# The Shearline Controlled Drying Method

## Whole Plant Drying

Whole plant drying slows moisture removal, prevents flower compression, and prepares the material for efficient mechanical trimming. Keeping the plant intact allows moisture to migrate gradually from the interior while maintaining flower structure.

Quality cannabis processing begins with **controlled drying**. The drying stage establishes the physical condition of the flower that will later determine trimming performance, visual quality, aroma preservation, and final product stability.

The Shearline drying system is based on drying the plant in its **whole form rather than bucking immediately after harvest**.

Keeping the plant intact provides several important advantages.

First, the main stalk and branches act as a **natural moisture reservoir**. The thicker plant structure contains significant water mass which releases moisture slowly over time. This buffers the drying process and prevents the flowers from drying too quickly at the surface.

Second, the branching structure naturally **separates the individual flowers**. When buds are removed from the plant too early they tend to compress together, causing the sugar leaves to stick tightly against the body of the flower. This compression makes mechanical trimming more difficult because the suction that pulls the leaf through the trimming drum slots cannot easily separate the leaf from the flower surface.

Whole plant hanging prevents this compression and keeps the leaves slightly extended away from the bud structure. This allows the trimming system to begin cutting earlier in the pass through the drum, producing faster and cleaner trimming.

Third, the branching structure acts as a **natural rack system**. When hanging on wire grid racks the thicker lower branches easily hook over the grid without the need for clips, wires, or string. This makes loading extremely fast while keeping the drying environment simple and easy to clean.

These factors combine to produce slower, more controlled moisture removal while preparing the flower for efficient mechanical finishing.

**Scope of This Guide**

This guide explains the drying principles used in the Shearline controlled drying system and how those principles can be applied to drying rooms of different sizes and layouts. The focus is on the relationships between temperature, humidity, airflow, and plant curtain geometry, and on the Page 1 environmental conditions required for consistent, high-quality drying.

While the concepts described here apply to many types of rooms—including container modules, dedicated drying rooms, and larger facilities—this guide is not intended as a license to improvise a drying system from scratch or to omit critical components. Cutting corners on airflow control,

dehumidification, cooling capacity, insulation, or plant curtain density will reliably produce poor results, even if some elements of this guide are followed.

Dimensions, rack layouts, and equipment capacities presented in this guide are included to illustrate the underlying principles and to show how a properly configured system behaves under real operating conditions. These examples should be treated as reference points rather than minimums to be reduced or optional features to be removed.

In practice, drying rooms should be designed or reviewed by qualified personnel to ensure they can maintain approximately **60°F**, **relative humidity above 60%**, **gentle low-velocity airflow through a continuous plant curtain**, and a **minimum drying cycle of approximately 14 days under full load**

## What Happens When Drying Systems Fail

Drying failures are not random. They occur when airflow, humidity, temperature, or plant curtain integrity are not properly controlled. When any part of the system is undersized, bypassed, or improperly configured, the resulting defects in the finished product are predictable.

- Low humidity or high airflow causes surface hardening (flash drying)
- Air bypass around the plant curtain causes uneven drying
- Undersized equipment creates unstable environmental conditions
- Oversized equipment can cause cycling and loss of control

---

**Low humidity or aggressive airflow**

When relative humidity falls below approximately **60%**, or when air velocity across the crop becomes too high, the outer tissue of the flower can dry faster than moisture can migrate from the interior.

Growers often refer to this condition as **flash drying**.

Flash drying leads to brittle flowers, loss of aroma compounds, and poor trimming performance with increased trim loss.

---

**Poor airflow control or plant curtain gaps**

When gaps appear in the plant curtain or airflow paths allow conditioned air to bypass the crop, the air moves around the plants instead of through them.

This produces uneven drying, pockets of overly wet material, and an increased risk of mold development.

---

**Insufficient dehumidification or cooling capacity**

Undersized equipment cannot maintain approximately **60°F** and **relative humidity above 60%** throughout the full **14-day drying cycle** under real crop and climate loads.

The room may swing between overly warm, overly dry, or overly humid conditions, producing inconsistent results from batch to batch.

---

For these reasons, this guide should **not** be used to justify removing components or reducing equipment capacity.

The principles described here only work when all critical elements—whole-plant hanging, a continuous plant curtain, controlled recirculating airflow, dehumidification, cooling, and humidity control—are implemented together and sized correctly for the room.

### Excessively oversized equipment

While insufficient cooling or dehumidification capacity creates obvious problems, equipment that is greatly oversized can also destabilize the drying environment.

Very large dehumidifiers or air-conditioning systems may remove moisture or heat faster than the crop releases it. This can cause the room to swing between operating conditions as equipment repeatedly cycles on and off.

These fluctuations can push humidity below the desired drying range or create uneven airflow conditions within the plant curtain.

For this reason, drying equipment should be sized to maintain stable environmental conditions rather than simply maximizing capacity. Slight reserve capacity is beneficial, but extreme oversizing can reduce control stability and lead to inconsistent drying results.

---

# Rolling Rack Curtain System

* racks form a continuous vertical curtain

*air is forced through the plant mass

*gaps reduce system effectiveness

*bypass airflow leads to uneven drying

The Shearline drying system uses a **rolling rack curtain** rather than fixed hanging lines.

Rack panels constructed from stainless steel wire grid hang vertically from trolley rollers mounted on ceiling rails. Each rack can roll sideways across the room width, allowing the drying curtain to be adjusted according to plant size and density.

Typical racks are constructed from **4' × 8' stainless wire grid using ¼" wire with a 4" square pattern**.

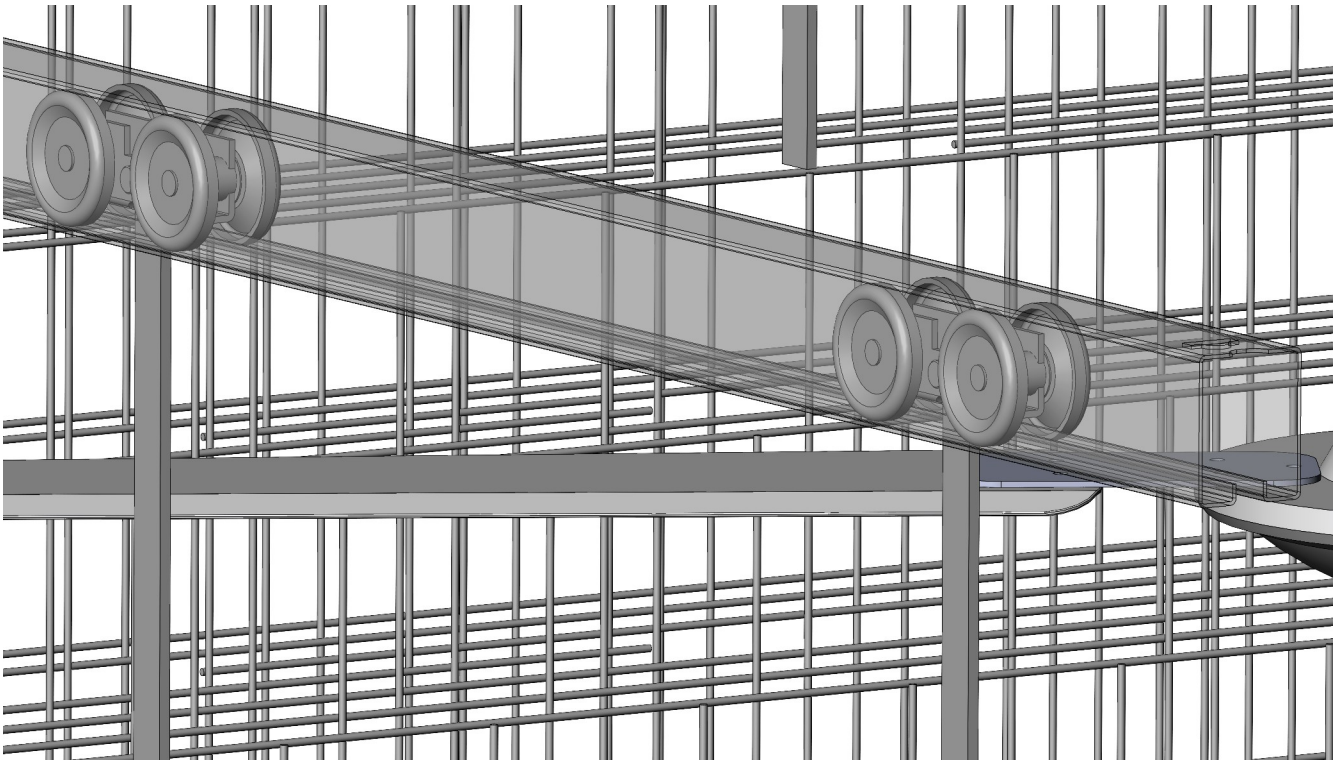
The following figures illustrate the key components of the rolling rack system.

