BRIDGE MAGAZINE's 3rd International Online Workshop: The International Online Workshop on Orthotropic & Steel Bridges

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Amin Ghafooripour

Director of the Outreach Program in SEI (Structural Engineering Institute) San Francisco Chapter ASCE, Adjunct Lecturer at Santa Clara University

Dr. Amin Ghafooripour is an international educator with 25 years of experience in the United States, United Kingdom, UAE, and Iran. He is experienced in guiding the research projects in a wide range of structural/civil engineering topics such as System Identification and Health Monitoring, Offshore Engineering, Dynamic Analysis, Earthquake engineering, Interaction problems and Non-linear Analysis. He has patented four inventions and published over 90 papers. He is the founder and President/ CEO of Padir Consulting Engineers.

Crawler Crane Live Load Distribution Factor on Bridge Decks

This presentation evaluates the AASHTO closed-form formulas for the live load distribution of the vehicles with crawlers such as military tanks and cranes. It discusses the numerical evaluation and verification of the AASHTO LRFD formulas for type 'k' bridges concerning the results of the finite element analysis of heavyweight. The modification factors 'β' to the AASHTO standard formulas for the analyzed cases (type 'k') based on the statistical comparison and a probabilistic approach are also introduced.

MIKI Chitoshi

President of Tokyo City University,
Professor of Civil Engineering

MIKI Chitoshi was a Professor of Civil Engineering and has been the President of Tokyo City University since 2015. He received a doctorate degree of Engineering from Tokyo Institute of Technology. His research interest lies in the areas of bridge designs and structural mechanics with publications of more than 400 academic papers and 10 books. He received awards include JSCE Awards, JICA Award, etc. He served as the Chair of the Public Engineering Application Technology Evaluation Committee and the New Technology Application Evaluation Committee of Japan's Ministry of Land, Infrastructure, Transport and Tourism, and Chief Advisor of the ASEAN University Network's Engineering Education Network, etc.

Improving Fatigue Resistance of Orthotropic Steel Bridge Deck

Japan's major expressway enterprises have a relatively wide usage of orthotropic steel bridge decks. Orthotropic Steel Deck is an excellent bridge deck system but contains a ubiquitous problem of fatigue. Many fatigue cracks are distortion induced and can be solved by improving the structural details. With demonstration of cases in Japan, this presentation covers topics including fatigue damage occurred in orthotropic steel bridge decks, the cause and mechanism of fatigue damage in each mode, methods of retrofitting fatigue damages, as well as the proposal of structural improvement for newly constructed orthotropic steel decks.

Robert Conner

PE, Jack and Kay Hockema Professor of Civil Engineering, Lyles Schoolof Civil Engineering, Purdue University, USA

Prof. Connor has nearly thirty years of experience in the research and testing of bridges and related structures. He is currently a Professor in the School of Civil Engineering at Purdue University and is Director of the S-BRITE Center. Prior to joining the faculty at Purdue, he was a Senior Research Engineer and the manager of the Infrastructure Monitoring Program at the ATLSS Engineering Research Center at Lehigh University. He has developed and is currently developing fatigue design specifications for highway bridge structures and bridge expansion joints for NCHRP and state agencies. He served as the Former Chair of ASCE - Committee on Fatigue and Fracture and has recently won American Iron and Steel Institute Richer S. Fountain Award in 2020.

Variability in Acoustic Properties and UT & PAUT NDT Data

This presentation is related to NCHRP Project 14-35: Acceptance Criteria of Complete Joint Penetration Steel Bridge Welds Evaluated Using Enhanced Ultrasonic Methods. It was revealed there can be considerable scatter in both the acoustic properties of A709 grades of steel. A round robin testing program was used to determine the minimum flaw size that could be reliably detected with enhanced ultrasonic methods and how the advanced methods compare with the historical conventional UT method. This presentation will focus on the observed variability in acoustic properties of the steels tested and the variability observed during the round robin study. Recommendations on how to address these issues will also be presented.

Sougata Roy

Associate Research Professor,
Center for Advanced Infrastructure and
Transportation (CAIT), Rutgers University

Dr. Sougata Roy is an expert in Structural Engineering with specialization in Fatigue and Fracture of Steel Bridges and Structures. He has more than 31 years' experience in academic research and structural engineering consultancy. Over the past 12 years he is active in research and knowledge dissemination on steel orthotropic bridge decks. Roy is involved with AASHTO Technical Committees, and is the Chair of TRB AFH70: Metal Fabrication Committee, member of AISI/NSBA Design Advisory Group/Bridge Task Force, AASHTO/NSBA Task Group 16-Orthotropic Decks among others.

