ROMTEC UTILITIES SCOPE OF SUPPLY AND DESIGN SUBMITTAL

FOR:

ANIMAL HEALTH PRODUCT FACILITY

(De Soto, KS)

DATE: October 28, 2013

REVISION: 6 – FOR THE RECORD

ENGINEER CONTACT INFORMATION:

Customer Name
Company Name
(555) 555-5555
customername@companyname.com

ROMTEC UTILITIES

18240 North Bank Road ~ Roseburg ~ OR ~ 97470
541.496.9678(ph) / 541.496.0804(fx)
romtec3@romtecutilities.com

October 28, 2013

To: Customer Name,

Company Name

From: Romtec Utilities Document Control

Re: Documentation for the proposed pump station project identified as

Project Name: Animal Health Product Facility

Based on Design Criteria dated: 5/20/13 Revision #: 6

Romtec Utilities is pleased to offer this Scope of Supply and Design Submittal for the project listed above. All parties with an interest in this project must carefully read and comprehend the information contained herein.

1. Introduction
Includes information about this document and how to use it, typical Romtec Utilities process AND Submittal Approval –Notice to Proceed form.

2-3. Scope of Supply
Lists products and services to be supplied by Romtec Utilities and those products and services not supplied by Romtec Utilities.

4-5. Design Criteria & Project Site
Includes data supplied to Romtec Utilities by Romtec Utilities' direct customer or customer's representative.

6. Warranty & Limitations
Includes warranty details and limitations of Romtec Utilities responsibilities.

7. Operation & Maintenance Manual
Includes description of Operation & Maintenance Manual to be supplied by Romtec Utilities.

8-16. Design Submittal
Includes detailed drawings, descriptions and specifications of products to be supplied by Romtec Utilities.

Please address questions, comments and requests for changes to this document to:

Romtec Utilities Document Control
541-496-9678
romtec3@romtecutilities.com

INDEX

INDEX

INDEX

1. INTRODUCTION

This section contains the necessary information and procedures for the understanding and use of this document by the client and other parties of interest.

This section is structured as follows:

1.01 ABOUT THIS DOCUMENT

1. Document identification

This Scope of Supply and Design Submittal provided by Romtec Utilities, Inc., herein referred to as Romtec Utilities contains the information for the project listed below:

Name (herein referred to as “the project”): Animal Health Product Facility

Location (herein referred to as “the site”): De Soto, KS

Document Date: 10/28/13 Revision #: 6

2. The Romtec Utilities Scope of Supply & Design Submittal is defined by Romtec Utilities as follows:

a. A Complete document

This document is Romtec Utilities’ complete Scope of Supply and Design Submittal for the project referenced above. There is no other document that contains this information. This document supersedes all other documents, written correspondence and verbal communication as to Romtec Utilities scope of supply, products and services.

b. Supplied to customer only

Romtec Utilities supplies this document exclusively to the direct customer (the entity signing Romtec Utilities’ purchase order), herein referred to as the customer, and not to any other party associated with this specific project. Any other party reviewing any part of this document is informed that the information within it is Romtec Utilities’ communication with the customer and no other party.

c. Based on customer-supplied design criteria

Romtec Utilities has designed the pump station described herein to meet the specific design criteria provided to Romtec Utilities by the customer and/or the customer’s representative on the Lift Station Design Form (Section 4). Romtec Utilities’ supply of products and services is related exclusively to these design criteria.

d. Entire supply and design for Customer only

Romtec Utilities’ entire supply and design, as described in the Scope of Supply and Design Submittal, are for the customer only and no one

else. Romtec Utilities will not provide any other products and/or services related to the project to any other party.

e. Limited to this supply and design

Romtec Utilities agrees only to the supply and design described in this Scope of Supply and Design Submittal. Romtec Utilities expressly states that this document does not meet, and Romtec Utilities does not agree to meet any agency standard, any other specification or any other document and/or statement describing the project.

f. Approval is acceptance of this supply and design

By approving this document, the customer accepts the products and services identified herein to be supplied by Romtec Utilities.

g. Change orders

The customer agrees that, following approval of this document, there can be no modification to the products and services described herein without a written change order issued to Romtec Utilities by the customer and/or the customer's representative on the standard Romtec Utilities Change Order Form. The customer acknowledges that change orders will incur additional charges to the customer and may cause delays in Romtec Utilities' delivery of the products and services described herein as well as any products and services required by the change orders.

3. This Romtec Utilities Scope of Supply & Design Submittal supersedes all prior design and bid documents related to the project as follows:

a. This document negates other pump station documents / statements

Romtec Utilities recognizes that projects often begin with other designs and bid documents, however this document supersedes and makes null and void any other document or statement from any party, including Romtec Utilities' own prior documents and/or statements, as related to the pump station described in this Scope of Supply and Design Submittal.

b. This document does not represent other documents / statements

This document does not represent any specific standards, bid documents, design drawings or any other document and/or statements by any party other than Romtec Utilities.

1.01 ABOUT THIS DOCUMENT

4. This Scope of Supply and Design Submittal states that the following are not Romtec Utilities' responsibility:

a. Suitability of the pump station

It is not Romtec Utilities' responsibility to determine the suitability of the pump station to the project's site plan, electrical plan, influent line and force main profiles and other documents.

b. Document analysis is Customer's responsibility

This Scope of Supply and Design Submittal is limited to the pump station; however this document must be considered in its relationship with the overall project and site. It must be analyzed along with the project's site plan, electrical plan, influent line and force main profiles and other documents. Romtec Utilities does not provide this analysis, which is the responsibility of the customer and/or the customer's representative.

c. Requested layouts are suggestion only

At the Customer's request, Romtec Utilities will provide suggested layouts of the products to be supplied by Romtec Utilities on the Approved Site Plan provided by the customer. The customer can choose to accept or reject any suggested layouts.

d. No claim or guarantee of site conformance or suitability

Romtec Utilities makes no claim and provides no guarantee that any of the products to be supplied by Romtec Utilities will fit on project's site or within any building associated with the project.

1.02 HOW TO USE THIS DOCUMENT

1. Be sure that the Document Date and Revision # are current

If unsure, contact: **Romtec Utilities Document Control**
18240 North Bank Rd., Roseburg, OR 97470
541-496-9678 (phone); 541-496-0804 (fax)
romtec3@romtecutilities.com

2. Carefully review all sections of this document

If unsure of any information, contact Romtec Utilities Document Control immediately.

3. How to make comments and request changes

Comments and/or requests for changes to this document must be submitted, **in a written document, either MS Word or MS Excel**, to Romtec Utilities Document Control.

Please supply a list of your comments and change requests along with a copy of any marked up drawing, edited specification or any other part of the document to which you are commenting or requesting a change. All redline comments must be numbered on the drawing or specification and have a corresponding written explanation on the written document. Romtec Utilities will send the reviewing authority further instructions and a blank comment log in MS Excel format that can be filled out and sent back after reviewing the SSDS. If the reviewer would rather use their own format, it must have the same information provided as the Romtec Utilities blank comment log.

Romtec Utilities will promptly review your comments and/or change requests, and will contact you to ensure complete understanding. Revisions to the Scope of Supply and Design Submittal for this project are made at the discretion of Romtec Utilities.

4. How to approve the design

The Submittal Approval Form is included with this document. To approve the design, you must check, initial and sign where requested. Email, fax or mail the completed form to Romtec Utilities Document Control.

1.03 TYPICAL ROMTEC UTILITIES PROCESS

Below the typical steps in the process to design, price, approve, produce, deliver, install and start-up a Romtec Utilities pump station are listed:

1. Customer (or customer's representative) sends pump station design criteria to Romtec Utilities.
2. Romtec Utilities produces preliminary pump station design and quotation, sends to Customer.
3. Customer sends Purchase Order to Romtec Utilities.
4. Romtec Utilities produces Scope of Supply and Design Submittal, sends to Customer.
5. Customer reviews Scope of Supply and Design Submittal, sends written comments to Romtec Utilities.
6. Based on Customer comments, Romtec Utilities revises Scope of Supply and Design Submittal and, if necessary, the pump station quotation; sends revised documents to customer.
7. Customer distributes revised Scope of Supply and Design Submittal to all project stakeholders, gathers comments from Stakeholders, sends written comments to Romtec Utilities.
8. Based on stakeholder comments, Romtec Utilities revises Scope of Supply and Design Submittal and, if necessary, the pump station quotation; sends revised documents to customer.
9. Customer and stakeholders send formal approval of Scope of Supply and Design Submittal to Romtec Utilities.
10. Customer sends Notice to Proceed with delivery date to Romtec Utilities.
11. Romtec Utilities begins pump station manufacturing and sends projected delivery date to customer.
12. Customer's contractor prepares project site for installation of pump station.
13. Romtec Utilities delivers pump station to project site.
14. Customer's contractor installs underground portion of pump station.
15. Customer's electrical contractor performs electrical construction/installation.
16. Romtec Utilities performs pump station start-up and testing.

1.03 TYPICAL ROMTEC UTILITIES PROCESS

17. Warranty period commences.
18. Romtec Utilities performs operation and maintenance (O&M) training and delivers O&M manuals to the customer.

1.04 SUBMITTAL APPROVAL FORM & NOTICE TO PROCEED

I, _____, representing _____, have reviewed the Romtec Utilities' Scope of Supply and Design Submittal for the project named _____, dated _____, revision # _____, purchase order #_____.

1. INTRODUCTION

_____I have read the introduction outlining how this submittal will be used, and I agree that these lists are complete and correct.

_____I request the following changes: _____

2. SCOPE OF SUPPLY – PRODUCTS & SERVICES

_____I have read the detailed lists of products and services to be supplied By Romtec Utilities, and I agree that these lists are complete and correct.

_____I request the following changes: _____

3. PRODUCTS & SERVICES NOT SUPPLIED BY ROMTEC UTILITIES

_____I have read the detailed lists of products and services to be not supplied By Romtec Utilities, and I agree that these lists are complete and correct.

_____I request the following changes: _____

4. DESIGN CRITERIA

_____I have confirmed that the data listed on the Lift Station Design Form are accurate.

5. PROJECT SITE

_____If site drawings (by others) are included in this document; I have confirmed they are accurate.

6. WARRANTY & LIMITATIONS

_____I have read the Romtec Utilities, Inc. Limited Warranty & Limitations. I agree with its terms conditions and limitations.

7. OPERATION & MAINTENANCE (O&M) MANUAL

_____I have reviewed the operation & maintenance section. I approve the documents as submitted.

_____I request the following changes: _____

8. WET WELL & RELATED EQUIPMENT

_____I have reviewed the wet well documents. I approve the documents as submitted.

_____I request the following changes: _____

9. PUMPS

_____I have reviewed the documents for the pumps. I approve the documents as submitted.

_____I request the following changes: _____

10. LIQUID LEVEL SENSORS

_____I have reviewed the documents for the liquid level sensors. I approve the documents as submitted.

1.04 SUBMITTAL APPROVAL FORM & NOTICE TO PROCEED

11. ELECTRICAL INTERCONNECTIONS

_____If site electrical drawings (by others) are included in this document; I have confirmed they are accurate.

12. CONTROL PANEL/ELECTRICAL & COMMUNICATIONS

_____I have reviewed the documents for the control panel/electrical and communications system. I approve the documents as submitted.

_____I request the following changes: _____

13. PUMP ELECTRICAL CONNECTION ENCLOSURE/PANEL

_____I have reviewed the documents for the pump electrical connection enclosure/panel. I approve the documents as submitted.

_____I request the following changes: _____

14. INSTALLATION

_____I have reviewed the document describing the pre-installation requirements. I approve the documents as submitted.

_____I request the following changes: _____

15. FIELD START-UP REPORT

_____I have reviewed the document describing the field start-up report requirements. I approve the documents as submitted.

_____I request the following changes: _____

1.04 SUBMITTAL APPROVAL FORM & NOTICE TO PROCEED

Upon receipt of your notice to proceed, Romtec Utilities will produce the pump station and deliver it to the project site on or after the date you specify.

Please fill in the form below.

☐ Yes, I want Romtec Utilities to produce the specified pump station and deliver it to the project site to be installed on _____.
(delivery date)

☐ No, I don't want Romtec Utilities to produce and deliver the pump station at this time. I will send a separate written notice to proceed at a later date.

_____ _____

Signature Date

By signing the Submittal Approval & Notice to Proceed, I approve the products and services as specified in the Romtec Utilities Scope of Supply and Design Submittal for this project. I understand that any change(s) I have requested may change other Romtec Utilities documents, including but not limited to the pump station quote, the scope or supply and design submittal and the O&M manual. I understand that such changes may cause delays to the project.

Please return the form to:

Documentation Manager
Romtec Utilities, Inc.
18240 North Bank Rd.
Roseburg, OR 97470
Fax: 541-496-0804
Email: romtec3@romtecutilities.com

END

OF

SECTION

2. SCOPE OF SUPPLY – PRODUCTS & SERVICES

This section outlines what products and services are provided by Romtec Utilities for this design. In addition, this section includes the Start-UP Preparation Checklist to be filled out by the owner/contractor prior to the scheduled start-up.

This section is structured as follows:

2.01 SCOPE OF SUPPLY PRODUCTS (TO BE SUPPLIED BY ROMTEC UTILITIES)
2.02 SCOPE OF SUPPLY SERVICES (TO BE SUPPLIED BY ROMTEC UTILITIES)
2.03 START-UP, TESTING & TRAINING OUTLINE
2.04 START-UP PREPARATION CHECKLIST

Send the completed Start-Up Preparation Checklist to:

Romtec Utilities Document Control
18240 North Bank Rd., Roseburg, OR 97470
Phone: 541-496-9678; Fax: 541-496-0804
romtec3@romtecutilities.com

IMPORTANT!

Various products and services NOT supplied by Romtec Utilities are listed in the Warranty & Limitations section of this Scope of Supply and Design Submittal.

2.01 SCOPE OF SUPPLY PRODUCTS (SUPPLIED BY ROMTEC UTILITIES)

COMPLETE PUMP STATION INCLUDES:

WET WELL & RELATED EQUIPMENT

QTY	ITEM

2.01 SCOPE OF SUPPLY PRODUCTS (SUPPLIED BY ROMTEC UTILITIES)

CONTROL PANEL / ELECTRICAL & COMMUNICATION

QTY	ITEM

2.02 SCOPE OF SUPPLY SERVICES (TO BE SUPPLIED BY ROMTEC UTILITIES)

1. Administrative & design services

a. Receive pump station design criteria from customer or customer's representative.

b. Design pump station to meet the design criteria and perform as specified.

c. Produce all drawings and other documents included in this Scope of Supply and Design Submittal.

d. Only if ordered by customer or customer's representative, provide optional sealing of drawings, calculations and/or the entire Design Submittal at additional cost to customer.

e. Receive submittal approval from customer or customer's representative

f. Receive purchase order and notice to proceed from customer's installation contractor.

2. Production services

a. Produce the complete pump station as specified in Scope of Supply-Products.

3. Delivery services

a. Deliver pump station to project site on date(s) specified by customer or customer's representative.

b. Provide information on weights of parts and lifting devices.

4. Pre-installation & installation advisory services

a. Provide advisory services to our customer or customer's representative and/or their contractor(s) and others who will install/construct this pump station on the site. One day is provided.

5. Electrical advisory services

a. Provide advisory services through customer or customer's representative to the licensed electrical contractor installing electrical service to the pump station.

2.02 SCOPE OF SUPPLY SERVICES (TO BE SUPPLIED BY ROMTEC UTILITIES)

6. Start-up services

a. Direct all pump station start-up activities at the project site on the designated start-up day. One day is provided.

7. Testing & training services

a. Perform all pump station tests specified in Field Start-Up Report for the project, report test results to the Customer or Customer's representative, deliver O&M Manuals and train any and all owners.

b. Training is provided contiguous to the start-up date. If the testing and training is not scheduled and/or completed the day following start-up, there will be additional charges for Romtec Utilities to return and complete the testing and training services.

2.03 START-UP, TESTING & TRAINING OUTLINE

Start-up, testing & training outline

1. Understanding the Complete System (Wet Well-Bottom up)
    a. Pumps, Guide Rails, Elbows
    b. Level devices
    c. Hatches

2. Control panel (Overview/Power Up)
    a. Overview (Front Panel)
    b. Procedure of operating panel
    c. Overview (inside panel)
    d. Power up Procedure
    e. Back-up System Operations
    f. Primary Level Operation/Lead-lag, Alternations, Starts/Stops.
    g. Controller Operation

3. System Protection Methods/Devices
    a. Seal Thermal-Moisture Seals
    b. Phase Monitor
        i. Surge Suppression
4. Alarms
    a. Critical Alarms
    b. Non-critical Alarms
5. Trouble Shooting
    a. Hands On
    b. Who to call first

Please see the "Start-up Checklist" following this page and the "Field Star-Up" section of the Scope of Supply Submittal for a more detailed example of what is covered on the day of start-up.

Pre Start-Up Checklist

(To be completed by the Contractor)

OVERVIEW

This form must be completed before Romtec Utilities can schedule travel for your start-up advisor. Send the completed checklist to romtec8@romtecutilities.com or fax to 541-496-0804.

This document is a checklist. It ensures that all necessary components have been installed and that your lift station is prepared and ready for start-up. We have outlined below the tasks that need to be completed before start-up and training can occur in the following sections:

1. **Scheduling for start-up and training**
2. **Review of previously completed underground construction**
3. **Review of electrical construction connecting to the wet well**
4. **Back-up power generator**
5. **Communication equipment**
6. **Water availability**
7. **Wet Well**
8. **Required photos**
9. **Personnel required for start-up**

All activities and requirements stated in this document have been approved in the Scope of Supply and Design Submittal.

Please follow this checklist to ensure that all appropriate actions have been taken in preparation for start-up and personnel training for your lift station.

ATTENTION!

DO NOT LOWER THE PUMPS INTO THE WET WELL. A Romtec Utilities start-up advisor will lower the pumps into the wet well at start-up, in accordance with the pump warranty. If you lower the pumps on your own you risk voiding the warranty.

1. SCHEDULING FOR START-UP AND TRAINING

A. LEAD TIME TO SCHEDULE START UP

Romtec Utilities and all associated technical personnel require four (4) weeks advance notice to schedule a start-up date.

B. DURATION OF START-UP AND TRAINING

i. Start-up begins at **8 am** and will require one (1) full day.

ii. Training begins the following day at **8 am** and the advisor will be available all day.

iii. These days **must be contiguous weekdays**. Romtec Utilities does not schedule start-ups over Saturdays or Sundays.

iv. Please see attached document outlining events performed at start-up and training.

Note: These timelines are stated in the approved Romtec Utilities Scope of Supply and Design Submittal.

C. SCHEDULING PUMP AND GENERATOR SERVICES

If Romtec Utilities is providing services from a generator or pump supplier to the customer during start-up and training, these vendors will only be available the same days that Romtec Utilities' personnel are on-site.

Note: Any additional time required of the suppliers must be directly ordered and contracted from the supplier by the customer.

ATTENTION!

PROPER EQUIPMENT MUST BE ON-SITE THE DAY OF START-UP

You must provide equipment to safely lower the pumps into the wet well. Romtec Utilities will not proceed with start-up if there is not equipment to lower the pumps.

2. PREVIOUSLY COMPLETED UNDERGROUND CONSTRUCTION REVIEW

A. The following wet well and valve vault components must be installed and approved.

i. Discharge Pipes

1. Are connected to elbows?

☐ **Yes** ☐ **No**

2. Are plumb and connected to discharge pipe brackets?

☐ **Yes** ☐ **No**

3. Are connected to valve vault?

☐ **Yes** ☐ **No**

ii. Valve Vault

1. Is connected to force main?

☐ **Yes** ☐ **No**

2. Upstream valves are open for wet well discharge?

☐ **Yes** ☐ **No**

iii. Guide Bars

1. All stainless steel guide bars installed?

☐ **Yes** ☐ **No**

2. Upper guide bar brackets are installed and tight?

☐ **Yes** ☐ **No**

3. Intermediate guide bar brackets (if equipped) are installed?

☐ **Yes** ☐ **No**

3. REVIEW OF ELECTRICAL CONSTRUCTION CONNECTING TO THE WET WELL

Note: High voltage is in use. Only licensed and qualified personnel should perform electrical services in preparation for, and during start-up.

i. Have the conduits been installed between the wet well and the main control panel (At least one (1) for each pump cable and at least one (1) for the level control device)?

☐ **Yes** ☐ **No**

Note: Romtec Utilities does not core holes into the wet well for electrical conduit ports or conduit runs. The cored holes in the wet well are the responsibility of the contractor and electrician. Final size, orientation, height, and number are best determined after installation of the wet well and other electrical components.

CAUTION!

All cored holes into the wet well shall be made 8 in. above or 3 in. below any barrel joints in such a manner as not to impact the integrity of the barrel joint and seal.

ii. Have the level control wires been pulled between the pump control panel and the wet well?

☐ **Yes** ☐ **No**

iii. Have the level control wires been landed on the appropriate terminals inside the control panel?

☐ **Yes** ☐ **No**

Note: The pump power cables will be pulled through the conduit at the time of start-up. The pump power cord standard length varies between pump manufacturers. Typical lengths range from 30 ft. to 50 ft; if more is needed, custom lengths can be ordered at an additional cost.

iv. Have the "meter base" and main disconnect been installed and inspected?

☐ **Yes** ☐ **No**

v. Have the panel power wires been installed between the main disconnect, automatic transfer switch (if present) and the pump control panel?

☐ **Yes** ☐ **No**

vi. Has the power company energized the meter?

☐ **Yes** ☐ **No**

Note: Permanent utility power to the job site is required in order to perform start-up, testing, and training.

ATTENTION!

If all necessary field wiring is not completed at the time of start-up, Romtec Utilities reserves the right to charge for our time required to complete the wiring.

4. BACK UP POWER GENERATOR

i. Has the generator been delivered and installed?

☐ **Yes** ☐ **No**

ii. Is the fuel for the generator on-site?

☐ **Yes** ☐ **No**

iii. Has the automatic transfer switch been wired into the electrical system (if applicable)?

☐ **Yes** ☐ **No**

5. COMMUNICATION EQUIPMENT

i. Has all required communication equipment (radio, phone, cellular) been installed and confirmed to be operational?

☐ **Yes** ☐ **No**

6. WATER AVAILABILITY

i. Is enough water available to fill the wet well 1-½ times?

☐ **Yes** ☐ **No**

7. WET WELL

i. Is the wet well clean and free of any debris?

☐ **Yes** ☐ **No**

ii. Have the incoming sewer line(s) and upstream man holes been flushed of all debris?

☐ **Yes** ☐ **No**

iii. Do you have permission from the appropriate parties to pump water out of the pump station into the treatment plant?

☐ **Yes** ☐ **No**

IMPORTANT!

All debris must be flushed from all inlet lines and man holes prior to starting the system.

8. REQUIRED PHOTOS

A. Have the following required photos been taken and prepared to deliver with the checklist?

i. Photo of the inside of the control panel (specifically the terminal blocks at the base of the panel).

☐ **Yes** ☐ **No**

ii. Photo of the control and disconnect panel from approx. 5 ft. away.

☐ **Yes** ☐ **No**

iii. Photo of the inside of the wet well.

☐ **Yes** ☐ **No**

9. PERSONNEL REQUIRED FOR START-UP

Note: It is the contractor's responsibility to invite and schedule all appropriate parties.

NAME_____
(Print Name & Company)
CELL#_____ Safety Manager

NAME_____
(Print Name & Company)
CELL#_____ Site Engineer's Representative

NAME_____
(Print Name & Company)
CELL#_____ Owner's Representative

NAME_____
(Print Name & Company)
CELL#_____ Electrical Inspector(s)

IMPORTANT!

This form must be completed before Romtec Utilities can schedule travel for your start-up advisor. Your project start-up date can be set with Romtec Utilities at any time. By completing the start-up preparation documents you are acknowledging the following:

A. Romtec Utilities has provided its customer with two contiguous days for start-up, testing, and training. If you say you are ready for Romtec Utilities to come to the site and perform these services, when in fact

you are not ready, Romtec Utilities will charge its customer for another trip and the time (two days) on the job site to perform these services.

B. The Romtec Utilities system warranty is not provided to its customer and/or the owner unless, and until, the Romtec Utilities system start-up, testing, and training have been completed.

C. By signing this document you agree to reimburse Romtec Utilities for any costs incurred, whether by Romtec Utilities directly or through a related vendor, due to on-site delays caused by inaccurate representations herein. Typical costs attributed to delays include labor, travel and lodging. However, this list in not meant to be exclusive, and other costs may apply.

Please send this Checklist and the required photos back to Romtec Utilities two (2) weeks before the scheduled start-up and training dates.

PROPOSED START-UP & TRAINING

DATES:_____

_____

AUTHORIZED SIGNATURE

_____

PRINT NAME

END

OF

SECTION

3. PRODUCTS & SERVICES NOT SUPPLIED BY ROMTEC UTILITIES

This section outlines what products and services are not provided by Romtec Utilities for this design.

This section is structured as follows:

3.01 PRODUCTS & MATERIALS (NOT SUPPLIED BY ROMTEC UTILITIES)

Each Romtec Utilities pump station is designed and supplied for the specific pumping requirement, as determined by the design criteria provided to Romtec Utilities by the customer or the customer's representative.

The specific products and materials to be supplied by Romtec Utilities are unique to this pump station and are listed in the Scope of Supply-Products list. Any component not on the list will not be supplied by Romtec Utilities.

Unless otherwise specified, products and materials NOT supplied by Romtec Utilities include:

1. **Any item not listed in the Scope of Supply-Products**

   a. Any fasteners not associated with the pre-assembled systems or components not listed in the Scope of Supply-Products list are NOT supplied.

2. **Site drawings**

   a. Any site drawing included in this Scope of Supply and Design Submittal has been supplied by others.

3. **Construction equipment, materials and labor for:**

   a. Unloading trucks, traffic control, site safety

   b. Securing materials delivered to project site: dunnage, fencing, storage

   c. Excavation, shoring, dewatering, sub-base rock, backfill material

   d. Installation of supplied pump station systems and components

   e. Piping to and from pump station

   f. Piping between pump station systems (i.e. between wet well and valve vault)

   g. Electrical conduit and wiring (except wires attached to supplied components)

   h. Concrete poured in place, crushed rock, asphalt paving

   i. Site lighting, signage, fencing, bollards

   j. Site drainage control

3.02 SERVICES (NOT SUPPLIED BY ROMTEC UTILITIES)

The services to be supplied by Romtec Utilities are unique to this pump station and are listed in the Scope of Supply-Services list. Any service not on the list will not be supplied by Romtec Utilities.

Unless otherwise specified, services NOT supplied by Romtec Utilities include:

1. **Any item not listed in the Scope of Supply-Services**

2. **Sealing of the Scope of Supply and Design Submittal, including drawings contained herein**

    a. If required, sealing of this document and/or supply of sealed plans and/or calculations are available from Romtec Utilities at additional cost.

3. **Design and engineering services for aspects of the project not included in this Scope of Supply and Design Submittal**

    a. Site engineering, site drawings, electrical service design and plans.

    b. Construction meetings not directly related to the pump station.

    c. Design/specification of delivery or installation space, equipment, safety.

    d. Review of any documents supplied by any party other than Romtec Utilities.

4. **Construction services**

    a. Romtec Utilities personnel at the project site during installation of underground components are there only in an advisory capacity.

    b. Romtec Utilities does not perform work during this phase of the project, unless such work is specified in the Scope of Supply.

5. **Electrical services**

    a. Romtec Utilities does not perform or advise on the performance of any electrical services that must be performed by a licensed electrical contractor.

3.02 SERVICES (NOT SUPPLIED BY ROMTEC UTILITIES)

6. Start-up, testing & training services

a. Romtec Utilities' standard start-up, testing and training services are based solely on the pre-specified operational parameters contained in this Scope of Supply and Design Submittal.

b. Additional start-up, testing and/or training services requested or required by the regulatory agency or any other party will not be conducted by Romtec Utilities.

END

OF

SECTION

4. DESIGN CRITERIA

The information submitted for the Romtec Utilities design within this document is explained and organized in this section. The design criteria was submitted by the person(s) stated in Section 2.01 not Romtec Utilities itself.

This section is structured as follows:

4.01 INTRODUCTION TO DESIGN CRITERIA

Romtec Utilities has created this Scope of Supply and Design Submittal solely on the basis of the design criteria listed on the attached Lift Station Design Form. The design criteria are identified as:

Project Name: Animal Health Product Facility

Design criteria supplied by: Company Name

Design criteria date: 5/20/13

CAUTION! By approval of and/or use of this Romtec Utilities Scope of Supply and Design Submittal, the customer and/or the customer's representative agrees that Romtec Utilities has correctly based this scope of supply and this design of the pump station on the exact design criteria listed on the attached Lift Station Design Form.

Romtec Utilities has not checked the information listed on the Lift Station Design Form. Romtec Utilities does not have responsibility for checking this information or confirming its accuracy. This information has been accepted as fact by Romtec Utilities.

NOTE: The pump station will perform as designed, only if the design criteria stated in the Lift Station Design Form represent the actual conditions at the project site. If the project site's actual conditions are, in any way, different from the design criteria supplied to Romtec Utilities, then the pump station could perform differently than stated or not perform at all.

IMPORTANT! Romtec Utilities has relied on the design criteria supplied by the customer and/or the customer's representative (listed on the Lift Station Design Form) as the only information forming the basis for design of the pump station described herein.

Additional information about this project, including agencies' standards, bid documents, design drawings and other documents, may have been available to and/or supplied to Romtec Utilities. Romtec Utilities may have studied such information; however the pump station design represented by this Scope of Supply and Design Submittal is based solely on the design criteria listed on the attached Lift Station Design Form.

Romtec Utilities makes no claim as to whether or not the pump station described herein will meet any agency's standard, any bid document or any other document. Romtec Utilities is not responsible for making such a determination.

4.02 LIFT STATION DESIGN CRITERIA FORM

Romtec Utilties has designed this 10/14/13 dated Scope of Supply and Design Submittal based on the following information:

PART 1: PROJECT CONTACT INFORMATION

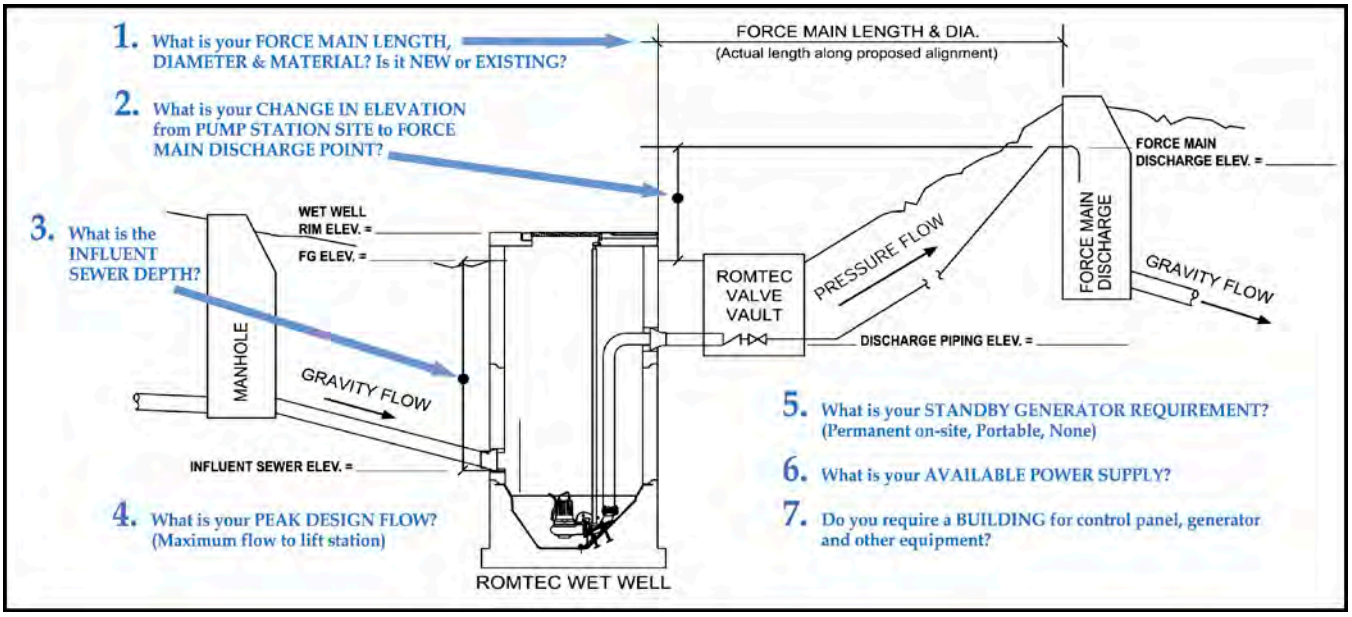
Today's Date: 5/20/2013

Information here in provided by:	Company Name
Company/Agency Type:	[Engineer] Engineer / Developer / Gov't. Agency / Other
First Name:	Customer
Last Name:	Name
Title:	
Email Address:	customername@companyname.com
Address:	111 Company Address
City:	City
State/Province:	State Zip Code:
Country:	United States
Telephone:	555-555-5555 Phone Ext:
Mobile/Other Phone:	Fax:
Project Name:	Animal Health Product Facility
Your Client for this project is:	[Private Co.] Public Agency / Private Co.
Project Type:	[Wastewater] Wastewater / Stormwater / Other
Project City:	De Soto Project Zip:
Project Engineer:	Jane Doe
Reviewing Entity who reviews/approves this Scope of Supply & Design Submittal:	
Final Project Owner and/or Operator:	
Governing Sewer or Water Authority:	
Does Authority have a lift station standard?	[N/A] Yes / No / N/A
Who should Romtec contact about the lift station design standard?	
What is the Expected Project Bid Date?	Project Completion Date:

4.02 LIFT STATION DESIGN CRITERIA FORM

PART 2: DESIGN DATA

If using assumed elevations, note this in Additional Information.



1. Force main length: 40 ft. (actual length along proposed alignment)

Force main diameter (inside): 3 in. inside dia.

Force main material (i.e., PVC C-900 class 150, ductile iron class 52, HDPE DR17 class 100, etc.): PVC SCH80

Force Main is: [New] New Existing

2. Elevation change from lift station site to force main discharge point: -5.5 ft.

Finish grade elevation at wet well: 919 ft.

Discharge piping elevation at valve vault: 913 ft.

Force main discharge elevation: 913.5 ft.

3. Influent sewer elevation: 912 ft.

4. Design peak inflow (maximum flow to lift station): 100 g.p.m.

5. Standby generator requirement: [None] Permanent Portable None Don't Know

Standby generator fuel: [SELECT ONE] Diesel Natural Gas Propane

6. Available power supply: [480V] 208V 240V 480V

[3-phase] Single-phase 3-phase

Additional loads on site (besides the lift station) to be powered by generator: _____ KVA

4.02 LIFT STATION DESIGN CRITERIA FORM

7. Electrical controls weather protection: None | Enclosed Building | Shelter Structure | None

Weather protection structure is for: SELECT ONE

- Electrical Controls Only
- Electrical Controls & Generator
- Controls, Generator, Chemical Feed

END

OF

SECTION

5. SITE PLAN

The location of any project is critical in design. This section includes a site plan drawing with lift station orientation for the use of the contractor.

This section is structured as follows:

5.01 SITE DRAWINGS (BY OTHERS) WITH SUGGESTED PUMP STATION LAYOUT

5.02 SITE SPECIFIC CONDUIT & WIRE LAYOUT LIMITATIONS

IMPORTANT!

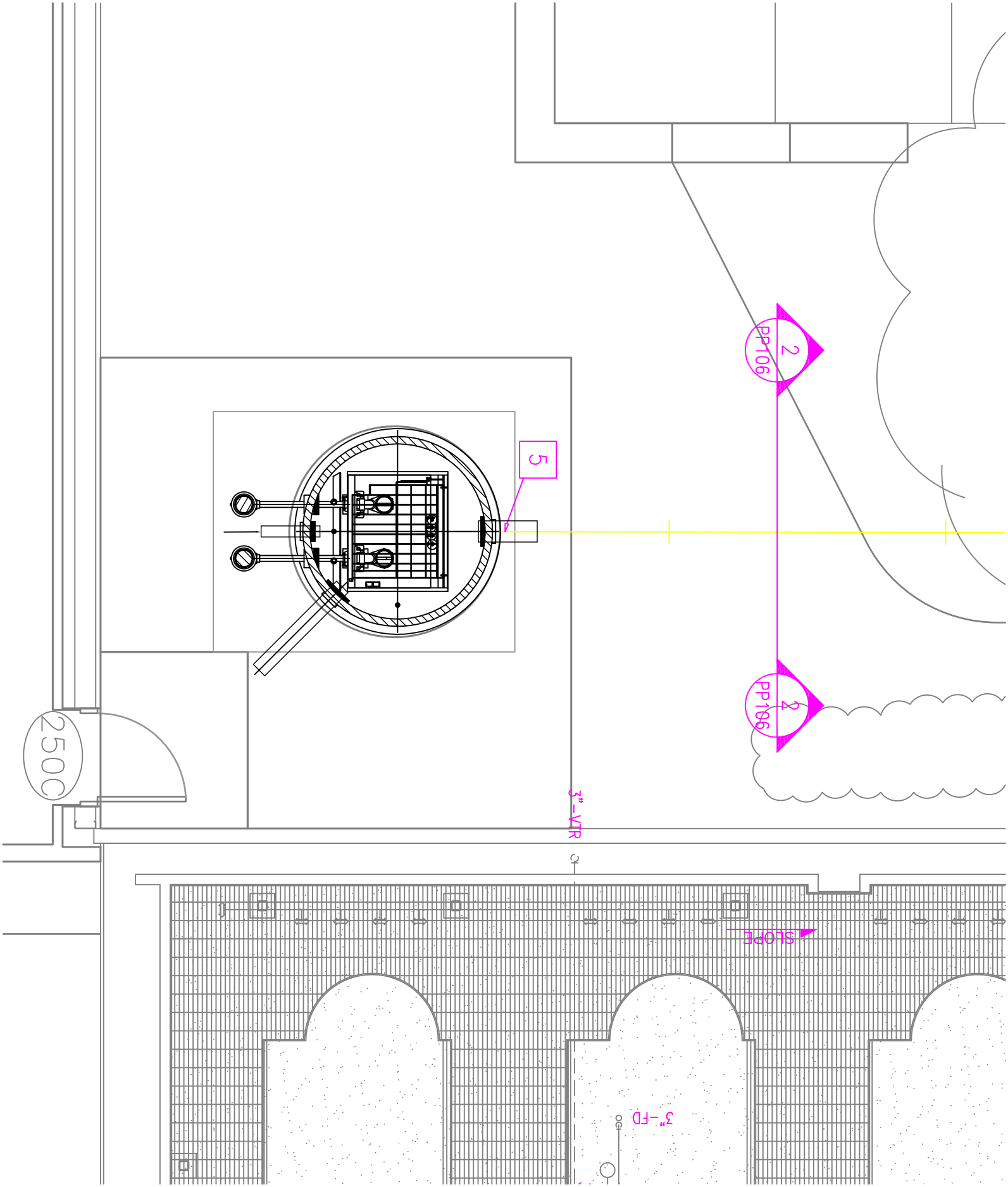
Romtec Utilities has not produced drawings of the project site. Any site drawings in this Scope of Supply and Design Submittal have been produced by others. Romtec Utilities has not checked the site drawings for their accuracy.

Romtec Utilities makes no claim as to the accuracy of information contained in these site drawings.

The layout of the pump station on the site plan is only a suggestion by Romtec Utilities. Receiving final approval of the pump station layout on the approved site plan is the responsibility of the Customer or the Customer's representative.

Romtec Utilities makes no claim as to the suitability of the suggested pump station layout for the project.

If anyone other than Romtec Utilities provides a layout of the Romtec Utilities equipment on the site plan, any difficulties that may arise due to incorrect layout of the equipment is not Romtec Utilities responsibility.


2
PP106
5
2
PP106
2500
3"-VTR
SLOPE
3"-FD

5.02 SITE SPECIFIC CONDUIT AND WIRE LAYOUT

Romtec Utilities does not provide a site specific (to scale) layout of the electrical conduit and wire which interconnects the Romtec Utilities supplied equipment on your site.

Each job is site specific and under the jurisdiction of the local utility and local inspectors. We (Romtec Utilities) are not providing the conduit or the wire and we are not licensed electricians who are performing the field installation of the actual conduit and wire.

What Romtec Utilities does provide for you and your electrician is the following.

1. Section 5.01 – Site Drawings with Suggested Pump Station Layout.

   Note: An approved (and correctly orientated) site plan layout (of the Romtec Utilities equipment) to scale. Site drawings are by others.

2. Section 11.01 – Typical Field Wiring Plan.

   Note: This drawing reflects the electrical interconnection from the Romtec Utilities control panel to the Romtec Utilities supplied field devices.

3. Section 12.05 – One-line drawing.

   Note: This drawing aids in the understanding and installation of the overall control system.

CONCLUSION

Complete field wiring and installation instructions are not included in the Romtec Utilities Scope of Supply and Design Submittal. Instead, the correct installation and conformance to all applicable codes is the responsibility of the installer and/or their electrician.

END

OF

SECTION

6. WARRANTY & LIMITATIONS ON WARRANTY

This section includes all warranty information for Romtec Utilities products and services.

This section is structured as follows:

6.01 ROMTEC UTILITIES LIMITED WARRANTY

6.02 LIMITATIONS OF ROMTEC UTILITIES' RESPONSIBILITIES

6.01 ROMTEC UTILITIES LIMITED WARRANTY

Romtec Utilities Limited Warranty

Romtec Utilities, Inc. (herein referred to as "Romtec Utilities") warrants that the equipment supplied will be free from defects in material and workmanship under normal use and service, when used in accordance with Romtec Utilities' procedures as set forth below for a period of one year from date of acceptance (acceptance is defined as the date Romtec Utilities' "Start-Up" report is completed) or one year and six months from installation of the wet well (or delivery of the wet well or the date that the wet well was ready to deliver), whichever comes first. The obligation of Romtec Utilities under this warranty is limited to replacing or repairing any defective part (failure of other manufacturer supplied components will be addressed according to the individual manufacturer's warranty, the periods of which, and the manufacturer's obligations therein may differ from Romtec Utilities' Warranty). This warranty extends only to Romtec Utilities' direct customer (as named in the Romtec Utilities Purchase Order), herein called "customer", and not to any person or entity with whom customer has business relationships, or any party other than customer.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PURPOSE, WHICH IMPLIED WARRANTIES ARE EXCLUDED. ROMTEC SHALL NOT BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES.

Components resold or supplied with Romtec Utilities materials

Certain components are warrantable directly by the original manufacturer for periods between 90 days and 5 years. Replacement for, repair or refund of defective workmanship or material under normal use shall be remunerated directly with the manufacturer of the component. Examples of components would be generators, manual cranes, pumps, pump controls, valves, etc.

Warranty voidable

Start-up that is performed without the presence of Romtec Utilities' representative shall void all warranties.

Claims of defective manufacture

Claims that the merchandise was incorrectly manufactured or that is defective in any way must be made directly to Romtec Utilities on a product-by-product basis. All claims must be made within 72 hours of the defective condition, or the time when the defect should have been discovered, whichever is earlier. All claims must include the following:

1. A detailed description of the specific problem, failure, or other event giving rise to the claim; and
2. Supporting photographs or videos; and
3. Specific location; and
4. Names and phone numbers of individuals who can substantiate the claim, but who do not work for contractor.

Failure of pump station

Romtec Utilities pump stations pump all types of water containing all kinds of materials. Sometimes pumps may clog or power may be lost and the pump station will fail to operate. If your station fails to operate, Romtec Utilities will suggest a

6.01 ROMTEC UTILITIES LIMITED WARRANTY

local service company to evaluate the problem. If it is a warranty issue, Romtec Utilities will repair and/or replace per the terms of this warranty. If however, the pumps are simply "clogged" or the power is simply lost Romtec Utilities will advise you that it is not a warranty issue and you will simply pay for the service call and the associated services.

Action in event of established claim

In the event it is determined that goods have been incorrectly manufactured or are defective, the liability of Romtec Utilities shall be limited to, at its option, repair or replacement of the goods. Romtec Utilities also reserves the right to establish reasonable time limits for completion of any specific installation tasks resulting from the replacement of defective merchandise.

No third party claims

Under no circumstances shall Romtec Utilities be responsible for any damage claims by any party other than claims by Romtec Utilities direct customers.

Release and hold harmless

Contractor releases and agrees to defend, indemnify, and hold Romtec Utilities harmless from and against any and all claims, demands, actions, and causes of action for any matters arising out of or connected with the materials whereby the contractor is responsible for errors or omissions.

FURTHER LIMITATIONS ON ROMTEC LIABILITY

1. Specific limitations

a. Romtec Utilities' liability under the foregoing warranty and under the transaction of which this document is a part is limited as follows:

b. Romtec Utilities has designed the lift station supplied under this project to meet a specific design standard and specific set of parameters as dictated to Romtec Utilities by its customer as set forth in the "Lift Station Design Form" located in section 4 of the Romtec Utilities Scope of Supply and Design Submittal.

c. Romtec Utilities' Scope of Supply & Design Submittal is a part of and limited by CUSTOMER'S site civil and electrical plans.

d. Romtec Utilities makes no guarantees that any of its supply will fit on customer's site and/or building. However, at customer's request, Romtec Utilities will provide <u>suggested</u> layouts for the customer's project. Ultimately, the customer decides to accept or reject any given layout.

e. Romtec Utilities cannot make final layout or equipment placement judgments at the site (i.e. generator or control panel "fit" in or out of a building). It is the responsibility of customer's site engineer and contractor to check dimensions, etc. If customer has not accepted (or received) final dimensions, etc., please request further definition before approval. Romtec Utilities is <u>not</u> responsible for items that do not fit on the site.

f. It is Romtec Utilities' customer's responsibility and obligation to review Romtec Utilities' Scope of Supply & Design Submittal to insure it meets with customer approval relative to any customer third party agreements.

6.01 ROMTEC UTILITIES LIMITED WARRANTY

g. Romtec Utilities is not responsible for any aspect of the construction/installation of the Romtec Utilities lift station. The Contractor bears sole responsibility for installation of products manufactured by Romtec Utilities. The Romtec Utilities Scope of Supply and Design Submittal defines Romtec Utilities scope of supply relative to equipment, documentation, start-up services and warranty.

h. If Romtec Utilities is on site during the construction/installation of the Romtec Utilities lift station it is only as an advisor. Romtec Utilities is never on site to perform any construction and/or installation tasks.

i. Romtec Utilities designs and prefabricates its lift station system to enable contractors to install the Romtec Utilities system quickly and completely. However, Romtec Utilities has made no representation and/or claims as to "how long" it will take to construct/install the Romtec Utilities system.

   i. *Note: If any Romtec Utilities-supplied part is found to be defective and/or has been manufactured in error relative to this document, Romtec Utilities will repair and/or replace that part at Romtec Utilities' expense. Romtec Utilities does not offer, nor will Romtec Utilities accept, any charges and/or claims by anyone relative to the time it takes to install/construct the Romtec Utilities system and or claims for delays relative to a part that has to be repaired and/or replaced by Romtec Utilities.*

j. Romtec Utilities' responsibility is to its direct customer. We want to help all parties, but we are ultimately responsible only to our direct customer.

   i. If Romtec Utilities' direct customer has hired a sub-contractor Romtec Utilities will communicate with that sub-contractor through a representative of Romtec Utilities' direct customer.

      IN OTHER WORDS
      Romtec Utilities will not direct and/or advise any sub-contractor. Instead, Romtec Utilities will communicate directly with its "direct customer" and they will communicate with their sub-contractors, engineers, and/or owners.

k. The Romtec Utilities design reflects all elevations and/or orientations to an accuracy of and/or minus .10'. Romtec Utilities does not claim to manufacture any aspect of its lift station systems to absolute elevations. It is simply not possible in the general underground construction world to meet absolutes. Therefore, any owner and/or installer of a Romtec Utilities system is accepting the Romtec Utilities system proposed herein to the plus or minus .10' offered by Romtec Utilities.

2. Performance Characteristics and Start-Up.

a. The lift station is a sophisticated device that can be operated in many different ways. The Romtec Utilities Scope of Supply & Design Submittal defines Romtec Utilities' approach to the operation of the lift station.

   i. Note: While there are many ways to vary and/or adjust "operational parameters" within the overall lift station, Romtec Utilities is only

prepared to start-up per its <u>own</u> parameters (as specified in the customer's design criteria, see attached).

b. Romtec Utilities' obligation is to show that the station can run as designed to meet specific design criteria as shown in its Scope of Supply & Design Submittal. It is understood that the regulating agency may want to test many other scenarios. This will not be part of the standard Romtec Utilities' start-up procedures and training. At start-up, Romtec Utilities will only prove that the station can run at the pre-specified design parameters.

c. Romtec Utilities is not an operator, installer or an electrical interconnector for the lift stations and equipment it supplies.

d. During start-up, Romtec Utilities is completely in charge. Romtec Utilities' start-up technician will start-up and "prove" the station per the approved Romtec Utilities Scope of Supply & Design Submittal. After the lift station is accepted other parties may choose to adjust and/or vary the operational parameters to suit their specific preference. However, Romtec Utilities will not be involved with these issues either during or after start-up, and is not responsible for problems arising from any adjustments or variations by such other parties.

3. Training.

a. Romtec Utilities will perform system training at no additional cost as part of its scope of supply if the training is scheduled for the day after start-up. If training is scheduled for any other time than the day after start-up, Romtec Utilities will require prepayment of the additional costs (incurred as a result of the need to reschedule) prior to confirming the alternate training schedule. If training is scheduled for any other time other than the day after start-up, Romtec Utilities will require prepayment of the additional costs incurred as a result of the need to reschedule.

6.02 LIMITATIONS OF ROMTEC UTILITIES' RESPONSIBILITIES

1. Romtec Utilities is the equipment supplier only

a. Unless specified otherwise in this document, Romtec Utilities is not a subcontractor and does not perform any installation or construction tasks at the project site, unless those duties are specified in this document.

b. Romtec Utilities staff persons at the project site are there strictly to observe and advise.

2. Romtec Utilities' responsibilities are to its direct customer only

a. Romtec Utilities will communicate with project subcontractors, engineers, owners and any other parties only through a designated representative of the customer.

3. The pump station design is based, solely, on information supplied to Romtec Utilities and listed in the Lift Station Design Form

a. All site-related data are the responsibility of the customer, not Romtec Utilities.

4. Complete review of this document will require information contained in other documents not supplied by Romtec Utilities

a. Romtec Utilities does not supply various documents related to the project, such as: the pump station site plan, the area plan, the influent line and force main plan and profile, the electrical plan and many other documents.

b. Thorough understanding of the environment in which the pump station will be installed and operated requires complete knowledge of information included in these related documents.

c. Romtec Utilities does not know any information included in any of these other documents, except those specific design details included in the Lift Station Design Form.

5. Romtec Utilities is not responsible for the review or understanding of this document by the customer, the customer's representatives or agents, engineers and installation contractor/subcontractors

a. The customer, engineers, installation contractor/subcontractors, owner and all other parties interested in the project are urged to contact Romtec Utilities Document Control, at any time, with any questions they may have about the system described herein, or about Romtec Utilities' responsibilities related to the project.

b. Romtec Utilities will make every effort to ensure that all parties have access to complete information about the pump station; however, Romtec Utilities is not responsible for the distribution of this document and/or

6.02 LIMITATIONS OF ROMTEC UTILITIES' RESPONSIBILITIES

misunderstandings, errors and costs that arise from an incomplete understanding, by any party, of the information contained in this document.

6. Sealing of documents will incur additional charges

a. Romtec Utilities has not offered to "seal" the Scope of Supply and Design Submittal, including drawings contained herein.

b. Sealing of this document and/or the providing of sealed plans and/or sealed calculations are available from Romtec Utilities, if required, at additional cost.

7. Installation/construction time is not specified

a. Romtec Utilities designs and manufactures its pump station systems for quick and complete installation. However, Romtec Utilities makes no representation as to how long it will take to prepare the site, install the system described herein, connect the system to other equipment not supplied by Romtec Utilities or to start-up and complete the system.

i. *Note: By approving the Romtec Utilities' Scope of Supply and Design Submittal, the customer agrees to reimburse Romtec Utilities for any cost incurred, whether by Romtec Utilities directly or through a related vendor, due to on-site delays caused by inaccurate representation herein.*

8. Installation time and/or defective or incorrect parts do not justify delay claims

a. If, at the time of installation, any part supplied by Romtec Utilities is found to be defective or incorrect, relative to this document, Romtec Utilities will repair and/or replace said part at Romtec Utilities' expense.

b. Romtec Utilities does not accept any charge and/or claim by anyone, related to the time it takes to install/construct the Romtec Utilities system and/or claims for delays related replacement or repair of any part of the system by Romtec Utilities.

9. Final (As Built) size for the control panel enclosure

a. The size of the final (as built) enclosure for the control panel may change! In other words, the size of the panel enclosure (as proposed) in this Romtec Utilities' Scope of Supply and Design Submittal may not be the actual size and/or mounting style of the final (as built) panel and enclosure.

i. *Note: The final as built drawings will not be available until at least 3 to 4 weeks following Romtec Utilities' receipt of Notice to Proceed from its direct customer. Any changes to the enclosure size will result in notification from Romtec Utilities to its direct customer.*

6.02 LIMITATIONS OF ROMTEC UTILITIES' RESPONSIBILITIES

10. Romtec Utilities Pre-construction Checklist has suggestions only

a. All references to installation preparations, methods and/or equipment contained in the Romtec Utilities Installation Checklist or any other Romtec Utilities document are only suggestions, not directions.

11. Romtec Utilities is not responsible for determining the methods and equipment used in site preparation and/or installation/construction

a. All methods and equipment used at the site are the responsibility of the installation contractor/subcontractors, not Romtec Utilities. The contractor/subcontractor bears sole responsibility for installation of products manufactured by Romtec Utilities.

b. Romtec Utilities does not know or specify what site preparation methods should or will be used, for example: whether or not excavated areas will require shoring or dewatering, what backfill methods will be required or any other site-related aspects of the project.

c. Romtec Utilities does not specify and does not know what types of equipment the installation/construction contractor and/or subcontractors plan to use at the site.

d. Romtec Utilities does not know the suitability of any equipment for installation of products supplied by Romtec Utilities.

