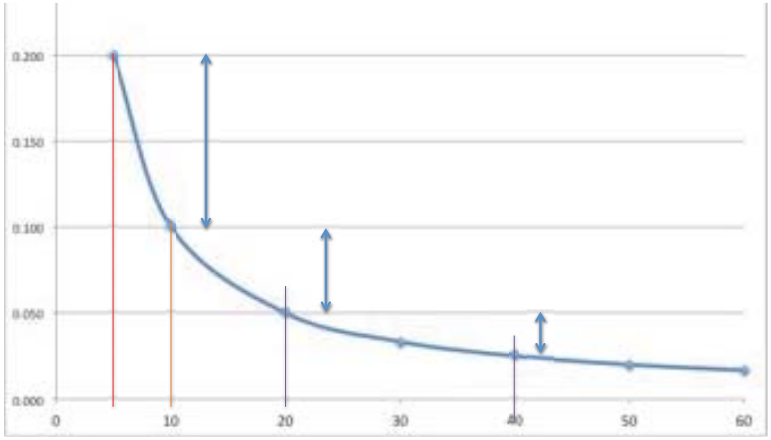
A Balanced Approach to Reducing Building Energy Use

Dr John Straube, P.Eng.,
University of Waterloo, Waterloo, Canada

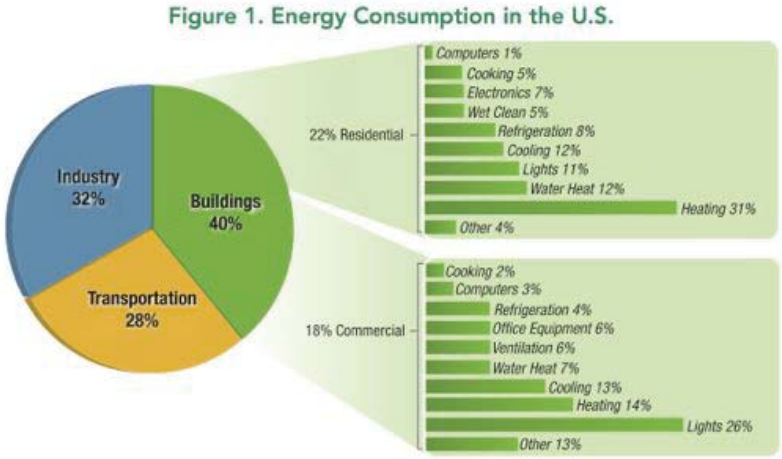
Scope

- Future trends…
- Low-energy use
- Lower nonrenewable energy use
- How much insulation?

R-value



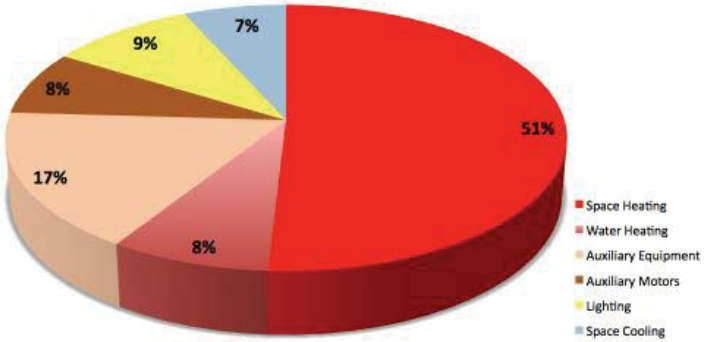
What uses energy?

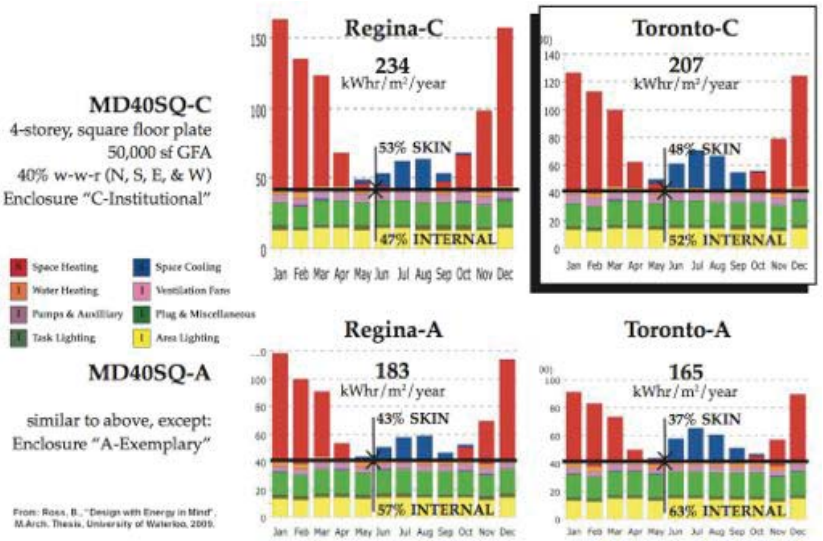


Source: 2007 DOE Buildings Energy Data Book, Tables 1.1.3, 1.2.3, 1.3.3.

What uses energy in buildings?

