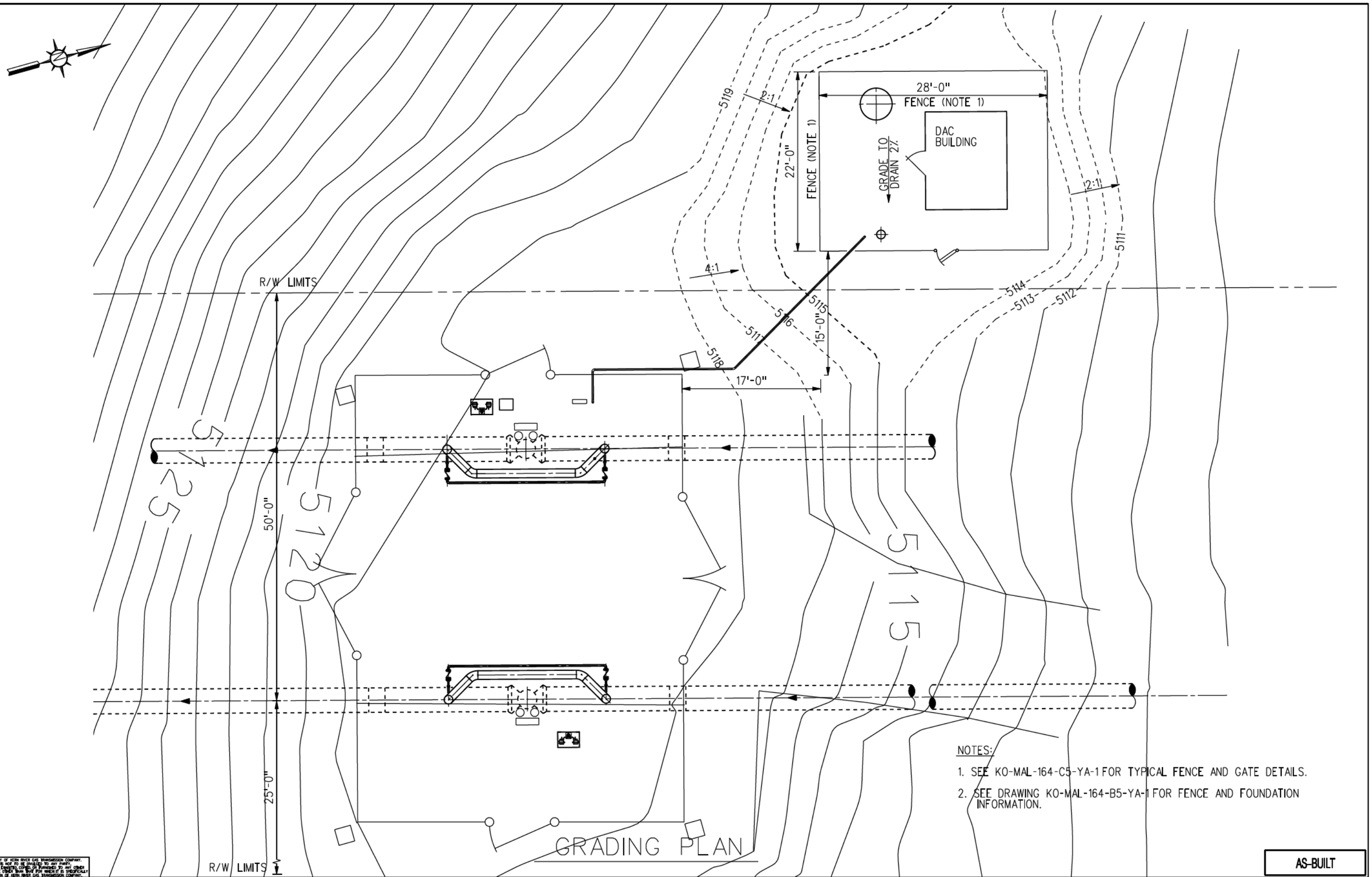
   A. MEET AASHTO M 284 OR AASHTO M 111
   B. MAINTAIN EPOXY COATING THICKNESS BETWEEN 8 AND 12 MILS.
   C. COAT BARS AFTER BENDING, UNLESS THE FABRICATOR CAN SHOW THAT SATISFACTORY RESULTS CAN BE OBTAINED BY COATING BEFORE BENDING.
   D. REJECT ANY BENT BARS WITH VISIBLE CRACKS OR DAMAGE IN THE COATING.

2. BAR SUPPORTS

   A. EPOXY-COATED, GALVANIZED, OR PLASTIC-COATED, OR PLASTIC BAR SUPPORTS.
   B. REMOVE CONTAMINANTS THAT AFFECT THE ADHESION OF THE COATING TO THE WIRE.
   C. US AN ELECTROSTATIC-SPRAY METHOD, FLUIDIZED BED, OR FLOCKING TO APPLY AN EPOXY COATING.
   D. APPLY PLASTIC COATING BY SPRAYING, DIPPING, OR USING AS A POWDER.
   E. MAINTAIN GALVANIZED COATING THICKNESS AS SPECIFIED. AASHTO M111.
   F. MAINTAIN THE THICKNESS OF EPOXY OR PLASTIC COATINGS OF AT LEAST 5 MILS WITH NO MAXIMUM.
   G. USE PATCHING MATERIAL PER THE MANUFACTURER'S RECOMMENDATION TO REPAIR DAMAGED COATING.
   - USE PATCHING MATERIAL THE IS COMPATIBLE WITH THE COATING, AND THAT IS INERT IN CONCRETE.
   - HANGER MARKS ON THE COATED BAR SUPPORTS THAT RESULT FROM THE COATING APPLICATION PROCESS ARE ACCEPTABLE AND ARE NOT CONSIDERED DAMAGED COATING.

