GENERAL INSTRUMENT OR FUNCTION SYMBOLS

	PRIMARY LOCATION (b)NORMALLY ACCESSIBLE TO OPERATOR	FIELD MOUNT	AUXILIARY LOCATION (b)NORMALLY ACCESSIBLE TO OPERATOR
DISCRETE INSTRUMENTS	XXX(a)		
SHARED DISPLAY, SHARED CONTROL			
COMPUTER FUNCTION			
PROGRAMMABLE LOGIC CONTROL			

(a) DESIGNATIONS SUCH AS 100 (LOCAL CONTROL BOARD NO. 100), 200 (LOCAL CONTROL BOARD NO.200), ETC., ARE USED WHEN NECESSARY TO SPECIFY INSTRUMENT OR FUNCTION LOCATION.

(b) NORMALLY INACCESSIBLE OR BEHIND-THE-PANEL DEVICES OR FUNCTIONS ARE DEPICTED BY USING THE SAME SYMBOLS BUT WITH DASHED HORIZONTAL BARS, I.E.

SINGLE INSTRUMENT OR OTHER COMPONENT HAVING MULTIPLE FUNCTIONS

(XXX) SOFTWARE OR LOGIC RESIDENT IN DISTRIBUTED CONTROL SYSTEM (DCS) AT PROGRAMMABLE LOGIC CONTROLLER (PLC) XXX. SEE ASSOCIATED LOGIC DIAGRAMS.

(XXX) DESIGNATIONS OF CONTROL FUNCTIONS ASSOCIATED INSTRUMENT OR OTHER COMPONENTS.

AHC – AUTO/HOLD/CLOSE
AM – AUTO/MANUAL
DEV – DEVIATION
HOA – HAND/OFF/AUTO
HOR – HAND/OFF/REMOTE
LOS – LOCKOUT STOP
LR – LOCAL/REMOTE
MOA – MANUAL/OFF/AUTO
OO – ON/OFF
FS – FAST/SLOW
OCA – OPEN/CLOSE/AUTO
OSC – OPEN/STOP/CLOSED
POT – POTENTIOMETER
RL – RAISE/LOWER
RSL – RAISE/STOP/LOWER
SD – SHUTDOWN
SEL – SELECT
SP – SET POINT
SR – START/RESET
SS – STOP/START

FY * INSTRUMENT PANEL MOUNTED WITH COMPUTING OR CONVERTING FUNCTION

CONVERT */*
E – VOLTAGE
I – CURRENT
P – PNEUMATIC
A – ANALOG
B – BINARY
H – HYDRAULIC
O – ELECTROMAGNETIC, SONIC
R – RESISTANCE (ELECT.)
D – DIGITAL

COMPUTE *

SUMMING	Σ	AVERAGING	Σ/n
SUBTRACTOR	—	RATIO	1:1
MUTIPLYING	X	DIFFERENCE	Δ
DIVIDING	÷	HIGH SELECTING	>
ROOT EXTRACTION	√	LOW SELECTING	<
PROPORTIONAL	P	INTEGRAL	I
DERIVITIVE	R		

(XXX) PANEL MOUNTED PILOT LIGHT WITH PANEL NUMBER DESIGNATION(i.e. XXX = 100, 200, ETC.).

IDENTIFICATION LETTERS

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

INSTRUMENT LINE SYMBOLS

- INSTRUMENT OR CONNECTION TO PROCESS (1)
- PNEUMATIC SYMBOL (2)
- ELECTRIC SYMBOL
- HYDRAULIC SYMBOL
- CAPILLARY TUBE
- ELECTROMAGNETIC OR SONIC SIGNAL (3) (GUIDED)
- ELECTROMAGNETIC OR SONIC SIGNAL (3) (NOT GUIDED)
- INTERNAL SYSTEM LINK (SOFTWARE OR DATA LINK)
- MECHANICAL LINK
- PNEUMATIC BINARY SIGNAL
- ELECTRIC BINARY SIGNAL - OR

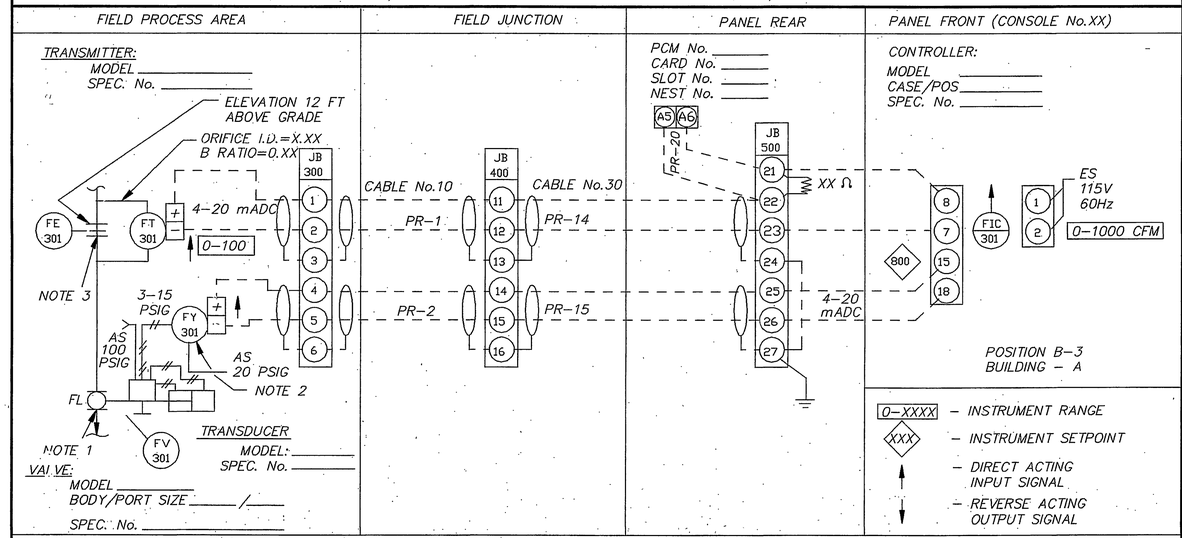
(1) THE FOLLOWING ABBREVIATIONS ARE USED TO DENOTE THE TYPES OF POWER SUPPLIES. THEY MAY ALSO BE USED TO DENOTE PURGE FLUID SUPPLIES.

AS – AIR SUPPLY
IA – INSTRUMENT AIR
PA – PLANT AIR
ES – ELECTRIC SUPPLY
GS – GAS SUPPLY
HS – HYDRAULIC SUPPLY
NS – NITROGEN SUPPLY
SS – STEAM SUPPLY
WS – WATER SUPPLY

(2) THE PNEUMATIC SIGNAL SYMBOLS APPLIES TO A SIGNAL, NOT A SUPPLY SOURCE, USING ANY GAS AS A MEDIUM. IF A GAS OTHER THAN AIR IS USED, THE GAS IS IDENTIFIED BY A NOTE ON THE SIGNAL.

(3) ELECTROMAGNETIC PHENOMENA INCLUDE HEAT, RADIO WAVES, NUCLEAR RADIATION, AND LIGHT.

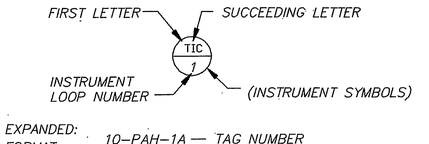
SAMPLE LOOP DIAGRAM ISA EXPANDED FORMAT



NOTES:
1. FV-301 FULLY OPEN AT 3 PSIG AND FULLY CLOSED AT 15 PSIG.
2. STAND MOUNT PER INSTRUMENT STANDARD XXXX NEAR, BUT NOT ON THE CONTROL VALVE.
3. FE-301 REQUIRES 10 PIPE DIAMETERS UPSTREAM AND 5 PIPE DIAMETERS DOWNSTREAM OF STRAIGHT PIPE.

TAG NUMBERS

TYPICAL FORMAT: TIC-1
- TIC – FUNCTIONAL IDENTIFICATION
- T – FIRST-LETTER
- IC – SUCCEEDING-LETTER(S)
- 1 – LOOP NUMBER



EXPANDED FORMAT: 10-PAH-1A
- 10 – OPTIONAL PREFIX
- PAH – TAG NUMBER
- A – OPTIONAL SUFFIX

MISC.

XXX XXX = DIGITAL OUTPUT
XXX XXX = ANALOG OUTPUT
XXX XXX = DIGITAL INPUT
XXX XXX = ANALOG INPUT

REGISTERED PROFESSIONAL ENGINEER — HASDA JITPATIMA — No. 14326 Exp. 9/30/97 — ELECTRICAL — STATE OF CALIFORNIA

JOB NO. S-1636

REV	DATE	BY	DESCRIPTION

SCALE: NONE

WARNING 0 1/2 1 — IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

DESIGNED K.JITPATIMA
DRAWN K.JITPATIMA
CHECKED

SUBMITTED Padja Namudiri — PROJECT ENGINEER — C-49471 — R. C. E. NO. — 5-23-94 — DATE
RECOMMENDED Surendra Thakral — MONTGOMERY WATSON — 44599 — R. C. E. NO. — 5-23-94 — DATE

MONTGOMERY WATSON
Pasadena, California

APPROVED ____ DATE ____
APPROVED ____ DATE ____

CITY OF RIVERSIDE
PIERCE STREET PUMP STATION UPGRADE
INSTRUMENTATION SYMBOLS AND ABBREVIATIONS P&ID AND LOOP SYMBOLS (1)

