

Health, Safety & Security

Standardizing Mooring Operations at Busan Port

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1 Overview of Busan Port

Busan Port Authority BPA

✓ Nature

A state-owned enterprise (SOE) established under the Port Authority Act

✓ Establishment

January 16, 2004

✓ Purpose

To develop and manage port facilities, strengthen Busan Port's competitiveness, and contribute to national economic growth

✓ Scope of Responsibilities

- Operation and management of Busan Port
- Construction and maintenance of port facilities
- Execution of port redevelopment projects and marina facility management, etc.



Busan Port, which opened as Korea's first trading port in 1876, is the largest nationally managed trading port in Korea.



The world's second-busiest transshipment container port



The world's seventh-busiest container port

Korea's No.1

Container Port



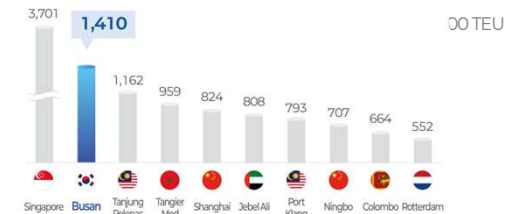
Busan Port 24.88M TEU > **77.8%**

Incheon Port	3.44M TEU	> 10.8%
Gwangyang Port	2.06M TEU	> 6.4%
Ulsan Port	0.35M TEU	> 1.1%
Other ports	1.24M TEU	> 3.9%

Source : Ministry of Oceans and Fisheries Integrated Port-MIS Statistics

The World's 2nd

Largest Transshipment Container Port



Source : Drewry Maritime Research

The World's 7th

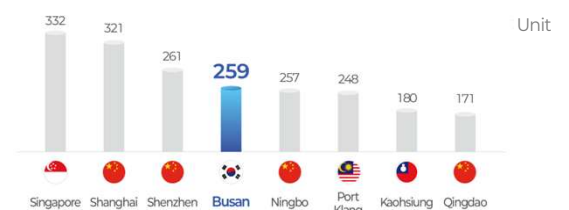
Largest Container Port



Source : Drewry Maritime Research

Excellent Connectivity

No. of weekly services



Source : LInerlytica

2 Current Status of Mooring Operations at Busan Port

“Mooring is essential to port operations, but operates within a **highly vulnerable structure**”



Current Status



12 mooring service providers



174 Total workers



65 Average age



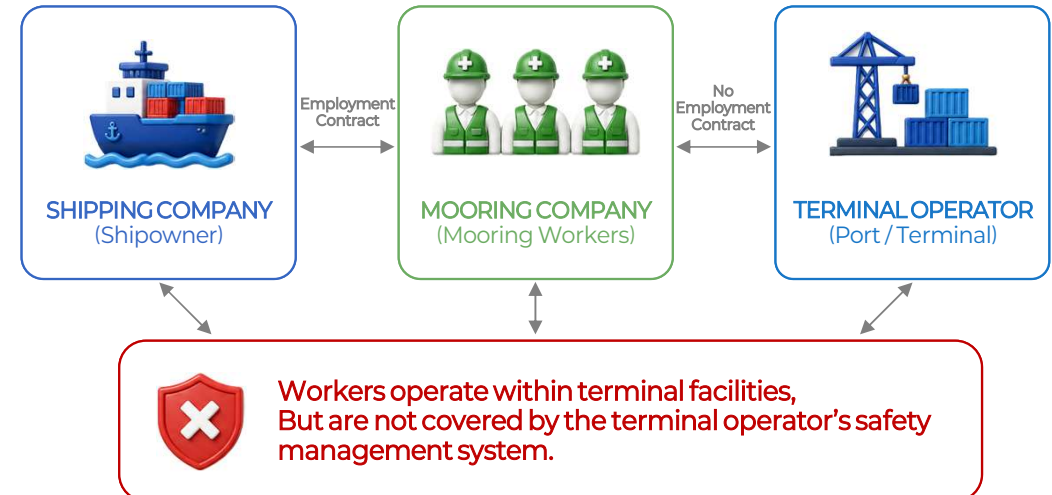
Mostly small businesses



Structural Issue

- Workers contract with shipping lines rather than terminal operators.
-> Workers are left outside the terminal operator's safety management system despite working within terminal facilities.

