BUILDING SOLUTIONS

HOME PERFORMANCE CONTRACTING

2121 peralta st. suite 153
oakland, ca 94607-1626

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Ms. May Kimball
1448 Shasta Road
Berkeley, CA 94708

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Ms. May Kimball
1448 Shasta Road
Berkeley, CA 94708

p. 510 501-5674
mkimball@yahoo.com

HOME

Year Built	1919
Square Feet	2200 sqf
Bedrooms	4
Bathrooms	2
Site Conditions	Flat
Foundation Type	Raised
Construction	2X4 Wood Frame
Number of Floors	2
Roof Type	Tile
Siding	Stucco
Wall Type	Plaster
Plumbing	Copper
Electrical Service	100 amp
HVAC System	Forced Air

HOME FACTS

1

OWNER CONCERNS

- ASTHMA
- ALLERGIES
- COMFORT
- DUST
- DRAFTS
- AIR QUALITY
- MOISTURE
- MOLD
- UTILITY BILLS

Homeowner's primary concern is comfort. The building currently has no insulation in the crawlspace, is serviced by a single zone forced air system located in an interior closet, and has cold floors. The homeowner would like to address comfort issues and concurrently reduce utility bills if possible.

In addition to comfort, the homeowner would also like to explore renewable options including domestic hot water and solar electric.

OWNER INTERESTS

- SEALING
- HVAC
- FILTRATION
- HEALTH
- EFFICIENCY
- INSULATION
- RE-SALE
- SOLAR
- WATER HEATING

In solving comfort issues, the homeowner has already replaced several windows and would like to understand what improvements would solve the problem at the least cost. Possible solutions include insulating the crawlspace and or attic, air sealing to reduce air exchange between the indoors and outdoors, duct sealing or replacement, as well as a whole heating and cooling system change out.

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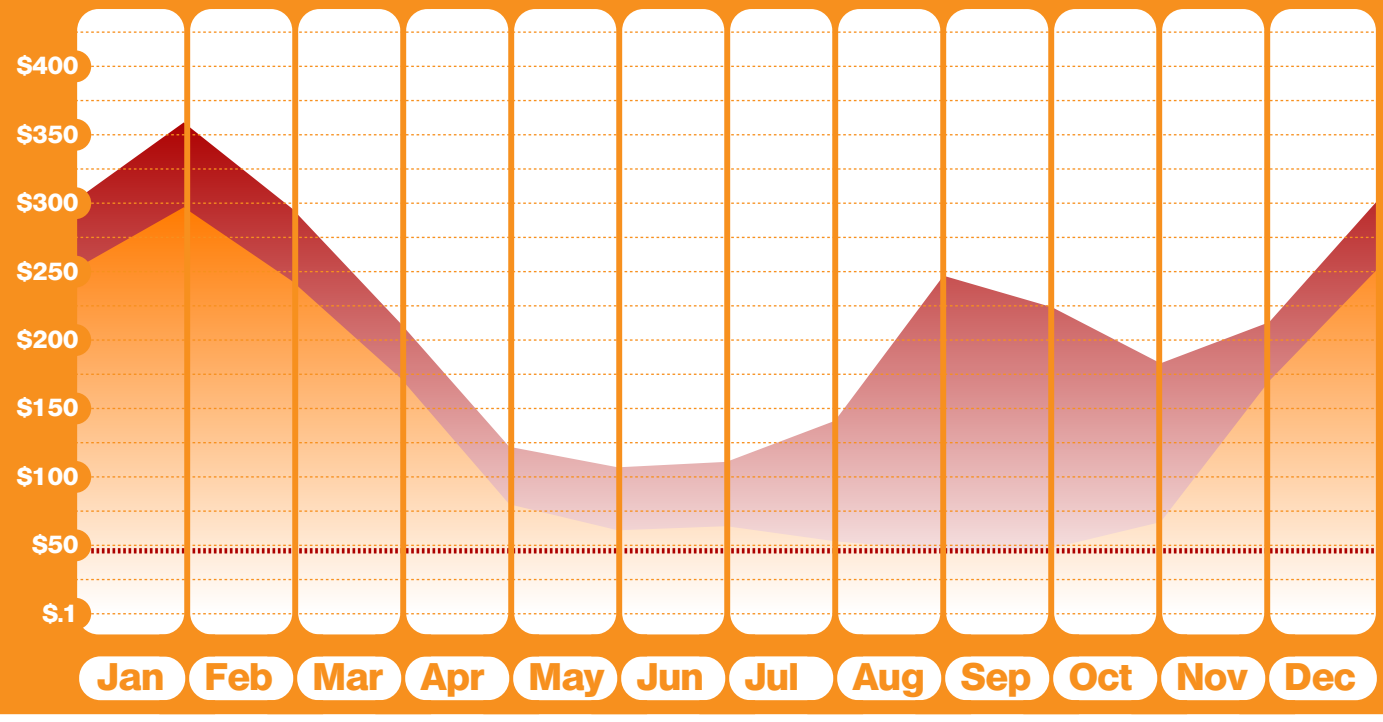
California households rely on two primary sources of energy: electricity and natural gas. The tremendous rise in energy costs has made home efficiency measures and renewable energy options attractive ideologically and economically.

Analysis of energy use not only tells where your energy dollars are being spent, but can also indicate problems and inefficiencies in your home. The whole house diagnostic report will provide insight into your home's current performance, isolate problems, and develop an array of improvement options designed to increase comfort, air quality, and energy efficiency.

ENERGY USE 2 UTILITIES

ENERGY BILLS

ELECTRIC GAS



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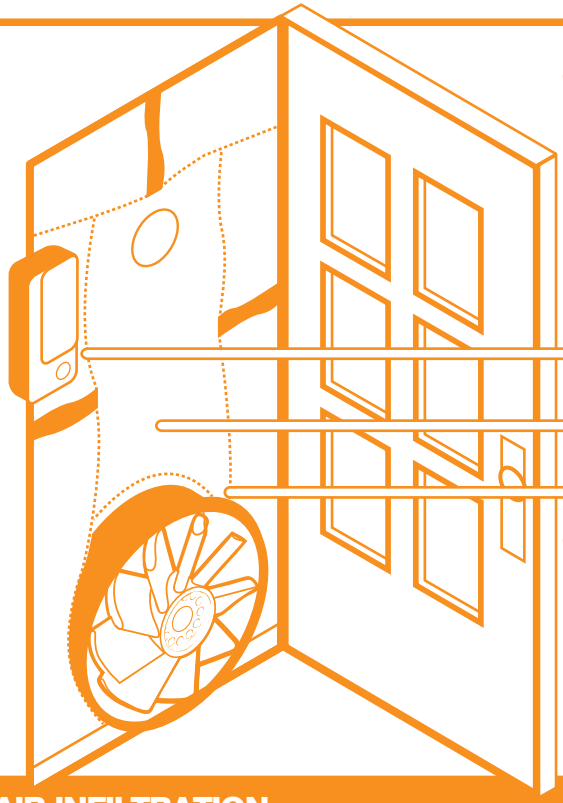


The building envelope is the boundary between the indoor and outdoor environments. Heat loss or gain through the envelope is the single largest energy demand on a home and occurs in two ways, transmission and leakage. Air leaks into and out of buildings through penetrations in the envelope, most notably around windows and doors. Hidden voids, however, such as construction flaws and plumbing and electrical penetrations, often make up a significant portion of the total leakage.

DIGITAL MANOMETER RECORDS PRESSURE AND FLOW RATES

ADJUSTABLE FRAME AND JACKET SEALS FAN TO DOOR

VARIABLE SPEED CALIBRATED FAN PRESSURIZES OR DEPRESSURIZES BUILDING

The blower door is a diagnostic tool used to measure the rate at which air enters or leaves a building. It consists of a powerful fan mounted in the frame of an exterior door. The fan blows air into or out of a building, creating a pressure differential that is recorded using a digital manometer. The work the fan performs to maintain a constant pressure recorded in cubic feet per minute (CFM), is a product of gross air leakage.

