SEWC 2002 회원들의 논문 요약문

LIABILITY AND ASSESSMENT OF THE DEFECTS IN A COMPLETED STRUCTURE

Lee Tae-hyung

Korean Structural Engineers Association

In the construction industry, it is common that many professionals such as developers, architects, engineers, contractors, construction manager and supervisors, material and equipment suppliers, maintenance and repair specialists, and government employees are engaged cooperatively in the process of constructing a building structure. Because of these complicated production system and the nature of construction industry requiring a large investment, relatively long construction period, and careful maintenance after completion, it is difficult for the Client to trace the causes of the defects in a turned over building structure and to determine which party is responsible for the defects in case of discovering them.

In this paper, the causes and assessment procedure of structural defects will be discussed based on current law and supreme court's decrees of Korea by categorizing them as the defects of design and engineering documents, the improper execution of field construction, the negligence of construction manager and supervisor, the flaw of construction material, and the poor maintenance of a compeleted structure.

Finally, the study is concluded with a reasonable proposal to improve the performance and efficiency of the defects assessment procedure in the troubled structure.

STRUCTURAL DESIGN OF PUSAN LOTTE WORLD II

[1] Kim Jong-Ho, [2] Park Young-Wook, [3] Pak Hak-Kil

[1,2] Chang & Minwoo Structural Consultants

[3] Dong-A University

ABSTRACT:

The Lotte World II in Pusan is designed to be the tallest building in the world. It is very sensitive in lateral load for the high slenderness ratio of 8. The system was designed to super columns with 5 outriggers, belt trusses and concrete core wall, which are a hybrid system. For more economical and stable structural system, stiffness participation ratio of each structural system was studied when stiffness participation factor was applied. It was concluded that outrigger element is the most effective for lateral stiffness. Each member section is introduced.

STRUCTURAL DESIGN OF DAEWOO TRUMP WORLD I

Kim Jong-Ho, Suh Hyun-Joo

Chang &Minwoo Structural Consultants

ABSTRACT

This article summarizes some key aspects of the structural design of Daewoo Trump World I in Yoido, Seoul, Korea. It is a 41-story residential structure and was the highest RC structure in Korea when it was designed. The compressive strength of concrete in the vertical members varies from 240kgf/㎠ to 400kgf/㎠.

Wide beams with relatively shallow 350mm depth were used to reduce the floor height. RC shear walls in the core, outrigger girders, and outrigger walls were designed to resist the lateral forces. A Wind tunnel test, inclusive of wind force test, wind pressure test, and wind circumstance test, was performed.

An Experimental Study on the Structural Performance of the Stressed-Arch System

[1] Hang Sang-Eul, [2] Kim Jong-Ho, [3] Kim Ji-Dong,
[4] HwangBo Seok,

[1] Inha university

[2,3] Chang & Minwoo Structural Consultants

[4] ES & Partners Structural Engineering Co,. Ltd

ABSTRACT:

This article describes contents to grasp member force and structural behavior for the stress erection process and to confirm structural performance of each structural element through test to estimate stability about stress erection process of Stressed-Arch system.

APPLICATION OF CONTINUUM BEAM ANALOGY FOR SHEAR ANALYSIS OF TUBE STRUCTURES

Kang-Kun LEE , Li-Hyung LEE

Han-Yang University

ABSTRACT:

A numerical modelling technique is proposed for estimating the shear stress distribution in beams of tube structures with multiple internal tubes. The structures are analysed using a continuum approach in which each tube is individually modelled by a tube beam that accounts for the flexural and shear deformations, as well as the shear lag effects. By simplifying assumptions regarding the form of strain distributions in external and internal tubes, the shear stress distributions are expressed in terms of a series of linear functions of the second moments of area of the structures and the corresponding geometric and material properties, as well as the applied loads. The simplicity and accuracy of the proposed method are demonstrated through the solutions of three numerical examples.

The Buckling Strength of Rectangular Plates under Different In-plane Loading Conditions

[1] Soo-gon Lee, [2] Soon-chul Kim , [3] Seung-deog Kim

[1] Chonnam National University

[2] Dongshin University

[3] Semyung University

ABSTRACT:

The elastic critical loads of two rectangular plates with different edge loading conditions are determined by the finite element method. Kinney's fixity factor is introduced to describe the boundary conditions at the plate edges. For each aspect ratio of the plates, the changes of elastic critical load coefficient are represented by the algebraic function of two stability analysis parameters. The proposed algebraic equation predicts critical load changes fairly well and can thus serve as a design aid.

