

# **DESIGNING AND BUILDING A BASEMENT ORCHID ROOM: PART 1**

---

For the past six months I have been planning and building a basement orchid room. During this time I have looked at the various factors which will affect the health and well being of the intended occupants, as well as practical considerations which must be attended to for economic and social reasons (I am not a bachelor.) In the next few issues I will share with you some of the information I have gained in the planning process and some of the problems I have encountered and solved during the implementation.

One note which is important for understanding some of my plans and decisions. Shortly after getting into the hobby I decided to specialize in the genus *Phalaenopsis*. I won't go into why, the reasons are obvious if you are a *Phalaenopsis* fanatic and controversial if you are not. During the discussions which follow, I will try to point out places where other decisions would be made if you are growing a different genus or if you are attempting to grow many different genera in your collection. The design of a greenhouse or artificial light environment is unquestionably simplified by sticking to one genus. As you will see, there are enough problems making an environment ideally suited for a single genus.

## **GREENHOUSE VS GROWING UNDER LIGHTS**

It must be every new orchid grower's dream to own a greenhouse. It wasn't three months after I had purchased my first orchid plant that I was walking around the house, in the dead of winter, eyeing the yard for likely places to put a greenhouse. I am fortunate to have a large yard which could easily accommodate a greenhouse so this was indeed a serious problem.

A greenhouse is a large investment in time and money. It is a new structure, either attached or unattached to the house or garage. The first, obvious expense is in designing or building the new structure. One weighty concern here is how the new structure will fit in with your existing house and property. You don't want to build a large, permanent, ugly building which will annoy your neighbors and dramatically decrease your property value (even though your property taxes will probably go up.) If there is even a faint chance that you will move to a different house in the next five years your decision should be very simple. Building a new structure which fits aesthetically into your existing house and

yard is an expensive proposition. Throwing up a plastic greenhouse is not so expensive, and not so permanent, though it will not look as nice.

The second set of problems which must be considered in building a greenhouse are those associated with maintaining the proper environment. In most cases, where you aren't simply bumping out an extra room on your house, this will require heating, cooling and humidifying a new structure. Heating a structure is not cheap, whether you use gas, oil, or electric. Cooling the plants during our New Jersey summers is less of a problem economically, but can be equally fatal to the plants if not properly addressed. Humidifying is the easiest of the three. The fourth concern is light control. Especially for tender orchids like *Phals*, it is essential to have good control of the light reaching the plants. And all of these factors must be controlled within pretty tight margins to maintain healthy plants. This either means constant vigilance by someone who lives in or near the greenhouse or a sophisticated set of automatic controllers. Either way you go this is a large investment.

Growing under lights, either in a spare room or in your basement, is in many ways simpler and cheaper than the greenhouse solution. Unless you are growing some of those little orchids from strange environments that look like weeds (the kind that Doug is so fond of) most orchids enjoy an environment similar to that of most houses. Modern basements will hold 60 to 70 degrees year round without trying. This means that if you just walk off for several days, you won't come back to find plants that are frozen into black mush or fried into grey ash. This is a big advantage. It doesn't take much effort to extend the environment by ten degrees on either side of this value. It's certainly a lot easier than trying to hold 70 degrees in a greenhouse when it's twenty degrees and windy outside. It is also relatively simple to isolate your growing area from the rest of the house.

The major problem in growing under lights is just that. Sunlight is free, electric lights are not. There are many lighting alternatives (I will explore them in a subsequent article) which will provide adequate light for most orchids. All you do is add money. This is a major concern which I have never seen in any of the literature. How much does it cost to raise orchids under light? I think this is a question which everyone avoids. We like to think that the expense is in purchasing the lights, buying new bulbs, and spending the rest of our free money on new plants. I'm afraid it isn't that simple. One plant cart with three shelves and four 40 watt florescent bulbs per shelf will cost you \$0.60 per day if you run it 12 hours per day. If you run it 16 hours per day it will cost \$0.80 per day. Doesn't sound like much? That's \$220 and \$290 per year respectively. So how many orchids do you want? Two carts will cost you \$440 (\$580). Three carts will