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AS-BUILT



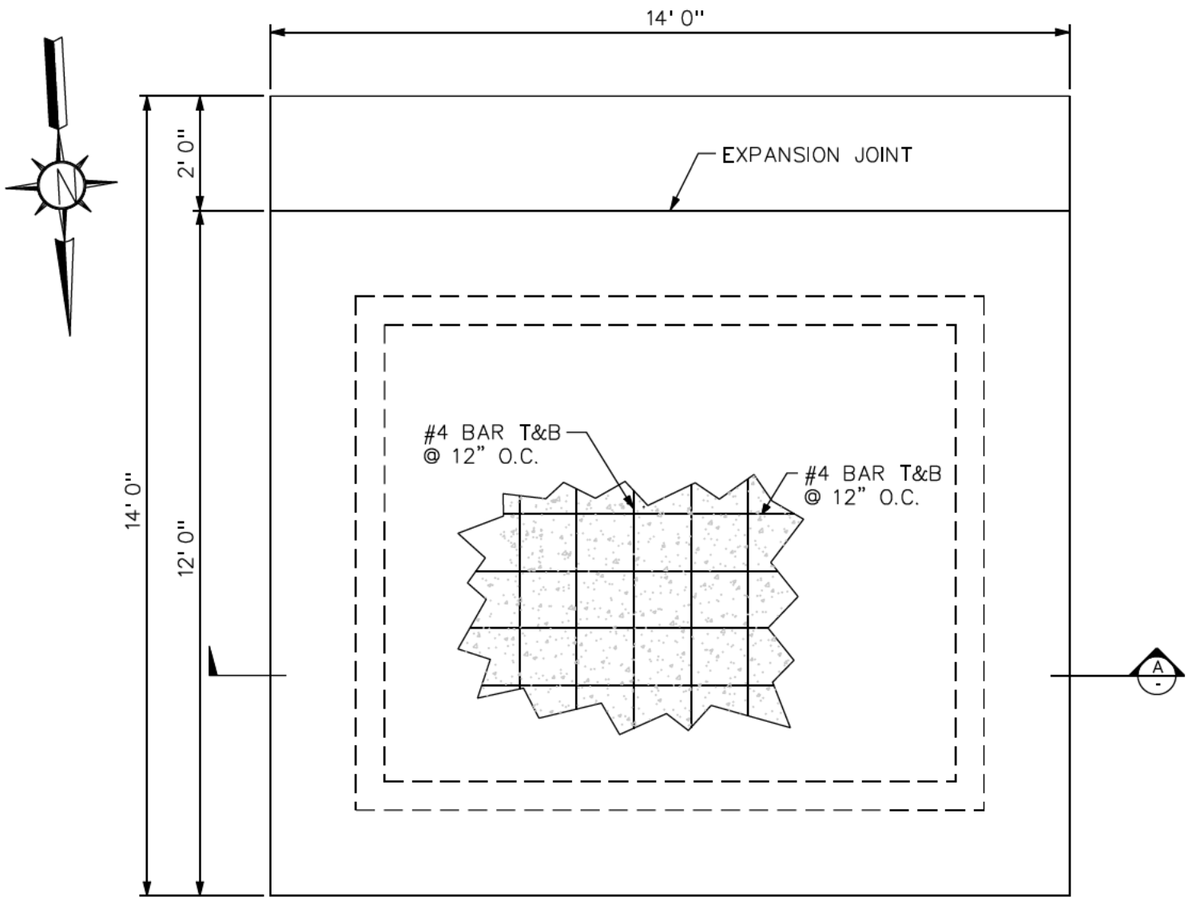

NOTES:

1. SEE KO-MAL-164-C5-YA-1 FOR TYPICAL FENCE AND GATE DETAILS.
2. SEE DRAWING KO-MAL-164-B5-YA-1 FOR FENCE AND FOUNDATION INFORMATION.