Standard Manufacturable Orthotropic Bridge Deck

Prefabricated modular steel orthotropic decks can provide life-cycle cost-effective solution for steel bridges. These decks are ideal for accelerated bridge construction and is the only deck system likely to ensure a service life exceeding 100 years with minimum maintenance. A standard deck is also an ideal manufacturable product, incorporating repeated well established cost-effective fatigue resistant details that are amenable to automated fabrication. This manuscript presents a standard manufacturable design of orthotropic bridge deck that easily accommodates variation of girder and floor beam spacing and can be easily integrated to the floor framing system. This deck design effectively addresses the challenges to wide spread implementation of steel orthotropic decks for steel bridges, providing a life-cycle cost-effective solution for the bridge infrastructure.

Ajay Sehgal

Senior Bridge Engineer and
District Permit Branch Chief
California Department of
Transportation (Caltrans), USA

Mr. Sehgal is a Senior Bridge Engineer and a Falsework Specialist in the Bridge Department within California Department of Transportation (Caltrans). He provided guidance in the design & construction of falsework, scaffolding, bridge trestles, temporary bridges, trenching and shoring, and bridge demolition. He was the chairman of Caltrans's Falsework Committee and was responsible for updating the Falsework Manual and assisted with updates to the Trenching & Shoring Manual. He started with Caltrans in 1988 and was involved in the inspection of the shear keys and bearings of the Self-Anchored Suspension portion of the San Francisco-Oakland Bay Bridge. He has also worked on multiple rehabilitation & emergency projects on long-span toll bridges owned within California by Caltrans.

The California Orthotropic Steel Deck Bridges' Erection Techniques (1965-2015): A Fifty Year Retrospective

This presentation highlights Accelerated Bridge Construction (ABC) techniques and construction methods used to construct orthotropic decks in California. Caltrans adopted orthotropic deck/box girder system in the 1960's for long span bridges. California with high seismic activity has about 20 percentage of bridges with an Orthotropic or 'steel deck' system with around 11 percent of the USA's bridges. ABC techniques used to construct these bridges are conceptually summarized with drawings and photos of the key stages of erection. These ABC techniques/methods are applicable to future projects around the world.

Xiaohua ‘Hannah’ Cheng

Bridge and Structure engineer of New Jersey Department of Transportation(NJDOT), USA

Dr. Xiaohua ‘Hannah’ Cheng obtains a Bachelor’s Degree from Tsinghua University, a Master’s Degree from the China Academy of Railway Sciences and a Doctoral Degree from Nagoya University. Her primary duties include development and update of policy, manuals, standards, and guidance for design, construction, and maintenance of State highway bridges and traffic structures. She is also in charge of development of special design and construction criteria for major bridge projects. Dr. Cheng is serving AASHTO Committee on Bridges and Structures as a member. She was a researcher in bridges and structures with ATLSS Research Center, Lehigh University in the US, and Public Works Research Institute (PWRI) in Japan, and worked with consultants as a structural engineer.

Fatigue and Durability of Orthotropic Steel Decks - What We've Learned from Research and Practice?

Orthotropic decks have been used to reduce dead load of long span bridges, moveable bridges, and replacement of existing bridges. Different types of bridges and traffic volume have different requirements for design and construction when orthotropic deck system is used. Fatigue is one of the most critical issues that have to be addressed in design and fabrication due to direct action of vehicle wheel loads and relative thin steel members of such a deck system. This presentation will provide overall technical considerations, lessons/causes learned from damaged bridges, fatigue test research, discussions of design, fabrication, construction, minimized maintenance, and future suggestions.

Qi Ye

P.E., CHI Consulting Engineers,
Summit, New Jersey, USA

Mr. Ye received a Bachelor Degree from Tongji University and a Master Degree from SUNY at Buffalo. He has over 25 years of extensive experience in design and rehabilitation of suspension bridges, fatigue evaluation of steel structures, seismic analysis and design, and vibration study of bridges. He designed steel orthotropic decks on many long span bridges, including the Bronx-Whitestone Bridge, the Queensboro Bridge, and the Throgs Neck Bridge. He has led many award-winning projects, winning the 2014 ACEC New York Platinum Award and the same award in 2020. He was recognized as one of the Outstanding 50 Asian Americans in Business in 2015 by Asian American Business Development Center in the US.

Open Rib Orthotropic Decks-History And Recent Development

This presentation first demonstrates a brief history of steel orthotropic deck development in Europe and US, then discusses the reasons why engineers have been avoiding the open rib decks in the past several decades. A comparison of pros and cons of closed and open rib decks is elaborated afterwards. In the end, results of a case study are presented, which demonstrate that open rib steel decks can be designed as light as the closed rib ones, while achieving similar or even better fatigue performance.

YI Lunxiong

National Engineering Survey and Design Master.
Deputy Chief Engineer of China Railway Major
Bridge Reconnaissance Design Institute Co., Ltd.

YI Lunxiong holds a PhD in Engineering and graduated from Central South University of China. He has presided over the design of the Beijing-Shanghai High-Speed Railway Section of the Dashengguan Yangtze River Bridge and more than ten super-long-span bridges, and has conducted in-depth researches on long-span high-speed railway bridges, bridge steel structures and bridge structural steel. He has won one special prize and one second prize for China's National Scientific and Technological Progress Award.