Contract Structure and Safety Management Gap



2 Current Status of Mooring Operations at Busan Port

Larger Vessels



Increased mooring line weight



Higher operational risks



Simultaneous use of vehicles and winches

BUT

Increasing Risks, Persistent Limitations for Small-Scale Businesses



Non-existence of standardized safety guidelines



Inconsistent work practices across service providers



Heavy reliance on experience-based operations

Challenges persist in establishing internal safety standards, investing in equipment, and providing systemic training.



Unfortunately, 2 fatal accidents occurred during mooring operations in 2025

Growing Confusion Due to Conflicting Safety Standards from Different Authorities



Busan Regional Office of Employment and Labor



A worker died when he was caught between a vehicle and a bollard after a co-worker mistakenly operated the vehicle.

Use of winches recommended



Conflicting Safety Standards



Changwon Regional Office of Employment and Labor



A worker died when a wire rope snapped during combined winch and vehicle-assisted mooring operations.

Complete ban on the use of winches

3 Busan Port Authority's Efforts

 **Conflicting government safety standards and funding constraints hindered rapid action**

BPA took the lead in establishing the **Busan Port Mooring Safety Management System** and proposed institutional improvements to the government based on the newly established framework

Implementation Roadmap

Comprehensive survey on mooring sector



- Interviews
- Consultation meetings
- On-site surveys

Establishment of Safety Standards



- Classification of work stages
- Standardized safety guidelines and work procedures

Safety Training Programs



- Establishment of safety training program & facility
- Hands-on safety training

Policy Recommendations to the Government



- Amendment of the Special Act on Port Safety
- Strengthened registration requirements for port transport businesses



Establishment of the Port Safety Consultative Body comprising government agencies and relevant port industry stakeholders

Regular/ad-hoc monitoring to ensure implementation and continuous compliance with safety standards

4 Establishment of Mooring Safety Management System at Busan Port

1 Result of Comprehensive Survey on Mooring Sector

Survey Overview

✓ **Target Group**
12 mooring companies
in Busan Port

✓ **Survey Period**
March 2026 (one month)

✓ **Method**
- Questionnaires
- Company interviews
- Field survey

✓ **Field survey**
103 mooring operations
- 68 berthing operations
- 35 departure operations

Key Survey Findings

Workforce Demographics

Average age
65 years old

Aging Workforce

Company size

Average workforce
16.1 workers per company
Small businesses with 10 or
fewer employees **45.5%**

High proportion of small businesses

Training Status

Safety training completion rate
74.7%

Continued expansion of
training needed

Workload

Monthly workload
191.5 Inversely correlated
with vessel size

Wide variation
across service providers

Operational Practices

Primary work method
63.6% Combined use of
personnel and
equipment

Mixed operations predominate

Equipment and Safety Devices

Equipment installation rate **72.7%**
Safety device installation rates:
- Sudden acceleration prevention **59.2%**
- Autonomous Emergency Braking **25.5%**

Additional safety
measures required



Key Insights from the Survey

Aging workforce and a large
number of **small-scale businesses**

Significant variation in work
practices and equipment


Need for improved safety
training completion rate


4 Establishment of Mooring Safety Management System at Busan Port


1 Result of Comprehensive Survey on Mooring Sector

Field Survey Findings


Areas of Strong Compliance


-  compliance with safety rules **100 %**
(Equipment operation, access control, etc.)


-  occurrence of prohibited practices **0 %**
(Prohibited: line-carrying on the shoulder)


-  occurrence of unsafe behavior **0 %**
(e.g., waiting in hazardous areas such as quayside railings)

Areas Requiring Improvement

-  compliance with minimum staffing requirements **62.1 %**
(4 personnel and 6 equipment units)

-  implementation rate of access control measures **68.0 %**
(securing safe work zones)

-  bollards with nearby obstacles **10.7 %**

-  installation rate of sudden acceleration prevention devices **59.2 %**

Feedback from the field

-  Need for safety standards tailored to vessel size 

-  Government support for standardized equipment required 

-  Insufficient rest areas 



Actions Completed
(as of April 2026)

