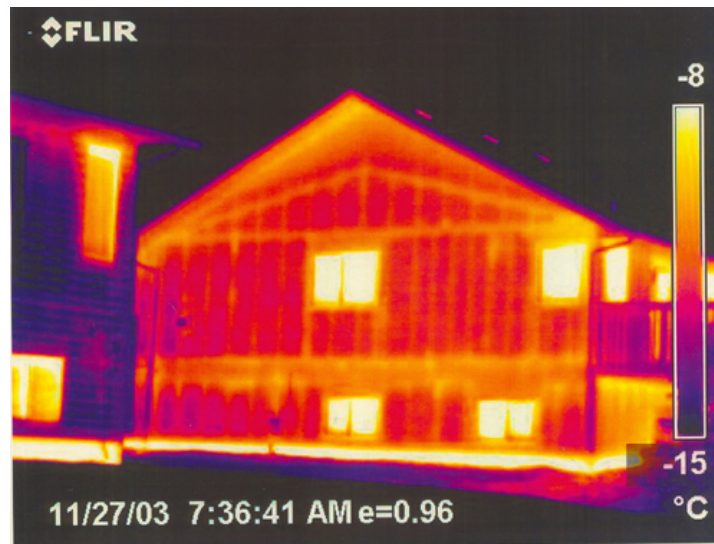


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This is a thermal image of a conventional framed home, The bright orange color represents loss of heat (also known as your money!) A typical 2 by 6 wall with R-19 insulation has a much lower value because each 2 by 6, header, top and bottom plate and rim joist has an R-value of about 1 per 1 inch of wood. The effective value is about R-12. It is also very difficult to make a conventional frame home completely airtight, another significant source of energy loss.



This is a thermal image of an ICF home, as is quite evident this home has a much lower heat loss. The only really serious heat loss is the windows and doors, and the slab. (we have a solution for that!) There are three forms of heat loss or gain. Convection, heat carried in the air. Conduction, heat passing through a solid object. Radiation, Invisible heat waves. To build a super-insulated house all three must be considered.

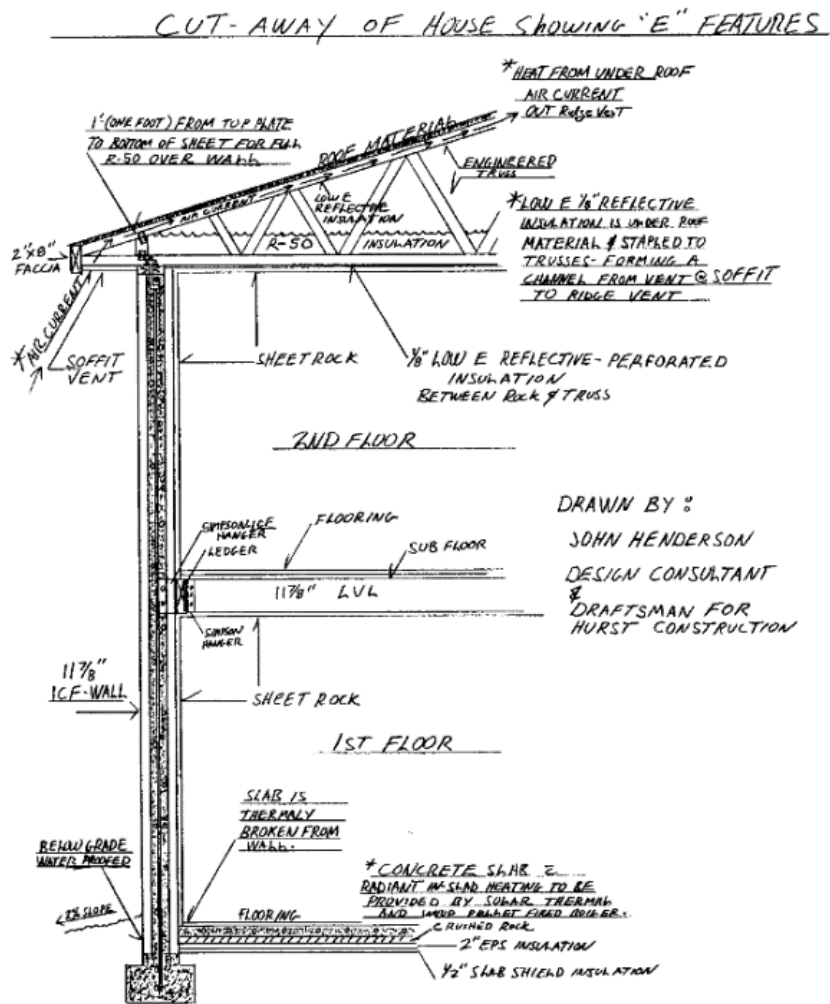


Are ICF buildings Strong? Look at this picture of about the only oceanfront building to survive the Katrina hurricane disaster in Biloxi Mississippi, and for a lot more info on how to build in a hurricane prone area go to www.hurricane-man.com

[Click here to download a video of Military explosive test](#)



This is what most of the wood frame buildings looked like after the hurricane



Construction cross section, super insulated house.

When designing any structure proper building orientation should always be considered to take advantage of passive solar gain, prevailing winds for cooling and natural lighting and ventilation for all rooms.



This is the prototype first super energy efficient building for the University of Nevada, Reno at their lake Tahoe facility. We provided the high performance windows and worked as a consultant during the design phase and laying up the ICF block



Building dedication ceremony for the University of Nevada building at lake Tahoe. This is a great project as it will serve as a working laboratory on sustainable building for the students.



