This standard has been developed from the accumulated knowledge and experience of qualified engineers of the oil, petroleum, petrochemical, chemical, and general bulk liquid storage industry.

Engineering studies of a particular tank can indicate that the appropriate venting capacity for the tank is not the venting capacity estimated in accordance with this standard. The many variables associated with tank-venting requirements make it impractical to set forth definite, simple rules that are applicable to all locations and conditions.

This standard covers the normal and emergency vapor venting requirements for aboveground liquid petroleum or petroleum products storage tanks and aboveground and underground refrigerated storage tanks designed for operation at pressures from full vacuum through 103.4 kPa (ga) (15 psig). Discussed in this standard are the causes of overpressure and vacuum; determination of venting requirements; means of venting; selection and installation of venting devices; and testing and marking of relief devices.

This standard is intended for tanks containing petroleum and petroleum products, but it can also be applied to tanks containing other liquids; however, it is necessary to use sound engineering analysis and judgment whenever this standard is applied to other liquids.

This standard does not apply to external floating-roof tanks.
Contents

C.4 Direct-acting Vents .......................................................................................... 55
C.5 Pilot-operated Pressure Vent (Single Diaphragm) ........................................... 56
C.6 Pilot-operated Pressure/Vacuum (Double Diaphragm) .................................. 57
D.1 Isentropic Expansion Coefficient .................................................................... 70
F.1 Trip Pressure Diagram for Nitrogen Blanketing. ............................................ 77
G.1 Surface to Volume Ratio for Conical Roof Tanks ......................................... 79
G.2 Rate of Change of Tank Vapor Space Temperature Used in the Two Sizing Methods .......................................................... 80
G.3 Maximum Inbreathing for Various Tanks Sizes; Solid Black Lines—Thermodynamic Model; Solid Crosses—Annex A Method; Red Line \( V = 5 \cdot V^{0.7} \) .................................................. 81
G.4 Rate of Change of Tank Vapor Space Temperature vs Rain Density ............... 82

Tables
1 \( Y \)-factor for Various Latitudes ......................................................................... 10
2 \( C \)-factors ........................................................................................................... 11
3 Heat Input, \( Q \) (Expressed in SI Units) ................................................................. 13
4 Heat Input, \( Q \) (Expressed in USC Units) ............................................................... 14
5 Venting Capacity (Expressed in SI Units) .............................................................. 14
6 Venting Capacity (Expressed in USC Units) ......................................................... 15
7 Emergency Venting Required for Fire Exposure vs Wetted Surface Area (Expressed in SI Units) ........................................ 16
8 Emergency Venting Required for Fire Exposure vs Wetted Surface Area (Expressed in USC Units) ........................................ 17
9 Environmental Factors for Nonrefrigerated Aboveground Tanks (Expressed in SI and USC Units) ................................... 18
10 Maximum Allowable Leak Rates ....................................................................... 34
A.1 Normal Venting Requirements (Expressed in SI Units) .................................. 40
A.2 Normal Venting Requirements (Expressed in USC Units) .............................. 40
A.3 Normal Venting Requirements for Thermal Effects (Expressed in SI Units) .... 41
A.4 Normal Venting Requirements for Thermal Effects (Expressed in USC Units) ................................. 42
D.1 Guidance on Converting Calculated Flows to Normal/Standard Conditions .... 67
G.1 Surface to Volume Ratio of Small, Medium, and Large Flat Roof Tanks .......... 79
G.2 Assumptions Used in the Annex A Method and General Method ................. 80