Research on the Break Prevention and Crack Resistance Technique for Orthotropic Steel Decks

The presentation starts with some typical damage of orthotropic steel decks, analyzes the influencing factors of the damage and several improved technical solutions and puts forward the technical direction to prevent fractures to solve the problems of fatigue damage. Based on the fracture prevention criteria and the criteria of fracture mechanics, this presentation deduces and formulates the quality grade and mechanical performance requirements of U-rib welds of steel bridges in service. The presentation introduces the research and development, the engineering application and the industrial manufacturing of the new U-rib full penetration welding of orthotropic steel decks.

SHI Yongji

Researcher of the Railway Engineering Research Institute, China Academy of Railway Sciences

SHI Yongji's research areas include bolted and welded steel beams, bridge design standards, fatigue and fracture of steel bridges, safety assessment and maintenance and reinforcement of existing bridges, composite structures, long-span suspension bridges and cable-stayed bridges, steel bridge manufacturing, train-bridge dynamic interaction and vibration reduction, as well as researches in the field of new urban transportation systems.

The main railway bridge projects he participated in China include the bolted and welded steel beams of Chengdu-Kunming Railway Bridge, Baihe Bridge, Changdong Yellow River Bridge, Jiujiang Yangtze River Bridge, Ankang Hanjiang Bridge, etc. He has published more than 60 papers, of which more than 10 have been published in international conference proceedings and journals. He published 2 volumes of monographs, translated 4 books from English and Japanese and edited 2 standards of China's Ministry of Railway. In addition, he teaches Modern Bridges, Fatigue and Fracture of Steel Structures, Composite Structures, etc. to graduate students. His research of "Residual Life Assessment of Old Riveted Steel Bridges" chaired by China's Ministry of Railways won the Second Prize for the Ministerial Scientific and Technological Progress Award in 1994. His research of "Key Manufacturing Process of Long-Span Steel Box Girders" won the First Prize of the Nanjing Municipal Scientific and Technological Progress Award in 2000.

The Durability Design of Steel Bridge Decks

Due to the complexity of the fatigue of steel bridge decks, it is difficult to use the traditional fatigue check and computation methods to evaluate the fatigue properties of steel bridge decks. In the "Fatigue Design Guidelines for Steel Road Bridges" published in March 2002, Japan originally proposed the concept of fatigue design method of steel bridge decks structural details. Such concept and the structural details have been stipulated in the later published steel bridge design codes. This presentation introduces the durability design of steel bridge decks from the following five aspects:

1. Structural characteristics and fatigue of steel bridge decks;
2. Fatigue design method of steel bridges;
3. Structural fatigue design of steel bridge decks;
4. Fatigue design of steel bridge deck structural details;
5. Requirements for manufacturing welding and processing.

FAN Wenli

Professor, Southwest Jiaotong University, China

Prof. FAN Wenli is an expert in bridge steel structure. He has long been engaged in the research, design and teaching of bridge steel structure and concrete-filled-steel tube structure stability and fatigue behavior, connection behavior, corrosion and anti-corrosion. He participated in many domestic highway and railway large bridge engineering research projects and served as a technical consultant. He has won a total of 9 First and Second Prizes of the National Science and Technology Progress Award of provincial and ministerial levels. He was involved in the compilation of China's current design code for the domestic highway and railway concrete filled steel tube bridge and highway bridges, as well as the culvert construction technical codes. He is a senior council member of the Bridge Structure Branch of the China Steel Construction Society, and a council member of the Steel Structure Welding Branch.

The Fatigue Performance and Fatigue Resistance of Orthotropic Steel Decks

Service life prediction is a great challenge in the engineering community. The multiple fatigue cracks in orthotropic steel decks and diaphragms not only reduce the bearing capacity but are also extremely difficult to repair, resulting in the aging of structures.

Fatigue is the result of structure damage and repetitive loading. The "notch effect" of welded joints is often difficult to predict. On the ultra-long high-degree weld between the steel deck plates and the U ribs, the type and distribution of defects are difficult to determine, and the location, the size, and the frequency of the moving load acting on it are also uncertain. A large number of longitudinal fatigue cracks in service are from the weld toe; Fatigue cracks of diaphragms mostly occur at cope holes and extend in the horizontal direction. In view of the different fatigue crack characteristics of the diaphragms, measures were taken to eliminate the "notch effect" of the welded joints and weaken the local "stiffness effect" of the diaphragm as much as possible, which have become the weapon to crack the aging of the orthotropic steel decks.

WU Chong

Professor, Department of Bridge Engineering,
College of Civil Engineering,
Tongji University, China

Professor WU Chong obtained his Doctorate Degree from Kyoto University, Japan. He is the Deputy Chief Engineer of the Bridge Engineering Design Institute and the Municipal Design Institute of Tongji University's Architectural Design and Research Institute (Group) Co., Ltd. He is mainly engaged in the design theory and methodology of steel bridges and composite structure bridges, steel bridge construction technology and equipment. He has participated in and presided over a number of national and provincial longitudinal researches, the scientific researches and designs of major national bridge projects, as well as the revision of the Design Standard for China's Highway Steel Bridges (JTGD64-2015).