12. Romtec Utilities is not responsible for structural testing done after backfill

a. The customer is responsible for any water or vacuum testing conducted on underground vessels.

b. Romtec Utilities recommends any and all testing of the underground structures occur prior to backfill. Romtec Utilities is available to assist with any repairs after testing is done, prior to backfilling the structures.

c. If testing takes place after backfilling has occurred, Romtec Utilities ability to assist with repairs is severely limited. Romtec Utilities will not assume costs caused by testing after backfill.

13. Installing a level and "plumb" wet well that will not "settle"

a. The specification for and the process for creating a stable compacted "footing" or "base" for the Romtec Utilities wet well to be placed on is by others.

b. In other words, creating a compacted base that will not allow the Romtec Utilities wet well to "settle" and/or "tilt" during or after installation is not the responsibility of Romtec Utilities.

6.02 LIMITATIONS OF ROMTEC UTILITIES' RESPONSIBILITIES

c. Romtec Utilities wants every installation contractor to be successful. We want every wet well to be plumb, level and to never settle. Romtec Utilities however is not responsible for any of these "installation" related problems if they occur.

14. A Romtec Utilities advisor will be at the project site during installation of the pump station's underground components

a. Any Romtec Utilities personnel at the project site during installation of the pump station's underground components are there only in an advisory capacity. Romtec Utilities does not perform work during this phase of the project, unless such work is specified in the Scope of Supply.

b. To facilitate communication about the project, the Romtec Utilities Advisor may be at the project site or available by telephone or other electronic means.

15. Getting ready for the Romtec Utilities construction advisor and the delivery of the Romtec Utilities system for installation

a. Typically the Romtec Utilities delivery of the underground portion of the Romtec Utilities system is done in conjunction with its installation. In other words, the Romtec Utilities system is unloaded from the Romtec Utilities trucks and installed directly into the prepared hole.

b. Our goal is to save you (or your contractor) time and money. One way to do this is to deliver and install the underground portion of the Romtec Utilities system on the same day (from the Romtec Utilities' delivery truck to the prepared excavation).

c. Therefore, when Romtec Utilities schedules its construction advisor to be on-site we assume that the hole will be dug, the base of the hole prepared and any shoring will be installed.

i. *Note: The Romtec Utilities "Installation Checklist" is the document that Romtec Utilities is relying on. We assume that all of the work on the Installation Checklist will be done and all equipment, etc will be on site and ready to install on the day Romtec Utilities arrives.*

ii. *Note: Normally our trucks will arrive the night before and along with our construction advisor, we will be "ready to go" on the day of the scheduled delivery and installation.*

iii. *Special Note: If the job as scheduled and as defined in the Romtec*

6.02 LIMITATIONS OF ROMTEC UTILITIES' RESPONSIBILITIES

Utilities' "Installation Checklist" located in this Romtec Utilities' Scope of Supply and Design Submittal is not really "ready to install", Romtec Utilities will require a change order to reschedule its construction advisor at a later date.

16. Delivery / Installation / Start-up delays

a. When the Customer schedules delivery of the system and/or Romtec Utilities and its suppliers to be on-site for either the "construction" and/or the "start-up and training", the customer agrees to additional charges if any of the following occur.

i. In the event that the shipment is cancelled after the truck has been loaded, there will be a cancellation fee, unless the shipment is rescheduled for the same day.

ii. Any undue delay in unloading of trucks (over 2 hours per truck) will result in a waiting time fee.

iii. If Romtec Utilities discovers upon arrival that the customer is not ready to construct or start-up.

1. *Note:* *Romtec Utilities works very hard to confirm the customers "readiness" to construct and/or start-up. If we ultimately find (upon arrival) that the system is not ready for either, we will leave the site and reschedule at a later date for an additional charge.*

2. Special Note: *Having the Romtec Utilities construction advisor and start-up technician on-site helps everyone complete the project without difficulty. We provide these on-site services as part of our price, but we rely on the customer to confirm that they are ready for us to perform.*

iv. The customer chooses to cancel or reschedule the construction and/or changes the date after Romtec Utilities and/or its vendor have purchased tickets for travel, etc.

v. If the installation and/or start-up is delayed for any reason and runs into a weekend or holiday, keep in mind that the Romtec Utilities offices will be closed and there will be no one available for technical support.

17. Romtec Utilities does not perform or advise on performance of any electrical installation work

a. All electrical installation work on the project site must be performed by a licensed electrical contractor. Romtec Utilities personnel are generally not on the project site during electrical installation.

18. Start-up Preparation Form must be completed by the customer and returned to Romtec Utilities before start-up and testing day will be scheduled

6.02 LIMITATIONS OF ROMTEC UTILITIES' RESPONSIBILITIES

a. To expedite timely and efficient completion of the pump station, Romtec Utilities will schedule start-up and testing approximately two weeks after receipt of the completed Pre Start-up Checklist from the customer indicating all work has been done to prepare for station start-up and testing.

19. Romtec Utilities directs the pump station start-up and testing

a. The Romtec Utilities technician directs all station start-up and testing procedures. No other party shall operate the station until after the start-up and testing procedures are completed by Romtec Utilities.

b. Romtec Utilities requests the presence of the licensed electrical contractor who installed the pump station's electrical system at the project site during pump station start-up and testing.

20. System start-up, testing and training services are limited to the operational parameters described in this Scope of Supply and Design Submittal

a. The pump station described herein is a sophisticated device that can be operated in many different ways; however this document defines only a specific set of operational parameters.

b. Romtec Utilities' standard start-up, testing and training services are based solely on these pre-specified operational parameters. Additional start-up, testing and/or training services requested or required by the regulatory agency or any other party will not be conducted by Romtec Utilities, unless those services are included in this Scope of Supply and Design Submittal.

21. Additional start-up/training time by Romtec Utilities and/or any Romtec Utilities supplier

a. Any additional time required of Romtec Utilities (other than the time and/or services outlined in this Scope of Supply document and/or as part of the purchase order) must be ordered and contracted separately from this purchase order. Romtec Utilities will require a change order or a separate purchase order for any additional time.

b. If more time is required of any Romtec Utilities supplier (other than the time and/or services outlined in this Scope of Supply document and/or as part of the purchase order) the Customer must order it directly from that supplier, not Romtec Utilities.

22. The schedule for standard pump station start-up and operation and maintenance training is limited

a. Romtec Utilities has provided two (2) contiguous days (not including holidays or weekends) for pump station start-up and operation and maintenance training as part of the standard services included in this Scope of Supply.

6.02 LIMITATIONS OF ROMTEC UTILITIES' RESPONSIBILITIES

i. Note: *This is only if the operation and maintenance training is scheduled for the day after the pump station start-up is conducted.*

b. If training is scheduled for any time other than the day after start-up, Romtec Utilities will charge $1,900.00 per day (from the time our technician leaves Romtec Utilities) plus travel and per diem, for the service with a minimum charge of two days. This will result in a change order or additional purchase order.

i. Note: *If you have purchased a Romtec Utilities' system and for whatever reason have not elected to have Romtec Utilities "start-up" the system prior to the end of the warranty, start-up services will need to be scheduled and purchased separately.*

In other word

Our "free start-up" services are included with the purchase of the Romtec Utilities' system. We will withdraw the free start-up if you elect to not start-up the system prior to the end of warranty. We will however, be glad to start-up the system at a fee to be quoted when you are ready.

23. Pump station owner and/or owner's designated station operator must receive training for warranty to be to be in place

a. The Customer must designate, in advance, the persons who will participate in the pump station operation and maintenance training provided by Romtec Utilities.

b. The Romtec Utilities Limited Warranty will not be in place until after the pump station owner and/or the owner's designated station operator have participated in and passed the operation and maintenance training supplied by Romtec Utilities unless Romtec Utilities has not started the system.

c. Romtec Utilities does not train the installation contractor in the operation and maintenance of the pump station, unless this installation contractor is designated by the owner as the party responsible for station operation.

24. Ongoing operation and maintenance training is the responsibility of the station owner/operator, not Romtec Utilities

a. Romtec Utilities does not provide ongoing operation and maintenance training, except for the training specified this Scope of Supply. It is the responsibility of the pump station owner and/or operator to conduct ongoing operation and maintenance of the pump station and its components.

6.02 LIMITATIONS OF ROMTEC UTILITIES' RESPONSIBILITIES

25. Failure of pump station-warranty

a. Pump station function is a complex combination of parameters. Sometimes pumps may clog or power may be lost and the pump station will fail to operate. Sometimes the failure is caused by mechanical or sometimes it's electrical. A pump station failure does not constitute a warranty issue. In order to make a warranty claim follow this procedure:

i. Trouble-shoot the problem with the help of Romtec Utilities over the phone.

ii. If you cannot provide trouble shooting assistance Romtec Utilities can recommend a local company to provide trouble-shooting assistance at your cost.

iii. Once the cause of the failure has been determined then a warranty claim can be made. Warranty claims extend to defective parts only. Romtec Utilities does not warranty trouble shooting, service calls, installation or re-installation associated with defective parts or their failure. Romtec Utilities will repair and/or replace per the terms of the Romtec Utilities warranty.

1. <u>Note</u>: *If however no parts have failed and let's say that the pumps are simply "clogged" or the power was simply lost, Romtec Utilities will advise the owner that this is not a warranty issue and the owner will be responsible for payment of the service call and the associated services.*

26. Start-up after the warranty expires

a. Romtec Utilities start-up, testing and training services are included at no additional cost if these services are performed <u>within 18 months</u> of the delivery, or deliverability of the lift station per its accepted purchase order. If start-up services are required after this period they will not be free and/or included as part of the accepted purchase order. Instead they will be quoted and ordered under a new and separate quote and service order.

27. Storage of electrical components and/or pumps prior to start-up

a. Romtec Utilities will keep the lift station electrical components and/or pumps at its facility prior to start-up. However, if the customer does not scheduled start-up within 4 months after the installation of the underground components, and all components are fully paid for, Romtec Utilities will ship these components to the customer.

END

OF

SECTION

7. OPERATION & MAINTENANCE (O&M) MANUAL

The Romtec Utilities Operation & Maintenance Manual will be delivered at start-up of the system. This document contains all the as-built drawings and operation, maintenance manuals & manufacturers warranties for the associated mechanical.

One (1) hard copy and one (1) CD Rom of the Romtec Utilities Operation & Maintenance Manual will be provided to the customer at start-up of the system.

Any request for additional copies will result in additional fees and a change order.

END

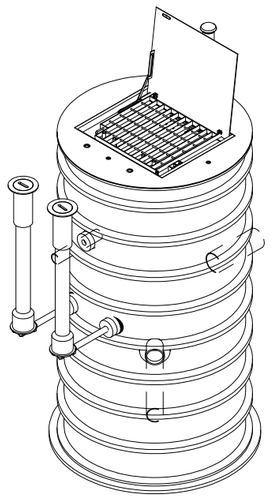
OF

SECTION

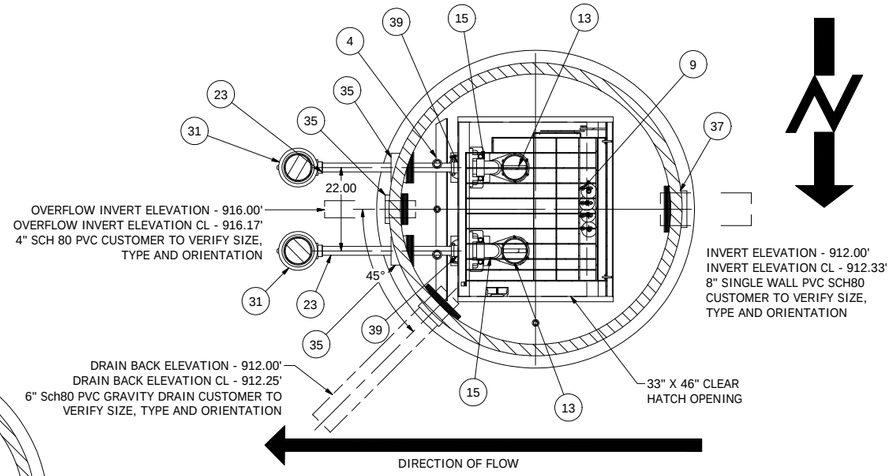
8. WET WELL & RELATED EQUIPMENT

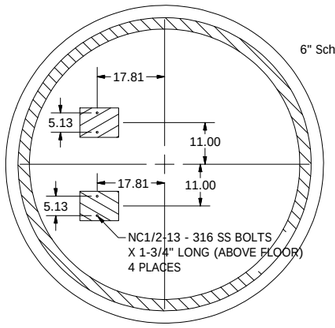
This section contains information pertaining to the wet well. There is both technical information and related drawings necessary for the wet well construction.

This section is structured as follows:



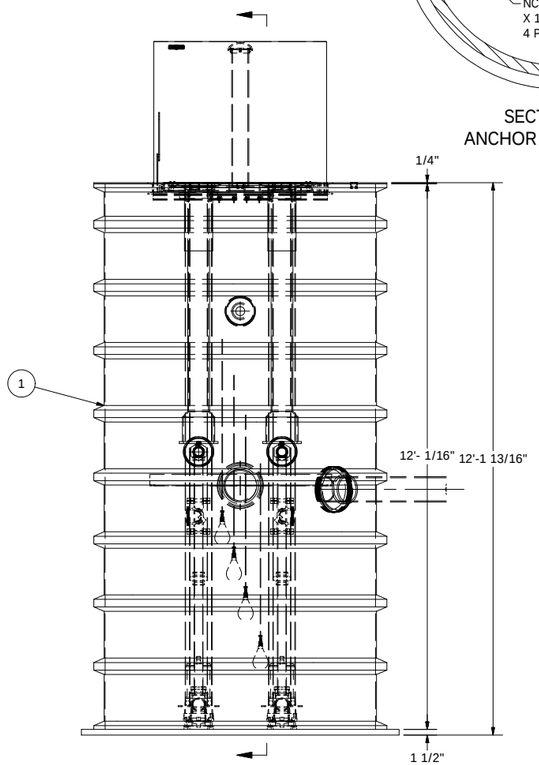
SENSOR AND ELEVATION TABLE		
LEVEL ELEVATION	DISTANCE BETWEEN POINTS	SET POINT DESCRIPTION
912.00		SEWER INVERT IN
909.80		HIGH LEVEL ALARM
	0.5	SENSOR SPACING
909.30		LAG PUMP START
	0.5	SENSOR SPACING
908.80		LEAD PUMP START
	1.0	SENSOR SPACING
907.80		PUMP STOP
	0.83	DISTANCE TO FLOOR
906.97		FLOOR ELEVATION
919.00		TOP OF WET WELL
912.00		6" SEWER INVERT
916.00		4" SEWER INVERT
913.00		3" DIS. INVERT



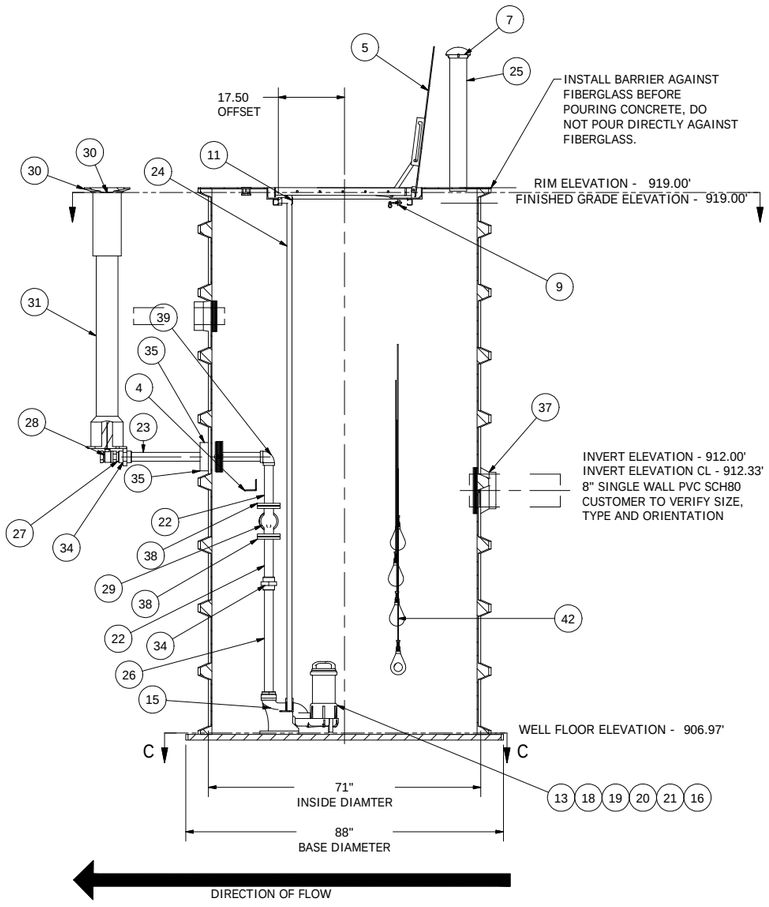


SECTION C-C
ANCHOR BOLT LAYOUT

NOTE: WET WELL TOP SLAB IS PEDESTRIAN RATED



DISCHARGE ELEVATION - 913.00'
DISCHARGE ELEVATION CL: 913.08'



NOTE: ALL DIMENSIONS AND ELEVATIONS SHOWN ARE NOMINAL DIMENSIONS. IT IS THE RESPONSIBILITY OF THE ON-SITE CONTRACTOR OR ROMTEC UTILITIES CUSTOMER (NOT ROMTEC UTILITIES) TO VERIFY THE ACCURACY OF ANY CRITICAL DIMENSIONS OR ELEVATIONS PRIOR TO SETTING OR INSTALLING ANY EQUIPMENT.

6' DIAMETER WET WELL
2" DISCHARGE PIPING

REV	DESCRIPTION	DATE	APPROV
	REVISION HISTORY		
3	REVISIONS PER PRODUCTION LAUNCH	10-21-13	AD
2	PIPE ELEVATION REVISIONS	9-27-13	AD
1	PER COMMENTS 5/17/13	5-28-13	NG

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY

DSN - NG
DRN - NG
CKD - AD
DATE - 4/1/2013

COMPONENT DRAWING

ROMTEC UTILITIES
18240 NORTH BANK ROAD
ROSEBURG, OREGON 97470
(541) 496-9678
FAX (541) 496-0804

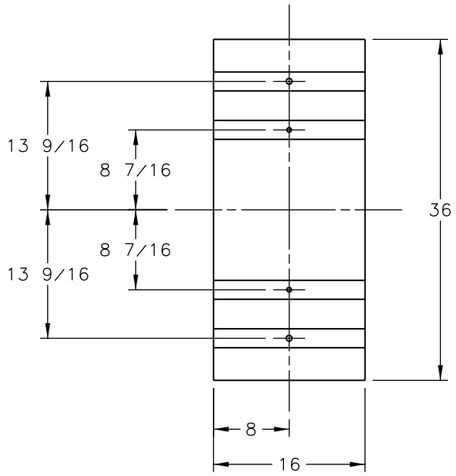
ANIMAL HEALTH PRODUCT FACILITY
2" - 6' DIA WET WELL

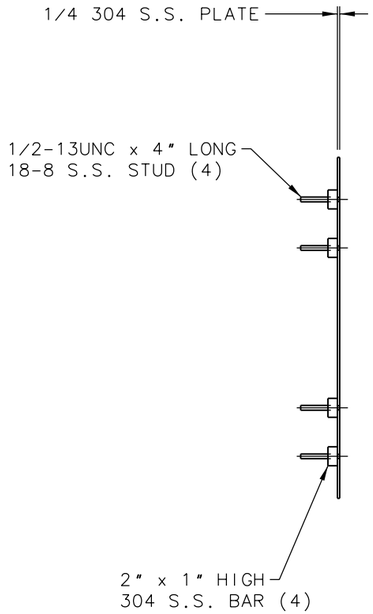
SHEET
1 OF 1

JOB NUMBER
RMTC
0000

NOTE:

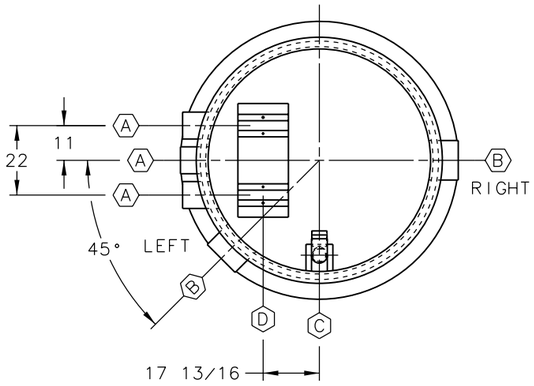
1 - DRAFT ONLY- NOT FOR PRODUCTION.
2 - ALL CHEMICAL TANKS REQUIRE CUSTOMER SUBMITTAL OF "UNDERGROUND CHEMICAL TANK LIMITED WARRANTY EXHIBIT A".
3 - RESIN SYSTEM FOR FRP COMPONENTS TO BE DETERMINED.

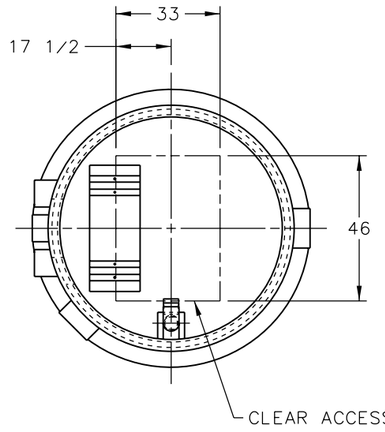


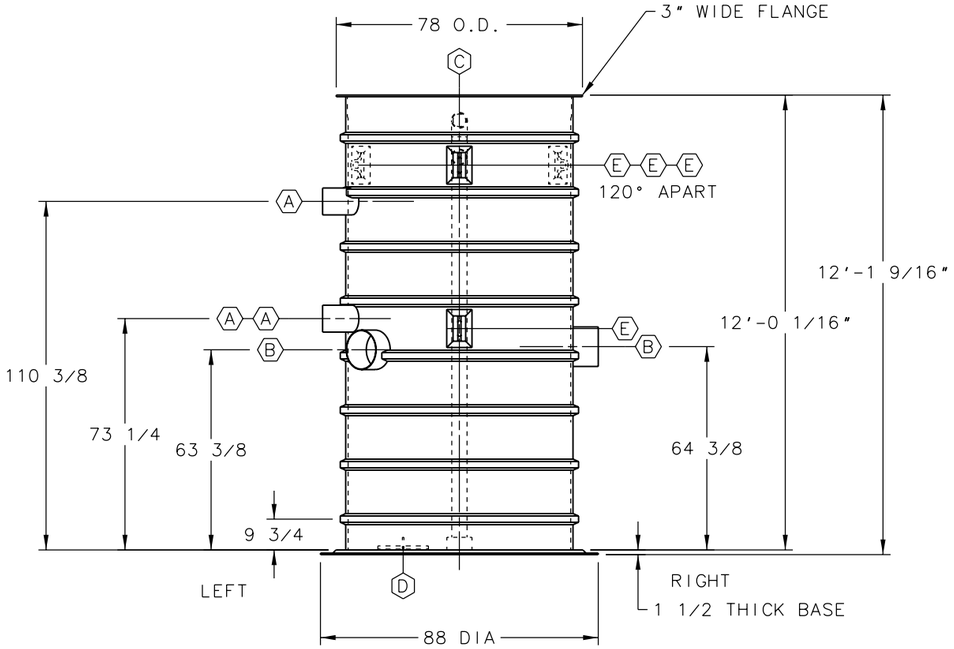


.TAIL

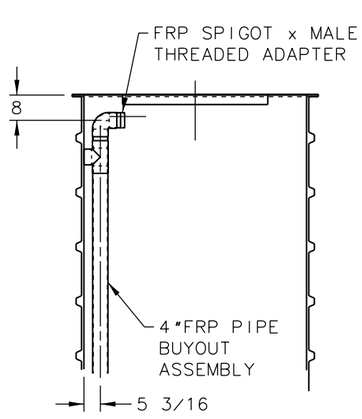
SCALE: 1/8







FRONT VIEW



ITEM	QTY	
A		_. FRP PIPE SLEEVE
B		12"DIA V.E. FRP PIPE SLEEVE
C		

LIFTING LUG

2	MOVE PIPES "A" LEFT SIDE DOWN 1/16" "B" RIGHT SIDE UP 1/6", MOVE BOLTING PLATE					
DRN DAG	DATE 10-11-13	CHK'D -	DATE -	APPR'D JB	DATE 9-14-13	
1	RELOCATE TOP NOZZLE 'A'. RELOCATE LEFT NOZZLE 'B'.					
DRN PRM	DATE 7-12-13	CHK'D -	DATE -	APPR'D JWL	DATE 7-12-13	

XERXES® a ZCL company

DRN DAG	DATE 6-11-13	TITLE	6'DIA x 12'HIGH DW VERTICAL WET WELL ANIMAL HEALTH
CHK'D	DATE		
APPR'D JWL	DATE 6-12-13	DR. SIZE D	DR. NUMBER 643-661 REV 02
SALES MANAGER Bruce Coe		SCALE: 1/2"=1'-0"	SHT 1 OF 1
INDUSTRY TYPE: M401 UNDERGROUND CHEMICAL			

XERXES®
a ZCL company

October 25, 2013

Natalie Mc Farland
E-mail: romtec14@romtecutilities.com

CC: Bruce Coe, Xerxes

Re: Xerxes 6-foot-diameter x 12-foot-tall Double-Wall Wet Well
Buoyancy Calc – Animal Health - 3500 W. 91st St., De Soto KS 66018

Dear Natalie:

We have summarized the buoyancy data you requested. All of the calculations are based on the site data you have provided to us and on nominal engineering values for the physical parameters.

All of the calculations are based on standard engineering practice. Xerxes uses approaches in a manner similar to the protocols presented in the Petroleum Equipment Institute's Recommended Practices manual (PEI/RP 100-05) to calculate the underground tank Buoyancy Safety Factors. Note that for wet wells, Xerxes assumes a soil friction angle of 30 degrees.

It is the tank owner's responsibility to determine the suitability and applicability of installation. Our sole responsibility in any installation is as stated in our Limited Warranty.

Our calculations show that, given the installation parameters that you have provided to us (calculated with water table at finished grade and no secondary anchorage), Xerxes has found the following:

Wet Well	Buoyancy Safety Factor
6-foot-diameter x 12-foot-tall	4.26:1

Xerxes recommends a minimum Buoyancy Safety Factor of 1.20:1. I have included a copy of the worksheet for your files.

If we can be of additional assistance, please feel free to contact us.

Sincerely,

Sales Engineer

Attachment

XERXES® a ZCL company

WET WELL BUOYANCY CALCULATIONS NO SECONDARY ANCHORS

Animal Health - 3500 W. 91st St., De Soto KS 66018

JWL | **10/25/13**

WET WELL DATA				INSTALLATION DATA		
NOMINAL SHELL DIAMETER (FT)	=	6	*CALCULATED WITH WATER TABLE AT FINISHED GRADE*	HEIGHT BELOW GRADE (FT)	=	12.13
DIAMETER OF BOTTOM (FT)	=	6		DEPTH TO WATER TABLE FROM FINSHED GRADE (FT)	=	0.00
ANTI-FLOTATION FLANGE (IN)	=	6		VOLUME, BALLAST (GAL)	=	0.00
NUMBER OF RIBS	=	8				
WEIGHT OF WET WELL (LBS)	=	1200				

RESULTS

SAFETY FACTOR = **DOWN FORCE / UP FORCE** = **92602 LBS / 21717 LBS** = **SAFETY FACTOR 4.26:1**

WORKSHEET SUMMARY

DOWN FORCES:

BACKFILL, TOTAL WEIGHT (LBS)	=	*91401.52*
+ WET WELL, WEIGHT (LBS)	=	*1200.00*
+ BALLAST, WEIGHT (LBS)	=	*0.00*
= TOTAL DOWN FORCE (LBS)	=	*92601.52*

UP FORCES:

TOTAL DISPLACEMENT (GAL)	=	*2603.99*
x UNIT WEIGHT, WATER (LB/GAL)	=	*8.34*
= TOTAL UP FORCE (LBS)	=	*21717.23*

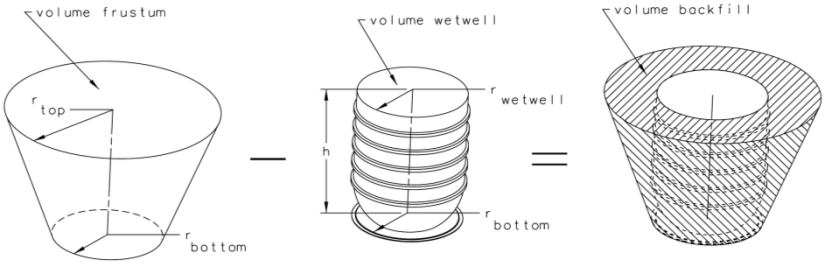
WORKSHEET

EQUATIONS:

$$Volume_{frustrum} = \frac{1}{3}\pi h(r_{top}^2 + r_{top}r_{bottom} + r_{bottom}^2)$$

$$Volume_{wetwell} = \pi r_{wetwell}^2 h_{cylinder} + Volume_{bottom}$$

$$Volume_{backfill} = Volume_{frustrum} - Volume_{wetwell}$$



ASSUMPTIONS:

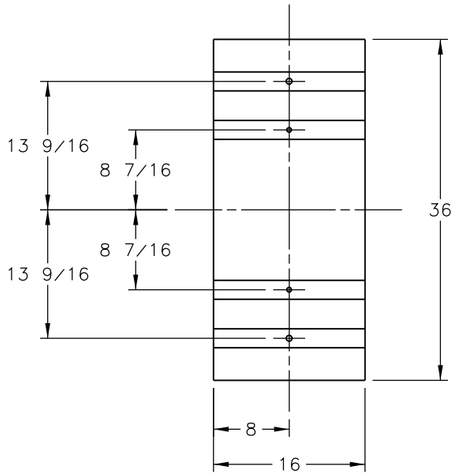
SOIL FRICTION ANGLE (DEG)	=	*30.00*	*UNIT WEIGHT, WET SOIL (LB/FT^3)*	=	*60.00*
WATER, UNIT WEIGHT (LB/GAL)	=	*8.34*	*UNIT WEIGHT, DRY SOIL (LB/FT^3)*	=	*100.00*

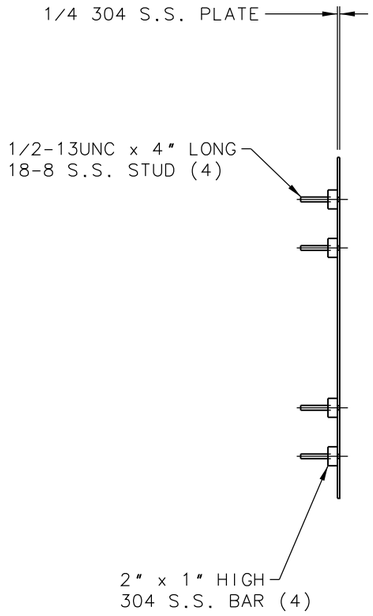
CALCULATIONS:

TOP RADIUS (AT GRADE) (FT)	=	*10.00*	*FRUSTUM, PORTION BELOW WATER TABLE (FT^3)*	=	*1871.49*
RADIUS (AT WATER TABLE) (FT)	=	*10.00*	*FRUSTUM, PORTION ABOVE WATER TABLE (FT^3)*	=	*0.00*
RADIUS AT BOTTOM (FT)	=	*3.50*	*FRUSTUM, TOTAL VOLUME (FT^3)*	=	*1871.49*
CYLINDRICAL PORTION, HEIGHT (FT)	=	*12.13*	*CYLINDER, PORTION BELOW WATER TABLE (FT^3)*	=	*342.97*
			CYLINDER, PORTION ABOVE WATER TABLE (FT^3)	=	*0.00*
BOTTOM PORTION, HEIGHT (FT)	=	*0.00*	*BOTTOM PORTION, VOLUME (FT^3)*	=	*0.00*
			RIBS, VOLUME (FT^3)	=	*5.15*
WET WELL, TOTAL VOLUME (GAL)	=	*2603.99*	*WET WELL, TOTAL VOLUME (FT^3)*	=	*348.13*
WET BACKFILL, WEIGHT (LBS)	=	*91401.52*	*WET BACKFILL, VOLUME (FT^3)*	=	*1523.36*
DRY BACKFILL, WEIGHT (LBS)	=	*0.00*	*DRY BACKFILL, VOLUME (FT^3)*	=	*0.00*
BACKFILL, TOTAL WEIGHT (LBS)	=	*91401.52*			

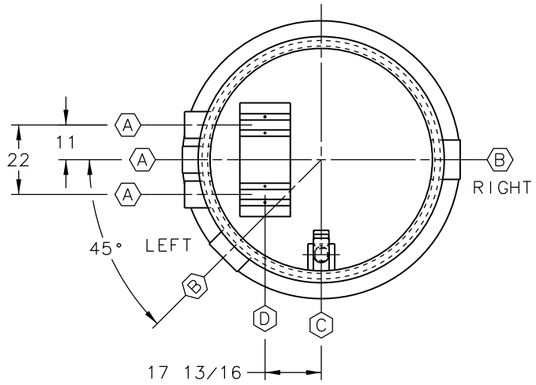
NOTE:

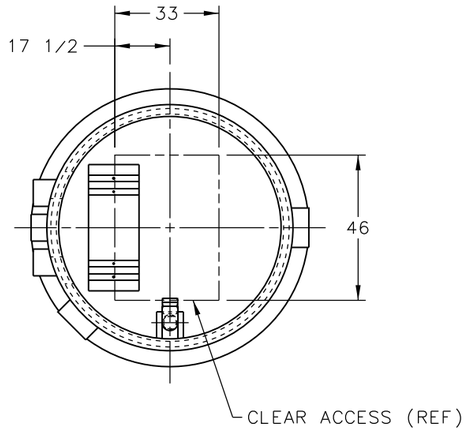
1 - SEE UCT# 571.13 FOR CONSTRUCTION DETAILS.

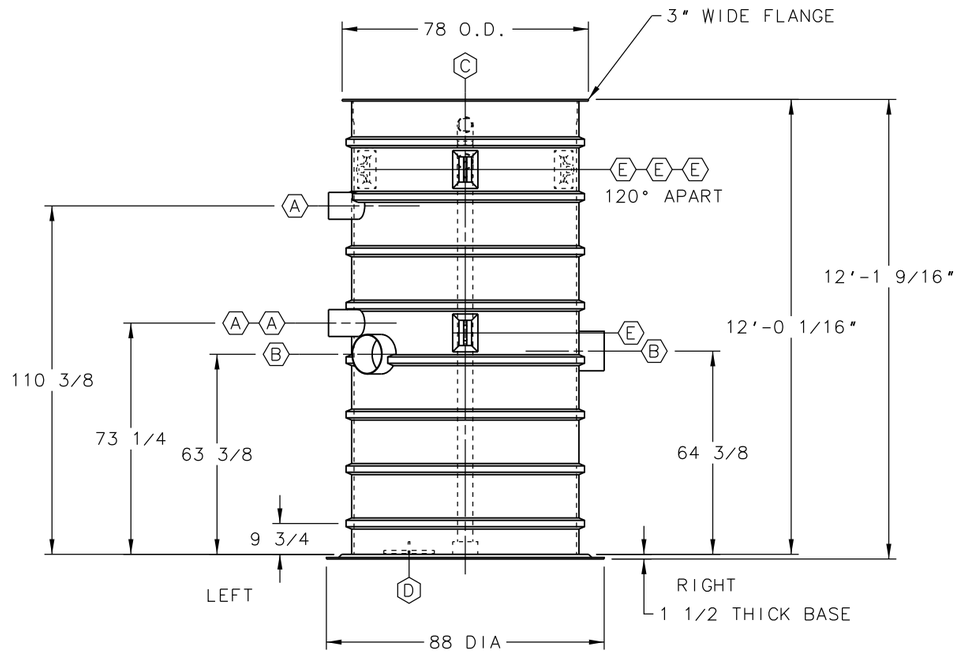




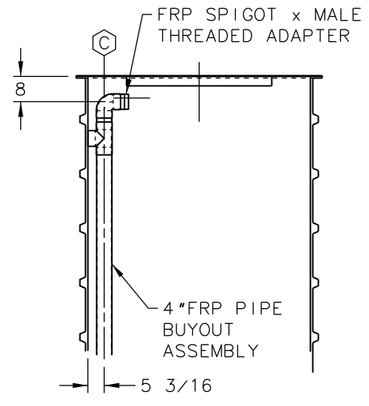
BOLTING PLATE DETAIL
SCALE: 1/8







FRONT VIEW



3	DELETE "DRAFT ONLY" NOTATIONS. ADD UCT #.					
DRN PRM	DATE 10-25-13	CHK'D	DATE	APPR'D JWL	DATE 10-25-13	
2	MOVE PIPES "A" LEFT SIDE DOWN 1/16" "B" RIGHT SIDE UP 1/6", MOVE BOLTING PLATE					
DRN DAG	DATE 10-11-13	CHK'D -	DATE -	APPR'D JB	DATE 9-14-13	
1	RELOCATE TOP NOZZLE 'A'. RELOCATE LEFT NOZZLE 'B'.					
DRN PRM	DATE 7-12-13	CHK'D -	DATE -	APPR'D JWL	DATE 7-12-13	

XERXES® a ZCL company

DRN DAG	DATE 6-11-13	TITLE	6'DIA x 12'HIGH DW VERTICAL WET WELL ANIMAL HEALTH
CHK'D	DATE		
APPR'D JWL	DATE 6-12-13	DR. SIZE D	DR. NUMBER 643-661 REV 03
SALES MANAGER Bruce Coe		SCALE: 1/2"=1'-0"	SHT 1 OF 1

INDUSTRY TYPE: M401 UNDERGROUND CHEMICAL

CHEMICAL COMPOSITION FOR TANK

Romtec Utilities requires the customer to complete the following form from the supplier of the fiberglass wet well. Romtec Utilities can only design to the disclosed standards provided by the customer. Failure to provide the service conditions could lead to problems with the operation of the lift station.

XERXES®
CORPORATION

Nicole Gifford
Romtec Utilities
18240 North Bank Rd.
Roseburg, OR 97470

June 11, 2013

Subject: Animal Health

Dear Andy,

Xerxes standard practice is to pull a vacuum test on the interstial space of all double wall tanks or lift stations. Your tank will have vacuum of 15 inches of mercury put on the interstial space and held for 48 hours prior to shipment. Xerxes will verify this test with a written statement of completion of this test for your file.

Sincerely,

Bruce Coe
Western Regional Sales Manager
Water Products Division
Xerxes Corporation
16452 SE Keystone Drive
Milwaukie, OR 97267
503-653-1604
612-963-7561 (mobile)
bruce.coe@xerxes.com
www.xerxes.com

XERXES® CORPORATION

Underground Chemical Tank Limited **Warranty Exhibit A**

UNDERGROUND CHEMICAL TANK APPLICATION FOR APPROVAL

[redacted]

NO UL LISTING. SEE XERXES CHEMICAL TANK LIMITED WARRANTY

Customer _____ End User _____

Location _____ Location _____

Phone _____ _____

Fax _____ _____

Contact _____

(NOTE: The information below must be provided by Xerxes' customer or end user)

Tank Size_____ Diameter_____ Single-Wall ☐ Double-Wall ☐

Service Conditions (List all chemicals and concentration percentages) **(print or type)**

Inlet temperature of chemicals _____ (cannot exceed 100° F.)

Specific gravity of contents _____ (standard design is 1.1 S.G.)

By:_____
Printed Name

NOTE: Signatory warrants his/her authority to bind customer or end user.

By:_____
Signature

With:_____
Company Name

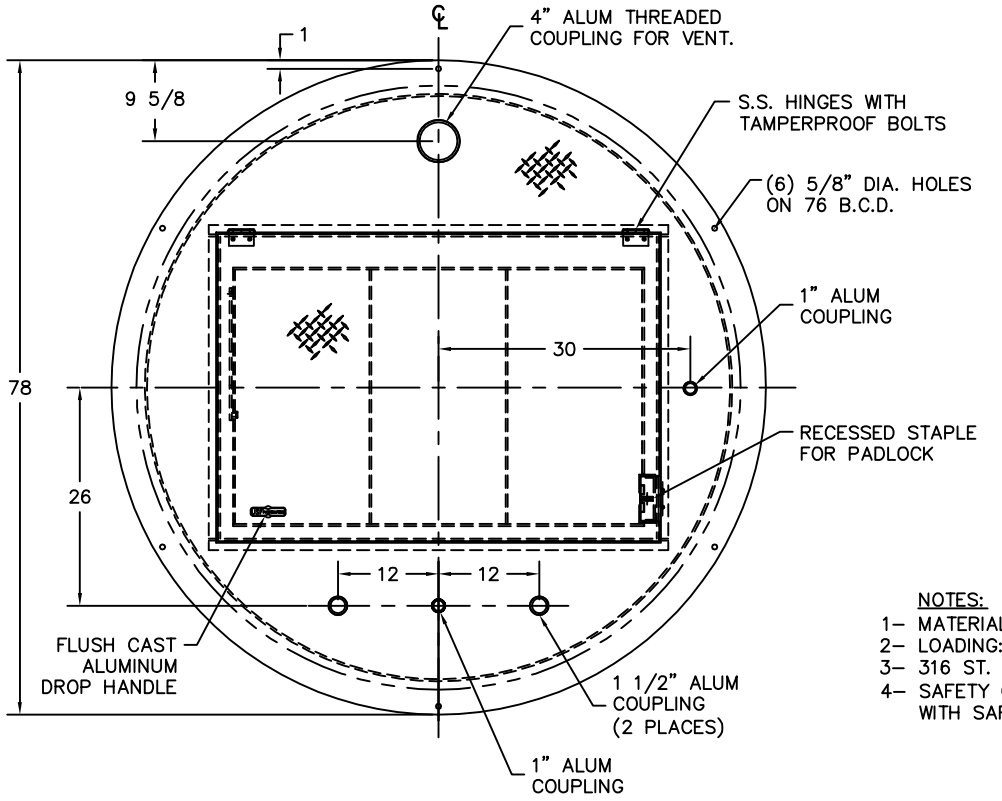
Dated:_____

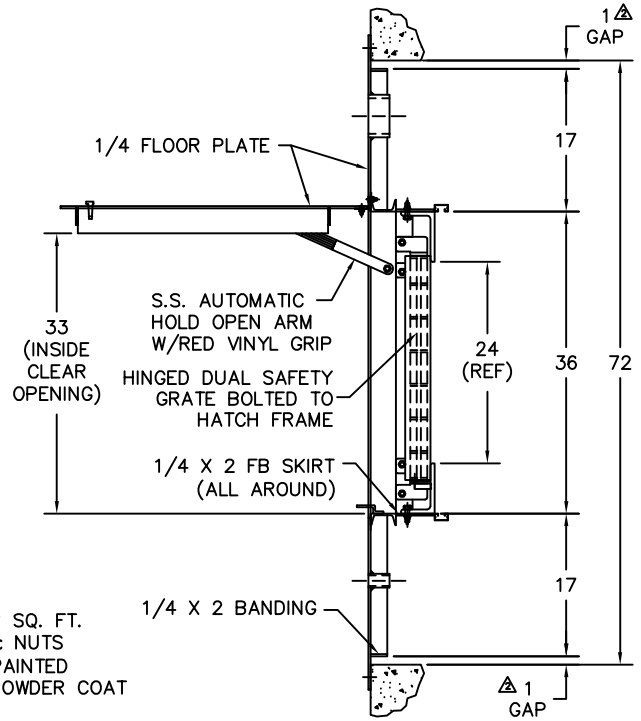
Its:_____
Title

OFFICE USE ONLY

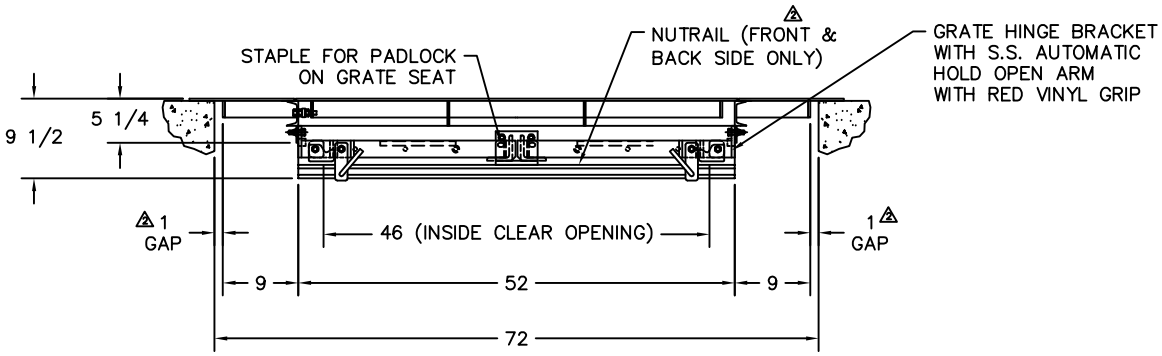
APPLICATION APPROVED	**APPLICATION DENIED**
UCT Log Number _____	Reason _____
Construction details _____	

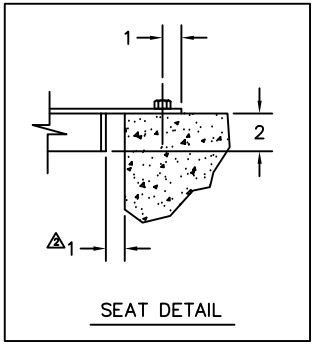
Reviewed by Date





NOTES:
1- MATERIAL: ALUMINUM
2- LOADING: 300 LBS. PER SQ. FT.
3- 316 ST. STEEL BOLTS & NUTS
4- SAFETY GRATE TO BE PAINTED WITH SAFETY ORANGE POWDER COAT





REV.	DATE	BY	CHK.	DESCRIPTION
2	12/6/12	C.S.	A.Q.	ADDED NUTRAIL / 1" GAP WAS 1/4"
1	12/5/12	C.S.	A.Q.	ALUMINUM HATCH WAS STEEL / ADDED COUPLINGS

INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M

TOLERANCES UNLESS OTHERWISE SPECIFIED
SURFACE FINISH: Mill
FRACTIONAL
± 1/16

U.S.F. FABRICATION INC.
HIALEAH, FLORIDA

HATCH BPS 72 ID X 78 OD – ALUMINUM 36 X 52 ACCESS DOOR W/RECESSED PADLOCK, NUTRAIL & DUAL SAFETY GRATE

DWN. BY:	SCALE:	QUOTE#	DATE:
C.S.	1=12	70076	10/12/12
CHK. BY:	DWG.#	SHEET SIZE:	SHEET NO:
DAV	75932-R2	C	1 OF 1

REV: 2

8.04 WET WELL RELATED DATA SHEETS

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Wet Well Installation Instructions and Operating Guidelines

1. INTRODUCTION

1.1. It is the responsibility of the owner, installer and operator to follow all requirements contained in these instructions and to comply with all federal, state and local safety regulations that may apply to wet well installations and operations.

1.2. No instructions or procedures presented in this document should be interpreted so as to put at risk any person's health or safety, or to harm any property or the environment.

⚠ WARNING

Follow OSHA regulations for excavations. Collapse of excavation walls could result in death or serious injury.

1.3. Working in and around excavations is dangerous. The Occupational Safety and Health Administration (OSHA) has specific requirements that must be followed. Prior to beginning work at the site, the installer should obtain a copy of OSHA's Standard, Part 1926 (Construction), Subpart P -Excavations. A copy of this standard is available free of charge at OSHA's Web site (www.osha.gov).

1.4. Careless activity or reckless operation of equipment can cause death, serious injury or property damage.

1.5. It is important to follow the procedures and instructions in this document in order to safely and properly install a Xerxes wet well. Failure to follow these instructions will void Xerxes' obligations under the limited warranty and may cause product failure, serious personal injury or property damage.

1.6. The Xerxes limited warranty applies only to a wet well installed according to these instructions. Since Xerxes does not control the parameters of any installation, Xerxes' sole responsibility in any installation is that presented in the limited warranty.

1.7. Comply with all applicable federal, state and local construction, health, safety and environmental codes, and industry standard practices.

1.8. For additional information, contact your state, county and city authorities having jurisdiction, including health, fire or building departments, and environmental agencies. All work must be performed according to standard industry practices and OSHA regulations.

1.9. Federal, state and local codes and regulations always take precedence over a Xerxes requirement.

1.10. Xerxes must authorize – in writing and prior to wet well installation – any variation to, or deviation from, these instructions.

1.11. All correspondence regarding variations must be retained for any warranty claim to be valid.

1.12. If you have questions or encounter situations not covered in these instructions, contact technical support at Xerxes Minneapolis, 952-887-1890.

2. PREPARATION FOR INSTALLATION

2.1. Although Xerxes wet wells are rugged, the wet well owner and/or the wet well owner's representative must take care so that the wet well is not dropped or damaged during delivery, unloading and handling on the jobsite.

2.1.1. Before unloading the wet well from the truck, the wet well owner and/or the wet well owner's representative must make sure that all tools or other items that may damage the wet well during unloading are removed from the trailer bed.

2.1.2. When unloading the wet well from the truck, the wet well owner and/or the wet well owner's representative must make sure that the wet well is secured in such a way that it does not roll off the truck.

⚠ WARNING

Do not allow driver to release straps securing the wet well to the truck until lifting equipment (such as a crane) is secured to the wet well's lifting lug(s). Failure to do so could result in death or serious injury.

⚠ WARNING

Always chock the wet well. The wet well is heavy and has a large surface area. The wet well will roll on sloped surfaces and could be blown about by the wind. Movement of the wet well could result in death or serious injury.

2.2. Before the wet well is unloaded or relocated on the jobsite, the wet well owner and/or the wet well owner's representative must complete the following steps:

2.2.1. Visually inspect the entire exterior surface of the wet well to make sure that no shipping or handling damage has occurred.

Look particularly for holes, cracks or deep scrapes.

2.2.1.1. If damage is detected, do not attempt repairs. Contact the UST coordinator at the Xerxes plant nearest you. Telephone and fax numbers are found in Section 10 of these instructions.

2.2.2. Sign the shipping papers accepting the wet well as delivered.

2.2.3. Be sure that all equipment used to lift the wet well is rated to handle the load.

2.2.4. Select a solid, level area to place the wet well, and clear that area of all rocks, trash and debris.

2.3. When hoisting the wet well, follow these instructions: (*See FIGURE 2-1 and FIGURE 2-2.)*

2.3.1. When the wet well is not rotated (the wet well is upright), use all lifting lug(s) to unload and install the wet well. *(See FIGURE 2-2.)*

2.3.2. Some wet wells are rotated on the truck for shipping purposes. These wet wells have extra lifting lug(s) to aid in the loading/unloading process. *(See FIGURE 2-2.*

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2.3.2.1. To unload these wet wells, use the lifting lugs that are situated on top of the wet well in its rotated position. To install the wet well, carefully rotate the wet well to its upright position and then use all lifting lugs situated on top of the wet well in its upright position. (*See FIGURE 2-2.)*

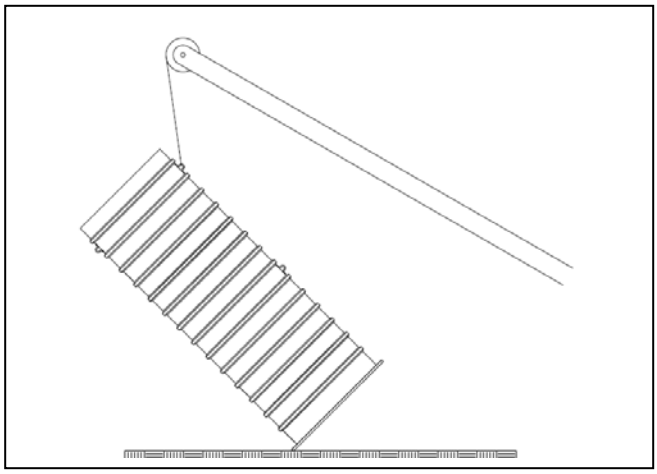


FIGURE 2-1

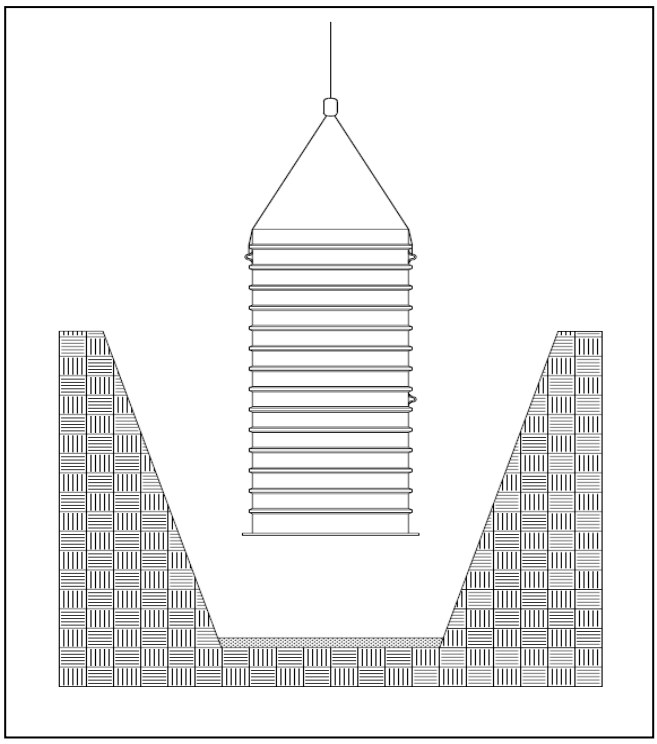


FIGURE 2-2

2.3.3. Do not wrap chain or cable around the wet well.

2.3.4. Use guy ropes to guide the wet well when needed.

2.3.5. Do not roll the wet well to move it.

2.4. Whenever a wet well is temporarily placed aboveground at the site, chock it in place to prevent rolling. Tie the wet well down if high winds are expected.

2.5. Whenever a wet well is temporarily placed above the ground in a situation in which there could be freezing temperatures, always take extra care so that water does not accumulate in a way that could result in damage to the wet well.

2.6. Excavate a hole large enough to accommodate basin, underground piping, backfill material, and adequate working space.

3. INSTALLATION

3.1. Xerxes wet well must be installed using either pea gravel or crushed stone as the backfill material. *(See FIGURE 3-1.)* For additional information, refer to the Xerxes document, Backfill Guidelines.

