



# Series 591

## Vertical Flow Hardwall Modular Cleanroom

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The Series 591 is a free-standing, hardwall, modular, prefabricated cleanroom system that is designed to provide superior cleanroom performance and aesthetic appeal. Its modular, prefabricated design combines functionality with flexibility to create systems that will meet your cleanroom needs of today and into the future.

These rooms are available from Class 100,000 to Class 10. The rooms are available with open free spans from 6 to 34 feet and interior room heights of 8 to 14 feet. Multiple rooms can be combined to form larger cleanroom systems. The system allows for additional sections to be added to existing rooms to expand the cleanroom at a future date.

The Series 591 cleanroom has high visual appeal and is often used as a showcase cleanroom system. The large clear walls offer good visibility into and out of the room. Clear anodized aluminum panels cover the filter light area above the drop ceiling, so the exterior has a clean appearance.

### Features

- ❖ Modular and prefabricated
- ❖ Free-standing; does not become part of the building
- ❖ Can be easily and quickly relocated
- ❖ Large open spans up to 34 ft.
- ❖ Interior clear height 8 to 14 ft.
- ❖ Room Class 100,000 to Class 10
- ❖ Aesthetic design, visually appealing
- ❖ High quality performance
- ❖ Easy to assemble
- ❖ Expandable and upgradeable
- ❖ Single pass or recirculating
- ❖ Internal room pressure adjustable up to 0.06 in. W.C.

 For more information or to download or fax this product from the web, simply go to:  
[www.cleanairproducts.com/591](http://www.cleanairproducts.com/591)

## Series 591 Vertical Flow Hardwall Modular Cleanroom

### Overview

The Series 591 is a free-standing, hardwall, modular, prefabricated cleanroom system designed to combine superior cleanroom performance with high visual appeal. The rigid wall design allows the cleanroom to operate at higher internal pressures than may be found in other types of cleanroom systems. This pressure is adjusted through variable wall dampers that regulate the flow of air out of the room to control the internal room pressure. ISO specifications require room pressures for some medical device and pharmaceutical applications higher than what a softwall cleanroom can provide. Higher internal room pressure on non-recirculating rooms can occasionally reduce the infiltration caused by drafts flowing under the bottom of the curtains.

### Modular Design for Ultimate Flexibility

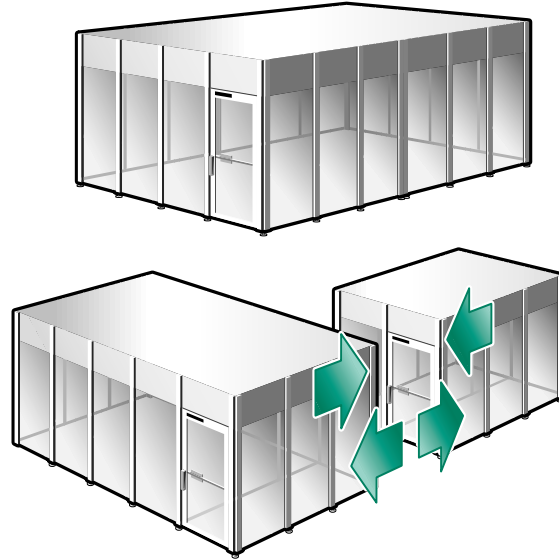
The modular prefabricated design makes installation fast and easy. Factory installation is available, but simple step-by-step instructions and detailed installation drawings allow the rooms to be assembled using in-house maintenance personnel. The room assembles with common hand tools. Holes are pre-punched and predrilled, so the room is assembled by lining up holes and installing screws, bolts and snap-in extrusions. The room ships knocked down on compact skids.

After a room has been installed, its versatile modular design allows the room to be expanded, relocated, or reconfigured into a different shape or made into multiple smaller rooms. This versatility makes your Series 591 cleanroom system an asset that keeps pace with your cleanroom requirements.

The modular design of the Series 591 means that the cleanroom can

### From One Room to Two... And Back Again

Multiple small rooms can be made into one large room, or a large room can be reconfigured into multiple small rooms. This modular design means the Series 591 cleanroom will never become obsolete.