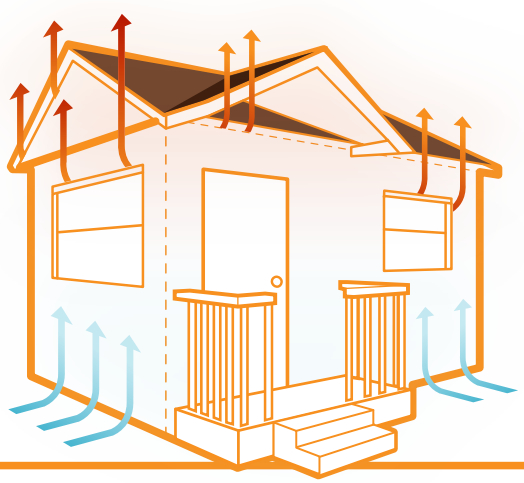
AIR INFILTRATION

3

BLOWER DOOR

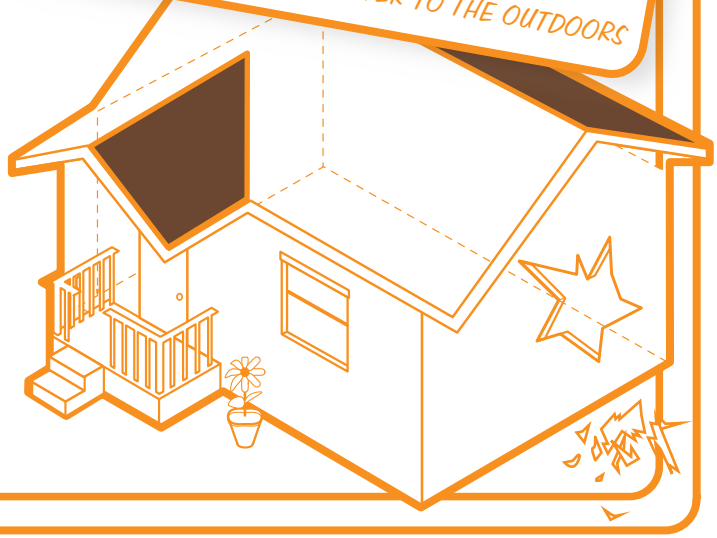
STACK EFFECT

Stack effect is the movement of air into and out of your home driven by temperature. During the winter, or throughout the course of a day, warm indoor air rises and escapes through leaks in your home. The negative pressure created when warm air exits is balanced when cool air, usually from your crawlspace, infiltrates the building.



RESULTS

IN YOUR HOME
THE TOTAL LEAKAGE THROUGH THE BUILDING ENVELOPE WAS MEASURED AT
4124 CFM @50PA.
LEAKAGE ASSOCIATED WITH THIS MEASUREMENT EQUATES TO
A HOLE 16.99 INCHES IN DIAMETER TO THE OUTDOORS



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4

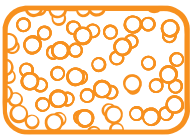
INSULATION

Heat transmission is driven by the temperature difference between indoors and outdoors. The thermal resistance of a home, or the level and quality of insulating materials, determines how much heat will be lost or gained through the building envelope.

Thermal insulators are materials specifically designed to reduce the flow of heat by limiting conduction and convection. The goal of insulators is to slow heat transfer, or the passage of thermal energy from a hot to cold space. The ability of insulation to inhibit the flow of heat through a building assembly results in the largest single factor affecting heat loss. This ability is measured in R-value, or resistance to heat flow, with greater R-values reflecting better insulating properties.

MATERIALS

Batt & Blanket (R2.9-R4.3) insulation is made of flexible mineral fibers that are formed into rolls that fit between attic and floor joists as well as wall studs

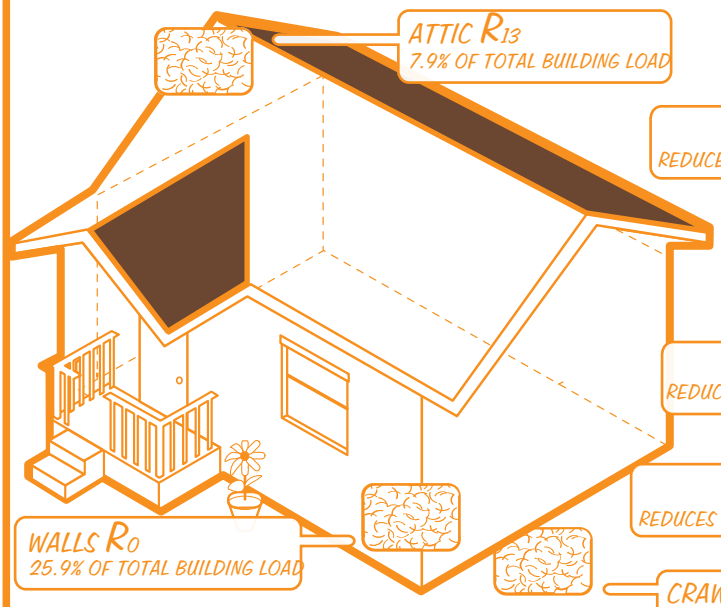


Loose fill (R2.2-R3.8), is blown into building cavities and fills small spaces better than both batt and board insulation, making it a good choice for difficult access applications

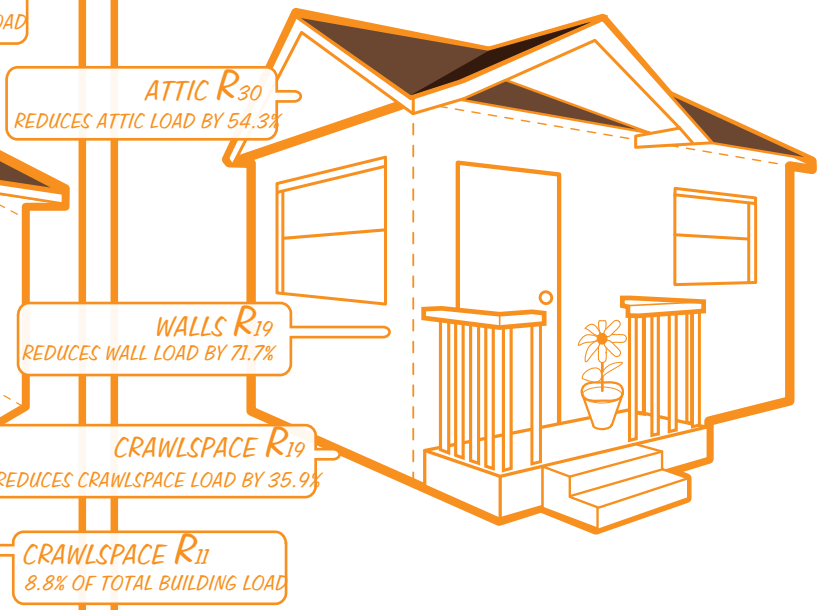
Spray Foam- (R3.2-R6.5), is sprayed into building cavities and expands into a solid cellular plastic that provides a high R-value and good air sealing properties

Foam Boards (R3.8-R8 per inch), have structural strength, high R-values and have good sound attenuation properties

EXISTING



RECOMMENDED



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All windows are rated by the National Fenestration Rating Council (NFRC) on performance as it relates to energy efficiency and quality of light.

Windows have a huge impact on the efficiency of your home. High performance windows can reduce your heating and cooling bills, improve comfort and add value to your home.

