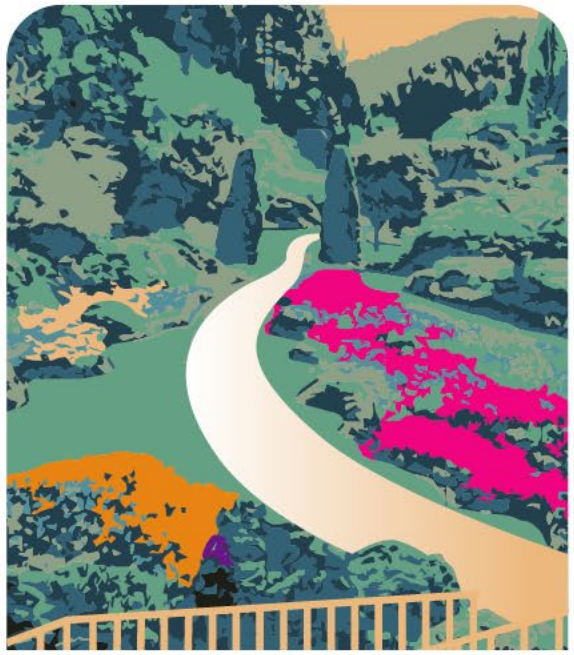

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WELCOME

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A Change is Gonna Come

The Basics of Contract Changes

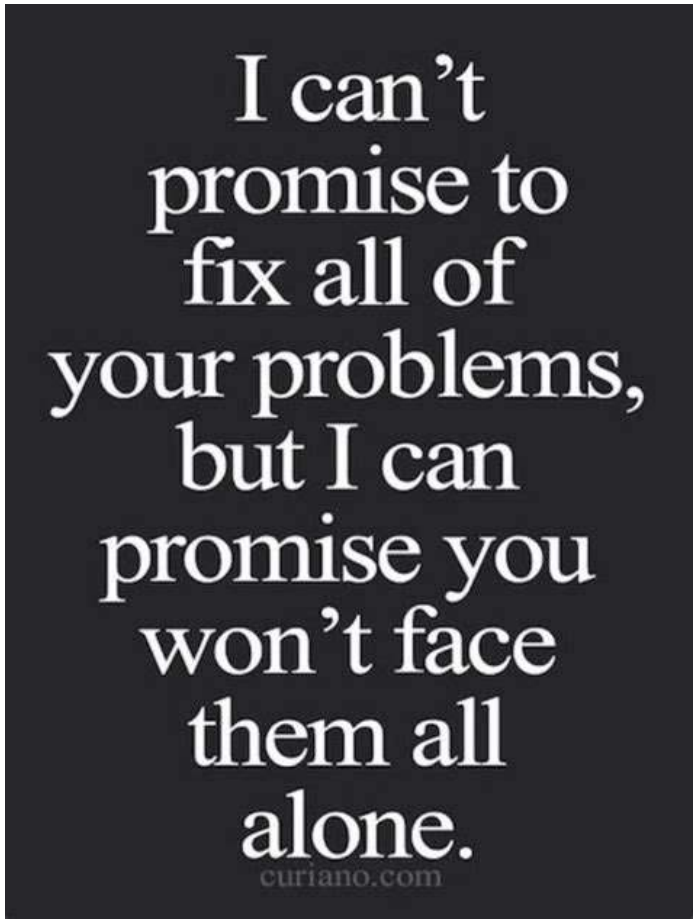
Cherise Lakeside, FCSI

This session will cover best practices for making changes to the Contract, where you can find these rules, what is and is not a contractual change, and the definition and differences between Change Orders, ASI's and CCD's – and much more!

Cherise Lakeside, FCSI (#CSIKraken)

- Senior Spec Writer at **RDH Building Science Inc.**
- Experience in Architecture, Construction, MEP Engineering and Building Science
- Host of the **ARCAT "DETAILED" Podcast** (www.arcat.com/Podcast) - # 2 on Feedspots 100 top Architecture Podcasts on the Planet
- **CSI Fellow** and heavily involved in CSI (Construction Specifications Institute)
- Speaker, Teach CDT Certification, Mentor, Social Media
- Who am I? People Lover, Music Fanatic, Dallas Cowboys / Yankees / Timbers Fan, Love Good Whiskey, and travelling is one of my many passions!

Thank you ASIC!



Suggested Reading Material

- **Construction Specifications Institute (CSI)**

  - **Project Delivery Practice Guide, 3rd Edition:** Cradle to grave education in project delivery, best practice and contractual procedures.

  - **Construction Specifications Practice Guide, 2nd Edition:** Specification education and guidelines.

  - **Construction Contract Administration Practice Guide, 2nd Edition:** Thorough overview of standard contract documents, their use and best practices for administration of the contract.

Project "BIBLES"

What is Change?

- A “Change Order is the industry term for a written amendment that contractually changes the Contractor’s scope of work or time to complete the project.

- It could be a minor change or any change that affects scope, cost, or time. There is more than one way to implement contractual change.

- A Change Order must be agreed upon (and signed) by the Owner, Architect and Contractor to be valid.

Stop – Look – Listen!

- First and foremost - Your Contract documents are legally binding as a part of the Contract. Treat them as such!
  - You **CANNOT** do any work or use any material that isn't in the Contract Documents.
  - You **CANNOT** change anything in the Contract Documents without using an appropriate and approved method for change.

Where do I find the rules?

- Start with the General Conditions!
  - AIA A201 General Conditions, Article 7 – Changes in the Work
    - Changes may be made without invalidating the Contract.
    - A change order is based upon agreement between Owner, Architect and Contractor.
    - Changes will be made under provisions of the Contract Documents.
    - Defines a Change Order.
    - Defines Construction Change Directives.
    - Defines “Minor Changes in the Work”
    - Defines all the rules associated with these items.

Where do I find the rules?

- AIA A201 General Conditions, Article 15 – Claims and Disputes
  - A Change Order is a claim.
  - Outlines time limits for claims (make claim within 21 days of whatever gave rise to the claim).
  - Outlines rules for notification process of claim.
  - Say's you must keep working while waiting for resolution of your claim.
  - Rules for documentation of claim.

Where else do I look for rules?

- Supplementary Conditions

- Next Step, Division 01 of your Specifications – These are the rules of the road for the specific project and expand upon the General Conditions!

    - 01 20 00, Price and Payment Procedures
    - 01 26 00, Contract Modification Procedures

        - Note: Some Architects will bunch all their requirements in a “General Requirements” or “Administrative Requirements” Section.

        - Regardless, you should read the General Conditions and Division 01 on every project you do.

Change Order's

- Records all of the details of a change.
- Provides evidence that the change was necessary.
- Has approval of all parties involved in the Contract.
- Makes the change a part of the Contract.
- Is a legally binding document.

When do I need a Change Order?

- If the Owner requests a change to the design or a specific material.
- The Owner requests new or additional work.
- The original design has errors and/or omissions that must be corrected in order to successfully complete the work.
- If you discover new information or unforeseen conditions on the site that affect your scope or time on the project.
- If work is redistributed among subcontractors during the project.

How to appropriately make change?

There are Three Ways (and only 3-ways) to change the Contract!

1. An ASI (Architect's Supplemental Instructions) or "Minor Change in the Work" document.
2. A Construction Change Directive.
3. A Change Order.

Check your General Conditions for the terminology.


ASI or “Minor Change in the Work”

- Minor changes.
- Often used for clarifications.
- Can only be used if the change does not affect cost or time on the project.
- Does not have to be signed by the Owner, Architect and Contractor.

Construction Change Directive (CCD)

- This is a bridging document that must result in a Change Order.
- Used in absence of total agreement to keep the work going.
- CCD Work should not largely or fundamentally alter the original intent of the Contract.
- Should be signed by Owner, Architect and Contractor but can be implemented without Contractor's agreement.

Change Order

- ANY CHANGE that affects cost or time, no matter how minor.

- Signed by the Owner, Architect and the Contractor to show agreement (AIA and others have standard forms).

- Everything in an ASI, CCD, or Change Order is now contractually a part of the Contract Documents.


Change Orders, continued

- 6 Things Every Change Order should include:
  - Project and contact info.
  - Date(s) of the change.
  - Details of the work.
  - Updated schedule.
  - Cost of the change.
  - Updated contract value.


What about a Substitution Request?

- If a substitution is approved during Construction, that change in product/material MUST be documented with an ASI or a Change Order.

- It is not enough to just accept a substitution request because substitution request forms are NOT contract documents.


I received a change on a Submittal!

- Your submittal must match what is in the Contract Documents.
- The Submittal itself is NOT a Contract Documents.
- If you receive your submittal back with notes that make changes to the work in the original contract documents.

Limitations of Change Orders

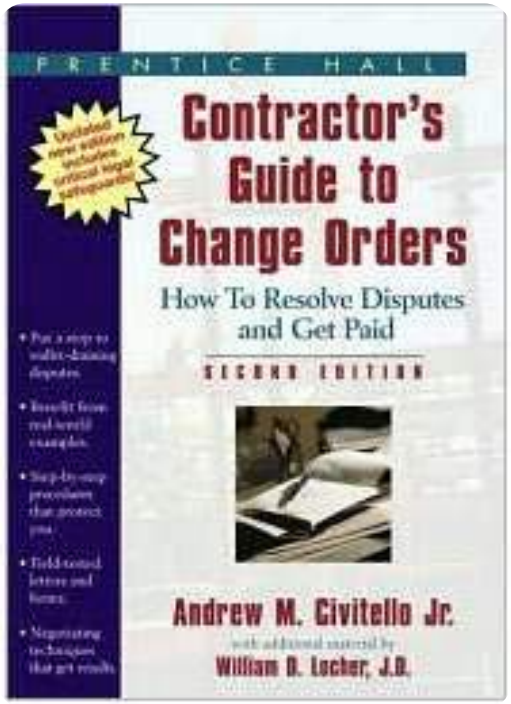
- The scope of the change is far more extensive and wider than the original Contract. A change order may not be enough here to satisfy the client's new needs.

- Some jurisdictions have statutes that limit the amount a project's scope can be increased through change orders.


Change Order Pitfalls

- You didn’t review your contract thoroughly so you didn’t follow the change order rules. You might not get paid!
- You didn’t catch new additions to the Drawings or Specs that affect you and you waited too long.
- You did work before the Change Order was approved.
- You didn’t keep the GC apprised of ongoing and upcoming changes.
- You didn’t include the appropriate backup materials for the Change Order.

Newsflash


PRENTICE HALL
Contractor's Guide to Change Orders
How To Resolve Disputes and Get Paid
SECOND EDITION
Andrew M. Civitello Jr.
William D. Locher, J.D.


Change Order
YAMAHA
Original Contract

TIPS

- If you are a contractor, NEVER do any work if you don't have proper proof of approval on a valid vehicle for change.

