Title	**Explain the principles of vessel displacement, stowage, stability, and loading stress**		
Level	**5**	**Credits**	**10**

Purpose	People credited with this unit standard are able to explain vessel displacement, stability, and trim concepts; apply stability theory to vessel loading scenarios; and explain loading stress considerations.

Classification	Stevedoring and Ports Industry > Cargo Operations

Available grade	Achieved

Guidance Information

1 Legislation relevant to this unit standard includes
Maritime Transport Act 1994;
Maritime Rules are as prescribed by Maritime New Zealand and listed in the rules section at: http://www.maritimenz.govt.nz.

2 Any new, amended or replacement Acts, regulations, standards, codes of practice, guidelines, or authority requirements or conditions affecting this unit standard will take precedence for assessment purposes, pending review of this unit standard.

Outcomes and performance criteria

Outcome 1

Explain vessel displacement principles.

Performance criteria

1.1 Explanation includes the principles of vessel flotation in achieving floatation equilibrium.

Range includes – Archimedes principle, displacement, volume, draft, buoyancy, floatation, density of water, mass and weight of vessel.

1.2 Explanation includes the principles of displacement and buoyancy for different stowage loading weight situations.

Range three different stowage loading weight situations; explanation includes – tonnage, draft, load line zones, specific gravity of water (tropical fresh), immersion.

Outcome 2

Explain vessel stability and trim concepts.

Performance criteria

2.1 Stability and trim is explained in terms of centres of gravity and buoyancy.

2.2 Stability is explained in terms of righting lever, initial/small angle and large angle/ultimate stability and the GZ Curve.

2.3 The explanation includes how the metacentric height is used to indicate vessel stability.

2.4 The free surface effect is explained in terms of centre of gravity and centre of buoyancy.

2.5 The concept of reserve buoyancy is explained.

2.6 Trim is explained in terms of moments to trim and the effects of cargo weight and placement on trim.

Outcome 3

Apply stability theory to vessel loading scenarios.

Performance criteria

3.1 Stability principles are applied to different cargo weight scenarios.

Range scenarios include – light ship, fully laden ship, vertical centre of gravity variations, draft marks.

3.2 The implications of varying cargo densities are determined for a vessel loading scenario.

3.3 The implications of the free surface effect are determined for liquid cargoes.

Outcome 4

Explain loading stress considerations.

Performance criteria

4.1 Deck-weight load considerations for cargoes are explained in relation to vessel strength.

4.2 Container pile weight considerations are explained in relation to vessel strength.

This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	17 September 2015	31 December 2022
Review	2	29 July 2021	31 December 2022

Consent and Moderation Requirements (CMR) reference	0145

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.