

Quality is more than a word

ESPEC

# Walk-in Test Chambers

Panelized & Solid Construction



ESPEC NORTH AMERICA, INC.

# ESPEC's Custom Design Walk-ins Deliver the Chamber Performance and Size You Need

Walk-in chambers are complex systems that can push the limits of lab space and utilities—ESPEC works to design a system that suits our clients' test requirements.

From concept...

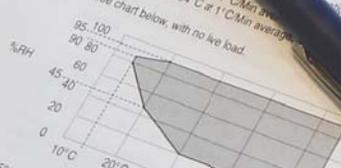


| REVISION | PREPARED BY  | DATE |
|----------|--------------|------|
| A        | 08/24/12 TJE |      |
| B        | 10/01/12 TJE |      |
| C        | 11/12/12 TJE |      |
| D        | 5/9/13 TJE   |      |
| E        |              |      |

| Product Name                                   | Model | Drawing No. | Spec. No. | Scale |
|--|-------|-------------|-----------|-------|
| WALK-IN TEMPERATURE AND HUMIDITY SPECIFICATION |       |             | 3213629   | 1/4   |

1. Temperature Control System  
 2. Performance  
 3. Temperature Range  
 4. Humidity Performance  
 4.1. Temperature Performance  
 4.1.1. Temperature Performance  
 4.1.2. Temperature Range  
 4.1.3. Temperature Fluctuation  
 4.1.4. Temperature Gradient  
 4.1.5. Temperature Transition Times  
 4.2. Humidity Performance  
 4.2.1. Humidity Range  
 4.2.2. Humidity Fluctuation  
 4.2.3. Humidity Gradient  
 5. Air Flow  
 5.1. Dimensions  
 5.1.1. Exterior



