CITY OF SCOTTSDALE

Abbreviated Water and Sewer Needs

PRELIMINARY SEWER BASIS OF DESIGN REPORT

PRELIMINARY Basis of Design Report

- [x] **ACCEPTED**
- [ ] **ACCEPTED AS NOTED**
- [ ] **REVISE AND RESUBMIT**

CITY OF SCOTTSDALE
SCOTTSDALE WATER
9379 E San Salvador Dr.
Scottsdale, AZ 85258

Disclaimer: If accepted; the preliminary approval is granted under the condition that a final basis of design report will also be submitted for city review and approval (typically during the DR or PP case). The final report shall incorporate further water or sewer design and analysis requirements as defined in the city design standards and policy manual and address those items noted in the preliminary review comments (both separate and included herein). The final report shall be submitted and approved prior to the plan review submission.
For questions or clarifications contact the Water Resources Planning and Engineering Department at 480-312-5685.

BY scan **DATE** 5/26/2020

05/26/2020

Solitude

Southeast of Happy Valley Road and Pima Road
Scottsdale, Arizona

Prepared for:

Sonora West Development INC.
8937 East Bell Road
Suite 100
Scottsdale, Arizona 85260

Prepared by:

Kimley-Horn and Associates
1001 West Southern Avenue, Suite 131
Mesa, Arizona 85210
291203001
February 2020

17-ZN-2019
5/8/2020

PRELIMINARY
SEWER BASIS OF DESIGN REPORT

SOLITUDE

SOUTHEAST OF HAPPY VALLEY ROAD AND PIMA ROAD

SCOTTSDALE, ARIZONA

FEBRUARY 2020

Prepared By:

Kimley»Horn

17-ZN-2019
5/8/2020

Contents

Figures

Tables

Appendices

INTRODUCTION

SITE LOCATION

This Preliminary Sewer Basis of Design Report (SewerBOD) has been prepared for the proposed Solitude single family development located southeast of Happy Valley Road and Pima Road in Scottsdale, Arizona (development). The development is bound to the West by the 91st Street alignment, to the north by Happy Valley Road, to the south by undeveloped land, and to the west by the 92nd Street alignment. The development is located within Section 7 of Township 4 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. Refer to Figure 1 for the Vicinity Map.

PROJECT SIZE AND TYPE

The development is a proposed 17-unit single family residential subdivision. The proposed buildings are one-story units. The development is approximately 20 acres.

PURPOSE AND OBJECTIVES

This report presents the basis of design criteria that will be used for engineering design of the proposed development. This report establishes a preliminary sewer solution for the development of the site.

- Demonstrate compliance with the City's Design Standards & Polices Manual (DSPM).
- Identify a preliminary sewer system layout for the proposed development.
- Determination of the sewer demand generated by the development.
- Analysis of the capacity of the development's gravity sewer system.
- Proposed lift station location and force main sizing.

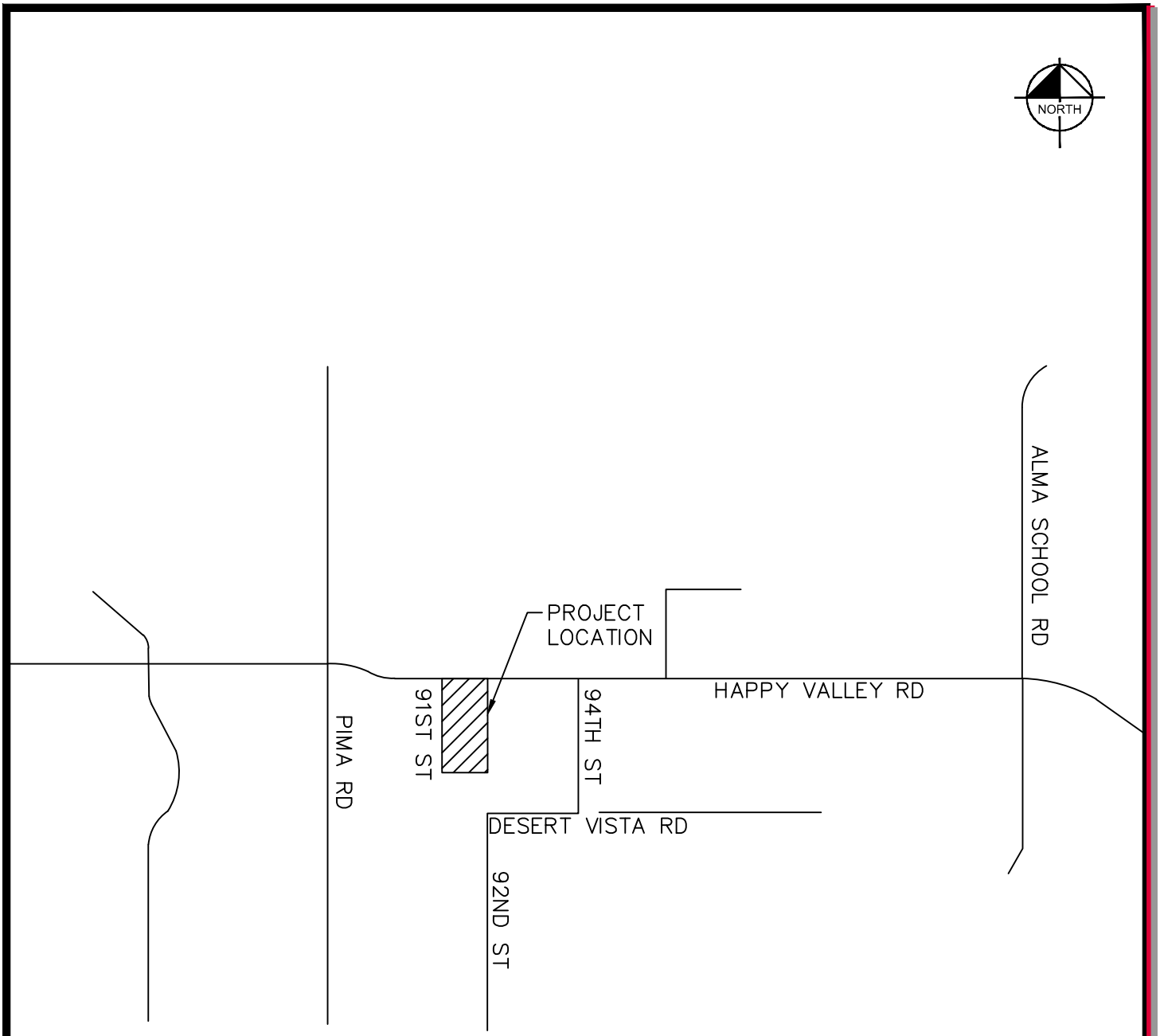


FIGURE 1
VICINITY MAP

Kimley»Horn

17-ZN-2019
5/8/2020

K:\EAV_Civil\291203001 - HV92\Reports\WaterBOD\Figures\V-MAP.dwg Sep 24, 2019 dan.recker
XREFS:

COLLECTION SYSTEM DESCRIPTION

EXISTING COLLECTION SYSTEM

The existing site is undeveloped natural desert and one existing residential lot. The site slopes consistently in the southwesterly direction across the site. Existing grade elevations on the site range from approximately 2125-2080. Based on a review of the City Quarter Section Maps, there is existing 8-inch sewer in Happy Valley Road routing flow west to Pima Road. Existing invert elevations of the 8-inch sewer in Happy Valley Road along the development frontage appear to range from 2096-2120+/- according to the City Quarter Section Maps. Additionally, there is an 8-inch sewer in the 92nd Street which appears to be a dry line and run south from the Whispering Wind alignment. The existing home is served by a septic system.

PROPOSED COLLECTION SYSTEM

On the western boarder of the proposed development is the HV91 development (CoS Plan Check #310-19). As a part of the HV91 project a lift station with a force main line connecting to the existing 8-inch sewer line in Happy Valley Road has been approved. The Lift station was anticipated to accommodate the flows from HV91 and future development. The wet well and forcemain can accommodate the additional flow. A larger pump will be installed to handle the increased flow. As apart of HV91 an 8-inch sewer stub will be installed at the western boundary of the proposed development, in the Whispering Wind alignment. A biofilter system will be designed and installed for the outfall of the force main system at Happy Valley Road.

The proposed development consists of 17 single family residential units. This development will be served by an 8-inch public sewer system within the private roadway tract and will connect to the 8-inch sewer stub installed with the HV91 system. From there flows will connect to the lift station described above. Refer to Figure 2 for the proposed sewer layout.

In addition to the installation of the proposed sewer system, the existing septic system will be removed from the site.

92ST STREET (ALIGNMENT)

HAPPY VALLEY ROAD

110' EX. ROW

EX. 8" SEWER TO REMAIN

PROJECT BOUNDRY

APN: 217-05-10E

APN: 217-05-10F

APN:

PROP. 8" SEWER, TYP.

40' PROP. TRACT

WHISPERING WIND DR

PROP 20' UTILITY ESMT.

CONNECT TO HV91 8" SEWER

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

HV91 IMPROVEMENTS
PER SEPARATE PLAN AND PERMIT
(#310-19)

8" SEWER PER HV91 IMPROVEMENT PLANS, TYP.

90TH WAY

FORCE MAIN PER HV91 IMPROVEMENT PLANS, TYP.

LIFT STATION PER HV91 IMPROVEMENT PLANS (310-19-1)

LEGEND

- S — EX. SEWER LINE
- S — PROP. SEWER LINE
- FM — FORCE MAIN PER HV91 IMPROVEMENT PLANS
- PROP. SEWER MANHOLE

NORTH

GRAPHIC SCALE IN FEET
0 75 150 300

NO.	REVISION	DATE

Kimley»Horn

1001 West Southern Avenue, Suite 131
Mesa, Arizona 85210 (480) 207-2666

SCALE (H): 1"=150'
SCALE (V): NONE
DESIGNED BY: TAF
DRAWN BY: DJR
CHECKED BY: JMB
DATE: SEP 2019

SOLITUDE
FINAL SEWER BOD
FIGURE 2 - SEWER SYSTEM LAYOUT
SCOTTSDALE, ARIZONA

PROJECT NO.
291903001

DRAWING NAME

17-ZN-2019

1 OF 1

5/8/2020

BASIS OF DESIGN

DESIGN CRITERIA

The design criteria for the development is based on the City of Scottsdale Design Standards and Policies Manual (DS&PM). Average daily demands and peaking factors for the various building uses were used to determine the existing and proposed peak flows generated on site. See Table 1 below for a summary of the design criteria used.

Table 1. Wastewater Design Criteria

WASTEWATER DESIGN CRITERIA			
Wastewater Demands			
Land Use	Average Daily Flow (gpd)		Peaking Factor
Residential	250	Per Unit	4
Wastewater Design Criteria			
Minimum Pipe Slope			
8-inch	0.52	%	
Full Flow Velocities			
Minimum	2.5	fps	
Maximum	10	fps	
Manning's Roughness Coefficient (n)	0.013		
Design d/D	0.65		

The proposed site generates a peak flow of approximately 17,000 gpd or 12 gpm. Additionally, a peak demand of 35pm is added to the lift station flow to account for swimming pool drainage. The previously approved lift station will serve flow from this development and HV91 for a total peak flow of approximately 59 gpm. A new pump has been selected to handle this flow, see Appendix B. See Table 2 below for a summary of the proposed flows generated with the proposed development. See Appendix C for the HV91 Lift Station Report.

Table 2. Wastewater Demand Calculations

Wastewater Demand Calculations						
Use	Units	Demand (gpd)	Average Daily Demand (gpd)	Peaking Factor	Peak Flow (gpd)	Peak Flow (gpm)
Solitude	17	250	4,250	4.0	17,000	12
HV91	17	250	4,250	4.0	17,000	12
Pool Drainage	-	-	-	-	50,400	35
Total to Lift Station					84,400	59

WASTEWATER SYSTEM ANALYSIS

To determine the capacity of the proposed wastewater collection system, the peak design flow was analyzed using the minimum design pipe slope. At the minimum design slope of 0.0052 ft/ft, an 8-inch line has the capacity to convey approximately 391 gpm. An 8-inch line at the minimum design slope can convey the proposed peak design flow from Solitude of 12 gpm at a normal depth of 0.08 or a d/D ratio of 0.13, at a velocity of 1.13 ft/s. An 8-inch line at the minimum design slope can convey the proposed combined peak design flow to the lift station of 59 gpm at a normal depth of 0.167 or a d/D ratio of 0.25, at a velocity of 1.74 ft/s.

The existing 2-inch forcemain conveys the pumped flor of 59 gpm at a velocity of 6 ft/s. See Appendix A for Flowmaster results.

CONCLUSION

The proposed development for Solitude results in a generated wastewater peak flow of 17,000 gallons per day. The proposed wastewater flow will be conveyed through a gravity sanitary sewer to connect with the HV91 sewer system. From there the combined peak flow of 84,400 gallons per day to a proposed lift station at the southwest corner of the adjacent property. From there, flow will be pumped back to the existing 8-inch gravity sewer in Happy Valley Road. Previous discussions with City staff has indicated that the existing gravity line in Happy Valley Road has capacity to serve the proposed development flows identified in this report. The scope of this BOD does not include analysis of the existing Happy Valley Road sewer system.

