Understanding the Intrinsic Safety Certification Process

We want your experience with UL’s intrinsic safety group to be a positive one. With decades of experience in intrinsic safety and a wide range of services, UL has the tools to meet your needs for hazardous locations certifications. In a continuing effort to improve our service delivery and our interaction with you, we’ve put together this guide with the hopes that a better understanding of how your project proceeds through UL will help us work together more effectively. We hope you’ll take the time to read this information and help us serve you better.

For general information on hazardous locations and UL in general, please visit our website at www.ul.com/hazloc.

Getting Started

UL Services

The first step in beginning a project with UL is to decide which service(s) you desire. If you are experienced in hazardous locations and with the requirements for intrinsic safety, a complete certification project is likely what you’ll request. On the other hand, if you are new to hazardous locations, intrinsic safety, or both, an initial design review or one of our other services may be more useful. No matter what level of experience you have with intrinsic safety or hazardous locations, UL offers a service to meet your needs.

A. Complete Investigation

A complete investigation is a project intended to result in equipment Listing or certification.

Challenge: You may think that a complete investigation is the only service you’ll need, but it is not always the most effective choice. Read on to learn about initial design reviews and other services UL offers to assist you at every stage of product development.

B. Alternate Construction

For currently Listed or certified equipment that has been revised, you’ll request a revision project. Such projects include assessments of revised constructions, alternate constructions, new versions, alternate model designations, etc.

C. Preliminary Investigation

Also known as a preliminary investigation, an initial design review is a project opened to evaluate a particular product or part of a product that will eventually be submitted to UL for a complete investigation. The purpose of such a project is to identify construction issues that do not comply with the applicable requirements before you have committed to a final design. The scope of these projects ranges from a review of a draft schematic to a full technical evaluation. Even preliminary testing can be completed as part of an initial design review project. This is especially helpful in cases where the complete design revolves around one or more critical parts, such as a battery cell. If a battery were not to pass the required tests, a major redesign of the product could be needed, costing you significant time and money.
Initial design review projects result in a letter report. This letter report will include a detailed summary of all items evaluated and the results found, unless you indicate that such a summary is not necessary (such as when a face-to-face meeting takes place between your company and UL and you, for example, take notes on the items discussed).

**Challenge:** Many customers receive UL’s initial design review, make modifications to the product, but still have noncompliance issues arise in the complete investigation. Why? Unfortunately, intrinsic safety encompasses a complex set of requirements, where changes to one part of the circuit intended to fix one noncompliance may result in changes that create noncompliances in another part of the circuit.

**D. Technical Consultation**

Unlike an initial design review, a technical consultation is for customers who are in the very early design stages of a new product or have limited experience with intrinsic safety and need additional guidance before completing an initial design. Technical consultations usually involve a face-to-face meeting between UL’s staff and personnel from your company.

Technical consultation projects result in a letter report providing a general summary of the meeting without detailing specific noncompliances (since the final design may change significantly).

**Did you know...**

**Meetings**

Face-to-face meetings can be an effective way to complete a project with UL. Most commonly, we are asked to travel to a customer’s facility (and we travel all over the world), but you can visit us at our Northbrook, Illinois office too. Many customers find this to be an invaluable service, since they can get immediate responses to their questions, or they can discuss several alternate construction options directly with UL staff. Some of our customers have their entire design team participate when we visit their facility, which means that everyone involved can hear how their work affects the overall certification (and get their specific questions answered too!). Any aforementioned type of project can involve a factory visit — even a complete investigation. We can even send a team of UL staff to your facility to work with you — a common approach for those customers who need expedited service. Very often, the only difference in the overall project cost limit is the travel expense.

**E. Seminars**

UL University offers one- and two-day seminars tailored to our hazardous locations customers. Courses on the basics of hazardous locations equipment and installation or the specifics of intrinsic safety design are presented by some of UL’s foremost experts on the subjects. For further information, please contact UL University at [www.uluniversity.com](http://www.uluniversity.com) and search for “Hazardous Locations.”
F. Quality Audits
Many international certifications require that applicants have a certified quality management system. UL provides this service for the international IECEx Scheme, the European ATEX Directive, and the Brazilian INMETRO Mark.

