



SYSTEM 420 HYBRID GREENHOUSES

# White Paper

**The Essence of Benches & Growing Systems**

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## Background

A cannabis greenhouse growing system is an important aspect of your facility design. The optimal system can improve crop yield and airflow, increase worker efficiency, reduce plant disease, and improve profits. Yet, determining the best growing system is not an easy endeavor. Systems widely vary in cost and complexity from simple stationary benches to sophisticated palletized rolling benches, which can also serve as a material handling system.

With a System 420™ hybrid greenhouse from [Nexus](#), the grower can receive the privacy benefits of the indoor grow and the modern agricultural practices of the greenhouse. Cannabis crop efficiency, reduced operating costs, natural sunlight, and a healthier work atmosphere can be achieved in a hybrid greenhouse growing environment.

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 integrated greenhouse development. This white paper outlines several items to consider for developing the best possible growing systems for your cannabis greenhouse.

## Key Reasons for Cannabis Greenhouse Benches

1. More convenient height for working
2. Improves air circulation & environmental control
3. Better disease & growth management
4. Warmer roots than growing on the ground
5. Increases operational efficiency and throughput (palletized rolling benches)

## Ground Floors

The least expensive and simplest way to grow is on the ground without a benching system. Although the cost is attractive, the constant worker complaints and injuries will lead the grower to seek other options. The consistent bending to work on plants can contribute to additional strain or fatigue for employees from working in an awkward position.

Floor materials may consist of standard concrete, porous concrete, gravel, or dirt. A strong benefit of concrete is cleanliness. Concrete floors can be washed down with water to ensure a clean overall cannabis growing environment. The solid concrete surface prevents weed growth.

There are many long-term concerns with dirt floors. These floors cannot be properly cleaned and disinfected. When plants touch the floors, there is a risk for transmitting diseases. Pests often reside in the gravel or dirt floor surfaces. Consistent muddiness may result from frequent irrigations. Muddy or unstable floors may pose a liability since workers or visitors can easily fall. Transporting supplies using carts and trolleys is more difficult.

Grow pots on the ground requires a well-drained floor in combination with ground floor heating. Using grow pots is becoming more popular, yet the cement must be laid on a precise level without a slope to ensure an even water distribution when flooding floors. Be sure to work with a qualified contractor to ensure proper floor specifications and construction.



Cannabis growing in pots placed on the greenhouse floor

### **Stationary Benches**

These strong, durable benches remain in one place. The main reason to use this type of bench is to provide additional aisle space when more access to the plants is needed. Stationary benches are common in retail, educational, and research growing operations. However, the extra aisle spacing reduces plant utilization and growing efficiency to an approximate level of 66%. Commercial cultivators often prefer rolling benches to gain productivity by achieving a higher level of plant utilization at roughly 88%.



Stationary benches with aisles

### **Ebb and Flow**

These benches have become increasingly popular since they reduce water, fertilizer, and labor costs. An ebb and flow method is a closed system, where the water and fertilizers are pumped out onto the trays. When using ebb and flow, the pot needs to contain holes at the bottom to ensure nutrient uptake. The plants soak up the water and the additional fertilizer. After a specific amount of time, the trays are emptied again, and the remaining water runs back into a central tank. Then, clean water and fertilizer can be added until the mixture again has the desired composition before the next watering is completed. This type of irrigation on a large scale has one centralized water treatment station, which recondition the water for proper PH, environmental control, and dissolved oxygen. Small facilities have smaller catch reservoirs with less filtration.

### **Rolling Benches**

When bench tops roll, then additional opportunities for cannabis space utilization emerge. A small amount of aisle space (12%) exists and new aisles are created by rolling the bench tops when workers need to access different bench top spaces. Higher plant utilization is obtained by bringing more plants into the cultivation space using temporary aisles. Rolling benches also have anti-tip retainers, which prevent the benches from tipping over from high concentrated loads, and still maintain structural integrity. Wider aisles for carts or additional workers can be constructed, when necessary. These benches are often fitted with drip irrigation, yet ebb and flow or hand watering can be used.



Rolling benches to reduce aisle space

### **Palletized Rolling Benches**

Palletized rolling benches (often called Dutch trays) are effective in large growing operations when it is useful to have benches serve as a material handling system. These systems are custom designed to manage the crop flow through both the greenhouse and the headhouse (warehouse). Ideally, planted crops enter the greenhouse on one end and then exit the greenhouse on the opposite end.

This movement creates a circular product flow throughout the facility. Proper system design accounts for efficient space utilization. Maintaining regular, predictable zones is necessary. With many palletized bench systems, ebb and flow irrigation is used for crops with established roots at the bottom of the pots. Otherwise, standard watering practices can be used, when appropriate (temp, humidity, and crop).



Palletized rolling bench system, which also serves as material handling system

### **Bench Size**

Greenhouse benches should be uniquely selected for each growing operation. Bench sizes depend on many factors, including the height and arm reach of people working adjacent to the benches, the types of plants grown, and aisle access to one or opposite sides of the aisle. Tall workers with long arm reaches could work comfortably with higher and wider benches than a shorter person. In commercial greenhouses with a variety of workers, benches should consist of heights and widths for average-sized workers. Fewer long runs of benches typically have less up front costs than shorter run benches.

The dimensions for typical-sized benches, include:

- Height – 32 to 36 inches
- Width (worked from one-side) – 30 to 36 inches
- Width (worked from two-sides) – 42 to 72 inches

### **Bench Configuration**

The arrangement of benches within a cannabis greenhouse depends on a variety of factors, including:

- Greenhouse size dimensions and walkway locations
- Heating and air circulation patterns
- Material handling processes

When determining this configuration, the bench-to-aisle space ratio should be considered. For stationary benches, aisle space can be 25% to 33% of the grow space. However, by investing in rolling benches, aisle space can be reduced to about 12%.

The following 10,000 sf example illustrates this point:

Space (sf)	Capacity (%)	Grow Area (sf)	Assumed Revenue/sf (\$)	Total Revenue
10,000	88	8,800	300	\$2,640,000
10,000	66	6,600	300	\$1,980,000
10,000	22		<b>Revenue Increase</b>	<b>\$660,000</b>

### Costs

- **Stationary Bench** – \$4.00/sf x 6,600 sf greenhouse = **\$26,400**
- **Rolling Bench** - \$6.00/sf x 8,800 sf greenhouse = **\$52,800**

By paying a higher price for rolling benches over stationary benches, there can be additional revenue of approximately \$660,000 per year.

### 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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