CITY OF ALBUQUERQUE, NEW MEXICO

PUMP STATION NO. 34 NORTH EDITH OPERATIONS MANUAL

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The technical material and data contained in the Operations Manual were prepared under the supervision and direction of the undersigned, whose seal as a Professional Engineer, licensed to practice in the State of New Mexico, is affixed below.

DISCLAIMER

All information pertaining to the stormwater pump station equipment and mode of operation is based on information relevant at the time this manual was prepared. Information will be subject to change as equipment is up graded and replaced in the future. We recommend the Owner update the information contained in this manual as improvements occur so this manual can continue to serve as a useful tool to the operations staff.

(SEAL)

Kenneth R. Muller, P.E. N.M.P.E. No. 12548

All questions about the meaning or intent of these documents shall be submitted only to the Engineer of Record, stated above, in writing.

OPERATIONS MANUAL
FOR THE
CITY OF ALBUQUERQUE STORMWATER PUMP STATION NO. 34 NORTH EDITH

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LIST OF ACRONYMS AND ABBREVIATIONS

3P	Three Phase
A	Ampere
ABCWUA	Albuquerque Bernalillo County Water Utility Authority
AC	Alternating Current
AC/hr	Air Changes per hour
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
AWG	American Wire Gauge
BSCP	Bar Screen Control Panel
CAS	Control and Status (pump relay)
CFM	Cubic feet per minute
CP	Control Panel
CT	Control Transformer
CV	Check Valve
DB	dry bulb
DC	Direct Current
FVNR	Full Voltage Non-Reversing (Motor Starter)
FVR	Full Voltage Reversing (Motor Starter)
GF	Ground Fault
GND	Ground
gpm	gallons per minute
HMI	Human-machine interface (screen and keyboard)
H-O-A	hand-off- automatic
HP	horsepower
HVAC	Heating, Ventilation, and Air Conditioning
Hz	Hertz (cycles per second)
ICP	Integrated control panel
IM	isolation means
IMP	Impedance
JB	junction box
kcmil	thousand circular mils (area of conductor)
kV	Kilovolt
kVA	Kilo volt-ampere
kW	kilowatt
kWH	Kilowatt Hour (meter)
LE	Level Element
LIT	Level Indicator Transmitter
LOA	Local-Off-Auto
LOR	Local-Off-Remote
LOTO	lock-out-tag-out
LPCP	Lift Pump Control Panel
LSCP	Lift Station Control Panel
LS	Level Switch

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

mA	Milliampere
MCB	Main Circuit Breaker
MCC	Motor Control Center
mg/L	milligrams per liter
MGD	million gallons per day
MLO	Main Lug Only
MV	Medium Voltage
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPSH	Net Positive Suction Head
O&M	Operation and Maintenance
OC	open-close
OCA	open-close-automatic
OIP	operator interface panel
OIS	operator interface station (screen and keyboard)
OL	Overload
OSE	Office of the State Engineer
P	Pump
P&ID	process and instrumentation diagram
PFCC	Power Factor Correction Capacitor
PLC	programmable logic controller
PMH-9	Model of Primary Voltage Switchgear Manufactured by S&C Electric
PNM	Public Service Company of New Mexico
PPE	personal protection equipment
PRV	pressure relief valve
psi	pounds per square inch
PT/CT	Potential (voltage) transformer/current transformer
PT	power transformer
RCP	reinforced concrete pipe
RMC	Rigid Metal Conduit
ROF	Reverse-Off-Forward
RPM	revolutions per minute
RTU	radio telemetry unit
RVPW	reduced voltage part winding
RVSS	reduced voltage solid state starter
SCADA	supervisory control and data acquisition
SLCP	Station Level Control Panel
SMP	Standard Maintenance Procedure
SOJP	Standard Operation Job Procedure
SPCP	Sump Pump Control Panel
sq.ft.	square feet
SS	stainless steel
SSCP	Stepped Speed Contactor Panel

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

SWRP	Southside Water Reclamation Plant
TDH	total dynamic head
UPS	Uninterruptible Power Supply
V	Volts
V	Valve
VDC	Volts Direct Current
VFD	variable frequency drive
WB	Wet Bulb
WC	Water column
WUA	Water Utility Authority
WUA-AMP	Water Utility Authority Asset Management Program
WWTP	Wastewater Treatment Plant
XFMR	Transformer

1.0 INTRODUCTION

This Operations Manual refers exclusively to the existing stormwater pump station facilities for Pump Station No. 34 North Edith. Refer to Section 1.3 for a description of existing facilities. The intent of this manual is to inform the operator of how each component operates and to serve as a reference for performing particular tasks. The intent of this manual is achieved by addressing three (3) areas of operation: Operations & Maintenance (O&M); Overview, Standard Operating Job Procedure (SOJPs); and Standard Maintenance Procedures (SMPs). This manual is written with the assumption that the operator reading it has more than just a basic understanding of storm drainage systems and stormwater pump stations in general and is not intended to be used as an education publication.

1.1 Guide to the Manual

1.1.1 Section Organization

The information presented in this manual for the three (3) areas of operation is organized into nine (9) major sections. Each section includes specific information that pertains to the section title. Although each section contains valuable information necessary for efficient, orderly, and safe operations of the facilities, certain sections cover the technical operations of the facility and contain detailed instructions on how the pump station should be operated.

There is some variation, but most of the sections listed above are broken down into subsections under the following headings:

- Overview
- Equipment Description
- Design Criteria
- Instrumentation and Alarms
- Normal Operation
- Safety: Information Unique to the System or Process

1.1.2 Section Headings

The text of this manual is prepared using a sequence numbering system for all of the headings and components (figure numbers, table numbers, and page numbers). The first number denotes the start of a section. The second number denotes the start of a subsection. The third number denotes the headings or the component of each subsection. Some sections that appear in this manual may have a fourth division. For example, 4.1.4 refers to the normal operations for the mechanical barscreen in Section 4 – Pump Station System.

This section would be located under Section 4 – Pump Station System, Subsection 4.1 – Mechanical Bar Screen, Heading 4.1.4 – Normal Operation.

Tables, page numbers, and figures are presented using a similar numbering system. The first number indicates the section where the figure, table, or page can be found. The second number is separated from the first number by a dash and indicates the order of the figures, table, or page in the appropriate section.

To minimize repetition, many systems are cross-referenced throughout the text to show the interrelationship between the various units. Where possible, discussions concerning identical or similar equipment installed at different locations are kept as similar as possible to provide the personnel with a routine, which can be used at all of the involved locations.

1.2 City-Wide Stormwater Pumping System Description

The City of Albuquerque stormwater pump stations are located mostly in low areas of the Valley, with three (3) stations, Nos. 31, 35, and 36, designed to discharge into the North Diversion Channel, and are used to collect and pump stormwater runoff and prevent or mitigate the impact of flooding; three (3) stations, Nos. 30, 44, and 47, are located outside of the City limits in unincorporated Bernalillo County. A map of all fourteen (14) pump stations is presented in Figure 1-1. Please note station No. 42 Paseo Del Norte has been decommissioned, but is shown in Figure 1-1.

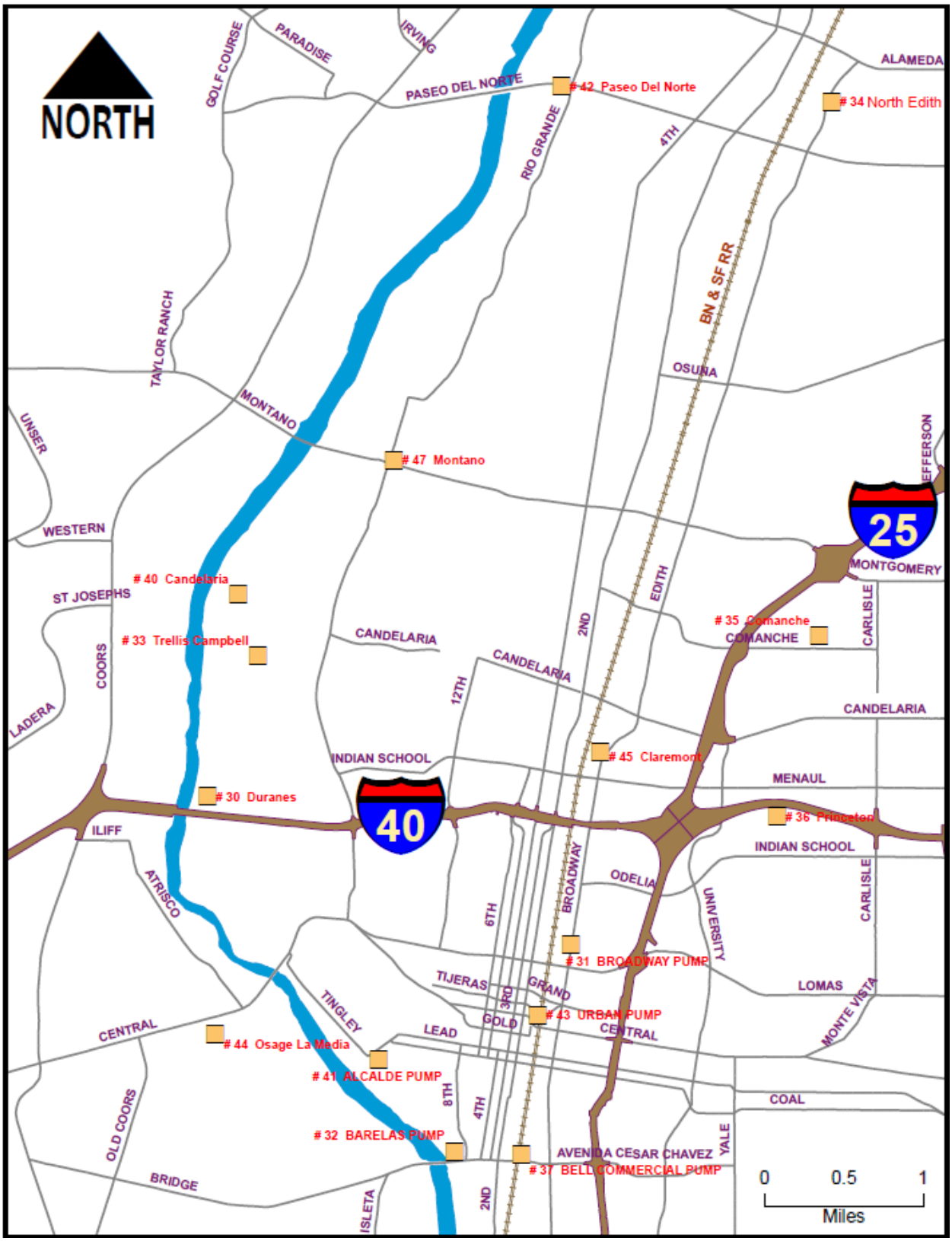


FIGURE 1-1
STORMWATER PUMP STATIONS MAP
Source: City of Albuquerque, DMD, SDD

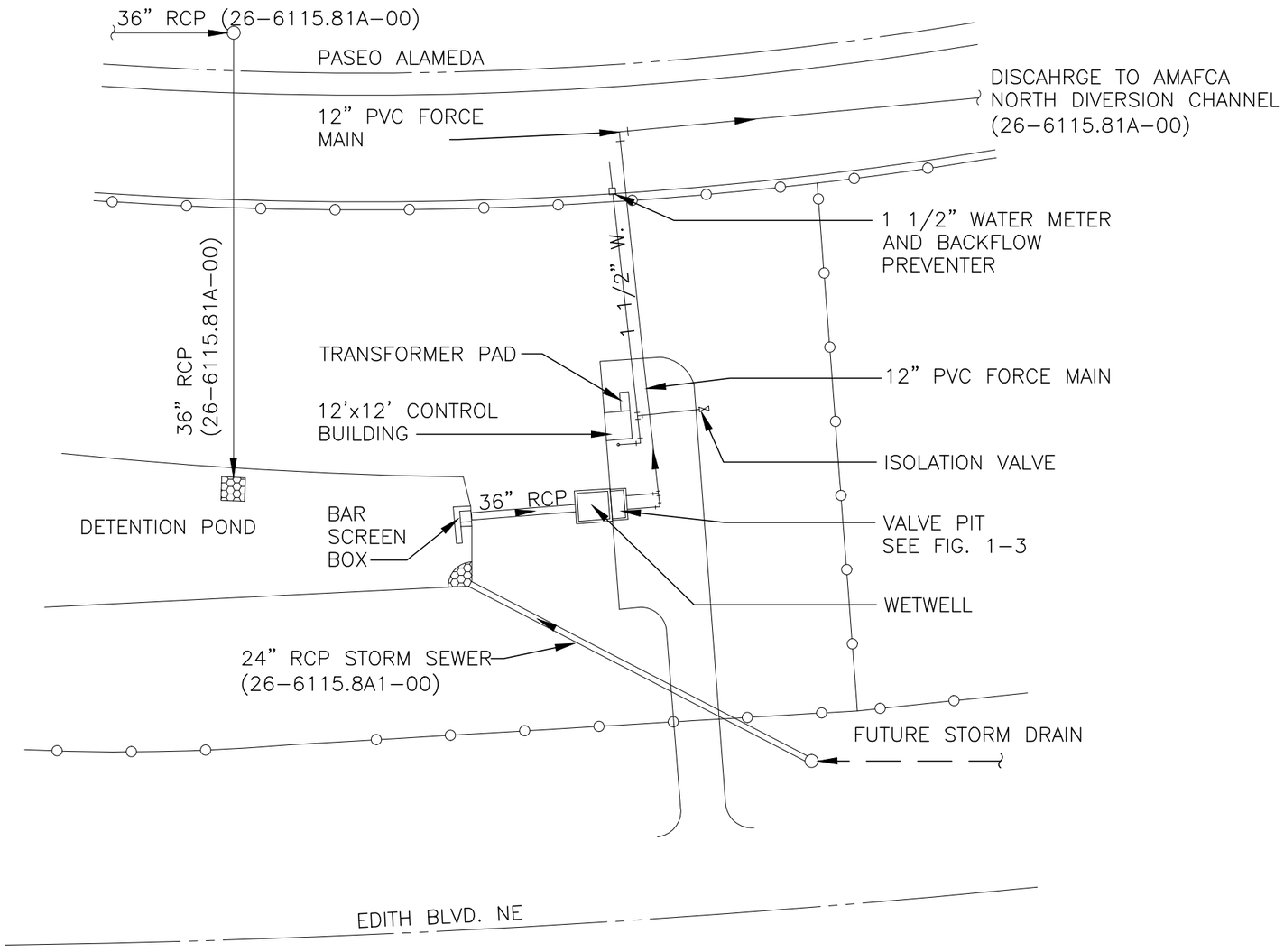
The stormwater pump stations are owned by the City of Albuquerque (COA) and are administered by the Albuquerque Department of Municipal Development (DMD), Engineering Division, Storm Drain Design (SDD). Through an agreement between the City and the Albuquerque Bernalillo County Water Utility Authority (ABCWUA), the ABCWUA Field Operations Department, Line Maintenance/ Lift Station Section operate and maintain the stormwater pump stations, along with their other duties to operate and maintain the wastewater vacuum and lift stations.

1.3 General Description of Stormwater Pump Station No. 34 North Edith

Pump Station No. 34 North Edith is located on the east side of Edith Boulevard NE, roughly 250 feet south of the three-way intersection of Edith Boulevard and Lemmons Lane NE, shown in Figure 1-1. The address is 8531 Edith Boulevard NE, and it is located in zoning map grid C-16. It was constructed in 2000 and receives runoff from the surrounding neighborhood.

The drainage area is primarily stormwater from Alameda Business Park, but there is also an overflow pipe from the Alameda Ditch to the west that feeds into the station's 3.1 million gallon detention pond. The full flow capacity of the inlet pipe from the business park, assuming an empty pond, is approximately 51,000 gallons per minute (gpm) into the detention pond. In a surcharge condition, where the pond and upstream street are flooded, the pipe capacity is approximately 129,000 gpm, as discussed in Section 3.1.1. The station is serviced by two (2) 90 HP submersible pumps, which discharge through a force main into the AMAFCA North Diversion Channel to the east.

A site and base plan of the pump station is provided in Figure 1-2 and Figure 1-3, respectively. Additionally, reference section drawings from previous construction projects at the North Edith Station are provided in Figures 1-4 and 1-5. Reference drawings are for information only and may not be representative of existing conditions.



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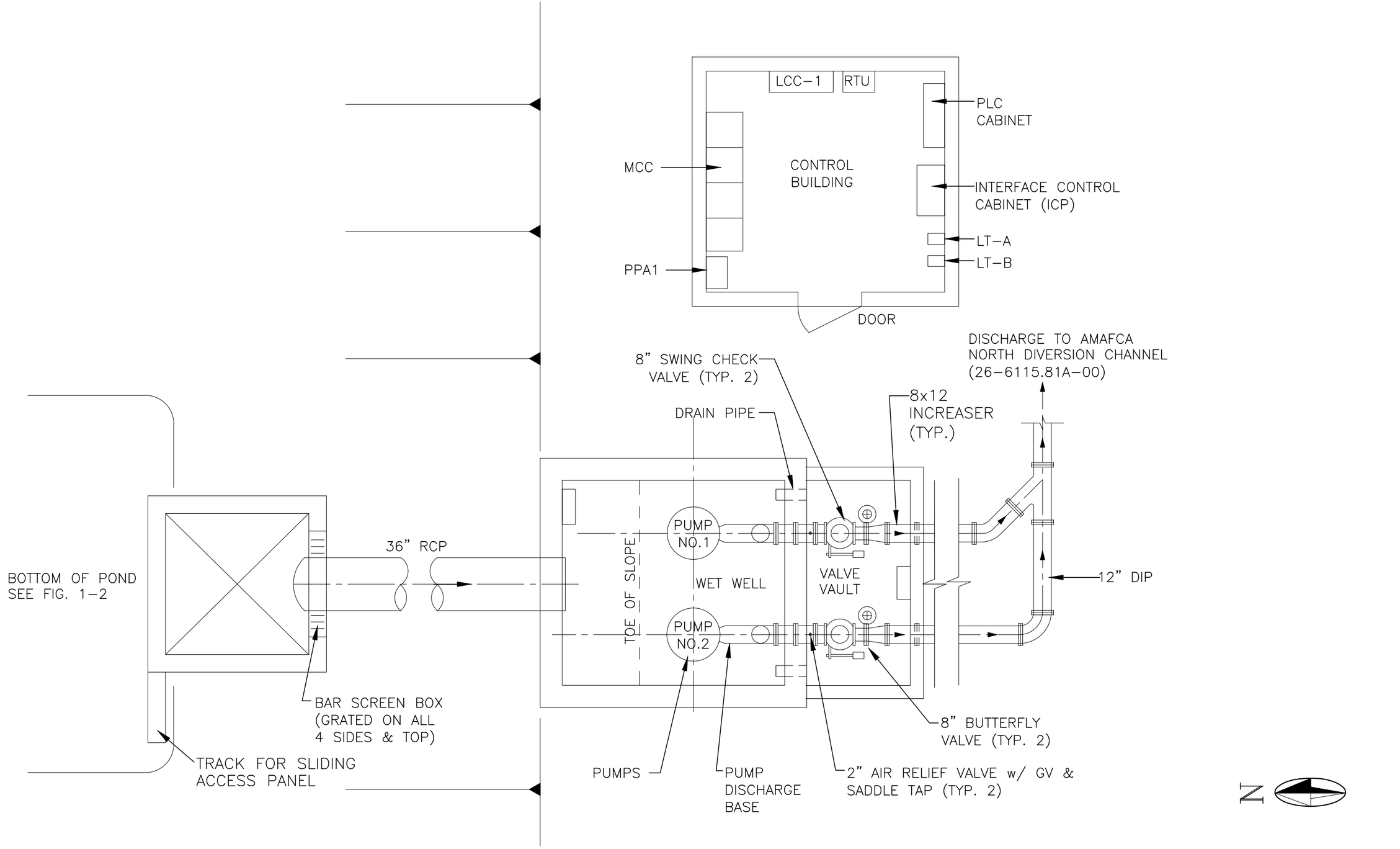
City Of Albuquerque Stormwater Pump Stations

Pump Station No. 34 North Edith Site Plan

Figure 1-2



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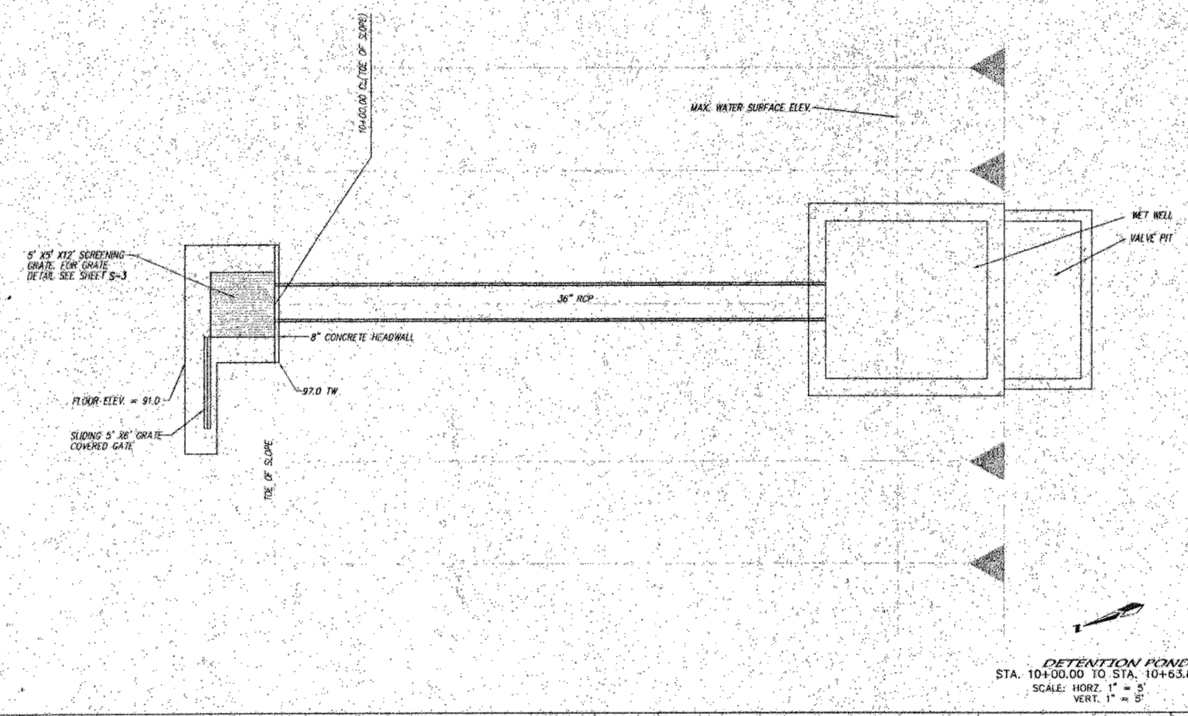
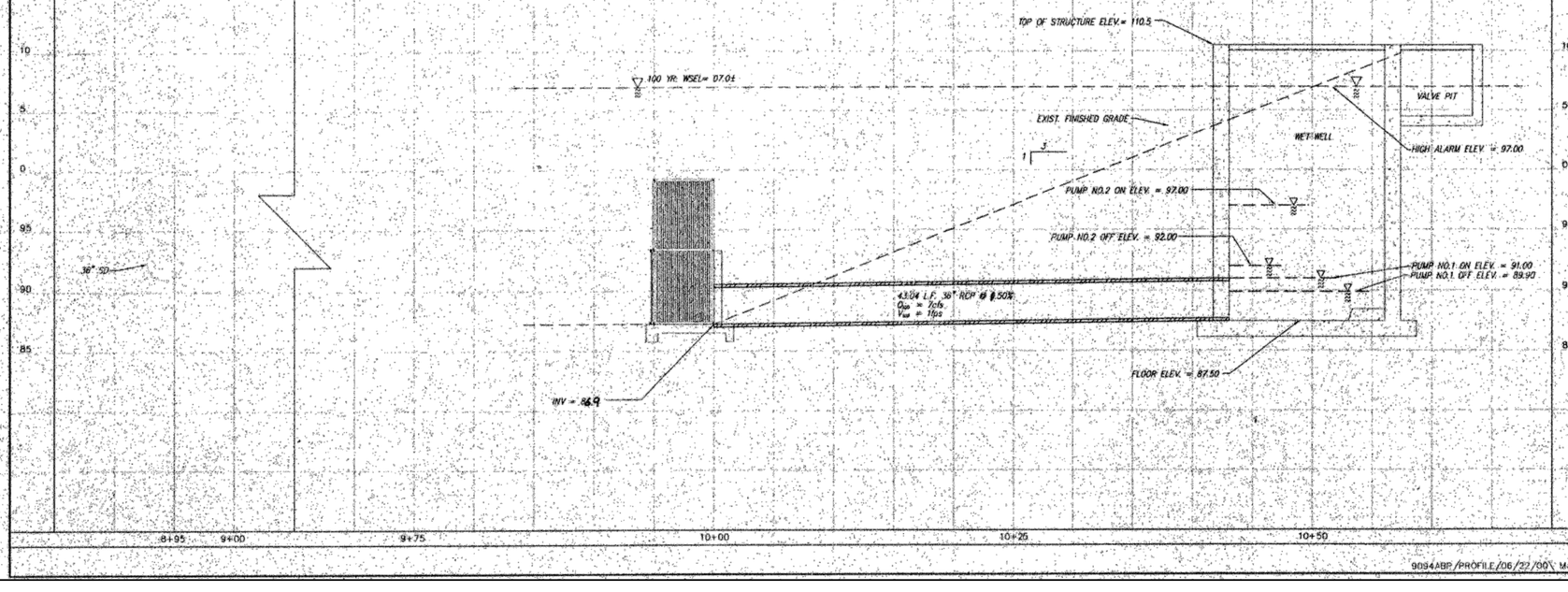
City Of Albuquerque Stormwater Pump Stations

Pump Station No. 34 North Edith Base Plan

Figure 1-3



DETENTION POND
STA. 10+00.00 TO STA. 10+63.84
SCALE: HORZ. 1" = 5'
VERT. 1" = 5'



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NOTES

NO.	BY	DATE	REVISIONS
			AS BUILT GRADING
			AS BUILT
			RECORD DRAWINGS

DESIGNED BY: JDH
DRAWN BY: KJS
CHECKED BY: DMS
DATE: 2/20
DATE: 2/20
DATE: 2/20

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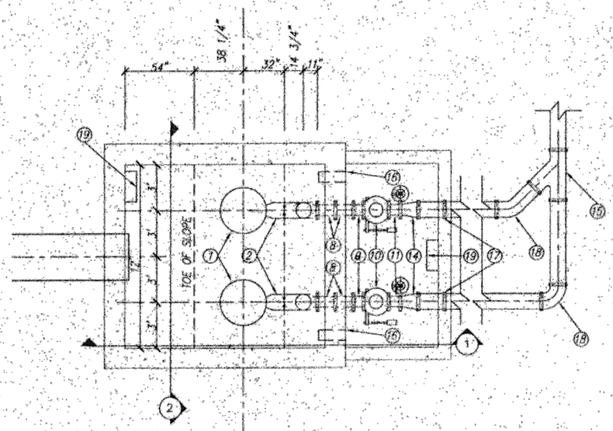
CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING DEVELOPMENT GROUP

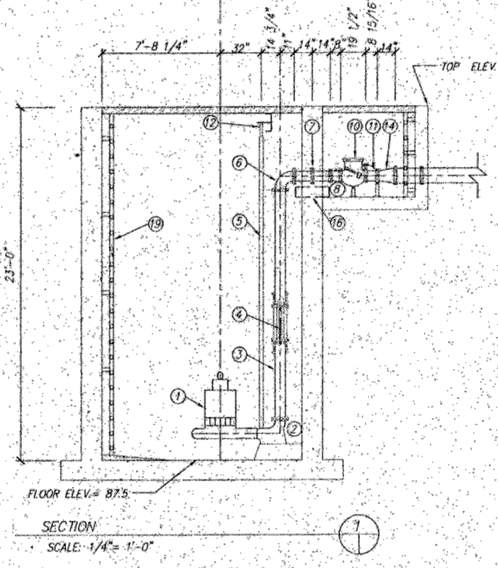
TITLE: ALAMEDA BUSINESS PARK LIFT STATION
PUMP STATION
PLAN AND PROFILE PLAN

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	NO.	DATE	NO.	DATE
OCT 2 0 2000	OCT 2 1 2000				
REVISIONS MUST BE APPROVED BY DRC	CITY ENGINEER				

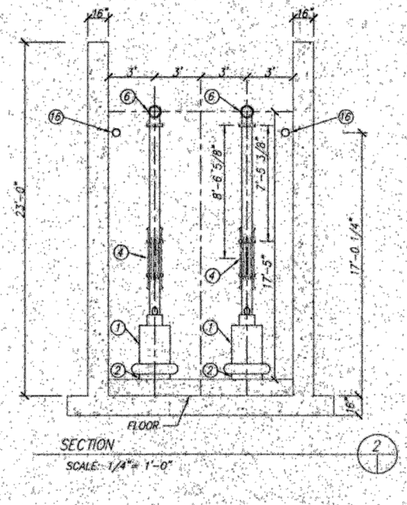
CITY PROJECT NO.	ZONE MAP NO.	SHEET	OF
6115.92	C-16	M-1	



LIFT STATION PLAN VIEW
SCALE: 1/4"= 1'-0"



SECTION
SCALE: 1/4"= 1'-0"



SECTION
SCALE: 1/4"= 1'-0"

NOTES

PLUMBING SCHEDULE

1. FLYGT 3231/605 90 hp-460V
2. PUMP DISCHARGE BASE (8")
3. 8" D.I. PIPE FL X PE
4. 8" RESTRAINED DRESSER COUPLING
5. 3" GUIDE BARS AS PER PUMP MANUFACTURER
6. 8"-90° BEND W/FLANGED JOINTS
7. 8" D.I. WALL PIPE-FLANGED-CAST IN WALL
8. 8" D.I.PIPE-FLANGED
10. 8" CHECK VALVE-FLANGED
11. 8" BUTTERFLY VALVE-FLANGED
12. 8" GUIDE BAR SUPPORT-BRACKETS
13. 36" RCP
14. 8" X 12" D.I. REDUCER
15. 12" X 12" WYE
16. 8" DIA. X 20" LONG DRAIN PIPE THROUGH WALL
17. 12" D.I. WALL PIPE-FLANGED-CAST IN WALL
18. 12"-90° BEND
19. LADDER

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CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING DEVELOPMENT GROUP

TITLE: ALAMEDA BUSINESS PARK LIFTSTATION
PUMP STATION PLUMBING, SECTIONS AND SCHEDULE

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	NO./DATE	NO./DATE
DEC 7 2001	DEC 1 2001 CITY ENGINEER		

CITY PROJECT NO.	ZONE MAP NO.	SHEET OF
6115.82	C-16	M-2

9094ABP/DETAILS/04/26/00

2.0 STANDARDS

This section provides a brief description of the standards applicable to this pump station and identifies the governing regulations which dictate the level of standards recommended for design and installation.

2.1 Water Resource Standards

The stormwater pumps are recommended to be designed and installed to meet the following standards by the American National Standard Institute/ Hydraulic Institute (ANSI-HI):

- ANSI/HI 1.3 Rotodynamic (Centrifugal) Pumps for Design and Application
- ANSI/HI 2.3 Rotodynamic (Vertical) Pumps for Design and Application
- ANSI/HI 9.6.4 Rotodynamic Pumps for Vibration Measurement and Allowable Values
- ANSI/HI 9.8 Intake Design for Rotodynamic Pumps**.**
- ANSI/HI 14.6 Rotodynamic Pumps for Hydraulic Performance Acceptance Tests

2.2 Electrical Standards

The Electrical systems are recommended to be designed and installed to meet the following standards: 2012 National Fire Protection Association (NFPA) – National Fire Code, NFPA 70 – National Electrical Code, NFPA 70B – Recommended Practices for Electrical Equipment Maintenance, NFPA 70E – Standard for Electrical Safety in the Workplace, NFPA 110 – Standard for Emergency and Standby Power Systems, and New Mexico Electrical Code (14.10.4.) Title 14 – Housing and Construction, Chapter 10.

Also, the Electrical design is to comply with the recommended practices of the following organizations:

- NEMA – National Electrical Manufacturer's Association
- UL – Underwriters Laboratories
- IEEE – Institute of Electrical and Electronics Engineers

2.3 HVAC Standards

The HVAC systems are recommended to be designed and installed to meet the following standards: 2009 International Building Code, 2009 Uniform Mechanical Code, 2009 International Energy Conservation Code, and the National Fire Code. Special attention is focused on 2012 National Fire Protection Association (NFPA) 820, Recommended Practice for Fire Protection in Wastewater Treatment Plants.

Also, the HVAC design and installation is to comply with the recommended practices of the following organizations:

- ASHRAE Standard 62.1-2010 Ventilation for Acceptable Indoor Air Quality
- American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
- Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
- Air Moving and Conditioning Association (AMCA)
- Associated Air Balance Council (AABC)

2.3.1 HVAC Standard Description

2009 Uniform Mechanical Code – The Uniform Mechanical Code provides requirements for the installation and maintenance of heating, ventilating, cooling, and refrigeration systems.

2009 International Energy Conservation Code – The International Energy Conservation Code is a model code that regulates the minimum energy conservation requirements for all aspects of energy use in facilities heating and ventilating systems.

2012 National Fire Protection Association (NFPA) 820, Recommended Practice for Fire Protection in Wastewater Treatment Plants – This standard establishes the minimum requirements for protection against fire and explosion hazards in waste water treatment plants or collections systems such as storm sewers.

American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) – ASHRAE is the world's foremost technical society in the fields of heating, ventilation, air conditioning, and refrigeration.

Sheet Metal and Air Conditioning Contractors National Association (SMACNA) – SMACNA standards address all facets of the sheet metal industry, from duct construction and installation to air pollution control, and from energy recovery to roofing.

Air Moving and Conditioning Association (AMCA) – The Air Moving and Control Association is a non-profit association of air system equipment manufacturers – primarily fans, louvers, dampers, and air curtains used in commercial or industrial buildings.