Appendix A – Flowmaster Calculations

Worksheet for 8" Sewer (min. slope)

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	8.0 in
Diameter	8.0 in
Discharge	0.87 cfs

Results	
Discharge	0.87 cfs
Normal Depth	8.0 in
Flow Area	0.3 ft²
Wetted Perimeter	2.1 ft
Hydraulic Radius	2.0 in
Top Width	0.00 ft
Critical Depth	5.3 in
Percent Full	100.0 %
Critical Slope	0.009 ft/ft
Velocity	2.50 ft/s
Velocity Head	0.10 ft
Specific Energy	0.76 ft
Froude Number	(N/A)
Maximum Discharge	0.94 cfs
Discharge Full	0.87 cfs
Slope Full	0.005 ft/ft
Flow Type	SubCritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	8.0 in
Critical Depth	5.3 in
Channel Slope	0.005 ft/ft
Critical Slope	0.009 ft/ft

Worksheet for 8" Sewer (Design)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Diameter	8.0 in
Discharge	0.03 cfs

Results	
Normal Depth	1.0 in
Flow Area	0.0 ft²
Wetted Perimeter	0.5 ft
Hydraulic Radius	0.6 in
Top Width	0.43 ft
Critical Depth	0.9 in
Percent Full	12.0 %
Critical Slope	0.007 ft/ft
Velocity	1.13 ft/s
Velocity Head	0.02 ft
Specific Energy	0.10 ft
Froude Number	0.849
Maximum Discharge	0.94 cfs
Discharge Full	0.87 cfs
Slope Full	0.000 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	12.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.0 in
Critical Depth	0.9 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for 8" Sewer (Combined Design)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.005	ft/ft
Diameter	8.0	in
Discharge	53.00	gal/min

Results		
Normal Depth	2.0	in
Flow Area	0.1	ft²
Wetted Perimeter	0.7	ft
Hydraulic Radius	1.2	in
Top Width	0.58	ft
Critical Depth	1.9	in
Percent Full	24.9	%
Critical Slope	0.007	ft/ft
Velocity	1.74	ft/s
Velocity Head	0.05	ft
Specific Energy	0.21	ft
Froude Number	0.897	
Maximum Discharge	420.70	gal/min
Discharge Full	391.09	gal/min
Slope Full	0.000	ft/ft
Flow Type	Subcritical	

GVF Input Data		
Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data		
Upstream Depth	0.0	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.0	%
Normal Depth Over Rise	12.0	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.0	in
Critical Depth	1.9	in
Channel Slope	0.005	ft/ft
Critical Slope	0.007	ft/ft

Worksheet for Force main

Project Description

Friction Method	Manning Formula
Solve For	Pressure at 1

Input Data

Pressure 2	0	psi
Elevation 1	2,070.00	ft
Elevation 2	2,105.00	ft
Length	1,200.0	ft
Roughness Coefficient	0.010	
Diameter	2.0	in
Discharge	59.00	gal/min

Results

Pressure 1	74	psi
Headloss	136.60	ft
Energy Grade 1	2,242.16	ft
Energy Grade 2	2,105.56	ft
Hydraulic Grade 1	2,241.60	ft
Hydraulic Grade 2	2,105.00	ft
Flow Area	0.0	ft^2
Wetted Perimeter	0.5	ft
Velocity	6.03	ft/s
Velocity Head	0.56	ft
Friction Slope	0.114	ft/ft

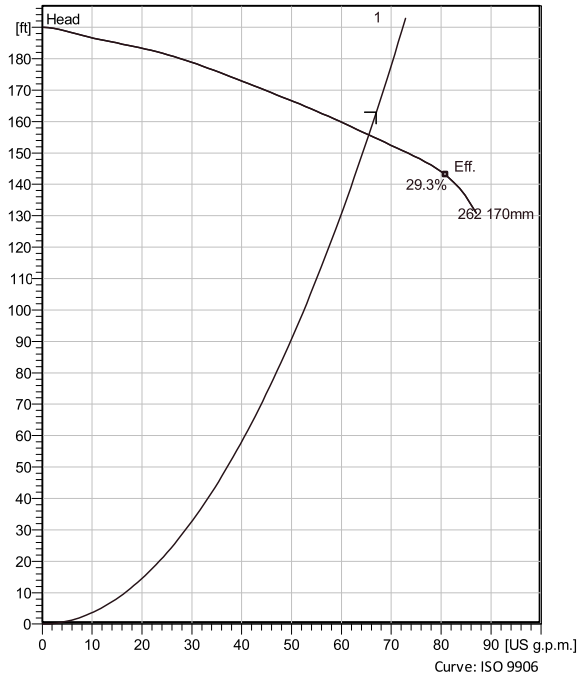
17-ZN-2019
5/8/2020

MP 3127 HT 3~ 262

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

Technical specification

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
M3127.170 21-11-2AL-W 11hp

Installation type
P - Semi permanent, Wet

Impeller diameter
170 mm

Discharge diameter
1 15/16 inch

Pump information

Impeller diameter
170 mm

Discharge diameter
1 15/16 inch

Inlet diameter
50 mm

Maximum operating speed
3495 rpm

Number of blades
6

Max. operating temperature
40 °F

Materials

Impeller
Grey cast iron

Stator housing material
Grey cast iron

Project		**Created by**	**Last update**
Block	0	**Created on**	3/4/2020

17-ZN-2019
5/8/2020

MP 3127 HT 3~ 262

Technical specification

Motor - General

Motor number M3127.170 21-11-2AL-W 11hp	**Phases** 3~	**Rated speed** 3495 rpm	**Rated power** 11 hp
Approval No	**Number of poles** 2	**Rated current** 13 A	**Stator variant** 12
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 170			

Motor - Technical

Power factor - 1/1 Load 0.92	**Motor efficiency - 1/1 Load** 87.6 %	**Total moment of inertia** 0.285 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.90	**Motor efficiency - 3/4 Load** 88.4 %	**Starting current, direct starting** 110 A	
Power factor - 1/2 Load 0.85	**Motor efficiency - 1/2 Load** 87.7 %	**Starting current, star-delta** 36.7 A	

Project		**Created by**		**Last update**
Block	0	**Created on**	3/4/2020	

17-ZN-2019
5/8/2020

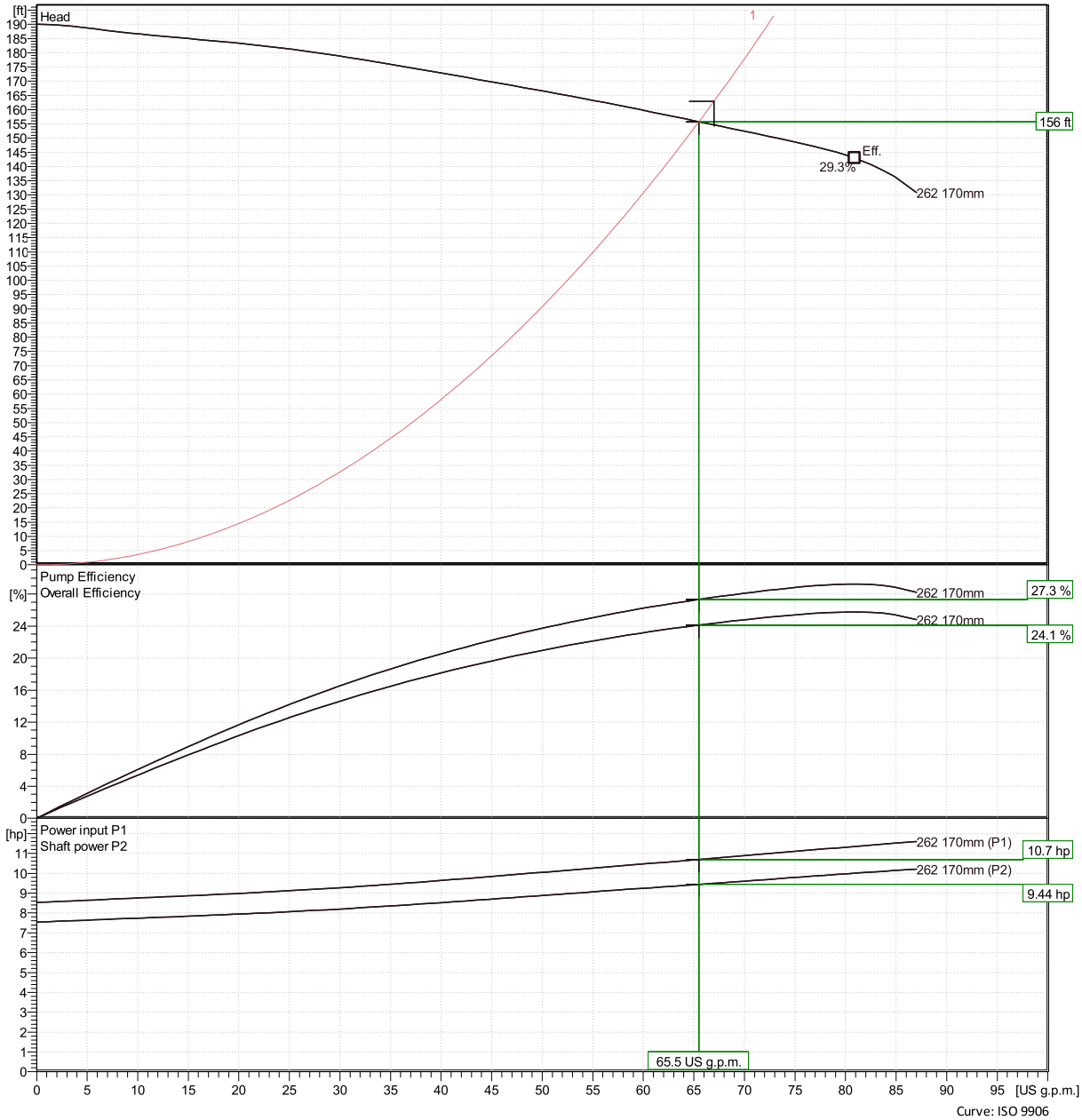
MP 3127 HT 3~ 262

Performance curve

Duty point

Flow	Head
65.5 US g.p.m.	156 ft

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

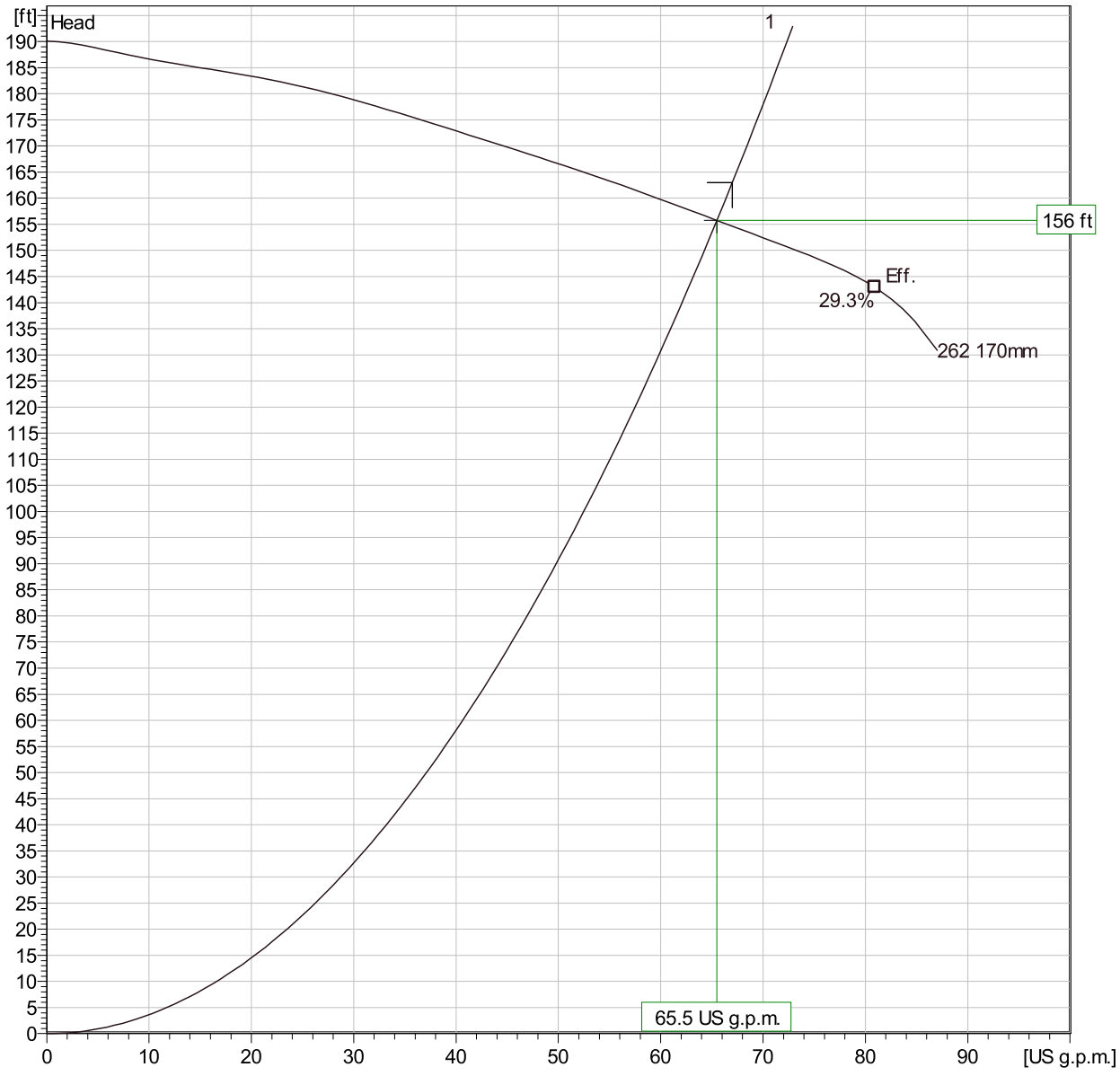
Project		Created by		Last update
Block	0	Created on	3/4/2020	

17-ZN-2019
5/8/2020

MP 3127 HT 3~ 262

Duty Analysis

Curves according to: Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Operating characteristics

Pumps/Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHr
1	65.5 US g.p.m.	156 ft	9.44 hp	65.5 US g.p.m.	156 ft	9.44 hp	27.3 %	2030 kWh/US M	

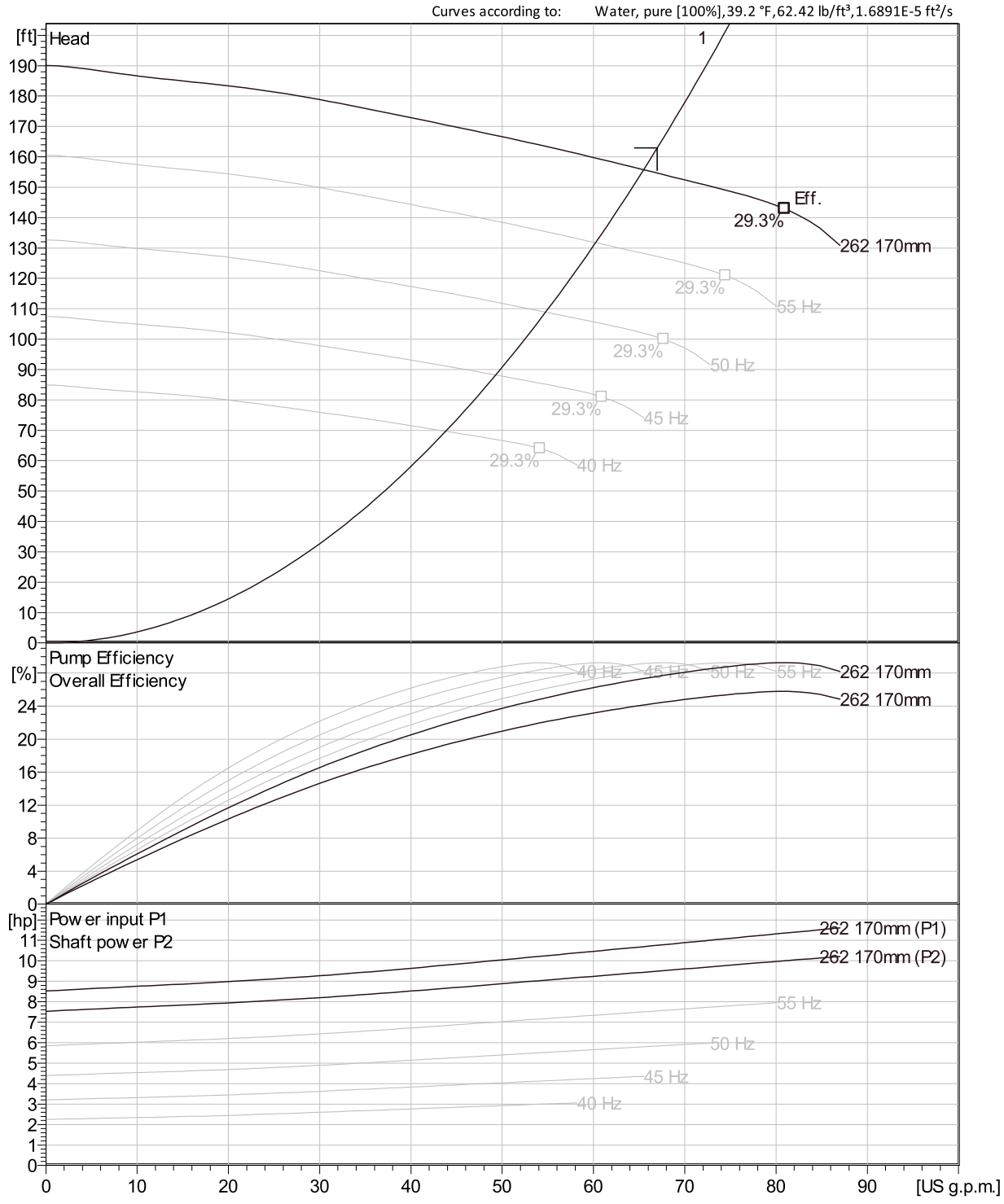
Project		**Created by**		**Last update**	
Block	0	**Created on**	3/4/2020		

