

Heating & Air Conditioning an Ai Dome

Heating & Air Conditioning an Ai dome. Ai dome winner of Energy Star Award.



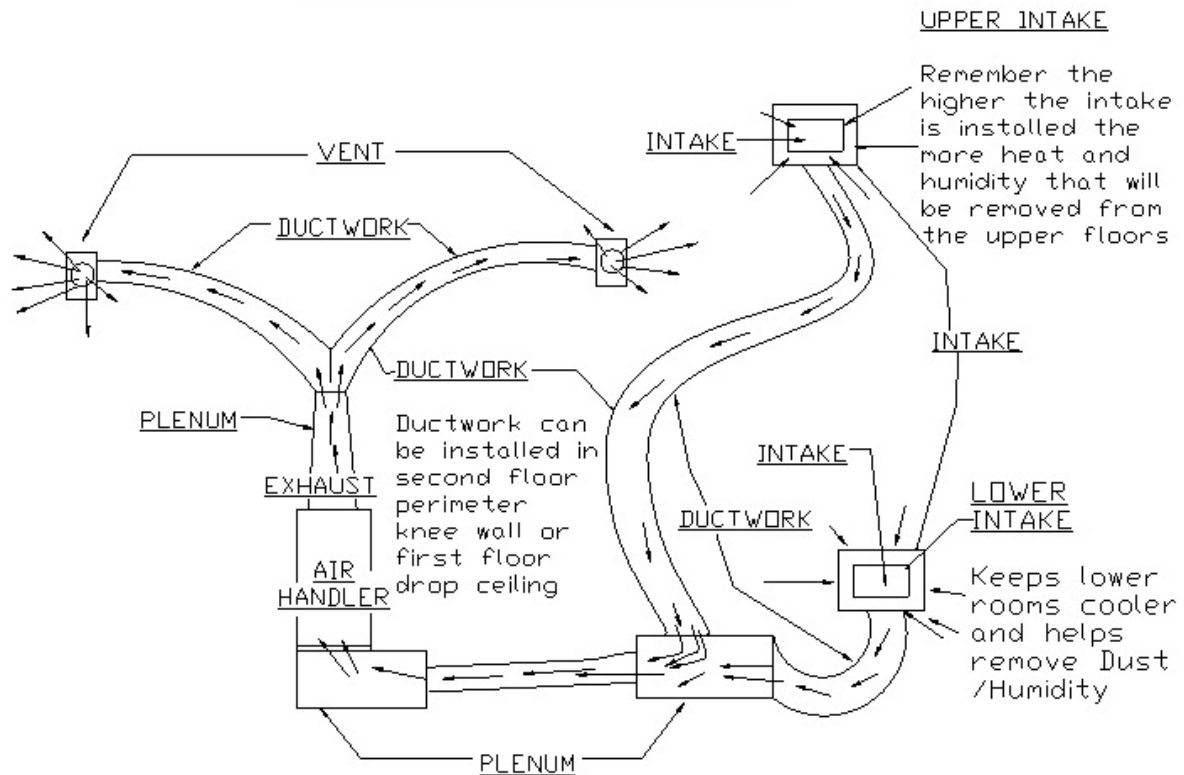
American Ingenuity 40' dome home linked to 27' garage earned Energy Star rating.

Typical AC Ductwork Design: The following info pertains to the chart below:

An air handler is the inside unit that forces cool air into the house. An air handler needs to have a plenum if installing two or more intakes. A Plenum is a foam box made of special materials that are flame retardant designed for connecting

ductwork at the bottom or top of the air handler also for splitting ductwork. Cut a hole in the plenum to accept ductwork. It could be done for an air intake grate or exhaust vents. When installing an air intake in the second floor (Intake is where you put your Air Filter. It is easier to put the air intake grate in a second floor knee wall. Knee walls are usually large enough to support multiple duct work. The grate size will be determined by the size air filter you want to install. Intake ductworks are about 10 to 12 inches large. Exhaust ductworks are usually 6 inches. (Exhaust is where the air comes out of vents in your walls, ceilings and even floors). Ductwork can be run in interior walls or drop ceilings between floor joists and in knee walls. If running ductwork in interior framed walls, the walls may need to be wider than normal to support the ductwork. It is recommended that you install two Intakes one in the upper floor of your house and one in the lower floor of your home. The upper Intake will remove humidity and hot air and dust from the upper floors. The closer you have the Intake to a room, the cooler that room will be. The lower intake is doing the same job as the upper intake removing dust, moisture and hot air. Air needs to exit out of each room, your HVAC subcontractor may have you put a grill above a door or have a space below your door for air to exit rooms. Mini-split ductless heat pumps can be installed in the dome.

TYPICAL AC DUCTWORK



Where are the AC and Heating Ducts installed in the dome? The ducts can be run in the interior walls, second floor joists, and behind the second floor perimeter knee wall. Above is a HVAC diagram showing typical way system works. Contact your local HVAC subcontractor for specific needs and air flow to rooms in your dome home. Or ductless AC/heating units are available.

