

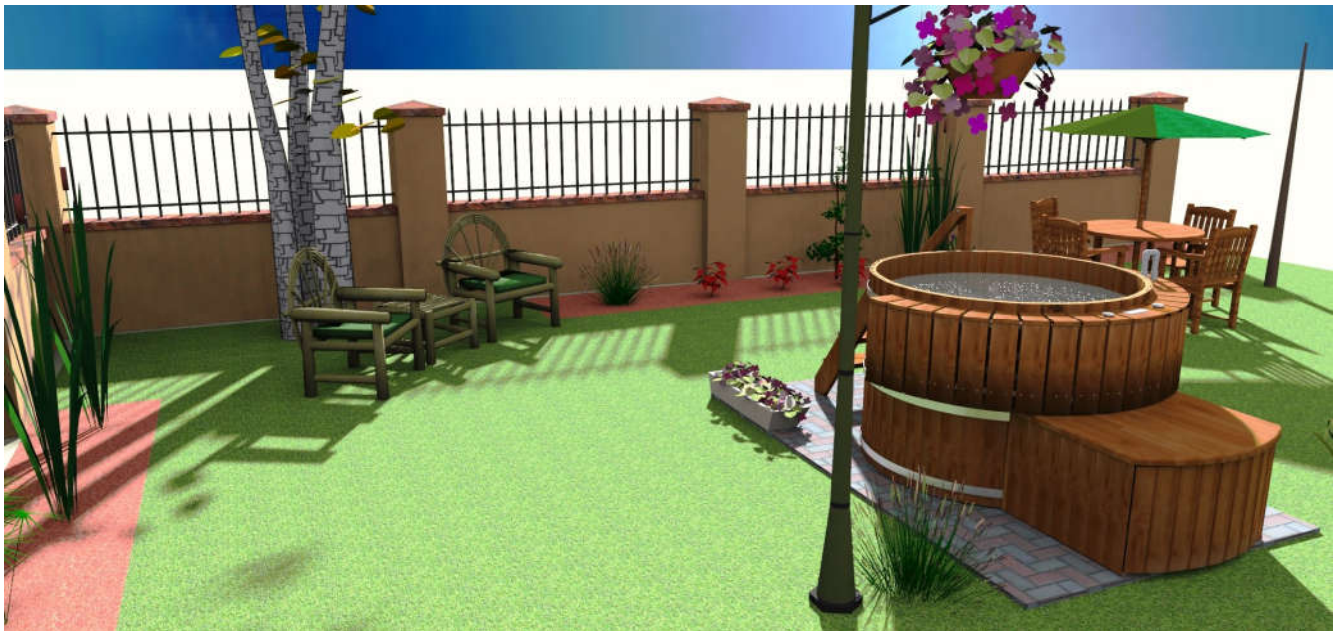


Site Preparation for a Hot Tub

Revision 3.0

Table of Contents

Location	2
Tub Dimensional Information.....	2
Preparing the Foundation	2
Stand-Alone Tub Considerations	3
Built into Deck Considerations	4
Deck Opening Information	4
Deck Height Information	5
Rain and Spillage Protection.....	6
Deck Board Choice and Finish	6
Using a Pit.....	7
Vertical Placement of the Equipment Pad	9
Electrical Services.....	9
UL/CSA Certification.	10
Gas Heat Requirements.....	10
Heat Pump Option.....	13



Location

Choosing where to place your hot tub is a most important and often overlooked step. Ambiance and surroundings should be considered. The tub may be located as a stand-alone unit, or it may be combined with a deck. Also consider privacy, wind and sun direction, and noise from traffic and neighbors. Most people wish to locate the tub in a quiet, private and tranquil area. However, it can be desirable to have it close to an entrance, especially considering the colder months. Ideally the tub should have one clear unobstructed side that acts as a showpiece, giving just the pure cedar tub look. The other side is typically the hardware and plumbing side.

Indoor placement, though not common, is also possible. In such a case carefully consider having adequate ceiling height as well as drainage and ventilation. Cedar tubs will leak for the first while and indoor floor drainage considerations are a must.

Also consider the location of the equipment pad. This unit comes mostly preassembled, but you do need to consider where it will be placed so that it remains accessible and that it will stay dry.

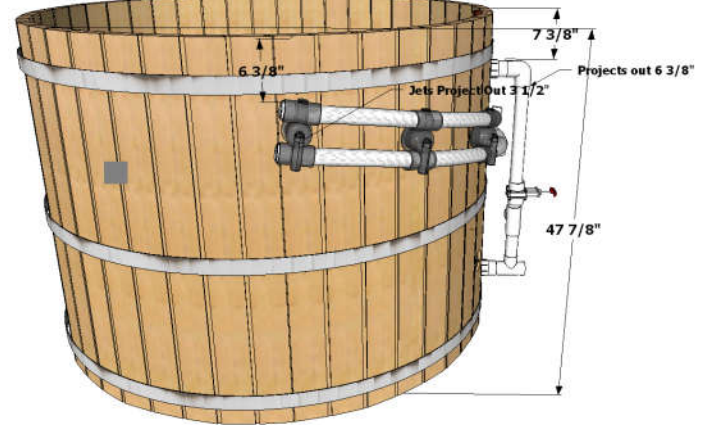
Tub Dimensional Information

All standard tubs are 47-7/8" (122 cm) in height (from the foundation to the brim), without the cover on. The cover is another 4" (10 cm) high and has a 1.5" (3.7 cm) skirt. The following table provides dimensional information for the various tub sizes.

Table 1 -Tub Diameter & Projection Dimensions

Tub Size	O.D.	Jet Projec- tion	Skimmer tube Projection
Small	56"(142cm)	3.5"(9cm)	6-3/8"(16 cm)
Regular	65"(165cm)	3.5"(9cm)	6-3/8"(16 cm)
Large	74"(188cm)	3.5"(9cm)	6-3/8"(16 cm)
X-Large	84"(213cm)	3.5"(9cm)	6-3/8"(16 cm)

