Chapter 7

WASTEWATER

7

This chapter provides ordinance, policy, and standards establishing design criteria for constructing and modifying water systems to be owned and operated by the city. It provides guidance on agreements, design report preparation, transmission and distribution systems, fire protection and final plans preparation.

DEPARTMENT RESOURCE INFORMATION

Aviation/Airport	15000 N. Airport Dr.	480-312-2321
Advance Planning Services	7506 E. Indian School Rd.	480-312-7990
Capital Project Management	7447 E. Indian School Rd., Suite 205	480-312-7250
Current Planning	7447 E. Indian School Rd., Suite 105	480-312-7000
Customer Service	7447 E. Indian School Rd., Suite 100	480-312-7800
Downtown Group	4248 N. Craftsman Ct.	480-312-7750
Facilities Management	9191 E. San Salvador Dr.	480-312-5999
Fire & Life Safety/ Inspections	8401 E. Indian School Rd.	480-312-1855
Fire Plan Review	7447 E. Indian School Rd., Suite 125	480-312-7080
Inspections & Land Survey	9191 N. San Salvador Dr.	480-312-5750
Parks Department	7340 Scottsdale Mall	480-312-2915
One Stop Shop/Permit Services	7447 E. Indian School Rd., Suite 100	480-312-2500
Plan Review	7447 E. Indian School Rd., Suite 125	480-312-7080
Records Division	7447 E. Indian School Rd., Suite 100	480-312-2356
Solid Wastewater Management	9191 N. San Salvador Dr.	480-312-5600
Stormwater Management	7447 E. Indian School Rd., Suite 205	480-312-7250
Street Operations	9191 N. San Salvador Dr.	480-312-5626
Transportation	7447 E. Indian School Rd., Suite 205	480-312-7696
Water Resources	9388 E. San Salvador Dr.	480-312-5685
City of Scottsdale	www.scottsdaleaz.gov	

WASTEWATER

7-1

GENERAL INFORMATION

7-1.000

A. Ordinance Requirements

Developers are required to install at their expense, all improvements necessary to provide wastewater service to their development. This includes any sanitary sewer lines, lift stations, force mains or other facilities, and the payment of all required development fees. See the Scottsdale Revised Code, Section 49-73, www.ScottsdaleAZ.gov/codes.

Developers must also adhere to the city's requirements for extension of the city's wastewater system to newly developed areas and subdivisions inside the city's service area. See Section 49-212, www.ScottsdaleAZ.gov/codes.

A civil engineer registered in the State of Arizona is required to analyze the wastewater generation from a proposed development and determine its impact on the city's wastewater collection system. This analysis is typically required from the development to a point on the downstream system where the engineer can certify compliance with a master plan previously accepted by the city. The city is responsible for analysis of sanitary sewer lines shown in the city's Wastewater System Master Plan.

B. Diligence

It is strongly advised that developers and property owners verify the need for any sewer extensions necessary to provide service to a site and comply with the extension/frontage requirements of the City's Code.

Available Resources:

1. Records Counter; obtain existing utility maps and as-built drawings.
2. Scottsdale Revised Code; (generally Chapters 47 through 49), www.ScottsdaleAZ.gov/codes.
3. City of Scottsdale, Home Improvement Center, www.ScottsdaleAZ.gov/bldgresources/MyHome.
4. A city civil plans examiner and/or a city water resources engineer can confirm the need for any required extension or condition for sewer service.

Information obtained from the city will be good for a six month period.

EPA REGULATIONS

7-1.001

The US Environmental Protection Agency (EPA) requires the city to develop and implement a program to control discharges that might harm the Publicly Owned Treatment Works (POTW). The program establishes local discharge limits for non-residential users and provides a permitting process based on the users' discharges and types of businesses. Details of the program and requirements are found in the Scottsdale Revised Code: Article IV of Chapter 49; Water, Sewers and Sewage Disposal. Specific information may be obtained by calling the Water Resources Department at 480-312-5685.

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.

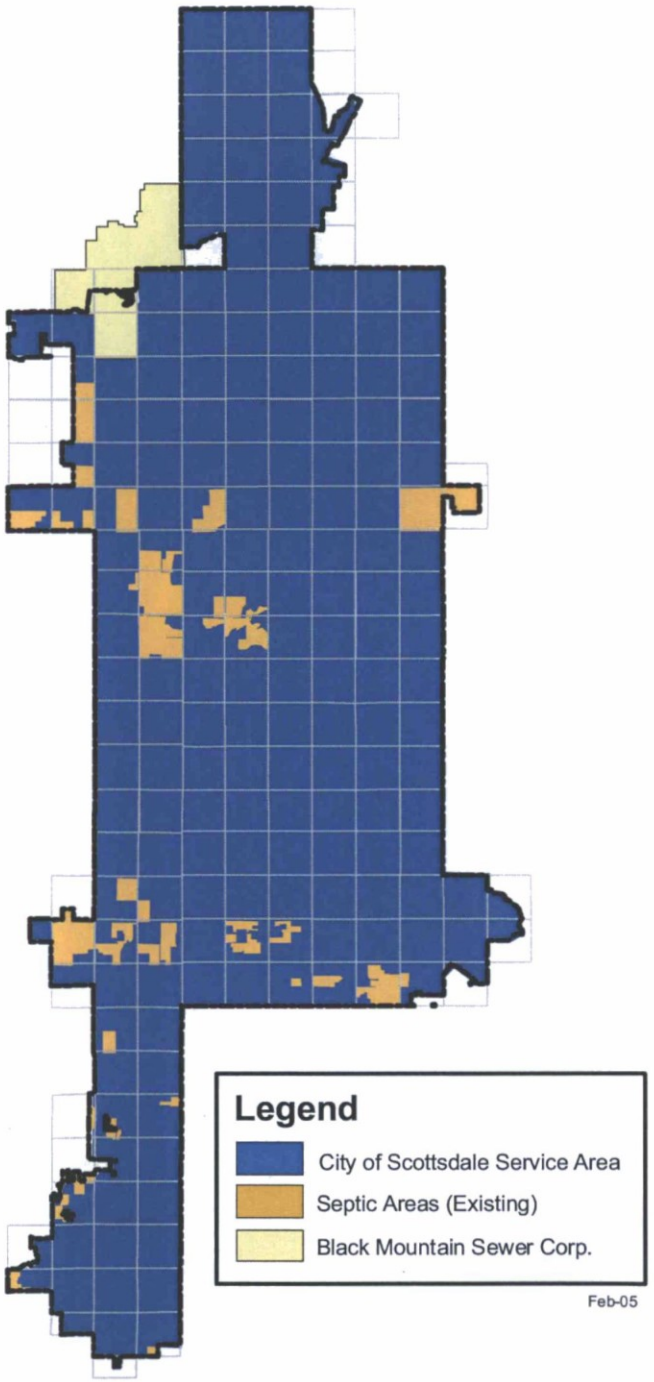


FIGURE 7.1-1 WASTEWATER SERVICE AREAS

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.

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.

