

600.05 **Minimum Diameter**

- A. The minimum diameter of storm sewer pipe shall be 12 inches. The diameter shall be increased as necessary according to the design analysis.

600.06 **Minimum Cover**

- A. The minimum cover over storm sewer pipe shall be 2 feet unless otherwise approved by the Village Engineer. Cover is measured from the top of pipe to the finished grade directly above the pipe.

600.07 **Minimum Slope**

- A. The minimum recommended slope for storm sewers shall be 0.10 feet per 100 feet, unless a greater slope is required to obtain the minimum mean velocity. Culverts may be installed on flatter grades as approved by the Village Engineer.

600.08 **Minimum Velocity**

- A. The absolute minimum mean velocity for all storm sewers shall be 2.0 feet per second when flowing full based on Manning's Formula using an "n" value of 0.013. Use of other "n" values will be considered if deemed justifiable on the basis of extensive field data. The desirable minimum velocity is 3.0 feet per second based on the same criteria.

600.09 **Maximum Velocity**

- A. The maximum velocity of all storm sewers shall be 10 feet per second. If the velocity is greater than 10 feet per second, provisions should be made to protect against displacement and erosion of the pipe or as approved by the Village Engineer.

600.10 **Maximum Headwater**

- A. The maximum allowable headwater depth for culverts shall be 2 feet below pavement surfaces and/or finish floor elevations.

600.11 **Manholes**

- A. Manholes or inlets shall be installed at the end of each line except at the discharge end; at all changes in grade, size, and alignment; and at all pipe intersections. Manholes shall be installed at distances not greater than 400 feet. Intervals of more than 400 feet may be approved in sewers 42 inches and larger. Manholes may be either poured-in-place or precast concrete. Concrete construction shall conform to ASTM C-478. Any changes of manhole or inlet placement shall be approved by the Village Engineer.

- B. The flow channel through manholes should be made to conform in shape, slope, and smoothness to that of the sewers.
- C. All manhole covers shall be adjusted to grade by the use of no more than 12 inches of precast adjusting collars.
- D. Manholes shall be consistent with those shown in the standard drawings.

600.12 Manhole Minimum Diameter

- A. Manholes shall be constructed large enough to allow access to all sewers. The minimum diameter of manholes shall be 48 inches. Where large sewers require the use of manholes with diameters greater than 48 inches, the manhole shall be returned to the 48-inch diameter as soon as practical above the sewer crown. Manhole openings of 24 inches or larger are required for easy access with safety equipment and to facilitate maintenance.

600.13 Catch Basins

- A. Curb inlets shall be placed at all low points, points of change to a flatter street grade, the dead end of descending streets, and at the Point of Curvature and Point of Tangency of all intersection radius curves where the street grade descends toward the radius curve and at all intersections. The basis for the design and spacing of curb inlets shall conform to the Bureau of Roads Hydraulic Engineering Circular No. 12, "Drainage of Highway Pavements".
- B. Under normal conditions, curb inlets shall be placed on both sides of the street at intervals indicated by the street grade. Approximate spacing ranges from 150 feet to 300 feet maximum with an average of 250 feet spacing under normal conditions for the spread of flow-in gutters.
- C. Catch basins not placed in the street shall be selected and placed so that they blend with the surrounding and not appear unsightly.
- D. Curb inlets shall be placed on the property lines if at all possible.
- E. Driveway cuts shall not be placed at curb inlets.
- F. Catch basin types shall be consistent with the types shown in the standard drawings.

600.14 Basis of Culvert Design

- A. The basis of design for street and roadway culverts shall be the Ohio Department of Transportation's Location and Design Manual, Volume Two, Drainage Design.

- B. Hydraulic analysis of culverts may also be performed utilizing Hydraulic Design Series No. 5, Hydraulic Design of Highway Culverts, Federal Highway Administration and Computer Program HY-8.
- C. Design shall be based on a 25-year storm for full flow capacity and an overtopping capacity of at least a 100-year storm.
- D. Culvert flow type must be determined for each culvert design. There are 2 types of culvert flow: Inlet Control and Outlet Control. This must be determined to help ensure proper culvert design.
- E. Maximum allowable headwater shall be 1 foot below the low edge of the pavement. However, the designer should generally limit the maximum 100-year headwater depth to twice the diameter or rise of the culvert.
- F. Tailwater conditions shall also be analyzed for all culverts. In some locations, a high tailwater will control the operation of the culvert. This condition can greatly affect the capacity and headwater of the culvert and shall be checked to help determine upstream design storm and storm water elevations.

600.15 **Open Drainage Ditches**

- A. The basis of design for drainage ditches shall be the Manning Formula, as defined in Section 600.03. Table 6.2 may be used to determine the value of “n”, Manning’s Roughness Coefficient, to be used in the calculations. These calculations of open ditch capacity should be provided to the reviewing agency along with the construction drawings.

TABLE 6.3

<u>CHANNEL MATERIAL</u>	<u>n</u>
Vitrified clay	0.014
Cast iron pipe	0.015
Smooth earth	0.018
Firm gravel	0.023
Corrugated metal pipe	0.022
Natural channels in good condition	0.025
Natural channels with stones and weeds	0.035
Very poor natural channels	0.060

600.16 Channel Protection

- A. Channel protection material shall be placed at pipe outlets and other areas of high velocity flow to prevent erosion. The type, location and depth of the protective material shall be reviewed and approved by the Village.

600.17 Storm Water Detention Basin/Retention Pond Size Requirements

- A. It is recognized that certain outlets for storm water runoff in the Village may be very limited. These outlets do not have the capacity to receive and convey the increased runoff resulting from rapid development around the Village.
- B. Developer/Owners must participate in providing detention storage to eliminate the excessive runoff during heavy storm periods. Where impervious areas are planned or contemplated, it is the intent that detention be provided as required by the provisions hereinafter set forth. It is proposed that well maintained landscaped areas would be provided to act jointly as detention reservoirs and recreation facilities as aesthetic focal points in new developments. Other control methods to regulate the rate of storm water discharge which may be acceptable, include detention on parking lots, streets, lawns, underground storage, oversized storm sewers with restricted outlets, etc. However, these methods must be approved by the Village Service Manager, Service Director and Engineer.

- C. It is recognized that in order to better serve the long-range interests of the Village and the surrounding area, comprehensive basin-wide planning for runoff control should be formulated, adopted, and implemented. Comprehensive planning is far more beneficial than small, on-site detention areas, although on-site detention does provide protection and is acceptable for compliance.
- D. Normal detention of storm water shall be required for all developments and proposed development which would alter storm runoff as to flow, velocity, or time of concentration. These basins are required to detain the peak post-developed runoff which exceeds the runoff created by a 5-year storm under pre-developed condition. The Village reserves the option to require more stringent detention requirements based upon the estimated capacity of the existing storm sewers. All calculations must be submitted to the Village for approval.
- E. Calculations must include a profile of the existing storm sewer from the proposed connection point to a point 500 feet downstream or the first outfall structure nearest to or beyond the required 500 feet. The calculated full flow capacity of the existing storm water outfall shall also be provided.
- F. Design of storm water detention facilities shall be based on the following:
 - 1. The Village suggests that runoffs and capacities are to be computed using the Rational Method and Manning Formula as determined in Section 600.03 of this document for areas less than 20 acres.
 - 2. The release rate from on-site detention shall not be greater than the storm runoff created by the pre-developed site during a 5-year frequency storm. The allowable outflow rate used in Figure 6.5 “Storage Calculation for Drainage Basin” is derived using a C coefficient of 0.2 and a rainfall intensity of 3.65 inches based on 5 years with a duration of 15 minutes multiplied by the site area. Consideration may be given for different intensity and coefficient based on the situation. If runoff from off-site acreage flows through the detention basin, storage volume should be calculated using Figure 6.5 for the on-site area only. After the volume has been calculated, the allowable outflow rate should be calculated using the acreage of the entire area draining across the site.
 - 3. Storage volume shall not be less than the storm runoff created by the post-developed site during a 100-year storm event. The storage volume may be computed by using the appropriate Figure 6.5, “Computation Worksheet for Detention Storage Using Rational Method” based on imperviousness.
- G. Table 6.4 “Percentage of Impervious Area” is used to calculate detention required for each land use.

Table 6.4 Percentage of Impervious Area

10%	FP Flood Plain
10%	OS Open Space
20%	SR-1 Suburban Residence
20%	SR-2 Suburban Residence
30%	UR-1 Urban Residential Low Density
30%	UR-2 Urban Residential Moderate Density
40%	AR-1 Multi-Family Residential
90%	GCC-1 General Community Commercial
90%	GCC-2 General Community Commercial
90%	LM Light Manufacturing
70%	VC Village Commercial

1. Outlet size shall be determined by using the orifice equation as defined by:

$$Q = CA \sqrt{2gh}$$

$$C = 0.6$$

A = Area in square feet

$$g = 32.2 \text{ ft./s}^2$$

H = height from the center of the pipe to the top of the water surface

2. Special detention consideration may be given by the Village Engineer for high impervious areas that are smaller than two acres in size.

H. An emergency overflow from the basin to a major storm system must be provided to protect the facility and adjacent properties. The designer should investigate the capacity of the downstream drainage facilities to determine if they will be adequate to handle the design flow from this particular development. If the downstream facilities are inadequate, it may be necessary to provide on-site retention or ponding basins to limit the flow to an amount which the downstream system can accept.

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STORAGE CALCULATIONS FOR DRAINAGE BASIN

Figure 6.5a

STORM DURATION T MIN/HOUR	RUNOFF COEF. C 10% IMP.	RAINFALL INTENSIT Y _i (IN/HR) 100 YEAR	AREA (ACRES) A	INFLOW DEVELOPE D Q _i = C _i A 100 YR - CFS	OUTFLOW NATURAL Q _o = 5YR-60M .2(3.65)A	STORAGE RATE Q _i -Q _o (CFS)	STORAGE REQUIRED 1/12 (Q _i Q _o)T (ACREFEET)	REMARKS
5 MIN								
0.083	0.14	9.9						
8 MIN								
0.133	0.18	8.2						
10 MIN								
0.167	0.20	7.6						
15 MIN								
0.250	0.24	6.3						
20 MIN								
0.333	0.28	5.5						
30 MIN								
0.500	0.33	4.4						
40 MIN								
0.667	0.37	3.3						
60 MIN								
1.000	0.42	2.8						
100 MIN								
1.667	0.48	1.9						
200 MIN								
3.333	0.58	1.1						

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STORAGE CALCULATIONS FOR DRAINAGE BASIN

Figure 6.5b

STORM DURATION T MIN/HOUR	RUNOFF COEF. C 20% IMP.	RAINFALL INTENSIT Y _i (IN/HR) 100 YEAR	AREA (ACRES) A	INFLOW DEVELOPE D Q _i = C _i A 100 YR - CFS	OUTFLOW NATURAL Q _o = 5YR-60M .2(3.65)A	STORAGE RATE Q _i -Q _o (CFS)	STORAGE REQUIRED 1/12 (Q _i Q _o)T (ACREFEET)	REMARKS
5 MIN								
0.083	0.18	9.9						
8 MIN								
0.133	0.22	8.2						
10 MIN								
0.167	0.24	7.6						
15 MIN								
0.250	0.28	6.3						
20 MIN								
0.333	0.32	5.5						
30 MIN								
0.500	0.38	4.4						
40 MIN								
0.667	0.41	3.3						
60 MIN								
1.000	0.46	2.8						
100 MIN								
1.667	0.53	1.9						
200 MIN								
3.333	0.62	1.1						

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STORAGE CALCULATIONS FOR DRAINAGE BASIN

Figure 6.5c

STORM DURATION T MIN/HOUR	RUNOFF COEF. C 30% IMP.	RAINFALL INTENSITY develop (IN/HR) 100 YEAR	AREA (ACRES) A	INFLOW develop D $Q_i = C_i - 100 \text{ YR} - \text{CFS}$	OUTFLOW NATURAL $Q_o = 5\text{YR} - 60\text{M} .2(3.65)A$	STORAGE RATE $Q_i - Q_o$ (CFS)	STORAGE REQUIRED $1/12 (Q_i - Q_o)T$ (ACREFEET)	REMARKS
5 MIN	0.083	0.22	9.9					
8 MIN	0.133	0.25	8.2					
10 MIN	0.167	0.28	7.6					
15 MIN	0.250	0.32	6.3					
20 MIN	0.333	0.36	5.5					
30 MIN	0.500	0.42	4.4					
40 MIN	0.667	0.46	3.3					
60 MIN	1.000	0.51	2.8					
100 MIN	1.667	0.57	1.9					
200 MIN	3.333	0.66	1.1					

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STORAGE CALCULATIONS FOR DRAINAGE BASIN

Figure 6.5d

STORM DURATION T MIN/HOUR	RUNOFF COEF. C 40% IMP.	RAINFALL INTENSIT Y _i (IN/HR) 100 YEAR	AREA (ACRES) A	INFLOW DEVELOPE D Q _i = C _i A 100 YR - CFS	OUTFLOW NATURAL Q _o = 5YR-60M .2(3.65)A	STORAGE RATE Q _i -Q _o (CFS)	STORAGE REQUIRED 1/12 (Q _i Q _o)T (ACREFEET)	REMARKS
5 MIN								
0.083	0.25	9.9						
8 MIN								
0.133	0.29	8.2						
10 MIN								
0.167	0.32	7.6						
15 MIN								
0.250	0.36	6.3						
20 MIN								
0.333	0.41	5.5						
30 MIN								
0.500	0.46	4.4						
40 MIN								
0.667	0.50	3.3						
60 MIN								
1.000	0.55	2.8						
100 MIN								
1.667	0.61	1.9						
200 MIN								
3.333	0.71	1.1						

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STORAGE CALCULATIONS FOR DRAINAGE BASIN

Figure 6.5e

STORM DURATION T MIN/HOUR	RUNOFF COEF. C 70% IMP.	RAINFALL INTENSIT Y _i (IN/HR) 100 YEAR	AREA (ACRES) A	INFLOW DEVELOPE D Q _i = C _i A 100 YR - CFS	OUTFLOW NATURAL Q _o = 5YR-60M .2(3.65)A	STORAGE RATE Q _i -Q _o (CFS)	STORAGE REQUIRED 1/12 (Q _i Q _o)T (ACREFEET)	REMARKS
5 MIN	0.083	9.9						
8 MIN	0.133	8.2						
10 MIN	0.167	7.6						
15 MIN	0.250	6.3						
20 MIN	0.333	5.5						
30 MIN	0.500	4.4						
40 MIN	0.667	3.3						
60 MIN	1.000	2.8						
100 MIN	1.667	1.9						
200 MIN	3.333	1.1						

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STORAGE CALCULATIONS FOR DRAINAGE BASIN

Figure 6.5f

STORM DURATION T MIN/HOUR	RUNOFF COEF. C 90% IMP.	RAINFALL INTENSIT Y _i (IN/HR) 100 YEAR	AREA (ACRES) A	INFLOW DEVELOPE D Q _i = C _i A 100 YR - CFS	OUTFLOW NATURAL Q _o = 5YR-60M .2(3.65)A	STORAGE RATE Q _i -Q _o (CFS)	STORAGE REQUIRED 1/12 (Q _i Q _o)T (ACREFEET)	REMARKS
5 MIN 0.083	0.45	9.9						
8 MIN 0.133	0.49	8.2						
10 MIN 0.167	0.51	7.6						
15 MIN 0.250	0.57	6.3						
20 MIN 0.333	0.61	5.5						
30 MIN 0.500	0.67	4.4						
40 MIN 0.667	0.71	3.3						
60 MIN 1.000	0.77	2.8						
100 MIN 1.667	0.83	1.9						
200 MIN 3.333	0.87	1.1						

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STORAGE CALCULATIONS FOR DRAINAGE BASIN

Figure 6.5g

STORM DURATION T MIN/HOUR	RUNOFF COEF. C 100% IMP.	RAINFALL INTENSIT Y _i (IN/HR) 100 YEAR	AREA (ACRES) A	INFLOW DEVELOPE D Q _i = C _i A 100 YR - CFS	OUTFLOW NATURAL Q _o = 5YR-60M .2(3.65)A	STORAGE RATE Q _i -Q _o (CFS)	STORAGE REQUIRED 1/12 (Q _i Q _o)T (ACREFEET)	REMARKS
5 MIN 0.083	0.49	9.9						
8 MIN 0.133	0.52	8.2						
10 MIN 0.167	0.55	7.6						
15 MIN 0.250	0.61	6.3						
20 MIN 0.333	0.65	5.5						
30 MIN 0.500	0.71	4.4						
40 MIN 0.667	0.75	3.3						
60 MIN 1.000	0.81	2.8						
100 MIN 1.667	0.86	1.9						

600.18 Detention Basin/Retention Pond Guidelines

A. Recommendations for Dry Detention Basins

1. Where water quality during dry weather periods in a small basin would be a potential problem due to lack of adequate dry weather flow, direct pollution from surface water runoff, or high nutrients in the flow; the basin should be designed to remain dry except when in flood use.
2. Dry detention basins shall be designed to minimize the wetness of the bottom so that water does not remain standing in the bottom; thereby harboring insects and limiting the potential use of the basin. This shall be accomplished by means of a concrete low flow channel between inlet and outlet structures. Minimum slope shall be no less than 0.5%. An acceptable alternative to a concrete low flow channel will be an underdrain. In this case, a minimum of 1% slope shall exist between inlet and outlet structures and the surface above the underdrain shall be grass sod.
3. The detention basin should be designed to have a multi-purpose function. Recreational facilities, aesthetic qualities, etc., as well as flood water storage should be considered in planning the basin.
4. Side slopes shall be 3:1 or flatter.
5. There shall be a minimum of a 3-foot berm at 2% between right-of-way and top basin slopes.