STRUCTURAL BEHAVIOR OF T-SHAPED WALLS UNDER LATERAL LOADS

Young-S. Cho, Jeong-W. Lee, Li-H. Lee

Hanyang University

ABSTRACT

As current buildings show a trend of high rise to meet the demand of urban city's expansion, to secure the stable lateral load resisting systems such as shear walls, bearing walls and columns in concrete building structures is an important task in building construction industry. There are considerable research records regarding the shear walls such as rectangular walls and barbel-shaped walls which have reinforced end or extended area of end. However, there are many irregular shaped walls such as H-shaped, T-shaped, Box-shaped and L-shaped in actual construction projects. As these irregular walls are connected with rigid joints, one side walls of irregular walls affect the other side walls structurally. The composite structural behavior has been studied in this experimental research. This study includes the evaluation of effective width of flange part when lateral loads are applied to the web part of T-shaped walls to be used to assess the structural performance.

DUCTILITY CONFINEMENT OF RC SHEAR WALLS WITH RECTANGULAR CROSS SECTION

Honggun Park, Su-Min Kang

Seoul National University

ABSTRACT

Experimental studies were performed to investigate variations in the ductility of shear walls with the depth of the boundary confinement. Five specimens modeling the compressive zone of cross sections with different confinement area were tested against eccentric vertical load. Through the experimental and numerical studies, the strength, ductility, and failure mode of the compression zone were investigated. Also, nonlinear numerical analyses for the overall cross-sections of shear wall were performed to investigate variations of the stress and strain profiles with the depth of compression zone. On the basis of the experimental and numerical studies, a design method was developed to determine the confined area and the corresponding reinforcement ratio required for a given ductility demand of curvature.

STRUCTURAL PERFORMANCE OF RC L-SHAPED WALLS WITH DIFFERENT CONFINEM -ENTS SUBJECTED TO BI-DIRECTIONAL CYCLIC LOADS

[1] Chang Sik Choi, [2] Sang Su Ha, [2] Young-Hun Oh, [2] Li-Hyung Lee

[1] Daejin University

[2] Hanyang University

ABSTRACT:

This experimental research was performed to examine the behavior of structural performance of L-shaped shear walls whose variable is the area and spacing of the transverse confinement in the compressive toe of the walls. The maximum strength of a shear wall subjected to lateral load is influenced by many factors, such as loading direction, the spacing and confined area of transverse reinforcement, aspect ratio, vertical and horizontal reinforcement. According to the experimental results, the confining area of wall corner has a great influence on the maximum strength and initial stiffness of an L-shaped wall. Therefore, the area and spacing of the transverse confinement would be the most important factor, when designing the L-shaped walls subjected to earthquake excitation.

[1] Soo-gon Lee, [2] Soon-chul Kim

Free Vibration Analysis of Non-Symmetrically Tapered Members

[1] Chonnam National University

[2] Dongshin University

ABSTRACT:

The fundamental lateral vibration frequencies of three types of tapered members are determined by the finite element method. Taper and sectional property parameters are considered in the free vibration analysis. The analytical method applicable only to the linearly tapered members give frequencies that agree well with those by the numerical method. In order to aid structural engineers in the dynamic or free vibration analysis of tapered bars, the frequency changes are expressed by algebraic equations of two analysis parameters. The frequencies estimated by the proposed equations coincide well with those by the numerical method, which proves the validity of the proposed equations.

Young-Hun OH, Li-Hyung LEE

DRIFT AND DUCTILITY CAPACITY OF T-SHAPED CANTILEVER STRUCTURAL WALLS

Hanyang University

ABSTRACT:

If RC structural walls are properly designed and proportioned, these walls can behave in a ductile manner. To achieve this goal, the designer should provide adequate strength and deformation capacity of structural walls corresponding to each performance level (e.g. immediate occupancy, life safety, collapse prevention). In this study, drift and ductility capacity of T-shaped structural walls were investigated from the results of moment-curvature analyses and experimental tests. These results are used to determine available displacement ductility factors for T-shaped structural walls with different longitudinal reinforcement ratio, distribution of longitudinal reinforcement, lateral confinement ratio and axial load ratio. Based on the results, the levels of permissible drift and ductility factor in UBC 1997, which incorporate the strain-based damage limit and interstory drift ratio, were examined.

