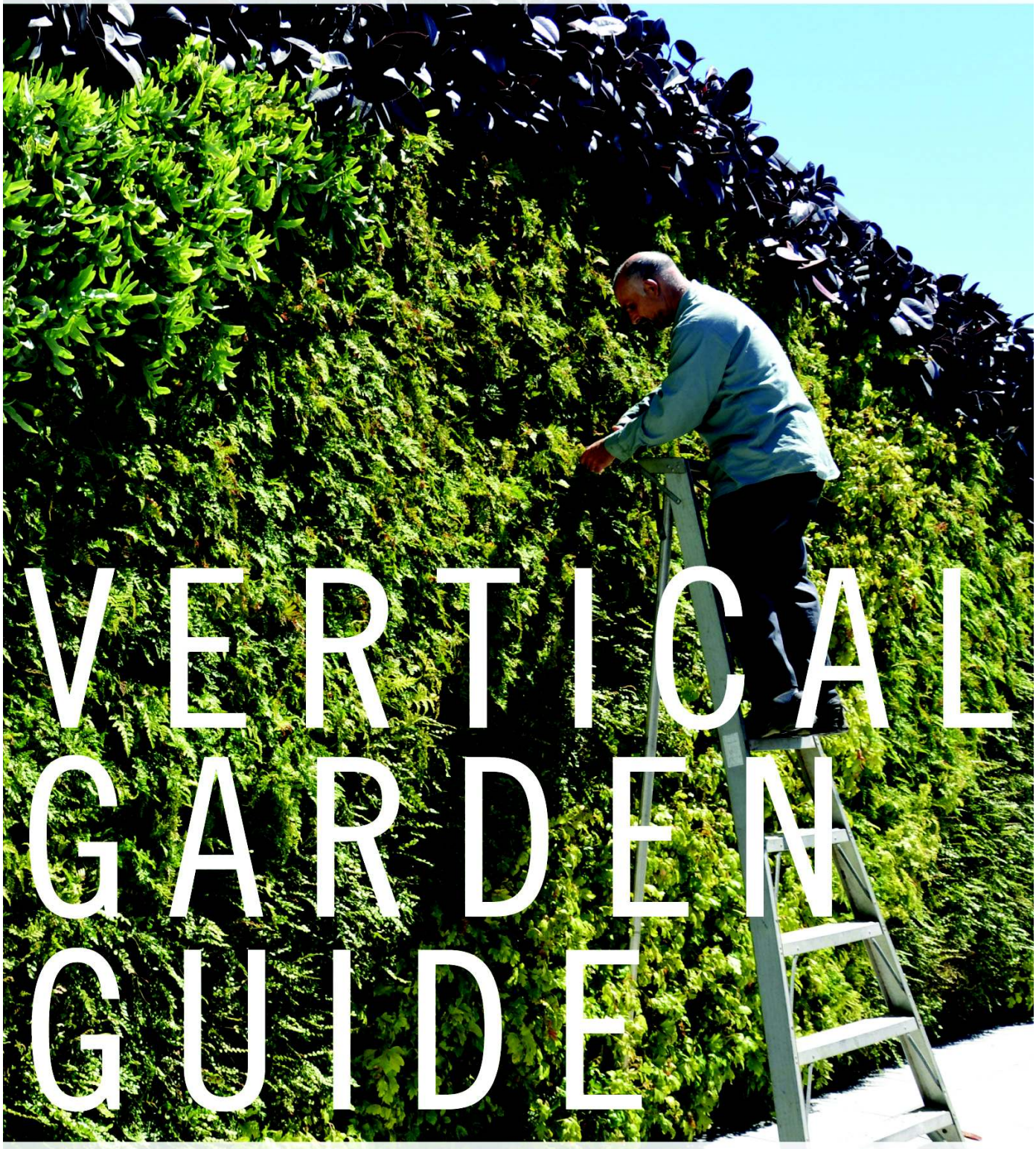
FLORAFELT®



VERTICAL GARDEN GUIDE

BY CHRIS BRIBACH

FLORAFELT
Vertical Garden Guide

by Chris Bribach

FLORAFELT
VERTICAL GARDEN PLANTERS

FLORAFELT 12-POCKET (F12)

FLORAFELT 4-POCKET (F4)

Cover: Over 2000 ferns and ficus installed for a private residence in San Francisco. Designer: Chris Bribach, Plants On Walls. Maintenance: Michael Bonicci, Showplant Nurseries.

BRING BUILDINGS ALIVE AN ECOLOGICAL POSITIVE

Plants Are Here For Us

A number of studies have shown that plants in the workplace reduce sick days and increase productivity, and everyone knows that greenery always makes a home more inviting. Aside from pleasant aesthetics, plants fill our rooms with fresh oxygen, and deep in our subconscious we understand that leaves and flowers symbolize food, health and life. Since most of us work and live in urban areas, and we spend the vast majority of our time indoors, barren interiors can be both softened and reinvigorated by the inherent promise of abundance offered by plants.

Healthy Spaces

Interiors require walls and walls are an exciting new place to fill with plants. The creative possibilities are endless. You can create the illusion of looking into a garden, glimpsing a jungle or enjoying the views from a cliff that is covered in foliage. And that feeling of freshness is not just a pleasant sensation. It is measurable, since leaves transform carbon to oxygen, and the soil itself removes toxins from the air. Millions of active organisms in every scoop of soil neutralize toxins because the microbiology converts VOC's into nitrogen, which is vital for plants. Using this ancient symbiosis to improve our modern world keeps us thriving and alive.

Urban Oasis

In a beautiful irony, cities and urban areas provide more surface area per square foot to grow plants than even our majestic countrysides. Inside and out, our walls can be filled with plants, creating a complex, biodiverse living oasis in even the most densely populated areas. Native birds and animals would flock to join us in our urban centers, reconnecting us with nature in thousands of ways. Edible plants and fruits would be plentiful, a harvest at arm's reach.

FLORAFELT IT'S A WHOLE NEW WAY TO THINK ABOUT GARDENING

CBRE Office Tower, Downtown San Francisco, California. Designer: Chris Bribach of Plants On Walls.

FLORAFELT VERTICAL PLANTERS

Growing a living wall is easy with Florafelt Vertical Garden Planters. Our hand-made planters are designed to use the micro fibers in PET felt so that all the plants are watered equally. The felt is made from recycled plastic bottles, a nylon non-toxic fiber that is practically indestructible. This amazing material provides a safe growing medium that is pH neutral and non-reactive, so you can garden organically right on your wall. It's even safe for vegetables and herbs! Roots grow right into the felt, which comes alive thanks to the microbiology in the soil.