| DATE    | TITLE           |
|---------|-----------------|
| 9/24/12 | CHAMBER CONCEPT |

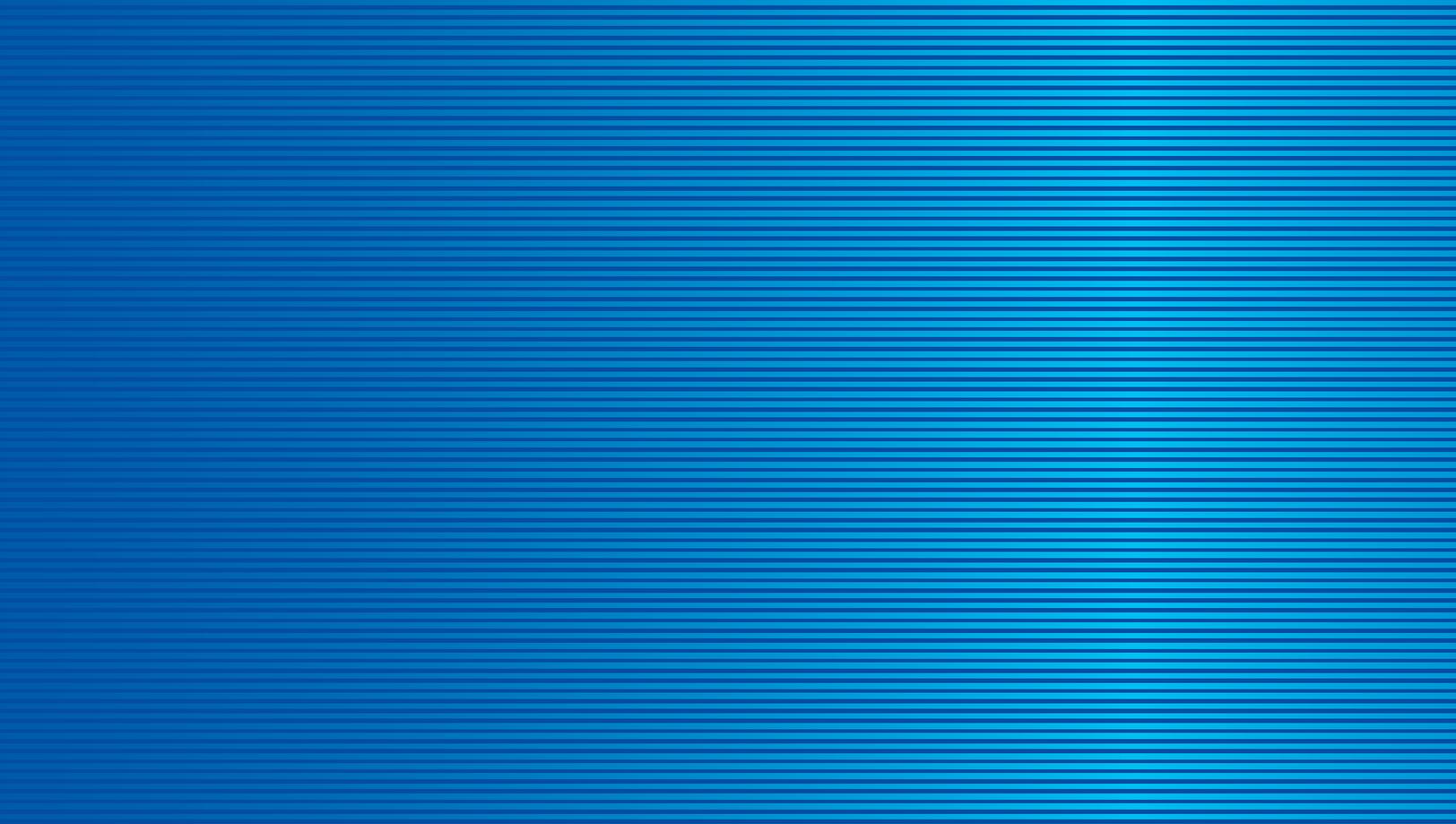
  

| DESIGNED BY | SCALE  | MODEL NO.     | REVISION |
|-------------|--------|---------------|----------|
| EWC         | 1:1/20 | EWSH7020-25CA |          |

| DRAWING NO.   | UNITS  | REVISION |
|---------------|--------|----------|
| C-3213629-001 | INCHES | C        |

ESPEC NORTH AMERICA, INC.  
 4141 Control Parkway  
 Hudsonville, MI 49426



...to reality

...to reality  
...to 5 micron or less.  
... (10mm) barb.  
... over structural steel frame.  
... Instrument  
7.1.4 Interior  
7.1.5 Insulation

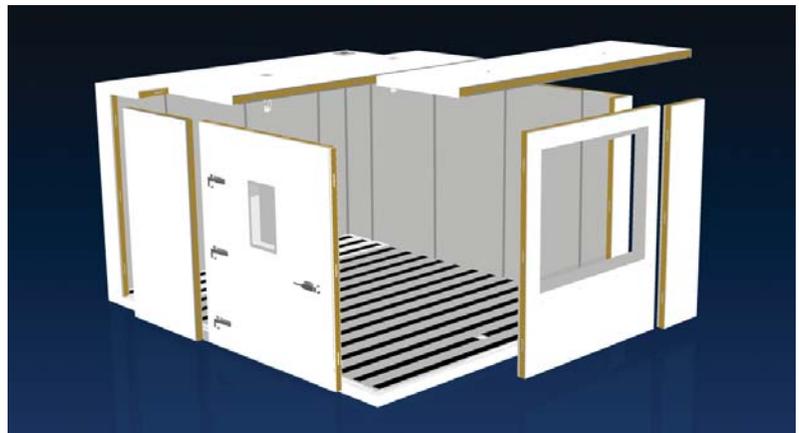
# Panelized Construction



## Most popular walk-in type

Panelized chambers are built with interlocking insulated panels, making construction of any size with few troubles regarding move-in. See page 9 for an example of a extremely large drive-in chamber built with panels.

- Standard sub-assemblies for quick delivery and lower cost
- Quality panels manufactured to ESPEC standards
- Standard multi-layer heated window in door(s)
- Operation allowable to 85°C (75°C in humidity mode)
- Temperature change rates to 10°C/m.



Panels are easy to move-in and assemble. Tongue and groove assembly is held together with cam-latches and silicone sealant. Embedded metal banding links the cam-latches together, creating a secure, strong unit when completed.

## Flexibility

The panels used in our chamber are 4" (100mm) thick urethane-foam sandwiched between a stainless-steel interior wall and a coated-steel exterior. An assembled box is self-supporting, so that no heavy structural members are required. Our conditioning MAP (see page 10) simply rolls-up to an assembled box to complete installation.

Different door sizes, access ports, and other modifications are possible.

## Flooring upgrades

The standard insulated panel floors can handle typical foot-traffic and distributed loading, but can be deformed by carts and large loads. For this reason, ESPEC offers medium-duty flooring. The heavy-duty floor is an ESPEC specialty that can support extreme loads while still effectively insulating the chamber.

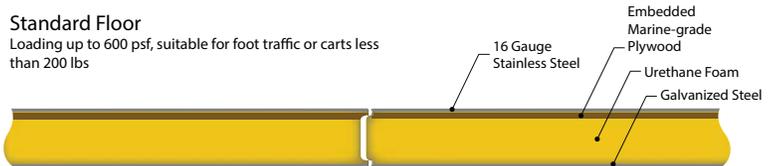
## Steady-state options

For clients with steady-state or light-duty testing, ESPEC can offer coated-steel interior for cost savings, as well as the possibility of dropping the need for an insulated floor.



