HYDRAULIC CALCULATIONS TIPSHEET

IDEAS & TOOLS FOR ITERATING FIRE SPRINKLER HYDRAULIC CALCULATIONS

Hydraulic calculations are an important part of ensuring that the systems designed will be effective in suppressing a fire. These topics below are important aspects to consider – not corners to cut – but rather ideas to get unstuck in optimizing a sprinkler system. For more fire protection resources visit www.meyerfire.com/subscribe.

TOPIC	DESCRIPTION	RESOURCE / REFERENCE
Backflow Preventer Loss	**Concept:** Different backflow preventers offer different loss characteristics. Upsizing the backflow preventer or changing manufacturer/models can offer less friction loss.	TOOLKIT: BACKFLOW DATABASE
Drop Configuration	**Concept:** Direct drop, hard-pipe armovers, return-bends, and flexible drops all offer different friction loss characteristics. Adjusting the sprinkler connection can offer friction loss savings.	ARTICLE: FLEX DROPS ARTICLE: RETURN BENDS
K-Factor	**Concept:** Adjusting the k-factor based on density and sprinkler spacing directly impacts the starting pressure within a hydraulic calculation. **Adjust:** Sprinkler k-factor suited for density and sprinkler coverage area	TOOLKIT: K-FACTOR SELECTOR SPRINKLER FLOW ARTICLE: K-FACTOR
Main Routing	**Concept:** Locating mains strategically to capture most of the system flow can benefit system efficiency. Consider shifting the main location to best accommodate the system, such as a middle cross main in a grid, centrally-located main on a tree, etc.	TOOLKIT: REMOTE AREA CALCULATOR
Pipe C-Factor	**Concept:** Pipe type (plastic, copper, ductile iron, or steel) and system type (wet, dry, pre-action, or deluge) will impact the c-factor. C-factor directly relates to friction loss using the Hazen-Williams method of hydraulic calculations.	TOOLKIT: FRICTION LOSS CALCULATOR
Pipe Schedule	**Concept:** Pipe wall thickness can have a major effect on friction loss. Changing from Schedule 10 to Schedule 40, for instance, can increase friction loss by 24%.	TOOLKIT: FRICTION LOSS CALCULATOR
Pipe Sizes	**Concept:** The larger the pipe diameter, the easier (less friction loss) the water will experience when passing through the pipe. Conversely, having oversized pipe on branch lines can allow too much water to flow through open orifices; right-sizing can reduce wasted water and lower friction loss.	TOOLKIT: FRICTION LOSS CALCULATOR
Remote Area Size	**Concept:** NFPA 13 allows reduction in remote area sizes, including (perhaps the most common) quick-response reduction. Reduced remote area sizes flow less sprinklers, require less water, and require less water to be forced through pipe.	TOOLKIT: REMOTE AREA CALCULATOR
Special Application Sprinklers	**Concept:** Many manufacturers have designed sprinklers specific to a protection purpose. These can often offer better flow characteristics for a specific hazard.	TOOLKIT: SPRINKLER DATABASE
Sprinkler Spacing	**Concept:** Using the maximum allowable sprinkler spacing will affect the minimum flow required through a sprinkler, which, combined with the k-factor, will affect the starting (minimum) pressure required at the sprinkler. This has greater effect with extended-coverage sprinklers.	TOOLKIT: K-FACTOR SELECTOR SPRINKLER FLOW ARTICLE: K-FACTOR
System Type	**Concept:** Perhaps most important consideration is the system type (grid, loop, or tree). Dry and pre-action systems have limitations (no grids allowed), but if a facility is big enough then moving to a loop or grid configuration may significantly help the system perform more efficiently (ie: smaller size pipe).	NFPA 13: 2002 7.2.3.5, 2007-16 7.2.3.10, 2019 8.2.3.10
Valve Type	**Concept:** Valves which do not restrict or obstruct waterflow typically offer less pressure loss than valves that do.	-
Water Source Elevation	**Concept:** Is the water source elevation accurate relative to the project elevation? The height of the water source directly impacts available pressure at the project.	TOOLKIT: WATER SUPPLY