Associated Air Balance Council (AABC) – The Associated Air Balance Council establishes industry standards for the field measurement and documentation of HVAC systems.

ASHRAE Standard 62.1-2010 Ventilation for Acceptable Indoor Air Quality – ASHRAE 62.1 standard specifies the minimum ventilation rates and measures intended to provide indoor air quality that is acceptable to human occupants.

3.0 DESIGN CRITERIA

This section provides a brief description of the criteria applicable to this pump station.

3.1 Water Resources Design Criteria

3.1.1 Inlet Pipe Capacity and Local Storage Volume

The station wet well is fed by 43-feet of 36-inch reinforced concrete pipe (RCP) draining a small detention pond. From the construction plans, this pipe has a design capacity of 7 cfs or 3,140 gpm. The detention pond inlet pipe is a 36-inch RCP storm drain at an uphill slope of 0.03 feet per foot. The full flow capacity of the detention pond storm drain inlet pipe, assuming the pond is empty, is approximately 51,140 gpm. In a surcharge condition, assuming the pond is full with 2-feet freeboard (at the design 100-year elevation) and the upstream street is flooded, the inlet pipe capacity is approximately 129,000 gpm.

The station wet well and adjacent detention pond combine to provide a local equalization volume for larger flood events. If it is assumed that the station and pond are flooded to the design 100-year water surface elevation (5,007 feet above mean sea level), the local storage volume can be estimated to be 12.0 acre-feet (4.0 million gallons).

3.1.2 Lift Pumps

The station operates using any combination of the two (2) wet well installed Flygt submersible pumps. Both pumps are Model 3231 with 420-mm, 605-type impellers. The pumps are driven by integral 90 horsepower, 1,185 RPM full speed motors that run on 460-volt, 3-phase power. The individual 8-inch discharge pipes are equipped with swing-disk check and butterfly isolation valves, as well as a 2-inch air relief valve. The discharge pipes combine into a common, below-grade 12-inch discharge pipe outside the valve vault that runs approximately 2,000 linear feet before discharging into the AMAFCA North Diversion Channel.

Each pump is designed to deliver approximately 2,500 gpm at 85 feet total dynamic head (TDH). However, because of their combined discharge configuration and relatively long discharge pipe, the peak capacity of the pumps is an estimated 3,700 gpm at 97 feet of TDH. Refer to Appendix C for manufacturer's pump curve and data and estimated system hydraulics.

The manufacturer's pump curve indicates that the pumps require approximately 11 feet of net positive suction head (NPSH) when running at the design flow to prevent cavitation. When cavitation occurs, the pump runs noisily and sounds as if it were pumping marbles. Prolonged cavitation will result in pitting of the impeller and volute. Stormwater pumping periods tend to be brief, and some cavitation is tolerable over the life of the pump.

At station elevation, the available NPSH is greater than the required quantity. Therefore, the pumps are capable of pulling approximately 13.7 feet of suction lift. That is, the pumps could pull water through suction piping from a wet well at a lower elevation with a water level approximately 13.7 feet below the elevation of the impeller. However, Flygt recommends that the water surface never fall below the top of the volute during normal operation in this type of application.

The pumps are installed in Flygt's "P" configuration, which indicates that the pump has a vertical discharge riser, no suction piping, and is submerged under normal operating conditions.

3.1.3 Manual Bar Screen Cage

The 36-inch RCP inlet pipe is screened by a 6-foot square by 10-foot tall bar screen cage that requires manual cleaning. The cage is constructed with a sliding door to allow for inlet pipe maintenance and interior maintenance of the screen.

3.2 Electrical Design Criteria

3.2.1 Electrical Service

The station power is fed 480V from a 12,470V to 480V pad mounted transformer. Transformer output is connected through a service meter to the main circuit breaker (MCB) in the station Motor Control Center (MCC).

3.2.2 Electrical Low Voltage

Low voltage power is distributed from the MCC to the lift pumps, an electric unit heater, and via a 480V to 120/208V transformer to the station panelboard. The MCC also houses a circuit breaker for connection of a standby generator.

3.2.3 Controls

The lift pumps are controlled by the Lift Station Control Panel (LSCP) which is a programmable logic controller type control panel. An interface control cabinet adjacent to the LSCP, houses control and status relays for the lift pumps. The LSCP receives level inputs from level transmitters suspended in the wet well. The LSCP has an operator interface panel for controlling station operations and displaying station status and alarm messages.

3.3 HVAC Design Criteria

3.3.1 Outdoor Design

Outdoor Design conditions as follows:

Outside Summer: 96 °F DB / 60 °F WB

Outside Winter: 16 °F DB

3.3.2 Indoor Design

Indoor design conditions vary, depending on the occupancies of the areas served. Table 3-1 lists the indoor design conditions, as well as the code required ventilation rates. The ventilation rates for spaces are as required by NFPA 820 or ASHRAE 62.1. These rates are expressed in air changes per hour (AC/hr). This corresponds to the flow of fresh, outdoor air that is required to be supplied to the spaces.

TABLE 3-1
INDOOR HVAC DESIGN CRITERIA

Facility	Area	Min Indoor Design Temperature (°F)	Max Indoor Design Temperature (°F)	Ventilation Rate (Outdoor Air) (AC/hr)	Source/Reason for Ventilation Rate
North Edith – Pump Station No. 34	Wet Well	Ambient	Ambient	Not Required	NFPA 820
	Control Room	55	90	Not Required	ASHRAE 62.1

4.0 PUMP STATION SYSTEM

This section provides a brief description of the different components of the stormwater pump station shown in Figure 1-2, including an overview of each process, equipment description, instrumentation and alarms, and safety information unique to the system or process. This section is supplemented with photos and diagrams of the processes at this pump station. The process and instrumentation diagram for the station is shown in Section 7.

4.1 Bar Screen Cage

4.1.1 Overview

Stormwater enters the pump station through a 6-foot by 6-foot by 10-foot (LxWxH) manual bar screen cage by Hydro-Gate (Figure 4-1). The cage is situated over the station intake piping in the middle of a detention pond adjacent to the pump station.

FIGURE 4-1
BAR SCREEN CAGE

4.1.2 Equipment Description

The bar screen cage sits on top of a reinforced concrete pad and screens the 36-inch inlet RCP. The cage is equipped with a sliding door to allow for maintenance of the inlet pipe and interior of the cage. The bar screen cage is not tagged with a Water Utility Authority Asset Management Program Equipment Tag. A tag number was prescribed to the bar screen cage to aid in identification. The tag number is listed below in Table 4-1 and shown on Figure 34-1 in Section 7 to provide clarity.

TABLE 4-1
EQUIPMENT INFORMATION

Equipment No.	Asset Info	Classification Type	Classification
U53420	Station	Bar Screen	Unit

4.1.3 Instrumentation and Alarms

There is neither instrumentation nor alarms associated with the bar screen cage.

4.1.4 Normal Operation

During normal operation, the bar screen cage may be inaccessible because it is either completely or partially submerged in stormwater. It is a passive system, but requires maintenance to operate properly.

4.1.5 Safety: Information Unique to the System or Process

Refer to Section 9 for general safety guidelines. Additional safety guidelines for performing work in confined spaces are detailed in Appendix F.

4.2 Lift Pumps

4.2.1 Overview

After passing through the inlet structure, stormwater enters the wet well. Stormwater level is monitored by an Ametek Drexelbrook Universal III level transmitter with fixed-probe type sensing elements and an additional sensor for redundancy. There is also a Flygt ENM-10 float switch that trips a high water level alarm. The two (2) lift pumps cycle on and off in lead/lag/alternate sequence according to the level in the wet well (Figure 4-2). The lift pumps run at a constant speed.

4.2.2 Equipment Description

Stormwater is pumped by any combination of the two (2) submersible lift pumps. Both pumps are Flygt Model 3231 with 420-mm, 605-type impellers. The integral motors are 90 horsepower (HP) running at 1,185 full speed revolutions per minute (RPM) using 460V, 3-phase power. The pumps are individually rated for 2,350 gallons per minute at 85 feet of total dynamic head. The combined station capacity is approximately 3,700 gpm. The pumps are installed in Flygt's "P" configuration, which indicates that the pumps have a vertical discharge riser, no suction piping, and are submerged under normal operating conditions.

The pumps at this station are not tagged with Water Utility Authority Asset Management Program Equipment Tags. Tag numbers were prescribed to the pumps to aid in identification. The Equipment Tag numbers are listed below in Table 4-2 and shown on Figure 34-1 in Section 7 to provide clarity.

TABLE 4-2
EQUIPMENT INFORMATION

Equipment No.	Asset Info	Classification Type	Classification
P53401	Station	Lift Pump No. 1 (East)	Pump
P53402	Station	Lift Pump No. 2 (West)	Pump

FIGURE 4-2
WET WELL AND LIFT PUMPS

4.2.3 Instrumentation and Alarms

The wet well level signal is connected to the Lift Station Control Panel.

Alarms connected to telemetry include:

- Lift Pump 1 Run
- Lift Pump 2 Run
- Lift Pump 1 Fail
- Lift Pump 2 Fail
- High Wet Well Level

4.2.4 Normal Operation

The lift pump start is initiated by one (1) of two (2) redundant probe-type level sensor/ transmitters located in the wet well. The pumps lift water from the wet well to a 12-inch discharge pipe that discharges into the North Diversion Channel. Once the wet well level drops below a specific depth, the pumps will cease to operate and excess water will flow back into the detention pond.

4.2.5 Safety: Information Unique to the System or Process

Refer to Section 9 for general safety guidelines.

4.3 Valve Vault

4.3.1 Overview

As stormwater is pumped from the wet well, it is conveyed in discharge piping through the valve vault. The valve vault contains individual check, isolation, and air relief valves for each lift pump. Check valves prevent backflow from the force main through the inactive pump(s) into the detention pond, while isolation valves allow individual pumps and check valves to be isolated for

maintenance or replacement. Air relief valves allow excess air to be dispelled from the system during start-up and also facilitate air reentry through their suction piping during shut down. These valves sometimes discharge excess water onto the floor of the valve vault during start-up. The valve vault is fitted with drains that are connected to the wet well.

4.3.2 Equipment Description

The discharge from each lift pump flows past a 2-inch air relief valve, then through an 8-inch swing-type lever and spring check valve, and an 8-inch butterfly isolation valve (Figure 4-3). Both pumps feed a single 12-inch discharge pipe, which daylights into the North Diversion Channel. The valves at this station are not tagged with Water Utility Authority Asset Management Program Equipment Tags. Tag numbers were prescribed to the valves to aid in identification. The valve tag numbers are listed below in Table 4-3 and shown on Figure 34-1 in Section 7 to provide clarity.

TABLE 4-3
EQUIPMENT INFORMATION

Equipment No.	Asset Info	Classification Type	Classification
CV53401	Station	Lift Pump Check Valve (East)	Check Valve
CV53402	Station	Lift Pump Check Valve (West)	Check Valve
PRV53401	Station	Lift Pump Air Relief Valve (East)	Pressure Relief Valve
PRV53402	Station	Lift Pump Air Relief Valve (West)	Pressure Relief Valve
V53401	Station	Lift Pump Isolation Valve (East)	Isolation Valve
V53402	Station	Lift Pump Isolation Valve (West)	Isolation Valve

4.3.3 Instrumentation and Alarms

The check valves are equipped with an electronic limit switch that monitors the valve position.

FIGURE 4-3
VALVE VAULT

4.3.4 Normal Operation

Valve positions during normal operation are as follows:

IN SERVICE – Lift Pump No. 1 air relief valve **PRV 53401**

IN SERVICE – Lift Pump No. 2 air relief valve **PRV 53402**

IN SERVICE – Lift Pump No. 1 check valve **CV53401**

IN SERVICE – Lift Pump No. 2 check valve **CV53401**

OPEN – Isolation valve for air relief valve No. 1

OPEN – Isolation valve for air relief valve No. 2

OPEN – Lift Pump No. 1 butterfly isolation valve **V53401**

OPEN – Lift Pump No. 2 butterfly isolation valve **V53402**

4.3.5 Safety: Information Unique to the System or Process

Refer to Section 9 for general safety guidelines. Additional safety guidelines for performing work in confined spaces are detailed in Appendix F.

5.0 ELECTRICAL SYSTEM

This section provides a brief description of the electrical system at this pump station. Refer to Figure 5-1 for Electrical One-Line Diagram and Figure 5-2 for Electrical Site Plan.

5.1 Electrical Service

5.1.1 Overview

The pump station receives 480V, 3-phase power from a pad mounted transformer that is owned and maintained by PNM.

5.1.2 Equipment Description

The service disconnect is a 400A main circuit breaker of the station 480V MCC.

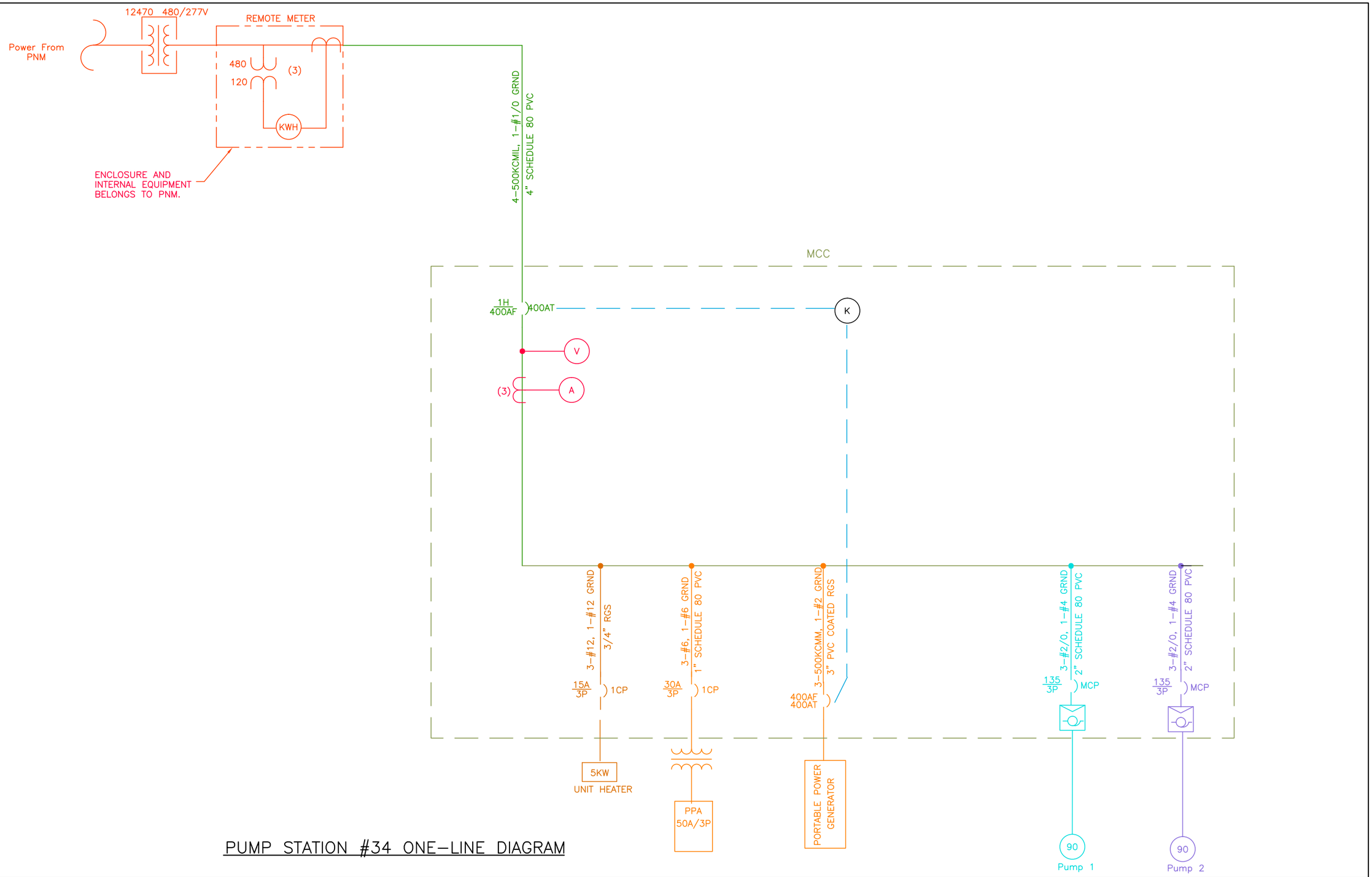
5.1.3 Controls

The Lift Station Control Panel (LSCP) is a programmable logic controller (PLC) manufactured by Yukon and Associates. Wet well level transmitters in the wet well are connected to the LSCP.

5.1.4 Normal Operation

The LSCP detects the wet well level from the level transmitters. When the Lead pump is stopped, the LSCP alternates the lead pump to lag pump. The LSCP provides the following control:

- Start Lead Pump
- Stop Lead Pump
- Start Lag Pump
- Stop Lag Pump
- Alarm



PUMP STATION #34 ONE-LINE DIAGRAM

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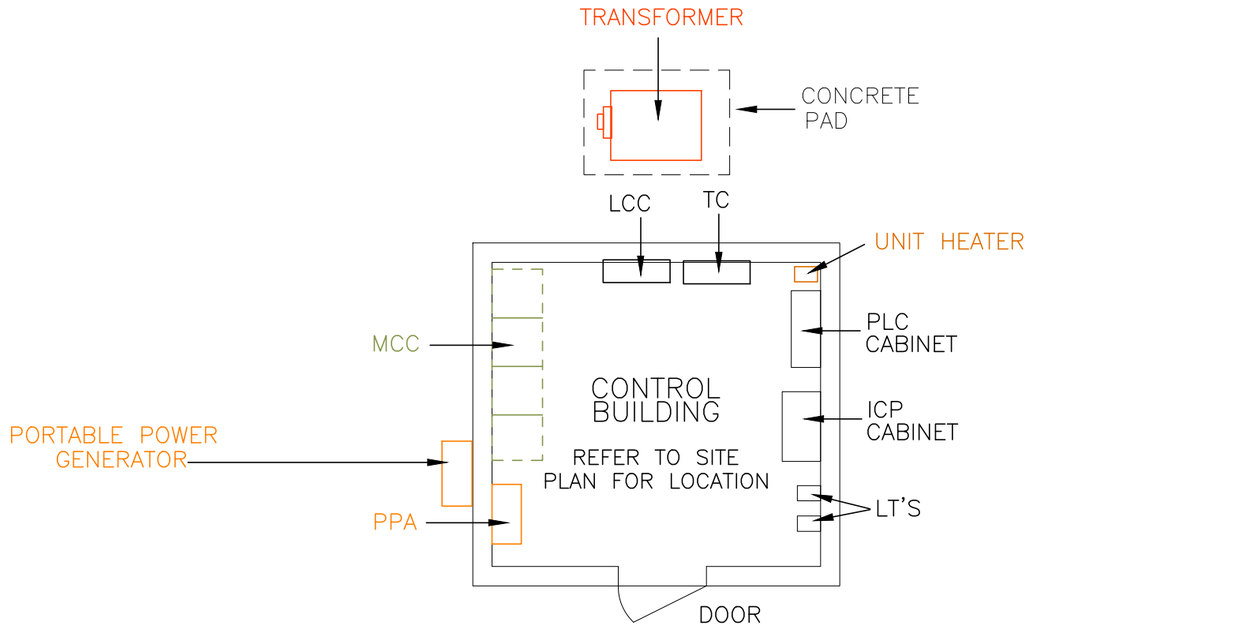
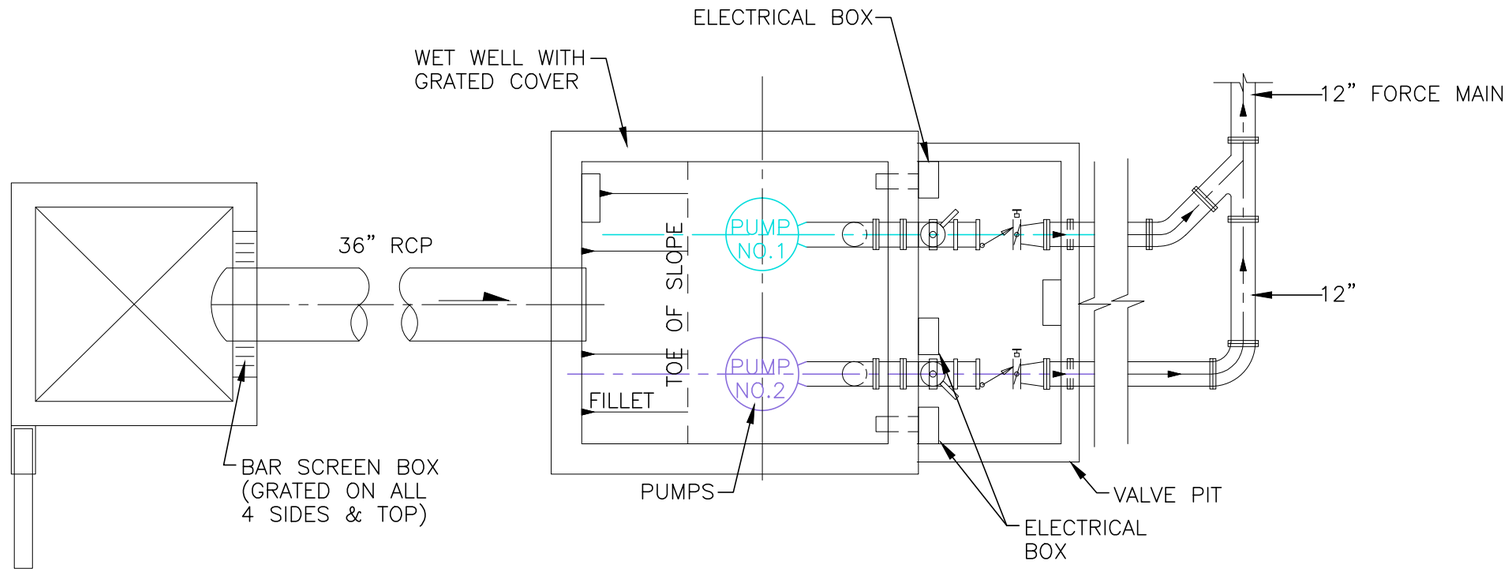
City Of Albuquerque Stormwater Pump Stations

Pump Station No. 34 North Edith Electrical One-Line Diagram

Figure 5-1





Electrical Site Plan

5.1.5 Safety: Information Unique to the System or Process

The wet well is a confined space; entry allowed only by trained personnel who are properly equipped.

5.2 480V Motor Control Center (MCC)

5.2.1 Overview

The 480V MCC serves as the station service disconnecting means. Additionally, it contains starters and circuit breakers to connect station 480V loads to the electrical service.

5.2.2 Equipment Description

The 480V MCC contains the 400A main circuit breaker (MCB) that serves as the station service disconnecting means. The MCC also houses reduced voltage solid state (RVSS) starters for the two (2) lift pumps, and circuit breakers (CB) for an electric unit heater and the station 480V to 208V transformer. Additionally, the MCC contains a 400A sub-feed circuit that serves as a connection point for a portable generator. The sub-feed CB is interlocked with the MCB to avoid paralleling a generator with the utility.

5.2.3 Controls

Controls on the lift pump starters include the starter disconnect switch, the Hand-Off-Auto (HOA) switch, and a start pushbutton. The generator circuit breaker contains a key interlock with the main circuit breaker to allow closing only one (1) at a time.

5.2.4 Normal Operation

When the LSCP calls for a pump to run, it signals to the associated starter in the 480V MCC. The starter connects the pump motor to the 480V source to start the pump.

5.2.5 Safety: Information Unique to the System or Process

The 480V MCC operates at 480V. The disconnect switches shall be operated by trained personnel; the MCC shall be serviced and maintained by trained electricians. Contact PNM to disconnect source, then lockout and tagout source before servicing the MCC.

5.3 Lift Pumps

5.3.1 Overview

The lift pumps are submersible style installed inside the wet well.

5.3.2 Equipment Description

The lift pumps are 90 HP submersible type pumps that operate at 480V. The pumps are controlled by the LSCP based on level sensors installed in the wet well.

5.3.3 Controls

Each pump has an internal temperature switch and a moisture detection switch. The internal switches are connected in the starter control circuit and a control relay connects a pump alarm.

5.3.4 Normal Operation

The LSCP receives the wet well level from the level sensors installed in the wet well. When the level rises to the start lead pump level, the LSCP starts the lead pump. If the level continues to rise, and reaches the start lag pump level, the LSCP starts the lag pump. The LSCP stops the lag pump when pumping has lowered the wet well level to open the stop lag pump level switch. The LSCP stops the lead pump then the lowest level switch opens.

5.3.5 Safety: Information Unique to the System or Process

A ladder is required for access into the wet well. The pumps are remotely controlled. Lockout and tagout source at MCC before servicing.

5.4 Lift Station Control Panel

5.4.1 Overview

The LSCP receives the wet well level signals. The LSCP energizes relays to start the lift pumps in accordance to the wet well level and the lead selections made by the operator. The LSCP relay contacts are connected to the radio transmitter to broadcast alarms to the WWTP.

5.4.2 Equipment Description

The LSCP is a PLC type control panel.

5.4.3 Controls

The LSCP has an operator interface panel for controlling station operations and displaying station status and alarm messages. The LSCP also has a reset pushbutton operators use to acknowledge and reset station alarms.

5.4.4 Normal Operation

In automatic, operation level signals are applied to the LSCP. When the level signal reaches a prescribed value, level relays are operated to start the lead pump. As the wet well level rises, the lag pump is started.

5.4.5 Safety: Information Unique to the System or Process

The control panel has voltage from more than one (1) source. Disconnect all sources before servicing. The LSCP is energized at 230V. It shall be accessed only by electricians who are trained in the operation and are equipped with proper protective gear.

6.0 HVAC SYSTEMS OPERATION

This section provides a brief description of the HVAC system at this pump station.

6.1 Exhaust Fan System

6.1.1 Overview

The exhaust fan system provides minimal ventilative cooling in the control room.

6.1.2 Equipment Description

The existing exhaust fan is roof-mounted, up-blast unit manufactured by Greenheck. The model number is G-150-BX-QD. The capacity of the exhaust fan is estimated at 2,000 cubic feet per minute.

6.1.3 Controls

The exhaust fan is activated by a line voltage thermostat.

6.1.4 Normal Operation

The line voltage thermostat in the control room should be set to a maximum temperature of 90°F. A line voltage thermostat mounted in the control room will activate the exhaust fan whenever temperatures in the control room are equal to or above 90°F. When temperatures in the control room are below 90°F, the exhaust fan will be off.

6.1.5 Safety: Information Unique to the System or Process

Ventilation is required to maintain safe working temperatures of the electrical equipment. Overheating of the electrical equipment would likely result in costly replacement or possible down time on the pumping station.

6.2 Electric Heater

6.2.1 Overview

The electric heater provides minimal heating in the control room.

6.2.2 Equipment Description

The existing electric heater is a Dayton Model 2YU70 rated at 5.0 kW, using 480V, 60Hz, 3-phase power. The heater's fan draws 0.15 amps.

6.2.3 Controls

The electric heater is activated by a line voltage thermostat.

6.2.4 Normal Operation

The line voltage thermostat in the control room should be set to a minimum temperature of 55°F. A line voltage thermostat mounted in the control room will activate an electric heater whenever temperatures in the control room are equal to or below 55°F. When temperatures in the control room are above 55°F, the electric heater will be off.

6.2.5 Safety: Information Unique to the System or Process

Heating is required to prevent freezing conditions.

7.0 STANDARD JOB OPERATING PROCEDURES

This section includes Standard Operating Job Procedures (SOJP) for the system and equipment for Pump Station No. 34 North Edith. The SOJPs provide the detailed instructions for testing each component necessary to ensure that during the summer storm season of July 1st through September 30th, the facilities will be prepared to operate. SOJPs are utility by the Albuquerque Bernalillo County Water Utility Authority (WUA) and are used as the primary means for testing the equipment within their system. If a facility appears to have an issue, the SOJP testing shall bring the issue to light and a means to promptly correctly address the issue.

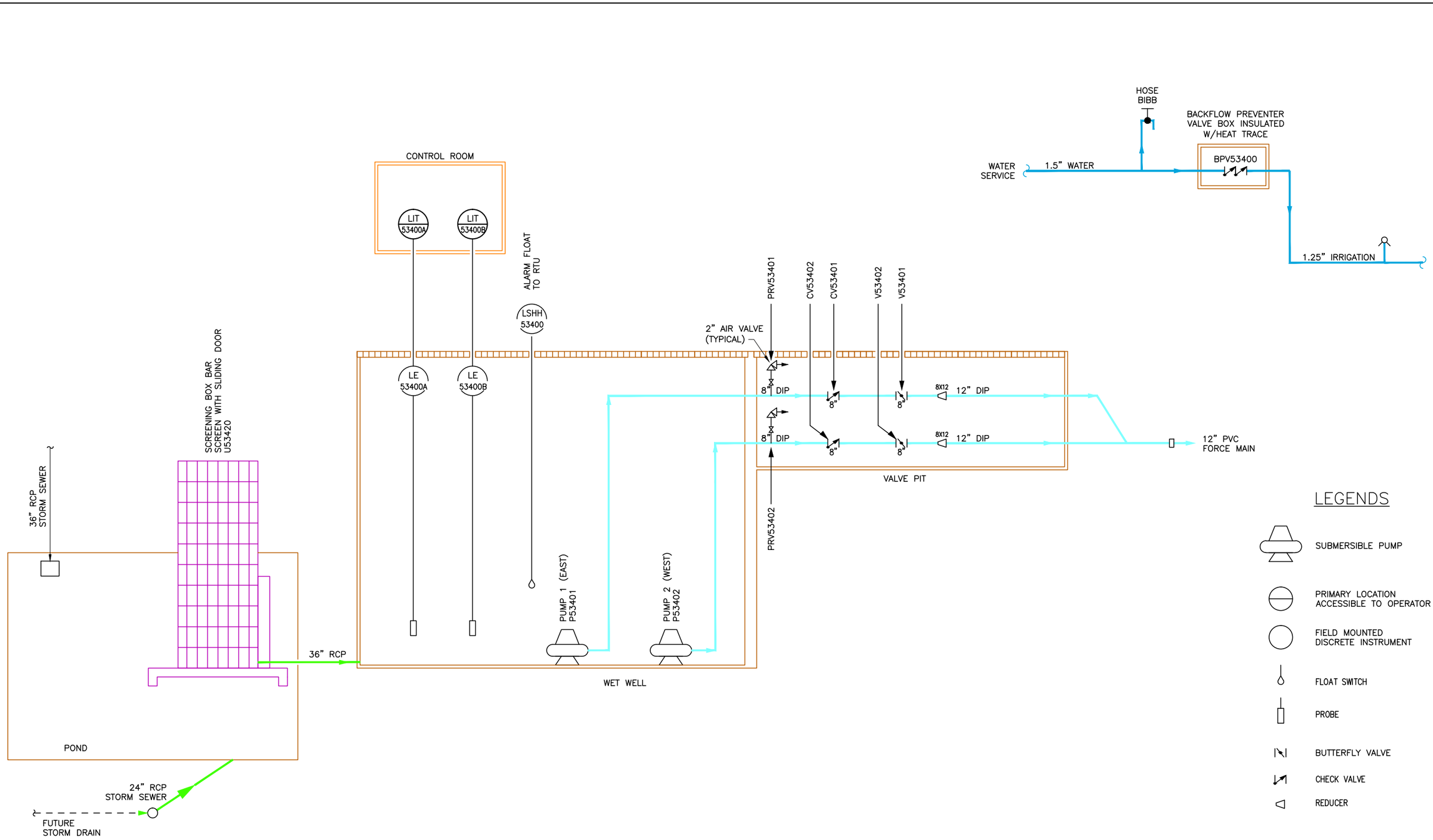
7.1 List of SOJPs

Below is a list of the SOJPs developed for Pump Station No. 34 North Edith and are included in this section.