Corrective actions requested for non-compliant companies

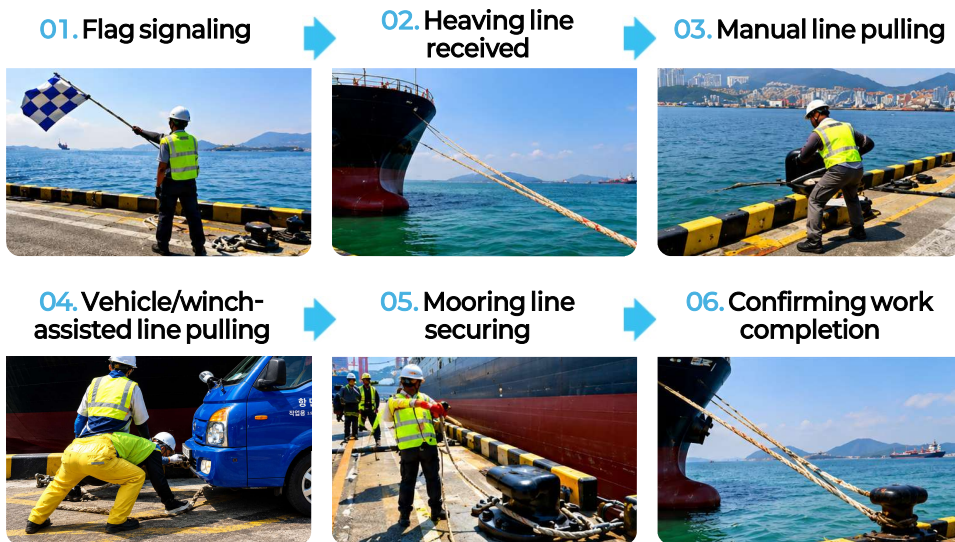
Obstacle removal and housekeeping around bollards

Survey findings and recommendation shared with the Ministry of Oceans and Fisheries

4 Establishment of Mooring Safety Management System at Busan Port

2 Result of Comprehensive Survey on Mooring Sector

- Classification of mooring work stages and development of standard safe work procedures



- Minimum Staffing Requirements by Operational Method

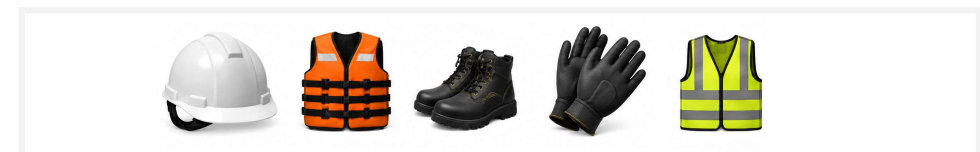
Manul Line Pulling

- 4 workers
(2 at bow, 2 at stern)

Vehicle- or Winch-Assisted Line Pulling

- 6 workers
(3 at bow, 3 at stern)

- Personal Protective Equipment (PPE) Requirements



Wearing Guidelines

- Mandatory before starting work
- Replace damaged or contaminated PPEs
- Regularly inspect PPE conditions and proper use



Compliance with **basic safety rules** is the first step in preventing major accidents.

4 Establishment of Mooring Safety Management System at Busan Port

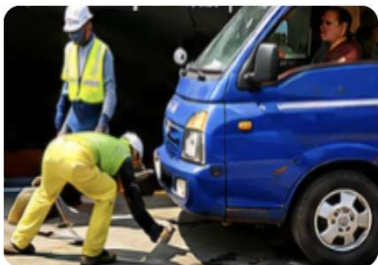
2 Development of Mooring Safety Standards

Method 1 Vehicle-assisted line pulling using a towing hook



! Risk factor

- Fatal injury caused by **vehicle misoperation** during mooring operations



✓ Safety Measures

- **GPS-based sudden acceleration prevention system** suppresses unintended acceleration caused by operational error within designated work areas using GPS
- **Autonomous Emergency Braking(AEB)** detects pedestrians ahead using sensors, provides warnings, and automatically controls the vehicle

Method 2 Winch-assisted line pulling



! Risk factor

- Wire rope failure and struck-by injuries caused by the **simultaneous operation of a vehicle and a winch**



✓ Safety Measures

- Shift the gear to Park(P) and engage the parking brake
- Install wheel chocks
- Prohibit vehicle movement during winch operations
- Prohibit workers from remaining inside the vehicle during winch operations