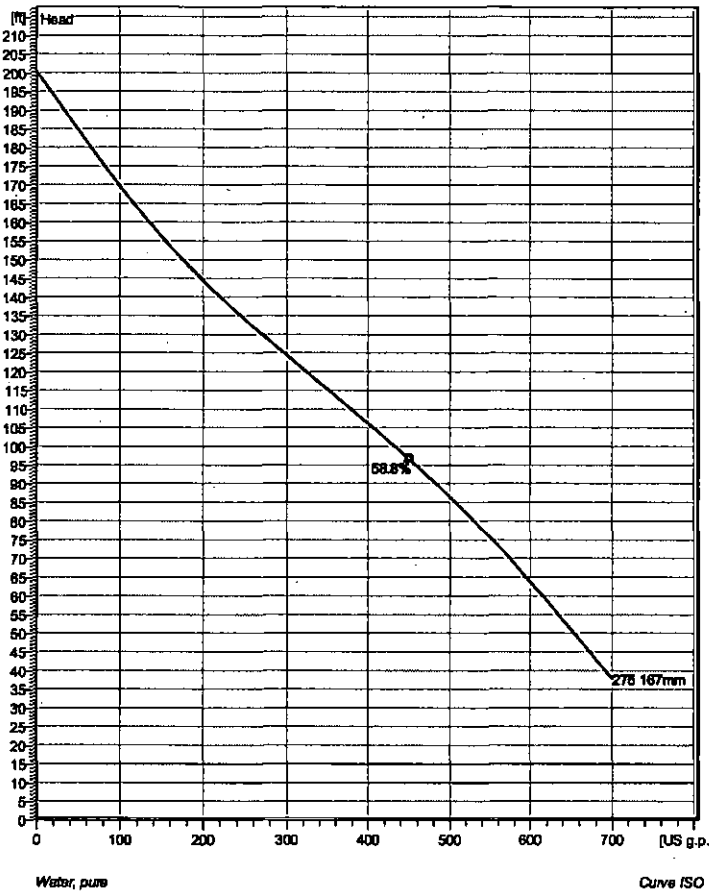
No final plans will be submitted unless accompanied by a copy of the accepted basis of design report, when one is stipulated for the project. If master plans or basis of design reports are being submitted as part of a development review board or preliminary plat package, they should also be submitted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

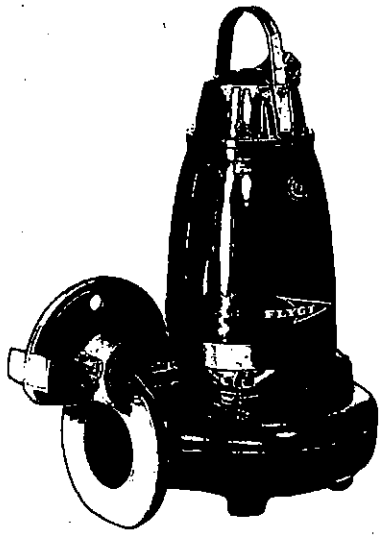
Appendix C – NP 3153 SH3-275 (167mm Impeller) Pump Information

NP 3153 SH 3~ 275

Technical specification



Water, pure *Curve ISO*



Note: Picture might not correspond to the current configuration.

General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

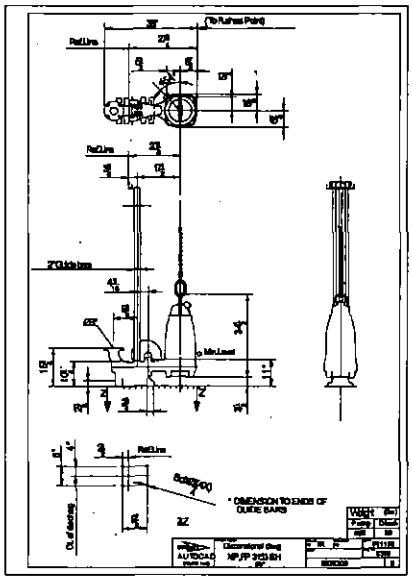
Impeller material	Grey cast iron
Discharge Flange Diameter	3 1/8 inch
Inlet diameter	80 mm
Impeller diameter	167 mm
Number of blades	2

Motor

Motor #	N3153.091 21-18-28B-W 23hp
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	2
Phases	3~
Rated power	23 hp
Rated current	26 A
Starting current	215 A
Rated speed	3510 rpm
Power factor	
1/1 Load	0.90
3/4 Load	0.87
1/2 Load	0.79
Pump Efficiency	
1/1 Load	91.0 %
3/4 Load	91.5 %
1/2 Load	91.5 %

Configuration

Installation: P - Semi permanent, Wet



Project	Project ID	Created by	Created on	Last update

NP 3153 SH 3~ 275

Performance curve

Pump

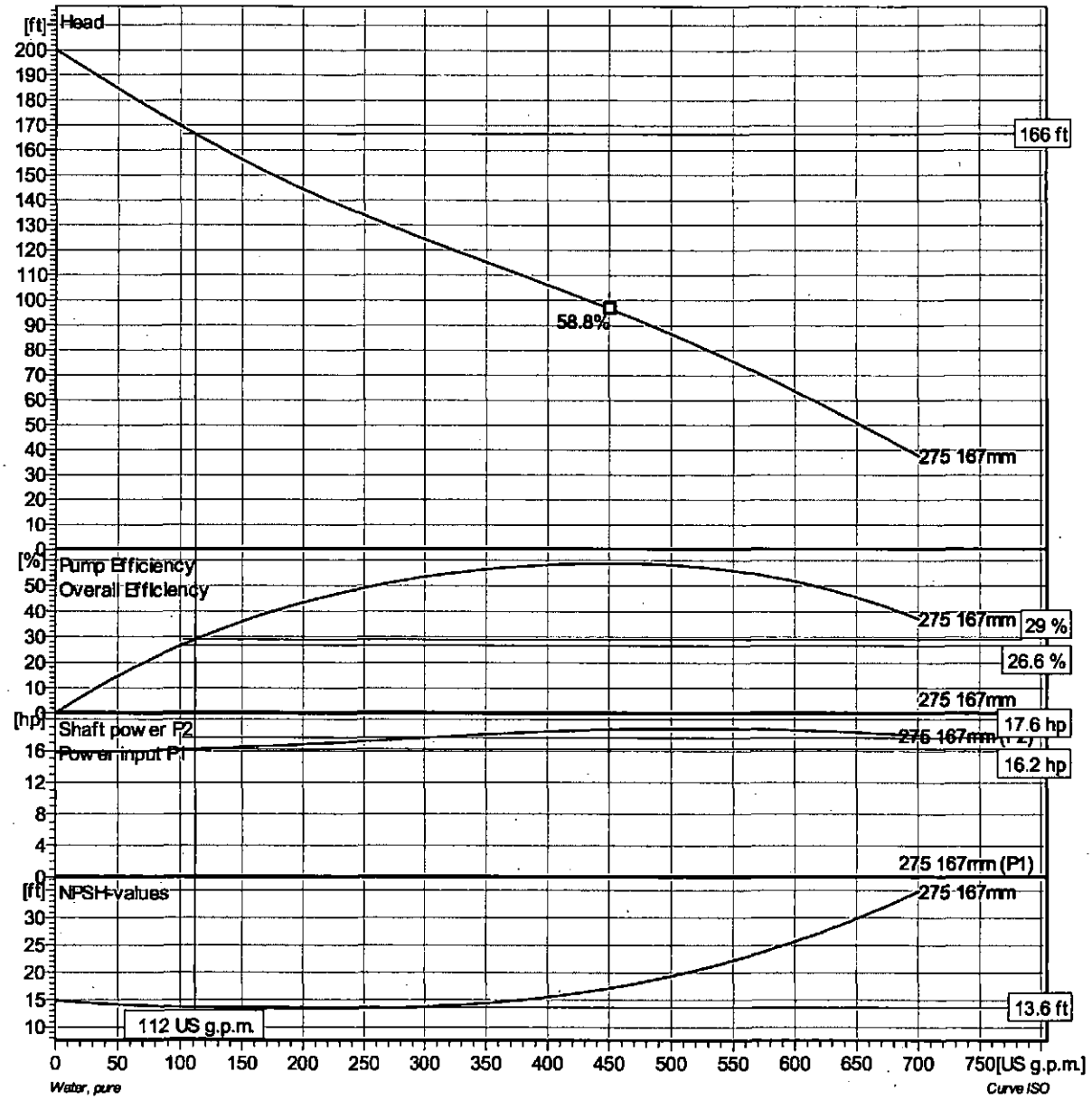
Discharge Flange Diameter	3 1/8 inch
Inlet diameter	80 mm
Impeller diameter	6 9/16"
Number of blades	2

