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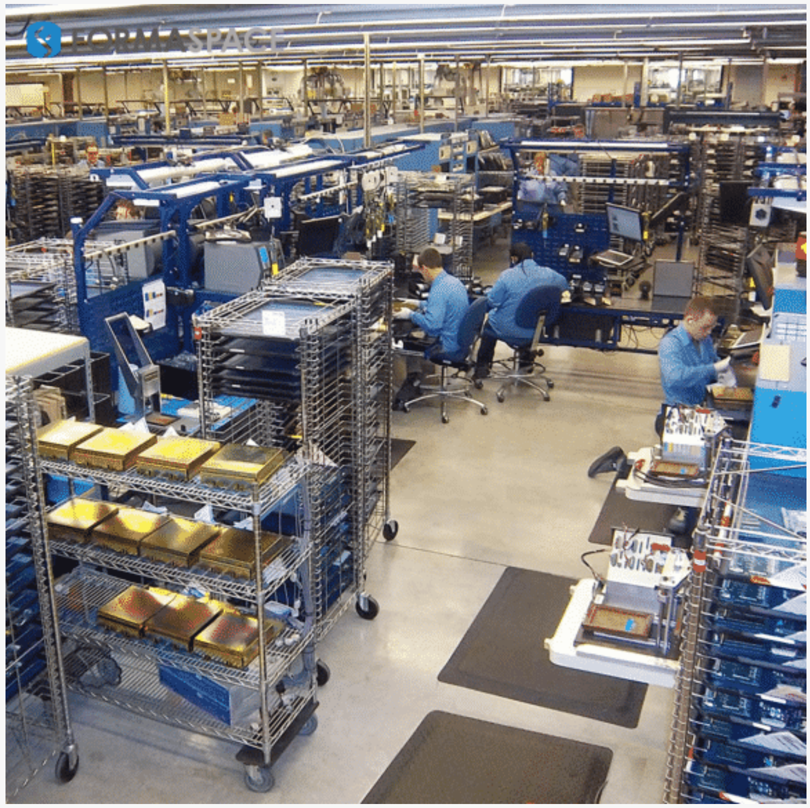
12 Electrostatic Discharge Prevention Strategies for Electronics Manufacturers

Find out what are the necessary organizational changes and investments in proper equipment required for an effective ESD protection plan.



AUSTIN, TEXAS, UNITED STATES, October 28, 2021 /EINPresswire.com/ -- As a society, our lives are increasingly dependent on powerful yet microscopic electronic circuits that power the smartphones, computers, automobiles, appliances, or aircraft that we depend on every day.

Progress in miniaturization is at the heart of increasing the performance of integrated circuits, with the latest designs built around transistors that are so small that they are approaching the size of individual atoms.

Yet, as electronics become smaller, the risk of accidental damage from electrostatic discharge (ESD) increases, and, given the ubiquity of electronic components in nearly every consumer and industrial design in use today, the problem of how to prevent ESD damage has grown beyond the bounds of computer chip manufacturers to the industry at large – which must grapple with how to handle, test, assemble, diagnose, repair, or pack and ship electronic circuit boards without damaging them internally.

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>
> *Formaspace*

We take a look at twelve steps you can take to organize an ESD protection program at your facility.

1. Understanding The Need For ESD Standards

Compliance

The first question to address is why you should invest in an ESD-proof protection program at all.

Electrostatic discharge (ESD) is like a hidden tax on the electronics manufacturing industry, with some analysts calculating that ESD losses reduce industry revenues by 6.5% on average.

In an ideal world, any ESD damage to microelectronics could be identified at the factory through quality assurance testing; however, ESD damage is a pernicious foe – oftentimes, ESD-damaged electronics fail later, often during the burn-in phase, e.g. once they are in consumers' hands or embedded in mission-critical industrial products.