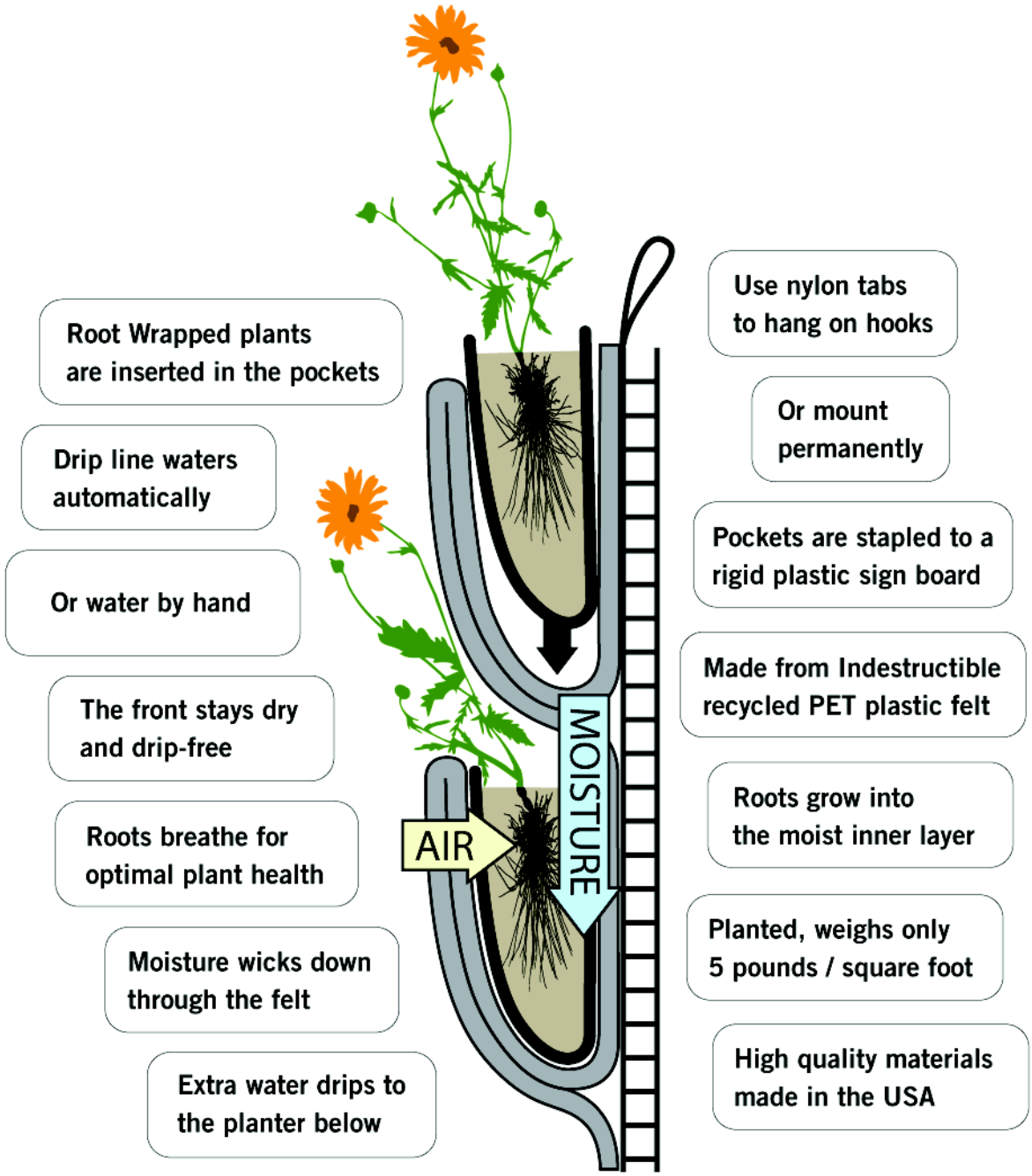
ROOT WRAPPERS

Florafelt planters come with our custom Root-Wrapping system. It lets you change and rearrange your living wall at will, while maintaining the integrity of every plant in its own soil.

FLORAFELT HOW IT WORKS

FLORAFELT
VERTICAL GARDEN SYSTEMS

VERTICAL GARDEN PLANTER
HOW IT WORKS



FLORAFELT ADVANTAGES OF SYNTHETIC FELT

Growing in synthetic felt allows unlimited possibilities. Parisian designer Patric Blanc has some of the longest-living, largest and most gorgeous living walls to date, many planted in the mid 1970s. They grow in synthetic felt, which is ideal for breathability and allows for fully mature root development. Florafelt has taken this concept and added pockets created from the same material for ease of installation and plant replacement.

Conservatory of Flowers, San Francisco, California. Designer: Chris Bribach of Plants On Walls.

USING A LITTLE SOIL MAKES VERTICAL GARDENING MUCH EASIER

We created the pockets so that they would accommodate a handful of soil. The soil balances pH and introduces microbiology to let nature do its work and bring the felt alive. And it is crucial to use synthetic materials so the support system doesn't dissolve.

WHAT'S WRONG WITH SMALL COMPARTMENTS OR PLANTER BOXES

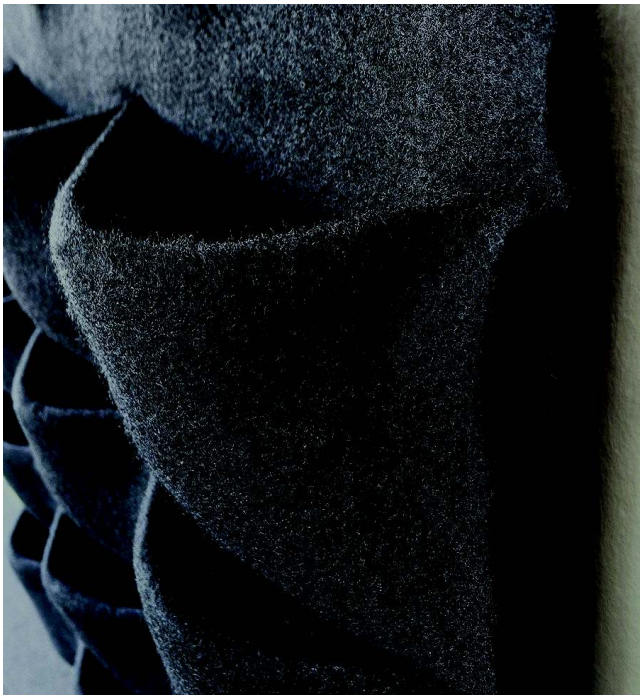
Plastic compartments and planter boxes restrict root growth and create the same problem as planters - root binding. Plastic also doesn't allow breathability, and our felt pockets eliminate the many difficulties with root rot issues. Additionally, the soil is tightly held in place by the felt wraps within the pockets, keeping the entire system extremely tidy. And the pleats direct the water inward, making it drip-free.

VERY LARGE VERTICAL GARDENS
With a bolted attachment, our Florafelt planters can be used at any height. Florafelt is made from recycled PET and is virtually indestructible. Once it is planted, the root material makes it a permanent living membrane.

PET PLASTICS AND TOXICITY
Not all plastics are the same. PET plastic is a non-reactive, non-toxic plastic which is why it is used for anything from milk jugs to water bottles. Trace amounts of toxins are known to emerge from PET, but soil microbes break down those complex molecules long before they reach plant roots. We chose 100% recycled PET felt fibers for our Florafelt, turning unused water bottles into something useful. Additionally, plants grown in this material absorb carbon from the atmosphere, making Florafelt a 'carbon absorbing' product.

VERTICAL GARDENS THAT EVOLVE
It is very important for the vertical garden to be interactive so that it can be modified as needed. Like any garden, there are unpredictable changes in climate, mishaps with watering systems, or plant disease.

SLIT-AND-STAPLE METHOD
The slit-and-staple method, which was used several years ago for the vertical garden at the Drew School in San Francisco, often show large planted areas that did not take. It is very difficult to add new plants to fill in these spaces.



PLEATED-POCKET DESIGN
But our Florafelt pleated-pocket design makes it very easy for any gardener to remove the problem plants and tuck healthy starts into the existing pockets. It also allows caretakers to replace the dead foliage with plants that are thriving in the same vertical garden. Starting with a bio-diverse selection allows you to try many plants and minimize the failures. You simply add more of what works.

SUSTAINABLE
A sustainable solution to vertical gardening is one that uses the skills of an existing landscape service or even maintenance crews on staff. This keeps long-term maintenance affordable and easy.

VERTICAL GARDEN DESIGN TIPS AND TRICKS

Private residence, Beverly Hills, California. Designer: Chris Bribach, Plants On Walls.

NATURAL LIGHT - Bright indirect light from a bank of windows is an indoor tropical favorite. The plants will reach for the light and align their leaves to the source, making a perfect display. Direct light may cause burning, but can be workable if it is limited to a few hours a day.

INDOOR LIGHTING - Without bright windows, existing room light provides the minimal illumination for growing plants, so you'll want to add a track lighting system. Halogen bulbs project a wide spectrum of light, which makes it ideal for any number of different plans. Metal halide and fluorescent lights are also excellent. New LED lights may also work for some situations.

