PRELIMINARY ENGINEERING REPORT

ALUM CREEK WATER RECLAMATION FACILITY
POST TREATMENT STUDY

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1.0 EXECUTIVE SUMMARY

Staff at the Alum Creek Water Reclamation Facility (ACWRF) have identified needs for improvements at the treatment plant. The plant, constructed in 2001-2002, currently receives an average daily flow of approximately 5.2 MGD. Given the plant has been in operation for approximately 20 years and in being proactive in identifying needs for improvement, the Delaware County Regional Sewer District has contracted with ms consultants to evaluate potential alternatives related to tertiary and post treatment operations. In general, the improvements being considered as part of this evaluation pertain to three main areas: the Post Treatment Building, the Filter Building, and the Administration Building.

In the Post Treatment Building, the existing UV disinfection system has reached the end of its useful life. This evaluation has considered proposals provided by four different UV manufacturers. Additionally, existing slide gates in the post treatment building are not operating correctly and are in need of replacement. Alternatives for the slide gate materials and actuator manufacturers have been evaluated.

Regarding the Filter Building, DCRSD is able to meet their discharge permit requirements without the use of the filters. The filter building is an approximately 14,000 square foot structure and consists of eight (8) filters. Four (4) of the filters are currently non-operational and all of the filters are reaching the end of their useful life with a typical life expectancy of 20 years. This evaluation provides alternatives for the decommissioning of the existing filters and converting the Filter Building into a storage facility for plant maintenance equipment and spare parts for DCRSD's plant and collection system operations, or providing a new structure on site for storage.

ACWRF currently utilizes water furnaces for heating and cooling in the Administration Building and Maintenance Building. Water furnaces are maintenance intensive and costly to operate. Combined with eight (8) water furnaces at ACWRF, DCRSD also has nine (9) additional water furnaces at the Olentangy Environmental Control Center (OECC) and Central Maintenance Facility (CMF). This evaluation provides an alternative to these water furnaces in order to reduce maintenance and monthly operating costs.

The following provides a summary and cost of the proposed improvements. The costs include all associated contingencies and accounts for inflation to the expected mid-point of construction in 2023. A further breakdown of costs can be found in Section 10.0.

UV Improvements (SUEZ)	$	902,220
Slide Gates & Actuators (RW Gates & AUMA/Limitorque)	$	442,900
Water Furnace Replacement	$	336,900
HVAC and Electrical Improvements - Post Treatment	$	83,170
Filter Building Modifications	$	381,100
Non-Potable Pump Replacement	$	304,800
Backwash Tank Decommissioning	$	47,850
Total Construction Cost (Inc. all Est. and Const. Contingencies)	**$**	**2,498,900**

2.0 INTRODUCTION

2.1 GENERAL

The Delaware County Regional Sewer District (DCRSD) has identified needs for improvements at the Alum Creek Water Reclamation Facility (ACWRF). The plant has an average daily design flow (ADDF) of 10 MGD with a peak hourly flow of 30 MGD. Currently, the plant receives an average daily flow of approximately 5.2 MGD. In general, the improvements being considered as part of this evaluation pertain to three main areas: the post treatment building, the filter building, and the administration building.

Regarding the post treatment building, the existing UV disinfection system has reached the end of its useful life. This evaluation reviews proposals provided by four different UV manufacturers. Additionally, existing slide gates in the post treatment building are not operating correctly and are in need of replacement. Alternatives for slide gates and actuators are provided and analyzed. Finally, an electrical and mechanical assessment of the post treatment building was conducted with recommended improvements outlined for the two systems.

Currently, DCRSD is able to meet their discharge permit requirements without the use of the filters. The filter building is an approximately 14,000 square foot structure and consists of eight (8) filters, four of which are non-operational at this time. DCRSD would like to convert a portion of the filter building to a storage facility, but with the option to convert the structure back to a filter building should their permit requirements change in the future.

ACWRF currently utilizes water furnaces for heating and cooling for certain buildings on-site. The Administration Building contains seven (7) existing water furnaces while the maintenance building contains one unit. The water furnaces are maintenance intensive and are reaching the end of their useful life. Furthermore, they require significant non-potable water usage which is pumped continuously from the post treatment building. DCRSD has requested an evaluation to replace the existing water furnaces at ACWRF and a similar request to replace the existing water furnaces at the Olentangy Environmental Control Center (OECC) and Central Maintenance Facility (CMF), which have a combined nine (9) additional water furnaces.

A detailed description of the potential improvements evaluated as part of this report can be found in Section 2.2.

2.2 PROJECT SCOPE

- Review available information including prior drawings, equipment data, and O&M issues
- Request and evaluate proposals from four UV manufacturers (Suez (IDI), Trojan, Enaqua, and Wedeco)
- Evaluate alternatives for replacing the 11 slide gates having operational issues in the post treatment building
- Evaluate potential decommissioning of existing filter building and conversion to a storage facility
- Conduct post-treatment building electrical and HVAC condition assessment and provide recommendations for improvements
- Evaluate potential replacement of the existing water furnaces at ACWRF, OECC, and CMF to a more maintenance and cost efficient system
- Evaluate improvements to the existing non-potable water pumps in the post treatment building to reduce sediment issues in the downstream strainers
- Backwash Tank Decommissioning

3.0 UV ALTERNATIVES

The existing UV system at ACWRF is original to the plant's construction approximately 20 years ago. The technology is now outdated and based on feedback from the manufacturer, it would be more cost effective to replace the existing system rather than repairing it. Obtaining replacement parts for the aging system will only get more difficult in the future and for these reasons, as well as the additional benefits associated with 20 years of improvements to UV systems, DCRSD has elected to evaluate different UV system alternatives to replace the existing system.

The existing system was manufactured by IDI (now owned by SUEZ) and consists of five (5) existing UV channels, with two (2) banks per channel. Each channel has a capacity of 6 MGD, with one bank per channel providing the 3 MGD of disinfection capacity. There is a 6th channel through the center of the UV room, which is used as a bypass channel. The banks contain vertical lamps and DCRSD uses a crane in the UV room to pull the banks for maintenance as needed.

ms consultants received proposals from four UV manufacturers, each with different configurations. The following sections outline the proposals provided by each manufacturer. Each manufacturer was provided the following operating parameters: 65% transmissivity, 126 CFU/100 mL E. coli limit, a 10 MGD ADDF, and 30 MGD PHF. The value for transmissivity was determined in the field and the other values are based on the NPDES permit and plant design, respectively, while 10 MGD was used for calculating operating costs.

3.1 SUEZ (IDI)

For ACWRF, Suez has proposed the Aquaray 40 HO Vertical Lamp UV system. As previously noted, Suez provided the original UV system for the plant. Similar to the original model installed at ACWRF, each bank consists of a vertical lamp configuration, and because of this, Suez is able to fit this system into the existing UV channels without any channel modifications. In total, Suez's proposal includes the 5 existing channels with 2 UV banks capable of 3 MGD each.

Figure 1: IDI Aquaray 40 HO Vertical UV system - ACWRF

The banks are equipped with hydraulically actuated wipers that clean the bulbs automatically once per day. The rubber wipers need to be replaced every two years at a cost of $4/wiper. The cleaning system is automatically

controlled from the PLC, but each module houses its own hydraulic motor to operate the wipers.

The system is flow-paced to conserve energy. The Aquaray system can turn off rows as needed and alternate which UV bank is used for treatment to provide even usage. As the system operates on a row-by-row basis, the UV banks in this configuration would be capable of switching increments as low as 10%, which will increase the operational flexibility of the system, and minimize operational costs.

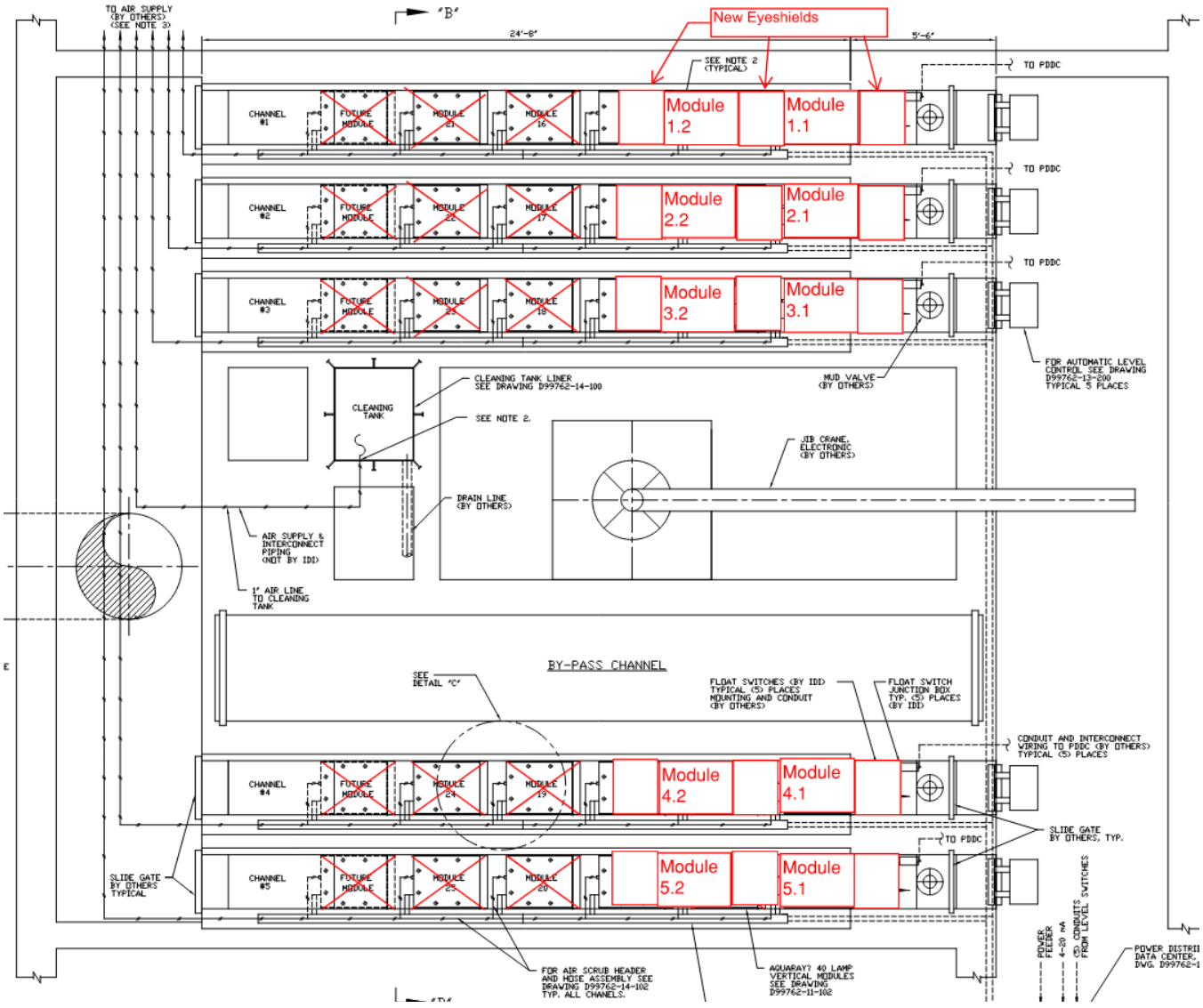

Figure 2: IDI Aquaray 40 HO Vertical UV System – Post Treatment Building

Matching the existing system where two banks per channel have been installed, Suez provided two banks per channel to treat 30 MGD. Ten State Standards requires a minimum of two banks per channel, but it does not specifically state capacity requirements, i.e. if redundancy is required at PHF for the plant. Therefore, Suez's proposal provides redundancy in each channel up to 15 MGD which covers the ADDF, but does not provide redundancy at 30 MGD should a bank be out of service. Suez noted once the existing banks have been removed, there is sufficient space for a future bank should it be preferred. At this time, an additional bank has not been

provided for costing purposes, but for reference Suez provided a budgetary quote of $25,000 for each additional bank. A summary of Suez's UV system and their operational costs can be found in the following tables.

Table 1: Suez UV System Summary

Suez - Summary					
Manufacturer	Model	Orientation	No. of Channels	Banks per Channel	Equipment Cost ($)
Suez(IDI)	Aquaray 40 HO	Vertical	5	2	$400,000

Table 2: Suez UV System Operational Costs

Suez- Operating Costs (20-year Life Expectancy, Present Worth)							
Bulb Replacement Cost ($)	Bulb Lifespan (Hrs)	No. of Bulbs (not inc. spare banks)	Bulb Costs (20 years)*	Power Consumption (10 MGD, kW-Hr)	Power Consumption (20 years)*	Cleaning method	Total Operational Costs (20 years)*
$30	13000	200	$40,540.00	27.5	$299,500	Auto Wipers	$340,000

*Assumes May 1 through October 31 for disinfection per the NPDES Permit

Through Suez, the services provided as part of this proposal include: installation inspection, startup and commissioning, and operator training. Additionally, Suez has a full service staff with service for Ohio being located out of either Leonia, NJ or Ashland, VA. The systems are manufactured in Ashland, VA.

3.2 TROJAN TECHNOLOGIES

For the Trojan alternative, their UVSigna model was evaluated. This is their newest technology with an inclined bulb layout that has a motorized retraction system; therefore, the bridge crane is not needed for normal maintenance. The model selected for this installation is Trojan's smallest unit; however, it is still too large to fit in the existing channels. The minimum width required is 4.7 ft. To fit the UVSigna banks, two existing channels would need to be modified into one larger channel. The existing channel depth is adequate. Each channel includes two UV banks and is capable of handling a peak flow of 30 MGD. Redundancy is only provided at the ADDF with no redundancy provided at a peak flow of 30 MGD.

Figure 3: Trojan UVSigna Inclined UV System

Routine maintenance on the system can be performed while the system is still in the channel, but for other tasks such as winterization, the bulbs are raised out of the channel using the automatic raising mechanism. While in the channel, the UVSigna has an automatic wiping system used in

conjunction with a cleaning gel to prevent fouling.

Figure 3 provides an installation photo of the UVSigna system. Figure 4 provides a layout of the proposed system overlaid on the post treatment building, and Figure 5 provides a section view of the proposed system in the modified existing channel(s).

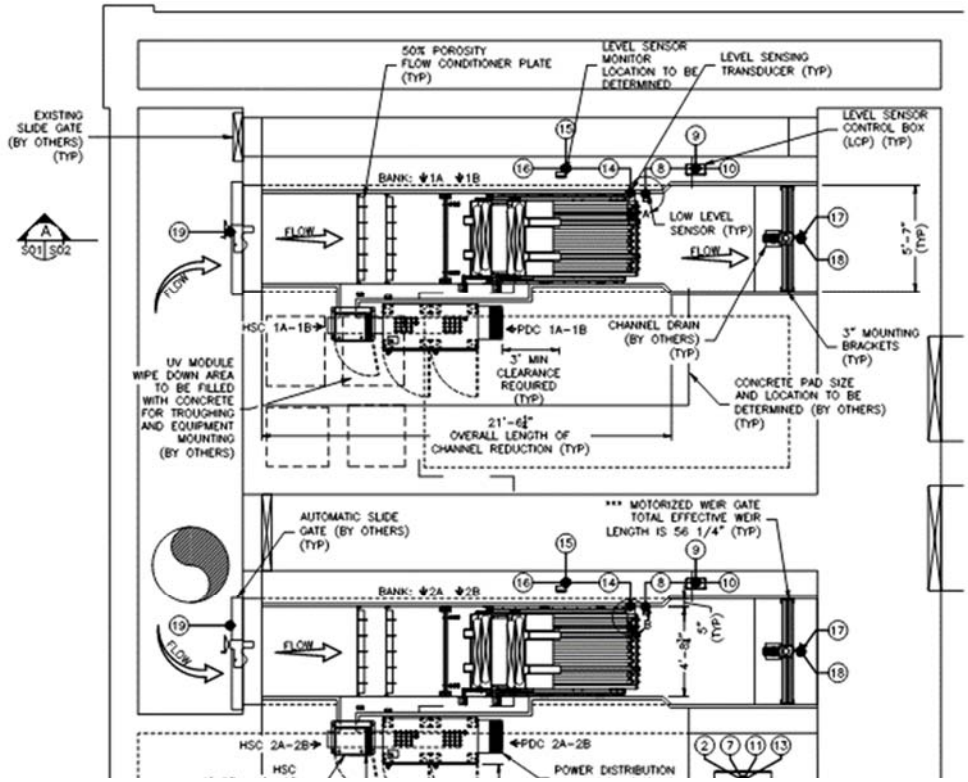

Figure 4: Trojan UVSigna Inclined UV System in existing Post Treatment Building

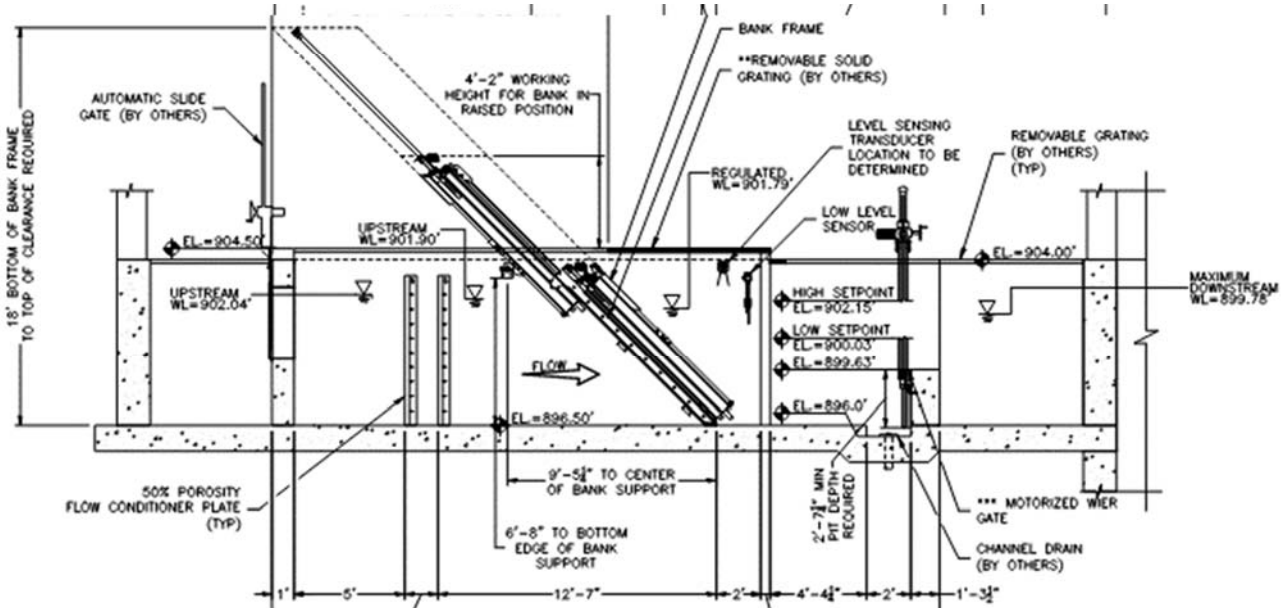

Figure 5: Trojan UVSigna Inclined UV System in existing Post Treatment Building channel

Table 3: Trojan UV System Summary

Trojan - Summary					
Manufacturer	Model	Orientation	No. of Channels	Banks per Channel	Equipment Cost ($)
Trojan	UVSigna	Inclined	2	2	$660,000

Table 4: Trojan UV System Operational Costs

Trojan - Operating Costs (20-year Life Expectancy, Present Worth)							
Bulb Replacement Cost ($)	Bulb Lifespan (Hrs)	No. of Bulbs (not inc. spare banks)	Bulb Costs (20 years)*	Power Consumption (10 MGD, kW-Hr)	Power Consumption (20 years)*	Cleaning method	Total Operational Costs (20 years)*
$720	15000	40	$168,650.00	22.4	$244,000.00	Auto Wipers	$412,700.00

*Assumes May 1st through October 31st for UV operation based on NPDES Permit

Trojan systems are manufactured just north of Lake Erie in London, Canada. For service issues, Trojan has technicians in the Ohio area and at their Canadian facility, in addition to a 24/7 technical support number to provide customers with assistance.

3.3 WEDECO

Wedeco has proposed using their Duron UV system for this installation. The Duron system is an inclined system that requires similar channel modifications as the Trojan UVSigna. The main difference in the required modifications are that, for the Duron system, the channels only need to be 3.3' wide and would require the bottom of the channel to be raised slightly. The configuration of this alternative is two UV channels, each with three banks.

Wedeco takes into account the real-time sensor readings of UV intensity, lamp output, lamp aging, and sleeve fouling to provide dose flow pacing for their UV system. This also allows the system to conserve energy depending on the flow rate.

Figure 6: Wedeco Duron UV System

As with the previous alternatives, there is an automatic wiping system included with the Duron. Additionally, the Duron system can have routine maintenance performed in the channel but also operates on a rail and slides up out of the channel for additional maintenance or replacement.

The three UV banks in each channel are required to meet the peak hourly flow (no redundancy at PHF provided). The total capital cost and operations and maintenance costs for the Duron system are shown below in Tables 5 and 6 respectively.

Table 6: Wedeco UV System Summary

Wedeco - Summary					
Manufacturer	Model	Orientation	No. of Channels	Banks per Channel	Equipment Cost ($)
Wedeco	Duron	Inclined	2	2	$473,000

Table 5: Wedeco UV System Operational Costs

Wedeco - Operating Costs (20-year Life Expectancy, Present Worth)							
Bulb Replacement Cost ($)	Bulb Lifespan (Hrs)	No. of Bulbs (not inc. spare banks)	Bulb Costs (20 years)*	Power Consumption (10 MGD, kW-Hr)	Power Consumption (20 years)*	Cleaning method	Total Operational Costs (20 years)*
$395	14000	96	$237,920.00	22.7	$247,300	Auto Wipers	$485,200

*Assumes May 1 through October 31 for disinfection per the NPDES Permit

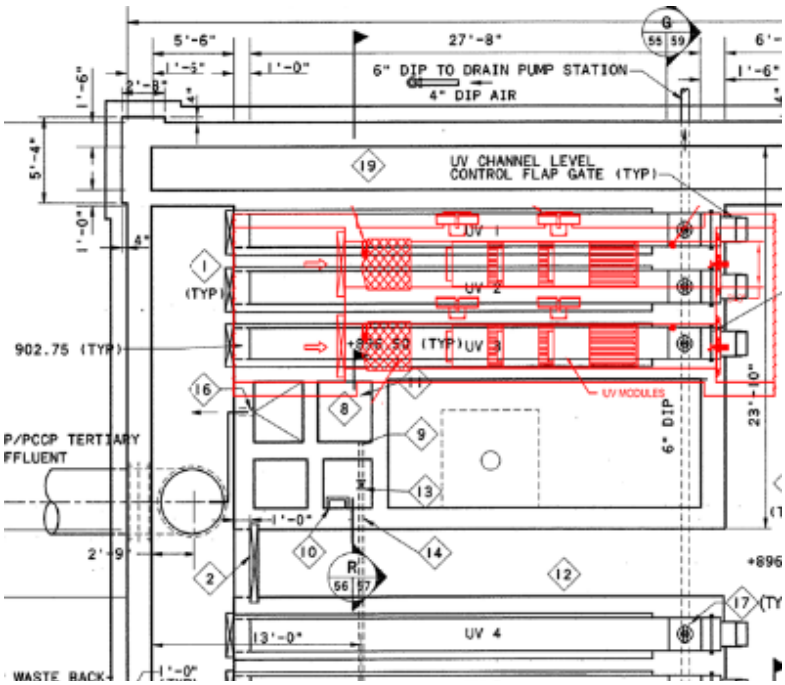

Figure 7: Wedeco Duron UV System in existing Post Treatment Building

The Wedeco Duron is manufactured in Germany, but have a warehouse in Mississippi with spare parts so replacements will not require international shipping. Wedeco also has engineers and service technicians located around the U.S. and a 24/7 service hotline for clients.

3.4 ENAQUA

The Enaqua system is a non-contact UV system. The wastewater flows inside plastic tubes and the bulbs are installed in racks on the outside of the tubes. This alternative would require significant modifications to the existing channels. To accommodate the Enaqua system, the existing channels would need to be lengthened and several of the channels would need to be combined. Additionally, the influent would have to be modified with new buried valves to split the flow into two channels outside of the building. Enaqua recommended using two channels, each with three UV banks.

Figure 8: Enaqua Non-Contact UV System

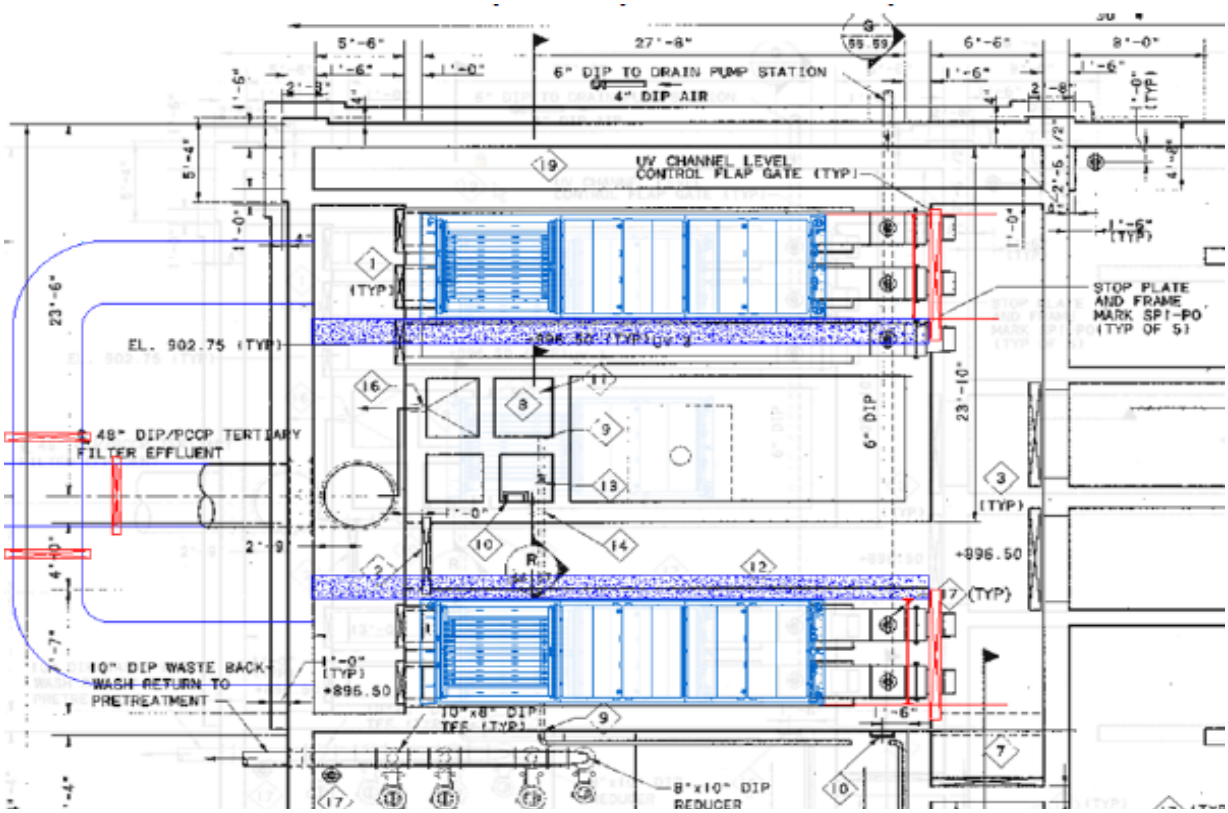

Figure 9: Enaqua UV System Required Modifications

The Enaqua system requires manual brushing for system cleaning; however, only the outside of the plastic tube reactor component of each UV bank is ever in contact with the water. By minimizing contact between UV system components and the water, Enaqua is able to limit the amount of maintenance needed for system operation.

Each bank would handle 7.5 MGD which would leave the third bank in each channel for redundancy at peak flow. The cost estimate for this alternative is shown in Tables 7 and 8 below.

Table 7: Enaqua UV System Summary

Enaqua- Summary					
Manufacturer	Model	Orientation	No. of Channels	Banks per Channel	Equipment Cost ($)
Enaqua	D9i.10102	Non-Contact	3	3	$990,000

Table 8: Enaqua UV System Operational Costs

Enaqua - Operating Costs (20-year Life Expectancy, Present Worth)							
Bulb Replacement Cost ($)	Bulb Lifespan (Hrs)	No. of Bulbs (not inc. spare banks)	Bulb Costs (20 years)*	Power Consumption (10 MGD, kW-Hr)	Power Consumption (20 years)*	Cleaning method	Total Operational Costs (20 years)*
$75	12000	396	$217,404.00	40.6	$442,200	Manual Brushes	$659,600

*Assumes May 1 through October 31 for disinfection per the NPDES Permit

Enaqua systems are manufactured in the U.S. The reactors and lamp racks are made in the San Diego area, while the UV lamps can be purchased from several U.S. suppliers. Enaqua has a service department at their facility in Vista, California in addition to assistance from Baker and Associates and factory support.

3.5 UV SYSTEMS SUMMARY

Table 9 below summarizes the capital and O&M costs associated with each alternative. A full breakdown of the costs including the modifications to the existing building is provided in Section 10.

Table 9: UV Systems Cost Summary

UV Disinfection System Summary				
Manufacturer	Model	Installation Cost	20-year O&M Cost	Total 20-year Cost
SUEZ (IDI)	Aquaray 40 HO	$552,000.00	$340,000.00	$892,000.00
Trojan	UVSigna	$1,211,000.00	$412,700.00	$1,623,700.00
Enaqua	D9i.10102	$1,796,500.00	$659,600.00	$2,456,100.00
Wedeco	Duron	$858,550.00	$485,200.00	$1,343,750.00

*Installation and Material Costs include labor and all required modifications to the Post Treatment Building, except for roof reconstruction and/or replacement costs (if applicable)

**Costs utilize 2021 dollars with no additional inflation or present worth analysis

In addition to the above associated costs for each UV alternative, the Suez Aquaray is the only alternative able to fit within the existing channels in the Post Treatment Building. This benefits the Suez alternative from a construction sequencing perspective as the other three alternatives would require two or three existing channels to be out of service at a given time to allow for the proposed channel modifications. Furthermore, the existing Post Treatment Building does not currently have overhead door access to the UV room and only double doors provide access. Given the size of the other three alternatives, they would most likely require an overhead door to be installed or a temporary roof removal so the equipment can enter the Post Treatment Building.

As was previously noted, only the Enaqua proposal provided redundancy up to 30 MGD; however, the additional capacity does still not account for the increased installation cost. Currently, the lack of redundancy up to the PHF is not a significant concern for the other three alternatives given that UV redundancy up to a plant's PHF is not required by Ten State Standards. Furthermore, this is not required based on the flows currently being received at the plant. Should flows increase at the plant in the future, the Suez alternative offers the potential for an additional bank to be provided in each channel, which would increase the firm capacity for UV treatment from 15 MGD to 30 MGD.

Given the cost of the Suez alternative, in addition to the above construction sequencing and lack of required Post Treatment Building modifications, the Suez Aquaray alternative is the recommended alternative for DCRSD at ACWRF.

3.6 CHLORINE DISINFECTION ALTERNATIVE

The DCRSD requested an evaluation to convert from UV to sodium hypochlorite for disinfection. The Ohio EPA requires a chlorine dose of 6 mg/L and a contact time of 15 minutes. This equates to 500 lb of 100% chlorine per day at 10 MGD, which at 10% strength and 10 lb per gallon is 500 gallons/day. 15,000 gallons of storage is required to provide 30 days of supply at the average daily flow of 10 MGD. The tank volume required to provide proper contact time is 312,500 gallons based on the peak hour flow rate.

New tanks for chlorination and dechlorination are not feasible, both in terms of cost and siting considerations. As will be discussed in Section 6.0, DCRSD is proposing modifications to the existing Filter Building. Currently, four (4) of the filter bays are non-operational. Each bay has an approximate capacity of 29,500 gallons. Even if all eight (8) existing filters converted to chlorine contact tanks, this results in 236,000 gallons of potential chlorine contact tankage in the filter building. Additional tankage would be required.

For dechlorination, an additional 10,500 gallons of tank volume is required. Mixing systems for both chlorination and dechlorination are required. Chemical day tanks, scales, secondary containment, building ventilation, and other systems are required in order for the system to be permitted by the Ohio EPA.

For the reasons listed above, the chlorine disinfection alternative was not considered viable and was not evaluated further.

4.0 SLIDE GATE ALTERNATIVES

Within the Post Treatment Building, there are eleven (11) aluminum slide gates in need of replacement. Figure 10 provides an overview of the gates to be replaced. Note the following analysis assumes eleven (11) gates will need to be replaced for consistent cost purposes; however, only the IDI UV system will require all 11 gates to be replaced. The other three UV manufacturers will only require eight (8) gates to be replaced due to the number of required channels.

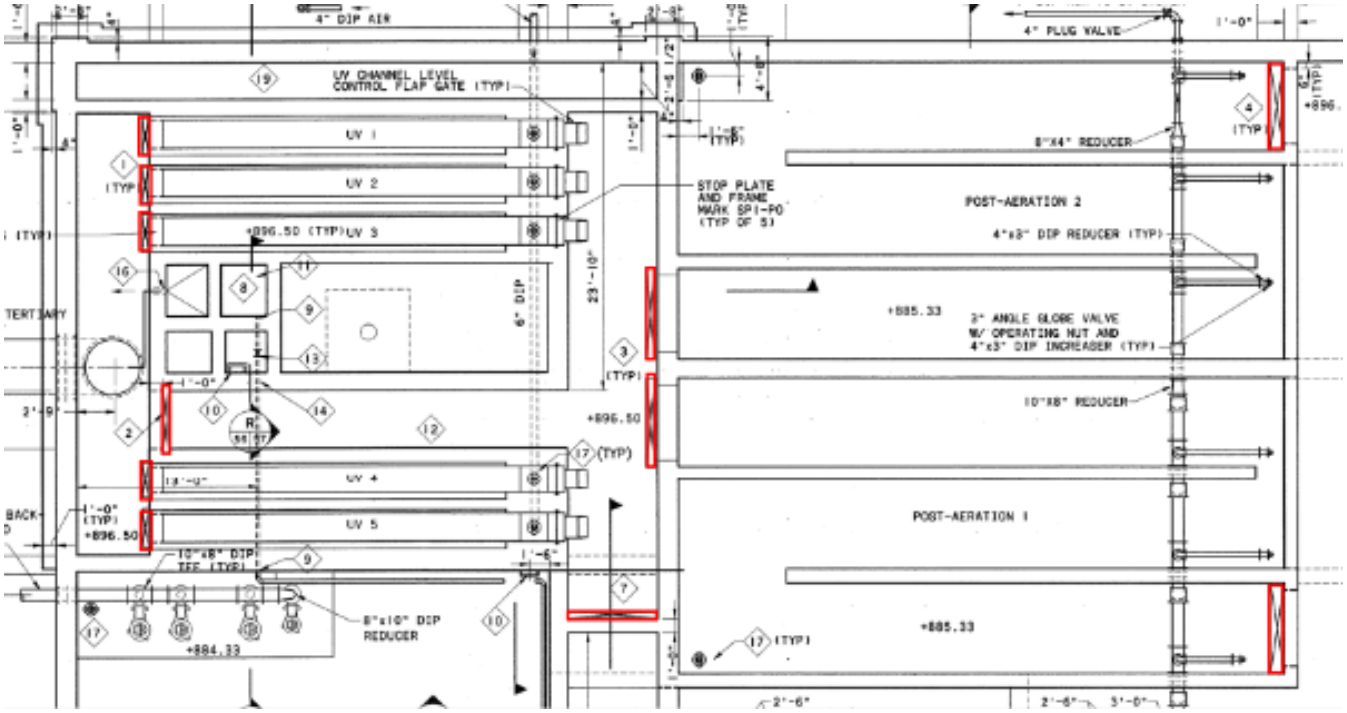

Figure 10: Slide Gates to be Replaced – Post Treatment Building

4.1 NON-METALLIC ALTERNATIVES

Coplastix slide gates are manufactured by Alfa Laval and are made out of a "composite plastic" material similar to Kevlar. The gates are able to use any of the preferred electric actuators in a pedestal mounted configuration. Per the manufacturer, the gate material provides a lower coefficient of friction (0.10) due to the lack of metal to metal contact and the lighter weight of the gate material. The gate meets AWWA C563 for leakage rates, provides a 10 year warranty, and a 30+ year life expectancy on the seals.

- Gate (disc) material: "Coplastix", a composite plastic similar to Kevlar
- Frame: carbon steel
- Wall mounted with 1-inch of grout
- Seals: ultra high molecular weight polyethylene (UHMWP)
- Fasteners: 316SS
- Equipment Cost (Not including actuators): $250,000, assuming all existing eleven (11) gates are replaced

4.2 METALLIC ALTERNATIVES

The first metallic alternative considered was the stainless steel Fontaine Series 20 Slide gates. The manufacturer stated the gates are able to use any of the preferred electric actuators in a pedestal mounted configuration, but they noted they have had issues with Rexa in the past. For this reason, Fontaine typically provides AUMA actuators. The gate provides a coefficient of friction of 0.20 and meets the requirements of AWWA C561 for leakage rates. Fontaine provides a 5 year warranty. A summary of the Fontaine specification is provided as follows.

- Gate (disc) material: 304SS (316SS available)
- Frame: 304SS (316SS available)
- Wall mounted
- Seals: ultra high molecular weight polyethylene (UHMWP)
- Fasteners: 304SS (316SS available)
- Equipment Cost (not including actuators): $171,400, assuming all existing eleven (11) gates are replaced

Waterman has recommended their SS-250 series gates. Similar to Fontaine, the manufacturer stated the gates are able to use any of the preferred electric actuators in a pedestal mounted configuration, but they also noted they have had issues with Rexa in the past and getting them to supply their actuators on their gates. Waterman's preferred actuators are AUMA and Rotork. The SS-250 series meets AWWA C561 standards. Waterman states they provide a manufacturer's equipment warranty which has a typical duration of 5 years.

- Gate (disc) material: 316SS
- Frame: 316SS
- Wall mounted
- Seals: ultra high molecular weight polyethylene (UHMWP) and neoprene
- Fasteners: 316SS
- Equipment Cost (not including actuators): $134,900, assuming all existing eleven (11) gates are replaced

RW Gates has recommended their RW 1000-S series gates. RW gates stated they typically provide AUMA or limitorque electric actuators in a pedestal mounted configuration. The RW specified gates meet AWWA C561 standards. Their initial warranty is for 1 year and they stated an additional $12,000 for 10-year warranty on all gates. They noted this warranty does not include actuators, which would be a significant cost increase of approximately $10,000 per actuator.

- Gate (disc) material: 304SS
- Frame: 304SS
- Wall mounted
- Seals: ultra high molecular weight polyethylene (UHMWP) and nitrile or epdm compression cord
- Fasteners: 304SS
- Equipment Cost (not including actuators): $132,000, assuming all existing eleven (11) gates are replaced and including a 10-year warranty at a cost of $12,000. No warranty on actuators.

Whipps has recommended their 923/924 series stainless steel gates. Whipps' preferred electric actuator manufacturer in Limitorque. Whipps' gates meet the requirements of AWWA C561. Their initial quote includes a 5 year warranty and they could not provide a 10-year warranty.

- Gate (disc) material: 304SS
- Frame: 304SS
- Wall mounted
- Seals: ultra high molecular weight polyethylene (UHMWP) on side and top, neoprene invert
- Fasteners: 304SS
- Equipment Cost (not including actuators): $145,000, assuming all existing eleven (11) gates are replaced
    - Includes a 5 year warranty at a cost of $12,000. No warranty on actuators

4.3 SLIDE GATE ACTUATORS

As previously noted, the stainless steel gate manufacturers typically provide AUMA or Limitorque actuators, with Waterman also providing Rotork actuators. Some stainless steel gate manufacturers noted they have had issues with Rexa in the past. Coplastix, on the other hand, did not note any issues working with Rexa.

DCRSD has indicated their preference for Rexa actuators in certain applications. There is a significant cost difference between Rexa and the other listed actuator manufacturers. ms contacted the Rexa local representative directly to receive their pricing for Rexa actuators only (no gates). The cost from the Rexa rep is shown in Table 10.

Feedback from the stainless steel gate manufacturers indicated a typical electric actuator cost of $5,000 per actuator, while the average cost per actuators provided by Rexa is approximately $38,000

Table 10: Rexa Actuator Cost Overview from Rexa Rep

Rexa Actuator Cost Overview				
Existing Gate Number	Replacement Gate Model	Amount	Unit Cost	Cost
1	X3L5000-36-C-P	5	$33,473.00	$167,365.00
2	X3L5000-36-C-P	1	$33,473.00	$33,473.00
3	X3L10000-36-1/2D-P	2	$42,203.00	$84,406.00
4	X3L10000-36-1/2D-P	2	$46,674.00	$93,348.00
7	X3L10000-36-1/2D-P	1	$42,203.00	$42,203.00
Total Cost				$420,795.00

Furthermore, the UV system is not anticipated to require the more refined level control provided by a Rexa actuator rendering the Rexa actuator's additional capabilities unnecessary for this application. For the reasons listed above, overall pricing for gates and actuators has been provided in Table 11 not including the cost of Rexa actuators. The remaining actuators are considered equivalent with consistent costs obtained for all three actuators, which are AUMA, Rotork, and Limitorque. DCRSD can provide a specification to their preferred actuators as part of detailed design.

For final design and bidding, ms recommends providing specifications for all gate manufacturers to maintain competition. There was no significant difference in performance noted between the manufacturers and both stainless steel and composite materials are suitable for use in the Post Treatment Building. Table 11 provides a summary of the cost and warranty information provided by each manufacturer. Regarding the warranties, the warranties are for manufacturing defects causing issues related to the performance of the gate. These warranties do not include improper installation. Installation defects would defer back to the Contractor's warranty/maintenance period which is typically 1-2 years. Most gate manufacturers stated any material defects are realized relatively soon, so there may be no difference between a 1, 5, and 10-year warranty supplied by the gate manufacturers.

Table 11: Slide Gate Actuator Overview

Slide Gate and Actuator Cost Overview			
Manufacturer	Equipment Cost (Assuming 11 Gates)	Equipment Cost w/ Auma/Rotork/Limitorque	Warranty
Coplastix	$250,000.00	$305,000.00	10 year
Waterman	$134,900.00	$189,900.00	5 year
Fontaine	$171,400.00	$226,400.00	5 year
RW Gates	$132,000.00	$187,000.00	10 year
Whipps	$145,000.00	$200,000.00	5 year

5.0 CONDITION ASSESSMENT – POST TREATMENT BUILDING

5.1 ELECTRICAL

The Post Treatment Building electrical is fed 480V, 3phase, 3 wire, 1200A power from the maintenance building Main Switchgear. Power enters the Post Treatment Building and is distributed through a motor control center (MCC-PO). MCC-PO is an Allen Bradley Centerline 2100 series MCC. The data tag indicates the horizontal bus is rated for 1200A with vertical bus sections rated for 300A each. The Allen Bradley Centerline series of MCC is still in production and buckets and parts are still available from the manufacturer. It was noted during the site visit the electrical room was exceptionally warm and doors were propped open in order to try to keep the space cool. The existing lights in the post treatment building are fluorescent type fixtures.

Figure 11: MCC-PO in Post Treatment Building Electrical Room

The existing UV System is an IDI Aquaray 40 vertical lamp system. The ballast modules are located on top of the lamps above water surface level. During the site visit and review of the record drawings, it was identified the existing UV system was designed for 120/208V, 3-phase power. The UV system power and control cabinet is located within the UV Channel room for easy routing of power and control cables. The system appears to be working, but does show signs of age on the modules.

Overall the Post Treatment Building electrical system is in very good condition. The incoming power appears to be sufficiently sized and the existing MCC-PO appears to be in good, working condition. Replacing or upgrading the HVAC system in the electric room to ensure the electric equipment stays cool will not only prolong the life of MCC-PO, but also the life of the transformers and variable frequency drives within the electric room. Lighting in the building should be replaced with more efficient LED fixtures. The existing fluorescent fixtures should be replaced with comparable output LED fixtures for ease of replacement. The existing Aquaray 40 UV system was installed in 2002 and is reaching the end of its 20 year life span. The new system will use 480V, 3 phase, 4 wire power. A new isolation transformer will need to be installed for the neutral for the new UV System. Installing a UV System that is 480V rather than 208V will decrease the size of the conductors between the channels and the

UV System Power/Control Cabinet. It was also noted during the site visit that the VFD for Non Potable Water Pump No. 1 (NPW1) does not appear to meet NEC clearance guidelines of 36 inches in front of the enclosure. The VFDs are to be replaced along with the existing non-potable pumps, so it is recommended the VFDs be relocated in compliance with the NEC.

5.2 MECHANICAL

In general, the mechanical equipment in the Post Treatment Building is in good condition. In the UV room, the existing exhaust fans, ductwork, and gas unit heaters were not in operation due to outdoor temperatures, but upon a visual inspection appear to be in good condition despite minor surface rust and weathering. It was noted the unit heaters have exposed electrical connections and these are recommended to be protected and covered. Also within the UV room, the domestic water piping insulation shows signs of damage and should be replaced.

Within the chemical feed room, blower room, and non-potable pump room, the gas unit heaters, intake louvers, exhaust fans, and ductwork were all in good condition.

During the condition assessment of the electrical room, it was noted that the temperature in the space was exceptionally high. Exhaust fan F6-PO appears to be non-functional, leading to the warm air not being evacuated from the space. A portable 1-ton air conditioner was being used to provide temporary cooling, however the existing exhaust fan is recommended for replacement.

On the exterior of the structure, all louvers, air devices, downspouts, hose bibbs, and yard hydrants were all in good condition and no additional recommendations for improvements are necessary.

6.0 FILTER BUILDING

The existing Tertiary Filter Building consists of an approximately 14,000 square foot structure which houses eight (8) filters for tertiary treatment. The plant consistently meets their NPDES limits without the filters in service. Currently, half of the filters are offline and non-operational. For these reasons, DCRSD has requested an evaluation to identify means of converting a portion of the existing filter building to a storage facility.

Initially, the filter building was evaluated to convert half of the existing space into storage. This would involve a partition through the center of the structure consisting of a metal stud wall with a plywood surface up to the underside of the roof. The resulting modifications would provide approximately 7,000 square feet of storage space. Additionally, DCRSD would have liked the converted storage space to have the potential to transition back to usable space for filters should more stringent permit limits ever be imposed. Given all eight existing filters are reaching the end of their useful life as they are the original filters to the plant's construction in 1999, all eight filters would need replaced in the near term regardless of how the filter building is used. There is no near term expectation for more strict discharge limits to be placed on the plant. Therefore, the initial evaluation was revised to convert the entire structure to storage space rather than to partition the structure in half. The following is a summary of this evaluation to convert the Filter Building to a storage facility, with the means to convert it back to a Filter Building in the future should the need arise.

The existing filters occupy approximately 1,500 square feet each, resulting in 12,000 square feet of space which is 8.5 ft below the finished floor elevation of the filter building. Two options were identified to elevate this space to the finished floor elevation. The first option consists of filling the existing filters with engineered fill, such as 304 aggregate, to grade. A temporary floor would be constructed utilizing HDPE panels which pin together and can be designed for a variety of loading conditions. Should the filter building ever need to revert back to use for filters, the panels can be reused or sold. The engineered fill would need to be removed to convert back into a filter building. HDPE panels are a widely manufactured product. For the purposes of this evaluation, engineered HDPE panels by Matrax, Inc. were used as the basis of design.

The second option consists of installing 8-inch precast concrete panels which would span the existing pit walls and be covered with a 2-inch concrete slab to provide a level surface. In order to access the surface, ramps would need to be installed throughout the filter building to provide access as the new concrete flooring would be raised 10 inches above the finished floor elevation. It was ultimately determined this alternative was not suitable as it was a more permanent modification to the existing filters and it was cost prohibitive compared to the HDPE panel alternative.

As previously noted, the existing filter building is approximately 14,000 square feet. If the structure is converted to a storage facility, per the Ohio Building Code, the threshold for maintaining a Low Hazard classification is 26,000 square feet. Since the filter building is below this threshold, no additional modifications such as a sprinkler system are required based on code. This will allow DCRSD to store items such as lawn mowers, snow blowers, etc. which are regarded as minor fuel storage. If DCRSD wishes to store commercial vehicles, additional requirements for the building code as well as structural considerations for the HDPE panels will need to be accounted for in final design.

The estimated cost for decommissioning the entire Filter Building and converting it to a storage facility was approximately $950,000 including general conditions, contingencies, etc. Because of this cost, during this

evaluation DCRSD requested ms modify the evaluation to only convert two (2) of the eight filter structures while decommissioning the remaining six (6) filters. Modifying two of the filters still provides approximately 3,500 square feet of storage at an estimated cost of approximately $381,100, including all contingencies. This cost includes the HDPE panels, aggregate backfill, removing all eight (8) existing filters, new overhead door located on the south side of the Filter Building as well as all site piping modifications which will be outlined later in this section.

A second item requested by DCRSD for evaluation includes a new structure which would be housed on the ACWRF site to be utilized as a storage facility. An approximate cost per square foot for new structures similar to this proposed storage facility is $200 per square foot. Assuming the structure would also be 3,500 square feet to match the alternative previously discussed, the resulting cost, not including any contingencies, would be $700,000. For this reason, as well as existing site limitations for location, it is recommended to convert two of the filters at the existing Filter Building into a storage area.

As part of the modifications to the filter building, additional site modifications are recommended as well based on DCRSD feedback. Figure 12 shows the existing site piping plan around the filter building.

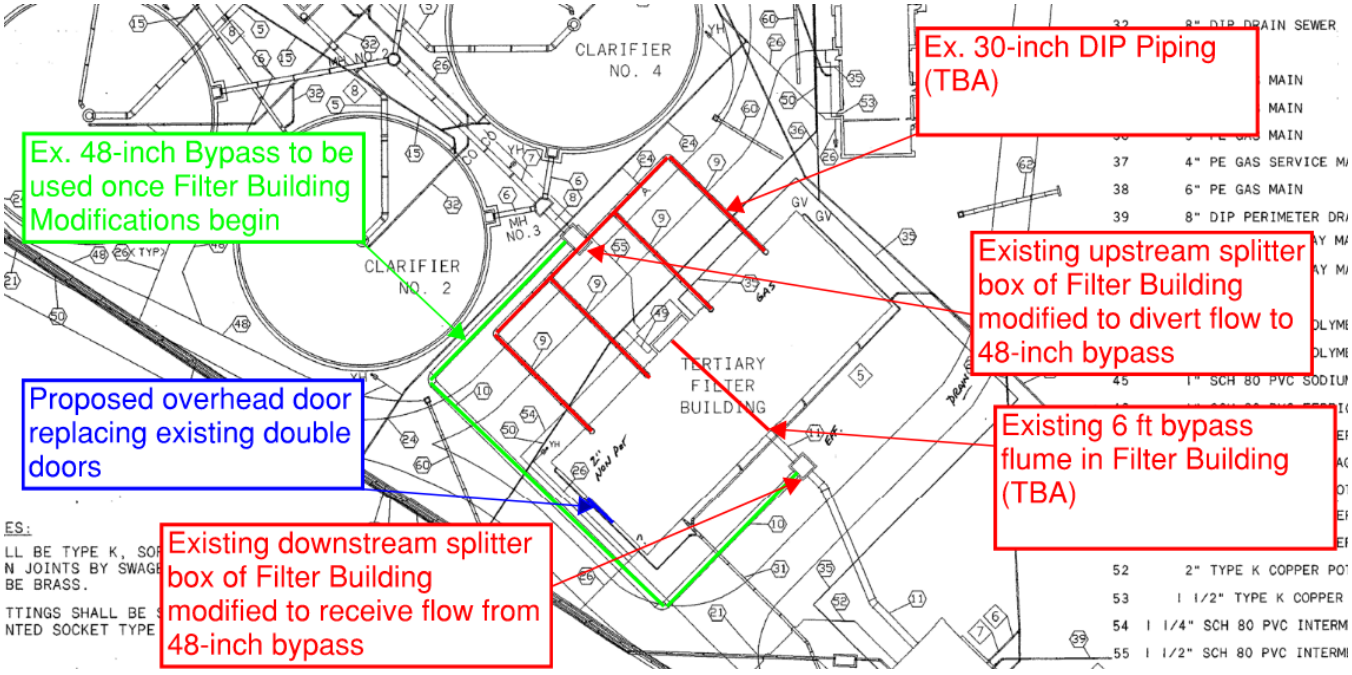

Figure 12: Filter Building Site Piping Plan

Currently, flows to the filter building enter through existing 30-inch ductile iron pipes from the upstream splitter box, shown in red in Figure 12. Once the filter building is converted to storage, these pipes as well as the 6 ft bypass flume through the center of the filter building (also shown in red) are no longer needed. It is recommended the splitter boxes upstream and downstream of the filter building be modified so flow from the clarifiers is diverted around the filter building through the existing 48-inch concrete bypass piping to the Post Treatment Building. Currently the splitter boxes operate using downward closing gates. It is not recommended to rely solely on these gates for isolation. Given the age of the gates, leakage will occur and overtime the influent piping and filter bays may begin to slowly fill with flows from the plant. For this reason, additional appurtenances may be

required such as a watertight cap or plug which could be removed in the future if the filter building needed to go back into service. Finally, for access to the proposed storage facility, the existing double doors on the south/southwest side of the filter building are recommended to be converted to an overhead coiling door to allow better access to the space. A summary of the opinion of probable cost associated with the selected HDPE panel alternative for the filter building and the associated site modifications can be found in Section 10.0.

7.0 NON-POTABLE WATER PUMPS

DCRSD currently utilizes non-potable water for multiple processes. The non-potable water is distributed from the Post Treatment Building, specifically in pump bays downstream of post aeration. The three main purposes for the non-potable system are to provide water to the existing water furnaces (located throughout the plant), provide water for the belt filter press cleaning, and to provide water to the existing yard hydrants and hose bibbs located in many of the buildings. Per DCRSD staff, the water furnaces require approximately 80% of the water usage, if not more.

There are two (2) existing 90 HP submersible pumps being used for the non-potable water system. The two non-potable pumps operate continuously on VFDs to supply 220 gpm continuously to the plant. Based on this flow rate, the existing rated motor horsepower for the pumps is oversized and can be reduced when the pumps are replaced. Assuming a very high operating pressure of 300 feet (130 psi) at 220 gpm would result in an approximately 50 HP rated motor. The larger motor could have been supplied to ensure the motors are non-overloading at all points on the curve due to an atypical operating condition; however, as will be discussed in the following section, there is a potential to significantly reduce the required flow rate of the non-potable pumps as the existing water furnaces will no longer be in service (see Section 8.0) and require the majority of non-potable water used throughout the plant.

During preliminary discussions with DCRSD staff, it was noted the existing non-potable water pumps have issues with picking up sediment in the existing pump bays. This leads to continual maintenance issues with the downstream strainer. The issue appears to stem from the pump bays being located in a low spot downstream of the post aeration channels, which leads to a continuous accumulation of sediment as the pumps operate and pull water into their bays.

To alleviate the sedimentation issue, ms recommends removing the existing submersible non-potable water pumps and installing self-priming suction lift pumps installed within the non-potable pump room. The pumps will be appropriately sized during final design once a full inventory of all potential uses of non-potable water are accounted for from DCRSD staff. The suction lift pumps will be mounted at the finished floor elevation. The existing submersible pumps sit at the bottom of the pump bay, which allows sediment to enter the pump and discharged to the strainer. The suction lift pumps can have their inlet set to an elevation above the pump bay floor with the intent to reduce the potential for sediment to enter the pump. The sidewater depth is approximately 12 ft during normal operation which allows ample elevation to install the suction inlet for a suction lift pump and still provide proper submergence to avoid vortexing.

If DCRSD prefers submersible pumps in lieu of suction lifts pumps, a second alternative is to elevate the pumps off the channel floor. This would require rigid supports to elevate the pumps off the floor to a suitable depth of prevent vortexing and to reduce the amount of sedimentation entering the pumps.

Should the pumps be replaced, construction sequencing will need to be a focus of the non-potable pump replacement. First, the pump replacement should occur once the existing water furnaces are removed and replaced with a different method of heating and cooling at the plant. One non-potable pump should be removed, allowing one to remain in service while the first suction lift pump could be installed. Replacing the existing submersible pumps with smaller suction lift pumps will reduce the operational costs of the non-potable water system and may alleviate the current sedimentation issues.

8.0 WATER FURNACE ALTERNATIVES

The ACWRF Administration and Maintenance Buildings are heated and cooled by eight (8) 2-6.7 ton Spectra Vertical Water Furnaces, where the Administration Building contains seven of the units and the Maintenance Building contains one unit. Each furnace is fed by non-potable cold water from the Post Treatment Building in an open loop system that drains into the on-site sanitary system. At least one of the furnaces (HP1-AD) supplements the domestic hot water on a closed loop. It is estimated the furnaces require 65 gpm of cold non-potable water. The existing non potable water pumps are 90 HP pumps where one pump is required to operate continuously to be available for heating or cooling for the furnaces.

Similar to ACWRF, the OECC and CMF are heated and cooled by water furnaces (9 in total) that are fed by two (2) 35 HP non-potable water pumps that operate continuously in an open loop system which drains into the on-site sanitary system. At least one of the furnaces (HU-A2) supplements the domestic hot water on a closed loop.

The water furnaces typically have an expected useful life of 15-20 years. Being installed in 2002, the water furnaces are reaching the end of their useful life and some have already required replacement. In addition to their significant cost to maintain, the water furnaces also use a refrigerant that is no longer legal to be manufactured and is increasing exponentially in price.

It is recommended each furnace be replaced with a similar size split-system direct expansion heat pump air conditioner with an exterior pad-mounted air-cooled condensing unit. The electrical usage of the new heat pumps would be slightly higher than the existing water furnaces, but would eliminate the need for the non-potable pumps to provide water to the furnaces, which would significantly reduce overall electrical usage. There are no expected improvements required to the existing ductwork and the furnaces would be able to fit in the existing space allocated to the furnaces in each building. The required modifications consist of exterior concrete pads and two (2) refrigerant lines per unit to be installed between the exterior condensing units and interior furnaces.

The annual electrical cost for the 8 water furnaces at ACWRF is approximately $60,000/year. Note this number accounts for the pumping required to yard hydrants and to the solids building for the filter press. For the 8 replacement heat pumps, the expected annual electric cost is approximately $30,000/year leading to a net savings of $30,000/year at ACWRF. At OECC and CMF, the combined annual savings is expected to be approximately $10,000/year for a total utility savings of $40,000/year combined for all 17 furnaces. Using the capital costs for the replacement of the 17 units, this leads to a payback period of approximately 7 years and doesn't account for the reduction in maintenance/replacement costs of the existing water furnaces if they were to remain.

9.0 BACKWASH TANK DECOMMISSIONING

With the existing filters planned for removal from the Filter Building, the existing filter backwash waste holding tank will no longer be required in the Post Treatment Building. The backwash tank, shown in Figure 13, is located below the chemical storage room in the Post Treatment Building.

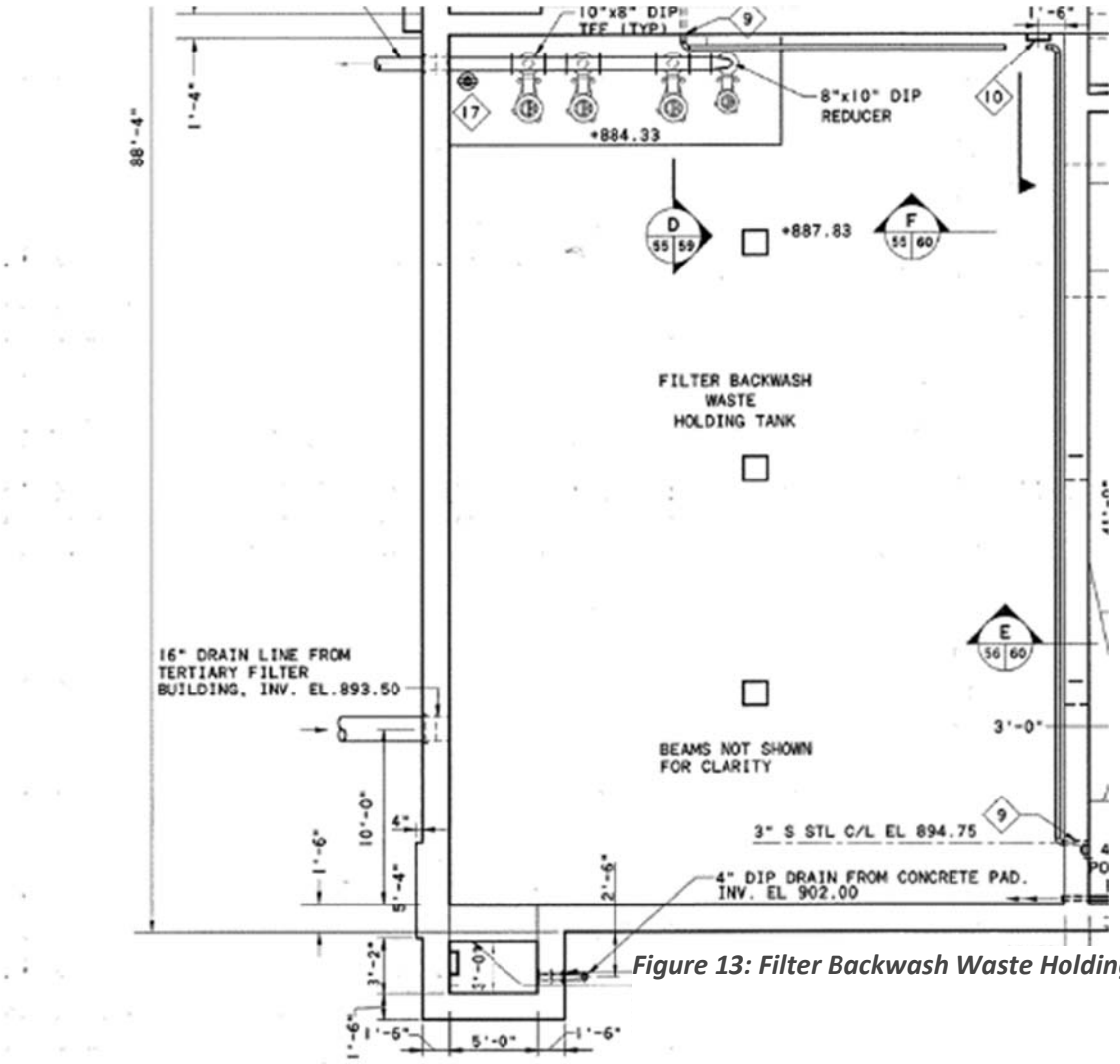

Figure 13: Filter Backwash Waste Holding Tank

Flow enters the backwash tank from the existing Filter Building through a 16-inch drain line. Additionally, there is a 4-inch drain from an exterior concrete pad. This concrete pad receives flow from the chemical storage room through exterior wall penetrations. These wall penetrations are chemical fill lines to the chemical storage room, which is currently not used by the plant. One storage tank contains ferric chloride and while the plant currently meets its phosphorus limit without chemical addition, more stringent limits may be placed in the future and require the use of ferric. Flow from these fill lines only enters the backwash tank in the event of a spill.

Flow is able to exit the backwash tank by two means. First, there are four (4) existing pumps located in a sump to convey flows from the backwash tank to the Pretreatment Building through a 10-inch DIP line. Second, there is

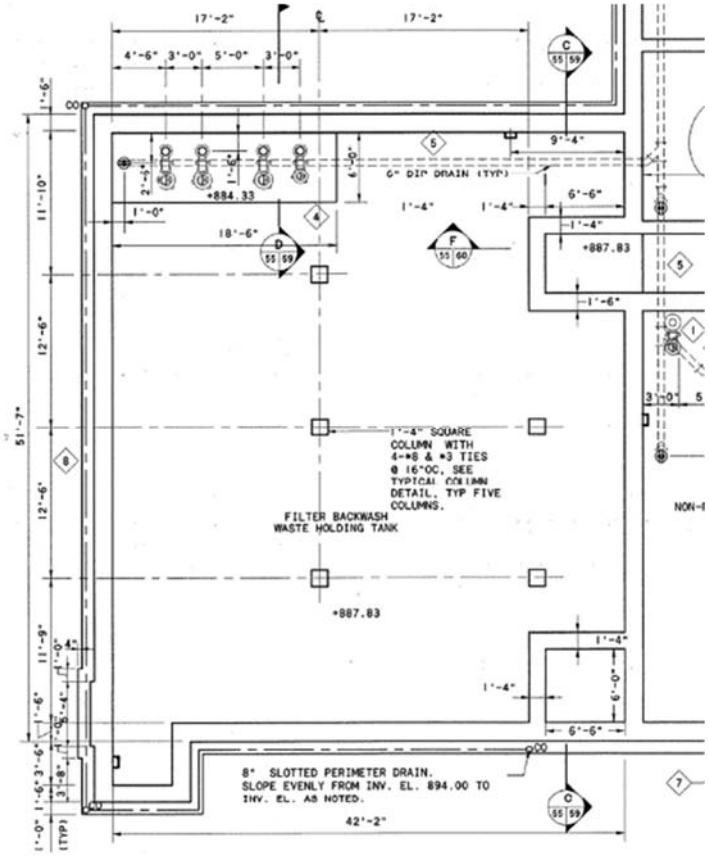

Figure 14: Filter Backwash Waste Holding Tank Lower Level

an existing mud valve which controls a 6-inch drain line located in the sump. This drain line, shown in Figure 14, ultimately conveys flows to the drain pump station.

Initially, it was thought that in order to decommission the backwash tank, leaving one pump in service to dewater any I & I and removing all other influent sources would be sufficient and allow the tank to drain. However, the pump may not operate often enough to ensure proper operation when needed. For this reason, ms proposes the following steps in order to decommission the existing backwash tank:

- Abandon the four (4) existing pumps
- Abandon the existing 16-inch influent and 10-inch discharge piping in the yard adjacent to the structure and install trench dams to minimize inflow and infiltration through the trenches of both pipes.
  - Plug the 10-inch wall sleeve for potential future use if pumps are needed. Their discharge piping can also connect to the 10-inch abandoned in the yard.
- Regarding the chemical fill lines, there are two potential options:
  - If DCRSD wishes for the fill lines to remain, a hose bib is recommended to be installed on the exterior of the building adjacent to the fill lines. If in the future, a spill occurs during filling, this will allow for the chemical to be diluted as it drains into the 4-inch drain. A 4-inch PVC pipe is recommended from the 4-inch drain to the 6-inch drain in the backwash tank so the chemicals do not rest on the concrete for extended periods of time.
  - If the fill lines are not necessary for the foreseeable future, it is recommended to leave the wall sleeves plugged in place and cap the fill lines on the interior of the structure. The 4-inch drain should also be plugged.

10.0 PRELIMINARY OPCC

Preliminary Opinion of Probable Cost

Project Name:	ACWRF Post Treatment Evaluation	Calc By:	ADB
Job Number:	61-04F19	Rev By:	WJ
Owner:	Delaware County Regional Sewer District	Date:	02/04/2022

UV Improvements (SUEZ)	$	552,000
Slide Gates & Actuators (RW Gates & AUMA/Limitorque)	$	266,000
Water Furnace Replacement	$	200,000
HVAC and Electrical Improvements - Post Treatment	$	42,000
Filter Building Modifications	$	227,500
Non-Potable Pump Replacement	$	180,000
Backwash Tank Decommissioning	$	20,000
Base Construction Total	**$**	**1,487,500**
General Conditions (10%)	$	148,750
Mobilization	$	100,000
Mid Point Escalation Factor (3% Per Year, 2 year)	$	89,250
Estimating Contingency (30%)	$	446,250
Estimated Construction Cost	**$**	**2,271,750**
Construction Contingency (10%)	$	227,175
Total Construction Cost	**$**	**2,498,900**

APPENDIX A

Appendix A: UV Equipment Literature

Aquaray® 40 HO Vertical Lamp
Generation 2
Ultraviolet Disinfection Equipment

Budget Proposal
Delaware County, OH
Alum Creek WRF

June 17, 2021

Contact information:

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June 17, 2021

Re: Aquaray Vertical 40 HO Vertical Lamp System
Sabine Creek WWTP

We are pleased to submit our preliminary proposal for the Aquaray® 40 HO Generation 2 Vertical Lamp ultraviolet disinfection system for the above referenced project.

The benefits of the Generation 2 Aquaray 40 HO modules include:

- Third-Party validated UV system performance
- Easy maintenance without the need to remove equipment from channel for lamp and ballast replacement.
- Automatic dose control is achieved turning on/off lamps in relation to a flow signal, ensuring that the plant is operated economically while still providing the required performance.
- Option available to locate ballasts and other electronics remotely in a separate airconditioned enclosure. Standard UV modules are included in this proposal with electronics located inside the UV modules.
- Lowest lamp replacement cost of any UV system in the market ($25 per lamp)

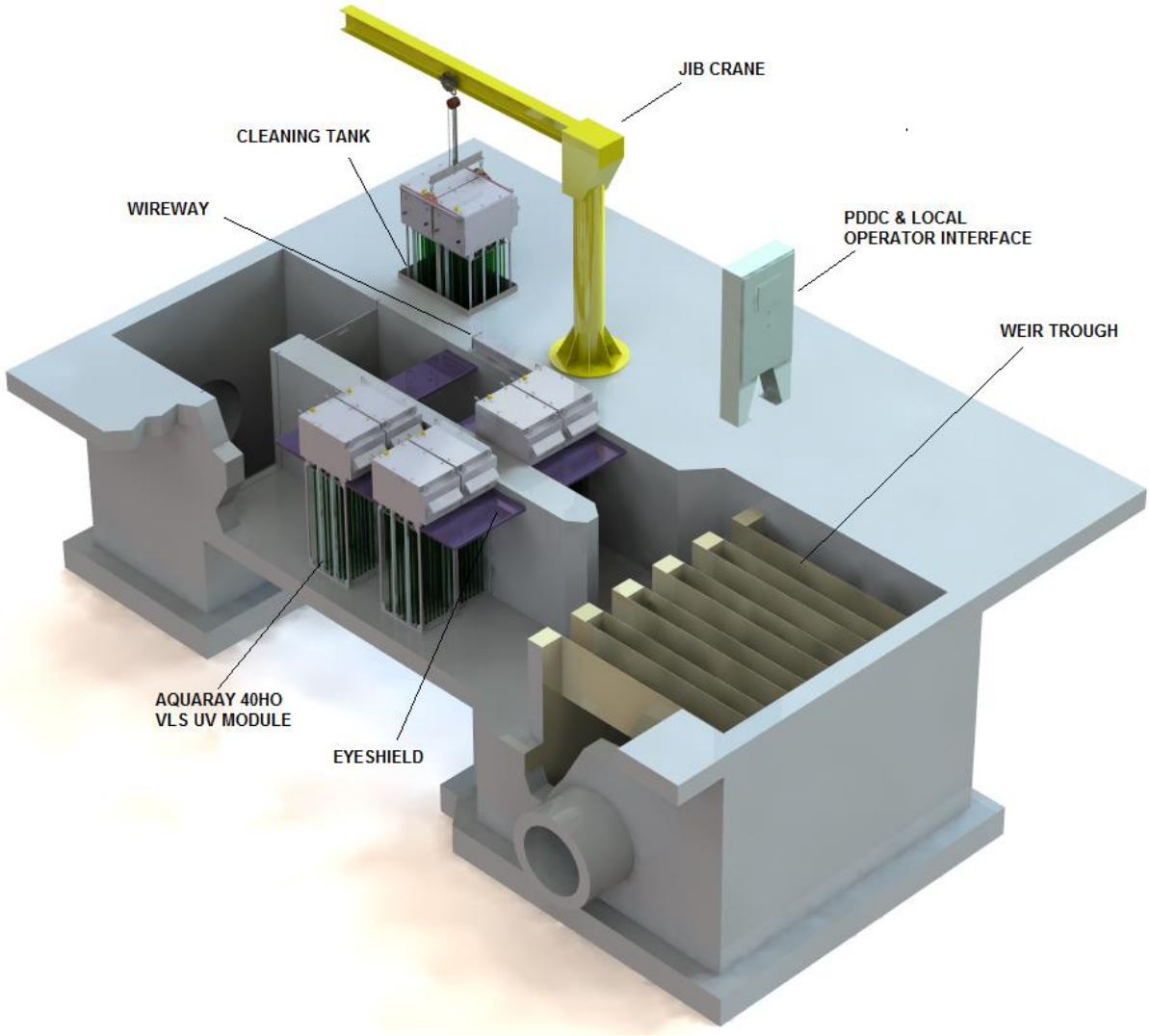
For a peak flow of 30 MGD and an assumed minimum UV transmittance of 65%, SUEZ Treatment Solutions Inc. proposes to furnish five (5) existing UV disinfection channels. Each UV channel will have UV modules mounted one (1) across by two (2) banks in series. The UV system will have a total of ten (10) UV modules. The proposed UV system will deliver a minimum UV dose of 30 mJ/cm^2 at peak flow with all UV banks in service.

If you have any questions or require any additional information, please don't hesitate to contact the undersigned or our local representative below or the writer.

Sincerely,
For SUEZ Treatment Solutions Inc.

George Vrachimis
Applications Engineer

I. AQUARAY® 40 HO GENERATION 2 VERTICAL LAMP SYSTEM DESCRIPTION:



The Aquaray 40 “HO” Generation 2 System is latest generation of the Aquaray® 40 HO design which has been in use around the world since the early 2000s. The Aquaray® 40 “HO” Gen. 2 System is based on the arrangement of the original Aquaray® 40 HO design but incorporates the latest electronic ballast and communication technology. With over 600 installations in North America, the vertical lamp orientation of the system and configuration has been proven through general use to be a very effective form of disinfection and the system also has many features that make it easy and safe to operate and maintain.

In addition to the latest in ballast and communication technology, an option is now available to locate ballasts and other electronics remotely in a separate airconditioned enclosure. For reference, standard UV modules are included in this proposal with electronics located inside the UV modules.

HIGH OUTPUT LAMP ARRANGEMENT:

The ultraviolet lamps are mounted vertically so that all electrical connections are made out of the water and within the protection of a NEMA 4X stainless steel enclosure. Unlike other designs, all the lamps are easily accessed through the lid of this enclosure. Therefore, routine service such as lamp changes can be made without having to remove the lamp modules from the channel.

The lamps are also mounted in a uniform staggered array, three inch on center across the channel and five inch on center along the channel. This ensures a semi-tortuous path so that every particle of water will come into intimate contact with the most intense point of lamp output.

MODULE ARRANGEMENT:

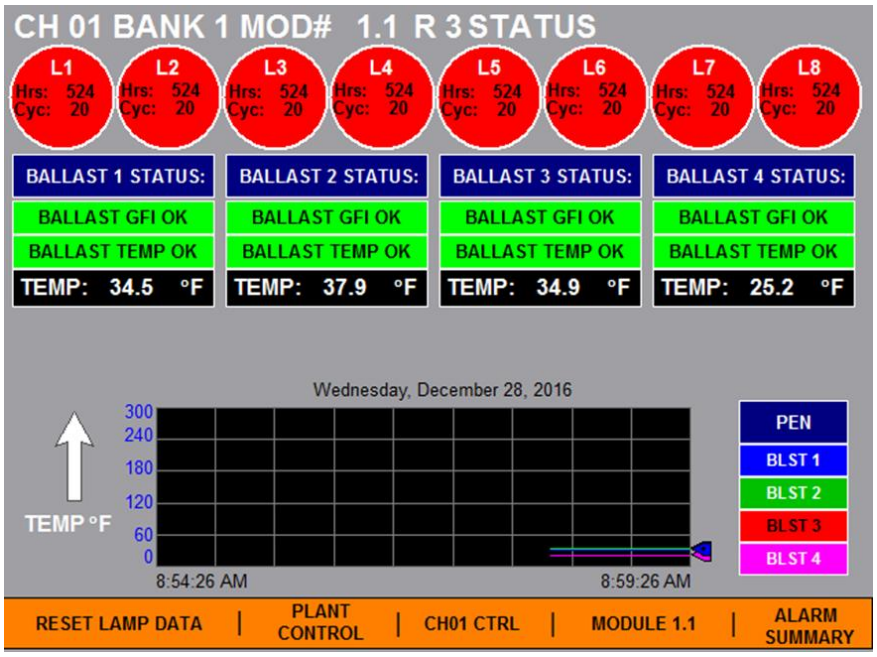
The number and layout of the modules within the channel is determined based on the required UV dosage and a UV path for the water that eliminates any possibility of hydraulic short-circuiting. See “BRIEF DESIGN” for details of module arrangement for this project.

