# Is This Material An Explosive Hazard?

*By: William W. Stewart III*

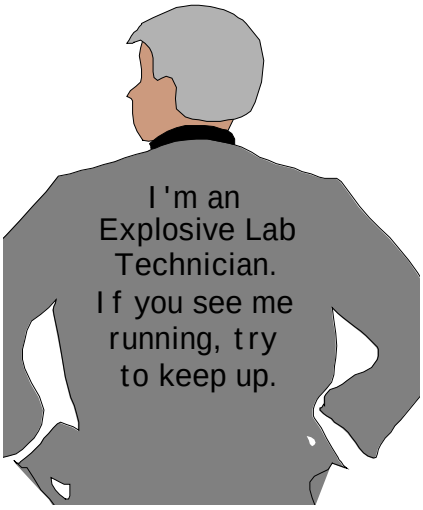


**Figure 1**

How might this material present a hazard? This basic question drives the inquiries into characterizing any hazardous material. It should come up whenever a new chemical formulation or shipping container is considered. Because these changes influence the hazards, new risk and regulatory management may be needed. If the material is known, or suspected, to be an explosive the answer is especially important. Because explosives have a long history as a recognized hazard the process is also especially complex. Understanding that process is fundamental to the proper risk and regulatory management of explosives.

Is this material an explosive? If the answer is "yes" charting the action for many is easy: run (Figure 1). However, in the explosives industry, this question is the starting point for the transportation hazard classification of an explosive. For those not certain of how that classification is reached this article offers an overview and how it figures in the management of both the regulations and risks of explosive materials and components.

Accurate knowledge of a material's specific response to spark, impact or fire is the only way to manage the risk. Obviously trial and error is a poor way to gather this knowledge and ignorance is no defense against civil litigation or regulatory sanctions. So proper hazard characterization works both to manage the risk and comply with the regulations (Figure 2). Risk management refers to the steps taken to safely handle, store and transport a material or component. Regulatory compliance is taking these steps in a way that documents adherence to the relevant rules. Good regulatory compliance is good risk management. But the converse may not be true if steps are not taken to conduct and document proper testing.

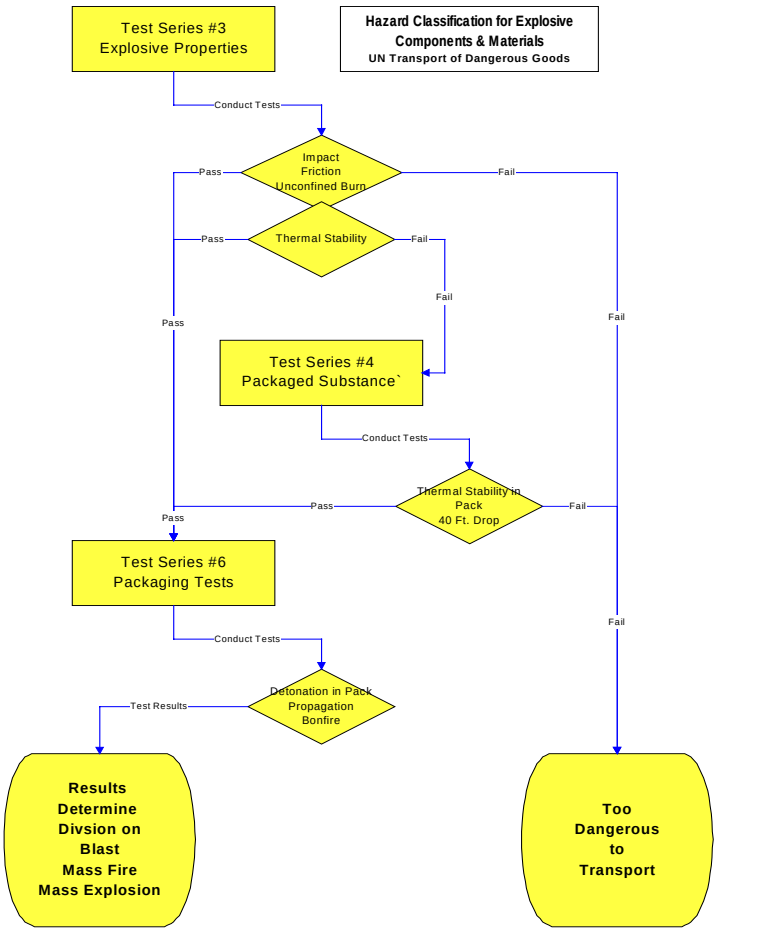


**Figure 2**

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First, it is useful, to place the risk and regulations regarding explosives in the context of two larger pictures. The first picture is historical. Explosives were the original hazardous material. Centuries before environmental hazards or industrial safety were considered soldiers and civil engineers knew that special precautions were needed to keep this powerful tool, explosives, from literally backfiring.