SOJP_3400_SU_North Edith Pump Station
SOJP_3400_N_ North Edith Pump Station
SOJP_3400_SD_ North Edith Pump Station

SOJP_3400_SU_North Edith Exhaust Fan
SOJP_3400_N_North Edith Exhaust Fan
SOJP_3400_SD_North Edith Exhaust Fan

SOJP_3400_SU_North Edith Electric Heater
SOJP_3400_N_North Edith Electric Heater
SOJP_3400_SD_North Edith Electric Heater



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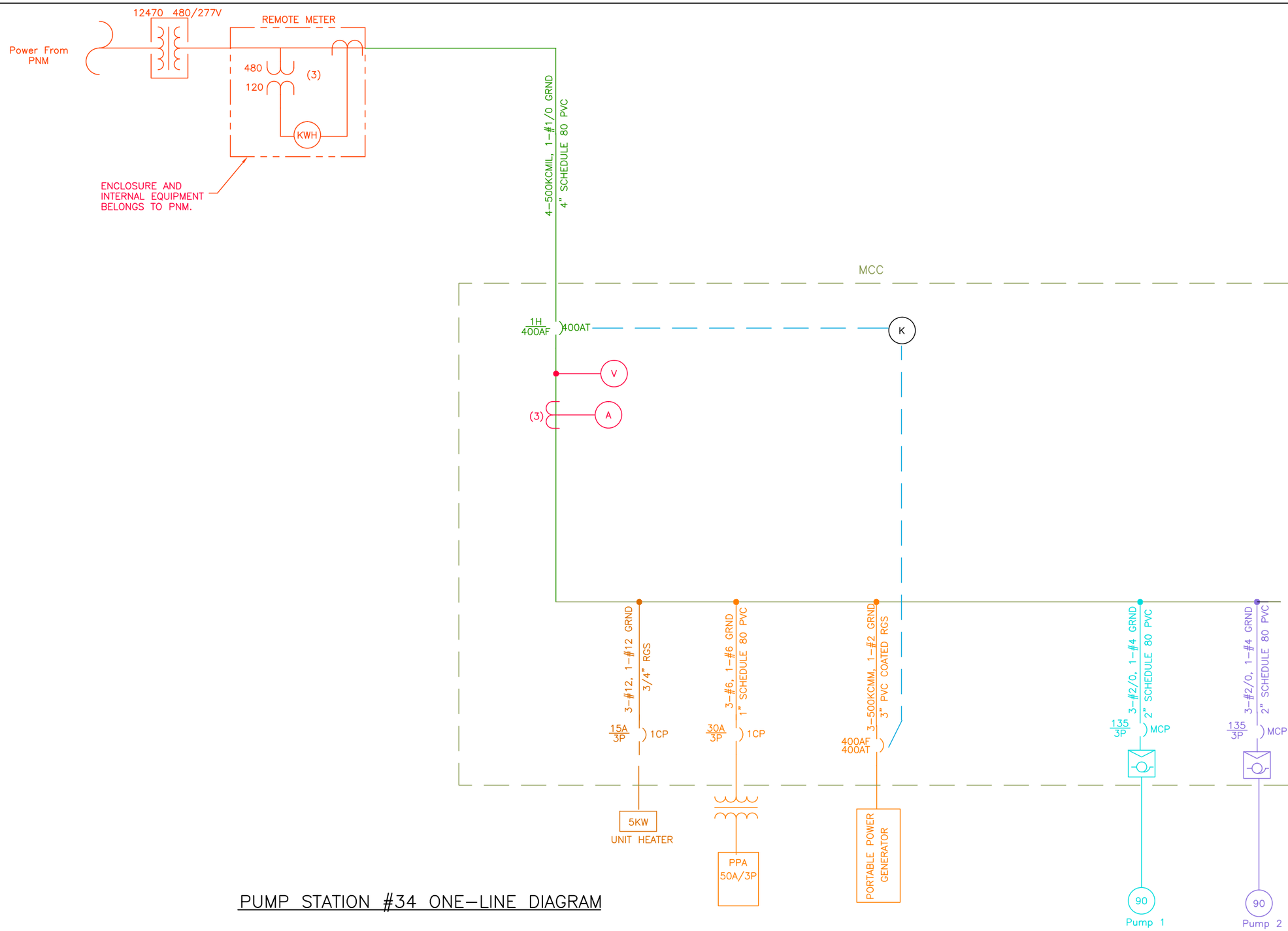
City Of Albuquerque Stormwater Pump Stations

Pump Station No. 34 North Edith

Figure 34-1



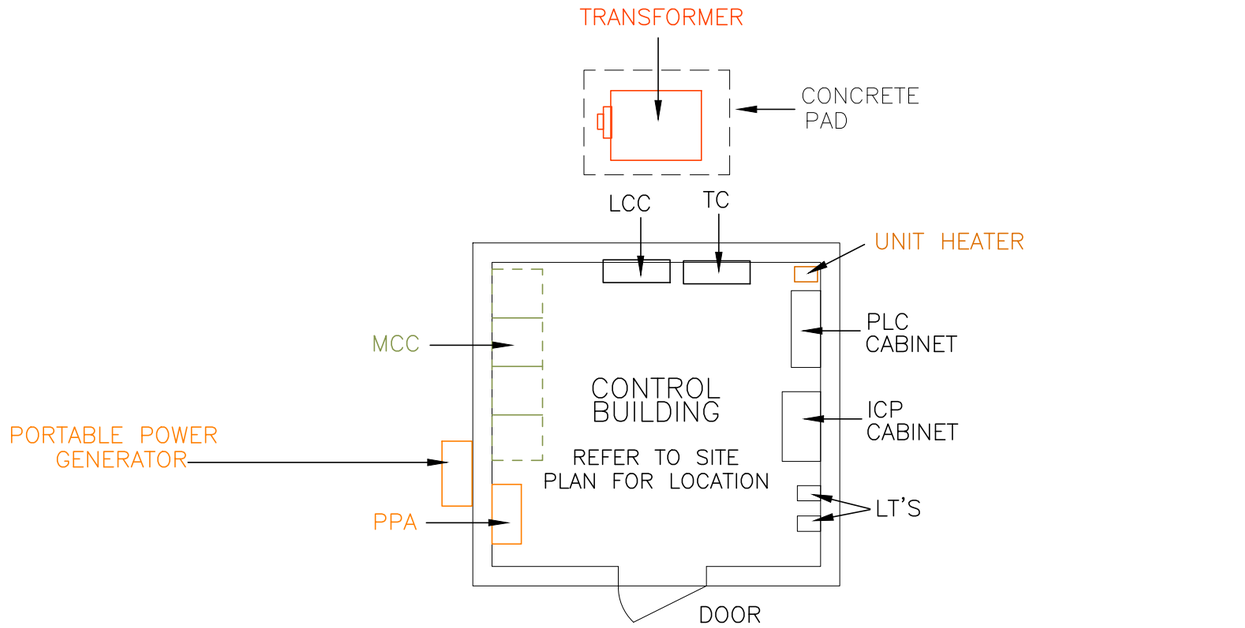
PUMP STATION #34 ONE-LINE DIAGRAM

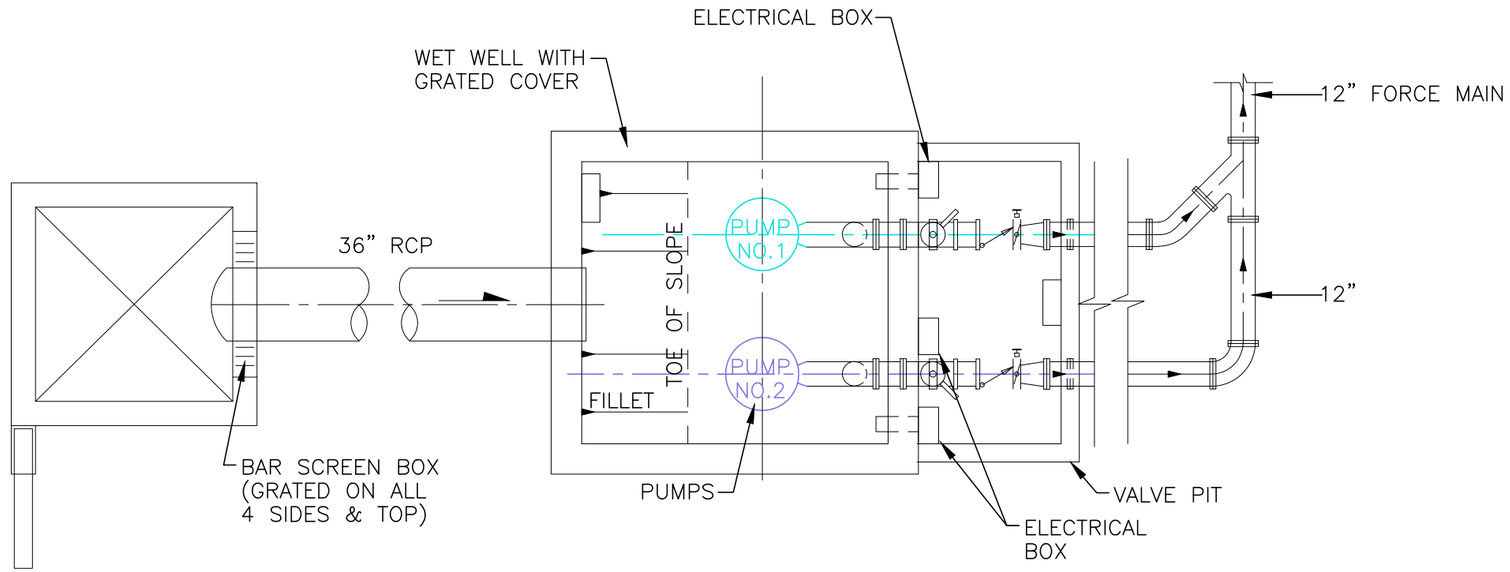
MOLZENCORBIN

City Of Albuquerque Stormwater Pump Stations

Pump Station No. 34 North Edith Electrical One-Line Diagram

Figure 34-2





Electrical Site Plan

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City Of Albuquerque Stormwater Pump Stations

Pump Station No. 34 North Edith Electrical Site Plan

Figure 34-3

REF (Filename): SOJP_3400_SU_NORTH EDITH PUMP STATION.doc
Revision Date: 6/24/2015
Revised By: Molzen Corbin
Approved by:

SOJP NO.: 3400-SU-NORTH EDITH PUMP STATION

TITLE: NORTH EDITH PUMP STATION – START-UP

Tools: Personal Protection Equipment: Hard hat, safety boots and safety glasses.

Hazards: Slip and fall and electrical shock.

Caution: See Section 9 Safety of the Stormwater Pump Station No. 34 North Edith Operations Manual

SYSTEM SCHEMATICS

Figure 34-1 Pump Station No. 34 North Edith P&ID
Figure 34-2 Pump Station No. 34 North Edith Electrical One-Line Diagram
Figure 34-3 Pump Station No. 34 North Edith Electrical Site Plan

NORTH EDITH PUMP STATION

SYSTEM START-UP

PROCEDURE

Station Entry/Exit and Alarm Deactivation Procedure

Entry

1. Call Plant Control: Identify yourself with a Call Number: Example #202 and advise of your entry.
2. Entry: At the Touchscreen, enter the code 5241 “Enter”. This code will disable the intrusion alarm. A banner on the bottom of the screen will appear and state “Entry Alarm”. Push the screen button “Acknowledge all alarms”. This will disable all alarms and PLC will be in operation.

Exit

1. To exit the station: At the Touchscreen, select “Reset All” and “Clear All” and select the “Password Entry”. This will allow the operator to enter a two (2) number scramble code: Example 07. The operator at this time will need to select Enter Arrow “ ←-------“ . This will start the timer and allow the operator to exit the station within 120 seconds.
2. The operators will need to push the reset button to clear and acknowledge all alarms. Once the reset button has been pushed and cleared, the operator will exit the station after securing the doors. The alarm system will reset in 120 seconds.
3. Call Plant control to verify all the alarms have been cleared and advise of your departure.

Before Normal Operation, the following is required:

1. Position or verify that the pump station valves are as follows:
   IN SERVICE – Lift Pump No. 1 air relief valve **PRV53401**
   IN SERVICE – Lift Pump No. 2 air relief valve **PRV53402**
   IN SERVICE – Lift Pump No. 1 check valve **CV53401**
   IN SERVICE – Lift Pump No. 2 check valve **CV53402**
   OPEN – Isolation valve for air relief valve 1 **PRV53401**
   OPEN – Isolation valve for air relief valve 2 **PRV53402**
   OPEN – Lift Pump No. 1 butterfly isolation valve **V53401**
   OPEN – Lift Pump No. 2 butterfly isolation valve **V53402**
2. Test the pumps starting with water in the wet well at a level at least 10 feet above the wet well floor. A plug must be inserted into the 36-inch diameter inlet pipe in order to allow the wet well to fill. Water may be diverted into the wet well from a nearby ditch or from a fire hydrant.
3. Check that the station medium voltage (MV) disconnect switch is closed (**ON**).
   Test the Lift Pumps.
4. Check that the pump breaker switch(es) on the MV Motor Control Center are closed (in the **ON** position.)
   Note: If a breaker or disconnect switch (other than a 120V) for the equipment to be started is not in the **ON** position, notify the shift supervisor, enter the event in the operator log, and generate a work order for a maintenance repair dispatch to have the switch(es) placed in the **ON** position.
   Test the Lift Pumps in HAND.
5. Place the lift pump HAND-OFF-AUTO (HOA) switch(es) on the Lift Station Control Panel (LSCP) in **AUTO**.
6. Select a lead lift pump with the selector switch at the LSCP.
   Note: Verify there is sufficient wet well level before starting a lift pump.
7. Place the HOA selector in **HAND** position to start the lead pump. Record amperage and secondary voltage.
   Test the Lift Pumps in AUTO.
8. Place the HOA switches on the LSCP in the **AUTO** position.
9. Check and record the level at which the lead lift pump starts.
10. Check and record the level at which the lead lift pump stops.
11. Verify the HOA switches are in the **AUTO** position after start-up is complete.

Albuquerque Bernalillo County
Water Utility Authority

REF (Filename): SOJP_3400_N_ NORTH EDITH PUMP STATION .docx
Revision Date: 6/24/2015
Revised By: Molzen Corbin
Approved by:

SOJP NO.: 3400-N-NORTH EDITH PUMP STATION

TITLE: NORTH EDITH PUMP STATION - NORMAL OPERATION

Tools: Personal Protection Equipment: Hard hat, safety boots, and safety glasses.

Hazards: Slip and fall and electrical shock

Caution: See Section 9 Safety of the Stormwater Pump Station No. 34 North Edith Operations Manual

SYSTEM SCHEMATICS

Figure 34-1 Pump Station No. 34 North Edith P&ID
Figure 34-2 Pump Station No. 34 North Edith Electrical One-Line Diagram
Figure 34-3 Pump Station No. 34 North Edith Electrical Site Plan

NORTH EDITH PUMP STATION

NORMAL OPERATION

GENERAL

Stormwater will be conveyed from the detention pond into the pump station wet well through a 36-inch reinforced concrete pipe. Before entering the inlet pipe, the stormwater passes through a fixed bar screen cage, that requires manual raking. After passing through the screen cage, stormwater enters the pump station wet well and lift pumps. The pump station has a duty-standby configuration for the two (2) lift pumps. Stormwater is pumped by any combination of the two (2) 90 HP submersible pumps.

The lead and lag lift pumps have turn on wet well depths of 3.5 and 9.5 feet, respectively. Both pumps will operate until they reach their respective shut off depths of 2.5 and 4.5 feet. The high water level alarm will be triggered at a depth of 19.5 feet. These values are from design documents and are field adjustable at the operator interface panel. Excess water in the wet well after pumping will flow back down the inlet pipe and infiltrate into the detention pond after the pond level subsides.

NORMAL OPERATION CONDITIONS

During normal operation, the HAND-OFF-AUTO (HOA) switches for the lift pumps will be in **AUTO** and will start and stop automatically based on the level transmitters.

LEAD, LAG, STANDBY assignments:

The lead lift pump is selected manually with the selector at the Lift Station Control Panel.

The active level transmitter is selected automatically as the transmitter with the highest level indications or manually with a switch at the Station Level Control Panel.

Valve positions at Pump Station No. 34 North Edith during operation are as follows:

IN SERVICE – Lift Pump No. 1 air relief valve **PRV53401**
IN SERVICE – Lift Pump No. 2 air relief valve **PRV53402**
IN SERVICE – Lift Pump No. 1 check valve **CV53401**
IN SERVICE – Lift Pump No. 2 check valve **CV53401**
OPEN – Isolation valve for air relief valve No. 1 **PRV53401**
OPEN – Isolation valve for air relief valve No. 2 **PRV53402**
OPEN – Lift Pump No. 1 butterfly isolation valve **V53401**
OPEN – Lift Pump No. 2 butterfly isolation valve **V53402**

NORMAL OPERATING PROCEDURES

Station Entry/Exit and Alarm Deactivation Procedure

Entry

1. Call Plant Control: Identify yourself with a Call Number: Example #202 and advise of your entry.
2. Entry: At the Touchscreen, enter the code 5241 “Enter”. This code will disable the intrusion alarm. A banner on the bottom of the screen will appear and state “Entry Alarm”. Push the screen button “Acknowledge all alarms”. This will disable all alarms and PLC will be in operation.

Exit

1. To exit the station: At the Touchscreen, select “Reset All” and “Clear All” and select the “Password Entry”. This will allow the operator to enter a two (2) number scramble code: Example 07. The operator at this time will need to select Enter Arrow “ ←-------“ . This will start the timer and allow the operator to exit the station within 120 seconds.
2. The operators will need to push the reset button to clear and acknowledge all alarms. Once the reset button has been pushed and cleared, the operator will exit the station after securing the doors. The alarm system will reset in 120 seconds.
3. Call Plant control to verify all the alarms have been cleared and advise of your departure.

After initial Start-Up, Normal Operation is as follows:

1. Check for abnormal conditions when entering facility – flooding, broken equipment, electrical fires, etc.
2. Check the building thermostat for proper HVAC settings.
3. Check the pump station and equipment status at the control panel.
4. Check and record the AC voltage at the Motor Control Center.
5. During lift pump operation check and record the amperage and secondary voltage.
6. Check and record wet well level at the level transmitters.

Albuquerque Bernalillo County
Water Utility Authority

REF (Filename): SOJP_3400_SD_ NORTH EDITH PUMP STATION.docx
Revision Date: 6/24/20151
Revised By: Molzen Corbin
Approved by:

SOJP NO.: 3400-SD-NORTH EDITH PUMP STATION

TITLE: NORTH EDITH PUMP STATION- SHUTDOWN

Tools: Personal Protection Equipment: Hard hat, safety boots and safety glasses.

Hazards: Slip and fall and electrical shock.

Caution: See Section 9 Safety of the Stormwater Pump Station No. 34 North Edith Operations Manual

SYSTEM SCHEMATICS

Figure 34-1 Pump Station No. 34 North Edith P&ID
Figure 34-2 Pump Station No. 34 North Edith Electrical One-Line Diagram
Figure 34-3 Pump Station No. 34 North Edith Electrical Site Plan

NORTH EDITH PUMP STATION

SYSTEM SHUTDOWN

PROCEDURE

Station Entry/Exit and Alarm Deactivation Procedure

Entry

1. Call Plant Control: Identify yourself with a Call Number: Example #202 and advise of your entry.
2. Entry: At the Touchscreen, enter the code 5241 “Enter”. This code will disable the intrusion alarm. A banner on the bottom of the screen will appear and state “Entry Alarm”. Push the screen button “Acknowledge all alarms”. This will disable all alarms and PLC will be in operation.

Exit

1. To exit the station: At the Touchscreen, select “Reset All” and “Clear All” and select the “Password Entry”. This will allow the operator to enter a two (2) number scramble code: Example 07. The operator at this time will need to select Enter Arrow “ ←-------“ . This will start the timer and allow the operator to exit the station within 120 seconds.
2. The operators will need to push the reset button to clear and acknowledge all alarms. Once the reset button has been pushed and cleared, the operator will exit the station after securing the doors. The alarm system will reset in 120 seconds.
3. Call Plant control to verify all the alarms have been cleared and advise of your departure.

Lift Pump Shutdown

Shutdown is required for maintenance or for replacement. Shutdown of the selected lift pump is as follows:

1. Disconnect, lock, and tag power source before servicing. Failure to disconnect power source can result in fire, shock, or serious injury. Follow ABCWUA LOTO (lock out, tag out). Refer to Appendix E.
2. Close the isolation valve in the valve pit for the selected pump, **V53401** or **V53402**.
3. Select the **OFF** position for the selected pump with the HOA switch on the door of the Lift Station Control Panel.
4. Verify the HOA for the remaining lift pump is in the **AUTO** position.

Albuquerque Bernalillo County
Water Utility Authority

REF (Filename): SOJP_3400_SU_NORTH EDITH EXHAUST FAN.doc
Revision Date: 6/24/2015
Revised By: Molzen Corbin
Approved by:

SOJP NO.: 3400-SU-NORTH EDITH EXHAUST FAN

TITLE: NORTH EDITH EXHAUST FAN SYSTEM – START-UP

Tools: Personal Protection Equipment: Hard hat, safety boots and safety glasses, tachometer, and screw driver for set crews.

Hazards: Improper installation can result in electric shock.

Caution: When servicing fan, motor may be hot enough to cause pain or injury.

SYSTEM SCHEMATICS

NA

NORTH EDITH EXHAUST FAN SYSTEM

SYSTEM START-UP

GENERAL

The exhaust fan system provides minimal ventilative cooling in the control room.

PROCEDURE

Before Normal Operation, the following is required:

1. Check all fasteners for tightness. In particular, check the setscrews in the wheel hub.
2. While in the **OFF** position or before connecting the fan to power, turn the fan wheel by hand to be sure it is not striking any obstacle.
3. Start the fan and shut if off immediately to check rotation of the wheel with directional arrow in the motor compartment.
4. When the fan is started, observe the operation and check for unusual noises
5. With the system in full operation, measure the current input to the motor and compare with the nameplate rating to determine if the motor is operating under safe load conditions.
6. Inspection of the fan should be conducted at the first 30-minute and 24-hour intervals of satisfactory operation.
7. At the 30-minute interval, inspect bolts, setscrews and motor mounting bolts. Adjust and tighten as necessary.
8. At the 24-hour interval, check all internal components. On belt drives only, inspect belt alignment and tension. Adjust and tighten as necessary.
9. Set line voltage thermostat to 90°F for system serving control room. Set switch to on for system serving the control valve room.

Albuquerque Bernalillo County
Water Utility Authority

REF (Filename): SOJP_3400_N_NORTH EDITH EXHAUST FAN.doc
Revision Date: 6/24/2015
Revised By: Molzen Corbin
Approved by:

SOJP NO.: 3400-N-NORTH EDITH EXHAUST FAN

TITLE: NORTH EDITH EXHAUST FAN SYSTEM – NORMAL OPERATION

Tools: Personal Protection Equipment: Hard hat, safety boots and safety glasses, tachometer, and screw driver for set crews.

Hazards: Improper installation can result in electric shock.

Caution: When servicing fan, motor may be hot enough to cause pain or injury.

SYSTEM SCHEMATICS

NA

NORTH EDITH EXHAUST FAN SYSTEM

NORMAL OPERATIONS

GENERAL

The exhaust fan system provides minimal ventilative cooling in the control room.

NORMAL OPERATION PROCEDURE

After initial Start-Up, Normal Operation is as follows:

1. The line voltage thermostat in the control room should be set to a maximum of 90°F. The thermostat will activate an exhaust fan whenever temperature in the control room is equal to or above 90°F. When temperature in the control room is below 90°F, the exhaust fan will be off.

Albuquerque Bernalillo County
Water Utility Authority

REF (Filename): SOJP_3400_SD_NORTH EDITH EXHAUST FAN.doc
Revision Date: 6/24/2015
Revised By: Molzen Corbin
Approved by:

SOJP NO.: 3400-SD-NORTH EDITH EXHAUST FAN

TITLE: NORTH EDITH EXHAUST FAN - SHUTDOWN

Tools: Personal Protection Equipment: Hard hat, safety boots and safety glasses, tachometer, and screw driver for set crews.

Hazards: Improper installation can result in electric shock.

Caution: When servicing fan, motor may be hot enough to cause pain or injury.

SYSTEM SCHEMATICS

NA

NORTH EDITH EXHAUST FAN SYSTEM

SHUTDOWN OPERATIONS

PROCEDURE

Shutdown is required for maintenance or for replacement. Shutdown of the exhaust fans are as follows:

1. Disconnect, lock, and tag power source before servicing. Failure to disconnect power source can result in fire, shock, or serious injury.

REF (Filename): SOJP_3400_SU_NORTH EDITH ELECTRIC HEATER.doc
Revision Date: 6/24/2015
Revised By: Molzen Corbin
Approved by:

SOJP NO.: 3400-SU-NORTH EDITH ELECTRIC HEATER

TITLE: NORTH EDITH ELECTRIC HEATER SYSTEM – START-UP

Tools: Personal Protection Equipment: Hard hat, safety boots and safety glasses, and screw driver.

Hazards: Improper installation can result in electric shock.

Caution: Heater must be mounted at least 7 feet above floor to prevent accidental contact with fan blade. To prevent possible overheating, keep at least a 5-foot clearance in front of the heater, 6 inches from ceiling, 6 inches from side wall and 13 inches from back wall.

SYSTEM SCHEMATICS

NA

NORTH EDITH ELECTRIC HEATER SYSTEM

SYSTEM START-UP

GENERAL

The electric heater system provides minimal heating in the control room.

PROCEDURE

Before Normal Operation, the following is required:

1. Check all fasteners for tightness.
2. Ensure wiring installed per National Electric Code and heater must be grounded against possible electrical shock. Inspect the control panel wiring to make certain insulation is intact and all connections are tight.
3. Verify the power supply voltage coming to heater matches the ratings printed on the heater nameplate before energizing.
4. The heater is hot when in use.
5. Do not insert or allow foreign objects to enter any ventilation or exhaust opening, as this may cause electric shock, fire, or damage to the heater.
6. To prevent a possible fire, do not block air intakes or exhaust in any manner. Keep combustible materials away from heater.
7. A heater has hot and arcing or sparking parts inside. Do not use it in areas where gasoline, paint or flammable liquids are used or stored.
8. Set line voltage thermostat to 55°F for system.

Albuquerque Bernalillo County
Water Utility Authority

REF (Filename): SOJP_3400_N_NORTH EDITH ELECTRIC HEATER.doc
Revision Date: 6/24/2015
Revised By: Molzen Corbin
Approved by:

SOJP NO.: 3400-N-NORTH EDITH ELECTRIC HEATER

TITLE: NORTH EDITH ELECTRIC HEATER – NORMAL OPERATION

Tools: Personal Protection Equipment: Hard hat, safety boots and safety glasses, and screw driver.

Hazards: Improper installation can result in electric shock.

Caution: Heater must be mounted at least 7 feet above floor to prevent accidental contact with fan blade. To prevent possible overheating, keep at least a 5-foot clearance in front of the heater, 6 inches from ceiling, 6 inches from side wall and 13 inches from back wall.

SYSTEM SCHEMATICS

NA

NORTH EDITH ELECTRIC HEATER SYSTEM

NORMAL OPERATIONS

GENERAL

The electric heater system provides minimal heating in the control room.

NORMAL OPERATION PROCEDURE

After initial Start-Up, Normal Operation is as follows:

1. The line voltage thermostat in the control room should be set to a minimum of 55°F. The thermostat will activate an electric heater whenever temperature in the control room is equal to or below 55°F. When temperature in the control room is above 55°F, the electric heater will be off.

Albuquerque Bernalillo County
Water Utility Authority

REF (Filename): SOJP_3400_SD_NORTH EDITH ELECTRIC HEATER.doc
Revision Date: 6/24/2015
Revised By: Molzen Corbin
Approved by:

SOJP NO.: 3400-SD-NORTH EDITH ELECTRIC HEATER

TITLE: NORTH EDITH ELECTRIC HEATER- SHUTDOWN

Tools: Personal Protection Equipment: Hard hat, safety boots and safety glasses, and screw driver.

Hazards: Improper installation can result in electric shock.

Caution: Heater must be mounted at least 7 feet above floor to prevent accidental contact with fan blade. To prevent possible overheating, keep at least a 5-foot clearance in front of the heater, 6 inches from ceiling, 6 inches from side wall and 13 inches from back wall.

SYSTEM SCHEMATICS

NA

NORTH EDITH ELECTRIC HEATER SYSTEM

SHUTDOWN OPERATIONS

PROCEDURE

Shutdown is required for maintenance or for replacement. Shutdown of the electric heaters are as follows:

1. Disconnect, lock, and tag power source before servicing. Failure to disconnect power source can result in fire, shock, or serious injury.

8.0 STANDARD MAINTENANCE PROCEDURES

Standard Maintenance Procedures are developed to provide a list of tasks to be performed at a specified frequency to increase the overall life and performance of the lift station equipment. These procedures provide the recommended maintenance to be performed at the pump station with input from facilities staff and/or manufacturer's instructions.

8.1 Water Resource Equipment

8.1.1 Manual Bar Screen Cage

Inspect the screen visually after storm events. Manually remove and haul away debris as needed.

8.1.2 Lift Pumps

Maintenance is to be performed only by qualified personnel who are familiar with this type of equipment. The local sales and service representative for Flygt pumps is James, Cook, and Hobson (JCH) located in Albuquerque, NM. For further instruction, refer to the manufacturer's O&M manual. Appendix C may also be referenced for manufacturer's general information and pump maintenance specifications.

Removal of the pumping unit requires lifting the unit out of the wet well with a portable crane or winch. The wet well is equipped with guide bars to prevent the pump from swinging during removal and aid in reinstallation alignment.

8.1.3 Valves

Maintenance is to be performed only by qualified personnel who are familiar with this type of equipment. Annually exercise the isolation butterfly valves, air relief isolation valves, and check valves. Inspect for leakage around mating surfaces and replace gaskets as needed. Check the air relief valve for proper operation by observing the valve during pump start up and initial

operation. A small burst of water may exit the top pipe shortly after startup, but there should not be a continuous discharge. If the valves appear to be faulty, they should be removed, inspected, and repaired or replaced as necessary. Refer to Appendix A for a list of valve manufacturers and source of local service.

8.2 Electrical Equipment

8.2.1 480V Motor Control Center (MCC)

The 480V MCC contains motor starters, and circuit breakers for station 480V loads.

Maintenance: Always disconnect, lock, and tag power source before servicing.

Ongoing:

1. Visual inspection
2. Keep the surrounding area clean

Annual:

1. Visual inspection
2. Vacuum interior of the MCC
3. Operate each circuit breaker
4. Plug or cover all unused openings

5-Year:

1. Perform annual inspection
2. Check/tighten all connections
3. Infrared scan

8.2.2 Lift Station Control Panel (LSCP)

The LSCP operates the lift pumps to maintain the level in the wet well.

Maintenance: Always disconnect, lock, and tag power source before servicing.

Ongoing:

1. Visual inspection
2. Keep the surrounding area clean

Annual:

1. Visual inspection
2. Vacuum interior of the control panel
3. Check/tighten all connections
4. Operate all switches
5. Test all pilot indicators
6. Plug or cover all unused openings
7. Manually operate level switches and check control relative to rising signal.
8. Verify transmission of alarm signals to SWRP

5-Year:

1. Conduct annual maintenance
2. Infrared scan

8.2.3 480V to 208/120V Transformer

The 480V to 208/120V transformer steps 480V from the MCC down to power the 208/120V panelboard.

Maintenance: Always disconnect, lock, and tag power source before servicing.

Ongoing:

3. Visual inspection
4. Verify weather guards are installed.
5. Check for and remove any wild life.
6. Keep the surrounding area clean

Annual:

7. Visual inspection
8. Plug or cover all unused openings

5-Year:

9. Conduct annual maintenance
10. Infrared scan

8.2.4 120V to 208V Panelboard

Maintenance: Always disconnect, lock, and tag power source before servicing.

Ongoing:

1. Check for tripped circuit breakers.
2. Verify all panel covers are in place.

Annual:

3. Check for tripped circuit breakers.
4. Verify all panel covers are in place.
5. Open and close each circuit breaker.

5 year:

1. Perform annual inspection
2. Cover any unused openings
3. Check and tighten connections
4. Infrared scan

8.3 HVAC Equipment

8.3.1 Exhaust Fan

Maintenance is to be performed only by qualified personnel who are familiar with this type of equipment. Maintenance is generally limited to cleaning, replacing belts, lubricating bearings and checking wheel alignment. Cleaning is limited to exterior surfaces only and removing dust build up on motor housing. Refer to the specific manufacturer's guidelines for further details.

The following general guidelines should be followed every 12 months:

1. Always disconnect, lock, and tag power source before servicing.

2. Greasing of motors is only intended when fittings are provided. Many fractional horsepower motors are permanently lubricated and should not be lubricated.

3. Motors supplied with grease fittings should be greased in accordance with manufacturer's recommendations. Where motor temperatures do not exceed 104°F, the grease should be replaced after 2,000 run hours.

4. Wheels and motor housing should be dusted off.

5. Shaft bearings that are non-lubricating require no further lubrication.

6. Cast pillow block bearings are factory lubricated and are provided with external grease fittings. Use only one (1) or two (2) shots of lubricant with a hand gun while rotting bearings.

7. Grease fittings should be wiped clean.

8. Grease should be pumped slowly until slight bead forms around the seal. A high grade lithium base grease should be used. Some Grease manufactures include the following:

   1. US Electric Motors – Grease No. 83343

   2. Chevron USA Inc - Chevron SRI Grease #2

   3. Mobile oil Corporation – Mobilith or Mobil 532.

9. Fan RPM should not be readjusted. Only use pulleys of identical size and type when replacing pulleys. The adjustable motor pulley is factory set for the RPM specified. Speed is increased by closing or decreased by opening the adjustable pulley. Any increase in

speed represents a substantial increase in horsepower and motor amperage should always be checked to avoid serious damage when speed is varied.

10. All fasteners should be checked for tightness each time maintenance checks are performed prior to restarting.

11. Wheel position is factory preset and realignment may be necessary if movement occurred. Reference vendor's maintenance manual for minimum overlap and gap dimensions.

12. Check wheel rotation by momentarily energizing the unit. Rotation should be clockwise when viewing from the shaft side. If wheel rotation is incorrect, reverse tow of the wiring leads or check motor wiring for single phase.

13. For units with two (2) groove pulleys, adjust so the tension is equal in both belts.

14. If adjustments are made, it is very important to check the pulleys for straight alignment.

Belt Drive Only

1. Worn belts should be replaced with new belts of the same type as supplied with unit.

2. To ensure belt tightness, check pulley set screws. Proper keys must be in keyways. Belt tension can be adjusted by loosening four fasteners on the drive frame. Reference vendor's maintenance manual for Belt tension requirements.

3. Centering can be accomplished by loosening the bolts holding the drive frame to the shock mounts and repositioning the drive frame.

4. Wheel and inlet cone overlap can be adjusted by loosening the set screws in the wheel and moving the wheel to the desired position.

Direct Drive Only

1. Centering height alignment can be accomplished by loosening the set screws in the wheel and moving the wheel to the desired position.

2. Fan RPM should be checked and verified with a tachometer.

8.3.2 Electric Heater

Maintenance is to be performed only by qualified personnel who are familiar with this type of equipment. Maintenance is generally limited to cleaning and lubrication. Refer to the specific manufacturer's guidelines for further details. The following general guidelines should be followed every 12 months:

1. Always disconnect, lock, and tag power source before servicing.

2. Inspect the control panel wiring to make certain insulation is intact and all connections are tight. Inspect all heaters and relay contacts. If the contacts appear badly pitted or burned, replace the contactor/relay.
3. For proper heater protection, ensure the correct size fuse is used.
4. Clean the unit casing, fan and motor once a year. Any rusty spots on the casing should be cleaned and repainted.
5. All units up to 20 kW have fan motors that are permanently lubricated so that only occasionally cleaning is required. Units above 20 kW have fan motors lubricated for five (5) years of continuous duty or ten (10) years of intermittent operation. When required, remove the oil access plug on back of heater at motor intake grill, open oil cap, fill with S.A.E. No. 10 electric motor oil, and replace plugs and access plug.