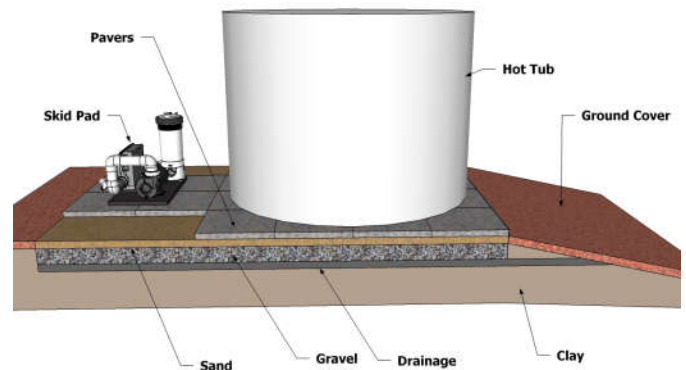
Figure 1 -Piping Projections



Preparing the Foundation

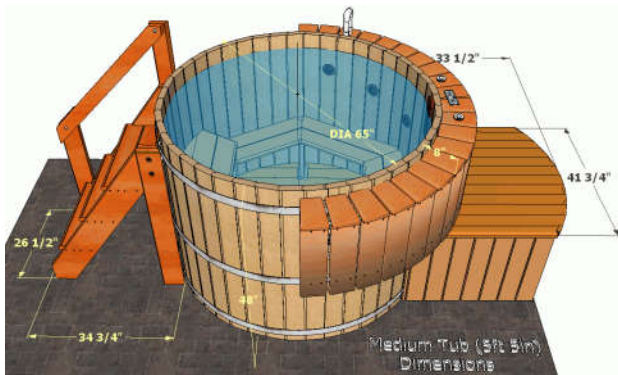
Once the best location has been found, the next step is preparing the foundation. Dig out any soft loose soil until you have reached firm ground. Then fill the area in with small aggregate gravel & sand and compact and level this bed properly. Next lay down appropriately sized patio pavers (12, 18 or 24-inch square type are popular sizes). The dimensions of the slab surface should be somewhat larger (for example by 6 inches) than the diameter of the tub. Alternatively, a cement foundation can be constructed. Drainage needs to be considered. Direct any drainage pipes or ditching so water will not stay under the foundation and that the water drains where you want it to flow.

Figure 2 - Foundation Blocks



The foundation often needs to be extended to provide space for the mechanical equipment or accessories such as a stair or enclosure. The next illustration provides the dimensions of the enclosure. If using an enclosure design the foundation so that it extends another 36 inches on the side at which it will be located. If using stairs, design the foundation so that it also extends another 36 inches.

Figure 3 - Foundation Length Increases for Enclosure and Stairs



Stand-Alone Tub Considerations

The standalone tub presents the least problems with accessibility and the equipment pad is located adjacent to the tub and inside a fitted custom cedar housing (available from *Northern Lights*). In this case the foundation pad should be extended on the side where the cedar housing will be positioned. See Figure 3

A standalone tub also requires stairs, shelves and shelf skirts. Stairs are typically placed opposite to where the equipment pad and spa controls are located. The illustration that follows shows you how the jets and seats are typically arranged and where you would place stairs, shelves, shelf skirts and enclosure.

Figure 4 – Stand-alone Tub Electric Heat Soaker or 4 – 6 Jets



Note that one section of the seats is higher. We call this the “step-in seat”. This seat is raised relative to the others and is more heavily supported. As the name implies, this is where one enters the tub and where the stairs would be located.

The above illustration with the fitted enclosure suits only electric heat tubs; either soaker tubs or tubs with 4 to 6 jets. If 8 or 10 jets are deployed the equipment pad will

have 2 filters and is unsuitable for the fitted enclosure (its too large to fit inside). Furthermore, if the heating system includes a gas heater or heat pump, the fitted enclosure does not suit the plumbing that will be required. In these situations, either the small or the large box enclosure are used and examples of stand-alone tubs using these are provided below. Whether it’s the small or large box enclosure will depend on the size of the equipment pad needed in the specific order.

Figure 5 - Photo Stand-alone 8-jet Electric Heat Tub with Large Box Enclosure

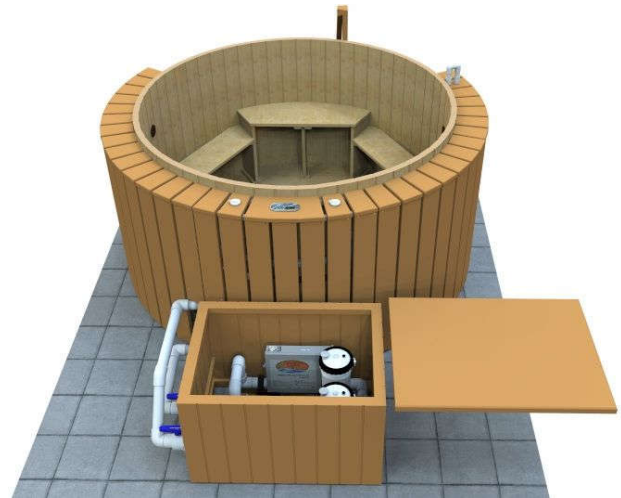


Figure 6 - 7ft Stand-alone tub with Heat Pump

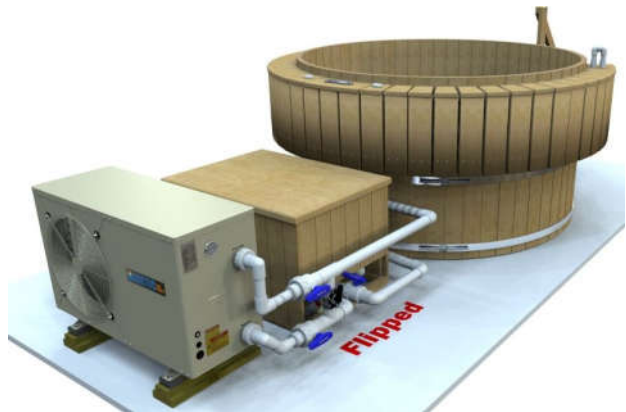
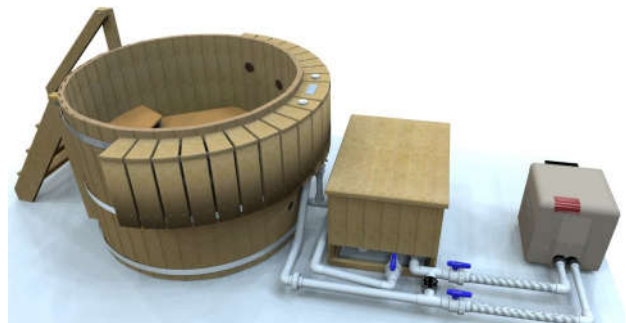


Figure 7 - - 5ft Stand-alone tub with Gas Heater



Built into Deck Considerations

The hot tub can be fully built into a deck, as illustrated in Figures 8 & 9. Or it can be partially attached to a deck as illustrated in Figure 10 or 11. The deck can come near the rim of the hot tub (high deck as shown in Figure 8 or 10), or the deck can be lower as illustrated in Figure 9. These are by no means the only ways a tub can be used with a deck. We cannot illustrate all the possible permutation and combinations. To determine the size of the joists, positioning of support posts, beams, etc., the customer must either refer to a deck designer or a deck construction handbook that covers these topics. A separate document is available that provides more details about the three designs that are illustrated.