National Fenestration Rating Council®
CERTIFIED

BEST VIEW
Mucha Vista 2000
Vinyl- Clad Wood Frame
Double Pane • Argon Filled • Low E
Product Type : **Horizontal Vertical Box**

ENERGY PERFORMANCE RATINGS

U-Factor(U.S./I-P)	Solar Heat Gain Coefficient
0.28	0.36

ADDITIONAL PERFORMANCE RATINGS

Visible Transmittance	Air Leakage (US /I-P)
0.63	0.18

U-VALUE MEASURES THE INSULATING PROPERTIES OF A WINDOW, WITH LOWER VALUES REPRESENTING GREATER RESISTANCE TO HEAT FLOW

SHGC MEASURES HOW WELL WINDOWS BLOCKS HEAT CAUSED BY SUNLIGHT. LOWER SHGCS CORRESPOND TO LESS HEAT TRANSMISSION

VISIBLE TRANSMITTANCE IS THE AMOUNT OF LIGHT THAT PASSES THROUGH A WINDOW. HIGHER VALUES DENOTES GREATER TRANSFER

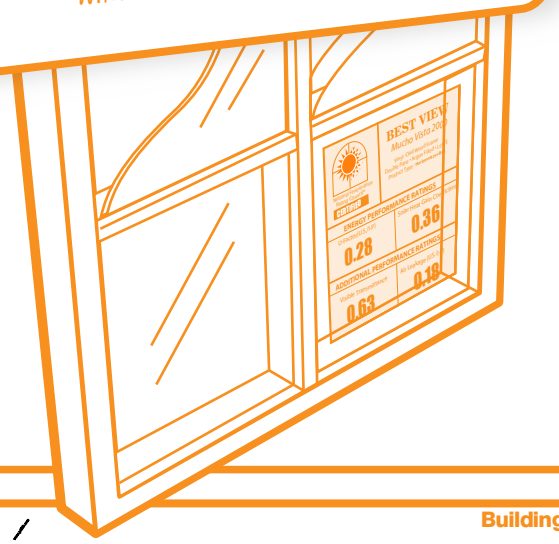
AIR LEAKAGE MEASURES THE CUBIC FEET OF AIR PASSING THROUGH A SQUARE FOOT OF WINDOW. LOWER LEAKAGE RATES ARE DESIRABLE

WINDOWS **5** **WINDOW RATING**

EXISTING

CURRENTLY, YOUR HOME HAS SINGLE PANE, METAL FRAME, CLEAR GLASS WINDOWS WHICH ACCOUNT FOR 22.2% OF YOUR HOME'S TOTAL BUILDING LOAD.

BY CHANGING ALL THE WINDOWS IN YOUR HOME TO DOUBLE PANE LOW E, YOU WOULD REDUCE YOUR WINDOW LOAD BY 47.8%



PASSIVE SOLAR

Sun path diagrams illustrate seasonal changes in the sun's movement through the sky. These diagrams help determine the impact a single window will have on your heating and cooling loads given placement, orientation, and shadings conditions.

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To maintain comfort, the heat lost by your home in the winter must be replaced by your heating system. Factors that determine how well your heating system operates include system condition, layout, efficiency, and sizing.

A correctly sized heating system is designed to provide heat at roughly the same rate as it is lost during worst case outdoor temperatures. Typically heating systems are oversized, leading to energy waste, short cycling, air quality issues, and discomfort.

In accordance with ACCA Manual J, your heating load has been determined accounting for volume of space in each room, insulation values, number and placement of windows, number of occupants, total air infiltration and duct leakage, system efficiency and local weather patterns.

FURNACE MAKE: CARRIER
FURNACE MODEL: 58WAV155-20
SIZE: 154000 BTU IN/ 124000 BTU OUT
* AFUE: 81% AFUE

HEATING LOAD: 83546 BTU
POTENTIAL REDUCTION IN HEATING LOAD: 47%

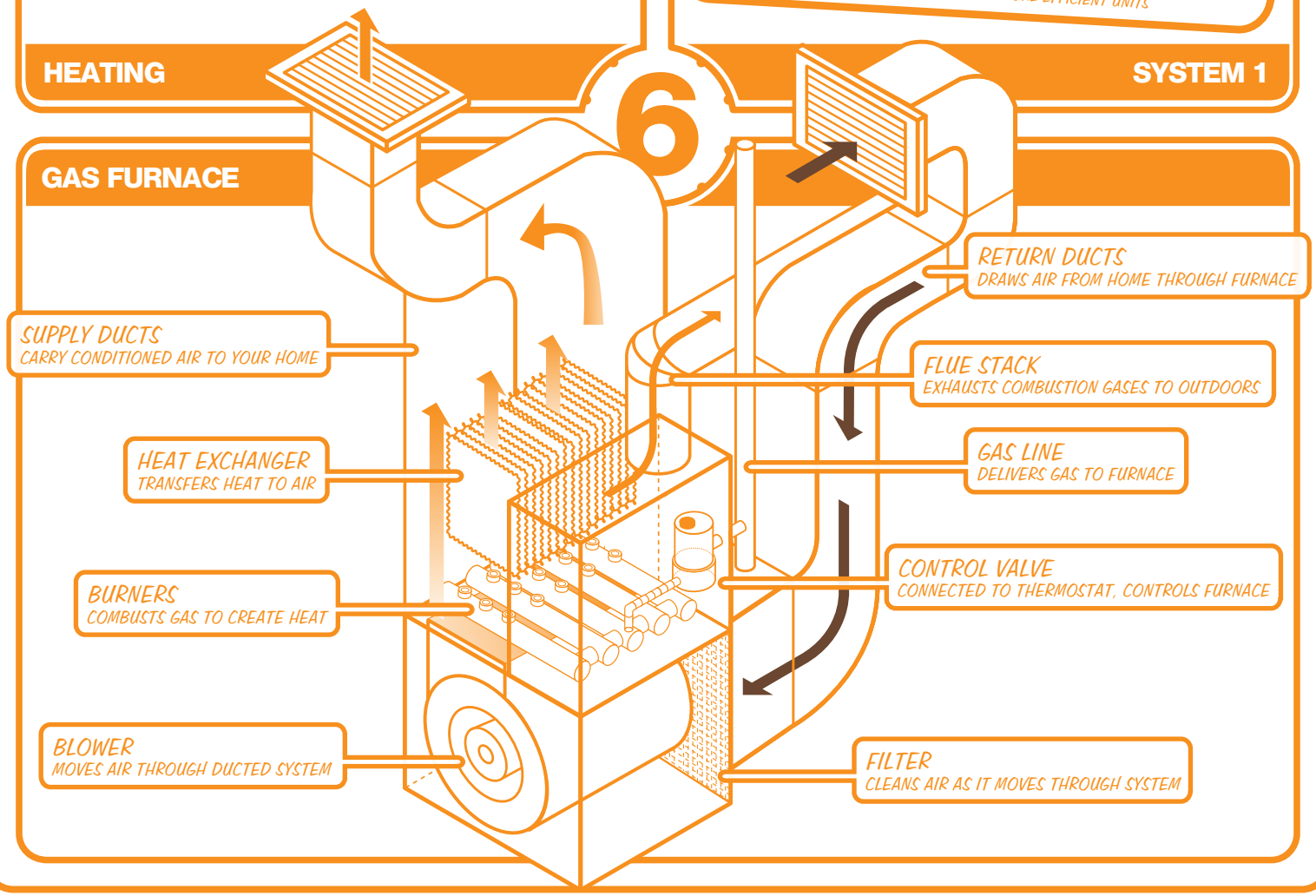
YOUR FURNACE IS 148% OVERSIZED
AND HAS THE ABILITY TO HEAT

* ANNUAL FUEL UTILIZATION EFFICIENCY (AFUE) MEASURES EFFICIENCY OF FURNACES. HIGHER AFUES TRANSLATE TO MORE EFFICIENT UNITS

HEATING SYSTEM 1

6

GAS FURNACE



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The total amount of heat that must be removed from your home in the summer months is expressed as the cooling load.

The cooling load for your home is determined in a similar way to the heating load, though the placement, type and location of windows plays a larger role in heat gain. Additionally, the amount of heat that is generated by appliances and occupants (internal heat gains) must be removed by the cooling system, and is therefore added to the total cooling load.

The electrical draw associated with air conditioning units can account for up to 60% of your total utility bill in summer months. High efficiency AC units, properly charged refrigerant and a tight duct system are essential to reducing the total cost of operation.

