Smarter Science Better Buildings
Western Development Museum - Moose Jaw

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. What factors make ***cellulose insulation*** an environmentally beneficial insulation choice?

2. ***Heat Pumps*** use electrical energy to move heat energy from one location to another. Compare the size of the blue “electrical energy coming in” arrow, to the size of the red “heat energy coming out” arrow. What does that tell you about the efficiency of the heating system?

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

4. In ***How Heat Moves***, which home would be warmer and less drafty in winter? Which home uses the least amount of energy?

5. Set the ***thermostats*** in the display to 15ºC. If you set the thermostat in your home back to 15ºC at night, how would it help you to 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 the things that make up the ***building envelope***. Why is it important for the 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. What is **thermal bridging** and how does the double wall construction reduce it?

4.

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

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

5. What is the connection between the energy our homes use and ***climate change***?

Lighting and Appliances

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

1. The ***Innovative Design:*** How does the reflective material bring natural light into the interior of the buildings?

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**. Excluding the exit lamp, which light uses the least amount of power?

5. ***Energy = Power x Time.*** If your lamp has two, 15watt 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.

2. Explain how a **rainwater system** described here makes use of rainwater.

3. What role do wetlands play 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:

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

Solar

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

1. What parts of Canada have the highest ***annual photovoltaic potential***? What part of Saskatchewan has the highest potential?

2. Try the ***solar panel*** display. What difference do the clouds make to how bright the lights are? Why?

3. ***Innovative designs:***
   - LightLeaf panels – where would you use these panels?
   - 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 the benefits of this project for the two First Nations involved.

5. If your home uses 7,500 kWh/yr and the average solar panel produces 400 kWh/yr, how many panels will 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 factors helped the older homes use less energy? What factors help the 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 contribute to heat loss or retention.

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

4. What are some of the benefits the Prairie South School Division achieved by putting new windows and lighting in these Moose Jaw ***heritage schools***?

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

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

Smarter Science Better Buildings

WDM Moose Jaw Exhibits Visit Guiding Questions – Pages 7 - 15

You and your classmates will work your way through the Museum building and exhibits, answering questions provided and discussing what you see.

Use the map found on page 15 to locate the artifacts and exhibits.

Enter the Museum Galleries

Stop as you enter the Museum galleries and look up and around, past the exhibits at the Museum building to examine the roof, doors, lights and walls. Do you notice what a big space it is?

The WDM Moose Jaw opened in 1976. The Museum was built to provide lots of space for cars, trains, planes, people and more.

Think about the size of the building. Pay attention to the doors, walls, heaters and lights as you go through the Museum as we will ask you more about them later.

Move to the Railway Station Replica

53 sq. metres (577 sq. feet) ERS Rating: 1 Energy Consumption: 449 GJ

In 1885, Canada was linked from coast to coast by the Canadian Pacific Railway. Every 12 km (8 miles) on the prairies, the railway built a siding complete with station, section houses and a name. These places would later become mail, market and supply centres for settlers farming within driving distance. In 1882, the CPR reached Moose Jaw, which became a divisional point for the railway. This railway station is a replica of a 1935 CPR station.

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

2. Can you guess what materials were used as insulation in the walls of this building?

_____

3. Where would cold air or water leak into this building? _____

_____

_____

4. Why might it be harder for businesses to be energy efficient, compared to a home?

_____

_____

_____

Move to the Hodge Coal Truck

Most homes and small businesses today are heated by natural gas. However, there are also homes that are heated by wood, electricity and oil. Large buildings such as schools and apartment buildings may be heated using boilers, instead of furnaces. Boilers heat buildings using water and steam that are heated by natural gas. Do you know what kind of fuel you use to heat your home?

Estimated efficiency of furnaces over time:

Heat Source/Year	Fuel Source	% Efficiency
Wood stove/ 1880-1910	Wood	<30%
Furnace/ 1920- 1940	Coal	30-40%
Furnace/ 1950-1970	Oil/Natural Gas	90%
Furnace: ENERGY STAR/2010	Natural Gas	95-98%

1. From 1920 - 40, many buildings were heated using coal. How was coal hauled to homes and businesses?

_____

_____

2. Think about how home heating fuel is transported to homes and businesses today? Do you think heating fuel is transported the same as it was 100 years ago in Saskatchewan? How do you think we move heating fuel today?

_____

_____

_____

3. When people used coal to heat their home, they needed a large space to store the coal. Do you need a place to store heating fuel in your house? Why or why not?

