

**BERTIN ENGINEERING**

66 GLEN AVENUE

GLEN ROCK, NEW JERSEY 07452

(201) 670-6688

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JOB

SHEET NO.

CALCULATED BY

CHECKED BY

SCALE

U353A - Watchung Hills: North Plainfield, NJ

1 OF

MBL DATE 5/30/2007

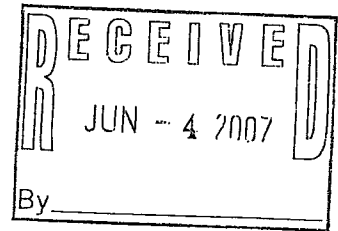
CJB DATE 5/30/2007

**SANITARY SEWER SYSTEM ANALYSIS REPORT**

**WATCHUNG HILLS AT NORTH PLAINFIELD, LLC  
BLOCK 110, LOT 2  
641 SOMERSET STREET  
BOROUGH OF NORTH PLAINFIELD, SOMERSET COUNTY, NJ**

**BEA U353A**

**JANUARY 31, 2007  
REVISED: MAY 30, 2007**



A handwritten signature in black ink, appearing to read "Calisto J. Bertin".

**Calisto J. Bertin NJPE Lic # 28845**

**SANITARY SEWER DESIGN**

**I) Projected Flow Criteria**

Use: Residential Apartments (1 & 2 Bedroom)

From N.J.A.C. 7:9A-7.4

225 Apartments @ 350 GPD per unit = 78,750 GPD

**II) Design of Sewer Pump Station**

Average Daily Sewer Flow = 78,750 GPD  
 Peak Design Sewer Flow = 2.5 x Ave. Daily = 196,875 GPD  
 Bottom of Pump Pit Elevation = 111.20 ft  
 Discharge Elevation = 134.00 ft

Static Head = 22.80 ft  
 Pipe Size = 3 inches  
 Pipe Length = 335 ft of PVC Pipe

Minor Head Loss:	eq.ft/unit	eq. ft
4 Elbows (90 degrees - reg)	13.0	52.0
2 Gate Valves	2.5	5.0
2 Check Valves	38.0	76.0

Total Minor Losses 133.0 ft ≈ 133 ft

Equivalent Pipe Length = 468 ft

**III) Force Main Design**

$H_L(\text{Total}) = H_p + H_s + H_M$  where:  $H_p$  = Head loss due to flow in pipe  
 $H_s$  = Static head loss  
 $H_M$  = Minor Head loss

Using Hazen-Williams Formula

where:	V =	Velocity = $1.318C \times R^{0.63} \times S^{0.54}$
	C =	Roughness Coef. = 120
	S =	Hydraulic Slope = $H_p/L$
	L =	Equivalent Length of Pipe = 468 ft
	R =	Hydraulic Radius = $r/2$
	r =	Radius of Pipe = 1.5 inches

$$V = 1.318 \times 120 \times 0.174 \times \{(H_{P+M}) / 468\}^{0.54}$$

$$V = Q / A = Q / (\pi r^2) = Q / 0.049 = 0.997 (H_{P+M})^{0.54}$$

$$Q = 0.049 (H_{P+M})^{0.54}$$

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$$H_{P+M} = 20.439 Q^{1.852} = 267.16 Q^{1.852}$$

$H_L(\text{Total}) = H_P + H_S + H_M$				
Q (GPM)	Q (CFS)	V = Q/A	$H_{P+M}$	Total $H_L$
120	0.267	5.45	23.22	46.02
140	0.312	6.35	30.89	53.69
160	0.356	7.26	39.56	62.36
162	0.361	7.35	40.48	63.28
180	0.401	8.17	49.20	72.00
200	0.446	9.08	59.80	82.60
220	0.490	9.99	71.34	94.14

**IV) Pump Selection**

See Manufacturer's chart (Total Head in feet vs. USGPM)

Use MP3102-212-3 by Flygt Pump Flow (D) = 162 GPM

**V) Wet Well Design**

Diameter: 4 ft Depth: 3.00 ft

1. Sewer Storage

$$V = \pi \times r^2 \times h = 37.70 \text{ cf} = 282.01 \text{ Gal.}$$

2. Detention Time

A. Average Daily Flow (Q) = 78,750 GPD = 54.7 GPM  
 Detention Time (t) =  $(V / (D - Q)) + (V / Q) = 7.78 \text{ mins}$

B. Peak Design Flow (Q) = 196,875 GPD = 136.7 GPM  
 Detention Time (t) =  $(V / (D - Q)) + (V / Q) = 13.22 \text{ mins}$

