
Wolf Ridge
Environmental Learning Center
District Energy – From Cordwood to Pellets and Computer Controlled Combustion
www.wolf-ridge.org

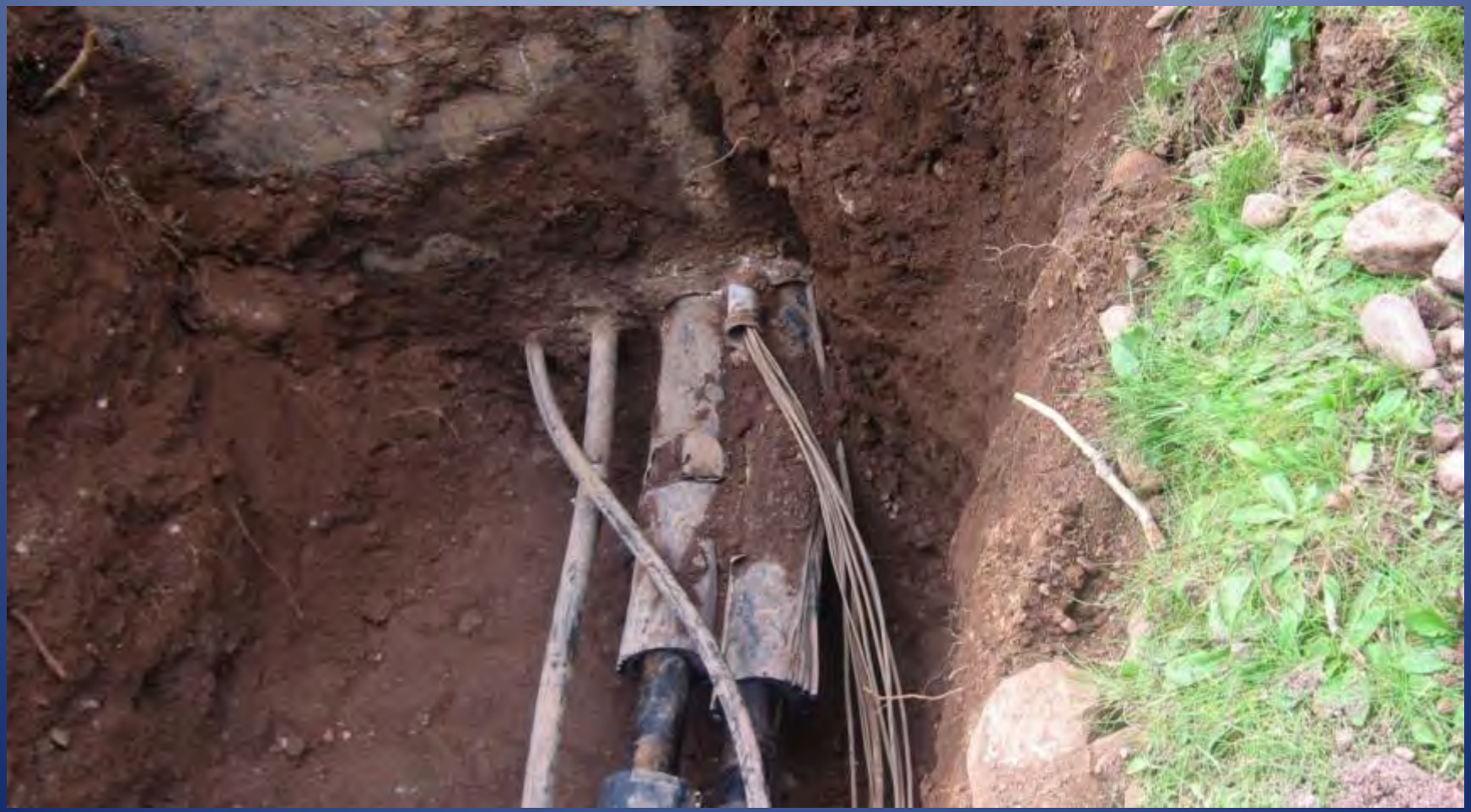
100,000 sq ft of heated buildings
84,000 by wood
2-3’ of soil