Motor

Motor #	N3153.091 21-18-2BB-W 23hp
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	2
Phases	3~
Rated power	23 hp
Rated current	26 A
Starting current	215 A
Rated speed	3510 rpm

Power factor	
1/1 Load	0.90
3/4 Load	0.87
1/2 Load	0.79

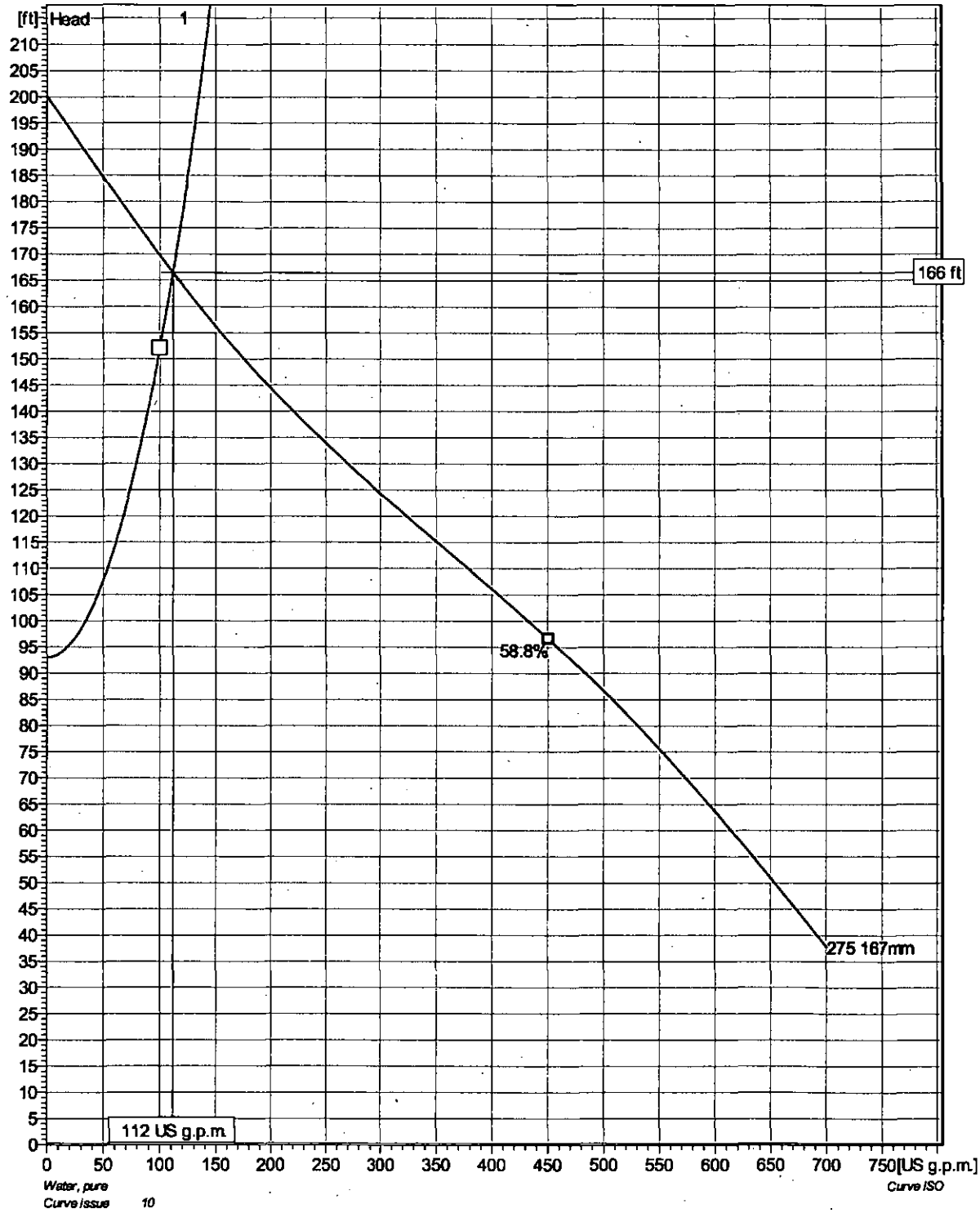
Pump Efficiency	
1/1 Load	91.0 %
3/4 Load	91.5 %
1/2 Load	91.5 %



