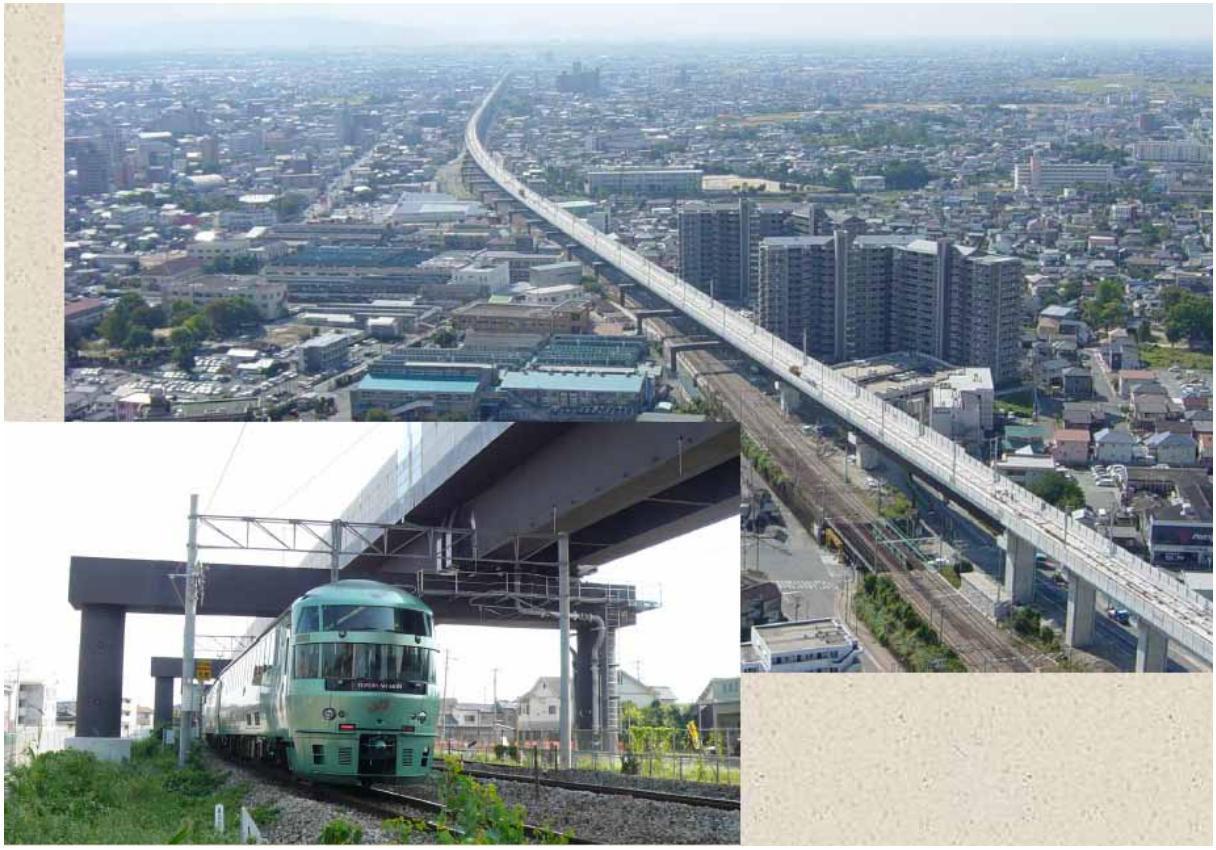
Kyushu Shinkansen

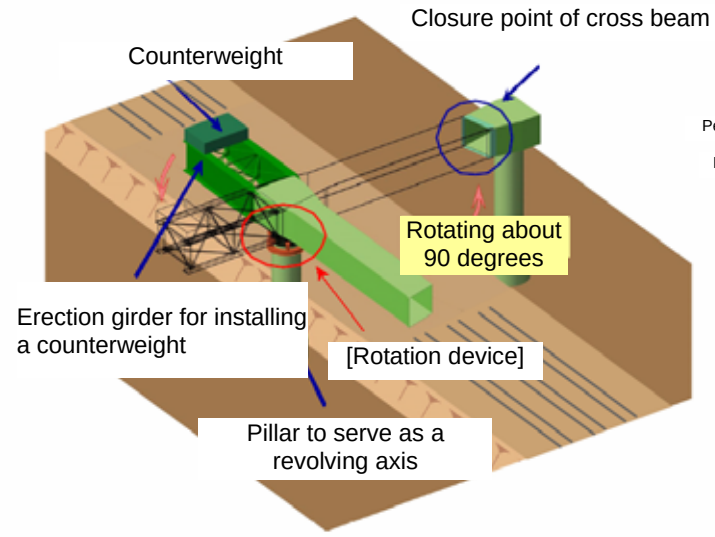
Matsubara Railway Bridge



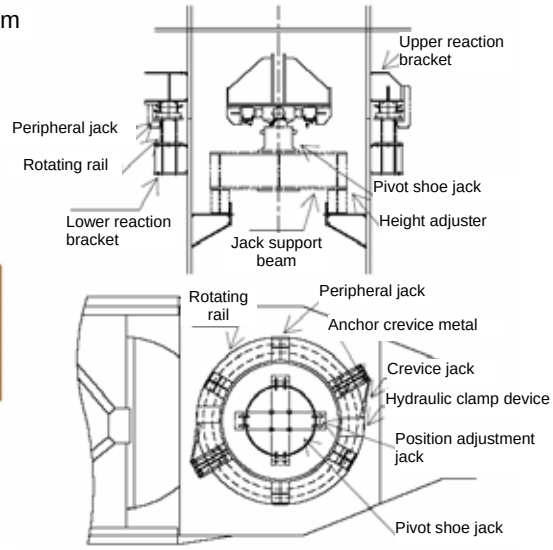
Owner:	Kyushu Shinkansen Construction Bureau of the Japan Railway Construction, Transport and Technology Agency Kyushu Railway Company
Designer:	Fukken Enginering Co., Ltd.
Constructors:	Kyutetsu and Yokogawa Construction Work JV Kyutetsu Corporation Sakurada and Hitachi Construction Work JV Sumitomo