B. Recommendations for Basins Containing Permanent Water

1. In order to provide better management for water quality, retention basins containing permanent lakes should have a water area of at least one-half acre. The lake area should be an average depth of 5 feet to inhibit weed and insect growth, and should have no extension shallow areas. A system to augment storm flows into the lake with water from other sources should be provide to enhance the water quality, if necessary. These systems would include the use of public water supplies.
2. In excavated lakes, the underwater side slopes in the lake should be stable.
3. A safety ledge 4 feet to 6 feet in width is recommended and should be installed in all lakes approximately 18 inches to 24 inches below the permanent water level to provide a footing if people fall into the water. In

addition, there shall be a minimum of a 5 berm at 2% slope beginning at least 1 foot above normal pond elevation. The slope between 2 ledges should be stable and of a material which will prevent erosion due to wave action (see Figure 6.6). Walkways consisting of a non-erosive material should be provided in areas where extensive population use tramples growth. One area in particular would be along the shoreline of a heavily fished lake. Side slopes above the berm shall be 3:1 or flatter.

4. Side slopes of the pool shall be 2:1 or flatter.
5. To obtain additional recreational benefits from developed water areas and provide for insect control, ponds may be stocked with fish. For best results, stocking should follow recommendations for warm water sport fishing by the Ohio Department of Conservation, Division of Fisheries, or similar organizations.
6. Periodic maintenance will be required in lakes to control weed and larval growth. The basin should also be designed to provide for the easy removal of sediment which will accumulate in the lake during periods of basin operation. A means of maintaining the designed water level of the lake during prolonged periods of dry weather is also recommended. One suggested method is to have a water hydrant near the pond site.
7. No rubble or construction refuse shall be disposed of at any time.

C. Recommendations Common to Either Dry Detention Basins or retentions Basins with Permanent Water

1. A 20-foot-wide Village easement shall be provided for access to all storm water storage ponds. The top of berm centerline plus a 15-foot buffer/access area will be included in the storm sewer petition.
2. All basins shall have an emergency overflow.
3. All excavated spoils should be spread so as to provide for aesthetic and recreational features such as sledding hills, sports fields, etc. Slopes of 6 horizontal to 1 vertical are recommended except where recreation uses call for steeper slopes. Even these features should have a slope no greater than 3 horizontal to 12 vertical for safety, minimal erosion, stability, and ease of maintenance.
4. When conduits are used for the outlet of the reservoir, they shall be protected by bar screens or other suitable provisions so that debris or similar trash will not interfere with the operation of the basin.

5. Safety screens should also be provided for any pipe or opening to prevent children or large animals from crawling into the structures. For safety, a suggested maximum opening is 6 inches.
6. Grass or other suitable vegetative cover should be maintained throughout the entire reservoir area. Grass should be cut regularly no less than five times a year.
7. Debris and trash removal and other necessary maintenance should be performed after each storm to assure continued operation in conformance to the design. A report shall be submitted to the Village detailing the maintenance performed after each rain event.

D. Inspection of Basins

1. Record drawings will be required for all basins to assure compliance with all applicable requirements.
2. The Village may inspect all private detention basins and if problems exist, report these to the owner. The owner shall be given a reasonable amount of time to correct the problem, weather permitting, as per Village Ordinance A-1947.
3. The Village shall perform such work as it deems necessary and charge owner if the owner fails to correct the problem.

E. Detention Basin Ownership

1. Detention basin maintenance and ownership shall remain private. Within a residential development, an established homeowners association shall own and maintain the basin.
2. Owners will be responsible for routine maintenance of the development detention basin located on their lots. Grass mowing, ornamental landscaping, and fencing are considered routine maintenance. No activity which will interrupt the operation of the detention basin will be allowed. No accessory buildings or gardens will be permitted. The Village will be responsible for major erosion control and fixed structures such as piping, manholes, and inlets, if covered under petition. This statement shall be added to each deed of transfer.

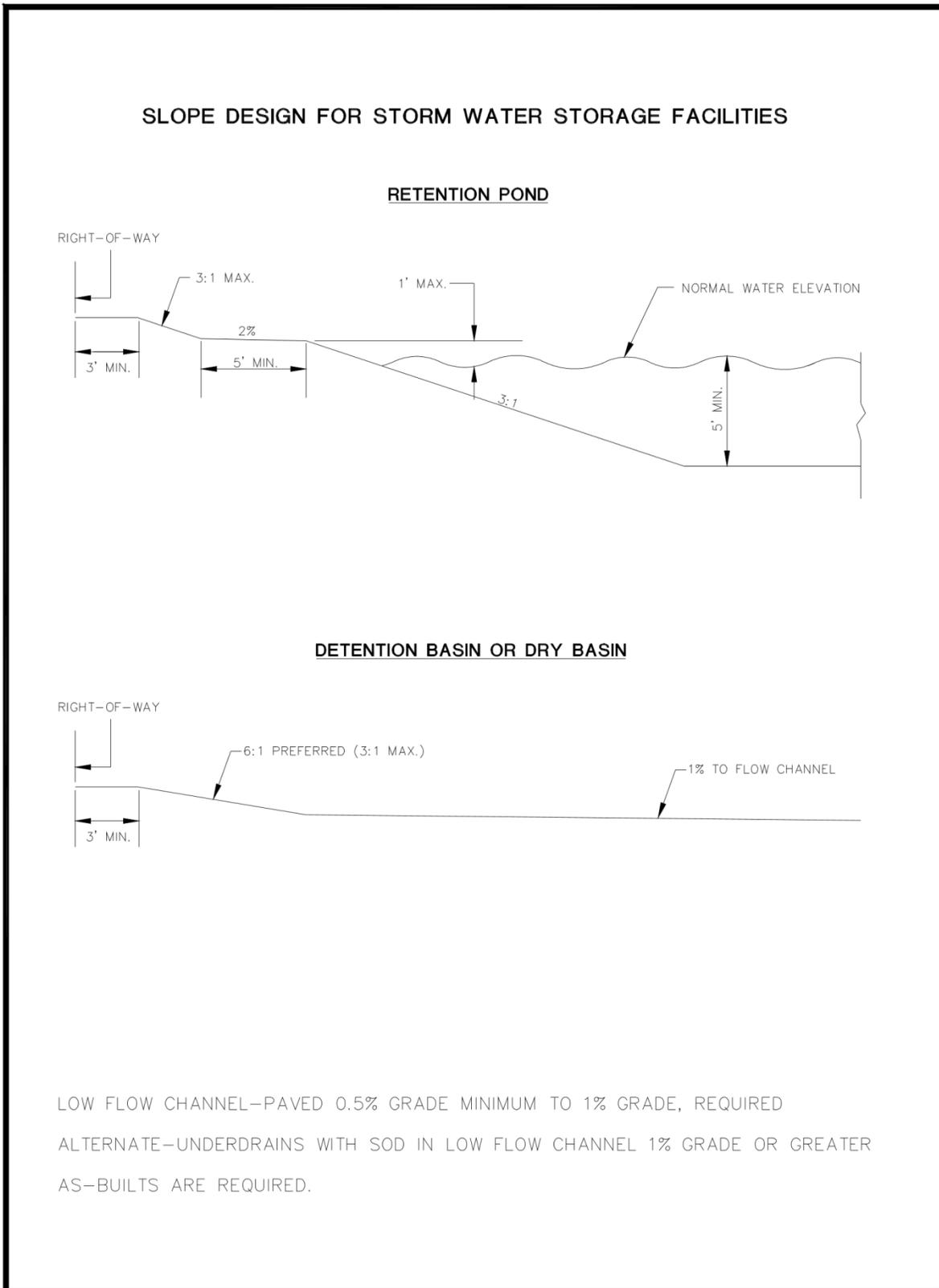
F. Submerged Outlets

1. Submerged outlets may be permitted provided a manhole is constructed between the outlet at the retention pond and the main storm system. This manhole must also be after the last pavement crossing. The invert elevation of the pipe into this manhole will be at least 1 foot above the normal pool elevation. The slope of the basin at the outlet shall be no flatter than 2:1 to avoid siltation at the outlet. The manhole shall have a grated casting or, in some cases, may require being a manhole with a catch basin with windows frame and top.

G. Outlet Material

1. Outlet structure materials shall be reinforced concrete and/or RCP pipe. Stainless steel plates shall be used if orifice size is smaller than available RCP sizes.

Figure 6.6



600.19 **Flood Routing Path**

A. Capacity

1. The flood routing path is that part of the major storm drainage system that carries the runoff that exceeds the capacity of the designed drainage facilities. The major storm drainage system shall have the capacity to carry runoff from a storm with a return period of not less than 100 years without causing significant threat to property or public safety.

B. Surface Flood Routing Paths

1. Generally, it is not economically feasible to size a storm sewer system to collect and convey more than the frequent storm runoff. Essentially, the complete drainage system of an urban area contains two separate drainage elements. While the storm sewers belong to the initial system, surface drainage ways must be provided for the major flow from more intense storms.

C. Intent In providing Flood Routing Paths

1. The intent of planning for the major drainage element is to ensure storm water runoff which exceeds the capacity of the initial drainage system has a route to follow which will not cause a major loss of property or any loss of life. It should be remembered that the major drainage system exists even when it is not planned for and whether or not development exists in respect to it.

D. Street Rights-Of-Way

1. Street rights-of-way are common choice for conveying major drainage flows. Such use must be anticipated when the street layout is established. Side and rear lot lines offer one alternative to the street. The problem with this alternative is the possibility of individual property owners encroaching on the major drainage easement. Rarely is the problem recognized until the frequent rainstorm occurs and the major system fails to operate properly.
2. Where the street is designated as the major drainage way, the depth of flow shall not exceed 12 inches at the gutter line for local and collector streets and the crown for arterial streets. The same maximum depth criteria will apply where a major drainage way crosses the street. Where a major drainage way is located outside a street right-of-way, easements shall be provided. All major storm routing easements shall be shown on the grading plan.

E. Multi-Purpose Flood Routing Paths

1. In order to protect the integrity of the non-street drainage rights-of-way, the consultant is encouraged to design flood routing paths for multi-purpose functions. Pedestrian and bicycle paths lend themselves naturally to this application. Linear parks aligned along the major drainage corridor are also very effective, but usually require greater width than would normally be necessary for drainage purposes.

F. Major Storm Runoff

1. The major storm runoff is routed through the drainage system to determine if the combined capacity of the flood routing path and storm sewer system is sufficient.

600.20 Site Grading

A. Site Grading Plan

1. Site grading plans shall be prepared with 1 foot existing and proposed contours showing all lots or lots having proper drainage. Site grading plans for developments shall also have proposed building pad elevations to ensure proper drainage of the development. Individual site plans within a development must conform to the subdivision drainage site plan.

B. Cuts and Fills

1. No land shall be graded, cut, or filled so as to create a slope exceeding a vertical rise of 1 foot for each 2½ feet of horizontal distance between abutting lots, unless a retaining wall of sufficient height and thickness is provided to retain the graded bank. Major cuts, excavation, grading, and filling, where the same material changes the site and its relationship with surrounding areas, shall not be permitted as such excavation, grading, and filling will result in a slope exceeding a vertical rise of 1 foot for each 2½ feet of horizontal distance between abutting lots or between adjoining tracts of land, except where adequate provision is made to prevent slides and erosion by cribbing and retain walls.

C. Compaction of Fill

1. All fill shall be compacted to a density of 95% or greater. Inspection of fill shall be conducted by the Village Engineer.

D. Retaining Walls

1. Retaining walls may be required whenever topographic conditions warrant or where necessary to retain fill or cut slopes within the right-of-way. Such improvements shall require the approval of the Village Engineer.

E. Filling of Existing Areas

1. No existing area shall be filled or graded to adversely affect adjoining properties, as determined by the Village Engineer.

600.21 Runoff from Upstream Drainage Areas

- A. The runoff from drainage areas upstream of the proposed development or improvement must be provided with an unobstructed outlet and an emergency overflow. The system should provide the capacity needed to carry the runoff from a 5year storm in its existing land use condition.

600.22 Runoff from Contiguous Properties

- A. All site drainage shall be contained on-site. No land altering activity shall disperse runoff into areas adjacent to the area experiencing development.

600.23 Soil Sediment Pollution Control Regulations

- A. The purpose of the regulation is to prevent the undue polluting of public waters by sediment from accelerated soil erosion and accelerated storm water runoff caused by earth-disturbing urban areas. Control of such pollution will promote and maintain the health, safety, and general well-being of all life and inhabitants herein the Village.

B. Scope

1. This shall apply to earth-disturbing activities on areas of land used or being developed for commercial, industrial, residential, recreational, public service, or other non-farm purposes which are within the Village unless otherwise excluded within or unless expressly excluded by state law.

C. Disclaimer of Liability

1. Neither submission of a plan under provisions of this article nor compliance with provisions of these regulations shall relieve any person from responsibility for damage to any person or property otherwise imposed by law, nor imposed any liability upon the Village or its appointed representative for damage to any person or property.

D. Severability

1. If any clause, section, or provision of this resolution is declared invalid or unconstitutional by a court of competent jurisdiction, validity of the remainder shall not be affected thereby.

E. Requirements

1. No person shall cause or allow earth-disturbing activities on a development area except in compliance with the standards and criteria and the applicable item listed below:
 - a. When a proposed development area consists of five or more acres and earth disturbing activities are proposed for the whole area or any part thereof, the responsible person shall develop and submit for approval a sediment control plan prior to any earth-disturbing activity. Such a plan must contain sediment pollution control practices so that compliance with other provisions of this resolution will be achieved during and after development. Such a plan shall include specific requirements established by regulation.
 - b. When a proposed development area involves less than five acres, it is necessary to submit a sediment control plan. All earth-disturbing activities shall be subject to surveillance and site investigation to determine compliance with the standards and regulations.
 - c. Erosion Control Plan General Notes must be included and consist of the following:
 - 1) Preconstruction Notes: Grading operations shall not begin until the Village approves erosion control. Contractor is responsible to install and maintain tire scrubbers at each construction site access, and to clean up mud and debris tracked onto the roadway within 24 hours or sooner.

- 2) During Construction Maintenance Notes: The Contractor must maintain erosion control measures until area is stabilized.
- 3) Post Construction Note: Contractor shall seed and mulch the entire site within 30 days of final grading.

F. Standards and Criteria

1. In order to control sediment pollution of water resources, the owner or person responsible for the development area shall use conservation planning and practices to maintain the level of conservation established by one or more of the following standards:
 - a. Timing of Sediment-Trapping Practices - Sediment control practices shall be functional throughout earth-disturbing activity. Settling facilities, perimeter controls, and other practices intended to trap sediment shall be implemented as the first step of grading and within 7 days from the start of earth disturbing activities. They shall continue to function until the upslope developed area is re-stabilized.
 - b. Stabilization of Denuded Areas - Denuded areas shall have soil stabilization applied within 7 days if they are to remain dormant for more than 30 days. Permanent or temporary soil stabilization shall be applied to denuded areas within 7 days after final grade is reached on any portion of the site, and shall also be applied within 7 days to denuded areas which may not be final grade, but will remain dormant (undisturbed) for longer than 30 days.
 - c. Settling Facilities - Concentrated storm water runoff from denuded areas shall pass through a sediment-settling facility. The facility's storage capacity shall be 67 cubic yards per acre of drainage area.
 - d. Sediment Barriers - Sheet flow runoff from denuded areas shall be filtered. Sediment barriers such as sediment fence or straw bales shall protect adjacent properties and water resources from sediment transported by sheet flow.
 - e. Storm Sewer Inlet Protection - All storm sewer inlets which accept water runoff from the development shall be protected so that sediment-laden water from soils that are not permanently stabilized will not enter the storm sewer system without first being filtered or otherwise treated to remove sediment.