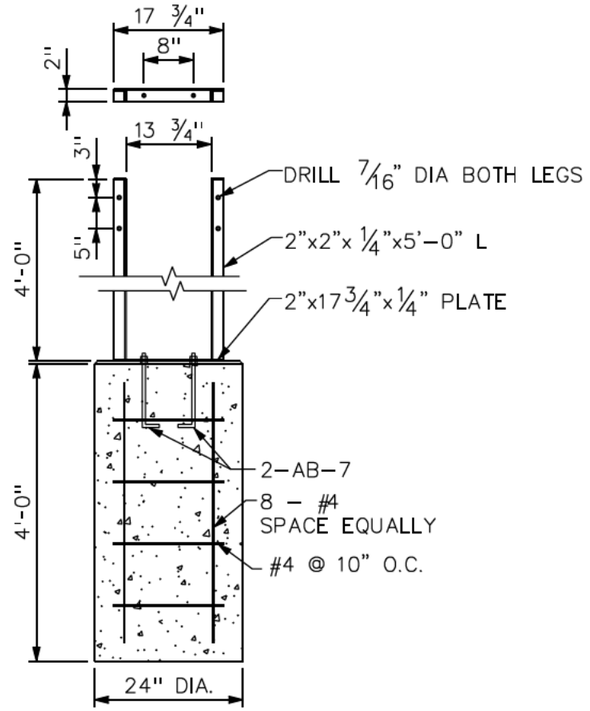
# GRADING PLAN

AS-BUILT

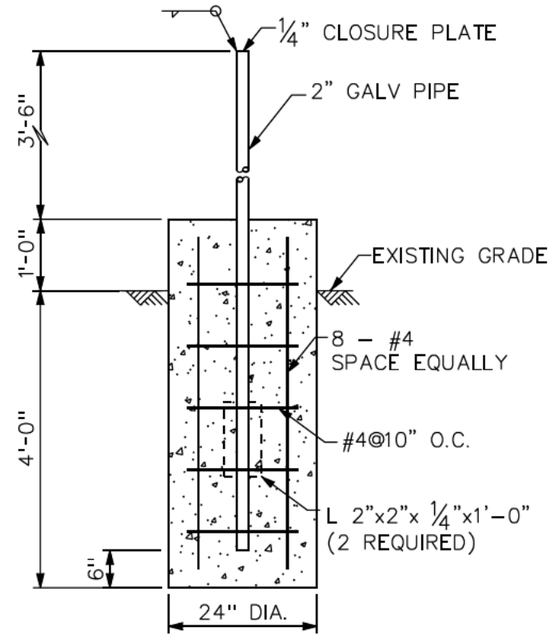
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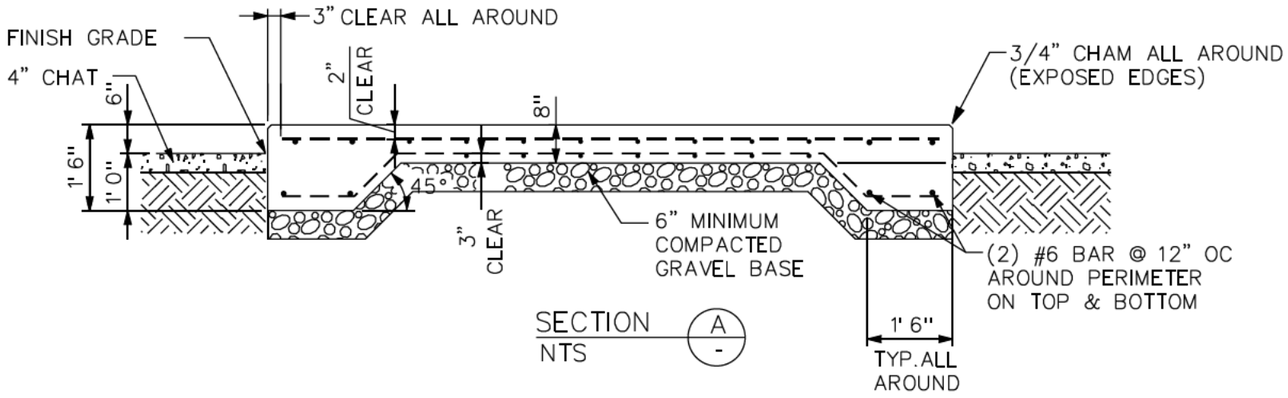

