



PLAN CHECK CORRECTION SHEET FOR SEWAGE EJECTORS AND SUMP PUMPS 2020 LAPC

This is intended to provide uniform application of the codes by the plan check staff and to help the public apply the codes correctly.

Section: Mechanical Plan Check

Plan Check/PCIS Application No.: _____ Date: _____

Job Address: _____

Applicant Name: _____

Address: _____ Phone: _____

City/State/Zip: _____ E-mail: _____

Plan Check Engineer: _____

Telephone: _____ E-mail: _____
firstname.lastname@lacity.org

Your feedback is important; please visit our website to complete a Customer Survey at www.ladbs.org/LADBSWeb/customer-survey.jsf.

If you have any questions or need clarification on any plan check matters, please contact a plan check supervisor or call our Customer Hotline at (213) 482-0056.

Your plans have been examined and the issuance of a permit is withheld for the reasons set forth. The approval of plans and specifications does not permit the violation of any section of the Code, or other local ordinance or state law.

INSTRUCTIONS:

- Corrections with circled item numbers apply to this plan check.
- Additional corrections are at the end of the list.
- Incomplete or non-legible drawings or calculations will not be accepted.
- Incorporate all comments as marked on the checked set of plans and calculations and this correction sheet.
- For each correction indicate the sheet number and detail or note number on the plans where the corrections are made.
- **WHEN YOU HAVE COMPLIED WITH ALL CORRECTIONS, CALL OR EMAIL THE PLAN CHECK ENGINEER TO MAKE AN APPOINTMENT FOR VERIFICATION**
- **PLEASE BRING THE MARKED UP PLANS AND THE CORRECTIONS SHEET TO THE VERIFICATION APPOINTMENT**

SEE MARKED UP PLANS FOR CLARIFICATIONS OF CORRECTIONS.

As a covered entity under Title II of the Americans with Disabilities Act, the City of Los Angeles does not discriminate on the basis of disability and, upon request will provide reasonable accommodation to ensure equal access to its programs, services and activities.

GENEREAL REQUIREMENTS

NOTES ON PLANS

1. Plans shall bear, on every sheet, the registration or license number and signature of an architect, contractor, or engineer, registered in the appropriate classification by the State of California. (LAPC 101.5.2; State of California Business and Professions Code Div. 3, Chap. 7, Art. 3, Sec. 6735.4; LAPC 101.5.2)
2. Indicate the job address on each sheet of the plans. (LAPC 101.5.1; LAPC 103.2.2)
3. Indicate on the plans the piping materials. (LAPC 701.2; 1101.4;)
4. Provide an airtight cover for the sump. (LAPC 710.10; 1101.6.2)
5. Sump(s) shall be made of concrete, metal, or other approved materials. Fiberglass sumps shall be listed by a City of Los Angeles recognized agency. (LAPC 710.8; 301.2)
6. Please specify the type of material of the sump on the plans, or specify make, model and research report number, or listing certification by a City of Los Angeles recognized listing agency, of the prefabricated sump. (LAPC 101.5.1; 301.1)

PLAN DETAILS

7. Show the make, model, and horsepower of the pump on the plans. (LAPC 101.5.1; 103.2.2)
8. State the length of the pipe from the pump to the gravity line, and the elevation difference between the bottom of the sump and the gravity line. (LAPC 101.5.1; 103.2.2)
9. Provide a riser diagram showing the sump, sump inlet & outlet check valves, and gravity line. (LAPC 101.5.1; LAPC 103.2.2)
10. The discharge line shall connect to the horizontal gravity line from the top through a wye branch fitting. (LAPC 710.4)
11. Show size, length and type of material of the pump discharge line. (LAPC 101.5.1; LAPC 103.2.2)
12. The discharge line from the sewer ejector or sump pump shall be provided with an accessible check valve and gate valve. (LAPC 710.4; LAPC 710.6)

13. The gate valve shall be located on the discharge side of the check valve. (LAPC 710.4)
14. Gate valves and check valves shall be located outside the pit. (LAPC 710.6)
15. Sump(s) shall be provided with a vent pipe that shall extend through the roof. (LAPC 710.7; LAPC 906.1)
16. Show high water level. It shall be at least 2 inches below the lowest inlet. (LAPC 710.9)
17. Show all pipe sizes on the plan (LAPC 101.5.1; 103.2.2).
18. Show the gravity line all the way to the property line. (LAPC 101.5.1; LAPC 103.2.1)
19. Provide a detail showing the sump location, the inlet lines, the outlet line, and gravity line. (LAPC 101.5.1; LAPC 103.2.2)
20. Provide a plot plan or lay out showing the sump location, the inlet lines, the outlet line, and gravity line. (LAPC 101.5.1; LAPC 103.2.1)