17-ZN-2019
5/8/2020

MP 3127 HT 3~ 262

VFD Curve

FLYGT
a xylem brand



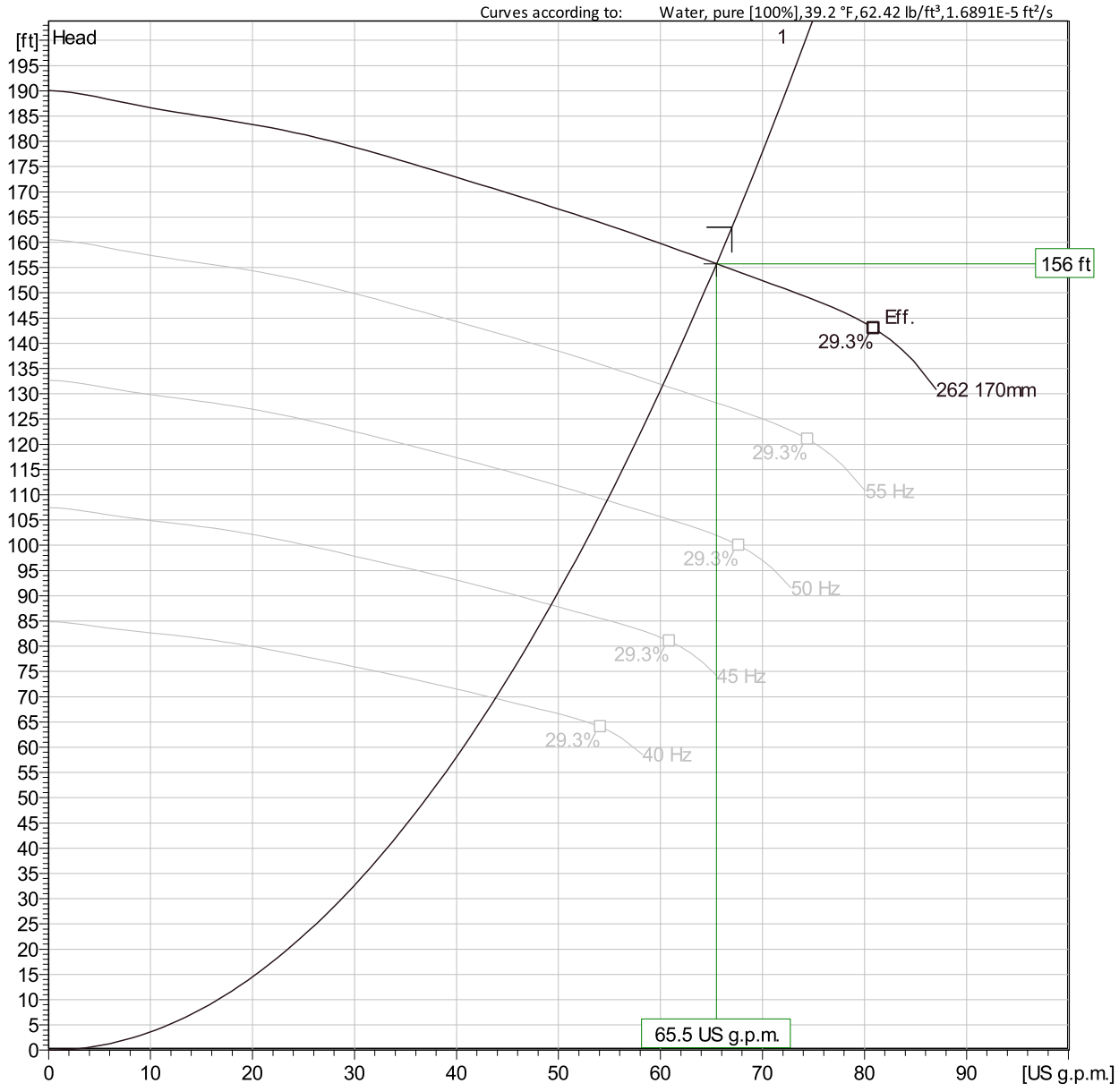
Curve: ISO 9906

Project		**Created by**	**Last update**
Block	0	**Created on**	3/4/2020

17-ZN-2019
5/8/2020

MP 3127 HT 3~ 262

VFD Analysis



Operating Characteristics

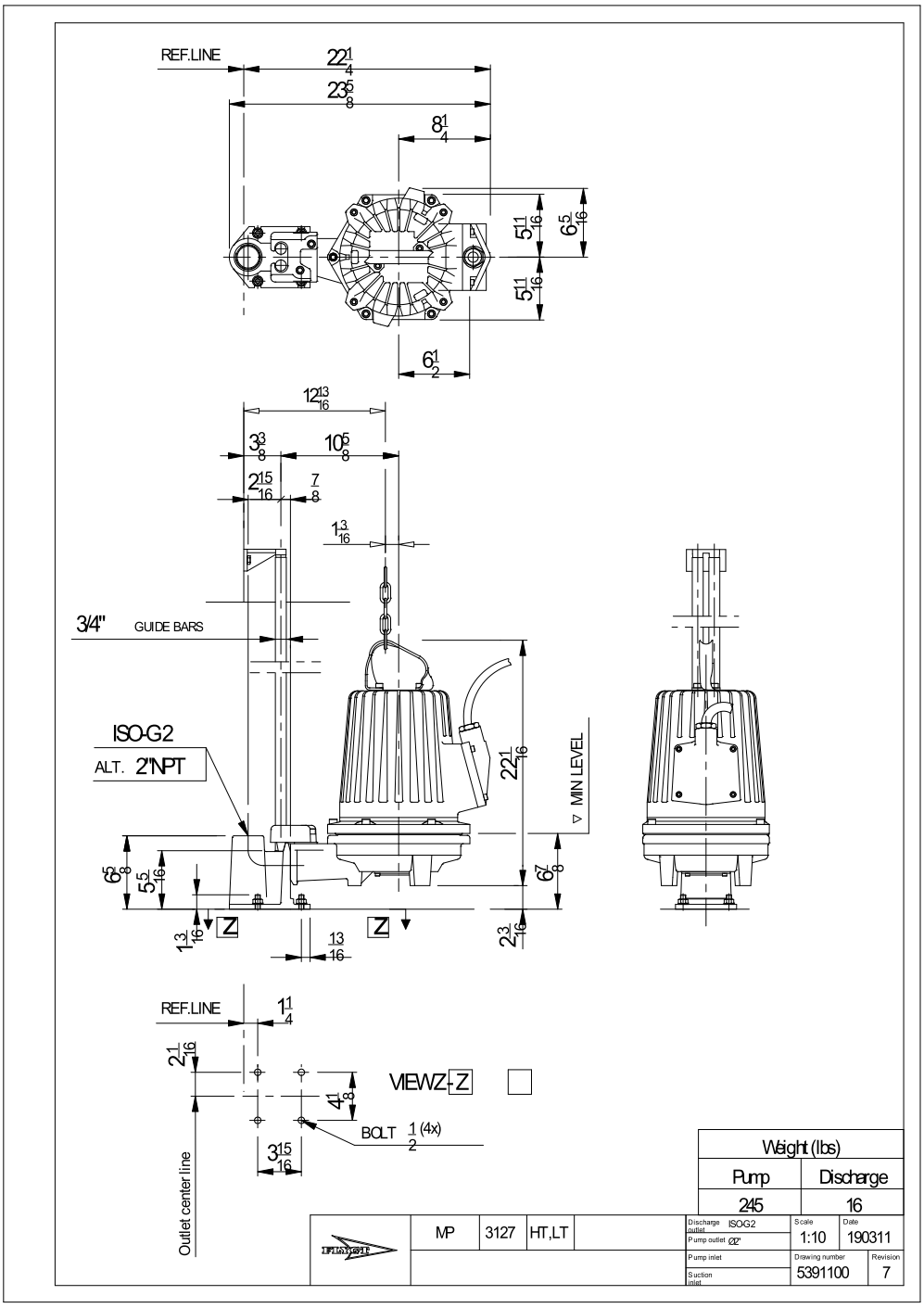
Pumps/Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHr
1	59.9 Hz	65.5 US g.p.m	156 ft	9.44 hp	65.5 US g.p.m	156 ft	9.44 hp	27.3 %	2030 kWh/US M	
1	55 Hz	60.2 US g.p.m	132 ft	7.35 hp	60.2 US g.p.m	132 ft	7.35 hp	27.3 %	1720 kWh/US M	
1	50 Hz	54.8 US g.p.m	109 ft	5.52 hp	54.8 US g.p.m	109 ft	5.52 hp	27.3 %	1430 kWh/US M	
1	45 Hz	49.3 US g.p.m	88.2 ft	4.02 hp	49.3 US g.p.m	88.2 ft	4.02 hp	27.3 %	1180 kWh/US M	
1	40 Hz	43.8 US g.p.m	69.7 ft	2.83 hp	43.8 US g.p.m	69.7 ft	2.83 hp	27.3 %	965 kWh/US M	

Project		**Created by**		**Last update**
Block	0	**Created on**	3/4/2020	

17-ZN-2019
5/8/2020

MP 3127 HT 3~ 262

Dimensional Drawing



Project		**Created by**		**Last update**	
Block	0	**Created on**	3/4/2020		

17-ZN-2019

5/8/2020

Appendix C – Lift Station Report

FINAL LIFT STATION DESIGN REPORT

HV91

Southeast of Happy Valley Road and Pima Road
Scottsdale, Arizona

Prepared for:

Parolo, LLC
7775 E. Fledgling Drive
Scottsdale, Arizona 85255

Prepared by:

Kimley-Horn and Associates
1001 West Southern Avenue, Suite 131
Mesa, Arizona 85210
291203000
January 2018

FINAL
LIFT STATION DESIGN REPORT

HV91

SOUTHEAST OF HAPPY VALLEY ROAD AND PIMA ROAD

SCOTTSDALE, ARIZONA

JANUARY 2018

Prepared By:

Kimley»Horn

17-ZN-2019
5/8/2020

Contents

Figures

Appendices

INTRODUCTION

SITE LOCATION

The purpose of this report is to provide preliminary design analysis for the construction of a new lift station serving HV91, a single-family development located southeast of Happy Valley Road and Pima Road in Scottsdale, Arizona (development). 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 development is located within Section 7 of Township 4 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. Refer to **Figure 1** for the Vicinity Map.

PROJECT SIZE AND TYPE

The development is a proposed 17-unit single family residential subdivision. The proposed buildings are one-story units. The development is approximately 20 acres.

PURPOSE AND OBJECTIVES

This report presents the basis of design criteria that will be used for engineering design of the proposed public lift station.

- Demonstrate compliance with the City's Design Standards & Polices Manual (DSPM) & Lift Station Design Criteria.
- Identify lift station site and preliminary site layout.
- Determine preliminary design for lift station equipment including: pump, wet-well, and forcemain.

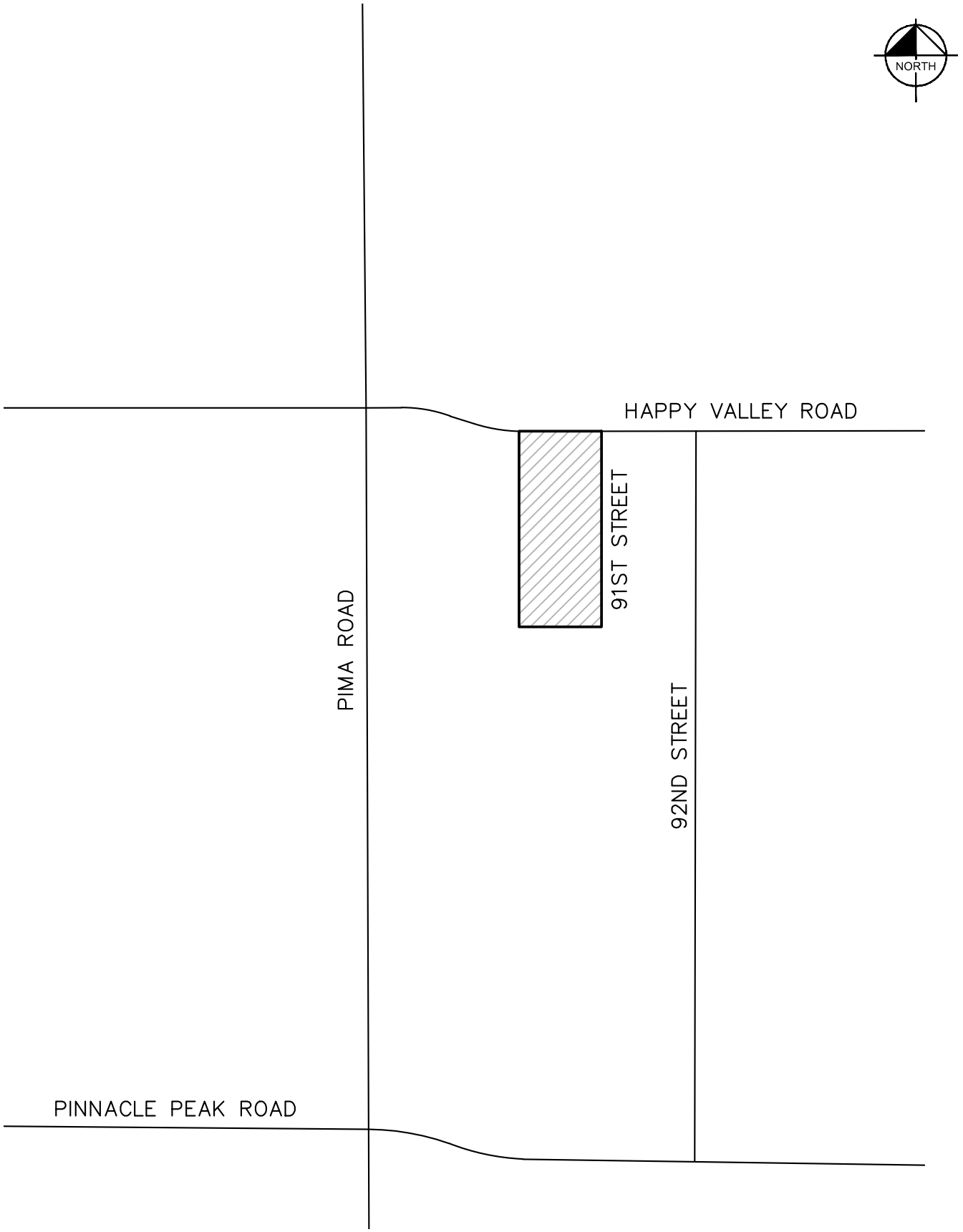


FIGURE 1
VICINITY MAP

Kimley»Horn

17-ZN-2019
5/8/2020

K:\EAV_Civil\191069030 - 70th and Continental\Reports\Drainage\Zoning\Figures\Figure 1 Vicinity Map.dwg Nov 25, 2017 zach.hill

DESIGN CRITERIA

COLLECTION SYSTEM

The Preliminary SewerBOD for HV91 establishes the design criteria for the gravity sewer collection system, per City of Scottsdale Design Standards and Policies Manual (DS&PM).