Project	Project ID	Created by	Created on	Last update

NP 3153 SH 3~ 275

Duty Analysis

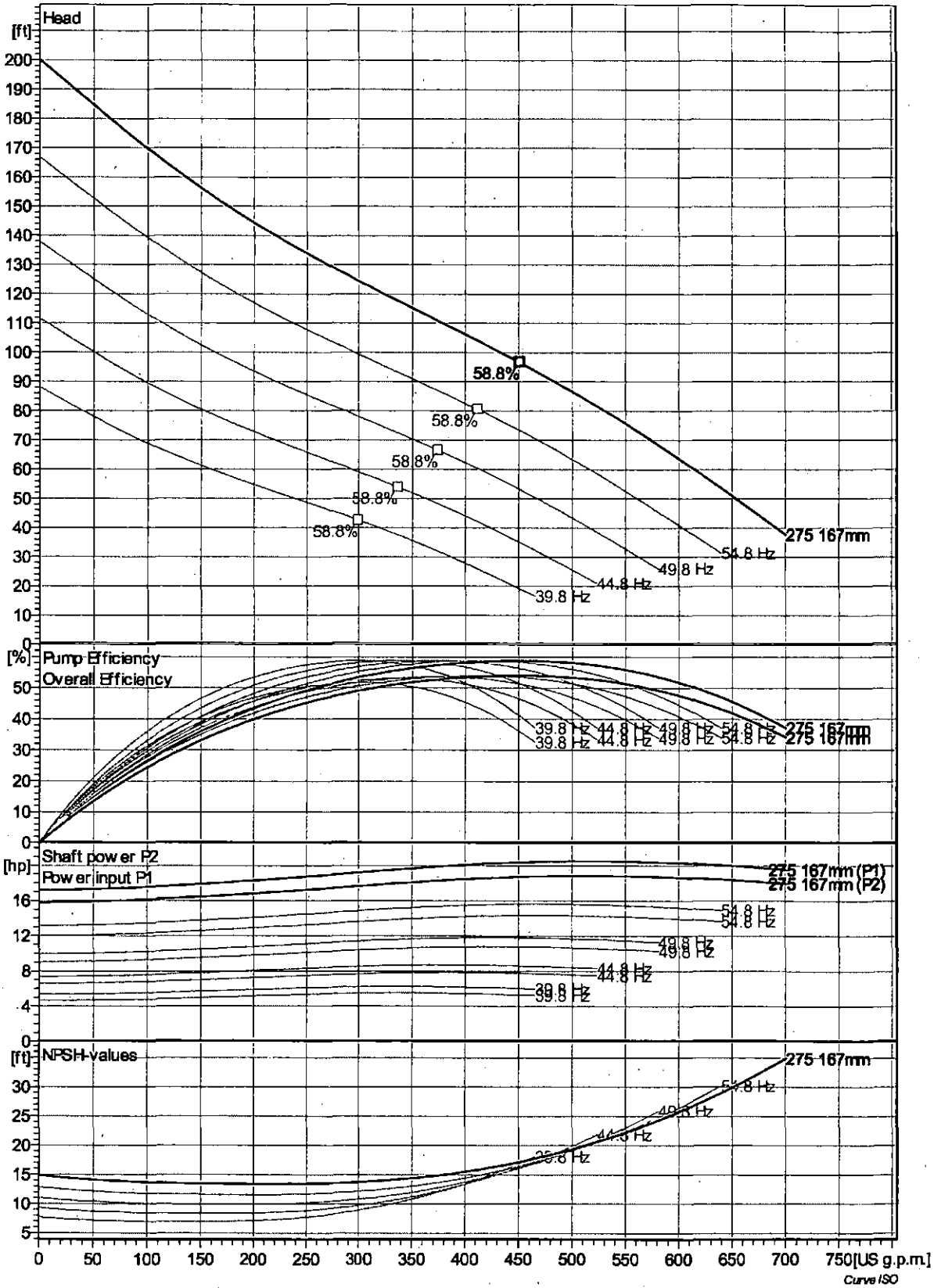


Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	112 US g.p.m.	166 ft	16.2 hp	112 US g.p.m.	166 ft	16.2 hp	29 %	1960 kWh/US MG	13.6 ft