OUTDOORS - A deck with full day of sun is perfect for growing herbs and vegetables, flowers and succulents. Partial sun is great for lettuce or ferns and most other plants. Ferns also do well on shady walls.

LIGHT METER - Consider a light meter as part of your tool kit. They are easy and inexpensive. Ambient light is measured in Foot Candles. Indoor tropical plants need a minimum of 300 foot candles to thrive. Direct sun measures in at 10,000 foot candles and will burn most indoor

plants, but succulents, herbs and vegetables require a full day of direct sun to thrive. Test the area you want to plant and add supplemental lighting or shade if necessary. Explore the internet to learn more about which plants you should choose for your installation.

MOISTURE - Florafelt planters are intended for water-safe areas. Generally, water will remain within the unit, but there is always the chance for some dripping. If you intend to use the unit indoors on wood floors or carpeting, use extra caution and keep watch during pump operation. Use common sense when placing the unit and clean up occasional plant mess or moisture leakage.

REGULAR WATERING - Daily watering, along the top row only, is normally required when using Florafelt planters. For most situations, we recommend connecting the planters to an automatic irrigation system. A simple drip tube across the top, set to water twice daily, will provide adequate moisture for most situations. Recirculating systems are more water efficient, with a tank, pump and timers set to run once-a-day for 30 minutes for most situations.

FERTILIZE - Light fertilizing is preferred for vertical gardens. We recommend the use of an organic based fertilizer such as Maxsea to minimize salt buildup and promote active microbiology within the soil and felt. Fertilizer can be added manually or by use of an injector in your irrigation system. For recirculating systems simply add fertilizer when you top off the water tanks. Or you can fertilize manually with a pressure sprayer.

SEASONAL PLANTINGS - Flowering annuals are an excellent choice for seasonal plantings. In early spring, Florafelt pockets can be planted with small starts, seeds and cuttings for a dazzling display of color all summer long. When growing season has ended, the Root Wrapped plants can be removed, cleaned and stored for next year, along with the lightweight panels.

WINTER EXPOSURE - Most plants will go dormant in the winter. Planted in the ground, they are protected from extreme freezing temperatures. In walls, as with planters, only certain rugged natives will survive a hard freeze. Consult with a landscaping professional in your area for advice on specific plants that can make it through winter.

CHILDREN AND PETS - All gardens are at risk to the terrors of youth and fauna. Use caution, as some plants are toxic. Florafelt can be damaged by claws, teeth, and beaks. The Recirc unit can tip if it is destabilized by climbing children or jumping pets. Use common sense and be selective about placement.

PLANTING VERTICALLY

PLANT SELECTION

Full sun, part shade, or full shade are the standard considerations when you select plants. But also consider whether you have a dry or moist environment and freezing or temperate conditions. For example, some indoor tropicals require a certain amount of shade, and won't respond well to abrupt temperature changes. Talk to someone at your local nursery - you'll find that they love to talk about plants and will be happy to make recommendations for your situation.

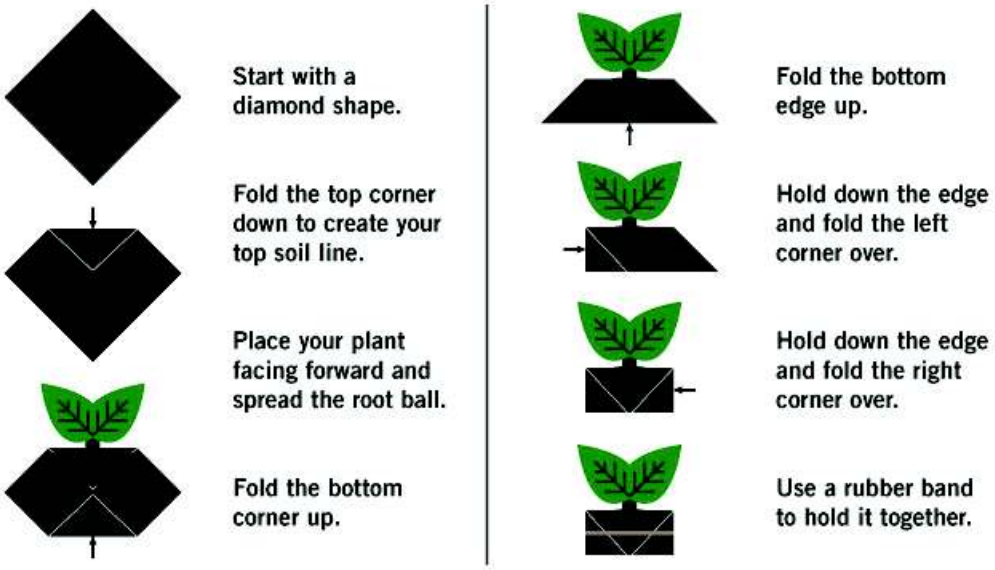
COMBINE PLANTS

Each pocket can be home to many plants clustered together. Create a mini-garden in each pocket. Add cuttings, bulbs and seeds and enjoy seeing what emerges. You might be surprised to discover what thrives in your specific conditions!

BIO-DIVERSE LIVING WALL

It's fun to try many different types of plants to learn what does best in your environment. It's a quick and interesting way to grow a garden that is exquisitely refined for both your sense of beauty and your room. Simply remove the failures and replace with the species that are thriving.

HOW TO USE ROOT WRAPPERS

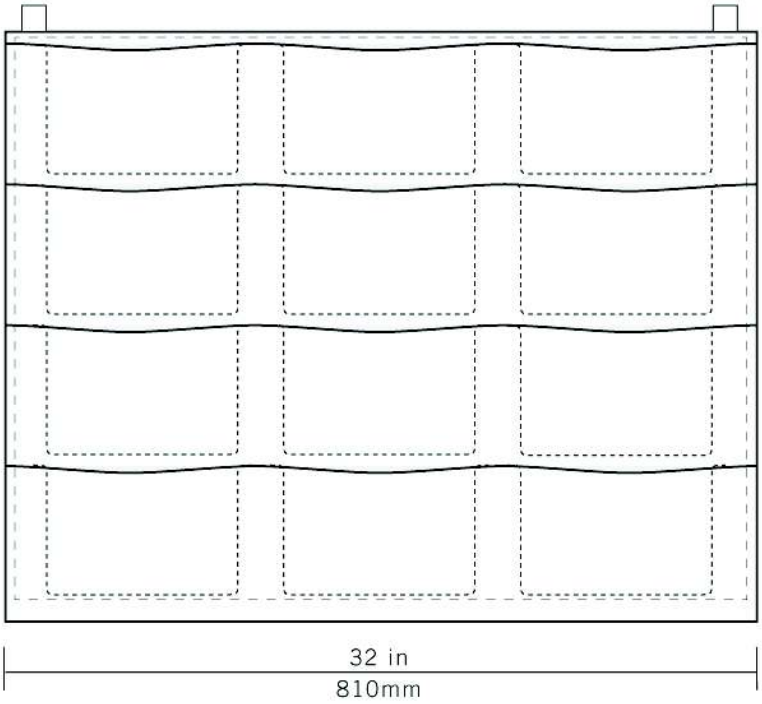


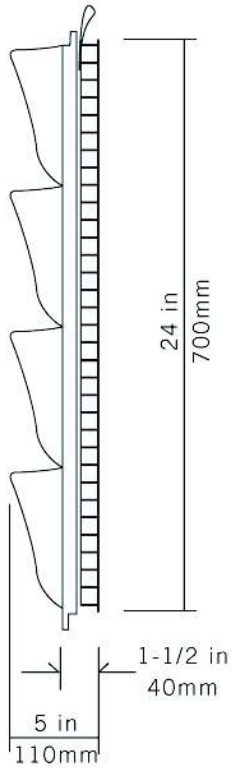
SPECIFICATIONS 12-POCKET VERTICAL GARDEN PLANTER

FLORAFELT
VERTICAL GARDEN PLANTERS

F12 SPEC SHEET

FLORAFELT 12-POCKET VERTICAL GARDEN PLANTER F12





100% RECYCLED P.E.T. PLASTIC FELT POCKETS MOUNTED TO RIGID PLASTIC PANELS

MATERIALS CONTENT

- LIGHTWEIGHT - 1.5 LBS/SF (7.5g/sm)
- PLANTED WEIGHT: APROX. 5 LBS/SF (2.4g/sm)
- MADE FROM INDESTRUCTIBLE, RECYCLED NYLON FELT
- EASY-TO-MOUNT WALL GARDENING SOLUTION
- VERSATILE - MOVE AND CHANGE PLANTS AT WILL

POCKET SIZE
10 in x 6 in x 3 in
250mm x 150mm x 80mm

FELT POCKETS - High tensile strength and resiliency. Superior thermal insulation and acoustical properties (0.66 noise reduction coefficient) - Will not break down or bottom out - Hypo-allergenic - moth-proof; mildew and odor-resistant - contains no irritants or carcinogens. - lightweight and formable.
Passes FMVSS 302.