9.0 SAFETY

This section presents general information on safety procedure to help prevent accidents. Consequently, to reduce the danger, anyone engaged in the operation of a stormwater pump station must be familiar with safety practices that pertain specifically to the profession. Once recognized, the inherent hazards can be readily corrected or at least guarded against by proper warnings and safety procedures. The overall dangers of accidents are much the same whether in valve vaults, pumping stations, or other facilities. These hazards can usually be classified under one (1) of the following categories:

- Physical injuries
- Body infections
- Dangers from explosive or noxious gases or vapors and oxygen deficiency

Safety regulations such as New Mexico Occupation Health & Safety Bureau (OHSB) and Occupational Safety & Health Administration (OSHA) should be followed. More information can be found at:

- https://www.osha.gov/law-regs.html and
- https://www.osha.gov/dcsp/osp/stateprogs/new_mexico.html.

9.1 General Safety Guidelines

1. Observe all written and verbal safety rules and be aware of the particular hazards surrounding your job.
2. Do not start a task until you have received and fully understand the instructions.
3. Immediately correct or report to your supervisor any hazardous conditions, unsafe equipment, or unsafe working practice.
4. Report all injuries or accidents to your supervisor.
5. Do not run. Watch for and avoid slippery or congested areas.
6. Do not ride on or operate any moving equipment unless it is part of your job and you have been instructed in its use.

7. When operating moving equipment, observe all traffic signs, speed limits, and parking regulations.
8. Do not wear loose clothing or carry rags in your pockets. Cloth may become caught in equipment and cause personal injury.
9. Use protective equipment (PPE) such as goggles, hard hats, gloves, and respirators, whenever warranted or required by the tasks.
10. Do not operate any equipment unless all safety guards and safety devices designed for that equipment are in place, except as permitted in written maintenance or emergency operation procedures.
11. Lock out equipment before cleaning debris from moving parts. Follow ABCWUA LOTO Procedures before working on any equipment. Refer to Appendix E.
12. If it is necessary to remove safety devices, handrails, manhole covers, or related items, warn fellow employees.
13. Keep all tools in good repair and ensure that you use tools appropriate to the work being performed.
14. Do not pass under or work beneath fellow employees unless a task requires doing so. Never enter a wet well, tank, or basin until all precautions have been taken to ensure safety.
15. Practice good housekeeping. Immediately clean up any grease, oil, or hydraulic fluid that may have spilled or leaked from the equipment. Do not use gasoline to clean up oil and grease. Keep all passageways, aisles, stairs, and exits clear of tools, equipment, and other materials.
16. Do not consider a job finished until you have made conditions as safe as possible for the next person.
17. Work in pairs when feasible, especially if the work being done has high risk of injury or requires assistance.

9.2 Electrical Hazards

1. Do not ground yourself in water or on pipes or drains. Avoid them when working near any electricity.
2. Allow only authorized people to work on electrical equipment and repairs.

3. Keep all electrical controls accessible and well marked.
4. Keep rubber mats on the floor in front of electrical panels; keep edges trimmed so they do not become a tripping hazard.
5. Keep wires from becoming a tripping hazard.
6. Work in pairs around electrical equipment.
7. Place "MAN ON LINE" signs on electrical disconnects, and lock the disconnects when working on electrical equipment which another person can turn on.
8. Never use metal ladders around electrical equipment.
9. Handle breaker wires as though they were "live" wires.
10. When there is a question about any electrical hazard, ask before you expose yourself to it.
11. Do not use any part of your body to test a circuit.
12. Ground all electrical tools.
13. When working around electrical equipment, as with any other hazardous work, always remain aware of the potential hazard.

9.3 Mechanical Equipment Hazards

The exposed moving parts of some pieces of equipment pose a safety hazard to personnel working around the equipment. Installing stationary guards where necessary can prevent accidental injury related to these parts. These guards, which would shield the moving part without interfering with its operation, should be considered for belts, wheels, chains, shafts, and any couplings between a piece of equipment and its drive motor or two (2) moving parts of a piece of equipment. Protective guards are sometimes furnished in the form of screens, plates, hollow shells, or tubes by the manufacturer and installed when the equipment is put into service. The designated personnel should inspect V-belts, drive chains, horizontal or vertical drive shafts, and all exposed moving parts.

Guards should be kept in good condition and replaced if necessary. Bent or improperly fitting guards could rub and interfere with the movement of a belt, shaft, wheel, etc. Before a guard is replaced, the related piece of equipment should be shut off and the power disconnected.

In addition, certain pieces of equipment may pose noise problems. High noise levels could cause serious injury to personnel coming into close contact with the equipment. Some form of ear protection, such as headsets, should be provided for personnel working near the unit. However, before any corrective measure is taken, the personnel should make certain the high noise level is not the result of a malfunction in the unit. At no time should unauthorized personnel be allowed to come near a piece of machinery that poses a safety threat. Whether guards are installed or not, this protective measure should always be observed.

9.4 Explosion and Fire Hazards

1. Install fire extinguishers where a fire hazard exists, and mark the location of the extinguishers with properly placed signs.
2. Post "NO SMOKING" signs where a potential fire hazard exists.
3. Instruct plant employees in fire prevention and what action to take in case of a fire.
4. Label all portable containers of flammable materials to indicate their contents.
5. Mark storage locations for flammable materials with signs reading "FLAMMABLE MATERIAL".
6. Store flammable combustible liquids in tanks or closed containers.
7. Clean up leaks or spills of flammable materials immediately and dispose of them promptly.
8. Inspect fire extinguishers monthly, keep them charged, and test them at least once every five (5) years.

9.5 Biological Hazards

1. All cuts, skin abrasions, scratches, and similar injuries should be treated promptly. It is recommended that all cuts and scratches, no matter how small, be treated immediately with a povidone-iodine solution and watched closely for any signs of redness, tenderness, swelling, or infection. If any of these signs appear, the individual should see a physician.
2. A doctor should be called for all but minor injuries.
3. Treatment facility personnel should be familiar with first aid treatment.
4. Avoid putting fingers in nose, mouth, or eyes while working.

5. Thoroughly clean hands when convenient and always before eating, smoking, or leaving work. Fingernails should be kept short to aid cleanliness.
6. Wear proper shoes and clothing on site, especially when working in the pump station wet well, to protect from injury (ex., needles, razors, broken glass, etc.).
7. Wear leather gloves to protect hands from nicks, scratches, etc.
8. Wear rubber gloves when direct contact with wastewater is a possibility.

9.6 Oxygen Deficiency and Noxious Gas Hazards

1. Test atmosphere before entering any confined space, in conformance with ABCWUA confined space entry procedures. Refer to Appendix F.
2. In closed spaces, allow no smoking or open flames, and guard against sparks.
3. Use only safety explosion-proof lighting equipment or mirrors.
4. Always ventilate all manholes, tanks, etc. (enclosed areas), before entering.
5. Test the atmosphere for explosive and toxic gases and oxygen deficiency, as required by the New Mexico Occupational and Health Safety Bureau. If the atmosphere is normal, a worker may enter with a safety harness attached and two (2) men available at the top. The atmosphere must be continually monitored.
6. If gas or oxygen deficiency is found, the atmosphere should be ventilated with pure air by natural or artificial means. Use of a portable blower is the most practical method of artificial ventilation. Gas tests should then be repeated and atmosphere cleared as normal before workers enter. Adequate ventilation must be maintained during work, and tests frequently repeated.
7. If gas or oxygen deficiency is present and it is not practical or possible to ventilate adequately before workers enter (such as in the saving of life), a hose mask or self-contained breathing apparatus should be worn and extreme care taken to avoid all sources of ignition if flammable gas is present. Use explosion-proof safety lights (not ordinary flashlights), wear rubber boots or non-sparking shoes, use non-sparking tools, etc.

Note: Work in a flammable gas atmosphere is extremely hazardous and should never be attempted except by those thoroughly familiar with the dangers and fully equipped with the proper protection safety equipment, and then only if it is impossible to provide a safe atmosphere within the time limitation of the emergency.

9.7 Safety Equipment

Safety helmets provide head protection from falling or flying objects and from limited electric shock.

Hearing protection (e.g. earplugs or earmuff) is required in areas of high noise levels.

Goggles prevent eye injury where there is a reasonable probability of injury.

Protective creams protect the skin from sunburn, oils, greases, paints, and dust.

Gloves of the appropriate material prevent injuries while handling pipe, tools, chemicals, solvents, and similar materials.

Safety boots protect toes from falling objects and when moving heavy items.

Oxygen, toxic gas, and explosive condition detectors are used to assure that the air in confined spaces or other work areas is not hazardous.

Portable air blowers are used for ventilating manholes and other confined spaces before entering.

Self-contained breathing apparatus or hose masks are used when atmospheres immediately hazardous to life or health must be entered.

Safety harness is required where individuals are exposed to hazardous atmospheres; the only type that should be used is that consisting of a body belt with a buckle and a shoulder harness.

1. Warning Signs or Tags: Required to be placed in strategic areas around dangerous or potentially dangerous areas; temporary tags should be attached to broken-down units to prevent start-up resulting in an injury.
2. Tools: Required by OSHA standards that the management makes sure that proper tools in good repair are available at all times (even those tools owned by employees); non-sparking tools should be available and used in required areas.
3. Fire Extinguishers: Required to place fire extinguishers approved by the Underwriter's Laboratories in areas of possible fire hazards.
4. Medical Aid: Required by OSHA standards that the employer must insure the availability of medical personnel; if there are no medical facilities in the nearby area, some employee trained in first aid should be available, as should a first aid kit.
5. Gas Detection Meter: Prevents injury by the detection of explosive and toxic gases before removal of manhole covers.

APPENDIX A

Pump Station List of Equipment

Pump Station No. 34 - North Edith Equipment List

Equipment Number	Description	Manufacturer	Model Number	Serial Number	Size, Capacity	Local Source for Parts and Service
BPV53400	Backflow Preventer Valve	FEBCO	765 PVB	AA1102	1.25 IN	
CP53400	Control panel	YUKON & ASSOCIATES	DWG 287FO1PC ASSEMBLY	UL# AY-185475		Yukon & Associates; Albuquerque, NM
CP53401	Interface control panel	YUKON & ASSOCIATES	DWG 287FO1IC ASSEMBLY	UL# AY-185474		Yukon & Associates; Albuquerque, NM
CP53402	Lighting control panel	YUKON & ASSOCIATES	DWG 287FO1LC ASSEMBLY	UL# AY-185484		Yukon & Associates; Albuquerque, NM
CV53401	Pump 1 Check Valve	MUELLER	175WP		8 in	
CV53402	Pump 2 Check Valve	MUELLER	175WP		8 in	
E53400	Motor Control Center	ALLEN-BRADLEY	CENTERLINE BW.2100 Series L	GXWB841/1		
E53401	Pump 1 Reduced Voltage Starter	ALLEN-BRADLEY	SMC DIALOG PLUS MOTOR CONTROLLER	CAT #150-B240NBDB		
E53402	Pump 2 Reduced Voltage Starter	ALLEN-BRADLEY	SMC DIALOG PLUS MOTOR CONTROLLER	CAT #150-B240NBDB		
E53410	Lighting	ALLEN-BRADLEY				
H53461	Exhaust Fan	GREENHECK				
H53462	Electric Heater	MARLEY ENGINEERED PRODUCTS	Q MARK MUH105			
LE53400A	Wet well level element	DREXELBROOK	700-0005-054	6395		
LE53400B	Wet well level element	DREXELBROOK	700-0005-054	6396		
LSH53400	Wet well level switch	FLYGT	ENM-10			James, Cooke, and Hobson; Albuquerque, NM
LT53400A	Wet well level transmitter	DREXELBROOK	409-1030-1	10831		
LT53400B	Wet well level transmitter	DREXELBROOK	409-1030-1	10829		
P53401	Sump Lift Pump 1	FLYGT	3231/605		90 HP, 8" Discharge	James, Cooke, and Hobson; Albuquerque, NM
P53402	Sump Lift Pump 2	FLYGT	3231/605		90 HP, 8" Discharge	James, Cooke, and Hobson; Albuquerque, NM
PRV53401	Pump 1 Vacuum Relief Valve	VALMATIC	102		2 INCHES	Pipestone Equipment; Golden, CO

Pump Station No. 34 - North Edith Equipment List

Equipment Number	Description	Manufacturer	Model Number	Serial Number	Size, Capacity	Local Source for Parts and Service
PRV53402	Pump 2 Vacuum Relief Valve	VALMATIC	102		2 INCHES	Pipestone Equipment; Golden, CO
T53400	Telemetry system	MOTOROLA	F7563A CDUACE3600	085SNG042T		
U53420	Barscreen Unit	HYDRO-GATE	HYDROLOGY		6' W x 6' L x 10' H	ISI West; Longmont, CO
V53401	Pump 1 Butterfly Isolation Valve	PRATT	2F2		8 INCHES	Construction Product Marketing; Phoenix, AZ
V53402	Pump 2 Butterfly Isolation Valve	PRATT	2F2		8 INCHES	Construction Product Marketing; Phoenix, AZ
XA53425	Intrusion Alarm	SENTROL				
YS53424	Smoke detector switch	EDWARDS				
ZS53401	Pump 1 Check Valve Position Switch	SQUARE D	802T-WS1			
ZS53402	Pump 2 Check Valve Position Switch	SQUARE D	802T-WS1			

APPENDIX B

(NOT USED)

APPENDIX C

Manufacturer's Lift Pump Curve and General Information

SUBMITTAL DATA

MECHANICAL EQUIPMENT
JANUARY 15, 2001

ALAMEDA BUSINESS PARK LIFT STATION
ALBUQUERQUE, NM This station was renamed North Edith.

MARK GOODWIN & ASSOCIATES
ALBUQUERQUE, NM

SUBMERSIBLE STORM PUMPS WITH CONTROLS

PREPARED FOR: SUNDANCE MECHANICAL
ALBUQEURQUE,NM

PREPARED BY: JCH, INC
SANDY EDENS
ALBUQUERQUE, NM
505-344-7100

FLYGT

TEST REPORT

PRODUCT

Serial No.		Performance curve No.	Motor module/type	Voltage (V)
3231.605	0131032	63-630	35-29-6AA	460

Base module	Impeller No.	Gear type	Gear ratio	Imp.diam/Blade angle	Water temp °C
000	621 10 08			420	23

TEST RESULTS

Pump total head H (ft)	Volume rate of flow Q (USGpm)	Motor input power P (kW)	Voltage U (V)	Current I (A)	Overall efficiency η(%)
147.62	14	27.37	461	59.0	1.39
123.09	813	37.07	460	68.5	50.90
103.35	1577	44.78	461	77.2	68.65
94.93	1977	49.04	461	82.0	72.19
84.93	2408	52.22	461	86.0	73.88
69.36	3052	55.07	460	89.3	72.51
38.04	4199	52.20	461	85.9	57.73

Accepted after	Test facility	Test date	Time	Chief tester
HI	LINDAS Sweden Q2	01-04-17	09:43	1358

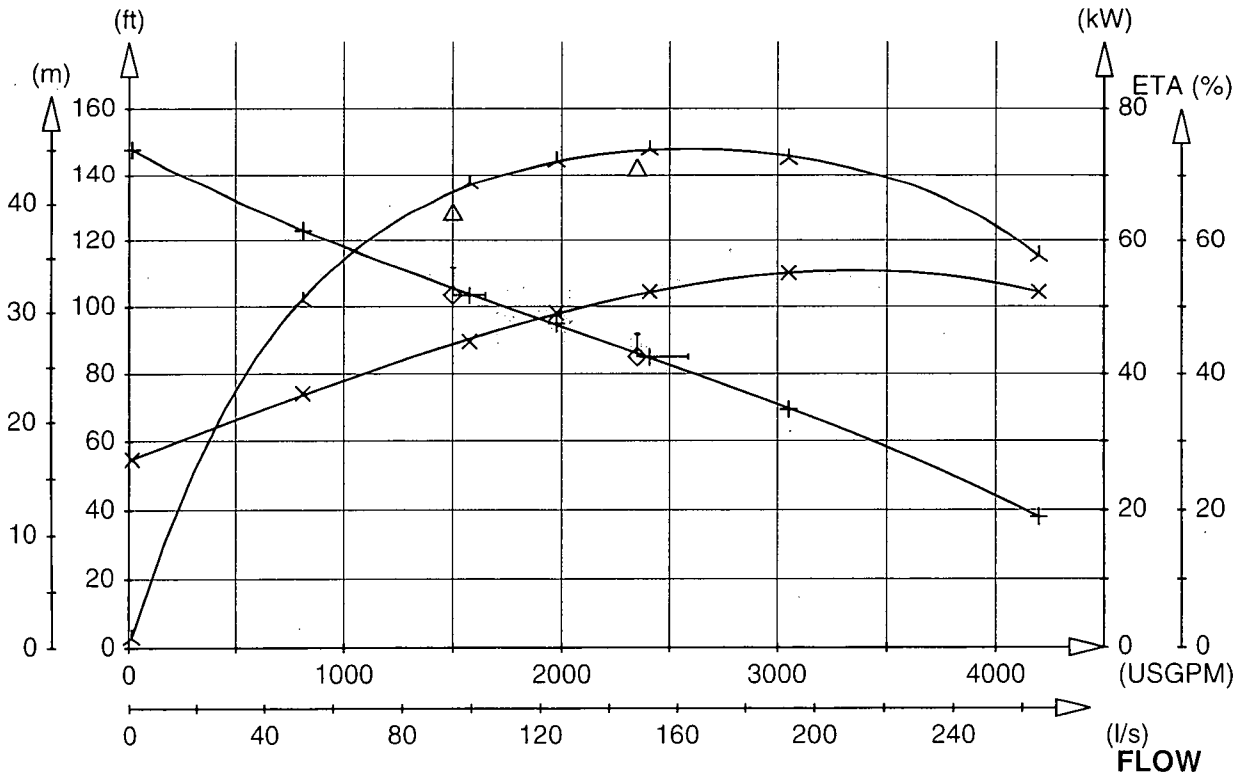
PLOTTED TEST RESULTS

Measured point : + = Q/H, × = Q/P Duty point : ◇ = Q/H, □ = Q/P, △ = Q/ETA overall Calculated point : 人 = Q/ETA overall

1

TOTAL HEAD

INPUT POWER



FLYGT

TEST REPORT

PRODUCT

Serial No.		Performance curve No.		Motor module/type	Voltage (V)
3231.605	0131031	63-630		35-29-6AA	460
Base module	**Impeller No.**	**Gear type**	**Gear ratio**	**Imp.diam/Blade angle**	**Water temp °C**
000	621 10 08			420	24

TEST RESULTS

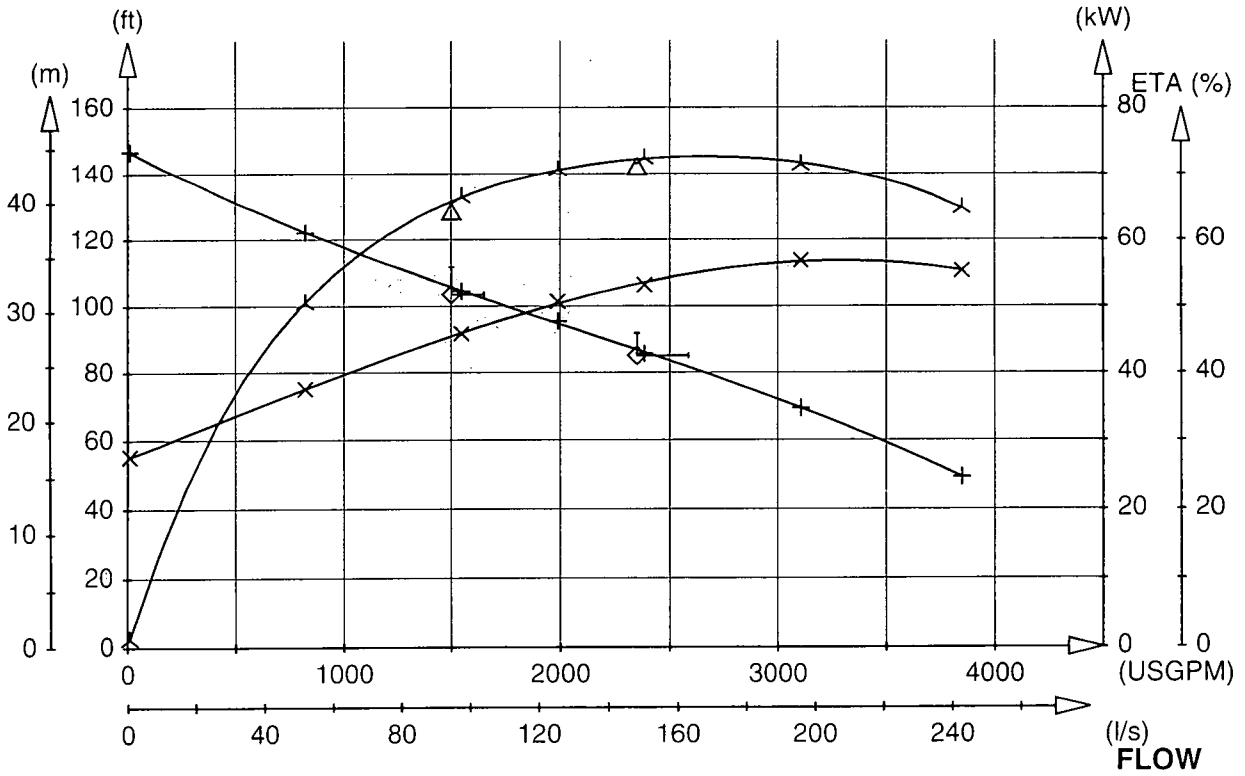
Pump total head H (ft)	Volume rate of flow Q (USGpm)	Motor input power P (kW)	Voltage U (V)	Current I (A)	Overall efficiency η(%)
146.74	12	27.64	464	59.4	1.17
122.18	822	37.55	464	69.3	50.47
104.51	1547	45.85	464	78.0	66.52
95.45	1989	50.70	463	83.6	70.65
85.62	2383	53.16	463	86.8	72.41
69.37	3105	56.87	463	91.4	71.44
49.36	3848	55.30	463	89.1	64.80

Accepted after	Test facility		Test date	Time	Chief tester
HI	LINDAS Sweden	Q2	01-04-17	12:29	1517

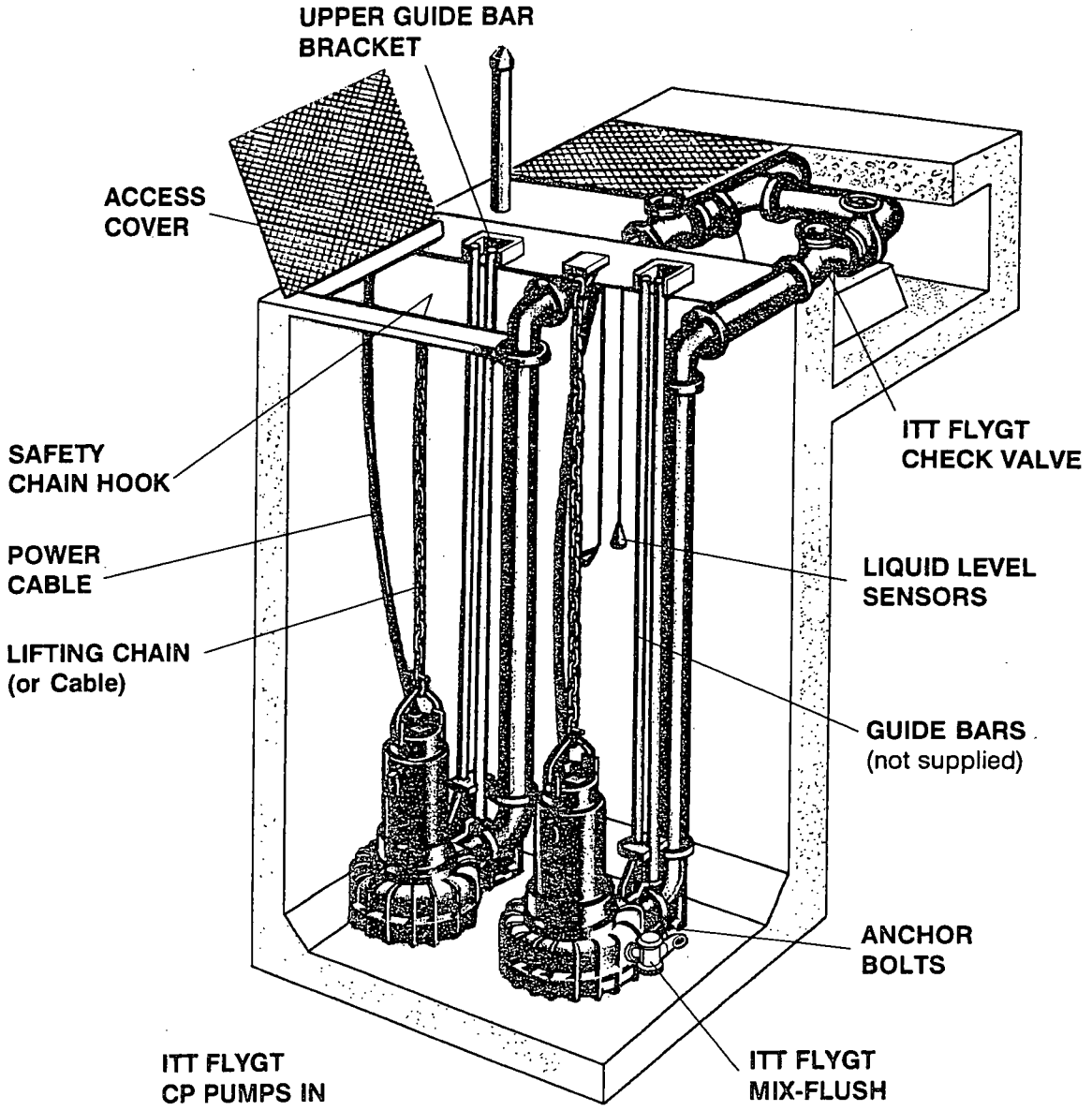
PLOTTED TEST RESULTS

Measured point : + = Q/H, × = Q/P Duty point : ◇ = Q/H, □ = Q/P, △ = Q/ETA overall Calculated point : ⅄ = Q/ETA overall

1



ITT Flygt Duplex "CP" Pumping Station



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ITT FLYGT 5 YEAR (10,000 HOUR) PUMP WARRANTY
MUNICIPAL: PERMANENT INSTALLATIONS

For the period defined below. ITT FLYGT offers a Commercial Warranty to the original End Purchaser against defects in workmanship and material covering Parts and Labor on its pumps when used in permanent installations, in compliance with the requirements of the ITT FLYGT Catalog and Technical Manual specifications, for use in Sewage Collection Systems or for intermittent (40% duty cycle or less) pumping of Raw Sewage, Municipal Wastewater, Potable or Raw Water, Storm Water or similar, abrasive free non-corrosive liquids ("Qualified Liquids").

ITT FLYGT Pumps used with Qualified Liquids in Sewage Lift Stations are Warranted for 5 years. ITT FLYGT pumps used for Sewage Treatment Processing or for more continuous (41% duty cycle or more) pumping of Qualified Liquids are Warranted for 10,000 hours of operation. Warranty begins on the date of shipment from ITT FLYGT. ITT FLYGT will pay the following share of the cost of replacement parts and labor provided the Pump, with Cable attached, is returned prepaid to an Authorized ITT FLYGT Service Facility for repairs. Cutting Plates and Impellers for FP Pumps are not included in this warranty.

	TIME AFTER SHIPMENT		
Months:	0-18	19-39	40-60
Hours:	0-3000	3000-6500	6500-10,000
Warranty:	100%	50%	25%

Unless otherwise specified by ITT FLYGT Corporate Headquarters, time after shipment shall be determined from shipping date, to date of receipt of defective product (or Warranty Claim) by ITT FLYGT or any of ITT FLYGT's Authorized Service Facilities.

Start-up report and electrical System Schematics (including Bills of Material) will be required to support any Warranty Claims. This Warranty shall not apply to any Product or Part of Product which has been subjected to misuse, accident, negligence, used in a manner contrary to ITT FLYGT's printed instructions or damaged due to a defective power supply, improper electrical protection or faulty installation or repair. The 5 year (or 10,000 hour) Warranty applies to the following Accessories if originally purchased with the pumps: Discharge Connection, Access Cover, HDL Valve, Guide Bar Bracket(s), Starting Control & Power Cable(s).

IMPORTANT: For warranty purposes, Monitoring devices supplied with specific pumps for protection must be connected and utilized. Failure to do so will invalidate the warranty.

ITT FLYGT's sole obligation under this Warranty shall be to Repair, Replace or Grant a Credit Reimbursement at its discretion, through its Warranty Processing Procedures for defective products when returned prepaid to ITT FLYGT and upon ITT FLYGT's exclusive examination found to be defective. Products repaired or replaced under this warranty will be returned freight prepaid.

ITT FLYGT neither assumes, nor authorizes any person or company to assume for it, any other obligation in connection with the sale of its equipment. Any enlargement or modification of this Warranty by a Representative, or other Selling Agent shall become his exclusive responsibility.

ITT Flygt will not be held responsible for travel expenses, rented equipment, outside contractor's fees, unauthorized repair shop expenses, or for pumps purchased or used without ITT Flygt supplied cable or controls unless suitable for the purpose and equal to ITT Flygt cables or controls. The warranties made herein by ITT Flygt are in lieu of any and all other warranties, expressed or implied and the implied warranties of merchantability and fitness for a particular purpose are hereby expressly disclaimed. ITT Flygt assumes no liability for loss of use or for any direct, indirect or consequential damages of any kind in respect to the use or operation of ITT Flygt products, or any equipment or accessories in connection therewith.

THE ITT FLYGT CORPORATION
FUS 6-1994

PERFORMANCE CURVE

DATE 2000-06-20	PROJECT ALAMEDA BUSINESS PARK S.W.P.S.	ISSUE 2	PROD C3231/605

NO. OF BLADES.....	2	TOT.MOM.OF INERTIA.....	1.69	KGM²	POLES: 6	FREQ: 60	HZ
IMPELLER THROUGHLET...	88*88 Circul.	RATED SPEED.....	1185	RPM	VOLTAGE.....	460	V
					MOTOR SHAFT POWER.....	90 67	hp KW
					STARTING TORQUE.....	745	NM
					MAX TORQUE.....	1295	NM
					RATED CURRENT.....	115	A
					STARTING CURRENT.....	685	A

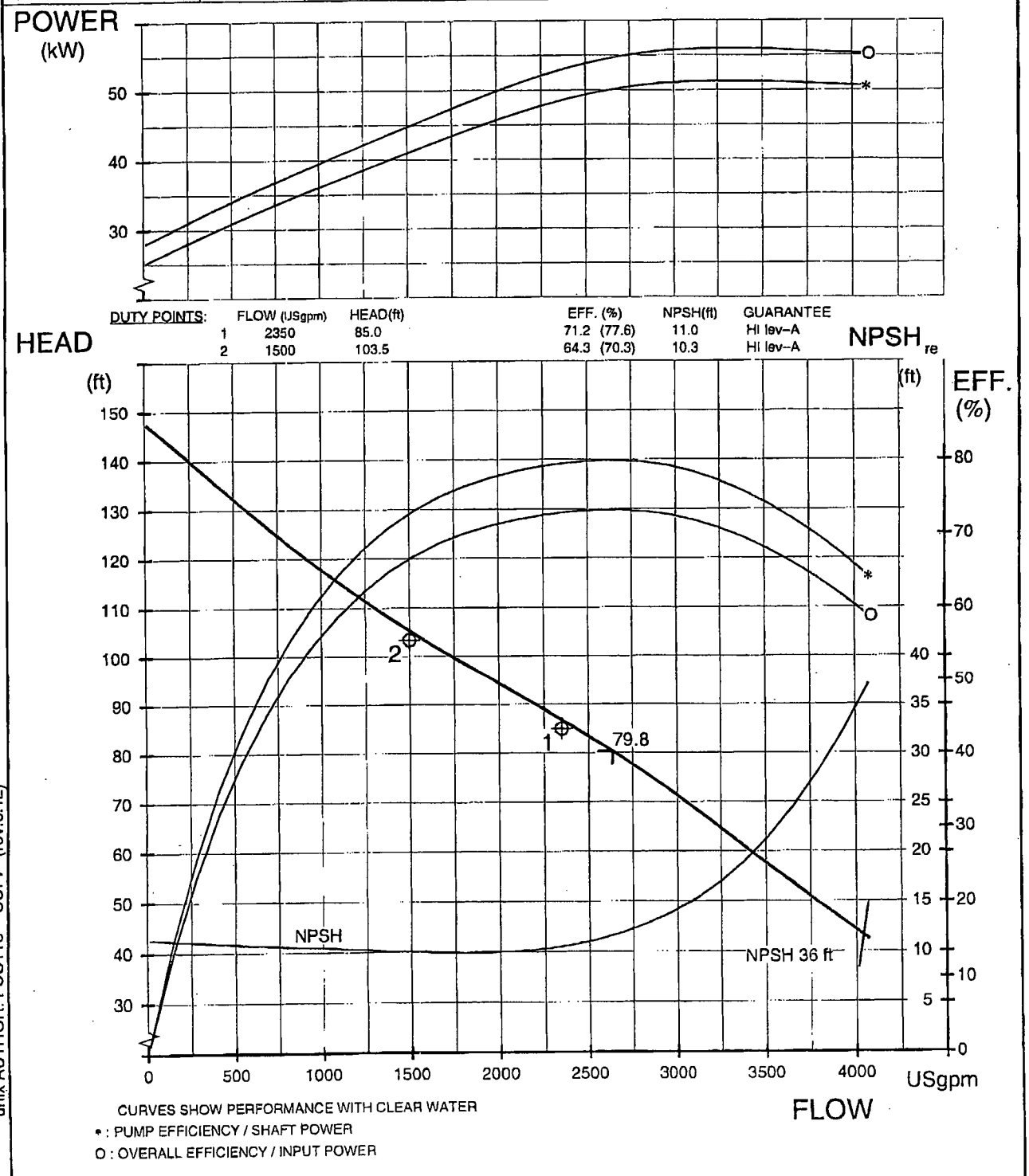
	1/1-LOAD	3/4-LOAD	1/2-LOAD
MOTOR COS FI	0.81	0.76	0.66
MOTOR EFFICIENCY	91.0%	91.5%	91.0%
GEAR EFFICIENCY			

CURVE NO 63-630

IMPELLER DIAMETER 420 MM

MOTOR TYPE 35-29-6AA/01 (10)

GEAR TYPE | RATIO



CURVES SHOW PERFORMANCE WITH CLEAR WATER

*: PUMP EFFICIENCY / SHAFT POWER

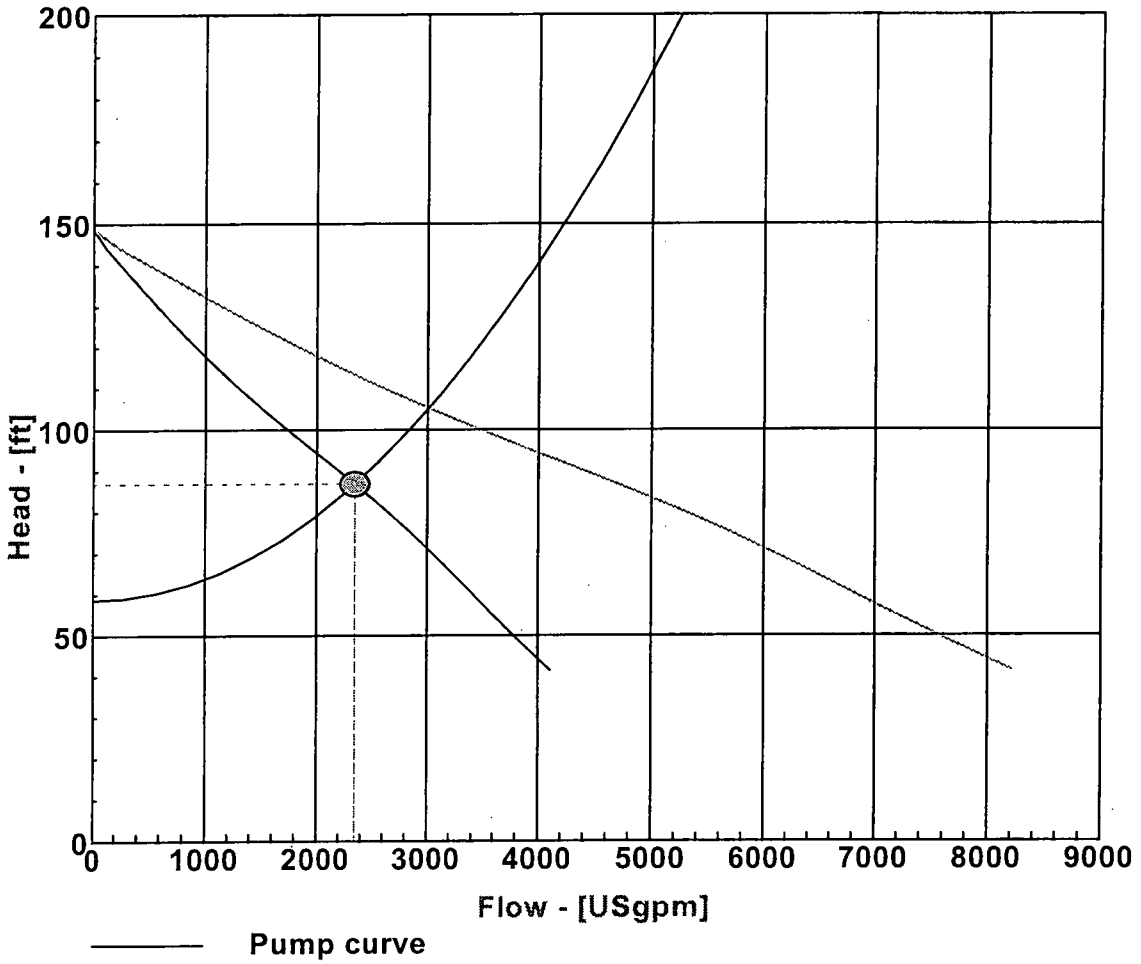
O: OVERALL EFFICIENCY / INPUT POWER

unix AUTHOR: FUS116 CUPF (rev:6.12)

Duty Analysis - Duty conditions

Project: Alameda Business Park Storm Water L. S.

