



# CHINESE NATIONAL ENGINEERING RESEARCH CENTRE FOR STEEL CONSTRUCTION (HONG KONG BRANCH)

## INTRODUCTION

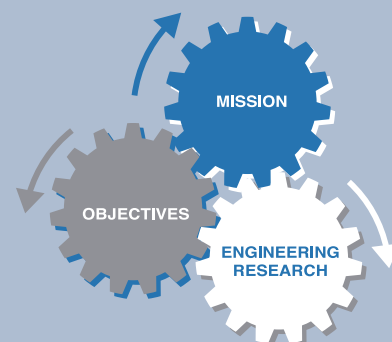
Establishment of the **Chinese National Engineering Research Centre for Steel Construction (Hong Kong Branch)** at the Hong Kong Polytechnic University (PolyU) was approved by the State Ministry of Science and Technology (MOST), People's Republic of China on 12th October 2015. Through applied engineering research on steel construction, the CNERC aims to capitalize huge potentials offered by construction professionals in Hong Kong to further enhance socio-economic development through technological advancement in sustainable infrastructure development. The CNERC receives strong support from the Development Bureau of the Government of Hong Kong SAR and also from the Construction Industry Council.



On 6th December 2015, Mr. Wan Gang, Head of Ministry of Science and Technology, the People's Republic of China presented the Official Plaque of the Chinese National Engineering Research Centre for Steel Construction (Hong Kong Branch) in the Hong Kong Science and Technology Parks, supported and congratulated by Mr. Nicholas Yang Wei-Hsiung, Secretary for Innovation and Technology Bureau, and Ms Annie Choi, Commissioner for Innovation and Technology of the Government of Hong Kong Special Administration Region.

## FUNDING SUPPORT

The CNERC is provided with an annual research funding of HK\$10 million for three years by the Innovation and Technology Commission of the Government of Hong Kong SAR as well as a matching fund from PolyU.



## Mission

To launch Hong Kong as the International Engineering Design Centre for Infrastructure to the world, and to promote export of professional services of the Hong Kong Construction Industry to overseas.

To launch China as the International Engineering Construction Centre for Infrastructure to the world, and to promote export of Chinese Steel Construction Industry, in particular, Chinese steel materials and structural steelwork.

## Objectives

To establish a high-level technological platform to enable effective design and construction of modern building and civil engineering structures to promote sustainable infrastructure development in Hong Kong.

To advance technological capabilities of the Hong Kong Construction Industry in design and construction of super high-rise buildings, long-span bridges and buildings of large enclosure using high-performance materials in Hong Kong and overseas.

The CNERC is dedicated to promote technological developments and internationalization of both the Hong Kong Construction Industry and the Chinese Steel Construction Industry. It is actively engaged with international as well as national exchanges in research and development of steel construction.

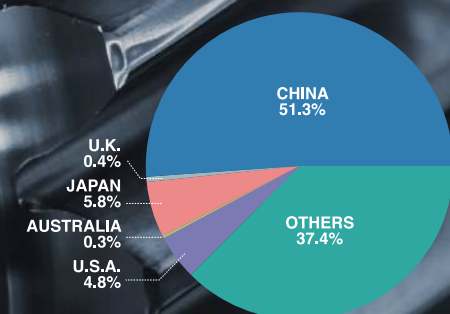
## Collaboration

The CNERC has been working closely with its local research teams and international collaborative partners. The local research teams compose of academics from the Hong Kong Polytechnic University, the University of Hong Kong, the Hong Kong University of Science and Technology and the City University of Hong Kong. Moreover, international collaborating partners include Imperial College London and the Steel Construction Institute of the United Kingdom, Tsinghua University, Tongji University, Beijing University of Science and Technology of the Mainland China, Central Research Institute of Building and Construction Co., Ltd., China Steel Construction Society, China Iron and Steel Association, and China Construction Metal Structure Association.

## CHALLENGES OF CHINESE STEEL CONSTRUCTION INDUSTRY

STEEL PRODUCTION (MILLION METRIC TONS)

YEAR	AUS	CHN	JPN	UK	USA	World Production
1980	7.6	37.1	111.4	11.3	101.5	568.5
1990	6.7	66.4	110.3	17.8	89.7	616.0
2000	7.1	128.5	106.4	15.2	101.8	848.9
2015	4.9	803.8	105.2	10.9	78.8	1620.9
2018	5.7	928.3	104.3	7.7	86.7	1808.6



STEEL PRODUCTION OF 5 COUNTRIES OF INTEREST IN 2018

## Steel Construction in Hong Kong

In Hong Kong, steel construction is often adopted in areas where foundation is weak, and thus use of steel construction can reduce self-weights of a building. While for high-rise buildings of more than 250 m high, steel-concrete composite structures are both structurally and economically beneficial. In general, self-weights of buildings and wind loads often control structural design of these buildings. As for seismic design, there is no mandatory requirement yet in Hong Kong.

