Drainage Reports

Abbreveated Water & Sewer Need Reports

Water Study

Wastewater Study

Stormwater Waiver Application

Preliminary Engineering Report
Prepared: October 2016

StoryRock
Lift Station #3

Prepared for:

CAV-RANCH, LLC.
14400 North 7th Place
Scottsdale, Arizona 85260

Prepared by:

Kimley-Horn and Associates, Inc.
7740 N. 16th Street, Suite 300
Phoenix, AZ 85020
(602) 944-5500

191069013

Kimley»Horn

5-PP-2016#5
11/17/16

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EXECUTIVE SUMMARY

The purpose of this report is to provide preliminary design analysis for the construction of a new lift station serving StoryRock, a proposed master planned community development consisting of 462-acres of single family residential construction. The purpose of this report is to provide for review and comment a preliminary design for the lift station layout, pumping alternatives, and associated pumping and force main options. The following points summarize the findings of the preliminary design work that has been completed to date:

Lift Station Analysis Site Analysis

- Analyzed location based on the following criteria; existing topography, proximity to a 100-year flood plain, integration with the proposed gravity sewer system along N 128th Street.

Pumps

- Two 11hp pumps to be installed to accommodate an anticipated 37 gpm flow.

Force Main Analysis

- Preliminary alignment options for redundant force main lines based on flow and pump requirements for StoryRock site development.

Electrical Systems Analysis

- Electrical and instrumentation needs for the lift station include: power delivery and collaboration with utility, design of control specifics, lighting design, and instrumentation selection and implementation.

Odor Control Analysis

- Options to install odor control into either wet well and gravity sewer manhole. Odor control will not be required at the lift station site, however the site will be configured so that a chemical feed system could fairly easily be added at a later time.

Opinion of Probable Cost (OPC)

- An OPC was generated for the project, and projects the total project cost to be approximately $427,000. OPC can be found in **Appendix H**.

1.0 INTRODUCTION

1.1 Project Background

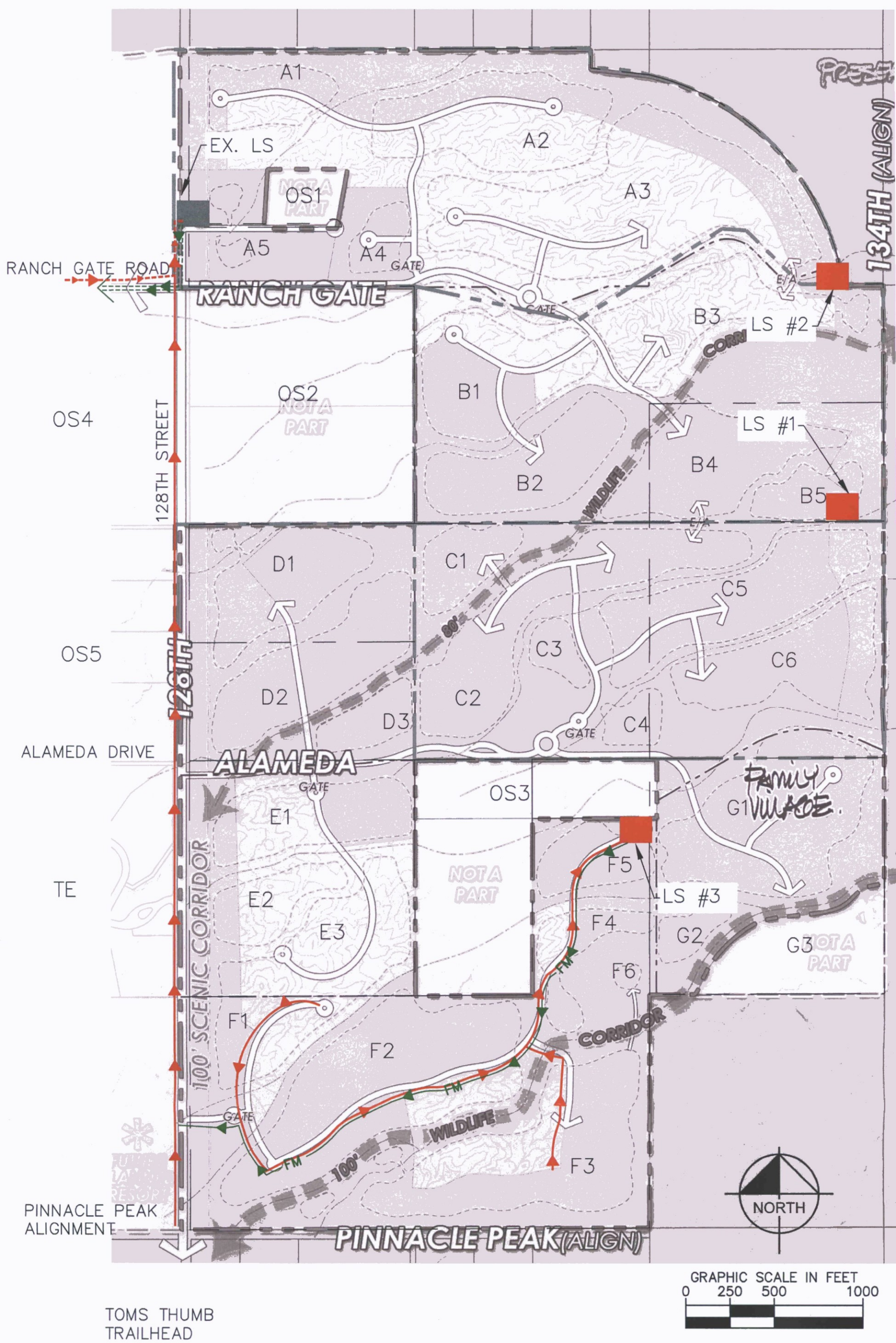
StoryRock is a proposed master planned community development consisting of 462 acres of single family residential construction. StoryRock is located within Section 12 of Township 4 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. The site is bound to the north by the Happy Valley Road Alignment and to the west by 128th Street. The Pinnacle Peak Road alignment bounds the site to the south. The McDowell Sonoran Preserve boarders the site to the east and portions of the site to the north and south. See **Figure 1: Vicinity Map** & **Figure 2 – StoryRock Vicinity Map.** The proposed site is located within the City of Scottsdale and falls under the City's Environmentally Sensitive Lands Ordinance (ESLO). Residential development is planned at a density of 0.96 dwelling units per acre within Environmentally Sensitive Lands (ESL).

This Preliminary Engineering Report for StoryRock establishes lift station design parameters and criteria for site planning and preliminary design. The report presents a conceptual layout of the Lift Station #3 site, as well as associated pump and force mains. Wastewater demands have been calculated based on the overall development layout presented in the *Cavalliere Ranch Sewer Master Plan.*

1.2 Project Scope

Kimley-Horn's design team preformed the following services as part of this preliminary analysis:

- Review of existing and proposed water/wastewater information
- Prepare an overall wastewater drainage area map of the service area
- Identify the lift station site
- Identify pump sizing to convey the proposed interim and ultimate peak design flows
- Prepare site layout exhibits
- Prepare preliminary OPC



GRAPHIC SCALE IN FEET
0 250 500 1000

DRAWING NAME: SITE LAYOUT PROJECT NO. 191069020		STORYROCK ENGINEER DESIGN REPORT LIFT STATION #3 VICINITY MAP SCOTTSDALE, ARIZONA	SCALE (H): 1"=500' SCALE (V): NONE DESIGNED BY: ZJH DRAWN BY: MRN CHECKED BY: REL DATE: OCT 2016	Kimley»Horn 7740 North 16th Street, Suite 300 Phoenix, Arizona 85020 (602) 944-5500	NO. REVISION DATE

A1
A2
A3
A4
A5
EX. LS
OS1
NOT A PART
RANCH GATE ROAD
RANCH GATE
GATE
FM
134TH (ALIGN)
B1
B2
B3
B4
B5
LS #1
LS #2
CORR
WILDLIFE
OS2
NOT A PART
OS4
128TH STREET
D1
D2
D3
C1
C2
C3
C4
C5
C6
60'
OS5
ALAMEDA DRIVE
ALAMEDA
GATE
OS3
E1
E2
E3
F1
F2
F3
F4
F5
F6
G1
G2
G3
FAMILY VILLAGE
NOT A PART
100' SCENIC CORRIDOR
CORRIDOR
100'
WILDLIFE
TE
PINNACLE PEAK ALIGNMENT
PINNACLE PEAK (ALIGN)
NORTH
GRAPHIC SCALE IN FEET
0 250 500 1000
TOMS THUMB TRAILHEAD

DRAWING NAME: SITE LAYOUT PROJECT NO. 191069020	STORYROCK ENGINEER DESIGN REPORT STORYROCK VICINITY MAP SCOTTSDALE, ARIZONA	SCALE (H): 1"=500' SCALE (V): NONE DESIGNED BY: ZJH DRAWN BY: MRN CHECKED BY: REL DATE: OCT 2016	Kimley»Horn 7740 North 16th Street, Suite 300 Phoenix, Arizona 85020 (602) 944-5500	NO.	REVISION / DATE

2.0 Design Criteria

2.1 Lift Stations

See **Appendix A – City of Scottsdale Sewer Lift Station Design Criteria.**

The City of Scottsdale Design Guide, Chapter 7 "Wastewater" can be found in **Appendix B** and contains the following information regarding wastewater lift stations:

The City's Water Operations maintains a separate document outlining the design, specifications and materials required for City owned and maintained wastewater lift station. This document may be viewed at www.ScottsdaleAZ.gov/bldgresources/counterresources/WaterFeePacket.

A. Site Selection
In selecting a site for the sewage lift station, considerations included accessibility, drainage patterns, visual impact, function and design constraints.

The station's equipment must be protected from damage and remain operable during a 100-year flood plain. The proposed site is located outside the 100-year flood plain.

Unless otherwise agreed to in writing by the City's rights-of-way agent, the tract or lot dedicated to the City will be conveyed by a general warranty deed and accompanied by a title policy in favor of the City, both to the satisfaction of the City.

B. Lift Station Design
Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control," contains minimum requirements for a wastewater lift station. At a minimum, telemetry, dual pumps, backup power supply, three-phase power, provisions for future odor control, and perimeter walls will be required. The site will also be large enough to contain all the equipment and service equipment for repairs.

A final design report prepared by a registered professional engineer, licensed in the State of Arizona, must accompany all pump station design drawings and specifications submitted to the City for review.

2.2 Force Main

City of Scottsdale staff has indicated that force mains smaller than 4 inches will require a parallel force main with interconnecting valves.

The City of Scottsdale Design Guide, Chapter 7 "Wastewater" can be found in **Appendix B** and contains the following information regarding Force Main Design:

Force mains will be located within a right-of-way, private street tract or utility easement. The line must be located under pavement where possible.

A. Velocity Requirements

The flow velocity in the force main must be between 3 and 6 feet per second (fps).

B. Materials of Construction
All pipe material used in design of the force mains must have established ASTM, ANSI, AWWA and NSF standards of manufacture or seals of approval and shall be designated as pressure sanitary sewer pipe. Force mains must be identified as such with marking tape 1 foot above the pipe. All ductile iron force mains shall be lined.

C. Air Release Valves
Air release valves designed for sewage must be provided on force mains at all peaks in elevation see City of Scottsdale (COS) Standard Detail No. 2405, www.ScottsdaleAZ.gov/design/COSMAGSupp..

D. Cleanouts
Two-way cleanouts shall be provided every 1,300 feet apart or 1-way cleanouts every 650 feet. Single cleanouts must be provided at all horizontal bends oriented in line with the downstream pipe. See COS Standard Detail No. 2403, www.ScottsdaleAZ.gov/design/COSMAGSupp.

E. Force Mains
Force mains will be constructed with 3" schedule 40 PVC pipe. Force mains will be constructed of restrained ductile iron pipe for the following conditions:
1. All locations where a vertical realignment is required;
2. Drainage wash crossings;
3. Air release assemblies;
4. Clean-out assemblies.

F. Line Separations
1. Where a force main crosses a water main or transmission line, protection must be provided as per ADEQ Engineering Bulletin No. 10 and the Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control." At a minimum, the force main should be constructed of ductile iron pipe for a distance of 10 feet on each side of the water line.
2. See COS Standard Detail No. 2402 for details regarding discharge into a manhole from a force main.
3. The minimum separation between the force mains and water lines should be 2 feet wall-to-wall vertically and 6 feet horizontally under all conditions. Where a force main crosses above or less than 6 feet below a water line, the force main shall be encased in at least 6 inches of concrete for 10 feet on either side of the water line. Fittings should not fall within the encasement.

The engineer must evaluate the potential for odor to develop from a force main downstream of the receiving manhole. One-way valves on building service lines shall be specified where there is potential for gasses to strip from the waste stream. The valves should be located at or near the building

2.3 Lift Station Design

Preliminary pump design criteria has been developed for the proposed lift station. Pumps are required to convey the peak design flow rate at the total dynamic head calculated. In order to mitigate low design flow rates, the City has accepted the use of

3.0 Civil Analysis

3.1 Adjacent Sanitary Systems

The Sereno Canyon development is located directly west of the project. Wastewater generated by a large portion of Sereno Canyon is conveyed by gravity sewer to an existing lift station located on the east side of 128th Street approximately 350' north of Ranch Gate Road. This lift station is located on the western boundary of the proposed Cavalliere Ranch Development. From the lift station wastewater flows are conveyed through an existing 6-inch force main west along the Happy Valley Road alignment. This force main connects to an existing manhole along the Happy Valley Road alignment approximately 300 feet east of 122nd Street. Flows are then conveyed by gravity sewer through the existing Granite Ridge subdivision to an 8-inch line within Happy Valley Road. Flows are ultimately conveyed to the City of Scottsdale treatment facility located at Pima Road and Hualapai Drive. Two existing gravity sewer lines exist within Ranch Gate Road. Both lines are currently dry as no development has occurred to the north of Ranch Gate Road. The first line runs east from approximately 124th Street to the existing lift station. The second line runs west from approximately 122nd Street to 118th Street. The second line has not yet been connected to an active downstream system. See **Figure 3 – System Layout** for existing lift station location.

TR1
118TH STREET
SL2
SL1
UD1
EX. 8" SEWER
RANCH GATE ROAD
TR2
OS6
TR3
PROP. 8" GRAVITY SEWER
GR1
EXISTING LIFT STATION
EX. 8" SEWER
TR4
EX. 8" SEWER
HAPPY VALLEY ROAD (ALIGNMENT)
EX. 6" FORCEMAIN
GR2
OS4
EX. 8" SEWER (MIN SLOPE = 0.052%)
GRANITE RIDGE
128TH STREET
EX 8" SEWER @0.040% SLOPE (POTENTIAL SURCHARGED AREA – 300 LF)
OS5
EX. 8" SEWER @1.04% SLOPE (POTENTIAL SURCHARGED AREA – 450 LF)
SC
EX. 8" SEWER
ALAMEDA ROAD
ALAMEDA ROAD
HAPPY VALLEY ROAD
TR5
TE
100' SCENIC CORRIDOR
FUTURE PINNACLE PEAK ROAD
PINNACLE PEAK ROAD
UD2
A1
A2
A3
A4
A5
OS1 NOT A PART
134TH ALIGN
RANCH GATE
B1
B2
B3
B4
B5
LS#2
OS2 NOT A PART
CORRIDOR
LS#1
D1
C1
C5
C3
C6
D2
D3
C2
C4
GATE
ALAMEDA
OS3
FAMILY VILLAGE
E1
E2
E3
NOT A PART
F5
LS#3
F4
G2
G3 NOT A PART
F6
F1
F2
CORRIDOR
F3
PINNACLE PEAK (ALIGN)

NO.	REVISION	DATE

Kimley»Horn

7740 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

SCALE (H): 1"=500'
SCALE (V): NONE
DESIGNED BY: ZJH
DRAWN BY: MRN
CHECKED BY: REL
DATE: OCT 2016

STORYROCK
ENGINEER DESIGN REPORT
LIFT STATION #3 SYSTEM MAP
SCOTTSDALE, ARIZONA

PROJECT NO.
191069020

DRAWING NAME
SITE LAYOUT

3.2 Existing Lift Station and Sereno Canyon Service Area

The development of the Sereno Canyon lift station at 128th Street and Ranch Gate Road was intended to serve the properties adjacent to Sereno Canyon as described by the Sereno Canyon sewer service area within the *Facility Payback Agreement for Sewer System Improvements in the Sereno Canyon Service Area.* All properties in the proposed development are within this service area and have been allocated a percentage of capacity based on the proposed zoning and 0.31 du/acre.

The approved *Conceptual Master Wastewater System Report for Sereno Canyon* provides detailed analysis of the proposed system, including analysis of downstream pipe capacities in existing and ultimate conditions. The Sereno Canyon Lift Station consists of a duplex pumping station in a single wet well with an overflow storage area. Two identical pumps are provided, with a design flow of 350 GPM at a total dynamic head (TDH) of 151 feet.

The Sereno Canyon Lift station is shown on **Figure 3 – System Layout.**

3.3 Proposed System Layout

Lift Station #3 will be one of three lift stations to be constructed to service the proposed StoryRock development. Approximately 5,400 feet of gravity sewer will be installed within the development that will outfall to the lift station. The lift station will utilize a new force that will convey flows into a proposed gravity sewer line that will be installed along 128th Street. Flows to this gravity sewer will outfall to the existing Sereno Canyon lift station. The full system layout can be seen on **Figure 1 – Vicinity Map.**

3.4 Proposed Site Layout

The proposed site is laid out on a 100' by 100' piece of land, at the low point of the StoryRock development. The site will consist of a six-foot diameter wet well, valve vault, meter vault, electrical control pad, transformer, concrete pad for a future chemical feed system, and a gas powered generator. The full site layout is shown in **Figure 4 – Site Layout.**

66'

ANTENNA STAND

TRANSFORMER

CHEMICAL PAD

ELECTRICAL CONTROL PAD

VALVE VAULT

6'ø WET WELL

CONCRETE METER VAULT

48" CONC MANHOLE

GENERATOR

S

FM

PROP GATE

3" FORCE MAIN

BLOCK WALL

8" GRAVITY SEWER

S

FM

NORTH

GRAPHIC SCALE IN FEET
0 5 10 20

Kimley»Horn

7740 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

NO. REVISION DATE

SCALE (H): 1"=20'
SCALE (V): NONE
DESIGNED BY: MRN
DRAWN BY: MRN
CHECKED BY: REL
DATE: MAY 2016

STORYROCK
ENGINEER DESIGN REPORT
LIFT STATION #3 SITE LAYOUT
SCOTTSDALE, ARIZONA

PROJECT NO.
191069020

DRAWING NAME
SITE LAYOUT

4.0 *Hydraulic and Capacity Analysis of Proposed Lift Station*

4.1 Sereno Canyon Lift Station Allocation

This Conceptual Master Wastewater Plan has been prepared for the proposed Cavalliere Ranch Master Planned Community. See *Cavalliere Ranch Sewer Master Plan* for further information.

4.2 Sereno Canyon Service Area

In addition to the Storyrock project area, the existing lift station is intended to serve a total service area of approximately 1,200 acres. The original zoning of the service area was R1-130 with an associated density of 0.31 dwelling units per acre. The *Sereno Canyon Amended Master Wastewater Report* addressed the rezoning of Sereno Canyon to a higher density. It is anticipated that other developments in the service area may rezone to a higher density similarly to StoryRock and Sereno canyon. For the purpose of this report, it is assumed that the developments to the west of 128th would rezone to a density of 1 dwelling unit per acre. The state land north of Ranch Gate Road is not anticipated to rezone to a higher density due to its proximity to existing low density developments. The calculated a peak wet weather flow of the Sereno Canyon service area per this report is 320 GPM.

According to the Sereno Canyon Amended Master Wastewater Report the Sereno Canyon Lift Station has a design capacity of 350 GPM. The existing lift station has the capacity for the calculated peak flow of the service area. Additionally, the existing 6" force main has adequate capacity to convey this peak flow.

4.3 Site Required Capacity

The StoryRock project area has been divided into multiple phases for constructability purposes, with Lift Station #3 supporting phase 3A which is shown in **Figure 1 – Vicinity Map**. Ultimate design flow is estimated at 37 GPM as shown in **Figure 5 – Design Flows.**

Using the existing topography and proposed locations of both the gravity sewer, as well as Lift Station #3, we've determined the static head for the proposed force main to be as follows:

Pumps Off Elevation	**2618.00**
Flow Line of Force Main at High Point	**2756.00**
Calculated Static Head	**138.00**

4.4 Pump & Force Main Phasing

With the construction of the StoryRock community, it is anticipated that most of the lots will not have been constructed when Lift Station #3 is initially put into use. In order to mitigate low design flow rates, the City has accepted the use of supplementing low demands with potable water that can be entered into the gravity sewer system upstream of the proposed lift station. This will flush the gravity system with potable water and will allow daily flushing of the force main to prevent the settling of solids within the force main. This will also reduce the potential of odor issues as well as help ensure that downstream gravity sewers are adequately flushed. Analysis of the system under ultimate conditions can be seen below and in **Figure 5 – Design Flows**. The ultimate pump and system curves can be found in **Figure 6 – MP 3127 HT 3-262 System & Pump Curve.** Further information regarding the pump, including specs, efficiencies, pump curve, etc., can be found in **Appendix C**.

Condition	Total # of Lots	Flow to Lift Station (GPM)	Force Main Size	Pump	Pump Flow (GPM)	Total Dynamic Head (ft)	Force Main Flow Velocity (fps)
Ultimate	79	37 + supplemented potable water	3"	NP3127 HT3-262, 170mm Impeller	54	170.75	2.34

Lift Station # 3 Design Flows							
Phase	**AREA**	**DWELLING UNITS (DU)**	**POPULATION**	**AVERAGE FLOW (gpd)**	**AAC Peaking Factor[1]**	**AAC Pipe Peak Wet Weather Flow (gpd)[2]**	**AAC Pipe Peak Wet Weather Flow (gpm) (Total)**
Phase 3A	F1	6	13	1,032	3.14	4,051	37
	F2	35	75	6,020	3.14	23,629	
	F3	24	52	4,128	3.14	16,202	
	F4	5	11	860	3.14	3,376	
	F5	8	17	1,376	3.14	5,401	
	F6	1	2	172	3.14	675	
	Total	**79**	**170**	**13,588**	**3.14**	**53,333**	
					GPM	**37**	
					Pumped Flow	**54**	

(1) Peaking factor per AAC Title 18 - Chapter 9

(2) Wet Weather Peak Flow = 125% Dry Weather Peak Flow

Job Number	191988002
Job Description	Storyrock LS #3
Date	10/12/2016
Designed By	MRN
Checked By	REL
Pump Type	MP 3127 HT3-262

HAZEN-WILLIAMS EQUATION FOR TDH CALCULATIONS

System Elevations:

Pumps Off Elevation		2618.00	ft
Flow Line of Force Main at High Point		2756.00	ft
Calculated Static Head	$\Delta Z =$	138.00	ft

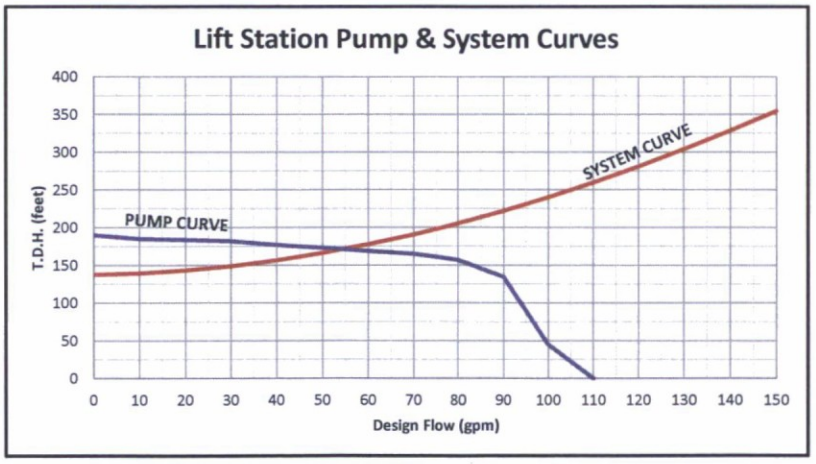
Hazen-Williams Parameters:

Dia. of Discharge Piping	D =	3.069	inches
Length of Discharge Piping	L =	10	ft
Dia. of Force Main	D =	3.07	inches
Length of Force Main	L =	3720	ft
Hazen Williams Coefficients	C =	130	
Minor Losses - Sum of Coefficients for Discharge Piping	K_D =	1	taken from Minor Losses tab
Minor Losses - Sum of Coefficients for Force Main	K_{FM} =	6.87	taken from Minor Losses tab

Flow Interval for Tables: 10 gpm

C = 130 for Discharge Piping, C = 130 for Proposed Force Main

Flow (GPM)	Friction Head (Discharge Piping) (ft.)	Minor Losses (Discharge Piping) (ft.)	Friction Head (Force Main) (ft.)	Minor Losses (Force Main) (ft.)	T.D.H. (ft.)	Force Main Flow Velocity (fps)	Pump Curve (ft.)
0	0.00	0.00	0.00	0.00	138.00	0.00	190
10	0.00	0.00	1.44	0.02	139.45	0.43	185
20	0.01	0.01	5.19	0.08	143.21	0.87	184
30	0.03	0.03	10.98	0.18	149.04	1.30	182
40	0.05	0.05	18.70	0.32	156.80	1.73	177
50	0.08	0.07	28.26	0.50	166.41	2.17	173
60	0.11	0.11	39.59	0.72	177.80	2.60	169
70	0.14	0.14	52.66	0.98	190.94	3.04	165
80	0.18	0.19	67.41	1.28	205.78	3.47	157
90	0.23	0.24	83.83	1.63	222.29	3.90	135
100	0.27	0.29	101.87	2.01	240.43	4.34	45
110	0.33	0.35	121.51	2.43	260.19	4.77	0
120	0.38	0.42	142.73	2.89	281.53	5.20	
130	0.44	0.49	165.51	3.39	304.45	5.64	
140	0.51	0.57	189.83	3.93	328.91	6.07	
150	0.58	0.66	215.67	4.52	354.91	6.51	



Approximate Capacity at C = 130: 54 gpm

5.0 Sitework

5.0 Site Options

The StoryRock project is being developed with the intent of attracting high income families. With the resulting higher quality developments, it may be preferable to look at different alternatives for the lift station to prevent neighbors and area developments being obstructed by the various aspects of the lift station (e.g. how the site looks, controlling odors, noise, etc.). Options for the site development of the lift station are as follows:

- Develop a decorative wall high enough to shield immediate neighbors from both views of the lift station, as well as prevent excess noise. Wall articulation that matches the theme of the neighborhood would help maintain an attractive look to the neighborhood.
- Decorative sun shades could be utilized to shield the site from above. Shades could be constructed for both the individual pieces of equipment, as well as for the whole site.
- Landscaping could be utilized, including large trees and native vegetation, and/or well placed earth with retaining walls to give a more natural look and obstruct views of the station equipment.
- Depending on the topography of the area, parts of the lift station can be constructed into sunk areas with retaining walls, creating a larger difference between the top of the walls and the top of the equipment
- The developers could look at constructing a house or architectural building matching area homes. Examples of other buildings utilized on other lift station projects can be found in **Appendix D**.