SHEET 1-1 OF 44 SHEETS

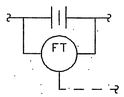
INDEXED 1-31-05 LFH

Job No. 193.0454 File No. J:\PRJ\RIVERPS\INS\RW01D 5/23/1994

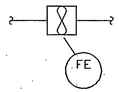
SYMBOL

FUNCTION	DEFINITION
STATEMENT OF INPUT ALTERNATIVELY: STATEMENT OF INPUT INITIATING INSTRUMENT OR DEVICE NUMBER, IF KNOWN.	AN INPUT TO THE LOGIC SEQUENCE.
STATEMENT OF OUTPUT ALTERNATIVELY: STATEMENT OF OUTPUT OPERATED INSTRUMENT OR DEVICE NUMBER, IF KNOWN.	AN OUTPUT FROM THE LOGIC SEQUENCE.
A, B, C — A — D	AND GATE: LOGIC OUTPUT "D" EXISTS IF AND ONLY IF ALL LOGIC INPUTS "A", "B" AND "C" EXIST.
A, B, C — OR — D	OR GATE: LOGIC OUTPUT "D" EXISTS IF AND ONLY IF ONE OR MORE LOGIC INPUTS "A", "B" AND "C" EXIST.
A — DI t — B	DELAY INITIATION OF OUTPUT: THE CONTINUOUS EXISTENCE OF LOGIC INPUT "A" FOR TIME "t" CAUSES LOGIC OUTPUT "B" TO EXIST. WHEN "t" EXPIRES "B" TERMINATES WHEN "A" TERMINATES.
A — DT t — B	DELAY TERMINATION OF OUTPUT: THE EXISTENCE OF LOGIC INPUT "A" CAUSES LOGIC OUTPUT "B" TO EXIST IMMEDIATELY. "B" TERMINATES WHEN "A" HAS TERMINATED AND HAS NOT AGAIN EXISTED FOR TIME "t".
A — PD t — B	PULSE OUTPUT: THE EXISTENCE OF LOGIC INPUT "A", REGARDLESS OF ITS SUBSEQUENT STATE, CAUSES LOGIC OUTPUT "B" TO EXIST IMMEDIATELY. "B" EXISTS FOR TIME "t" AND THEN TERMINATES.
A, B, C — * — D *INTERNAL DETAILS REPRESENT NUMERICAL QUANTITIES	QUALIFIED OR GATE: LOGIC OUTPUT "D" EXISTS IF AND ONLY IF A SPECIFIC NUMBER OF LOGIC INPUTS "A", "B", AND "C" EXISTS.
A — B THE NOT SYMBOL MAY BE DRAWN TANGENT TO AN ADJACENT LOGIC SYMBOL.	NOT GATE: LOGIC "B" EXISTS IF AND ONLY IF LOGIC INPUT "A" DOES NOT EXIST.
A — S — C B — R — D * *OUTPUT D SHALL NOT BE SHOWN IF IT IS NOT USED.	FLIP-FLOP (LATCH): LOGIC OUTPUT "C" EXISTS AS SOON AS LOGIC INPUT "A" EXISTS. "C" CONTINUES TO EXIST REGARDLESS OF THE SUBSEQUENT STATE OF "A" UNTIL RESET BY THE EXISTENCE OF LOGIC INPUT "B". LOGIC OUTPUT "D", IF USED, EXISTS WHEN "C" DOES NOT EXIST. "D" DOES NOT EXIST WHEN "C" EXISTS.
A — MS — C B — R — D	MAINTAINED FLIP-FLOP: SIMILAR TO DEFINITION OF FLIP-FLOP EXCEPT THAT THE MEMORY SHALL BE MAINTAINED IN THE EVENT OF LOGIC POWER LOSS.

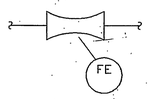
FLOW



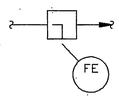
ORIFICE PLATE WITH VENA CONTRACTA, RADIUS, OR PIPE TAPS CONNECTED TO DIFFERENTIAL-PRESSURE-TYPE FLOW TRANSMITTER



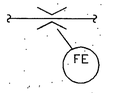
TURBINE-OR PROPELLER TYPE PRIMARY ELEMENT



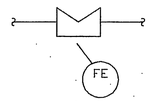
VENTURI TUBE



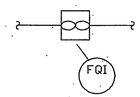
SINGLE PORT PITOT TUBE OR PITOT-VENTURI TUBE



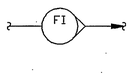
FLUME



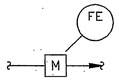
WEIR



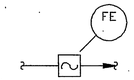
POSITIVE-DISPLACEMENT-TYPE FLOW TOTALIZING INDICATOR



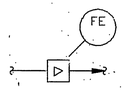
VARIABLE AREA FLOW INDICATOR (ROTAMETER)



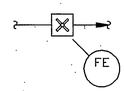
MAGNETIC FLOWMETER



SONIC FLOWMETER "DOPPLER" OR "TRANSIT TIME" MAY BE ADDED

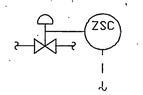


VORTEX SENSOR

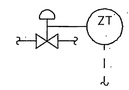


PADDLE WHEEL

POSITION

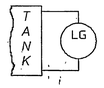


LIMIT SWITCH THAT IS ACTUATED WHEN VALVE IS CLOSED TO A PRE-DETERMINED POSITION

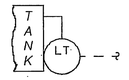


POSITION TRANSMITTER

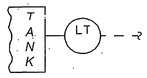
LEVEL



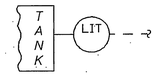
GAGE GLASS, EXTERNALLY CONNECTED



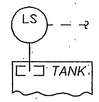
LEVEL TRANSMITTER, DIFFERENTIAL-PRESSURE TYPE, MOUNTED ON TANK



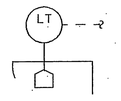
LEVEL TRANSMITTER WITH ONE CONNECTION



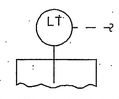
LEVEL TRANSMITTER WITH INTEGRAL INDICATION



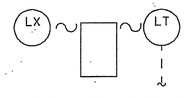
LEVEL SWITCH, PADDLE WHEEL OR LEVER TYPE, TO MEASURE LEVEL OF SOLIDS



LEVEL TRANSMITTER FLOAT TYPE

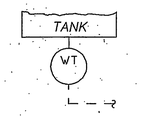


CAPACITANCE OR DIELECTRIC TYPE LEVEL ELEMENT CONNECTED TO LEVEL TRANSMITTER (TAG LEVEL ELEMENT LE)

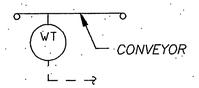


RADIOACTIVE OR SONIC TYPE LEVEL TRANSMITTER WITH INTEGRAL SENSOR

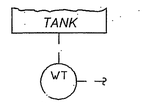
WEIGHT



WEIGHT TRANSMITTER, DIRECT-CONNECTED

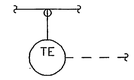


WEIGH-BELT SCALE TRANSMITTER

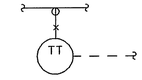


STRAIN GAGE CONNECTED TO SEPARATE WEIGHT TRANSMITTER (TAG STRAIN GAGE WE)

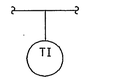
TEMPERATURE



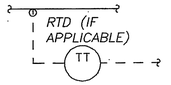
TEMPERATURE ELEMENT WITH WELL (ELEMENT NOT CONNECTED TO SECONDARY INSTRUMENT)



FILLED-SYSTEM-TYPE TEMPERATURE TRANSMITTER WITH WELL

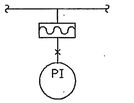


BIMETALLIC-TYPE THERMOMETER, GLASS THERMOMETER, OR OTHER LOCAL UNCLASSIFIED TEMPERATURE INDICATOR

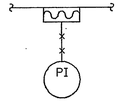


THERMOCOULPE, RESISTANCE BULB (RTD) OR THERMISTOR (TH) CONNECTED TO TEMPERATURE TRANSMITTER

PRESSURE OR VACUUM

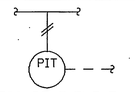


WITH PRESSURE LEAD LINE

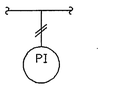


LINE – MOUNTED

PRESSURE INDICATOR CONNECTED TO DIAPHRAGM SEAL WITH FILLED SYSTEM

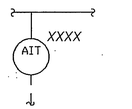


PRESSURE ELEMENT STRAIN-GAGE TYPE, CONNECTED TO PRESSURE INDICATING TRANSMITTER



PRESSURE INDICATOR, DIRECT – CONNECTED

ANALYTICAL



ANALYSIS INDICATING TRANSMITTER

XXXX =
- ALK – ALKALINITY
- CL2 – CHLORINE CONCENTRATION
- COMB – COMBUSTABLE GAS
- CON – CONDUCTIVITY
- DO – DISSOLVED OXYGEN
- H_2S – HYDROGEN SULFIDE
- LEL – LOWER EXPLOSIVE LIMIT
- O_2 – OXYGEN CONCENTRATION
- O_3 – OZONE
- ORP – OXIDATION/REDUCTION POTENTIAL
- PH – HYDROGEN ION CONCENTRATION
- SO_2 – SULFUR DIOXIDE
- TH – TOTAL HARDNESS
- TURB – TURBIDITY
- UV – ULTRA VIOLET

REGISTERED PROFESSIONAL ENGINEER — KEITH A. JITPATIMA — No. 14326 Exp. 9/30/97 — ELECTRICAL — STATE OF CALIFORNIA

JOB NO. S-1636

REV	DATE	BY	DESCRIPTION

SCALE: NONE

WARNING: 0 1/2 1 — IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

DESIGNED K.JITPATIMA
DRAWN K.JITPATIMA
CHECKED K. Jitpatima

SUBMITTED Parshotam Kundra — PROJECT ENGINEER — C-49471 R. C. E. NO. — 5-23-94 DATE
RECOMMENDED Surendra Thakral — MONTGOMERY WATSON — 44599 R. C. E. NO. — 5-23-94 DATE

MONTGOMERY WATSON
Pasadena, California

APPROVED _____ DATE _____
APPROVED _____ DATE _____

CITY OF RIVERSIDE
PIERCE STREET PUMP STATION UPGRADE
INSTRUMENTATION SYMBOLS AND ABBREVIATIONS P&ID AND LOOP SYMBOLS (2)

