



UK Health
Security
Agency

Methane

Incident management

This document provides information needed for response to a chemical incident, such as physicochemical properties, health effects and decontamination advice.

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Main points

General

Methane is a colourless gas and is extremely flammable. It reacts with powerful oxidising agents creating an explosion hazard.

Health

The major route of exposure is via inhalation.

Inhalation of methane causes euphoria, agitation, slurred speech, nausea, vomiting, flushing and headache. In severe cases, respiratory depression, hypotension, myocardial infarction, cardiac dysrhythmias, seizures, coma, and death may occur.

Dermal exposure to methane may cause frostbite on the skin.

Casualty decontamination at the scene


Surface contamination following exposure to methane gas is unlikely; therefore, decontamination should not be required. Methane may be stored as a liquid under pressure in cylinders for industrial use, this liquid will rapidly volatilise on release, though it may cause thermal burns on contact with skin.

Environment

Inform the [Environment Agency](#) where appropriate and avoid release into the environment.

Hazard identification

Table 1a. Standard (UK) dangerous goods emergency action codes for methane, compressed or natural gas, compressed with high methane content

| | | | | |
|----------------|------------------|------|---|--|
| UN | | 1971 | Methane, compressed or natural gas, compressed with high methane content | |
| EAC | | 2SE | <p>Use fine water spray. Wear normal fire kit in combination with breathing apparatus [note 1].</p> <p>Substance can be violently or explosively reactive. Where there is an immediate threat to people, spillages and decontamination run-off may be washed to drains with large quantities of water [note 2].</p> <p>There may be a public safety hazard outside the immediate area of the incident [note 3].</p> | |
| APP | | - | - | |
| Hazards | Class | 2.1 | Flammable gases |  |
| | Sub-risks | - | - | |
| HIN | | 23 | Flammable gas | |

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.

Notes to Table 1a

Note 1: Normal firefighting clothing is appropriate: self-contained open circuit positive pressure compressed air breathing apparatus conforming to BS EN 137 worn in combination with fire kit conforming to BS EN 469, fire fighters' gloves conforming to BS EN 659 and firefighters' footwear conforming to BS EN 15090 (Footwear for firefighters) type F3- Hazmat and structural firefighting [CH – marking for chemical resistance] or alternatively firefighters' boots conforming to Home Office Specification A29 (rubber boots) or A30 (leather boots). Leather footwear including those conforming to A30 may not provide adequate chemical resistance therefore caution should be exercised in the use of these boots.


Note 2: In such cases due care must be exercised to avoid unnecessary pollution of surface and groundwaters and wherever possible control measures such as the sealing of drains should be employed.

Note 3: People should be warned to stay indoors with all doors and windows closed, preferably in rooms upstairs and facing away from the incident. Ignition sources should be eliminated, and ventilation stopped. Effects may spread beyond the immediate vicinity. All non-essential personnel should be instructed to move at least 250 m away from the incident.

References

National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. '[Dangerous Goods Emergency Action Code List](#)' The Stationery Office 2023 (viewed on 28 October 2024)

Table 1b. Standard (UK) dangerous goods emergency action codes for methane, refrigerated liquid or natural gas, refrigerated liquid with high methane content

| | | | | |
|----------------|------------------|------|--|---|
| UN | | 1972 | Methane, refrigerated liquid or natural gas, refrigerated liquid with high methane content | |
| EAC | | 2YE | <p>Use fine water spray. Wear normal fire kit in combination with breathing apparatus [note 1].</p> <p>Substance can be violently or explosively reactive. Spillages, contaminated fire and decontamination run-off should be prevented from entering drains and surface and groundwaters.</p> <p>There may be a public safety hazard outside the immediate area of the incident [note 2].</p> | |
| APP | | - | - | |
| Hazards | Class | 2.1 | Flammable gases |  |
| | Sub-risks | - | - | |
| HIN | | 223 | Refrigerated liquefied gas, flammable | |

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.

HIN = hazard identification number.

Notes to Table 1b



Note 1: Normal firefighting clothing is appropriate: self-contained open circuit positive pressure compressed air breathing apparatus conforming to BS EN 137 worn in combination with fire kit conforming to BS EN 469, fire fighters' gloves conforming to BS EN 659 and firefighters' footwear conforming to BS EN 15090 (Footwear for firefighters) type F3- Hazmat and structural firefighting [CH – marking for chemical resistance] or alternatively firefighters' boots conforming to Home Office Specification A29 (rubber boots) or A30 (leather boots). Leather footwear including those conforming to A30 may not provide adequate chemical resistance therefore caution should be exercised in the use of these boots.

Note 2: People should be warned to stay indoors with all doors and windows closed, preferably in rooms upstairs and facing away from the incident. Ignition sources should be eliminated, and ventilation stopped. Effects may spread beyond the immediate vicinity. All non-essential personnel should be instructed to move at least 250m away from the incident.

References

National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. '[Dangerous Goods Emergency Action Code List](#)' The Stationery Office 2023 (viewed on 28 October 2024)

Table 2. The GB classification, labelling and packaging (CLP) regulation for methane

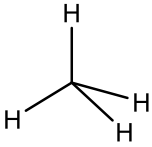
| | | | |
|----------------------------------|--------------|---------------------------|---|
| Hazard class and category | Flam. Gas. 1 | Flammable gas, category 1 |  |
| | Press. Gas | Pressurised gas |  |
| Hazard statement | H220 | Extremely flammable gas | |
| Signal words | DANGER | | |

References

The Health and Safety Executive (HSE). '[GB CLP Regulation](#)' (viewed on 28 October 2024).

Physicochemical properties

Table 3. Physicochemical properties

| | |
|----------------------------------|--|
| CAS number | 74-82-8 |
| Molecular weight | 16.04 |
| Formula | CH ₄ |
| Common synonyms | Marsh gas; methyl hydride |
| State at room temperature | Colourless, tasteless gas |
| Volatility | Vapour pressure = 4.66 x 10 ⁵ mmHg at 25°C |
| Specific gravity | 0.55 (air = 1) |
| Flammability | Extremely flammable |
| Lower explosive limit | 5 % |
| Upper explosive limit | 15% |
| Water solubility | 3.3 mL/100 mL of water at 20°C |
| Reactivity | Reducing agent, creates explosion hazard when combined with powerful oxidisers such as bromine pentafluoride, chlorine trifluoride, chlorine, iodine, heptafluoride, dioxygenyl tetrafluoroborate, dioxygen difluoride, trioxygen difluoride and liquid oxygen. Other violent reactions include chlorine dioxide and nitrogen trifluoride. A superheat explosion may occur when in contact with hot water. |
| Odour | Odourless (may have artificial odour added, for example sulphide odour of household natural gas) |
| Structure |  |

References

World Health Organization. International Programme on Chemical Safety '[International Chemical Safety Card entry for methane](#)' ICSC 0291, 2000 (viewed on 28 October 2024)

PubChem. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information. '[PubChem Compound Summary for CID 297, methane](#)' (viewed on 28 October 2024)

Reported effect levels from authoritative sources

No data available

Published emergency response guidelines

Table 4. Acute exposure guideline levels (AEGLs)

| | Concentration | | | | |
|------------------------|---------------------|------------|------------|---------|---------|
| | 10 minutes | 30 minutes | 60 minutes | 4 hours | 8 hours |
| AEGL-1 [note 1] | No values specified | | | | |
| AEGL-2 [note 2] | | | | | |
| AEGL-3 [note 3] | | | | | |

Notes to Table 4

Note 1: Level of the chemical in air at or above which the general population could experience notable discomfort.

Note 2: Level of the chemical in air at or above which there may be irreversible or other serious long-lasting effects or impaired ability to escape.

Note 3: Level of the chemical in air at or above which the general population could experience life-threatening health effects or death.

Exposure standards, guidelines, or regulations

Table 5. Occupational standards

| | LTEL (8-hour reference period) | | STEL (15-min reference period) | |
|------------|--------------------------------|-------------------|--------------------------------|-------------------|
| | ppm | mg/m ³ | ppm | mg/m ³ |
| WEL | No values specified | | | |

Abbreviations

WEL = workplace exposure limit.

LTEL = long-term exposure limit.

STEL = short-term exposure limit.

Table 6. Public health standards and guidelines

| | |
|---|--------------------|
| Drinking water standard | No value specified |
| WHO guideline for drinking water quality | No value specified |
| UK indoor air quality guideline | No value specified |
| WHO indoor air quality guideline | No value specified |
| WHO air quality guideline | No value specified |

Health effects

Asphyxiant gases act mainly by displacing oxygen from the atmosphere. This reduces the oxygen concentration in inspired air leading to hypoxaemia. Low dose accidental exposures are unlikely to cause toxicity.

Table 7. Signs or symptoms of acute exposure

| Route | Signs and symptoms |
|--------------------|--|
| Inhalation | <p>Features include euphoria, agitation, decreased alertness, slurred speech, decreased visual acuity, memory loss, nausea, vomiting, flushing and headache. Increased respiratory rate and tachycardia are often early compensatory features.</p> <p>Ataxia, paraesthesia and progressive impairment of consciousness may develop.</p> <p>Respiratory depression, hypotension, myocardial infarction, cardiac dysrhythmias, pulmonary oedema, seizures, coma, and death may occur if exposure is prolonged or if inhaled concentrations are high.</p> <p>In high concentrations loss of consciousness and hypoxia can develop within minutes.</p> |
| Dermal/Eyes | Direct contact of skin and eyes with liquefied gases directly from container may cause cold burns and frostbite |

Reference

National Poisons Information Service (NPIS). TOXBASE '[Methane](#)' 2022 (viewed on 28 October 2024)

Decontamination at the scene

Chemical specific advice

The approach used for decontamination at the scene will depend upon the incident, location of the casualties and the chemicals involved. Therefore, a risk assessment should be conducted to decide on the most appropriate method of decontamination.

Surface contamination following exposure to methane gas is unlikely; therefore, decontamination should not be required. Methane may be stored as a liquid under pressure in cylinders for industrial use, this liquid will rapidly volatilise on release, though it may cause thermal burns on contact with skin.

Emergency services and public health professionals can obtain further advice from the UK Health Security Agency (UKHSA) Radiation, Chemicals, Climate and Environmental Hazards Directorate using the 24-hour chemical hotline number: 0344 892 0555.

Clinical decontamination and first aid

Clinical decontamination is the process where trained healthcare professionals, using purpose-designed decontamination equipment, treat contaminated persons individually.

[Detailed information on clinical management](#) can be found on TOXBASE.

Important notes

Decontamination is unlikely to be required for methane as it exists as a gas at room temperature.

Dermal exposure

Treat cold burns and frostbite conventionally.

Other supportive measures as indicated by the patient's clinical condition.

Inhalation

Maintain a clear airway and ensure adequate ventilation.

In the event of cardiac arrest in hospital or witnessed out of hospital cardiac arrest with bystander CPR, resuscitation should be continued for at least 1 hour and only stopped after discussion with a senior clinician. Prolonged resuscitation for cardiac arrest is recommended following poisoning as recovery with good neurological outcome may occur.

Administer oxygen to achieve adequate oxygenation.

Monitor vital signs and check capillary blood sugar.

Perform a 12 lead ECG in all patients who require assessment.

Carry out other supportive measures as indicated by the patient's clinical condition.

Clinical decontamination and first aid references

National Poisons Information Service. TOXBASE '[Methane](#)' 2022 (viewed on 28 October 2024)

About the UK Health Security Agency

UKHSA is responsible for protecting every member of every community from the impact of infectious diseases, chemical, biological, radiological and nuclear incidents and other health threats. We provide intellectual, scientific, and operational leadership at national and local level, as well as on the global stage, to make the nation health secure.

UKHSA is an executive agency, sponsored by the Department of Health and Social Care.

This document from the UKHSA Radiation, Chemicals, Climate and Environmental Hazards Directorate reflects understanding and evaluation of the current scientific evidence as presented and referenced here.

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