Durisol is one of the first ICF blocks which was invented in Europe at the end of World War 2 and it has many advantages. It is a natural building material made out of mineralized recycled wood chips and mineral wool insulation. The design of the block with the insulation to the outside of the wall puts more thermal mass to the inside of the home.

Website link: www.durisolbuild.com



Passive Solar Durisol Home Under Construction.



The Hurst construction crew checks the building footings for proper solar orientation with a compass.



The footings have been dug and the re bar and the screed board is in place and we are ready to pour the concrete.



Fill the footings with concrete and level to the bottom of the screed board.



Stack the block.



Filling the wall with concrete.



The Hurst construction crew is installing under-slab insulation. This will greatly reduce energy loss into the earth, And also allow for a quicker response time for the in-slab radiant heating system. Note that the insulation goes all the way to the Durisol block on the edge of the building so there is no thermal gap.



The Hurst construction crew installing the radiant heating system in a passive solar Durisol home.

Beaver Plastics

07200/BEA

TERRAFOAM[®] EPS

EXPANDED POLYSTYRENE INSULATION

PRODUCT DESCRIPTION

TERRAFOAM is an inert closed cell expanded polystyrene (E.P.S.) insulation material manufactured by Beaver Plastics Ltd. It has excellent resistance to freeze/thaw and has zero capillarity and low moisture absorption properties. TERRAFOAM will never rot, or support mold or mildew.

TERRAFOAM is suited to a wide range of applications because of its excellent physical and chemical properties, and economical cost. It is manufactured in a range of densities, in order to meet specific application requirements. Standard sheet sizes are 2'X8' (610mm x 2440mm) and 4'X8' (1220mm x 2440mm), but TERRAFOAM is also produced to custom sizes, with edges plain or shiplapped. TERRAFOAM contains ordinary air; not refrigerant gases. This means that insulating properties do not degrade over time.

APPLICATIONS

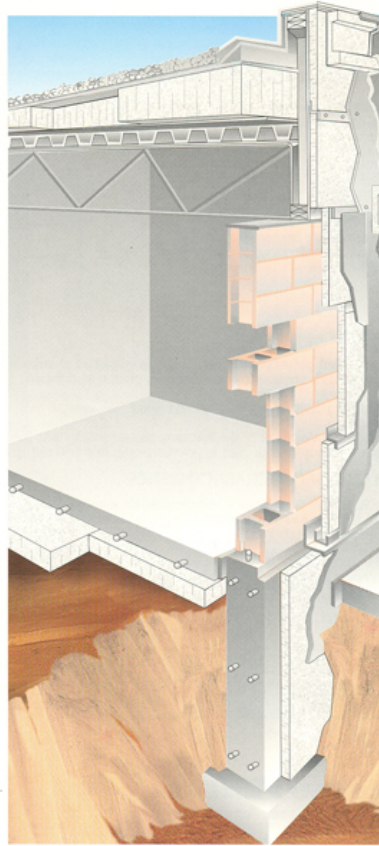
TERRAFOAM can be used on roofs, under both conventional built-up and single ply membranes. Panels can be produced in flat or tapered configurations that will provide slope-to-drain. TERRAFOAM is also used in walls, under slabs and as perimeter insulation for grade beams, foundation walls and buried in soil for shallow foundation designs. TERRAFOAM is available in 'ANK' grade, which is conditioned and sized expressly for exterior insulated finish systems. TERRAFOAM is resistant to soil weight and pressure, and can be specified for all below-grade applications. The following is a sampling of common applications.

- Above-grade cladding under stucco, siding
- Masonry Cavity Walls
- Exterior Insulated Finish Systems (E.I.F.S.)
- Conventional and Slope-to-Drain Roofing
- Floatation applications
- Under concrete slabs on grade
- Grade beams, foundation walls, shallow foundations
- Coolers, Freezers, and ice arenas
- Hot Tub Covers
- Packaging, protection, container linings

SPECIFICATIONS/COMPLIANCIES

TERRAFOAM is manufactured to CAN/ULC-S701-01 for Type 1, 2 and 3. Warnock Hersey has licensed Beaver Plastics under their Third Party Certification Program as a "Certified Manufacturer". This provides the purchaser/specifier with the highest degree of confidence that TERRAFOAM will meet or exceed specifications.

Beaver Plastics Ltd. was the first EPS manufacturer in North America to be certified under the International Standards Organization (ISO) 9001-9002 Quality Assurance Program. This is a set of standards and criteria which is internationally recognized as an assurance of product quality and consistency.



Terrafoam is totally inert expanded polystyrene, R-value 4.0 per inch. This product can be used as an above grade insulation, under stucco or siding, roof insulation systems and below grade under-slab insulation.