Heavy Industries and Matsuo Construction Work JV Miyaji and Komai Construction Work JV Yokogawa and Takada Construction Work JV Penta-Ocean Construction, Sato Benec, and Hirose Construction Work JV

Schematic drawing of the Bridge

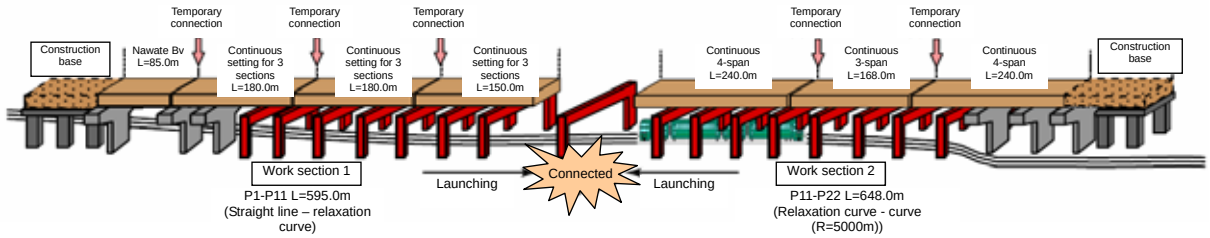
- Cross beam rotation method

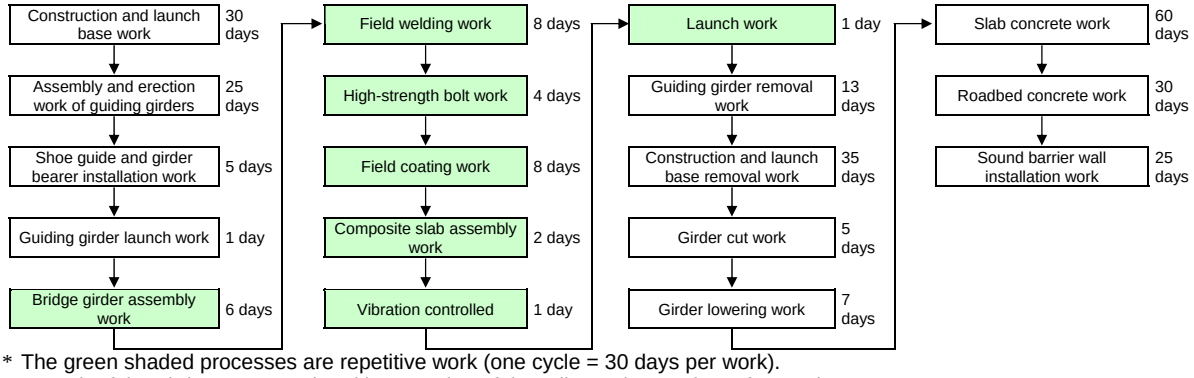


- Rotation devices in pillar



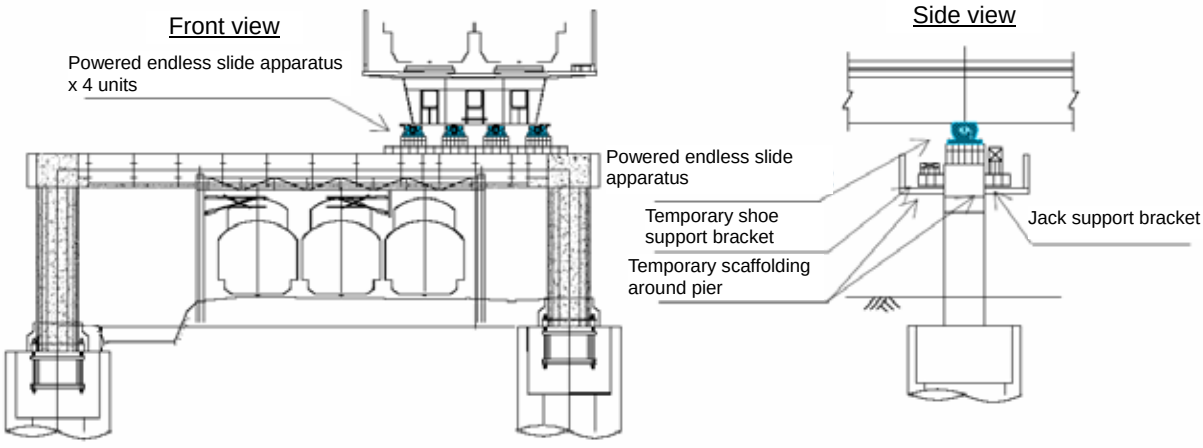
- Procedures for girder launch and erection work