LIFT STATIONS

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.

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. Additionally, the lift station design will confirm to City of Scottsdale DS&PM and Lift Station Design Criteria.

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.

FORCEMAIN

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

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

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.

Air release valves designed for sewage must be provided on force mains at all peaks.

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.

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.

See COS Standard Detail No. 2402 for details regarding discharge into a manhole from a force main.

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

FINAL LIFT STATION DESIGN

SITE LAYOUT

The proposed lift station is located at the southwest end of the site, adjacent to the cul-de-sac of the private roadway tract. The lift station is located on a parcel of land approximately 0.16 acres in size. The land for the proposed lift station will be deeded to the City of Scottsdale as part of the final plat for the 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. Refer to **Figure 2** for Final Lift Station Layout.

LIFT STATION DESIGN

Final 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 supplementing demands with potable water that can be entered into the gravity sewer system upstream of the proposed lift station. The proposed lift station will need to meet the following calculated pump requirements:

Lift station Design Summary

Site	Gravity Collection Peak Flow (gpm)	Swimming pool Drainage (gpm)	Total Lift Station Pumped Flow (gpm)	Static Head (ft)	Total Dynamic Head (ft)
Lift Station	17	35	47	35	101

*Assumes a Hazen-Williams C value of 130

A “xylem FLYGT model MP 3102 HT” pump has been preliminarily selected to convey the peak design flow. Refer to **Appendix A** for pump information.

Final wet well sizes have been calculated for the proposed lift stations. Wet well volume calculations are based on the following criteria and assumptions:

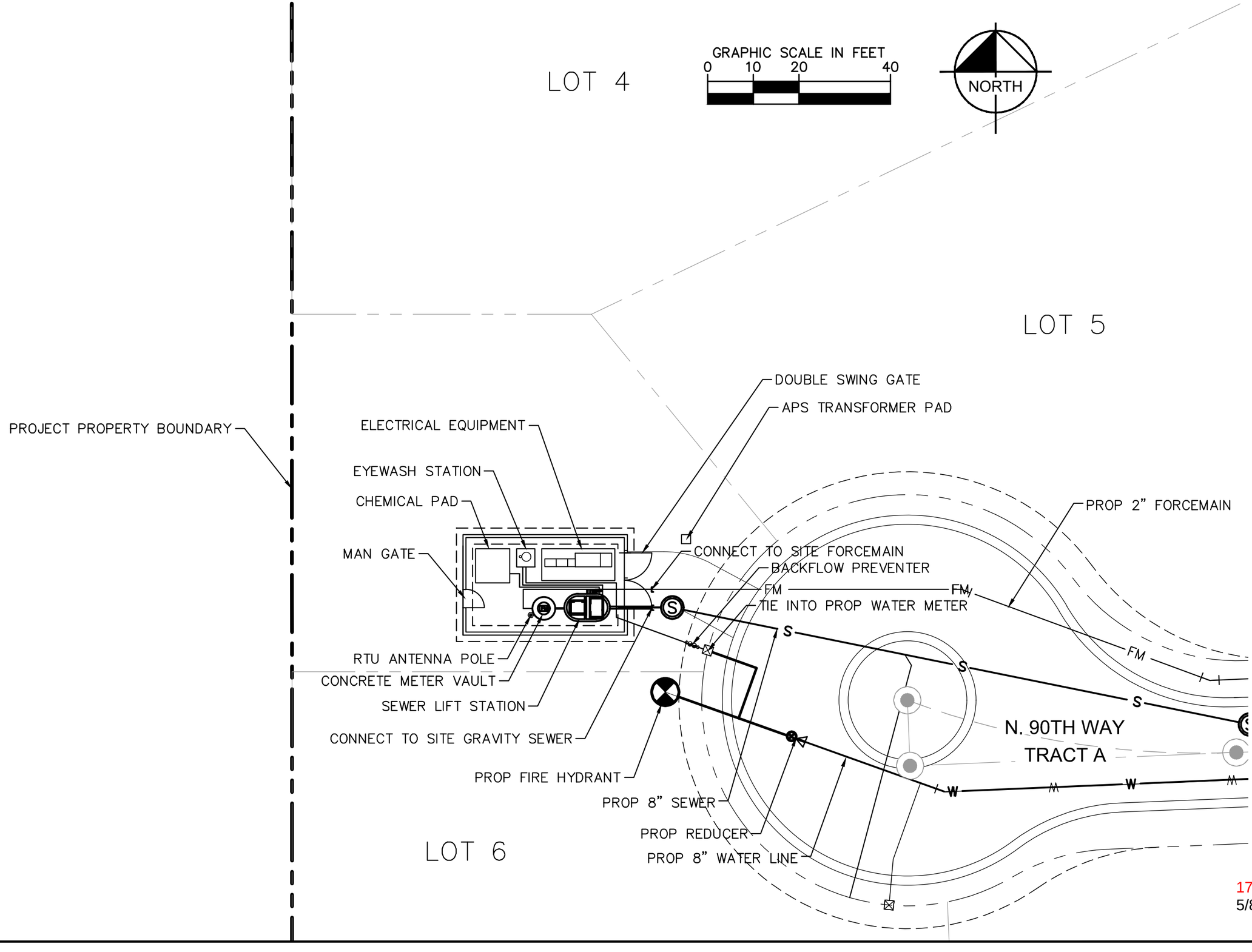
- Minimum flow to lift station = 0 gpm
- Minimum pump running time = 2 minutes
- Minimum pump cycle time = 10 minutes
- Wet well diameter = 5 feet

Based on the above criteria wet well volumes are as follows:

	Lift Station
Wet Well Volume (ft^3)	40
Operational Depth (ft)	0.81

FORCEMAIN DESIGN

The proposed forcemain is designed to convey the pumped flow within the accepted velocity range per the City Design Criteria. A 2-inch PVC pipe was selected to convey the pumped flow. The proposed pumped flow of 47gpm is conveyed through a 2-inch force main line with a velocity of 4.8 ft/s. **See Appendix B – Forcemain Calculations**.



NO.	REVISION	DATE

Kimley»Horn

SCALE (H): 1"=20'
SCALE (V): NONE
DESIGNED BY: ZJH
DRAWN BY: ZJH
CHECKED BY: JMB
DATE: JAN 2019

HV91
FINAL LIFT STATION REPORT
LIFT STATION LAYOUT
SCOTTSDALE, ARIZONA

PROJECT NO.
291203000
DRAWING NAME

1 OF 1

17-ZN-2019
5/8/2020

SITEWORK

SITE OPTIONS

The proposed development will consist of high end residential homes. The development is conscious of the potential negative aspects associated with a lift station (e.g. how the site looks, controlling odors, noise, etc.). This report present options to reduce these hindrances and shield the properties from the proposed lift station. 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.

SITE 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.

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 sewer outfall with a 'blower' to send the air through a filter that absorbs the H2S. See **Appendix C – 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.

GENERATOR

The site power will be supplemented with a standby generator. Similar sites (using combined motor Hp under 100Hp) utilize generators in size from 60KVA to 150KVA. This site will utilize a 60KVA generator that is switched via ATS in an emergency condition.

CONTROLS

Per Scottsdale Sewer Lift Station Design Criteria (Revision 10/15/15) the lift station will include controls of the station pumps and control its overall operation. City 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.

SITE 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.

PUMP ENCLOSURE

Various options exist for the wet well on the Lift Station development site, which will vary based on the required volume and maximum depth of the wet well. As stated in Section - Lift Station Design, the size of the wet well will be 6' diameter with approximately a 3' operational depth. Additional vender information regarding the layout of the wet well and associated piping can be found in **Appendix D**.

An additional option for the wet well construction would be a OneLift 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 OneLift wet well can be found in **Appendix E**.

Job Number	291203000
Job Description	HV91
Date	1/18/2019
Designed By	ZJH
Checked By	REL
Pump Type	MP3102 HT3-267

HAZEN-WILLIAMS EQUATION FOR TDH CALCULATIONS

System Elevations:

Pumps Off Elevation		2070.00	ft
Flow Line of Force Main at High Point		2105.00	ft
Calculated Static Head	$\Delta Z =$	35.00	ft

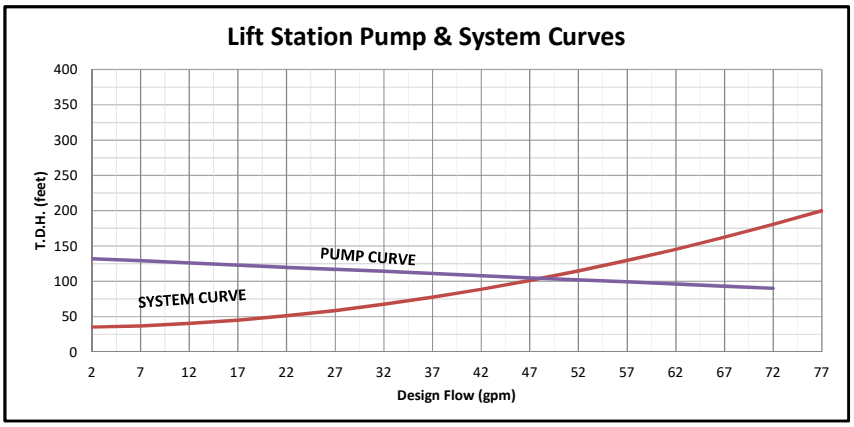
Hazen-Williams Parameters:

Dia. of Discharge Piping	D =	2	inches
Length of Discharge Piping	L =	10	ft
Dia. of Force Main	D =	2.000	inches
Length of Force Main	L =	1200	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		5	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.)	Pressure (PSI)	Force Main Flow Velocity (fps)	Pump Curve (ft.)
2	0.00	0.00	0.19	0.00	35.19	15.23	0.20	135
7	0.02	0.01	1.93	0.05	36.95	16.00	0.71	132
12	0.04	0.02	5.22	0.16	40.28	17.44	1.23	129
17	0.08	0.05	9.94	0.32	45.07	19.51	1.74	126
22	0.13	0.08	16.01	0.54	51.23	22.18	2.25	123
27	0.19	0.12	23.39	0.81	58.70	25.41	2.76	120
32	0.27	0.17	32.03	1.14	67.46	29.20	3.27	117
37	0.35	0.22	41.90	1.52	77.47	33.54	3.78	114
42	0.44	0.29	52.97	1.96	88.70	38.40	4.29	111
47	0.54	0.36	65.22	2.46	101.12	43.78	4.80	108
52	0.66	0.44	78.64	3.01	114.73	49.67	5.31	105
57	0.78	0.53	93.19	3.62	129.50	56.06	5.82	102
62	0.91	0.62	108.88	4.28	145.41	62.95	6.33	99
67	1.05	0.73	125.68	5.00	162.45	70.33	6.84	96
72	1.20	0.84	143.58	5.77	180.61	78.19	7.35	93
77	1.35	0.96	162.57	6.60	199.88	86.53	7.86	90



Approximate Capacity at C = 130: 47 gpm

17-ZN-2019
5/8/2020

Worksheet for Force main

Project Description

Friction Method	Manning Formula
Solve For	Pressure at 1

Input Data

Pressure 2	0.00	psi
Elevation 1	2070.00	ft
Elevation 2	2105.00	ft
Length	1200.00	ft
Roughness Coefficient	0.010	
Diameter	2.00	in
Discharge	47.00	gpm

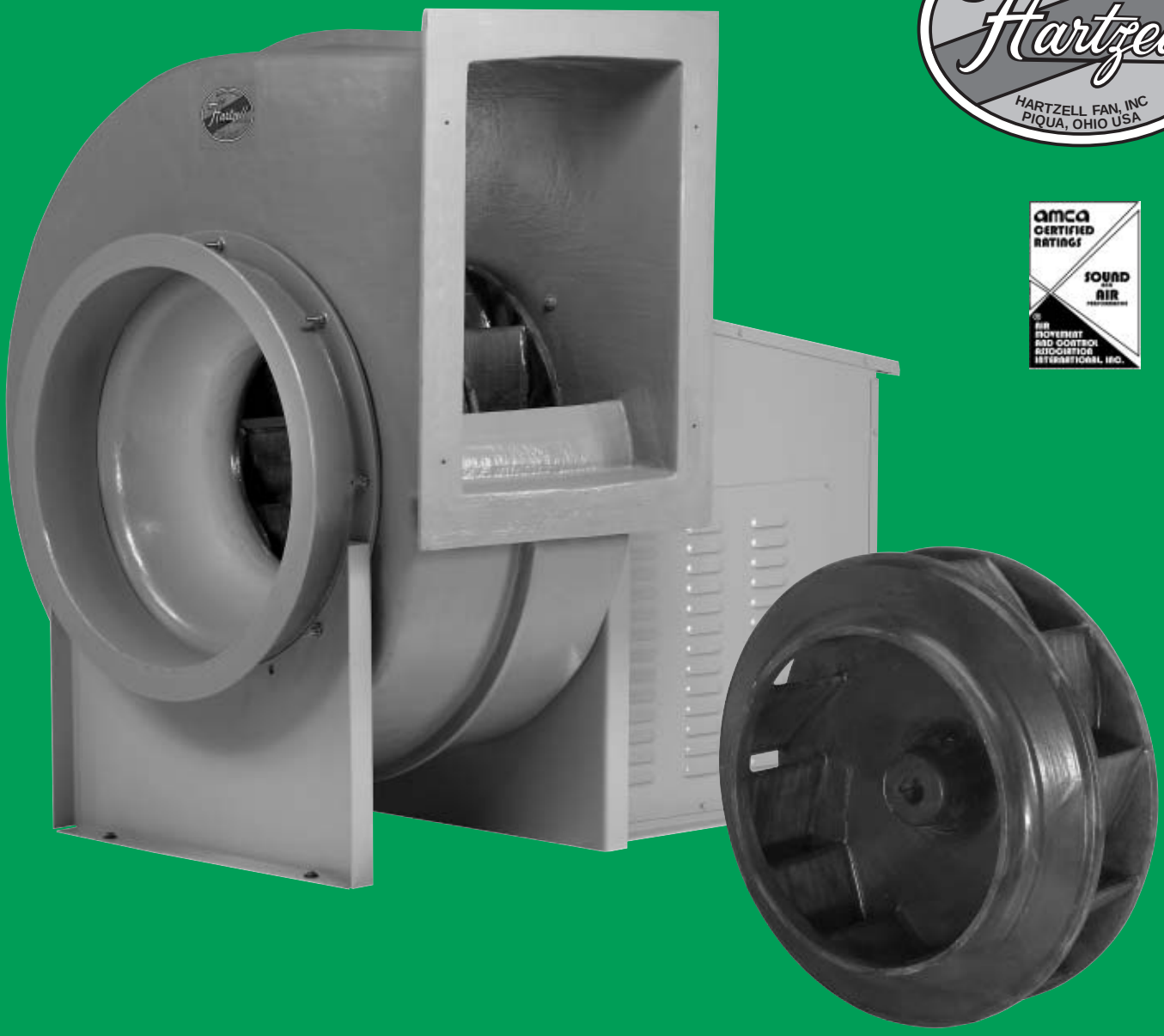
Results

Pressure 1	52.75	psi
Headloss	86.68	ft
Energy Grade 1	2192.04	ft
Energy Grade 2	2105.36	ft
Hydraulic Grade 1	2191.68	ft
Hydraulic Grade 2	2105.00	ft
Flow Area	0.02	ft^2
Wetted Perimeter	0.52	ft
Velocity	4.80	ft/s
Velocity Head	0.36	ft
Friction Slope	0.07223	ft/ft

17-ZN-2019
5/8/2020

Fiberglass Backward Curved Centrifugal Fans

Type FA **Series 41** **Series 41P**



HARTZELL®

Hartzell Fan, Inc., Piqua, Ohio 45356
www.hartzellfan.com

Bulletin A-160-C April 2005

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.

