

Keywords: Grow Room Heating, Evapotranspiration

Introduction

For sizing any HVAC system, the building should have a heat load analysis performed by a qualified engineer or contractor to determine the heat gain expected during the summer months and heat loss during the winter months. This information along with a detailed analysis of the evapotranspiration process are required for the design engineer to appropriately size the environmental control HVAC system to handle all of the following:

- Latent heat (moisture) from the evapotranspiration process
- Sensible heat gain from the lights
- Sensible heat gain to the space during the summer
- Sensible heat loss from the space during the winter

Heat Gain/Loss Basics

Conduction is the transfer of heat through solid objects, such as the ceilings, walls, and floors of a home. Insulation (and multiple layers of glass in windows) reduces conduction losses.

Heat gain refers to the transfer of heat into the grow room through a variety of sources. The primary source of heat is the sun, and the absorption of heat by your structure increases dramatically during the summer months as solar radiation intensifies.

Heat loss refers to the transfer of heat out of the grow room. The primary source of loss is the conduction of heat through the ceiling. This loss by your structure increases dramatically during the cold winter months.

Grow rooms lose sensible heat to the environment (or gain sensible heat from it in three principal ways:

- **Conduction:**
The transfer of heat between substances which are in direct contact with each other.
- **Convection:**
The heat transfer caused by the movement of gasses and liquids.
- **Radiation:**
When electromagnetic waves from the sun travel through space, it is called radiation. When these waves strike the building, they transfer their heat to that room.

Tech Tip # 118



HVAC Sizing

This technical tip will focus on the heat loss during lights off of an indoor grow room. Please refer to other Desert Aire technical bulletins for the evapotranspiration calculation.

Insulated “Room within Room”

If a grow room is utilizing a “room within a room” design technique with well insulated and sealed walls, ceilings, and ducts, (think of a freezer box inside a warehouse) then very little auxiliary heat is anticipated. When the lights turn off, the transpiration process slowly shuts down and what is left is only evaporation of water at the roots. The dehumidifier with a full capacity hot gas reheat coil can return the recovered heat back to the space.

For most building, losses due to a concrete slab floor are not significant, particularly in a “room within a room design” since the perimeter where most of the heat would be lost is outside of the growing room. Only in extreme climate zones where the sub-slab insulation is anticipated to be poor would this be an issue.

Non-Dedicated Construction

If the grow room is using normal building walls and ceilings, then some heat loss is expected. This loss is generally greater than the recovered energy that is available, so an auxiliary heater must be added to the space. The following are some examples:

- Electric heat added to the dehumidifier
- Hot water coil from a boiler
- Gas-fired unit heater in the space
- Baseboard hydronic heat from a boiler

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A design professional should be sought out that can help to calculate the losses in the building envelope. The losses can vary greatly depending on the insulation installed, exposure of the room, and expected ambient temperature. This said, generally, only a minimal amount of heat is typically needed if there is no ventilation air is introduced. Sizing the heater to provide 10°F increase in air temperature as it moves through the air handler is enough to offset most losses for typical construction.

Conclusion

When plants are relatively large and healthy they require a good deal of water to grow. Although most of the water transpires during the lights-on period, evaporation and a small amount of transpiration continues during the lights-off period. This moisture needs to be removed from the space and in doing so, the energy absorbed can be converted to space heating energy. Often, in a very well-sealed and insulated structure, this heating energy is enough to offset all of the losses.

Care must be taken if larger losses due to varying construction, uninsulated ductwork, or very cold climates are encountered. Calculation of the losses and a small heater may be required to maintain a very tight temperature tolerance in the space.