

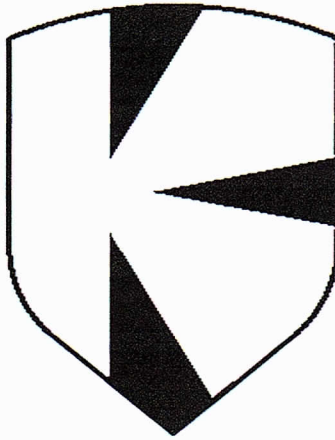
**SANITARY SEWER COLLECTION/TRANSMISSION SYSTEM
ENGINEERING REPORT**

for

SOUTHGATE

Section 30, Township 22 South, Range 25 East
City of Groveland, Lake County, Florida

FEBRUARY 2016
TLK PROJECT #T1507

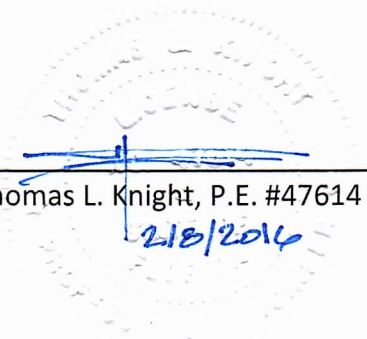


Thomas L. Knight, P.E., Professional Association
Planning, Design, Permitting, Inspection
P.O. Box 120625, Clermont, Florida 34712
Phone: (352)394-8514
Certificate of Authorization No. 29972

Prepared by: _____

Thomas L. Knight, P.E. #47614

2/18/2016





NARRATIVE

PURPOSE AND SCOPE

The purpose of this engineering report is to provide calculations and supporting documentation for the design of the proposed sanitary sewer system for Southgate subdivision. The proposed development, as detailed on the accompanying construction plans, has been designed to meet the regulatory criteria of the Florida Department of Environmental Protection (FDEP) and City of Groveland. This report contains calculations and reference information that is the basis of the design for the proposed sanitary sewer collection and transmission systems.

GENERAL PROJECT INFORMATION

The Southgate project site is located in Section 30, Township 22 South, Range 25 East, City of Groveland, Lake County, Florida. The project entrance is located at State Road 33.

The subdivision will consist of 85 lots, open space areas, conservation areas and road rights-of-way. The details and specifications for the proposed improvements are included in the Construction Plans for Southgate. The project will be constructed in one phase of development.

GRAVITY SYSTEM

The proposed sanitary sewer system will serve all 85 lots in Southgate. The proposed improvements include a gravity sewer system comprised of a network of interconnected concrete manholes and PVC sewer pipes. All manholes have an inside diameter of 4 feet and a maximum centerline spacing of 400 feet. All sanitary sewer pipes are 8" diameter with a minimum slope of 0.40%. The proposed collection sanitary sewer collection system includes an 8" PVC stub-out to Hope International Church located north of and adjacent to the Southgate project site. The church will not connect to the sewer stub-out without a permit from DEP.

PROPOSED LIFT STATION AND FORCE MAIN

The proposed improvements include an onsite lift station and force main. The proposed lift station is designed to receive domestic wastewater from the 85 single-family residential units that it serves. Submersible pumps in the lift station force the wastewater through a 4" PVC force main to an existing manhole located approximate 40 feet south of the intersection of Anderson Street and Gadson Street. The existing manhole is part of the City of Groveland sanitary sewer collection system. The force main will consist of 1,680 feet of 4" PVC pipe. An easement is being obtained from the church to install the force main through church property. The easement generally runs along the top of an existing stormwater retention area that serves the church.

The design parameters for the proposed lift station are summarized below.

Description of service area: 85 single-family residential units.

Average daily flow: 250 GPD/unit

Peak flow factor: 4.0

Total design ADF = 85 units x 250 GPD/unit = 21,250 GPD

Design peak flow = 21,250 GPD/1440 x 4.0 = 59.0 GPM

Target pump discharge = 100 GPM

Both Pumps Off elevation = 91.22 feet

High point in force main elevation = 114.9 feet

Total static head = 23.7 feet

Pipe length of 4" force main = 1,680 feet
Equivalent length of force main = 2,110 feet

Top elevation = 114.25 feet
East 8" gravity pipe invert elevation = 93.72
North 8" gravity pipe invert elevation = 109.11
Wet well bottom elevation = 89.22 feet
Wet Well Diameter = 6.0 ft

