Smarter Science Better Buildings
Western Development Museum – North Battleford

Workstation Guiding Questions – Pages 1 - 6

Heating and Cooling

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. List some reasons why ***cellulose insulation*** is an environmentally beneficial insulation choice.

2. ***Heat Pumps*** use electrical energy to move heat energy from one location to another. Look at the Heat Pump Diagram. Compare the size of the blue “electrical energy coming in” arrow to the size of the red “heat energy coming out” arrow. Explain what this tells you about how efficient the heating system is.

3. Name three things ***Beardy’s and Okemasis’ Cree Nation*** wanted to accomplish with their new homes.

4. In ***How Heat Moves,*** which home is warmer in winter? Which home uses the least amount of energy?

5. Set the ***thermostats*** in the display to 15ºC. If you set your thermostat at home back to 15ºC at night, how would this save energy?

Net Zero Home

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. List what makes up the ***building envelope***. Explain why it is important for the building envelope to be airtight and have good insulation.

2. ***Canada's National Energy Code:*** How much more energy efficient is tier 4 than the current Saskatchewan code?

List three actions that would increase a home's energy efficiency.

1. _____

2. _____

3. _____

3. Explain ***thermal bridging.*** How does the double-wall construction reduce it?

4.

$$Q = \frac{A \times DT}{R}$$

When you "turned down" the thermostat (DT), what happened to the power (Q), consumption of the house? Why?

5. How does energy use in our homes connect to ***climate change***? List some things we can do in our homes to act on climate change.

Lighting and Appliances

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. Look at the ***Innovative Design*** section: How does Daylighting use reflective materials to bring natural light into the interior of buildings and save energy?

2. The ***average Saskatchewan home*** uses a lot more electricity than the NET ZERO home. Name three ways the NET ZERO home uses less.

3. Look at the circle graph of ***household electricity use***. Check (✓) ways you think you and your family could make changes to save electricity.

Use LED lights	Turn out lights that aren't needed	Dry clothes on a clothesline
Use timers for lights and vehicle block heaters	Use a power bar to turn off phantom load	Unplug electronics not in use
Buy ENERGY STAR® appliances	Reduce Air Conditioner use by setting the thermostat to 24ºC or higher	Other:

4. Look at the ***light display***. Besides the exit lamp, which light bulbs use the least amount of power?

OPTIONAL *- Can be done in the classroom:*

5. ***Energy = Power x Time.*** If your lamp has two 15-watt bulbs, and you have them on for five hours, how much energy do they use?

   Energy (watt hours) _____ *= 2(15W) x 5hrs*

   Explain how reducing power (W) and time (hrs) can reduce overall energy use?

Water

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. How does the ***drain water heat recovery Powerpipe*** use ***conduction*** to save energy? Look at the large copper pipe on the left side of the display and the diagram to understand.

2. Explain how the ***rainwater system*** works. How is rainwater used?

3. How are wetlands used in the ***Logan Green Water Management System***?

4. Check (✓) ways you could ***save water*** in your home and at school.

Turn off the tap while brushing your teeth	Replace your old dishwasher with an ENERGY STAR® dishwasher	Take a shorter shower
Fix a leaking toilet	Turn off the tap after washing your hands	Install a low-flow showerhead
Collect rainwater to water your lawn/garden	Grow drought tolerant plants	Other:

OPTIONAL *- Can be done in the classroom:*

5. ***Shorter showers:*** If a showerhead has a flow rate of 6 litres/minute, calculate the amount of water used for a five-minute shower versus a 20-minute shower.

   6L/min x 5min = _____ L 6L/min x 20min = _____ L

   How much water do you save by shortening your showers from 20 minutes to 5 minutes?

Solar

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. What part of Canada has the highest ***annual photovoltaic potential***? Which region of Saskatchewan has the highest potential?

2. Try the ***solar panel*** display. How do the clouds affect how bright the lights are? Why?

3. Look at the ***Innovative Design*** section:
   - LightLeaf panels – where would these panels be installed?

   - Mitrex building integrated panels – what makes these solar panels innovative?