Figure 8 - Tub Fully Built into a High Deck

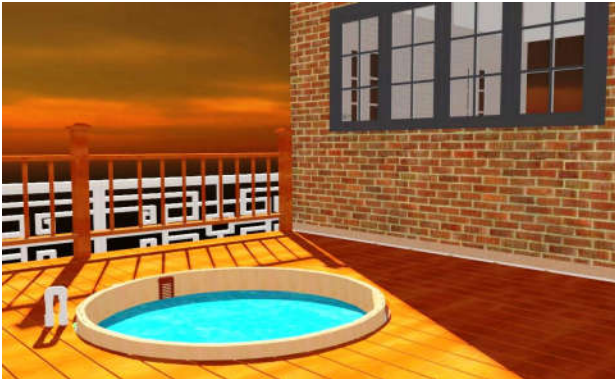


Figure 9 - Tub Fully Built into a Low Deck with Steps and Shelves and Skirts

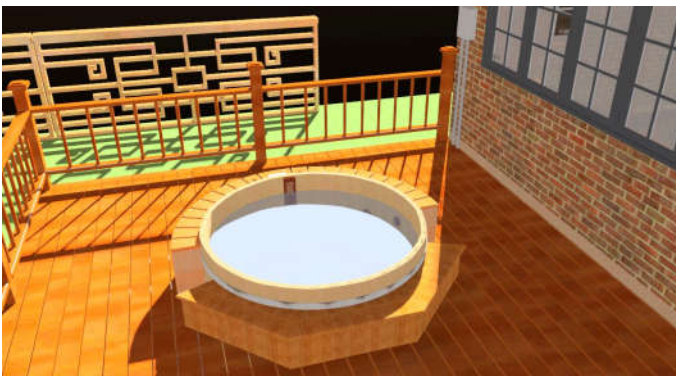


Figure 10 - Tub Partially Built into a High Deck with Enclosure Shelves and Skirts



Figure 11 - Tub Partially Built into a High Deck with Full length Skirts and Extended Piping



Deck Opening Information

Frequent questions we field relate to the clearance required so the deck substructure clears all the plumbing parts attached to the tub. The illustrations below indicate how much clearance you need to provide in forming an opening within the deck substructure.

Figure 12 - Clearances Needed in Deck Sub-Structure for Fully Built-In Tub

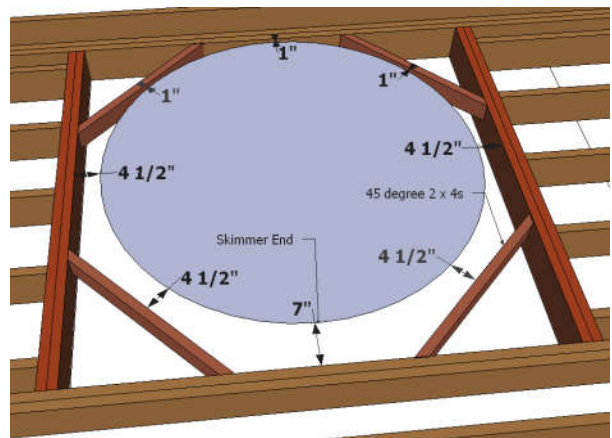
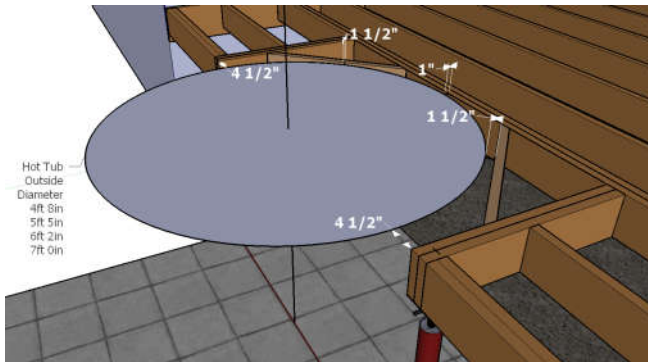


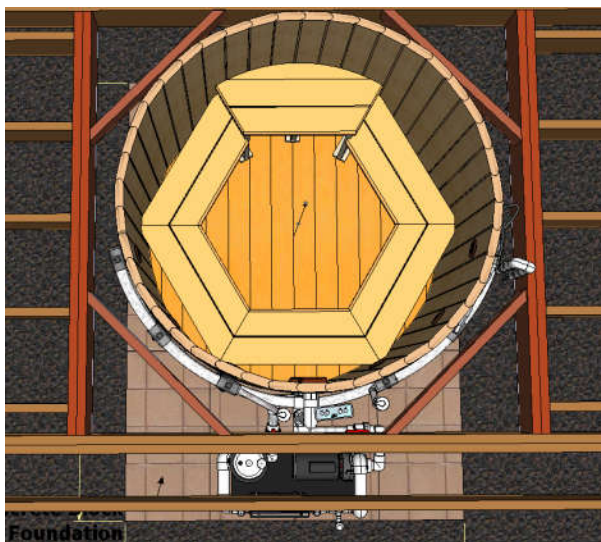
Figure 13 - Clearances Needed in Deck Sub-Structure for Partially Built-In Tub



The clearances are the same for all sizes of our standard hot tubs. The part of the tub that is adjacent to the step-in seat (front of tub) should be 1" away from its nearest joist. The opposite end, which is associated with the skimmer pipe, should be 7" away from its nearest joist (if tub is fully built in). Left and right, the tub should be centered and the clearance at these sides should be 4.5". To provide support for deck board screws the corners are filled in with 2 x 4" boards positioned at a 45° angle. It is suggested, in the case of a fully built-in situation, that these angled boards be installed after the tub has been lifted into its final position. Also note that this size opening allows the tub, with jets and skimmer pipe attached, to be lowered down the opening. However, it must be done before the surrounding deck boards are attached.

Note: With our *Elite line* of tubs the equipment connection end can be either at the normal 6 o'clock position or it can be at the alternate 12 o'clock position (see Figure 12). If at the alternate position, 4-1/2" clearance must be left all the way around and at the 12 o'clock position 7" is required.

