



WESTPORT, CONNECTICUT

DEPARTMENT OF PUBLIC WORKS

TOWN HALL, 110 MYRTLE AVE.
WESTPORT, CONNECTICUT 06880
(203) 341 1120

MEMORANDUM

November 1, 2015

To: All Engineering Firms and interested parties.

Re: Updates to Town of Westport Storm Water Drainage Design Standards

Below are several updates and clarifications to the Town of Westport Engineering Department's Storm Water Drainage Design Standards (the Standards) which went into effect on October 1, 2014. These updates shall be in effect as of 11/01/2015.

- 1. Soil Testing to be Witnessed by Engineering Department.** Soil testing is required to be witnessed by a representative of the Engineering Department. This is stipulated on p. 1 for non-engineered systems, and p. 3 for engineered systems. While we can and often do review other soil testing, in particular testing for the Westport-Weston Health Department and/or tests from an engineer from a previous proposed development for the site, hydrological conditions for a site can change. This is especially so for a site that has had extensive development on it. *So it is imperative that the Engineering Department witness the soil testing.*
- 2. Footing Drains Draining into Town of Westport Catch Basins.** As stated in Item 7 on p. 3-4, groundwater drains, e.g. footing drains, shall not be connected to the Town of Westport storm drainage system unless specifically allowed by the Director of Public Works. Most of the Town of Westport storm drainage systems are already at or beyond their capacities. Any petition to the Director of Public Works for such a connection would require a hydrologic and hydraulic analysis of the existing Town-owned system to determine if it is adequate enough to accommodate the increase in proposed flow. The same is true for high level overflows or metered overflows from storm drainage systems, as stipulated in Item 3 on p. 2-3.
- 3. Drainage Systems in Coastal Areas.** Any storm drainage system that is proposed in areas where groundwater conditions might reasonably be expected to be affected by the tides of Long Island Sound shall be set at a minimum elevation of 5.0' NAVD88. This is based on combining the Mean High Water (MHW) elevation in Westport, 3.30', one standard deviation of that mean, or 0.70', and the required 12" buffer as stipulated in Item 6 of the Standards, p. 3.
- 4. Level Spreaders.** Where a level spreader is proposed for a system overflow, the rule of thumb to be used for design is a flow rate of 0.20 CFS per 10 linear feet of level spreader. This is based on insuring that the flow rate out of a level spreader remains "overland flow", with a height of less than 1/2", and not concentrated flow; and to insure flow velocities that will minimize potential down-gradient erosion. Level spreaders shall be constructed with a minimum width of 18", with a level lip, using 1 1/4" stone (3/4" to 1 1/4" stone is acceptable).

Please note also that level spreaders are to be no closer than 30' from the property line, unless approved by the Town Engineer. Again, the design principle is that the spreader will promote overland flow and avoid concentrated flow.

5. **Drainage System Overflows.** If an underground storm water detention system is proposed with a catch basin high-level overflow, the maximum outflow from the catch basin shall be 0.25 CFS. This is based the condition that outlet discharges shall not concentrate flow or adversely affect adjacent or downstream properties, as stated in Item 3, p. 3 of the Standards. Overflow catch basins that are located on driveways that might potentially drain onto a Town or private roadway may be required to have a less flow, and will be considered on a case by case basis. This limitation of outflow is required regardless of the fact that the system as a whole for the whole site might have been modelled for a zero net increase in flow rate from the site, pre- to post- conditions.
6. **Separation Distance for a Detention System from a Property Line:** The separation distance from a storm water detention system to a property line shall be 15', unless approved by the Town Engineer.

As we stated when we published the revised Standards in October of 2014, these Standards may be modified from time to time, as need be, to account for new government regulations, changes in technology, or constructive criticism by the design professional implementing them. If you wish to offer commentary or have specific questions regarding these Standards, please contact our office.

Sincerely,

Peter Ratkiewich, P.E.
Town Engineer (203) 341-1131



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MEMORANDUM

Effective 10/01/2014

Town of Westport Storm Water Drainage Design Standards

Non-engineered Systems:

Where the proposed development involves construction of less than 850 sq. ft. of new impervious area, the Town of Westport Engineering Department may be able to specify the size of a non-engineered storm water detention system. This will be only be possible on sites with favorable groundwater conditions, no wetland issues, and no interference with septic systems. Test pits may be required to determine feasibility of a non-engineered system. If a system is feasible, it shall be specified using the criteria listed below. In cases of more difficult site conditions, the applicant may be directed to obtain the services of a licensed professional civil engineer to perform a more detailed hydrological and hydraulic analysis of the site, and provide an engineered design for the site.