17-ZN-2019
5/8/2020

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.

17-ZN-2019
5/8/2020

Hartzell Selection Guide

The Hartzell Fiberglass Backward Curved Centrifugal Fan performances on the following pages are based on standard air conditions (sea level, 70°F, and 29.92 inches barometric pressure). Performance data does not include drive losses on belt drive units.

How to use Performance Tables

1. Select a model for a given air delivery and pressure by looking up the required flow vertically along the left column of the performance table and moving to the required pressure. The model is identified with each table.
2. Note the required RPM and BHP. Refer to page 2 Hartzell Model Code Explanation for additional details.
3. If non-standard temperature or altitude is involved, correct to standard air density (see Temperature/Altitude Applications).

When placing your order, be sure to specify the Hartzell Model Code. Be sure to include fan model, performance requirements, operating temperature, motor data (enclosure, voltage, mounting position, etc.), and a list of required accessory items. (See pages 22 and 23.) For selection assistance and additional data contact your local Hartzell Sales Representative for assistance.

Temperature/Altitude Applications

When a fan operates in ambient conditions, generally it is handling standard air at 70°F, 29.92" barometric pressure, weighing 0.075-lbs./cu. ft. For an application where the fan operates at other than ambient conditions (temperature, altitude, or both), correction factors must be applied to the selection of the fan. In addition, the standard construction of the fan must be modified.

Correction factors for temperatures and altitudes are provided in Table 1. When a fan operates at other than ambient conditions, the correction factors in Table 1 will be required to correct static pressure and horsepower.

Table 2 shows the maximum safe operating speeds for each size fan wheel. At high temperatures, these maximum safe operating speeds should be derated.

Table 3 provides maximum safe speed correction factors by temperature and material construction. An example on the use of these tables appears at the bottom of this page.

Table 1 Altitude/Temperature Correction Factors

Temp.*(°F)	-50	-25	0	25	50	70	100	125	150	175	200	250
Factor	0.77	0.82	0.87	0.91	0.96	1.00	1.06	1.10	1.15	1.20	1.25	1.34

Alt.** (Ft.)	0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
Factor	1.00	1.04	1.08	1.12	1.16	1.20	1.25	1.30	1.35	1.40	1.46

Above table has inverted values. Actual density is the reciprocal of the above values.
***At sea level. **At 70°F.**
For corrections involving both temperature and altitude, correction factors should be multiplied.
Example: 150°F at 7000 ft.: Temperature factor 1.15 x altitude factor 1.30 = 1.50 combined correction factor.

Table 2 Maximum Safe Speeds @ 70°F

Fan Size	100% Width	66% Width
12	4,520	5,320
15	3,600	4,340
18	2,990	3,610
22	2,440	2,950
24	2,240	2,710
27	2,000	2,410
30	1,840	2,220
33	1,670	2,020
36	1,530	1,850
40	1,370	1,660
44	1,240	1,500
49	1,130	1,360
54	1,020	1,230
60	920	1,110

Table 3 Maximum Safe Speed Correction Factors*

Temp. (°F)	0	70	100	150	175	200	225	250
FRP	1.00	1.00	1.00	0.98	0.95	0.91	0.82	0.70

*** To correct maximum safe operating speeds (Table 2) for high temperatures, multiply those speeds by correction factors from Table 3.**

Use of Correction Factors and Tables

First select size, RPM and BHP of the blower needed.

If temperature or altitude is involved, correct to standard air.

Example: Assume the required performance to be 12,000 CFM at 4.62" SP, 175°F and 2000 feet altitude.

1. Temperature factor 1.20 x altitude factor 1.08 = 1.30 combined correction factor.
2. Correct SP to standard 4.62" SP x 1.30 = 6" SP for 70°F at sea level.
3. A Series 41, size 33" class II 66% width belt drive backward curved centrifugal, selected from the rating tables (page 17) for the new condition shows 12,000 CFM at 6" SP, 1,398 RPM and 15.5 BHP.
4. Correct the horsepower and static pressure in item 3 to non-standard performance by dividing by factor: 6" SP divided by 1.30 = 4.62" SP; 15.5 BHP divided by 1.30 = 11.9 BHP.
5. Check the maximum safe speed. Maximum speed at 70°F for fan size 33" 66% width, 2,020 RPM. Using the maximum safe speed factor table for fiberglass construction yields a safe speed factor of .95. The maximum safe speed is 2,020 x .95 = 1,919 RPM; thus operation at 1,438 RPM at 175°F is satisfactory.
6. Final performance of the unit at the assumed conditions: 12,000 CFM at 4.62" SP, 1,398 RPM, 11.9 BHP at 175°F and 2000 feet altitude.
7. Size motor for cold startups and use a special high altitude motor if altitude exceeds 3300 feet.

17-ZN-2019
5/8/2020

Corrosion Resistance Guide

Temperature values shown are for immersion or condensate contact applications. Where temperature values are shown, resin is suitable for hood and duct type applications for the full operating temperature range of the product. See product specifications for materials of construction and maximum operating temperature limits.

Environment	Hetron 693 Ashland F.	6694 Reichold F.	510A Dow F.
ACIDS			
Acetic to 10%	180	200	210
Acetic to 50%	90	160	180
Acetic to 100%		NR	NR
Acrylic to 25%	–	100	100
Benzene Sulfonic to 25%	180	210	150
Benzene Sulfonic 25% up	90	210	NR
Benzoic	250	220	210
Boric	180	220	210
Butyric to 50%	150	150	210
Butyric 50% up	–	100	80
Carbonic	160	220	NR
Chloroacetic to 25%	NR	*180	*150
Chloroacetic 25% to 50%	NR	*150	*120
Chromic to 5%	100	110	150
Chromic to 10% to 20%	–	NR	150
Citic	*200	*220	*210
Fluoboric	*S90	*S220	*S210
Gluosilicic up to 10%	S100	S150	S180
Formic up to 10%	200	150	180
Gluconic to 50%	120	180	180
Hydrobromic to 25%	*160	*170	*180
Hydrochloric to 15%	*230	*210	*180
Hydrocyanic to 10%	200	170	210
Hydrofluoric to 10%	***S100	***S150	***S150
Hydrofluorsilicic up to 10%	*S100	*S150	*S180
Hypochlorous to 20%	90	110	NR
Lactic	*200	*220	*210
Maleic	170	210	210
Nitric to 5%	200	170	150
Nitric 5% to 20%	–	140	120
Oleic	200	220	210
Oxalic	*220	*220	*210
Perchloric to 10%	H&D	**150	**150
Phosphoric	*220	*S210	*S210
Phosphoric, super	–	*S210	*S210
Phthalic Anhydride	*150	*210	*210
Picric to 10%	100	170	NR
Silicic	–	220	NR
Stearic	200	220	210
Sulfamic to 25%	160	150	NR
Sulfuric to 25%	*200	*220	*210
Sulfuric to 50%	*200	*200	*180
Sulfuric to 70%	*150	*180	*100
Sulfuric to 80%	NR	80	NR
Sulfurous to 10%	90	110	120
Tannic	200	220	210
Tartaric	220	220	210
Trichoroacetic to 50%	*90	*220	*200
ALCOHOLS			
Amyl	200	210	120
Benzyl	NR	100	NR
Butyl	190	150	120
Ethyl	90	120	80
Methyl	90	80	NR
GASES AND VAPORS			
Ammonia, Dry	90	170	100
Ammonia, Wet	90	NR	NR
Bromine, Wet	90	*100	NR
Carbon Dioxide	250	250	250
Carbon Monoxide	200	250	250
Chlorine, Dry	*200	*210	NR
Florine	–	NR	80
Hydrogen Fluoride, Vapor	*90	*S180	*S180
Hydrogen Sulfide to 5%	250	240	180
Sulfur Dioxide, Dry	200	250	210
Sulfur Dioxide, Wet	200	250	210
Sulfur Trioxide, Wet	–	220	210

Environment	Hetron 693 Ashland F.	6694 Reichold F.	510A Dow F.
ALKALIES (Synthetic Veil)			
Ammonium Bicarbonate to 50%	140	S170	160
Ammonium Carbonate	120	S140	150
Ammonium Hydroxide to 5%	S90	S180	S180
Ammonium Hydroxide to 10%	S90	S170	S150
Ammonium Hydroxide to 29%	NR	S100	S100
Barium Carbonate	180	S240	210
Barium Hydroxide to 10%	–	S170	150
Calcium Hydroxide to 15%	160	S210	S180
Magnesium Carbonate	160	S210	180
Potassium Bicarbonate to 10%	90	S170	S150
Potassium Carbonate to 10%	90	S180	S150
Potassium Hydroxide to 25%	NR	S120	S150
Sodium Bicarbonate to 10%	140	S210	S180
Sodium Carbonate to 35%	90	S180	S180
Sodium Hydroxide to 10%	NR	S160	S180
Sodium Hydroxide to 25%	NR	S160	S180
Sodium Sulfide	90	S220	S210
Trisodium Phosphate to 50%	–	S175	210
SALTS			
Aluminum Chloride	*120	*240	*210
Aluminum Potassium Sulfate	160	240	210
Aluminum Sulfate	250	240	210
Ammonium Chloride	*200	*220	*210
Ammonium Nitrate	200	220	220
Ammonium Persulfate	150	200	180
Ammonium Persulfate, saturate	150	NR	NR
Ammonium Sulfate	200	220	220
Aniline Sulfate to 25%	150	220	210
Aniline Sulfate, saturated	150	220	NR
Barium Chloride	200	240	210
Barium Sulfide	NR	S210	180
Calcium Chlorate	180	220	220
Calcium Chloride	250	240	220
Calcium Sulfate	*200	*240	*210
Copper Chloride	*250	*220	*220
Copper Cyanide	90	S220	210
Copper Fluoride	NR	S170	NR
Copper Sulfate	250	240	210
Ferric Chloride	*250	*220	*210
Ferric Nitrate	170	220	210
Ferric Sulfate	200	220	210
Ferrous Chloride	*220	*220	*210
Ferrous Nitrate	160	220	210
Ferrous Sulfate	220	220	210
Lead Acetate	160	220	210
Magnesium Chloride	220	240	210
Magnesium Hydroxide	–	S210	210
Magnesium Sulfate	200	210	210
Mercuric Chloride	*210	*220	*210
Mercurous Chloride	210	220	210
Nickel Chloride	220	220	210
Nickel Nitrate	220	220	210
Nickel Sulfate	220	220	210
Potassium Chloride	200	240	210
Potassium Dichromate	200	220	210
Potassium Ferricyanide	200	220	210
Potassium Nitrate	200	220	210
Potassium Permangnate	150	210	210
Potassium Persulfate	90	220	210
Potassium Sulfate	200	240	210
Silver Nitrate	200	220	210
Sodium Acetate	150	220	210
Sodium Bisulfate	200	220	210
Sodium Chloride	200	240	180
Sodium Chlorite to 10%	175	170	150
Sodium Cyanide	100	220	210
Sodium Dichromate	160	220	210

Environment	Hetron 693 Ashland F.	6694 Reichold F.	510A Dow F.
SALTS (cont'd.)			
Sodium Ferricyanide	220	220	210
Sodium Floride	–	S180	S180
Sodium Nitrate	220	220	210
Sodium Nitrite		220	NR
Sodium Silicate PH less than 1	160	210	NR
Sodium Sulfate	180	240	210
Sodium Sulfite	–	220	210
Stannic Chloride	*180	*220	*210
Stannous Chloride	*200	*220	*210
Zinc Chloride	200	*220	*210
Zinc Nitrate	180	220	210
Zinc Sulfite	150	220	NR
SOLVENTS			
Acetone to 10%	NR	180	180
Benzene	90	80	NR
Carbon Disulfide	NR	NR	NR
Carbon Tetrachloride	90 VAPOR	110	150
Chlorobenzene	NR	NR	NR
Ethyl Acetate	NR	NR	NR
Ethyl Chloride	90 VAPOR	NR	NR
Ethylene Dibromide	NR	NR	NR
Ethylene Glycol	250	220	210
n-Heptane	120	210	210
Hexane	–	150	160
Methyl Ethyl Ketone to 10%	NR	80	NR
Naphtha	200	210	180
Naphthalene	130	220	210
Tetrachloroethylene	NR	100	80
Toluene	90	NR	80
Xylene	90	80	80
BLEACHES			
Calcium Chlorate	180	220	220
Calcium Hypochlorite	100	NR	S160
Chlorine Dioxide up to 15%	–	160	*200
Chlorine Water	*125	*210	*200
Hydrogen Peroxide to 30%	120	100	150
Sodium Chlorate	90	210	210
Sodium Hypochlorite to 15%	NR	125	S180
OTHERS			
Alum. Chlorohydroxide to 50%	–	220	210
Ammonium Phosphate	150	210	210
Aqua Rega	NR	*80	NR
Detergents	120	170	150
Glycerine	200	220	210
Kerosene	120	210	180
Photographic Solutions	–	80	NR
Perchlorethylene	NR	100	80
Sodium Tetraborate	180	S210	180
Sodium Tripolyphosphate	125	210	210
Sodium Xylene Sulfonate	–	170	160
Sorbitol Solutions	180	220	160
Urea	90	170	150
Urea-Ammonium-Nitrate	–	120	120
Fertilizer Fumes	100	120	150
Shell-D-D	NR	100	NR
Steam Vapor	180	210	180

Reference
C.R.G.1.1

NOTES: **NR = Not Recommended S = Synthetic surfacing veil or mat required. Contact factory. "–" = No test data available**

*** Special shaft and hardware required, contact factory.**

**** Special design considerations required (explosive environment), contact factory.**

***** Do not use HartKoate. Special shaft and hardware required, contact factory.**

For environments not shown, or when temperatures exceed the maximum listed, contact factory.

