Irrigation Codes and Standards and How They Impact You
Brent Mecham, Brian Vinchesi
Market Transformation

Voluntary
- BMPs
- Standards
- Green Initiatives
- Consumer Expectations

Mandatory
- Ordinances
- Codes
- Executive Orders
Irrigation BMPs

Collaboration between ASIC & IA

BMP & Practice Guidelines
– Design
– Installation
– Management

Appendices
– Inspection & Commissioning
– Water Budgeting
– Scheduling
Definitions

Tests—Sprinklers & Bubblers
- Flow Rate
- Distance of Throw
- Distribution Uniformity
- Burst Pressure
- Check Valve
- Pressure Regulation
ASABE/ICC 802—2014 Landscape Irrigation Sprinkler and Emitter Standard

Tests—Emitters and Microsprays
  Uniformity of flow rate
  Flow rate as a function of pressure
  Emitter exponent for PC emission devices
  Check valve function
Standardized Procedure for Determining Landscape Plant Water Demands
## Annual Average Fraction of ET<sub>0</sub>

<table>
<thead>
<tr>
<th>Plant Type</th>
<th>Plant Factor</th>
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<tbody>
<tr>
<td>Turf – Cool Season</td>
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<td>Turf – Warm Season</td>
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<tr>
<td>Annual Flowers</td>
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<tr>
<td>Woody plants, herbaceous perennials—Wet* (&gt; 20 inches of precipitation)</td>
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<tr>
<td>Woody plants, herbaceous perennials—Dry*</td>
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<tr>
<td>Desert plants (&lt; 10 inches of precipitation)</td>
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</table>
ASABE X626

• Measuring Irrigation Performance
  – Catch Can Tests
  – Drip Evaluation
  – Soil Moisture Tests

• Commissioning
ASABE X633 and X627

• Soil Moisture Sensors
  – Sensor Only
  – Beta Testing

• Environmentally Responsive Controllers
  – Weather Based Only
SWAT vs. EPA WaterSense Labeling

• If you have one should you get the other?
  – How?
Green Codes

• Supplement or overlay other building codes and enforceable
• “Greener” way of building
  – Energy efficiency
  – Water efficiency
  – Indoor environment
• Go outside of the building envelope
  – Site requirements
  – Landscape & irrigation requirements
ASHRAE 189.1

- ASHRAE 189.1-2014 Standard for the Design of High-Performance Green Buildings
  - 40% turf limitation in the water efficiency section
  - Irrigation provisions
    - Hydrozoning
    - Controllers—SWAT posted 80% / 10%
    - 33% of landscape can use potable water or
    - 35% of total landscape water can be potable or municipally reclaimed water
      - 70% ET₀ for turf, 55% ET₀ for plantings
  - Meters > 25,000 s.f. or 1000 gal/day (potable)
IgCC-2015

• Reduce potable water use by 50%
  – Unless allowed by AHJ
• Design and installation by accredited or certified professional
• Controller regulates based on weather or soil moisture
• Rain sensor
• Hydrozoning
• Pressure regulation for drip is 40 psi or less
IgCC-2015

• Sprinklers shall:
  – MPR
  – Prohibited in area less than 4 feet
  – Prohibited on slopes greater than 25%
    • Except if PR is less than 0.50 in./h
  – Sprinklers on turfgrass only
  – 4 inch pop up minimum
  – $DU_{lq}$ not less than 0.65
IgCC-2015

- Alternate water sources
- Rainwater systems no limit on method
- Graywater systems subsurface only and storage maximum 24 hours
- Signage & equipment marking requirements
- Water quality testing requirements
- Metering potable and nonpotable water required if there is a controller
LEED v4

• Understanding that what they say is not the same as what they mean.
• Water really means potable water.
• Maximum points for harvesting water for irrigation.
News brief

• ASHRAE 189.1, IgCC, LEED, AIA are merging efforts.
• Minimize duplication and overlap.
• LEED picks up where the standard ends.
Green Supplement-2012

• Backflow for potable and reclaimed
• Designed to use minimum 75% of alternate water for annual demand.
• Control system
  – WBIC or SMS
  – Rainfall and soil moisture suspension
  – Cycle & Soak
  – Post irrigation controller settings
    • PR
    • Plant factors
    • Sensor settings
    • Peak demand schedule
Green Supplement-2012

