PASSIVE OFFICE

AN EXPERIMENT IN ENERGY EFFICIENT CONSTRUCTION

CHET CHAMBERS, TOM MARSIK
UAF BRISTOL BAY CAMPUS, SUSTAINABLE ENERGY PROGRAM

OBJECTIVE: Build a structure in Dillingham, Alaska largely based on the Passive House Standard. It is designed to maintain a comfortable, year-round temperature relying primarily on heat from passive solar gain, body heat and "waste" heat from lighting and electrical appliances.


Passive Office under construction.


Detail of the floor joist system


CTT Instructor Kent Winship


Exterior of the Passive Office near completion. August 2010

METHODS: The structure was built using the following principles:

- Super insulation
- Airtight building envelope
- Limited thermal bridging
- Passive solar design
- Ventilation with heat recovery
- High performance windows
- Reliance on internal heat gain
- Energy efficient lighting

CONSTRUCTION DETAILS:

R-values: Walls and Floor: R-90
Ceiling: R-140

Target Air Tightness: 0.6 ACH

Windows: Triple-paned, double low-emissivity coatings with U-Factors of 0.17 and 0.15


CTT students Ron Johansen and Craig Schlosser ready to build a wall.

The Passive Office under construction. July 2010


Installed heat recovery ventilator.

DATA COLLECTION: Data will be collected and analyzed on the following items:

- Required supplemental heat usage
- Internal heat gains
- Electrical usage of appliances
- Air tightness of building envelope
- Indoor air quality
- Wall cavity moisture
- Local weather

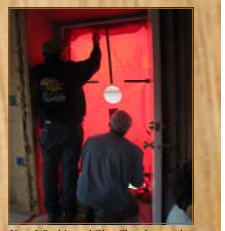

Construction Trades Technology (CTT) student Jacob Nelson cutting a header.


CTT student Meagan Tolley taking a well-deserved break.


CTT student Craig Schlosser hard at work.


Chet Chambers installing moisture sensors in the wall cavity


Meagan Tolley loading cellulose insulation into the hopper.


Kent Winship and Chet Chambers making preparations for a blower door test.

DESIRED OUTCOME: By following the principles of the Passive House Standard, the structure will be heated predominately from passive solar gain, body heat and "waste" heat from lighting and appliances. A baseboard heater will be used for supplemental heat. The "Passive Office" will be used as an educational model for cold-climate, energy efficient building techniques. Data is being collected to determine the structure's energy performance.