313 HEATING DISTRIBUTION

AIA Continuing Education Provider

JEFF ZUMWALT – CENERGISTIC INC.
LALIT AGARWAL – UNIVERSITY OF NEBRASKA

AIA INFORMATION

Credit(s) earned on completion of this course will be reported to American Institute of Architects (AIA) Continuing Education Session (CES) for AIA members.

Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

ML

AIA Continuing Education Provider

COURSE DESCRIPTION

In a district heating system, the heating medium, hot water or steam, is produced in a central utility plant and distributed to campus buildings. The central utility plants use various pumping equipment to accomplish this task. The piping used for transfer of this hot water or steam to the buildings and back to the utility plant (as lower temperature water or condensate) is typically underground, either in a utility tunnel or directly buried in ground. Being a closed loop, it is important to minimize losses due to leaks or improper taps into the system. This course will explore the various components that entail the heating distribution system and the challenges that go along with operations of these equipment.

ML

AIA Continuing Education Provider

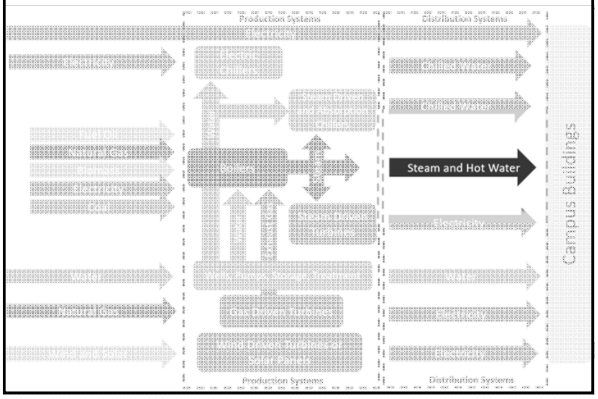
LEARNING OUTCOMES

- Learning Objective 1:
  Discuss how central utility plants use various pumping equipment.
- Learning Objective 2:
  Discuss piping systems used for transferring hot water or steam to building and back to the utility plant.
- Learning Objective 3:
  Explore various components that entail the heating distribution system.
- Learning Objective 4:
  Discuss the challenges that go along with operating these systems

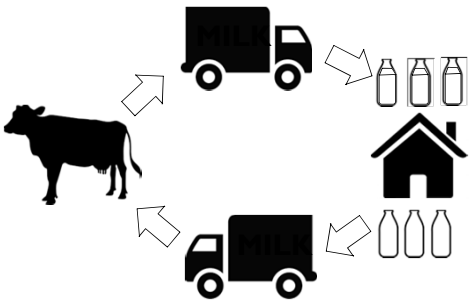
ML

AIA Continuing Education Provider

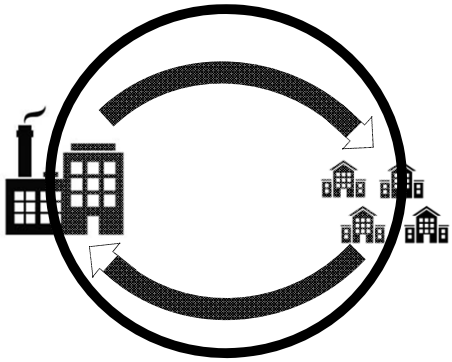
HEATING DISTRIBUTION



HEATING A CAMPUS



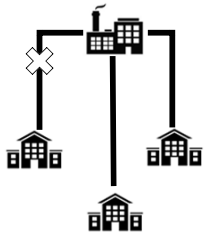
HEATING A CAMPUS



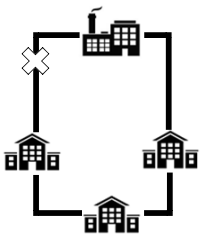
OVERVIEW

Radial or Looped
How Pipe Fails
Steam or Hot Water
Pipe Materials
Direct Buried or Tunnel
Costs

RADIAL OR LOOPED



Radial



Looped

HOW PIPE FAILS

Corrosion
Expansion
Water Hammer
Excavation

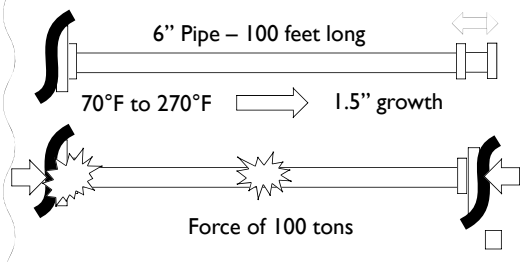
CORROSION

External and Internal

Water + Iron + Oxygen = Rust

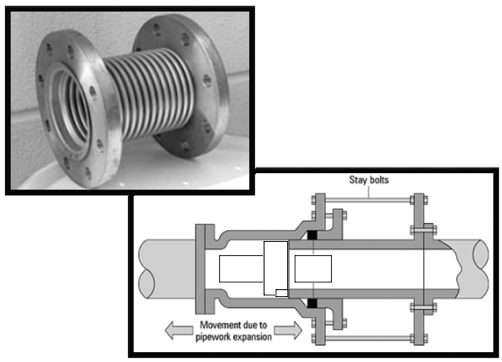
Solution:
No Water,
No Iron, or
No Oxygen

