



ENGINEERING DEPARTMENT
1201 S. Nappanee Street
Elkhart IN 46516
Phone (574) 293-2572
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DRAINAGE REQUIREMENTS
Updated 2/12/16

Commercial & Industrial Sites

The City of Elkhart maintains a policy wherein all storm water shall be retained upon the property from which it accumulates. Retention methods using dry wells, swales, or retention ponds have historically been the type of runoff storage facilities submitted for approval. Alternative storage measures will be considered, but greater detail must be submitted relating the design and benefits of the alternative. Paved area surface retention shall not exceed 20% of total retention required. When retention basins are installed deeper than two (2) feet below the ground surface, a minimum of a six (6) foot fence or barrier may need to be placed along the perimeter of the proposed basin as described in *City Code 151.228 (E)*.

Other regulations pertaining to drainage requirements are established in *City Code 97.121 and 151.146 (E)*. Per the requirements established by *City Code 97.121*, no owner or occupant of any building shall cause the pipes conducting water from the eaves of the building to be so constructed as to spread water over the adjoining sidewalk, street or alley pavement. (Also, no roof drains will be allowed to empty into the City's sewer system, in compliance with Federal Law). In an instance where a wetland district adjoins a site, storm water runoff from the development shall be directed away from the ecosystem as designated in *City Code 151.146 (E)*. Previously mentioned references are not an inclusive list of regulations governing storm water runoff. City Codes are subject to change based on Common Council rulings.

Drainage plans shall be submitted to the City of Elkhart, Engineering Department at:

**Public Works & Utilities
1201 S. Nappanee Street
Elkhart IN 46516
Attention: Drainage Plans**

Drainage plans forwarded to this office shall contain the following information and materials:

- 1 copy of the drainage plans.
- Name of owner and company requesting approval.
- Applicant's address, phone number and contact person.
- Complete plan of site showing property lines, buildings, parking lots, sidewalks, retention areas, location of dry wells, and other pertinent structures or features of the property.
- Plan shall be to scale.
- Plans shall also show how water flows across the entire site by use of elevations and/or contour lines, or flow arrows.
- Detailed drawings shall also be included to show dry well size and dimensions, retention ponds in profile, or dimensions, including depth and slope, and/or any other drainage structures.
- All drainage calculations shall be on the drainage plans submitted.
- The City of Elkhart's Engineering Department will verify all calculations.

“Rational Method”

A simplified version of the rational method is the formula used by the City’s Engineering Department to calculate the necessary on site drainage requirements. The formula is:

$$Q = CIA$$

where **Q** = runoff to be retained (ft³)

C = runoff coefficient

I = rainfall intensity (ft/24-hours)

A = area (ft²)

An explanation of how the City uses the rational method is necessary to avoid confusion. To make understanding the calculations process, an example of a mock site has been provided on the following page.

When first sitting down to calculate drainage requirements, one must first decide what portions of the property are **impervious** (i.e. asphalt, concrete roofs, etc.) and what portions are **pervious** (i.e. landscape areas). Having classified the different areas, begin using basic geometry to calculate the square footage (ft²) of the **impervious** and **pervious** segments of the property. Following the steps on the next page, it can be seen that the area has been broken down into two parts added together: one for **impervious** and one for **pervious** site considerations.

$$Q = C_1IA_1 + C_2IA_2$$

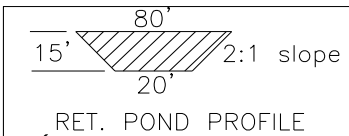
Let (**C₁IA₁**) be designated for the **impervious** and (**C₂IA₂**) for the **pervious** calculation.

At this point, be aware the City has made some assumptions. The first assumption for **I**, (intensity), is that a 3 inch rainfall is a common occurrence over a 24-hour period in northern Indiana. Three inches is converted to 0.25 feet in order to allow the final answer to be recorded in cubic feet. The other assumption, for the term **C** (runoff coefficient), is that **impervious** surfaces have an estimated runoff of **90%** and **pervious** surfaces have an estimated runoff of **30%** (0.9 will be used in calculation for the **impervious**, and 0.3 will be used for **pervious**).

$$I = 0.25' \text{ (for a 3" rainfall)}$$
$$C_1 = 0.9 \text{ (for impervious surfaces)}$$
$$C_2 = 0.3 \text{ for (pervious surfaces)}$$