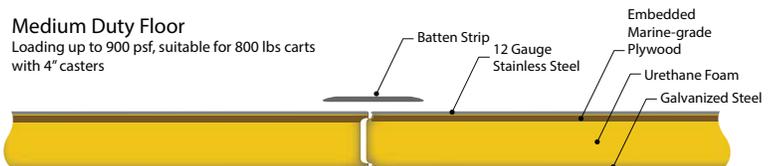
### Standard Floor

Loading up to 600 psf, suitable for foot traffic or carts less than 200 lbs



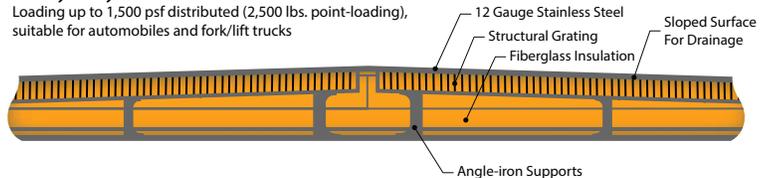
### Medium Duty Floor

Loading up to 900 psf, suitable for 800 lbs carts with 4" casters



### Heavy Duty Floor

Loading up to 1,500 psf distributed (2,500 lbs. point-loading), suitable for automobiles and fork/lift trucks



## COMPUTER SERVER TESTING APPLICATION

A major computer manufacturer required a walk-in chamber to test several racks of servers at the same time. A full load of servers can generate over 10 kilowatts of heat, which can cause problems with uniformity, so ESPEC recommended a ceiling air plenum to distribute the air. The high heat also dictated that humidity generation be boosted with a atomizing vapor system.

Because the servers could not be immediately turned off in the case of an alarm, a ventilation system was added to ensure the interior did not overheat. The chamber also was designed to accommodate wiring and supports for the server racks.



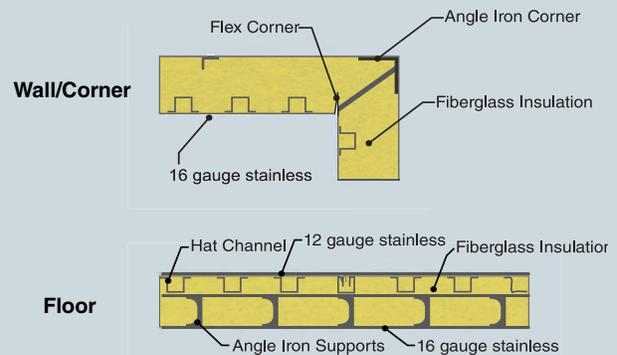
# Solid Construction



## Widest range, most customizable

Solid construction walk-ins can go up to 150°C, accommodating extreme test conditions that panelized chambers cannot. Solid chambers are also needed for temperature cycling faster than 10°C/m.

- High temperature range to 150°C
- Custom high temperature range to 300°C
- Extended humidity range to 85/95%
- Full-opening doors
- Stronger standard floor, (600 lbs./sq. ft. static loading, carts up to 800 lbs.)
- Rigid frame for strength
- Stainless steel interior is hermetically welded



An angle-iron outer frame supports the inner chamber and insulation space. The walls are reinforced with hat-channels.

Metal-to-metal connection between the frame and chamber is minimized, keeping chamber temperature extremes from being transmitted to the exterior.

## Heavy-duty construction

Solid construction is preferred when structural strength is needed such as: placement over a shaker, external equipment, or special interface ports. The standard full-opening door(s) is also desirable for loading large test loads.

Because they usually ship in one piece, solid walk-ins can be more challenging to move in, but much easier to install, as no assembly is required except to attach the conditioning MAP unit.

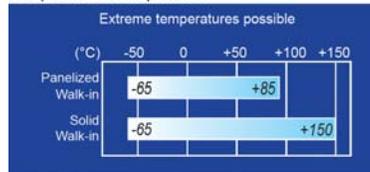
## Expanded performance range

The use of fiberglass insulation allows solid chambers to go to 150°C or more without any risk of damage. Hermetically-welded seams ensure no leakage of moisture to the insulation during high humidity testing.

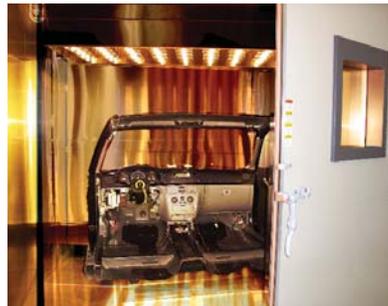
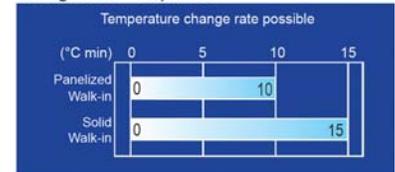
The heavier-gauge interior walls and reinforcements allow the chambers to withstand extreme temperature changes of 15°C/m. or more. Reinforcement is important because fast changes of temperature can quickly expand or shrink the air, pushing or pulling on the walls. A pressure-relief port also is included to stabilize pressure in the chamber.



Temperature Comparison



Change Rate Comparison



Automotive test application



Custom floor for cube shaker

## APPLICATION FOR SOLAR PANELS

The IEC (International Electrotechnical Commission) established environmental testing methods for solar panels that include operation at 85°/85%, thus requiring solid construction chamber. The size and number of solar panels being tested at one time benefits from full-opening doors and heavy-duty floor construction.