In some cases, minimal additional parts may be required, but are reusable if needed. Consult factory for details.

be expanded, modified, reconfigured or even sold. It can have value throughout its life. The cleanroom system is not typically considered part of the building and can often be depreciated faster than a built-in cleanroom. Consult your tax adviser for specifics of the tax advantages.

The removable wall panels are supported by special heavy-duty 3 x 3 anodized aluminum support posts with upper cross panels. Together these form a strong, decorative exterior wall system. Each support post is equipped with a leg-leveling glide to adjust for variations in floor level. The walls extend down to approximately 2 in. above the floor allowing air to be vented around the entire perimeter. Adjustable wall vents located between the bottom of the wall panel and the floor fine tune the room pressure. Additional vents may be required with some rooms with a higher total airflow. Exact room

configuration for lower wall spacing, quantity and location of adjustable grills, is subject to room size and class.

The wall panels are available in the following materials:

- Clear acrylic
- Translucent acrylic
- Yellow acrylic
- Clear ESD acrylic
- Polycarbonate
- White painted aluminum
- Combination white lower with clear upper.

Wall panel materials can be combined to meet individual room requirements. The walls (or parts thereof) can be made of solid white painted aluminum panels to prevent viewing into or out of the room (such as when the room is installed close to an existing building wall). White lower panels with clear upper panels can be used create specific viewing areas into the room. The most common

room configuration is full length clear acrylic panels. This provides the most open feel within the cleanroom.

The rooms are available in recirculating and non-recirculating room airflow configurations. The requirements of the cleanroom and the conditions of the ambient space surrounding the cleanroom will determine the option selected.

### Airflow

#### Non-Recirculating Single Pass Rooms

The non-recirculating or single pass room draws in ambient air from above the room into the motorized HEPA filter located in the cleanroom ceiling. This HEPA filtered air is blown into the cleanroom where it cleans the interior space, then is discharged from the cleanroom through the approximate 2 in. space located below the walls and through the adjustable wall grills back into the surrounding space.

The temperature inside the room is typically about 1 degree warmer than the ambient. The humidity of the room will be that of the ambient. It is possible to vent air conditioning to the space above the cleanroom or into the HEPA filters. This can keep the room cooler than the surrounding space. This system works best when the space surrounding the cleanroom is also air-conditioned. The air conditioned room air venting into the surrounding space will assist in cooling that ambient space.

#### Recirculating Cleanrooms

Recirculating cleanrooms recirculate the air within the cleanroom and prevent it from mixing with the ambient which allows for better control of the temperature and humidity. In order to recirculate the air back to the HEPA filters located in the

cleanroom ceiling, return air walls need to be added to the cleanroom. The room can use existing building wall(s) or add a second set of cleanroom wall(s) and a metal top to the cleanroom. Consult the factory for details regarding the best return air configuration for your particular application.

In addition to environmental control, recirculating cleanrooms will have less contamination loading on the HEPA filters. The HEPA filters are drawing air in that is closer to that of the cleanroom. With less contamination loading, the filters will last longer and perform better.

Note: Recirculating cleanrooms require supplemental cooling or the temperature will rise inside the cleanroom. This is because all of the air and heat from the motorized filters, lights, equipment and people is recirculated and contained within the cleanroom. See the air conditioning section for methods of cooling.

### Filters

The Series 591 uses the Series 112 low-noise motorized ceiling filters. These are available in standard 2x4 and 2x2 sizes and in 99.99% HEPA and 99.9995% ULPA efficiencies. The quantity of filters is subject to the class and size of the cleanroom.

### Lights

The cleanroom uses the Series CAP1210-2x4-4L cleanroom lights. They are a 2x4, 4 lamp fixture and available in T8 and T12 lamps. The quantity of lights is subject to room size, height and required lighting levels. The standard room is designed for approximately 80 footcandles of lighting. The standard room is shipped with T12 lamps unless otherwise specified.