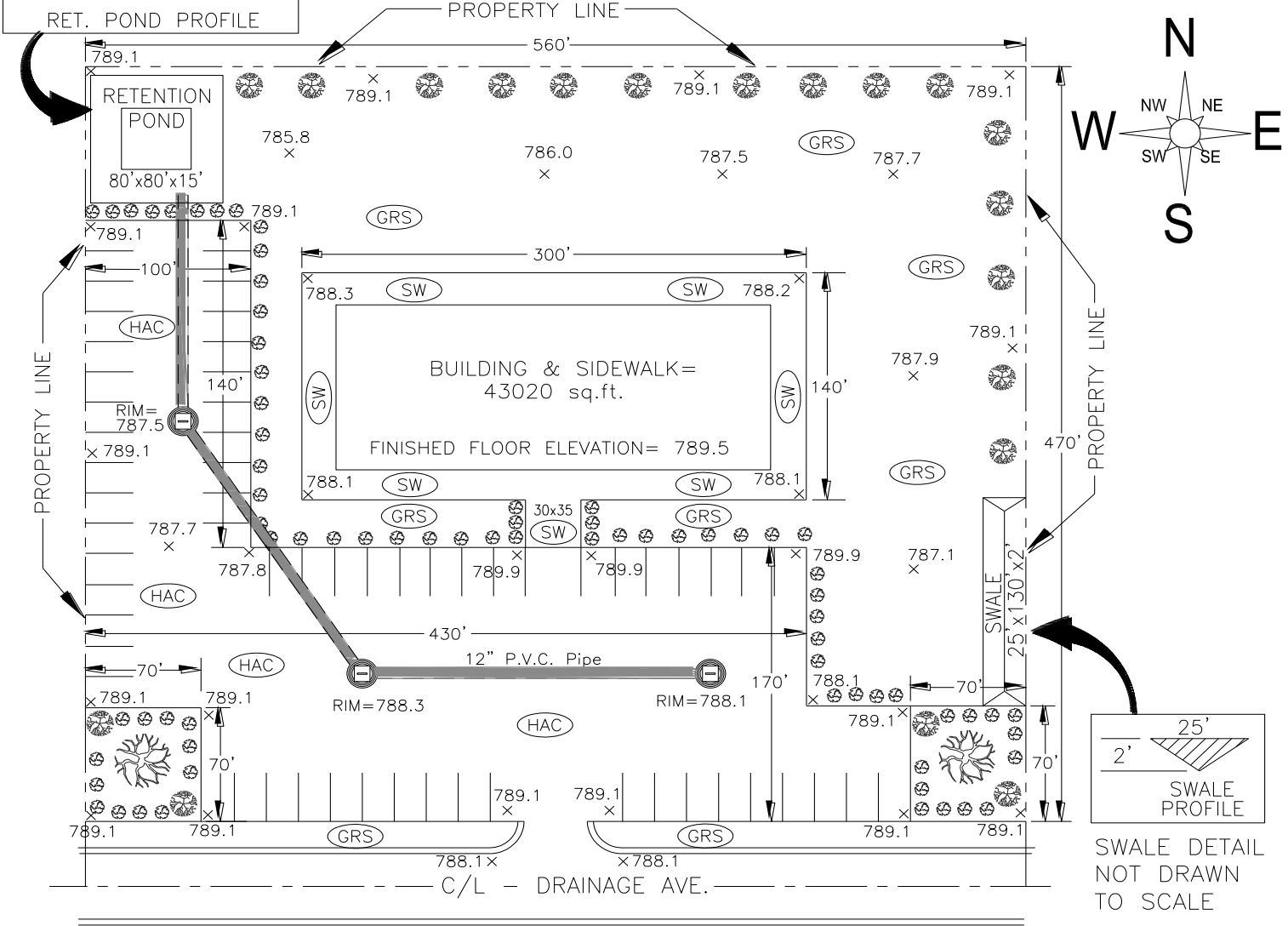
Calculation of the drainage requirements for a site can be accomplished using the square footage for the **impervious** and **pervious** surfaces in combination with the assumptions provided.

Having the necessary storage requirements, it is now the responsibility of the Owner to create on site storage facilities that meet or exceed the current runoff volume.



RETENTION POND
DETAIL NOT
DRAWN TO SCALE

DRAWING NOT TO SCALE



AREA REQUIRING RETENTION

PARKING LOT	= 92,800sq.ft.
BUILDING & SIDEWALK	= 43,020sq.ft.
GREEN SPACE	= 117,730sq.ft.

AVAILABLE RETENTION

SWALE = (130x25x2)/2 = 3,250cu.ft.
VOLUME OF RET. POND = 42,000cu.ft.

- 1.) IMPERVIOUS AREA = PARKING LOT + BUILDING & SIDEWALK = 135,820cu.ft.
- 2.) PERVIOUS AREA = GREEN SPACE = 117,730sq.ft.

$Q = C_1 IA_1 + C_2 IA_2$

$Q = (.90)(.25)(135,820) + (.30)(.25)(117,730) = 39,389.25\text{cu.ft. NEEDED}$

39,389.25cu.ft. < 42,000cu.ft. PLAN APPROVED

ALL DIMENSIONS and AREAS MUST BE IN: FT., SQ.FT., OR CU.FT.