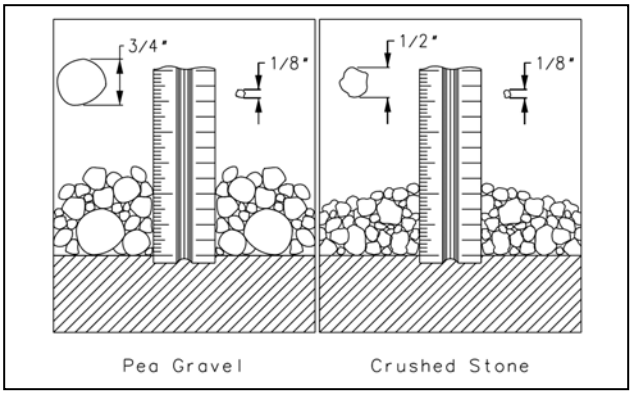


FIGURE 3-1

3.1.1. When using pea gravel, the material is to be a mix of rounded particles, sizes between 1/8 inch and 3/4 inch. The pea gravel must conform to the specifications of ASTM C-33, paragraph 9.1, sizes 6, 67 or 7.

3.1.2. When using crushed stone, the material is to be a mix of angular particles, sizes between 1/8 inch and 1/2 inch. The crushed stone must conform to the specifications of ASTM C-33, paragraph 9.1, sizes 7 or 8.

3.1.3. If material which meets these specifications is not available, contact technical support at Xerxes Minneapolis for information on alternate materials and the process for approval.

3.2. DRY-HOLE INSTALLATION

3.2.1. Prepare a smooth, level bed, 6 inches thick, of approved backfill material, or a concrete pad designed by a project engineer.

3.2.2. Place the wet well onto the bed or concrete pad.

3.3. WET-HOLE INSTALLATION

3.3.1. Before performing Point 3.2.1. of the dry-hole installation, pump the water from the hole and continue pumping to maintain minimum water level during wet well installation.

3.3.2. During Point 3.2.2. of the dry-hole installation, when setting the wet well, partially ballast the wet well until it settles firmly on the prepared bed. The ballast level in the wet well must never exceed the water level in the hole by more than 1 foot until the backfill reaches the top of the wet well.

3.4. DRY-HOLE AND WET-HOLE INSTALLATIONS

3.4.1. From the edge of the hole, bring the backfill up in the excavation. Approved backfill material must be used at least 12 inches around the entire periphery of the wet well.

3.4.2. Xerxes recommends the use of a geotextile fabric to help separate the select backfill from the in-situ soil.

4. PIPING AND CONNECTIONS

4.1. All piping must conform to all applicable codes and standards.

CAUTION

All connections to the wet well must be flexible. Provisions must be made to accommodate movement and misalignment between the piping and the wet well. Failure to do this may damage the wet well or surrounding property.

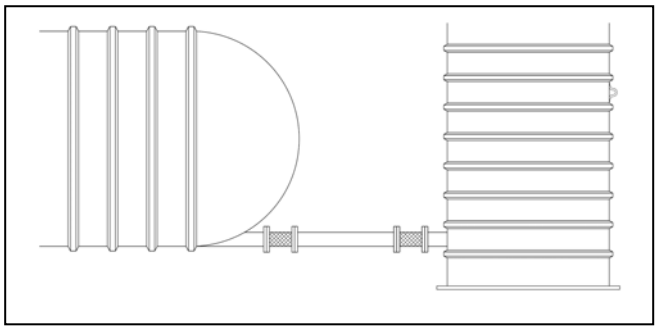


FIGURE 4-1

5. OPTIONAL HYDROSTATIC TEST

5.1. Seal off influent and effluent piping with watertight caps or plugs.

5.2. Fill the wet well with water up to 3 inches into the access openings after the hole is backfilled at least 3/4 of the way up the wet well.

5.3. Let the water stand in the wet well for a minimum of 1 hour (or longer if required by applicable local codes).

5.4. If the water level drops, check to see that plugs or caps sealing off piping are tight and then add more water to fill air voids back to the standard testing level. (*See Point 5.2.)*

5.3. If water level does not stabilize, there may be a leak in the system. If damage is detected, do not attempt repairs. Contact the UST coordinator at the Xerxes plant nearest you. Telephone and fax numbers are found in Section 10 of this document.

6. OPERATING GUIDELINES

6.1. Owner must retain the Wet Well Installation Instructions and Operating Guidelines for future reference to operating guidelines.

6.2. In addition to the Wet Well Installation Instructions and Operating Guidelines, follow all federal, state and local laws, regulations, codes and safety precautions that pertain to underground storage wet wells and/or their associated systems.

6.3. Consult the applicable limited warranty for each wet well for further operating guidelines and limitations. A copy of the limited warranty is available upon request from the UST coordinator at the Xerxes plant nearest you. *(See SECTION 7.)*

6.3. A Xerxes wet well is designed to store materials identified in the manufacturer's applicable limited warranty.

CAUTION

Storing materials other than those identified in the manufacturer's applicable limited warranty will void Xerxes' obligation under the warranty and may cause wet well failure or property damage.

6.4. Maximum temperature for storing wastewater products is 150° F.

CAUTION

Storing a material in a wet well in excess of the allowable temperature may damage the wet well. Failure to follow this caution may damage the wet well and surrounding property.

6.5. Do not allow anyone to enter the wet well unless it has been properly emptied and vented, and unless the person entering the wet well has been trained in confined-space entry procedures and applicable OSHA regulations.

⚠ WARNING

Improper wet well entry could cause fire, explosion or asphyxiation and could result in death or serious injury.

7. LIMITED WARRANTIES

7.1. A copy of the relevant Xerxes limited warranty is found in the printed material that accompanies each wet well, in each applicable product brochure and on the Xerxes Web site (www.xerxescorp.com). It is also available upon request from the UST coordinator at the plant nearest you.

8. SUPPLEMENTAL MATERIALS

8.1.Supplemental materials, which may apply to specific installations and/or conditions, are available upon request from the UST coordinator at the Xerxes plant nearest you or from technical support at Xerxes Minneapolis (and on the Xerxes Web site at www.xerxescorp.com).

9. RETAINING INSTALLATION AND OPERATING GUIDELINES

9.1. After installation, wet well owner must retain the Wet Well Installation Instructions and Operating Guidelines for future reference to operating guidelines.

10. CONTACTING XERXES

10.1. CORPORATE OFFICE (TECHNICAL SUPPORT):

7901 Xerxes Avenue South
Minneapolis, MN 55431-1288
Phone: (952) 887-1890
Fax: (952) 887-1870
www.xerxescorp.com

10.2. MANUFACTURING FACILITIES:

Anaheim, California
Phone: (714) 630-0012
Fax: (714) 632-7133

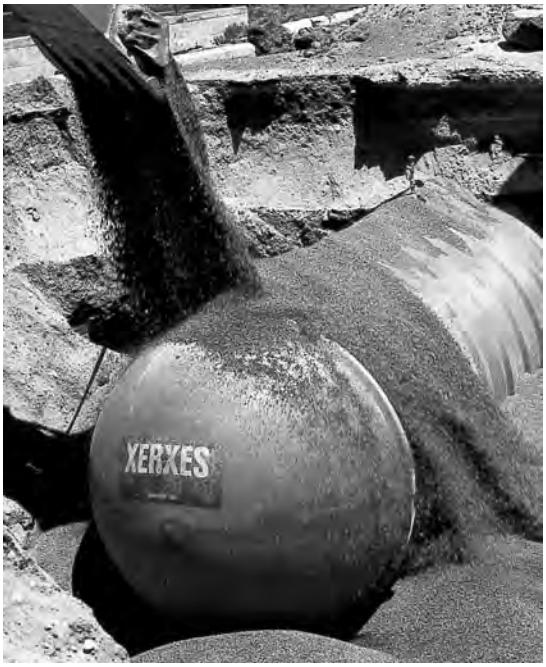
Hagerstown, Maryland
Phone: (301) 223-6933
Fax: (301) 223-6836

Seguin, Texas
Phone: (830) 372-0090
Fax: (830) 372-0321

Tipton, Iowa
Phone: (563) 886-6172
Fax: (Fax: (563) 886-2042

Backfill Guidelines

The backfill material surrounding an underground storage tank (UST) is a critical part of a proper tank installation. This document gives guidelines for choosing the best material to use when installing Xerxes fiberglass tanks. The Xerxes Installation Manual and Operating Guidelines (Installation Manual) specifies that rounded gravel or crushed stone be used as backfill material.



Materials that meet Xerxes' specifications for backfill material

Coarse aggregate is a technical term for the material (rounded gravel and crushed stone) that meets Xerxes' backfill size requirements. The American Society for Testing and Materials (ASTM) and The American Association of State Highway Transportation Officials (AASHTO) have specifications for standard sizes of coarse aggregate. The tables in this document give the standard sizes of coarse aggregate that meet Xerxes' backfill material specifications. The following descriptions of rounded gravel and crushed stone are taken from the Xerxes Installation Manual.

Rounded Gravel

When using rounded gravel, the material is to be a mix of rounded particles, sizes between 1/8 inch and 3/4 inch. The rounded gravel must conform to the specifications of ASTM C-33, paragraph 9.1, sizes 6, 67 or 7. No more than 5% (by weight) of the backfill may pass through a #8 sieve. The material is to be washed, free-flowing, and free of ice, snow and debris. See Table 1 on other side of this document for more information.

Crushed Stone

When using crushed stone, the material is to be a mix of angular particles, sizes between 1/8 inch and 1/2 inch. The crushed stone must conform to the specifications of ASTM C-33, paragraph 9.1, sizes 7 or 8. No more than 5% (by weight) of the backfill may pass through a #8 sieve. The material is to be washed, free-flowing, and free of ice, snow and debris. See Table 2 on other side of this document for more information.

Some material suppliers may produce materials that meet Xerxes' requirements but are not identified by a standard coarse aggregate size number. The supplier should be able to provide a specification that identifies the size or gradation of the material. If a specification for the material is not available, an independent testing laboratory can provide a sieve analysis performed on a sample of the backfill material according to ASTM C-136 specifications. The sieve analysis or material specification can then be compared against Xerxes' size requirements for the rounded gravel or crushed stone.

Another important characteristic of good backfill material is hardness or stability when exposed to water or loads. Most materials have no problems meeting the hardness requirement. Materials like soft limestone, sandstone, sea shells or shale should not be used as backfill because they break down over time.

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These tables identify standard sizes of coarse aggregate that meet Xerxes' specifications for rounded gravel (Table 1) and crushed stone (Table 2). Each table identifies standard sieve sizes used to grade aggregate material. For each aggregate size, the amount of material finer than each laboratory sieve (square openings) is given as a percentage of the total weight of the sample.

These percentages give an indication of the particle size distribution or gradation within a given aggregate size. With aggregate size number 6 of rounded gravel, for example, 20-55% of the sample (measured by weight) should pass through a 1/2-inch sieve. And, with aggregate size number 7 of crushed stone, 0-15% of the sample (measured by weight) should pass through a No. 4 sieve.

Table 1 Standard Sizes of Coarse Aggregate[1] Meeting Xerxes' Rounded Gravel Specifications

Grade Number	Amount of material passing through each laboratory sieve given as percentage of total weight.					
6	100%	90-100%	20-55%	0-15%	0-5%	—
67	100%	90-100%	—	20-55%	0-10%	0-5%
7	—	100%	90-100%	40-70%	0-15%	0-5%
						
Sieve Size	1 inch 25.0 mm	3/4 inch 19.0 mm	1/2 inch 12.5 mm	3/8 inch 9.5 mm	0.187 inch 4.75 mm No. 4	0.094 inch 2.36 mm No. 8

Note: 1. Standard sizes of coarse aggregate per ASTM D-448, ASTM C-33 and AASHTO M 43.

Table 2 Standard Sizes of Coarse Aggregate[2] Meeting Xerxes' Crushed Stone Specifications

Grade Number	Amount of material passing through each laboratory sieve given as percentage of total weight.					
7	—	100%	90-100%	40-70%	0-15%	0-5%
8	—	—	100%	85-100%	10-30%	0-10%
						
Sieve Size	1 inch 25.0 mm	3/4 inch 19.0 mm	1/2 inch 12.5 mm	3/8 inch 9.5 mm	0.187 inch 4.75 mm No. 4	0.094 inch 2.36 mm No. 8

Note: 2. Standard sizes of coarse aggregate per ASTM D-448, ASTM C-33 and AASHTO M 43.

Specialty Switches – Continued

Portable Level Switch — Integral Mounting Magnet

Precisely monitors liquid level and is ideal for controlling filling operations and preventing overflows. Permanent magnet attaches unit securely to steel tank wall at exact level required.

LS-750 Series — Weighted for Suspension Cable

With a compact-sized float, slosh shield and weighted collar, the LS-750 provides liquid level detection for a wide variety of applications. Suspend in stand pipes or sumps for leak detection duty, or drop into wells for ground-water monitoring. Supplied with 25 feet of waperproof cable.

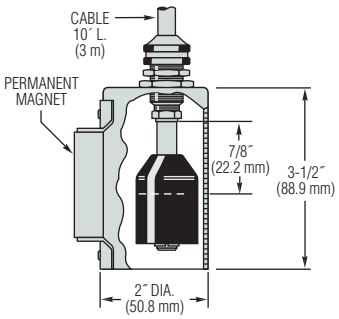
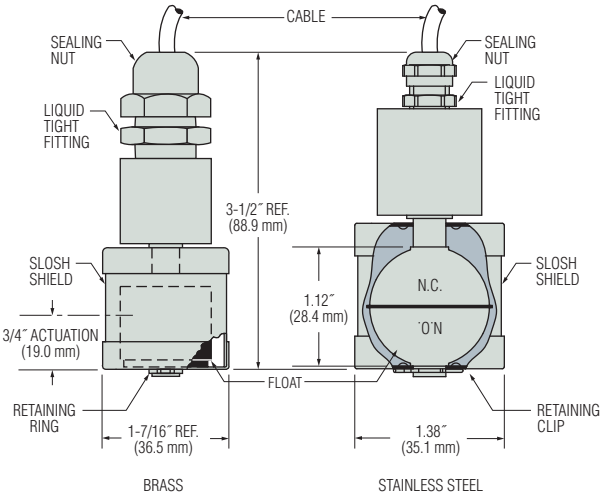
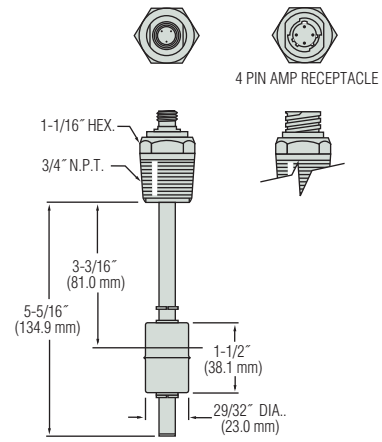
U.L. Recognized— File No. E-45168. CSA Listed-File No. LR-30200.

LS-700F Series

Overfill Protection for Refrigerant Tanks.The LS-700F enables safe compliance with EPA directives to recover refrigerants. These units are designed to fit standard 30# and 50# D.O.T. approved refrigerant tanks. They provide 80% full shutoff capability when used as an integral part of a recovery system.

U.L. Recognized— File No. SA8857. CSA Listed-File No. LR-30200-31.

Dimensions

Portable Level Switch	LS-750	LS-700F
		
SJO, 18/2 10´L., Neoprene	22 AWG, 2-Wire Cable	3- or 4-Pin, Quick-Connect Receptacle

†L_1 = Switch actuation level. In liquid with specific gravity of 1.0, switch actuation is approximately half the distance from end of stem to mounting, or at the halfway point of float travel.

How To Order — Select Part Number based on specifications required.

Series	Material			Min. Liquid Sp. Gr.	Operating Temperature	Pressure PSI, Max.	Switch*	Electrical Termination Option	Part Number
	Stem and Mounting	Float	Other Wetted						
Portable	Brass	Buna N	Aluminum, 316 S.S.	.85	Oil: -40°F to +230°F (-40°C to +110°C) Water: to 180°F (82°C)	10	SPST, 20 VA N.O., Dry	—	**15208** ⚡
LS-750	Brass	Buna N	Nylon, PVC, Beryllium Copper	.45		150	SPST, 20 VA N.O., Dry	PVC Cable Jacket	**149350** ⚡
	316 S.S.**	316 S.S.	PVDF, Viton®	.65	-40°F to 212°F (-40°C to +100°C)	375	SPST, 10 VA N.C., Dry	Teflon® Cable Jacket	**197433**
LS-700F	Brass	304 S.S.	—	.98	-40°F to +221°F (-40°C to +105°C)	400	SPST, 20 VA N.C., Dry	3-Pin	**128500** ⚡
								4-Pin	**144900** ⚡

*See "Electrical Data" on Page X-5 for more information.

⚡ – Stock Items.

** Stainless steel is generally recognized as safe (GRAS) with FDA for food contact regulations.

VELAN

CAST STEEL
Gate, Globe and Check Valves

API 600 & 603 • ASME Class 150–1500 • 2 – 60" (50 – 1500 mm)

VELAN COMPANY PROFILE

Velan is one of the world's leading manufacturers of industrial valves, supplying forged and cast steel gate, globe, check, ball, butterfly and knife gate valves for critical applications in the chemical, petrochemical, oil and gas, fossil and nuclear power, cogeneration, pulp and paper and cryogenic industries.

Founded in 1950, Velan earned a reputation for excellence as a major supplier of forged valves for nuclear power plants and the U.S. Navy. Velan Inc., pioneered many designs which became industry standards, including bellows seal valves, all stainless steel knife gate valves and forged valves up to 24".

Velan valves are manufactured in 12 specialized manufacturing plants, including five in Canada, two in Korea, and one each in the U.S., France, U.K., Portugal and Taiwan. We have a total of 1,126 employees in North America and 374 overseas.

CONTENTS

The **Velan Corporate Philosophy** is to bring to the market new and innovative valve designs with special emphasis on quality, safety, ease of operation, simple in-line maintenance and most of all, long service life. All this combined with the use of high quality materials, advanced manufacturing technology and automation in all stages of manufacturing ensures the highest possible quality at a competitive price. Velan is strongly committed to defending its market position and aggressively competing in all countries around the world.

MONTREAL, CANADA 115,000 sq. ft. (10,683 m²)
3–24" (80–600 mm) butterfly, ⅜–4" (10–100 mm) metal & resilient seated ball valves

MANUFACTURING LOCATIONS

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VELAN INC.
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Montreal, QC H4T 1G2
Tel: (514) 748-7743
Fax: (514) 748-8635

PLANT 1
2125 Ward Avenue
Montreal, QC H4M 1T6
Tel: (514) 748-7743
Fax: (514) 748-8635

PLANT 2/7
550 McArthur Ave.
Montreal, QC H4T 1X8
Tel: (514) 748-7743
Fax: (514) 341-3032

PLANT 4/6
1010 Cowie Street
Granby, QC J2J 1E7
Tel: (450) 378-2305
Fax: (450) 378-6865

PROQUIP
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Oakville, ON L6L 5B8
Tel: (905) 842-1721
Fax: (905) 849-0923

U.S.A.

VELAN VALVE CORPORATION
PLANT 3
94 Avenue C
Williston, VT
05495-9732
Tel: (802) 863-2562
Fax: (802) 862-4014

ENGLAND

VELAN VALVES LTD.
Cambridge Rd.,
Whetstone
Leicester LE8 6LH
Tel: 44-116-275-0206
Fax: 44-116-275-0224

FRANCE

VELAN S.A.S
90, rue Challemel Lacour
F 69 367 Lyon Cedex 7
Tel: (33) 4 78 61 67 00
Fax: (33) 4 78 72 12 18

PORTUGAL

VELAN VÁLVULAS INDUSTRIAIS, LDA.
Av. Ary dos Santos
1679-018 Famoes
Tel: (351-21) 934-7800
Fax: (351-21) 934-7809

TAIWAN

VELAN-VALVAC
P.O. Box 2020
Taichung, Taiwan, R.O.C.
Tel: (04) 2792649
Fax: (886) 42750855

KOREA

VELAN LTD.
1060-4 Shingil-Dong
Ansan City,
Kyunggi-do
425-833
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Fax: (82) 31-491-2813

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605 Commerce Park Drive SE
Marietta, GA 30060
Tel: (770) 420-2010
Fax: (707) 420-7063

GERMANY

VELAN GmbH
Daimlerstrasse 8
D-47877 Willich
Tel: (49) 2154/4938-00
Fax: (49) 2154/4938-99

Velan has sales offices and distributors located worldwide.

GENERAL INFORMATION

Tel: (514) 748-7743 Fax: (514) 748-8635

Visit the Velan website at **www.velan.com** for an updated contact list.

NOTE: *The material in this catalog is for general information. For specific performance data and proper material selection, consult your Velan representative. Although every attempt has been made to ensure that the information contained in this catalog is correct, Velan reserves the right to change designs, materials or specifications without notice.*

MANUFACTURING PLANTS AROUND THE WORLD

MONTREAL, CANADA 109,000 sq. ft. (10,126 m²) ¼–4" (8–100 mm) forged gate, globe & check valves, ASME 'N' stamp, ISO 9001

MONTREAL, CANADA 170,000 sq. ft. (15,800 m²)
2–60" (50–1500 mm) forged and cast steel gate, globe, check, ball, knife and butterfly valves 3–36" (80–700 mm) ASME 'N' stamp, ISO 9001

GRANBY, CANADA 186,500 sq. ft. (17,325 m²)
2–12" (50–300 mm) cast steel gate and check valves,
¼–12" (8–300 mm) ball valves, ISO 9001

TORONTO, CANADA *Velan-Proquip* 41,000 sq. ft. (3,800 m²)
2–48" (50–1200 mm) wafer check valves
½–24" (15–600 mm) clamp joint connectors, ISO 9001

WILLICH, GERMANY 12,000 sq. ft. (1,115 m²) ISO 9002

LEICESTER, ENGLAND 14,000 sq. ft. (1,300 m²), ISO 9002

WILLISTON, VERMONT, U.S.A. 155,000 sq. ft. (14,400 m²)
2–24" (50–600 mm) forged and cast steel gate, globe and check valves, ASME 'N' stamp, ISO 9001

LYON, FRANCE 160,000 sq. ft. (14,900 m²) ¼–40" (8–1,000 mm) forged and cast steel gate, globe and butterfly valves, ISO 9001

LISBON, PORTUGAL 60,000 sq. ft. (5,600 m²) ISO 9002
2–12" (50–300 mm) cast steel gate, globe and check valves

ANSAN CITY, SOUTH KOREA *Plant 1* 30,000 sq. ft. (2,800 m²)
components and 2-4" (50–100 mm) cast steel valves, ISO 9002

ANSAN CITY, SOUTH KOREA *Plant 2* 65,000 sq. ft. (5,800 m²)
2–12" (50–300 mm) cast steel gate, globe, check, ball and knife gate valves

TAICHUNG, TAIWAN *Velan-Valvac* 20,000 sq. ft. (1,840 m²)
¼–2" (8–50 mm) ball valves, ISO 9002

VELAN API 600 & 603 CAST STEEL VALVES

FOR THE OIL, GAS, PETROCHEMICAL, CHEMICAL AND PULP & PAPER INDUSTRIES

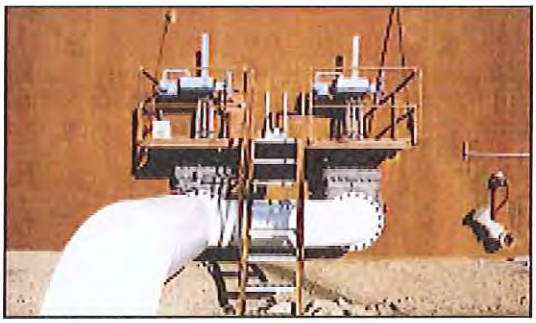
LOW FUGITIVE EMISSIONS

Velan's comprehensive line of cast steel gate globe and check valves features leading edge design, engineering and manufacturing technology. Our valves meet the most stringent national and international standards for fugitive emissions.

Our gate globe and check valves are widely used in many industries including:

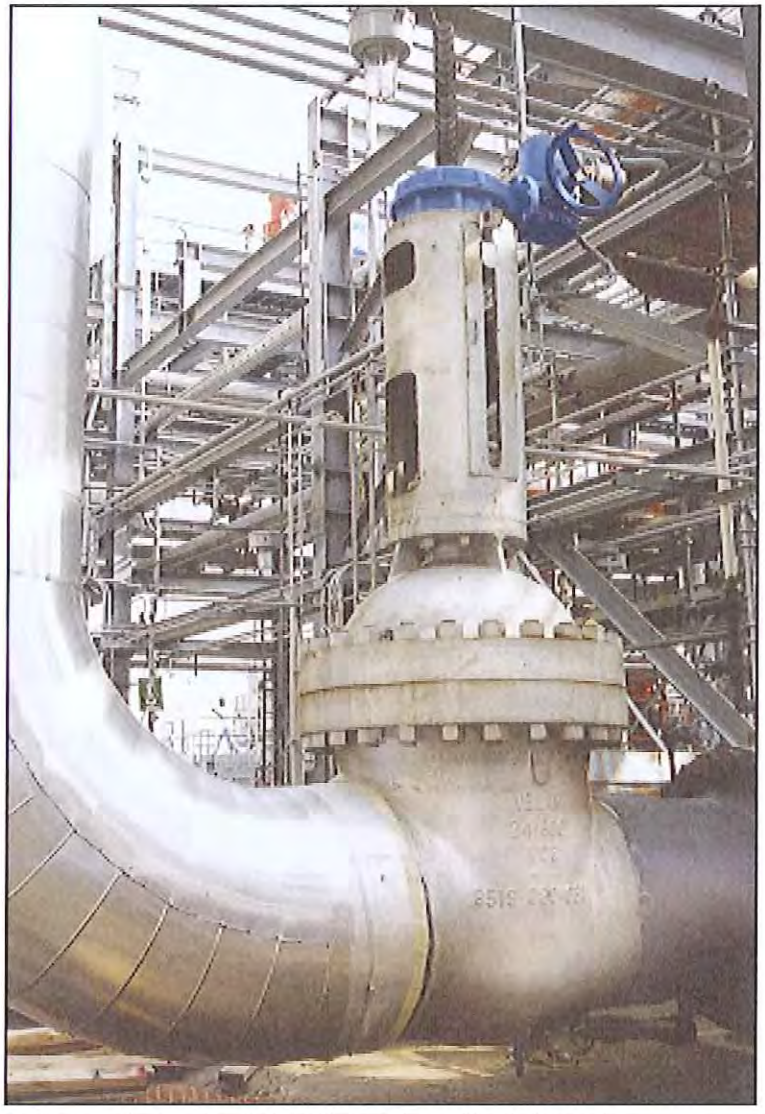
- **Process Industries** – Oil, Chemical, Petrochemical, Refining, Pulp & Paper, Pharmaceutical and Food Processing.
- **Power Industries** – Nuclear, Fossil Fuel, Combined Cycle, Cogeneration and District Heating.

In addition, our valves are used for Shipbuilding, LNG Tanker Carriers, Offshore Platforms, Water Treatment, Mining and more.

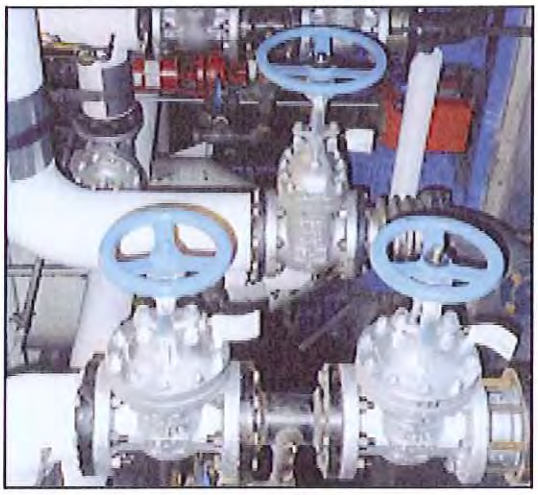


Cast steel valve installation at an oil refinery.

A geothermal power plant valve installation for sour gas service.



Carbon steel gate valve (ASME Class 600), used for boiler feed water installation at a Hydrogen Plant in Texas.



API 600 gate valves in service for a boiler feed installation.

CAST STEEL VALVES MANUFACTURING PROGRAM

API 600 CAST STEEL GATE, GLOBE & CHECK VALVES

VALVE TYPE & CLASS		SIZE (in, mm)																					
		2 50	2½ 65	3 80	4 100	6 150	8 200	10 250	12 300	14 350	16 400	18 450	20 500	24 600	28 700	30 750	32 800	36 900	40 1000	42 1100	48 1200	54 1350	60 1500
GATE	150	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	300	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
	600	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
	900	✓	✓	✓	✓	✓	✓	✓															
	1500	✓	✓	✓	✓	✓	✓	✓															
GLOBE	150	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓											
	300	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓											
	600	✓	✓	✓	✓	✓	✓	✓															
	900	✓		✓	✓																		
	1500	✓		✓	✓																		
CHECK	150	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓					
	300	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓								
	600	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									
	900	✓	✓	✓	✓	✓	✓																
	1500	✓	✓	✓	✓	✓	✓																

API 603 CAST STAINLESS STEEL GATE, GLOBE & CHECK VALVES

VALVE TYPE & CLASS		SIZE (in, mm)																
		½ 15[1]	¾ 20[1]	1 25[1]	1½ 40[1]	2 50	2½ 65	3 80	4 100	6 150	8 200	10 250	12 300	14 350	16 400	18 450	20 500	24 600
GATE	150	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	300	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
GLOBE	150	✓	✓	✓	✓	✓	✓	✓	✓	✓								
	300	✓	✓	✓	✓	✓	✓	✓	✓	✓								
CHECK	150	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
	300	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					

(1) Refer to API 603 catalog.

API 600 BONNET GASKET MATERIALS

VALVE TYPE	MATERIAL
GATE	Class 150: corrugated steel/graphite (except 2–2½" (50–65 mm) spiral wound)
	Class 300–1500: spiral wound stainless steel and graphite
GLOBE	Spiral wound stainless steel and graphite
CHECK	Spiral wound stainless steel and graphite

API 603 BONNET GASKET MATERIALS

VALVE TYPE	MATERIAL	
	Trim SX or SY	Trim GX, GY or GS
GATE, GLOBE and CHECK	PTFE with stainless wire mesh	graphite with stainless steel foil

OPTIONAL BODY MATERIALS

ASTM SPEC. GRADE	NOMINAL DESIGNATION	MIN. TEMP °F	MIN. TEMP °C	MAX. TEMP. °F	MAX. TEMP. °C	VELAN CODE
A216-WCB	Carbon steel	-20	-29	800	427	02
A217-WC6	1¼ CR–½ Mo	-20	-29	1100*	593	05
A217-WC9	2¼ CR–1 Mo	-20	-29	1100*	593	06
A217-C5	5 CR–½ Mo	-20	-29	1200*	649	04
A217-C12	9 CR–1 Mo	-20	-29	1200*	649	09
A352-LCB	Carbon steel	-50	-46	650	343	25
A352-LCC	Carbon steel	-50	-46	700	371	31
A352-LC2	2½ Ni	-100	-73	650	343	26
A351-CF8M	18 CR-9 Ni-2 Mo	-425	-254	1500*	816*	13
A351-CF3M	18 CR-9 Ni-2 Mo	-425	-254	850	454	14

*Note: *Flanged end ratings terminate at 1000°F (538°C) for Class 150.*

VELAN

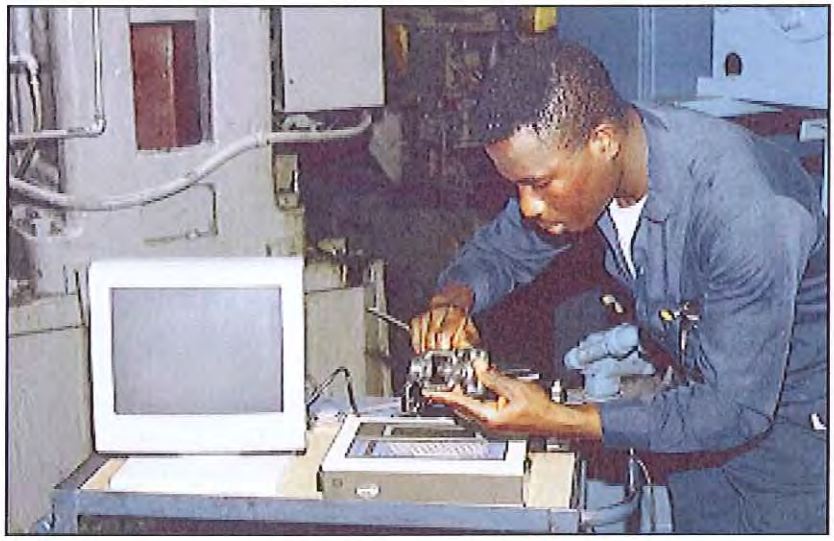
Mission Statement

Our aim is to offer products and services which not only meet, but clearly exceed, the expectations of our customers.

Through training, teamwork and performance, our employees strive to achieve continuous improvement of all processes.

Our goals are:
Total Quality and On-time Delivery.
Our method is Total Commitment.

A.K. Velan,
President and C.E.O.



ON-LINE NETWORKED SPC

Velan has installed on-line networked SPC computers operated by machinists themselves.

Each unit can handle four gageports and provide instant feedback on tool wear and lubrication to a control manager station.

6 SYSTEMS ENSURE THE FINAL QUALITY GOALS

1. DESIGN

All valves are designed to comply with the requirements of ASME B16.34, the ASME code and special customer requirements, as applicable.

2. QUALITY ASSURANCE

Every step from procurement through production, welding, assembly, testing and packaging is in accordance with written quality programs and procedures. (An ASME Section III manual for code valve production and an ISO 9001 QA manual for all other production.) Velan's six North American plants are certified to IS0 9001 and Plants 1 and 2 have ASME "N" type Certificates of Authorization, Plant 3 has a Certificate of Accreditation Furthermore, Velan has been fully approved to supply CE marked valves in accordance with the PED (European Pressure Equipment Directive). Orders are reviewed by Engineering and QA Departments and all special customer requirements are incorporated into QCI (Quality Control Instructions) issued for each project. The QA Department also maintains calibration and gauge control systems, and trains and qualifies skilled welders and NDT inspectors.

3. QUALITY CONTROL

The QC Department is responsible for all aspects of quality, from receiving of material to control of machining processes, welding, nondestructive examination, assembly, pressure testing, cleaning, painting and packaging. When required, a permanent record of all completed quality goals is prepared and sent to customers in the form of a "Valve Data Package".

4. PRESSURE TESTING

Each valve is pressure tested in accordance with ASME B16.34, the ASME Code, or special customer requirements as applicable. In all plants test status is integrated into production control/inventory management software.

TQM innovations at Plant 2 include "snag lists" of any problems encountered in daily engineering and manufacturing processes. The lists are compiled on a weekly basis and automatically become the first items on the agenda for TQM team meetings.

5. IMPROVEMENT TEAMS

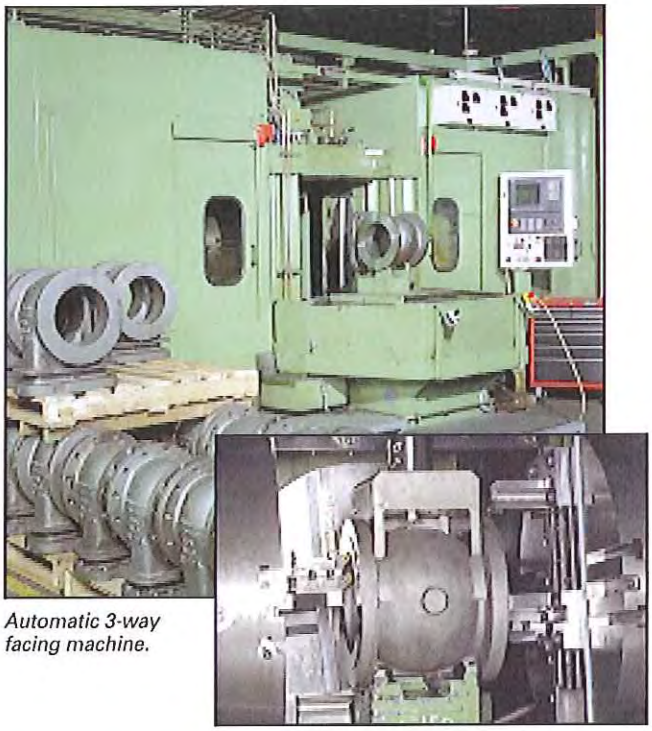
Continuous Improvement Teams at point of manufacturing ensure quality at source, process control, higher quality workmanship and operator ownership.

6. QUALIFICATION TESTING

A key to reliability is the performance of functional qualification tests. These tests are performed on all valves to determine reliability and service life. 1000 cold and 1000 thermal cycles with 1000°F superheated steam and five blowdowns with "0" leakage.

Operator on CNC horizontal boring mill monitors his own quality.

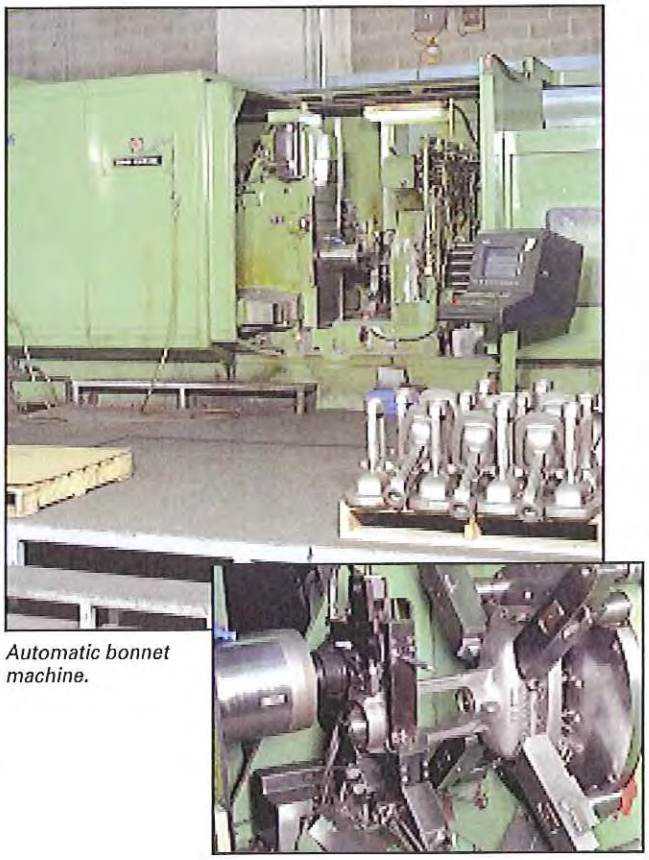
WORLD'S LARGEST MASS PRODUCTION
OF API 600 CAST STEEL VALVES



Automatic 3-way facing machine.

For smaller runs, complete automatic machining and drilling in one set-up.

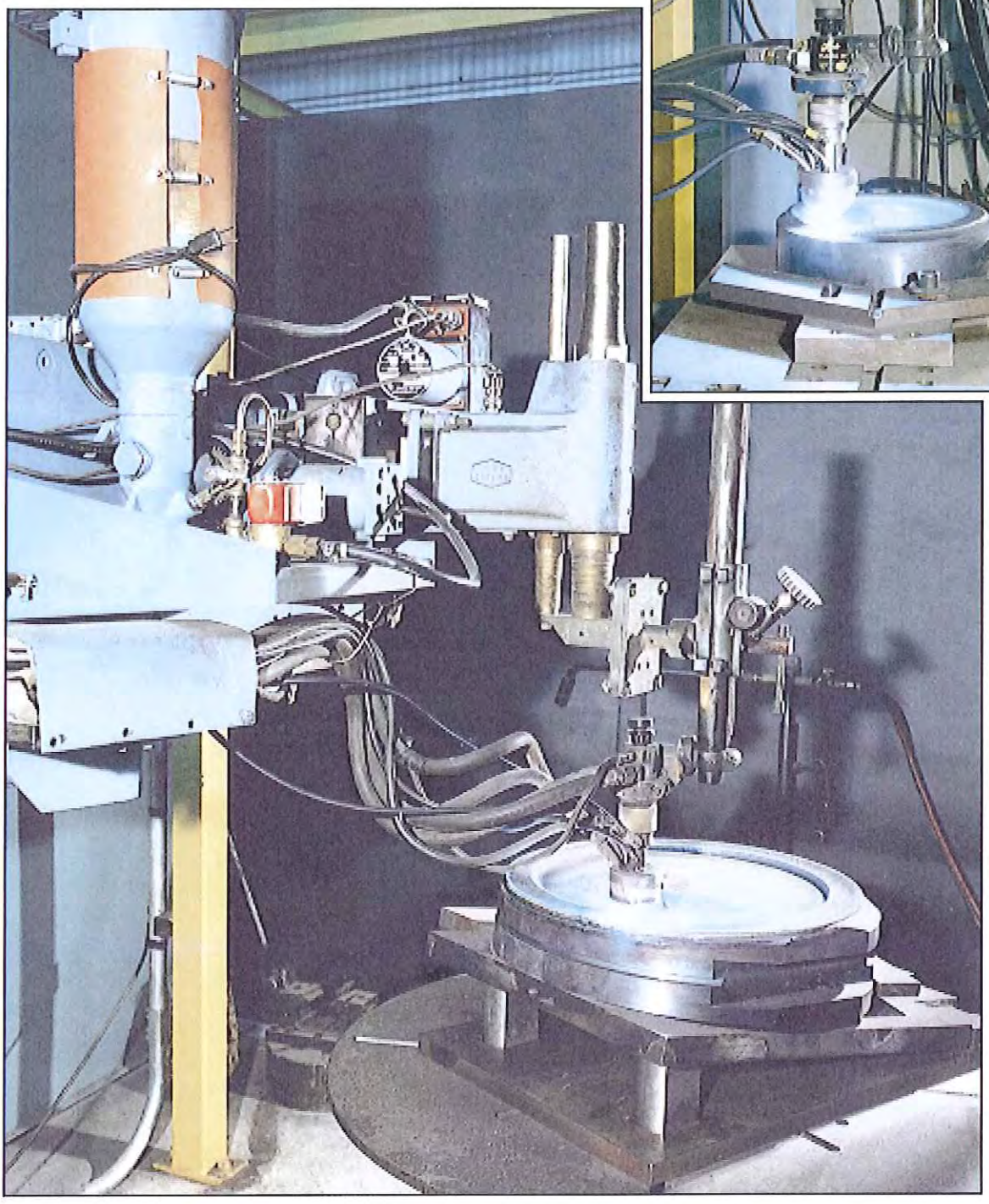
Automatic multiple drilling machine.



Automatic bonnet machine.

AUTOMATIC PLASMA ARC HARDFACING
FOR SEATS AND DISCS

High quality deposits of Stellite 6 and other hardfacing alloys are assured by the use of the following state of the art technology: controlled preheating, automatic Plasma Arc hardfacing equipment and a controlled cooling process. Shown below is the hardfacing of a gate valve wedge and to the right a cast steel seat.



RELIABILITY THROUGH TESTING

Top:
Semi-automatic stations for testing 2–12" (50–300 mm) valves to API 598.

Bottom Right:
Operational test for electric actuators.

Bottom Left:
TA-LUFT qualification test on a 4" Class 600 gate valve with live-loading. The test medium is helium at 1500 psi (100 bar).

All valves are tested during production for reliability with pressurized air and hydrotested for bubble-free tightness in accordance with API 598 specifications.

CONTINUOUS CASTING QUALITY IMPROVEMENT
AND COMPUTERIZED CASTING PROCESS SIMULATION

VELAN'S VEL-QCI-955 PROGRAM (API 600/ISO 10434)

The **Velan VEL-QCI-955 Program** was implemented to set the quality control standards for pressure boundary castings, and to ensure a consistent supply of quality castings to Velan.

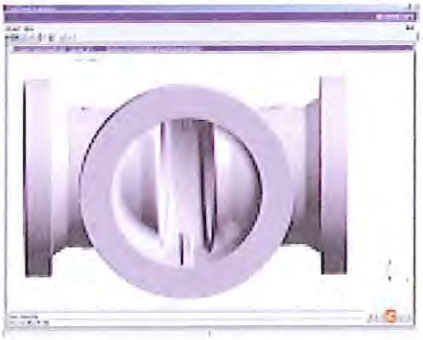
1. X-Ray Sample (pattern) Approval Process;
2. X-Ray Monitoring Program;
3. Casting Monitoring Program.

SAMPLE CASTINGS

Before castings are released for production, the Velan NDE Inspector Level III, evaluates and approves the submitted x-ray films (100% coverage) as per B16.34 acceptance standard.

X-RAY MONITORING:

Random x-ray monitoring requires that castings taken every six months from each vendor, randomly by size and quantity sets and x-rayed per B16.34 requirement.

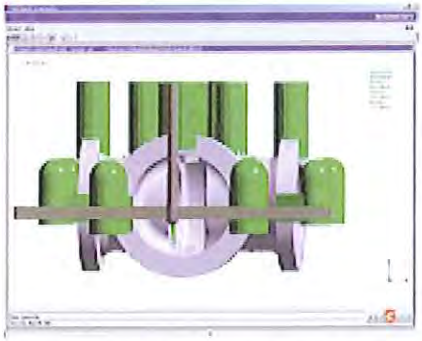


Pro-Engineering model imported into Magmasoft® casting simulation program.

If casting fails to meet the x-ray requirements of B16.34, Velan's Senior Metallurgist will issue a corrective action request to the vendor, including recommendations for detailed methoding change and re-x-ray.

CASTING MONITORING:

Rejected castings due to defects such as hydro-test leakage, porosity, inclusions, shrinkage indication discovered by x-ray or machining, are entered into the computer, as part of the statistical control of each vendor.

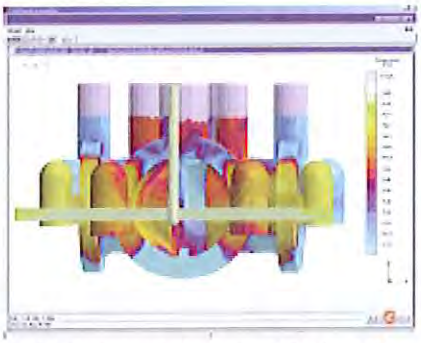


Risering and gating simulation on a 30" Class 600 gate body.

3-D SOLIDIFICATION SIMULATION:

Velan is one of the first valve manufacturers in the world to have the MAGMASOFT® computer casting simulation program at its design facilities.

Working together with foundry engineers and our designers, we continue improving the internal integrity of castings, to X-Ray Level II or better as a general standard.



90% filling simulation on a 30" Class 600 gate body.

One example of the successful cooperation of Engineering, our Metallurgist and the foundry, using the MAGMASOFT® simulation, is shown for 30" Class 600 Gate body on this page.

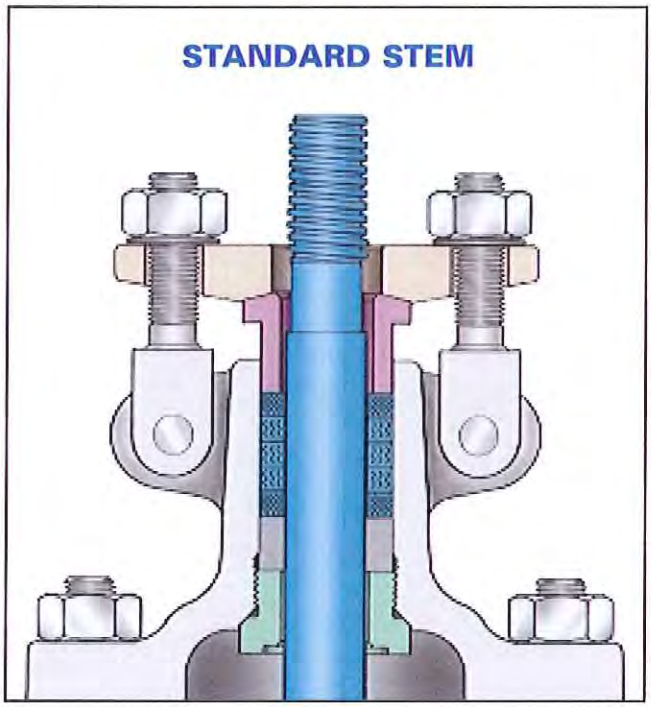
No shrinkage on a 30" Class 600 gate body simulation.

Benefits to Velan's customers and to the foundries:

- **Shorter delivery time,**
- **Higher quality of commercial castings,**
- **Optimum methoding system,**
- **Elimination of trial at sample approval,**
- **Improves the internal integrity of castings (RT level 2 or better) at pattern approval,**
- **Optimizes the metal flow and solidification pattern,**
- **Predicts internal defects,**
- **Reduces scrap,**
- **Optimizes the design of the castings,**
- **Solves problems such as shrinkage and porosity, without test castings,**
- **Reduces NDE (x-ray) upgrading.**

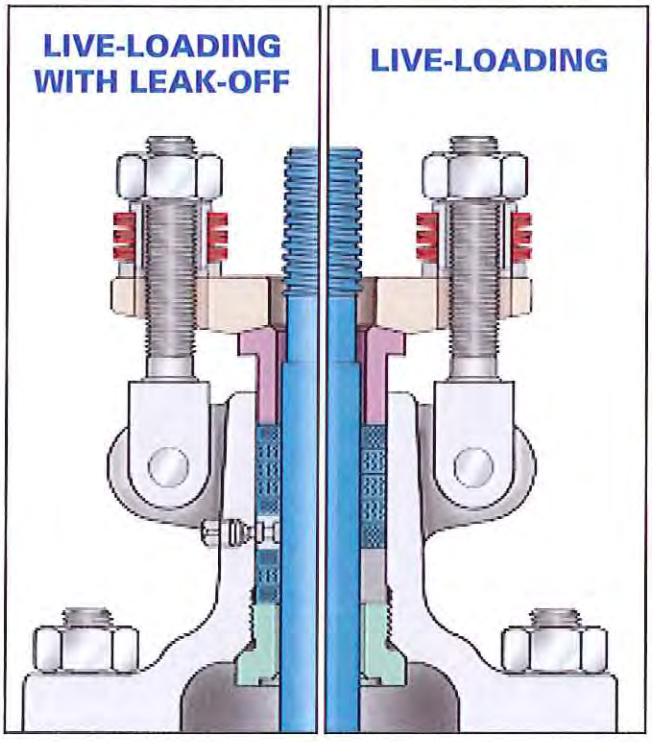
DESIGN OF STEM SEALS

Velan now offers standard cast steel bolted bonnet gate and globe valves qualification tested for compliance with EPA fugitive emissions regulations



The Velan stem seal evolved from these test findings:

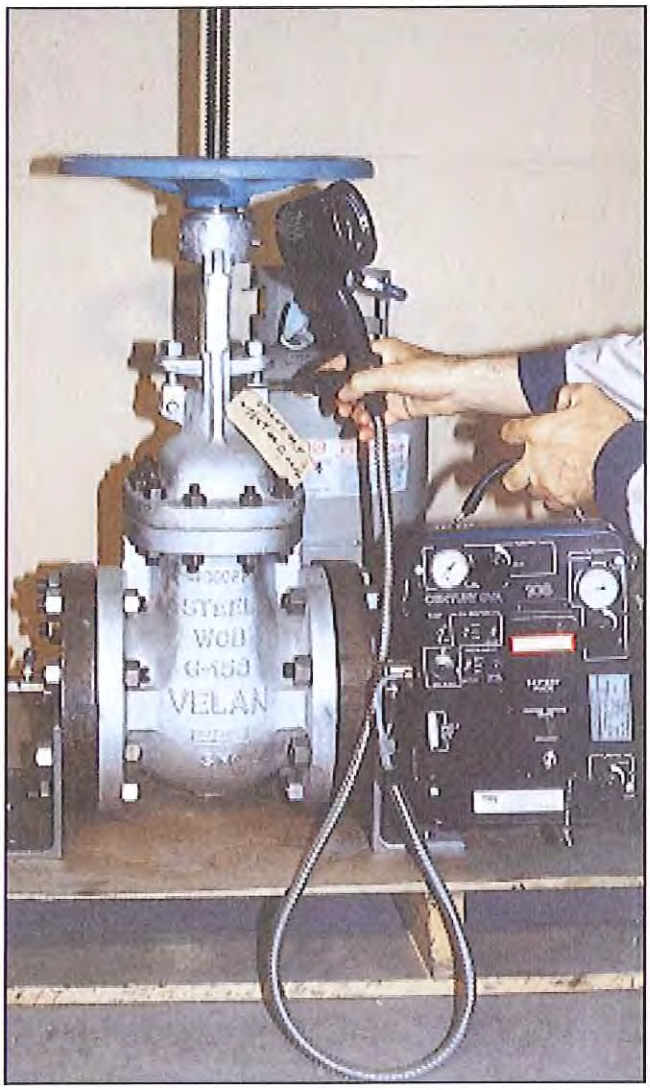
- **Ensures leakage of less than 100 ppm** as demonstrated through extensive laboratory testing.
- **Large loads.** Sealing is achieved when compression load is high and packing forms a mass of low porosity and permeability (4,000 psi for graphite).
- **Small clearances between vital parts.**
- **Precision stem and packing chambers.** Straightness, roundness and fine finish of stem and packing chamber wall are essential.
- **Short and narrow packing chambers improve sealing.** Maximum six rings in a single set chamber and wherever possible, only ¼" wide.
- **Stem and packing chamber walls.** Close roundness, straightness and superior surface finish of 6 RMS or better for the stem and 63 RMS for the packing chamber.



LIVE-LOADING OPTIONS

- **Live-loading.** Two sets of Belleville springs maintain a permanent packing stress of 3500–4000 psi. Live-loading extends low emission service life especially in service with large pressure/ temperature transients or frequent cycling.
- **Leak-off.** For critical service a lantern ring and double packing can be provided with a leak-off connection. The leak-off is provided to allow collection of leakage from the lower packing set.
- **Rings individually compressed in packing chamber** to 3500 –4000 psi for graphite and 2,000 psi PTFE to ensure equal stress distribution and effectiveness of all rings.
- Velan has extensive experience in valve live-loading. The original live-loading concept was developed by Velan in 1972 in a research project for AECL to eliminate leakage in Nuclear service. Velan has been supplying live loaded valves for Nuclear and non-Nuclear service for more than 30 years.

