<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>8:20-8:25 AM</td>
<td>MWEA News and Introductions</td>
</tr>
<tr>
<td>8:30-9:15</td>
<td>Valves 101 - Types, Attributes and Selection, Tim Sullivan</td>
</tr>
<tr>
<td>9:15-10:00</td>
<td>Valves 201 – Valves, Components and Maintenance, Chuck Bugeja</td>
</tr>
<tr>
<td>10:00-10:15</td>
<td>Break</td>
</tr>
<tr>
<td>10:15-11:00</td>
<td>Specialty Valves, John Hunter</td>
</tr>
<tr>
<td>11:00-11:45</td>
<td>Specialty Valves Maintenance, Paul Marchi</td>
</tr>
<tr>
<td>11:45-12:30 PM</td>
<td>Lunch</td>
</tr>
<tr>
<td>12:30-1:00</td>
<td>Gates 101 - Slide Gate Types, Materials and Components, Chuck Kronk</td>
</tr>
<tr>
<td>1:00-1:15</td>
<td>Sluice and Slide Gate Maintenance, Chuck Kronk</td>
</tr>
<tr>
<td>1:15-1:45</td>
<td>Actuator Types, Attributes and Selection, Chuck Bugeja</td>
</tr>
<tr>
<td>1:45-2:00</td>
<td>Break</td>
</tr>
<tr>
<td>2:00-3:00</td>
<td>Actuator Maintenance, Chuck Bugeja</td>
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</table>
MWEA Maintenance Committee
Valves 101
Tim Sullivan, P.E.

[Image of a valve system]
Valves 101 Outline

- Valve Use
- Service Conditions
- General Characteristics
- Valve Specifics
- Vendor / MFR neutral
Valve Types Covered (in order of valves sold)

- Gate valves
- Plug valves
- Check valves
- Butterfly valves
- Ball valves
- Knife gate valves
- Globe valves
Valve Use and Service:

- Isolation vs. Throttling / Control
- Water vs. Wastewater vs. Air
- Valve Characteristics & Materials – Dictate their use
Valve Use (in order)

- Isolation
- Direction check
- Throttling/control
- Air/vacuum relief
Isolation Valves

- Gate
- Plug (sludge)
- Knife gate
- Butterfly (cleaner water, air)
- Ball (cleaner water and air)
Throttling / Control Valves

- Globe valve
- Diaphragm (specialty valve)
- Needle valve (packing / seal water)
- Plug (sludge)
- Pinch valve (sludge)
- Butterfly (air)
- Ball valves, V-Port ball valve (chemicals)
Wastewater Valves

- Plug valve
- Certain Check valves
- Knife gate
- Resilient wedge gate
Clean(er) Water Valves

- Butterfly (secondary effluent)
- Dual Disk Gate
- Nearly all check valves
Potable Water

- Gate, Ball, Butterfly
- AWWA approved
- NSF 61
- Coatings
Air Service

- Ball valves (isolation) $\leq 2''$
- Butterfly (control)
- Water check valves
- Hi Temp can be a concern
Chemical Service

- PVC / FRP / SS Ball valves
- Body and Gasket Materials critical
- Hi Temp / Concentrations can be a concern
- Connections can be source of leaks
Valves 101 Outline

- Valve Use
- Valve Service
- General Characteristics
- Valve specifics
General Valve Characteristics and Considerations

- Body Style
- Headloss
- Cost
- Connections
- Laying Length
- Operator
- Materials
Body Styles

- Line of sight / full port
- Tortuous path (globe, needle, diaphragm, control valves)
- Effect headloss
- “Non-flow” valves (pressure, air/vacuum relief)
- Quarter Turn vs. Multi-turn
Body Materials

- Cast/Ductile Iron
- Plastic:
  - PVC
  - FRP
  - Gaskets (nylon, vyton, EPDM, Buna-N, etc)
- Bronze / Brass / SS
- Fabricated (SS)
Valve Connections

- Mechanical / Push on (underground)
- Flanged (>3”)
- Threaded (<3”)
- Welded/solvent (<2”)
- Grooved coupling
- Union (chemical)
“Service” Materials

Service – Slurry / Chemical feed / Potable Water / Hi temp / air

• Seats
• Seals
• Packing
• O-rings gaskets
• Lining

• Let valve manufacturer know service conditions and he can pick materials
Valve Characteristics & Materials – Dictate their use
Allowable Leakage

- Bubble-tight, ANSI Class VI
- ANSI Class V to II
- Pressure Dependent
- Flow direction dependent
Operators

- Hand wheel (most common)
- Chain wheel (above ~7 ft.)
- Quarter Turn
  - Lever ≤ 6”
  - Gear > 6”
- Gate Valve
  - OS&Y
  - NRS
- Motor/hydraulic/pneumatic actuators
- Open / closed / position
Standard Laying Length

- Nearly standard with all valves except:
  - Knife gates (Fabricated body)
  - Check valves
  - Specialty valves
- AWWA Valves - same laying length
- Butterfly Valves:
  - Flange
  - Lug
  - Wafer
Pressure Rating

- 125 psi/150 psi (norm)
- 250 psi (exception)
- Not all valves designed for shut-off in both directions
Head Loss (in order)

- Ball: 0.4
- Gate: 1.0
- Plug: 2
- Butterfly: 6
- Std Wt. -lever check valves: 7
- Globe: 40

* relative to the Gate Valve

**Wide variation of HL with Check Valves
Location Considerations

- Pump Suction / Meter Isolation
- Laying length
- Flanged / lug / wafer
- Fabricated Grooved coupling (tight installs)
- Under/Overhead
  - Operator and Stems
  - Service - Top Entry: Plug, Gate, Globe
Weight

Valve Weights (6"")