5.1 Wall

Per Section 7-1.205 of the *City of Scottsdale Design Standards & Policies Manual*, a perimeter wall will be required to be constructed around the site, but maintaining enough room inside of the site that all equipment and service equipment will be easily accessible for repair. As such, a 10-foot block wall is proposed around the site, with gate access located on the northwest corner of the site. As discussed in the previous section, there are several different options available to improve the aesthetics of the wall.

5.2 Odor Control

Per discussions with the City, odor control is not typically installed at new lift station sites. However, provisions for odor control chemical additional shall be provided at the lift station site in case the City deems it necessary to have installed. Installation will include a concrete pad for a future chemical storage tank, as well as electrical hook ups for future installation.

The City will require an odor control system at the force main outfall into the gravity system. Various options for outfall odor control include:

- Installing a sealed manhole at the outfall with a 'blower' to send the air through a filter that absorbs the H2S. See **Appendix E – Odor Control** for examples of a Hartzell Blower, as well as a both a Vapex and Ecoair filter.

- Installing a chemical feed at the lift station to help treat the sewage for H2S. The bioxide chemical used in this process is non-toxic, which means secondary containment on-site is unnecessary and chemical refilling procedures are greatly simplified. The chemical would be added before the sewage enters the force main, allowing the chemical to work as it works its way towards the outfall.

5.3 Generator

We plan to supplement the site power with addition of a standby generator. Similar sites (using combined motor Hp under 100Hp) utilize generators in size from 60KVA to 150KVA. Currently we plan to use a 150KVA generator that is switched via ATS in an emergency condition. We will coordinate with Scottsdale utility personnel to account for error conditions and controls to the generator.

5.4 Controls

Per Scottsdale Sewer Lift Station Design Criteria (Revision 10/15/15) we will provide controls of the station pumps, and control its overall operation. Scottsdale design standards will dictate flow sensing, telemetry, alarm systems and safety precautions, and associated hardware to ensure reliable communication with existing radio systems. Overall functionality and sequence of lift station's operations will be confirmed with city personnel in cases of specific operations for this lift station.

5.5 Lighting

Perimeter lighting will be installed per applicable City of Scottsdale standards. We will first design lighting in accord with lift station design requirements. In absence of specific lighting requirements for lift stations, IES (Illuminating Engineering Society) suggestions will be supplemented. Site lighting will be placed in locations that maintenance personnel agree with, and will be controlled using a hierarchy that is dictated by site management. We will conduct a basic calculation (AGI32 or approved software) to determine light levels and provide verification of fixture number and positioning.

5.6 Pump Enclosure

Various options exist for the wet well on the Lift Station #3 development site, which will vary based on the required volume and maximum depth of the wet well. As stated in Section 2.3 – Lift Station Design, the size of the wet well will be 6' diameter with

approximately a 1.5' operational depth. Additional vender information regarding the layout of the wet well and associated piping can be found in **Appendix G**.

An additional option for the wet well construction would be a fiberglass wet well, which is pre-constructed to include pumps, valve box, and water meter all in the construction of the wet well itself. This particular wet well would have a smaller foot print, which would assist in minimizing the size of the overall lift station site. Example plans of the Fiberglass Wet Well can be found in **Appendix F**.

6.0 Permits Required

1) Project shall require submittal of an Approval to Construct (ATC) and Approval of Construction (AOC) to the Maricopa County Environmental Services Department (MCESD).

2) Project shall require submittal of a Building Permit to the City of Scottsdale Planning and Development Services Department.

7.0 Recommendations

City of Scottsdale, *Design Standards and Policies Manual*, January 2013:

1) Lift station site will be designed and constructed to include the following: Electrical Control Pad, Transformer, Generator, 6-foot diameter wet well, chemical pad, valve vault, and meter vault. *Report for Sereno Canyon Water* [illegible] Associates, September, 2005

2) Lift station site will be designed to aesthetically accommodate the surrounding development through the use of either a decorative wall, landscaping, shade structure(s), combination thereof, or an architectural building.

Facility Payback Agreement for Sewer System Improvements [illegible]

3) Wastewater flows will be collected via 8" Sanitary Sewer lines across the Storyrock development area for Lift Station #3.

4) Site will be designed to accommodate a 37 GPM ultimate design flow. Lower flows will be accommodated by introducing potable water into the gravity sewer system upstream of the proposed lift station.

5) Lift Station #3 will require the installation of two MP 3127 HT 3 – 262 Motors

6) Odor control options will be required at the gravity sewer force main outfall.

7) Dual PVC force mains will be constructed. Both force mains will be constructed as 3" PVC lines.

8) Force main will tie in with a currently proposed gravity sewer line, which will take flows to the Sereno Canyon Lift Station.

CITY OF SCOTTSDALE
SEWER LIFT STATION DESIGN CRITERIA
Revised 10/15/15

The purpose of this Sewer Lift Station Design Criteria document is to provide direction for the design of sewer lift stations that will ultimately be owned and operated by the City of Scottsdale (City). It is also recommended that privately-owned lift stations follow this document in the event that the City is asked or required to assume responsibility. While this document provides additional guideline for the design of sewer lift stations, it is not comprehensive and additional criteria may be required by both the City and the client based on project specific needs. The reader is also referred to the City of Scottsdale Design Standards and Policies Manual (DS&PM) for additional wastewater system criteria, including lift stations. The criteria provided herein are organized into general categories as shown below.

1 GENERAL/DOCUMENTATION

1.1 Prior to final inspection and acceptance, three sets of the following documents shall be prepared and provided to the City Water Resources Department (WRD): (1) As-Built/Record Drawings, and (2) Operation and Maintenance manuals. Each set shall include 1 hard copy and 1 electronic copy of the provided materials. In addition, each control panel shall have a copy of the panel drawings located inside the panel itself.

1.2 The City shall be provided a copy of all Maricopa County Environmental Services Department (MCESD) Approval to Construct (ATC) and Approval of Construction (AOC) documentation. AOC shall be obtained after functional testing and prior to system start-up.

1.3 All equipment shall be provided with the manufacturer recommended spare parts.

2 PROCESS/MECHANICAL

2.1 Each sewer lift station shall include a minimum of 2 pumps sized in a 1 duty + 1 standby configuration (or n+1 for larger configurations). Design flows shall be calculated in accordance with the DS&PM and in consultation with City WRD. Each pump shall additionally include a 35 gpm flow allowance above the peak calculated flow to account for the draining of swimming pools in the service area.

2.2 The following list provides the submersible sewage pump requirements:

- Pump shall be of submersible type and mounted on two (2) 304L stainless steel rails. Rail mounting hardware shall also be 304L stainless steel including the submersible cable for pump removal.
- Motors shall be air cooled submersible type, totally enclosed, non-ventilated, constant speed, inverter duty (VFD rated), 480V/3PH/60Hz.
- Pumps shall be capable of passing 2 1/2" solids.
- Pump shall be equipped with stainless steel motor shafts.
- Pump Manufacturer shall be Fairbanks Morris, Flygt ITT, or approved equal.

2.3 Provide ductile iron piping for the discharge forcemain to a point 10 feet outside of the lift station property boundary.

2.4 The wet well access hatch shall include a locking hasp and be construction of aluminum, stainless steel, or other non-corrosive material. Access hatch shall be H20 load rated if located within a vehicle pathway.

2.5 Check valves shall be the full-port solids handling ball-type and shall be located outside the wet well in a separate vault. Air release valves shall also be installed inside the vault upstream of the check valves and plug valves shall be installed downstream. All equipment shall be rated for sewer service.

2.6 A 1.5" metered water source shall be installed for wash-down and cleaning up. The meter and backflow prevention device will be located adjacent to but outside the walls of the facility (See City of Scottsdale Standard Detail 2354). At least one hose bib shall be provided and shall have an approved atmospheric vacuum breakers and installed in an above ground location. At no time shall there be a connection between domestic water and the wet well or waste water.

2.7 Wet well wall interior surface shall be coated with Raven 405, Neopoxy 5300 or approved Equal. The coating will be applied to a minimum thickness of 80 mils. A factory certified technician will install the coating. The coating will be guaranteed free of defects and workmanship for a five-year period. The warranty will cover material, coating replacement and or repair. After the protective coating has set hard to the touch it shall be inspected with high-voltage holiday detection equipment. An induced holiday shall be made on to the coated concrete surface and shall serve to determine the minimum/maximum voltage to be used to test the coating for holidays at that particular area. The spark tester shall be initially set at 100 volts per 1 mil (25 microns) of film thickness applied but may be adjusted as necessary to detect the induced holiday. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional protective coating material can be hand applied to the repair area. All touch-up/repair procedures shall follow the protective coating manufacturer's recommendations. The manhole that receives the sewer lift station fluids will also be coated per these details.

3 ODOR CONTROL

3.1 Odor generation at a lift station is a highly variable element of lift station design that is impacted by upstream dischargers, hydraulic turbulence, upstream odor control chemical use, etc. At a minimum, provisions for odor control chemical addition shall be provided, including a concrete pad for a future chemical storage tank. However, due to the variable nature of odor generation and odor mitigation alternatives, the City Water Resources shall be contacted for approval of the specific odor control concept.

4 ELECTRICAL

4.1 The electric utility service shall be 480V 3PH.

4.2 A main service entrance disconnect is required.

4.3 Electrical cabinets shall be NEMA 4.

4.4 Phase protection shall be provided for all three-phase motors and pumps.

4.5 An hour meter (i.e. run-time totalizer) with local display shall be provided for each pump.

4.6 A power monitor shall be provided for each pump and shall be a watt-hour transducer Sineax PQ502, or approved equal. Power monitoring shall detect electrical load balance with current transformers and shall produce a 4-20 mA signal to the RTU, proportional to power used at each pump.

4.7 Pumps shall be driven with a motor soft starter, Benshaw or approved equal. For "grandfathered" lift stations without 480V/3PH power, Toshiba Variable Frequency Drives shall be used to transform the site power to 3PH for the pumps.

4.8 Oversized conduits shall be provided for the pumps to facilitate future pump replacement. Additionally, a spare conduit shall be provided.

7 SAFETY, SECURITY, AND SIGNAGE

7.1 All lift station sites shall be secured by an eight-foot high block wall, with a minimum of two access points. Access shall be provided by a 36" wide passage door and a sliding gate, minimum of twelve feet wide for vehicular access (See City of Scottsdale Standard Detail 2165-1 and 2165-2). Each access will be electronically keyed to City specification. No miscellaneous equipment inside the site shall protrude above the fence line, except the emergency beacon and the RTU antenna.

7.2 A site sign mounted on the exterior wall will have a green background with 2" white reflective lettering. The sign will be made of aluminum. The sign will read:

CITY OF SCOTTSDALE
SEWER LIFT NO. _____
PHONE NO. 480-312-5650

7.3 The wetwell shall be provided with the appropriate warning signage regarding confined space entry.

8 SOUND LEVEL LIMITS

8.1 It shall be unacceptable for any pump station to cause noise by any means to the extent that any fifteen minute period average sound level exceed the applicable limit given in the following table, at any location in the City of Scottsdale on or beyond the boundaries of the property line of the pump station facility. The noise subject to these limits is that part of the total noise at the specified location that is due solely to the action of said pump station.

TABLE OF APPLICABLE LIMITS	
Land Use Zone	**Fifteen-Minute Average Sound Level (decibels)**
Residential	**45**
Commercial	**60**

GENERATOR MAXIMUM NOISE LEVEL WILL BE 85 DECIBELS

8.2 Average sound level measurements will consist of Leq (15) measurements performed with an ANSI-S1.4-1971 Type 1 or Type 2 Sound Level Meter using the A-weighting network. Instrument response shall be "slow". Leq means the constant sound level that, in a given situation and time period, conveys the same sound energy as the actual time -varying A-weighted sound. Measurements with sound level meters shall be made when the wind velocity at the time and place of such measurement is not more than five miles per hour.

8.3 The location for measuring exterior sound levels shall be at the property line of the pump station facility and four to five feet above ground level and at least four feet from walls and other reflective surfaces. If a wall is closer than the required four feet to the property line, move the required distance outside the property line. An exception occurs when the pump station shares a boundary with an affected property. In this case the location for measuring exterior sound levels shall be at least one foot inside the property line of the affected property and four to five feet above ground level and at least four feet from walls and other reflective surfaces.

7-1.002 ADEQ REQUIREMENTS

A. Design Policy

Maricopa County Environmental Services Department (MCESD) is required to review and approve all public sanitary sewer line extensions and construction of wastewater-related facilities within the city's service area, prior to the city approving the final plans.

Engineering Bulletin No. 10, "Guidelines for the Construction of Water Systems" published by the Arizona Department of Environmental Quality (ADEQ) and Arizona Administrative Code, "Title18 - Environmental Quality," contain specific requirements for submittals, approvals and notifications when extension of a public sanitary sewer line is proposed. Some of the provisions are outlined below. The developer is responsible for reading and complying with all regulations and requirements.

1. Before Plan Review approves final plans, the developer will submit a cover sheet for the improvement plans with a completed signature and date of approval from the MCESD. The city's Water Resources engineer accepting the sewer design report will provide a letter to comply with the requirements of Arizona Administrative Code Section R18-9-E301.
2. Before commencing construction, the contractor or developer will provide documentation to the city public works inspector that a Certificate of Approval to Construct and/or Provisional Verification of General Permit Conformance has been approved by MCESD.
3. Before building permits are issued, the developer will submit to the city public works inspector a Certificate of Approval of Construction and/or Verification of General Permit Conformance signed by MCESD.
4. Before Inspection Services issues a Letter of Acceptance, the developer will deliver to the city's Public Works Inspector an acceptable set of full-size 4-mil as-built mylars of the improvements.

7-1.003 PRIVATE WASTEWATER COMPANIES

Portions of Scottsdale's municipal service area are served by private wastewater companies. Figure 7.1-1 delineates these areas.

Placing private sanitary sewer lines within city rights-of-way (ROW) will require an agreement between the private wastewater company and the city.

The private company should review modifications or construction of wastewater systems within their franchise areas. When submitting final plans, the developer must provide written documentation that the private wastewater company has reviewed and approved the sanitary sewer lines within its jurisdiction.

The city cannot provide wastewater service within private wastewater company franchise areas and will not review private wastewater systems unless requested by the owner or for work that is to occur within the city's ROW. In cases where the city is requested to review private wastewater systems, the applicable review fees must be paid. A note must be placed on the drawings stating operation and maintenance responsibilities.

7-1.100 AGREEMENTS

Developers and property owners who install improvements to the public wastewater system may be eligible to request a credit, oversize or payback agreement with the city allowing for partial reimbursement of costs to design and construct those improvements.

A. Ordinance Requirements

Developers who construct wastewater system improvements may receive credit for such construction, see Scottsdale Revised Code, Section 49-74.2. The city has specific programs

to provide for reimbursement agreements with developers or property owners and for the collection of line payback charges and for the oversizing of wastewater lines, see Scottsdale Revised Code, Section 49-212.

CREDIT AGREEMENTS

7-1.101

Credit agreements are established to compensate a developer for installing system infrastructure that has been identified in the city's Capital Improvement Plan (CIP) and/or included in the most recent Development Fees Report. Credit agreements are set up through the Water Resources Department and are to be identified in the developer's master plan.

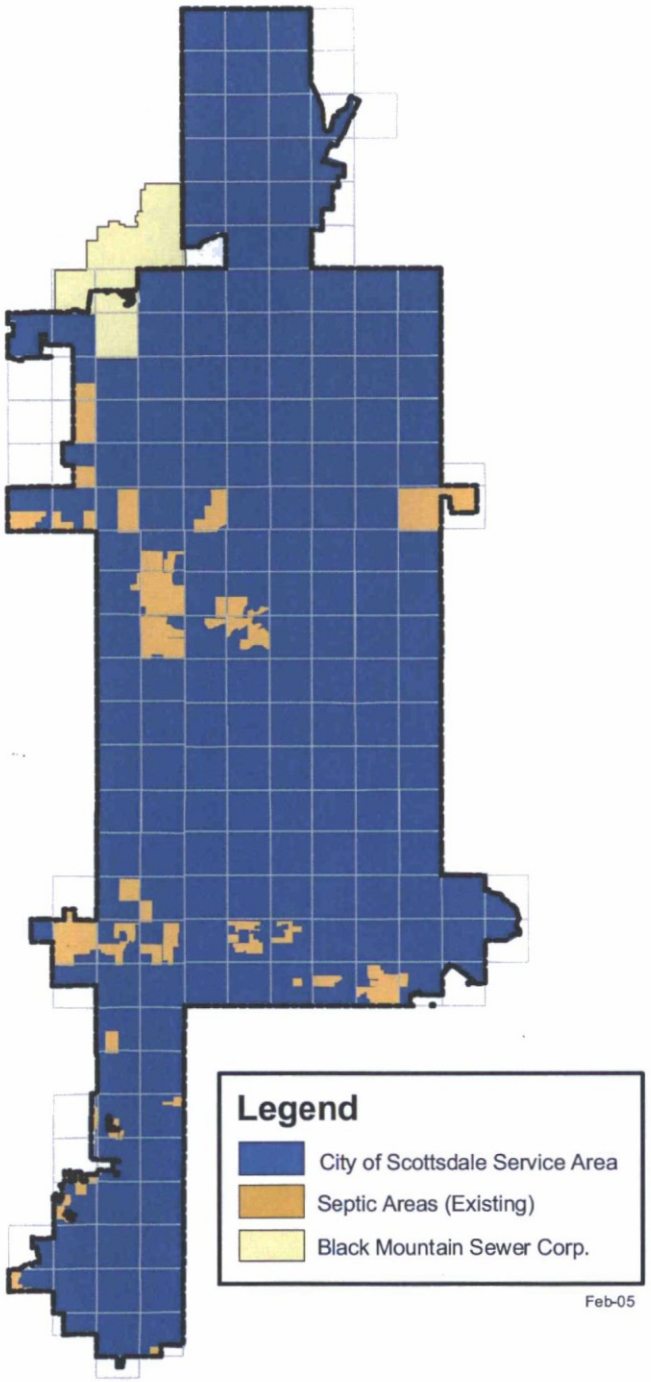


FIGURE 7.1-1 WASTEWATER SERVICE AREAS

7-1.102

OVERSIZE AGREEMENTS

Oversizing Agreements allow the city to compensate developers for the cost to install a sanitary sewer line larger than what is minimally required to serve the development. Oversizing is requested by the Water Resources Department when a larger line is necessary to meet the needs of additional properties upstream of a development. All oversizing projects involving city funds must have an oversizing agreement and must meet all the city

requirements prior to plan approval and construction. The city can only participate in the cost of oversizing when there are sufficient funds in the CIP budget and the amount does not exceed the limitations set forth by the Arizona Revised Statutes, Title 34, Article 2, Paragraph 201.D. If sufficient funds do not exist, the oversized lines will be installed at the developer's cost. Oversizing agreements are set up through the Water Resources Department.

PAYBACK AGREEMENTS 7-1.103

Developers may request a Payback Agreement when constructing sanitary sewer lines across frontages of parcels not currently receiving wastewater service from the city. When a designated parcel requests wastewater service, a pro-rated cost of the sanitary sewer line is collected by the city and returned to the developer. Line extension payback agreements are set up through the Water Resources Department. For questions or details on procedures to initiate an agreement, contact the Water Resources Department. The Extension Participation Program (see www.ScottsdaleAZ.gov/bldgresources/counterresources/waterfeepacket/ExtensionParticipation) may be available to single family property owners required to public extended public sewer lines to their lot for service.

WASTEWATER SERVICE AGREEMENT 7-1.104

The county's Sewer Service Agreement is to be completed by the engineer and submitted with the final plans to the One Stop Shop. Plan Review will sign the water and wastewater portions of the agreement and Solid Waste Management staff will sign for the refuse service. It is the owner's responsibility to obtain these signatures from the respective city divisions. The agreements will not be signed prior to the city approving the final plans. Following is specific information regarding the city's municipal wastewater system and the appropriate identification numbers:

- Water Campus – Wastewater Treatment # 37-024
- Gainey Ranch – Wastewater Treatment # 37-160
- System Name: City of Scottsdale Water Campus
- Address: 8787 E. Hualapai Dr., Scottsdale, AZ 85255

The following identification number relates directly to that portion of the city's wastewater system that is not treated at the Water Campus or Gainey Ranch. This area is generally south of Doubletree at Scottsdale Road, south of Via Linda at Pima Road and excludes the Hayden corridor to Frank Lloyd Wright Blvd:

- General sanitary sewer collection system # 37-011

The city's Wastewater System Master Plan is helpful in determining the appropriate system identification facility number.

DESIGN REPORTS 7-1.200

Wastewater master plans and basis of design reports provide an analysis of the impact that a development will have on the city's wastewater system. These reports are reviewed and accepted by the Water Resources Department and then utilized by Plan Review to verify the infrastructure to be constructed. Accepted design reports are retained in the Records Division and are made available to developers and engineers upon request.

A. Design Policy

Analysis of all proposed development, determined by the city to have an impact on the wastewater system, needs to be performed by a civil engineer registered in the State of Arizona. The analysis needs to include the effects of peak flow to ensure proper sizing and layout of the proposed wastewater system facilities.

A wastewater master plan or a wastewater basis of design report may be required for each development within the city when an extension of the system is necessary or the proposed development will produce more than 10,000 gallons of wastewater per day. Water Resources staff will determine which report is appropriate for a given development and convey this requirement to the city's project coordinator for inclusion in the case's stipulations. Reports will be separately submitted for review to the One Stop Shop, directed to the attention of the Water Resources Department. The reports must be accepted by the Water Resources Department prior to the submittal of final plans for review by Plan Review, unless otherwise agreed to by Plan Review staff.

7-1.201 WASTEWATER MASTER PLAN

A wastewater master plan is required when a change in the existing zoning or land use is proposed, phased construction is proposed or when the Water Resources Department determines. The Wastewater System Master Plan must show compliance with the city's design criteria and development policies for each phase of the project and to establish a skeletal system for the phased development of a master planned project.

7-1.202 WASTEWATER BASIS OF DESIGN REPORT

Most projects within the city will require a Basis of Design Report. The objectives of a basis of design report are to determine the development's wastewater demand, analyze the hydraulics of the proposed sanitary sewer system to a point evaluated by the city's Wastewater System Master Plan and demonstrate conformance for each phase of the development with the accepted master plan for that development.

7-1.203 GENERAL REPORT REQUIREMENTS

All reports submitted to the city for review must be prepared in accordance with the guidelines listed below.