The Forms of Fatigue Failure and Fatigue Resistance Measures for Steel Bridge Decks

This presentation will analyze and summarize typical forms of fatigue failure of orthotropic steel decks. The following steel structure construction measures will be discussed: increasing the thickness of roofs, reducing the spacing of beams, optimizing the shape of the curved cut, opening stiffeners, using hot-rolled U ribs with thick edges and thick flanges, hot U-ribs with thick edges, and U-ribbed high-strength bolt connections, as well as the influence of UHPC pavement, steel fiber concrete pavement and ordinary concrete pavement on the fatigue life of steel bridge decks. The presentation will also introduce the application of advanced technologies such as robot automatic welding, U-ribbed inner welding robot, U-rib submerged arc full penetration welding, etc. in the manufacture of steel bridge decks.

ZHENG Kaifeng

Professor, Southeast Jiaotong University,
Adjunct Professor of Southampton University

Professor ZHENG Kaifeng's main research directions include complex structural steel bridges, long-span bridges and the fine calculations and simulation analysis calculations for bridges. He was a selected talent of the "National Million Talent Project" and is an expert on special allowances of the State Council. He has published more than 120 papers. His papers have been included within the "F5000 Top Chinese Academic Journal of Excellent Scientific and Technological Papers", and won the first prize of the Science and Technology Progress Award of Provincial Level, the first prize of the Chinese Railway Society's Excellent Paper, and the China Highway and Bridge Society's Excellent Paper Award. Professor Zheng has participated in the compilation of "Road Suspension Bridge Design Code" and other design specifications, served as a technical consultant and consulting expert for more than 50 large and complex bridge projects, and inspected more than 60 national famous bridges and complex structural bridges.

Some New Development of Steel Bridges and New Exploration of Orthotropic Steel Decks

The presentation will focus on the main advantages and disadvantages of steel bridges, the review of the development of steel bridges in China, several new developments in steel bridges at home and abroad, three development stages of orthotropic steel decks, key technical issues of orthotropic steel decks and the latest exploration and development of orthotropic steel decks.