Created by:: Rick Hobson



1 CP 3231 C3231-63-630

PRODUCT DATA

Rtd. pwr.: 90 hp
Imp. diam.: 420 mm
Vanes: 2
Throughlet: 3.5 inch

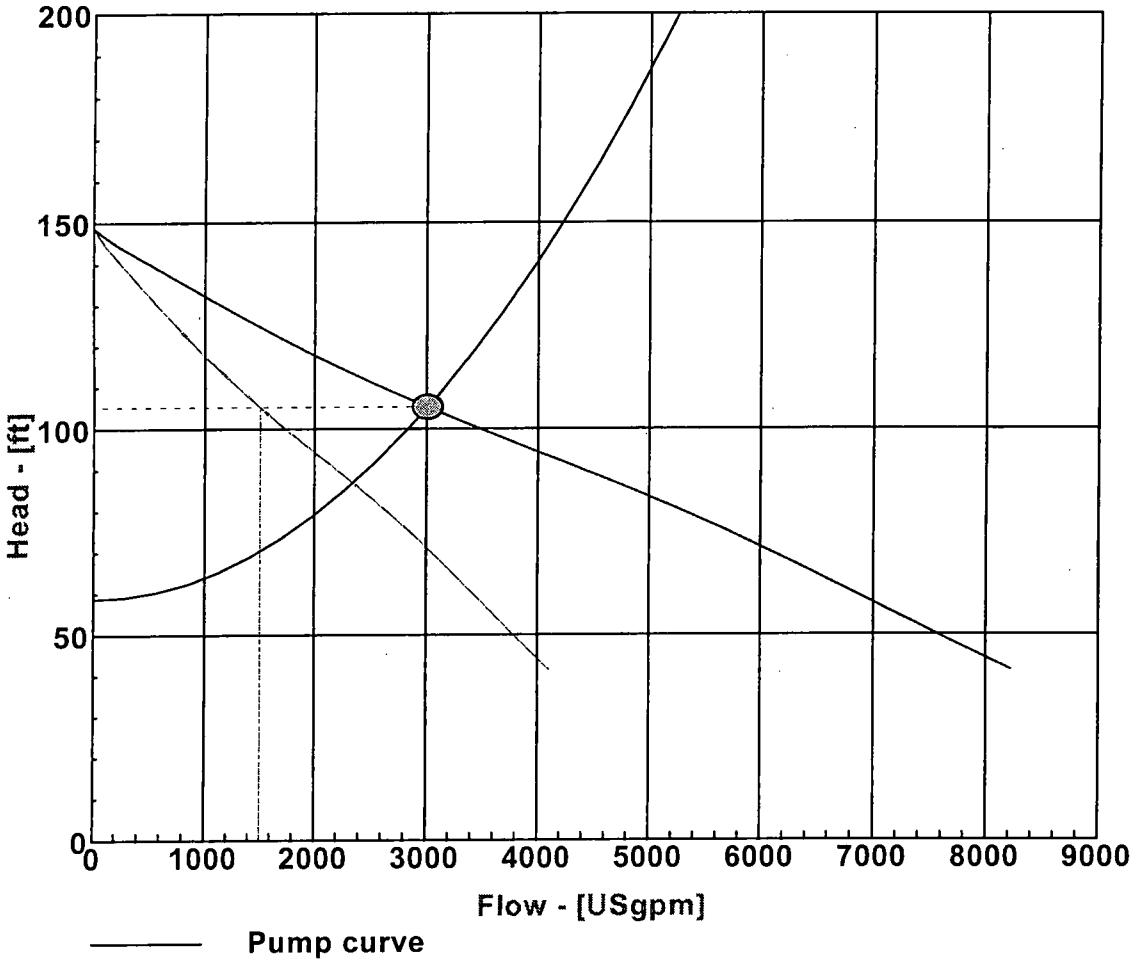
DUTY CONDITIONS

No of pumps: 1
Flow: 2347.4 USgpm
Head: 86.8 ft
Shaft power: 64.9 hp
Pump efficiency: 79.4 %
Specifc energy: 374.3 kWh/mg

Duty Analysis - Duty conditions

Project: Alameda Business Park Storm Water L. S.

Created by:: Rick Hobson



2 CP 3231 C3231-63-630

PRODUCT DATA

Rtd. pwr.: 90 hp
Imp. diam.: 420 mm
Vanes: 2
Throughlet: 3.5 inch

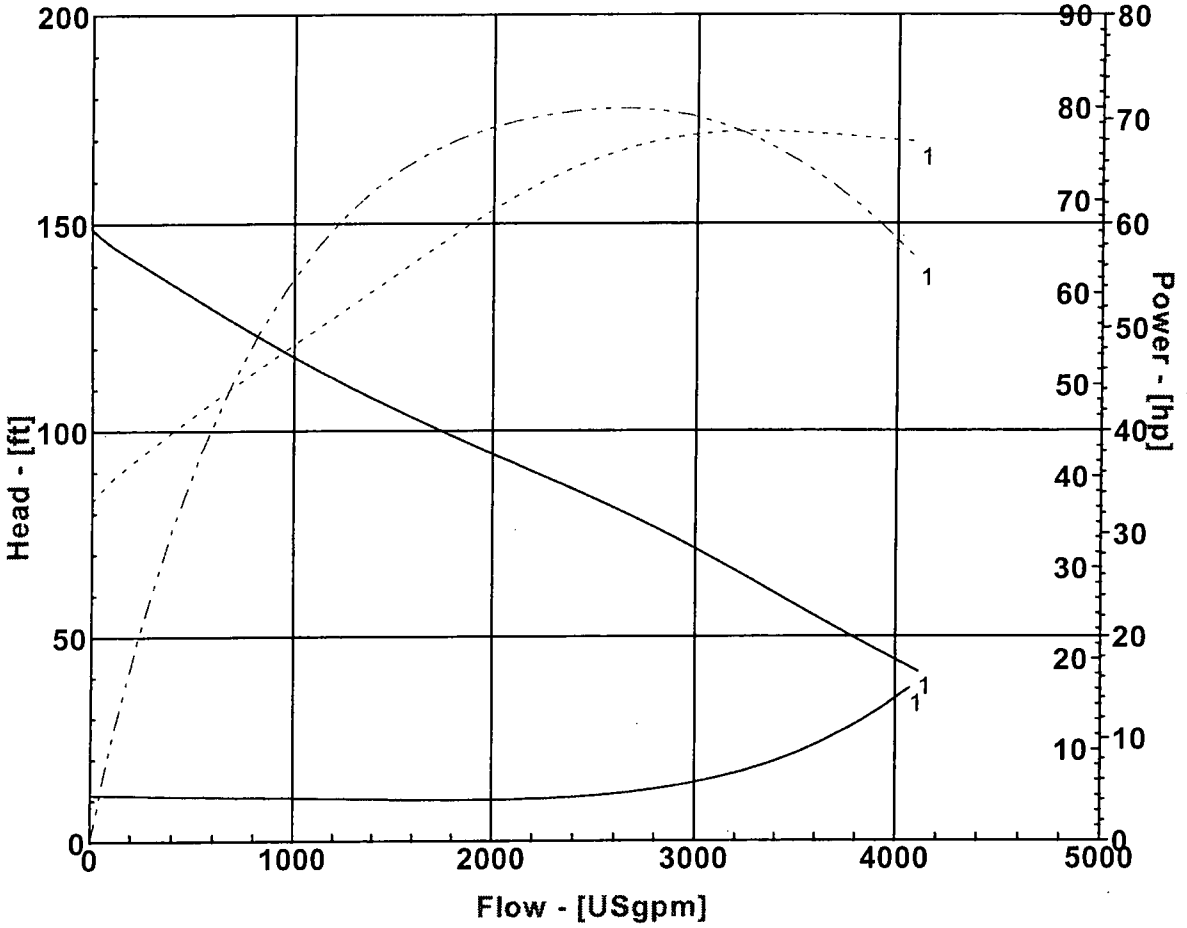
DUTY CONDITIONS

	Each Pump
No of pumps: 2	
Flow: 3014.2 USgpm	1507.1
Head: 105.2 ft	105.2
Shaft power: 110.1 hp	55
Pump efficiency: 72.8 %	
Specifc energy: 494.8 kWh/mg	

Duty Analysis - Performance curves

Project: Alameda Business Park Storm Water L. S.

Created by:: Rick Hobson



Performance/NPSHre

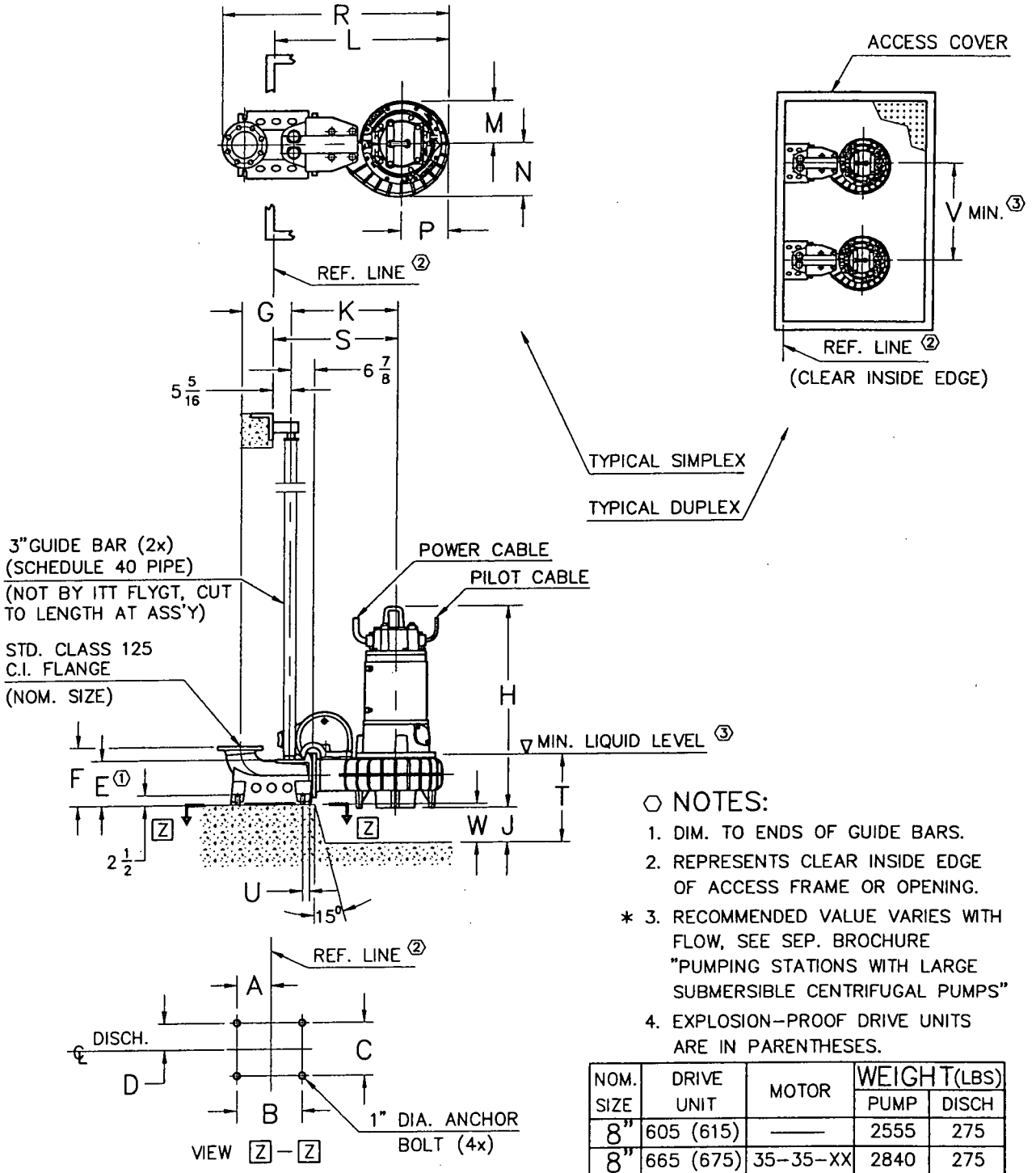
Shaft power

Pump efficiency

1. CP 3231 - C3231-63-630 90 hp 420 mm

CP-3231 (600 Series Drives)
Outline Dimensions

SECTION	PAGE
4	1
SUPERSEDES	ISSUED
	10/96



NOTES:

1. DIM. TO ENDS OF GUIDE BARS.
2. REPRESENTS CLEAR INSIDE EDGE OF ACCESS FRAME OR OPENING.
* 3. RECOMMENDED VALUE VARIES WITH FLOW, SEE SEP. BROCHURE "PUMPING STATIONS WITH LARGE SUBMERSIBLE CENTRIFUGAL PUMPS"
4. EXPLOSION-PROOF DRIVE UNITS ARE IN PARENTHESES.

NOM. SIZE	DRIVE UNIT	MOTOR	WEIGHT (LBS) PUMP	WEIGHT (LBS) DISCH
8"	605 (615)	——	2555	275
8"	665 (675)	35-35-XX	2840	275
8"	665 (675)	35-45-XX	2905	275

ALL DIMENSIONS IN INCHES

NOM. SIZE	DRIVE UNIT	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W
8"	605 (615)	9 7/8	19 3/4	15 3/4	7 7/8	13 1/2	17 3/4	14 3/4	61	10 3/4	32	51 1/4	12 3/4	15 1/4	14	67 1/2	37 1/4	*	2	*	12
~~8"~~	~~665 (675)~~	~~9 7/8~~	~~19 3/4~~	~~15 3/4~~	~~7 7/8~~	~~13 1/2~~	~~17 3/4~~	~~14 3/4~~	~~67 3/4~~	~~10 3/4~~	~~32~~	~~51 1/4~~	~~12 3/4~~	~~15 1/4~~	~~14~~	~~67 1/2~~	~~37 1/4~~	*	~~2~~	*	~~12~~

C-3231

SECTION	PAGE
6	1
SUPERSEDES	ISSUED
10/96	2/99

Motor Data

RATED OUTPUT POWER HP	(kW)	MOTOR DRIVE UNIT (FM)	Ø	VOLTS NOM.	FULL LOAD AMPS	LOCKED ROTOR AMPS	LOCKED ROTOR KVA	LOCKED ROTOR CODE LETTER KVA/HP	RATED INPUT POWER kW	POLES/RPM
90	(67)	605 (615)	3	~~230~~ 460 ~~575~~	~~230~~ 115 ~~92~~	~~1370~~ 685 ~~548~~	546	G	74	6/1185
110	(82)	665 (675)	3	230 460 575	278 139 111	1730 865 692	689	H	89	6/1185
*160	(119)	665 (675)	3	460 575	183 146	1395 1116	1112	H	127	4/1780

PUMP MOTOR HP	EFFICIENCY 100% LOAD	EFFICIENCY 75% LOAD	EFFICIENCY 50% LOAD	POWER FACTOR 100% LOAD	POWER FACTOR 75% LOAD	POWER FACTOR 50% LOAD
90	91.0	91.5	91.0	0.81	0.76	0.66
~~110~~	~~92.0~~	~~92.5~~	~~92.0~~	~~0.81~~	~~0.76~~	~~0.65~~
~~*160~~	~~94.0~~	~~94.0~~	~~93.5~~	~~0.87~~	~~0.83~~	~~0.73~~

Cable Data

HP	VOLTS	MAX. LENGTH FT.	CABLE SIZE/ NOMINAL DIA.	CONDUCTORS (IN ONE CABLE)	PART NUMBER
90	**230	240	4 G 50 43mm (1.69")	(3) 50 (PWR) (1) 50 (GND)	94 20 66
	460 575	445 695	1 AWG 41.7mm (1.64")	(3) 1 AWG (PWR) (2) 10 AWG (CTRL) (1) 4 AWG (GND) (1) 8 AWG (GC)	94 21 11
110	**230 460	200 395	4 G 50 43mm (1.69")	(3) 50 (PWR) (1) 50 (GND)	94 20 66
	575	575	1 AWG 41.7mm (1.64")	(3) 1 AWG (PWR) (2) 10 AWG (CTRL) (1) 4 AWG (GND) (1) 8 AWG (GC)	94 21 11
*160	**460 575	575 450	4 G 50 43mm (1.69")	(3) 50 (PWR) (1) 50 (GND)	94 20 66
90, 110 & *160	Pilot Cable		12 X 1.5 19.7mm (0.78")	(12) 1.5 (CTRL)	94 19 20

* For R version only. ** Requires 2 cables

C-3231, 3306, 3312, 3356, 3501, 3531, 3602
Performance Specifications

SECTION	PAGE
7	1
SUPERSEDES	ISSUED
9/94	10/96

REQUIREMENTS

Furnish and install 2 submersible non-clog wastewater pump(s). Each pump shall be equipped with a close coupled 90 HP, submersible electric motor connected for operation on 460 volts, 3 phase, 60 hertz, 3 wire service with 40 linear feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval. Also, 40 linear feet of multiconductor submersible cable (SUBCAB) will be used to convey pump monitoring device signals.

The pump shall be supplied with a mating cast iron 8 inch discharge connection and be capable of delivering 2350 GPM at 85' FT. TDH. An additional point on the same curve shall be 1500 GPM at 104 FT. TDH. Pump shut off head shall be no less than 140 feet. Each pump shall be fitted with 30 feet of 5S lifting chain ~~or stainless steel cable~~. The working load of the lifting system shall be 50% greater than the pump unit weight.

PUMP DESIGN

The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two parallel guide bars extending from the top of the station to the wet well mounted discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. The entire weight of the pump/motor unit shall be borne by the pump discharge elbow. No portion of the pump/motor unit shall bear on the sump floor directly or on a sump floor mounted stand.

Power and pilot cable supports shall be provided and consist of a wire braid sleeve with attachment loops or tails to connection to the under side of the access frame.

PUMP CONSTRUCTION

Major pump components shall be of gray cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other casting irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel. All metal surfaces coming into contact with the pumped media, other than stainless steel, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate **metal-to-metal contact** between machined surfaces. Pump/Motor unit mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Joint sealing will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific bolt torque limit. Rectangular cross sectioned rubber, paper or synthetic gaskets that require specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

COOLING SYSTEM

Each pump/motor unit shall be provided with an integral, self-supplying cooling system. The motor water jacket shall encircle the stator housing and shall be of cast iron, ASTM A-48, Class 35B. The water jacket shall thus provide heat dissipation for the motor regardless of whether the motor unit is submerged in the pumped media or surrounded by air. After passing through a classifying labyrinth, the impeller back vanes shall provide the necessary circulation of the cooling liquid, a portion of the pumpage, through the cooling system. Two cooling liquid supply pipes, one discharging low and one discharging high within the jacket, shall supply the cooling liquid to the jacket. An air evacuation tube shall be provided to facilitate air removal from within the jacket. Any piping internal to the cooling system shall be shielded from the cooling media flow allowing for unobstructed circular flow within the jacket about the stator housing. Two cooling liquid return ports shall be provided. The internals to the cooling system shall be non-clogging by virtue of their dimensions. Drilled and threaded provisions for external cooling and, seal flushing or air relief are to be provided. The cooling jacket shall be equipped with two flanged, gasketed and bolted inspection ports of not less than 4"Ø located 180° apart. The cooling system shall provide for continuous submerged or completely non-submerged pump operation in liquid or in air having a temperature of up to 40°C (104°F), in accordance with NEMA standards. Restrictions limiting the ambient or liquid temperatures at levels less than 40°C are not acceptable.

CABLE ENTRY SEAL

The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the cable entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function.

The assembly shall provide ease of changing the cable when necessary using the same entry seal. **The cable entry junction chamber and motor shall be sealed from each other, which shall isolate the stator housing from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.**

MOTOR

The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber, NEMA B type. The stator windings and stator leads shall be insulated with moisture resistant Class F insulation rated for 155°C (311°F). The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be specifically designed for submersible pump usage and designed for continuous duty pumping media of up to 40°C (104°F) with an 80°C temperature rise and capable of at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber shall contain two distinct and separate terminal boards. The first terminal board shall be used for the connection of the pilot sensor leads with the pilot sensor cable. The second terminal boards shall be utilized for the line power connection to the motor stator leads. This power terminal board shall use threaded compression type binding posts to connect the cable conductors and motor stator leads. The use of wire nuts or crimping type connectors is not acceptable. The motor and pump shall be produced by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber.

The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of at least 65 feet.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

BEARINGS

The pump shaft shall rotate on at least three grease-lubricated bearings. The upper bearing, provided for radial forces, shall be a single roller bearing. The lower bearings shall consist of at least one roller bearing for radial forces and one or two angular contact ball bearings for axial thrust.

The minimum L_{10} bearing life shall be 100,000 hours at any point along the usable portion of the pump curve at maximum product speed.

The lower bearing housing shall include an independent thermal sensor to monitor the bearing temperature. If a high temperature occurs, the sensor shall activate an alarm and shut the pump down.

MECHANICAL SEAL

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The lower seal shall be independent of the impeller hub. The seals shall operate in an lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating **tungsten-carbide** seal ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary **tungsten-carbide** seal ring and one positively driven rotating **tungsten-carbide** seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance or adjustment and shall be capable of operating in either clockwise or counter clockwise direction of rotation without damage or loss of seal. For special applications, other seal face materials shall be available.

Should both seals fail and allow fluid to enter the stator housing, a port shall be provided to direct that fluid immediately to the stator float switch to shut down the pump and activate an alarm. Any intrusion of fluid shall not come into contact with the lower bearings.

The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. Cartridge type systems will not be acceptable. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

Each pump shall be provided with an lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. **The motor shall be able to operate continuously while non-submerged without damage while pumping under load.**

Seal lubricant shall be FDA Approved, nontoxic.

PUMP SHAFT
Pump and motor shaft shall be a solid continuous shaft. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be of carbon steel C1035 and shall be completely isolated from the pumped liquid.

IMPELLER
The impeller(s) shall be of gray cast iron, Class 35B, dynamically balanced, multiple vaned, double shrouded non-clogging design having long throughlets without acute turns. The impeller(s) shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request. Impeller(s) shall be keyed to the shaft, retained with an expansion ring and shall be capable of passing a minimum 3 inch diameter solid. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.

WEAR RINGS
A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a Nitrile rubber coated steel or brass ring insert that is drive fitted to the volute inlet.

This pump shall also have a stainless steel impeller wear ring heat-shrink fitted onto the suction inlet of the impeller.

VOLUTE
Pump volute(s) shall be single-piece gray cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified.

PROTECTION
All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. Should high temperature occur, the thermal switches shall open, stop the motor and activate an alarm.

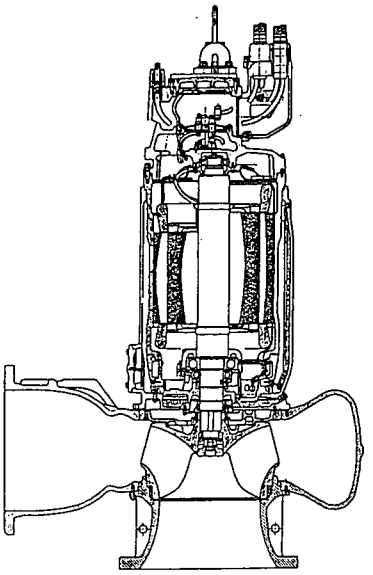
A lower bearing temperature sensor shall be provided. The sensor shall directly contact the outer race of the thrust bearing providing for accurate temperature monitoring.

A leakage sensor shall be provided to detect water in the stator chamber. The Float Leakage Sensor (FLS), a small float switch, shall be used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and activate an alarm. **USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS SHALL NOT BE ALLOWED.**

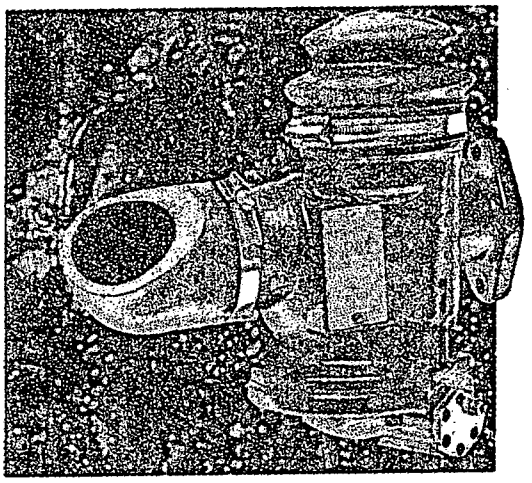
The thermal switches, FLS and the lower bearing temperature monitor shall be connected to a CAS (Control and Status) monitoring unit. The CAS shall be designed to be mounted in the control panel.

MODIFICATIONS
1. Explosion-proof Pumps (X).
2. Dry Pit Installations (CT).

Refer to the General Guide Specifications for additional information.



ITT Flygt Mix-Flush System

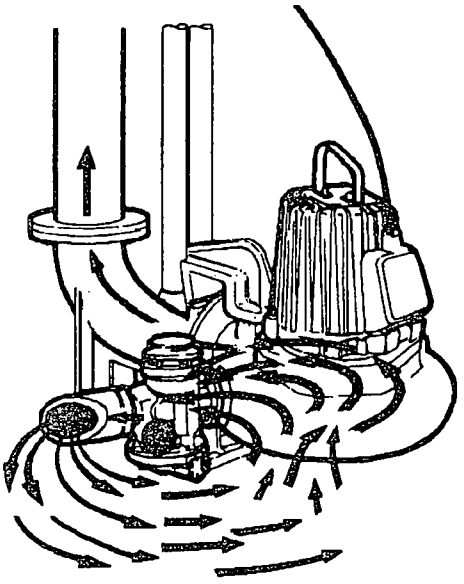


Model 4901 Flush Valve
(with 90° discharge elbow)
Part No. 556 51 01

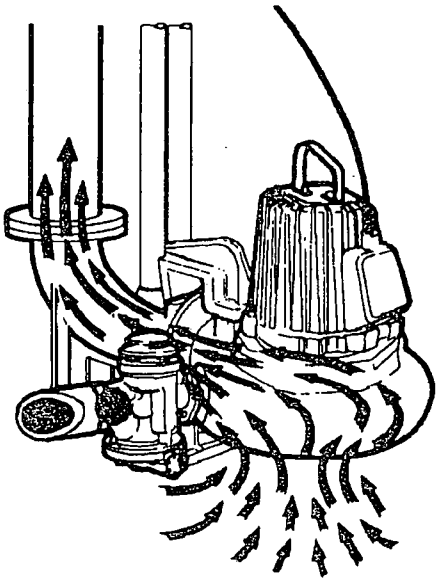
The ITT Flygt Mix-Flush(TM) System automatically flushes the sump during initial operation of the pump. The system consists of the ITT Flygt 4901 Flush Valve, Impeller and Volute. The operation of the valve depends only on the pump flow and pressure. No electrical components or cables are used with the valve. Thus, the valve is intrinsically safe and suitable for pumps used in hazardous locations Class 1, Division 1, Groups C and D.

The powerful stream of water exiting the valve violently churns up the liquid in the sump thus re-suspending any built up sludge.

The system is based on the ejector principle with a ball closing the valve in a period of 20 to 50 seconds. A means of adjustment is provided on the outside of the valve to obtain the desired flushing period.



Valve Open



Valve Closed

ITT Flygt Monitoring Devices
CAS

Description:

ITT Flygt monitoring unit **CAS** (Control and Status) is an electronic module designed spesifically to supervise the overtemperature and moisture sensors in ITT Flygt large pumps (3231 and larger) and hydroturbine generators.

The **CAS** unit allows for the connection of four (4) sensors on its four channels.

The **CAS**'s four channels (A,B,C and D) work independently, but each channel will trigger a general alarm circuit. Basically, Channel A and B are designed for leakage sensor connections, but Channel B can also accommodate an oil pressure sensor for machines equipped with a gear box. Channel C is intended for stator temperature sensor's connections - thermal switches or PTC thermistors, and Channel D for bearing temperature sensors PT100.

Channel A and B inputs are provided with an LED which is lit when no sensor is connected or there is a broken wire.

Note: As in most applications, the Channel B is not used; the red LED No. 52 (see Manual) is permanently on, but this will not trigger the **CAS** output.

Also, each Channel output has a red LED that will indicate a FAULT.

A general alarm output (Σ) and an interlocking relay contact (GO) are activated when any channel receives a fault input.

It is to be noted that all **CAS** outputs (except for GO output) are solid state relays, with a maximum rating of 24 VAC, 100 mA.

However, GO output (terminals 11-12) is a rely output, with a contact rating of 240 VAC, 4 amps, and it is to be used for pump motor starter interlocking.

Channel D is also provided with an analog output and a set D-Alarm potentiometer. As the PT100 sensor provides a linear signal to the **CAS** unit, the bearing temperature can be monitored continuously over a 50°C - 150°C temperature range.

The "D-Value" output provides a 0-20 mA signal, which is proportional to the bearing temperature in the above-mentioned range. A multimeter or a panel readout calibrated in °C can be connected between terminals 31-32 permanently or only for calibration purposes. (See Installation Manual for details).

Technical Data:

Supply Voltage	24V ±10% 50-60 Hz
Power Consumption	Ca 5 VA
Dimensions mm (in)	(WxHxD)150x70x112 (5.9x2.75x4.4)
Temperature range	0°C- +50°C (32°F-122°F). Max 80% RH
Channel A	
Voltage to detector	12V
Alarm	I>20 mA
Output alarm	Solid state relay 24VAC 100 mA
Reset	Manual
Channel B	
Voltage to detector	12V
Alarm	I > 20 mA (I< 20 mA if RUN is activated).
Output alarm	Solid state relay 24VAC 100 mA
Channel C	
Alarm	I ≥ 3 k Ω
Output alarm	Solid state relay 24VAC 100 mA
Reset	Manual when R < 900 Ω
Channel D	
Alarm	$R > R_{set}$
Output alarm	Solid state relay 24VAC 100 mA
Output	0-20 mA range 50°C-150°C (122°F-302°F) (0.2 mA/°C ± 2.5%.
Reset	Manual
Σ-alarm	
Alarm	Activated by alarm from each individual channel.
Output alarm	Solid state relay 24VAC 100 mA
Interlock	
Alarm	Activated by alarm and power supply failures.
Function	Normally closed
Breaking capacity	240V 4A at cos φ = 1

Part Number: 83 58 40

The monitoring unit is designed to be installed in a control panel. The unit can be mounted either on a 35 mm symetric DIN rail, or directly on a mounting plate. The drawing below shows the positioning of the drill holes for mounting on a flat surface.