Sang Whan Han, Li Hyung Lee

SEISMIC BEHAVIORS OF COLUMNS IN ORDINARY MOMENT RESISTING CONCRETE FRAMES

Hanyang University

ABSTRACT

This study investigates the performance of the columns in Ordinary Moment Resting Concrete Frames (OMRCF). For this purpose 3-story OMRCF building was designed in compliance to design provisions (ACI 318 (1999) and UBC (1994)). The building is assumed to be located at zone 1 (zone factor of 0.075 according to UBC 1994). Minimum reinforcement detailing requirements specified in ACI 318 were applied. The columns in 1st story of the building are considered in this study since these columns shall resist largest axial force during an earthquake. Four test specimens were made, which are upper part and lower part of exterior and interior column. All specimens are two-third scale. Lower part of the column has lap spice whereas the upper part of the column has the continuous longitudinal reinforcements. Quasi-static cyclic reversed lateral load was applied to the specimens. Throughout the test constant axial load was applied to the interior column specimen. For exterior column specimen varying axial load was applied to account for the effect of overturning moment. Based on test results this study estimates

deformation, ductility, strength, and energy absorption capacities as well as plastic hinge length. The results obtained from this study are compared with those of similar studies by other researchers. Also the parameters of analytic models such as strength and stiffness degradation, and pinching are studied.

[1] Seo, Soo-Yeon, [2] Lee, Chenggao, [3] Lee, Li-Hyung

EXPERIMENTAL STUDY ON THE SHEAR STRENGTH OF COMPOSITE BASEMENT WALLS

[1] Chungju National University

[2] Yanbian University

[3] Hanyang University

ABSTRACT

This paper presents an experimental study to evaluate the shear strength of composite basement wall in which H-pile and reinforced concrete basement wall of building are combined using shear connector. Twelve specimens are tested to evaluate the shear strength of the wall. Main variables in the test are composite rario, distribution of shear connector, thickness of wall, shear-span-to depth ratio, and shear reilnforcement. Test result indicated that the shear strength of the specimens varied with the foregoing parameters except the composite ratio. Especially, the shear strength of the specimens closely depended on the strength of concrete wall. Calculation result considering the contribution of concrete wall showed a good aggreement with test results.

[1] Young-Kyu JU, PhD, [2] Sang-Dae KIM, PhD,

EXPERIMENTAL STUDY OF THE SHEAR CAPACITY OF THE iTECH SYSTEM

[3] Kwang-Ryang CHUNG, [4] Do-Hyun KIM

[1] Daewoo Institute of Construction Technology

[2] Korea University

[3] DongYang Structural Safety Engineers

[4] Korea University

ABSTRACT:

This paper proposed and tested a newly developed structural system called the Innovative, Technical, Economic, and Convenient Hybrid System (iTECH system) using a simple beam test. iTECH has an asymmetric steel assembly with a web opening, with the top plate welded on top of an inverted T shape steel cut referred to as 'honeycomb' type. Both sides of the web and the slab were filled with cast-in-site concrete. The shear capacity was experimentally evaluated and verified, with parameters determined by factors that shared the shear strength of the iTECH beam. Results show that steel web, inner concrete panel, and outer concrete panel contributed to the shear strength of iTECH. However, shear stirrup did not contribute much to shear strength. Therefore, a design equation using steel web and inner concrete panel was suggested.

Jong Soo KIM

Structural Design of Cable Stayed Truss of 2002 Chonju World Cup Stadium

C · S Structural Engineers Inc.

ABSTRACT:

Chonju stadium has 42,000 seats with 260m 160m. All aspects are designed in accordance with FIFA standards. The roof of stadium covers 20,000. that is 87.5% of

Stadium area(FIFA requires 60% of Stadium area). The roof structure is comprised of two major structural systems. One is the cable-stayed truss structure and the other is open-dome structure. A prismatic steel truss(inner ring truss) acts as primary support system to the roof, which is suspended at 28 positions around stadium by Π 65.1~84.9 mm front stay cables. The 28 front and back stay cables are suspended by four 63.0m-high masts located at corner of stadium. The ring truss (inner ring) and the perimeter truss (outer ring) supported by A-shaped column make the roof behave as a dome. A system of steel rod bracing in the plane of the roof transfers stability and in-plane forces back to the A-shaped columns.

JEON, Bong-Soo

Jeon and Associates

CABLE MEMBRANE ROOF WITH OVAL OPENING OF 2002 ASIAD MAIN STADIUM, BUSAN, KOREA

ABSTRACT:

The Stadium for the 2002 Korea-Japan FIFA World Cup and 2002 ASIAD in Busan, Korea primarily consists of cable-membrane roof trusses of 228m in diameter, supporting concrete structures, and stand structures. This stadium with a retractable roof was initially designed as a multi-purpose event hall and as well as the main stadium of 2002 ASIAD. And later the Busan City Authority had decided to use the stadium not only for 2002 ASIAD but also for 2002 FIFA world cup and hit by 1997 economic crisis. Eventually, the design had to be modified to a cable membrane roof with an oval opening in stead of retractable dome. In this paper, the structural system, details, and construction of the cable membrane roof with an area of 20,000㎡ and an oval opening of 180m×152m have been introduced. The roof structure consists of ring cables, radial cables, and vertical posts that are made up of fully locked Galfan-coated cable and SM490 YB steel.

