University of Zurich[UZH]

Directorate for Real Estate and Facility Management

University of Zurich
Safety, Security and Environment
Winterthurerstrasse 190
CH-8057 Zurich
Phone +41 44 635 44 10
www.su.uzh.ch

Fact sheet B9

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Transport of infectious biological agents and organisms

1. Objectives and types of transport situations

Pathogens and genetically modified organisms[1] must be transported according to special regulations in order to ensure the safety of people and the environment. There are no special packing or transport regulations for natural organisms in group 1.

All other transport situations can be broken down into the following categories depending on the hazard (risk group, amount, etc.), transport distance, public access to the transport routes and type of transport:

A: Same lab:	Transport within labs with the same security levels[2]. See section 1.1.
B: Same facility:	Transport within the same department building (or building complex; within the same working group while passing through low security zones[3]). See section 1.2.
C: Europe:	Transport by motor vehicle on public roads according to hazardous goods legislation (ADR) [4]. See section 1.3.
D: Shipping:	Shipping within Switzerland in Europe See section 1.4.

All first time shipments or transport of organisms in groups 2 and 3 must be discussed with the UZH hazardous goods officer in the Safety, Security and Environment office[5].
Further transport can be managed independently in agreement with the hazardous goods officer.

[1] This involves genetically modified organisms in groups 1 to 3 and pathogens in groups 2 to 3.

[2] Either level 1, 2 or 3. This includes transporting group 1 organisms within the same department building or building complex.

[3] For instance, from lab A (level 2) via a stairway (level 1) to lab B (level 2).

[4] ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road.

[5] Hazardous goods officer, Safety, Security and Environment, Winterthurerstrasse 190, 8057 Zurich, info@su.uzh.ch, 044 63 54115. The hazardous goods officer can provide ready-made containers for the transport of biological material.

1.1. A: Same lab: Transport within a lab with the same security level

The biological material in question is transported within the same lab unit (may consist of several rooms) in which **activities of the same security level** are carried out.

One-layer packaging is sufficient for organisms in **group 2** if the container is liquid tight (e.g., Falcon tubes, Eppendorf tubes with screw top, etc.) and clearly labelled so that the sample is readily identifiable (best practice: name of the owner (initials), organism, concentration and date).

For organisms in **group 3**, **two-layer packaging** with the use of an appropriate transport container is required.

1.2. B: Same facility: Transport within the department building

The material in question is transported within the same building and without being handed over to a third party. The material can be transported over several stories and through zones with low security levels as needed.[6]

In contrast to transport within a lab, here it is necessary to use **two-layer packaging**. This consists of interior packaging (sample container) plus watertight, shatterproof exterior packaging (protective container), which usually refers to watertight plastic or metal transport boxes with secure, tightly closing lids.[7] The exterior packaging can contain several sample containers.

The samples are to be labelled in the same way as for transport within a lab so that they are clearly identifiable (best practice: name of the owner (initials), organism, concentration and date). The lid should be securely closed, and a biohazard symbol should be affixed on the inside. The lid should also contain information about the lab that owns the transport box (lab number; potentially also the shipper and the courier).

For liquid samples, a sufficient amount of absorbent material should be placed between the two layers of packaging. For cooled samples, please be aware that the cooling agents (dry ice, liquid nitrogen) are to be placed outside of the second packaging layer in a third (open) container (e.g., open Styrofoam box).

[6] The transport of group 1 organisms within the same department building or building complex means that all areas have the **same security level** (level 1); this falls under the category of situation A.

[7] For example, *7135 Bio Transport Carrier from* NALGENE®

1.3. C: Europe: Transport by motor vehicle on public roads according to 2023 hazardous goods legislation (ADR)

Introduction
The following explanations refer exclusively to the correct application of 2023 ADR legal regulations for the transport of dangerous goods in class 6.2 (infectious substances). This refers to transport on public roads using a motor vehicle the size of a passenger car or larger. It is generally not allowed to conduct this type of hazardous goods transport with other vehicles or via public transportation.

