

ISO/TR 27929:2025-12 (E)

Carbon dioxide capture, transportation and storage - Transportation of carbon dioxide by ship

Contents		Page
Foreword		v
Introduction		vi
1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Abbreviated terms	3
5	Regulatory regime for maritime and inland waterways for CO2 transportation	3
5.1	General	3
5.2	Maritime governance	4
5.3	Technical safety regime for maritime transportation of liquid CO2	5
5.4	Greenhouse gas emissions	6
5.5	Trading and cross-border transportation	6
6	Ship transport of CO2	7
6.1	General	7
6.2	CO2 cargo transport conditions	7
6.2.1	General	7
6.2.2	Low pressure	8
6.2.3	Medium pressure	8
6.2.4	High pressure	8
6.2.5	Density effects	9
6.2.6	Solid state CO2 (dry ice)	9
6.3	Cargo tank design	9
6.3.1	Cargo tank design considerations	9
6.3.2	Tank material	10
6.3.3	Novel materials	10
6.3.4	Design pressure	11
6.3.5	Insulation	11
6.4	CCS ship transport concepts	11
6.4.1	General	11
6.4.2	Ship terminal to terminal	12
6.4.3	Barge terminal to terminal (inland waterways)	12
6.4.4	Offshore floating storage and injection unit (FSIU)	12
6.4.5	Offshore injection unit	12
6.4.6	Offshore direct injection	13
6.5	Multi-gas and dedicated carriers	13
6.5.1	General	13
6.5.2	Existing ship conversion	13
6.6	Ship design	13
7	Properties of CO2, CO2 streams and mixing of CO2 streams influencing the ship transportation	13
7.1	Thermodynamic properties of CO2 and CO2 composition	13
7.2	CO2 impurities and trace components	15
7.2.1	Common impurities	15

7.3	Flexibility and mixing of CO2 streams from different sources	16
8	Ship operation	17
8.1	Ship and terminal modes of operation	17
8.2	Compatibility and interface	17
8.3	Cargo operations	18
8.3.1	Responsibilities	18
8.3.2	Manifold operations	18
8.3.3	Loading and offloading operations	18
8.4	Cargo management	19
8.4.1	General	19
8.4.2	Cargo tank preparation	19
8.4.3	Cargo voyage management	19
8.4.4	Cargo losses	20
9	Technical gaps and development	20
9.1	Applicability and precision of existing requirements	20
9.2	Identification of additional relevant requirements such as practices onshore	20
9.3	Qualification and process for new technology	21
9.4	Gaps and need for development	21
10	Safety and risks	21
10.1	Health, safety and environment (HSE)	21
10.1.1	Toxicity and asphyxiation	21
10.1.2	Hazards of liquid CO2	22
10.2	Measures to mitigate risks	22
10.2.1	Gas detection	22
10.2.2	Emergency shut down	22
10.2.3	Emergency release system	22
10.3	Special risks with liquid CO2 as ship cargo	22
10.3.1	Solid formation	22
10.3.2	Material integrity	22
10.3.3	Electrostatic charge	23
11	Quantification and verification of CO2 cargo	23
11.1	General	23
11.2	Quantification and measurement	23
11.2.1	General	23
11.2.2	Cargo measurement	23
11.2.3	CO2 quality	24
11.2.4	Co-mingling	24
11.2.5	Onboard carbon capture	24
11.3	Verification	24
12	Summary status and development needs for CO2 ship transportation for CCS value chains	24
	Bibliography	26