



273 Weymouth Street • Rockland MA 02370



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**water supply and pollution control equipment**

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**E/ONE Pressure System Design Report  
For  
Holmes Drive  
Bailey, Road, Holden, MA  
March 3, 2021**

Revision 2.0



December 1, 2020



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Julian Votruba  
New England Environmental Design  
P. O. Box 376  
Rutland, MA 01453

RE: Holmes Drive, Off Bailey Road, Holden, MA REV 2.0

Dear Julian;

This revised design analysis examines the use of the E/One Pressure Sewer System for your project. E/One is celebrating over 50 years of installation and O&M experience along with considerable research and development leading to continuous product and system improvements. E/One remains the worldwide industry standard and industry leader in the pressure sewer technology. The unique characteristics of the E/One Pressure Sewer approach provides not only a technical solution, but also an economic advantage to be realized with low up front and O&M costs.

### System Analysis

This project proposes to collect wastewater from 7 residential buildings to discharge to an existing gravity in Baily Road. The revised 'low' elevation has been changed to 775.0 feet. We have changed from a system following around the roadway to a single pressure line in the roadway. This reduced the length of pipe and eliminates the need for air/vacuum release assembly.

We ran the enclosed preliminary pressure sewer pipe sizing analysis through our Low-Pressure Sewer Design Software that employs our Flow Velocity and Friction Head Loss vs. Pumps in Simultaneous Operation Spreadsheet.

### Zone Layout

Using your site plan and profile, we laid out a system of 1 flow zone leading to the final discharge point. The pressure sewer will follow around Holmes Road in easements and not be part of the final roadway. The new connection is proposed to connect to the existing pressure line that then runs a short distance to the gravity sewer.

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Computations are based on the Hazen-Williams formula for friction loss, using calculations of cross-sectional area and flow rate to determine pipe sizes that results in "self-cleaning" velocities of 2.0 fps or higher. A "C" factor of 150, SDR 11 HDPE pipe and the average expected daily volumes for single family homes are also used in this analysis.

The highest Total Dynamic Head generated is approximately 18 feet which is comprised of static head and friction loss in the proposed pipeline. This is well below our pump's continuous-run rating of 185 ft, and well within its intermittent, i.e., normal, operating range. Flow velocity throughout the system meets or exceeds 2 fps. These characteristics and low retention time indicate that this will be a reliable, low-maintenance system.

### **Design Flows & System Velocity**

We normally use average daily flows for system designs rather than the peak design flows commonly used for gravity sewer sizing. We do this because the system is sealed, and void of inflow and infiltration commonly allowed for in gravity sewer designs. We size the system for an average daily flow of 200+/- gpd generally for single family homes. The pumps selected are rated to flows up to 700 gpd thus peak flows are easily handled. We size the pipelines for the proper scouring velocity based on the pump's output which has a consistent flow rate over a wide range of head conditions. We then look at the pipeline retention time to optimize the line size for the lowest retention that will pass wastewater in a short period of time to reduce sediment in the lines and prevent odor issues. This makes for a very reliable and maintenance free wastewater collection system.

Often, we are asked to use the published "State" design values from various flow tables in order to secure approval. We can do this; but then we run the reports based on the actual predicted average flow to optimize the line size as mentioned above.

Many of our installations have seen flows that more closely mirror the EPA water use goals of 70 gpd/capita. We also look at seasonal uses a little more closely due to greater reductions in flow in the offseason. In applications of this type we look to find the best for both seasons.

## Appurtenances

- Cleanouts, Air/Vacuum Release

Our normal recommendations for valve placement are as follows: flushing connections at 1,000' to 1,500' intervals and at branch ends and junctions; isolation valves at branch junctions; and air release valves at peaks of 25 ft. or more and/or at intervals of 2,000 to 2,500 ft.

For this project we recommend one inline flushing manhole in Zone # 1 end of line.

- Service Laterals and Check Valves

Common practice in pressure sewers requires the ability to isolate each lot with a corporation stop off the main and service lateral kit to the lot line. E/One now requires that each pump connection be isolated with a combination curb stop/redundant check valve.