CALCULATIONS

21. Determine the gallons per minute going into the sump (LAPC 101.5.1; 103.2.2; 1101.6.2).
22. For rainwater, calculate the amount of water collected at the rate of 0.021 gpm per square foot (LAPC Appendix D Table D101.1).
23. Provide a hydrologic report based on the proper 50-year isohyetal. Calculations shall be according to the Peak Rate Method for a (LAPC 7013.6)
24. For sewer assume 1 gpm every 2 fixture units. (LAPC 702.3; 710.5)
25. Provide pump performance curve (LAPC 101.5.1, 103.2.2).
26. Provide calculations for the system curve. Take into consideration all the fittings, gate valve and backwater valve (LAPC 101.5.1; LAPC 103.2.2).
27. Draw the system curve on the pump curve to determine the point of intersection, which will determine the volume flow coming out of the pump (LAPC 101.5.1; 103.2.2).
28. Determine the fixture unit loading of the gravity drain by allowing two (2) fixture units for every gallon per minute pumped by the sewage ejector (LAPC 702.3; 710.5).
29. Determine the square footage loading of the gravity drain by allowing 24 square feet per

gallon per minute pumped by the sump pump and then using the 4-inch of rainfall column of table 1103.2, or allowing 48 square feet of area for every gallon per minute pumped by the sump pump and then using the 2-inch of rainfall column of table 1103.2, (see "SIZING THE RAINWATER PIPE DOWNSTREAM OF A PUMP" after the correction list) (LAPC 1104.1; LAPC Appendix D Table D101.1, and Section D101.1).

30. Provide calculations showing that the discharge to the street does not exceed 7 ft/s (Department of Public Works requirement).
31. Provide clearance from the Department of Public Works allowing the water velocity to exceed 7 ft/s at the point of discharge to the public street (Department of Public Works requirement)

SEWAGE EJECTORS

32. Provide dual pumps each capable of handling the load independently. (LAPC 710.9)
33. Sewage ejectors located in single-family dwellings and receiving waste from water closets or urinals shall be able to pass a 1 ½ inch diameter ball. (LAPC 710.3(2))
34. Sewage ejectors located in single-family dwellings and receiving waste from water closets or urinals shall be connected to a discharge pipe with a backwater valve and a gate valve of at least 2 inch. (LAPC 710.3(2))
35. In other than single dwellings, sewage ejectors receiving waste from water closets or urinals shall be able to pass a 2-inch diameter ball. (LAPC 710.3(3))
36. Sewage ejectors, in other than single dwellings, and receiving waste from water closets or urinals shall have discharge piping, check valves, and gate valves not less than 3 inch in diameter (LAPC 710.3(3))
37. The pump shall have a discharge capacity of not less than 20 gpm (Sewage ejectors LAPC 710.3(1))

SUBSOIL DRAINS

38. Provide a statement from a California registered civil engineer showing the required flow. (LAPC 101.5.1)
39. Either terminate the subsurface drains to the city storm drain, or provide a soil report showing that there is no continuously flowing springs or

ground water. (LAPC 1101.6.1)

40. The discharge line from the sump shall be at least 1½ inch diameter (LAPC 1101.6.2)
41. The sump pit shall be at least 15 inches in diameter and 18 inches in depth. LAPC 1101.6.2)
42. The sump pump shall have adequate capacity to discharge water coming into the sump LAPC 1101.6.2)
43. The capacity of the sump pump shall not be less than 15 gpm (LAPC 1101.6.2)
44. Backwater valves shall be installed to prevent flooding of the garage from outside water (LAPC 1101.6.4)