CONTROL AND MONITORING:

Electronic lamp control assemblies are utilized within the Aquaray 40 HO to minimize power consumption. Electronic lamp control assemblies (ballasts) are conveniently mounted in the Aquaray® High Output Module's NEMA-4X enclosure. This locates the assemblies close to the high output lamps, which minimizes the effect of outside interference such as radio waves, lightning, and voltage spikes. With our Aquaray® High Output Module each individual lamp is monitored through the use of an on-board computer called a Data Controller Assembly (DCA). The DCA gathers and stores information relative to individual lamp hours and cycles. A non-volatile memory is included so that a possible relocation of the module will not result in a loss or misdirection of valuable lamp data.

The benefits of recording the individual lamp history may not be immediately apparent. UV lamps are guaranteed to provide a minimum operating life measured in terms of active operating hours, usually up to 13,000 hours. If a lamp fails electrically before the guarantee, our end-of-lamp life conditional warranty provides for a replacement at a cost pro-rated to the actual use achieved with the original lamp. For example, if a lamp fails at mid-life the replacement will be provided at half price.

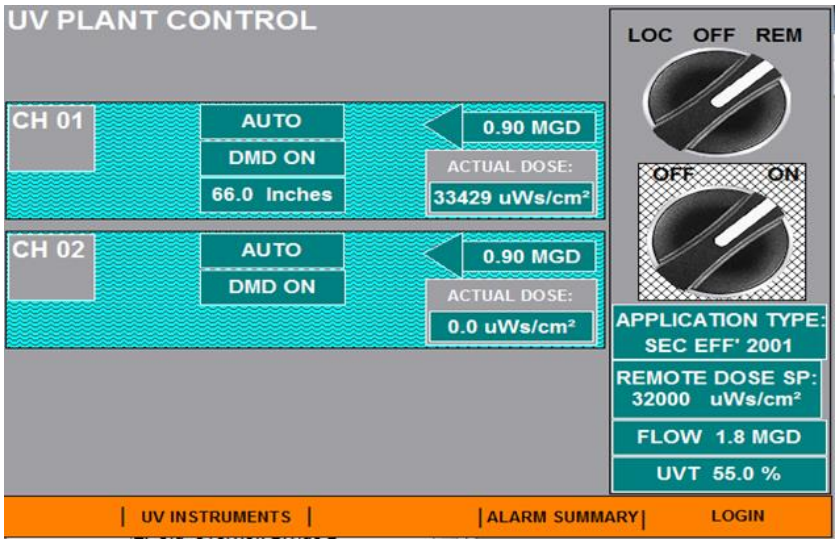
A Power Distribution and Data Center (PDDC) included which houses the load center enclosure and GFCI Breakers for each high output module. The PDDC also includes the Allen CompactLogix PLC and Panelview 7 1000 Operator Interface. Each Aquaray ® High Output module in the UV disinfection channel receives power from the load center locally mounted at the PDDC via a single power cable with waterproof plug-in connectors.



Each Aquaray® High Output module is fully independent and capable of automatic, fail safe operation in case of a control fault. This "default on" design ensures continuous disinfection even under emergency conditions.

FLOW PACING:

Flow Pacing is an automatic system whereby lamp rows are switched on and off in relation to plant flow variations. The Aquaray® 40 HO System provides for very fine adjustments of the number of High Output lamps in service. Adjustments are made in direct proportion to the flow (and optional online UVT Analyzer) , with switching increments as low as 3%. To take full advantage of this feature we take a control signal, usually from the plant flow meter, and switch the lamps on or off as the flow changes.



The advantage of being able to switch the lamps ON/OFF on a row by row basis is twofold:

- Energy Conservation
- Lamp Conservation

SYSTEM CLEANING:

Any UV system gradually accumulates a coating on the quartz sleeves housing the lamps. This routine fouling must be removed periodically. The Aquaray® 40 HO System offers a fully automatic, in-channel cleaning system which reduces maintenance. The automatic wiping system is to be operated once daily and the wipers are to be replaced once every two years. This system is included in our proposal.

SERVICE:

Every piece of equipment within a wastewater plant requires service. The Aquaray® 40 HO VLS System has been developed to permit easy troubleshooting and quick replacement of components. The majority of maintenance activities can be carried out while the equipment is still located within the channel

The recommended spares included in this proposal will ensure that the system can be maintained efficiently and brought back to full operation in the shortest possible time.

II. DESIGN BRIEF:

Parameter	Value	Units
Peak Hourly Flow	30	MGD
Average Daily Flow	9	MGD
Design UV Transmittance, assumed	65	% UVT
TSS, Monthly average	<30	mg/L
TSS, Maximum	<45	mg/L
Fecal Coliform Permit, Assumed 30 Day Geometric Mean	<200	MPN/100 mL
Minimum UV dose	30	mJ/cm^2

III. PROPOSED AQUARAY® 40 HO GENERATION 2 VERTICAL LAMP SYSTEM DESIGN:

Description	
Number of Channels	5
Number of Modules Across (Modules per Bank)	1
Number of Modules in Series (Number of Banks)	2
Channel Width, in.	Existing
Channel Length, ft.	Existing
Minimum Channel Depth, ft	Existing
Nominal Water Depth, in.	57.5” to 62”
Aquaray® Modules/Channel	2
Total Number of Modules	10
Number of Lamps/Module	40
Total Number of Lamps	400
Headloss across UV modules at Peak Flow , in.	5.22 in.
Power Consumption per Lamp, W	165 watts
Power Consumption at 30 MGD, kW	68.8 kW
Power Consumption at 10 MGD, kW *Through 2 channels*	27.5 kW
Total Installed Power	68.8 kW
Power Feed Requirement	480V/3ph/60Hz

IV. SCOPE OF SUPPLY

UV System Component	
Number of Aquaray® 40 HO Generation 2 Modules	10
Number of UV Lamps (Excluding Spares)	400
Number of UV Intensity Sensors	10
Number of Eyeshields	15
Number of Power Distribution and Data Control Center	1
Number of Power Cables	10
Number of Data Cables	10
Number of Wireways	5
Number of Stepdown Transformers	1
Number of Level Control Gates	5
Number of Conductivity Level Switches	5
Typical Spare Parts	1 set
Field Service	5 days, 2 trips
Freight to job site	Included

V. ITEMS PROVIDED BY OTHERS

1) Note that the following items are to be provided by others (unless indicated otherwise above):
   - UV channel construction/modification
   - Channel grating
   - Influent/Isolation gates
   - Piping and drain valves
   - Installation
   - Embedded conduits
   - Sample collection and laboratory analysis during performance testing
   - ½ Ton Jib Crane (reuse existing)
   - Cleaning Tank (reuse existing)
   - Air scour system (reuse existing)

VI. PRICING, TERMS AND CONDITIONS

Budget Price	**To be provided by local SUEZ Representative**
Taxes	Not included
Payment Terms	• 10% Net Cash, Payable in thirty (30) days from date of submittal of initial drawings for approval; • 85% Net Cash, Payable in progress payments thirty (30) days from dates of respective shipments of the Products; • 5% Net Cash, Payable in thirty (30) days from Product installation and acceptance or Ninety (90)
Submittals	6-8 weeks
Equipment Delivery	18-20 weeks after submittal approval
Freight	FOB jobsite
Warranty	1 year after start-up or 18 months after delivery, whichever occurs first

Typical Aquaray® 40 “HO” Vertical Lamp Ultraviolet Disinfection System Installations

Plant Location: Selkirk, MB

Peak Flow: 12 MGD

Number of Channels: 2

Number of Modules: 3 per channel (6 total)

Typical Aquaray® 40 “HO” Vertical Lamp Ultraviolet Disinfection System Installations

Plant Location: Lawrenceburg, KY

Peak Flow: 14 MGD

Number of Channels: 2

Number of Modules: 3 per channel (6 total)

Typical Aquaray® 40 “HO” Vertical Lamp Ultraviolet Disinfection System Installations

Plant Location: Greensburg, PA

Peak Flow: 20 MGD

Number of Channels: 2

Number of Modules: 4 per channel (8 total)

Typical Aquaray® 40 “HO” Vertical Lamp Ultraviolet Disinfection System Installations

Plant Location: Peekskill, NY

Peak Flow: 24 MGD

Number of Channels: 2

Number of Modules: 6 per channel (12 total)

New Eyeshields

TO AIR SUPPLY (BY OTHERS) (SEE NOTE 3)

"B"

24'-8"

5'-6"

SEE NOTE 2 (TYPICAL)

TO PDDC

CHANNEL #1 — FUTURE MODULE — MODULE 21 — MODULE 16 — Module 1.2 — Module 1.1

CHANNEL #2 — FUTURE MODULE — MODULE 22 — MODULE 17 — Module 2.2 — Module 2.1

CHANNEL #3 — FUTURE MODULE — MODULE 23 — MODULE 18 — Module 3.2 — Module 3.1

FOR AUTOMATIC LEVEL CONTROL SEE DRAWING D99762-13-200 TYPICAL 5 PLACES

MUD VALVE (BY OTHERS)

CLEANING TANK LINER SEE DRAWING D99762-14-100

CLEANING TANK

SEE NOTE 2.

JIB CRANE, ELECTRONIC (BY OTHERS)

DRAIN LINE (BY OTHERS)

AIR SUPPLY & INTERCONNECT PIPING (NOT BY IDI)

1" AIR LINE TO CLEANING TANK

"A"

INFLUENT PIPE (NOT BY IDI)

BY-PASS CHANNEL

SEE DETAIL "C"

FLOAT SWITCHES (BY IDI) TYPICAL (5) PLACES MOUNTING AND CONDUIT (BY OTHERS)

FLOAT SWITCH JUNCTION BOX TYP. (5) PLACES (BY IDI)

CONDUIT AND INTERCONNECT WIRING TO PDDC (BY OTHERS) TYPICAL (5) PLACES

CHANNEL #4 — FUTURE MODULE — MODULE 24 — MODULE 19 — Module 4.2 — Module 4.1

CHANNEL #5 — FUTURE MODULE — MODULE 25 — MODULE 20 — Module 5.2 — Module 5.1

TO PDDC

SLIDE GATE BY OTHERS, TYP.

SLIDE GATE BY OTHERS TYPICAL

FOR AIR SCRUB HEADER AND HOSE ASSEMBLY SEE DRAWING D99762-14-102 TYP. ALL CHANELS.

AQUARAY? 40 LAMP VERTICAL MODULES SEE DRAWING D99762-11-102

WIREWAY ASSEMBLY SEE DRAWING D99762-11-400 TYP. EACH CHANNEL

POWER FEEDER 4-20 mA (5) CONDUITS FROM LEVEL SWITCHES

POWER DISTRIBUTION DATA CENTER, SEE IDI DWG. D99762-12-100

PDDC

(2) CONDUITS, (1) POWER, 1 1/2"ø (1) DATA, 1"ø

"B"

PLAN VIEW

"A"

NOTES

1. FOR SECTION "A-A" AND SECTION "B-B" REFER TO DRAWING D99762-11-101 AND DRAWING D99762-11-103.

NOTE
CONTACT INFILCO DEGREMONT, INC. IF ADDITIONAL INFORMATION IS REQUIRED.

2. PROVIDE 3/4" MPT CONNECTORS FOR EACH AIR SCRUB HOSE ASSEMBLY.

3. AIR SUPPLY TO MODULES: 12.5 CFM @ 6.5 PSI PER MODULE BEING AIR SCOURED.

NOTE:
INFORMATION ON THIS DRAWING SUBMITTED "FOR APPROVAL" MAY BE SUBJECT TO CHANGES. ONLY DRAWINGS SUBMITTED "CERTIFIED" MAY BE USED FOR CONSTRUCTION, ERECTION OR FABRICATION. INFILCO DEGREMONT,INC. WILLNOT BE RESPONSIBLE FOR ANY CHANGES RESULTING FROM THE USE OF THIS DRAWING PRIOR TO BEING SUBMITTED "CERTIFIED".

Infilco Degremont Inc.

- ☐ Information Only – Return not required.
- ☐ Preliminary – Not to be used for construction.
- ☐ For Approval – Requests for changes can add
- ■ Certified – to price and delay shipment

For ALUM CREEK WWTP
DELAWARE COUNTY, OHIO
Cust. Ord. No. 58676
Infilco Degremont Inc. No. 99762
Date 11/18/99 Item No. 1101

ANCHOR BOLTS — 6" — 3'-0" +1/4" -0" — EYESHIELD — -0" +1/2" 2'-0 1/2" — FLOW — WIREWAY — 4" FROM END OF EYESHIELD — AIR HEADER (NOT BY IDI)

DETAIL "C"

REV. NO.	DR.	CHK.	APP.	APP.	DATE	
B	JP	HC	HC		11 99	RELEASED AS CERTIFIED.
A	WP	✓	H C		08 99	REV. PER APPROVAL COMMENTS

DR.	JRP	06 99
CHK.	HMC	06 99
APP.	HMC	06 99
APP.		

CADD NO. 76211100

Infilco Degremont Inc.
Post Office Box 71390 Richmond Virginia 23255-1390

LAYOUT - PLAN
AQUARAY 40-LAMP VERTICAL MODULES
AQUARAY? DISINFECTION SYSTEM

ASSEMBLY	SCALE	SIZE	DWG. NO.	REV.
	1/2" = 1'-0"	D	99762-11-100	B
REFERENCE	MICRO			

What's the same?

	Aquaray 40 (Type B)	Aquaray 40 HO Generation 2
Configuration	Vertical	
Footprint	Same module dimensions	
Water Levels	57.5" to 62"	
Lamp Diameter / Quartz Sleeve	Same lamp diameter / Quartz Sleeve	
Air Scour	Both systems have the capability to use air scour	

What's different?

	Aquaray 40 (Type B)	Aquaray 40 HO Generation 2
Lamp Power	72 watts	165 watts
Wiping System	No wiping system	Mechanical Wiping System
Electronics	Electronics designed in late '90s	Electronics upgraded in 2016 Option to be located outside UV module
UV Intensity Sensor	Outside of quartz sleeve with small viewing window	Inside quartz sleeve with 360 degree viewing
Validation	1986 US EPA Protocols	2012 NWRI Guidelines

What's different?

	Aquaray 40 (Type B)	Aquaray 40 HO Generation 2
Spacing	12"	18"-24"
Power Requirements	120 V /1 phase	480 V / 3 phase
Controls	Based on Eason controllers	Allen Bradley PLC Allen Bradley HMI

Aquaray® Open Channel Vertical Lamp
Ultraviolet Disinfection System Installations

**** Indicates Title 22/Water Reuse Installations***

Location			Capacity (MGD)	Year
Brokenstraw	PA	USA	2.48	2021
Sellersburg	IN	USA	7.5	2021
Harris County	TX	USA	12	2021
Mountain House*	***CA***	***USA***	***8.5***	***2021***
Pearland – John Hargrove	TX	USA	24	2021
Corpus Christi - Greenwood	TX	USA	24	2020
Penn Hills	PA	USA	16	2020
New Stanton	PA	USA	22.7	2020
Hoke County	NC	USA	3.75	2020
Princeton Meadows	NJ	USA	2.57	2020
Broomfield	CO	USA	18.6	2020
Security	CO	USA	3.51	2020
Indian Land Expansion	SC	USA	12.5	2020
Elsinore Valley	***CA***	***USA***	***36***	***2019***
Conroe	TX	USA	24	2019
Rio Rancho	NM	USA	12	2019
Birch Bay	WA	USA	5	2019
Blackfoot	ID	USA	6	2019
College Station	TX	USA	15	2019
Fishers	IN	USA	20	2019
Wylie	TX	USA	24	2019
Pearl River	MS	USA	3	2018
South Fort Collins	CO	USA	5.1	2018
Cypresswood	TX	USA	7.5	2018
Auburn	NY	USA	25.4	2018
Torrington	CT	USA	25.76	2018
Howell	MI	USA	8	2018
Ashland	MO	USA	2.4	2018
Jackson	MI	USA	26	2018
Eldridge	IA	USA	5.25	2018
Kingwood	TX	USA	10.1	2018
New Braunfels – Gruene Road	TX	USA	10	2018
Fort Bend County - Sienna Plantation	TX	USA	3.5	2018
Dorado		Puerto Rico	8	2018
West Mifflin – Thompson Run	PA	USA	16.9	2017
Southington	CT	USA	30	2017
Georgetown	TX	USA	9	2017
Sanger	TX	USA	7.03	2017

Versailles	KY	USA	12.5	2017
Morden	MB	Canada	6.61	2017
Dona Ana	NM	USA	3	2017
Fairfield	IA	USA	9	2017
Indian Land	SC	USA	6	2017
Cheyenne Expansion	WY	USA	11.4	2017
Patuxent	MD	USA	48	2016
Jim Thorpe	PA	USA	3.68	2016
Pearland	TX	USA	24	2016
Farmington	NM	USA	24.9	2016
JEA Mandarin*	***FL***	***USA***	***8.75***	***2016***
Corpus Christi - Whitecap	TX	USA	7.5	2016
Marshfield	MA	USA	8.3	2016
Findlay Township	PA	USA	1.7	2016
Okaloosa Expansion	FL	USA	37.5	2016
MCI Hagerstown	MD	USA	2.4	2016
Wallace	NC	USA	10	2016
King County	WA	USA	70	2016
Ashville	OH	USA	4	2016
East Lansing	MI	USA	48	2015
Annapolis	MD	USA	20	2015
As-Sayliyah – Doha Expansion 3&4*	***Doha***	***Qatar***	***60***	***2015***
As-Sayliyah – Doha Expansion 5*	***Doha***	***Qatar***	***50***	***2015***
Colony	TX	USA	15.75	2015
Bethel Park	PA	USA	22	2015
West Mifflin – New England WWTP	PA	USA	4.1	2015
Buckeye WRF	AZ	USA	7.2	2015
Harris County	TX	USA	9	2015
North Canaan	CT	USA	1	2015
Rio Medio		Mexico	7.98	2015
Bristol	CT	USA	38	2015
Louisville	CO	USA	4.58	2015
New Wilmington	PA	USA	5	2015
Front Royal	VA	USA	16.9	2015
Elwood	IN	USA	15	2015
Deer Park	TX	USA	24	2014
Lumber Bridge -Hoke County	NC	USA	3.75	2014
Greenville	NC	USA	35	2015
Pocatello	ID	USA	28	2014
Wylie Upgrade	TX	USA	4	2014
Presa Guadalupe		MEXICO	11.4	2014
New Braunfels	TX	USA	10	2014
Joint Base Lewis McChord	***WA***	***USA***	***12.3***	***2014***
Springwood Village HCID No. 18	TX	USA	9	2014
Hoke County	NC	USA	4	2014
Waynesburg	PA	USA	5	2013
Ottumwa	IA	USA	12	2013

Gig Harbor	WA	USA	10	2013
Green Valley	WV	USA	4	2013
Orem	UT	USA	19.5	2013
St. John County*	***FL***	***USA***	***5.4***	***2013***
Havelock	NC	USA	8.4	2013
Clearfield	PA	USA	25	2013
Edgewood Area	MD	USA	5	2013
Franklin Township	PA	USA	5	2013
Middlebury	IN	USA	4	2013
Cincinnati Indian Creek	OH	USA	6	2013
Chesapeake Beach	MD	USA	4.5	2013
Stonington – Borough WPCF	CT	USA	1.52	2013
Stonington – Mystic WPCF	CT	USA	2	2013
Stonington – Pawcatuck WPCF	CT	USA	3.3	2013
Bridgeland - Cypress	TX	USA	8.4	2012
Poza Rica		MEXICO	12.8	2012
Osiris Zacatecas		MEXICO	13.7	2012
Jose 2		MEXICO	2.5	2012
Chelan	WA	USA	4.4	2012
Fort Nelson	BC	CANADA	3	2012
Wilsonville	OR	USA	8	2012
Denver Metro	CO	USA	51.4	2012
Great Falls	MT	USA	60	2012
Green Bay De Pere	WI	USA	31.2	2012
Kiski Valley	PA	USA	31	2012
Harris County 418	TX	USA	8.4	2012
Quarryville	PA	USA	5.2	2012
Logan Township	NJ	USA	4	2012
Jacksonville East	FL	USA	32	2012
Pinellas County	***FL***	***USA***	***10***	***2012***
Galveston	TX	USA	27	2012
Conway	AR	USA	50	2012
Iowa City	IA	USA	30	2012
Shamoakin	PA	USA	12	2012
Bath	ON	USA	3.2	2012
Mayo	MD	USA	1.87	2012
Midwest City	OK	USA	16	2012
Jeffersonville	IN	USA	9	2012
Rexburg	ID	USA	8.1	2011
Zion	VA	USA	1.75	2011
Tooele	UT	USA	5.8	2011
Moore County	NC	USA	25	2011
Lower Fountain	CO	USA	4.63	2011
Johnson Creek - Wall	MS	USA	6	2011
Middle Big Creek	MO	USA	6.75	2011
Putnam	CT	USA	7.6	2011
Bryan	TX	USA	6	2011

Lewiston	PA	USA	16.5	2011
Canton	IL	USA	13.5	2011
Duckett Creek	MO	USA	15	2011
Lebanon	PA	USA	34	2011
Ipswich	MA	USA	5	2011
Washington	IA	USA	7.68	2011
Peekskill	NY	USA	26	2011
Kamloops	BC	CANADA	12	2011
Sanford	NC	USA	36	2011
McKeesport	PA	USA	36	2011
Broadneck	MD	USA	20	2011
Annapolis	MD	USA	27	2011
Dryden	ON	CANADA	6.84	2011
League City	TX	USA	6.0	2011
Visalia*	***CA***	***USA***	***28.8***	***2011***
Collinsville	IL	USA	24.0	2011
Clermont County	MO	USA	21.0	2011
Azle	TX	USA	6.1	2011
Perryville	MO	USA	3.6	2011
Speedway	IN	USA	15.0	2011
Enterprise	AL	USA	10.0	2011
Annapolis	MD	USA	27.0	2011
Laurel	MD	USA	14.0	2010
Bull Hide Creek	TX	USA	6.0	2010
Hagersville	ON	CANADA	5.5	2010
Rupert	ID	USA	15.0	2010
Kansas City- Fishing River	MO	USA	4.0	2010
Kansas City- Todd Creek	MO	USA	9.2	2010
Kansas City-Rocky Branch	MO	USA	9.2	2010
Dubuque	IA	USA	40.86	2010
Pueblo	CO	USA	33	2010
Drayton Valley	AB	CANADA	5.7	2010
Walsenburg	CO	USA	6	2010
Douglas	GA	USA	12	2010
Cadereyta		Mexico	5.7	2010
Pflugerville	TX	USA	9	2010
Greensburg	PA	USA	20	2010
Windemere	TX	USA	9	2010
Chalfont – New Britain	PA	USA	20	2010
Marlborough	MA	USA	12	2010
Willits	CA	USA	7.0	2010
Mexico	MO	USA	6	2010
New Rochelle	NY	USA	58	2010
Valdosta	GA	USA	17	2010
St. Louis Lemay	MO	USA	240	2010
McAllen	TX	USA	45	2010
Harnett South Expansion	NC	USA	25	2010

Warsaw	MO	USA	4	2010
Shelton	WA	USA	12	2010
Cedar Falls	IA	USA	22	2010
Timpanogos	UT	USA	60	2010
Franklin	NH	USA	36	2010
Portsmouth	OH	USA	14	2010
Moberly	MO	USA	12	2010
Airway Heights*	***WA***	***USA***	***2.5***	***2010***
North Laredo	TX	USA	9	2010
Janesville	WI	USA	21.6	2010
Panther Creek – Frisco	TX	USA	30	2009
Hartford	CT	USA	120	2009
Springfield	IL	USA	80	2009
Pasco	WA	USA	15	2009
Santa Paula*	***CA***	***USA***	***10.4***	***2009***
Jefferson City	MO	USA	66	2009
Colorado Springs	CO	USA	135	2009
Council Bluffs	IA	USA	31	2009
Brigham City	UT	USA	9	2009
Newburgh	IN	USA	24	2009
Grantsville	UT	USA	2.25	2009
Lake Stevens*	***WA***	***USA***	***7.4***	***2009***
Little Elm	TX	USA	12	2009
Tri-City	OR	USA	28	2009
Post Falls	ID	USA	13.8	2009
Panther Creek	TX	USA	30	2009
Irvine Ranch*	***CA***	***USA***	***21***	***2009***
Swansea	IL	USA	12	2009
Fishers	IN	USA	16.7	2009
Salt Lake City	UT	USA	150	2009
Oakdale*	***CA***	***USA***	***10***	***2009***
Cayey	Puerto Rico	USA	29	2009
Pickerington	OH	USA	8	2009
Anderson	SC	USA	29	2009
Salida	CO	USA	6.75	2009
New Milford	CT	USA	6.60	2009
Lititz	PA	USA	9.4	2009
Denton - Doe Ranch	TX	USA	10	2008
Huntington	PA	USA	13	2008
Taber	AB	Canada	5	2008
Haggerstown	MD	USA	32	2008
Indian Creek (Cincinnati)	OH	USA	8	2008
Buffalo	MO	USA	4.25	2008
McComb	MS	USA	15	2008
El Dorado Hills Phase II*	***CA***	***USA***	***8.3***	***2008***
Taber	AB	USA	7	2008
Plainfield	IL	USA	17.2	2008

Bacliff	TX	USA	5.7	2008
Saskatoon	SK	Canada	75.3	2008
Lubbock Plant #3	TX	USA	23.1	2008
Lubbock Plant #4	TX	USA	29.9	2008
Warden*	***WA***	***USA***	***1.2***	***2008***
Greer	SC	USA	7.2	2008
Madison	AL	USA	36	2007
Pearland	TX	USA	16	2007
Osan City		Korea	21	2007
Festus – Crystal City	MO	USA	14.7	2007
Harnett County (South)	NC	USA	12.5	2007
Ansonia	CT	USA	11.9	2007
SPA III - Surprise, AZ	AZ	USA	3.6	2007
Broomfield	CO	USA	6.2	2007
Barrie Upgrade	ON	CANADA	51.52	2007
Vieques	PR	USA	0.72	2007
Barwood	TX	USA	5.3	2007
Millstadt	IL	USA	2	2007
Novato	CA	USA	31	2007
Okaloosa	FL	USA	25	2007
Glastonbury	CT	USA	15	2007
Buckeye	WA	USA	7	2007
Richland County	SC	USA	15	2007
Lompoc*	***CA***	***USA***	***5.5***	***2007***
Rosenberg	TX	USA	18	2007
Hobbs	NM	USA	10.6	2007
Broken Bow	OK	USA	5	2007
Russian River (Sonoma County)*	***CA***	***USA***	***3.7***	***2007***
Tecumseh	MI	USA	3	2007
Hoover (expansion)	AL	USA	3	2007
Brewster	WA	USA	1.6	2007
La Grange	MO	USA	1	2007
Buckley	WA	USA	6.9	2007
Winchester- Parkins Mill	VA	USA	13.8	2007
Sardinia	OH	USA	2.4	2006
Leesburg	OH	USA	1.4	2006
Goochland	VA	USA	0.9	2006
Placerville*	***CA***	***USA***	***5.7***	***2006***
Lawton	OK	USA	24	2006
Caseyville	IL	USA	23	2006
Fort Collins	CO	USA	9	2006
Harnett County (North)	NC	USA	18.75	2006
Buckeye Lake	OH	USA	7	2006
Marysville	OH	USA	24	2006
Cabot	AR	USA	16.4	2006
Huntley	IL	USA	6.5	2006
Morris	IL	USA	2.7	2006

Muddy Creek	TX	USA	15	2006
Mount Olive	NC	USA	5	2006
Cheyenne	WY	USA	8	2006
Stratford	CT	USA	36	2005
Kingwood	TX	USA	20	2005
Madison	GA	USA	2.5	2005
Lakeland	TN	USA	4.5	2005
Dove Springs	TX	USA	6.25	2005
West Memphis,	AR	USA	17.68	2005
Olivehurst*	***CA***	***USA***	***7.4***	***2005***
Arlington	TN	USA	17.68	2005
Selkirk	Manitoba	Canada	4.5	2005
Colony	TX	USA	14	2005
Colville	WA	USA	5.3	2005
Delphos	OH	USA	12	2005
Eastview	OH	USA	2.8	2005
Pontotoc	MS	USA	2.25	2004
Soldotna	AK	USA	2.7	2004
Clear Lake	TX	USA	31	2004
Deer Creek*	***CA***	***USA***	***10***	***2004***
Dorado	Puerto Rico	USA	8	2004
Eureka Springs	AR	USA	6	2004
Fort Sill	OK	USA	6	2004
Lawrenceburg	KY	USA	9.9	2004
Linwood	GA	USA	10	2004
Manchester	CT	USA	19.2	2004
Manhattan	IL	USA	3.8	2004
Tartesso	AZ	USA	2.4	2004
Prudes Creek	AL	USA	3.8	2004
Sand Hill*	***FL***	***USA***	***14.4***	***2004***
Shelbyville	KY	USA	9.5	2004
Vega Baja	Puerto Rico	USA	8.4	2004
Dry Creek	WY	USA	18.4	2003
Empire	MN	USA	36	2003
Mountain House*	***CA***	***USA***	***5.4***	***2003***
Lansing	KS	USA	12.8	2003
Marysville	WA	USA	15.6	2003
Monette	MO	USA	12	2003
Utuado	Puerto Rico	USA	5	2003
Walla Walla*	***WA***	***USA***	***14***	***2003***
Wapakoneta	OH	USA	8	2003
Xenia (2 Plants)	OH	USA	12 ea.	2003
Cedarville	OH	USA	3	2003
Columbiana	AL	USA	3	2003
Brokenstraw	PA	USA	2.48	2002
CNP Utility District	TX	USA	7	2002
Green Valley	WV	USA	4	2002

Helena	AL	USA	7	2002
Litchfield	CT	USA	8	2002
New Philadelphia	OH	USA	8	2002
Alabaster	AL	USA	11	2002
Camp Creek	GA	USA	60-90	2002
Fajardo	Puerto Rico	USA	14.5	2002
Santa Rosa Racheria*	***CA***	***USA***	***0.5***	***2002***
Mallard Creek	NC	USA	17.5	2002
Selah	WA	USA	4.43	2002
Sherman	TX	USA	42	2002
Myrtle Creek	OR	USA	7.3	2002
Sherwood	KS	USA	10	2002
Southwest Licking	OH	USA	10	2002
Vereen	SC	USA	17.5	2002
Ypsilanti	MI	USA	64	2002
Broomfield	CO	USA	12	2001
Cheyene	WY	USA	4	2001
City of Quincy*	***WA***	***USA***	***2.2***	***2001***
Easley	SC	USA	10	2001
Garnett	KS	USA	6	2001
Massard Creek	Ft. Smith, AR	USA	20	2001
McDowell Creek	NC	USA	17.6	2001
Pearland	TX	USA	8	2001
South WA	MN	USA	30	2001
Stillwater	OK	USA	32	2001
Cinco Ranch	TX	USA	10	2001
East Meridian	MS	USA	3	2001
Herrington	KS	USA	3	2001
Lake Stevens	WA	USA	6	2001
Dublin San Ramon Exp*	***CA***	***USA***	***3***	***2001***
Lower East Fork	OH	USA	15	2001
O'Bannon Creek	OH	USA	1	2001
Pecan Branch	TX	USA	4	2001
Plymouth	UK	FOR	8	2001
Swansea	IL	USA	12	2001
Waverly	OH	USA	3	2001
Wynne	AR	USA	6	2001
Fort McDowell	AZ	USA	4	2001
Buckeye*	***AZ***	***USA***	***2.4***	***2001***
Yankton	SD	USA	6	2001
Deer Park	TX	USA	24	2000
Patuxant	MD	USA	20	2000
Plainfield	IL	USA	8	2000
Blackfoot	ID	USA	8	2000
Charlestown	WV	USA	6	2000
Livermore*	***CA***	***USA***	***6.5***	***2001***
Choctaw	MS	USA	1	2000

Coffeyville	KS	USA	8	2000
Coralville	IA	USA	12	2000
Deer Park	TX	USA	3	2000
Hanover	VA	USA	20	2000
Kansas City Wayandotte WWTP	MO	USA	10	2000
Ocean Isle	NC	USA	4	2000
Omak	WA	USA	5	2000
Pleasant Valley	OH	USA	3	2000
Riverchase	AL	USA	3	2000
Robson Ranch	TX	USA	4	2000
Steamboat Springs	CO	USA	8	2000
Stowe	VT	USA	8	2000

PROPOSAL FOR DELAWARE COUNTY - ALUM CREEK, OH
QUOTE: 230465
07/02/2021

TrojanUVSigna™ incorporates revolutionary innovations, including TrojanUV Solo Lamp™ technology, to reduce the total cost of ownership and drastically simplify operation and maintenance. It is the ideal solution for facilities wanting to upgrade their disinfection system easily and cost-effectively.

We are pleased to provide the enclosed TrojanUVSigna proposal. Please do not hesitate to contact us if you have any questions regarding this proposal. We look forward to working with you.

With best regards,

John Faber

3020 Gore Road
London, Ontario N5V 4T7
(519) 457 – 3400 ext. 2389
jfaber@trojantechnologies.com

Local Representative:

Chris Kushner
The Henry P. Thompson Company
513-248-3208
ckushner@hpthompson.com

DESIGN CRITERIA

Peak Design Flow:	**30 MGD**
UV Transmittance:	**65%** (minimum)
Total Suspended Solids:	**20 mg/l** (30 Day Average, grab sample)
Disinfection Limit:	**126 *E.coli* per 100 ml** (30 Day Geometric Mean, grab sample)

DESIGN SUMMARY

CHANNEL (Refer to Trojan layout drawing for complete details)	
Number of Channels:	**2**
Minimum Channel Length Required:	**28 ft**
Channel Width at UV Banks:	**4.7 ft**
Channel Depth Recommended:	**7.5 ft**
UV BANKS	
Number of Banks per Channel:	**2**
Number of Lamps per Bank:	**20**
Total Number of UV Lamps:	**80**
Maximum Duty Power Draw:	**84.2 kW**
Headloss through UV Banks at Peak Flow:	**1.3 in**
UV PANELS	
Power Distribution Center Quantity:	**2**
Hydraulic System Center Quantity:	**2**
System Control Center Quantity:	**1**
ANCILLARY EQUIPMENT	
Level Controller Quantity and Type:	**2 - Motorized Weir Gate**
Integral Bank Walls:	**Included**

ELECTRICAL REQUIREMENTS

1. Electrical supply for each Power Distribution Center to be one (1) 480Y/277V, 3-phase, 4-wire + ground, 43.5 kVA
2. Electrical supply for each Hydraulic System Center to be one (1) 480V, 3-phase, 3-wire + ground, 2.5 kVA
3. Electrical supply for System Control Center to be one (1) 120V, 1-phase, 2-wire + ground, 1.8 kVA
4. Electrical disconnects are not included in this proposal. Refer to local electrical codes

COMMERCIAL INFORMATION

Total Capital Cost: $ 660,000 (USD)

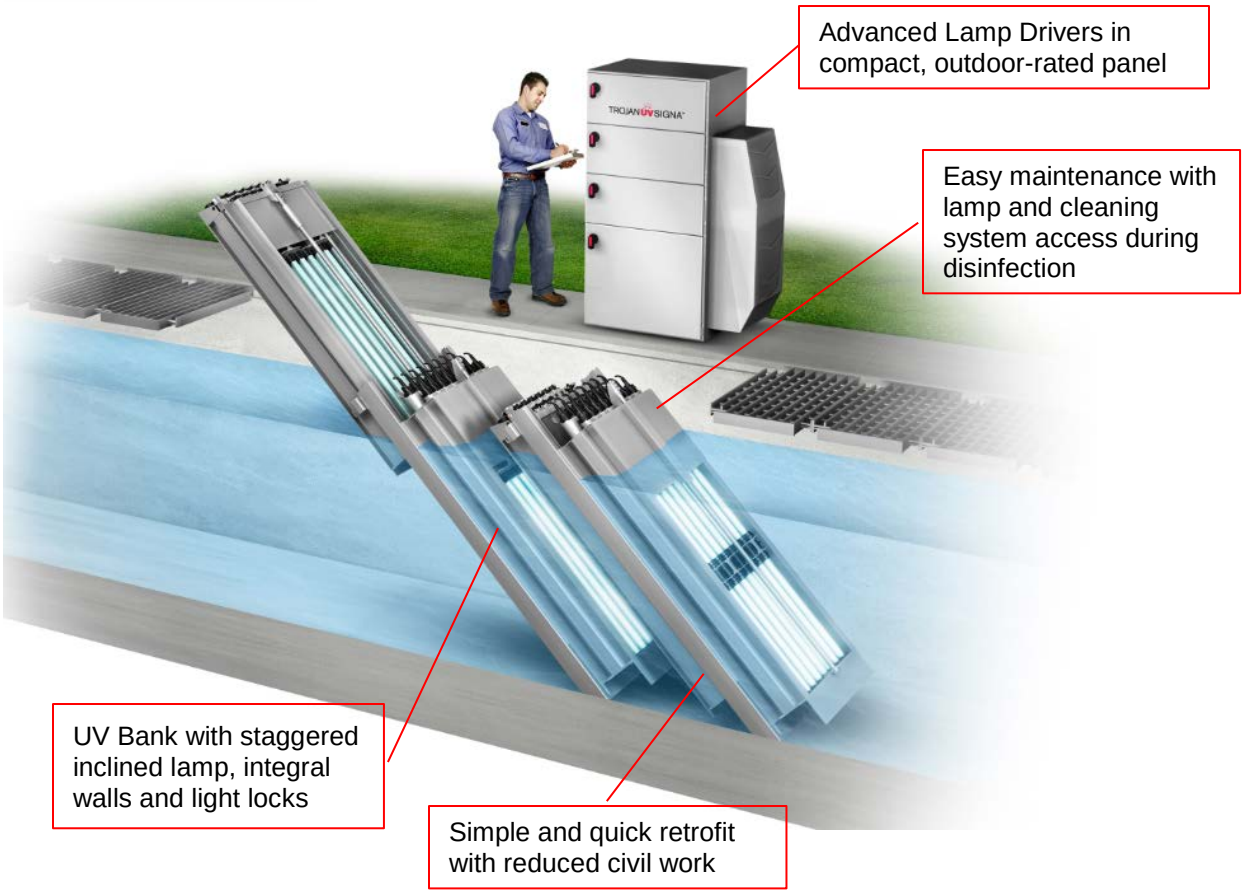
This price excludes any taxes or duties that may be applicable.
Standard equipment warrantees and start up by Trojan-certified technicians are included.

Easy and Cost-Effective Maintenance

- The 1000 watt TrojanUV Solo Lamp combines the benefits of both low pressure and medium pressure lamps
- Fewer lamps, long lamp life and easy change-outs save time and money
- Lamp change-outs and cleaning solution replacement are done while the UV system is in the channel – minimizing downtime and simplifying maintenance
- Routine maintenance can be performed while banks are in the channel, but an Automatic Raising Mechanism (ARM) makes other tasks, such as winterization, simple, safe and easy
- Lamp plugs with LED status indicators and integral safety interlock prevent an operator from accidentally removing an energized lamp
- ActiClean WW™ chemical/mechanical cleaning system to keep sleeves clean during operation

SYSTEM OVERVIEW

SOLO LAMP TECHNOLOGY

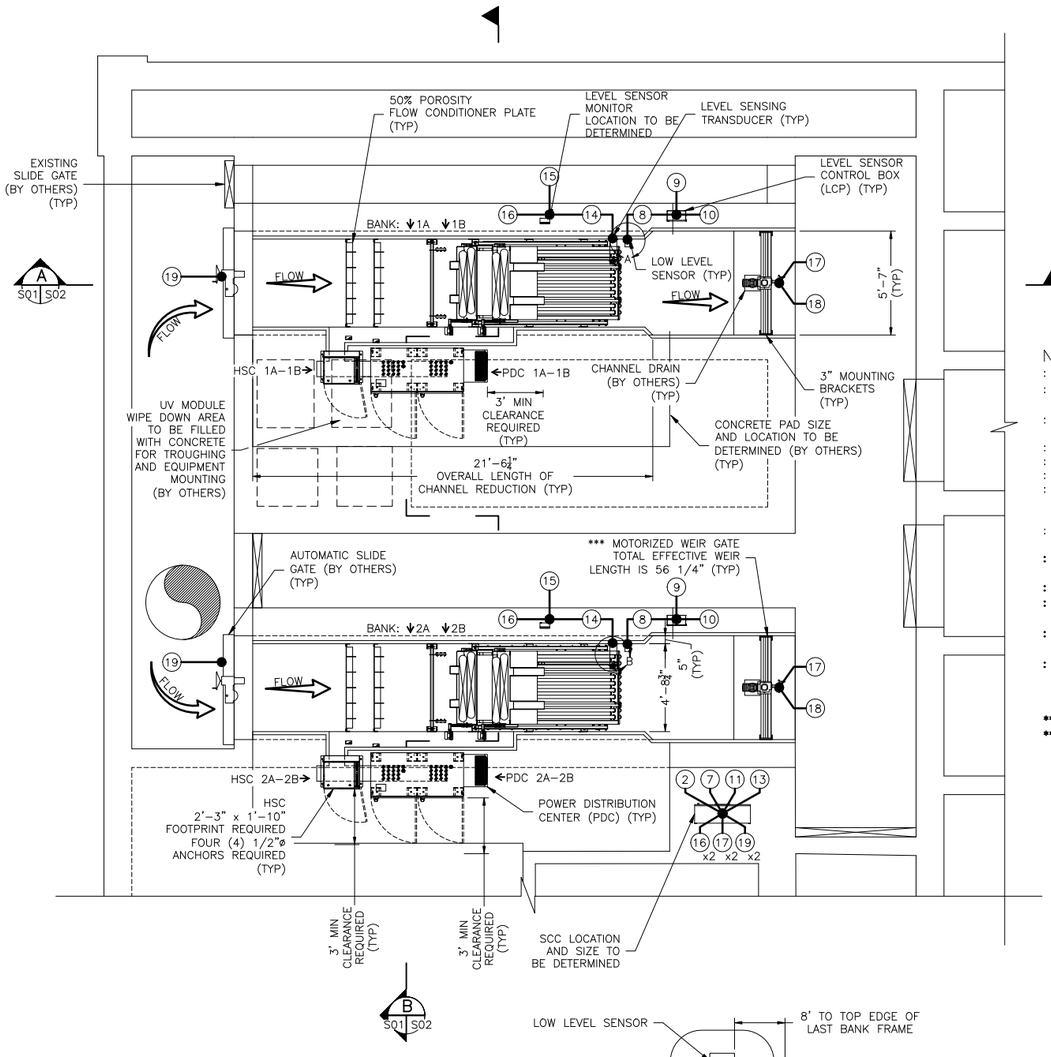


Simple to Design and Install

- Light locks on the UV banks control water level within the channel, reducing dependence on downstream weirs and preventing short-circuiting above the lamp arc
- UV Banks include integral reactor walls to make installation easy and prevent short circuiting at the channel walls
- Stringent tolerances on concrete channel walls are not required – making retrofits simple and cost-effective

Supported by Trojan Technologies

- Trojan Technologies warrants all components of the system (excluding UV lamps) against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, whichever comes first.
- UV lamps are warranted for 15,000 hours of operation or 3 years from shipment, whichever comes first. Lamp warranty is pro-rated after 9,000 hours of operation. This means that if a lamp fails prior to 9,000 hours of use, a new lamp is provided at no charge.
- Trojan offers an unparalleled Lifetime Performance Guarantee. The spirit of this guarantee is simple: the Trojan equipment, as sized for the project, will meet the disinfection requirements for the life of the system.



PLAN VIEW
SCALE: AS SHOWN

NOTES:
: DO NOT SLOPE CHANNEL FLOOR.
: CHANNEL WIDTH MUST BE KEPT WITHIN A TOLERANCE OF −/+1½" AT UV BANK FRAME AND −/+¼" FOR REST OF CHANNEL.
: ALL CHANNEL ELEVATIONS MUST BE KEPT WITHIN A TOLERANCE OF −/+¼" AGAINST A COMMON DATUM ELEVATION.
: ANCHOR BOLTS ARE NOT SUPPLIED BY TROJAN TECHNOLOGIES,
: SYSTEM CONDUIT, WIRING, DISTRIBUTION PANELS & INTERCONNECTIONS BY OTHERS.
: ELECTRICAL REQUIREMENTS SHOWN ARE TO SUPPLY TROJAN UV EQUIPMENT ONLY.
: REMOVABLE GRATING SECTIONS SHALL BE EASILY REMOVED BY ONE PERSON. MAXIMUM WEIGHT OF THE SECTIONS SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF THE APPLICABLE JURISDICTION.
: CONTRACTOR TO REVIEW ALL TROJAN TECHNOLOGIES INSTALLATION INSTRUCTIONS PRIOR TO EQUIPMENT INSTALLATION.
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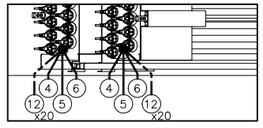
: HYDRAULIC HOSE ELEVATIONS NOT TO EXCEED 12" ABOVE HSC MOUNTING ELEVATION.
: INCLUDED CABLE LENGTH ALLOWS FOR 26' ROUTING (RISE + RUN) BETWEEN CABLE/HOSE MANAGEMENT BRACKET AND UNDERSIDE OF PDC. (10' ROUTING ASSUMED BASED ON THIS LAYOUT.)
: INCLUDED HOSE LENGTH ALLOWS FOR 14' ROUTING (RISE + RUN) BETWEEN CABLE/HOSE MANAGEMENT BRACKET AND HOSE CONNECTION ON THE HSC. (5' ROUTING ASSUMED BASED ON THIS LAYOUT.)
: SITE TO PROVIDE APPROVED (ENGINEERED) ANCHOR POINTS FOR PERSONNEL TO USE AS PART OF THEIR FALL RESTRAINT SYSTEM AROUND OPEN CHANNELS. THE ANCHOR POINTS MUST BE POSITIONED SO THAT THE PREFERRED RETRACTABLE LIFELINE OF 8 FEET IS OF SUFFICIENT LENGTH TO ACCESS THE WORK AT THE CHANNEL.
** SOLID GRATING REQUIRED TO BLOCK ULTRAVIOLET (UV) LIGHT.**
*** MOTORIZED WEIR GATE REQUIRES 1 MINUTE TO TRAVEL 1'-0"**

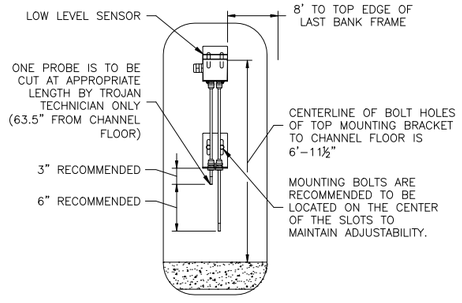
TROJAN UVSIGNA™
EQUIPMENT INTERCONNECTIONS

No.	DESCRIPTION	FROM	TO
1	POWER DISTRIBUTION CENTER (PDC)* POWER SUPPLY 480Y/277V, 3 PHASE, 4 WIRE + GROUND 57.0 AMPS MAXIMUM CURRENT/PHASE 44.7 kVA/PDC POWER DRAW	DISTRIBUTION PANEL (DP) (BY OTHERS) (NOT SHOWN)	PDC(s) (TOP OF PANEL)
2	SYSTEM CONTROL CENTER (SCC)* POWER SUPPLY 120V, 1 PHASE, 2 WIRE + GROUND, 1.8 kVA	DP (BY OTHERS) (NOT SHOWN)	SCC
3	HYDRAULIC SYSTEM CENTER (HSC)* POWER SUPPLY 480V, 3 PHASE, 3 WIRE + GROUND, 2.5 kVA	DP (BY OTHERS) (NOT SHOWN)	HSC
4	BONDING CONDUCTOR 8 AWG TYPE TWH STRANDED	PDC(s) (UNDERSIDE OF PANEL)	UV BANK(s)
5	UV INTENSITY 4-20MA ANALOG INPUT (SUPPLIED)	UV BANK(s)	PDC(s) (UNDERSIDE OF PANEL)
6	BANK IN PLACE PROXIMITY SENSOR 3 CONDUCTOR CABLES (SUPPLIED)	PROXIMITY SENSOR(s)	PDC(s) (UNDERSIDE OF PANEL)
7	MODBUS BELDEN 3106A OR EQUIVALENT (ONE LINE PER CHANNEL)	SCC	HSC(s) & PDC(s) (UNDERSIDE OF PANEL) (DAISY CHAINED)
8	DISCRETE LOW LEVEL SIGNAL 12 VDC – 2 CONDUCTORS	LOW LEVEL SENSOR	LEVEL SENSOR CONTROL BOX (LCP)
9	DISCRETE WATER LEVEL SIGNAL 2 CONDUCTORS	LEVEL SENSOR CONTROL BOX (LCP)	PDC(s) (UNDERSIDE OF PANEL)
10	LEVEL SENSOR CONTROL BOX (LCP)* POWER SUPPLY 120V, 1 PHASE, 2 WIRE + GROUND, 0.12 kVA	DP (BY OTHERS) (NOT SHOWN)	LEVEL SENSOR CONTROL BOX (LCP)
11	FLOW METER 4-20 mA, DC ANALOG INPUT (BY OTHERS)	FLOW METER PANEL (NOT SHOWN) (BY OTHERS)	SCC
12	LAMP CABLES (SUPPLIED BY TROJAN) (ROUTED BY OTHERS)	UV BANK	PDC (UNDERSIDE OF PANEL)
13	ETHERNET/IP COMMUNICATION	SCC	PLANT SCADA (BY OTHERS) (NOT SHOWN)
14	COMMUNICATION LINK (30' CABLE SUPPLIED)	LEVEL SENSING TRANSDUCER	LEVEL SENSOR MONITOR
15	LEVEL SENSOR POWER SUPPLY* 120V, 1 PHASE, 2 WIRE+ GROUND, 36 VA	DP (BY OTHERS) (NOT SHOWN)	LEVEL SENSOR MONITOR
16	WATER LEVEL SENSING 4-20 mA ANALOG SIGNAL	LEVEL SENSOR MONITOR	SCC
17	OPEN COMMAND DISCRETE OUTPUT (MIN 20 AWG) – 2 CONDUCTORS CLOSE COMMAND DISCRETE OUTPUT (MIN 20 AWG) – 2 CONDUCTORS GATE IN REMOTE MODE DISCRETE INPUT (MIN 20 AWG) – 2 CONDUCTORS GATE FAULT DISCRETE INPUT (MIN 20 AWG) – 2 CONDUCTORS GATE POSITION ANALOG INPUT 4-20mA 1 TWISTED SHIELED PAIR (24 AWG)	SCC SCC WEIR GATE WEIR GATE WEIR GATE	WEIR GATE WEIR GATE SCC SCC SCC
18	WEIR GATE POWER SUPPLY* 480V, 3 PHASE, 3 WIRE + GROUND	(DP) (BY OTHERS) (NOT SHOWN)	WEIR GATE
19	DISCRETE GATE OPEN CONTROL INPUT 2 CONDUCTORS DISCRETE GATE CLOSED CONTROL INPUT 2 CONDUCTORS DISCRETE OPEN COMMAND OUTPUT 2 CONDUCTORS DISCRETE CLOSE COMMAND OUTPUT 2 CONDUCTORS DISCRETE GATE IN REMOTE MODE INPUT 2 CONDUCTORS	SLIDE GATE (BY OTHERS) SLIDE GATE (BY OTHERS) SCC SCC SLIDE GATE (BY OTHERS)	SCC SCC SLIDE GATE (BY OTHERS) SLIDE GATE (BY OTHERS) SCC

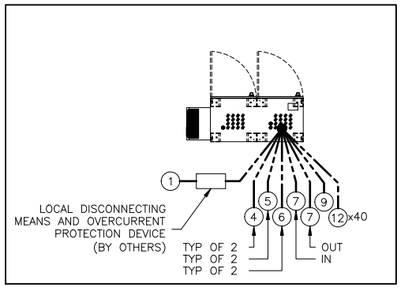
*** GROUND CONNECTION REQUIRED TO PLANT GRID (BY OTHERS).**



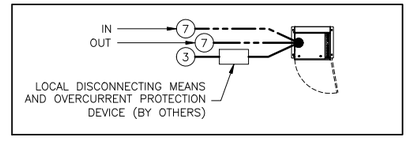
UV BANK INTERCONNECT DETAIL
SCALE: NOT TO SCALE
NOTE: TYPICAL FOR ALL UV BANKS. TROUGH NOT SHOWN FOR CLARITY.



DETAIL A
SCALE: NOT TO SCALE



PDC INTERCONNECT DETAIL
SCALE: NOT TO SCALE



HSC INTERCONNECT DETAIL
SCALE: NOT TO SCALE

PRELIMINARY, NOT FOR CONSTRUCTION
VERIFY DIMENSIONS BEFORE COMMENCING CIVIL OR DESIGN WORK

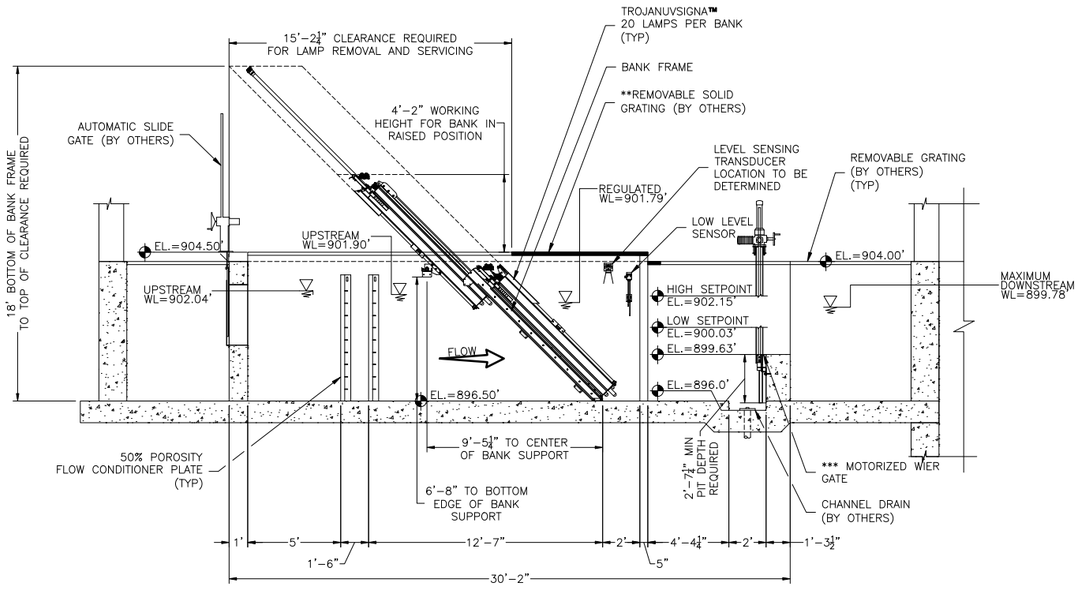
DESIGN CRITERIA		
	PEAK FLOW	30 **MGD**
	U.V TRANSMITTANCE AT 253.7 nm	65%
	SUSPENDED SOLIDS	20 mg / L (30 DAY AVG)
	DISINFECTION STANDARD	126 E.COLI / 100ml (30 DAY GEO MEAN)

TROJAN UV
A TROJAN TECHNOLOGIES BUSINESS

DESCRIPTION: LAYOUT, TROJANUVSIGNA
DELAWARE COUNTY – ALUM CREEK, OH

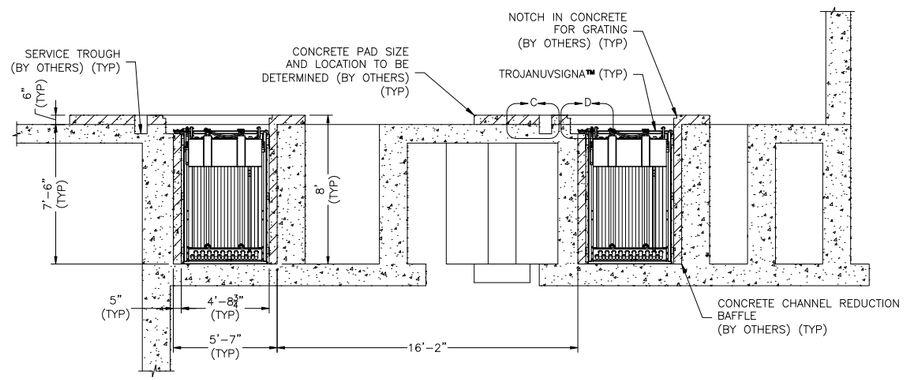
DRAWN BY : AB/CM	DATE : 21SE24
CHECKED BY : MU	DATE : 21SE29
APPROVED BY : SO	DATE : 21OC05
SCALE (11x17) : 1/8" = 1'-0"	LOG NUMBER : N/A

QUOTE NO. 230465
PROJECT NO. N/A
DWG NO. S01 REV. B



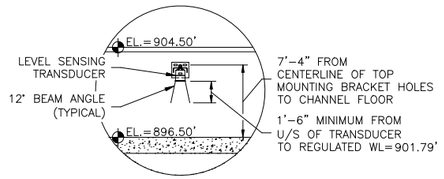
A SECTION

S01 S02 SCALE: AS SHOWN
NOTE: LEVEL SENSOR CONTROL BOX NOT SHOWN FOR CLARITY.



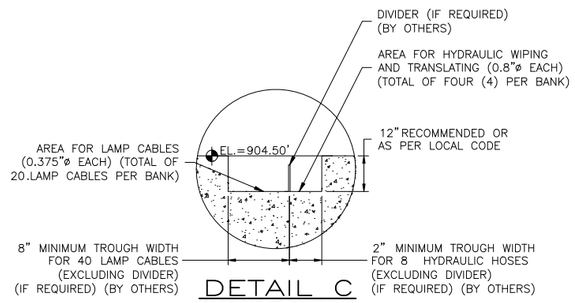
B SECTION

S01 S02 SCALE: AS SHOWN
NOTE: PDC, HSC, AND REMOVABLE GRATING (BY OTHERS)
NOT SHOWN FOR CLARITY.



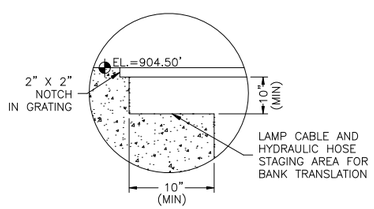
DETAIL B

SCALE:NOT TO SCALE



DETAIL C

SCALE:NOT TO SCALE
NOTE: REFER TO TROJAN TROUGH
CABLE INSTALLATION GUIDELINE
DC000601-017 OR LOCAL CODE IF
MORE RESTRICTIVE. TROUGH WIDTHS
BASED ON SOLID STYLE GRATING.



DETAIL D

SCALE:NOT TO SCALE

NOTES:

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*** MOTORIZED WEIR GATE REQUIRES 1 MINUTE TO TRAVEL 1'-0"**

PRELIMINARY, NOT FOR CONSTRUCTION

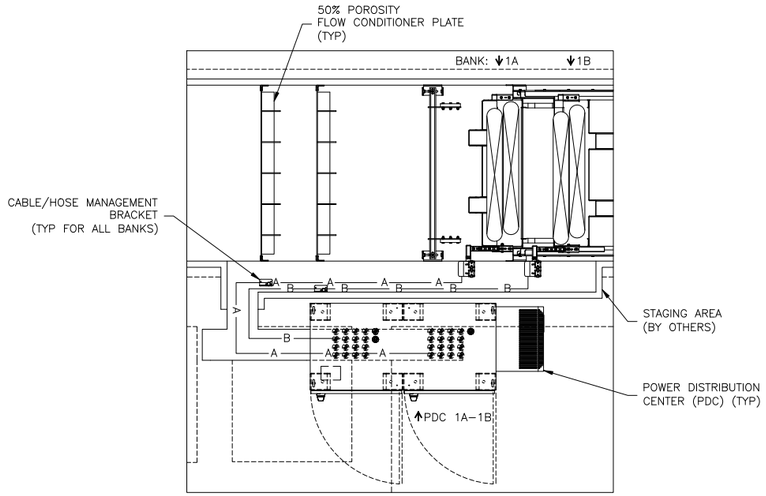
VERIFY DIMENSIONS BEFORE COMMENCING CIVIL OR DESIGN WORK

TROJANUV™
A TROJAN TECHNOLOGIES BUSINESS

DESCRIPTION:
LAYOUT, TROJANUVSIGNA
DELAWARE COUNTY – ALUM CREEK, OH

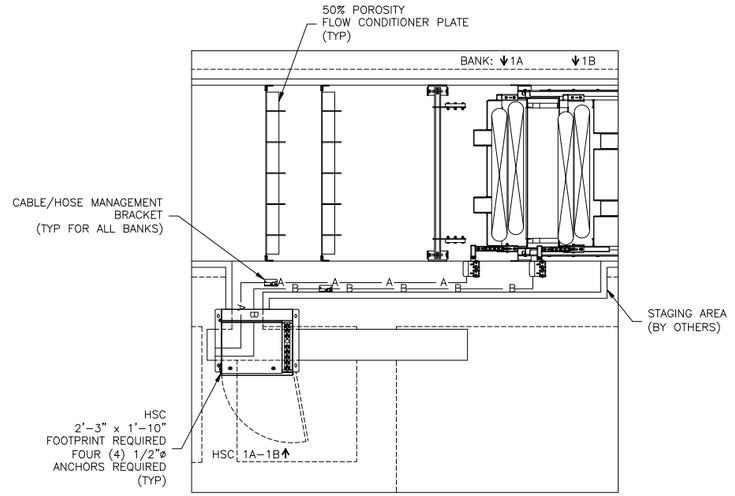
DRAWN BY : AB/CM	DATE : 21SE24
CHECKED BY : MU	DATE : 21SE29
APPROVED BY : SO	DATE : 21OC05
SCALE (11x17) : 1/8" = 1'-0"	LOG NUMBER : N/A

QUOTE NO.	230465
PROJECT NO.	N/A
DWG NO.	S02
REV.	B



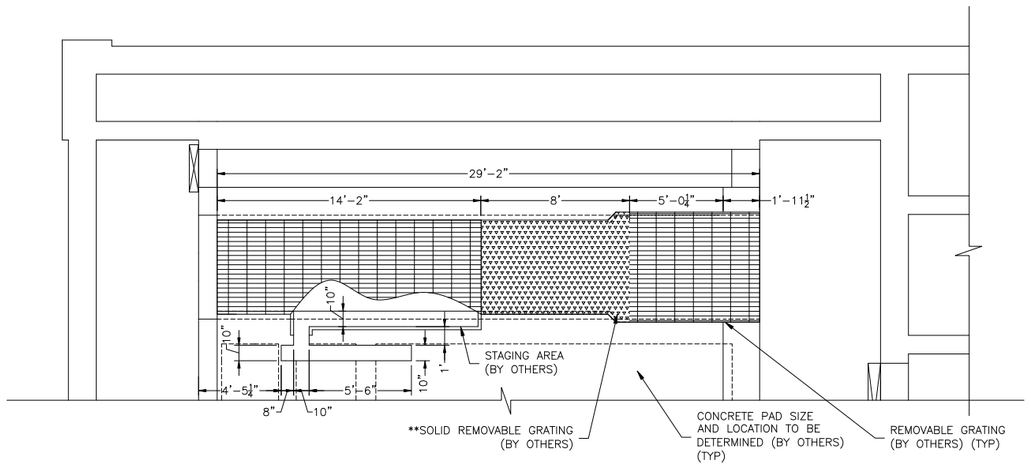
LAMP CABLE ROUTING PLAN

SCALE: NOT TO SCALE
NOTE: HSC NOT SHOWN FOR CLARITY.



HYDRAULIC HOSE ROUTING PLAN

SCALE: NOT TO SCALE
NOTE: PDC NOT SHOWN FOR CLARITY.



GRATING AND TROUGH PLAN VIEW

SCALE: AS SHOWN
NOTE: DESIGN OF GRATING SECTIONS SHOULD BE SIZED TO ALLOW FOR EASY REMOVAL BY SERVICE TECHNICIANS. SOLID GRATING MUST BE PROVIDED IN AREA INDICATED TO BLOCK UV LIGHT. TYPICAL FOR ALL UV CHANNELS.

NOTES:

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DESCRIPTION:
LAYOUT, TROJANUVSIGNA
DELAWARE COUNTY – ALUM CREEK, OH

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SCALE (11x17) : 1/8" = 1'–0"	LOG NUMBER : N/A

QUOTE NO. 230465
PROJECT NO. N/A
DWG NO. S03
REV. B

Budget Proposal

Alum Creek WRF

Prepared for:

Delaware County, OH

June 30, 2021

Xylem Water Solutions USA, Inc.
4828 Parkway Plaza Blvd Suite 200
Charlotte, NC 28217

June 30, 2021

Delaware County, OH

Project Name: Alum Creek WRF
Project Number: J21060937460
Revision Number: 0

Sir or Madam:

We are pleased to submit the following proposal for the Alum Creek WRF UV opportunity based on the information provided within your inquiry.

The Duron system is a modular open channel UV system that offers owners best in class operational efficiency and an entirely operator-oriented design. We would like to highlight a few key items with our proposal provided:

- **45° Vertical Incline Design -** WEDECO has used our 30+ years of experience in the UV industry to develop this staggered lamp array design, combining the advantages of vertical and horizontal designs. This design results in better hydraulics and performance.
- **All electrical components are out of the effluent** - This eliminates underwater electrical seals and simplifies the overall system.
- **Integrated Electric Lifting System** - This integrated device raises each module out of the channel individually, providing easy access to the entire UV module for inspection and routine maintenance. It also means that no crane or separate maintenance area is needed for Duron equipment.
- **Simple maintenance** - With the Duron system, lamps and sleeves can be replaced right in the channel. The lifting system can bring the equipment to the operator, increasing safety. Additionally, no tools are needed for any maintenance procedure such as lamp changes, quartz removal, sensor replacement, or wiper ring replacement.
- **Latest lamp technology** - Our system includes our latest low-pressure, high-intensity Ecoray lamps which have a guaranteed life of 14,000 hours. At 600 watts per lamp, the Duron system also requires fewer lamps and associated replacement components.
- **True "intensity based" dose pacing control** - WEDECO is unique in the marketplace by taking into account real-time sensor readings of UV intensity, as a function of lamp output, aging and sleeve fouling. This is combined with real-time UV transmittance data to offer true dose pacing for all effluent conditions. Knowing that flows and water quality constantly vary, this system provides the end user with power savings and prevents over-dosing, allowing us to ensure that the UV system will meet permit at a wide variety of water qualities.
- **Electric motor driven automatic wiping system** – This prevents quartz sleeve fouling with very easy replacement of wipers. It also eliminates the need for a compressor or a hydraulics system.

- **Remote enclosures** - WEDECO's ballasts are located away from the channel which allows for easy accessibility for maintenance.
- **TotalCare** - WEDECO's established and proven TotalCare Program provides our customers with proactive services all designed to minimize the cost of ownership to operate and maintain a UV system. TotalCare services can provide our customers with system health checks, efficiency audits, training and preventative maintenance contracts.

Please refer to our local representative Kelli Jamison of B.L. Anderson, (614) 601-0051 or us if you have any questions. We look forward to working with you on this exciting project.

Sincerely,

Victoria Bates
Territory Manager
(980) 275-9061

Bill Mattfeld
Senior Applications Engineer

Table of Content

1 Xylem Overview

Xylem is a leading global water technology provider, enabling customers to transport, treat, test and efficiently use water in public utility, residential and commercial building services, industrial and agricultural settings. The company does business in more than 150 countries through a number of market-leading product brands, and its people bring broad applications expertise with a strong focus on finding local solutions to the world's most challenging water and wastewater problems.

Xylem's treatment business offers a portfolio of products and systems designed to effectively meet the demands and challenges of treating water and wastewater. From smarter aeration to advanced filtration to chemical-free disinfection, Xylem leverages its well-known Treatment brands, Flygt, Leopold, Sanitaire, and Wedeco, to offer hundreds of solutions backed by a comprehensive, integrated portfolio of services designed to ensure we can meet our customers' needs in a number of different industries including municipal water and wastewater, aquaculture, biogas and agriculture, food and beverages, pharmaceuticals, and mining.

Our scientists and engineers utilize their deep applications expertise and continually listen and learn from our customers' situations to create solutions that not only use less energy and reduce life-cycle costs, but also promote the smarter use of water.

WEDECO
a xylem brand

Wedeco has accepted the challenge of the 21st century. With the Wedeco brand for UV Disinfection, ozone oxidation & AOP solutions, we own the advanced technologies for chemical-free and environmentally friendly treatment of drinking water, wastewater and process water as well as further industrial treatment processes. We constantly invest a large portion of our energy in the development of high-tech components, systems and equipment, as well as in the study of new areas of application for UV, ozone & AOP. In doing so, we have always given special attention to the increase in energy efficiency of our Products equipped with our unique UV lamps and ozone electrodes.

The special characteristics of the Wedeco Ecoray UV lamp are its special doping and the unique long-life coating. Because of these features, a constantly high UV light yield is achieved with a substantially extended lamp service life at the same time. In addition, by using this technology it is not necessary to apply liquid mercury inside the lamp. Wedeco UV lamps cannot be surpassed in economic efficiency.

In relation to expenditure of energy, the High-Intensity/Low-Pressure Technology provides a light yield three times higher than comparable UV lamps of widely used Medium Pressure Technology. A higher light yield also means a lower heat generation at the same time.

Thanks to this, Wedeco UV lamps become less susceptible to varying water temperatures. Even the formation of deposits on the quartz sleeves as well as lamp aging is considerably lower than with alternative UV lamp technologies in Herford and Essen.

WEDECO Ecoray UV lamp

Xylem's Wedeco ozone systems combine maximum flexibility and reliable operating characteristics for small to large ozone capacities. The ozone generator system and control unit can be combined and supplemented with option sets that allow for various application requirements.

Effizon evo 2G ozone electrodes are the core of our technology and achieve an unmatched level of reliability and energy efficiency. The electrodes are manufactured completely from inert materials, without the need for fuses or coatings, making them highly resistant to corrosion. This means that the Wedeco ozone generators are practically maintenance free with no need for regular cleaning or replacement of the electrodes.

We rely on consistently high-quality standards in all divisions of the company. Moreover, product quality and manufacturing operations are constantly monitored and optimized in continuous improvement processes. Established quality controls give Xylem and you the security of knowing that Wedeco UV, Ozone & AOP systems will always operate reliably.

For more information please visit us at
http://www.xylem.com/treatment/

WEDECO Effizon® evo 2G Ozone electrode

2 General Process Description

2.1 DESIGN

- Design Flow Rates
  - Peak Design Flow — 30 MGD
  - Average Design Flow — 5.17 MGD
- Total Suspended Solids (Maximum) — 30 mg/L
- Iron Content (Maximum) — 0.3 mg/L
- Manganese Content (Maximum) — 0.05 mg/L
- Hardness (Maximum) — 400 mg/L as $CaCO_3$
- Particle Size (Maximum) — 30 µm
- Allowable Effluent Temperature Range — 41-86°F
- UV Transmittance at 253.7 nm — 65%, minimum
- Effluent Disinfection Standard
  - E. Coli (30 day geometric mean) — 126 E. Coli/100 mL
- UV Dose
  - Minimum Design UV Dose (based on IUVA/UVDGM (T1) bioassay) — 15 mJ/cm²
  - Equivalent Design UV Dose (based on calculated PSS dose) — >40 mJ/cm²

2.2 PROCESS DESCRIPTION

The proposed UV disinfection system is based upon a properly functioning activated sludge process producing a secondary effluent meeting the above criteria.

3 Technical Description

CONFIGURATION:	Duron 16 i 1 - 3 x 2 eW eL	
DESCRIPTION	**UNITS**	**VALUE**
Total Number of lamps		96
Number of lamps per channel		48
Number of channels		2 duty
Number of banks per channel		3 duty
Number of modules per bank		1
Number of lamps per module		16
CHANNEL DIMENSIONS:	Inches	
Width along UV banks		3'-3"
Width along weir		3'-3"
Design water depth @ influent		42 ⅛"
Overall channel height		6'-2 ¾"
Approx. length		27'-8"
HEADLOSS (at peak flow):	Inches	
Across UV system		3.6
Across level control		19.7
Allowable freefall		4.0
Total Headloss		27.3
POWER CONSUMPTION:	kW	
Peak Flow		56.1
Average Flow		15.1
Total Connected System Power		68.4

4 Price & Scope of Supply

4.1 WEDECO SCOPE OF SUPPLY

- All required UV modules incl. lamps and support framework for installation of the UV modules
- 82 ft (25 m) power cabling from lamps to Ballast Enclosures
- Type 12, Fan-cooled, Painted Steel Ballast Enclosures
- Allen Bradley PLC with PanelView Plus HMI and SCADA communication
- Power supply requirements: 480 V, 3 phase, 4 wire + ground (WYE)
- Electric motor driven automatic wiping system
- Integrated electric module lifting system
- UV-intensity sensors [one per bank]
- Low level probe [one per channel]
- YSI UV transmittance monitor
- OptiDose Dose-Pacing and lamp dimming control system
- Downward opening gate [one per channel]
- Remote Service Support
- Three (3) operating and maintenance manuals in English language
- Factory testing of all parts and equipment prior to shipment
- Packaging of UV equipment
- Manufacturer's field services on site (3 trip(s) / 9 days)

4.2 BUDGET PRICE

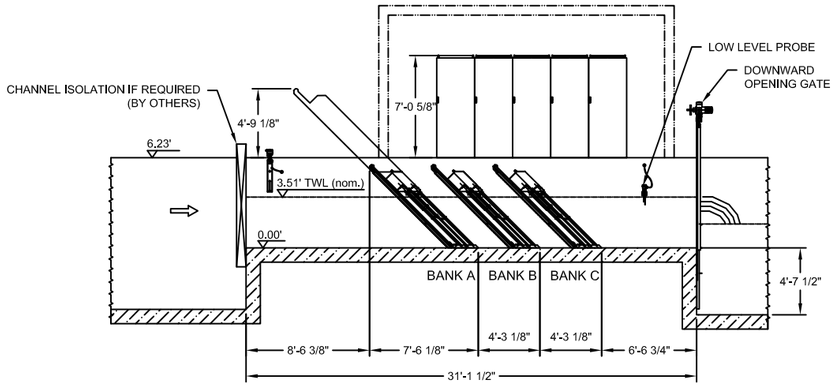
Duron Standard Equipment	
Total	***$473,000***

5 Commercial Terms & Conditions

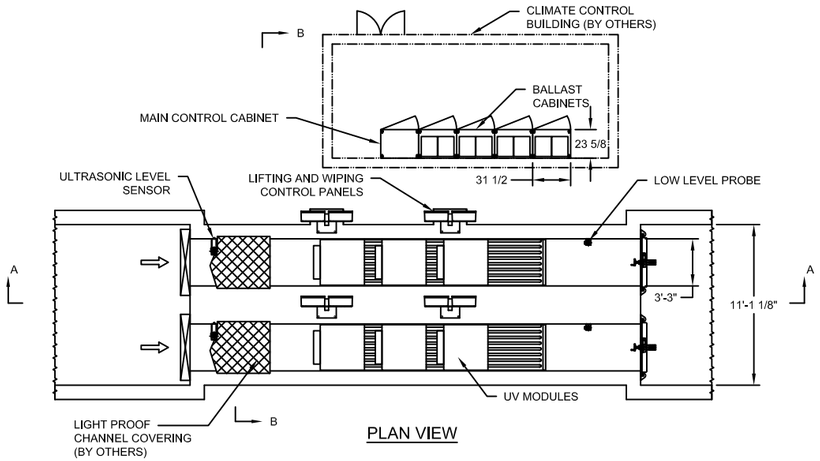
Commercial Details	
Submittal time:	8 weeks after approved purchase order
Delivery time:	18 weeks after approved submittals
Terms of Delivery:	Incoterms 2020 DAP destination. Title and risk of loss will transfer to buyer upon delivery. Offloading and arrangement of the equipment is not included.
Terms of Payment:	This proposal is based upon WEDECO's General Terms of Business. Price is based upon the following payment terms (net 30 days): • 10% net 30 days upon initial submittal of mechanical/electrical drawings for approval • 80% net 30 days from the date of the respective shipments of the product • 5% installation of the Xylem equipment, NTE 150 days after shipment (whichever comes first) • 5% start-up / training on the Xylem equipment, NTE 180 days after shipment (whichever comes first)
Warranties:	Lamp Warranty: Guaranteed 14,000 hours of operation, prorated after 9,000 hours. System Warranty: 18 months from date of delivery or 12 months from date of substantial completion of UV equipment whichever comes first.

