

# CLEANROOM PROJECT DESIGN GUIDE

*What You Need To Know  
Before Ordering Your Cleanroom*



When your company decides to invest in a cleanroom, it can easily become an overwhelming task. First of all, there isn't a lot of information out there on cleanrooms, despite the fact that they're used almost every day by manufacturing, pharmaceutical, and medical companies across the country. Secondly, much of the information that is out there is highly technical and doesn't really answer the question of how to go about ordering a cleanroom.

Unfortunately, it isn't as simple as just calling up a cleanroom manufacturer and saying "Hey I'd like a new cleanroom, please." There are actually a lot of choices to be made, and your options aren't always straightforward. But that's why we at Angstrom Technology created this guide. Within our Cleanroom Project Design Guide, we've broken down many of your major initial cleanroom choices into clear, defined options, so you know what to convey to your cleanroom manufacturer during the design process. By following this guide step-by-step, you'll easily be able to determine which type of cleanroom you need, and what sort of features your specific cleanroom will require to meet class standards.

**LET'S GET STARTED** [▶](#)



## CLASS

Before you can even begin looking at cleanroom providers and comparing prices, you have to know what cleanroom classification you're going to need. Your room particle classification will narrow down your options big time, making your decisions a lot easier as you go along. If you're not sure what classification your cleanroom needs to meet, it's best to look at industry standards. So to get started, check to see what the minimal requirements are for cleanrooms in your industry.

## ROOM DIMENSIONS

When you're asking for cleanroom quotes, most manufacturers will want to know what dimensions they're working with. It's important to measure accurately the area you're planning to use for your cleanroom. If you have anything hanging from the ceiling that may alter your standard length, width, or height dimension, you should clarify this.

## HUMIDITY

Depending on your cleanroom application, you may or may not need a humidity specification. Typically, humidity levels are driven by product needs, but as this can be a very expensive part of cleanroom development and maintenance, you should be certain of your humidity requirements before you design your cleanroom. Most standard humidity designs allow for the RH control through the air handler cooling coil and maintain ambient to 60% RH.

For more stringent requirements, you may use the air handler cooling coil to control humidity in the summer, and additive humidification in the winter. If your product is extremely sensitive to humidity, you may have to set a specific range of % RH, which your system will then be designed to maintain through all seasons. While this is less common, it is often required for highly technical products and can add a significant expense to your cleanroom budget.

## TEMPERATURE

Typical temperature standards state 68°F with a  $\pm$  of 5°F, but this is not necessarily right for your cleanroom. You'll want to decide what temperature you'd like to aim for, and then give your cleanroom manufacturer a range within which the temperature may fluctuate, say one or two degrees. This, however, is easier said than done. To appropriately heat and cool your cleanroom, you'll want to take into account each area of the cleanroom, from the gowning room to the airlock to the machinery, approaching each as a different zone.

You should remember that the bigger the equipment load in any given area, the more work you'll have to do to keep it cool. If your cleanroom is going to have a lot of heavy equipment, you may require a unique approach to your cooling solution. These are all important considerations to share with your cleanroom manufacturer before you begin a project.



## VELOCITY

Cleanroom performance is largely determined by the velocity of cross-sectional airflow within your cleanroom. This means that depending on the volume of your cleanroom, you'll need a certain amount of air circulating around the room at a specific velocity. Typically you can determine what velocity you need by what classification of cleanroom you're looking for. For instance:

- Class 10 - 90-100 (FPM)
- Class 100 - 72-90 (FPM)
- Class 1000 - 25-40 (FPM)
- Class 10,000 - 5.5 (FPM)

If your cleanroom requires a velocity that is different in range from what is standard for your classification, you'll need to notify your cleanroom manufacturer or builder.

## LIGHTING COLOR

Another consideration that goes along with lighting concern is whether your cleanroom processes will tolerate UV lighting or not. If not, you should notify your cleanroom manufacturer. Generally, this calls for some version of UV filtering, whether it's through lens shields or tubes that cover the lamps. However, through this process you will lose illumination levels by as much as 20 percent, as the shields change the color of the lighting, making it more yellow and less illuminating to the human eye. Therefore, if your process requires the absence of UV lighting, you'll have to account for additional fixtures.

## LIGHTING LEVELS

If your cleanroom is used to produce or test very small objects, you'll need adequate lighting so your employees can carefully handle those tiny parts. When deciding how many fixtures you need for your cleanroom, the goal is to specify the minimum number of fixtures that can provide the necessary amount of lighting. By doing this, you optimize your energy efficiency, and save on maintenance costs, as you'll have fewer light bulbs to replace. It's also good to consider the reflectivity levels of many surfaces in your cleanroom as you will want adequate lighting without glare. Today, you can purchase high-efficiency fluorescent options that will provide you with the amount of light you need, without the glare off the highly-reflective surfaces in the cleanroom.