E/One has developed a true wastewater rated check valve which is built into our stainless-steel lateral kit shown in this report. These components are rated to 235 psi and with standard connection fittings rated to 150 psi. These items are included in the budget analyses and shown in this report.

We strongly advise against the use of waterworks check valves as they are not rated for sewage environments. We do not like to recommend brass due to concerns for corrosion. **WEF Manual of Practice FD-12, Second Edition**, page 45 speaks to the limited success of brass or bronze alloys.

“Besides corrosion considerations, brass is subject to de-alloying, while some bronze, such as 85-5-5, will give better performance. The terms *brass* and *bronze* are used loosely, despite having different meanings; the engineer is advised to evaluate these materials with caution.”

We have also seen PVC body check valves with pressure rating to 150 psi that do not have the same rating for back pressure on the check valve. This can result in damage to the check valve and pumping issues as the check valve disc can become dislodged under pressure and then become a line obstruction.



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- Corporation Stops/ Mainline Connections

Connections to the main pressure line do not require WYE type fittings. We commonly use a TEE or saddle connection. We isolate each connection to the main line with a stainless-steel corporation valve in the same manner used for other utilities such as gas and water services.

We recommend that the service laterals connect to the mainline and do not need to enter a cleanout manhole or other structure. These connections are very similar to a connection of a water service off a water main.

### Budget Notes

We show both our outdoor Model DH071-93 pumps and indoor pump Model IH091-IDU in this report. We have used out outdoor pump for the budget in this report. Indoor pumps are another option, that we are happy to quote.

Costs of pipeline excavation and pump installation are best obtained from sources in your region. You may be better able to determine these costs.

I am looking forward to working with you on this and future projects. Please contact me if you have any questions or require additional information.

Best regards,

*Henry S. Albro*

West Townsend Office

781-982-9300, Ext. 222

[henryalbro@frmahony.com](mailto:henryalbro@frmahony.com)