Risk group 1
Classification according to ADR: Not hazardous

Packaging: No special regulations, recommended to pack according to P 650 packing instructions (see chapter 4).

Documents: Does not need any special documentation.

Vehicle: Your choice of vehicle.

Driver: No special training required.

Risk groups 2 and 3, not classified as cultures*:
Classification according to ADR: Class 6.2 category B

→ UN 3373 (BIOLOGICAL SUBSTANCE, CATEGORY B)

Packaging: Mandatory to pack according to P 650 packing instructions (see below).

Documents: Does not need any special documentation.

Vehicle: Your choice of vehicle.

Driver: No special training required.

* Note: Cultures
Samples taken directly from patients and transported for research, diagnostic, examination, treatment or prevention purposes are never classified as cultures.
Cultures of Escherichia coli verotoxigen, Mycobacterium tuberculosis and Shigella dysenteriea type 1 can always be transported as Category B biological materials (UN-No. 3373) as long as they are intended for diagnostic or clinical purposes.

Risk group 4 and risk groups 2 and 3, classified as cultures*:

Note: Cultures in risk group 2 must only be transported according to the guidelines outlined in this section if they can cause permanent disability or fatal/potentially fatal illness in **otherwise healthy** humans or animals upon exposure. If that is not the case, they can be transported according to UN 3373 (BIOLOGICAL SUBSTANCE, CATEGORY B).

Classification as per ADR: Class 6.2
Category A → UN 2814 (infectious substance, hazardous to humans) or UN 2900 (infectious substance, only hazardous to animals)

Packaging: Mandatory to pack according to P 620 packing instructions (see chapter 4):

- 3-layer packaging is required (2-layer interior packaging plus exterior packaging).
- The packaging needs to be officially approved for class 6.2 substances, which must be visible as a code on the packaging.
  Example code:
  UN 4G / CLASS 6.2 / 01 / S / SP-9989-ERIKSSON
  Packaging that does not contain the label “CLASS 6.2” is not allowed.
- A detailed list of the content must be placed between the second interior container and the exterior container.
- The appropriate UN number must be placed on the outside of the packaging along with the hazard label for class 6.2 substances.

Documents: Transport documents in accordance with general ADR regulations that also contain the name and telephone number of one of the responsible parties.

- Written instructions regarding the procedure in case of an incident and the accompanying emergency equipment.
- Photo ID of the driver

Vehicle: The vehicle needs to be equipped according to general ADR regulations (fire extinguisher, etc.) and have the special equipment outlined in the documentation and also needs to be marked with two orange warning signs.

* Note: Cultures
Samples taken directly from patients and transported for research, diagnostic, examination, treatment or prevention purposes are never classified as cultures.
Cultures of Escherichia coli verotoxigen, Mycobacterium tuberculosis and Shigella dysenteriea type 1 can always be transported as Category B biological materials (UN-No. 3373) as long as they are intended for diagnostic or clinical purposes.

Shigella dysenteriea type 1 cultures can always be transported as Category B biological materials (UN-Nr. 3373) as long as they are intended for diagnostic or clinical purposes.

Driver: Requires special training in accordance with ADR for transporting hazardous goods.

Note: Drivers of vehicles that exclusively transport materials categorized as class 6.2, UN-No. 2814, 2900, 3373 and class 9 UN-No. 3245 can be exempted from the basic course requirement. They need to provide proof of training in biology or medicine or training as a lab assistant with proven experience in dealing with organisms.
They also need to complete the course recognized by the relevant authorities and pass an examination. In Switzerland this course is offered by ASTAG.

Genetically modified microorganisms

Classification: Infectious microorganisms should be handled according to the ADR guidelines outlined above.
Genetically modified organisms or microorganisms that are not infectious (class 1) that have the capability of changing other organisms in a way that would not normally result from natural reproduction should be packed and transported according to the following instructions. If this risk can be ruled out, the materials are not considered hazardous and only need to follow packaging instructions P 904 listed below.

