



Smarter Science Better Buildings

Western Development Museum - North Battleford

Explore Jakob Marjan's Shoe Repair Shop, the McLaren Family Farmhouse, and the Schoolhouse as well as the *100 Years of Saskatchewan History* exhibit.

Students will work their way through the Museum exhibits, answering the questions provided and discussing what they see. Students will explore three Museum exhibit buildings. Have students identify where air would leak into the homes and where heat would be lost. As students tour the exhibits, have them 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?



EDUCATION
PROGRAMS



Saskatchewan
Environmental
Society



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 asked for this little building to be built in North Battleford so he could run a shoe repair shop. His business was open on Railway Avenue for 37 years. Both Jakob and his wife, Leokadia, were very active in the community. Jakob's family still lives in North Battleford today.

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 manufactured bricks made from clay found onsite from 1914-1989. 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.

DO NOT enter this building. Examine the building from the outside as you read the questions below.

1. Estimated thickness of the walls. _____





2. Places where heat would 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. Look through the windows. Can you see the pipe hanging from the ceiling and the brick outline on the wall? They are the leftover parts of the machine that would have been used to heat the shop. What type of machine do you think it would have been? Can you guess what would have been the fuel source for this type of machine?

6. 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?

7. 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?





MOVE TO THE MCLAREN FAMILY FARMHOUSE



The farm home of the McLaren family of Rockhaven was built in 1914 and donated to the WDM in 1987. The house was not wired for electricity.

Prior to 1949, about one percent of Saskatchewan's farms had electricity. A few communities, like North Battleford, had electricity but it was considered a luxury enjoyed by city dwellers. In the 1950s and 1960s, electricity came to many rural areas.

1. Estimate the thickness of the walls. _____
2. Places where heat would escape from this building.
 1. _____
 2. _____
 3. _____
 4. _____
3. How was this home heated? _____
4. What could have provided light for this house? -

5. How many panes of glass are in the windows? _____
6. List three things in this building that did not use electricity in the 1920s, but today might require electricity.
 1. _____





MOVE TO THE SCHOOLHOUSE



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

2. Estimate the thickness of the walls. _____

3. Places where heat would 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? _____

How many panes of glass are in each window? _____

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

1. _____





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 buffalo, 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 buffalo hides or a wooden farmhouse? Explain your choice.

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 see the use of 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.



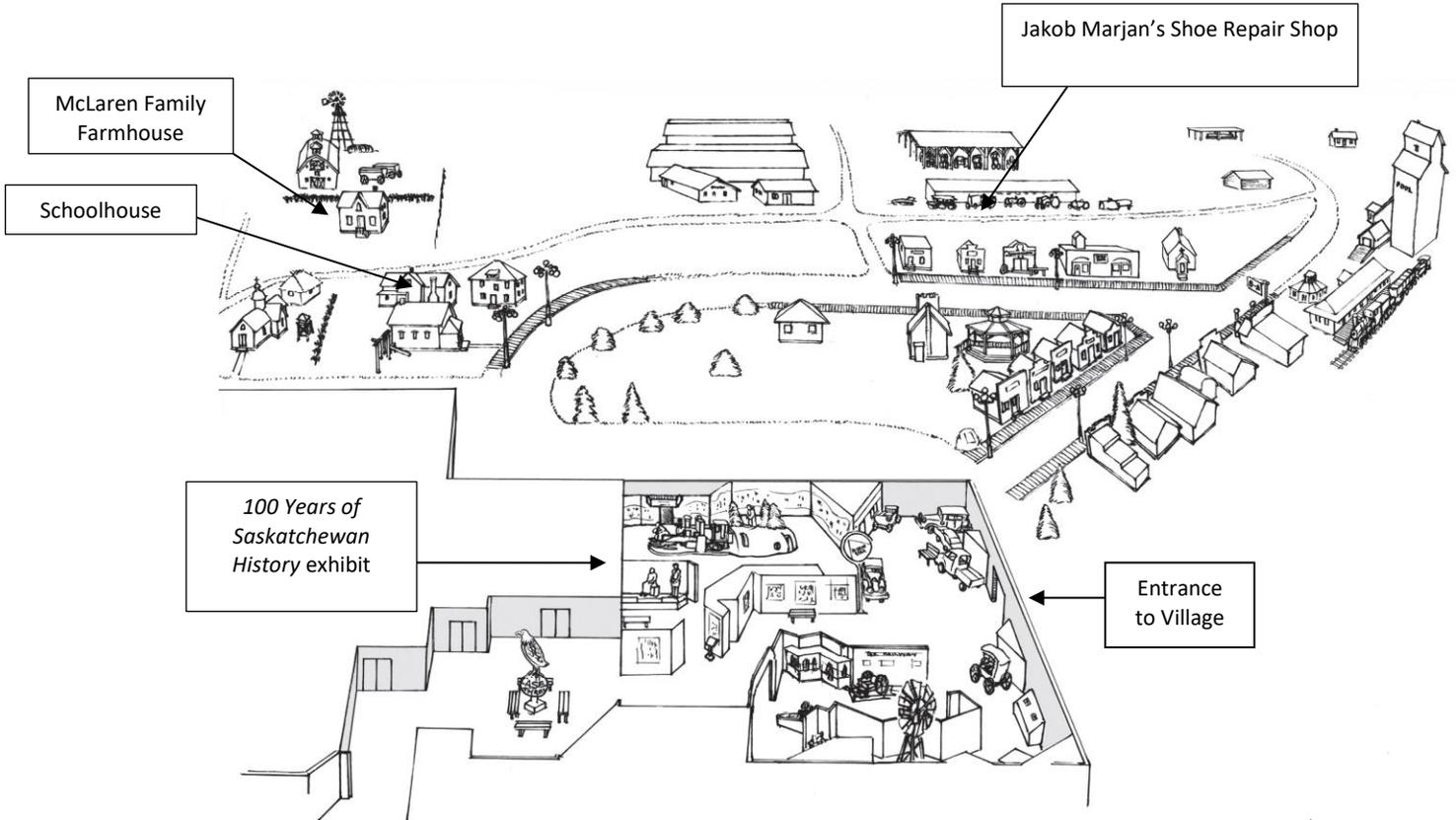


Enter the mine door when the light above the door is green. Make your way to the Coal display.