200 cords of birch / year

4 Cordwood GARN Boilers

Biomass boilers are fabulous teaching tools with kids

Mid 80s Insulation



Heating System Audit

Wolf Ridge Environmental Learning Center
Finland, MN

Heating System Audit

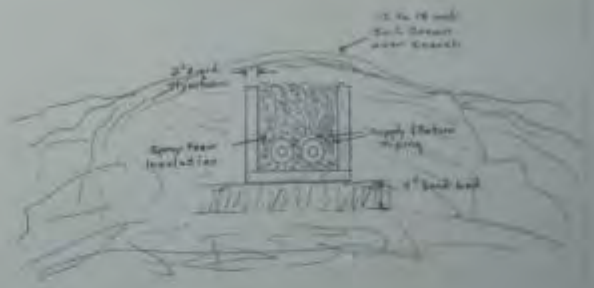
McKinstry

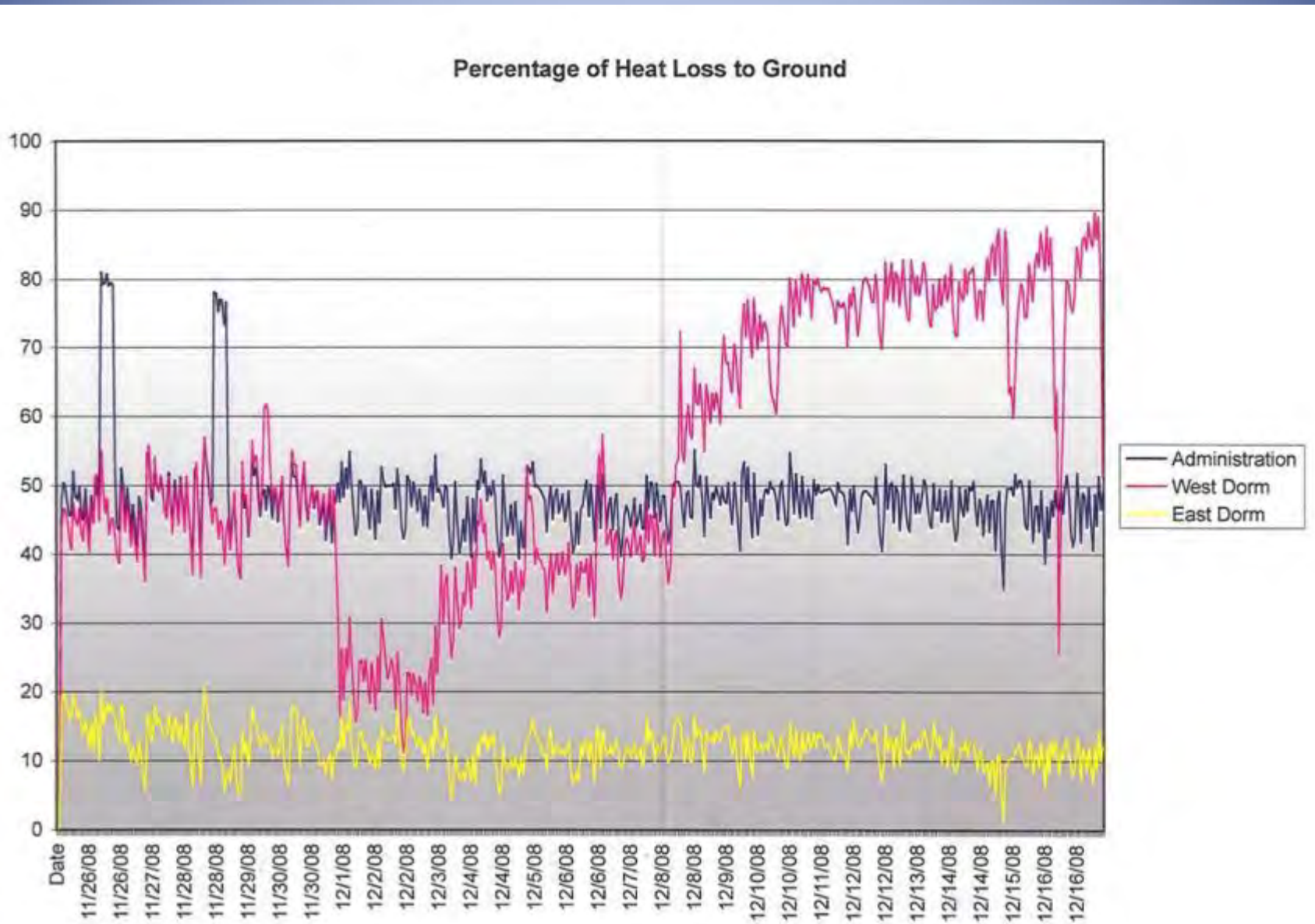
additional insulation to reduce heat loss and assure long-term performance.

The new piping system will be trenched into the ground to the maximum depth permitted by the existing soil conditions. The subsoil composition, rock outcroppings and granite ledge prohibit trenching below the frost line. Because of this, alternative insulation methodology is required.