JEON, Bong-Soo

Jeon and Associates

STRUCTURAL DESIGN AND CONSTRUCTION OF JEJU STADIUM FOR 2002 FIFA WORLDCUP, SEOGWIPO, KOREA

ABSTRACT:

The Stadium for the 2002 Korea-Japan FIFA World Cup in Jeju, Korea accommodates 42,000 seats, the west stand of which is covered with membrane roof supported by cable stayed truss linking to six gigantic steel masts. Earth works were minimized by exploiting the unique geographical features of Orum, secondary volcano, which are being used as a playing field in its concave and as a stands at its slope. The access system to the stadium from front had been provided in care full consideration of the movements of spectators the stadium being located in such a way to harmonize with surrounding buildings.

[1] Kwang-Ryang CHUNG, [2] In-Ki KIM, [3] Myeong-Han KIM

[1] Dongyang Structural Engineers Co., Ltd.

[2] HYCA Architects & Engineers Associates

STRUCTURAL DESIGN OF HYUNDAI-HYPERION PROJECTS, SEOUL, KOREA

[3] Dept. of Architectural Engineering

ABSTRACT:

Hyundai-Hyperion Project is a residential development

located at Mok-dong, Seoul, Korea. The development comprises 3 proposed residential towers ranging in height from 200m (53 stories) to 254m (69 stories) above ground, nine levels of podium and six levels of basement for parking, retail area and club house and nine stories development store. The towers typically comprise a central concrete core with perimeter composite columns and floors. Two or three outrigger levels are located at approximately quarterly height of the towers to provide lateral stiffness. Hyundai Construction & Engineering Com

pany has started the construction work in November 1999, and would complete the works in June 2003. In this paper, Hyundai-Hyperion Project, which would be the tallest building in Korea, has been introduced. Key points in the structural design process and engineering characteristics were briefly reported.

[1] CHA, Seung-Yeol, [2] YI, Waon-Ho,
[3] JEON, Bong-Soo, [4] KIM, Seung-Weon,
[5] LEE, Li-Hyung

STRUCTURAL DESIGN AND CONSTRUCTION OF KOREAN AIR MAINTENANCE HANGAR, INCHEON, KOREA

[1] Dongyang Consulting & Structural Engineers
[2] Kwangwoon University
[3] Jeon and Associates
[4] Newtech & Associates
[5] Hanyang University

ABSTRACT:

The Korean Air maintenance hangar at Incheon International Airport, Korea, completed June 2002 accommodates three aircrafts of two B747 and one B727 simultaneously, which is box shaped with 180m 110m in plane and 39.6m height. The frames work of the hangar comprises of diagonal grid trusses, edge trusses and supporting frames with 8 automatic hanger doors. The 8 heavy cranes are suspended under the flat roof trusses that are 11meter deep, and the service, snow load and wind, and earthquake loads are subjected to and resisted by roof trusses with 5 supporting frames. The steel members fabricated in the shop were all in-situ bolt connected. The roof trusses together with the claddings were lifted up by pulling cables at six temporary masts, with 5 supporting frames inserted and welded.

[1] KIM, Seung-Weon, [2] JEON, Bong-Soo
[1] Newtech & Associates
[2] Jeon and Associates

STRUCTURAL DESIGN AND CONSTRUCTION OF ASEM CONVENTION CENTER, SEOUL, KOREA

ABSTRACT:

The 5-story ASEM Convention Center in Seoul, completed in early 2000 for the occasion of ASEM (ASia Europe Meeting), contains spaces for convention for 6,000 peoples, exhibition and support facilities in a total of exhibition. A large roof of 117m×171m is supported by 117m lenticular Pratt trusses and 27m cantilever trusses. And the grand convention hall of 7,300 sq.m and the heavy-loaded exhibition hall are supported by composite beams and truss girders. The tension cable truss facade at main entrance reaches 29m high and 81m wide where field bolt connections are adopted at 234m x 295m basement without expansion joints.

[1] Jin-Ho CHEON, [2] Chang-Ho LEE, [3] Byung-Hai LEE

[1] New Engineering Consultants Inc.

[2] Hankyong National Univ.