**Figure 2 – Rolling rack trolley assembly**

Rack panels are suspended from trolley rollers that travel along ceiling-mounted rails.
This allows racks to roll sideways across the room width during loading and positioning of the plant curtain.

In larger drying rooms with taller racks, dual-wheel trolleys may be used for additional support, while container modules typically use a simplified single-wheel trolley.

---



Each rack is supported by **two hanger brackets spaced 48 inches apart (center-to-center)**. Because the rack length is 8 feet, this spacing places the hangers near the middle of the rack, leaving approximately **24 inches of rack extending beyond each hanger point**.

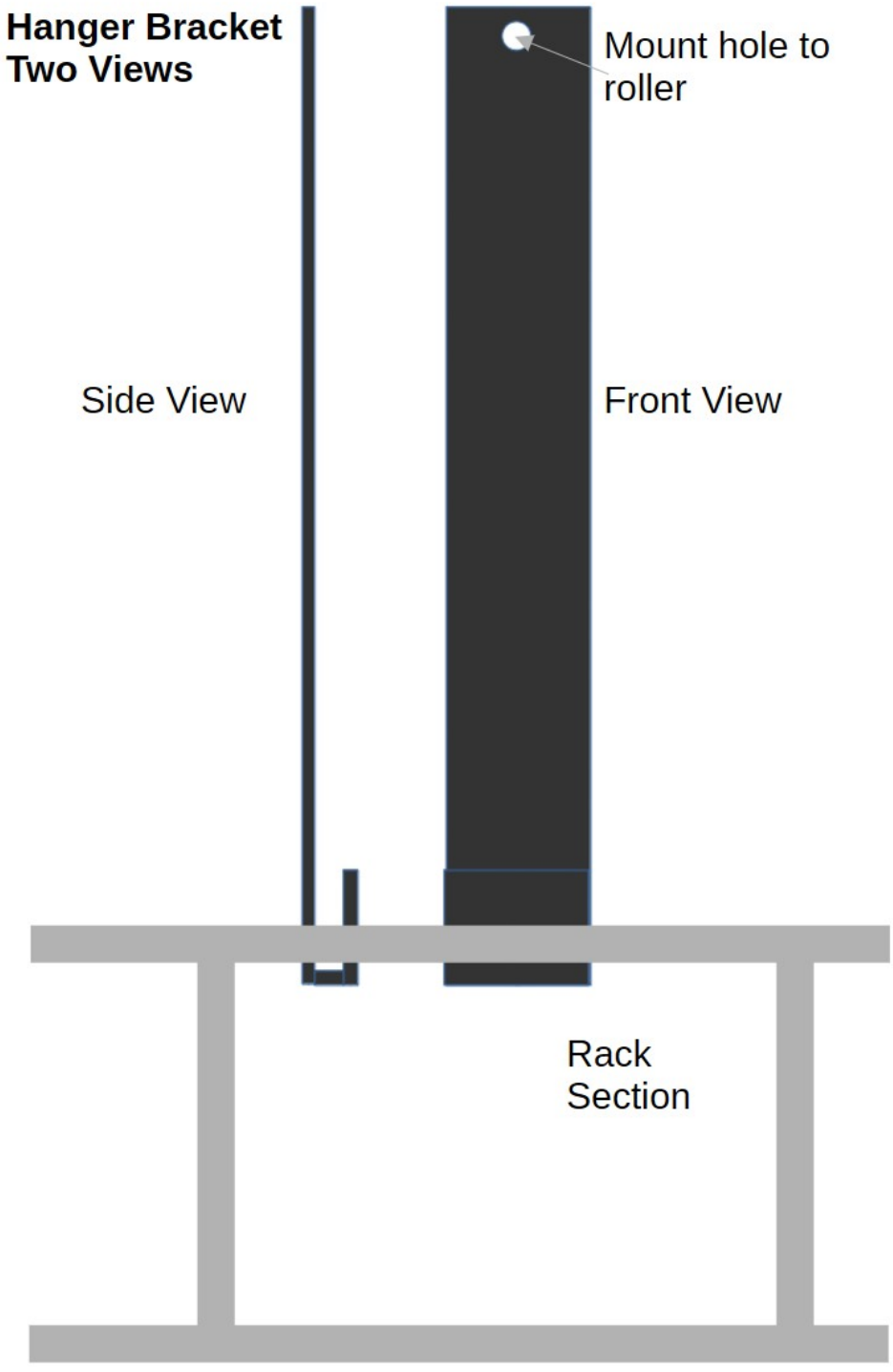
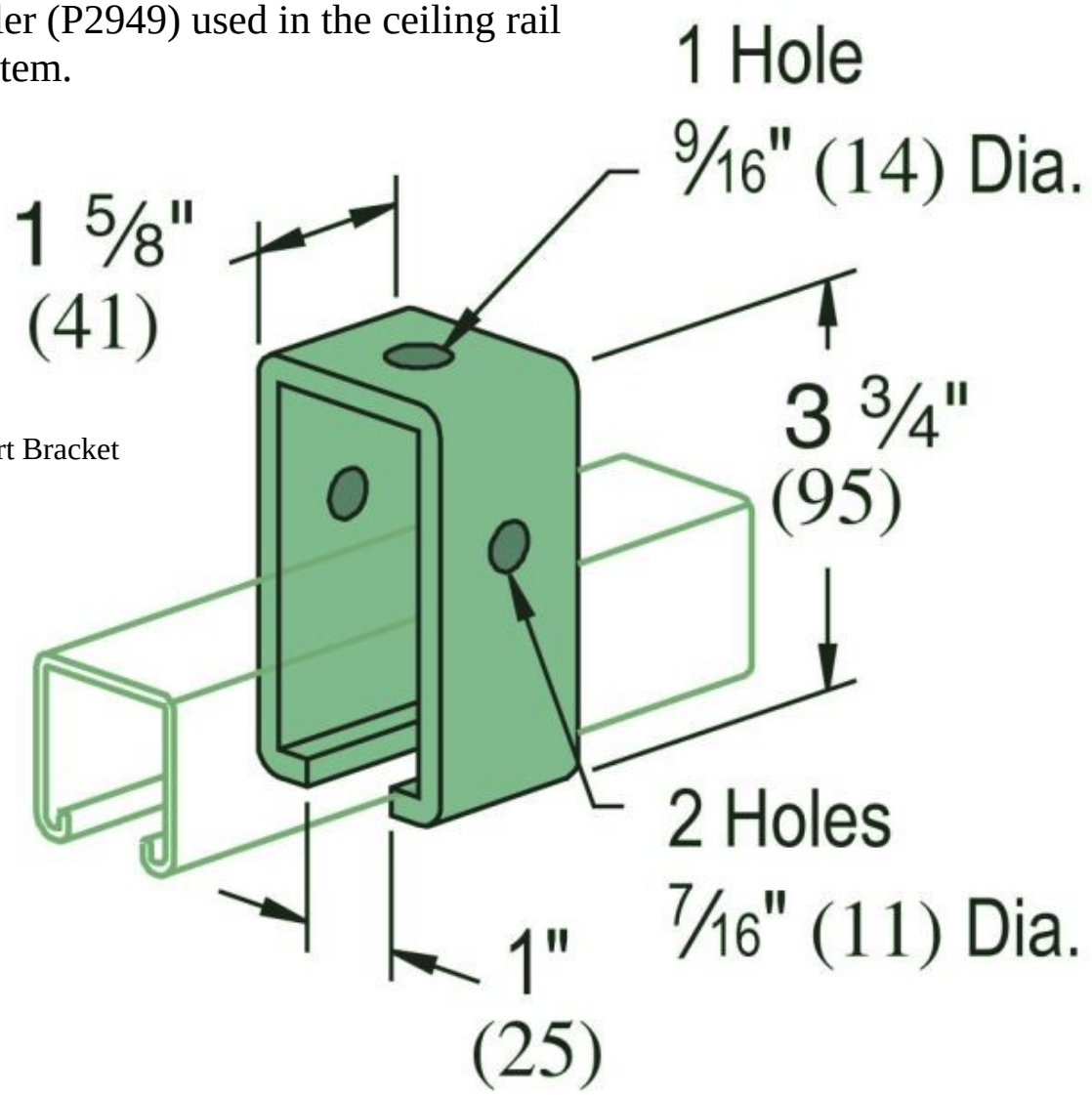