A. General format

1. The report should be on letter-sized paper (8 ½ x 11).
2. All reports will have a table of contents.
3. Maps and other supporting materials larger than folded ledger size paper (11 x 17) should be placed into sleeves providing an appendix to the report.
4. A civil engineer licensed to practice in the State of Arizona must seal each report.

B. Report cover

1. Covers should consist of cardstock paper or better.
2. The project name should be located on the cover.
3. The names, addresses and phone numbers of the developer/owner and engineer should be stated on the cover.
4. The original submittal and any subsequent revision dates should be located on the cover.

C. Vicinity map

Identify the project's location with respect to major cross streets.

7-1.204 WASTEWATER BASIS OF DESIGN REPORT CONTENT

A. Introduction

Summarize the proposed development:

1. Include a legal description based on sectional breakdown or reference within a platted development.
2. Describe the existing and proposed site zoning and land uses.

3. Include reference to elements of the city's General Plan and identify any designated character area or studies that will affect the project's design.

B. Design Documentation

Note compliance with this manual and all other applicable standards and codes on the Design Report.

1. Include a discussion of which design procedures, policies and methodologies will be incorporated into the design engineering of the wastewater system.
2. List the title and version of any software used in the design analysis.

C. Existing Conditions

1. State the existing zoning and land use.
2. Describe the existing, topography, vegetation and landform features.
3. Include the location and description of existing utilities in the vicinity.
4. Reference any existing master plans or design reports applicable to adjacent development.
5. Indicate the results of any certified flow testing of the existing system.

D. Proposed Conditions

1. Include a site plan that indicates the layout of the proposed development.
2. Describe the proposed connection(s) to the city's wastewater system. Show extension of sanitary sewer lines into the site.
3. Address maintenance responsibilities of the proposed wastewater system.

E. Computations

1. Base wastewater flows on the design flows in this manual.
2. Verify any variance from the stated design flows with the Water Resources Department.
3. Give particular attention to wastewater peaking factors used for restaurants or specialty developments.
4. Use scour analysis where surface runoff exceeds 500 cubic feet per second (cfs) over a sanitary sewer pipe.
5. Pipe data - ID, upstream and downstream nodes, invert elevations, pipe material, slope, length, diameter, Manning's n-value, peak flow, flow depth, flow depth/diameter ratio, actual flow velocity, full flow design capacity and average pipe cover.

F. Design Documentation.

1. Common spreadsheet formats shall be compatible with MS® Excel.

G. Summary

1. Provide a summary of the proposed wastewater improvements stating that all city design standards and policies have been met or indicate any variance or exception. Note why the developer is requesting any variance or exception.
2. Include a brief project schedule indicating the proposed start and completion of the development's improvements.

H. Supporting Maps

Include a scaled site plan showing all existing and proposed utility lines and surface improvements.

1. Graphics should screen the development's background, present existing utilities as dashed lines and proposed utilities as bold solid lines.

2. Screen existing topography into the background. Clearly label, at 2-foot intervals, all existing and proposed contour intervals. Show sufficient information to evaluate pipe cover.
3. Show, dimension and label clearly all property lines, rights-of-way, tract and easement lines.

I. Miscellaneous

Requests for more specific information regarding report requirements and the wastewater system may be obtained by contacting the Water Resources Department.

7-1.205 WASTEWATER MASTER PLAN REPORT CONTENT

1. The Wastewater Master Plan Report will specify the terms and requirements for wastewater service to the development.
2. All development projects will be responsible for determining their specific wastewater discharge and will include flow from any upstream developments to ensure the system is designed properly.
3. If the proposed development requires a change in zoning, which increases density or proposes a wastewater system different from the city's existing Wastewater System Master Plan, then additional off-site calculations will be required.
4. Flows will be calculated according to this section.
5. A computer disk containing all calculations will be submitted along with the Master Plan report.
6. Each Master Plan map must show the following:
   a. All proposed on-site and off-site facilities including, but not limited to, lift stations, trunk lines and collection lines.
   b. Proposed street locations, parcel boundaries and proposed lots within each parcel.
   c. Contour lines at 2-foot intervals showing the elevation of the land surface.
   d. A separate area location map showing existing and proposed streets, as well as existing parcels surrounding the project to a distance of 1 mile from the exterior boundaries of the project. Assessor's maps can provide the information required to prepare these composite maps.
   e. A scale that is sufficient to show all required information clearly.
7. All sanitary sewer lines that cross golf courses or other open areas must do so within established roads. If dedicated roads are not practical, then the crossing must be within a 20-foot-wide accessible easement within a tract. No walls may cross these easements.
8. The Wastewater Master Plan must show compliance to construct sanitary sewer lines, if not already in place, across all dedicated frontages of the development where future extension is possible.
9. A construction schedule will be included in a table format for all wastewater related construction required to serve the development. The schedule will have each phase or parcel as column headings and each construction project or system component as rights-of-way (ROW) headings. A mark in each box will specify when each constructed item will be required for each phase of the development.
10. The master plan report must comply with the adopted city Wastewater System Master Plan encompassing the respective area.
11. Those Master Planned Developments that design a wastewater collection system that will be phased will provide a description of the phasing.

For specific information regarding wastewater plan requirements and/or the city's current Wastewater Integrated Master Plan, contact the Water Resources Department.

WASTEWATER FACILITIES

7-1.300

Lift stations and force mains are typically designed and constructed by the city through its Capital Improvement Program. Developers needing to construct these facilities must contact the Water Resources Department and request a meeting. The developer should be prepared to address how the proposed system will conform to the city's Wastewater System Master Plan. The city will address design issues, the city's review process for wastewater facilities and any potential city cost participation.

A. Ordinance Requirements

When wastewater service is not available, a septic system or alternative system acceptable to the Water Resources Department may be allowed with the approval of both the City of Scottsdale and the Maricopa County Environmental Services Department, Section 49-116.

B. Design Policy

Maricopa County Environmental Services Department and the city discourage the development of privately owned packaged treatment facilities designed to serve two or more lots.

Where lift stations are necessary, the engineer will meet with the Water Resources Department to discuss design requirements, ownership and maintenance responsibilities.

SEPTIC SYSTEMS / ON-SITE TREATMENT FACILITIES

7-1.301

The property owner is responsible for the design, construction, operation and maintenance of septic systems / on-site wastewater treatment facilities. The city will not accept any type of on-site system for operation and maintenance.

All on-site wastewater treatment facilities will be designed and constructed compliant with the applicable requirements of the Maricopa County Environmental Services Department. Final plans submitted to the One Stop Shop will include the county's permit number for the on-site system.

WASTEWATER LIFT STATIONS

7-1.302

Water Operations maintains a separate document outlining the design, specifications and materials required for a city owned and maintained wastewater lift station. This document may be viewed at www.ScottsdaleAZ.gov/bldgresources/counterresources/WaterFeePacket. Contact the Water Resources Department for additional information.

A. Site Selection

In selecting a site for a sewage lift station, consider accessibility, drainage patterns, visual impact, function and design constraints.

Consider the potential for flooding when selecting a pump station location. The station's equipment must be protected from damage and remain operable during a 100-year flood.

Unless otherwise agreed to in writing by the city's Rights-of-Way Agent, each tract or lot dedicated to the city will be conveyed by a general warranty deed and accompanied by a title policy in favor of the city, both to the satisfaction of the city.

B. Lift Station Design

Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control," contains minimum requirements for a wastewater lift station. Additional requirements specific to the city must be obtained from the Water Resources Department before beginning design. At a minimum, telemetry, dual pumps, backup power supply, three-phase power, odor control and perimeter walls will be required. The site will also be large enough to contain all the equipment and service equipment for repairs.

Prior to the preparation of construction drawings, a preliminary design report will be prepared and submitted to the One Stop Shop for Water Resources Department review. The preliminary report will outline the type of equipment and controls proposed for the station. A final design report prepared by a registered professional engineer, licensed in the State of Arizona, must accompany all pump station design drawings and specifications submitted to the city for review.

7-1.303 FORCE MAINS

Force mains will be located within a rights-of-way, private street tract or utility easement. The line must be located under pavement where possible.

A. Velocity Requirements

The flow velocity in the force main must be between 4 and 6 feet per second (fps).

B. Materials of Construction

All pipe material used in design of the force mains must have established ASTM, ANSI, AWWA and NSF standards of manufacture or seals of approval and shall be designated as pressure sanitary sewer pipe. Force mains must be identified as such with marking tape 1 foot above the pipe. All ductile iron force mains shall be lined.

C. Air Release Valves

Air release valves designed for sewage must be provided on force mains at all peaks in elevation see COS Standard Detail No. 2405, www.ScottsdaleAZ.gov/design/COSMAGSupp.

D. Cleanouts

Two-way cleanouts shall be provided every 1,300 feet apart or 1-way cleanouts every 650 feet. Single cleanouts must be provided at all horizontal bends oriented in line with the downstream pipe. See COS Standard Detail No. 2403, www.ScottsdaleAZ.gov/design/COSMAGSupp.

E. Force Mains

Force mains will be constructed of restrained ductile iron pipe for the following conditions:

1. All locations where a vertical realignment is required;
2. Drainage wash crossings;
3. Air release assemblies;
4. Clean-out assemblies.

F. Line Separations

1. Where a force main crosses a water main or transmission line, protection must be provided as per ADEQ Engineering Bulletin No. 10 and the Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control." At a minimum, the force main should be constructed of ductile iron pipe for a distance of 10 feet on each side of the water line.
2. See COS Standard Detail No. 2402 for details regarding discharge into a manhole from a force main.
3. The minimum separation between the force mains and water lines should be 2 feet wall-to-wall vertically and 6 feet horizontally under all conditions. Where a force main crosses above or less than 6 feet below a water line, the force main shall be encased in at least 6 inches of concrete for 10 feet on either side of the water line. Fittings should not fall within the encasement.

The engineer must evaluate the potential for odor to develop from a force main downstream of the receiving manhole. One-way valves on building service lines shall be specified where there is potential for gasses to strip from the waste stream. The valves should be located at or near the building cleanout and include provisions for access and maintenance by the property owner.

COLLECTION SYSTEM

7-1.400

This section describes the minimum requirements for extending the public wastewater collection system.

A. Ordinance Requirements

When a public sanitary sewer line is located within 660 feet of the boundary of the subject property, extend the line to provide service to the property, Section 49-224. A separate private on-site wastewater treatment system shall be constructed for each lot only when a public wastewater system is not available, Section 49-116.

Sanitary sewer lines are required along the entire length of property line frontage whenever future upstream extension of the wastewater system is possible. The property line frontage is that portion of the property that abuts a street, public utility easement or public rights-of-way. If a parcel to be developed has more than one property line frontage, the city may require a sanitary sewer line be installed along the entire length of all frontages, Section 49-219.

1. Developers must install, at their expense, all on-site and off-site improvements necessary to serve their developments. This expense includes all required development fees, Section 49-73.
2. On-site sanitary sewer lines to commercial shopping center developments must be privately owned, operated and maintained. Multi-family developments may elect to install public or private sanitary sewers, Section 49-118.
3. When required by the city, users who discharge non-residential wastewater must install monitoring manholes, Section 49-96. Users discharging industrial wastes must install monitoring manholes and provide written notice to the Water Resources Department, Section 49-161.

B. Design Policy

Reconstruction of residential or commercial structures requires compliance with all current ordinances and design guidelines relating to sewer line extensions.

Sanitary sewer lines will not be privately owned if future connections to those lines would be necessary to serve adjacent parcels.

For planned developments and subdivisions where an existing sanitary sewer is not available, a dry sanitary sewer line must be installed conforming to all the design requirements for a public sanitary sewer line. Use a permanent marking system to locate the capped ends of service line stubs on a dry system. Also, design interim on-site wastewater treatment systems for future connection to the dry system when sanitary sewer service becomes available.

Wastewater systems must be designed to serve the ultimate population density expected in the tributary area. Make sure the design is in conformance with the current city approved Wastewater System Master Plan and takes into consideration future connections. Where a wastewater collection system extension is possible upstream of a subdivision, extend the sanitary sewer through the subdivision to the platted boundary to a point of connection that will provide wastewater service to adjacent properties.

C. Design Standards

The engineer should be familiar with the Maricopa Association of Government's Uniform Standard Specifications for Public Works Construction and the COS Supplement to MAG Uniform Standard Specifications for Public Works Construction, including all applicable Standard Details. These documents contain construction related specifications and details that impact the design of water systems including trenching, bedding, backfill and pavement replacement, etc.

Private wastewater systems must be designed in compliance with Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control".

7-1.401 MATERIALS

In selecting pipe material for sanitary sewer lines, give consideration to chemical characteristics of wastewater, especially industrial wastes. Consider velocity; the possibility of septicity; external and internal pipeline forces and preventing infiltration; abrasion; and similar type problems.

Use sanitary sewer lines that are vitrified clay pipe (VCP); polyvinyl chloride (PVC) SDR35, up to 15 inches in diameter; PVC (meeting ASTM F679 - T1) between 18 and 27 inches in diameter; or ductile iron pipe (DIP) with approved interior and exterior linings. Submit in writing to the Water Resources Department any requests for consideration of alternative materials.

Note: Do not change pipe material between manholes.

Where standard strength pipe is not structurally sufficient due to external loading, or 4 feet of pipe cover cannot be maintained, submit a written request with supporting calculations to the Water Resources Department for permission to use extra-strength pipe, special bedding specifications, or alternative construction methods. The Water Resources Department must accept the request in writing prior to Plan Review approval of the final plans.

Ensure that all types of pipe material used in design have established ASTM, ANSI or NSF standards of manufacture or seals of approval, and are designated for use with wastewater.

7-1.402 SYSTEM LAYOUT

Generally, sanitary sewer lines constructed along a street grid should be aligned parallel to, and south or west of the street centerline. Lines should not cross the street centerline except in cases where curvilinear roadway alignments are encountered.

Public sanitary sewer lines within commercial, industrial or multi-family developments must be located within drive aisles a minimum of 6 feet from any structure. Public sanitary sewer lines will be located within tracts and/or public utility easements. No private utilities are allowed longitudinally within a public utility easement.

If the horizontal direction, slope, material or size of the sanitary sewer line changes, a manhole must be constructed. The horizontal angle formed between the two lines cannot be less than 90 degrees. In sanitary sewer lines that are 12 inches or larger, angles formed must be between 120 and 150 degrees to the downstream pipe for odor control purposes.

Note: Curvilinear sanitary sewer lines will not be allowed. Wastewater flows that have not been accepted by the city shall not pass through collection systems.

Developments with numerous curved streets will be discussed with the Water Resources Department to decide whether the city will consider a design report with water and sewer layouts in accordance with the following criteria:

1. Water and sanitary sewer lines will be placed under the paved section of the roadway within the area, from back-of-curb to back-of-curb.
2. Sanitary sewer lines must maintain a minimum of 6-feet horizontal clearance to dry utilities per COS Standard Detail No. 2401.
3. Sanitary sewer manholes are to be located at the approximate center of the drive lane.
4. The water line and sanitary sewer line will run parallel to each other, with 9 feet of separation to the pipes' centerline in order to maintain 6 feet of clearance at manholes.
5. Deflections in the sanitary sewer line shall be designed to nominal fitting angles within standard tolerances and will occur at the same locations where the water line is deflected.

See Section 6-1.302 for related water system criteria.

DESIGN FLOWS

7-1.403

A. Residential

Sanitary sewer lines 8 to 12 inches in diameter will be designed using 100 gallons per capita per day (gpcpd) and a peaking factor of 4.

Sanitary sewer lines larger than 12 inches in diameter will be designed using 105 gpcpd and a peaking factor developed from "Harmon's Formula":

$$Q_{max} = Q_{avg} [1+14 / (4+P1/2)]$$

$$P = Population / 1,000$$

Residential densities are to assume 2.5 persons per dwelling unit, apartment or town home.

B. Commercial and Industrial

Wastewater flows for uses other than those listed below shall be based upon known regional or accepted engineering reference sources approved by the Water Resources Department.

AVERAGE DAY SEWER DEMANDS		
Land Use	**Demand**	**Peaking Factor**
Commercial/Retail	0.5 per sq. ft.	3
Office	0.4 per sq. ft.	3
Restaurant	1.2 per sq. ft.	6
High Density Condominium	140 per room	4.5
Resort Hotel (includes site amenities)	380 per room	4.5
School: without cafeteria	30 per student	6
School: with cafeteria	50 per student	6
Cultural	0.1 per sq. ft.	3

FIGURE 7.1-2 AVERAGE DAY SEWER DEMAND IN GALLONS

HYDRAULIC DESIGN

7-1.404

No public sanitary sewer lines will be less than 8 inches in diameter unless permission is received in writing from the Water Resources Department.

Sanitary sewer lines should be designed and constructed to give mean full flow velocities of not less than 2.5 fps, based upon Manning's Formula, using an "*n*" value of 0.013.

Conversely, to prevent abrasion and erosion of the pipe material, the maximum velocity will be limited to 10 fps at estimated peak flow. Where velocities exceed this maximum figure, the line should be constructed of DIP and lined. In no case will velocities greater than 15 fps be allowed.

Actual velocities will be analyzed under peak flow conditions for each reach of pipe.

Generally, the sanitary sewer system will be designed to achieve uniform flow velocities through consistent slopes. Abrupt changes in slope should be evaluated for hydraulic jump.

The depth to diameter (d/D) ratio for gravity sanitary sewer pipes 12 inches in diameter and less should be no greater than 0.65 in the ultimate peak flow condition. The d/D ratio for gravity drains greater than 12 inches diameter should be no greater than 0.70 for the ultimate peak flow condition.

Mitigation of hydrogen sulfide will be analyzed in the design report and be provided for in the design of the system.

7-1.405

MANHOLES AND CLEAN OUTS

Manholes in city streets should be located near the center of the inside traffic lane, rather than on or near the line separating traffic lanes. Manholes should not be located in bike trails, equestrian trails, sidewalks, crosswalks or wash crossings. Manholes are required at all changes of grade, pipe size, pipe material or alignment and at distances not to exceed those shown below:

Pipe Diameter (inches)	**Maximum Manhole** Spacing (feet)
8 – 15	500
18 – 30	600
36 – 60	800
Over 60	1,300

FIGURE 7.1-3 MANHOLE SPACING

A. Manhole Base

Manhole bases are to be cast in place. The flow channel through the manhole should be steel trowel finished to conform in shape and slope to that of the sanitary sewer pipe. The manhole shelf should be brush or broom finished, with a slope of 1 inch per foot. The manhole bottom should be filleted to prevent solids depositions and channeled to ensure satisfactory flow to the lower invert.

B. Manhole Sections and Cones

All manhole sections and cones should be the precast concrete as detailed in the MAG Standard Detail No. 420, deleting the manhole steps and/or cast in anchors for steps, see www.ScottsdaleAZ.gov/design/COSMAGSupp.

C. Manhole Covers

Manhole covers are to be per MAG Standard Detail No. 424 and COS Standard Detail No. 2421, see www.ScottsdaleAZ.gov/design/COSMAGSupp.

D. Manhole Linings

Manholes will be lined or coated at the junction of a force main, when constructed on sanitary sewer lines 15 inches in diameter or larger or in other design situations where corrosive conditions are anticipated. Manholes receiving wastewater from force mains and ejector lines must be lined. Manholes requiring linings or coatings shall be noted on the final plans.

E. Intersecting Lines within Manholes

Manholes are required for all lines intersecting at angles other than 180 degrees, a change in slope, a change in pipe size or a change in pipe material. The manhole must have a minimum 0.10-foot drop across the trough unless otherwise approved by the Water Resources Department. Where pipe size changes through a manhole, the top invert of the upstream pipe(s) will be equal to or higher than the top invert of the downstream pipe. In large trunk lines, inverts at junctions should be designed to maintain the energy gradient across the junction and prevent backflow.

F. Drop Manholes

The difference in invert elevations between inflow and outflow lines shall not exceed one pipe diameter, unless a drop connection is installed. Drop connections shall be in accordance with MAG Standard Detail No. 426*, modified as follows:

- For drops up to and including 5 feet, use Type "A" drop connections.

- For drops greater than 5 feet, use Type "B" drop connections.

The manhole bottom should be filleted to prevent solid deposition.

G. Manholes at Washes and Drainage Areas

Manholes must be protected from storm drainage and flooding conditions. Sanitary sewer lines will not be allowed in washes or drainage areas unless otherwise approved in writing by the Water Resources Department.

When approved by the city, manholes located within washes or drainage areas are to have bolted watertight covers to prevent inflow and the rim elevation should be a minimum of 18 inches above adjacent finish grade, see COS Standard Detail No. 2420*. Design watertight manhole bases, barrels and grade rings and provide structural protection against scour from a 100-year storm flow. This protection may require encasing the entire manhole using sono-tube form material or constructing a monolithic manhole. The manhole should be designed by the engineer to meet the amount of protection as calculated by the flow conditions of the wash. The engineer is responsible to provide a manhole design eliminating infiltration in wash areas.

H. Cleanouts

Cleanouts per MAG Standard Detail No. 441*, may be used in place of manholes at the ends of laterals that cannot be extended and are less than 150 feet in length. Cleanouts are required to allow for maintenance and inspection of the lines. When a sewer line can be extended by others along the same alignment and grade, a cleanout may be permissible beyond 150 feet in length.

Service connections are not allowed at the ends of cleanouts. Service connections should be provided off the sanitary sewer line a minimum of 2 feet downstream of the cleanout.

*Note: For COS and MAG Standard Details, www.ScottsdaleAZ.gov/design/COSMAGSupp.

MONITORING VAULTS AND MANHOLES

7-1.406

A. Monitoring Vaults

The Water Quality Division has sole discretion when to require a developer to install a monitoring vault for testing wastewater flow and composition. Generally, properties in industrial land use/zoned areas with a projected wastewater discharge of 25,000 gallons per day will be required to install a monitoring vault per COS Standard Detail No. 2460*.

*Note: For COS and MAG Standard Details, www.ScottsdaleAZ.gov/design/COSMAGSupp.

B. Monitoring Manholes

The Water Quality Division has sole discretion when to require a developer to install a monitoring manhole. Generally, commercial properties with potential mixed uses, restaurants and developments that will use chemicals or solvents are required to install monitoring manholes.

Monitoring manholes will be constructed per MAG Standard Detail No. 420*, with a straight channel and no taps or bends for 10 feet upstream or downstream or as approved by the Water Resources Department. Design details for monitoring manholes on sanitary sewer lines, 6 inches or larger with a peak flow greater than 40 gallons per minute (gpm), must be approved by the Water Resources Department.

Monitoring vaults and manholes will be located in a minimum 16-foot-wide easement that extends from the manhole to the existing public wastewater system and be designed for access at all times to monitoring crews and vehicles.

PIPE COVER AND SEPARATIONS

7-1.407

Sanitary sewer pipe will be installed at a depth sufficient to ensure gravity drainage of wastewater from each service line and should anticipate the lowest potential finish floor elevation for each building pad.

Pipe design should ensure gravity drainage from the ultimate drainage area and will allow for future extensions of service to adjacent parcels.

In no case will sanitary sewer lines be installed with less than 4 feet of cover over the top of the pipe, unless otherwise approved by the Water Resources Department.

All sanitary sewer lines will be designed to absorb superimposed live loads and backfill overburden without damage to the pipe material and without adversely affecting the hydraulic characteristics of the pipe. The engineer will specify minimum depths of cover to be provided during the construction of roadways or other facilities affecting cover over the line.

A. Separation of Water and Sanitary Sewer lines

Caution should be taken in the design and construction of the sanitary sewer lines to protect all water supplies from wastewater contamination. To minimize the potential of contamination, the engineer must design the horizontal and vertical separation of water and sanitary sewer lines in accordance with Engineering Bulletin No. 10, "Guidelines for the Construction of Water Systems" published by the Arizona Department of Environmental Quality and the Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control".

The minimum horizontal distance from a water line to a sanitary sewer line will be 6 feet, wall-to-wall. The minimum vertical clearance of a water line crossing under a sanitary sewer line will be 18 inches. Water lines crossing over a sanitary sewer line should provide 2 feet of minimum vertical separation.

Where conditions prevent adequate vertical separation or where a water line must cross under a sanitary sewer line:

1. Both the water and sewer line will be constructed for ductile iron pipe (minimum Class 350) with restrained joints, or
2. Where the existing water line is other than restrained ductile iron, the water lines shall be replaced with restrained ductile iron pipe per MAG Standard Detail No. 404-2, www.ScottsdaleAZ.gov/design/COSMAGSupp, and/or
3. where the existing or proposed sewer line is other than restrained ductile iron, the sewer line shall be encased in concrete per MAG Standard Detail No. 404-3, www.ScottsdaleAZ.gov/design/COSMAGSupp.

B. Separation from Structures

Sanitary sewer lines will have a minimum of 6 feet of horizontal clearance from any structural footing or substantial improvement. Design will consider any structural load imposed on the pipe.

