



SYSTEM 420 HYBRID GREENHOUSES

White Paper

Hybrid Growing – Merging Indoor Grows & Greenhouses

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Background

When an indoor grower realizes that the upside of indoor cannabis growing is limited, then new opportunities may quickly emerge. The one major benefit of indoor growing is security and privacy. Yet, through metal walls and polycarbonate roof coverings, cannabis greenhouses can be every bit as protected as a warehouse. Growers can obtain more efficient cannabis crop production, lower costs, and a healthier growing environment in a greenhouse.

The transition to cannabis greenhouse growing is often exciting for the experienced grower. An opportunity awaits to construct an optimal growing environment with considerable flexibility in growing practices. Developing a climate control system, implementing insect exclusion, monitoring light deprivation and other greenhouse system components puts the grower in a position to manage the growing operation in a customized manner.

As a greenhouse manufacturer, [Nexus](#) designs high quality, commercial greenhouses for the traditional horticulture and the emerging cannabis markets. The company partners with supplemental equipment providers, and manages the development of integrated greenhouses. This white paper outlines the various factors ahead when shifting from indoor cannabis growing to hybrid greenhouses.

Climate Control & Environmental Factors

Building the best possible greenhouse growing environment involves understanding the natural weather conditions in the specific geographic location and managing the greenhouse system components to ensure effective cultivation conditions for the cannabis plants. Weather conditions, such as humidity, average temperatures, precipitation patterns, and wind velocity will have a significant impact on the necessary greenhouse system components as well as the operational management practices.

Forced air heating, horizontal airflow, floor heating, evaporative cooling, positive pressure cooling, fog systems, natural ventilation, CO2 enrichment, irrigation, and fertilization all contribute to creating the cannabis greenhouse growing climate. The ability to manage these system components in combination with geographic weather factors determines the growing operation's overall productivity. Greenhouses provide far more flexibility than indoor warehouses in constructing a growing environment where cannabis plants can thrive.

Controlling this internal cannabis greenhouse climate occurs through automation. Sensors monitor climate conditions, such as temperature and humidity, which trigger mechanical systems to bring those conditions to a set point. When a greenhouse becomes too warm, motorized windows or vents will open in combination with exhaust fans to push out the hot air. These systems can be a modest thermostat or sophisticated computer control. Efficient equipment cycling through different stages by setting parameters can achieve the desired environmental goals. Specific controls run ventilation equipment, watering systems, or alarm warnings to correct problems in single or multiple zones.



Greenhouse Environmental Controls

Governmental Compliance

Cannabis is consumed for a variety of reasons including recreational use and a wide range of medical conditions. Whether human consumption occurs through a smoking or edible form, the use of pesticides can contribute to adverse health conditions. Given the uncertain legal status of cannabis, governmental regulations regarding pesticide use can be confusing. Normally, when a pesticide is used in agricultural cultivation, an evaluation takes place at the specific growing location and an assessment occurs concerning potential health and environmental risk. In the case of cannabis, the US government cannot conduct its normal review process given the classification of cannabis as a narcotic under federal law.

As a result, there is a patchwork of state laws and federal guidelines, which can be uncertain. Many growers incorrectly assume that since federal pesticide registrations for marijuana production do not currently exist, then all pesticide use is banned except substances, which are exempt from federal registration. States are mandated under federal law to only permit pesticides registered or exempt by the U.S. Environmental Protection Agency (EPA).

The EPA told the states that while marijuana does not fit into any specific group, such as an herb, spice, or vegetable, pesticides may be legally used on marijuana under certain general types of crops/sites when there is an exemption from tolerance (allowable pesticide residues set by the EPA). The agency has determined that broad spectrum herbicide and fumigant use is allowed under some circumstances. There are also six states, which have some form of legalized marijuana, yet are silent on their allowable pesticide uses. In Colorado, two consumers recently filed a lawsuit against a cannabis grower claiming an inappropriate use of the Eagle 20 pesticide on its plants.

Insect Exclusion

Growing cannabis in an organic environment without the use of pesticides is important for consumer health and significantly minimizes governmental compliance or lawsuit issues. To prevent insect infestations, a pest management strategy needs to be developed. Insect screening is the most effective and economical method for excluding pests without reliance on pesticides.

While screening does not guarantee a total pest-free cannabis growing environment, screens play a large role in nearly eliminating pests. Using screens over greenhouse vent inlets can be difficult due to airflow requirements inside the greenhouse. Screens create resistance, which decreases the amount of airflow and impacts the cooling/ventilation system operation. The larger the mesh openings within the screen, the smaller the resistance. Matching the mesh type to the excluded pests is important. Increasing the screen-hole size permits the ventilation system to work more effectively. When selecting the ventilation equipment, the cannabis greenhouse design team needs to carefully consider mesh type and corresponding insects.

Positive pressure cooling pushes air through an evaporative cooling system, which forces air into the greenhouse environment. Exhaust vents allow the air pressure to stabilize while creating higher air pressure inside the greenhouse than outside. Due to this internal air pressure, insect infiltration through cannabis greenhouse openings is further restricted. Insect screening and positive pressure cooling provides a strong combination towards the goal of full insect exclusion.



Insect screening mesh along greenhouse end walls

Light Deprivation

One of the biggest changes of moving from indoor cannabis growing to greenhouses is the use of light. With indoor growing, there is an 18 hours of light/6 hours of dark cycle. These quantities shift to a 12 hours of light/12 hours of dark cycle with greenhouses due to light deprivation. Light deprivation, which has become nearly standard, is a growing method of changing the light cycle of flowering plants. The cannabis greenhouse uses blackout curtains to block light and deprives the cannabis crop of an extended photoperiod.

Consistent periods of darkness are nature's trigger for cannabis flowering. To initiate flowering, plants are placed under 12 hours of darkness along with 12 hours of light on a daily basis. This process can be implemented using curtains or shades along the greenhouse sidewalls and roof. The plants are tricked into thinking summer has concluded and that it is time to ripen. The grower can obtain potential extra harvests within the yearly cultivation season, and lower operating costs from decreased utility bills.

Greenhouse curtains and metal sidewalls create a dark environment, even with light transmitting roof coverings. Light deprivation systems also enhance energy savings at night by preventing heat from escaping through the roof. The blackout curtains provide thermal insulation. The light deprivation system enhances cannabis crop productivity while saving energy at the same time.



Light deprivation with metal sidewalls

Sunlight vs. Lights

Light deprivation systems are utilizing the power of natural sunlight, a continuous source of free energy, while still creating a dark environment. The use of sunlight reduces the role of supplemental lighting. In a cannabis greenhouse, there are 25% fewer light fixtures used in the cannabis growing process. This lesser amount of lighting optimizes natural light from the sun and decreases financial operating costs. As a result, greenhouses become a more energy efficient cultivation environment. Cannabis greenhouses represent the best of both growing worlds – indoor and outdoor, a true hybrid system.

About Nexus

Nexus Corporation has served the greenhouse industry as a top US manufacturer since 1967. With a corporate office and production facility in Northglenn, CO along with an advanced manufacturing plant in Pana, IL, the company brings innovative designs, high quality products, and exceptional customer service to its [System 420™](#) hybrid greenhouse systems.

Nexus has a team of engineers (licensed in 49 states), sales, project management, customer service, and operations professionals dedicated to managing a greenhouse development project from start to finish. The team has expertise regarding the customized design components, efficiency features, and cost management strategies necessary to maximize crop yields and return-on-investment.

For more information on greenhouses from Nexus Corporation, [click here.](#)

Sources

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