Project	Project ID	Created by	Created on	Last update

NP 3153 SH 3~ 275

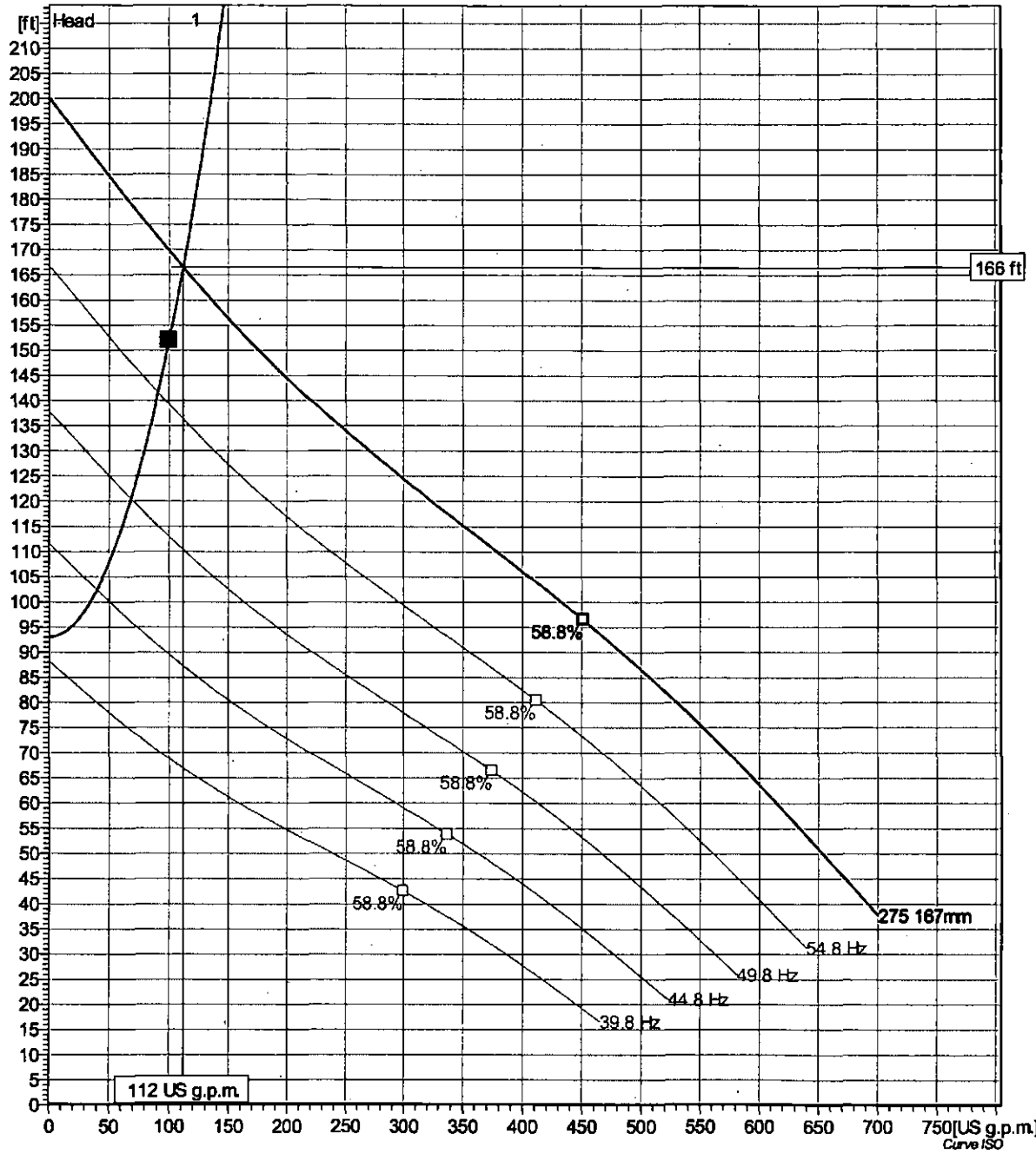
VFD Curve



Project	Project ID	Created by	Created on	Last update

NP 3153 SH 3~ 275

VFD Analysis

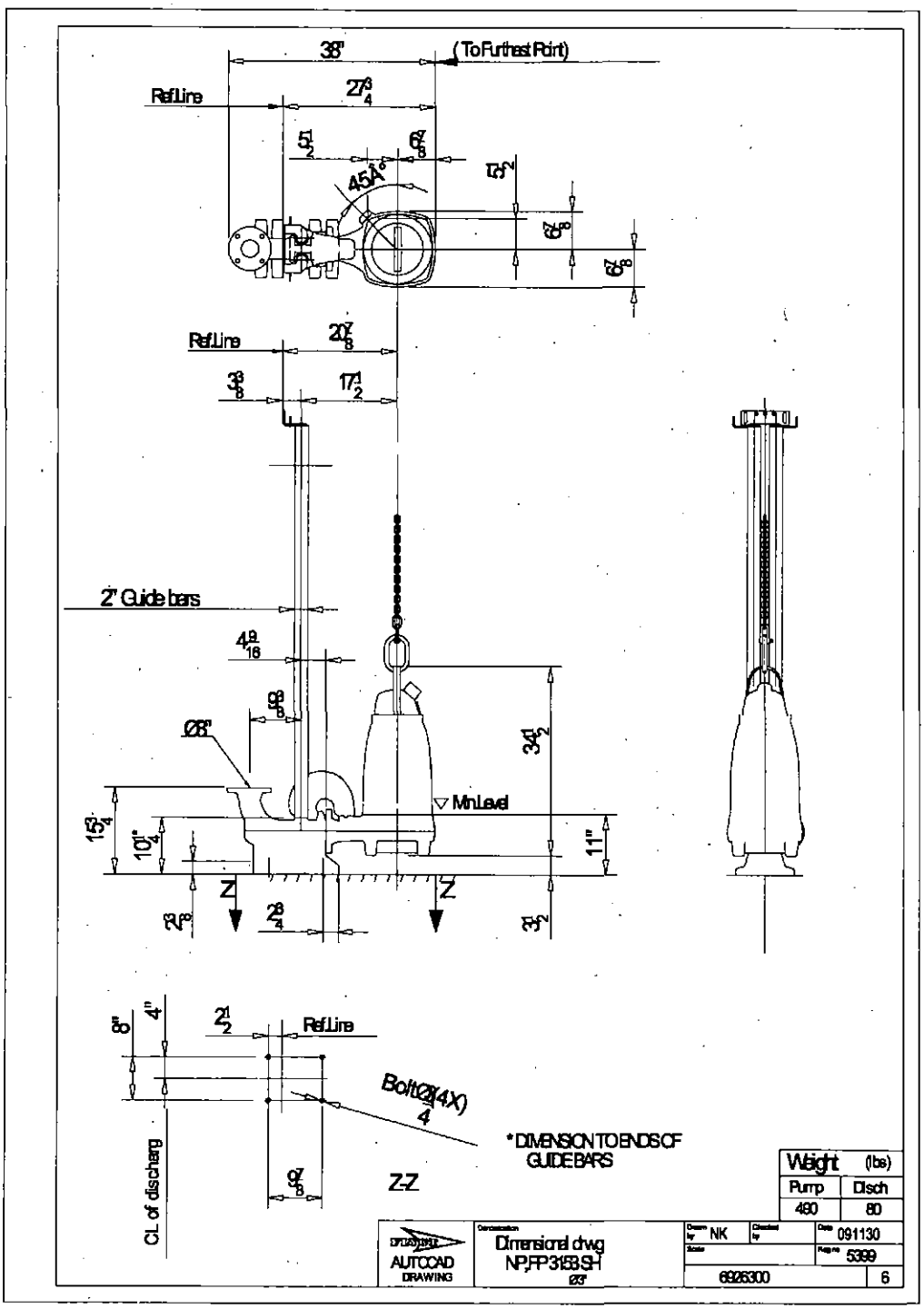


Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	60 Hz	112 US g.p.m.	166 ft	16.2 hp	112 US g.p.m.	166 ft	16.2 hp	29 %	1960 kWh/US MG	13.6 ft
1	54.8 Hz	90.7 US g.p.m.	142 ft	12.3 hp	90.7 US g.p.m.	142 ft	12.3 hp	26.5 %	1640 kWh/US MG	11.8 ft
1	49.8 Hz	68.2 US g.p.m.	120 ft	9.18 hp	68.2 US g.p.m.	120 ft	9.18 hp	22.7 %	1840 kWh/US MG	10.3 ft
1	44.8 Hz	40 US g.p.m.	102 ft	6.84 hp	40 US g.p.m.	102 ft	6.84 hp	15.6 %	2310 kWh/US MG	8.84 ft
1	39.8 Hz									