API 600 CAST STEEL VALVES
TYPICAL TEST REPORT



TEST CONDITIONS

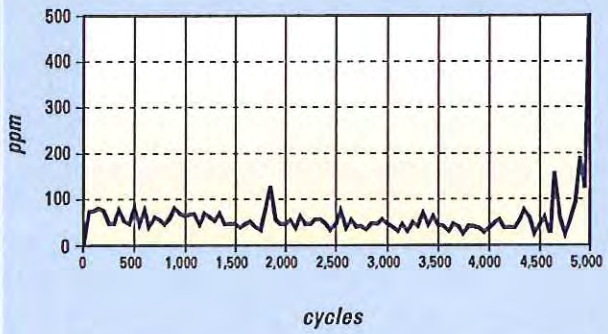
Test Medium:	Propane at 115 psi, ambient temperature
Instrument:	Organic vapor analyzer OVA-108, range 1–10,000 ppm
Valve Type:	Gate, Class 150, API 600
Sizes:	3", 6", 12" (80, 150, 300 mm)
Packing:	Graphite
Gasket:	Corrugated steel with graphite filler
Trim:	Wedge: 13 CR Seat: Stellite
Quantity:	3" (80 mm) – one valve 6" (150 mm) – four valves 12" (300 mm) – one valve

TEST COMPARISON TO API 598 TEST

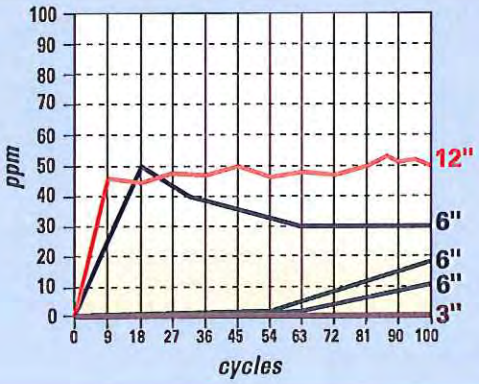
- API 598 test standard requires no visible external leakage (gasket, packing chamber and casting). The organic vapor analyzer measures leakage in parts per million (ppm). "Visible leakage" in API 598 is one drop of liquid per minute which we estimate is equivalent to about 2,400 ppm of gas. The API 598 test does not invoke cycling while we have cycled valves between 100 and 5000 cycles in our research testing.

- Critical factors in low emission service life include severity of pressure-temperature transients, number of cycles and cleanliness. During extensive cycling tests it was found that after leak paths developed, leakage could be reduced or eliminated by retightening gland bolts. For example a 150 ppm leak that developed after 350 cycles could be reduced to zero after retightening gland bolts.

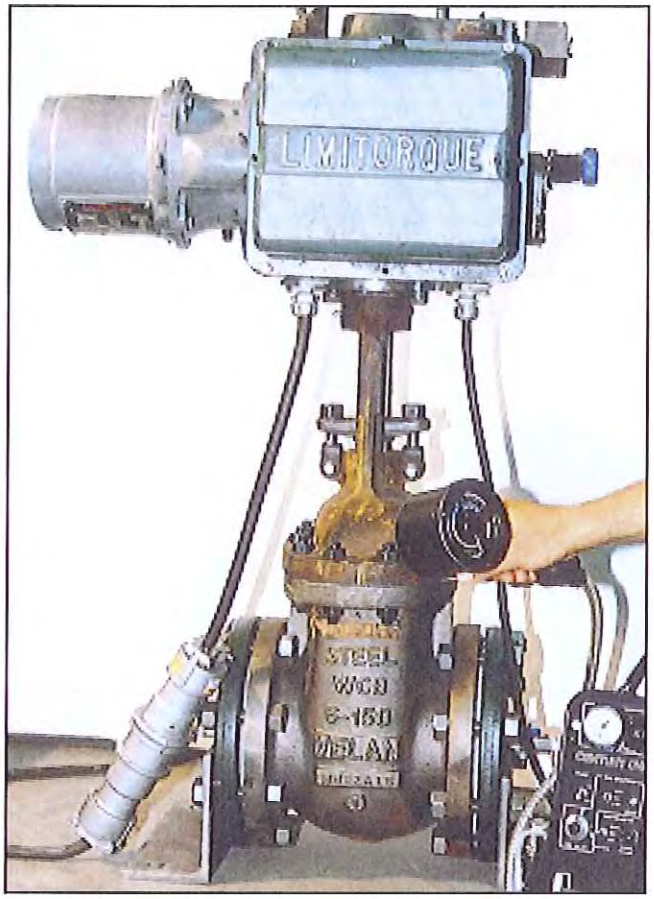
6" GATE VALVE 5,000 CYCLE TEST

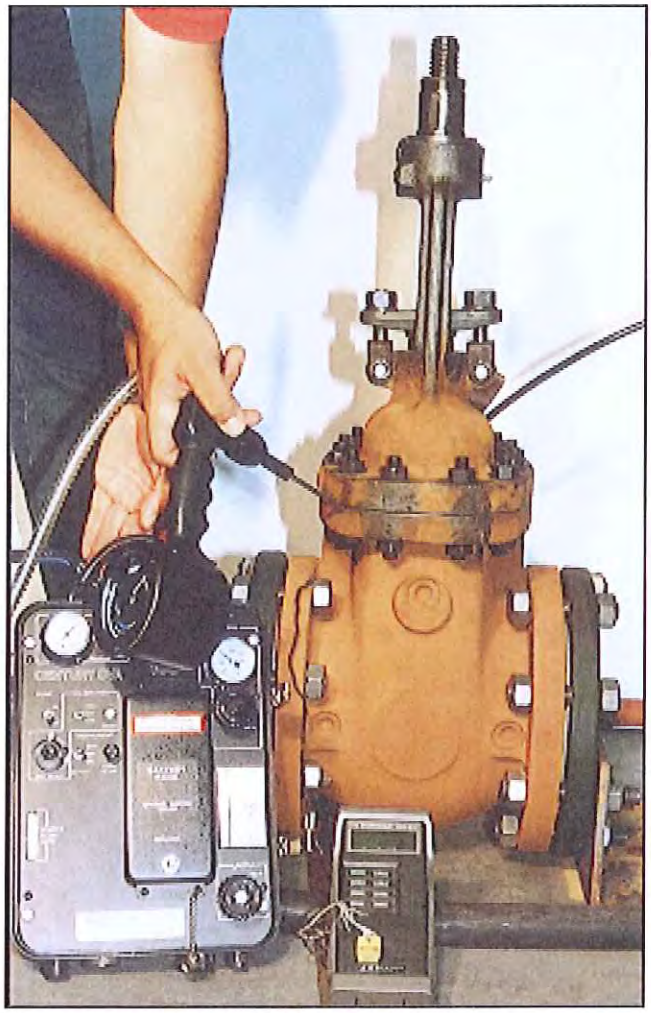


3", 6" & 12" GATE VALVES 100 CYCLE TEST

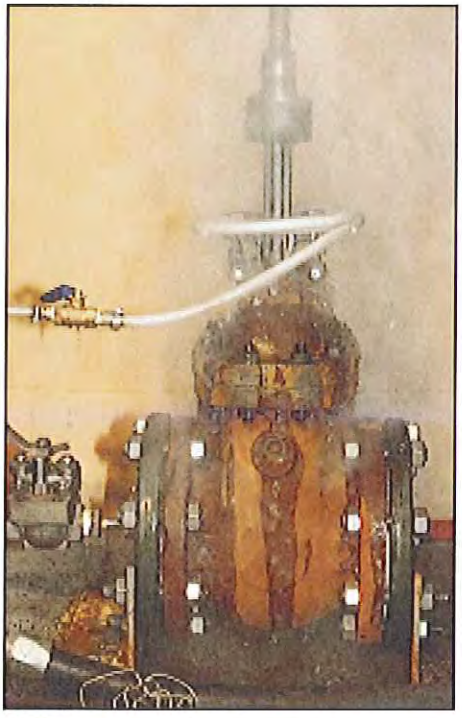


TESTING GASKET PERFORMANCE





Upper right: *50 cycles with steam at 400°F (204°C)*
Leakage: zero ppm.

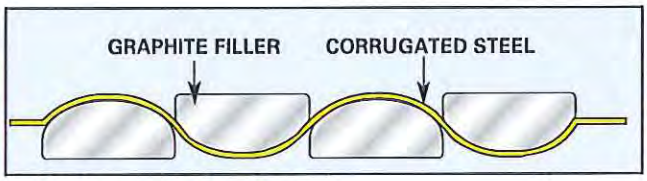


Upper left:
3000 cycles with propane at 125 psi
Leakage: zero ppm.

Left:
Thermal shock with water at 60°F (15°C)
Leakage: zero ppm.

Valve type:	**Class 150 gate valve**
Size:	**6" (150 mm)**
Gasket:	**Corrugated steel with graphite filler**
Instrument:	**OVA-108 vapor analyzer Range: 1–10,000 ppm**

BODY-BONNET GASKET DESIGN
GATE VALVES WITH OVAL FLANGES



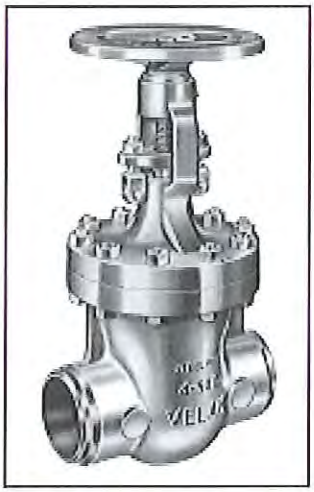
Standard corrugated steel gaskets without graphite as specified in API 600 were found to be an unacceptable choice for low emission service, even under ideal laboratory test conditions, and regardless of flange finish and gasket load. After testing several alternative gaskets, we selected the best performing gasket in our tests - a corrugated steel gasket with graphite filled channels.

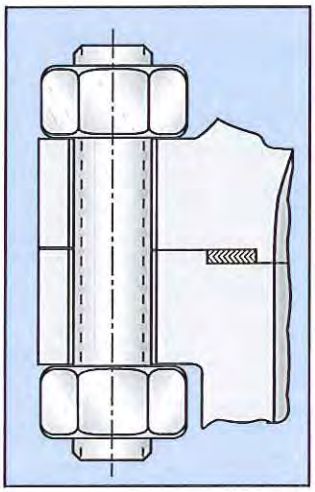
TYPICAL TEST RESULT:
3700 cycles with zero ppm for 6" Class 150.

DESIGN FEATURES:

- **Ensures leakage of no more than 20 ppm** as demonstrated through extensive laboratory testing.
- **Requires no retorquing** after long cycling.
- **Effective under wide fluctuations** of temperature and pressure.
- **Insensitive to flange finish.**
- **Steel walls of graphite channels** provide additional protection from oxidation, corrosion and blow-out.
- **Seal offers the advantage of flexible graphite** (0–14pH, -328°F to +2000°F).
- **Lower bolt torques.**
- **Modern torquing methods.**

API 600 CAST STEEL VALVES WITH ROUND BODY-BONNET FLANGES





FULLY–ENCASED SPIRAL WOUND 316 or 347 SS/GRAPHITE BODY-BONNET GASKET

Gate	Class 150: 2–2½" (50–65 mm) Class 300–1500: 2–36" (50–900 mm)
Globe	Class 150–600: 2–16" (50–400 mm)
Check	Class 150–1500: 2–36" (50–900 mm)

DESIGN FEATURES:

- **Full enclosure** to allow gasket to retain positive radial support during loading.
- **Ensures leakage of no more than 20 ppm** as demonstrated through extensive laboratory testing.
- **Accurate control of compression** through close tolerance of gasket groove and allowance for radial expansion.
- **No radial machine marks.**
- **Minimum of three inner wraps** to prevent buckling.
- **Minimum of three tack welds.**
- **Minimum of three filler wraps.**
- **Close tolerance** (± 0.005" or 0.13 mm) for gasket thickness.
- **Regular testing of gasket resiliency** and inspection at Receiving due to sensitivity to inconsistent quality.
- **Modern torquing methods.**

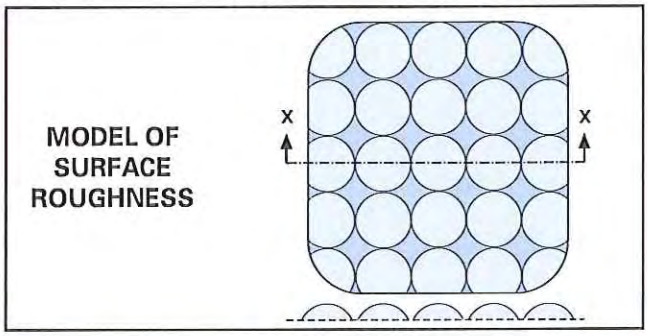
TYPICAL TEST RESULT:
3100 cycles with zero ppm for 10" Class 300.

TECHNOLOGY OF SEAT-DISC TIGHTNESS

The initial seat tightness of valves which can be proven by hydro-testing has little effect on extended long-term tightness.

SEAT-DISC CONTACT MECHANICS

- When magnified, even a ground, lapped surface appears irregular and rough.
- The rate of leakage is a function of the smoothness and finish of the surfaces.
- The seat-disc (wedge) contacts are between the peaks.
- For absolutely leak-tight joints, the peaks must be deformed with torque until a large portion of mating surfaces is in microscopic contact.
- The compression stress is approximately 3 times the yield (for 70,000 psi–210,000 psi).
- Sufficient contact pressure generated by the torque is essential. A small increase in contact pressure produces a rapid decrease in leakage.
- The valve seat should be either very narrow or very wide, depending on the valve type.



Globe Valves	Conical seat-line contact
Gate Valves and Swing Check Valves	Large, flat-faced seats

VELAN API 600 GATE VALVE SEAT TIGHTNESS

GATE VALVE SEAT TIGHTNESS

- Welded-in Stellite 6 faced seats and a flexible wedge in 13 CR, SS 316, Monel or hardfaced with Stellite 6.
- Seating faces ground and lapped to 2 RMS.

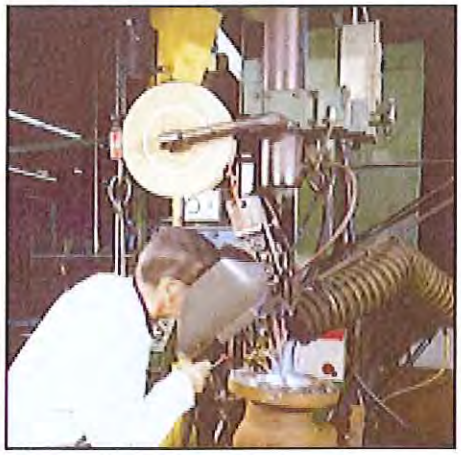
Factory Acceptance Standard for Gate Valve Seat Leakage

Size in	Velan Standard (VEL-NDT-571)	Seat Leakage Rate (1) (API 598–October 1996)	
		Low Pressure Test	High Pressure Test
2	0	0	0
2½–6	0	24	12
8–12	0	40	20
14+	28	56	28

(1) Leakage rates are in bubbles per minute for low pressure test and drops per minute for high pressure test

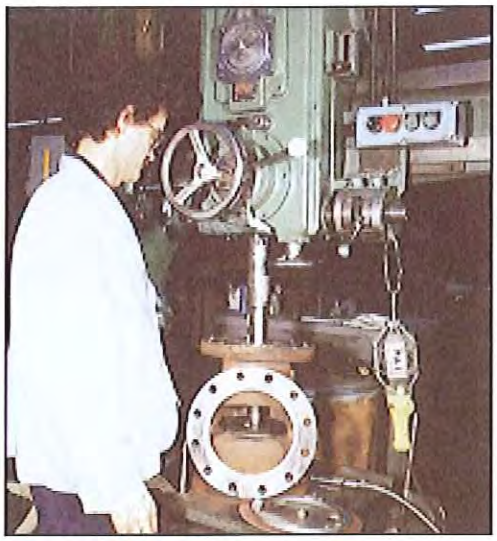
EIGHT IMPORTANT STEPS IN ASSEMBLY & TESTING

Make the Difference in Seat Tightness and Performance

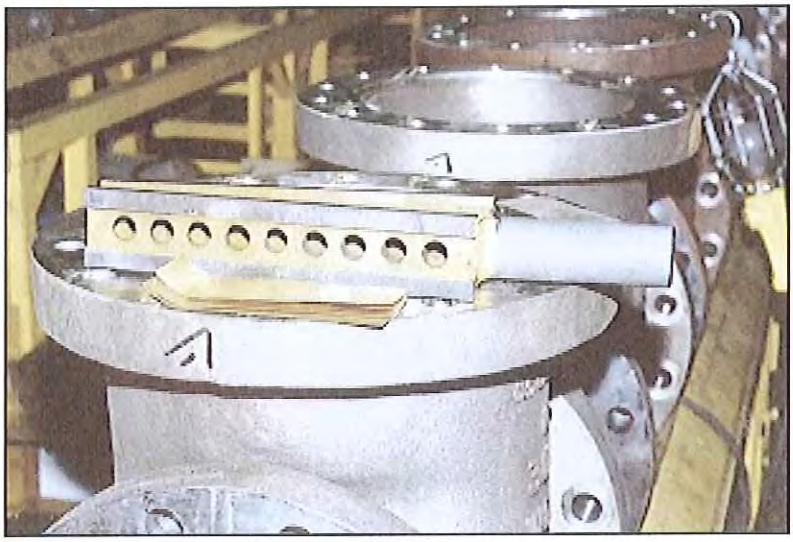


1 Automatic seal welding of Stellite 6 hardfaced seats.

2 Air-under-water test of the seat's welds.



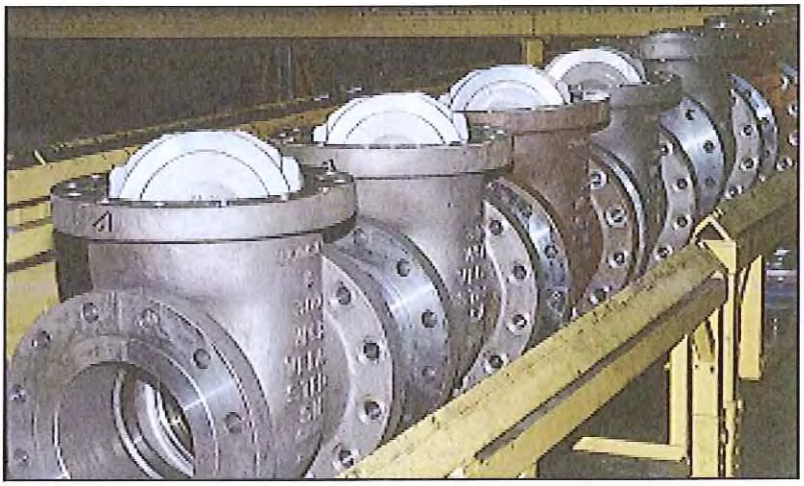
3 Relapping of seating faces after seal welding.



4 Determination of final seat/seat angle with gauge and shims to determine ideal wedge angle (6–60").

5 Precision grinding of individually fit wedge seating surfaces.

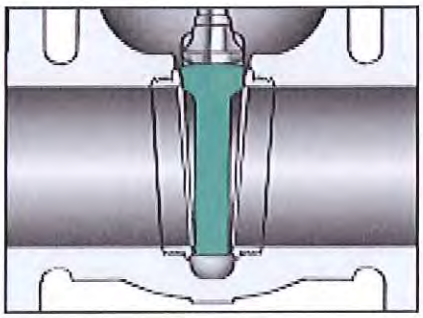
6 Lapping of wedge seating surfaces.



7 Assigning the ideally fitted wedge, ground and lapped, to proper valve body.

8 After assembly, pressure testing of shell, seats, packing and backseat to API 598.

VELAN API 600 GATE VALVES
FLEXIBLE WEDGE VERSUS SOLID WEDGE



FLEXIBLE ROUND WEDGE PIONEERED BY VELAN

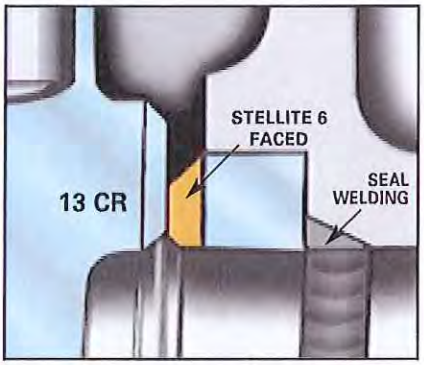
- Universal use for temperatures up to 1000°F (538°C).
- Flexibility compensates for seat face distortion.
- Compensates for deformation of body due to pipe stresses.
- Long cycle life.
- Ideal for processes with large temperature fluctuations.
- Assures valve tightness on both seats over wide range of pressures.
- Stem to wedge connection is inside the seating faces supporting the wedge ears during opening.

  More robust with less mass.

CLASSICAL SOLID WEDGE ON COMPETITIVE DESIGNS

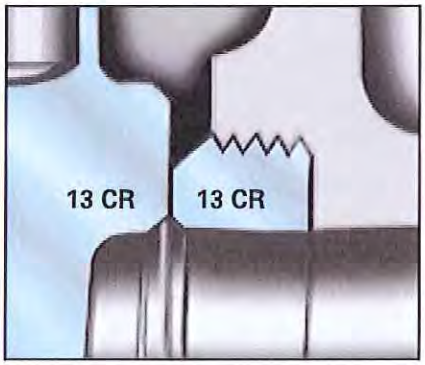
- Wedge may cause severe jamming at temperatures over 200°F (93°C).
- Suitable for small valves (½–2", 15–50 mm).
- Wedge will stick when valve is closed hot and allowed to cool.
- No compensation for deformation of body due to pressure-temperature or pipe stresses.
- Difficult to make valve tight on both seats due to seat face distortion.

SEAL WELDED SEATS VS SCREWED-IN SEATS



VELAN STANDARD GROUND AND LAPPED SEAL WELDED SEAT RINGS FACED WITH STELLITE 6

- Pioneered by Velan and considered state-of-the-art technology.
- Welded-in leakproof.
- Weld quality 100% tested.
- Stellite 6 seating faces for long service life.
- Ground and lapped to 2 RMS finish after weld-in.
- Standardized use for steam up to 1000°F (538°C), oil and gas.
- Stellite face will wear less than the 13 CR wedge, which can easily be repaired or replaced.

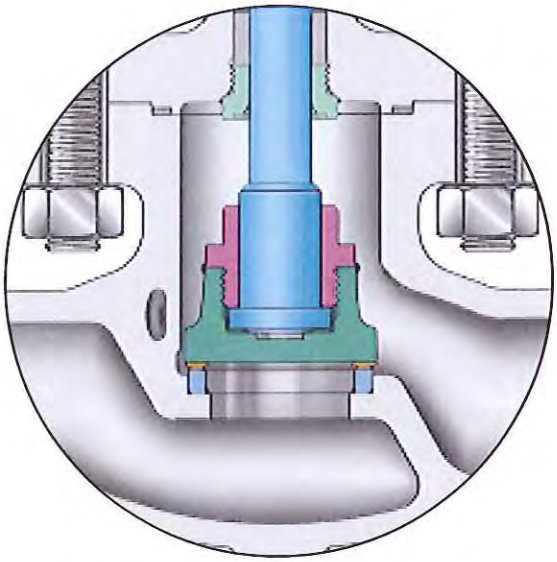


COMPETING SCREWED-IN SEATS IN 13 CR

- Can loosen up due to corrosion and cause substantial leakage.
- Replacement is difficult if not impossible.
- Threads can corrode and cause leakage.
- Seat is unsecured from unscrewing.
- Seat can become loose due to temperature fluctuations, corrosion or vibration, and can leak.
- Not suitable for steam service. Steam and other fluids will wire draw body threads of loose seats beyond repair.
- 13 CR seat suitable only for certain fluids.

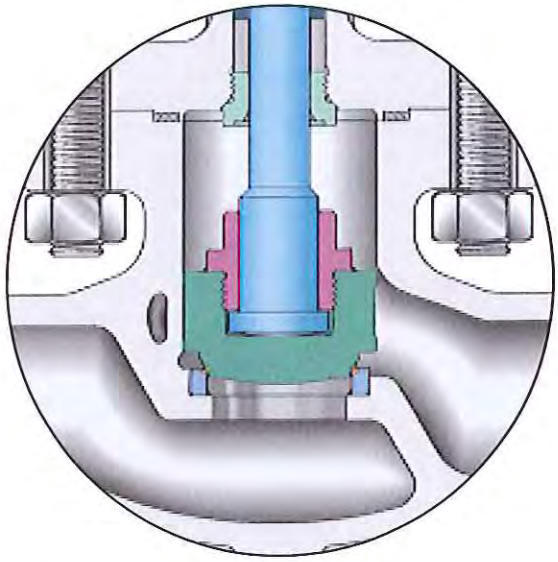
VELAN API 600 GLOBE VALVES
FLAT AND CONICAL SEATS

FLAT SEAT



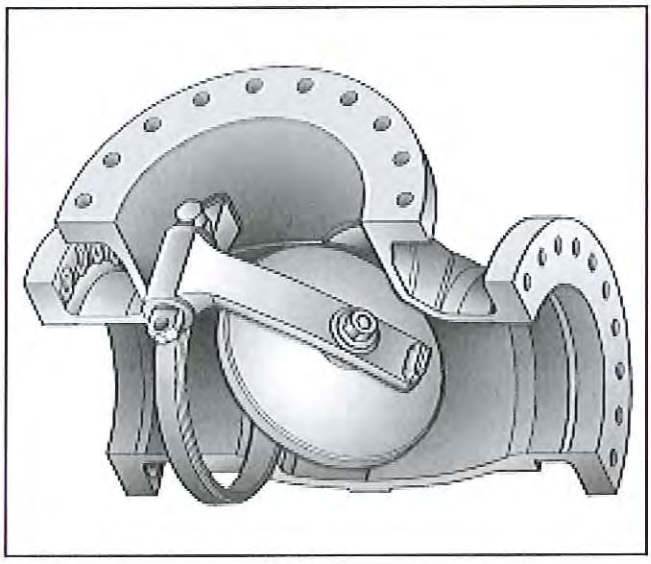
- Machining, lapping to close tolerances is easy.
- Flatness tolerance easy to control.
- Area contact wide seat.
- Disc is guided by the mating surface of the seat.
- Hard thrust pad prevents galling.
- Faster maintenance in-line. Flat seating faces can be lapped and checked for flatness easier.

CONICAL SEAT



- Line contact seal.
- Contact pressure increase by 1.5–5 with same stems and yokes.
- Seat has greater elasticity.
- Lower closing torques.
- Recommended for high pressure-temperature.

VELAN API 600 SWING CHECK VALVES

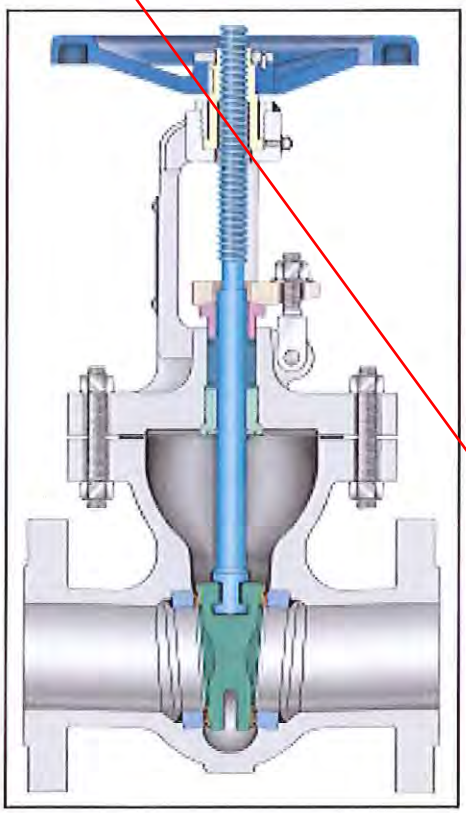


- Cage unit design with no penetration of body prevents:
  - *a)* Possibility of leakage with gasketed or packed hinge pin.
  - *b)* Possibility of pin ejection.
- All parts are accessible from the top for easy servicing.
- Welded-in seat is Stellite 6 faced.
- Disc is free to rotate to prevent localized wear.
- Ground and lapped seating surfaces.

VELAN

CAST CARBON, STAINLESS OR ALLOY STEEL API 600 BOLTED BONNET GATE VALVES, 2–60" (50–1500 mm)

ASME CLASSES 150, 300, 600, 900 AND 1500



CLASS	FIGURE NUMBER
150	0064C
300	1064C
600	2064C
900	7064C
1500	3064C

DESIGN FEATURES:

- **Universal Trim.** 13 CR stem, wedge in CA 15 or 13 CR faced, and Stellited seat API Trim 8 suitable for applications up to 850°F (454°C).
- **Seat face** Stellited, ground and lapped to a mirror finish.
- **Flexible Wedge** with low center stem-wedge contact, in solid CA15 (13 CR) or hardfaced with 13 CR, SS 316, Monel or Stellite. Wedge is ground and lapped to a mirror finish and tightly guided to prevent dragging and seat damage. A Stellite 6 hardfaced CF8M wedge is also available.
- **Non-rotating stem** with precision Acme threads and burnished finish. Double Acme for faster operation.
- **Body and bonnet joint** accurately machined. Gasket materials on page 3, details on page 13.

STANDARD MATERIALS

PART	MATERIALS			
Body[1]	WCB	WC6	WC9	CF8M
Bonnet[1]	WCB	WC6	WC9	CF8M
Stem[1][3]	SS 410			SS 630, 600 or SS 316
Wedge[1]	CA 15 or 13 CR faced WCB	CA 15 or 13 CR faced WC6	CA 15 or 13 CR faced WC9	CF8M
Seat[1][2]	Stellite 6 faced carbon steel	Stellite 6 faced F11	Stellite 6 faced F22	Stellite 6 faced F316
Packing flange	Carbon steel			Stainless steel
Gland bushing	Carbon steel			Stainless steel
Packing ring[1]	Graphite			Graphite
Gland stud	Gr. B or B7[4]			F316, B8M or 630[5]
Gland nut	Gr. 2H			Gr. 8M
Body/bonnet nut	Gr. 2H	Gr. 4		Gr. 8M
Body/bonnet stud	B7	B16		B8M or 630
Back seat[1][3]	SS 410			SS 316
Gasket[1]	Class 150: corrugated steel/graphite Class 300-1500: spiral wound stainless steel/graphite			
Key	Carbon steel			
Yoke bushing	Carbon steel			Stainless steel
Bearing	Steel			
Handwheel nut	Malleable iron or steel			
Handwheel[1]	Malleable iron or steel			
Grease fitting	Steel			
Groove pin	Carbon steel			Stainless steel
Bushing	Carbon steel			Stainless steel
Washer	Carbon steel			Stainless steel
Name plate	Stainless steel			
Identification tag	Stainless steel			
Rivet	Stainless steel			
Stem nut	A 439 Austenitic ductile iron Gr. D-2C			

(1) Other materials available. (2) Stellited. (3) Hardened.
(4) For eye bolts Gr.B, for studs B7 is used.
(5) For eye bolts F316, for studs B8M or 630 is used.

DESIGN SPECIFICATIONS

ITEM	APPLICABLE SPECIFICATION
Wall thickness and general valve design	API 600, BS1414
Pressure-temperature rating	ASME B16.34
Face to face dimensions for butt weld and flanged valves	ASME B16.10
Flange design	ASME B16.5
Butt welding design	ASME B16.25
Materials	ASTM

- **Body and bonnet** castings are precision machined. One-piece bonnet up to 12" (300 mm) for better alignment and fewer parts.
- **Gland** has two-piece construction for easy alignment.
- **Flanges:**
  Classes 150–300: 1/16" raised face,
  Class 600 –1500: 1/4" raised face.
  Finish 125–250 AARH for all valves.
- **Rotating stem nut** is Austenitic ductile iron Gr. D-2C renewable in line (as shown). Thrust bearings are supplied as follows:
  150–300: 10–12" (250–300 mm), 1 bearing (top),
  16" (400 mm) and up, two bearings
  600: 6" (150 mm) and up
  900–1500: 6" (150 mm) and up.

For information on BELLOWS SEAL VALVES see VEL-BS catalog.

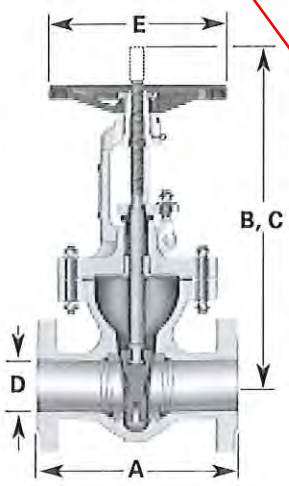
GATE VALVE DIMENSIONS (CLASSES 150–600)

SIZE	ASME 150 (PN 20)						ASME 300 (PN 50)					ASME 600 (PN 100)				
in / mm	A BW	A FL	B(1)	C(1)	D	E	A(3)	B(1)	C(1)	D	E	A(3)	B(1)	C(1)	D	E
2 50	8.50 216	7.00 178	15.63 397	20.38 518	2.00 51	8 203	8.50 216	15.63 397	20.38 518	2.00 51	8 203	11.50 292	15.66 398	20.51 521	2.00 51	8 203
2½ 65	9.50 241	7.50 191	16.88 429	22.14 562	2.50 64	8 203	9.50 241	16.94 430	22.20 564	2.50 64	8 203	13.00 330	18.59 472	24.19 614	2.50 64	10 254
3 80	11.12 282	8.00 203	18.56 471	24.26 616	3.00 76	10 254	11.12 283	20.22 514	26.38 670	3.00 76	10 254	14.00 356	21.63 549	27.78 706	3.00 76	10 254
4 100	12.00 305	9.00 229	22.25 565	28.32 719	4.00 102	10 254	12.00 305	23.90 607	30.95 786	4.00 102	10 254	17.00 432	25.75 654	32.76 832	4.00 102	14 356
6 150	15.88 403	10.50 267	31.19 792	38.00 965	6.00 152	14 356	15.87 403	32.31 821	40.38 1026	6.00 152	14 356	22.00 559	36.28 922	44.18 1122	6.00 152	20 508
8 200	16.50 419	11.50 292	38.19 970	46.13 1172	8.00 203	18 457	16.50 419	40.94 1040	50.16 1274	8.00 203	18 457	26.00 660	43.72 1110	53.25 1353	7.88 200	24 610
10 250	18.00 457	13.00 330	47.16 1198	56.28 1430	10.00 254	20 508	18.00 457	49.19 1249	59.87 1521	10.00 254	20 508	31.00 787	49.06 1246	59.87 1521	9.75 248	30 762
12 300	19.75 502	14.00 356	55.91 1420	66.75 1695	12.00 305	20 508	19.75 502	59.00 1499	70.61 1763	12.00 305	20 508	33.00 838	61.13 1553	72.74 1848	11.75 298	30 762
14 350	22.50 572	15.00 381	61.50 1562	75.50 1918	13.25 337	24 610	30.00 762	61.38 1559	77.75 1975	13.25 337	24 610	35.00 889	72.50 1842	83.50 2121	12.88 327	(2)
16 400	24.00 610	16.00 406	68.75 1746	85.00 2159	15.25 387	24 610	33.00 838	68.75 1746	85.50 2172	15.25 387	30 762	39.00 991	82.25 2089	91.00 2311	14.75 375	(2)
18 450	26.00 660	17.00 432	73.25 1861	90.00 2286	17.25 438	24 610	36.00 914	77.88 1978	94.00 2388	17.00 432	(2)	43.00 1092	87.06 2211	116.00 2946	16.50 419	(2)
20 500	28.00 711	18.00 457	83.00 2108	100.00 2540	19.25 489	30 762	39.00 991	86.50 2197	100.00 2540	19.00 483	(2)	47.00 1194	103.00 2616	123.00 3124	18.25 464	(2)
24 600	32.00 813	20.00 508	97.00 2464	115.00 2921	23.25 591	30 762	45.00 1143	101.25 2572	125.00 3175	23.00 584	(2)	55.00 1397	115.00 2921	132.00 3353	22.00 559	(2)
26 650	34.00 864	22.00 559	114.50 2908	125.00 3175	25.00 635	(2)	49.00 1245	114.50 2908	125.00 3175	25.00 635	(2)	– –	– –	– –	– –	– –
28 700	36.00 914	24.00 610	118.63 3013	130.00 3302	27.00 686	(2)	53.00 1346	118.63 3013	130.00 3302	27.00 686	(2)	– –	– –	– –	– –	– –
30 750	36.00 914	24.00 610	124.12 3153	140.00 3556	29.25 743	(2)	55.00 1397	124.13 3153	145.00 3683	29.25 743	(2)	65.00 1651	122.50 3112	150.00 3810	24.75 629	(2)
32 750	38.00 965	26.00 660	129.63 3293	150.00 3810	30.75 781	(2)	60.00 1524	129.63 3293	150.00 3810	30.75 781	(2)	– –	– –	– –	– –	– –
36 900	40.00 1016	28.00 711	146.68 3726	170.00 4318	35.25 895	(2)	68.00 1727	147.81 3754	185.00 4699	35.25 895	(2)	68.00 1727	145.13 3686	170.00 4318	29.00 737	(2)
40 1000	42.00 1067	30.00 762	158.66 4030	188.00 4775	38.50 978	(2)	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –
42 1050	44.00 1118	31.00 787	166.50 4229	195.00 4953	40.25 1022	(2)	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –
48 1200	– –	36.00 914	189.81 4821	225.00 5715	46.00 1168	(2)	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –
54 1350	52.00 1321	40.00 1016	216.56 5501	248.00 6299	51.50 1308	(2)	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –
60 1500	– –	42.00 1067	238.80 6066	275.00 6985	57.50 1461	(2)	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –

CLASSES 900-1500

SIZE	ASME 900 (PN 150)					ASME 1500 (PN 250)				
in / mm	A(3)	B(1)	C(1)	D	E	A(3)	B(1)	C(1)	D	E
2 50	14.50 368	21.25 540	29.00 737	1.88 48	10 254	14.50 368	21.25 540	29.00 737	1.88 48	10 254
3 80	15.00 381	25.75 654	34.50 876	2.88 73	14 356	18.50 470	25.75 654	34.50 876	2.75 70	14 356
4 100	18.00 457	28.75 730	37.50 953	3.88 99	18 457	21.50 546	28.75 730	37.50 953	3.63 92	18 457
6 150	24.00 610	39.00 991	49.00 1245	5.75 146	20 508	27.75 705	39.00 991	49.00 1245	5.38 137	(2)
8 200	29.00 737	51.75 1315	62.75 1594	7.50 191	(2)	32.75 832	45.25 1149	60.00 1524	7.00 178	(2)
10 250	33.00 838	57.75 1467	67.25 1708	9.38 238	(2)	39.00 991	57.75 1467	71.00 1803	8.75 222	(2)
12 300	38.00 965	66.57 1691	83.00 2108	11.12 283	(2)	–	–	–	–	–
14 350	40.50 1029	73.88 1877	90.00 2286	12.25 311	(2)	–	–	–	–	–
16 400	44.50 1130	80.44 2043	100.00 2540	14.00 356	(2)	–	–	–	–	–

(1) Height does not include actuator. (2) Gear actuator. (3) Butt weld & flanged valves have the same end-to-end dimensions for Class 300 and up.



BW = Butt weld
FL = Flanged

B = Center-to-Top, Open
C = Dismantling Height

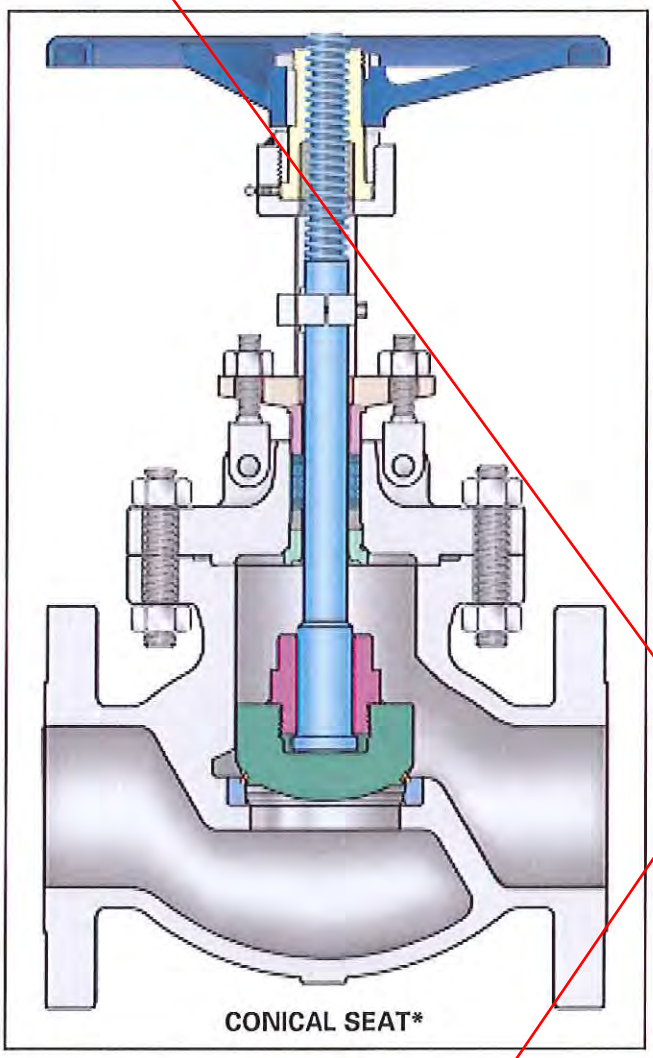
Classes 900–2500 forged gate valves also available.

See page 32 & 33 for valve weights and CVs.

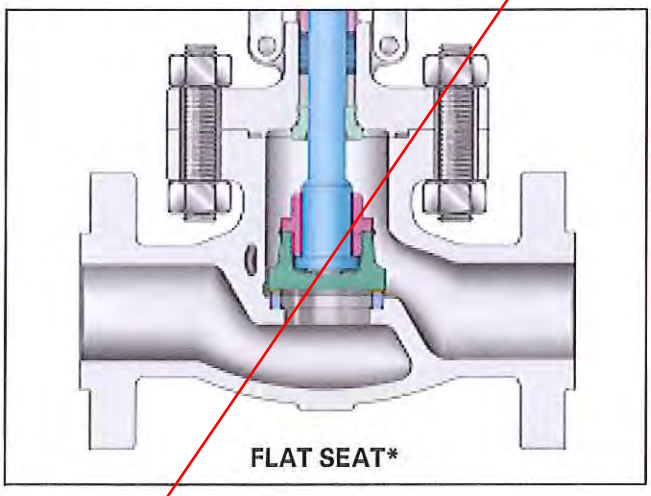
VELAN

CAST CARBON, STAINLESS OR ALLOY STEEL API 600 BOLTED BONNET GLOBE AND STOP CHECK VALVES, 2–16" (50–400 mm) ASME CLASSES 150, 300 AND 600

NOW THE ONLY API 600 GLOBE VALVE WITH NON-ROTATING STEM



CONICAL SEAT*



FLAT SEAT*

DESIGN FEATURES:

- **Non-rotating Stem** with precision Acme threads and burnished finish. Valve suitable for horizontal installation.
- **Universal Trim.** 13 CR stem, 13 CR faced disc and Stellite 6 faced seats API Trim 8 suitable for service up to 850°F.
- **Seat** face Stellited, ground and lapped to a mirror finish. Conical seat machined to 8 RMS.
- **Flat disc.** Floating stem-disc engagement, hardfaced with 13 CR, Stellite 6, SS 316 or Monel, ground and lapped with seat. Disc in SS 316 hardfaced with Stellite 6 also available.
- **Tapered disc.** Disc is guided by the mating surface of the seat, hardfaced with 13 CR, Stellite 6, SS 316 or Monel, ground and lapped with seat. Disc in SS 316 hardfaced with Stellite 6 also available. 2–6" (50–150 mm) valves may have solid CA15 (13 CR) discs.
- **Body and bonnet.** Castings are precision machined. One-piece bonnet for better alignment, fewer parts.
- **Stuffing box** finish to 63 RMS or better.
- **Body and bonnet joint** accurately machined. Fully enclosed gasket. Gasket materials on page 3. Details on page 13.
- **Gland** has two-piece construction for easy alignment.
- **Rotating Stem nut.** Austenitic ductile iron Gr. D-2C, renewable in-line.
- **Torque arm.** To reduce wear on packing rings, to enable better sealing and to reduce torque.
- **Impactor handwheels.** Globe and stop check valves require higher closing torques than gate valves with the same seat diameter and pressure class. The most economical mechanism for tight shutoff is the impactor handwheel. Two lugs cast under the wheel strike simultaneous blows and give 3–10 times the closing force of standard handwheels. Impactor handwheels are supplied at manufacturer's option unless specified by customer (see page 21).
- **Flanges.** Class 150–300: 1/16" raised face. Class 600: 1/4" raised face. Finish 125–250 AARH for all valves.

***NOTE:** Most sizes and pressure classes have conical seats. Choice of flat or conical seat is manufacturer's option unless specified by customer.

For information on BELLOWS SEAL VALVES see VEL-BS catalog

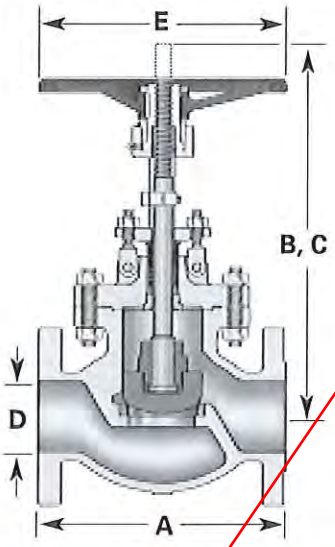
GLOBE VALVE DIMENSIONS (CLASSES 150-600)

SIZE	ASME 150 (PN 20)					ASME 300 (PN 50)					ASME 600 (PN 100)				
in mm	A	B[1]	C[1]	D	E	A	B[1]	C[1]	D	E	A	B[1]	C[1]	D	E
2 50	8.00 203	16.85 428	20.88 530	2.00 51	8 203.2	10.50 267	16.85 428	20.88 530	2.00 51	8 203	11.50 292	17.10 434	21.13 537	2.00 51	10 254
2½ 65	8.50 216	17.10 434	21.25 540	2.50 64	10 254	11.50 292	17.10 434	21.25 540	2.50 64	10 254	13.00 330	18.67 474	22.88 581	2.50 64	10 254
3 80	9.50 241	18.42 468	22.75 578	3.00 76	10 254	12.50 318	18.42 468	22.75 578	3.00 76	10 254	14.00 356	20.19 513	24.13 613	3.00 76	14 356
4 100	11.50 292	20.88 530	26.18 665	4.00 102	14 356	14.00 356	20.88 530	26.18 665	4.00 102	14 356	17.00 432	23.88 607	29.25 743	4.00 102	24 [2][3] 610
6 150	16.00 406	25.75 654	32.00 813	6.00 152	24 610	17.50 445	26.38 670	32.88 835	6.00 152	24 [2][3] 610	22.00 559	31.22 793	37.88 962	6.00 152	24 [2][3] 610
8 200	19.50 495	30.73 780	38.38 975	8.00 203	24 610	22.00 559	32.00 813	38.88 988	8.00 203	24 [2]or[4] 610	26.00 660	41.75 1060	57.88 1470	7.88 200	(4)
10 250	24.50 622	39.25 997	46.75 1187	10.00 254	24 [2][3] 610	24.50 622	42.34 1075	52.18 1325	10.00 254	24 [2]or[4] 610	31.00 787	47.16 1198	59.00 1499	9.75 248	(4)
12 300	27.50 699	42.52 1080	53.00 1346	12.00 305	24 [2]or[4] 610	28.00 711	46.19 1173	62.75 1594	12.00 305	(4)	– –	– –	– –	– –	– –
14 350	31.00 787	54.21 1377	65.44 1662	13.25 337	(4)	33.00 838	54.21 1377	72.00 1829	13.25 337	(4)	– –	– –	– –	– –	– –
16 400	36.00 914	59.94 1522	72.63 1845	15.25 387	(4)	34.00 863	59.94 1522	76.00 1930	15.25 387	(4)	Inclined cast classes 900-2500 globe valves also available				
18 450	38.50 978	59.62 1514	75.00 1905	17.50 444	(4)	38.50 978	59.62 1514	75.00 1905	17.50 444	(4)					

CLASSES 900-1500

SIZE	ASME 900 (PN 150)					ASME 1500 (PN 250)				
in mm	A	B[1]	C[1]	D	E	A	B[1]	C[1]	D	E
2 50	14.50 368	19.75 502	25.00 635	1.88 48	18 457	14.50 368	19.75 502	25.00 635	1.88 48	18 457
3 80	15.00 381	24.09 612	30.50 775	2.88 73	14[2][3] 356	18.50 470	24.09 612	30.50 775	2.75 70	14[2][3] 356
4 100	18.00 457	27.50 699	35.38 899	3.88 99	18[2][3] 457	21.50 546	27.50 699	35.38 899	3.63 92	18[2][3] 457

(1) Height does not include actuators. (2) Impactor handwheel.
(3) Gear actuator is optional. (4) Gear actuator.



Forged globe valves classes 900–2500 also available.

See page 32 & 33 for valve weights and CVs.

B = Center-to-Top, Open
C = Dismantling Height

CLASS	FIGURE NUMBERS		
	GLOBE	STOP CHECK	NEEDLE
150	0074C	0084C	0094C
300	1074C	1084C	1094C
600	2074C	2084C	2094C
900	7074C	7084C	7094C
1500	3074C	3084C	3094C

STANDARD MATERIALS

PART	MATERIALS			
Body[1]	WCB	WC6	WC9	CF8M
Bonnet[1]	WCB	WC6	WC9	CF8M
Seat[1][2]	Stellite 6 faced Carbon steel	Stellite 6 faced F11	Stellite 6 faced F22	Stellite 6 F316
Disc	CA 15 or 13 CR faced A105	CA 15 or 13 CR faced F11	CA 15 or 13 CR faced F22	CF8M or F316
Disc nut	Carbon steel	SS 304 or 316		
Stem[1][3]	SS 410			SS 316 or 630
Backseat[1][3]	SS 410			SS 316
Packing ring[1]	Graphite			
Gland stud	Gr. B or B7 [4]			F316, B8M or 630[5]
Gland nut	Gr. 2H			Gr. 8M
Packing flange	Carbon steel			SS
Gland bushing	Carbon steel			SS
Bonnet stud	B7	B16		B8M or 630
Bonnet nut	Gr. 2H	Gr. 4		Gr. 8M
Hinge pin	Steel			SS
Gasket[1]	Spiral wound stainless steel/graphite			
Torque arm	Carbon steel			
Yoke bushing	Carbon steel			Stainless steel
Stem nut	A 439 Austenitic ductile iron Gr. D-2C			
Handwheel nut	Malleable iron or steel			
Handwheel[1]	Malleable iron or steel			

(1) Other materials available. (2) Stellited. (3) Hardened.
(4) For eye bolts Gr.B, for studs B7 is used.
(5) For eye bolts F316, for studs B8M or 630 is used.

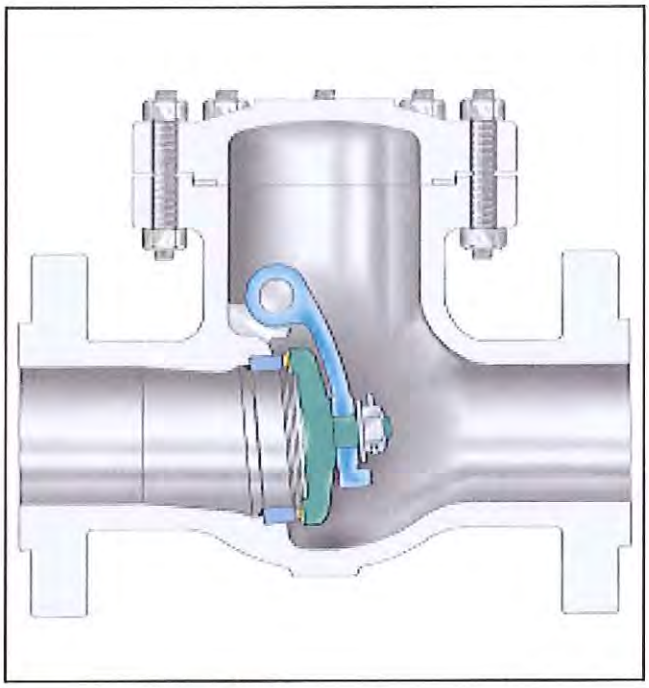
DESIGN SPECIFICATIONS

ITEM	APPLICABLE SPECIFICATION
Wall thickness and general valve design	API 600, BS 1873
Pressure-temperature rating	ASME B16.34
Face-to-face dimensions for butt weld and flanged valves	ASME B16.10
Flange design	ASME B16.5
Butt welding design	ASME B16.25
Materials	ASTM

VELAN

CAST CARBON, STAINLESS OR ALLOY STEEL API 600 SWING CHECK VALVES, 2–36" (50–900 mm)

ASME CLASSES 150, 300, 600, 900 AND 1500



CLASS	FIGURE NUMBER	CLASS	FIGURE NUMBER
150	0114C	900	7114C
300	1114C	1500	3114C
600	2114C		

STANDARD MATERIALS

PART	MATERIALS			
Body[1]	WCB	WC6	WC9	CF8M
Seat[1][2]	Stellite 6 faced CS	Stellite 6 faced F11	Stellite 6 faced F22	Stellite 6 faced F316
Hinge pin[1][3]	SS 410			SS 630 or 660
Gasket[1]	Spiral wound stainless steel/graphite			
Cover stud	Gr. B7	B16		B8M or 630
Cover nut	Gr. 2H	Gr. 4		Gr. 8M
Cover[1]	WCB	WC6	WC9	CF8M
Washer	Commercial			
Disc[1]	CA 15 or 13 CR faced WCB	CA 15 or 13 CR faced WC6	CA 15 or 13 CR faced WC9	CF8M
Disc hanger	WCB	WC6	WC9	CF8M
Disc nut	Gr. 2H	Gr. 4		Gr. 8M

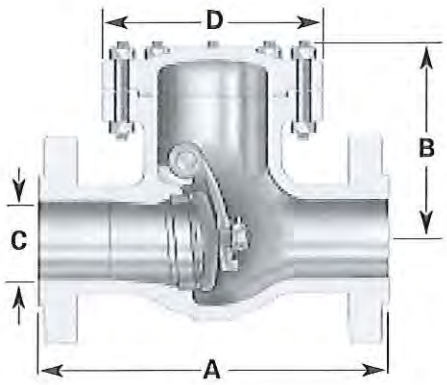
(1) Other materials available. (2) Stellited. (3) Hardened.