6 Attachments

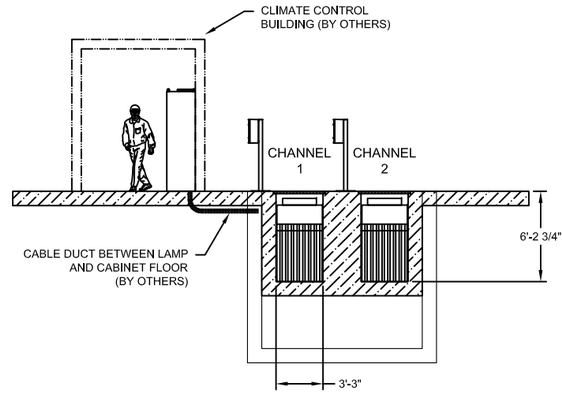
6.1 BROCHURES / DRAWINGS / OTHERS



SECTION A-A



PLAN VIEW



SECTION B-B

NOTES:

1. TOTAL CONDUIT LENGTH SHALL NOT EXCEED 50 FEET.
   LAMP CABLES FROM LAMP TERMINATION AT THE MODULE TO CONTROL ENCLOSURE TERMINATION NOT TO EXCEED 82 FT. ALL CONDUITS AND CABLING SHALL BE IN ACCORDANCE WITH LOCAL AND NATIONAL ELECTRICAL CODES. REFER TO WEDECO STDS-360 FOR LAMP CABLE TERMINATION PROCEDURE
   MINIMUM LAMP CABLE LENGTH IS 12m OR 39'
   MAXIMUM NUMBER OF LAMP CABLES PER CONDUIT SHALL NOT EXCEED 24 CABLES.
2. ALL WIREWAY/CONDUIT TO HAVE LONG RADIUS BENDS. (CONTRACTOR TO SIZE AND SUPPLY).
3. SYSTEM CONTROL ENCLOSURES TO BE CLIMATE CONTROLLED BUILDING (BY OTHERS)
4. ALL CIVIL DIMENSION TOLERANCES TO BE $\pm\frac{1}{4}$ UNLESS OTHERWISE STATED.
5. COVERING OF CHANNEL BY OTHERS.
6. ISOLATION GATE e.g. INLET GATE VALVE (SUPPLIED BY OTHERS) IF REQUIRED.
7. DISINFECTION CANNOT BE GUARANTEED IF MAXIMUM WATER LEVELS ARE EXCEEDED.
8. ANCHOR BOLTS FOR WEDECO SUPPLIED EQUIPMENT TO BE PROVIDED WITH EQUIPMENT.
10. ELECTRICAL EQUIPMENT TO BE LOCATED IN ACCORDANCE WITH LOCAL/NATIONAL ELECTRICAL CODES.
11. BOTTOM OF UV CHANNEL MUST BE FLAT WITHIN $\pm\frac{1}{8}$". CHANNEL WALLS TO BE PERPENDICULAR TO BOTTOM OF CHANNEL WITHIN $\pm\frac{1}{8}$".
12. GIVEN DIMENSIONS RELATE TO THE CORRECT INSTALLATION AND OPERATION OF WEDECO EQUIPMENT AND SHOULD BE ADHERED TO.
13. CONTROL ENCLOSURES PROVIDED BY WEDECO. TYPE 12

REV	REV # ECN #	SHEET (ZONE)	DESCRIPTION	DATE	APPROVAL

REVISIONS

FOR INFORMATION ONLY

PROJECT

LOCATION

CUSTOMER

CONSULTING ENGINEER

NAVISION NUMBER | JOB NUMBER

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE
X/X = $\pm\frac{1}{16}$ .X = ±.05 .XX = ± .02 .XXX = ± .005 ANG = ± 1°

THIRD ANGLE PROJECTION

DESIGNER | DATE

APPROVED BY | DATE

WEDECO
a xylem brand
www.xyleminc.com

TITLE
UV DISINFECTION SYSTEM GENERAL ARRANGEMENT

MODEL NO.
DURON 16i1-3x2

SIZE	DRAWING NO.	REV
B		

SCALE	WEIGHT	MATERIAL	FINISH	SHEET
				OF 1

WEDECO
a xylem brand

Rev J.9.7 HF

Hydraulic Profile for project Delaware Co, OH - Alum Creek WW

prepared by Mattfeld

approved by xxx

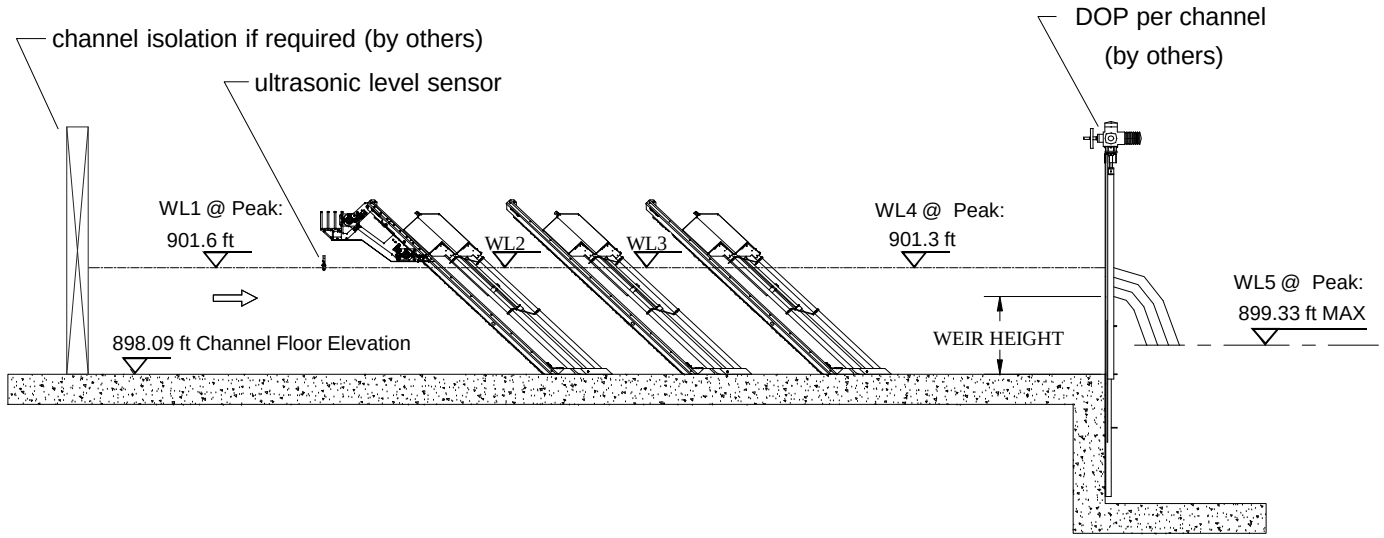
Configuration: Duron 16 i 1 - 3 x 2

Number of hydraulic banks = 3	Flow per channel MGD	Flow over weir MGD	Weir overfall length inches	WL upstream of 1st bank inches	HL across each bank inches	HL across all banks inches	Crest above top of weir inches	HL across banks + weir inches	Free-fall after weir inches	Total HL banks+crest+ freefall inches
Peak	15.0	15.0	39.0	42.1	1.2	3.6	19.7	23.3	3.9	27.2
Average	5.2	5.2	39.0	42.1	0.2	0.7	9.7	10.4	3.9	14.3

Notes: _____

_____

	WL 1 inches		WL 2 inches	WL 3 inches		WL 4 inches		Weir Height inches	WL 5 inches
Peak	42.1		40.9	39.7		38.5		18.8	14.9
Average	42.1		41.9	41.6		41.4		31.7	27.8



ENAQUA™
A GRUNDFOS COMPANY

NON-CONTACT UV DISINFECTION SYSTEM CONCEPT LEVEL PROPOSAL

Alum Creek WRF – Delaware County, OH

Prepared For:

Joe Dameron
MS Consultants
2221 Schrock Rd
Columbus, Ohio 43229

DOCUMENT REVISION HISTORY

Name	Ref #	Date	Reason For Change	Revision #
Concept Level Proposal	ASR_B21USOH03	7/15/2021	N/A	0

Addressed to:

Joe Dameron
MS Consultants
2221 Schrock Rd
Columbus, Ohio 43229

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1350 Specialty Drive, Suite F
Vista, CA 92081
Phone: (+1)760 599 2644
Fax: (+1)760 599 2642
www.enaqua.com

Name: Arijit Sarkar
Direct: 760 477 0852
Email: asarkar@grundfos.com
Date: July 15, 2021

REF: Alum Creek WRF – Delaware County, OH
SUB: Concept Level Proposal for UV Disinfection System **Enaqua Ref No: ASR_B21USOH03**

Dear Joe,

Enaqua is pleased to provide the following concept level proposal for Non-Contact UV Disinfection Systems for the above referenced project. The proposal includes the following options for your consideration:

Option 1: 3 UV Channels in Parallel.
Option 2: 2 UV Channels in Parallel.

The budgetary pricing for each proposed UV scope of supply is provided at the end of each respective section.

Enaqua Non-Contact UV Disinfection Systems have been proven to provide superior performance, resistance to fouling and scaling, combined with electrical efficiency and minimum maintenance. The lack of quartz sleeves and seals completely eliminate the need for automated cleaning systems, acid baths, hoists, and the replacement cost of the quartz sleeves housing the lamps.

Please do not hesitate to contact us with any questions you may have regarding this proposal, or the Enaqua Non-Contact UV Disinfection system operation. Thank you for your interest in in Enaqua and the opportunity to provide you with this proposal.

Regards,

Arijit Sarkar
Applications Manager

Your Local Sales Representative:

Douglas D. Borkosky, P.E.
Baker & Associates
1284 SOM Center Rd. #215
Cleveland, Ohio 44124
Phone: (614) 361-3673
doug@hlbaker.com

Your Enaqua Sales Contact:

Rick McIntyre (Director of Sales)
Office: 203-269-9890
Cell: 760-936-1979
Email: rmcintyre@grundfos.com

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OPTION 1: 3 UV Channels in Parallel

SUMMARY:

For Option 1, three UV Channels are proposed to be installed in parallel.

The details of the UV design criteria, process configuration, UV reactor(s), scope of supply, reactor drawings, summarized O & M information, and other pertinent information are provided in the following sections.

1. UV DESIGN CRITERIA – Option 1:

The flow rates and water quality parameters used for reactor sizing are listed in the Table 1 below:

Table 1: UV Design Criteria – Option 1

Average Flow Rate	10.0/6,944	MGD/GPM
Peak Design Flow Rate (Peak Disinfection Flow Rate)	30.0/20,833	MGD/GPM
UV Transmittance	65.0	% UVT (Minimum)
Total Suspended Solids	< 10.0	mg/l (30 day average)
BOD	< 12.0	mg/l (30 day average)
Target Indicator Organism	E. Coli	
Disinfection Permit Criteria	126.0	CFU/100 ml monthly geomean
UV Dose (manufacturer calculated)	30.0	Minimum UV dose of 30.0 mJ/cm^2. After applying certified Lamp End of Lamp Life (EOLL) of .87, Fouling Factor of .89.
Plant Process	Conventional Activated Sludge, clarified secondary effluent.	
Mean Particle Size*	30.0	Microns
Total Iron*	0.3	mg/l
Turbidity*	5	NTU
Equipment Redundancy	50% redundancy of UV Channels at peak flow. Three UV channels in parallel, each with a two-bank reactor. Two channels duty and one on stand-by at peak flow.	

*Note: Industry standard parameters used for this proposal.

2. SCOPE OF SUPPLY – Option 1:

Summary details of the proposed reactor selected to meet the effluent permit criteria (based on the water quality parameters listed in Table 1) are provided in the tables below:

Table 2: Scope of Supply – UV Reactor(s) – Option 1

Reactor model number	D9i.10102
Reactor type	In-Channel
Installation notes	Indoor/ Outdoor – Covered Installation
Process connection	Channel Flange Adapter
Reactor configuration	Standard
UV Lamps - Enaqua part #: 001.0617045 XUV60L	145-Watt LPHO Non-Amalgam Smart Lamps
UV Lamp output at 253.7 nm (Nominal Watts)	55.00 Watts
Ballasts - Enaqua part #: 502.5V2427M	145-Watt Enlight High Efficiency Ballast
Non-Contact Reactor Material	D-Series AFP840 Tube
Material of Construction	304 SS
UV REACTOR(S)	
# of proposed UV reactors	3
# of banks per reactor	2
# of AFP tubes per reactor	100
# of lamp racks per bank	11
# of lamps per lamp rack	12
Total # of lamps per bank	132
Total # of ballasts per bank	132
Total #of lamps per reactor	264
Total # of lamps in system	792
REACTOR THERMAL CONTROL MECHANISM	
Air to water heat exchangers	24 (Four per bank)
Cooling Pumps	6 (Two per reactor)

Table 3: Scope of Supply – Controls – Option 1

CONTROLS & ELECTRICAL	
ADR GEN 2. Enaqua part number: 062.01003500	12 (Two per bank)
EDC GEN 2 (Ensure Dosing Controller) and SCADA integration using MODBUS TCP	3 (One per uv reactor)
Power Disconnect Panel in NEMA 4X SS Enclosure	9 (One per bank + One per cooling system)
UV System Master Control PLC. AB CompactLogix PLC. AB Part # 1769-L16ER-BB1B. OIT for UV Master PLC. Discrete I/O Modules, Analog I/O Modules, Power supply, network card. SCADA integration using ETHERNET IP	1(Common)
UV Control Panel - HMI Panel: 19.00" Touch Screen Color HMI (Panel PC)- Enaqua part Number 064.01000542 installed in NEMA 4 X SS- Model WM483612N4. 48.00" x 36.00" x 12.00" Enclosure.	
SENSORS	
Ultrasonic level sensor	3 (One per reactor)
UV intensity sensor - Enaqua part number: 560.601902	6 (One per bank)
EFFLUENT LEVEL CONTROL MECHANISM	
Effluent flat weir plate (Rectangular or V-Notch) to be installed in UV Channels. Weir plate and frame 304 SS.	3 (One per UV channel)
UV CHANNEL INFLUENT & EFFLUENT ISOLATION VALVES	
Actuated (OPEN/CLOSE-DUTY) slide gates. BY OTHERS.	6 (One influent, and one effluent gates per UV Channel)

3. PROPOSED PROCESS FLOW & DESIGN REDUNDANCY – Option 1:

The proposed UV configuration consists of three UV channels in parallel, each with a two-bank "In-Channel" UV reactor. With two channels and four banks active, the UV system is sized to disinfect 100% of the peak disinfection flow rate, given the water quality parameters listed in Table 1. With the third channel on stand-by at 30.0 MGD, this configuration offers 50% redundancy of banks at peak flow.

The proposed process flow diagram is shown in Figure 1 below, and the flow ranges of the UV reactor banks presented in Table 4 below.

Figure 1: Preliminary Process Flow Diagram – Option 1

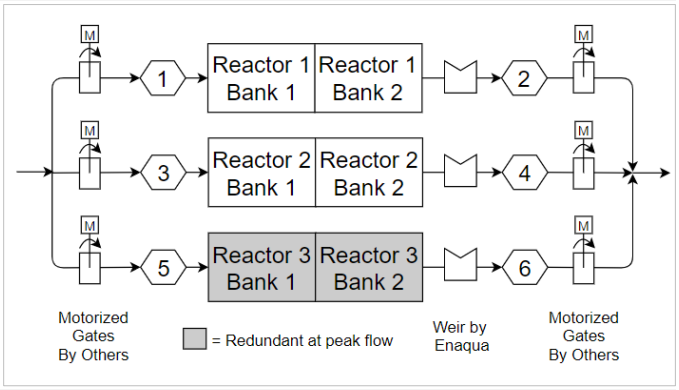


Table 4: Process Flow – Option 1

Tag	Description	Bank 1- Disinfection Peak Flow MGD	Bank 2- Disinfection Peak Flow MGD
1	Influent to UV 1	7.5	7.5
2	Effluent from UV 1	7.5	7.5
3	Influent to UV 2	7.5	7.5
4	Effluent from UV 2	7.5	7.5
5	Influent to UV 3	7.5	7.5
6	Effluent from UV 3	7.5	7.5

4. OPERATING CONDITIONS – Option 1:

The reactor head loss at peak flow rate and the total connected load of the reactors are provided in Table 5 and Table 6 below:

Table 5: Head Loss Calculations – Option 1

Calculated Head loss (inches)-Flange to Flange	
Peak flow rate (15.0 MGD per channel)	< 18.1 Inches+

A proposed preliminary hydraulic grade line through the UV system is provided in Figure 3 of this proposal. With a proposed TOS of the UV Channels at 896.91', the proposed UV configuration has a calculated upstream MWSEL of 901.6' AMSL, the same as the existing vertical UV system.

Table 6: Electrical Details – Option 1

Total Connected Load Per Reactor @ 480V 3Ø	
Total connected Load (kW)	42.22
Total connected Load (kVA) (w/ PF of .95)	44.44
Total connected Load (Amps)*	53.45

*Note: Total connected load for the entire UV reactor including cooling and control components

5. OPERATIONS & MAINTENANCE INFORMATION – Option 1:

The estimated power usage at daily average flow (kW), and the projected lamp replacement costs based on 24/7 operations at average flow are provided in Table 7 and Table 8 below:

Table 7: Power Usage at Daily Average Flow – Option 1

Power Usage (kW)	
Average flow of 10.0 MGD	40.61 kW*

*Note: Assumed one channel/ reactor operating using flow pacing. All 100 AFP tubes and associated UV lamps active to disinfect average flow rate.

Table 8: Lamp Replacement Cost Evaluation – Option 1

Lamp Replacement Costs ($)	
Number of lamps per year	193+
Price per Lamp ($)	75.0
Annual Lamp Replacement Cost ($)	14,475.0

+ Note: Based on 264 UV Lamps in 2 UV Banks at average flow, and an annual lamp replacement factor of .73 {(24 hrs. /day x 365 days a year)/ (12,000 Hr. expected lamp life)}

GENERAL MAINTENANCE:

The AFP840™ Tube reactors are the only UV transmitting reactor component that is in contact with waste water, and the AFP840™ tubes have been demonstrated to have high resistance to fouling. No cleaning chemicals are required/ necessary for cleaning of the AFP840™ tubes. The cleaning procedure is very simple and cleaning instructions are provided in the O&M manual and the brush attachment for manual cleaning is supplied with the reactors.

6. ELECTRICAL REQUIREMENTS – Option 1:

The electrical requirements for the proposed reactor(s) are provided in Table 9 below:

Table 9: Electrical Requirements – Per UV Reactor – Option 1

1. Each UV Reactor requires an electrical supply of Two (2)480V/3P 4 wire (plus ground) –40.0 A, one per UV bank
2. Each cooling pump requires an electrical supply of One (1) 480V/3P 3 wire (plus ground) – 10.0 A
3. Each reactor thermal control mechanism requires an electrical supply of one (1) 120V/ 1P/ 2 wire (plus ground) – 30.0 A
4. Each reactor cooling system & control requires an electrical supply of Two (2) 120V/ 1P/ 2 wire (plus ground) – 10.0 A, one per bank.
5. UV Control Panel requires an electrical supply of one (1) 120V/ 1P/ 2 wire – 20 A

Note: Based on 60Hz power

7. STANDARD EQUIPMENT WARRANTIES – Option 1:

The equipment furnished (excluding lamps, ballasts) shall be warranted to be free of defects in material and workmanship, including damages that may be incurred during shipping for the lessor of a period of 12 months from substantial completion of the installed UV system or 18 months from receipt of all equipment supplied by the contractor and received in good condition by owner.

UV LAMPS: UV lamps shall be warranted for a minimum of 12,000 hours operating time under the conditions specified herein prorated after 9,000 hours. In the event of premature UV lamp failure, the UV system supplier shall offer the following:

1. Lamp failure before 9,000 hours – send a replacement lamp free of charge

2. Lamp failure after 9,000 hours – issue a credit proportional to the hours not used.

BALLASTS: Electronic ballasts are fully warranted for 3 years, extended to five years with first purchase of (1:1) replacement lamps from ENAQUA lamps within three years of installation.

8. BUDGETARY PRICING – Option 1:

Budgetary pricing for the proposed UV reactor(s) is provided in Table 10 below:

Table 10: Budgetary Pricing in US $ – Option 1

DESCRIPTION	QTY
UV Reactor s– D9i.10102	3
UV Power Panels	9
UV Control Panel (UVPLC & HMI Panel)	1
Effluent Level Control Weirs	3
Spare Parts	Per Table 11
Start-up and Commissioning	Per Table 12
Shipping and handling	1
Net sales price	$994,650.00
***TOTAL**	**$994,650.00**

Note: Shipping is FOB Jobsite, Delaware County, OH.

*Note: Budgetary prices valid for 6 months from the date of this proposal.

Table 11: Spare Parts included in scope of supply – Option 1

ITEM	QTY
Spare UV Lamps	40
Spare UV Ballasts	10
Spare Cooling Pump	1
Spare UV Sensor	1
Operator's safety kit	3
Cleaning Kit	3

Table 12: Startup services included in scope of supply – Option 1

ITEM	QTY (hr.)
TRIP 1- One trip, and two eight hour work days included for installation inspection.	16
TRIP 2- One trip, two technicians, and four eight hour work days per technician included for Start-up, performance testing, commissioning, and operator training.	64

Table 13: Terms of Payment: Net 30 – Option 1:

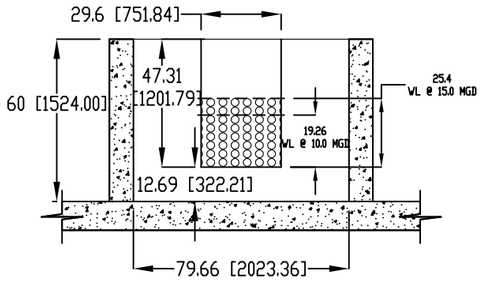
Order acceptance (prior to shipping)	30	%
Upon approval of shop drawings	30	%
Upon delivery of all goods, or six weeks after declaration of "ready to ship"	30	%
After start up and commissioning of UV system	10	%

9. MECHANICAL DRAWINGS – Option 1:

Sales Engineering drawings of the proposed UV reactor are provided in Figure 2 below; the drawings are for dimensional reference only.

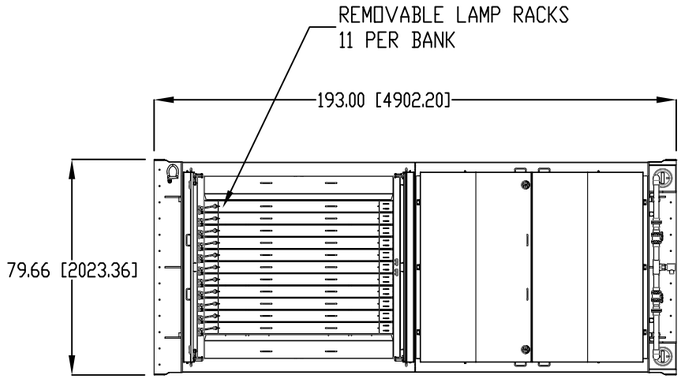
Figure 2: UV Reactor Drawings – Option 1

REVISIONS					
REV.	ZONE	ECM#	DESCRIPTION	DATE	APPROVED
A	ALL	-	INITIAL RELEASE	6/29/2021	WIM

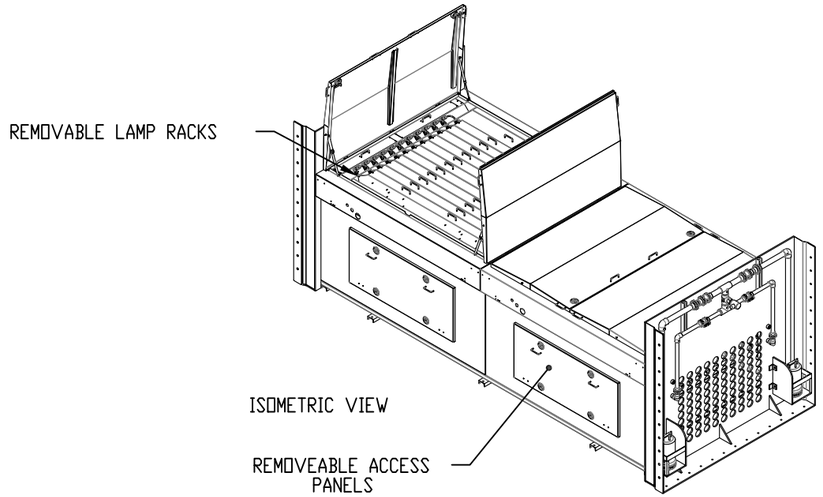


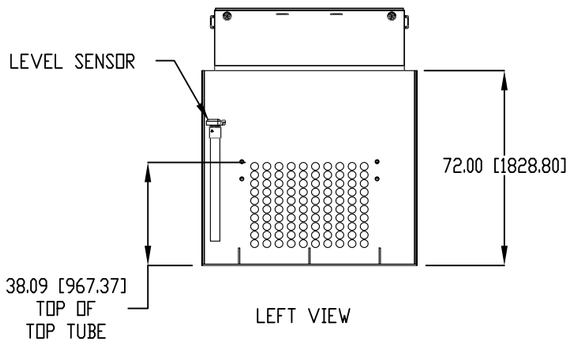
WEIR SECTION

FLOW →

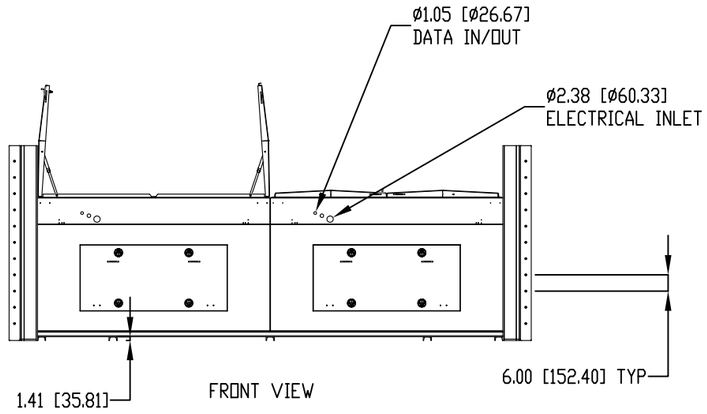


TOP VIEW

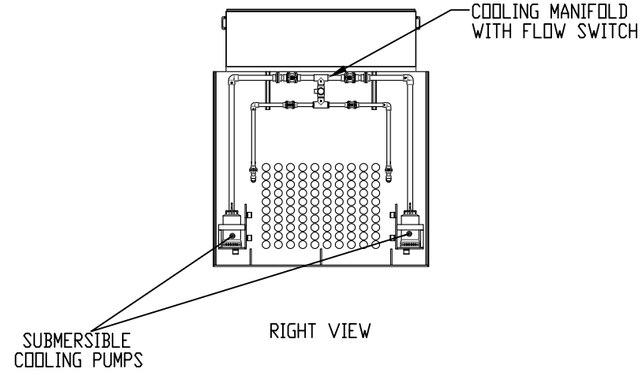




LEFT VIEW



FRONT VIEW



RIGHT VIEW

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DRAWING IS IN ACCORDANCE WITH ASME Y14.5-2009.
2. ALL DIMENSIONS ARE IN INCHES AND/OR [MILLIMETERS].

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES[mm]
TOLERANCES: ANGLES:
X.X ± .1[2.54] X ± 1°[25.4]
X.XX ± .03[.76] .X ± .5°[12.7]
X.XXX ± .010[.25] .XX ± .25°[6.4]
XX/XX ± 1/16

ERP NO.: -
SERIES: D-SERIES
MATERIAL: -
FINISH: -

DO NOT SCALE DRAWING

APPROVALS		
TITLE	NAME	DATE
DRAWN	WIM	6/29/2021
CHECKED		
ENG. APPR.		
MFG. APPR.		
Q.A.		

WEIGHT (LBS.): -

ENAQUA A GRUNDFOS COMPANY
1350 Specialty Dr
Ste F, Vista, CA 92081

TITLE:
SE DRAWING, MODEL D9i.10102

SIZE	DWG. NO.	REV
B	D9i.10102-SE	A

SCALE: 1:56 | SHEET 1 OF 1

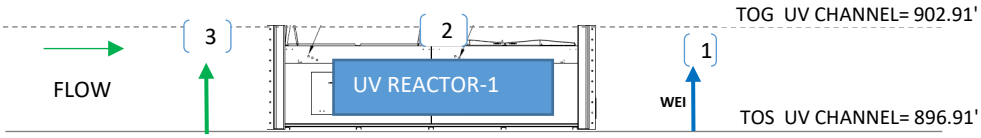
Figure 3: Preliminary Hydraulic Grade Line– Option 1

Table F 3.1 - Hydraulic Gradeline Information-Option 1

Flow to UV System (MGD)	# of UV Channels Active	Flow Rate-PER UV CHANNEL (MGD)	Water over weir Depth-Above Bottom of UV Reactor-Controlled by Rectangular Contracted weir plate downstream- Inches [1]^	Headloss through UV reactor @ Flow (Inches) [2]	Calculated Water Level in UV Channel upstream of UV Reactor (Reference TOS of UV Channel floor)-Inches [3]	Calculated Upstream Water Elevation Reference TOS of UV Channel floor)-Feet [3]
5	1	5	24.68	5.8	30.48	899.45'
10	1	10	31.95	12.7	44.65	900.63'
30	2	15	38.09	18.2	56.29	901.6'

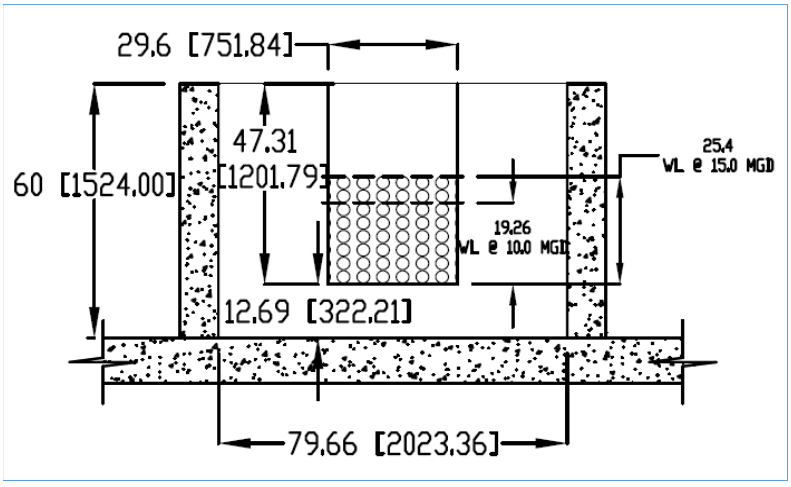
^Note: Calculated with a 29.6" Wide rectangular contracted Weir, with crest of weir 12.69" (897.96') above proposed floor of UV Channel (896.91')

Figure 3.1: Hydraulic Gradeline through proposed UV System-Option 1 [N.T.S]



*Note: One UV reactor shown above to be installed in a UV Channel

Figure 3.2: Rectangular Contracted weir plate [N.T.S]



OPTION 2: 2 UV Channels in Parallel

SUMMARY:

For Option 2, two UV Channels are proposed to be installed in parallel.

The details of the UV design criteria, process configuration, UV reactor(s), scope of supply, reactor drawings, summarized O & M information, and other pertinent information are provided in the following sections.

10. UV DESIGN CRITERIA – Option 2:

The flow rates and water quality parameters used for reactor sizing are listed in the Table 14 below:

Table 14: UV Design Criteria – Option 2

Average Flow Rate	10.0/6,944	MGD/GPM
Peak Design Flow Rate (Peak Disinfection Flow Rate)	30.0/20,833	MGD/GPM
UV Transmittance	65.0	% UVT (Minimum)
Total Suspended Solids	< 10.0	mg/l (30 day average)
BOD	< 12.0	mg/l (30 day average)
Target Indicator Organism	E. Coli	
Disinfection Permit Criteria	126.0	CFU/100 ml monthly geomean
UV Dose (manufacturer calculated)	30.0	Minimum UV dose of 30.0 mJ/cm^2. After applying certified Lamp End of Lamp Life (EOLL) of .87, Fouling Factor of .89.
Plant Process	Conventional Activated Sludge, clarified secondary effluent.	
Particle Size*	30.0	Microns
Total Iron*	0.3	mg/l
Turbidity*	5	NTU
Equipment Redundancy	50% redundancy of UV banks at peak flow. Two UV channels in parallel, each with a three-bank reactor. Two banks per channel duty and one bank per channel on stand-by at peak flow.	

*Note: Industry standard parameters used for this proposal.

11. SCOPE OF SUPPLY – Option 2:

Summary details of the proposed reactor selected to meet the effluent permit criteria (based on the water quality parameters listed in Table 14) are provided in the tables below:

Table 15: Scope of Supply – UV Reactor(s) – Option 2

Reactor model number	D9i.10103
Reactor type	In-Channel
Installation notes	Indoor/ Outdoor – Covered Installation
Process connection	Channel Flange Adapter
Reactor configuration	Standard
UV Lamps - Enaqua part #: 001.0617045 XUV60L	145-Watt LPHO Non-Amalgam Smart Lamps
UV Lamp output at 253.7 nm (Nominal Watts)	55.00 Watts
Ballasts - Enaqua part #: 502.5V2427M	145-Watt Enlight High Efficiency Ballast
Non-Contact Reactor Material	D-Series AFP840 Tube
Material of Construction	304 SS
UV REACTOR(S)	
# of proposed UV reactors	2
# of banks per reactor	3
# of AFP tubes per reactor	100
# of lamp racks per bank	11
# of lamps per lamp rack	12
Total # of lamps per bank	132
Total # of ballasts per bank	132
Total #of lamps per reactor	396
Total # of lamps in system	792
REACTOR THERMAL CONTROL MECHANISM	
Air to water heat exchangers	24 (Four per bank)
Cooling Pumps	4 (Two per reactor)

Table 16: Scope of Supply – Controls – Option 2

CONTROLS & ELECTRICAL	
ADR GEN 2. Enaqua part number: 062.01003500	12 (Two per bank)
EDC GEN 2 (Ensure Dosing Controller) and SCADA integration using MODBUS TCP	2 (One per UV reactor)
Power Disconnect Panel in NEMA 4X SS Enclosure	8 (One per bank + One per cooling system)
UV System Master Control PLC. AB CompactLogix PLC. AB Part # 1769-L16ER-BB1B. OIT for UV Master PLC. Discrete I/O Modules, Analog I/O Modules, Power supply, network card. SCADA integration using ETHERNET IP	1(Common)
UV Control Panel - HMI Panel: 19.00" Touch Screen Color HMI (Panel PC)- Enaqua part Number 064.01000542 installed in NEMA 4 X SS- Model WM483612N4. 48.00" x 36.00" x 12.00" Enclosure.	
SENSORS	
Ultrasonic level sensor	2 (One per reactor)
UV intensity sensor - Enaqua part number: 560.601902	6 (One per bank)
EFFLUENT LEVEL CONTROL MECHANISM	
Effluent flat weir plate (Rectangular or V-Notch) to be installed in UV Channels. Weir plate and frame 304 SS.	2 (One per UV channel)
UV CHANNEL INFLUENT & EFFLUENT ISOLATION VALVES	
Actuated (OPEN/CLOSE-DUTY) slide gates. BY OTHERS.	4 (One influent, and one effluent gates per UV Channel)

12. PROPOSED PROCESS FLOW & DESIGN REDUNDANCY – Option 2:

The proposed UV configuration consists of two UV channels in parallel, each with a three-bank "In-Channel" reactor. With two banks active per channel, the UV system is sized to disinfect 100% of the peak disinfection flow rate, given the water quality parameters listed in Table 14. With the third bank per channel on stand-by at 30.0 MGD, this configuration offers 50% redundancy of banks at peak flow.

The proposed process flow diagram is shown in Figure 4 below, and the flow ranges of the UV reactor banks presented in Table 17 below.

Figure 4: Preliminary Process Flow Diagram – Option 2

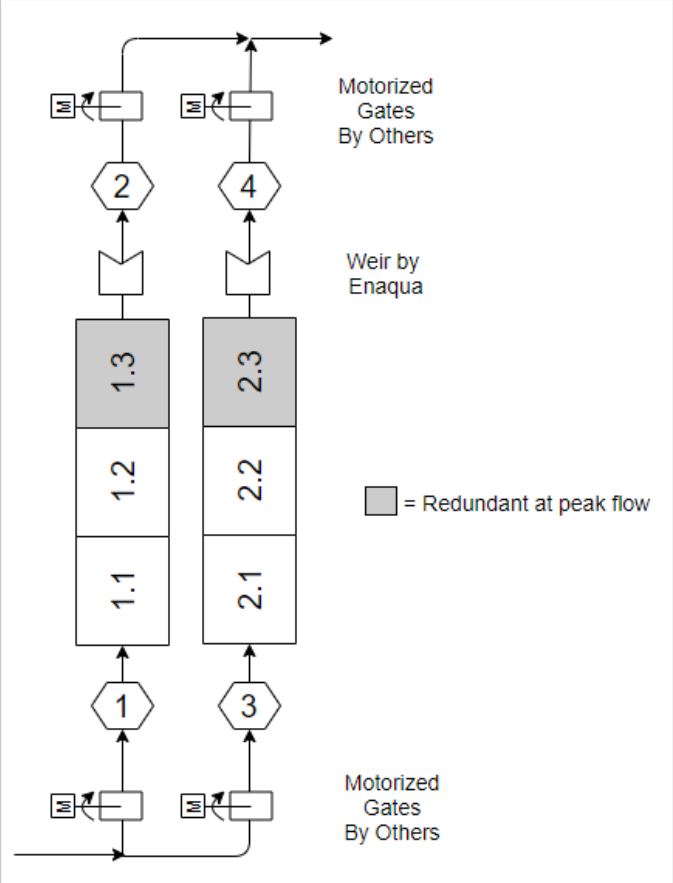


Table 17: Process Flow – Option 2

Tag	Description	Bank 1-Disinfection Peak Flow MGD	Bank 2-Disinfection Peak Flow MGD	Bank 3-Disinfection Peak Flow MGD
1	Influent to UV 1	7.5	7.5	7.5
2	Effluent from UV 1	7.5	7.5	7.5
3	Influent to UV 2	7.5	7.5	7.5
4	Effluent from UV 2	7.5	7.5	7.5

13. OPERATING CONDITIONS – Option 2:

The reactor head loss at peak flow rate and the total connected load of the reactors are provided in Table 18 and Table 19 below:

Table 18: Head Loss Calculations – Option 2

Calculated Head loss (inches)-Flange to Flange	
Peak flow rate (15.0 MGD per channel)	< 21.1 Inches+

A proposed preliminary hydraulic grade line through the UV system is provided in Figure 6of this proposal. With a proposed TOS of the UV Channels at 896.67', the proposed UV configuration has a calculated upstream MWSEL of 901.6' AMSL, the same as the existing vertical UV system.

Table 19: Electrical Details – Option 2

Total Connected Load Per Reactor @ 480V 3Ø	
Total connected Load (kW)	62.74
Total connected Load (kVA) (w/ PF of .95)	66.04
Total connected Load (Amps)*	79.43

*Note: Total connected load for the entire UV reactor including cooling and control components

14. OPERATIONS & MAINTENANCE INFORMATION – Option 2:

The estimated power usage at daily average flow (kW), and the projected lamp replacement costs based on 24/7 operations at average flow are provided in Table 20 and Table 21 below:

Table 20: Power Usage at Daily Average Flow – Option 2

Power Usage (kW)	
Average flow of 10 MGD	40.61 kW*

*Note: Assumed one channel/reactor and two banks operating using flow pacing. All 100 AFP tubes and associated UV lamps active to disinfect average flow rate.

Table 21: Lamp Replacement Cost Evaluation – Option 2

Lamp Replacement Costs ($)	
Number of lamps per year	193+
Price per Lamp ($)	75.0
Annual Lamp Replacement Cost ($)	14,475.0

+ Note: Based on 264 UV Lamps in 2 UV Banks at average flow, and an annual lamp replacement factor of .73 {(24 hrs. /day x 365 days a year)/ (12,000 Hr. expected lamp life)}

GENERAL MAINTENANCE:

The AFP840™ Tube reactors are the only UV transmitting reactor component that is in contact with waste water, and the AFP840™ tubes have been demonstrated to have high resistance to fouling. No cleaning chemicals are required/ necessary for cleaning of the AFP840™ tubes. The cleaning procedure is very simple and cleaning instructions are provided in the O&M manual and the brush attachment for manual cleaning is supplied with the reactors.

15. ELECTRICAL REQUIREMENTS – Option 2:

The electrical requirements for the proposed reactor(s) are provided in Table 22 below:

Table 22: Electrical Requirements – Per UV Reactor – Option 2

6. Each UV Reactor requires an electrical supply of Three (3) 480V/3P 4 wire (plus ground) – 40.0 A, one per UV bank
7. Each cooling pump requires an electrical supply of One (1) 480V/3P 3 wire (plus ground) – 10.0 A
8. Each reactor thermal control mechanism requires an electrical supply of one (1) 120V/ 1P/ 2 wire (plus ground) – 40.0 A
9. Each reactor cooling system & control requires an electrical supply of Three (3) 120V/ 1P/ 2 wire (plus ground) – 10.0 A, one per bank.
10. UV Control Panel requires an electrical supply of one (1) 120V/ 1P/ 2 wire – 20 A

Note: Based on 60Hz power

16. STANDARD EQUIPMENT WARRANTIES – Option 2:

The equipment furnished (excluding lamps, ballasts) shall be warranted to be free of defects in material and workmanship, including damages that may be incurred during shipping for the lessor of a period of 12 months from substantial completion of the installed UV system or 18 months from receipt of all equipment supplied by the contractor and received in good condition by owner.

UV LAMPS: UV lamps shall be warranted for a minimum of 12,000 hours operating time under the conditions specified herein prorated after 9,000 hours. In the event of premature UV lamp failure, the UV system supplier shall offer the following:

3. Lamp failure before 9,000 hours – send a replacement lamp free of charge
4. Lamp failure after 9,000 hours – issue a credit proportional to the hours not used.

BALLASTS: Electronic ballasts are fully warranted for 3 years, extended to five years with first purchase of (1:1) replacement lamps from ENAQUA lamps within three years of installation.

17. BUDGETARY PRICING – Option 2:

Budgetary pricing for the proposed UV reactor(s) is provided in Table 23 below:

Table 23: Budgetary Pricing in US $ – Option 2

DESCRIPTION	QTY
UV Reactor – D9i.10103	2
UV Power Panels	8
UV Control Panel (UVPLC & HMI Panel)	1
Effluent Level Control Weirs	2
Spare Parts	Per Table 24
Start-up and Commissioning	Per Table 25
Shipping and handling	1
Net sales price	$986,575.00
***TOTAL**	**$986,575.00**

Note: Shipping is FOB Jobsite, Delaware County, OH.

*Note: Budgetary prices valid for 6 months from the date of this proposal.

Table 24: Spare Parts included in scope of supply – Option 2

ITEM	QTY
Spare UV Lamps	40
Spare UV Ballasts	10
Spare Cooling Pump	1
Spare UV Sensor	1
Operator's safety kit	3
Cleaning Kit	3

Table 25: Startup services included in scope of supply – Option 2

ITEM	QTY (hr.)
TRIP 1- One trip, and two eight hour work days included for installation inspection.	16
TRIP 2- One trip, two technicians, and four eight hour work days per technician included for Start-up, performance testing, commissioning, and operator training.	64

Table 26: Terms of Payment: Net 30 – Option 2:

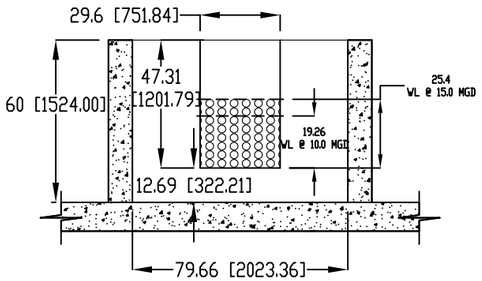
Order acceptance (prior to shipping)	30	%
Upon approval of shop drawings	30	%
Upon delivery of all goods, or six weeks after declaration of "ready to ship"	30	%
After start up and commissioning of UV system	10	%

18. MECHANICAL DRAWINGS – Option 2:

Sales Engineering drawings of the proposed UV reactor are provided in Figure 5 below; the drawings are for dimensional reference only.

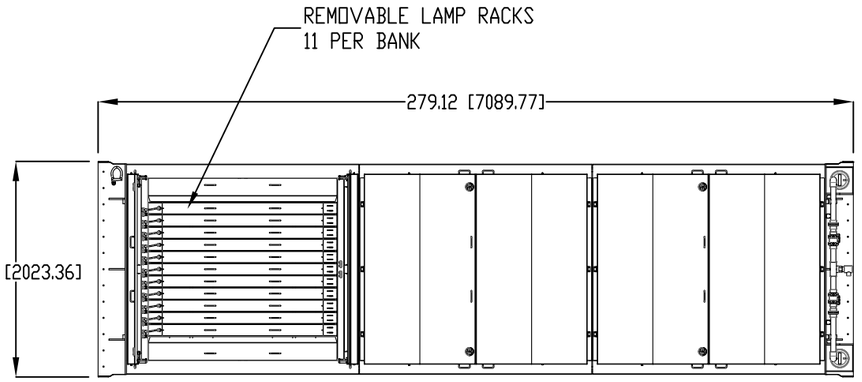
Figure 5: UV Reactor Drawings – Option 2

REVISIONS					
REV.	ZONE	ECM#	DESCRIPTION	DATE	APPROVED
A	ALL	-	INITIAL RELEASE	6/29/2021	WIM

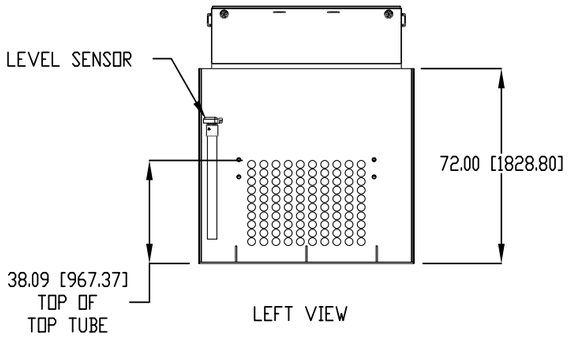


WEIR SECTION

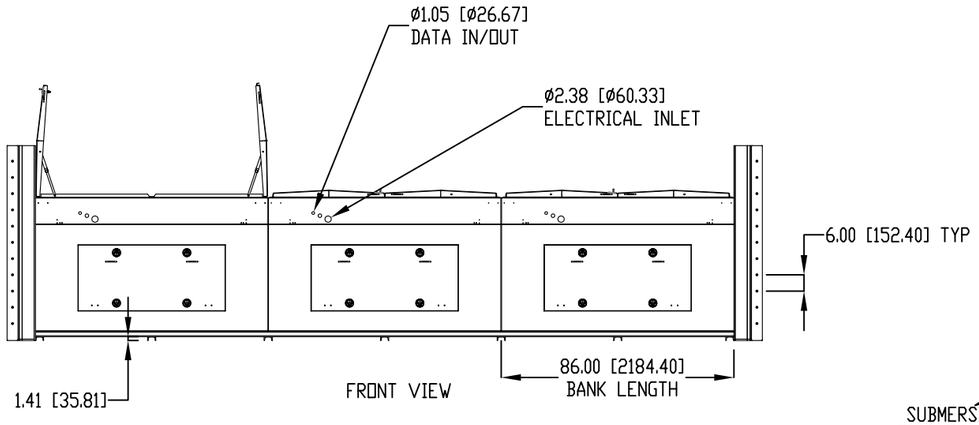
FLOW →



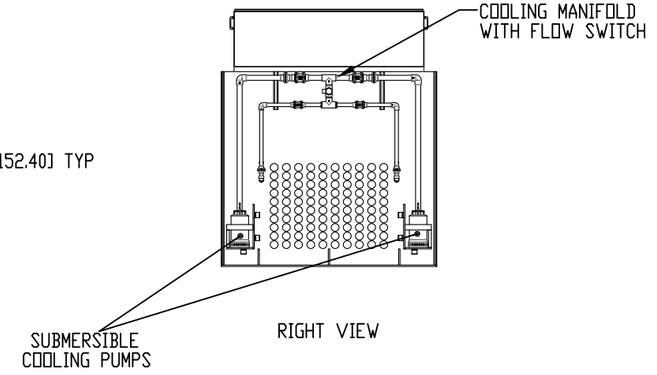
TOP VIEW



LEFT VIEW



FRONT VIEW



RIGHT VIEW

NOTES (UNLESS OTHERWISE SPECIFIED):

1. DRAWING IS IN ACCORDANCE WITH ASME Y14.5-2009.
2. ALL DIMENSIONS ARE IN INCHES AND/OR [MILLIMETERS].

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES[mm]
TOLERANCES: ANGLES:
X.X ± .1[2.54] X ± 1°[25.4]
X.XX ± .03[.76] .X ± .5°[12.7]
X.XXX ± .010[.25] .XX ± .25°[6.4]
XX/XX ± 1/16

DO NOT SCALE DRAWING

ERP NO.: -
SERIES: D-SERIES
MATERIAL: -
FINISH: -

APPROVALS		
TITLE	NAME	DATE
DRAWN	WIM	6/29/2021
CHECKED		
ENG. APPR.		
MFG. APPR.		
Q.A.		

WEIGHT (LBS.): -

ENAQUA A GRUNDFOS COMPANY
1350 Specialty Dr
Ste F, Vista, CA 92081

TITLE:
SE DRAWING, MODEL D9i.10103

SIZE	DWG. NO.	REV
B	D9i.10103-SE	A

SCALE: 1:56 SHEET 1 OF 1

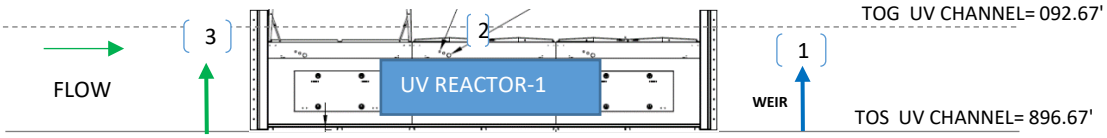
Figure 6: Preliminary Hydraulic Grade Line– Option 2

Table F 6.1 - Hydraulic Gradeline Information-Option 2

Flow to UV System (MGD)	# of UV Channels Active	Flow Rate-PER UV CHANNEL (MGD)	Water over weir Depth-Above Bottom of UV Reactor-Controlled by Rectangular Contracted weir plate downstream- Inches [1]^	Headloss through UV reactor @ Flow (Inches) [2]	Calculated Water Level in UV Channel upstream of UV Reactor (Reference TOS of UV Channel floor)-Inches [3]	Calculated Upstream Water Elevation Reference TOS of UV Channel floor)-Feet [3]
5	1	5	24.68	6.77	31.45	899.29'
10	1	10	31.95	14.82	46.77	900.57'
30	12	2.5	38.09	21.1	59.19	901.6'

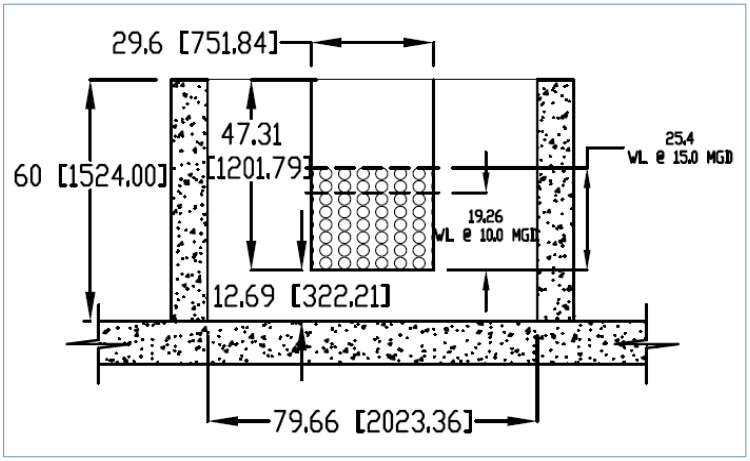
^Note: Calculated with a 29.6" Wide rectangular contracted Weir, with crest of weir 12.69" (897.73') above proposed floor of UV Channel (896.67')

Figure 6.1: Hydraulic Gradeline through proposed UV System - Option 1 [N.T.S]



*Note: One UV reactor shown above to be installed in a UV Channel

Figure 6.2: Rectangular Contracted weir plate [N.T.S]



APPENDIX B

Appendix B: Gate Equipment Literature

July 14, 2021

To: All Bidding Contractors.
FTA: Estimating Department or Project Manager.

Re: Alum Creek WRF, Delaware County, OH
Specification: None
Alfa Laval Quote No.: Budget

10470 Deer Trail Drive
Houston, TX 77038 - USA
(800) 362 - 9041

Dear Gentlemen,

We are pleased to offer our bid, for the supply of the specified Coplastix Sluice Gate(s) to meet the intent and fulfill the requirements as detailed in the specification, based upon our Coplastix Design. We also include our **Ten-Year Warranty**, which is and has proven to be a great attribute to the longevity and quality of our equipment. The Coplastix equipment offered comes complete, ready for installation by the contractor unless noted otherwise. If you disagree with the take-off contained herein, you must advise us.

1. FRAME.
Carbon steel, 5/16 minimum thickness, sand blasted to near white metal, flame zinc sprayed 4 to 6 mils. Primed and epoxy coated to a 12 to 14 mils. DFT. Frames are wall mounted against a 1" nominal grout base, no thimbles or flanges are needed or included.

2. SEALS
Sluice gates frames shall be fitted with fixed sealing faces that are mounted in the frame sides. Seals shall be molecularly incompatible with the Disc face and shall have a co-efficient of friction of 0.10 or less.

3. DISCS
Shall be manufactured from suitably reinforced composite plastic materials. The outer skin material shall have a minimum thickness of 1/8" and is non-toxic, ultra-violet light stabilized. The internal steel reinforcing members shall be designed to adequately withstand the hydraulic forces and/or the mechanical operating loads that will be imposed upon the Disc. The Disc shall be designed for a deflection of less than 1/1000 of the span (Width of Opening/1000).

4. LEAKAGE RATES
Per Specification (AWWAC563), no factory water testing will be performed as site testing will need to be done and passed, normal factory inspection and certification report issued.

Item #1

Qty.:	Five (5)
Size:	24” x 36”
Gate:	Wall mounted Coplastix Slide Gate, suitable for door depth on & off Head pressure. Invert to floor 75” and top of slab 90” approx.
Operator:	Electric actuator assembly mounted on a frame-mounted pedestal at floor level.
Stem:	Rising 304 stainless steel.

Item #2

Qty.:	One (1)
Size:	48” x 36”
Gate:	Channel mounted Coplastix Slide Gate, suitable for door depth on & off Head pressure. Invert to floor 75” and top of slab 90” approx.
Operator:	Electric actuator assembly mounted on a frame-mounted pedestal at floor level.
Stem:	Rising 304 stainless steel.

Item #3

Qty.:	Two (2)
Size:	72” x 36”
Gate:	Wall mounted Coplastix Slide Gate, suitable for door depth on & off Head pressure. Invert to floor 90” approx.
Operator:	Electric actuator assembly mounted on a floor-mounted pedestal at floor level.
Stem:	Rising 304 stainless steel.

Item #4

Qty.:	Two (2)
Size:	66” x 48”
Gate:	Wall mounted Coplastix Weir Gate, suitable for door depth on & off Head pressure. Invert to floor 96” approx.
Operator:	Electric actuator assembly mounted on a wall-mounted pedestal at floor level.
Stem:	Rising 304 stainless steel.

Item #5

Qty.:	One (1)
Size:	78" x 36"
Gate:	Channel mounted Coplastix Slide Gate, suitable for door depth on & off Head pressure. Invert to floor 90" approx.
Operator:	Electric actuator assembly mounted on a frame-mounted pedestal at floor level.
Stem:	Rising 304 stainless steel.

NOTES AND EXCEPTIONS:

A. Equipment offered is Coplastix Standard Design.
B. Alfa Laval excludes grout, packers, etc.
C. Anchor Bolts: 316 stainless steel, Included. (if required)
D. **No Service Included.** If needed, see service terms.

DO NOT assume any item not listed above is included in our proposal.

Total Budget Price = $0.00
Contact (BL Anderson) Tel # (513) 889 – 4746 for pricing.
F.O.B. Houston, Texas, FFA to job site. **NO TAXES INCLUDED.**

Unless otherwise specified in this proposal, all installation of equipment supplied by Alfa Laval, Inc. shall be installed by others.

Taxes:

The quoted price does not include any local, state or federal taxes, permits or other fees. Any taxes or fees that may apply must be added to the quoted price and paid by the buyer.
Note: Alfa Laval, Inc. is only registered to collect and remit sales tax in the following states: Arizona, Arkansas, California, Florida, Georgia, Indiana, Kentucky, Louisiana, Massachusetts, New Jersey, North Carolina, Ohio, Texas and Washington. Taxable projects located in states outside of these will need to accrue and remit these taxes directly to the respective state.

Proposal Acceptance:

This proposal is offered for acceptance within thirty (30) days from date of this quotation or date of bid opening, whichever is the later date. Prices are subject to review thereafter. Prices are firm, based upon receipt of a Letter of Intent or Purchase Order and notice to proceed within this thirty (30) day period and the review and return of submittal drawings to Alfa Laval within thirty

(30) days. Delays caused by slow return of submittals and/or other manufacturing delays caused by the contractor, owner, owner's agent or engineer may result in additional charges of 1% per month for such delays or part thereof.

Submittal Drawings (2 to 3 weeks from receipt of written Purchase Order)

Mechanical submittal and drawings on the preceding equipment will be submitted in accordance with the required delivery date of the equipment and after receipt of a firm purchase order.
Note: A purchase order signed by both Alfa Laval, Inc. and the purchase order originator must be executed prior to any submittal being forwarded.

Shipment:

Shipment on the preceding equipment can be made within fourteen (14) to sixteen (16) weeks from receipt of approved submittals.

Payment Terms:

100% net 30 days (subject to credit approval) and as such no provision for retainage will be allowed under the terms of this project. These payment terms are not contingent upon payment from owner to Purchaser. Shipments such as embedded metal or partial items will be invoiced as shipped on a prorated price to be determined by Alfa Laval, Inc.
If Purchaser delays shipment, Alfa Laval, Inc. may invoice and pass title to the Purchaser; Purchaser agrees to remit the amount due at the times stated, as if the equipment had shipped. All costs of storage shall be at the Purchaser's expense.

Escalation Charges:

In the event that delivery of equipment cannot be made on the scheduled delivery date agreed upon between Alfa Laval and buyer and as evidenced by the terms of the contract, due to buyer delay, Alfa Laval reserves the right to assess reasonable escalation charges to the project at the rate of 1% per month of the contract value for each month that the project is delayed.

Terms:

Alfa Laval's Standard Terms and Conditions are enclosed and apply in their entirety. All applicable sales, use or other taxes are to be paid by buyer. If any taxes are to be paid by seller, the quotation price shall automatically be increased by the same amount. Failure to pay invoices promptly when due nullifies Alfa Laval, Inc. obligation to perform work under warranty, installation and start-up in a timely manner.
The contractor explicitly agrees that subject to acceptance by the consulting engineer and/or the owner, Alfa Laval, Inc. may substitute a stand-by letter of credit in lieu of cash retainages

required in the plans and specifications and contract documents, and 100% of the cash released by such acceptance will flow through immediately to Alfa Laval, Inc. All orders are subject to credit approval prior to acceptance of contract and/or purchase order.

General Notes:

There is no provision included in the quoted price, unless noted, for field erection supervision, tests, inspections or adjustment of equipment. If factory representative is required for any of these services, please refer to "Service Terms" enclosed. The equipment offered by Alfa Laval, Inc. is our standard design, materials and manufacture. In the event that these items of equipment are subject to any alteration in design or materials or manufacture by the contractor, owner, owner's agent or engineer, such alterations shall be subject to change in the contract price and/or delivery schedule.

We wish to thank you for the opportunity of offering this proposal. Should you have any questions, please feel free to contact our representative or us noted below.

Sincerely,

Doug Thomas

Doug Thomas
Business Development Manager Fluid Control

cc. BL Anderson (Kelli Jamison), Alfa Laval Local Representative

TERMS AND CONDITIONS OF SALE

These Terms and Conditions of Sale ("Terms and Conditions") apply to all quotations, orders, and contracts for Alfa Laval Inc. products (hereafter "Equipment") and associated services ("Services") As used in these Terms and Conditions, the word "Equipment" includes all hardware, parts, components, software and options.

1. ACCEPTANCE: Our sale to you is limited to and expressly made conditional on your assent to these Terms and Conditions and, if applicable, on the attendant quotation, both of which form a part of the contract between us and which supersede and reject all prior agreements, representations, discussions or negotiations, whether written or oral, with respect to this sale and any conflicting terms and conditions of yours, whether or not signed by you. Any terms and conditions contained in your purchase order or request for quotation or other form which are different from, in addition to, or vary from these Terms and Conditions are expressly rejected, shall not be binding upon us, and are void and of no force or effect. These Terms and Conditions may not be changed except by the written agreement of both parties.

2. PRICES: Unless otherwise specified in writing, all quoted prices are in U.S. Dollars and are firm for thirty (30) days from the date of offer. Prices quoted are exclusive of taxes, freight and insurance, and you agree to pay any and all sales, revenue, excise or other taxes (exclusive of taxes based on our net income) applicable to the purchase of Equipment. If you claim an exemption from any such taxes you shall provide us with a tax exemption certificate acceptable to the taxing authorities.

3. DELIVERY; FORCE MAJEURE: Dates for the furnishing of Services and/or delivery or shipment of Equipment are approximate only and are subject to change. Quoted lead times are figured from the date of receipt of complete technical data and approved drawings as such may be necessary. We shall not be liable, directly or indirectly, for any delay in delivery or failure to deliver caused by carriers or by labor difficulties, shortages, strikes or stoppages of any sort, or difficulties in obtaining materials from ordinary sources and suppliers. In addition, we shall not be liable for any such delays or for any failure to perform our obligations under an order or contract due to any one or more of the following events, whether foreseeable or not: war, hostilities, military operations, terrorism, riots, disorder, accidents, floods, storms, natural disasters, fires, acts of God, epidemics and/or pandemics (and specifically in relation hereto and notwithstanding anything else stated herein, whether or not outbreak of such epidemic or pandemic has occurred prior to acceptance of this order or execution of a contract for the Services), governmental, judicial or administrative decisions, decrees or orders, embargoes or blockades, or any causes beyond our reasonable control. Unless otherwise specifically agreed in writing by us, in no event shall we be liable for any damages or penalties whatsoever, or however designated, resulting from our failure to perform or delay in performing due to any of the causes specified in this paragraph 3.

4. SHIPMENT, RISK OF LOSS, TITLE: All sales are made F.O.B. Alfa Laval shipping point, unless otherwise noted. Duty, brokerage fees, insurance, packing and handling as applicable are not included unless otherwise noted. Our liability for delivery ceases upon making delivery of Equipment to the carrier at the shipping point in good condition. The carrier shall be your agent. Risk of loss shall pass to you upon such delivery. Regardless of the delivery term specified, we shall retain title to the Equipment until final payment thereof has been made.

5. CREDIT AND PAYMENT: Payment terms are (30) days net, unless agreed otherwise by us in writing. Pro rata payments shall become due with partial shipments. Any discount period which may be granted by us begins on the invoice date and all payments are due 30 days after the invoice date. All payments shall be made without deduction, deferment, set-off, lien or counterclaim of any nature. All amounts due not paid within 30 days after the date such amounts are due and payable shall bear interest at the lesser of 1.5 percent per month or the maximum rate of interest allowed by law. We reserve the right at any time to suspend credit or to change credit terms provided herein, when, in our sole opinion, your financial condition so warrants. Failure to pay invoices when such invoices are due and payable, at our election, shall make all subsequent invoices immediately due and payable irrespective of terms, and we may withhold all subsequent deliveries until the full account is settled. We shall not, in such event, be liable for delay of performance or nonperformance of contract in whole or in part subsequent to such event.

6. SECURITY AGREEMENT: You hereby grant us a security interest in the Equipment, including a purchase money security interest, and in such materials, proceeds and accessories thereof, to secure payment of the purchase price of the Equipment. You authorize us to file or record a purchase order or copy thereof or any UCC financing statement showing our interest in the Equipment in all jurisdictions where we may determine filing to be appropriate, and you agree to sign all such documents reasonably related thereto promptly following our request. You will not encumber the Equipment with any mortgage, lien, pledge or other attachment prior to payment in full of the price therefor.

7. CANCELLATIONS AND CHANGES: Orders which have been accepted by us are not subject to cancellation or changes in specification except upon prior written agreement by us and upon terms that will indemnify us against all losses resulting from or arising out of such cancellation or change in specifications. In the absence of such indemnification, we shall be entitled to recover all damages and costs of whatever nature permitted by the Uniform Commercial Code.

8. DEFERRED SHIPMENT: If shipment is deferred at your request, payment of the contract price shall become due when you are notified that the Equipment is ready for shipment. If you fail to make payment or furnish shipping instructions we may either extend the time for so doing or cancel the contract. In case of deferred shipment at your request, storage and other reasonable expenses attributable to such delay shall be payable by you.

9. EQUIPMENT WARRANTY AND REMEDY:

(a) For new Equipment only, we warrant to you that the Equipment that is the subject of this sale is free from defects in design (provided that we have design responsibility), material and workmanship. The duration of this warranty is twelve (12) months from start-up or eighteen (18) months from delivery to you, whichever occurs first (the "Warranty Period"). If you discover within the Warranty Period a defect in design, material or workmanship, you must promptly notify us in writing. Within a reasonable time after such notification, we shall repair, replace, or, at our option, refund you the price of the defective Equipment or part thereof.

(b) For repairs, parts and Services provided by us, we warrant to you that the repairs, parts and Services we provide to you will be free from defects in material and workmanship. The duration of this warranty is ninety (90) days from as applicable (i) the date the Equipment which required the repairs, parts or Services is returned to you by us, (ii) the date of your receipt of the part, or (iii) the date of completion of the repair or other Services, if performed at your facility. If during this ninety day period you discover a defect in the repairs, parts or Services you must promptly notify us in writing and we shall correct such defect with either new or used replacement parts or reperform the Services as applicable. If we are unable to correct the defect after a reasonable number of attempts, we will provide a refund of the price paid for the defective repair, parts or Services.

(c) All warranty service is subject to our prior examination and approval and will be performed by us at your facility or at service centers designated by us. All transportation to and from the designated service center will be at our expense. The remedies set forth above are your exclusive remedies for breach of warranty. Unless otherwise agreed in writing by us, our warranty extends only to you and is not assignable to or assumable by any subsequent purchaser, in whole or in part, and any such attempted transfer shall render all warranties provided hereunder null and void and of no further force or effect.

(d) The warranties set forth above are inapplicable to and exclude any product, components or parts not manufactured by us or covered by the warranty of another manufacturer. We shall have no responsibility for defects, loss or damage to the extent caused by (i) normal wear and tear, (ii) your failure to follow all installation and operation instructions or manuals or to provide normal maintenance, (iii) repairs or modifications by you or by others not under our direct supevision, or (iv) a product or component part which we did not design, manufacture, supply or repair.

(e) DISCLAIMER OF IMPLIED WARRANTIES. THE WARRANTIES SET FORTH ABOVE AND IN SECTION 12 BELOW ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

10. LIMITATION OF LIABILITY: In no event shall we be liable, and you hereby waive any claims against us and release us from liability to you, for any indirect, special, punitive, incidental, or consequential damages whatsoever based upon breach of warranty, breach of contract, negligence, strict tort, or any other legal theory. In no circumstance, shall we be liable for, however such damages are characterized, loss of profits, loss of savings or revenue, loss of use of the Equipment or any associated equipment, cost of capital, cost of any substitute Equipment, facilities or services, downtime, or loss of prospective economic advanrtage. OUR AGGREGATE LIABILITY FOR FAILURE TO PERFORM, BREACH OF WARRANTY OR BREACH OF OTHER CONTRACTUAL OBLIGATIONS SHALL NOT EXCEED THE TOTAL PRICE PAID TO US FOR THE EQUIPMENT AND SERVICES THAT ARE THE SUBJECT OF ANY CLAIM BY YOU.

11. OWNERSHIP: All drawings, designs, specifications, data and other proprietary rights supplied by us (including without limitation in connection with the Equipment) have been prepared or assembled by us and are (and shall remain) exclusivelyour property, and upon our request you agree to execute any additional documents needed to give effect to the foregoing. Such drawings, designs and specifications have been furnished in order to provide full documentation and on the condition that they shall not be disclosed, reproduced or copied in any manner whatsoever, in whole or in part, except for your internal use as necessary, and upon the further condition that, as our sole property, they shall not be used for furnishing information and/or disclosed, in whole or in part, to others or otherwise for any purpose not specifically authorized in a writing signed by one of our corporate officers.

12. PATENT INFRINGEMENT

(a) We make no express or implied warranties of non-infringement with respect to the Equipment. We will, however, defend, indemnify and hold you harmless from any third party apparatus claims based upon an issued U.S. patent to the extent such claim relates to the Equipment supplied and sold to you; provided, however, that we undertake no indemnification in respect of third-party rights (i) where the alleged patent infringement is based upon or related to any method, process or design claims in third- party U.S. patents, any combination of the Equipment with other equipment not supplied by us, or any modifications of the Equipment made by you and not approved by us, or (ii) to the extent the alleged infringement is directly attributable to the negligence or intentional misconduct of you or otherwise for which you are obligated to indemnify us for under paragraph 12(c).

(b) We shall assume defense of a claim at our expense in accordance with these Terms and Conditions, provided you shall notify us within 30 days of your receipt of notice of an alleged third-party claim that you believe would entitle you to patent infringement indemnification pursuant to paragraph 12(a). You acknowledge and agree that we shall have the sole right to settle or otherwise compromise such a third-party claim, including but not limited to the right to either (i) modify the Equipment to avoid infringement if you are agreeable to the modification, (ii) repurchase the Equipment from you at a price equal to the then-current fair market value of the Equipment, or (iii) secure rights by assignment or license to permit continued use of the Equipment.

(c) If a third party charges us with patent infringement relating to Equipment sold by us to you, we shall have the right to either (i) modify the Equipment to avoid infringement if you are agreeable to the modification, (ii) repurchase the Equipment from you at a price equal to the then-current fair market value of the Equipment, or (iii) secure rights by assignment or license to permit continued use of the Equipment. If a third party charges us with patent infringement on the bases set forth in paragraph 12(a)(i) or (ii), you shall indemnify and hold us harmless for all expenses as well as any awards of damage assessed against us, and, without limiting any of our other rights and remedies available at law or in equity, we shall also have the right to modify or repurchase the Equipment or to secure rights for continued use by way of assignment or license as set forth in this paragraph.

13. INSPECTION: Upon prior written notice, you may make reasonable inspections of Equipment at our facility. We reserve the right to determine the reasonableness of the request and to select an appropriate time and location for such inspection. You agree to execute appropriate confidentiality provisions upon our request prior to visiting our facility. All costs of inspection shall be solely determined by us and shall be payable by you. No inspection or expediting by you at the facilities of our suppliers is authorized.

14. SOFTWARE PROVISIONS: If software is provided hereunder (whether such is integrated into the Equipment or otherwise operates alongside the same), you are hereby granted a non-exclusive, non-sublicenseable, non-transferable, royalty free license to access and use such software as provided and as intended with our Equipment. Without limiting the foregoing, under the foregoing license you may specifically: (i) use our software in machine readable object code only and only with the Equipment provided; (ii) copy our software into any machine readable object code form solely for back up purposes in support of your use of our software on the Equipment provided in accordance with these Terms and Conditions; and (iii) create one additional copy of the software for archival purposes only. This license may only be assigned, sublicensed or otherwise transferred by you with our prior written consent. You hereby recognize and acknowledge that the software provided to you hereunder comprises valuable trade secret and/or copyright property of Alfa Laval (or its licensors) and you covenant that you will take adequate precautions against access to the software by, or disclosure of the software to, anyone not authorized hereunder to use or have access to the software as contemplated herein. The software is subject to the confidentiality obligations set forth below in paragraph 15.

15. CONFIDENTIALITY: Subject to any non-disclosure or confidentiality agreement already in effect between us, any drawings, data, software or other information exchanged between us is proprietary or confidential to us and shall not be used or disclosed by you without our prior written consent. Confidential information shall not be any information that (i) is known previously to you under no obligation of secrecy;
(ii) becomes known to the public through no breach of an obligation of secrecy by you; or (iii) is independently developed by you without use or reference to any of the confidential information or materials provided to you by us.

16. INAPPLICABILITY OF CISG: The parties specifically agree that the United Nations Convention on Contracts for the International Sale of Goods shall not apply to any sale or order or the contract between us.

17. GOVERNING LAW & VENUE: These Terms and Conditions and any dispute or claim arising out of or related to an order or the contract between us shall be finally decided in accordance with the laws of the Commonwealth of Virginia, without giving effect to the provisions thereof relating to conflict of laws. You agree that the venue for any such dispute shall lie in the United States District Court for the Eastern District of Virginia, Richmond Division. In the event that federal jurisdiction cannot be established pursuant to 28
U.S.C. §§ 1331 or 1332, the venue for any such dispute shall lie in the Circuit Court of Henrico County, Virginia. You expressly submit and waive any objection to the sole and exclusive jurisdiction of such courts.

18. GENERAL: All previous agreements or understandings between us, either oral or written, with regard to the subject order, with the exception of a pre-existing non-disclosure agreement between us, are void and these Terms and Conditions constitute the entire agreement between us with respect to the matters addressed herein. Neither of usshall assign an order or contract to which these Terms and Conditions apply without the prior written consent of the other party, which consent shall not be unreasonably withheld. If any provision of these Terms and Conditions is held to be invalid or unenforceable, such holding shall not affect the validity or enforceability of any other provision herein. No waiver by either of usof any default or breach by the other party will operate as or be deemed a waiver of any subsequent default or breach.