### Electrical

The filters and lights can be wired with the Reloc prefabricated wiring system for fast, simple electrical assembly. The Reloc wiring system has flexible metal cables with special end plugs that are joined together in a daisy chain manner. The cables are designed to be plugged together and then unplugged without having to undo any wiring. The filters and lights can be quickly plugged together while the room is being assembled. An additional advantage of the Reloc plug together wiring system is ease of service of the room components after the room is operational. A component can be quickly unplugged, a new component installed, plugged in, and the room is back in operation. The field electrician will connect power from the building to a junction box(es) located on the room.

A light switch is located on the outside of a post next to the door. The light switch will turn off all the lights. No night lights or emergency lights are furnished as standard. These items must be specifically optioned out.

### Humidity Control

Processes that require humidity control will require special environmental control packages. Humidity is added by electric steam generators. Humidity is removed by the air conditioning system or a desiccant drying system if the humidity is below 40%. The system can be made to just add or just remove humidity. Humidity control is only available on recirculating cleanrooms. Consult the factory for details.

### Air Conditioning

Non-recirculating cleanrooms can use existing air conditioning from the building if the A/C unit to cool the ambient space is above the

cleanroom. In these applications an air conditioning duct is typically run over the top of the cleanroom, venting the cool air over the top of the room or ducted directly into the motorized ceiling HEPA filters. The amount of temperature reduction inside the room is subject to the ambient temperature and amount of cooling.

Recirculating cleanrooms allow a greater difference in temperature between the interior and ambient space. The room air is not mixing with the ambient and only requires cooling to compensate for the internal heat load, thermal conductivity through the wall and cooling of the make up air.

Note: All air conditioning systems will require a condensate drain. If there is no drain located near the room a condensate pump will be required. No temperature control is furnished with the room as standard.

### Internal Ceiling Grid System

The cleanroom utilizes the Nest-Tight ceiling grid system. This unique system makes for a tighter ceiling grid than conventional butt joint T-bar grids. In addition they are faster and easier to assemble than other types of T-bar grid systems. The motorized ceiling filters, lights and blank panels will install into this grid. The class of the room is determined by the number of filters in the ceiling (air changes per hour). Flow thru lights are also available for applications where 100% ceiling filter coverage is required or where a filter and light need to be in the same location. The ceiling grid system and integrated beams are supported by the perimeter.

The walls and the ceiling grid system are modular. This allows the room to be reconfigured in size and shape reusing most parts. Consult the factory for details.

### Metal Top to the Cleanroom Recirculating Rooms

A metal cleanroom top is added on recirculating cleanrooms. It forms a space between the interior cleanroom ceiling and serves as the return air duct for the motorized ceiling HEPA filters. This space is filled with HEPA filtered air being returned from the cleanroom. It also minimizes dust and other contamination from settling on top of the filters and lights, keeping them semi-clean. The metal roof panel has enough strength that it can be walked on by building maintenance personnel. No guard rails are provided as part of the cleanroom.

### Non-Recirculating Rooms

The metal roof is a non-insulated metal top. The roof can be walked on by a service technician, but is not designed to support any other live or dead load. There are no handrails supplied on the roof. A metal roof can be installed onto the top metal roof. This will allow changing of the prefilters from the side of the room rather than from inside the room or by reaching over the upper sides.

### Interior Walls or Room Dividers

Interior walls can divide the room up into gowning, area 1, and area 2, as required. The interior can utilize rigid wall panels (like exterior walls) and/or soft vinyl curtains, strip doors, aluminum frame doors, sliding doors or simply wall openings between areas. Rigid walls within the room will enable the room to have different pressure levels within the cleanroom. The cleanroom has a higher pressure than the gowning room. The gowning room has higher pressure than the ambient. A cascading pressure goes from cleanest to ambient.

### Doors Swing Doors

The entrance door is 45 in. x 93 in. with aluminum frame acrylic doors. Its larger width and height allows for easy movement of carts and equipment into the cleanroom. While the door is wider than standard, it is no harder or more awkward to use than a standard door. The doors are made so they can be located in any standard width panel opening. They will swing out of the cleanroom as standard and can be ordered with either swing. The doors are furnished with a hydraulic door closer on the outside of the door, push bar, and pull handle. No latch, lock, or passage set is on the standard door. The door is held closed by the door closer. Cam action key door locks are available but must be ordered as a separate item. Doors can be ordered without exterior pull handle when used for an emergency exit. They can be located in any standard width panel opening.