Ai does not specify which heating and cooling units to use within its domes because the needs vary by regions of the country. Heating and cooling systems that are practical or common in your area can be used in the dome. We have had clients use radiant heat in the floor. We have also had clients' incorporate large spans of glass to let in the passive heat; usually this is not practical, as the dome is so energy efficient. The large amount of glass just lets in hot or cold air. Our clients have had great success with solar hot

water heaters.

For a system that is best for your area, consult a local air-conditioning contractor. All types of systems will work but it would be important to consider what type of fuel is readily available, what type of units can be serviced locally and your own preferences. However, keep in mind that because of the superb energy efficiency of the dome, you can reduce the required size of your air-conditioning and heating system by about one third. Also the cost of heating and air conditioning will also be about half that of typical houses in your area and therefore the savings provided by super efficient units will be less. It is economical to select efficient systems but not very expensive systems.

Q: Are electric vents necessary at the peak of the dome as well as in the bathrooms to prevent moisture buildup?

A: Yes due to the tightness of the dome, water vapor from cooking, showering, doing laundry, breathing, etc. needs to be removed from the dome. Electric exhaust vents are installed in a vertical wall near the top of the dome, in top center of the dome, in bathrooms, in laundry room and above stove/microwave to exhaust water vapor. In interior walls, use galvanized metal ducting that extends down the interior wall, through the floor joist and vents out under an entryway or door dormer framed wall or a hole can be cut in the concrete panel. Instructions in the Dome Kit Assembly Manual. A heat recovery ventilator or energy recovery ventilator will probably need to be installed to remove excess water vapor. To view our web site info on heat recovery ventilators, click on [HRV](#).

Can the smaller American Ingenuity domes be cooled or heated without central air conditioning or furnaces? Yes. The smaller sized American Ingenuity domes have such small heating and air-conditioning demands; it could be practical for you to use only a window air-conditioner and a space heater. Please check your local building code, some building departments

require a permanent heat source to be installed which does not allow a wood stove or fireplace as the permanent source.

What air conditioner size do you recommend for your domes?

34' Dome: 1 $\frac{1}{2}$ Ton

40' Dome: 2 Ton

45' Dome: 2 $\frac{1}{2}$ Ton

48' Dome: 3 Ton

Tell me about a ground water heat pump. A ground water (or water-to-air) heat pump is extremely efficient as it uses the constant moderate temperature of underground water to both heat and cool, instead of using outside air, it uses water from a well or underground loop to transfer heat through a concentric copper coil located inside your home. Besides being more efficient than air-to-air unit, it can produce heat when the outside temperature is below freezing. Mini-split ductless heat pumps are available. Ask your local HVAC subcontractor what units he prefers.

Can Ai's Domes be cooled without an air conditioner? Yes. Because the Ai dome is so super insulated, our clients who do not prefer air conditioning, have found the interior of the dome to be cooler than a conventional house.

- Of course you would want to install windows and doors opposite of each other so that air will flow through the dome.
- In the hot summer months, you may want to install a window AC to cool some areas and draw out moisture.
- Standing fans can be used to move the air.
- Install awnings out from the dormers and entryways to keep the sun from beaming into the dome.
- To help maintain a cooler interior temperature you may want to consider installing underground cooling pipes

which will bring air into the dome that has been cooled by the earth. To learn more about this read about Energy Efficiency under advantages.

- Plus you can install pipes in the slab to run cold water through. A 45' dome needs about 2 ½" in diameter cooling pipes that are buried 5' deep and go out about 20'. You angle the tubes where condensation can be pumped out.

Does the HVAC diagram come with the Building Plans? No. The installation and routing of the heating and cooling ducts, electrical wiring and plumbing pipes can best be determined on site by the person making the installation. Ai has found if the layouts are included, then the inspectors require the subcontractors to follow the diagrams when the subs like to design their own layouts.

Do American Ingenuity's building plans meet the new building codes requiring air exchangers? We are not sure what your code requires, if there is a minimal air exchange from the outside to inside, that requirement would best be fulfilled with an air to air heat exchanger sometimes called a heat recovery unit or energy recovery ventilator. These ventilation systems bring in fresh air and minimize the loss of heating and air conditioning. Please check with your local HVAC subcontractor.

What types of Ducts does your company recommend? Collapsible plastic inner and outer liners have insulating material between the inner and outer liners and a spiral wire that holds them round. Because the dome is all one cooled or heated space (no attic), the ducting does not need to be insulated. Sometimes building departments require insulated ducts.

How do you move hot air from the second floor to the first floor? In a vertical wall near the top of the dome install a bathroom exhaust fan that can be turned on to move hot air to the first floor. Use dryer ducting for the exhaust fan ducting. It extends down the interior wall, through the floor joist and vents out on the first floor. See above description

describing possible HVAC ductwork diagram.