- f. Working in Crossing Streams
 - 1) Streams including bed and banks shall be restabilized immediately after inchannel work is completed, interrupted, or stopped. To the extent practicable, construction vehicles shall be kept out of streams. Where inchannel work is necessary, precautions shall be taken to stabilize the work area during construction to minimize erosion.
 - 2) If a live (wet) stream must be crossed by construction vehicles regularly during construction, a temporary stream crossing shall be provided.
- 2. Construction Access Routes - Measures shall be taken to prevent soil transport onto surfaces where runoff is not checked by sediment controls or onto public roads.
- 3. Sloughing and Dumping
 - a. No soil, rock, debris, or any other material shall be dumped or placed into a water resource or into such proximity that it may readily slough, slip, or erode into a water resource unless such dumping or placing is authorized by the approving agency and, when applicable, the U.S. Army Corps of Engineers, for such purposes, including but not limited to, constructing bridges, culverts, and erosion control structures.
 - b. Unstable soils prone to slipping or land sliding shall not be graded, excavated, filled, or have loads imposed upon them unless the work is done in accordance with a qualified professional engineer's recommendations to correct, eliminate, or adequately address the problems.
- 4. Cut and Fill Slopes - Cut and fill slopes shall be designed and constructed in a manner which will minimize erosion. Consideration shall be given to the length and steepness of the slope, soil type, upslope drainage area, groundwater conditions, and slope stabilization.
- 5. Stabilization of Outfalls and Channels - Outfalls and constructed or modified channels shall be designed and constructed to withstand the expected velocity of flow from a post-development, 10-year frequency storm.

6. Establishment of Permanent Vegetation - A permanent vegetative cover shall be established on denuded areas not otherwise permanently stabilized.
7. Disposition of Temporary Practices - All temporary erosion and sediment control practices shall be disposed of within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed, unless otherwise authorized by the approving agency. Trapped sediment shall be permanently stabilized to prevent further erosion.
8. Maintenance - All temporary and permanent erosion and sediment control practices shall be designed and constructed to minimize maintenance requirements. They shall be maintained and repaired as needed to assure continued performance of their intended function. The person or entity responsible for the continued maintenance of permanent erosion controls shall be identified to the satisfaction of the approving agency.
9. The standards are general guidelines and shall not limit the right of the approving agency to impose additional, more stringent requirements, nor shall the standards limit the right of the approving agency to waive individual requirements.
10. Erosion and sediment control practices used to satisfy the standards shall meet the specifications in the current edition of water management and sediment control for urbanizing areas (Soil Conservation Service, Ohio).

G. Maintenance

1. The property owner shall assume responsibility for maintenance of structures and other facilities designed to control erosion.

600.24 **Drainage Easement Criteria**

- A. An adequate easement shall be required along any subsurface drainage tile, detention basin, drainage way, ditch, watercourse, stream, or storm sewer that is not already within the street right-of-way. The easement shall be of sufficient width to allow cleaning, widening, deepening, and replacing or otherwise general maintaining of such drainage course. Easements for flood routes (100-year) shall be established to 1 foot above the 100year storm elevation.
- B. When it is required to convey subsurface drainage or surface water outside the limits of the proposed improved area in order to discharge into an approved adequate outlet, it shall be the responsibility of the Developer to obtain

easements or rights-of way for construction and maintenance of said drainage course.

- C. All drainage easements shall be shown on the final plat and the “Final Engineering and Construction Plan”. The drainage easements shall be recorded for public use, and the maintenance of such drainage courses shall be the responsibility of the property owners receiving direct benefit therefrom, unless otherwise provided. Drainage easement widths shall conform to the Village Engineer’s supplement to these Standards.
- D. Where no direct access is provided to a drainage feature, an adequate access easement shall also be provided. The minimum width of any such easement shall be 15 feet.

Minimum Permanent Easement Width for all Storm Sewers

Depth (Feet)	Total Min. Width	* Min. Dist. C.L. Offset	Total Min. Width	* Min. Dist. C.L. Offset	Total Min. Width	* Min. Dist. C.L. Offset	Total Min. Width	* Min. Dist. C.L. Offset
	12-inch		15-inch		18-inch		21-inch	
2	25	10	--	--	--	--	--	--
3	30	11	30	12	30	12	30	12
4	30	12	30	12	30	12	30	12
5	30	12	30	12	30	12	30	12
6	30	12	40	12	40	12	40	12
7	40	12	40	12	40	12	40	12
8	40	12	40	12	40	12	40	12
9	40	12	40	12	40	12	40	12
10	40	12	40	13	45	13	45	13
	24-inch		27-inch		30-inch		36-inch	
3	30	12	--	--	--	--	--	--
4	30	12	30	12	30	12	30	13
5	30	12	30	12	30	12	40	13
6	40	12	40	12	40	12	40	13
7	40	12	40	13	40	13	40	13
8	40	13	40	13	40	13	40	13
9	40	13	45	13	45	13	45	13
10	45	13	45	13	45	13	45	13
11	45	13	45	13	45	13	45	13

Depth (Feet)	Total Min. Width	* Min. Dist. C.L. Offset						
	42-inch		48-inch		54-inch		60-inch	
5	35	13	35	13	--	--	--	--
6	35	13	35	13	35	14	35	14
7	35	13	35	13	35	14	35	14
8	45	13	45	14	45	14	45	14
9	45	14	45	14	45	14	45	14
10	45	14	45	14	45	14	45	14
11	45	14	45	14	55	14	55	15
12	55	14	55	14	55	14	55	15

*Minimum distance from centerline of pipe to either side of easement. Table values are in feet unless otherwise noted.

800.00 WATER DISTRIBUTION

800.01 General

- A. The following Design criteria are summarized herein to establish practical, uniform design of water distribution systems for the Village. These criteria cover design factors and provide guidelines for evaluation of plans and specifications by the Village departments having jurisdiction over the review of plans and specifications. These design criteria are also intended to conform to the standard drawings for water systems. All improvements to the water distribution system shall be coordinated with the Village Engineer's Office and the Superintendent of the Water Treatment Plant.

800.02 Basis of Design

- A. The basis of design for water distribution systems shall be the Hazen-Williams Equation, an empirical formula for estimating pipe flow:

$$V = 1.318CR^{0.63} S^{0.54}$$

V = Velocity in feet per second

C = Roughness Coefficient

R = Hydraulic Radius (pipe diameter in feet for pipes flowing full) in feet

S= Head loss per unit length of pipe

- B. Distribution systems shall be designed for the estimated maximum day rate of flow, or the fire flow plus the estimated average day rate of flow, whichever is more demanding. Selection of a roughness coefficient shall be coordinated through the Village Engineer.

800.03 Minimum Pressure

- A. The minimum allowable pressure in the water distribution system at ground level at all points in the distribution system, at all times and all conditions of flow including fires, shall be 20 pounds per square inch in all mains. The minimum fire flow for design purposes shall be 600 gallons per minute at the residual pressure of 20 pounds per square inch.

800.04 Maximum Velocity

- A. The maximum velocity of the water in the system shall be 10 feet per second.

800.05 Water Mains

- A. The value of C to be used in the Hazen-Williams Equation shall be C=130. The minimum size of water mains shall be 6 inches in diameter. Dead-ending mains shall be minimized by looping of all mains. In the event the Village permits a dead-end, they shall be provided with a fire hydrant for flushing purposes when the dead end is less than 50 feet. When dead end lines exceed 50 feet an automatic flusher capable of flowing 300 gpm shall be provided with a minimum of five (5) cubic yards of Number 1 & 2 stone installed to receive and dissipate the flushing flow and as approved by the Village Engineer. The flushing device shall be of the portable type included with a curb stop and tap.

- B. The minimum depth of water mains shall be 4 feet, 6 inches from the top of the pipe to the finished grade elevation. The maximum depth of water mains shall be 5 feet from the top of the main to the finished grade elevation, except where utilities must be underpassed or as directed by the Village.

800.06 Water Service Lines

- A. The value of C to be used in the Hazen-Williams Equation shall be C = 130. The minimum diameter of service lines shall be ¾ inches, unless the distance from the main to the meter exceeds 120 feet, where the minimum service line diameter shall be 1 inch. Table 8.1 lists required minimum service sizes as determined by residential population. Fire hydrant services shall have a minimum diameter of 6 inches, but shall be no larger than the water main. For all ¾-inch through 2-inch services, a corporation stop shall be installed on the main at a 45° angle above horizontal. For services larger than 2 inches, a tapping sleeve and valve must be installed.

**TABLE 8.1
MINIMUM SIZE -- WATER SERVICES AND METERS
RESIDENTIAL AREAS**

<u>No. of Families</u>	<u>Service Size (inches)</u>	<u>Meter Size (inches)</u>
1	3/4	5/8 x 3/4
2-5	1	1
6-8	1-1/2	1 1/2
9-12	2	1 1/2
13-20	2	2
21-50	4	3
51-115	4	4

800.07 Meter Installation

- A. When not completed by the Village, meter installation for individual services shall be consistent with the standard drawings. Table 8.2 lists required meter sizes as determined by Maximum Flow Demand for Commercial-Industrial.
- B. Applications: Meters must be installed prior to connecting the service to the main and before service starts. No common meters will be approved. All plans shall indicate meter and service stop location with a note stating “Location shall be coordinated with Village Service Department Staff”.

TABLE 8.2

METER SIZE FOR COMMERCIAL-INDUSTRIAL APPLICATIONS

<u>Maximum Flow Demand (GPM)</u>	<u>Meter Size (inches)</u>
20	5/8 x 3/4
30	3/4
50	1
100	1 1/2
160	2
320	3
500	4
1000	6

800.08 Backflow Prevention

- A. All commercial, industrial and other OEPA required users shall provide adequate backflow prevention between the public water system and the customer’s system. These devices shall be approved by the OEPA and the Village of Johnstown prior to construction and installation. These devices shall be tested and inspected annually under the supervision of the Water Superintendent or his designee and paid for by the owner of the property. These devices shall be repaired or replaced if they do not meet the testing requirements. Testable backflow devices shall be provided with all necessary appurtenances including, but not limited to, plumbed in drainage to convey the testing flow stream to the sanitary sewer system. An annual report shall be submitted by a licensed plumber in the State of Ohio to the Village of Johnstown detailing the testing procedures and results.

800.09 **Cross Connection Control Policy**

A. Purpose

1. Cross connection control is intended to prevent the contamination of the public water supply by controlling the flow of water, other liquids or substances into the public water system from any source other than the potable water supply. This policy addresses the control of actual or potential cross connections from the consumer's plumbing to the public water system. Backflow prevention control devices provide protection to the public water system by preventing the backflow of contaminants from the consumer's system to the public system.

B. Authority

1. Pursuant to the authority granted under Johnstown Village Codes Section 921.15, the Director of Utilities hereby adopts, establishes, and publishes this rule and regulation to be effective at the earliest date allowed by law. This rule and regulation is in addition to any established requirements that have not been superseded or rescinded by this or any previous act.

C. Application

1. This rule and Regulation shall apply to all properties served by the public water system of the Village of Johnstown.

a. Water Systems:

- 1) For the purposes of this Rule and Regulation, the water system shall be considered as consisting of two parts; the public water supply system and the consumer's water system.
- 2) The public water supply shall consist of the source facilities and distribution system, and shall include all the facilities of the potable water system under the control of the Director of Utilities up to the point where the consumer's water system begins.

- 3) The source shall include all components of the facilities utilized in the production, treatment, storage, and delivery of water to the public water distribution system.
- 4) The public water supply distribution system shall include the network of piping used to deliver water from the source to the consumer's water system.
- 5) The consumer's water system shall include all parts of the facilities beyond the curb stop used to convey water from the public water supply distribution system to point of use.

b. Plumbing Systems

- 1) It shall be the responsibility of the consumer to have their water plumbing system compliant with the latest revision of the Ohio Plumbing Codes and the Village of Johnstown Codes. The consumer shall retain records of installation, maintenance, testing, and repairs as required by this rule and regulation and the Village of Johnstown Code Section 921.15 for a period of five (5) years.

c. Cross Connection Prohibited

- 1) No water service connection shall be installed or maintained to any premises where actual or potential cross connections to the public potable or consumer's water system may exist unless such actual or potential cross connections are abated or controlled to the satisfaction of the Director of Utilities or designee.
- 2) No water service connection shall be installed or maintained whereby water from an auxiliary water system may enter the public potable or consumer's water system unless such auxiliary water system and the method of connection and

use of such system shall have been approved by the Director of Utilities or designee.

- 3) There shall be no arrangement or connection by which an unsafe substance may enter the public supply

d. Water Use Surveys and Inspections

- 1) The owner/consumer's premises shall be accessible at all reasonable times to the Village of Johnstown's Water Department or authorized representative for the purpose of making surveys and investigations of water use practices within the property.
- 2) On request by the Director of Utilities or authorized representative the consumer shall furnish information regarding the piping system or water use within the consumer's property.
- 3) It shall be the owner/consumer's responsibility to arrange periodic surveys of the water use practices at their property to determine whether there are actual or potential cross-potential cross-connections to the water system through which contaminates or pollutants could backflow into the potable water supply system. All cross-connection control, water use surveys or other plumbing inspections must be conducted by the Director of Utilities or authorized representative.

e. Where Protection is Required

- 1) An approved backflow prevention assembly shall be installed on each service connection to a consumer's water system serving premises where in the judgment of the Director of Utilities or designee a pollution system, health or serve health hazard to the public water system exists.

- 2) When determining where protection is required the Director of Utilities or designee will evaluate the premises for the following:
 - a) Access to an auxiliary water source, if any substances are handled in such a fashion to create an actual or potential hazard to the public water system, if there are internal cross connections that are not correctable or complex plumbing that make it impractical to determine whether or not a cross connections exist, security or other restrictions that make it impractical to perform a complete cross connection survey, if there is a repeated history of cross connections being established, and the existence of fire suppression or irrigation systems.

- 3) An approved backflow device shall be installed on each service connection to a consumer's water system that serves the following type of facilities:
 - a) Properties which have or will have access to a second source of water.
 - b) Properties where any substance is handled which can create an actual or potential hazard to the public potable water supply. This shall include properties having sources or systems containing process fluids or, water originating from the public potable water supply system that are no longer under the quality control of the Director of Utilities.
 - c) Properties having internal cross-connections that in the judgment of the Director of Public Utilities are not correctable or where intricate or complex plumbing arrangements make it impractical to determine whether or not cross-connections exist.

- d) Properties where, because of security requirements or other prohibitions or restrictions, it is impossible or impractical to make a complete cross-connection survey.
 - e) Properties supplied by more than one service.
 - f) Properties having a repeated history of cross connections being established or re-established.
- 4) If the complete interruption of water through a given service is critical to the customer's operations, an installation of a backflow prevention assembly in parallel is require.
- f. Type of Protection Required
- 1) The type of protection required shall depend on the degree of hazard. The degree of hazard and appropriate backflow protection shall be determined by the Director of Public Utilities.
 - a) A "severe health hazard" classification shall mean an actual or potential threat of contamination of the water system that could be lethal. An approved fixed air gap separation shall be installed and maintained in accordance with this Rule and Regulation.
 - b) A "health hazard" Classification shall mean an actual or potential threat of contamination of a physical or toxic nature that would be a danger to health. An approved fixed air gap (AG) separation, an approved reduced pressure principle backflow prevention assembly (RP), or an approved pressure vacuum breaker backflow prevention assembly (PVB) shall be installed and maintained in accordance with this Rule and Regulation.

- c) A "non-health hazard" classification shall mean an actual or potential threat to the physical properties or the potability of the water system, but which would not constitute a health hazard as defined. An approved fixed air gap separation (AG), an approved reduced pressure principle backflow prevention assembly (RP) or an approved double check backflow assembly (DC) shall be installed and maintained in accordance with this Rule and Regulation.
- 2) Below is a list of types of properties and the backflow requirements. This list was established as a guideline and is not to be used as a legal requirement without the approval of the Director of Utilities. Updates to these requirements can be obtained by contacting the Director of Utilities.

TYPE OF PROPERTY

REQUIREMENTS

INDUSTRIAL (as defined by the Director of Utilities)

RP

COMMERCIAL

RP

Backflow protection at this service shall match the highest level of water-use hazard on site. However, if there is only one water-use hazard on site and in the opinion of the Director of Utilities the make-up piping to this hazard can be permanently isolated, an isolated backflow assembly approved for the hazard can be used in lieu of one at the water service.

Facilities where one service supplies, or have ability to supply, more than one tenant (such as retail shopping centers, strip malls, business suites and office buildings) and buildings not 100% occupied by the owner.

RESIDENTIAL

RP**

With lawn irrigation or direct plumbing pool.

**Air gap or Pressure Vacuum Breaker (where no potential for back pressure exists) can be used as isolation in lieu of an RP at the service, with approval from the Director of Utilities.

