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**COMMITTEE OF EXPERTS ON THE TRANSPORT  
OF DANGEROUS GOODS**

(Twenty-first session,  
4-13 December 2000,  
agenda item 2 (b))

**WORK OF THE SUB-COMMITTEE OF EXPERTS  
ON THE TRANSPORT OF DANGEROUS GOODS**

**Draft amendments to the Recommendations on the Transport of Dangerous Goods**

**Explosives**

**Comments on proposals contained in document ST/SG/AC.10/2000/20**  
**(Revised report of the Working Group on the Classification of Ammonium Nitrate Emulsions)**

**Transmitted by the expert from Canada**

**1. Background**

An informal working group on the classification of ammonium nitrate emulsions (ANEs) met in Norway (October 1999) and produced a report recommending changes to the UN test scheme to enable proper classification of these materials (ST/SG/AC.10/C.3/2000/21.) The group reconvened in Geneva (July 2000) to consider UN/SCETDG/18/INF.47 from the United Kingdom and conference room papers from Canada and France commenting on the report, and presenting some test results. The working group decided that a revised proposal should be presented to the Committee of Experts, and since the introduction of new test methods raises questions on their appropriateness, it was also decided to produce test results bearing on their validity. These results will, due to time restraints, appear in separate informal documents to the 21st session of the Committee.

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The results from the Geneva discussions were presented in document UN/SCETDG/18/INF.70 and subsequently in document ST/SG/AC.10/2000/20. The working group expressed the opinion that there is urgent need for internationally agreed conditions for the transportation of these substances, since they are

being transported in large amounts around the world, with various classifications and conditions for transport.

## **2. Discussion**

The products under consideration are water-in-oil emulsions; supersaturated aqueous solutions of inorganic nitrate salts dispersed in oil or oil/wax blends. They are designed to function as blasting explosives when sensitized by the addition of small quantities of rigid voids (e.g. hollow glass microspheres) or chemically generated gas bubbles. They are transported in large quantities around the world, normally in road tankers in lots up to 20 tonnes, or even more. In various jurisdictions they are classified as 1.1 explosives, 1.5 explosives, 5.1 oxidizers or even non-regulated products. This situation is due at least in part to the inability of the existing test scheme to properly classify these products.

The working group proposes that the UN test scheme be modified to accommodate these materials. A new test series (Series 8) will be added, which will result in ANEs being classified either as Class 1 explosives or Class 5.1 oxidizers. The tests originally proposed for inclusion in Series 8 were: cap sensitivity test, Koenen test, DDT test, 75 °C thermal stability test, USA vented vessel test. All but one are tests which exist in the current UN scheme, in various test series. They have a number of disadvantages: they were designed to test more traditional products such as dynamites, TNT, black powder, etc., they were designed for packaged products shipped at ambient temperature, and in general they are very small scale. While they are adequate to identify materials which are relatively sensitive and have small critical mass, they are not well suited for evaluation of modern water-containing explosives. ANEs do not contain self-explosive ingredients, and are often shipped at elevated temperature (70-80 °C at least) in bulk lots of 20 tonnes. The one new test (vented vessel) is designed for bulk products but has its own problems, detailed in the United Kingdom document. These issues were discussed in Geneva, and it was decided to remove the cap sensitivity, DDT and 75 °C tests, and to add large-scale gap and thermal stability tests.

While these changes undoubtedly improve the ability of Test Series 8 to identify material capable of detonation, they may not be sufficient to cover all eventualities which may be met with in transportation. For instance, the crash of a road tanker and subsequent fire would certainly render at least some ANEs detonable through a combination of elevated temperature and voids due to vaporization. A product which may detonate in a credible transportation scenario should not be classified as a 5.1 material, with all that implies for emergency response activities.

Two events which could lead to the explosion of a bulk shipment of ANE are runaway thermal decomposition, and initiation of a portion of the contents which then acts as a booster for the rest of the shipment. Test Series 8 should be capable of addressing this behaviour. While it is highly desirable that any test proposed should be capable of being performed in as many test facilities as possible, it is not justifiable to propose tests simply on the basis they are easy to perform. Thus there is a conflict between the need for accessibility and the requirement for larger-scale, high-temperature tests to reflect the realities of modern transportation. It is Canada's intention to continue to work on tests which satisfy these criteria, those in the proposed series and others. Canada believes that some version of the Dewar test can address the thermal decomposition, while a "minimum burning pressure test" (MBP) can assess the ability to undergo a deflagration-to-detonation transition (DDT).

## **3. Conclusions**

There is considerable variation in the classification for transport of ANEs in various jurisdictions. In view of the increasing frequency of cross-border shipments this is obviously an undesirable situation which should be remedied as soon as possible. Thus Canada is prepared to support the proposals in

ST/SG/AC.10/2000/20, in spite of reservations on the adequacy of the proposed Test Series 8. However, Canada strongly suggests that the proposals be accepted subject to a review of the tests when more results become available, and to possible future modification of the test series. It is Canada's intention to generate such results, with some being available for the December 2000 meeting, and more for subsequent meetings. It is also intended to propose the MBP Test as part of Series 8 when sufficient results are available.

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