Packaging: Mandatory to pack according to P 904 packing instructions (see chapter 4).
UN number 3245 must be placed on the outside of the packaging along with the hazard label for class 9 substances.

Documents: A simple accompanying document that contains information about the contents along with the sender's and receiver's addresses is sufficient for **shipments up to 333 kg**.

Vehicle: A vehicle of your choice can be used for **shipments up to 333 kg**.

Fire extinguisher mandatory.

Driver: No special training for the driver is required for **shipments up to 333 kg**.

Clinical waste

Classification: Generally: Inactive clinical waste is not considered hazardous, and ADR regulations do not apply.
If the waste contains infectious materials that fall into risk group 4 (suspicion is sufficient), it should be handled according to group 4 guidelines (see above).
Otherwise, it should be classified as class 6.2 UN 3291 (clinical waste).

Packaging: Mandatory to pack according to P 621 packing instructions.
UN number 3291 must be placed on the outside of the packaging along with the hazard label for class 6.2 substances.

Documents: A simple accompanying document that contains information about the contents along with the sender's and receiver's addresses is sufficient for **shipments up to 333 kg**.

Vehicle: A vehicle of your choice can be used for **shipments up to 333 kg**.

Fire extinguisher mandatory.

Driver: No special training for the driver is required for **shipments up to 333 kg**.

Exemptions: Patient samples that have only a minimal probability of containing pathogens are exempt from ADR regulations. The samples must be transported in packaging that fulfills points 2, 3 and 5 of the P 650 packaging criteria (see chapter 4) and is labeled as containing an "EXEMPT MEDICAL SAMPLE" or "EXEMPT VETERINARY SAMPLE".

Live vertebrate or invertebrate animals
Live animals that have been intentionally infected, and where it is known or suspected that they contain an infectious substance, may only be transported with the approval of the relevant authorities.

1.4. D: Shipping: Shipping within Switzerland in Europe

Generally, the same packing regulations described in section 1.3 apply to transport by third parties such as the postal service or courier. The following must also be included, depending on the destination:

- Customs declaration

  The university post office can provide more information on customs documents: 044 63 54051
- IATA hazardous goods transport (transport by plane)
- Consignment note

The transport company needs to be chosen carefully, since the responsibility for the transported material is borne by the shipper.

Transport by post:

- Shipment by post is possible for diagnostic samples that have a low or zero probability of containing level 2 or 3 organisms.
- The post office will not accept any samples with known infectious biological agents or organisms unless that particular branch has a special permit (e.g., post office 8028 in Zurich-Fluntern).
- For maximum permitted quantities and further information: www.postlogistics.ch/gefahrgut
- Swiss Post International should always be consulted for shipments abroad:
  Phone: 031 338 70 74

Transport by courier service

- Samples that cannot be shipped by mail (see section above) need to be transported using a private courier service.
  There are at least two options: FedEx (not global) or

  World Courier (global):

  1313 4th Ave.

  New Hyde Park, NY 11040-9832

  Phone: 044 307 10 50 (for shipping orders)

  Phone: 0800 810 910 (free, for shipping orders)

  Phone: 044 307 10 54 (experts for special questions)

  Fax.: 044 307 10 60

  staff@worldcourier.ch or ops@worldcourier.ch

2. More details on special transport situations

2.1. Transport of group 1 microorganisms

Organisms of this kind can be sent to all countries via the postal service without any special labeling. For shipments abroad, you should declare the contents on the green customs form as follows:

- “Harmless biological material”
- “No commercial value” (value declaration)

2.2. Transport of genetically modified microorganisms

Genetically modified microorganisms in group 1 that have the capability of changing other organisms in a way that would not normally result from natural reproduction should be packed according to P 904 packaging instructions (see chapter 4) and declared with UN number 3245 and a class 9 hazard sheet. If this risk can be ruled out, only the packaging instructions need to be followed. For the transport of genetically modified organisms in group 2 or 3, the same transport rules for microorganisms in these groups apply, and UN numbers 2814 or 2900 must be used.