• Low Flow Irrigation
  – Pressure regulation appropriate for emission devices
  – Required for vegetation over 12 inches in height

• No runoff out of zone

• No low-head drainage

• No off target application

• Prohibited on narrow areas less than 4 feet

• Sloped areas maximum 0.75 PR
Green Supplement-2012

- Sprinklers-low precipitation rate
- Sprinklers have MPR
- Sprinklers shall have pressure regulation
  - At the valve or the sprinkler
- Sprinklers shall pop up at least 4 inches
- Sprinklers shall not exceed 1 in./h
- Catch can test (6 cans for 15 minutes)
- Competent designers and contractors shall be certified to perform the work
2015 additional provisions

• Dedicated meter for landscapes > 1,500 s.f. with controller (2,500 s.f. w/o controller)
• Meter for vegetated roofs > 300 s.f.
• Maximum velocity for irrigation is 5 fps in plastic pipes, 7.5 fps in metal pipes
• Master valve for continuously pressurized alternate water sources
• Identification when using alternate water on conversions. New areas use purple pipe.
2015 additional provisions

- Sensors to inhibit irrigation when raining or freezing conditions.
- Controls follow WaterSense specifications
- Sprinklers and Emitters comply with ASABE/ICC 802-2014 standard
2015 additional provisions

• Exception to runoff / off target application is allowed for paved walkways, paths, etc. that are outside of public right of way. Water stays within hydrozone.

• Outside hose bibs shall be allowed on irrigation pipe downstream of PBD with signage.

• Pipe bury
  – > 10,000 s.f., 18 in. for main line, 12 in. for laterals
  – < 10,000 s.f., 12 in. for main line, 8 inches for laterals
  – Vehicle surfaces in sleeve minimum 24 inches deep
News

• IAPMO GTS 2015 will be last version
  – Creating a standard about water use efficiency instead of code for easier adoption.
  – WE-Stand 2017 ANS for Water Efficiency

• Green Building Initiative
  – Working on updating the 2010 standard

• National Green Building Standard
  – Updating for 2015
Alternate Water Sources

• Rainwater Harvesting Standard
  – ASPE/ARCSA 63

• Stormwater Harvesting Standard
  – ASPE/ARCSA 78
Commissioning

- ICC 1000-201X Standard for Commissioning
- 1st draft out for public comment
- Commission Providers/Specialist –certified
- Commissioning plan
- Testing & Evaluating
- Documentation, i.e. operators manual
- Report
- 3rd Party Vendor
EPA WaterSense

• Pending
  – NOI Pressure Regulating Sprinklers
  – NOI Soil Moisture Sensors
A New Way to Measure, Calculate and Use Irrigation Efficiency
A New Way to Measure, Calculate and Use Irrigation Efficiency

David Zoldoske,
Center for Irrigation Technology
Brent Mecham, Irrigation Association
Key Terms

- Coverage
- Distribution Uniformity
- Overspray losses
- Percolation losses
- Sprinkler Operation Efficiency
- Irrigation Efficiency
Runoff
Percolation
Keeping Water on Target
Simple
Challenging
Difficult
Spray nozzle
MSMT Rotary Nozzles
Multiple nozzle performance
Multiple nozzle performance
SWAT Testing Protocol

• Spray Head Nozzles Performance Characteristics 3.2
  – Individual nozzles and groups of nozzles
  – Spacing configurations
  – Operating pressures
  – Repeatability
  – $D_{U_{lq}}$
  – Sprinkler operational efficiency

• Finalized April, 2015—ready for testing
Testing configurations
Testing Area
Pressure is set to manufacturer recommendations

Catchment devices measure to 0.01 inches
Testing

• Consider:
  – Operating pressure
  – $DU_{lq}$
  – Overspray
  – Percolation (excess)
  – Median and Effective application rate
  – Sprinkler Operating Efficiency
$DU_{1q} = 0.40 \quad OS = 0.1\% \quad PL = 42.7\% \quad OE_S = 57.2\%$
$DU_{eq} = 0.83 \quad OS = 1.5\% \quad PL = 10.4\% \quad OE_S = 88.3\%$
$DU_{iq} = 0.49 \quad OS = 6.8\% \quad PL = 15.3\% \quad OE_S = 78.9\%$
Results-Spray