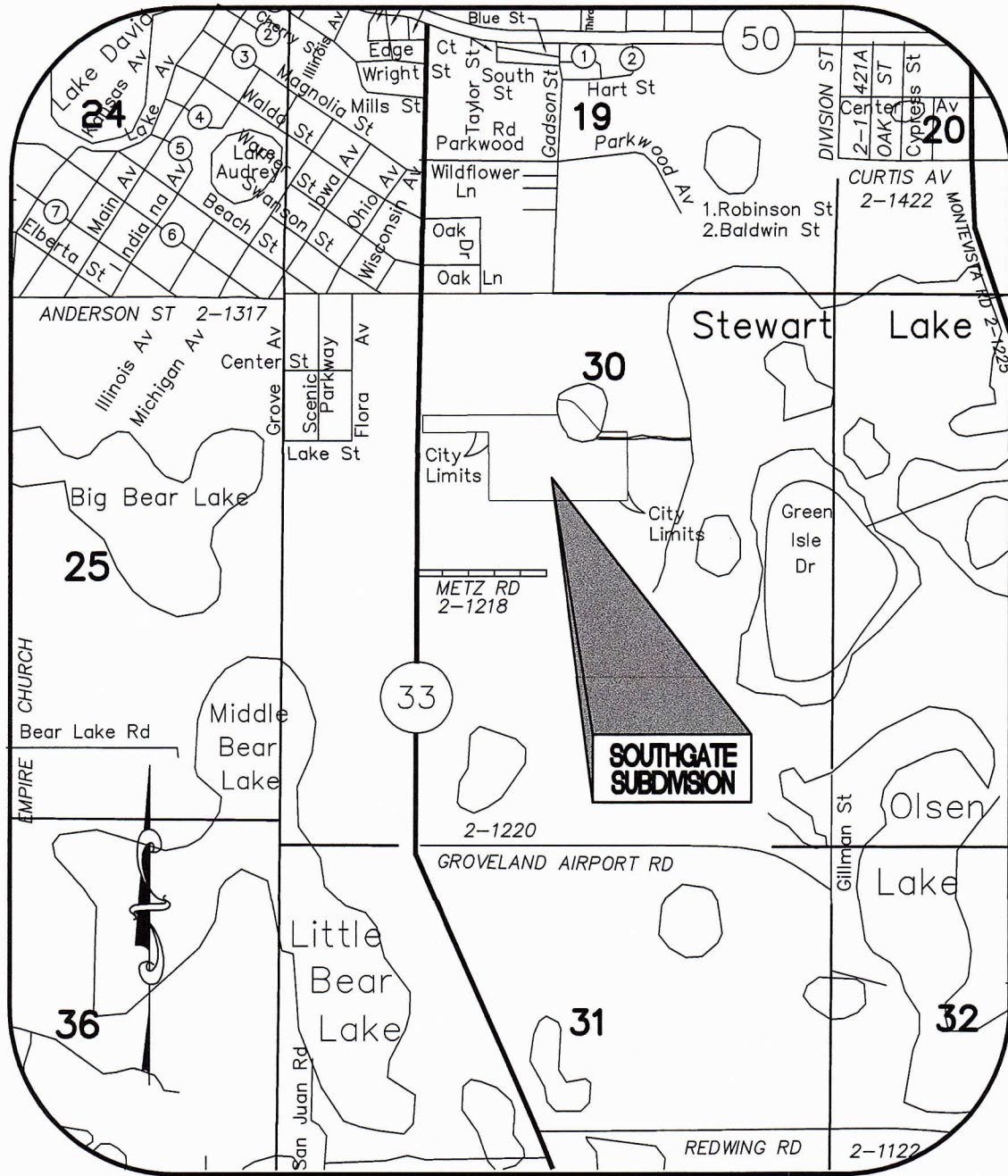
Design point of each pump = 100 GPM at 49.9 ft. TDH
Pipe Velocity = 0.2066 cfs / 0.0872 sq.ft. = 2.37 fps

Every pump cycle will draw the water level in the wet well down 1.5 feet. At the projected peak inflow, the difference between the pump discharge rate and the inflow rate is 41.0 GPM. The pump run time is 3.17 minutes and the time to refill is 5.38 minutes therefore the total pump cycle time at the peak inflow rate is approximately 8.5 minutes which equates to 7 starts per hour.

Although there is additional capacity in the proposed lift station, the lift station components may have to be upgraded if the church connects to the proposed stub-out, depending on the amount of additional flow will come from the church. Any connection by the church to the proposed stub-out must be permitted by DEP and the City of Groveland prior to construction.

Refer to the following supporting information:

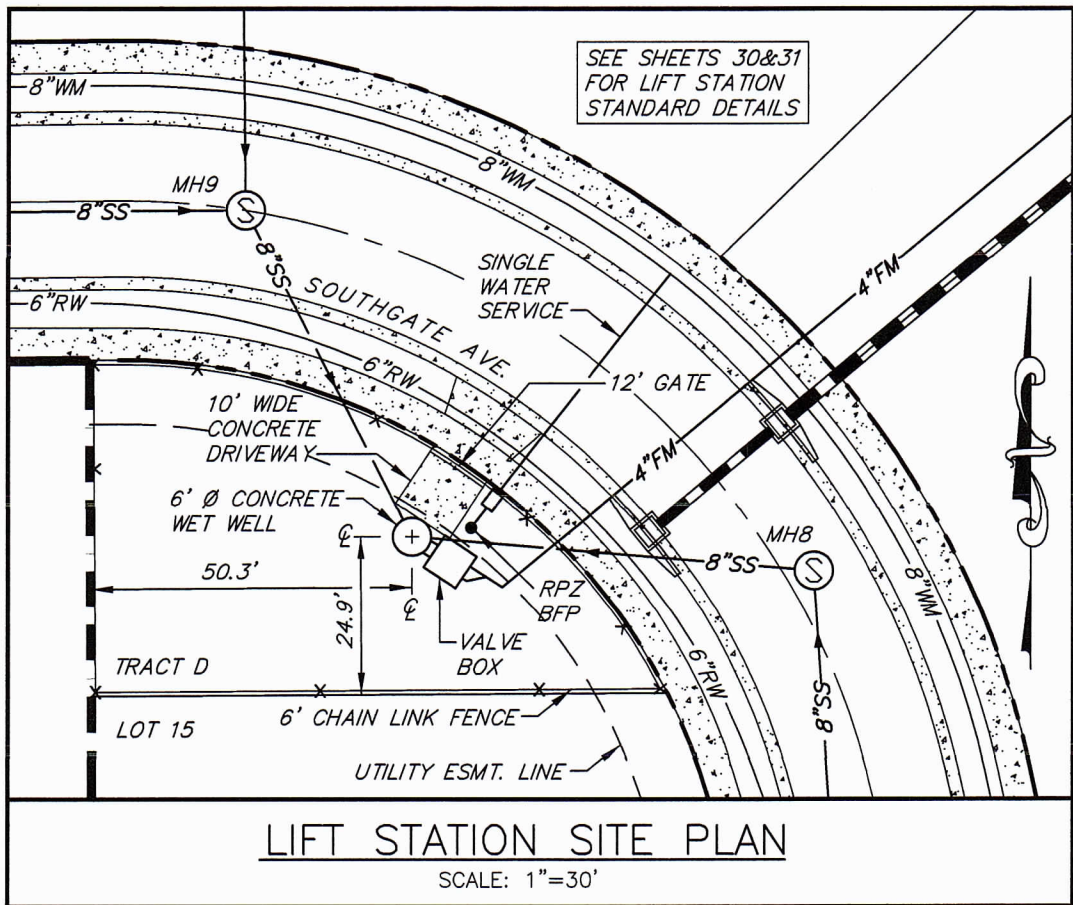
- Location Map
- Lift Station Site Plan
- Southgate – Summary of Sanitary Sewer System
- Sanitary Sewer Structure Table
- Pump Station (Elevation View)
- Lift Station Analysis
- Hydromatic Pump Curve with System Curve
- Wet Well Flootation Calculations
- Febco Series 825Y RPZ BFR Product Information