DESIGN FEATURES:

- **Body and cover.** Precision machined castings. ***Exclusive:*** Disc shaft does not penetrate body.
- **Body and cover joint.** Accurately machined, fully-enclosed gasket (gasket materials on page 3).
- **Disc.** Robust one-piece construction to withstand the severe shock of check valve service. Hardfaced with 13 CR, Stellite 6, SS 316, or Monel, ground and lapped to mirror finish. Sizes 2–6" (50–150 mm) may have solid CA15 (13 CR) disc. SS 316 disc with Stellite 6 facing also available.
- **Disc assembly.** Disc is fastened securely to disc hanger with a lock nut and cotter pin. Disc is free to rotate to avoid localized wear. Disc hanger is supported on a sturdy disc carrier hinge pin of excellent bearing qualities. All parts are accessible from top for easy servicing.
- **Flanges.**
  Class 150/300: 1/16" raised face.
  Class 600: 1/4" raised face.
  Finish: 125–250 AARH for all valves.

DESIGN SPECIFICATIONS

ITEM	APPLICABLE SPECIFICATION
Wall thickness and general valve design	API 600, BS1868
Pressure–temperature rating	ASME B16.34
Face-to-face dimensions for butt weld and flanged valves	ASME B16.10
Flange design	ASME B16.5
Butt welding design	ASME B16.25
Materials	ASTM



See page 32 & 33 for valve weights and CVs.

CHECK VALVE DIMENSIONS

SIZE	ASME 150 (PN 20)				ASME 300 (PN 50)				ASME 600 (PN 100)				ASME 900 (PN 150)				ASME 1500 (PN 250)			
in mm	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
2 50	8.00 203	5.75 146	2.00 51	6.75 171	10.50 267	6.00 152	2.00 51	6.75 171	11.50 292	6.25 159	2.00 51	6.75 171	14.50 368	9.50 241	1.88 48	8.63 219	14.50 368	9.50 241	1.88 48	8.63 219
2½ 65	8.50 216	6.25 159	2.50 64	6.75 171	11.50 292	6.25 159	2.50 64	6.75 171	13.00 330	6.50 165	2.50 64	7.50 191	16.50 419	10.00 254	2.25 57	9.25 235	16.50 419	10.00 254	2.25 57	9.25 235
3 80	9.50 241	7.75 197	3.00 76	8.50 216	12.50 318	7.75 197	3.00 76	8.50 216	14.00 356	8.75 222	3.00 76	9.75 248	15.00 381	10.50 267	2.88 73	10.50 267	18.50 470	11.50 292	2.75 70	10.50 267
4 100	11.50 292	8.75 222	4.00 102	10.25 260	14.00 356	8.75 222	4.00 102	10.25 260	17.00 432	9.25 235	4.00 102	12.00 305	18.00 457	11.75 299	3.88 99	12.25 311	21.50 546	12.00 305	3.63 92	12.25 311
6 150	14.00 356	10.75 273	6.00 152	12.50 318	17.50 445	10.75 273	6.00 152	12.50 318	22.00 559	11.50 292	6.00 152	15.75 400	24.00 610	15.00 381	5.75 146	15.25 387	27.75 705	16.50 419	5.38 137	16.00 406
8 200	19.50 495	12.75 324	8.00 203	15.75 400	21.00 533	12.75 324	8.00 203	15.75 400	26.00 660	13.50 343	7.88 200	15.75 400	29.00 737	19.25 489	7.50 191	18.38 467	32.75 832	21.00 533	7.00 178	20.75 527
10 250	24.50 622	15.50 394	10.00 254	18.50 470	24.50 622	16.25 413	10.00 254	18.50 470	31.00 787	16.75 425	9.75 248	19.50 495	– –	– –	– –	– –	– –	– –	– –	– –
12 300	27.50 699	17.00 432	12.00 305	20.50 521	28.00 711	17.00 432	12.00 305	20.50 521	33.00 838	18.50 470	11.75 298	22.50 572	– –	– –	– –	– –	– –	– –	– –	– –
14 350	31.00 787	19.63 499	13.25 337	23.00 584	33.00 838	19.63 499	13.25 337	23.00 584	35.00 889	20.93 532	12.88 327	26.25 667	– –	– –	– –	– –	– –	– –	– –	– –
16 400	34.00 864	22.00 559	15.25 387	26.50 673	34.00 864	22.50 572	15.25 387	26.50 673	39.00 991	23.38 594	14.75 375	28.25 718	– –	– –	– –	– –	– –	– –	– –	– –
18 450	38.50 978	25.00 635	17.13 435	28.50 724	38.50 978	25.00 635	17.13 435	28.50 724	43.00 1092	28.67 728	16.50 419	31.50 800	– –	– –	– –	– –	– –	– –	– –	– –
20 500	38.50 978	26.50 673	19.00 483	31.50 800	40.00 1016	26.50 673	19.00 483	31.50 800	47.00 1194	27.12 689	18.25 464	35.25 895	– –	Other sizes on application.						– –
24 600	51.00 1295	31.25 794	23.25 591	37.00 940	53.00 1346	31.25 794	23.25 591	37.00 940	55.00 1397	35.69 907	22.00 559	40.25 1022	– –							– –
26 650	51.00 1295	32.63 829	25.00 635	37.25 946	53.00 1346	32.63 829	25.00 635	37.25 946	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –
28 700	57.00 1448	36.55 928	27.00 686	42.00 1067	59.00 1499	36.55 928	27.00 686	42.00 1067	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –
30 750	60.00 1524	36.89 937	29.25 743	44.50 1130	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –
36 900	77.00 1956	41.78 1061	35.25 895	53.00 1346	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –

See catalog VEL-PS for Classes 900 and 1500 FORGED STEEL CHECK VALVES.

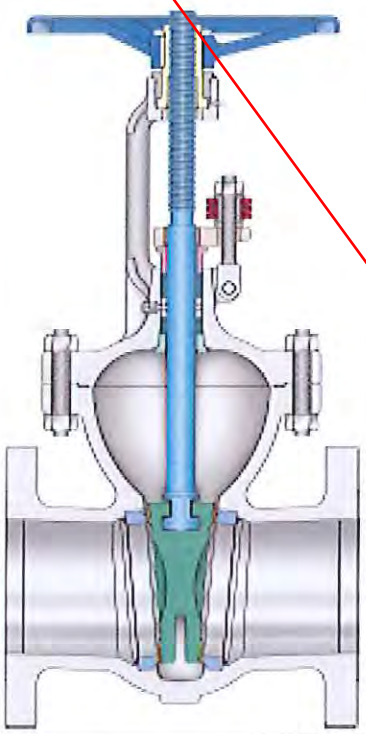
YELAN

CAST STEEL API 600 GATE, 2–60" (50–1500 mm) & GLOBE VALVES, 2–16" (50–400 mm)

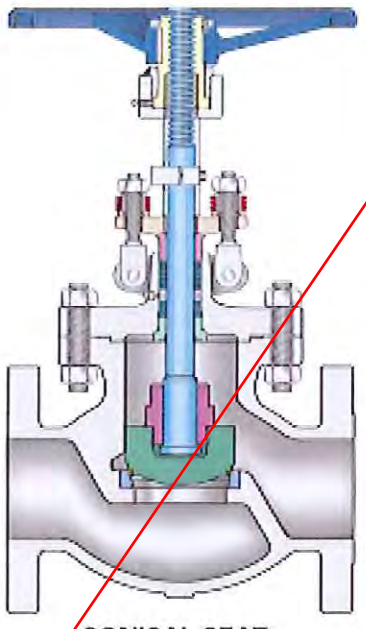
ASME CLASSES 150, 300, 600, 900 AND 1500
WITH SINGLE OR DOUBLE PACKING, LEAK-OFF AND LIVE-LOADING

LIVE-LOADED VALVES

GATE VALVE



GLOBE VALVE



CONICAL SEAT

DESIGN FEATURES:

- **Safer and tighter stem seal.**
- **Short and narrow packing chamber** improves sealing effectiveness.
- **Long-life leakproof packing chamber** with double packing and leak-off or single set packing.

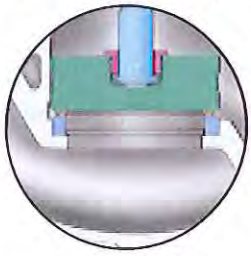
  Double packing: two sets of graphite packing rings compressed to 4000 psi. A lantern ring and leak-off provide option for removal of leakage, if any, from lower packing set.

  Single set packing: three or four graphite rings between braided rings, 80-90 lbs./cu. ft. density.
- **Live-loading.** Two sets of Belleville springs keep stem tight for long periods of time without maintenance.
- **Two-piece stem drive** is renewable in-line.
- **Stronger leakproof body-bonnet joint.** **Class 150:** Corrugated graphite-filled steel gasket.

  Class 300-600: Fully-encased spiral wound graphite-filled stainless steel gasket.
- **Classes 300, 600, 900 and 1500** have round bonnet and encased gasket
- **Welded-in seats** hardfaced with Stellite 6.
- **Flexible one-piece wedge,** hardfaced with Stellite 6 or 13 CR (solid 13 CR up to 8").
- **13 CR hardened stem** with mirror-like, burnished finish for longer packing life.

For dimensions on Gate valves see page 19.
For dimensions on Globe valves see page 21.
For other Globe valve design features see page 20.

Most sizes and pressure classes have conical seats.



FLAT SEAT

Choice of flat or conical seat is manufacturer's option unless specified by customer.

For BELLOWS SEAL GATE & GLOBE VALVES ½–12" (15–300 mm) see VEL-BS catalog.

VELAN

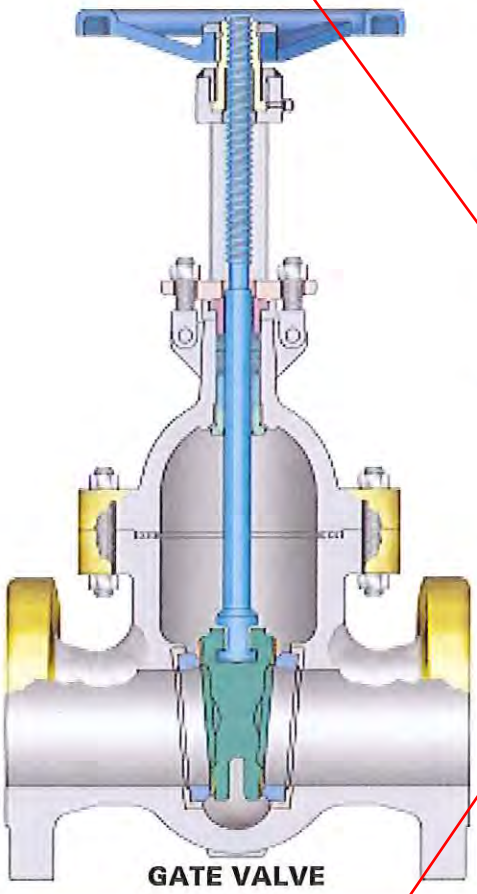
HF ACID GATE, GLOBE AND CHECK VALVES
CARBON STEEL AND MONEL 2–36" (50–900 mm)

PRESSURE CLASSES 150–300

HYDROFLUORIC ACID PROCESSING VALVES

Hydrofluoric Acid is one of the strongest and most corrosive acids. Industries using HF acid in their manufacturing process have placed an increasing emphasis on safety in using this product.

Fugitive emissions are a critical factor in the performance of any HF Acid valve and at Velan, we have been committed to reducing emissions beyond the industry standards, and providing the highest quality products to our customers for over 50 years. Velan offers a comprehensive line of Phillips approved and UOP listed API 600 gate, globe and check HF acid valves with several benefits.



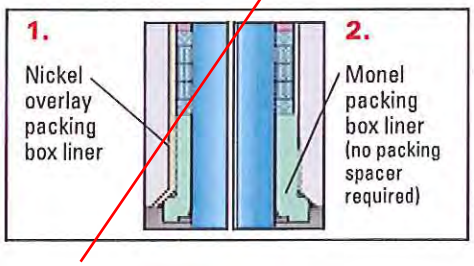
GATE VALVE

DESIGN FEATURES:

- **Nickel plated overlay on backseat in stem hole** to combat severe alkylation conditions.
- **HF acid detecting paint** to ensure valve integrity.
- **Stem** - made from solid age hardened K-Monel 500 for increased strength and corrosion resistance.
- **Casting design**
  X-ray "RT" quality castings as per B16.34 acceptance standards. Velan is one of the first valve manufacturers to have the MAGMASOFT® computer casting simulation program to ensure high quality levels.
- **Bonnet Joint** - accurately machined for better service life.
- **Seal Welded Seats in Monel**
  Monel seats are welded-in for ensuring zero leakage behind and around the seat and then ground and lapped after welding using state of the art technology to prevent in-service corrosion.
- **Body/Bonnet wall thickness** to API 600.
- **Velan's low-fugitive emissions guarantee**
  Based on extensive laboratory testing and field experience.

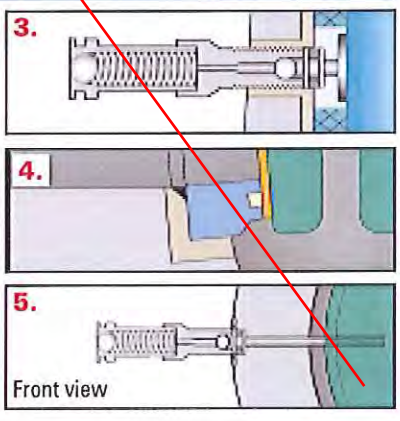
OPTIONAL DESIGN FEATURES

1. **Nickel overlay packing box liner**
2. **Packing box in Monel**
   – to combat severe alkylation conditions in this critical area.



3. **Grease injector & lantern ring**
   – where grease injection is a requirement (UOP only).
4. **PTFE seat insert** – resists abrasion and corrosion
5. **PTFE seat seal grease injection**
   – when required (UOP only)

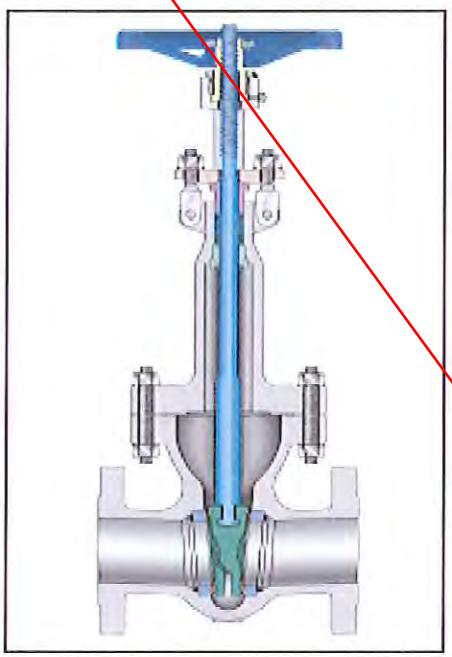
For more information on VELAN HF ACID GATE, GLOBE & CHECK VALVES see VEL-HFA catalog.

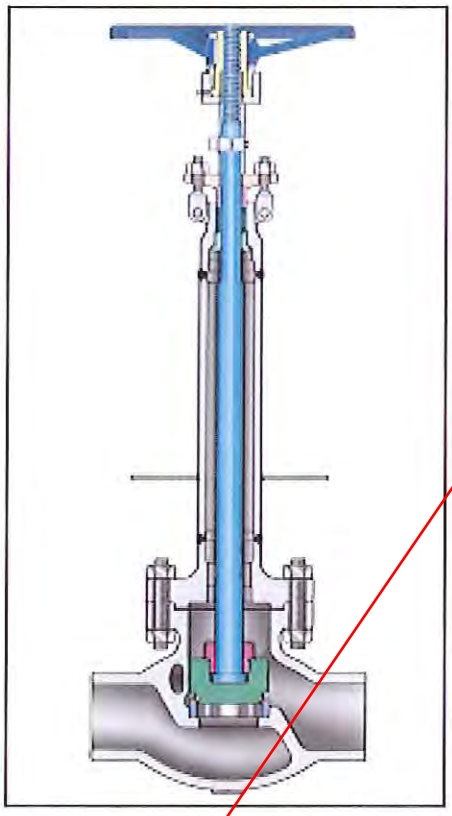


CAST CRYOGENIC GATE, GLOBE AND CHECK VALVES AUSTENITIC STAINLESS STEEL 2–30" (50–750 mm)

PRESSURE CLASSES 150–1500

CAST STEEL CRYOGENIC VALVES





For more details on Cryogenic Gate, Globe & Check Valves see VEL-CRYO catalog.

The production, transport and storage of liquefied gases such as oxygen, nitrogen, argon, natural gas, hydrogen or helium (down to -425°F), presents several technical problems. Velan specially-adapted extended bonnet cast valves offer safe and efficient service.

MATERIALS:

- **Body and bonnet:** Austenitic stainless steel castings used for bodies and bonnets offer excellent impact strength, minimal heat loss and protection against corrosion.
- **Stem:** Austenitic stainless steel. To reduce galling, stems are also offered in A479 grade XM-19 with high tensile strength even at extreme low temperatures, excellent low friction and galling-free movement at points of stem contact.
- **Wetted parts:** All Austenitic stainless steel and Stellite 6.
- **Stem nut/yoke bushing:** Austenitic ductile iron Gr. D-2C.
- **Packing:** PTFE or graphite packing protected from freezing by a column of insulating gas.
- **Seating faces:** Stellite 6 is used to prevent seizing and galling. When extremely tight shutoff is required, globe and check valves are supplied with Neoflon, PTFE or other soft inserts.
- **Bolting:** Strain-hardened Austenitic stainless steel.
- **Lubrication of stem nut:** Exxon Nebula Lubriplate No. 930-AA or Shell Darina EPI or equivalent.

DESIGN FEATURES:

- **Extended bonnets** with sufficient gas column length, usually specified by customer, are supplied for all valves to keep stem packing at sufficient distance away from the cold fluid to remain functional.
- **Flexible wedges** with Stellite seating faces for cryogenic service.
- **Neoflon inserts** are available for globe, piston, and swing check discs.
- **Cleaning:** All cryogenic valves are thoroughly degreased and cleaned and pipe ends are sealed to prevent contamination.

TABLE OF LIQUEFIED GASES

Type	Boiling Point °C	Boiling Point °F	Liquid Density lb/ft.³	Type	Boiling Point °C	Boiling Point °F	Liquid Density lb/ft.³
Natural gas (LNG)	-168	-270	26	Air	-194.4	-318	57.87
Methane (CH_4)	-161.5	-258	26.20	Nitrogen (N^2)	-195.8	-320	50.45
Oxygen (O_2)	-182.9	-296	71.20	Hydrogen(H_2)	-252.7	-423	4.43
Argon (Ar)	-185.9	-303	87.40	Helium (He)	-268.9	-452	7.82
Carbon Dioxide (CO_2)	-78.5	-109	50.60	Absolute zero	-273.16	-460	–

VELAN

BLOCK & BLEED GATE VALVES
FOR CHEMICAL AND PETROCHEMICAL INDUSTRIES

Valve shown has a special "Pipeline" bonnet.

Standard bonnets with regular yoke also available.

DESIGN FEATURES:

- **Positive shutoff** with visual or remote proof of seat tightness.
- **No product contamination** absolute tightness.
- **Dual seating.** Elastomer-to-metal seat plus metal-to-metal secondary seal.
- **Fire Safe.** The metal-to-metal seat ensures tightness if the secondary elastomer seat is damaged during the fire.
- **PTFE seat insert** resists corrosive media, has high abrasion resistance and operates up to +400°F (204°C).
- **Seat hardfaced** with SS 410 and seal welded.

AVAILABLE RANGE

Velan block and bleed gate valves are available in the following sizes:

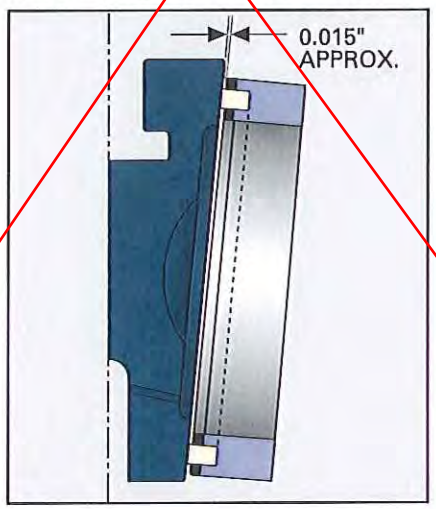
Class 150: carbon steel, flanged or butt weld, 2–60" (50–1500 mm).

Class 300: carbon steel, flanged or butt weld, 2–36" (50–900 mm).

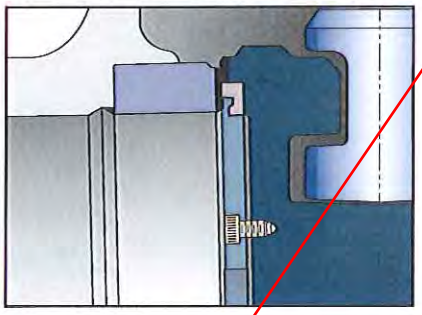
EASY IN-LINE VALVE RESEATING

Seats are hardfaced with SS 410 and welded-in for lifetime service. A worn soft seat insert can easily be replaced after removal of wedge from the body. Shut off flow and relieve pressure before replacing the seat insert.

STYLE A
2–12" SEAT - WEDGE DESIGN



STYLE B
14–60" SEAT–WEDGE DESIGN*



*14–24" (350–600 mm) may be STYLE A or B at manufacturer's option

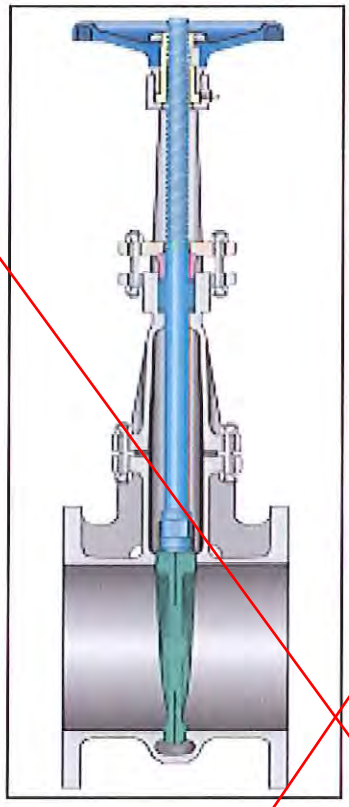
SPECIFICATIONS FOR SEAT INSERT MATERIALS

TYPE	MAXIMUM OPERATING TEMPERATURE	NOT RECOMMENDED
PTFE	-100°F to +400°F -73°C to +204°C	Fluorinated hydrocarbons
Buna-N	-20°F to +200°F -29°C to +93°C	Halogenated hydrocarbons, Nitrobenzene, Aniline, Hydraulic fluids, Skydrol, Cellulube, Pydrazil, Acetone
Viton	-20°F to +400°F -29°C to +240°C	Acetone, Anines, Anhydrous ammonia, Hot Hydrofluoric acid, Ester, Ethers

YELAN

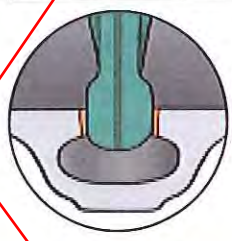
CAST STAINLESS STEEL GATE VALVES API 603 INTEGRAL SEAT, 2–24", (50–600 mm)

FLANGED, ASME CLASSES 150, 300, WALL THICKNESS TO B16.34
WITH FLEXIBLE WEDGE



STANDARD MATERIALS

PART		MATERIAL
Body		A 351 Gr. CF8M
Bonnet		A 351 Gr. CF8M
Wedge		A 351 Gr. CF8M
Stem		Gr. 316
Gland		Gr. 316
Gland flange		A 351 Gr. CF8M
Yoke bushing		Gr. 316
Handwheel		Malleable iron (painted)
Handwheel nut		Carbon steel
Body/bonnet stud		Gr. B8M
Body/Bonnet nut		Gr. 8M
Gland stud		Gr. 304
Gland nut		Gr. 8M
Spring pin		Stainless steel
Gland packing	SX or SY GS, GX or GY	PTFE Graphite
Gasket	SX or SY GS, GX or GY	PTFE with stainless wire mesh Graphite with stainless steel foil
Name plate		Stainless steel
Stem nut		A 439 Austenitic ductile iron Gr. D-2C

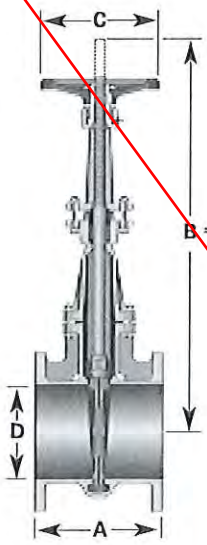


Optional integral Stellited seat face available for longer service life.

DIMENSIONS AND WEIGHTS

SIZE	FLANGED, ASME 150 (PN 20)					FLANGED, ASME 300 (PN 50)				
in mm	A	B	C	D	WEIGHT lb (kg)	A	B	C	D	WEIGHT lb (kg)
2 50	7.00 178	13.00 330	8.00 203	2.00 51	30 13.6	8.50 216	14.00 356	8.00 203	2.00 51	44 20.0
2½ 65	7.50 191	15.75 400	8.00 203	2.50 64	46 20.9	9.50 241	16.75 425	8.00 203	2.50 64	60 27.2
3 80	8.00 203	17.75 451	8.00 203	3.00 76	52 23.6	11.13 283	18.50 470	8.00 203	3.00 76	86 39.0
4 100	9.00 229	21.50 546	10.00 254	4.00 102	80 36.4	12.00 305	22.63 575	10.00 254	4.00 102	134 60.8
6 150	10.50 267	28.25 718	10.00 254	6.00 152	135 61.2	15.88 403	29.75 756	10.00 254	6.00 152	247 112.07
8 200	11.50 292	36.50 927	14.00 356	8.00 203	222 100.9	16.50 419	39.19 995	14.00 356	8.00 203	390 177.3
10 250	13.00 330	45.00 1143	18.00 457	10.00 254	324 147.3	18.00 457	45.50 1150	18.00 457	10.00 254	630 285.8
12 300	14.00 356	60.25 1530	18.00 457	12.00 305	472 214.1	19.75 502	65.38 1661	18.00 457	12.00 305	880 400.0
14 350	15.00 381	65.00 1651	21.63 549	13.25 337	685 310.7	– –	– –	– –	– –	– –
16 400	16.00 406	75.00 1905	23.63 600	15.25 387	1000 453.5	– –	– –	– –	– –	– –
18 450	17.00 432	81.00 2057	29.50 749	17.25 438	1300 589.6	– –	– –	– –	– –	– –
20 500	18.00 457	93.00 2362	29.50 749	19.25 489	1500 680.3	– –	– –	– –	– –	– –
24 600	20.00 508	107.00 2718	31.50 800	23.25 591	2000 907.0	– –	– –	– –	– –	– –

CLASS	FIGURE NUMBERS	
	STAINLESS SEAT	STELLITE SEAT
150	0064C–13SX or GX	0064C–13SY, GS or GY
300	1064C–13SX or GX	1064C–13SY, GS or GY



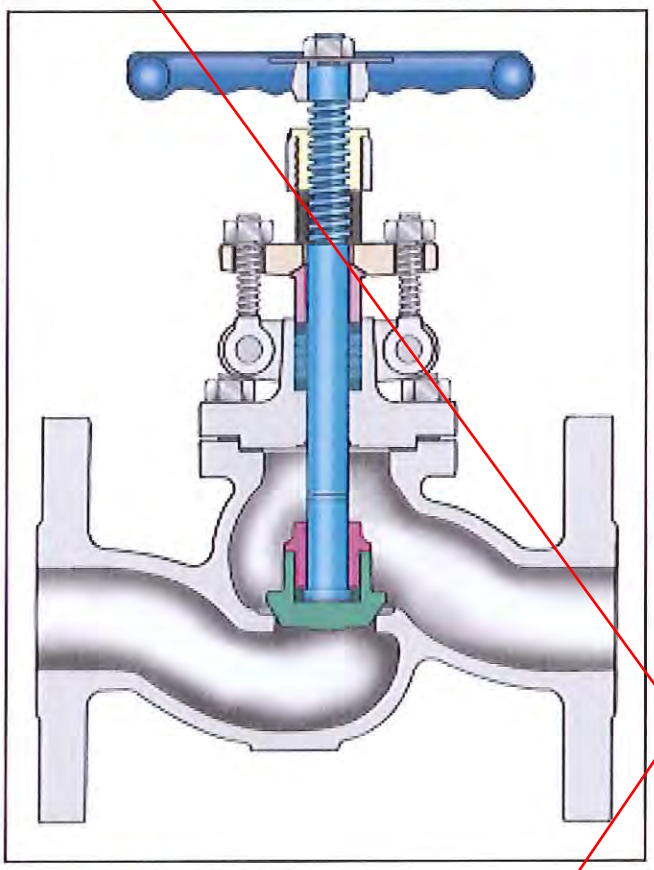
B = Center-to-Top, Open

For API 603 GATE VALVES see VEL–API–603 catalog.

VELAN

CAST STAINLESS STEEL GLOBE VALVES API 603 INTEGRAL SEAT, 2–6" (50–150 mm)

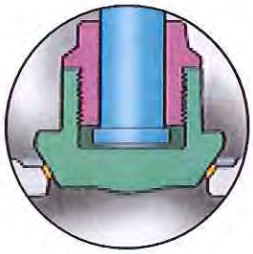
FLANGED, ASME CLASSES 150, 300, WALL THICKNESS TO B16.34



STANDARD MATERIALS

PART		MATERIAL
Body		A 351 Gr. CF8M
Bonnet		A 351 Gr. CF8M
Disc		A 351 Gr. CF8M
Stem		Gr. 316
Disc nut		A 351 Gr. CF8M
Gland pin		Gr. 316
Gland		Gr. 316
Gland flange		A 351 Gr. CF8M
Yoke bushing		Austenitic ductile iron Gr. D-2C
Handwheel		Malleable iron
Handwheel nut		Carbon steel
Name plate		Stainless steel
Bonnet stud		Gr. B8M
Bonnet nut		Gr. 8M
Gland stud		Gr. 304
Gland nut		Gr. 8M
Gland packing	SX or SY GS, GX or GY	PTFE Graphite
Gasket	SX or SY GS, GX or GY	PTFE with stainless wire mesh Graphite with stainless steel foil

CLASS	FIGURE NUMBERS	
	STAINLESS SEAT	STELLITE SEAT
150	0074C–13SX or GX	0074C–13SY, GS or GY
300	1074C–13SX or GX	1074C–13SY, GS or GY

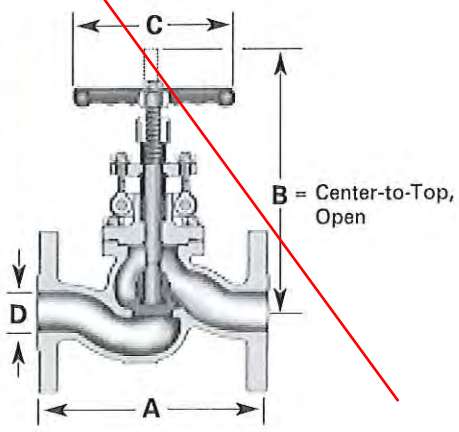


Optional integral Stellited seat face available for longer service life.

For API 603 GLOBE VALVES see VEL–API–603 catalog.

DIMENSIONS AND WEIGHTS

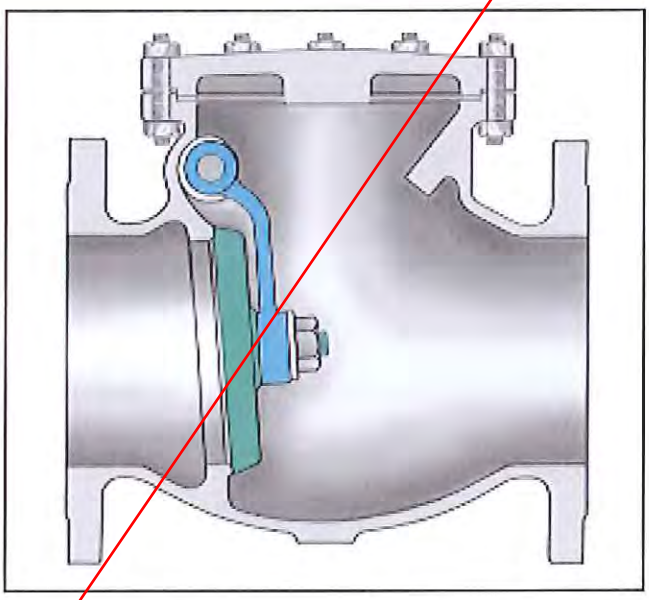
SIZE	FLANGED, ASME 150 (PN 20)					FLANGED, OASME 300 (PN 50)				
in mm	A	B	C	D	WEIGHT lb (kg)	A	B	C	D	WEIGHT lb (kg)
2 50	8.00 203	9.50 241	8.00 203	2.00 51	27 12.3	10.50 267	11.06 281	8.00 203	2.00 51	45 20.4
2½ 65	8.50 216	10.44 265	10.00 254	2.50 64	40 18.2	11.50 292	12.25 311	10.00 254	2.50 64	70 31.7
3 80	9.50 241	12.19 310	10.00 254	3.00 76	50 22.7	12.50 318	13.75 349	10.00 254	3.00 76	87 39.5
4 100	11.50 292	14.81 376	10.00 254	4.00 102	83 37.6	14.00 356	16.44 418	10.00 254	4.00 102	130 59.0
6 150	16.00 406	19.19 487	10.00 254	6.00 152	154 69.9	17.50 445	21.38 543	14.00 356	6.00 152	252 114.3

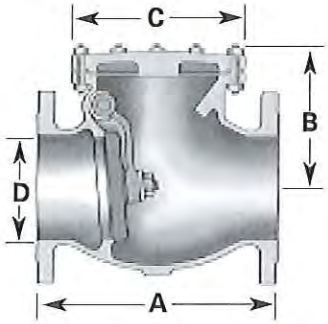


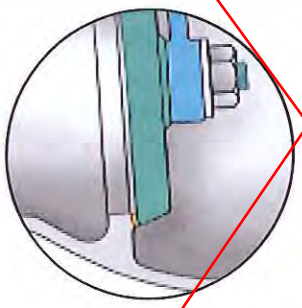
VELAN

CAST STAINLESS STEEL SWING CHECK VALVES API 603 INTEGRAL SEAT, 2–12" (50–300 mm)

FLANGED, ASME CLASSES 150, 300, WALL THICKNESS TO B16.34







Optional integral Stellited seat face available for longer service life.

For API 603 CHECK VALVES see VEL-API-603 catalog.

CLASS	FIGURE NUMBERS	
	STAINLESS SEAT	STELLITE SEAT
150	0114C–13SX or GX	0114C–13SY, GS or GY
300	1114C–13SX or GX	1114C–13SY, GS or GY

DIMENSIONS AND WEIGHTS

SIZE	FLANGED, ASME 150 (PN 20)					FLANGED, ASME 300 (PN 50)				
in mm	A	B	C	D	WEIGHT lb (kg)	A	B	C	D	WEIGHT lb (kg)
2 50	8.00 203	4.00 102	4.00(1) 102	2.00 51	21 9.5	10.50 267	4.75 121	5.00(1) 127	2.00 51	42 19.1
2½ 65	8.50 216	4.50 114	5.50 140	2.50 64	30 13.6	11.50 292	5.50 140	6.50 165	2.50 64	62 28.2
3 80	9.50 241	5.00 127	6.75 172	3.00 76	43 19.5	12.50 318	6.25 159	8.00 203	3.00 76	80 36.4
4 100	11.50 292	5.75 146	8.00 203	4.00 102	68 30.9	14.00 356	7.00 178	9.00 229	4.00 102	118 53.6
6 150	14.00 356	7.56 192	10.00 254	6.00 152	128 58.2	17.50 445	8.63 219	11.00 279	6.00 152	212 96.4
8 200	19.50 495	9.50 241	13.25 337	8.00 203	226 102.7	21.00 533	10.63 270	13.00 330	8.00 203	330 150.0
10 250	24.50 622	10.75 273	16.00 406	10.00 254	317 143.8	24.50 622	12.00 305	17.00 432	10.00 254	528 240.0
12 300	27.50 699	13.00 330	19.00 482	12.00 305	530 240.9	28.00 711	15.00 381	20.00 508	12.00 305	802 364

(1) Square.

STANDARD MATERIALS

PART		MATERIAL
Body		A 351 Gr. CF8M
Cover		A 351 Gr. CF8M
Disc		A 351 Gr. CF8M
Hinge		A 351 Gr. CF8M
Pin		Gr. 316
Plug		Gr. 316
Disc nut		Gr. 8M
Washer		Gr. 316
Cotter pin		Gr. 316
Cover stud		Gr. B8M
Cover nut		Gr. 8M
Gasket	SB, SX or SY	PTFE gasket and packing
	GB, GS, GX or GY	Graphite gasket and packing
Nameplate		Stainless steel

ACCESSORIES

GEAR ACTUATORS

Gearing is generally applied to valves to make operation easier. The gearing may be of the spur, bevel or worm type–any of which may be applied to Velan valves.

The gears and gear brackets may be either cast iron or cast steel and may have cast or cut teeth, depending on the loads and the application. Gearing is too often neglected when valve operation is considered, resulting in unsatisfactory operation requiring expensive changes.

	CLASS	OPTIONAL	STANDARD
GATE	150	6–24" (150–600 mm)	30–60" (750–1500 mm)
	300	6–16" (150–400 mm)	18–36" (450–900 mm)
	600	4–12" (100–400 mm)	14–36" (350–900 mm)
	900	3–6" (80–150 mm)	8–10" (200–250 mm)
	1500	3–4" (80–100 mm)	6–10" (150–250 mm)
GLOBE	150	6–12" (150–300 mm)	14–16" (350–400 mm)
	300	6–12" (150–300 mm)	14–16" (350–400 mm)
	600	4–10" (100–250 mm)	—
	900	2–4" (50–100 mm)	—
	1500	2–4" (50–100 mm)	—

ELECTRIC ACTUATORS

Motorized controls may be applied to valves of almost any size for operation in practically any position or location.

All units, whether installed directly on a valve or on a floor stand, can be manually operated in case of power failure. The units are available for either alternating or direct current.

Motor units supplied by Velan are the high torque type with windings impregnated to resist both oil and moisture. They are completely weather-proof, explosion-proof (optional) and dust and steam tight. Various sizes and styles are available for different applications, and systems and can be varied to fit special requirements.

CYLINDER ACTUATORS

The most commonly-used cylinders are actuated by air, but oil and water types are also available if required. In all designs, the valve stem normally serves as a piston rod with disc fastened directly to them. Tail rods are also supplied as standard equipment to serve as position indicators and for emergency opening. Handwheels and gear heads can be mounted on top of cylinders for operation in an emergency which may arise due to the loss of operating medium in the cylinder.

Velan cylinders can be furnished with mounting pads for one of the commercial cylinders or valve positioners which provide throttling control. High pressure cylinders are also available for specific applications.

VALVE ACTUATOR SIZING

The Velan philosophy for selecting an actuator is to calculate the required thrust and torque to operate the valve at the required service conditions. A reasonable margin of excess actuator capability over that required is always allowed for in the final actuator selection, but grossly oversized actuators are avoided.

Because of the wide variations in system operating conditions, actuator sizing is based on the following:

ACTUATOR TYPE	LINE PRESSURE	DIFFERENTIAL PRESSURE (CLOSED)	POWER SUPPLY
ELECTRIC	Specified by customer	Specified by customer	Voltage, type, phase and frequency specified by customer
PNEUMATIC	Specified by customer	Specified by customer	Air pressure specified by customer
HYDRAULIC	Specified by customer	Specified by customer	Hydraulic pressure specified by customer
HANDWHEEL/ GEAR ACTUATED	70% of CWP(1) unless otherwise advised by customer	70% of CWP(1) unless otherwise advised by customer	200 lb. rimpull(2) unless otherwise advised by customer

(1) CWP = cold working pressure per ASME B16.34 at 100°F (e.g., Class 150, CWP = 285 psig, 70% of CWP = 200 psig).

(2) Rimpull is defined as the total tangential force acting on the handwheel (e.g., 200 lb. rimpull requires 100 lb force per hand). This rimpull figure is given for closing/opening conditions. For running conditions (travel from open to closed or vice versa), the rimpull is considerably less. For details, contact the company.

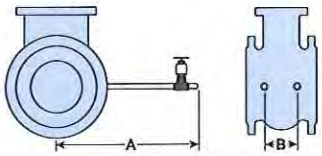
CHAIN WHEELS

Chain wheels are available for all types of Velan cast steel valves. They may be substituted for a plain handwheel or may be used in addition to the existing handwheel.

FLOOR STANDS

Floor stands are available in a number of sizes, and the size to be used depends on the stem size and stem load of the valve.

BYPASSES



AVAILABLE FOR ALL VELAN CAST STEEL VALVES IN ACCORDANCE WITH MSS-SP45 - SERIES A

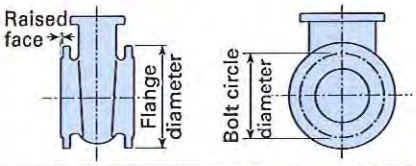
API 600 GLOBE *(Note: Dimensions are in inches)*

SIZE	CLASS 150				CLASS 300				CLASS 600			
in	BYPASS	A	ELBOW	B	BYPASS	A	ELBOW	B	BYPASS	A	ELBOW	B
3	1/2	13.00	1/2	6.38	1/2	11.50	1/2	6.13	1/2	13.00	1/2	8.25
4	1/2	13.00	1/2	7.50	1/2	16.50	1/2	7.00	1/2	15.00	1/2	9.50
6	3/4	11.13	3/4	11.00	3/4	14.75	3/4	11.00	3/4	13.00	3/4	11.00
8	3/4	11.50	3/4	14.00	3/4	13.00	3/4	14.00	3/4	13.00	3/4	11.25
10	1	18.00	1	14.88	1	18	1	15.00	—	—	—	—
12	1	18.00	1	19.00	1	18	1	18.00	—	—	—	—
14	1	18.00	1	19.50	1	18	1	19.50	—	—	—	—
16	1	18.00	1	24.00	1	18	1	24.00	—	—	—	—

API 600 GATE *(Note: Dimensions are in inches)*

SIZE	CLASS 150				CLASS 300				CLASS 600			
in	BYPASS	A	ELBOW	B	BYPASS	A	ELBOW	B	BYPASS	A	ELBOW	B
3	1/2	10.50	1/2	4.75	1/2	12.25	1/2	6.25	1/2	12.31	1/2	6.25
4	1/2	13.00	1/2	5.63	1/2	13.00	1/2	6.50	1/2	14.00	1/2	6.50
6	3/4	14.00	3/4	6.13	3/4	14.00	3/4	9.00	3/4	15.00	3/4	9.00
8	3/4	17.00	3/4	6.81	3/4	17.00	3/4	10.00	3/4	17.38	3/4	10.00
10	1	18.00	1	7.69	1	18.00	1	11.00	1	18.50	1	11.00
12	1	18.00	1	8.13	1	18.00	1	12.50	1	18.50	1	12.50
14	1	23.00	1	9.00	1	18.50	1	16.00	1	18.50	1	19.13
16	1	24.00	1	10.00	1	18.50	1	15.50	1	20.50	1	20.00
18	1	26.63	1	12.00	1	19.50	1	14.00	1	20.50	1	24.00
20	1	26.63	1	12.00	1	19.50	1	16.00	1	20.50	1	24.00
24	1	28.75	1	12.25	1	22.50	1	18.25	1	22.50	1	32.00
30	1	33.63	1	14.00	1	26	1	24.00	1	27	1	36.00
36	1	34.00	1	15.25	1	28	1	50.00	1	30	1	35.00
42	1	32.00	1	18.00	—	—	—	—	—	—	—	—
48	1	38.00	1	22.00	—	—	—	—	—	—	—	—
60	1	44.00	1	24.00	—	—	—	—	—	—	—	—

FLANGES, WEIGHTS & CV FLOW COFFICIENTS



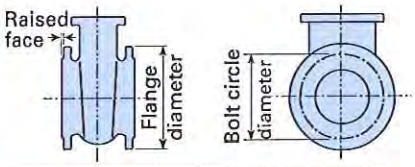
API 600 CAST STEEL VALVES CLASS 150

DRILLED AND FACED AS FOLLOWS: 2–24" ASME B16.5[1]

ASME CLASS	DIMENSIONS IN INCHES						WEIGHT IN LBS.						CV FLOW FLOW COEFFICIENTS		
							GATE		GLOBE		SWING				
	SIZE in	FLANGE DIAM.	BOLT CIRCLE DIAM.	HOLE DIAM.	QTY. HOLES	DIAM. BOLTS	BW	FL	BW	FL	BW	FL	GATE	GLOBE	CHECK
150 1/16 RAISED FACE	2	6.00	4.75	0.75	4	5/8	42	48	48	55	31	40	260	35	95
	2½	7.00	5.50	0.75	4	5/8	50	59	54	58	35	44	420	60	150
	3	7.50	6.00	0.75	4	5/8	67	78	82	102	59	78	625	92	220
	4	9.00	7.50	0.75	8	5/8	97	117	120	152	98	121	1150	180	410
	6	11.00	9.50	0.88	8	3/4	180	198	240	280	179	212	2650	430	950
	8	13.50	11.75	0.88	8	3/4	278	319	405	435	314	360	4850	810	1750
	10	16.00	14.25	1.00	12	7/8	456	515	500	550	513	586	7750	1400	2800
	12	19.00	17.00	1.00	12	7/8	646	738	1050	1200	602	823	11,500	1950	4100
	14	21.00	18.75	1.13	12	1	875	954	1700	1850	765	960	14,000	2500	6200
	16	23.50	21.25	1.13	16	1	1120	1200	2300	2500	1120	1300	19,000	3400	8400
	18	25.00	22.75	1.25	16	1⅛	1485	1570	2640	2850	1450	1660	24,000	4500	11,000
	20	27.50	25.00	1.25	20	1⅛	1825	1910	—	—	1700	2050	31,000	—	13,500
	24	32.00	29.50	1.38	20	1¼	2870	2960	—	—	2900	3300	45,000	—	20,000
	26[1]	34.25	31.75	1.38	24	1¼	3600	3700	—	—	3600	4000	53,000	—	23,500
	28[1]	36.50	34.00	1.38	28	1¼	4400	4500	—	—	4300	5000	62,000	—	28,000
	30[1]	38.75	36.00	1.37	28	1¼	4705	4750	—	—	6300	7000	73,000	—	33,000
	32[1]	41.75	38.50	1.62	28	1½	5800	6000	—	—	—	—	81,000	—	—
	36[1]	46.00	42.75	1.63	32	1½	6500	6850	—	—	8500	9500	108,000	—	48,000
	40[1]	50.75	47.25	1.62	36	1½	8400	9000	—	—	—	—	130,000	—	—
	42[1]	53.00	49.50	1.63	36	1½	10,000	11,000	—	—	—	—	142,000	—	—
	48[1]	59.50	56.00	1.63	44	1½	14,000	15,000	—	—	—	—	190,000	—	—
	54[1]	66.25	62.75	1.88	44	1¾	21,000	23,000	—	—	—	—	238,000	—	—
	60[1]	73.00	69.25	1.88	52	1¾	22,600	26,600	—	—	—	—	300,000	—	—

(1) 30"and up: ASME B16.47 Series A (MSS-SP–44), for Series B (API 605) contact the factory.

FLANGES, WEIGHTS & CV FLOW COFFICIENTS



API 600 CAST STEEL VALVES CLASS 300, 600, 900 & 1500

DRILLED AND FACED AS FOLLOWS: 2–24" ASME B16.5

ASME CLASS	DIMENSIONS IN INCHES						WEIGHT IN LBS.						CV FLOW FLOW COEFFICIENTS		
							GATE		GLOBE		SWING				
	SIZE in	FLANGE DIAM.	BOLT CIRCLE DIAM.	HOLE DIAM.	QTY. HOLES	DIAM. BOLTS	BW	FL	BW	FL	BW	FL	GATE	GLOBE	CHECK
300 1/16 RAISED FACE	2	6.50	5.00	0.75	8	⅝	46	60	45	60	37	45	260	35	95
	2½	7.50	5.88	0.88	8	¾	55	76	63	72	49	57	420	60	150
	3	8.25	6.62	0.88	8	¾	90	115	88	114	70	96	625	92	220
	4	10.00	7.88	0.88	8	¾	136	166	130	171	110	150	1150	180	410
	6	12.50	10.62	0.88	12	¾	245	314	261	337	204	265	2650	430	950
	8	15.00	13.00	1.00	12	¾	415	506	447	565	360	455	4850	810	1750
	10	17.50	15.25	1.13	16	1	646	762	1000	1150	582	650	7750	1325	2800
	12	20.50	17.75	1.25	16	1⅛	900	1100	1300	1550	825	945	11,500	1950	4100
	14	23.00	20.25	1.25	20	1⅛	1392	1720	1800	2100	1200	1350	14,000	2500	6200
	16	25.50	22.50	1.38	20	1¼	1870	2220	2300	2700	1500	1800	19,000	3400	8400
	18	28.00	24.75	1.38	24	1¼	2405	2960	2640	3200	2000	2400	23,500	4500	11,000
	20	30.50	27.00	1.38	24	1¼	3260	3700	—	—	2600	3000	30,000	—	13,500
	24	36.00	32.00	1.63	24	1½	4250	5100	—	—	3000	4050	44,000	—	20,000
	26(1)	38.25	34.50	1.75	28	1⅝	5000	5500	—	—	4000	5000	53,000	—	23,500
	28(1)	40.75	37.00	1.75	28	1⅝	7000	7500	—	—	5000	6000	62,000	—	28,000
	30(1)	43.00	39.25	1.88	28	1¾	8550	9000	—	—	—	—	73,000	—	—
	32(1)	45.25	41.50	2.00	28	1⅞	8200	8800	—	—	—	—	81,000	—	—
	36(1)	50.00	46.00	2.13	32	2	13,500	15,500	—	—	—	—	108,000	—	—
600 1/4 RAISED FACE	2	6.50	5.00	0.75	8	⅝	60	72	60	72	48	52	260	35	95
	2½	7.50	5.88	0.88	8	¾	89	102	89	100	59	87	420	60	150
	3	8.25	6.62	0.88	8	¾	130	157	130	150	96	130	625	92	220
	4	10.75	8.50	1.00	8	⅞	224	275	213	285	167	225	1150	180	410
	6	14.00	11.50	1.13	12	1	394	540	415	515	332	476	2650	430	950
	8	16.50	13.75	1.25	12	1⅛	726	884	1050	1220	525	715	4850	800	1750
	10	20.00	17.00	1.38	16	1⅛	1125	1405	1550	1830	1000	1250	7750	1250	2800
	12	22.00	19.25	1.38	20	1¼	1490	1812	—	—	1500	1750	11,500	—	4100
	14	23.75	20.75	1.50	20	1⅜	2200	2500	—	—	1750	2050	13,000	—	5900
	16	27.00	23.75	1.62	20	1½	3000	3700	—	—	2400	3100	18,000	—	7800
	18	29.25	25.75	1.75	20	1⅝	4000	4800	—	—	3200	4000	22,000	—	9900
	20	32.00	28.50	1.75	24	1⅝	5600	6800	—	—	4500	6100	27,000	—	12,000
	24	37.00	33.00	2.00	24	1⅞	8000	9800	—	—	6400	7600	40,000	—	18,000
	30(1)	44.50	40.25	2.12	28	2	12,000	14,000	—	—	—	—	52,000	—	—
	36(1)	51.75	47.00	2.62	28	2½	17,000	19,500	—	—	—	—	72,000	—	—
900 1/4 RAISED FACE	2	8.50	6.50	1.00	8	⅞	150	185	—	—	135	165	230	—	80
	2½	9.63	7.50	1.12	8	1	235	270	—	—	175	210	560	—	200
	3	9.50	7.50	1.00	8	⅞	235	270	—	—	175	210	560	—	200
	4	11.50	9.25	1.25	8	1⅛	270	355	—	—	245	330	1050	—	380
	6	15.00	12.50	1.25	12	1⅛	830	980	—	—	485	635	2400	—	875
	8	18.50	15.50	1.50	12	1⅜	1220	1500	—	—	700	900	4200	—	1325
	10	21.50	18.50	1.50	16	1⅜	2000	2400	—	—	—	—	6750	—	1525
	12	24.00	21.00	1.50	20	1⅜	3170	3670	—	—	—	—	9700	—	—
	14	25.25	22.00	1.62	20	1½	3900	4460	—	—	—	—	12,000	—	—
	16	27.75	24.25	1.75	20	1⅝	5570	6250	—	—	—	—	16,000	—	—
1500 1/4 RAISED FACE	2	8.50	6.50	1.00	8	⅞	150	185	—	—	135	165	230	—	80
	2½	9.63	7.50	1.12	8	1	255	325	—	—	205	275	510	—	185
	3	10.50	8.00	1.25	8	1⅛	255	325	—	—	205	275	510	—	185
	4	12.25	9.50	1.37	8	1¼	430	520	—	—	340	430	925	—	330
	6	15.50	12.50	1.50	12	1⅜	1045	1205	—	—	805	965	2100	—	750
	8	19.00	15.50	1.75	12	1⅝	1850	2550	—	—	1350	2050	3650	—	1325
	10	23.00	19.00	2.00	12	1⅞	2600	3300	—	—	—	—	5850	—	—

(1) 30"and up: ASME B16.47 Series A (MSS-SP–44), for Series B (API 605) contact the factory.

ENGINEERING DATA

PRESSURE-TEMPERATURE RATINGS
STANDARD CLASS VALVES, FLANGED AND BUTT WELD END

NOTE: FOR SPECIAL CLASS VALVES, WHICH HAVE HIGHER RATINGS CONTACT THE COMPANY.