With water use other than domestic

With second source or access to second source

THE FOLLOWING ARE TO BE PROTECTED AS LISTED, REGARDLESS OF THE TYPES OF WATER-USE HAZARDS

Hospitals	RP
Mortuaries	RP
Medical clinic, office, etc.	RP
Nursing & convalescent homes	RP
Laboratories	RP
Sewage Treatment Plants & Pumping Stations	RP
Storm Water Pumping Stations	RP
Car Washes	RP
Lawn Irrigation	RP
Automotive repair & body shops	RP
Commercial Lease Accounts	RP
Full service restaurants	RP

Backflow Prevention Assembly Requirements Key

RP - Reduced Pressure Backflow Prevention Assembly

DC - Double Check Backflow Prevention Assembly

PVC - Pressure Vacuum Breaker Backflow Prevention Assembly

- 3) The type of protection required under Section 3. C. 1), 3), 4), 5) & 6) of this Rule and Regulation shall be an approved fixed air gap separation or an approved reduced pressure principle backflow prevention assembly.
- 4) The type of protection required for the bypass line under

Section 3. D. of this Rule and Regulation shall be equal to the containment assembly require.

- 5) Properties with access to an auxiliary water supply shall install a Reduced Pressure backflow assembly (unless abated or controlled as directed by the Director of Utilities or designee).
- 6) Fire protection systems or water storage tank with chemicals added or the ability to be added shall install an approved reduced pressure principle backflow prevention assembly.
- 7) Fire protection systems or water storage tanks that cannot be subject to chemicals shall have an approved double check backflow prevention assembly installed.
- 8) A reduced pressure detector assembly (ASSE 1047) and double check detector assembly (ASSE 1048) can be installed in lieu of a reduced pressure or double check backflow assemblies respectively. Note that all meter requirements are to comply with the Village of Johnstown Water meter installation rules.
- 9) This rule shall not supersede the Village of Johnstown Water Rule that prohibits' direct or indirect connections between Johnstown public potable water system and second source water systems that include, but are not limited to, wells, ponds or gray water.

g. Backflow Prevention Assemblies

- 1) All backflow prevention assemblies required after the date of this policy shall be endorsed by the American Society of Sanitary Engineering (ASSE) or approved equal.
- 2) The required backflow protection shall be met as follows:
 - a) Air gap separations shall meet American National Standards Institute standard A 1 12.1.2
 - b) Reduced pressure principle backflow prevention assembly -ASSE 1013 or an air gap
 - c) Reduced pressure principle-detector assembly -

ASSE 1047 or an air gap Double check valve assembly -ASSE 1015, or ASSE 1013 or an air gap

- d) Double check-detector check valve assembly - ASSE 1048, or ASSE 1047 or an air gap
 - e) Pressure vacuum breaker backflow prevention assembly -ASSE 1020, or ASSE 1015, ASSE 1013 or an air gap
- 3) Maintenance shall be performed as recommended by the manufacturer of the assembly and this Rule and Regulation.
 - 4) A fixed proper air gap separation is defined as a physical separation between the free flowing discharge end of a potable water supply pipeline and an open or non-pressure receiving vessel. The separation shall be at least double the diameter of the supply pipe measured vertically above the overflow rim of the vessel and in no case less than one (1) inch.

h. Installation

- 1) The installation and expense of the required backflow prevention devices shall be the responsibility of the water customer.
- 2) Backflow prevention assemblies (Reduced Pressure and Double Check) are to be installed immediately after the meter, except where a meter bypass, limited area fire system or strainer are needed.
- 3) All assemblies are to be installed in the horizontal orientation, include properly located test cocks and manufacturer approved tightly closing shut-off valves and not subject to excessive heat or freezing.
- 4) Devices must be a minimum of 12 inches from any wall or obstruction and the test cocks need a minimum clearance of 24 inches in front of them. Clearance above the floor should be at least 12 inches and not more than 36 inches.

- 5) A floor drain should be installed as close as possible to the assembly.
- 6) Reduced Pressure assemblies shall not be installed in any area subject to flooding and have an air gap assembly on the relief valve drain.
- 7) Pressure Vacuum Breakers shall not be subject to back pressure and must be installed a minimum of 12 inches above the highest downstream discharge. Lawn irrigation systems shall not have any outside exposed tees, drains or hose bibs.
- 8) Containment backflow devices on the customer's service line prevent the release of on-site pressure to the public water system and therefore a thermal expansion tank or other internal compensation in accordance with the Ohio Plumbing Code Section 608 shall be installed.
- 9) If water flow cannot be interrupted for backflow assembly testing a bypass line with equal protection should be installed. No backflow prevention assembly shall be plumbed with a bypassed unless the bypass line contains equal backflow protection.
- 10) Any exceptions to these installation requirements need the approval of the Director of Utilities or designee.

i. Testing And Maintenance

- 1) The owner/consumer shall be responsible for the inspection, testing, maintenance and repair requirements of any required backflow prevention device. The Director of Utilities or designee has the duty to ensure the above mentioned is complied with.
- 2) Backflow prevention assemblies shall be inspected and tested at the time of installation and at least every 12 months and rebuilt/repared as needed.
- 3) Testing shall be performed by an Ohio Department of Commerce certified backflow tester (www.com.state.oh.us/dic/plans/scripts/bkfloqy.htm). Test results shall be provided to the consumer on a Village of Johnstown "Backflow Prevention Assembly Test Report" or similar form. A copy must be forwarded to

the Director of Utilities to document compliance with this policy.

- 4) The owner/consumer shall be responsible for retaining a maintenance and test log/record that is readily available to the Village. Each device shall have a tag attached documenting the most recent test. The log shall include:
 - a) Date of each test
 - b) Name and certificate number of the tester
 - c) Name of company with which the tester is employed
 - d) Test results
 - e) Repairs or servicing required
 - f) Repairs made and date completed
 - g) Servicing performed and date completed
 - 5) Whenever backflow prevention assemblies required by this policy are found to be defective they shall be repaired or replaced by the owner/consumer at their expense without delay.
 - 6) Backflow prevention assemblies shall not be removed or otherwise made ineffective without specific authorization of the Director of Utilities or designee.
 - 7) Test equipment used for initial, annual or emergency backflow prevention assembly testing required by this Rule and Regulation shall be calibrated at least every twelve (12) months by an independent calibration company.
- j. **Booster Pumps**
- 1) Booster pumps shall not be permitted on premises serving a one, two or three family dwellings, unless an air gap is provided.
 - 2) Booster pumps on premises, not included in paragraph A, shall be equipped with a low pressure cut-off designed to shut off the pump when pressure in the

service line on the suction side of the pump drops to ten pounds per square inch or less.

- 3) It shall be the responsibility of the owner/consumer to maintain the low pressure cut-off device in proper working order and to certify to the Division of Water at least every twelve months that the device is operable and maintained in continuous operation.

k. Abandonment

- 1) It shall be the responsibility of the owner/consumer at any property on which backflow assemblies are required by this Rule and Regulation to use one of the following methods when choosing to abandon a previously backflow protected system:

- a) Interior backflow protected system (i.e. boiler):

- (1) Cut and cap the supply line AND remove backflow preventer.

- b) Exterior backflow protected system (i.e. irrigation system):

- (1) Cut and cap the supply line inside the facility AND remove backflow preventer and the visible pipe outside the facility. This means pipe cut below ground level.

- (2) Remove backflow preventer and the visible pipe outside the facility, cut pipe below ground level and install a hose bibb with vacuum breaker on the water line protruding from the facility.

- (3) Option two (2) above would allow the customer to keep their deduction meter, and deduct water used through the new hose bibb, provided they have a deduction account set up.

1. Violations

- 1) The Director of Utilities or designee shall deny or discontinue, after proper notice to the occupants thereof, the water service to any premise wherein any required backflow prevention assembly is not installed, maintained in working order, properly or timely tested, removed or bypassed.
- 2) The Director of Utilities or designee shall immediately discontinue water service to any premise wherein a backflow condition exists or is suspected to exist.
- 3) Water service to the above premises shall not be restored until the consumer has corrected or eliminate such conditions or defects in conformance with this policy.
- 4) Water service that has been terminated for not conforming to this policy shall be assessed a tum-on charge based on labor costs plus twenty percent

900.00 SANITARY SEWERS

900.01 General

- A. The following Design Criteria are summarized herein to establish practical, uniform design of sanitary sewers within the Village of Johnstown, Ohio. These criteria cover design factors and approved guidelines for evaluation of plans and specifications by the Village departments having jurisdiction over the review of plans and specifications. These design factors are consistent with the requirements of the OEPA. If these design criteria should conflict in the future with the requirements of the OEPA, these criteria shall be modified to conform to their requirements. These design criteria are also intended to conform to the standard drawings for sanitary sewers.

900.02 Minimum Velocity

- A. All sanitary sewers shall be designed to give a mean velocity of at least 2.0 feet per second, when flowing full, based on Manning's Formula using an "n" value of 0.013. Use of other "n" values will be considered, if deemed justifiable, on the basis of extensive field data.

900.03 Maximum Velocity

- A. The maximum velocity shall be 10 feet per second. If the velocity is greater than 10 feet per second, provisions should be made to protect against displacement. The provisions will be concrete collars, anchoring, and ductile iron pipe.

900.04 Minimum Grades

- A. All sanitary sewers shall be designed to give a mean velocity of at least 2.0 feet per second when flowing full based on Manning's Formula. Values of "n" to be used with the Manning Formula vary from 0.010 to 0.015 with 0.013 recommended. Use of "n" values other than 0.013 may be considered if justified. Use of formulas other than Manning's Formula may be accepted. If plans are recommended for approval with a slope less than the minimum, the consulting Engineer must show justification for the recommendation and obtain approval from OEPA. See Table 9.1.

TABLE 9.1

REQUIRED MINIMUM SLOPE

**Based on “n” Value of 0.013
Sewer Sizes - 8 through 36 inches**

<u>Sewer Size</u>	Minimum Slope in Feet
	<u>Per 100 Feet</u>
8	0.40
10	0.28
12	0.22
15	0.15
18	0.12
21	0.10
24	0.08
27	0.067
30	0.058
36	0.046

900.05 **Sanitary Sewers**

- A. In general, the minimum size of sanitary sewers shall be 8 inches. Six inches will not be considered as a main line sewer; however, 6-inch sanitary sewers may be used as private lateral sewers for apartments, camps, schools, restaurants, and other semi-public operations, provided their hydraulic capacity is not exceeded because of short run-off periods (high peak flows). In multi-tenant buildings, individual services shall be provided to a common pipe, then to the main.

- B. The lateral connections shall be premium joint construction and should be made of the same material as the street sewer whenever possible to minimize infiltration from the connection between the street main and house lateral. When joint material and/or dimensions are not compatible, a commercial adapter shall be provided.

900.06 House Laterals

- A. Six-inch sewer pipe may be used for house connections. The cover over the lateral coming out of the house shall be a minimum depth of 3 feet. The house connections shall be of premium joint construction and made of PVC schedule 40 pipe or SDR-35.
- B. Cleanouts for laterals are required outside all structures or units. A lateral cleanout shall be provided for every 100 feet of lateral. Individual meters shall be used for separate sanitary sewers. When joint material and/or dimensions are not compatible, a commercial adapter shall be provided. A copy of an ordinance or regulation requiring this type of construction must be on file with OEPA district office or submitted with all sewer plans to receive approval.

900.07 Invert Drop in Manhole

- A. When a smaller sewer discharges into a larger one, the invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient. An approximate method for securing this result is to place the 0.8 depth point of both sewers at the same elevation or matching the top elevation of the pipes.

900.08 Illegal Connections

- A. Roof drains, foundation drains, sump pumps, yard drains, and all other clear water connections to the sanitary sewer are prohibited.
- B. There shall be no physical connection between a public or private potable water supply system and a sewer or appurtenances thereto which would permit the passage of any sewage or polluted water into the potable supply.

900.09 Utility Separations

- A. Sanitary sewers and sewage forcemains should be laid with at least a 10-foot horizontal and 18-inch vertical separation from any water main. This is enforceable for both main line and laterals. If a repair occurs with both water and sanitary in the same trench, the Village will allow the utilities to remain in the same trench.

- B. If it is impossible to maintain the 18-inch vertical separation when the sewer is laid closer than 10 feet to the water main, the sanitary sewer should be constructed of (or encased in) water main type materials (ductile iron is preferred) which will withstand a 50 psi water pressure test.
- C. If a sewage forcemain is laid closer than 10 feet to a water main, in no case should the sewage forcemain be laid such that the crown of the sewage forcemain is less than 18 inches below the water main.
- D. Sewers (or sewage forcemain) may be laid closer than 10 feet to a water main if it is laid in a separate trench and elevation of the crown of the sewer (or sewer forcemain) is at least 18 inches below the bottom of the water main

900.10 **Crossing Utilities**

- A. Whenever a sanitary sewer and water main must cross, the sewer shall be laid at such an elevation that the crown of the sewer is at least 18 inches below the bottom of the water main. If it is absolutely impossible to maintain the 18-inch vertical separation, the sanitary sewer should be constructed of water main type material which will withstand a 50 psi water pressure test for a distance of 10 feet on both sides of the water main.
- B. Whenever a sewage forcemain and water main must cross, the sewage forcemain is at least 18 inches below the bottom of the water main.

900.11 **Manholes**

- A. Manholes shall be installed at the end of each line, at all changes in grade, size, alignment, and at all pipe intersections. Manholes shall be installed at a distance not greater than 400 feet for 8-inch to 15-inch and 350 feet for 15-inch or greater. Greater spacing may be allowed in larger sewers and in those carrying a settled effluent. Watertight castings are to be non-vented. Vented manholes will be approved by the Service Director.
- B. The flow channel through manholes should be made to conform in shape, slope, and smoothness to that of the sewers.
- C. All manhole covers shall be adjusted to grade by the use of no more than 12 inches of precast concrete adjusting collars. Metal adjustment rings will not be allowed. In areas outside the pavement, the manhole casting should be adjusted so that the top is slightly above grade to prevent the entrance of the surface water off pavement.

- D. Manhole concrete mix design shall include Xypex Waterproofing.
- E. Admixture Series C-1000NF at a dosage rate of 1.5 percent by weight of cement.

900.12 Manhole Minimum Diameter

- A. Manholes shall be constructed large enough to allow access to the sewer. The minimum diameter of manholes shall be 48. Where manhole diameters of greater than 48 inches are used to accommodate the sewer pipes, the manhole shall be returned to a 48-inch diameter as soon as practical above the sewer crown. Manhole openings 24 inches or larger are required for easier access with safety equipment to facilitate maintenance.

900.13 Manhole Water Tightness

- A. Manholes shall be constructed to permit casting adjustments by use of cast-in-place or precast concrete adjusting collars not to exceed 12 inches in height. Solid manhole covers shall be used in all pavement locations. In other areas, the manhole casting shall be adjusted so the top of the manhole cover is slightly above grade to prevent the entrance of the surface water. In areas subject to flooding, secured watertight and solid manhole covers should be used. All manhole covers, seating frames, and adapter rings shall be machined to a firm and even bearing to provide a true fit into the frames. Manholes shall be installed with chimney seals and water tight dishes.
- B. Inlet and outlet pipes should be joined to the manhole with a gasketed and/or flexible watertight connection meeting ASTM Specification C-443. Where three or more manholes in sequence are to be constructed with solid, watertight covers, adequate ventilation shall be provided if approved.

900.14 Flow Channel

- A. The invert of the lowest pipe entering manhole shall be at least 3 inches (75 mm) above the top of the base slab so that the sewer flow channel maybe installed and shaped. The flow channel through manholes should be made to conform in shape, slope, and smoothness to that of the sewers.
- B. Cut pipe shall not extend beyond the inside face of the manhole wall. Concrete placed inside the manhole to form the channel through the manhole shall not be placed between the pipe and the opening so as to interfere in any way with the flexibility of the joint.

900.15 Drop Manholes

- A. Drop manholes shall be used when the invert of the inflow sewer is 2 feet or higher than the manhole invert. When this difference of elevation is less than 2 feet, the manhole invert shall be filled and channeled to prevent solids deposition.
- B. Ductile iron pipe on “deep” manholes will be as directed by the Village Engineer. Pre-cast drop structure at the base is required.
- C. Due to the unequal earth pressure that would result from the backfilling operation in the vicinity of the manhole, the entire outside drop connection shall be encased in concrete.
- D. Drop manholes shall be constructed with outside drop connection.

900.16 **Test Inspection**

- A. The leakage and deflection tests are to be carried out by the contractor after 30 days of installation and witnessed and certified by the Village officials and/or their representative.

900.17 **Railroad and Highway Crossings**

- A. When boring is required, the casing pipe shall be designed to meet the requirements of the local authority having jurisdiction and in compliance with the Village of Johnstown Construction Standards and Drawings. The size of the casing pipe shall be at least 4 inches greater than the largest outside diameter of the sewer pipe, joints, or couplings.