- If the General Contractor wants you to proceed with work without a change order, get it in writing and get the Owner to sign it.

- Document everything and save those documents according to current law rules for document retention.


ALWAYS

- Learn more about project delivery, risk, and contract documents so you can recognize risk when you see it and you understand the rules of the game. (See me about CDT Education.)
- Communicate. Nothing substitutes for clear communication on the project team.
- Don’t let the General Contractor push you around.
- Understand that you are often working with documents that are prepared by people who don’t know what they are doing. You need to know how to protect yourself!


Thank you! Any questions?

Cherise Lakeside
cheriselakeside@gmail.com

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Pump Station Monitoring

A Fluid Discussion from the Experts

Moderator: Brian Vinchesi

Chip Carlson, Robert Dickson, Justin McDaniel, John Murtaugh

PARTICIPANTS

- John Murtaugh, Vice President - Water Products
  - MCI Flowtronex
- Justin McDaniel, Pump Station Product Manager
  - Munro Companies. Inc.
- Robert Dixon, Regional Sales Manager
  - Precision Pumping Systems
- Chip Carlson, Co-President CEO
  - Watertronics

Question #1

Is there a minimum pump station size (total horsepower) for monitoring or where remote monitoring becomes cost effective?

Is remote monitoring mostly a golf thing or commercial systems also?

Is your monitoring package one size fits all or are their various options?

Question #2

Communication: there are many options; radio, hardwire, cellular, etc.

What is most common?

What do you prefer and why?

Question #3

Does the client pay the cell provider or does the client pay an annual fee to the pump station manufacturer, who pays the cell provider?

Can the client specify the cell provider to be used?

Question #4

Apps – do you have an App?

What features does the app have or not have versus standing in front of the pump station control panel, if any?

Question #5

Can the pump station manufacturer remotely change programs/settings in the PLC?

Can you troubleshoot the pump station panel components remotely?

Can you remotely do firmware upgrades?

Question #6

How does your pump station restart after an alarm-based shutdown?

Does it notify the end user after an alarm-based shutdown?

Question #7

In your opinion, do the clients that buy all the bells and whistles on a pump station really use them after the first month, if ever?

Is it an issue of lack of training ambivalence?

Question #8

Does (or how does) your pump station interface with an irrigation central control system (i.e. Hunter, Toro, Rain Bird, etc.)?

Is there two-way communication?

Question #9

Can the irrigation central PC act on data received from your pump station? (Example: Turn off 500 GPM of heads if pump station reports it lost a 500 GPM pump).

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Watering Artificial Turf

Considerations in Planning & Design

Catherine Eiswerth, Binnie & Associates
Vice President, Sports, Recreation & Open Space

So Why Water Fake Grass?

- Field Hockey Performance
- Optimize Organic Infill Moisture
- Heat Reduction
- Fibre Lubrication
- Sanitation (Pets, Play Areas)

Reasons Not to Water

- Global Water Conservation
- Demand on Local Water System
- Public Perception
- Added Capital Cost
- Additional O & M Cost

Watering - Go or No Go

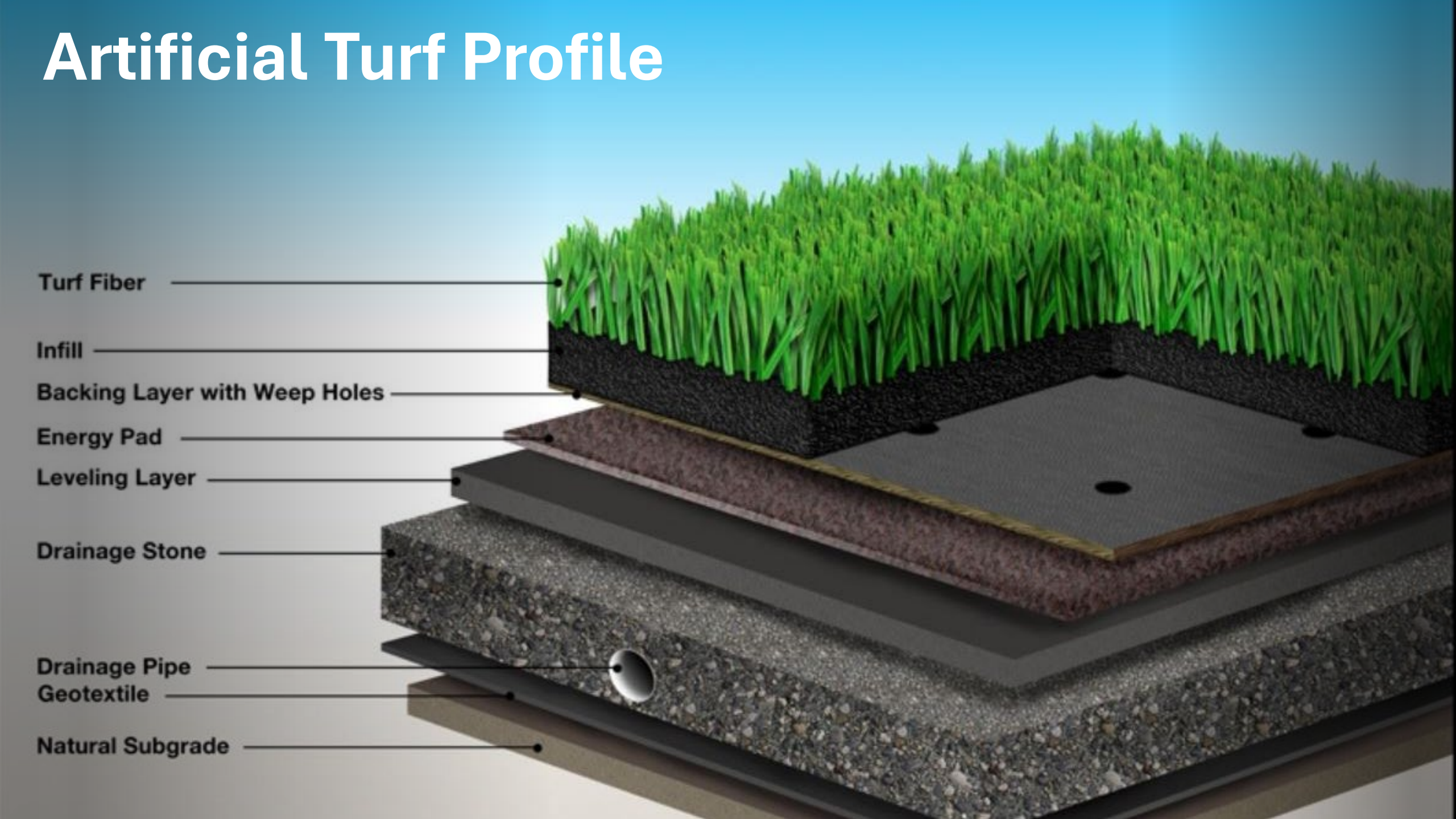
Go:

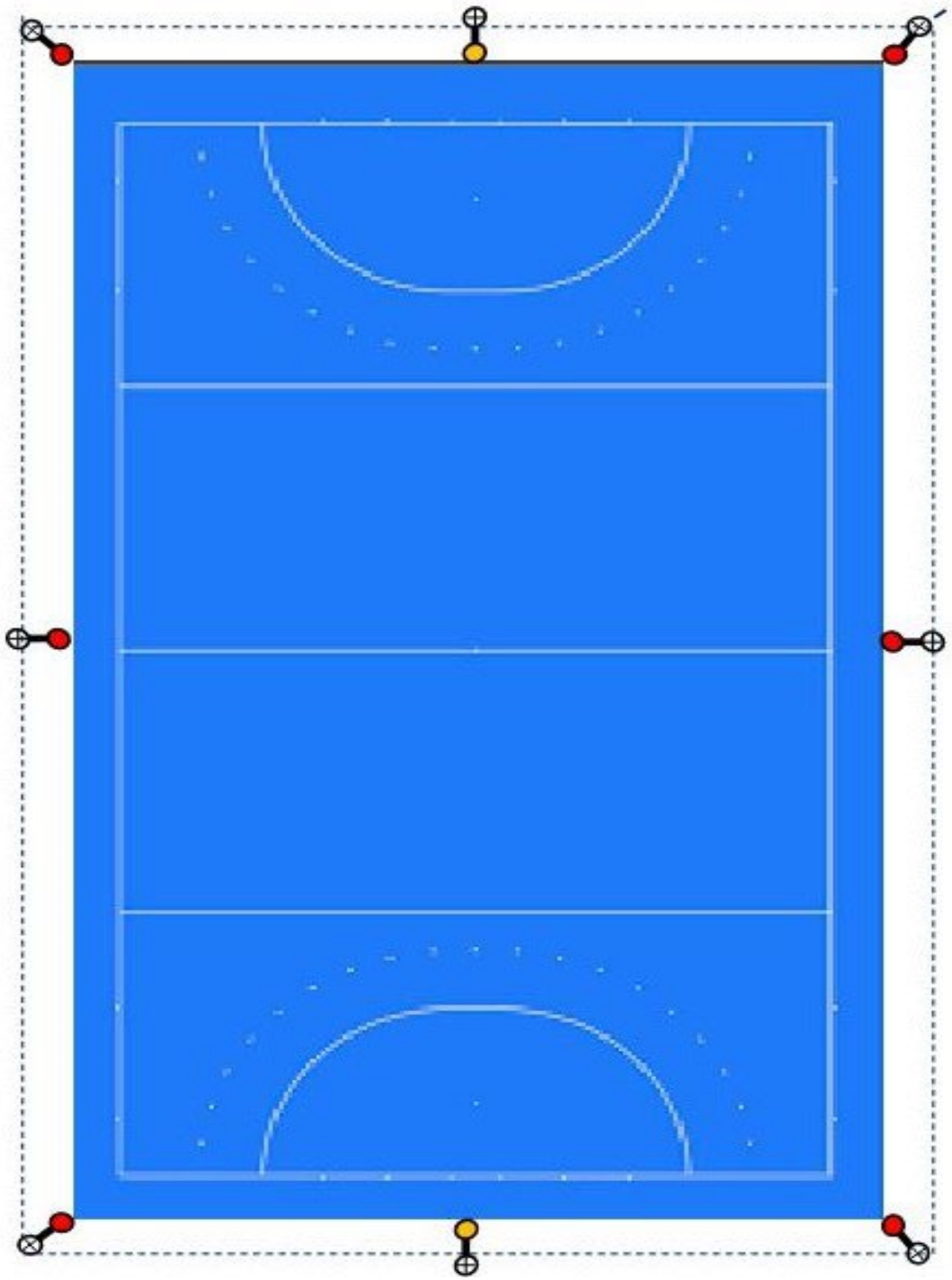
- Elite Field Hockey
- Organic Infill Moisture Mgmt
- High Use Pet Turf