Figure 14 - Tub with High Deck in Its Final Position



To have the deck boards cut in a smooth circle around the tub, it is best to do this before the tub is in place. Install the deck boards that will be near the tub temporarily, draw out the circle or arc and cut the circle or arc with a good jig saw and then remove these boards. Now lower the tub and only then reposition the cut boards, permanently.

Figure 15 - Cutting the Hole into the Deck Boards

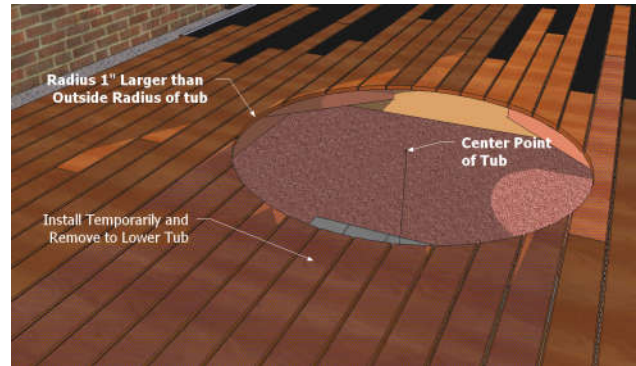


Figure 16 - Lowering Tub through the Opening

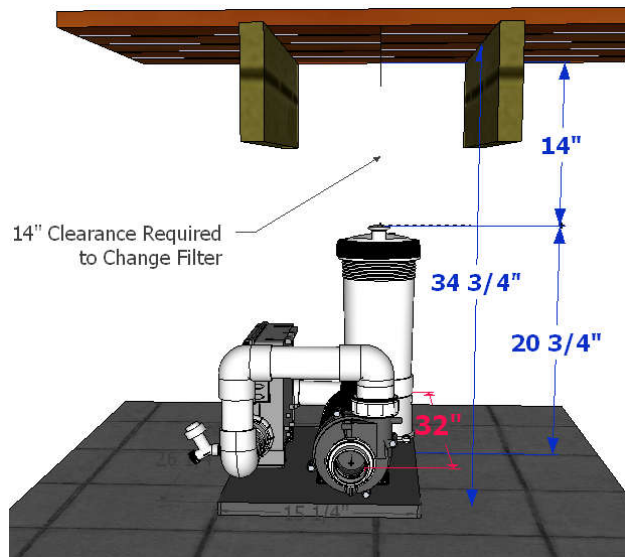


Deck Height Information

Typically, to retain the cover, the rim must extend at least 2" (5.1 cm) above the top of the deck boards. The exception to this is if the deck is designed so that the cover will be recessed into the hole. This recessed-cover method is not common. Thus, with a tub height of 48" (122 cm) above grade, the top of the deck boards should be no more than 46" (117cm) above grade. This allows the skimmer and all other components and piping to be entirely below the deck boards. This arrangement also provides adequate room for the filter cartridge to be changed assuming the equipment pad is located underneath the deck. The minimum height to the top of the deck joists, which still allows removing of the filter cartridge, without having to have a hatch in the deck is 34-3/4" (88.3 cm). If this criterion is used, then the top of the deck boards will be approximately 36" above grade. This still provides room to crawl under the deck, if you are young.

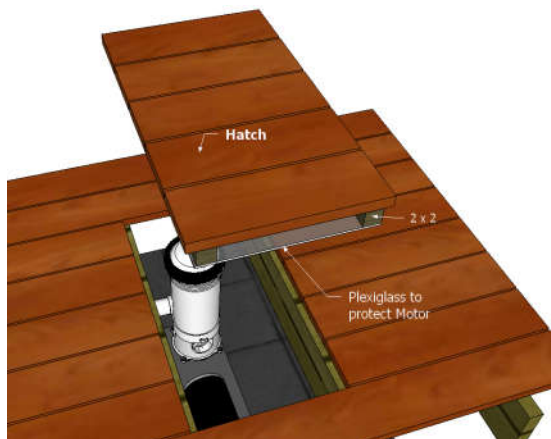
Be sure you position the equipment pad so that the filter body is centered between two joists.

Figure 17 Min Clearance Required to Change Filter



This, however, is not the absolute lowest the deck can be positioned. If lower than above, so the filter cartridge cannot be removed, an access hole and a matching hatch needs to be constructed as illustrated next.

Figure 18 Access Hole and Hatch for Filter Changes



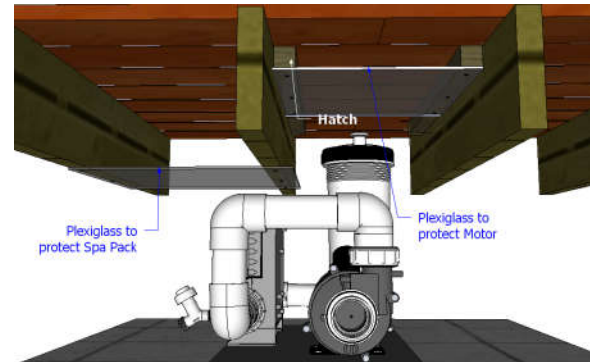
With this technique, it is possible to have the top of the deck as low as 24 inches above grade. This however will leave only 15-16" to crawl, prone, underneath the deck for maintenance purposes. It is therefore recommended that the deck be at least 30 inches above grade and if it needs to be lower, to then position the equipment pad at the edge of the deck or use the partial built-in method as per Figure 10.

Rain and Spillage Protection

The pump motor at least is not fully weatherproof and needs to be provided with some protection from rain and spillage. In the case of the stand-alone configuration this

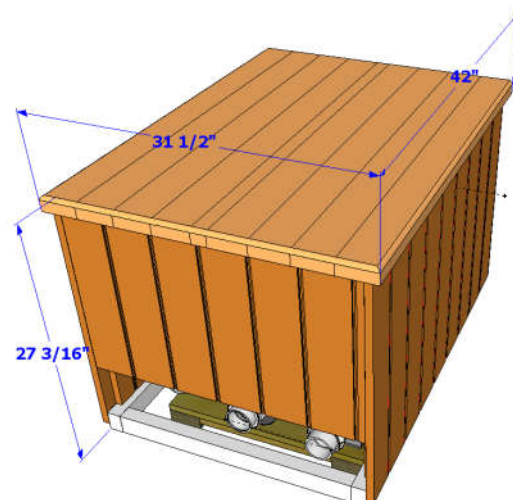
is done with the fitted or box enclosure (see Figure 4). When the tub is built into a deck, deploy some technique that prevents water from falling on the equipment pad and especially not on the pump motor. In the next diagram we show the use of 3/16" Plexiglas to serve this purpose.

