Glen Arbor Outdoor
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# An Eco-Friendly Way to Obtain Exceptional Heating and Air Conditioning for Your Homestead Property

Since the high heat and humidity of the summer of 2010 and the current winter's frigid cold weather, several condominium owners and associations have approached us to assist them in finding alternatives as they struggle with high energy costs related to winter heating.

This document, still a work in progress, represents hundreds of hours of consulting with HVAC experts, mechanical contractors who are northern Michigan based, electrical and general contractors and finally product engineers along with systems analysts who reviewed our exact needs. To assist us in fully understanding the technological aspects of the proposed state-of-the-art HVAC system, most consultations were done on site at the Homestead.

After completing this process we are pleased to inform you of our selection of the Mitsubishi Electric HVAC Advanced Products Division, the manufactures of the Mr Slim Split-Ductless heating and cooling system (www.mrslim.com)to be available to those who request this type of change for heating and cooling – **once your Homeowners Board approves.**

With electric heat being our only heating option at the Homestead, we are all familiar with noisy and expensive wall heaters and/or slow-heating and costly baseboard heaters. Also, please consider we live in an air conditioned world from our homes to where we work, where we shop to even the local gas station. We are all familiar with conventional air conditioning that comes from a central system to the whole house or from portables in the windows or walls. Unfortunately, we are also familiar with the noise of an outdoor compressor, especially when the unit starts up with a loud "bang".

## Another Option for Heating and Cooling

There is another option, called ductless or mini-split heating/AC, that you can install right here at the Homestead.

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## What it is:

Ductless installations are a hybrid design. Like a central system, the compressor and the condenser, the part that disperses heat, installs outside the condominium. Each room's interior component has its own evaporator, the part that disperses cool air. Each room is connected to the outside compressor by flexible, small-diameter refrigerant lines that you can easily conceal like house wiring. The interior units that you barely notice were designed by Mitsubishi to be wall mounted, positioned close to the ceiling and controlled by a hand held remote.

## Why Use Them:

The main applications are upgrading condos and homes without hot-air furnaces and thus no installed ducts. This is exactly what we have at the Homestead. The ductless system we are discussing can heat/cool up to four rooms with one small compressor. There are larger compressors available that can serve up to eight rooms but none of our condo units require this type of an installation. We will keep our present heating systems and use them as an emergency back-up to the new system in times of severe cold weather.

## Advantages:

The main advantages of mini-splits are their small size and flexibility for zoning for heating and cooling individual rooms totally independent of each other.

There will be no more whole house heating, whether you want it or not, as we know happens with conventional heating and AC. Since each of the zones will have its own thermostat, you only need to heat/cool that place when someone is there.

**This process will save energy and money.**

Ductless mini-split systems are easier to install than other types of space conditioning systems. For example, the hook-up between the outdoor and indoor units generally requires only a three-inch hole through a wall for the conduit.

In comparison to other heating/AC systems, mini-splits offer more flexibility in interior design options. The interior units can be suspended from a ceiling, mounted flush into a drop ceiling, or hung on a wall. Most indoor units have profiles of about seven inches deep and usually come with sleek, high tech-looking jackets. All of the indoor units we are considering have hand held easy-to-use remote controllers.

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# Heat Pumps – The Bonus That Saves Money

The mini-split HVAC system we have selected comes with a state-of-the-art heat pump **for heating at a significant cost savings when compared to the resistant heaters we all use now.**

Like your refrigerator, heat pumps use electricity to pump refrigerant and transfer heat from one space to another. When we transfer heat from within our home to the outdoors, we call it "air conditioning". Conversely, when we transfer heat from the outdoors to within a home, we call it a "heat pump". Because refrigerant is much colder than outdoor temperatures, even on a very cold day, it actually absorbs heat from outdoors and transfers the heat it absorbed outside to within your home. The refrigerant's physical properties do this naturally. What you pay for is the electricity to pump refrigerant via copper tubing from outdoors to indoors. Because we move the heat rather than generate it (as many condos are heated with 1500 watt resistant heaters), **heat pumps can deliver up to 4 times the amount of heat for the energy consumed.**

The Mitsubishi heat pump heating/AC system selected is perfect for the Homestead because we are mandated to heat with electricity. **A heat pump can trim the amount of electricity you use for heating by as much as 30 to 40 %.**

High-efficiency heat pumps also dehumidify better than standard central air conditioning, **resulting in less energy usage and more cooling comfort in summer months.**

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# Mitsubishi Mr. Slim Inverter Technology

The Mitsubishi Electric's outdoor compressors use inverter compressor technology (variable frequency drive) to provide exceptional indoor high speed heating and cooling.

