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Title	Authors
Commentaries/ Standard Specifications for Concrete Structures-2010 — Revision of "Test Methods and Specifications, JSCE Standards"—	Atsushi UENO and Toshiro KAMADA
Technical reports/ Standard of the Japanese Society for Non-Destructive Inspection (NDIS) for Investigating Location of Reinforcing Bars by Radar and Electromagnetic Induction	Yoshihiro MASUDA, Kazumasa MORIHAMA and Hitoshi HAMASAKI
Technical reports/ Construction of the Link Slab for PC Girders Using Fiber Reinforced Cementitious Composite	Hideaki TANIGUCHI, Yoshihiko TAIRA Kei MURODA and Takeshi OSHIRO
Construction records/ Design and Construction of the First Railway Bridge applying Ultra High Strength Fiber Reinforced Concrete in the World	Yohei MORIKAWA, Yukihiro TANIMURA, Tadashi KAMIO and Hikari OHKUMA
Construction records/ Renaissance Plan 1 at Mukougaoka 1st housing — Technological development for total renovation of housing complexes that includes architectural changes—	Katsunori SATO

Concrete Journal Vol.49, No.4, pp.3-8, Apr. 2011/

Commentaries

Standard Specifications for Concrete Structures-2010
—Revision of "Test Methods and Specifications, JSCE Standards"—

Atsushi UENO[*1] and Toshiro KAMADA[*2]

Keywords: Standard Specifications for Concrete Structure, JSCE Standards, and Japanese Industrial Standards

"Test Methods and Specifications" as a part of Standard Specifications for Concrete Structures was revised in November 2010 by Concrete Committee in Japan Society of Civil Engineers.

It consist of two volumes, one contains JSCE standards on test methods and specifications of concrete fields and some related test methods established by the other organizations, and the other lists Japanese Industrial Standards regarding materials for concrete, steel bars, test methods for concrete and so on.

Testing methods and specifications has played important roles for performance verification of concrete structures. Therefore, this publication has also been utilized when designing, constructing and repairing concrete structures.

This article describes outlines of newly included JSCE standards.

"Test Methods and Specifications" contains two new test methods for repairing material. One is "Test method of resistance against falling of concrete pieces for surface coating materials by means of punching loading (JSCE-K533 2010)", and the other is "Test method of measuring resistivity for patching repair materials with four electrodes (JSCE-K562 2008)". Repairing of existing concrete structures becomes very major interest for many developed countries. It also has significance of reducing environmental impacts.

Table 1 shows 10 test methods for evaluation of performance of metal or plastic sheath for prestressed concrete. Although, the "Materials and Construction" part of Standard Specifications for Concrete Structures describes the needs for performance evaluation of metal or plastic sheath for prestressed concrete, there have been no JSCE standards for the purpose in the previous version of this publication. To respond above mentioned situation, JSCE Concrete Committee has prepared 10 new standards for prestressed concrete sheaths.

Table 1 Test methods for metal or plastic sheath for prestressed concrete

Standards number	Title
JSCE-E 701-2010	Test method for resistance of metal sheath for prestressed concrete under concentrated loading
JSCE-E 702-2010	Test method for resistance of metal sheath for prestressed concrete under uniform compressive loading
JSCE-E 703-2010	Test method for flexibility of metal sheath for prestressed concrete
JSCE-E 704-2010	Test method for resistance of plastic sheath for prestressed concrete under concentrated loading
JSCE-E 705-2010	Test method for resistance of plastic sheath for prestressed concrete under uniform compressive loading
JSCE-E 706-2010	Test method for flexibility of plastic sheath for prestressed concrete
JSCE-E 707-2010	Test method for leak tightness for plastic sheath of prestressed concrete
JSCE-E 708-2010	Test method for flexural characteristics of plastic sheath for prestressed concrete
JSCE-E 709-2010	Test method for abrasion resistance of plastic sheath for prestressed concrete
JSCE-E 710-2010	Test method for bond characteristics of plastic sheath for prestressed concrete