Note: It is possible to field modify the door to reverse the door swing. However, the resulting relocation will result in exposed mounting holes that will need to be plugged with plastic inserts.

### Double Doors

Double doors are made similar to the single doors.

### Sliding Doors

Manual sliding doors are available in 36, 48 and 60 in. widths. They have no bottom threshold or floor track. They are available in manual-open and manual-close or manual-open-gravity-close. They require a space of 2x the door slide clear opening on the slide side, and surface-mount to the walls.



**Sliding Door Options:**

- Special sized door
- Door locations other than between the vertical support posts.
- Door locks
- Power sliding

**Headers for Larger Wall Openings**

Larger wall openings or openings that fall where a vertical support post is located will require a header panel. These panels will allow wall openings or bulk head connection points. A variety of configurations are available, but there are some design restrictions. Please consult the factory for details.

**Sprinklers**

The cleanroom typically utilizes sprinklers that drop down from the existing overhead sprinkler system. The heads can come down through the internal cleanroom ceiling or in through the sidewalls. Sprinklers are not furnished and installed by Clean Air Products, unless specifically quoted.

**Flooring**

The cleanroom requires a good concrete floor that is covered by either vinyl flooring or epoxy paint. When installing new vinyl flooring, seamless vinyl with welded or glued joints is the best. Consult the factory for details.

**Air Pressure Control Dampers**

The rooms are furnished with manual, adjustable air pressure dampers located on the bottom of the wall panels. The dampers adjust the open space between the

floor and the bottom of the wall panel. By reducing this clearance, the pressure within the cleanroom is increased. Increasing the clearance decreases room pressure. Rooms are designed for pressures up to 0.06 in. W.C. differential pressure between the cleanroom and ambient. Things that can affect room pressure are openings in walls, exhaust, and quantity of filters. Specify the required room pressure.

**Receptacles**

Receptacles are NOT provided as standard and must be specifically ordered. When receptacles are ordered, they are installed into the vertical support post at a height of 12 in. AFF. The vertical support post serves as the conduit, and the receptacle mounts into the face of the post. At the top interior side of the post is a junction box. Field wiring between the receptacles is not part of the prefabricated wiring. The field electrician would wire between the junction boxes on the internal top support post. The receptacles are designed for 20 amp circuits.

**Gowning Rooms**

Gowning rooms are an optional item. They can be internal or external to the cleanroom space. They can be made of the same rigid wall panels as the cleanroom with aluminum framed doors. Vinyl enclosures within the cleanroom are also available with a strip door used in place of a swing door.

Note: When a rigid wall gowning room is used, the room can be set with cascading pressures. The cleanroom is at the highest pressure, then gowning room, and then ambient.

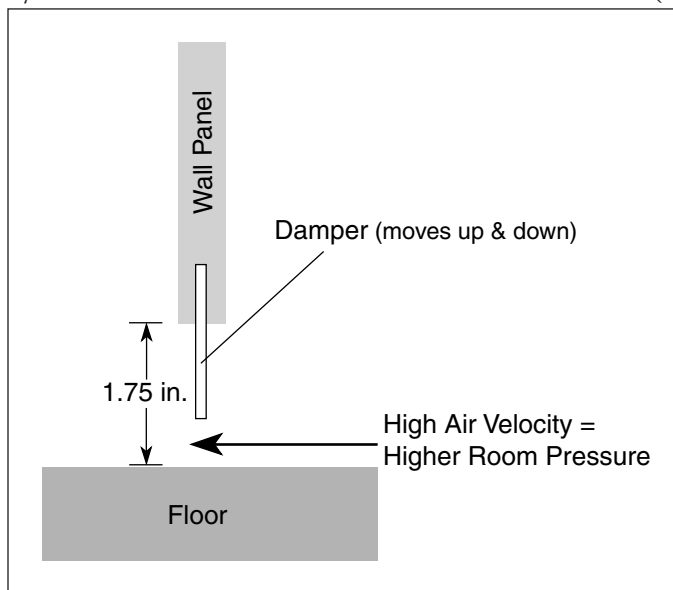
**Additional gowning room options:**

- Wall or floor pass thru, with and without interlock
- Tables
- Gowning benches
- Storage cabinet, gowning racks
- Laminar flow hoods
- Fume hoods
- Wall cut outs
- Gowning rooms
- Internal wall dividers, return air walls
- Emergency lighting
- Air showers