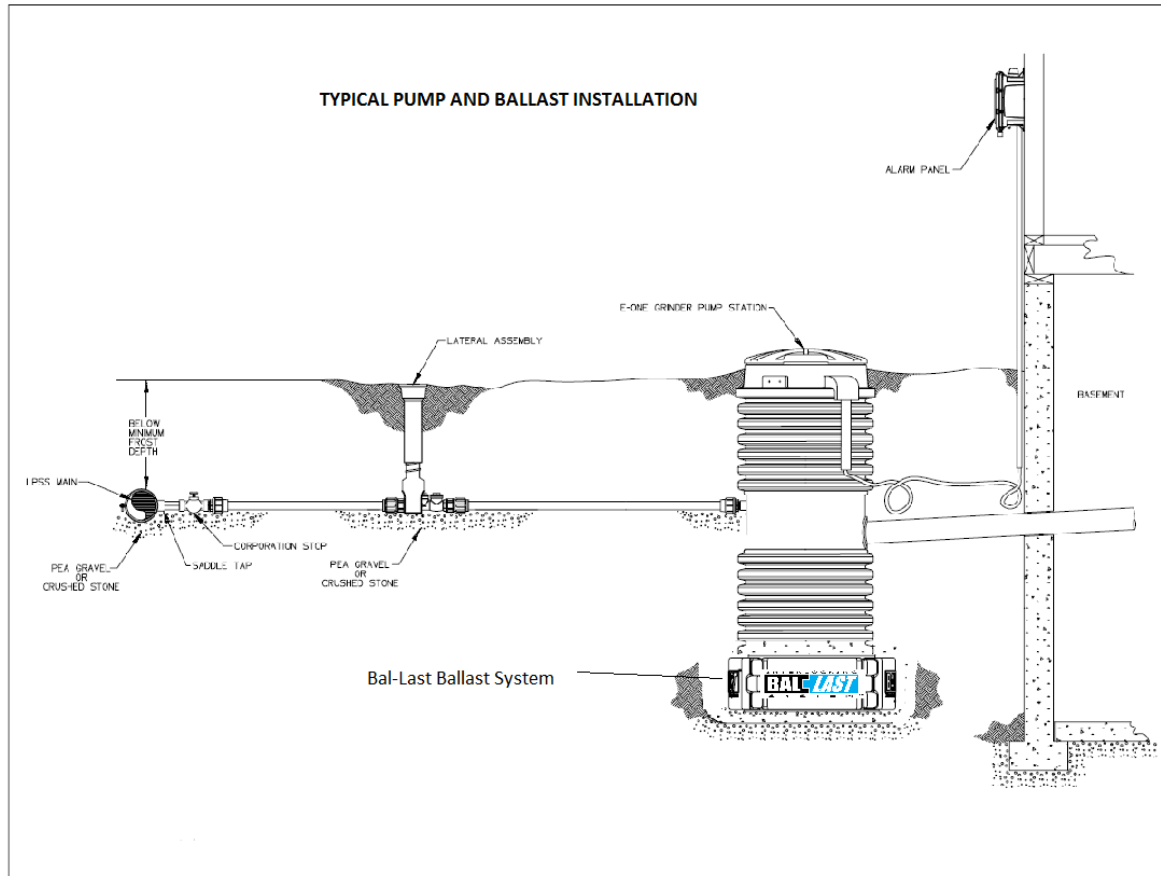
Enclosures

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This image shows the typical layout of an outdoor pump unit for single-family home use. The pump unit is furnished complete, ready for installation. The installer needs to confirm the power cord length and discharge and inlet configuration. Standard products are supplied with 32 foot power supply cable. Standard inlets are 4-inch Schedule 40 Grommets (@ zero degrees) with 1-1/4 inch discharge (@ 180 degrees). Other configurations are available.



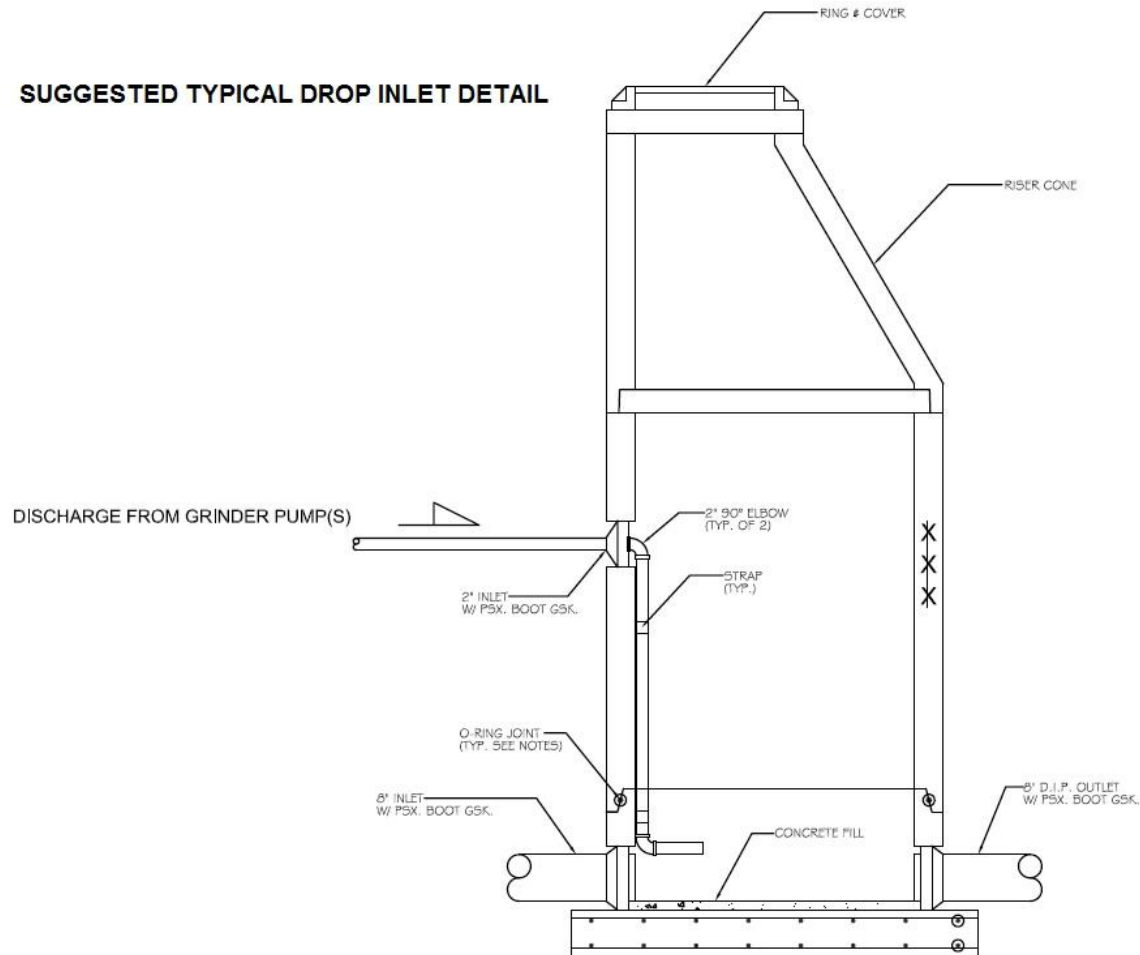
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**SUGGESTED TYPICAL DROP INLET DETAIL**