INTEGRATED STRUCTURAL DESIGN SYSTEM FOR REINFORCED CONCRETE BUILDINGS

[3] Hanyang University

ABSTRACT:

This paper describes an example of developing an integrated design system, Integrated Structural Design System for Reinforced Concrete Buildings (INDECON). INDECON incorporates a central database and three design modules: a preliminary design module (PDM), a structural analysis module (SAM), and a detailed design module (DDM). The development of INDECON begins with the development of design models including Design Object Model (DOM) which describes design data during the structural design process. The Design Object Model is transformed to Design Table Model (DTM) for the central database, and is specified to be in detail for the three design modules. Then the central database is implemented and managed by relational database management system (RDBMS), and the three design modules are implemented using C++ programming language. The developing procedure for INDECON in this paper can be applied for developing other integrated structural design systems.

[1] Seung-Hun KIM, [2] Jung-Min NA, [3] Yong-Taeg LEE

[4] Li-Hyung LEE, [3] Jung-Hee LEE

[1] Hanyang University

Structural Behaviors of Shear Strengthened Reinforced Concrete Columns with Carbon Fiber Sheets

[2] Sang Young Engineering, Co.

[3] Hanbat University

[4] Hanyang University

ABSTRACT:

This study described the experimental works to investigate the structural behavior and shear retrofit performance of reinforced concrete (RC) columns with carbon fiber sheets (CFS). Experimental works were conducted for five specimens varied in the reinforcement quantity and adhesion method of CFS. Throughout cyclic test, the strength, stiffness, failure modes, ductility, and energy dissipation capacity were discussed. The test results showed that the increase of the CFS quantity improved the ductility and energy dissipation capacity and changed shear failure mode into flexural failure mode.

[1] Waon-Ho Yi, [2] Jae-Hyung Lim

[1] Kwangwoon University

[2] Woosong Technical College

STRENGTHENING EFFECT ON SHEAR CAPACITY OF REINFORCED CONCRETE BEAM WITH CARB -ON FIBER SHEET

ABSTRACT:

The objective of this study is to develop a new equation that can predict the strengthening effect on the shear capacity of the RC beam with Carbon Fiber Sheets. To evaluate the influence on each experimental variable, the existing test data were investigated. The variables that had effects on the increment of shear capacity were shear span/depth ratio and shear reinforcement ratio by CFS. The previous equations were compared with the result of the existing test data, and the merits and demerits of existing equations were analyzed, using the coefficient of correlation obtained by the regression analysis. The proposed equation was derived in such a way that main

parameters and their combination were obtained from the analytical study and then their coefficients were determined by the regression analysis using the previous test data. As a result, the proposed equation showed the better agreement with existing test data than the previous equations.

Kim, Won Jong

Assistant Vice President at Daewoo Engineering

A Simple Method to Measure Deformation of Structure

ABSTRACT:

Structural engineers are interested in the quantity of deformation under actual loading conditions. To measure deformation, many different approaches can be used. The use of LVDT(Linear Variable Differential Transducer) may be widely accepted method. However, it is not easy for engineers to adopt this method for practical purpose because of establishing test equipment. In this paper, a new approach is suggested using sensor and probe. This new approach is used to measure the deformation of heavy loaded slab on paper producing company.

Kim, Won Jong

Daewoo Engineering

ESTABLISHING STANDARDS OF POLYMER CEMENT FOR CONCRETE STRUCTURE REPAIR

Polymer cement is used as a repair material for concrete structure. The construction time and cost can be reduced with proper use of polymer cement. Polymer cements, however, are produced in many companies with different quality and price. For example, bond strength is varying from 15 to 35 kg/cm2. As a result, it is very difficult to select the right polymer cement.

Since polymer cement is used at the location where carbonation, spalling or corrosion has occurred, only small amount of polymer may be consumed. The widely used polymer cements are developed for multi-purpose, which results in good quality under all the extreme conditions. On the contrary, the price becomes higher.

In this paper, standards for a polymer cement as a repair material will be made for a fire damaged 3-story concrete structure. Some polymer cements have enough data in detail-bond strength, creep and shrinkage, freeze and thaw test result, compressive strength and so forth. Some polymer cements, however, have only one data-compressive strength at 28 days. Based on the test data reviews for many polymer cements, some important items are selected from consumer's points of view-compressive strength (in particular 3-day compressive strength), shrinkage and elongation, and bond strength. Repair method and price are also important factor for internal use.

Based on the established criteria, all the purchasable polymer cements are tested using same test method and specimen. In most cases, test results at sites are different from those specified at brochure. These test results are compared and summarized for many different polymer cements. Daewoo Engineering is establishing these test results and use them for selecting an appropriate polymer cement for different projects.