**Size**

The Series 591's standard modular widths (maximum open span) are 6 feet to 34 feet (Odd sizes available upon request). The inside room length is made up of 4-ft. nominal modular sections of 5 1-3/8 in. sections with other optional sections of 27-3/8 and 39-3/8 in. Using only the nominal 4-ft. sections will give the room 2 x 4 grid sections. Recirculating rooms will add additional length or width to the room.

The cleanroom can be installed with as little as 25 in. of clearance over the



inside clear height of the room on non-recirculating rooms, and 29 in. with recirculating rooms. Please advise the factory on the clear height of the space in which the room is being installed.

### Drawings

After receipt of order, Clean Air Products will furnish drawings confirm the size, shape and electrical requirements of the room, and ask for a signature of approval.

### Shipping

The Series 591 ships knocked down on skids and is designed to ship by truck. Most standard room sizes have components that will fit through a 3 ft. 0 in. x 7 ft. 0 in. door when off the shipping skids. Some of the components, such as the ceiling support beams, are as long as the width of the room. Review the path from the loading dock to the cleanroom assembly area. Consult the factory for specific parts sizes. Please let the factory know the path from the receiving area to the area where the room is to be installed.

Note: Please advise us on whether or not you have a loading dock, truck restrictions, hallways, door sizes the materials will be going through, if it is a second floor installation, and special material handling requirements so as to avoid problems when receiving the room.

### Installation

The room reassembles using simple hand tools. Step-by-step instructions are provided. Holes are pre-drilled so that installation is just a matter of lining up holes and installing screws and bolts and snap-in extrusions. Clean Air Products can install the cleanroom, but the majority of our end users install the rooms them-

selves using in-house or local contract assembly personnel. Please advise if there are any special installation conditions, security restrictions, work rules, working hours, only weekends or nights, etc.

### Guarantee

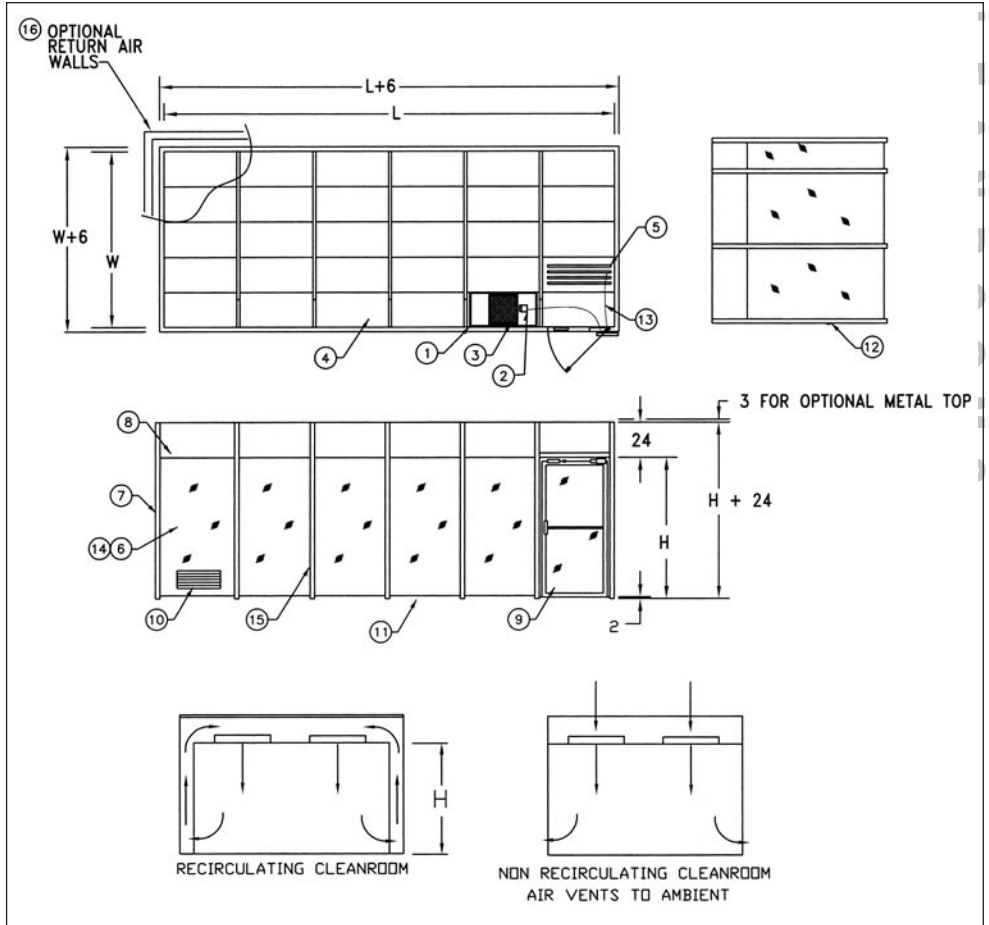
A written 1 year warranty is furnished with each cleanroom.

