

**Ecofutures Zero Energy New and Remodeled Homes, 2005 and Beyond** as of 5.28.2008

	A	B	C	D	E	F
	Doub/Childs Residence, Solar Harvest (SH)	Skinner Residence, Broomfield	Graham-Jackson Residence, South Boulder	Gregerson Residence, Longmont**	Leonardi Residence, Indian Hills, Denver	Moore Residence, Evergreen
<b>New or Retrofit / Yr. Built / Elevation</b>	New / 2005 / 5,450 ft. elevation	New / 2007 / 5,390 ft. elevation	Retrofit / 1970 / 5,600 ft. elevation	Retrofit / 1995 / 5,200 ft. elevation	New / 2007 / 7,500 ft. elevation	New / 2007-8 / 7,700 ft.
<b>Conditioned SF</b>	4,600	6,800	2783 (2068 existing incl. basement + 713 new)	1,500	4,700	3,000
<b>Approx. Design Heat Load (BTUs/hr) @ degF</b>	29,000 @ 2F	45,000 @ -5F	22,000 @ -5F	20,000 @ 0F	40,000 @ -10F (includes 30% warm-up factor)	25,000 @ -10F
<b>Passive Gain (Hi / Med / Low)</b>	High, into sunspace; heat distributed w/ fans and ducts	Very Low (2 windows of 56 in house)	Low	Medium	High	Medium
<b>S Glazing: SHGC, and as % of floor area</b>	0.62 in sunspace; 0.54 elsewhere / 7.3%	0.27 / 0.4%	0.48 / 4%	0.62 / 7%	0.62 / 8.8%	0.62 / 5%
<b>E &amp; W Glazing: SHGC; built &amp; natural shading</b>	0.27 / new aspen trees on E; 4 pm +, by existing neighbor's trees	0.27 / Porch overhangs on 60% of glazing; no natural shading	0.27 / 50% tree shading	0.27 / 20% tree shading	0.27 / No trees yet	0.27 / 30% tree shading; roll-down shutters on W (wind protection; traffic noise; thermal insulation; shading)
<b>Envelope: Framing, Insulation</b>	1" ext. Blueboard; 2x6 with 1.5" resilient channel; 7" Icynene	1" ext. expanded polystyrene (EPS); 2x6 with 1.5" resilient channel; 7" Icynene	Remove brick; add 2x4 ext. wall; Icynene. New construction: 2.x6 wall with 1.5" RC, Icynene-filled for 7" total	Dense pack walls with cellulose over existing fiberglass batts; Air seal in attic and add R-60 cellulose over existing fiberglass batts	1/2" ext. expanded polystyrene (EPS); two 2x4 walls w/ 1/4" separation; 7 1/4" Icynene	2" ext. expanded polystyrene (EPS); 2x6 w/ 5.5" Icynene
<b>Envelope: Windows</b>	Fibertec; Heat Mirror (dbl. on north); tuned	Fibertec; triple pane w/ LowE	Fiberglass frames by Duxton, thru Alpen; double Heat Mirror throughout	Fiberglass frames by Duxton, thru Alpen; double Heat Mirror throughout	Loewen wood clad windows with triple-pane glazing, tuned	Fiberglass frames by Duxton, thru Alpen; double Heat Mirror throughout
<b>Envelope: Air Tightness (NACH = Natural Air Changes per Hour)</b>	Very tight: <0.1 NACH	Very tight: <0.1 NACH	Tight: ~0.2 NACH	Medium tight: ~0.35 NACH. Retrofit air sealing as possible.	Very tight: <0.1 NACH	Very tight: <0.1 NACH
<b>Thermal Mass</b>	Double 5/8" drywall throughout (all walls & ceiling planes) for indirect, distributed mass	Double 5/8" drywall throughout	1.5" Gypcrete throughout (existing, with radiant floor tubes)	Existing: typical / low. Add: 5/8" drywall to most ceilings and some walls	Double 5/8" drywall throughout	Double 5/8" drywall throughout
<b>Indoor Air Quality / Heat Recovery</b>	Low-emissions building materials; Stirling ERV (**Sensible Recovery Efficiency: 83-81)	Low-emissions building materials; Stirling ERV (**Sensible Recovery Efficiency: 83-81)	Low-emissions building materials; Stirling ERV (**Sensible Recovery Efficiency: 83-81)	Older materials (low toxic now); spot ventilation with programmable timers; Lifebreath HRV (**Sensible Recovery Efficiency: 63-66)	Low-emissions building materials; Stirling ERV (**Sensible Recovery Efficiency: 83-81)	Low-emissions building materials; Enerboss Clean Air Furnace with ERV core (**Sensible Recovery Efficiency: 74)
<b>Utilities</b>	Natural gas for cooking & clothes drying/therms offset 2005-2007; All-electric after July 2007/natural gas removed	No natural gas to home	No natural gas to home	Keep natural gas for now	No natural gas to home	Natural gas only for cooking
<b>Onsite Renewables: Electricity from solar and other sources (rated capacity of PVs); approx. annual production</b>	8.74 kW; 12,586 kWh; net excess 200 kWh, 1st year (with 6.84 kW array)	10 kW; 14,400 kWh	6.615 kW; 9,600 kWh	Roof space could hold 7 kW; 10,800 kWh; will run system for one year (buying RECs), then size the PV system***	10 kW; 14,400 kWh	10 kW; 14,400 kWh
<b>Anticipated Annual Household Consumption</b>	10,000 kWh/year thru 2007; 9,500 kWh/year 2008+	15,000 kWh/year	6,300 kWh/year		14,000 kWh/year	12,000 kWh/year
<b>Onsite Renewables: Solar Thermal, w/ Collector Tilt Angle &amp; Heat Rejection</b>	12 - 4x8 Novan flat plate collectors, @ 55 deg tilt; sunspace air distributed w/ fans & ducts	240 Thermomax evacuated tubes, @ 65 deg tilt; summer heat rejection with roof-mounted fin tubes	180 Thermomax evacuated tubes, @ 55 deg tilt	40 evacuated tubes @ 45 deg for DHW and space heating through Lifebreath***	180 Thermomax evacuated tubes, @ 37 deg	180 evacuated tubes, @ 60 deg