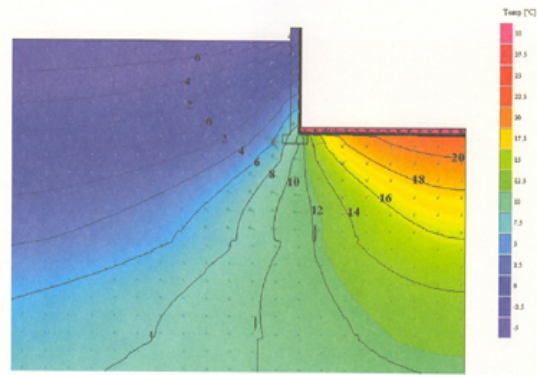


Figure 6: Insulated Slab in February

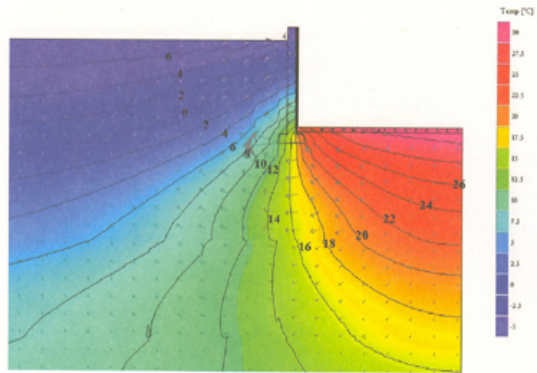


Figure 7: Uninsulated Slab in February

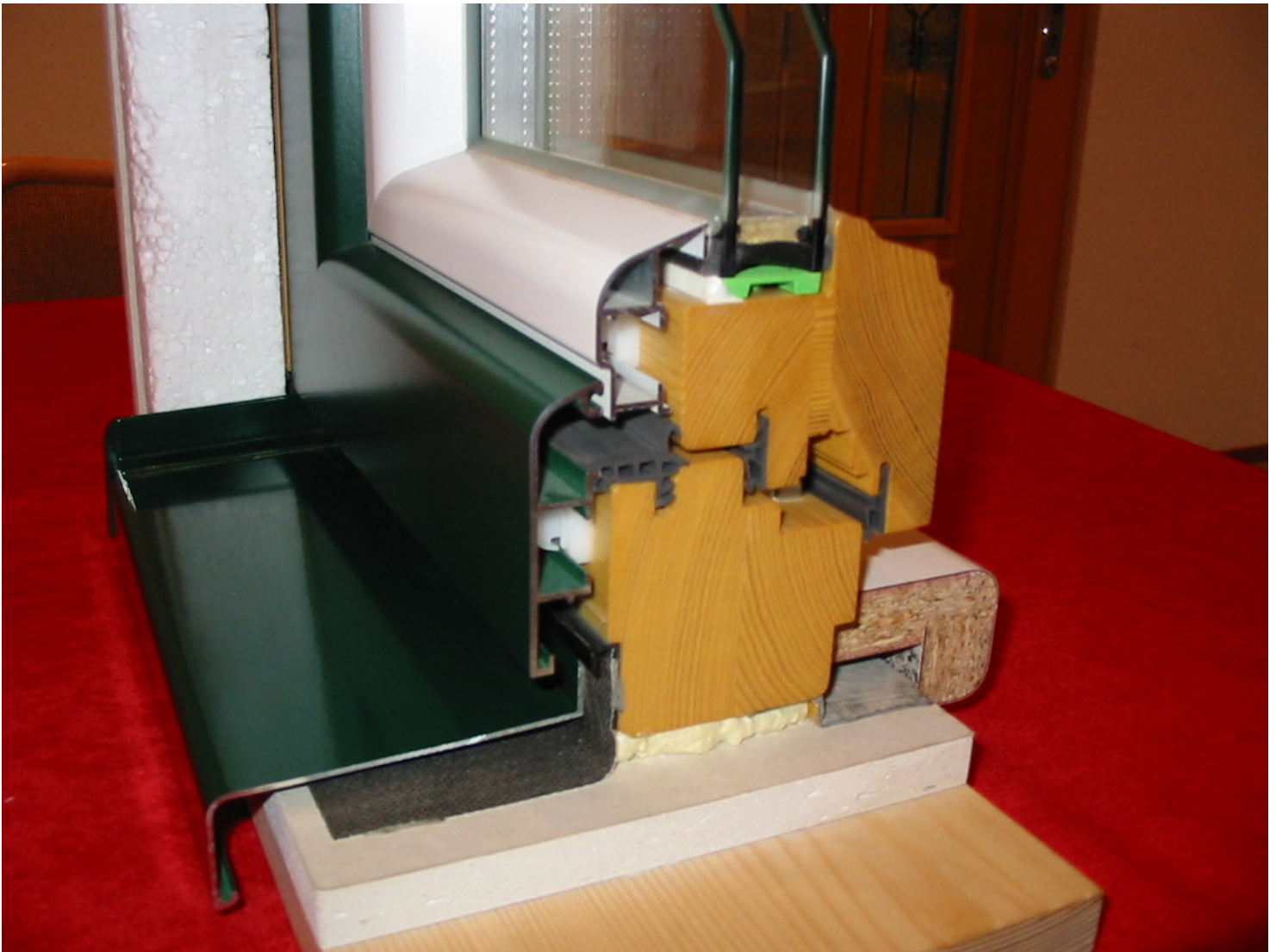
Beaver Plastics INSULWORKS Effectiveness

Page 7 of 10

This chart shows that in the case of an uninsulated heated slab almost half of the purchased energy is lost into the soil. The insulation of the slab with 2 inches of Insulworks EPS will greatly reduce this heat loss. In the case of very moist soil below the slab this loss would be even higher!