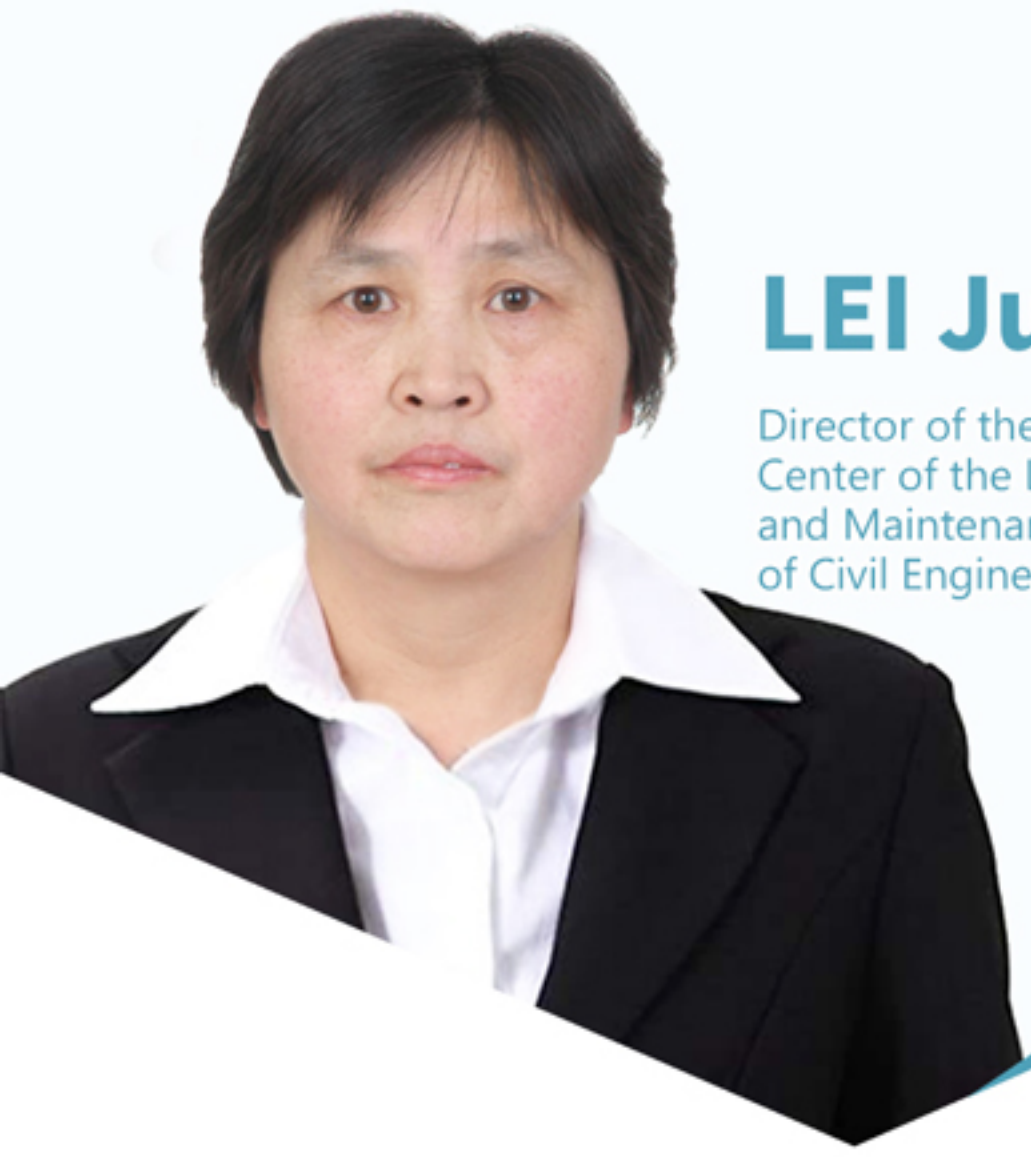
LI Chuanxi

Head of the School of Civil Engineering,
Changsha University of
Science and Technology

Professor LI Chuanxi obtained his PhD from China's Hunan University. He is a candidate for China's National "New Century Million Talents Project". He has presided over four projects of the National Natural Science Foundation of China and was a "973 Project" principal researcher. He has presided over the construction control and research of nearly 50 super-long-span bridges of various bridge types such as Foshan Pingsheng Bridge, Yueyang Dongting Lake Bridge, Nanning Yonghe Bridge, as well as the calculation of the CB04 standard steel box girder spreaders of Hong Kong-Zhuhai-Macao Bridge and Nansha Bridge's construction control of the catwalk in the Nizhou waterway. He has won 2 Second Prizes of the National Science and Technology Progress Award and 4 First Prizes in the Provincial and Ministerial Science and Technology Progress Awards. He has published more than 300 papers and won more than 10 invention patents.

The New Technology of Fatigue Prevention for Steel Box Girders: CFRP Method for Treatment of Diaphragm Crack and Lightweight STC of Bridge Deck

In response to the two major fatigue problems in orthotropic steel deck (OSD): fatigue cracks at the cope hole of the diaphragms and fatigue cracks at the longitudinal welds between the U-ribs and the deck plate. The presenter's research team was researching and developing materials (nano modification) on the basis of a large number of component tests, full-scale model tests and comparative tests in different situations and developed new technologies for CFRP method and STC lightweight method for the treatment of cracks in the diaphragm. The new technology is applied to a steel box girder suspension bridge in use for 12 years and a newly constructed UHPC-steel box girder bridge with OSD (i.e.STC lightweight composite bridge deck). The new technology not only effectively solves the two major fatigue problems, but also significantly improves the construction performance and reduces the cost of construction compared with the previous methods.



LEI Junqing

Director of the Research and Development Center of the Long Bridge Construction and Maintenance Engineering, School of Civil Engineering, Beijing Jiaotong University

Prof. LEI Junqing is a doctor of engineering and is a standing council member of the Bridge and Structural Engineering Branch of China Highway and Transportation Society and a council member of the Steel Bridge Branch of China Steel Construction Society. She is also an expert in railway and highway bridge engineering and a member of the International Association of Bridge and Structural Engineering (IABSE). She gained her academic experience at Southwest Jiaotong University, Highway College of Chang'an University, and the University of California, USA.

Professor Lei has been engaged in bridge engineering for more than 40 years. Her main research interests are the theory and application of bridge engineering structures; civil engineering project management, etc. She has undertaken or participated in more than 90 national, provincial and enterprise-level scientific research projects.

She has published more than 180 papers and 12 monographs and teaching materials. She has won more than 10 teaching awards at university, provincial and ministerial levels, and has trained nearly 100 postdoctoral, doctoral and master-level students. In 2014, she won Mao Yisheng Railway Science and Technology Award. She has won 3 provincial and ministerial Science and Technology Progress Awards and 5 Science and Technology Progress Awards issued by enterprises owned by the Chinese central government.

A Study on Several Problems of Fatigue Cracking Damage of Orthotropic Steel Decks

In order to solve the problem of fatigue cracking damage in orthotropic steel deck (OSD), this presentation includes the statistical analysis and formulation of material performance, designing of structural system, structural component construction, overload of vehicle load, fatigue spectrum of vehicle load, fatigue test of specimens of steel bridge deck, measurement of acoustic emission technology, evaluation and detection of welding process between deck plate and Uribs. The reliability theory of probability theory is used to evaluate the fatigue damage and the reinforcement and maintenance countermeasures.