Figure 3 – Rack hanger bracket detail

Two-view diagram showing mounting tab connection to trolley and hook engagement with rack wire.

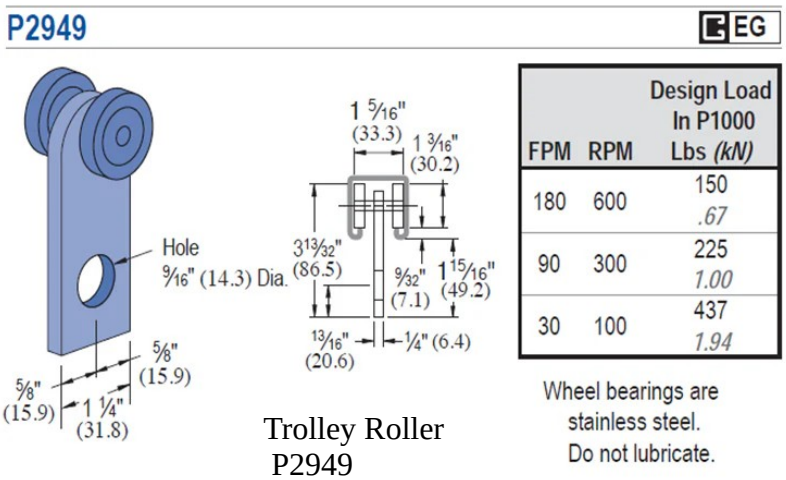
Figure 4 – Rolling rack hardware components

Rail support bracket (P1834) and trolley roller (P2949) used in the ceiling rail system.




Rail Support Bracket

P1834




Trolley Roller
P2949

Strut Rail Profile
P1000

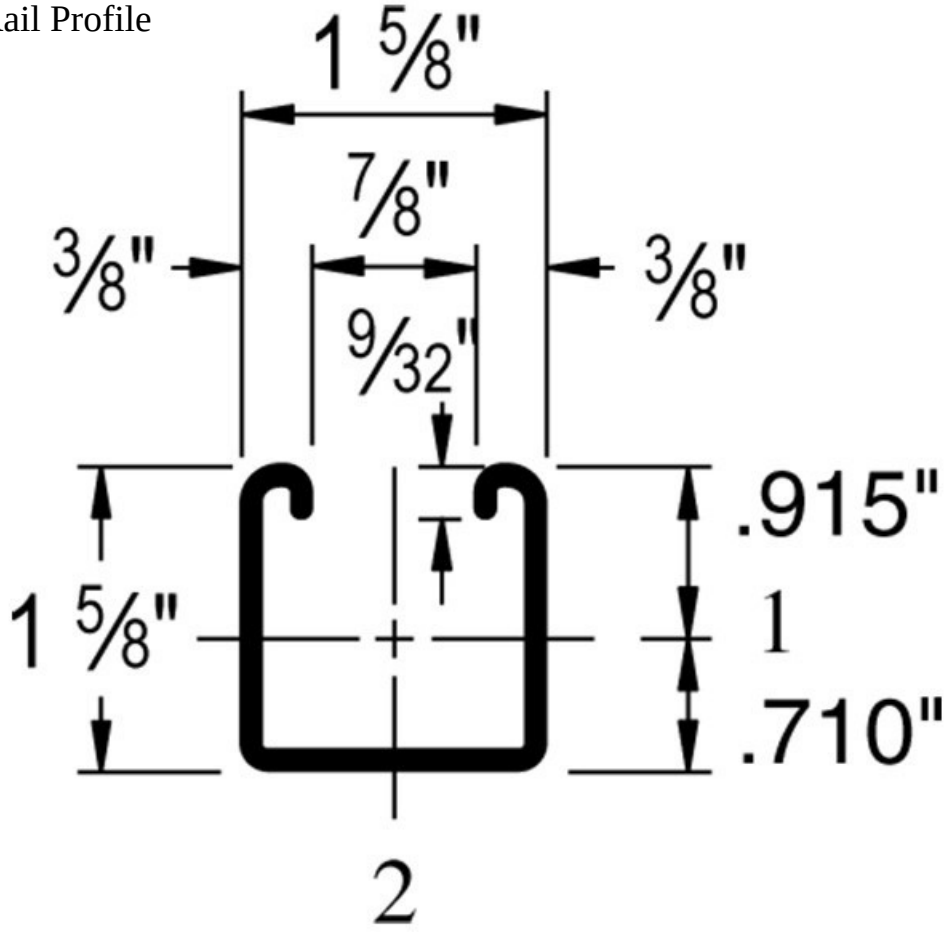



Figure 5 – Strut rail profile (P1000)

Standard strut channel used as ceiling rail for trolley-mounted racks.

These extensions form short cantilever sections that have proven more than strong enough for the distributed plant load.

The hanger brackets are fabricated from **3/16" stainless flat bar**. A 90° bend at the top forms a mounting tab that bolts to the trolley plate. The lower end of the hanger is bent into a short **hairpin hook** approximately 3 inches long. This hook slips under the top horizontal wire of the rack panel and the weight of the rack holds it securely in place.

Ceiling rails run **across the width of the drying room**, allowing racks to roll sideways as needed. There is **no fixed spacing between racks**. During loading, racks are positioned according to plant size so that branches lightly touch between rows. This forms a dense plant curtain while still allowing air to move evenly through the biomass.

Small clearance gaps of only a few inches are left between racks placed end-to-end along the airflow. The racks are oriented parallel to the primary airflow direction through the room so that the curtain remains nearly continuous.

## Service Access at the Entry Door

Because the rolling rack system forms a nearly continuous plant curtain across the drying room, special consideration should be given to personnel access once the room is fully loaded.

If racks extend directly to the entry door, opening the door would place the operator immediately against the plant curtain, making movement through the room difficult and potentially damaging the hanging plants.