Hydrocarbon fuel environments may require static grounding, contact factory.

Do not use HartKoate (Alum. Oxide) with Hydrofluoric acid.

17-ZN-2019
5/8/2020

Series 41 Backward Curved Centrifugal Fan, Type FA

Series 41 Hartzell Fiberglass Backward Curved Centrifugal Fans offers **non-overloading, high efficiency, low noise,** and economy for corrosive atmospheres. This fan is unique in the fan and blower industry. The fan incorporates the proven, highly efficient, backward curved, airfoil-bladed, solid fiberglass, Type FA wheel in a solid fiberglass housing. This design incorporates the airfoil centrifugal wheel, centrifugal fan housing, and inlet cone to produce a compact, highly efficient unit with low noise characteristics.

- **Applications** – Developed for compatible corrosive applications where it is advantageous to have fiberglass materials and have the motor out of the airstream with the versatility of a belt drive fan.
- **Performance** – Type FA fiberglass airfoil wheel with inlet cone and aerodynamically designed housing produces from **800 CFM to 90,000 CFM at pressures from free delivery to 14" W.G.** at high efficiencies with non-overloading horsepower, low noise, and low RPM. Maximum temperature capability is 250°F.

Series 41

AMCA CERTIFIED RATINGS — SOUND AND AIR PERFORMANCE — AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.

Hartzell Fan, Inc. certifies that the Series 41, Fiberglass Backward Curved Centrifugal Fans, Type FA, shown herein 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 Publication 211 and Publication 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.

Type FA Wheel

Features

- **Sizes** – 12", 15", 18", 22", 24", 27", 30", 33", 36", 40", 44", 49", 54", and 60" wheel diameters. Available in Class I and II in 100% width and Class I, II, and III in 66% width. Available in Belt Drive Arrangements #1, #9, and #10, Direct Drive Arr. #4 and Direct Coupled Arr. #8. Contact Factory for Arr. #8 dimensions and for other arrangements.
- **FRP Materials** – Solid fiberglass wheel molded with Dow Derakane 510-A corrosion resistant vinylester resin having a Class I flame spread rate of 25 or less. The housing and other standard FRP components are constructed of fiberglass and Ashland Hertron 693 corrosive resistant polyester resin having a Class I flame spread rate of 25 or less. No metal parts are exposed in the airstream. See Corrosion Resistance Guide on page 5 for resin characteristics. Other resins are available.
- **Type FA Wheel** – **High efficiency**, **airfoil** design with **one-piece**, **solid fiberglass**, construction. Tapered inlet side design efficiently moves large volumes of air at high pressures. Wheel has non-overloading horsepower characteristic curve.
- **Rotation and Discharge Positions** – Available in both clockwise and counterclockwise rotations and in all standard discharge positions. Housing discharge position can be changed on fan sizes 12" through 36". Larger size housings are non-rotatable.
- **Easy Installation and Maintenance** – Motor, drives, and bearings are readily accessible for ease in wiring, installation, adjustment, and lubrication.
- **Shafts** – Shafts are turned ground and polished, keyed at both ends with fiberglass sleeve in the airstream and sized to operate well below critical speed.
- **Bearings** – Bearings are heavy duty, self-aligning, ball or roller type, in cast iron pillow block housings, selected for minimum L-50 Life of 250,000 hours, and include extended lubrication fittings as standard.
- **Standard Shaft Seal** – 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. Seal is not gas tight.
- **Hardware** – Airstream hardware is Type 304 stainless steel and encapsulated.
- **Motor Out of the Airstream** – Exterior mounting of Drip-Proof Protected motor on an adjustable motor slide base in belt drive models is standard. Motors can be furnished as TEFC, Mill and Chemical Duty, or to specifications upon request. Motor HP and frame size limits are identified in Dimensions and Material Specifications table.
- **Drives (Belt Drive Fans)** – V-Belt Drives are oversized for long life and continuous duty and are fixed pitch as standard option. Variable pitch drives are available upon request. Belts are oil, heat, and static resistant type.
- **Balancing** – The fan is electronically statically and dynamically balanced to the requirements of Fan Application Category BV-3 of AMCA ANSI Std. 204-96. All fans receive an inspection prior to shipment and, whenever possible, an operational test.
- **Flanged Duct Connections** – Outlet flange is standard, inlet flange is optional. Flange bolt holes are optional.
- **Bases** – Heavy gauge, welded, hot rolled steel with epoxy coating are standard.
- **Options and Accessories** – See pages 22 and 23.
- **Spark Resistant Construction and Protective Coatings** – Spark resistant construction for fiberglass equipment is optional, and for abrasive environments or extremely corrosive environments, special construction is available. See page 23.

17-ZN-2019
5/8/2020

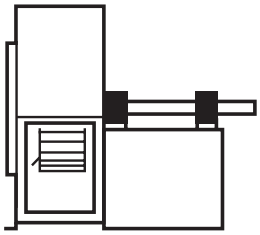
Hartzell Centrifugal Fan Classifications

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	

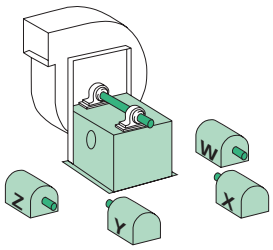
*** At standard air conditions (70°F, 29.92 in. HG barometric pressure, .075 lbs./ft.3). Static pressure shown in inches of water; outlet velocity shown in feet per minute. Performance Ranges apply only to 100% width construction.**

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.

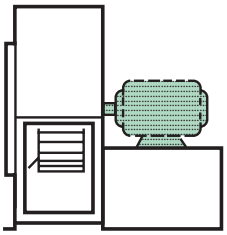


Motor Position Designation

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

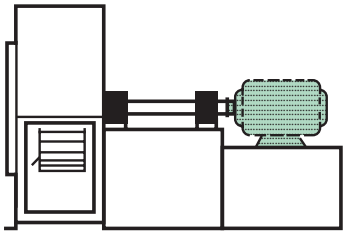
1 – V Belt Drive.
2 – Vibration Bases.
3 – Belt Guards.

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.



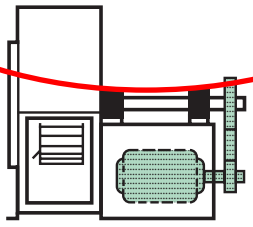
Arrangement 4

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



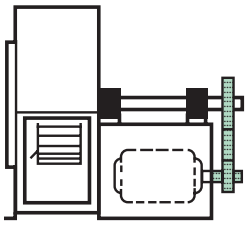
Arrangement 8

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

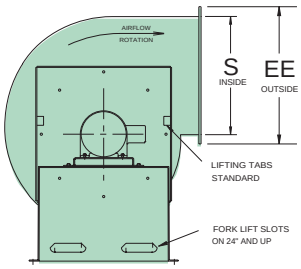
Belt drive configuration with motor mounted inside base. Packaged unit, wheel is overhung. Temperature limitations: 250°F.

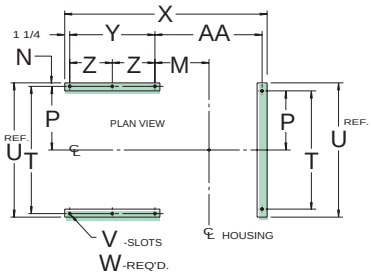
Adapted from AMCA Standard 99-2404-03, *Drive Arrangements for Centrifugal Fans*, and AMCA Standard 99-2407-03, *Motor Positions for Belt or Chain Drive Centrifugal Fans*, with written permission from Air Movement and Control Association International, Inc.

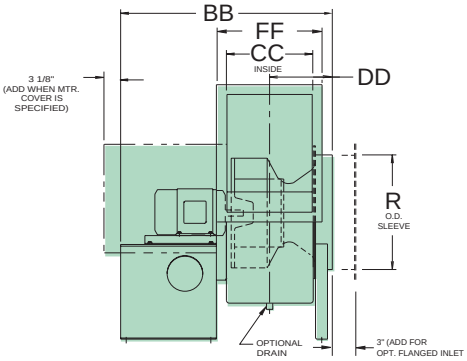
17-ZN-2019
5/8/2020

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

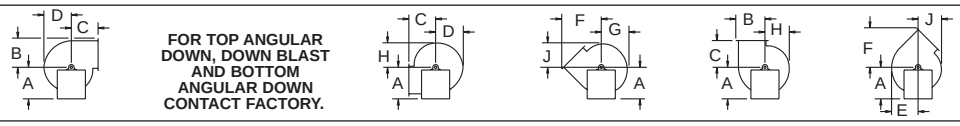
Fan Size	BB		CC		DD		EE				FF			
	100% Width	66% Width	100% Width	66% Width	100% Width	66% Width	100% Width		66% Width		100% Width		66% Width	
							Class I/II	Class III	Class I/II	Class III	Class I/II	Class III	Class I/II	Class III
12	27 3/16	26 1/32	9 9/32	8 5/8	8	7 7/16	18 1/8	18 1/8	18 1/8	18 1/8	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.

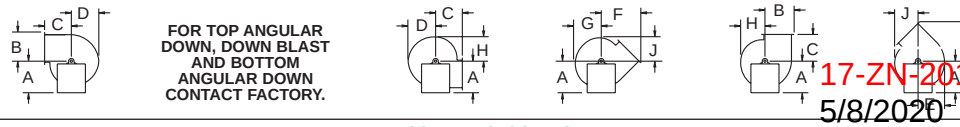
Fan Discharges

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

CLOCKWISE



TOP HORIZONTAL | BOTTOM HORIZONTAL | BOTTOM ANGULAR UP | UP BLAST | TOP ANGULAR UP



COUNTERCLOCKWISE

17-ZN-2019
5/8/2020

Material Specifications/Weights

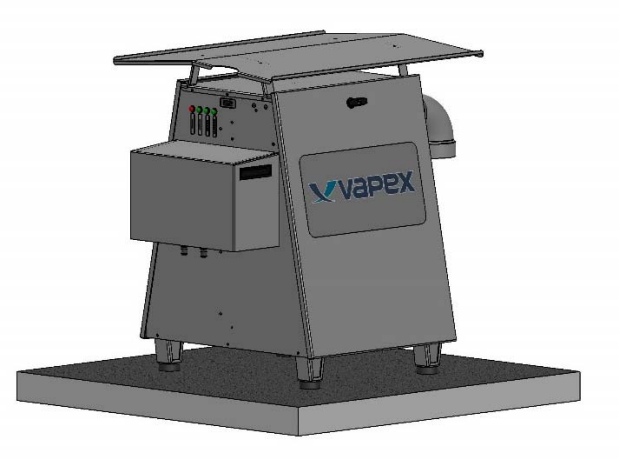
Series 41

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



Main Features

- Eliminates H_2S and other odorous compounds
- Reduce or eliminate some forms of Fats, Oils, and Grease (FOG)
- Reduce or eliminate biofilm or bacterial growth in the treatment area
- Reduce the rate of corrosion typically associated with low pH
- Impart a residual oxidant to the defined space to absorb unexpected spikes of odors

Specifications

System

Oxidant Output: ≤ 1.5 lbs/day
Number of Nozzles: 1-3
Standard 500 Nozzle
20 CFM
5 to 10 GPH
Low Volume Nozzle
1 CFM
1 to 2 GPH
Treatment Area
Up to 18,000 ft^3
Low Volume Nozzle – up to 1,000 ft^3

Power supply

220 VAC, 30A, 60 Hz, Single Phase or
110 VAC, 30A, 60 Hz

Physical

Aluminum Powder Coated with TGIC polyester
Dimensions
41.6”L × 29.5” W × 39.4” H
Unit Weight
150 to 165 lbs avg

Operating environment

20°F to 100°F

Description

The Vapex 1500 is an odor control system specifically designed to treat H_2S, mercaptans, amines, and other odorous compounds in enclosed spaces. It combines ozone, water, and air using a patented 3-fluid nozzle to atomize the water molecules to create hydroxyl radicals. The odorous air is not extracted instead the odors are treated at the same space where they are generated.

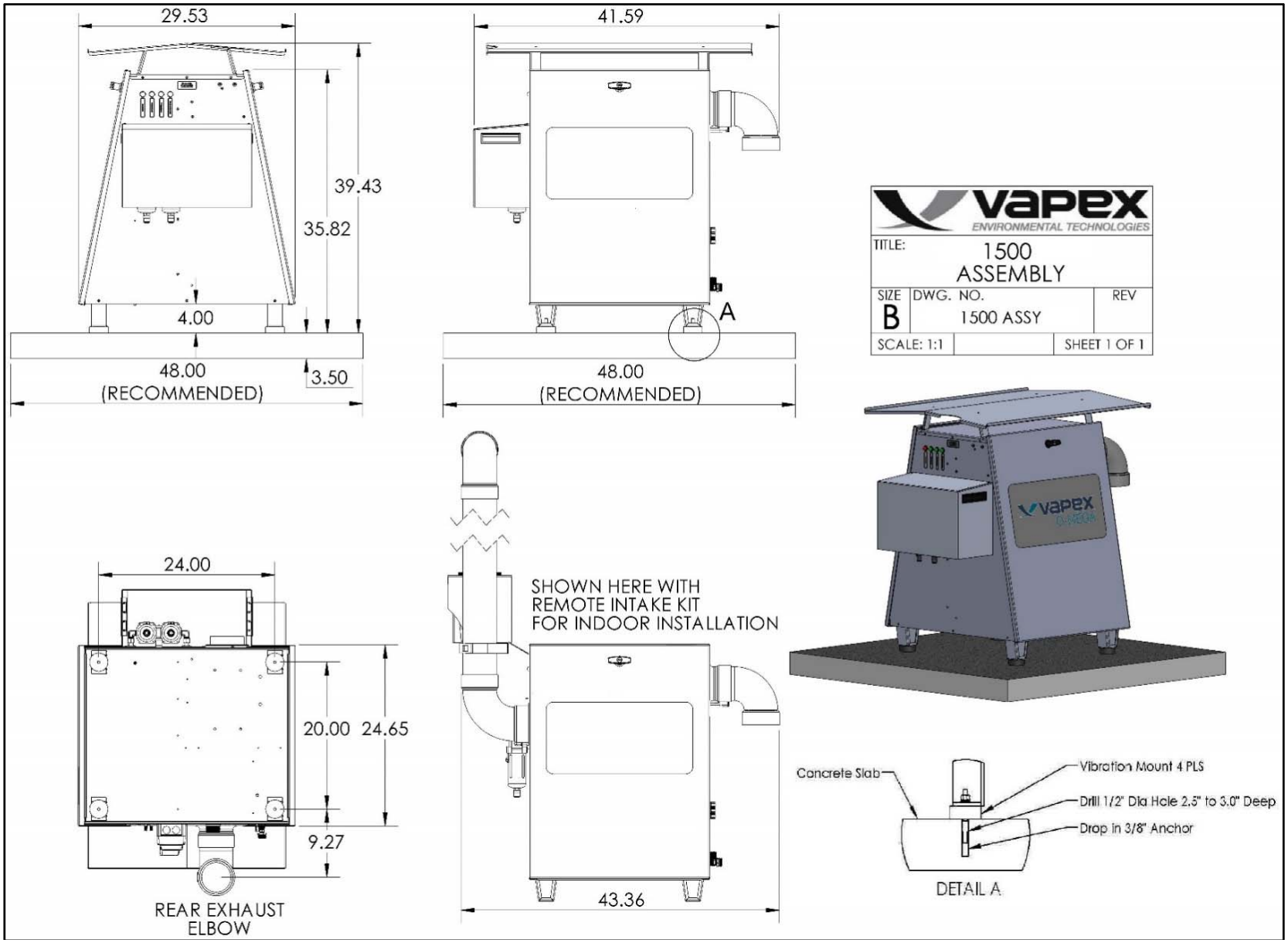
Applications

- Lift Stations/Pump Stations
- Wet Wells
- Holding Tanks
- Headworks
- Covered Clarifiers