2.3. Transport of GMO seeds

There are no special rules for the transport of GMO seeds that have been approved for cultivation.

The Release Ordinance applies to the transport of GMO seeds that have not been approved for cultivation. GMO seeds that have the capability of changing other organisms in a way that would not normally result from natural reproduction are considered hazardous and must be packed according to P 904 packaging instructions (see chapter 4) and declared with UN number 3245 and a class 9 hazard sheet. If this risk can be ruled out, only the packaging instructions need to be followed.

The transport must be done in a way that prevents unintentional release into the environment. Genetically modified seeds must be transported in tightly sealed containers. This requires secure two-layer packaging that can withstand normal shipping conditions of vibration, temperature change and moisture and pressure fluctuations without any contents escaping the packaging.

2.4. Transport of patient samples

Samples taken from patients, including excretions, are never classified as cultures. This means that only samples from patients who are infected with or suspected of being infected with contagious pathogens from risk group 4 need to be labeled with UN number 2814 or 2900 (see chapter 1.3C). All other samples, as long as they're not exempt (see chapter 1.3 C, exemptions), should be labeled with UN number 3373 (BIOLOGICAL MATERIAL, CATEGORY B) and are not subject to additional hazardous goods regulations as long as P 650 packing instructions (see chapter 4) have been followed.

2.5. Transport of plants and plant pathogens

Environmentally damaging plants such as exotic species or plants that contain pathogens must be transported in securely sealed containers.

Transport measures are to be decided on a case-by-case basis and should achieve a safety/security standard analogous to transporting microorganisms in group 2 or 3.

The provisions of the Plant Protection Act (PSV) must be followed. The transport of plants is not regulated by the ADR and therefore does not require any special labeling.

Exception:

Genetically modified plants that do not contain any pathogens can be transported in open containers as long as they don't have any flowers or fruit.

2.6. Transport of animals

The transport of infected animals always needs to be approved by the cantonal veterinary office and the university biosafety office.

Transport measures are to be decided on a case-by-case basis and should achieve a safety/security standard analogous to when pathogens are shipped as separate samples.

The transport of infected animals is not regulated by the ADR and therefore does not require any special labeling.

Animals should be transported in cages or containers from which they cannot escape and that comply with animal protection regulations. Additional safety measures are necessary if the infected animals pose the risk of airborne transmission (sealed containers that ensure proper airflow, e.g., insulators with mini supply cylinders). No bedding or other elements should be able to escape from the transport container.

The cages or containers need to be clearly labeled with identifiable contents (number of animals, information about the animal/pathogen). The animals should be counted before and after transport.

If any animals escape despite these measures, the procedure decided on in advance shall be applied. Written instructions regarding what to do in case of emergency should be prepared in advance and transported along with appropriate emergency equipment. Everyone involved in the transport should be adequately informed and instructed.

(according to the biosafety office, KSF, AWEL, Canton of Zurich, November 2000).

3. Labeling and packaging

3.1. Labeling with UN numbers

UN numbers	Official designation	Hazard sheet	Applies to
UN 2814	Infectious substance, hazardous to humans[1)] (specify whether solid or liquid)	Class 6.2	Group 2 and 3 microorganisms[2)]
UN 2900	Infectious substance, only hazardous to animals[1)] (specify whether solid or liquid)	Class 6.2	Group 2 and 3 microorganisms[2)]
UN 3373	Biological substance, category B	Class 6.2	Group 2 and 3 microorganisms
UN 3291	Clinical waste, unspecified	Class 6.2	Not specified
UN 3245	Genetically modified microorganisms	Class 9	Group 1 microorganisms[3)]
UN 1845	Carbon dioxide, solid (dry ice), only to be labeled for air transport	Class 9	Packing material
UN 1977	Nitrogen, frozen, liquid	Class 2.2	Packing material

- The scientific name should be added in parentheses. If the transported item is a specific kind of waste, a category B biological substance or a genetically modified organism, the designation should be expanded as follows: Waste contains: ... or Diagnostic sample contains: ... or Genetically modified organism contains: ...
- UN numbers 2814 and 2900 should also be used for genetically modified organisms in group 2 and 3.