To avoid this problem, a narrow service aisle can be maintained along the wall containing the entry door. A clear space of approximately 24–30 inches across the room width is typically sufficient for personnel access.

This aisle allows an operator to enter the room and walk along the front of the rack curtain before separating two adjacent rack panels to access the interior rows.

To minimize disturbance of the drying environment, the aisle opening can be fitted with flexible strip curtains similar to those used in refrigerated storage areas. These hanging plastic strips allow easy passage while reducing air exchange between the drying room and the surrounding space.

Because the aisle is narrow and located at the perimeter of the curtain, it does not significantly affect airflow through the plant curtain.

## Curtain Extension for Partial Room Loads

When the drying room is loaded with a smaller-than-normal crop, fewer rack lanes may be required to form the plant curtain. In this situation, the unused portion of the room can create an open bypass path that allows conditioned air to travel around the crop rather than through it.

To prevent this, a retractable curtain extension system can be installed along the sidewall. A practical arrangement is to mount a series of spring-loaded roll-down plastic curtains in manageable widths, such as approximately 6-foot sections, along the wall adjacent to the equipment-room access side.

When a partial load is being dried, an empty rack can be positioned immediately beyond the last loaded rack to act as a support frame. The retractable curtains are then pulled across to this empty rack and allowed to hang downward to approximately the lower extent of the plant curtain.

This creates a temporary continuation of the curtain boundary, reducing bypass airflow through the unused portion of the room while preserving the intended re circulation path through the crop.

Because the system is retractable, it does not interfere with normal loading when the room is filled to capacity.

# Airflow and Plenum Architecture

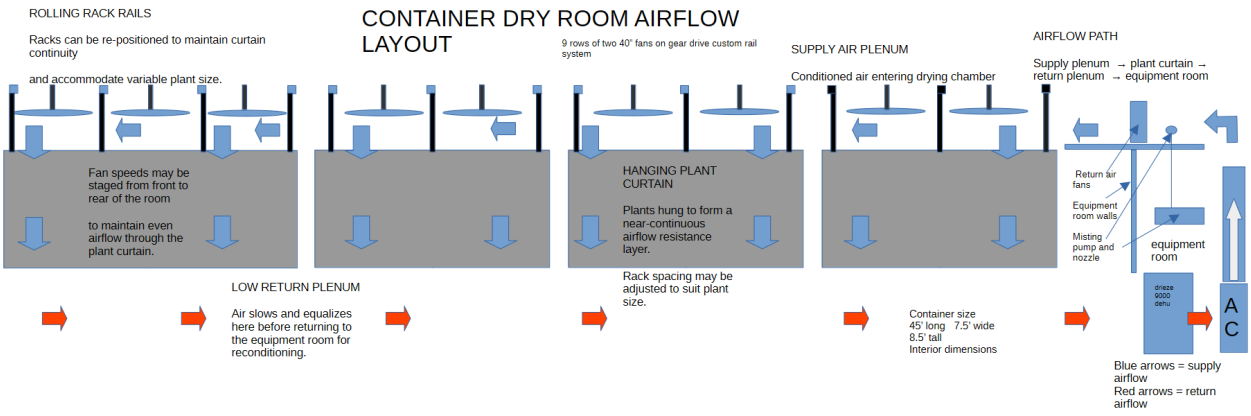
Airflow in a controlled drying system must be designed as a closed loop. Conditioned air is introduced through a supply plenum, pulled uniformly through the plant curtain, and returned through a low return plenum back to the equipment room. The objective is not air movement alone, but controlled, uniform air movement through the crop.

# Core Airflow Principles

Air must be forced **through the plant curtain, not around it**

- Airflow must be **uniform across the full width of the room**
- The system must operate as a **closed loop, not an open space**
- Return air must be collected low and evenly
- Supply air must be distributed without creating jets or turbulence

## The following diagram illustrates the overall airflow path and system layout within the drying module.




The drying system operates as a closed-loop airflow path: Air is conditioned in the equipment room It enters the upper plenum It is distributed across the ceiling It moves downward through the plant curtain It returns through the lower plenum It re-enters the equipment room for reconditioning room is separated from the equipment room by a divider wall constructed from **2-inch FRP-faced insulated panels**. Mechanical equipment is kept outside the drying space to simplify cleaning and maintenance.

A **personnel door** is typically included in the divider wall to allow access between the rooms. Because of this door, the lower air return opening may not extend across the entire wall width. In these cases the opening height can be increased to maintain adequate airflow area.

Moist air leaving the plant curtain flows downward into a **lower return zone approximately 18–24 inches high**. From this zone the air moves toward the divider wall and enters the equipment room through the lower return opening.

On the drying-room side of the divider wall, **hinged baffles** are installed above the return opening. These baffles can be tilted downward so the returning air is directed into the intake zone of the dehumidifiers rather than rising upward and bypassing the conditioning equipment. During commissioning the baffles can be adjusted to fine-tune the return airflow pattern.

Inside the equipment room, **dehumidifiers are positioned directly in front of the return opening** so that the returning moist air passes immediately through them. After moisture removal, the air flows through the **air-conditioning units**, where temperature is controlled and additional moisture may condense.

A short vertical extension or baffle is typically constructed beneath the supply tunnel on the equipment-room side of the divider wall. This extension prevents air leaving the dehumidifiers from short cutting directly back into the drying room. Instead, the airflow is directed through the cooling equipment before entering the upper supply tunnel. This geometry ensures that all circulating air passes through the full conditioning process before returning to the plant curtain.

The conditioned air then enters a full-width upper supply tunnel located at the top of the divider wall. This tunnel acts as a low-restriction air transfer passage between the equipment room and the drying room. Unlike a small enclosed plenum, the tunnel remains broadly open across the room width so the airflow path is not reduced to the diameter of the assist fans.

Inside this tunnel, conditioned air from the cooling equipment mixes and travels toward the drying room before entering the ceiling space above the plant curtain.

Slow-moving ceiling fans mounted within this plenum distribute the air evenly across the room width before pushing it downward through the hanging plants.

The air then travels through the plant curtain, enters the lower return zone, and flows back to the divider wall to begin the cycle again.

This simple geometry forces the entire room air mass to repeatedly pass through the conditioning equipment while maintaining even airflow through the plant material.

# Environmental Control and Airflow Philosophy

Successful cannabis drying depends on maintaining a stable environment that removes moisture slowly and evenly from the harvested plants. The goal is not rapid drying, but rather controlled moisture migration from the interior of the plant to the surrounding air.

The Shearline drying system is designed to maintain an environment that supports this slow and uniform drying process.

# Plenum Air Distribution and Supplemental Assist Fans

The drying system described in this guide relies on controlled recirculation of conditioned air through the plant curtain. Air movement within the room is produced primarily by the blowers contained in the dehumidifiers and air-handling equipment. These units establish the basic recirculation flow that carries conditioned air from the equipment room into the ceiling plenum and back through the return path.

Supplemental plenum assist fans are used to refine this airflow. Their role is not to provide the entire drying-room airflow, but to supplement and equalize the air movement already produced by the conditioning equipment.

Properly implemented, these fans serve two important purposes.

First, they provide any additional airflow required to maintain the desired gentle downward movement through the plant curtain when the room is heavily loaded with crop.

Second, they help equalize air distribution across the width and length of the plenum so that all sections of the curtain receive similar airflow. Without this balancing effect, some areas of the room may experience weak air movement while others receive excessive velocity.

Because plant density varies significantly between cultivars and loading conditions, supplemental fans should be selected with moderate reserve capacity and equipped with variable speed control. Slightly oversized fans operating at reduced speed provide far greater flexibility than fans sized precisely to a theoretical load. This approach allows the operator to fine-tune airflow for different crop conditions while maintaining sufficient static pressure to overcome the resistance of a densely loaded curtain.

