

# DIVISION OF DRINKING WATER

## HYDRAULIC MODELING RULE SUMMARY

### Hydraulic Modeling Rule (R309-511) Applicability

I. Typically, a hydraulic modeling report and a certification of the hydraulic modeling results by a Professional Engineer (PE) are both required as a part of the plan review process for **public drinking water projects** that are for new construction, water system expansions, and new public drinking water systems.

- Hydraulic modeling report and PE certification may NOT be required if:

the water system is a transient system, and R309-550-5(3) does not apply. *[R309-511-4(1)(a); R309-550-5(3)(b) and (c)]*; or,

the water system is a non-transient non-community water system with system demand less than the requirement in R309-510 and does not provide water for fire suppression. *[R309-511-4(1)]*.

- Hydraulic modeling report and PE certification are NOT required if the proposed public drinking water project will not result in negative hydraulic impact. *[R309-511-4(1)(a)(i)(A) through (G)]*. For example:

Addition of new sources.

Re-development of any spring or well source.

Adding disinfection, fluoridation, or other treatment facilities that do not adversely impact flow, pressure or water quality.

A change or addition of a water treatment process.

Interior re-coating or re-lining of any raw or drinking water storage tank, or water storage chamber within any treatment facility.

Water main additions with no expansion of service (i.e. looping lines).

The "in-situ" re-lining of any pipeline.

Adding pump station(s) from source or storage upstream of distribution service connections.

Adding transmission lines to storage or sources without adding service connections.

Public drinking water projects that have negligible hydraulic impact as determined by the Director.

- A hydraulic modeling report is not required but a PE certification of the hydraulic analysis of the proposed project is required if:

the water line project is part of a planned phase of a master plan previously approved by the Director. *[R309-511-4(1)(a)(ii)]*; **or**,

the water system has formally notified the Division of Drinking Water that the water system maintains and updates a hydraulic model of the system and designates a

professional engineer who is responsible for overseeing the hydraulic analysis.  
[R309-511-4(1)(a)(iii)].

II. The following are considered **on-going operation and maintenance procedures** [R309-500-5(2)J]. Therefore, neither plan review nor hydraulic modeling requirements apply.

Pipeline leak repair.

Replacement of existing deteriorated pipeline where the new pipeline segment is the same size as the old pipeline or the new segment is upgraded to meet the minimum pipeline sizes required by R309-550-5(4) or larger sizes as determined by a hydraulic analysis in accordance with R309-550-5(3), excluding substantial distribution system upgrades that involve long-term planning and complex design.

Tapping existing water mains with corporation stops so as to make connection to new service laterals to individual structures.

Distribution pipeline additions where the pipeline size is the same as the main supplying the addition or the pipeline addition meets the minimum pipeline sizes required by R309-550-5(4) or larger sizes as determined by a hydraulic analysis in accordance with R309-550-5(3), the length is less than 500 feet and contiguous segments of new pipe total less than 1000 feet in any fiscal year.

Entry into a drinking water storage facility for the purposes of inspection, cleaning and maintenance.

Replacement of equipment or pipeline appurtenances with the same type, size and rated capacity (fire hydrants, valves, pressure regulators, meters, service laterals, chemical feeders and booster pumps including deep well pumps).

### **Minimum Requirements for the Hydraulic Model** [R309-511-5]

Are all the following requirements addressed in the hydraulic model?

1. Include at least 80% of the total pipe lengths in the distribution system affected by the proposed project.
2. Account for 100 % of the flow in the distribution system affected by the proposed project. Water demand allocation must account for at least 80% of the flow delivered by the distribution system affected by the proposed project if customer usage in the system is metered.
3. Include all 8-inch diameter and larger pipes. Pipes smaller than 8-inch diameter should also be included if they connect pressure zones, storage facilities, major demand areas, pumps, and control valves, or if they are known or expected to be significant conveyers of water such as fire suppression demand.
4. Include all pipes serving areas at higher elevations, dead ends, remote areas of a distribution system, and areas with known under-sized pipelines.
5. Include all storage facilities and accompanying controls or settings applied to govern the open/closed status of the facility that reflect standard operations.
6. If applicable, include all pump stations, drivers (constant or variable speed), and accompanying controls or settings applied to govern their on/off/speed status that reflect various operating conditions and drivers.

