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## Best Practices for Electrical Switchboard Manufacturing Success



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## Introduction

Electrical switchboard manufacturing is a competitive business. So, hitting cost, delivery and quality targets are important for manufacturers. That allows builders to succeed with current projects and to win future jobs while making a profit.

Key to achieving cost and other goals is effective manufacturing, which requires organization. This starts with the warehouse. The aim here is to ensure the right part is available at the right moment every time. Since there are thousands of components that may be needed, inventory management is critical. Different organizational



Carrying out quality inspections and practicing quality control throughout the manufacturing process minimizes visible and invisible costs.

systems exist to allow parts to be located quickly and accurately. The important requirement is that a builder pick one that works for a given situation and stick with it. The result will be smoother manufacturing.

A warehouse should only stock parts that are needed, the list of which comes from a build schedule and a bill of materials (BOM). That brings up a second area of planning: preparation before assembly. This includes production files, with the BOM one of these. Clearly, components must also be available, which is how the warehouse comes into play. Beyond that, builders need a proper workspace and an appropriately trained workforce.

With parts on hand and pre-assembly preparation complete, builders are ready to move onto actual manufacturing – if they have an organized manufacturing area. A typical panel building work area will be arranged in sections, with projects flowing through copper and busbar workshops, wiring, assembly, quality inspection and packaging. A well-organized manufacturing space enables this flow to be efficient, which, in turn, makes it easier to achieve goals involving cost, delivery and quality.

Speaking of quality, it is important to remember that the price of poor quality is like an iceberg. While some expense, like scrap, is visible, most of it is hidden, such as lost sales or expensive engineering



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## Introduction (cont.)

change orders. Carrying out quality inspections and practicing quality control throughout the manufacturing process minimizes visible and invisible costs. Ensuring quality also avoids delays and having customers receive unacceptable panels.

The rest of this eGuide goes over these concepts in more detail. For even more information, Schneider Electric's [Panel Builder Portal](#) offers many practical resources to help make the best possible electrical switchboard manufacturing. By following these best practices, panel builders can not only survive but thrive in a competitive business.

### About the Author



Petre Butu has more than 20 years experience in different roles including electrical engineering, sales, sales management and marketing, and more than 18 years with Schneider Electric in their Romania and France locations. In his current role, Petre is the Panel Builder Channel Director.

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A well-organized manufacturing space enables the process to be efficient, which makes it easier to achieve cost, delivery and quality goals.

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# Electrical Switchboard Manufacturing: Organizing A Manufacturing Area

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### Where and how you work can affect the final product.

Panel building is a very competitive business. Companies that want to enter this area and hope to succeed in the long term must design their facilities to operate efficiently while providing an environment able to support quality and precision.

In a panel building company, there are four typical areas (see Figure 1) and this article will cover three of them, related directly to the manufacturing process:

- Warehouse (will be discussed in a coming article)
- Preparation and assembly
- Quality inspection
- Packaging and shipping



Testing needs to be performed carefully and methodically, according to a checklist, to ensure safety.