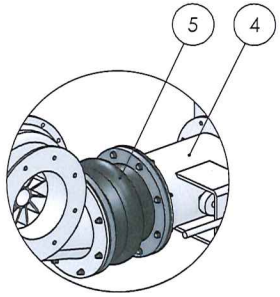
Contact Information

- Contact your local Vapex rep
- Call Vapex – 407-977-7250
- Email Vapex – Info@vapex.com

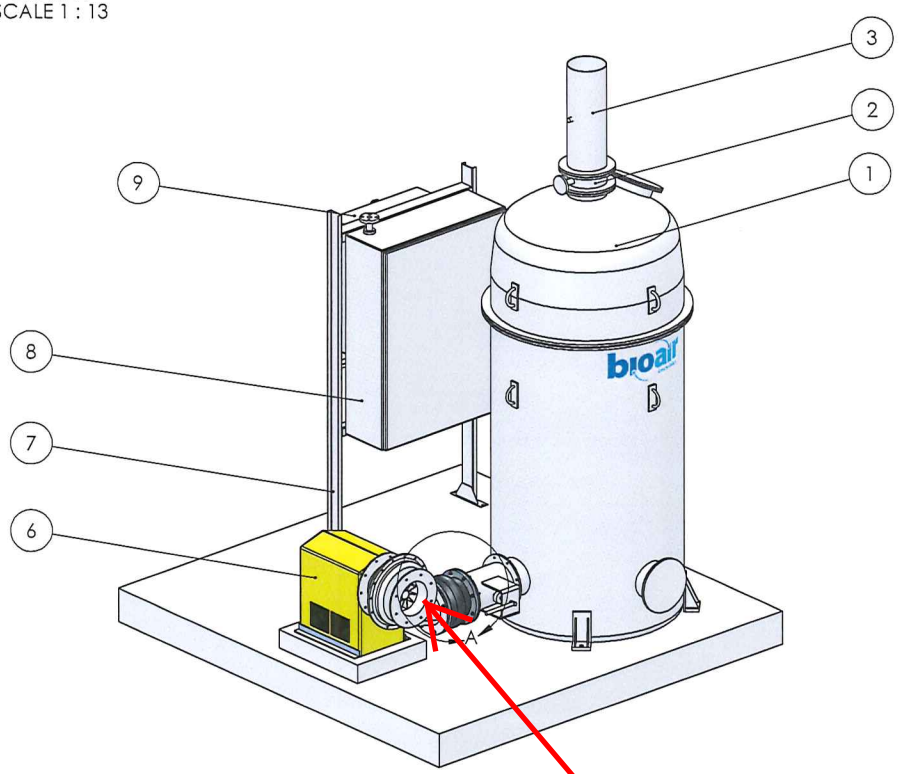
17-ZN-2019
5/8/2020


29.53
39.43
35.82
4.00
48.00
(RECOMMENDED)
3.50
41.59
A
48.00
(RECOMMENDED)
TITLE:
1500
ASSEMBLY
SIZE
B
DWG. NO.
1500 ASSY
REV
SCALE: 1:1
SHEET 1 OF 1
24.00
20.00
24.65
9.27
REAR EXHAUST
ELBOW
SHOWN HERE WITH
REMOTE INTAKE KIT
FOR INDOOR INSTALLATION
43.36
Concrete Slab
Vibration Mount 4 PLS
Drill 1/2" Dia Hole 2.5" to 3.0" Deep
Drop in 3/8" Anchor
DETAIL A

REV.	DATE	ECN#	REVISION RECORD	DR	CK
A	10/24/2011			KZ	



DETAIL A
SCALE 1 : 13



ITEM	PART NUMBER	QTY	DESCRIPTION	OPERATING WEIGHT (LBS)
1	RE031000	1	EF31 REACTOR ASSEMBLY WITH Ø2" ANSI 150 DRAIN	1725
2	NA081000	1		
3	ST082400	1	FRP STACK Ø8 PS1569 x 24"	
4	DV081000	1	FRP CONTROL DAMPER VALVE Ø8" PS15-69	10
5	FC080000	1	FLEX CONNECTOR SINGLE ARCH Ø8" PS15-69	10
6	BL200000	1	CAST ALUMINUM BLOWER	150
7	PS000100	1	STAINLESS STEEL PANEL STAND	49
8	WP101000	1	FRP WATER PANEL	65
9	CP000100	1	FRP ELECTRICAL PANEL	60

MATERIAL: SEE TABLE

FINISH:

bioair Breathe Better.

DRAWN BY	DATE	ENG APPR.	DATE	QC APPR.	DATE
KZ	10/24/2011				

PART NAME

GENERAL ARRANGEMENT ECOFILTER™ 31

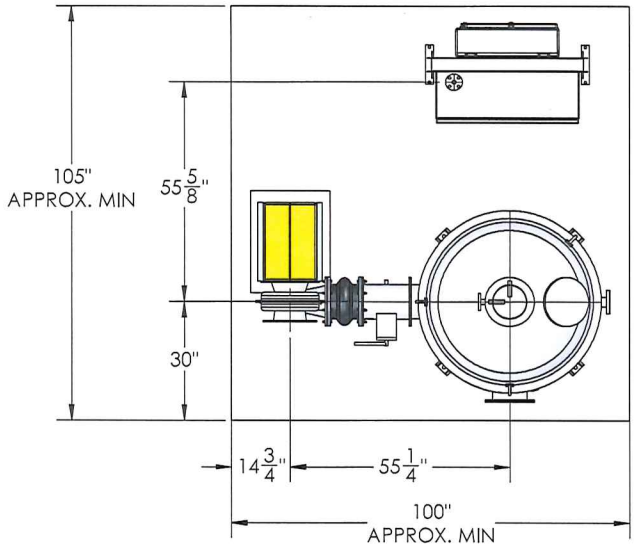
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
ANGULAR: ±1°
FRACTIONS: ±1/4
TWO PLACE DECIMAL: ±.060
THREE PLACE DECIMAL: ±.030

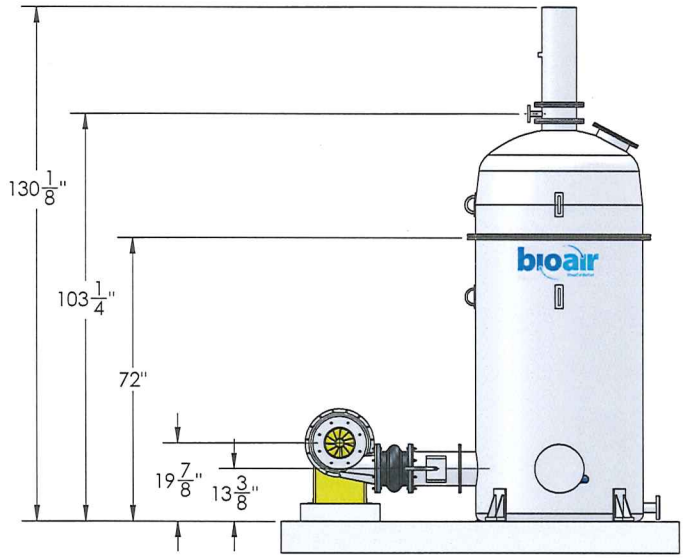
SIZE	DWG. NO.	REV
B	EF31_GA	A

SCALE: 1 : 26 | SHEET 1 OF 2

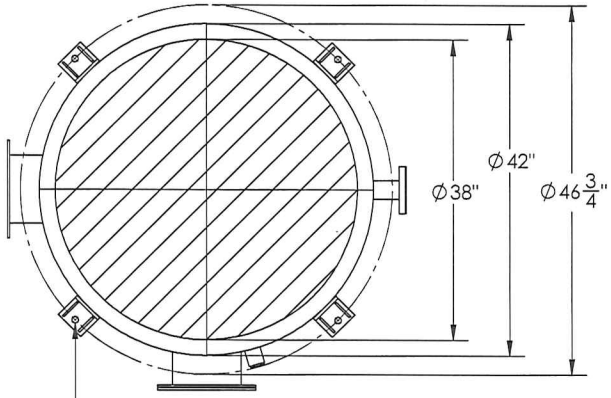
this is the connection port, right ?

17-ZN-2019
5/8/2020





NOTES:
1. FOUNDATION PAD MUST BE FABRICATED UNIFORM IN TEXTURE AND APPEARANCE AND MEET A SURFACE PLANE TOLERANCE OF 1/8" IN 10'.
2. REACTOR TO BE SET ON 30LB FELT PAPER
3. LOAD DISTRIBUTION AREA = 1134 in^2
4. SHIPPING WEIGHT = 872 LBS, OPERATING WEIGHT = 1725 LBS

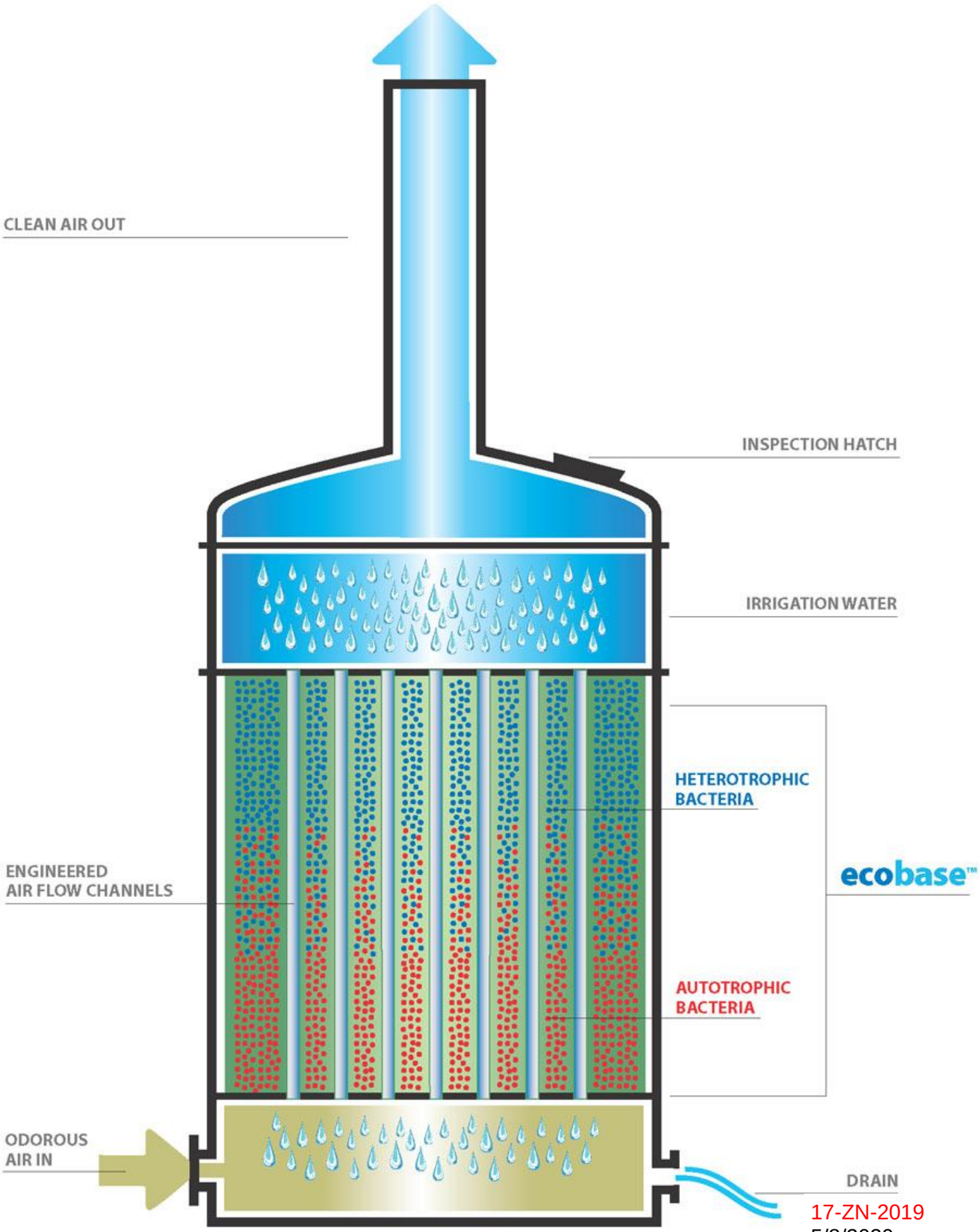


Ø 7/8" MOUNTING HOLE
EQUALLY SPACED ON
46 3/4" B.C.

LOADING DIAGRAM
SCALE: 1 : 15

SIZE	DWG. NO.	REV
B	EF31_GA	A
SCALE: 1 : 30	SHEET 2 OF 2	

17-ZN-2019
5/8/2020



17-ZN-2019
5/8/2020

PUMP ONE® LIFT STATION

17-ZN-2019
5/8/2020

Oldcastle Precast®

17-ZN-2019
5/8/2020

Created from more than 25 years of experience.

The OneLift™ by Oldcastle Precast, provides a standard turnkey submersible pump station product with the distinction of having a sole-source point of responsibility. The OneLift Pump Station is designed with an integral valve vault built into the unused top portion of the wet well, which yields a single-structure product, that solves the problems of differential settlement found with the conventional 2-structure systems. In addition; the single-structure design significantly reduces the product footprint for sites with tight area restrictions, and reduces complexity, size and cost of the excavation. The OneLift has proven to significantly reduce the time required for site installation.

OneLift's standard innovative design allows for quicker project documentation, faster product delivery and repetitive high quality manufacturing. Oldcastle Precast's turnkey obligation means that the OneLift Pump Station will be factory preassembled with all mechanical and electrical components prior to delivery, and that Oldcastle Precast, or our licensed distributors, are responsible for product commissioning, training and complete package warranty.

You can depend on the name and quality of Oldcastle Precast

17-ZN-2019
5/8/2020

TURNKEY PACKAGE station from a single supplier and installed in less than a day.

