

# HOW DOES CERES APPLY PRINCIPLES OF QBD?



## BUILDING MATERIALS

We use the highest quality materials constructed to withstand local year-round climates.



## WORKFLOW

Greenhouse layout is designed to account for directional movement of plants and people, while simultaneously engineered for the flow of air and water.



## DATA ANALYSIS

Controls are integrated for balancing and exact manipulation of CO<sub>2</sub>, VPD, soil temperature, light levels, temperature and humidity, air quality, nutrient levels, etc.



## SYSTEMS SELECTION & INTEGRATION

Grow systems are carefully selected for built-in quality, ease of integration, and client need.



PRODUCT/  
PROCESS DESIGN

**QUALITY  
BY  
DESIGN**

PRODUCT/  
PROCESS IMPROVEMENT

## WHAT IS QBD?

Quality by Design (QbD) is a design approach with a focus on building quality into the original product. A product can be defined as a good, service, information, or an internal process.

## CERES & QBD

Beyond just the greenhouse structure, we provide a complete grow solution, working with our partners to supply and integrate all necessary equipment. We also do all Mechanical, Electrical, Plumbing, and Structural engineering, ensuring that the facility functions as a single unit (as opposed to many individual parts).

## ADVANTAGES OF QBD

- Product Consistency
- Risk Management / Minimal Crop Failure
- Effective Control of Change
- Return on Investment / Cost Savings
- Supports Good Manufacturing Practices Principles

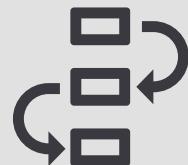
## QBD DESIGN CONSIDERATIONS:

- Biosecurity
- Workflow
- Environmental consistency
- Measurability
- Manufacturing efficiency

As a turnkey solution for optimal grow-environments, we have adapted the guidelines of QbD to our design process. We believe building a better product, service, or system starts with defining the appropriate goals and carries through to the delivery of the end product. Every step of our process is thoughtfully designed for maximum quality and client satisfaction.

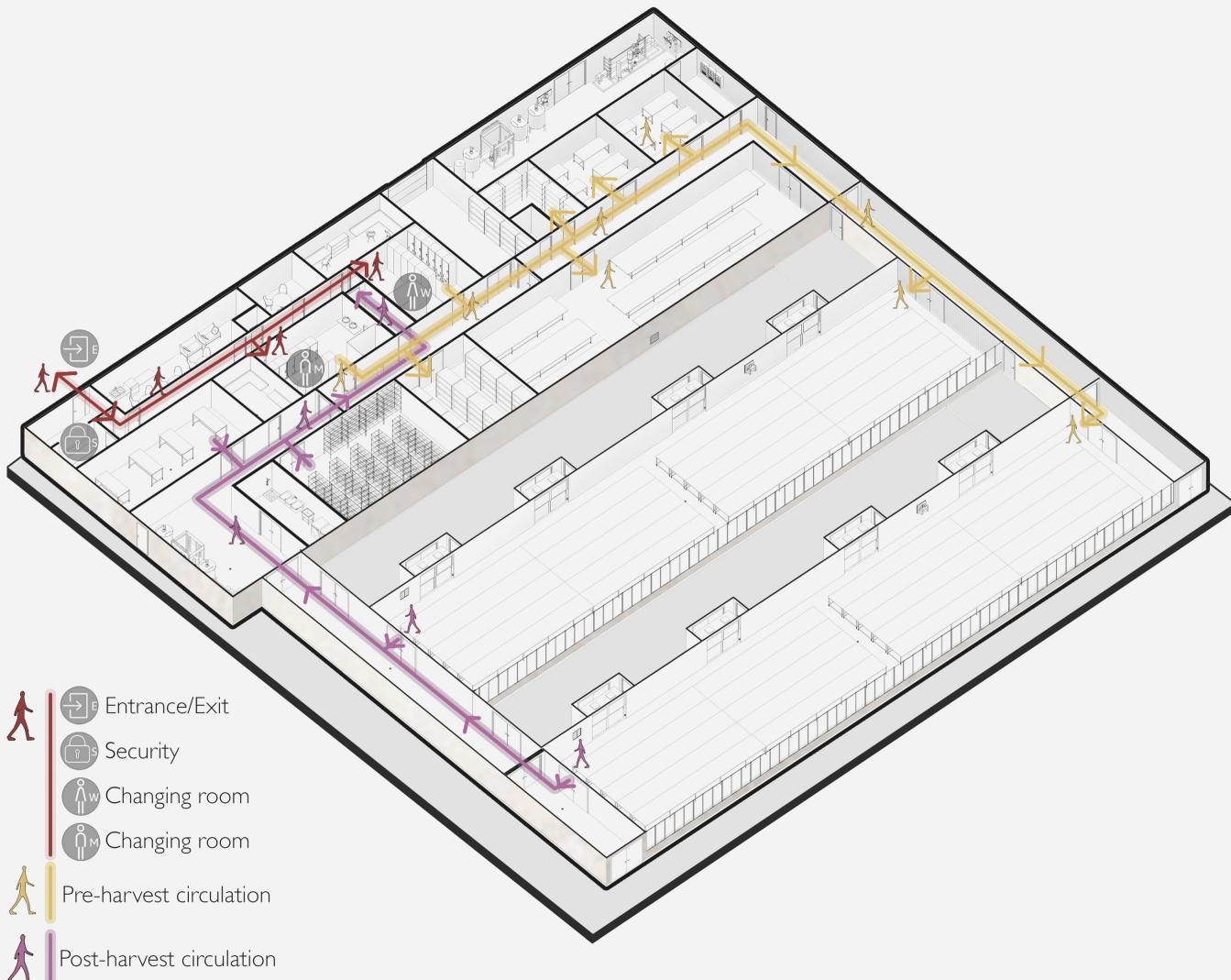
## WHAT IS "WORKFLOW"?