Non-engineered systems shall be sized based on detaining a volume equal to 100% of the runoff from new impervious surfaces in a 25-year, 24-hour storm event, (6.4 inches of rainfall over any 24 hour period). There shall be no credit allowed for any existing impervious area removed, and the system shall be designed based on the total proposed new impervious areas. Also, no credit shall be allowed for exfiltration volume.

In-ground swimming pools shall be assumed to have a 4" storage volume over the entire area of the pool, and thus shall need to account for 2.4 inches (or 6.4 - 4.0) of runoff over the area of the pool. Patios, (even if brick pavers or slate with stone dust base), are considered impervious, and will need to be accounted for in the storm water runoff volume calculations. The concrete slab used for pool equipment shall be included in the runoff volume amount.

For non-engineered detention systems, the contractor shall contact the Town of Westport Engineering Department to coordinate testing of the soils in the area of the proposed drainage system. The Engineering Department shall witness the soil tests, verify the drainage characteristics of the soil, and verify the size of the proposed detention system. The bottom of the proposed detention system shall be a minimum of 24" above any ledge and a minimum of 12" above any mottling layer. The Contractor shall contact the Town of Westport Engineering Department to inspect the installed drainage galleries prior to backfilling of the system.

Engineered Systems:

Where the proposed development involves the construction of more than 850 sq. ft. of new impervious area, or if site conditions warrant as described above, the applicant shall obtain the services of a licensed professional civil engineer to perform a hydrological and hydraulic analysis of the site. The storm water detention system shall be designed using the criteria listed below.

1. The Engineer shall utilize the Natural Resources Conservation Service (NRCS) TR-55 or TR-20 methodology to evaluate the hydrological difference in runoff for an appropriate area of concern between the proposed developed condition and an assumed existing condition of vacant land with no impervious area. There is no "credit" given for existing impervious surfaces to be removed. The area of concern for existing conditions shall be given an appropriate curve number (CN) as though it were entirely vacant land, even though it may include impervious surfaces.

This shall be so for any proposed development, whether new dwelling construction, small additions, or site improvements. Furthermore, if the proposed activity can be classified as "new construction", as defined in the Planning & Zoning Regulations, storm water detention shall be required. Only a structure that is not classified as "new construction" as defined in the Regulations and that retains the same physical foundation -- not just the same footprint, but the same actual foundation -- shall be considered existing impervious area and shall not require (additional) storm water detention.

The impervious area to be accounted for in the hydrological analysis shall include all roofs, driveway and parking areas, patios, decks, walkways, and retaining walls with a top width of more than 18". Gravel driveways shall be considered impervious, and shall use a CN of 98. In-ground swimming pools shall be considered impervious, along with their adjoining patios and walkways. Brick pavers and slate patios installed with only stone dust (i.e. no cement) shall also be considered impervious, and for these it is up to the discretion of the design engineer to use a suitable CN, subject to the approval of the Town Engineer.

2. Engineered systems shall be designed to accommodate a Type III, 25-year, 24-hour rain storm event. The Town of Westport uses $P_{25} = 6.4"$ for the 25-year 24-hour storm event. The 2-year storm event, used for computing a T_c with sheet flow, shall be $P_2 = 3.5"$. The source for the precipitation data is the Northeast Regional Climate Center Publication No. RR 93-5, which supersedes the U.S. Department of Commerce Technical Paper No. 40 (TP-40). See also Appendix A at the end of this memo. For your reference, Publication No. RR 93-5 is available from the NRCC website through the following link:

http://www.nrcc.cornell.edu/reports/RR_93-5.pdf

3. The volume of runoff to be detained shall be determined by routing, using either a manual stage-discharge analysis or a routing program. Exfiltration, if used, must be based on an actual percolation test, performed in the general area and discharge (invert) depth of the proposed detention system, and must also be routed. A minimum factor of safety of 1.5 shall be used for all percolation rates, subject to the approval of the Town Engineer.

Other outlet discharges, such as high level overflows or metered outflows, shall discharge in a manner that will not concentrate flow or adversely affect adjacent or downstream properties. Proposed connections to Town of Westport drainage systems shall be allowed only by permit and only if the existing Town-owned system is investigated and analyzed by the design engineer and found to be adequate to handle the increase in proposed flow.

