Land Development Services

Technical Bulletin

Subject: Setting basement floor elevation above the groundwater table in residential construction | **Date: July 15, 2019** | **No.: 19-09**

Summary: This Technical Bulletin clarifies the process for design engineers to follow to prevent future problems with groundwater intrusion into basements or lowest floors.

Effective Date: Immediately

Background: Designing the basement or lowest finished floor elevations for residential developments in the area where the water table is high can be challenging. If the basement or lowest finished floor elevation is set to be below the groundwater table or subjected to rising groundwater levels, problems such as groundwater flooding of the basement or continuously running sump pumps may arise. These can cause damage to the building and create hardship and financial loss for existing and future homeowners. Frequent cycling of sump pumps, due to the extended presence of groundwater, can also result in concentrated and sustained discharge, yard flooding, potential right-of-way hazards, and impacts to adjacent properties.

Policy: Design engineers must evaluate the proposed basement floor elevation or the lowest finished floor elevation as compared to the seasonal high water table (SHWT) elevation and include appropriate mitigation on the civil plans, if appropriate, to avoid future problems with groundwater intrusion into basements or lowest finished floors.

For residential construction of single-family dwellings and townhouses, the required groundwater mitigations depend on the freeboard outlined below. Freeboard is defined as the distance between the SHWT and basement or lowest finished floor elevation.

1. Case 1: Freeboard is greater than 2.5 feet (SHWT is more than 2.5 feet below the basement or lowest finished floor elevation). For this case:
    a. Groundwater mitigation is not required and standard perimeter underdrains, both exterior and interior, connected to a sump pit are considered adequate.
    b. Foundation drain details must be included on the civil plans.

2. Case 2: Freeboard is between 1 and 2.5 feet. For this case:
    a. Every effort must be made to raise the basement or lowest finished floor elevation to achieve the required freeboard of Case 1.
    b. If raising the basement or lowest finished floor elevation is not feasible and the site topography allows for a gravity outfall, installation of an underdrain system connecting to a structure associated with a gravity storm-drain system or to a free gravity outfall condition is required. The hydraulic gradient of the underdrain pipe is to be calculated from the 10-year hydraulic gradient of the mainline storm-drain system.
    c. Foundation drain details must be included on the civil plans.
    d. In case the site topography or storm-drain system elevation do not allow for a gravity outfall or gravity connection from the underdrain, a dual pump system

will be permitted provided each pump is rated and designed for the anticipated load, and the system must have backup power.

3. Case 3: Freeboard is negative and groundwater is above the surface of the basement or the lowest finished floor or freeboard is between 0 and 1 foot. For this case:
    a. Every effort must be made to raise the basement or lowest finished floor elevation to achieve the required freeboard of Case 1.
    b. If that is proven not to be feasible and the County concurs, the basement or lowest finished floor elevation must be raised to Case 2.
    c. If that is also proven not to be feasible, a crawl-space may be used or the basement must be eliminated altogether.

The process outlined above applies to all residential construction of single-family dwellings with Infill Lot Grading Plans (INF), Conservation Plans (CON), Bonded Lot Grading Plans (SDGP/SPGP), and Rough Grading Plans (RGP); and townhouses with Site Plans (SP), Rough Grading Plans (RGP), and Bonded Lot Grading Plans (SPGP).

If you have any questions, please contact Behzad Amir Faryar, Ph.D., P.E. in the Site Development and Inspections Division at behzad.amirfaryar@fairfaxcounty.gov or 703-324-1720, TTY 711.

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