RAINWATER DRAIN SUMP PUMP

45. Provide an approved modification from Grading allowing the site drainage to drain into a sump system. (LABC 7013.10)
46. Provide dual pumps each capable of handling the load independently. (LAPC 1101.14)
47. The pump shall have a discharge capacity of not less than 15 gpm. (Subsoil drainage only) (LAPC 1101.6.2)
48. When discharging to the public street the pressure line shall connect to a gravity pipe within the property. (Department of Public Works requirement)
49. When discharging under the curb, the drain line shall not be smaller than three-inch diameter nor greater than four-inch diameter. (Department of Public Works requirement)
50. When the gravity line from rain water exceeds four inch in diameter either use rectangular fitting having height between three and four inches and a cross section equal or greater the cross section of the pipe, or manifold multiple pipes having aggregate cross sectional area equal or greater the cross sectional area of the gravity pipe. (Department of Public Works requirement)
51. Provide clearance from the Department of Public Works allowing the water velocity to exceed 7 ft/s at the point of discharge to the public street (Department of Public Works requirement)

SIZING THE RAINWATER PIPE DOWNSTREAM OF A PUMP

The plumbing code reads:

“ 1104.1. General. Where there is a continuous or semi-continuous discharge into the building storm drain or building storm sewer, as from a pump, ejector, air-conditioning plant, or similar device, 1 gpm of such discharge shall be computed as being equivalent to 24 square feet of roof area, based upon a rate of rainfall of 4 inches per hour”.

The pipe sizing can be demonstrated with an example:

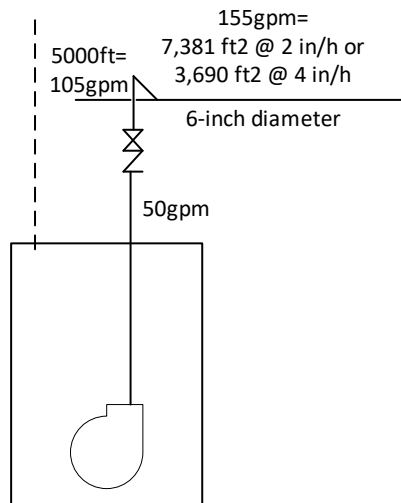
1.

Assuming a pump discharges 50 gpm into a horizontal pipe laid at 1/8 inch/ft slope:

at 4 in/h rainfall, 50 gpm are equivalent to $50/0.042=1190 \text{ ft}^2$ (from Table D101.1)

Which leads to a horizontal pipe size of 4-inch in diameter. (Table 1103.2)

Would we have stayed with the local rainfall of 2 in/h we would have had:



at 2 in/h rainfall, 50 gpm are equivalent to $50/0.021=2381 \text{ ft}^2$ (Table D101.1)

Which leads to a horizontal pipe of 4-inch in diameter. (Table 1103.2)

In both cases the required pipe size is the same. In fact, pipes are calculated according to the flow that they can accommodate, and, being the flow the same in both cases, we found the same pipe size.

2.

Let's assume now that the pump discharges into a pipe that is already carrying the flow collected by 5000 ft² area. In Los Angeles, at 2 in/h rainfall, it means: $5000 \times 0.021 = 105 \text{ gpm}$,

adding this volume rate to the flow discharging from the pump:

$$105 + 50 = 155 \text{ gpm.}$$

Converted into the area that would collect the same volume of water at 4 in/h rainfall:

$$155/0.042 = 3690 \text{ ft}^2 \text{ which according to Table 1103.2 requires 6-inch pipe.}$$

Would we have left the rainfall at 2 in/h, the pump would have contributed 2381 ft² which added to the upstream area would result in:

$$5000 + 2381 = 7381 \text{ ft}^2$$

And Table 1103.2 at 2 in/h gives 6-inch pipe.

3.

Assume now that the above system has additional load of water collected by 2,000 square feet of area connected to the gravity pipe downstream of the pump:

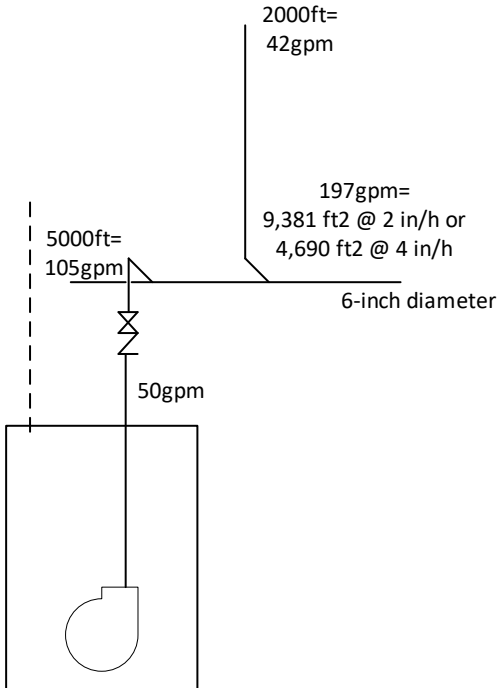
The contribution of 2,000 square feet means an additional 42 gpm ($2000/0.021$). Adding all volume rates the total flow is $105+50+42=197$ gpm