3. Operation Time

$$\text{Operation Time (T)} = V / D = 1.74 \text{ mins}$$

4. Max. Velocity

Area (A) = 0.0491 sf  
 Pump Flow (D) = 162 GPM = 0.36 cfs

$$\text{Max. Velocity} = D / A = 7.4 \text{ ft/s}$$

5. Force Main Capacity

$$335 \text{ ft} \times 0.0491 \text{ sf} = 16.44 \text{ cf} = 123.01 \text{ Gal.}$$

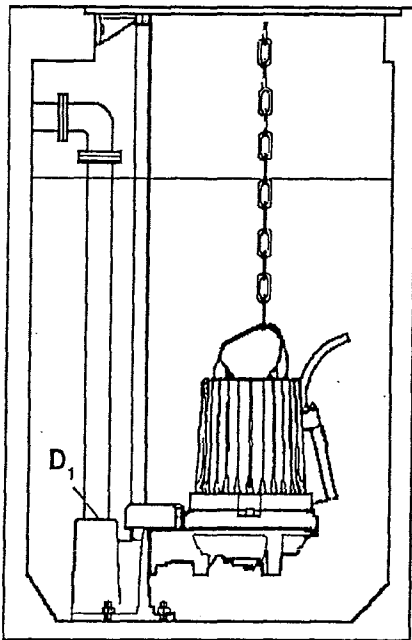
$$123.01 \text{ Gal.} / 282.01 \text{ Gal./cycle} = 0.44 \text{ cycles to clear the pipe.}$$

## Impeller/Motor/Nominal Sizes

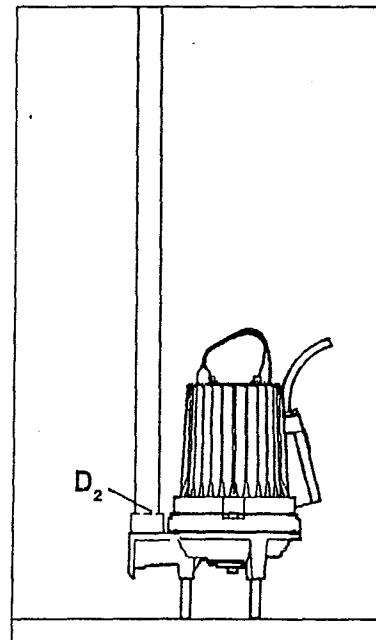
GRINDER MODEL	IMPELLER CODE	HP RATING	VAC	RPM	D1	D2
		MP & MF				
M-3127 3Ø	212 262	7.5	200 230/460 575	3475	2"	2"
M-3127 1Ø	216 266	5.0	230	3430	2"	2"

**Notice:**

For other than domestic grinder pump usage, please consult  
ITT Flygt Engineering for evaluation of product application.