The Water Resources Department may consider an indemnity agreement where no alternative sewer alignment is possible and surface improvements, including decorative paving or screen walls, are to be located within 6 feet of the sanitary sewer line. If an indemnity agreement is acceptable to the Water Resources Department, boilerplate language for an indemnity agreement will be provided with final plans review.

C. Separation from Other Utilities

For information about separation from other utilities see COS Standard Detail No. 2401, www.ScottsdaleAZ.gov/design/COSMAGSupp.

D. Separation from Storm Drains and Culverts

Sanitary sewer lines crossing less than 2 feet below a storm drain, culvert or under large structures, such as box culverts and bridges, will require the additional protection of a ductile

iron pipe or encasement. Sanitary sewer lines crossing over storm drains and culverts must be a minimum of 1 foot above and be adequately protected.

WASH CROSSINGS

7-1.408

All wash crossings will be constructed using restrained joint Class 350 ductile iron pipe coated per specification. Bury requirements to place sanitary sewer lines under washes or channels will be based upon the 100-year peak design discharge (Q100) in the channel or wash. The minimum depth of bury below the design flow line of the channel or wash.

100-year flow rate	Minimum depth of bury
1 to 49 cfs	5 feet
50 to 99 cfs	6 feet
100 to 499 cfs	7 feet
Greater than 499 cfs	Scour depth based on scour analysis required

FIGURE 7.1-4 WASH CROSSINGS – MINIMUM DEPTH OF BURY

Wash crossings with a 100-year flow above 500 cfs will have the scour depth estimated using Arizona State Standard Attachment SSA 5-96, Guideline 2, Level I, as published by the Arizona Department of Water Resources. The engineer will estimate the depth of scour and design the top of pipe to be 3 feet below the estimated scour depth. The engineer will provide a detailed analysis of the scour depth with final plans for review and approval.

All pipelines that must be located within the scour zone or will not meet the minimum required depth of bury, as indicated above, will be protected by installing a cut-off wall downstream of the pipeline to stabilize the scour depth to a minimum of 3 feet above the pipeline. The engineer will design the cut-off wall and include details on the improvement plans. Plan Review will review pipe protection and scour stabilization requirements on a case-by-case basis.

GRAVITY SANITARY SEWER SERVICE CONNECTIONS

7-1.409

The engineer will make every effort to use existing sanitary sewer lines that have been stubbed out to a property by previous construction. Where the use of stubbed out lines are not feasible, the existing line will be abandoned and capped at the sanitary sewer main. If the existing service line is connected to a manhole, the trough of the manhole will be rebuilt to conform to the active lines.

A. Minimum Diameters for Service Lines

- Residential: 4 inch
- Multi-family: 6 inch
- Commercial: 6 inch

B. Installation

All service line connections will be installed perpendicular to the sanitary sewer line in accordance with MAG Standard Detail No. 440-3, www.ScottsdaleAZ.gov/design/COSMAGSupp and extended to the back of the public utility easement and marked. Within the rights-of-way or easement, no bends in the service line will be allowed.

C. Location

1. All proposed service line connections will be shown on the final plans with stations and dimensions or offsets, from street centerline. Typical separation dimensions from the water service lines shall be shown. Each lot or building must be provided with its own individual service line unless otherwise approved in writing by the Water Resources Department.
2. The service line location should be coordinated to avoid conflicts with other utilities, with driveway locations and should be located within the downstream 1/3 of the fronting sanitary sewer line length.
3. Because water lines are located behind the curb in many locations, conflicts with sanitary sewer service lines are possible. Sanitary sewer lines should be designed to allow for the sanitary sewer service lines to pass under water lines with 12 inches of vertical clearance to minimize potential health hazards.
4. When it is not possible to maintain sufficient vertical clearance or the sanitary sewer service line will pass over the water main, the sanitary sewer service line must be encased in concrete of 6 inches minimum thickness to 6 feet from each side of the crossing or ductile iron pipe must be used for the same distance. See MAG Standard Detail No. 404-2, www.ScottsdaleAZ.gov/design/COSMAGSupp.

D. Service Line Connection to Large Diameter Sanitary Sewer Lines

Sanitary sewer lines 15 inches in diameter or larger, may be tapped only with a manhole. Service lines into manholes may be angled, but the flow line of the service line should not be more than 4 inches below the crown of the sanitary sewer line.

E. Service Line Connections into Manholes on Small Diameter Sewer Lines

No more than 4 service lines may be made into any manhole on a sanitary sewer line 14 inches in diameter or smaller, without written approval from the city. Sanitary sewer service line inverts will be not be more than 1 service line pipe diameter above the crown of the downstream sanitary sewer line in the manhole.

F. Service Line Connections at Cleanouts

Sanitary sewer service connections will be located a minimum of 2 feet downstream of the cleanout structure.

G. Maintenance

The property owner receiving wastewater service is responsible for maintenance of the sanitary sewer service line including the wye connection to the public main.

7-1.410 PRESSURIZED SANITARY SEWER SERVICE CONNECTIONS

Pressurized sanitary sewer ejector systems will be owned, operated and maintained by the property owner. The property owner's civil engineer is responsible for the design and hydraulic analysis of the pressurized system.

A. Connection of Individual Ejector to Adjacent Gravity Sanitary Sewer Line

The sanitary sewer service line constructed within the rights-of-way will be per MAG Standard Detail No. 440-3, www.ScottsdaleAZ.gov/design/COSMAGSupp. The pressurized line will connect into the gravity service line outside of the rights-of-way and if applicable, the adjacent public utility easement. Connection to the gravity service line will be at a cleanout connection.

B. Connection of Individual Ejector(s) Downstream of a Property

The city does not support extending private pressurized ejector lines across the frontages of adjacent lots or properties. The developer or property owner will request a meeting with the Water Resources Department to discuss available options. One potential option is for the developer or owner to design and construct a segment of a public gravity collection system

Sanitary sewer line easements, located outside of paved areas, will have a 10-foot-wide hardened path with a cross-sectional slope not greater than 10 percent. The hardened path will consist of native soil compacted to 95 percent to a depth of 1 foot from the existing or design surface, whichever is lower. Any revegetation within the easement will consist of low growing shrubs or plant material acceptable to the Water Operations Division. Trees may be located along the edge of the easement but not within 7 feet of the sanitary sewer line as measured to the trunk of the tree.

Locating a public sanitary sewer line on private property within a public utility easement but without dedicating a tract will require written permission from the Water Resources Department.

A copy of any written approval from the Water Resources Department shall be submitted with the final plans.

7-1.413 EASEMENT ABANDONMENT REQUIREMENTS

When a property owner or developer believes a sanitary sewer line easement or portion thereof, is no longer required by the city, an abandonment may be requested by completing and filing an application through the city's One Stop Shop.

After completing and filing the application, the property owner or developer will send a letter requesting abandonment of the easement, along with the reason, to the Water Resources Department with the following exhibits attached:

1. A detailed map highlighting the easement to be abandoned and locations of existing water and sewer lines shown in reference to the easement.
2. If existing water and/or sewer lines are to be abandoned, a detailed civil plan prepared by a professional engineer licensed in the State of Arizona must be supplied describing the method of abandonment and any necessary relocations of the water and/or sewer lines.
3. The Water Resources Department will issue a letter recommending approval or denial of the abandonment request and any stipulations that may be required in conjunction with the abandonment.
4. This letter will be attached to an Application for Release of Easement and will be submitted by the applicant to the One Stop Shop for subsequent processing by Development Services.

Failure to comply with the above process will result in a denial of the request. Where replacement rights are requested by the city, the city will not relinquish existing rights until the replacement rights have been granted.

7-1.414 PRIVATE SANITARY SEWER LINES

Private sanitary sewer lines must meet the Maricopa County Environmental Services Department and the City of Scottsdale Building Inspection Services requirements for approval. Privately owned and maintained sanitary sewer lines shall not be located in the street rights-of-way or a in a public utility easement.

Wastewater collection systems within commercial properties will be designed as private system per the Uniform Plumbing Code and Arizona Administrative Code, Title18, Chapter 9, "Water Pollution Control".

7-1.415 ALTERNATIVE SANITARY SEWER SYSTEMS

Developers or property owners may request that the Water Resources Department consider the design of alternative wastewater systems upon their engineer's determination that conventional gravity or forced sanitary sewer systems cannot provide adequate service to the development. Contact the Water Resources Department for information regarding alternative sewer designs.

If an alternative wastewater system is acceptable to the Water Resources Department, the design concept will then be coordinated with the Maricopa County Environmental Services Department for their input.

FINAL PLANS PREPARATION 7-1.500

Construction Plan Submittal Requirements for the preparation of final plans in the city are described in Section 1-1.100. This section supplements the requirements of Chapter 1.

A. Ordinance Requirements

Upon development of property for which city wastewater service is desired and available, the developer shall submit a plan for the wastewater system prepared by a professional engineer licensed in the State of Arizona (Section 49-122).

B. Design Policy

Any variance to these standards will require written permission from the Water Resources Department.

C. Design Standards

Any project specific notes that apply to construction on the city's wastewater system are required on each set of final plans that include improvements to the city's wastewater system or a wastewater system that is to be dedicated to the city.

SPECIFIC SEWER PLAN REQUIREMENTS 7-1.501

The following paragraphs highlight requirements for the preparation of wastewater final plans that are to be submitted to the city for approval.

1. All sanitary sewer lines will be shown in both plan and profile and pipe material called out.
2. Each manhole will have a unique identifier and be labeled in both plan and profile.
3. Sanitary sewer line stationing will be along the centerline of the pipe.
4. Concrete encasement will be shown in both plan and profile. The beginning and ending stations of the encasement shall be called out.
5. If a line is to be connected to an existing system, the following note should be placed on the final plans:

> Contractor shall verify the location of the existing sanitary sewer line before proceeding with trenching.

6. Both slope and elevation must be shown on all proposed sanitary sewer lines stubbed out for future extension.
7. Where sanitary sewer lines cross water lines, storm drains or drainage culverts, the clearances will be shown in profile.
8. For permitting purposes, quantities for all items of work within the public rights-of-way and public utility easements will be included on the cover sheet of the final plans.
9. Sanitary sewer service line invert elevations will be called out for all final plans. All service line connections shall be shown on the final plans with the ends of any capped service lines located by station, offset or dimension.
10. The drawings will show all utility locations, sizes, easements, rights-of-way and other structural features affecting the sanitary sewer line.
11. Lift station plans will show all invert elevations, structural elevations, existing and finished grades, control setting elevations, structural design of the wet well and dry well, valves

and piping, surge control devices, pump suction and discharge details and any other details necessary to provide construction of the design.

12. Plans and profiles of force mains will show size, invert and grade elevations, material, existing and proposed utility locations and any other necessary details.
13. Private and dry sanitary sewer lines will be noted as such on the final plans set. The responsibility for operation and maintenance of private sewer systems will be stated on the final plans.
14. Easements within tracts will be shown and labeled in plan view. Existing County recording numbers shall be shown on the final plans.
15. Final plans must comply with any design review or preliminary plat stipulations and any accepted wastewater basis of design report.

All plan documents for sanitary sewer lines and/or wastewater treatment works will be prepared by a registered civil professional engineer licensed in State of Arizona under the provisions of ARS 32:141-145.

Additional requirements for the preparation of final plans in the city are presented in Section 1-2.100.

7-1.502 REVIEWS AND APPROVALS

All final plans that include work on the city's wastewater system or on a system which is to be dedicated to the city, must be submitted to the One Stop Shop for review. Plan Review fees must be paid at the time of plan submittal.

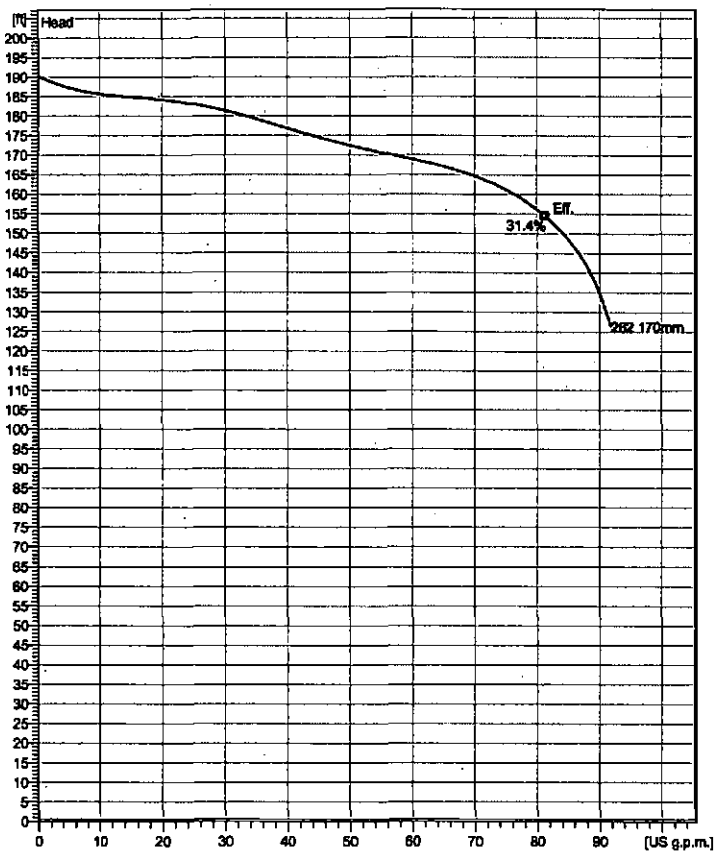
No final plans will be submitted unless accompanied by a copy of the accepted basis of design report, when one is stipulated for the project. If master plans or basis of design reports are being submitted as part of a development review board or preliminary plat package, they should also be submitted separately through the One Stop Shop for review by the Water Resources Department.

Maricopa County Environmental Services Department approval is required prior to approval of final plans by Plan Review. No permits for improvements to the public wastewater system will be issued until the owner or developer has provided all necessary easements and rights-of-way. These instruments of dedication must be approved and submitted to the city for recording at the Maricopa County Recorder's Office.

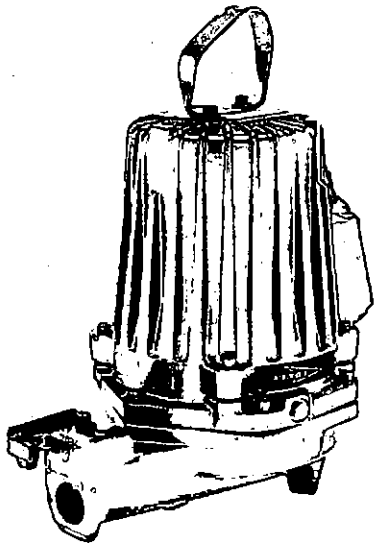
Appendix C – MP 3127 HT 3 - 262 (170mm Impeller) Pump Information

MP 3127 HT 3~ 262

Technical specification



Water, pure *Curve ISO*



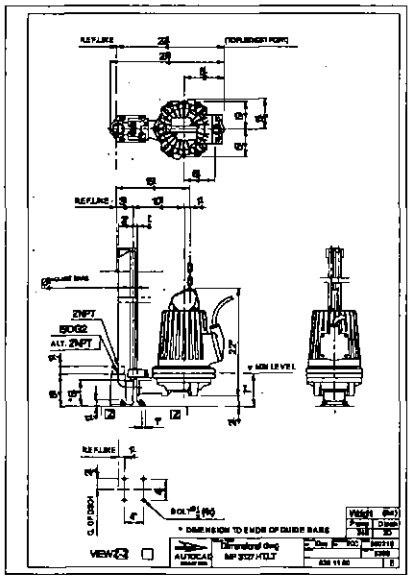
Note: Picture might not correspond to the current configuration.

General
Semi-open multi-channel impellers with integral grinder cutter in single volute casing for liquids containing solids and fibres.

Impeller

Impeller material	Grey cast iron
Discharge Flange Diameter	1 15/16 inch
Inlet diameter	1 15/16 inch
Impeller diameter	170 mm
Number of blades	6

Installation: P - Semi permanent, Wet



Motor

Motor #	M3127.170 21-11-2AL-W 11hp
Approval	Standard
Stator variant	30
Frequency	60 Hz
Rated voltage	380 V
Number of poles	2
Phases	3~
Rated power	11 hp
Rated current	16 A
Starting current	142 A
Rated speed	3500 rpm
Power factor	
1/1 Load	0.91
3/4 Load	0.89
1/2 Load	0.82
Motor efficiency	
1/1 Load	87.9 %
3/4 Load	88.5 %
1/2 Load	87.6 %

Configuration

Project	Project ID	Created by	Created on	Last update

MP 3127 HT 3~ 262

Performance curve

Pump

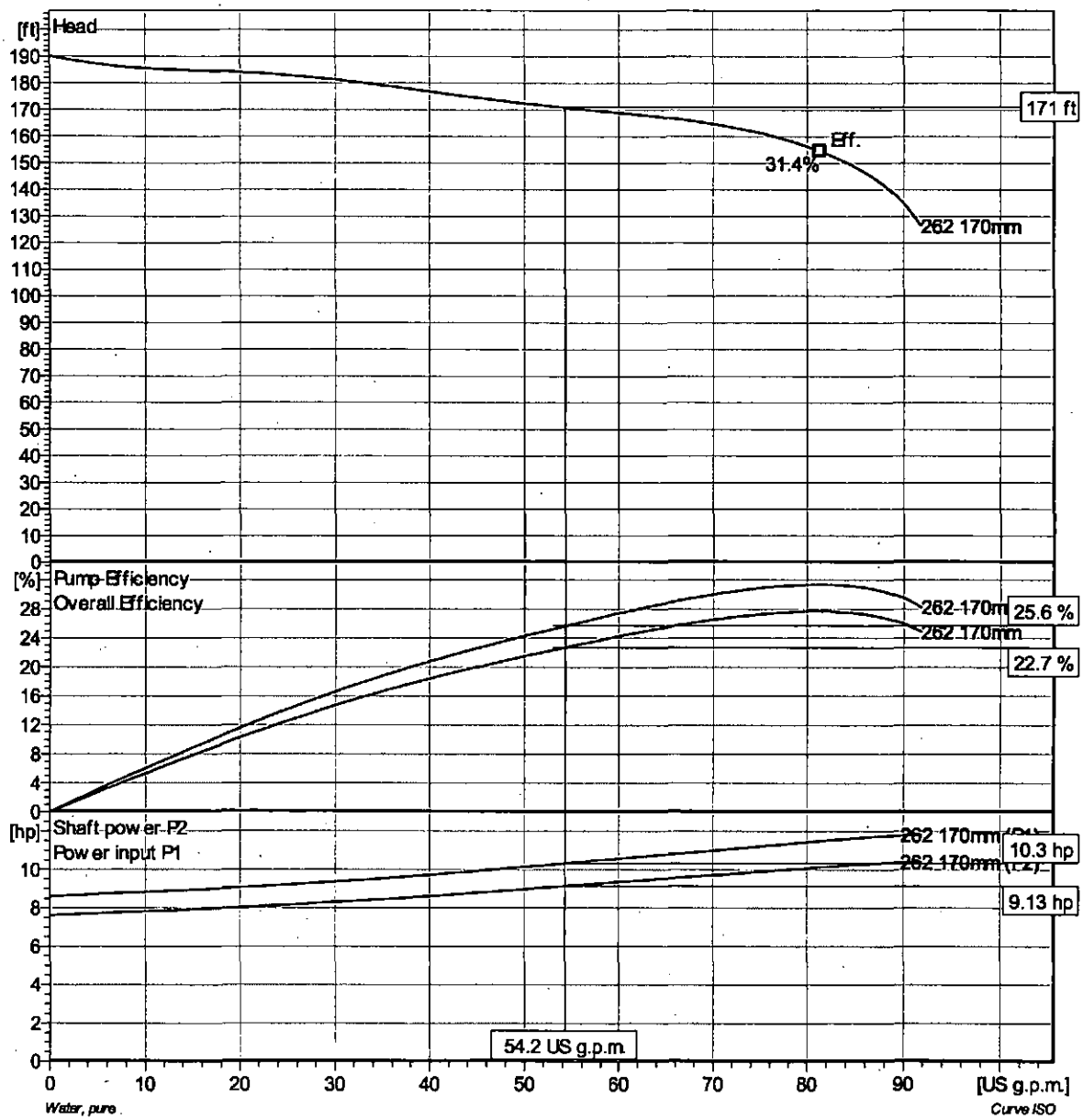
Discharge Flange Diameter	1 15/16 inch
Inlet diameter	50 mm
Impeller diameter	6 11/16"
Number of blades	6

Motor

Motor #	M3127.170 21-11-2AL-W 11hp
Approval	Standard
Stator variant	30
Frequency	60 Hz
Rated voltage	380 V
Number of poles	2
Phases	3~
Rated power	11 hp
Rated current	16 A
Starting current	142 A
Rated speed	3500 rpm

Power factor	
1/1 Load	0.91
3/4 Load	0.89
1/2 Load	0.82

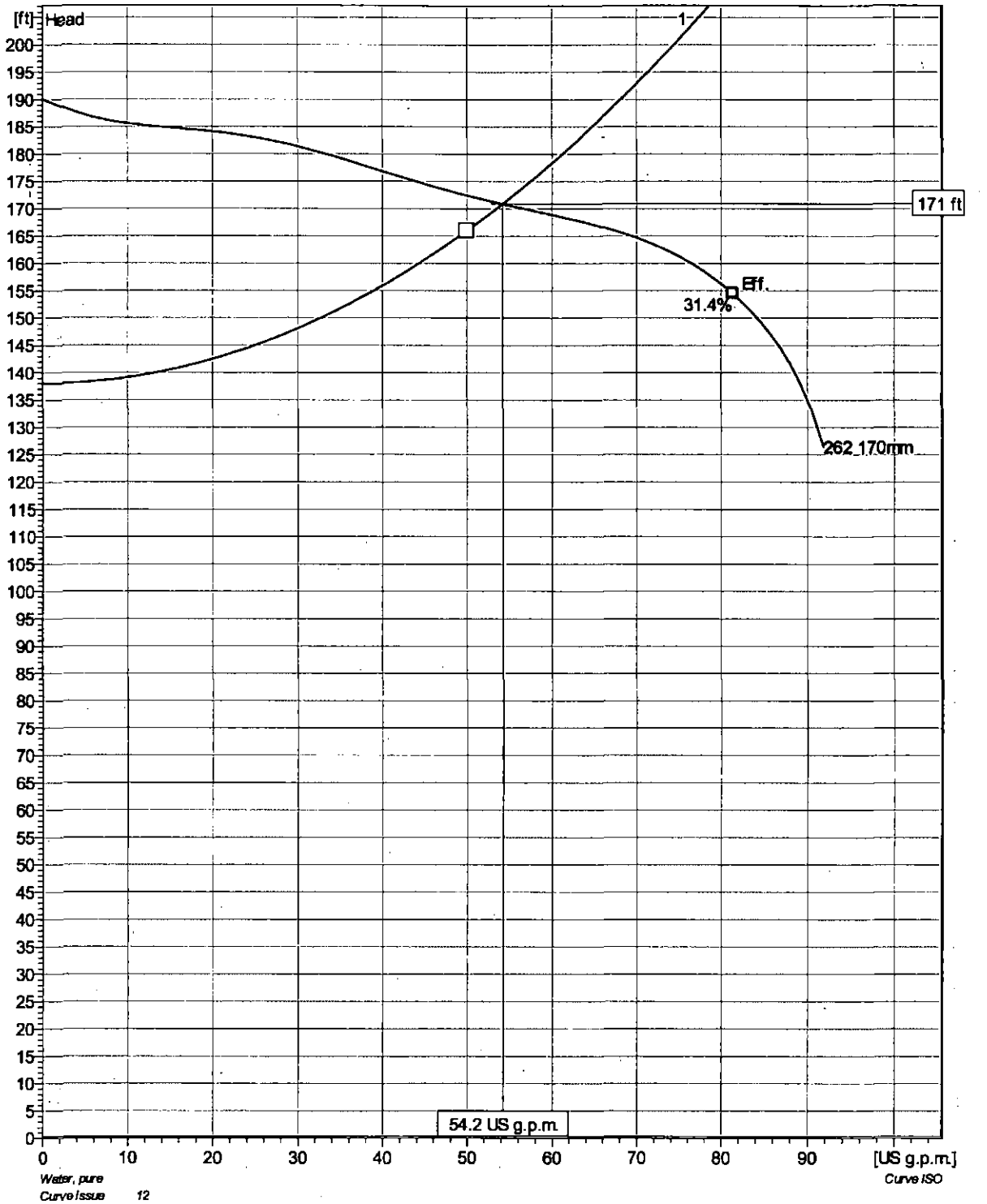
Motor efficiency	
1/1 Load	87.9 %
3/4 Load	88.5 %
1/2 Load	87.6 %



