

Outline of Guidelines for Maintenance of Prestressed Concrete Cable-Stayed Bridge and Extradosed Bridge, 2012

2012年制定 斜張橋・エクストラドーズド橋維持管理指針の概要

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1. Introduction

The number of prestressed concrete (PC) cable-stayed bridges and extradosed bridges is currently increasing all over the world, and more than 150 bridges of those types are in service in Japan. Although characteristics of cable-stayed bridges and extradosed bridges are different from those of girder bridges, maintenance of such bridges is performed according to standards for girder bridges. Those standards vary among bridge owners and maintenance is not conducted in a uniform manner throughout the country.

In consideration of the situation, Guidelines for Maintenance of Prestressed Concrete Cable-Stayed Bridge and Extradosed Bridge was published in English by the Japan Prestressed Concrete Institute in 2012 (Fig.1).

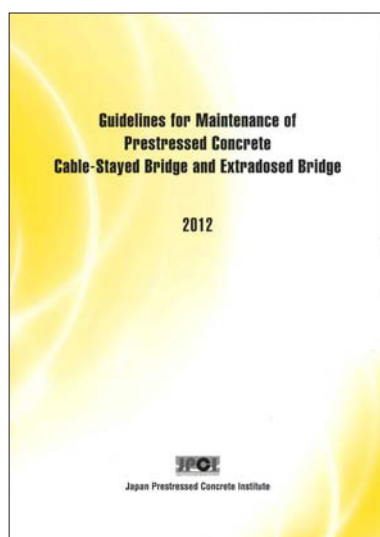


Fig.1 Cover of the Guidelines

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2. Guidelines

(1) Outline

The guidelines deal with maintenance of girders, decks, and accessories, which are common elements of all types of bridges, as well as towers and stay cables, which are characteristic elements of cable-stayed bridges and extradosed bridges. Maintenance of steel box girders employed in steel-concrete mixed girders is also covered in the guidelines.

All activities to be performed for maintenance of PC cable-stayed bridges and extradosed bridges are explained for each element.

(2) Table of Contents

Chapter 1	General
Chapter 2	Required Performance
Chapter 3	Maintenance Procedure
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Chapter 5	Evaluation and Judgement for Diagnosis
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Chapter 7	Records
Appendix 1	Type and Outline of Stay Cable System
Appendix 2	Type and Outline of External Cable
Appendix 3	Focal Points of Inspection and Survey for Existing PC Cable-Stayed Bridge
Appendix 4	Examples of Degradation in Existing Bridge.

3. Chapter Summary

The unique features of each chapter of the guidelines are explained in the following.

(1) General

Scope of the guidelines, principles of maintenance, definition of terms and symbols and relevant standards are presented.

The guidelines cover cable-stayed bridges and extradosed bridges that have concrete towers and concrete or steel-concrete mixed girders (Fig.2).



Fig.2 Ibi River Bridge – extradosed bridge with steel-concrete mixed girders

(2) Required Performance

Structural safety, serviceability and durability are defined as required performance measures that need to be ensured during the intended service lives of bridges.

(3) Maintenance Procedure

Maintenance of PC cable-stayed bridges and extradosed bridges is divided into five activities: establishment of a maintenance plan, inspection, evaluation and judgement, execution of intervention, and documentation of the activities (Fig.3).

Maintenance strategy for a bridge is categorized as preventive maintenance, breakdown maintenance, or condition monitoring. The roles and importance of the bridge, third parties' safety, intended service life, environmental conditions, and life cycle costs are considered.

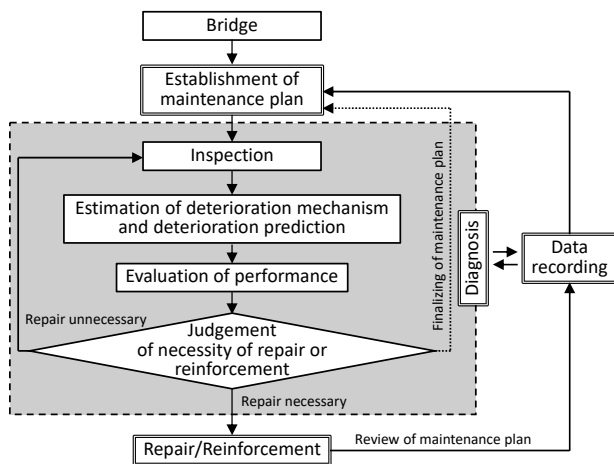


Fig.3 General flow of maintenance of PC cable-stayed bridges and extradosed bridges

(4) Inspection

Five inspection types are prescribed: initial inspection, routine inspection, regular inspection, extraordinary inspection, and emergency inspection.

Damage and deterioration characteristically observed in elements of cable-stayed bridges and extradosed bridges are described. Inspection methods and tips for inspectors are explained in detail for efficiently and unfailingly detecting characteristic damage and deterioration (Fig.4).

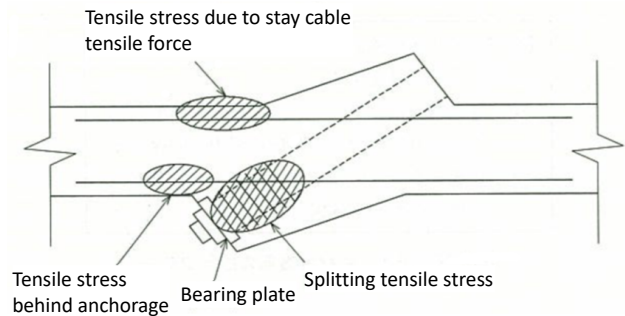


Fig.4 Stress states at cable-girder anchorage zone

(5) Evaluation and Judgement for Diagnosis

Evaluation of performance is based on inspection results, taking into consideration the performance requirements for each element.

Judgement of the necessity of repair or reinforcement is based on evaluation of the performance, where remaining intended service life and the roles/importance of bridges, maintenance strategy, and life cycle cost need to be considered.

(6) Measures

Target performance to be achieved after adopting measures is determined, considering deterioration mechanisms and performance degradation of bridges. Subsequently, several possible measures are worked out and the best one is selected in terms of maintainability and cost-effectiveness.

(7) Records

All maintenance activities are documented and archived according to rules set in the maintenance plan.

(8) Appendices

Stay cable systems used to date in Japan are explained. The maintenance practices of a cable-stayed bridge are presented.