SHOP DRAWING REVIEW
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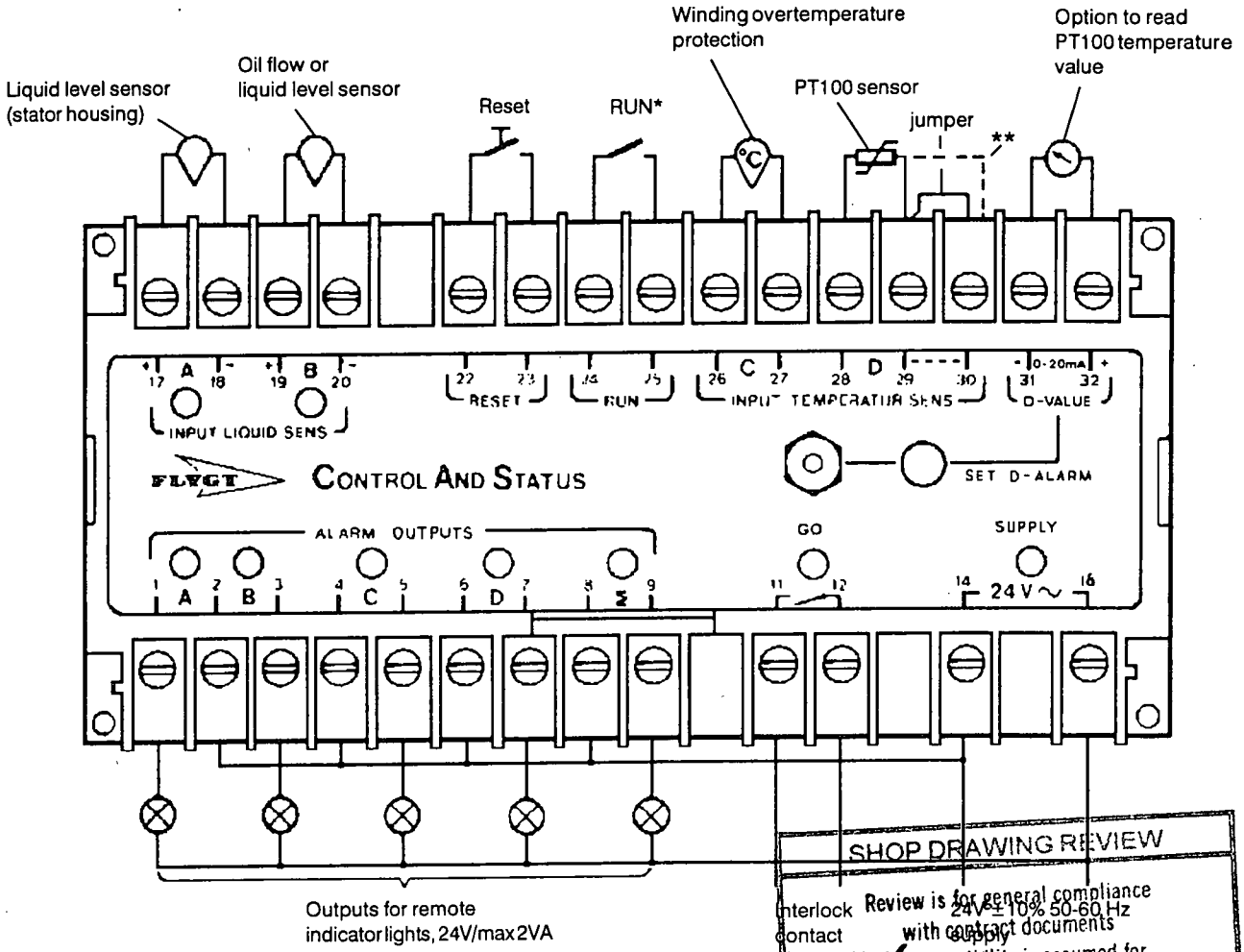
Electrical Connections:

The electrical connections shall be made in accordance with the electrical diagram (see also the top of the unit). Connect a 24VAC power source to terminals 14 and 16. Connect a normally open spring switch for reset after alarm between terminals 22 and 23.

Connect the starter's interlock circuit between terminals 11 and 12 so that the pump/turbine is shut off when an alarm is issued.

Connect 29 and 30 with a jumper, except when a 3-lead system for compensation for the resistance of the sensor is used.



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* To be connected only when oil pressure is monitored.
** 3-wire connection for lead resistance compensation for long pilot cable.

ITT Flygt Monitoring Devices
SUBMEG and SUBMEG-D

• The ITT Flygt **SUBMEG** and **SUBMEG-D** are Automatic Motor Insulation Monitoring devices and are a major advance in the protection of electrical motors.

• Automatically monitor the motor winding insulation resistance.

• Compact, solid state plug-in design allows installation in new control panels or retrofitting of existing controls.

Description

The monitoring devices are designed to produce a low current and high voltage (500 VDC) which is applied to the motor windings each time a pump is started. If the winding leakage to ground falls to one megohm or less, a local or remote alarm will be activated and, depending on the type of module selected, the motor will not start or the motor will run.

The SUBMEG and SUBMEG-D devices are contained in a compact 12-pin plug-in module and have sunlight visible LED indicators: "Power On", "500VDC On" and "Low Meg" on the **SUBMEG** module, "Power On", "1 Meg" and "5 Meg" on the **SUBMEG-D** module. A "Motor Reset" push-button and "Emergency Bypass" switch are mounted on the **SUBMEG** module for Simplex applications, so that the pump may be run in emergency situations. The **SUBMEG-D** module for Duplex applications has (2) "Motor On/Off" switches.

Another feature of each monitoring device is a manual "Meg Test" button which tests the internal circuitry of the module.

The **SUBMEG** and **SUBMEG-D** represent a major breakthrough in preventive maintenance and eliminate the need for an electrician to manually megger any motor every thirty days.

In addition to the initial low cost of the monitoring devices, savings are compounded because motor burn-outs due to moisture penetration are virtually eliminated. Repair work can be more efficiently scheduled.

Features

- Solid state 12 pin plug-in electronic module
- Simple, low cost installation
- Tests insulation for 10 seconds prior to starting
- Prevents motor from starting if 1 Megohm or less (optional on SUBMEG for Simplex applications only)
- Eliminates manual testing
- Tests motor before starting after power failure
- Early warning system to prevent motor burn-outs due to moisture.
- Allows repairs to be scheduled
- Monitors repaired submersible motors
- Monitors cable entry leakage (submersible)
- Optional resistance values available.
- Can be easily retrofitted into existing control panels
- Adaptable to telemetering
- Emergency Bypass switch,Motor Reset, 500 VDC LED (on SUBMEG for Simplex applications only)
- MegTest button for internal circuitry
- Two (2) year warranty

Technical Specifications:

- Temperature Range: -30°C to +60°C (-22°F to +140°F)
- Power Supply (pins 1 & 2): 120 VAC, 60Hz, ±10% @ 15 VA
- Test Voltage: 500 VDC @ 0.25 mA or less
- Output Contact Ratings:
  Motor Start Signal - 3.0 amps, 120 VAC max.
  Alarm Contact - 1.0 amp, 120 VAC max.
- Physical Dimensions: Plug-in Modules: 3.5" x 3.5" x 2.75".

For door-mounted Duplex SubMeg and configurations for the SUBMEG for Simplex applications, as well as Part Numbers refer to the Schematic Drawings on the next three pages.

Note: SUBMEG and SUBMEG-D are Registered Trademarks of ITT Flygt Corporation.

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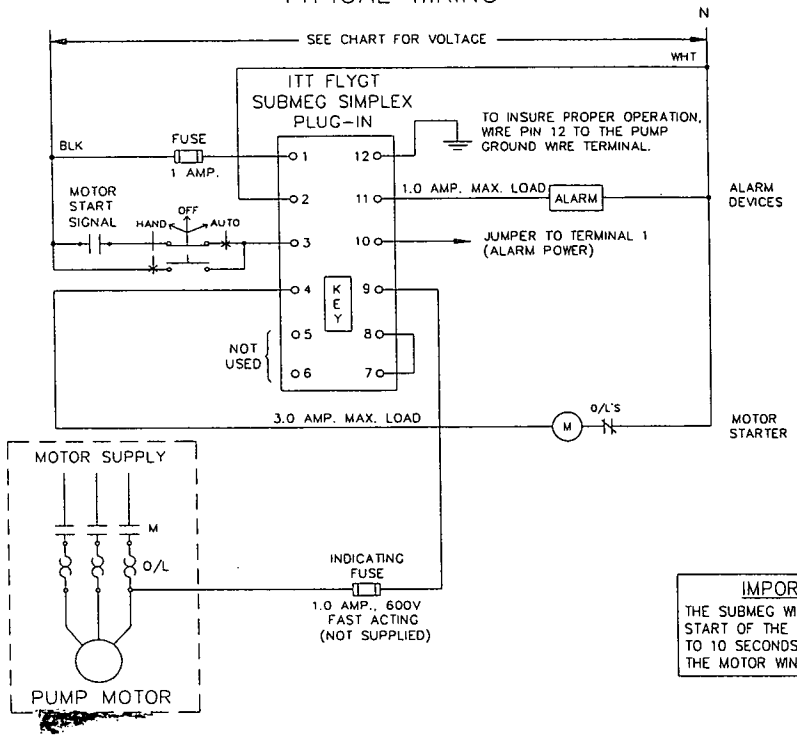
FLYGT

ITT Flygt Monitoring Devices
SUBMEG

TYPICAL WIRING



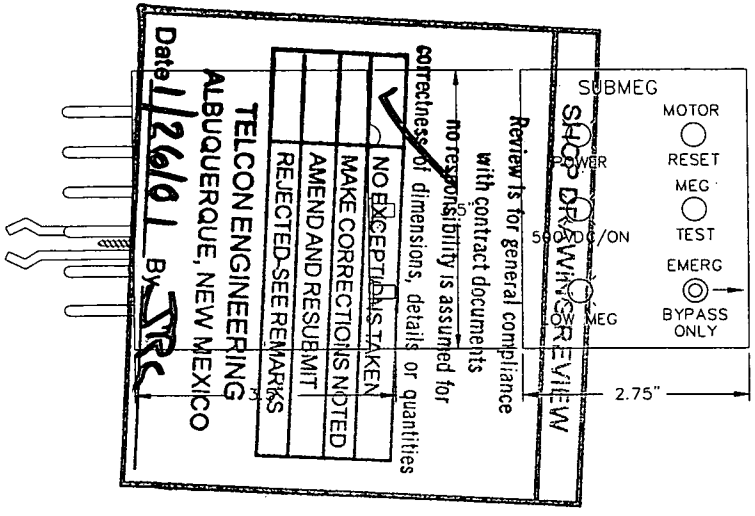
ITT FLYGT SUBMEG – UL APPROVED				
TYPE	SUBMEG PART NUMBER	ASSEMBLY (RELAY & SOCKET)	VOLTS 50/60 Hz	FUNCTIONS
A	14-50 60 07	14-50 00 54	120	ALARM ONLY
B	14-50 60 08	14-50 00 55	120	ALARMS AND INHIBITS MOTOR START
B	14-50 60 11	14-50 00 74	220	ALARMS AND INHIBITS MOTOR START
C	14-50 60 09	14-50 00 56	120	SAME AS TYPE "B" WITH SAFETY WIRE AND SEAL ON EMERGENCY BYPASS SWITCH
—	14-40 31 60	——	600	12 PIN SOCKET

IMPORTANT
THE SUBMEG WILL DELAY THE START OF THE MOTOR FOR UP TO 10 SECONDS WHILE TESTING THE MOTOR WINDINGS.

DESCRIPTION OF OPERATION

- THE "POWER ON" LIGHT IS LIT WHEN POWER IS APPLIED TO PINS 1 AND 2.
- WHEN POWER IS APPLIED TO PIN 3, EITHER DIRECT (HAND) OR THROUGH MOTOR START SIGNAL (AUTO), THE DEVICE MONITORS THE MOTOR WINDINGS THROUGH PIN 9. A POTENTIAL OF 500 VOLTS AT LESS THAN 0.25 mA IS USED. THE "500 VDC/ON" LIGHT INDICATES THE MOTOR IS BEING TESTED.
- IF THE MOTOR WINDING INSULATION RESISTANCE EXCEEDS 1 MEGOHM, THE PUMP WILL START.
- IF THE MOTOR WINDING INSULATION RESISTANCE IS EQUAL TO OR LESS THAN 1 MEGOHM, THE "LOW MEG" LIGHT WILL COME ON AND:
  - IF A TYPE "A" AUTOMATIC SUBMEG IS SUPPLIED, THE ALARM SIGNAL (PIN 11) WILL BE ACTIVATED, BUT THE PUMP WILL START.
  - IF A TYPE "B" OR "C" SUBMEG IS UTILIZED, THE ALARM SIGNAL WILL BE ACTIVATED AND THE PUMP WILL NOT START.
- THE "RESET" BUTTON MUST BE PUSHED AFTER A "LOW MEG" ALARM.
- THE "EMERGENCY BYPASS ONLY" SWITCH TURNS THE SUBMEG OFF.
- PUSHING THE "MEG TEST" BUTTON TESTS THE INTERNAL CIRCUITRY OF THE SUBMEG. THE GREEN "POWER" LIGHT WILL GO OUT AND THE "LOW MEG" LIGHT WILL BE LIT. THE "MEG TEST" BUTTON WILL NOT FUNCTION WHEN THE MOTOR IS RUNNING.

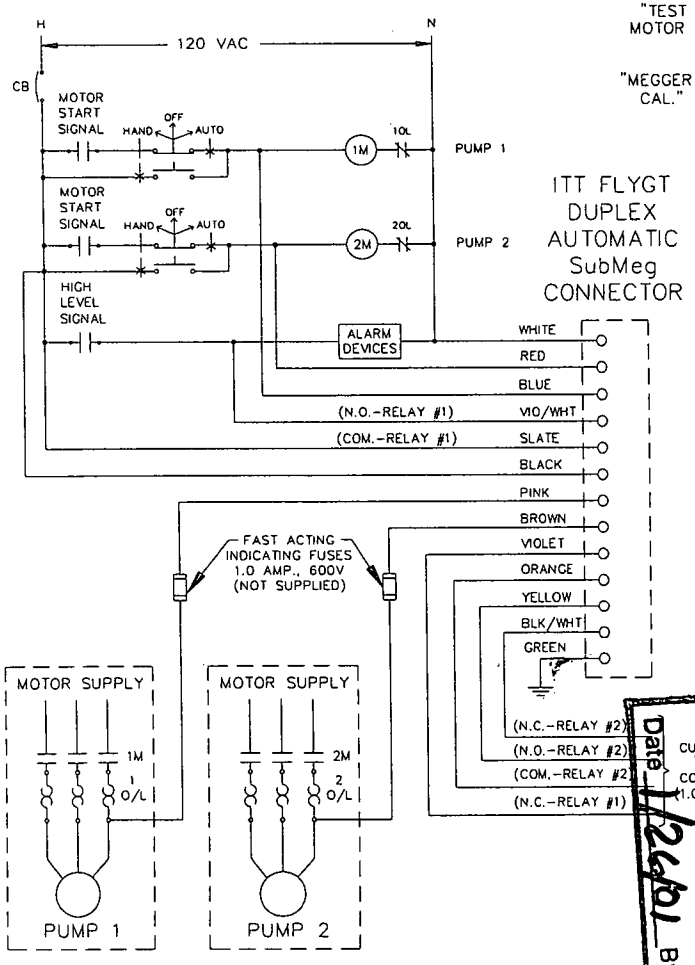
NOTE: THIS CONFIGURATION CAN ONLY BE USED WITH MOTOR POWER SUPPLIES OF 600 VOLTS OR LOWER. CONTACT A FLYGT REPRESENTATIVE FOR MOTOR POWER SUPPLIES HIGHER THAN 600 VOLTS. THE SUBMEG MAY BE USED WITH SUPPLIES AS HIGH AS 5000 VOLTS IF A SPECIAL INTERPOSING RELAY IS USED.



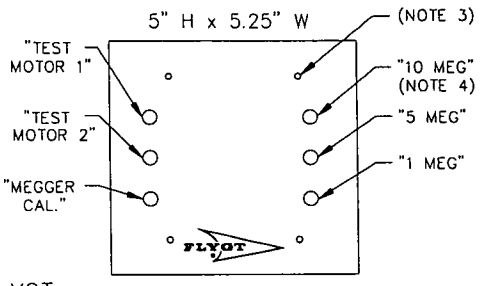
UL FILE No. E146119

Note:
If the plug-in **SUBMEG** for Simplex applications is being used with a Variable Frequency Drive (VFD) or a solid state starter, a contactor must be used to isolate the motor windings from the solid state circuitry during the test cycle. Refer to wiring diagram.

TYPICAL WIRING

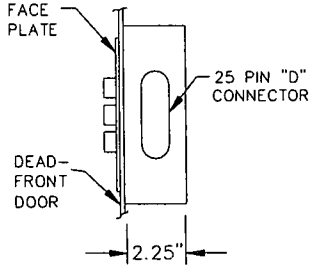


FACE PLATE



SIDE VIEW

AUTOMATIC SubMeg ASS'Y.



INSTALLATION INSTRUCTIONS

1. ON THE INNER DOOR (DEAD-FRONT) OF THE ENCLOSURE LOCATE A SUITABLE AREA WHICH PERMITS THE INSTALLATION AND FIT OF THE SubMeg WITHOUT INTERFERING WITH OTHER COMPONENTS.
2. AFTER REMOVING THE BACKING PAPER, AFFIX THE FACE PLATE PERMANENTLY TO THE FRONT SIDE OF THE INNER DOOR.
3. CENTER PUNCH ALL TEN (10) MARKED HOLES ON THE FACE PLATE AND DRILL A 1/8" PILOT HOLE AT EACH LOCATION.
4. ENLARGE THE THREE (3) PUSHBUTTON HOLES ON THE LEFT SIDE AND THE THREE (3) L.E.D. HOLES ON THE RIGHT SIDE TO 3/8".
5. MOUNT THE SubMeg TO THE INSIDE OF THE INNER DOOR WITH FOUR (4) #4 x 1/2" SCREWS.
6. MOUNT THE "D" CONNECTOR, COMPLETE WITH WIRING HARNESS, TO THE SubMeg AND CONNECT THE WIRES ACCORDING TO THEIR RESPECTIVE COLOR CODE AS SHOWN IN THE WIRING DIAGRAM.

NOTE: THE ITT FLYGT DUPLEX AUTOMATIC SubMeg MUST NOT BE USED WITH POWER SUPPLIES IN EXCESS OF 600 VOLTS. FOR FURTHER INFORMATION CONSULT AN ITT FLYGT REPRESENTATIVE.

DESCRIPTION OF OPERATION

- THE ITT FLYGT DUPLEX AUTOMATIC SubMeg AUTOMATICALLY MONITORS THE IDLE MOTOR WHEN THE DUTY MOTOR IS OPERATING. NO MONITORING OCCURS WHEN BOTH MOTORS ARE IDLE OR ARE RUNNING.
- THREE L.E.D. LIGHTS INDICATE THE MOTOR WINDING INSULATION RESISTANCE (10 MEG, 5 MEG, OR 1 MEG)
- IF THE MOTOR WINDING INSULATION RESISTANCE OF THE MOTOR BEING MONITORED FALLS BELOW 1 MEGOHM, THE INTERNAL ALARM RELAYS WILL BE ENERGIZED.
- TO TEST A MOTOR MANUALLY:
  - OPEN MOTOR CIRCUIT BREAKERS.
  - PRESS MOTOR TEST PUSHBUTTONS, ONE AT A TIME, AND NOTE WHICH L.E.D. LIGHTS.

Door-mounted SubMeg for Duplex Applications
PART NUMBER: 14-50 60 02

Note:
The Duplex SubMeg may not be used with a Variable Frequency Drive (VFD) or solid state starters. Contact your ITT Flygt representative if these devices will be used.

PAGE	SECTION
20	11
ISSUED	SUPERSEDES
6/96	

ITT Flygt Monitoring Devices
SUBMEG

PART NUMBERS	
SUBMEG-D	14-50 60 10
12 PIN, 600V. SOCKET	14-40 31 60
ASSEMBLY (RELAY & SOCKET)	14-50 00 59

DESCRIPTION OF OPERATION

- THE "POWER" LIGHT IS LIT WHEN 120VAC IS APPLIED TO PINS 1 AND 2.
- THE SUBMEG-D CONTINUOUSLY MONITORS THE IDLE MOTOR WHEN THE DUTY MOTOR IS OPERATING. NO MONITORING OCCURS WHEN BOTH MOTORS ARE IDLE OR RUNNING. A POTENTIAL OF 500 – 600 VOLTS AT LESS THAN 0.25MA IS USED.
- THE "5 MEG" AND "1 MEG" L.E.D. PILOT LIGHTS INDICATE THE CONDITION OF THE MOTOR WINDING BEING MONITORED.
  - THE "5 MEG." LIGHT WILL COME ON WHEN THE INSULATION RESISTANCE OF THE MONITORED MOTOR HAS DROPPED TO 5 MEGOHMS, OR LESS.
  - THE "1 MEG." LIGHT WILL COME ON WHEN THE RESISTANCE OF THE MONITORED MOTOR HAS DROPPED TO 1 MEGOHM, OR LESS.
- THE ALARM RELAYS WILL BE ACTIVATED IF THE INSULATION RESISTANCE OF THE MONITORED MOTOR FALLS TO 1 MEGOHM, OR LESS.
- PUSHING THE "MEG TEST" BUTTON TESTS THE INTERNAL CIRCUITRY OF THE SUBMEG-D. BOTH THE "5 MEG." AND "1 MEG." LIGHTS WILL BE LIT AND THE ALARM CIRCUIT WILL BE ACTIVATED.
- THE MOTOR POWER SUPPLY MUST NOT BE MORE THAN 600 VOLTS.

NOTE: THE SUBMEG-D IS NOT COMPATIBLE WITH THE SIMPLEX SUBMEG EVEN THOUGH THEY USE THE SAME 12 PIN SOCKET. USING A SUBMEG-D IN A SOCKET WIRED FOR THE SIMPLEX UNIT, OR VICE VERSA, WILL VOID THE SUBMEG WARRANTY.

Note: The plug-in DuplexSUBMEG-D may not be used with a Variable Frequency Drive (VDF) or solid state starters. Contact your ITT Flygt representative if these devices will be used.

SUBMEG-D is a Registered Trademark of ITT Flygt Corporation.

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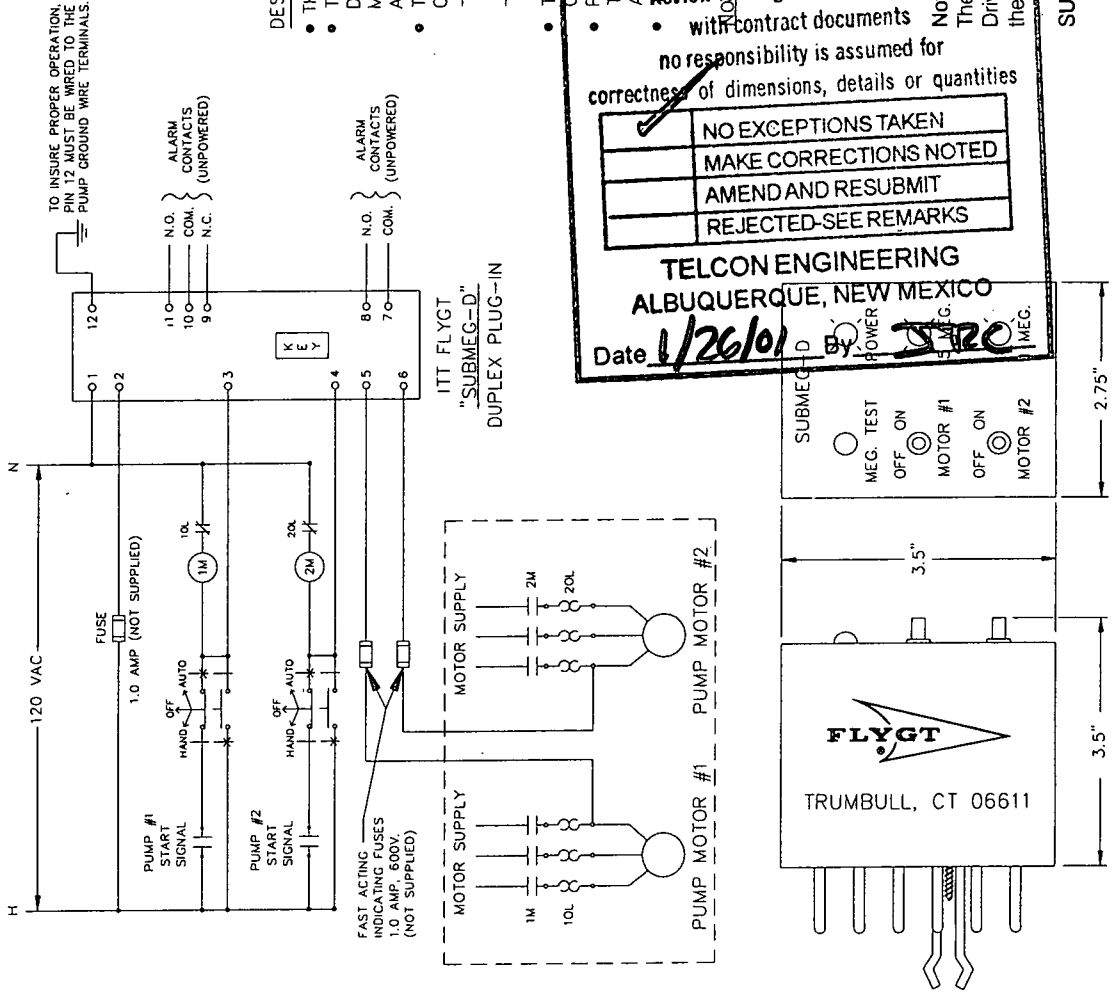
TYPICAL WIRING



ITT Flygt Monitoring Devices
Ground Wire Alarm Relay

Technical Data

Supply Voltage:	120 VAC, 50/60 Hz
Relay Type:	SPDT, 10 amp
Contact Rating:	10 amps, 220 VAC
Temperatures:	Operating: -20°C to 60°C Storage: -45°C to 85°C
Dimensions:	Width: 1-3/4" Height: 2-3/8" Depth: 3-9/16"
Part Number:	**14-50 00 57**

Description

The ground wire alarm relay requires a 7-conductor cable with a ground check conductor or, on large pumps, a pilot cable with an extra conductor that can be used as a ground check. The unit continuously monitors the ground cable conductor utilizing safe, low power levels. The LED type pilot lights on top of the case indicate the following conditions:

Power (green) -- Power has been applied and the ground circuit is being monitored.

Resist (green) -- When lit, the ground circuit resistance is below a preset level (160 ohms). When this light goes out, it means the ground circuit resistance has exceeded the preset level (160 ohms) and the ground circuit connections in both the pump and control should be checked for good contact and/or corrosion.

Alarm (red) -- Normally off, this light will light if ground continuity is lost (open circuit) or if a high resistance condition is detected (over 500 ohms). The relay will energize and a normally open contact will close on alarm. This can be used to activate an alarm circuit.

Test push-button simulates an open ground wire and checks the relay for proper operation (the green "RES" light will turn off and the red "alarm" light will turn on). The alarm circuit will be activated.

Features

- Plug In Base
- Lexan Enclosure
- Built-In Test Function
- Solid State Design
- intrinsically Safe Voltages

Specifications

The pump's ground conductor(s) and associated ground terminals shall be continuously monitored for open circuits, corrosion and loose connections. This monitoring shall take place in the pump control panel and shall not require the addition of any electrical/electronic circuitry within the pump. The standard pump cable shall be provided with a yellow ground check conductor in addition to the green ground conductor(s), to provide a continuous ground loop for monitoring.

A solid state plug-in relay shall be provided to monitor the continuity of the ground loop and to measure the ground connections for a resistance of less than 500 ohms.

LED pilot lights shall provide an indication of a faulty ground condition and in the event of an alarm, the relay shall shut down the motor. A manual reset shall be provided to reset the alarm condition. A test push-button shall simulate an open ground wire and shall check the relay for proper operation.

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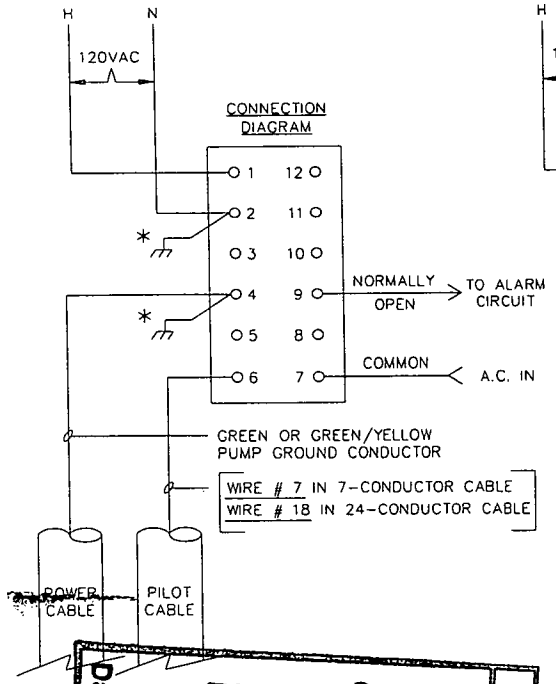
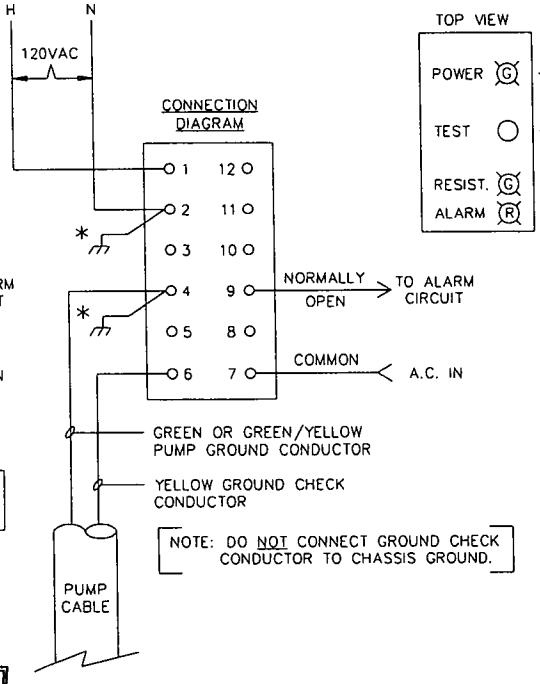
ITT Flygt Monitoring Devices
Ground Wire Alarm Relay

FOR PUMPS WITH SEPARATE POWER AND PILOT CABLE



FOR PUMPS WITH SINGLE CABLE



NOTE: DO NOT CONNECT GROUND CHECK CONDUCTOR TO CHASSIS GROUND.

OTES:

1. THE GROUND WIRE ALARM RELAY REQUIRES AN ITT FLYGT 7-CONDUCTOR CABLE WITH A GROUND CHECK CONDUCTOR OR, ON LARGE PUMPS, A PILOT CABLE WITH AN EXTRA CONDUCTOR THAT CAN BE USED AS A GROUND CHECK.
2. THE UNIT CONTINUOUSLY MONITORS THE GROUND CABLE CONDUCTOR UTILIZING INTRINSICALLY SAFE LOW POWER LEVELS.
3. THE LED TYPE PILOT LIGHTS ON TOP OF THE CASE INDICATE THE FOLLOWING CONDITIONS:
   "POWER" (GREEN) – POWER HAS BEEN APPLIED AND THE GROUND CIRCUIT IS BEING MONITORED.
   "RESIST" (GREEN) – WHEN LIT, THE GROUND CIRCUIT RESISTANCE IS BELOW A PRE-SET LEVEL. WHEN THIS LIGHT GOES OUT IT MEANS THE GROUND CIRCUIT RESISTANCE HAS EXCEEDED THE PRE-SET LEVEL AND THE GROUND CIRCUIT CONNECTIONS IN BOTH THE PUMP AND CONTROL SHOULD BE CHECKED FOR GOOD CONTACT AND/ OR CORROSION.
   "ALARM" (RED) – NORMALLY OFF, THIS LIGHT WILL LIGHT IF GROUND CONTINUITY IS LOST (OPEN CIRCUIT) OR IF A HIGH RESISTANCE CONDITION IS DETECTED.
4. THE OUTPUT IS A SPST RELAY WITH A 10 AMP, 230VAC CONTACT.
5. TERMINAL 7 IS THE COMMON.
6. TERMINAL 9 IS NORMALLY OPEN AND CLOSES ON ALARM. THIS CAN BE USED TO ACTIVATE AN ALARM CIRCUIT.
7. THE "TEST" PUSHBUTTON SIMULATES AN OPEN GROUND WIRE AND CHECKS THE RELAY FOR PROPER OPERATION (THE GREEN "RES" LIGHT WILL GO OUT AND THE RED "ALARM" LIGHT WILL GO ON). THE ALARM CIRCUIT (PINS 7 & 9) WILL BE ACTIVATED.

PART NUMBER		DESCRIPTION
4-50-00	58	GROUND CABLE MONITOR & SOCKET ASSEMBLY CONSISTING OF:
4-50-00	57	GROUND CABLE MONITOR RELAY
4-50-00	60	12-PIN SOCKET

TERMINALS 2 & 4 MUST BE GROUNDED TO THE CHASSIS.