EXPANSION



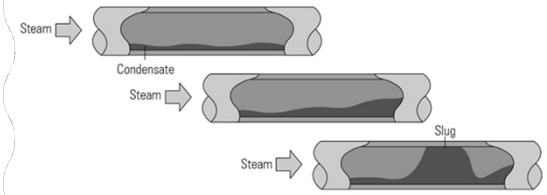
Solution:
Add Flexibility

EXPANSION



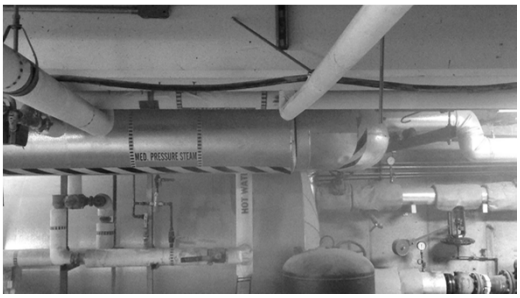
EXPANSION

STEAM INDUCED WATER HAMMER

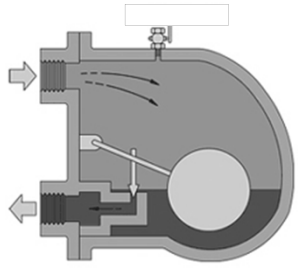


Solution:
Remove condensate from steam line

STEAM INDUCED WATER HAMMER



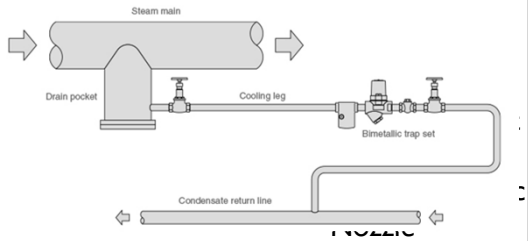
STEAM INDUCED WATER HAMMER



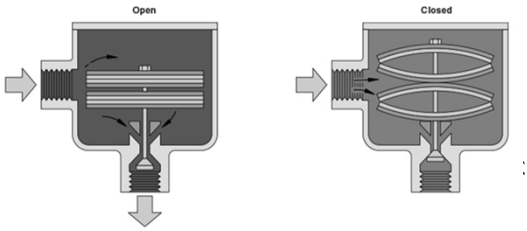
Traps

Float
Inverted Bucket
Thermostatic
Thermodynamic
Nozzle

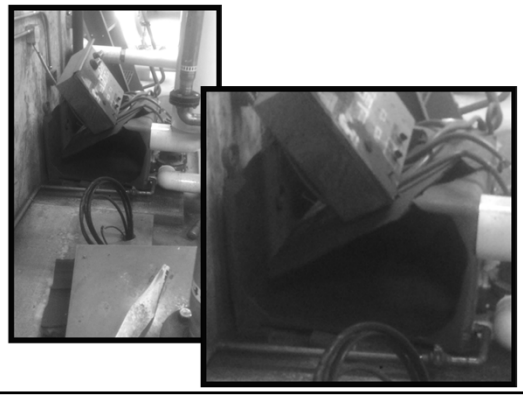
STEAM TRAPS



STEAM TRAPS



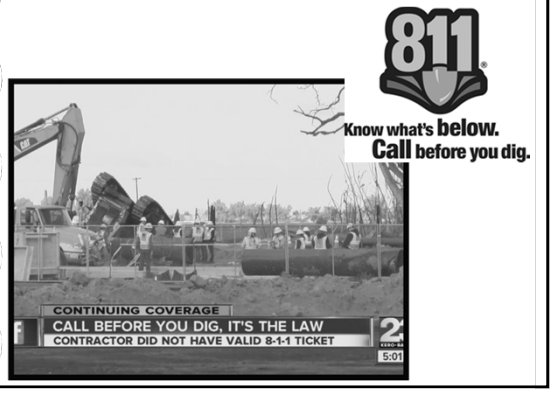
STEAM INDUCED WATER HAMMER



STEAM INDUCED WATER HAMMER

STEAM INDUCED WATER HAMMER

EXCAVATION



STEAM OR HOT WATER

1100 Btu/lb
~350°F

180 Btu/lb
150°F – 300°F

PIPE

DIRECT BURIED PIPE

STEEL

High Temp. = Steel

- Corrosion
+ Expansion
+ Water Hammer
- Excavation

$500 - $1,000/ft

DIRECT BURIED STEEL PIPE

DIRECT BURIED PIPE

PLASTIC

Low Temperature:
Plastic is an option

+ Corrosion
+ Expansion
+ Water Hammer
- Excavation?

$400 - $700/ft

TUNNELS

+ Corrosion
+ Expansion
+ Water Hammer
+ Excavation

$4,000 - $7,000/ft

SHALLOW TRENCH

+ Corrosion
+ Expansion
+ Water Hammer
+ Excavation

$2,000 - $3,000/ft

COMPARISON

Direct-Buried
+ Simple and fast
+ Lowest cost

- Less reliable
- More disruption

Tunnel
+ High reliability
+ No disruption

- Very expensive
- Low flexibility

Shallow Trench
+ Good reliability
+ Low disruption

- Expensive
- Low flexibility

PIPE CAPACITY

100,000 GSF
1,000 feet

What size pipe?

125 psig system
4" pipe - $400,000 (100,000 GSF)

10" pipe - $500,000 (1,200,000 GSF)

+25% Cost = +1200% capacity

THIS CONCLUDES THE AMERICAN INSTITUTE OF ARCHITECTS CONTINUING EDUCATION SYSTEMS COURSE.

ML

AIA Continuing Education Provider

QUESTIONS?