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Development of Composite New RCS System: An Academia-Industry Joint Venture

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The New RCS project, led by Prof. Yu-Chen Ou of National Taiwan University (NTU), has revolutionized the construction of high-rise buildings with its innovative Composite Moment Frame System (RCS). By merging reinforced concrete (RC) columns with steel (S) beams, the system offers a cost-effective and structurally sound alternative to conventional construction methods. The project was funded by the National Science and Technology Council (NSTC) of Taiwan and Ruentex Engineering & Construction Co., Ltd (Ruentex). Ruentex, a premier Taiwanese real estate developer, joined the project to contribute its extensive industrial expertise.

The New RCS project aimed to develop new RCS joints that could leverage high-strength concrete and reinforcement for improved structural efficiency. Additionally, the project focused on designing versatile beam-column joints capable of accommodating various configurations, including eccentric framing and different column cross-sections, making the beam-column joints more adaptable for real-world constructions. **Fig. 1** shows the details of the innovative joint developed as part of the project.

Through their collaboration, NTU and Ruentex ensured that the designs under development were not only structurally sound but also practical for precast construction, a faster and more highly controlled building method. The project researchers conducted large-scale testing at the National Centre for Research on Earthquake Engineering (NCREE) to simulate the behavior of the joints under earthquake loads (see **Fig. 2**). The experimental results provided valuable information for developing design guidelines. Prof. Ou's research team has published a comprehensive design manual for designing a wide variety of RCS joints, along with various journal articles in top-rated structural engineering journals. Following successful testing and design approval by the Taiwan National Land Management Agency, Ruentex constructed a 27-story office building in Taipei using the New RCS system (see **Fig. 3**). At present, this new technology is being utilized in the construction of five more high-rise buildings.

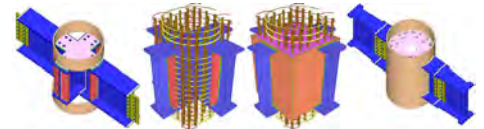


Fig. 1: Graphic representation of RCS joint details developed as a part of the project.



Fig. 2: Typical large-scale experimental setup for an interior joint.

The project's success has led to a second phase aimed at integrating eco-friendly "green concrete" and advanced modeling techniques. A venture between Taiwan and the Czech Republic (NSTC-TACR project) has paved the way for more efficient, sustainable, earthquake-resistant building designs for the near future. This innovative method will not only improve structural performance but also promote the development of sustainable infrastructure.



Fig. 3: A 27-story New RCS building in Nangang, Taipei, nearing completion.