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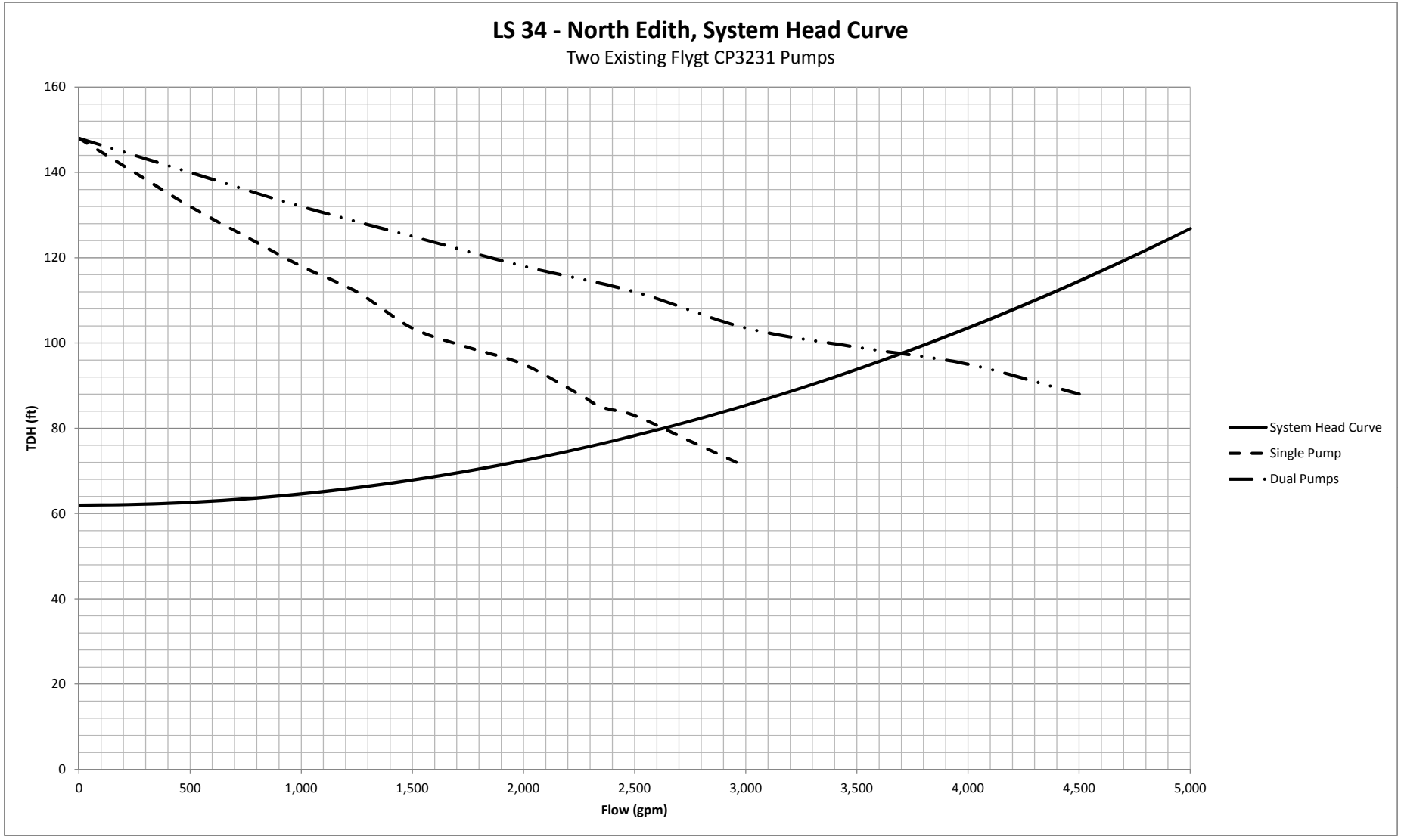

LS 34 - North Edith, System Head Curve
Two Existing Flygt CP3231 Pumps
TDH (ft)
160
140
120
100
80
60
40
20
0
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
Flow (gpm)
System Head Curve
Single Pump
Dual Pumps

APPENDIX D

(NOT USED)

APPENDIX E

Albuquerque Bernalillo County Water Utility Authority

Lockout/Tagout (LOTO)

Albuquerque Bernalillo County
Water Utility Authority

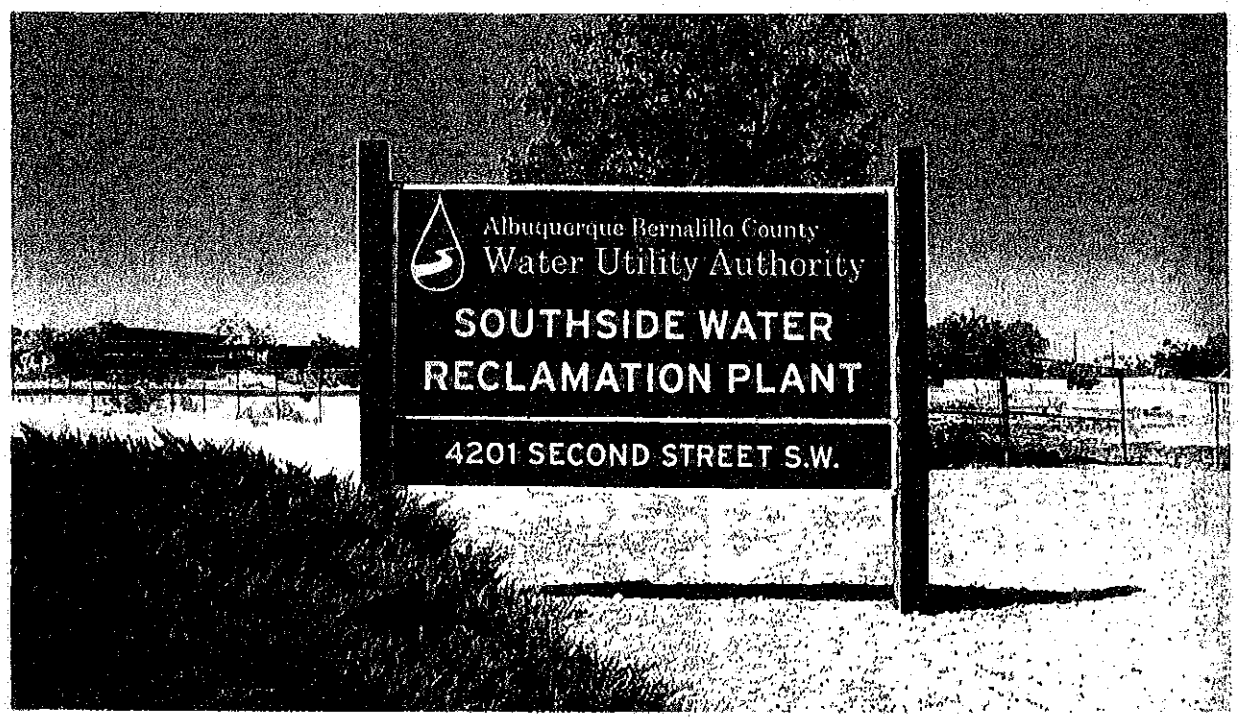
Southside Water Reclamation Plant

Program for the

Control of Hazardous Energy (Lockout/Tagout)

Based on

OSHA 29 CFR PART 1910.147



The Control of Hazardous Energy (Lockout/Tagout) Program

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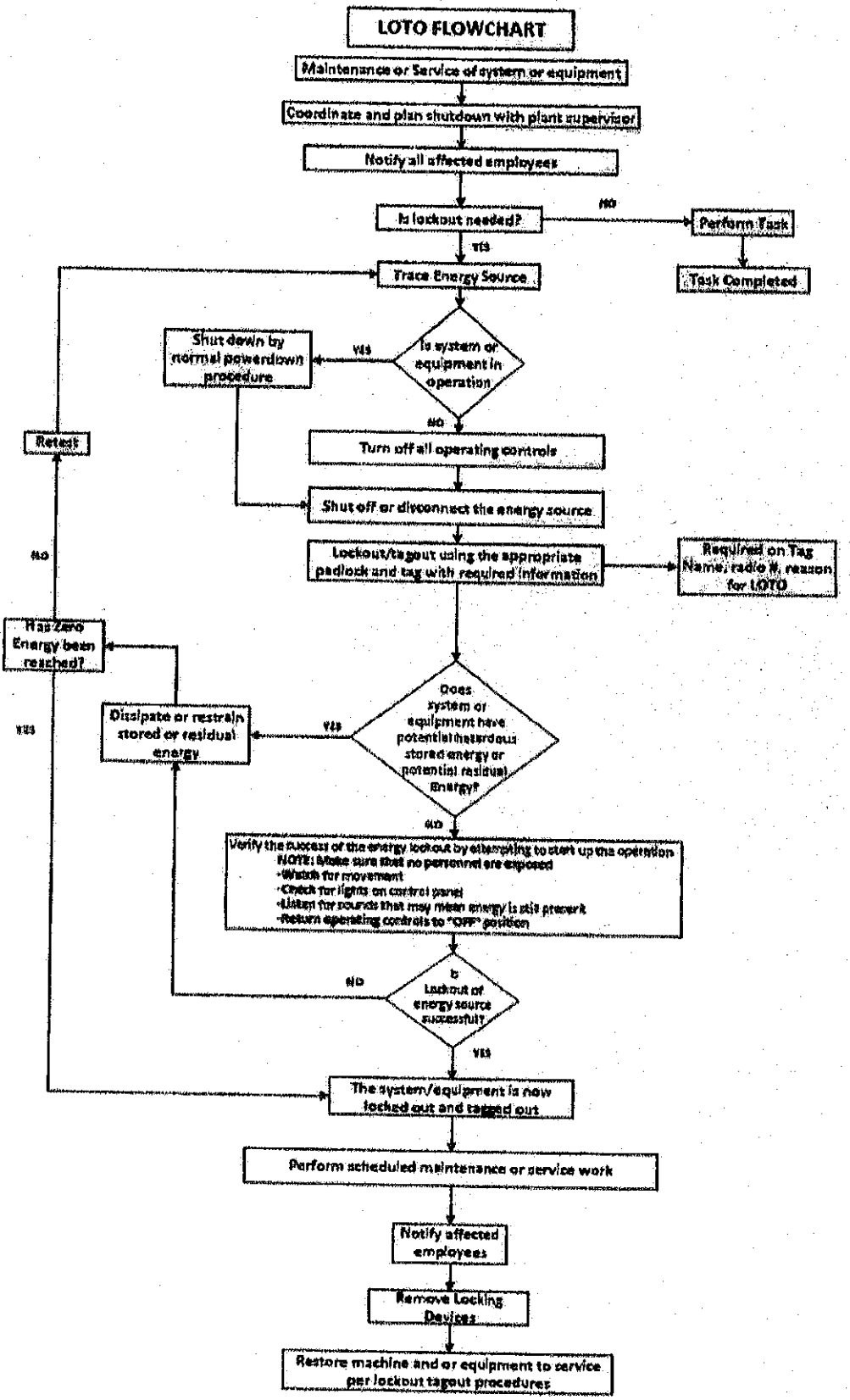
Lockout/Tagout

Last Revised: March 2013

REVIEWED/APPROVED

Title/Name	Signature	DATE
Chief Engineer Jeff Romanowski		3-28-13
Operations Superintendent Joey Nogales		3-29-13
Maintenance Superintendent Jeff Romero		4-1-13
SAF J. Frank Bailey		4-1-13
Safety Manager Mike Cummings		4/4/13


LOTO FLOWCHART
Maintenance or Service of system or equipment
Coordinate and plan shutdown with plant supervisor
Notify all affected employees
Is lockout needed?
NO
Perform Task
Task Completed
YES
Trace Energy Source
Is system or equipment in operation
YES
Shut down by normal powerdown procedure
NO
Turn off all operating controls
Shut off or disconnect the energy source
Lockout/tagout using the appropriate padlock and tag with required information
Required on Tag Name, radio #, reason for LOTO
Does system or equipment have potential hazardous stored energy or potential residual energy?
YES
Dissipate or restrain stored or residual energy
Has Zero Energy been reached?
NO
YES
Retest
NO
Verify the success of the energy lockout by attempting to start up the operation
NOTE: Make sure that no personnel are exposed
-Watch for movement
-Check for lights on control panel
-Listen for sounds that may mean energy is still present
-Return operating controls to "OFF" position
Is Lockout of energy source successful?
NO
YES
The system/equipment is now locked out and tagged out
Perform scheduled maintenance or service work
Notify affected employees
Remove Locking Devices
Restore machine and or equipment to service per lockout tagout procedures

I. Introduction

The following "Lockout/Tagout" (LOTO) are the specific practices and procedures of the Albuquerque Bernalillo County Water Utility Authority (ABCWUA, hereafter referred to as Water Authority) Southside Water Reclamation Plant (SWRP) requirements to safeguard employees from the unexpected energization or startup of machinery and equipment, or the release of any stored hazardous energy during service or maintenance activities. This stored energy could be electrical, hydraulic, mechanical or any other source that may cause unexpected movement. This requires that a designated individual turns off, disconnects, disengages or blocks the machinery or equipment from its energy source(s) before performing service or maintenance.

All employees are required to follow the procedures outlined in this program.

II. Purpose

It is the policy of the SWRP for all employees working at this facility to follow all these established and effective lockout/tagout practices and procedures to ensure the safety of Water Authority employees.

III. Program Management Responsibilites

(A) Management (Chief Engineer):

(1) Responsible for providing the tools and resources necessary to implement this program and for ensuring that the provisions in this program are being followed by the Program Administrator.

(2) Developing specific lockout procedures for each individual piece of machinery/equipment at the facility. The Administrator will involve the maintenance staff, electricians, and employees operating the machinery/equipment in the development of the procedures to ensure all energy sources are identified.

(3) Identifying employee classifications – "Authorized" and Affected".

(B) Program Administrator (Safety Manager):

(1) Review program at least annually, or more frequently if changes are needed or new equipment is aquired.

(2) Identifying the proper personal protective equipment (PPE) needed, if any, during the LOTO procedures.

(3) Providing appropriate level of safety training to employees based on their classification.

(4) Providing outside contractors working at the SWRP with training and information on the SWRP Lockout/Tagout Program and procedures.

(C) Superintendents and Supervisors:

(1) Ensuring that only Authorized Employees who are qualified and trained apply and remove locks and tags.

(2) Ensuring that employees who are found to have insufficient skills or understanding of LOTO requirements do not perform LOTO and receive retraining before conducting any lockout/tagout procedures.

(3) Ensuring employees comply with all elements described in this program.

(4) Providing any information necessary for the continued functioning or updating of this program.
(5) Implement disciplinary procedures for employees deviating from the LOTO procedure.

(D) Employee Classification:

(1) "Authorized" Employees: Employees who are trained on the dangers of exposure to hazardous energy and are authorized (and trained) to perform de-energization of this hazardous energy. Employess are also trained to perform proper lock and tag out on a machine or piece of equipment in order to conduct servicing or maintenance on that machine, tool or piece of equipment under this program.

Duties of an "Authorized" employee include:

(a) Completing all training required to be authorized to perform lockout/tagout procedures on specific equipment, tool(s) or machinery under this program.
(b) Performing lockout/tagout activities which are in conformance with this program.
(c) Retaining control of the equipment, system or machinery while a lockout/tagout is in progress and works only under their own lock and tag.
(d) Maintaining lockout/tagout hardware and tags in good condition.
(e) Notifications of staff.

(2) "Affected" Employees. All employees whose job requires them to operate or use a machine or piece of equipment on which servicing or maintenance activities are being performed under LOTO, or whose job requires them to be in an area in which LOTO is being used, are considered "Affected" employees. They are not authorized to implement lockout/tagout procedures.

IV. Training and Communication

(A) Authorized Employees and their Supervisors

(1) The SWRP has developed and will provide LOTO training on the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, the methods and means available for energy isolation and control, and removal of energy-control devices. Equipment-specific training will be accomplished by presenting applicable written procedures to Authorized Employees, verifying that they understand the requirements of the procedure and observing correct performance of the lockout/tagout procedure(s). Reference SOJP's, SMJP's, and O&M manuals. Employees shall be trained on all individual lockout devices.

(B) Affected Employees

(1) Affected Employees working in areas where lockout/tagout may be used will be trained in the purpose of the lockout/tagout program, identification of locks and tags and restrictions these impose on equipment operation.
(2) Affected Employees must be retrained if a significant OSHA regulation or SWRP lockout/tagout guideline change has been made (i.e., new requirement, change in locks or tags).
(3) Affected Employee retraining can be delivered through awareness campaigns. Other Employees will be trained on the procedure and instructed never to attempt to restart or reenergize a machine that has been locked out or tagged out.

(C) Retraining of Authorized and Affected Employees

Retraining is required if:

(1) There is a change in task assignment that involves use of different LOTO procedures for which the Authorized Employee has not been previously trained.

(2) There is a change in the machine, equipment or processes that presents new hazards.

(3) There is a change in the energy-control procedures.

(4) The Supervisor has reason to believe, or determines through a periodic inspection or observation, that an Authorized or Affected Employee is performing the energy-control procedures inadequately or has deviated from or lacks sufficient knowledge of established procedures.

(D) Record retention

(1) All training records, including employee names and training dates, will be maintained in the employee's personnel files, or in plant administrative safety files.

(2) Training records will be maintained indefinitely.

(3) Training will be certified using Attachment A (Authorized Personnel) or Attachment B (Affected and Other personnel). The certifications will be retained in the employee personnel files.

V. Lockout/Tagout Control

LOTO devices are provided by the Water Authority. LOTO devices must be standardized as to color, size and shape. Each authorized person will have access to his/her individual lockout devices. Locks must be individually keyed. It shall be the responsibility of the employees performing the maintenance or repair to implement the lockout/tag out procedure before work begins. Supervisors are responsible for maintaining LOTO stations.

Note: LOTO procedures are the required method of isolating equipment. Tag out alone shall only be used when it is not possible to lock out the energy-isolating device and **shall not** be considered as an alternative method until all other options have been proven "Infeasible". When alternative methods are proven infeasible and only a tagout is used a safety watch, visual barriers, and danger or caution tape are required to be in place.

(A) Short-term locks are working-locks that are individually keyed in *red*, working locks are to be attached to energy isolation devices by each person in a work crew. Working locks are to be removed when maintenance is no longer being performed. Whenever a working lock is used, a "Danger - Do Not Operate" lock out tag shall be attached to the working lock. The lock out tag must also include the date that the lock is attached, a legible name and radio number of the person attaching the lock (see Appendix A).

(B) Long-term locks are color coded for operations and each maintenance group as shown in the table below:

DEPARTMENT	COLOR
Electrical	White
Instrumentation	Yellow
Mechanical	Blue
Operations	Green
Operations (* construction coordination)	Black

* Black padlocks are used by the Operations Superintendent or Assistant Operations Superintendent for new construction, contractor coordination and assistance requests.

VI. TAG OUT REQUIREMENTS

Tags used in the LOTO program (Appendix A) will be constructed of a laminated material (so that the following information can be recorded/written with a "grease pencil"); this information will contain but not be limited to:

(1) Full name
(2) Date, radio number, and phone number if applicable
(3) Reason for the LOTO / description

These Tags will be standardized as described below:
When a long-term lock is used, an identification tag shall be attached to a lock. The identification tag must also include the date that the lock was attached, a legible name and radio number of the person attaching the lock, and a brief description of work. Long-term locks are common keyed per work group and controlled by work group supervisors.

A tag may be used when it is infeasible to, or may create an unsafe condition to use a lockout/tagout device, and such no other means of isolation is possible. This tag will need approval from the Superintendent.

Tags shall be attached in such a manner as will clearly indicate that the operation or movement of energy isolating devices from the "neutral" or "off" position is prohibited. Tags shall be attached using all environment-tolerant nylon tie-wraps. Where a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

Note: Other (caution or work order) tags are not part of the LOTO program, but is used for informational purposes. They are not intended for employee protection. This process is referred to as an "administrative control" and is not a part of the LOTO procedure.

VII. ENERGY CONTROL PROCEDURE

(1) Coordinate and plan the shutdown of process equipment with the plant or field operations supervisor, as appropriate. Operations is primarily responsible for shut down, isolation, and lockout of plant process equipment. All personnel shall place their work group specific lock on the isolation device relevant to the equipment that they will be working on, along with a lock out tag.
Note: Planning and coordination must be done between the affected groups and all isolation points must be identified and addressed prior to the commencement of any work.
(2) Notify impacted employees that a lock out procedure is going to be utilized, and advise them of the machine or equipment that is involved.
(3) Isolate the equipment from all applicable energy sources using the isolation switches, breakers, valves or other energy isolating devices as appropriate.
Example: To change the drive belts on a HVAC system, isolate the voltage source. To perform maintenance on the heating cores, on a HVAC System, isolate the voltage source and the hot water supply and return lines. Bleed any stored thermal and hydraulic energy.

(4) Relieve stored energy associated with the equipment. Stored energy (such as that in springs, elevated machine members, hydraulic systems and air, gas, steam or water pressure, etc.) must be dissipated or restrained by methods such as repositioning, blocking, bleeding down pressure, etc. *Example:* To remove a hotsy after isolating all energy sources (voltage, gas and water supplies), allow the unit to cool, bleed off the water pressure, and after ensuring proper ventilation, vent off the gas pressure before proceeding to remove the equipment.
(5) LOTO the energy isolating device with an assigned padlock and attach a tag (Appendix A) to the lock.
(6) Verify that the equipment will not operate using normal operating controls.

VIII. REMOVING THE LOTO FOR START-UP

(1) After the servicing and/or maintenance are complete, and equipment is ready for normal operation, check the area around the machine or equipment that is locked out. Ensure that no one is exposed to danger if the machine or equipment is energized.
(2) Check the machine or equipment to ensure that all tools have been removed from the machine or equipment and that any guards that were removed have been reinstalled.

CAUTION: Insure controls are in "neutral" or "off" position prior to start-up and testing of equipment. Follow applicable SOJP's when starting or testing equipment.

(3) Notify operations supervisor that the equipment is ready for testing or start-up. Plant Operations is responsible for the start-up of plant equipment by removing operations locks from energy isolating devices. Operate the energy isolating devices to restore energy to the machine or equipment. Test the operation of the machine or equipment that was locked out for proper operation.
(4) Notify shift supervisor and the control room operator that the machine or equipment is no longer locked out and available for service or appropriate equipment status.

IX. DISCIPLINARY ACTION REQUIRED FOR VIOLATING LOTO PROCEDURES

The only person authorized to remove the LOTO devices is that person who installed the devices; therefore, unauthorized removal or by-passing the LOTO device procedure compromises the worker's safety. Any person who violates a LOTO procedure and energizes, starts or otherwise activates a machine or who removes a LOTO device without authorization shall be disciplined according to Water Authority policies and procedures. Disciplinary action shall be taken whether or not injury or damage occurs.

X. PROCEDURES INVOLVING MORE THAN ONE PERSON

If more than one person is involved in the service or repair of a machine or equipment, each individual will place his/her personal LOTO device on all energy isolating devices. When an energy isolating device cannot accept multiple locks or tags, a multiple lockout device (a hasp) may be used.

If LOTO is used, a single lock may be used to lockout the machine or equipment, but the key to that lock must be placed in a lockout box or cabinet which allows the use of multiple locks to secure it. Each employee will then use his/her own lock to secure the box or cabinet. As each person no longer needs to maintain his/her LOTO protection, that person will remove his/her own lock from the lockout device or from the lockout box.

XI. PROCEDURES INVOLVING MORE THAN ONE WORK GROUP

When a work group finishes its daily work, the work crew shall ensure that all tools are removed. Only that crews red lock out device and identification tag shall be removed from the energy isolating device associated with the machine or equipment. The technician/operator shall not remove his/her lock until all coworkers and affected personnel are notified and clear. If the equipment is ready for service, the last work crew to complete its work will assist operations in the complete procedure for removing the lock out devices and ensuring proper operation.

There may be occasions when a LOTO device must remain in place for more than one work shift or after other personnel changes. The procedure depends on whether or not employees on the incoming shift will be working on the locked out or tagged out equipment.

(A) Service or repair work will be continued by the new shift:
Employees leaving the work place will remove their locks and incoming employees will connect their locks under the direct observation of their supervisors. The supervisors for both shifts will be present for the transfer of the LOTO.

(B) Employees on other shifts will not be working on the machines:
The LOTO devices will remain in place and the incoming personnel will be notified that a LOTO is in affect. The supervisors of both shifts will be responsible for ensuring that the information is made available to the incoming personnel.

XII. NON-ROUTINE REMOVAL OF A LOTO DEVICE

When the employee who applied the LOTO device is not available to remove it, the LOTO may be removed under the direction of the supervisor of the employee who applied the lock out device, or under the direction of the responsible superintendent. The rules for LOTO removal still apply. Moreover, the supervisor must:

(1) Verify that any Authorized Employee who applied lock(s) and associated tag(s) is not on duty and that their work is no longer in progress. All reasonable efforts will be made to contact the Authorized Employee(s) to discuss the planned removal of their lock(s) and determine if the Authorized Employee(s) have any safety concerns with removal of their lock(s).
(2) An Authorized Employee/Supervisor returns the equipment to service and notifies the Affected Employees that service or maintenance is completed and the equipment is ready for use.
(3) When the Authorized Employee(s) whose lock(s) were removed return to work, their Supervisor(s) will again notify them that their lock(s) and tag(s) were removed.

XIII. HOT TAP OPERATIONS

Hot Tap Operations requires preapproval of the Chief Engineer. Work involving transmission and distribution systems for substances such as gas, steam, water or petroleum can be performed on pressurized pipeline systems if:
(A) The employer can demonstrate that the continuity of service is essential.
(B) Shutdown of the system is infeasible, and could lead to employees being exposed to other

hazards. In this case employees will need to follow established safe work procedures, developed for these operations.

(C) Special equipment is used that will provide effective protection for employees.

XIV. AUDIT/INSPECTION OF THE LOTO PROCEDURE

All LOTO procedures will be reviewed at least **annually**. The procedure will be reviewed for adequacy and completeness by an Authorized Employee who does not regularly use the machine/equipment-specific lockout procedure or by the Safety Manager or his/her designee. If any deviations or inadequacies are identified, the Program Administrator will take all necessary steps to update the procedure. The annual inspection will include a review, between the Reviewer and each Authorized Employee of that machine/equipment, to determine if they understand their responsibilities under that procedure. Annual inspections are documented with the information shown in **Attachment D**. This inspection record will be retained indefinitely.

XV. PROCEDURES FOR OUTSIDE PERSONNEL/ CONTRACTORS

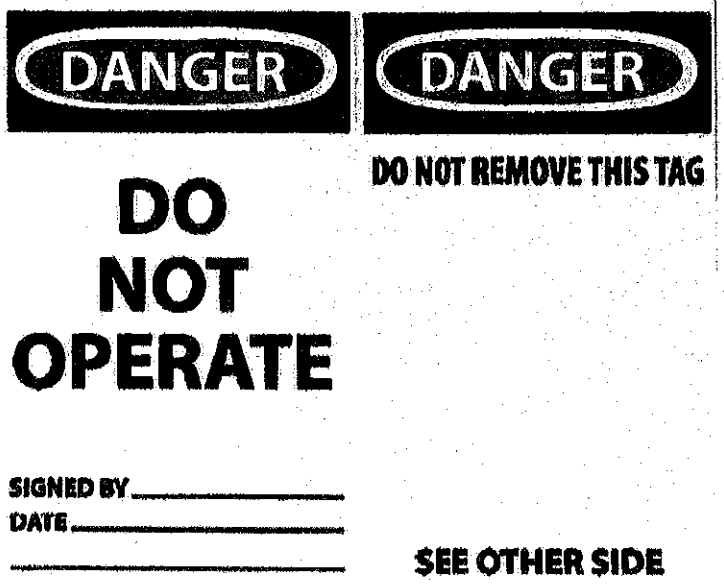
(A) Outside personnel/contractors shall be advised that the SWRP has and enforces the use of LOTO procedures. They will be informed of the use of locks and tags and notified about the prohibition of attempts to restart or re-energize machines or equipment that are locked out or tagged out.

(B) The company will obtain information from the outside personnel/contractor about their LOTO procedures and advise affected employees of this information.

(C) The outside personnel/contractor will be required to sign a certification form (see Attachment E). If outside personnel/contractor has previously signed a certification that is on file, additional signed certification is not necessary.

APPENDIX A

Lock Out Tag



ATTACHMENT A

Certification of Training
(Authorized Personnel)

I certify that I received training as an "Authorized Employee" under SWRP Lockout/Tagout program. I further certify that I understand the procedures and will abide by those procedures.

AUTHORIZED EMPLOYEE SIGNATURE

DATE

ATTACHMENT B

Certification of Training
(Affected Personnel)

I certify that I received training as an Affected Employee under SWRP Lockout/Tagout Program. I further certify and understand that I am prohibited from attempting to restart or re-energize machines or equipment that are locked out or tagged out.

AUTHORIZED EMPLOYEE SIGNATURE _____ DATE _____

ATTACHMENT C

Lockout/Tagout Equipment Inspection Certification

I certify that _____was inspected on this date utilizing lockout/tagout procedures. The inspection was performed while working on

_____.

_____ _____

AUTHORIZED EMPLOYEE SIGNATURE DATE

_____ _____

INSPECTOR SIGNATURE DATE

ATTACHMENT D

Annual Evaluation Report

Date(s) of Evaluation _____

Evaluation was made by _____.
(PRINT)

General policy has been reviewed: YES____NO____

Comments on general policy:

The following specific procedures have been reviewed (list below):

Does the procedure comply with the SWRP program?

If a specific lockout/tagout were inspected in the field placed by the employee evaluated:

Location: _____

Equipment No.: _____

Equipment Name: _____ Serial No.: _____

Department who apply the Lockout/Tagout in the machine/equipment: _____

Does the machine/equipment have properly the LOTO? Yes____ No____

If not explain what need to be addressed and fix it:_____

ATTACHMENT E

Outside Personnel/Contractor Certification

I certify that _____and _____ (outside personnel/contractor) have informed each other of our respective Lockout/Tagout procedures.

_____ _____

AUTHORIZED EMPLOYEE SIGNATURE DATE

_____ _____

INSPECTOR SIGNATURE DATE

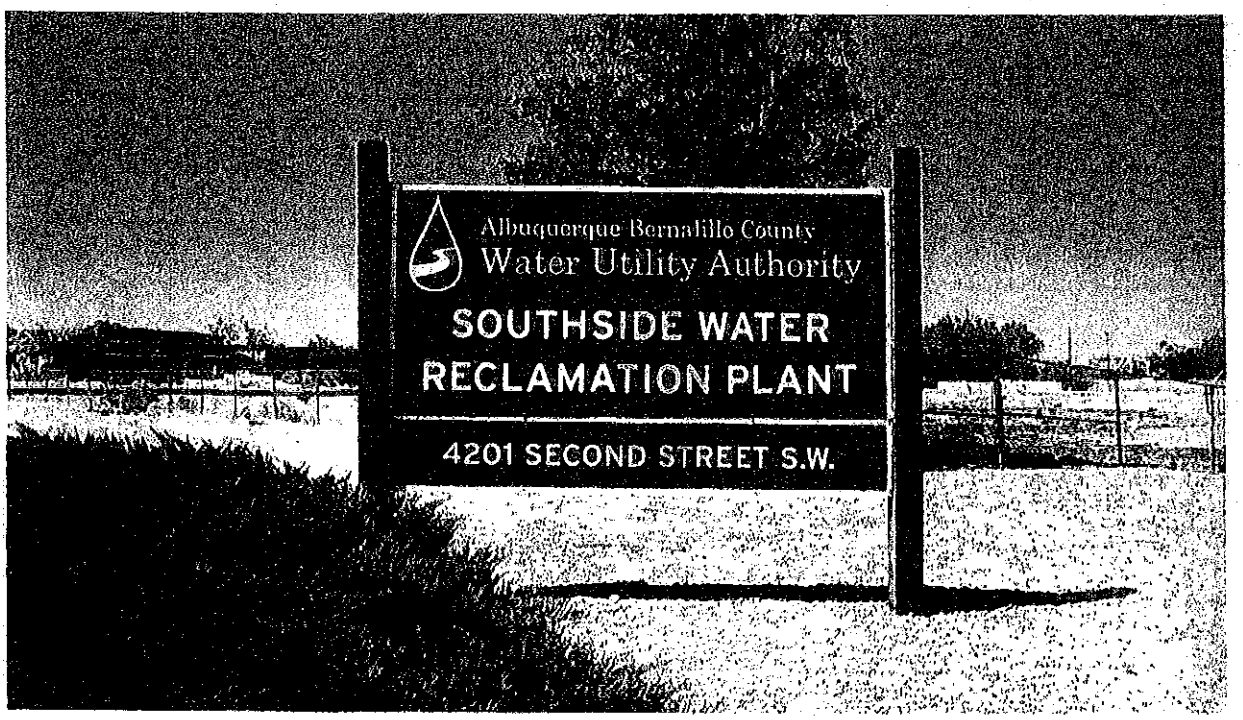
APPENDIX F

Albuquerque Bernalillo County Water Utility Authority

Confined Space Program

Albuquerque Bernalillo County
Water Utility Authority

Confined Space Program
For
Southside Water Reclamation Plant



Albuquerque Bernalillo County
Water Utility Authority

Southside Water Reclamation Plant

Confined Space Program

Last Revised: April 3, 2014

REVIEWED/APPROVED

SAFETY SUPERVISOR: _____

SWRP CHIEF ENGINEER: _____

SWRP OPERATIONS SUPERINTENDENT: _____

SWRP MAINTENANCE SUPERINTENDENT: _____

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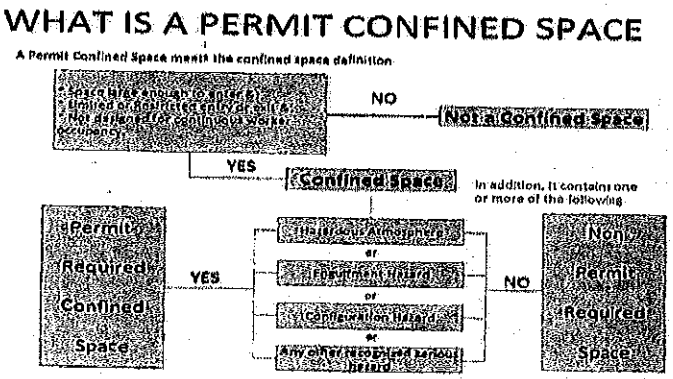
ALBUQUERQUE BERNALILLO COUNTY WATER UTILITY AUTHORITY
CONFINED SPACE ENTRY PROGRAM

I. Description of our Water Authority Program

The purpose of this program is to set forth the requirements for practices and procedures to protect Water Authority employees and contractors from exposure and injury from the hazards of entering and performing work in confined spaces. The policies and procedures in this document are elements that make up the Water Authority's Permit Space Program. This program is intended to meet and exceed the requirements of the U.S. Department of Labor, Occupational Safety and Health Administration's Confined Space Standard 29 CFR 1910.146.