## **DESIGNING AND BUILDING A BASEMENT ORCHID ROOM: PART 2**

---

set you back \$660 (\$870). And four carts is a whopping \$880 (\$1,160) for a single year. More orchids, more lights, more money. You can buy a lot of natural gas for heating a good size greenhouse for \$1000 per year. To bring this down to scale, I figure that the cost per year to illuminate a mature Phal in a 6" pot will run about \$4.00 per year. By the way, Betty Schmidt of Laurelwood Orchids charges \$30 per month rental for a bench that's 12'x 3'6". If you do the numbers this is a good deal. Just lighting that much space would cost between \$35 and \$45 per month depending on the type of lighting you prefer and the kind of plants you what to grow. The disadvantage is that all your little beauties are at Betty's house, not yours.

So where does this leave us? A greenhouse is a large initial investment which is expensive unless you are planning on having a large quantity of plants. Growing under lights is relatively cheap initially and can be expanded in stages, but gets expensive for large numbers of plants. Indoor growing is also easier to maintain and you don't have this big building in your backyard when you want to move.

So where does that leave me? I am building a basement orchid room. It will be large enough to house 300 - 400 mature Phals with all the comforts. Would I like to build a greenhouse someday? You bet! For two reasons: The big kicker that worries every basement grower is the almost universally agreed on fact that orchids will bloom and grow better in a perfectly controlled greenhouse than under lights. In the end there is no substitute for the sun. Also, if you want lots of plants, you will eventually be forced into a greenhouse. I don't know of a single, full time commercial grower who grows under lights. Short of filling your entire house with artificial lights and orchid benches, and increasing your electric service from 200 amps to 1000 amps, a greenhouse is the only way to go for the long term orchid fanatic who wants unlimited quantities of plants.

In the next issue I will discuss the basic design and construction of a basement orchid room and how it can be made to approximate the conditions that the plant would experience in the natural environment.

**Ken Wilson**

*from the Deep Cut Orchid Society Newsletter of  
November 1990; Dennis Dell, Editor*

### **SELECTING THE SPACE**

If you are a dedicated orchid grower and you own a house, I will bet that you can find a space that can be converted into an orchid room. Everyone has a small bedroom that isn't used any more, an attic, a large closet, or, in this part of the country, a basement. Any space big enough to hold a few plant carts will do. The bigger your appetite for new orchids, the bigger the space should be. If your kids are just leaving for college, you could turn the old bedroom into a new orchid room. This has a secondary affect which should not be overlooked. The kids can't move back in at a later time. A bedroom with a south facing window is ideal. You can augment the artificial light of the plant carts with some natural light from the window. East and west facing windows are almost as good for supplementing the artificial lighting. A north facing room is no better than a basement.

Speaking of basements, maybe it is time to clean up a corner, throw in some lighting and put some orchids down there to cheer the place up. With some creativity, not to mention some time and money, a basement can be made into an environment suitable for most orchid genera. In this article I will give some details on how to design a basement orchid room.

### **DESIGNING THE SPACE**

Unless you want to convert your entire basement into an orchid growing room (it has been done) you will need to select a portion of the basement as the target site. Several factors should be considered: How difficult will it be to enclose? Is there ventilation to the outside or can ventilation be provided? Will you be able to heat and possibly air-condition the room? Is water convenient? How do you want the orchids situated in the room, on carts, flat benches, step benches, etc.