A/C MAKE: CARRIER
A/C MODEL: RCB60B2A
SIZE: 60000 BTU IN/ 5 TONS
*SEER: 9

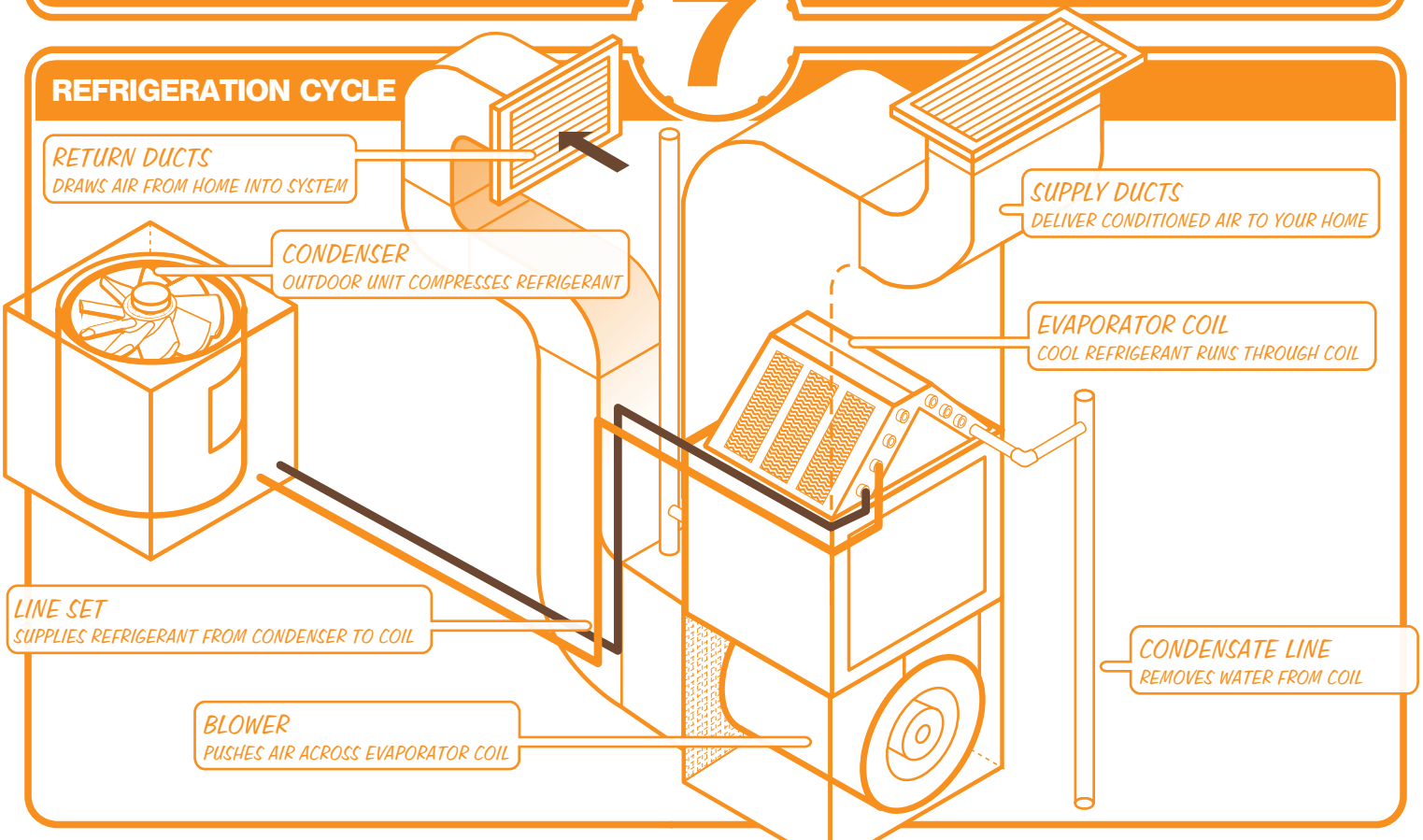
COOLING LOAD: 42320 BTU
POTENTIAL REDUCTION IN COOLING LOAD: 51%

YOUR A/C SYSTEM IS 142% OVERSIZED AND HAS THE ABILITY TO COOL

* SEASONAL ENERGY EFFICIENCY RATIO (SEER) MEASURES EFFICIENCY OF AIR CONDITIONERS. HIGHER SEER VALUES TRANSLATE TO MORE EFFICIENT UNITS

COOLING 7 SYSTEM 1

REFRIGERATION CYCLE



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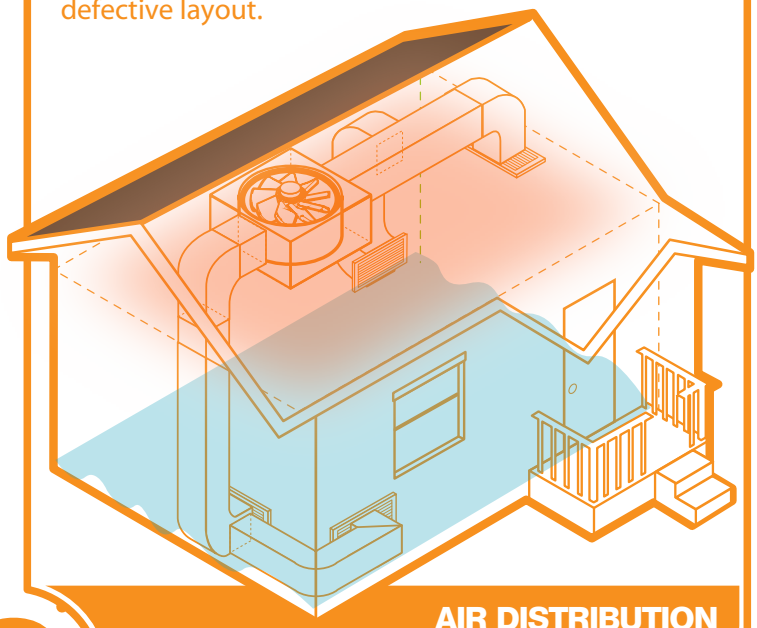
Once the total heating and cooling loads have been calculated, a room-by-room analysis is used to assess how much heating or cooling capacity is needed in each area of your home.

The room-by-room chart shows the current amount of air entering each room, what is needed to maintain comfort given particular design temperatures, and what would be needed after improvements have been made and the total building load reduced.

Analysis of the room-by-room chart allows us to locate areas of discomfort where incorrect distribution or failures may be occurring. This chart is also used in the mechanical design process to properly size distribution systems that ensure peak efficiency, enhanced comfort, and uniform heating and cooling.

Stratification, or the layering of hot and cold air zones, occurs in many poorly designed forced air systems. The result of insufficient air mixing, stratification is the product of poor installation practices, incorrect register and duct sizing, or defective layout.