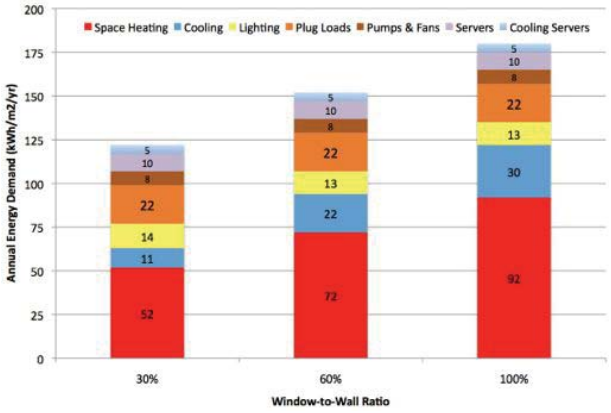
- Canadian Commercial Buildings
  - Conduction, leaks, & ventilation … we can save a



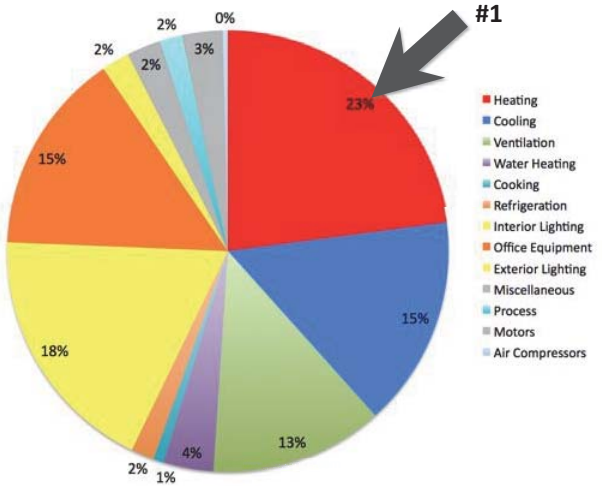


Cold-climate office model

- Swedish Low-energy office

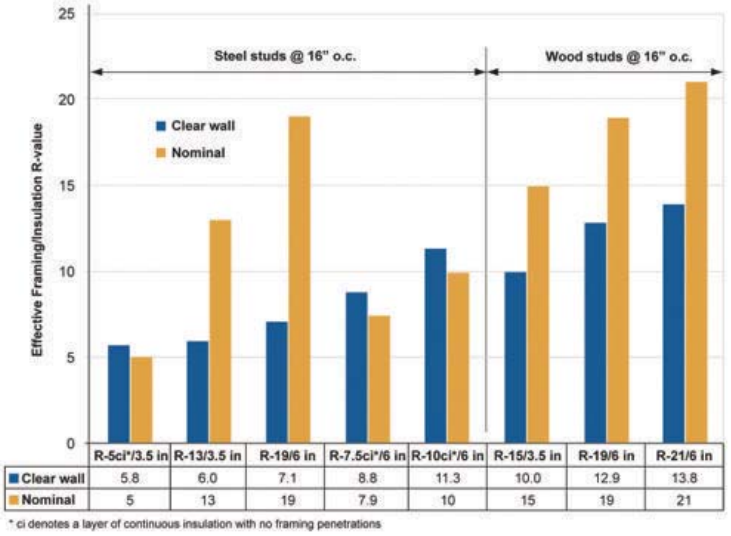


California Large Office: All Energy



Summary Commercial

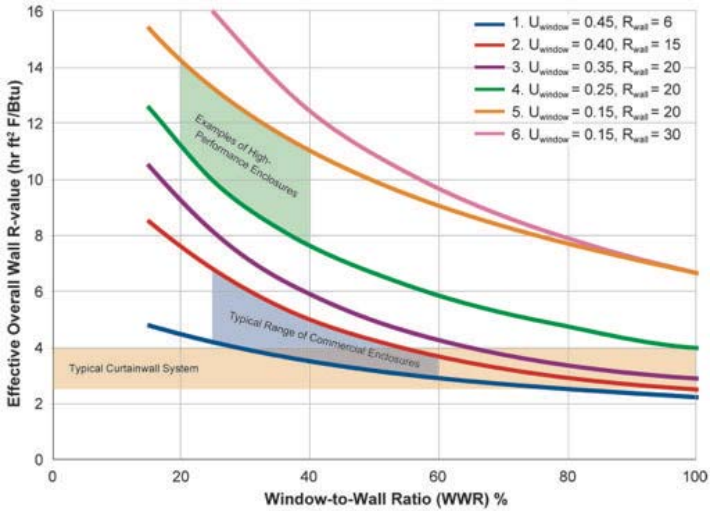
- Air leakage & Ventilation can be important
- Cold Climates
  - Significant heat loads because of conduction
- Ergo,
  - reduce conduction, reduce leakage,
  - Heat recovery ventilation
- Warm climates
  - Insulation is less important



	R-5ci*/3.5 in	R-13/3.5 in	R-19/6 in	R-7.5ci*/6 in	R-10ci*/6 in	R-15/3.5 in	R-19/6 in	R-21/6 in
Clear wall	5.8	6.0	7.1	8.8	11.3	10.0	12.9	13.8
Nominal	5	13	19	7.9	10	15	19	21

* ci denotes a layer of continuous insulation with no framing penetrations

True R-values



Conclusion

- True R-value of 20, triple-glazed windows (limit WWR) can reduce conductive heat gains by 3-4 times.
- Hard to justify much higher R-values for commercial
  - Until HVAC / lighting / controls
- Residential: higher R-values justified