*1 Associate Prof., Graduate School of Civil and Environmental Engineering, Tokyo Metropolitan University, Dr. of Eng., JCI Member
*2 Professor, Graduate School of Engineering, Osaka University, Dr. of Eng., JCI Member

（email：eagle@tmu.ac.jp）

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Technical reports

Standard of the Japanese Society for Non-Destructive Inspection (NDIS) for Investigating Location of Reinforcing Bars by Radar and Electromagnetic Induction

Yoshihiro MASUDA[*1], Kazumasa MORIHAMA[*2] and Hitoshi HAMASAKI[*3]

Keywords: investigating location of reinforcing bars, cover depth, standard of the Japanese society for non-destructive inspection (NDIS), radar, electromagnetic induction

Recently, nondestructive testing methods have been adopted for inspecting the arrangement of reinforcements of RC structures. However, no standardized method has yet been established. This report explains the two standard methods established by the Japanese Society for Non-Destructive Inspection (JSNDI). NDIS 3429 is a method which uses electromagnetic radar, and NDIS 3430 is based on the use of electromagnetic induction.

Table 1 shows the contents of the NDIS 3429 and NDIS 3430 standards. The contents of both standards are adjusted as much as possible.

Periodic inspections are important for ensuring the reliability of measurements. The standards include descriptions of the timing, contents, procedure, and test pieces for inspection.

In the radar-based method, the key to achieving highly accurate measurement of the cover depth is the value of relative permittivity that is used. In this regard, NDIS 3429 outlines several methods for determining the relative permittivity.

In the electromagnetic induction method, it is important to identify the effects of adjacent rebars and to avoid these effects during the measurements. In appendix E of NDIS 3430, a method for measuring the effects of adjacent rebars is described, in addition to a procedure for determining the appropriate investigation position following the pre-investigation.

Table 1 Contents of Standards

NDIS 3429	NDIS 3430	Contents
1.	1.	Scope
2.	2.	Related Codes
3.	3.	Definition of Terms
4.		Principle of Investigation
5.	4.	Personnel of Investigation
6.	5.	Measuring Device of Investigation
6.1	5.1	Components of Device
6.2	5.2	Function and Performance of Device
6.3	5.3	Inspection of Device
7.	6.	Measurement
7.1	6.1	Pre-Investigation
7.2	6.2	Determination of Position of Investigation
7.3	6.3	Location of Reinforcement
7.4		Scanning
7.5		Calculation of Relative Permittivity
8.		Estimation of Location and Cover Depth of Reinforcement
9.	7.	Reports
9.1	7.1	Mandatory Items
9.2	7.2	Additional Information depending on Requirements
Appendix		
A.		(Informative) Principal of Investigation by Electromagnetic Radar
B.	A	(Normative) Function and Performance of measuring Device
C.	B.	(Inf.) Method of Inspection of Measuring Device
	C.	(Inf.) Measurement Procedure of Rebar Location and Cover Depth
D.		(Inf.) Reference Test Piece
	D.	(Inf.) Test Piece for Inspection
E.		(Inf.) Curve Fitting Method
	E.	(Inf.) Method of Measuring the Effects of Other Adjacent Rebars
F.		(Inf.) Rebar Diameter Method
G.		(Inf.) Actual Survey Method
H.		(Inf.) Processing of Measurement Data
I.	F.	(Inf.) Sample Format of Report

*1 Prof., Dept. of Architecture and Civil Engineering, Graduate School of Engineering, Utsunomiya University, Dr.Eng., JCI Member
*2 Deputy Team Leader, Public Works Research Institute, JCI Member
*3 Senior Research Scientist, Building Research Institute , JCI Member

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Technical reports

Construction of the Link Slab for PC Girders Using Fiber Reinforced Cementitious Composite

Hideaki TANIGUCHI [*1], Yoshihiko TAIRA[*2] Kei MURODA[*3]and Takeshi OSHIRO[*4]

Keywords: fiber reinforced cementitious composite, low elasticity, high ductility, self-compactability, link slab, prestressed concrete girder

In the construction of Kyo-Tanabe Parking Area, the parking area is located above the existing expressway and was constructed with the array of multi-spans prestressed concrete (PC) girders. The link slab structures which connect PC girders without using the expansion joint were required in this project.