CAST

ASTM MATERIAL STANDARD–TO ASME B16.34

ASME Boiler and Pressure Vessel Code Section II materials that also meet the requirements of the listed ASTM specifications.

psig/°F (bar/°C) CLASSES 150–4500

A216 Gr. WCB

TEMP.	WORKING PRESSURE by classes, psig						
°F	150	300	600	900	1500	2500	4500
100	285	740	1480	2220	3705	6170	11110
200	260	675	1350	2025	3375	5625	10120
300	230	655	1315	1970	3280	5470	9845
400	200	635	1270	1900	3170	5280	9505
500	170	600	1200	1795	2995	4990	8980
600	140	550	1095	1640	2735	4560	8210
650	125	535	1075	1610	2685	4475	8055
700	110	535	1065	1600	2665	4440	7990
750	95	505	1010	1510	2520	4200	7560
800	80	410	825	1235	2060	3430	6170
850[1]	65	270	535	805	1340	2230	4010
900[1]	50	170	345	515	860	1430	2570
950[1]	35	105	205	310	515	860	1545
1000[1]	20	50	105	155	260	430	770

(1) Permissible, but not recommended for prolonged usage above 800°F (427°C).

TEMP.	GAGE WORKING PRESSURE BY RATING NUMBER, bar						
°C	PN 20	PN 50	PN 100	PN 150	PN 250	PN 420	PN 760
38	19.6	51.1	102.1	153.2	255.3	425.5	765.8
50	19.2	50.1	100.2	150.2	250.4	417.3	751.1
100	17.7	46.4	92.8	139.1	231.9	386.5	695.7
150	15.8	45.2	90.5	135.7	226.1	376.9	678.4
200	14.0	43.8	87.6	131.5	219.1	365.2	657.3
250	12.1	41.7	83.4	125.2	208.6	347.7	625.8
300	10.2	38.7	77.5	116.2	193.7	322.8	581.0
350	8.4	37.0	73.9	110.9	184.8	308.0	554.4
375	7.4	36.5	72.9	109.4	182.3	303.9	547.0
400	6.5	34.5	69.0	103.5	172.5	287.5	517.5
425	5.6	28.8	57.5	86.3	143.8	239.6	431.4
450[1]	4.7	20.0	40.1	60.1	100.2	166.9	300.5
475[1]	3.7	13.5	27.1	40.6	67.7	112.9	203.2
500[1]	2.8	8.8	17.6	26.4	44.0	73.3	131.9
525[1]	1.9	5.2	10.4	15.5	25.9	43.2	77.7
540[1]	1.3	3.3	6.5	9.8	16.3	27.2	48.9

A217 Gr. WC6

TEMP.	WORKING PRESSURE by classes, psig						
°F	150	300	600	900	1500	2500	4500
100	290	750	1500	2250	3750	6250	11250
200	260	750	1500	2250	3750	6250	11250
300	230	720	1445	2165	3610	6015	10830
400	200	695	1385	2080	3465	5775	10400
500	170	665	1330	1995	3325	5540	9965
600	140	605	1210	1815	3025	5040	9070
650	125	590	1175	1765	2940	4905	8825
700	110	570	1135	1705	2840	4730	8515
750	95	530	1065	1595	2660	4430	7970
800	80	510	1015	1525	2540	4230	7610
850	65	485	975	1460	2435	4060	7305
900	50	450	900	1350	2245	3745	6740
950	35	320	640	955	1595	2655	4785
1000	20	215	430	650	1080	1800	3240
1050	20[1]	145	290	430	720	1200	2160
1100	20[1]	95	190	290	480	800	1440

(1) For welding end valves only. Flanged end ratings terminate at 1000°F (538°C).

TEMP.	GAGE WORKING PRESSURE BY RATING NUMBER, bar						
°C	PN 20	PN 50	PN 100	PN 150	PN 250	PN 420	PN 760
38	20.0	51.7	103.4	155.2	258.6	431.0	775.9
50	19.5	51.7	103.4	155.2	258.6	431.0	775.9
100	17.7	51.4	103.0	154.5	257.4	429.1	772.4
150	15.8	49.6	99.6	149.2	248.8	414.5	746.3
200	13.9	48.1	95.9	143.9	239.8	399.6	719.6
250	12.1	46.2	92.4	138.6	231.0	385.0	692.6
300	10.2	42.9	85.8	128.6	214.4	357.2	642.8
350	8.3	40.3	80.3	120.8	201.1	335.4	603.5
375	7.4	38.9	77.6	116.6	194.1	323.3	582.0
400	6.5	36.5	73.3	109.8	183.1	305.0	548.7
425	5.6	35.2	70.2	105.4	175.7	292.6	526.3
450	4.6	33.7	67.7	101.4	169.1	281.9	507.2
475	3.7	31.7	63.4	95.1	158.2	263.9	475.0
500	2.8	25.3	50.6	75.7	126.1	210.1	378.6
525	1.9	18.1	36.3	54.5	90.8	151.2	272.5
550	1.4[1]	12.7	25.4	38.1	63.6	105.9	190.7
575	1.4[1]	8.8	17.7	26.3	44.0	73.4	132.1
600[2]	1.4[1]	6.0	12.0	18.3	30.3	50.5	90.8

(2) Not to be used over 593°C.

A217 Gr. WC9

TEMP.	WORKING PRESSURE by classes, psig						
°F	150	300	600	900	1500	2500	4500
100	290	750	1500	2250	3750	6250	11250
200	260	750	1500	2250	3750	6250	11250
300	230	730	1455	2185	3640	6070	10925
400	200	705	1410	2115	3530	5880	10585
500	170	665	1330	1995	3325	5540	9965
600	140	605	1210	1815	3025	5040	9070
650	125	590	1175	1765	2940	4905	8825
700	110	570	1135	1705	2840	4730	8515
750	95	530	1065	1595	2660	4430	7970
800	80	510	1015	1525	2540	4230	7610
850	65	485	975	1460	2435	4060	7305
900	50	450	900	1350	2245	3745	6740
950	35	375	755	1130	1885	3145	5665
1000	20	260	520	780	1305	2170	3910
1050	20[1]	175	350	525	875	1455	2625
1100	20[1]	110	220	330	550	915	1645

(1) For welding end valves only. Flanged end ratings terminate at 1000°F (538°C).

TEMP.	GAGE WORKING PRESSURE BY RATING NUMBER, bar						
°C	PN 20	PN 50	PN 100	PN 150	PN 250	PN 420	PN 760
38	20.0	51.7	103.4	155.2	258.6	431.0	775.9
50	19.5	51.7	103.4	155.2	258.6	431.0	775.9
100	17.7	51.6	103.1	154.6	257.7	429.5	773.2
150	15.8	50.3	100.3	150.6	250.9	418.3	753.0
200	13.9	48.8	97.5	146.3	244.1	406.6	731.9
250	12.1	46.3	92.7	139.1	231.9	386.3	695.0
300	10.2	42.9	85.8	128.6	214.4	357.2	642.8
350	8.3	40.3	80.3	120.8	201.1	335.4	603.5
375	7.4	38.9	77.6	116.6	194.1	323.3	582.0
400	6.5	36.5	73.3	109.8	183.1	305.0	548.7
425	5.6	35.2	70.2	105.4	175.7	292.6	526.3
450	4.6	33.7	67.7	101.4	169.1	281.9	507.2
475	3.7	31.7	63.4	95.1	158.2	263.9	475.0
500	2.8	27.7	55.7	83.4	139.0	231.8	417.4
525	1.9	21.6	43.3	64.9	108.4	180.6	325.3
550	1.4[1]	15.4	30.7	46.1	77.0	127.9	230.7
575	1.4[1]	10.6	21.1	31.7	52.7	87.7	158.1
600[2]	1.4[1]	6.9	13.8	20.7	34.6	57.4	103.2

(2) Not to be used over 593°C.

ENGINEERING DATA

A217 Gr. C5

TEMP.	WORKING PRESSURE by classes, psig						
°F	150	300	600	900	1500	2500	4500
100	290	750	1500	2250	3750	6250	11250
200	260	745	1490	2235	3725	6205	11170
300	230	715	1430	2150	3580	5965	10740
400	200	705	1410	2115	3530	5880	10585
500	170	665	1330	1995	3325	5540	9965
600	140	605	1210	1815	3025	5040	9070
650	125	590	1175	1765	2940	4905	8825
700	110	570	1135	1705	2840	4730	8515
750	95	530	1055	1585	2640	4400	7920
800	80	510	1015	1525	2540	4230	7610
850	65	485	965	1450	2415	4030	7250
900	50	370	740	1110	1850	3085	5555
950	35	275	550	825	1370	2285	4115
1000	20	200	400	595	995	1655	2985
1050	20[1]	145	290	430	720	1200	2160
1100	20[1]	100	200	300	495	830	1490
1150	20[1]	60	125	185	310	515	925
1200	15[1]	35	70	105	170	285	515

TEMP.	GAGE WORKING PRESSURE BY RATING NUMBER, bar						
°C	PN 20	PN 50	PN 100	PN 150	PN 250	PN 420	PN 760
38	20.0	51.7	103.4	155.2	258.6	431.0	775.9
50	19.5	51.7	103.3	155.0	258.6	430.3	774.6
100	17.7	51.1	102.3	153.4	257.2	425.9	766.8
150	15.8	49.3	98.6	148.2	246.8	411.2	740.5
200	13.9	48.7	97.4	146.1	243.7	406.0	730.8
250	12.1	46.3	92.7	139.1	231.9	386.3	695.0
300	10.2	42.9	85.8	128.6	214.4	357.2	642.8
350	8.3	40.3	80.3	120.8	201.1	335.4	603.5
375	7.4	38.9	77.5	116.4	193.9	323.0	581.5
400	6.5	36.5	72.6	109.2	181.8	303.0	545.4
425	5.6	35.2	70.1	105.4	175.6	292.4	526.1
450	4.6	33.7	67.1	100.8	167.9	280.1	504.0
475	3.7	27.6	55.0	82.6	137.7	229.7	413.5
500	2.8	21.3	42.6	64.0	106.4	177.4	319.5
525	1.9	16.1	32.3	48.3	80.5	134.1	241.7
550	1.4[1]	12.1	24.3	36.0	60.3	100.3	180.8
575	1.4[1]	9.0	17.9	26.6	44.3	74.1	133.2
600	1.4[1]	6.2	12.6	18.8	31.1	52.0	93.4
625	1.3[1]	3.9	8.1	12.0	20.0	33.3	59.9
650	1.0[1]	2.4	4.8	7.2	11.7	19.7	35.5

(1) For welding end valves only. Flanged end ratings terminate at 1000°F (538°C).

A217 Gr. C12

TEMP.	WORKING PRESSURE by classes, psig						
°F	150	300	600	900	1500	2500	4500
100	290	750	1500	2250	3750	6250	11250
200	260	750	1500	2250	3750	6250	11250
300	230	730	1455	2185	3640	6070	10925
400	200	705	1410	2115	3530	5880	10585
500	170	665	1330	1995	3325	5540	9965
600	140	605	1210	1815	3025	5040	9070
650	125	590	1175	1765	2940	4905	8825
700	110	570	1135	1705	2840	4730	8515
750	95	530	1065	1595	2660	4430	7970
800	80	510	1015	1525	2540	4230	7610
850	65	485	975	1460	2435	4060	7305
900	50	450	900	1350	2245	3745	6740
950	35	375	755	1130	1855	3145	5655
1000	20	255	505	760	1270	2115	3805
1050	20[1]	170	345	515	855	1430	2570
1100	20[1]	115	225	340	565	945	1695
1150	20[1]	75	150	225	375	630	1130
1200	20[1]	50	105	155	255	430	770

TEMP.	GAGE WORKING PRESSURE BY RATING NUMBER, bar						
°C	PN 20	PN 50	PN 100	PN 150	PN 250	PN 420	PN 760
38	20.0	51.7	103.4	155.2	258.6	431.0	775.9
50	19.5	51.7	103.4	155.2	258.6	431.0	775.9
100	17.7	51.6	103.1	154.6	257.7	429.5	773.2
150	15.8	50.3	100.3	150.6	250.9	418.3	753.0
200	13.9	48.8	97.5	146.3	244.1	406.6	731.9
250	12.1	46.3	92.7	139.1	231.9	386.3	695.0
300	10.2	42.9	85.8	128.6	214.4	357.2	642.8
350	8.3	40.3	80.3	120.8	201.1	335.4	603.5
375	7.4	38.9	77.6	116.6	194.1	323.3	582.0
400	6.5	36.5	73.3	109.8	183.1	305.0	548.7
425	5.6	35.2	70.2	105.4	175.7	292.6	526.3
450	4.6	33.7	67.7	101.4	169.1	281.9	507.2
475	3.7	31.7	63.4	95.1	158.2	263.9	475.0
500	2.8	27.7	55.7	83.4	139.0	231.8	417.0
525	1.9	21.4	42.8	64.1	107.1	178.6	321.1
550	1.4[1]	15.0	30.0	45.0	75.0	125.1	225.0
575	1.4[1]	0.4	21.0	31.4	52.1	87.2	156.7
600	1.4[1]	7.2	14.3	21.5	35.8	59.9	107.5
625	1.4[1]	4.9	9.9	14.8	24.7	41.5	74.5
650	1.4[1]	3.4	7.2	10.7	17.6	29.7	53.1

(1) For welding end valves only. Flanged end ratings terminate at 1000°F (538°C).

A351 Gr. CF8M[3], A351 Gr. CF3M[2]

TEMP.	WORKING PRESSURE BY CLASSES, psig						
°F	150	300	600	900	1500	2500	4500
100	275	720	1440	2160	3600	6000	10800
200	235	620	1240	1860	3095	5160	9280
300	215	560	1120	1680	2795	4660	8390
400	195	515	1025	1540	2570	4280	7705
500	170	480	955	1435	2390	3980	7165
600	140	450	900	1355	2255	3760	6770
650	125	445	890	1330	2220	3700	6660
700	110	430	870	1305	2170	3620	6515
750	95	425	855	1280	2135	3560	6410
800	80	420	845	1265	2110	3520	6335
850	65	420	835	1255	2090	3480	6265
900	50	415	830	1245	2075	3460	6230
950	35	385	775	1160	1930	3220	5795
1000	20	350	700	1050	1750	2915	5245
1050[3]	20[1]	345	685	1030	1720	2865	5155
1100[3]	20[1]	305	610	915	1525	2545	4575
1150[3]	20[1]	235	475	710	1185	1970	3550
1200[3]	20[1]	185	370	555	925	1545	2775
1250[3]	20[1]	145	295	440	735	1230	2210
1300[3]	20[1]	115	235	350	585	970	1750
1350[3]	20[1]	95	190	290	480	800	1440
1400[3]	20[1]	75	150	225	380	630	1130
1450[3]	20[1]	60	115	175	290	485	875
1500[3]	20[1]	40	85	125	205	345	620

TEMP.	GAGE WORKING PRESSURE BY RATING NUMBER, bar						
°C	PN 20	PN 50	PN 100	PN 150	PN 250	PN 420	PN 760
38	19.0	49.7	99.3	149.0	248.3	413.8	744.8
50	18.3	48.1	96.3	144.4	240.6	401.0	721.9
100	16.1	42.3	84.6	126.8	211.0	351.7	633.2
150	14.8	38.6	77.1	115.7	192.4	320.8	577.7
200	13.6	35.8	71.2	107.0	178.5	297.2	535.2
250	12.0	33.5	66.8	100.3	167.0	278.2	500.8
300	10.2	31.6	63.1	95.0	158.1	263.6	474.6
350	8.3	30.4	61.0	91.3	152.3	253.9	456.9
375	7.4	29.6	59.9	89.7	149.3	249.1	448.3
400	6.5	29.3	59.0	88.2	147.2	245.4	441.9
425	5.6	29.0	58.3	87.3	145.6	242.9	437.2
450	4.6	29.0	57.7	86.7	144.3	240.4	432.8
475	3.7	28.7	57.3	86.1	143.4	239.0	430.3
500	2.8	27.3	54.8	82.1	136.7	228.0	410.5
525	1.9	25.2	50.6	75.9	126.4	210.7	379.2
550[3]	1.4[1]	24.0	47.8	71.8	119.8	199.5	359.0
575[3]	1.4[1]	22.8	45.4	68.3	114.1	190.1	341.9
600[3]	1.4[1]	19.9	39.9	59.7	99.5	166.0	298.6
625[3]	1.4[1]	15.7	31.7	47.4	79.2	131.7	237.3
650[3]	1.4[1]	12.6	25.3	37.9	63.2	105.7	189.8
675[3]	1.4[1]	10.1	20.6	30.8	51.4	86.1	154.8
700[3]	1.4[1]	8.3	16.9	25.1	42.0	69.8	125.8
725[3]	1.4[1]	6.9	13.9	21.1	35.0	58.2	104.9
750[3]	1.4[1]	5.7	11.3	17.1	28.7	47.7	85.7
775[3]	1.4[1]	4.6	9.0	13.7	22.8	38.1	68.4
800[3]	1.4[1]	3.5	7.0	10.6	17.4	29.2	52.6

(1) For welding end valves only. Flanged end ratings terminate at 1000°F (538°C).
(2) CF3M: Not to be used over 850°F (454°C).
(3) At temperatures over 1000°F (538°C), use only when the carbon content is 0.04% or higher.

SPECIFICATION OF CAST VALVE MATERIALS

BODY AND BONNET, WEDGE–DISC–PACKING FLANGE

DESCRIPTION		CARBON STEEL			ALLOY STEEL				STAINLESS STEEL				
					1¼ CR ½ Mo	2¼ CR-1 Mo	5 CR	9 CR-1Mo	13 CR		316	316L	304
	ASTM DESIGNATION	A216 WCB	A352 LCB	A352 LCC	A217 WC6	A217 WC9	A217 C5	A217 C12	A217 CA15	A296 CA40	A351 CF8M	A351 CF3M	A351 CF8
COMPOSITION %	Carbon	0.25(1)	0.25(1)	0.25	0.20	0.18	0.20	0.20	0.15	0.10-0.40	0.08	0.03	0.08
	Manganese	1.00	1.00	1.20	0.50-0.80	0.40-0.70	0.40-0.70	0.35-0.65	1.00	1.00	1.50	1.50	1.50
	Phosphorus	0.04	0.04	0.04	0.04	0.40	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Sulphur	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.040	0.040
	Silicon	0.60	0.60	0.60	0.60	0.60	0.75	1.00	1.50	1.50	1.50	1.50	2.00
	Nickel	0.50	—	0.50	0.50	0.50	0.50	0.50	1.00	1.00	9.00-12.00	9.00-13.00	8.00-11.00
	Chromium	0.50	—	0.50	1.00-1.50	2.00-2.75	4.00-6.50	8.00-10.00	11.5-14.0	11.5-14.0	18.00-21.00	17.00-21.00	18.00-21.00
	Molybdenum	0.20	—	0.20	0.45-0.65	0.90-1.20	0.45-0.65	0.90-1.20	0.50	0.50	2.0-3.00	2.0-3.00	0.50
	Copper	0.30	0.30	0.30	0.50	—	0.50	0.50	—	—	—	—	—
Heat Treat.		Anneal	Quench and Temper		Temper	Temper	Temper	Temper	Solution anneal				
Tensile psi min.		70,000	65,000-90,000	70,000-95,000	70,000-90,000	70,000-90,000	90,000-115,000	90,000-115,000	90,000-115,000	100,000	70,000	70,000	70,000
Yield psi min.		36,000	35,000	40,000	40,000	40,000	60,000	60,000	65,000	70,000	30,000	30,000	30,000
Elong. % Min.		22	24	22	20	20	18	18	18	15	30	30	35
R. Area % Min.		35	35	35	35	35	35	35	30	25	—	—	—
Hardness HB		187 max.	197 max.	200 max.	207 max.	207 max.	241 max.	241 max.	327-381	475 min.	—	187 max.	—
Parts		BODIES–BONNETS–LARGE DISCS							DISC MATERIALS		BODIES–BONNETS–DISCS		

(1) Velan standard: 0.25 or less.

TRIM SPECIFICATION

		BAR STOCK								CAST		
		CR 13		Stainless Steels			Monel		Hastelloy	Monel	Stellite 6	Austenitic Ductile
	ASTM DESIGNATION	A 479 410*	A 582 416*	A 479 316 St. Hard.	A 479 316	A 564 630	B 164 Monel	AMS 4676A K-Monel	B574 N 10276	A 494 M-25S	AMS 5387 A	A 439 D-2C
COMPOSITION %	Carbon	0.15	0.15	0.08	0.08	0.07	0.3	0.25	0.010	0.25	0.9–1.4	2.90
	Manganese	1.00	1.25	2.00	2.00	1.00	2.0	1.50	1.0	1.50	1.0	1.80–2.40
	Phosphorus	0.040	0.06	0.045	0.045	0.040	–	0.02	0.04	0.03	0.04	0.08
	Sulphur	0.030	0.15 min.	0.030	0.030	0.030	0.024	0.010	0.03	0.03	0.04	–
	Silicon	1.00	1.00	1.00	1.00	1.00	0.5	1.00	0.08	3.5-4.5	1.5	1.00–3.00
	Nickel	–	–	10.00–14.00	10.00–14.00	3.00–5.00	63.0	63.00–70.00	Balance	Balance	3.0	21.00–24.00
	Chromium	11.50–13.50	12.00–14.00	16.00–18.00	16.00–18.00	15.00–17.50	–	–	14.5–16.5	–	27.0–31.0	0.50
	Molybdenum	–	–	2.00–3.00	2.00–3.00	–	–	–	15.0–17.0	–	1.5	–
	Copper	–	–	–	–	3.00–5.00	28.0–34.0	Balance	–	27.0-33.0	–	–
	Aluminum	–	–	–	–	–	3.00	–	3.00	–	–	–
	Cobalt	–	–	–	–	–	–	–	–	–	Balance	–
	Tungsten	–	–	–	–	–	–	–	–	–	3.5-5.5	–
	Iron	–	–	–	–	–	–	–	–	3.50	3.0	–
Special Condition		Temper	Hard	Level 2	–	–	Hot worked	Hot Fin.	–	Age Hard.	–	–
Heat Treat.		Class 2	Hard Temper	Sol. Ann.	Sol. Ann.	H 1100	–	–	–	–	–	–
Tensile psi min.		110,000	–	95,000	75,000	140,000	80,000	140,000	100,000	–	130,000	58,000
Yield psi min.		85,000	–	75,000	30,000	115,000	40,000	100,000	41,000	–	–	28,000
Elong. % min.		15	–	25	30	14	30	20	40	–	1	20
R. Area % min.		45	–	40	40	45	–	–	–	–	–	–
Hardness HB		269 max.	293–352	–	–	302 min.	–	326 min.	–	300 min.	344 min.	121–171

** 13 CR or Monel trim also available in soft form (less than 237 HB). Non-cobalt hardfacing also available.*

SOUR SERVICE VALVES

To meet **NACE STANDARD MR0175** Velan manufactures the complete range of valves shown in this catalog in compliance with NACE standard MR0175. Trim materials must be selected by customers from table based on experience in corrosion resistance against sulphides (sour gas) found in processing crude oil.

For trim material (wedge/disc surface, seat surface, stem) see page 37.

TRIM	
NA, ND, NE, NF:	B7M / 2HM RC. 22 MAX.
NB, NC, NN:	B7M / 2HM OR B8M / 8

CAST STEEL GATE, GLOBE & CHECK VALVES

Type of Connection	Size of Connection			Pressure Rating	Type		Body/Bonnet Style			Body Material		Trim Material	
A	B			C	D		E			F		G	
F	0	8	—	0	1	1	4	C	—	1	3	S	X
e.g.: F	1	0	—	0	0	6	4	C	—	0	2	T	Y

Example: *Flanged 3" class 150 cast carbon steel full bore gate valve with TY trim.*

The figure numbers shown on this key are designed to cover essential features of Velan valves.
Please use figure numbers to ensure prompt and accurate processing of your order.
A detailed description must accompany any special orders.

A TYPE OF CONNECTION

- A - Special
- B - Butt weld
- C - Combination
- D - DIN flanged
- E - Welded stubs
- F - Flanged B16.5 (B16.47 series A)
- P - Flanged B16.47 series B (API 605)
- R - Flanged ring joint
- U - Undrilled flanges
- X - Butt weld (intermediate class)

B SIZE OF CONNECTION

Customers have the choice of specifying valve size as part of the valve figure number (**B**) using the numbers below, or indicating valve size separately.

EXAMPLES:
F10-0064C-02TY (valve size is part of figure number)
3"F-0064C-02TY (valve size is shown separately)

08 - 2" (50 mm)	16 - 10" (250 mm)	26 - 26" (650 mm)	44 - 44" (1100mm)
09 - 2½" (65 mm)	18 - 12" (300 mm)	28 - 28" (700 mm)	46 - 46" (1150 mm)
10 - 3" (80 mm)	19 - 14" (350 mm)	30 - 30" (750 mm)	48 - 48" (1200 mm)
11 - 3½" (90 mm)	20 - 16" (400 mm)	32 - 32" (800 mm)	54 - 54" (1350 mm)
12 - 4" (100 mm)	21 - 18" (450 mm)	34 - 34" (850 mm)	60 - 60" (1500 mm)
13 - 5" (125 mm)	22 - 20" (500 mm)	36 - 36" (900 mm)	99 - Special
14 - 6" (150 mm)	23 - 22" (550 mm)	40 - 40" (1000 mm)	
15 - 8" (200 mm)	24 - 24" (600 mm)	42 - 42" (1050 mm)	

C PRESSURE RATING

0 - 150 | 1 - 300 | 2 - 600 | 3 - 1500 | 7 - 900

D VALVE TYPE

- 01 - Flow control
- 06 - Full port gate
- 07 - Stop globe
- 08 - Stop check
- 09 - Needle
- 11 - Swing check
- 99 - Special

E BODY / BONNET STYLE

4 - Vertical

- A - Special
- C - Bolted bonnet (cast)
- E - Extended bonnet (cryogenic)
- V - Cast bolted bonnet bellows seal

F BODY MATERIAL

01 - Special	09 - C12	19 - Monel M35	31 - LCC
02 - WCB	11 - CF8	23 - Alloy 20	34 - C12A (F91)
03 - WC1	12 - CF3	25 - LCB	38 - LC1
04 - C5	13 - CF8M	27 - LC3	39 - LC2
05 - WC6	14 - CF3M	28 - CG8M	46 - GS-C25N
06 - WC9	15 - CF8C	29 - CG3M	

G TRIM

CODE		WEDGE/DISC SURFACE[1]	SEAT SURFACE[1]	STEM	API Number	If applicable BELLOWS[2]
MS	STANDARD	Stellite 6[3]	Stellite 6[3]	316		321
MY	STANDARD	CF8M or 316	Stellite 6[3]	316	12	321
TS	STANDARD	Stellite 6[3]	Stellite 6[3]	13 CR (410)[4]	5	321
TY	STANDARD	13 CR (410 or CA15)	Stellite 6[3]	13 CR (410)	8	
NA	NACE SERVICE[6]	13 CR (410 or CA15) HRC 22 max	Stellite 6[3]	13 CR (410) HRC 22 max.	8[6]	
NB	NACE SERVICE[6]	CF8M	Stellite 6[3]	316	12[6]	321
NC	NACE SERVICE[6]	Monel	Stellite 6[3]	Monel	11[6]	Hastelloy C
ND	NACE SERVICE[6]	Stellite 6[3]	Stellite 6[3]	630 (H1150M)		
NE	NACE SERVICE[6]	Stellite 6[3]	Stellite 6[3]	13 CR (410) HRC 22 max.	5[6]	
NF	NACE SERVICE[6]	Stellite 6[3]	Stellite 6[3]	Same as Body		
NG	NACE SERVICE[6]	Stellite 6[3]	Stellite 6[3]	316		321
NN	NACE SERVICE[6]	CF8M	Stellite 6[3]	316		IN 625
NX	NACE SERVICE[6]	Monel	Monel	Monel		
AS		Stellite 6[3]	Stellite 6[3]	321		321
AY		CF8C/F321	Stellite 6[3]	321		321
CC		Alloy 20	Alloy 20	Alloy 20	13	
ES		Stellite 6[3]	Stellite 6[3]	347		
EY		CF8C/F347	Stellite 6[3]	347		
HC		Hastelloy C	Stellite 6[3]	Hastelloy C		Hastelloy C
MF		CF8M or 316 w/ Teflon insert[5]	Stellite 6[3]	316		
MH		Stellite 6[3]	Stellite 6[3]	316		Hastelloy C
MN		Stellite 6[3]	Stellite 6[3]	316		IN 625
MX		CF8M	316	316	10	
TF		13 CR (410 or CA15) w/ Teflon insert[5]	Stellite 6[3]	13 CR (410)		
TH		Stellite 6[3]	Stellite 6[3]	13 CR (410)[4]		Hastelloy C
TN		Stellite 6[3]	Stellite 6[3]	13 CR (410)[4]		IN 625
XS		Stellite 6[3]	Stellite 6[3]	Monel		
XX		Monel	Monel	Monel	9	
XY		Monel	Stellite 6[3]	Monel	11	
SX[7]	API 603	Same as body	Integral	Same as body	10	
GX[7]	API 603	Same as body	Integral	Same as body	10	
SY[7]	API 603	Same as body	Stellite 6[3]	316	12	
GY[7]	API 603	Same as body	Stellite 6[3]	316	12	
GS	API 603	Stellite 6[3]	Integral	316		
SB[7]	API 603	Bronze	Integral	316		

(1) Base material is either the same as the body or solid trim at manufacturer's option.
(2) Bellows material shown as standard, Inconel can be used in lieu of 321 and Hastelloy C in lieu of Inconel, where design and/or pressure class applicable.
(3) Stellite 6 or Stellite 21 based on material or application at manufacturer's option.
(4) 616HT Manufacturer's Std. (F91 and C12A only).
(5) Inserts may be in seat or wedge at manufacturer's option.
(6) NACE service valves are supplied with all materials conforming to NACE MR0175. (including bolting with max. hardness of RC22).
(7) SB, SX, SY PTFE gasket and packing GS, GX, GY Graphite gasket and packing.

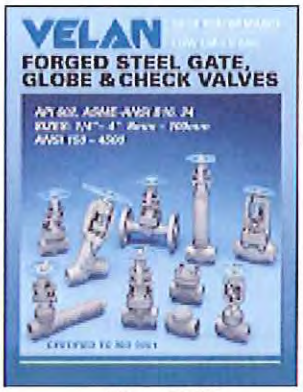
Note: *For a more detailed list of available trims, contact the factory or visit our web site at www.velan.com*

THE MOST COMPREHENSIVE LINE OF INDUSTRIAL FORGED AND CAST STEEL, GATE, GLOBE, CHECK, BALL, KNIFE GATE AND BUTTERFLY VALVES

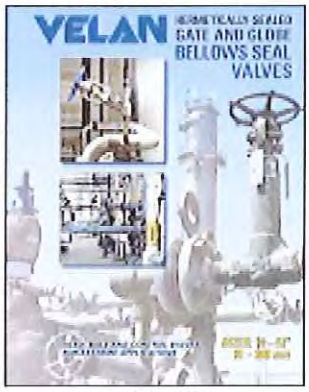
ASME Pressure Classes 150–4500 in Carbon, Alloy and Stainless Steel

VEL-PS

VEL-BG

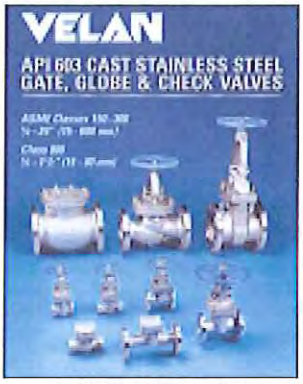


VEL-SFV



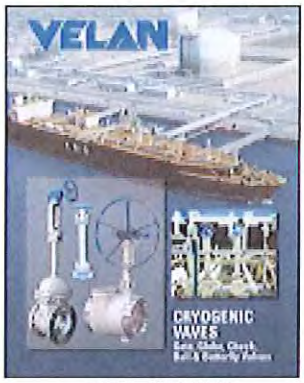
VEL-BS

VEL-PRO-CV

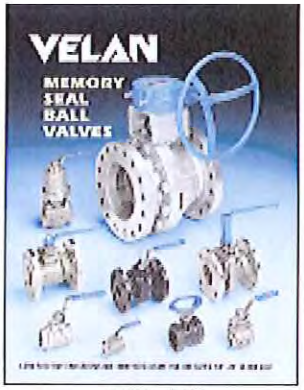


VEL-API-603

VEL-KGV



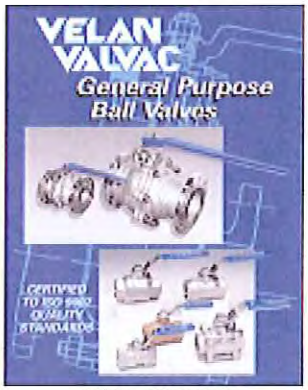
VEL-CRYO



VEL-BV

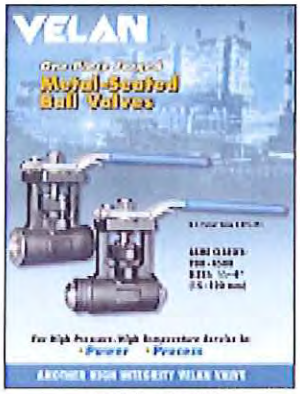
VEL-UB

VEL-TE

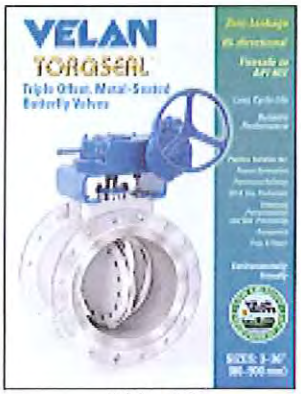


VEL-GP2BV

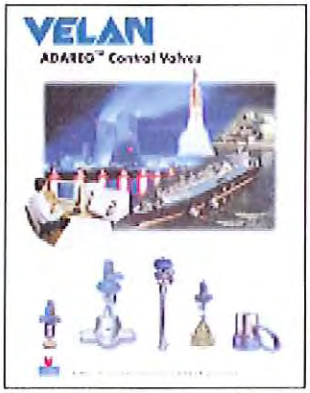
VEL-MS



VEL-PBV



VEL-BF



VEL-ADCV

Printed in Canada

VEL-CSV-2002

PSX:DIRECT DRIVE

NITRILE

OIL-RESISTANT PIPE-TO-MANHOLE CONNECTOR

What It Is

PSX:Direct Drive - Nitrile is a high-performance flexible pipe- to-manhole connector that combines easy installation and proven watertight performance with the ability to resist common underground contaminants, including most hydrocarbons and many mixed chemistries

How It Works

PSX:Direct Drive - Nitrile
has superior materials and technology

- Specially developed synthetic nitrile rubber is continuously tested and lab-certified
- Power Sleeve made from tempered Series 304 stainless steel
- Installation Mechanism made from Series 300 stainless steel
- Installation Mechanism is infinitely adjustable
- Installation tools are calibrated and certified
- Take-up clamps made from Series 304 stainless steel with quick-adjusting screws

How It Performs

PSX:Direct Drive - Nitrile *meets or exceeds all requirements of the following Specifications and/or Test Methods:*

ASTM C 923
ASTM C 443 (Oil Resistance)
ASTM C 1244
ASTM C 1478
ASTM F 2510

TYPICAL TEST RESULTS for PSX:Direct Drive - Nitrile (as in ASTM C 923, C 1478, and C 443)

Test	ASTM Test Method	Test Requirements	Typical Result
CHEMICAL RESISTANCE; 1N SULFURIC ACID and 1N HYDROCHLORIC ACID	D 534, AT 22ºC FOR 48 HRS	NO WEIGHT LOSS NO WEIGHT LOSS	NO WEIGHT LOSS NO WEIGHT LOSS
TENSILE STRENGTH	D 412	1200 PSI, MIN.	1403 PSI
ELONGATION AT BREAK	D 412	350%, MIN.	563%
HARDNESS	D 2240 (SHORE A DUROMETER)	±5 FROM THE MANUFACTURER'S SPECIFIED HARDNESS	<2
ACCELERATED OVEN-AGING	D 573, 70± 1ºC FOR 7 DAYS	DECREASE OF 15%, MAX. OF ORIGINAL TENSILE STRENGTH, DECREASE OF 20%, MAX. OF ELONGATION	-3% TENSILE CHANGE, -10% ELONGATION CHANGE
COMPRESSION TEST	D 395, METHOD B, AT 70ºC FOR 22 HRS	DECREASE OF 25%, MAX. OF ORIGINAL DEFLECTION	10%
WATER ABSORPTION	D 471 IMMERSE 0.75 BY 2-IN.SPECIMEN IN DISTILLED WATER AT 70ºC FOR 48 hrs	INCREASE OF 10%, MAX. OR ORIGINAL BY WEIGHT	2.70%
OZONE RESISTANCE	D 1171	RATING 0	PASS
LOW-TEMP, BRITTLE POINT	D 746	NO FRACTURE AT -40ºC	PASS
TEAR RESISTANCE	D624, METHOD B	200 LBF/IN (MIN.)	255 LBF/IN.
OIL RESISTANCE	D 471; ASTM IRM 903 AT 100ºC FOR 70HRS	80% MAX VOL. CHANGE	-1.9%

Protected by one or more of the following patents: 6805359, 7146689, 7263746

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Made in USA

PSX:DIRECT DRIVE NITRILE

OIL-RESISTANT PIPE-TO-MANHOLE CONNECTOR *SELECTION GUIDE*

How It Performs

PSX:Direct Drive - Nitrile *meets or exceeds all requirements of the following Specifications and/or Test Methods:*

ASTM C 923
ASTM C 443 (Oil Resistance)
ASTM C 1244
ASTM C 1478
ASTM F 2510

NOMINAL HOLE SIZE	PSX: DD NITRILE SIZE and DESCRIPTION	GASKET I.D. (INCHES)	PIPE O.D. ACCOMMODATION RANGE (INCHES)	TAKE-UP CLAMP QTY	TAKE-UP CLAMP PART #	MINIMUM SIZE ROUND STRUCTURE (INCHES)	MINIMUM SPAN/RISE STRAIGHT WALL (INCHES)
REQUIRES BLACK SHORT 7/16" TORQUE WRENCH PRESET TO 12 FT/LBS PART # 850.605							
8	8 QRS STEP "S" PSX: DD NITRILE 8 QRS STEP "R" PSX: DD NITRILE 8 QRS STEP "Q" PSX: DD NITRILE 8 QRS PSX: DD NITRILE	2.20 3.50 4.60 N/A	1.70 TO 2.50 2.75 TO 3.75 3.75 TO 4.80 1.70 TO 4.80	1 1 1 1	600-088 600-088 600-088 600-088	36	16
12	12Y PSX: DD NITRILE 12 M PSX: DD NITRILE	6.50 8.63	5.70 TO 6.90 8.00 TO 9.10	1 1	600-128 600-152	36	20
14	14 M PSX: DD NITRILE	10.35	9.75 TO 11.10	1	600-188	36	22
REQUIRES BLUE 1/2" TORQUE WRENCH PRESET TO 20 FT/LBS PART # 850.610							
16	16 M PSX: DD NITRILE	12.75	12.05 TO 13.30	1	600-232	36	24
18	18 M PSX: DD-2 NITRILE	15.35	14.60 TO 15.50	2	600-296	36	26

Protected by one or more of the following patents: 6805359, 7146689, 7263746

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Made in USA

Figure 310A
STAINLESS STEEL BALL VALVES

FNW™

3 PC FULL PORT 1000 CWP

Features:

- 1000 PSI CWP Non-Shock
- 150 PSI WSP
- Full Port
- Blow-out Proof Stem
- Adjustable Packing
- Investment Cast Body
- End Connections
  - Threaded
  - Socket Weld
- Stainless Steel Handle
- Locking Lever
- RTFE Seats
- Vented Ball
- Manufactured Silicone Free

Standards:

- Design: ASME B16.34, MSS SP-110
- End Connections:
  - NPT - ASME B1.20.1
  - SW - ASME B16.11
- Seat/Shell Test: MSS SP-110

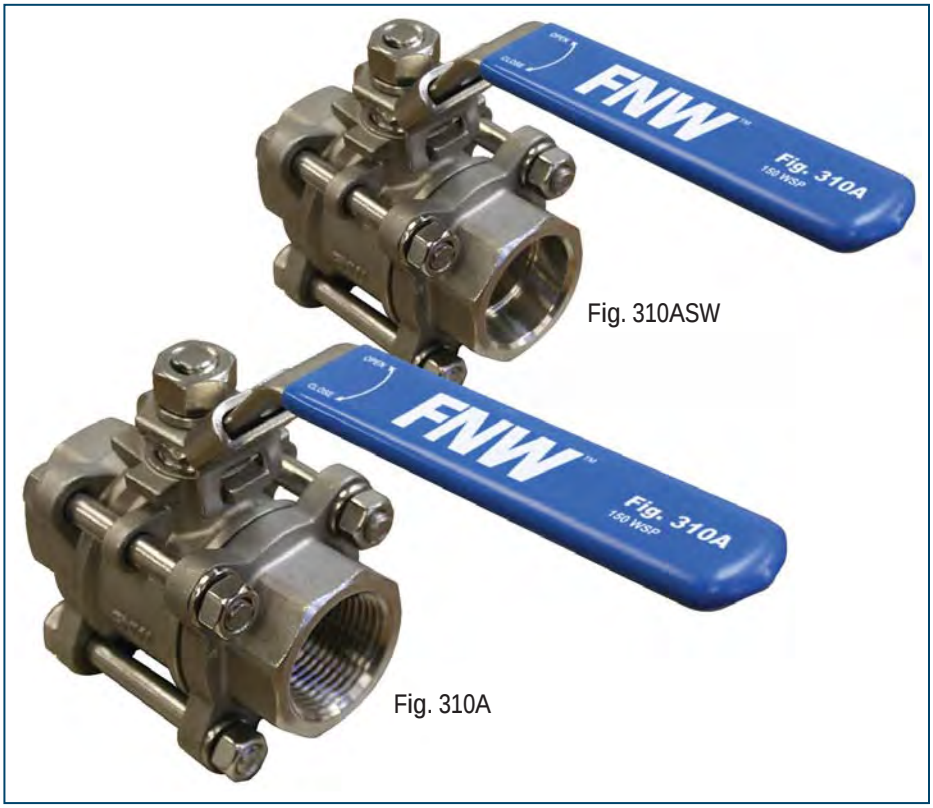
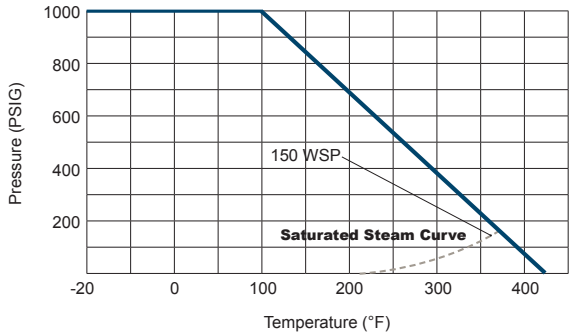


Fig. 310ASW

Fig. 310A



Cv, Torque & Weight

Size	Cv	Torque (in-lbs)	Wt (lbs)	
			NPT	SW
1/4	15	60	1.01	0.93
3/8	15	60	1.01	0.98
1/2	18	66	1.12	1.10
3/4	36	80	1.81	1.76
1	48	146	2.69	2.60
1-1/4	58	252	4.28	4.19
1-1/2	120	344	5.73	5.60
2	190	503	9.04	8.95
2-1/2	450	631	18.25	18.08
3	600	1337	25.57	25.88

Figure Number Matrix

FNW 310A Ends Size

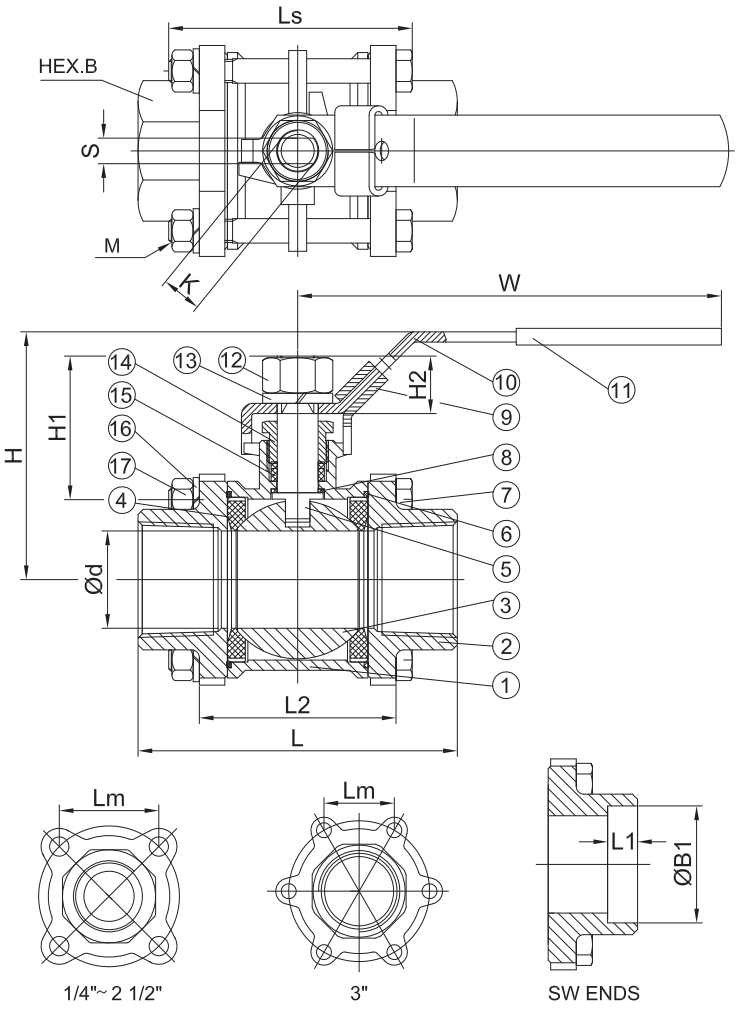
END CODE	SIZE CODE	
Blank = Threaded NPT	1/4 = B	1-1/4 = H
SW = Socket Weld	3/8 = C	1-1/2 = J
	1/2 = D	2 = K
	3/4 = F	2-1/2 = L
	1 = G	3 = M

(For 4" valves, use FNW Figure number 310AM)

FNW™

Figure 310A
STAINLESS STEEL BALL VALVES

3 PC FULL PORT 1000 CWP



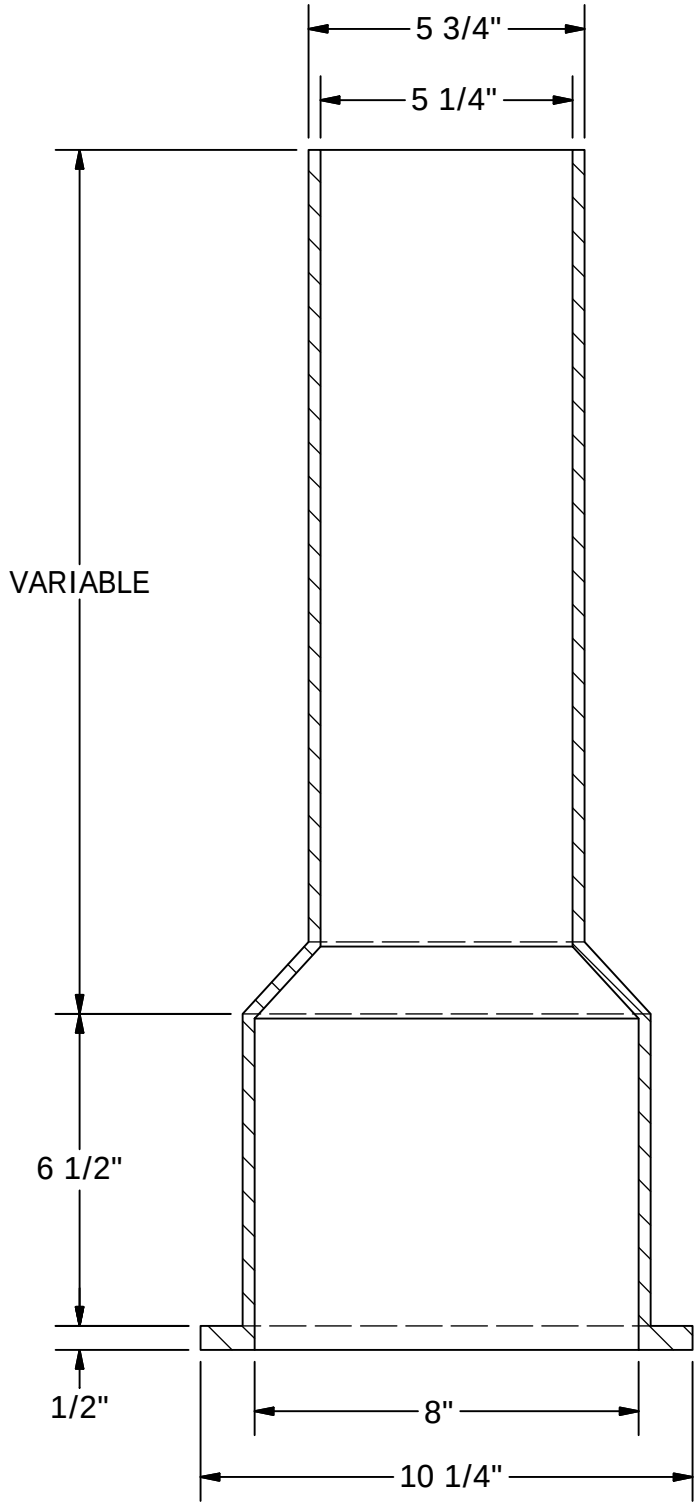
Standard Materials

Ref. No.	Description		Material	Qty
1	Body		ASTM A351 Gr. CF8M Stainless	1
2	End Cap	NPT	ASTM A351 Gr. CF8M Stainless	2
		SW	ASTM A351 Gr. CF3M Stainless	
3	Ball		316SS Stainless	1
4	Seat		RTFE	2
5	Stem		316SS Stainless	1
6	Body Gasket		PTFE	2
7	Body Bolt	1/4"~2-1/2"	ASTM A193-B8 Stainless	4
		3"		6
8	Thrust Washer		PTFE	1
9	Locking Device		304SS Stainless	1
10	Handle		304SS Stainless	1
11	Handle Sleeve		Vinyl Plastic	1
12	Stem Nut		ASTM A194-8 Stainless	1
13	Stem Washer		304SS Stainless	1
14	Gland Nut		304SS Stainless	1
15	V-Ring Packing		PTFE	1 Set
16	Bolt Washer	1/4"~2"	SUS304 Stainless	4
		2-1/2"		8
		3"		12
17	Bolt Nut	1/4"~2"	ASTM A194-8 Stainless	4
		2-1/2"		8
		3"		12

Dimensions (inches)

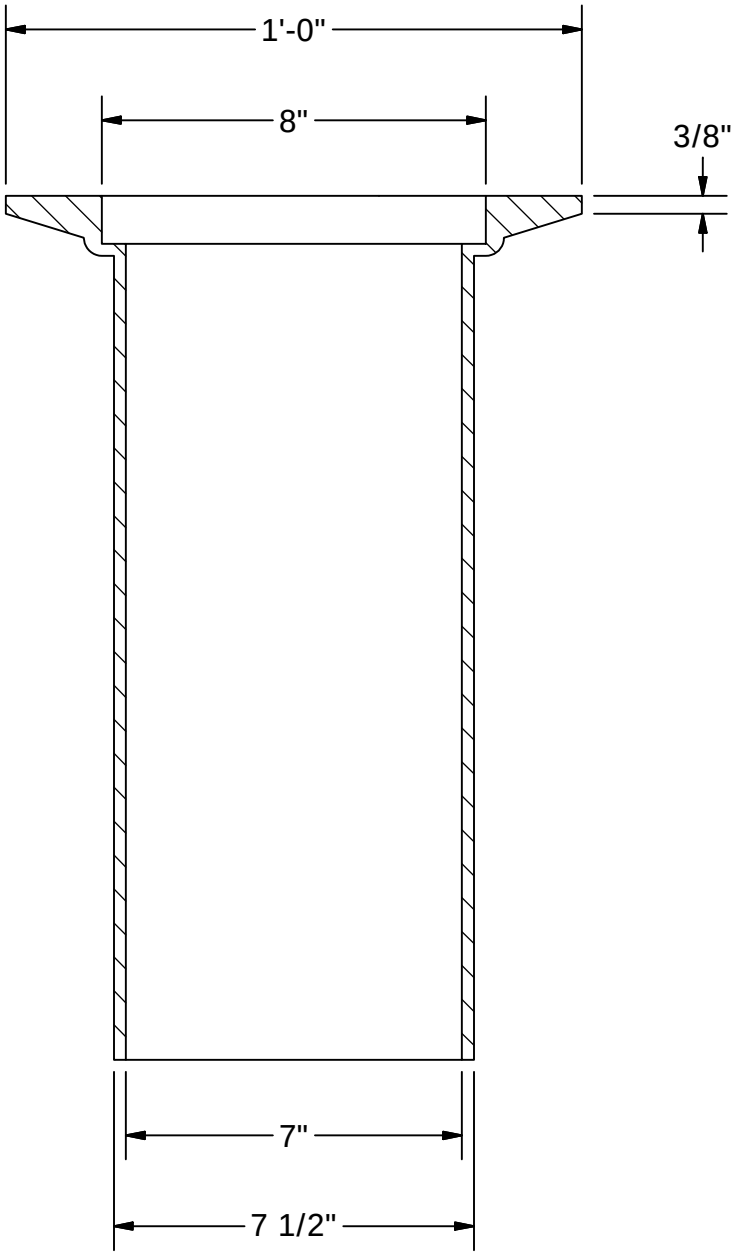
SIZE	Ød	L	Lm	H1	H2	H	W	S	K (UNC)	Ls	L2	M (UNC)	B	L1	ØB1
1/4	0.42	2.57	1.14	1.20	0.43	2.26	3.94	0.197	5/16-18	1.98	1.46	1/4-20	0.93	0.39	0.56
3/8	0.50	2.57	1.14	1.20	0.43	2.26	3.94	0.197	5/16-18	1.98	1.46	1/4-20	0.93	0.39	0.69
1/2	0.59	2.74	1.21	1.11	0.38	2.26	3.94	0.197	5/16-18	2.13	1.63	1/4-20	1.10	0.39	0.86
3/4	0.79	3.15	1.52	1.30	0.49	2.50	5.08	0.256	3/8-16	2.44	1.82	5/16-18	1.36	0.51	1.07
1	0.98	3.54	1.76	1.61	0.62	2.97	6.14	0.314	7/16-14	2.79	2.10	5/16-18	1.65	0.51	1.34
1-1/4	1.26	4.33	2.13	1.61	0.55	3.19	6.14	0.314	7/16-14	3.37	2.68	3/8-16	2.05	0.63	1.69
1-1/2	1.50	4.72	2.42	2.12	0.89	3.70	7.19	0.394	5/8-11	3.81	3.05	3/8-16	2.30	0.63	1.93
2	1.97	5.51	2.95	2.19	0.89	4.11	7.19	0.394	5/8-11	4.36	3.59	3/8-16	2.81	0.67	2.42
2-1/2	2.50	7.28	3.62	2.69	0.93	5.16	9.92	0.472	3/4-10	5.75	4.36	9/16-12	3.41	0.67	2.91
3	2.99	8.07	2.93	2.75	0.93	5.47	9.92	0.472	3/4-10	6.34	4.93	9/16-12	3.98	0.67	3.54

DOC: FNW310A11 Ver. 01/2011



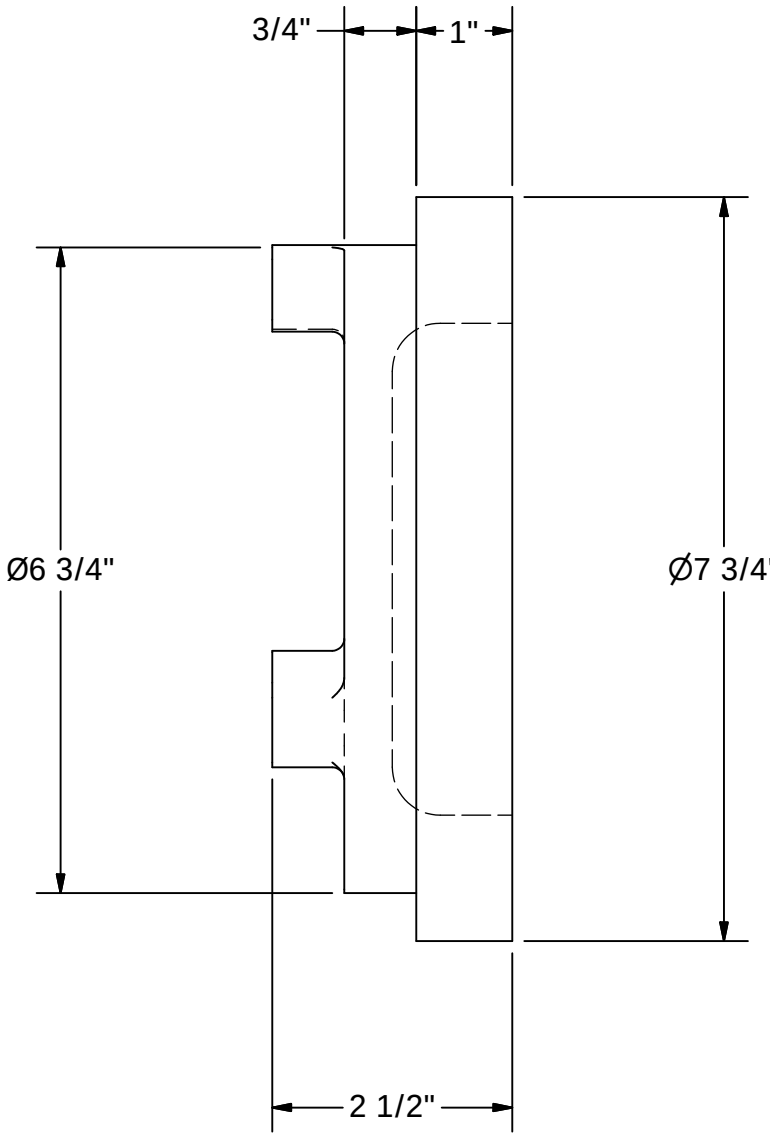
MATERIAL: CAST IRON ASTM A48, CL30
OR DUCTILE IRON ASTM A536 CL80-55-06
RATING - H-20

DRN BY AM	DATE 03/10/11	ROMTEC UTILITIES	18240 NORTH BANK ROAD ROSEBURG, OREGON 97470 541-496-3541
CHK BY	DATE		
APR BY	DATE	DESCRIPTION	
		VALVE BOX BOTTOM	
		DWG NO NO. 931	REV



MATERIAL: CAST IRON ASTM A48, CL30
RATING - H-20

DRN BY AM	DATE 03/10/11	ROMTEC UTILITIES	18240 NORTH BANK ROAD ROSEBURG, OREGON 97470 541-496-3541
CHK BY	DATE		
APR BY	DATE	DESCRIPTION	
		18" FLANGE UP VALVE BOX	
		DWG NO NO. 910	REV



DRN BY AM	DATE 03/10/11	ROMTEC UTILITIES	18240 NORTH BANK ROAD ROSEBURG, OREGON 97470 541-496-3541
CHK BY	DATE		
APR BY	DATE	DESCRIPTION	
		VALVE BOX LID	
		DWG NO NO. 910	REV

END

OF

SECTION

9. PUMPS

This section provides the information pertaining to the pumps for this project.