DAC BUILDING FOUNDATION PLAN VIEW



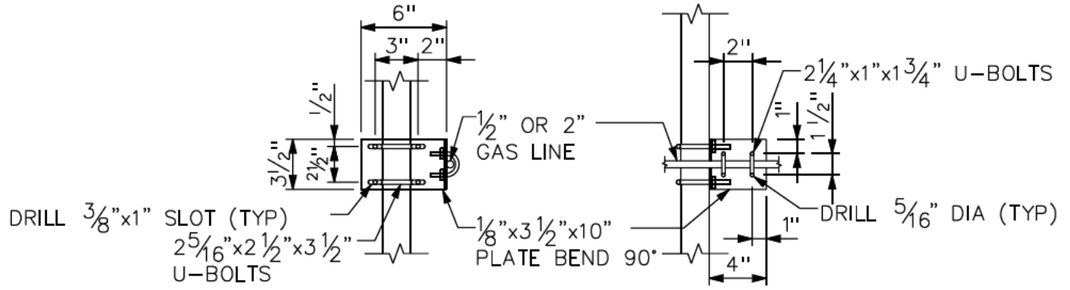

HEATER FOUNDATION DETAIL (1) NTS KO-MAL-164-B5-YA-1




FD-2 FILTER FOUNDATION DETAIL (2) NTS KO-MAL-164-B5-YA-1




SECTION (A) NTS




PIPE SUPPORT FOR GAS PIPE

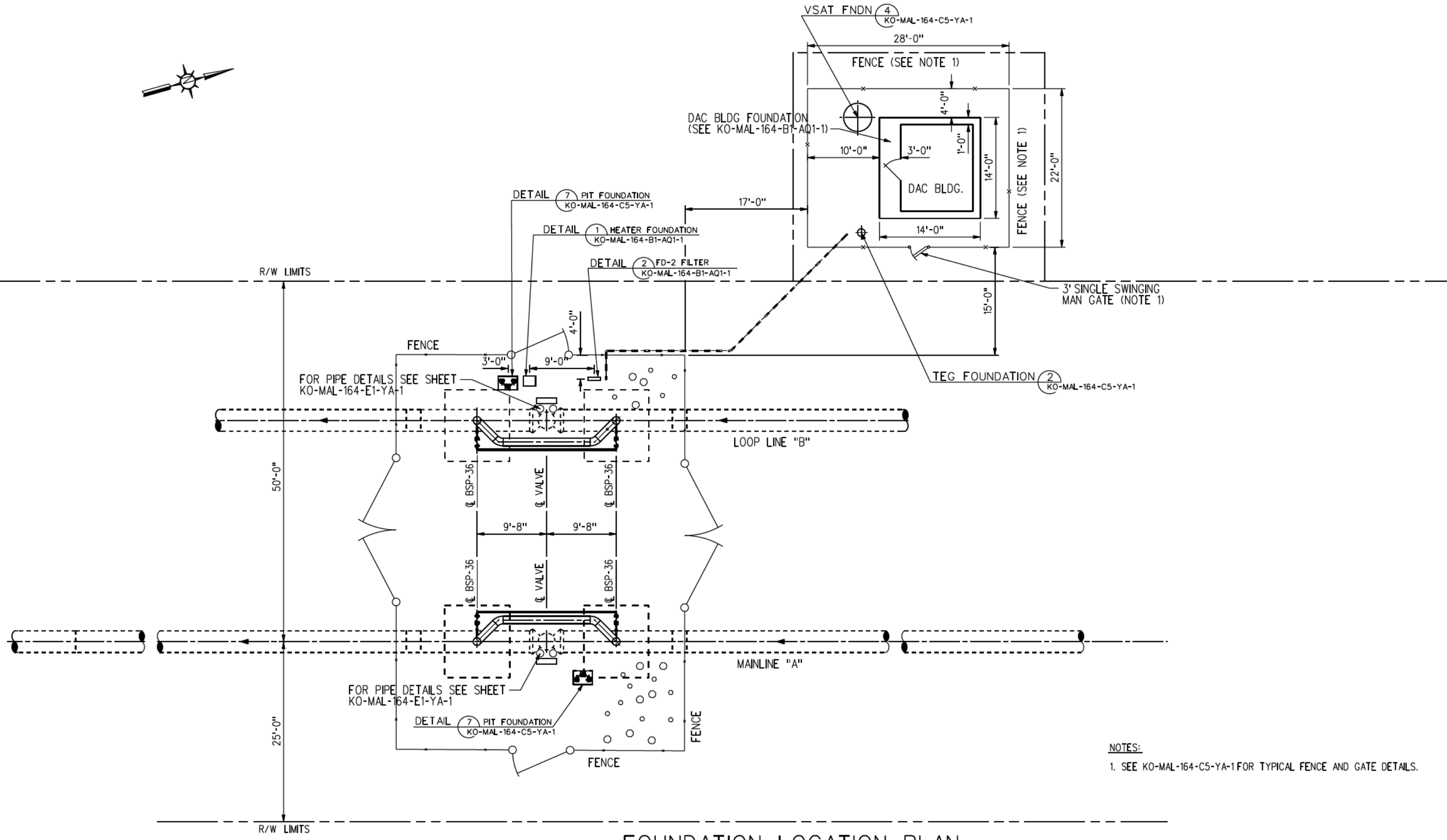
(1/2" PIPE-2 REQUIRED)
(2" PIPE-1 REQUIRED)

NOTES:

1. ANCHOR DAC W/ 5/8" DIA HAS-E x 6" EMBED W/HILTI RE500 EPOXY @ 48" O.C.
2. ALL REBAR SHALL BE EPOXY COATED REBAR.

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AS-BUILT




NOTES:

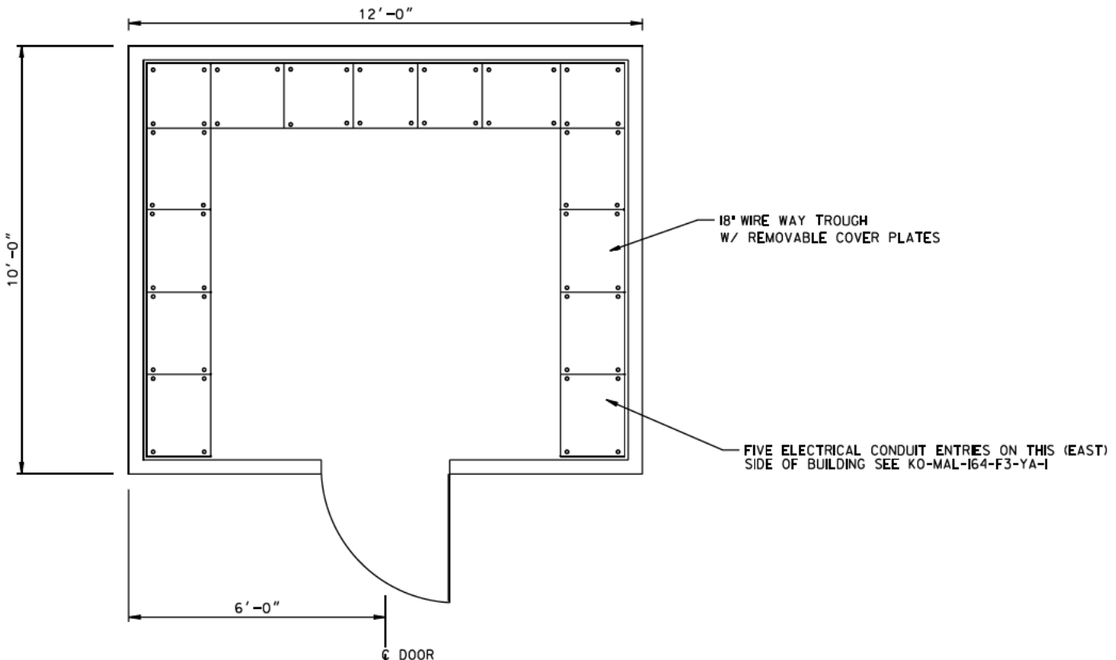
1. SEE KO-MAL-164-C5-YA-1 FOR TYPICAL FENCE AND GATE DETAILS.

