

MAINTENANCE MANUAL FOR PORT AND HARBOR FACILITIES IN VIETNAM (2026)

Version 1



Table of Contents

- 1 Introduction
- 2 Inspection Technology of Port and Harbor Structures
 - 2.1 General
 - 2.2 Investigation of External Appearance
 - 2.2.1 Visual Investigation
 - 2.2.1.1 Visual Surveys Above Sea Level
 - 2.2.1.2 Visual Survey Below Sea Level
 - 2.2.2 Investigation using equipment
 - 2.3 Investigation of Shape and deformation
 - 2.3.1 Investigation below sea level
 - 2.3.2 Investigation above sea level
 - 2.3.2.1 Survey of water depth
 - 2.3.2.2 Survey of seabed topography
 - 2.4 Cavity Investigation
 - 2.4.1 General
 - 2.4.2 Type of cavity investigation
 - 2.4.3 Cavity investigation using electromagnetic wave radar
 - 2.5 Investigation of Waterways and Basins
 - 2.5.1 General
 - 2.5.2 Investigation of water depth
 - 2.6 Investigation of Concrete Structures
 - 2.6.1 General
 - 2.6.2 Inspection/examination methods
 - 2.6.3 Investigation of Concrete Deterioration
 - 2.6.3.1 Concrete Strength
 - 2.6.3.2 Cracks, Spalling, and Internal Cavities
 - 2.6.4 Corrosion of steel bars
 - 2.6.5 Chloride ion Distribution
 - 2.6.5.1 Measurement of chloride ion content
 - 2.6.5.2 Prediction of chloride ion penetration in concrete
 - 2.6.6 Carbonation
 - 2.6.7 Alkali-Silica Reaction (ASR)
 - 2.7 Investigation of Steel Structure
 - 2.7.1 General
 - 2.7.2 Investigation of Cathodic Protection System
 - 2.7.3 Investigation of Protective Coating System
 - 2.7.4 Measurement of steel plate thickness
- 3 Repair and Rehabilitation Methods
 - 3.1 General
 - 3.2 Types and selection of countermeasures
 - 3.3 Countermeasures for waterways and basins
 - 3.3.1 Causes and symptoms of deterioration
 - 3.3.2 Countermeasures for deterioration
 - 3.4 Countermeasures for concrete structures
 - 3.4.1 General
 - 3.4.2 Definition of repair and strengthening
 - 3.4.3 Selection of repair and strengthening method
 - 3.4.4 Repair method
 - 3.4.4.1 Surface coating method
 - 3.4.4.2 Crack repair method
 - 3.4.4.3 Section repair method
 - 3.4.4.4 Electrochemical repair method
 - 3.4.4.5 External Formwork Repair Method

- 3.4.5 Strengthening methods
 - 3.4.5.1 Concrete jacketing method
 - 3.4.5.2 Bonding method
 - 3.4.5.3 External cable method
 - 3.5 Countermeasures for steel structures
 - 3.5.1 General
 - 3.5.2 Diagnosis and repair of cathodic protection
 - 3.5.3 Diagnosis and repair of coating protection
 - 3.5.3.1 Painting method
 - 3.5.3.2 Organic coating method
 - 3.5.3.3 Petrolatum coating method
 - 3.5.3.4 Inorganic coating method (mortar coating)
 - 3.5.4 Repair/Reinforcement of corroded steel
 - 3.6 Countermeasures for the underground cavity
 - 3.6.1 General
 - 3.6.2 Repair method
4. Maintenance Records
- 4.1 General
 - 4.2 Items and Methods of Maintenance Records
 - 4.3 Retention of Maintenance Records
 - 4.4 Retention period for maintenance records

Appendices

- Appendix-1 Underwater Structure Shape Measurement System Using an Underwater 3D Scanner
- Appendix-2 System of Inspection and Diagnosis for Port Structures Using an Unmanned Boat
- Appendix-3 Repair Case Study: Section Repair of Superstructure Concrete of a Coal Unloading Jetty Using the PCM Dry-Mix Shotcrete Method
- Appendix-4 Corrosion Protection of Port Concrete Structures by Cathodic Protection Methods
- Appendix-5 Repair and Reinforcement of Steel Sheet Pile Quay Walls with Reduced Strength Due to Corrosion
- Appendix-6 Cavity Repair Method Using Bagged Liquefied Stabilized Soil

Abbreviation

OCDI : The Overseas Coastal Area Development Institute of Japan (<https://ocdi.or.jp/>)

CDIT : Coastal Development Institute of Technology (<https://www.cdit.or.jp/>)

JSCE : Japan Society of Civil Engineers (<https://jsce.or.jp/>)

JCI : Japan Concrete Institute (<https://www.jci-net.or.jp/>)

References

- 1) CDIT : Technical Manual for Maintenance of Port Facilities (Revised Edition), 2018.July
- 2) CDIT : Repair Manual for Concrete Port Structures, 2018.July
- 3) JCI : Practical Guideline for Investigation, Repair and Strengthening of Cracked Concrete Structures, 2009
- 4) TCVN13330:2021, Marine Port Facilities: Maintenance Requirement
- 5) CDIT: Corrosion Protection and Repair Manual for Port Steel Structures (2022 Edition)