<table>
<thead>
<tr>
<th>Nozzle</th>
<th>Shape</th>
<th>psi</th>
<th>(PR_{\text{median}})</th>
<th>(PR_{\text{effect}})</th>
<th>OS %</th>
<th>PL %</th>
<th>(OE_S)%</th>
<th>DU_{\text{lq}}</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
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<td>0.82</td>
<td>0.63</td>
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<td>0.94</td>
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<td>69.9</td>
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</table>

Same nozzle and spacing, different operating pressures
### Results-MSMT

<table>
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<th>Shape</th>
<th>psi</th>
<th>$\text{PR}_{\text{median}}$</th>
<th>$\text{PR}_{\text{effect}}$</th>
<th>OS %</th>
<th>PL %</th>
<th>$\text{OE}_s$ %</th>
<th>$\text{DU}_{\text{lq}}$</th>
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<td>R-1</td>
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<td>19.1</td>
<td>80.0</td>
<td>.66</td>
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<tr>
<td>R-2</td>
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<td>40</td>
<td>0.60</td>
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<td>10.4</td>
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<td>45</td>
<td>1.04</td>
<td>0.70</td>
<td>0.1</td>
<td>57.4</td>
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<td>.40</td>
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</table>

<table>
<thead>
<tr>
<th>Nozzle</th>
<th>Shape</th>
<th>psi</th>
<th>$\text{PR}_{\text{median}}$</th>
<th>$\text{PR}_{\text{effect}}$</th>
<th>OS %</th>
<th>PL %</th>
<th>$\text{OE}_s$ %</th>
<th>$\text{DU}_{\text{lq}}$</th>
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</thead>
<tbody>
<tr>
<td>R-1</td>
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<td>0.37</td>
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<td>0.65</td>
<td>0.57</td>
<td>6.8</td>
<td>15.3</td>
<td>78.9</td>
<td>.49</td>
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<tr>
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<td>1.35</td>
<td>0.88</td>
<td>6.0</td>
<td>36.6</td>
<td>59.6</td>
<td>.53</td>
</tr>
</tbody>
</table>

Rotating multi-stream, multi-trajectory nozzles
In 2014 CIT was asked to develop a protocol useful in administering sprinkler rebate programs

- The protocol would be administered by third-party testing agencies to:
  - Pre-qualify turf sprinklers for rebate programs
  - Establish current “state-of-the-art”
  - Provide incentives for ongoing improvements
  - Unfortunately no test protocol existed that calculated sprinkler application efficiency
Current sprinkler test method:

• NOT consistent with operational conditions
• Single head tested
• Computer simulation using multiple heads
• Makes no allowances for jet mechanical interference
Full scale irrigation set-up in CIT sprinkler test laboratory to evaluate performance

- Sprinkler heads operated simultaneously
- Sprinkler heads operated individually
- Application efficiency calculated for each
Irrigation Design/Operation Test Setup
Phenomena of Jet Interference = DU: 59.8

All sprinklers operated simultaneously
Non Interference = DU: 87.1

All sprinklers operated individually
Test

• Tests conducted by CIT
• Defined shape and spacing
• Manufacturers supply the nozzle best suited to the situation.
Pattern Loss = \frac{\sum_{i=1}^{75} (x_i - x)}{100 \bar{x}}

Where \( x_i \) = app rate at 75% of area
\( \bar{x} \) = average application rate
# Manufacturers recommended and supplied the nozzle to irrigate a square shape that is 30 ft. x 30 ft. in size.

## Results—Square

<table>
<thead>
<tr>
<th>Nozzle</th>
<th>Shape</th>
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<th>PR&lt;sub&gt;median&lt;/sub&gt;</th>
<th>PR&lt;sub&gt;effect&lt;/sub&gt;</th>
<th>OS %</th>
<th>PL %</th>
<th>OE&lt;sub&gt;S&lt;/sub&gt; %</th>
<th>DU&lt;sub&gt;lq&lt;/sub&gt;</th>
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<td></td>
<td>30</td>
<td>1.62</td>
<td>1.38</td>
<td>1.0</td>
<td>20.1</td>
<td>79.1</td>
<td>.74</td>
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<tr>
<td>#2</td>
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<td>1.61</td>
<td>1.40</td>
<td>0.1</td>
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<td>.74</td>
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<td>0.56</td>
<td>6.2</td>
<td>12.7</td>
<td>81.9</td>
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<tr>
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<tr>
<td>#5</td>
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<td>30</td>
<td>1.25</td>
<td>1.09</td>
<td>0.9</td>
<td>21.2</td>
<td>78.1</td>
<td>.65</td>
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<tr>
<td>Avg</td>
<td></td>
<td></td>
<td>2.0</td>
<td>19.7</td>
<td>78.6</td>
<td>.71</td>
<td></td>
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</table>
### Results—Circular