SHEET 1-2 OF 44 SHEETS

INDEXED 1-31-05 LH

Job No. 193.0454 File No. J:\PRJ\RIVERPS\INS\RIV102D 5/23/1994

VALVE SYMBOLS


BUTTERFLY


GLOBE


ROTARY VALVE

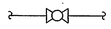

ANGLE

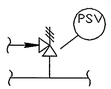

SWING CHECK VALVE

BALL CHECK VALVE

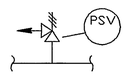

GATE VALVE


PLUG VALVE

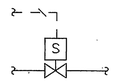

BALL VALVE



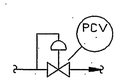
VACUUM RELIEF VALVE



PRESSURE RELIEF OR SAFETY VALVE

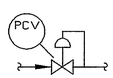


SOLENOID VALVE

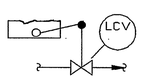


BACKPRESSURE REGULATOR

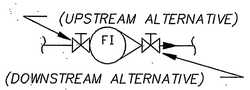

BACKFLOW PREVENTOR



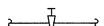
PRESSURE-REDUCING REGULATOR



LEVEL CONTROL VALVE WITH MECHANICAL LINKAGE



INDICATING VARIABLE AREA METER WITH INTEGRAL MANUAL THROTTLE VALVE


NEEDLE VALVE


DIAPHRAM OR PINCH VALVE

VALVE ACTUATORS

SOLENOID

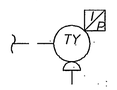

PREFERED FOR DIAPHRAGM ASSEMBLED WITH PILOT. ONE INPUT SHOWN (TYPICALLY WITH ELECTRIC INPUT)


DIAPHRAGM PRESSURE-BALANCED


ELECTROHYDRAULIC

DIGITAL

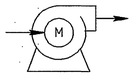
ROTARY MOTOR (SHOWN TYPICALLY WITH ELECTRIC SIGNAL. MAY BE HYDRAULIC OR PNEUMATIC)



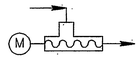
VALVE ACTUATOR WITH ATTACHED ELECTRO-PNEUMATIC CONVERTER


WITH OR WITHOUT POSITIONER OR OTHER PILOT

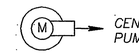
PUMP AND COMPRESSOR SYMBOLS



CENTRIFUGAL PUMP

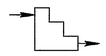


PROGRESSIVE CAVITY PUMP

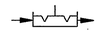


CENTRIFUGAL WET PIT PUMP OR TURBINE PUMP

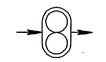
SUBMERSIBLE SUMP PUMP OR SAMPLE PUMP

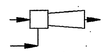

CHEMICAL FEED PUMP

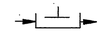

COMPRESSOR (CENTRIFUGAL), OR TURBINE MOTOR

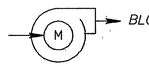

DIAPHRAGM PUMP


COMPRESSOR (PISTON)

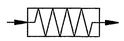

GEAR PUMP OR BLOWER (POSITIVE DISPLACMENT)


EJECTOR

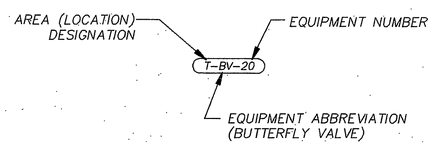

PISTON PUMP



BLOWER(CENTRIFUGAL)


SCREW PUMP

MECHANICAL EQUIPMENT CALLOUT



MISCELLANEOUS SYMBOLS

DIAPHRAGM SEAL

ANNULAR DIAPHRAGM SEAL

BLIND FLANGE

MIXER

AIR GAP

ELECTRIC MOTOR

VENT TO ATMOSPHERE

RADIO ANTENNA

DRAIN

PIPE MATERIAL CHANGE

HORN

SAMPLE TAP

FILTER

RUPTURE DISK

EXPANSION TANK

FLOW STREAM IDENTIFICATION

LEGEND	SERVICE	LEGEND	SERVICE
A	AERATION	NG	NATURAL GAS
AA	AQUEOUS AMMONIA	OF	OVERFLOW
AC	ACTIVATED CARBON	OG	OFF-GAS
AW	FILTER AIR WASH	OTE	OXIDATION TOWER EFFLUENT
BD	BOTTOM DRAIN	OW	OZONATED WATER
BP	BYPASS	OX	OXYGEN
BW	FILTER BACKWASH	OZ	OZONE
C	CONDENSATE	PA	PLANT AIR
CAW	CHANNEL AGITATION WATER	PD	PLANT DRAIN
CD	CHEMICAL DRAIN AND VENT	PEA	POLYMER - ANIONIC
CHE	CHLORINATED EFFLUENT	PEC	POLYMER - CATIONIC
CL	CHLORINE (GAS OR LIQUID STATE)	PEF	PRIMARY EFFLUENT
CLS	CHLORINE SOLUTION	PEN	POLYMER - NONIONIC
CLV	CHLORINE GAS UNDER VACUUM	PI	PLANT INFLUENT
CN	CENTRATE	PO	PLANT OVERFLOW
CS	CAUSTIC SODA	PW	POTABLE WATER
CSL	CONDITIONED SLUDGE	RAS	RETURN ACTIVATED SLUDGE
CV	CHLORINATOR VENT & DETECTION LINE	RC	RECYCLE COOLANT
DCS	DEFOAMING CHEMICAL SOLUTION	REW	RECLAIMED WATER
DN	DECANT	RSL	RAW SLUDGE
DSL	DIGESTED SLUDGE	RW	RAW WATER
ET	ELECTROLYTE	RWL	RAINWATER LEADER
EW	ELUTRIATION WATER	S	SCUM
EWR	ENGINE COOLING WATER RETURN	SA	SAMPLE LINE
EWS	ENGINE COOLING WATER SUPPLY	SC	SPARE CHEMICAL
F	FROTH	SCS	SCRUBBER CHEMICAL SUPPLY
FA	FOUL AIR	SD	SANITARY DRAIN & VENT
FE	FINAL EFFLUENT	SDR	STORM DRAIN
FLW	FLOCCULATED WATER	SE	SECONDARY EFFLUENT
FM	FORCE MAIN	SF	SLUDGE FILTRATE
FOR	FUEL OIL RETURN	SI	SODIUM SILICATE
FOS	FUEL OIL SUPPLY	SN	SUPERNATANT
FS	FROTH SPRAY	SO	SULFUR DIOXIDE (GAS OR LIQUID STATE)
FSP	FIRE PROTECTION SPRINKLER SYSTEM	SOA	SULFURIC ACID
FSW	FILTER SURFACE WASHWATER	SOS	SULFUR DIOXIDE SOLUTION
FTW	FILTER TO WASTE	SOV	SULFUR DIOXIDE GAS UNDER VACUUM
FW	FILTERED WATER	SPD	SUMP PUMP DISCHARGE
G	GRIT	SS	SANITARY SEWER
H	HYPOCHLORITE	ST	STEAM (LOW PRESSURE TO 10 PSI)
HF	HYDROFLUOSILICIC ACID	SU	STRUCTURE UNDERDRAIN
HP	HYDROGEN PEROXIDE	SUC	STRUCTURE UNDERDRAIN COLLECTOR
HR	HEATING WATER RETURN	SW	SETTLED WATER
HS	HEATING WATER SUPPLY	SWR	SCRUBBER WATER RETURN
HWR	DOMESTIC HOT WATER RETURN	TPR	THICKENER PRESSURIZED RECYCLE
HWS	DOMESTIC HOT WATER SUPPLY	TS	THICKENER SUPERNATANT
IA	INSTRUMENT AIR	TSL	THICKENED SLUDGE
IE	INTERMEDIATE EFFLUENT	TSO	THICKENER SUBNATANT OVERFLOW
ISL	INTERMEDIATE SLUDGE	UW	UTILITY WATER (NON-POTABLE WATER)
LO	LUBE OIL	V	VACUUM
LPG	LIQUEFIED PETROLEUM GAS	WAS	WASTE ACTIVATED SLUDGE
LS	LIME SLURRY	WLO	WASTE LUBE OIL
LSP	LANDSCAPING SPRINKLER SYSTEM	WW	WASTE WATER
MA	MURIATIC ACID	WWR	WASTE WATER RECLAIMED
ML	MIXED LIQUOR	WWW	WASTE WASHWATER

NOTES

1. ADDITIONAL INSTRUMENTATION AND CONTROL SYMBOLS MAY BE USED AS REQUIRED. SYMBOLS AND NOMENCLATURE ARE BASED ON ISA STANDARDS S5.1, S5.2, S5.4.
2. SEE ASSOCIATED ELECTRICAL AND MECHANICAL SYMBOL SHEETS FOR ADDITIONAL SYMBOLS AND ABBREVIATIONS.
3. FOR PIPE SIZES, MATERIAL, AS WELL AS DETAILS OF METER COUPLING AND OTHER MECHANICAL EQUIPMENT (E.G. VALVE, PUMP ETC.) SEE PROCESS AND INSTRUMENTATION DIAGRAMS, MECHANICAL DRAWINGS AND SPECIFICATIONS.
4. POWER SUPPLIES FOR LOOPS OR SYSTEMS SHALL BE FURNISHED BY THE INSTRUMENTATION MANUFACTURER TO MEET THE PARTICULAR CHARACTERISTICS (E.G. VOLTAGE AND CURRENT REQUIREMENTS) OF COMPONENTS IN EACH LOOP OR SYSTEM.