Then, a new structural type to connect PC girders with the slab developed by the authors was designed. The conventional structure that connects PC girders by the cross beam is shown in Fig.1 (a). On the other hand, the adopted structure that connects PC girders by the slab for this project is shown in (b). The sectional forces which act on connecting member become smaller and the workability in the construction is highly improved by using this structure.

The new fiber reinforced cementitious composite (FRCC) developed by the authors with low modulus of elasticity, high ductility and crack distribution that was used for link slab where high sectional forces act. The FRCC is a kind of high performance fiber reinforced cementitious composite (HPFRCC). A thin board (10mm in thickness) made from the FRCC shows large bending deformation as shown in Photo.1 as a lot of minute cracks in the bottom.

The compressive strength of the FRCC is almost the same as normal concrete value (30N/mm^2 in design strength). The test value at 28 days of Young's modulus becomes 18kN/mm^2 or less though the design value is 20kN/mm^2.

Photo.2 shows the situation of the FRCC placing. The FRCC was placed without vibrators, because the FRCC had high fluidity and self-compactability.

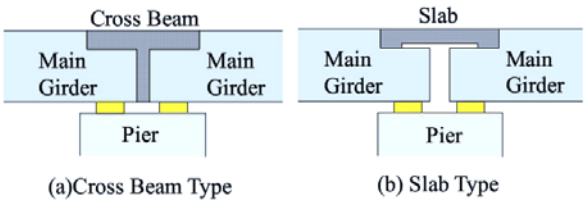

Fig.1 Types of structure connecting PC girders

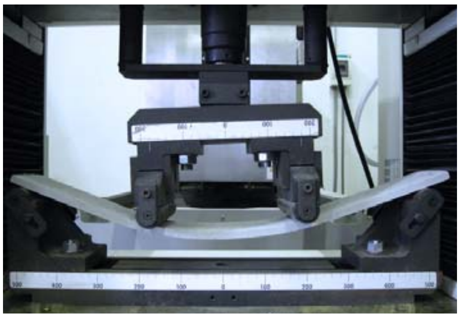

Photo.1 Bending deformation of FRCC board

Photo.2 Placing of FRCC

*1 Technological Development Center, Sumitomo Mitsui Construction Co., Ltd., Dr. E., JCI Member
*2 Civil Engineering Designing Department, Sumitomo Mitsui Construction Co., Ltd.,
*3 Osaka Branch, Sumitomo Mitsui Construction Co., Ltd.,
*4 Kansai Regional Branch, West Nippon Expressway Co., Ltd.

（email：hitaniguchi@smcon.co.jp）

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Construction records

Design and Construction of the First Railway Bridge applying Ultra High Strength Fiber Reinforced Concrete in the World

Yohei MORIKAWA*1, Yukihiro TANIMURA*2, Tadashi KAMIO*3 and Hikari OHKUMA*4

Keywords: ultra high strength fiber reinforced concrete, UFC, railway bridge, thin slab

Ultra high strength Fiber reinforced Concrete (hereafter referred to as "UFC") is a new concrete material developed as UHPFRC. UFC possesses excellent characteristics such as ultra high strength, high toughness, high durability, high flowability, and also has a noteworthy feature that it requires no reinforcing bars.

For the first time in the world, UFC has been applied in the "Kayogawa River Bridge", a railway bridge that was completed on the Sangi Railway in Mie Prefecture (Photo 1).

An old railway bridge across the Kayogawa River was supposed to be rebuilt because of the river improvement of broadening and a rise of the estimated high-water level (H.W.L.). A pre-stressed concrete U-girder was designed and the thickness of the slab was needed by 390mm. However it was necessary to adjust the thickness of the slab to 250mm or less so as not to change the height of the railroad track (Fig. 1).

