



**DANGEROUS GOODS PANEL (DGP)**  
**MEETING OF THE WORKING GROUP OF THE WHOLE**  
**Montreal, 18 to 22 April 2005**

- Agenda Item 2: Development of recommendations for amendments to the Technical Instructions for incorporation in the 2007/2008 edition**  
**2.4: Part 4 – Packing Instructions**

**PRESSURE DIFFERENTIAL**

(Presented by H. Brockhaus)

**1. INTRODUCTION**

1.1 According to 4;1.1.6 of the ICAO-TI “packagings for which retention of liquid is a basic function must be capable of withstanding without leakage an internal pressure which produces a **pressure differential** of not less than 95 kPa (not less than 75 kPa for liquids in Packing Group III of Class 3 or Division 6.1)”. This general requirement is particularly repeated in packing instructions 602 and 650 for the carriage of infectious substances and diagnostic specimens. As specific requirement for those dangerous goods this requirement gained entry into the UN Modal Regulations and the regulations of the modes.

1.2 At first sight an external pressure reduction should be equivalent to the overpressure testing method proving the requirement of withstanding a pressure differential of 95 kPa. It can be observed that this is not true. For example, a plastics bag filled with a liquid was leak-tight after external pressure reduction almost to zero but failed at an internal overpressure of 30 kPa loaded to the plastics bag.

1.3 Generalizing that observation it can be stated that it is impossible to achieve a pressure differential of 95 kPa applying an external pressure reduction testing method in the following cases.

- Flexible packagings containing air (or another gas) in addition to the solid or liquid filling substance: External pressure reduction causes a decrease of the initial atmospheric pressure in the flexible packaging by volume expansion of the flexible packaging under the developing pressure differential. As an example, in the case of having a flexible packaging with an ullage of 10 % a volume increase of only 10 % of the packaging will cause a decrease of the partial pressure of the contained air to 50 kPa. Applying an external pressure reduction testing method a maximum pressure differential of 50 kPa could be achieved under these circumstances.
- Vacuum-packed packagings: Under these circumstances the internal pressure of a packaging is determined by the vapour pressure of the filling substance only. As the vapour pressure is only

dependent on the temperature of this substance, it would be necessary to heat a packaging filled with water up to 100 °C in order to achieve a pressure differential of 95 kPa by applying an external pressure reduction testing method.

## 2. **CONCLUSION**

### 2.1 **Option 1**

2.1.1 Keeping the existing pressure differential requirement in a strict interpretation of the regulations according to this document, it should be clarified that the external pressure reduction testing method can only be applied to specific cases. The general testing method should be an internal pressure method as it is specified in 6;4.5 of the ICAO-TI. As a consequence, most of the used plastics bags for medicine supply are not able to withstand itself such tests, if they are packed as primary receptacles according to packing instruction 602 or 650. It would be necessary to pack them into secondary packagings resistant to a pressure differential defined in that way.

### 2.2 **Option 2**

2.2.1 Taking into consideration the real situation under flight conditions an external pressure reduction testing method could be sufficient covering the conditions of the arising pressure variations. As a consequence, it would be necessary to amend the existing regulatory text. As demonstrated above by the influence of the vapour pressure of the filling substance, it would be necessary to define a temperature at which an external pressure reduction test should be performed. Furthermore, it seems to be possible that the result of such tests performed on a complete package can be different from the result of a test performed on a single inner packaging or inner receptacle, because the volume increase of each inner packaging may damage the outer packaging.

## 3. **SUMMARY**

3.1 The Working Group is invited to discuss this issue with a view to identifying the adequacy of the further actions which may be needed.

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