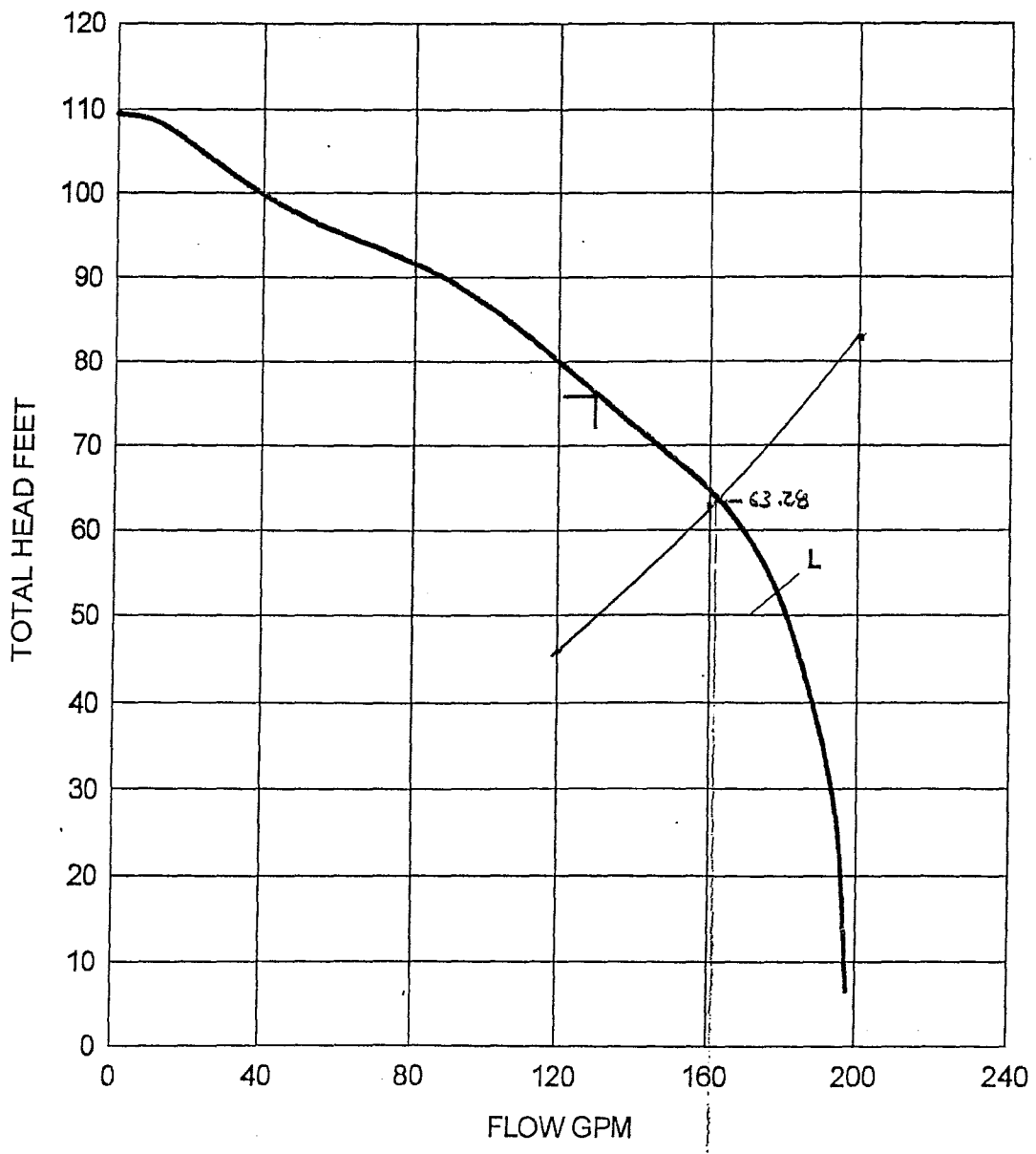
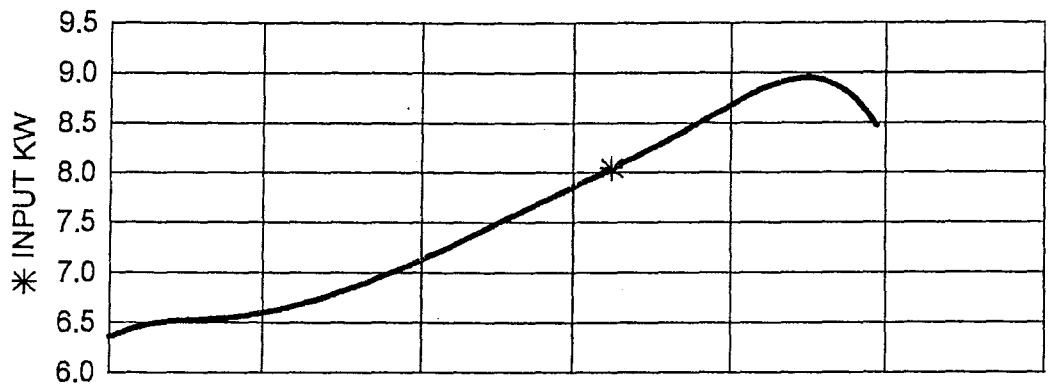


MP



MF

PAGE	SECTION	<b>M-3127</b> <b>212 Impeller</b>	CONFIG.	
<b>6</b>	<b>9</b>		<b>MP/MF</b>	
ISSUED	SUPERSEDES		VANES	PHASE
6/94	2/88	--	3	



L = Limited to intermittent duty

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(b) The criteria for estimating the volume of sanitary sewage from private residential sources shall be as follows:

Volume, first bedroom .....	200 gallons per day ("gal/day")
Volume, each additional bedroom .....	150 gal/day
Minimum volume per dwelling unit .....	350 gal/day
Minimum volume per apartment .....	350 gal/day

2. The minimum volume for a dwelling unit shall be reduced to 200 gallons per day in the case of deed restricted senior citizen communities or mobile home parks with dwelling units less than 500 square feet in size.

(c) The volume of sanitary sewage from commercial or institutional establishments shall be based upon the type and size of the facility and the maximum expected number of persons that may be served during any single day of operation. The volume shall be estimated as follows:

1. Depending upon the method of estimation selected from (d) below, multiply the number of gallons per person (user) by the maximum expected number of persons per day, or multiply the number of gallons per facility (unit) per day by the number of facilities (units) present or proposed.

2. Estimate the maximum number of employees which may be present during a single day of operation and add an additional 15 gallons per employee per each additional eight hour shift, except in the case of (d)24, (d)32, (d)38 and (d)40 below.