Project	Project ID.	Created by	Created on	Last update

MP 3127 HT 3~ 262

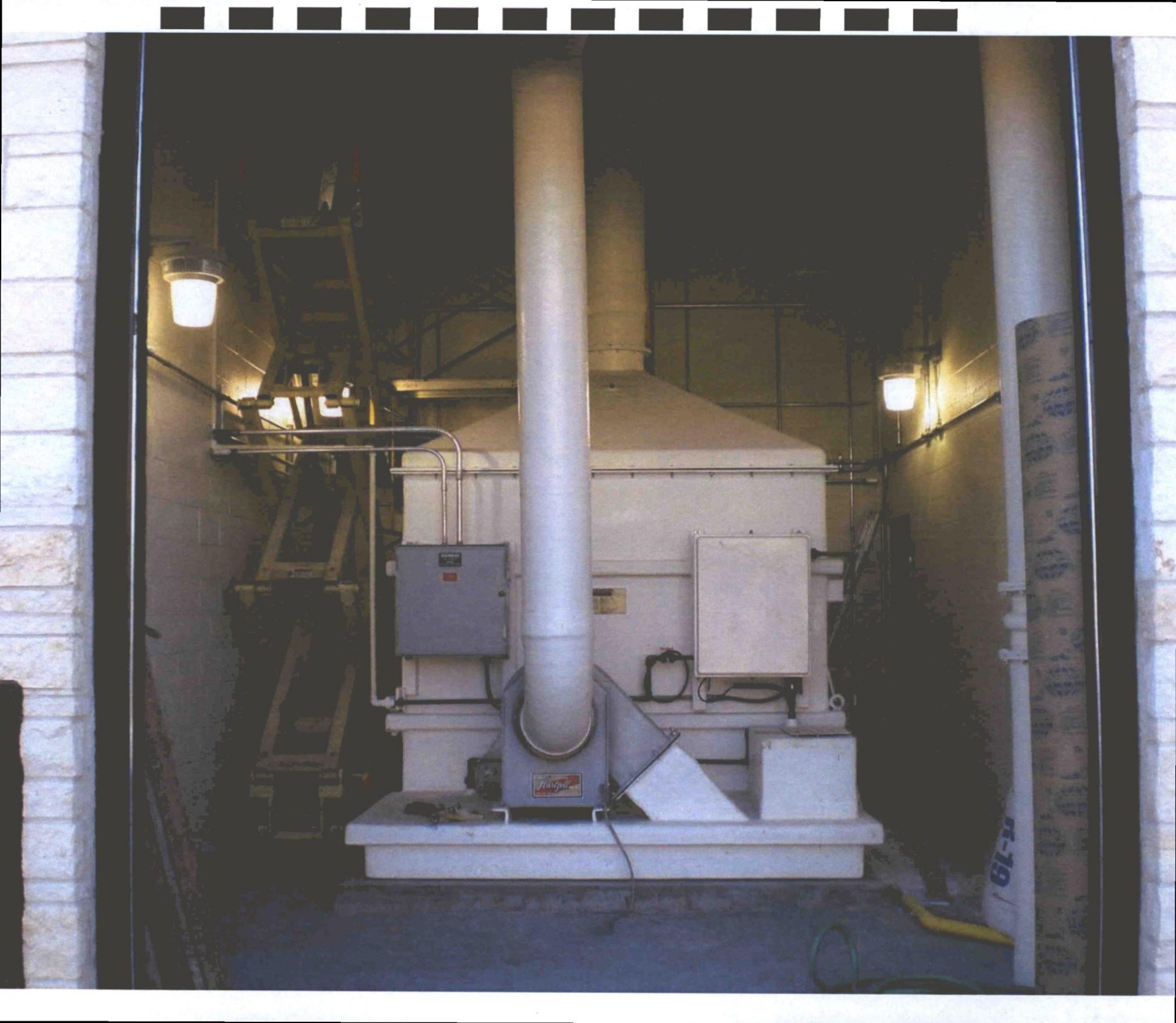
Duty Analysis



Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	54.2 US g.p.m.	171 ft	9.13 hp	54.2 US g.p.m.	171 ft	9.13 hp	25.6 %	2370 kWh/US MG	

Project	Project ID	Created by	Created on	Last update


2914

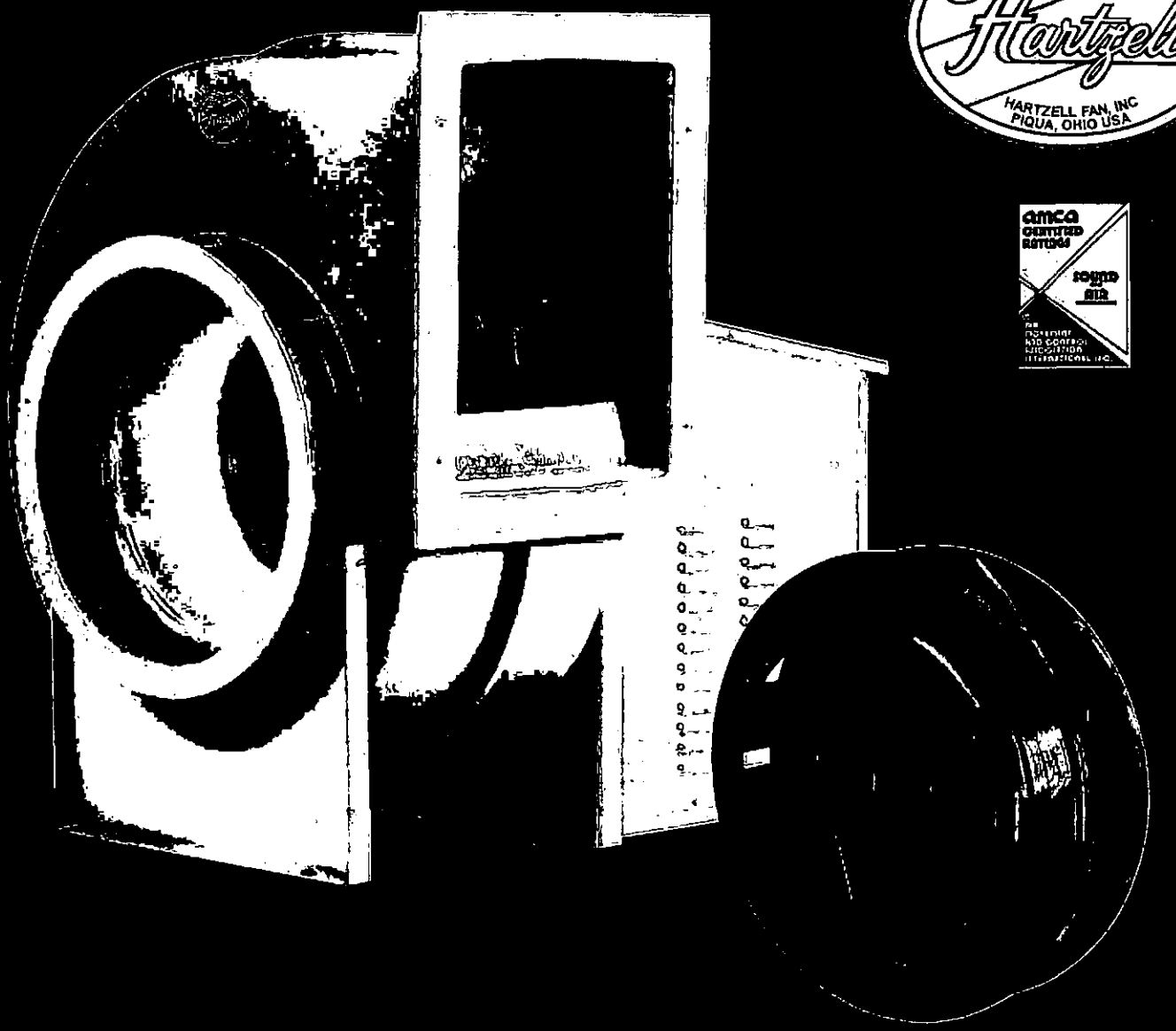



8665
NOTICE
Unite
SITE SERVICES
1-800-TOIL

Appendix E – Odor Control

Fiberglass Backward Curved Centrifugal Fans

Type FA Series 41 Series 41P



HARTZELL®

Hartzell Fan, Inc., Piqua, Ohio 45356

Index

Certified Ratings for Air and Sound

Hartzell Fan, Inc. certifies that the Series 41, Fiberglass Backward Curved Centrifugal Fans, Type FA shown on pages 7–11 and 14–21, and Series 41P, Fiberglass Backward Curved Centrifugal Fan, Packaged, shown on pages 12–20, are licensed to bear the AMCA Seal for Air and Sound Performance. The ratings shown are based on tests and procedures performed in accordance with AMCA Standard 211 and AMCA Standard 311 and comply with the requirements of the AMCA Certified Ratings Program.

Sound Performance data is available upon request. Please contact the factory and ask for Engineering Publication #SD-160.

Hartzell Model Code Explanation

Hartzell Model Code

A 41– 9 –33 1 FA 100 FG OP M 3

- Type
  - A – Production Item
  - S – Stock Item
  - Q – Special Quote
- Product Series
- Arrangement (centrifugals only)
- Size (nominal wheel diameter, inches)
- Class
- Wheel Code
- Wheel Width (entries represent percents)
- Material of Construction
- Motor Enclosure
- Motor Horsepower
- Motor RPM/Phase
  - Motor RPM/Phase Code

3 Phase	1 Phase
2 = 3450	B = 3450
3 = 1750	C = 1750
4 = 1140	D = 1140
5 = 870	E = 870
6 = 690	F = 690
7 = 575	G = 575

Motor Horsepower

Horsepower	1/4	1/3	1/2	3/4	1	1 1/2	2	3	5	7 1/2	10	15	20	25	30	40	50	60	75	100	125	150	200
Code Letter	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

Example:

Assume a needed performance of 12,000 CFM at 5" SP, standard air. Reading the 33" rating table for 100% width on page 17, we find a fan RPM of 1,168 and brake horsepower (BHP) of 12.3. Required motor horsepower is 15. The model code can be constructed as follows: Type will be a production item (code A), product series for the Fiberglass Backward Curved Fans is 41, arrangement is 9 (code 9), size of the wheel is 33", class of construction is I (code 1), wheel code for this item is FA, wheel width is 100% (code 100), material of construction is fiberglass (code FG), motor enclosure is open protected drip-proof (code OP), motor horsepower is 15 (code O), and motor RPM/phase is 1750 (code 3).

Note: All other informational fields must be filled with hyphens/dashes (-) if they are not applicable to the fan being considered.

This bulletin lists Hartzell's line of Fiberglass Backward Curved Centrifugal Fans, Type FA and accessories. More than 70 Hartzell offices can provide specific performance and installation data to meet your requirements. Call your Hartzell representative for assistance. Visit our website **(www.hartzellfan.com)** or call toll-free **(1-800-336-3267)** for the name of your Hartzell representative.

General Fiberglass Construction Features

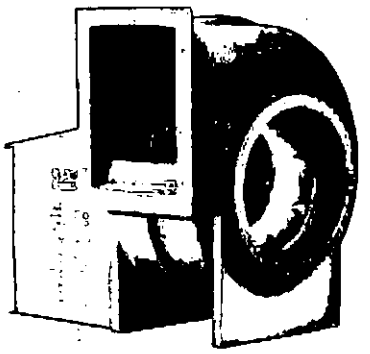
A variety of corrosion problems plague industry today. Fans and blowers made of coated steel or metals such as stainless and monel can handle some problem areas. Please refer to the corrosion resistance table on page 5 of this bulletin. Fiberglass centrifugal blowers can be used in most applications where corrosive elements exist in fume and vapor form. The resistance to corrosive elements is a major advantage, but the physical properties of fiberglass equipment offer these additional advantages:

- Fiberglass equipment is corrosion resistant.
- Fiberglass equipment weighs 25% less than comparable equipment made of carbon steel.
- Fiberglass has an extremely high strength-to-weight ratio, stronger than steel on a per-pound basis.
- Dimensional stability of fiberglass is excellent.
- Fiberglass air moving equipment will not become brittle at low temperatures and at 0°F the laminated fiberglass will be stronger than at room temperature.

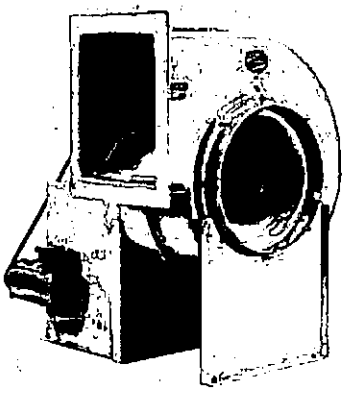
Hartzell Fan, Inc. conforms to ASTM D4167-97, Standard Specification for fiber-reinforced plastic fans and blowers, when optional surfacing veil, electrical grounding, and dynamic balancing to ASTM D4167-97 levels, are added to the fan.

The following are standard Hartzell fiberglass construction features:

- Corrosion resistant polyester resin, having a Class I flame spread rate of 25 or less is used for all housings. Vinylester resin having a Class I flame spread rate of 25 or less is used for all wheels.
- All structural parts in the airstream are fiberglass and resin. All fiberglass surfaces are protected with a minimum 10-mil thickness of chemical, flame, and ultraviolet resistant resin.
- Shafts are turned, ground, polished, and keyed at both ends with a fiberglass sleeve in the airstream. Shafts are sized to operate well below critical speed. 304 or 316 Stainless steel or monel shafting is available as an option at extra cost.
- Internal hardware (airstream) is Type 304 stainless steel. All internal hardware (airstream) is encapsulated. All external hardware (out of airstream) is zinc plated as standard. Where metal is subject to attack by the corrosive elements being handled, all metal parts can be resin-coated after assembly.
- A fiberglass and neoprene shaft seal is placed where the shaft leaves the housing along with a neoprene shaft slinger between the seal and wheel on belt drive units (seal is not gas tight).



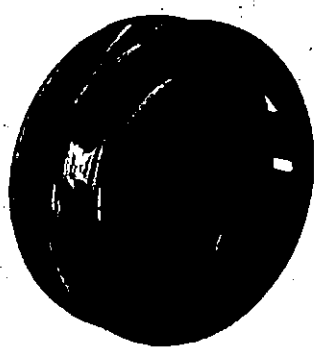
Series 41P



Series 41

Fiberglass Centrifugal Fans

- Bearings on belt drive units are heavy duty, deep row radial ball or double row spherical roller type self-aligning and shielded in cast iron housings. Long inner races ensure even load distribution, providing a high radial and thrust load capacity. Bearings are relubricable for continuous service with lubrication tubes extended to the exterior of fan base as necessary.
- V-Belt Drives are oversized for long life and continuous duty as standard. Fixed pitch or variable pitch drives are available upon request. Belts are oil, heat, and static resistant type.



Type FA Wheel

Type FA Wheel Features

The Type FA wheel is unique in the fan and blower industry. It is available in diameters from 12" to 60" in both clockwise and counter-clockwise rotations. The wheel is airfoil design and solid fiberglass die formed and coated with Dow Derakane 510-A corrosion resistant vinylester resin. The manufactured wheel is a single piece, removed from the pattern whole. This ensures each wheel is aerodynamically identical and provides reliable repeatable performance without the variability of hand made and taped components. The design is the result of a substantial investment in research, development, tooling, and manufacturing methods by Hartzell Fan, Inc.

The type FA wheel is highly efficient, with tapered inlet side and airfoil blades. It has non-overloading horsepower characteristic curve. When used in conjunction with a precision inlet cone it **efficiently moves large volumes of air at high pressures with low noise characteristics at low RPM.**

The fiberglass resin has a Class I flame spread rate of 25 or less. The wheel is electronically statically and dynamically balanced to the requirements of Fan Application Category BV-3 of AMCA ANSI Std. 204-96 and receives an Operational Test and Inspection before shipment. Special constructions are available for abrasive environments or extremely corrosive environments.

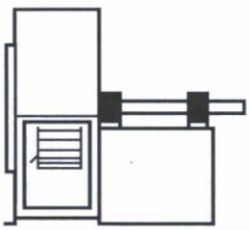
Hartzell Centrifugal Fan Classifications

Hartzell Series 41 Fiberglass Backward Curved Centrifugal Fans, Type FA, 100% width, are designed and classified to perform within the centrifugal fan classification parameters established by AMCA Standard No. 2408; AMCA Publication 99. Hartzell Series 41 Fiberglass Backward Curved Centrifugal Fans, Type FA, 100% width are available in Class I and II construction. Hartzell Series 41 in 66% width are available in Class I, II, and III construction. Series 41P are available in Class I construction only. See performance tables for specific ratings. These parameters are explained in the following table.

FAN CLASS	PERFORMANCE RANGE*	TABLE SHADING
I	5" @ 2300 FPM To 2½" @ 3200 FPM	
II	8½" @ 3000 FPM To 4¼" @ 4175 FPM	
III	13½" @ 3780 FPM To 6¾" @ 5260 FPM	

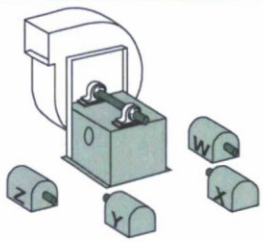
*** At standard air conditions (70°F, 29.92 in. HG barometric pressure, .075 lbs./ft.3). Static pressure shown in inches of water; outlet velocity shown in feet per minute. Performance Ranges apply only to 100% width construction.**

Centrifugal Fan Arrangements



Arrangement 1

Unit furnished with shaft and bearings, less motor and drive. Designed to be driven by a separately mounted motor. Impeller is overhung – two bearings on base. Temperature limitations: 250°F.

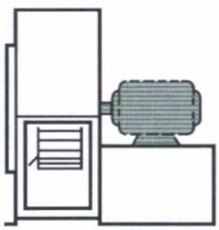


Motor Position Designation

Motor position designation is necessary when ordering the following for Arrangement 1 fans –

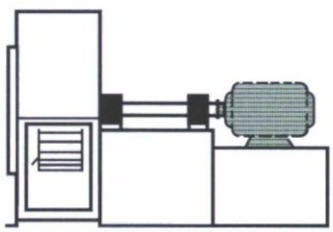
1 – V Belt Drive.
2 – Vibration Bases.
3 – Belt Guards.

Note: Location of motor is determined by facing the drive side of the fan and designating the motor position by letters W, X, Y, or Z. Consider discharge location and height when specifying.



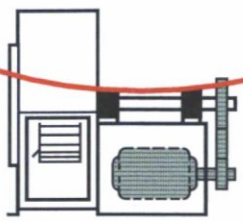
Arrangement 4

Direct drive packaged unit, wheel is overhung and attached to the shaft of the electric motor. No bearings on fan. Temperature limitations: 200°F.



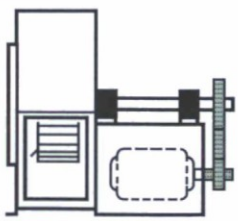
Arrangement 8

Direct coupled configuration with motor mounted to common fan base. Impeller is overhung and supported by two bearings on fan base. Temperature Limitations: 250°F.



Arrangement 9

Belt drive configuration with motor mounted on outside of bearing base support. Packaged unit, wheel is overhung, slide rail motor base permits easy adjustment of belt tension. Available on either left or right hand side of base (when facing drive end of shaft). Temperature limitations: 250°F.



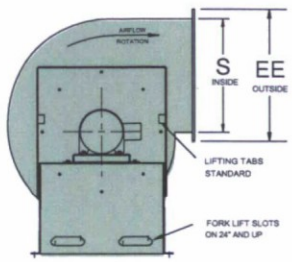
Arrangement 10

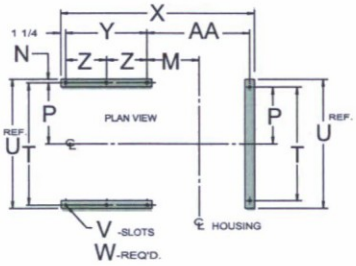
Belt drive configuration with motor mounted inside base. Packaged unit, wheel is overhung. Temperature limitations: 250°F.

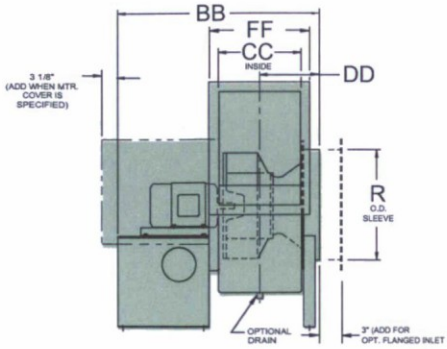
Adapted from AMCA Standard 99-2404-03, *Drive Arrangements for Centrifugal Fans*, and AMCA Standard 99-2407-03, *Motor Positions for Belt or Chain Drive Centrifugal Fans*, with written permission from Air Movement and Control Association International, Inc.

Dimensions – Arrangement 4

SERIES 41, Type FA
Sizes 12" Through 33", Rotatable Housing
Standard Construction – Classes I, II and III, Maximum Temperature – 200°F.







Principal Dimensions (Inches) – Sizes 12" – 33"

Fan Size	A	B		C	D	E	F	G	H	J	M		N
		Class I/II	Class III								100% Width	66% Width	
12	16	15 1/2	15 1/2	13	11 1/2	12 1/4	20 1/8	10 3/4	10	11 1/16	8 7/16	7 7/8	5/8
15	18 3/4	18 5/8	19 5/8	16 3/16	15 7/8	16 11/16	25 1/2	14 15/16	14	13 1/16	9 11/16	9	5/8
18	22	21 15/16	22 7/8	19	18 7/16	19 9/16	28 1/2	17 5/16	16 3/16	15 1/16	10 15/16	10 1/8	5/8
22	26 3/4	26 1/4	27 3/16	21 1/8	22 11/16	24 1/16	34 3/8	21 5/16	19 15/16	18 9/16	12 7/8	11 9/16	5/8
24	28 1/2	28 5/16	29 1/4	23	24 7/16	25 15/16	37 3/16	22 15/16	21 7/16	19 15/16	13 3/8	12 1/4	7/8
27	32 1/4	32 1/2	32 1/2	24	27 7/16	29 1/8	40 3/16	25 13/16	24 1/8	22 7/16	14 5/8	13 3/8	7/8
30	34 3/4	35	35	28 1/2	29 9/16	31 3/8	43 7/16	27 3/4	25 13/16	24 1/16	15 11/16	14 5/16	7/8
33	38	38 3/16	38 3/16	28 11/16	33 1/4	35 1/4	47 9/16	31 1/4	29 1/4	27 3/16	16 13/16	15 5/16	7/8

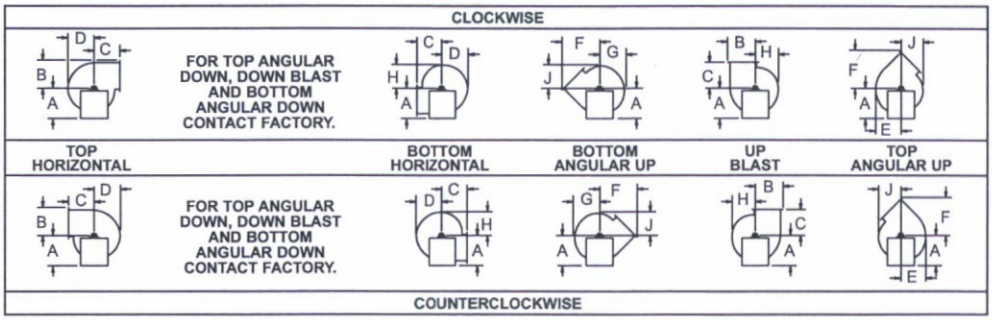
Fan Size	P	R	S	T	U	V	W	X		Y	Z	AA	
								100% Width	66% Width			100% Width	66% Width
12	9 1/8	12 1/4	12 7/8	18 1/4	19 1/2	9/16 x 1 1/16	6	26 7/16	25 9/32	9 1/2	–	14 11/16	13 17/32
15	10 3/4	16 1/2	16 1/8	21 1/2	22 3/4	9/16 x 1 1/16	6	36	34 5/8	16 1/2	–	17 1/4	15 13/16
18	12 3/8	19 1/2	19 3/8	24 3/4	27 3/4	9/16 x 1 1/16	6	40 5/16	39 1/4	19	–	19 11/16	18
22	14 1/2	23 7/8	23 5/8	29	30 1/4	9/16 x 1 1/16	6	44 1/4	42 3/16	19	–	23	21
24	15 7/8	25 7/8	25 3/4	31 3/4	33 1/2	11/16 x 1 3/16	6	45 13/16	43 5/8	19	–	24 9/16	22 3/8
27	17 5/8	28 3/4	29	35 1/4	37	11/16 x 1 3/16	6	48 1/2	46	19	–	27 1/4	24 3/4
30	18 7/8	31 3/16	31 1/2	37 3/4	39 1/2	11/16 x 1 3/16	8	52 5/16	50 1/4	21 1/2	10 3/4	29 3/16	26 1/2
33	20 5/8	34 3/16	34 11/16	41 1/4	43	11/16 x 1 3/16	8	57 1/2	54 9/16	23 3/4	11 7/8	31 1/2	28 9/16

Fan Size	BB		CC		DD		EE				FF			
	100% Width	66% Width	100% Width	66% Width	100% Width	66% Width	100% Width		66% Width		100% Width		66% Width	
							Class I/II	Class III	Class I/II	Class III	Class I/II	Class III	Class I/II	Class III
12	27 3/16	26 1/32	9 9/32	8 5/8	8	7 7/16	18 1/8	18 1/8	18 1/8	18 1/8	14 3/8	14 3/8	13 1/2	13 1/2
15	36 11/16	35 1/4	11 11/16	10 5/16	9 1/4	8 1/2	21 1/16	23 1/8	21 1/16	23 1/8	16 5/8	18 11/16	15 1/4	17 5/16
18	41 5/8	39 3/4	14	12 5/16	10 7/16	9 3/8	24 1/2	26 3/8	24 1/2	26 3/8	19 1/16	21	17 3/8	19 5/16
22	45 1/8	42 13/16	17 1/8	15 1/16	12	11	28 3/4	30 5/8	28 3/4	30 5/8	22 1/4	24 1/8	20 3/16	22 1/16
24	46 7/16	44 3/16	18 5/8	16 3/8	12 13/16	11 11/16	30 13/16	32 3/4	30 13/16	32 3/4	23 11/16	25 5/8	21 7/16	23 3/8
27	49	46 1/2	21	18 1/2	14 1/8	12 7/8	36	36	36	36	28	28	25 1/2	25 1/2
30	53 1/2	50 3/4	22 13/16	20 1/16	15 1/16	13 11/16	38 1/2	38 1/2	38 1/2	38 1/2	29 13/16	29 13/16	27 1/16	27 1/16
33	58 1/16	52 13/16	25 1/8	22 1/8	16 1/4	14 3/4	41 11/16	41 11/16	41 11/16	41 11/16	32 1/8	32 1/8	29 1/8	29 1/8

Dimensions and specifications are subject to change. Clockwise rotation is shown. Certified prints are available.