The steel construction industry in Hong Kong was evolved from a booming shipbuilding industry in the 1950s. The shipbuilding industry created a lot of talents in fabrication and steel erection, and welding technology and testing. Their diligent and hard work has laid a solid foundation for development of modern steel structures in Hong Kong. In the 1970s and 1980s, the infrastructure of Hong Kong was developed rapidly, and a number of structural steel buildings were built on both sides of the Victoria Harbour, and they soon became landmarks of Hong Kong.

From the 1980s to the 1990s, most of the high-rise buildings in Hong Kong were designed by British engineers through support of Hong Kong engineers. Japanese steel contractors were able to provide equivalent design, and proposed use of steel materials manufactured in various countries which also met British steel material specifications and standards, i.e. design to equivalent steel materials specifications.

In the 2000s, many high-rise buildings were designed by both British and Hong Kong engineers while British steel materials were commonly specified to facilitate direct cost comparisons in construction projects. Chinese steel materials were used in Hong Kong, Macau and Singapore through established practice on design to equivalent steel materials specifications.

Nowadays, Hong Kong and Chinese contractors are able to use high quality Chinese steel materials in many construction projects in Hong Kong as well as neighbouring countries and areas because of their high competitiveness in quality, steady supply and costs.

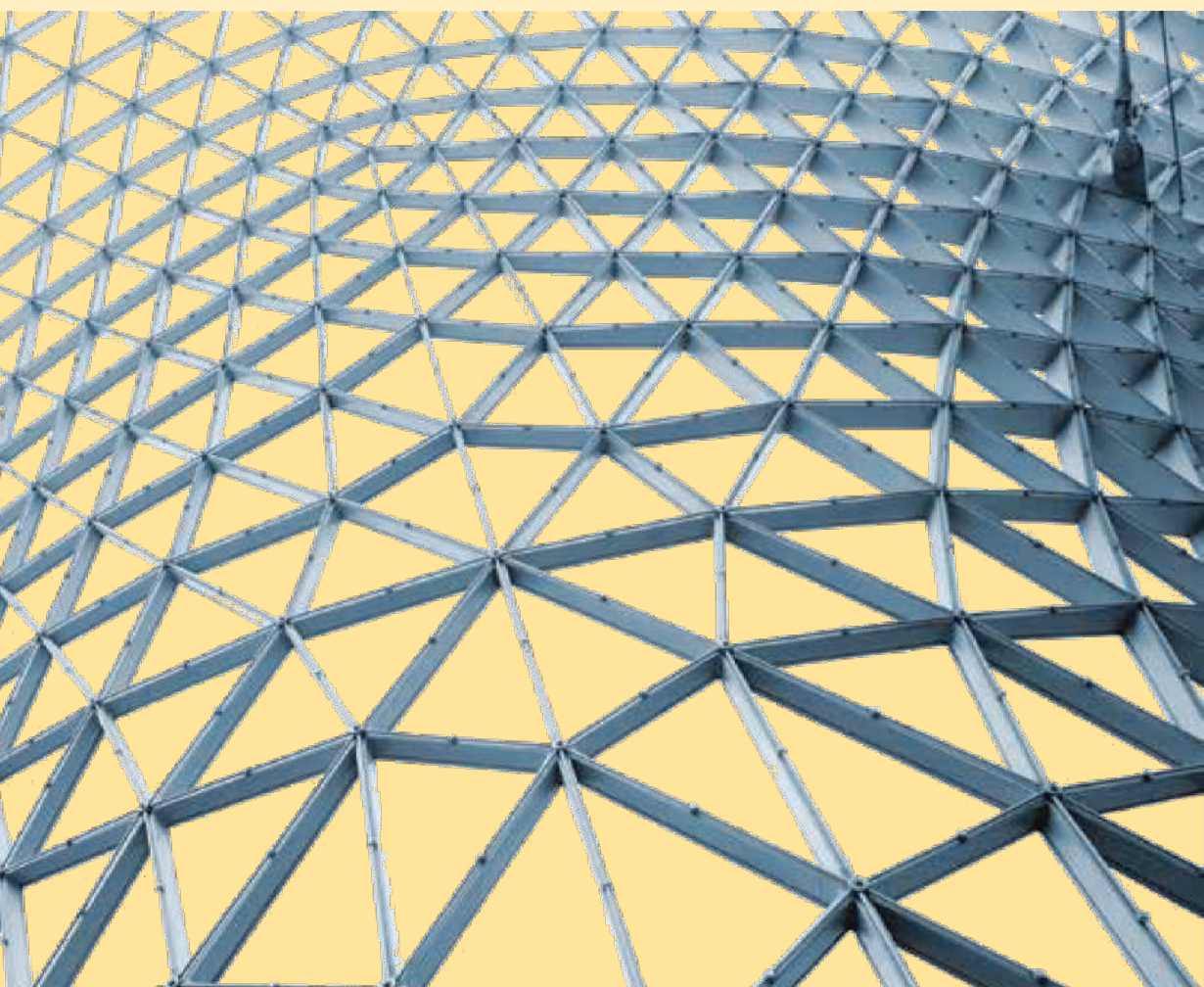




## Steel Construction and Fabrication Committee

Effective steel fabrication and construction is a crucial part of development for a steel construction industry in Hong Kong, and a successful implementation will lead to an overall savings in construction cost together with quality and sustainable end-products. After discussions with various stakeholders, it is considered important to set up an effective communication platform for industrial development and experience sharing amongst government departments, major utilities and developers, designers and contractors, steel building product suppliers and steelwork fabricators as well as welders and NDT personnel. Hence, to this end, the "Steel Construction and Fabrication Committee" is established in March 2017 with the following terms of reference:

1. To act as a platform to promote steel construction in Hong Kong.
2. To collate construction and fabrication experience, and channel it to the Development Bureau of the Government of Hong Kong SAR for positive input to current specifications in both public and private projects.
3. To explore innovative materials and construction technology of structural steel and coordinate pilot trials for implementation.
4. To draft a series of manuals incorporating construction practice of structural steel for use by engineers and supervisors as well as by quality assurance and testing personnel on site and in factory.
5. To promote deployment of qualified and highly skilled welders in both public and private projects through collaboration with prevailing vocational training institutes in the industry.



CNERC will conduct various research and development projects, and compile design recommendations for application of high strength steel materials. This will provide an important positioning of Hong Kong construction professionals in working with the Chinese Steel Construction Industry in exporting steel materials and structural steelwork to overseas construction projects.



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### General Enquiry

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## MAJOR WORK THEMES

### Work Theme A

#### Sustainable Infrastructure Development

To confront potential durability problems of the infrastructure in Hong Kong, CNERC will investigate and understand various controlling mechanisms in corrosion in both reinforced concrete structures and exposed structural steelwork. The following two research areas will be addressed:

- Atmospheric corrosivity of exposed structural steelwork under local environments in Hong Kong.
- Localized corrosion in galvanized steel reinforcements in reinforced concrete structures.

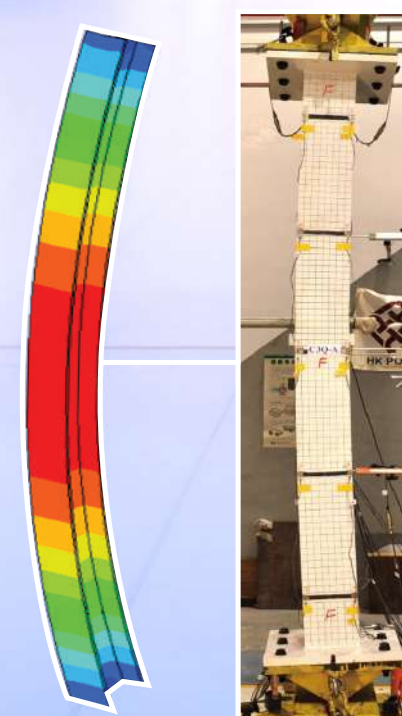
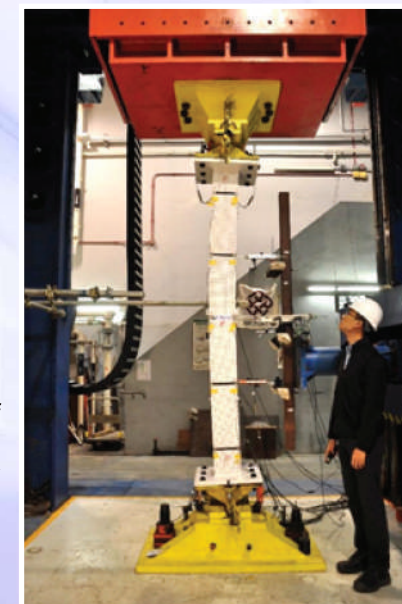
CNERC will conduct various projects, and develop design recommendations suitable for implementation in Hong Kong. These new recommendations will be of paramount importance for durability assessment on existing structures as well as durability design of new structures in Hong Kong and neighbouring cities in the Greater Bay Area.



A1 Atmospheric corrosivity of exposed structural steelwork



A2 Localized corrosion of galvanized rebar in concrete



## Work Theme B

### Structural Engineering on Modern Steel Construction

To promote modern steel construction technology in Hong Kong as well as in overseas, CNERC will formulate effective use of high performance constructional materials, in particular, of high strength steel materials produced in China. The following four research areas will be addressed:

- Effective use of high performance Q690 to Q960 steel materials
- Application of high performance Q690 to Q960 steel materials in building and civil engineering structures
- International practice on engineering design and management
- International visibility of Chinese Steel Construction Industry

#### Technology Development



B1 Effective use of high strength steel materials - Q690 to Q960



B2 Application of high performance steel materials Q690 to Q960 in super high-rise commercial buildings

#### International Practice and Visibility



B3 International practice on engineering design and management

B4 International visibility of Chinese Steel Construction