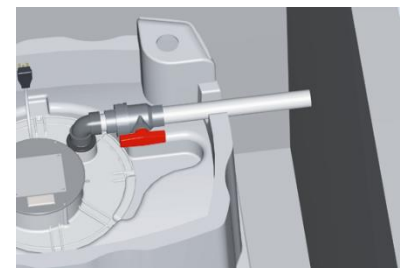
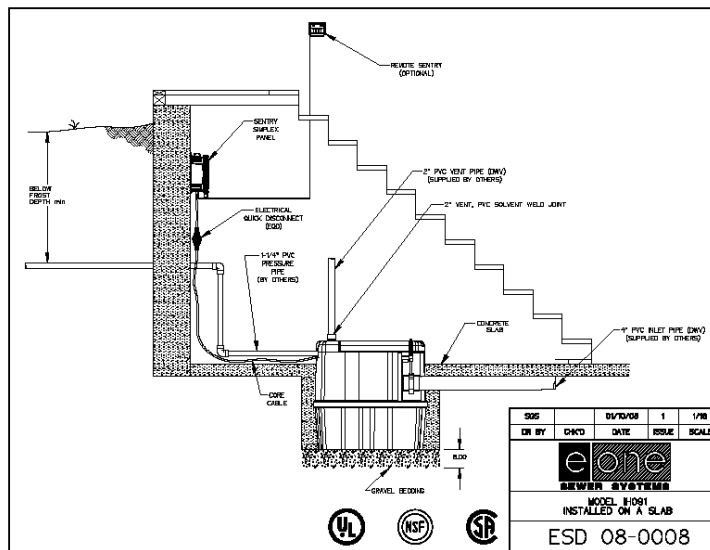
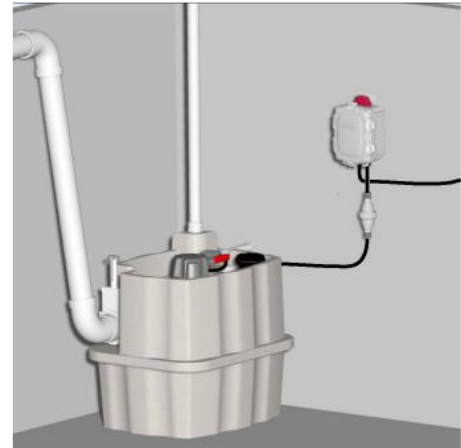
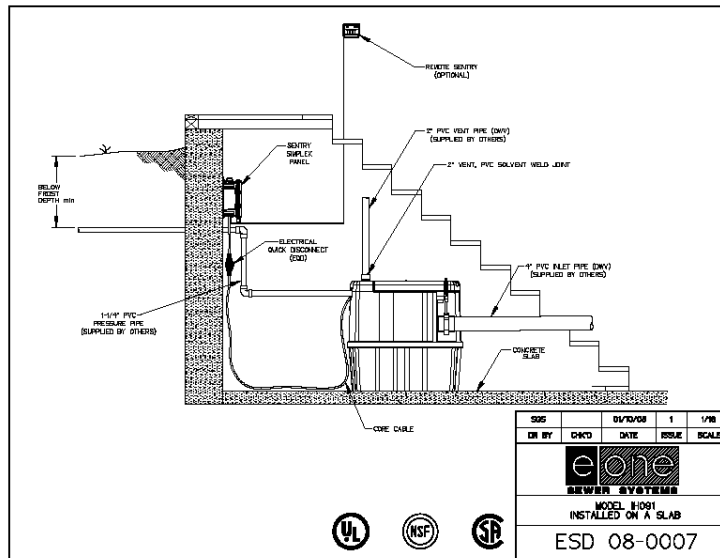