Fan Discharges

TAD, BAD, and DB discharge must have discharge extension. Contact factory.



Material Specifications/Weights

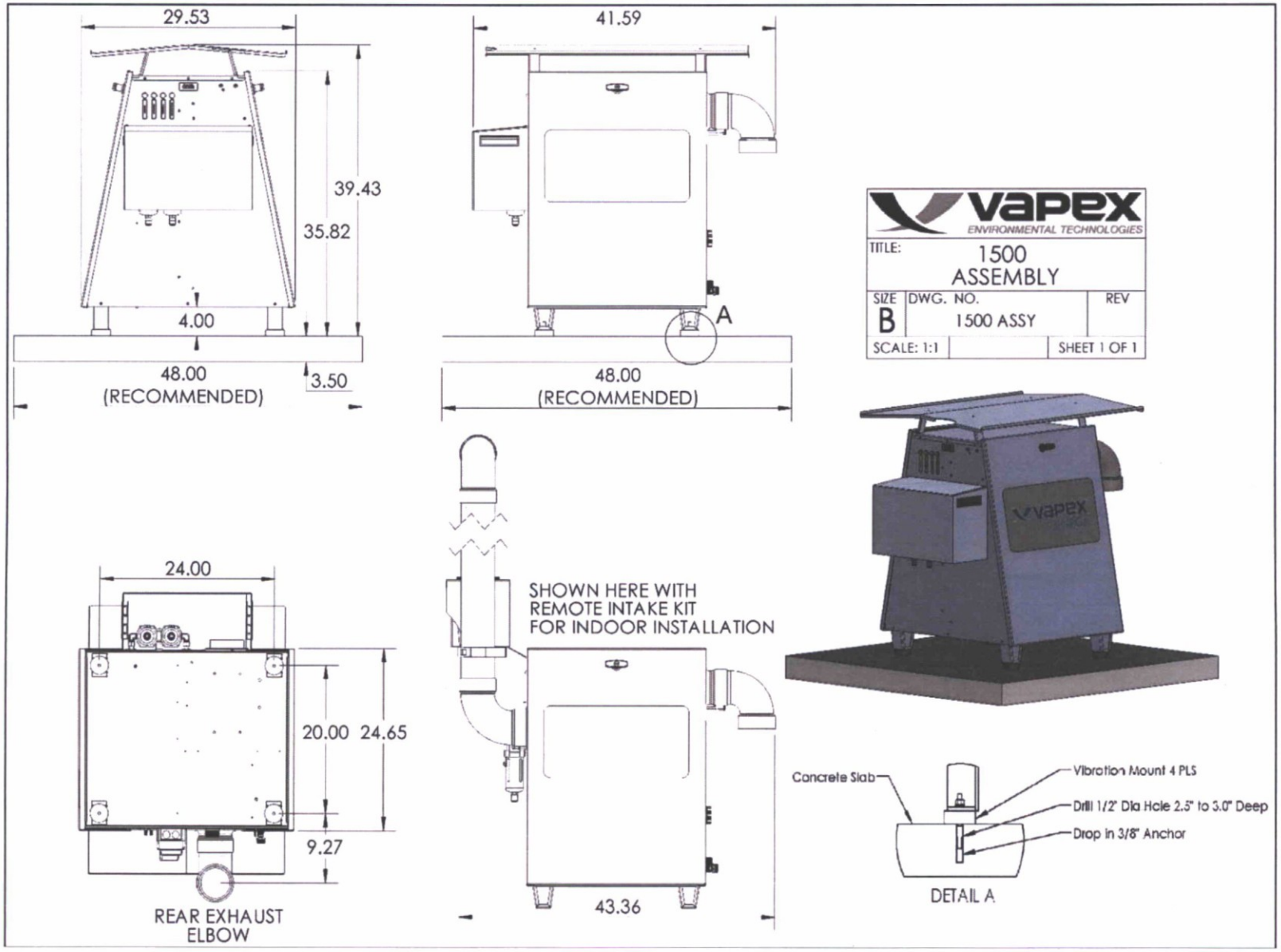
Series 41

Class	Fan Size	Flanges				Shaft & Bearings		FA Type Wheel WR² (Lbs.-Ft.²)	Motor Frames			Installation Weights (Lbs. Less Motor)	
		Inlet		Outlet					Minimum Arr. #4	Maximum Arr. #4	Maximum Arr. #9 & #10	Arr. #4	Arr. #9 & #10
		Thickness	Holes	Thickness	Holes 100% & 66%	Size	Type						
I	12	1/8	7/16 x 8	1/4	7/16 x 10	1 3/16	P3U219	1.6	56	184T	182T	160	193
	15	3/16	7/16 x 8	1/4	7/16 x 14	1 3/16	P3U219	4.7	143T	215T	184T	235	230
	18	3/16	7/16 x 8	1/4	7/16 x 14	1 7/16	P3U223	11	143T	256T	213T	350	355
	22	1/4	7/16 x 8	1/4	7/16 x 18	1 7/16	P3U223	29	182T	286T	215T	490	490
	24	1/4	7/16 x 8	1/4	7/16 x 18	1 7/16	P3U223	44	182T	286T	254T	580	605
	27	5/16	7/16 x 8	3/8	7/16 x 18	2 3/16	P3U235	78	182T	286T	254T	660	770
	30	5/16	7/16 x 8	3/8	7/16 x 18	2 7/16	P3U239	119	213T	326T	256T	935	975
	33	5/16	7/16 x 8	3/8	7/16 x 22	2 7/16	P3U239	160	254T	365T	284T	1145	1185
	36	5/16	7/16 x 8	3/8	7/16 x 22	2 11/16	P3U243	251	—	—	286T	—	1550
	40	5/16	7/16 x 8	1/2	7/16 x 26	2 15/16	P3U247	423	—	—	324T	—	2015
	44	3/8	7/16 x 8	1/2	7/16 x 30	2 15/16	P3U247	717	—	—	324T	—	2515
	49	3/8	9/16 x 16	1/2	7/16 x 34	2 15/16	P3U247	1180	—	—	326T	—	2940
	54	7/16	9/16 x 16	1/2	7/16 x 34	2 15/16	PB22447	1810	—	—	364T	—	3340
	60	7/16	9/16 x 16	1/2	7/16 x 38	2 15/16	PB22447	2875	—	—	365T	—	3670
II	12	1/8	7/16 x 8	1/4	7/16 x 10	1 7/16	P3U223	1.6	56	184T	184T	160	202
	15	3/16	7/16 x 8	1/4	7/16 x 14	1 7/16	P3U223	4.7	143T	215T	215T	235	235
	18	3/16	7/16 x 8	1/4	7/16 x 14	1 11/16	P3U227	11	143T	256T	256T	350	355
	22	1/4	7/16 x 8	1/4	7/16 x 18	1 11/16	PB22427	29	182T	286T	256T*	490	505
	24	1/4	7/16 x 8	1/4	7/16 x 18	1 11/16	PB22427	44	182T	286T	286T*	580	625
	27	5/16	9/16 x 8	3/8	7/16 x 18	2 3/16	PB22435	78	182T	286T	286T*	660	800
	30	5/16	9/16 x 8	3/8	7/16 x 18	2 7/16	PB22439	119	213T	326T	286T*	935	995
	33	5/16	9/16 x 8	3/8	7/16 x 22	2 7/16	PB22439	160	254T	365T	326T*	1145	1195
	36	5/16	9/16 x 8	3/8	7/16 x 22	2 11/16	PB22443	251	—	—	326T*	—	1620
	40	5/16	9/16 x 8	1/2	7/16 x 26	2 15/16	PB22447	423	—	—	365T*	—	2060
	44	3/8	9/16 x 8	1/2	7/16 x 30	2 15/16	PB22447	717	—	—	365T*	—	2560
	49	3/8	11/16 x 16	1/2	7/16 x 34	2 15/16	PB22447	1180	—	—	405T*	—	3040
	54	7/16	11/16 x 16	1/2	7/16 x 34	2 15/16	PB22447	1810	—	—	405T*	—	3480
	60	7/16	11/16 x 16	1/2	7/16 x 38	2 15/16	PB22447	2875	—	—	405T*	—	3670
III	12	1/8	9/16 x 8	1/4	7/16 x 10	1 11/16	P3U227	1.6	56	184T	184T	160	213
	15	3/16	9/16 x 8	1/4	7/16 x 14	1 11/16	P3U227	4.7	143T	215T	215T*	235	250
	18	3/16	9/16 x 8	1/4	7/16 x 14	1 15/16	P3U231	11	143T	256T	256T*	350	375
	22	1/4	9/16 x 8	1/4	7/16 x 18	1 15/16	PB22431	29	182T	286T	256T*	490	525
	24	1/4	9/16 x 8	1/4	7/16 x 18	1 15/16	PB22431	44	182T	286T	286T*	580	635
	27	5/16	9/16 x 16	3/8	7/16 x 18	2 3/16	PB22435	78	182T	286T	286T*	660	820
	30	5/16	9/16 x 16	3/8	7/16 x 18	2 7/16	PB22439	119	213T	326T	286T*	935	1040
	33	5/16	9/16 x 16	3/8	7/16 x 22	2 7/16	PB22439	160	254T	365T	326T*	1145	1210
	36	5/16	9/16 x 16	3/8	7/16 x 22	2 11/16	PB22443	251	—	—	326T*	—	1630
	40	5/16	9/16 x 16	1/2	7/16 x 26	2 15/16	PB22447	423	—	—	365T*	—	2080
	44	3/8	9/16 x 16	1/2	7/16 x 30	2 15/16	PB22447	717	—	—	365T*	—	2580
	49	3/8	11/16 x 16	1/2	7/16 x 34	2 15/16	PB22447	1180	—	—	405T*	—	3110
	54	7/16	11/16 x 16	1/2	7/16 x 34	2 15/16	PB22447	1810	—	—	405T*	—	3500
	60	7/16	11/16 x 16	1/2	7/16 x 38	2 15/16	PB22447	2875	—	—	405T*	—	3800

*** Motor Frames exceeding these values must be Arrangement 9M, Arrangement 1, or Arrangement 8.**
For other Arrangement maximum motor frame size and dimensions, please contact factory.

Series 41P

Class	Fan Size	Flanges				Shaft & Bearings			FA Type Wheel WR² (Lbs.-Ft.²)	Maximum Motor Frame Arr. #10	Installation Weights (Lbs. Less Motor)
		Inlet		Outlet							
		Thickness	Holes	Thickness	Holes 100% & 66%	Size	Drive Side	Inlet Side			
II	12	1/8	7/16 x 8	1/4	7/16 x 10	1 11/16	P3U-227	P3U-227	1.6	215T	188
	15	3/16	7/16 x 8	1/4	7/16 x 14	1 11/16	P3U-227	P3U-227	4.7	215T	215
	18	3/16	7/16 x 8	1/4	7/16 x 14	1 15/16	P3U-231	P3U-231	11	254T	309
	22	1/4	7/16 x 8	1/4	7/16 x 18	1 11/16	P3U-227	P3U-227	29	256T	397
	24	1/4	7/16 x 8	1/4	7/16 x 18	1 15/16	P3U-231	P3U-231	44	256T	554
	27	5/16	9/16 x 8	3/8	7/16 x 18	2 3/16	P3U-235	P3U-235	78	286T	728
	30	5/16	9/16 x 8	3/8	7/16 x 18	2 3/16	PB-22435	P3U-235	119	324T	878
	33	5/16	9/16 x 8	3/8	7/16 x 22	2 3/16	P3U-235	P3U-235	160	324T	1013
	36	5/16	9/16 x 8	3/8	7/16 x 22	2 3/16	P3U-235	P3U-235	251	326T	1131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Concrete Slab
Vibration Mount 4 PLS
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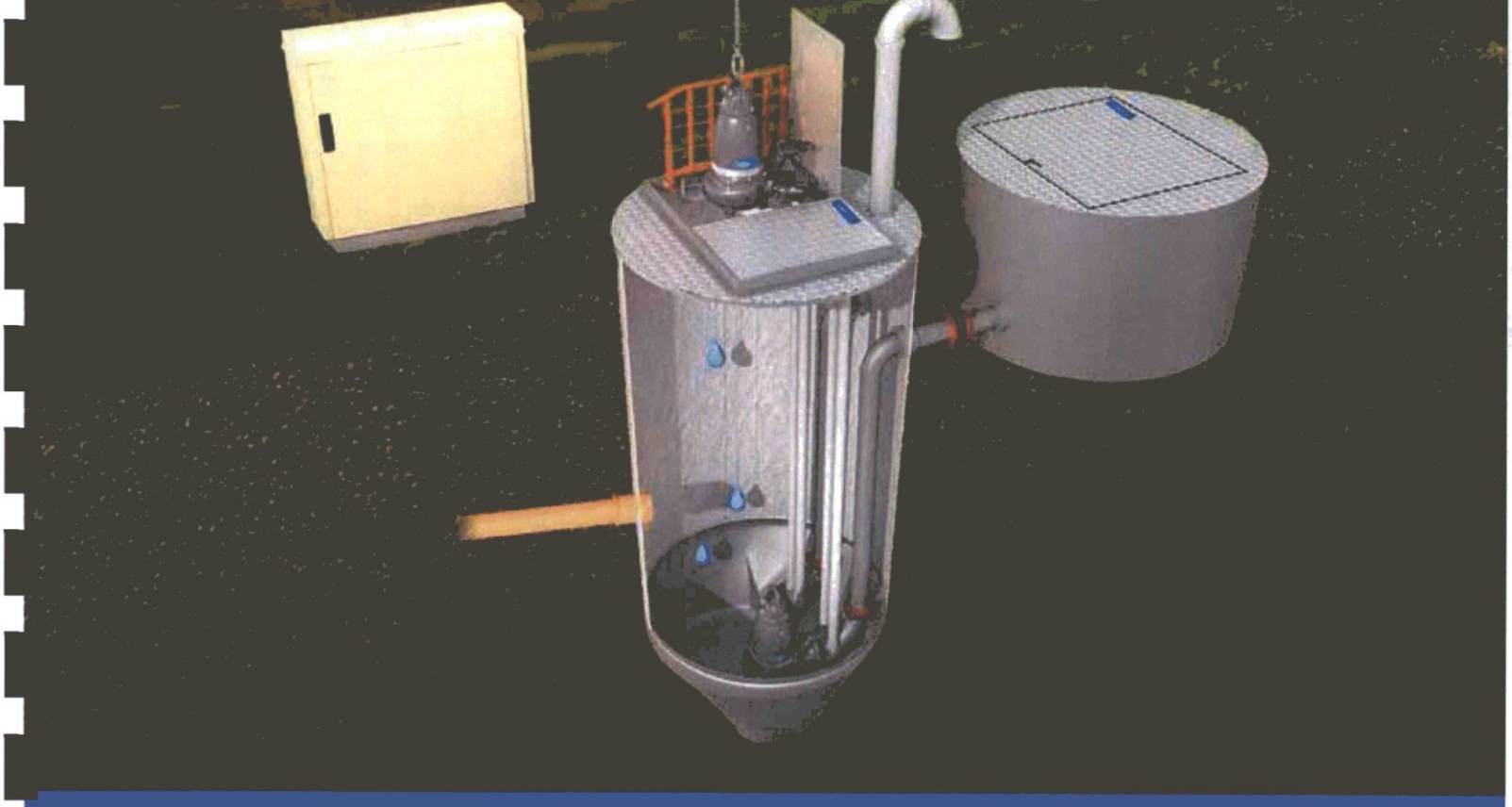
Drop in 3/8" Anchor
DETAIL A



TOP Pre-engineered Fiberglass Pump Station

THE OPTIMUM PUMP STATION

FLYGT

a xylem brand

TOP Station Premium Pre-engineered Pump Station

The Flygt TOP fiberglass pump station from Xylem is a premium, pre-engineered and factory built packaged pump station that utilizes advanced features to provide customers with superior pump station performance.

The innovative, self-cleaning, TOP Station sump bottom directs the solids and debris normally found in wastewater to the inlet of the Flygt N-Pumps where they can be effectively pumped away.

The interior of the pump station has a smooth finish which helps inhibit the build-up of grease and sludge.

The outside diameter of the station is equipped with an integral anti-flotation ring utilized to secure the station.

The aluminum pump station lid utilizes an integral Safe-Hatch access cover that provides personnel fall-through protection when the aluminum access door is opened. The raised frame provides a kick plate surround eliminating the possibility of tools or debris rolling into the pump station.

During normal inspection, individual pumps can be raised and placed upon one of the closed Safe-Hatch grates and washed-down. The debris will fall back down into the sump resulting in a clean pump to check.

Flygt Pump Station Controls

Xylem offers offers a fully engineered control panel solution. Our integrated, purposely designed control panels provide an intuitive user interface with the reliability you have come to expect from the leader in submersible pumping.

Standard Control Features

- UL 508 listed
- NEMA 4X 304 Stainless Steel enclosure with aluminum dead front inner door
- Lockable enclosure
- Hand/Off/Auto Selector switches
- Full voltage across-the-line starting
- Main incoming power circuit breaker
- Individual pump circuit breakers
- NEMA rated motor starters w/overloads
- Mini-CAS II pump seal & motor thermal protection
- MultiSmart™ intelligent pump station controller
- Current transformers
- 24VDC power supply
- ENM-10 float regulators

Available Options

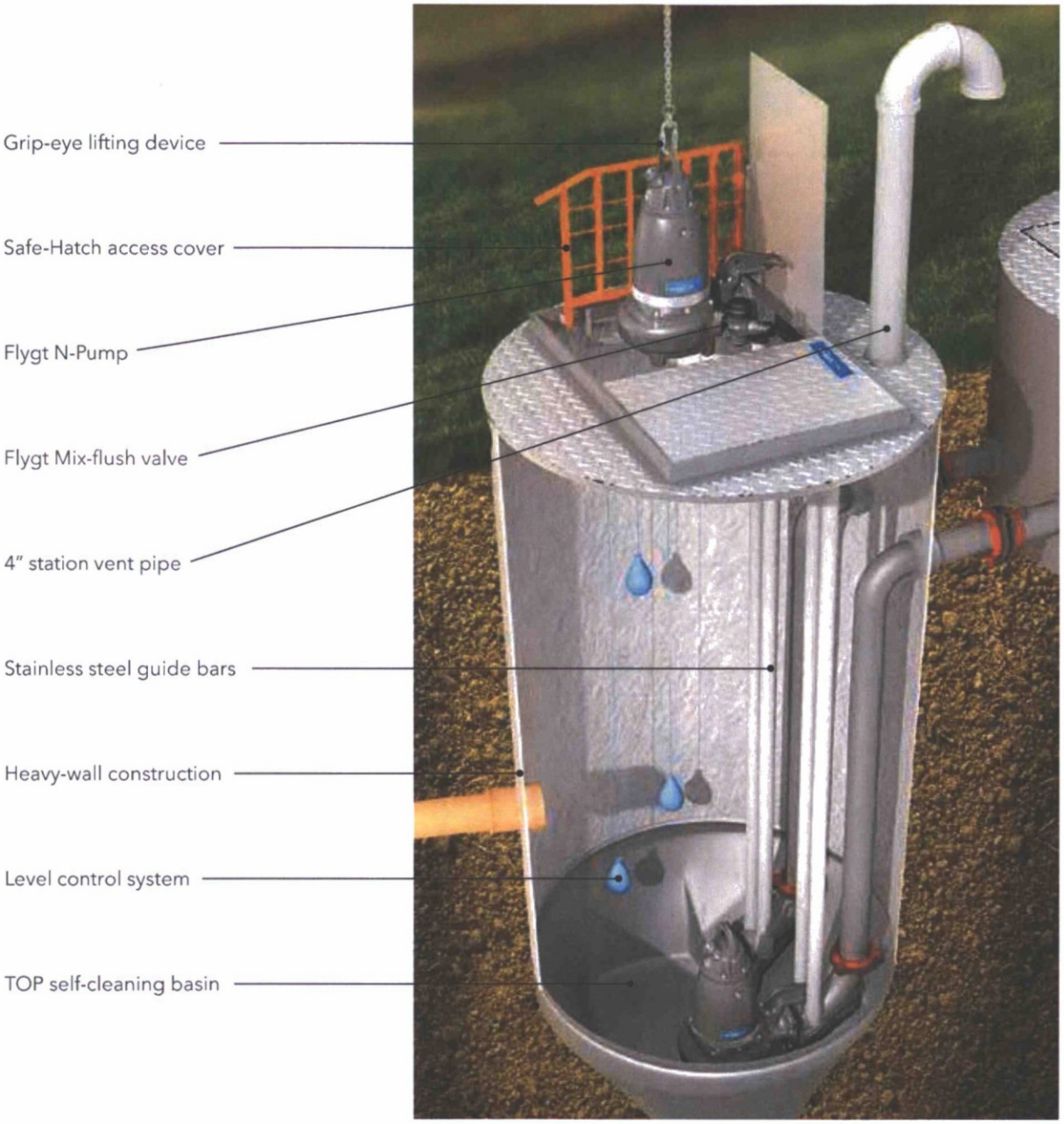
- Generator receptacle and plug assembly with manual transfer switch
- Solid state reduced voltage starting
- LS-100 submersible pressure transducer
- MIO module and multi-sensor level probe
- Horn or bell audible alarm
- Anti-condensation heater and thermostat
- Back up floats (2 x ENM-10, when transducer or probe option is selected)
- Elapsed time meters for pumps
- TD-33 Telephone modem
- 12" x 10" space in panel reserved for future telemetry

Features & Benefits

- Pre-engineered, factory built pump station
  - Available in 4-ft, 5-ft or 6-ft diameters
- Heavy-wall filament-wound fiberglass tank
- Exclusive self-cleaning TOP sump bottom
- Flygt heavy-duty submersible N-Pumps
  - Clog-free, innovative technology
  - 3-hp through 35-hp motors
  - Self-cleaning N-Impeller
  - Sustains high hydraulic efficiency
- Flygt mix-flush valve
  - Provides sump mixing
  - Re-suspends solids
- 2", 3", 4" or 6" diameter discharge pipe
  - PVC discharge pipe
  - Stainless steel discharge pipe
- Stainless steel guide bars
- Stainless steel upper guide bar bracket
- Stainless steel cable holder hooks
- Integral Safe-Hatch aluminum access cover
- Flygt Grip-eye easy lift pump retrieval system
- 4-in diameter PVC station vent pipe
- Pump station level control choices
  - Flygt ENM-10 ball float-type
  - Flygt LS-100 pressure transducer-type
  - Flygt probe-type
- Duplex Flygt pump station controls
  - NEMA-4 enclosure
  - Several enclosure material choices
  - UL listed control available
  - NEMA or IEC rated starters available
  - Standard and custom controls
- Single lift, easy station installation
- Single-source responsibility

Fully sealed station wall penetrations can be factory installed for the influent pipe, discharge pipes, and electrical connection points. Depending on pipe diameter, properly selected fiberglass hubs with link seals are utilized. Influent pipe wall penetration can be shop installed or field located.