Did you know…
The European ATEX Directive requires that companies that manufacture and sell continuously produced intrinsically safe equipment or associated apparatus have a quality management system certified to EN 13980:2002, which is based on the requirements of ISO 9001:2000. Known as a Production Quality Assurance Notification (PQAN or simply QAN), this certificate is required in conjunction with a Certificate of Conformity or Component before Europe's compliance mark, the CE Mark, can be affixed to the product. Similarly, a Quality Assessment Report (QAR) to IECEx OD005 is required before a product certificate can be issued under the IECEx Scheme. For more information, see our website at www.ul.com/hazloc/potential.

Certifications UL Can Provide
One of the most important pieces of information that UL needs to know in order to effectively handle your needs is the certification(s) desired for your product. Since this is often confusing, here is a brief summary of the certifications that UL's intrinsic safety group can provide:

1. For the United States

UL Listing or UL Classification — For complete devices ready for installation. Both are considered “Listed” by an NRTL (Nationally Recognized Testing Laboratory), which is required by the National Electrical Code for all intrinsically safe equipment and associated apparatus. A UL Classification denotes that some aspects of the safety of the device have not been evaluated to the level required for a Listing. For example, Classified gas detectors are not subjected to a complete performance test program as Listed ones are.

UL Recognized Component — For components that are intended for factory installation in Listed (or other) products. Common examples are relays, optical isolators, transformers, and fuses.

2. For Canada

C-UL Listing or C-UL Classification — Same as UL Listing or UL Classification, but for Canada.

C-UL Recognized Component — Same as UL Recognized Component, but for Canada.

Did you know…
Products that obtain both UL and C-UL certifications to corresponding standards are marked with a combined UL/C-UL mark, the C-UL-US Mark.

3. For Europe

ATEX Certificate of Conformity — For complete devices ready for installation.

ATEX Certificate of Component — For components.

ATEX Production Quality Assurance Notification Certificate — Required for manufacturers of intrinsically safe equipment and associated apparatus before the CE Mark can be affixed on the product. May be requested by the Notified Body for verification before a Certificate of Conformity or Component is issued for a product.

Did you know…
Only one ATEX PQAN is required for each applicant, and is valid for the quality aspects of all products that use the protections methods included in the scope of the PQAN certificate. The PQAN may come from a European Notified Body (i.e. testing and certification agency) other than the one that issued the Certificate(s) of Conformity or Component for your product(s).
4. For the international IECEx Scheme

Hazardous Locations (Ex) Test Reports (ExTR)

IECEx Scheme Certificate of Conformity — For complete equipment.

IECEx Scheme Certificate of Component — For components.

IECEx Scheme Quality Assessment Report — Required for manufacturers of intrinsically safe equipment and associated apparatus before an IECEx Certificate of Conformity or Component can be issued for a product.

5. Others

For Brazil — INMETRO Certification

For China — CQST Certification

For Japan — TIIS Certification

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**Did you know…**

**Recognized Components**

Using UL Recognized Components in the construction of your product saves you time. These components have already been evaluated for specific characteristics and are under UL’s Follow-Up Services program, so further control or inspection of them in your file is not necessary.

**Did you know…**

**Ordinary Locations Requirements**

All hazardous locations equipment evaluated by UL for a UL and/or C-UL Mark must comply with the applicable hazardous locations requirements for explosion safety as well as the requirements applicable to that product in an unclassified, non-hazardous location, i.e., an “ordinary” location. The ordinary locations evaluation analyzes shock, fire and casualty hazards associated with the equipment. For example, an associated apparatus intended to be located in a Division 2 location and providing intrinsically safe circuits into a Division 1 location must also comply with an appropriate ordinary locations standard, such as UL 60950, the Standard for Information Technology Equipment. Please note that these evaluations are usually handled by UL groups other than our hazardous locations department.

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**Requesting a Quote**

Once you have decided which UL service and certifications you desire, you may request a quote by going to [http://my.home1.ul.com/portal/page/portal/RFQ/INDUSTRY](http://my.home1.ul.com/portal/page/portal/RFQ/INDUSTRY) and following the directions posted there.

**Accepting the Quote**

Once you have requested a UL service, a price quote will be provided to you from our Customer Service or Sales staff. This quote will contain only information about the price of the requested service; other project specifics will be provided in the project planning stage. You must accept the quote per the directions provided before a project can be opened. In many cases, a preliminary deposit will also be required.

**Challenge:** The determination as to whether a deposit is needed is normally made immediately after you have accepted the quote, so to avoid delays, please be prepared to provide a deposit. If you have any questions about the criteria for determining if a deposit is needed, please direct them to our Customer Service or Sales staff.