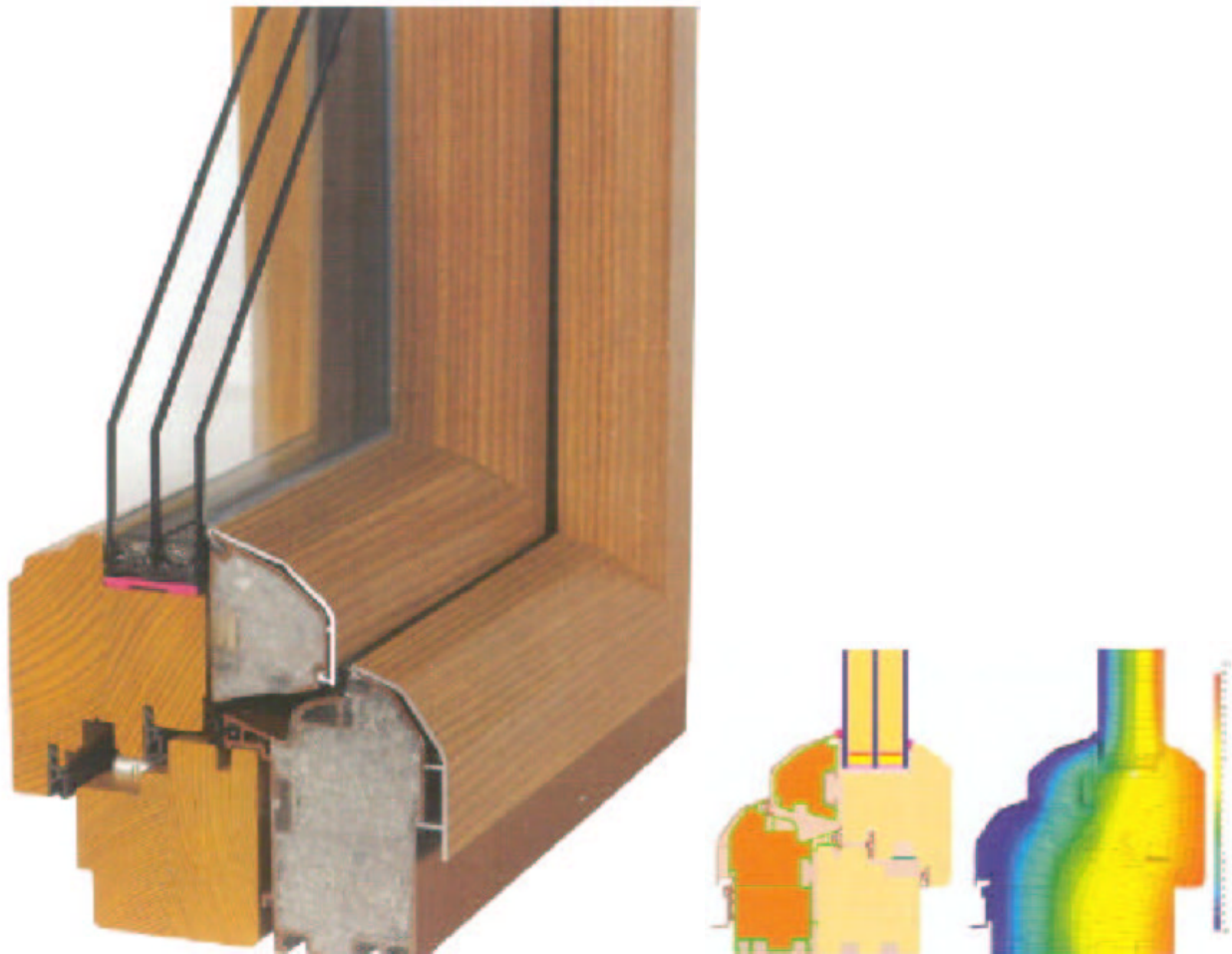
This is a job site in Austria. they are building with hollow bricks with insulation on the outside. Energy efficiency is very important there. The windows and doors are super insulated with triple seals making this a very airtight structure. The standard wall thickness is 14 inches.



This is the profile of a European window, quite possibly the finest windows in the world. Note the triple seal system, this is a positive seal meaning the seals are compressed with multiple cams on the window frames. The exterior aluminum sills available in one inch increments allow you to recess the window in to the ICF wall. Special adhesive vapor permeable sealing tape is used to install the windows (Bosig) in addition insulating foam is used to gain full r-value right up to the wall.



[Tilt & Turn Windows](#)



Super-insulated passive house window. This window is triple glazed with I-Plus 3CS glass, krypton gas fill and two low-e thermal function layers. The window unit also has four air seals



This is an example of an exterior roller shutter system. The shutters are made out of powder coated hollow aluminum filled with insulating foam. When closed this system will effectively almost double the efficiency of the window system. It can also be used to regulate the amount of heat received from passive solar gain. The shutters can be hooked up to a thermostat to maintain a constant temperature in a passive solar home.



Wind power is useful at many sites and can produce a significant amount of power (photo courtesy Sunfire research).



Power inverters and control room this is a grid tie system meaning we are hooked up to the power grid and we can sell power back to them! (photo courtesy Sunfire research.)



Two 1620 watt solar tracking arrays and a wind power power supplement make up the complete system. (Photo courtesy Sunfire research.)

What is Solar Thermal Energy?

Hot Water from the Sun

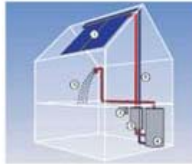


What It Does

Solar thermal energy systems capture the heat of the sun and use it to heat water. A properly installed system works year-round, even when it's cloudy.

Solar thermal lowers your utility bill, and lets you be part of reducing energy consumption, pollution, and global warming. It also adds to the value of your home – a Schüco solar thermal system looks great and lasts for years.