Converted to 4 inch/h rainfall we get 4,690 ft²

from Table 1103.2 at 4 inch/h the required pipe diameter is 6"

Would we have converted to 2 inch/h rainfall we would have gotten 9,381 ft² and

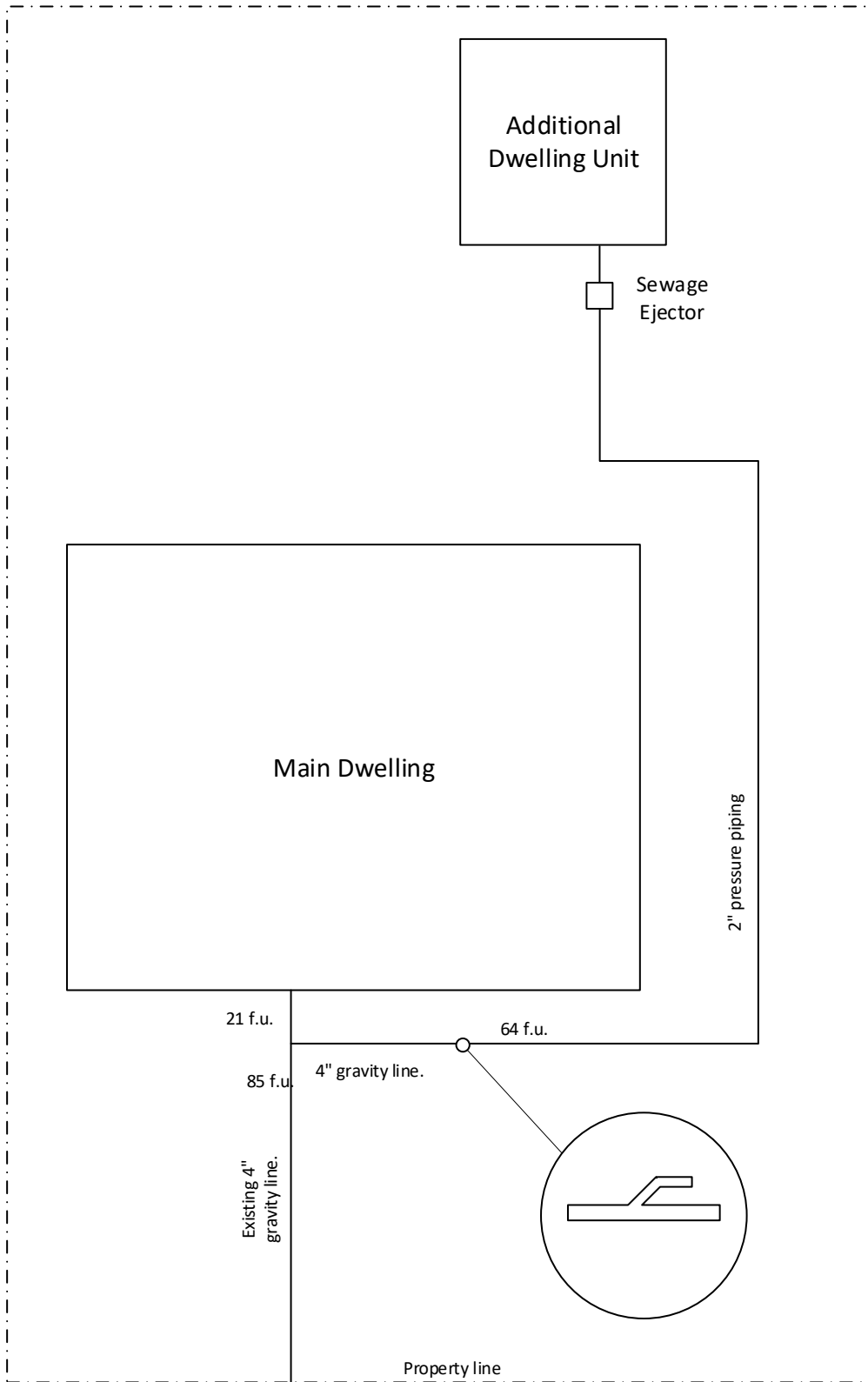
from Table 1103.2 at 2 inch/h the required pipe diameter is still 6"