Project	Project ID	Created by	Created on	Last update

NP 3153 SH 3~ 275

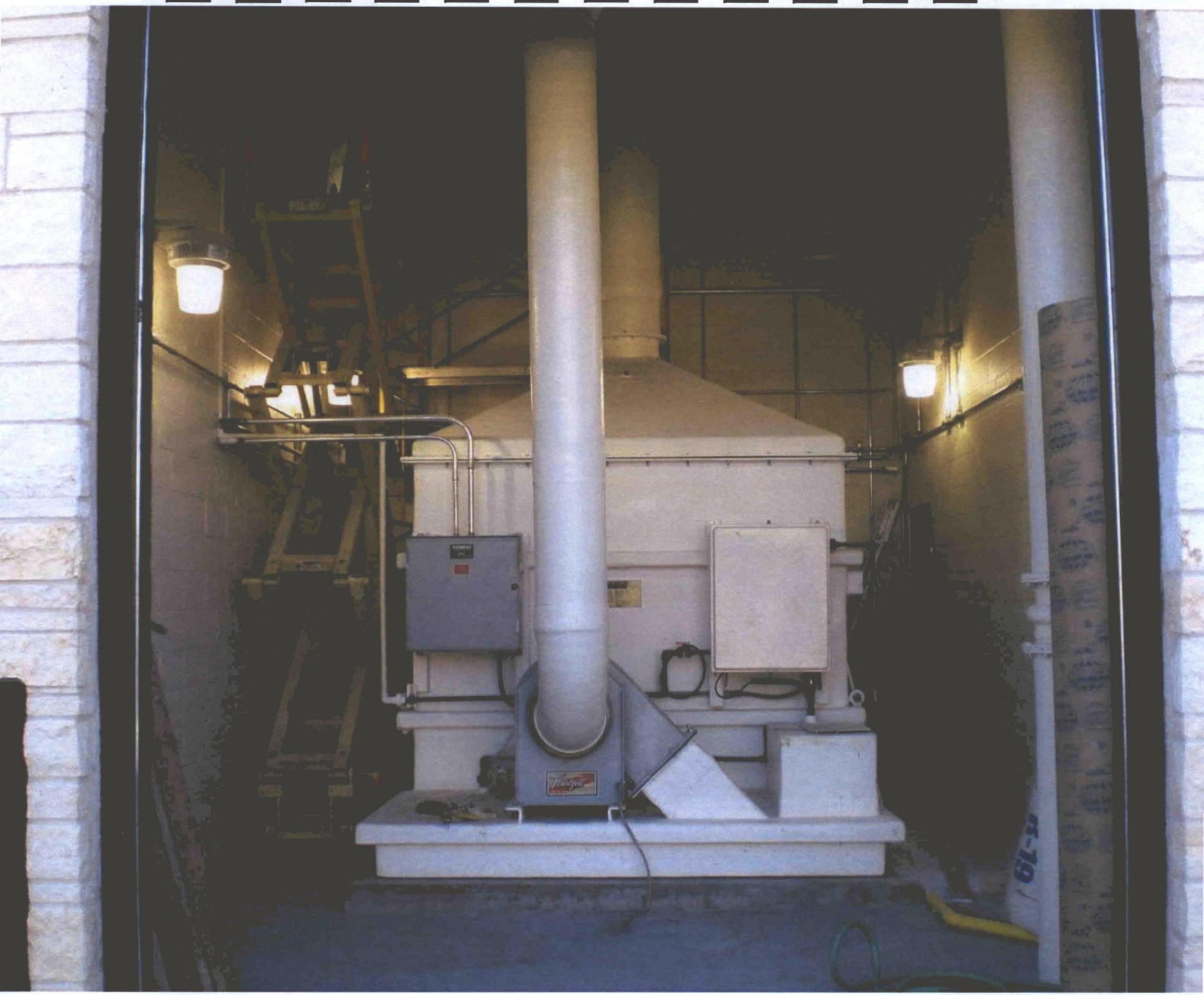
Dimensional drawing



Project	Project ID	Created by	Created on	Last update

Appendix D – Lift Station Layout Examples


2914


R-19


8665
Unite
SITE SERVICES
1-800-TOILE

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:

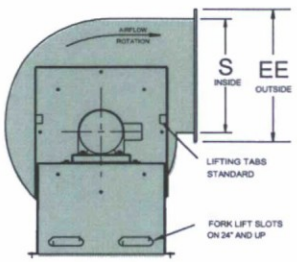
Assume a needed performance of 12,000 CFM at 5" SP, standard air. Reading the 33" rating table for 100% width on page 17, we find a fan RPM of 1,168 and brake horsepower (BHP) of 12.3. Required motor horsepower is 15. The model code can be constructed as follows: Type will be a production item (code 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).

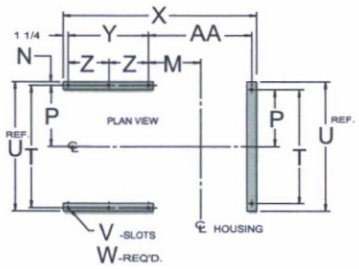
Note: All other informational fields must be filled with hyphens/dashes (-) if they are not applicable to the fan being considered.

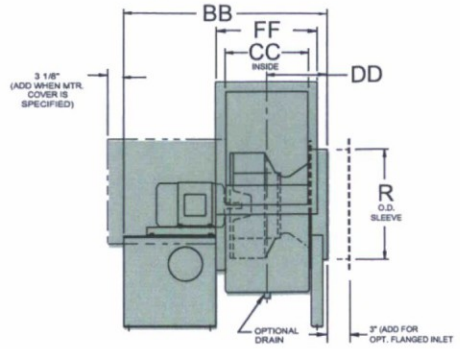
This bulletin lists Hartzell's line of Fiberglass Backward Curved Centrifugal Fans, Type FA and accessories. More than 70 Hartzell offices can provide specific performance and installation data to meet your requirements. Call your Hartzell representative for assistance. Visit our website **(www.hartzellfan.com)**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

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

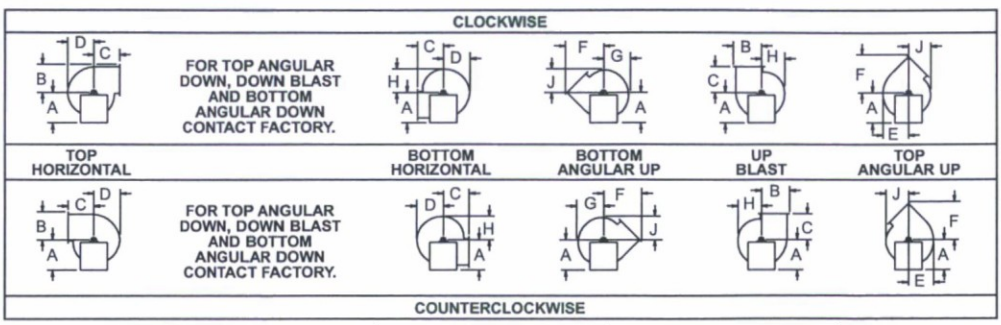
Fan Size	P	R	S	T	U	V	W	X		Y	Z	AA	
								100% Width	66% Width			100% Width	66% Width
12	9 1/8	12 1/4	12 7/8	18 1/4	19 1/2	9/16 x 1 1/16	6	26 7/16	25 9/32	9 1/2	–	14 11/16	13 17/32
15	10 3/4	16 1/2	16 1/8	21 1/2	22 3/4	9/16 x 1 1/16	6	36	34 5/8	16 1/2	–	17 1/4	15 13/16
18	12 3/8	19 1/2	19 3/8	24 3/4	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 3/32	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

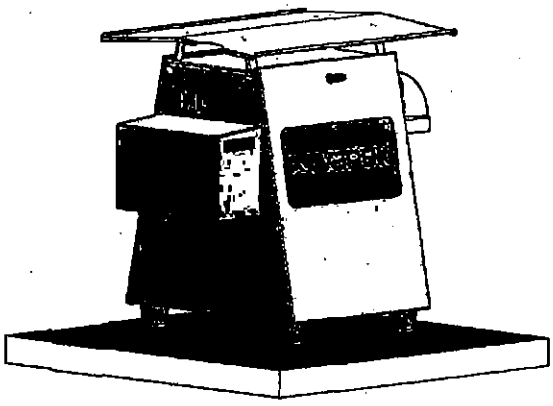
Class	Fan Size	Flanges: Inlet Thickness	Flanges: Inlet Holes	Flanges: Outlet Thickness	Flanges: Outlet Holes 100% & 66%	Shaft & Bearings: Size	Shaft & Bearings: Type	FA Type Wheel WR² (Lbs.-Ft.²)	Motor Frames: Minimum Arr. #4	Motor Frames: Maximum Arr. #4	Motor Frames: Maximum Arr. #9 & #10	Installation Weights (Lbs. Less Motor): Arr. #4	Installation Weights (Lbs. Less Motor): Arr. #9 & #10
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: Inlet Thickness	Flanges: Inlet Holes	Flanges: Outlet Thickness	Flanges: Outlet Holes 100% & 66%	Shaft & Bearings: Size	Shaft & Bearings: Drive Side	Shaft & Bearings: Inlet Side	FA Type Wheel WR² (Lbs.-Ft.²)	Maximum Motor Frame Arr. #10	Installation Weights (Lbs. Less Motor)
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