XU Shifa

Professor, Beijing University of Civil Engineering and Architecture

Professor XU Shifa obtained his Bachelor's Degree, Master's Degree and Doctorate Degree from Tongji University of China in Road Engineering, and is a Postdoctoral Researcher in Road Engineering at Wuppertal University in Germany. His research directions include construction technology of longevity road surface with solid waste, road construction technology with disaster reduction and emission reduction functions, as well as the durable cold mixed and cold paved environment-friendly pavement technology. He participated in the technical consultation and guidance of more than 30 key projects at home and abroad. He has won the second prize of China's National Science and Technology Progress Award, four provincial and ministerial first prizes, and more than 10 provincial and ministerial second and third prizes. He has published more than 100 papers, of which 28 are included in SCI and EI. His main works include: "Cold Mix and Cold Asphalt Mixture and Its Application in Heavy-Duty Longevity Pavement", "Asphalt Pavement Disease Prevention and Typical Case Studies", "Performance Evaluation, Application and Key Technologies of New Sulfur Modified Asphalt Mixture".

The Latest Technical Advances of the Polyether Polyurethane Concrete Pavement on Steel Bridge Decks

Steel bridges' deck pavement is the anti-sliding layer and protective layer of long-span steel girder bridge. Most of the pavement materials used are hot-mix asphalt concrete, which has high energy consumption and short life cycles and thereby need to be improved urgently. Based on this, Professor Xu's team independently developed Polyether Polyurethane Concrete (PPC) as the cold mix and cold pavement materials, which can be constructed using traditional asphalt mixture mixing, paving and rolling equipment and there is no need to develop a new supporting equipment. Studies have shown that the resistance of high temperature, low temperature and the durability of PPC are more than 3 times higher than that of asphalt-based materials, and PPC can be produced and constructed without heating, which can significantly extend the construction season and is expected to achieve energy saving, emission reduction and longer life cycle. At present, this technology has been successfully applied to the heavy-duty deck of Xinjie Bridge in Fangshan District, Beijing, and the pavement layer is in good condition after being opened to traffic.

LUO Sang

Professor, Southeast University, China

Professor LUO Sang's research area covers special paving technology and application of information and BIM (building information modeling) technology in transportation infrastructure. He presided over 12 national, provincial, and ministerial funded projects, edited two Industry Specifications of the Chinese Ministry of Transport. He has also participated in several major projects of steel bridge deck asphalt pavement engineering, such as Hangzhou Bay Cross-sea Bridge, Jiangyin Bridge, Nanjing Second Yangtze River Bridge, Taizhou Bridge. He was awarded one Second Award of National Science and Technology Progress and two First Award of China Highway and Transportation Society Science and Technology Progress. He has published more than 70 research papers in core journals at home and board, including 37 SCI and EI indexed research papers.

Key Issues and Technical Development of Steel Bridge Pavement

Insufficient durability of steel bridge deck pavement is one of the key factors restricting the large-scale application of steel bridges. Compared with developed countries in Europe and America, the distinct heavy-load traffic and the high axle load in China put forward higher requirements for bridge deck pavement performance. Therefore, foreign "original" pavement materials and technologies do not adapt well to steel bridges' traffic characteristics in China. Recently, the steel bridge deck pavement materials and structures in China have developed rapidly, forming multiple types of pavement materials such as epoxy asphalt mixture, guss asphalt mixture, UHPC, and polyurethane mixture, as well as different combinations of the above materials. This presentation will focus on the critical problems of steel bridge deck pavement and discuss the direction of pavement technology development based on the existing problems.

LI Linting

Deputy Chief Engineer, Coastal Branch,
China Construction Bridge Co., Ltd.

LI Linting is a senior engineer and graduated from Harbin Institute of Technology, China. He has been engaged in the construction and technical management of long-span bridges and super-long-span bridges for 15 years. He has obtained 10 patents, 7 original construction methods, 3 science and technology awards, 3 provincial and ministerial QC achievements, and won one First Prize of the National Engineering Construction Quality Management Award.

A Case Study of Bridges with Orthotropic Steel Decks

This presentation is based on the Project of Main Channel in Ningbo-Zhoushan Port, in which the traditional orthotropic steel deck with closed U-rib is applied for the Nantong-Hangkong Bridge, and the orthotropic steel deck with the hot-rolled longitudinal open rib is applied for the Changbai Interchange. According to the selection study on the structural details of longitudinal open rib, finite element analysis and fatigue testing results, the structural details about the orthotropic steel deck with longitudinal open rib is recommended for the Changbai Interchange. Finally, the automatic and smart welding devices and processes, which can systematically ensure the processing quality of the steel box girder, will be presented.

WANG Yuangen

Secretary of Party Committee and Executive Director of China Railway Jiujiang Bridge Engineering Co., Ltd.

WANG Yuangen is currently a professor-level senior engineer. He graduated from China's Southwest Jiaotong University with a major in Hoisting and Transportation Machinery. He has long been engaged in the technical research and development as well as the manufacture of steel bridge structure, bridge construction, and special equipment for bridge construction.