JOB NO.
S-1636

REV	DATE	BY	DESCRIPTION

SCALE: NONE

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

DESIGNED K.JITPATIMA
DRAWN K.JITPATIMA
CHECKED

SUBMITTED Pandu Namuduri C-49471 5-23-94
PROJECT ENGINEER R. C. E. NO. DATE

RECOMMENDED Surendra Thekdi 44599 5-23-94
MONTGOMERY WATSON R. C. E. NO. DATE

MONTGOMERY WATSON
Pasadena, California

APPROVED _____ DATE _____
APPROVED _____ DATE _____

CITY OF RIVERSIDE
PIERCE STREET PUMP STATION UPGRADE
INSTRUMENTATION SYMBOLS AND ABBREVIATIONS P&ID AND LOOPS SYMBOLS (3)

SHEET 1-3 OF 44 SHEETS

INDEXED 1-31-05 LH

Job No. 193.0454 File No. J:\PRO\RIVERPS\INS\RVI03D 5/23/1994

NEW RTU

PLC

NEW LOCAL CONTROL PANEL (NLCP)

FIELD

SCADA BYPASS CTRL SELECTED DI 172
SCADA CONTROL SELECTED DO 109
PLC CONTROL SELECTED DO 102
DO 106
DI 221
AI 107
DI 107

P-4
DI 141
DI 142
VFD ON/OFF DO 143
DI 140
VFD SPD CTRL AO 144
VFD CTRL IN VFD DI 148
BYPASS ON/OFF DO 147

P-2
DI 121
DI 122
VFD ON/OFF DO 123
DI 120
VFD SPD CTRL AO 124
VFD CTRL IN VFD DI 128
BYPASS ON/OFF DO 127
DI 231

RUN DI 171
FAIL DI 172
DO 102
RUN DI 220
FAIL DI 221

WETWELL
LEVEL LOW DI 100D
LEVEL AI 107
DI 107

RUN DI 141
FAIL DI 142
ON/OFF DO 143
SW. IN AUTO DI 140
SPEED CONTROL AO 144
SPEED AI 145
CHECK V. OPEN DI 146

RUN DI 121
FAIL DI 122
ON/OFF DO 123
SW. IN AUTO DI 120
SPEED CONTROL AO 124
SPEED AI 125
CHECK V. OPEN DI 126
RUN DI 230
FAIL DI 231

LI 107
LN 107
5
LIT 107
FAIL
LLL 100A
LLLL 100A
YA 107
FAIL

VIBRATION YA 140E
BEARING HI TEMP. YA 140C
MOTOR WINDING HI TEMP. YA 140D
PRESS., SUCTION LOW YA 140A
PRESS. DISC. HIGH YA 140B
HS 140 HOA
9
HS 148
SK 140 POT.
SN 140

VIBRATION YA 120E
BEARING HI TEMP. YA 120C
MOTOR WINDING HI TEMP. YA 120D
PRESS. SUCTION LOW YA 120A
PRESS. DISC. HIGH YA 120B
HS 120 HOA
9
HS 128
SK 120 POT.
SN 120

SD
TO VFD'S 4 10
LOW LEVEL
SS
HS 170B
YI 170
YA 170
10
MCC
LOS
HS 170A

MCC
HS 220A FS
HS 220B AM
11
FSL 220
TO ATM
M
F-4 (FAN)
LSL 100A
LSLL 100A
12
5
LE 107
— LWL EL.
— LLWL EL.
P-7
EAST WET WELL

VARIABLE SPEED DRIVE UNIT (VFD-4) 10 5
VARIABLE SPEED DRIVE UNIT (VFD-2) 10 5

LOW-LOW LEVEL (CUT OFF)
F-1
6
TE 140A (MOTOR)
2
5
TE 140B (BEARING)
VSH 140 (VIBRATION)
11
ZSD 140
PSL 140
S
PSH 140
P-4

TE 120A (MOTOR)
TE 120B (BEARING)
VSH 120 (VIBRATION)
ZSD 120
PSL 120
PSH 120
P-2

MCC
HS 230A FS
HS 230B AM
10
I-5
FSL 230
FROM ATM
M
F-3 (FAN)

CONTINUE ON SHEET I-5
TO I-5
LOW LEVEL FROM I-5
FROM I-6
FANS, HI SPEED AUTO ON

NOTES:
SEE NOTES ON SHEET I-6.

REGISTERED PROFESSIONAL ENGINEER
KRISDA JITPATIMA
No. 14326
Exp. 9/30/94
ELECTRICAL
STATE OF CALIFORNIA

JOB NO. S-1636

REV	DATE	BY	DESCRIPTION

SCALE: NONE

WARNING 0 1/2 1 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

DESIGNED K.JITPATIMA
DRAWN K.JITPATIMA
CHECKED

SUBMITTED Padma Yamuduri C-49471 5-23-94
PROJECT ENGINEER R. C. E. NO. DATE
RECOMMENDED Surendra Thakral C-44599 5-23-94
MONTGOMERY WATSON R. C. E. NO. DATE

MONTGOMERY WATSON
Pasadena, California

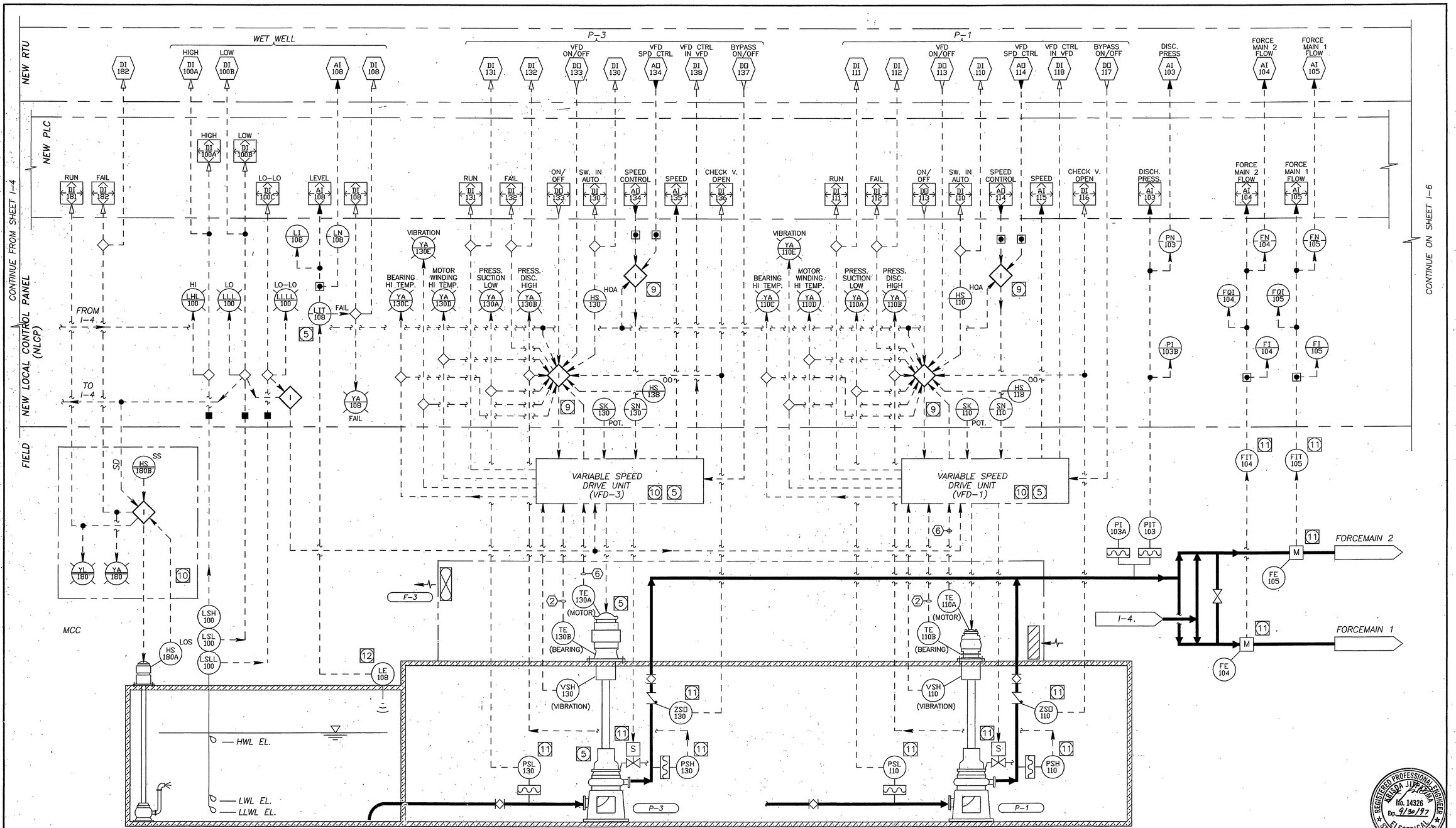
APPROVED DATE
APPROVED DATE

CITY OF RIVERSIDE
PIERCE STREET PUMP STATION UPGRADE
PROCESS AND INSTRUMENTATION DIAGRAM - 1

SHEET I-4 OF 44 SHEETS

INDEXED 1-31-05 LH

Job No. 193.0454 File No. J:\PRJ\RIVERPS\INS\RIV041 5/23/1994



NOTES:

SEE NOTES ON SHEET I-6.

REGISTERED PROFESSIONAL ENGINEER KALSHA JITPATIMA No. 14326 Exp. 9/30/97 ELECTRICAL STATE OF CALIFORNIA

JOB NO. S-1636

REV	DATE	BY	DESCRIPTION

SCALE: NONE

WARNING 0 1/2 1 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

DESIGNED K. JITPATIMA
DRAWN K. JITPATIMA
CHECKED

SUBMITTED Kantha Namuduri, PROJECT ENGINEER, C-49471, R. C. E. NO., 5-23-94, DATE
RECOMMENDED Surendra Thakral, MONTGOMERY WATSON, 49599, R. C. E. NO., 5-23-94, DATE

MONTGOMERY WATSON
Pasadena, California

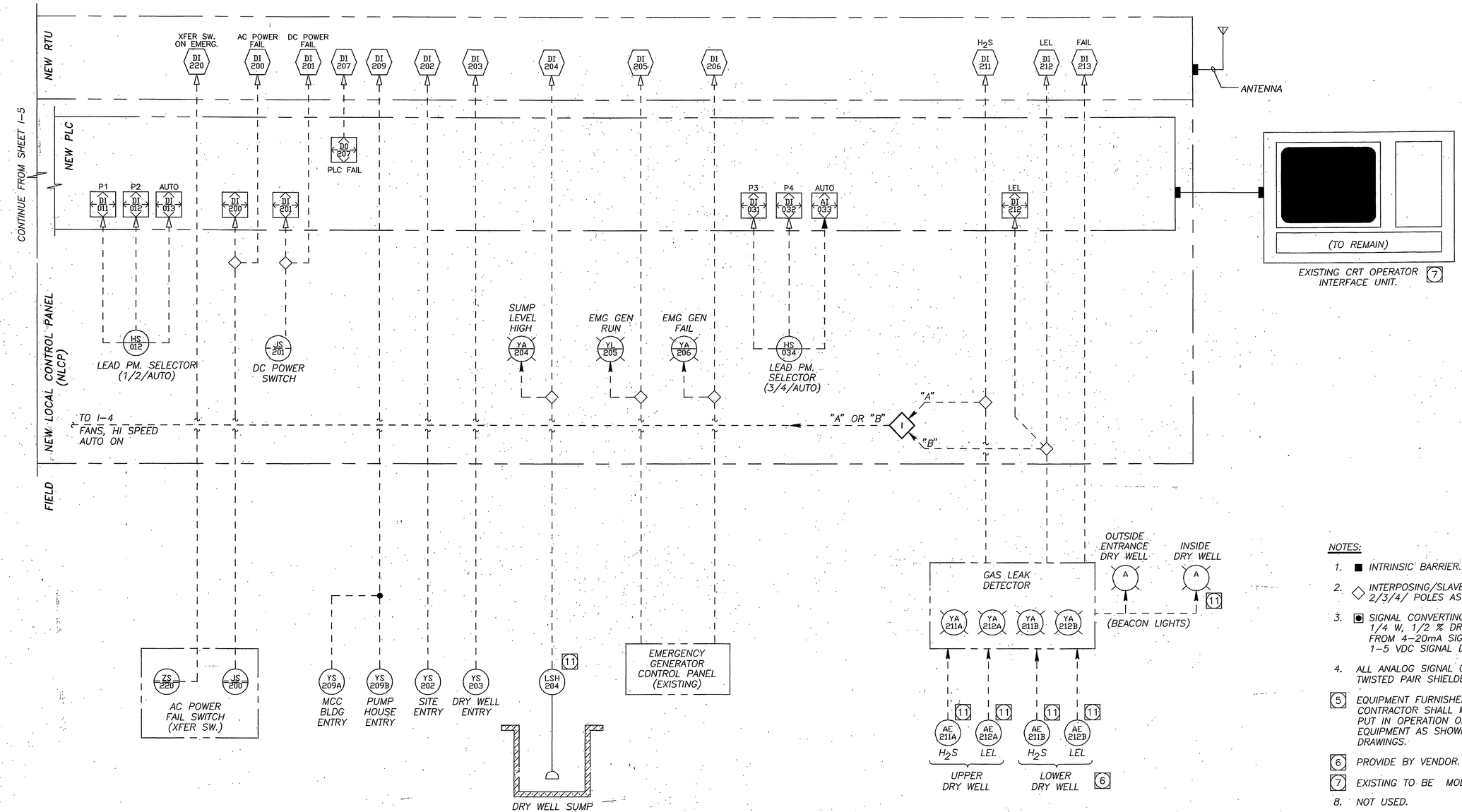
APPROVED ____ DATE ____
APPROVED ____ DATE ____

CITY OF RIVERSIDE
PIERCE STREET PUMP STATION UPGRADE
PROCESS AND INSTRUMENTATION DIAGRAM - 2

SHEET I-5 OF 44 SHEETS

Job No. 193.0454 File No. J:\PROJ\RIVERPS\INS\RM05I 5/23/1994

INDEXED 1-31-05 GH



NOTES:

1. ■ INTRINSIC BARRIER.
2. ◇ INTERPOSING/SLAVE RELAY (24 VDC, 2/3/4/ POLES AS REQUIRED).
3. ◉ SIGNAL CONVERTING WITH 250 Ω, 1/4 W, 1/2 % DROPPING RESISTOR FROM 4–20mA SIGNAL UPSTREAM TO 1–5 VDC SIGNAL DOWNSTREAM.
4. ALL ANALOG SIGNAL CABLES SHALL BE TWISTED PAIR SHIELDED WIRES.

[5] EQUIPMENT FURNISHED BY OWNER. CONTRACTOR SHALL MODIFY, INSTALL AND PUT IN OPERATION OF THE FURNISHED EQUIPMENT AS SHOWN ON CONTRACT DRAWINGS.

[6] PROVIDE BY VENDOR. SEE SPECIFICATIONS

[7] EXISTING TO BE MODIFIED.

8. NOT USED.

[9] SEE I–11 FOR TYPICAL SCHEMATIC DIAGRAM.

[10] SEE ELECTRICAL DRAWINGS AND SPECIFICATIONS.

[11] EXPLOSION PROOF HOUSING (NEMA 7) IS REQUIRED.

[12] INTRINSICALLY SAFE EQUIPMENT.

REGISTERED PROFESSIONAL ENGINEER — RAJAN JITPATIMA — No. 14326 — Exp. 9/30/97 — ELECTRICAL — STATE OF CALIFORNIA

JOB NO. S–1636

REV	DATE	BY	DESCRIPTION

SCALE: NONE

WARNING 0 1/2 1 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

DESIGNED K.JITPATIMA
DRAWN K.JITPATIMA
CHECKED

SUBMITTED Pandia Vamidwri C-49471 5-23-94
PROJECT ENGINEER R. C. E. NO. DATE

RECOMMENDED Surender Thakral C-44599 5-23-94
MONTGOMERY WATSON R. C. E. NO. DATE

MONTGOMERY WATSON
Pasadena, California

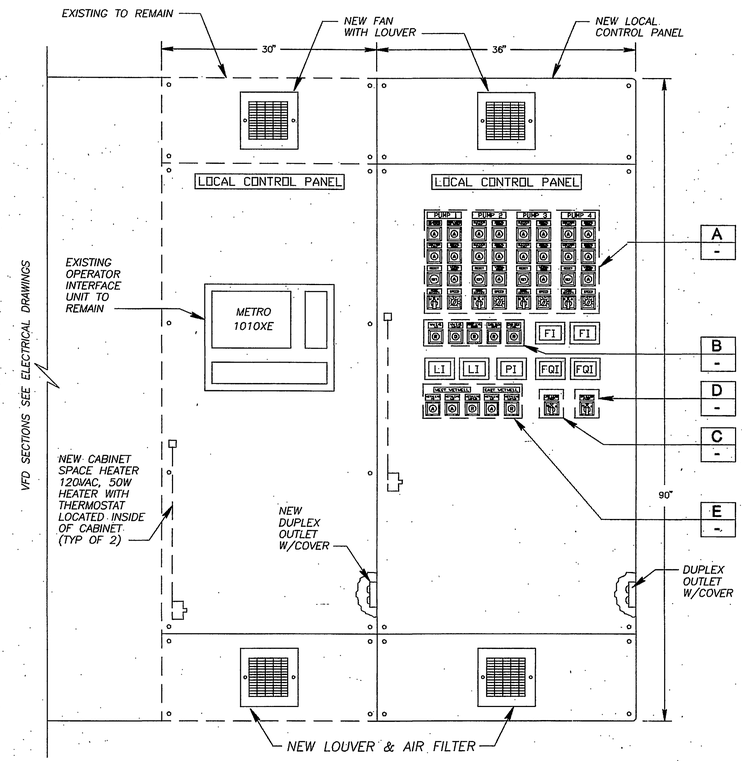
APPROVED _____ DATE _____
APPROVED _____ DATE _____

CITY OF RIVERSIDE
PIERCE STREET PUMP STATION UPGRADE
PROCESS AND INSTRUMENTATION DIAGRAM – 3

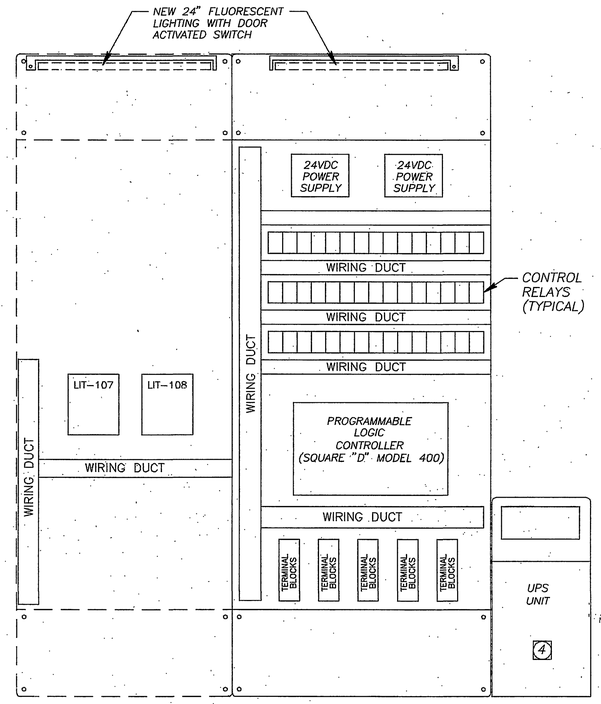
SHEET 1–6 OF 44 SHEETS

INDEXED 1-31-05 GH

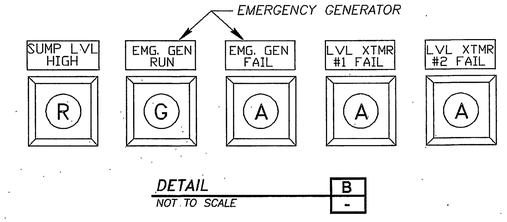
Job No. 193.0454 File No. J:\PRJ\RIVERPS\INS\RIW106I 5/23/1994



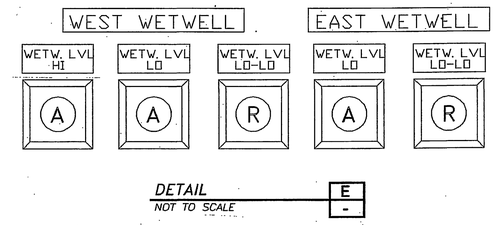
FRONT VIEW



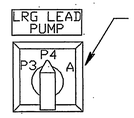
FRONT VIEW
WITH DOOR REMOVED
(SOME EQUIPMENT ARE NOT SHOWN FOR CLARITY)



DETAIL B
NOT TO SCALE

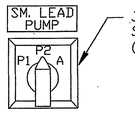


DETAIL E
NOT TO SCALE



3 POSITION SELECTOR SWITCH (P3/P4/AUTO)

DETAIL C
NOT TO SCALE

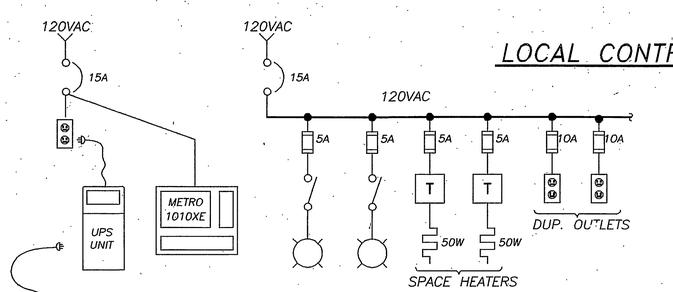


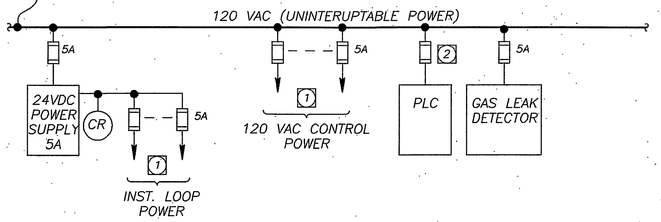
3 POSITION SELECTOR SWITCH (P1/P2/AUTO)