900.18 **Stream Crossings**

- A. Location of Sewers in Streams
 - 1. Cover depth
 - a. The top of all sewers entering or crossing streams shall be at a sufficient depth below the natural bottom of the stream bed to protect the sewer line. In general, the following cover requirements must be met:
 - 1) One foot of cover where the sewer is located in rock
 - 2) Three feet of cover in other material. In major streams, more than 3 feet of cover may be required

- 3) In paved stream channels, the top of the sewer line should be placed below the bottom of the channel pavement.
- 4) Less cover will be approved only if the proposed sewer crossing will not interfere with the future improvements to the stream channel. Reasons for requesting less cover shall be provided in the project proposal.

2. Horizontal Location

- a. Sewers located along streams shall be located outside of the stream bed and sufficiently removed there from to provide for future possible stream widening and to prevent pollution by siltation during construction.

3. Structures

- a. The sewer outfall, headwalls, manholes, gate boxes, or other structures shall be located so they do not interfere with the free discharge of flow through the stream.

4. Alignment

- a. Sewer crossing streams should be designed to cross the stream as nearly perpendicular to the stream flow as possible and shall be free from change in grade. Sewer systems shall be designed to minimize the number of stream crossings.

B. Construction

1. Materials: Sewers entering or crossing streams shall be constructed of ductile iron pipe with mechanical joints; otherwise they shall be constructed so they will remain watertight and free from changes in alignment or grades. The ductile iron pipe shall extend one full pipe length past the top of bank of the stream being crossed. Material used to backfill the trench shall be stone, coarse aggregate, washed gravel, or other materials which will not readily erode, cause siltation, damage pipe during placement, or corrode the pipe.

2. Siltation and Erosion: Construction methods that will minimize siltation and erosion shall be employed. The design engineer shall include in the project specifications the method(s) to be employed in the construction of sewers in or near streams. Such methods shall provide adequate control of siltation and erosion by limiting unnecessary excavation, disturbing or uprooting trees and vegetation, dumping of soil or debris, or pumping silt-laden water into the stream. Specifications shall require that cleanup, grading, seeding, and planting or restoration of all work areas shall begin immediately. Exposed areas shall not remain unprotected for more than 7 days.

900.19 Sewage Pumping Stations

A. General

- a. When sewage pumping stations are required, they shall be designed and installed per the following standards:
 - a. Great Lakes Upper Mississippi River Board (GLUMRB) (Ten States Standards) “Recommended Standards for Wastewater Facilities”, latest version.
 - b. Ohio Environmental Protection Agency’s latest requirements.
 - c. Village of Johnstown Design Criteria and Standard Construction Drawings.
 - d. All other applicable codes and regulations.
- b. Flooding: The sewage pumping station structures and electrical and mechanical equipment shall be protected from physical damage by the 100-year flood. Sewage pumping stations should remain fully operational and accessible during the 25-year flood. Regulations of state and federal agencies regarding flood plain obstructions shall be followed.
- c. Individual Grinder Pump: No individual residence or common residence grinder pumps will be permitted unless approved by the Service Director. Gravity sewers outletting into a common pump station will be required. Grinder pump and electric alarm system, if approved, shall be maintained by property owner.

B. Introduction

1. This pump station design criteria has been developed to provide guidance to land developers, their consulting engineers, and Contractors as to the requirements of the Village for design and technical specifications of sewage pumping stations. These requirements are intended to supplement the requirements set forth by the Ohio Environmental Protection Agency (OEPA) and in the following Village documents:
 - a. Standard Specifications for Water and Sewer Construction Projects.
 - b. Standard Details for Water and Sewer Construction Projects.
 - 1) There are several general requirements for all new and replacement sewage pumping stations to be built in the Village. These include the following:
 - a) All new and replacement sewage pumping stations shall be fitted with submersible pumps.
 - b) New pumping stations shall at a minimum be duplex stations, where each of two pumps will be capable of meeting the station's design capacity. In some cases, larger capacity pumping stations may be required, which shall be constructed with three or more pumps.
 - c) Where possible, the requirements presented in this document have been developed to address both temporary and permanent installations; however, the Village reserves the right to modify the requirements for individual projects as deemed necessary for the protection of public health and/or the environment.
 - d) In general, ALL pumping stations shall be considered to be permanent unless a project exists on the Village of Johnstown's 5-year Capital Improvements Plan that would eliminate the pumping station or the Developer has specific plans for eliminating the pumping station within approximately 5 years. However, each pumping station will be reviewed at the inception of design by the Village of Johnstown

to determine whether the pumping station will be considered permanent or temporary for design purposes. If a pumping station is to be temporary (as determined by the Village of Johnstown), certain requirements may be modified or omitted at the discretion of the Service Director of the Village of Johnstown. In general these modifications and omissions will be as defined in Section M, Temporary Pumping Station.

- e) Wherever the requirements specify "Contractor", they are intended to refer to land developers and their agents, who are typically contractors and their consulting engineers. Nothing in these requirements is intended to assign responsibility contradictory to legitimate contractual arrangements between those parties.
- f) Where these specifications are included with Plans and Bidding Documents for a project publicly bid by the Village of Johnstown, the Plans and Detailed Specifications shall govern in the event of conflicts between them and this document.
- g) All pump stations shall be provided with a gas and odor control system utilizing sodium hypochlorite with an LMI drip pump.

C. Scope

- 1. The specifications herein given are general and subject to any special provision or requirements set forth in the sections of this document.

a. Scope of Work

- 1) The Contractor shall, unless otherwise notified, furnish all labor, materials, equipment, tools, and incidentals necessary to install, test, complete, and make ready for operation a submersible sewage pumping station. This includes the furnishing and installation of all necessary

and desirable accessory equipment and auxiliaries, whether specifically mentioned in these specifications or not, as required for an installation incorporating the highest standards for the types of service which this pumping station is to perform.

- 2) These specifications are intended to give a general description of that which is required and do not claim to describe all details of the equipment to be furnished. Such details are considered to be either standard among all manufacturers or variable in accordance with specific equipment formulations, but resulting, in either case, in equipment equal in performance, long-term reliability, and life-cycle cost-effectiveness.
- 3) The Contractor shall be responsible for all excavation and removal of obstructions and restoration of all properties involved directly with the construction and/or installation of the lift station.

b. Capacity

- 1) The facility shall be sized to handle all flows from the total upstream watershed, except for the pumps, which shall be sized to handle the peak flow of the upstream watershed or twice the design peak flow of the proposed development, whichever is less. However, the facility shall be designed to permit future installation of pumps sized to handle the peak flow of the upstream watershed.
- 2) The capacity of a pump station handling flow from existing gravity sewers shall be adequate to manage existing flows, including infiltration/inflow, as well as additional flows anticipated to be required for the proposed development.

c. Design

- 1) Design of sewage pumping stations shall be coordinated at all stages with the Village of Johnstown. Plans shall be submitted for review and approval along with water and sewer construction plans.

- 2) Design efficiency of the pumps shall be submitted for review and approval by the Village. Pumps which are not properly selected for efficient operation may be rejected.
- d. Responsibilities of Contractor: The Contractor shall be responsible for all materials stored on the job site. The Contractor shall bear the responsibility of any damages incurred either to private or public property.
 - e. Inspection: Materials provided and work performed shall be subject to inspections by the Village representatives and/or by appointed agents of the Village. Acceptance of the lift station shall be contingent on the condition that all materials, equipment, and workmanship provided pass set inspections, satisfactory completion of all work, and proper operation of the completed lift station.
 - f. Warranty
 - 1) A minimum of a full 18-month warranty beginning on the date of acceptance shall be provided for the lift station. The warranty shall cover the following:
 - a) All equipment, parts, and labor.
 - b) Site materials, roadways, and fences.
 - c) Ground subsidence and settlement of valve chamber and wet well.
 - 2) The pumps shall have an 18-month full factory labor and material replacement warranty and 5-year prorated warranty (which shall both begin on the date of acceptance of the pumping station).
 - g. Tools and Spare Parts
 - 1) All special tools and recommended spare parts required for normal operation and maintenance shall be supplied for each piece of equipment furnished.
 - 2) The following spare parts shall be furnished as a minimum:

- a) One set of one upper and one lower mechanical seals and a seal tool.
 - b) One set of gaskets, O-rings, grommets, and other sealing devices.
 - c) One rotating wear ring (if so equipped) or a spare impeller, and one stationary wear ring (if so equipped) or a spare volute.
 - d) One complete set of spare fuses for all electrical devices.
 - e) Ten spare bulbs for each lamp type.
- 3) All tools and spare parts shall be properly packed and protected for long storage and placed in containers clearly identified in permanent markings as to contents. All tools shall be furnished in steel toolboxes.

h. Submittals

- 1) The Contractor shall submit to the Village the following prior to ordering equipment and materials or initiating construction:
 - a) Certified shop and erection drawings and data regarding pumps, motors, characteristics, and performance. The data shall include guaranteed performance curves, based on actual shop tests of job pumping units unless otherwise approved, which show that the units meet the specified requirements for head, capacity, efficiency, and input power. Curves shall be submitted in quadruplicate on 8½" x 11" sheets.
 - b) Literature and drawings describing the equipment and showing all important details of construction and dimensions.
 - c) Complete data on motors, including schematic electrical wiring diagrams and other data as required.

- d) Complete schematic electrical wiring diagrams for pumping station, control panel, and telemetry monitoring system.
 - e) Conduit routing and wire-pulling schedules.
- i. Operation and Maintenance Manuals
- 1) Five complete sets of operating and maintenance instructions shall be provided for all equipment and shall be furnished no later than the date of acceptance. The manuals shall be prepared specifically for the installations to which they pertain and shall include all required catalog cuts, drawings, equipment lists, spare parts, descriptions, etc.
 - 2) The manual for each piece of equipment shall be a separate document with the following specific requirements:
 - a) Contents:
 - (1) Table of contents and index
 - (2) Brief description of each system and its components
 - (3) Starting and stopping procedures
 - (4) Special operating instructions
 - (5) Routine maintenance procedures
 - (6) Manufacturer's printed operating and maintenance instructions, parts list, illustrations, and diagrams
 - (7) Instrumentation data sheets with calibration data and specifications
 - (8) One copy of each wiring diagram
 - (9) Conduit routing and wire-pulling schedules

- (10) One copy of each approved shop drawing and each Contractor's coordination and layout drawing
- (11) List of spare parts, manufacturer's price, and recommended quantity
- (12) Name, address, and telephone numbers of local service representatives

b) Material:

- (1) Loose leaf, on 60-pound punched paper
- (2) Holes reinforced with plastic, cloth, or metal
- (3) Page size, 8½" x 11"
- (4) Diagrams, illustrations, and attached foldouts as required, of original quality, reproduced by dry-copy method
- (5) Covers of oil-, moisture-, and wear-resistant material, 9½" x 12" in size

j. Record Drawings

- 1) The Record Drawings shall consist of the Contract Drawings, revised per as built conditions, and the approved Shop Drawings. As-built revisions to the Contract Drawings shall be professionally drafted. The Record Drawings shall be submitted to the Village in reproducible form (i.e., Bond paper) upon completion of the construction.
- 2) Contract Drawings shall be legibly marked to record actual construction, including:
 - a) All deviations in location or elevation of any underground installation from that shown on the Contract Drawings

- b) Any significant changes in aboveground installations from the approved Shop Drawings or Contract Drawings
 - c) Indication of Village's approval of any such deviations or changes from the Contract Drawings or approved Shop Drawings
- 3) Specifications and addenda shall be legibly marked to record:
- a) Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed
 - b) Changes made by change order or field order
 - c) Other matters not originally specified
- 4) Shop Drawings shall be legibly annotated to record changes made after review.
- 5) Reproducible Record Drawings shall be submitted within seven calendar days after the date of acceptance.
- k. Additional Items
- 1) Provide five (5) DVD sets in pdf format that include the complete operation manuals, record drawings, specifications and shop drawings of all equipment provided.
 - 2) Each installation shall be individually assessed as to the need for equipment, structures, procedures, and other items not named or described in these specifications. Installation of these items may be required at the discretion of the Utilities Director or his appointed agent.
 - 3) Any variations from the specifications provided in this document must be approved through the Village's representative or the appointed agent of the Village.

- 4) These specifications are subject to change or revision without notification.

D. Submersible Pumps

1. The pumps used in all submersible sewage pumping stations shall meet the following specifications.
 - a. Pumps, Motors, and Installation
 - 1) Pumps shall be ITT Flygt CP or approved equal, shall be capable of passing solids at least 3 inches in diameter, shall have a maximum ambient operating temperature of at least 115° F, and shall be capable of withstanding corrosive materials normally found in domestic and industrial waste.
 - 2) Pump motors shall be 460/480 volt AC, 3-phase, 60 Hz or 220/240 volt AC, 3-phase, 60 Hz, depending upon site constraints, power availability, and pump size and application requirements. The need for dual-voltage motors which are field changeable shall be considered on an individual basis dependent on pump size, location, and other factors.
 - 3) A nameplate of 316 stainless steel shall be attached to each pump, giving the name of the manufacturer, rated capacity, head, speed, model number, serial number, and all other pertinent data.
 - 4) All anchor bolts shall be of 316 stainless steel.
 - 5) Each pump shall be provided with a sufficiently long power cable to suit its installation without splicing. The power cable shall be type SPC cable, chloroprene rubber-jacketed, and suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and shall also meet with P-MSHA approval. Each power cable shall be installed in a separate conduit to the control panel.
 - 6) A 316 stainless steel lifting chain shall be provided for each pump, of sufficient length to reach from the pump attachment to a chain holder, furnished by the equipment manufacturer, and installed near the upper

guide rail support for that pump. The chain shall be of sufficient strength to allow the raising and lowering of the pump with a safety factor of at least 5, but in no case less than 5/16 inch chain links.

- 7) The pump shall be supplied with a mating cast-iron discharge connection elbow. The discharge connection elbow shall be permanently installed in the wet well along with the discharge piping. The pump shall be automatically connected to the discharge connection elbow when lowered into place and shall be easily removed for inspection or service. There shall be no need for personnel to enter the wet well to install, remove, or maintain the pumps.
- 8) Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump. A sliding guide bracket shall be an integral part of the pump unit. The entire weight of the pump unit shall be guided by no less than two guide bars and shall be pressed tightly against the discharge connection elbow with metal-to-metal contact. Sealing of the devices by any other means shall not be acceptable. No portion of the pump shall bear directly on the floor of the wet well, and the minimum clearance specified by the manufacturer shall be maintained with at least 4 inches in all cases. The pump, with its appurtenances and cable, shall be capable of continuous submergence under water to a depth of 65 feet without loss of watertight integrity.
- 9) Major pump components shall be of gray cast iron with smooth surfaces devoid of blow holes and other irregularities. All exposed nuts and bolts shall be of AISI-type 304 stainless steel or brass construction. All surfaces which will come into contact with sewage, other than stainless steel or brass, shall be protected by an approved sewage-resistant coating. The impeller shall be factory-coated with acrylic dispersion zinc phosphate primer. The pump exterior shall be protected by a factory-applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish.

- 10) All mating surfaces where watertight sealing is required shall be machined and fitted with nitrile rubber O-rings. Fitting shall be such that sealing is accomplished by metal-to-metal contact between machined surfaces. This shall result in controlled compression of the O-rings without the requirement of a specific torque limit. No secondary sealing compounds, rectangular gaskets, elliptical O-rings, grease, or other devices shall be used.
- 11) The design of the cable-entry water seal shall ensure a watertight and submersible seal. A single-cable entry to the pump housing shall contain all leads. The cable entry shall be comprised of a single-cylindrical elastomer grommet, flanked by stainless steel washers, all having a close-tolerance fit against the outside diameter of the cable and compressed by the entry body containing a strain-relief function, separate from the function of sealing the cable. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall protect the interior of the motor from foreign material which might gain access through the top of the pump. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable. The pump supplier shall provide a watertight connector, equal to a Crouse Hinds type CGB with a neoprene gland to terminate the cable in the pump disconnect.
- 12) The pump motor shall be designed and manufactured by the same manufacturer as the pump. The pump motor shall be of a squirrel-cage, induction, shell-type design, housed in an air-filled, watertight chamber. The stator winding and stator leads shall be insulated with moisture-resistant Class F insulation which shall resist a temperature of 155° C. The stator shall be dipped and baked three times in Class F varnish and shall be fitted into the stator housing by heat-shrinking. The use of bolts, pins, or other fastening devices requiring penetration of the stator housing shall not be acceptable. The motor shall be designed for continuous duty, capable of sustaining a minimum of ten starts per hour with the liquid surface located at the top of the pump's volute, but below the motor casing, with a temperature rise not exceeding 40° C above ambient temperature.