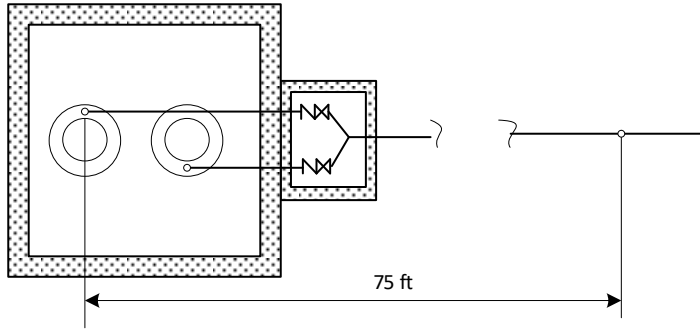
Conclusion: Since pipes in Table 1103.2 have been sized according to the flow that they can carry, it is not surprising that regardless of what rainfall is used, the results are the same. Therefore, whether the continuous flow is converted into 24 square feet per gpm and then use the 4-inch rainfall column, or converted into 48 square feet per gpm and use the 2 inch of rainfall column will lead to the same results.

EXAMPLES

The following is a design example:

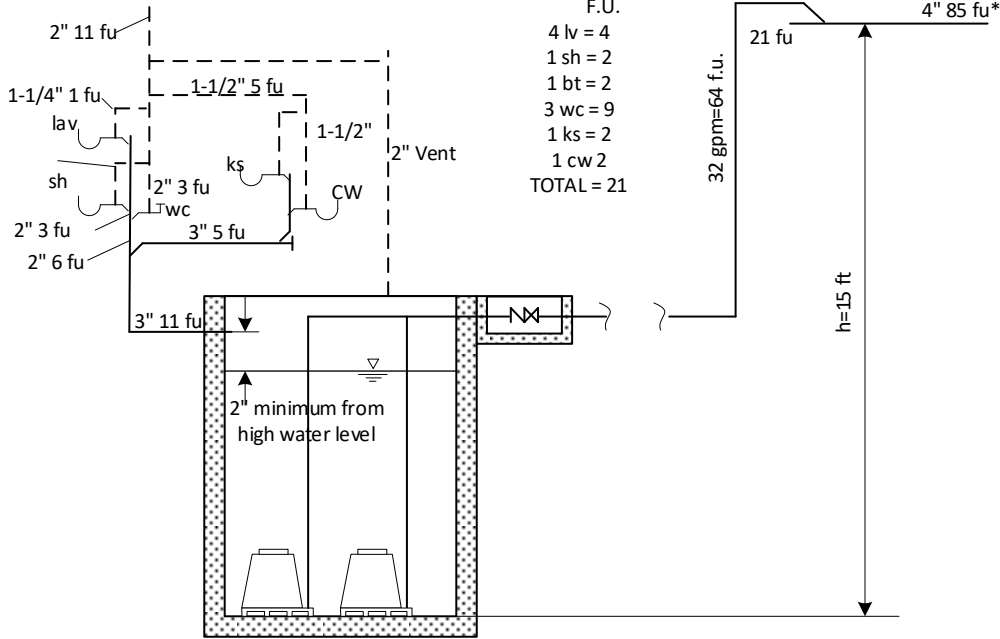


- Bathtub (bt)
- Clothes Washer (cw)
- Kitchen Sink (ks)
- Lavatory (lv)
- shower (sh)
- Water Closet (wc)



Existing load
from the main
dwelling

- F.U.
- 4 lv = 4
 - 1 sh = 2
 - 1 bt = 2
 - 3 wc = 9
 - 1 ks = 2
 - 1 cw = 2
 - TOTAL = 21



DO NOT SUBMIT PLANS ON 8 1/2" x 11" Sheets
USE REGULAR SIZE BLUPRINTS

Sample of calculations:

Step 1. Calculate the equivalent pipe length:

Use the following equivalent length for the fittings:

Diameter of fitting in inches	45° bend feet	90° bend feet	Gate Valve feet	Backwater valve feet
2"	4'	7'	1.3'	11'
3"	6'	10'	2'	16'
4"	8'	14'	2.7'	22'
6"	12'	20'	4'	31'