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

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







Workstation Guiding Questions – Answer Key

BUILDING MATERIALS

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

1. Why is it important to consider the whole **life cycle of building materials**? Describe how this information could affect how we choose products?
2. How do materials that have a high **R value** increase the energy efficiency of a building?
3. Name one **social, environmental or economic benefit** of building an energy efficient home.
4. Check (✓) **sustainable building materials**, and for one item, explain why you chose it.

Vinyl flooring	Polyurethane insulation	Concrete board siding
Reclaimed or FSC wood	Granite countertops	Triple pane windows
Metal roofing	Straw bale insulation	Other:

Item: _____

Why I would choose it:

5. In **Saved from the Landfill**, 67,436 tonnes of material kept out of the landfill equalled 95% of the weight. What was the weight of the material that went to landfill (5%)?





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 factors helped the older homes use less energy? What factors help the modern homes use less energy?
2. Test the **window display**. Which types of glass allow more heat to escape? Which kinds keep more heat in and how does their construction contribute to this?
3. Do you have a **programmable thermostat** in your home? Program this one to the suggested setting and then consider doing the same thing in your home. How would it help you save energy?
4. Try out the home retrofit samples like **weather stripping, pipe and wall place insulation**. Which retrofits would be useful in your home and where would you use them?
5. Insulating the basement/foundation of the **1970s Split-Level** home will reduce the home's energy use by 25 GJ/year. Calculate the reduction in greenhouse gas emissions from making this retrofit to the home. Use this calculation:

$$25\text{GJ/year} \times 50\text{kgCO}_2/\text{GJ} = \underline{\hspace{2cm}} \text{ kgCO}_2/\text{year reduction}$$





SOLAR

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

1. Explain **convection**, **conduction**, and **radiation**. Hint: They are part of the radiant floor heating and solar evacuated tube panels.
2. Check (✓) ways you could use **solar power** in your home or school. *Student choice.*

Use natural light from windows	Close curtains to keep summer heat out	Use solar panels for yard lighting
Use solar photovoltaic panels to make electricity at the cabin	Use solar thermal panels to heat pool water	Other:

3. Try the solar panel display. What difference do the clouds make to how much the meter moves? Why?
4. If your home uses 7500 kWh/yr and the average panel produces 300 kWh/yr, how many panels will you need to produce enough electricity for your home?
5. List buildings in your neighbourhood whose roofs are large or face south, aren't shaded by trees or buildings, and could be used to hold solar panels.





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.
2. Explain how a **grey water system** described here works to make use of rainwater.
3. Look at **Try This!** Using a water efficient low flow showerhead, calculate the amount of water used for a 5 minute shower, compared to a 20 minute shower.

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

How much water do you save by shortening your shower this much?

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

Turn off the tap while brushing your teeth	Replace your old washing machine with an ENERGY STAR® washing machine	Replace your old dishwasher with an ENERGY STAR® dishwasher
Fix a leaking toilet	Turn off the tap after washing your hands	Take a shorter shower
Collect rainwater	Grow drought tolerant plants	Other:

5. People in the UK (United Kingdom – England, Scotland, Wales & Northern Ireland) use half the water that we do in Canada. What do you think they are doing differently?





NET ZERO HOME

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

1. **LEED buildings** reach a high standard of energy efficiency. Why do you think **awareness and education** are included in the checklist?
2. List the things that make up the **building envelope**. Why is it important for the envelope to be airtight and have good insulation?
3. What is **thermal bridging** and how does the double wall construction reduce it?

$$Q = \frac{A \times \Delta T}{R}$$

When you “turned down” the thermostat (ΔT), what happened to the power (Q), consumption of the house? Why?

- 4.
5. **“Warming of the climate system is unequivocal [and] Human influence on the climate system is clear.”** – Intergovernmental Panel on Climate Change, Climate Change 2013. The Physical Science Basis, Summary for Policymakers
 - a. What does “unequivocal” mean?
 - b. What does “human influence on the climate system is clear” mean?





LIGHTING & APPLIANCES

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

1. The **average Saskatchewan home** uses a lot more electricity than the Vereco NET ZERO home. Name three ways the NET ZERO home uses less.
2. 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 the line
Use timers for lights and block heaters	Use a power bar	Unplug electronics
Buy ENERGY STAR® appliances	Reduce Air Conditioner use by setting the thermostat to 24°C	Other:

3. Look at the **light display**. Excluding the exit lamp, which light uses the least amount of power?
4. Look at **Try This!** We use much more electricity than our parents and grandparents did. Name two modern appliances you could do without in order to use less electricity.
5. **Energy = Power x Time**. Explain what this equation means in terms of the kind of lights we use and how long they are on.