### Typical Panel Builder Workshop Layout

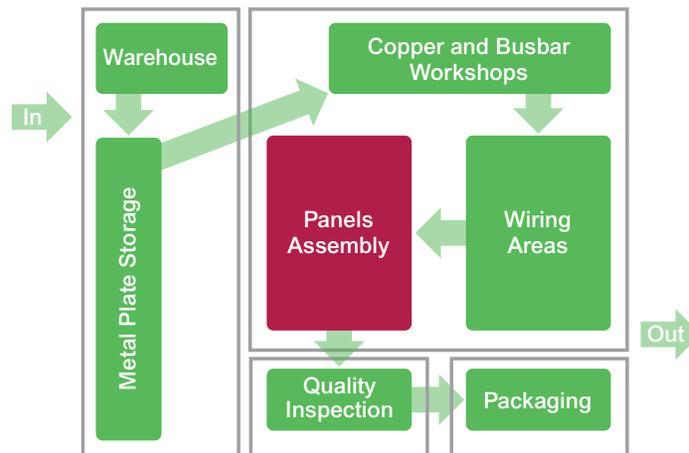


Figure 1

### Success Through Organization

**Preparation and assembly:** Assembling a switchboard is a process that typically takes some number of days. There must be a dedicated space where the enclosures can remain undisturbed and have not to be moved to permit other activities in the facility. Given the complexity of the assembly process, it requires a well-organized workshop, clean environment and easy access to the right tools. For more details, refer to method “[5S](#).”

**Quality inspection:** Like assembly, inspection can take some time and should be done in an area where the quality inspector can concentrate and have not to move equipment out of the way. Testing needs to be performed carefully and methodically, according to a checklist, to ensure safety.



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**Packaging and shipping:** An assembled electrical enclosure needs careful handling as it is being prepared for shipment. To avoid damage to the cabinet and external fittings, it must be well protected. The choice of packaging method should be defined according to the distance and shipping mode (e.g., truck, boat or plane). This is not an action that should be performed hastily, or the panel may have to be repaired or its IP/IK rating lowered when it reaches its destination.

With a well-organized workshop, it is much easier to achieve reliable quality for your switchboard and productivity process to create an outstanding brand image. The ability to create a switchboard and enclosure that looks as good as it operates will identify your shop as a professional operation. Besides all the points we mentioned above, the competency of your individual workers is also a key point and needs to be kept in mind. When your shop delivers products exhibiting excellence in all areas, customers will return for additional projects.

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With a well-organized workshop, it is much easier to achieve reliable quality for your switchboard and productivity process to create an outstanding brand image.

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# Electrical Switchboard Manufacturing: Storing Components for Easy and Accurate Retrieval

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***Having to hunt for components and tools wastes time and money. Organization reduces manufacturing costs.***

An electrical switchboard can include thousands of individual components. Some, such as power breakers or busbars are critical and expensive. Others are more common, such as screws and nuts. Having access to the right items, quickly and accurately, will permit the most efficient and profitable construction and preparation on every project.

Inventory management is absolutely critical. If there is not an easy and accurate mechanism for knowing what is in stock, construction will be erratic and shipping a project on time will be virtually impossible. An effective supply chain mechanism can ensure the factory maintains the minimum quantity stocks, for some items, in warehouse. This approach is also called safety stock management.

### **The Right Part, Every Time**

Many of the components installed in a switchboard look alike. Devices must be organized in inventory, contained in appropriate bins on designated shelves such that they can be located quickly and accurately. There are many rules and guides you can

follow such as placing the items used most frequently closest to the assembly area, putting heavy goods on lower shelves and FIFO (first-in, first-out) stock rotation.

As a panel builder, your business model is mostly ETO (Engineering to Order), so you normally don't have

huge volumes of parts needing to be stored. But as parts are often delivered in a package with all the components in one pallet, you need to stock some parts in the warehouse after the incoming inspection. After reception and before moving to the inventory shelf, items should be protected from dust and dirt. Many industrial environments are subject to residues that can deposit on surfaces over time. Components not used frequently might remain in inventory for a year or more and if left uncovered, can accumulate dirt and grime, resulting potentially in degraded performance.

The packaging should always have a clear identification label to show the contents such as: reference, quantity, batch number and/or bar code, etc., on multiple surfaces to make them easy to read when

stacked on a shelf or in a bin. You should also add the project number information to each product to make assembly preparation more efficient.



An effective supply chain mechanism can ensure the factory maintains the minimum quantity stocks, for some items, in warehouse.



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Selection of high quality components tells customers your panels are designed for many years of trouble-free operation.

are installed on the rails or the interior mounting panels, they are subject to the same airborne dirt and residues as unprotected parts in inventory.