Because the MAP conditioner is separated for shipment, these units can be more easily shipped to countries where solar panels are being manufactured.



# Drive-in Chambers

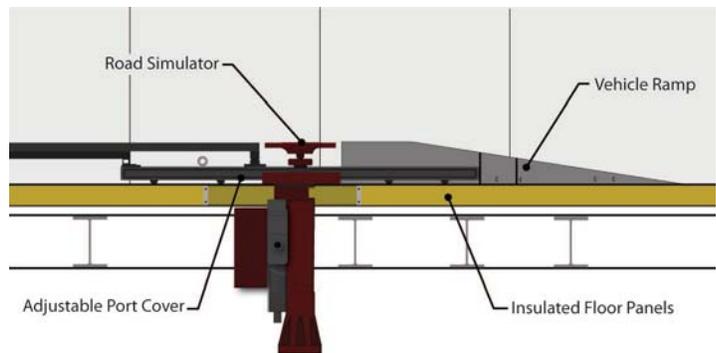


## Custom systems for vehicle testing

Environmental testing of automobiles requires additional consideration of the facility where the chamber will be installed, and its planned use. Test methods for vehicles can include additional conditions besides temperature and humidity in an attempt to simulate real-world conditions.

Drive-in chambers include:

- Heavy-duty flooring to support vehicles
- Large doors
- Special MAP system with larger refrigeration and additional airflow capability.
- Customization to suit additional test requirements



Four-post road vibration simulators can be combined with a drive-in chamber to create a harsh environment for accelerating the development of squeak, buzz, and rattle problems with full vehicles. The chamber's custom floor adjusts with the simulator, allowing for different wheelbase vehicles.

## Custom built chambers

Drive-in chambers are typically built using panelized construction, but can use solid construction if testing requirements demand it. ESPEC customizes each drive-in to include features to suit the client's simulation requirements.

## Additional testing conditions

### Chassis dynamometer or four-post road simulator:

ESPEC builds special floor interfaces to allow use of these additional types of equipment supplied by other vendors.

### Infrared lighting:

ESPEC builds infrared systems to create radiant surface heating of vehicles to look for deformation and other quality problems. These systems can be adjusted vertically and angled to ensure even coverage.

### Running vehicle:

From cold-start to high-heat stress, a running engine is a common need, but complicated requirement.

Fresh air must be conditioned and introduced to the chamber to make up for that used in combustion, and exhaust must be safely removed from the chamber.