4. The ***Pesâkâstêw Solar Project*** powers 2,500 homes and eliminates more than 15,000tCO2e/year. List some benefits you think this project brings for the two First Nations involved.

OPTIONAL *- Can be done in the classroom:*

5. If your home uses 7,500 kWh/yr and the average solar panel produces 400 kWh/yr, how many panels do you need to produce enough electricity for your home? If you live in Saskatoon, check MyHEAT Solar to see the solar potential of your address.



Retrofits

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. Compare the ***EnerGuide® ratings*** of the historical and modern houses. What helped older homes use less energy? What helps modern homes use less energy?

2. Put your hands on the ***window display***. Which type of glass allows more heat to escape? Which window keeps more heat in? Explain how the window's design and construction reduces heat loss.

3. Try out the home retrofit samples like ***weather stripping, pipe and wall plate insulation***. Which could you use in your home and where?

4. List some benefits that the Prairie South School Division achieved by installing new windows and lighting in these Moose Jaw ***heritage schools***?

OPTIONAL *- Can be done in the classroom:*

5. ***Real Retrofit:*** The 2018 Energy Retrofits of the 1970s Split-Level reduced the home's energy use by about 40% (70 GJ/year). Calculate the reduction in greenhouse gas emissions from this home's retrofit. Use this calculation:

   70GJ/year x 50kgCO2/GJ = _____kgCO2/year reduction.

Smarter Science Better Buildings

WDM North Battleford Exhibits Visit Guiding Questions – Pages 7 - 16

Explore Jakob Marjan's Shoe Repair Shop, the Hamelin Family House and the Grey Schoolhouse as well as the *100 Years of Saskatchewan History* exhibit. Use the map on page 16 to locate the buildings and exhibits.

With your classmates, you will work your way through the Museum exhibits, answering the questions provided and discussing what you see. You will explore three Museum exhibit buildings. Think about where air would leak into the buildings and where heat would be lost. Compare the exhibit buildings to each other. What factors make some of the buildings more energy efficient than others? What factors make modern buildings either more or less energy efficient than these buildings?







Move To Jakob Marjan's Shoe Repair Shop



This brick building was the business of Jakob Marjan. Jakob was a shoemaker who immigrated to Saskatchewan from Europe. In 1931, he had this little building built so he could run a shoe repair shop. His business was open on Railway Avenue in North Battleford for 37 years. Both Jakob and his wife, Leokadia, were very active in the community. Jakob's family still lives in North Battleford.

In 1991, the WDM saved Jakob's brick shoe repair shop from demolition and made it part of the Heritage Farm and Village.

Saskatchewan has a long history with brick as a building material. The Claybank Brick Plant in southern Saskatchewan, manufactured bricks made from clay found onsite from 1914 - 89. These bricks were used in the construction of several well-known buildings, including the Bessborough Hotel in Saskatoon and on NASA's rocket launch pads at Cape Canaveral in Florida.

Examine the building as you read the questions below.

1. Estimate the thickness of the walls in cm: _____

2. Where could heat escape from this building?

1. _____
2. _____
3. _____
4. _____

3. How many windows does the brick shop have? _____



4. Think about the thickness of brick when compared with the thickness of wood. Do you think a building made of brick keeps the building warm better or worse than a building made of wood? Why or why not?

_____

_____

_____

_____

5. As a business, the door of Jakob's shop would have been frequently opening and closing. How would this impact energy efficiency when compared with a home?

_____

_____

_____

_____

6. Compared with many businesses today, Jakob's shop is very small. If we are trying to conserve energy, what are some helpful things about a smaller building?

_____

_____

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_____

Move to the Hamelin Family House



This is the home of Dr. Joseph Jules Hamelin, one of the first doctors to practice in North Battleford. He arrived in 1911 when the town was booming. North Battleford had many amenities, including electricity and running water. Dr. Hamelin built this house on 99th Street. In 1970, this house was donated to the WDM and moved to the Heritage Village.