II. Scope

This program applies to all confined spaces owned by the Water Authority. This program also applies to all confined spaces that may be entered by Water Authority employees. Included in this program are the Southside Water Reclamation Plant, Surface Water Treatment Plant, Sanitary Lift Stations, Storm Water Lift Stations, Well Stations, Water Pump Stations, and Chemical Feed Stations.



III. Requirements of the Water Authority

(1) In administering this Confined Space Entry Program the Chief Engineers and Safety Manager will:

(a) Monitor the effectiveness of the program;

(b) Provide training to affected employees and supervisors that is sufficient to impart necessary understanding, knowledge and skills;

(c) Certify that training has been accomplished. Certification must include employee's name, signature of trainer, dates of training;

(d) Provide atmospheric testing equipment as needed;

(e) Provide personal protective equipment as needed;

(f) Provide technical assistance as needed;

(g) Review and update the program on an annual basis or more often as needed.

(2) The Chief Engineers and Operation/Maintenance Superintendents are responsible for managing the Confined Space Entry Program in the Water Authority facilities and they will:

(a) Verify that all confined spaces at their facilities are properly labeled and maintained;
(b) Review all confined space entry permits for successful operation and perform "lessons learned" for any entry that experienced any problems or presented any condition that caused the permit to be canceled and the confined space to be evacuated;
(c) Maintain hard copies and electronic storage of all canceled/completed confined space entry permits. These canceled/completed permits will be kept for a minimum of 3 years;
(d) Require all employees who enter confined spaces to receive training which will make them both competent and qualified to perform confined space entry operations and establish employee proficiency in required duties;
(e) Verify that employees are provided all necessary confined space entry/rescue equipment, maintain that equipment properly, and ensure employees use that equipment properly;
(f) Perform monthly inspections of all related confined space entry equipment and verify all such equipment meets manufacturers' standards.

IV. Safety Policies and Regulations

It is the safety policy of the Water Authority that a confined space:
(1) Is large enough and so configured that an employee can bodily enter to perform assigned work; and
(2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); and
(3) Is not intended for continuous employee occupancy.

It is the safety policy of the Water Authority that a Permit-Required Confined Space means a confined space that has one or more of the following characteristics:
(1) Contains or has a potential to contain a hazardous atmosphere;
(2) Contains a material that has the potential for engulfing an entrant;
(3) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
(4) Contains any other recognized serious safety or health hazard.
Unauthorized entry into a permit-required confined space by Water Authority employees and contractors is forbidden and cause for disciplinary action.

Manpower and equipment shall be available during permit-required confined space entry to immediately and safely remove any disabled worker from the confined space. Assisted Self-Rescue is the approved procedure Water Authority employees will use to remove a disabled worker from a confined space.

Water Authority employees will perform Assisted Self-Rescue (ASR) vertical direct retrieval operations only. Horizontal confined space rescue is not allowed and will be contracted out to Rocco or some other confined space rescue service.

No Hot Work shall be conducted inside a confined space prior to completion of the appropriate Hot Work Permit.

Facial hair at the facepiece-to-face interface that may interfere with the operation of the full-face piece of the supplied air respirator shall not be permitted. This facial hair may include beards, sideburns, mustaches, long hair and or bangs.

Water Authority employees are required to consider all confined spaces as Permit-Required Confined

Spaces unless they can be reclassified as a Non-Permit Confined Space.

Multiple confined space entries are not to be monitored by a single attendant.

When the Water Authority arranges to have a contractor perform work that involves permit space entry, the Authority shall:
(1) Inform the contractor that the workplace contains permit-required confined spaces and that permit space entry is allowed only through compliance with the Water Authority permit space program;
(2) Apprise the contractor of the hazards identified and the Water Authority's experience to include but not limited to the presence of hydrogen sulfide (H_2S), carbon monoxide (CO), carbon dioxide (CO2), hydrogen chloride (HCL), and methane (CH4) gas in the space, that make the space in question a permit space;
(3) Apprise the contractor of any precautions or procedures that the Water Authority has implemented for the protection of employees in or near permit spaces where contractor personnel will be working;
(4) Coordinate entry operations with the contractor, when both Water Authority personnel and contractor personnel will be working in or near permit spaces;
(5) Meet and debrief the contractor at the conclusion of the entry operations regarding the Water Authority's permit space program regarding any hazards confronted or created in permit spaces during entry operations.

CONFINED SPACE IDENTIFICATION

V. Confined Space Identification

The Water Authority has implemented this written permit space program and it is available for inspection by employees and their authorized representatives. The Water Authority has evaluated the workplace and has determined that the workplace contains permit-required confined spaces. The permit spaces are posted with one or more of the following danger signs:

DANGER
PERMIT-REQUIRED CONFINED SPACE
AUTHORIZED ENTRY ONLY

DANGER
PERMIT-REQUIRED CONFINED SPACE
DO NOT ENTER

The Permit-Required Confined Spaces are also labeled with a number that identifies the confined space for identification and inventory purposes. The inventory label is PRCS followed by the confined space number, for example PRCS 365. This evaluation/inventory system will be used for annual review and to provide employees additional information about the confined space they will be working in. The Water Authority has evaluated the hazards of our permit spaces and the following procedures, practices, and acceptable entry conditions necessary for safe permit space entry operations are specified below.

VI. Permit-Required Confined Space Entry Permit

The Water Authority's confined space entry permit documents compliance with the Water Authority's Permit Space Program and authorizes entry to a permit space. The confined space entry permit is the most essential tool for assuring employee safety during entry operations in permit-required confined spaces with known hazards, or with unknown or potentially hazardous atmospheres. The entry permit process guides the entry supervisor, attendant, and entrants through a systematic evaluation of the permit space to be entered. The entry permit will be used to establish acceptable conditions before each entry and verify that conditions in the confined space are acceptable throughout the duration of an authorized entry.

VII. Permit-Required Confined Space Entry Procedures

(1) When entry into a permit-required confined space is necessary the Operations/Maintenance Superintendent from the appropriate section will select an entry supervisor, attendant, and entrant(s) to initiate the confined space entry procedures. An Operations/Maintenance Supervisor may also select the entry team.

(2) Prior to entry of the permit-required confined space, the entry supervisor, attendant, and entrant shall be responsible for the following:

(a) Completion of the confined space entry permit;
(b) Verify acceptable entry conditions in the confined space;
(c) Isolation of the permit space; establishing communication with the Control Room;
(d) Verifying the availability of the Assisted Self-Rescue service;
(e) Signature of the entry supervisor on the entry permit after its completion.

(3) Remove the entrance cover, hatch, or grating to the confined space to be entered. Any conditions making it unsafe to remove an entrance cover to the confined space shall be eliminated before the cover is removed. When entrance covers are removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space.

(4) Before an employee enters the confined space, the internal atmosphere shall be tested, with a calibrated direct-reading gas detector, for oxygen content, for flammable gases and vapors, and for potential toxic air contaminants, in that order. Any entrant who enters the confined space shall be provided an opportunity to observe the pre-entry testing. The approved gas detectors for atmospheric testing are the RKI GX-2012, GX-2009 and GX-2001.

(5) Isolate the confined space from any potential hazards that may be encountered. This includes electrical hazards, mechanical hazards, Engulfment hazards, Entrapment hazards, and physical hazards. Make sure the proper isolation procedures are followed such as lock out/tag out, double block and bleed, blanked, blocked, chocked and disengaged. Document this isolation on the confined space entry permit. Employees are required to observe and assist with this isolating of the permit space.

(6) Ventilate the permit-required confined space with continuous forced air ventilation. The entry supervisor, attendant, and entrant shall be responsible for setting up the mechanical ventilation and it shall be used, as follows:

(a) An employee may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere;
(b) The forced air ventilation shall be so directed as to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees have left the space;
(c) The air supply for the forced air ventilation shall be from a clean source and may not increase the hazards in the space.

(7) Test the confined space for a hazardous atmosphere. The entry supervisor, attendant, and entrant shall continuously monitor the atmosphere within the confined space. The pre-entry atmospheric check shall be documented on the entry permit. The entrant must have a calibrated gas detector on

his/her body at all times during entry operations. The entry supervisor, attendant, or designee shall monitor the atmosphere within the permit space from outside the confined space using a calibrated gas detector with a sample draw pump and tubing. This atmospheric testing will ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere. There may be no hazardous atmosphere within the space whenever any employee is inside the space.

(8) If a hazardous atmosphere is detected during entry;

(a) Each employee shall leave the space immediately;

(b) The space shall be evaluated to determine how the hazardous atmosphere developed;

(c) Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

(9) The entry supervisor, attendant, and entrant shall establish the communication procedures to be used by the authorized entrants and attendants to maintain contact during entry operations. The preferred communication procedures are visual and voice contact at all times; every effort should be made to maintain this type of contact between the attendant and entrant. Visual contact at all times and the Authority radio system are also acceptable communication procedures. Any other communication procedures necessary must be preapproved by the entry supervisor.

(10) The attendant shall establish contact with the Control Room and inform the control room operator that a permit-required confined space entry is taking place. Give the control room operator the location of the confined space, authorized attendant, authorized entrant, and the purpose of the entry in case an emergency arises and emergency medical services needs to be contacted. A copy of the entry permit may also be posted in the Control Room if it is going to be a prolonged entry. The confined space entry permit must be located at the confined space during all entry operations.

(11) The entry supervisor shall select an Authority Assisted Self-Rescue Team required for the permit-required confined space entry. The entry supervisor will select an Assisted Self-Rescue team leader and team members. This Assisted Self-Rescue team will be responsible for rescue procedures associated with the confined space entry. Log this information down on the entry permit.

(12) The entry team (entry supervisor, attendant and entrant) shall procure all required personal protective equipment required for the permit entry. Don all equipment properly and set up the DBI-SALA confined space entry/retrieval system required for Assisted Self-Rescue.

(13) The entry supervisor shall certify that the confined space is safe for entry and that the pre-entry measures required by the confined space entry permit have been taken. The entry supervisor will then sign the permit-required confined space entry permit and allow work to commence.

(14) The entry supervisor shall assign a person to take periodic atmospheric tests of the atmosphere inside the confined space during entry operations. If an attendant is assigned this task it cannot interfere with his attendant duties. The interval between atmospheric readings shall be every 15 minutes unless specified otherwise by the entry supervisor. The names or initials of the person conducting these tests and an indication of when the tests were performed must be noted on the entry permit.

(15) When the confined space entry is completed the entry supervisor will make sure the permit is cancelled and closed out; all equipment is returned to its proper location and the entrance cover is replaced to the confined space.

Water Utility Authority

CONFINED SPACE ENTRY PERMIT

PERMIT VALID FOR 8 HOURS MAXIMUM ONLY. ALL COPIES OF PERMIT WILL REMAIN AT JOB SITE UNTIL JOB IS COMPLETED.
DATE: _____ PERMIT SPACE TO BE ENTERED: _____
PURPOSE OF ENTRY: _____
AUTHORIZED DURATION OF THE ENTRY PERMIT (Hours): _____
AUTHORIZED ENTRANTS (Full Name): _____, _____,
_____, _____.
AUTHORIZED ATTENDANTS (Full Name): _____, _____.
ENTRY SUPERVISOR (Full Name): _____
HAZARDS OF THE PERMIT SPACE TO BE ENTERED

EMPLOYEES COULD BE EXPOSED TO THE FOLLOWING:	YES	NO	N/A	LIST
Engulfment/Entrapment	( )	( )	( )	_____
Presence of toxic gases	( )	( )	( )	_____
Presence of explosive/flammable gases	( )	( )	( )	_____
Oxygen deficiency	( )	( )	( )	_____
Bio-hazards	( )	( )	( )	_____
Wet conditions, slip, trip, and fall hazards	( )	( )	( )	_____

Mitigation: _____

ISOLATION OF THE PERMIT SPACE (Lock out/tag out devices specific to entry)	YES	NO	N/A	LIST & INITIAL ISOLATION
Electrical systems locked out and tagged out	( )	( )	( )	_____
Mechanical systems (blocked, chocked, disengaged)	( )	( )	( )	_____
Gas systems (blanked) locked out and tagged out	( )	( )	( )	_____
Liquid systems (double block, bleed) locked out	( )	( )	( )	_____
Secure area (Post, Flag, Barricade)	( )	( )	( )	_____

Mitigation _____

VENTILATION MODIFICATION	YES	NO	N/A	MODEL & FLOW RATE
Mechanical	( )	( )	( )	_____
Mechanical explosion proof	( )	( )	( )	_____
Natural ventilation only	( )	( )	( )	

ATMOSPHERIC CHECK AFTER ISOLATION AND VENTILATION
DATE: _____ TIME: _____ TESTER: _____ CALIBRATION DATE: _____
(Must be within 2 month period)
Percent Oxygen _____ % (Must be between 19.5% to 23.5%)
Explosive Gases _____ %LEL (Must be less than 10% LEL)
Toxic Gas (H2S) _____ PPM (Must be less than 5 PPM)
Toxic Gas (CO) _____ PPM (Must be less than 35 PPM)
Other (Specify) _____ PPM (Must be less than PEL)

COMMUNICATION PROCEDURES	YES	NO	N/A	LIST
Authority Radio System or Cellular Phone	( )	( )	( )	_____
Contact established with Control Room/Dispatch	( )	( )	( )	_____

RECLASSIFICATION (NON-PERMIT CONFINED SPACE)
If all hazards have been eliminated or mitigated, then this permit-required confined space can be reclassified as a non-permit confined space.

All hazards mitigated:	YES	NO
	( )	( )

Certification by: _____ Date: _____ Time: _____
(If "NO" continue with permit-required confined space procedures. If "YES" refer to WUA non-permit confined space procedures or OSHA 1910.146(C)(7) for further clarification on reclassifying a PRCS to non-permit confined space)

ASSISTED SELF-RESCUE & EMERGENCY SERVICES	YES	NO	N/A
Authority Assisted Self-Rescue on Site	( )	( )	( )
911 Emergency Medical Service Available	( )	( )	( )

Authority Assisted Self-Rescue Team (Full Name): _____, _____
Assisted Self-Rescue Team Leader: _____
All confined space, CPR, and first aid certifications current? YES ( ) If not do not proceed

PROTECTIVE CLOTHING AND EQUIPMENT IN ADDITION TO REGULAR HARD HAT, SAFETY SHOES AND SAFETY GLASSES

	YES	NO	N/A	LIST
Review MSDS, Post at Confined Space	( )	( )	( )	
Respiratory protection (Check one): ☐ SCBA ☐ Airline ☐ Cartridge type	( )	( )	( )	_____
Eye protection (Check one): ☐ Chemical goggles ☐ Face shield ☐ Dust goggles	( )	( )	( )	_____
Gloves (Check Type): ☐ Chemical ☐ Leather ☐ Other _____	( )	( )	( )	_____
Protective clothing (Check Type): ☐ Chemical suit ☐ Rubber apron ☐ Rubber boots	( )	( )	( )	_____
Electrical shock protection ☐ Flash suit ☐ Rescue hook ☐ Hot stick	( )	( )	( )	_____
Full body harness with lifeline, **(Mandatory)**	( )	( )	( )	_____
Rescue davit & retrieval winch **(Mandatory)**	( )	( )	( )	
Hearing protection _____	( )	( )	( )	
Fall protection _____	( )	( )	( )	
Lighting (Explosive Proof) _____	( )	( )	( )	
Hot work permit	( )	( )	( )	
Fire extinguishers _____	( )	( )	( )	
First Aid kit	( )	( )	( )	

I have reviewed the work authorized by this permit and the information contained here-in.
Permit Approved By:
ENTRY SUPERVISOR: _____
(Printed Name) (Signature)
Reviewed By: (Unit Superintendent) _____
(Printed Name) (Signature)
Reviewed By (Safety Manager) _____
(If Available #239-4122) (Printed Name) (Signature)

ATMOSPHERE TEST RESULTS, RECORD CONTINUOUS MONITORING RESULTS EVERY 15 MINUTES OR AS NECESSARY TO ENSURE PERMIT COMPLIANCE.
(Permissible safe limits for personnel are 19.5 - 23.5% Oxygen, less than TWA for toxics and less than 10% LEL.)
Instrument Model _____ Serial # _____ Date Calibration Performed? _____ Calibration Performed by Whom? _____

Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____

VIII. Duties of Authorized Entrants

(1) Complete all required confined space training prior to entry operations.

(2) Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure. Review the appropriate Material Safety Data Sheet (MSDS) for each chemical hazard that may be encountered;

(3) Properly use equipment as required by the Water Authority's permit-required confined space program. This equipment must be properly maintained and includes:

(a) Testing and monitoring equipment (RKI GX-2012, GX-2009 or GX-2001);
(b) Ventilating equipment needed to obtain acceptable entry conditions;
(c) Communications equipment;
(d) Personal protective equipment;
(e) Lighting equipment needed to work safely and to exit the space quickly in an emergency;
(f) Barriers and shields;
(g) Equipment, such as ladders, needed for safe ingress and egress by authorized entrants;
(h) Rescue and emergency equipment;
(i) Any other equipment necessary for safe entry into and rescue from permit spaces.

(4) Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space as required by the permit-required confined space program.

(5) Alert the attendant whenever the entrant recognizes any warning sign or symptom of exposure to a dangerous situation or the entrant detects a prohibited condition.

(6) Exit from the permit space as quickly as possible whenever:

(a) An order to evacuate is given by the attendant or the entry supervisor;
(b) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation;
(c) The entrant detects a prohibited condition; or
(d) An evacuation alarm is activated.

IX. Duties of Attendants

(1) Complete all required confined space training prior to entry operations.

(2) Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure. Review the appropriate MSDS for each chemical hazard that may be encountered;

(3) Is aware of possible behavioral effects of hazard exposure in authorized entrants;

(4) Continuously maintain an accurate count of authorized entrants in the permit space and ensures that the means used to identify authorized entrants accurately identifies who is in the permit space;

(5) Remain outside the permit space during entry operations until relieved by another attendant;

(6) Communicate with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the confined space;

(7) Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions:

(a) If the attendant detects a prohibited condition;
(b) If the attendant detects the behavioral effects of hazard exposure in an authorized entrant;
(c) If the attendant detects a situation outside the space that could endanger the authorized entrants; or
(d) If the attendant cannot effectively and safely perform all the duties required;

(8) Activate assisted Self-Rescue Procedures or summon emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards;

(9) Take the following actions when unauthorized persons approach or enter a permit space while entry is underway:

(a) Warn the unauthorized persons that they must stay away from the permit space;
(b) Advise the unauthorized persons that they must exit immediately if they have entered the permit space; and
(c) Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space;

(10) Perform non-entry rescue as specified by the Water Authority Assisted Self-Rescue procedures; and

(11) Perform no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

X. Duties of Entry Supervisors

(1) Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure. Review the appropriate MSDS for each chemical hazard that may be encountered;

(2) Check that the appropriate entries have been made on the permit, all tests specified by the permit have been conducted and all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin;

(3) Terminate the entry and cancel the permit when;

(a) The entry operations covered by the entry permit have been completed; or
(b) A condition that is not allowed under the entry permit arises in or near the permit space;

(4) Verify Authority Assisted Self-Rescue services are available and that the means for summoning them are operable;

(5) Remove unauthorized individuals who enter or who attempt to enter the permit space during entry operations; and

(6) Reevaluate the permit space in the presence of any authorized entrant who has reason to believe

that the evaluation of that permit space may not have been adequate;

(7) Determine, whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

(8) The Entry Supervisor shall provide at least one authorized attendant outside the permit space into which entry is authorized for the duration of entry operations. Multiple spaces are not to be monitored by a single attendant according to the Water Authority's Permit Space Program.

NON-PERMIT CONFINED SPACE

XI. Non-Permit Confined Space

(1) A non-permit confined space means a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm. The only hazard posed by the confined space is an actual or potential hazardous atmosphere.

(2) A space classified by the Authority as a permit-required confined space may be reclassified as a non-permit confined space under the following procedures:

(a) If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated.

(b) If it is necessary to enter the permit space to eliminate hazards, such entry shall be performed as a permit-required confined space entry. If testing and inspection during that entry demonstrate that the hazards within the permit space have been eliminated, the permit space may be reclassified as a non-permit confined space for as long as the hazards remain eliminated.

(c) The Authority shall document the basis for determining that all hazards in a permit space have been eliminated through a certification that contains the date, the location of the space, and the signature of the person making the determination. The certification shall be made available to each employee entering the space. This non-permit confined space certification shall be documented through the Confined Space Entry Permit.

(d) If hazards arise within a permit space that has been declassified to a non-permit required confined space, each employee in the space shall exit the space. The entry supervisor shall then reevaluate the space and determine whether it must be reclassified as a permit space.

(3) The Water Authority has determined that many of the permit-required confined spaces around its facilities may be declassified or reclassified to a non-permit required confined space if the proper reclassification procedures have been followed and documented. This reclassification procedure requires an entry supervisor, authorized attendant, or authorized entrant to perform an analysis of the hazards within the confined space and demonstrate and certify that these hazards have been eliminated.

(4) The certification that these confined space hazards have been eliminated will be accomplished through the first page of the Water Authority's Confined Space Entry Permit. The first page of the confined space entry permit will require an employee to document his or her basis for making a non-permit confined space reclassification and document the procedures followed. If the confined space cannot be reclassified as a non-permit confined space then it shall be treated as a permit-required confined space and the appropriate procedures shall be followed.

(5) All confined spaces shall be considered permit-required confined spaces until the pre-entry procedures completed on the Confined Space Entry Permit demonstrate that the space can be maintained in a safe condition for entry by natural ventilation or mechanical ventilation alone.

(6) When there are changes in the use or configuration of a non-permit confined space that might increase the hazards to entrants, the Authority shall reevaluate that space and, if necessary, reclassify it as a permit-required confined space.

XII. Non-Permit Confined Space Entry Procedures

(1) Prior to initiating the entry, the entry supervisor, attendant, and entrant shall:

(a) Obtain the Confined Space Entry Permit/Reclassification Form for the confined space to be entered. The Confined Space Entry Permits are on file in the SWRP Control Room or appropriate Maintenance/Operations shop.

(b) Assess whether or not recent changes due to construction, equipment failures, or other causes may have generated actual or potential hazards not anticipated in the Reclassification Permit.

(c) Designate authorized entrant(s).

(d) Designate authorized attendant(s).

(e) Designate Assisted Self-Rescue team members, minimum of two including the team leader.

(f) Establish contact with the Assisted Self-Rescue Team Leader and the Control Room. Advise them of all relevant details of the proposed entry, providing at least, the following information:

(1) Exact location of the confined space to be entered.

(2) Number of people who will be performing the entry.

(3) Estimated length of time the work will take.

(4) Radio call number of the authorized attendant.

(g) Verify that all required personal protective equipment, rescue equipment, and hazardous gas monitors are available for the entry to take place.

(h) The authorized attendant and authorized entrant shall check the calibration on the hazardous gas monitor and verify the operability of the gas detection equipment.

(2) Any conditions making it unsafe to remove an entrance cover to the confined space shall be eliminated before the cover is removed.

(3) When the entrance cover(s) are removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening.

(4) Test atmospheric conditions in the confined space to determine if acceptable entry conditions exist before entry is authorized to begin and are being maintained during the course of entry operations;

(a) When testing for atmospheric hazards, test for oxygen first, test for combustible gases and vapors second, and then for toxic gases and vapors.

(5) Acceptable atmospheric conditions inside the confined space shall be 19.5% to 23.5% oxygen, less than 10% LEL, less than 5 ppm H_2S, and less than 35 ppm CO.

(6) The authorized attendant and authorized entrant shall continuously and independently monitor the atmosphere inside the non-permit confined space during entry operations. The entrant must have a calibrated gas detector on his/her body at all times during entry operations. The attendant shall monitor the atmosphere within the space from outside the confined space using a calibrated gas detector with a sample draw pump and tubing.

(7) The authorized attendant shall maintain contact with the Control room and the Assisted Self-Rescue team leader during entry operations.

(8) The authorized attendant shall notify the Control Room and the Assisted Self-Rescue team leader upon completion of the work inside the confined space.

(9) The confined space entrance shall be properly secured by entrant(s) before leaving the site.

(10) All equipment used during the entry operation shall be returned to proper storage.

ASSISTED SELF-RESCUE AND EMERGENCY SERVICES

XIII. Assisted Self-Rescue and Emergency Services

(1) The Water Authority will provide Assisted-Self Rescue Services to all employees required to enter permit-required confined spaces. Assisted Self-Rescue means trained, equipped rescuers standing by outside the confined space, prepared to perform vertical direct retrieval operations. Water Authority employees will not perform horizontal confined space rescue, an outside contractor like ROCCO will be contracted out to perform horizontal confined space rescue. Water Authority employees who have been designated to provide vertical permit space Assisted Self-Rescue shall be considered Assisted Self-Rescue Team members and shall take the following measures:

(a) Assisted Self-Rescue Team members shall be trained as permit space entrants and attendants at a minimum, including training in the potential hazards of all permit spaces from which rescue may be needed. Assisted Self-Rescue Team members shall demonstrate proficiency to perform assigned rescue duties;

(b) Assisted Self-Rescue Team members will be provided with and properly trained in the use and need for PPE, such as SCBA or fall arrest equipment, which may be required to perform permit space rescues. Every team member shall be properly trained to perform his or her functions and make rescues, and to use any rescue equipment, such as ropes and harnesses, that may be needed in a rescue attempt. Assisted Self-Rescue Team members shall demonstrate proficiency in the use of that PPE;

(c) Assisted Self-Rescue Team members shall be trained in the first aid and medical skills needed to treat victims overcome or injured by the types of hazards that may be encountered in the permit spaces until Emergency Medical Services arrive. At least one member of the rescue team must have current certifications in CPR, Basic First Aid, and Hazwoper 40; and

(4) Assisted Self-Rescue Team members shall practice making permit space rescues at least once every 12 months, by means of simulated rescue operations in which they remove dummies, manikins, or actual persons from the actual permit spaces or from representative permit spaces.

(2) Assisted Self-Rescue Team members shall focus on their own safety before considering the safety of the victim. Members shall be able to test the atmosphere to determine if it is IDLH. Members shall be able to identify information pertinent to the rescue from entry permits, hot work permits, and MSDSs.

(3) To facilitate non-entry rescue, employees will use the DBI-SALA confined space entry/retrieval systems whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of injury or would not contribute to the rescue of the entrant. The DBI SALA retrieval systems meet the following requirements:

(a) Each authorized entrant (includes rescue entrants) must use a full body or chest harness, with a

retrieval line attached at the center of the entrant's back near shoulder level, above the entrant's head.

(b) The other end of the retrieval line shall be attached to the DBI-SALA rescue davit retrieval system outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary. The rescue davit retrieval system shall be available to retrieve personnel from vertical type permit spaces more than 5 feet deep.

(4) If an injured entrant is exposed to a substance for which a MSDS or other similar written information is required to be kept at the worksite, that MSDS or written information shall be made available to the medical facility treating the exposed entrant.

(5) Assisted Self-Rescue Team members shall properly package and retrieve victims from a permit space that has a limited size opening (less than 24 inches in diameter), limited internal space, or internal obstacles or hazards. Airline respirators shall be used when required.

(6) The Chief Engineer, Safety Manager, Superintendents, and Assisted Self-Rescue Team members shall develop a plan for each of the kinds of permit space rescue operations at the facility that may be required. This rescue plan shall be developed in writing and shall be updated annually or as needed. Rescue operation plans of representative permit spaces with: Internal configuration, Elevation, Portal size and Space access.

XIV. Assisted Self-Rescue Procedures

Once an employee is assigned to an Assisted Self-Rescue Team or is selected to be an Assisted Self-Rescue team leader the following procedures shall be followed:

(1) Obtain all required personal protective equipment (PPE) as well as monitoring, communication, and rescue equipment to make a rescue feasible. SCBAs and mechanical ventilation are an example of PPE required to be on site at all times. Most of the required PPE will be housed in the Safety Equipment Building adjacent to the Operations and Maintenance Facility;

(2) Set up the required DBI-SALA rescue/retrieval equipment at the confined space to be entered before entry operations begin. This will ensure immediate Assisted Self-Rescue services are available at all times;

(3) Assisted Self-Rescue Team members will evaluate the confined space and scheduled work to be completed and assist with the isolation of the confined space and mitigation of all confined space hazards;

(4) Assisted Self-Rescue Team members will come up with a rescue plan that details how to rescue authorized entrants should an emergency situation arise. This rescue plan can be verbal among the rescue team members or it can be a written plan as long as all rescue team members understand how rescue procedures will be conducted and their roles;

(5) The Assisted Self-Rescue Team shall outfit every authorized entrant with a chest or full body harness equipped with fall protection, a retrieval line attached at the center of the entrant's back near shoulder level, above the entrant's head, and a retrieval hoist system. The confined space entry/rescue equipment authorized by the Water Authority is the DBI-SALA hoist systems;

(6) Continuously monitor the atmospheric conditions and potential hazards during entry operations. Two gas detectors are required during entry/rescue procedures, one detector on the entrant and the

other outside the confined space monitoring the internal atmosphere. Perform required duties until entry operations are completed. Assisted Self-Rescue Team members have the authority to stop permit space entry operations should a prohibited condition be detected;

(7) Once entry operations have been completed and the confined space entry permit has been cancelled, return all rescue equipment and personal protective equipment to its proper location. Please make sure the entrance cover to the confined space is properly secured.

DEFINITIONS

XV. Definitions

Acceptable entry conditions means the conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space.

Assisted Self-Rescue means Water Authority employees trained to provide vertical confined space rescue procedures.

Attendant means an individual stationed outside a permit space who monitors the authorized entrants and who performs all attendant's duties assigned in the Water Authority Permit Space Program.

Authorized entrant means an employee who is authorized by the Water Authority to enter a permit space.

Bio-Hazard or Biological Hazard refers to biological substances that pose a threat to the health of living organisms, primarily that of humans. This can include medical waste or samples of a microorganism, virus or toxin that can affect human health. It can also include substances harmful to animals.

Blanking or blinding means the absolute closure of a pipe, line, or duct by the fastening of a solid plate (spectacle blind or skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

Confined space means a space that:

(1) Is large enough and so configured that an employee can bodily enter and perform assigned work; and

(2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and

(3) Is not designed for continuous employee occupancy.

Double block and bleed means the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

Emergency means any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

Engulfment means the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Entrapment/engulfment means converging walls; to swallow up or overwhelm by or as if by overflowing and enclosing.

Entry means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

Entry permit means the written or printed document that is provided by the Water Authority to allow and control entry into a permit space and that contains the information required in **1910.146(f) Entry permit.**

Entry supervisor means the person (such as the operations/maintenance supervisor or superintendent) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by the Water Authority Permit Space Program.

Hazardous atmosphere means an atmosphere that may expose employees to the risk of death, incapacitation, and impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

(1) Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL);

(2) Airborne combustible dust at a concentration that meets or exceeds its LFL;

(3) Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;

(4) Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, of this part and which could result in employee exposure in excess of its dose or permissible exposure limit;

(5) Any other atmospheric condition that is immediately dangerous to life or health.

Hot work permit means the Water Authority written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

Immediately dangerous to life or health (IDLH) means any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

Inerting means the displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

Isolation means the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

Line breaking means the intentional opening of a pipe, line, or duct that is or has been carrying

flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

Mitigate or Mitigation means to become less harsh or to eliminate the hazard.

Non-permit confined space means a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

Oxygen deficient atmosphere means an atmosphere containing less that 19.5 percent oxygen by volume.

Oxygen enriched atmosphere means an atmosphere containing more than 23.5 percent oxygen by volume.

Permit-required confined space means a confined space that has one or more of the following characteristics:

(1) Contains or has a potential to contain a hazardous atmosphere;
(2) Contains a material that has the potential for engulfing an entrant;
(3) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
(4) Contains any other recognized serious safety or health hazard.

Permit-required confined space program means the Water Authority's overall program for controlling, and, where appropriate, for protecting employees from, permit space hazards and for regulating employee entry into permit spaces.

Permit system means the Water Authority's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

Prohibited condition means any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

Rescue service means the personnel designated to rescue employees from permit spaces. This rescue service could be provided by a contractor such as ROCCO.

Retrieval system means the equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.

SWRP means the Southside Water Reclamation Plant.

TRAINING

XVI. Training

Training shall be provided by the Water Authority so that all employees whose work is regulated by the permit space program acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned.

(A) Training shall be provided to each affected employee:

(1) Before the employee is first assigned duties under the permit space program;

(2) Before there is a change in assigned duties;

(3) Whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained;

(4) Whenever the Water Authority has reason to believe either that there are deviations from the permit space entry procedures or that there are inadequacies in the employee's knowledge or use of these procedures.

(B) The training shall establish employee proficiency in the duties required by the permit space program and shall introduce new or revised procedures, as necessary, for compliance.

(C) The Water Authority shall certify that the training required of this program has been accomplished. The certification shall contain each employee's name, the signatures or initials of the trainers, and the dates of training. The certification shall be available for inspection by employees.

XVII. Respirator Fit Testing

Before a Water Authority employee may be required to use any respirator with a negative or positive pressure tight-fitting face-piece, the employee must be fit tested with the same make, model, style, and size of respirator that will be used. Water Authority employees will use the SCOTT AV-3000 full facepiece respirator or the SCOTT XCEL half facepiece respirator.

(A) The Water Authority shall ensure that employees using a tight-fitting facepiece respirator pass an appropriate qualitative fit test (QLFT) or quantitative fit test (QNFT).

(B) Employees using a tight-fitting facepiece respirator are to be fit tested prior to initial use of the respirator and whenever a different respirator facepiece (size, style, model, or make) is used. Employees must pass a qualitative fit test at least annually thereafter.

(C) The Water Authority shall conduct an additional fit test whenever the employee reports, or the employer, PLHCP, supervisor, or program administrator makes visual observations of, changes in the employee's physical condition that could affect respirator fit. Such conditions include, but are not limited to, facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight.