



Economic and Social Council

Distr.: General
15 June 2022

Original: English

Economic Commission for Europe

Inland Transport Committee

Working Party on the Transport of Dangerous Goods

Administrative Committee of the
European Agreement concerning the
International Carriage of Dangerous Goods by
Inland Waterways (ADN)

Twenty-eighth session

Geneva, 26 August 2022

Item 3(b) of the provisional agenda

**Matters relating to the implementation of ADN:
special authorizations, derogations and equivalents**

Special authorization concerning UN No 1977, NITROGEN, REFRIGERATED, LIQUID

Transmitted by the Government of Belgium

Introduction

1. The Belgian government has received a request for a special authorization concerning the transport of UN 1977, NITROGEN, REFRIGERATED, LIQUID in tank vessels. The request has been submitted to the competent authority according to ADN 1.5.2.
2. The request for the special authorization has been submitted by Titan LNG BV, Piet Heinkade 93B, 1019 GM Amsterdam. A first request was initially submitted to the Dutch government as well as to the Belgian government. The Dutch authorities treated the request initially but when some differences were noticed between the two requests, some questions of understanding on the inland waterways application, the properties and hazards were raised. As a result, Titan LNG BV submitted an updated request only to the Belgian authority in Flanders for both inland waterways in Flanders and the Netherlands. The request was in conformity with the model in ADN 3.2.4.1, as presented in annex I of this working document.
3. The competent authority has considered the application and has drawn up a special authorization based on the criteria contained in ADN 3.2.4.3.
4. The Belgian government also presented the special authorisation to the Dutch competent authorities as foreseen in 1.5.2.2.2 of the regulations annexed to the ADN. The Dutch authorities agreed with the special authorization and the carriage in question.
5. The special authorization is granted to the vessels Flexfueler 001 and Flexfueler 002 and is presented in annex II of this working document.
6. The request for the special authorization and the subsequently granted special authorizations have been communicated to the ADN Safety Committee for their



consideration as well. The Belgian delegation would like to request the ADN Administrative Committee to consider this special authorization and to take action as it deems appropriate.

Proposal

7. The Belgian delegation proposes to add the following entry to Table C of Chapter 3.2, and to amend 3.2.3.1 as a consequence as follows (new text in bold and underlined, deleted text in strikethrough):

3.2.3.2 Table C:

UN No. or substance identification No.	Name and description	Class	Classification code	Packing group	Dangers	Type of tank vessel	Cargo tank design	Cargo tank type	Cargo tank equipment	Opening pressure of the pressure relief valve/high velocity vent valve, in kPa	Maximum degree of filling in %	Relative density at 20 °C	Type of sampling device	Pump room below deck permitted	Temperature class	Explosion group	Anti-explosion protection required	Equipment required	Number of cones/blue lights	Additional requirements/Remarks
(1)	(2)	(3a)	(3b)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
	3.1.2	2.2	2.2	2.1.1.3	5.2.2 / 3.2.3.1	1.2.1 / 7.2.2.0.1	3.2.3.1 / 1.2.1	3.2.3.1 / 1.2.1	3.2.3.1 / 1.2.1	3.2.3.1 / 1.2.1	7.2.4.21	3.2.3.1	3.2.3.1 / 1.2.1	3.2.3.1 / 1.2.1	1.2.1	1.2.1 / 3.2.3.3	1.2.1 / 3.2.3.3	8.1.5	7.2.5	3.2.3.1
1977	NITROGEN, REFRIGERATED, LIQUID	2	3A		2.2	G	1	1	1		95		1	No			No	PP	0	31, 39*, 42, 46**

3.2.3.1 Explanations concerning Table C, Column (20) "Additional requirements/Remarks":

- * Amended 39. (a) The joints, outlets, closing devices and other technical equipment shall be of such a sort that there cannot be any leakage of ~~carbon dioxide~~ **refrigerated liquefied gases** during normal transport operations (cold, fracturing of materials, freezing of fixtures, run-off outlets etc.).
- (b) The loading temperature (at the loading station) shall be mentioned in the transport document.
- (c) An oxygen meter shall be kept on board, together with instructions on its use which can be read by everyone on board. The oxygen meter shall be used as a testing device when entering holds, pump rooms, areas situated at depth and when work is being carried out on board.
- (d) At the entry of accommodation and in other places where the crew may spend time there shall be a measuring device which lets off an alarm when the oxygen level is too low ~~or when the CO2 level is too high.~~
- (e) The loading temperature (established after loading) and the maximum duration of the journey shall be mentioned in the transport document.

**New 46. Materials of construction and ancillary equipment such as insulation shall be resistant to the effects of high oxygen concentrations caused by condensation and enrichment at the low temperatures attained in parts of the cargo system. Due consideration shall be given to ventilation in areas where condensation might occur, to avoid the stratification of oxygen-enriched atmosphere.

Annex I

Application form for special authorizations under section 1.5.2

For applications for special authorizations, please answer the following questions and points¹. Data are used for administrative purposes only and are treated confidentially. Please note that according to subsection 1.5.2.3 the Administrative Committee shall consider the special authorization and application.

Applicant

Name: Edwin van Leeuwen

Company: Titan LNG BV

Address: Piet Heinkade 93B

1019 GM Amsterdam

It concerns several applicants

Summary of the application

Authorization for transport in tank vessels of liquid nitrogen as a substance of Class

2.2 - Non-flammable, non-toxic gases on the following places and/or routes:

Inland waterways in the Netherlands and Flanders (Belgium).

Annexes² (with brief description)

Liquid nitrogen is used to inert a fluid stored in the tank by constantly flowing LIN into the vessel.

Nitrogen is commonly used for purging or pressurizing pipelines and storage containers, inerting flammable materials, sterilizing, tank blanketing, and shielding oxygen-sensitive materials from the air. In accordance with 3.1, 3.2, 4.1 and 4.2, liquid nitrogen is non-flammable (has no flash-point), non-corrosive (3.8) and has no known toxicological effects. Nitrogen is not expected to cause mutagenic, embryotoxic, teratogenic or adverse reproductive effects in humans. It is also not considered to be a marine pollutant. Nitrogen occurs naturally in the atmosphere. The gas will be dissipated rapidly in well-ventilated areas. Only in liquified state or as refrigerated gas, however, LN2 can cause cryogenic burns or injury after dermal contact. Spillages can cause embrittlement of structural materials and frost damage to vegetation. Major or permanent damage may result from single or repeated exposure. In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation.

NITROGEN: Log Kow = 0.92; Water solubility = 1.49% v/v (25°C, 1 atm.). Oral Toxicity LD50 Rat: < 1 mg/kg. Dermal Toxicity LD50 Rat or Rabbit: < 20 mg/kg. Inhalation Toxicity LC50 4-hrs Rat: < 0.05 mg/L).

In reference to 7.1, storage containers and equipment (pipes, valves, fittings to relieve pressure, etc.) are designed for the storage of Liquid Nitrogen. Neodymium, lithium, zirconium and ozone can react with Nitrogen. Calcium, strontium, barium and titanium will react at red heat to form nitrides. Hydrogen reacts on sparking to form ammonia. Liquid Nitrogen in cryogenic grinding of fatty materials can lead to an explosion. A mixture of

¹ For questions not relevant to the subject of the application, write "not applicable".

² Additional information to this application form must be provided in the annexes.

magnesium powder and Liquid Nitrogen reacts very violently when lit with a fuse, forming magnesium nitride. Liquid Nitrogen is not corrosive to metals.

Local exhaust ventilation is preferred, because it prevents Nitrogen dispersion into the workplace by eliminating it at its source. The transport must be carried out in such a way that the vessel cannot be overturned.

Safety measures are needed such as wearing protective clothing and designed equipment for using and to store liquid nitrogen (8.1). In reference to question 8.2 no additional safety measures are needed.

For loading and unloading, a water curtain must be in place to protect the hull from mechanical damage in case of a spill.