LOCATION MAP

SCALE 1:1600

**SECTION 30, TOWNSHIP 22 SOUTH, RANGE 25 EAST
CITY OF GROVELAND, LAKE COUNTY, FLORIDA**



Southgate - Summary of Sanitary Sewer System

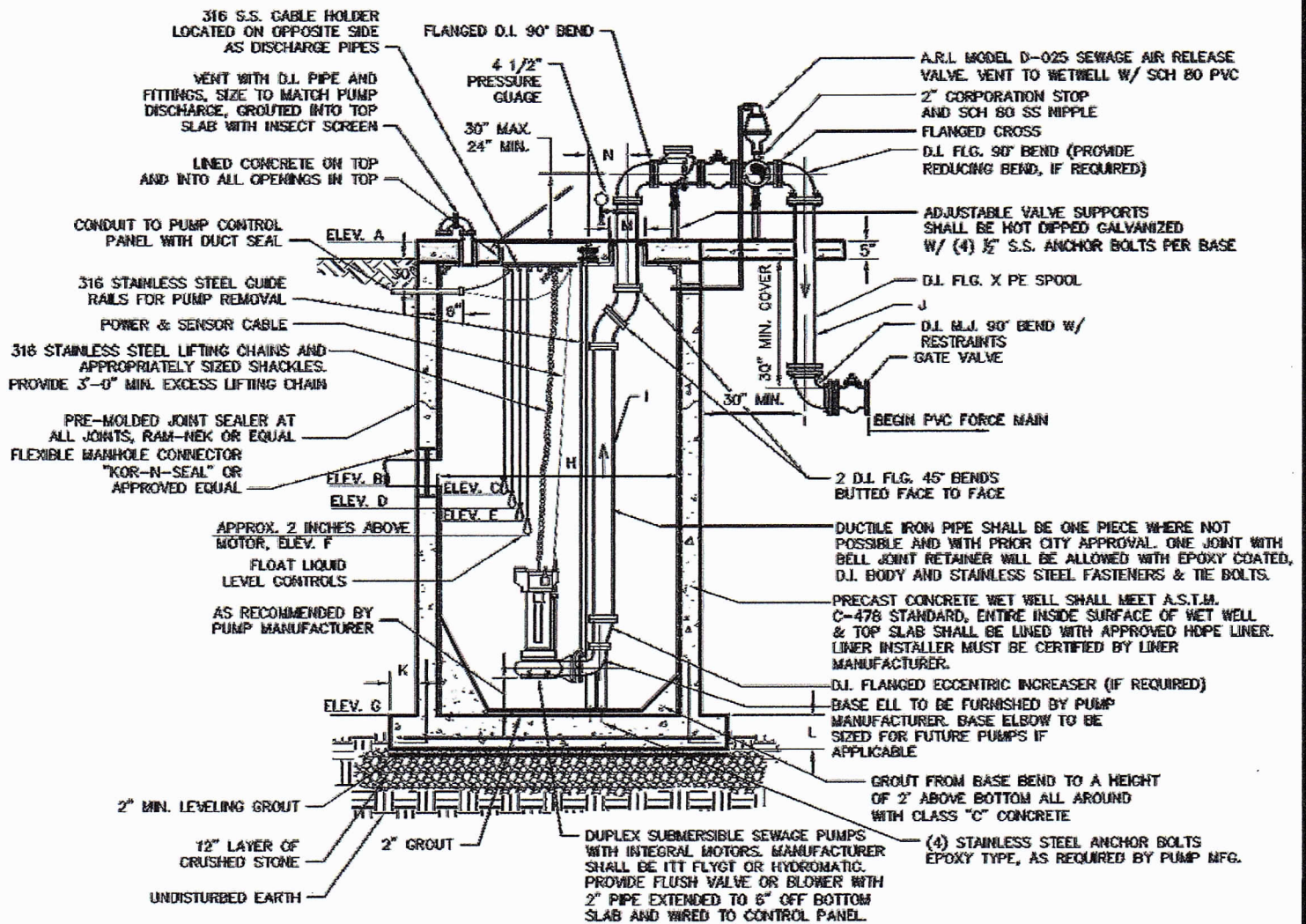
Date: July 5, 2015

	Description	Size	Material	Quantity
	Gravity Main	8 inch dia,	SDR 35 PVC	601.1 lf
	Gravity Main	8 inch dia.	SDR 26 PVC	1,473.4 lf
	Gravity Main	8 inch dia.	SDR 18 PVC	120.5 lf
Total Length of 8 inch Gravity Main				2,195.0 lf
	Force Main	4 inch dia.	SDR26 PVC	1,616 lf
	Force Main	4 inch dia.	Class 50 DIP	64 lf
Total Length of 4 inch Force Main				1,680.0 lf
	Manhole	4 ft. dia.	Reinf. Conc.	9
Total Number of Manholes				9
	Lift Station	8 ft. dia.	Reinf. Conc.	1
Total Number of Lift Stations				1

SANITARY SEWER STRUCTURE TABLE

FROM:			TO:		PIPE:		
M.H. I.D.	RIM ELEV	INV ELEV	M.H. I.D.	INV ELEV	DIA. (in)	LGTH (ft)	SLOPE (%)
MH1	119.67	114.67	MH9	109.79	8	400.00	1.22
MH2	106.56	101.65	MH3	100.84	8	201.13	0.40
MH3	107.25	100.74	MH4	99.22	8	380.84	0.40
MH4	114.15	99.12	MH5	98.03	8	272.07	0.40
MH5	116.99	97.93	MH6	96.38	8	387.34	0.40
MH6	118.24	96.28	MH7	95.33	8	237.38	0.40
MH7	115.68	95.23	MH8	94.45	8	195.79	0.40
MH8	113.42	94.35	L.S.	93.72	8	63.09	1.00
MH9	114.79	109.69	L.S.	109.11	8	57.38	1.00

NOTE: ALL PIPE LENGTHS MEASURED FROM CENTER OF STRUCTURE



PUMP MANUFACTURER	HYDROMATIC	
MODEL	S4NRC/S4NVX	IMPELLER RECESSED 7.9375"
DISCHARGE	4"	MOTOR RPM 1750
	5 HP	230 VOLTS 3 PHASE 60 HZ
DESIGN POINT	100 GPM AT 49.63 FT. TDH	
RUNOUT POINT	140 GPM AT 55 FT. TDH	
MAX. SPHERE	3.0	INCH (ES)
PUMP ACCESS HATCH SIZE	3 ft X 4 ft	
PUMP CENTERLINE SEPARATION:	2.5 ft	

NOTES:

1. PRECAST CONCRETE STRUCTURE, INCLUDING TOP SLAB, SIDE WALLS AND BOTTOM SLAB TO MEET ASTM C-478. CERTIFICATION BY FLA. REGISTERED PROFESSIONAL ENGINEER TO BE PROVIDED BY MANUFACTURING COMPANY.