IN-LINE MANHOLE  
ELEVATION VIEW

This detail is shown as a concept sketch when major grade adjustments are required. We recommend that smaller inlet lines match the crown of outlet gravity sewer lines in all cases in order to direct flow to properly drain to the gravity sewer



**Model IH091 Indoor Pump** Connection options for this station can be adapted to connect above the sill plumbing or below slab plumbing as seen in the sketches below.



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Standard alarm panels are the Sentry® panel mounted outside of the home as shown in the drawing (above).

Options include emergency generator connection (see photo) and Redundant alarm Remote Sentry® panel shown. Other panel configurations are available. See the partial listing of panel options below.



- Basic Panels include circuit breaker for the pump and separate breaker for the alarm. These panels include alarm light, alarm buzzer and alarm silence button. ***All F. R. Mahony panels are equipped with dry contacts to enable the connection of the Remote Sentry® (battery powered redundant alarm panel option)***
- Standard options include auto transfer generator connection shown above. This panel provides automatic power transfer without having to open the alarm panel or having to operate any manual transfer switching. This feature can be added to the basic panel or the panels offered below.
- Popular options include the “**Protection Package**” which monitors and protects the system from:
  - Pump Run Dry Condition (Pump running out of water)
  - Pump Overpressure Condition (Closed valve)
  - Brownout Condition (Main voltage under 12% of nameplate)
  - High Liquid Level
- The “**Protect Plus**” panel features offer the same items in the “Protection Package” plus the following:
  - High & Low Amperage draw by the pump
  - High & Low voltage to the pump
  - Extended Runtime by the pump (indicating wear or excessive flow) (field adjustable settings)
  - Monitoring of:
    - Real-time Pump Voltage and Current
    - Cycles & Hours (can be reset)
    - Minimum & Maximum Amperage (can be reset)
    - Minimum, Maximum, Average, and Last Run Cycle (in minutes, can be reset)

## Emergency Generator Transfer Options.

The indoor pump units may be furnished with a receptacle for connection of emergency power supplies. The image to the right shows the connection receptacle on the right side of our Sentry panels. This connection may be connected by your electrician to a remote connection port outside of the home.



Wiring must be performed by a licensed electrician and conforming to NEC and local electrical codes.

The box (left) is shown in the face view (face up) and is intended to be mounted on the outside wall to permit connection of a portable generator to the receptacle on the bottom. Generator operation must always be in well ventilated areas outside of any living space.

The pump may be operated under emergency power provided the automatic transfer option is selected with the Sentry® panel. Normal pump run times are short and should not require the continuous connection of a generator. A single portable generator may be used to service several homes

effectively.



NEMA# L14-20R  
20 Amp  
1-120/240 VAC



Pump models may be the DH071-93 (standard height) for outdoor use or the Model IH091 indoor unit. Both products are UL listed NSF and CSA certified and Massachusetts Plumbing Board Accepted.