He edited the "Handbook of Highway Bridge Construction Series-Bridge Steel Structures", published 16 papers; won 17 science and technology awards, and obtained 30 patents. He was awarded the National Employee Innovation Expert in 2004; he won the Tien-yow Jeme Railway Science and Technology Youth awards in 2005; he was elected as the candidate of Jiangxi Province's million talents project in 2009; he was awarded the title of "China Railway Expert" in 2016 and enjoyed special government allowances from the State Council. The bridge projects participated by him won him 2 "George Richardson" awards, 16 China Construction Engineering Luban Prizes, 6 Tien-yow Jeme Civil Engineering Prizes and 9 national excellent welding engineering awards.

The Manufacturing, Erection Construction Equipment Technology of Steel Bridges

This presentation introduces the development of steel bridge construction technology in China in terms of steel bridge materials, steel bridge connection types, and steel bridge structure types. It explains the development of China's steel bridge manufacturing technology from the aspects of steel bridge manufacturing process and new technology of steel bridge manufacturing. It also elaborates on the development of China's steel bridge erection technologies from the cantilever erection method, scaffolding method, incremental launching method, erection by longitudinal method , surface tow method, swinging method, integral lifting method, cable-carrying crane method, cable crane method, steel-concrete composite beam integration method, gantry crane methods, tower with suspended cables method and overall construction scheme method, etc. Lastly, it briefs the development of China's steel bridge construction equipment including the walking beam-erecting crane, mast beam cranes, full-circle slewing beam crane, girder erection crane with climbing capability , cable-carrying crane, cable crane, wall crane, walking incremental launching device, tower with suspended cables, floating box, etc.

Ma Lifen

Secretary of the Party Committee and
Chief Engineer of Shanghai Zhenhua
Heavy Equipment Manufacturing of
Zhenhua Heavy Industries (Group) Co., Ltd.

MA Lifen is a senior engineer and a registered builder. Ms.Ma has been the chief engineer of many bridges and has nearly 30 years of bridge manufacturing and construction experience. At present, she is mainly engaged in the research and application of digital manufacturing technology, BIM manufacturing technology and intelligent manufacturing related technology of steel bridges.

The Research and Application on the Durability of Orthotropic Steel Bridge Decks

The fatigue damage of orthotropic steel deck has become the key factor affecting the service life of steel bridge. In view of the fatigue crack phenomenon of U-rib, scientific researches and development are carried out to optimize the welding process and improve the weld fatigue strength. Zhenhua Heavy Industries has improved the fatigue performance of steel bridge by studying the fatigue performance of U-rib weld and advanced welding technology. Through a large number of welding tests of different plans, the penetration depth of the U-rib single-side welding is increased from 80% to 100% of full penetration, and the internal weld of U-rib is well formed, which meets the requirements of the specification. At the same time, the fatigue loading tests of full-scale bridge deck model and U-rib small test pieces were carried out jointly with the CCCC Highway Bridges National Engineering Research Centre, Chongqing University, Shanghai Jiaotong University and other scientific research institutes to verify the improvement of fatigue performance of U-rib full penetration welding technology.

LI Zhongjie

Deputy Director of the Technical Center,
Chongqing Sanxia Paints Co., Ltd

LI Zhongjie graduated from Beijing Institute of Technology with a Bachelor's Degree of Engineering in 2007. He obtained his Master's Degree in Chemical Technology from China's Chongqing University in 2014. He's engaged in the research and development of coating products in Chongqing Sanxia paints Co., Ltd. since 2010. He served as the technical director of the company's automobile paint workshop and the deputy director of the technical center. He's dedicated to the research and development of heavy-duty anticorrosion coatings and coating applications. He has undertaken and completed the tasks such as Graphene Anticorrosive Coating and Waterborne Alkyd (industrial) Coating issued by Chongqing Municipal Economic and Information Commission.

The Application of New Generation of Anticorrosive Materials - Graphene Anticorrosive Coating on the Steel Structure Coating of Steel Bridge

The presentation will introduce the Graphene Anticorrosive Coating (GAC), as a revolutionary new material for steel structures. It will mainly cover the application of GAC on the heavy-duty anti-corrosion fields such as bridge steel structures, as well as its absolute advantages in properties of paint film and construction compared with traditional heavy-duty anti-corrosion coatings and related supporting coatings.

GAC can be applied not only on the substrates with low level of surface treatment but also on rusted substrates. It can achieve the similar anti-corrosion effect as that from the traditional heavy-duty anti-corrosion coating under relatively thin coating conditions. By replacing the traditional "three-layer coating film" with the "two-layer coating film", GAC can make the coated component more lightweight and reduce the coating cost and VOC emissions during painting. It has excellent performance in both the painting of new bridges and the renovation of old bridges.