Schüco dealers are trained and certified to install our systems, and ensure the best installation quality on and in your home.



What You Need

A Schüco solar thermal energy system is a complete, all-in package with everything you need:

- Collectors
- Storage tank
- Expansion tank
- Solar station with pump
- Controller
- Solar fluid
- Mounting hardware
- Piping

How it Works

1. The sun heats a non-toxic, freeze-proof solar fluid in a solar collector on the roof.
2. The controller detects that the solar fluid is hotter than the water in the hot water tank.
3. A pump in the Solar Station pumps solar fluid from the collector to the hot water tank.
4. The solar fluid flows through a pipe coiling inside the hot water tank, and heats the water in the tank.
5. The hot water is available for use in the house.
6. The solar fluid is pumped back up to the collector, where it is once again heated by the sun.

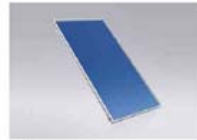


SCHÜCO

Key Components

Collector

Schüco collectors are guaranteed for 10 years. The front is tempered safety glass, to stand up to any weather, and the smooth surface looks good on the roof. We offer collectors in silver or bronze frame colors. Two or three collectors can typically supply a family with all the hot water they need.



Collector



Storage tank

Storage Tank

We offer several versions of tanks which can be combined with your existing heating systems. The solar fluid running through the tank heats the water, but never touches it.



Solar station



Controller

Solar Station

The unique Schüco Solar Station contains the pump and all the valves for the system. It's insulated to keep solar heat in.

Controller

The DeltaSol controller monitors system temperature. When the tank temperature falls below the temperature in the collector, the controller sends solar fluid to the tank to heat up the water. When the water is hot enough, it shuts off the pump, saving electricity.

To learn more about Schüco Solar Energy Systems, visit our website or consult your dealer.

Schüco USA, L.P.
schuco-usa.com



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www.schueco.com



Custom home built by Hurst construction in Sonora California incorporating many state of the art features including a 5000 watt grid tie photovoltaic system, on demand water heater with a manifold plumbing system, radiant heat and super energy efficient windows and doors.



Static solar photo-voltaic system needs 50% more panels



A simple power inverter for a grid-tie photovoltaic system



This is an example of a Bosch Aquastar on-demand water heater combined with a Vanguard manablock manifold plumbing system. this is the most energy efficient way to heat and distribute water (photo courtesy hurst construction)

*A new wave in water conservation...
introducing the Aqus™
from WaterSaver Technologies!*



Conserving water is important to anyone who wants to preserve scarce natural resources and save money.

In homes across the U.S., the bathroom accounts for 74 percent of water used. About 40 percent of all domestic water consumed is used to flush toilets.

To capture and reuse lavatory water, WaterSaver Technologies developed Aqus™. Simple to install, Aqus™ uses water from bathroom sinks to flush toilets.

Aqus can help individual households, hotels, schools, commercial buildings, government structures and multi-family complexes save gallons of water and dollars. In addition, Aqus™ is:

- **Hardly noticeable.** There is no change to the normal operation of your lavatory sink and toilet.
- **Easy to use.** Aqus™ is simple to install and requires minimal annual maintenance.

Aqus™ can reduce metered water usage in a two-person household by about 10 to 20 gallons a day — or approximately 5,000 gallons a year.

Contact WaterSaver Technologies, LLC
Learn more about conserving water and saving money.

 **WaterSaver Technologies**
A new wave in water conservation

120 Webster Street, Suite 322
Louisville, KY USA 40206
P: 502.550.1506
P: 502.741.1859
www.WaterSaverTech.com
info@WaterSaverTech.com

The Aqus system is an excellent water saving device, about 40 percent of all domestic water consumed is used to flush toilets. The Aqus system reuses grey water from bathroom sinks to flush the toilet. An average 2 person household can reduce water usage by about 10-20 gallons per day or approximately 5000 gallons per year. www.watersavertech.com



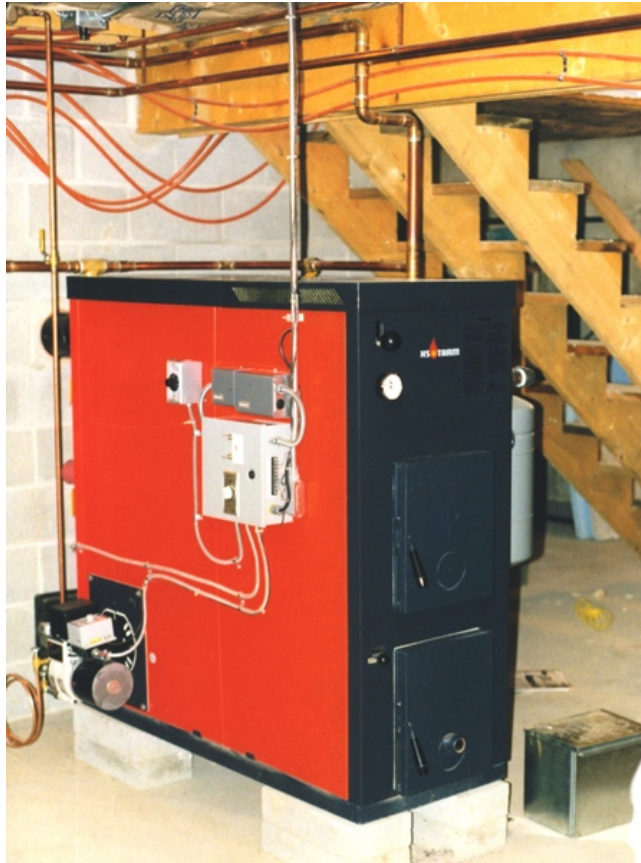
Radiant wall heating systems are very popular in Europe. The coils can be hidden behind the wall surface. The home is much more comfortable without the constant fans of a forced air system.