### **Model DH071-93 Outdoor Pump With Bal-Last™**

The outdoor model is complete - ready for installation and connection to exterior plumbing and power supply. This unit is fully tested for operation and factory leak tested. No assembly is required and there are no floats to adjust. The pump is furnished complete with the alarm panel and direct bury power supply cable. Standard cable length is 32 feet with 50, 75, and 100 and up to 150-foot cables available. (See Alarm Panel options above)



Other station configurations are available for higher flow requirements. Please contact us for more information. Additional information may be found at [www.eone.com](http://www.eone.com)

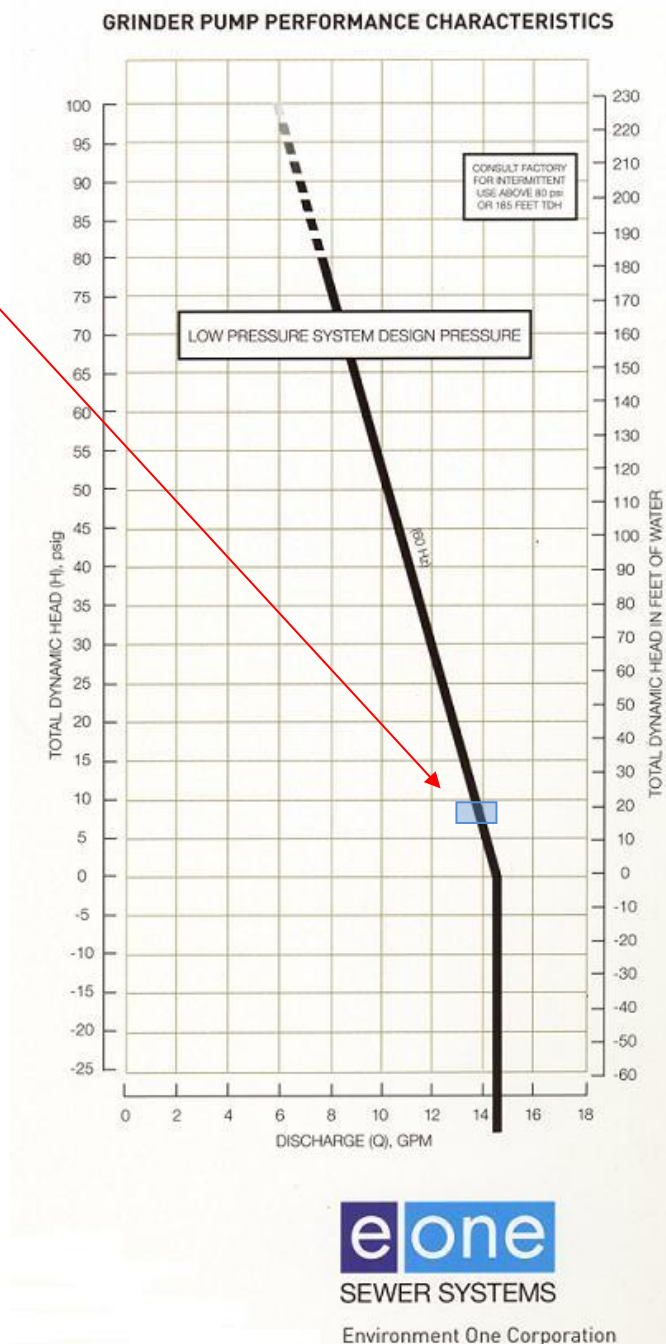
## Operation Conditions

18 Feet is the highest TDH at simultaneous operating conditions with the expected number of pumps operating in each zone, or the head of an individual pump operating in a single zone condition.

Operating range of E/One pumps from 0-185 feet TDH and from 0 to -60 feet TDH.