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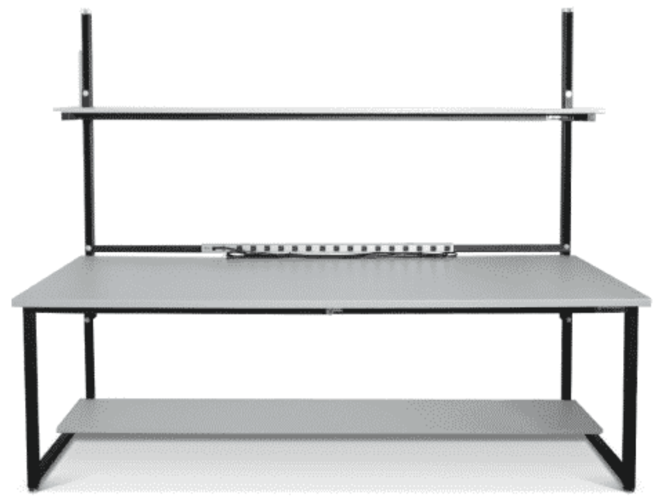


Shown above is a Formaspace Benchmarx™ workbench custom-made for an aircraft manufacturer that designs, develops, manufacturers, and services business jet aircraft.

The consequences of ESD-caused electronics failure can vary depending on the industry sector – for consumer-electronics companies, it can drive up the warranty costs while it drives down a company's brand reputation. For mission-critical components in industries such as aerospace or healthcare, ESD-caused failures can literally become a matter of life or death.

The logical place to start any new ESD protection program is to study the relevant ANSI/ESD S20.20-2016 standard for the protection of electrical and electronic parts, assemblies, and equipment. This document can be purchased on the ANSI web store, and it's a highly recommended investment for creating your own ESD Control Program.

2. Perform A Needs Assessment / Risk Measurement

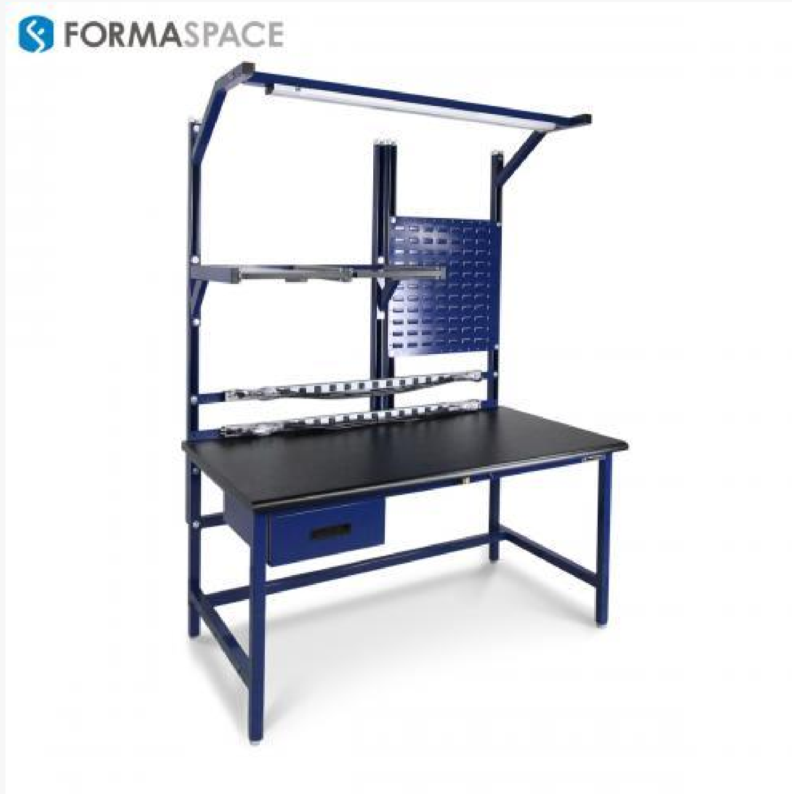
The next step is to perform a needs assessment to establish your particular ESD protection requirements, including quantifying the potential risks.

For example, at an electronics manufacturing facility, it's quite likely that there is already a very well-established ESD protection program in place (the need for this has become well understood over the last 20 years).