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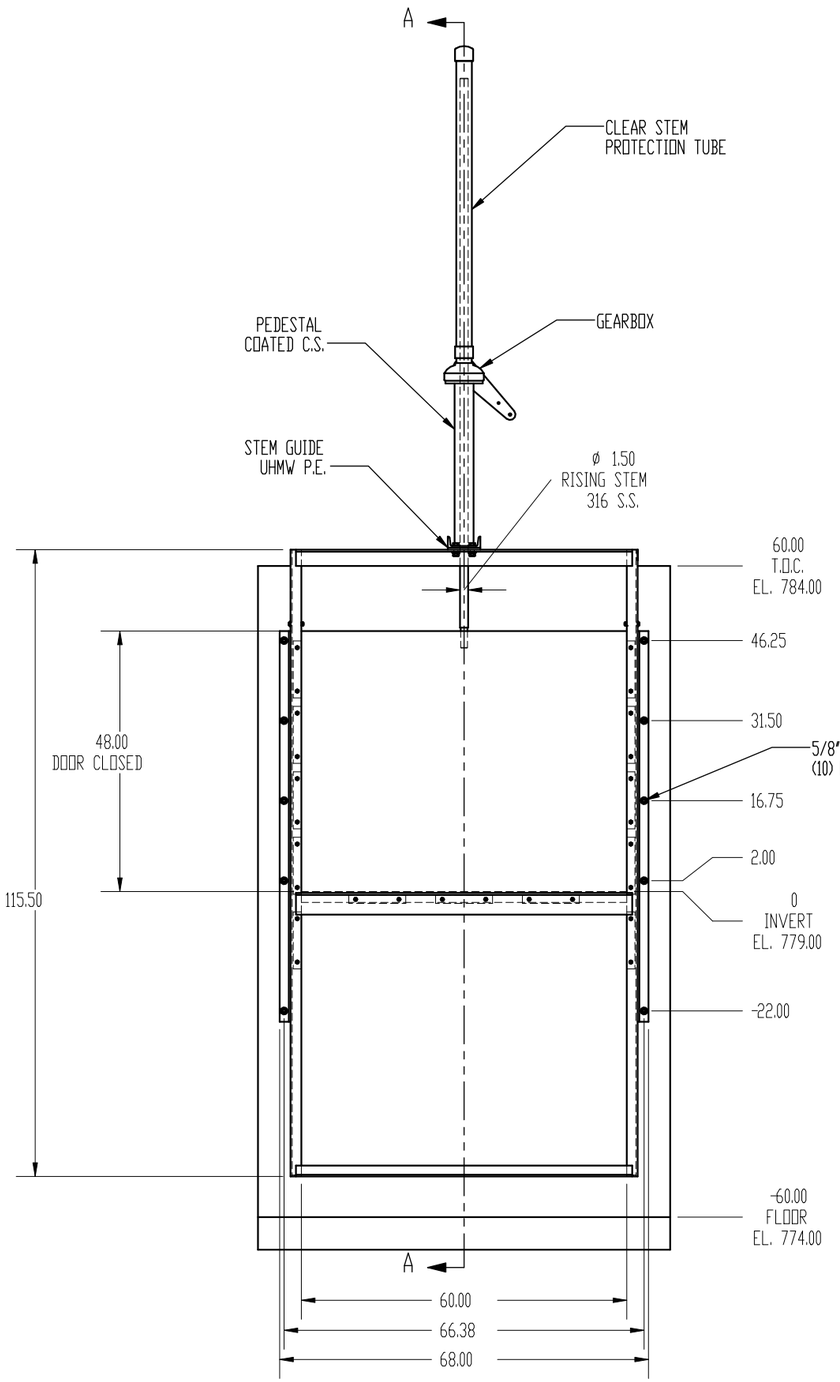
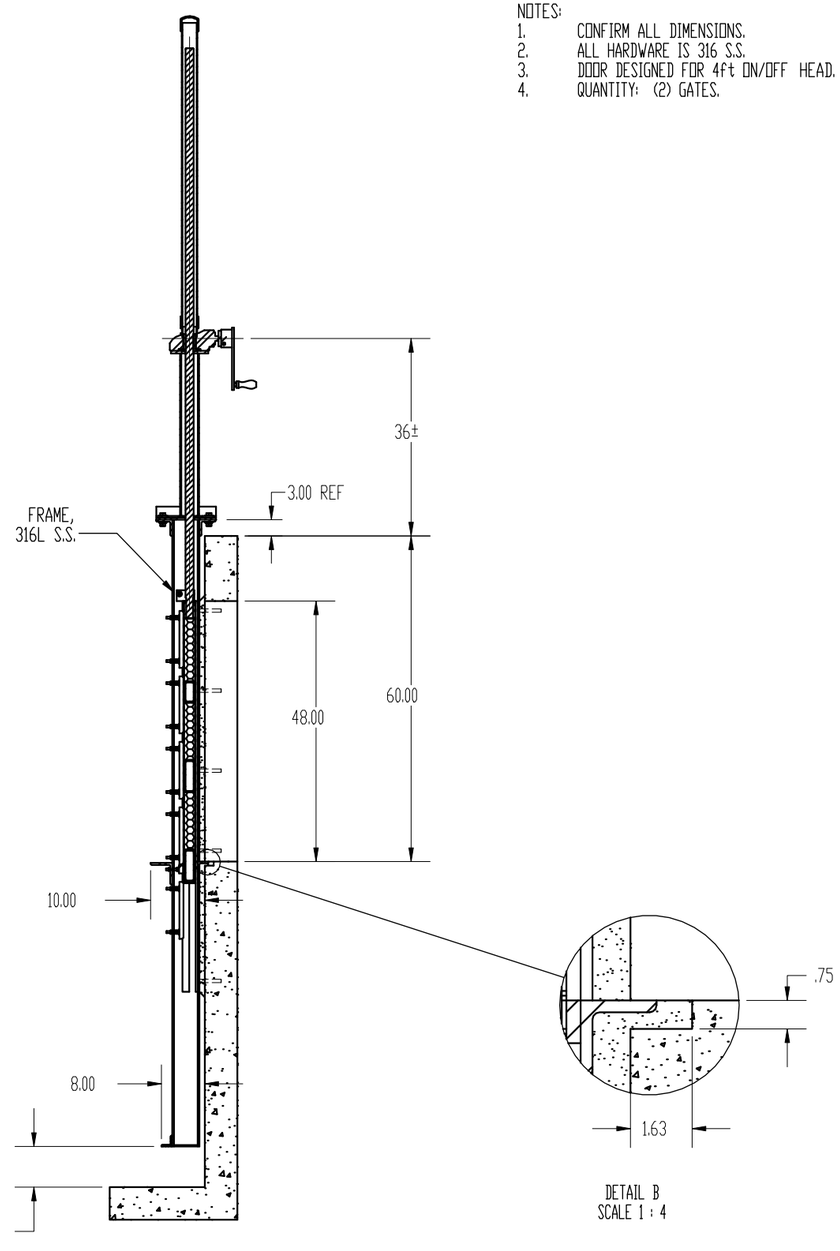


SECTION A-A



DETAIL B
SCALE 1 : 4

NOTES:
1. CONFIRM ALL DIMENSIONS.
2. ALL HARDWARE IS 316 S.S.
3. DOOR DESIGNED FOR 4ft ON/OFF HEAD.
4. QUANTITY: (2) GATES.

TOLERANCE, UNLESS NOTED			REV	DATE	SUMMARY DESCRIPTION OF CHANGES	BY	APP	REV	DATE	SUMMARY DESCRIPTION OF CHANGES	BY	APP
	INCH	MILLIMETER	1					7				
FRACTION	+/- 1/32"	N/A	2					8				
X.	+/- 0.100	+/- 3.0	3					9				
X.X	+/- 0.030	+/- 1.0	4					10				
X.XX	+/- 0.015	+/- 0.5	5					11				
X.XXX	+/- 0.005	+/- 0.1	6					12				

DRAWN	MCA	DATE 12/6/07
CHECKED	MCA	DATE 12/6/07
APPROVED	DY	DATE 12/6/07
NEXT ASSY	N/A	WEIGHT 900 lb

NOTE:
1) DEBURR ALL SHARP EDGES.
2) MARK FINISHED PARTS WITH PART NUMBER PER WORK ORDER OR PURCHASE ORDER.

Ashbrook Simon-Hartley

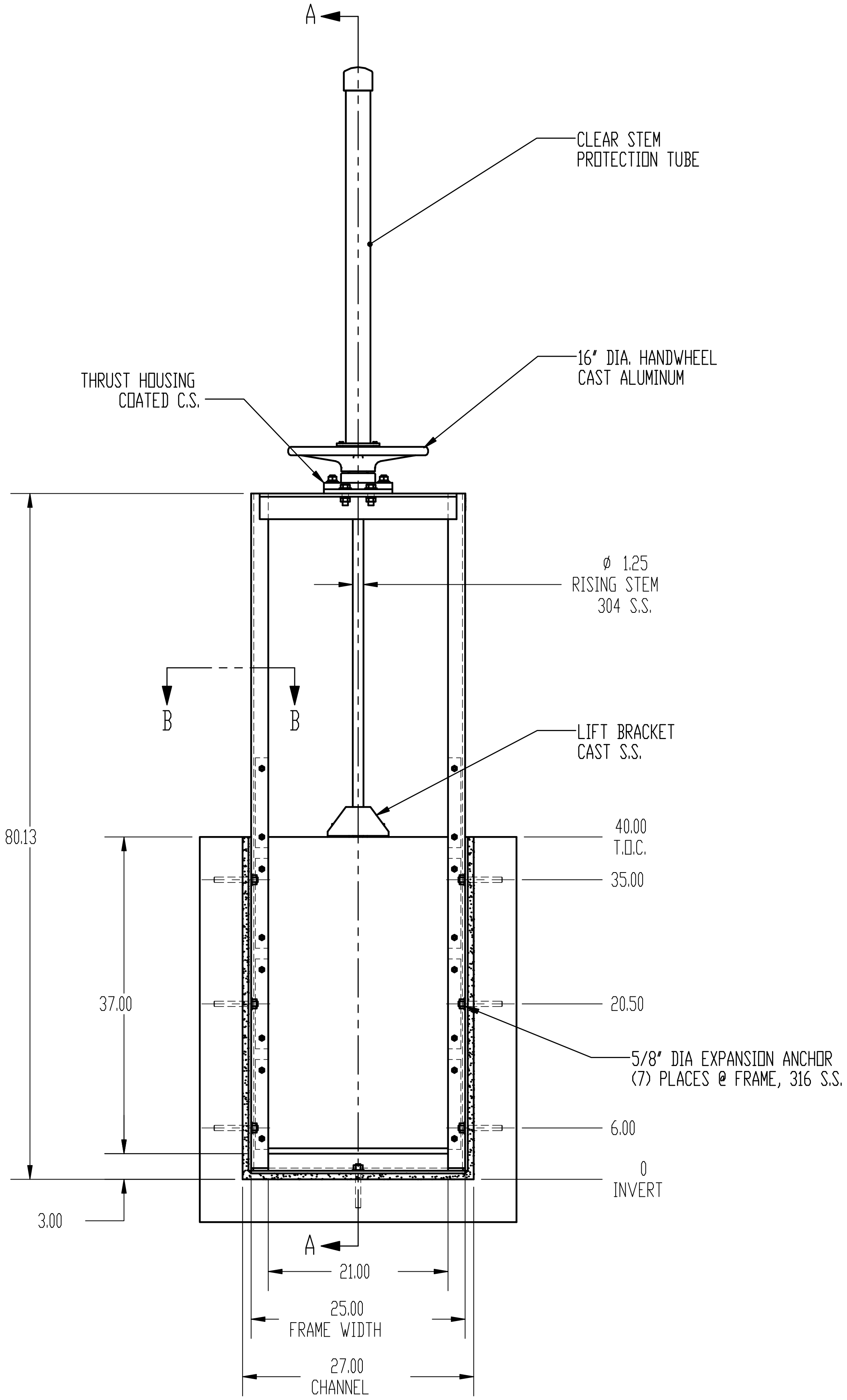
Ashbrook Simon-Hartley Operations LP
11600 East Hardy Rd.
Houston, Texas 77093
Phone: 281-449-0322
Fax: 281-449-1324

TITLE
60 x 48 SGW DD ASSEMBLY

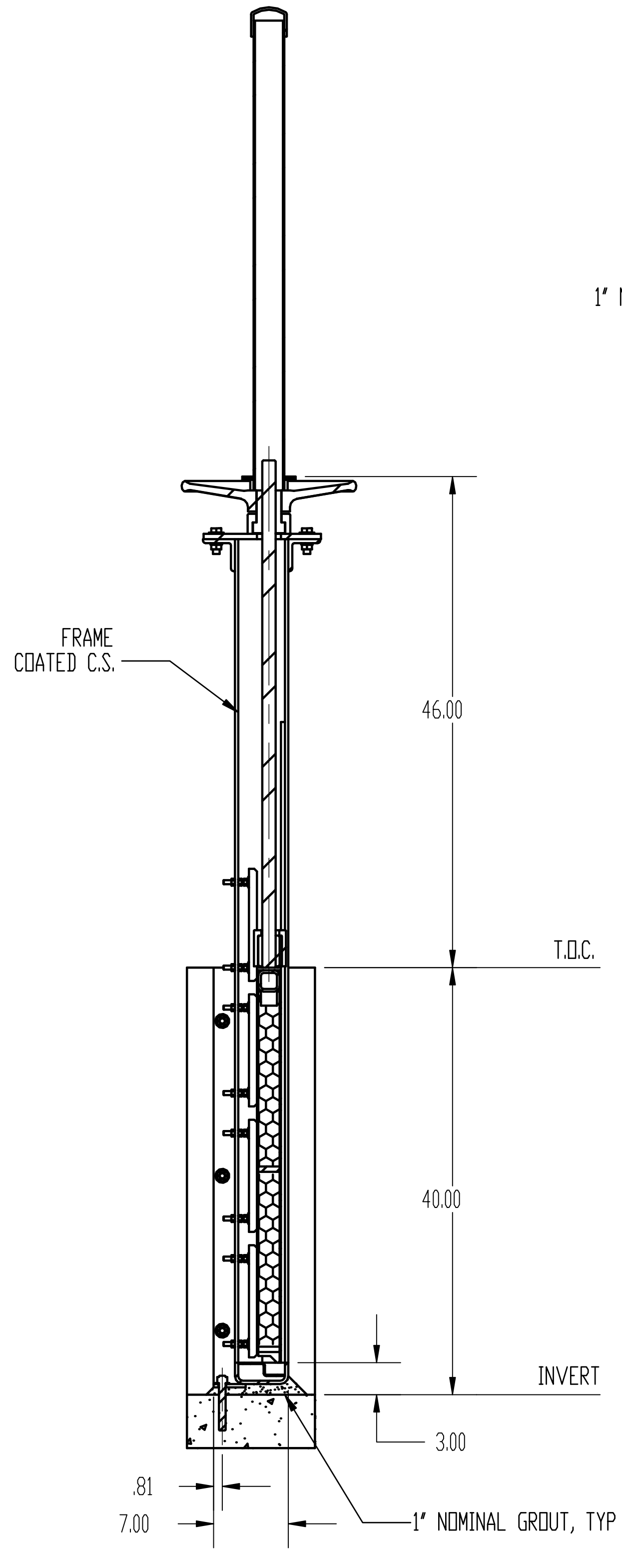
SCALE	DWG. NO.	REV
1:28	SK003349	0

CUSTOMER NEWPORT, NH

B4MATSW.Rev12

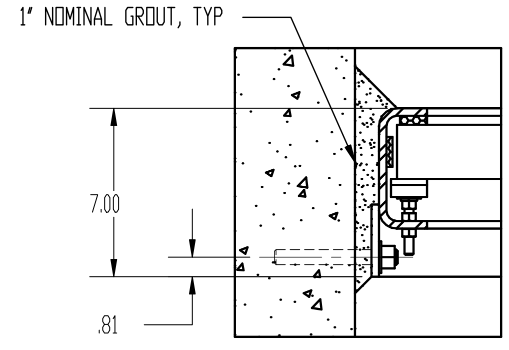


DOOR WILL STROKE UP
APPROXIMATELY 36"



SECTION A-A

NOTES:
1. CONFIRM ALL DIMENSIONS.
2. ALL HARDWARE IS 316 S.S.
3. DOOR DESIGNED FOR DOOR DEPTH HEAD.
4. QUANTITY: (1) GATE.



SECTION B-B
SCALE 1 : 8

TOLERANCE, UNLESS NOTED			REV	DATE	SUMMARY DESCRIPTION OF CHANGES	BY	APP	REV	DATE	SUMMARY DESCRIPTION OF CHANGES	BY	APP
	INCH	MILLIMETER	1	3/08	GATE WAS EMBEDDED - CHANGED TO FLUSH MOUNT	MCA	DY	7				
FRACTION	+/- 1/32"	N/A	2					8				
X.	+/- 0.100	+/- 3.0	3					9				
X.X	+/- 0.030	+/- 1.0	4					10				
X.XX	+/- 0.015	+/- 0.5	5					11				
X.XXX	+/- 0.005	+/- 0.1	6					12				

DRAWN	MCA	DATE	1/23/08
CHECKED	MCA	DATE	1/23/08
APPROVED	DY	DATE	1/23/08
NEXT ASS'Y	N/A	WEIGHT	380 lb

NOTE:
1) DEBURR ALL SHARP EDGES.
2) MARK FINISHED PARTS WITH PART NUMBER PER WORK ORDER OR PURCHASE ORDER.

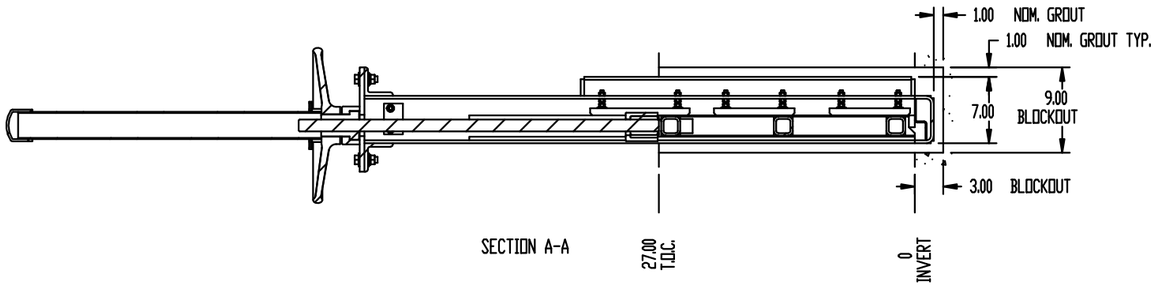
Ashbrook Simon-Hartley

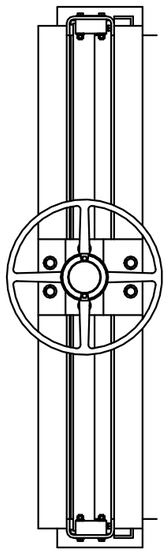
Ashbrook Simon-Hartley Operations LP
11600 East Hardy Rd.
Houston, Texas 77093
Phone: 281-449-0322
Fax: 281-449-1324

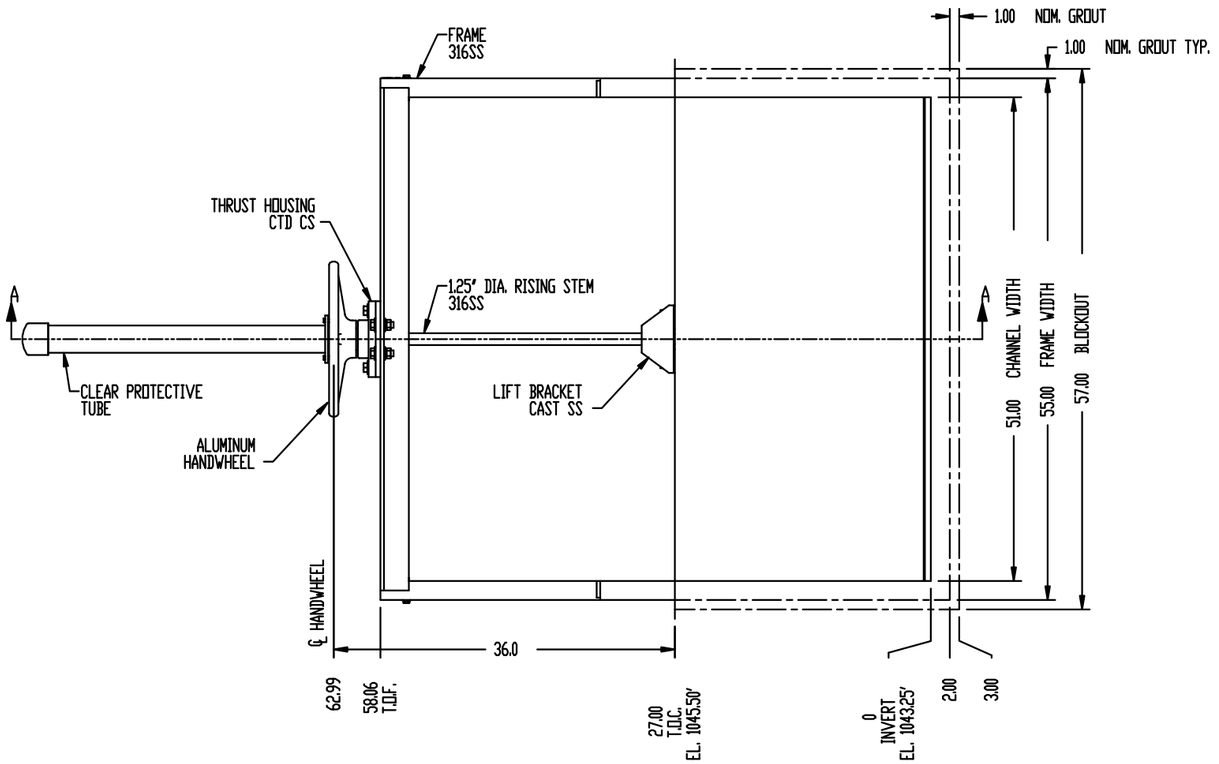
TITLE: 27 x 40 SGF DD ASSEMBLY

SCALE: 1:18
DWG. NO.: SK003384
REV: 1
CUSTOMER: WILLINGBORO, NJ

BAMATSVRev12







NOTES:
1) CONFIRM ALL DIMENSIONS.
2) ALL HARDWARE IS 316SS.
3) DOOR DESIGNED FOR 2' ON/OFF HEAD.
4) QUANTITY: 1 GATE.

TOLERANCE, UNLESS NOTED			REV	DATE	SUMMARY DESCRIPTION OF CHANGES	BY	APP
	INCH	MILLIMETER	1				
FRACTION	+/- 1/32"	N/A	2				
X.	+/- 0.100	+/- 3.0	3				
X.X	+/- 0.030	+/- 1.0	4				
X.XX	+/- 0.015	+/- 0.5	5				
X.XXX	+/- 0.005	+/- 0.1	6				

REV	DATE	SUMMARY DESCRIPTION OF CHANGES	BY	APP
7				
8				
9				
10				
11				
12				

DRAWN	MM	DATE 8/20/2009
CHECKED	MM	DATE 8/20/2009
APPROVED	MCA	DATE 8/20/2009
NEXT ASS'Y	N/A	WEIGHT 448 lbs

NOTE:
1) DEBURR ALL SHARP EDGES.
2) MARK FINISHED PARTS WITH PART NUMBER PER WORK ORDER OR PURCHASE ORDER.

Ashbrook Simon-Hartley

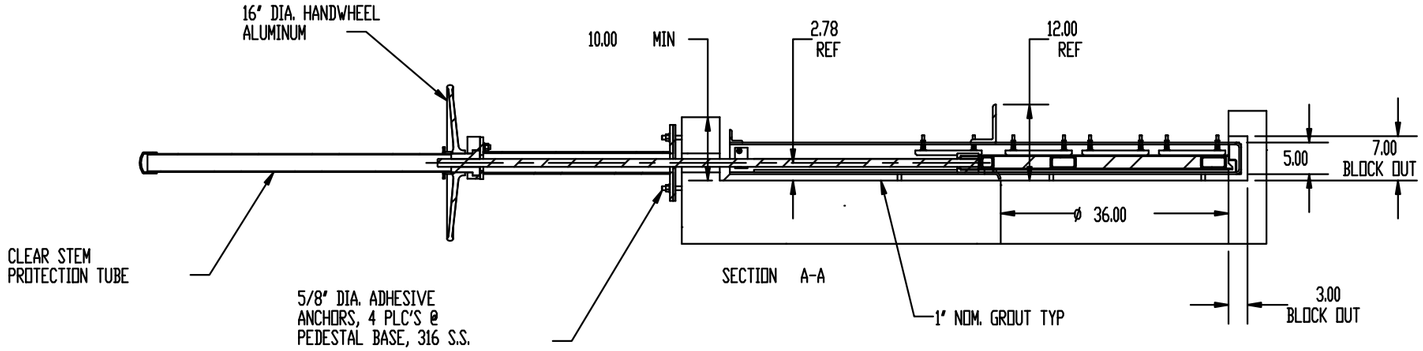
Ashbrook Simon-Hartley Operations LP
11600 East Hardy Rd.
Houston, Texas 77093
Phone: 281-449-0322
Fax: 281-449-1324

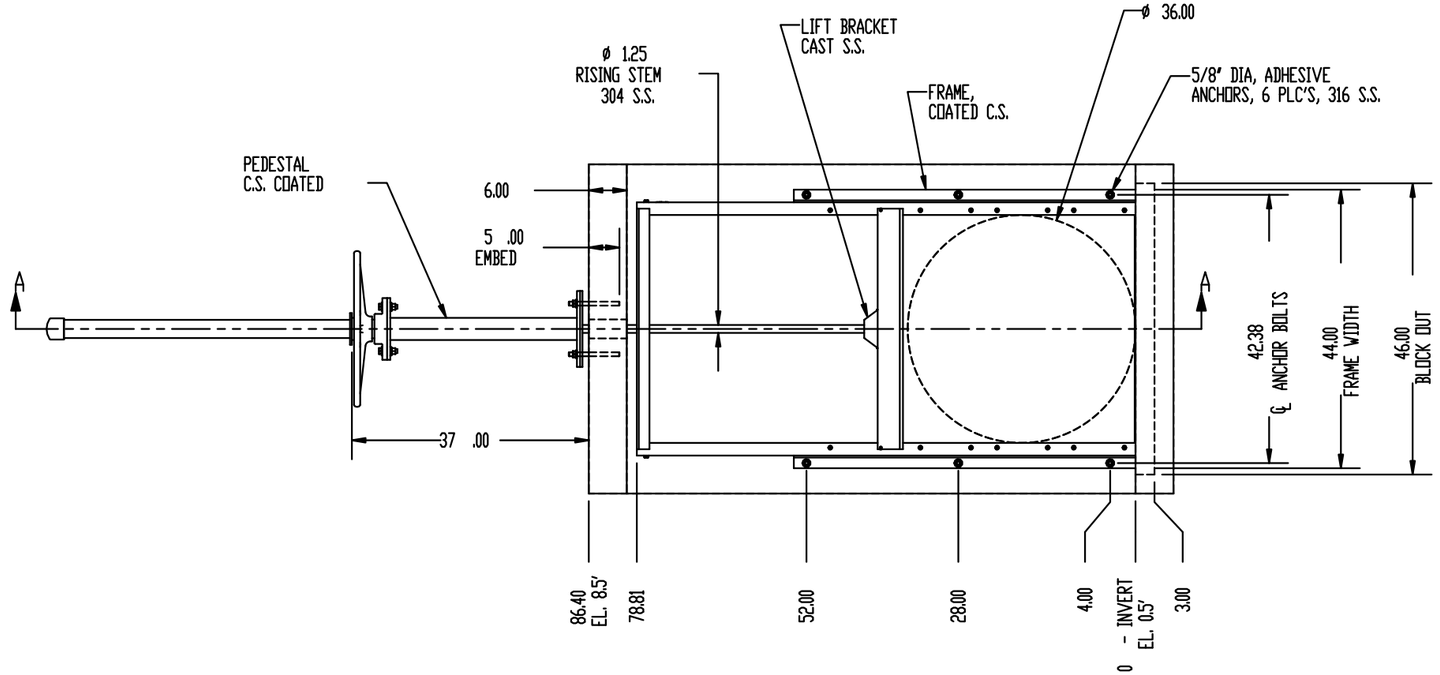
TITLE
GENERAL ARRANGEMENT
51 x 27 SGE D/D ASSY

SCALE	DWG. NO.	REV
1:16	SK003631	0

CUSTOMER MNT CARMEL

BMMATSV.Rev13





TOLERANCE UNLESS NOTED		
	INCH	MILLIMETER
FRACTION	+/- 1/32"	N/A
X.	+/- 0.100	+/- 1.0
X.X	+/- 0.030	+/- 0.5
X.XX	+/- 0.015	+/- 0.25
X.XXX	+/- 0.005	+/- 0.1

REV	DATE	SUMMARY DESCRIPTION OF CHANGES	BY	APP
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

DRAWN	RLD	6/25/2014
CHECKED	RLD	6/25/2014
APPROVED	RLD	6/25/2014
NEXT ASS'Y	N/A	WEIGHT 670 lb

NOTE:
1) DEBURR ALL SHARP EDGES.
2) MARK FINISHED PARTS WITH PART NUMBER PER WORK ORDER OR PURCHASE ORDER.

ALFA LAVAL
ASHBROOK SIMON-HARTLEY

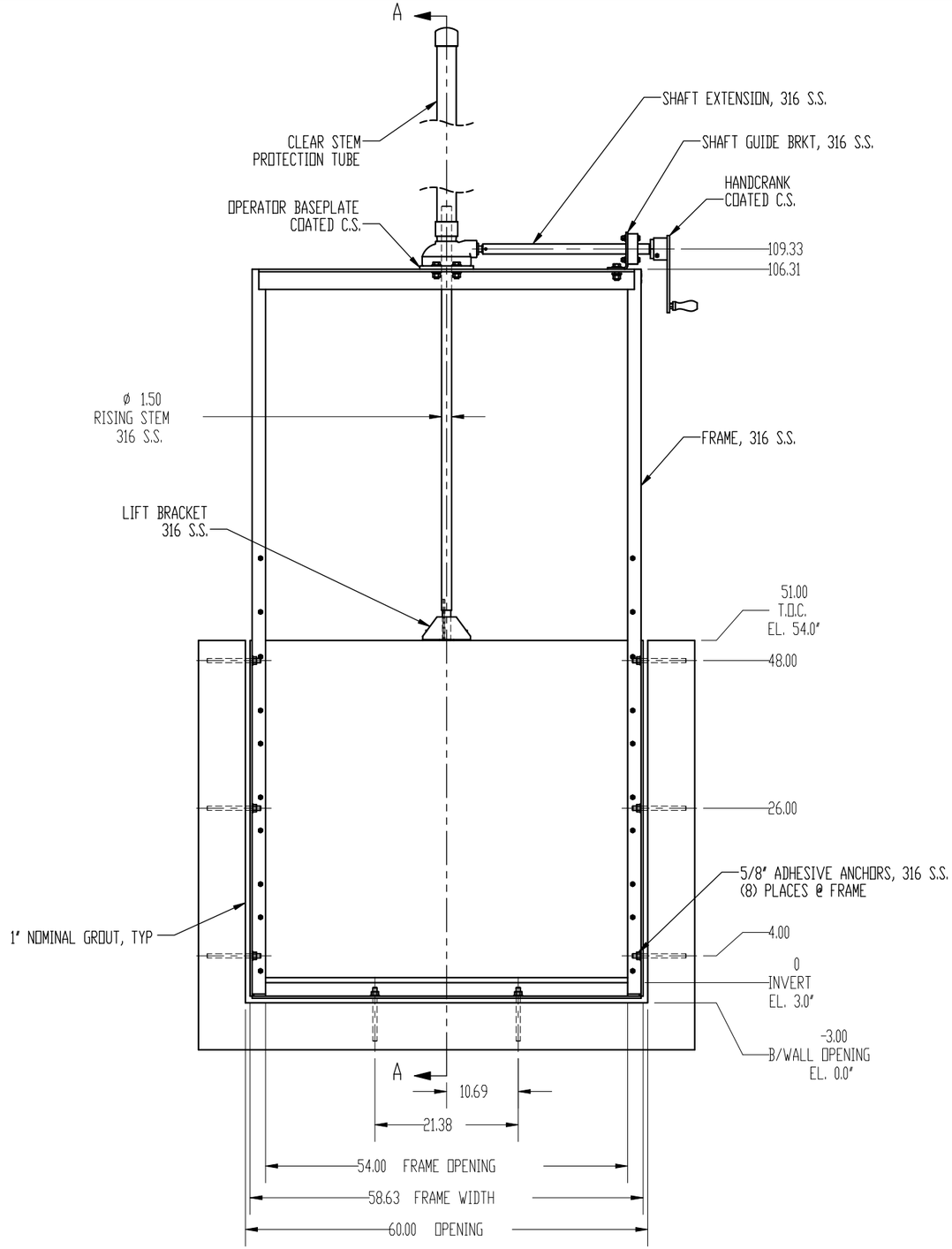
ALFA LAVAL ASHBROOK SIMON HARTLEY INC
11600 East Hardy Rd.
Houston, Texas 77093
Phone: 281-449-0322
Fax: 281-449-1324

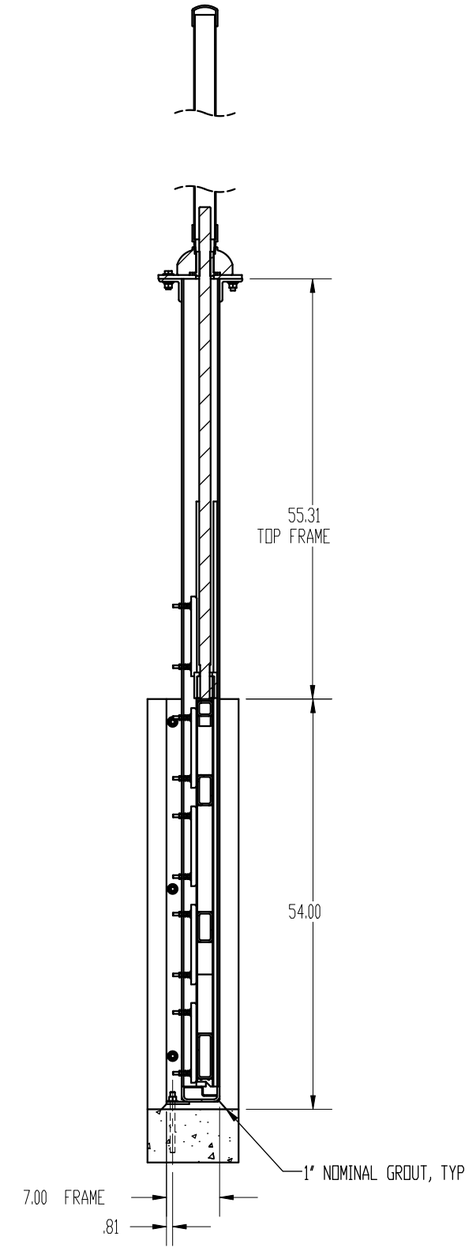
TITLE
36 x 36 SGF 8/8 ASSEMBLY

SCALE	DWG. NO.	REV
1:24	SK4428	0

CUSTOMER VERMILLION, LA

BAMATSV.Rev13





SECTION A-A

NOTES:
1. CONFIRM ALL DIMENSIONS
2. ALL HARDWARE IS 316 S.S.
3. DOOR DESIGNED FOR DOOR DEPTH HEAD
4. QUANTITY: (1) SLUICE GATE
   GATE No. 5

TOLERANCE UNLESS NOTED	INCH	MILLIMETER
FRACTION	+/- 1/32"	N/A
X.	+/- 0.100	+/- 1.0
X.X	+/- 0.030	+/- 0.5
X.XX	+/- 0.015	+/- 0.25
X.XXX	+/- 0.005	+/- 0.1

REV	DATE	SUMMARY DESCRIPTION OF CHANGES	BY	APP
1				
2				
3				
4				
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7				
8				
9				
10				
11				
12				

DRAWN	MCA	DATE 4/7/20
CHECKED	MCA	DATE 4/7/20
APPROVED	MCA	DATE 4/7/20
NEXT ASS'Y	N/A	WEIGHT 750 lb

NOTE:
1) DEBURR ALL SHARP EDGES.
2) MARK FINISHED PARTS WITH PART NUMBER PER WORK ORDER OR PURCHASE ORDER.

ALFA LAVAL

ALFA LAVAL INC
10470 Deer Trail Drive
Houston, Texas 77038
Phone: 281-449-0322
Fax: 281-449-1324

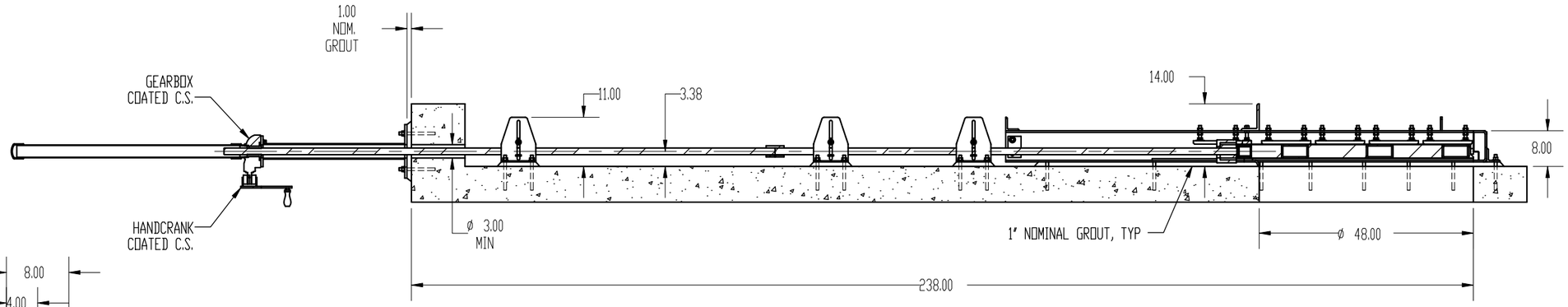
TITLE
GENERAL ARRANGEMENT
54 x 51 SGF DD ASSEMBLY
GATE No. 5

SCALE	DWG. NO.	REV
1:20	SK005086	0

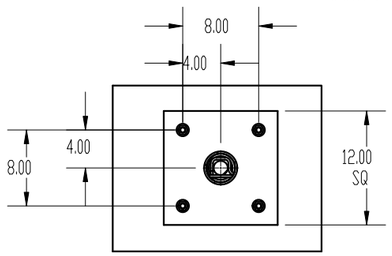
CUSTOMER MANATEE, FL

BAMATSV.Rev13

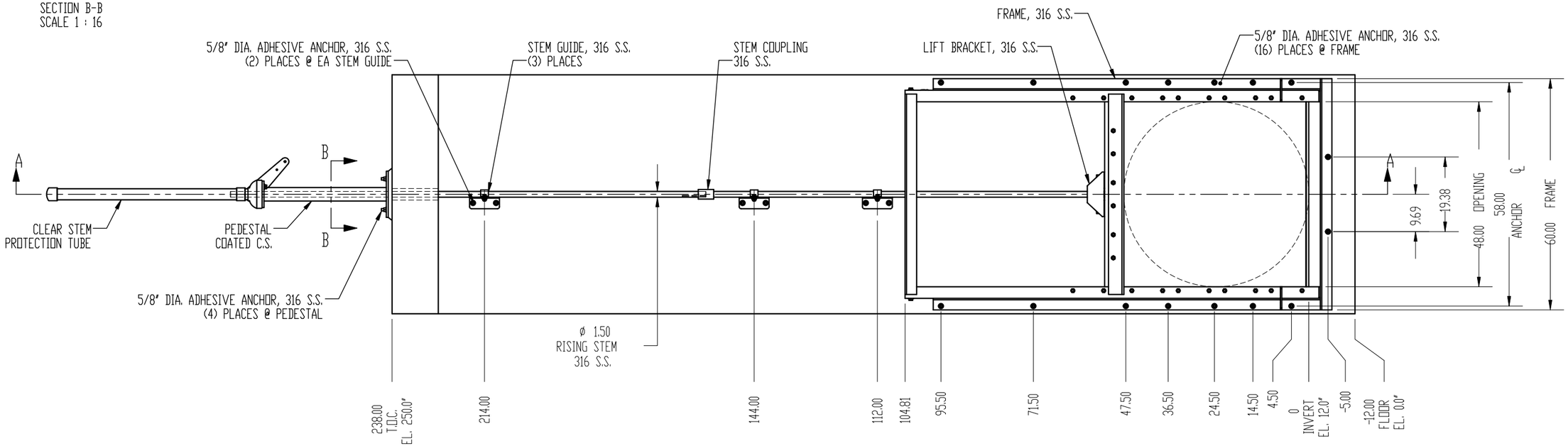
NOTES:
1. CONFIRM ALL DIMENSIONS
2. ALL HARDWARE IS 316 S.S.
3. DOOR DESIGNED FOR 18ft ON/OFF HEAD
4. QUANTITY: (1) SLUICE GATE
   GATE No. 17



SECTION A-A



SECTION B-B
SCALE 1 : 16



TOLERANCE UNLESS NOTED	INCH	MILLIMETER
FRACTION	+/- 1/32"	N/A
X.	+/- 0.100	+/- 1.0
X.X	+/- 0.030	+/- 0.5
X.XX	+/- 0.015	+/- 0.25
X.XXX	+/- 0.005	+/- 0.1

REV	DATE	SUMMARY DESCRIPTION OF CHANGES	BY	APP
1				
2				
3				
4				
5				
6				
7				
8				
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10				
11				
12				

DRAWN	MCA	DATE 4/7/20
CHECKED	MCA	DATE 4/7/20
APPROVED	MCA	DATE 4/7/20
NEXT ASS'Y	N/A	WEIGHT 1,400 lb

NOTE:
1) DEBURR ALL SHARP EDGES.
2) MARK FINISHED PARTS WITH PART NUMBER PER WORK ORDER OR PURCHASE ORDER.

ALFA LAVAL

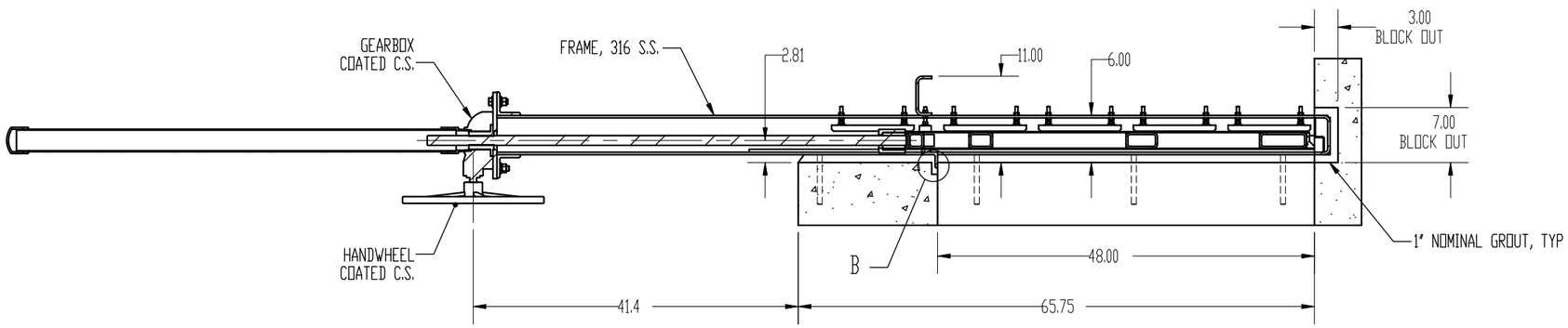
ALFA LAVAL INC
10470 Deer Trail Drive
Houston, Texas 77038
Phone: 281-449-0322
Fax: 281-449-1324

TITLE
GENERAL ARRANGEMENT
48 x 48 SGF 18/18 ASSEMBLY
GATE No. 17

SCALE	DWG. NO.	REV
1:28	SK005093	0

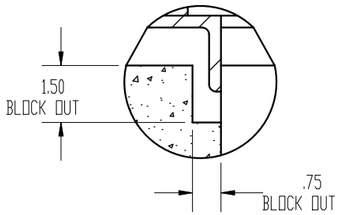
CUSTOMER MANATEE, FL

B4MATSV.Rev13

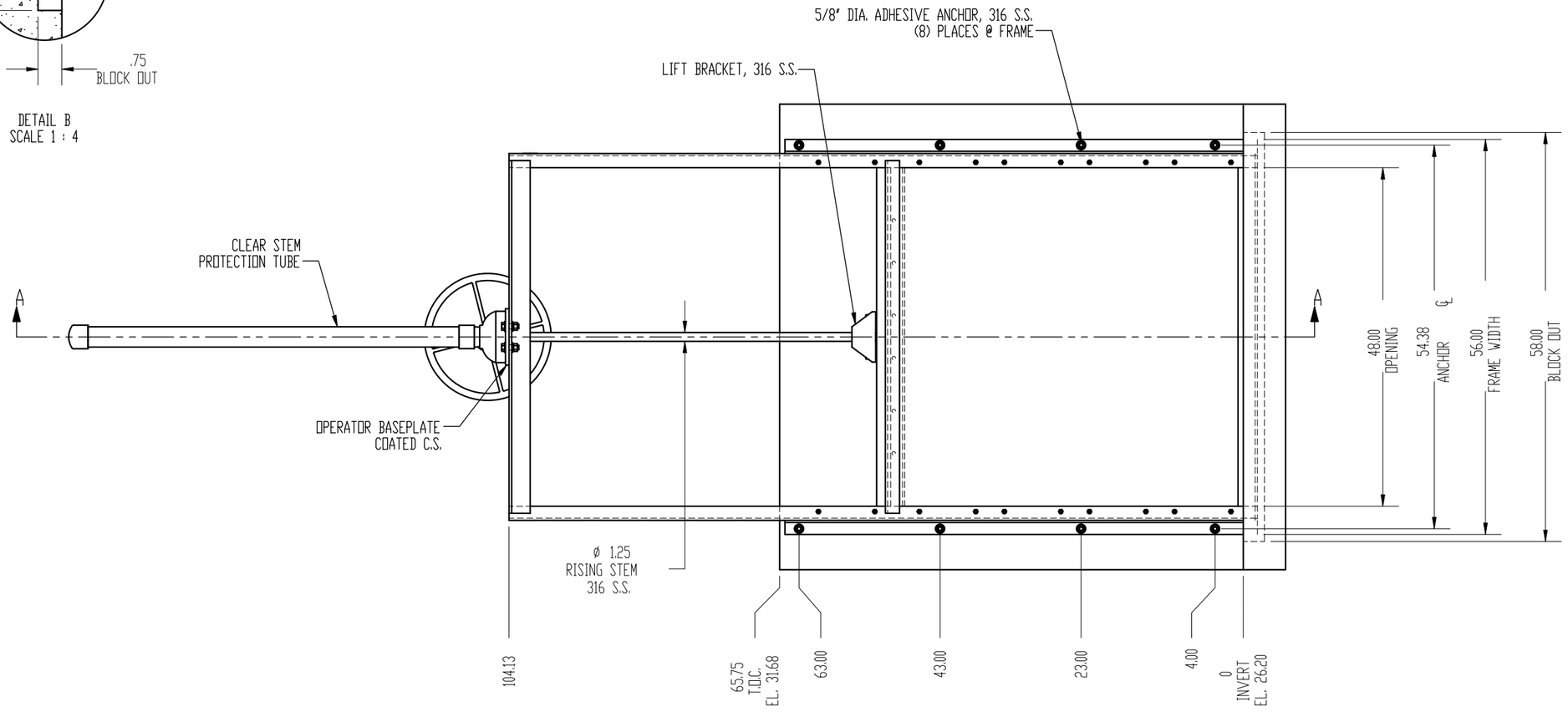


SECTION A-A

NOTES:
1. CONFIRM ALL DIMENSIONS
2. ALL HARDWARE IS 316 S.S.
3. DOOR DESIGNED FOR 5ft ON/OFF HEAD
4. QUANTITY: (8) SLUICE GATES
5. TAG IDs: SG-20311, SG-20312, SG-20313 SG-20314, SG-20315, SG-20316, SG-20317, SG-20318



DETAIL B
SCALE 1 : 4



TOLERANCE UNLESS NOTED	INCH	MILLIMETER
FRACTION	+/- 1/32"	N/A
X.	+/- 0.100	+/- 1.0
X.X	+/- 0.030	+/- 0.5
X.XX	+/- 0.015	+/- 0.25
X.XXX	+/- 0.005	+/- 0.1

REV	DATE	SUMMARY DESCRIPTION OF CHANGES	BY	APP
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

DRAWN	MCA	4/20/20
CHECKED	MCA	4/20/20
APPROVED	MCA	4/20/20
NEXT ASS'Y	N/A	WEIGHT 750 lb

NOTE:
1) DEBURR ALL SHARP EDGES.
2) MARK FINISHED PARTS WITH PART NUMBER PER WORK ORDER OR PURCHASE ORDER.

ALFA LAVAL

ALFA LAVAL INC
10470 Deer Trail Drive
Houston, Texas 77038
Phone: 281-449-0322
Fax: 281-449-1324

TITLE
48 x 48 SGF 5/5 ASSEMBLY
TAG IDs: SG-20311, SG-20312, SG-20313, SG-20314 SG-20315, SG-20316, SG-20317, SG-20318

SCALE	DWG. NO.	REV
1:18	SK005100	0

CUSTOMER: MANATEE, FL SWWRF

SECTION 11295

COPLASTIX SLIDE GATES

PART 1 - GENERAL

1.01 SCOPE OF WORK:

The work to be performed under this Section shall include furnishing all labor, materials, tools and equipment necessary to install and test all slide gates, consisting of, but not limited to frames, discs, seals, stems, operators, floor stands, stem guides, anchorage, and all other appurtenances, in place and complete, as manufactured by:
Alfa Laval, Inc., Houston, Texas. (800) 362-9041. Approved equals must be approved ten days prior to bid.

1.02 SUBMITTALS:

A. Materials and Shop Drawings:

1. Copies of all materials required to establish compliance with the specifications shall be submitted to the Engineer. Submittals shall include the following:

a. Certified shop and erection drawings and data regarding slide gates.

b. Literature on drawings describing the equipment and showing all-important details of construction and dimensions.

B. Operating Instructions: Operating and maintenance instructions for each type of slide gate shall be furnished to the Engineer.

C. Installation: The manufacturer shall provide installation instructions. The installation and adjustment of gates, operators and all accessories shall be in full accordance with these instructions. The slide gates shall be installed by the best practices and methods.

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING:

All equipment shall be delivered in suitable packaging, cases, or crates and stored or placed in the appropriate manner. Each package shall have an identifying mark and a complete list showing contents.

1.04 APPLICABLE PUBLICATIONS:

The following publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS. D635-81 Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position D648-82 Test Method for Deflection Temperature of Plastics Under Flexural Load NASA CR-1457, "Manual for Structural Stability Analysis of Sandwiched Plates and Shells" et al.

B. AMERICAN WATER WORKS ASSOCIATION (AWWA) C563 Standard for Composite Slide Gates.

1.05 WARRANTY AND GUARANTEE:

The Manufacturer shall guarantee the slide gates, when installed and operated as recommended by the Manufacturer, trouble-free operation for a period of ten (10) years. If the Owner or Engineer is not completely satisfied with the performance of the product, the Manufacturer shall remedy the problem at no cost or refund the materials and installation cost upon the return of the equipment The Manufacturer shall guarantee the following:

A. Leakage shall be no more than that allowed by the AWWA C563 Standard during the guarantee period.

B. Door (disc) shall be free of sticking or binding as judged by the Engineer (move freely via operator provided) with no exercising required. Gate operators are to be warranted by the operator manufacturer per their standard warranty.

C. No exception or revision shall be taken to the warranty.

1.06 OTHER:

A. All gates shall be fully assembled in their frames except for operators, guides, stem-extension, and stem covers or concrete-mounted pedestals. Where shipping constraints require it, frame may be partially assembled such that the top may be easily mounted to the bottom containing the disc.

B. Where square-to-circular or bell-lip conversion is required the Contractor shall provide a bell-end pipe insert of suitable diameter and water stop.

C. P-Bulb or J-Bulb type seals attached to the Disc / mounted to the frame, or any seal that needs replacement in less than 20 years shall not be acceptable. No part of the seal shall protrude into the clear opening.

D. All slide gates shall be supplied by the same manufacturer, who shall be fully experienced, reputable and qualified in the manufacturing of the specified equipment. The manufacturer of the specified equipment will have built specified equipment and show installations in the US both in excess of ten (10) years.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS:

Slide gates shall be designed for the seating and unseating heads as listed in the gate schedule. Slide gates shall exceed the standard of AWWA C563. Exceeding the conformance to AWWA C563 applies to discs and frames with a safety factor of five (5) with regard to tensile, compressive and shear strength and with the requirement that all gates will yield no more leakage than shown in Section 6.8 (AWWA) Field Leakage Test. Materials of construction shall be suitable for the environment in which the slide gates shall be installed and operated.

A. Frames – Carbon Steel that is Flame Sprayed with 100% pure zinc (4 to 6 Mils) & Epoxy Coated (min. 14 mils DFT) with a 5/16” minimum metal thickness for all items. Frames are wall or recessed mounted using a 1” nominal grout; no thimbles or flanges are needed or included.

B. Slide (Disc): Shall be constructed with a reinforced rigid composite skin, having a minimum thickness of 1/8-inch on the outside. Slide (disc) shall have an internal matrix of carbon steel of suitable strength for the specified service. The total minimum slide thickness should not be less than 2”. The slide (disc) outer surface skins shall be a homogeneous plastic material having extremely high tensile and impact strength, be nontoxic and shall be stabilized against ultraviolet light. The plastic material shall be an Aramid fiber from the KEVLAR family of fibers, and shall have the following minimum properties and shall be designed to limit the deflection to a maximum of 1/1000 of the span under design head conditions based upon horizontal support members only. Manufacturer shall submit drawings and comprehensive design criteria to substantiate that the required deflection figure for each door has been achieved. Safety factors shall be calculated for the disc under maximum head, and shear at the disc/seal interface. No substitute of fiber type will be acceptable.
FRP, GRP, plastic coated steel or externally reinforced slide (disc) shall not be acceptable. All welds on the slide shall be continuously welded and no stitch welding to be allowed.

PROPERTIES TABLE

Tensile Strength	15,400
Young's Modulus	1,756,000 psi
Flexural Strength	28,000 psi
Flexural Modulus	1,497,000 psi
Compressive Strength	30,200 psi
Impact Strength	9.65 ft-lb/in
Water Absorption	0.09 %
Specific Gravity	1.72
Coefficient of Thermal Expansion	1.6×10^{-5} per C
Heat Distortion Point	80 degrees C ASTM D648
Low Temperature Impact Strength	93% @ -20 C
Notch Sensitivity	Not notch sensitive
Weathering Properties	Excellent
Fire Resistance	Class 1 Spread of Flame, Rating BS476: Part 1: 1953 self-extinguishing, ASTM D635 - 56R
Chemical Resistance	Organics, Alkaline, Ozone (2 to 3 PPM)

Rigid Polyurethane foam shall be used as filler between the steel grid reinforcing system and shall be a min. of 7 LB density/cu.ft.

C. Seals: The sealing arrangement for the reinforced plastic slide gates shall comprise of sealing faces and side guides constructed of ultra high molecular weight polyolefin having an extremely low coefficient of friction and a backing constructed of highly resilient expanded neoprene. Guides and seating of the gate shall be easily adjustable (min. 5/8-inch). All moving contact surfaces shall be compatible to each other there by minimizing sticking / jamming and making the operation easy. Leakage rates shall be one-half (½) that allowed by AWWA C563.

2.03 FASTENERS:

Shall be 316 stainless steel. All anchor bolts, assembly bolts, screws, nuts, etc. shall be of ample section to safely withstand the forces created by operation of the gate while subjected to the heads specified.

2.04 STEMS:

All stems shall be the rising types. The entire stem, including extension stem, shall be Type 304 Stainless Steel solid bar. The sections of extension stems shall be joined together by solid couplings, threaded and keyed to the stems. All couplings of the same size shall be interchangeable.

Stems shall be furnished with adjustable, stem guides, spaced as necessary to maintain a slenderness ratio L/R of less than 200. Stems shall be of ample cross section to prevent distortion and shall have stub acme threads. Stems shall be designed to withstand tensile and compressive loads that occur under maximum operating conditions. Design for compressive loading shall meet AISC code where K=1 with a minimum safety Factor of 2 to 1. These requirements exceed AWWA standards. Stems shall be cold rolled or cut with a double start stub acme thread and a finish of 32 microns or less.

Stems shall be fixed to the disc by a threaded and keyed assembly into a lifting nut attached to the disc in a lifting bracket, which is bolted to the disc. The bolts securing the bracket shall be in tension and not shear. Bolts in shear will not be acceptable as they will bind against the outer material causing stress.

PART 3 – EXECUTION

3.01 INSTALLATION

Installation of all gates and guides shall be done by the Contractor in a manner acceptable to the Manufacturer and Owner. It shall be the responsibility of the Contractor to handle, store, and install the equipment specified in this Section in strict accordance with the Manufacturer's drawings and recommendations. Frames and guides shall be installed in a true vertical plane with 90-degree corners.

3.02 INSPECTION AND TESTING

A. Furnish the services of a factory representative for one (1) day who has complete knowledge of proper operation and maintenance to inspect the final installation and supervise a test run of the equipment.

B. Maximum gate leakage shall be as defined in the General Design Criteria of this Specification, herein. If gates, operators, and appurtenances do not meet specified requirements, corrective measures shall be taken by the Contractor, or the equipment shall be removed and replaced with equipment that satisfies the conditions specified.

END OF SECTION

Fontaine Aquanox

Water Control Gates

Stainless Steel Slide Gates

Standardized Gates

UP TO

48" (1200mm)

IN STOCK!

To get your specifications, drawings and prices, visit us at **fontaine-aquanox.com**

100%
AWWA C561-14
COMPLIANT

CERTIFICATION TO
NSF/ANSI 61
AVAILABLE ON REQUEST

DETAILED ENGINEERING

Fontaine-Aquanox has been a global leader in fabricated slide gate design for more than a generation, engineering high quality products to meet a variety of flow control applications. We strive for excellence in all aspects of the business from design assistance and support to installation and after-market service. We are fully committed to our customers and we will continue to develop the most cost-effective slide gate solutions to meet the challenging needs of the municipal and industrial water control market.

INNOVATION

With our ongoing investment in research and new technologies, we are continually developing new design, manufacturing and installation solutions that make our gates the most cost-effective in the industry. Our self-adjusting seal technology outperforms the AWWA Standard and is far ahead of the marketplace with long-term tight sealing that extends the life of the gate and eliminates the need for maintenance. This and other innovative solutions allow us to provide the best products and services to meet your needs.

QUALITY

Fontaine-Aquanox brings exceptional quality to every project from design to manufacturing and testing. We are one of the few manufacturers in the industry to fully test all wall mounted, four side sealing gates for both operation and leakage performance as standard operating procedure. ISE Metal has ISO 9001 in many of its facilities.

SERVICE

The measure of a great manufacturer is their dedication to customer service. From quotations to design to installation, **Fontaine-Aquanox** maintains a sharp focus on customer satisfaction and service. Skilled, highly trained specialist are always available to help with your gate selection or installation requirements.

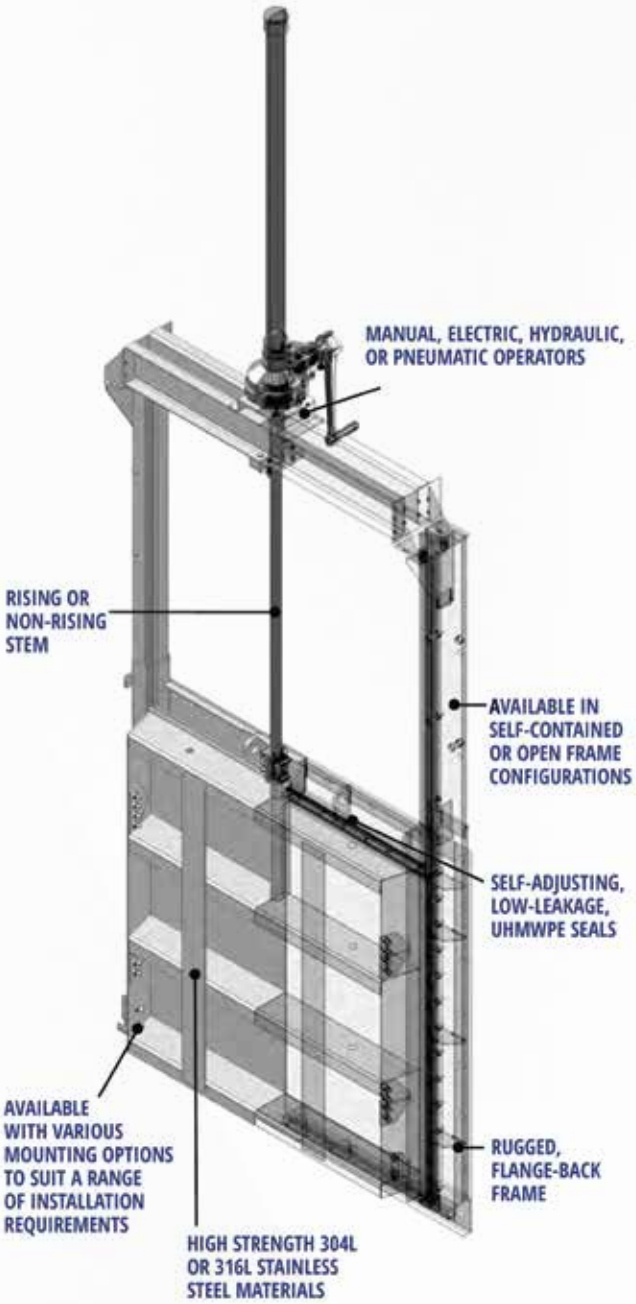
Fontaine Aquanox
Water Control Gates

SERIES 20, 25 and 40

Fabricated Stainless Steel Slide Gates

Solid stainless steel construction and high corrosion and erosion resistance ensures many years of trouble free operation. The one-piece welded, flange-back frame design makes all Series 20, 25 and 40 gates robust and durable.

Fontaine-Aquanox Series 20, 25 and 40 Fabricated Stainless Steel Gates fully comply with AWWA Standard C-561 and NSF-61 certified for potable water applications.



Guaranteed Leakage Rate

All gates have a guaranteed leakage rate tested below the AWWA C-561 standard and other worldwide standards.

Unique Self-Adjusting Seals

Side and top seals are self-adjusting type, constructed of UHMWPE (Ultra-high Molecular Weight Polyethylene) with EPDM compression cords which assure long term tight sealing.

Rugged and Corrosion Resistant

High strength 304L or 316L stainless steel materials provide long-term corrosion resistance, increasing the service life of the slide gate.

Mounting Flexibility

Slide gates are available for wall mounting, in-channel mounting on existing concrete surfaces or embedded into new concrete walls. Also available are radius mounting flanges for circular manhole installations.

Ease of Installation

Fontaine-Aquanox gates are typically wall mounted directly to a concrete wall using an EPDM gasket. This means that NO grouting or thimbles are required in most installations. Gates arrive at the jobsite fully assembled and fully adjusted, ready for install.

Tested and Certified

Fontaine-Aquanox Series 20, 25 and 40 slide gates have successfully undergone stringent 25,000 cycle testing to ensure long term reliability. Every gate is rigorously tested prior to leaving the factory.

Maintenance-free

Self-adjusting seal design eliminates maintenance required vs. competitive "J" Bulb seal designs. Seals have no metal-to-metal contact to ensure no sticking, even after years of non-operation.

All Fontaine-Aquanox slide gates are versatile, durable, easy to install and require little or no maintenance.

Series 20 Sluice Gates

Fontaine-Aquanox Sluice Gates are made entirely of stainless steel and UHMWPE. Thus they have very high corrosion and erosion resistance, ensuring many years of trouble free operation with minimum maintenance. Series 20 sluice gates also have a one-piece welded flange-back frame design that makes them extremely robust.

Series 25 Channel Gates

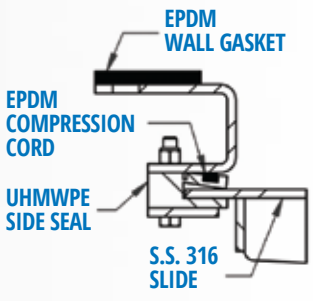
The Series 25 **Fontaine-Aquanox** Channel Gate can be adapted to all types of channels and applications. **Fontaine-Aquanox** Channel gates feature a flange back frame made of stainless steel 304L or 316L along with a reinforced slide. It is solidly built in one piece which permits easy installation.

Series 40 Weir Gates

The **Fontaine-Aquanox** Downward Opening Weir Gate is used primarily for flow control and level control applications where the slide drops down to open and the flow is over the top of the gate. Series 40 Weir Gates feature a stainless steel flange back frame and reinforced slide.

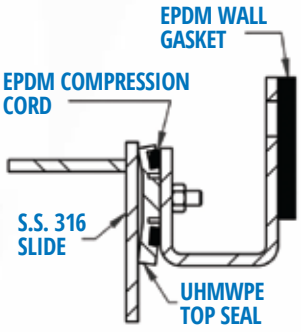
Exclusive UHMWPE Seals

The side and top seals of the Series 20, 25 and 40 slide gates are made from self-lubricating ultra-high molecular weight polyethylene (UHMWPE) allowing no metal-to-metal contact. With a friction coefficient of 0.2, the seals make the gate easy to operate, even after long periods of non-operation. The “self-adjusting” feature is achieved by a continuous compression cord that ensures a tight seal between the slide and the frame in both seating and unseating conditions. The wedging action of the compression cord enables the gate to control flow by only permitting flow through the open area of the gate. The remaining perimeter remains sealed providing a gate highly suitable for throttling applications.



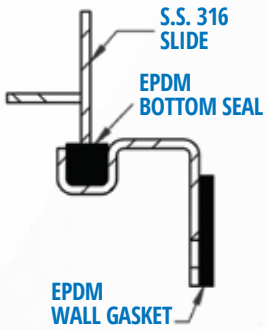
Side Seal

Flanged back design for wall mounting with self-adjusting UHMWPE seal and EPDM Gasket.



Top Seal

UHMWPE Seal with twin contact surfaces and two compression cords.



Bottom Seal

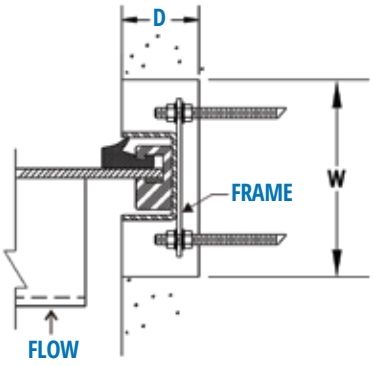
Resilient EPDM seal forms flush bottom.

FLAP GATES - Series 60 and Series 70

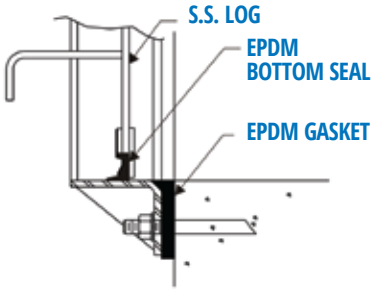
The **Fontaine-Aquanox** Flap Gates are the simplest way to prevent flow of water from returning back up pipes or conduits. The gate design is such that whatever the size, a small flow will open the gate in negative pressure but it will remain watertight under positive pressure. The flap can be adjusted (on models > 24") to open under a specific head of water since its adjustable hinges can be adjusted to modify the force needed to push the flap.
A self-lubricating UHMWPE bushing in the hinges prevents any metal-to-metal contact, thereby reducing friction and easing operation. Even if the flap is not used for long periods of time there is little risk the hinges will rust or seize.
Available in square sizes

STOP LOGS – Series 95

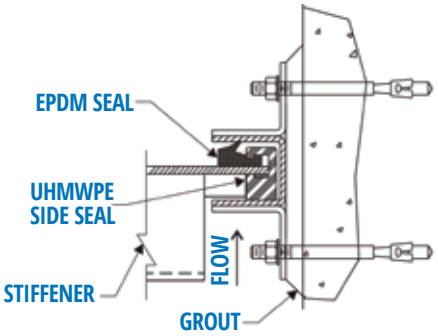
The **Fontaine-Aquanox** Series 95 Stop Logs are an easy and economical way to control flow in a channel and isolate other equipment for repair or maintenance. Their lightweight construction makes them easy to handle and the UHMWPE guides eliminate all metal-to-metal contact between the log and the frame, thereby allowing the logs to slide up and down with minimal friction.
The logs can be supplied in either stainless steel or aluminum and can be either wall mounted or embedded into the concrete.



S95 Side embedded



S95 Bottom wall mount



S95 side frame wall mount

Engineered Flow Control Products from Fontaine-Aquanox

- **Sluice Gates –** Four side sealing, Stainless Steel
- **Channel Gates –** Three Side Sealing, Stainless Steel
- **Weir Gates –** Three or Four Side Sealing, Stainless Steel
- **Stop Plates –** Three Side Sealing, Stainless Steel or Aluminum
- **Stop Logs –** Stainless Steel or Aluminum
- **Bulkhead Gates –** Stainless Steel
- **Flap Gates –** Stainless Steel

Actuation

Fontaine-Aquanox can offer many options for actuation ranging from manual, electric or hydraulic systems.

Service

Our team of inside sales representatives and engineers have a wealth of slide gate knowledge and are able to assist you with your slide gate design. We can offer drawings, details, specification and budget pricing. Just call to inquire.

Fontaine-Aquanox offers the very best in on-site service, field inspection and commissioning.
Our on-site service can be done either through our local factory trained service representatives or directly from our dedicated service team.

For More Information about **Fontaine-Aquanox** products or to contact a local sales representative please visit our website at **fontaine-aquanox.com**

Fontaine Aquanox
Water Control Gates

DESIGNED AND MANUFACTURED
BY **FONTAINE-AQUANOX**
A division of ISE Metal Inc.

20 Windsor Road,
Sherbrooke, Quebec, Canada J1C 0E5
1-855-769-0157
info@fontaine-aquanox.com

QUOTATION NO: 19885 BUDGET

Division of ISE METAL Inc.
20 Windsor Rd
Sherbrooke, QC
J1C 0E5
Ph.: 819-769-0157
www.ISEaquanox.com
info@ISEaquanox.com

Date: 2021-06-23

To: MS Consultants

Att of:

PROJECT: Alum creek Water reclamation Facility
Delaware County OH

Itm	Description		Qty	Unit USD	Total USD
01	Tag:	**UV 1 TO 5** Fontaine-Aquanox Series 20 Slide Gate Model: 204-P4B-24x36-B-CW/EC-7 Dimensions: 24in x 36in Design Pressure (On/Off): 7,0ft/7,0ft Installation depth: 7,50ft Open frame, Single Rising Stem Mounting: Face of Wall Material: 304L stainless steel Operator: Pedestal mounted electric actuator Anchors not-included (Dia.: 0,50in, Qty=38) Certification: AWWA C561-14	5	13 505	67 525
02	Tag:	Fontaine-Aquanox Series 20 Slide Gate Model: 204-P4B-48x36-B-CW/EC-7 Dimensions: 48in x 36in Design Pressure (On/Off): 7,0ft/7,0ft Installation depth: 7,50ft Open frame, Single Rising Stem Mounting: Face of Wall Material: 304L stainless steel Operator: Pedestal mounted electric actuator Anchors not-included (Dia.: 0,50in, Qty=49) Certification: AWWA C561-14	1	15 381	15 381
03	Tag:	Fontaine-Aquanox Series 20 Slide Gate Model: 204-P4B-72x36-B-CW/EC-7 Dimensions: 72in x 36in Design Pressure (On/Off): 7,0ft/7,0ft Installation depth: 7,50ft Open frame, Single Rising Stem Mounting: Face of Wall Material: 304L stainless steel Operator: Pedestal mounted electric actuator Anchors not-included (Dia.: 0,50in, Qty=60) Certification: AWWA C561-14	2	16 149	32 298
04	Tag:	Fontaine-Aquanox Series 20 Inverted Slide Gate Model: 204-P4B-66x48-B-EC/CW-8-INV Dimensions: 66in x 48in Design Pressure (On/Off): 8,0ft/8,0ft Installation depth: 8,00ft Open frame, Single Rising Stem Mounting: Face of Side Walls Material: 304L stainless steel Operator: Pedestal mounted electric actuator Anchors not-included (Dia.: 0,50in, Qty=46) Certification: AWWA C561-14	2	17 859	35 718

05	Tag:	Fontaine-Aquanox Series 20 Slide Gate Model: 204-P4B-78x36-B-EC-7 Dimensions: 78in x 36in Design Pressure (On/Off): 7,0ft/7,0ft Installation depth: 7,50ft Open frame, Single Rising Stem Mounting: Face of Side Walls Material: 304L stainless steel Operator: Pedestal mounted electric actuator Anchors not-included (Dia.: 0,63in, Qty=64) Certification: AWWA C561-14	1	18 784	18 784

	Sub-Total:	169 706
	Freight Charges:	1 700
Field Service:	(0 visits, 0 days on site):	-
	Total Net Price (USD):	**171 406**

NOTES: **<u>According to : June 17th Email.</u>**

1. Note that gates, stop logs and stop plate frames cannot always be shipped 100% assembled and might require some field assembly. Stems need to be aligned, operators installed and long self contained gate frames (>10ft - 3m) assembled. This is part of gate installation and common to all manufacturers, per industry standards. Detailed instructions are available in our manuals available online.

2. Please note that the American Iron and Steel (AIS) requirement of projects funded by EPA's SRF do NOT apply to gates. Gates are mechanical equipment, and have been specifically excluded from the list of equipment covered by AIS requirements.

CONDITIONS:

Lead Times:

Submittal Drawings:	3-4	Weeks
Gate(s) Shipment:	10-12	Weeks after approval
Actuator(s) Shipment:	14-16	Weeks after approval

Above lead times are based on average shop loading and are subject to change depending on actual work load at the time of the order.

Taxes:	All applicable taxes extra
Currency:	USD
Payment Terms:	Net 30 days
Freight (Incoterms):	FCA (freight prepaid) to destination Via LTL dry box, not unloaded.
Validity:	60 days
Field Service:	Not included, unless indicated in price above If required: 850/day, plus travel and living expenses

<u>François Laguë</u>
Inside Sales Representative
francois.lague@iseaquanox.com
819-769-0157 ext 365

<u>For more information on this quote:</u>

Jim Steele
Rawdon Myers, Inc.
300 Milford Parkway,Milford, OH 45150
513-965-6693 Cell: 513-600-6817
jims@rawdonmyers.com

SERIES 40 DOWNWARD-OPENING WEIR GATES

1. GENERAL CONDITIONS

1.1. SCOPE. This section covers Stainless Steel Downward Opening Weir Gates and operators.

1.2. GENERAL. The equipment provided under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer unless exceptions are noted by the engineer.

Gates and operators shall be supplied with all the necessary parts and accessories indicated on the drawings, specified or otherwise required for a complete, properly operating installation and shall be the latest standard product of a manufacturer regularly engaged in the production of water control gates.

Weir gates supplied under this section shall be Series 40 Stainless Steel Downward Opening Weir Gates as manufactured by H.Fontaine Ltd.

1.3. GOVERNING STANDARDS. Except as modified or supplemented herein, all gates and operators shall conform to the applicable requirements of AWWA C513, latest edition.

1.4. QUALITY ASSURANCE

1.4.1. The manufacturer shall have experience in the production of substantially similar equipment, and shall show evidence of satisfactory operation in at least 50 installations. The manufacturer's shop welds, welding procedures and welders shall be qualified and certified in accordance with the requirement of the latest edition of ASME, Section IX.

1.4.2. Weir gates shall be shop inspected for operation before shipping.

1.4.3. The manufacturer shall be ISO 9001 : 2000 certified.

1.5. SUBMITTALS. The manufacturer shall submit, for approval by the purchaser, drawings showing the principal dimensions, general construction and materials used in the gate and lift mechanism.

2. PERFORMANCE

2.1. LEAKAGE. Weir gates shall be substantially watertight under the design head conditions. Leakage shall not exceed 0.05 U.S. gallon per minute per foot (0.60 l/min per meter) of seal periphery under the design seating head and 0.1 U.S. gallon per minute per foot (1.25 l/min per meter) of seal periphery for the design unseating head.

2.2. DESIGN HEAD. Weir gates shall be designed to withstand the design head (maximum design head shall be taken as the height of the slide unless otherwise shown in the schedule).

2.3. SEAL PERFORMANCE TEST. The weir gate's sealing system should have been tested through a cycle test in an abrasive environment and should show that the leakage requirements are still obtained after 25,000 cycles with a minimum deterioration.

3. PRODUCT

3.1. WEIR GATES

3.1.1. GENERAL DESIGN. Weir gates shall be either self-contained or non self-contained, and of the rising stem or non-rising stem configuration, as indicated on the gate schedule.

3.1.3. FRAME. The gate frame shall be constructed of structural members or formed plate welded to form a rigid one-piece frame. The frame shall be of the flange back design, suitable for mounting on a concrete wall (CW). The guide slot shall be made of UHMWPE (ultra high molecular weight polyethylene).

3.1.4. SLIDE. The slide shall consist of a flat plate reinforced with formed plates or structural members to limit its deflection to 1/720 of the gate's span under the design head.

3.1.5 GUIDES AND SEALS. The guides shall be made of UHMWPE (ultra high molecular weight polyethylene) and shall be of such length as to retain and support at least two thirds (2/3) of the vertical height of the slide in the fully open position.

The bottom and side seals shall be made of UHMWPE (ultra high molecular weight polyethylene) of the self-adjusting type. A continuous compression cord shall ensure contact between the UHMWPE guide and the gate in all positions. The sealing system shall maintain efficient sealing in any position of the slide and let the water flow only in the open part of the gate.

Seals shall maintain the specified leakage rate in both seating and unseating conditions.

3.2. OPERATORS AND STEM

3.2.1. STEM AND COUPLINGS. The operating stem shall be of stainless steel designed to transmit in compression at least two (2) times the rated output of the operating manual mechanism with a 40 lbs (178 N) effort on the crank or handwheel.

The stem shall have a slenderness ratio (L/r) less than 200. The threaded portion of the stem shall have machine cut threads of the Acme type.

Where a hydraulic, pneumatic or electric operator is used, the stem design force shall not be less than 1.25 times the output thrust of the hydraulic or pneumatic cylinder, with a pressure equal to the maximum working pressure of the supply or 1.25 times the output thrust of the electric motor in the stalled condition.

3.2.1.1. For stems in more than one piece and with a diameter of 1 ¾ inches (45 mm) and larger, the different sections shall be joined together by solid bronze couplings. Stems with a diameter smaller than 1 ¾ inches, shall be pinned to an extension tube.

The couplings shall be grooved and keyed and shall be of greater strength than the stem.

3.2.1.2. Gates having width equal to or greater than two times their height shall be provided with two lifting mechanisms connected by a tandem shaft.

3.2.2. STEM GUIDES. Stem guides shall be fabricated from type 304L (or 316L) stainless steel. The guide shall be equipped with an UHMWPE bushing. Guides shall be adjustable and shall be spaced in accordance with the manufacturer's recommendation. The L/r ratio shall not be greater than 200.

3.2.3. STEM COVER. Rising stem gates shall be provided with a clear polycarbonate stem cover. The stem cover shall have a cap and condensation vents as well as a clear mylar position indicating tape. The tape shall be field applied to the stem cover after the gate has been installed and positioned.

3.2.4. LIFTING MECHANISM. Manual operators of the types listed in the schedule shall be provided by the gate manufacturer.

All bearings and gears shall be totally enclosed in a weather tight housing. The pinion shaft of crank-operated mechanisms shall be constructed of stainless steel and supported by roller or needle bearings.

Each manual operator shall be designed to operate the gate under the maximum specified seating and unseating heads by using a maximum effort of 40 lbs (178 N) on the crank or handwheel, and shall be able to withstand, without damage, an effort of 80 lbs (356 N).