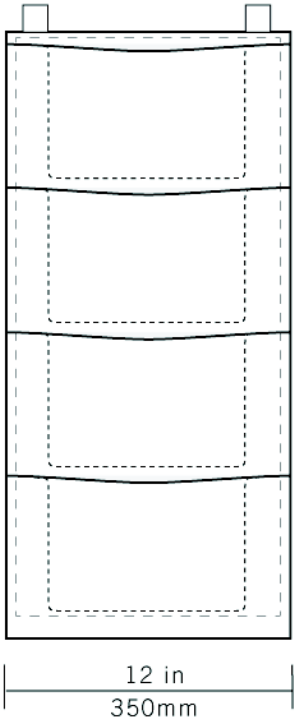
BACKING BOARD - The backing board is a sturdy plastic sheeting extruded from polyethylene (HDPE). Its fluted ribs support both surfaces, making it lightweight, tough and abuse resistant. Additionally, it is both chemical and water resistant, and recyclable.

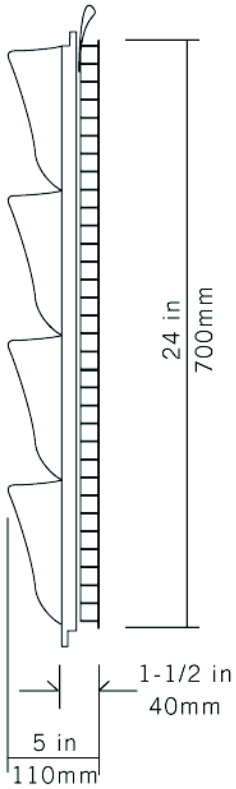
SPECIFICATIONS 4-POCKET VERTICAL GARDEN PLANTER

FLORAFELT
VERTICAL GARDEN PLANTERS

F4 SPEC SHEET

FLORAFELT 4-POCKET VERTICAL GARDEN PLANTER F4





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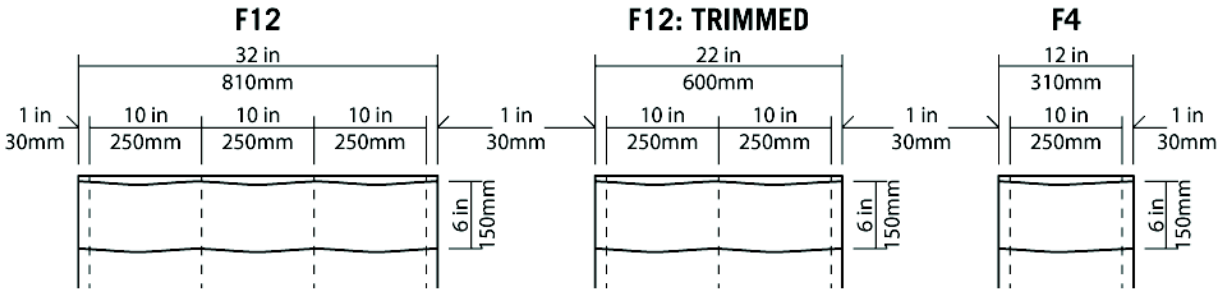
CUSTOM SIZING

FLORAFELT
VERTICAL GARDEN SYSTEMS

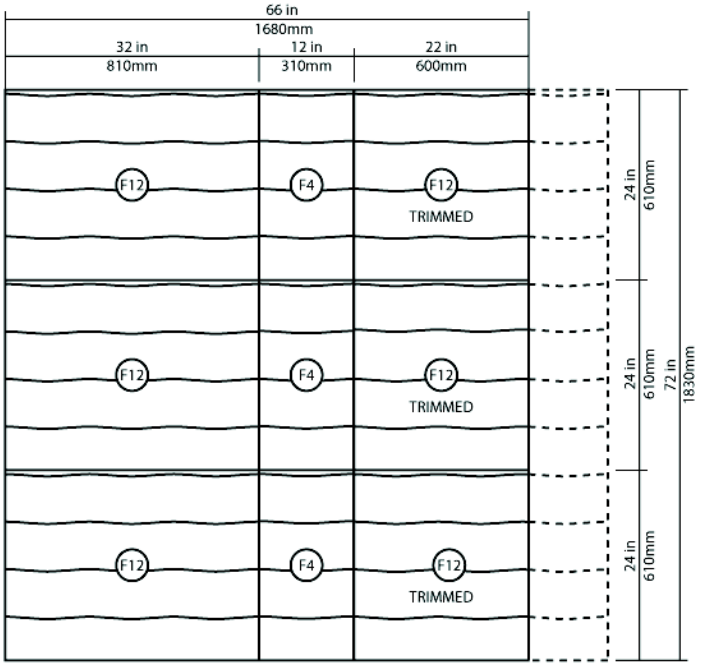
HOW TO TRIM PANELS TO CUSTOM SIZES

Florafelt vertical garden planters come in standard sizes that can be tiled to exact specifications to closely fit any width. The panels can also be trimmed for custom sizes. Our standard pocket size is 10 in wide x 6 in high (.254 m x .152 m). Allow an additional 1 in (.025 m) to each side for attachment staples.



TRIM AND TILE TO CREATE CUSTOM SIZES

Use combinations of the panels to create custom sizes as in the example below.

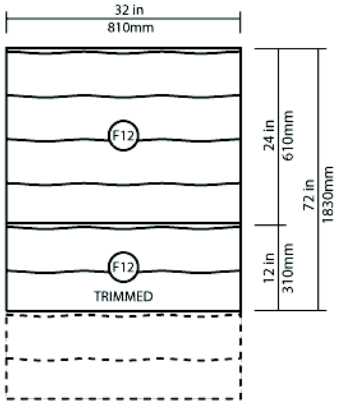


EASY TO TRIM BY HAND

FLORAFELT Vertical Garden Planters can be cut with a utility knife and sharp scissors:

- Place panel felt side down.
- Use a straight edge and utility knife to cut plastic backing board.
- Trim felt using sharp scissors or multiple cuts with a utility knife.

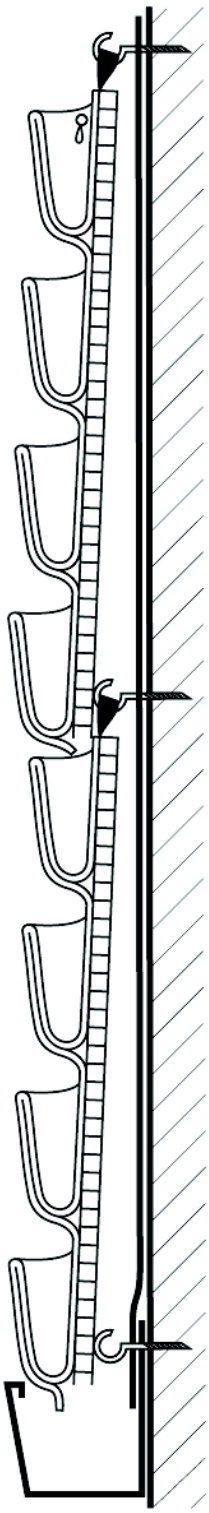
Panels can also be trimmed vertically every 6 in (.125 m) to create more custom sizes.