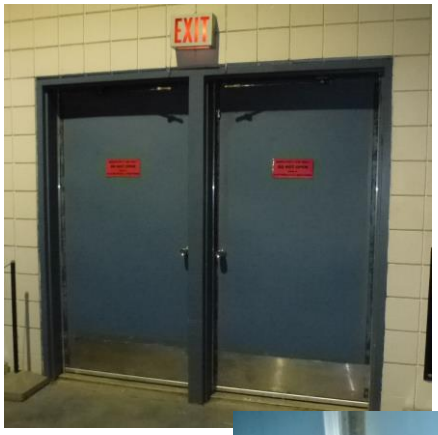
_____

_____

_____

Museum Exterior Doors

Located near the Railway Station are some of the Museum's exterior doors. Let's take a closer look at them.



1. Without opening the door, do you feel air coming in around the door? _____

2. Is daylight visible around the door?

   _____

3. In the winter, frost can collect on and around doors. This happens if there is air or moisture leaking in around the door. What can be done in a home, business or school to help stop air from leaking around doors?

   _____

   _____

   _____

   _____

Move to the Auto Repairs Building

In the early years of cars, also known as automobiles, there were few places where they could be repaired. Cars and trucks were sold by farm machinery dealers who didn't always know a lot about them. Between 1910 and 1920, cars became more common in Saskatchewan and more garages and repair shops were opened.

This auto repair shop was built by Museum staff using photographs to guide them.

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

   _____

   _____

   _____

2. Estimate the thickness of this building's walls in cm: _____

3. Notice the stove. What fuel was used to heat this building?_____

4. What provided light for this building? _____

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

6. Find two of the places where heat would escape from this building:

   1. _____
   2. _____

7. List three things in this building that did not use electricity in the early 1900s, but today require electricity:
   1. _____
   2. _____
   3. _____

8. Stop and listen while standing in front of the Auto Repair Shop. Do you hear the Museum's heating system and can you feel heat? Can you see where the Museum's heaters are located (look up)?
   1. Do you know what type of heat it is? _____
   2. Is this similar to how your school is heated? _____

9. It is hard for businesses in large buildings, like museums, to heat their buildings efficiently. Do you have any suggestions that would help make it easier to heat (or cool) a large building?

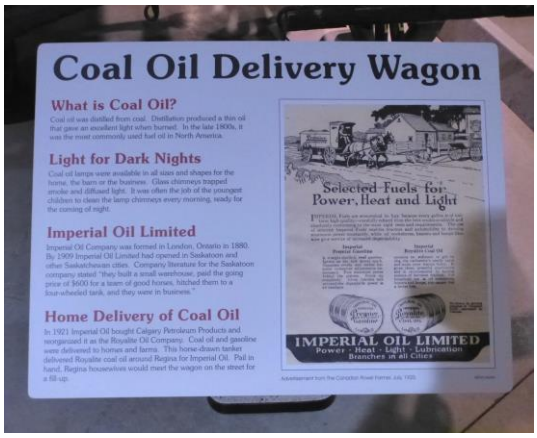
   _____

   _____

   _____

Move to the Coal Oil Delivery Wagon

Coal was used to heat homes and businesses from around 1910 - 40.



1. What is coal oil? _____
2. What was coal oil used for? _____
3. Is coal oil a renewable resource? _____
4. How did homes get coal oil? _____

Our homes, schools and businesses are only one part of living sustainably. Let's explore other ways that we can live sustainably.

Move to the 1929 Streetcar

In early Saskatchewan, hardly anyone owned a car. Just like today, booming cities needed public transit.

1. How is using public transit good for the environment?_____

_____

_____

2. What kind of energy powered the 1929 Streetcar? _____

3. Why did streetcars become unpopular? _____

4. Cities like Los Angeles and Atlanta have considered a return to streetcars in recent years. Why do you think they may be considering this?

_____

_____

Move to the 1951 Trolley Coach

1. What kind of energy powered the 1951 Trolley? _____

_____

2. What are two advantage trolleys had over streetcars?
   1. _____
   2. _____

3. What replaced trolley cars?

_____

Move to the *100 Years of Saskatchewan History* exhibit - Weather Display

In Saskatchewan, we have all kinds of weather from very hot to very cold. Today, we are lucky to have electricity in our homes that provides power for furnaces to keep us warm in the winter. Electricity also powers air conditioners and fans to keep us cool in the summer. How did people keep warm or cool before we had electricity?

Prior to 1949, only about one percent of Saskatchewan's farms had electricity. A few communities had electricity, but it was considered a luxury enjoyed by people in the cities. In the 1950s and 1960s, electricity came to many rural areas. Let's take a look at the weather display.