Air movement through the crop should remain gentle. Leaves may show slight movement in the airflow, but branches should not sway or flutter. Excessive velocity can accelerate surface drying and should be avoided.

During commissioning, airflow distribution can be evaluated using a handheld anemometer at several points along the curtain. Measurements taken across the width and length of the room help identify areas of uneven airflow so fan speeds can be adjusted to achieve uniform distribution.

Supplemental assist fans are installed within the upper supply tunnel rather than defining the air opening itself. The tunnel remains open across the full room width, preserving a large low-resistance airflow path between the equipment room and the drying space. The fans are suspended within this passage so they assist circulation and improve mixing without restricting the overall transfer area.

Because the fans operate within a large open passage rather than a small fan chamber, the airflow between rooms remains smooth and balanced while still allowing the fans to boost circulation when needed.



**Figure 6 – Controlled airflow drying system**

Conditioned air enters the drying room through the upper plenum and is distributed across the plant curtain by slow-moving circulation fans.
Air then travels downward through the hanging plants and returns through the lower plenum to the equipment room where moisture and heat are removed before the air is recirculated.

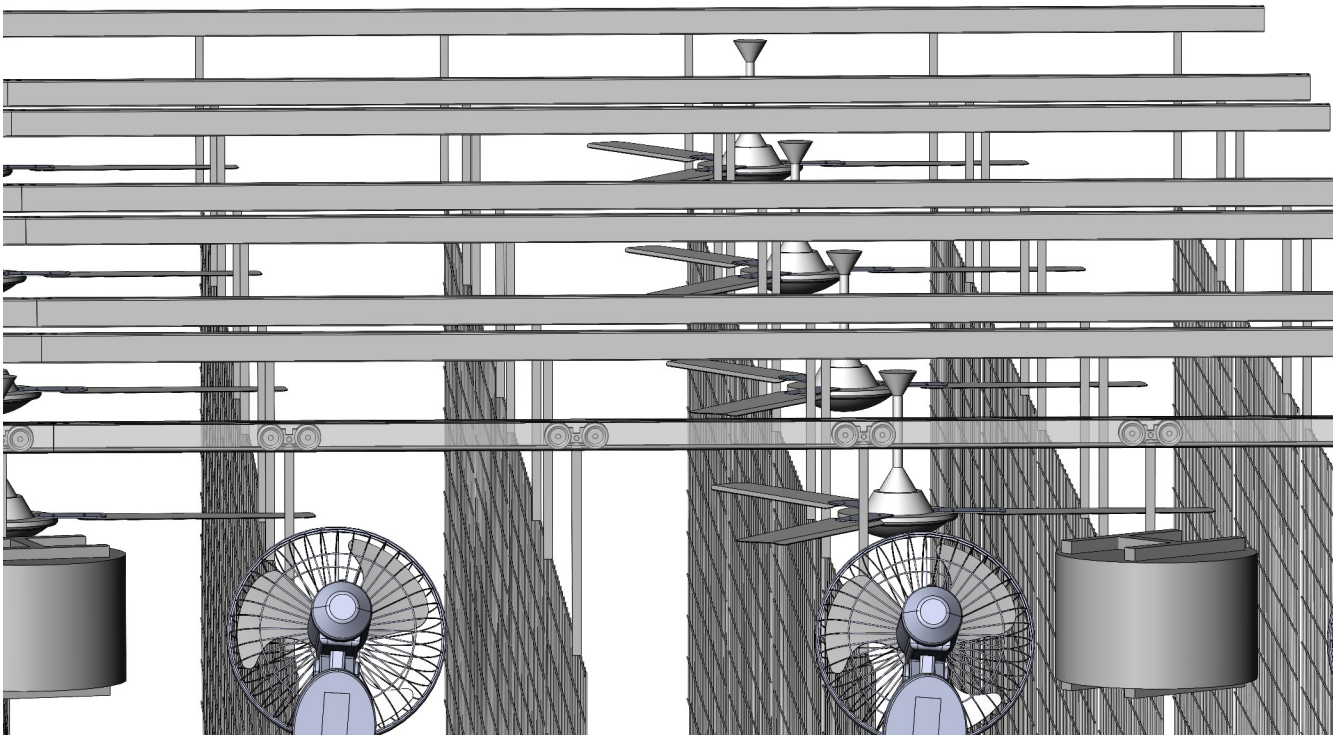


Figure 7 – Upper plenum and air distribution
Ceiling plenum with assist fans distributing conditioned air evenly across the plant curtain.

# Humidity Control and Plenum Misting

In most installations the cooling equipment and dehumidifiers remove moisture from the recirculating air stream continuously. Under some conditions, particularly when the room is lightly loaded or when outside air is very dry, humidity may fall below the desired drying range.

To maintain stable humidity, a fine mist humidification system can be installed within the conditioned air plenum. These systems introduce a very small quantity of water into the moving air stream where it rapidly evaporates and raises the relative humidity of the circulating air.

High-pressure fogging systems designed for HVAC or air-handling applications are well suited to this role. Stainless steel nozzles producing very fine droplets are preferred because they evaporate quickly in moving air and reduce the risk of free water accumulation within the plenum.

The humidification manifold should be installed downstream of the cooling and dehumidification equipment and upstream of the plenum assist fans. In this position the assist fans help mix the fog evenly into the airflow before it enters the drying space.

Nozzles should not be aimed directly at fans or structural surfaces. Instead they should discharge into the moving air stream so the droplets remain suspended long enough to evaporate fully.

---

# Temperature and Humidity Targets

The recommended operating environment for the drying room is:

Temperature: **approximately 60°F**
Relative Humidity: **maintained above 60%**

Humidity should **never be allowed to fall below 60% during the drying cycle**.

In most installations the drying room will operate between **60–65% RH** during the drying cycle. Maintaining humidity in this range slows surface evaporation while still allowing moisture to migrate steadily from the interior of the plant.

One of the most common drying problems in cannabis processing is what growers often refer to as **flash drying**. Flash drying occurs when the outer surfaces of the flower lose moisture faster than moisture can migrate outward from the interior of the bud. When this happens, the outer tissue tightens and begins to restrict internal moisture movement.

This condition can lead to uneven internal moisture distribution, brittle flowers, loss of aroma compounds, and poor trimming performance.

The most common cause of flash drying is **relative humidity dropping below 60%**. When humidity falls below this level, surface evaporation accelerates and the exterior of the flower begins to dry too quickly.

Temperature can also contribute to this problem. If room temperatures rise significantly above 60°F, the air can absorb moisture more aggressively, increasing the drying rate at the surface of the plant.

For these reasons, both temperature and humidity must be maintained within a stable range that supports gradual moisture removal.

# Interaction of Cooling and Humidity Control

In drying rooms that use air-conditioning equipment, it is important to recognize that cooling systems also remove moisture from the air.

When warm return air passes across the cooling coils of an air-conditioning unit, water condenses and drains away. As a result, humidity levels can continue to fall even after the dehumidifiers have stopped operating.

Many growers assume that setting dehumidifiers to 60% RH will prevent the room from drying further. In practice, the air-conditioning system may continue to reduce humidity whenever it operates to maintain temperature.

To prevent humidity from falling below the safe drying range, the Shearline drying system includes **fine mist humidification within the conditioned airflow**.

Humidity is injected into the air stream **after the air has passed through the cooling equipment**, allowing the humidity level to be restored before the air reenters the drying room. This ensures that temperature control can continue without allowing the room to drop below the desired humidity level.

Because the mist is introduced into the moving air stream, it evaporates quickly and mixes evenly before the air reaches the plant curtain.

The purpose of this system is not to increase humidity aggressively, but simply to prevent the room from falling below the safe drying threshold.