Manufacturers recommended and supplied the nozzle to irrigate a circular shape that is 30 feet in diameter.

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<th>Shape</th>
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<th>PR$_{\text{median}}$</th>
<th>PR$_{\text{effect}}$</th>
<th>OS %</th>
<th>PL %</th>
<th>S$_{OE}$ %</th>
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<td>0.2</td>
<td>33.6</td>
<td>66.3</td>
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<td>40</td>
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<td>0.49</td>
<td>6.0</td>
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<td>67.9</td>
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<td>68.4</td>
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<tr>
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<td>1.82</td>
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Comparison—same nozzle

<table>
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<th>Nozzle</th>
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<th>PR$_{\text{median}}$</th>
<th>PR$_{\text{effect}}$</th>
<th>OS %</th>
<th>PL %</th>
<th>$S_{OE}$ %</th>
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<td>.74</td>
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<td>1.47</td>
<td>7.0</td>
<td>24.2</td>
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<td>0.2</td>
<td>33.6</td>
<td>66.3</td>
<td>.29</td>
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</tbody>
</table>

Same nozzle. Test #1-c is “fine-tuning” after test #1-b
Study at Cal Poly-Pomona

• Distribution Uniformity of Multi-Stream, Multi-Trajectory Rotary Nozzles Spaced Below Recommended Distance
  – Kumar, Green, Vis
Study: RMSMT nozzles

- Maximum spacing  HTH
- Spacing reduced 10%, nozzle unadjusted
- Spacing reduced 25%, nozzle unadjusted
- Spacing reduced 10%, nozzle adjusted
- Spacing reduced 25%, nozzle adjusted

10% = common design practice
25% = common maximum radius adjust
<table>
<thead>
<tr>
<th>Treatment</th>
<th>Nozzle A</th>
<th>Nozzle B</th>
<th>Nozzle C</th>
<th>Overall</th>
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</thead>
<tbody>
<tr>
<td>Max HTH</td>
<td>.58</td>
<td>.58</td>
<td>.45</td>
<td>.54</td>
</tr>
<tr>
<td>-10% unadj.</td>
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<td>.65</td>
<td>.57</td>
<td>.62</td>
</tr>
<tr>
<td>-25% unadj.</td>
<td>.59</td>
<td>.78</td>
<td>.62</td>
<td>.66</td>
</tr>
<tr>
<td>-10% adjust.</td>
<td>.81</td>
<td>.76</td>
<td>.52</td>
<td>.70</td>
</tr>
<tr>
<td>-25% adjust.</td>
<td>.75</td>
<td>.74</td>
<td>.67</td>
<td>.72</td>
</tr>
<tr>
<td>Overall</td>
<td>.68</td>
<td>.71</td>
<td>.56</td>
<td>.65</td>
</tr>
</tbody>
</table>

Average of four replications

Unadjusted = over spraying target area
Questions?

Thank You!
Conclusions

• Curvilinear shapes are more difficult to irrigate efficiently.
• DU is one metric—focus is on “dry”
• Sprinkler operation efficiency considers where is the water going.
• MSMT nozzles create less interference of pattern.
• Keeping water on target is more important than highest DU.
Recommendations

• Reduce catalog info by 10-15%
• Adjust nozzle to keep water on target
• Shoot for highest DU possible
• Use the real application rate for scheduling
• Limit extra run time to no more than 20%
• If there are persistent dry areas—fix the sprinklers, or check for other causes
• Install sprinklers expertly
  – Spacing, correct nozzle, aligned, plumb, etc.
Creating Efficiency in Design
Using Hydraulic Modeling

Joel Johnson, Bentley Systems, Inc.
Presentation Overview

• Introduction

• Basics of Hydraulics

• Available Modeling Tools

• Workshop
  • Construction of a Hydraulic Model
  • How to Use Model Results
Hydraulic Modeling Survey

What is the “black box” behind a hydraulic model?