This application concerns the following vessels:

Name: Flexfueler 001	ENI: 2338215
Name: Flexfueler 002	ENI: 6105694
Name:	ENI:
Name:	ENI:
Name:	ENI:
Name:	ENI:

Application made:

At: **Amsterdam**

Date: **26 May 2021**

Signature (of the person responsible for the data):

1. General data on the dangerous substance

1.1 Is it

- a pure substance ,- a mixture ,- a solution ?1.2 Technical name (if possible ADN nomenclature or possibly the IBC Code)³**NITROGEN, REFRIGERATED LIQUID UN 1977 Class 2.3A**1.3 Synonym: **LIN, LN2**

1.4 Trade name: Liquid Nitrogen

1.5 Structure formula and, for mixtures, composition and/or concentration:

N₂, Inert gas and Cryogenic liquid

1.6 Hazard class and, where applicable classification code, packing group:

2.2

1.7 UN No. or substance identification number (if known):

1977**2. Physico-chemical properties**2.1 State during transport (e.g. gas, liquid, molten, ...): **liquid**2.2 Relative density of liquid at 20 °C or at the transport temperature if the substance is to be heated or refrigerated during transport: **0.8**2.3 Transport temperature (for substances heated or refrigerated during transport): **-196 °C**2.4 Melting point or range: **-210 °C.**2.5 Boiling point or range: **-195.8 °C.**

2.6 Vapour pressure at

15 °C	not applicable
20 °C	not applicable
30 °C	not applicable
37.8 °C	not applicable
50 °C	not applicable
for liquefied gases, vapour pressure at 70 °C	not applicable
for permanent gases, filling pressure at 15 °C	not applicable

2.7 Cubic expansion coefficient: **0.0058 K⁻¹**

2.8 Solubility in water at 20 °C

Saturation concentration **20 mg/l**

or

³ International Code for the Construction and Equipment of ships carrying Dangerous Chemicals in Bulk

Miscibility with water at 15 °C

Complete partial none

(If possible, in the case of solutions and mixtures, indicate concentration)

2.9 Colour: **Colorless**

2.10 Odour: **Odorless**

2.11 Viscosity: **0.174** mm²/s.

2.12 Flow time (ISO 2431-1996): **not applicable**.

2.13 Solvent separation test: **not applicable** .

2.14 pH of the substance or aqueous solution (indicate concentration): **not applicable**.

2.15 Other information⁴

none

3. Technical safety properties

3.1 Auto-ignition temperature in accordance with IEC 60079-20-1:2010, EN 14522:2005, DIN 51 794:2003 in °C; where applicable, indicate the temperature class in accordance with IEC 60079-20-1:2010.⁵

3.2 Flashpoint⁵

For flashpoints up to 175 °C

Closed-cup test methods — non-equilibrium procedure

Abel method: EN ISO 13736:2008

Abel-Pensky method: DIN 51755-1:1974 or NF M T60-103:1968

Pensky-Martens method: EN ISO 2719:2012

Luchaire apparatus: French standard NF T60-103:1968

Tag method: ASTM D56-05(2010)

Closed-cup test methods — equilibrium procedure

Rapid equilibrium procedure: EN ISO 3679:2004; ASTM D3278-96 (2011)

Closed-cup equilibrium procedure: EN ISO 1523:2002+AC1:2006; ASTM D3941-90 (2007)

For flashpoints above 175 °C

In addition to the above-mentioned methods, the following open-cup test method may be applied:

Cleveland method: EN ISO 2592:2002; ASTM D92-12.

3.3 Explosion limits:⁶

Determination of upper and lower explosion limits in accordance with EN 1839:2012.