# Airflow Philosophy

Airflow in the drying room should be kept **as slow as possible while still preventing stagnant air pockets that could encourage mold growth**.

In practice this usually means that leaves should move only slightly in the airflow. If branches are visibly swaying or leaves are fluttering strongly, air velocity is likely higher than necessary and surface drying may accelerate.

The purpose of airflow is not to dry the plants directly. Instead, airflow gently moves conditioned air through the plant curtain so that moisture released from the plants can be carried away and replaced with freshly conditioned air.

Excessive airflow across the crop can accelerate surface drying, increase the risk of flash drying, and contribute to the loss of delicate aromatic compounds.

For this reason, the Shearline drying system uses low-velocity airflow distributed evenly across the entire plant curtain. Conditioned air enters through the ceiling plenum and is gently directed downward through the hanging plants using slow-moving circulation fans.

Because the air entering the room is already conditioned to the correct temperature and humidity, high-velocity airflow is unnecessary.

# Plant Curtain Density

The density of the hanging plant curtain plays an important role in controlling airflow through the crop.

Plant size, branch structure, cultivar, and growing method all influence the bulk and density of the hanging plants. For this reason, curtain thickness cannot be defined by a fixed dimension.

Instead, racks should be positioned so that the hanging plants form a **continuous curtain of plant material**.

The objective is to keep the plant mass tight enough that conditioned air cannot bypass the crop, while still allowing air to move evenly through the branches and flowers.

Whole plants naturally create an effective drying geometry. Their branching structure spaces the flowers apart while maintaining a connected mass of plant material. The rolling rack curtain system should be adjusted so that adjacent rows of plants lightly meet, mimicking this natural density.

When properly arranged, the plant curtain forces conditioned air to travel **through the crop rather than around it**, ensuring that all plant material experiences the same drying conditions.

# Controlled Drying Philosophy

The drying system described in this guide is built on a simple principle that has long been understood by experienced agricultural producers.

As one traditional tobacco grower summarized it:

“Dry slow if you want a good smoke — and slower if you want a great smoke.”

Maintaining stable temperature, humidity, and gentle airflow allows the plant to release moisture gradually while preserving aroma, structure, and quality.

By combining this long-established curing philosophy with modern environmental control systems, cannabis producers can achieve highly consistent drying results while preserving the quality of the finished flower.

# Cleanable Room Construction and Wash down System

## Core Clean-ability Requirements

### All interior surfaces must be non-porous and washable

- **No debris traps or inaccessible cavities should exist**
- **All equipment inside the room must tolerate washdown conditions**
- **Floors must drain completely and prevent standing water**
- **The room must support full cleaning between cycles**

**The drying room must be designed not only for controlled airflow and environmental stability, but also for complete wash down cleaning between cycles.**

**Without this capability, contamination accumulates over time, leading to inconsistent drying performance and increased risk of product degradation.**

**Washdown Capability (Primary Requirement)**

**The room should be designed so that all interior surfaces and equipment can be cleaned using a hot water pressure washer.**

**Recommended system:**

- **Commercial hot water pressure washer**
- **Water temperature: ~180°F to 200°F**
- **This temperature range is widely used in agricultural and food-processing environments to achieve sanitary cleaning conditions**

**This allows:**

- **removal of organic residue**
- **effective sanitation between cycles**
- **cleaning of all exposed surfaces, including difficult areas**

**All interior components must be compatible with this cleaning method.**

---

**Cleanable Components**

**The following elements should be designed for direct washdown:**

- **walls and ceiling surfaces**
- **rolling rack panels (wire grid construction)**
- **ceiling rails and trolley rollers**
- **circulation fans (wash down-rated or outdoor-rated types)**
- **exposed structural components within the drying space**

**The rolling rack system is particularly well suited to washdown cleaning, as wire grid panels allow water to pass through easily and can be cleaned either:**

- **in place or grouped together for batch cleaning**

**Wall and Ceiling Construction**

**All interior surfaces should be constructed using:**

- **FRP (fibreglass reinforced panels), or**
- **equivalent smooth, non-porous, washable materials**

**Installation requirements:**

- **all seams sealed using manufacturer-approved joining strips**
- **additional sealing (e.g., silicone) at joints to prevent moisture intrusion**
- **full coverage over any underlying absorbent materials (e.g., drywall or framing)**

**Where possible:**

- **inside corners should be coved or radiused**
- **this eliminates debris traps and improves cleanability**

---

**Floor Design and Drainage**

**The floor must support full wash-down cleaning.**

**Requirements:**

- **sealed, non-porous surface (e.g., coated concrete)**
- **sloped toward floor drains**

**Drain systems must include:**

- **P-traps or water seals**
- **or removable drain covers after cleaning**

**This prevents:**

- **contaminated air**
- **odours**
- **microbial back flow**

**from re-entering the drying space through the drainage system.**

**Steam Management During Cleaning**

**Hot water washdown produces significant steam, which can:**

- **reduce visibility**
- **slow cleaning operations**
- **leave excess humidity in the room**

**To address this, drying rooms should include a temporary ventilation mode for cleaning operations.**

**Recommended configuration:**

- **one exhaust point (fan-assisted)**
- **one intake point (passive or fan-assisted)**
- **intake air should be filtered to limit contamination**

**This system allows:**

- **rapid removal of steam during cleaning**
- **improved visibility and operator safety**
- **accelerated drying of the room after wash down**

---

**Vent Design Considerations**

**Vent openings should be:**

- **seal-able or self-closing during normal drying operation**
- **located to allow effective cross-ventilation during cleaning**

**During drying:**

👉 **vents remain closed to maintain controlled airflow**

**During cleaning:**

👉 **vents are opened and fans activated to purge steam and moisture**

---

**Equipment Separation**

**As described in Section 3, all mechanical equipment should remain outside the drying room.**

**This allows:**

- **full wash down cleaning without damaging equipment**
- **reduced contamination risk**
- **simplified maintenance**

---

**Design Philosophy**

**The drying room should be treated as a wash down-capable processing environment, similar to food or pharmaceutical facilities.**

**Every surface and component should support:**

- **complete cleaning**
- **fast turnaround between cycles**
- **repeatable operating conditions**

**Clean-ability is not an optional feature—it is a core requirement for consistent drying performance.**

---

# Cooling Capacity for Drying Rooms

Cooling capacity in the Shearline drying system must account for several heat sources within the room:

• heat generated by dehumidifiers
• heat released during moisture condensation
• small circulation fans and plenum blowers
• heat gain through the container shell
• infiltration through doors and openings.

For drying rooms of the size described in this guide, the primary internal heat source is the pair of dehumidifiers operating in the equipment room.

A typical module uses **two Dri-Eaz LGR 6000Li dehumidifiers** and operates with a **minimum 14-day drying cycle**. Under these conditions, the internal process load from the dehumidifiers and circulation fans typically falls in the range of:

**6,700–8,000 BTU per hour**

Additional cooling load must be provided to offset heat entering through the container walls and roof.

In the Okanagan region, containers frequently operate under **very sunny summer conditions**, with daytime temperatures commonly reaching **30–35°C (86–95°F)**. Steel containers exposed to direct sunlight can absorb significant radiant heat, even when insulated.

For this reason, a realistic allowance for shell heat gain and infiltration is typically:

**4,000–6,000 BTU per hour**

Combining these factors produces a total cooling requirement for a typical drying container of approximately:

**11,000–14,000 BTU per hour**

## Recommended Cooling Capacity

Based on this load range, the following cooling capacities are recommended:

**1 ton (12,000 BTU/h)**
This represents the absolute minimum cooling capacity. Systems of this size may operate near full capacity during the hottest summer afternoons and recovery after door openings may be slower.