Figure 19 - Using Plexiglas to Protect Spa Pack and Motor



If the equipment pad needs to be located to the side of the deck, because of lack of clearance under the deck, a box should be built for it. Northern Lights can supply such a box. Two sizes are available. We only make it out of 1-1/2" thick clear cedar boards and this makes it costly. The larger of the two is designed to fit all our larger equipment pads, such as the ones with an auxiliary heater and/or dual filter canisters. The lid lifts off to provide access to the equipment pad.

Figure 20 - Rectangular Style Enclosure.



Deck Board Choice and Finish

Common size deck boards are either called 2x6s (1.5 x 5.5" true cross-sectional dimensions) or 5/4 x 6s (1 x 5.5" true cross-sectional dimensions). These can be obtained

in pressure treated wood, in cedar, in man-made composite material, or in exotic hardwoods such as South American hardwood (such as Pedra). Pedra board is very dense and strong and very durable. It will easily outlast all other popular deck materials including composite board.

Figure 21- Pedra (Portuguese for Rock) Decking



Composite deck materials are popular but beware this material often droops with time. Pressure treated wood will not last as long as Pedra or composite. The boards are fastened by using coated deck screws or by using a hidden deck fastening clip system. The latter will result in a more pleasing appearance.

All the wood materials will quickly fade when exposed to sunlight and should be treated with a transparent or semitransparent uV resistant exterior finish. We recommend a good quality transparent exterior finish such as PPG (formerly Sikkens) SDR or the Cetol products. Follow the manufacturer's recommended application guides. Don't skimp on the number of coats. The finish to the tub and top rim is best applied before the wall fittings are attached.

The Location of the Seats

In the various illustrations that depict the seats, such as Figure 4 and Figure 14, the seats are aligned so that the step-in seat is directly across from the skimmer. (The only exception to this is with the Elite line of tubs, which allow the skimmer to be moved to be behind the step-in seat.) If the step-in seat is desired to be located diagonally, such as it would be if the tub is kept in the position illustrated in Figure 16, then simply rotate the tub so the skimmer pipe is towards the corner. However, you must work out the clearances and the tub's center position before you start cutting the circle in the deck boards. It is also possible to rotate the seats themselves, within the tub, but only by a full 60 degrees either way. For example, it should not be rotated 30 or 45 or 90 degrees. This is to have the suction screen remains in the center behind and below a seat boards and for the seat legs not interfering with the drain wall fitting. Decide on this before you install the seats.

Using a Pit

We also have some customers who wish to sink the tub into a pit so that they can use a low deck and have only a minimal portion of the tub showing above the deck. The

construction of the pit needs careful planning. All sorts of difficulties can arise if the pit is not made large enough and there is no good access method, and the pit doesn't drain well.

The pit must be wide enough to allow for access right around the tub. The pit needs to include adequate space for the equipment (pump/heater), which will be a considerable larger area especially if a gas heater is also involved. Don't just make it the size of the footprint of the tub and equipment. Plan on having at least 1ft of access space all around; more where access the spa pack and/or the gas heater internals are needed. Both can usually be rotated so those sides face in, rather than facing a pit wall. Also avoid placing the pump/heater equipment much above the tub's foundation level, since this can lead to draining and air lock problems.

The finished deck has to allow for a method to get down into the pit, to change filters, open/close valves and to carry out maintenance should something fail or need attention. Often this is done by having a section of the deck constructed to be removable. It may be that one or two such removable panels are used. Also, a useful technique is to have any joists that are underneath this access area remain removable. For example, the joist(s) in the access area may be supported by joist hangers but are not screwed down. This then leads to a more open access space and avoids banging your head into joists all the time.



Keeping the pit from filling with water when there is a downpour is another challenge that must be overcome. If you are planning to use a sump hole and sump pump to

achieve this, consider that power outages occur most frequently during storms. The sump pump needs to keep working during such power outages. The next two diagrams give you some ideas on how to construct a pit and the deck over it.