MOUNTING HANG ON HOOKS

FLORAFELT
VERTICAL GARDEN SYSTEMS

HANG ON HOOKS



A grid of hooks on the wall is a simple way to create a living wall.

The air gap keeps the back dry, while the planters shingle down so that the water drips into the lower felt. Simply water the top row only and the liquid will spread evenly down the wall. It's an ideal method for outdoors - on fences and walls where water is not an issue. For extra safety indoors, use rubber pond liner on the wall. Be sensible. Consult with a licensed architect for structural advice for a large installation and when you are concerned about moisture sensitive areas. Stuff pockets with Root-Wrapped plants to create your living design. Plants will grow out a foot or more, and eventually the felt pockets will simply disappear behind your living wall.

1. Choose a rigid backing like masonry wall, wood fence, or plywood facing.

2. Waterproofing is not necessary for exterior rated surfaces. However, for interior surfaces glue a rubber EDPM pond liner to the wall first.

3. Measure and mark a grid pattern spaced 32 inches across and 24 inches high for each Florafelt 12-Pocket planter. You can vary the width using the Florafelt 4-Pocket planters, which are 12" wide.

4. Install sturdy hooks on the grid marks. If needed, use rubberized sealant where the hook penetrates the rubber membrane.

5. Use the nylon tabs on the top of the Florafelt planters to create the shingle pattern. Adjacent planters can share the hook.

5. Install a drip line in the top row of pockets only. Water will slowly drip down and wick evenly throughout. Connect to an automatic watering timer that runs 30 minutes, twice daily. Adjust as needed.

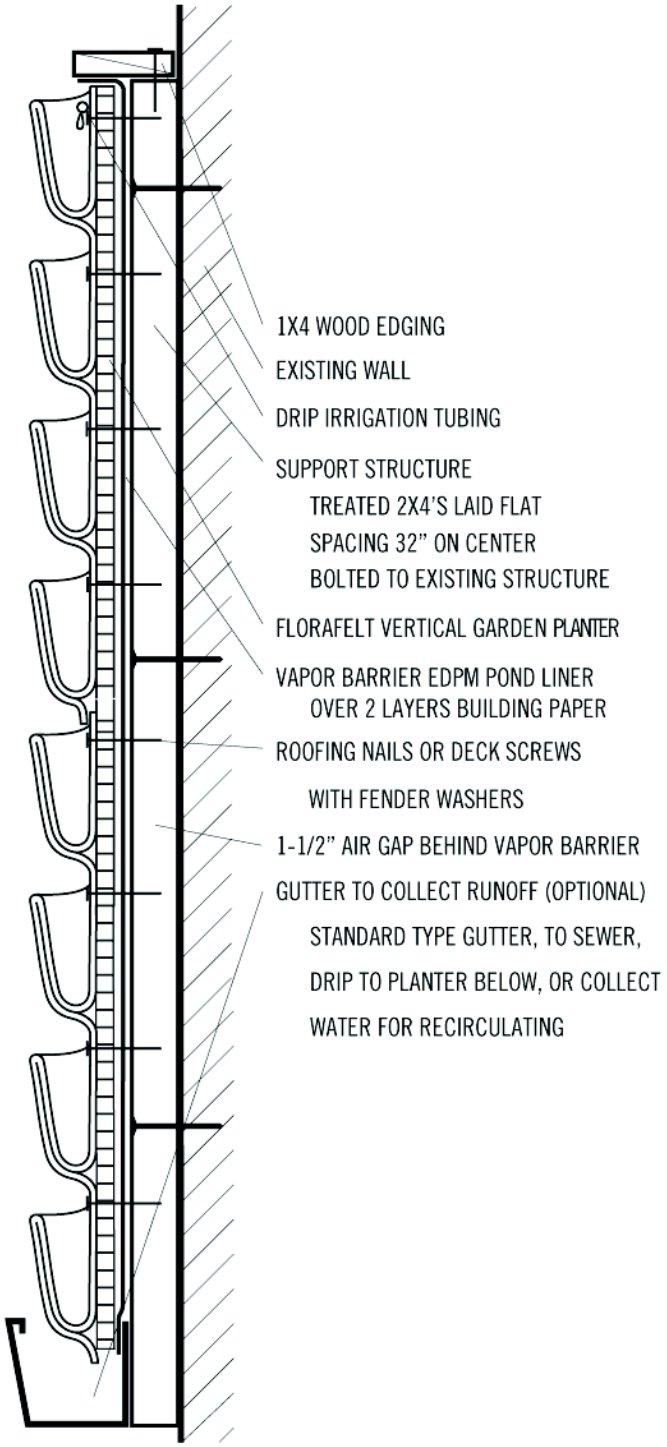
6. Excess water will drip from the bottom, which can water a planter below or be directed, using a rain gutter, to a nearby drain or collection tank to recirculate.

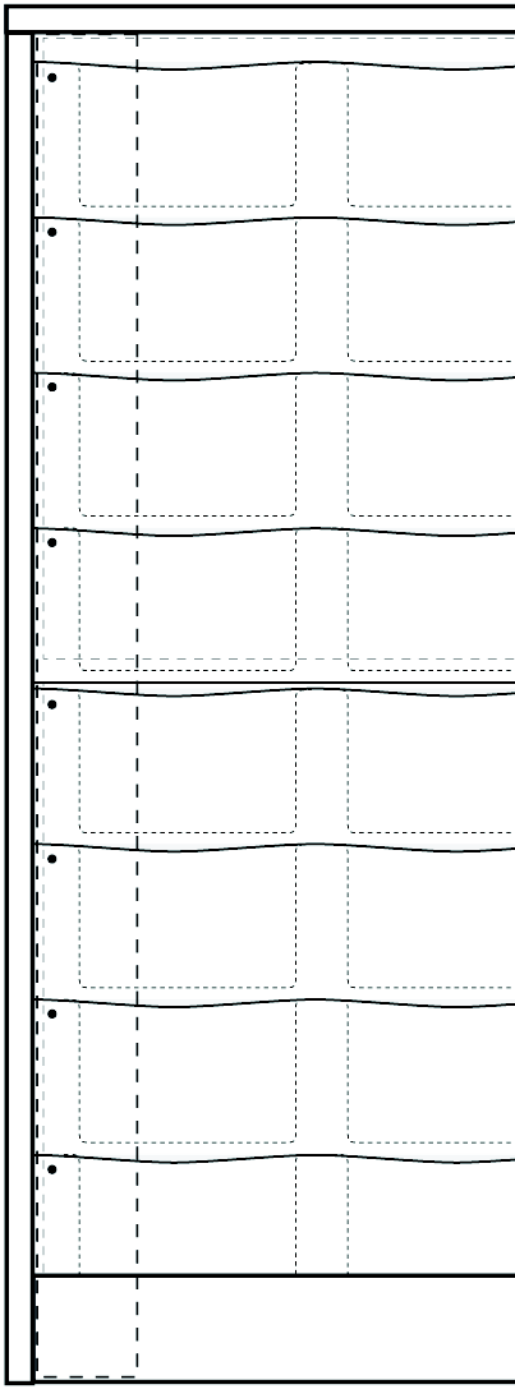
7. (Optional) Build a frame to finish the edges. Leave pond liner long at the edges to make the edges watertight too. Bend up and trim at the frame's front edge.