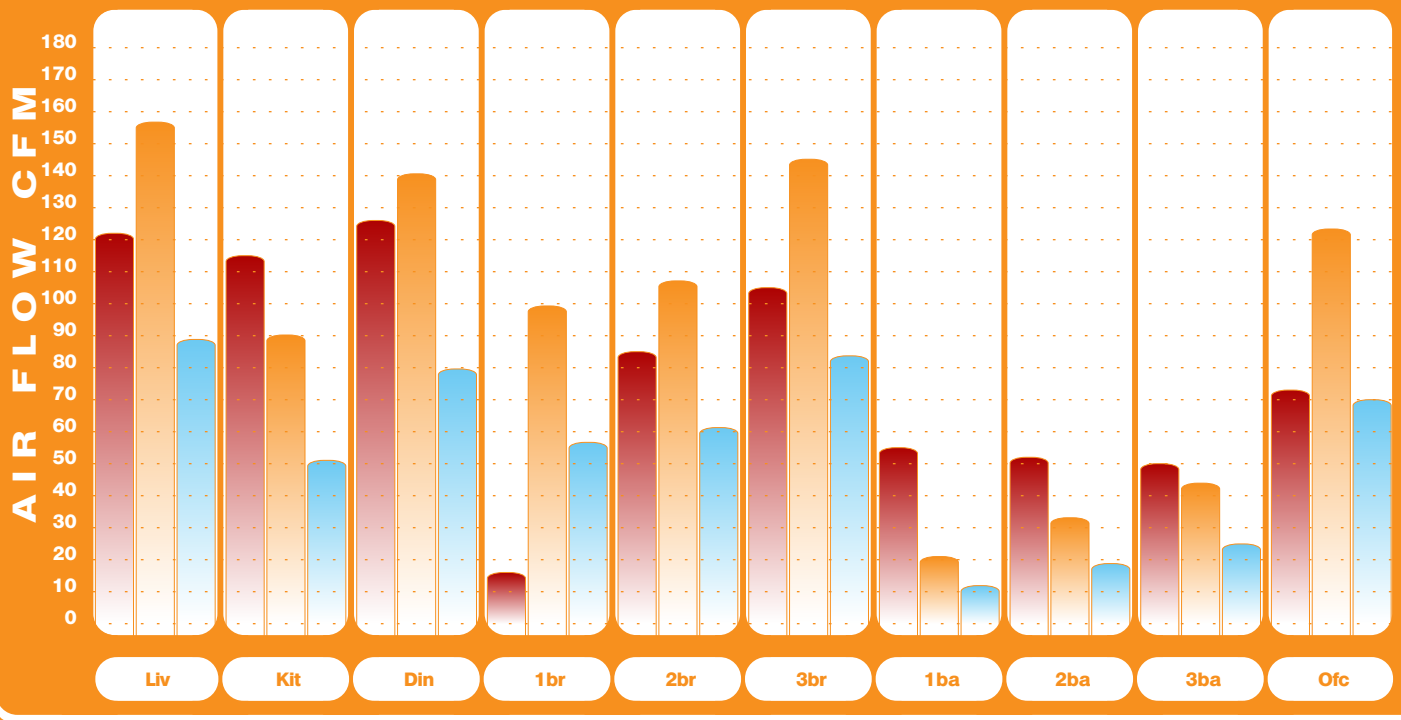
ROOM BY ROOM

8

AIR DISTRIBUTION

AIR FLOW ANALYSIS

CURRENT NEEDED REDUCED LOAD



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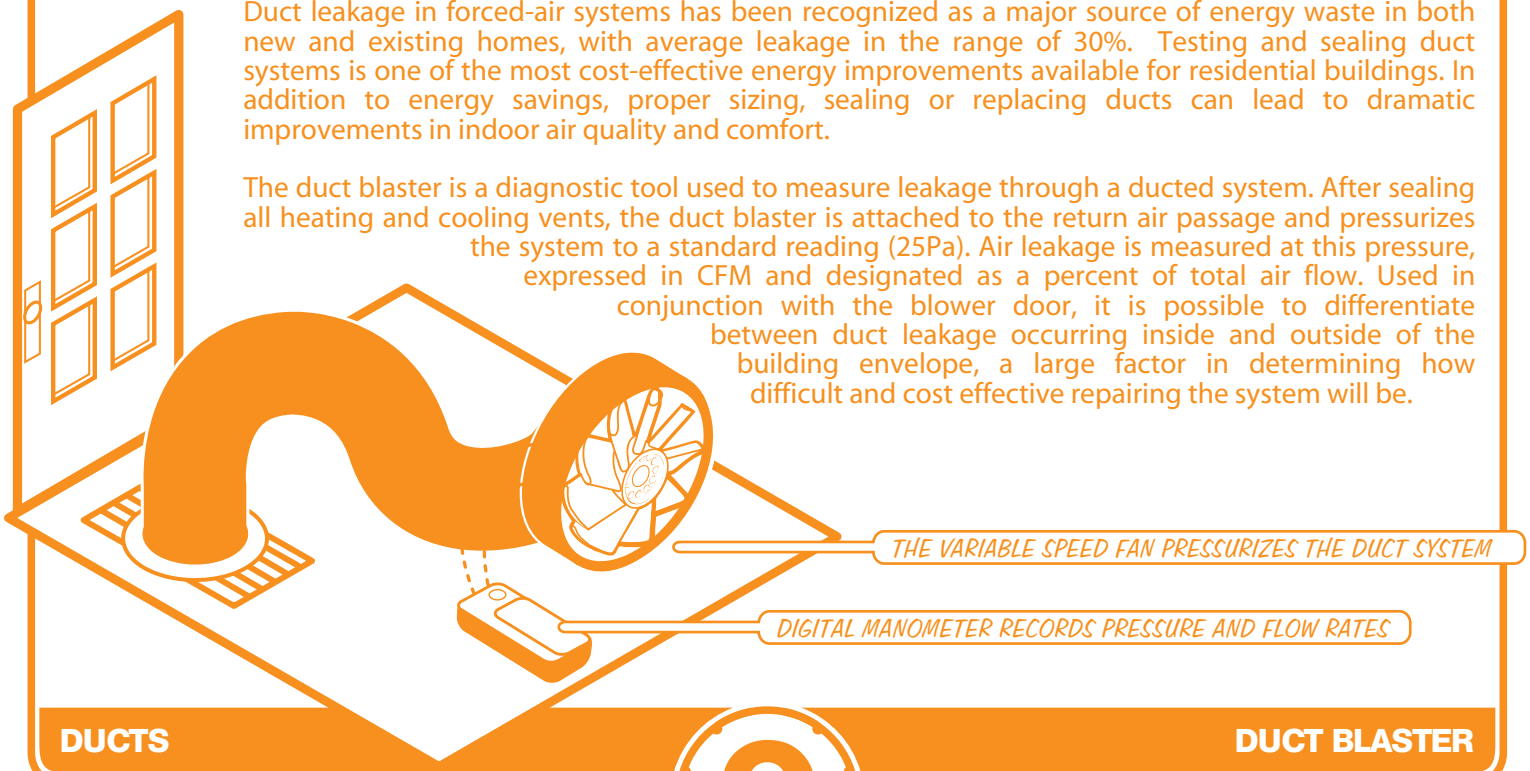
Duct leakage in forced-air systems has been recognized as a major source of energy waste in both new and existing homes, with average leakage in the range of 30%. Testing and sealing duct systems is one of the most cost-effective energy improvements available for residential buildings. In addition to energy savings, proper sizing, sealing or replacing ducts can lead to dramatic improvements in indoor air quality and comfort.

The duct blaster is a diagnostic tool used to measure leakage through a ducted system. After sealing all heating and cooling vents, the duct blaster is attached to the return air passage and pressurizes the system to a standard reading (25Pa). Air leakage is measured at this pressure, expressed in CFM and designated as a percent of total air flow. Used in conjunction with the blower door, it is possible to differentiate between duct leakage occurring inside and outside of the building envelope, a large factor in determining how difficult and cost effective repairing the system will be.



DUCTS **9** **DUCT BLASTER**

EXISTING

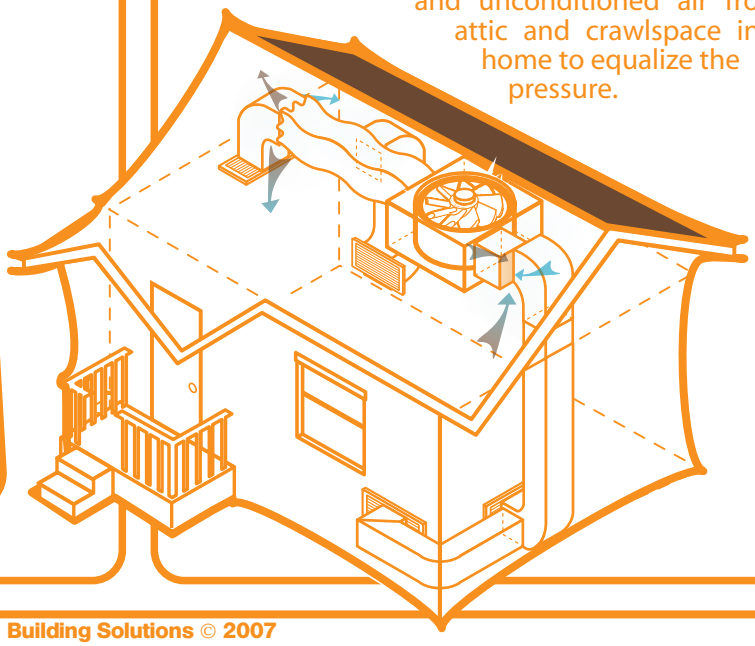
THE DUCT BLASTER TEST ON YOUR HOME SHOWS THAT THE TOTAL LEAKAGE AT 25 PASCALS IS 724 CUBIC FEET PER MINUTE (CFM).

THIS EQUATES TO 34.8% LEAKAGE, ACCOUNTING FOR 16.8% OF YOUR HOME'S TOTAL HEATING AND COOLING LOAD.
OF THE 34.8% TOTAL SYSTEM LEAKAGE, 100.0% IS LOCATED OUTSIDE OF THE BUILDING ENVELOPE.