If your company uses Purchase Order (PO) numbers, please be prepared to provide that number as well.

Once the quote has been accepted and the preliminary deposit has been received, a project will be opened and passed to the appropriate UL conformity assessment group(s), where a project plan will be generated.
Project Flow

Project Planning

Once opened, each project goes through a planning stage to confirm: the scope and standard(s) to be used, to prepare a test program, to develop a list of samples and information required, and to establish project assumptions.

Upon receiving a project for planning, the responsible UL project handler will contact you within two business days to discuss the request. It is imperative for the handler to have a complete understanding of your project so that he or she may generate an accurate project plan. This includes the exact certifications desired, and when known, the editions of the standards to be used. Therefore, you should be prepared to provide as much information about the project as you can at that stage. For example, if the project is a complete investigation, the handler will likely request the schematics and perhaps bills of materials to help with planning. If these are not available, the handler will not be able to complete the project plan, adding time and possible cost to the project.

Once complete, the plan will be conveyed to you, normally via e-mail. You should immediately review this plan to ensure that the scope of the project is accurate and that no desired service is missing. If you see an error or omission, contact the project handler immediately. Errors or omissions pointed out later in the project will be treated as scope changes, and additional evaluation and testing, as well as cost increases or completion date extensions, may be necessary.

Also, the actual evaluation cannot begin until the samples and information requested in the plan have been received, so prompt attention to this document will minimize delays in processing your project.

Challenge: It is common for manufacturers to begin the certification process as soon as the design is complete but before samples of the product have been produced. This can, of course, cause problems for certification agencies, since we need actual samples for our tests and construction examinations. In some cases, we can start our evaluation without all of the necessary samples, but this must be discussed and agreed upon with the project handler in the planning phase. At a minimum, a complete drawing package, including schematics, printed circuit board trace and component layouts, and bills of materials/parts lists must be available. A complete sample must also be available when needed for a construction examination, although in most cases, a prototype sample can be used for this purpose as long as it accurately depicts the construction of the final product (any assessments made will be confirmed by examination of an actual sample when available). However, actual production samples must be available by the time testing begins to avoid delays and extensions to the project’s assigned completion date. Assumptions concerning the delivery times will be addressed in the project plan.

Providing Samples

Instructions for providing samples to UL will be included with the project plan. Since the UL evaluation cannot be completed without all of the samples, it is imperative that the samples be made available as soon as possible.
Although it is sometimes difficult for customers to predict what samples UL will require, we have prepared a document entitled “Customer Deliverables for Intrinsic Safety Projects” to help you. Please see this document for details on the samples and documentation normally required for UL intrinsic safety projects.

**Turnaround Time**

Once all necessary samples and information have been received to proceed with the investigation, the project handler will send you a communication, typically via e-mail, that indicates the anticipated completion date of your project. Our turnaround times are based on the complexity of the project, the certifications desired, and, to a lesser degree, the current backlog of our laboratory (when the project includes testing):

- Minor revision: 2 weeks
- Normal revision without testing: 4 weeks
- Normal revision with testing, or complex revision: 7 weeks
- Normal complete investigation: 11 weeks
- Complex complete investigation: 16 weeks

Please note that projects including international certifications will take longer due to the need for review by the Certification Body who issues the certificate. For ATEX or IECEx projects, add two weeks. Others, e.g. INMETRO, will vary.

If you have specific turnaround time needs, please note this during the quoting stage, and reiterate your request in the project planning stage. Rush projects are at the discretion of UL’s management based on staff availability and impact on other projects currently underway.

**Challenges:** These turnaround times start on the day that we receive all of the necessary samples and documentation requested in the project plan (or on the day the project plan is completed in cases where all the necessary materials were provided before then).

These turnaround times assume that no major nonconformities will arise during the evaluation. If we obtain unacceptable results during testing, or if the product has features that do not comply with the requirements in the standard(s) being used, it is very likely that these dates will no longer be accurate. See the section on major and minor nonconformities for more details.

The majority of intrinsic safety tests are not time consuming and do not encounter a long laboratory backlog. However, should you anticipate that you will need testing that may have long lead times, such as battery testing or ingress protection (IP) testing, please take this into account when planning your submittal.