MOUNTING WOOD FRAMED VERTICAL GARDEN

FLORAFELT
VERTICAL GARDEN SYSTEMS

WOOD FRAMED VERTICAL GARDEN

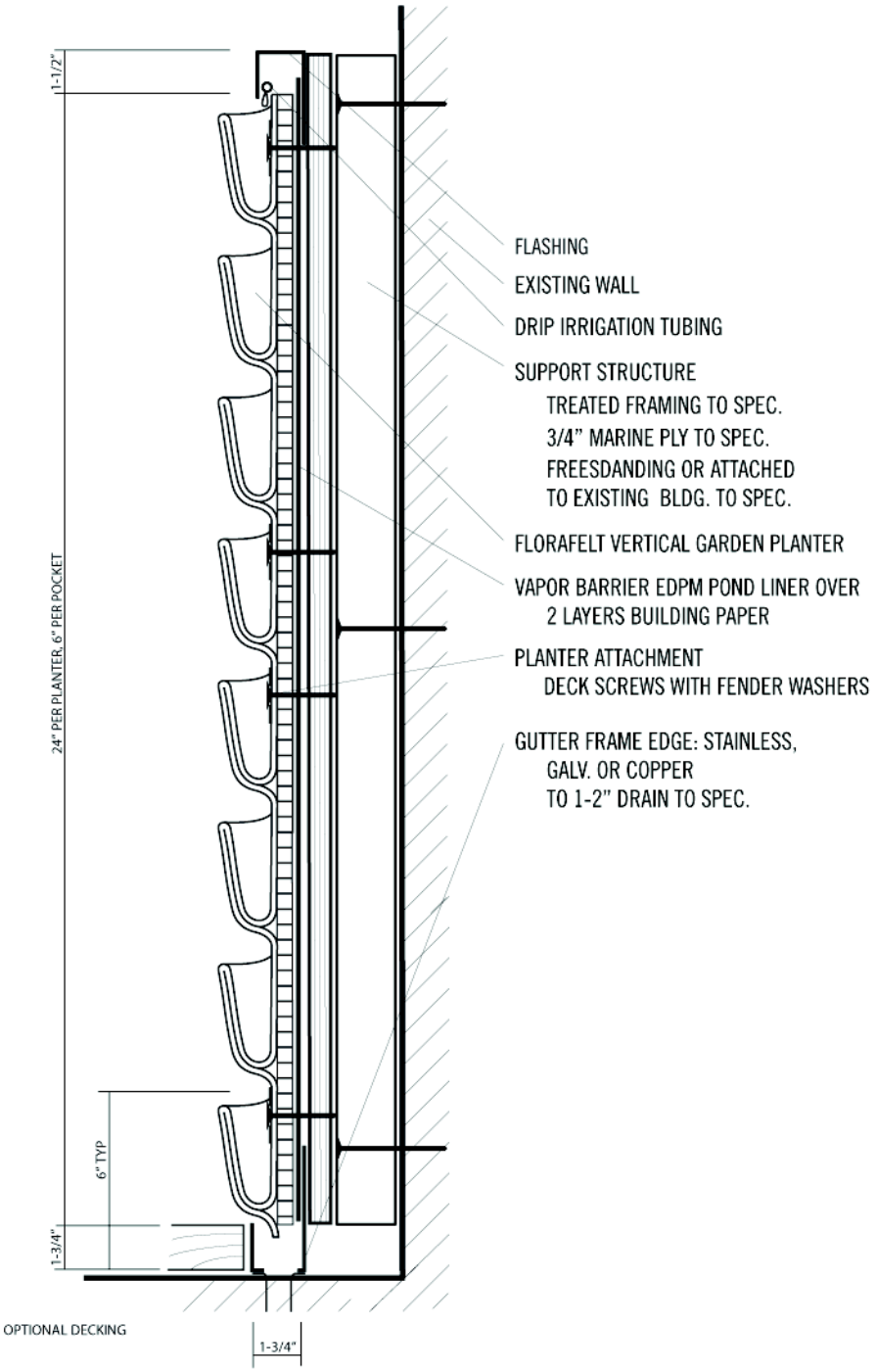




MOUNTING METAL FRAME

FLORAFELT
VERTICAL GARDEN SYSTEMS

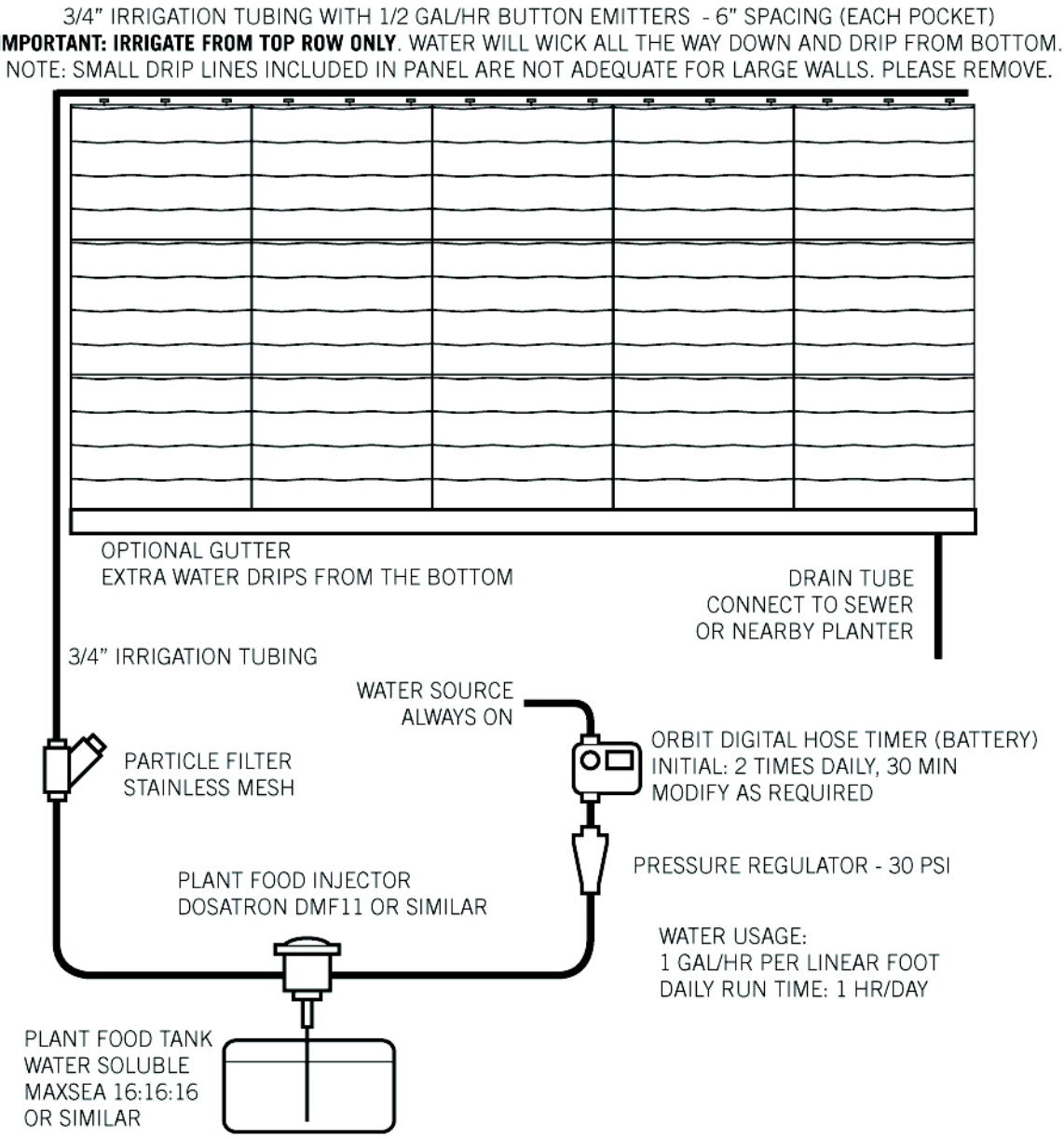
METAL FRAMED VERTICAL GARDEN



IRRIGATION DRAIN AWAY

FLORAFELT
VERTICAL GARDEN SYSTEMS

DRAIN AWAY IRRIGATION



IRRIGATION PARTS

Most of these parts (or similar) are available at your local pro landscape supplier, Lowes or Home Depot, or online through Google Search and Amazon.com.