The second larger picture is the present comprehensive management of the many hazardous materials. Originally, and until quite recently, explosives alone were regulated with the special care that now is correctly extended to a variety of hazards. This comprehensive

approach owes much to the regulation of the transportation of explosives in the nineteenth century. The makers and users of explosives managed their own risks then. However, the railroads for which it was a commodity in transit, demanded these risks be better defined. Through the American Association of Railroads Bureau of Explosives they were and that regulatory framework and authority eventually migrated to the US DOT and the United Nations.

The step by step Hazard Classification as codified for transportation is often the starting point even when the immediate concern is not transportation. For example the US Department of Defense references the hazard classes of the DOT for its safety manual.

Stresau Laboratory, of Spooner, Wisconsin, is at the intersection of many of these concerns. It performs test and evaluation of explosive military components as well as transportation hazard classification tests for explosives, oxidizers, corrosives and organic peroxides. It prepared a flow chart (Figure 2) to help its diverse customers safely approach explosive hazards *and* reach proper transportation hazard classification.

Proper transportation hazard classification for an explosive, of course, culminates with the assignment of an EX Number. Much more specific than a Hazard Classification, an EX Number applies to a particular explosive formula and its packaging. The two larger pictures of historic regulation of explosives and the present system of classification of all hazardous materials are needed to make clear the EX Number. In the nineteenth century the EX Number was essentially a privately administered classification of the only recognized hazardous material. Today it is administered publicly as part – albeit a special part – of the larger system that regulates hazardous materials.

A specific series of tests determines the hazard classification. The manufacturer's knowledge of the material can, in some cases, substitute for some of the tests in this process. In the absence of assumptions, except a concern that the material is explosive, the material moves through Test Series 1 and 2 in that order. Test 1 looks at output ascertaining if the material exhibits explosive characteristics. If not, then for transportation classification, it exits from Class 1 consideration at this point.

If the material has explosive characteristics it advances to Test Series 2 for determination of sensitivity. It might be insensitive enough to exit from Class 1 consideration at this point. However, if both *output* (Test Series 1) and *sensitivity* (Test Series 2) are demonstrated the material starts at Test Series 3 for the same course of tests as material intended as an explosive. It will experience the same tests on its route to classification. If that primary hazard classification is Class 1: Explosives, then an additional review and designation is required. This comes from the competent authority which, in the United States, resides with the office of Associate Administrator for Hazardous Materials Safety, Research and Special Programs of US DOT. It acts on recommendations from a restricted list of individuals. These recommendations are based on test results and analogy with existing explosives. Revision of 49 CFR 173.58 in October 1999, enlarged the group of recommending authorities to include the Explosives Bureau, of Short Hills, New Jersey; Safety Consulting Engineers of Schaumburg, Illinois and Safety Management Services of West Jordan, Utah.

One element prompting this change was the change at the Bureau of Mines. Its functions moved to NIOSH and it significantly reduced the work performed for non-government customers. US Naval Sea Systems at Indian Head, Maryland, may be going in just the opposite direction. It has had authority for classification of US Department of Defense explosive devices for years. It may see that capability expanded to accept commercial components for recommendation.

In some instances the recommending authorities perform tests. In most they witness tests or accept reports of tests as the basis for recommendation. The same CFR revision that expanded the number of authorities deliberately divided the recommending authority from facilities with large explosive handling capability. In either case the tests are those required by the UN Transportation of Dangerous Goods. It is the final test results upon which the recommendations to the competent authority will be made and an EX Number issued.

The tests for transportation regulation are the benchmark tests for explosive hazards. Even material that will not be shipped in its native state should be characterized for safe handling. How do you characterize something for which no shipping classification exists? Two basic options: One option is for the laboratory to provide customers with special DOT approved containers to transport up to 25 grams of any explosive – or potentially explosive – material safely. Another is to use a tentative, and conservative, package design that is approved by the competent authority with a TA Number. It is possible that these two options may be used together for proper transport of sufficient materials for Test Series #6 to a test site.

While an overview is important it is no substitute for the actual regulations and the expertise to interpret them and test results. This expertise is critical in determining which tests are needed and which, by analogy and previous experience, need not be conducted. The documentation to support these decisions is as important to regulatory compliance as proper hazard reduction is to risk management.

Running away is obviously not an option for industry but neither is standing still without good information. Follow the transportation hazard classification route for the information needed to manage both the risk and the regulations.

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