**Standard**

1. Motorized Ceiling HEPA filters
2. Electrical junction box
3. Prefilter
4. Blank panel – white vinyl covered gypsum board with taped edges
5. Light – fluorescent with lamps
6. Acrylic or solid white panels
7. 3 in. x 3 in. anodized aluminum support legs and frame
8. Anodized aluminium shroud
9. Door
10. Grills (quantity subject to total airflow; normally not required; use only in higher air flow rooms)
11. Adjustable floor return air grill typically on all 4 sides
12. Light switch

**Optional**

13. Reloc prefabricated wiring
14. Wall panels available in acrylic or white painted aluminum or white clear combination
15. Receptacles in wall post
16. Returns on air walls; can use existing building walls.



**Part Number Configuration**

CAP591 - W x L x H - XXX

A = Standard nominal room size. If A is X, then special room dimensions apply. XXX is a number specific to that room.

**Example:**

CAP591-2400x5350x0800 is a 24 foot wide x 53 foot 5 inch long x 8 foot high room.

**Standard Heights**

- 7 ft. 6 in.
  - 8 ft. 0 in.
  - 9 ft. 0 in.
  - 10 ft. 0 in.
  - 11 ft. 0 in.
  - 12 ft. 0 in.
  - 13 ft. 0 in.
  - 14 ft. 0 in.
- In-between heights available.

**Inside Standard Width**

- 8 ft. 0 in.
- 9 ft. 0 in.
- 10 ft. 0 in.
- 11 ft. 0 in.
- 12 ft. 0 in.
- 13 ft. 0 in.
- 14 ft. 0 in.
- 15 ft. 0 in.
- 16 ft. 0 in.
- 17 ft. 0 in.
- 18 ft. 0 in.

**Inside Standard Width**

- 19 ft. 0 in.
- 20 ft. 0 in.
- 21 ft. 0 in.
- 22 ft. 0 in.
- 23 ft. 0 in.
- 24 ft. 0 in.
- 25 ft. 6 in.\*
- 27 ft. 9 in.\*
- 29 ft. 9 in.\*
- 32 ft. 1 in.\*
- 34 ft. 1 in.\*

\* Room lengths will be slightly different than shown on the table.  
Custom sizes available.

**Inside Standard Lengths**

Nominal	Actual
8	8 ft. 4 in.
10	10 ft. 8 in.
12	12 ft. 8 in.
14	14 ft. 11 in.
16	16 ft. 11 in.
18	19 ft. 3 in.
20	21 ft. 3 in.
22	23 ft. 6 in.
24	25 ft. 6 in.
26	27 ft. 9 in.
28	29 ft. 9 in.
30	32 ft. 1 in.
32	34 ft. 1 in.
34	36 ft. 1 in.
36	38 ft. 4 in.
38	40 ft. 8 in.
40	42 ft. 8 in.
42	44 ft. 11 in.