SCHEDULE OF ELEVATIONS:

PUMP STATION STREET ADDRESS	TOP SLAB	INFLUENT	H/WL ALARM	LAG PUMP ON	LEAD PUMP ON	BOTH PUMPS OFF	BOTTOM	WET WELL DIA.	DISCHARGE PIPE DIA.	DISCHARGE F.M. DIA.	BOT. SLAB OVERHANG	BOT. SLAB THICKNESS	PIPE HOLE DIAMETER	HATCH EDGE TO # PIPES
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
TRACT D SOUTHGATE BLVD.	114.25	109.11N 93.72E	93.72	93.22	92.72	91.22	89.22	6'-0"	4"	4"	12"	12"	*	*

* PER PUMP MANUFACTURER'S RECOMMENDATION

CITY OF GROVELAND STANDARD DETAILS: SANITARY SEWER



METZGER & WILLARD, INC.
Civil - Environmental Engineers - Surveyors
8600 Hidden River Parkway, Suite 550
Tampa, Florida 33637 (813) 977-6005

PUMP STATION (ELEVATION VIEW)

DATE: JULY 7, 2008
SCALE: N.T.S.

S-9B

SOUTHGATE SUBDIVISION

Lift Station Analysis
System Head Curve

DATE: 2/8/16

Factor 1=ON, 0 = line off	Pipe No.						REQUIRED STORAGE:								
	1	2	3	Area(sf)	Static El. Diff+ Press.(ft)	Total System Head Loss (ft)	Volume (v)	Volume (v)	Min. cycle time (t)	Wet well dia. (D)	Qin	Qout	Min. Height (h)	Area (A)	
Inch-Dia Eqv.length	Single	Single	Single	Area(sf)	El. Diff+ Press.(ft)	Head Loss (ft)	0.19625	241.9 gal	32.3396 cf	10 min	6 ft	59 gpm	100 gpm	1.14 ft	28.27 sf
Add.GPM	HL	HL	HL												
FACTOR C	(ft)	(ft)	(ft)	Vel - FPS	Vel - FPS	Vel - FPS	TDH	Where:	t= [v/(Qout-Qin) + v/Qin]	v = [t(Qout-Qin)(Qin)]/Qout	A = pi(D)^2/4	h = v/A			
MGD	100	100	100												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.70								
0.04	1.99	0.64	0.00	0.64	0.00	0.00	25.69								
0.07	7.19	1.28	0.00	1.28	0.00	0.00	30.89								
0.11	15.23	1.92	0.00	1.92	0.00	0.00	38.93								
0.14	25.93	2.55	0.00	2.55	0.00	0.00	49.63								
0.22	54.89	3.83	0.00	3.83	0.00	0.00	78.59								
0.29	93.46	5.11	0.00	5.11	0.00	0.00	117.16								
Equivalent Length Description	# of fittings	Equiv L	Number of	Equiv L	Total										
Plug Valve-Open	5.00	5	0.00	25.00	0.00										
90 deg. elbow	4.00	15.20	0.00	60.80	0.00										
Long rad 90 or 45	14.00	8.09	0.00	113.26	0.00										
Std Tee thru Flow	1.00	12.00	0.00	12.00	0.00										
Std Tee Branch flow	1.00	30.30	0.00	30.30	0.00										
Increaser	1.00	10.00	0.00	10.00	0.00										
Swing check valve	2.00	50.50	0.00	101.00	0.00										
Outlet	1.00	50.00	0.00	50.00	0.00										
Discharge Connection	1.00	25.00	0.00	25.00	0.00										
Butterfly valve	0.00	0.00	0.00	0.00	0.00										
regular pipe length	1683.00	1683.00	0.00	1683.00	0.00										
Total length		2110.36		2110.36	0.00										

SYSTEM CURVE	
0.00	23.70
25.00	25.69
50.00	30.89
75.00	38.93
100.00	49.63
150.00	78.59
200.00	117.16

Description Elev.
 Invert in 93.7
 Wet Well Bottom 89.2
 All Pumps Off 91.2
 Lead Pump On 92.7
 Lag Pump On 93.2
 High Alarm 93.7
 Finish grade 114.3

Pump Data Sheet - HYDROMATIC

Company: Thomas L. Knight, P.E. Professional Assoc
 Name: Southgate Subdivision
 Date: 6/30/2016
 Section: SOUTHGATE



Pump:

Size: S4NRC/S4NVX
 Type: VORTEX-4
 Synch speed: 1750 rpm
 Curve: S4N1750
 Specific Speeds
 Dimensions
 Speed: 1750 rpm
 Dia: 7.9375 in
 Impeller:
 Ns ---
 Nss ---
 Suction: ---
 Discharge: 4 in

Search Criteria:

Flow: 100 US gpm
 Head: 49.9 ft
 Near miss: 90 % of Head

Fluid:

Water
 Density: 62.37 lb/ft³
 Viscosity: 1.105 cP
 NPSHa: ---
 Temperature: 60 °F
 Vapor pressure: 0.2563 psia
 Atm pressure: 14.7 psia