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FUMIN BRIDGE

金汤桥：旧貌新颜
JINTANG BRIDGE

金阜桥：翠袖当空
JINFU BRIDGE

赤峰桥：因地制宜
CHIFENG BRIDGE

吉兆桥：创新引领
JIZHAO BRIDGE

直沽桥：花瓣盈枝
ZHIGU BRIDGE

IMPORTANT AWARDS

重 要 奖 项

詹天佑奖

国家优质工程银质奖

国家科技进步二等奖

国际尤金·菲戈奖

国家技术发明一等奖

中建桥梁有限公司

CHINA STATE CONSTRUCTION BRIDGE CORP.,LTD

China Construction Sixth Engineering Bureau Co., Ltd. is a specialized company under the joint-stock company, formerly known as Bridge Company of China Construction Sixth Engineering Bureau co., Ltd. in order to comply with the national investment orientation and respond to the call of "creating professional characteristics" of Chinese architecture, further promoting the transformation of industrial structure and integrating the advantageous resources of Sixth Engineering Bureau.

At present, China Bridge registered capital of 1 billion yuan. The company has 13 construction qualifications including municipal and highway general contracting level, mainly engaged in investment construction and operation and construction management of large infrastructure projects such as bridge, highway, municipal and housing construction. It has more than 3,200 employees, with an average age of 30, and 375 first-class registered builders.

China Bridge has six branches with an annual production capacity of more than 10 billion yuan. The company's business covers four types of modern Bridges, and its bridge projects cover the Yangtze River, The Yellow River, the Songhua River, The Haihe River, the Liaohe River and the Pearl River. It has created a number of world no.1 in the industry and in the system.

China construction bridge co., ltd. adheres to the development strategy of "going out", actively implements the "One Belt And One Road" initiative, takes "overseas business first-class" as its target, and extends its market reach to brunei, Israel, Mongolia and the Philippines. Company currently has in the project-host country set up the brand, the formation of stable output, and on the basis of brunei, the Philippines, Mongolia, Israel, continue to the depth development in the Middle East, north Asia, southeast Asia, the three core area and "neighbourhood" all the way along the key national market, strive for a bigger international market share and higher international brand image.

During the period of "much starker choices-and graver consequences-in", build a bridge co., LTD will follow along and coordinated development of the beijing-tianjin-hebei region, the Yangtze river economic belt along the national strategy, to seize the strategic opportunity, in order to build "Bridges, team leading, international first-class sincerity" of the Chinese construction professional company for the enterprise vision, thought creating customer value as the guidance, gradually formed the "build Bridges" world business card, build a bridge of high quality cast, creating more high-quality goods project, make contributions to national infrastructure construction.

中建桥梁有限公司

CHINA STATE CONSTRUCTION BRIDGE CORP.,LTD

Jialingjiang bridge in Hongyan village, Chongqing

Chongqing Jijiang Yangtze River Bridge

Shouguang Jinguang Street bridge across the Mihe River

DSSG02 bid section of Ningbo Zhoushan port main channel

Luzhou Shaxi River Crossing channel (Chengdong Yangtze River Second Bridge) and connecting line

Fujian Longyan Avenue viaduct

Chongqing Dingshan Yangtze River Bridge

Chongqing Jiangjin Baisha Yangtze River Bridge

中铁九桥工程有限公司
CHINA RAILWAY JIUJIANG BRIDGE ENGINEERING CO.,LTD.

BUILD BRIDGES
FOCUS ON ACTION
IINGENUITY IN CREATION

China Railway Jiujiang Bridge Engineering Co., Ltd (CRJB) , established in 1971, is an independent legal entity and a key subsidiary of China Railway Group Limited (CREC), a company being listed in Fortune Global Top 500 Corporations and in the World's 500 Most Influential Brands.

INDUSTRIAL STRUCTURE
CRJB is a high-tech enterprise and national technology center integrated with industries including development of bridge machinery.steel girder manufacturing,bridge construction,scientific inspection and large logistics.

COMPANY CERTIFICATION
CRJB has obtained a number of general contracting and professional contracting qualifications for municipal, highway, railway, steel structure, bridge, bridge deck pavement, hoisting equipment installation, etc., and has a number of product manufacturing licenses and installation qualifications.

PROJECT PERFORMANCE
CRJB has participated in the manufacturing , construction and erection of more than 1000 bridges at home and abroad, built the core competitiveness of the whole bridge construction integration, and formed a professional beam erection and bridge superstructure installation team. The bridge has 15 spans of the Yangtze River, 10 spans of the Yellow River, 9 spans of the Ganjiang River, 18 spans of the Pearl River Basin,and first to create ten bridge construction equipment.

AWARDS GAINED
CRJB has participated in construction of the most bridges in China among which some have been accredited as excellent works and received a lot of prizes including one item of FIDIC Award of Merit,one item of Excellent Structural Engineering Awards of the International Bridge Association, two items of International George S. Richardson, five items of National Quality Engineering Award, four items of First Prize of National Award for Science & Technology Progress, four items of Second Prize of National Award for Science & Technology Progress, one item of Fourth Prize of National Award for Science & Technology Progress, sixteen items of Luban Prize for China Construction Project, six items of Zhan Tianyou Civil Engineering Prize, nine items of First Prize of National Excellent Welding,two items of Gold Award of China building steel structure.

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全熔透焊接技术研究

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