- UN number 3245 should only be used for genetically modified organisms in group 1.

3.2. Hazard sheet

Hazard sheet (100 x 100 mm, for small packages 50 x 50 mm)[8]

Class 2.2

Gases

Class 6.2

Infectious substances

Class 9

Various hazardous substances and objects

3.3. Cooling agents

If any cooling agents are used, these need to be declared with UN 1845 for “solid carbon dioxide (dry ice)” or UN 1977 for “nitrogen, frozen, liquid”. The class 9 hazard sheet is only required for air transport with dry ice; hazard sheet 2.2 for gases must always be used for nitrogen cooling agents.

8 Hazard and handling sheets have already been pre-printed on certain types of packaging or can be obtained from packaging manufacturers and transport companies, or in limited amounts from the hazardous goods officer in the Safety, Security and Environment office (see footnote 4).

1. ADR packing instructions

P620	PACKING INSTRUCTION	P620

This instruction applies to UN Nos. 2814 and 2900.

The following packagings are authorized provided the special packing provisions of **4.1.8** are met:

Packagings meeting the requirements of Chapter 6.3 and approved accordingly consisting of:

(a) Inner packagings comprising:

(i) leakproof primary receptacle(s);

(ii) a leakproof secondary packaging;

(iii) other than for solid infectious substances, an absorbent material in sufficient quantity to absorb the entire contents placed between the primary receptacle(s) and the secondary packaging; if multiple primary receptacles are placed in a single secondary packaging, they shall be either individually wrapped or separated so as to prevent contact between them;

(b) A rigid outer packaging:

Drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A1, 3A2, 3B1, 3B2, 3H1, 3H2).

The smallest external dimension shall be not less than 100 mm.

Additional requirements:

1. Inner packagings containing infectious substances shall not be consolidated with inner packagings containing unrelated types of goods. Complete packages may be overpacked in accordance with the provisions of 1.2.1 and 5.1.2; such an overpack may contain dry ice.
2. Other than for exceptional consignments, e.g. whole organs which require special packaging, the following additional requirements shall apply:
   (a) Substances consigned at ambient temperatures or at a higher temperature: Primary receptacles shall be of glass, metal or plastics. Positive means of ensuring a leakproof seal shall be provided, e.g. a heat seal, a skirted stopper or a metal crimp seal. If screw caps are used, they shall be secured by positive means, e.g., tape, paraffin sealing tape or manufactured locking closure;
   (b) Substances consigned refrigerated or frozen: Ice, dry ice or other refrigerant shall be placed around the secondary packaging(s) or alternatively in an overpack with one or more complete packages marked in accordance with 6.3.3. Interior supports shall be provided to secure secondary packaging(s) or packages in position after the ice or dry ice has dissipated. If ice is used, the outer packaging or overpack shall be leakproof. If dry ice is used, the outer packaging or overpack shall permit the release of carbon dioxide gas. The primary receptacle and the secondary packaging shall maintain their integrity at the temperature of the refrigerant used;
   (c) Substances consigned in liquid nitrogen: Plastics primary receptacles capable of withstanding very low temperature shall be used. The secondary packaging shall also be capable of withstanding very low temperatures, and in most cases will need to be fitted over the primary receptacle individually. Provisions for the carriage of liquid nitrogen shall also be fulfilled. The primary receptacle and the secondary packaging shall maintain their integrity at the temperature of the liquid nitrogen;
   (d) Lyophilised substances may also be carried in primary receptacles that are flame-sealed glass ampoules or rubber-stoppered glass vials fitted with metal seals.
3. Whatever the intended temperature of the consignment, the primary receptacle or the secondary packaging shall be capable of withstanding without leakage an internal pressure producing a pressure differential of not less than 95 kPa. This primary receptacle or secondary packaging shall also be capable of withstanding temperatures in the range -40 °C to +55 °C.
4. Other dangerous goods shall not be packed in the same packaging as Class 6.2 infectious substances unless they are necessary for maintaining the viability, stabilizing or preventing degradation or neutralizing the hazards of the infectious substances. A quantity of 30 ml or less of dangerous goods included in Classes 3, 8 or 9 may be packed in each primary receptacle containing infectious substances. These small quantities of dangerous goods of Classes 3, 8 or 9 are not subject to any additional requirements of ADR when packed in accordance with this packing instruction.
5. Alternative packagings for the carriage of animal material may be authorized by the competent authority of the country of origin [a] in accordance with the provisions of 4.1.8.7.

