1. REMOTE TELEMETRY UNITS		
	S AND APPURTENANCES (R.T.U.)	B. Remote be a heavy
Controllers (PLC's) which shall serve as an int analog status and control messages between t	processor based, user programmable, Programmable Logic terface to accumulate, process, transmit and receive discrete and the RTU base stations and the remote RTU sites located within a	furnished o antenna co Antenna ar
to provide all discrete and analog status, mon	nt battery backed RAM, or EEPROM non—volatile backup memories nitoring and control functions and shall be designed to operate in	or approve required if antenna he antenna fr
an outdoor industrial environment. C. The programmable controller shall be designed to operate in an industrial environment. The PLC shall be capable of operation in an ambient temperature range of 0°-60°C and a relative humidity of 5-95 percent,		diameter) of the pipe Corporatior
non—condensing. The PLC shall be capable of operation on supply voltages of 24VDC. D. All components of the PLC system shall be of the same manufacturer who is regularly engaged in the manufacture of programmable controllers. The manufacturer shall have fully tested units similar to that being		cable shall connector antenna m tubing sha
furnished in an industrial environment with ass	sociated electrical noise. The processing unit shall perform the on the program stored in memory and the status of the inputs	communico communico C. The cor
E. The processor and its associated memory shall be enclosed in a modular sheet metal enclosure. Memory shall consist of battery—backed RAM, which shall retain the control program in the event of AC power loss. Memory shall be not less than 8K user logic for any PLC and shall be adequate for all control functions specified. A minimum of 1920 on—board registers shall be addressable.		D. Radios that the r stations. F
F. The relay logic instructions of the programmable controller shall include normally open; normally closed; transitional positive and negative contacts; timers in .01, .1, and 1.0— second resolution; and up/down counters. Register and table instructions shall include block moves, table to register, register to table, FIFO, table search, and table to table. Register matrix operations shall include bit sense, bit set/clear, and, or, exclusive or, bit rotate, and complement.		1. North T For statior 2956 Pine
G. LED-type indicating lights shall be provided		2. North T For statior 8130 Nort
H. Programmable controllers and accessory equipment shall be Allen Bradley MicroLogix 1400, with memory module and two analog extension modules. I. All RTUs shall be powered with 115 VAC through a power supply capable of float charging sealed Gel—cell		3. Central For statior 12751 Hag
batteries and shall include an AC power monitor with alarm output to the RTU on loss of AC power. Power supply shall be of sufficient capacity to provide all required DC power to all RTU equipment, discrete and analog input/output circuitry, under full load, communications interface equipment, radios and other radio interface/conditioning equipment and appurtenances as required. The primary power supply for radio, PLC and battery backup shall be 100 Watt, 24VDC Allen Bradley 1606-XLP100E. The batteries shall be lead acid sealed, 12 volt, 18 ampere-hour, model Power Sonic PS-12180. Two 12 volt batteries shall connected in series to get 24VDC battery backup. The Radio shall be powered through a relay contact and the PLC shall be able to power		4. Central the new C
		Moore Rd. 5. South 1 For statior
up or power down the radio as necessary. As second power source, provide a Solar Panel with all necessary components including a solar controller. Solar panel shall be mounted on the antenna pole with stainless steel U—bolts. The solar panel Installation shall meet 150MPH wind loading requirements. Solar panel shall be 55 watt, 24 volt panel Solartech SPM055P—WP—F with pole mounting kit Sunwize 007954. The solar controller shall be Morningstar Sunsaver SS—10L—24V. See wiring		6. West To For station of Roebuc
schematics for general information. J. Provide one spare PLC and one spare radio	o for every group of three lift stations or less.	20 s.r. 88 4. RTU
K. All analog inputs shall be furnished with lightning surge protection devices. Sufficient I/O shall be provided for each RTU to accommodate future expansion.		A. All elec electrical t
<ol> <li>Digital inputs shall be 24VDC from dry contacts.</li> <li>All outputs shall be wired through interposing relays (item 27). All analog and digital</li> </ol>		electrical s B. Manufac
inputs shall be wired to terminal strip. 3. Analog input circuits shall be isolated, 12—bit resolution type.  Analog inputs shall be coordinated with the receivers but shall generally be isolated 24V 4—20 mA inputs		a company devices fo C. Suppres
powered from the PLC. Analog input hardware types of analog inputs being transmitted to th	e shall be provided as specified for all	locations: 1. At any
L. The RTU hardware shall be assembled to the placed in a separate panel enclosure with a be- mechanically secured and fully wired. A bonding terminals is required between the back plate a	pack plate. All components shall be g wire #12 AWG with crimped end	2. At the any portion 3. Betweer
M. The following is a summary of approved reamonufacturers. Equipment/Material	mote telemetry equipment/materials and <u>Manufacturer</u>	D. Surge signal circ