But that's not generally the case at other types of manufacturing companies, many of which are new to the idea of incorporating electronic components into their production lines.

(In other words, the chances are good that ESD has become an issue for your manufacturing facility – given that nearly every product made today includes some form of microprocessor component.)

Bear in mind that the manufacturing assembly line is not the only place to perform an ESD risk assessment.



Shown above is a highly-customized Benchmarx™ workbench that features pull-out shelves overhead and as a small part storage unit under the work surface.

You might find that quality assurance, maintenance, and repair, and material handling operations (including packing stations) are functions that need to be assessed as well, as they may need to up their game when handling sensitive electronic components by protecting them with a comprehensive ESD protection program.

Once we've assessed which processes or departments we need to protect, it's time to look at measuring the potential risk; in other words, what's the scope of possible damage that can occur, as measured in terms of voltage that can be accidentally transmitted to vulnerable electronic components.

The ANSI/ESD S20.20-2016 standard mentioned in the previous section is designed to do just that. It outlines the potential risks and mitigation measures you can take.

But putting this technical document into good use requires a little bit of explanation for the layperson who lacks the electrical engineering background needed to read and understand it properly.

For example, the standards written into ANSI/ESD S20.20-2016 are meant to "protect electrical or electronic parts, assemblies, and equipment susceptible to damage by electrostatic discharges greater than or equal to 100 volts HBM, 200 volts CDM, and 35 volts on isolated conductors."

But what does that mean in plain English?

Let's break this down step-by-step.

The first term is HBM, which stands for the human-body model; as the name implies this is a scientific model of how much voltage (e.g. electrostatic discharge) can be transferred from the human worker to an electronic device, such as an integrated circuit (IC).

Human bodies (or other conductive objects) can get electrostatically charged if not grounded. (Think about walking across the carpet during wintertime when the humidity is low and touching something metal – the big static shock that you feel through your fingertips is quantified by the human body model.)

The HMB is covered in more detail in ANSI/ESD STM5.5.1-2016, which identifies 7 specific class levels of protection.

The charged-device model (CDM) is an alternative scientific model that can be used instead of the human body model in some instances; see ANSI/ESD SP5.3.3-2018. It simulates the effect of static charge being conducted through one pin or connector.

And finally, an isolated conductor in this context refers to an isolated metal object (e.g. something that's not in contact with another conductor) that might have a charge on the outer surface. (A good example is an isolated metal desk with rubber wheel casters that prevent it from being grounded to a metal floor.) It's important to remember that the charge on an isolated conductor is spread out over the entire surface; meaning it might have a very low voltage overall but can still cause major ESD damage.

3. Choose Ruggedized Electronic Components

At this point, you might be thinking to yourself that establishing an ESD protection program sounds complicated and expensive – "wouldn't it be cheaper and simpler in the long run just to specify integrated circuits and electronic components that are somehow 'hardened' against damage from electrostatic shocks?"

This is a really good point.

Indeed, many manufacturers in the electronics industry have invested heavily in attempting to do just that, e.g. ruggedize their electronic components so that they are more resistant to potential damage from wayward electrostatic shocks.

Choosing to specify electronic components with greater internal protection against ESD can make economic sense (assuming the products are available and offered at a reasonable price).

However, this is not an overall panacea, given that most electronic assemblies are made from a collection of parts sourced from a variety of different manufacturers, and their ability to resist ESD damage will only be as strong as the weakest link in the chain.

4. Create An Electrostatic Discharge (ESD) Protection Plan

If you've been in the manufacturing world for any length of time, you're probably very familiar with the earthy expression: Prior Planning Prevents P*** Poor Performance.

Even though the expression may not be the best one for use in polite conversation, it's a useful reminder that if we don't make a workable plan, we can't expect to achieve measurable results and improvements.

This is especially true for managing ESD, given that it's an invisible threat, one that requires rigorous adherence to standard operating procedures in order to achieve successful results.

Read more...

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