INNOVATION

Single Structure design

The factory built OneLift pump station offers a monolithically cast valve vault, in what is typically an unused portion of the pump station. This results in a significantly smaller footprint – up to 50% smaller than conventional 2 structure pump stations – allowing it to fit tight sites. The innovative shape and structural design provides ample space for the interior valve vault, while increasing workable system volumes and decreasing the depth of the excavation. The single structure of the OneLift pump station eliminates any potential differential settlement issues, allows for a quick and easy installation by eliminating the typical two-tier excavation of conventional stations, and is proven to be a cost-effective method of providing a high quality pump station solution with rapid and reliable delivery. With the OneLift pump station you get fast turnaround time on submittals; which include standard structural and mechanical components.

Design Features:

- Rounded-corner design – allows for thinner/ lighter walls and prevents solids accumulation
- Near rectangular shape – provides more storage volume in the bottom and more space in the top to integrate the valve chamber
- Single structure design – provides a smaller footprint, simpler excavation, rapid installation, and eliminates potential for differential settlement
- Standard design – allows for stockable components for quicker turnaround and a rapid submittal package

STOCKED COMPONENTS of various heights to fit specific jobsite needs.

QUALITY CONSTRUCTION

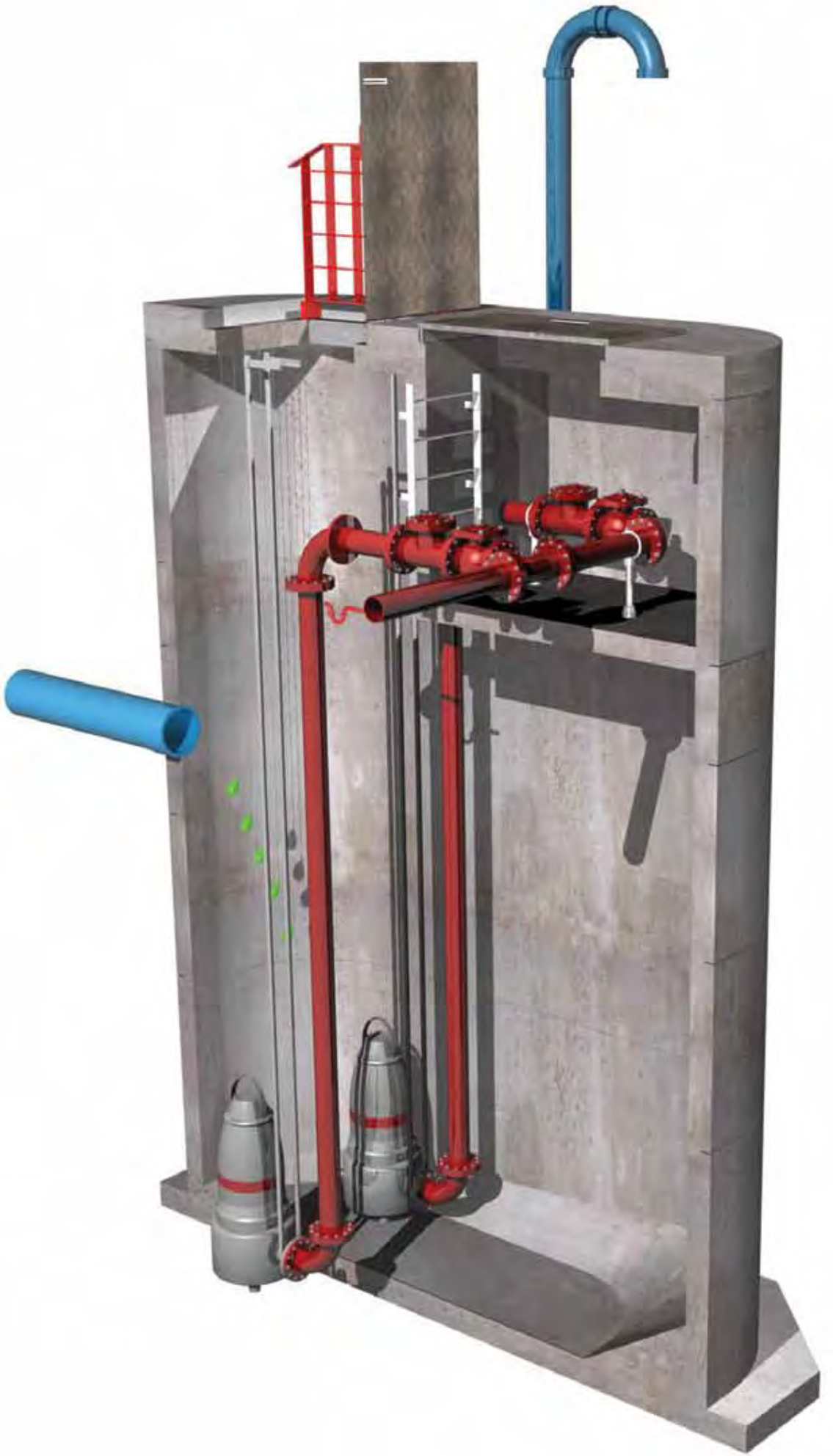
Factory built to rigid Oldcastle Precast quality standards

With the OneLift pump station you get quick submittal turn-around and high quality repetitive factory outfitting. Assembly of mechanical and electrical components in controlled factory conditions means a consistently higher quality product than site assembled stations. The OneLift pump station is factory preassembled and then partially disassembled for shipping. This prepackaged solution allows for field erection and reassembly in less than four hours. You get standard structural and mechanical components that allow for factory stocking, resulting in quicker station deliveries.

Construction Features:

- Standardized/stockable components that allow for fast production
- Packaging in controlled factory vs. variable field conditions
- Oldcastle quality and local availability
- Quick project turnaround

17-ZN-2019
5/8/2020



17-ZN-2019
5/8/2020

PREASSEMBLED equipment package providing rapid installation and factory built quality.

Valve Assembly in Valve Vault, pre-assembled in factory.

Technical info:

- Station height 10'-10" to 24'-10""
- Top slab with hatches: 300# pedestrian, or H20 design loading
- Valve vault extension risers (2' & 4')
- Integral valve vault section (4'-8 high)
- Wet well riser sections (2', 3', & 4' high)
- Base section 4'-8' w/ mono fillet & collar
- Factory preassembly of equipment provides: factory assembled quality which further accelerates installation to ½ day

Pump Station during factory assembly.

BENEFITS TO . . .

the Design Engineer

- Smaller footprint on site
- Accommodates multiple pump manufacturers
- Turn-key package from one supplier
- AutoCAD drawings and specs readily available
- Timely and accurate budget estimates
- Can be considered a "standard off-the-shelf product"

the Owner

- Rapid project cycle (design & construct)
- Smaller footprint on site
- Standardized and repeatable
- Overall cost savings
- Reliability and quality of Oldcastle Precast

the Site Contractor

- Quick delivery timeline and rapid installation process
- Single smaller excavation (possibly shallower)
- Rapid installation limits the dewatering process
- Preassembled-requires only minor reassembly on site
- Safer below grade construction process
- Competitive installed cost
- Greater value and known quantity

TYPICAL 1/2-DAY INSTALLATION

As a prepackaged solution, the OneLift pump station arrives at your job site preassembled and ready for installation. The preassembly of the OneLift pump station allows for a simplified construction process reducing installation time to 3-4 hours or just half a day. The single structure of the OneLift pump station is significantly easier to install.

9:30 am

Flat bed trucks arrive with pump station components. Contractor has excavation ready for pump station installation.

10:15 am

Crane off-loads base section into excavation, additional sections are set at a rate of approximately one every thiry minutes.

A single tier excavation is all that is required which improves job site safety as assembly time in the excavation is reduced. Dewatering time and costs are reduced as well. ***Case study: RC509 delivered and installed in North Truro, MA.***

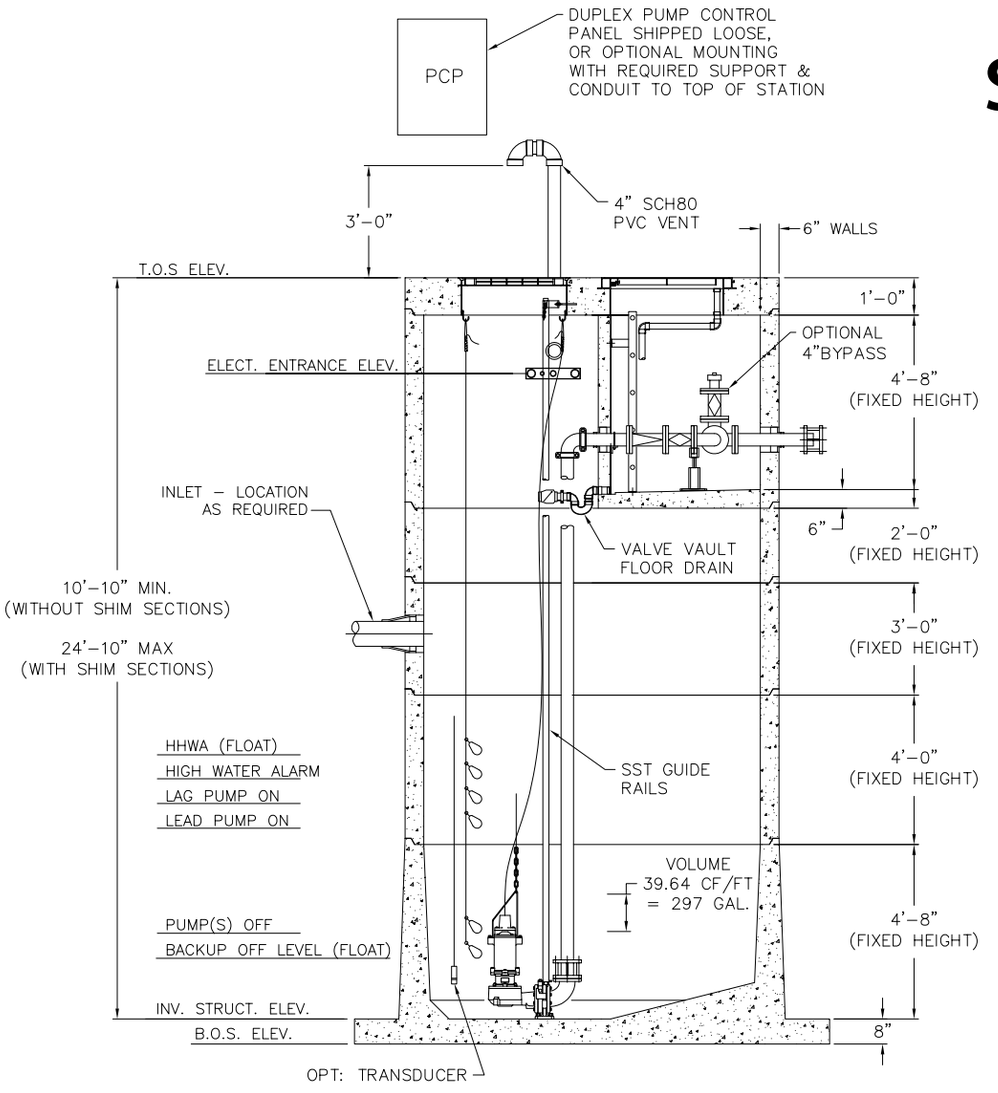
11:15 am

Crane sets long discharge pipes and pump guide rails (shipped loose) into station. Pump station top section with integral vault is set.

12:00 Noon

Minor reassembly of shipped loose items are completed in two hours and backfill begins.

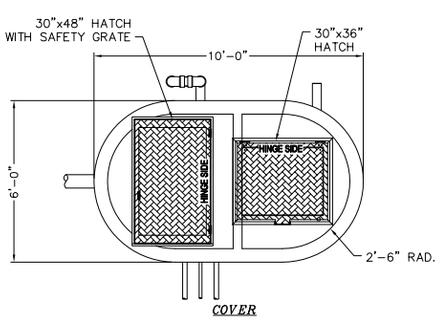
SPECIFICATIONS



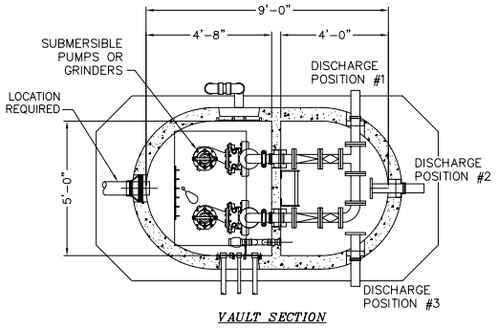
INTERIOR ELEVATION VIEW
RC509 x 10'–10" to 24'–10"

PUMP STATION SIZING CHART

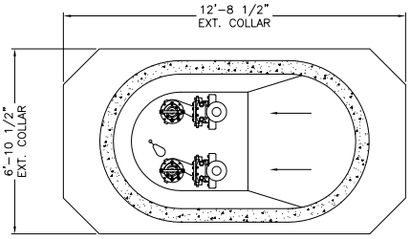
Model Number	RC509	RC611
Interior Width	5'-0"	6'-0"
Interior Length	9'-0"	11'-0"
Min/Max Height (T.O.S. to floor)	10'-10" / 24'-10"	10'-10" / 24'-10"
Volume (gal/vertical foot)	297 gal	436 gal
Standard DI Piping & Discharge Size*	4"	6"
Replaces Conventional Pump Stations	6' diameter & 8' diameter	8' diameter & 10' diameter



COVER

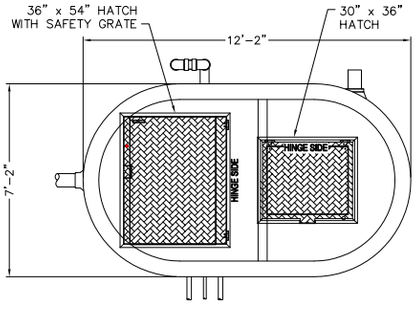


VAULT SECTION



PUMP SECTION

RC509 PLAN VIEWS



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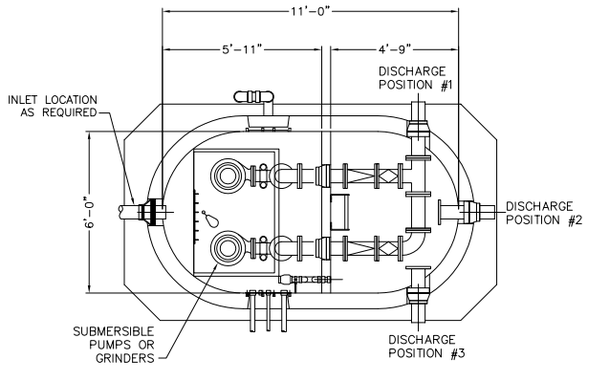

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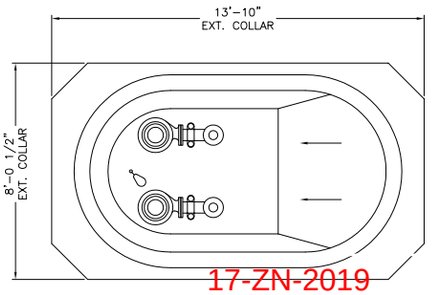

PUMP SECTION

RC611 PLAN VIEWS

PUMP ONE LIFT STATION

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PUMP ONE LIFT STATION

Oldcastle Precast

www.onelift.com

888-965-3227

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