Maybe:

- Heat Reduction
- Fibre Lubrication
- Sanitation

Artificial Turf Profile





Hockey Pitch Design

- Larger Dia. Lines - 4” to 6”
- High Volume/Short Duration ~ 4 mm within 10 min. period
- 8 head layout
- 120 PSI at Field
- ~250 gpm to 450 gpm
- Locate all piping off turf
- Rotors at back of runout area
- Manual Control of Cycle

Hockey Water Cannon (raised on post)

Hockey Water Cannon Spray Range – Across Field

Hockey Water Cannon (raised, at grade)

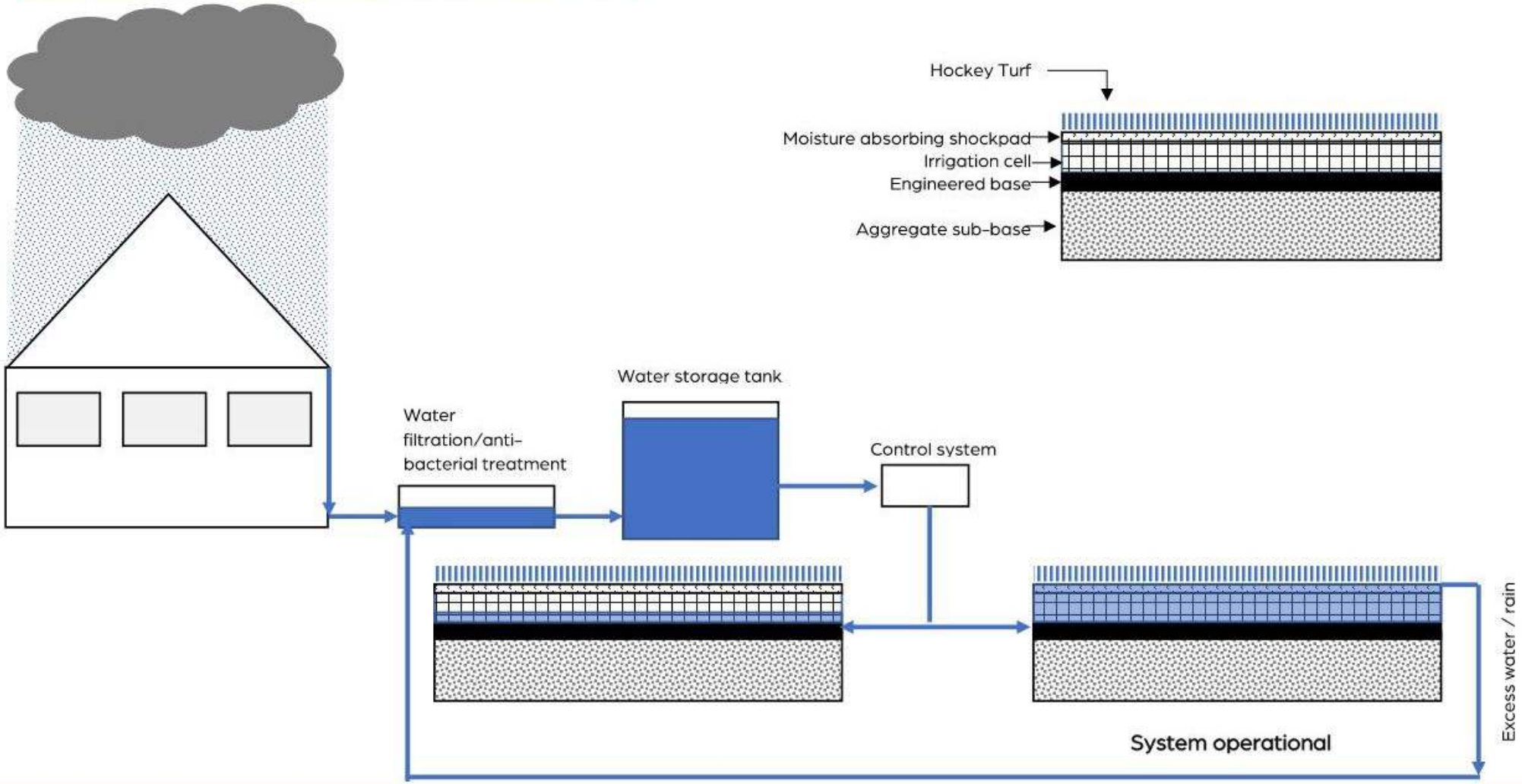
Pop-up Rotors - Hockey

- Siren Needed (Safety)
- Less Wind Impact
- Better Coverage vs Raised Cannons
- Spectators Stay Dryer
- Locate at Back of Runout
- Some Issues with Turf Covers Lifting

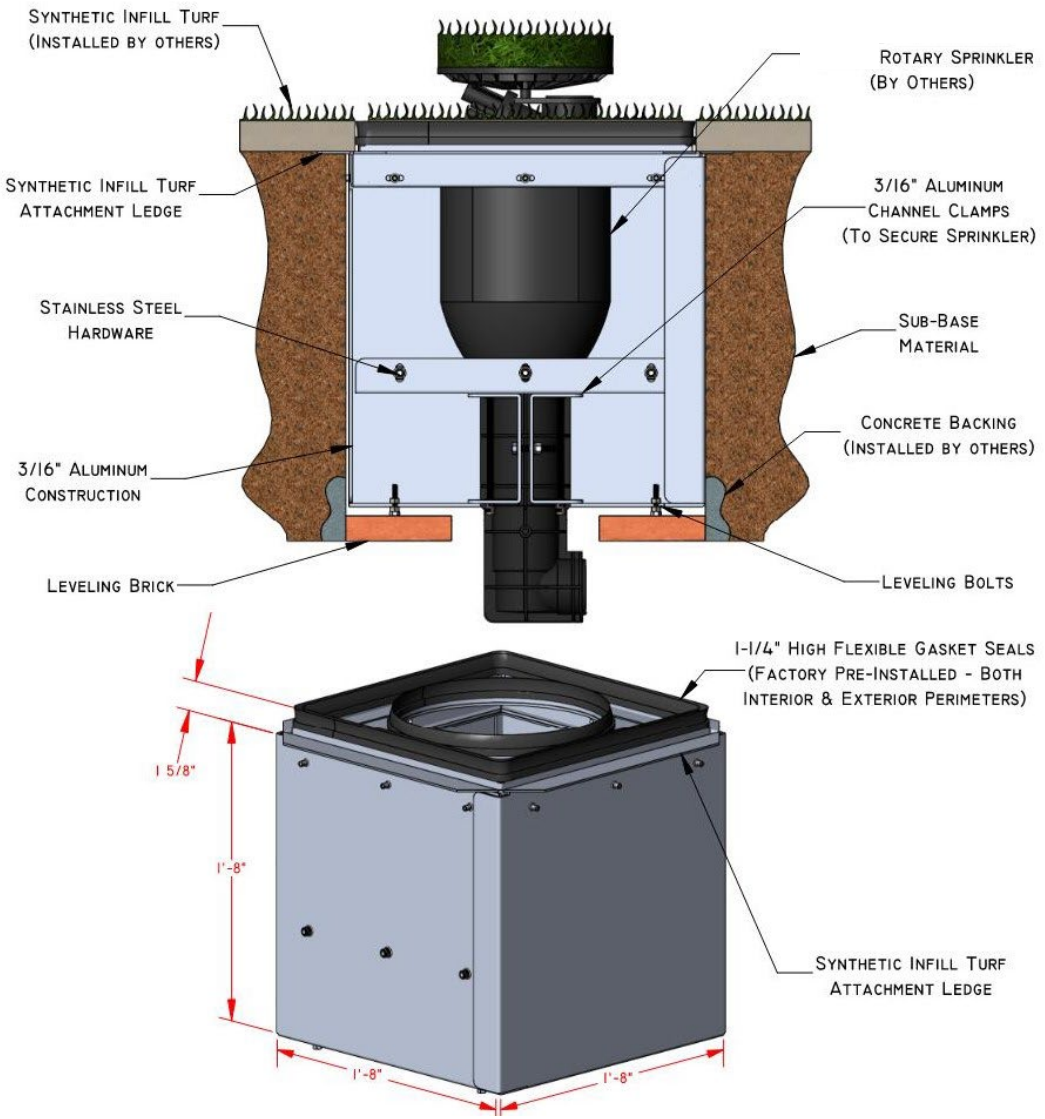
Watering a Hockey Pitch by Hand

Sub-Field System

APPENDIX B - PRINCIPLES OF SUB-FIELD IRRIGATION



Valve Box and Rotor Turf Covers



Watering Turf – Heat & Sanitation

- Few Standards – Common Sense
- Soak Field ~ 15 minutes
- Heat reduced by ~ 20F at Surface
- Pet Turf Watered Daily
- Could Use QCV but Pop-Up System Preferred

Tips & Lessons Learned

- Confirm Watering with Turf/Infill Supplier
- Local Climate is Crucial
- Watch for Algae Bloom Risks
- Wind Impact can be Significant
- Avoid High Pipe Velocities (Big Pipes)
- Locate one Rotor Behind Hockey Net
- FIH Requires Potable Water Only
- Use Pre-Manufactured Box/Rotor Covers
- Be Aware of Conservation Concerns

Trends

- Waterless Turf approved in 2024 for FIH Global Elite Hockey

- Polymer Infill Ban in EU = More Organic Infill/No Infill Turfs

- Residential Turf, Pet Turf on the Increase

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Hydraulics Pt. 1

A deep dive on controls and their effects

Craig Fisher – Texas Regional Engineer, Westlake Pipe & Fittings

PVC Cyclic Pipe Design

Like in irrigation systems, repetitive surge pressures can occur in municipal applications, too.

There are multiple approaches. Which one is correct? Why?

Is it even possible to address PVC's cyclic capabilities with confidence?

PVC Cyclic Pipe Design

Like in irrigation systems, repetitive surge pressures can occur in municipal applications, too.

There are multiple approaches. Which one is correct? Why?

Is it even possible to address PVC's cyclic capabilities with confidence? **SPOILER. YES!**

How?

