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China Steel Construction Society – Scientific and Technological Achievement Evaluation Meeting on "Basic Theory, Key Technology and International Application of Chinese 690MPa High-strength Steel Structures"
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On 16 July 2022, the China Steel Construction Society (CSCS) organized a video conference on the evaluation of scientific and technological achievements on "Basic Theory, Key Technologies and International Application of Chinese 690MPa High-strength Steel Structures". The achievement was jointly completed by The Hong Kong Polytechnic University, Tsinghua University and other units. Prof. K. F. Chung, Director of CNERC, together with Dr. H. C. Ho and Dr. Y. F. Hu of CNERC, and Prof. Y. J. Shi and Special Researcher Dr. H. Y. Ban of Tsinghua University, and other key project participants attended the meeting.

The evaluation meeting was hosted by Y. Liu, Executive Vice President of CSCS, and the Expert Committee comprised of:

- Academician of the Chinese Academy of Engineering, Prof. X. H. Zhou of Chongqing University as the team leader;
- Prof. Y. Q. Yu, National Engineering Survey and Design Master, Deputy General Manager and Chief Engineer of China Building Standards Design and Research Institute;
- Prof. M. X. He, Senior Engineer, Chief Expert of China Baowu Iron and Steel Group Co., Ltd.;
- Prof. A. L. Zhang, Beijing University of Technology;
- Prof. L. J. Wang, Design Master of National Engineering Survey, Chief Expert / Chief Structural Engineer of Huacheng Boyuan Engineering Technology Group Co., Ltd.;
- Mr. Z. X, Hou, National Engineering Survey and Design Master, and Senior Engineer China Metallurgical Construction Research Institute (Shenzhen) Co., Ltd.

At the meeting, Prof. K. F. Chung of The Hong Kong Polytechnic University and Special Researcher Dr. H. Y. Ban of Tsinghua University represented the project team respectively and reported the project research background, key innovative technologies and application of results. The evaluation experts reviewed the technical data, and after inquiries and discussions, they believed that the project team had carried out systematic and in-depth research on basic theories and key technologies for the structural mechanical properties and engineering applications of Chinese 690MPa high-strength steel, and the main innovations achieved were results as follows:

1. The whole range constitutive model of Chinese 690MPa high-strength steel from elastic stage to fracture failure is proposed, and based on this, the performance requirements of Q690 structural steel in compliance with EU design standards are explained;
2. Developed the welding technology and mechanical properties evaluation method of domestic 690MPa high-strength steel, combined with the microscopic mechanism analysis, proposed the welding process for medium and thick plates below 70mm;
3. The 2D and 3D distribution model of residual stress of domestic 690MPa high-strength steel welded structure was established, the stress mechanism of components and connection nodes was revealed, and the design method was proposed;
4. The evaluation method of disaster resistance of domestic 690MPa high-strength steel structure under fire and earthquake is proposed, and the design method of high-strength steel composite beam and CFST column is developed.

The research results of this project have been applied in construction projects such as the main-span double-arch steel bridge of the Cross Bay Link Road in Tseung Kwan O, Hong Kong, the fourth Macao-Taipa sea-crossing bridge in Macau, and the Longxing Temple commercial Center in Pengzhou, realizing the Chinese Q690 high-strength steel meets the EU design standards. The international engineering application demonstration has fully verified the compatibility with EU technical standards, and has laid a foundation for promoting the "going out" strategy of domestic steel. The economic and social benefits and environmental benefits are significant, which promote the technological progress of the industry and has broad prospect in application. The research results have been incorporated into 7 technical standards including Hong Kong Steel Structure Design Standards, Hong Kong Steel Structure Guidelines, and

Mainland Industry Standards, and have obtained 7 nationally authorized invention patents, published 50 academic papers, and published 2 books.

The Expert Committee believes that the results have generally reached international advanced level, and the welding technology and performance evaluation methods of Chinese 690MPa high-strength steel structures, as well as the evaluation methods of disaster resistance under fire and earthquake, have reached the international leading level.