Figure 22 - Pit Dimensions for 7ft Electric Heat Tub

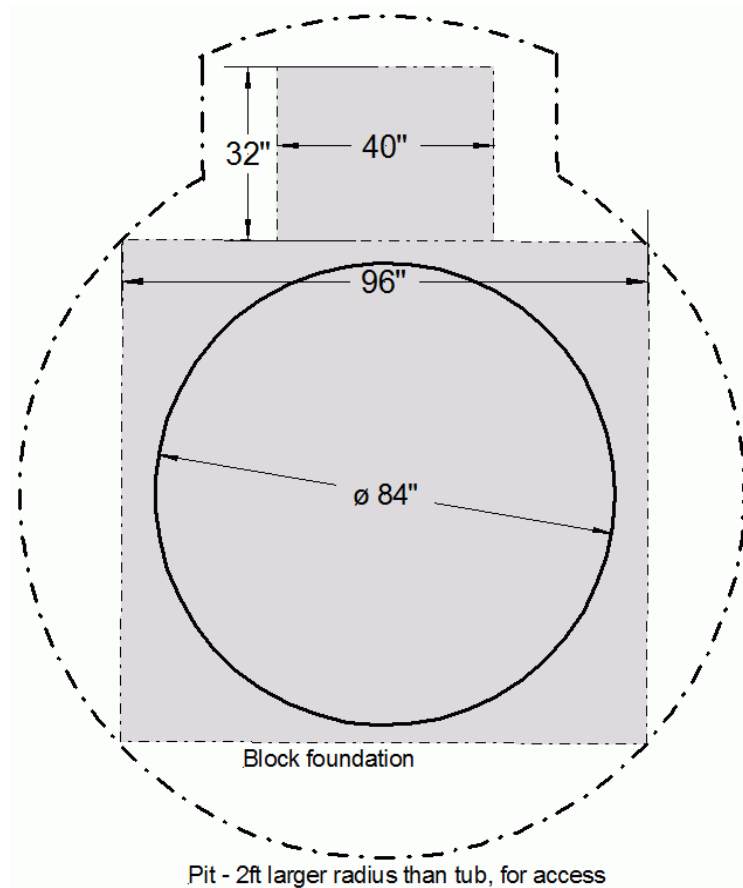
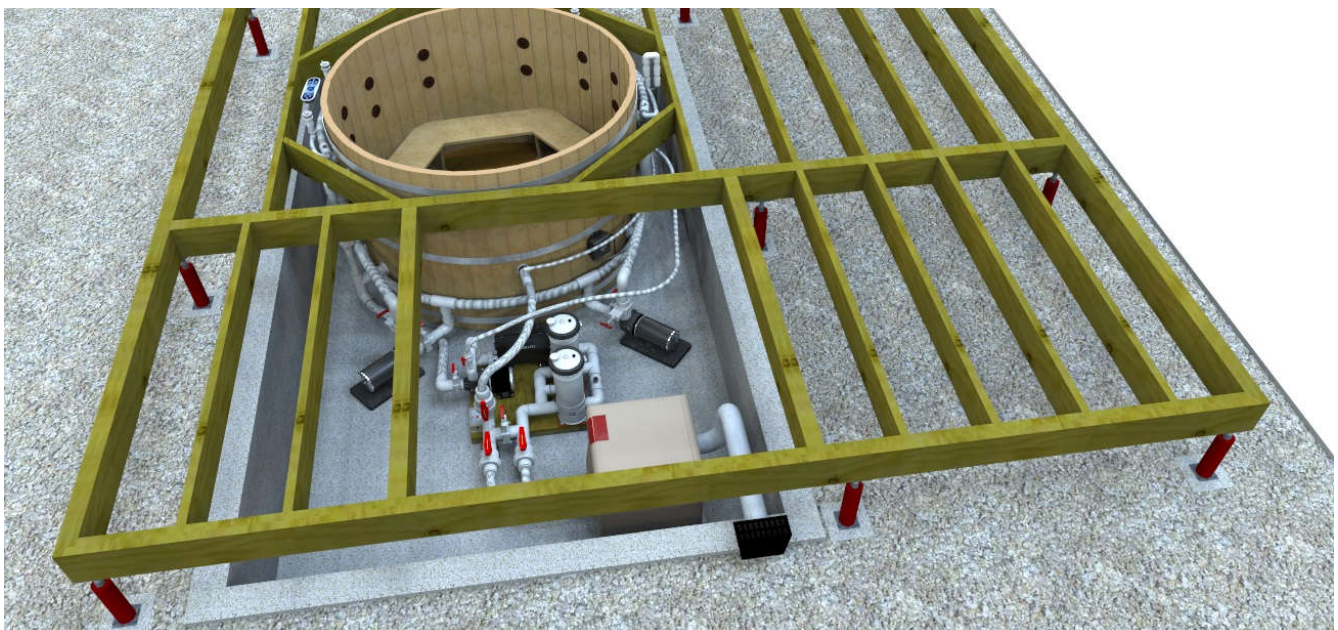
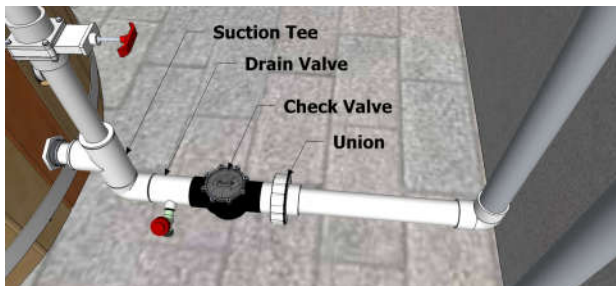


Figure 23 - Pit with Deck Structure for Hybrid Gas/Electric Elite Tub



Vertical Placement of the Equipment Pad

Another frequent question deals with the vertical placement of the pump equipment. Can I place the equipment below the tub foundation? Can I place it above the foundation? The answer to placing it below is yes. However, placing it above can lead to pump priming problems, and this is not recommended. For example, if the tub is sunk into a deck but you wish the equipment pad to be located on top of the deck, the water in the pump will drain back to the lower hot tub and then not be primed, next time the pump starts. To avoid this from happening additional equipment is required, including a water retaining pump basket, and a check valve near the tub suction tee. There is an upcharge for this.



Electrical Services

If a standard jetted tub uses an electrical heater, this will usually be a 5 or 5.5kW unit (3 kW in Europe). This will require a 40-50* Amp service (32 Amp in Europe) when the requirements of pump and heater are considered. In North America a 2 Pole service with neutral (3 wires + ground) will be required. In Europe it will be a 1 Pole service (2 wires + ground). * 40Amp with 4 or 6 jets, 50Amps with 8 or 10 jets.

There are variations on electric service requirements, however. For example, if an Elite tub, there will be 3 instead of 1 pump and current requirements go up. Contact us. Also, the spa packs we use have a low current setting. When so set, the heater will not come on if the pump(s) is running in high speed. In such a situation, the

customer can sometimes reduce the service wiring to a 30-40 Amp rating (16-20 Amp in Europe).

Electric heat tubs that are installed using only **120 volts** wiring, would come with a 120-volt pump. If it is a soaker tub, using a circulating pump, the service size will be a 30 Amp 1 Pole 2C/#10. The heat produced by the element will be 1375 Watts. If it is 4-jets tub, using a 2-speed jet pump, the service size will be a 40 Amp 1 Pole 2C/#8.

To achieve the full 5500 watts of heating power, the spa pack service must be rewired for 120/240-volt service, although the 120-volt pump can be retained.

We offer an auxiliary heater for certain electric heat configurations (not available with custom enclosures). For Europe this allows the total heater power to be raised to 6 or 7 kW and for North America to 11kW. In this case another separate circuit rated at 30 Amps in North America and 16 or 20 Amp in Europe is required. Typically, this would be done by running a common cable (example 70-80 Amps) to the external splitter box and there splitting to the two circuits (e.g. 40-50Amp for spa pack and 30Amp for auxiliary heater)

When heating with a gas heater only, the service requirements for a soaker tub (no jets) is usually 120 volts 15-20 Amp 1 pole in North America and 120 volts 30 Amp 1 Pole if it is a tub with 4 jets. If a hybrid gas electric unit is purchased the service requirements is 120/240 v 50-60 Amp depending on whether 4 or 6 jets or 8 or 10 jets and if both gas and electric heat will be used and the spa pack is in high current mode. In low current mode the requirements is reduced to 120/240v 40Amp and if electric heat is disconnected, permanently, service can be reduced to 120/240 v 20-30Amp depending on the number of jets.

When heating with a heat pump only, the service requirements for a soaker tub (no jets) is usually 120/240 volts 20 Amp 2 pole in North America and 120/240 volts 30 Amp 2 Pole if it is a tub with 4 jets. If a hybrid heat pump/electric unit is purchased the service requirements is 120/240 v 60 Amps if both the heat pump and electric heater could be used and the spa pack is in high current mode. In low current mode the requirements is reduced to 120/240v 50 Amp and if electric heat is disconnected, permanently, service can be reduced to 120/240 v 30Amp.

