

Documentation: The Missing Link

The Critical Importance of Documentation in Hazardous Locations Certification

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Abstract

Documentation is to certification what the “missing link” is to evolution: both are poorly understood, rarely considered much (if at all), and often completely ignored. Yet, without this essential bridge, it is simply not possible to evolve to the next stage: namely, a certified design.

Problem #1: It's Boring

Let's face it: documentation is not sexy. It is mundane, fussy, and above all boring. Given a choice between design and documentation, documentation loses every time.

Worse, design documentation is not taught in school. Most technical professionals receive their degree without ever having heard of an indented bill of material, seen an assembly procedure, or drawn up a decent schematic. The sole exception - commenting source code - is barely given lip service and routinely ignored thereafter.

As a result, most designers enter the world ill-equipped to understand documentation requirements, much less appreciate them. They focus first on the design itself, and less so on writing it down. This disconnect is often so fundamental that it can take years to resolve.

Problem #2: It's Essential

As is always the case, ignoring the problem does not make it go away. Like it or not, adequate documentation is absolutely essential to your project in several critical ways.

First off, without proper documentation, you are not going to be able to actually construct your equipment. Despite what garage tinkerers and Mom & Pop shops think, at some point, your informal system of tribal knowledge will break down. Mistakes will happen, products will be broken, and customers will be unhappy.

Secondly, without knowing how to build something, you will not know what you need to build it. This is a problem, for businesses of all sizes have to manage their money carefully. This involves

keeping track of inventory, paying the correct taxes on time, and spending money wisely. None of these things are remotely possible if you do not know what to buy, how much to buy, and when to buy it.

Thirdly, when you do get certification, you will get audited. Regardless of the type or frequency of these audits, one thing is certain: the auditor can't audit unless there is something to audit. That something is – you guessed it – design documentation.

The final and potentially most critical reason for adequate documentation is even simpler: No documentation, no certification. Contrary to (semi-)popular belief, it is not possible to verify safety merely by looking at product samples; you must have the documentation to back them up.

These requirements stand regardless of if you are building a one-off assembly or thousands of units daily. If you do not provide the certifications agency with documentation that clearly demonstrates product compliance, you do not have a product to sell – period.

Just Do It – But What?

So the solution is obvious: just do the documentation already! Easy, right?

Of course, this just begs the question. Which is: what documentation do I need?

This is a difficult question to answer since there are a lot of different kinds of products out there. Documentation that is appropriate for one may not be appropriate for another. So what is to be done?

There are a lot of different answers out there, each tailored to a specific situation. But the underlying theme is always the same, and is as follows: The agency needs enough documentation to verify that your product meets the certification standards. That's it, that's all.

When you think about it, this makes sense. The job of the agency is to verify compliance against the standards, and said compliance can only be verified via documentation. So, obviously, the documentation must be complete enough to allow them to do their job. If they can't, they cannot grant you that all-important certification you desire.

Admittedly this definition is annoying because it is non-specific; it does not provide a handy checklist for ensuring your documentation is complete. But it is interesting nevertheless, both for what it does say, and for what it doesn't say.

The Basics

Without exception, the foundation of any certifications package is the bill of material. Without a complete, comprehensive and accurate bill of material, your certification is doomed to failure.

It is a common expectation that agencies only need certain parts of the bill of material, such as the PCB design or electrical parts. Alternatively, some believe that the bill of material is secondary to the inspection of physical samples. These are both incorrect: agencies always need a bill of material that is fully complete in all respects.

Beyond the bill of material, details vary. But it is not incorrect to say that the agency needs all of the same documentation you would provide to those designing, manufacturing, servicing and/or using the product. This would typically include schematics or electrical diagrams, mechanical assembly drawings, part drawings and specifications, user instructions and so forth.

For certain types of equipment, additional information may be prudent, or even required. Examples include airflow diagrams and parameters for purged equipment, or detailed calculations and ratings for intrinsically safe equipment. While such information might be characterized as only for guidance purposes, it can nevertheless be very helpful to the certifications process.

Those unfamiliar with documentation requirements are often taken aback by these requirements, and sometimes go to incredible lengths to try and “cut down” their effort. This is often ill-advised and introduces unnecessary risk of rejection – to say nothing of the additional problems created in other areas of the business.

