# Chapter 3.1
# Storm Drainage Sizing

# Building Drain & Sewer

- *Building Drain*—That part of the lowest piping of a drainage system that receives the discharge from soil, waste and *other* drainage pipes inside and the extends 30 inches in developed length of pipe beyond the exterior walls of the building and conveys the drainage to the building sewer.
- *Building Sewer*—That part of the drainage system that extends from the end of the building drain and conveys the discharge to a public sewer, private sewer, individual sewage disposal system or other point of disposal.

# Building Drain & Sewer Types

- *Combined*—a building drain or sewer that conveys both sewage and storm water or other drainage.
- *Sanitary*—a building drain or sewer that conveys sewage only
- *Storm*—a building drain or sewer that conveys storm water or other drainage, but not sewage.

# Conductor vs. Leader

- *Conductor*—a pipe inside the building that conveys storm water from the roof to a storm or combined building drain.
- *Leader*—an exterior drainage pipe for conveying storm water from roof or gutter drains to an approved means of disposal.

# Information Required for Sizing Exercise

- 2003 International Plumbing Code Book
- Tables
  - 1106.2 Size of Vertical Conductors and Leaders
  - 1106.3 Size of Horizontal Storm Drainage Piping
  - Appendix B Area Rain Fall Rate

# Sizing Example

Before we can start we must first determine what we are looking for.

- Are we sizing the vertical conductors or leaders?
- Are we sizing the horizontal drains?
- Are we looking for the required number of roof drains?

We must also have some given information.

1. Roof Size
2. Area Rain Fall Rate

# Sizing Exercise

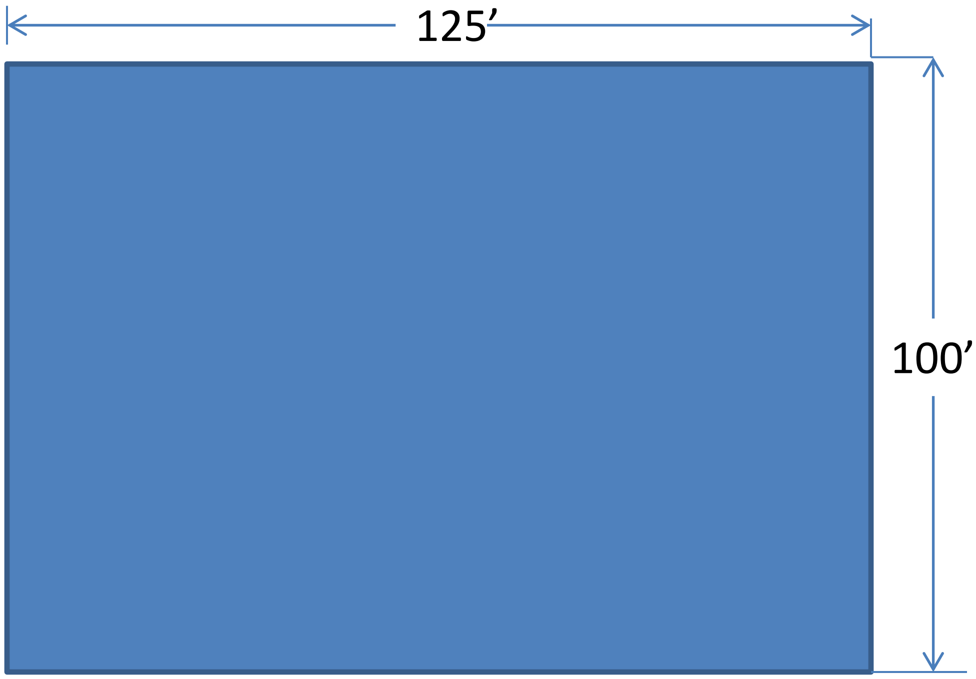
The next three slides are roof sizing exercises.

Figure #1 is a rectangular roof.