In response to outdoor temperature changes, the system varies the compressor speed, thereby **reducing power consumption for extra energy savings. The key thing to remember is the system performs only to the level needed to maintain a constant and comfortable indoor environment.**

This mechanism described above is totally new to those of us who have experienced the "all-on or all-off" of conventional compressors. No two inverter compressors, if placed side by side, will ever be operating at the same speed due to the individual room thermostat settings.

Unlike conventional compressors that start abruptly, run at maximum speed and stop repetitively, inverter units are able to detect subtle changes in room temperature and adjust compressor speed automatically. **The results of this fine tuned compressor speed is a more uniform temperature for a more comfortable climate.**

**Simply said – Inverter technology means reduced energy consumption and less cost to operate the system.**

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# The Mitsubishi Corporation

The company began producing the Mr Slim product line in Japan some 40+ years ago. It was established here in the US in 1980, some 31 years ago, to market their innovative HVAC product line. Besides being the innovator of ductless heating/AC the company maintains superior dominance over the entire field with its research and development mission. Interestingly, many of the original Mr Slim units installed in the Western United States are still in full operation today.

Mr Slim origins started in Japan where the major objectives were defined by the unique living circumstances of the people. To this day, worldwide these objectives define the product line we are suggesting for your consideration. There were three founding needs of the company: (1) **SPACE –** real estate is such a premium that buildings are built tall rather than flat and wide. The interior ductless system has no bulk to add to a standard sized room and the exterior compressors are thin and short, some 35"x 34" x 10". (2) **SOUND –** because buildings in Japan are so close together and the density of the population is so great sound level of any component of the system became a major concern. The ductless systems by Mitsubishi are known worldwide to have the quietest exterior and interior units. Even the largest compressors, those producing 4 tons of heating/cooling, only produce about 55 decibels of sound compared with a standard upright vacuum cleaner at 74 decibels. The interior units produce about 19 to 30 decibels compared to 33 for a library reading room and 35 for whisper-tone voice noise level. One barely hears the indoor or outdoor units especially when compared to modern, conventional compressors that generate almost 90 decibels as they continually run full speed. The low level of sound is not only during running periods but occurs at start-up as well. (3) **ENERGY –** energy demand is great and expensive in Japan**,** Asia and Europe.

There is tremendous pressure placed on the available energy resources in these countries. Ductless provides a true zoning solution and in these countries it is common practice to heat or AC only the spaces being occupied rather than an entire house regardless of occupancy. "Soft start" reduces the instantaneous peak demand associated with AC equipment starts. The Mitsubishi compressor starts at minimum speed, avoiding high inrush current associated with standard compressors. **Energy consumption is greatly reduced resulting in cost savings to the Mr Slim owner.**

For these three reasons Mitsubishi has always been the innovator with a few failed attempts to copy their product line. We are most confident in our selection of this product line for you.

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# Significant Considerations of the Mr. Slim Product line as it Provides Homestead Owners with Year-Round Comfort

## Three Key Contractors for the Installation:

**General Contractor –** Glen Arbor Outdoor will be responsible for managing and supervising the installation. We will construct interior and exterior chases where required as well as construct the platforms and coverings for the compressors. Glen Arbor Outdoor has exclusively serviced the Homestead since 1995 and is most sensitive to maintaining the appearance of each of the buildings that only these many years of experience can generate.