# FOUNDATION LOCATION PLAN

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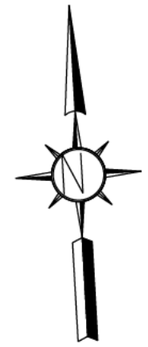
NOTE: DRAWING KO-MAL-164-B5-YA-1 SUPERSEDES KO-1-SP03-11C

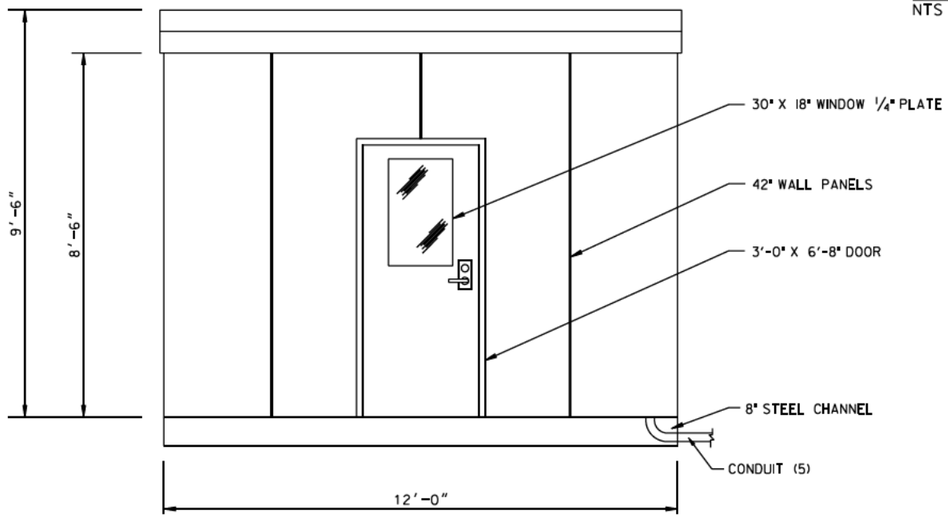
AS-BUILT




DAC BUILDING

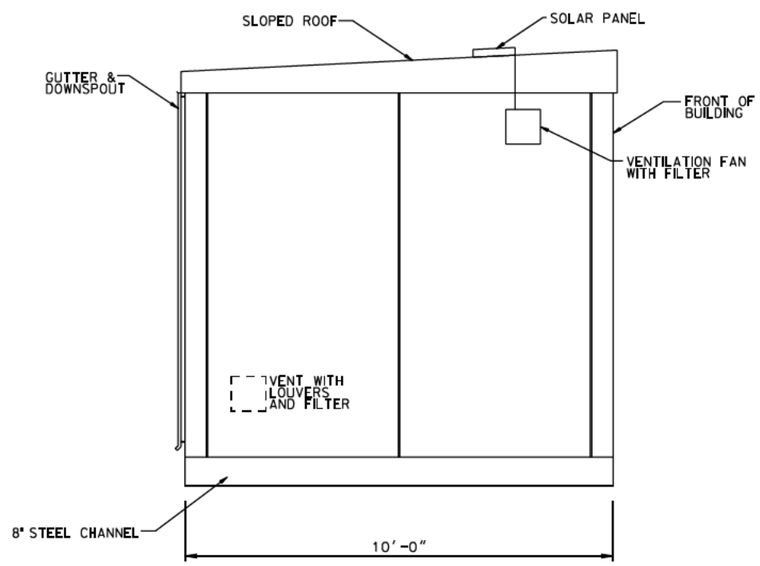
FLOOR PLAN
NTS






DAC BUILDING

FRONT VIEW
NTS




DAC BUILDING

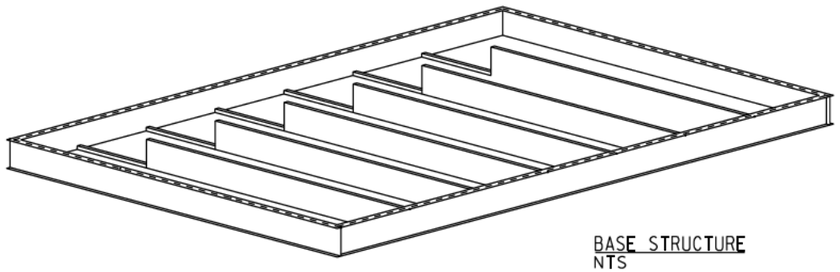
LEFT SIDE VIEW
NTS

NOTE:

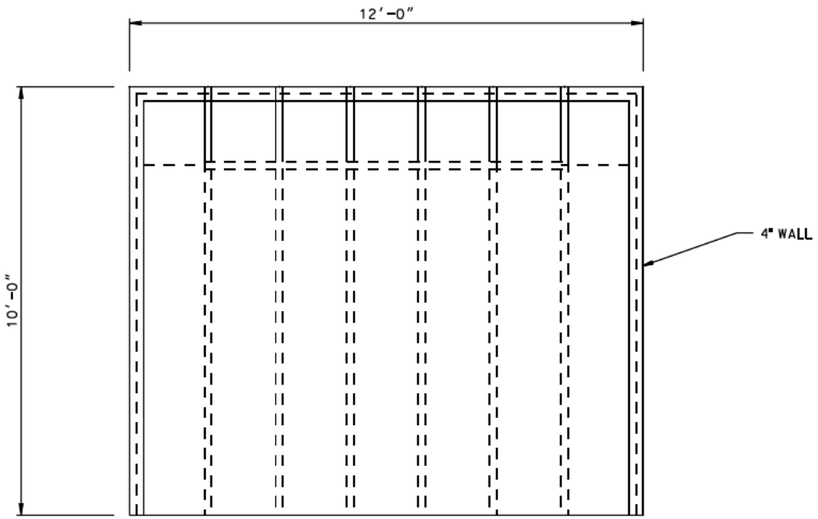
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AS-BUILT