This section is structured as follows:

TSURUMI PUMP

BUILT FOR WORK

SEWAGE AND WASTEWATER PUMPS

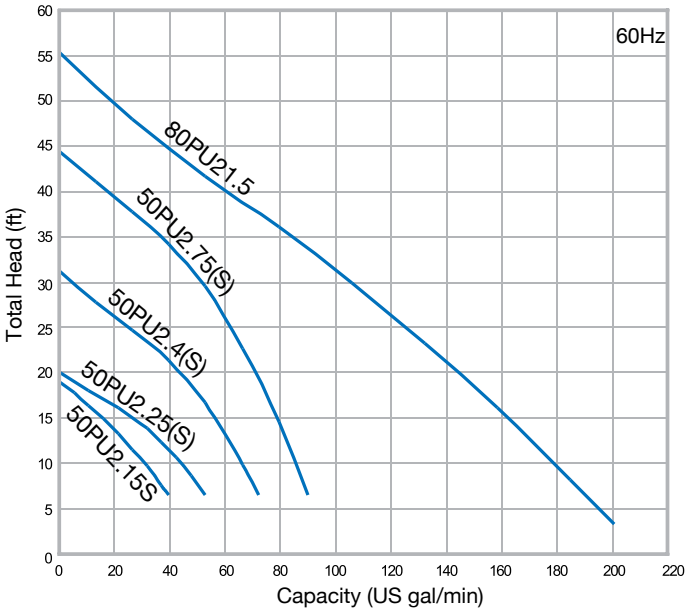
CORROSION RESISTANT PUMPS
VANCS SERIES

PU • PN • PSF • TM

Electric Submersible Pumps • Engine Powered Pumps • Accessories

PU Series

Performance Curves

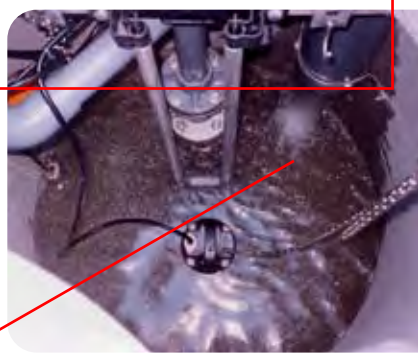


Feature

- 304 Stainless Steel
- FRP Resin Molded Parts
- Semi-Vortex Impeller Design

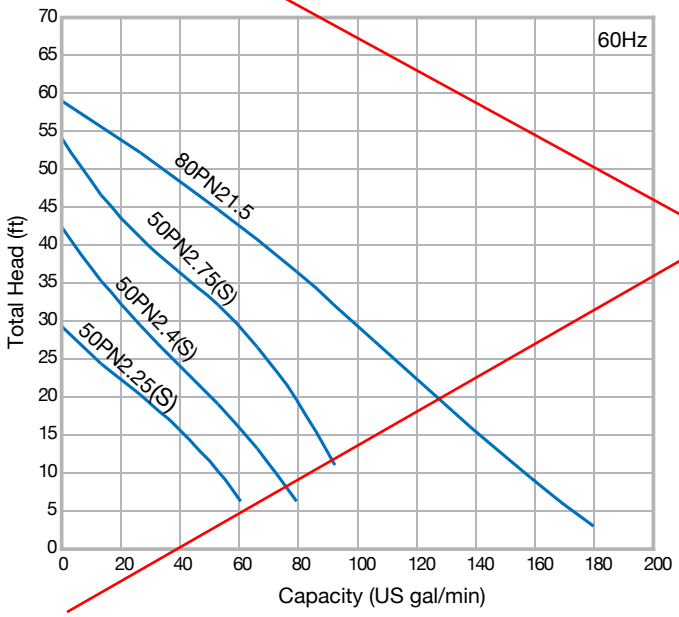
Applications

- Residential, commercial, industrial sewage, effluent, wastewater and site drainage.
- Chemical spill containment
- Decorative waterfalls, fountains and fish ponds.
- Raw water supply from rivers or lakes.
- Anywhere your sump pump is subject to rust or corrosion, VANCS is the answer.



PN Series

Performance Curves



Feature

- 304 Stainless Steel
- FRP Resin Molded Parts
- Semi-Open impeller Design

Applications

- Residential, commercial, industrial, effluent, wastewater and site drainage.
- Chemical spill containment
- Raw water supply from rivers or lakes.
- Anywhere your sump pump is subject to rust or corrosion, VANCS is the answer.

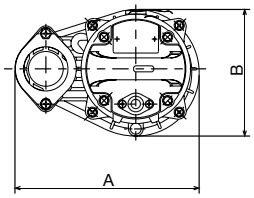
TSURUMI PUMP

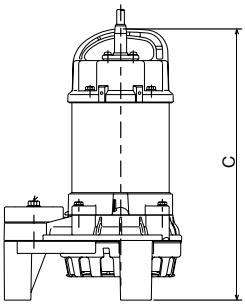
VANCS Series Specification

Model		Discharge Size (inch)	Phase	Voltages	Motor Output (HP)	Dimensions (inch)						Cable length (ft)	Free Standing Weight (lbs.)	※Guide Rail Fitting (lbs.)
						Free Standing Models			TOK Guide Rail Models					
						A	B	C	D	E	F			
PU	50PU2.15S	2	1Ø	115/230	1/5	8 7/8	6 1/16	14 13/16	16	6 1/16	16 1/8	20	13	15
	50PU2.25S	2	1Ø	115/230	1/3	9 5/16	6 3/8	14 3/16	16 3/4	6 11/16	16	32	16	17
	50PU2.25	2	3Ø	230/460	1/3	9 5/16	6 3/8	13 3/4	16 3/4	6 11/16	16	32	13	16
	50PU2.4S	2	1Ø	115/230	1/2	9 5/16	6 3/8	14 3/16	16 3/4	6 11/16	16 5/16	32	16	19
	50PU2.4	2	3Ø	230/460	1/2	9 5/16	6 3/8	14 3/16	16 3/4	6 11/16	16 5/16	32	15	17
	50PU2.75S	2	1Ø	115/230	1	9 5/16	6 3/8	14 15/16	16 3/4	6 11/16	16 8/9	32	20	24
	50PU2.75	2	3Ø	230/460	1	9 5/16	6 3/8	14 3/4	16 3/4	6 11/16	16 7/8	32	18	21
	80PU21.5	3	3Ø	230/460	2	11 5/8	7 11/16	18 11/16	20 7/16	7 11/16	19 1/4	32	35	35
PN	50PN2.25S	2	1Ø	115/230	1/3	9 5/16	6 3/8	14 3/16	16 3/4	6 11/16	16	32	16	17
	50PN2.25	2	3Ø	230/460	1/3	9 5/16	6 3/8	13 3/4	16 3/4	6 11/16	16	32	13	16
	50PN2.4S	2	1Ø	115/230	1/2	9 5/16	6 3/8	14 3/16	16 3/4	6 11/16	16 5/16	32	16	19
	50PN2.4	2	3Ø	230/460	1/2	9 5/16	6 3/8	14 3/16	16 3/4	6 11/16	16 5/16	32	15	18
	50PN2.75S	2	1Ø	115/230	1	9 5/16	6 3/8	14 15/16	16 3/4	6 11/16	16 7/8	32	20	24
	50PN2.75	2	3Ø	230/460	1	9 5/16	6 3/8	14 3/4	16 3/4	6 11/16	16 7/8	32	18	21
	80PN21.5	3	3Ø	230/460	2	11 5/8	7 11/16	17 1/8	20 7/16	7 11/16	19 1/4	32	35	35
PSF	50PSF2.25S	2	1Ø	115/230	1/3	9 5/16	6 3/8	14 3/16	16 3/4	6 11/16	16	32	16	17
	50PSF2.25	2	3Ø	230/460	1/3	9 5/16	6 3/8	13 3/4	16 3/4	6 11/16	16	32	14	16
	50PSF2.4S	2	1Ø	115/230	1/2	9 5/16	6 3/8	14 3/16	16 3/4	6 11/16	16 5/16	32	16	19
	50PSF2.4	2	3Ø	230/460	1/2	9 5/16	6 3/8	14 3/16	16 3/4	6 11/16	16 15/16	32	16	18
	50PSF2.75S	2	1Ø	115/230	1	9 5/16	6 3/8	14 15/16	16 3/4	6 11/16	16 7/8	32	20	24
	50PSF2.75	2	3Ø	230/460	1	9 5/16	6 3/8	14 3/4	16 3/4	6 11/16	16 7/8	32	19	21
	80PSF21.5	3	3Ø	230/460	2	11 5/8	7 11/16	17 1/8	20 7/16	7 11/16	19 1/4	32	35	35
TM	50TM2.4S	2	1Ø	115/230	1/2	9 5/16	6 3/8	14 3/16	N/A	N/A	N/A	32	15	N/A
	50TM2.4	2	3Ø	230/460	1/2	9 5/16	6 3/8	14 3/16	N/A	N/A	N/A	32	15	N/A
	50TM2.75S	2	1Ø	115/230	1	9 5/16	6 3/8	14 3/4	N/A	N/A	N/A	32	17	N/A
	50TM2 75	2	3Ø	230/460	1	9 5/16	6 3/8	14 3/4	N/A	N/A	N/A	32	17	N/A

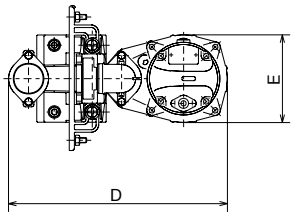
※ Pump weight only

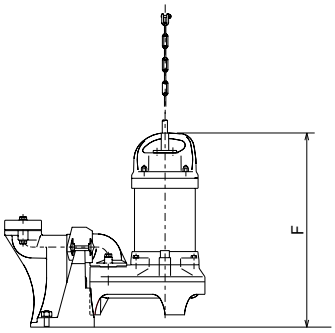
Dimension: Free Standing





Dimension: Guide Rail Fitting (TOK)





TSURUMI PUMP

The Pump Technology That The World Trusts.

Tsurumi introduced its international strategy in the 1960s. Our technical capabilities gained recognition first in Asia in the 1970s and then in the United States and Europe in the 1980s.

Following the initial steps, our international division successfully penetrated many worldwide markets including: construction, civil engineering, mining, industrial, wastewater, sewage treatment, and flood control.

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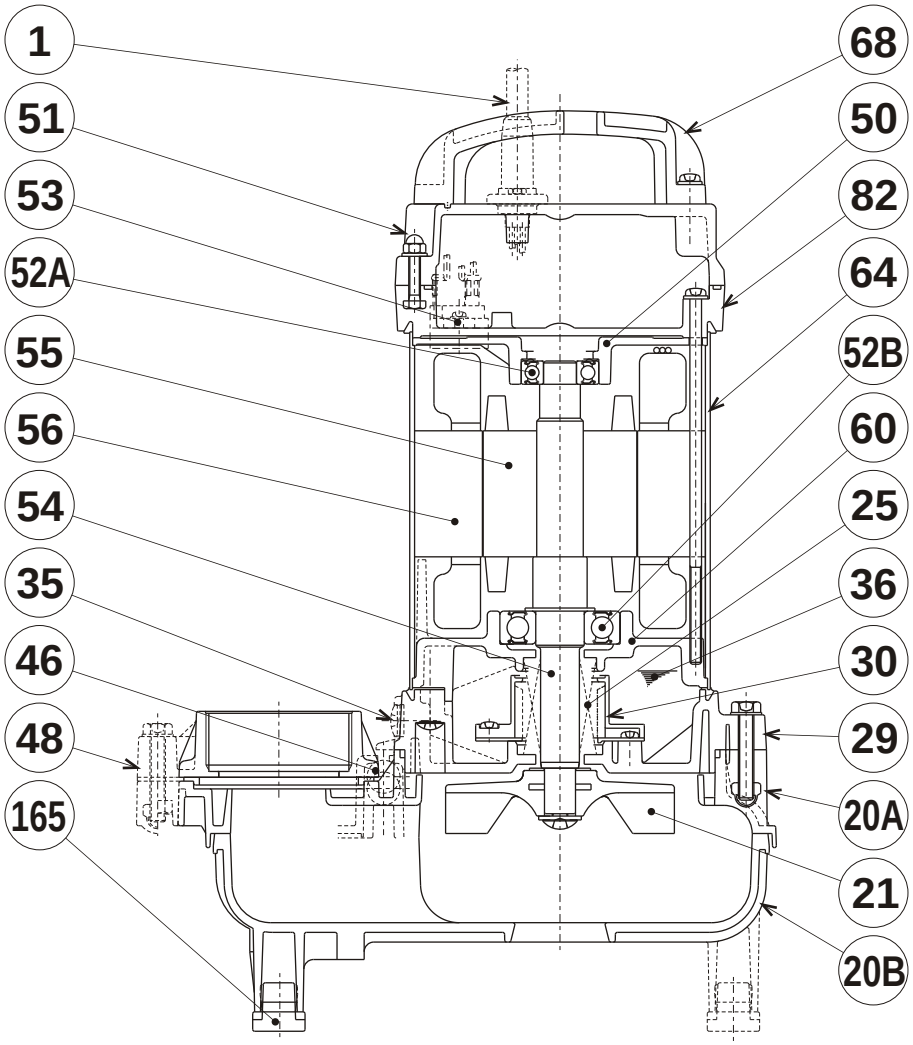
TSURUMI PUMP

VANCS - SERIES - PU
(FRP) SEMI-VORTEX - SEWAGE & WASTEWATER PUMPS

SECTIONAL VIEW

80PU21.5-62



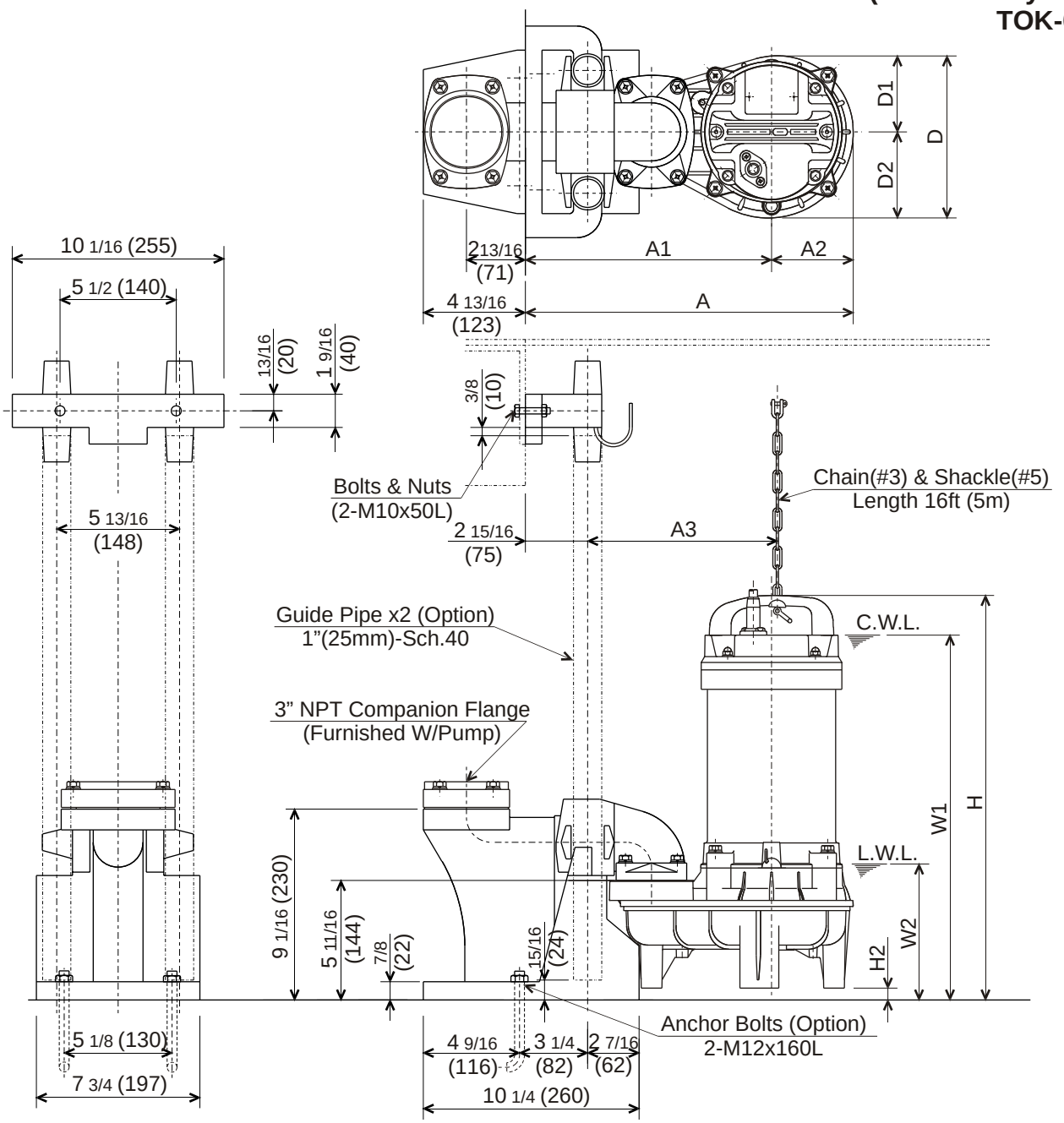
PART#	DESCRIPTION	MAIN MATERIAL / NOTE	RELATED ASTM, AISI CODE	RELATED EN CODE	QTY
1	Power Cable	PVC Sheath AWG16/4-32ft			1
20A	Upper Pump Casing	PA+ABS Plastic w/GF30			1
20B	Lower Pump Casing	PA+ABS Plastic w/GF30			1
21	Impeller	PPO Plastic w/GF20			1
25	Mechanical Seal	Silicon Carbide / H-20A			1
29	Oil Casing	PPS Plastic w/(GF+MD)50			1
30	Oil Lifter	PBT Plastic W/(GF+MD)40			1
35	Oil Plug	Stainless Steel	S 30400	1.4301	1
36	Lubricant	White Mineral Oil ISO VG32			
46	Air Valve	Glass Ball			1
48	Companion Flange	PVC / NPT 3"			1
50	Motor Bracket	Aluminum Alloy Die Casting	B85 383.0	EN 1706 AC-46100	1
51	Motor Head Cover	PPS Plastic w/GF40			1
52A	Upper Bearing	#6203ZZC3			1
52B	Lower Bearing	#6305ZZC3			1
53	Motor Protector				1
54	Shaft	Stainless Steel	S 30400	1.4301	1
55	Rotor				1
56	Stator				1
60	Bearing Housing	Aluminum Alloy Die Casting	B85 383.0	EN 1706 AC-46100	1
64	Motor Housing	Stainless Steel	S 30400	1.4301	1
68	Handle	ABS Plastic			1
82	Motor Head Cover Spacer	PPS Plastic w/GF40			1
165	Rubber Cusion	Nitrile Butadiene Rubber			5

TSURUMI PUMP

VANCS-SERIES - PU
(FRP) SEMI-VORTEX - SEWAGE & WASTEWATER PUMPS

DIMENSIONS

TOK80PU21.5
(Slide Rail System
TOK-65)



C.W.L. : Continuous running Water Level
L.W.L. : Lowest running Wtaer Level

DIMENSIONS:USCS (Inch)

Model	HP	NOM.	Pump & Motor									C.W.L.	L.W.L.	Wt.
		SIZE	A	A1	A2	A3	D	D1	D2	H	H2	W1	W2	(lbs.)
TOK80PU21.5	2	3"	15 9/16	11 11/16	3 7/8	9 1/16	7 11/16	3 5/8	4 1/8	19 1/4	9/16	17 3/8	6 1/2	34.8

DIMENSIONS:METRIC (mm)

Model	kW	NOM.	Pump & Motor									C.W.L.	L.W.L.	Wt.
		SIZE	A	A1	A2	A3	D	D1	D2	H	H2	W1	W2	(kg)
TOK80PU21.5	1.5	80	396	297	99	231	196	92	104	489	14	441	164	15.8

TSURUMI PUMP

VANCS - SERIES - PU
(FRP) SEMI-VORTEX - SEWAGE & WASTEWATER PUMPS

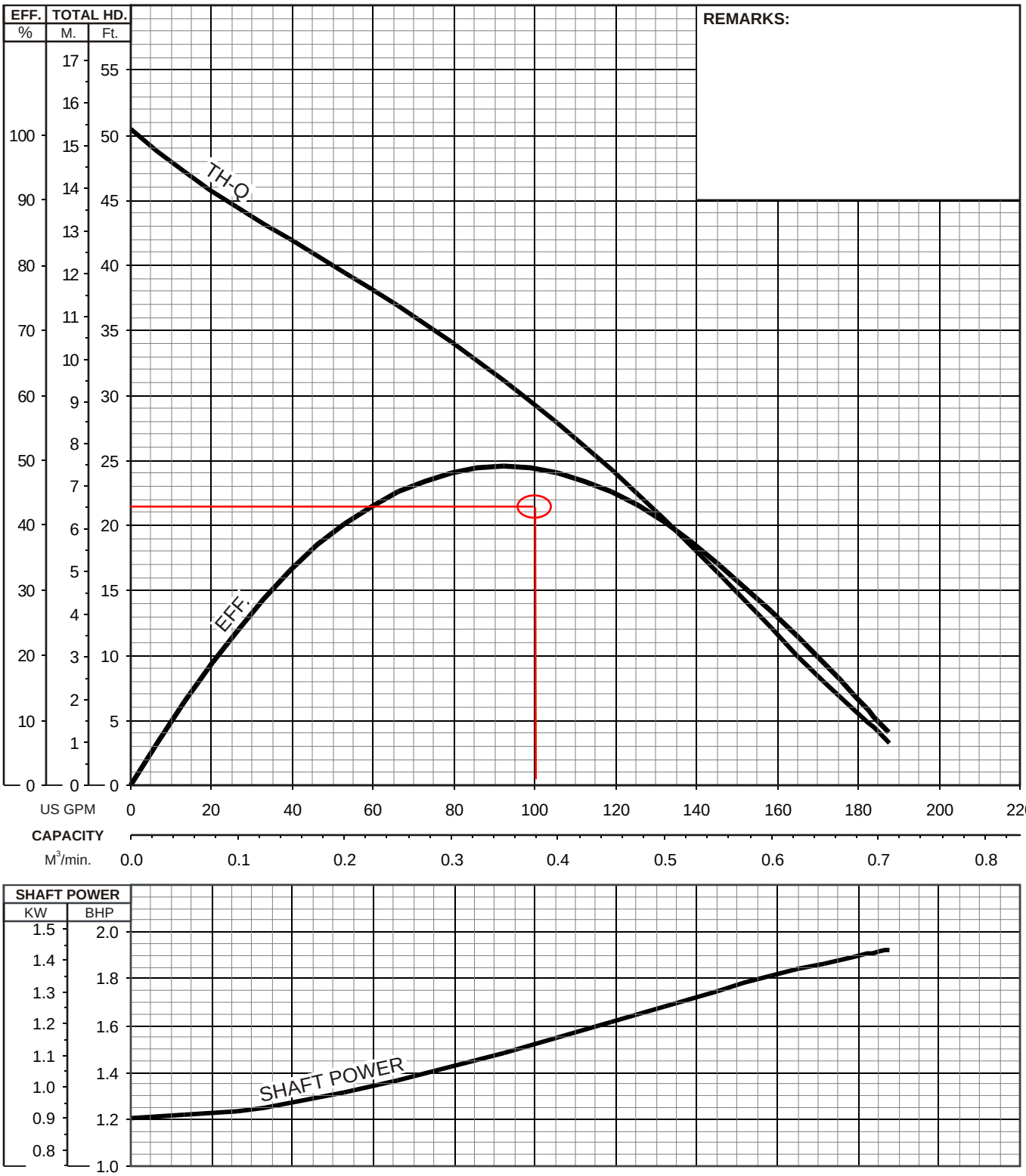
PERFORMANCE CURVE

MODEL	BORE	HP	KW	RPM	SOLIDS DIA	LIQUID	SG.	VISCOSITY	TEMP.
80PU(A/W)21.5 -62	3"/80mm	2	1.5	3455	1.81"/46mm	Water	1.0	1.123 CST	60°F

PUMP TYPE	PHASE	VOLTAGE	AMPERAGE	HZ	STARTING METHOD	INS. CLASS
Semi-Vortex - Sewage & Wastewater	3	208 - 220 / 440	6.9 - 6.6 / 3.6	60	Direct On Line	E

CURVE No.	DATE	PHASE	VOLTAGE	AMPERAGE	HZ	STARTING METHOD	INS. CLASS
-	-	-	-	-	-	-	-

REMARKS:



9.04 PUMP RELATED DATA SHEETS

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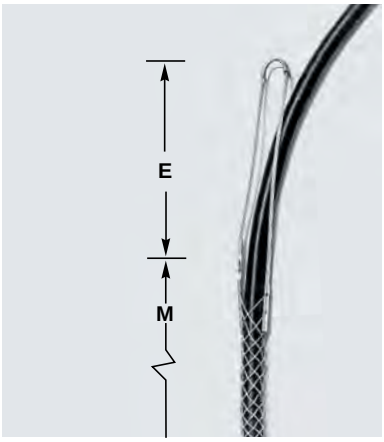
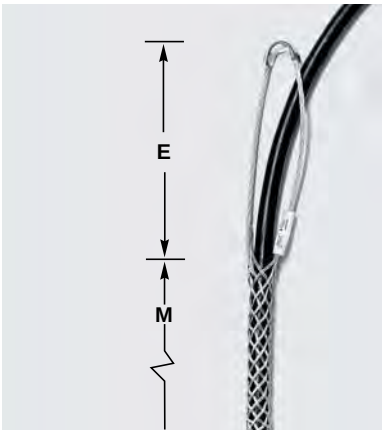
Support Grips
Service Drop
Single Eye, Tin-Coated Bronze

IMPORTANT!
It is important that you read all breaking strength, safety and technical data relating to this product on pages T-43 through T-48.



Light Duty, Single Eye, Closed Mesh



Heavy Duty, Single Eye, Closed Mesh

Light Duty, Single Eye, Closed Mesh Single Weave
For permanent support when cable end is available to be installed.

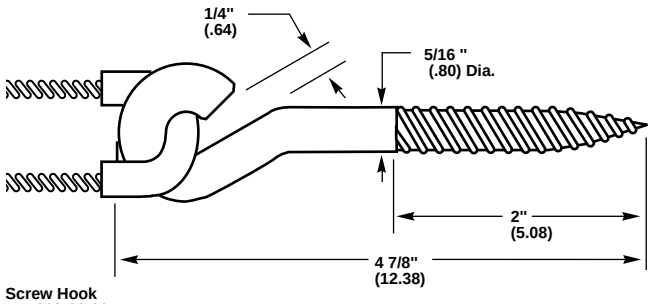
Cable Diameter Range Inches (cm)	Approx. Breaking Strength Lbs. (N)	E Inches (cm)	M Inches (cm)	Catalog Numbers
.23"-.31" (.58-.79)	290 (1,290)	3" (7.62)	3 3/4" (9.52)	**02216001**
.29"-.37" (.74-.94)	290 (1,290)	5" (12.70)	4 1/4" (10.79)	**02216002**
.35"-.44" (.89-1.12)	500 (2,224)	5 1/2" (13.97)	4 3/4" (12.06)	**02216003**
.41"-.50" (1.04-1.27)	500 (2,224)	5 1/2" (13.97)	5" (12.70)	**02216004**
.46"-.56" (1.17-1.42)	660 (2,936)	6" (15.24)	5 1/4" (13.33)	**02216005**
.52"-.62" (1.32-1.57)	790 (3,514)	7" (17.78)	6 1/4" (15.87)	**02216006**
.58"-.68" (1.47-1.73)	790 (3,514)	7" (17.78)	6 1/2" (16.51)	**02216007**
.64"-.75" (1.63-1.90)	790 (3,514)	7" (17.78)	6 3/4" (17.14)	**02216008**
.70"-.81" (1.78-2.06)	790 (3,514)	7" (17.78)	7 1/4" (18.41)	**02216009**
.75"-.87" (1.90-2.21)	1,020 (4,537)	8" (20.32)	8" (20.32)	**02216010**
.81"-.94" (2.06-2.39)	1,020 (4,537)	8" (20.32)	8 1/4" (20.95)	**02216011**
.87"-1.00" (2.21-2.54)	1,020 (4,537)	8" (20.32)	8 3/4" (22.22)	**02216012**
.94"-1.06" (2.39-2.69)	1,020 (4,537)	9" (22.86)	9" (22.86)	**02216013**
1.00"-1.18" (2.54-3.00)	1,020 (4,537)	9" (22.86)	9 1/2" (24.13)	**02216014**
1.06"-1.25" (2.69-3.17)	1,020 (4,537)	9" (22.86)	9 1/2" (24.13)	**02216015**

2416004

Heavy Duty, Single Eye, Closed Mesh Multi-Weave
For permanent support when cable end is available to be installed.

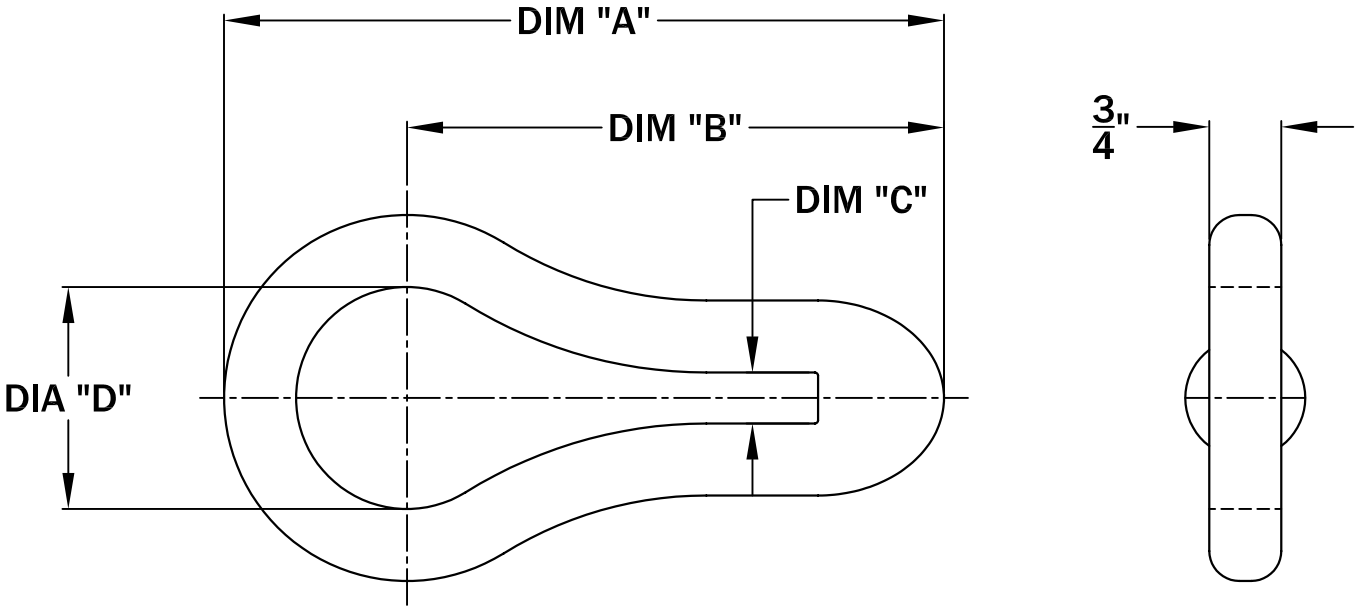
Cable Diameter Range Inches (cm)	Approx. Breaking Strength Lbs. (N)	E Inches (cm)	M Inches (cm)	Catalog Numbers
.23"-.31" (.58-.79)	500 (2,224)	5" (12.70)	4 1/2" (11.43)	**02217001**
.29"-.37" (.74-.94)	500 (2,224)	5" (12.70)	5 1/2" (13.97)	**02217002**
.35"-.44" (.89-1.12)	870 (3,870)	6" (15.24)	6 1/2" (16.51)	**02217003**
.41"-.50" (1.04-1.27)	870 (3,870)	6" (15.24)	7 1/2" (19.05)	**02217004**
.46"-.56" (1.17-1.42)	1,050 (4,670)	6" (15.24)	8" (20.32)	**02217005**
.52"-.62" (1.32-1.57)	1,050 (4,670)	7" (17.78)	8 1/2" (21.59)	**02217006**
.58"-.68" (1.47-1.73)	1,050 (4,670)	7" (17.78)	9 1/2" (24.13)	**02217007**
.64"-.75" (1.63-1.90)	1,390 (6,183)	7" (17.78)	9 1/2" (24.13)	**02217008**
.70"-.81" (1.78-2.06)	1,390 (6,183)	8" (20.32)	10 1/2" (26.67)	**02217009**
.75"-.87" (1.90-2.21)	1,390 (6,183)	8" (20.32)	10 1/2" (26.67)	**02217010**
.81"-.94" (2.06-2.39)	1,390 (6,183)	8" (20.32)	10 1/2" (26.67)	**02217011**
.87"-1.00" (2.21-2.54)	1,790 (7,962)	8" (20.32)	11 1/2" (29.21)	**02217012**
.94"-1.06" (2.39-2.69)	1,790 (7,962)	9" (22.86)	12 1/2" (31.75)	**02217013**
1.00"-1.18" (2.54-3.00)	1,790 (7,962)	9" (22.86)	13 1/2" (34.29)	**02217014**
1.06"-1.25" (2.69-3.17)	1,790 (7,962)	9" (22.86)	14 1/2" (36.83)	**02217015**

E-Eye length *M-Mesh length at nominal diameter*



Screw Hook
No. 203-03-001
Yield Strength 900 lbs (4003)

GRAB LINK



	DIM "A"	DIM "B"	DIM "C"	SAFE WORK LOAD	DIM "D"
GRABLINK	7 1/2”	5 19/32”	17/32”	6,400 Lbs	2 5/16”

CONERY MFG INC

CHANGES	TOLERANCES	DRAWN BY	DATE
F	DECIMALS	D. MIDDLETON	01/21/08
E	.XXX = ±.005		
D	.XX = ±.010	MATERIAL SPECIFICATION:	
C	FRACTIONAL	ALLOY STEEL	
B	X/X = ±.1/64		
A	ANGLES X° = ±1/2°		

SPECIFICATION SHEET
DIMENSIONAL DATA

SCALE:	PART NO.
HALF	ALLOYED STEEL

END

OF

SECTION

10. LIQUID LEVEL SENSORS

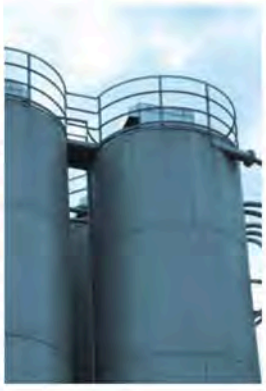
This section provides the information pertaining to the level sensing for this project.

This section is structured as follows:

10.01 PRIMARY LEVEL SENSOR DATA SHEETS

The NIVA level controller MS 1 C
is the ideal solution to control liquids with limited switching space. For example in:

- Chemical plants
- Electro plating shops
- Purifying Plants



Level Controller MS 1 C

The NIVA level controller MS 1 C was designed for an extremely high resistance to chemical liquids and for use at high temperatures up to 100 °C (212 °F).

Available versions:

Type	Cable	Lenght (m)	Order-no.
W	Teflon/FEP 4 x 0.5	5	40 000705
W	Teflon/FEP 4 x 0.5	10	40 000710
W	Teflon/FEP 4 x 0.5	20	40 000720

W = Changeover (SPDT)

Other cable types and lengths are available upon request

Application:

For use in chemically loaded liquids at temperatures up to 100 °C (212 °F).

Electronic connection

Connection of level controllers	Wire grey	black	brown	⏚
For emptying a tank	insulate	X	X	X
For filling a tank	X	insulate	X	X
Alarm high level	insulate	X	X	X
Alarm low level	X	insulate	X	X

Technical data subject to change

⏚ Potential equalization wire

Technical data:

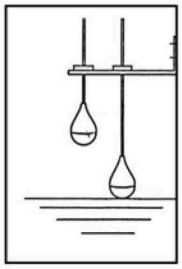
Specific weight:	0.95 –1.05 or according to specification
Max. temperature:	100 °C (212 °F)
Breaking capacity:	1 mA / 4 V - 5 A / 250 V *
Switch point:	10 °
Protective system:	IP 68 / 2 bar
Protection class:	II
Cable cross section:	4 x 0.5 mm²
Height / diameter:	180 / 100 mm (7 in / 3.9 in)
Housing quality:	Polypropylene (PP)
Housing Colour:	Grey
Cable quality:	Teflon (FEP)
Cable colour:	Black
Cable seal:	Viton

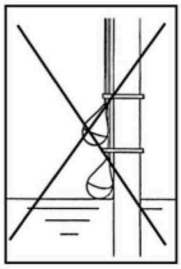
* Micro-switch with gold-plated contacts especially for low currents in electronic circuits

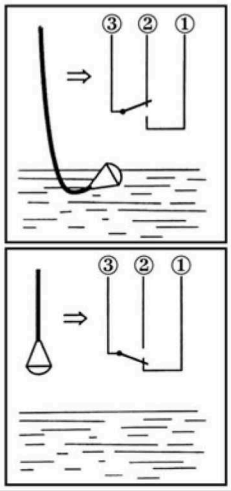
MS 1

CE
73/23/EEC
RoHS 2002/05/EC

1mA/4V-5A/250V
μ T80
γ 0,95 - 1,05





			①	②	③
GB	Connection of Level Regulators		grey	black	brown
D	Anschluss der Niveauregler		grau	schwarz	braun
F	Branchement des régulateurs de niveau		gris	noir	brun
I	Collegamento regolatori di livello		grigio	nero	marrone
E	Conexión de los reguladores de nivel		gris	negro	marrón
P	Conexão dos reguladores de nível		cinzento	preto	castanho
NL	Aansluiting van de niveauregelaar		grijs	zwart	bruin
DK	Tilslutning af niveauregulator		grå	sort	brun
S	Anslutning av nivåregulatorn		grå	svart	brun
N	Forbindelse til nivåregulatoren		grå	svart	brun
FIN	Pinnansäätimen liitäntä		harmaa	musta	ruskea
RUS	подсоединение регулятора уровня		серый	чёрный	коричневый
PL	Przyłącze regulatorów poziomu		kolor szary	kolor czarny	kolor brązowy
H	A szintszabályozók csatlakoztatása		szürke	fekete	barna
CZ	Přípoj regulátorů hladiny		šedý	černý	hnědý
SK	Prípoj regulátorov hladiny		sivý	čierný	hnedý
SLO	Priključitev regulatorjev nivoja		siv	črno	rjavo
HR	Cijev za regulator razine		sivo	crni	smeđi
SCG	Cev za spravu za regulisanje nivoa		sivo	crni	smeđi
GR	Σύνδεση ρυθμιστή στάθμης		γκρίζο	μαύρο	καφέ
TR	Seviye regülatörlerinin bağlantısı		gri	siyah	kahverengi

GB	For emptying a tank	Alarm high level	insulate		
D	Zum Entleeren eines Behälters	Alarm bei hohem Flüssigkeitsstand	isolieren		
F	Pour vider un réservoir	Alarme au niveau supérieur	isoler		
I	Per lo svuotamento	Allarme di massimo livello	isolare		
E	Para vaciar un recipiente	Alarma con alto nivel de líquido	aislar		
P	Para esvaziar um reservatório	Alarme de nível máximo	isolar		
NL	Om een reservoir te legen	Alarm bij een hoog vloeistofpeil	isoleren		
DK	Til tømning af en beholder	Alarm ved høj væskeniveau	isoler		
S	För tömning av en behållare	Larm vid hög vätskenivå	isolera		
N	For å tømme en beholder	Alarm ved høyt væskenivå	isolere		
FIN	Säiliön tyhjennykseen	Ylärajahälytys	eristä	X	X
RUS	для опорожнения резервуара	сигнал тревоги при высоком уровне жидкости	изолировать		
PL	Opróżnienie pojemnika	Alarm w przypadku wysokiego poziomu cieczy	zaizolować		
H	Egy tartály ürítéséhez	Riasztás túl magas töltésszint esetén	szigeteljük		
CZ	K vyprázdnění nádrže	Poplach při vysokém stavu kapaliny	izolovat		
SK	K vyprázdneniu nádrže	Poplach pri vysokom stave kvapaliny	izolovat'		
SLO	Za praznjenje posode	Alarm pri visokem nivoju tekočine	izolirati		
HR	Za pražnjenje nekog spremnika	Alarm kod visokog stanja tekućine	izolirati		
SCG	Za pražnjenje nekog rezervoara	Alarm kod visokog stanja tećnosti	izolovati		
GR	Γ ια την εκκένωση τον περιέκτη	Αλάρμ οε πολύ νψηλή στάθμη υγρού	μόνωση		
TR	Bir hazneyi/kabı boşaltmak için	Yüksek sıvı seviyesinde alarm	İzole etmek		

GB	For filling a tank	Alarm low level		insulate	
D	Zum Füllen eines Behälters	Alarm bei niedrigem Flüssigkeitsstand		isolieren	
F	Pour remplir un réservoir	Alarme au niveau inférieur		isoler	
I	Per il riempimento	Allarme di minimo livello		isolare	
E	Para llenar un recipiente	Alarma con bajo nivel de líquido		aislar	
P	Para encher um reservatório	Alarme de nível mínimo		isolar	
NL	Om een reservoir te vullen	Alarm bij een laag vloeistofpeil		isoleren	
DK	Til fyldning af en beholder	Alarm ved lav væskeniveau		isoler	
S	För fyllning av en behållare	Larm vid låg vätskenivå		isolera	
N	For å fylle en beholder	Alarm ved lavt væskenivå		isolere	
FIN	Säiliön täyttämiseen	Alarajahälytys	X	eristä	X
RUS	для наполнения резервуара	сигнал тревоги при низком уровне жидкости		изолировать	
PL	Napełnienie pojemnika	Alarm w przypadku niskiego poziomu cieczy		zaizolować	
H	Egy tartály töltéséhez	Riasztás túl alacsony töltésszint esetén		szigeteljük	
CZ	K naplnění nádrže	Poplach při nízkém stavu kapaliny		izolovat	
SK	K naplneniu nádrže	Poplach pri nízkom stave kvapaliny		izolovat'	
SLO	Za polnjenje posode	Alarm pri nizkem nivoju tekočine		izolirati	
HR	Za punjenje nekog spremnika	Alarm kod niskog stanja tekućine		izolirati	
SCG	Za punjenje nekog rezervoara	Alarm kod niskog stanja tećnosti		izolovati	
GR	Γ ια την πλήρωση τον περιέκτη	Αλάρμ οε πολύ χαμηλή στάθμη υγρού		μόνωση	
TR	Bir hayneyi/kabı doldurmak için	Düşük sıvı seviyesinde alarm		İzole etmek	

11 2126

NOLTANIVA

CE

EC Declaration of Conformity

according to

EC Directive 2006 /95 / EC
EC Directiv RoHS 2002 / 95 / EC

We

NOLTA GmbH
35091 Cölbe

hereby declare, that the products we manufacture conform in conception, design and circulated model to the relevant basic health and safety requirements of EC directives. If any changes are made to the level – controllers without our prior consent, this declaration loses its validity.

Products:	**Level – Controllers**
Type:	**MS 1 C**
Applied harmonized standards:	• **DIN EN 60730-1 (VDE 0631-1):2005-12+Ber.1:2007-11 +/A2:2008-04+/A15:2007-08+/A16:2008-02** • **DIN EN 60730-2-16 (VDE 0631-2-16):200208+/A11:2005 11** • **DIN IEC 60730-1 (VDE 0631-1):2008-10+/A3:2005-01**

Cölbe, 14.04.2009

.....
Dr.-Ing. Jochen Knake / Geschäftsführer

.....
Wolfgang Seip / Quality Manager

NOLTA GmbH – 35091 Cölbe / Germany
Telefon Fon +49 64 21 / 98 59 14 - Fax +49 64 21 / 98 59 28 - Email: info@nolta.de – www.nolta.de

END

OF

SECTION

11. ELECTRICAL INTERCONNECTIONS/ ELECTRICAL CORED HOLES

This section includes data and drawings for typical field wiring.

11.01 TYPICAL FIELD WIRING PLAN

11.02 ELECTRICAL INSTALLATION RECOMMENDATIONS

IMPORTANT!

Romtec Utilities has not produced site electrical drawings. Any site electrical drawings in this Scope of Supply and Design Submittal have been produced by others. Romtec Utilities has not checked the site electrical drawings for their accuracy.

Romtec Utilities makes no claim as to the accuracy of information contained in these site electrical drawings.

The typical field wiring plan is only a suggestion by Romtec Utilities. Receiving final approval of the field wiring on the approved site plan and/or site electrical drawings is the responsibility of the Customer or the Customer's representative.

Romtec Utilities makes no claim as to the suitability of the typical field wiring plan for the project.

IMPORTANT!

Romtec Utilities does not provide cored holes into the wet well for electrical conduit ports or conduit runs. The electrically related cored holes into the wet well are the responsibility of the contractor and electrician.

Wet well electrically related cored holes' final size, orientation, height and number are best determined after installation of the wet well and other electrical components.

CONTROL PANEL

FIELD WIRING

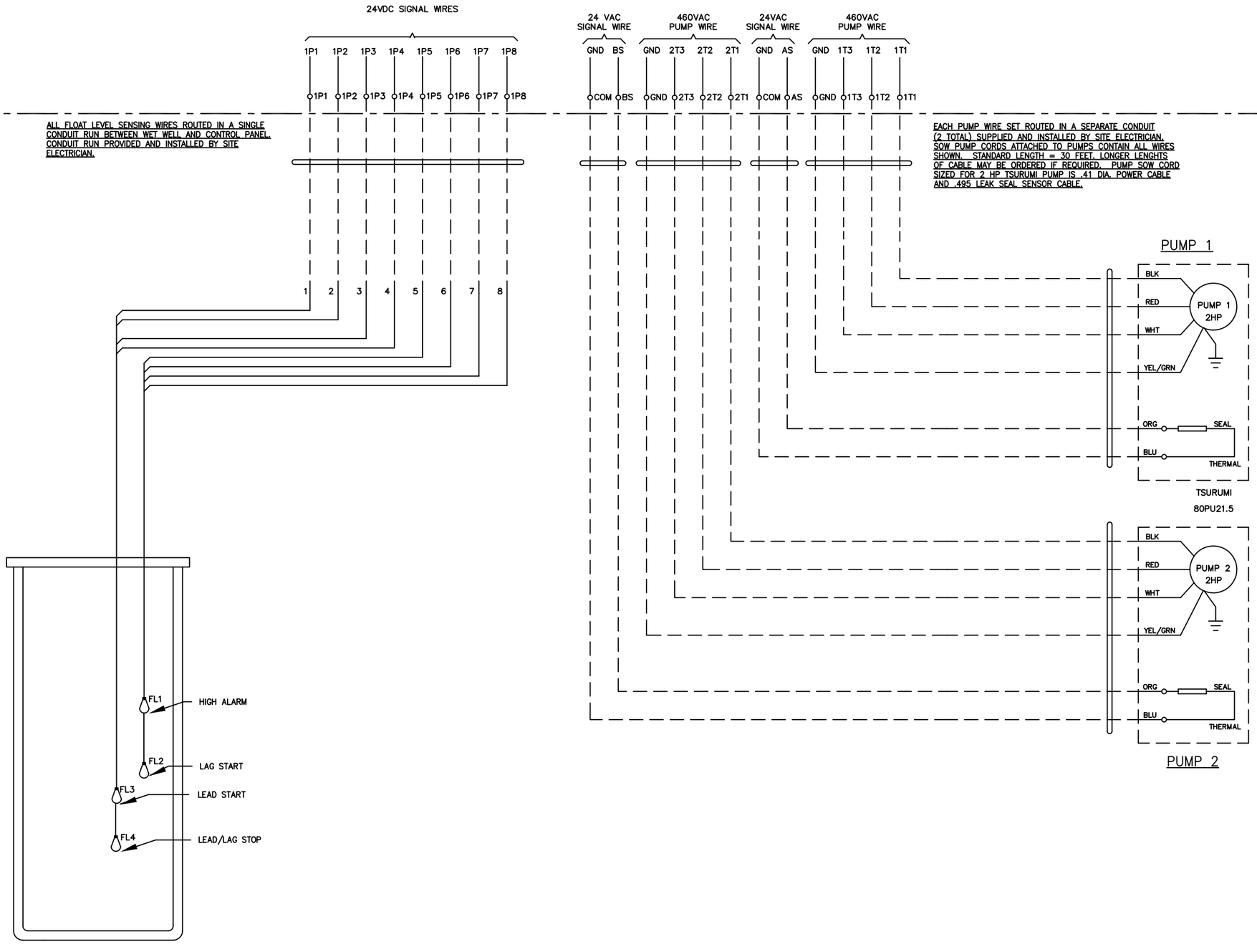
LIFT STATION CONTROL PANEL WITH TERMINAL INTERCONNECTS SUPPLIED BY ROMTEC UTILITIES INSTALLED BY SITE ELECTRICIAN

GENERAL:
THE CONNECTION DIAGRAM DRAWING AIDS IN THE UNDERSTANDING AND INSTALLATION OF THE CONTROL SYSTEM. COMPLETE FIELD WIRING AND INSTALLATION INSTRUCTIONS ARE NOT INCLUDED HERE. THE CORRECT INSTALLATION AND CONFORMANCE TO ALL APPLICABLE CODES IS THE RESPONSIBILITY OF THE INSTALLER.