1. Estimate the thickness of the walls in cm: _____

2. Where could heat escape from this building?
1. _____
2. _____
3. _____
4. _____

3. How was this home heated? _____

4. How many panes of glass thick are the windows? _____

5. What are possible light sources for this building (name as many as you can think of)?

_____

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_____

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Compare the Hamelin Family House and Jakob Marjan's Shoe Repair Shop

Let's compare Jakob Marjan's Shoe Repair Shop and the Hamelin Family House now that we have looked at both buildings in the Heritage Farm and Village.

Which building is more energy efficient? Think about the size of the buildings, thickness of the walls, number and size of windows, type of heat, etc. Explain your choice.

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Move to the Grey Schoolhouse



This school is known as Grey School. It was moved to the WDM from the Maymont area. The school opened in 1909 with 21 students. This was called a 'one room schoolhouse' as all of the grades were in the same room. The school was also used by the local community as a meeting place and as an entertainment centre.

The school stayed open year-round and only closed because of blizzards and illness. For example, the school was closed in 1916 for two weeks because of a measles outbreak and again for six weeks in 1918 due to the Spanish Flu Pandemic. The school building was donated to the WDM in 1965.

1. List the materials that were used to build this school. Where would local builders get these materials?

_____

_____

_____

2. Estimate the thickness of the walls in cm: _____

3. Where could heat escape from this building?

_____

_____

4. How was this building heated? _____



5. What provided light for this building? _____

6. How many windows are in the Schoolhouse? _____

7. How many panes of glass thick are each window? _____

8. List three things in this Schoolhouse that did not use electricity in the 1920s but might need electricity in your classroom today.

1. _____
2. _____
3. _____

Compare the Grey Schoolhouse with your School

The Museum's schoolhouse was built in the 1920s. Let's compare it with your school building today.

Which building is more energy efficient? Think about the size of the schools, thickness of the walls, number and size of windows, type of heat, etc. Explain your choice.

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Move to the *100 Years of Saskatchewan History* Exhibit





Traditionally, nomadic Indigenous groups used easily transportable tipis or tents. Tipis were constructed, owned and set up by women. Women erected the tipis by constructing a framework of 15 - 17 wooden poles upon which a covering of 12 - 20 hides, usually bison, was overlaid and held in place using pegs. Smoke flaps near the top allowed for smoke to escape from the fire that was built within for cooking and heat. The tipi was waterproof, windproof, warm in winter and cool in summer, and portable - all important attributes to support a nomadic lifestyle in a changing climate.

Imagine you are standing in a real tipi.

1. Why do you think tipis were warm in the winter?

_____

_____

_____

2. Which home do you think would be more comfortable in the winter – a tipi covered in bison hides or a wooden house? Explain your choice.

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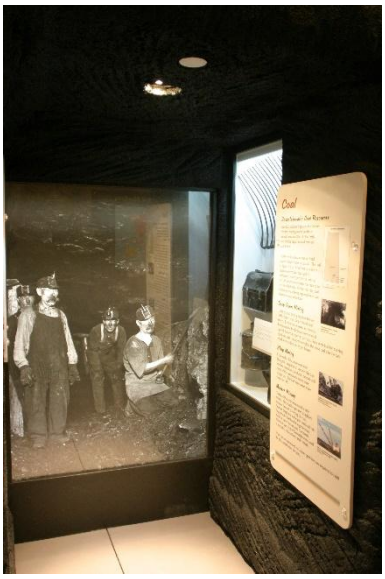
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Natural Resources

Near the tipi is an exhibit about natural resources in Saskatchewan.

Few places have been blessed with the richness of natural resources that Saskatchewan enjoys. Beneath our feet are natural resources such as coal, oil and natural gas. For many years we have used these natural resources to heat our homes. These natural resources are called non-renewable resources meaning that we cannot replenish them once they are gone. Solar and wind power are called renewable resources. In Saskatchewan we are starting to use more renewable resources. For example, the visitor centre at Fort Battleford has solar panels on the roof and a wind turbine to provide power to the building.





Enter the mine door when the light above the door is green. Make your way to the Coal display.

