

**Progress Report Number 16
Factor 9 Home: A New Prairie Approach**

**Robert Dumont
Saskatchewan Research Council
dumont@src.sk.ca**

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Executive Summary

Based on the measured energy and water consumption over the period from May 7, 2007 to February 17, 2008, it is anticipated that the Factor 9 Home will be able to meet the energy target of 30 kWh/square metre per year. The water consumption target of a 50% reduction compared with conventional homes is also likely to be met.

1. Purchased Energy Consumption

The annual energy target for the Factor 9 Home is 30 kilowatt-hours per square metre of floor area including the basement. As the home has a total floor area of 301 square metres including the basement, the annual energy target is 9030 kWh assuming average year weather conditions. For the Regina climate, the annual average space heating degree-days are 5661(base 18 °C) and the annual average cooling degree days (base 18 °C) are 146.

For the period from May 8, 2007 to February 17, 2008, the purchased energy consumption for the house averaged of 24.2 kWh/day.

Pro-rating the energy consumption to 365 days, the purchased energy consumption would amount to 8833 kWh/year, which is less than the target of 9030 kWh/year.

The actual consumption over the one year period will depend on the weather for the remainder of the one year monitoring period. For instance, colder weather will increase the house energy consumption for space heating. Sunny weather will increase the useful passive and active solar collection. At the end of the monitoring period, the consumption figures will have to be adjusted for the weather, and also corrected for the energy use of the data logging equipment in the house.

Based on the energy consumption for the period ending February 17, 2008, it is likely that the home will be able to meet the target of 9030 kWh/year or 30 kWh/sq.m.

For comparison, the energy consumption of a group of 209 Regina homes built in 1970 to 1973 had a measured average value of 331 kWh/sq.m. (Reference: Hedlin, C.P. and Orr, H.W., "A Study of the Use of Natural Gas and Electricity in Saskatchewan Homes," Proceedings, 91st Annual EIC Meeting, 1977, National Research Council of Canada, Division of Building Research, NRCC 16898)

2. Purchased water consumption

The annual water consumption target is a 50% reduction in purchased water consumption compared with conventional homes. Conventional homes use 343 litres per person per day of water, according to the Atlas of Canada based on 1998 figures.

<http://atlas.nrcan.gc.ca/site/english/maps/freshwater/consumption/domestic/1>.

This water consumption number is approximately in agreement with some measured data for houses in Saskatoon, Saskatchewan (Dumont, unpublished data). Thirty houses were monitored for 4 years (1977-1981). The average annual water consumption was 356 litres per person per day, or 3.8% slightly higher than the 343 litres per person per day mentioned above in the Atlas of Canada.

For a 4 person family consuming 343 litres per person per day, the annual consumption would equal 500.7 cubic metres. A 50% reduction would be equivalent to 250 cubic metres per year.

Water conservation technologies used in the Factor 9 Home include low flow toilets (approximately 4 litres/flush), low flow shower heads, aerating faucets, a water conserving Energy Star dishwasher and a front loading clothes washer.

In addition, water is collected from the roof and stored in two plastic membrane tanks with a storage capacity of 19 cubic metres. The tanks are located in the crawl space beneath the basement floor. A pump is used to move the water to the end uses. This water is used for non-potable uses, namely toilet flushing and exterior landscaping watering.

Based on the water consumption over the period from May 8, 2007 to February 17, 2008, the water consumption averaged 0.489 cubic metres per day. Prorating this consumption to 365 days, the projected water consumption for the year would be 178 cubic metres. This value would readily meet the target of 250 cubic metres per year.

3. Submetered Water Consumption of Toilets

Toilets in typical Canadian houses account for about 45% of indoor water consumption. (Soroczan, C. Household Guide to Water Efficiency, page 10, Canada Mortgage and Housing Corporation, 2000)

The three toilets in the house (Gerber and Toto Models) have a water consumption average of 3.69 litres per flush, which is well below the 6 litre per flush requirement for toilets in the United States. Older toilets in Canada have flush values of approximately 20 litres per flush (prior to 1985) or 13 litres per flush (1985 or later), while some cities mandated 6 litre toilets after 1996. (Soroczan, op. cit.) 13 litre toilets are still on the market in many parts of Canada.

The toilets receive water from plastic membrane storage tanks that supply both the toilets and the outdoor landscaping. The plastic membrane storage tanks collect rainwater from the roof. In the winter months, no water is used for outdoor landscaping and only the toilets receive water from the plastic membrane storage tanks. For the period from October 8, 2007 through February 17, 2008, the average toilet water consumption was 50.3 litres per day. Prorating this to 365 days, the projected annual toilet consumption would be 18.4 cubic metres, or 10.3% of the total purchased water consumption for the house.

The water conserving toilets thus have dramatically reduced household water consumption.

4. Publicity

In October, 2007, a talk on the Factor 9 Home was presented at the Sustainable Northern Shelter Conference in Fairbanks, Alaska. On December, 2007, a talk on the Factor 9 home was presented to a group of Heating and Ventilating Contractors (TECA) in Vancouver, B.C. The house was discussed in the context of other low energy houses in the Canadian prairies. A copy of the Vancouver talk is presented on the www.factor9.ca web site.

6. Next Steps

A full year of monitoring will be completed on May 7, 2008. At that time an extended report on the year of monitoring will be written. The data will be corrected for annual weather data, and also for the effect of the energy used for the data logging system in the house.

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