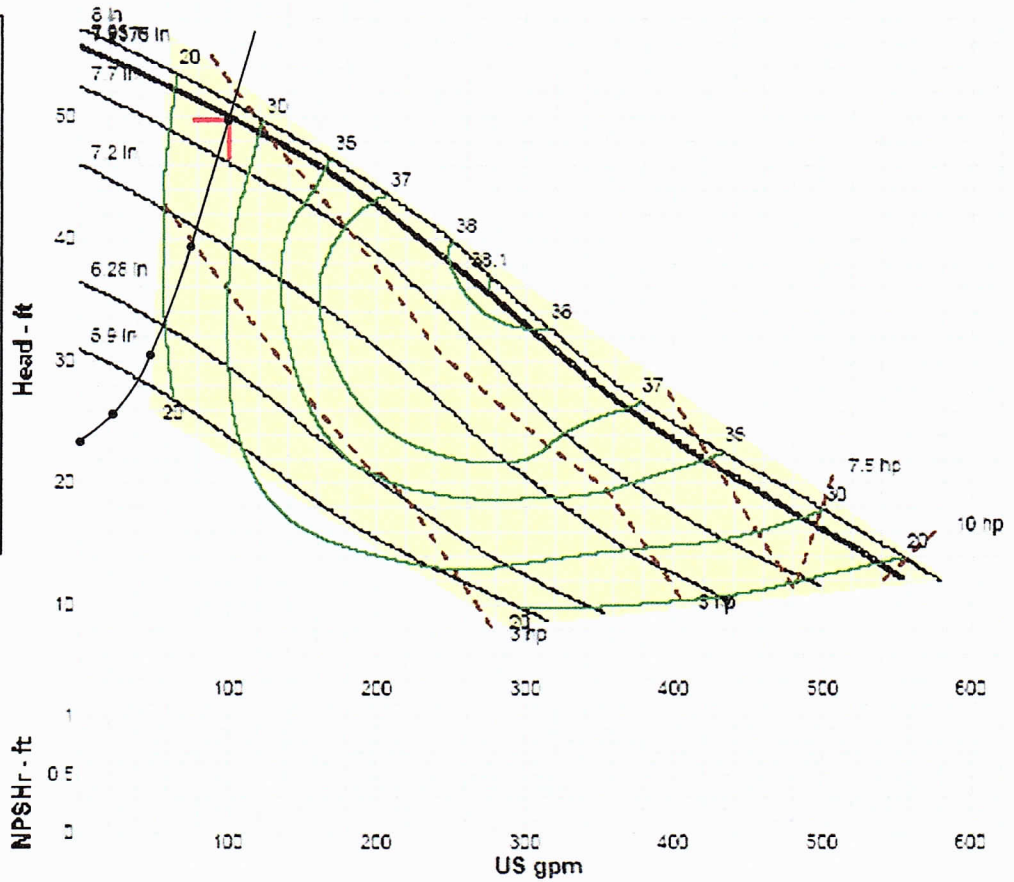
Pump Limits:

Temperature: 140 °F
 Pressure: 125 psi g
 Sphere size: 3 in
 Power: ---
 Eye area: ---

Motor:

Consult HYDROMATIC to select a motor for this pump

--- Data Point ---	
Flow:	100 US gpm
Head:	49.9 ft
Eff:	27%
Power:	4.64 hp
NPSHr:	---
--- Design Curve ---	
Shutoff head:	55.6 ft
Shutoff dP:	24.1 psi
Min flow:	---
BEP:	33% @ 276 US gpm
NOL power:	10.6 hp @ 552 US gpm
--- Max Curve ---	
Max power:	11.7 hp @ 579 US gpm

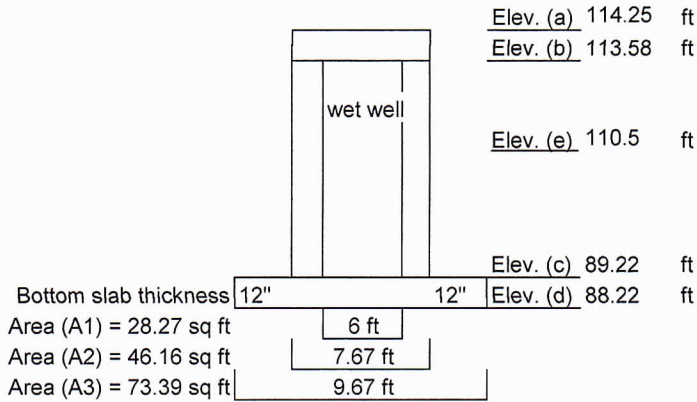


Performance Evaluation:

Flow US gpm	Speed rpm	Head ft	Efficiency %	Power hp	NPSHr ft
120	1750	49.6	30	4.91	---
100	1750	49.9	27	4.64	---
80	1750	51.1	23	4.37	---
60	1750	52.3	20	4.1	---
40	1750	---	---	---	---

PROJECT: SOUTHGATE SUBDIVISION
 WET WELL BOUYANCY ANALYSIS

Top slab diameter = 7.33 ft
 Top slab thickness = 8 inches
 Top slab area = 42.24 sf
 Wet well cylinder thickness = 10"



ASSUMPTIONS

High Groundwater Elev (e) = 110.5
 Concrete Density = 150 lb/cu-ft
 Soil backfill density = 100 lb/cu-ft
 Hatch Door Area = 12.00 sq ft