RF Lightning Surge Suppressor	A) PolyPhaser Corporation — IS—50NX—C2	1. Have a 2. Employ
Analog Surge Suppressor Antenna Cable	A) EDCO Inc. — PC 642C-036 (Qty. 4) A) Andrews Heliax — LDF4-50A Low Loss Coaxial Cable	3. Be epo shall be f
5 Watt Ethernet/Serial Radio to communicate v towers NTEL 1, NTEL 2, CTEL 1, STEL, WTEL		4. Meet o a. Peak S
10 Watt Ethernet/Serial Radio to communicate with tower CTEL 2	A) Microwave Data System — ORBIT MXNXL2XNNNNNNS1F5DUNN	b. Voltage c. Temper d. Maximu
Programmable Logic Controller Processor	A) Allen Bradley MicroLogix 1400/1766—L32BXB, with memory module 1766—MM1 & two analog extension modules 1762—IF4	e. Operatir 5. The sup
120VAC to 24VDC Power Supply	A) Allen Bradley — 1606-XLP100E	E. RF Surg
Antenna — 450MHz — 475MHz	A) Sinclair — SY307—SF3SNM(ABK) — (Single array Yagi antenna) B) Sinclair — SY3072—SF3SNM(ABK) — (Dual array Yagi antenna)	1. Meet or a. Surge:
Antenna — 216MHz — 235MHz	A) Type to be determined after new Tower CTEL 2 is established.	b. Turn on c. Turn on d. Frequen
RF Coaxial Connector	A) Andrews — L4TNM—PSA or L4TNF—PSA A) Hoffman Model A—HC15E	e. VSWR: <u>&lt;</u> f. Insertion g. Tempero
Vapor Phase Corrosion Inhibitor Capsules	B) ZERUST Model VC-6-2	h. Unit Im i. Mounting
Pump No. 1 Run Pump No. 2 Run Pump No. 1 HOA	digital input I/O digital input I/1 digital input I/O	2. The su equal.
Pump No. 1 HOA Pump No. 2 HOA Generator Run (future)	digital input I/2 digital input I/3 digital input I/4	5. RTL
Back-up Float Fail	digital input I/5 digital input I/6	A. All ind phase corr
Power Fail	digital input I/7 digital input I/8	year; Hoffr be labeled
Power Fail High Level Alarm Phase Monitor Alarm	digital input 1/9	6. RTL
Power Fail High Level Alarm Phase Monitor Alarm Main Breaker OFF Generator Breaker ON	digital input I/10	
Power Fail High Level Alarm Phase Monitor Alarm Main Breaker OFF Generator Breaker ON Pump No. 1 Start Pump No. 2 Start	digital input I/10 digital output O/0 digital output O/1	A. Cabinets input/outpu
Power Fail High Level Alarm Phase Monitor Alarm Main Breaker OFF Generator Breaker ON Pump No. 1 Start	digital input I/10 digital output O/0 digital output O/1 digital output O/2 digital output O/3	input/outpu shall be pi
Power Fail High Level Alarm Phase Monitor Alarm Main Breaker OFF Generator Breaker ON Pump No. 1 Start Pump No. 2 Start Portable Generator Start (future) Radio Power Control	digital input 1/10 digital output 0/0 digital output 0/1 digital output 0/2 digital output 0/3 analog Input IV1 (extension module 1)	input/outpu shall be pı B. Termina channel bo fuse holder
Power Fail High Level Alarm Phase Monitor Alarm Main Breaker OFF Generator Breaker ON Pump No. 1 Start Pump No. 2 Start Portable Generator Start (future) Radio Power Control Lift Station Level Gen. Fuel Level or water pressure ( Force Main Pressure (future) Potable water pressure 2. RTU COMMUNICATIONS INT	digital input 1/10 digital output 0/0 digital output 0/1 digital output 0/2 digital output 0/3 analog Input IV1 (extension module 1) analog Input IV2 (extension module 1) analog Input IV3 (extension module 1) analog Input IV4 (extension module 1) TERFACE	input/outpu shall be pr B. Termina channel bo fuse holder terminals v C. The terr
Power Fail High Level Alarm Phase Monitor Alarm Main Breaker OFF Generator Breaker ON Pump No. 1 Start Pump No. 2 Start Portable Generator Start (future) Radio Power Control Lift Station Level Gen. Fuel Level or water pressure ( Force Main Pressure (future) Potable water pressure 2. RTU COMMUNICATIONS INT A. Bi-directional communications of status, con RTUs and the RTU base station shall be provide	digital input 1/10 digital output 0/0 digital output 0/1 digital output 0/2 digital output 0/3 analog Input IV1 (extension module 1) (future) analog Input IV2 (extension module 1) analog Input IV3 (extension module 1) analog Input IV4 (extension module 1) TERFACE mmands and radio diagnostics between the ed by the RTU communications interface	input/outpu shall be pr B. Termina channel bo fuse holder terminals v C. The tern from top t field incom shall not b
Power Fail High Level Alarm Phase Monitor Alarm Main Breaker OFF Generator Breaker ON Pump No. 1 Start Pump No. 2 Start Portable Generator Start (future) Radio Power Control Lift Station Level Gen. Fuel Level or water pressure ( Force Main Pressure (future) Potable water pressure 2. RTU COMMUNICATIONS INT A. Bi-directional communications of status, con	digital input 1/10 digital output 0/0 digital output 0/1 digital output 0/2 digital output 0/3 analog Input IV1 (extension module 1) (future) analog Input IV2 (extension module 1) analog Input IV3 (extension module 1) analog Input IV4 (extension module 1) TERFACE mmands and radio diagnostics between the ed by the RTU communications interface port shall serve as the RTU	input/outpu shall be pr B. Termina channel bo fuse holder terminals v C. The tern from top t field incom