1. What is most of Saskatchewan's coal used for?

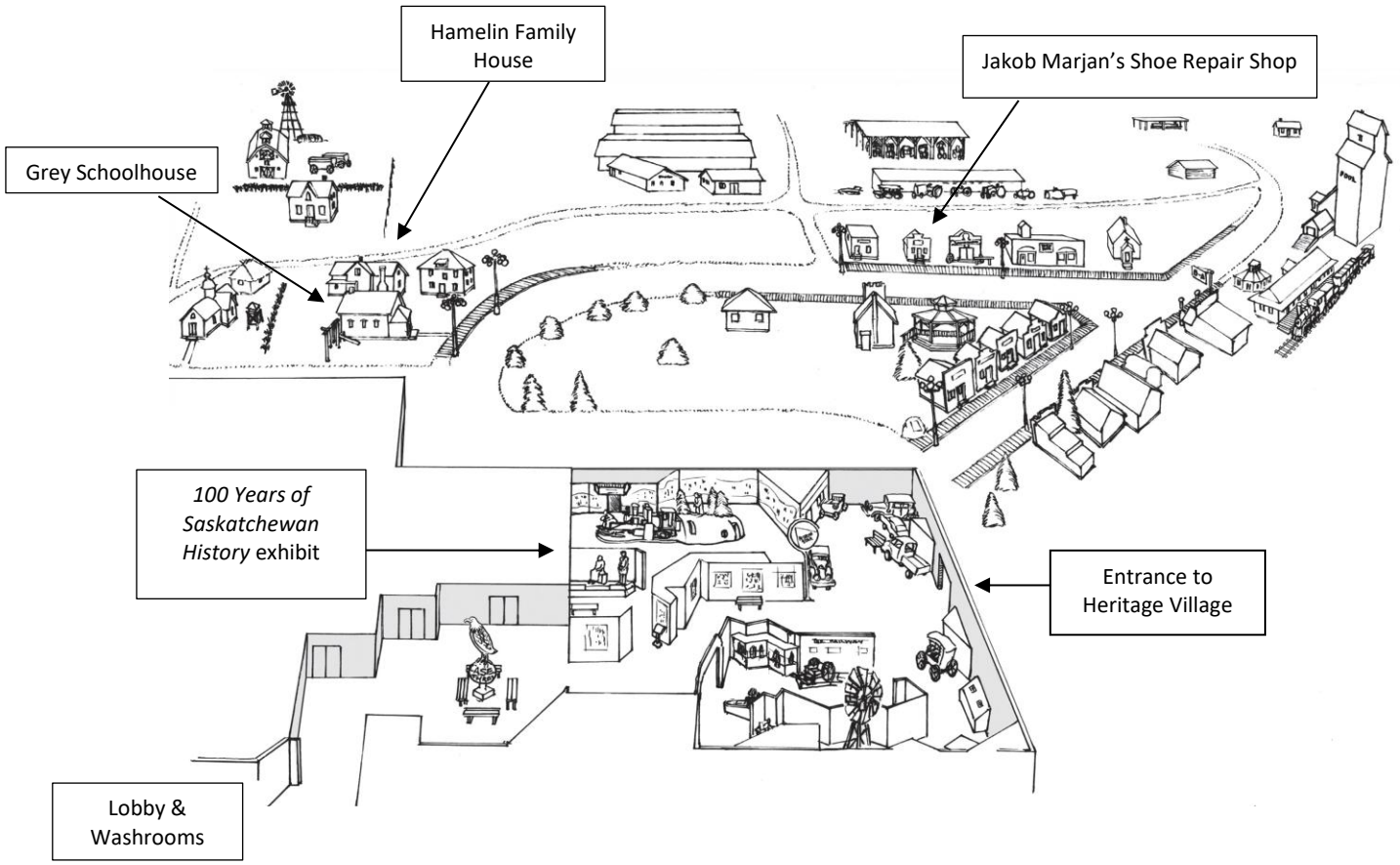
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2. What are modern mine operators required to do after they have removed all the coal from the ground?

_____

_____


Hamelin Family House
Jakob Marjan's Shoe Repair Shop
Grey Schoolhouse
100 Years of Saskatchewan History exhibit
Entrance to Heritage Village
Lobby & Washrooms