– One of those nomograph chart things that you draw lines on to size pipes
– A series of spreadsheet calculations using engineering formulas
– A complex algorithm that simultaneously solves for the water pressure and flow in a pipe network
Survey (continued)

The last time I used hydraulic modeling was:

– Um... Never?
– I remember a course back in college...
– We had a big project once, so we used hydraulic modeling software
– I use it on most, if not all, pressure system designs
Hydologic vs. Hydraulic Modeling
Basics of Hydraulics
Types of Modeling

Hydrologic Modeling:
Rainfall, Runoff

Hydraulic Modeling:
Pipes, Channels, Engineered Systems
Types of Modeling

**Gravity Flow Systems:** Ditches, Channels, and Pipes that are not flowing at full depth

- stormwater conveyance, gravity sewers

**Pressurized Flow Systems:** Pipes are flowing full, interaction with pumps, storage, and discharge under pressure

- water distribution, fire protection, sprinklers
Pressure System Hydraulics

• Pressure measured at any point in a volume of water is caused by the weight of the liquid above that point.

Pressure is usually measured in pounds per square inch (psi), 2.31 ft = 1 psi.
Hydraulics in a Pipe

• In a pressure system the water is enclosed within pipes

• The water surface is now in the tank therefore the pressure is measured vertically to this point
Pumped Systems

• If the stored water is lower than the delivery point, you must design a pump to achieve the desired pressure.

  Design pressure of 60 psi ~ 150 feet: pump must add this in addition to any elevation change (total head).
Hydraulic Grade Line (HGL)

• What is total head (HGL) ?

• It is the pressure you would measure if you were at sea level

• Therefore total head or HGL = Elevation + Pressure
Hydraulic Model Computations

• Hydraulic models work in total head (HGL)
• Pressures are defined by subtracting the elevation from the total head (HGL):
  \[
  \text{Pressure} = \text{HGL} - \text{Elevation}
  \]
• It takes energy to transport water along a pipeline
  This energy is taken from the water’s potential energy (HGL)
• So as you travel away from the water source the HGL reduces
  – This reduction/loss of HGL is known as **HEAD LOSS**
Head Loss

• HEAD LOSS is calculated as the difference in the HGL from one end of a pipe to the other

\[
\text{Head Loss} = \text{Upstream HGL} - \text{Downstream HGL}
\]

• HEAD LOSS = Upstream HGL – Downstream HGL
Head Loss in Piping Systems

• What causes Head Loss in a pipe?
What is the relationship of Length, Roughness, Flow and Diameter to Head Loss?

Hazen Williams: \[ h = \frac{KL}{D^{4.87}} \left( \frac{Q}{C} \right)^{1.85} \]

Darcy Weisbach: \[ h = \frac{KLfQ^2}{D^5} \]

- Headloss \( \propto \) Length
- Headloss \( \propto \) f(Roughness)
- Headloss \( \propto \) Flow^2
- Headloss \( \propto \) 1 / Diameter^5

Therefore, changing Diameter has the greatest impact on Head Loss
Other Losses

• What else in the piping system can cause Head Loss?

  – Meters, sensors, or other measurement devices
  – Valves
  – Backflow preventers
  – Filters
  –Reducers
  – Bends and fittings
Modeling Software and Process
Why Model?

Hydraulic modeling can help:

• Determine the expected pressure distribution in a system
• Evaluate storage capacity/needs and volume supplied
• Evaluate parallel/concurrent operation of systems
• Determine appropriate pipe size
• Evaluate operation schedules and determine constraints
• Evaluate pumping needs and efficiency
What Tools Are Available?