7. Include all control valves or other system features that could significantly affect the flow of water through the distribution system (i.e. interconnections with other systems, pressure reducing valves between pressure zones) reflecting various operating conditions.
8. Impose peak day and peak instantaneous demands to the water system's facilities.
9. The model has been calibrated to adequately represent the actual field conditions using field measurements and observations.
10. Account for fire suppression flow and duration if fire hydrants are connected to the distribution system or if the fire suppression requirements are specified by the fire authority.
11. Account for outdoor use, such as irrigation, if the drinking water system supplies water for outdoor use.

### **Certification Elements [R309-511-6]**

Does the Professional Engineer's certification address the following elements?

1. The hydraulic model meets the minimum requirements in R309-511-5.
2. The demand requirements specified in Rules R309-510 and -511 have been used to evaluate various operating conditions of the public drinking water system.
3. The hydraulic model predicts that new construction will not result in any service connection within the new expansion area not meeting the minimum distribution system pressures as specified in R309-105-9.
4. The hydraulic model predicts that new construction will not decrease the pressures within the existing water system such that the minimum distribution system pressures as specified in R309-105-9 are not met.
5. The calibration methodology is described and the model is sufficiently accurate to represent conditions likely to be experienced in the water delivery system.
6. Identify the hydraulic modeling method. If computer software was used, identify the software name and version.
7. The certification is signed, dated, and stamped by a registered Professional Engineer, licensed to practice in the State of Utah.
8. The velocities in the model are not excessive and are within industry standards.

For community public water systems:

Has the water system management certified that they have received a copy of input and output data for the hydraulic model with the simulation showing the worst case results in terms of water system pressure and flow?

### **Hydraulic Model Design Elements Report [R309-511-7]**

Does the Hydraulic Model Design Elements Report include the following elements?

1. If the public drinking water system provides water for outdoor use, the report must describe the criteria used to estimate this demand.
2. The total number of connections served by the water system including existing

connections and anticipated new connections served by the water system after completion of the construction of the project.

3. The total number of equivalent residential connections (ERC) including both existing connections as well as anticipated new connections associated with the project.
4. Provide the following information:
  - methodology used for calculating demand and allocating it to the model;
  - a summary of pipe length by diameter;
  - a hydraulic schematic of the distribution piping showing pressure zones, general pipe connectivity between facilities and pressure zones, storage, elevation and sources; and,
  - values of friction coefficients used in the hydraulic model according to pipe material and condition in the system.
5. A statement stating either “yes fire hydrants exist or will exist within the system” or “there are no fire hydrants connected to the system and there is no plan to add fire hydrants with this project.” Identify the local fire authority’s name, address, and contact information, as well as the fire flow quantity and duration if required.
6. The locations of the lowest pressures within the distribution system, and areas identified by the hydraulic model as not meeting each scenario of the minimum pressure requirements in R309-105-9.
7. Calibration method and quantitative summary of the calibration results (i.e., comparison tables, graphs).

**Additional Requirements for “Hydraulic Model Design Elements and System Capacity and Expansion Report” [R309-511-7; R309-511-8; R309-110-4 “Master Plan” Definition]**

For a regional or system-wide hydraulic analysis, instead of a “Hydraulic Model Design Elements Report,” a “Hydraulic Model Design Elements and System Capacity and Expansion Report” is often required. A Hydraulic Model Design Elements and System Capacity and Expansion Report typically includes the following elements in addition to the seven items listed above.

1. A listing of sources including source name, source type for both existing and additional sources needed for system expansion, minimum reliable flow of the source in gpm, status of the water right, and the water right limit.
2. A listing of storage facilities including storage tank name, the type of material, the diameter, the total volume in gallons, the elevation of the overflow, the lowest level of the equalization volume, the fire suppression volume, and the emergency volume or the outlet elevation.
3. A listing of pump stations including pump station name and pumping capacity in gpm.
4. A listing of the pipe sizes with their associated pipe materials and, if readily available, the approximate length of pipe in each size and material category.
5. A schematic of the distribution piping showing node points, elevations, length and size of lines, pressure zones, demands, and coefficients used for the hydraulic analysis.
6. A listing by customer type along with an assessment of their associated number of ERCs.

7. The number of future connections along with their associated ERC value that the public drinking water system is committed to serve, but has not yet physically connected to the infrastructure.
8. A description of the nature and extent of the area currently served by the water system and a plan of action to control addition of new service connections or expansion of the public drinking water system to serve new development(s). The plan shall include current number of service connections and water usage as well as land use projections and forecasts of future water usage.
9. A hydraulic analysis of the existing distribution system along with any proposed distribution system expansion already identified.
10. A description of potential alternatives to manage system growth, including interconnections with other existing public drinking water systems, developer responsibilities and requirements, water rights issues, source and storage capacity issues and distribution issues.