Liquefied Natural Gas (LNG) as Fuel Bunkering Operations — study guide

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Using LNG as fuel cuts sulphur and CO_2 emissions, but it demands a level of control that ordinary bunkering never does. This guide covers the properties, the zones, the equipment and the procedures.[1][2]

What LNG is

LNG is **colourless**, **odourless** and **non-corrosive**. Its flashpoint when returned to vapour is **minus 188 °C**. The term "bunkering" comes from "bunker": in the early days of shipping the coal used to fuel ships was stored in a space called the bunker.

Emissions context

Sulphur oxide (SOx) causes acid rain, acidification of the oceans, and inflammation of the respiratory and cardiovascular systems in humans. The IMO 2020 limit reduced the sulphur content of fuel used on board (outside emission-control areas) to **0.5%**, and the Global Sulphur Cap set the sulphur emission limit at **0.5% m/m**.

Control zones

Bunkering LNG is organised in concentric zones: the **Hazardous Zone**, where a flammable atmosphere may be present at all times, directly around the bunkering area; the **Safety Zone**, extending beyond the hazardous zone with further precautions in case of an LNG spill; the **Marine Exclusion Zone**, which keeps passing traffic from affecting safety (the port may assist in enforcing it); the **External Zone**, a large area protecting public access under local regulations; and the **Monitoring and Security Area**, where other shipboard activities and SIMOPS are monitored to prevent encroachment of the safety zone. The International Safety Guide for Oil Tankers and Terminals (ISGOTT) provides guidance on risk assessments, vapour and pressure control, processes and procedures, and control zones.

Equipment and systems

A **closed system** can only be practised if LNG articulated rigid piping and certified hoses, valves and couplings are in place; suitably constructed tanks allow pressure build-up within a safe range; and an **ESD system** is connected to both the supplier and receiver of LNG. The **"dry disconnect"** process can be achieved by draining or inerting the system so no LNG vapour is present before disconnection, or by using dry connect/disconnect couplings that close in any LNG vapour before disconnection.

Procedures and checks

After an understanding has been reached, new personnel **cannot** simply join the bunkering operation at any time. If at any point there is a communication failure,

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bunkering must be stopped in a safe condition and not resumed until communications are re-established. Extinguishers that can be used on LNG fires are dry powder, high-expansion foam and carbon dioxide. Checklists for bunkering may include the Planning Stage, Terminal Information, LNG Transfer Data and Pre-transfer Checks — and checklists should not be mixed. A disadvantage of ship-to-ship transfer is that the bunker barge is vulnerable to vessels in the vicinity.

Key facts to remember

- LNG is colourless, odourless, non-corrosive; flashpoint back to vapour −188 °C.
- SOx → acid rain, ocean acidification, respiratory/cardiovascular harm. IMO 2020 / Global Sulphur Cap: 0.5%.
- Zones: Hazardous → Safety → Marine Exclusion → External → Monitoring and Security Area. ISGOTT covers risk assessments, vapour/pressure control, procedures, control zones.
- Closed system needs rigid piping/certified hoses/valves/couplings, pressure-capable tanks, and an ESD on supplier and receiver.
- Dry disconnect: drain or inert the system, or use dry couplings that close in vapour.
- Comms failure → stop safely, don't resume until re-established. New personnel can't join at any time.
- LNG fire extinguishers: dry powder, high-expansion foam, CO_2. Don't mix checklists. STS: barge is vulnerable.

Sources

1. IMO International Code of Safety for Ships using Gases or other Low-flashpoint Fuels (IGF Code) — LNG as fuel and bunkering.
2. MARPOL Annex VI — prevention of air pollution from ships (sulphur limits) and the International Safety Guide for Oil Tankers and Terminals (ISGOTT).