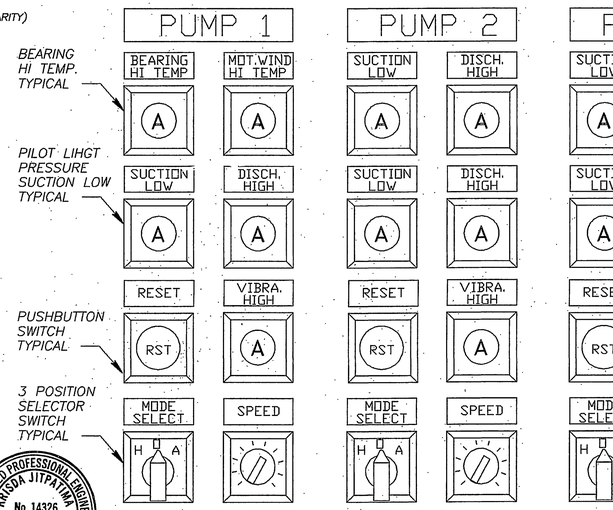
DETAIL D
NOT TO SCALE

LOCAL CONTROL PANEL LAYOUT

SCALE: NTS







DETAIL A
NOT TO SCALE

NOTES:

1. FUSES (5 AMP) FOR EA. CONTROL CKT. (QTY OF CKT AS REQUIRED)
2. PER MANUFACTURE'S REQUIREMENT.
3. PULL SECTION'S PARTITION SHALL BE REMOVED.
4. UPS UNIT, 500 VA, 20 MINS. WITH SEALED MAINTAINANCE FREE BATTERIES.

REGISTERED PROFESSIONAL ENGINEER — RIKADA JITPATIMA — No. 14326 — Exp. 9/30/97 — ELECTRICAL — STATE OF CALIFORNIA

CONTROL POWER DISTRIBUTED DIAGRAM

REV	DATE	BY	DESCRIPTION

SCALE: NONE

WARNING 0 1/2 1 — IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

DESIGNED K.JITPATIMA
DRAWN K.JITPATIMA
CHECKED L. James

SUBMITTED Rikada Jamnivai C-49471 5-23-94
PROJECT ENGINEER R. C. E. NO. DATE

RECOMMENDED Narendra Thakral 44599 5-23-94
MONTGOMERY WATSON R. C. E. NO. DATE

MONTGOMERY WATSON
Pasadena, California

APPROVED _____ DATE _____
APPROVED _____ DATE _____

CITY OF RIVERSIDE
PIERCE STREET PUMP STATION UPGRADE
LOCAL CONTROL PANEL LAYOUT AND DETAILS

JOB NO. S-1636

SHEET 1-7 OF 44 SHEETS

INDEXED 1-31-05 GH

Job No. 193.0454 File No. J:\PRJ\RIVERPS\INST\RIV107I 5/23/1994

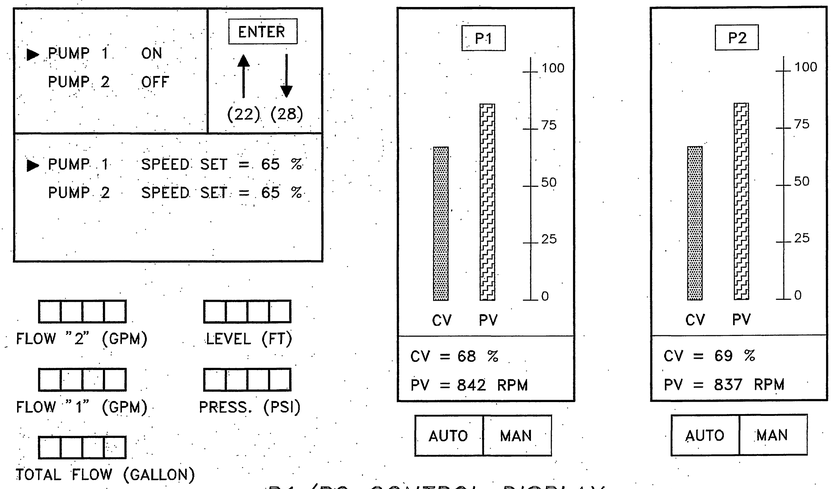
CITY OF RIVERSIDE
PIERCE STREET PUMP STATION

MAIN MENU
01 — STATION OVERALL OPERATION DISPLAY
02 — P1/P2 CONTROL DISPLAY
03 — P3/P4 CONTROL DISPLAY

ALARM STATUS AND LOGGER			
ITEM	DESCRIPTION/MESSAGE	STATUS	DATE/TIME
ACKNOWL. ALARM = 39	LINE UP = 22	LINE DOWN = 28	*

DISPLAY – 02

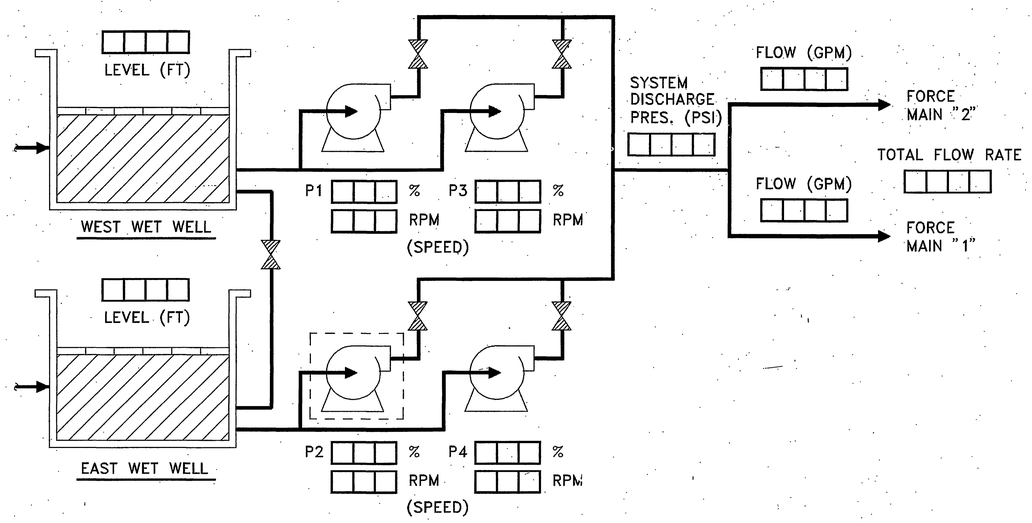
ESC. TO RETURN TO MAIN MENU



P1/P2 CONTROL DISPLAY

DISPLAY – 01

ALARM | SEE MAIN MENU



PIERCE STREET PUMP STATION

ESC. TO RETURN TO MAIN MENU

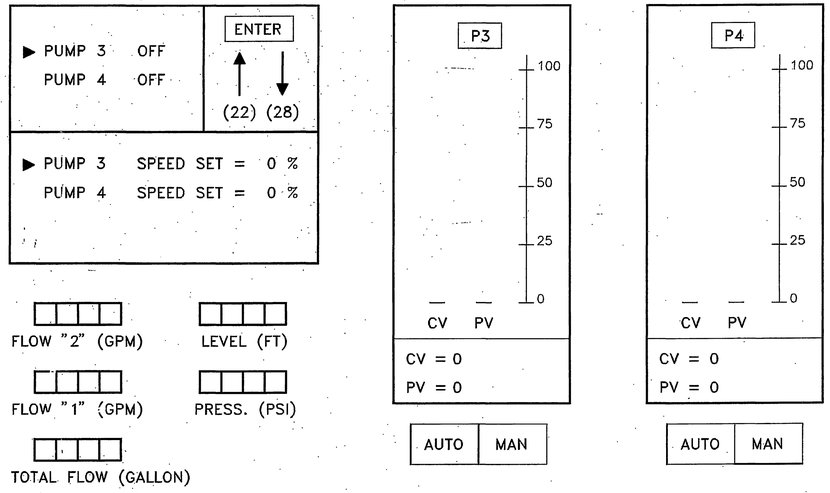
DATE: = XX/XX/XX
TIME: = XX:XX

STATION CONTROL MODE

SCADA	PLC	SCADA VFD BYPASS

DISPLAY – 03

ESC. TO RETURN TO MAIN MENU



P3/P4 CONTROL DISPLAY

REGISTERED PROFESSIONAL ENGINEER — KRISHNA JITPATIMA — No. 14326 — Exp. 9-30-97 — ELECTRICAL — STATE OF CALIFORNIA

NOTES:
1. SEE SHEET I–9 FOR EXPLANATION AND DETAILS.