Hose Splitter - Connect the hose splitter to your faucet. This allows you to have access to your water but also provides an 'always on' connection to your water timer. Be sure the faucet and splitter valve remain open to ensure consistent watering. Consider covering the valves using stretch wrap to prevent accidental shut off.

Digital Hose Timer -The timer uses 2 AA batteries. The Orbit Digital Hose Timer (shown) works best for this application since it allows for 1 minute run times, which reduce water waste. It also allows for 6 hour intervals so you can water 4 times a day, if necessary. We recommend each living wall have it's own independant battery operated timer to insure reliable and easy-to-adjust watering cycles.

Food Injector - The Dosatron DM11F is a water operated unit that adds a specific concentration of food to the system with each watering cycle. It uses water pressure to operate and is designed for low water flow. Venturi injectors can be used for large, high flow systems. Liquid food tanks can be made from 6 inch ABS tube for a thin profile that will be completely hidden among the plants.

Particle Filter - A mesh filter prevents clogs in drip lines. Inline stainless filters provide long service and can be easily flushed clean on a regular schedule. Make sure your particle filter is downstream from your food injector to prevent plant food from clogging your drippers.

Pressure Regulator - The pressure regulator keeps the water pressure low to prevent hose connection blow-outs, and slows the watering rate. Slower watering allows plants to absorb the water, reducing waste. 30 PSI is common for most irrigation applications.

Tubing - ¾ inch irrigation tubing is inexpensive and easy to use. This common type of irrigation is standard for most landscape applications. Slip connectors are quick and easy to install. Garden hose with threaded connectors are extremely easy to use.

Button Drip Emitters - Button emitters come standard in ½ gallon per hour. Barbed connectors are easily punched into the ¾ inch irrigation tubing. Place one 1/2 gallon per hour button emitter at the very top of each pocket row. Make the drip visible for ease of inspection and replacement. If the top edge is sloped, pressure compensating emitters will maintain a consistent drip from top to bottom. Use irrigation emitters at the top row only. Water will wick down the entire wall. Longer and slower watering times allow for more complete water absorption and less waste.

Drain Tray - Extra water will drip from the bottom edge. You can simply let it drain into a planter or garden below, or you can use a small drip tray (2 x 2 inches) to direct the water to a sewer connection, or into a floor drain. Allow the water to drain completely by keep the bottom pocket clear of the bottom of the tray. Tuck the bottom flap into the tray to prevent drips.

Plant Food - We recommend using MaxSea 16:16:16 Seaweed Based Fertilizer. It is a gentle food that can be used for hydroponic feeding and is mostly made from organic nutrients. Organic nutrients are preferred because they encourage active microbiology in the soil and reduce the problem of salt build-up from chemical fertilizers.

CUSTOM DESIGN
Creative problem solving can lead you to unique solutions. Using various fittings the entire system can be enclosed in a stainless steel utility box.

MAINTENANCE SCHEDULE DRAIN AWAY

Daily
- Observe the plants
- Notice if plants look wilted
- Or if they have faded leaves
- Or show rotting bases or browned leaves
- Also notice if they have new buds or have made new roots

Monthly
- Add plant food to the Feeder (Maxsea)
- Notice plant health and adjust water timing if necessary
- Remove dead leaves
- Remove dead plants and replace
- Clear drain of any debris

Every 3 Months
- Clean the filter
- Use ladder to visually check drip emitters

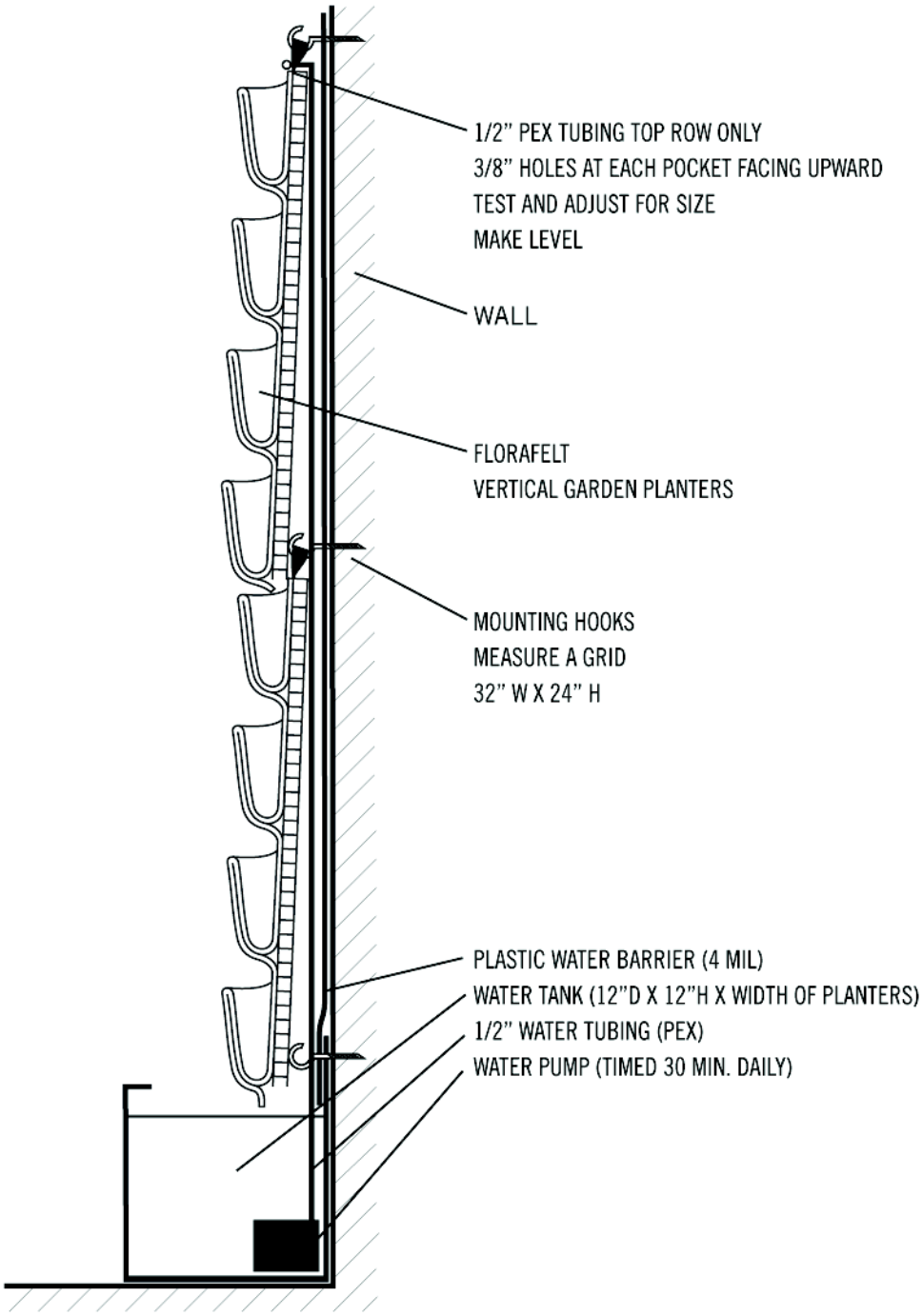
Every Year
- Change the timer battery
- Change out the drip lines

Tip: Use your E-Calendar
- Add these events to your electronic calendar and use the repeated events feature with reminders.
- Copy and paste this info for each frequency listed.