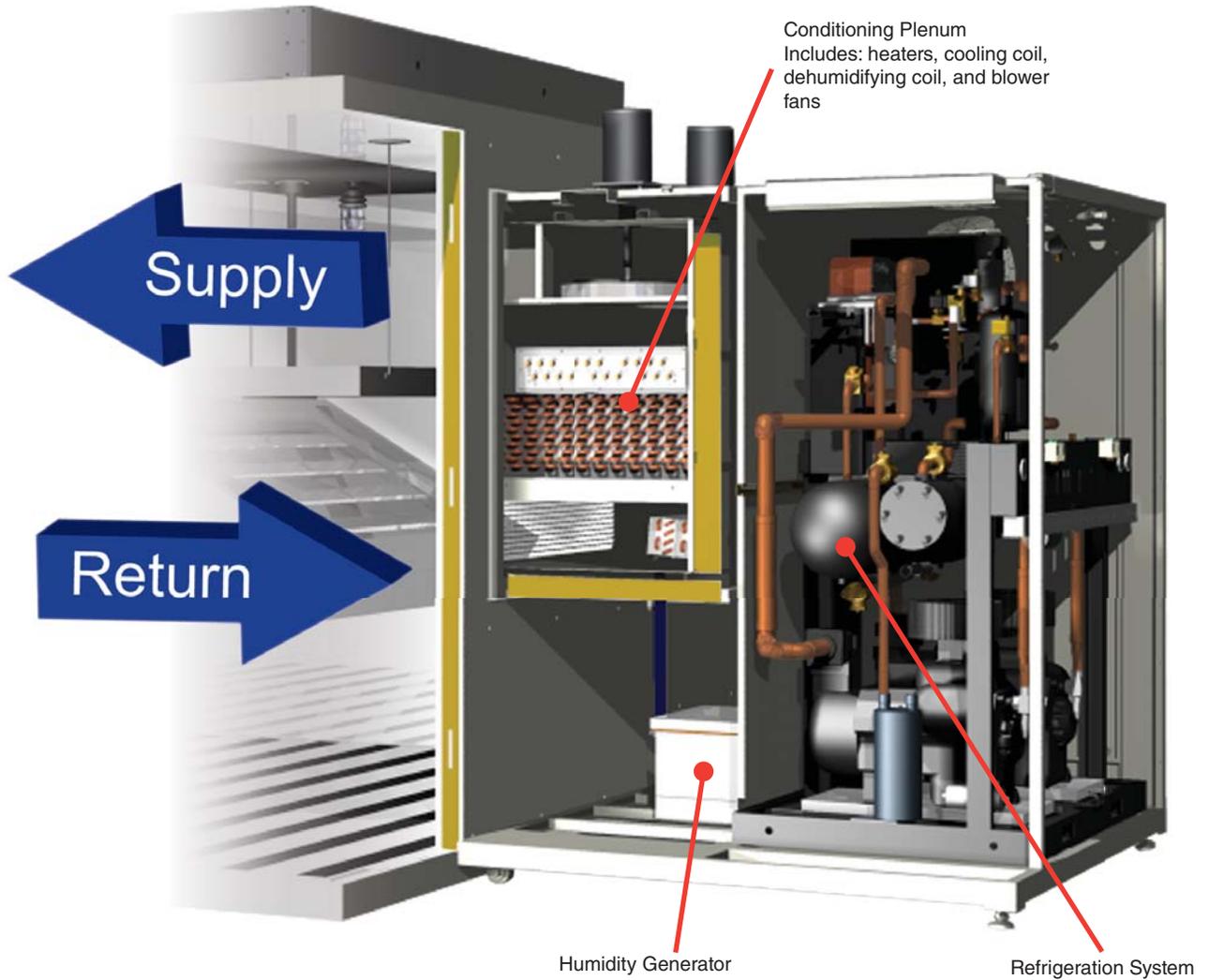
## GENERAL PURPOSE DRIVE-IN APPLICATION

A tier-one automotive supplier needed a drive-in large enough to hold two vehicles at a time, one preconditioning, the second under mechanical durability stress.

ESPEC designed a chamber to suit their available space, with a heavy-duty floor built into a recess in their lab floor, for flush loading of vehicle without needing a ramp. Bright halogen lighting was included to ensure easy observation of the testing from outside the chamber, via any of the multiple insulated windows.



# Modular Air Plenums



## Temperature (and humidity) conditioning systems

ESPEC standard air conditioning systems are called Modular Air Plenums (MAP). These MAPs are designed with the proper heating, refrigeration, and humidity control to achieve your desired performance and capabilities. The MAP simply rolls-up to a solid or panelized chamber to complete installation.



Reliable environmental control systems on ESPEC chambers are the result of standardized engineering, hand-built craftsmanship, and strict quality control.



MAP I



MAP II



Stability MAP

## Standard systems

ESPEC has four standard MAP sizes to suit different needs. Our application engineers will select the MAP type to fit the refrigeration and heating necessary. Humidity control systems are included when required.

- MAP I - Two blower fans and larger C-frame refrigeration
- MAP II - Two blower fans and compact refrigeration
- Stability MAP - Two smaller fans and minimal refrigeration for steady-state applications
- Drive-in MAP - Three blower wheels and larger C-frame refrigeration (not shown)

## Quality features

- One-piece shaft, direct-drive blowers
- High-volume humidity generators with easy maintenance
- Copeland brand compressors (Scroll or Discus)
- Easy access for refrigeration servicing
- Hinged service panels
- Water or air cooling (see page 15)
- Low sound levels

## INSTRUMENTATION AND CONTROL

Operation of the MAP is controlled by the ESPEC P-300 touch-screen controller. The controller is installed in a console that can be installed next to the chamber door for easy access.

Instrumentation features:

- Three levels of overheat protection
- Running time meter
- Audible alarm
- USB upload / download test profiles and data
- Event relays for interfacing with additional test equipment

ESPEC control systems include a 'specimen power' relay which should be used to interlock any powered test samples with the chamber. In the event of a chamber alarm or shut-down, the samples will also be turned off. Otherwise damage may occur because the chamber will heat-up due to the samples running.



The equipment specifications on these pages are for general reference only. Please submit a request to your ESPEC sales representative or at [espec.com](http://espec.com) for a complete system specification for a chamber to meet your requirements.