(d) The criteria listed below are minimum standards for average facilities of the categories listed. In cases where a facility does not fall within any of the categories, the administrative authority may approve the use of other documented criteria, such as actual water data for the facility or other similar facilities, provided that the value used for design is at least 50 percent greater than the average daily volume of sewage.

Type of Establishment	Method of Estimation (gallon per user or gallon per unit per day)
1. Airport	5 gal/passenger
2. Assembly Hall	3 gal/seat/day
3. Auto Service Station	10 gal/car served
4. Bar	5 gal/patron
5. Bathroom with shower without shower	25 gal/person 10 gal/person
6. Beach Club	25 gal/person
7. Beauty parlors and salons	120 gal/day/sink
8. Boarding House, Meals	75 gal/guest <sup>2</sup> 15 gal/non-resident boarder
9. Bowling Alley, no food with food, add	125 gal/lane/day 5 gal/patron
10. Bus Stop Rest Area	5 gal/passenger
11. Cafeteria	5 gal/customer
12. Camp, Cottage (barracks type)	65 gal/person
13. Camp, Day, no meals	20 gal/person
14. Camp, Resort	100 gal/site/day <sup>2</sup>
15. Camp, Trailer with toilets, add	100 gal/site/day <sup>2</sup> 10 gal/person/day
16. Church, with or without kitchen	3 gal/seat/day
17. Cocktail Lounge	5 gal/customer
18. Coffee Shop	5 gal/customer
19. Comfort Station/Picnic Grounds, with toilets	10 gal/person

Type of Establishment	Method of Estimation (gallon per user or gallon per unit per day)
20. Cottages with toilets and showers	15 gal/person 100 gal/person <sup>2</sup> minimum 350 gal/dwelling unit/day
21. Country Club	60 gal/member/day 25 gal/non-member
22. Dining Hall	5 gal/customer
23. Dormitory, Bunkhouse	40 gal/bed/day
24. Factory/Industrial Building with showers, add	15 gal/employee per eight hour shift 15 gal/employee per eight hour shift
25. Hospital, Medical	250 gal/bed/day
26. Hospital, Mental	150 gal/bed/day
27. Hotels	130 gal/room/day
28. Institution, Other than hospi- tal	150 gal/bed/day
29. Laundry, Self-service	50 gal/wash
30. Motel	130 gal/room/day
31. Nursing/Rest Home	150 gal/bed/day
32. Office Buildings	15 gal/employee per eight hour shift or 0.125 gal/ft <sup>2</sup> , which- ever is greatest
33. Prison	150 gal/inmate/day
34. Restaurant sanitary wastes only kitchen wastes, add	5 gal/patron 5 gal/patron
35. Rooming House, no meals	65 gal/bed/day
36. School, Boarding	100 gal/student/day
37. School, Day No cafeteria or showers Cafeteria only Cafeteria and showers Cafeteria, showers and labo- ratories	10 gal/student/day 15 gal/student/day 20 gal/student/day 25 gal/student/day
38. Shopping Center	0.125 gal/square ft./day <sup>1</sup>
39. Stadium	3 gal/seat/day
40. Store	0.125 gal/square ft./day <sup>1</sup>
41. Swimming Pool	10 gal/person
42. Theater, Indoor	3 gal/seat/day
43. Theater, Outdoor	10 gal/parking space
44. Visitor Center	5 gal/visitor

<sup>1</sup> Volume of sanitary sewage for employees included within method of estimation indicated.

<sup>2</sup> If laundry wastes are anticipated, increase the estimated flow by 50 percent.

Amended by R.1994 d.469, effective September 19, 1994.  
Sec: 26 N.J.R. 2715(a), 26 N.J.R. 3829(a).

**7:9A-7.5 Separate disposal of greywater and blackwater**

A greywater system may be approved by the administrative authority provided that all of the requirements of these standards are satisfied and provided that an acceptable means for disposal of the blackwater from the building served is indicated in the system design. When the blackwater from the building served by a greywater system is to be disposed of into a waterless toilet, a variance from the Uniform Construction Code, Plumbing sub-code, N.J.A.C. 5:23-3.5, must be obtained by the applicant prior to approval of the greywater system by the administrative authority and the volume of sanitary sewage to be used in the design of the greywater system shall be determined as prescribed in N.J.A.C. 7:9A-7.4. When the blackwater from the building served by a greywater system is to be disposed of into a separate subsurface sewage disposal system, the blackwater system shall meet all the requirements of this chapter and the volume of sanitary sewage used in the design of both the greywater system and the blackwater system shall be a minimum of 75 percent of the volume of sanitary sewage determined as prescribed in N.J.A.C. 7:9A-7.4.