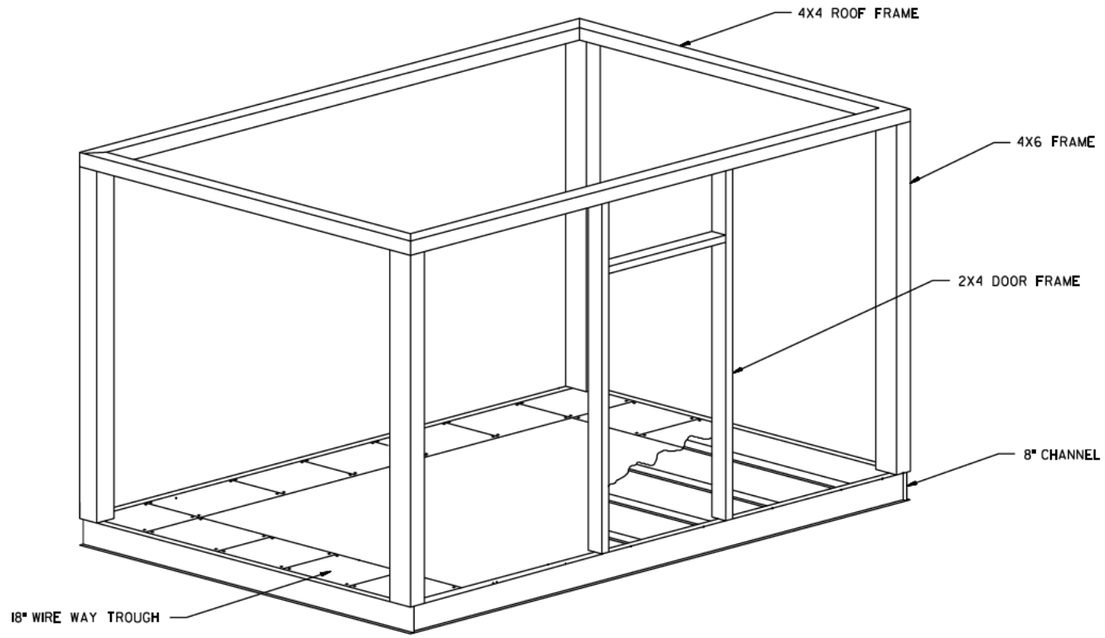
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BASE STRUCTURE
NTS




FLOOR PLAN
NTS



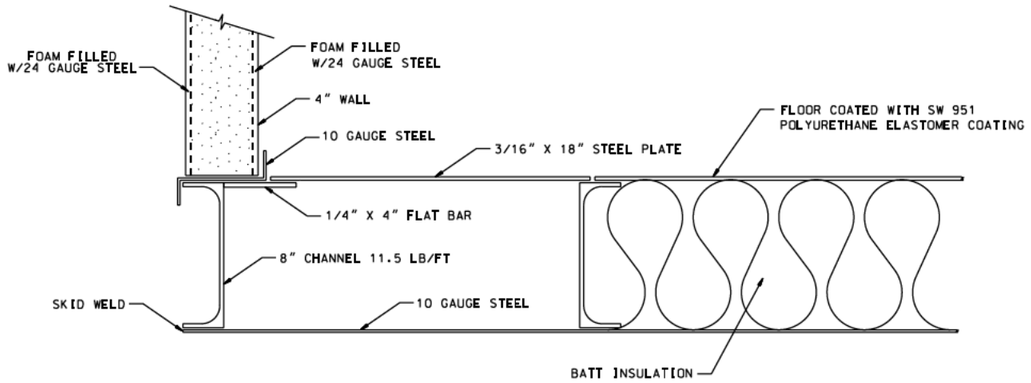

SQUARE TUBE FRAME ALL WELDED
NTS

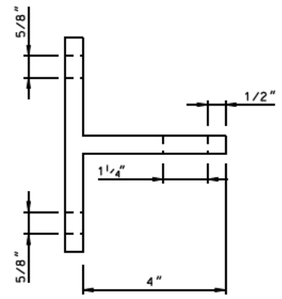
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ALL MATERIAL IS PROVIDED BY THE BUILDING CONTRACTOR UNLESS OTHERWISE NOTED.

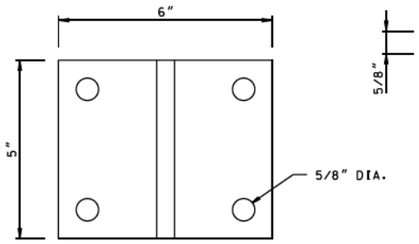
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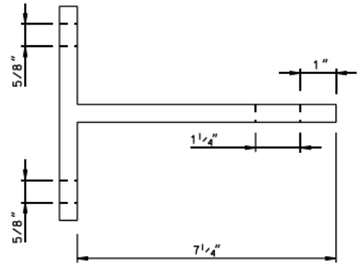
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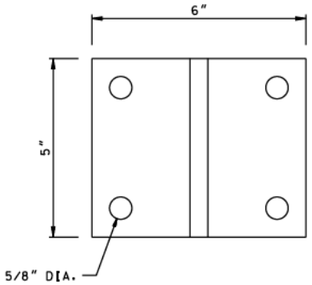