NOTES 1. CONDUITS AND WIRES TO BE PROVIDED AND SIZED BY ELECTRICAL CONTRACTOR. ACTUAL FIELD WIRING MY VARY FOR YOUR PANEL. CONSULT ASBUILT WIRING DOCUMENTATION. THESE DRAWINGS ARE A SUGGESTION ONLY. ALL STATE AND LOCAL CODES SUPERCEDE THESE SUGGESTIONS.

2. THE CONNECTION DIAGRAM DRAWING AIDS IN THE UNDERSTANDING AND INSTALLATION OF THE CONTROL SYSTEM. COMPLETE FIELD WIRING AND INSTALLATION INSTRUCTIONS ARE NOT INCLUDED HERE. THE CORRECT INSTALLATION AND CONFORMANCE TO ALL APPLICABLE CODES IS THE RESPONSIBILITY OF THE INSTALLER.

3. INSTALL CONDUIT SEALS RATED FOR CLASS 1, DIV 1 AS REQUIRED.



CABLE DIAMETER TABLE	
DEVICE	CABLE DIA.
PUMP	.41/.495
FLOAT	.25

BY	DESCRIPTION REVISIONS	DATE	REV

E0114001

DSN. KAS
DRN. KAS
CKD. KAS
11/9/12

ROMTEC UTILITIES
18240 NORTH BANK ROAD
ROSEBURG, OR 97470
(541)-496-9678
FAX (541)-496-0804
WWW.romtecutilities.com

ANIMAL HEALTH

FIELD CONNECTION DIAGRAM
PUMPS AND SENSORS

SHEET
1 OF 1

JOB NUMBER

11.02 ELECTRICAL INSTALLATION RECOMMENDATIONS

The following information is a recommendation only. It is the responsibility of the installing electrical contractor to review all as-built system information and make the installation as per the National Electrical Code (NEC).

Install all electrical conduits in accordance with the NEC, or as shown, whichever is greater.

Install all branch circuit and feeder conductors in accordance with the NEC, or as shown, whichever is greater.

Install all branch circuit and/or feeder overcurrent protection devices in accordance with the NEC.

Lift Station Control Panel (LCP)							
Volts	480		Largest HP	2.0		SCCR Rating	5KA
Phase	3		Largest FLA	3.6			
Frequency	60 HZ		Total FLA	12.3			

11.02 ELECTRICAL INSTALLATION RECOMMENDATIONS

Recommended Conduit Sizes				
Device	**HP**	**Power Dia.**	**Control Dia.**	**Conduit Size**
Pump 1	2	.41	.495	1-1/4”
Pump 2	2	.41	.495	1-1/4”
Floats			.25	1”

Note: *All conduit calculations based on rigid metal conduit (RMC) @ 40% maximum fill as per the 2011 National Electrical Code.*

Size all conduits in accordance with the NEC, or as recommended, whichever is greater.

Special Note: *The above information is preliminary information only. It is the installing contractor's responsibility to reference the as-built documentation to verify all information and to confirm that the installation meets the requirements of the National Electrical Code and any local code requirements.*

Further Recommendations:

Where the NEC allows, use schedule 40 PVC for all conduits installed underground. Use a long radius rigid steel conduit elbow and rigid steel conduit for transition to above grade terminations. PVC conduit shall not be exposed. All below grade rigid steel conduit shall be PVC coated, half-lap wrapped with corrosion protection tape, or coated with corrosion protection paint.

END

OF

SECTION

12. CONTROL PANEL / ELECTRICAL & COMMUNICATIONS

This section includes design and data pertinent to the control panel and electrical communication.

This section is structured as follows:

12.01 STANDARD TEMPERATURE SPECIFICATIONS

Standard Temperature Specifications for Electrical Control Panels <u>Without</u> VFDs:

Operating Temperature Ranges Tmin[1] All = -5°F (-20C)	NEMA 4 Painted Gray	NEMA 4 Painted White	NEMA 4X Stainless Steel	NEMA 3R With Fans
Direct Sun Exposure	Tmax 96°F (35.6°C)	Tmax 109°F (42.8°C)	Tmax 106°F (41.1°C)	Tmax 118°F (41.1°C)
No Sun Exposure (Completely Shaded)	Tmax 109°F (42.8°C)	Tmax 109°F (42.8°C)	Tmax 109°F (42.8°C)	Tmax 120°F (42.8°C)
Direct Sun Exposure Air Conditioned Enclosure	Tmax 112°F (44.4°C)	Tmax 122°F (50°C)	Tmax 118°F (47.8°C)	Not Applicable

1. If lower temperature ranges are required a larger than standard heater can be added at additional cost.

2. If higher temperature ranges are required an air conditioner unit can be added at additional cost.

Application Notes Regarding Temperature:

- Romtec Utilities recommends adding sunshades to all enclosure installations.
- Direct sunlight doubles heat loading in gray painted cabinets as reflected in the above temperature specifications. Romtec Utilities does not recommend using gray painted cabinets in direct sunlight applications.
- Where large temperatures swings (less than -5°F to greater than 96°F) are common, consider purchasing a Romtec Utilities shelter or building.
- The above operating temperatures do not reflect cabinets containing VFDs. When VFDs are required the Romtec Utilities suggested enclosure is NEMA 3R with fans. Romtec Utilities can accommodate other VFD enclosure configurations but this will require full design analysis including expected site temperature ranges provided by the customer.
- Romtec Utilities will not warranty panels that are operating outside of the stated temperature ranges.
- Panels that are partially shaded fall into the Direct Sun Exposure temperature ranges listed above. Romtec Utilities cannot quantify the effect of partial shading related to temperature performance.
- Designs do not include air-conditioning unless specifically requested.

12.02 POWER QUALITY DISCLAIMER

Power Quality

Poor power quality can have an adverse effect on the control system operation and reliability. In addition, pump motors can be damaged by sustained application of unbalanced phase voltages and/or balanced phase voltages operating above or below normal nameplate ratings.

Romtec Utilities recommends that the supply voltage to the Romtec Utilities control panel comply with the National Equipment Manufacturers Association (NEMA) Standard MB1-1987-SECTION 14.34B. Any performance issues that arise as a result of the supply voltage not meeting these standards are the responsibility of the owner. Romtec Utilities is not responsible for identifying or mitigating any power quality issues that are result of power quality associated with the utility supply voltage.

NEMA Published Tolerances

Voltage imbalance not to exceed 1% measured at the motor terminals
Current imbalance not to exceed 5% measured at the motor terminals
Voltage levels not to exceed +/- 10% name plate rating.

2/14/13

ANIMAL HEALTH
, KANSAS

Electrical System Design Voltage

This system has been designed to operate on 480V, 3 Phase supplied power.

Please verify that this is the correct voltage configuration available on-site.

12.04 SPECIFICATIONS–CONTROL PANEL SCOPE OF SUPPLY

ROMTEC UTILITIES

Control Panel Scope of Supply
2/14/13
ANIMAL HEALTH
, KANSAS

General information

- ELECTRICAL SERVICE - 480V, 3 Phase
- PUMPS - (2) 2HP, 460V, 3 PH, 3.6FLA, DUPLEX configuration
- PUMPS - MODEL TSURUMI , 80PU21.5
- PRIMARY CONTROLLER - ALTERNATOR configured for DUPLEX
- ENCLOSURE MOUNTING - WALL MOUNT

Liquid level sensing

- PRIMARY LEVEL SENSING - MS1C NOLTA FLOATS WIRED FOR INTRINSICALLY SAFE

Station Control Panel

Qty.	Description
1	NEMA 4X FIBERGLASS , 36"H X 30"W X 12"D enclosure.
1	Controls are mounted on inner swing door.
1	Main Circuit Breaker with operator handle on inner swing door.
1	Phase Monitoring device to detect incoming power to the pump station and prevent the pumps from running if a voltage problem exists. This device shall be protected by a monitoring circuit breaker.
1	Transient Voltage Surge Suppression device to protect controls and associated equipment.
1	Power distribution terminal block with safety cover.
2	Pump motor circuit breakers, operable directly through panel front.
2	Full voltage starters, with thermally compensated overloads sized to the full load current of the motor These starters will have illuminated pushbutton reset mounted on the control front for each overload for electric reset.
1	Primary pump control of type ALTERNATOR configured for DUPLEX
2	HAND-OFF-AUTO switches for operation of the pump station.
2	Pump run time meters
1	Control transformer to generate a 120V control Bus.
1	A caged flashing alarm beacon mounted on panel for local alarm notification
1	Enclosure heater and thermostat
2	Pump Green LED Pump Call Pilot lights
1	Red "Tank Leak" alarm light
1	Red pump "High Level Alarm" light
1	Audible alarm w/push to silence push-buttion
2	Leak detection for TSURUMI pumps mounted on swing panel.
1	IS Barrier for connection to level sensing floats
1	IS Barrier for tank leak detection sensor.
-	Terminal blocks for field connections

Alarm Inputs to the terminal strip will be as follows

5 Dry Contacts

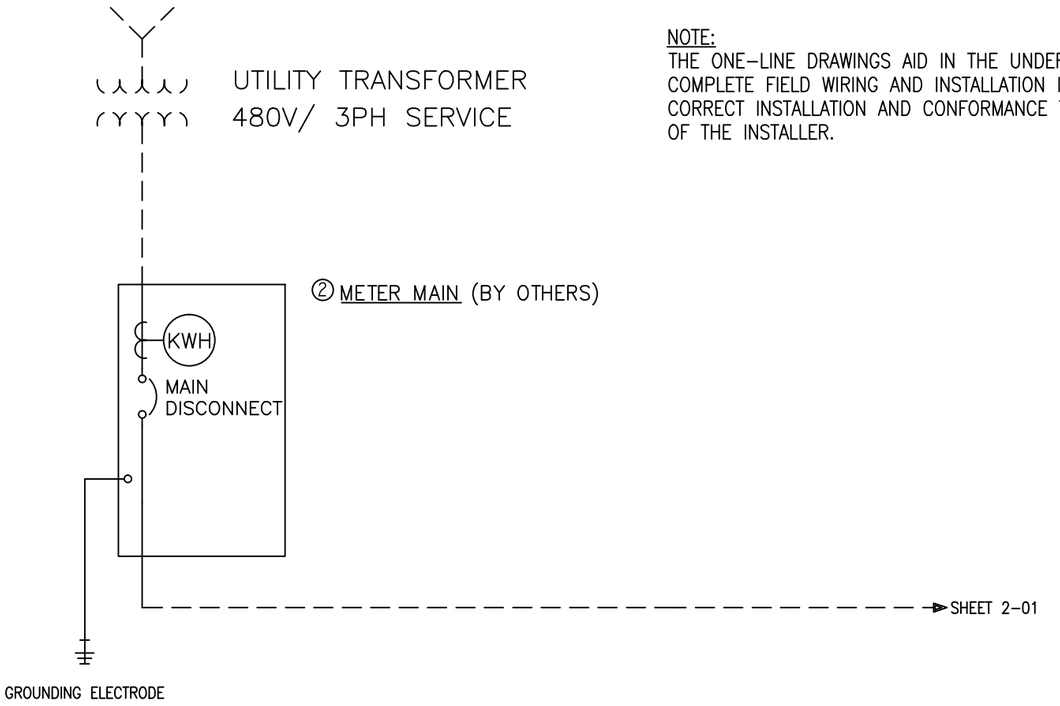
TO1 Pump 1 Run
TO2 Pump 2 Run
TO3 High Level Alarm
TO4 Pump Fault
TO5 Tank Leak Detected

Operation

Stop Float - All pumps off
Lead Float - Lead pump on
Lag Float - Lag pump on
High Level Float - Alarm

UTILITY SUPPLY

① INCOMING POWER
480V/ 3PH



NOTE:
THE ONE-LINE DRAWINGS AID IN THE UNDERSTANDING AND INSTALLATION OF THE CONTROL SYSTEM. COMPLETE FIELD WIRING AND INSTALLATION INSTRUCTIONS ARE NOT INCLUDED HERE. THE CORRECT INSTALLATION AND CONFORMANCE TO ALL APPLICABLE CODES IS THE RESPONSIBILITY OF THE INSTALLER.

EMERGENCY BACK-UP SYSTEM

EMERGENCY POWER BACK-UP SYSTEM:
AN EMERGENCY POWER BACK-UP SYSTEM HAS NOT BEEN SPECIFIED BY ROMTEC UTILITIES FOR THIS PROJECT.

SHEET 1 OF 4

REVISIONS	DESCRIPTION	DATE	REV	BY
			1	

E0106D03

DSN. KAS
DRN. KAS
CKD. KAS
2/14/13

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18240 NORTH BANK ROAD
ROSEBURG, OR 97470
(541)-496-9678
FAX (541)-496-0804
WWW.romtecutilities.com

ANIMAL HEALTH
KANSAS
DUPLEX LIFT STATION SYSTEM
ONE LINE DIAGRAM
DRAWING

SHEET 1 OF 4

SCADA

CONTROL PANEL

FIELD

TELEMETRY FORM "A" CONTACTS

PUMP1 RUN | PUMP2 RUN | PUMP FAULT | HIGH LEVEL | TANK LEAK

SHEET 1-01

MAIN BREAKER

PUMP 1 | PUMP 2

MCP | MCP

TVSS | PHASE | DOL AC 2 HP | DOL AC 2 HP | CPT

HORN | LIGHT

END

END

PRIMARY CONTROLLER DUPLEX

① INCOMING POWER
480V/ 3ϕ

VALVE CANS

FLOW

HIGH LVL ALARM

LAG START

LEAD START

PUMPS STOP

HP2 | HP2

⑨ PRIMARY LEVEL CONTROL

WET WELL

⑩ DUPLEX PUMP CONFIGURATION
TSURUMI / 80PU21.5

LEAD
LAG
PUMP 1 | PUMP 2
STEP 1

PUMP 1 | PUMP 2
STEP 2

SHEET 2 OF 4

REV	DATE	DESCRIPTION	BY
		REVISIONS	
1			

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ROSEBURG, OR 97470
(541)-496-9678
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ONE LINE DIAGRAM
DRAWING

SHEET 2 OF 4

GENERAL NOTES:

1. THE ELECTRICAL CONTRACTOR SHALL SUPPLY POWER TO AND MAKE ALL CONNECTIONS TO THE EQUIPMENT SHOWN ON THE ELECTRICAL ENGINEER'S ELECTRICAL SITE PLAN. IT SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR TO REVIEW ALL THE DRAWINGS FOR THE LOCATION AND SIZE OF EQUIPMENT. IT SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR TO FAMILIARIZE HIM/HERSELF WITH THE PLANS AND SPECIFICATIONS AND ASK FOR CLARIFICATION, IF ANY IS REQUIRED, BEFORE INSTALLATION BEGINS.

2. THE ELECTRICAL CONTRACTOR SHALL SUPPLY THE INCOMING POWER.

3. ALL ITEMS RELATED TO THE ELECTRICAL SERVICE SUCH AS SERVICE CONDUIT, CONDUCTORS, DUCTS, PAD MOUNT, RISERS, PULL BOXES, PERMITS, FEES, AND PROTECTIVE COVERING FROM THE SERVICE POINT LOCATION SHALL BE VERIFIED WITH THE SERVING UTILITY. THE ELECTRICAL CONTRACTOR SHALL INSTALL THE SERVICE IN COMPLIANCE WITH THE SERVING UTILITY, NATIONAL ELECTRICAL CODE, STATE AND LOCAL ELECTRICAL CODES.

4. THE ELECTRICAL CONTRACTOR SHALL SUPPLY AND INSTALL THE METER BASE AND MEANS OF MAIN DISCONNECT (A METER MAIN IS THE PREFERRED EQUIPMENT).

5. THE ELECTRICAL CONTRACTOR SHALL SUPPLY AND INSTALL ALL REQUIRED CONDUIT AND WIRE TO CONNECT TO THE ROMTEC UTILITIES SUPPLIED EQUIPMENT.

6. IT SHALL BE THE ELECTRICAL CONTRACTOR'S RESPONSIBILITY TO SIZE AND INSTALL ALL CONDUIT AND CONDUCTORS AS PER THE ELECTRICAL ENGINEER'S ELECTRICAL SITE PLAN, NEC, STATE AND LOCAL ELECTRICAL CODES.

7. INSTALLATION OF EQUIPMENT INCLUDING ANY GROUNDING ARRANGEMENT TO BE IN ACCORDANCE WITH NEC ARTICLES 501, 502, 504 AND ANSI/ISA–RP12.06.01–2003 RECOMMENDED PRACTICE FOR WIRING METHODS FOR HAZARDOUS (CLASSIFIED) LOCATIONS INSTRUMENTATION WHEN APPLICABLE.

ELECTRIC NOTES:

1. INCOMING POWER
   480V THREE PHASE POWER

2. METER MAIN
   POWER UTILITY METER BASE AND METHOD OF MAIN DISCONNECT. METER BASE MUST CONFORM TO THE LOCAL SERVICE PROVIDERS REQUIREMENTS. PROVIDE METHOD OF MAIN DISCONNECT, (A METER MAIN IS PREFERRED).
   MOUNTED AS A SEPARATE ENCLOSURE IN COMPLIANCE WITH NEC, STATE, AND LOCAL ELECTRICAL CODES.

3. AUTOMATIC TRANSFER SWITCH
   N/A

4. GENERATOR
   N/A

5. LIFT STATION CONTROL PANEL
   POWER CONFIGURATION:
   THREE PHASE INCOMING POWER
   DUPLEX PUMP CONTROL PANEL
   PRIMARY CONTROLLER:
   – ALTERNATOR DUPLEX

   CONTROL PANELS ARE UL 508A LISTED AS A COMPLETE CONTROL PANEL.
   ENCLOSURE:
   – NEMA 4X FIBERGLASS ENCLOSURE
   – WALL MOUNT

   OPTIONAL EQUIPMENT:
   BEACON
   DRY CONTACTS
   TANK LEAK DETECTION

6. COMMUNICATIONS
   N/A

7. PUMP DISCONNECT PANEL
   N/A

SHEET 3 OF 4

REV	DATE	DESCRIPTION	BY
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18240 NORTH BANK ROAD
ROSEBURG, OR 97470
(541)–496–9678
FAX (541)–496–0804
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ANIMAL HEALTH
KANSAS
DUPLEX LIFT STATION SYSTEM
ONE LINE DIAGRAM
DRAWING

SHEET 3 OF 4

ELECTRIC NOTES CONTINUED:

8. BACK–UP LEVEL CONTROL
N/A

9. PRIMARY LEVEL CONTROL
– NOLTA (MS1C FLOAT)

PRIMARY LEVEL CONTROL IS USED FOR ALL OPERATIONAL POINTS WITHIN THE WET WELL.
– PUMPS STOP
– LAG PUMP START
– LEAD PUMP START
– HIGH LEVEL ALARM

10. DUPLEX PUMP CONFIGURATION
TSURUMI SUBMERSIBLE PUMPS.
– 80PU21.5
– 460V/3PH/60HZ
– 2HP

PIPING AND VALVE NOTES:

11. VALVE VAULT

SEE WET WELL COMPONENT DRAWING FOR DETAILS

12. METER VAULT

N/A

SPECIAL NOTES:

1. THE PROJECT SITE ENGINEER AND ELECTRICAL ENGINEER ARE RESPONSIBLE FOR ALL ASPECTS OF THIS PROJECT. ROMTEC UTILITIES OFFERS THIS INFORMATION TO CLARIFY OUR PRODUCT OFFERING. THIS INFORMATION REFLECTS A TYPICAL PROJECT. DASHED LINES SHOW TYPICAL SITE WIRING/CONDOUIT SUPPLIED AND INSTALLED BY ELECTRICIAN OR CONTRACTOR. PLEASE REFER TO THE PROJECT ENGINEER'S SITE PLANS AND ELECTRICAL LAYOUT FOR THE SPECIFIC DETAILS. THE PROJECT ENGINEER'S PLANS, SPECIFICATIONS AND THE APPROVED SUBMITTAL DOCUMENTS SHALL GOVERN ALL WORK.

2. ROMTEC UTILITIES DOES NOT PROVIDE CORED HOLES INTO THE WET WELL FOR ELECTRICAL CONDUIT RUNS. THE ELECTRICALLY RELATED CORED HOLES INTO THE WET WELL ARE THE RESPONSIBILITY OF THE CONTRACTOR AND ELECTRICIAN.

3. ALL COMMUNICATION DEVICES FOR REMOTE ANNUNCIATION OR SYSTEM CONTROL AND DATA ACQUISITION (SCADA) ARE TO BE CONFIGURED, TESTED, AND MAINTAINED BY OWNER/CONTRACTOR UNLESS OTHERWISE NOTED. ROMTEC UTILITIES WILL INSTALL CUSTOMER SPECIFIED COMMUNICATION DEVICES IN OUR CONTROL PANEL IF REQUESTED.

SHEET 4 OF 4

BY	DESCRIPTION REVISIONS	DATE	REV

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ROSEBURG, OR 97470
(541)–496–9678
FAX (541)–496–0804
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KANSAS
DUPLEX LIFT STATION SYSTEM
ONE LINE DIAGRAM
DRAWING

SHEET 4 OF 4

END

OF

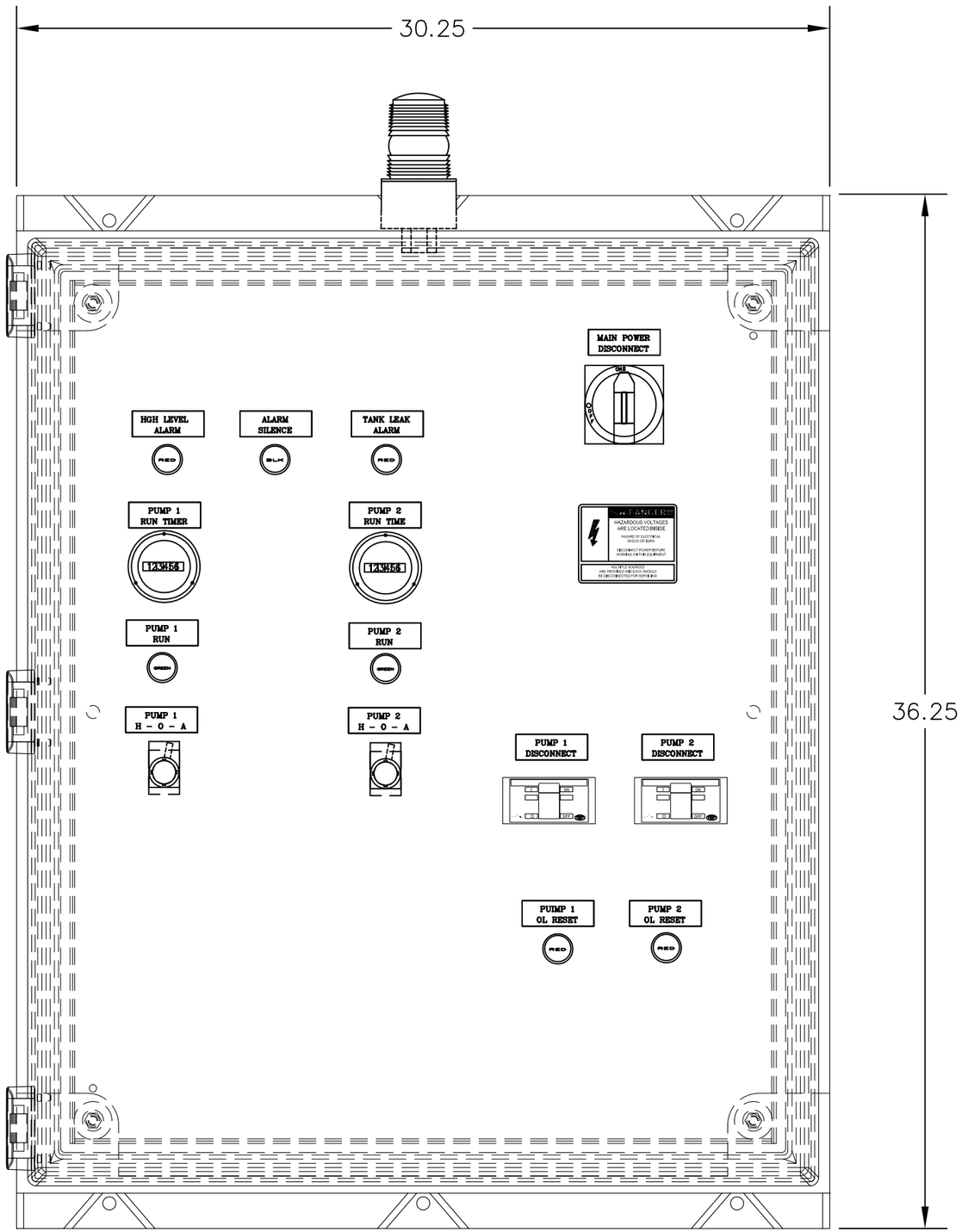
SECTION

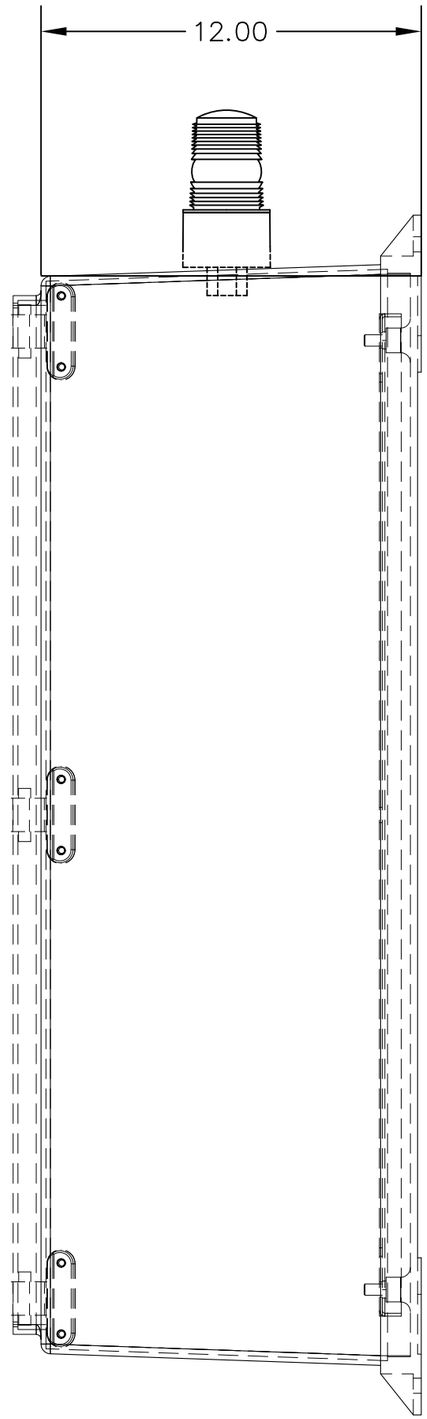
13. PUMP ELECTRICAL CONNECTION ENCLOSURE/ PANEL

This section includes design and data pertinent to the pump electrical connection enclosure/panel.

This section is structured as follows:

13.01 PUMP ELECTRICAL CONNECTION ENCLOSURE/PANEL DRAWINGS





REVISIONS	DESCRIPTION	DATE	REV	BY

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DRN. KAS
CKD. KAS 2/14/13

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18240 NORTH BANK ROAD
ROSEBURG, OR 97470
(541)-496-9678
FAX (541)-496-0804
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ANIMAL HEALTH

DUPLEX LIFT STATION SYSTEM
CONTROL PANEL LAYOUT
ELECTRICAL CONTROLS

SHEET
1 OF 1

DRAWING #

END

OF

SECTION

14. PRE-INSTALLATION

This section includes an example of the Romtec Utilities Installation Checklist that Romtec Utilities requires the owner/contractor to fill out prior to installation of the system.

14.01 INSTALLATION CHECKLIST

Send the completed Start-Up Preparation Checklist to:

Romtec Utilities Document Control
18240 North Bank Rd., Roseburg, OR 97470
Phone: 541-496-9678; Fax: 541-496-0804
romtec3@romtecutilities.com

Installation Checklist

Contractor / Romtec Utilities

Jobsite Address:

_____

_____

Name of person in charge of safety: _____

Name and Contact Information of Person in Charge of Field Installation:

_____

_____

ATTENTION

The specification and the process for creating a stable compacted "footing" or "base" for the Romtec Utilities wet well foundation is by others. Creating a compacted base that will not allow the Romtec Utilities wet well to "settle" and/or "tilt" during or after installation is not the responsibility of Romtec Utilities.

1. SCHEDULING INSTALLATION

A. LEAD TIME: Romtec Utilities and all associated technical personnel require two (2) weeks advance notice to schedule an installation date.

B. DURATION: Installation begins at 8 am and will take one full day (as stated in the approved Romtec Utilities Scope of Supply and Design Submittal dated _____.

2. ITEMS DELIVERED FOR INSTALLATION

PLEASE REVIEW

A. **Pre-cast Base Slab**

i. Ready to set

ii. Pump discharge elbows attached

iii. Lifting methodology included:

1. **WARNING! WEIGHTS OF CONCRETE VARY!** See approved scope of supply and design submittal section____, dated_____for concrete weights.
2. The contractor must provide a crane capable of lifting the base.
3. LIFTING STRAP RECOMMENDATIONS
    a. 4' Base, barrels and vault: Four (4) 16' straps.
    b. 5' Base, barrels and vault: Four (4) 16' straps.
    c. 6' Base, barrels and vault: Four (4) 16' straps.
    d. 8' Base, barrels and vault: Four (4) 16' straps.
    e. 10' Base, barrels and vault: Four (4) 16' straps.
4. **PAY ATTENTION!** Check the alignment marks on all concrete pieces. Check that all pieces are numbered, in order, bottom to top.
5. **IMPORTANT IF YOU ARE USING SHORING!** The base and first barrel are one solid piece. The base slab is square, rectangular or round! The shoring must be wide enough to allow rotation of the base 360 degrees to be able to align the gravity sewer and force main. See approved scope of supply and design submittal section_____, dated_____for concrete dimensions.

B. **Pre-cast Barrels**

i. All discharge and inlet holes pre-cored plus Kor-n-Seals installed.

ii. Romtec Utilities does not provide cored holes into the wet well for electrical conduit ports or conduit runs. The electrical related cored holes in the wet well are the responsibility of the contractor and electrician. Wet well electrical related cored holes final size, orientation, height and number are best determined after installation of the wet well and other electrical components.

iii. If the wet well includes Ameron T-Lock lining, all joints, cored holes and all penetrated concrete must be welded by a "Certified" Ameron welder. All piping going through the wet well must be installed prior to the welding.

iv. IF APPLICABE, Please advise when you will be ready for the Ameron welding: _____.

C. **Pre-cast/Pre-Fabricated Top Slab**

i. This is the last concrete piece.

D. **Accessory Pallet**

i. Wet well gaskets and sealers

ii. Discharge pipe (pre-fabricated)

1. **WARNING! TRIM TO FIT INSTALLATION DIMENSIONS.**
2. Discharge pipe intentionally too long, the contractor must measure and trim to fit.
3. Contractor must plumb discharge pipe and secure to wet well using the pre-installed bracket.

iii. Level sensing devices (store for installation at start-up)

iv. **On the accessory pallet there are going to be items that you will NEED to complete Start up of your pump station. Please keep track of these items for start up. Your pump station will not be able to be completed without them.**

E. **Guiderails**

i. **WARNING!** Trim to fit. Guiderails are produced too long intentionally; the contractor must measure and trim to fit.

F. **Upper Guiderail Brackets**

i. Mounting hardware included.

ii. Contractor must plumb guide rails before tightening the supplied bolts.

iii. **PLEASE!** Install in provided nut rail already built into top slab hatch.

G. **Deflector Panel (Optional)**

i. **LOOK!** Deflector panel goes in wet well on pre-installed concrete anchors inside concrete barrels (*this item may be pre-installed).*

ii. Look for, and install guillotine panel between deflector and concrete well.

iii. EXPLANATION: The deflector panel and guillotine panel are intended to deflect influent water and guide the flow.

H. **Inside drop system (Optional)**

i. **LOOK!** Inside drop system goes in wet well on pre-installed concrete anchors and provided adjustable pipe brackets.

ii. Look for, and install PVC drop pipe between inside drop bowl (pre-installed) and wet well base.

iii. EXPLANATION: The inside drop system is intended to direct the influent water and guide the flow.

I. **Valve Vault**

i. Place the valve vault (per the approved site plan) so that the alignment with the discharge piping of the wet well matches the two (2) pipes entering the valve vault. Place the two (2) supplied retainer glands on the discharge pipes and the force main pipe(s) of the valve vault, and secure.

ii. Once all connections are made, field pour the concrete thrust collar around these pipes (see plans).

iii. You must provide any additional pipe (beyond 4') required to connect the valve vault piping to the wet well piping.

iv. Install the supplied coupler to connect the wet well piping to the valve vault piping.

v. Connect the force main pipe to the force main (coupling supplied by contractor).

J. **Meter Vault**

i. Place the meter vault (per the site plan) so that the alignment with the discharge piping of the valve vault matches the pipes entering the meter vault. Place the two (2) supplied retainer glands on the discharge pipes and the force main pipe(s) of the meter vault and secure.

ii. Once all connections are made, field pour the concrete thrust collar around these pipes (see plans).

iii. You must provide any additional pipe (beyond 4') required to connect the meter vault piping to the valve vault piping.

iv. Install the supplied coupler to connect the valve vault piping to the meter vault piping.

v. Connect the force main pipe to the force main (coupling supplied by contractor).

K. **Pump Disconnect Panel and Stand (optional)**

i. Electrician to install the conduits between the disconnect panel and the control panel per the site engineer's direction. This includes one to three power conduits and one separate conduit for level sensing.

L. **Electrical Junction Box (optional)**

i. **WARNING!** Electrician to install.

ii. Electrician to install the conduits between the electrical junction box and the control panel per the site engineer's direction. This includes one to three power conduits and one separate conduit for level sensing.

M. **Control Panel (if included in this shipment)**

i. **WARNING!** Electrician to install per site engineer's direction.

N. **Pumps (if included in this shipment)**

i. Installed by Romtec Utilities after system construction.

ii. You do not need to bring pumps to the site until start-up.

iii. **PLEASE!** Leave the pumps and chains at the contractor's office until start-up.

O. **Odor Control System (if included in this shipment)**

i. Install as directed.

3. THE FOLLOWING ARE STRONGLY RECOMMENDED ON SITE:

A. Two (2) six-foot ladders.

B. One (1) six-foot level.

C. Shoring for safe working space in the hole and shoring of adequate size for room around the base slab.

D. Crane to off load and set all concrete components.

E. Forklift to offload accessory pallet and control panel (may be shipped separately at a later date).

F. Secure site for accessory pallet (and control panel with pumps, when they arrive). These items may need to be hauled to a secure site. Please provide a truck to transfer these items to a separate site if necessary.

G. Review the site and **LOOK** for overhead obstructions before delivery.

H. A person on-site whose sole purpose is to be in charge of safety.

4. PLEASE COMPLETE THE FOLLOWING TO CONFIRM YOU ARE READY FOR INSTALLATION

A. The delivery date and time that hole will be ready for the lift station installation is: _____.

B. All equipment and manpower will be on-site ready for the truck on: _____.

C. Will the site be prepared by the delivery date established?

☐ **Yes** ☐ **No**

D. Is the contractor ready to begin construction?

☐ **Yes** ☐ **No**

E. Is the hole excavated and prepared per site engineer specifications?

☐ **Yes** ☐ **No**

F. If not, when will it be ready?_____.

G. Will the crane be on-site on the delivery day to unload the Romtec Utilities supplied items from the delivery trucks?

☐ **Yes** ☐ **No**

H. Has the contractor confirmed that the crane to be used has the capacity to lift and install the lift station?

☐ **Yes** ☐ **No**

I. Has the contractor confirmed that the crane has appropriately stable ground from which to work?

☐ **Yes** ☐ **No**

J. Has the contractor confirmed that the crane will be adequately anchored?

☐ **Yes** ☐ **No**

K. Can a fully loaded semi-truck and trailer (up to 70 ft in length) park adjacent to the crane?

☐ **Yes** ☐ **No**

L. Will the contractor be ready to stack the wet well and possibly install the valve vault & related piping on the delivery date?

☐ **Yes** ☐ **No**

M. Will the hole be shored? Is the shoring wide enough to be able to rotate the base 360 degrees? Check the approved Scope of Supply and Design Submittal dated _____for base dimensions. Remember, the base may not be round.

☐ **Yes** ☐ **No**

N. Will the contractor have adequate dewatering on-site?

☐ **Yes** ☐ **No**

O. Will the bottom of the hole have the base rock installed and compacted and level as per site engineer's requirements, prior to 8:00 AM on_____?

NOTE: Construction should not occur on the same day the hole is being excavated.

☐ **Yes** ☐ **No**

P. Will someone from the contractor's company review and verify the Romtec Utilities packing list and the supply of all equipment? Please scan and e-mail or fax to Romtec Utilities after this has been completed, if there is not a Romtec Utilities construction advisor on-site.

☐ **Yes** ☐ **No**

Who will review and verify? _____

Q. Will the contractor provide at least one laborer exclusively for unloading the truck and prepping concrete parts per Romtec Utilities direction?

☐ **Yes** ☐ **No**

R. Does the contractor recognize that the elevations below are the elevations in the Romtec Utilities system drawing, and these are the governing elevations?

NOTE: Please list the elevations you have in the table below, and mark any elevations that do not match.

☐ **Yes** ☐ **No**

S. Does the contractor agree that these are the correct elevations?

NOTE: These elevations are based on our approved Scope of Supply and Design Submittal dated_____. Please call our office immediately if your elevations do not match ours.

WET WELL RIM ELEVATION:

RU Elevation: 919.00' ft.

Your Elevation: _____ ft.

DO THEY MATCH? ☐ **Yes** ☐ **No**

WET WELL INFLUENT PIPE ELEVATION:

RU Elevation: 912.00' ft.

Your Elevation: _____ ft.

DO THEY MATCH? ☐ **Yes** ☐ **No**

WET WELL FLOOR ELEVATION:

RU Elevation: 906.97' ft.

Your Elevation: _____ ft.

DO THEY MATCH? ☐ **Yes** ☐ **No**

WET WELL BASE ELEVATION:

RU Elevation: 906.85' ft.

Your Elevation: _____ ft.

DO THEY MATCH? ☐ **Yes** ☐ **No**

WET WELL DISCHARGE INVERT ELEVATION:

RU Elevation: 913.00' ft.

Your Elevation: _____ ft.

DO THEY MATCH? ☐ **Yes** ☐ **No**

T. Has a safety plan for installation been developed and implemented in conformance with OSHA requirements?

☐ **Yes** ☐ **No**

U. Does the safety plan include components for confined spaces, climbing, high voltage (underground and overhead) and shoring?

☐ **Yes** ☐ **No**

V. Have contractor's employees been instructed with respect to the safety plan?

☐ **Yes** ☐ **No**

Comments:

AUTHORIZED SIGNATURE

PROPOSED CONSTRUCTION DATE

PRINT NAME

Send the completed Start-Up Preparation Checklist to:

Romtec Utilities Document Control
18240 North Bank Rd., Roseburg, OR 97470
Phone: 541-496-9678; Fax: 541-496-0804
romtec3@romtecutilities.com

SAFETY DISCLOSURE & ACKNOWLEDGMENT

Installation Safety Threats

Installation of the equipment to be supplied may implicate five (5) specific potential safety threats, among others:

1. Work in confined spaces, particularly within the wet wells, valve vaults and meter vault.
2. Inadequate shoring of dirt walls in the installation well.
3. Work at heights, relative to the base of the lift station in the bottom of the excavated hole.
4. Misuse of machinery, such as cranes, used in installation.
5. High voltage.

Acknowledgment of Responsibility

Your signature below signifies your acceptance of the following:

1. You (including, but not limited to, you, your employees, or your Contractor), and not Romtec Utilities, assume full responsibility for installation of the equipment.
2. You are **not** an agent of Romtec Utilities in any capacity.
3. Romtec Utilities will provide fundamental instruction regarding installation by a Romtec Utilities advisor, but any such advisor will have no authority or obligation to supervise or direct your personnel in the course of installation.
4. **You are solely responsible for ensuring safety in all facets of installation.**

By signing this form you are agreeing to each of the above. Please contact our office with any questions or concerns you may have.

Signature Date

18240 North Bank Rd. ~ Roseburg ~ Oregon ~ 97470
Phone 541-496-9678/ Fax 541-496-0804
romtec3@romtecutilities.com

END

OF

SECTION

15. FIELD START-UP REPORT

This section includes the Field Start-UP Report to be filled out by Romtec Utilities onsite advisor at the scheduled start-up of the system.

This section is structured as follows:

15.01 FIELD START-UP REPORT

FIELD START-UP REPORT

TO BE COMPLETED BY ROMTEC UTILITIES START-UP TECHNICIAN

DATE: / /

(SITE OVERVIEW)

1. STRUCTURAL / MECHANICAL CONSTRUCTION

A. Are all the components for the wet well and valve vault installed and approved?

☐ **Yes** ☐ **No**

2. ELECTRICAL CONSTRUCTION

A. Have the conduits been installed between the wet well and the main control panel minimum (one (1) for each pump, one (1) for level control)?

☐ **Yes** ☐ **No** **Installed by**_____

B. Have the "pump power" wires been pulled between the main control panel and the wet well?

☐ **Yes** ☐ **No** **Installed by**_____

C. Have the level control signal wires been pulled between the pump control panel and the wet well?

☐ **Yes** ☐ **No** **Installed by**_____

D. Have the level control wires been landed on the appropriate terminals inside the control panel?

☐ **Yes** ☐ **No** **Installed by**_____

E. Have the panel power wires been installed between the main disconnect, automatic transfer switch (if present) and the pump control panel?

☐ **Yes** ☐ **No**

F. Have the "meter base" and main disconnect been installed and inspected?

☐ **Yes** ☐ **No**

G. Has the power company energized the meter?

☐ **Yes** ☐ **No**

3. BACK UP POWER GENERATOR (IF APPLICABLE)

A. Has the generator been delivered and installed?

☐ **Yes** ☐ **No** ☐ **NA**

B. Is the fuel for the generator on-site?

☐ **Yes** ☐ **No**

C. Has the automatic transfer switch been wired into the electrical system (if applicable)?

☐ **Yes** ☐ **No**

D. Has the generator control been wired into the electrical system (if applicable)?

☐ **Yes** ☐ **No**

E. If a portable generator is to be used for back-up power, has it been tested with the lift station (if applicable)?

☐ **Yes** ☐ **No** ☐ **NA**

4. COMMUNICATION EQUIPMENT

A. Has all required communication equipment (radio, phone, cellular) been installed and tested and operational?

☐ **Yes** ☐ **No** ☐ **NA**

5. WATER AVAILABILITY

A. Is there enough water available for a minimum of ½ hour of pumping?

☐ **Yes** ☐ **No**

(TESTING AND START-UP)

1. PUMP DATA

Pump: P-1 Model:_____ Serial No.:_____ Imp.:_____ HP:_____ FLA:_____

Pump: P-2 Model:_____ Serial No.:_____ Imp.:_____ HP:_____ FLA:_____

Pump: P-3 Model:_____ Serial No.:_____ Imp.:_____ HP:_____ FLA:_____

A. Do the above meet the approved scope of supply?

☐ **Yes** ☐ **No (Explain in Comments)**

2. PUMP CONTROL DATA

Primary Level Control Type/Mfg./Model:_____

Secondary Level Control Type/Mfg./Model:_____

A. Do the above meet the approved scope of supply?

☐ **Yes** ☐ **No (Explain in Comments)**

3. PHYSICAL INSPECTION

A. Have all of the terminals and lugs been checked for tightness?

☐ **Yes** ☐ **No**

B. Inspected pumps and cable for damage?

P-1: ☐ **Yes** ☐ **No**

P-2: ☐ **Yes** ☐ **No** ☐ **NA**

P-3: ☐ **Yes** ☐ **No** ☐ **NA**

C. Check oil in seal chamber for condition and quantity?

P-1: ☐ **Yes** ☐ **No**

P-2: ☐ **Yes** ☐ **No** ☐ **NA**

P-3: ☐ **Yes** ☐ **No** ☐ **NA**

D. Does impeller spin freely when rotated by hand?

P-1: ☐ **Yes** ☐ **No** **Verified by**_____

P-2: ☐ **Yes** ☐ **No** ☐ **NA**

P-3: ☐ **Yes** ☐ **No** ☐ **NA**

E. Discharge connection level and tight (verify with contractor)?

P-1: □ Yes □ No

P-2: □ Yes □ No □ NA

P-3: □ Yes □ No □ NA

F. Guide bars vertical and tight (verify with contractor)?

P-1: □ Yes □ No

P-2: □ Yes □ No □ NA

P-3: □ Yes □ No □ NA

G. Lifting cable free of damage and connected securely?

P-1: □ Yes □ No

P-2: □ Yes □ No □ NA

P-3: □ Yes □ No □ NA

H. Electrical connections tight and connected correctly?

P-1: □ Yes □ No

P-2: □ Yes □ No □ NA

P-3: □ Yes □ No □ NA

I. Pump station free of debris?

□ Yes □ No (Explain in Comments)

J. Junction boxes, conduits, seals installed correctly?

□ Yes □ No

K. Is the system properly grounded and bonded?

□ Yes □ No

L. Are cord grips properly installed?

□ Yes □ No

M. Are the working clearance requirements maintained as per code?

□ Yes □ No

N. Are all level sensing devices installed as designed & properly documented?

□ Yes □ No

O. Are the schematics on the door accurate?

□ Yes □ No

4. PRE-START-UP PUMP ELECTRICAL CHECKS

Resistance of Motor & Cable:

Pump: P-1 R(2)~W(3)_____Ω W(3)~B(1)_____Ω B(1)~R(2)_____Ω
Pump: P-2 R(2)~W(3)_____Ω W(3)~B(1)_____Ω B(1)~R(2)_____Ω
Pump: P-3 R(2)~W(3)_____Ω W(3)~B(1)_____Ω B(1)~R(2)_____Ω

Sensor Loop Resistance:

Pump: P-1 Thermal_____Ω Seal Test_____Ω
Pump: P-2 Thermal_____Ω Seal Test_____Ω
Pump: P-3 Thermal_____Ω Seal Test_____Ω

Insulation Resistance to ground (YEL/GRN-FLYGT PUMPS ONLY):

Pump: P-1 R(2)~GRD_____MΩ W(3)~GRD_____MΩ B(1)~GRD_____MΩ
Pump: P-2 R(2)~GRD_____MΩ W(3)~GRD_____MΩ B(1)~GRD_____MΩ
Pump: P-3 R(2)~GRD_____MΩ W(3)~GRD_____MΩ B(1)~GRD_____MΩ

Note: This value should exceed 10 MΩ.

5. OPERATIONAL CHECKS

1. Supply Voltage, Pumps Off:

   L1 ~ L2: _____V L2 ~ L3: _____V L1 ~ L3: _____V

   a. Do the above meet the approved scope of supply?

   ☐ **Yes** ☐ **No (Explain in Comments)**

2. Phase monitor settings: Voltage: _____, Delay: _____, % Imbalance: _____
3. Starter Type/Mfg./Model: _____
4. O.L. Type/Setting: _____Amp_____
5. Impeller Rotation (viewed from pump suction): P-1 CW / CCW, P-2 CW / CCW, P-3 CW / CCW
6. Volts, Pump Operating in System: Pump: 1 T1~T2 _____V T2~T3 _____V T3~T1 _____V
   Pump: 2 T1~T2 _____V T2~T3 _____V T3~T1 _____V
   Pump: 3 T1~T2 _____V T2~T3 _____V T3~T1 _____V

7. Amps, Pump Operating in System: Pump: 1 T-1 _____A T-2 _____A T-3 _____A
   Pump: 2 T-1 _____A T-2 _____A T-3 _____A
   Pump: 3 T-1 _____A T-2 _____A T-3 _____A

8. Abnormal noise/vibration?

P-1: □ Yes □ No

P-2: □ Yes □ No □ NA

P-3: □ Yes □ No □ NA

9. Does pump shut down and lockout when sensor lead(s) are disconnected?

P-1: □ Yes □ No

P-2: □ Yes □ No □ NA

P-3: □ Yes □ No □ NA

10. Have VFD's been programmed and do they work correctly (if applicable)?

P-1: □ Yes □ No

P-2: □ Yes □ No □ NA

P-3: □ Yes □ No □ NA

11. List of VFD parameters has been provided (if applicable) to: _____ (name)

12. Has controller been programmed and is it working correctly (if applicable)?

□ Yes □ No □ NA

13. List of controller parameters provided to: _____ (name)

14. Does the primary level control system work correctly? Pump On/Off Points _____

□ Yes □ No (Explain in Comments)

15. Does the hi level warning work correctly?

□ Yes □ No

16. Does the redundant level control system work correctly (if applicable)?

□ Yes □ No □ NA

17. Does flow meter work correctly (if applicable)?

□ Yes □ No □ NA

18. Has the auto dialer been powered up and does it work correctly (if applicable)?

□ Yes □ No □ NA

19. Has disconnect panel been installed and does it work correctly (if applicable)?

□ Yes □ No □ NA

20. Has all I/O been checked out and verified?

□ Yes □ No

21. Have all communication issues been tested & signed off by owner/contractor?

□ Yes □ No □ NA

6. DRAW DOWN TEST:

Gallons per foot: 4' diameter = 94 gallons
5' diameter = 146.88 gallons
6' diameter = 211.51 gallons
8' diameter = 376.01 gallons
10' diameter = 587.52 gallons

Draw down: P-1:_____FT
P-2:_____FT
P-3:_____FT

Pump flow: P-1:_____GPM
P-2:_____GPM
P-3:_____GPM

***DOES THE ABOVE MEET THE APPROVED SCOPE OF SUPPLY?**

YES____NO___EXPLAIN IN COMMENTS

7. PRESSURE READINGS (IF AVAILABLE):

Pump 1 - Pump off _____ psi. Pumping _____ psi. Pump on with valve closed _____ psi.
Pump 2 - Pump off _____ psi. Pumping _____ psi. Pump on with valve closed _____ psi.
Pump 3 - Pump off _____ psi. Pumping _____ psi. Pump on with valve closed _____ psi.

8. WET WELL PRIMARY LEVEL SETTINGS:

High/high level alarm: Elevation_____ft.
Distance measured from floor_____ft.
High level alarm: Elevation_____ft.
Distance measured from floor_____ft.
Lag/third pump start: Elevation_____ft.
Distance measured from floor_____ft.
Lag/second pump start: Elevation_____ft.
Distance measured from floor_____ft.
Lead pump start: Elevation_____ft.

	Distance measured from floor_____	ft.
Lag/third pump stop:	Elevation_____	ft.
	Distance measured from floor_____	ft.
Lag/second pump stop:	Elevation_____	ft.
	Distance measured from floor_____	ft.
Lead pump stop:	Elevation_____	ft.
	Distance measured from floor_____	ft.
Low level alarm:	Elevation_____	ft.
	Distance measured from floor_____	ft.

***DOES THE ABOVE MEET THE APPROVED SCOPE OF SUPPLY?**

YES____NO___EXPLAIN IN COMMENTS

9. WET WELL SECONDARY LEVEL SETTINGS:

Pumps Start:	Elevation_____	ft.
	Distance measured from floor_____	ft.
Pumps stop:	Elevation_____	ft.
	Distance measured from floor_____	ft.
High level alarm:	Elevation_____	ft.
	Distance measured from floor_____	ft.

Do all level settings match worksheet values?

□ **Yes** □ **No**

***DOES THE ABOVE MEET THE APPROVED SCOPE OF SUPPLY?**

YES____NO___EXPLAIN IN COMMENTS

COMMENTS

18240 North Bank Rd. Roseburg, Oregon 97470
Phone 541-496-9678; Fax 541-496-0804
info@romtecutilities.com

LIST ANY CORRECTIVE ACTION REQUIRED AND LIST RESPONSIBLE PARTY

18240 North Bank Rd. Roseburg, Oregon 97470
Phone 541-496-9678; Fax 541-496-0804
info@romtecutilities.com

10. The Romtec Utilities technician PERFORMED ALL OF THE FOLLOWING start-up activities

1. Verify electrical supply voltage.
2. Field check control panel.
3. Perform start-up procedure for pumps.
4. Set level controls per approved scope of supply.
5. Testing of pumping rate to the expected performance curve.
6. Field check and set back up power (generators) by Romtec Utilities (IF APPLICABLE).

All parties agree that Romtec Utilities has fulfilled all requirements (1-6) for this lift station, and the station is fully approved and commissioned.

Startup performed by:

_____(Tech: Print Name)

_____(Tech: Signature)

Cell Phone Number:_____

Date:_____

Contractor's Representative:

_____(Print Name)

_____(Signature)

Cell Phone Number:_____

Date:_____

Electrical Subcontractor Representative:

_____(Print Name)

_____(Signature)

Cell Phone Number:_____

Date:_____

Site Engineer Representative:

_____(Print Name)

_____(Signature)

Cell Phone Number:_____

Date:_____

Owner/Sewer Agency Representative:

_____(Print Name)

_____(Signature)

Cell Phone Number:_____

Date:_____

Startup witnessed by:

_____(Print Name)

_____(Signature)

Company:_____

Cell Phone Number:_____

Date:_____

Startup witnessed by:

_____(Print Name)

_____(Signature)

Company:_____

Cell Phone Number:_____

Date:_____

Upon approval in the form of the above signatures, this lift station is now in the warranty period.

16. AUTODESK DESIGN REVIEW DOWNLOAD PROCEDURE

This section explains how to use the file extension DWF that should be attached to this submittal.

16.01 AUTODESK DESIGN REVIEW DOWNLOAD PROCEDURE

16.01 AUTODESK DESIGN REVIEW DOWNLOAD PROCEDURE

Included with your ROMTEC Utilities, Inc. Submittal is a file with the extension DWF.

The DWF file is a viewable 3D model of your actual system. To view the file, download the free software following the procedure below.

Autodesk Design Review Download Procedure:

1. *Go to: www.autodesk.com*
2. *Click on: Autodesk Design Review Free tab located on the right of the page*
3. *Select the correct language and click Download Now*
4. *Select Save File*
5. *Go to the folder you downloaded the program to and double click the file AutodeskDesignRevSetup.exe*
6. *Click on Run*
7. *Follow the Installation Tips on the screen*

To view and manipulate your .DWF file double click on the .DWF file

END

OF

SECTION