JOB NO. S–1636

REV	DATE	BY	DESCRIPTION

SCALE: NONE

WARNING 0 1/2 1 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

DESIGNED K. JITPATIMA
DRAWN K. JITPATIMA
CHECKED L. Yamasaki

SUBMITTED Radha Vamsidhar C-49471 5-23-94
PROJECT ENGINEER R. C. E. NO. DATE
RECOMMENDED Surendra Thakral 44599 5-23-94
MONTGOMERY WATSON R. C. E. NO. DATE

MONTGOMERY WATSON
Pasadena, California

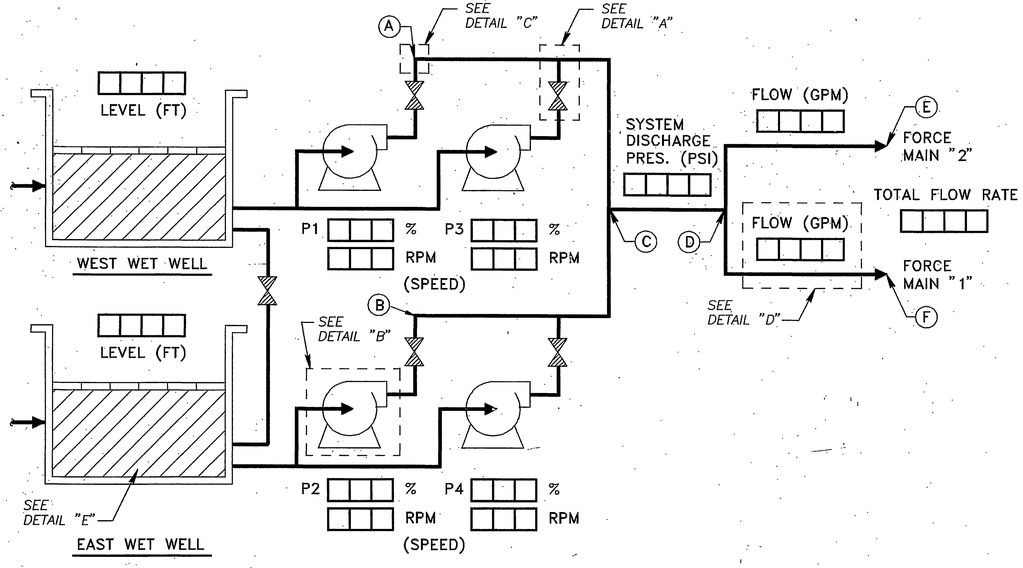
APPROVED ____ DATE ____
APPROVED ____ DATE ____

CITY OF RIVERSIDE
PIERCE STREET PUMP STATION UPGRADE
CONTROL SCREENS LAYOUT – 1

SHEET I–8 OF 44 SHEETS

Job No. 193.0454 File No. J:\PRJ\RIVERPS\INS\RIV08I 5/23/1994

INDEXED 1-31-05 GH



PIERCE STREET PUMP STATION

PROC. LINE	COLOR	CONDITION
A – C	GREEN	P1 ON V OPEN AND; P2 ON V OPEN AND; OR; SET A – C GREEN
B – C	GREEN	P3 ON V OPEN AND; P4 ON V OPEN AND; OR; SET B – C GREEN
C – D	GREEN	A – C OR B – C TRUE THEN SET B – D GREEN
D – E	GREEN	IF FLOW "A" > 5%
D – F	GREEN	IF FLOW "B" > 5%

NOTES:
1. ALL PROC. LINES SHALL BE 1/2 PIXEL.
2. RED COLOR ON "NO FLOW"
3. LIGHT BLUE COLOR FOR BACKGROUND

PROCESS LINE COLOR CODE: C

FILL FOREGROUND COLOR CODE	
STATUS	VALVE COLOR
OPENED	GREEN
CLOSED	RED
FAIL	AMBER/RED *

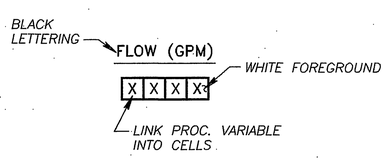
* FLIP–FLOP BETWEEN THE SPECIFIED COLOR.

VALVE COLOR CODE: A

FILL FOREGROUND COLOR CODE	
STATUS	MOTOR COLOR
OFF	GREEN
ON	RED
FAIL	AMBER/RED *

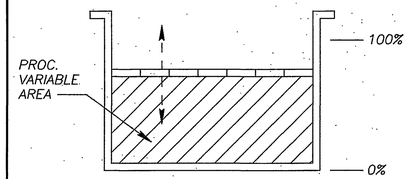
* FLIP–FLOP BETWEEN THE SPECIFIED COLOR.

PUMP COLOR CODE: B



PROCESS VARIABLE NUMERIC: D
(TYPICAL FOR ALL)

FILL FOREGROUND COLOR CODE	
LEVEL	COLOR
NORMAL	TAN
HIGH–HIGH	AMBER/RED *
HIGH	AMBER
LOW	WHITE
LOW–LOW	WHITE/RED *



* FLIP–FLOP BETWEEN THE SPECIFIED COLOR.

PROCESS VARIABLE AREA COLOR CODE: E

REGISTERED PROFESSIONAL ENGINEER KALSA JITPATIMA No. 14326 Exp. 9/30/97 ELECTRICAL STATE OF CALIFORNIA

JOB NO. S–1636

REV	DATE	BY	DESCRIPTION

SCALE: NONE.

WARNING 0 1/2 1 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

DESIGNED K. JITPATIMA
DRAWN K. JITPATIMA
CHECKED

SUBMITTED Radha Vamsidhar C-49471 5-23-94
PROJECT ENGINEER R. C. E. NO. DATE
RECOMMENDED Surendra Thakral 41599 5-23-94
MONTGOMERY WATSON R. C. E. NO. DATE

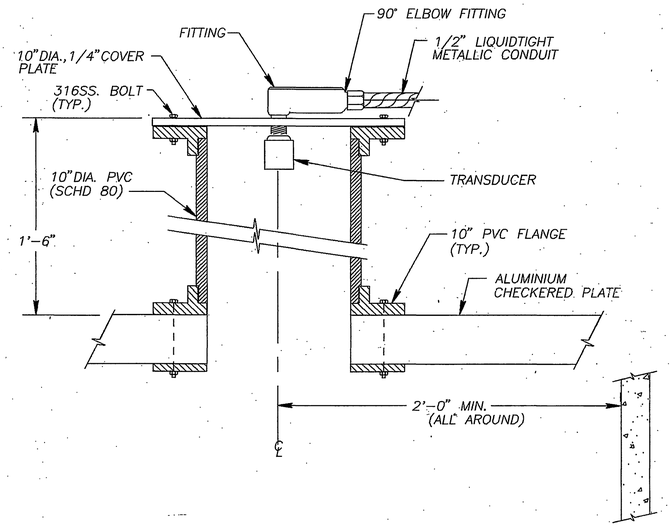
MONTGOMERY WATSON
Pasadena, California

APPROVED ____ DATE ____
APPROVED ____ DATE ____

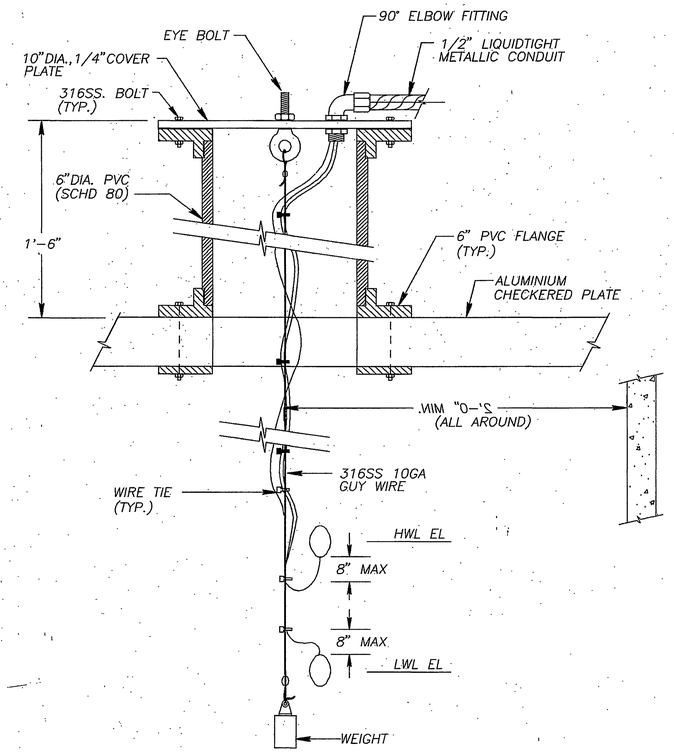
CITY OF RIVERSIDE
PIERCE STREET PUMP STATION UPGRADE
CONTROL SCREENS LAYOUT – 2

SHEET I–9 OF 44 SHEETS

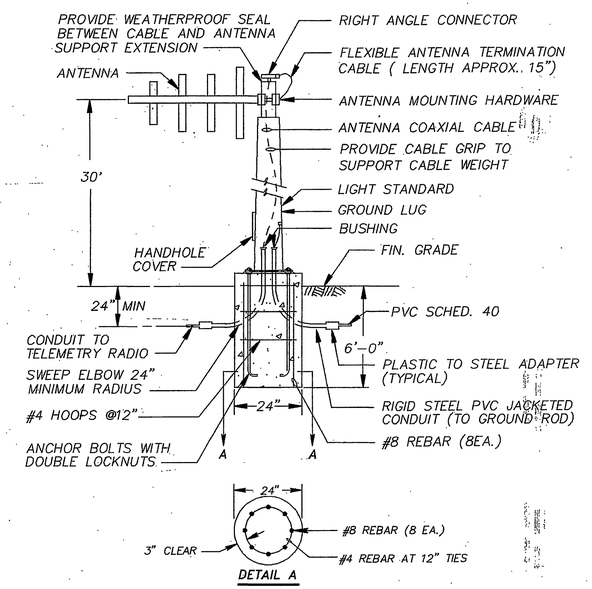
Job No. 193.0454 File No. JA\PRJ\RIVERPS\INS\RIW091 5/23/1994



ULTRASONIC TRANSDUCER (DEEP WELL) — I-150



FLOAT LEVEL SWITCH — I-151



POLE MOUNTED DIRECTIONAL ANTENNA DETAIL — I-404

REGISTERED PROFESSIONAL ENGINEER KRISSADA JITPATIMA No. 14326 Exp. 9/30/97 ELECTRICAL STATE OF CALIFORNIA

JOB NO. S-1636

REV	DATE	BY	DESCRIPTION

SCALE: NONE

WARNING: 0 1/2 1 — IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

DESIGNED K. JITPATIMA
DRAWN K. JITPATIMA
CHECKED L. Yamasaki

SUBMITTED Radha Namudari — PROJECT ENGINEER — C-49671 — R. C. E. NO. — 5-23-94 — DATE
RECOMMENDED Surendra Thakral — MONTGOMERY WATSON — 44599 — R. C. E. NO. — 5-23-94 — DATE