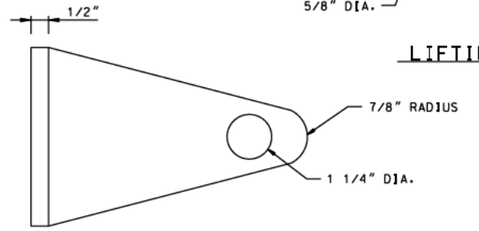

TRANSPORT BRACKET

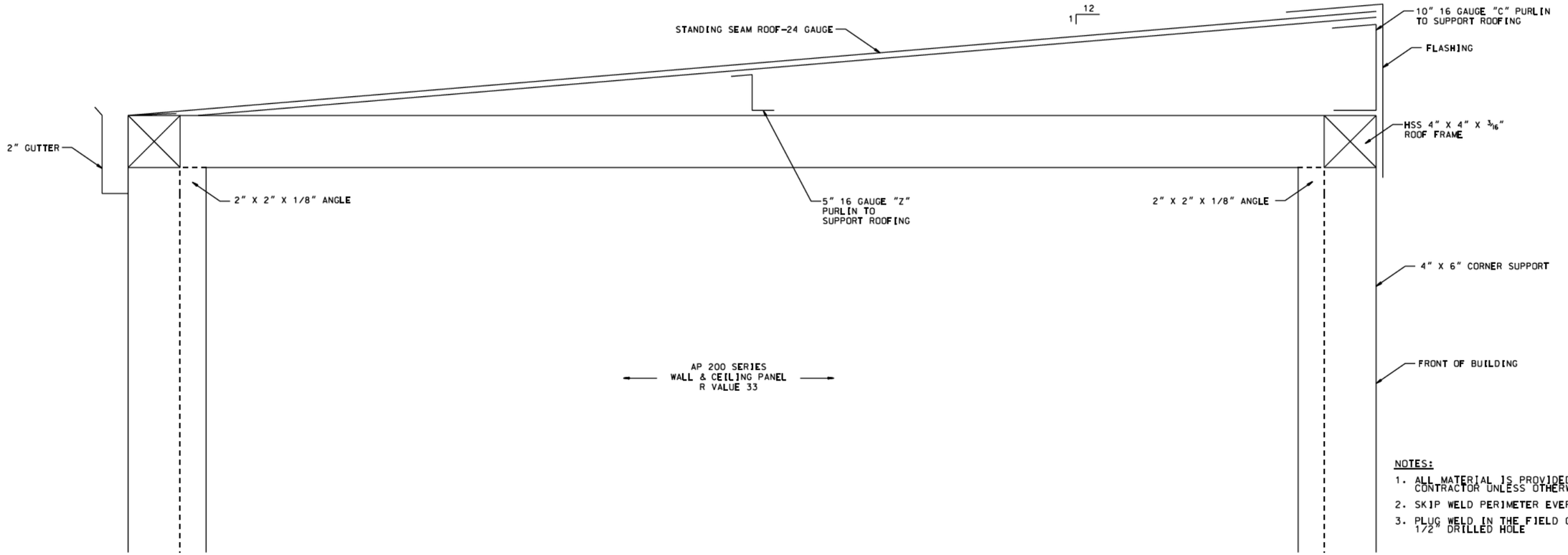



LIFTING BRACKET



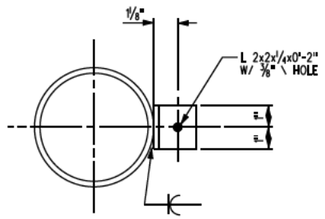




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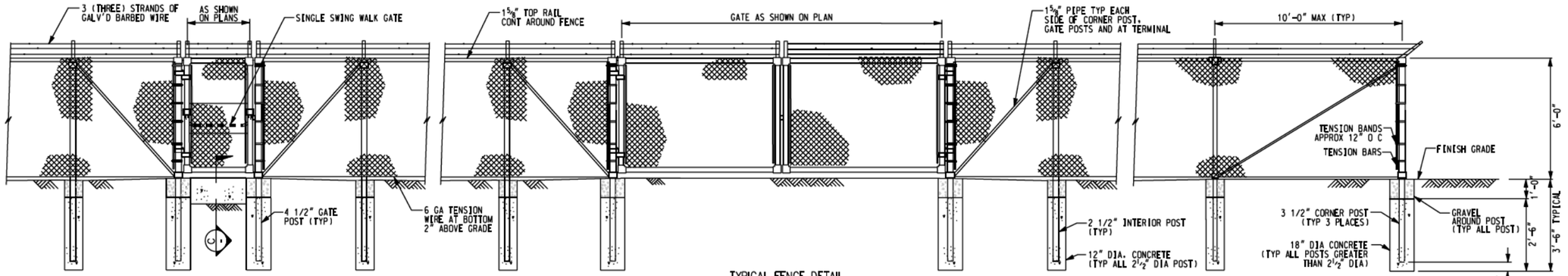
1. ALL MATERIAL IS PROVIDED BY THE BUILDING CONTRACTOR UNLESS OTHERWISE NOTED.
2. SKIP WELD PERIMETER EVERY 6" WITH 1/2" WELD
3. PLUG WELD IN THE FIELD ON 18" CENTERS WITH 1/2" DRILLED HOLE

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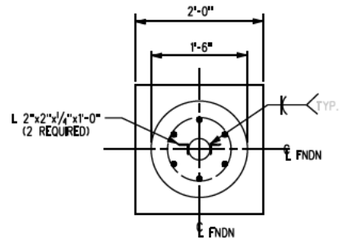