### Panelized Chambers

| Model  | Interior Volume              | Interior Dimensions * (WxDxH)             | Exterior Dimensions † (WxDxH)          |
|--|------------------------------|---|--|
| <b>9' Height Interior (also available in 10' height)</b> |                              |   |  |
| EPB279   | 279 cu. ft.<br>(7.9 cu. m)   | 61" x 84" x 94"<br>(155 x 212 x 238 cm)   | 6' x 8' x 9'<br>(1.8m x 2.4m x 2.7m)   |
| EPB355   | 355 cu. ft.<br>(10.1 cu. m)  | 61" x 107" x 94"<br>(155 x 270 x 238 cm)  | 6' x 10' x 9'<br>(1.8m x 3.1m x 2.7m)  |
| EPB431   | 431 cu. ft.<br>(12.2 cu. m)  | 61" x 130" x 94"<br>(155 x 330 x 238 cm)  | 6' x 12' x 9'<br>(1.8m x 3.7m x 2.7m)  |
| EPB384   | 384 cu. ft.<br>(10.9 cu. m)  | 84" x 84" x 94"<br>(212 x 212 x 238 cm)   | 8' x 8' x 9'<br>(2.4m x 2.4m x 2.7m)   |
| EPB489   | 489 cu. ft.<br>(13.8 cu. m)  | 84" x 107" x 94"<br>(212 x 270 x 238 cm)  | 8' x 10' x 9'<br>(2.4m x 3.1m x 2.7m)  |
| EPB594   | 594 cu. ft.<br>(16.8 cu. m)  | 84" x 130" x 94"<br>(212 x 330 x 238 cm)  | 8' x 12' x 9'<br>(2.4m x 3.7m x 2.7m)  |
| EPB623   | 623 cu. ft.<br>(17.6 cu. m)  | 107" x 107" x 94"<br>(270 x 270 x 238 cm) | 10' x 10' x 9'<br>(3.1m x 3.1m x 2.7m) |
| EPB757   | 757 cu. ft.<br>(21.4 cu. m)  | 107" x 130" x 94"<br>(270 x 330 x 238 cm) | 10' x 12' x 9'<br>(3.1m x 3.7m x 2.7m) |
| EPB891   | 891 cu. ft.<br>(25.2 cu. m)  | 107" x 153" x 94"<br>(270 x 388 x 238 cm) | 10' x 14' x 9'<br>(3.1m x 4.3m x 2.7m) |
| EPB1024  | 1024 cu. ft.<br>(29 cu. m)   | 107" x 176" x 94"<br>(270 x 446 x 238 cm) | 10' x 16' x 9'<br>(3.1m x 4.9m x 2.7m) |
| EPB919   | 919 cu. ft.<br>(26 cu. m)    | 130" x 130" x 94"<br>(330 x 330 x 238 cm) | 12' x 12' x 9'<br>(3.7m x 3.7m x 2.7m) |
| EPB1082  | 1082 cu. ft.<br>(30.6 cu. m) | 130" x 153" x 94"<br>(330 x 388 x 238 cm) | 12' x 14' x 9'<br>(3.7m x 4.3m x 2.7m) |
| EPB1245  | 1245 cu. ft.<br>(35.3 cu. m) | 130" x 176" x 94"<br>(330 x 446 x 238 cm) | 12' x 16' x 9'<br>(3.7m x 4.9m x 2.7m) |

### Solid Chambers

| Model  | Interior Volume             | Interior Dimensions *(WxDxH)             | Exterior Dimensions † (WxDxH)          |
|--------|-----------------------------|--|--|
| EWS183 | 183 cu. ft.<br>(5.1 cu. m)  | 48" x 70" x 94"<br>(122 x 178 x 238 cm)  | 9' x 7' x 9'<br>(2.8m x 2.3m x 2.8m)   |
| EWS282 | 282 cu. ft.<br>(8.0 cu. m)  | 72" x 72" x 94"<br>(183 x 183 x 238 cm)  | 9' x 9' x 10'<br>(2.8m x 2.7m x 3.1m)  |
| EWS364 | 364 cu. ft.<br>(10.3 cu. m) | 62" x 108" x 94"<br>(158 x 274 x 238 cm) | 13' x 10' x 9'<br>(4.0m x 3.1m x 2.8m) |
| EWS499 | 499 cu. ft.<br>(14.1 cu. m) | 85" x 108" x 94"<br>(216 x 274 x 238 cm) | 16' x 9' x 9'<br>(4.9m x 2.7m x 2.8m)  |

\* Interior sizes shown above are 'standard', and can be customized for your application.

† Exterior dimensions do not include MAP unit. See next page for additional width required.

### MAPL & MAPU Specifications (to -35°C)

| Temp/Humidity                        | MAPL-6NWL  | MAPL-12NWL      | MAPL-15NW                             | MAPL-30NW           |
|--------------------------------------|--|-----------------|---------------------------------------|---------------------|
| Temp Only                            | MAPU-6NWL  | MAPU-12NWL      | MAPU-15NW                             | MAPU-30NW           |
| Temperature Range                    | -35°C to 85°C for Panel Construction (-31°F to 185°F)  |                 |                                       |                     |
|                                      | -35°C to 150°C for Solid Construction (-31°F to 302°F) |                 |                                       |                     |
| Humidity Range                       | 10 to 95% RH (MAPL models only)                        |                 |                                       |                     |
| Example Change Rate *                | 0.25°C/m.  | 1.25°C/m.       | 2°C/m.                                | 4°C/m.              |
| Single-stage Refrigeration           | 6 hp Scroll  | 12 hp Scroll    | 15 hp Semi-hermetic                   | 30 hp Semi-hermetic |
| Power                                | 460V or 380V-415V                                      |                 |                                       |                     |
| Cooling Water with 30°C (85°F) Inlet | 14 GPM (53 LPM)  | 23 GPM (87 LPM) | 32 GPM (121 LPM)                      | 53 GPM (200 LPM)    |
| Exterior Dimensions                  | Adds 3.5 ft. (1m) to chamber exterior                  |                 | Adds 6 ft. (1.8m) to chamber exterior |                     |

\* Example change rates are with EPB770 chamber and 500 lb. (230 kg.) aluminum load from 85 to -20°C, and 460V main power.