REDUCING DUCT LEAKAGE TO 5%, WOULD DECREASE THE TOTAL HEATING AND COOLING LOAD OF YOUR HOME BY 11.6%

PRESSURE DIFFERENTIALS

Forced air systems located outside of the building envelope (attic, crawlspace, garage) with a high level of duct leakage will deposit less air into your home than is drawn out through the return air pathway. This results in a net depressurization, forcing dirty and unconditioned air from your attic and crawlspace into your home to equalize the pressure.



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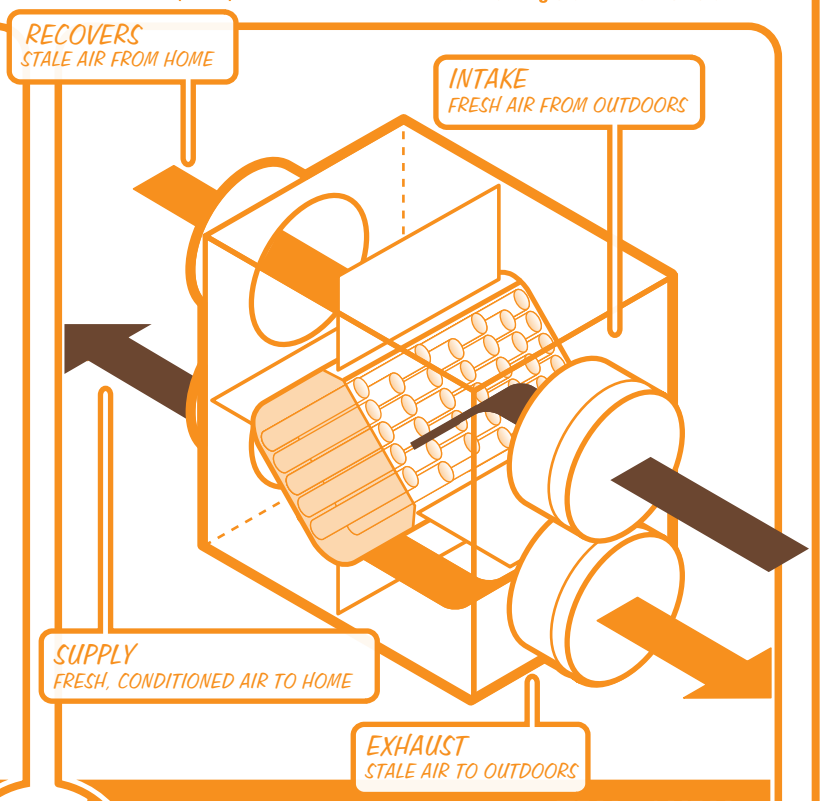
In addition to particulate matter, chemical pollutants and volatile organic compounds (VOCs) are found at much higher concentrations (2 to 5 times) indoors. Chemical pollutants are emitted in a wide range of products including paints and solvents, cleaning supplies, copiers and printers, and children's toys. Chemical pollutants are also present in a number of building materials and products, making their way into your home in cabinets, flooring, and furniture.

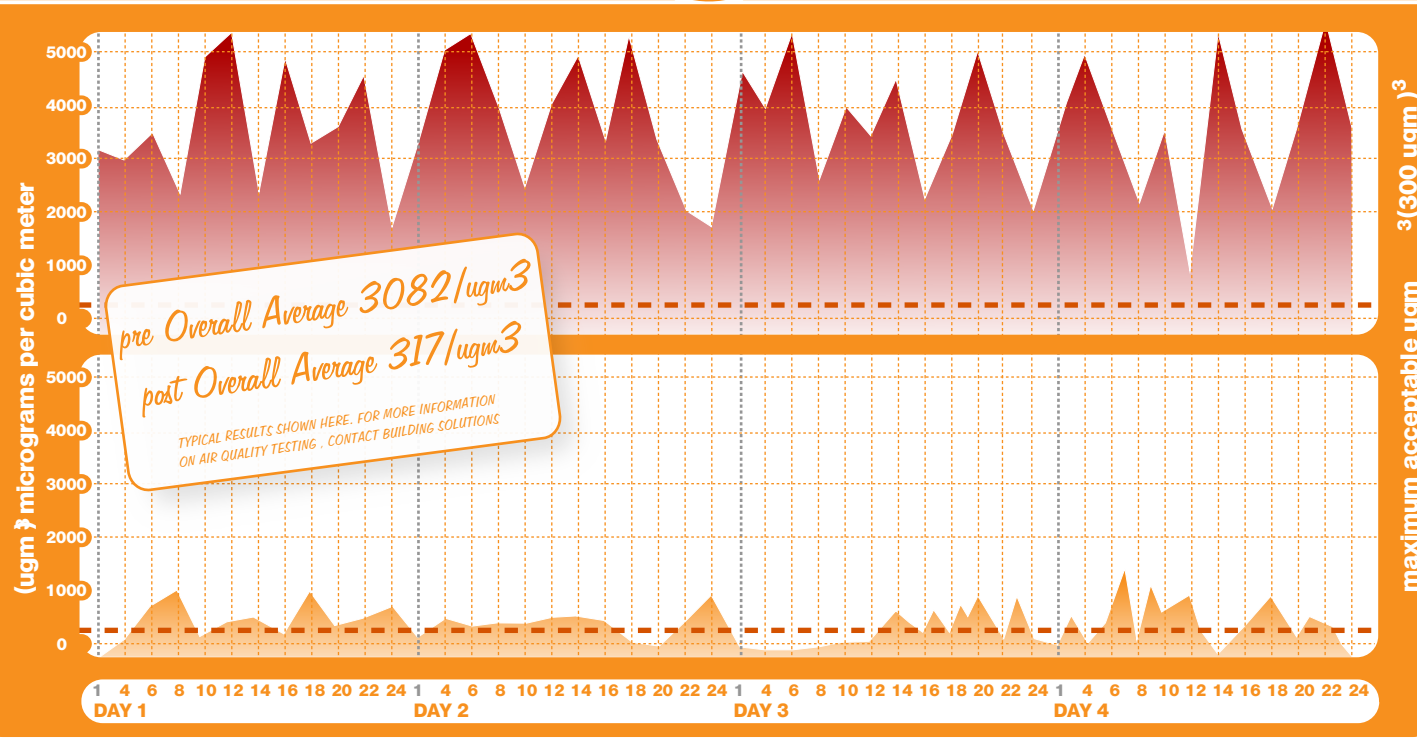
Chemical pollutants, unlike particulates, cannot be filtered. Instead, the introduction of fresh air into your home can dilute the levels and accelerate the rate at which these compounds decay. An air-to-air heat exchanger, or recovery ventilator, provides a constant stream of fresh air to your home while offering better climate control and energy efficiency. Heat recovery ventilators (HRVs) transfer heat between air entering and exiting your home, while energy recovery ventilators (ERVs) also transfer moisture.



VENTILATION **10** **ERVs / HRVs**

CHEMICAL POLLUTANTS

PRE VENTING POST VENTING



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Over the past several years, a growing body of scientific evidence has indicated that air within our homes is more seriously polluted than the outdoor air in even the largest and most industrialized cities.

Sources of particulate matter, a large component of indoor air pollution, are common near many of our homes and include wood smoke, aerosols, dust, combustion byproducts and motor vehicles exhausts. The American Medical Association (AMA) has found that exposure to particulate matter may increase susceptibility to bacterial or viral infections, adversely affect respiratory functions and can aggravate the severity of several other lung functions.

In addition to a tightly sealed envelope and duct system, air filters can reduce virtually all particulate matter in your home.