<b>Solar Storage Tank*</b>	6,000 gallons, Atmospherically vented	600 gallons	360 gallons	120 gallons	1,500 gallons	2,000 gallons
<b>Space Heat Distribution</b>	Staple-up radiant tubes, w/ >120F water from 6,000 gallon tank; sunspace heated air w/ fans & ducts	Fan coils w/ solar- or boiler-heated water; Coolerados as Air Handling Units (blowers); Sunny Day Bypass setup	In-slab radiant tubes throughout; can use 95 deg heat from evac. tubes, w/ Sunny Day Bypass setup	Forced air Lifebreath	Sunspace heated air w/ fans & ducts; fan coils w/ solar- or boiler-heated water; ECM var. spd. AHU	EnerBoss + ductwork for HRV & heat distr.: Fan coil w/ solar- or boiler-heated water
<b>Water Heating (DHW)</b>	Heat exchanger coils in solar tank (+ 40-gallon elec. water heater as backup ~8 days during 2006-7 record-breaking winter)	Heat exchanger coils in solar tank + electric boiler to boost solar-preheated water as nec.; expected 100% solar supply of DHW	Heat exchanger coils in solar tank + electric boiler to boost solar-preheated water as nec.; expected 100% solar supply of DHW	Expected 80% solar thermal supply of DHW w/ rest from natural gas	Heat exchanger coils in solar tank + electric boiler to boost solar-preheated water as nec.; expected 100% solar supply of DHW	Heat exchanger coils in solar tank + electric boiler to boost solar-preheated water as nec.; expected 100% solar supply of DHW
<b>Cloudy Cold Snap Heating Backup (usually needed on day 3 of cloudiness; Charge &amp; Coast system covers cold cloudy days 1 &amp; 2)</b>	Heat stored in tank + ~300 kWh/yr (2006-7 record-breaking winter) by 20-gal. water heater to boost radiant floor water temp. to 120F	Thermolec elec. tankless boiler, 15 kW, modulating; expected ~4,000 kWh/yr usage (PVs generate excess in summer; buy back in winter)	Thermolec elec. tankless boiler, 9 kW, modulating (PVs generate excess in summer; buy back in winter)	Rinnai tankless natural gas	Electric fan coil down stream of hydronic fan coil (PVs generate excess in summer; buy back in winter) expected useage ~800 kWh/year	Thermolec elec. tankless boiler, 15 kW, modulating (PVs generate excess in summer; buy back in winter; expected usage 15 - 20 days/year)
<b>Cooling</b>	Open windows @ night, close in morning; earthtubes deliver 65-75F air thru ERV, for daytime IAQ; skylight; Tamarack whole-house fan	2 Coolerado units	Open @ night, close in morning; skylight; Tamarack	Open @ night, close in morning; use of existing AC to be minimized by air sealing and added insulation	Outdoor air supplied thru ductwork, to sub for opening windows; higher altitude, w/ cooler and more effective nighttime air	Outdoor air from earthtube supplied thru ductwork, + opening windows (motorized, programmed); higher altitude, w/ cooler and more effective nighttime air
<b>Overhangs on south (2' projection, 12-16" above glazing)</b>	Yes	No	No	No	Yes on 80%	Yes
<b>Amenities / Notable End Uses</b>	Outdoor spa + steam shower + fish tank	Coolerados + large home office + woodshop + electronics shop	None, besides vehicle charging. Current usage ~320 kWh/mo.; w/ addition, ~375; expect <1,500 kWh/yr for backup heat	None. Current usage ~425 kWh/mo.	Outdoor spa + vehicle charging + steam shower	Outdoor spa
<b>\$ toward ZEH performance, for active solar (beyond envelope); % of building costs</b>	\$70,000; 8%	\$103,000; 7%	\$59,000; NA	\$40,000, including envelope improvements***	\$93,000; 7%	\$68,000; 8%
<b>HERS Rating: Required</b>	<i>Had it been built under the revised Green Points, would have been required to rate: 60</i>	<i>Had it been built under BuildSmart, would have been required to rate: less than 10</i>	not required ( <i>the revised GreenPoints does not address remodels</i> )	not required (Longmont)	not required (Evergreen)	not required (Evergreen)
<b>HERS Rating: Rated</b>	12	19	not rated	not rated	0	likely 12
<b>HERS Rating: Projected/Actual Performance</b>	0	0	0	likely 15	0	0
<b>Net-Zero Energy Home %</b>	99%, first year	100%, projected; if less, then remainder covered by RECs	130%, projected, with net excess >1,500 kWh/yr	95%**	100%	100%

\*All tanks are used dairy industry stainless steel tanks, atmospherically vented, insulated to ~R-90 w/ closed cell urethane foam, except SH (site built with ICF foundation walls for structure & EPDM rubber for liner)

\*\* Goal is DNZEH (Darn Near Zero Energy Home)  
\*\*\*Project in design; preliminary numbers shown

Sensible Recovery Efficiency (SRE) takes the actual temperature rise in the airstream into account along with all other energy use to provide a performance rating.