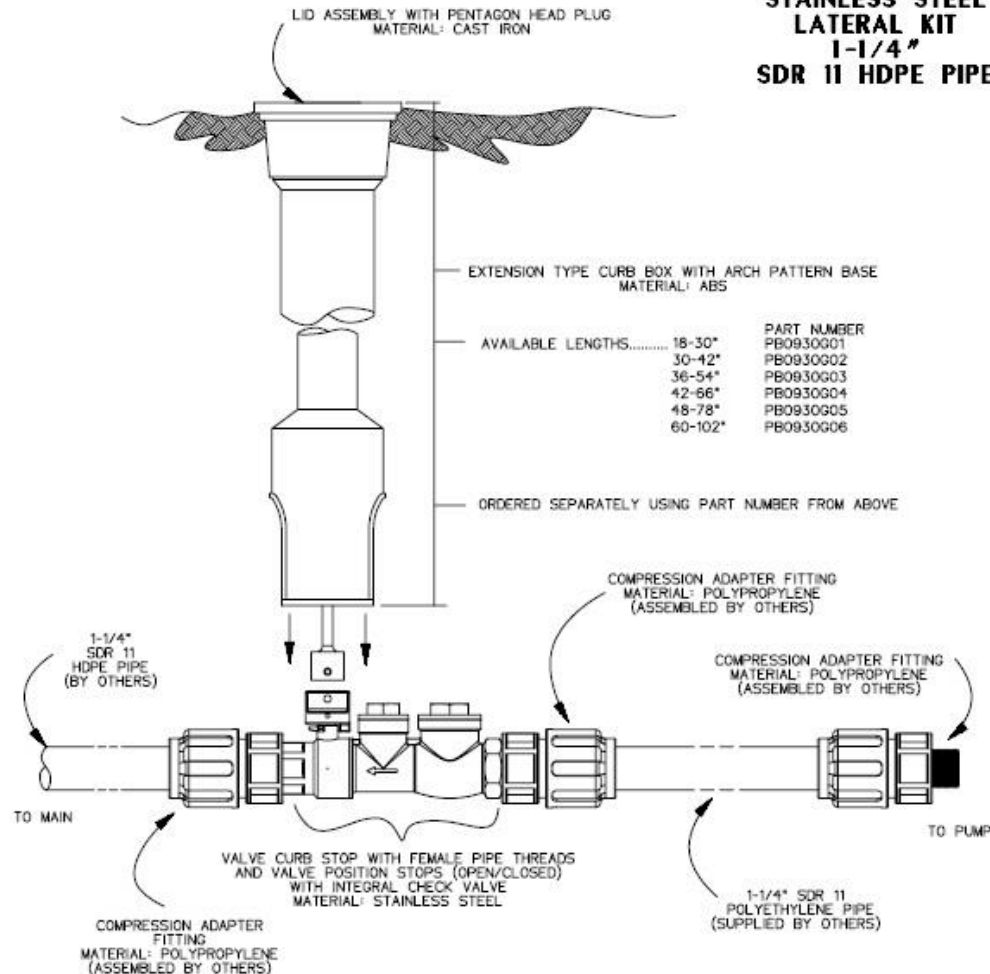
### Your System Range

Anti-siphon valves in E/One cores provide for negative head pumping. In common systems with negative heads of 25-30 feet or more we recommend the use of combination air/vacuum release valves as described below.