**Mechanical Contractor –** Will be responsible for all of the proper measurements to fit the correct size indoor units to the outdoor compressor. He will install the compressors, line-sets and platforms. He will engineer the appropriate location for each outdoor compressor and indoor unit. We have selected a well-seasoned Mitsubishi Diamond Award contractor for this critical installation. The award is given only to those contractors who have had the highest degree of training and installation proficiency.

**Electrical Contractor-** Will provide power from the owner's condominium to the outdoor compressor. To do this the electrical contractor will remove only one original heating circuit to power the entire system.

## Quiet Operation:

Mitsubishi Mr Slim indoor and outdoor units are noted to be the quietest split-duct system available today. The industry standard for quiet operation has been established by this manufacturer and they are trend setters for quiet operation in all of their product line.

The compressor and the evaporator components are housed in separate units which provide the quietest possible operation in both indoor and outdoor environments.

The selected system is ideal for applications where quiet is necessary such as bedrooms, living rooms and more. Sound levels for the indoor units range from 19 decibels at low

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speed to the low 30s at high speed. One can compare these decibel levels to standard indoor sound levels which are generally between 45 and 55 decibels. These indoor units emit similar sound levels you'd expect from a whisper.

The outdoor compressor units are also very quiet operating from 45 decibels to about 65 decibels, the later from the very largest compressors made by the company. To date, there are no installations at the Homestead that require this large of a compressor.

Special care was taken to design the outdoor compressor so that it was compartmentalized so that the sound is greatly reduced at the source. Specially designed blades and multi-speed motors also reduce system operation sound. These very low sound levels allow these outdoor compressor units to be installed near windows or on balconies - all resulting in minimizing disruption to your environment.

Some common sound levels (in decibels) to compare the quiet Mitsubishi system:

Police siren …….. 118 decibels
Normal fan on high speed …….100
Conventional AC compressor …. 88
Vacuum cleaner ……... 74
Normal conversation …… 60
Mitsubishi 3-ton compressor
operating on high …… 55
Whisper-tone voice …….. 35
Mitsubishi indoor unit
operating from low to high …… 19 – 34

Note it is particularly interesting to read the high sound levels achieved by a normal fan that we all have heard on many a warm night coming from our own as well as our neighbor's fan at the Homestead.

## Cost:

There are many variables that will determine the final cost of installation of a Mitsubishi Mr Slim system. Such particulars as the over-all size of the condominium, the location of the outdoor compressor and the number and type of indoor units all add into the equation. It is obvious that this is a complex process but one that will be appreciated by the owner once this customized installation is completed.

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## Cost and Benefits

### Energy Savings:

Since heating represents the bulk of the total energy cost, one needs to know what to expect in annual savings with installation of the Mr. Slim product line. If we take for, example, a condo unit that has had its original slider doors replaced with a modern thermopane structure, and if we assume an average annual energy expense (AAEE) of $2,000/year, by using the heat pump one can reduce the consumption of electricity by 30 to 40%.

Therefore (approximate) Energy Savings:

| | |
|---|---|
| AAEE $2,000 | $2,000 |
| Heat Pump Savings expected 40% | x 40% |
| Average Annual Savings Expected = | $800 |

Please bear in mind, with current system-restricted heating, there is NO savings because there is no energy being saved. In this case the owner pays $2,000/year in energy costs if he does not improve and he pays $1,200/year if he improves. (See Low Temperature Operation section below.)

### Return on Investment (ROI):

For the sake of example, an owner invests a total of $5,000 to improve his property. He saves $800/year as shown in the example above. What is his ROI?

| | | |
|---|---|---|
| Average Annual Savings (expected) | $800 | |
| Divided by Total Cost | $5,000 | = 16% ROI |

### Payback Period on Investment:

For our example, an owner spends $5,000 for his system with an annual savings expected of $800. How many years will it take to pay back the cost of improvement?

| | | |
|---|---|---|
| Total Cost | $5,000 | |
| Divided by Average Annual Savings Expected | $800 | = 6.25 years payback period |

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## Energy Efficiency

Most fixed-speed compressors in traditional HVAC systems only operate at 0% and 100%. In others words, fixed-speed compressors are either on or off which wastes electric energy when partial-load conditions prevail. Even if you have a traditional system with 2 or 3 stages, it does not compare to the full-range variable capacity of the inverter-driven system chosen for your condo.