The crank shall be removable and fitted with a corrosion resistant rotating handle. The maximum crank radius shall be 15 inches (381 mm) and the maximum handwheel diameter shall be 24 inches (610 mm).

3.2.5. YOKE. Self-contained gates shall be provided with a yoke made of structural members or formed plates. The maximum deflection shall be 1/360 of the gate's span.

4. MATERIALS

PART	MATERIAL
Frame, yoke, stem guides, slide, stem extension	Stainless steel ASTM A-240 type 304L or 316L
Guides, side and bottom seals, stem guide liner	Ultra high molecular weight polyethylene (UHMWPE) ASTM D-4020
Compression cord	Nitrile ASTM D2000 M6BG 708, A14, B14, E014, E034
Threaded stem	Stainless steel ASTM A-276 type 303 MX or 316
Fasteners	ASTM F593 and F594 GR1 for type 304 and GR2 for type 316
Pedestal, handwheel and crank	Tenzaloy aluminum
Gasket (between frame and wall)	EPDM ASTM 1056
Stem cover	Polycarbonate ASTM D-3935
Lift nut, couplings	Manganese bronze ASTM B584 UNS-C86500

5. SCHEDULE

Gate Identification		
Gate Type		
Size Width x Height		
Operating Floor Elevation		
Invert Elevation		
Head (Seating; Unseating)		
Mounting		

Gate Type: Open or self-contained

Mounting: CW - Mounted concrete wall

6. EXECUTION

6.1. INSTALLATION. Gates and appurtenances shall be handled and installed in accordance with the manufacturer's recommendations.

6.2. FIELD TESTS

6.2.1. Following the completion of each gate installation, the gates shall be operated through at least two complete open/close cycles. If an electric or hydraulic operator is used, limit switches shall be adjusted following the manufacturer's instructions.

6.2.2. Gates should be checked for leakage by the contractor (refer to the "Performance" section for approval criteria).

STAINLESS STEEL SLIDE GATES

PART 1 GENERAL

1.1. SCOPE OF WORK

This section covers stainless steel slide gates with 4 sides sealing for submerged applications and their associated accessories for operation. The contractor shall furnish all labor, materials, equipment and incidentals required to install and field test the gates shown on the Contract Drawings and specified herein.

1.2. REFERENCES

A. Definitions

Design Head: The maximum differential head that will be applied on the gate under worst case conditions, measured from the gate invert.

Seating Head: Head applied on a wall mounted gate, in the direction that pushes the gate against the wall it is installed on.

Unseating Head: Head applied on a wall mounted gate in the direction pulling the gate away from the wall it is installed on.

Operating Head: The highest differential head that is to be applied on the gate when it needs to be operated, measured from the gate invert.

B. Reference Standards

ANSI/AWWA C561 – Fabricated Stainless Steel Slide Gates.

ANSI/AWWA C542 – Electric Motor Actuators for Valves and Slide Gates.

ASTM A240/A240M – Standard Specification for Chromium and Chromium Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.

ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes.

ASTM A582/A582M - Standard Specification for Free-Machining Stainless Steel Bars.

ASTM A790/790M - Standard Specification for Seamless and Welded Ferritic / Austenitic Stainless Steel Pipe.

ASTM B179 - Standard Specification for Aluminum Alloys in Ingot and Molten Forms for Castings from All Casting Processes.

ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.

ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.

ASTM D4020 - Standard Specification for Ultra-High-Molecular-Weight Polyethylene Molding and Extrusion Materials.

ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

1.3. SUBMITTALS

A. Drawings

The slide gates manufacturer shall submit, for acceptance by the purchaser, general arrangement drawings of the equipment supplied under this section. Drawings must indicate all dimensions that will allow the contractor to ensure coordination with dimensions of the installation environment. Drawings will also show sufficient details to determine compliance with the requirements, including the stainless steel plate thickness used for all components. Drawings shall also include certification that the slide gates supplied meet all requirements of the latest edition of AWWA C561.

B. Design Calculations

The gate manufacturer shall submit, for acceptance by the purchaser, design calculations demonstrating compliance with the design requirements of these specifications and those of the latest edition of AWWA C561. In particular, calculations shall be submitted for the following gate components:

- Slide
- Seat contact pressure
- Frame
- Yoke
- Stem, stem connection
- Lifting nut
- Manual actuator operating force
- Electric actuator load
- Anchors

C. Test Reports

The gate manufacturer shall submit upon request, for information, the leakage and operation test reports specific to the actual gates that are being supplied demonstrating their compliance with the maximum leakage rate and maximum operating force allowed.

D. Installation, Operation and Maintenance Manual

The gate manufacturer shall provide a manual containing the instructions for installation, operation and maintenance of the slide gates. The manual shall also contain the detailed information on the terms of the 5 year warranty on the products.

1.4. QUALITY ASSURANCE

A. Qualifications

The gates supplied under this section shall be standard products of a manufacturer regularly engaged in the design and manufacturing of water control gates. The specifications are based on FONTAINE-AQUANOX Series 20 Slide Gates manufactured by ISE Metal Inc.

B. Standards and Certifications

The gates supplied under this section shall conform to all requirements of the latest edition of ANSI/AWWA C561. The slide gate manufacturer must maintain an ISO-9001 certification and also a company certification for its welding operations from the CWB or AWS.

1.5. DELIVERY

The manufacturer shall use due and customary care in preparing the gates and accessories for shipment. Self contained frame gates shall be shipped assembled with stem and manual operator. When shipping several gates together, every item shipped separately must be clearly marked to the gate it belongs to.

1.6. WARRANTY

The slide gates and manual operating accessories shall be covered by a five (5) year warranty from the manufacturer against defects in materials, design and workmanship. The warranty period will start from the date of delivery of the equipment to the installation site.

PART 2 PRODUCTS

2.1. EQUIPMENT

A. Manufacturers

Gates supplied shall be FONTAINE-AQUANOX Series 20 Slide Gates, as manufactured by ISE Metal Inc. or approved equal.

B. Description

The gates shall be upwards opening of the 4 sides sealing type designed for submergence in water or wastewater applications. They shall have flow control capability by allowing only flow through the open area in partial opening situations. As specified in the gate schedule, each gate shall be either open-frame or self-contained-frame design and either rising or non-rising stem configuration.

C. Performance and Design

1. Slide
The slide consisting of a flat plate with welded reinforcing ribs shall be designed to withstand the design head specified in the gate schedule with a maximum deflection of 1/720 of the gate opening width or 1/16 in (1.6mm) whichever is less and with stresses in the slide limited to 25% of the ultimate tensile, compressive, and shear strength and 50% of the yield strength, whichever is less. Minimum material thickness of all members of the slide shall be ¼ in (6mm).

2. Frame
The gate frame shall be made of formed plates or structural members creating the clear opening of the specified dimensions in a rigid one-piece unit. The mounting and bolting flange of the frame to the wall shall be separate and independent from the seating and sealing plane of the slide. The bottom of the frame will be of the flush invert type. Stresses in the frame under design head shall not exceed 25% of the ultimate tensile, compressive, and shear strength and 50% of the yield strength, whichever is less. Minimum material thickness of all members of the frame shall be ¼ in (6mm).

3. Yoke
Gates specified as self-contained design shall include a yoke consisting of a beam made of formed plates or structural members mounted on top of the frame to permit mounting of the actuator with proper stem alignment by the use of slotted holes in both direction. The yoke shall be sized to limit deflection under the design load to a maximum of 1/360 of the gate opening width or ¼ in (6mm) whichever is less. The yoke

design load must be considered as the vertical thrust generated by a 80 lbs (356 N) force on the crank or handwheel (for a manual actuator) or by the actuator in locked rotor condition (for an electric actuator). Per the latest edition of AWWA C561, the stresses in the yoke generated by the design load shall not exceed (for a manual actuator) 25% of the ultimate tensile, compressive, and shear strength and 50% of the yield strength, whichever is less, or (for an electric actuator) 2/3 of the yield strength.

4. Guiding and Seating
The slide shall seat and travel on guides made of ultra high molecular weight polyethylene (UHMWPE) designed to perform for the life of the slide gate without replacement. The slide shall be kept in positive contact with the guides on both its upstream and downstream faces, all along its travel in the gate clear opening by an elastomeric cord. Above the gate clear opening, the guides shall extend high enough to ensure that the slide is supported on a minimum of 1/2 of its height when fully opened. The low friction guides shall be secured to the frame by bolted retainers allowing factory adjustment of the contact pressure with the slide. The surface of contact on the side seats shall be large enough to limit the stress under the design head to 600 psi (4137 KPa) without considering the top and bottom seats as load bearing.

5. Sealing
The guides combined with the elastomeric cord will provide sealing on both sides of the opening. Sealing at the top section of the gate will also be achieved with a UHMWPE seat maintained in contact by an elastomeric cord. At the gate invert, the slide shall close on a flush invert rubber seat/seal secured in the bottom member of the gate frame. Under the design seating or unseating head specified in the gate schedule, the slide gates shall restrict leakage to a maximum of 0.04 gpm/ft (0.5 l/min/m) of clear opening perimeter. Manufacturer shall be able to demonstrate that the sealing system will retain its performance even after 25,000 operating cycles.

6. Stem Connection
In the case of gates with rising stems, the stem or its extension will be connected to the slide by means of a pinned connection. For gates with non-rising stems, the connection to the slide shall be by means of a threaded thrust nut matching the stem threads. Stem connection design shall limit the stress under the design load to a maximum of 25% of the ultimate tensile, compressive, and shear strength and 50% of the yield strength. The stem connection design load shall be the thrust and torque developed when a 80lbs (356N) efforts is applied the crank or handwheel (for a manual actuator), or 1.5 times the thrust and torque developed with the actuator in stalled condition (for electric motors).

7. Stem
The stem configuration shall be rising or non-rising according to the type specified in the schedule. The threads shall be machine rolled ACME left hand threads with double entry to minimize the number of turns required for operation and provide gate opening by counterclockwise rotation of the manual actuator. Surface finish of the machined threads will be 32 micro inch (0.813 µm) or better. For manually operated gates with rising stem, the stem shall be equipped with an adjustable stop collar to prevent over-closing the gate and potentially damaging components.

The stem shall be sized so that its critical buckling load (as determined by the Euler column formula) is higher than the design compression load, defined as the vertical force developed by a 80lbs (356N) effort applied on the crank or handwheel (for a manual actuator), or 1.5 times the thrust and torque developed with the actuator in stalled condition (for electric motors).

8. Couplings
The required stem extensions shall be joined together or to the threaded stem by means of a bolted connection, passing through both pipe and stem.

9. Stem guides
Guides will be provided as required to meet the stem buckling design criteria and positioned per the manufacturer's recommendations to ensure that the length to radius of gyration ratio (l/r) does not exceed 200. The guides shall incorporate a UHMWPE bushing supported by a stainless steel wall bracket adjustable in both horizontal directions.

D. Manual Actuators

1. Operation
Manual actuator of the proper type and mounting location, as listed in the gate schedule or shown on the drawings, shall be provided by the gate manufacturer. The effort required on the manual device to operate the gates shall not exceed 40 lbs (178 N), while to start the gate in motion from the fully closed position with the design pressure, the required effort shall not exceed 60 lbs (267 N). Indication of the opening direction of rotation shall be clearly marked in a permanent manner on the handwheel or crank.

2. Handwheels
The handwheel shall be removable and have a minimum diameter of 16" (406mm). It shall drive the lift nut directly or via the extension pipe of self-contained gates or it shall engage the input shaft of the gearbox, when specified.

3. Crank Operated Gearboxes
The gearbox, comprising a lift nut and thrust bearing assembly (as described below), shall be fully enclosed in a casted housing with seals around the lift nut and around the input pinion shaft. The input pinion shaft shall be supported on ball or tapered roller bearings. The removable crank, equipped with a revolving grip shall engage on the input shaft of the gearbox and have a minimum radius of 12" (305mm).

4. Square Nut Actuator
The square nut shall be 2" x 2" (50mm x 50mm) designed for mounting in the floor box supplied by the contractor and designed to accommodate a standard T-wrench. T-Wrench shall be supplied by the gate manufacturer in the quantity required by the gate schedule.

5. Actuator Lift Nut and Thrust Bearings
All gates shall include a thrust bearing assembly comprising a threaded bronze lift nut to engage the operating stem. This assembly must be enclosed in a machined stainless steel housing or be an integral part of the gearbox when supplied. Needle roller thrust bearings shall be provided above and below the lift nut to support the operating efforts in closing and opening the gate. The length of thread engagement shall be sufficient to ensure that the maximum pressure on the projected area of thread contact does not exceed 2000 psi (13,8 MPa) at normal maximum operating load and that the PV (pressure velocity) factor does not exceed 30,000. The PV factor is calculated by multiplying the pressure on the projected area of thread contact in psi by the surface velocity in ft/min at the pitch diameter of the threads. For non-rising stem gates, the actuator lift nut shall be keyed to prevent rotation relative to the threaded stem.

6. Mounting
The thrust bearing assembly or the gearbox shall be mounted on the yoke of the gate for all gates specified as self-contained or on a pedestal for gates specified as non self-contained. Pedestal height shall be such that the handwheel or input shaft of the gearbox is located approximately 36" (900mm) above the operating floor. Where shown on the drawings or when specified, a wall bracket shall be supplied to support the pedestal. The pedestal wall bracket shall be designed and supplied by the gate manufacturer to ensure that it can resist to all operating efforts of the gate based on the same design calculation criteria used for the yoke.

7. Stem Cover
All rising stem gates, weather manual or motorized shall be equipped with a clear stem cover with a closed top and ventilation hole. The cover shall bear graduation in both inches and centimeters to indicate the position of the gate.

E. Motorized Actuators

1. When required by the gate schedule or the drawings, motorized actuators shall be supplied as specified in specification section _____. Actuators shall be Rotork IQ3 or Auma SA series, for ON/OFF duty and have the characteristics indicated in the schedule shown below in this section.

F. Anchor Bolts

1. The quantity, size and location of anchor bolts shall be determined by the gate manufacturer and shown on the submittal drawings. The minimum required load capacity of the anchors used for design must also be indicated on the drawings.

G. Materials

Slide, Frame and Yoke	Stainless Steel	ASTM A240, grade 316L or 304L
Side Seal/Guides and Top Seal	Ultra High Molecular Weight Polyethylene (UHMWPE)	ASTM D4020
Flush Invert Bottom Seal	Ethylene Propylene (EPDM)	ASTM D2000
Compression Cord	Ethylene Propylene (EPDM)	ASTM D2000
Wall Gasket	Ethylene Propylene (EPDM)	ASTM D2000
Bolts and Hardware	Stainless Steel	ASTM F593, grade 316
Stem	Stainless Steel	ASTM A582, grade 316 or 304
Thrust Nut and Lift Nut	Aluminum Bronze or Manganese Bronze	ASTM B505, C95800 ASTM B584, C86300
Stem Couplings	Stainless Steel	ASTM A582, grade 316
Stem Guide Bracket	Stainless Steel	ASTM A582, grade 316
Stem Guide Bushing	Ultra High Molecular Weight Polyethylene (UHMWPE)	ASTM D4020
Handwheel	Cast Aluminum	ASTM B179
Crank	Aluminum	ASTM B209, 6061-T6
Pedestal	Stainless Steel	ASTM F593, grade 316
Gearbox Housing	Cast Iron	ASTM A48 35B/40B
Square Nut	Cast Aluminum	ASTM B179
Stem Cover	Clear PVC	
Stem Cover Cap	PVC	

2.2. FACTORY TESTS

The gates shall be tested in the factory for leakage and for operating force. Leakage shall be measured at the unseating design pressure. Operating force shall be measured with and without the design pressure. Factory test reports shall be available on request for all gates supplied.

PART 3 EXECUTION

3.1. INSTALLATION

A. It is the responsibility of the Contractor to handle, store and install the gates in strict accordance with the manufacturer's instructions and recommendations. The Contractor shall review the installation drawings and instructions before proceeding to the installation of the gates.

B. The gate assemblies must be installed on a true vertical plane, square and plumb. The operating stem shall be accurately aligned with the gate guides and properly greased.

3.2. FIELD TESTING

A. After installation, the gates must be field tested by the Contractor, in the presence of the Engineer and Owner, to ensure compliance with the requirements of these specifications. Each gate shall be operated on its complete open-close cycle to confirm operation without binding, scraping or distorting. Operating effort on the crank, handwheel or T-wrench shall be observed or measured. In the case of motorized actuators, the operating torque shall be noted, and the initial set-up of each actuator shall be done in accordance with the instructions in the manual.

B. Each gate shall be water tested by the Contractor and sealing performance shall be observed.

C. The Contractor shall supply a detailed report of the field tests to the Engineer for review.

STAINLESS STEEL SLIDE GATES SCHEDULE

Item	ID TAG	Qty	SIZE (W x H) (inches)	DESIGN HEAD (ft) Seat.	Uns.	FRAME TYPE	STEM TYPE	ACTUATOR TYPE	ACTUATOR MOUNTING	T-WRENCH Yes/No – Qty

ABBREVIATIONS:

FRAME TYPES:

SC: Self-Contained
NSC: Non Self-Contained

ACTUATOR TYPES:

H: Handwheel
GC: Gearbox and Crank
GH: Gearbox and Handwheel
EM: Electric Motor Actuator
SN: Square Nut

ACTUATOR MOUNTING:

P: Pedestal Mounted
PB: Pedestal Mounted with Wall Bracket
F: Floor Box
Y: Yoke Mounted

ELECTRIC MOTOR ACTUATOR CHARACTERISTICS

Item	ID TAG	Qty	ENCLOSURE RATING	POWER SUPPLY	CONTROLS VOLTAGE	INTEGRAL CONTROLS	POSTION TRANS-MITTER	POSI-TIONNER

ABBREVIATIONS:

ENCLOSURE RATINGS:

WT: Watertight IP68/NEMA 4&6
EX: Explosion Proof

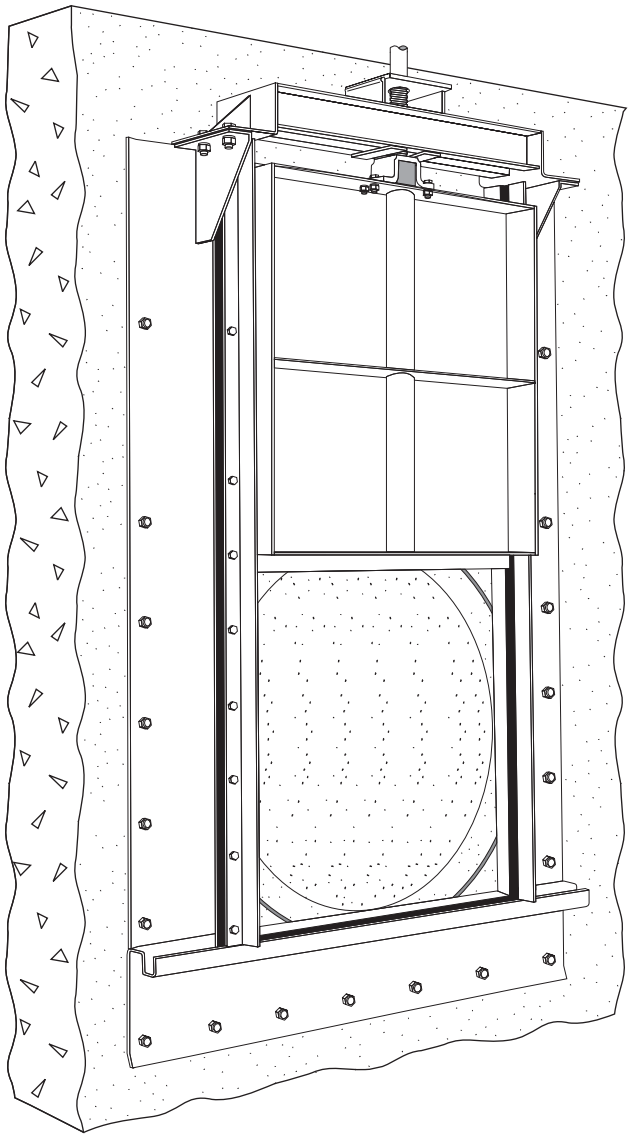
END OF SECTION

SERIES 20
STAINLESS STEEL SLIDE GATES

Designed to be adapted to all applications
Maximum leakage rate is less than half of the AWWA allowable
Low-maintenance gates

General Description

Fontaine-Aquanox's **SERIES 20** Sluice Gate is a highly versatile flow control gate with various types of mountings. Adaptable to different applications, the **SERIES 20** can be designed to the required seating and unseating heads. The seal design keeps the allowable leakage rate to 0.04 U.S. gpm per foot (0.50 l/min per meter) of seating perimeter



Stainless Steel Contruction

Because of its stainless steel construction, the **SERIES 20** has high corrosion and erosion resistance, and can be operated for many years with minimum maintenance. Stainless steel provides virtually limitless design flexibility. The result is a lighter weight and easier-to-install gate.

AWWA Standards

SERIES 20 Sluice Gates are built to meet or exceed AWWA C561 latest revision standards pertaining to design safety factors, stem and stem guides positioning, manual lifting devices,leakage, etc. As specified in the AWWA standard, all Fontaine-Aquanox **SERIES 20** water gates are tested for leakage and operation before shipping.

No	Part	Material
1	Frame	Stainless steel ASTM A-240 Type 304L or 316L
2	Guides and Side seals	Ultra high molecular weight polyethylene (UHMWPE) ASTM D-4020
3	Compression cord	EPDM
4	Bottom seal	EPDM
5	Slide	Ultra high molecular weight polyethylene (UHMWPE) ASTM D-4020
6	Yoke	Stainless steel ASTM A-240 Type 304L or 316L

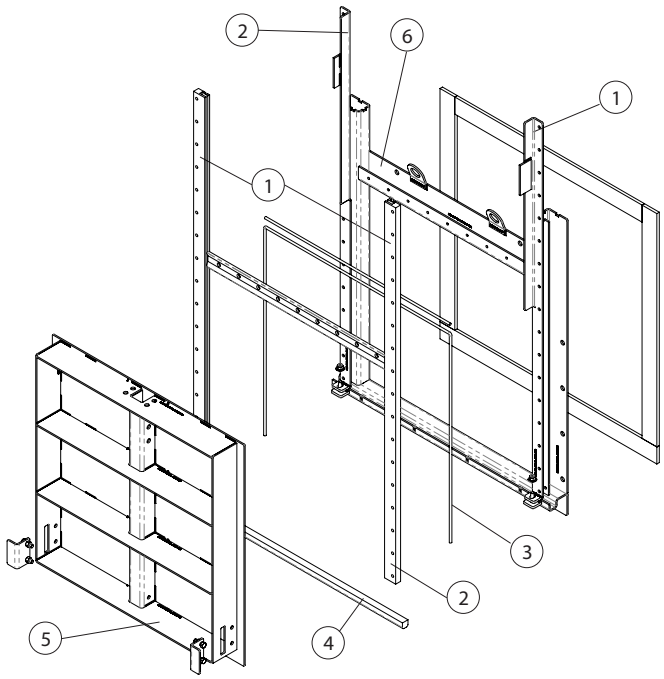


Fig. 20-01
Exploded view of a **SERIES 20** Model 204

Flange Back Frame

The stainless steel frame on the **SERIES 20** is a flange back type (fig.20-02) available in open or self-contained configurations, providing a solid one-piece gate.
The rigidity provided by the flange back frame makes it easier to handle in transportation and installation with less risk of distortion. The seal bolting is completely separated from the flange anchoring, allowing the flange to be modified to better suit all particular applications.
This feature also allows the gate to be completely factory assembled as well as tested for operation and leakage before being shipped. It also eliminates any on-site assembly and adjustments.

Reinforced Slide

The slide is a stainless steel plate reinforced with members welded to the plate, making it a solid single piece.

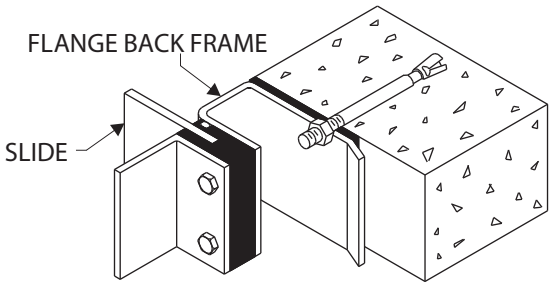


Fig. 20-02
Flange back frame

UHMWPE Seals

The side and top seals (fig. 20-02, 03) of the **SERIES 20** are made of a self-lubricating ultra high molecular weight polyethylene (UHMWPE), allowing no metal-to-metal contact. With a friction coefficient of 0.2, the seals make the gate easier to open even when not operated for a long period of time. The self-adjusting feature is obtained by a continuous compression cord that ensures a tight seal between the slide and the frame in both seating and unseating conditions.The continuous wedging action of the compression cord on the slide enables the **SERIES 20** Sluice Gate to control flow by allowing water only through the open portion of the gate.

The flush-bottom seal (fig. 20-04), leaves the opening unobstructed when the slide is in the open position.

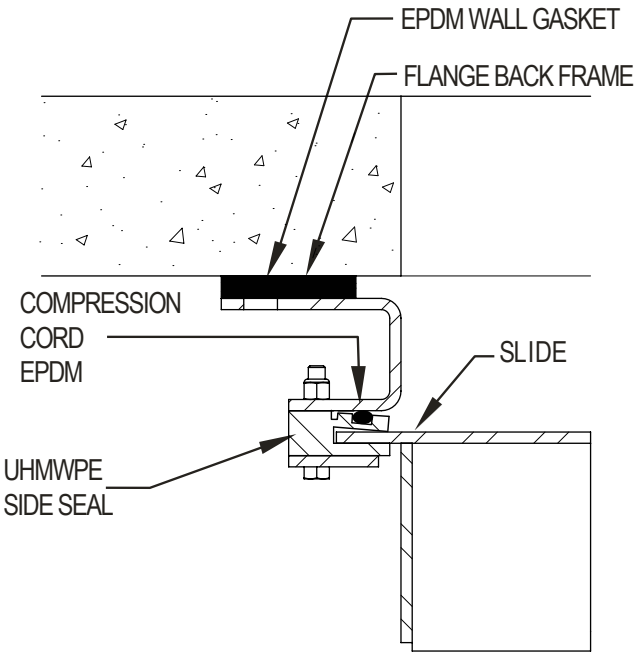


Fig. 20-02
Side frame section

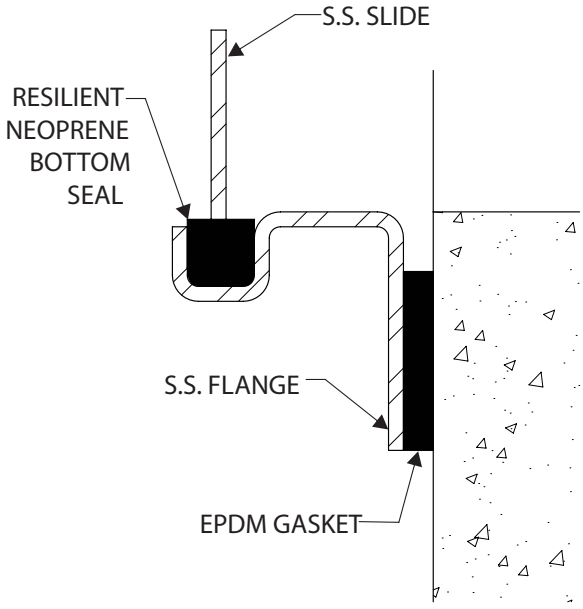


Fig. 20-04
Bottom frame section

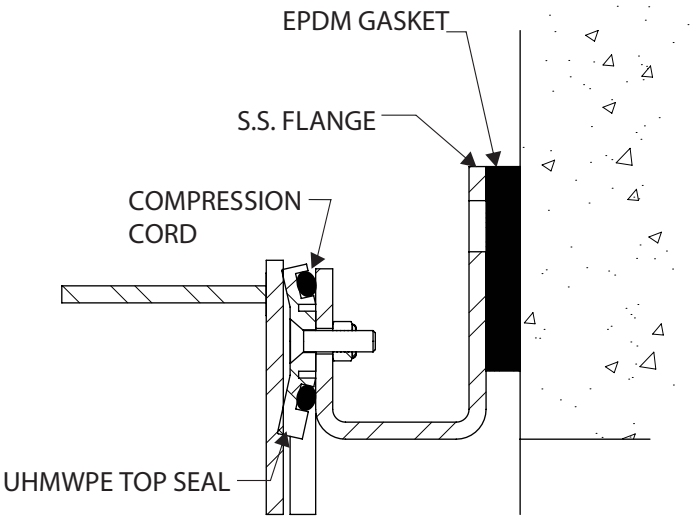


Fig. 20-03
Top frame section

Mountings

The **SERIES 20** can be mounted in almost any application. Fig. 20-02 through 20-06 show the different mountings

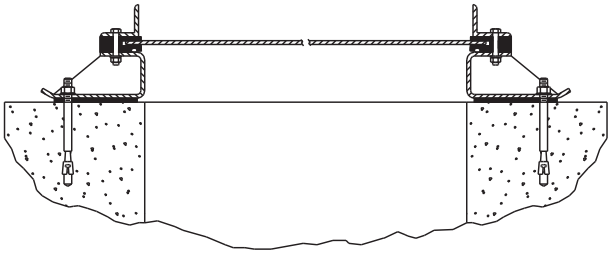


Fig. 20-02
Directly mounted on a concrete wall (CW)

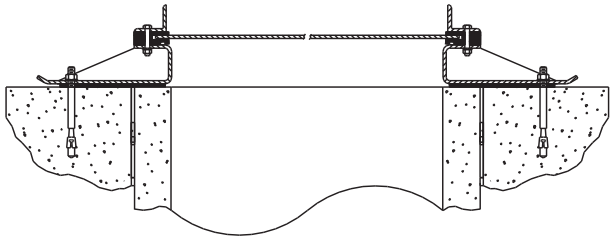


Fig. 20-03
In front of a flush pipe on a concrete wall (CWX)

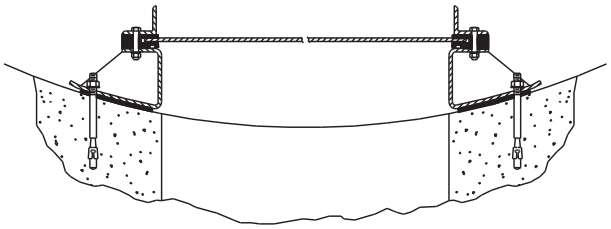


Fig. 20-04
Inside a round manhole (RM)

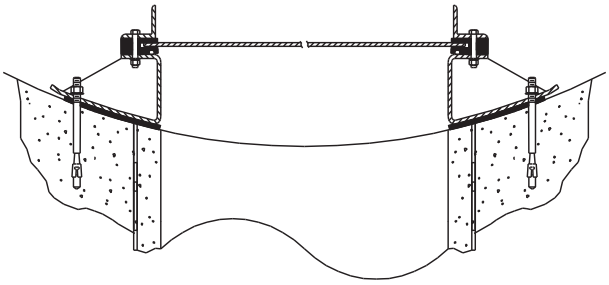


Fig. 20-05
In front of a flush pipe inside a round manhole (RMX)

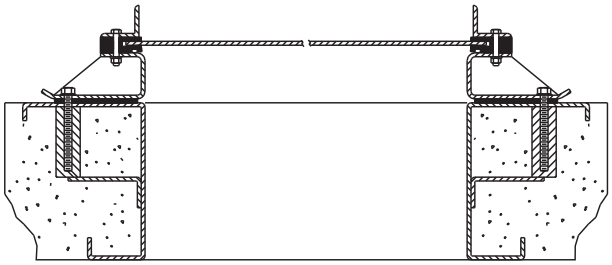


Fig. 20-06
On a wall thimble (WT)

Frame and Stem Configuration

Figures 20-08, 20-09 and 20-10 shows the most common frame and stem configurations. For special applications, refer to "Frame and Stem Configurations" in the Introduction section.

Model 204

Wall-mounted (CW) with pedestal-mounted gear box and crank operator
Rising stem

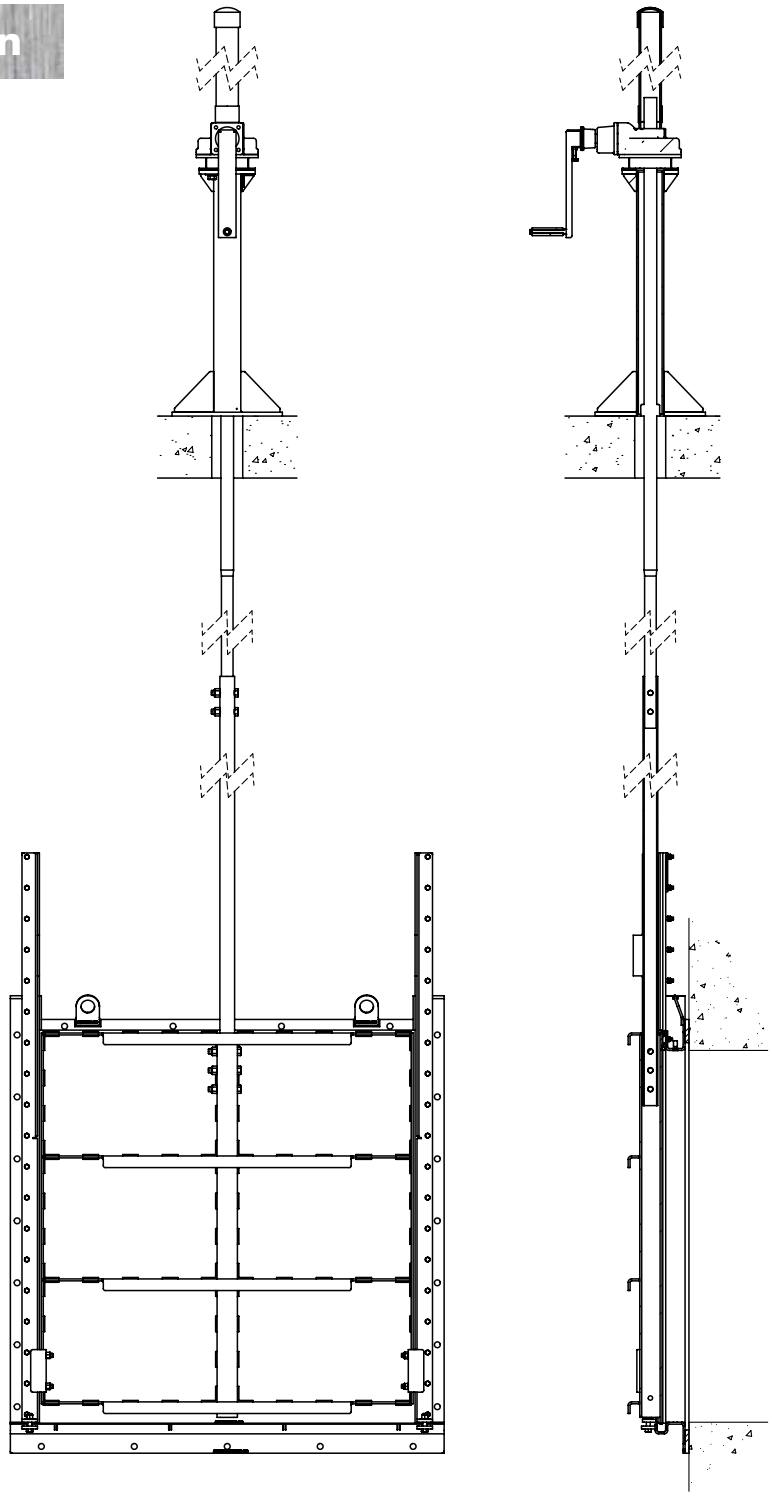
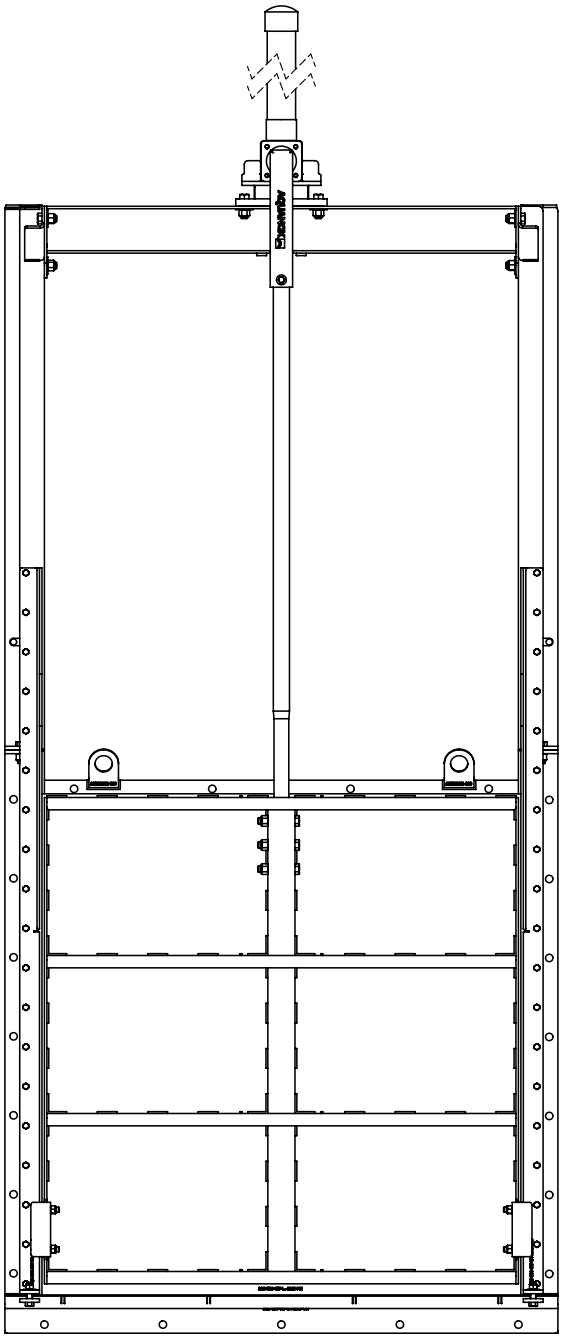


Fig. 20-08
(See page 3 for cross sections)

Frame and Stem Configurations

Model 203

Wall-mounted (CW) with yoke-mounted handwheel operator
Rising stem



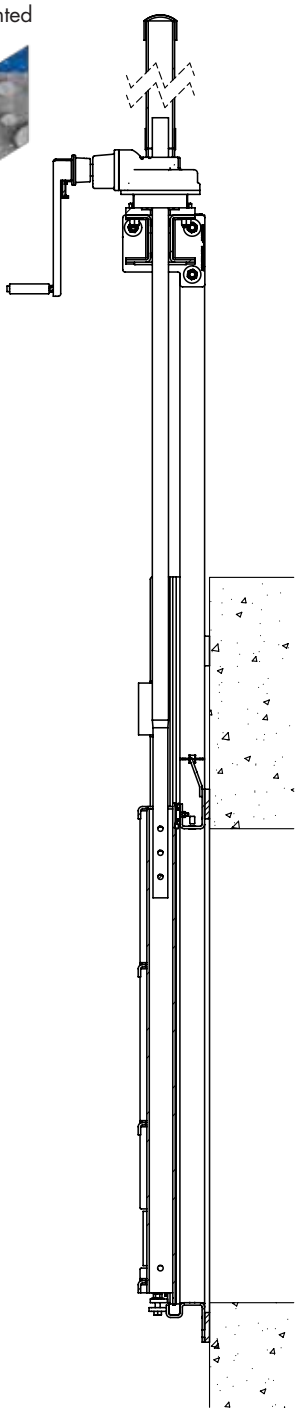
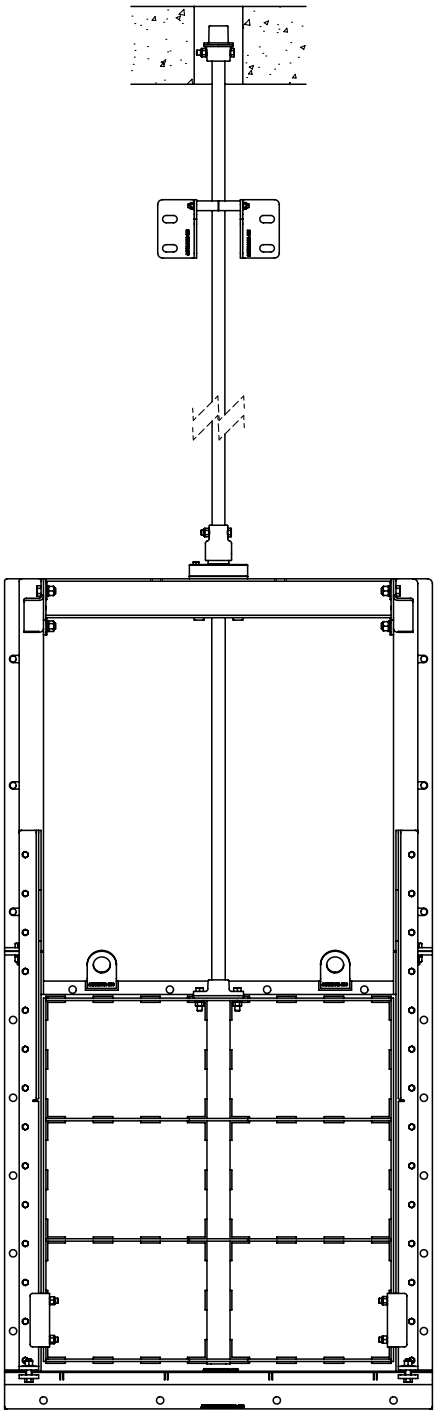


Fig. 20-09
(See page 3 for cross sections)

Frame and Stem Configurations

Model 202

Wall-mounted (CW) with square nut operator. Non-rising stem



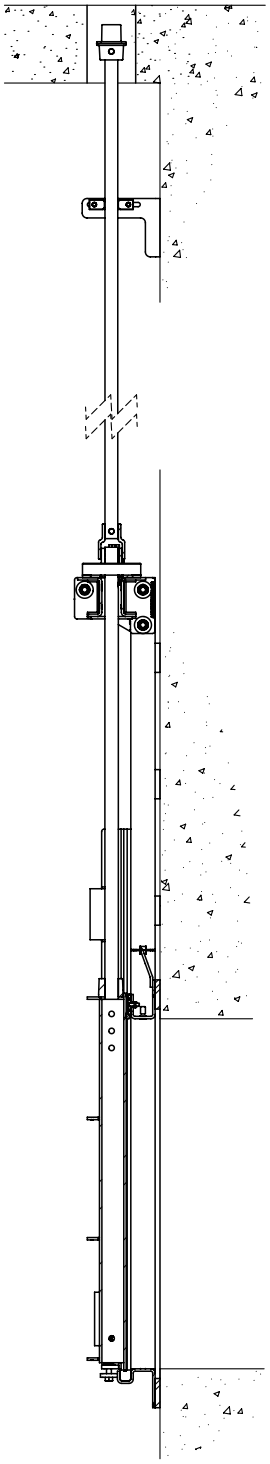


Fig. 20-10

(See page 3 for cross sections)

RW GATE COMPANY





EXPERIENCE BETTER WATER CONTROL

ROSS 1873 VALVE

Affiliated Company

RW GATE COMPANY

RW Gate Company designs and manufactures the highest quality and longest lasting water control gates and related equipment.

Our rugged, heavy-duty gates are substantially constructed and fitted with a wear-resisting seal system – making the RW Gate an unparalleled long-term solution and value.

RW Gate Company is an extension of the 138 year-old Ross Valve Manufacturing Company, one of the oldest and most respected providers of water control products and services.

With this outstanding pedigree, you can be assured that RW Gate brings the same level of stability, commitment and service that has earned Ross Valve its international reputation for industry leadership.

RW Gate headquarters are at the 16-acre Ross Technology Park in Troy, NY; housing our team of professionals who are deeply experienced in all facets of the water control gate industry.

Our gates are specified for multiple uses in the following industries and others:

- MUNICIPAL WATER & WASTEWATER
- INDUSTRIAL
- FLOOD CONTROL
- HYDROPOWER
- DAMS

RW GATE COMPANY

We bring an unmatched level of detail, responsiveness and commitment to the production of high quality, low leakage gates.

- We are rock-solid, backed by an industry-leading manufacturer that brings 6 generations of experience in water control combined with personnel with a deep expertise in gates.
- Our rugged, heavy-duty gates are more substantial and built more solidly than those of other manufacturers.
- Our gates utilize durable, UHMWPE seals that do not require field adjustment.
- We meet or exceed AWWA gate standards and we are A.I.S. and Buy American compliant
- ISO 9001:2008 certified

RW1000-S SLUICE GATE
STAINLESS STEEL MODEL SHOWN

PRODUCTS

- Sluice Gates
- Slide Gates
- Stop Log Assemblies
- Stop Gates
- Flap Gates
- Telescopic Valves
- Mud Valves
- Shear Gates

CERTIFIED ISO 9001:2008

American Iron & Steel

MEETS BUY AMERICAN ACT

Sluice Gates are heavy duty flow control devices that consist of a frame, slide and operating mechanism. Sluice gates are provided with seals along all four sides of the opening. They are typically used to stop or control flow through an orifice in a wall.

Stop Log Assemblies are flow control devices that consist of a frame and multiple stacking logs. Each stop log is provided with seals along the sides and across the bottom. Stop logs are typically used to stop flow or control level in a basin or a channel. Our low leakage stop log assemblies are outfitted with resilient seals to restrict leakage and they can be designed to handle high head applications. Stop logs can be provided in stainless steel or aluminum.

Slide Gates are flow control devices that consist of a frame, slide and operating mechanism. Slide gates are provided with seals along the sides and across the invert of the opening and they are typically used to stop flow, control flow or control level in a basin or a channel.

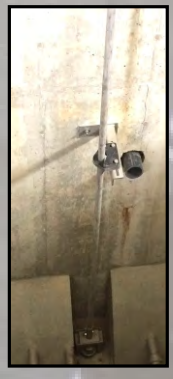
Weir Gates are flow control devices that consist of a frame, slide and operating mechanism. Weir gates are downward opening slide gates

Flap Gates are back flow prevention devices that are designed to open under an unseating head condition and close under a seating head condition. The flap is mounted offset from vertical to ensure a positive closing via gravity. A resilient seal is utilized to achieve low leakage between the frame and flap. Flap gates can be provided in stainless steel, aluminum or HDPE plastic.

Stop Gates are flow control devices that consist of a frame and one or more slide plates. Stop gates are economical, hand-lift gates.

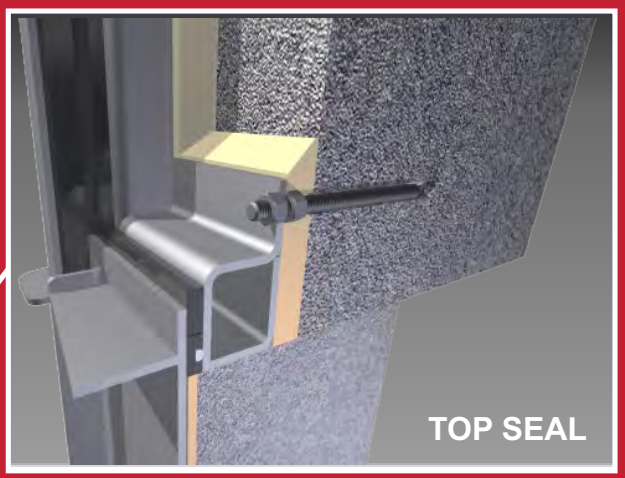
Telescopic Valves are flow control devices that utilize an adjustable slip tube that travels in a receiving pipe of larger diameter. Telescoping valves can be provided in stainless steel.

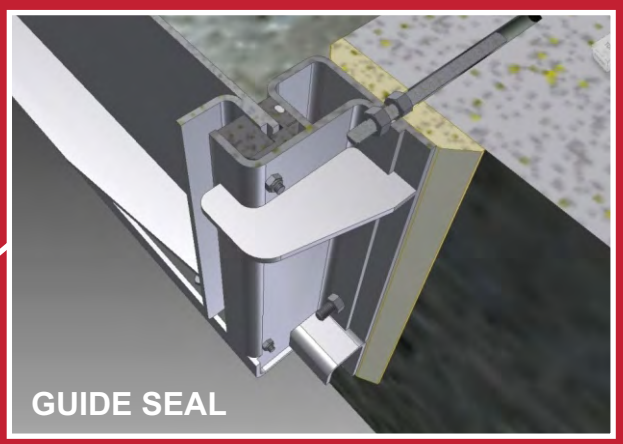
Shear Gates are manually operated flow control devices for small openings in low head operations. Shear gates can be provided in stainless steel.

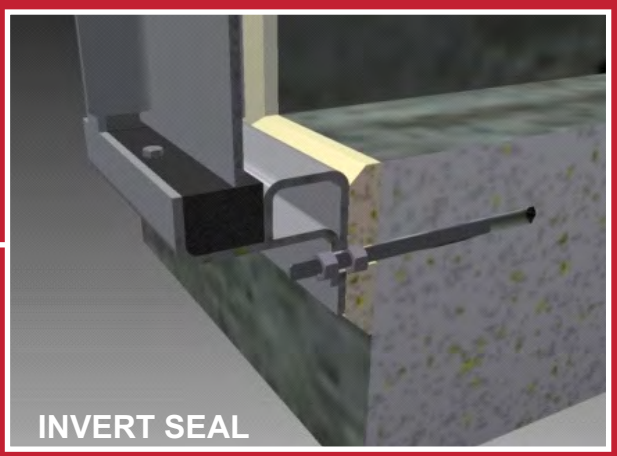


Mud Valves are primarily used to open or close a drain in the bottom of basins and channels. The resilient seal utilized by RWG ensures a tight shutoff. Mud valves can be anchored to the concrete floor or pipe flange mounted. Mud valves can be provided in stainless steel or HDPE plastic.

RW GATE COMPANY







RW1000-S SLUICE GATE

RW GATE COMPANY

Ross Tech Park
75 102nd St
Troy, New York,
USA, 12180

Direct inquiries to:
Sales Department
sales@rwgate.com
518-874-4750

www.rwgate.com

We meet or exceed AWWA gate standards
and we are A.I.S. and Buy American compliant

ISO 9001:2008 certified

A Ross Valve affiliated company

ROSS VALVE 1879

Since 1879

RWGEN17- 5000

RW GATE COMPANY
79 102nd Street – Suite 100
TROY, NEW YORK 12180
OFFICE: 518-874-4750
FAX: 518-274-0210
WEBSITE: www.rwgate.com

BUDGET QUOTATION

December 10, 2021

To: Joe Dameron @ MS Consultants **Budget Quotation #21-BQ-1227**

Subject: Delaware Co., OH – Alum Creek WWTP UV Disinfection Improvements
MS Consultants

Dear Mr. Dameron:

Following is our budget quotation for the **eleven (11) Stainless Steel Gates** on the referenced project. Our offering is as follows:

Item No. 01 – UV Disinfection Channel Nos. 1- 5 Influent
Qty. – Size: Five (5) Model RW1000-S Sluice Gates – 24" wide x 36 tall
Distance from the Invert of the Opening to the Operating Floor: 7.5'
Design Seating Head / Design Unseating Head (invert to MWL): 6.25' /5.1'
Description: The AWWA C561 compliant, self-contained, upward-opening sluice gates will be constructed of 304/304L stainless steel will have self-adjusting UHMWPE seals along the sides and top and an EPDM flush bottom invert seal. A single, rising, 304 stainless steel stem and clear butyrate stem cover will be provided.
Operating Mechanism: pedestal mounted on yoke, manual handwheel-operated gearbox
Mounting Style: Gate frames will be wall surface mounted with 304 stainless steel adhesive anchors and non-shrink grout. Anchor studs, nuts and washers are included.

Item No. 02 – UV Disinfection Bypass Channel Influent
Qty. – Size: One (1) Model RW1000-S Sluice Gate – 48" wide x 36 tall
Distance from the Invert of the Opening to the Operating Floor: 7.5'
Design Seating Head / Design Unseating Head (invert to MWL): 6.25' /5.1'

Description: The AWWA C561 compliant, self-contained, upward-opening sluice gate will be constructed of 304/304L stainless steel will have self-adjusting UHMWPE seals along the sides and top and an EPDM flush bottom invert seal. A single, rising, 304 stainless steel stem and clear butyrate stem cover will be provided.
Operating Mechanism: pedestal mounted on yoke, manual handwheel-operated gearbox
Mounting Style: Gate frame will be in-channel mounted with 304 stainless steel adhesive anchors and non-shrink grout. Anchor studs, nuts and washers are included.

Item No. 03 – Post Aeration Tank Nos. 1 & 2 Influent
Qty. – Size: One (1) Model RW1000-S Sluice Gate – 72" wide x 36 tall
Distance from the Invert of the Opening to the Operating Floor: 7.5'
Design Seating Head / Design Unseating Head (invert to MWL): 5.1' / 2.82'
Description: The AWWA C561 compliant, self-contained, upward-opening sluice gate will be constructed of 304/304L stainless steel will have self-adjusting UHMWPE seals along the sides and top and an EPDM flush bottom invert seal. A single, rising, 304 stainless steel stem and clear butyrate stem cover will be provided.
Operating Mechanism: pedestal mounted on yoke, manual handwheel-operated gearbox
Mounting Style: Gate frames will be wall surface mounted with 304 stainless steel adhesive anchors and non-shrink grout. Anchor studs, nuts and washers are included.

Item No. 04 – Post Aeration Tank Nos. 1 & 2 Effluent
Qty. – Size: Two (2) Model RW1000-S Weir Gates – 66" wide x 36 tall
Distance from the Invert of the Opening to the Operating Floor: 8.0'
Design Seating Head / Design Unseating Head (invert to MWL): 3.32' / 3.0'
Description: The AWWA C561 compliant, self-contained, downward-opening weir gates will be constructed of 304/304L stainless steel will have self-adjusting UHMWPE seals along the sides and invert. Slide extensions may be provided for slide stability during downward travel. No top seal. A single, rising, 304 stainless steel stem and clear butyrate stem cover will be provided.
Operating Mechanism: yoke mounted, manual handwheel-operated gearbox
Mounting Style: Gate frames will be wall surface mounted with 304 stainless steel adhesive anchors and non-shrink grout. Anchor studs, nuts and washers are included.

Item No. 05 – Post Aeration Tank Nos. 1 & 2 Bypass
Qty. – Size: One (1) Model RW1000-S Sluice Gate – 78" wide x 36 tall
Distance from the Invert of the Opening to the Operating Floor: 7.5'
Design Seating Head / Design Unseating Head (invert to MWL): 3.32' / 2.5'
Description: The AWWA C561 compliant, self-contained, upward-opening sluice gate will be constructed of 304/304L stainless steel will have self-adjusting UHMWPE seals along the sides and top and an EPDM flush bottom invert seal. A

single, rising, 304 stainless steel stem and clear butyrate stem cover will be provided.
Operating Mechanism: pedestal mounted on yoke, manual handwheel-operated gearbox
Mounting Style: Gate frames will be in-channel mounted with 304 stainless steel adhesive anchors and non-shrink grout. Anchor studs, nuts and washers are included.

TOTAL BUDGET PRICE: $_____

GENERAL: Our budget quotation is based on the information provided and the description listed herein. Please review the quotation and advise our local representative, **Wendell Smitley of Sullivan Environmental at 614-395-7379,** if there are any discrepancies between the details on this budget quotation and the actual requirements. The pricing and deliveries listed in the body of the quotation will be held for 120 days from the date on Page 1.

RW Gate is ISO 9001:2015 certified. RW Gate complies with AIS and Buy American requirements.

INCLUDED: Submittal drawings, installation instructions and O&M manuals. Installation instructions will be forwarded with the equipment. Information will be sent electronically unless otherwise indicated by the customer.

EXCLUDED: The following items are specifically excluded; demolition, installation, field measurements, electric actuators, control panels remote control stations, instrumentation, wiring, junction boxes, disconnects, wall thimbles, wall pipes, bulkheads, plugs, blind flanges, floor sleeves, concrete, grout, mastic, lubricants, grating, handrail, cover plates, epoxy for anchors and all taxes including local and state sales tax.

PAYMENT: Net 30 days. Please contact RW Gate prior to payment via credit card. An additional charge may be necessary when paying by credit card.

FREIGHT: Full freight to project site is included Unloading will be the responsibility of others.

STANDARD DELIVERY: Submittal drawings will ship within 4 weeks of receipt of a purchase order. The equipment will ship 12-16 weeks after receipt of approved submittal drawings. Electric actuators (if required) will ship 28-32 weeks after receipt of approved submittal drawings. Please contact our local representative for expedited or extended delivery dates.

FIELD SERVICE: Field service is not included. If field service is required, please contact our local representative for revised pricing. Please provide a 3-week notice for field service.

Best Regards,

Evan Whipps

Evan Whipps
RW Gate Company
ewhipps@rwgate.com

www.RWGATE.com

SECTION _____ STAINLESS STEEL SLUICE GATES & SLIDE GATES

GENERAL

1. The sluice gates and slide gates shall be provided as specified and as shown in the Contract Documents.
2. The gates shall be in compliance with the latest version of AWWA C561 as modified herein.

DEFINITIONS

1. A stainless steel sluice gate is defined herein as a heavy-duty gate with a four-sided seal system that is used to close off an orifice that experiences a maximum water level that can exceed the top of the orifice.
2. A stainless steel slide gate is defined herein as a gate that has a three-sided seal system. The seals are positioned along the sides and across the invert of the opening.
3. A stainless steel weir gate is a downward-opening slide gate.

PERFORMANCE REQUIREMENTS

1. Leakage for sluice gates and slide gates shall be restricted to 0.05 gpm/ft or less of the seal perimeter at the design seating head and the design unseating head.

SUBMITTALS

1. Submittals shall include, at a minimum, detailed custom drawings of the gate assembly with dimensional and mounting information and a listing of the materials of construction. General arrangement drawings and cut sheets are not considered acceptable drawings.
2. Calculations shall be provided to confirm compliance with the safety factors listed in AWWA C561 for all parts of the frame, anchorage and slide including the portion of the slide that engage the frame.
3. A copy of the test results from the minimum 30,000 cycle test confirming the durability of the seal system.
4. A copy of the ISO 9001:2015 certification.

QUALITY ASSURANCE

1. The basis for the design of the sluice gates and slide gates is the Model RW1000-S as manufactured by RW Gate Company, Troy, NY.
2. All gates shall be shop inspected for proper operation prior to shipment.
3. Welds shall be performed by welders with ASME Section IX or AWS D1.6 certification.
4. The gate manufacturer shall be ISO 9001:2015 certified.

MATERIALS OF CONSTRUCTION

1. All stainless steel referenced in this specification shall be Type 304, ASTM A240 or ASTM A276 unless otherwise indicated herein.

a. All welded stainless steel components shall be constructed of Type 304L stainless steel.
b. All structural stainless steel used in the construction of slides and frames shall have a minimum material thickness of 1/4-inch.
c. All non-welded stainless steel components, excluding anchor bolts and assembly bolts, shall be Type 304 or Type 304L stainless steel.
d. Anchor bolts and assembly bolts shall be Type 316 stainless steel.

SLIDE

1. The slide shall consist of a stainless steel plate that is reinforced with stiffeners to withstand the specified head conditions. The slide shall engage the frame a minimum of 1-inch on each side.
    a. The slide shall be reinforced with plates or channel shaped members to restrict deflection to 1/16-inch or less at the design head.
    b. The stiffeners shall be welded to the slide plate in the horizontal and vertical positions.
    c. The portion of the slide that engages the frame shall have a minimum thickness of 1/2-inch.
    d. On rising stem gates, a stem connector shall be welded to the slide as a means of connecting the operating stem. The bottom portion of the stem shall be affixed to the stem connector with a minimum of two attachment bolts.
    e. On non-rising stem gates, the slide shall be arranged to allow travel of the stem along the length of the slide.

FRAME

1. The frame shall be constructed of stainless steel plate, with the guide section formed into a C channel shape or similar to house the seal, and shall be reinforced to withstand the specified operating conditions.
    a. The guides shall be of a one-piece design with gussets that extend along the outside and top to accommodate unseating head. The guide members shall incorporate a tubular cross section along the guides for additional rigidity. Two-piece, sandwich type guides that are bolted together are not acceptable.
    b. The mounting configuration of the frame shall be as shown on the Contract Drawings.
    c. Wall mounted frames shall be of the flanged frame type. Flat frames shall only be provided on gates with frames that will be embedded in the concrete wall or mounted inside existing channels.
    d. The guide portion of flanged frame gates shall have a minimum weight of 13 lbs/ft. The guide portion of the flanged frame, where the anchors penetrate, shall have a minimum thickness of 1/2-inch.
    e. The guide extension portion of the frame shall have a minimum weight of 6 lbs/ft. Angles are not considered acceptable guide extensions.
    f. Lifting lugs shall be provided on all frame styles.

g. On self-contained gates, the side frame shall extend above the operating floor and the operating mechanism shall be mounted to the yoke. When shown, the frame may extend to or below the operating floor and a floorstand may be mounted on the yoke.
h. Yoke members shall be C channel shaped structural members. Angles are not considered acceptable yoke members.

SEALS

1. The seal system shall consist of self-adjusting UHMWPE seals with a nitrile or EPDM compression cord.
    a. The UHMWPE seals shall be arranged to ensure that there is no metal-to-metal contact between the slide and frame.
    b. The compression cord shall be contained by the UHMWPE seal so that it shall not be in contact with the slide.
    c. Seal system shall be self-adjusting for the life of the gate. Adjustable wedging devices such as wedges, wedge bars and pressure pads are not acceptable.
    d. On upward-opening gates, rubber side seals and/or top seals such as J-bulb seals or similar rubber seals are not acceptable in lieu of UHMWPE seals.
    e. On downward opening gates, rubber side seals and/or invert seals such as J-bulb seals or similar rubber seals are not acceptable in lieu of UHMWPE seals.
    f. The invert seal on upward opening gates shall use a compressible EPDM seal located in the invert of the frame.
        i. The invert seal shall be of a flush bottom arrangement.
        ii. The invert seal shall be mechanically fastened with stainless steel bolts.
        iii. Invert seals attached solely by the use of adhesives are not acceptable.
    g. All seats and seals shall be secured with assembly bolts. All seals shall be field removable and field replaceable without the need to remove the gate frame from the wall. Gates that require disassembly of any portion of the frame, to replace seals, are unacceptable.
    h. Anchor bolts shall not penetrate the seats or seals and anchor bolts shall not prevent the removal or replacement of seats or seals.
    i. The seal system shall have been shop tested with a minimum 30,000 cycle operating test in an abrasive environment to confirm the ability of the seals to withstand the abrasive condition with negligible deterioration and to confirm that the leakage restriction requirement is still possible.
        i. The shop test shall have been performed on a stainless steel sluice gate and the test results shall have been certified by the manufacturer in writing.
        ii. A copy of the test shall be provided to the Engineer.

OPERATING STEM

1. The operating stem shall be of stainless steel and shall be designed to transmit in compression at least 2 times the rated output of the manual operating mechanism with an 80 lbs effort.

2. The stem shall have a slenderness ratio (L/r) less than 200.
3. The threaded portion of the stem shall have a minimum diameter of 1-1/2 inches.
    a. The threads shall have machine rolled, full depth ACME threads.
    b. Stub threads are not acceptable.
4. Stems provided in multiple pieces shall be provided with couplings.
    a. Couplings shall be bronze or stainless steel and shall be internally threaded and keyed or bored and bolted.
5. Stem guides shall be constructed of stainless steel with UHMWPE bushings.
6. Gates with rising stems shall be provided with a clear plastic stem cover.
    a. The stem cover shall be butyrate and shall have a cap and condensation vents.
    b. Clear mylar indicating tape shall be provided for field application after the gate has been installed and positioned.
7. Stop collars shall be provided to limit the downward travel on gates with manual operating mechanisms.
    a. Stop collars shall be bronze and shall be internally threaded and provided with a stainless steel set screw.

OPERATING MECHANISM

1. Operating mechanisms shall be provided by the gate manufacturer.
2. Manual operators shall be yoke mounted on self-contained gates or floorstand mounted when shown in the Contract Documents.
    a. Manual operators shall be of the bevel gear type suitable for operation with a portable operator.
    b. Gear ratios shall be selected by the gate manufacturer to ensure that the maximum operating effort is 40 lbs at the design head.
    c. Minimum gear ratio shall be 2:1.
    d. Gearboxes shall have ductile iron housings, a bronze lift nut, steel gears and a stainless steel input shaft.
    e. Ball or roller bearings shall support the lift nut and input shaft.
    f. The housing shall be grease lubricated and permanently sealed.
    g. Handwheels shall be provided. Handwheels shall have a maximum diameter of 24 inches.
    h. Adaptor plates shall be utilized to attach the operating mechanism to the yoke. Adaptor plates shall be stainless steel and shall have a minimum thickness of 3/4-inch.
3. Electric motor actuators shall be provided a described in Section _____.
4. Interconnected gearboxes and multiple stems shall be provided to ensure proper operation of wide gates.
    a. Interconnected gearboxes are required on all upward opening gates when the opening width is greater than 60 inches and the height of the slide is less than half of the width.

b. Interconnected gearboxes are required on all downward opening gates when the opening width is greater than 48 inches and the height of the slide is less than half of the width.
c. Interconnected gearboxes shall consist of a stainless steel interconnecting shaft with flexible couplings on each end and stainless steel hardware. Aluminum shafts are not acceptable.
d. Gates with interconnected gearboxes, driven by an electric motor operator, shall be provided with a shroud to cover the interconnecting shaft.
    i. The shroud shall be removable.
    ii. The shroud shall be constructed of stainless steel and shall have a minimum thickness of 20 gauge.

FLOORSTANDS AND WALL BRACKETS

1. Floorstands shall be mounted to the concrete, mounted to a wall bracket or mounted on the yoke of a self-contained gate as shown on the Contract Drawings.
2. All floorstands and wall brackets shall be fabricated from stainless steel.
    a. The base plate, adaptor plate and gussets shall be minimum 1/2-inch thick.

ANCHORAGE

1. Anchor bolts shall be 316 stainless steel, fully threaded and shall have a minimum diameter of 1/2-inch.
    a. Anchor bolts shall be of the epoxy type.

FINISH

1. All heat tint and slag from the welding process shall be passivated in accordance with ASTM A380. If bead blasting is used, the entire slide and entire frame shall be bead blasted.
2. All ferrous components shall be suitably prepared and then shop coated with primer. Finish coating shall be applied by the Contractor. The ductile iron operator housing shall be finish coated by the Contractor with a suitable paint that complies with the Painting section.

INSTALLATION

1. Installation shall be performed in accordance with the gate manufacturer's installation instructions and the approved installation drawings.
2. Installation instructions and installation drawings shall be found in the O&M manual.
3. Non-shrink grout shall be applied, by the Contractor, between the gate frame and the wall to ensure that there is no leakage around the gate.

SECTION _____
TYPICAL SPECIFICATIONS FOR SS-250 SERIES FABRICATED SLIDE GATE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The equipment provided under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by the engineer.

Gates and operators shall be supplied with all the necessary parts and accessories indicated on the drawings, specified or otherwise required for a complete and properly operating installation, and shall be the latest standard product of a manufacturer regularly engaged in the production of fabricated water control gates.

B. Unit Responsibility: To insure compatibility of all components directly related to the slide gates, unit responsibility for the slide gates, actuators and accessories as described in this section shall be the responsibility of the slide gate manufacturer unless specified otherwise.

1.02 SUBMITTALS

A. Submittals shall be in accordance with Sections _____ and as specified herein. Submittals shall include as a minimum:
   1. Shop Drawings
   2. Manufacturer's operation and maintenance manuals and information.
   3. Manufacturer's installation certificate.
   4. Manufacturer's equipment warranty.
   5. Manufacturer's performance affidavit in accordance with Section _____.
   6. Design calculations demonstrating lift loads and deflection in conformance to the application requirements. Design calculations shall be approved by a licensed engineer (PE) and shall be available upon request.

1.03 QUALITY ASSURANCE

A. Qualifications
   1. All of the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 20-years of experience designing and manufacturing slide gates. The manufacturer shall have manufactured stainless steel slide gates of the type described herein for a minimum of 20 similar projects.

2. The sealing system shall be certified and tested for operation and performance to leakage specifications compliant with AWWA C-561 for a minimum of 100,000 cycles.
3. The project design is based on the Waterman SS-250 Series Fabricated Slide Gate as manufactured by Waterman Industries of Exeter, California. Proposed alternates must be pre-approved, per addendum, at least 14-days prior to close of bid. Requests for alternates must be supplemented with detailed drawings, specifications, and references. Any/all additional costs for structure modifications or other changes associated with utilizing a brand other than Waterman are to be borne by the contractor.
4. To insure quality and consistency, the slide gates listed in this section shall be manufactured and assembled in a facility owned and operated by the slide gate manufacturer. Third-party manufacturers contracted for fabrication and assembly of the slide gates will not be permitted.

PART 2 EQUIPMENT

2.01 GENERAL

A. The gates shall be either self-contained with yoke and bench stand operators, or non-self-contained with separate stem guides and operator, in accordance with the requirements of these specifications.
B. The gates shall be compliant with the latest version of AWWA C561 as described below.
C. Specific configurations shall be as noted on the gate schedule or as shown on the plans.
D. Materials:

COMPONENTS	MATERIALS
Frame, Yoke, Cover Slide, Wall Thimbles	Choose an item.
Seat/Seals & Stem Sleeves	Choose an item.
Cord Seal	Choose an item.
Flush Bottom Seals	Choose an item.
Stems	Choose an item.
Stem cover	Choose an item.
Stem Guides	Choose an item.
Wall Brackets	Choose an item.
Pedestals	Choose an item.

Fasteners and Anchor Bolts	Choose an item.
Finish	Choose an item.

E. Gate Schedule:

Equipment Number	Gate Size, inch[1]	Gate type[2]	Opening Direction[3]	Bottom Seating[4]	Design Head, feet		Operator Type
					Seating	Unseating	

Notes:

1. Clear opening width by height.
2. E = embedded frame, W = wall mounted, Y = self-contained, F = flatback
3. U = upward, D = downward
4. FB = flush bottom

2.02 FRAME AND GUIDE RAILS

A. The gate frame shall be composed of stainless steel guide rails with UHMW seat/seals upstream and downstream. The seat/seals shall form a tight seal between the frame and the slide (disc). The guides will be of sufficient length to support ½ the height of the slide when in the full open position.
B. Yoke shall not deflect more than 1/360th of the span under full head break load.
C. Seals shall be replaceable without removing the frame from the wall. In the case of embedded gates, they shall be constructed in a manner that allows replacement of the seals without removal of the gate frame from the embedment.

2.03 STEM AND STEM GUIDE

A. Material
   1. The stem shall be solid stainless steel of the specified grade.
B. Design
   1. Guides shall be adjustable with split stem sleeves. Guides shall be spaced per the manufacturer's recommendations. The stem L/r ratio shall not exceed 200.
   2. Stem threads shall be machine-cut 29-degree full Acme or stub Acme type.
   3. Nominal diameter of the stem shall not be less than the crest of the threaded portion.

2.04 SEALS

A. The seals shall be self-adjusting. Seals requiring periodic maintenance and adjustments to maintain specified leakage rates will not be permitted.
B. The top seal design on upward opening gates consisting of four side seals shall incorporate a self-cleaning wiping function that prevents debris from building-up above the top seal and causing premature wear of the seats, seals, and gate face.
C. The UHMW seats shall impinge on the slide (disc) by way of a continuous loop cord seal. Seal designs incorporating resilient seals such as “J-bulb” or “P” seals that come in direct contact with the friction surface of the slide will not be considered.
D. The cord seal shall function as a seal between the frame and the UHMW, and as a spring force to maintain contact between the UHMW and the slide (disc).
E. The resilient bottom seal shall be set into the invert member of the frame which shall be formed in a manner to protect 3 sides of the seal only exposing the side that will come in contact with the slide. Disc-mounted invert seals exposing additional surface area will not be permitted.
F. The self-adjusting seal system shall provide an allowable leakage rate of no more than ½ AWWA leakage rate per minute per peripheral foot of perimeter opening for seating and unseating heads.

2.05 SLIDE COVER (DISC)

A. The slide cover (disc) shall be stainless steel plate reinforced with structural shapes welded to the plate.
    1. The slide cover shall not deflect more than 1/720th of the span, or 1/16” at the seated sealing surface of the gate under maximum specified head.
    2. The stem to gate connection shall be either the clevis type, with structural members welded to the slide and a bolt or bolts to act as a securing method, or a threaded and bolted (or keyed) thrust nut supported in a welded nut pocket.
    3. The clevis, or pocket and yoke, of the gate shall be capable of taking, without damage, at least twice the rated thrust output of the operator at 40 pounds of pull on a hand wheel or hand crank, and at locked-rotor stall of a motor operator.
    4. The slide cover shall be constructed with vertical and horizontal reinforcement ribs.
    5. All welds shall be performed by an AWS-certified welding technician.

2.06 ANCHOR BOLTS

A. Anchor hardware shall be provided by the slide gate manufacturer.
    1. The size, quantity, and location of the anchor hardware shall be engineered by the slide gate manufacturer. Upon client request manufacturer shall provide calculations for anchor bolt sizing and quantity.

2. Anchor hardware consisting of studs, nuts and washers shall be provided by the manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

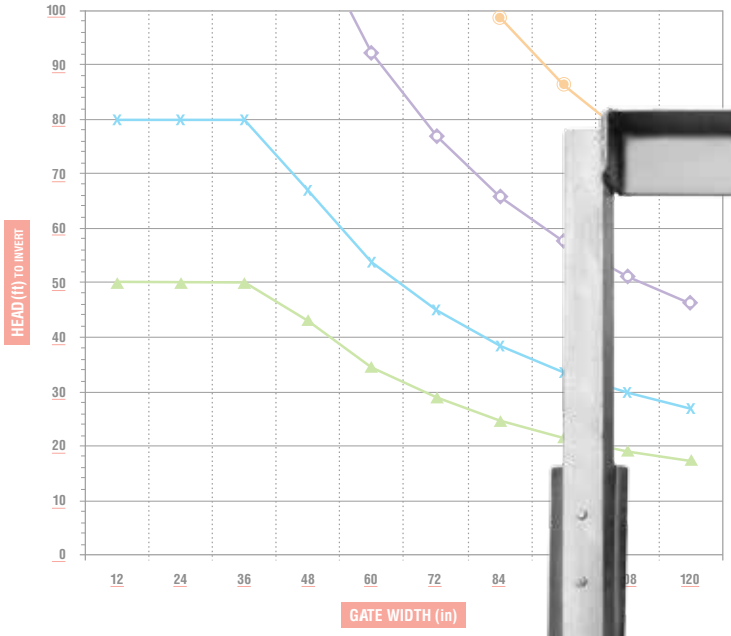
A. Installation of the gates shall be performed in accordance with standard industry practices. It shall be the responsibility of the CONTRACTOR to handle, store, and install the equipment specified in this Section in strict accordance with the Manufacturer's recommendations.
B. The CONTRACTOR shall review the installation drawings and installation instructions prior to installing the gates.
C. The gate frames shall be installed in a true vertical plane, square and plumb, with no twist, convergence, or divergence between the vertical legs of the guide frame.
D. The CONTRACTOR shall fill any void between the guide frames and the structure with non-shrink grout as shown on the installation drawing and in accordance with the grout manufacturer's recommendations.
E. The frame cross rail shall be adjusted as required to maintain consistent seal compression across the full width of the gate.