### MAPX & MAPZ Specifications (to -65°C)

| Temp/Humidity                        | MAPX-6NWL  | MAPX-12NWL                            | MAPX-15NW               | MAPX-30NW               |
|--------------------------------------|--|---------------------------------------|-------------------------|-------------------------|
| Temp Only                            | MAPZ-6NWL  | MAPZ-12NWL                            | MAPZ-15NW               | MAPZ-30NW               |
| Temperature Range                    | -65°C to 85°C for Panel Construction (-85°F to 185°F)  |                                       |                         |                         |
|                                      | -65°C to 150°C for Solid Construction (-85°F to 302°F) |                                       |                         |                         |
| Humidity Range                       | 10 to 95% RH (MAPX models only)                        |                                       |                         |                         |
| Example Change Rate †                | 0.25°C/m.  | 0.75°C/m.                             | 1.75°C/m.               | 5.5°C/m.                |
| Cascade Refrigeration                | 2 x 6 hp Scroll  | 2 x 12 hp Scroll                      | 2 x 15 hp Semi-hermetic | 2 x 30 hp Semi-hermetic |
| Power                                | 460V or 380V-415V                                      |                                       |                         |                         |
| Cooling Water with 30°C (85°F) Inlet | 14 GPM (53 LPM)  | 23 GPM (87 LPM)                       | 32 GPM (121 LPM)        | 53 GPM (200 LPM)        |
| Exterior Dimensions                  | Adds 3.5 ft. (1m)                                      | Adds 6 ft. (1.8m) to chamber exterior |                         |                         |

† Example change rates are with EPB770 chamber and 500 lb. (230 kg.) aluminum load from 85 to -40°C, and 460V main power.

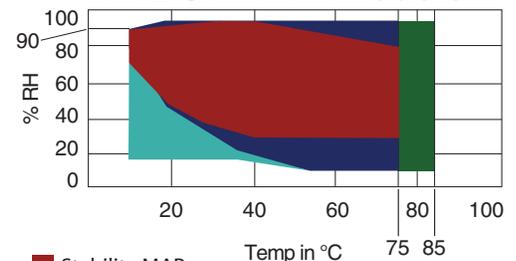
### Stability MAP

| Temp/Humidity                      | MAPL-1/2WA                            | MAPL-2WA                      |
|------------------------------------|---------------------------------------|-------------------------------|
| Temp Only                          | MAPU-1/2WA                            | MAPU-2WA                      |
| Temperature Range                  | 10°C to 85°C (50°F to 185°F)          | -10°C to 85°C (14°F to 185°F) |
| Humidity Range                     | 30 to 95% RH (MAPL models only)       |                               |
| Single-stage Refrigeration         | 1/2 hp Hermetic                       | 2 hp Hermetic                 |
| Power                              | 208/230V 1-phase                      | 208/230V 3-phase              |
| Heat to Room (built-in air-cooled) | 12,000 BTU/hr.                        | 25,000 BTU/hr.                |
| Exterior Dimensions ‡              | Adds 2 ft. (0.6m) to chamber exterior |                               |

‡ Also protrudes 14" (35 cm) into workspace

### Humidity Range

#### MAPL & MAPX models



- Stability MAP
- Panelized construction
- Solid Construction
- Optional low humidity

# Options

## Cabinet Options

### Windows

One window on the door is included with all chambers (two windows on double-doors). Additional windows may be added to suit.

### Cable Ports

Ports allow routing cables, hoses, and other connections into the chamber. Standard round sizes of 2", 4", and 6". Exclusive ESPEC flexible silicone port plugs included. Custom sizes possible.



### Floors (see page 5)

**Medium-duty**—Insulated floor reinforced with stainless steel plates and embedded marine-grade plywood. Loading up to 900 psf.

**Heavy-duty**—Insulated floor made of structural steel and 12-gauge top sheets. Loading up to 1,500 psf distributed (2,500 lbs. point-loading).

### Loading Ramp

Aluminum ramps with structural reinforcements. Ramps for solid-construction units may need to be moved to close the door.



### Installation Matting (Panelized only)

Ventilated matting (3/4" thick) installed under the chamber for longer life. Prevents condensation from collecting under the box.

### Remote Refrigeration

The refrigeration is separated from the MAP for remote location to aid in floorspace and noise constraints.

### Quiet Package

Baffling and multi-layer sound absorption added to the refrigeration compartment.

## Operation Options

### Air Flow Distribution

Ducting of conditioned air can be added to ensure even distribution in larger chambers. Recommended in applications where specimens generate significant heat. Full ceiling plenum uses perforated panels for even airflow throughout chamber.

### Low Humidity Control

Specialized de-humidification dryer system to allow humidity levels as low as 10% at 10°C.