Inverter compressors ramp up quickly providing the energy necessary to achieve heating or cooling demand of the zone. The inverter compressor varies its speed to maintain the desired comfort level. Thus the system performs at only the minimum energy levels necessary and does not waste electricity when partial-load conditions are present—which is 97% of the time in most locations.

**By switching to this very energy-efficient heating/AC system, our owners will consume fewer kilowatt-hours of electricity and emit fewer tons of carbon dioxide.**

## Efficiency Example

One series of condominiums at the Homestead uses, on average, 11,300 watts of power to heat. The Mitsubishi heating system selected will use 2,120 watts at start-up and then will only use 780 watts to maintain the set temperature. This is a significant reduction in power consumption.

The Homestead is serviced by Consumers Energy, one of the more expensive electric power suppliers in the State of Michigan according to local contractors. Any means an owner can reduce power consumption will result in saved dollars.

## Low Temperature Operation

For the HVAC unit we have selected, the lowest operational temperature is – 4 degrees F. At that point the outdoor unit shuts off until the outside temperature rises to 1 degree F. This is due to the superior engineering of the Mitsubishi system to allow operating at such low temperatures.

During the time that the outdoor unit is shut off, the back-up heating system currently operating in each condo would operate. It is suggested that the heat pump thermostat be set at 60 degrees F and the back-up system be set at 50 degrees F during the winter months when the condo is unoccupied. There is value to the old heating system. It can be used for a back-up heating source, if needed.

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## Air Quality

The Mitsubishi indoor units use a sophisticated multi-part filter system to remove contaminants such as allergens, viruses and bacteria from the circulating air. There is a Blue-Enzyme anti-allergen filter that reduces germs, bacteria, viruses and helps trap dust, pollens, mites and other particles. The filter uses an enzyme catalyst to help break down the sulfur atom bonds in allergen proteins, transforming them into non-allergen proteins.

A hybrid coating process makes the filter washable and, if properly maintained with monthly cleanings, will allow the filter to remain effective for more than ten years.

## Dehumidification

The selected system allows for three settings: Cool, heat and dry. The dry mode will act as a dehumidifier. The cooling setting also dehumidifies but the dry mode only dehumidifies.

## Lower Life Cycle Costs

The split system selected has fewer components than other HVAC systems, reducing initial equipment costs. The smaller/fewer components mean less time spent on installation.

The components of the indoor and outdoor units are robust. They have a 15 to 20 year life expectancy. The product requires significantly less maintenance than other systems.

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## Environmental Stewardship

Mitsubishi is a corporate member of the US Green Building Council. It is the first HVAC company to eliminate the use of lead and mercury in its products. They were one of the first companies to use the environmentally-friendly R410A refrigerant.
All of the company's HVAC products follow standards and guidelines as set by the ENERGY STAR, EPA, UL AND ISO, to name but a few.

Inverter technology is highly responsive and efficient, providing a more consistent indoor environment and wiser use of energy, since one rarely uses the compressor at full power and avoids repetitive on/off circumstances.

Normal maintenance consists of cleaning the inside units' filters monthly and the cleaning of the coils on the outside unit annually, as opposed to competitors' products requiring constant maintenance to preserve their efficiency.

## Modernization

In today's society, air conditioning is an expected amenity. The proposed heating/AC system will provide a higher resale value and provide more comfortable accommodations for our owners and their guests. By installing the correct heating/AC system with technology that has been tested and tried over a period of 40+ years in Japan, Europe and the United States, the property will be improved overall.

## Association Specifications

Glen Arbor Outdoor strongly recommends that the Association set the specifications for the system manufacturer and chose condenser locations and other outdoor specifications related to visual ambiance. Once these are agreed upon, Glen Arbor Outdoor will be able to provide a detailed quote to the interested condo owners.

As a side note, we recently installed this system in our office. Please feel free to stop by, view it, listen to it and even feel the comfortable room temperatures.

Sincerely,

Bob Ihme