**1.5 tons (18,000 BTU/h)**
This is the preferred cooling capacity for most installations. It provides sufficient headroom to maintain approximately **60°F and humidity above 60%** during typical Okanagan summer conditions while allowing the system to recover quickly after door openings.

**2 tons (24,000 BTU/h)**
Larger systems may be justified when containers have minimal insulation, dark exterior colors, or frequent door cycling during hot weather.

Whenever possible, containers should be painted **light colors such as white** or shaded to reduce solar heat gain. Reducing radiant heat on the container roof can significantly lower cooling demand and improve environmental stability.

# Drying Room Capacity and Rack Layout

The capacity of a drying room is determined primarily by the amount of hanging plant curtain that can be installed while still maintaining proper airflow through the crop.

In the Shearline drying system, racks are arranged to form a continuous curtain of hanging plants while preventing conditioned air from bypassing the crop. Because plant size and branch structure vary

significantly between cultivars and growing methods, room capacity cannot be defined by a single fixed number.

Instead, capacity should be estimated based on the number of rack lanes and the usable rack length available in the room.

# Example Drying Room Geometry

The container drying modules described in this guide use the following vertical arrangement:

Room height: **8.5 ft**

Upper supply plenum above plant curtain: **18 inches**

Vertical hanging rack height: **4 ft**

Lower return plenum: **36 inches**

The larger lower return space allows the lowest row of hanging plants to extend below the rack while still providing clear airflow return to the equipment room.

This geometry also ensures that conditioned air moves evenly downward through the plant curtain before returning to the dehumidification equipment.

# Rack Layout

Rack panels are typically constructed from **4 ft × 8 ft stainless steel wire grids** and hang vertically from ceiling rails.

Within a standard **45 ft container**, the usable drying length allows for approximately:

**Four full 8-foot rack sections plus one shorter terminal section of approximately 7 ft**

This produces about **39 ft of usable hanging length per rack lane**.

Across the width of the container, the system can typically support:

**Four to five rack lanes**, depending on plant bulk and branch structure.

Rolling racks form a continuous curtain of hanging plants across the drying room.
Conditioned air enters from the ceiling plenum above the curtain and moves downward through the plant material before returning through the lower plenum toward the equipment room.

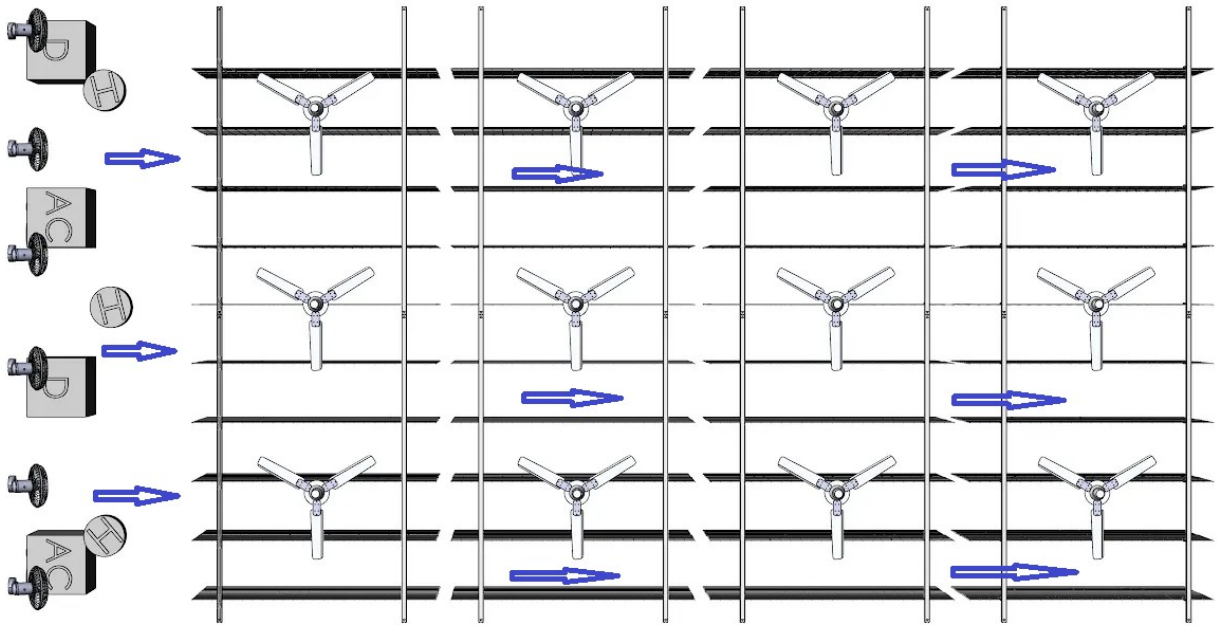



Figure 8 – Rack curtain layout within drying room

Rolling racks form a continuous plant curtain across the room, forcing airflow through the crop.

When plants are narrower and more upright, five lanes may be used. Crops with heavier branching may require four lanes to maintain proper airflow and avoid overpacking.

# Hanging Length Capacity

Based on this layout, the total available hanging length becomes:

Four rack lanes: **approximately 156 linear feet of hanging plant curtain**

Five rack lanes: **approximately 195 linear feet of hanging plant curtain**

This curtain length determines the total amount of plant material that can be dried without compromising airflow.

# Finished Flower Capacity

Because plant size and loading density vary between cultivars, finished capacity is best expressed as a range rather than a single fixed value.

For a 45 ft container drying module operating under the airflow and environmental conditions described in this guide, the typical finished capacity is:

**Approximately 80–100 pounds of finished flower**

Under favorable conditions with narrower plant structure and efficient loading, capacity may approach:

**Up to approximately 120 pounds of finished flower**

However, this higher value should be considered an **upper-range case rather than the standard design target**.

Maintaining proper airflow through the plant curtain is more important than maximizing biomass in the room. Over packing the drying space can lead to bypass airflow, uneven drying, and increased risk of flash drying or mold development.

## Loading Philosophy

Whole plants naturally create an effective drying geometry. Their branching structure separates individual flowers while maintaining a continuous plant mass.

Racks should be positioned so that adjacent plants **lightly meet between rows**, forming a continuous curtain that forces conditioned air to travel through the crop rather than around it.

This approach allows the room to remain flexible for different cultivars while preserving the controlled drying environment required for high-quality finished flower.

# Determining When Drying Is Complete

Drying time can vary depending on plant size, cultivar structure, and loading density within the racks. For this reason, the Shearline system does not rely on fixed drying schedules or stem “snap tests” to determine when material is ready to leave the drying room.

Instead, readiness is verified using a simple humidity equilibrium test.

### The Jar Test Method

Beginning around **day 10 of drying**, it is advisable to begin checking the material condition.

Select a **small sample of flowers** taken from random areas of the drying room. A handful of bucked flowers is sufficient for testing.

Place the sample into a **clean glass jar** along with a small digital hygrometer and seal the lid tightly.

Allow the jar to remain sealed for **at least one hour** so the internal humidity can stabilize.

### Interpreting the Reading

The humidity reading inside the jar provides a reliable indication of the moisture condition within the flowers. The humidity measured inside the sealed jar represents the equilibrium moisture condition of the flower, which closely reflects how the material will behave during mechanical processing.

Typical readings should be interpreted as follows:

Above **~68% RH**
The material still contains excessive moisture and should remain in the drying room longer.

**58–64% RH**
This range indicates the flowers have reached the proper drying level to move to the next stage of processing.

Below **~57–58% RH**
Material has become overly dry and may produce brittle flowers and increased trim loss during mechanical processing.

Because drying conditions and plant structure vary between crops, using the jar test provides a **repeatable and measurable way to determine readiness** rather than relying on guesswork.