3.4 Maximum safe gap in accordance with IEC 60079-20-1:2010: **not applicable**

3.5 Is the substance stabilized during transport? **no**.

If so, provide data on the stabilizer: **not applicable**

⁴ May be provided in an annex

⁵ To be provided in an annex

⁶ To be provided in an annex

3.6 Decomposition products in the event of combustion on contact with air or under the influence of an external fire:

Negligible fire hazard, but storage may rupture or explode if exposed to heat. Hazardous

Combustion Products are oxides of nitrogen

3.7 Is the substance fire intensifying?

no

3.8 Abrasion (corrosion): **0 mm/year.**

3.9 Does the substance react with water or moist air by releasing flammable or toxic gases?

No. Gases released:

3.10 Does the substance react dangerously in any other way?

Under certain conditions, nitrogen can react violently with lithium, neodymium, titanium (above 1472°F/800°C), and magnesium to form nitrides. At high temperature, it can also combine with oxygen and hydrogen.

3.11 Does the substance react dangerously when reheated? **No**

4. Physiological hazards

4.1 LD₅₀ and/or LC₅₀ value⁶. Necrosis value (where applicable, other toxicity criteria in accordance with 2.2.61.1 of ADN).

CMR properties according to Categories 1A and 1B of chapters 3.5, 3.6 and 3.7 of GHS.

4.2 Does decomposition or reaction produce substances posing physiological hazards?⁶ (Indicate which substances where known)

4.3 Environmental properties (see 2.4.2.1 of ADN)

Acute toxicity:

LC₅₀ 96 hr for fish: mg/l

EC₅₀ 48 hr for crustacea: mg/l

E_rC₅₀ 72 hr for algae: mg/l

Chronic toxicity:

NOEC: mg/l

BCF: mg/l or log K_{ow}

Easily biodegradable: **Yes/No**

5. Data on hazard potential

5.1 What specific damage is to be expected if the hazard characteristics produce their effect?

Combustion

Injury

Corrosion

Intoxication in the event of dermal absorption

Intoxication in the event of absorption by inhalation

Mechanical damage - Liquid spillages can cause embrittlement of structural materials, such as carbon steel.

Destruction

Fire

- Abrasion (corrosion to metals)
- Environmental pollution
- Asphyxiation - when used indoors

6. Data on the transport equipment

6.1 Are particular loading requirements envisaged/necessary (what are they)?⁷

Hull protection is required when loading by hose or hard arms, to protect against embrittlement of steel structures when a leak occurs. This is typically performed with a water curtain.

7. Transport of dangerous substances in tanks

7.1 With which materials is the substance to be carried compatible?⁷

Austenitic stainless steel

8. Technical safety requirements⁷

8.1 Taking into account the current state of science and technology, what safety measures are necessary in the light of the hazards posed by the substance or liable to arise in the course of the transport process as a whole?

8.2 Additional safety measures

Use of stationary or mobile techniques to measure flammable gases and flammable liquid vapours.

Use of stationary or mobile techniques (toximeters) to measure concentrations of toxic substances.

⁷ To be provided in an annex

Annex II

Special authorization under 1.5.2 of ADN concerning UN No 1977, NITROGEN, REFRIGERATED, LIQUID

Under 1.5.2 of ADN, the transport in tank vessels of the substance specified in annex to this special authorization shall be authorized in the conditions referred to therein.

Before transporting the substance, the carrier shall be required to have it added to the list referred to in 1.16.1.2.5 of ADN by a recognized classification society.

This special authorization shall be valid **on Inland waterways in the Netherlands and Flanders (Belgium)** (places and/or routes of validity).

For the following vessels:

- Flexfueler 001 (ENI: 02338215)
- Flexfueler 002 (ENI: 06105694)

It shall be valid for two years from the date of signature, unless it is repealed at an earlier date.

Issuing State: Belgium

Brussels,

The competent authorities for ADN in Flanders

Koenraad
Anciaux
(Authentication)

Digitaal ondertekend
Door Koenraad
Anciaux
(Authentication)
Datum: 2022.04.27
13:50:00+02'00'

Christiaan Danckaerts Digitally signed by
(Signature) Christiaan Danckaerts
(Signature)
Date: 2022.04.27
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Koen Anciaux
Director of the Board

Ir. Chris Danckaerts
Managing Director

Annex to Special authorization under 1.5.2 of ADN concerning UN No 1977, NITROGEN, REFRIGERATED, LIQUID

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