My portion of the presentation will…

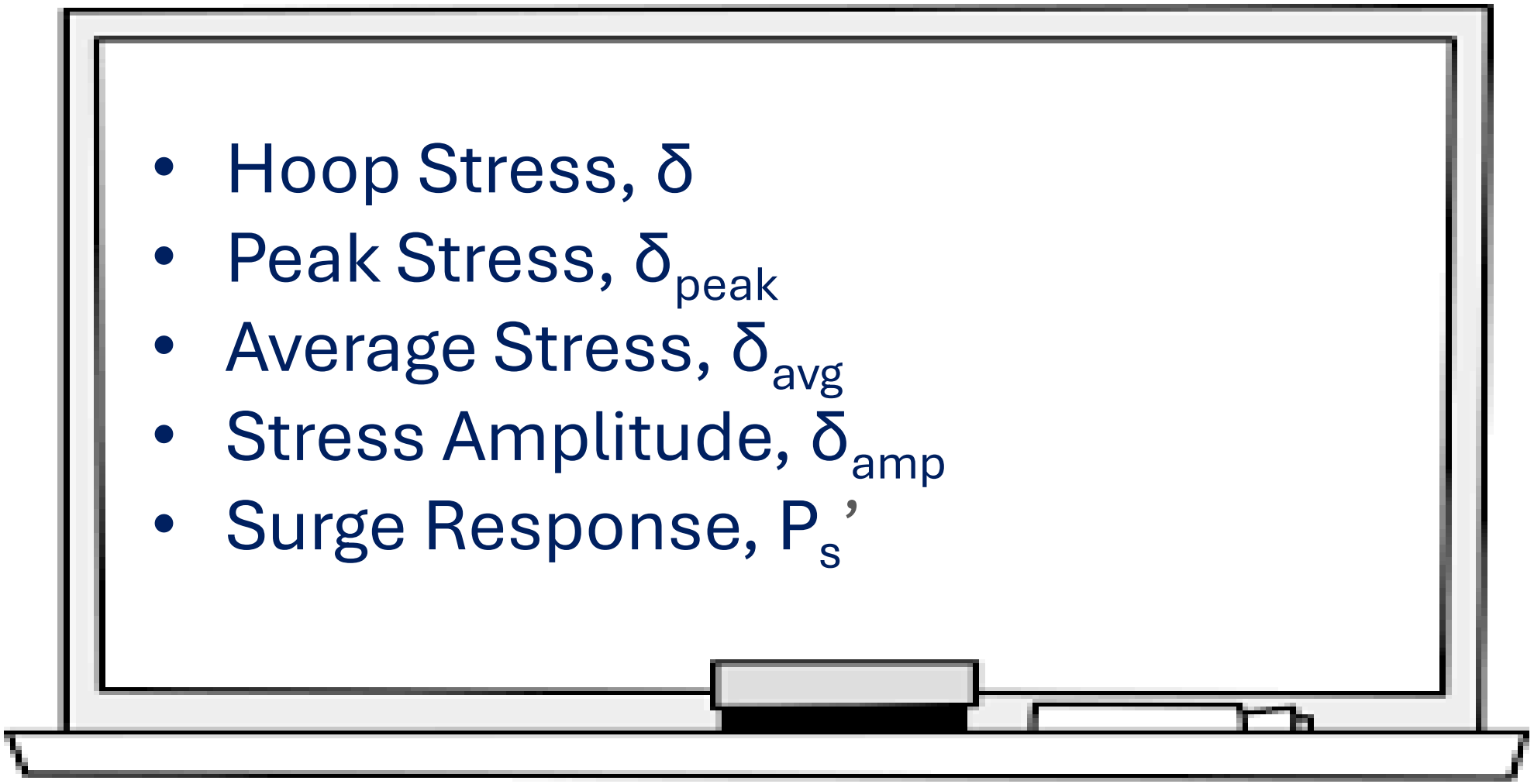
… review how designers should conduct the cyclic life design check in force main applications,

… discuss the evolution of cyclic design approaches,

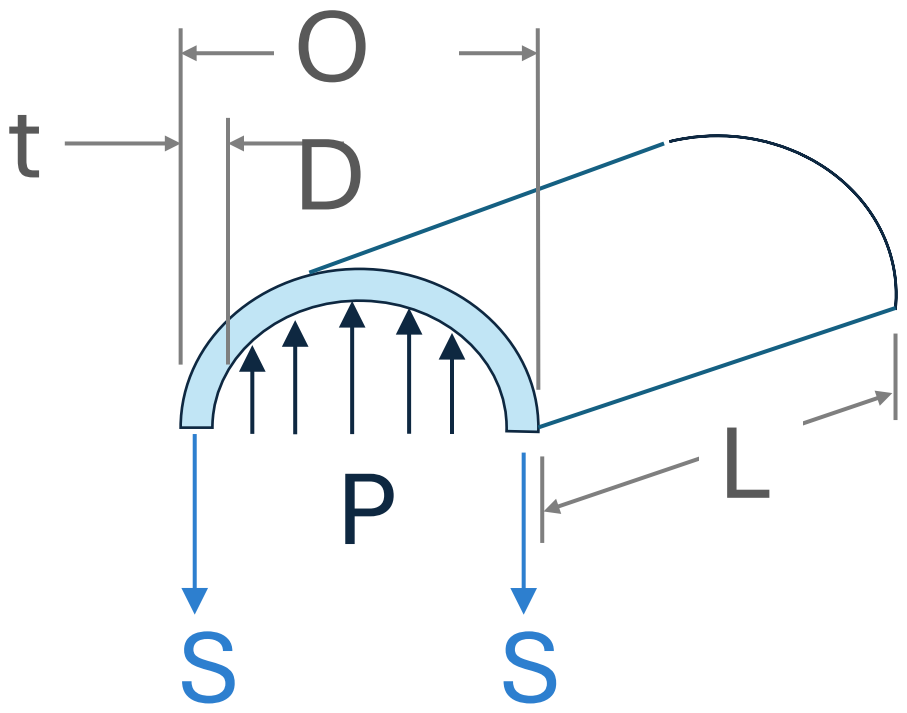
… provide a design example, and

… conclude with third party usage information, design tools, and academic references.