ENVIRONMENTAL TECHNOLOGIES



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

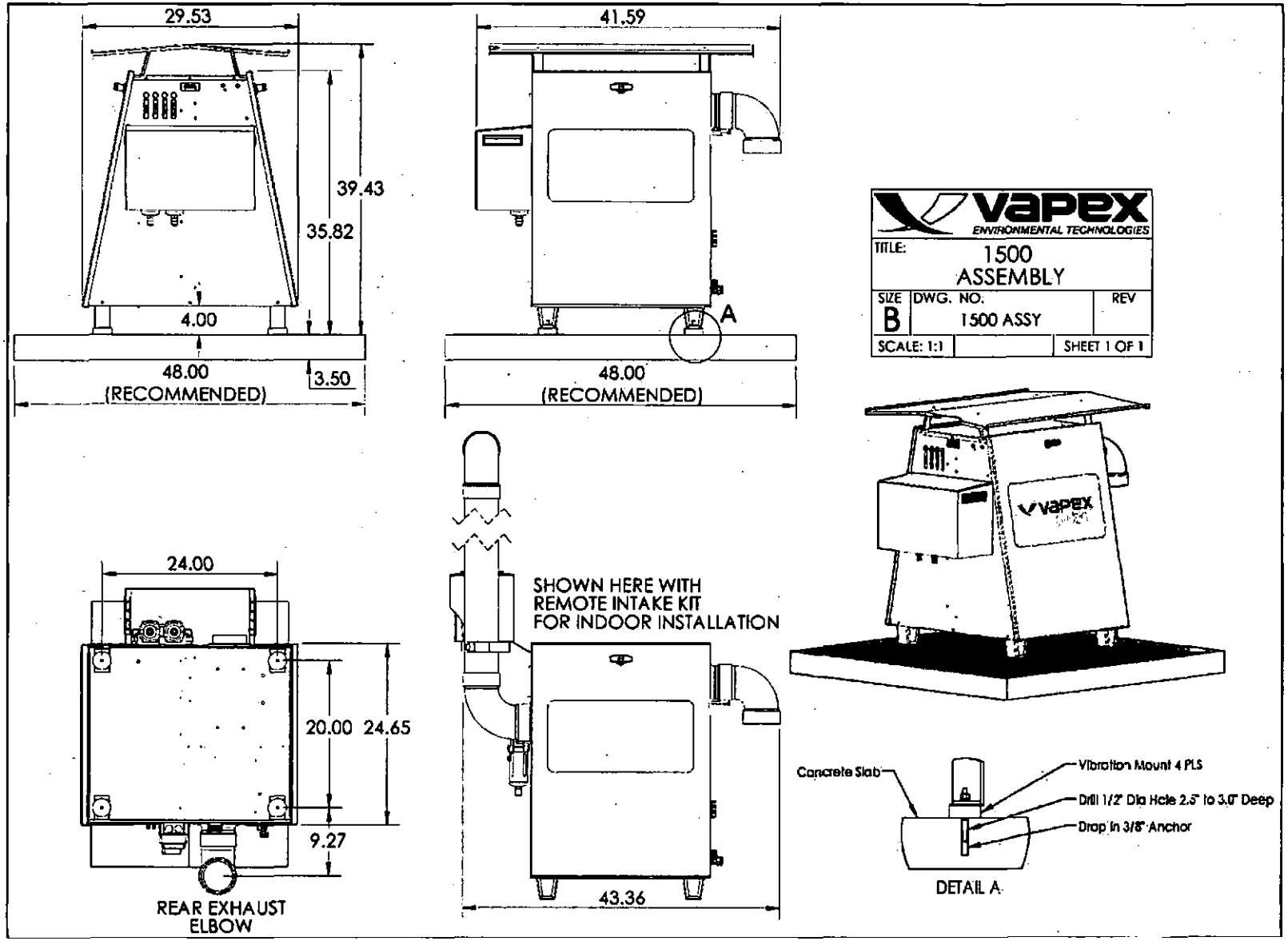
The Vapex 1500 is an odor control system specifically designed to treat H_2S, mercaptans, amines, and other odorous compounds in enclosed spaces. It combines ozone, water, and air using a patented 3-fluid nozzle to atomize the water molecules to create hydroxyl radicals. The odorous air is not extracted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

Applications

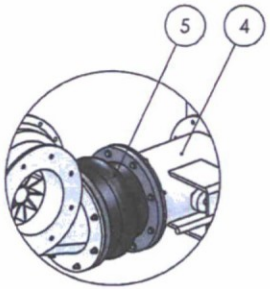
- Lift Stations/Pump Stations
- Wet Wells
- Holding Tanks
- Headworks
- Covered Clarifiers

Contact Information

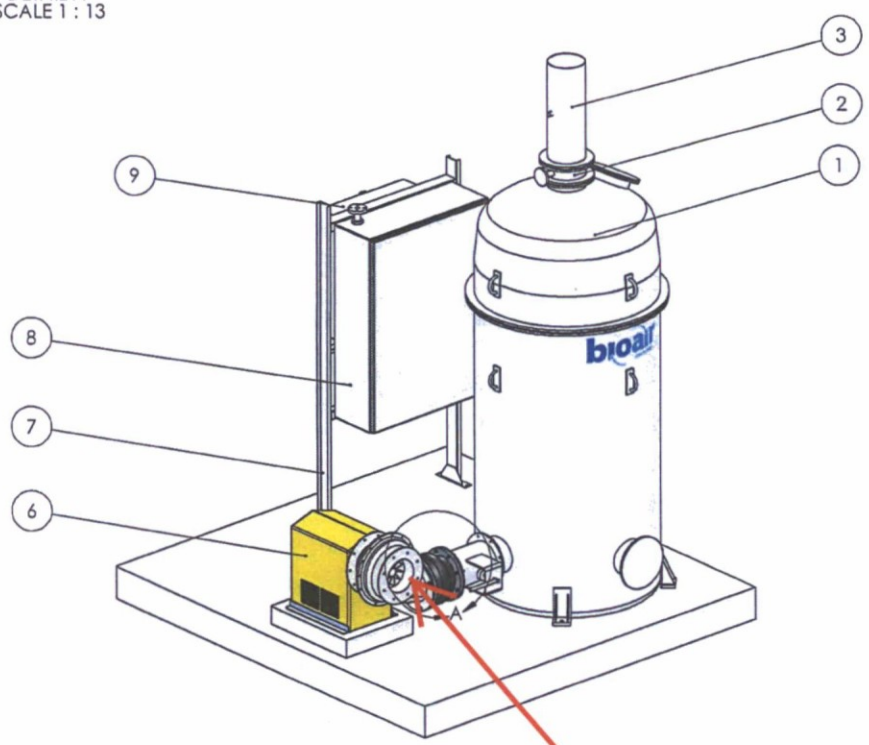
- Contact your local Vapex rep
- Call Vapex – 407-977-7250
- Email Vapex – Info@vapex.com


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:

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

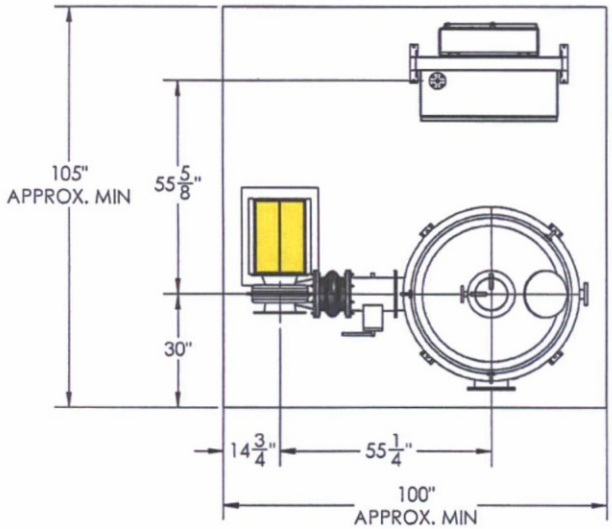
PART NAME

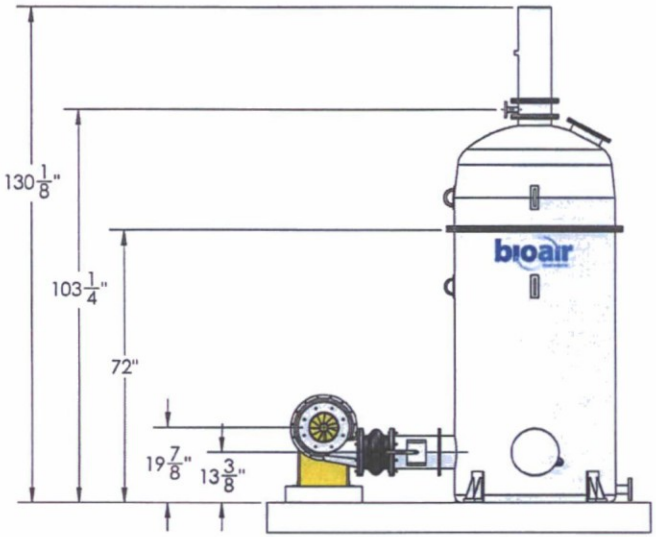
GENERAL ARRANGEMENT ECOFILTER™ 31

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

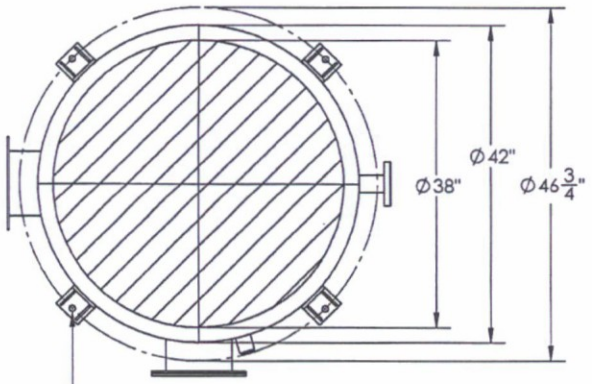
SIZE	DWG. NO.	REV
B	EF31_GA	A
	SCALE: 1 : 26	SHEET 1 OF 2

this is the connection port, right ?



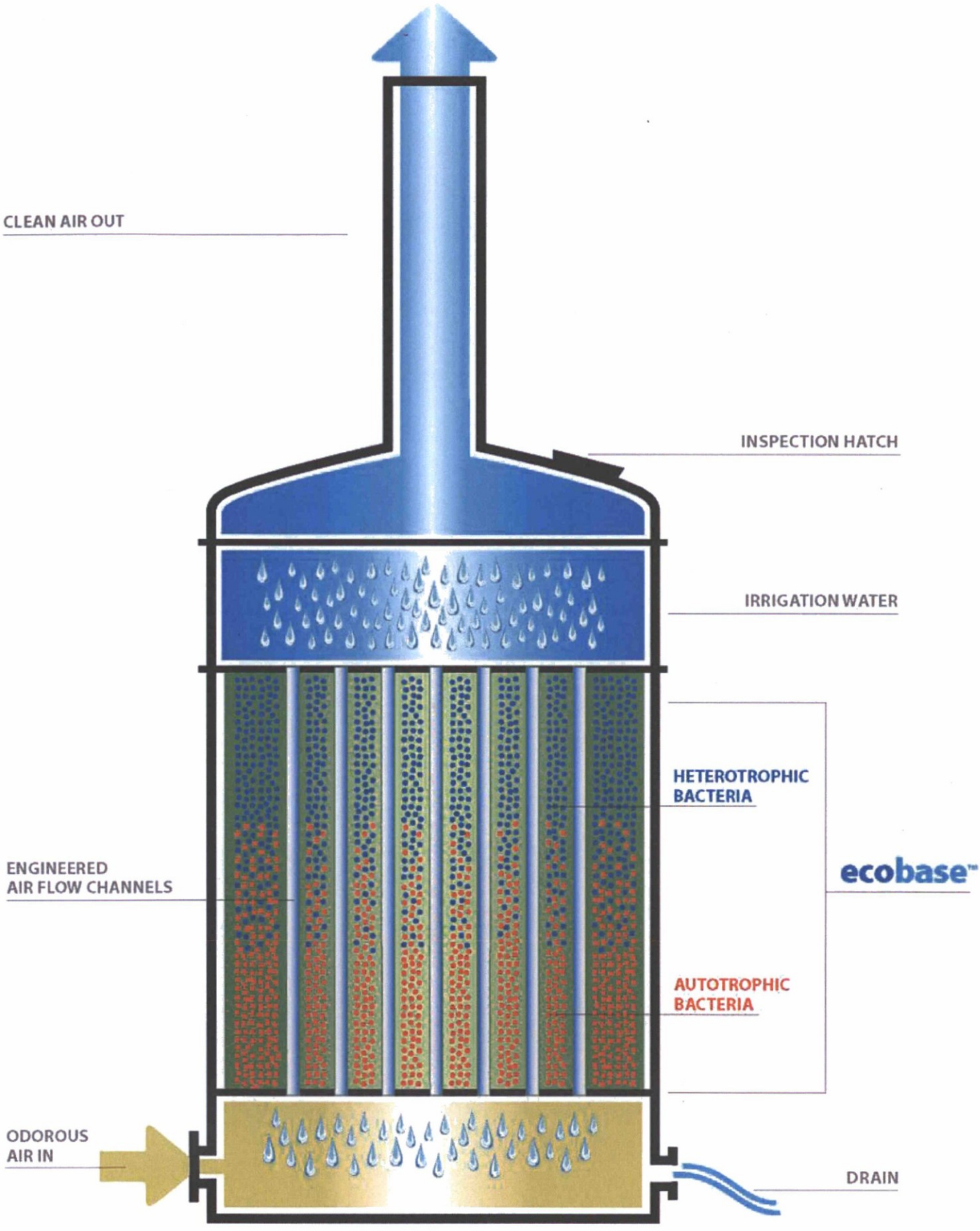


NOTES:
1. FOUNDATION PAD MUST BE FABRICATED UNIFORM IN TEXTURE AND APPEARANCE AND MEET A SURFACE PLANE TOLERANCE OF 1/8" IN 10'.
2. REACTOR TO BE SET ON 30LB FELT PAPER
3. LOAD DISTRIBUTION AREA = 1134 in^2
4. SHIPPING WEIGHT = 872 LBS, OPERATING WEIGHT = 1725 LBS



LOADING DIAGRAM
SCALE: 1 : 15

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


CLEAN AIR OUT
INSPECTION HATCH
IRRIGATION WATER
HETEROTROPHIC BACTERIA
ENGINEERED AIR FLOW CHANNELS
ecobase™
AUTOTROPHIC BACTERIA
ODOROUS AIR IN
DRAIN

Appendix F – Fiberglass Wet Well Product Information