Your company will be judged heavily on the appearance of your work. Selection of high quality components also tells customers your panels are designed for many years of trouble-free operation.

## Protecting Work in Progress

At various points in the manufacturing process, some large components, such as enclosure doors, need to be carefully stored when waiting for the next process step since they can be easily deformed and/or scratched, see Figure 2. Both types of defects will cause quality issues during the assembly and to the final switchboard appearance, which may require replacing the damaged parts. It is necessary to construct racks to hold such items with protection for edges and critical surfaces. The racks will improve your overall workshop organization as well.



Figure 2

If a partially finished panel needs to be stored for a long period of time, the enclosure should be closed, even if it necessitates fabricating a temporary cover. Once parts



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# Electrical Switchboard Manufacturing: Preparation Before Assembly

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**Careful evaluation before actual construction begins can avoid surprise problems later in the process.**

Building a switchboard should be a thoroughly planned activity. There are four main points that should be checked before the workshop starts the assembly process.

### 1 – Production Files

The designer should prepare the production files, including precise layout, bill of material (BOM), manufacturing drawings, front view drawing, single line diagram, command and control diagram and so on, to make the assembly job efficient and maintain a good quality level for the final production.

### 2 – Component Availability Inventory

It is essential to have all the components available when the operators start the assembly in the workshop. Once the designer has confirmed the BOM, the supply chain team should be able to take action to prepare all the components accordingly. The assembly schedule should also be aligned with the larger production schedule.

### 3 – Proper Workshop Space

A panel assembly workshop can take up a great deal of space, but it is critical to have it available when starting the assembly process. The workshop should include an area for the electrical panel, and space for components and feeding components. A well prepared space can provide a proper environment for the assembly job. For more information about Workshop Organization, you can check my another article, “Organizing a Manufacturing Area.”

### 4 – Manpower Competency

All things considered, the most valuable resource we need to prepare is our people. We should make sure that enough workers have been assigned to a project so it will be possible to meet the final delivery date. You should consider the personal experience and individual capabilities of workers when assigning them to different projects. Regular training programs should be included to maintain competency and skills of the operators.

The ability to deliver electrical switchboards with high quality construction and on-time delivery will identify your shop as a professional operation.



It is essential to have all the components available when the operators start the assembly in the workshop.



# Electrical Switchboard Manufacturing: Quality Control For a Panel Builder

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**Checking your work thoroughly throughout the process ensures correct functionality and avoids customer problems.**



Image 1-Cost of Quality

Image 1 illustrates many of the key concepts when we talk about industrial quality. It explains the basic concepts of quality functions, using the limited resources available to avoid huge negative impacts from quality issues.

Quality control and quality inspection should be carried out throughout the manufacturing process of an electric switchboard. Normally, we have three phases during the process: incoming inspection, in-process inspection and final inspection.

### Incoming Inspections

As a panel builder, you will receive different types of materials which might need incoming inspection. This action can avoid poor quality materials entering your inventory where they can impact the final quality of your products.

### Checking During Assembly

Quality control during assembly is a continuous process. Technicians should be checking their work at every stage to make sure everything is performing properly along the way.

### Final Checks

We hope most problems can be identified and fixed early in the process. However, some things cannot be checked until all components are in place. We need to verify carefully that the switchboard conforms to the customer's requests. There are also specific electrical and mechanical functions that should be inspected and verified during the final checking.

For an efficient quality system to cover all three phases, you should have:

- A quality inspection process your people can follow;
- Documented procedures to guide and record all inspections;
- Qualified inspectors;
- Dedicated tools and equipment.

Schneider Electric's [Panel Builder Portal](#) offers many practical resources to help you make the best design of electrical switchboards. When your workshop delivers products exhibiting excellence in all areas, customers will return for additional projects.

## Additional Resources

[Schneider Electric Panel Builder Portal](#)  
[Best Practices in Electrical Switchboard Design](#)