Directional flow through the greenhouse



# WORKFLOW: PEOPLE FLOW

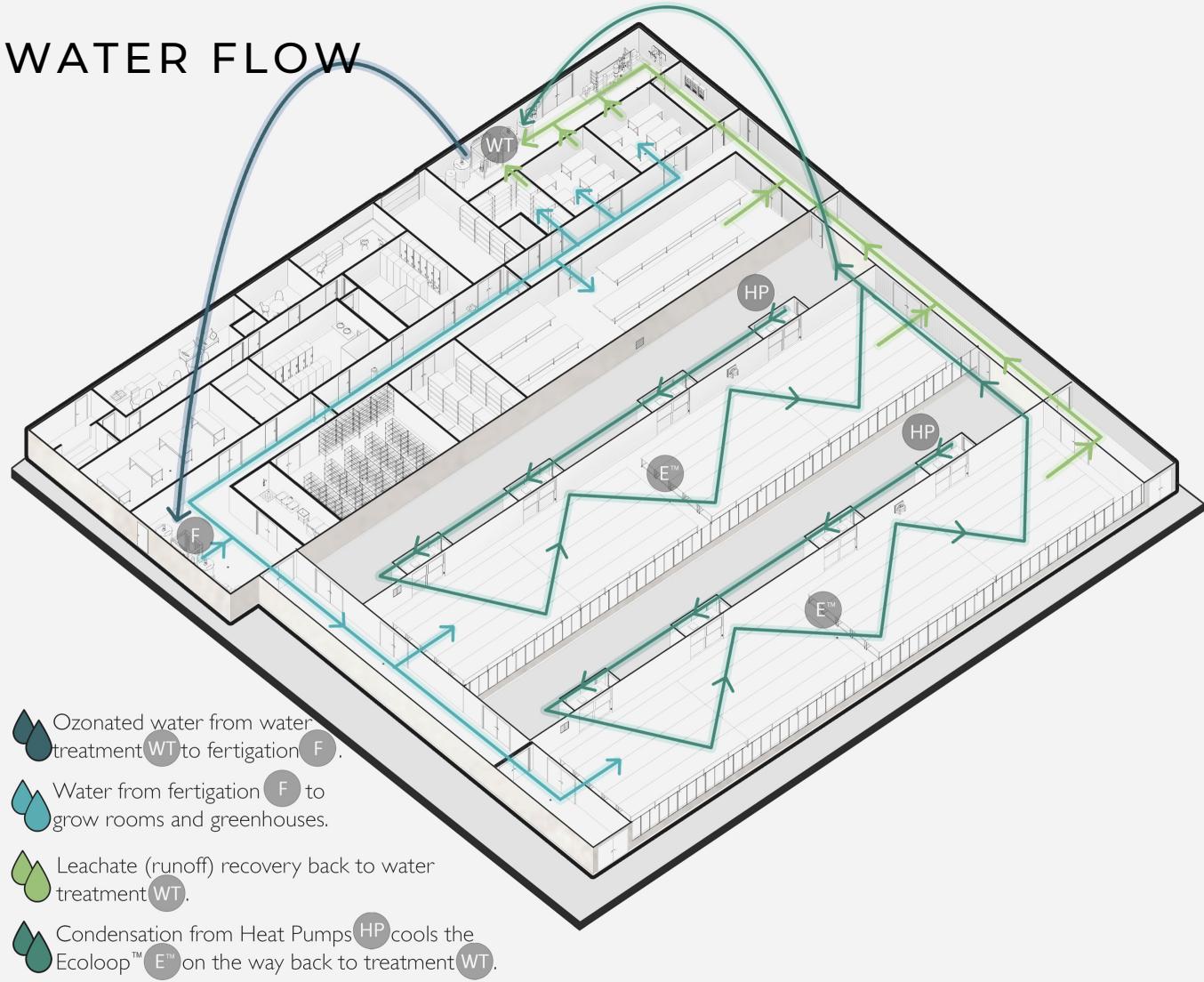
- From main entrance/security, access office or conference room, or If heading to a grow room then moving through changing room/bathroom is required.
- Changing and washing required (i.e. uniform, hairnet, footnet, beard-net) per facility requirements.
- From changing room, access to mother rooms, clone room, veg rooms and greenhouses (from the east side) permitted.
- People flow in same direction as plants (so pathogens cannot travel back to mothers, clones, or veg).
- Entrances to greenhouses are located on east side of greenhouses (pre harvest circulation).
- Exits are located on west sides, (post harvest circulation).
- Access to curing and trimming rooms located through west corridor.
- Exits from these rooms lead back through exit hallway to either exit the facility or re enter again after another cleaning and changing.



## WORKFLOW:

- From primary tank, water flows into ozone treatment (or other filtration), where filtered to remove solid particles before ozone kills biological elements from water. Treated water available in holding tanks.
- Fertigation system mixes precise recipe of ozonated water plus nutrients and sends it to plants in a specific room or greenhouse. If there is effluent (leachate) or runoff from watering process it is recaptured and pumped back to headhouse.
- Dehumidifiers collect plant transpiration, capturing up to 90% of transpired water. This water is cold and distilled.
- In EcoLoop™ applications the cold water is used to cool soil, assisting EcoLoop™ with cooling by increasing efficiency (allowing heat pumps to work less).

## WATER FLOW



- From dehumidifiers, (or under the greenhouse if using EcoLoop™) water is pumped back to headhouse
- Recaptured water is run through ozone water treatment again.
- As nutrients are not stripped from water during treatment, less nutrients are needed in fertigation system.



# WORKFLOW: PLANT FLOW

- Cut clones (from mother room) enter cloning room,
- Once clones are rooted they move to veg room.
- When plants are large enough for the greenhouse they move down the east hallway.
- Veg room plants exit the east side directly into the clean greenhouse supply corridor.
- When the flowers are mature in approx 8 weeks, plants are harvested and exit greenhouse on the west side (through post harvest corridor).
- They are hung in the dry/cure room for around a week, then they move to trim room for processing.
- From here they move into secure storage.
- Plants move in only one direction (the same as the people), for general efficiency.

- Directional flow reduces likelihood that pests and pathogens will infect what is directionally behind them, making potential outbreaks less likely and more manageable.