1. What are some ways that Saskatchewan people coped with extremely warm weather?

_____

_____

_____

_____

2. What are some ways to cope with extremely cold weather?

_____

_____

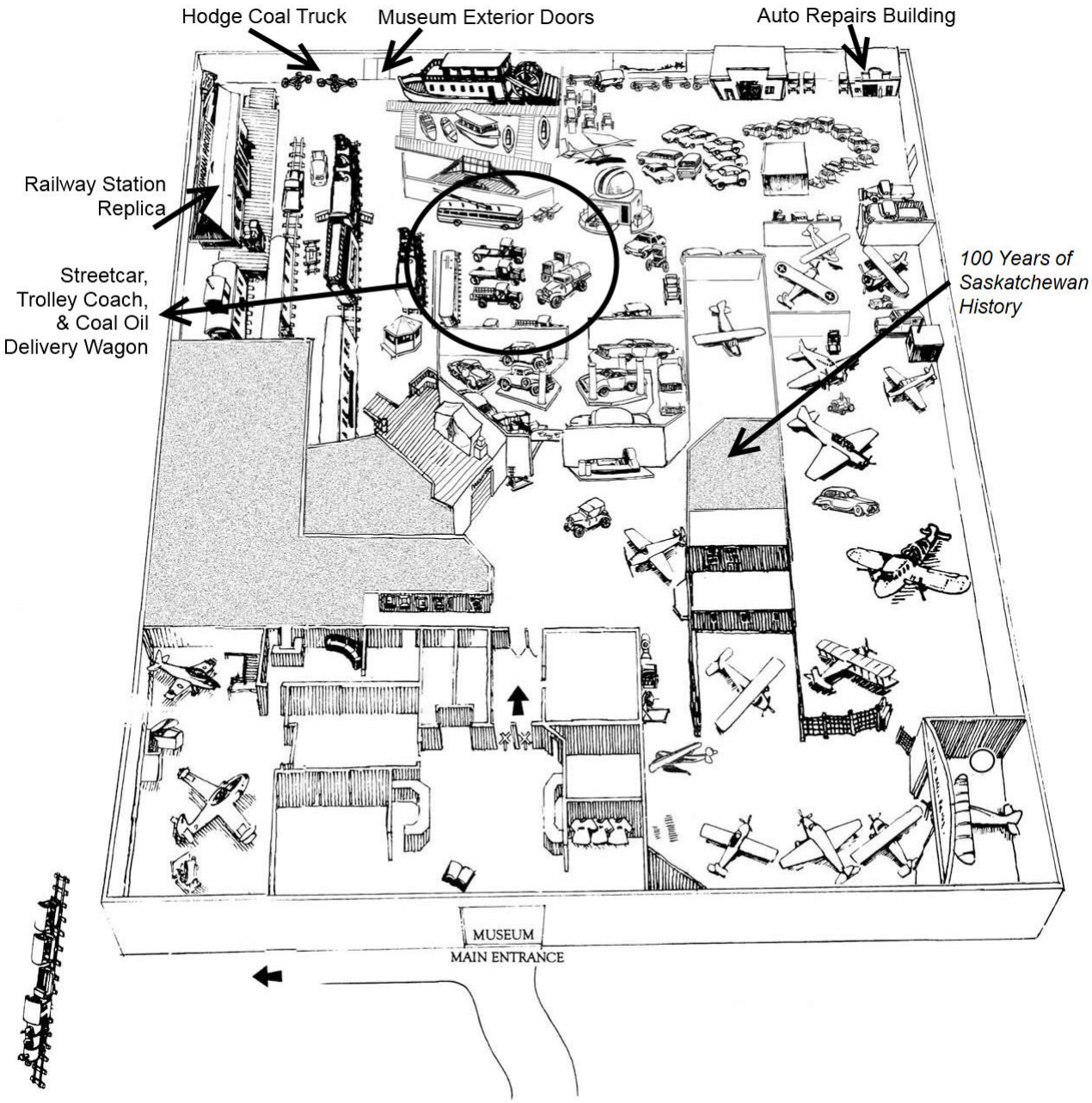
_____

3. How would you heat the things that kept you warm?

_____

_____

_____


Hodge Coal Truck
Museum Exterior Doors
Auto Repairs Building
Railway Station Replica
Streetcar, Trolley Coach, & Coal Oil Delivery Wagon
100 Years of Saskatchewan History
MUSEUM
MAIN ENTRANCE