---

# The Bag-It Conditioning Method

Once jar test readings consistently fall within the **58–64% range**, the material is ready to leave the drying room and enter the conditioning stage.

Although the plants were dried whole, bagging entire plants is impractical due to their size and the storage space required.

Instead, the branches should first be **cut from the plants into manageable lengths**, typically no longer than **approximately 24 inches**. This size allows comfortable handling and feeds easily into bucking equipment.

Whole-plant drying plays an important role in making this conditioning stage work effectively. Because the flowers have remained attached to the stalk and branches during the drying process, moisture leaves the plant gradually and evenly. When the branches are later sealed in conditioning bags, the remaining internal moisture within the stems and buds redistributes slowly through the flower structure. This natural moisture buffering helps prevent rapid surface wetting and allows the material to equalize without damaging the flower.

## Preparing the Conditioning Bags

Large **black plastic contractor bags** are used for conditioning.

Plastic bags prevent further rapid drying, while the black material protects the flower from light exposure. Clear bags should be avoided, as even moderate light can degrade flower quality.

Branches are loaded **tip first** into the bags so they can later be removed easily without damaging the flowers.

The material can be placed somewhat firmly within the bag. A slightly consolidated mass helps the remaining internal moisture redistribute evenly through the flowers.

Leave sufficient space at the top of the bag to allow it to close properly. The bag is then sealed by twisting the top and securing it with a twist tie or loose knot.

### Moisture Equalization

The sealed bags are left to sit for **approximately 12–24 hours**.

During this period, the small moisture differences that naturally remain within the flowers redistribute and equalize throughout the material.

Because the plants have already completed the controlled drying stage, this short conditioning period does not create a mold risk. The bags are not used to continue drying, but simply to allow the remaining internal moisture within the buds to balance.

## Temporary Stabilization Before Processing

Once branches have equalized moisture inside the sealed bags, the material enters a relatively stable condition.

Because the flowers have already completed the controlled drying phase and the sealed bags limit further moisture exchange with the surrounding air, the internal moisture balance of the material changes only slowly.

This creates a useful scheduling buffer between drying and mechanical processing.

In most commercial operations the material is processed within a few days. However, properly conditioned flower can remain in this stabilized state for longer periods when kept sealed in a cool, dark environment.

The conditioning bags are not intended to function as a long-term storage method. Their purpose is to stabilize the material and maintain the proper processing condition until bucking and trimming begin.

---

# Bag Storage During Conditioning

How the conditioning bags are stored is important.

Placing filled bags on the floor or stacking them can compress the flowers and flatten the buds under the weight of the material. Even laying the bags on their sides can create pressure along the contact surfaces.

A better solution is to **hang the bags during the conditioning period** so the branches remain suspended.

### Hanging Bag Storage

A simple wall-mounted rack can be constructed using short **fork-style hangers** that extend approximately **4 inches from the wall**.

Each hanger includes a shallow groove that captures the **twisted knot at the top of the contractor bag**, allowing the bag to hang securely while keeping the flowers suspended inside.

Multiple rows of hangers can be installed vertically along a wall or staggered across several walls depending on available space.

Hanging the bags provides several advantages:

• prevents compression damage to flowers
• keeps buds naturally suspended on the branches
• allows easy loading and removal of bags
• uses vertical room space efficiently

Real-world installations often store large numbers of conditioning bags this way while maintaining easy access for inspection and handling.

# Quick Sizing Reference — Shearline Drying System

This section provides a practical method for estimating airflow, cooling, and dehumidification requirements based on room size and plant curtain geometry.

These values are intended as **design starting points**, not absolute limits. Final equipment selection should account for insulation quality, climate, and operational conditions.

---

## 1. Room and Curtain Geometry

**Room floor area**

Ar=L×WA_r = L \times WAr=L×W

**Effective plant curtain area**

Ac=Lc×HcA_c = L_c \times H_cAc=Lc×Hc

Where:

- LLL = room length (ft)
- WWW = room width (ft)
- LcL_cLc = effective curtain length (ft)
- HcH_cHc = curtain height (ft)

👉 Room area determines equipment class
👉 Curtain area determines airflow requirement

---

## 2. Airflow Through Plant Curtain (CFM)

$Q = A_c \times V_f$

Where:

- $Q$ = airflow (CFM)
- $A_c$ = curtain area (ft²)
- $V_f$ = face velocity (ft/min)

### Recommended Face Velocity:

| Loading Condition | Face Velocity |
|---|---|
| Light load | 20–30 ft/min |
| Normal load | 30–40 ft/min |
| Heavy load | 40–50 ft/min |

👉 Increase airflow for dense crops
👉 Reduce airflow for lighter loads
👉 Air movement should remain gentle (no branch movement)

---

## 3. Cooling Capacity (BTU/hr)

$B = A_r \times K_b$

Where:

- $B$ = cooling capacity (BTU/hr)
- $A_r$ = room area (ft²)
- $K_b$ = cooling factor

### Recommended Range:

| Loading Condition | Cooling Factor |
|---|---|
| Light load | 30–35 BTU/ft² |
| Normal load | 35–45 BTU/ft² |
| Heavy load | 45–55 BTU/ft² |

👉 Higher values for:

- hot climates
- poor insulation
- frequent door opening

---

# 4. Dehumidification Capacity (Pints/Day)

$D = A_r \times K_{dehu}$

Where:

- DDD = dehumidification capacity (pints/day)
- $K_{dehu}$ = dehumidification factor

### Recommended Range:

| Loading Condition | Dehu Factor |
|---|---|
| Light load | 0.20–0.30 |
| Normal load | 0.30–0.45 |
| Heavy load | 0.45–0.60 |

👉 Actual requirement depends on:

- crop moisture load
- contribution from cooling system
- outside air infiltration

---

# 5. Equipment Behavior (Important)

- Cooling systems **also remove moisture**
- Dehumidifiers provide **control stability**
- Systems should be sized for **steady operation**, not maximum output

👉 Avoid extreme oversizing:

- causes short cycling
- unstable humidity
- uneven drying

---

# 6. Example — 30' × 20' Drying Room

**Room area**

$A_r = 30 \times 20 = 600 \text{ ft}^2$

**Curtain area (example)**

$A_c = 27 \times 7 = 189 \text{ ft}^2$

### Airflow:

- Light: ~3,800–5,700 CFM
- Normal: ~5,700–7,600 CFM
- Heavy: ~7,600–9,500 CFM

### Cooling:

- Normal: ~24,000 BTU/hr
- Heavy: ~30,000 BTU/hr

### Dehumidification:

- Normal: ~180–270 pints/day
- Heavy: ~270–360 pints/day

---

# 7. Practical Guidance

- Size from **room geometry first**
- Adjust using **loading density**
- Use **variable-speed airflow** whenever possible
- Maintain:
    - ~60°F
        - 60% RH
    - low, even airflow through curtain

---

# Bottom Line

A properly sized system:

- moves air **through** the plant curtain
- maintains stable temperature and humidity
- dries slowly and evenly over ~14 days

If airflow, cooling, and dehumidification are balanced correctly, the system becomes stable and repeatable across different crop conditions.

# Summary — Controlled Cannabis Drying

Controlled cannabis drying depends on system design rather then individual components.

- Air must be pulled uniformly through a continuous plant curtain
- Relative humidity must remain above approximately 60% during drying
- Temperature must remain near 60°F for stable moisture removal
- Airflow must remain low velocity and uniformly distributed
- Whole plant drying improves moisture control and trimming performance
- System stability is more important than maximum equipment capacity

When airflow, temperature, and humidity are balanced, drying becomes consistent and repeatable across different crop conditions.

This methodology defines the drying system developed by Shearline for controlled, repeatable cannabis processing environments.