AIR FILTRATION

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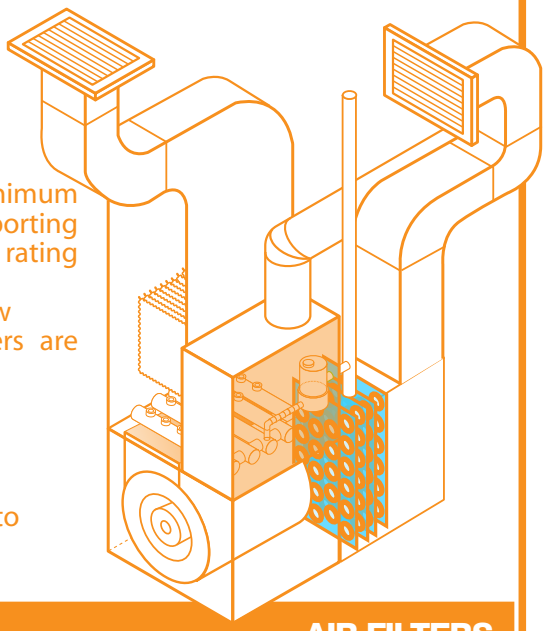
AIR FILTERS

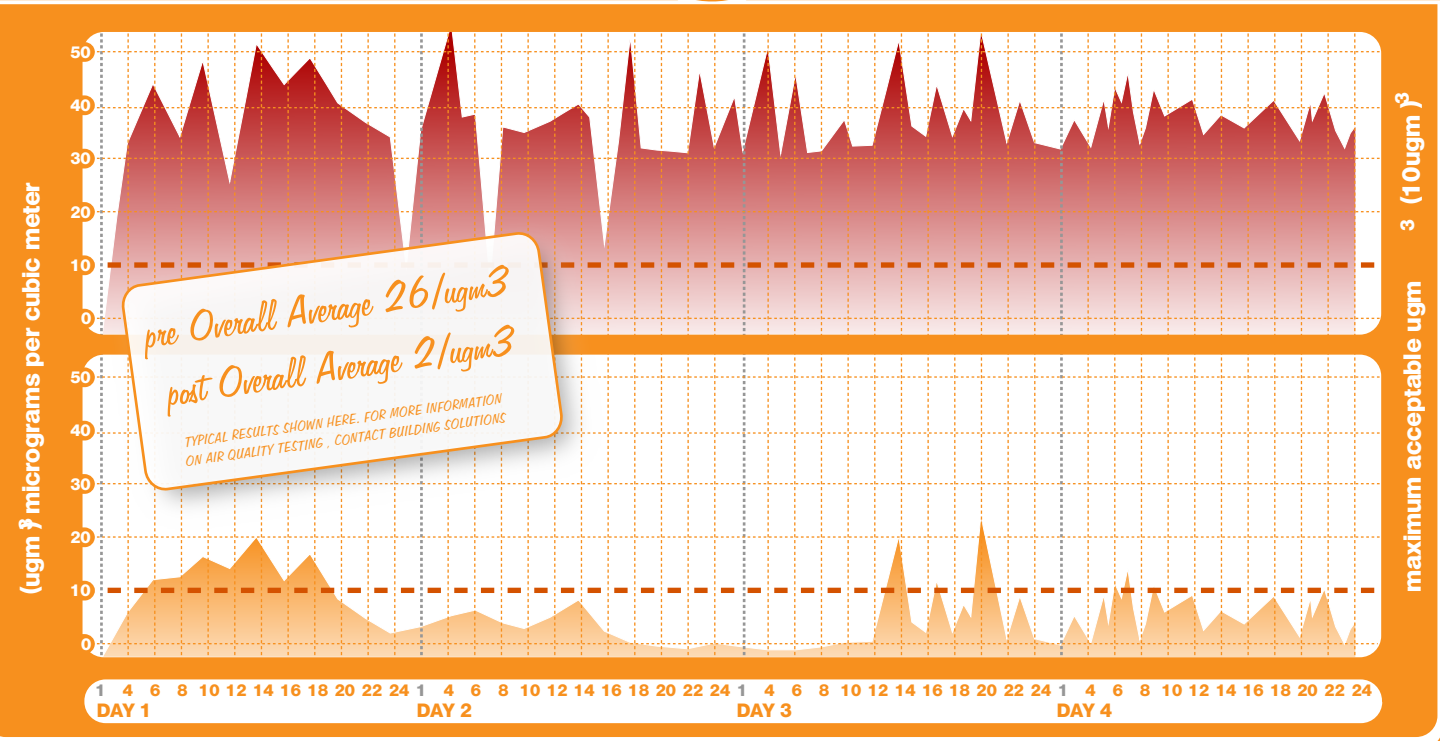
There are a range of air filtration methods including electrostatic, high efficiency particulate air (HEPA), UV and media filters. Filters can be installed as individual units or in-line with central heating systems to service the entire house.

MERV, or minimum efficiency reporting value, is the rating system that describes how effective filters are at removing airborne particulates. Higher MERV ratings corresspond to better filters.



PARTICULATE LEVELS

PRE FILTRATION POST FILTRATION



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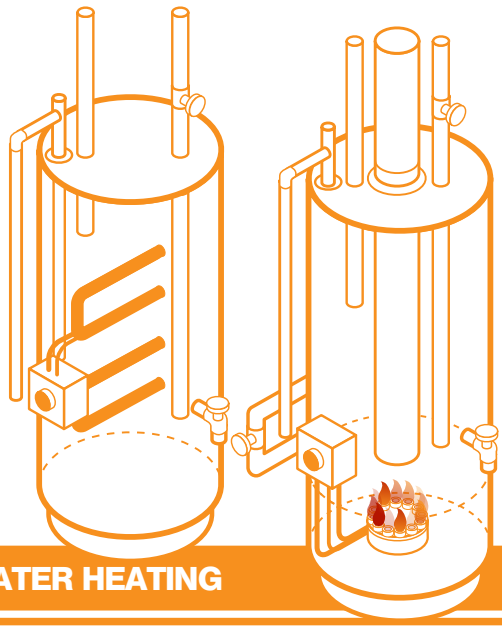
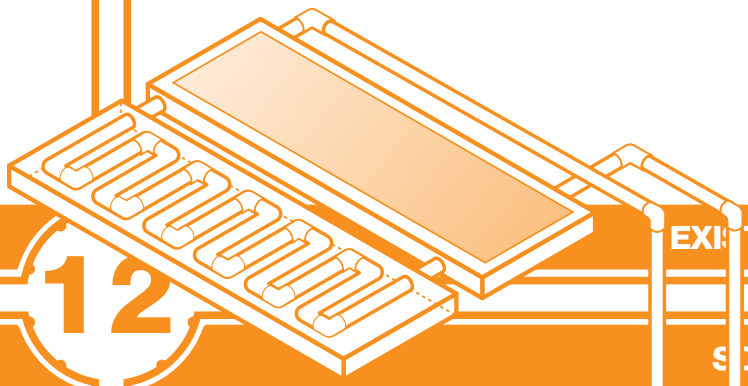
WATER HEATING

Conventional storage water heaters remain the most popular type of residential system. These tanks require constant heat, even when not in use, and have an associated standby loss. High efficiency and sealed combustion storage water heaters minimize this loss.



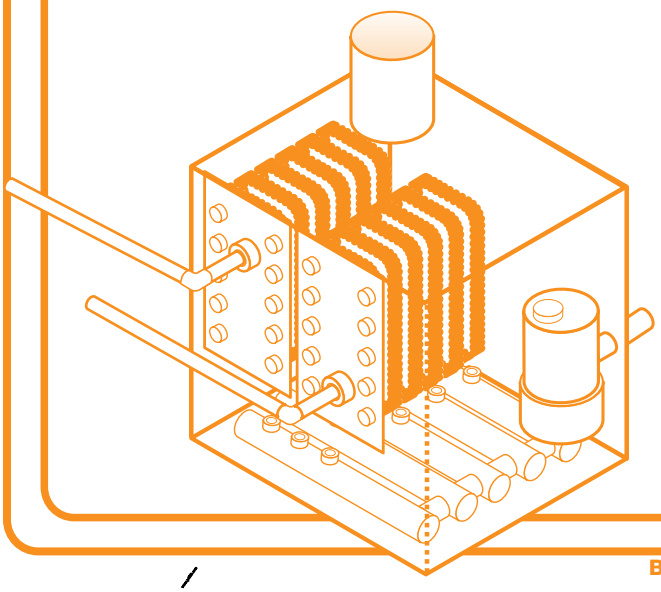
EXISTING

WATER HEATER TYPE: STORAGE
WATER HEATER MAKE: RHEEM
SIZE: 36000 BTU IN/ 40 GALLONS
EFFICIENCY: 78%
CAPACITY NEEDED: 80 GALLONS



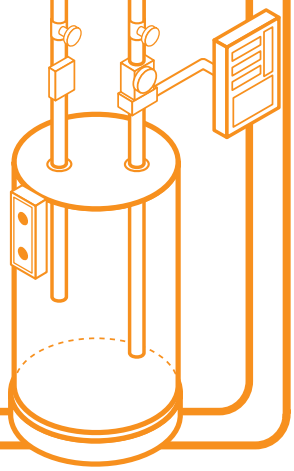
TANKLESS

On-demand water heaters heat water directly, without the use of a storage tank, avoiding standby heat loss. When a hot water outlet is turned on, cold water enters the unit and is heated either by a gas burner or electric element. The heat supply is constant but must be sized properly to accommodate multiple users.