- 13) The junction chamber, containing the terminal board, shall be sealed from the motor by an elastomer compression seal (O-ring). Connection between the cable conductors and stator leads shall be made with threaded, compressed-type binding posts permanently affixed to a terminal board.
- 14) Each motor 14 horsepower or larger shall be provided with an adequately designed cooling system, consisting of a water jacket encircling the stator housing. The water jacket shall be provided with a separate circulation of the pumped liquid. Cooling media channels and ports shall be non-clogging by virtue of their dimensions. Systems that utilize a closed loop cooling system such as ethylene or propylene glycol or oil shall not be acceptable.
- 15) Thermal sensors shall be used to monitor stator temperatures on all pumps. The stator shall be equipped with three normally open thermal switches, embedded in the end coils of the stator winding (one switch in each stator phase).
- 16) Each pump shaft shall be of either stainless steel or carbon steel C1034 and shall be completely isolated from the pumped liquid.
- 17) Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The upper of the tandem set of seals shall operate in an oil chamber located just below the stator housing. This set shall contain one stationary tungsten carbide ring and one positively driven rotating tungsten carbide ring and shall function as an independent secondary barrier between the pumped liquid and the stator housing. The lower of the tandem set of seals shall function as the primary barrier between the pumped liquid and the stator housing. This set shall consist of a stationary ring and a positively driven rotating ring, both of which shall be of tungsten carbide. Each interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. The following seal types

shall not be considered acceptable nor equal to the dual independent seals specified:

- a) Shaft seals without positively driven rotating members.
 - b) Conventional double mechanical seals containing either a common or double spring acting between the upper and lower units (this conventional system requires a pressure differential to offset external pressure and effect sealing).
- 18) The only functions of the oil chamber shall be as a secondary barrier between the pumped liquid and as a seal lubricant. It shall be designed to compensate for oil expansion that can occur due to temperature variations. Drain and inspection plugs, with positive sealing, shall be easily accessible from the outside.
 - 19) The pump shaft shall rotate on two permanently-lubricated bearings. The upper bearing, providing for radial thrust, shall be a single-row roller bearing. The lower bearing shall be a two-row, angular contact bearing to compensate for axial thrust and radial thrust.
 - 20) The impeller shall be of a gray cast-iron, dynamically-balanced, double shrouded, non-clogging design having a long throughlet without acute turns. The impeller shall be capable of handling grit, solids, fibrous materials, heavy sludge, and other matter found in normal sewage applications. The pump manufacturer shall furnish data on mass moment of inertia for the proposed impeller. The fit between the impeller and the shaft shall be a sliding fit with one key, and the fastening of the impeller to the shaft shall be made by a locking assembly which is sealed from the liquid by a protective rubber cap and a bolt threaded to the shaft terminal.
 - 21) The volute shall be of a single-piece, non-concentric design and shall have smooth fluid passages large enough at all points to pass any solids which can pass through the impeller. The volute bottom shall be of a suction-bell design. A replaceable wear-ring system

shall be installed to provide efficient sealing between the volute inlet and the impeller skirt. The wear rings shall consist of a stationary brass wear ring in the volute. Pumps 14 horsepower or larger shall also have a rotating stainless steel wear ring on the impeller skirt.

- 22) Cable support shall be provided for the pump power cable and shall consist of a wire braid sleeve with attachment tails for connection to supports furnished by the equipment manufacturer and installed in locations indicated in the manufacturer's drawings and approved by the Engineer.
- 23) A mix-flush system shall be provided for each pump. The mix-flush system shall be an ITT Flygt 4901 flush valve or approved equal. The valve shall use the ejector principle, in which water exiting the valve shall violently agitate the liquid in the sump, thereby re-suspending any accumulation of sludge. The flushing period of the valve shall be adjustable. The direction of discharge from the mix-flush system shall be adjustable in 360° to any part of the wet well.
- 24) Pump removal equipment shall meet the following specifications:
 - a) Lift stations supplied with pumps weighing 800 pounds or less shall be supplied with sockets at each pump and a single portable stainless steel winch-type hoist system capable of pulling either pump completely out of the wet well. The winch and hoist shall be rated at twice the maximum weight of the pump. The hoist shall be fitted with a static loop and screw pin anchor shackle to support the weight of the pump while regripping the chain with the winch hook. Hoist shall be Halliday Products Series DB or equal.
 - b) Lift stations equipped with pumps weighing in excess of 800 pounds shall have a derrick-type lifting system. This system shall be designed so as to allow lifting, moving, and loading of pumps onto the bed of a standard one-ton truck. The lifting system and the structural design of the derrick shall be rated at a minimum of twice

the weight of the heaviest pump installed in the station. The lifting system shall be supplied with a means of operating electrically for both lifting and rotating. A galvanized steel shield shall be attached to the jib to shield the trolley when not in use.

- b. Mounting Hardware: All slide rails shall be made of 316 stainless steel and shall be of tubular design. Upper guide bar brackets, middle support brackets, and float hangers shall also be made of 316 stainless steel. All other hardware (bolts, nuts, etc.) shall similarly be made of 316 stainless steel.
- c. Additional Equipment: All pumps shall be equipped with seal leak detectors, so as to give adequate warning if the lower seal unit should fail and shall be a ITT Flygt MINICAS II brand.
- d. Shop Testing of Pumps
 - 1) All pumps shall undergo certified testing at the factory for capacity, power requirements, and efficiency at specified extremes for rated head, shutoff head, and operating head, and at as many other points as necessary for accurate plotting of performance curves, with the completely assembled pump and motor that will be furnished.
 - 2) All tests and test reports shall be made in conformity with the requirements and recommendations of the Hydraulic Institute Standards.
 - 3) Copies of the test logs, a description of the test piping, equipment, and set-up, and a discussion of the test procedure shall accompany certified test performance curves and shall be submitted to the Village. The curves shall include head, bhp, overall (wire-to-water) efficiency, rpm, and test NPSH_{Re} plotted against capacity. The curves shall be easily read and plotted to scales consistent with performance requirements.

E. Wet Wells and Valve Pits

- 1. Wet wells and valve pits shall be constructed as required, in accordance with the following specifications:

a. Wet Well and Valve Pit Construction

- 1) Wet wells shall be constructed using either precast concrete sections or poured-in-place concrete. If precast construction is used, each section shall be set and sealed with the proper gasket and joint sealing compound approved by the Village. If the lift station will be constructed of poured in-place concrete, the concrete shall be reinforced with reinforcement rod in accordance with acceptable engineering design practice and shall be certified by a Professional Engineer registered in the State of Ohio.
- 2) Either type of construction shall have a foundation designed so as to adequately support the station. At least one subsurface test boring shall be made at the lift station site to at least five feet below the proposed bottom of the wet well. A complete soil analysis including ground water level shall be submitted with the plans. Soil analysis shall include at least Standard Penetration Tests (ASTM D 1586); classification of soils' textures and consistencies; tests for natural moisture content; engineering classification of predominant soil horizons (including sieve and hydrometer analysis (ASTM D 422), Atterberg limits (ASTM D 4318), and specific gravity (ASTM D 854); and determination of Rock Quality Designation values. This analysis shall be used by the design engineer to verify that adequate ground support exists for the station as well as to design the structure to prevent flotation. This design shall be certified by a Professional Engineer registered in the State of Ohio.
- 3) Plans shall indicate the elevation of the 100-year flood plain at the lift station site. The tops of the wet well and valve pit, as well as the generator and control panel pads, shall be at least 1 foot above the 100-year flood plain.
- 4) Design shall be such that a 30-minute cycle time for each pump (i.e. 15minute overall cycle time for duplex stations; 10-minute overall cycle time for triplex stations) shall be obtained at average design flow. The wet well shall also incorporate a design sufficient to provide at least 1 hour of storage at twice the ultimate

average flow from the high-water alarm to the invert of the influent sewer. In no case shall this distance be less than 6 feet.

- 5) No more than one influent sewer shall enter the wet well, and it shall be located opposite the pumps. The last manhole before the wet well shall be located within 10 feet of the wet well and shall be either within the fence or near one of the fence gates.
- 6) Wet wells shall have a minimum inside diameter of 6 feet. Valve pits shall have a minimum inside dimension in all directions of 6 feet. Valve pits shall have an inside depth of no more than 8 feet.
- 7) Each valve pit shall be fitted with a drainage system such that any liquid entering the valve pit will be drained back to the wet well. Drainage of the valve pit shall be ensured by a 1-degree slope to the floor of the valve chamber draining to the invert of a drain line fitted with a check valve to prevent sewage from entering the valve chamber. The drain line shall be a minimum 2-inch diameter constructed of Schedule 80 PVC, and the check valve shall be constructed of PVC. The check valve should be attached to the drain pipe with a NPT threaded joint to permit changing the valve. The pipe shall extend at least 12 inches into the wet well but shall not interfere with pump removal. The check valve shall be normally closed, or a "P" trap shall be placed in the drain line to prevent vapors from entering the valve pit.
- 8) Each valve pit shall also be furnished with a valved connection to the forcemain beyond the pump isolation valves for emergency pumping. This connection shall be sized to equal the discharge piping from the pumps and shall have a minimum diameter of 4 inches. This connection shall be equipped with a 4-inch galvanized steel Bauer fitting for ease of hose connection. If the valve is larger than 4 inches, a reducer or blind flange with a 4-inch threaded tap shall be installed for connecting the Bauer fitting. Bauer fitting and accessories shall be as follows, with one discharge connection, one rubber sealing ring, and one end cap.

Part Numbers				
Size & Type	Discharge Connection	Lever Ring	HK Rubber Sealing Ring	End Cap
4" Flanged	100-6987	Included	105-0140	105-0201
4" Threaded	105-0811	105-0134	105-0140	105-0201

- b. All pipe and conduit penetrations through the wet well and valve pit structures shall be sealed with Dura-seal rubber compression gaskets, rubber Link Seal sleeves with stainless steel components, or approved equal products. All voids should be filled with non-shrink grout on both sides of the wall.
- c. The wet well shall be provided with at least one "gooseneck" inverted vent pipe appropriately sized. The piping shall be made of epoxy-coated ductile iron, aluminum, or other corrosion-resistant material and shall be the same size as the largest pump discharge piping (minimum 4 inches). Black iron pipe will not be allowed. Also, PVC or other plastic pipe will not be allowed. The exterior end of the pipe shall be covered with a stainless steel screen.
- d. Adequate waterproofing of the wet well and valve pit shall be included in the design and performed by the Contractor. A leakage test shall be performed on the entire wet well and valve pit prior to backfilling (see Section 3.2). The Contractor/Developer shall be responsible for properly repairing any leaks or correcting any other problems discovered during this test.
- e. All valve pits shall be fitted with either an aluminum ladder or polypropylene manhole steps for access. An aluminum Bilco Ladder-Up safety post or equal shall be provided as well.
- f. Wet well and Valve Pit concrete mix design shall include Xypex Waterproofing Admixture Series C-1000NF at a dosage rate of 1.5 percent by weight of cement.

2. Leakage Testing of Wet Well and Valve Pit: Wet well and valve pits shall be tested for leakage prior to backfilling as follows.

3. Backfill and Embankment
 - a. The Contractor shall provide all labor, materials, tools, equipment, and incidentals required to place the compacted backfill or embankment where shown on the plans or where directed by the Engineer and as specified herein.

 - b. Compacted backfill and embankment shall consist of suitable excavated material approved by the Engineer or granular backfill meeting O.D.O.T. Item 603, Type 2. This material may be obtained from suitable excavated material elsewhere on the project, if available. Use of frozen material, wood, rocks, or rubbish for backfill or embankment will not be permitted. If suitable material cannot be obtained from the excavated material, the Contractor shall furnish the material.

 - c. No fill shall be placed covering other work until such work has been inspected and approved by the Engineer. Where fill is required on both sides of a foundation or wall, the fill shall be placed simultaneously on each side. Fill against building walls shall not be placed until the first floor slab has been poured and set, unless otherwise approved by the Engineer. Fill against other work shall be in a manner and at such time as not to endanger the stability of or damage the work. No fill shall be placed against water bearing walls until they have been inspected, tested, and approved by the Engineer. No fill shall be placed over snow or frozen material.

 - d. All fill shall be compacted as specified herein, unless otherwise shown.
 - 1) Backfill: Backfill shall be placed in 6-inch loose layers and each layer compacted to not less than 95% of maximum dry density; the moisture content shall be not greater than 3 percentage points above optimum as determined by ASTM D 698. Compaction shall be accomplished with a vibratory double-drum steel wheel roller no less than 2.0 tons and no greater than 3.0 tons or by other means approved in writing by the Engineer. Flushing with water before compacting is

also encouraged if satisfactory drainage is provided for the free water. The method of compaction within road rights-of-way shall be approved by the Village of Johnstown Engineer's Office or O.D.O.T., as appropriate.

- 2) Embankments. Embankment areas shall be constructed in accordance with this specification. Embankment fill shall be placed in 6-inch loose layers and each layer compacted to not less than the percent of maximum dry density specified herein; the moisture content shall be not less than optimum and not greater than 3 percentage points above optimum. For material which displays pronounced elasticity or deformation under action of compaction equipment, the moisture content shall be reduced and proper stability obtained. Moisture density shall be as determined by ASTM D 698.

Maximum Dry Density (lbs/cu ft)	Compaction <u>Percent Maximum Dry Density</u>
90-104.9	102
105-119.9	100
120 and more	98

- 3) Subgrade. All pavement subgrades for new pavement shall be compacted to a depth of 12 inches. Subgrade soils with a maximum dry density of less than 100 pounds per cubic foot are considered unsuitable for use where subgrade compaction for a depth of 12 inches is required, and when encountered in the upper 12 inches of the subgrade shall be replaced with suitable soil or granular material. Soil subgrade with maximum dry density of 100 to 105 pounds per cubic foot shall be compacted to not less than 102% of maximum dry density. All other soil subgrade shall be compacted to not less than 100% of maximum dry density; the moisture content shall be not greater than 3 percentage points above optimum as determined by ASTM D 698.

- e. The Contractor shall obtain up to three soil samples where directed by the Engineer and transport the samples to an approved testing agency for Standard Proctor dry density testing (ASTM D 698). In addition, the Contractor shall cause a trained and experienced soil technician from an approved testing agency to be onsite during all backfill and embankment placement and to conduct at least three field density tests for every vertical foot of backfill or embankment placed. The Engineer shall review and approve the field density test reports at least every five vertical feet of embankment, and placement of embankment may not continue without this approval.
4. Wet Well and Valve Pit Lids and Accessories
 - a. Wet well and valve pit lids shall be composed of .25-inch-thick aluminum rated at 150 pounds per square foot (300 pounds per square foot in traffic bearing situations or if top of structures are not elevated at least 6 inches above grade). Lids shall be affixed with stainless steel hinges and hardware. A retractable handle constructed of stainless steel shall be furnished with each lid--such that when the lid is closed, there shall be no protrusions above the lid level.
 - b. The channel frame shall be ¼ inch minimum aluminum with anchor flange around the perimeter with a drain into the wet well.
 - c. Factory finish shall be mill-finish with bituminous coating applied to the exterior of the frame.
 - d. Each lid shall be furnished with a stainless steel padlock tab for securing the lid, a stainless steel snap lock with gasketed, threaded cover plug and removable key wrench, and a stainless steel hold-open arm with release handle for securing the lid in a 90-foot open position. Also, compression-spring operators enclosed in telescopic tubes shall be provided for smooth, easy, and controlled door operation throughout the entire arc of opening and closing.
 - e. Pump access lids shall be sized according to the pump manufacturer's recommendation. Access hatch(es) on the valve pit shall be large enough to permit easy installation and removal of the check valves and gate valves, as well as permit access to the Bauer connection. Every structure shall have at least one access lid with a minimum size of 30 inches by 30

inches that will permit entry of maintenance personnel wearing self-contained breathing apparatus.

- f. Access lids over the pumps in the wet well shall lift away from the pump guide rails (i.e. toward the influent sewer).
 - g. Access to the control panels shall meet National Electric Code (NEC) conditions with the lids in the 90° open position.
 - h. Aluminum access lids shall be as manufactured by Bilco or approved equal.
- F. Pipes, Isolation Valves, Check Valves, and Surge Relief Valves: All pipes and related equipment shall conform to the following specifications:
- 1. Pipes:
 - a. The forcemain and other piping at the pumping station shall be a minimum of 4 inches in diameter. Pipes shall be of Class 53 ductile iron meeting ANSI/AWWA C151/A21.51. All pipes shall be cement-lined, meeting ANSI/AWWA C104/A21.4 standards with asphaltic seal coating on the interior.
 - b. All mating ends in the lift station and valve pit shall be Class 125 flanged meeting ANSI/AWWA C110/A21.10 and C115/A21.15, with a gasket no larger than 0.125 inch between flanges. Flange adapters such as Union Flange will not be allowed. All flanges shall be ductile iron, not gray iron. All flange bolts shall be 316 stainless steel. Exterior of pipes in the wet well and valve pit shall be coated with epoxy-based paint, in accordance with AWWA standards. Only one joint or fitting will be permitted on each pipe between the wet well and the valve pit. This shall be a restrained flexible joint such as a mechanical-joint solid sleeve with MegaLugs. No flanged joints will be permitted outside the wet well and valve pit.
 - c. Each pump discharge line shall have a pressure gauge with a lever-operated ball valve installed in the valve pit between the check valve and the gate valve. The gauges shall be stainless steel glycerin-filled diaphragm gauges suitable for raw sewage service. Gauges shall have at least a 2½-inch face with a polycarbonate window and a full scale pressure of twice the shut-off head of the pump. Connections shall be NPT brass or stainless steel with a stainless steel snubber between the valve

and the gauge. Ball valves shall be lever operated stainless steel with vinyl grip handles and NPT connections. Valves shall be rated for at least 350 psi working pressure. Piping shall be stainless steel or brass with a minimum pressure rating of 200 psi. Hydrostatic tests shall be performed with ball valves turned off.