National electrical codes require that a ground fault current interrupter, GFCI, (or called a Residual Current Device, RCD, in Europe) be used to supply the power to the Spa Pack. The codes usually also require a separate disconnect that is visible from the tub, but no closer than 5ft (1.5 m) from the tub. When such a disconnect box is used, the GFCI device can be either in the service panel (load center) or in the external disconnect box. **The 5ft minimum distance stems from the electrical code require-**

ing any high voltage electrical appliance (that could otherwise be accessible by a person in the tub) being placed out of reach. The only exception is if there is a barrier that prevents this, such as an enclosure, a wall, under a deck, etc. Such a barrier often serves dual purposes, to also protect the electrical equipment from rain, spillage or flooding.

UL/CSA Certification.

In the past, the pump and spa pack we have routinely been providing were UL Recognized. From a practical perspective that means they meet all code requirements but are not certified for outdoor use (they are not weatherproof). Thus, they need to be protected from rain and water spillage. In an increasing number of states and provinces, such as WA, OR, NJ, ON, AB their regulations call for UL “Listed” equipment and a local inspector may not approve the installation, unless either it gets final assembly approval from a certification company (which is not practical to do), or unless all electrical equipment and that includes the spa pack and pump are indeed UL “Listed”. In such regions this stays the case, even if the equipment is in a weather protected location. Consequently, we have sourced “listed spa packs and pumps” and in most cases are supplying these instead, along with an extra addendum describing their electric installation and operation.

Figure 24 - UL Listed Version of a Equipment pad



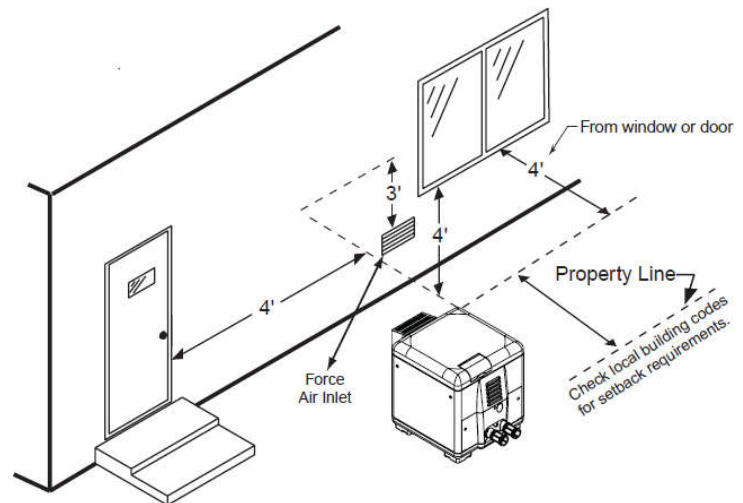
Gas heaters and heat pumps are “listed”.

Gas Heat Requirements

Northern Lights Cedar Tubs Inc. now uses the Pentair Pool MasterTemp 125 gas heater. This is an advanced gas heater that has replaced the MiniMax 100 that was previously used. The MasterTemp 125 is weatherproof and can be exposed to the weather. However, because of its forced draft design and its side venting capability, it can also be installed under a deck provided a minimum clearance of 6 inches above it is maintained. The design also makes it usable at any altitude.

The important requirements related to MasterTemp 125 revolve around location restrictions. Contact a gas fitter to ensure you will have no surprises. For example, a gas heater cannot be located next to the hot tub. It must be at least 5ft (1.5 m) away. The MasterTemp 125 can be installed under a deck but 4” vertical or horizontal Class III vent pipe needs to be used. The gas heater, without vent pipe also cannot be located next to or below a door, window or an air intake for a house. See Figure 25 and page 17 of the MasterTemp 125 Owner’s Manual for details. The Pentair MasterTemp 125 uses a 3/4-inch male NPT fitting for the gas line connection.

Figure 25 - Gas Heater Location Restrictions



The five figures following depict typical gas heater installations. Figures 26 and 27 depict a case where the tub is built into a low deck. The equipment pad (pump, spa pack and filter unit) is located underneath the deck and the gas heater has been located to the left of the deck. A hatch, to allow access to the equipment pad from above the deck is shown. A hatch is not necessary if the deck is high enough (example Figure 29). The exposed piping to the gas heater can be insulated and, if so desired, the insulation can be covered up.

Figure 28 is a variation where the equipment pad is instead located with the gas heater. Figure 29 shows a situation where the gas heater has been located under a high deck and is being side vented. This also depicts our Elite tub with hybrid gas/electric equipment that utilizes 3 pumps, 16 or more jets, despite this is the most efficient

option we offer. Lastly Figure 30 depicts a stand-alone hot tub that has the equipment pad inside the enclosure and the gas heater is located the required 5ft from the tub. The gas heater that is shown is still the old MiniMax 125.