[a] *If the country of origin is not a Contracting Party to ADR, the competent authority of the first Contracting Party to the ADR reached by the consignment.*

P621	PACKING INSTRUCTION	P621

This instruction applies to UN No. 3291.

The following packagings are authorized provided that the general provisions of 4.1.1 except 4.1.1.15 and 4.1.3 are met:

(1) Provided that there is sufficient absorbent material to absorb the entire amount of liquid present and the packaging is capable of retaining liquids:

Drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G);

Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);

Jerricans (3A1, 3A2, 3B1, 3B2, 3H1, 3H2).

Packagings shall conform to the packing group II performance level for solids.

(2) For packages containing larger quantities of liquid:

Drums (1A1, 1A2, 1B1, 1B2, 1N1, 1N2, 1H1, 1H2, 1D, 1G);

Jerricans (3A1, 3A2, 3B1, 3B2, 3H1, 3H2);

Composites (6HA1, 6HB1, 6HG1, 6HH1, 6HD1, 6HA2, 6HB2, 6HC, 6HD2, 6HG2, 6HH2, 6PA1, 6PB1, 6PG1, 6PD1, 6PH1, 6PH2, 6PA2, 6PB2, 6PC, 6PG2 or 6PD2).

Packagings shall conform to the packing group II performance level for liquids.

Additional requirement:

Packagings intended to contain sharp objects such as broken glass and needles shall be resistant to puncture and retain liquids under the performance test conditions in Chapter 6.1.

P650	PACKING INSTRUCTION *(cont'd)*	P650

(7) For liquid substances:

- (a) The primary receptacle(s) shall be leakproof;
- (b) The secondary packaging shall be leakproof;
- (c) If multiple fragile primary receptacles are placed in a single secondary packaging, they shall be either individually wrapped or separated to prevent contact between them;
- (d) Absorbent material shall be placed between the primary receptacle(s) and the secondary packaging. The absorbent material shall be in quantity sufficient to absorb the entire contents of the primary receptacle(s) so that any release of the liquid substance will not compromise the integrity of the cushioning material or of the outer packaging;
- (e) The primary receptacle or the secondary packaging shall be capable of withstanding, without leakage, an internal pressure of 95 kPa (0.95 bar).

(8) For solid substances:

- (a) The primary receptacle(s) shall be siftproof;
- (b) The secondary packaging shall be siftproof;
- (c) If multiple fragile primary receptacles are placed in a single secondary packaging, they shall be either individually wrapped or separated to prevent contact between them;
- (d) If there is any doubt as to whether or not residual liquid may be present in the primary receptacle during carriage then a packaging suitable for liquids, including absorbent materials, shall be used.