By using UFC, the thin thickness of the slab could be achieved and the change of the height of the railroad track became unnecessary and the total cost of this project could be reduced.

The overview of design and construction of this bridge are reported here, together with the results of displacement measurement and noise measurement of this bridge.

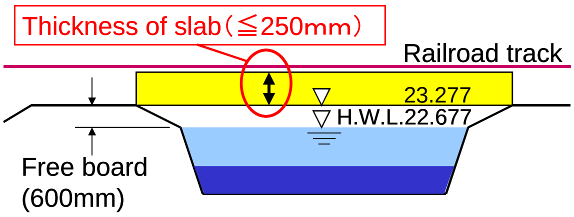

Fig.1 Condition of thickness of the slab

Table 1 Bridge specifications

Type of bridge	Railway bridge
Type of structure	Single span PC U-girder
Bridge length	15.86 m
Width	4.00 m
Girder height	1.50 m
Design strenth	1.50 m
Angle of skew	62° 00′ 09″

Photo 1 Kayogawa River Bridge

Photo 2 State of erection of UFC girder

*1 Railway Department, Sangi Railway Co., Ltd.
*2 Structures Technology Division, Railway Technical Research Institute, Dr. Eng., JCI Member
*3 Technology Department, All Nippon Engineering Consultants Co., Ltd.
*4 Civil Engineering Technology Promotion Department, Taisei Corporation, JCI Member

（email：h-ohkuma@ce.taisei.co.jp）

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Construction records

Renaissance Plan 1 at Mukougaoka 1st housing

—Technological development for total renovation of housing complexes that includes architectural changes—

Katsunori SATO*1

Keywords: renaissance plan, renovation, partial demolition, enlarging, housing complex

Since the 1950's, many housing complexes were built to meet the needs against population concentration in the metropolitan regions. By living in those housing complexes, young families could realize up-to-date lifestyles. Even today, the housing complexes - and its maturely grown communities and trees - continue to be important social overhead capitals in forming the housing environment of the city. Meanwhile, housing complexes need to meet social issues, such as the decrease in population and number of households, aging, declining of the birth rate, and diversification of lifestyle. Therefore, along with the reconstruction of old housing complexes , UR has developed a plan for total renovation of housing complexes which include architectural changes, called "Renaissance Plan 1". Total renovation of housing complexes contributes to sustainability of the global environment by reducing of waste, use of material and CO_2, and also by improving energy efficiency. In addition, it contributes to the improvement in the environment of the local societies with mature landscapes and in diversification of space and use. When renovating a housing complex, it is important to make the most of the environment, such as extensive outdoor spaces with trees, human-scale townscapes, housing units with wide frontage that allow sufficient ventilation and daylight. The experiment in renovation on Mukougaoka has been done in collaboration with the Toda Corporation Group *2.

The subject matters are;

1. Performance improvement.
   - Practicing partial demolition to improve safety against earthquakes.
   - Setting pipes outside of the housing units and renewing facilities.
   - Installing heat & sound insulation.
2. Barrier free access, diversification, attractive common space and living space.
   - Making access to the enlarged elevator by converting a housing unit into a common space that is attractive for the community.
   - Converting a housing unit into a facility and a pilotis.
   - Making various layouts and spaces for individual lifestyles by converting a flat type unit into a maisonette, combining two flat units into one flat unit, enlarging a room with a roofed terrace, changing a flat roof into an inclined roof, and lowering the floor level of the first floor.

Photo.1 panoramic view

Photo.2 Building No.26

Photo.3 Building No.27

Photo.4 Building No.28

*1 West Japan Branch , Urban Renaissance Agency "UR"

*2 Toda Corporation Ltd. Osaka Branch / Wakachiku Corporation Ltd. Osaka Branch / Katsuhiko Suzuki, Kyoto Institute of technology, Dr Eng and Professor / Itsuro Hoshida, Space & Urban Research Institute / Maitani Yoshiaki Design Studio / Wada Structual Engineer Consultants