Figure 26 - Typical location of Gas Heater when Using a Deck



Figure 27 - Typical location of Gas Heater when Using a Low Deck

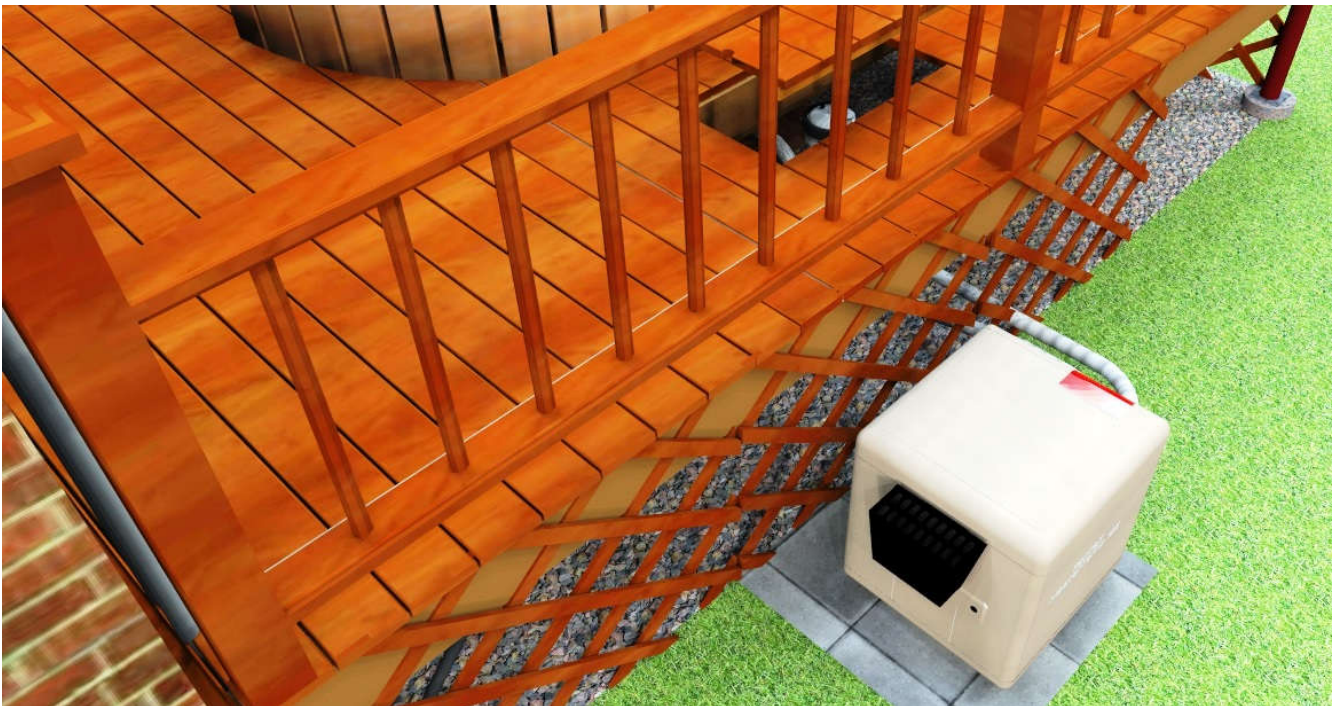


Figure 28 -Remote Location of Equipment pad and Gas Heater



Figure 29 - Gas Heater Located Under the Deck and Side Vented

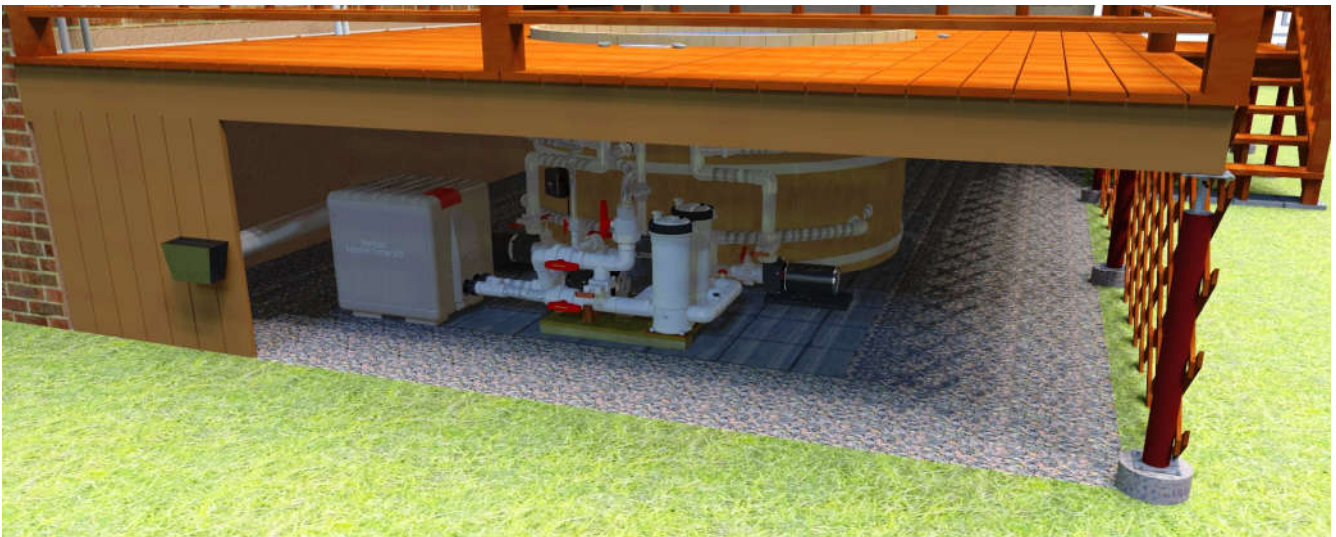
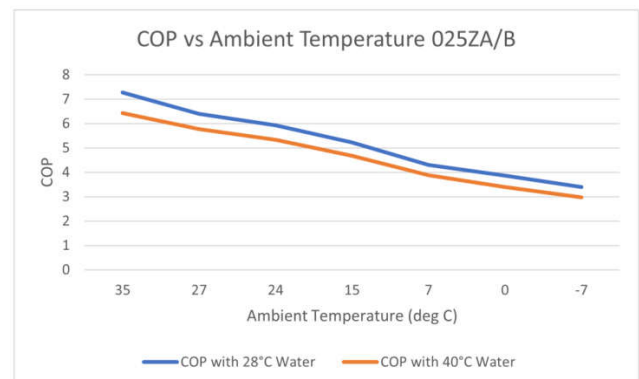


Figure 30 - Typical Stand-Alone Tub with Gas Heat (still showing old MiniMax 100)



Heat Pump Option

We have recently (spring 2018) introduced a heat pumps option for hot tubs. The heat pump is ideal for locations that suffer from high electric utility rates, such as California, and have relatively warm winters. The heat pump we offer will however remain operation down to ambient temperatures of -21°C (-6°F), so it is also usable where winter temperatures drop below freezing. However, unlike a gas heater, which gives a constant heat output and a constant cost differential between the gas fuel vs the electric fuel, the heat pump electric energy saving is variable with ambient temperature, but nevertheless significant (5:1 heat gain in warm conditions and 3-2:1 in cold freezing conditions).



In regions such as California they will average out with similar or better savings than if using natural gas, but they do have the advantage of not requiring what can be an expensive gas hookup and supply. We also can supply a heat

pump with electric heat backup, making the hot tub usable even in colder winter regions.

Installation wise, the heat pump installation is very similar to a gas heater. For example, you can substitute the heat pump for the gas heater in Figures 25 -30. However, there is a need for good air ventilation around the heat pump, and the heat pump air outlet cannot face an obstruction, such as a wall or fence. Allow 1 ft (300 mm) clearance on the air intake sides and at

least 5ft at the outlet of unrestricted air discharge. This requires some pre-delivery planning, so that the equipment pad supplied for customer actual installation will avoid inter-connection piping from having to cross. Below are two of many installation possibilities. Other examples are provided in the Plumbing and Electrical Installation Manual that will come with the tub ordered. It is also good for longevity if the unit is protected from rain, salt-water mist, and sun.

Figure 31 - Typical location of Heat Pump when Using a High Deck



Figure 32 - Typical Stand-alone installation with Heat Pump