- Wafer/Lug BFV
- Knife Gate
- Flgd BFV
- Plug
- Gate
- Check

<table>
<thead>
<tr>
<th>Weight (lbs.)</th>
<th>Wafer/Lug BFV</th>
<th>Knife Gate</th>
<th>Flgd BFV</th>
<th>Plug</th>
<th>Gate</th>
<th>Check</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>50</td>
<td>100</td>
<td>150</td>
<td>200</td>
<td>250</td>
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</table>
## Relative Valve Weights

<table>
<thead>
<tr>
<th>Type</th>
<th>Relative Weight</th>
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<tbody>
<tr>
<td>Wafer/Lug BFV</td>
<td>0.2</td>
</tr>
<tr>
<td>Knife Gate</td>
<td>0.4</td>
</tr>
<tr>
<td>Flanged BFV</td>
<td>0.5</td>
</tr>
<tr>
<td>Plug</td>
<td>0.8</td>
</tr>
<tr>
<td>Gate</td>
<td>1.0</td>
</tr>
<tr>
<td>Check</td>
<td>1.4</td>
</tr>
</tbody>
</table>
Costs

Costs vs Valve Type

- OW&L CHECK
- OS&Y RW GATE
- PLUG
- AWWA BFV
- KNIFE GATE

4 5 6 7 8 9 10 11 12
## Relative Valve Costs

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Relative to RW GV</th>
<th>Relative to Flanged BF</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLUG</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>AWWA BFV</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>OS&amp;Y RW GATE</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>KNIFE GATE</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>OW&amp;L CHECK</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>Butterfly Valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wafer</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Lug</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Flanged</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>
Valves 101 Outline

- Valve Types covered
- Valve Types not covered
- Valve Use
- General Characteristics
- Valve specifics
Plug Valves

- Preferred for sludge
- Full Port vs. STD Port
- Tapered, cylindrical or spherical plug
- Eccentric plug
- Quarter turn
- Coatings
  - Epoxy (common)
  - None (AWWA)
- Most installed wrong
3 & 4 Way Tapered Plug Valve
What’s wrong with this Picture?
Seating or Unseating Head?

- **Open**
- **Closing**
- **Closed**
Seating or Unseating Head?
Good or bad installation?
Gate Valves

- Resilient wedge (90%+)
- Double disk
- Multi-turn
- Rising Stem (OS&Y)/Non-Rising Stem (NRS)
Gate Valve
Resilient Wedge Gate Valves

- Most common valve
- Preferred for clean(er) water
- Bi-directional
- Full port
O-Ring seals at follower gland and bonnet to body- superior in sealing fluid pressure

Two o-rings above high strength bronze or stainless steel stem, thrust collar is replaceable with the valve in the full open position and under "live" water pressure

304 SS nuts and bolts provide excellent long-life corrosion protection

ARD offers a choice of high tensile strength stems- 304 SS or manganese bronze

100% encapsulated rubber coated ductile iron wedge- zero leakage up to 250psi

Corrosion resistant fusion bonded epoxy coating (internally and externally) NSF-61 approved
Meets AWWA C550 (protecting interior and exterior of valve)

Valves can be supplied with integral mounting pad for an electric motor actuator

Full port waterway- free of cavities and pockets allowing for better velocity and accepts full size tapping machine cutter
Open Stem & Yoke (OS&Y)
Non-Rising Stem (NRS)
Pressure/Balance By-Pass
Valve Barbeque
Ball Valves

- Very diverse types
  - 2 piece/3 piece
  - Floating/trunnion ball
  - Good for throttling
  - Full port/standard port
- Quarter turn
- DI/Teflon ball
- PVC True Union (very common)
- Often used for chemical feed
  - PVC / FRP Body
- Brass/Bronze (Air)
- V-Port ball
Butterfly

- Secondary Effluent or better
- OK for throttling (Air)
- 3 body styles-flanged, lug and wafer
- Rubber lined/seated
- Economical
- Better at lower pressure
- Quarter turn (automate easier)
- “Fly” extends outside of body
- Careful with installation
What’s wrong with this picture?
Globe

- Outdoor House faucet
- Best for potable water
- Throttles/controls very well
- Often small
- Large—very expensive
- High head loss
Knife gate valves

- Cast iron or fabricated (generally SS)
- Options
  - Seating
    - Standard (99/100) and fully bonneted
  - Knife wiper
- Bevel knife edge
- Lug, water and flange
- Not necessarily bi-directional (must be specified) Be careful of installation
- Round, square, rectangular
- Not suitable for throttling
- Wastewater
Knife Gate Valves Bodies
ANSI Face to Face
Rectangular
Check Valves

- Wide variety of styles (in order)
  - Open weight and lever (~7/10)
  - Lever and Spring
  - Rubber flapper
  - Dual disk
  - Cushioned
  - Ball
  - Lift check
Fab Check Valves
# Clean or Dirty Water?

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Dirty Water</th>
<th>Clean Water</th>
<th>Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swing Check</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Rubber Flapper</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Tilting Disk</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Double Disk</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Silent Check</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Ball Check</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Electric Check</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
Needle Valve

- Throttling
- High head loss
- Small sized only
Control Valves
If you properly select, install and maintain valves, everyone’s happy!
Thank You!

Q & A

Timothy Sullivan, P.E.
HNTB
Buhl Building, Suite 1100
Detroit, Michigan 48226
Phone: (313) 961-3330
ttsullivan@hntb.com
Valves not Covered

- Pilot operated diaphragm
- Multi style check valves
- Specialty valves
- Backflow preventers
Seats & Guides
Dual Disk Gate Valve

- Potable water only
Four Moving Components
Wedging Action
Valve Demos
Valve Demos
Valve Demos
Valve Demos
Valve Demos
Valve Demos
Valve Demos
Valve Demos