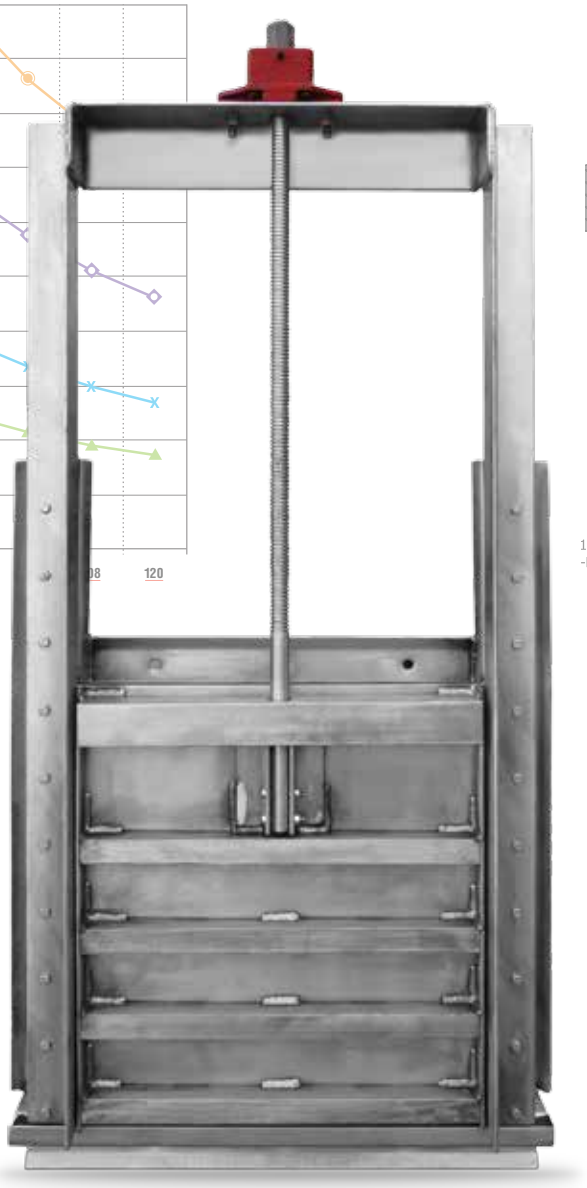
3.02 FIELD TESTING

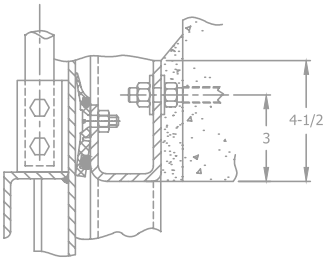
A. After installation, all gates will be field tested in the presence of the ENGINEER and OWNER to ensure that all items of equipment are in full compliance with this Section. Each gate assembly shall be water tested by the CONTRACTOR at the discretion of the ENGINEER and OWNER, to confirm that leakage does not exceed the specified allowed leakage.

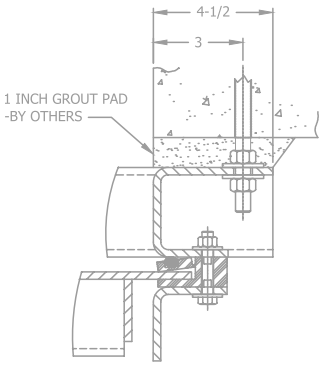
END OF SECTION
NOTHING FOLLOWS

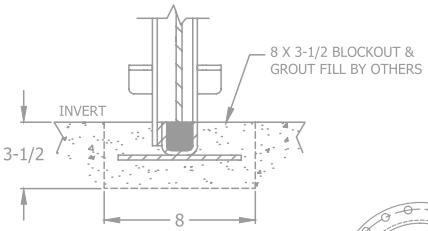
STAINLESS STEEL SLIDE GATES SS-250 SERIES

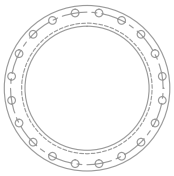












For Generations

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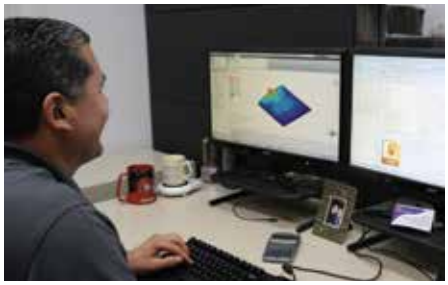
For the latest digital copies of all Waterman specifications and drawings, visit our website at www.WatermanUSA.com

SS-250 SERIES STAINLESS STEEL FABRICATED SLIDE GATES

Company Overview:

The experts at Waterman have custom-engineered thousands of flow control gates for projects worldwide. Waterman's team excels at developing innovative custom solutions to project needs. Our commitment to a highly-trained, customer-focused engineering department is unmatched by our competitors. Using computer modeling technology and finite element analysis, Waterman has systematically improved the design and construction of fabricated gates.



Product Overview:

Best-in-class fabricated water control gates provide reliable performance for water, wastewater and hydropower applications. They are noted for their excellent sealing / leak resistance and for their long service life. Each gate is custom-designed to your project's requirements including seating and unseating heads incorporating safety factors per AWWA standards.

Key Advantages and Performance:

- **Built for longevity and corrosion resistance** high strength 304L stainless steel and low-friction UHMW PE sliding and sealing surfaces lengthen the life of the gate. Optional 316L or 2205 stainless steel for use in unusually corrosive environments.
- **Guardian® seal system** (US Patent #8,820,711 awarded August 2015) dramatically increases seal life in both top and flush-bottom seals. Reduces leakage at critical corner joints. Offers superior performance to competitors' UHMW J-seal designs. No metal-to-metal contact prevents gate "sticking" and allows reliable operation even after years of no operation.
- **Best in class leakage performance Guardian®** UHMW PE continually self-adjusting seal system offers leakage rates up to 5 times better than the AWWA C561/C562 specification. The sealing system has been tested for 100,000 cycles (4x leading competitor) and continued to outperform the AWWA leakage specification.

Options:

- Models for normal aperture configuration, channel (embedded or surface mounted) as well as weirs (downward opening, often applied for decant and level control)
- SS-250 can be ordered as self-contained gates or with extension stems and separate operators.
- Gate frames can be embedded in channel walls, mounted to a wall with anchor bolts, mounted to a pipe flange or wall thimble. (Waterman offers a complete line of wall thimbles including “F”, “E”, “spigot style” as well as custom configurations.)
- “Q” seal bottom seal for high debris environments.
- Manual, electric or hydraulic actuation.
- Also available: A-250 Series Aluminum Slide Gates

SS-250 STAINLESS STEEL SLIDE GATE CONFIGURATIONS

TYPE OF GATE	APERTURE		END OF CHANNEL			IN CHANNEL	
(OPENING)	STANDARD	DOWNWARD OPENING	UPWARD OPENING	DOWNWARD OPENING (WEIR)	NON RESTRICTED FLOW	EMBEDDED GUIDE	WALL MTD. GUIDE
RISING STEM	251	252	253	254	255	256	257
MACHINED FLANGE	251-F	252-F					
CIRCULAR FLANGE	251-CF	252-CF					
FULLY CONTAINED SLIDE IN GUIDE RAIL	251-L	252-L	253-L	254-L	255-L	256-L	257-L
SELF-CONTAINED GATE	251-Y	252-Y	253-Y	254-Y	255-Y	256-Y	257-Y
NRS COVER	251-N	252-N	253-N	254-N	255-N	256-N	257-N
SPECIAL OR MODIFIED APPLICATION	251-X	252-X	253-X	254-X	255-X	256-X	257-X

FABRICATED STAINLESS STEEL GATES ADDITIONAL INFORMATION

Range of Sizes:
Waterman offers in-stock gates in standard dimensions for quick delivery and lowest total cost. In addition, we can custom design and manufacture gates in a nearly unlimited range of sizes and configurations.

Non-Rising Stem:
Fabricated gates can be ordered with a non-rising stem for areas with restricted space above the gate operator. The disadvantage of a non-rising stem is the threaded operating nut and stem are always exposed in the gate well. Lubrication of the threads becomes difficult to maintain and can lead to premature wear.

Optional Wall Thimbles:
Waterman can supply wall thimbles for mounting of fabricated gates. A thimble can be requested to ship prior to the gate so that it can be included in concrete forms before the structure is poured. Use of a thimble dramatically reduces the time for installation by eliminating labor of placing and aligning anchor bolts and the potential for misplaced or misaligned anchors. With a properly-installed thimble, the gate can be installed quickly when it arrives on site. See page 19 for a complete range of configurations.

Tandem Lifts / Interconnected Actuators:
For large gates, tandem actuators can be specified. This configuration is often used for gates over 72” width.

Actuator Loads for Structures:
For standard gates that are not self-contained, opening and closing thrusts from the actuator are resisted by the structure. Consult with Waterman’s engineering department for appropriate design parameters.

Actuators:
Waterman gates can be supplied with manual, electric or hydraulic actuators.

Manual actuators are typically geared “crank type” lifts, although handwheel-type actuators can be applied on small-sized gates with low operating loads. In situations where it will take substantial manual effort / time to open a gate, Waterman can supply electric or gasoline-powered portable operators. Consult with Waterman’s engineering department for specifications.

Electric actuators provide convenience for frequent opening, faster opening speeds and readily lend themselves to automation.

Hydraulic cylinders are frequently used in repetitive cycling applications and where automatic gate opening / closing in the event of a power failure is desired.

AWWA Fabricated Slide Gate Part Numbering Guide

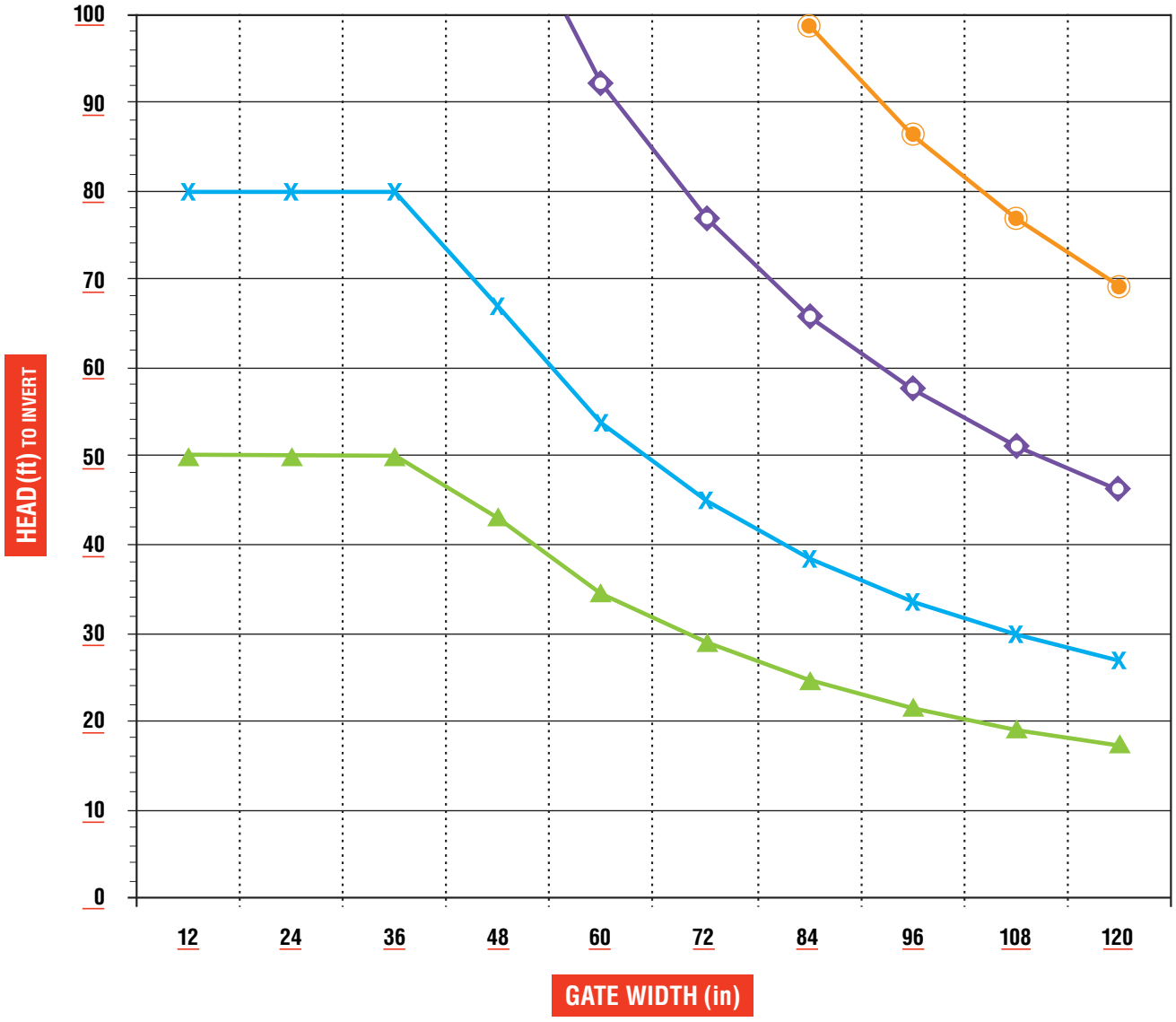
PART NUMBER BUILDER

SS – 25	1 –	1 –	Y –	36 x 42	10
Material **A-25** = Aluminum **SS-25** = Stainless Steel	**Opening Configuration Type** **1** = Standard **2** = Downward Opening **3** = Upward Opening **4** = Weir **5** = End of Channel Non Restricted Flow **6** = Embedded Guide **7** = Wall Mount	**Series** Indicate 1, 1.5, 2, or 3	**Options** Indicate **F** = Flanged **CF** = Circular Flange Modified ANSI 125# drilling **LF** = Fully Contained Slide **Y** = Self Contained Gate **N** = Non-Rising Stem Cover **X** = Special or Modified Option **Q** = Flush Bottom Seal **T** = Mounted to Wall Thimble	**Dimensions W x H** (separate with X), if metric, indicate MM after each number for millimeters	**Head Rating** indicate head rating in 5' increment

SS-251-1-Y-36 x 42-10

Indicates a stainless slide gate, standard series, self-contained, with 36" W x 42" H, rated for 10 feet of head.

STAINLESS STEEL GATE SERIES
HEAD RATINGS FOR CUSTOM SIZES

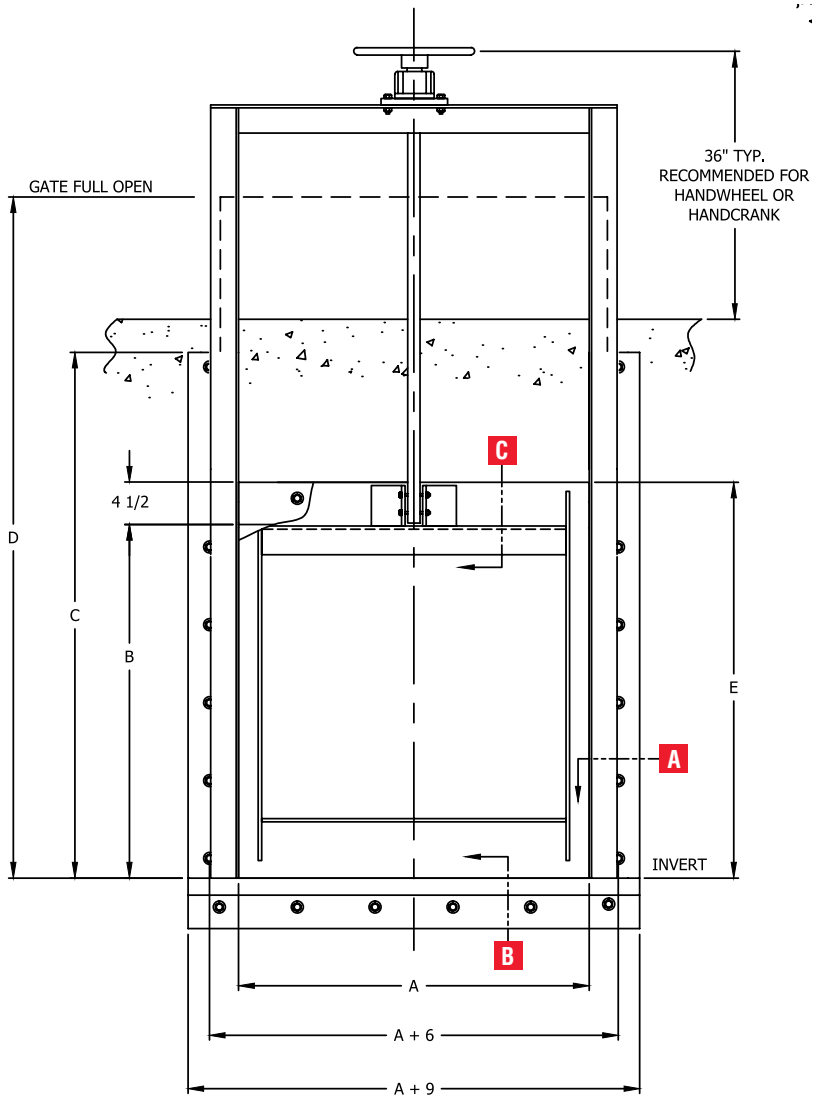


Drawings shown in this booklet are for 250-1 models only. Request drawings and specs for other models.

NOTES:

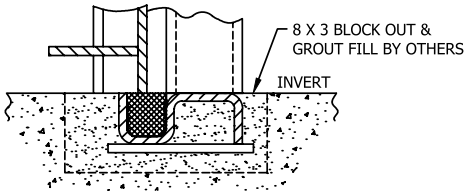
1) Formula to determine seat pressure:
Gate width (in)* Head (ft)*.2166

SS-251-1 SLIDE GATE



A	Gate Opening Width
B	Gate Opening Height
C	Guide Rail Height = B + 1/2 of Slide
D	Gate Full Open = 2B + 4-1/2
E	Slide Height = B + 4-1/2

ALTERNATE "Q" BOTTOM



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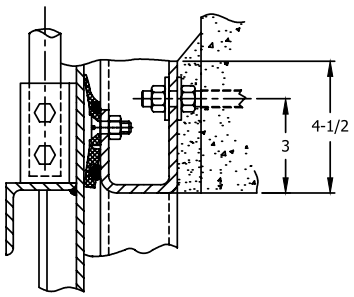

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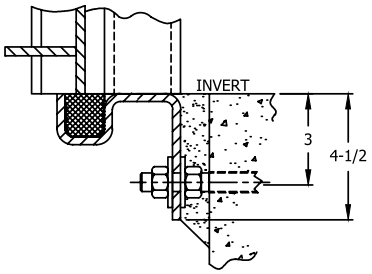

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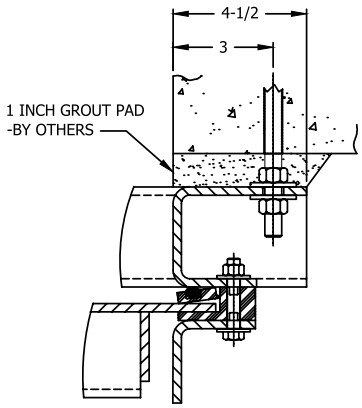
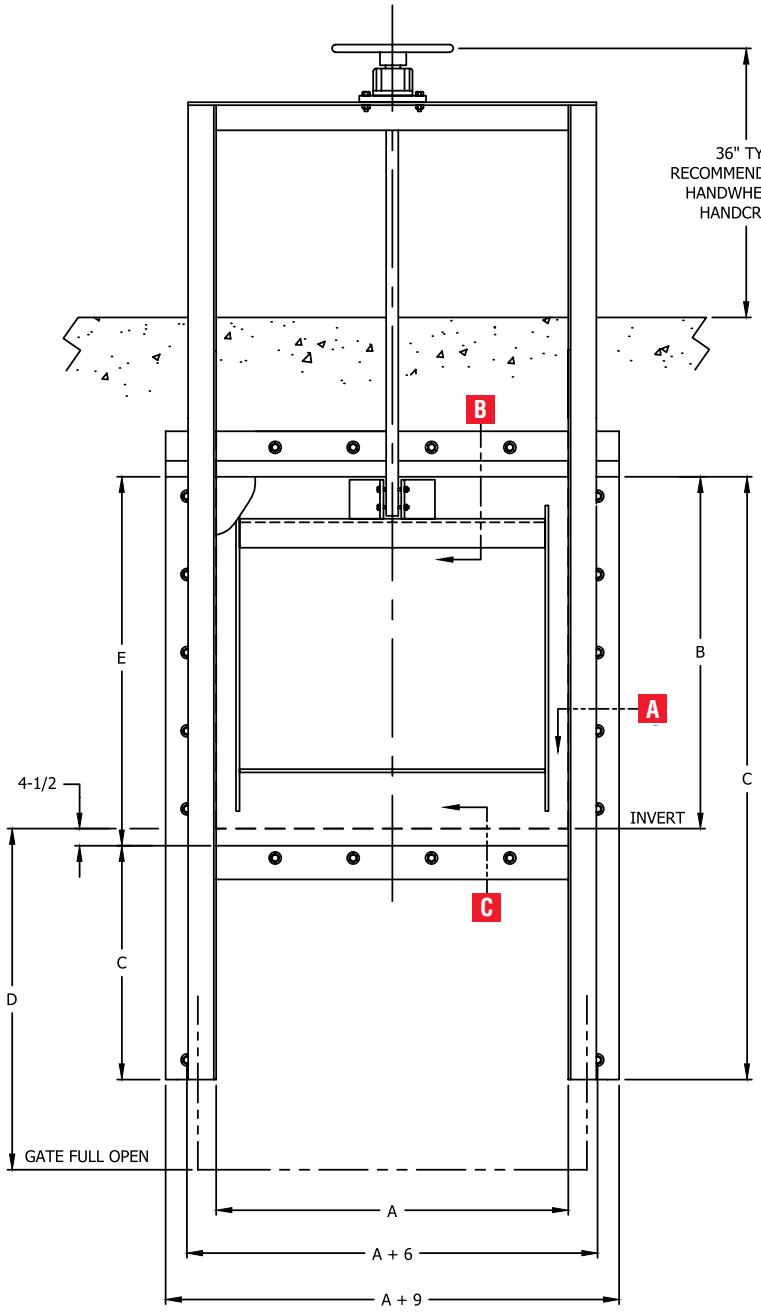
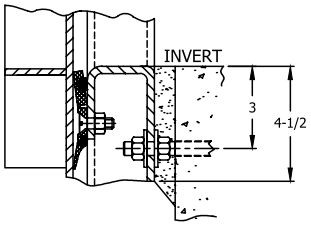


SS-252-1 SLIDE GATE



A	Gate Opening Width
B	Gate Opening Height
C	Guide Rail Height = B + 1/2 of Slide
D	Gate Full Open = B + 4-1/2
E	Slide Height = B + 4-1/2

SECTION C



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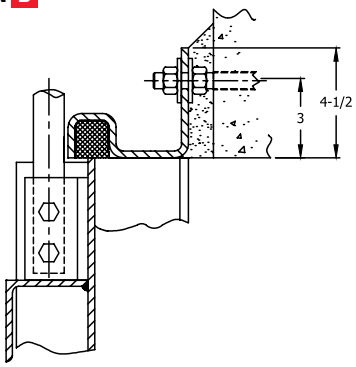

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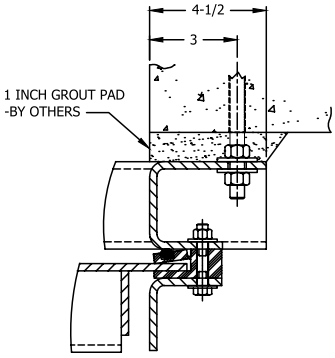
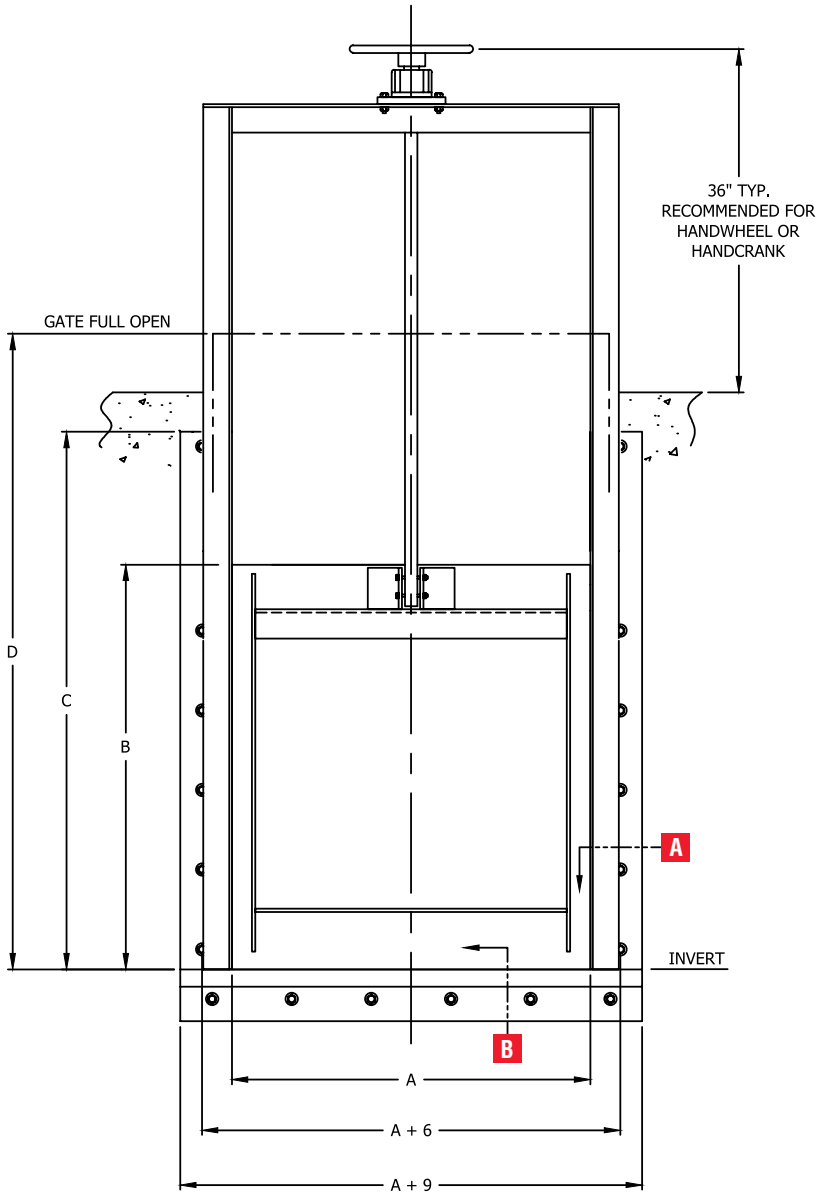
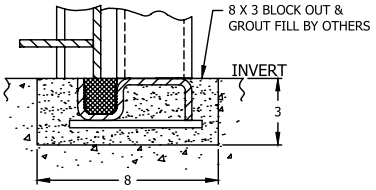


SS-253-1 SLIDE GATE



A	Gate Opening Width
B	Gate Opening Height
C	Guide Rail Height = B + 1/2 of Slide
D	Gate Full Open = 2B
E	Slide Height = B

ALTERNATE "Q" BOTTOM



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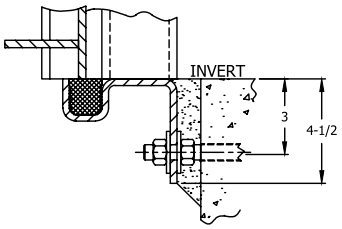

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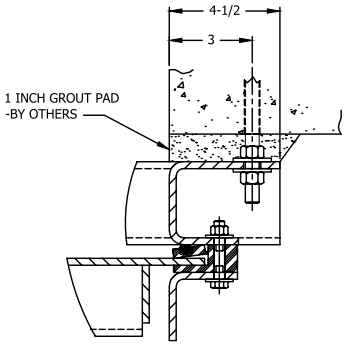
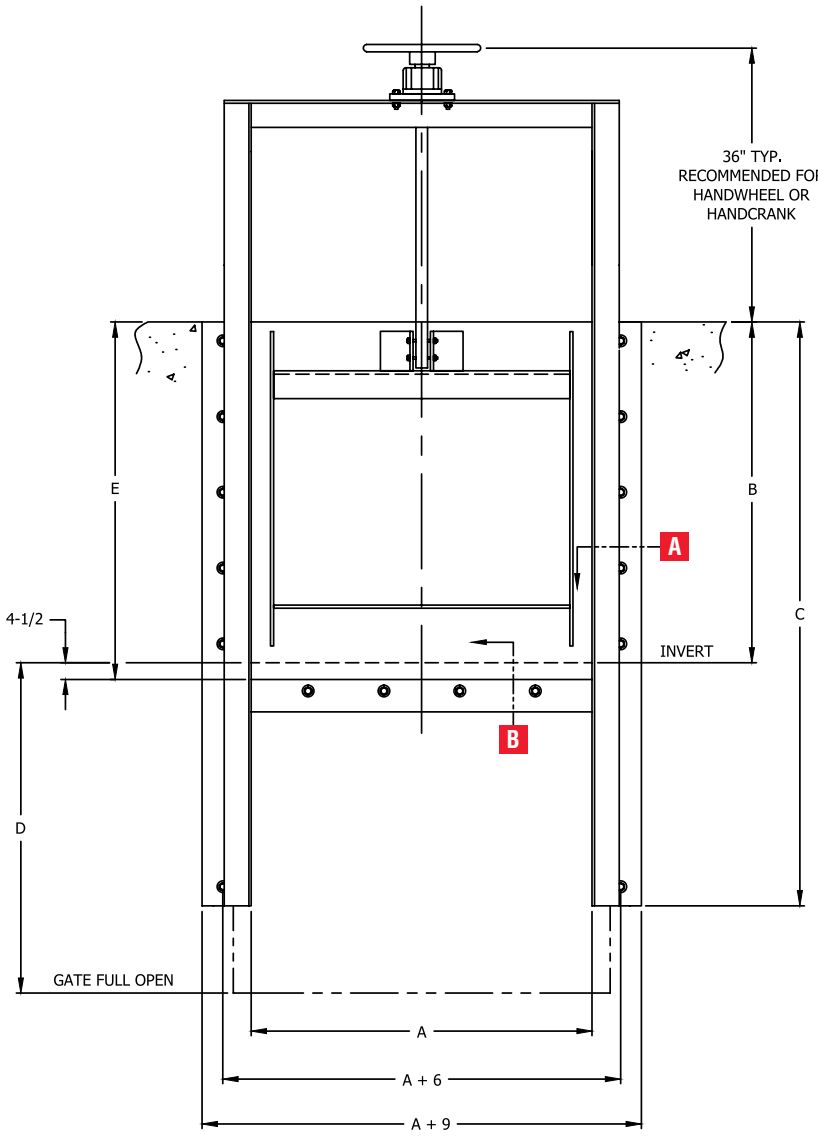


SS-254-1 SLIDE WEIR GATE



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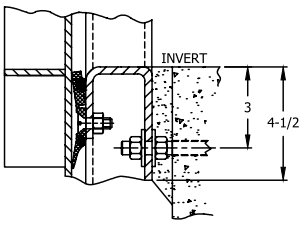

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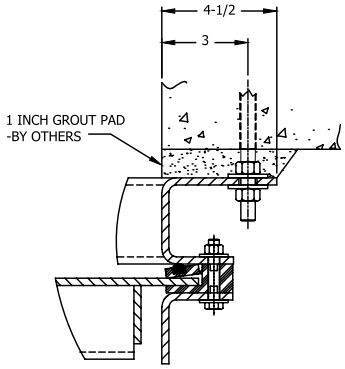
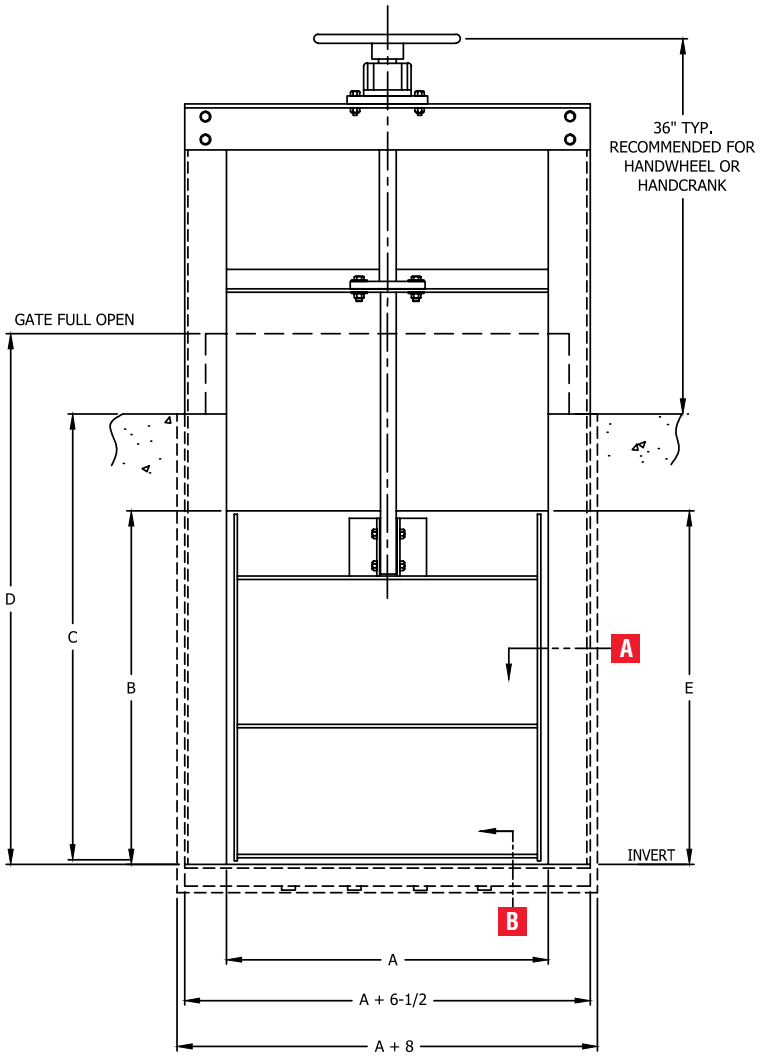


A	Gate Opening Width
B	Gate Opening Height
C	Guide Rail Height = B +1/2 of Slide
D	Gate Full Open = B + 4-1/2
E	Slide Height = B + 4-1/2

QSS-256-1 SLIDE GATE



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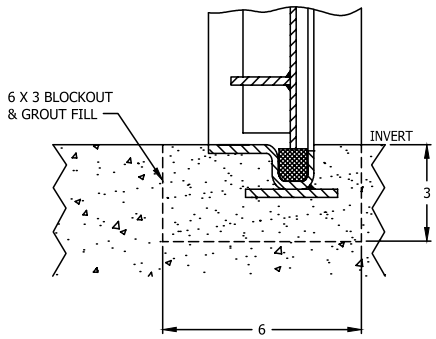

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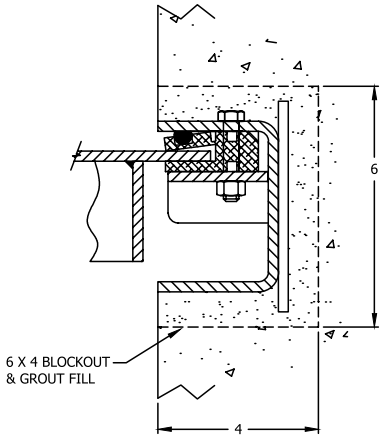

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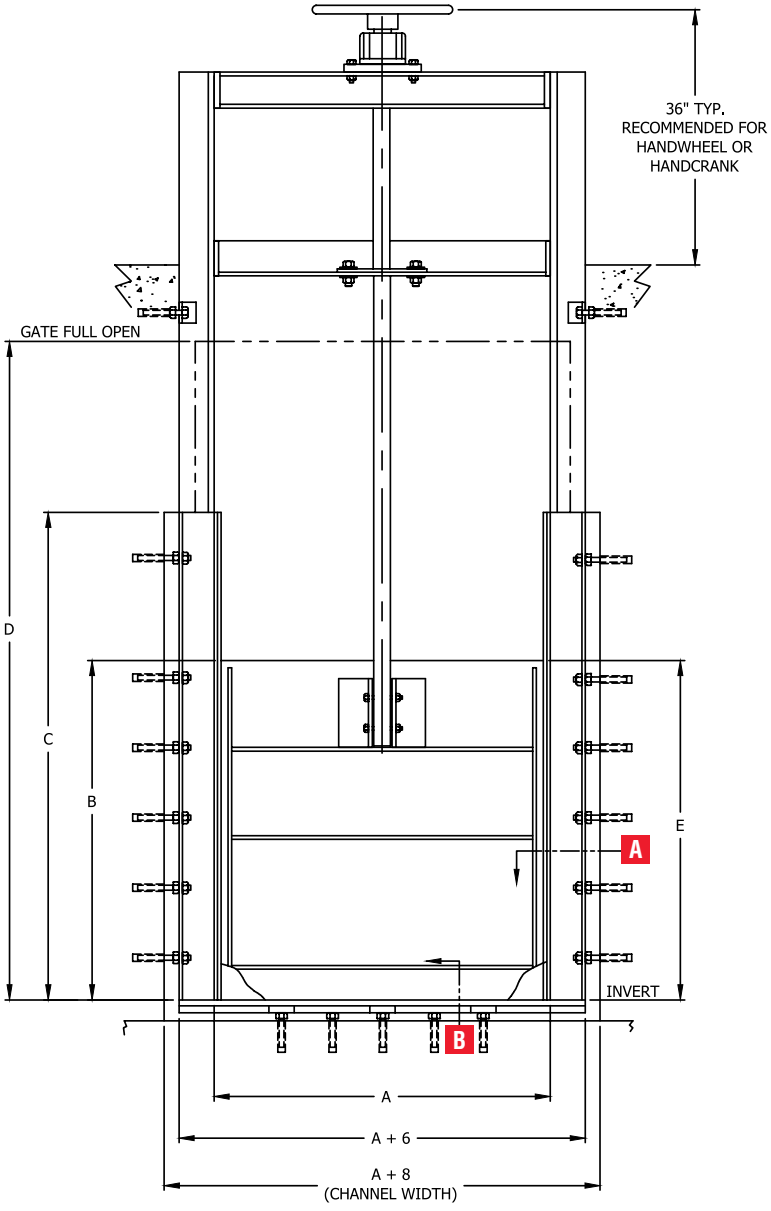
B	Gate Opening Height
C	Guide Rail Height = B + 1/2 of Slide
D	Gate Full Open = 2B
E	Slide Height = B

SS-257-1 SLIDE GATE



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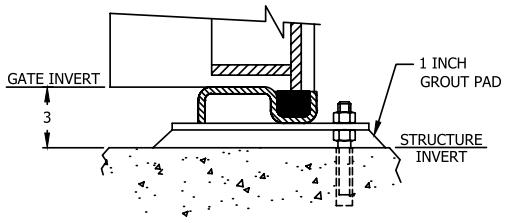

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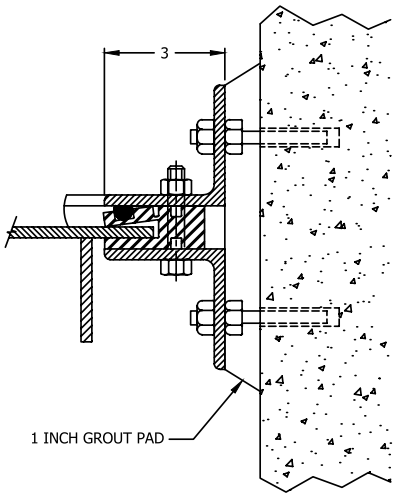
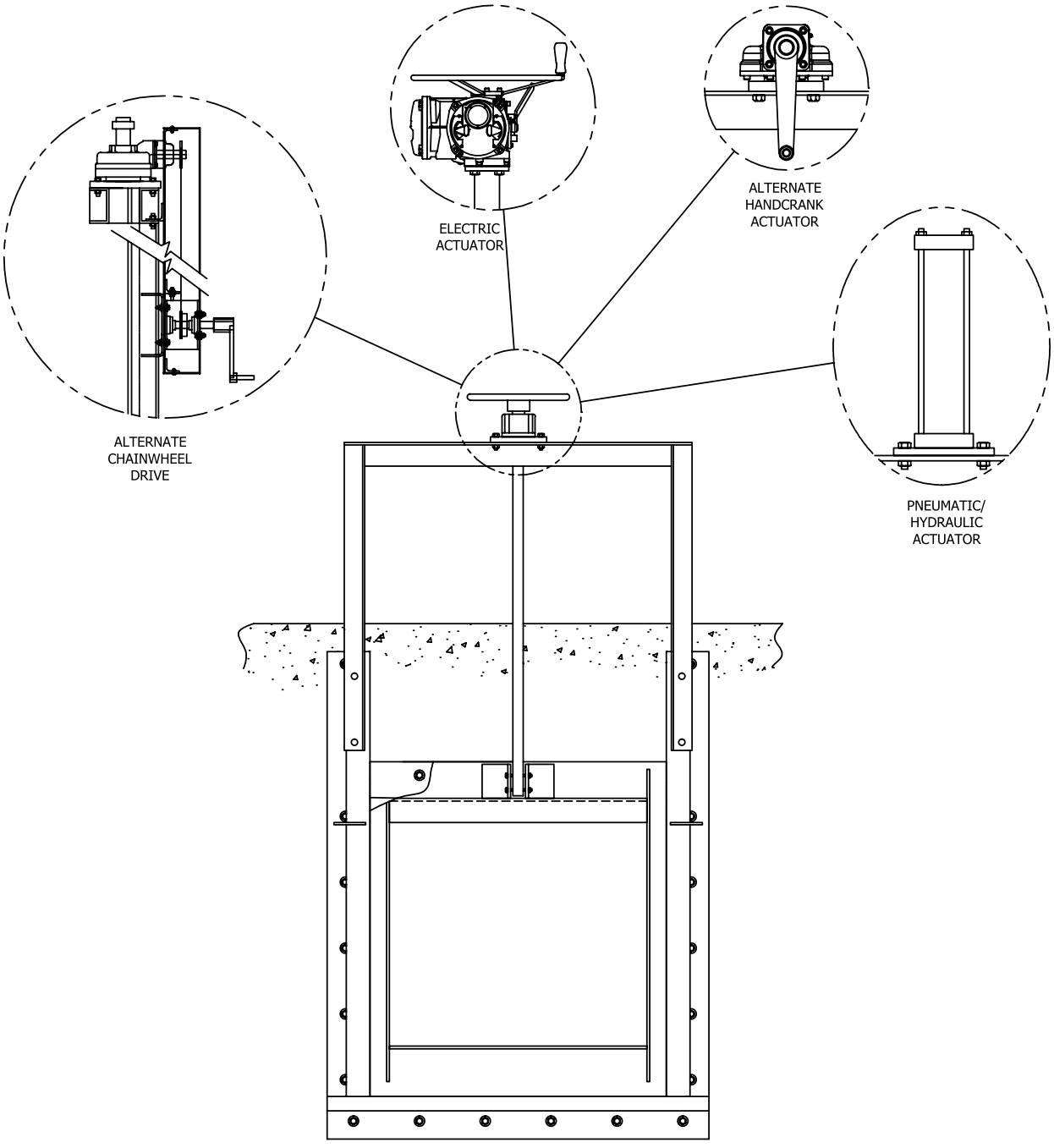


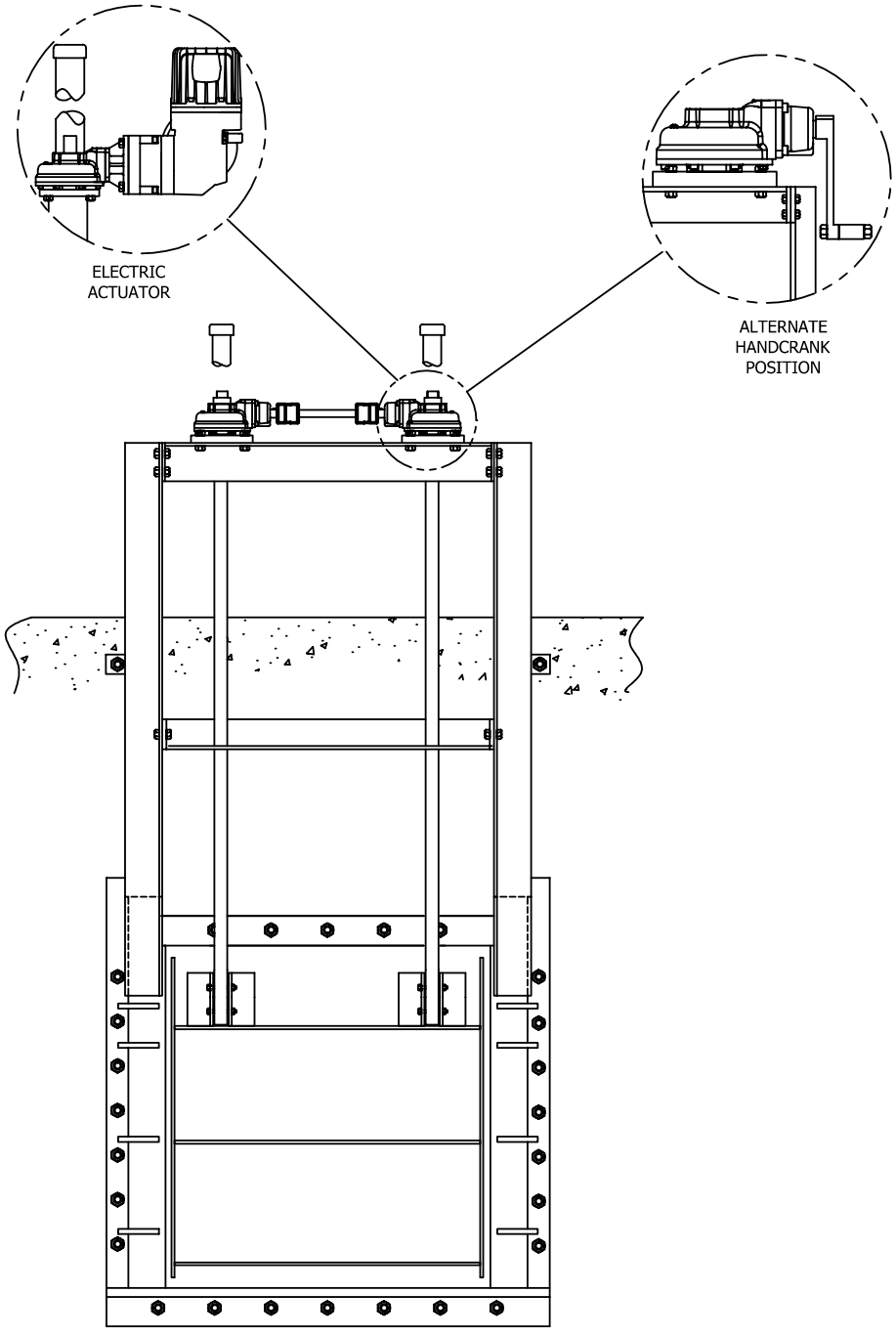
A	Gate Opening Width
B	Gate Opening Height
D	Gate Full Open = 2B
E	Slide Height = B

ACTUATORS SELF CONTAINED SLIDE GATES



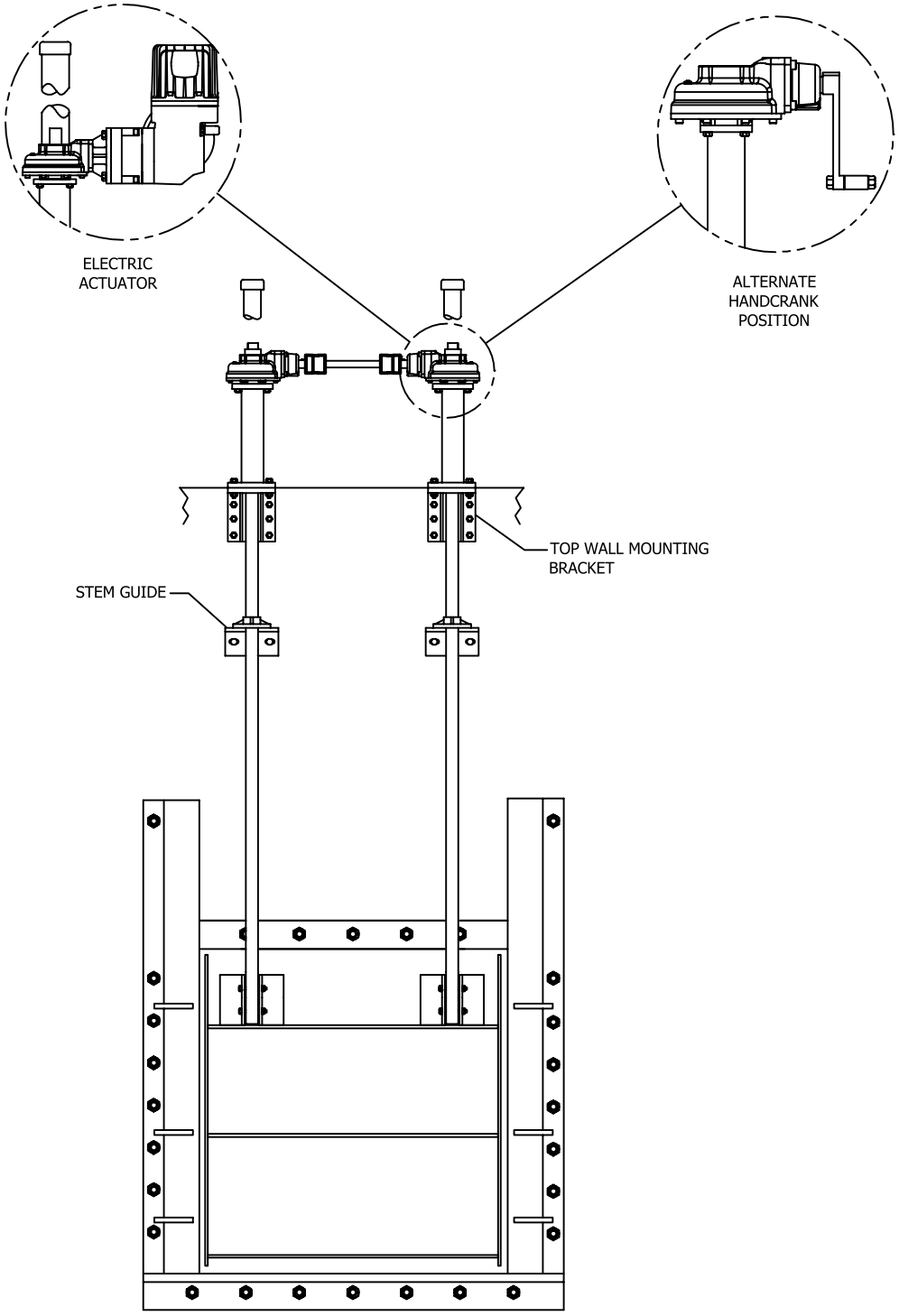
SINGLE LIFT & STEM

ACTUATORS SELF CONTAINED SLIDE GATES



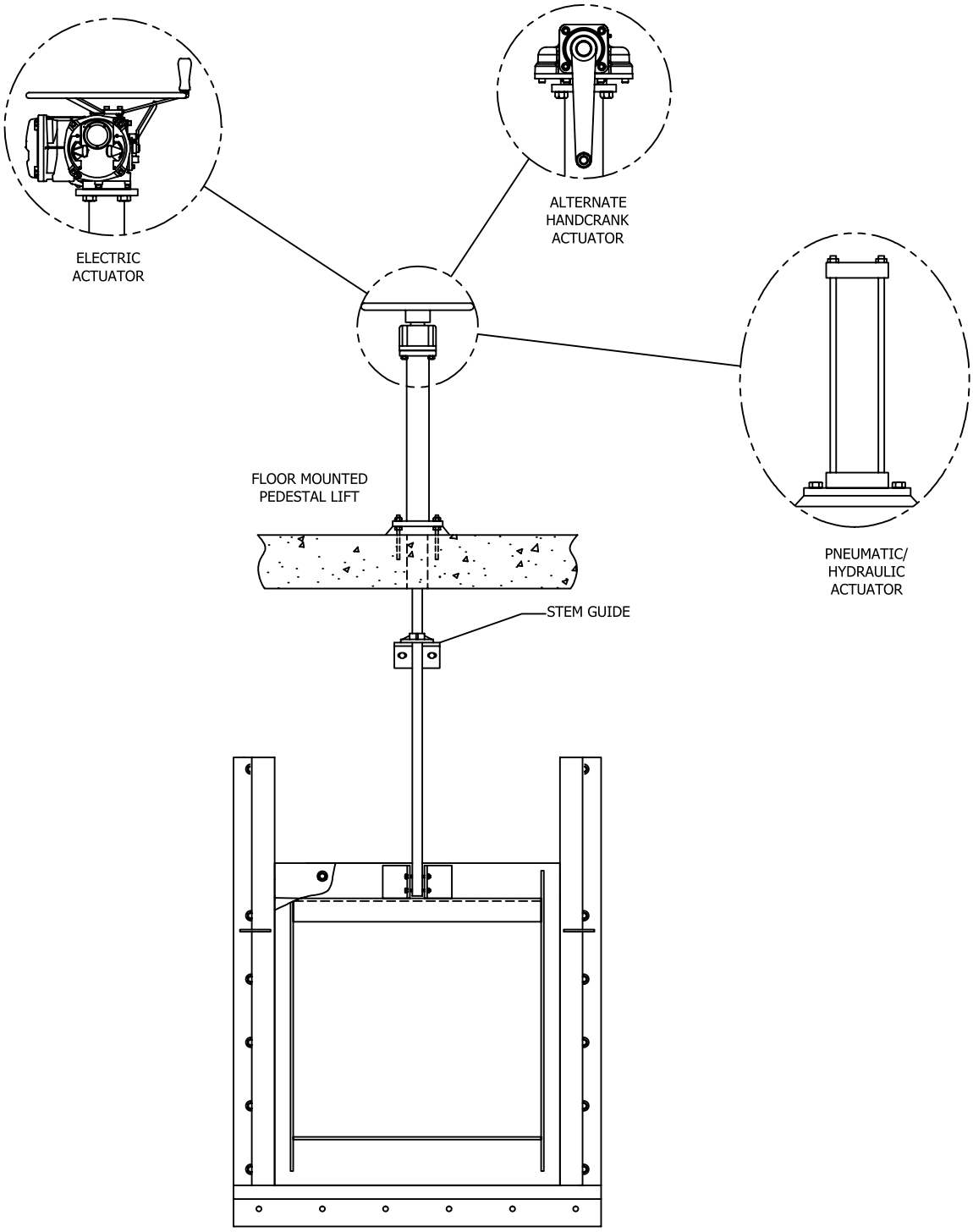
**TANDEM LIFTS
WITH DUAL STEMS**

ACTUATORS NON-SELF CONTAINED SLIDE GATES



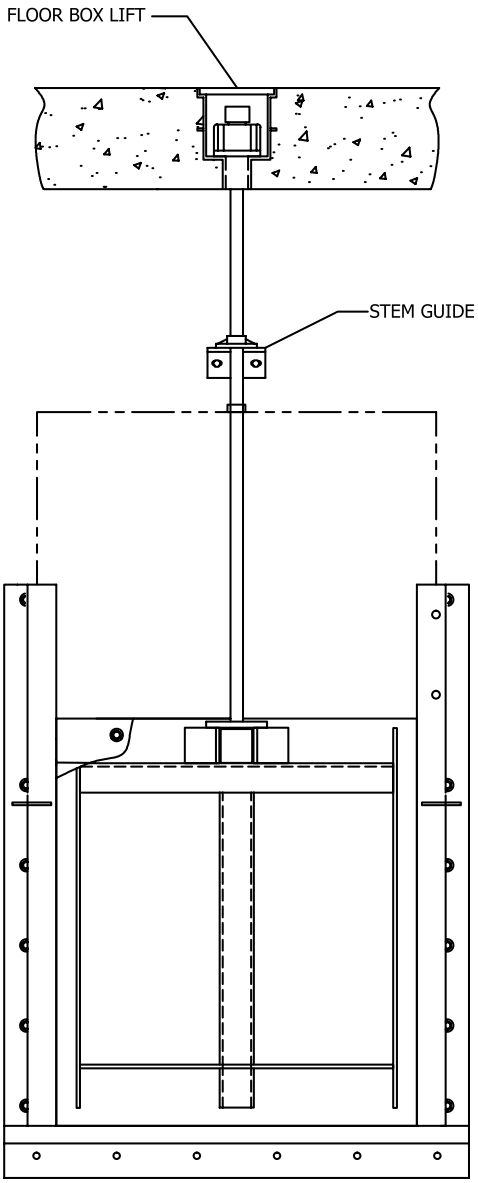
TANDEM LIFTS WITH DUAL STEMS

ACTUATORS NON-SELF CONTAINED SLIDE GATES

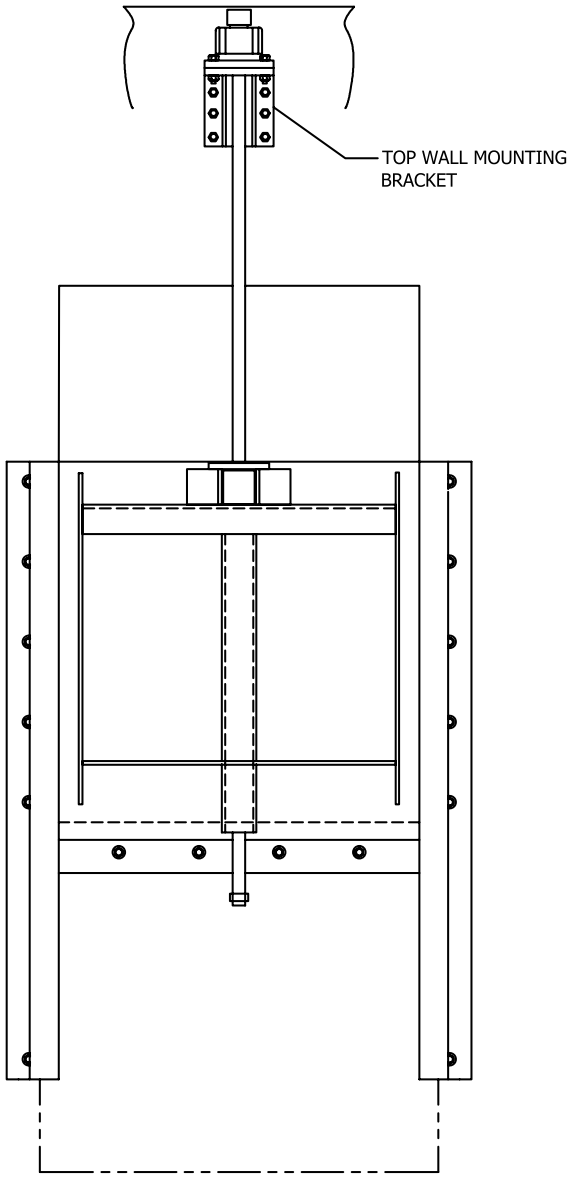


SINGLE LIFT & STEM

NON RISING STEM NON-SELF CONTAINED SLIDE GATES

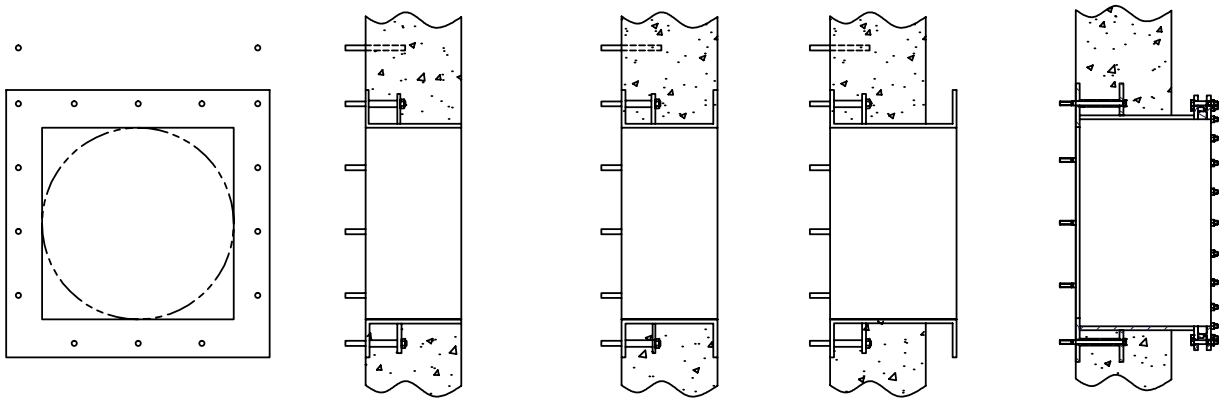


NON-RISING STEM SLIDE GATE



NON-RISING STEM SLIDE (WEIR) GATE

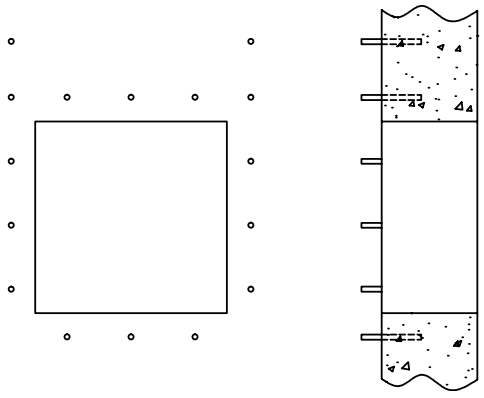
GATE MOUNTING CONFIGURATIONS



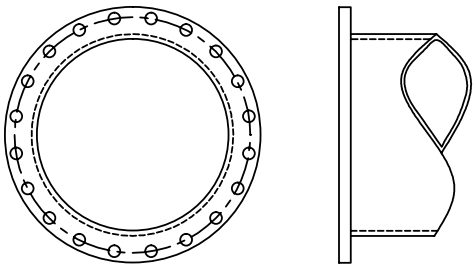
'F' TYPE 'E' TYPE 'MJ' TYPE

WALL THIMBLES

AVAILABLE WITH SQUARE, RECTANGLE OR CIRCULAR OPENING



ANCHOR BOLT MOUNTING



PIPE FLANGE MOUNTING

SECTION _____

TYPICAL SPECIFICATIONS FOR SS-250 SERIES FABRICATED SLIDE GATE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The equipment provided under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by the engineer.

Gates and operators shall be supplied with all the necessary parts and accessories indicated on the drawings, specified or otherwise required for a complete and properly operating installation, and shall be the latest standard product of a manufacturer regularly engaged in the production of fabricated water control gates.

B. Unit Responsibility: To insure compatibility of all components directly related to the slide gates, unit responsibility for the slide gates, actuators and accessories as described in this section shall be the responsibility of the slide gate manufacturer unless specified otherwise.

1.02 SUBMITTALS

A. Submittals shall be in accordance with Sections _____ and as specified herein.
Submittals shall include as a minimum:

1. Shop Drawings
2. Manufacturer's operation and maintenance manuals and information.
3. Manufacturer's installation certificate.
4. Manufacturer's equipment warranty.
5. Manufacturer's performance affidavit in accordance with Section _____.
6. Design calculations demonstrating lift loads and deflection in conformance to the application requirements. Design calculations shall be approved by a licensed engineer (PE) and shall be available upon request.

1.03 QUALITY ASSURANCE

A. Qualifications

1. All of the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 20-years of experience designing and manufacturing slide gates. The manufacturer shall have manufactured stainless steel slide gates of the type described herein for a minimum of 20 similar projects.
2. The sealing system shall be certified and tested for operation and performance to leakage specifications compliant with AWWA C-561 for a minimum of 100,000 cycles.
3. The project design is based on the Waterman SS-250 Series Fabricated Slide Gate as manufactured by Waterman Valve of Exeter, California. Proposed alternates must be pre-approved, per addendum, at least 14-days prior to close of bid. Requests for alternates must be supplemented with detailed drawings, specifications, and references. Any/all additional costs for structure modifications or other changes associated with utilizing a brand other than Waterman are to be borne by the contractor.
4. To insure quality and consistency, the slide gates listed in this section shall be manufactured and assembled in a facility owned and operated by the slide gate manufacturer. Third-party manufacturers contracted for fabrication and assembly of the slide gates will not be permitted.

PART 2 EQUIPMENT

2.01 GENERAL

A. The gates shall be either self-contained with yoke and bench stand operators, or non-self-contained with separate stem guides and operator, in accordance with the requirements of these specifications.

B. The gates shall be compliant with the latest version of AWWA C561, as described below.

C. Specific configurations shall be as noted on the gate schedule or as shown on the plans.

D. Materials:

COMPONENTS	MATERIALS
FRAME, YOKE, COVER SLIDE, WALL THIMBLES	Stainless Steel ASTM A240, Type 304L Stainless Steel ASTM A240, Type 316L Stainless Steel ASTM A240, Type 2205 Duplex
SEAT/SEALS & STEM SLEEVES	Ultra-High-Molecular-Weight Polyethylene (UHWMPE) ASTM D4020
CORD SEAL	Neoprene ASTM D2000 Nitrile ASTM D2000 Viton ASTM D1418
FLUSH BOTTOM SEALS	Neoprene ASTM D2000 Viton ASTM D1418
STEMS	Stainless Steel ASTM A276, AISI Type 304 Stainless Steel ASTM A276, AISI Type 316 Stainless Steel ASTM A276, AISI Type 2205 Duplex Stainless Steel ASTM A564, AISI Type 630
STEM COVER	Clear Butyrate with Mylar Strip Galvanized A53 Steel Aluminum
STEM GUIDES	Cast Iron (ASTM 126 Class B) Bronze Bushed Cast Iron (with 2% Nickel) Bronze Bushed Ni-Resist Cast Iron (ASTM A436, Type 2 or 2B) Bronze Bushed Stainless Steel (ASTM A240 Type 304L) UHMW Bushed Stainless Steel (ASTM A240 Type 316L) UHMW Bushed Stainless Steel (ASTM A240 Type 2205) UHMW Bushed
WALL BRACKETS	Not Applicable Cast Iron (ASTM 126 Class B) Cast Iron (with 2% Nickel) Ductile Cast Iron (ASTM A536) Ni-Resist Cast Iron (ASTM A436, Type 2 or 2B) Steel (ASTM A36) Stainless Steel ASTM A240, AISI Type 304L Stainless Steel ASTM A240, AISI Type 316L Stainless Steel ASTM A240, AISI Type 2205
PEDESTALS	Not Applicable Cast Iron (ASTM 126 Class B) Cast Iron (with 2% Nickel) Ductile Cast Iron (ASTM A536) Ni-Resist Cast Iron (ASTM A436, Type 2 or 2B) Steel (ASTM A36/A53) Stainless Steel ASTM A240/A312, AISI Type 304L Stainless Steel ASTM A240/A312, AISI Type 316L Stainless Steel ASTM A240/A312, AISI Type 2205
FASTENERS AND ANCHOR BOLTS	Stainless Steel ASTM A593 & A594, Type 304 CW A193 & A194 Stainless Steel ASTM A593 & A594, Type 316 CW A193 & A194 Stainless Steel ASTM A593 & A594, Type UNS S-32205 Duplex 2205
FINISH	Polyamide Epoxy Coal Tar Epoxy

E. GATE SCHEDULE

EQUIPMENT NUMBER	GATE SIZE, INCH[1]	GATE TYPE[2]	OPENING DIRECTION[3]	BOTTOM SEATING[4]	DESIGN HEAD, FEET		OPERATOR TYPE
					SEATING	UNSEATING	

Notes: Clear opening width by height. E = embedded frame, W = wall mounted, Y = self-contained, F = flatback U = upward, D = downward FB = flush bottom

2.02 FRAME AND GUIDE RAILS

A. The gate frame shall be composed of stainless steel guide rails with UHMW seat/seals upstream and downstream. The seat/seals shall form a tight seal between the frame and the slide (disc). The guides will be of sufficient length to support ½ the height of the slide when in the full open position.
B. Yoke shall not deflect more than 1/360th of the span under full head break load.
C. Seals shall be replaceable without removing the frame from the wall. In the case of embedded gates, they shall be constructed in a manner that allows replacement of the seals without removal of the gate frame from the embedment.

2.03 STEM AND STEM GUIDE

A. Material
   1. The stem shall be solid stainless steel of the specified grade.
B. Design
   1. Guides shall be adjustable with split stem sleeves. Guides shall be spaced per the manufacturer's recommendations. The stem L/r ratio shall not exceed 200.
   2. Stem threads shall be machine cut 29 degree full Acme or stub Acme type.
   3. Nominal diameter of the stem shall not be less than the crest of the threaded portion.

2.04 SEALS

A. The seals shall be self-adjusting. Seals requiring periodic maintenance and adjustments to maintain specified leakage rates will not be permitted.
B. The top seal design on upward opening gates consisting of four side seals shall incorporate a self-cleaning wiping function that prevents debris from building-up above the top seal and causing premature wear of the seats, seals, and gate face.
C. The UHMW seats shall impinge on the slide (disc) by way of a continuous loop cord seal. Seal designs incorporating resilient seals such as "J-bulb" or "P" seals that come in direct contact with the friction surface of the slide will not be considered.
D. The cord seal shall function as a seal between the frame and the UHMW, and as a spring force to maintain contact between the UHMW and the slide (disc).
E. The resilient bottom seal shall be set into the invert member of the frame which shall be formed in a manor to protect 3 sides of the seal only exposing the side that will come in contact with the slide. Disc-mounted invert seals exposing additional surface area will not be permitted.
F. The self-adjusting seal system shall provide an allowable leakage rate of no more than ½ AWWA leakage rate per minute per peripheral foot of perimeter opening for seating and unseating heads.

2.05 SLIDE COVER (DISC)

A. The slide cover (disc) shall be stainless steel plate reinforced with structural shapes welded to the plate.
   1. The slide cover shall not deflect more than 1/720th of the span, or 1/16" at the seated sealing surface of the gate under maximum specified head.
   2. The stem to gate connection shall be either the clevis type, with structural members welded to the slide and a bolt or bolts to act as a securing method, or a threaded and bolted (or keyed) thrust nut supported in a welded nut pocket.
   3. The clevis, or pocket and yoke, of the gate shall be capable of taking, without damage, at least twice the rated thrust output of the operator at 40 pounds of pull on a hand wheel or hand crank, and at locked-rotor stall of a motor operator.
   4. The slide cover shall be constructed with vertical and horizontal reinforcement ribs.
   5. All welds shall be performed by an AWS-certified welding technician.

2.06 ANCHOR BOLTS

A. Anchor hardware shall be provided by the slide gate manufacturer.
   1. The size, quantity, and location of the anchor hardware shall be engineered by the slide gate manufacturer. Upon client request manufacturer shall provide calculations for anchor bolt sizing and quantity.
   2. Anchor hardware consisting of studs, nuts and washers shall be provided by the manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation of the gates shall be performed in accordance with standard industry practices. It shall be the responsibility of the CONTRACTOR to handle, store, and install the equipment specified in this Section in strict accordance with the Manufacturer's recommendations.
B. The CONTRACTOR shall review the installation drawings and installation instructions prior to installing the gates.
C. The gate frames shall be installed in a true vertical plane, square and plumb, with no twist, convergence, or divergence between the vertical legs of the guide frame.
D. The CONTRACTOR shall fill any void between the guide frames and the structure with non-shrink grout as shown on the installation drawing and in accordance with the grout manufacturer's recommendations.
E. The frame cross rail shall be adjusted as required to maintain consistent seal compression across the full width of the gate.

3.02 FIELD TESTING

A. After installation, all gates will be field tested in the presence of the ENGINEER and OWNER to ensure that all items of equipment are in full compliance with this Section. Each gate assembly shall be water tested by the CONTRACTOR at the discretion of the ENGINEER and OWNER, to confirm that leakage does not exceed the specified allowed leakage.

INNOVATIONS IN WATER CONTROL

Waterman Industries is a leading supplier of water control products to the water treatment, rural water distribution, industrial processing and agricultural industries based in Exeter, California.

The company was founded by W.A. Waterman in 1912 as a fabricator of metal components for the growing California Central Valley agricultural markets. Waterman's purchase of the Red Top line in the early 1930's gave the company a leading position in both agricultural water distribution and on-farm water management products.

Herrick Waterman became company President in 1953, and rapidly expanded the company into production of large and complex sluice gates, slide gates and radial gates for water projects throughout the Western States. A new plant was opened in 1963 to support - growth from projects worldwide. The company remains one of North America's leading suppliers of gates for municipal water treatment and rural water distribution systems.

Beyond best-in-class products, Waterman Industries is also known as a leader in outstanding customer service, product training, and technical support.

In 2018, Waterman was acquired by McWane, Inc. McWane, Inc. is a family-owned business based in Birmingham, Alabama, with companies across the United States and the world. At the McWane Family of Companies, we cast ductile iron products–including pipe, valves, hydrants, fittings, and plumbing products–manufacture fire extinguishers, fire suppression systems, steel pressure vessels, build network switches and monitoring equipment. We are the leader in delivering clean, safe drinking water around the world while focusing on the safe, environmentally-friendly manufacturing of our products. The company employs more than 6,000 team members and has a longstanding commitment of support to the communities where we live and work.

Waterman Valve LLC - Engineered Water Control Products Since 1912
25500 Road 204 Exeter, California 93221 USA Tel: 1-(559) 562-4000 Fax: 1-(559) 562-2277 www.WatermanUSA.com
Nationwide Order Desk: (800) 331-0808

LIT-EP-002 Rev. 5/2018

BUDGET PROPOSAL

WATER CONTROL GATES

Whipps, inc.
370 South Athol Road
Athol, MA 01331
Phone : 978-249-7924
Fax : 978-249-3072

January 17, 2022

Please Reply To :
Smith Environmental, Inc.
1211 Chesapeake Avenue
Columbus, Ohio 43212
Paul Matrka

Budget Quotation No. 10626 rev 1

Subject : **Alum Creek WRF**
Delaware County, Ohio
Engineer : MS Consultants Inc.
Bid Date : January 17, 2022
Bid Expires : March 18, 2022

Bidding Contractors :

We are pleased to offer the following quotation for **Stainless Steel Gates:**

Item No 1

Location - Drawing Number :	UV 1-5 - Sheet 56
Quantity :	Five (5)
Gate Size - Model :	24" Wide x 36" High - Model 924 Self Contained Stainless Steel Slide Gate
Invert To Floor :	7.5 ft
Max Design Head :	5 ft seating - 5 ft unseating
Description :	The upward opening stainless steel slide gate will have the following features : SS304L construction; UHMW side and top seals and a neoprene invert seal; The single operating stem will be SS304L with a plastic stem cover.
Mounting Style :	Wall mounted with non-shrink grout and SS anchor studs.
Lifting Mechanism :	Yoke mounted electric actuator.
Anchor Bolts :	1/2" anchor studs and nuts included.

Item No 2

Location - Drawing Number :	UV - Sheet 56
Quantity :	One (1)
Gate Size - Model :	48" Wide x 36" High - Model 924 Self Contained Stainless Steel Slide Gate
Invert To Floor :	7.5 ft
Max Design Head :	5 ft seating - 5 ft unseating
Description :	The upward opening stainless steel slide gate will have the following features : SS304L construction; UHMW side and top seals and a neoprene invert seal; The single operating stem will be SS304L with a plastic stem cover.
Mounting Style :	Wall mounted with non-shrink grout and SS anchor studs.
Lifting Mechanism :	Yoke mounted electric actuator.
Anchor Bolts :	1/2" anchor studs and nuts included.

Item No 3

Location - Drawing Number :	Post Aeration - Sheet 56
Quantity :	Two (2)
Gate Size - Model :	72" Wide x 36" High - Model 924 Self Contained Stainless Steel Slide Gate
Invert To Floor :	7.5 ft
Max Design Head :	5 ft seating - 5 ft unseating
Description :	The upward opening stainless steel slide gate will have the following features : SS304L construction; UHMW side and top seals and a neoprene invert seal; The single operating stem will be SS304L with a plastic stem cover.
Mounting Style :	Wall mounted with non-shrink grout and SS anchor studs.
Lifting Mechanism :	Yoke mounted electric actuator.
Anchor Bolts :	1/2" anchor studs and nuts included.

Item No 4

Location - Drawing Number :	Post Aeration - Sheet 56
Quantity :	Two (2)
Gate Size - Model :	66" Wide x 48" High - Model 923D Self Contained Stainless Steel Weir Gate
Invert To Floor :	8 ft
Max Design Head :	5 ft seating - 5 ft unseating
Description :	The downward opening stainless steel weir gate will have the following features : SS304L construction; UHMW side and invert seals; The single operating stem will be SS304L with a plastic stem cover.
Mounting Style :	Wall mounted with non-shrink grout and SS anchor studs.
Lifting Mechanism :	Yoke mounted electric actuator.
Anchor Bolts :	1/2" anchor studs and nuts included.

Item No 5

Location - Drawing Number :	Post Treatment - Sheet 56
Quantity :	One (1)
Gate Size - Model :	78" Wide x 36" High - Model 924I Self Contained Stainless Steel Slide Gate
Invert To Floor :	7.5 ft
Max Design Head :	5 ft seating - 5 ft unseating
Description :	The upward opening stainless steel slide gate will have the following features : SS304L construction; UHMW side and top seals and a neoprene invert seal; The dual operating stems will be SS304L with plastic stem covers.
Mounting Style :	Wall mounted with non-shrink grout and SS anchor studs.
Lifting Mechanism :	Yoke mounted interconnected gearboxes with single electric actuator.
Anchor Bolts :	1/2" anchor studs and nuts included.

TOTAL BUDGET PRICE: $200,0000*

This quotation represents our best interpretation of the EXISTING project plans. Any subsequent changes may result in a price change.

INCLUDED: Submittal drawings and O&M manuals.

EXCLUDED: Installation, concrete, grout, deck sleeves, blind flanges, mastic, lubricant, control panels, instrumentation, wiring and epoxy capsules for anchor bolts. Field measurements are also not included as part of this quotation.

***WARRANTY: Pricing is based on an extended warranty of five (5) years from shipment date for <u>all</u> equipment. Ten (10) year warranty is NOT available for the electric actuators. We recommend the Owners consider a spare electric operator for each size actuator (2 units) in lieu of the ten (10) year warranty. This would add approximately $11,500 to budget price.**

DURATION: Our price is held firm for 60 days from the bid date listed on Page 1. Please contact our local representative for updated pricing after 60 days.