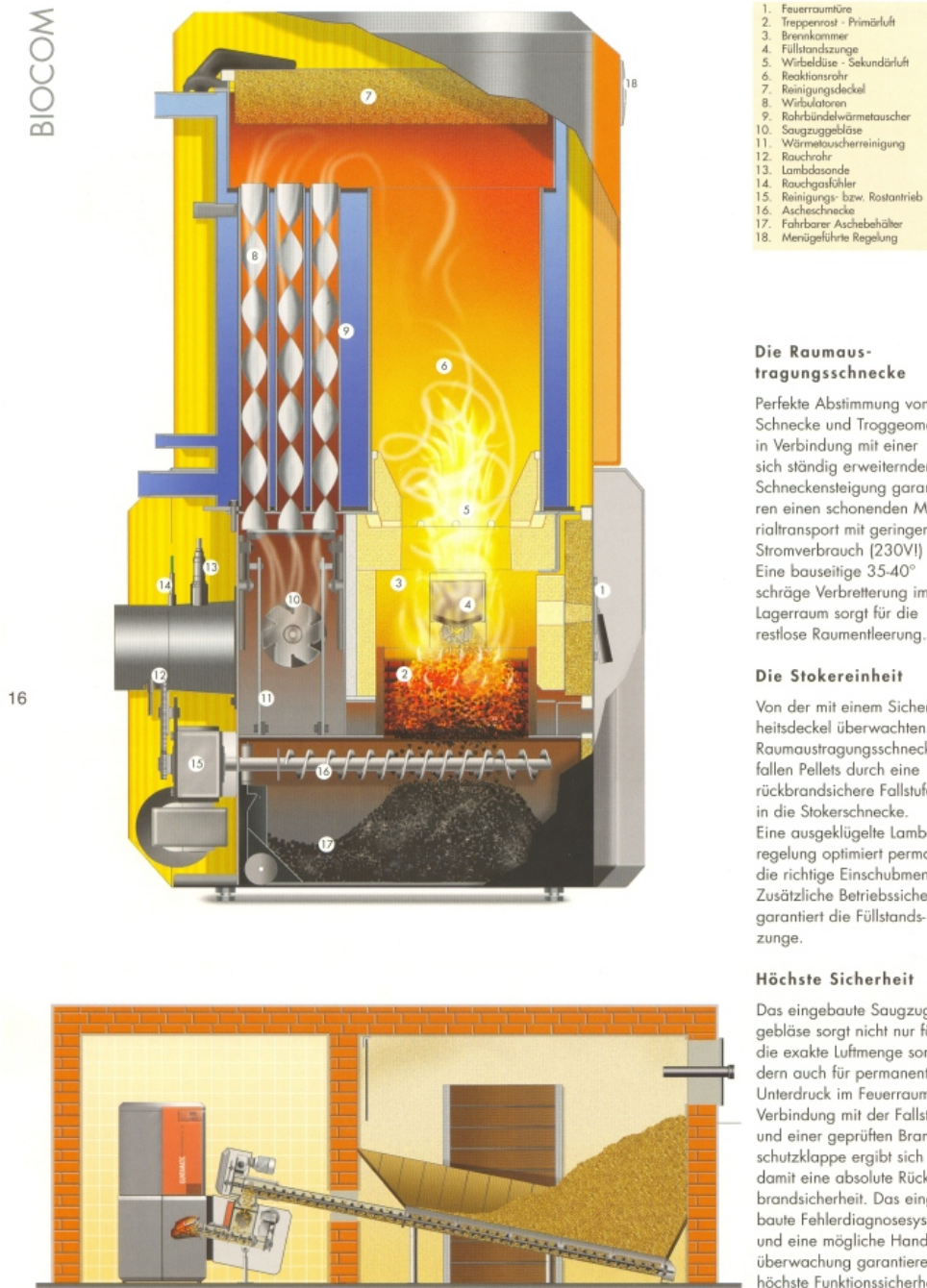
Radiant heating for your bathroom doubles as a towel rack, towel warmer and dryer. Provides great warmth and comfort in the bathroom.



A modern wall panel radiator.