Define Terms



Hoop Stress, S



Internal Forces = External Forces

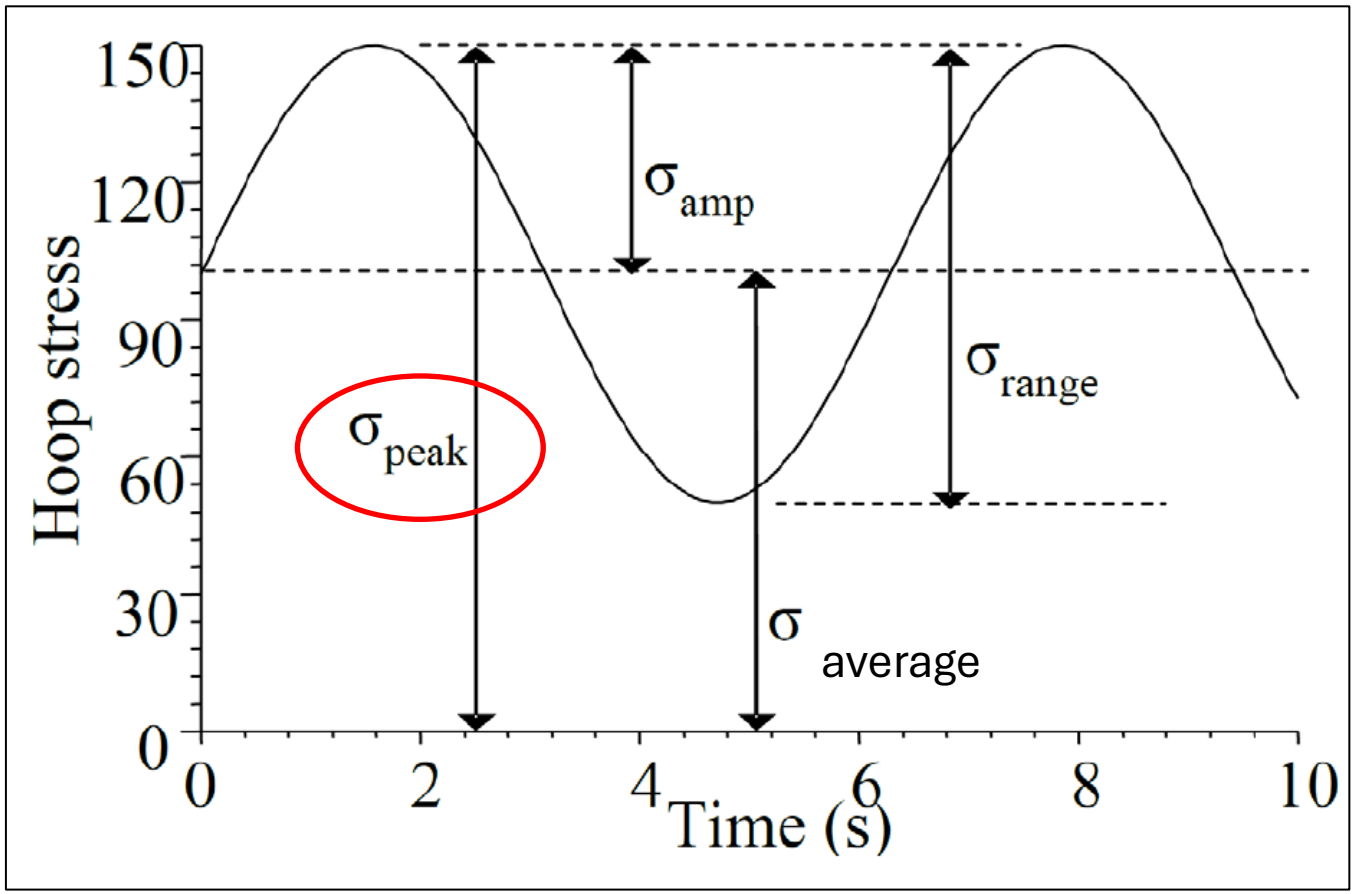
$$2St = P(OD - t)$$

$$S = \frac{P\,(OD\ - t)}{2t}$$

$$S = \frac{P}{2}(DR\ - 1)$$

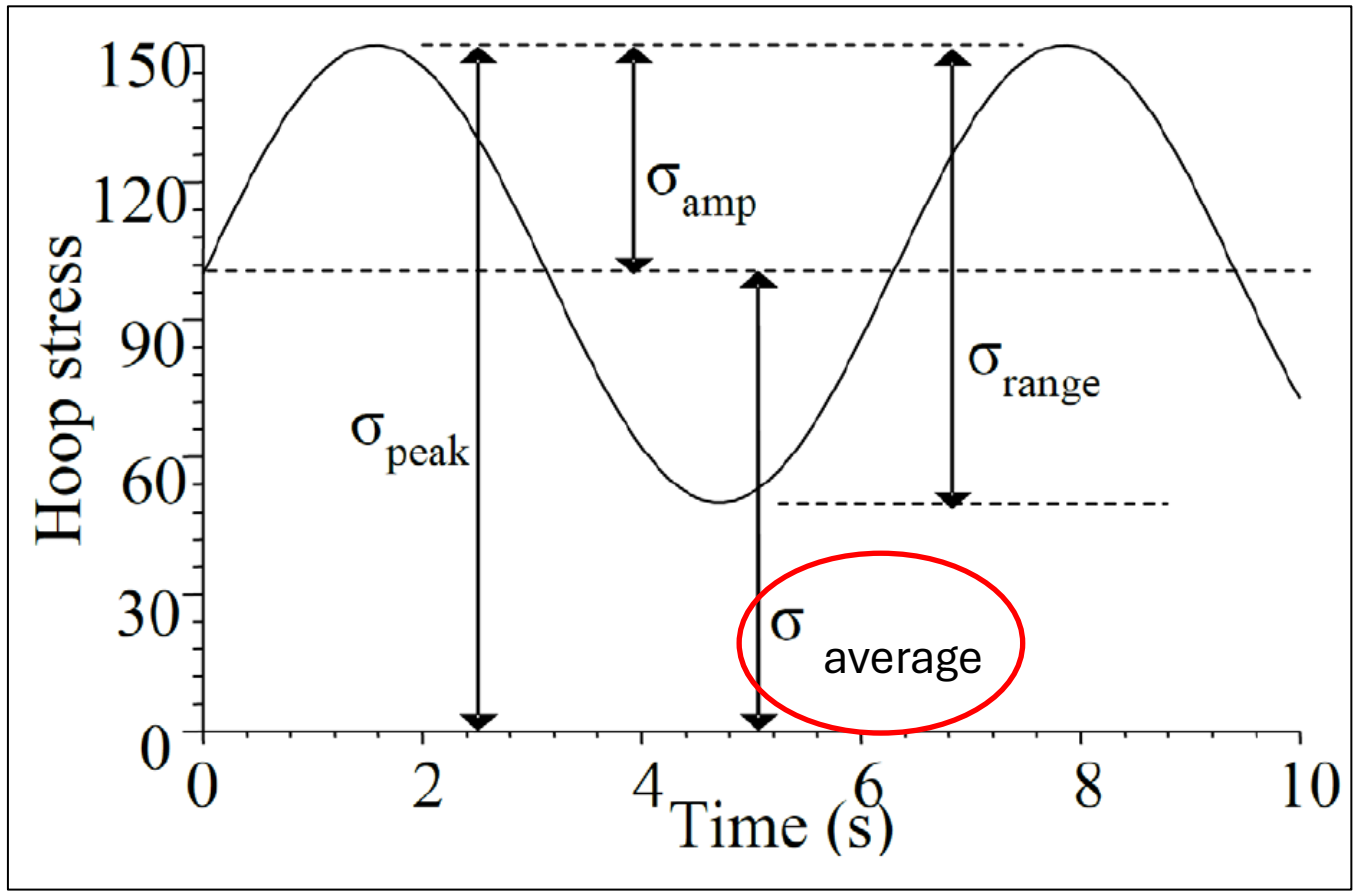
(Eq. 5.3, p. 5.7, Handbook of PVC Pipe, 5th Ed.)

Types of Cyclic Hoop Stresses



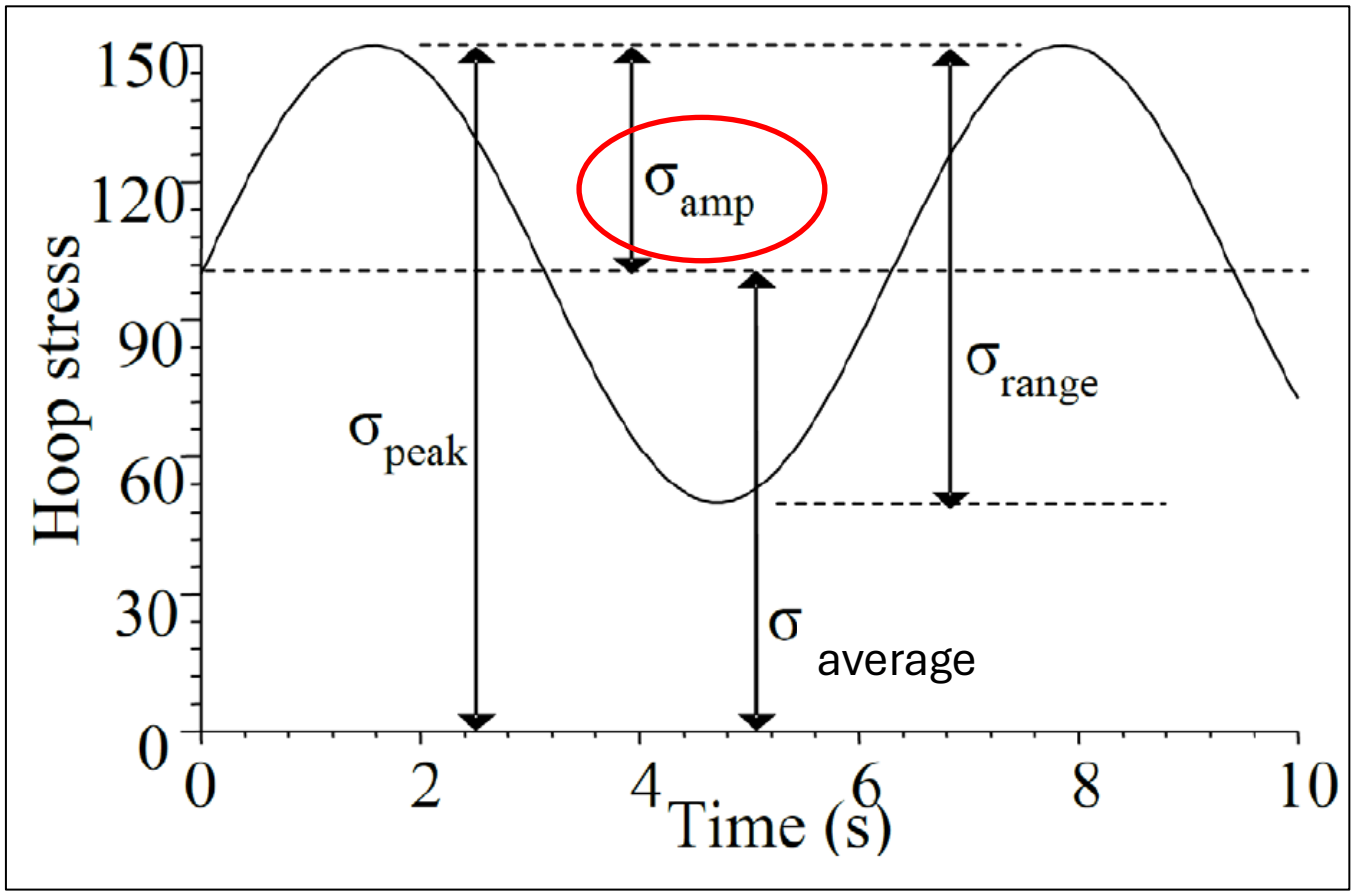
1. Peak Stress

Types of Cyclic Hoop Stresses



1. Peak Stress
2. Average Stress

Types of Cyclic Hoop Stresses



1. Peak Stress
2. Average Stress
3. Stress Amplitude

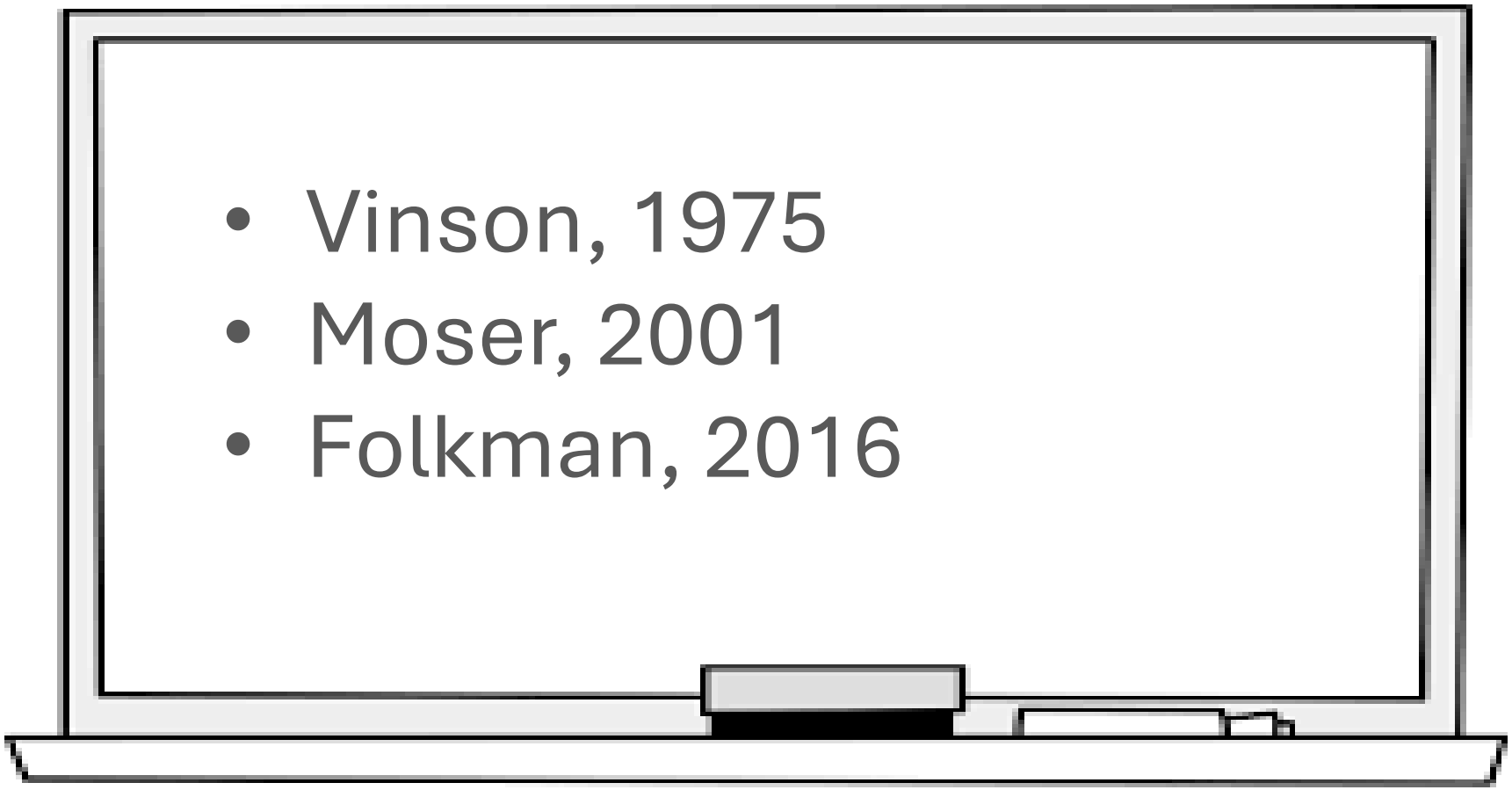
Surge Pressures

PVC Pipe Surge for a ΔV of 1.0 ft/sec	
DR	Pressure Surge (P_s') psi
25	14.7
18	17.4
14	19.8