Power Fail High Level Alarm Phase Monitor Alarm Main Breaker OFF Generator Breaker ON Pump No. 1 Start Pump No. 2 Start Portable Generator Start (future) Radio Power Control Lift Station Level Gen. Fuel Level or water pressure ( Force Main Pressure (future) Potable water pressure 2. RTU COMMUNICATIONS INT A. Bi-directional communications of status, con RTUs and the RTU base station shall be provide subsystem. The PLC MODBUS serial interface p communications interface. The data transmission Baud (synchronous) in RTU mode. B. The RTU communications interface shall cont sequence. It shall be possible to assign a base	digital input I/10 digital output 0/0 digital output 0/1 digital output 0/2 digital output 0/3 analog Input IV1 (extension module 1) (future) analog Input IV2 (extension module 1) analog Input IV3 (extension module 1) analog Input IV4 (extension module 1) TERFACE mmands and radio diagnostics between the ed by the RTU communications interface port shall serve as the RTU on rate shall be set to operate at 9600 trol the modem during the polling se address to each RTU through the data	input/outpu shall be pr B. Termina channel bo fuse holder terminals w C. The term from top t field incom shall not b Owner, a w acceptable. D. Wiring s and codes.
Power Fail High Level Alarm Phase Monitor Alarm Main Breaker OFF Generator Breaker ON Pump No. 1 Start Pump No. 2 Start Portable Generator Start (future) Radio Power Control Lift Station Level Gen. Fuel Level or water pressure ( Force Main Pressure (future) Potable water pressure 2. RTU COMMUNICATIONS INT A. Bi-directional communications of status, con RTUs and the RTU base station shall be provide subsystem. The PLC MODBUS serial interface p communications interface. The data transmissio Baud (synchronous) in RTU mode. B. The RTU communications interface shall cont sequence. It shall be possible to assign a bas interface. The addressing scheme shall allow of link. The communications protocol shall be ma	digital input 1/10 digital output 0/0 digital output 0/1 digital output 0/2 digital output 0/3 analog Input IV1 (extension module 1) (future) analog Input IV2 (extension module 1) analog Input IV3 (extension module 1) analog Input IV4 (extension module 1) TERFACE mmands and radio diagnostics between the ed by the RTU communications interface port shall serve as the RTU on rate shall be set to operate at 9600 trol the modem during the polling se address to each RTU through the data a minimum of 247 RTUs for each data baster-slave MODBUS RTU.	input/outpu shall be pr B. Termina channel bo fuse holder terminals w C. The tern from top t field incom shall not b Owner, a w acceptable. D. Wiring s and codes. the blocks.
Power Fail High Level Alarm Phase Monitor Alarm Main Breaker OFF Generator Breaker ON Pump No. 1 Start Pump No. 2 Start Portable Generator Start (future) Radio Power Control Lift Station Level Gen. Fuel Level or water pressure ( Force Main Pressure (future) Potable water pressure 2. RTU COMMUNICATIONS INT A. Bi-directional communications of status, con RTUs and the RTU base station shall be provide subsystem. The PLC MODBUS serial interface p communications interface. The data transmission Baud (synchronous) in RTU mode. B. The RTU communications interface shall cont sequence. It shall be possible to assign a base interface. The addressing scheme shall allow of link. The communications protocol shall be mad 3. RTU RADIO SECTION AND A. The radio to communicate with any towers e	digital input I/10 digital output 0/0 digital output 0/1 digital output 0/2 digital output 0/3 analog Input IV1 (extension module 1) (future) analog Input IV2 (extension module 1) analog Input IV3 (extension module 1) analog Input IV4 (extension module 1) TERFACE mmands and radio diagnostics between the ed by the RTU communications interface port shall serve as the RTU on rate shall be set to operate at 9600 trol the modem during the polling se address to each RTU through the data a minimum of 247 RTUs for each data baster—slave MODBUS RTU. APPURTENANCES except CTEL 2 shall consist of a Microwave Data	input/outpu shall be pr B. Termina channel bo fuse holder terminals w C. The term from top t field incom shall not b Owner, a w acceptable. D. Wiring s and codes. the blocks. E. All wirin required. A exceeding
Power Fail High Level Alarm Phase Monitor Alarm Main Breaker OFF Generator Breaker ON Pump No. 1 Start Pump No. 2 Start Portable Generator Start (future) Radio Power Control Lift Station Level Gen. Fuel Level or water pressure ( Force Main Pressure (future) Potable water pressure 2. RTU COMMUNICATIONS INT A. Bi-directional communications of status, con RTUs and the RTU base station shall be provide subsystem. The PLC MODBUS serial interface p communications interface. The data transmission Baud (synchronous) in RTU mode. B. The RTU communications interface shall cont sequence. It shall be possible to assign a base interface. The addressing scheme shall allow of link. The communications protocol shall be mod 3. RTU RADIO SECTION AND A. The radio to communicate with any towers of Systems model SD4-CES-NNSNN 5-watt (contin	digital input 1/10 digital output 0/0 digital output 0/1 digital output 0/2 digital output 0/3 analog Input IV1 (extension module 1) analog Input IV2 (extension module 1) analog Input IV3 (extension module 1) analog Input IV4 (extension module 1) TERFACE mmands and radio diagnostics between the ed by the RTU communications interface port shall serve as the RTU on rate shall be set to operate at 9600 trol the modem during the polling se address to each RTU through the data a minimum of 247 RTUs for each data baster—slave MODBUS RTU. APPURTENANCES except CTEL 2 shall consist of a Microwave Data nuous) digital FSK modulation type radio transceiver serial interface and cable, private line coded squelch	input/outpu shall be pr B. Termina channel bo fuse holder terminals w C. The term from top t field incom shall not b Owner, a w acceptable. D. Wiring s and codes. the blocks. E. All wirin required. A

terminal unit antenna to communicate with any towers except CTEL 2 shall *yy*-duty, pole-mounted, grounded, 450 MHz – 470MHz Yagi, directional type with a minimum of 30 feet of Andrews Heliax (LDF4-50A) low loss coaxial able or approved equal, line adapter, lightning protector and appurtenances. and accessories shall be an SY307-SF3SNM(ABK) as manufactured by Sinclair ed equal. Dual array Yagi antennae Sinclair SY3072-SF3SNM(ABK) shall be the Remote Receive Signal Strength (RSSI) is less than 95 dbm. Minimum eight shall be 18 feet above grade. On new mast installations, fabricate the rom 21 feet length of schedule 40 galvanized steel continuous pipe (2 inch or approved equal. Paint lower 4 feet with asphaltum paint and cap the top be. RF lightning surge suppressor shall be IS-50NX-C2 by Polyphaser n. Yagi antenna shall have a pig tail with N—Male connector. Coaxial antenna have an N-Female connector Andrew L4TNF-PSA on one end and an N-Male Andrew L4TNM-PSA connector on other end. The antenna connectors on the nast shall be wrapped with rubber tape and heat shrink tubina. Heat shrink all be Alpha FIT-321-1inch. The antenna orientation toward the receiving ation tower shall be set using appropriate instruments. The antenna to cate with CTEL 2 to be determined after the tower is established.

mplete communications subsystem including all interconnecting cables shall ghtning, surge and transient protection. All antennae masts shall be grounded.

shall be programmed by PBCWUD technicians for the frequency of the tower radio will be communicating with. See attached RTU Schedule for location of requencies are as follows:

Tower 1 (NTEL 1) - Remote transmit-465.1500 MHz - Receive-460.1500 MHz ons located north of Lantana Rd., south of Roebuck Rd., and east of S.R. 7 ehurst Dr., Greenacres, FL (Coordinates: 26°38.017'N, 80°09.352'W)

Tower 2 (NTEL 2) — Remote transmit—456.8625 MHz — Receive—451.8625 MHz ons located north of Forest Hill Blvd., and east of S.R. 7 rth Jog Rd., West Palm Beach, FL (Coordinates: 26°47'52.50"N, 80°08'12.97"W) Tower 1 (CTEL 1) - Remote transmit-465.750 MHz - Receive-460.750 MHz

ons located south of Lantana Rd. and North of Clint Moore Rd. agen Ranch Rd., Delray Beach, FL (Coordinates: 26°29.260'N, 80°10.018'W)

Tower 2 (CTEL 2) - Transmit and Receive frequencies to be determined after TEL 2 is built. For stations located south of Lantana Rd. and North of Clint (Coordinates: TBD)

Tower (STEL) — Remote transmit—465.075 MHz — Receive—460.075 MHz ons located south of Clint Moore Rd. 7. 7th Street, Boca Raton, FL (Coordinates: 26°20.586'N, 80°11.840'W)

ower (WTEL) — Remote transmit—465.525 MHz — Receive—460.525 MHz ons located north of S.R. 80 and west of S.R. 7; plus all stations located north k Rd.

B80, Loxahatchee, FL (Coordinates: 26°41.05'N, 80°23.37'W) U ELECTRICAL TRANSIENT PROTECTION

ctrical and electronic elements shall be protected against damage due to

transient induced in interconnecting lines from lightning discharges and nearby systems.

icturer's Requirements: All surge suppressor devices shall be manufactured by ny that has been engaged in the design, development, and manufacture of such r at least 5 years.

ssor Locations: As a minimum, provide surge suppressors at the following

connections between field mounted instrument and electronic equipment.

field, panel, or assembly connections of all analog signal circuits that have ion of the circuit extending outside of a protecting building. en the radio and external mounted antenna.

Suppressors for Analog Signal Connections: Surge suppressors for analog cuits shall:

dual-pair (four wire) module with the base

three-stage hybrid technology. oxy encapsulated with a nonflammable phenolic enclosure. Epoxy encapsulation lame retardant.

- exceed the following performance criteria: Source Current: 10,000 amps Clamp Rating: 36 volts

rature Range: -40 degrees C to +85 degrees C um Operating Voltage: 30V dc ing Current: 4 to 20 mA dc

ppressor shall be of the type PC 642C-036 by EDCO Inc. or approved equal.

ge Suppressors: RF surge suppressors shall: exceed the following technical specifications:

50kA IEC 1000-4-5 8/20ms Waveform 500 Joules

: 600 VDC +/-20% time: 2.5ns for 2kV/ns

cy Range: 125MHz to 1GHz

 $\leq$ 1.1 to 1 over frequency range Loss: <a></a></a>

ature: -45°C to +85°C Storage/Operating +50°C pedance: 50 Ohm j: Flange

uppressor shall be of the type IS-50NX-C2 by PolyPhaser Inc. or approved

## U CORROSION PROTECTION

door and outdoor cabinets, panels and consoles shall be fitted with vapor rosion inhibitor capsules capable of protecting 5-cubic feet of space for one fman Model A-HC15E, ZERUST Model VC-6-2 or approved equal. Capsules shall with the date of activation.

## U FABRICATION

ts and panels shall provide mounting for power supplies, control equipment, but subsystems, panel mounted equipment and appurtenances. Ample space rovided between equipment to facilitate servicing and cooling.

blocks shall be factory assembled on a miniature mounting channel and the olted to the steel strap. Terminals shall be miniature screw type with integral unless otherwise required. Terminal blocks shall provide access to screw without disabling the fuses.

minals shall be marked vertically with a permanent, continuous marking strip to bottom. One side of each terminal strip shall be reserved exclusively for ning conductors. Common connections and jumpers required for internal wiring be made on the field side of the terminal. Subject to the approval of the vendor's pre-engineered and prefabricated wiring termination system will be

shall comply with accepted standard instrumentation and electrical practices For each pair of parallel terminal blocks, the field wiring shall be between

ng shall be bundled and run open or enclosed in vented plastic wire way, as I conductors run open shall be bundled and bound at regular intervals, not 12 inches, with nylon cable ties. Care shall be taken to separate electronic crete signal, and power wiring. A copper ground bus shall be installed the full each panel. Interior panel wiring and field wiring shall be tagged at all ons with machine—printed plastic sleeves. The wire number shall be the ID sted in the input/output schedules.

F. Wires shall be color coded as follows: Neutral — White

Ground – Green Power - Red

Signal - Black and White Control - Violet

Special - Blue

G. Panels shall be provided with a main circuit breaker.

J. Stand alone RTU panel enclosures shall have the following specifications: 1. Enclosure shall be manufactured with 14 gauge Type 304, Powder Coated White, Stainless Steel Bodies and Doors, NEMA 4X.

2. Enclosure shall have seams continuously welded and ground smooth with no holes or knockouts.

3. Enclosure shall have a seamless foam-in-place gasket that assures a watertight and dust-tight seal. Glued-in place gaskets will not be accepted.

4. Enclosure shall have a rolled lip around three sides of door and all sides of enclosure to exclude liquids and contaminants.

5. All external hardware shall be stainless steel with piano hinge, three-point latch with roller fitting top and bottom and single handle with padlock fitting and stainless steel external parts.

6. Enclosure shall have an internal high impact thermoplastic data-pocket.

7. Enclosure shall have collar studs provided for mounting the Remote Telemetry Unit Panel. Collars studs will be placed identically in all enclosures and identical to existing Lift Station installations to facilitate moving of the Remote Telemetry Unit back-panel to another enclosure or lift station location as necessary.

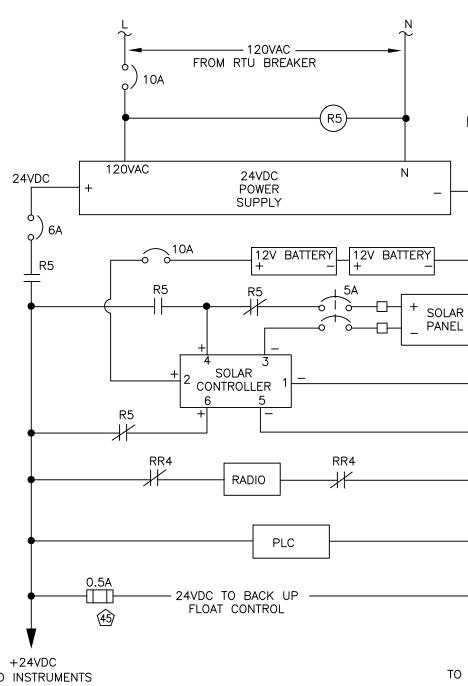
8. Enclosure shall be lockable 30 inches in height by 24 inches in width and 12 inches

in depth (30"H x 24"W x 12"D). 9. Enclosure shall be the product of a U.L. Listed manufacturer and made in accordance with the NEMA Type 4X standard.

10. Enclosure shall be by Hoffman Enclosures, Inc., or approved equal. The back-panel shall be stainless steel or aluminum.

11. Enclosure shall have a welded drip shield along the top front of the enclosure to guard against water intrusion. The drip shield shall extend 2-3-inches from top front edge of enclosure and be manufactured from stainless steel.

12. For RTUs to be incorporated into pump station electrical control panels: equipment shall be mounted on the back plate of the control panel.



TO INSTRUMENTS

NOTES: 1. 🖄 SEE BILL OF MATERIALS.

> <u>\* RTU WIRING DIAGRAM</u> 80S

\* REMOTE TELEMETRY UNIT SPECIFICATIONS 75S-79S