### Variable Airflow Control

Airflow speed can be reduced for infrared testing or to allow sound measurements.

### Entry Vestibule

Ante-room (airlock) allows personnel entry without disrupting chamber conditions.



## Instrumentation Options

### Emergency Stop

Red mushroom on console stops chamber. A horizontal pull-cord inside the chamber may also be added to help protect operators

### Chart Recorders

Paperless, strip chart, or circular chart recorders for documenting chamber operation.

### Product Temperature Control

Added feature allows primary control of chamber based on test specimen temperature.

### Computer Interface

RS-232C computer interface for general purpose applications using serial data communication.

GPIO/IEEE-488 digital interface particularly suited for instrument applications, especially LabView.

Web Controller for remote Ethernet/web access.

## Automotive Options

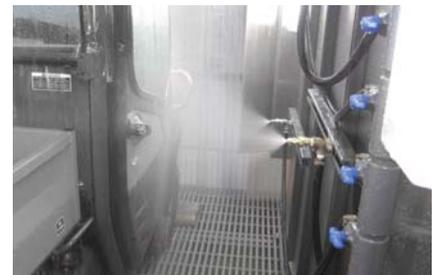
### Infrared Lighting

Lights are proportionally controlled based on surface temperature of the sample. Adjustable height and angles allow for even exposures. Banks of 50-100 lamps (250W or 375W) can be individually controlled. Wet cycle option also allows humidity control during IR operation.



### Rain Spray

Rain simulation systems, including water temperature, pre-conditioning and improved chamber drainage.



### Dyno or Road Simulator Integration

Flooring can be customized to allow dynamometers or four-post road simulators to be used with the chamber. Road simulators may also require a cooling system for the vehicle suspension.

### Fresh Air and Exhaust

Fresh air supply allows for testing running vehicles. Incoming air is conditioned to maintain chamber conditions. Includes an exhaust extraction system with flexible hose.

### Safety Systems

Gas Monitoring - Air sampling of oxygen, carbon monoxide, and LEL levels.

Operator Safety - Fresh air supply, and conditioning for personnel in vehicles.

Fire Detection and Suppression Systems - To meet site requirements.

# Planning

## Defining Your Walk-in Requirement

Selection of the proper MAP, chamber, and other system features is done by ESPEC based on the information you provide about your application. Providing the following details to your sales representative will ensure an accurate system selection and pricing quote.

- Chamber size desired
- Temperature extremes desired
- Temperature test profile including heat/cool ramping rates
- Is humidity control is needed
- Test load details including mass, composition, and heat generated
- Other testing needs, as well as utility and site limitations

## Utilities Planning

The utilities needed for large test chambers is significant and requires planning before a unit can be purchased.

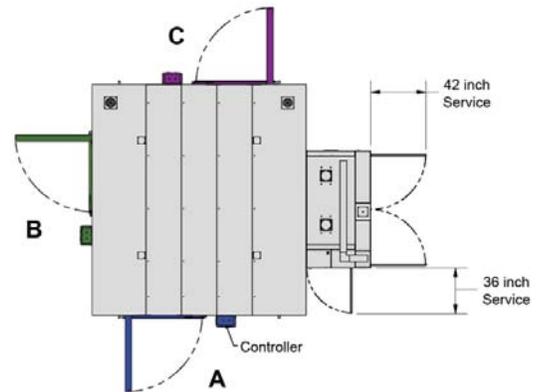
- Electric—See MAP specification table on page 13 for main electrical power requirements. A system quotation will include details on power draw.
- Refrigeration cooling—Our refrigeration systems need to be cooled typically by water. The MAP specification (page 13) shows peak water demand. Due to maintenance and installation needs, ESPEC recommends that customers arrange for their own recirculating water-cooling system. Where water cooling is impractical, ESPEC can offer an external air-cooled condenser. Units 6-hp and below are small enough to have integrated air-cooling.

## Site Planning

- Floor space—Allow space for the conditioning MAP adds to as well as three feet (one meter) spacing for servicing.
- Floor pit—In applications where large or frequent loading will occur, a loading ramp may be impractical. Instead, a recess in the facility floor may be made so that the chamber's interior floor is flush for easy entry. ESPEC can help provide specifications for a floor pit for your system.
- Safety—Users should investigate local and facility safety regulations for any equipment, but more importantly with a walk-in chamber. Consideration of the planned usage of the equipment may also dictate additional safety measures or equipment.
- Installation—Move-in of walk-in chambers to the final location needs to be planned, especially for solid-construction systems. Site modifications to accommodate the equipment must also be considered.



Air cooled condensers are sized by ESPEC to match the refrigeration system, but should be installed as close as possible to the chamber to ensure best performance.



Optional Door/Controller Locations  
(A,B, and C)

Chamber entry door location can be selected based on best use of available floor space. Service spacing examples are also shown here.



ESPEC will come to your site for assembly of the system, start-up, and operator training.

## **ESPEC NORTH AMERICA, INC.**

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