STRUCTURE WEIGHT

Walls: $(A2 - A1) \times (113.58 - 89.22) \times 150 = 65,366.8$ lb
 Bottom Slab: $(A3) \times (89.22 - 88.22) \times 150 = 11,008.3$ lb
 Top Slab: $(34.16) \times (114.25 - 113.58) \times 150 = 3,416.3$ lb
SUBTOTAL = 79,791.4 lb

SOIL OVERBURDEN

$(A3 - A2) \times (113.75 - 89.22) \times 150 = 66,786.1$ lb
SUBTOTAL = 66,786.1 lb

Total Downward Force = 146,577.5 lb

BUOYANT FORCE

$(A3) \times (110.5 - 88.22) \times 62.4 = 131,688.3$ lb
SUBTOTAL = 131,688.3 lb

Total Upward Force = 131,688.3 lb

Net Postive Downward Force = 14,889.2 lb (Non-flotation)

Series 825Y

Reduced Pressure Zone Assemblies

Size: 3/4" - 2" (20mm - 50mm)

The FEBCO Series 825Y Reduced Pressure Zone Assemblies are used to protect against high hazard (toxic) fluids in water services to industrial plants, hospitals, morgues, mortuaries, and chemical plants. They are also used in irrigation systems, boiler feed, water lines and other installations requiring maximum protection.

Features

- Ultimate mechanical protection of potable water, against hazards of cross-connection contamination.
- Meets all specifications of AWWA, ASSE, and CSA.
- Approved by the Foundation of Cross-Connection Control and Hydraulic Research at the University of Southern California.
- Modular relief valve for ease of maintenance.
- Simple Service procedures. All internal parts serviceable in line.
- Low head loss.
- Spring loaded "Y" type check valves.
- Internal relief valve pressure sensing passages.
- Replaceable seat rings on all sizes.
- End connection – NPT ANSI / ASME B1.20.1

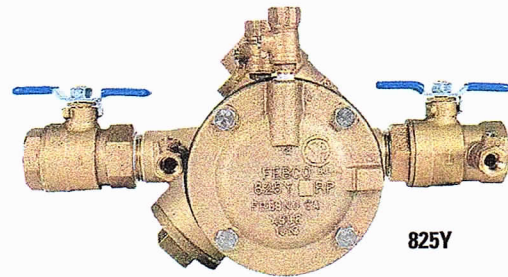
Specifications

The reduced pressure zone assembly shall consist of two independently operating, spring loaded, "Y" pattern check valves and one hydraulically dependent differential relief valve. The assembly shall automatically reduce the pressure in the "zone" between the check valves to at least 5psi lower than inlet pressure. Should the differential between the upstream and the zone of the unit drop to 2psi, the differential relief valve shall open and maintain the proper differential.

Mainline valve body and caps including relief valve body and cover shall be bronze. Check valve moving member shall be center stem guided. All hydraulic sensing passages shall be internally located within the mainline and relief valve bodies and relief valve cover. Diaphragm to seat area ratio shall be 10:1 minimum. Relief valve shall have a removable seat ring. Check valve and relief valve components shall be constructed so they may be serviced without removing the valve body from the line. All seat discs shall be reversible. Shutoff valves and test cocks shall be full ported ball valves.

The assembly shall be rated to 175psi (12.1 bar) working pressure and water temperature range from 32°F to 140°F (0°C - 60°C).

The assembly shall meet the requirements of ASSE Standard 1013; AWWA Standard Code C511; CSA Standard B64.4; and approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California.



Operation

In a flow condition the check valves are open with the pressure between the checks, called the zone, being maintained at least 5.0psi lower than the inlet pressure and the relief valve is maintained closed.

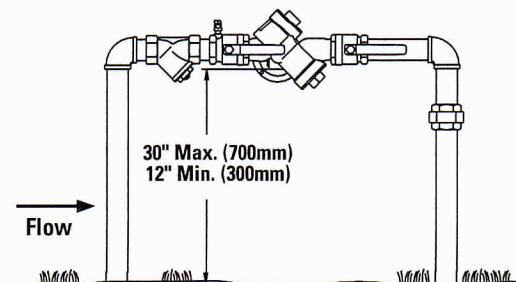
Should abnormal conditions arise under no flow or reversal of flow, the differential relief valve will open and discharge to maintain the zone at least 2psi lower than the supply.

When normal flow resumes, the zone's differential pressure will resume and the relief valve will close.

Typical Installation

Reduced pressure zone assemblies should be installed with minimum clearance of 12" (300mm) between relief valve discharge port and floor or grade. They must be installed where discharge will not be objectionable and can be positively drained away. They should be installed where easily accessible for testing and maintenance and must be protected from freezing. Thermal water expansion and/or water hammer downstream of the backflow preventer can cause excessive pressure. Excessive pressure situations should be eliminated to avoid possible damage to the system and assembly.

Refer to local codes for specific installation requirements. Some codes may prohibit vertical installation.