- d. Forcemain piping shall have standard push-on bell and spigot joints meeting ANSI/AWWA C151/A21.51 and shall be installed in accordance with ANSI/AWWA C600. Exterior of piping shall be coated with standard asphaltic coating. Ring gaskets shall be of approved composition suitable for the required service. Fittings shall be ductile iron conforming to ANSI/AWWA C110/A21.10. Piping at all bends and at both ends of the forcemain shall be restrained with flexible restrained push-on joints conforming to ANSI/AWWA C153/A21.53 or C111/A21.11 or other approved restrained joints for sufficient lengths to withstand the higher of the test pressure or the operating pressure plus a reasonable surge allowance.
- e. Forcemains shall have a minimum cover of 4 feet and a maximum cover of 6 feet. High points in the forcemain should be minimized by the use of deeper cuts through small hills along the alignment. Automatic air release valves shall be located at each high point on the forcemain. The forcemain shall discharge at an elevation not more than 2 feet above the invert of the receiving sewer, to a separate terminal manhole having no upstream gravity sewer connections.

2. Isolation Valves

- a. Each pump discharge line shall be furnished with an individual isolation valve. Isolation valves shall also be furnished for the Camlock connection and on the common forcemain before exiting the valve pit. The possibility of locating a buried valve outside the valve pit shall be considered on a case-by-case basis.
- b. Isolation valves shall be of the resilient-seat gate type and shall be as manufactured by Clow Corporation, American Flow Control, Kennedy Valve, M & H Valve, or equal.
- c. Gate valves shall conform to the requirements of AWWA C509 as applicable.

- d. Valves shall be furnished with Class 125 flanged ends.
- e. All-metal valves shall be manufactured of ASTM A126 cast iron, Class B, with bronze mounting hardware.
- f. Valves shall be of the non-rising stem type, using a double O-ring stem seal, except that packing shall be used when gear operations are required.
- g. Valves shall be rated for the following working pressures:

<u>Valve Size</u>	<u>Pressure (psig)</u>	<u>Class</u>
3 inch to 12 inch	200	125
14 inch to 20 inch	150	125

Piping and valves larger than 20-inch diameter shall be individually designed.

- h. All valve bodies shall be hydrostatically tested to at least twice the rated working water pressure. In addition, valves shall be seat-tested, bidirectional at the rated working pressure, with seat leakage not to exceed 1 fluid ounce per inch of valve diameter per hour. A certificate of testing shall be provided.
- i. Flanged valves shall have face-to-face dimensions in accordance with ANSI B16.1 and flanges in accordance with ANSI B16.10.
- j. All bonnet and packing gland bolts shall be steel, electro-plated with either zinc or cadmium; packing gland bolts shall have bronze nuts.
- k. Valves shall be furnished with handwheels as well as geared operators where required to produce the specified torque with a maximum pull of 80 pounds on the handwheel.
- l. All valves shall be marked in accordance with AWWA standards, including the name of the manufacturer, valve size, working pressure, and year of manufacture.
- m. Valves shall open counter-clockwise and close clockwise. Permanent labels shall be provided for each valve, showing both the "Open" position and indicating arrows.

- n. Resilient-seated valves shall be coated, interior, exterior, and valve bonnet, with fusion-bonded epoxy, in accordance with AWWA C550.
 - o. Valves shall be UL- and FM- approved.
 - p. Each valve gate shall be encapsulated with synthetic rubber which has been bonded and vulcanized in accordance with ASTM B429, Method B.
 - q. Recesses in the valve body shall not be permitted.
3. Check Valves
- a. Check valves for ductile iron pipelines shall be swing-type and shall meet the material requirements of AWWA specification C508 swing-check valves for ordinary waterworks service. The valves shall be of cast-iron body, bronze-mounted, single-disc 175 psi working water pressure, non-shock, and hydrostatically tested at 300 psi. Valve ends shall be 125 pound ANSI B16.1 flanges. Interior and exterior of valve body shall be coated with fusion-bonded epoxy in accordance with AWWA C550.
 - b. When there is no flow through the line, the disc shall hang lightly against its seat in a vertical position. When open, the disc shall swing clear of the waterway.
 - c. Check valves shall have bronze seat and body rings, extended bronze hinge pins, and bronze nuts on the bolts of bolted covers.
 - d. Valves shall be fitted with an extended hinge arm with outside lever and weights. Valves shall be so constructed that disc and body seat may be easily removed and replaced without removing the valve from the line. Check valves shall thus be installed with enough clearance between the valves and the walls of the valve pit to permit removal of the shaft for maintenance purposes.
 - e. Check valves in pump stations with total head in excess of 50 feet shall be equipped with a hydraulic cushion to dampen the last 10% of the valve closing action. The hydraulic cushion chamber shall be arranged so that the valve closing speed is adjustable to meet the service requirements.

- f. All check valve shafts shall be designed to accept a hydraulic cushion in case future modification is desired.

4. Surge Relief Valves

- a. On all sewage pumping stations with a total dynamic head in excess of 50 feet, the need for a surge relief valve shall be considered. The surge relief valve shall be designed to prevent damage to any piping, valves, or other equipment in the event of a power failure during operation of all pumps in the station.
- b. Any surge relief valve shall be installed in the valve pit with discharge into the wet well.
- c. The surge relief valve shall meet the same material and pressure-rating requirements as the check valves. Surge relief valve design and construction shall be approved by the Village.

G. Electrical

1. All electrical components shall meet NEMA standards, and shall comply with NEC as applicable to construction and installation of wiring and components. The electrical system inside the wet well shall comply with the National Electric Code for Hazardous Locations, Class 1, Group D.
2. An enclosure shall be provided to house all electrical equipment outlined in the following specifications. The enclosure shall be located on a separate concrete pad adjacent to the wet well. The pad shall be of sufficient size to support the enclosure and provide access in accordance with NEC requirements.
3. The enclosure and the electrical equipment which shall be supplied with each sewage pumping station are described in this section.
4. Each lift station shall have a minimum of a 175 watt metal halide or mercury vapor light on photocell mounted high enough to light up lift station area.
5. Enclosures

- a. The enclosure shall contain both the motor control panel and the telemetry monitoring system. The enclosure shall have room for the remote terminal unit (RTU) even if the initial installation of the telemetry monitoring system is waived by the Village. The RTU shall be isolated from the motor control panel. Hardwire controls shall be kept away from the RTU (or the space reserved for a future RTU) to prevent electrical noise interference.
- b. Enclosures supplied with each station shall be Hoffman #A-62H4812SSLP or equal (or appropriately-sized equivalent, if larger enclosure is required) and shall be rated NEMA Type 4X. The enclosure shall be large enough to provide an unused space equal to at least 30% the space required. This space shall be reserved for installation of future equipment by the Village, and no wiring or controls shall intrude into this reserved space. The construction shall be of 304 stainless steel, in accordance with ASTM A167, and shall be supplied with a drip shield, a continuous hinge on the panel, and smooth seamless sides.
- c. The enclosure shall include add-on kits equal to the Hoffman kits listed by catalog number below:
 - 1) D-L3630SOP Swing Out Door Kit (for mounting indicator lights and operator entry switch).
 - 2) ADSTOPK Door Stop Kit.
 - 3) XLF16D18 Door-Activated Light.
- d. Each enclosure shall have a door-in-door arrangement. The circuit breakers, control switches, pilot lights, etc., shall be accessible to the operator from the inner panel. The outer panel shall be void of control devices.
- e. The outer panel doors of the enclosure shall be secured as follows:
 - 1) The right-hand door shall be secured with Hoffman latch, Cat. #AL2CR.
 - 2) The left-hand door shall be secured with Hoffman latch, Cat. #A-L2CCCW.

- 3) Panel doors shall also be provided with stainless steel hasp and eye or tabs for securing with a padlock.
- f. Subpanels shall also be stainless steel.
 - g. Each sewage pumping station enclosure shall be provided with one duplex service outlet of 120-volt AC, 20-amp rating. This outlet shall be supplied from the control transformer and shall have GFCI circuit protection. The outlet shall be located in the motor control panel.
 - h. All wiring and components shall be tag-numbered and/or clearly marked in accordance with the drawings and as directed by the Engineer.
 - i. The motor control panel shall be UL-listed or listed by another nationally recognized testing agency and shall be built in accordance with NFPA 79 Electrical Standards for Industrial Machinery.
 - j. An outline drawing of the control panel shall be provided, showing panel elevation, dimensions, and weight. Interconnecting wiring diagrams shall be provided, which show all electrical connections between field-installed equipment and the control panel. Schematic control wiring diagrams shall be provided, showing all control components, switches, pilot lights, relays, etc. The wiring diagrams shall indicate wire and terminal numbers. Each component shall be uniquely labeled.
6. Circuit Breakers
- a. All circuit breakers shall be of the thermal-magnetic type, with molded case breakers. Breakers shall be UL-listed and CSA-certified, and shall meet Federal Specification W-G-375B/GEN.
 - b. Three-pole breakers shall be manufactured by Cutler/Hammer Series C and shall have a short-circuit rating equal to 125% of the available fault current. Regardless of the available fault rating, circuit breakers shall not be less than Style FA for applications under 100 amps, or Style KA for applications between 100 and 250 amps.

- c. Single-pole breakers shall be Cutler/Hammer Series C and shall be used for control circuits and peripheral devices.
- d. A main service entrance-rated circuit breaker shall be provided for the control panel, with separate circuit breakers for each motor and transformer primary and secondary, as well as single-pole circuit breakers for control circuitry, RTU, lighting, and outlets.
- e. Circuit breakers shall be accessible to the operator from the subpanel without having to come in contact with open wiring. The main and motor branch circuit breakers shall be lockable.
- f. A minimum of two spare 120-volt AC, 15-amp circuit breakers shall be provided and mounted on the panel.

7. Starters

- a. Motor starters shall be Cutler/Hammer Advantage Series. They shall be equipped with three poles and shall be provided with auxiliary contacts for status inputs to the telemetry monitoring system. Thermal overload relays shall be Cutler/Hammer solid state adjustable thermal overloads or equivalent.
- b. Starters shall conform to all NEMA ratings. The minimum size starter shall be NEMA 1.
- c. Where required by a local power company or the Village, electronic soft-start starters, as manufactured by Cutler/Hammer IT Soft Starts shall be supplied.
- d. Provisions for sequential pump starting shall be made in the controls to prevent more than one pump from starting simultaneously.

8. Control Transformers

- a. Control transformers shall be internal mounted. Primary voltage shall be 480/240 volt AC and secondary voltage shall be 120 volt AC.
- b. The transformer should be sized for the power requirements of the pumping station or shall have a minimum output current rating of 30 amps. The transformer shall be protected by circuit breakers on the primary and secondary sides.

9. Control Relays

- a. All control relays shall be of the 8- or 11-pin octal plug-in type, Cutler/Hammer or equivalent. Relays may be either direct panel-mounted or DIN rail-mounted. Control relays shall be of at least DPDT configuration.
- b. Intrinsically safe relays shall be provided for operation with the wet well float switches. Wiring associated with the intrinsically safe relays shall be segregated from other power and control wiring.

10. Duplex Alternator

- a. The alternating relay shall be as manufactured by ITT Flygt Part No. 008120-13SP.
- b. The above describes a duplex alternator. Pumping stations with three or more pumps shall have an alternator capable of equalizing operating hours among the pumps.

11. Multitrode (By Flygt)

- a. A multitrode level controller will be used to control the lift stations pumping and alarms. (Flygt Model 3.0/10-100).
- b. In a dual pump station Flygt MTR-3 and MTRA-3 controllers will be used for pump control and alarm.
- c. In a three-pump station, two Flygt MTRA-3 controllers will be used for pump control and alarm.
- d. A multitrode MTAK-2 will be included to provide 12 inches of extra wall clearance and provide a probe cleaner.
- e. The multitrode will provide an OFF pump signal, lead pump signal, lag pump signal, and a high-level alarm which ties into local horn and strobe as to a telemetry system.

12. Switches and Pilot Lamps

- a. All lamps shall be of the transformer type.

- b. Switches and pilot lamps shall be oil-tight and shall meet NEMA standards for A600 heavy-duty contacts. Each pump shall have a separate selector switch with the following settings: ON -- OFF -- AUTO. Each pump shall also have a pilot lamp to indicate when the pump is running. These switches and lights should be located inside the control panel.
- c. All HOA switches and pilot lamps shall be as manufactured by either Furnas or Allen-Bradley. Switches and pilot lamps shall be oil-tight and shall meet NEMA standards for A600 heavy-duty contacts.

13. Over-Current Relays

- a. Over-current relays shall be provided and shall be wired so that every motor lead passes through the current loops. When motor current exceeds 50 amps, current transformers shall be available to satisfy the current requirements (i.e. current shall be reduced to below 50 amps for monitoring purposes).
- b. Output contacts for a remote alarm shall be provided.
- c. The over-current relays shall be SSAC Model No. ECS41BC or equivalent for pumps with full-load current up to 20 amps or SSAC Model No. ECSH4HBD for pumps with current rating above 20 amps.

14. Voltage Monitors

- a. A voltage monitor shall be supplied to monitor the incoming voltage from the local power company. This unit shall be manufactured by SSAC, Model No. WVM011A* or equal. The monitor shall be rated at either 240 volt AC or 480 volt AC, according to the incoming voltage source. Voltage monitor shall monitor all incoming phases. Protection of the voltage monitor, on the incoming voltage, shall be through 1-amp fuses.
- b. When an under-voltage condition occurs, an alarm shall be sent via the telemetry monitoring system after an adjustable time delay.

15. Wire and Cable

- a. All wiring and cable installation shall conform to NEC regulations and shall comply with local codes. All conductors shall be copper. Wiring shall not be operated above 75° C.
 - b. For electrical equipment feeders (motor control centers, motor branch circuits, etc.) located below grade or for exterior control and motor circuits, wiring shall be type THHN through #2 AWG and type RHH for larger than #2 AWG.
 - c. For branch circuits for lighting and receptacles, wiring shall be type THHN in conduit. For branch circuits for interior control, wiring shall be type MTW.
 - d. Power wiring shall be 12 AWG minimum and control wiring shall be 14 AWG minimum.
 - e. For instrumentation (i.e. 4-20 mA signals), cables shall be 16 AWG copper, NEC-type TC rated at 600 volts (Belden No. 1118A or equal) individually shielded twisted pair cable. All digital signal wires may be of the type of wire specified above.
 - f. All telemetry monitoring system and signal wires shall be in conduit separate from any AC power lines. All motor circuits must be in separate conduits apart from any lighting, receptacle, or control wiring.
 - g. All conductors shall be sized such that voltage drop does not exceed 3% for branch circuits or 5% for feeder branch circuit combinations.
 - h. The use of pulling compound shall be required in all installations of wire pulled in conduit as needed. All conduits shall be sized in accordance with NEC regulations and/or local codes.
 - i. Fork-tongue compression terminals shall be installed on all control and metering conductors connected to terminal blocks. All terminations shall be coated with a UL-listed anti-oxidation compound.
16. Raceways and Conduit
- a. All conduits shall be of one of the following types:

- 1) Rigid steel, which shall be hot-dipped, galvanized, threaded-type conduit, conforming to FS WW-C-581E, ANSI C80.1. Rigid steel conduit shall only be used for interior conduits.
 - 2) Rigid aluminum, which shall comply with NEC and local codes. Rigid aluminum conduit shall not be used for buried conduits.
 - 3) PVC plastic, which shall be Schedule 80. All PVC conduit shall comply with NEC and local codes and have glued joints. PVC conduit shall not be used for interior conduits, but shall be used for all buried conduits and may be used for exterior conduits.
 - 4) Liquid-tight, which shall be flexible steel conduit with a high tensile strength galvanized steel core and continuous copper ground built into the core. This conduit shall have a smooth non-wrinkling PVC jacket that will not pull away from fittings. This conduit shall be type LA Liqueflex as manufactured by Electri-flex, or equal. Liquid-tight conduit shall be used for any final runs into instrumentation equipment and shall not exceed 18 inches in length.
- b. Conduits between the wet well and control panel shall have a minimum size of 2 inches and shall be as follows:
- 1) One conduit for each pump
 - 2) One conduit for future mixer or influent grinder (spare)
 - 3) One conduit for high high-level float (telemetry monitoring system)
 - 4) One conduit for remaining floats.
- c. All conduits shall be tagged and identified with brass tags held on by copper wire at both ends.
- d. Conduit routing and wire-pulling schedules shall be submitted with shop drawings.