SOLAR

Solar hot water systems are an effective and practical way to generate hot water for your home. Weatherproofed panels containing finned copper absorber plates under a glass or polymer cover are plumbed to tanks in which hot water is stored. These systems can be installed in either an open or closed loop, many with a backup source of hot water that is either in-tank (gas or electric) or external (on-demand or storage). Solar thermal arrays can also be used in conjunction with radiant floors or forced air ducted systems to provide heat for your home in addition to hot water.



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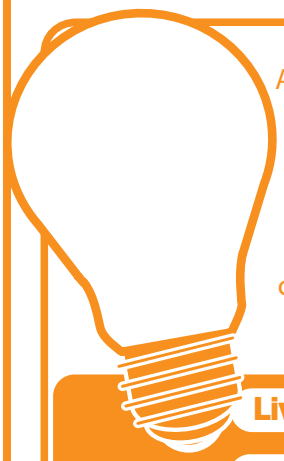

An average household spends roughly 5-10% of its energy budget on lighting, with about 50% of that energy being wasted due to inefficiencies. Lighting efficiency, or efficacy, is measured in lumens per watt. The higher the ratio of lumens (light output) per watt (unit of energy), the more efficient the lighting is.

The chart below details the potential for savings by improving lighting efficiency. Number of bulbs, watts, and usage per day are used to find the total cost of operation per month. Savings are calculated assuming that all incandescent bulbs are switched to compact florescents (CFLs).

	Liv	Kit	Din	1br	2br	3br	1ba	2ba	3ba	Ofc	Hall	Odrs	Grg	
Bulbs	4	4	3	2	2	3	2	2	2	3	2	2	1	
Watts	60	60	50	50	50	75	75	50	100	60	75	100	100	
Hours/Day	6	8	6	2	2	2.5	2.5	2	1	6	4	2	1	
$/Month	$15.12	$20.16	$9.45	$2.10	$2.10	$5.91	$3.94	$2.10	$2.10	$11.34	$6.30	$4.20	$1.05	
Savings	$11.34	$15.12	$7.09	$1.57	$1.57	$4.43	$2.95	$1.57	$1.57	$8.50	$4.72	$3.15	$0.79	

LIGHTING

LIGHTING SAVINGS $64.4

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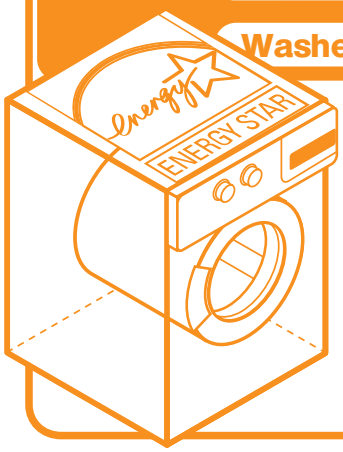
APPLIANCES

Make	MIELE	MIELE	SUB-ZERO	SUB-ZERO	MIELE		
Model	W113	T1302	601 RG	601 F	G832SCI		
$/Year	$63.87	$158.41	$116.25	$49.82	$79.20		
Age	5	5	3	3	1		
Savings	$15.97	$39.60	$17.44	$7.47	$3.96		
	Washer	Dryer	Fridge	Freezer	Dishwsr		



Of all the appliances in your home, washers, dryers and refrigerators use the majority of the total appliance bill (nearly 90%). As a rule of thumb, major appliances more than 10 years old consume more than twice the amount of energy that current Energy Star appliances use.

The chart above details the potential annual savings from replacing your current appliances with this year's Energy Star models.

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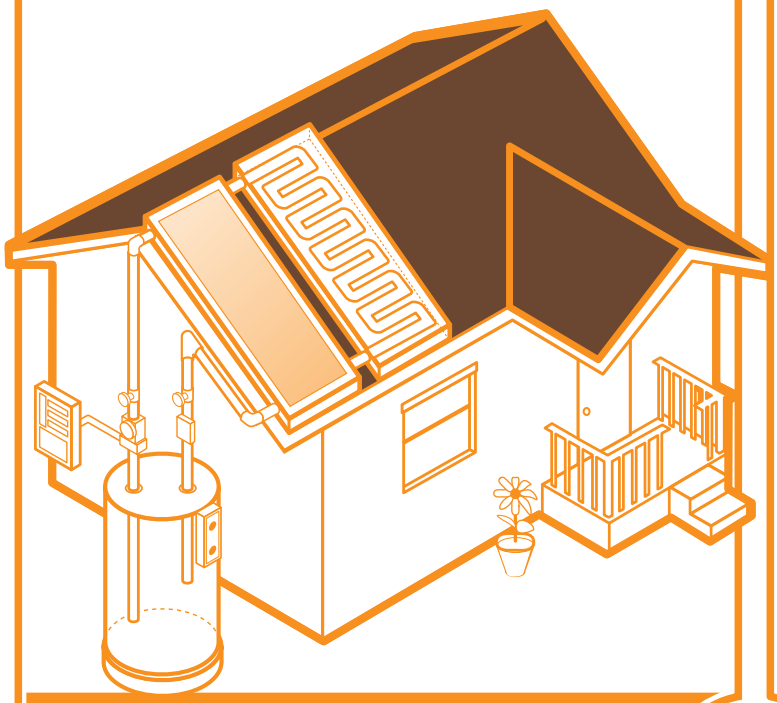

Solar hot water systems are a practical, cost effective and efficient way to heat hot water for domestic use as well as heat. These systems, composed of solar collectors mounted on the roof, a fluid system and pump to move the heat from collector to point of use, are both reliable and durable.

An auxilary energy source (electric or gas) is included depending on application. These systems may be used to heat domestic hot water, swimming pools, hot tubs, and for space heating. These systems can provide virtually all of your hot water needs in many climates while handling the homes' heating load by means of hydronic air handlers or radiant floors.

SOLAR THERMAL

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SOLAR HOT WATER AND HEAT

SYSTEM COST AND SIZING

EQUIPMENT:
4 GOBI 410 FLAT PANEL COLLECTORS
2 120 GALLON ENERGY SMART TANKS
1 HELIOFLOW PUMP AND CONTROL KIT

SYSTEM:
OPEN LOOP DOMESTIC HEAT AND HOT WATER
NORITZ TANKLESS BACKUP

NET SOLAR FRACTION: 85%

SYSTEM PRICE : $12900
FEDERAL TAX CREDIT: $2000
NET SYSTEM COST: $10900

RETURN ON INVESTMENT

YEAR	SAVINGS	(PAYBACK)	YEAR	SAVINGS	(PAYBACK)
YEAR 1	$827	($10073)	YEAR 11	$1785	$2866
YEAR 2	$893	($9180)	YEAR 12	$1928	$4794
YEAR 3	$965	($8215)	YEAR 13	$2083	$6877
YEAR 4	$1042	($7173)	YEAR 14	$2249	$9126
YEAR 5	$1125	($6048)	YEAR 15	$2429	$11555
YEAR 6	$1215	($4833)	YEAR 16	$2623	$14178
YEAR 7	$1312	($3521)	YEAR 17	$2833	$17011
YEAR 8	$1417	($2104)	YEAR 18	$3060	$20071
YEAR 9	$1531	($573)	YEAR 19	$3305	$23376
YEAR 10	$1653	$1080	YEAR 20	$3569	$26945