How can I calculate the BTU requirements for Ai Domes? You can calculate the approximate amount of heat required for the different size Ai domes by:

- Determine the difference in temperature from outside to inside. Say inside is 70 outside is -30, $T = 100$
- Look up the Exterior surface of the dome you want to calculate (on back side of Price list) 40' dome = 2,645
- On the bottom of same Specifications sheet get the K value for the insulation. 9" $K = 0.0278$
- Multiply all of these numbers together. $100 \times 2,645 \times 0.0278 = 7,351$ is the BTU's required to make up what escapes through the dome surface.
- Do the same thing with the windows. $T =$ same, Add up the areas. For a double pane use $K = 0.3$ or what ever the mfg. specifies.
- Do the same thing with the floor and its insulation.
- Add the three BTU values together and that is the approx. heat loss.

Heat & Cool Smartly: Save Energy, Save Money

Replacing old cooling and heating equipment with more efficient, ENERGY STAR qualified equipment is one way to save energy and money. However, your home's heating and cooling equipment is part of a larger system. Heating and cooling your home smartly can include properly maintaining your existing equipment, using a programmable thermostat, finding and sealing air leaks, tightening up your ducts, and more. To view governments Energy Star web site, click on [Energy Star](#).

[Repair or Replace?](#)

Changing out old cooling and heating equipment with ENERGY STAR qualified models can cut your annual energy costs by 20 percent. Learn more about each cooling and heating product from links in the left column.

[Finding the right contractor: 10 tips](#)

10 Tips for Hiring a Heating and Cooling Contractor

1. Study up – Find out about license and insurance requirements for contractors in your state. And before you call a contractor, know the model of your current system and its maintenance history. Also make note of any uncomfortable rooms. This will help potential contractors better understand your heating needs.

2. Ask for referrals – Ask friends, neighbors, and co-workers for contractor referrals. You can also contact local trade organizations for names of members in your area.

3. Call references – Ask contractors for customer references and call them. Ask about the contractor's installation or service performance, and if the job was completed on time and within budget.

4. Find special offers – A heating and cooling system is one of the largest purchases you'll make as a homeowner. Keep your costs down by checking around for available rebates on energy-efficient ENERGY STAR qualified heating and cooling equipment. Begin your search at www.energystar.gov.

5. Look for ENERGY STAR – ENERGY STAR qualified products meet strict energy efficiency guidelines set by the U.S. Environmental Protection Agency and offer significant long-term energy savings. Contractors should be able to show you calculations of savings for ENERGY STAR heating and cooling equipment.

6. Expect a home evaluation – The contractor should spend significant time inspecting your current system and home to assess your needs. A bigger system isn't always better; a contractor should size the heating and cooling system based on the size of your house, level of insulation, and windows. A good contractor will inspect your duct system (if applicable)

for air leaks and insulation and measure airflow to make sure it meets manufacturers specifications.

7. Get written, itemized estimates – When comparing contractors' proposals (bids), be sure to compare cost, energy efficiency and warranties. A lowest price may not be the best deal if it's not the most efficient because your energy costs will be higher.

8. Get it in ink – Sign a written proposal with a contractor before work gets started. It'll protect you by specifying project costs, model numbers, job schedule and warranty information.

9. Pass it on – Tell friends and family about ENERGY STAR. Almost one-quarter of households knowingly purchased at least one qualified product last year, and 71% of those consumers say they would recommend ENERGY STAR to a friend. Spread the word, and we can all make a big difference.

10. Get the ENERGY STAR Guide – For complete information on keeping your home comfortable year-round, get the [ENERGY STAR](#) 1-888-STAR-YES (1-888-782-7937).

Maintain your Equipment: A Checklist

Just as a tune-up for your car can improve your gas mileage, a yearly tune-up of your heating and cooling system can improve efficiency and comfort.

Use a Programmable Thermostat

Use an ENERGY STAR qualified model to adjust the temperature of your home when you are home or away. With proper use of the four pre-programmed temperature settings, you can save about \$100 each year in energy costs.

Duct Sealing

It's common to find gaps between duct joints, whether a home is new or old. Seal and insulate ducts that are exposed in areas such as your attic or crawlspace to improve your

system's efficiency and your own comfort.

[Seal Air Leaks and Add Insulation \(Home Sealing\)](#)

Air leaks in your home and a poorly insulated attic can lead to significant home comfort problems and high energy bills. By properly sealing those air leaks and adding insulation, you can improve comfort and cut your energy bills by up to 10 percent.

[Consider a More Efficient Ceiling Fan](#)

Upgrade to a more energy-efficient ceiling fan. ENERGY STAR qualified models are up to 50% more energy-efficient than conventional fans, with the most potential energy savings coming from those that include lighting. In the winter, set your fan to turn in the clockwise direction to help efficiently distribute warm air throughout your room.

Help Protect the Environment

Individual actions at home can add up to a lot of pollution prevention. If just one in ten households bought ENERGY STAR heating and cooling products, the change would keep over 17 billion pounds of pollution out of the air.