4 Establishment of Mooring Safety Management System at Busan Port

3 One Safety System, One Responsible Entity



Shift from Shipping Line Contracts to Terminal-Based Management

One contract, one safety management system



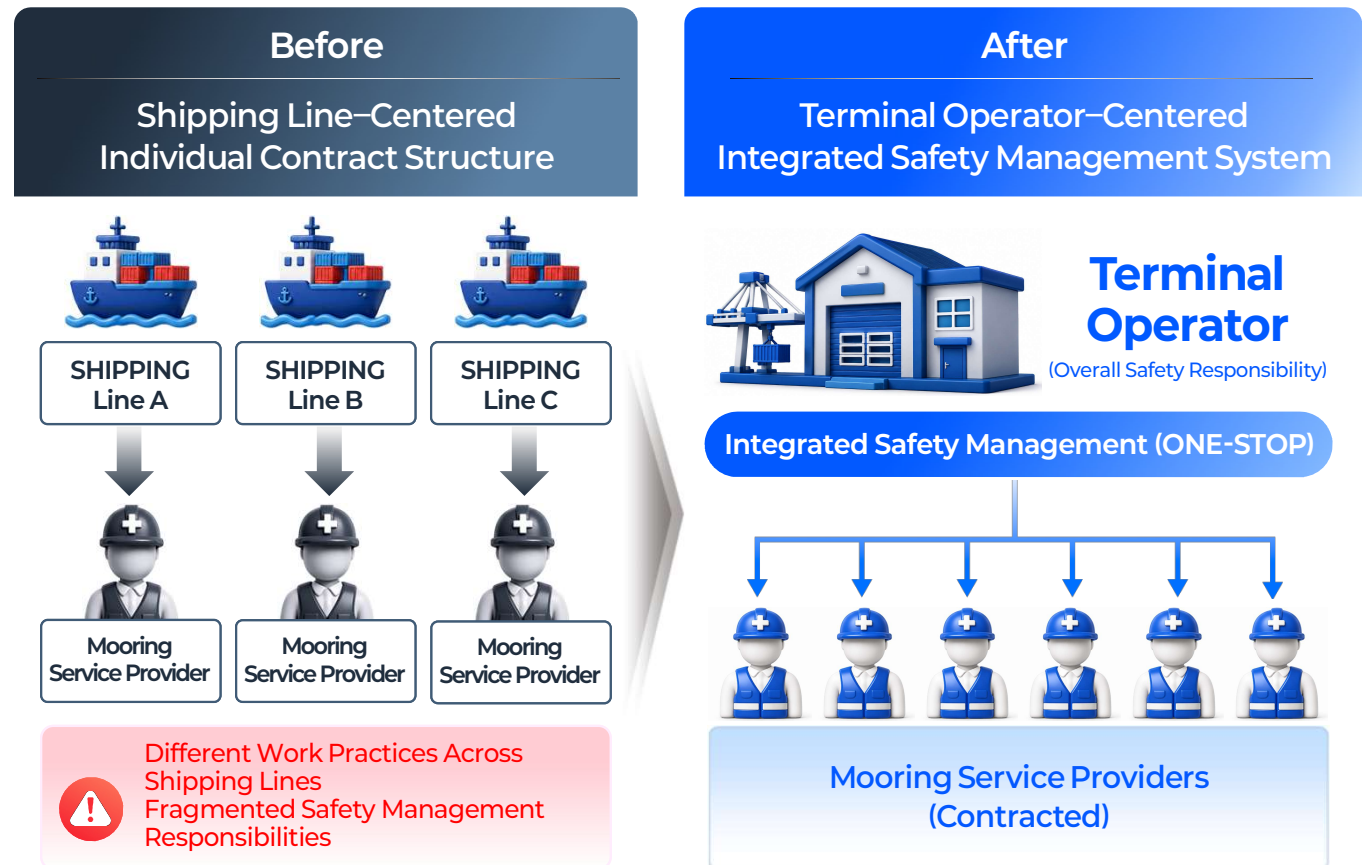
Include Mooring Service Providers in Terminal Safety Plans

Regular monitoring and safety oversight



Strengthen Government Safety Oversight

Regular inspections and compliance checks



4 Establishment of Mooring Safety Management System at Busan Port

4 Mooring Safety Training






Korea's first dedicated **hands-on training facility** for mooring workers



Accident Case Study Program for Supervisors
15 participants | 2 sessions
(March and November 2025)