(From Table 5.6, p. 5.17, Handbook, 5th Ed.)

$$P_s = \Delta V \text{ x } P_s'$$

Cyclic Research and Approaches



Vinson Equation, 1975 (δ_{peak})

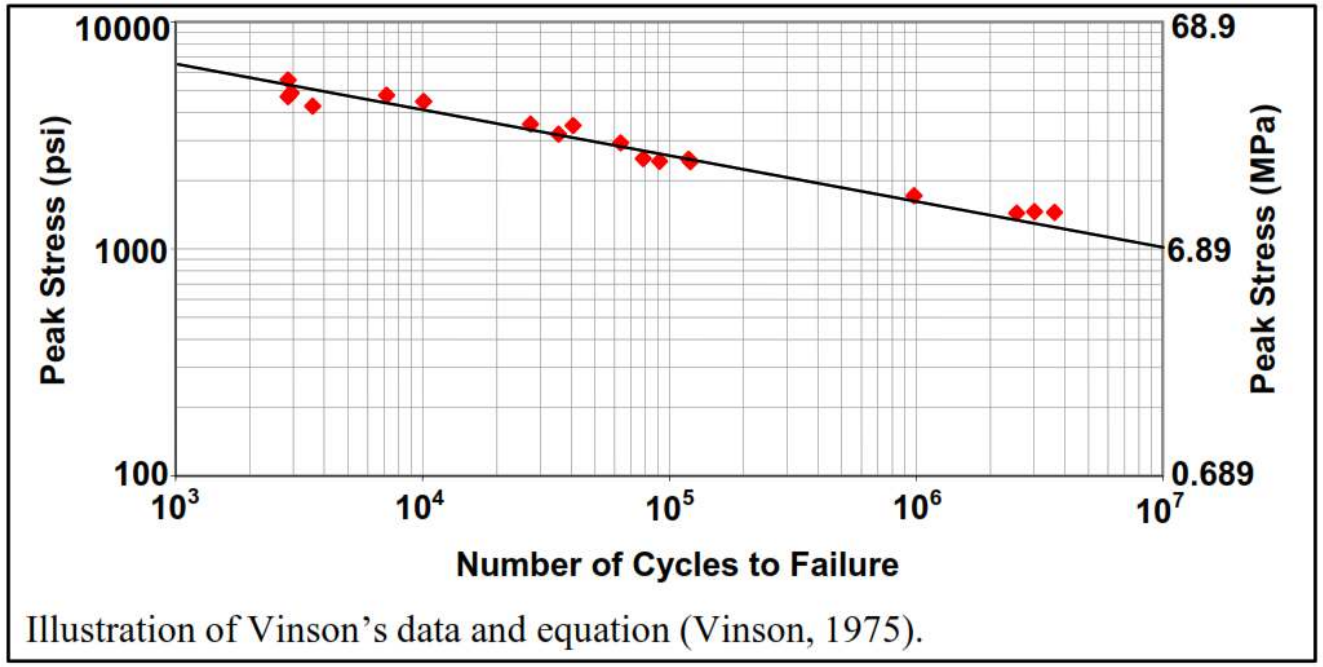
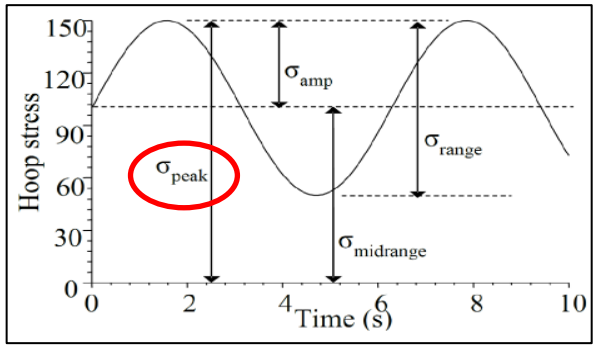


Illustration of Vinson's data and equation (Vinson, 1975).



$$C = (5.05 \text{ x } 10^{21})\, S^{-4.906}$$

Utah State University Testing, Dr. Moser

PVC Pressure Pipe Endures Over Ten Million Cycles

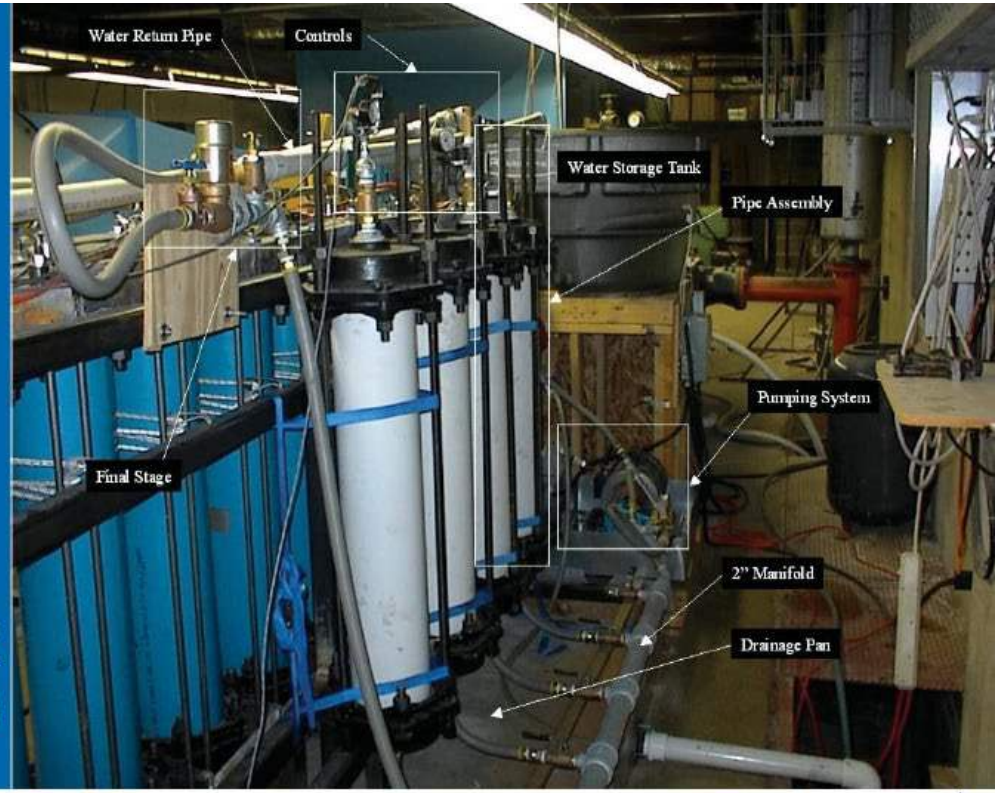
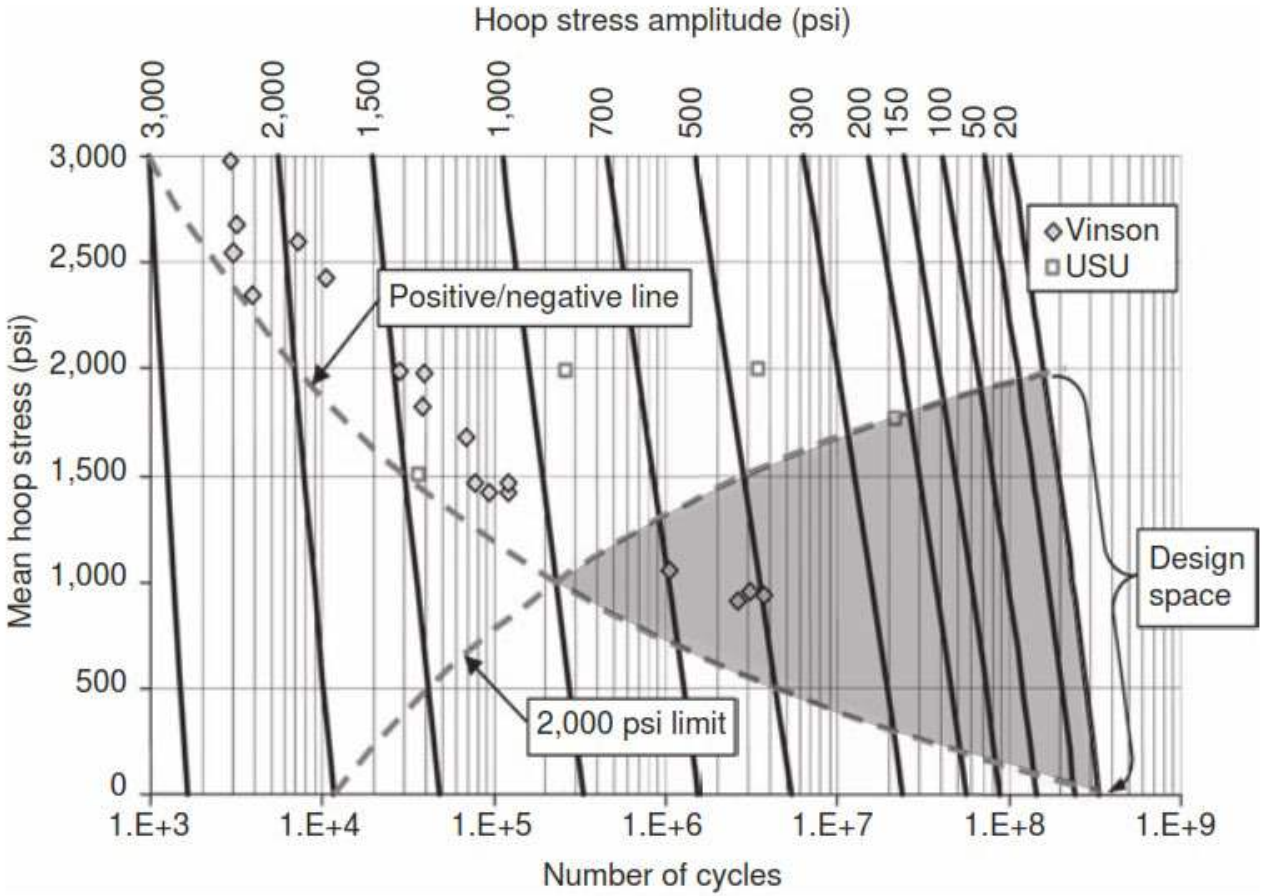
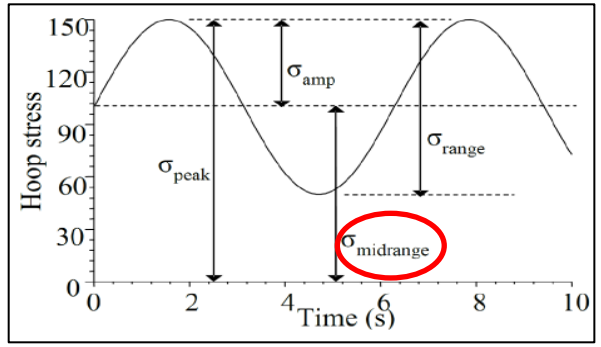


Figure 1:
Test Apparatus for cyclic testing. The blue pipe is AWWA C900, DR18, from Phase I. The white pipe is ASTM D2241, SDR41, introduced in Phase II

Cyclic testing of PVC pipe included pipe that reached over 10 million cycles and never failed

Moser, 2001 (δ_{avg} , δ_{amp})





Folkman Equation, 2016 (δ_{amp})

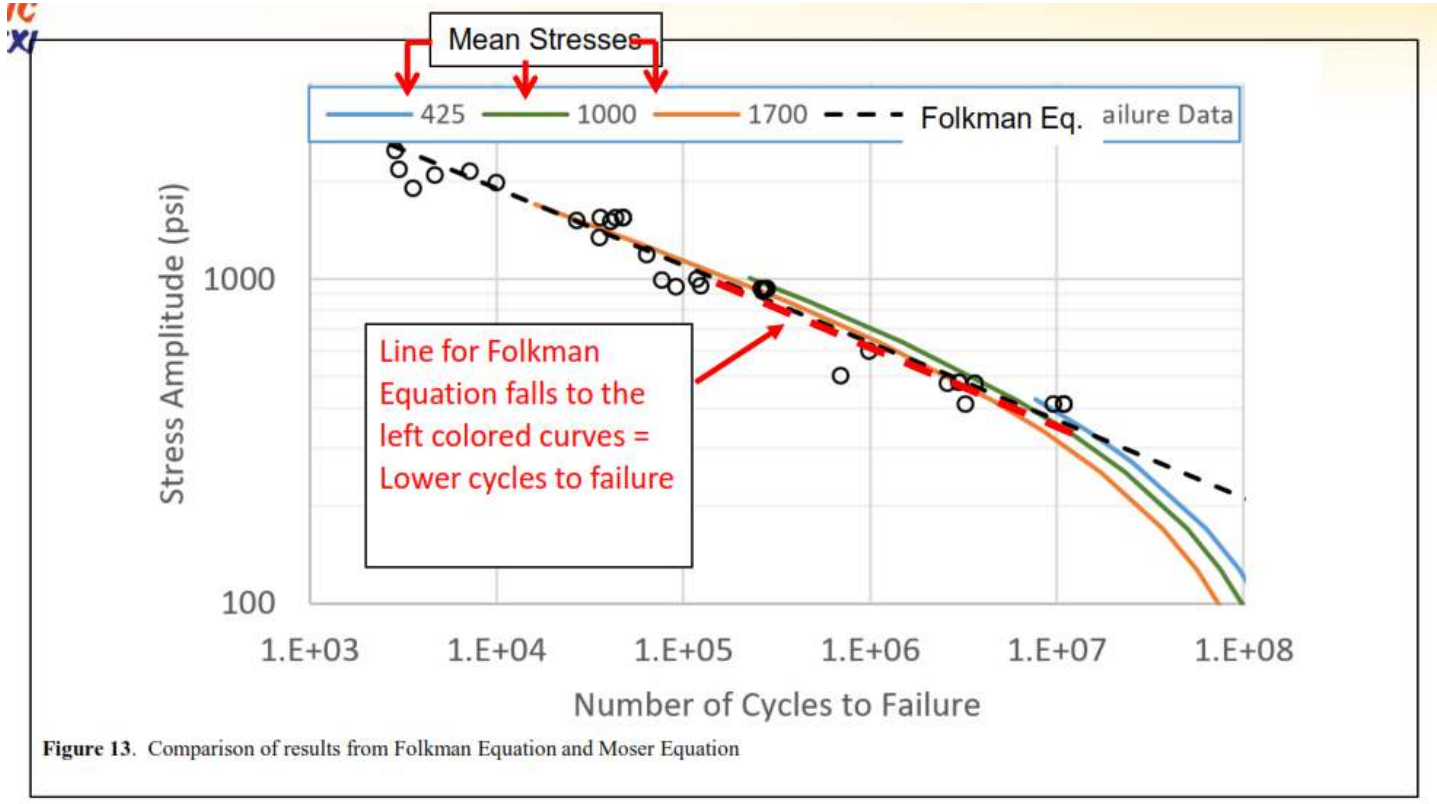
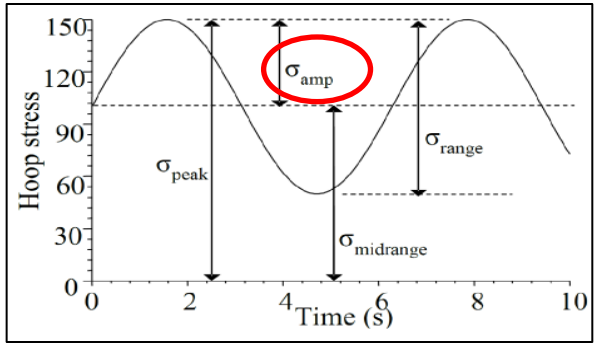


Figure 13. Comparison of results from Folkman Equation and Moser Equation



Folkman Equation:

$$N_{cycles\ to\ failure} = 10^{-4.196\ \log(\sigma_{amp})+17.76}$$

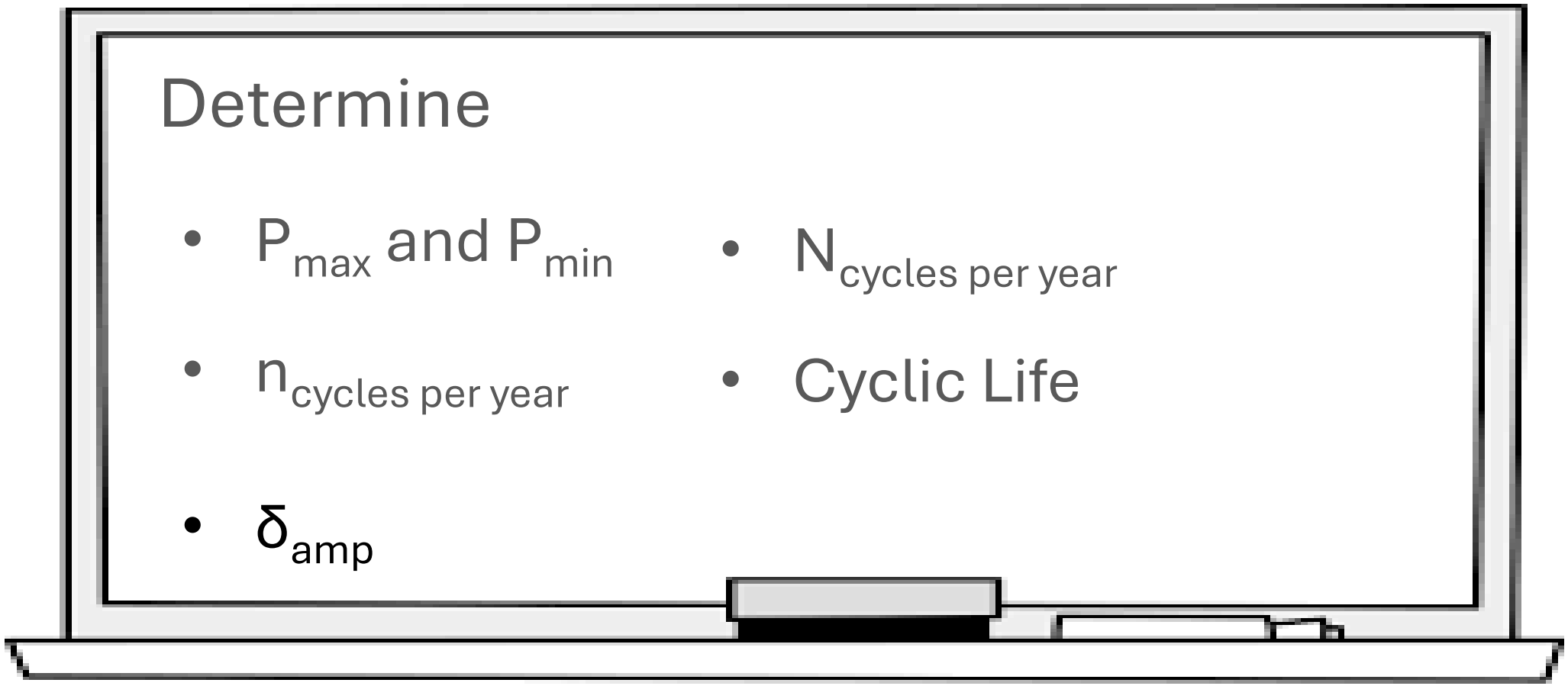
PVC's Cyclic Capabilities

Folkman Equation:

$$N_{cycles\ to\ failure} = 10^{-4.196 \log(\sigma_{amp})+17.76}$$

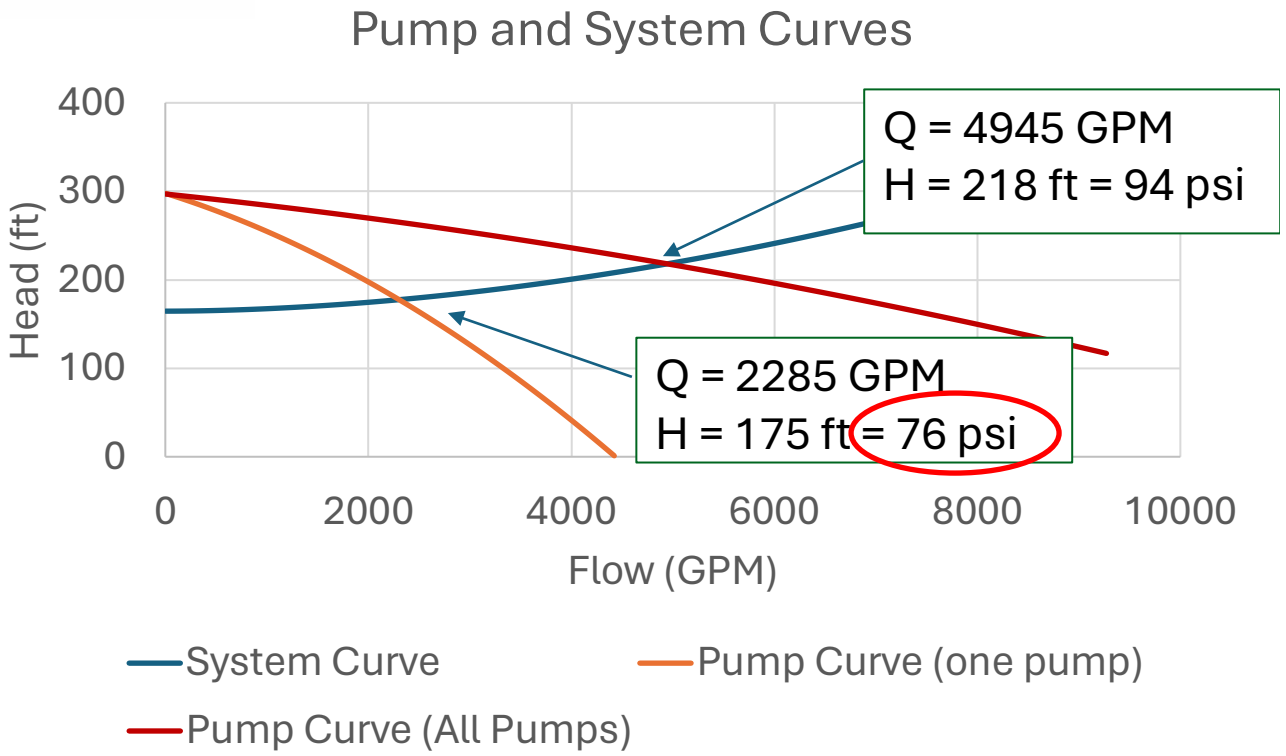
$$Cyclic\ Life\ (years) = \frac{N_{cycles\ to\ failure}}{n_{surge\ occurences\ per\ year}}$$

Design Example



Design Example

- 20” Force Main
- Peak Flow: 4945 gpm
  v≈5 fps
- Normal Flow: 2285 gpm
  v≈2.3 fps
- No VFDs
  No Surge Control Equipment
- Design Life: 100 years



Recurring Surges for DR25

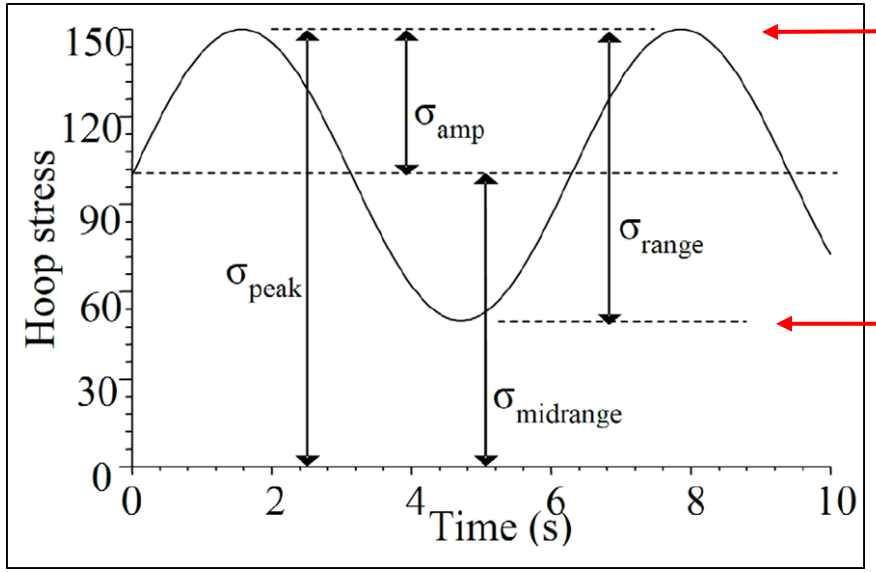
$$P_{\text{recurring surge}} = 2.3 fps \times 14.7 \frac{psi}{fps} = 34\ psi$$

(Based on a single lead pump shutoff event)

$$P_{\text{rs, Max}} = 76\ psi + 34\ psi = 110\ psi$$

$$P_{\text{rs, Min}} = 76\ psi - 34\ psi = 42\ psi$$

Cyclic Life Inputs for DR25



$P_{rs\ max}$ = 110 psi

$P_{rs\ min}$ = 42 psi

$$P_{recurring\ surge,\ Max} = 76\ psi + 34\ psi = 110\ psi$$

$$P_{recurring\ surge,\ Min} = 76\ psi - 34\ psi = 42\ psi$$

Cyclic Life Inputs for DR25

Determine Pump Cycles Per Day and Year

- Cycles should be lead pump shutoffs, which is every 15 minutes during normal flow

$$n_{cycles\ per\ day} = \frac{1\ cycle}{15\ minutes} \times \frac{60\ minutes}{1 hour} \times \frac{24\ hours}{1\ day} = 96\ {}^{cycles}/_{day}$$

$$n_{cycles\ per\ year} = \frac{96\ cycles}{day} \times \frac{365\ days}{year} = 35{,}040\ {}^{cycles}/_{year}$$

Cyclic Life for DR25

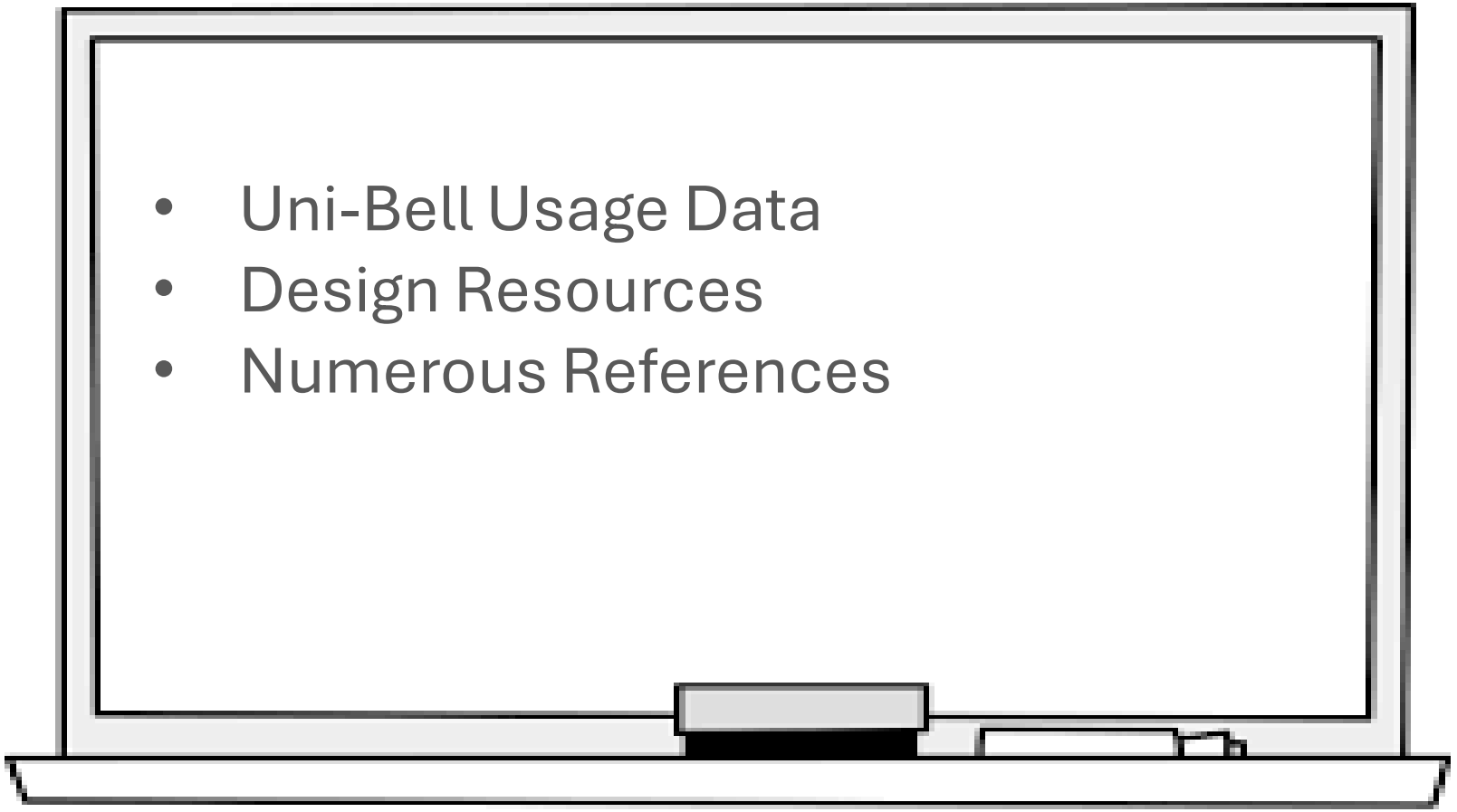
$$Stress\ Amplitude\ \sigma_{amp} = \frac{(P_{max} - P_{min}) * (DR - 1)}{4} = \frac{(110 - 42) * (25 - 1)}{4} = 408\ \text{psi}$$

$$N_{cycles\ to\ failure} = 10^{-4.196 \log(\sigma_{amp}) + 17.76} = 10^{-4.196 \log(408) + 17.76}$$
$$= 6.4 \times 10^6\ cycles$$

$$Cyclic\ Life\ (years) = \frac{N_{cycles\ to\ failure}}{n_{cycles\ per\ year}} = \frac{6.4 \times 10^6 cycles}{35040\ cycles/year} = \mathbf{182\ years}$$

Uni-Bell Cyclic Life Calculator

PVC's Cyclic Capabilities



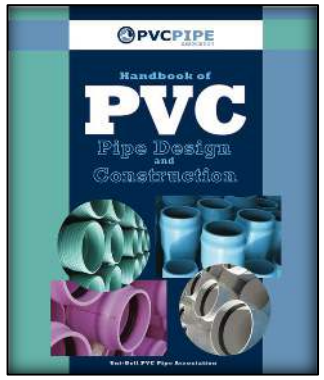
PVC's Force Main History

- Uni-Bell reports PVC use in Force Main applications dates back to 1970s

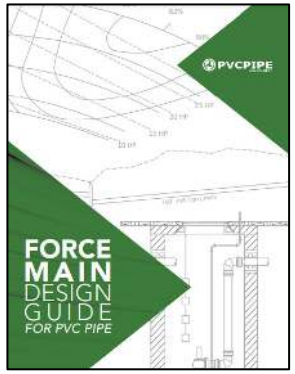
- Uni-Bell estimates 40,000 miles of PVC force mains are in service today.

Design Tools

- Chapter 5 of Handbook



- Force Main Design Guide for PVC Pipe



- Cyclic-Life Calculator (Shown Earlier)

Academic Papers

PVC Pipe Cyclic Design Method

Steven Folkman, Ph.D.[1]; and Jay Parvez[2]

[1]Retired; formerly, Buried Structures Laboratory, Utah State Univ., Logan, UT. Email: steven.folkman@usu.edu
[2]Regional Engineer, Uni-Bell PVC Pipe Association, Dallas, TX. Email: jparvez@uni-bell.org

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