One of the biggest roadblocks that we face in meeting assigned completion dates is a change to the product in the middle of our evaluation. Due to the nature of intrinsic safety, such changes often necessitate a partial (or in some cases a complete) reevaluation of the product. This extra work forces the project handler to change his or her schedule for the project, which can result in unexpected delays. It also increases the chances that a part of the evaluation will be incompletely addressed in initial assessment, only to be caught by the reviewer at a later stage of the project, causing additional delays for you. If changes must be made in the middle of the project, discuss them with the UL handler to see what impact they will have on the overall project.

In many cases, a separate project, initiated immediately following the current one, is a more effective solution. Otherwise, please understand that such changes will affect the completion date, and, in some cases, the project’s cost.

**Initial Assessment**

Once all of the necessary samples and documents have been received, the project moves to the Initial Assessment stage and the project handler will evaluate the product to the requirements applicable to the certifications requested. For intrinsic safety, the major parts of this assessment are:

1. **Determination of Power Sources**
2. **Determination of Protective Components and Protective Component Assessment**
3. **Spark Ignition Assessment**
   a. Resistive
   b. Inductive
   c. Capacitive
   d. Combination Inductive and Capacitive
4. Thermal Ignition Assessment
   a. Components
   b. Printed Circuit Wiring
   c. Wires

5. Construction Examination
   a. Enclosure
   b. Spacing Evaluation

6. Documentation Review
   a. Label
   b. Control Drawing
   c. Construction Drawings

Did you know...
Providing details on why you think that your product complies with the applicable requirements can help the investigation process. As part of our evaluations, we normally prepare an intrinsic safety block diagram of the device that shows the segregations of circuits and the protective components relied upon to maintain intrinsic safety. Providing such a diagram, and/or a written technical description of the intended protection, can help jumpstart the project. Of course we’ll still need to verify that you’ve assessed your circuit correctly, but understanding your intentions can go a long way toward helping your project proceed more efficiently.

The handler also prepares any laboratory data sheet packages for testing, and drafts an initial assessment status communication to update you on the status of the investigation. This communication, normally sent in letter form attached to an e-mail, will detail where the investigation stands, any noncompliance issues, and identifies any samples or information required to continue or complete our investigation.

Once the handler has completed these tasks, he or she requests a preliminary review of their work.

**Challenge:** The initial assessment stage is where the majority of our assessment work occurs. Although we try to anticipate all that might be needed to complete our work and convey this to you in the project plan, quite frequently, additional information is needed from you during the initial assessment (e.g. component data sheets). Providing this information as quickly as possible minimizes the chances that the project will be delayed due to lack of information. If the missing information is something minor and we can make an assumption about it and move on, we will do so, informing you in writing. However, if the missing information prevents us from proceeding with the evaluation, we will move the project into inactive status until the missing items are received. Inactivity due to missing items will affect the overall completion date of the project.

Did you know...
How noncompliance issues affect your project
Due to the complexity of the applicable requirements, compliance issues arise during many intrinsic safety projects. We classify these as major or minor.

**Minor** — A minor issue is one that you can address in a reasonable amount of time, and does not require significant reevaluation of the device. Examples are making corrections to drawings (including labels, manuals, and control/installation drawings), reductions in capacitance to address spark ignition concerns, alternate protective component values to address spark ignition concerns, and small trace layout changes to address simply spacing concerns. Minor nonconformities may affect the overall project completion date slightly (typically adding two weeks plus the time waiting for the requested items), but do not normally affect the cost limit.

**Major** — A major issue is one that will require significant redesign of the device or its subassemblies, and therefore, a partial or complete reevaluation of the device from an intrinsic safety standpoint will be needed. When a major design issue is discovered, we strongly recommend that your project be closed until you have addressed the concern(s) and redesigned the device to bring it into compliance with the requirements.
Did you know…
Isn't closing my project a bad thing?