17. Grounding: All submitted site plans shall show a grounding scheme. Grounding shall comply with NEC requirements.
18. Security System Devices
 - a. Security system devices shall be furnished and installed as described below.
 - b. All wet well and valve pit hatches shall have a limit switch on each exterior door. Limit switches shall be Cutler/Hammer or equal. All such switches shall be connected to the site entry input point on the telemetry monitoring system.
19. Nameplates
 - a. Engraved nameplates shall be provided for every circuit breaker, control switch, pilot light, etc. Nameplates shall be white-faced tags with engraved black letters. Letters shall be 1/8 inch in height.
 - b. Nameplates shall be attached to the panel by means of stainless steel machine screws.
20. Line-Surge Protection

A lightning arrester and line-surge capacitors shall be provided on the incoming power lines. The lightning arrester shall be of the 650-volt, 3-phase, "Transquell" type, as manufactured by General Electric Co., Cat. No. 9L15ECC001, or equal. Line-surge capacitors shall be 650-volt, 3-phase, non-toxic liquid-insulated, as manufactured by General Electric Co., Cat. No. 9L18BAB301, or equal. The lightning arrester shall be mounted outside the control panel.
21. Local Alarm
 - a. An audible and a visual alarm shall be mounted on the enclosure. Mounting the alarm on the top or front of the panel shall not be acceptable. Specific site conditions shall dictate the orientation of the alarm and panel.
 - b. The alarm light shall be visible from 360°.
 - c. The local alarm shall be connected to the high high-level float, as described in Section 5.7, Multitrode by (Flygt).

22. Elapsed-Time Meters

- a. An elapsed-time meter shall be furnished for each pump.
- b. Elapsed-time meters shall have an increment of 1/100 hour.
- c. Elapsed-time meters shall have both a field-resettable display and a nonresettable display. As an alternative, both a resettable meter and a nonresettable meter shall be provided for each pump.

H. Standby Power

1. Standby power shall be provided for each sewage pumping station through a permanent on-site generator.
2. A permanent on-site standby power system shall be required at all permanent sewage pumping stations and any other station where required by the OEPA or the Village of Johnstown (see Appendix A).
3. Each generator shall be sized to supply emergency backup power capable of starting and operating a sufficient number of pumps to pump the maximum design flow for the station, as well as operating all other electrical components.
4. Provisions for sequential pump starting shall be made to minimize generator size and prevent overloading.
5. The backup power supply unit shall be a modular, self-contained package, conforming to NEC and local electric codes, as well as to any and all EPA and OSHA regulations.
6. The power plant driving the permanent generator, shall be natural gas. An automatic transfer switch and auto-exercise capabilities shall be furnished with each unit.
7. Each location with a permanent generator shall be provided with natural gas feed sufficient for generator operation at full load.
8. Each permanent generator shall be mounted on a raised concrete pad in a weatherproof enclosure and shall have removable panels or housing to allow access to the engine, generator, or controls. Permanent generators shall be located so as to be accessible by a truck for maintenance purposes.

9. Other required equipment shall include an electric unit heater, ventilation system, automatic sump pump (which shall discharge into the wet well), and a sound-attenuating treatment to reduce sound levels to no more than 85 dbA at 50 feet from the enclosure. If residences are located within 100 feet of the enclosure, sound attenuation shall reduce sound levels to no more than 72 dbA at 50 feet from the enclosure.
10. Auxiliary contacts shall be furnished and installed to interface with the telemetry monitoring system for monitoring purposes.

I. Telemetry Monitoring System

1. To be installed per current Village requirements and standards.

J. Flowmetering

1. All permanent sewage pumping stations, as well as other pumping stations specifically identified by the Village, shall be provided with a flowmetering device for monitoring the discharge from each station. Station discharge piping shall be configured with a straight run of pipe with no valves upstream of the flowmeter equal in length to at least 10 pipe diameters and downstream of the flowmeter equal in length to at least 2 pipe diameters or as otherwise recommended by the flowmeter manufacturer, to provide an acceptable flow pattern through the flowmeter.
2. All flowmeters shall be calibrated at the factory prior to shipment to the site. The Contractor shall be responsible for the complete installation.
3. All new pumping station flowmeters shall be magnetic flowmeters and shall include the transmitter, the remote-mounted flow tube, and the vendor-supplied shielded cable between the two elements.
4. Magnetic Flowmeter Flow Element: The flow element of the magnetic flowmeter shall conform to the following specifications.
 - a. Pulsed DC electromagnetic induction-type, providing a signal which is linear in relation to the liquid flow rate.
NOTE: AC-type meters may be required if conductivity is below 5 microsiemens/centimeter.
 - b. Functional/performance specifications shall be as follows:

- 1) Power requirements shall be matched to the flow transmitter/converter.
 - 2) Accuracy shall be 1%± of rate (including the transmitter/converter).
 - 3) The flowmeter shall be suitable for operations in process liquid temperatures up to 70° C and an ambient temperature of 65° C.
 - 4) RFI protection shall be provided.
 - 5) The flowmeter shall be capable of operations under pressures of 240 psi, if 150-pound flanges are used and 700 psi, if 300-pound flanges are used.
 - 6) The flowmeter shall be capable of running under no-flow conditions without damage to any component.
- c. Physical specifications shall be as follows:
- 1) The metering tube of the flowmeter shall be carbon steel, unless otherwise indicated.
 - 2) Flowmeter flanges shall be ANSI 150-pound carbon steel, unless otherwise indicated.
 - 3) The liner shall be polyurethane or fusion-bonded epoxy, unless otherwise approved by the Village.
 - 4) Electrodes shall be 316 stainless steel, bullet-nosed or elliptical self-cleaning type, unless otherwise indicated.
 - 5) Flowmeters shall be housed in below-grade vaults and shall be designed to withstand accidental submergence in 30 feet of water for 24 hours. Where hazardous areas are indicated on the Contract Drawings, flowmeters shall be rated for conditions in those areas.
 - 6) All external surfaces of the flowmeters shall be painted with a chemical- and corrosion-resistant epoxy finish.
- d. Accessories/options required:

- 1) All flowmeters shall be factory-calibrated. A copy of the calibration report shall be included in the operations and maintenance manual.
 - 2) Flowmeters shall be grounded according to manufacturer's recommendation. All accessories, such as a ground ring, ground wires, gaskets, etc., shall be provided as required or as otherwise specified. All materials shall be suitable for the liquid being measured.
- e. The flowmeters shall be a Foxboro 8000 Series, Fischer and Porter, or Rosemount magnetic flowmeter.
5. Magnetic Flowmeter Transmitter/Converter
- a. The flow transmitter/converter shall be supplied by the manufacturer of the flow element.
 - b. Functional/performance specifications shall be as follows:
 - 1) Power requirements shall be 120-volt AC, 10%±.
 - 2) Accuracy shall be as defined for the flow element.
 - 3) The operating temperature range shall be -25° C to 65° C.
 - 4) The output shall be isolated 4-20 ma. DC into 0 to 1000 ohms.
 - c. The flowmeter transmitter/converter shall be housed in a NEMA 4X-rated wall mount and enclosure.
 - d. Accessories/options required:
 - 1) A signal cable shall be provided between the flow element and the signal converter.
 - 2) A local indicator shall be provided with an engineering scale to indicate actual flow rate and total flow.

- 3) A second flow rate indicator and non-resettable totalizer shall be provided on the enclosure RTU subpanel if the transmitter is not located in the enclosure. This unit shall be a Newport P6000 ratemeter/totalizer.

6. Chart Recorder

- a. A circular paper chart recorder shall be provided for each pumping station that has a flowmeter. Recorder shall have a rotation time (recording time per chart) of at least 7 days.
- b. Chart recorder shall be Eurotherm Chessel Model 392 or Foxboro 740.
- c. A one-year supply of charts shall be provided.

K. Perimeter Fence

1. The sewage pumping station area shall be enclosed with industrial-grade galvanized chain-link fence. This fence shall be 9-gauge galvanized chain link, with 3-inch end posts and 2-inch line posts. A 1½-inch top rail shall be placed on the fence. The end posts, line posts, and top rail shall be structural galvanized steel with a rating of SS20. The fence shall be 6-feet high and shall be topped with three strands of barbed wire facing outward.
2. Access through the perimeter fence shall be by means of a lockable sliding gate with a working length of 16 feet. In the event that the site layout makes a sliding gate impractical, dual-leaf swinging gates (8 feet each) may be acceptable. Either gate shall be constructed with SS20 structural galvanized steel for the outside frame (2½ inches for sliding gate or 2 inches for dual-leaf swinging gates) and SS20 structural galvanized steel 1½-inch filler supports. The frame shall be covered in 9-gauge chain link. The gate shall be capable of being padlocked to prevent unauthorized access to the station.
3. A personnel access gate shall also be installed in the fence in addition to the sliding gate. This gate shall be located on the perimeter fence as appropriate for convenient access to the station. This personnel access gate shall be capable of being padlocked to prevent unauthorized access to the station. The gate shall be constructed of SS20 structural galvanized steel tubing and 9-gauge chain link. The frame shall be 2-inch tubing and with a 1½-inch filler support.

4. The perimeter fence shall be constructed no closer than 10 feet from the wet well, valve pit, or any building, or 4 feet from the generator pad, control panel pad, or telemetry monitoring system pole. Gate placement shall be such that there is adequate truck access to the wet well, valve chamber, and generator. There shall be sufficient room within the fence to permit later installation of a generator (if one is not initially installed) while still meeting the above requirements.

L. Final Grading and Finish Work

1. Initial backfill for the sewage pumping station structure shall be non-compacting, washed pea gravel, extending to 5 feet above the bottom of the wet well. From that point to a point 8- to 10- inches below final grade, backfill shall consist of compacted fill dirt excavated from the station site, unless otherwise directed by the Village. No rock or unstable backfill will be accepted. The Contractor shall ensure that compaction is sufficient to prevent any subsidence. All ground shall be stable and Contractor is responsible for repairing all subsidence and associated damage for 18 months from acceptance of the pumping station by the Village.
2. Any access driveway longer than 120 feet should be constructed with a turnaround at the pumping station allowing a minimum 50-foot turning radius for a truck 8-foot 5-inches wide with an overall length of 33 feet 6 inches.
3. Access driveways and turnarounds shall be black-topped. Base for blacktopping shall consist of one 6-inch course meeting requirements of O.D.O.T. Item 304. The surface shall consist of two 1½-inch courses of asphalt concrete meeting requirements of O.D.O.T. Item 404.
4. A concreted parking area shall be provided for trucks. This area shall be located inside the perimeter fence if site considerations allow; otherwise, it shall be located outside the perimeter fence as near as possible to the sliding gate. This area shall be a minimum of 8 inches of 4,500 psi concrete with steel mesh reinforcing. A 4-inch-thick concrete slab shall be poured under the control panel. This slab shall have at least four times the horizontal surface area of the control panel to help prevent settlement. A minimum 4-inch-thick gravel base of O.D.O.T. Item 304 shall be provided under all concrete.
5. Six inches of O.D.O.T. Item 304 gravel shall be provided around all major pumping station items (i.e., wet well, valve chamber, generator

pad, etc.) and over all non-concreted areas within the perimeter fence. A solid layer of visquine plastic shall be placed under the gravel to prevent vegetative growth.

6. Pavement subgrades shall be compacted in accordance with Section 3.3, D, 1) of these specifications.
7. Finish grading shall provide positive drainage away from the wet well and valve pit top slabs and control panel. The tops of all structures should be either designed for H-20 loading or raised 6- to 12-inches above surrounding grade to prevent vehicles from driving onto them.
8. All unpaved areas around the pumping station shall be finish-graded and planted with grass seed, to meet O.D.O.T. Item 659 requirements. Bushes and trees shall be planted in accordance with the surrounding landscaping and anticipated land use. In general, the site shall be left in an aesthetically-pleasing manner.
9. All pumping stations shall be supplied with a $\frac{3}{4}$ -inch hose bib/yard hydrant. The hydrant will be frostless-type and will be fitted with a backflow preventer or vacuum breaker. Water service piping shall be Type K copper and shall be sized for a maximum pressure drop of 25 pounds per square inch from the water main to the pump station with the hydrant full-open.

M. Temporary Pumping Stations

1. In general, ALL pumping stations shall be considered to be permanent unless a project exists on the Village of Johnstown's 5-year Capital Improvements Plan that would eliminate the pumping station or the Developer has specific plans for eliminating the pumping station within approximately 5 years. However, each pumping station will be reviewed at the inception of design by the Village of Johnstown to determine whether the pumping station will be considered "permanent" or "temporary" for design purposes. The Utilities Director shall make the final determination.
2. The criteria to be considered by the Utilities Director will include: 1) capacity of the pumping station, 2) complexity of operation, 3) overflow impact upon customers, 4) overflow impact upon the environment, 5) location and ease of entry/exit for emergency equipment such as sludge trucks, etc., 6) proximity to the nearest gravity sewer and likelihood of a future sewer extension to eliminate

the pumping station, and 7) other factors unique to a given pumping station site.

3. If a pumping station is to be "temporary" (as determined by the Utilities Director), certain requirements may be modified or omitted at the discretion of the Utilities Director. An outline of what these modifications and omissions will generally be is provided below.
4. The Village will not require the pumping station to be sized for the total upstream watershed. Instead, the pumping station shall be sized for all existing and planned development (including all preliminary plans) within the watershed, regardless, of whether or not all such development is associated directly with the pumping station. This means that the pumping station shall have the capacity to both eliminate any existing upstream pumping stations and serve development in the watershed being planned by others. Also, the requirement of 1 hour emergency storage at twice the ultimate average flow will remain.
5. A permanent on-site generator and automatic transfer switch will not be required. Instead, a manual transfer switch and auxiliary receptacle shall be provided as described in Section H, Standby Power, 11. There shall be sufficient room within the perimeter fence to park a portable generator or install an on-site generator at a later time (see Section K, Perimeter Fence, 4). Also, if the generator required to operate the lift station would be too large to pull on a trailer behind a pickup truck, a permanent on-site generator will be required.
6. The telemetry monitoring system described in Section I Telemetry Monitoring System will not be required. Instead, a Sensaphone 4100 Advanced Industrial Monitoring System (dialer) manufactured by Phonetics, Inc., shall be provided. Inputs shall be as follows:
 - a. Pump fail for all pumps
 - b. High-water level
 - c. Unauthorized access
 - d. Power failure
 - e. Generator run (if provided)
4. No magnetic flowmeter and no flowmetering vault will be required. The pump hour meters will be used to estimate flow rates.

- a. The Service Director will assess each "temporary" pumping station individually, based on the criteria listed above, to determine the acceptability of each modification and omission. Therefore, it is possible that a "temporary" pumping station may be required to meet some or all of the "permanent" standards. The Service Director shall make the final decision.

All other requirements listed within the Sewage Pumping Station Requirements shall apply universally to all pumping stations, regardless of their status as "permanent" or "temporary."

900.20 Forcemains

- A. Velocity and Diameter
 1. At design pumping rates, a cleansing velocity of at least 2 feet per second should be maintained. The minimum forcemain diameter for raw wastewater shall be 4 inches.
- B. Air and Vacuum Relief Valve
 1. An air relief valve shall be placed at high points in the forcemain to prevent air locking. Vacuum relief valves may be necessary to relieve negative pressures on forcemains. The forcemain configuration and head conditions should be evaluated as to the need for and placement of vacuum relief valves. Forcemains shall be installed to keep high points and low points to a minimum.
- C. Termination
 1. Forcemains should enter the gravity sewer system at a point not more than 2 feet above the flow line of the receiving manhole.
- D. Pipe and Design Pressure
 1. Pipe and joints shall be equal to water main strength material suitable for design conditions. The forcemain, restrained fittings, and station piping shall be designed to withstand water hammer pressures and associated cyclic reversal of stresses that are expected with the cycling of sewage pump stations.
- E. Design Friction Losses

1. Friction losses through forcemains shall be based on the Hazen-Williams formula or other acceptable methods. When the Hazen-Williams formula is used, the value of "C" shall be 100 for unlined iron or steel pipe for design. For other smooth pipe materials such as PVC, lined ductile iron, etc., a higher "C" value not to exceed 120 may be allowed for design.

F. Identification

1. Where forcemains are constructed of material which might cause the forcemain to be confused with potable water mains, the forcemain shall be appropriately identified.

G. Leakage Testing

1. Leakage tests shall be required per the water main testing requirements as shown in the Village of Johnstown Construction Standards and Drawings.