GROUND LUG DETAIL 3

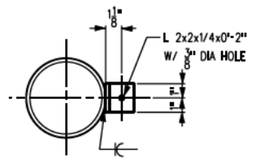



TYPICAL MAN-GATE DETAIL

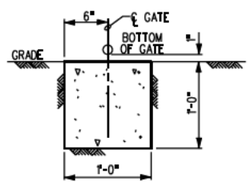
TYPICAL FENCE DETAIL



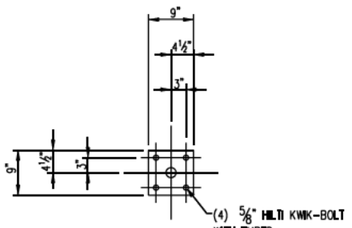

SECTION A



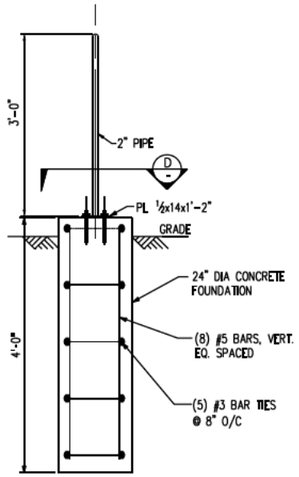

DETAIL 5




SECTION C

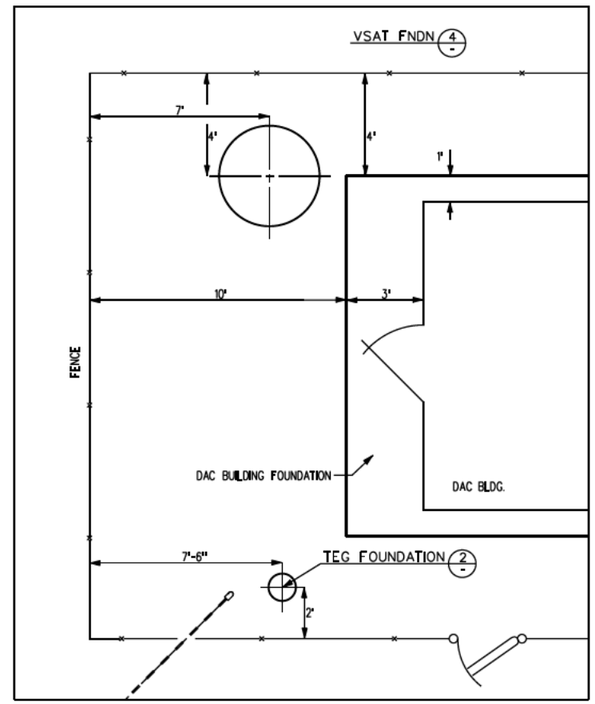



SECTION D



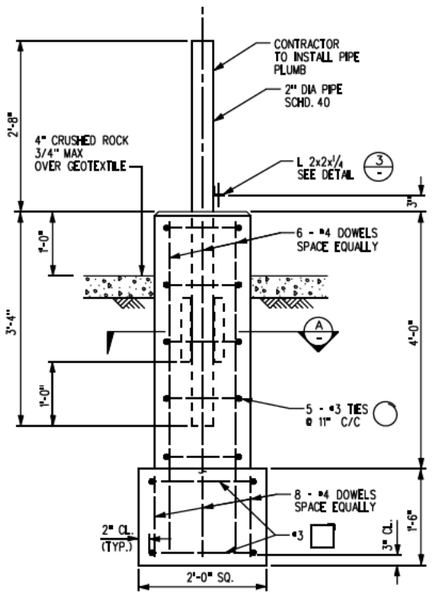

PIT FOUNDATION

DETAIL 7 KO-MAL-164-B5-YA-1



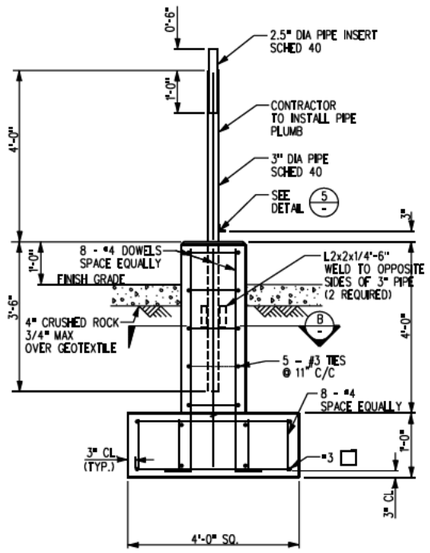

DIMENSIONS

DETAIL 1 KO-MAL-164-B5-YA-1



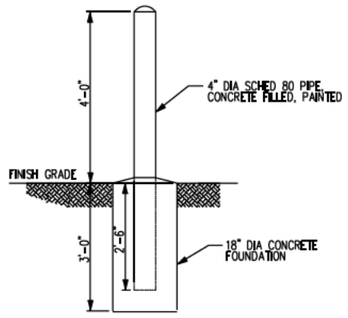

TEG FOUNDATION

DETAIL 2 NTS



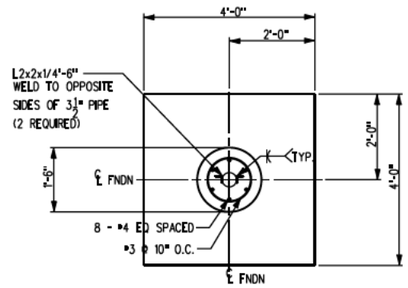

VSAT FOUNDATION

DETAIL 4 NTS




4" DIA. GUARD POST

DETAIL 6 NTS




SECTION B

NOTES

1. ALL PIPE SHOULD CONFORM WITH ASTM A53.
2. ALL REBAR SHALL BE EPOXY COATED REBAR.

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