The Details

The definition above states that the documentation has to be complete enough to verify against the standards. This implies that everything relevant to product safety must be described. This, in turn, leads to the basic requirement that documentation be fully comprehensive and complete.

So far, so good. But this leaves the specific details undefined. How to address those?

Since the standards are involved, one might expect that a clear understanding of the requirements of the standards might be essential to capturing these details – and you would be right. The single best way to ensure your documentation is complete is to thoroughly understand your standards.

Unfortunately, these requirements are not explicitly stated in the standards – they are only implicit. Rather than providing a list, it is up to the designer to understand what the standard requires and create documentation to satisfy that need.

This is not always straightforward. Certification standards are – by all accounts – complex, opaque, boring, and basically very user-unfriendly documents. This can make the task of design documentation rather difficult, to say the least.

It is also true that there are a lot of specific details that are not described in any publicly available standard or reference, as well as a significant number of conventions that can potentially make life easier for everyone. These can trip up even the most diligent designer and cause unnecessary delays at the agency.

For these reasons, having expert help in understanding and interpreting the standards can be very helpful. An experienced consultant can describe all of the requirements, expectations and conventions for certification documentation –both written and unwritten.

What You Do Need

As a rule, adequate documentation exhibits the following characteristics:

- Identification: Every drawing has a unique and visible drawing number and revision level.
- Completeness: The documentation describes the entire design, down to the last bolt, wire and label. Every part, subassembly and assembly is fully described and detailed.
- Organized: Drawings are well organized, and easy to locate and identify.
- Consistent: Drawings are named and referenced in a consistent, logical manner.
- Detailed: The drawings provide sufficient detail to verify that the product meets the standards. This may involve the inclusion of details such as materials, dimensions, inspection requirements, or even references to appropriate electrical codes.

In addition, documentation must be controlled - there must be some means of ensuring that only the correct documents are used for manufacture, and that they are not changed without prior agency approval. This is more of an auditing requirement and is not required for the certification *per se*, but is still a concern.

What You Don't Need

What is interesting, and often missed, in the discussion around design documentation is what you do not need.

That is, there are aspects of the documentation that actually do not matter to the certification effort. Understanding these items can go a long way towards reducing stress and uncertainty in the project.

These include items like the following:

- Format: Design documents can be provided in any format; the specific program or technique does not normally matter. Designers are therefore free to use whatever tools are desirable.
- Media: Drawings can be paper or electronic. While most organizations eschew paper, paper documents can sometimes be preferable.
- Organization: There is no set organizational framework. Drawings can be organized in any convenient fashion, as long as it is self-consistent and complete.
- Assembly procedures: Agencies do not generally need assembly procedures. This is because they care what you build – not how you build it. (There are rare exceptions.)

Help Is Out There

The certification world is not blind to the difficulties of design documentation, and has made some efforts to try and help. These include the following:

- Individual certification standards often have requirements for items such as markings, user instructions and other items.
- The IEC has created IECEx Operational Document 17 (IECEx OD 017), which gives basic guidance on the overall documentation requirements for hazardous locations products.
- Experienced hazardous locations consultants can provide detailed and specific guidance for all types of certifications documentation.
- Training courses are available. Some, but not all, will describe the documentation requirements for specific types of designs.

Summary

Design documentation is a complex topic and it is not possible to fully describe the requirements for all situations in a few pages. But designers who ensure that their documentation is both complete and fully addresses the requirements of the standards will enjoy much greater success.

Spark Institute consultants have extensive experience in all types of ordinary locations and hazardous locations documentation. Reduce your risk – put our experience to work for you today!



About Spark Institute

Spark Institute is a full-service consultancy that specializes in intrinsically safe and hazardous locations design services. Our experience covers North American, ATEX, and IEC requirements.

Design Consulting

Know what you want, but don't know how? Put our years of experience to work for you. We can design hazardous locations products to your specifications.

Design Evaluation

Have an existing product, design, or concept? Spark Institute can help evaluate your design to the relevant standards to help ensure compliance. Take advantage of our experience to reduce your risks before making costly mistakes.

Training Services

Good designers aren't born - they're trained. Our training courses will drastically shorten the learning curve for both new and experienced designers. Courses can be tailored to your product lines on request.

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