4. All detention systems shall be designed to store a minimum volume equal to 1” of runoff from all new impervious surfaces, i.e. a “first flush” of runoff. If there is an outflow discharge in the proposed system, the first flush storage volume must be accounted for below the invert of the discharge. In addition, a water quality evaluation in accordance with the 2004 Connecticut Stormwater Quality Manual shall be performed and incorporated into every storm drainage design submission.
5. The use of Low Impact Design (LID) methodology is encouraged; however any such design must also meet the design requirements herein. Rain gardens, pervious pavement systems, and pervious pavers must be designed as complete drainage systems, with appropriate subsoil investigation, including test pits and percolation tests, hydrological and hydraulic analysis of the system, inspection of the installation by the Design Engineer and the Town, and a maintenance plan. Rain gardens in particular must drain out fully within 24 hours of a design storm, and include a maintenance narrative that will prevent them from becoming regulated wetlands.
6. Each engineered design shall include the appropriate soils test data taken from the general area of the proposed system installation. Soil testing shall be performed and witnessed by the Town of Westport Engineering Department, and reported as part of the proposed development submission plans and report.

Soil test data shall include:

- a) Deep test pits indicating and identifying the elevation of soil strata, and indicating the presence (or lack of) mottling, groundwater, and/or ledge. If no restrictive layers are found the minimum depth of the test pit shall be 8 feet deep.
- b) A percolation test performed in accordance with the guidelines of the Connecticut State Health Code, or a permeability test performed by an approved testing laboratory.
- c) An assessment of the soils classification as designated by the Natural Resources Conservation Service, NRCS. This information is available from the NRCS Web Soil Survey at the following link:

<http://websoilsurvey.sc.egov.usda.gov>

The bottom of the proposed detention system shall be a minimum of 24” above any ledge and a minimum of 12” above any mottling layer.

7. If underground detention systems are proposed to be used for foundation footing drains that utilize a pit and pump system, such systems shall be designed to adequately handle a base flow of 0.05 cfs (~ 22 gpm), or the actual maximum flow rate of the pump, whichever is greater. Pump specifications and flow data shall be included in the design package.

In some cases where high levels of groundwater or mottling are apparent, the Town Engineer may require an evaluation of the impact on groundwater levels in the surrounding area. Pursuant to P&Z Regulation 32-8.3.10, drawdown of groundwater levels shall not be allowed.

Groundwater drains, whether by gravity or by pump, shall not be discharged as point discharges, but shall be discharged to a level spreader no closer than 30' from the property line, or into a separate drywell system. No connection to the Town of Westport storm drainage system shall be allowed unless specifically allowed by the Director of Public Works. All such connections shall be authorized by the obtaining of a Road Opening Permit prior to connection.

8. Concrete gallery volumes shall be the net volume available for water storage, i.e. less the concrete volume, and shall be equivalent to those supplied by gallery manufacturers, and those used in the HydroCAD program. Some typical values of net volume are:

<u>Nominal Dim.</u>	<u>Net Vol. (cu ft)</u>
1' x 4' x 8'	18.7
1.5' x 4' x 8'	32.2
2' x 4' x 8'	45.3
4' x 4' x 4'	44.3
4' x 4' x 8'	93.6

The porosity of the stone surrounding the galleries at the sides, between, above, and/or below shall be no more than 40%, or 0.40.

9. Galleries shall be sized for the specific impervious area collected, be that a roof section or driveway area, etc., and not just for the overall net increase in volume due to the proposed development.

Submission Standards

There are a number of commercially available software packages that utilize TR-55 and TR-20 methodology to evaluate storm water drainage systems, any of which can be used by the design engineer. Furthermore, the NRCS has made available to the public shareware versions of WinTR-55 and WinTR-20, which are available on their website.

Each proposed development project shall be required to submit an analysis and design that incorporates at minimum the following elements.

- a) A brief narrative of the activity, a summary of the change in impervious area, and a tabulation of the design input values.
- b) A routing diagram indicating how sub-watershed areas and detention systems are related.
- c) An analysis and listing for each sub-watershed area, indicating a curve number (CN) and Time of Concentration (T_c).
- d) A description, analysis, and summary of each storage element within the system.
- e) A graphic display of all appropriate hydrographs.
- f) A tabular summary of routing results.

- g) A site plan showing the existing conditions of the site and the extent of the proposed development, in accordance with Planning & Zoning submission standards.

Please note that the Town of Westport reviewer(s) will be evaluating proposed development submissions using a commercially available software program called HydroCAD, by HydroCAD Software Solutions, LLC, of Chocoura, NH.

Questions:

If you have any questions regarding these standards, please contact the Town of Westport Engineering Department at (203) 341-1131.

Appendix A: NRCC Rainfall Map, State of Connecticut

Extreme Precipitation Estimates 24hr 25yr