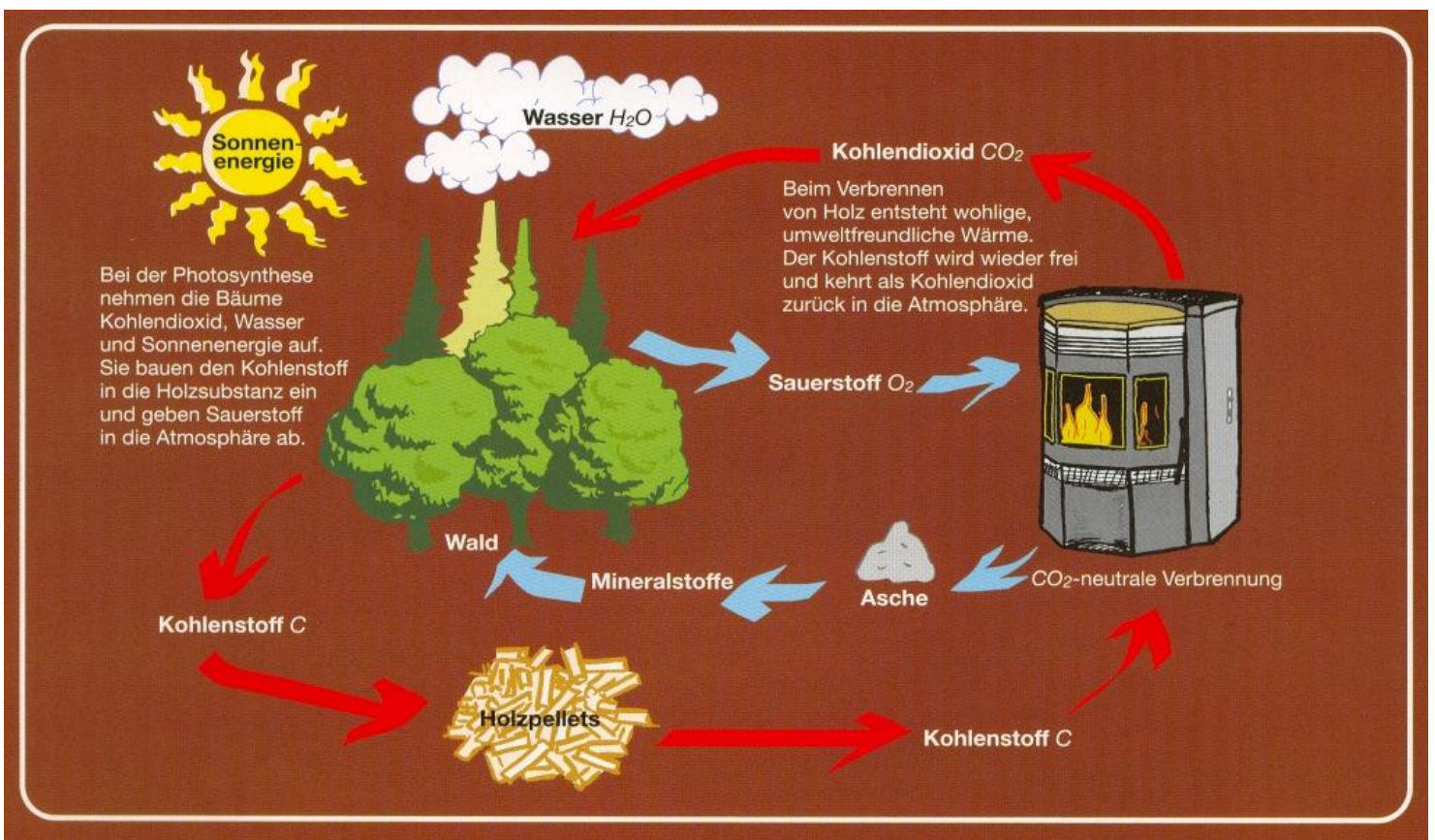
This is a wood pellet fired boiler system. The boiler can provide all of your domestic hot water and radiant heat for your home. Wood pellet fuel is a domestically produced renewable fuel source which is co2 neutral. The boiler can be fed from a pellet bunker by means of a screw auger.



This is a schematic of a pellet fired home boiler system, note the bunker and auger feeding system. In Europe pellets are delivered in bulk similar to a propane delivery in the USA. We know it does not make much sense to use a natural, renewable, co2 neutral energy source of which we have an huge supply of in the USA, but we thought in might be of interest.



A small pellet stove will easily heat a super insulated home, using a locally produced, CO₂ neutral renewable fuel source. With proper building orientation and passive solar design it will seldom be needed.



This diagram shows the natural cycle of using wood pellet fuel to heat your home, the impact on the environment is much less than using a fossil fuel source. A super-insulated home requires a much smaller fuel input to stay warm (and cool) than a normally constructed home.



A bulk delivery of wood pellet fuel in Austria, similar to a USA delivery of heating oil or propane, only this is a renewable fuel source.

GFX in Octagon Apartment Building

(Roosevelt Island, NY)

The Octagon was designed to achieve a Silver LEED rating and received an award from the EPA and the DEP for leadership in applying sustainable design principles to residential development

<p>Fig. 1 Model G4-80-4 GFX One of 33 for Octagon Building¹ www.octagonnyc.com/about.asp Courtesy, Don Johnson, Becker + Becker Developer, Architect & Planner www.beckerandbecker.com</p>	<p>Fig. 2 GFX-STAR™ Model GS-G3-52-4-006 www.gfstechology.com/GFX-STAR.pdf² Patent Pending</p>