Many customers feel that having their project closed due to inactivity or a noncompliance issue is a bad thing. They will be charged for the work completed to date and have nothing to show for it, i.e., no certification, and will then need to open another project to continue once changes are made. Although these statements are fundamentally true — that you will be billed for charges incurred and will need to request a new project once you’re ready to proceed again — it is not as painful as it may seem, and actually helps you in the long run. Consider that a product has a major nonconformity that will require four weeks of redesign, followed by functional testing, preparation of new samples, and so on. It will be probably two months before UL receives the samples and information needed to continue the evaluation, so our project would remain inactive for that entire time. Since we track the progress of all projects continuously, extra time on our end would be needed to review the status of the project and follow up on the status of the outstanding items. This extra time takes focus and time away from projects that can move forward (one of which might be yours!). Additionally, starting a new project gives us a chance to start our normal work process over again. In other words, we can perform another preliminary review on the revised construction, reducing the chances that any missed or incomplete assessment items will not be discovered until final review, adding delays for you. Another frequent customer concern when a project is closed is the time it takes to open a new project. However, the process for obtaining a quote is the same as for a new project, and the project planning stage is minimized because the necessary items for the continued investigation will be detailed in the report letter provided at the close of the original project. Therefore, opening a new project can be completed in a handful of days at most. Whenever possible, the original project handler will also handle the continued evaluation, minimizing delays because he or she will already be familiar with your product.*

Preliminary Review

All projects at UL that involve analysis of technical requirements must be reviewed by a qualified staff member to verify that the project handler has completed the evaluation correctly and completely. Although project handlers and reviewers work together on a continuous basis, there are two formal reviews that take place during the course of a project: preliminary review and final review.

Once the project handler has completed the initial assessment of the device, an official reviewer is assigned. Typically, the handler and reviewer then meet to discuss the project, with the handler explaining his or her technical evaluation and findings to the reviewer.

If no issues have been identified, projects then move forward to the Documentation and Testing stage. At this time, you will be provided with the finalized initial assessment status communication that the handler drafted during the initial assessment. Our goal is to provide this information in the early stages of the evaluation pending the type of service requested.

Documentation and Testing

Following preliminary review, tests are submitted to the laboratory, and the project handler begins to draft the paperwork to support the certification(s).

If the project does not involve testing, this stage is skipped.

Post Test Assembly

Once any testing is complete, the project handler verifies that all test results are acceptable and that any open issues have been addressed. Responses to UL’s initial assessment status communication are reviewed to verify that all open issues have been addressed. The handler then completes all certification documentation and prepares the project for final review.

If the results of the tests do not comply with the requirements, or if open issues remain from the initial assessment stage, we will inform you of this in writing at this point. If the nonconformities are major and will require significant redesign of the product to bring it into compliance, we will request that the project be closed until those changes have been made (see “How noncompliance issues affect

*Note: Closing your project will result in a 50% charge in fees, and reopening it again will result in 100% of fees due again.
my project"). If there are minor issues that can be addressed within a reasonable amount of time, e.g., within two to four weeks, we will place the project in inactive status until the corrections are made and adjust the project completion date accordingly.

**Final Review and Processing**

When the handler has completed his or her work and finds that the product complies with the applicable requirements, he or she requests a final review. Once a qualified reviewer has verified that the product complies, the project moves on to final processing, where the UL Follow-Up Services Procedure and Report are officially issued and the products are added to our published directories.

For UL and/or C-UL investigations for existing customers in good standing, a Notice of Authorization to Apply the UL Mark letter can be provided at this time.

For UL and/or C-UL investigations for new customers or for existing customers obtaining a certification in a new product category or at a new location, an Initial Production Inspection must be completed before you may apply the UL Mark to your products. Information on this process will be provided at the time your project is received in final processing.

**Challenge:** Initial Production Inspections (IPIs) are scheduled with our Field Representative once the paperwork for your project is received for final processing. The date of the inspection must be coordinated with the start of your production, and UL Marks cannot be applied to the product until the IPI has been successfully completed. Please anticipate the time needed to schedule and complete this IPI in your overall time-to-market projections.

This also marks the point where projects involving international certifications move on to the appropriate certification body for issuance of a Certificate of Conformity or Component. Certificates are normally issued within two to 10 days of receipt by the certification body. Electronic copies are provided directly to you upon issue, with the hard copies following shortly thereafter. Copies of the test reports are also provided when applicable e.g., IECEx ExTRs.

**Did you know...**

Under many international certification schemes such as the ATEX Directive and the IECEx Scheme, two types of certification agencies exist, Testing Laboratories and a Certification Bodies. The Testing Laboratory is responsible for evaluating and testing products to specific standards and/or requirements and preparing supporting test reports. The Certification Body then reviews these test reports along with any other required documentation (such as a quality system certificate) and makes the final determination as to whether a product can be certified. The final certificate comes from the Certification Body. Since this function is separate from the project handling function, additional time is needed for Certification Body review once the handler and reviewer have finished their evaluation.