There is concern for the negative impact this activity will have on the campus landscape. Some destruction of vegetation and altering of the natural contours of the terrain will be necessary and unavoidable. Effort to minimize this destruction will be required. The limitation of depth and need for additional insulation application does not permit directional boring or conventional plowing methods. The trench must be open topped and of sufficient width to permit the application of closed-cell foam insulation before and after pipe is installed. The intent is to achieve a permanent barrier between the piping and surrounding soil. This trenching method limits the trench to a maximum depth of five feet. Deeper excavation requires subsoil shoring to protect workers. Installing shoring would be a major detriment to proper installation and needs to be avoided.

An additional concern with trenching is the effect underground piping has on water flow, especially during spring thaw. Melted snow tends to channel along the piping as it flows downhill. This channeling greatly increases the conductive heat loss of the piping. To mitigate this effect it is recommended that the trenches be back-filled and mounded to direct water away from the trench. While the closed cell insulation is impervious to water, directing water away from the piping would remain beneficial. A minimal berm of 12 to 18 inches the length of the trenches would suffice.




Percentage of Heat Loss to Ground
100
90
80
70
60
50
40
30
20
10
0
Date
11/26/08
11/26/08
11/27/08
11/28/08
11/28/08
11/29/08
11/30/08
11/30/08
12/1/08
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12/15/08
12/16/08
12/16/08
Administration
West Dorm
East Dorm

Uponor EcoFlex Pipe
2”twin,3”, 3.5” & 4”

Quick, easy install!!

Main runs = separate supply/demand
Building runs = twin piped

One week = 1200’ jacketed pipe

Step 1 … Conservation

Switching to Uponor EcoFlex Pipe

20% savings on fuel, year one

(40 cords of birch)

Step 2 … Efficiency

Step 3 … Renewables = New Boilers

Cordwood or Pellets?

34 ton grain bin for pellets

Of course it snows on a day like this!

WoodMaster BM 300 & 650

1.1 million btuh (300 KW)

2.2. million btuh (650 KW)

2500 gallon buffering tank

District Heating
3 zones • 5 buildings • 84,000 sq ft

Maintenance … 1x/week, 45 min
1x/3 weeks, 2-3 hours

Computer controlled combustion

175 tons/year, 1/4” & 3/8”

Great Lakes Renewable Energy, Hayward, WI

The Ambassador of Sweden visits Finland

Energy In My Home

LESSON PLAN

Wolf Ridge Environmental Learning Center
6282 Cranberry Rd • Finland, MN 55603 • 800-523-2733 (MN); WI • 218-353-7414

Wolf Ridge's Realtime Energy Display

IMPROVING FIRE THROUGH TECHNOLOGY

this activity, students will be applying problem-solving skills to learn about fires and how people used hnology to make fires more efficient as a way to generate heat.

IECTIVES

student will be able to
scribe ways humans have developed technologies to solve the problem of conserving heat from while reducing the negative consequences of pollution.
rstand that technology changes with time.
in why some fuel sources are better suited to particular areas than others (e.g. wood heating s sense in forested areas)

LARY

logy: The application of scientific knowledge in order to make a process or product more (i.e. save time, save energy)
Solving: finding a solution in a situation one has not dealt with before

/EQUIPMENT

ning cards (Appendix A)
l other materials used for fire-building at your site
s and small metal cans to hold water (optional; directions included in Appendix C)

15-90 minutes depending on how much time you spend on fire-building

SICAL ACTIVITY: moderate

TIVITY

duced to the idea of problem-solving by trying to build a small fire.

me different reasons why people make fires now and why they made fires in the t they know about building a fire. Talk about the three key things needed for a fire d heat/source of flame. Have students explain how to construct the base of the rst, then larger pieces of wood once the fire is going. Depending on the site, you enals to use to start the fire: dried pine needles, birch bark, etc.

to take some time to have students practice lighting matches. Many students handle matches and are intimidated by the sudden flare when the match as an opportunity for students to safely learn how to use matches. Before es, show them how to orient the match (i.e. fire burns upward so hold the p as it burns) and what happens as it is tilted in different directions. Give tunity to light a match.

ve students gather and arrange materials for their fire. As part of the fire to have students experiment with green wood as well as with dry wood iment with burning different species of wood – especially softwoods vs. rt woods burn.

cted and arranged, pass out 2-3 matches per group and have Monitor the groups, asking leading questions to help groups that are wood? What size pieces of wood did you place on the bottom?

Wolf Ridge ELC
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