RECIRCULATING SYSTEM WITH BASE TANK

FLORAFELT
VERTICAL GARDEN SYSTEMS

RECIRCULATING SYSTEM WITH BASE TANK



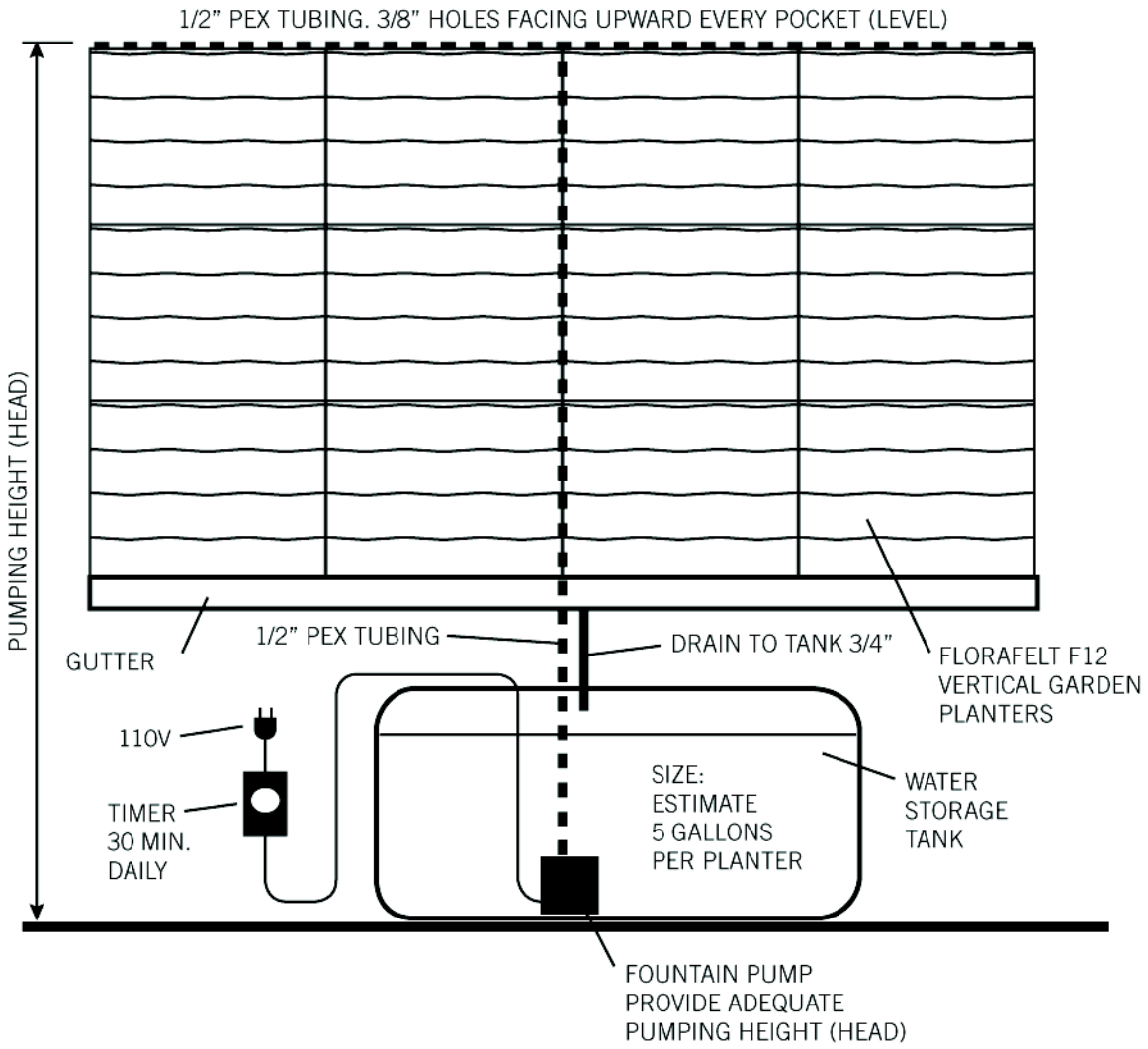
RECIRCULATING SYSTEM WITH HIDDEN TANK

FLORAFELT
VERTICAL GARDEN SYSTEMS

RECIRCULATING SYSTEM WITH HIDDEN TANK

Recirculating systems are required when water source or drain connections are not available.

Water tanks can be along the bottom of the vertical garden or hidden out of sight.



MAINTENANCE SCHEDULE RECIRCULATING

The water tank should be checked weekly and topped off. Do not add water while the unit is on since water will continue to drip from the planter and cause overflow. Wait one hour after the pump cycle or when all water has drained from the felt planter. Tank draining and water replacement is recommended every 4 to 6 months to prevent salt buildup from fertilizers.

Daily
- Observe the plants
- Notice if plants look wilted
- Or if they have faded leaves
- Or show rotting bases or browned leaves
- Also notice if they have new buds or have made new roots

Weekly
- Top off water tank. Do not add water while pump is running.
- Add plant food to the tank (1/4 tsp Maxsea)

Monthly Tasks
- Notice plant health and adjust water timing if necessary
- Remove dead leaves
- Remove dead plants and replace

Every 3 Months
- Empty tanks and replace water
- Clean pump and check water flow

Tip: Use your E-Calendar
- Add these events to your electronic calendar and use the repeated events feature with reminders.
- Copy and paste this info for each frequency listed.

ABOUT THE INVENTOR CHRIS BRIBACH

Chris Bribach planting a fully filled in fern wall for a private home in Los Altos Hills, California.

My love of architecture resulted in the fortunate opportunity attend and receive a 5 year bachelors degree from SCI-ARC in 1992. The school was located blocks from Frank Ghery's office, where ideas for an organic future were just beginning to blossom.

I was excited about organic ideas in architecture and created chaos sculptures made from many pieces of building elements connected in a free-form structure. I assembled the pieces in what seemed chaotic designs, but the goal was to create a redundantly efficient organic space frame. Similar to how a bird builds a nest, I wanted the assembly to become a process that organically helped create the scope and shape. On the human scale, I created what I called 'performance architecture' where the audience would create their own experience resulting in a structure.

The act of creating space with the materials at hand, quickly and efficiently, is how ancient people built dwellings. Nomadic communities living in harmony with their environment for thousands of years used very little to build comfortable homes. By passing down this knowledge, a rich architecture evolved that was sensitive to the environment and made efficient use of local materials.

The massive industrial urban centers of today are plagued with paved and roofed surfaces that require enormous amounts of energy to create and maintain. I wondered why buildings can't be covered with living foliage to cool interiors, prevent decay and even grow food.

In 2008 I turned to the work of the visionary artist Patric Blanc who began growing vertically in the 1970s using his home fish aquarium. Replicating the natural growth along cliffs and sloping surfaces, he created beautiful vertical gardens using nutrient water that flows over synthetic felt. Excited by the potential, I explored the slit-and-staple method Patric offered in his book, The Vertical Garden, where he removes almost all the soil when planting. It quickly became clear that a mastery of botany would be required to provide proper water and nutrients hydroponically. Finding this far too difficult for the rest of us, I simplified the concept by pleating the felt and stapling it to a lightweight non-toxic plastic board to create easily plantable pockets. I wrote and was granted a patent for the 'Vertical Garden Panel' filed Sep. 2, 2010.

I am committed to the use of sustainable manufacturing methods that I learned from William McDonough's book, Cradle To Cradle, so I worked with manufacturers to develop a synthetic growing medium I called Florafelt. Made from 100% recycled P.E.T. plastic bottles, it is considered food-safe and will not only last indefinitely but can be re-melted to create other products.

Florafelt Vertical Planters are proudly made in the USA from materials also made in the USA. Our team assembles planters and systems for customers throughout the world.

There's nothing like the joy you feel when you fill a wall with plants.

Sincerely, Chris Bribach

• Inventor of the Vertical Garden Panel, US Patent 8141294
• CEO and Founder of Florafelt Corporation and Plants On Walls