MONTGOMERY WATSON
Pasadena, California

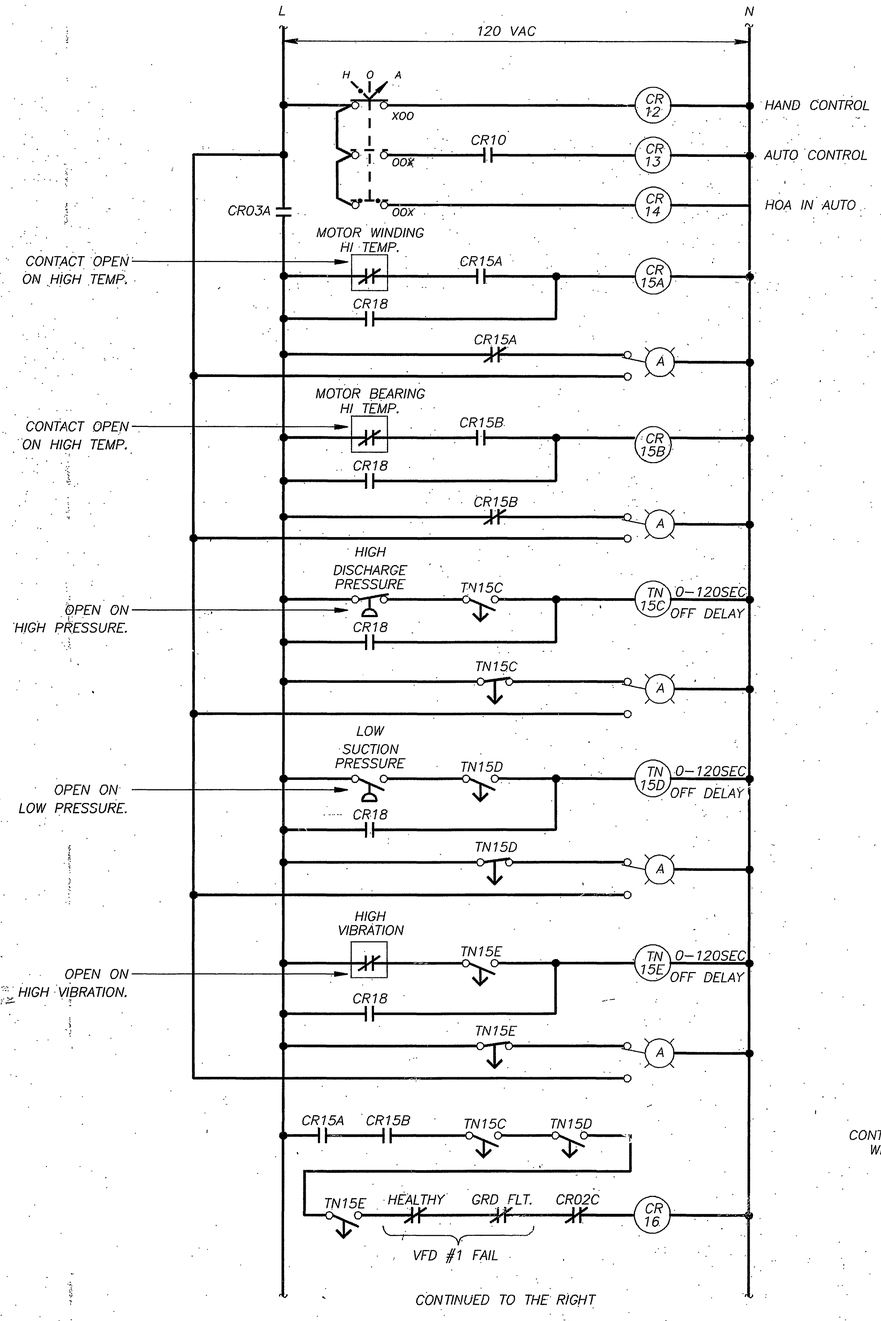
APPROVED _____ DATE _____
APPROVED _____ DATE _____

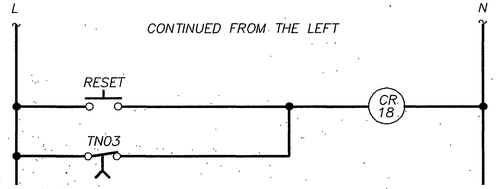
CITY OF RIVERSIDE
PIERCE STREET PUMP STATION UPGRADE
INSTALLATION DETAILS

SHEET I-10 OF 44 SHEETS

INDEXED 1-31-05 KH

Job No. 193.0454 File No. J:\PRJ\RIVERPS\INS\RM1101 5/23/1994





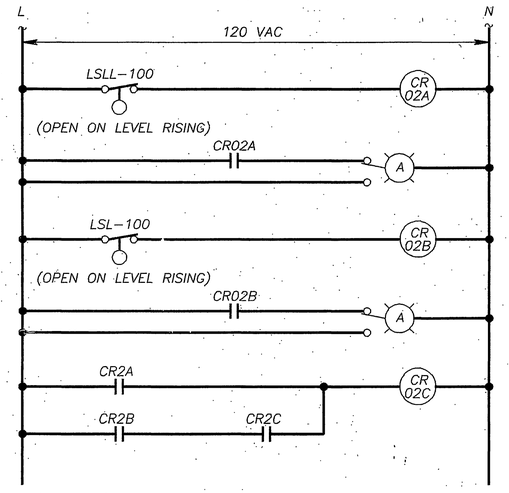
PUMP P-1 CONTROL CIRCUIT

(TYPICAL FOR PUMPS P-2, P-3, P-4)

N.O. CR12
N.O. CR13
N.O. CR16
} TO VFD #1

N.O. CR14
N.O. CR16
} TO PLC

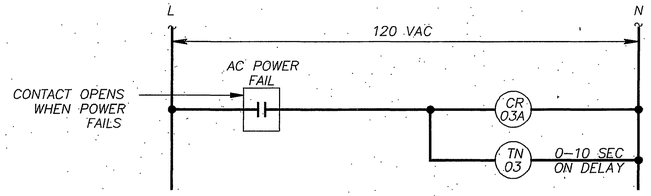
N.O. CR14
N.O. CR16
} TO RTU



LIFT PUMP P-1, P-3 LOW LEVEL CUT-OFF

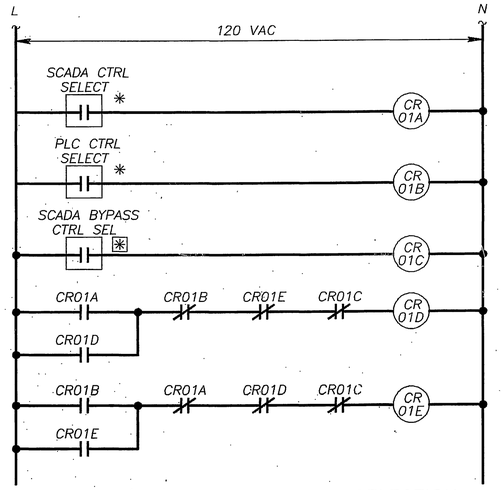
(TYPICAL FOR PUMP P-2, P-4 WITH LSL-100A, LSLL-100A)

N.C. CR02A _ _ _ _ TO P-1 CONTROL CKT.
N.C. CR02A _ _ _ _ TO P-3 CONTROL CKT.
N.O. CR02A _ _ _ _ TO PLC



AC POWER FAIL CKT

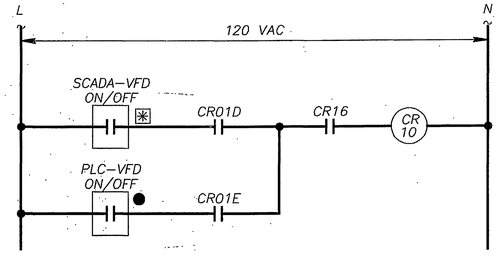
N.C. CR03A _ _ _ _ TO PUMP CONTROL CKT'S
N.C. CR03A _ _ _ _ TO PLC
N.C. CR03A _ _ _ _ TO RTU



SCADA/PLC CONTROL MODE SELECTION AND SCADA BYPASS CONTROL SELECTION

CR01C
CR01D
CR01E
} TO PLC

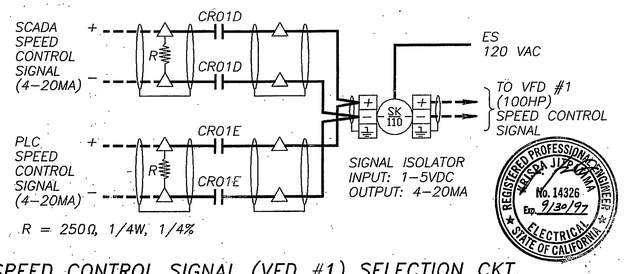
CR01D
CR01E
} TO SPEED AND ON/OFF CTRL CKT



ON/OFF CONTROL SIGNAL (VFD #1) SELECTION CKT.

(TYPICAL FOR VFD #2, #3 AND #4)

✳ RTU CONTROL OUTPUT (MOMENTARY)
● PLC CONTROL OUTPUT (MAINTAIN)
⊠ RTU CONTROL OUTPUT (MAINTAIN)



REGISTERED PROFESSIONAL ENGINEER
RAJESH JITPATIMA
No. 14326
Exp. 3/30/97
ELECTRICAL
STATE OF CALIFORNIA

SPEED CONTROL SIGNAL (VFD #1) SELECTION CKT.

(TYPICAL FOR VFD #2, #3 AND #4)

JOB NO. S-1636

REV	DATE	BY	DESCRIPTION

SCALE: NONE

WARNING: 0 1/2 1 — IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

DESIGNED K. JITPATIMA
DRAWN K. JITPATIMA
CHECKED

SUBMITTED Pandia Ramudu C-49471 5-23-94
PROJECT ENGINEER R. C. E. NO. DATE

RECOMMENDED Surendra Thakur 44599 5-23-94
MONTGOMERY WATSON R. C. E. NO. DATE

MONTGOMERY WATSON
Pasadena, California

APPROVED _____ DATE _____
APPROVED _____ DATE _____

CITY OF RIVERSIDE
PIERCE STREET PUMP STATION UPGRADE
SCHEMATIC DIAGRAMS

SHEET 1-11 OF 44 SHEETS

INDEXED 1-31-05 MH

Job No. 193.0454 File No. J:\PRJ\RIVERPS\INS\RIV1111 5/23/1994