(9) Refrigerated or frozen specimens: Ice, dry ice and liquid nitrogen:

- (a) When dry ice or liquid nitrogen is used as a coolant, the requirements of 5.5.3 shall apply. When used, ice shall be placed outside the secondary packagings or in the outer packaging or an overpack. Interior supports shall be provided to secure the secondary packagings in the original position. If ice is used, the outside packaging or overpack shall be leakproof.
- (b) The primary receptacle and the secondary packaging shall maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost.

(10) When packages are placed in an overpack, the package marks required by this packing instruction shall either be clearly visible or be reproduced on the outside of the overpack.

(11) Infectious substances assigned to UN No. 3373 which are packed and packages which are marked in accordance with this packing instruction are not subject to any other requirement in ADR.

(12) Clear instructions on filling and closing such packages shall be provided by packaging manufacturers and subsequent distributors to the consignor or to the person who prepares the package (e.g. patient) to enable the package to be correctly prepared for carriage.

(13) Other dangerous goods shall not be packed in the same packaging as Class 6.2 infectious substances unless they are necessary for maintaining the viability, stabilizing or preventing degradation or neutralizing the hazards of the infectious substances. A quantity of 30 ml or less of dangerous goods included in Classes 3, 8 or 9 may be packed in each primary receptacle containing infectious substances. When these small quantities of dangerous goods are packed with infectious substances in accordance with this packing instruction no other requirements of ADR need be met.

(14) If any substance has leaked and has been spilled in a cargo transport unit, it may not be reused until after it has been thoroughly cleaned and, if necessary, disinfected or decontaminated. Any other goods and articles carried in the same cargo transport unit shall be examined for possible contamination.

Additional requirement:

Alternative packagings for the carriage of animal material may be authorized by the competent authority of the country of origin [a] in accordance with the provisions of 4.1.8.7.

[a] *If the country of origin is not a Contracting Party to ADR, the competent authority of the first Contracting Party to the ADR reached by the consignment.*

P904	PACKING INSTRUCTION	P904

This instruction applies to UN No. 3245.

The following packagings are authorized:

(1) Packagings meeting the provisions of 4.1.1.1, 4.1.1.2, 4.1.1.4, 4.1.1.8 and 4.1.3 and so designed that they meet the construction requirements of 6.1.4. Outer packagings constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use, shall be used. Where this packing instruction is used for the carriage of inner packagings of combination packagings the packaging shall be designed and constructed to prevent inadvertent discharge during normal conditions of carriage.

(2) Packagings, which need not conform to the packaging test requirements of Part 6, but conforming to the following:

(a) An inner packaging comprising:

(i) primary receptacle(s) and a secondary packaging, the primary receptacle(s) or the secondary packaging shall be leakproof for liquids or siftproof for solids;

(ii) for liquids, absorbent material placed between the primary receptacle(s) and the secondary packaging. The absorbent material shall be in a quantity sufficient to absorb the entire contents of the primary receptacle(s) so that any release of the liquid substance will not compromise the integrity of the cushioning material or of the outer packaging;

(iii) if multiple fragile primary receptacles are placed in a single secondary packaging they shall be individually wrapped or separated to prevent contact between them;

(b) An outer packaging shall be strong enough for its capacity, mass and intended use, and with a smallest external dimension of at least 100 mm.

For carriage, the mark illustrated below shall be displayed on the external surface of the outer packaging on a background of a contrasting colour and shall be clearly visible and legible. The mark shall be in the form of a square set at an angle of 45° (diamond-shaped) with each side having a length of at least 50 mm; the width of the line shall be at least 2 mm and the letters and numbers shall be at least 6 mm high.

Additional requirement:

Ice, dry ice and liquid nitrogen

When dry ice or liquid nitrogen is used as a coolant, the requirements of 5.5.3 shall apply. When used, ice shall be placed outside the secondary packagings or in the outer packaging or an overpack. Interior supports shall be provided to secure the secondary packaging in the original position. If ice is used, the outside packaging or overpack shall be leakproof.