Flygt TOP Pre-engineered Pump Station



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xylem
Let's Solve Water

Flygt is a brand of Xylem, whose 12,000 employees are addressing the most complex issues in the global water market.

Xylem, Inc.
14125 South Bridge Circle
Charlotte, NC 28273
Tel 704.409.9700
Fax 704.295.9080
855-XYL-H2O1 (855-995-4261)
www.xyleminc.covm

www.xyleminc.com

Oldcastle Precast®

Pump Stations

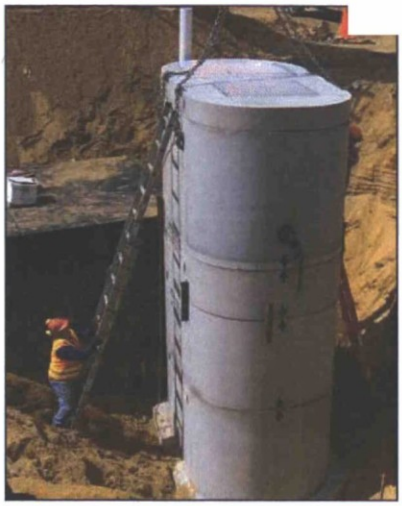
PLANNER

Turn-key package or with pre-assembled components including pumps, piping, wiring, and controls

Rounded Corner Pump Stations with Integral Valve Vault

Table of Contents

Product Overview

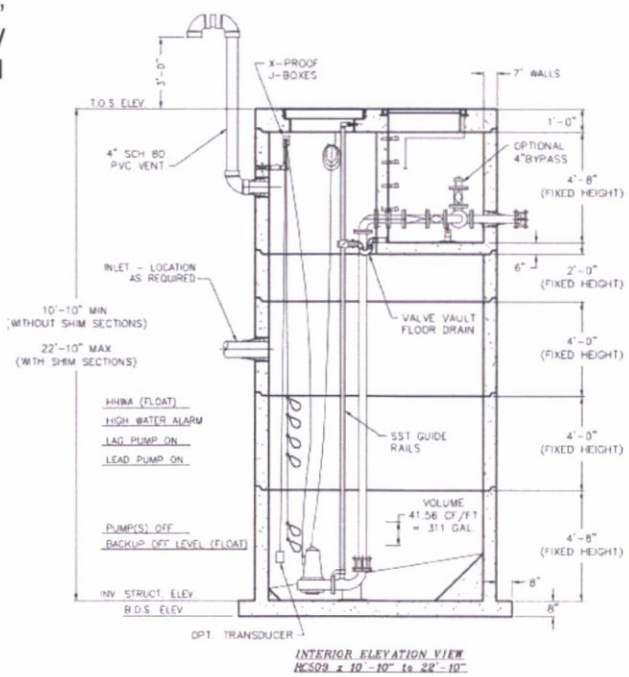


The RC509/611 pump station product is designed as a "stockable" structure with a unique oval shape and integral valve vault. It offers standard mechanical equipment, select options, and repeatable design. This product design has proven to be a cost-effective method of providing a high-quality product to the customer with rapid and reliable delivery.

Advantages

The RC509/611 pump station, with integral valve vault, is designed and produced specifically to provide the following advantages:

- Single structure, with integral valve vault.
  - o Valve vault cast within the structure; in normally unused area.
  - o Single structure means no differential settlement.
  - o Small footprint for tight sites.
- Standard and stockable structural sections; base, shims, valve vault and covers.
  - o Available as standard stock for quick delivery.
- Standard structural design (PE stamped), with standard components.
  - o Speedy budget estimates and quotations.
  - o Fast and accurate submittals.
- Select options to meet a majority of your project needs – see listings to follow in this brochure.
- Factory pre-assembled.
  - o All piping, valves, accessories and options are pre-assembled in our factory to ensure all piping, valves, accessories, and options are alignment and fit. Only vertical piping that crosses precast joints is removed for shipment.
- Quick site installation and cost savings.
  - o One small excavation to a single structural base elevation.
  - o Because of the factory pre-assembly, most structural installations are performed in only a couple of hours.
  - o Minimizes excavation open time and costly de-watering.
- Proven quality and repeatable design.
  - o Ready for your project without the need for design or re-design.
  - o Rapid project cycle.
  - o Consistent high level of quality derived from repeatable production.
- Comparable cost to the conventional 2-structure custom designed and built stations.



INTERIOR ELEVATION VIEW RC509 x 10'-10" to 22'-10"

Budget Savings

Proven Design Means Project Cost Savings

Oldcastle Precast has designed and refined this standard "stockable" pump station product, with integral valve vault, since 2006. We provide a quality pump station solution that is well accepted as a turn-key component for government, municipal, and private projects.. Oldcastle Precast's standard pump station vault has proven to save on design/engineering costs, product submittal/approval costs, site installation time/costs, as well as product purchase costs.

Eliminate Extras During On-site Construction

Oldcastle Precast provides the RC509/611 package pump station pre-assembled from the factory, to eliminate costly site labor and time-consuming site alterations. The pump station is installed in a matter of hours and backfilling usually occurs the same day. When de-watering is a site issue, this costly and tedious operation can be considerably lessened because the excavation open time is reduced.

Site Safety

The rapid installation of the pre-assembled RC509/611 package pump station also reduces the risk of on site injury by minimizing the amount of time that the hazardous excavation is open, which in most cases is a fraction of a day. In addition, the interior pre-assembled components package eliminates most of the confined space structure entry that would come from site-constructed products.

Schedule Savings

The RC509/611 standard pump station product is designed to save schedule time as follows:

- standard budget and quote pricing,
- standard drawings and cut sheets,
- "stockable" structural and mechanical components, and
- quicker manufacturing assembly due to product repetition.

This Oldcastle Precast product model has proven to save significant scheduling time on projects compared to conventional custom pump stations. In most cases weeks or even months can be saved.

Site Constraints and Excavation Savings

The RC509/611 pump station has an inherently smaller footprint when tight-site conditions are encountered. The unique single structure design also eliminates added costs for larger and step-elevation excavations.

When You Select An Oldcastle Precast Concrete Pump Station

- ***You reduce the project schedule time line.***
- ***You prevent scheduling conflicts.***
- ***You save cost on product and installation.***
- ***You receive a proven quality product.***
- ***You save space on your project site.***
- ***You reduce the time of open excavation and de-watering.***
- ***You receive turn-key system responsibility.***
- ***You can count on the quality and reputation of Oldcastle Precast.***

Turnkey Solution

Oldcastle Precast is long-known for its Turnkey solution products. This standard pump station is no exception. When the RC509/611 station is required on your project, you can rest assured that the pump station will be supplied with all of the equipment and services that you have come to depend on from Oldcastle Precast. Industry leading engineering, design assistance, budgeting, factory assembly, site services and product warranty are all part of our turnkey solution.

Oldcastle Precast's reputation and company values have been built on a strong foundation, and they will be there for you in the future.

Product Warranty

Warranty on all components is Standard 1-year warranty from site start-up or 15-months from factory completion, whichever occurs first.

Add the Value of Oldcastle Precast

For over 60 years, Oldcastle Precast has provided first-quality, high-performance, cost-effective products and service to the water and wastewater industry.

When you choose Oldcastle Precast you can be sure of continuous, dependable service from a global leader.

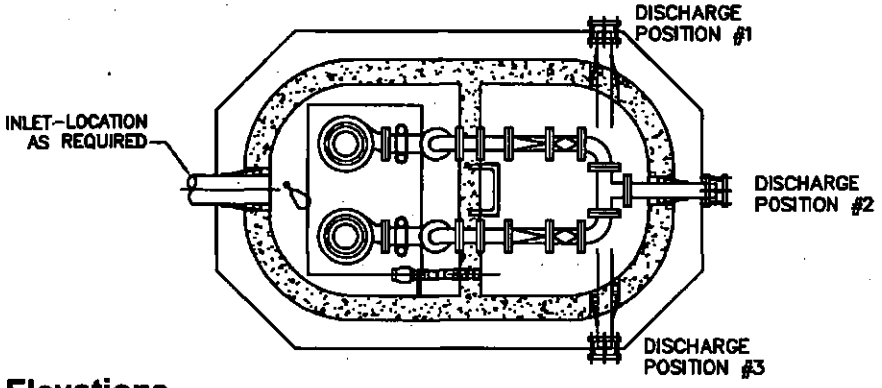
Safe and Sure Delivery

To ensure that your Pump Station arrives on schedule, our transportation department carefully reviews each state's weight and dimensional restrictions, along with permit requirements. Each Pump Station also includes cast-in-place lifting points to facilitate off-loading and positioning.

Planning Your Oldcastle Precast Pump Station

Layout

The RC509/611 pump station is very versatile when it comes to inlet and discharge layout. The inlet(s) can enter the station anywhere around the perimeter of the station. Cored openings, with manhole boots, are typically factory located and installed, unless, the opening spans or opening becomes critically close to the structural joints; in such a case, site coring after erection is required by the site contractor. The common discharge location from the valve vault can be selected in: Position #1, #2 or #3.



Elevations

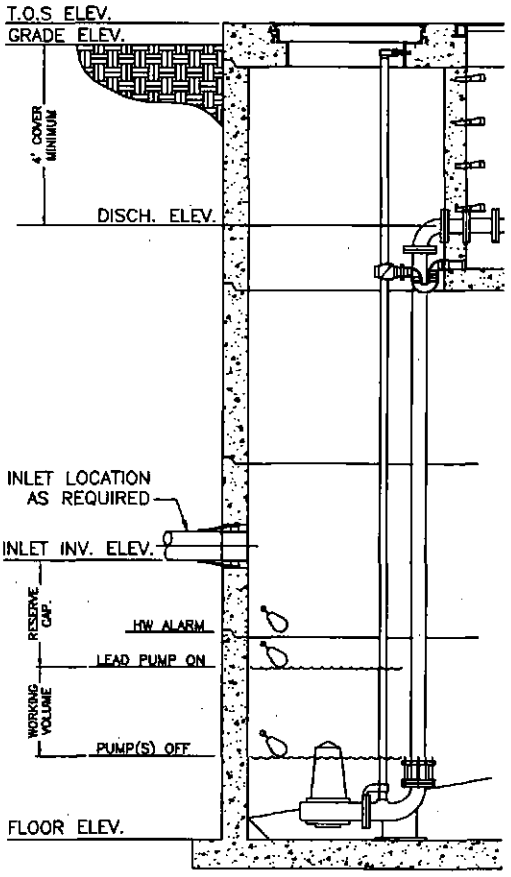
Critical pump station elevations are "Top of Structure" (TOS), grade elevation, inlet invert elevation, floor elevation of structure and discharge elevation.

TOS is usually set at grade elevation or at least 6" above grade elevation. When TOS is set at grade elevation, the H20 structural loading and hatches should be strongly considered, especially if accidental vehicle wheel loading can be foreseen. Typically, when the TOS is set 6" above grade, 300# pedestrian structural loading and hatches are utilized.

The inlet invert elevation is always site-dependent, where elevation is determined with a minimum slope to the pipe for gravity drainage, to the point where it intersects and drains into the pump station. The station inlet is the most critical and determining portion of this process. Elevation above the inlet is considered unusable space. Portions of the station space below the inlet invert are considered to be the "working volume" of the station and, as such, sets the minimum depth of the station.

Floor elevation for the RC509/611 pump station and the station's total eventual height is determined by the lowest inlet invert elevation, the systems reserve and working volume, and the TOS. Once the inlet invert, reserve and working volume is determined, based on volume/ft. values for the RC509/611, a minimum floor elevation of the pump station can be calculated. Compare the distance from the calculated minimum floor elevation to the TOS, evaluate this distance against the standard heights provided with the RC509/611 product line and increase that distance to the next closest available height (10'-10" to 22'-10" standard). The new floor elevation will be your TOS minus the standard pump station height selected.

Discharge elevation from the RC509/611 is usually a minimum of 4' below grade, even when the TOS is set 6" above grade. Should deeper common discharge elevation be required, optional valve vault riser sections (2' & 4') can be added to produce additional earth cover. Optional valve vault riser sections are discussed in structural options.



Cover Loading

It is important to consider hatch loading as it does affect the selection of the structural design for proper support. The pump station cover and hatch loading can be selected as: 300# pedestrian loading or H20 occasional vehicle loading. If the TOS is flush with grade, then H20 occasional vehicle loading should be strongly considered.

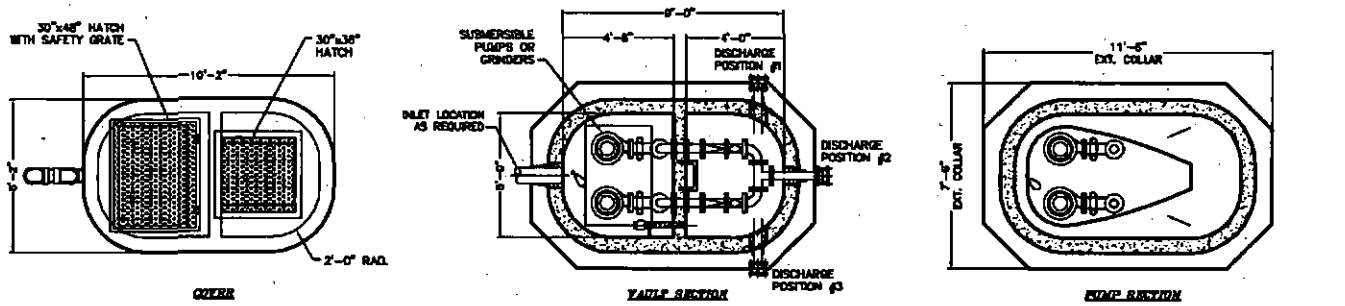
System Design Flows & On-Site Power Availability

Although this brochure does not go into detail about pump section and system controls, it will be important to convey the following information to assist in selecting the proper size station and components:

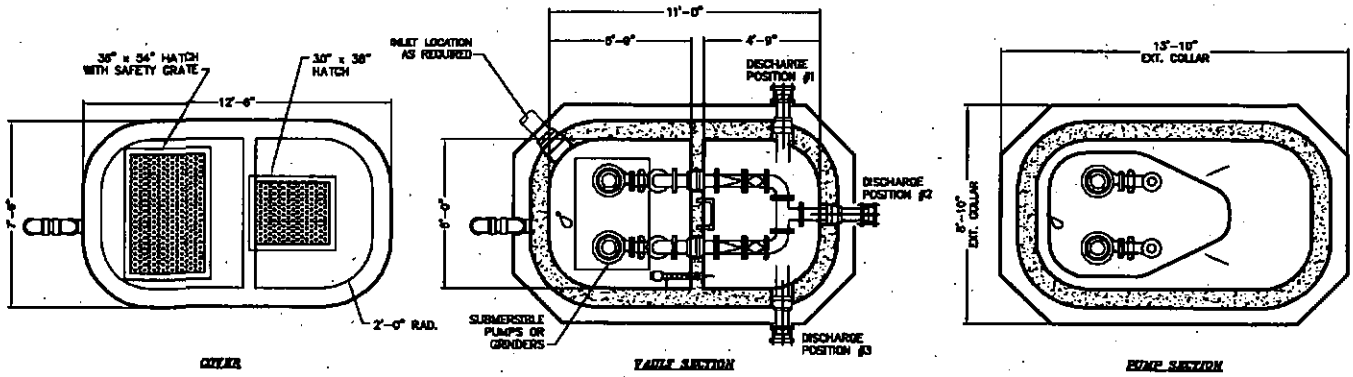
- System design flow rate and TDH.
  - o System design flow rate will determine the interior piping/valve size and force main size.
- Available site power (voltage and phase).
  - o This is critical information that is required for pump and control selection.

Should you require assistance in sizing your pumps for the system, or determining system controls, please contact Oldcastle Precast or one of our local product distributors in your area.

PLAN VIEW DIMENSIONS & STATION CAPACITIES



RC509 PLAN VIEWS



RC611 PLAN VIEWS

Model Number	Interior Width	Interior Length	Min/Max Height ** (T.O.S. to Floor)	Wall Thickness	Floor Thickness	Roof Thickness	Volume (gal/vertical foot)	Standard DI Piping & Discharge Size*	Replaces Conventional Pump Stations
RC509	5'-0"	9'-0"	10'-10" / 22'-10"	7"	8"	12"	310 gal	4"	6' Diameter & 8' Diameter
RC611	6'-0"	11'-0"	10'-10" / 22'-10"	9"	8"	12"	466 gal	6"	8' Diameter & 10' Diameter

* Consult factory for optional pipe size and material available. ** Consult Factory for Additional Structure Height

Product Component Information & Options

STRUCTURAL

Standard Structural Design Requirements

- Structural design calculations for the RC509/611 Pump Station with Integral Valve Vault will be prepared and stamped by a registered professional engineer in the project state, and will be submitted for approval prior to fabrication or for record purposes as project time allows.
- Precast concrete sections will conform to the latest requirements of ACI 350.
- The structural design will take into account discontinuities in the structure produced by the openings.
- The precast pump station with integral valve vault has been designed to support its own weight as well as the minimum superimposed loads tabulated below. All additional equipment will be accounted for in the design of the elements.

    o Pump Station with Integral Valve Vault.

    (i) Top Slab,
    Live Load – AASHTO HS20,

    (ii) Floor Slab (valve vault & base),
    Live Load – 200 psf,

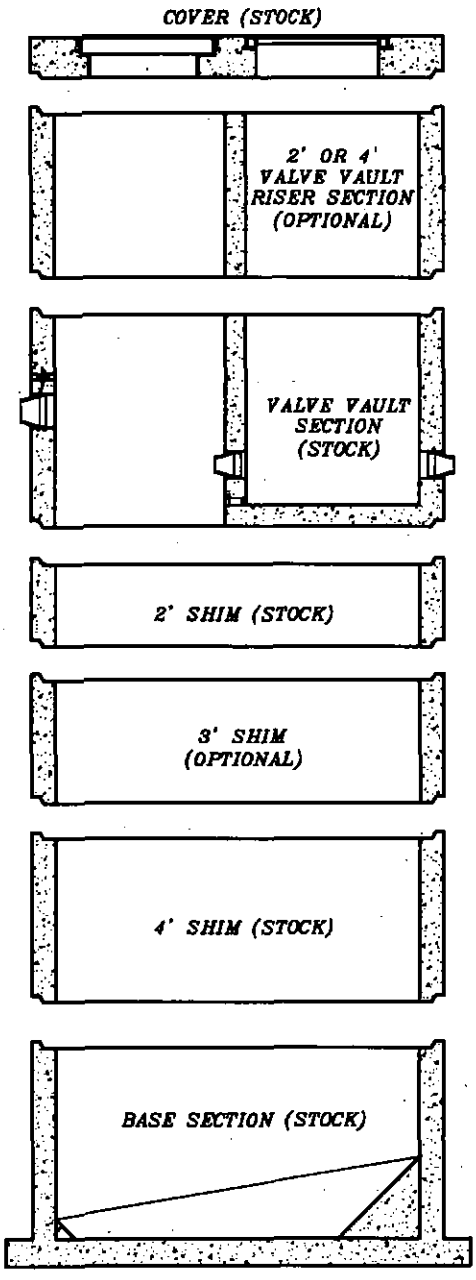
    (iii) Exterior Walls.
    All exterior walls below finished grade shall be designed for an equivalent fluid pressure of 90 psf per foot of depth caused by saturated earth pressure. The top of the pressure diagram is assumed to originate at finished grade. In addition to the soil pressure, a 2'-0" Live Load Surcharge shall be applied to a depth of 8'-0".

300# Pedestrian or H20 Cover Loading

As stated above; although all precast structural covers are designed for AASHTO HS20 Live Loading, hatches and subsequent hatch frame support must be selected for 300# loading or H20 occasional vehicle loading.

Buoyancy Footing Sizing

The structures have been designed to prevent flotation without requiring surface resistance or the weight of mechanical equipment, when the ground water level is at finished ground surface. The factor of safety against uplift calculated as a ratio of the total resisting force (excluding skin friction and the weight of the equipment) to the total hydrostatic uplift force, shall be at least 1.15. The net uplift force shall be transferred to the anti-buoyancy collar.



Stock Structural Components (standards)

Oldcastle Precast has pre-designed and manufactured standard structural components for the RC509/611 product line. The station base, 2' & 4' riser shims, integral valve vault section, and 300#/H20 covers with hatches are all stock components that are inventoried at our facility for ultimate cost savings and reduction in product assembly time. The use of stock structural components reduces the time frame required for project submittals. All stock structural components are designed and PE stamped for local final installation.

Optional Structural Components (non-stock)

Oldcastle Precast offers the following non-stock optional structural components, when special circumstances require. The following components, when used in the package, may increase the product delivery time by 2 to 3 weeks.

- 2' & 4' Integral valve vault extensions
- 3' Wet well shim

Joint Treatment and Sealing

The precast components will be fabricated on steel forms, with machined rings to form accurate bell and spigot joint surfaces, to ensure water-tightness. All horizontal joints between precast sections will be sealed with a vulcanized butyl rubber joint material conforming to AASHTO M-198. The joint material will be "Conseal CS-102" as manufactured by Concrete Sealants.

Optional Concrete Additives for Harsh Environments

A Crystalline Waterproofing Additive can be supplied when selected as a product option. The system shall cause the concrete to become sealed against the penetration of liquids from any direction and will protect the concrete, surface to surface, from deterioration due to harsh environmental conditions. The Waterproofing Additive offered is Xypex Admix C-100, as manufactured by XYPEX Chemical Corporation, Richmond, B.C., Canada. (Alternate product suppliers may be used at the manufacturers discretion)

Optional Exterior Waterproofing Coating

Although the RC509/611 pump station is warranted for water-tightness without exterior coatings or additives, Oldcastle Precast can offer the following damp proofing option (factory installed on all vertical below grade surfaces):

Karnak #83 AF Fibered Damp proofing asphalt compound, applied at the rate of 25 sf/gal. (Alternate product suppliers may be used at the manufacturers discretions)

Cored Opening with MH Boots for Pipe Penetrations

All pipe penetrations, for the RC509/611 product line, utilize cored openings with flexible manhole boots and stainless strap anchors. Pipe penetrations include: inlet(s), discharge piping from pumps and common discharge, exiting the station and station venting.

ACCESS EQUIPMENT

Aluminum Access Hatches

Pre-determined aluminum hatch sizes have been selected for the RC509/611 product line, and all precast covers with hatch embeds have been structurally designed for these sizes. The sizes have been selected for the maximum equipment expectations, and the factory should be consulted if any clearance questions arise. Hatch loading designations can be ordered for 300# pedestrian loading or H20 for occasional vehicle wheel loading. H20 aluminum hatches offered are not designed for continuous traffic loading. The hatches offered are equipped with the following features:

- The wet well side of the pump station is equipped with an angle frame and skit to full precast cover height, tar coated where aluminum comes in contact with precast, slam lock and removable key operator, recessed padlock hasp, lift assist, and OSHA safety grate that is permanently attached to the hatchway inner frame, hinged and lockable. Wet well nominal hatch opening sizes are:
    - 30" x 48" (RC509)
    - 36" x 54" (RC611)
- The valve vault side of the pump station is equipped with channel frame and skit to full precast cover height, tar coated where aluminum comes in contact with precast, slam lock and removable key operator, recessed padlock hasp and lift assist. The Valve Vault nominal hatch opening is as follows:
    - 30" x 36" (RC509 & RC611)

Aluminum Wall Mounted Valve Vault Access Ladder

The valve vault access ladder supplied, with the RC509/611 product line, is aluminum, wall-mounted and is properly sized to meet OSHA Standard 1910.27.

- Optional - An aluminum ladder-up, access-assist assembly can be supplied when selected.

DISCHARGE PIPING & RELATED OPTIONS

Piping and Valves

The RC509/611 product allows for a variety of piping, valve sizing and materials. The RC509 product can house piping and valve sizing up to 4 inches and the RC611 product can house piping valve sizing up to 6 inches.

Piping, valve sizing and material varieties are as follows:

- 2" PVC piping & valves to 2" PVC common force main (FM) discharge.
- 3" PVC piping & valves to 3" PVC common FM discharge.
- 3" DI discharge piping and valves to 3" DI common FM discharge.
- 4" DI discharge piping and valves to 4" DI common FM discharge.
- 6" DI discharge piping and valves to 6" DI common FM discharge. (only for RC611)

Galvanized Floor-Mounted Adjustable Pipe Supports in Valve Vault

Adjustable, floor-mount, galvanized pipe stands are supplied with the RC509/611 product line and will support piping in the middle of the vault. Standard aluminum wall mount support brackets with stainless U-bolts are supplied in 3 locations where piping penetrations enter and exit the vault area.

- Optional - Stainless floor mounted supports can be supplied when selected.

Stainless Wet Well Pipe Supports

Vertical discharge piping, from the pump base elbows, will be additionally supported to the wet well structure in intermediate locations utilizing stainless structural angles and stainless U-bolts where standard station heights exceed 15'-10".