WARNING

It is illegal to use this product in any plumbing system providing water for human consumption, such as drinking or dishwashing, in the United States. Before installing standard material product, consult your local water authority, building and plumbing codes.

Job Name _____

Contractor _____

Job Location _____

Approval _____

Engineer _____

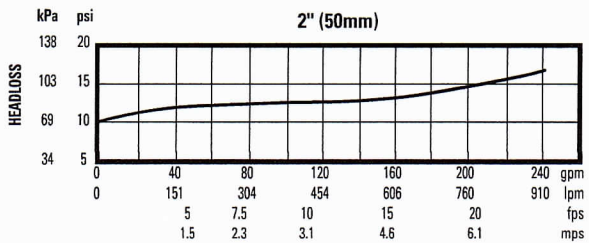
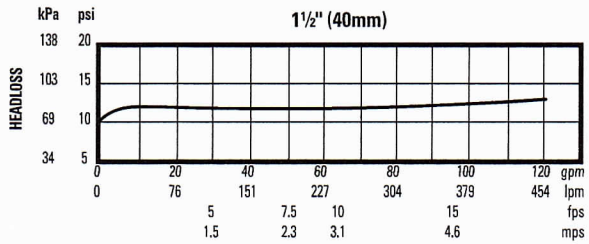
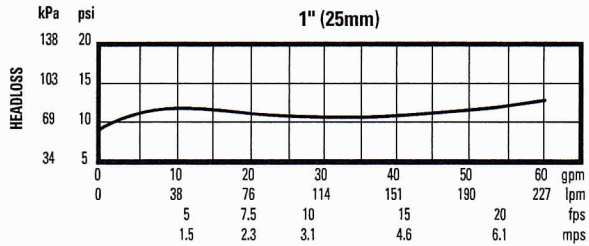
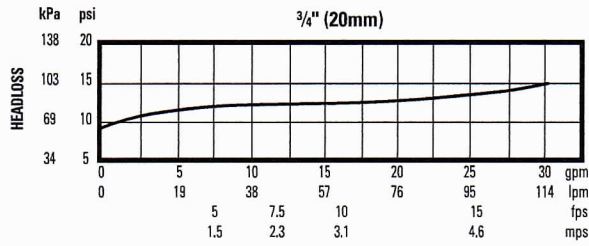
Contractor's P.O. No. _____

Approval _____

Representative _____

FEBCO product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact FEBCO. FEBCO reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on FEBCO products previously or subsequently sold.

Capacity



Dimensions – Weights

Size: 3/4" - 2" (20 - 50mm)

SIZE (DN)		DIMENSIONS								WEIGHT	
		A		B*		C		D		E	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
3/4	20	12	305	7 3/4	197	3 1/4	83	3 1/4	83	4 1/8	105
1	25	12 3/4	324	7 3/4	197	3 1/4	83	3 1/4	83	4 1/8	105
1 1/2	40	17	432	10 1/2	267	4 1/2	114	4 1/2	114	5	127
2	50	17 3/4	451	10 1/2	267	4 1/2	114	4 1/2	114	5	127
										lbs.	kgs.
										11.5	5.2
										12.5	5.7
										26.5	12.0
										29.0	13.0

* B Dimension is less shutoffs

NOTICE

Weights shown are approximate. Dimensions shown are nominal, allowance must be made for normal manufacturing tolerances.

Temperature – Pressure

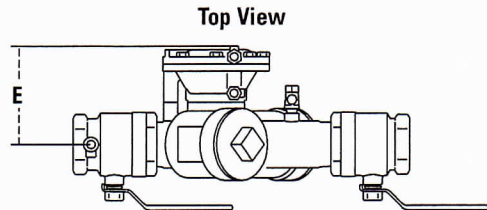
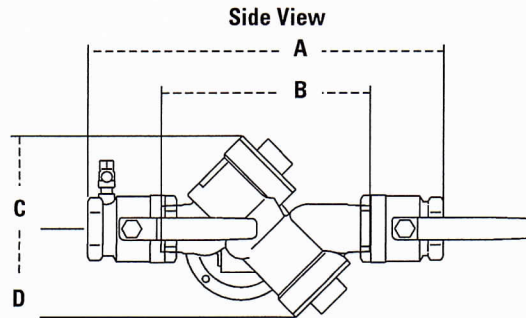
Maximum working pressure: 175psi (12.1 bar)
 Hydrostatic test pressure: 350psi (24.1 bar)
 Temperature range: 32°F to 140°F (0°C to 60°C)

Materials

Main valve body: Bronze
 Relief valve body: Bronze
 Elastomers: Nitrile Seat Discs
 Diaphragms: Nitrile, fabric reinforced
 Springs: Stainless Steel

Approvals – Standards

- Approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California.
- AWWA C511 Conformance



A Watts Water Technologies Company

USA: Tel: (800) 767-1234 • Fax: (800) 788-4491 • FEBCOonline.com
 Canada: Tel: (905) 332-4090 • Fax: (905) 332-7068 • FEBCOonline.ca
 Latin America: Tel: (52) 81-1001-8600 • FEBCOonline.com