**Inside Standard Lengths**

Nominal	Actual
44	46 ft. 11 in.
46	49 ft. 2 in.
48	51 ft. 2 in.
50	53 ft. 5 in.
52	55 ft. 5 in.
54	57 ft. 9 in.
56	59 ft. 9 in.
58	62 ft. 0 in.
60	64 ft. 0 in.
62	66 ft. 4 in.
64	68 ft. 4 in.
66	70 ft. 7 in.
68	72 ft. 7 in.
70	74 ft. 10 in.
72	76 ft. 10 in.
74	79 ft. 2 in.
76	81 ft. 2 in.

Series 591 Vertical Flow Hardwall Modular Cleanroom

Worksheet

**Question our sales people will ask when preparing a proposal:**

- ❖ Room Class \_\_\_\_\_
- ❖ Internal room size  
 \_\_\_\_\_ Length  
 \_\_\_\_\_ Width  
 \_\_\_\_\_ Height  
 Please indicate - dimensions are critical. CAP will propose closest standard size. Rooms can be made to specific sizes.
- ❖ Non-Recirculating or Recirculating \_\_\_\_\_
- ❖ Gowning room  
 \_\_\_\_\_ internal  
 or external to the cleanroom \_\_\_\_\_
- ❖ Quantity of doors \_\_\_\_\_  
 Openings \_\_\_\_\_
- ❖ Approximate number of people working inside room  
 \_\_\_\_\_
- ❖ Space available for cleanroom  
 \_\_\_\_\_ Length  
 \_\_\_\_\_ Width  
 \_\_\_\_\_ Height
- ❖ Temperature of the existing space  
 \_\_\_\_\_  
 Is it air conditioned?  
 \_\_\_\_\_
- ❖ Are building posts going to be inside the cleanroom? \_\_\_\_\_
- ❖ Heat load of equipment in room if known  
 \_\_\_\_\_  
 Exhaust \_\_\_\_\_
- \_\_\_\_\_ Loading dock and path to cleanroom area. (Can a standard semi truck back up to your dock? Can the longer support beams of the cleanroom turn all corners? Receiving hours?)
- \_\_\_\_\_ Is the existing space sprinkled?
- \_\_\_\_\_ Location of the electrical panels to power the room
- \_\_\_\_\_ Doors which the cleanroom parts need to be brought through
- \_\_\_\_\_ Special labor conditions (unions) (when CAP does installation)
- \_\_\_\_\_ Safety rules and/or safety training (when CAP does installation)
- \_\_\_\_\_ Working Hours (when CAP does installation)
- \_\_\_\_\_ Special working conditions, Security, inside an existing cleanroom, etc.

Inside Std. Width	Inside Std. Length	Inside Std. Length	Inside Std. Height
8'0"	8'4"	55'5"	7'6"
9'0"	10'8" *	57'9" *	8'0"
10'0"	12'8"	59'9"	9'0"
11'0"	14'11" *	62'0" *	10'0"
12'0"	16'11"	64'0"	11'0"
13'0"	19'3" *	66'4" *	12'0"
14'0"	21'3"	68'4"	12'3"
15'0"	23'6" *	70'7" *	
16'0"	25'6"	72'7"	
17'0"	27'9" *	74'10" *	
18'0"	29'9"	76'10"	
19'0"	32'1" *	79'2" *	
20'0"	34'1"	81'2"	
21'0"	36'4" *	83'5" *	
22'0"	38'4"	85'5"	
23'0"	40'8" *	87'9" *	
24'0"	42'8"	89'9"	
25'6"	44'11" *	92'1" *	
27'9"	46'11"	94'1"	
29'9"	49'2" *	96'4" *	
32'1"	51'2"	98'4"	
34'1"	53'5" *	100'7" *	

Note: \* = Rooms with one 2-ft. beam spacing. Rest of rooms will have 4-ft. beam spacing.  
 Model # CAP591-2400x5350x0800  
 This room is approximately 24'0" x 53'5" x 8'0" H  
 Special sized rooms or custom shapes are available upon request.

Specifications subject to change. Please contact factory for details.



**Solutions Built to Your Specifications.**

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