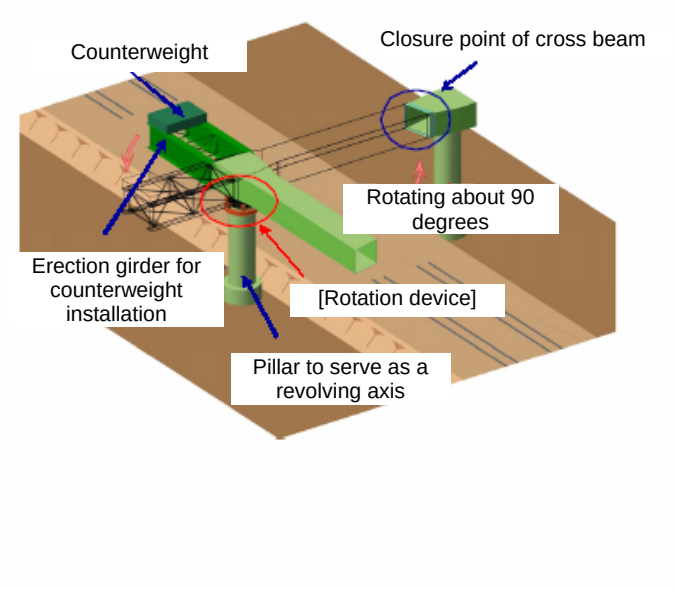
* The green shaded processes are repetitive work (one cycle = 30 days per work).
* Launch of the girder was completed in 120 min., of the railway closure time of 206 min.

- Layout drawing of endless slide device for girder launch and erection



Challenging new technology (patented)

Resolved various problems by applying the bridge erection rotation method (patented)



Overview of the bridge erection rotation method

Patent certificate

Rotation device on the top of the pillar

Verification testing under way

Concerning the installation method of steel gate bridge piers, the Japan Railway Construction, Transport and Technology Agency initiated the design development considering the rotating erection work method in June 2005 because only a few cases exist for the erection work method in difficult site conditions. In order to verify the safety of the construction work method and the movement of the bridge erection rotation device, since Japan Bridge Association and others have a supply of existing literature, the agency commissioned Yokogawa Bridge Corporation to conduct demonstration experiments for the rotation device. On July 13, 2006, a half-sized device model was used to reproduce a bridge erection girder in the Osaka plant before establishing the construction work method and a rotation device, which were then reflected in the design.

The agency and four other companies applied for a patent on the rotation device on December 16, 2005, which was granted on October 2, 2009. (Four other companies: Yokogawa Bridge Corporation, OXJACK Co., Ltd., Yokogawa Construction Co., Ltd., and Fukken Engineering Co., Ltd)

The steel cross beam rotation method is a system in which a cross beam is assembled on a bent installed in the local train direction and erected by rotating it around a pillar during an idle time after stopping the flow of electricity. Therefore, it excels in terms of safety and constructability as an erection method that can be used in limited work space where no large cranes or other equipment are available.

Characteristics of Matsubara Railway Bridge as a bridge

- The Bridge's construction type is characterized by:

(1) A longest railway bridge in Japan which was constructed safely in a short period above the railway track in continuing service.

(2) The development of a cross beam rotary erection work method to surmount the problems of a limited work space and short erection time.

(3) The longest launching system of box girders above an operating railway track.

(4) The adoption of a new foundation system in a limited installation space and construction environment close to a railway track in service.

The difficult constraints were resolved by applying various technologies including the above.

Challenging the effective use of limited urban space

- Spatial use above an existing railway in the area with clusters of factories, high-rise condominiums, and residential houses.

  - Ensuring a new railway space with connection to existing transportation station

Urban facilities in the vicinity of the Bridge

Railway for local trains on the ground and above it, for Shinkansens (Bullet train)

To secure safe and on-schedule service on a short headway railway section:

- Runs of 340 on-time train per full day was ensured (the work was completed without an accident or disaster).

- The safety of foot and bicycle traffics was ensured by consolidating work areas.

To reduce environmental loads during work:

- Achieved preserving the regional environment by decreasing on-site and at-night work hours.

  - Girders were assembled in daytime at locations away from the high-rise apartment and residential area (launch and erection of girder assembly in a single operation).

  - Power feed to the track was suspended and work was conducted during idle hours at night with a minimum frequency (once or twice per month) and in short times (30-120 min. per work).

Girder launch yard in the direction of Hakata (by a municipal road)

Condition prior to girder erection