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**COMMITTEE OF EXPERTS ON THE TRANSPORT OF  
DANGEROUS GOODS AND ON THE GLOBALLY  
HARMONIZED SYSTEM OF CLASSIFICATION  
AND LABELLING OF CHEMICALS**

Sub-Committee of Experts on the  
Transport of Dangerous Goods

Twenty-eighth session, 28 November-7 December 2005  
Item 5 of the provisional agenda

LISTING, CLASSIFICATION AND PACKING

Proposals of amendments to the packing containers of CALCIUM CARBIDE and its safety measures

Transmitted by the expert from China

**Background**

Calcium carbide (UN No.1402) belongs to substance (4.3) which emits flammable gas in contact with water. The combustion and explosion can easily take place when its packing or handling is not appropriate for the transport process. For safety in transportation, the packing requirements of calcium carbide and its relevant safety measures have been prescribed concretely in the fourteenth revised edition of the United Nations “Model Regulations on the Transport of Dangerous Goods” (for short, “Model Regulations”).

The relevant provisions concerning dangerous features and packing requirements of calcium carbide in Model Regulations are as follows:

UN No.	Name and description	Class or division	Subsidiary risk	UN packing group	Special provisions	Limited quantities	Packagings and IBCs		Portable tanks and Bulk containers	
							Packing instruction	Special packing provisions	Instructions	Special provisions
1402	CALCIUM CARBIDE	4.3		I		NONE	P403 IBC04	B1	T9	TP7 TP33
		4.3		II		500g	P410 IBC07	B2	T3	TP33

According to TP7 of section 4.2.5.3 of Model Regulations: After calcium carbide is encased in a portable tank or a bulk container, “Air shall be eliminated from the vapour space by nitrogen or other means.” It may be called "protecting method of filling nitrogen".

The aim of this kind of method is to eliminate the oxygen contained inside the container. But, in practice, it results in a complicated packing operation and significant costs for the packing of calcium carbide. It is well known that the three elements of combustion and explosion for packed calcium carbide after its packing are acetylene, oxygen and the source of ignition which exist simultaneously, and each element's quantity reaches or is above the lower scope of the critical value. By eliminating any element of the three elements or controlling its quantity out of the scope of the critical value, the combustion and explosion would not take place. In fact, it is difficult to control the source of ignition, because any quake and shock in the transport process of calcium carbide may create sparks. But controlling the oxygen would make the operation and costs of packing of calcium carbide complicated and increase them simultaneously. Therefore, Chinese suppliers tried to find a useful method which could prevent the combustion and explosion through controlling the acetylene contents in a packing container of calcium carbide from the 1990s. After many tests for the metal intermediate bulk container of one cubic meter filled with calcium carbide, a useful method has been found. The method is to check the acetylene contents in the packing container of calcium carbide and make sure that the acetylene content is less than 1% (by volume) before sealing up the container without filling it with nitrogen. With more than 10 years' practice of the method's application in Chinese local railway transport and export shipping to Japan, there has been no accident of combustion and explosion.

The explosive scope of acetylene in air is 2.5~100% (by volume), i.e. when the acetylene contents in air are less than 2.5%, the combustion and explosion would not take place. Therefore, putting the controlling target below 1% just to be 40% of the lower limit of the explosive scope of acetylene, the safety can be guaranteed. Because the controlling target of this method prescribed is concrete and clear, it is easy to accurately measure by an acetylene test gauge, simple and fast in operation, not only lowering the costs of packing of calcium carbide but also ensuring the transport safety.

### **Proposals:**

1. Delete "Air shall be eliminated from the vapour space by nitrogen or other means." of TP7 in section 4.2.5.3 of the Model Regulations, and add "For UN1402, the acetylene contents in the container should be controlled to be less than <1% (by volume)".
  2. Add behind the original contents of B1 of IBC04 and IBC07 in section 4.1.4.2 of the Model Regulations: "For UN1402, the acetylene contents in the container should be controlled to be less than <1% (by volume)".
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