Flange Gaskets and Stainless Hardware

Oldcastle Precast utilizes Toruseal -- ribbed, full faced black rubber flange gaskets for a drip-tight pressurized flange seal. Toruseal gaskets meet the "specially designed" gasket designation found in AWWA sections C110, C11 and C15. All flange bolting hardware throughout the pump station and valve vault shall be supplied 18-8 stainless steel.

Bypass Piping and Valve Options

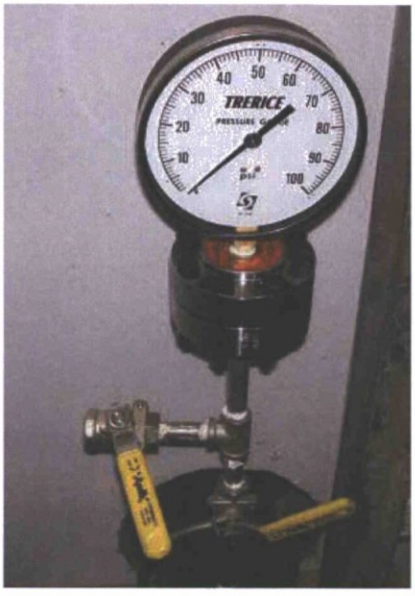
The bypass piping and valve option can be utilized when it is foreseeable that both pump station submersible pumps may be out of commission at the same time and temporary portable bypass piping equipment would be employed to collect from the pump station working volume area and discharge into the dedicated bypass force main option provided. This scenario, although unlikely, may also be required by the local municipal authority for back-up emergencies.

Bypass piping size and material options are as follows:

- 2" PVC & 3" PVC
- 3" & 4" DI

  Note: Bypass piping option not available for 3" DIP in discharge position #2 only

Stainless Pump Removal Guide Rail Assembly (standard)



All RC509/611 pump stations are supplied with stainless pump removal guide rail systems. The guide rails, appropriately sized for the pumps (3/4" -2"dia.), extend from the pump base elbows to the stainless upper guide brackets in the hatchway area. The guide rails will be of the material: 304 stainless, Sch40 and will be supported at intermediate locations with stainless brackets, as dictated by the pump manufacturer.

The pump guide rail system is designed to easily allow the submersible pumps to be removed from the pump station via a lifting chain, or cable at grade elevation, and allow all pump service to be performed from outside of the station.

Discharge Gauge Assembly Option

This option can be selected for factory installation of a pressure discharge gauge and related accessories on each pump discharge line as it enters the valve vault (set of 2 gauges total). The discharge pressure gauges will allow the owner to accurately assess down-stream force main pressure conditions and test pumping conditions with select discharge isolation valves. The discharge gauge assembly components consist of: discharge pipe saddle, ½" brass piping and isolation/ bleed-off ball valves, gauge seal fitting and liquid filled pressure gauge with 0-30, 60, 100psi gauge range readout as best meets pump and system requirements.

Standard CI Flanged Plug Valves- 3", 4" & 6"

Oldcastle Precast stocks and supplies: 3", 4" and 6" pump isolation plug valves with non-lubricated eccentric type plugs and provides a minimum port opening of 80% in order to assure minimum turbulence and minimum pressure drop. Valves are rated for 175psi working pressure and cast of ASTM A126 Class B cast iron. Valve flanges meet ANSI B16.1, Class 125 flange specifications. Valves will have a balanced plug, coated with Buna-N (Neoprene) resilient seating surfaces to mate with the body seat. All plug valves will be supplied with lever operators and shall be epoxy coated, with standard color and materials as supplied by the valve manufacturer.

Standard L&W Flanged Check Valves- 3", 4" & 6"

Oldcastle Precast stocks and supplies: 3", 4" and 6" system check valves that are full opening swing type, all iron body, bronze seat and have a resilient disc. The check valve complies with AWWA Standard C-508 latest revision and flanges meet ANSI B16.1, Class 125 flange specifications. The stock check valve is supplied with adjustable outside lever and weight (L&W), and is epoxy coated, with standard color and materials as supplied by the valve manufacturer.

- Optional - lever and air cushion check valves with L&W can be supplied when selected.

DI Pipe and Fittings- 3", 4" & 6"

Piping and fittings supplied with the RC509/611 pump station will be ductile iron class 53 of sizes as shown. The standard pipe and fittings will be cement lined to the thickness as specified ANSI A26.51 and ANSI A21.4 and shall be interior /exterior asphalt seal coated by the pipe manufacturer.

- Optional – the piping and fittings can be factory Coal-tar epoxy coated when selected.
- Optional – the piping and fittings can be factory epoxy Hi-Build Epoxoline (Tnemec N-69)coated when selected (Standard available color determined by owner or engineer).

Station Wet Well 4" Passive Vent

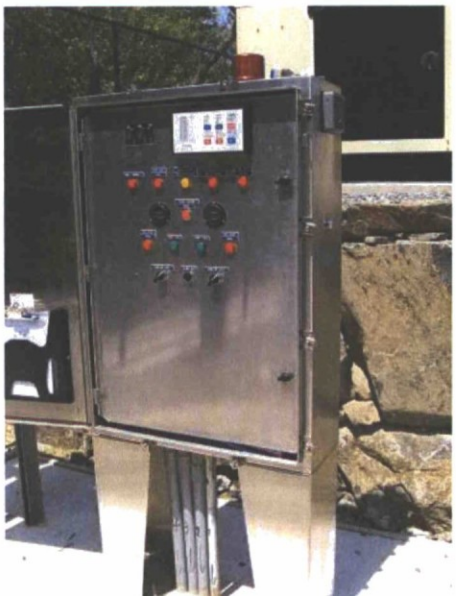
The RC509/611 product line offers a standard 4 inch passive wet well vent assembly fashioned from Sch80 PVC piping and fittings. The standard vent will end with a goose-neck downward tuning outlet and stainless steel insect screen, approximately 3 feet above the TOS elevation. Standard venting offered will be factory assembled and side mounted to the exterior of the station then removed and shipped loose to the job site for field installation.

Should vent piping run underground elsewhere on the site, a cored opening with manhole boot will be supplied below grade for customer use when site-venting is installed by others.

- Optional – 4"Carbon canister with carbon refill con be offered (vs. gooseneck and insect screen) when selected.
- Optional – opening and MH boot only below grade (no venting materials supplied), for vent piping by others.

Junction Boxes and Control Panel Placement (options)

Interior Junction Boxes (when selected): The standard RC509/611 is most often supplied with interior junction boxes for the pump power/control cable(s) and the level control float cables (when used). In these cases the control panel is typically remote-mounted elsewhere; adjacent to the station or within a nearby weatherproof structure/facility. The conduits and conductors between the pump control panel and the junction boxes inside the station are to be field supplied and installed by others. The standard pump power/control cable junction box is Nema 7 explosion-proof, and the float cable box (when used) is Polypropylene (intrinsically safe). Interior: junction boxes, RGS conduit, and stainless supports are supplied with this offering. Final wiring and exterior conduit and seal fittings by others.



When a level transducer is used, the cable is to run uncut to the control panel, and as such no junction box is required.

Exterior Junction Box (when selected): The standard RC509/611 can be offered with an exterior Nema 4X junction box with divided interior for power and control voltages. In this case, the junction box is mounted to the exterior of the station approx. 2' above TOS. The conduits and conductors between the pump control panel and the exterior junction box are to be field supplied and installed by others. Exterior: junction box, RGS conduit & seal-offs between j-box and station, and stainless supports are supplied with this offering. Final wiring and filling of conduit seals by others. When level transducer is used, the cable is to run uncut to the control panel, and as such will not be routed through the exterior junction box.

Junction Boxes and Control Panel Placement (options) *continued*

Float Junction Box only (when selected): It may be determined as a matter of preference that pump junction boxes are not required, and pump cables will be run uncut to the control panel, no matter the location of the PCP. In these cases float j-boxes are usually required alone. Interior: intrinsically safe float junction box, RGS conduit, and stainless supports are supplied with this offering. Final wiring and exterior conduit and seal fittings done by others.

Control Panel Factory Mounted to Pump Station (when selected): with this option the pump control panel can be mounted to the exterior of the station approx. 2'-6" above TOS. The connecting RGS conduit, external seal-off fittings and stainless unistrut framework support between the control panel and the pump station are all included.

With this option selected, the following equipment and tasks shall be clarified:

- o After factory mounting and conduit work; the control panel/supports and conduit shall be disassembled at the conduit unions and at the support-mounting locations to allow control panel to be shipped separately (due to trucking height restrictions). Minimal reassembly effort will be required on site by others.
- o Final wiring and filling of conduit seals: pumps to control panel & level devices to control panel by others.
- o All interior junction boxes, RGS conduit, seal-offs and supports are not required or offered with this option.

Level Control Devices (supplied with pump control panel)

The pump control panel will be supplied with floats, or submersible transducer, or a combination of both. The level control devices and operation is usually dictated by the owner/engineer or the local municipality. When multiple floats for primary operation are required (4-5 floats), Oldcastle Precast will provide a stainless chain tree and weight assembly for standard float positioning. The stainless chain and weight assembly with attached floats will hang from a support in the hatchway for easy access and removal for adjustment outside of the station.

When a transducer is required (primary control), with only 2 floats for emergency conditions; then the transducer cable and each float cable are suspended individually from supports inside the hatchway for easy access.

- Standard – 4 or 5 float primary operation with stainless chain tree and weight assembly
- Optional – Primary level transducer with 2 float emergency back-up
- Optional - Primary level transducer with 4 or 5 float secondary operation (or visa-versa)
    - o Note: floats and transducers are supplied with the pump control panel, and as such; site mounting and wiring is expected to be performed by others, unless specifically arranged otherwise.

Removable Aluminum Trash Basket and Rail Assembly – Option

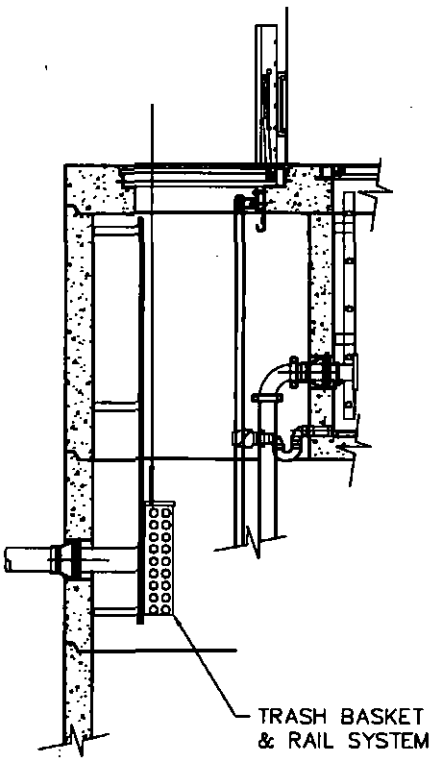
The RC509/611 pump station can be supplied with a trash basket straining system mounted on an aluminum rail guide system for easy extraction from grade elevation; similar to the pumps. Because the wet well hatch is set in size and location, there should be circumstances to consider with this option:

1. The inlet pipe to the station should come in the end-wall, perpendicular and in the center; this will position the interior basket centralized to the wet well hatch above.

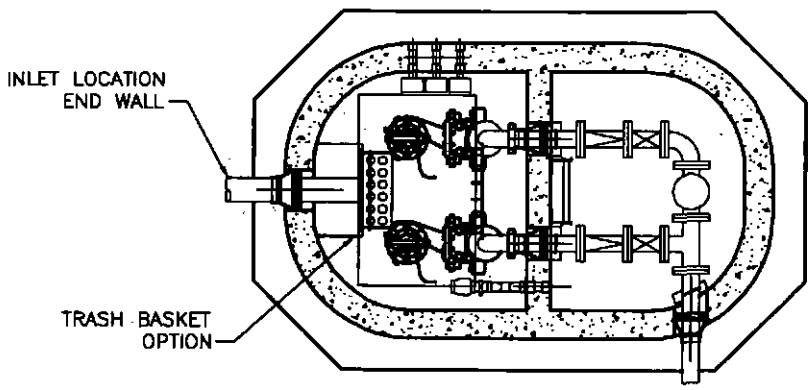
2. It should be noted that based on the pumping equipment size, the basket sitting above the pumps may interfere with the pump removal when required, and as such the basket may have to be removed first, prior to any pump removal.

- Basket construction: the trash basket can be offered with a low-flow, light-weight, thinner profile and perforated holes, or with higher flow, larger profile, heavy-duty bar screen construction.

- Optional – Stainless construction. The trash basket and rail system can be offered with stainless steel materials when selected.



ELEVATION



PLAN

Product Delivery

Before You Begin

Three issues must be addressed to ensure the successful, cost effective delivery of your prefabricated Pump Station.

1. Transportation
2. Off-loading
3. Site Access

1. Transportation

The RC509/611 pump stations have been designed with narrow dimensions to transport them, without the need for wide load permits. Devoid of permit restrictions; site delivery schedules can usually be met without compromise.

Once the station is complete and ready for shipment, an Oldcastle Precast representative will contact the site contractor with specific questions and details to make delivery and site access as seamless as possible. In most cases Oldcastle Precast trucking can be scheduled for early morning delivery times, and must be coordinated with the setting crane equipment through the site contractor.

All RC509/611 factory installed equipment, unless otherwise noted, will remain in the precast sections for transport to the site. All Oldcastle Precast transportation equipment and operators fully comply with insurance institute and on-site safety guidelines.

Maximum standard transportation width is 8'-8"W, and maximum transportation height (on the trailer) is 11'-3"H.

2. Off-loading

By design, Oldcastle Precast RC509/611 pump stations feature a four-point lifting configuration which utilizes (4) 8 ton Burke clamshell lifting toggles. Oldcastle Precast will provide the lifting toggles with the Oldcastle Precast truck driver, who is responsible to return the loaned lifting equipment to the Oldcastle Precast facility after the final piece is set that day. The setting equipment company (as arranged by the site contractor) is responsible for providing (1) 4 hook lifting cable x 20' long, rated for a minimum picking weight of 17 tons. Oldcastle Precast pump station structural weights will range from 17 tons (base or vault/cover sections) to 2.5 tons (smallest station riser section).

It is anticipated that the pump station sections will be off-loaded from the delivery truck and into the final excavation. Specialty lifting equipment cannot be left on site for future product placement, unless prior arrangements are made with Oldcastle Precast.

3. Site Access

To ensure a successful delivery, attention must be given to narrow roads, bridge restrictions, small site entries, inadequate turnarounds, steep inclines, soft surfaces, overhead obstructions (cables, trees, bridges), and crane accessibility.

About Your Company

Company Name: _____

Street Address: _____

City, State, Zip Code: _____

Your Name: _____ Title: _____

Business Telephone: ( ) _____ Fax: ( ) _____

Cell Phone Number: ( ) _____ E-mail: _____

Technical Contact for Your Company: _____

About the End User (if applicable)

Customer Name: _____

Project Name: _____

Application: (sewage,drainage,water) _____

Site Street Address: _____

City, State, Zip Code: _____

Business Telephone: ( ) _____ Fax: ( ) _____

Cell Phone Number: ( ) _____ E-mail: _____

Project Stage & Timeline

☐ Planning ☐ Design ☐ Emergency Replacement

Approximate Design Deadline: Month/Year: _____

Approximate Bidding Date: Month/Year: _____

Aproximate Installation Date: Month / Year: _____

Please Read Before You Begin

Complete the information on this page about your company, the site(s) for which you are planning a Pump Station installation, and the individuals who should be contacted if additional technical information is required. Then, starting with Item 1 (Structural Options) on page 7, fill in the quantity for each item you need in your Pump Station design. Refer to Product Information Section 3 for product descriptions.

For a firm quotation, send digital copies of your completed worksheets and sketch to:

e-mail to: ken.pasco@oldcastle.com

If you need assistance, call our product line staff at:(888) 965-3227

or visit : www.oldcastleprecast.com/pumpstations/

Now You're Ready To Begin!

Pumping System Design Form

Top of pump station structure elevation (TOS):_____ Ft

Grade elevation: _____ Ft

Inlet invert elevation(s): _____ Ft, **Inlet size(s):** _____ Inch

_____ _____

_____ _____

Pump station discharge invert elevation (if critical) _____ Ft (standard 4' below grade min)

- **(Known Pumping Requirements)**

Required pump performance (if known): _____GPM @ _____ Ft TDH

Pump power requirements _____ (volts, phase)

- **(Pump Sizing Information Requirements)**

Average daily flow _____ GPD

(ex: 200 Homes * 3.5 people/home * 100 gal per person per day = 70,000 gal per day)

Storage capacity (if required) _____ gal

(i.e. volume required between working volume and lowest inlet invert)

Force main length from pump station discharge to outflow _____ Ft

Force main difference in elevation from pump station discharge to outflow _____ Ft

Force main pipe: Size _____ inch, Material _____

(CI, DI, PVC Sch__, SDR___)

Force main outflow pressure(s) _____ psi, _____psi, _____ psi

(ex: 0-psi if outflow drop in gravity MH)

Pump power requirements _____ (volts, phase)

Pump Station Design and Option Selection Form

Select Standard Pump Station Size

☐ RC509 ☐ RC611

Select Standard Pump Station Height (stock components)

☐ 10'-10" (base, valve vault section and cover)

☐ 12'-10"

☐ 13'-10"

☐ 14'-10"

☐ 15'-10"

☐ 16'-10"

☐ 17'-10"

☐ 18'-10"

☐ 19'-10"

☐ 20'-10"

☐ 21'-10"

☐ 22'-10" (Maximum Structural Height)

Optional Structural Components

☐ 2' valve vault riser (non-stock) – overall interior VV height 6'-8"

☐ 4' valve vault riser (non-stock) – overall interior VV height 8'-8"

☐ 3' wet well riser (non-stock)

Optional Concrete Treatments

☐ Concrete admixture for Hydrogen Sulfide protection

☐ Exterior dampproofing treatment (vertical below grade surfaces)

Hatch Load Rating

☐ 300# (pedestrian) ☐ H20 (occasional vehicle wheel load)

Optional Access Equipment

☐ Aluminum ladder-up

Description Planner Form pg-3

Discharge Piping Material and Orientation

- ☐ Discharge position #1 ☐ Discharge position #2 ☐ Discharge position #3
- ☐ 2" PVC piping & valves
- ☐ 3" PVC piping & valves
- ☐ 3" DI piping and CI valves
- ☐ 4" DI piping and CI valves
- ☐ 6" DI piping and CI valves (only in RC611 structure)

DI Pipe & Fitting Coatings (PVC not coated)

- ☐ Asphalt coated – manufacture supplied (standard)
- ☐ Coal-tar epoxy finish coat
- ☐ Tnemec N69 Hi-Build Epoxoline finish coat

Optional Check Valve Selection

- ☐ Check valve – air cushion (optional)

Floor Stand Pipe Supports in Valve Vault

- ☐ Galvanized (standard) ☐ Stainless (optional)

Optional Bypass Connection (piping, isolation valve & quick connect)

- ☐ 2" PVC Bypass
- ☐ 3" PVC Bypass
- ☐ 3" DI Bypass (not available with Position #2 discharge)
- ☐ 4" DI Bypass (Offered on 4" and 6" DIP)

Optional Discharge Pressure Gauges

- ☐ None required ☐ 0-15 psi ☐ 0-30 psi ☐ 0- 60psi ☐ 0- 100psi ☐ Unknown

Guide Rail Sizing for Pumps (if known)

- ☐ 2" ☐ 1 ½" ☐ 1" ☐ ¾" ☐ Unknown size

Passive Station Venting

- ☐ 4" PVC Gooseneck with stainless insect screen attached to station (standard)
- ☐ 4" PVC with carbon odor control canister attached to station (optional)
- ☐ Opening with manhole boot for site venting by others (optional)

Description Planner Form pg-4

Control Panel Placement

☐ Shipped loose (standard) ☐ Mounted to station (optional)

Junction Box Location (pumps and intrinsically safe float cable j-boxes)

☐ All interior (X-proof Nema 7 pump j-boxes) ☐ All exterior Nema 4X ☐ Int. float j-box only

☐ None (PCP mounted to station or otherwise)

Level Control

☐ Floats (standard) ☐ Transducer w/emerg. Floats ☐ Transducer w/back-up floats

Trash Basket Option

☐ Perforated screen ☐ Bar rack

Materials: ☐ Aluminum ☐ Stainless steel

Stainless Portable Hoist Option

☐ 300# (optional) ☐ 1000# (optional)

Precast Concrete Pump Stations

Oldcastle Precast

Oldcastle Precast is the leading manufacturer of precast concrete, polymer concrete, and plastic products in the United States. With a nationwide network of facilities, our products are always close at hand. Our employees are committed to upholding core values of reliability, quality, and service in revolutionary ways. Our attention to detail exceeds the expectations of customers from some of the largest companies in the U.S., across a spectrum of industries.

Sales & Service
888-9 Oldcastle
(888-965-3227)

oldcastleprecast/pumpstation

StoryRock
Preliminary Engineering Report

Kimley»Horn

Project No : 191069013

Project Location : StoryRock Lift Station #3

Proj Manager : CAV-RANCH, LLC.

Project Description : Lift Station PER

BID ITEM NO.	ITEM DESCRIPTION	UNIT	Preliminary Engineering Report DATE: 10/14/16		
			TOTAL QTY	UNIT PRICE	AMOUNT
1	Wet Well	EA	1	$50,000.00	$50,000.00
2	Valve Pit	EA	1	$30,000.00	$30,000.00
3	Flygt NP 3127-HT3-262 Pump	EA	2	$16,500.00	$33,000.00
4	3.5" DIP Pipe	LF	70	$40.00	$2,800.00
5	3.5" Plug Valve	EA	2	$700.00	$1,400.00
6	3.5" Check Valve	EA	2	$500.00	$1,000.00
7	Gererac QT 15068KNAC Generator	EA	1	$40,000.00	$40,000.00
9	Square D 120/208 3Φ 4W Meter Section	EA	1	$3,494.00	$3,494.00
10	Square D 120/208 3Φ 4W EZ meter 400 Amp Terminal Box	EA	1	$3,517.70	$3,517.70
11	Generac HTS3R0200 (200 Amp 208V 3Φ 4-Pole) - Transfer Switch	EA	1	$11,986.80	$11,986.80
12	NEMA 3R Enclosure	EA	1	$3,568.60	$3,568.60
13	Panelboard Interior	EA	1	$8,023.60	$8,023.60
14	72"x72" 2 Door NEMA 4x Cabinet	EA	1	$24,086.00	$24,086.00
15	Square D 240V 7.5 HP Motor Starter	EA	2	$9,040.00	$18,080.00
16	IDEC 2 Pole Relay and Socket	EA	20	$76.00	$1,520.00
17	RACO Verbatim Autodialer	EA	1	$6,680.00	$6,680.00
18	Polysonics SX40 Flow Meter	EA	2	$3,300.00	$6,600.00
19	Siemens Hydro-ranger 200	EA	2	$5,959.20	$11,918.40
20	Door Contact - Cabinets	EA	2	$330.00	$660.00
21	Control Panel Fabrication Materials(Wire Duct, Panduit, Conductors)	EA	1	$9,400.00	$9,400.00
22	NEMA 4x Cabinet	EA	1	$9,000.00	$9,000.00
23	Associated Telemetry Equipment	EA	1	$6,000.00	$6,000.00
24	Panel Fabrication Materials(Wire Duct, Panduit, Conductors)	EA	1	$17,000.00	$17,000.00
25	1" Surface Mounted PVC Coated RMC for Lighting Design	LF	200	$25.40	$5,080.00
26	Junction Boxes	EA	8	$330.00	$2,640.00
27	#12 AWG Electrical Conductors	LF	675	$3.24	$2,187.00
28	#4/0 AWG Electrical Conductors	LF	250	$10.40	$2,600.00
29	Lighting Outdoor Rated Switch	EA	1	$167.20	$167.20
30	New APS Service	EA	1	$20,000.00	$20,000.00
31	Canopy Light	EA	3	$660.00	$1,980.00
32	Wall Pack Light	EA	4	$810.00	$3,240.00
33	3" Conduit Trench (Hand Dig)	LF	50	$400.00	$20,000.00
34	Install Service Entrance Panel	EA	1	$840.00	$840.00
35	Install Automatic Transfer Switch	EA	1	$840.00	$840.00
36	Install Pump Control Panel	EA	1	$1,680.00	$1,680.00
37	Comission and integrate PLC Panel	Hr	55	$200.00	$11,000.00
38	Install Distribution Panel	EA	1	$840.00	$840.00
39	Generator Install and Comissioning	EA	1	$3,200.00	$3,200.00
40	New Lighting System Startup Inspection	Hr	8	$100.00	$800.00
41	Slab on Grade with Housekeeping Pad	EA	1	$2,100.00	$2,100.00
42	Shade Structure	EA	1	$6,160.00	$6,160.00
43	Block Wall	LF	300	$45.00	$13,500.00