Accident Case Study Program for Supervisors
140 participants | 5 sessions
(November 2025)

	Course	Training Contents	Duration
Theory	 Hazards of Mooring Work	<ul style="list-style-type: none"> • Planning and preparation of line mooring work • Analysis of accident cases and hazard factors, etc. 	1 hour
	 Safety Procedures for Mooring Work	<ul style="list-style-type: none"> • Safety rules and work methods for Mooring workers (manual) • Identifying hazards and control measures, etc. 	
Practice	 On-site Practical Training	<ul style="list-style-type: none"> • Securing mooring ropes to the bollard on the quayside • On-site safety practice by equipment type and work stage 	2 hours



Prevention of accidents and promotion of a safer working environment through enhanced safety awareness and practical skills among mooring workers

4 Establishment of Mooring Safety Management System at Busan Port

5 Recommendations for Institutional Improvements

✓ Legalization of mooring safety rules

- Propose incorporation into the Port Safety Act
- Penalties for violation, port access suspension

✓ Stronger registration requirements

- Safety capability assessments for mooring service provider registration (including standards for facilities and equipment)

✓ Expansion of integrated safety management system

- Improved contracting structure centered on shipping lines
- Terminal operator-centered safety management

From field challenges to institutional improvements

6 Establishment of Sustainable Safety Management System

✓ Regular and Ad-hoc monitoring through the Port Safety Consultative Body

 Busan Regional Office of Oceans and Fisheries

 Busan Regional Office of Employment and Labor

 Busan Metropolitan City

 Gyeongsangnam-do Province

 KOSHA
(Korea Occupational Safety and Health Agency)

Busan Port Authority 

Terminal Operators 

Stevedore Union 

Busan Port Logistics Association 

Korea Shipowners' Association 

Busan Port Safety Consultative Body



Regular Monitoring

Once per Quarter

- Check compliance with safety standards
- Verify implementation of improvement tasks
- Collect field feedback



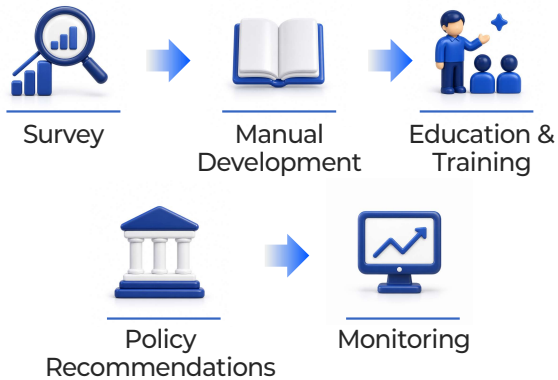
Ad-hoc Monitoring

Stakeholder Roundtable

Total 9 Sessions
(April ~ October)

5 Key Achievements

Establishment of Integrated Safety Management System



Integrated safety management system bridging policy, institutions, and field operations

Strengthened Safety Management Capacity in Mooring Operations

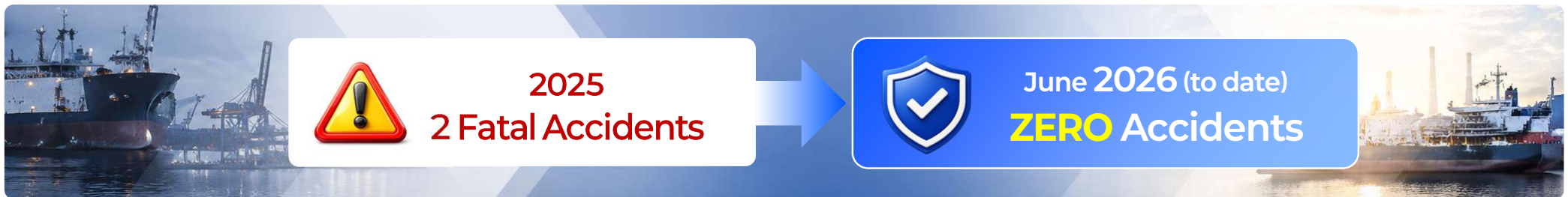


Improved safety management standards in mooring operations

Expansion Across Ports Nationwide



A Busan Port model setting the national standard for mooring safety





Thank you