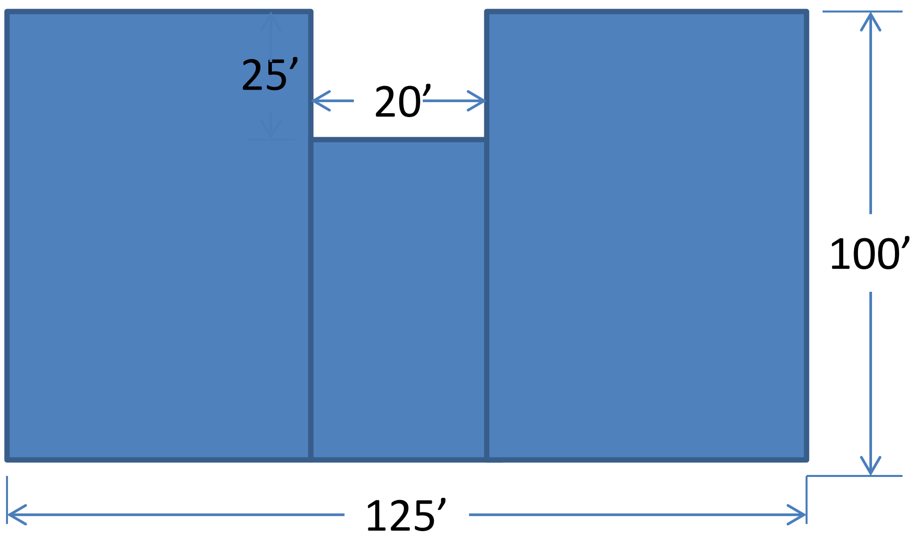
Figure #2 is a “U” shaped roof.

Figure #2 is a round roof.

# Roof Figure 1

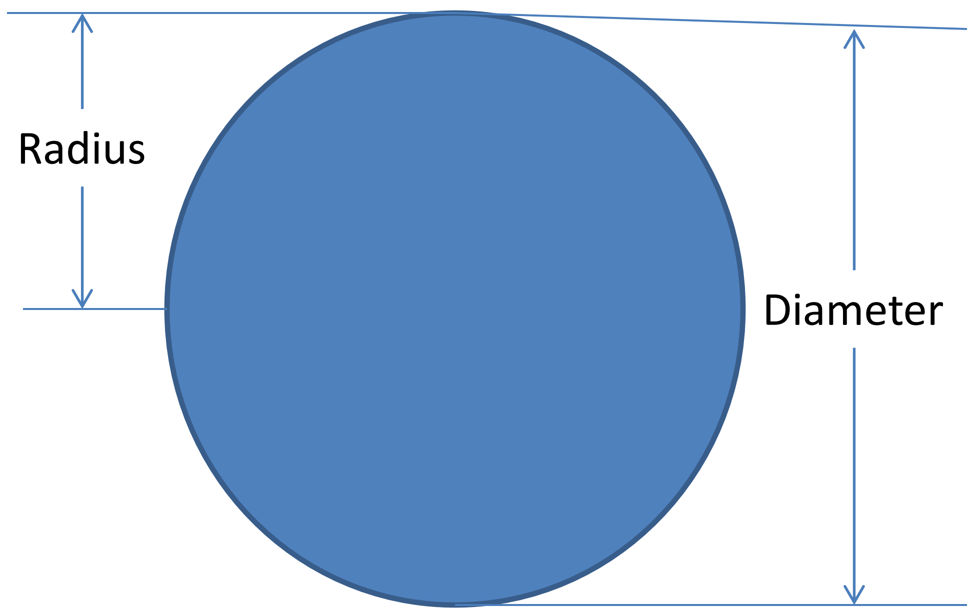


# Roof Figure 2



# Roof Figure 3

The radius is equal to half of the diameter. If the building has a 100’ diameter the radius will be 50’




$A = \pi r^2$ 3.14 x 2500 (50 x 50) *Area = 7,850 square feet*

# Sizing

Tables 1106.2 and 1106.3 are all based on one inch of rain fall. In appendix B of the International Plumbing Code the rain fall rate for the New Haven area is 2.8 inches.