Public Domain Software

• EPANET (http://www.epa.gov/nrmrl/wswrd/dw/epanet.html)
  – Advantages: Free! Widely used, minimal footprint on computer, relatively easy to use, access to source code
  – Disadvantages: No support, no upgrades, limited interface, no interaction with mapping or CAD software

Commercially Available Software

– Advantages: technical support, continued upgrade and development, advanced analytical features, can integrate with GIS and/or CAD platforms
– Disadvantages: Cost (compared to EPANET), multiple vendors
“Workshop”

• Use GIS base map to set up simple golf course model

• System Components:
  – Water source / storage (pond at constant level)
  – Pump station (1 pump)
  – Pipes (2” to 6”)
  – Sprinkler heads

• Design flow rate – use rotor sprinkler head with 60’ coverage radius, 30 gpm flow rate
Model Construction

- In EPANET, place junctions at sprinkler locations
- May be helpful to have CAD alongside, use northing and easting and input manually
- CAD or GIS embedded can overlap on basemap and place using strategic symbol size

EPANET: Place junctions and edit coordinates

Get coordinates from GIS or CAD or use background file in embedded modeling platform
System Layout

• “Connect the Dots” – create pipes by literally connecting sprinklers.
• Use uniform size at first, can adjust later based on analysis results
• Establish source and pump as necessary
Elevation Data

• Utilize ground surface data
  – Generally available through State/University sites
• Commercial programs have extraction utilities to extract elevations at nodes
• Include elevation and relevant volume of any storage features – these can be set as constant head or as varying level (requires level/storage capacity relationship)
Initial Settings

- Use one-point pump definition, unrealistically large for pipe sizing
  - Design Flow @ maximum with all sprinklers running
  - Head @ 60-80 psi on discharge side
- “Demands” = sprinkler output
  - Initially set all sprinklers on
- Pipe size:
  - Start with network at one size
  - Work from source to extremes, increase pipe size when head loss is extreme
<table>
<thead>
<tr>
<th></th>
<th>Flow (gpm)</th>
<th>Head (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shutoff</td>
<td>0</td>
<td>200.00</td>
</tr>
<tr>
<td>Design</td>
<td>2,000</td>
<td>150.00</td>
</tr>
<tr>
<td>Max. Operating</td>
<td>4,000</td>
<td>0.00</td>
</tr>
</tbody>
</table>

The diagram shows the pump performance characteristics with two curves representing different operating conditions. The x-axis represents flow (gpm) ranging from 0 to 4,000, while the y-axis represents head (ft) from 0 to 200.00.
Final Adjustments

• Add other “loss” items
  – Valves (define minor loss coefficient)
  – Filters
  – Backflow prevention
  – Bends/fittings
  – Etc.

• Readjust pipe or pump size if not meeting pressure at extremes
Make it Real

• Activate sprinklers in realistic operation and eliminate “demands” for sprinklers that are off
  – Valve closure shouldn’t matter – modeling at steady state so if there is no flow, there is no head loss
• Size the pumps based on realistic flow vs. head
• Replace one-point pump curve with defined pump curve from vendor literature
What Else Can I Do?

• Use “Extended period simulation” (EPS) modeling to define daily watering pattern
  – Cumulative flow to define volume of water applied
  – Iteratively check how you can or can’t concurrently run areas of the system
  – Evaluate use from storage, necessary daily water purchase
What Else Can I Do?

• Pressure Dependent Demands
  – Sprinklers flow at rate dependent upon system pressure
  – Render results with symbol sizes to show coverage

• Automated cost/benefit optimization of pipe sizes
In Summary

- Hydraulic modeling can help:
  - Layout of system/coverage area
  - Size pipes
  - Design necessary pumping
  - Evaluate potential operational schemes
  - Show effects of operational schemes on storage/source water as well as effective coverage
  - Understand the flexibility and limitations of the designed system
THANK YOU!

Joel.Johnson@Bentley.com
GATE VALVES
GATE VALVES

NRS Gate Valve

OS&Y Gate Valve

Knife Gate Valve
WEDGE TYPE GATE VALVES

Solid Wedge

Resilient wedge
### AWWA Torque Requirements

**Table 1  Design valve stem input torque**

<table>
<thead>
<tr>
<th>Nominal Valve Size or NPS</th>
<th>Design Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>in.</strong></td>
<td><strong>ft-lb</strong></td>
</tr>
<tr>
<td>3–4</td>
<td>200</td>
</tr>
<tr>
<td>(75–100)</td>
<td></td>
</tr>
<tr>
<td>6–16</td>
<td>300</td>
</tr>
<tr>
<td>(150–400)</td>
<td></td>
</tr>
<tr>
<td>Larger than 16</td>
<td></td>
</tr>
<tr>
<td>(400)</td>
<td></td>
</tr>
</tbody>
</table>