**STAINLESS STEEL  
 LATERAL KIT  
 1-1/4"  
 SDR 11 HDPE PIPE**



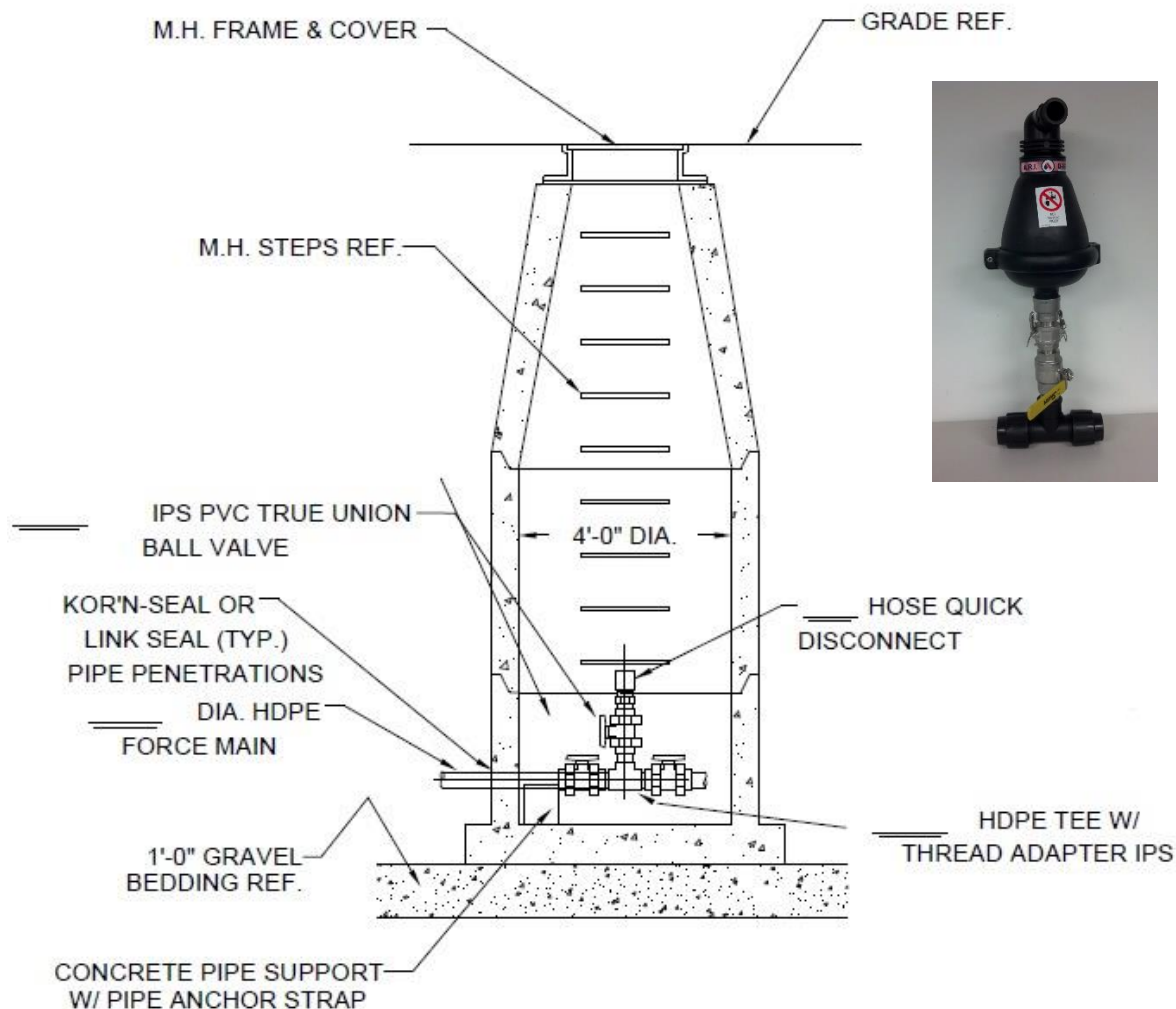
**NOTES:**

1. SS CURB STOP/CHECK VALVE AND FITTINGS ARE PROVIDED SEPARATELY, TO BE ASSEMBLED BY OTHERS
2. TO ASSEMBLE, APPLY A DOUBLE LAYER OF TEFLON TAPE, AND A LAYER OF PIPE DOPE (SUPPLIED BY OTHERS) TO THE THREADS ON THE PLASTIC FITTINGS AND INSTALL PER THE MANUFACTURER'S INSTRUCTIONS
3. ASSEMBLY IS TO BE PRESSURE TESTED (BY OTHERS)
4. ASSEMBLY IS TO BE USED WITH SDR11 HDPE PIPE
5. TO ORDER SS LATERAL KIT, USE PART NUMBER NC0193G01
6. CURB BOX IS TO BE ORDERED SEPARATELY, SEE ABOVE

KIT PARTS ARE NOT ASSEMBLED

|  |       |          |       |       |
|--|-------|----------|-------|-------|
| SGS  | DN    | 11/02/11 | A     | 3/16  |
| DR BY  | CHK'D | DATE     | ISSUE | SCALE |
|  |       |          |       |       |
| STAINLESS STEEL LATERAL KIT<br>1-1/4" SDR 11 HDPE PIPE |       |          |       |       |
| NA0330P02  |       |          |       |       |

## Example of Typical Cleanout Detail (Optional Air/Vacuum Valve shown –right)



Cleanout detail can be modified to match typical installation needs. Inline shut offs may be added to isolate flow direction. Image shown is flow through cleanout. These structures can be terminal end of line cleanouts, or junction cleanouts as may be required. Optional air and vacuum relief valves may be added when required.

*Designer/Installer must include proper pipe supports with corrosion resistant (Stainless Steel) hardware.  
 Supports will vary depending on cleanout configuration.*