PAYMENT TERMS: Payment terms are net 30 days with no retainer allowance. Interest will be charged on amounts past due at 1-1/2% per month.

TAXES: Taxes, duties and tariffs are not included in this quotation. Sales tax is not included in our Total Price. However, Whipps, Inc. is registered to collect sales tax in the states of California, Florida, Maryland and Massachusetts.

FREIGHT: The price quoted is F.O.B. our factory in Athol, Massachusetts with freight allowed to jobsite. Partial shipments may be provided upon request for an additional charge. Price includes shipment via common carrier. (Open top truck shipment may be provided upon request for an additional charge). Price does not include unloading at job site.

VOLUME DISCOUNT DISCLAIMER: The price shown reflects a volume discount for the quantity quoted. Please contact our local representative if you need to order a different quantity than the number shown herein and we will send a revised quotation.

FIELD SERVICE: **No field service is included.** Field service is available at $850 per day plus actual travel and maintenance expenses. Sundays and holidays the rate is $1275 per day plus expenses. Three weeks advance notice in writing is required for field service.

OPERATION AND MAINTENANCE MANUALS : Whipps, Inc. manuals are produced project specific. Our manual is set up in a manner designed for the user to easily comprehend information relating to our gates. This is our standard structured document representing the Whipps, Inc. products. Whipps, Inc. reserves the right to deviate from what is listed in the Project Specifications should Whipps, Inc. determine that specific provisions add little or no value to the Manual.

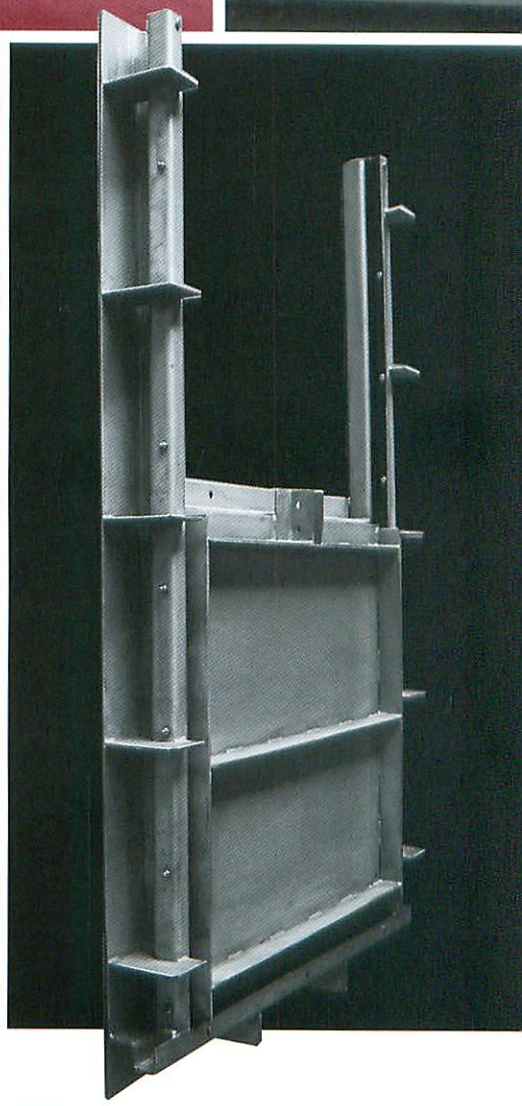
Sincerely,

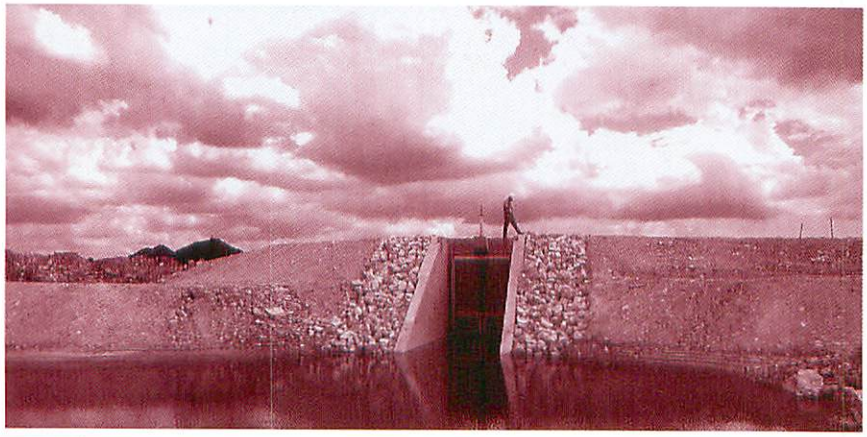
Paul Vardakis

Whipps, Inc.
P.O. Box 1058
370 South Athol Road
Athol, Massachusetts 01331 USA
Phone : 978-249-7924
Fax : 978-249-3092
paulv@whipps.com

Stainless Steel Gates

Series 900 AWWA® C561 Compliant





Whipps, inc.

Manufacturing high quality gates since 1977

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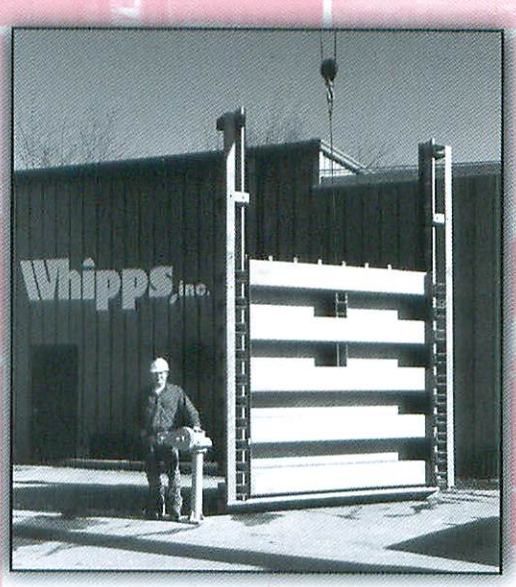
Manufacturing high quality gates since 1977



Whipps, inc.

Stainless Steel Gates

Series 900 AWWA® C561 Compliant

Contents

Introduction

Series 900 Stainless Steel Gates offer high performance and long life in designs which accommodate a wide range of mounting arrangements and flow conditions. Rugged, reinforced stainless steel construction is combined with tough, flexible ultra high molecular weight polyethylene (UHMW) seat/seals, to provide a heavy-duty assembly. Flush bottom closure is provided by a resilient bottom seal. In addition to the wide range of standard gates, Whipps, Inc. can quickly and economically produce standard gates or gates customized for unusual applications.

Advantages (vs. Cast Iron Gates)

Superior Performance: Whipps, Inc. guarantees lower leakage than that listed in AWWA C-501 - Cast Iron Sluice Gates or the latest revision, AWWA C-560 - Cast Iron Slide Gates. Whipps, Inc. will guarantee leakage of no more than 0.05 gpm/ft of seal perimeter in seating head and unseating head conditions. Including high head service.

Cost: Fabricated stainless steel gates almost always cost less than cast iron gates. As the size of the gate increases, the price difference increases. This is due to the manufacturing process (e.g. casting of parts and subsequent machining) required to produce cast iron gates.

Strength: The ultimate strength of stainless steel is in excess of twice the ultimate strength of cast iron and stainless steel has approximately twice the modulus of elasticity of cast iron.

Durability: Stainless steel resists corrosion better than cast iron. The uv stabilized UHMW seat/seals that are utilized on our stainless steel gates are field proven to maintain shape and integrity in demanding applications. Whipps, Inc. tested the UHMW seat/seals to confirm the ability to withstand continuous operation in an abrasive environment. The testing consisted of 25,000 gate open/close cycles in an abrasive media while experiencing only negligible wear. (Test results available upon request.)

Reliability: Unlike traditional cast iron gates, the slide will not "freeze" to the frame after long periods of inactivity. Whipps, Inc. stainless steel gates incorporate UHMW seat/seals to prevent any metal-to-metal contact between the slide and the frame.

Delivery: The fabrication process required to turn raw materials into a stainless steel gate is quicker than the casting and machining process required to turn raw materials into a cast iron gate.

Self-Adjusting Seals: The Series 900 stainless steel gates have a self-adjusting seal system that completely eliminates the need for field adjustment. This seal system was developed with the understanding that many gates are installed in locations where field adjustment of wedges is not practical or possible. Another drawback to a wedged system is that wedge adjustment is an inexact science. Wedge adjustment when attempted by inexperienced personnel can lead to additional leakage, difficult gate operation and increased localized gate stresses. The self-adjusting seal system is a combination of durable UHMW seat/seals and a resilient static spring/seal. The UHMW seat/seals are shaped to form a low friction, yet tight, seal with the slide. The spring/seal serves two main purposes: First; it acts as a bulb seal between the frame and the UHMW seat/seals,

Advantages (continued)

and secondly; it acts as a "spring" to ensure continuous contact between the UHMW seat/seals and the slide. The spring/seal is stationary, similar to an O-ring seal, and it is protected from wear or damage from the movable slide by the UHMW seat/seals. (Wedges can be provided on our Series 900, but they are not recommended since they do not improve the performance of our gate.)

Low Maintenance: Stainless steel gates do not require periodic painting, and require less operator attention compared to cast iron gates.

Ease of Repair: In the unusual event that the seat/seals are damaged, they can be replaced in the field with common tools. The gate does not have to be removed from the wall. If the seating surface on a cast iron gate is damaged, the gate will have to be removed from the wall and shipped back to the manufacturer for re-manufacture.

Range of Sizes: The process to design and manufacture fabricated gates allows for a nearly unlimited range of sizes. This is not the case with cast iron gates since new patterns or modifications to existing patterns are required to accommodate unusual sizes.

Mounting Configurations: Gate frames may be embedded in the channel walls, mounted to a wall with anchor bolts, mounted to a pipe flange, or wall thimble. Wall thimble mounting is possible although it is usually only necessary for applications with high unseating heads. Gates can also be designed to mount to existing wall thimbles or existing pipe flanges. Flanged frames or flat frames are available for gates to cover square, rectangular or round openings in concrete structures.

Design Features

The following chart shows the gate features indicated by each model number. These models represent the most commonly used configurations.

Additional arrangements are available for applications which cannot be served by these standard models.

GATE FEATURES		GATE MODEL NUMBERS							
		921 951 —	923 953 —	923-C 953-C —	923-D — —	923-D-I 953-D-I —	924 954 —	925 955 975	— 955-I —
GUIDE FRAME STYLE	Embedded	X							
	Wall Mount		X		X	X	X	X	X
	Channel Mount			X					
SEALS	Side & Invert	X	X	X	X	X			
	Side, Invert & Top						X	X	X
ACTUATOR MOUNTING	Yoke	X	X	X	X	X	X		
	Pedestal							X	X

Optional Features

Gate size and service conditions determine the gate configuration required for each application. Overall gate widths, side frame sections and invert sections shown in this literature illustrate only a few of the many configurations available.

Downward Opening: Most gate models can be specified for downward opening service by adding a "D" to the model number. Such gates are used where there is insufficient clearance to open an upward opening gate or where the gate is to be used as an overflow weir. Downward opening gates may be furnished with or without a top seal.

Interconnected Actuators: All models may be specified with two interconnected actuators by adding "I" to the model number. This arrangement is generally recommended for gates 72" or wider and having a width greater than twice the height.

Non-Rising Stems: All models may be specified with non-rising stems by adding "N" to the model number. This operating stem arrangement is normally selected for installations with low headroom.

Wall Thimbles: All models with top seals can be specified for wall thimble mounting. Thimbles are typically only necessary for applications that experience high unseating heads.

Gate Selection Criteria

Gate Size: In water and wastewater treatment plants, gates are most often sized to fit a pre-designed structure. In this regard, Whipps, Inc. stainless steel gates offer great flexibility to accommodate any round, square or rectangular opening.

Gate Mounting: Series 900 gate frames may be embedded in the channel walls, mounted on the face of a wall, on the inside of an existing channel, on a wall thimble or on a pipe flange.

Gate Material: Series 900 gates are typically constructed of either type 304/304L or type 316/316L stainless steel. Type 304/304L is less expensive and generally it may safely be specified for water or waste water applications if residual chlorine is 2mg/l or less.

Type 316/316L is a more conservative choice and provides greater resistance to pitting and crevice corrosion. In either case, the low carbon ("L") grade should be used for welded parts to reduce carbon precipitation in the welds. Different alloys are also available. Please consult the factory.

Actuator Selection: The various types of actuators are shown in the actuator section. Operating loads are calculated as shown on the adjacent page. Manual operators should be selected to provide the calculated operating thrust with no more than 40 pounds effort on the handwheel or handcrank. (For information regarding the selection of powered actuators, consult the factory.)

Gate Selection Criteria (continued)

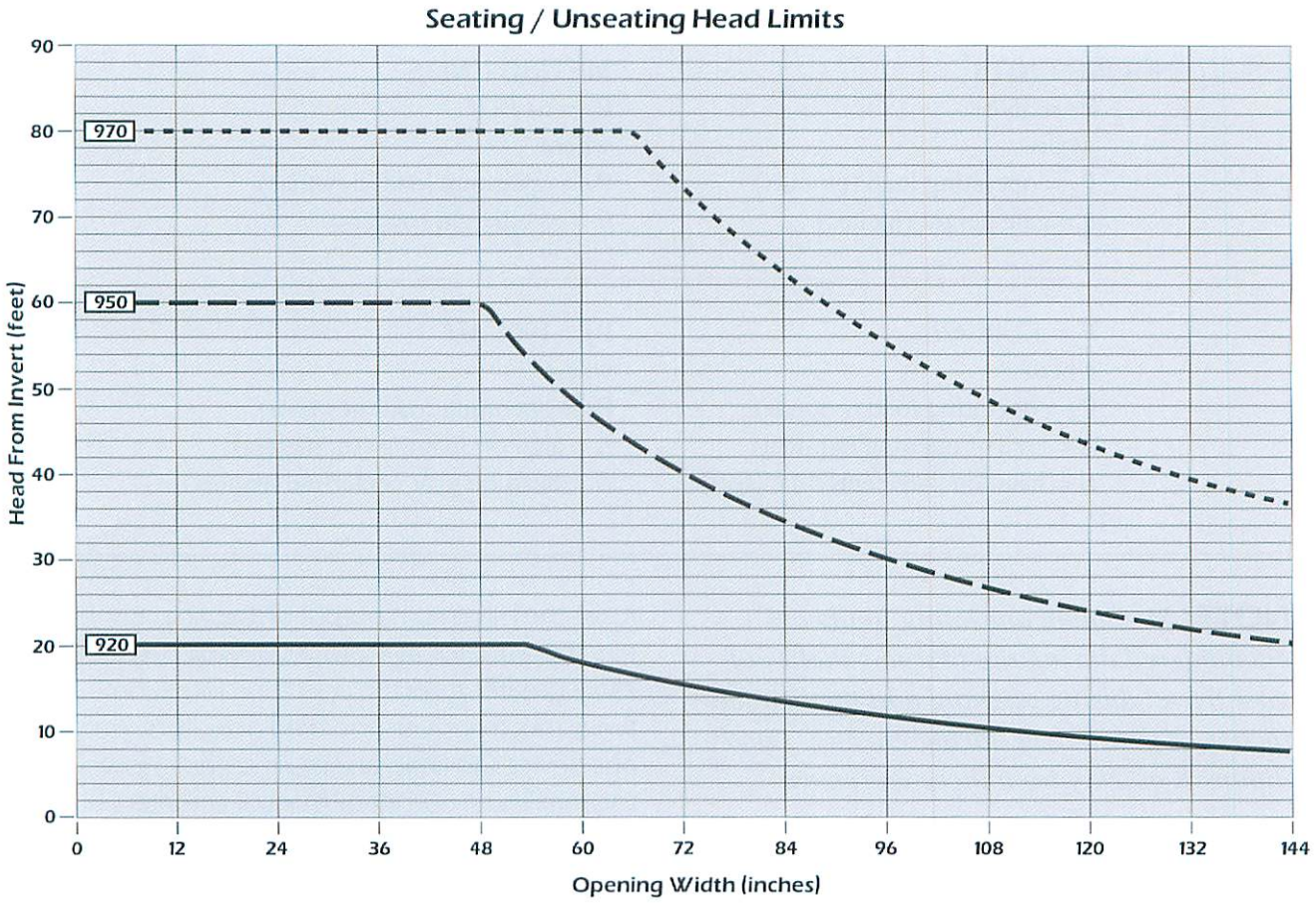
In either units, the operating load is taken as the greater of P_1 and P_2:

	ENGLISH UNITS	METRIC UNITS
1.	$P_1 = 35\ h$ where P_1 = operating load (pounds) h = gate height (inches)	$P_1 = 6129\ h$ where P_1 = operating load (newtons) h = gate height (meters)
2.	$P_2 = 12.48\ AH$ where P_2 = operating load (pounds) A = area of opening (sq. feet) H = head on gate centerline (feet)	$P_2 = 1961\ AH$ where P_2 = operating load (newtons) A = area of opening (sq. meters) H = head on gate centerline (meters)

NOTE: *Maximum operating loads are encountered during the first few inches of gate travel during opening and the last few inches of gate travel during closing. Loads diminish quickly from these extremes.*

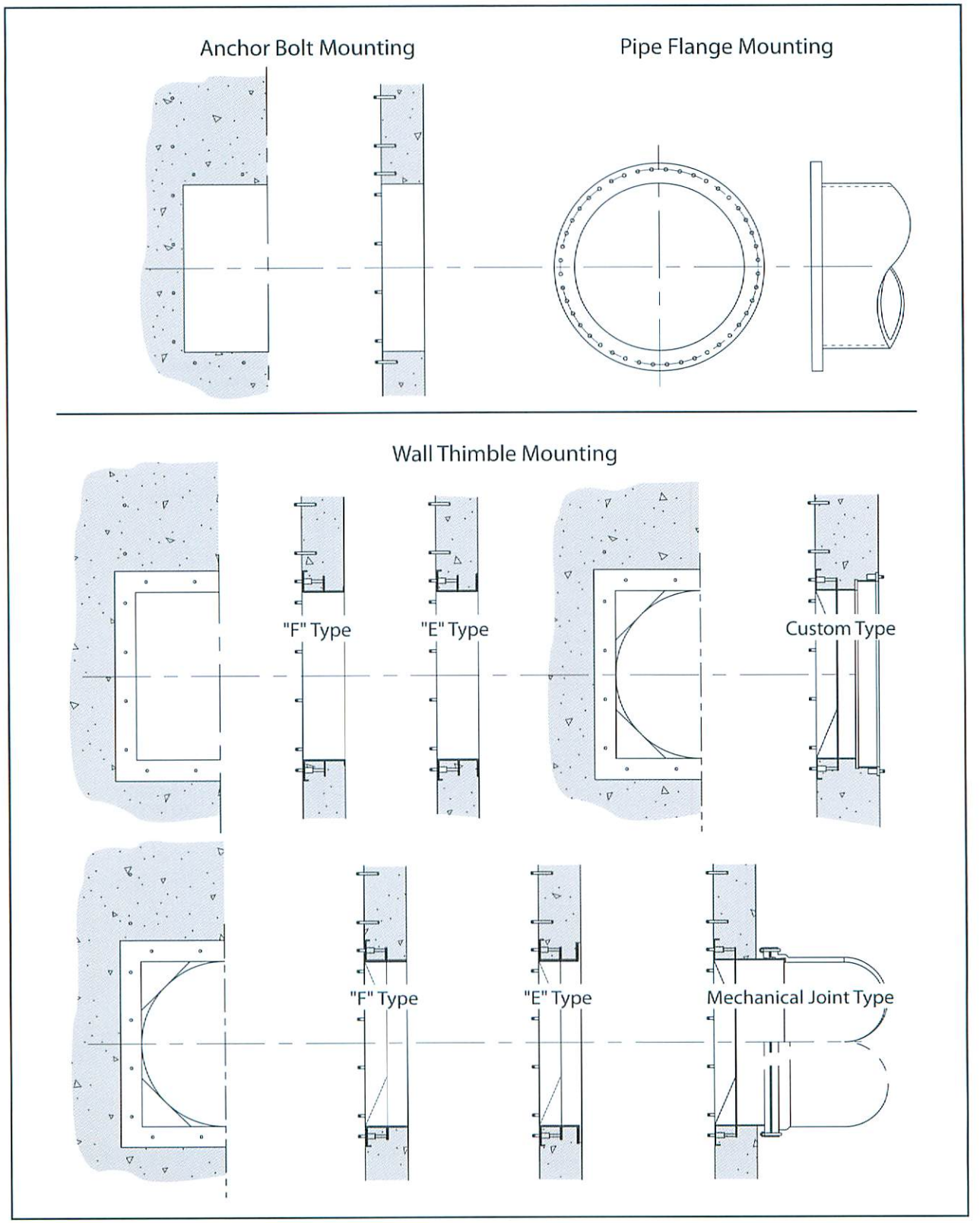
Actuator loads transmitted to structures: On non-self contained gates, the stem thrust of pedestal mounted actuators is resisted by the structure supporting the gate and actuator. The structure must be designed to resist the maximum output of the actuator (e.g., electric actuator at motor stall) which is necessarily greater than the operating load, sometimes much greater. Powered actuators use various devices to limit maximum output. However, the maximum output of manual actuators is only limited by the operating personnel's effort.

Application Chart

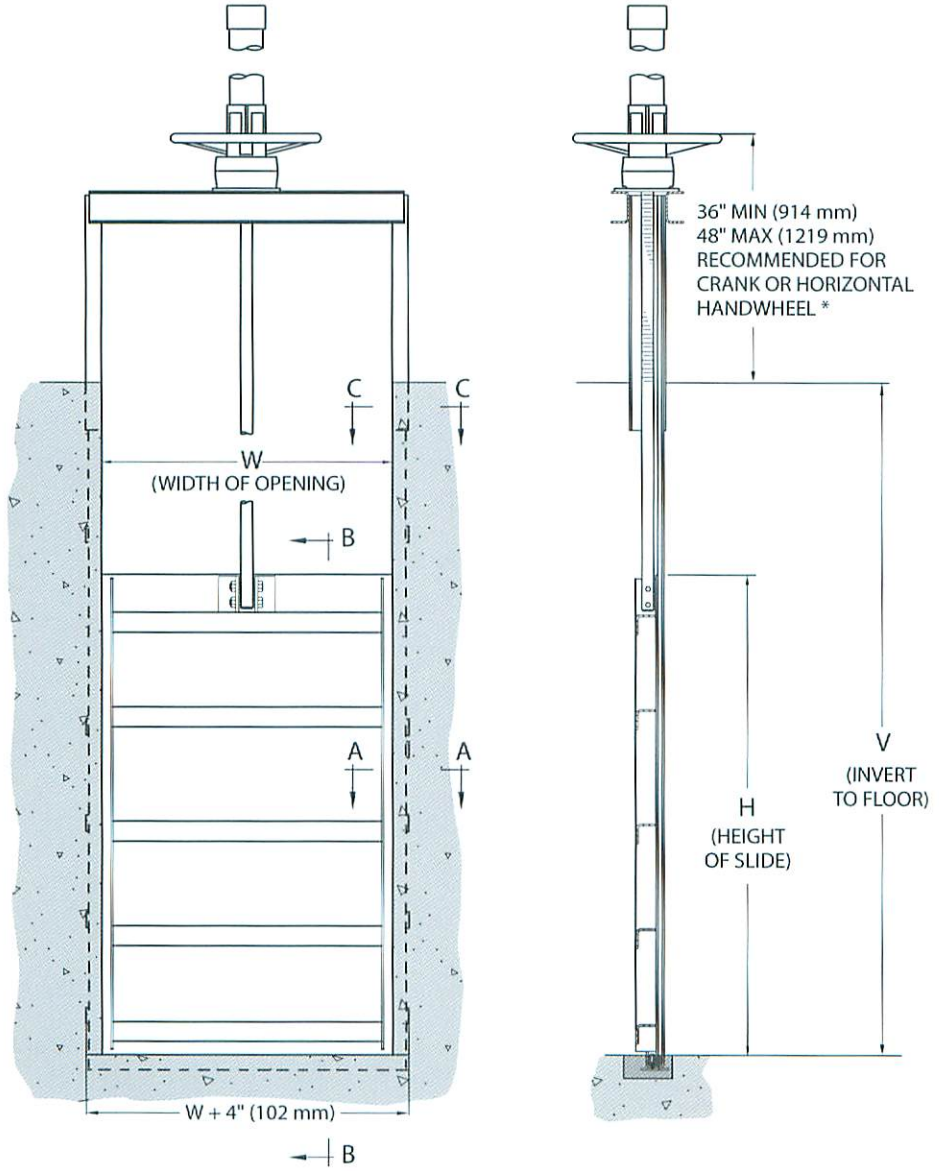


NOTE: *The chart shown above illustrates the normal maximum range of each stainless steel gate series. Higher ratings for each series can be achieved when necessary. Consult factory for details.*

Sluice Gate Mounting



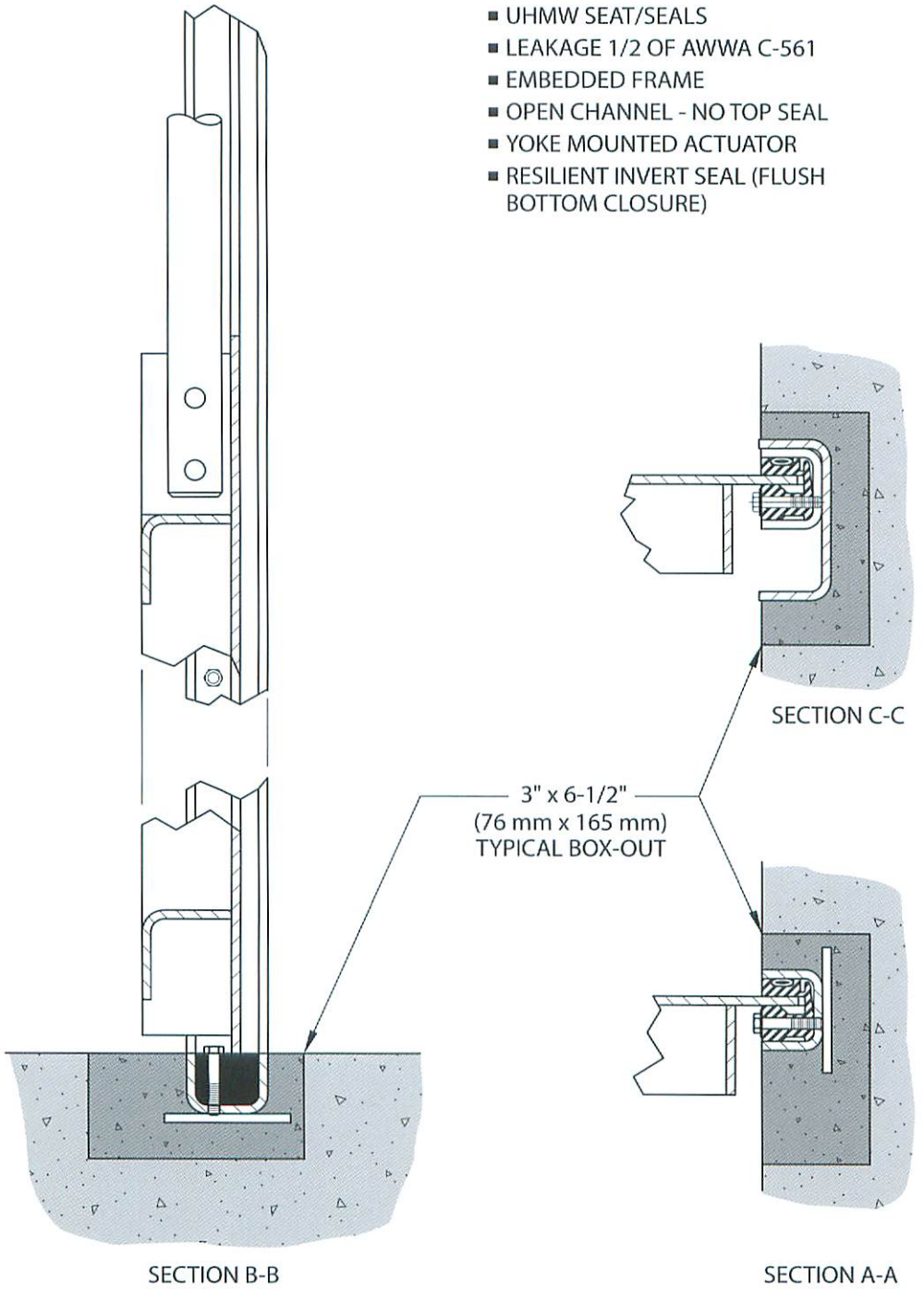
Model 921 Slide Gate



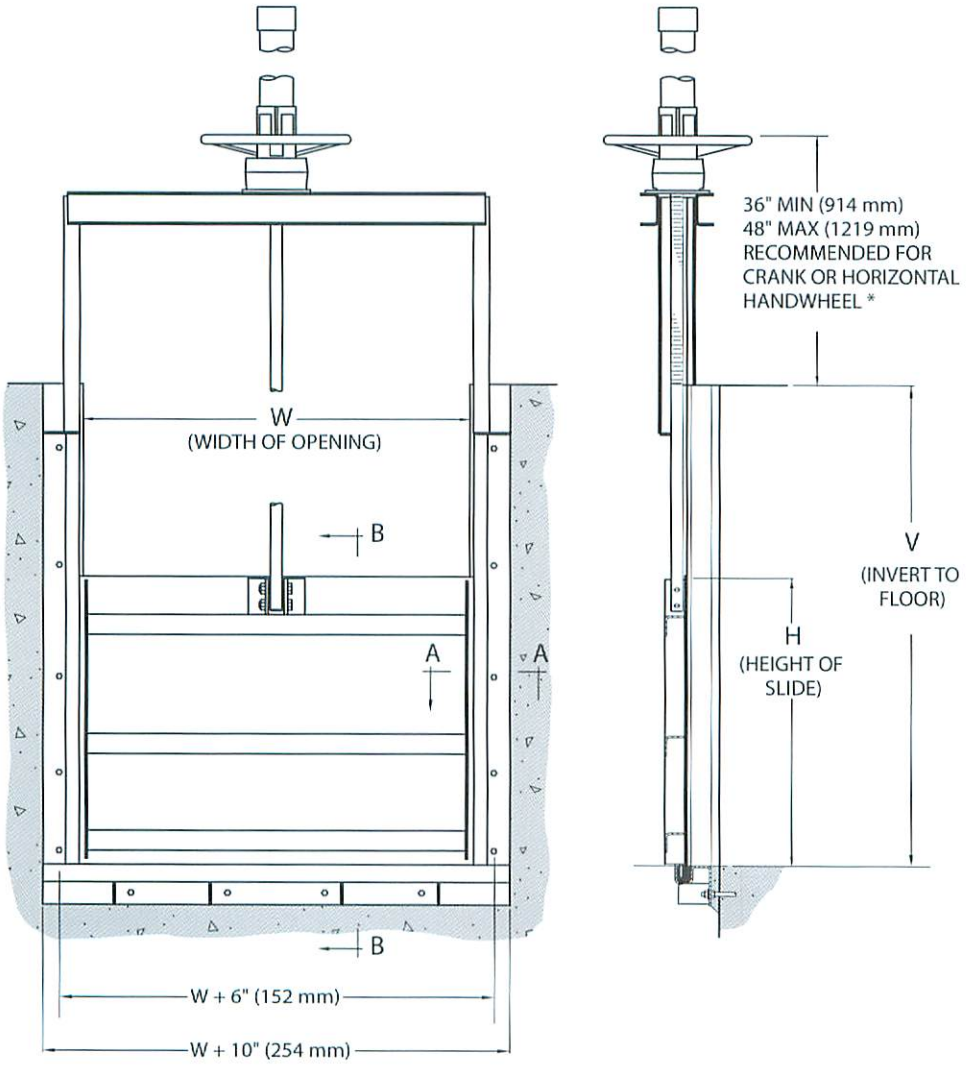
GATE ILLUSTRATED : 36" (W) x 60" (H) x 84" (V)
* SEE ACTUATORS SECTION FOR OTHER ARRANGEMENTS

Model 921 Features

- UHMW SEAT/SEALS
- LEAKAGE 1/2 OF AWWA C-561
- EMBEDDED FRAME
- OPEN CHANNEL - NO TOP SEAL
- YOKE MOUNTED ACTUATOR
- RESILIENT INVERT SEAL (FLUSH BOTTOM CLOSURE)

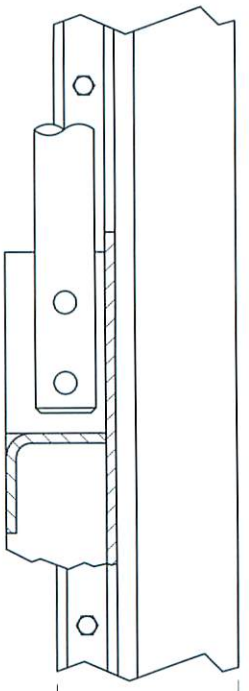


Model 923 Slide Gate

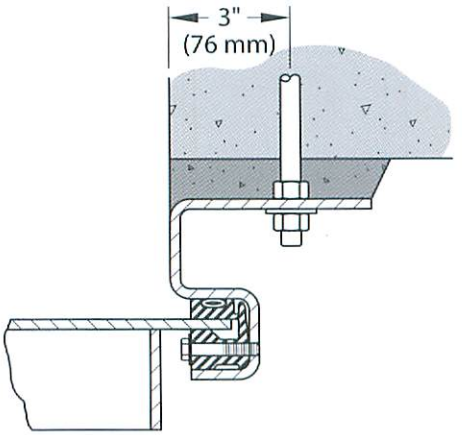


GATE ILLUSTRATED : 48" (W) x 36" (H) x 60" (V)
* SEE ACTUATORS SECTION FOR OTHER ARRANGEMENTS

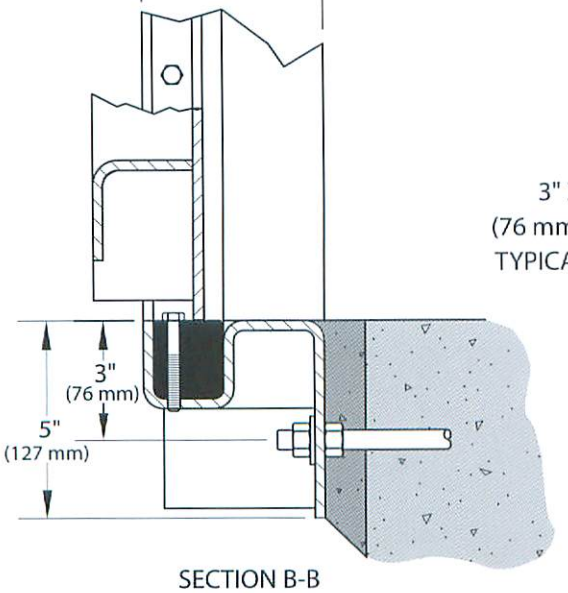
Model 923 Features



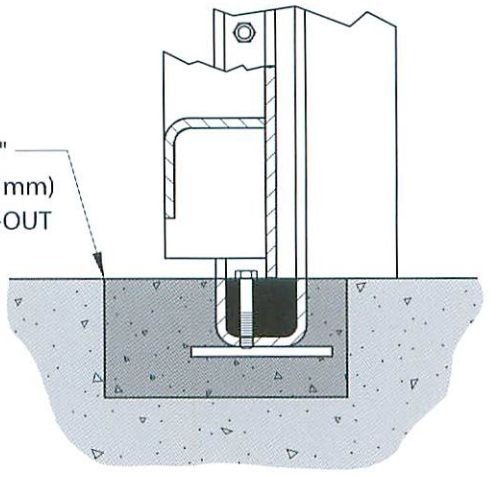
- UHMW SEAT/SEALS
- LEAKAGE 1/2 OF AWWA C-561
- WALL MOUNTED SIDE FRAMES
- OPEN CHANNEL - NO TOP SEAL
- YOKE MOUNTED ACTUATOR
- RESILIENT INVERT SEAL (FLUSH BOTTOM CLOSURE)



SECTION A-A

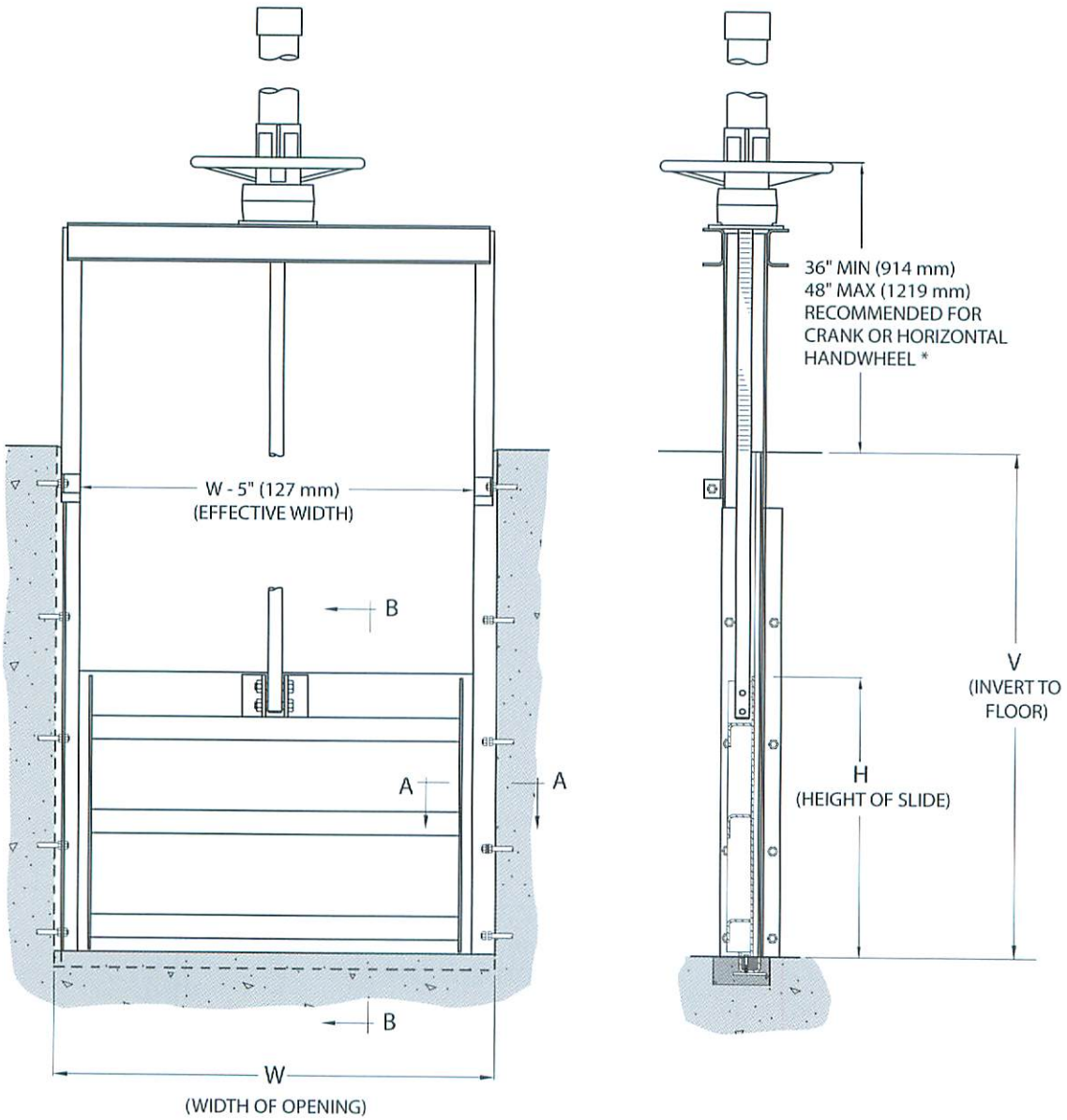


SECTION B-B



SECTION B-B
OPTIONAL EMBEDDED INVERT MEMBER

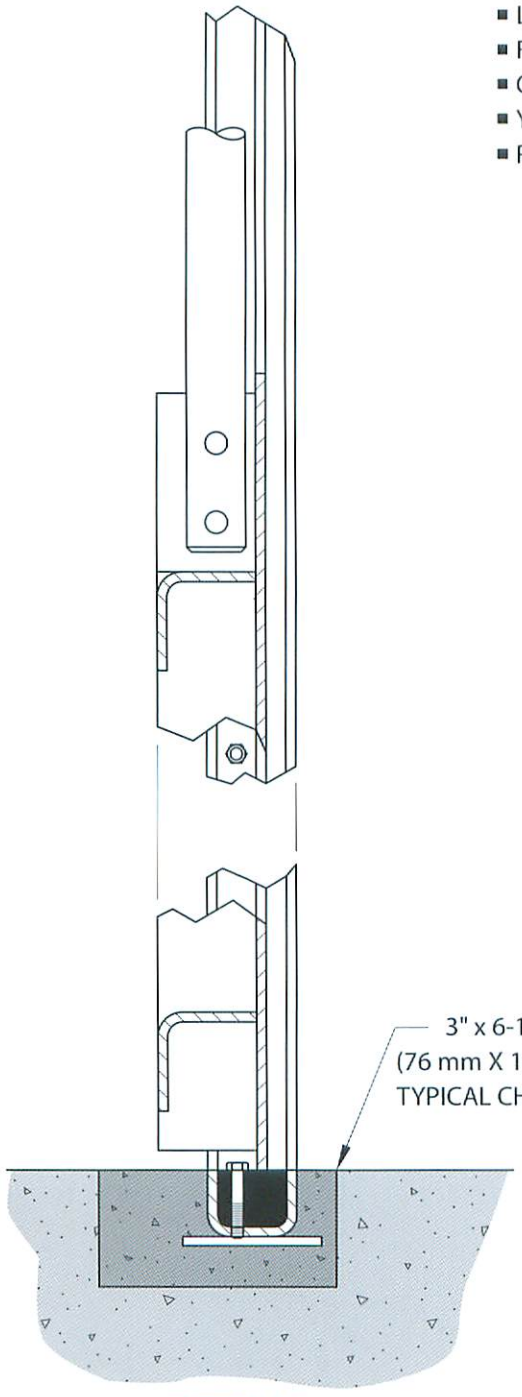
Model 923-C Slide Gate



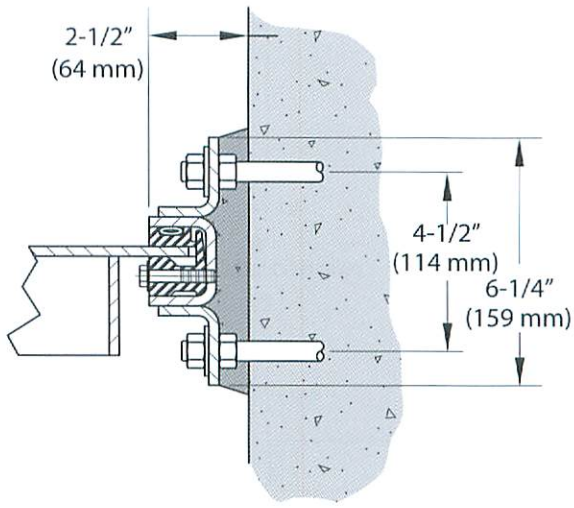
GATE ILLUSTRATED : 42" (W) X 30" (H) X 54" (V)
* SEE ACTUATORS SECTION FOR OTHER ARRANGEMENTS

Model 923-C Features

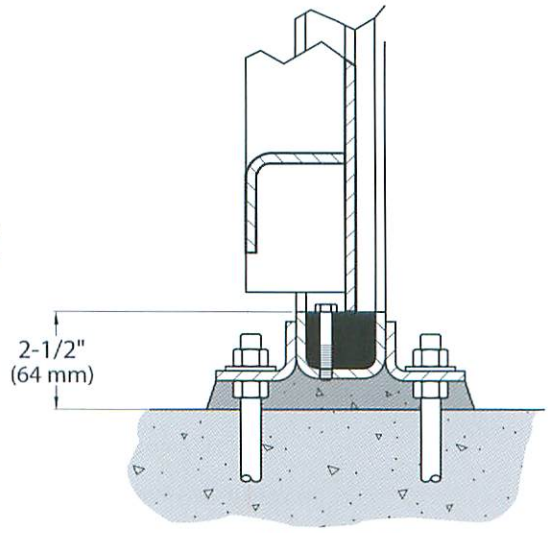
- UHMW SEAT/SEALS
- LEAKAGE 1/2 OF AWWA C-561
- FRAME MOUNTS IN EXISTING CHANNEL
- OPEN CHANNEL - NO TOP SEAL
- YOKE MOUNTED ACTUATOR
- RESILIENT INVERT SEAL (FLUSH BOTTOM CLOSURE)



SECTION B-B

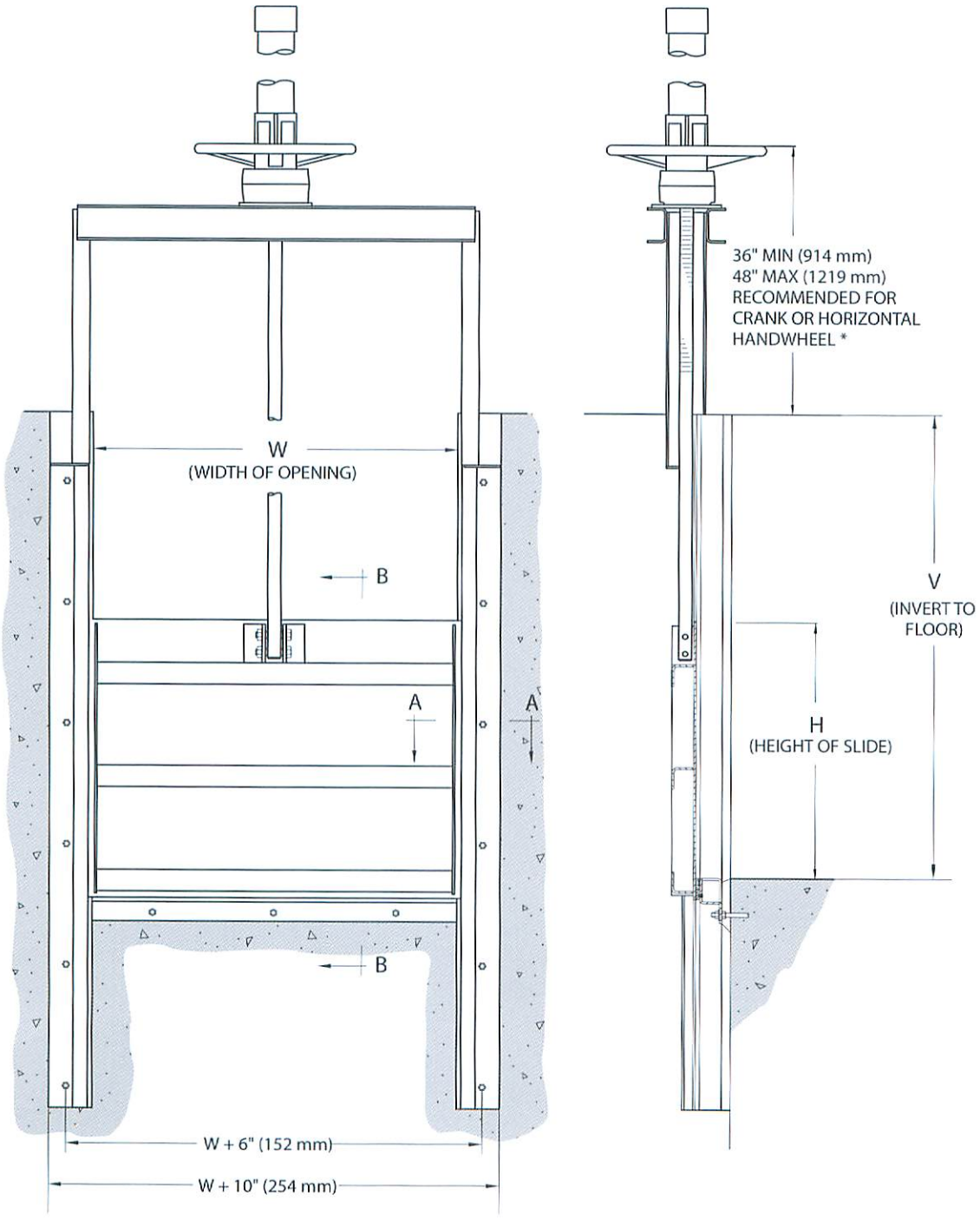


SECTION A-A



SECTION B-B
OPTIONAL SURFACE MOUNTED
INVERT MEMBER

Model 923-D Weir Gate

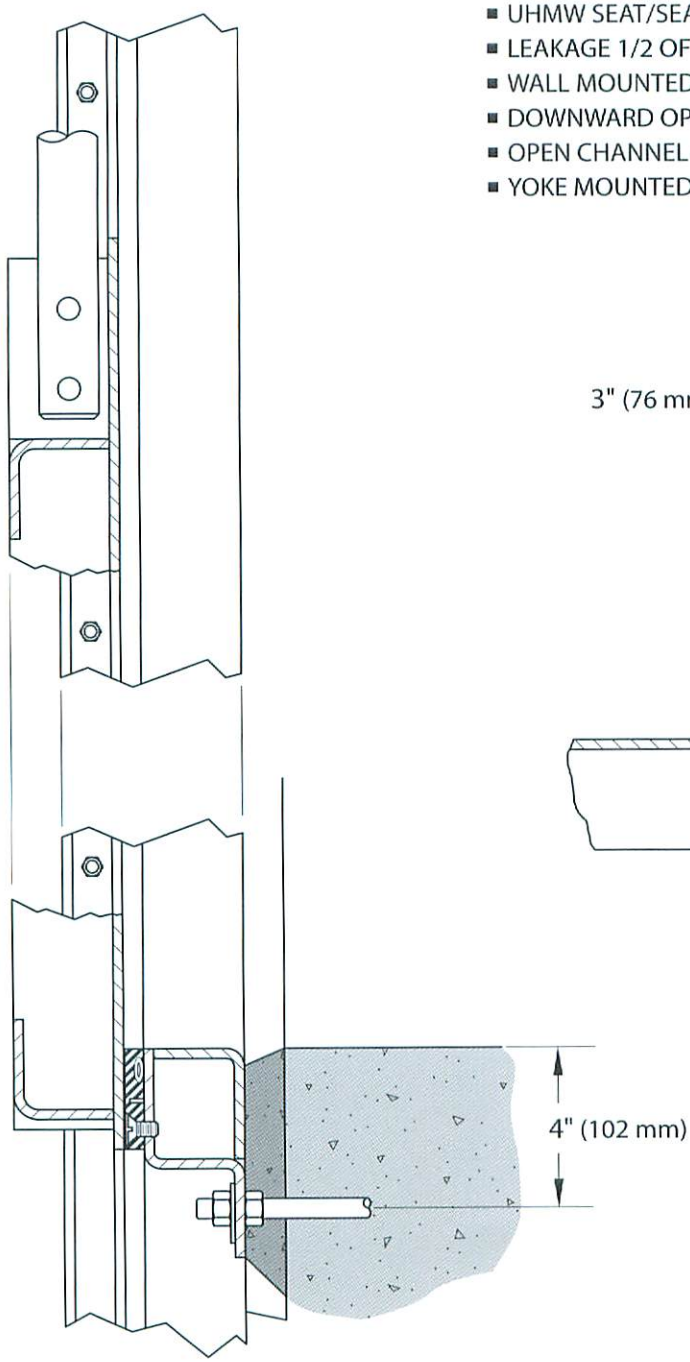


GATE ILLUSTRATED : 42" (W) x 30" (H) x 54" (V)

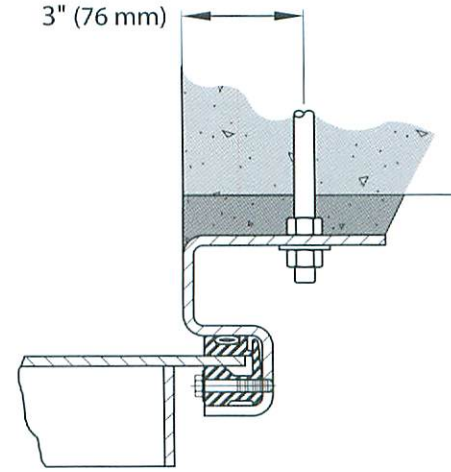
* SEE ACTUATORS SECTION FOR OTHER ARRANGEMENTS

Model 923-D Features

- UHMW SEAT/SEALS
- LEAKAGE 1/2 OF AWWA C-561
- WALL MOUNTED SIDE FRAMES
- DOWNWARD OPENING
- OPEN CHANNEL - OPTIONAL TOP SEAL
- YOKE MOUNTED ACTUATOR

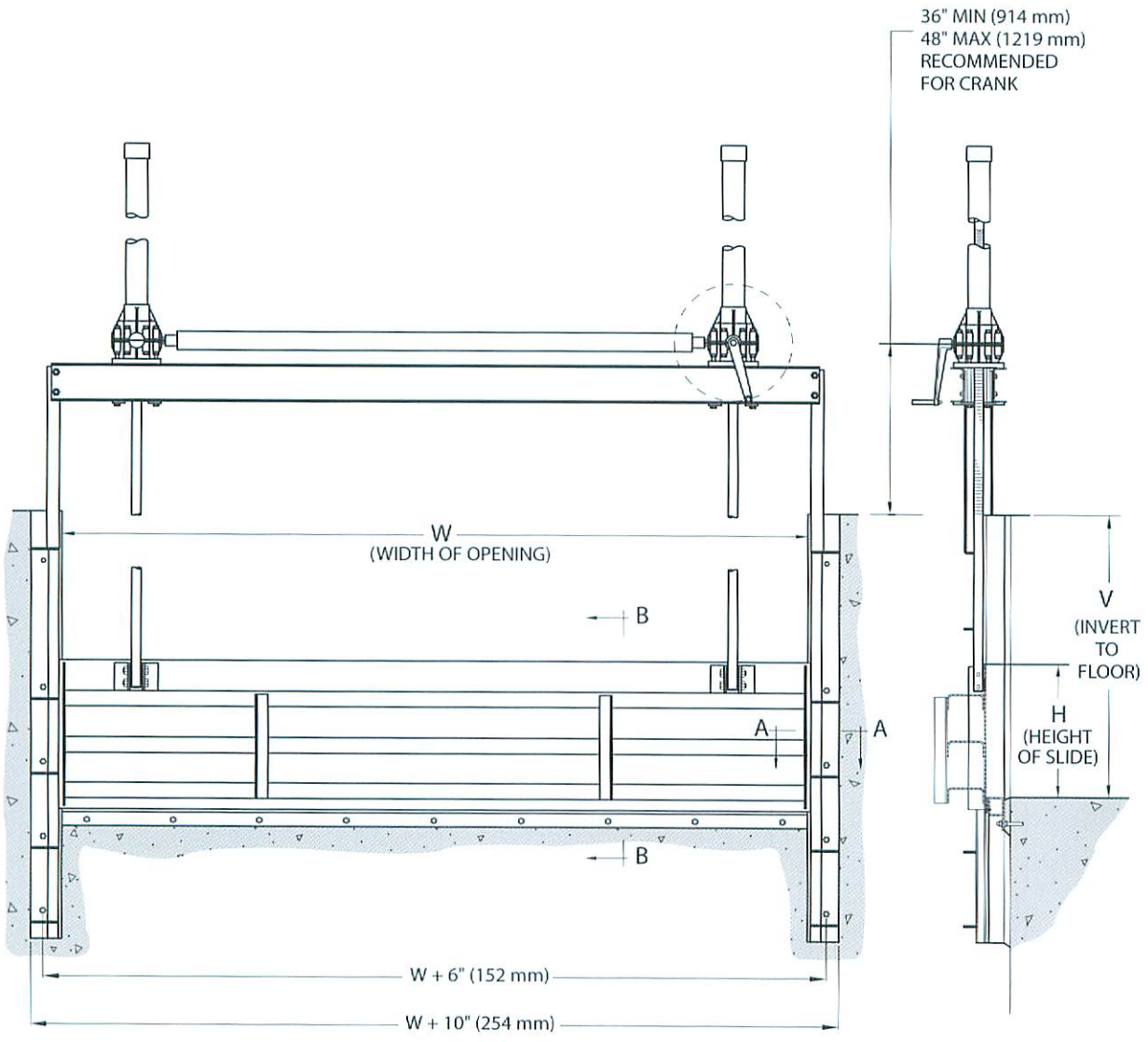


SECTION B-B



SECTION A-A

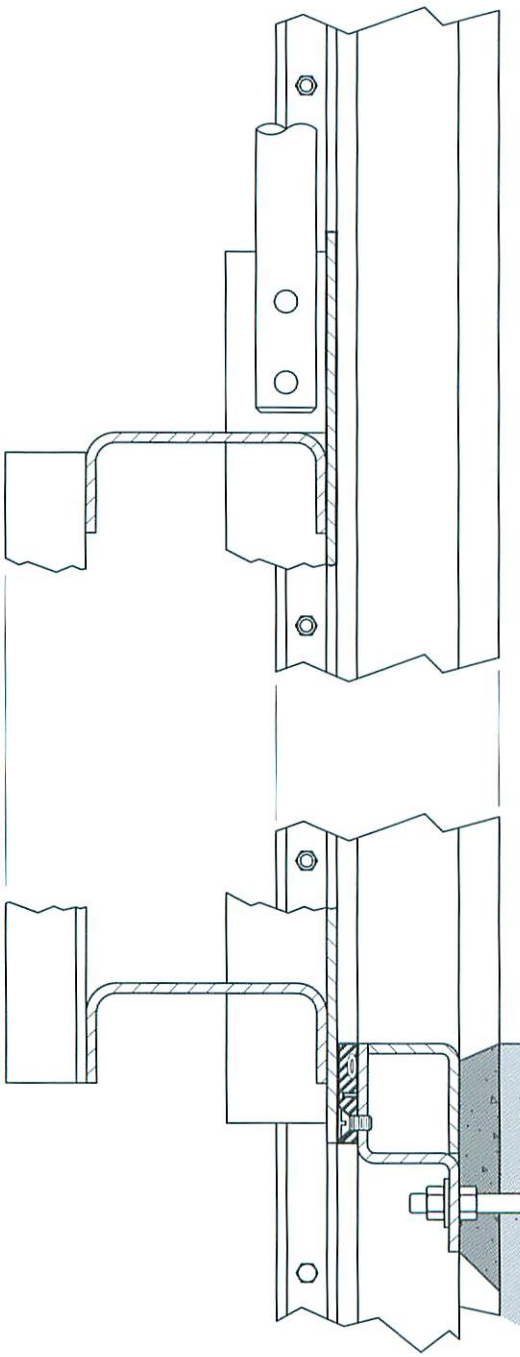
Model 923-D-I Weir Gate



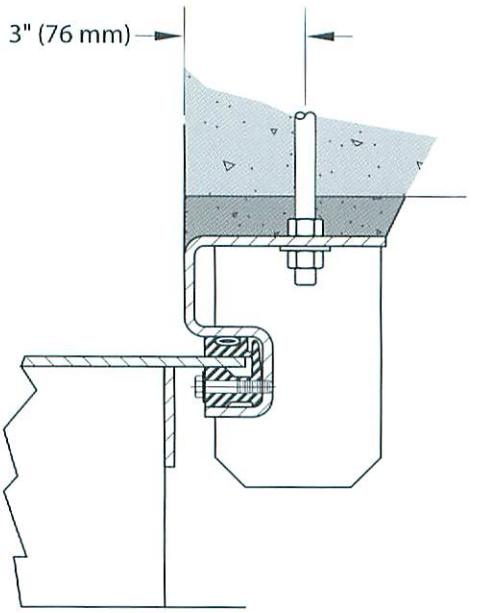
GATE ILLUSTRATED : 120" (W) x 24" (H) x 45" (V)
SEE ACTUATORS SECTION FOR OTHER ARRANGEMENTS

Model 923-D-I Features

- UHMW SEAT/SEALS
- LEAKAGE 1/2 OF AWWA C-561
- WALL MOUNTED SIDE FRAMES
- DOWNWARD OPENING
- OPEN CHANNEL - OPTIONAL TOP SEAL
- YOKE MOUNTED INTERCONNECTED ACTUATORS

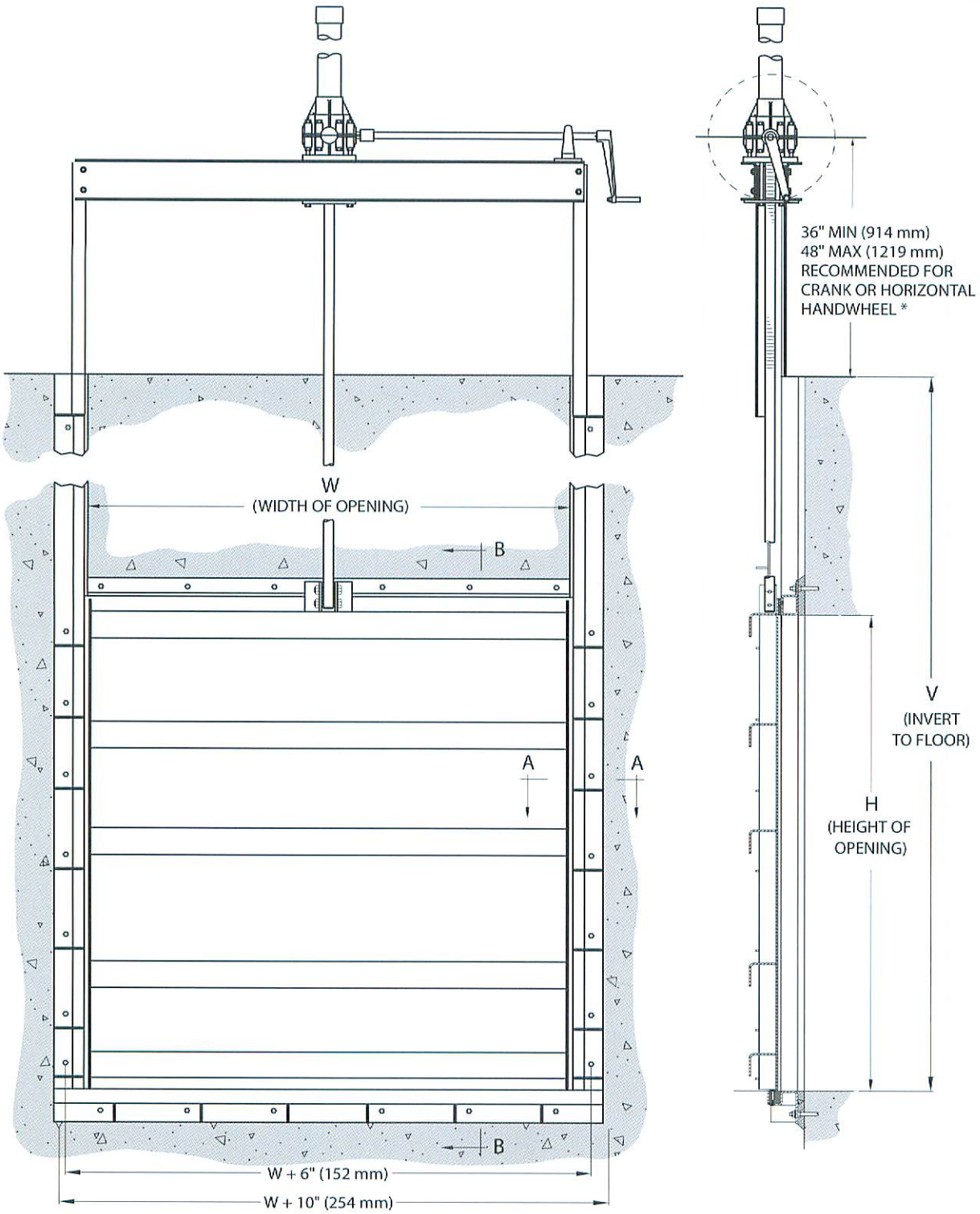


SECTION B-B



SECTION A-A

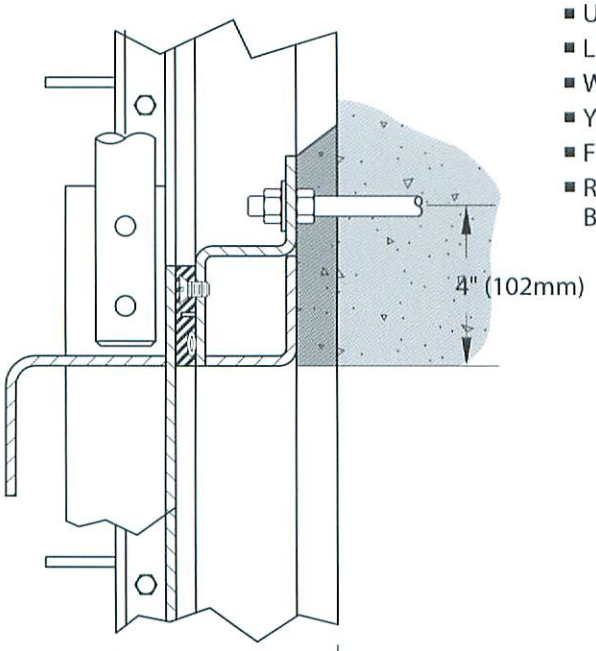
Model 924 Sluice Gate

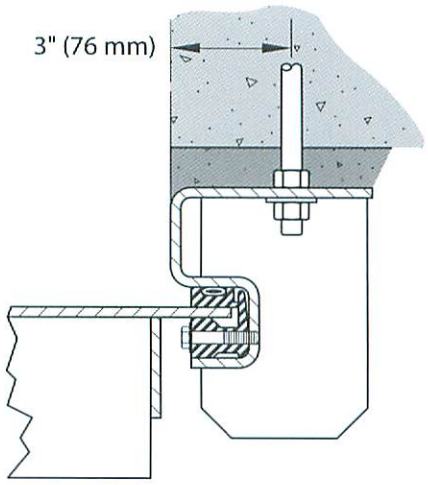


GATE ILLUSTRATED : 72" (W) x 72" (H) x 108" (V) * SEE ACTUATORS SECTION FOR OTHER ARRANGEMENTS

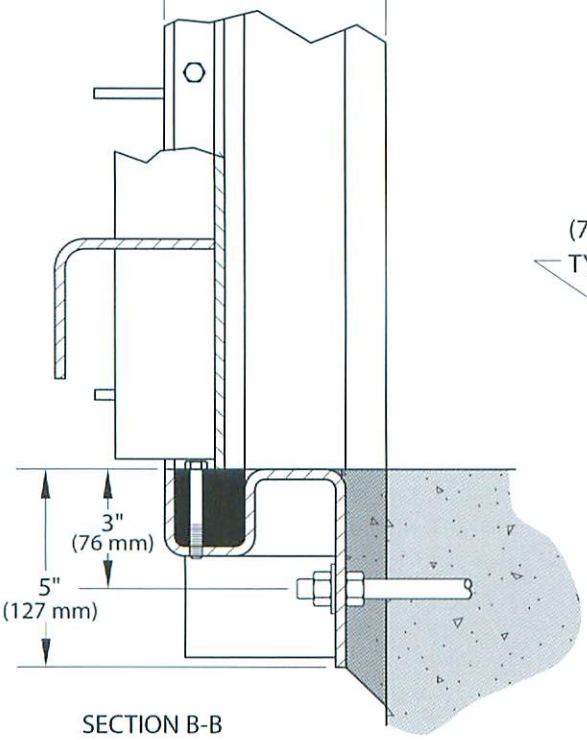
Model 924 Features

- UHMW SEAT/SEALS
- LEAKAGE 1/2 OF AWWA C-561
- WALL MOUNTED SIDE FRAMES
- YOKE MOUNTED ACTUATOR
- FULL APERTURE SEALING
- RESILIENT INVERT SEAL (FLUSH BOTTOM CLOSURE)

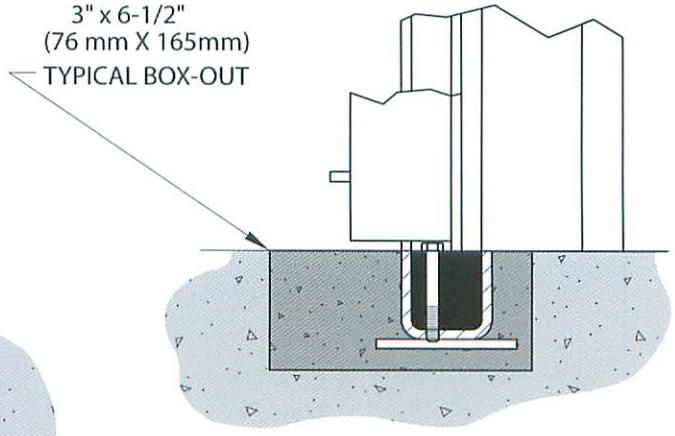




SECTION A-A

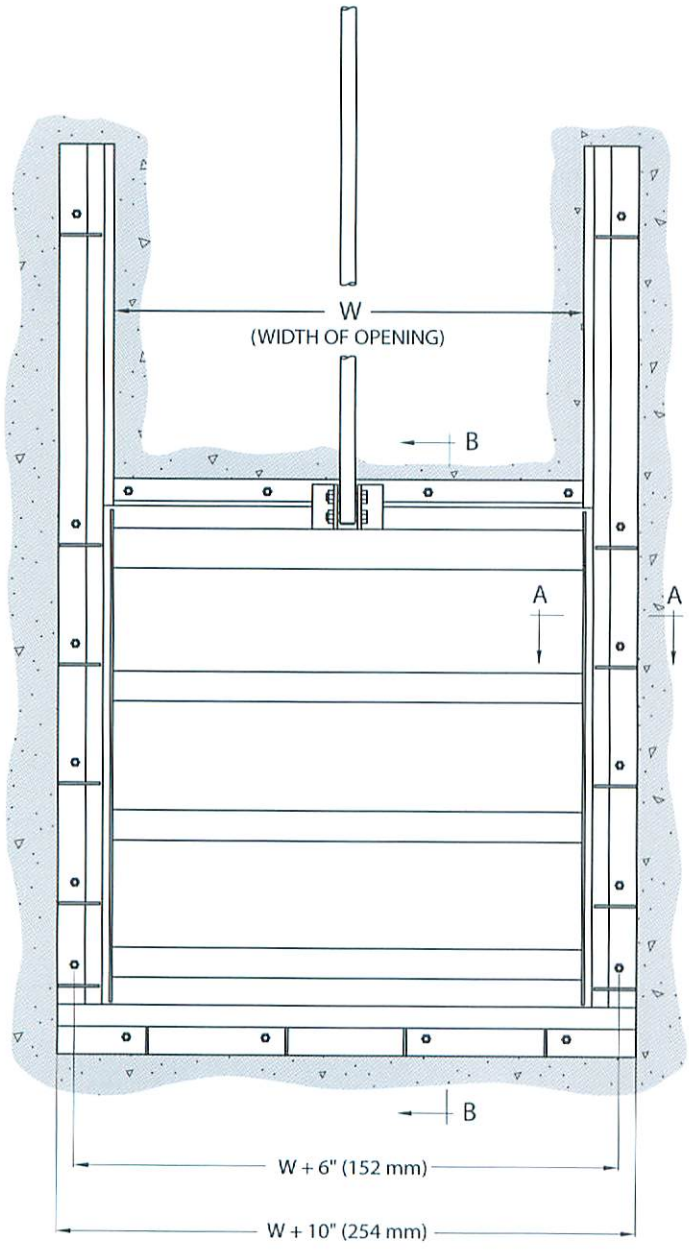


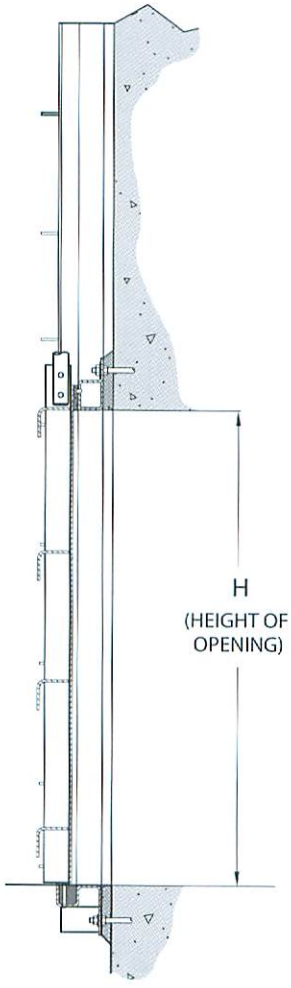
SECTION B-B



SECTION B-B
OPTIONAL EMBEDDED
INVERT MEMBER

Model 925 Sluice Gate

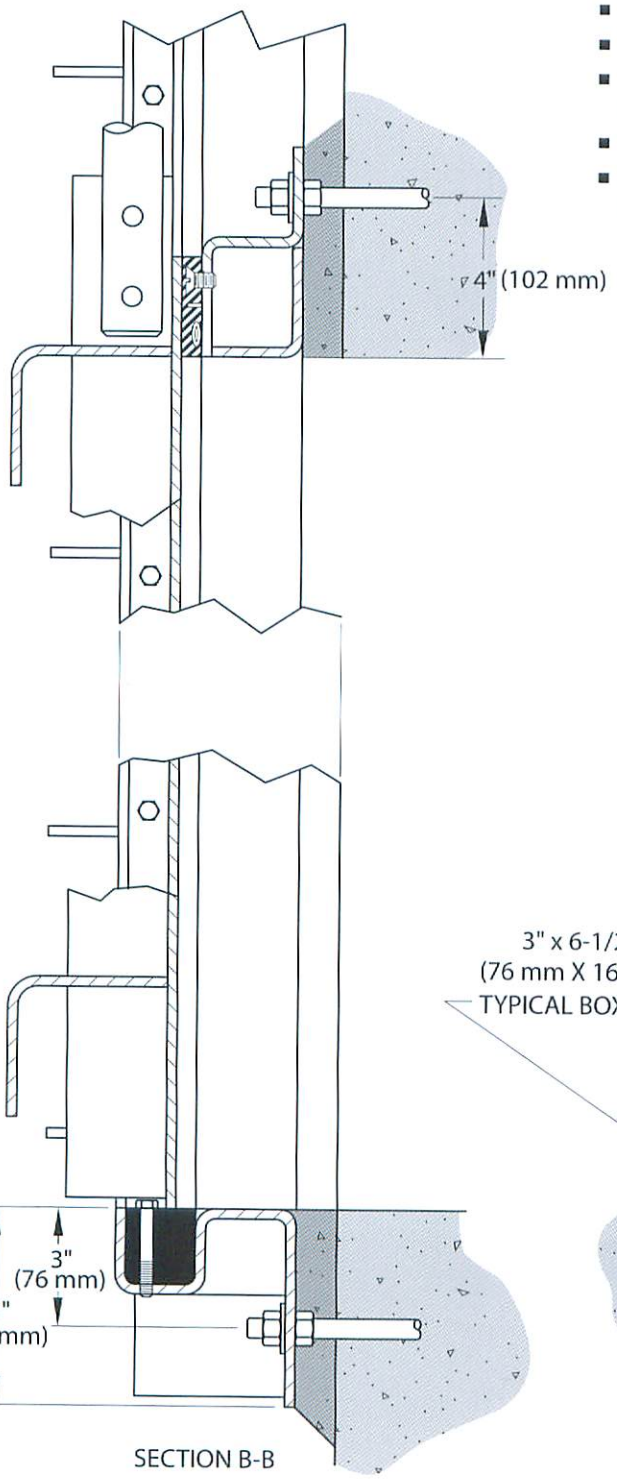




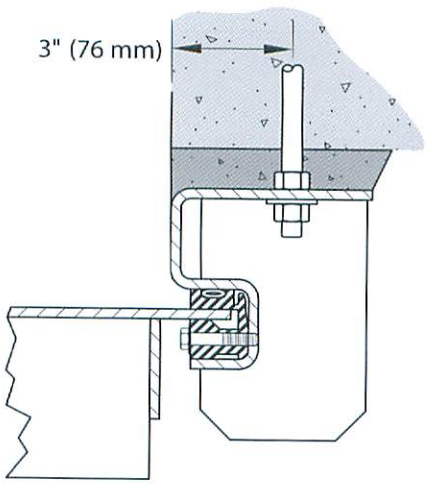
GATE ILLUSTRATED : 48" (W) x 48" (H)
SEE ACTUATORS SECTION FOR OPERATING OPTIONS