(1) 45° bend	4 ft
(6) 90° bend	42 ft
(1) Gate Valve	1.3 ft
(1) Backwater valve	11 ft
Developed pipe length	90 ft
TOTAL EQUIVALENT LENGTH $l =$	148.3 ft

Step 2. Calculate the System Curve:

$h_n = \frac{10.51Q^{1.85}}{C^{1.85}d^{4.87}} l \quad (\text{feet of water})$	<p>Q = Flow in g.p.m. d = Pipe diameter in inches l = Total Equivalent Length in feet C = Hazen-Williams Coefficient</p>
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Use:	C=100 for cast iron pipes C=120 for black iron pipes	C=140 for cement lined and copper pipes C=150 for plastic pipes
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$h =$ difference in elevation between the bottom of the sump basin and the gravity sewer line

$$h_{tot} = h_n + h \quad (\text{feet of water}) \quad \text{System Curve}$$

Assuming plastic pipes:

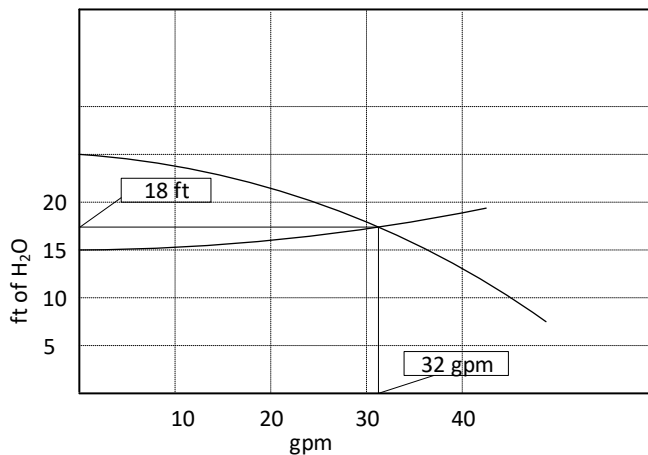
Q (g.p.m.)	10	20	30	40
h_n (ft)	0.3	1.2	2.5	4.2
h (ft)	15	15	15	15
h_{tot}	15.3	16.2	17.5	19.2

Step 3. Find the system operating point

Plot down the system curve on top of the pump performance curve. The point of operation of the pump system is where the two curves intersect; that is:

$$Q = 32 \text{ gpm}, h_{\text{tot}} = 18 \text{ ft}$$

Pump:
Best Pump Co. Model SE 300 Explosion proof
18 ft @32 gpm
¼ hp 1725 rpm
2 phase 60Hz 240V



Step 4. Acceptance of the pump:

The flow coming out of the pump must be equal or greater than the flow coming into the sump:
(fixture units coming in) x (2 fixture units/gpm) < gpm pumped out

Step 5. Determine the number of fixture units discharging from the pump:

$$32 \text{ gpm} \times 2 \text{ fixture units/gpm} = 64 \text{ fixture units.}$$

Step 6. Conclusions

Add the fixture units discharging from the pump to the fixture units in the horizontal drain and continue checking sizing the system.

SIZING OF SUMP BASIN

The code does not regulate the size of the sump basin in a sewer system however, the basin needs to be large enough to accommodate the pump or pumps installed inside it.

Some designers select a usable volume of the sump basin to be at least twice the volume that is ejected in one minute by the pump. (In our example $32 \times 2 = 64$ gal.)

Other designers chose pump and basin to have a minimum cycling time of 6 minutes (10 start-ups per hour).

The cycling time is the time between two consecutive pump start-ups:

Cycling time = Time to empty the basin + Time to fill the basin

Rate of discharge = 32 gpm (Pump discharge) – 5.5 gpm (Water incoming into the sump) = 26.5 gpm

If the sump usable volume is 90 gal, then the time it takes to empty the basin is:

$$\frac{64 \text{ gal}}{26.5 \text{ gpm}} = 3.9$$

and the time it takes to fill the basin is:

$$\frac{64 \text{ gal}}{5.5 \text{ gpm}} = 11.6 \text{ min}$$

Thus, the cycling time is:

$$(3.9 + 11.6) \text{ min} = 15.5 \text{ min}$$

Therefore, since the cycling time is more than 6 minutes, the useable sump volume of 64 gallons is adequate.

