DYNAMIC ENGINEERING

Capacity of Circular Pipe Flowing 1/2 Full

Project: Odin Pharmaceuticals
Job #: 2137-99-001
Location: Franklin Township, NJ

Computed By: DG
Checked By: MB
Date: 12/5/2022

PIPE DESCRIPTION	SLOPE (%)	SIZE (IN)	MANNING'S COEFFICIENT (n)	VELOCITY (FT/S)	CAPACITY (CFS)	CAPACITY (GPD)	CAPACITY (MGD)
6" PVC North	5.60	6.00	0.01	8.81	0.87	559,327	0.56
6" PVC South	1.48	6.00	0.01	4.53	0.44	287,543	0.29

Variables Defined

Q=Capacity of Pipe (CFS)
V=Velocity in Pipe Section (FT/S)
R=Hydraulic Radius of Pipe Section
S=Slope of Pipe Section (FT/FT)
D=Diameter of Pipe (FT)
d=Depth of Flow in Pipe (FT)
n=Manning's Coefficient
Wp=Wetted Perimeter (FT)

Typical Values for Manning's Coefficient (n)

n(RCP)=	0.013	
n(HDPE-Smooth Interior)=	0.012	*Varies with Manufacturer
n(DIP)=	0.013	
n(PVC)=	0.010	
n(CMP)=	0.024	

Equations used:

Q=VA
V=(1.49/n)*R^(2/3)*S^(1/2)
Q=(1.49/n)*R^(2/3)*S^(1/2)*A

Utilizing Appendix 16.A from the Civil Engineering Reference Manual-Seventh Edition, by Micheal Lindeburg, Copyright 1999
The following equations were utilized to calculate the Hydraulic Radius and Area of a Circular Pipe Section flowing 1/2 full

A=(π*D^2/4)*0.5=0.3927*D^2
R=A/Wp=0.3927*D^2/((2*π*D/2)*0.5)=0.25*D

Therefore:

Q=(1.49/n)*(0.25*D)^(2/3)*S^(1/2)*(0.3927*D^2)
V=(1.49/n)*(0.25*D)^(2/3)*S^(1/2)

Unit Conversion Equations

1 Cubic Foot=7.4805 Gallons
1 Day = 86,400 Seconds

Therefore:

$$\frac{\text{Cubic Foot}}{\text{Second}} \times \frac{86{,}400 \text{ Seconds}}{1 \text{ Day}} \times \frac{7.4805 \text{ Gallons}}{1 \text{ Cubic Foot}} = \frac{\text{Gallon}}{\text{Day}}$$

$$\frac{\text{Gallon}}{\text{Day}} \times \frac{1 \text{ Million Gallons}}{1{,}000{,}000 \text{ Gallons}} = \frac{\text{Million Gallons}}{\text{Day}}$$