After you have given these factors some thought and walked around your basement a few times, take your best tape measure (a 25' one if you want to look pro) and take some measurements. Jot them down and make a drawing of the basement layout. If you have an old blueprint of the basement you are way ahead. When you have a good drawing down on paper with dimensions, make some

copies so you can mark them up. If you want to get fancy you can make some cutouts of plant carts and benches to see how they will fit. It's better to plan the spacing now than to realize after the partitions are up that if you had put the wall three inches farther out you could have gotten four plant carts instead of three in the room. If you want a potting bench put that in and don't forget a door. Doors come in even inch sizes and you need to leave two inches extra for the door jamb (a 36" door needs a 38" hole.) Remember that walls aren't just lines on paper, they are about 4.5" thick. Take this into account when planning the space.

## INSULATION

I strongly suggest that you plan to insulate the exterior walls of your orchid room. This will save on your heating bill unless you are growing cool loving plants. Most basements are below grade (ground level is 6' or more above the basement floor.) While the temperature of the ground under the basement floor will be fairly constant year round at approximately 65 degrees, the temperature outside the basement will vary over a pretty large range. Bare concrete block walls can soak up an incredible amount of heat. In the summer that's great. In the winter that's cold. If you want a neatly finished orchid room with sheetrock walls, you might as well plan on putting some insulation behind them. The simplest design to accommodate both concerns is to frame out a 2" x 4" stud wall (like in a house) and put fiberglass insulation between the studs as you would in the outside wall of a house. If you want to control your humidity you can add a plastic sheet layer as a vapor barrier. Insulating the ceiling of the orchid room is also optional though in the summer the room may run hot and you might not want to keep this extra heat from getting into the living areas of the house. You definitely want to put plastic on the ceiling to keep the humidity in.

## VENTILATION

If the space you have picked for your basement orchid room has an outside window, even if it is a small one, you are in good shape. You can open the window in the evening to let cool air into the room and put a small fan in front of it if the natural airflow isn't sufficient. If you don't have an outside window you have three options. You can put a window in if there is enough space. You can ventilate to the rest of the basement (though this has its problems.) Or you can put vents to the outside and blowers to move air through them. This last option is the one I was forced to use. My basement space is below grade up to 1" from the ceiling. I planned to put blowers on each side of the room, one pulling air into the room and one pushing it out of the room. If you only put one blower moving air into the room,

the air must go somewhere. It is impossible to pressurize the room, so the air which is blowing in will eventually end up in the rest of the house. This air will be warm and humid in the summer and cold and dry in the winter. With two blowers, one in and one out, you can control the temperature in your orchid room without worrying about what it is doing to the rest of the house.

## HEATING AND COOLING

If you are like me and plan to eventually fill your new room completely with orchids~ you will probably get all the heat you need from the lighting. Every watt you spend for illuminating your beauties is going to end up as heat in the room. Three plant carts with three shelves each and four bulbs per shelf is about 1500 watts. This is the same as the average space heater puts out. If you have six plant carts you have the equivalent of two space heaters. If you have more than that you are in serious trouble and you may need to warn the electric company when you turn them on. If you have a new room which is only partially filled, you may need to add some heat to the room for the first winter by adding a space heater. This is extra incentive for filling the room with orchids and lights. Cooling the room in the summer is a different matter. If you have enough lights in the room to heat it in the winter, you probably will have trouble with heat build up in the middle of the summer. If you are growing heat loving orchids you might be ok. If you are trying to grow orchids which won't take high heat levels you should think about some type of air-conditioning. Unfortunately, unlike a space heater, you can't set a window unit air conditioner in the middle of the room and get any drop in temperature. In fact you get a great deal more heat. If you can put that unit in the window you have been leaving open for ventilation you are in great shape. If you have central air for the main floors of the house and the duct work is in the basement you are also in good shape. It isn't too difficult to put vents in the air-conditioning system for the orchid room. It will be additional load for the system but most home systems are over designed. You just have to pay more to the electric company. Another trick used by many basement growers is to switch day for night. Leave your lights on during nighttime when outside temperatures are cooler and turn them off during the day. If you work five days a week while I do this is better anyway as the prime time for working with the orchids is during the evening.

## WATER AND ELECTRICITY

It is wonderful to have a sink in the orchid room. It is, however, luxury. Having access to water for watering the plants is essential. You won't want to carry buckets of water from upstairs very long. In most houses the water pipes for

the kitchen and bathrooms are along the basement ceiling. There should be easy access to these pipes such that you can install a hot and cold faucet in the orchid room. Inspect your pipes for the easiest place to hook into the existing system.

The electrical system for your house is probably also located in the basement. However, unlike the water, you can't tap into the existing electrical runs unless there is one that you know is not being used. For every three plant carts you plan to put in the basement you need an additional 20 amp circuit. If your service panel (fuse or breaker box) is located in the basement you are in luck. If it is someplace else, like the garage, you will have a more difficult (ie expensive) time. Count up all the lights, blowers, air-conditioners, etc. that you may run at one time. For each 1500 watts you'll need a 20 amp circuit. This leaves some margin which is good planning. If you are planning a large orchid room you might want to consider putting a satellite service panel in the orchid room. This service panel would be connected to the main service panel through a large gauge wire and an appropriate size circuit breaker in the main service panel. A 60 or 80 amp breaker should be plenty.

If you aren't handy with plumbing and electrical work you will need professional help for these items. Or you might mention in the next club meeting that you need help, offer free lunch and a door prize and see if you can get some volunteers.

In the next newsletter I will discuss artificial lighting for the basement orchid room. This is an important and tricky subject which needs to be thoroughly explored.

**Ken Wilson**

*from the Deep Cut Orchid Society Newsletter of  
December 1990; Dennis Dell, editor*

## **DESIGNING AND BUILDING A BASEMENT ORCHID ROOM: PART 3**

---

### **DO IT YOURSELF**

Now that your design is complete, it's time to get started turning dreams into reality. You have two choices, take a good set of plans to a contractor, or do it yourself. Finding a good, reputable contractor is not easy. They will also want a lot of money for something which really shouldn't cost all that much. If you do decide to hire a contractor, take your time, look around and don't take the first one you contact. Get estimates, and don't think that the highest price means the best job, sometimes the opposite is true. Once you have selected a contractor, don't pay them too fast. Don't pay them anything until there is material on site and they have started work. A good contractor generally won't ask for money up front. And never, never pay them the final thousand dollars until they have completed the project to your satisfaction. Once you have paid them all that you owe, you won't see them again.

Building a basement orchid room yourself can be fun and saves lots of money. Usually the difference between an amateur and a professional is how fast the job is done, not how well. You can also do part of the work and hire others, like electricians and plumbers, to do the more technical aspects of the project. Either way, you will learn new skills, save money, and get the room you wanted in the bargain.

### **CLOSING IN THE SPACE**

Materials can be purchased at a lumber yard or a discount store such as Rickels or the Home Depot. I built my basement orchid room from the latter. One big advantage with the Home Depot is the excellent advice that the employees will give. You can go in with a drawing of what you want to do and they will help you pick out the materials you need. The prices are very good as well. Always get Douglas Fir when you purchase construction grade lumber. It is much stronger and less subject to warping than cheaper materials (Hemlock, Fir, HemFir, etc.).

Walls come first. Standard 2x4 stud wall construction can be used on inside walls (which separate the space from the rest of the basement) and outside walls (which will give insulation and a finished look.) You can put the studs on 2' centers as the walls don't support any real weight. The walls can be attached to the concrete floor with a power

# DESIGNING AND BUILDING A BASEMENT ORCHID ROOM: PART 4

---

## ARTIFICIAL LIGHTING

After all is said and done, this is the most critical part of growing orchids in the basement. Plants need light to grow and flower. Plants are well adapted to growing under sunlight. They use the visible spectrum for the most part, as do our eyes. They don't, however, "see" the sun's spectrum exactly like we do. Our eyes are most sensitive in the yellow/green part of the spectrum which is exactly opposite of plants. Plants use very little green light (this is why they look green to us), paying more attention to red and blue. The details of photosynthesis are fascinating, perhaps the topic for another time.

So how do we create artificial sunlight in the basement, or at least light which is close enough to sunlight for some orchids. Four factors must be considered; intensity, spectrum, initial cost, and electric bills. You can do yourself a favor up front by choosing orchid genii that are on the low end of light intensity needs. Cattleya orchids are at the upper end of what should be considered. Phalaenopsis are much more reasonable plants, requiring only 1,000 foot candles (one tenth full sunlight at noon on a clear summer day.) The following paragraphs will give a brief synopsis of several popular light types.

**Incandescent And Quartz Halide:** Forget about these types of bulbs. Both incandescent (whether spotlight, floodlight, or so called "grow lights") and their cousin the Quartz Halide bulb combine low efficiency and high amounts of infra red which make them unsuitable for orchids. To get enough illumination on the orchids, these bulbs need to be so close to the plants that they will cook them. They are cheap to purchase and install and they put out a very nice white light, but they are worthless for orchids.

**Florescent:** Florescent bulbs are from five to seven times more efficient at producing light as are incandescent bulbs. Florescent bulbs put out little infra red so they are very cool and can be put close to the plants. Much of the heat from florescent is concentrated in the ballast transformer in the fixture which can be put in another room if heat is a problem. The main disadvantage is that they must be very close (2"-4") to the leaves to get the intensity needed. At 2 to 4 inches from the leaf surface, new tubes put out around 1200 fc. After one year, this value will be down to

800-1000 fc. For Phalaenopsis, four 40 watt tubes will illuminate an area 2' by 4'. For miniature cattleya orchids six tubes are needed for the same area. There is an ongoing controversy as to what type of florescent tubes should be used. There are many types of "full spectrum" florescent tubes available on the market. They are very good for the plants and very expensive to purchase. A second option is to mix cool white and warm white florescent tubes. This is much more economical and many people get great results. The third solution is to buy regular, cheap cool white tubes, making sure that you replace them once per year. The replacement strategy makes sure you keep the foot candles up and may offset the benefit of the wide spectrum tubes (which no one can afford to replace every year.)

**High Intensity Discharge Tubes:** HID tubes come in two flavors, High Pressure Sodium and Metal Halide. These lamps are six to nine times more efficient than incandescent lamps with Sodium having a slight edge over Metal Halide. These lamps put out a tremendous amount of light. A 40 watt fixture will put out 1,000 fc over 25 to 30 square feet with the tube mounted 4' above the bench. This means that you can actually see the plants when you walk in the room whereas with florescent fixtures, you see the fixtures. Both tubes put out little infra red so they don't warm up the plants too much. High Pressure Sodium Tubes put out a golden yellow light. My Phals love it. There is some indication from another grower that Paphs don't like it. Metal Halide tubes put out a fuller spectrum, whiter light. However, they also age faster. The down side to these tubes is that the fixtures are expensive. A 400 watt fixture will cost from \$200 to \$300. The tubes cost around \$25 for High Pressure Sodium and \$65 for Metal Halide, though they will last from 3 to 6 years.

I have been using two 400 watt High Pressure Sodium tubes to illuminate my Phals for the past eight months. The plants love it and they are blooming well. Some of the blooms get within a foot of the lamp and don't seem to mind. The bottom of the fixtures (which are 2' tall) are 4' from the bench. This means that they are 3'6" from the leaves (on average.) The two fixtures are 6' apart and the bench is 5' wide. This setup provides 1000 fc (+/- 200 fc) over the entire area. The fixture I am using is called a High Bay and is used in commercial lighting for factories and warehouses. The ballast sits on top of the lamp, making the fixture very tall. I am lucky to have a high ceiling in my basement. Bill Struve of the North Jersey club runs five 400 watt HPS fixtures in his basement for many years. He has his plants on the floor because of a low ceiling. I am also planning a step bench for the basement. I will put the HPS fixture at an angle to illuminate the slanted surface of the step bench evenly.

driver (a tool which shoots hardened nails through the wood and into the concrete floor). The top of the new wall is attached to the floor joists. Set the wall about 1" out from the concrete block. This gives some added insulation. "How To" carpentry books found in lumberyards and discount stores are a good place to learn the ropes.

After the walls are up, it is time to rough in the electrical and plumbing facilities. You may want a pro to do this though there isn't any reason you can't do it. You need to decide where you want light switches, outlets, and if you want a sink or faucet in the room. Get the plastic switch and outlet boxes. They are easier to use and much cheaper. Run #12 electrical wire between the outlets. This will allow you to put in 20 amp circuits which you need for all those plant carts. You will have to connect the new outlet runs to the breaker box - which is usually in the basement somewhere. Lighting can be connected to switches using the cheaper #14 wire. Get Romax plastic coated cable, not the old BX metal cable. Plumbing is a bit more difficult as you have to hook up to existing pipes somewhere and drain the excess water to something. In a basement the drain is usually the biggest problem. You can drain a sink or an orchid bench to a basement sump. The sump pump will take the water outside when the sump fills up. Just remember the two basic laws of plumbing: Hot's on the left, and s\*\*t flows downhill. Everything else is easy.

After plumbing and electric, you are ready to finish the walls. First insulate between the studs with fiberglass insulation. Get either unfaced or paper backed insulation. After everything is stuffed with fiberglass, put up a sheet of plastic. You can buy plastic in rolls either 8' or 10' wide. Get clear plastic that is 4 mils thick. Both the plastic and the insulation are put up with a staple gun (get the kind that looks like a hammer, they are much faster.) The plastic is followed by sheetrock. This comes in 4'x 8' sheets that are 1/2" thick. Unless you have a very strong back, you will want some help putting up the sheetrock as it is very heavy. After the sheetrock is nailed up, you can put sheetrock tape and joint compound in the cracks to make seamless walls like the rest of your house. Taping sheetrock is an art

though since it is a basement orchid room and not a formal dining room, you might want to try your hand at it. Two or three coats of joint compound with sanding in between will give a smooth surface. The walls are then ready for painting. Use a light color, white, off white, light yellow etc. This will help the plants and give the room a cheery look. You can complete the finished look of the room by adding a drop ceiling. The Home Depot has all the material and they even give classes on how to put it up.

## FIXTURES

If you don't want to invest in dozens of plant carts, you can build benches to put your orchids on, similar to those used in a Greenhouse. Unlike a greenhouse, an orchid bench for the basement must hold water. I recommend benches made with plywood bottoms and 2x4 sides and legs. A wide bench must be supported underneath at regular intervals. I built a bench that is 5' wide and 20' long. I built it upside down and then three of us flipped it over (a good trick considering it weighted about 400 pounds.) The bench is then lined with one or two layers of plastic. You can use the same plastic that you used on the walls. The orchids must be above any standing water, so it is best to put either wire mesh or egg carton, propped up on bricks or wood blocks, above the plastic. Excess water can be drained from the bench by installing a drain or by using a siphon.

Your orchid room will need lighting for you and the plants. In next month's installment I will discuss the various lighting options. I will also talk about keeping temperature and humidity constant and controlling everything with timers.

**Ken Wilson**

*from the Deep Cut Orchid Society Newsletter of  
February 1991; Dennis Dell, Editor*

I am currently running an experiment between four types of tubes; Cool White Florescent, Full Spectrum Florescent, High Pressure Sodium, and Metal Halide. Under controlled conditions, I want to see which type of lighting will induce the most growth in Phalaenopsis orchids. I will report on the results of this "grow off" in six months. Until then, the comments above must suffice.

**Ken Wilson**

*from the Deep Cut Orchid Society Newsletter of  
April 1991; Dennis Dell, Editor*