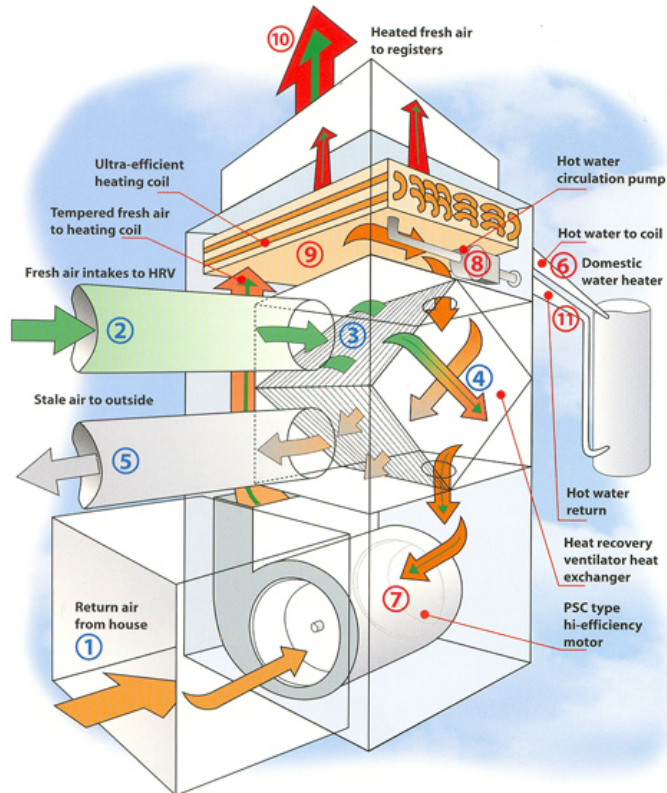
¹ The 80" long GFX of Fig. 1 will be feeding preheated water to showers and lavatories having drains connected to one of 33 4" drain stacks.
² GFX-STAR™ systems like the one shown in Figure 2 will allow increased savings in future projects by also feeding preheated water to a storage tank connected to a central water heater. The unit shown is equipped with a circulating pump controlled by a "Delta-T" controller that energizes the circulator whenever recoverable hot water energy enters a GFX's drain inlet. (GFX: Model G3-52-4, a special 52" long, 4-coil model evaluated by ORNL in a triplex in Duluth, MN (<http://www.gfstechology.com/Duluth.pdf>); Pump: TACO Model 906 Bronze; Controller: Analog temperature differential controller, Thermomax Model USDT 2005 www.thermomax.com/Differentia%20Controller.htm)

GFX installation in a office building in New York City.

Indoor comfort in a small package

The patented Lifebreath Clean Air Furnace* combines the fresh air benefits of the Heat Recovery Ventilator with the comfort and efficiency of the water heater/air handler. This combination heating system provides

constant ventilation and a steady stream of warm air for the healthiest, most comfortable home environment possible. This occurs with a system efficiency of up to 90%.



Also available in downflow and horizontal models

Fresh air for your home:

1. Warm, stale air from the home is returned to the Lifebreath Clean Air Furnace.
2. Outdoor air travels through the fresh air intake and is brought into the integral HRV.
3. The fresh and stale air pass through opposite sides of the HRV's aluminum heat exchange core.**
4. Heat from the stale air is transferred to the fresh air.
5. Stale air is exhausted outside.

Meanwhile, in Lifebreath's ultra-efficient heating coil:

6. Hot water is sent from the water heater to the furnace heating coil.
7. A PSC type high-efficiency fan blows the tempered fresh air from the HRV into the coil. *ECM upgrade recommended for maximum energy savings.
8. The circulation pump distributes hot water through the coil.
9. The circulating hot water heats the air to the desired temperature.
10. Warm, fresh air is distributed to registers throughout the house.
11. The hot water travels through the coil and returns to the water heater for domestic use.

And the cycle continues. The ventilation component works year-round to ensure that your home is always fresh, while the heating function operates only when required. Enjoy the comfort, convenience, and economy of a Lifebreath Clean Air Furnace.

Save money with combined whole-house heating, cooling and ventilation

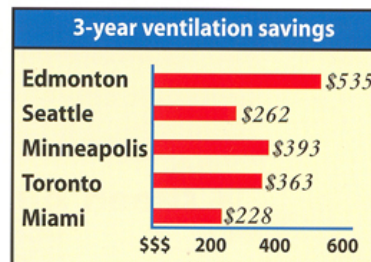
First-year savings of \$1,700 to \$3,800

The Lifebreath Clean Air Furnace is among the most efficient heating, cooling and ventilation systems available. Comparative tests have shown that Lifebreath offers first-year savings – including equipment, installation and operating costs – of \$1,700 to \$3,800 over competitive systems.

For example, the Clean Air Furnace doesn't require a flue. Unlike conventional furnaces, the CAF receives its energy from a domestic water heater. Since a second flue is not required for the furnace, installation costs are lowered by as much as \$500.

The built-in heat recovery ventilator saves you money while improving your health. By recovering energy from outgoing air, the CAF makes whole-house ventilation affordable, ensuring a minimum loss of energy to the outdoors. The chart on the right shows typical ventilation savings enjoyed in five North American cities from the installation of a Clean Air Furnace versus ventilation without heat recovery.

This represents the 3-year utility cost savings accrued from heat recovery during ventilation in an average home with oil or gas heating. These savings would be tripled with electric heat.



www.lifebreath.com

Lifebreath clean air furnace. The HRV brings in fresh filtered air while recovering the energy from the stale air exhausted from the home. An HRV is a necessity when building a super insulated airtight home. The unit is rated at 95% efficiency meaning that it recovers nearly all of your homes heat or coolness as it removes the stale air.

HURST CONSTRUCTION

LICENSE # 484908

Since 1986

Sustainable Construction



**Remodeling, Carpentry, Painting, Electrical, Concrete,
Tractor work, Plumbing, Septic System Repairs,
Hauling and Property Clean Up,
Brush, Pine Needle & Tree Removal ,
Energy Efficient Upgrades, Firewood
Snow Shoveling & Snowplowing**

Tuolumne, CA Phone: (209)743-2638 E-MAIL: chris@zeropowerhouse.com

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