To convert these tables for use in the New Haven area simply divide the square footage in the table by 2.8”.

# Sizing

- Table 1106.2-a 4" vertical conductor at 1" rainfall will handle 18,400 sq. ft. If you divide the 18,400 by 2.8, that same 4" conductor now only handles 6,571.5 sq. ft.
- Table 1106.3-a 4" horizontal drain at 1" rainfall at ¼" slope will handle 10,600 sq. ft. of roof area. If you divide the 10,600 by 2.8 that same 4" drain now only handles 3,786 sq. ft.

# Table 1106.3

Care must be taken when making any field adjustments to slope on horizontal drains. A 4" drain in New Haven will handle 3,517 sq. ft. of roof area at ¼" slope. If the slope were change to 1/8" the 4" drain will now only handle 2,686 sq. ft. of roof area. If we had to maintain the 1/8", we would have to increase the pipe size to 5" to be capable handling the same roof area as the 4" pipe at ¼ slope. With the price of materials, this could become quite costly.

# Values for Continuous Flow

Section 1109 of the International Plumbing Code addresses if equipment such as air conditioning units or similar devices discharge onto a roof, how you would calculate that discharge as additional roof area. Each gallon per minute shall be equal to 96 sq. ft. of roof area at 1" rainfall. As in the previous slide, if you divide the 96 by 2.8 the roof area is now 34.3 sq. ft.

# Practice Problem #1

In figure #1 we have a roof area of 12,500 sq. ft. If this roof where in New Haven, how many 4" conductors will be required.

If we divide 18,400 by 2.8 we find that a 4" conductor will handle 6,571 sq. ft. of roof. We now divide 12,500 by 6,571 and find that we need 2 4" conductors.

# Problem #1

- Roof Size
  - 150’ x 150’ = _________ sq. ft.
- Conductor Size… 3”
  - 3” @ 1” rainfall per hour = _______ sq. ft. roof area
  - ______ ÷ ____ (New Haven Rain Fall Per hr.) = _______ sq. ft. roof area.
  - __________ ÷ __________ = _______
- Number of conductors required. ______

# Problem #2

- Roof Size
  - 200' x 150' = _____________ sq. ft.
- Number of conductors 4
  - ________ sq. ft. ÷ 4 = ______ sq. ft. each conductor can handle.
  - 4"conductor handle 18,400 sq. ft. @ 1" per hr.
  - ______ ÷ _____ (N.H. rainfall rate) = ______ sq. ft.
  - 5"conductor handle 34,600 sq. ft. @ 1" per hr.
  - ________ ÷ _____ (N.H. rainfall rate) =_________ sq. ft.
- Minimum size conductor required. ______

# Problem #3

- Roof Size
  - 150’ x 150’ = _______ sq. ft.
- Slope 2%
- Six Roof Drains
  - _______ ÷ 6 = _______ sq. ft. each drain.
  - 4” horizontal @ 1” per hour = _______ sq. ft.
  - _______ ÷ ____ (N.H. rainfall rate) ______ sq. ft.
- Minimum size of horizontal drain. _____

# Problem #4

- Roof Size
  - 175’ x 150’ = _______ sq. ft.
- Discharge of 5 GPM into one roof drain.
  - 5 x 96 sq. ft. (1 GPM=96 sq. ft. roof area) = 480 sq. ft.
- Four Conductors
  - _______ ÷ 4 = ________ sq. ft. each drain
  - 4” conductor @ 1” PH rainfall rate = ________ sq. ft.
  - _______÷ 2.8” (N.H. rainfall rate) = ________ sq. ft.
  - _______ sq. ft. + _____ sq. ft. (discharge rate one drain) = ________ sq. ft.
- Minimum size of conductors.
  - 3—____ conductors handling _______ sq. ft. roof area.
  - 1—____ conductor handling _______ sq. ft. roof area.