## AIR CHANGES

As it corresponds to the classification of your cleanroom, as well as the size of your cleanroom, you'll have to establish how many air changes are necessary per what set amount of time. Depending on the air change rate, you'll have to choose exhaust fans that can keep up with your air velocity and change rate. Make sure to talk with your cleanroom manufacturer to assess what the right number of exhaust fans will be for your cleanroom. It's also important to notify your cleanroom manufacturer how much of the exhaust is solvent, acid, or general so you have a good idea of where these exhaust fans may be placed, and what type you'll need.



## PERSONNEL

It's very important to the cleanroom design process that you assess how many people will be in the cleanroom at any given time. It's best to go with the maximum number of people that will occupy the cleanroom, as this gives you a better idea of how much space you'll need, and it gives your cleanroom designer a better idea of how hard the cleanroom will have to work to maintain its standard of cleanliness.

## FLOORING MATERIAL

When designing your cleanroom, you'll have a lot of options for your cleanroom flooring. It's important that you understand the differences and benefits of each choice, so you can ensure that your cleanroom is equipped with the best flooring option for your application. We'll break down a few of the most popular choices below:

**PERFORATED RAISED FLOORING** This type of flooring is a great, lightweight-yet-durable option for many cleanroom applications. Raised flooring functions to maintain laminar air flow down and even through the flooring, thanks to perforated panels. Since there are many different options for perforated flooring size and porousness, you can configure your cleanroom flooring to achieve your own specific requirements for air volume and pressure differentials.

**SEAMLESS VINYL** A cost-effective option for smaller cleanrooms, vinyl flooring works well for applications where there is no weight loading capacity requirement. The seamless feature ensures that no particles get caught in cracks on the floor, and its ability to be covered up the walls makes for easy cleaning of walls and corners.

**EPOXY PAINT ON CONCRETE** If your cleanroom already has existing flooring that is metal, concrete, or may have been coated previously, then you may choose to go with an epoxy coating, instead of a brand new flooring material. Epoxy coatings simply make it easier for your floor to remain as clean as possible and reduce the potential of particles sticking to the floor. A major benefit of an epoxy coating is that you'll have a wide range of options for colors and finishes. You can choose coatings with high-gloss reflectivity, and you can even apply these coatings to the walls for a unified finish. Epoxy coatings are fairly easy to clean and maintain, and provide great abrasion and impact resistance. Epoxy is most commonly used in assembly and light manufacturing applications, but we do recommend that if your cleanroom will deal with any harsh chemicals, you choose a corrosion control system instead.

## ARCHITECTURAL WALL SYSTEM

Once you've decided on the right type of flooring, you'll want to figure out what your wall system will look like. If you know what materials you want, as well as what type of panel surface you'd like, make sure to let your cleanroom manufacturer know. Beyond that, you should decide where you'll want any windows or viewing panels. If you plan on using natural light via windows to illuminate your cleanroom, you should make that clear. From there, you should decide what kind of doors you'd like. If you do not have a floor plan, make sure to inform your cleanroom manufacturer how many doors you'd like, as well as what type of door: single door, double door, automatic or manual sliding doors, or doors that require panic hardware.

## STATIC ELIMINATION CEILING SYSTEM

If your cleanroom application has something to do with electronic manufacturing or any other application where ESD (Electrostatic Discharge) could disrupt production, or even damage the product, you may consider a static elimination ceiling system. If you're unsure whether that's necessary or not, talk to your cleanroom manufacturer.

## T-BAR DIMENSION

In the event that your cleanroom requires a suspended ceiling, it's likely that you'll be using an inverted T-grid for the ceiling support. You'll need to decide what size T-bar you'll need for this ceiling, standard options being 1-½" and 2" sizes. If your cleanroom will be non-rated, you may also choose a nominal 1" grid.

## FIRE RATING

Depending on your cleanroom application, as well as your location and the location of your cleanroom within your building, you'll likely be required to meet a certain fire rating. You'll need to communicate this fire rating to your cleanroom manufacturer, as well as any additional necessary fire safety precautions, such as sprinkler systems.

## ANY SPECIAL UTILITIES

Finally, if there are any additional or special utilities that your cleanroom will require, such as a defined shielding level, telephone conduits, intercom stations, airlocks, or gowning rooms, make sure to notify your cleanroom manufacturer of these additional features. While most cleanrooms, and especially modular cleanrooms, are completely customizable, it's still important that you give your designer/manufacturer a heads up before they start your project. This way, you'll receive a more accurate estimate on both cost and delivery time.