Model 925 Features

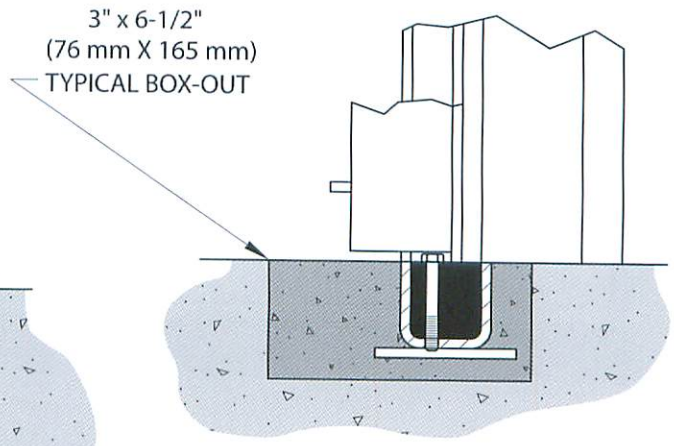
- UHMW SEAT/SEALS
- LEAKAGE 1/2 OF AWWA C-561
- WALL MOUNTED SIDE FRAMES
- PEDESTAL, WALL BRACKET OR FLOOR BOX MOUNTED ACTUATOR
- FULL APERTURE SEALING
- RESILIENT INVERT SEAL (FLUSH BOTTOM CLOSURE)



SECTION B-B

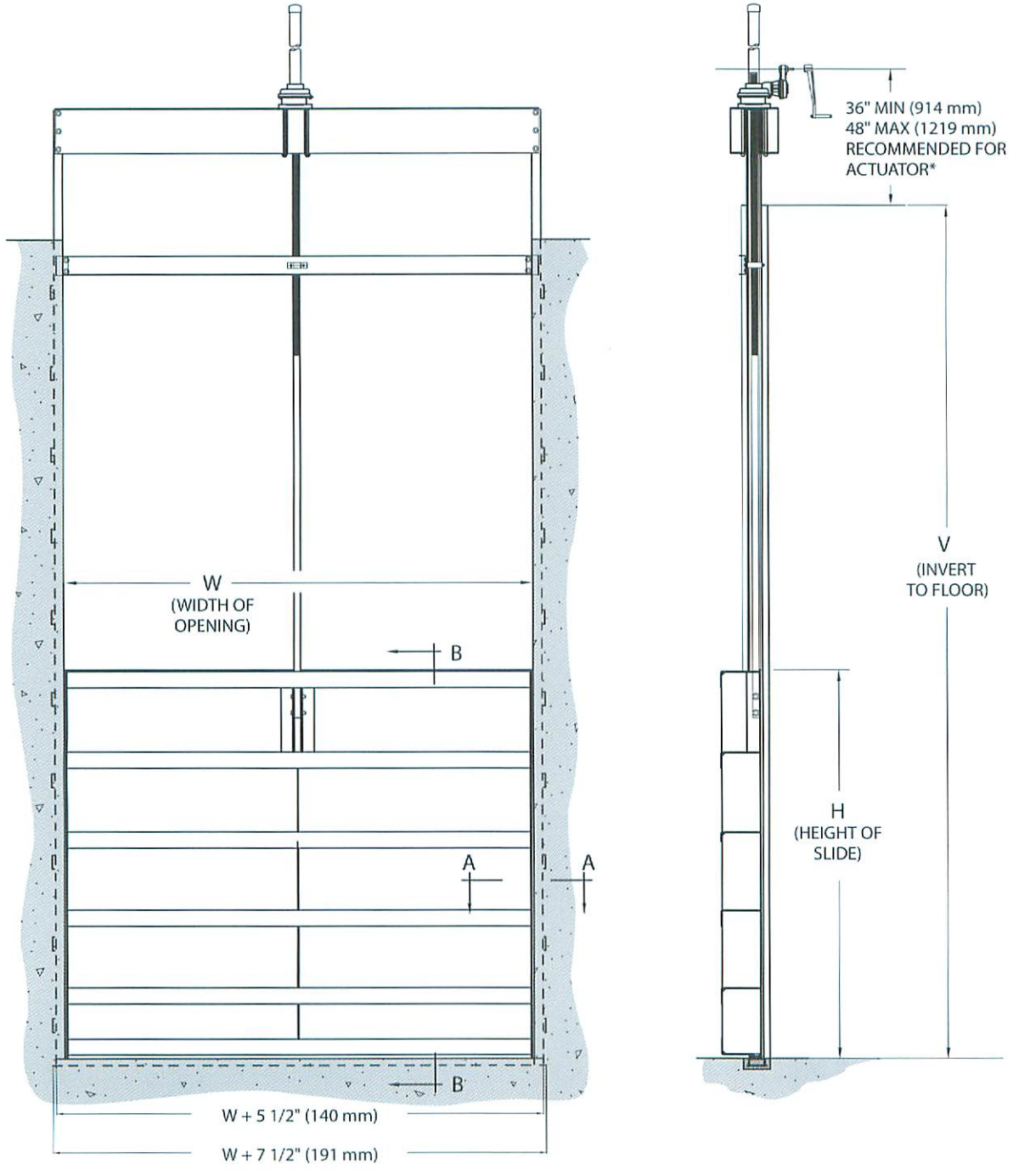


SECTION A-A



SECTION B-B
OPTIONAL EMBEDDED
INVERT MEMBER

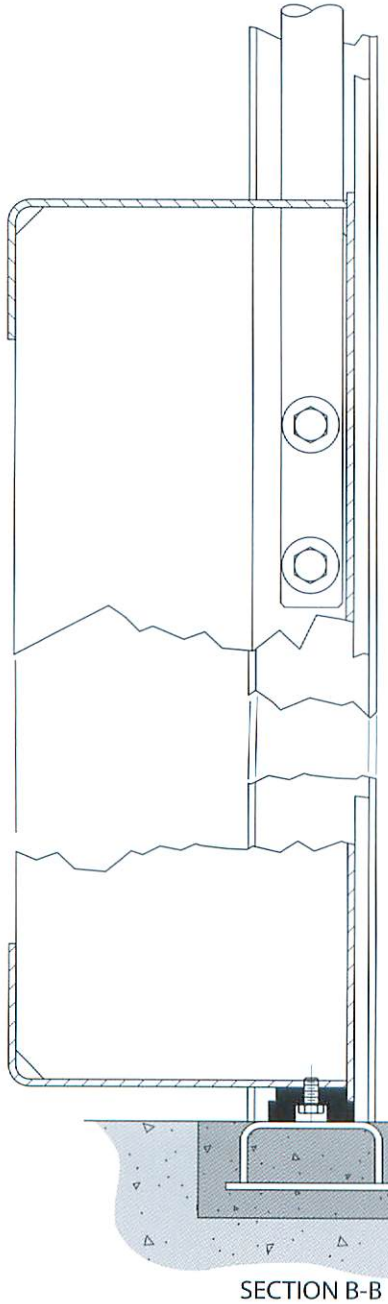
Model 951 Slide Gate



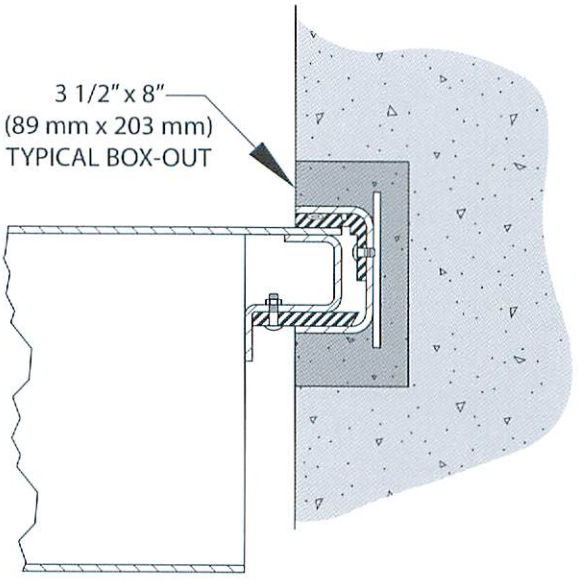
GATE ILLUSTRATED : 144" (W) x 120" (H) x264" (V)
*SEE ACTUATORS SECTION FOR OTHER ARRANGEMENTS

Model 951 Features

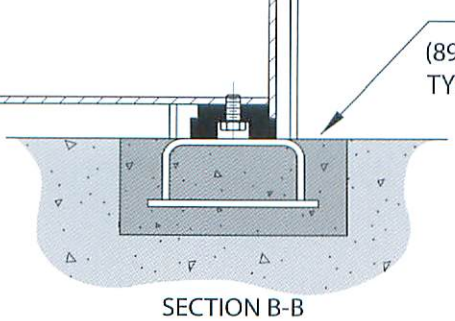
- UHMW SEAT/SEALS
- LEAKAGE 1/2 OF AWWA C-561
- EMBEDDED FRAME
- OPEN CHANNEL - NO TOP SEAL
- YOKE MOUNTED ACTUATOR
- RESILENT INVERT SEAL (FLUSH BOTTOM CLOSURE



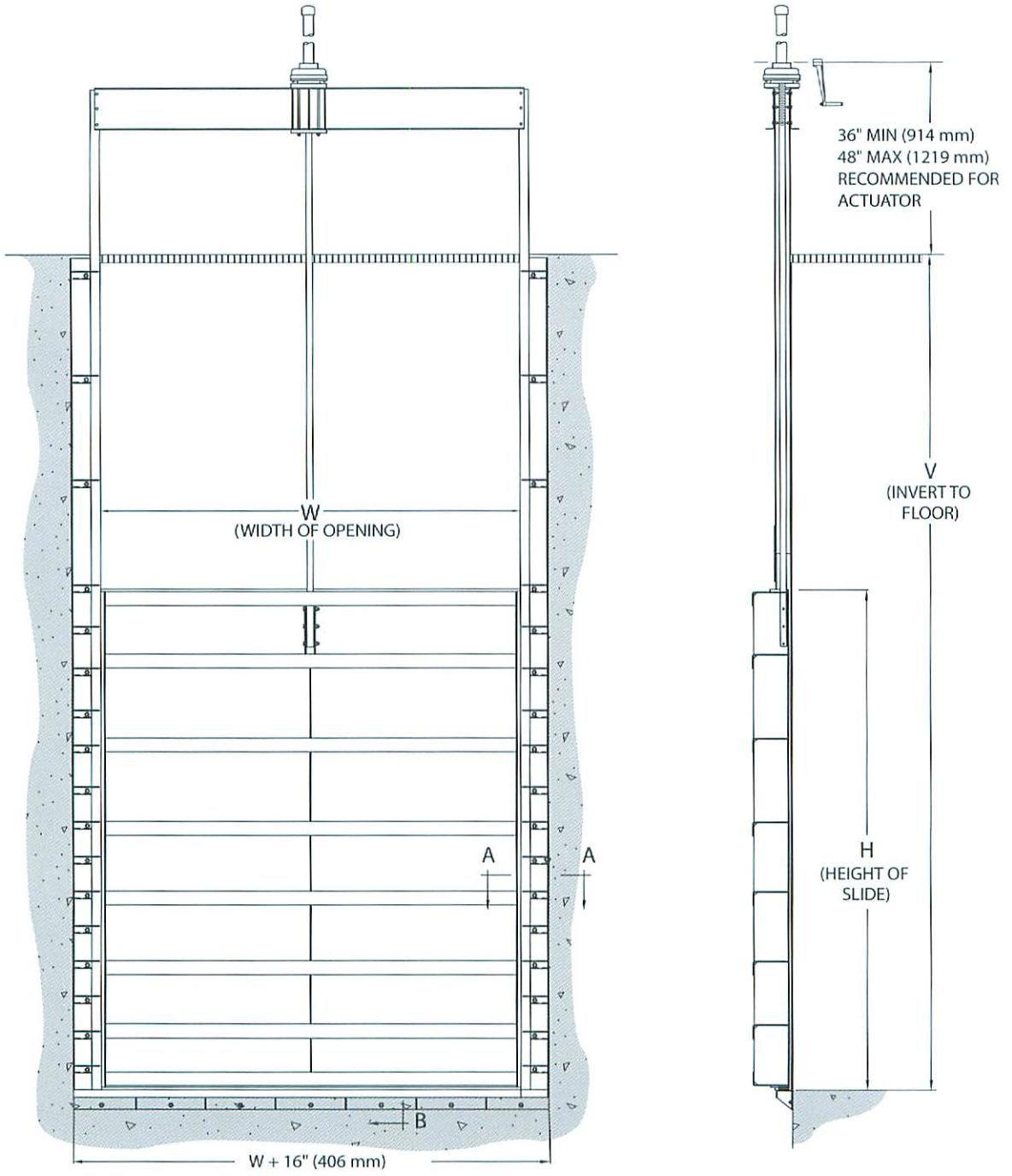
SECTION B-B



SECTION A-A



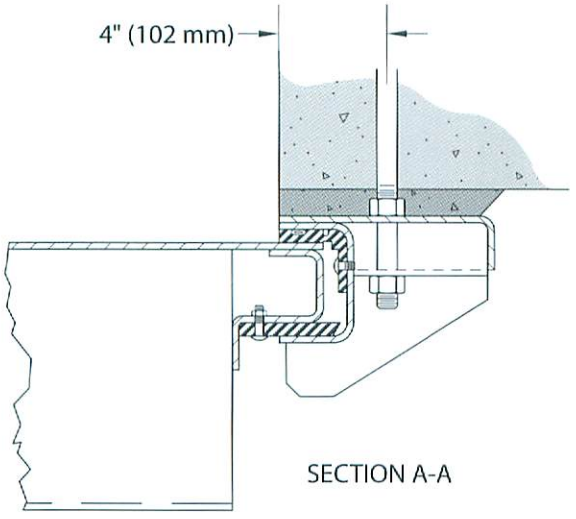
Model 953 Slide Gate



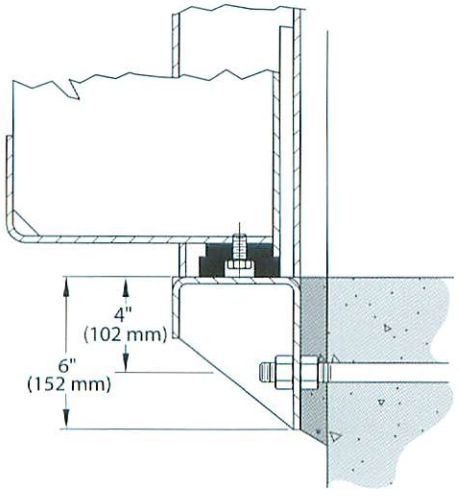
GATE ILLUSTRATED : 120" (W) x 144" (H) x 240" (V)
SEE ACTUATORS SECTION FOR OTHER ARRANGEMENTS

Model 953 Features

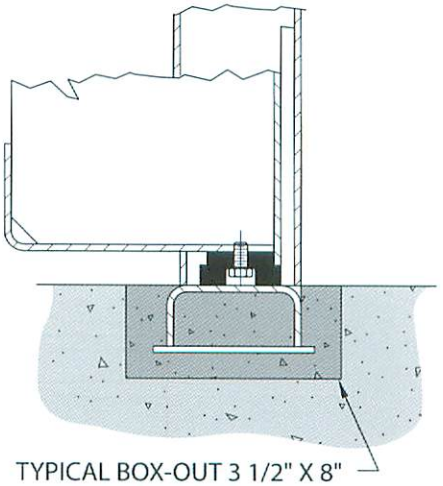
- UHMW SEAT/SEALS
- LEAKAGE 1/2 OF AWWA C-561
- WALL MOUNTED SIDE FRAMES
- OPEN CHANNEL - NO TOP SEAL
- YOKE MOUNTED ACTUATOR
- RESILIENT INVERT SEAL (FLUSH BOTOM CLOSURE)



SECTION A-A

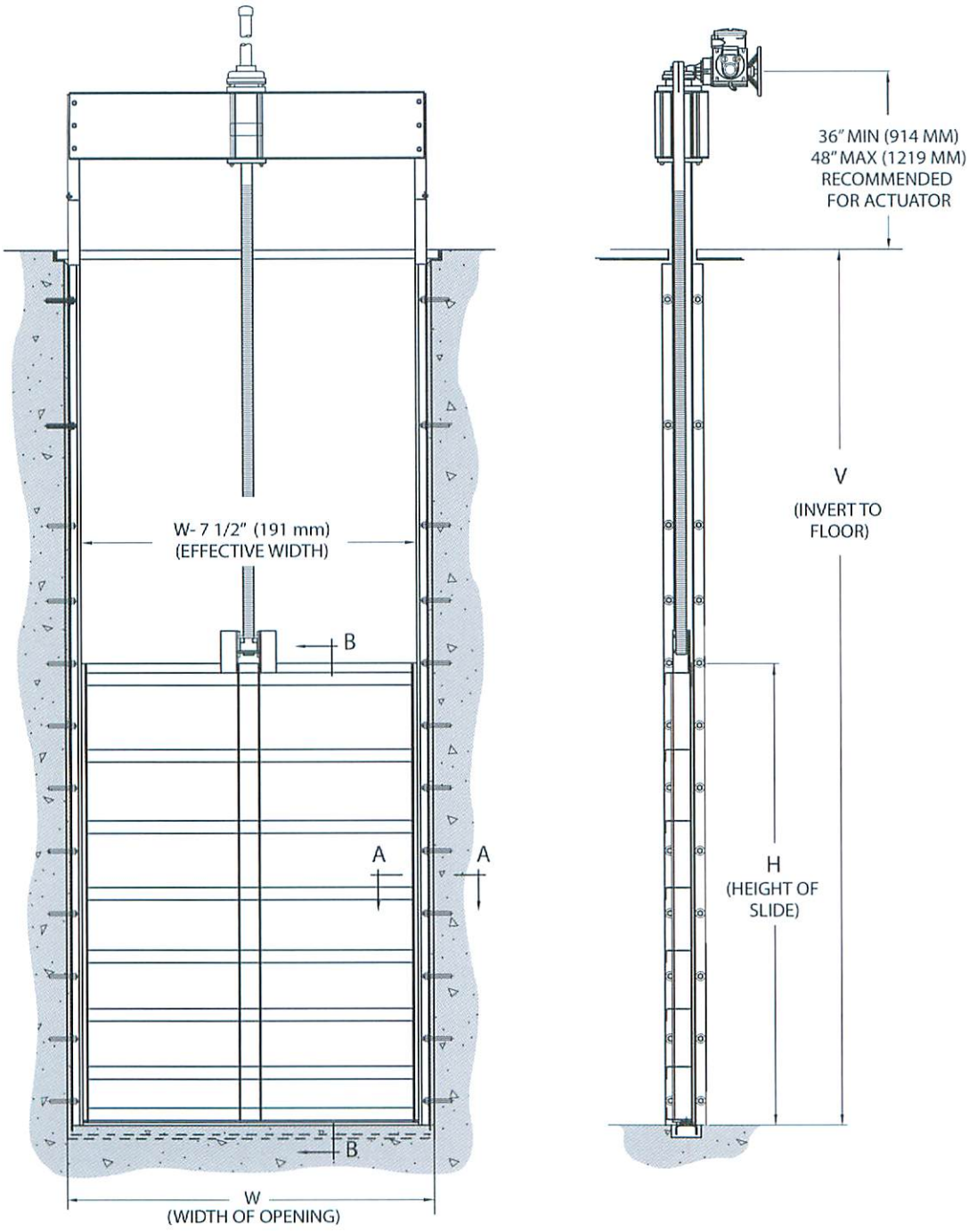


SECTION B-B



TYPICAL BOX-OUT 3 1/2" X 8"
(89 mm x 203 mm)
OPTIONAL EMBEDDED INVERT

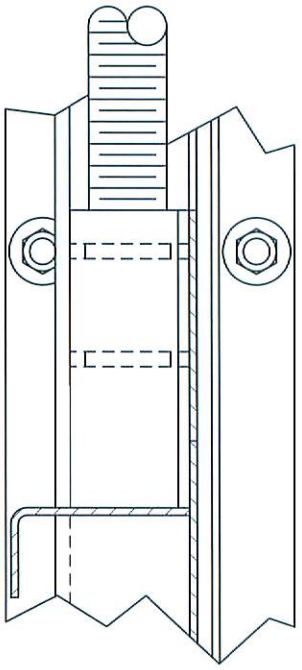
Model 953-C Slide Gate

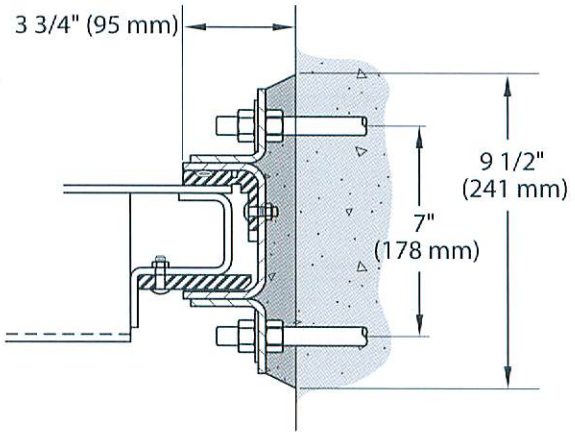


GATE ILLUSTRATED : 80" (W) x 111" (H) x 210" (V)
SEE ACTUATORS SECTION FOR OTHER ARRANGEMENTS

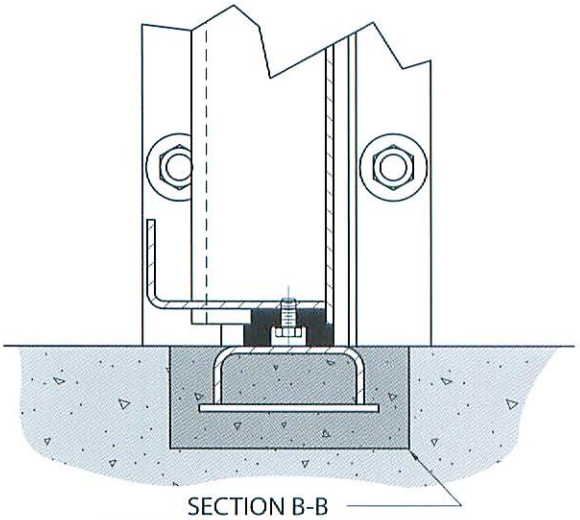
Model 953-C Features

- UHMW SEAT/SEALS
- LEAKAGE 1/2 OF AWWA C-561
- FRAME MOUNTS IN EXISTING CHANNEL
- OPEN CHANNEL - NO TOP SEAL
- YOKE MOUNTED ACTUATOR
- RESILIENT INVERT SEAL (FLUSH BOTTOM CLOSURE)

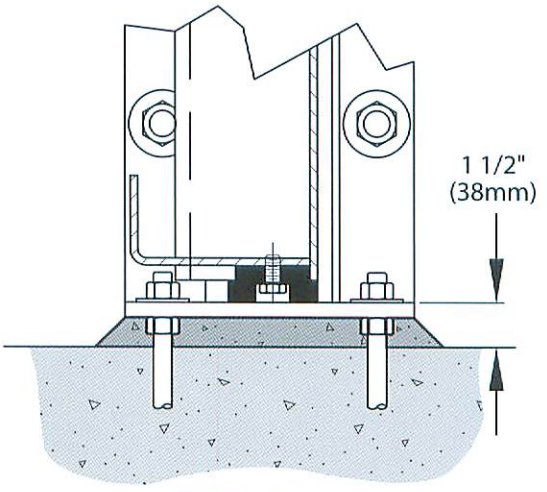




SECTION A-A

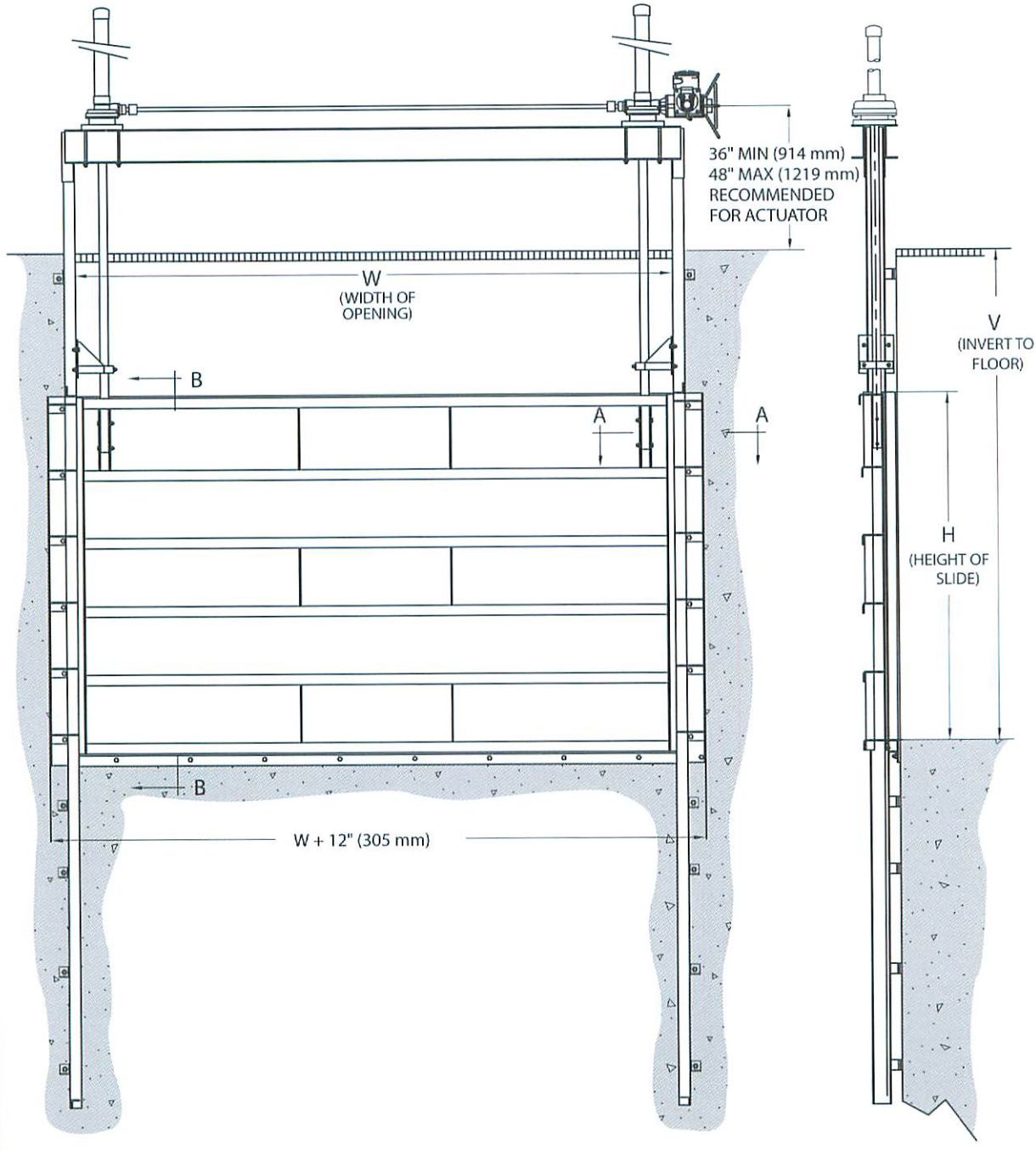


SECTION B-B
TYPICAL CHIP-OUT 3 1/2" X 8"
(90 mm x 200 mm)



SECTION B-B
OPTIONAL SURFACE MOUNTED
INVERT MEMBER

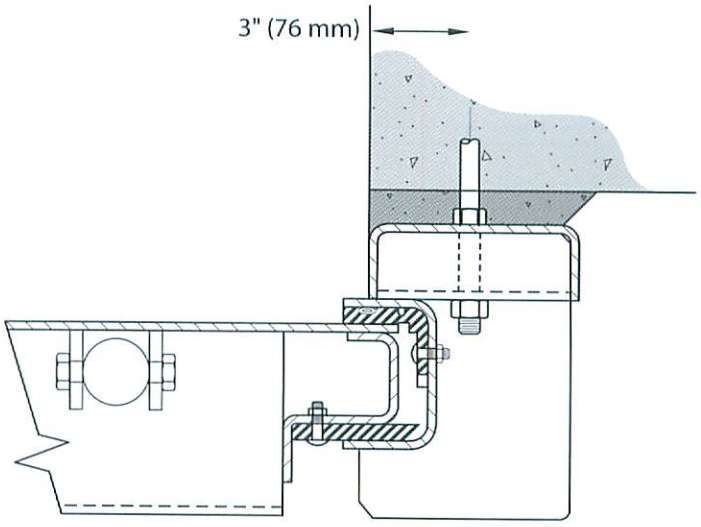
Model 953-D-I Weir Gate



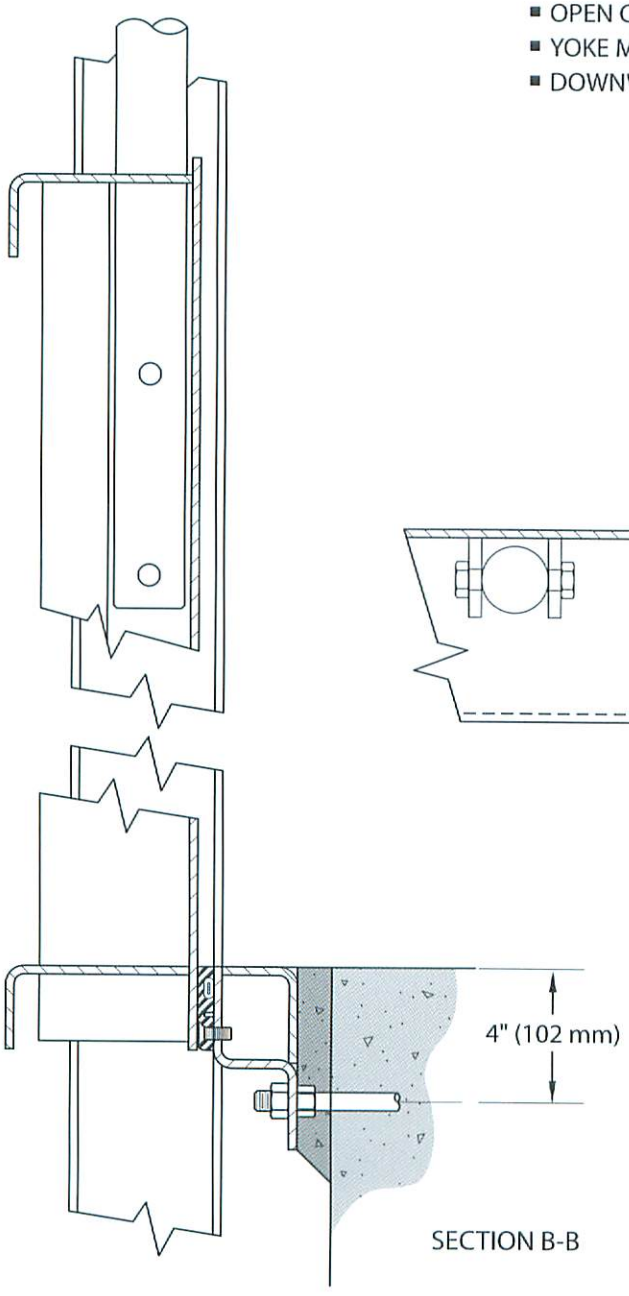
GATE ILLUSTRATED : 144" (W) x 84" (H) x120" (V)
SEE ACTUATORS SECTION FOR OTHER ARRANGEMENTS

Model 953-D-I Features

- UHMW SEAT/SEALS
- LEAKAGE 1/2 OF AWWA C-561
- WALL MOUNTED SIDE FRAMES
- OPEN CHANNEL - OPTIONAL TOP SEAL
- YOKE MOUNTED ACTUATOR
- DOWNWARD OPENING

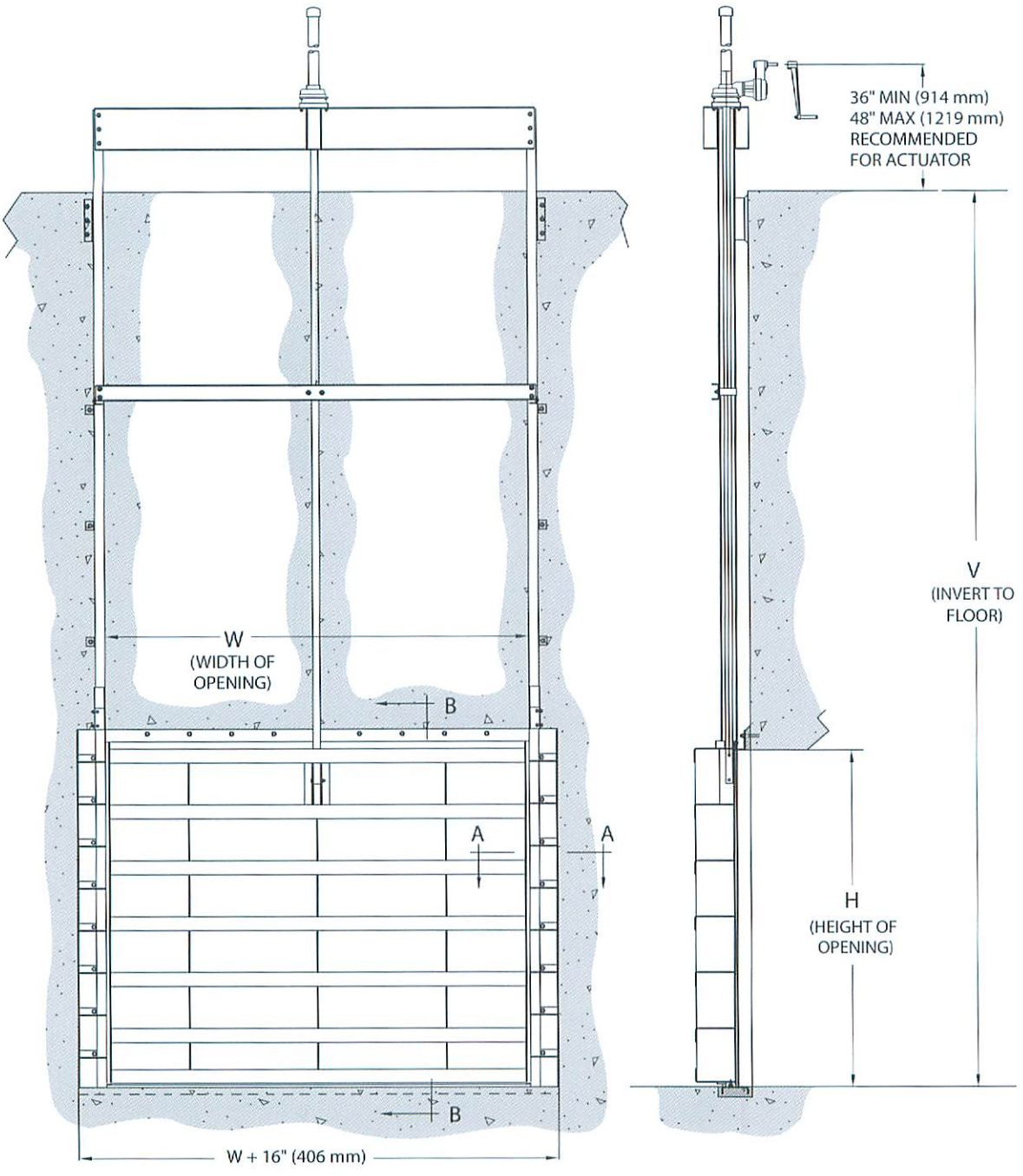


SECTION A-A



SECTION B-B

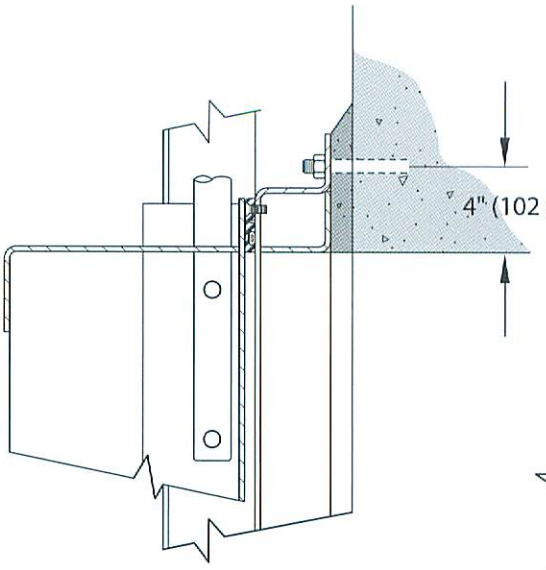
Model 954 Sluice Gate

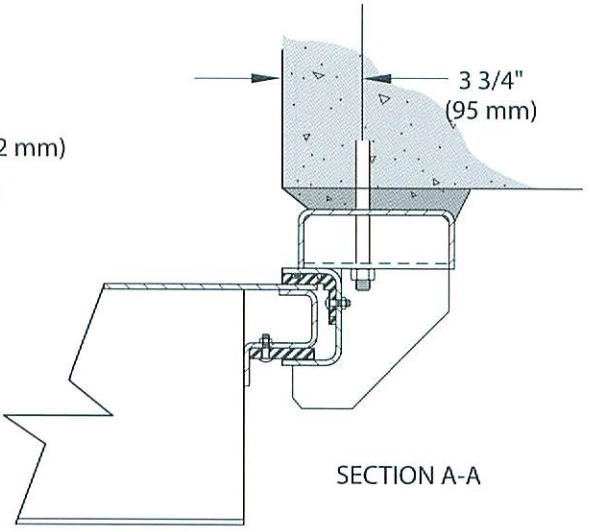


GATE ILLUSTRATED : 120" (W) x 96" (H) x255" (V)
SEE ACTUATOR SECTION FOR OTHER ARRANGEMENTS

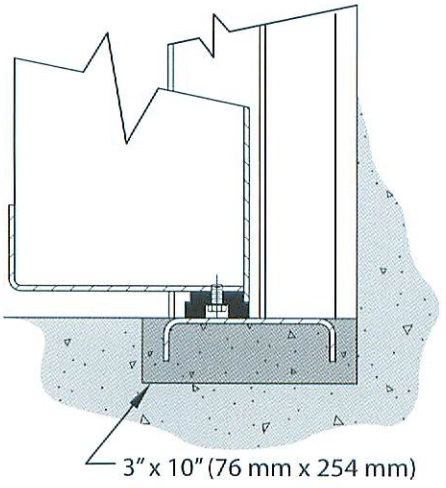
Model 954 Features

- UHMW SEAT/SEALS
- LEAKAGE 1/2 OF AWWA C-561
- WALL MOUNTED SIDE FRAMES
- YOKE MOUNTED ACTUATOR
- FULL APERTURE SEALING
- RESILIENT INVERT SEAL (FLUSH BOTTOM CLOSURE)

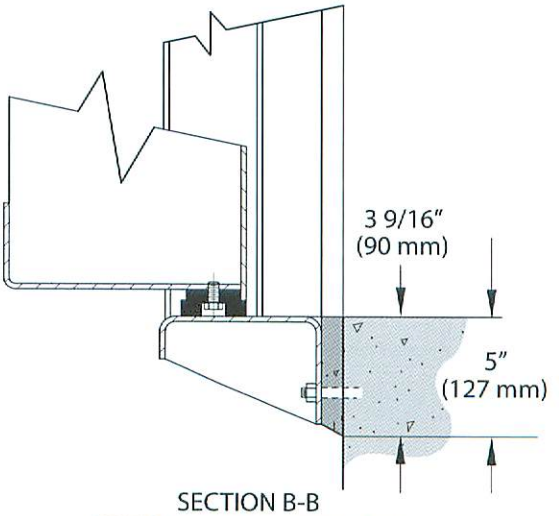




SECTION A-A

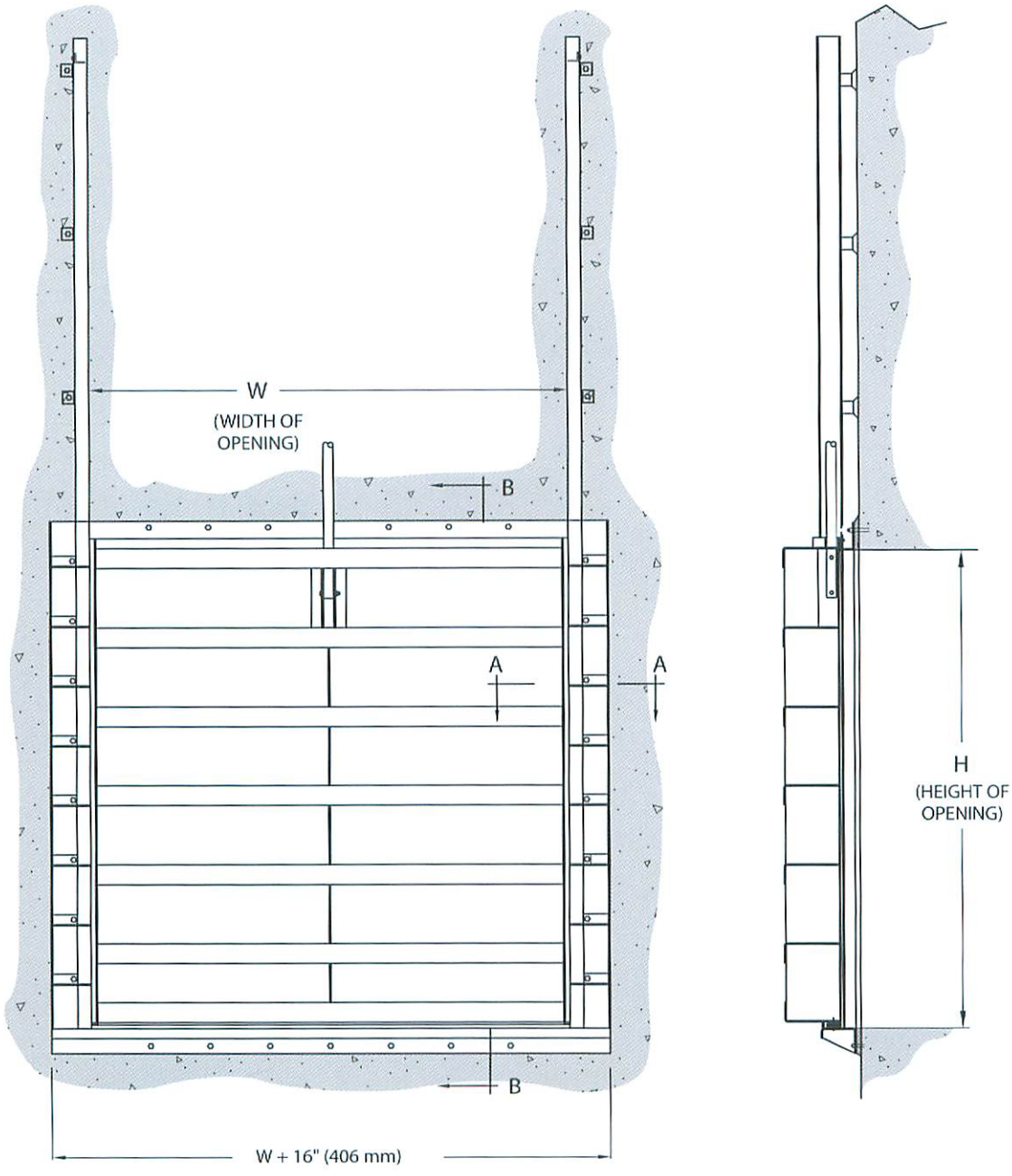


SECTION B-B
TYPICAL BOX-OUT



SECTION B-B
OPTIONAL WALL MOUNTED
INVERT MEMBER

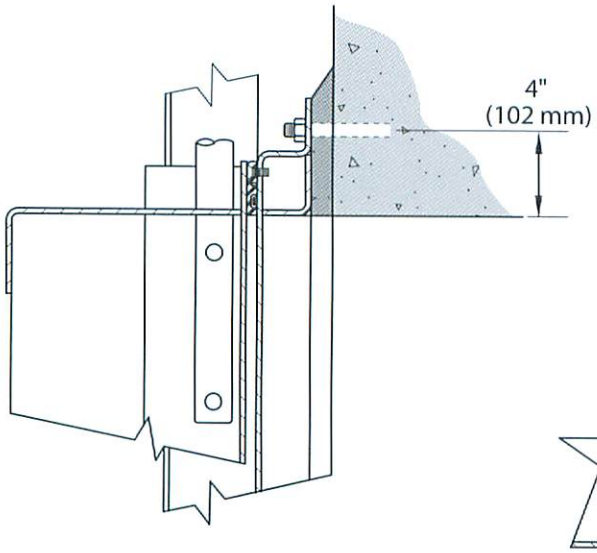
Model 955 Sluice Gate

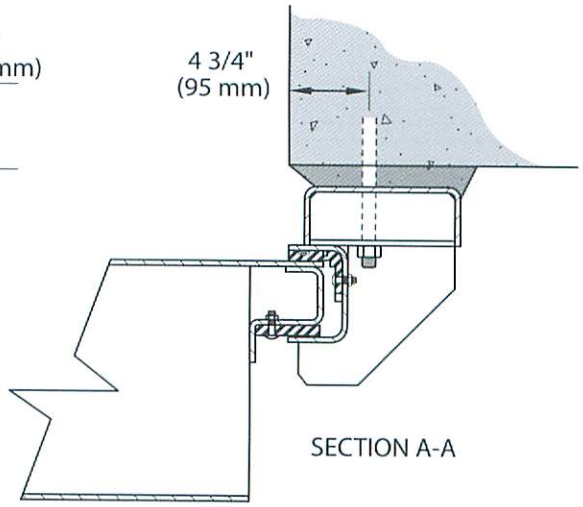


GATE ILLUSTRATED : 96" (W) x 96" (H)
SEE ACTUATORS SECTION FOR OTHER ARRANGEMENTS

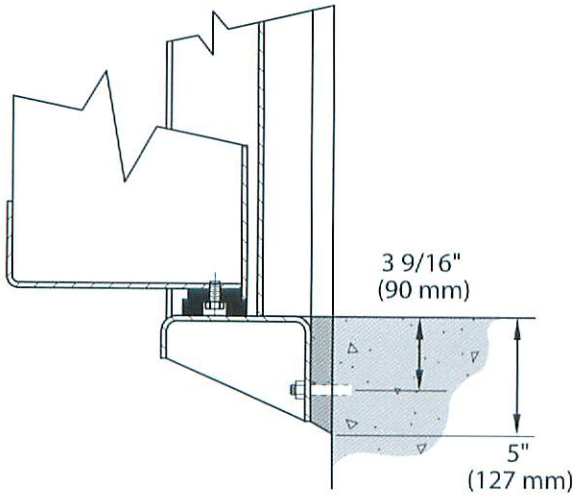
Model 955 Features

- UHMW SEAT/SEALS
- LEAKAGE 1/2 OF AWWA C-561
- WALL MOUNTED SIDE FRAMES
- PEDESTAL, WALL BRACKET OR FLOOR BOX MOUNTED ACTUATOR
- FULL APERTURE SEALING
- RESILENT INVERT SEAL (FLUSH BOTTOM CLOSURE

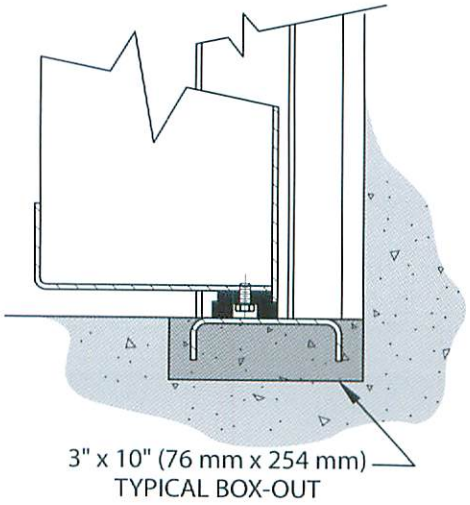




SECTION A-A

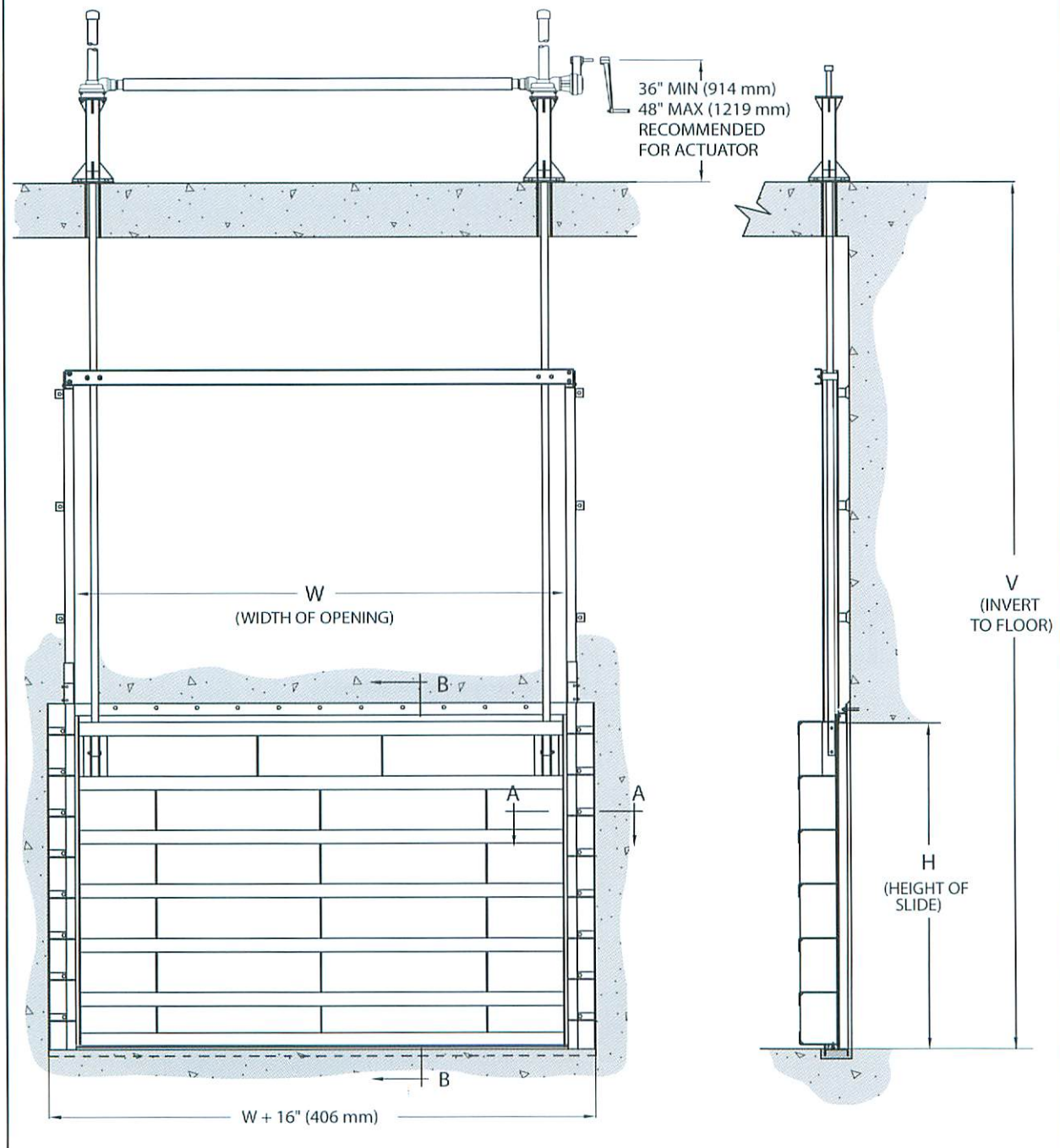


SECTION B-B



SECTION B-B
OPTIONAL EMBEDDED INVERT MEMBER

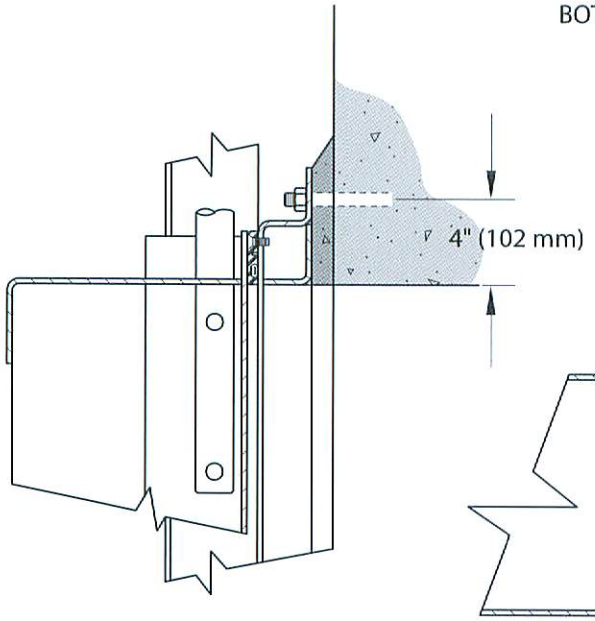
Model 955-I Sluice Gate

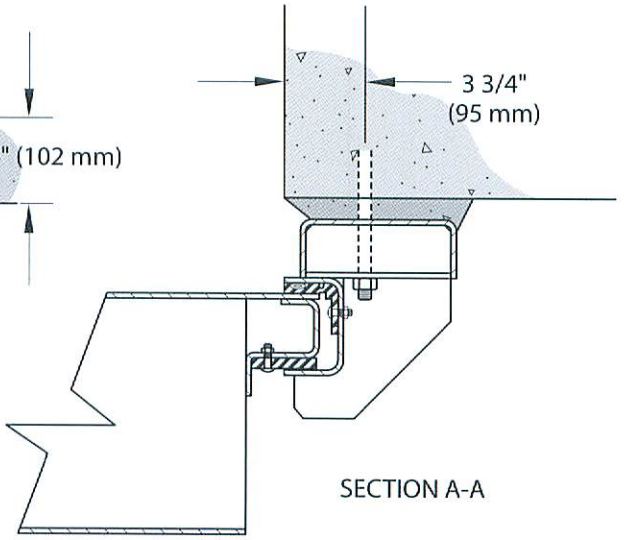


GATE ILLUSTRATED : 144" (W) x 96" (H) x252" (V)
SEE ACTUATORS SECTION FOR OTHER ARRANGEMENTS

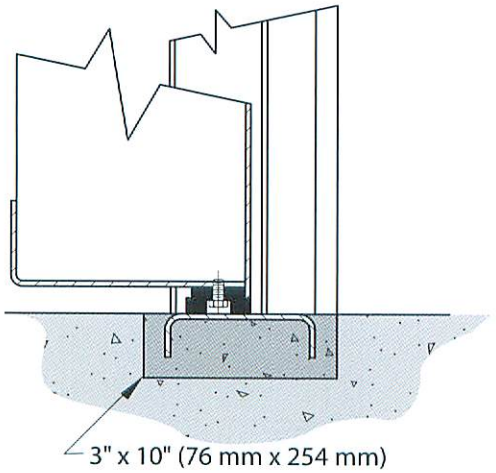
Model 955-I Features

- UHMW SEAT/SEALS
- LEAKAGE 1/2 OF AWWA C-561
- WALL MOUNTED SIDE FRAMES
- PEDESTAL ACTUATORS
- FULL APERTURE SEALING
- RESILIENT INVERT SEAL (FLUSH BOTTOM CLOSURE)

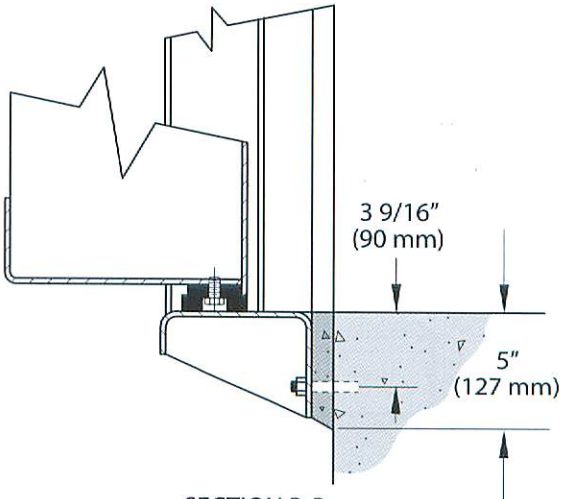




SECTION A-A

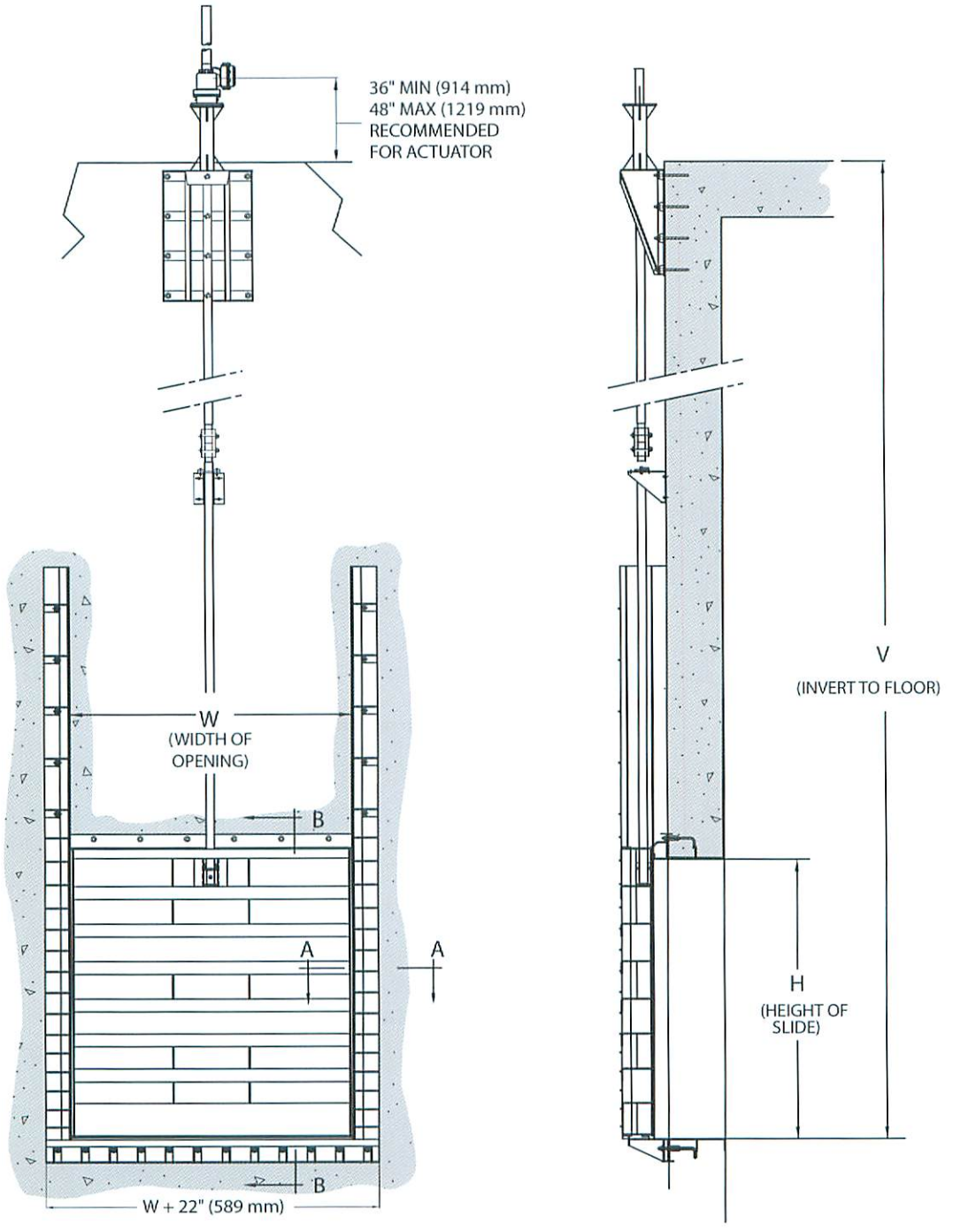


SECTION B-B
TYPICAL BOX-OUT



SECTION B-B
OPTIONAL WALL MOUNTED
INVERT MEMBER

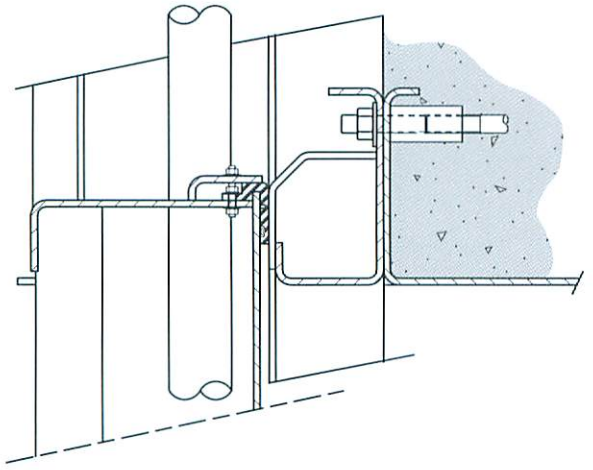
Model 975 Sluice Gate

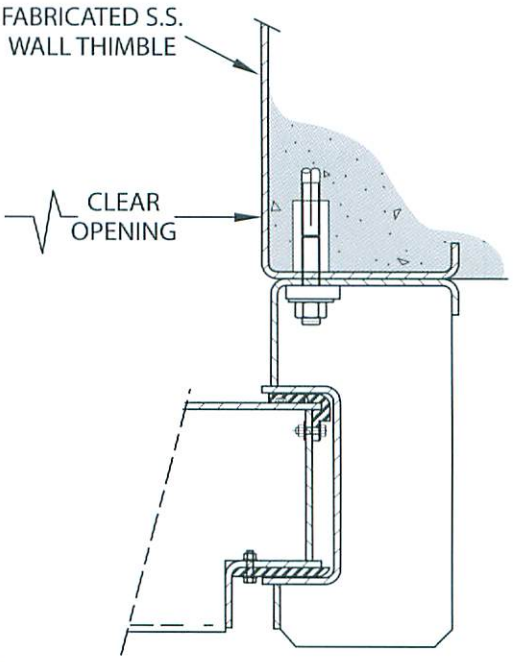


GATE ILLUSTRATED : 120" (W) x 120" (H) x 632" (V)
SEE ACTUATORS SECTION FOR OTHER ARRANGEMENTS

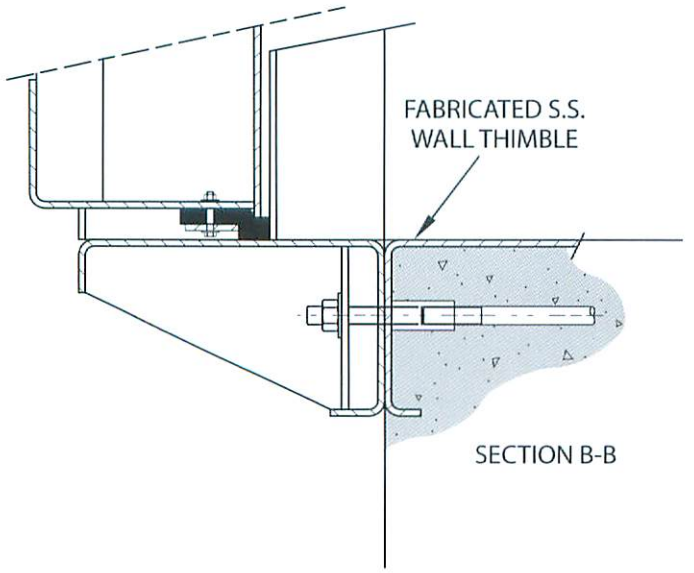
Model 975 Features

- UHMW SEAT/SEALS
- LEAKAGE 1/2 OF AWWA C-561
- WALL THIMBLE MOUNTED (SHOWN)
- PEDESTAL, WALL BRACKET OR FLOOR BOX MOUNTED ACTUATOR
- FULL APERTURE SEALING
- RESILIENT INVERT SEAL (FLUSH BOTTOM CLOSURE)
- 3/8" THICK CONSTRUCTION



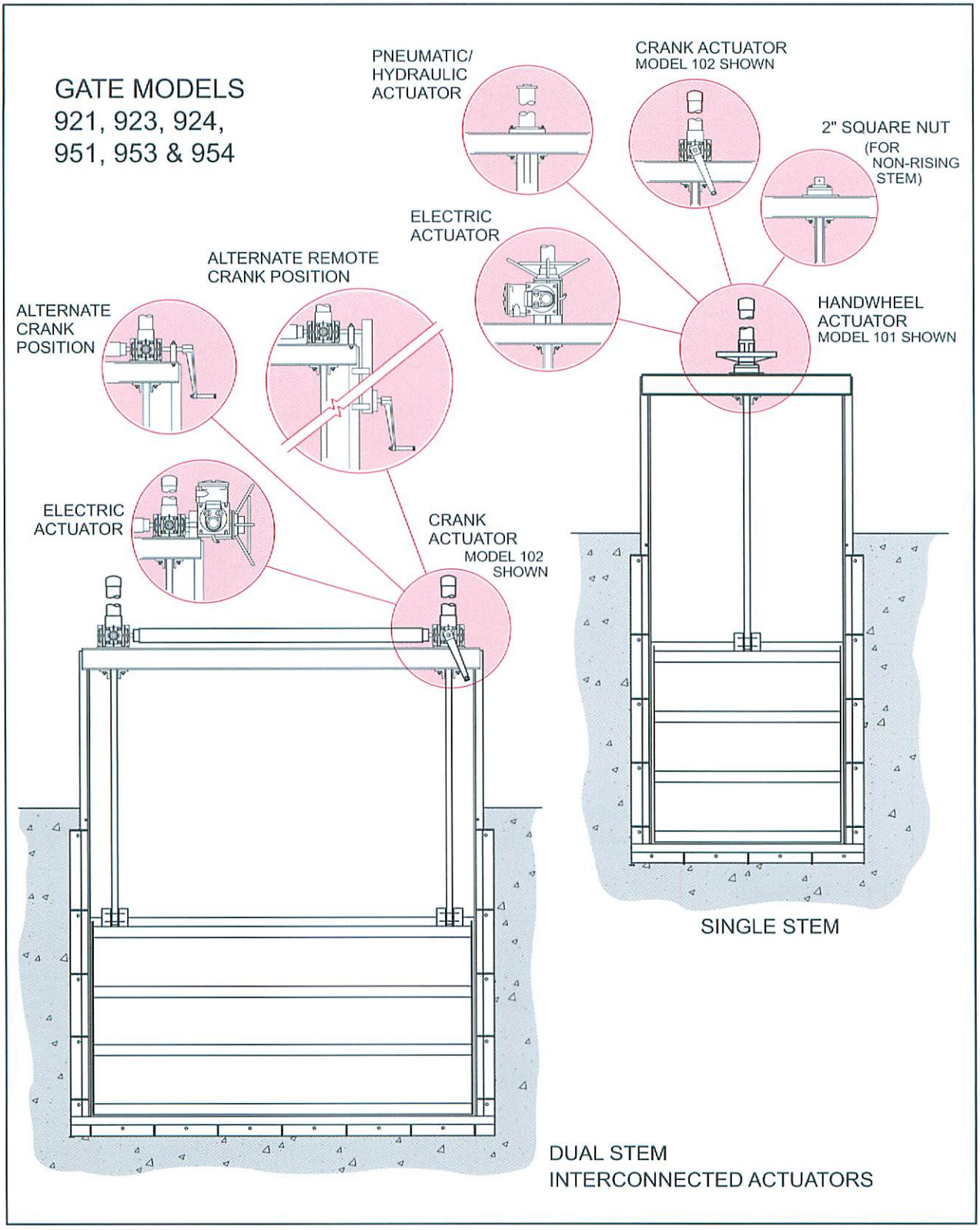


SECTION A-A

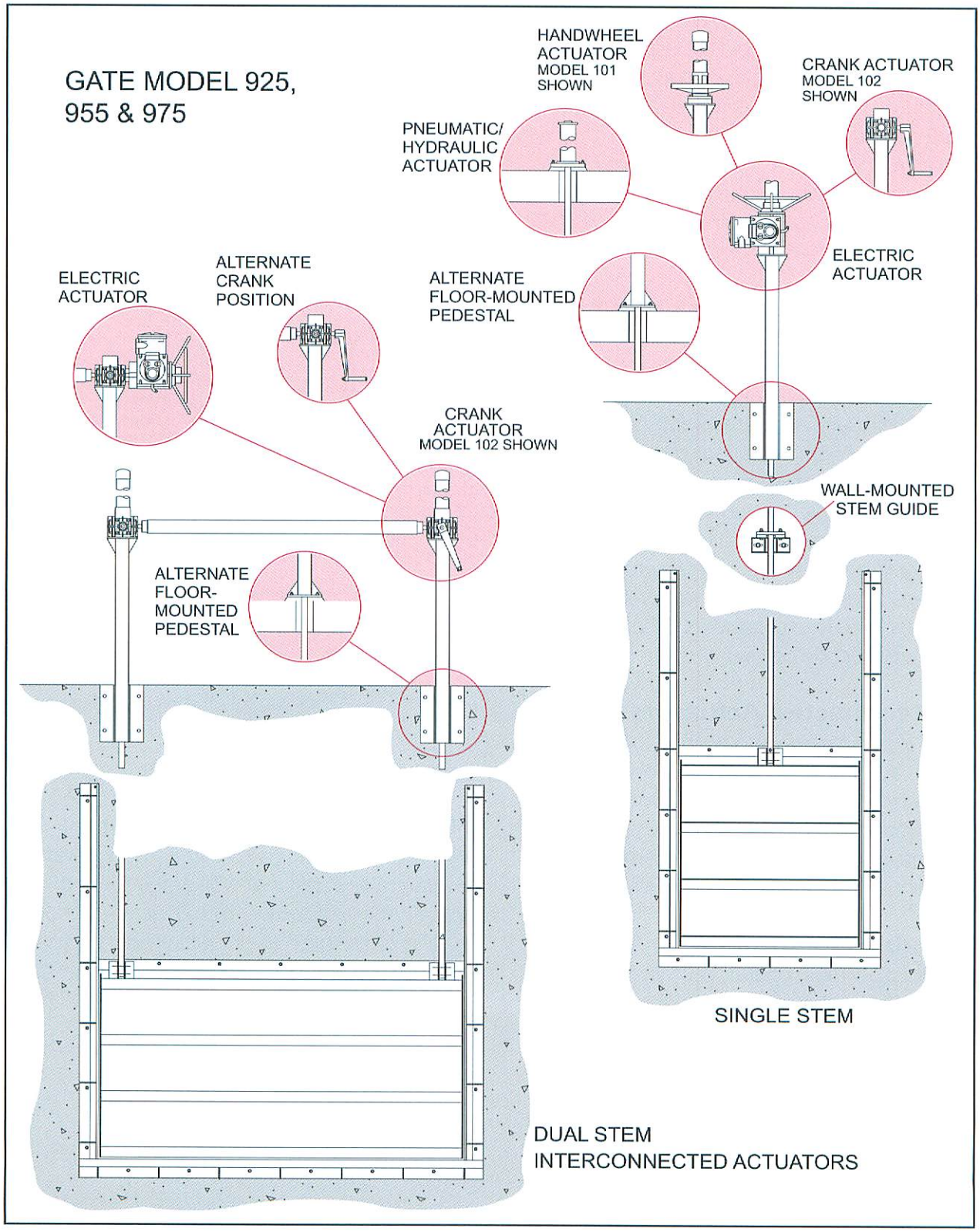


SECTION B-B

Actuators – Self Contained Gates



Actuators – Non-Self Contained Gates



Actuators — General Information

Manual Actuators: Manual actuators (handwheel or crank type) are used where operating loads are relatively low, where operation is infrequent or where electric power is unavailable.

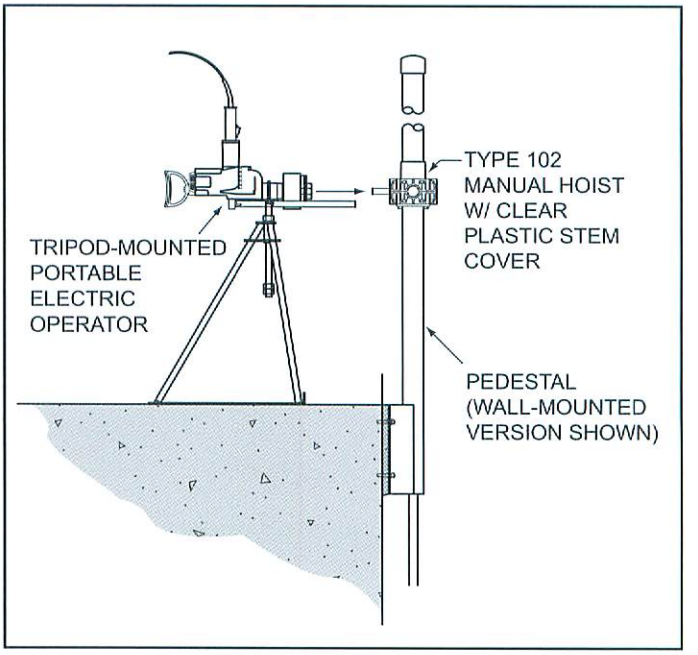
The term "handwheel type" is used to denote an actuator with a handwheel directly attached to the operating nut, concentric with the stem. This drives the nut at a one-to-one ratio.

The term "crank type" is used to denote an actuator with a horizontal input shaft which drives the operating nut through a right angle gear set. Drive ratios are available to operate virtually any gate, but it should be noted that at high ratios, e.g., greater than 8:1, the time and effort to manually operate a large gate is substantial. When crank type manual actuators are to be frequently used, or when they require many turns for full gate travel, portable operators should be considered (see comments in Portable Operators section below).

Interconnected Actuators: For gates with a large width relative to their height, as is common with overflow weirs, interconnected crank type actuators with a common input provide accurate positioning and smooth operation. These assemblies may be manually operated or electrically driven.

Portable Operators: Electric or gasoline powered portable operators of various configurations can be provided to drive crank type actuators. Consult the factory for details.

Electric Actuators: Electric actuators are used for higher loads, higher operating speed (12" -24" per minute), or when gates are operated with relative frequency. Electric actuators can provide remote control of gate position and can be integrated into automatic control systems.



Hydraulic Cylinder Actuators: Hydraulic cylinders can provide smooth and fast operation and they are well suited for automatic control systems which generate frequent cycling of the gate. Hydraulic cylinders actuators can be designed to provide automatic gate positioning upon electric power failure.

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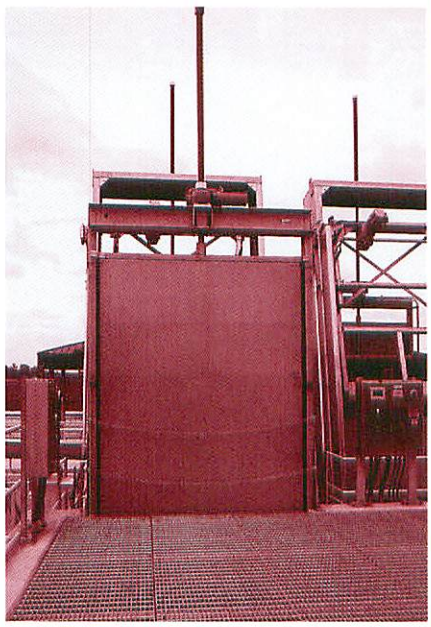

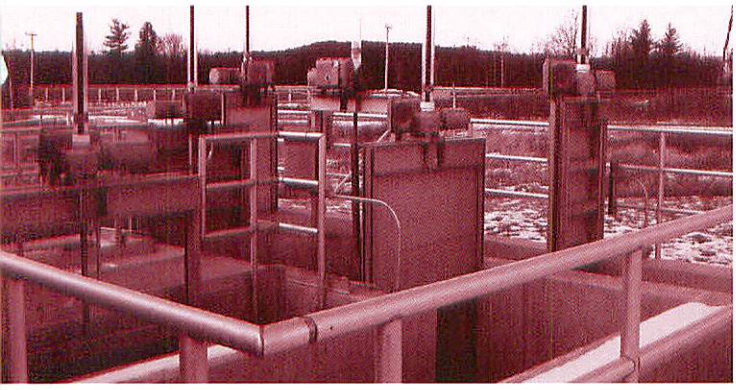

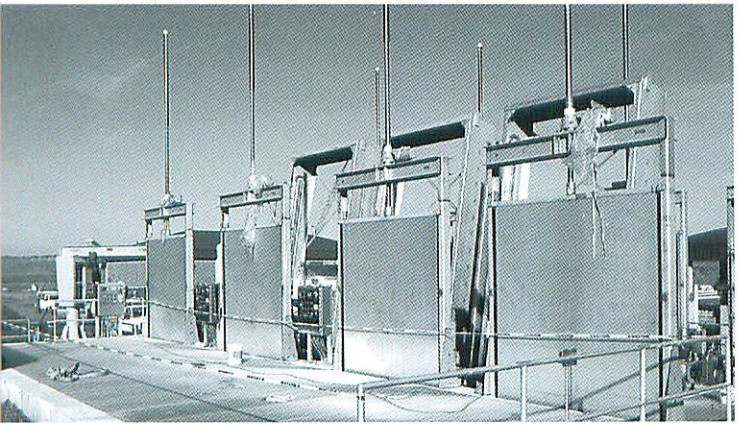

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