

# “THiNK SMART,” Technical Solution Centre for Steel Construction Materials Newly Opened in the Keihin Area<sup>†</sup>

## 1. Introduction

In civil engineering and construction, steady progress is being achieved in both the properties and design methods of materials used in order to cope with environmental issues such as global warming, ensure safety in natural disasters, and cope with asset management in public works. Responding to these changing needs adequately and in a timely manner is an important role for the steel industry. Construction is a major market and accounts for a large percentage of steel consumption. The JFE Group has created numerous new products and new technologies which meet market needs in this field.

In particular, to meet the market needs for cost reduction, disaster prevention, and environmental responsiveness, JFE Steel, Steel Res. Lab., and JFE R&D jointly established a technical solution centre for steel construction materials called THiNK SMART (Steel Materials for Application Research and Technology) on Nov. 1, 2005. The centre is located mainly in Keihin District. As a result, we are confident that the JFE Group can provide solution technologies for steel construction materials, processing and execution techniques, and design, fabrication and maintenance control at unprecedentedly high levels.

## 2. Outline of THiNK SMART

THiNK SMART is a group of wide-area-type open laboratory facilities mainly composed of JFE Steel, Steel Res. Lab., Steel Materials & Fabrication Building, Steel Structure Building, and Corrosion Protection Building in Keihin District, and other steel structure testing facilities located in JFE Group's Keihin, Tsurumi, and Chiba Districts. Articles on display and testing facilities relating to the latest steel structure solution technologies owned by JFE Group companies, such as JFE Steel and JFE R&D, have been brought together and integrated in THiNK SMART. An outline of THiNK SMART is shown in

**Fig. 1.** THiNK SMART displays and introduces new products which customers can actually touch, as well as new solution technologies, and enables joint use of testing facilities with customers. Product and technology displays are constantly updated to give customers a timely understanding of the most advanced technologies.

### 2.1 Display and Presentation of New Products and Technologies

New products and technologies are introduced and displayed by dividing the field of steel structures into the following categories:

#### (1) Civil Engineering and Foundations

Main items include steel sheet piles with the world's largest width (900 mm), steel products with ribs for construction material with increased bonding strength with concrete and stiffness (wide flange beams with inner ribs, wide flange beams with outer ribs (Stripe H), and steel pipe with inner ribs for composite pile), a mechanical joint (KASHEEN) which realizes labor cost saving in pile joining and shortens construction time, a threaded joint (NEJEEL), and a non-footing column-to-pile joint (ICHI-ICHI KISO) which provides a foundation-pile integration construction method that reduces costs and shortens construction time.

#### (2) Building Construction

Steel plates for building columns using JFE Group's advanced high toughness technology (JFE-EWEL) for the heat-affected zone (HAZ) in large heat input welding, a model of a column-to-beam joint using a newly developed welding technology (J-STAR welding) which features small heat input, minimal spattering, and a narrow gap, a hysteretic response control damper which prevents damage to columns and beams in earthquakes, a seamless rectangular hollow section for building structures (JFE KAKU-HOT) with excellent design properties and seismic performance, and steel products for steel frame housing (JFE FRAME-KIT and STEEL-HOUSE).

#### (3) Bridge Construction

High strength steels with excellent weldability

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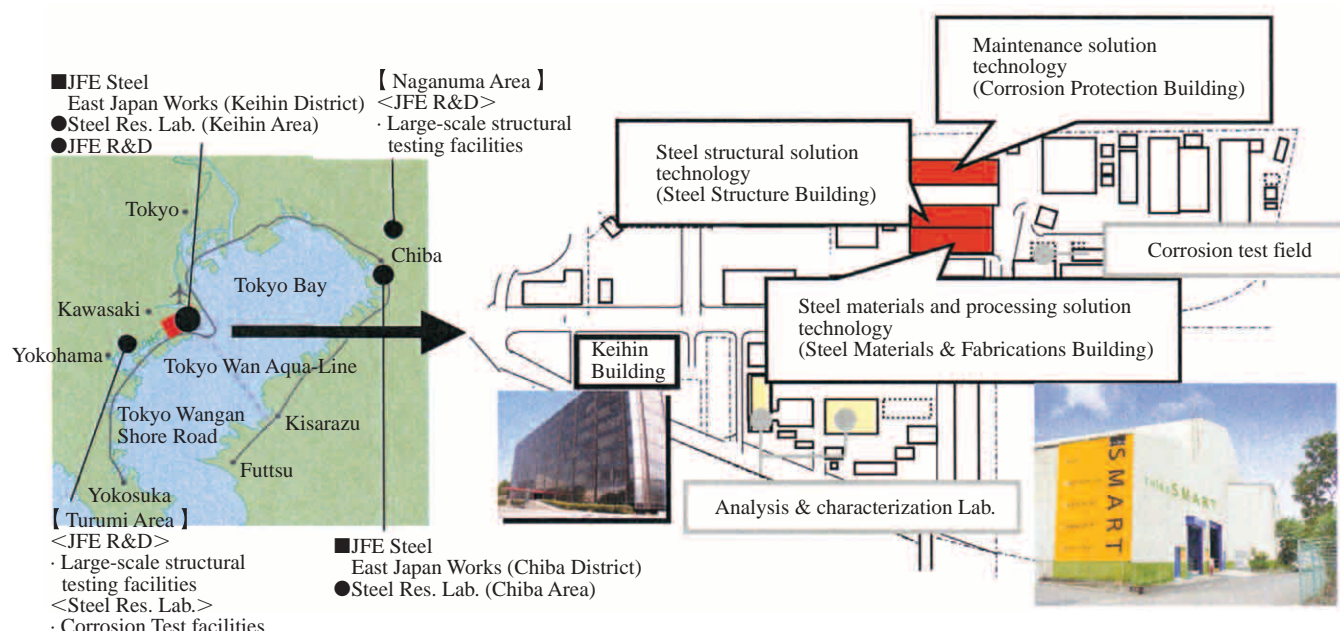


Fig. 1 Outline of THiNK SMART in Keihin area

(BHS) which permit next-generation rationalized design using advanced thermo-mechanical control process (TMCP) technology, weathering steels and a rust stabilizing treatment (CUPTEN COAT M) which reduce the life cycle cost (LCC) of steel bridges, and a corrosion prediction technology for predicting changes over time in the corrosion of weathering steels based on the air-borne salinity level, temperature, and wet time determined from information on the location and distance from the shoreline.

#### (4) Port, Harbor, and Offshore Structures

Heavy duty steels with organic or metallic coatings which provide high performance corrosion protection in marine environments and reduce the total life cycle cost (LCC) of steel structures, and a sheet pile for high performance cut-off walls (J-POCKET PILE).

#### (5) Other Field

THiNK SMART displays and introduces several products of JFE Steel's East Japan Works; corrosion protective steel pipes, such as a polyvinyl chloride-free plastic coated steel pipe (PLS-F) for penetrations through fire compartments of buildings, and a 3-layer polyethylene-coated steel pipe with fusion-bonded epoxy primer for high durability under cathodic protection.

### 2.2 Testing Facilities

Keihin District has the following equipment for the evaluation of steel structures and materials: (1) Testing facilities for steel materials and processing solutions, such as lab-scale welding facilities (GMAW, TIG, EGW, ESW, etc.), fatigue testing machines, and tensile testing machines, (2) facilities for seismic and wind-proof

design in evaluations of the structural performance of steel structures, such as 3 MN structural testing machines, steel and RC test-beds, 200 kN shaking tables, wind tunnels, and wave channels, (3) testing facilities for corrosion solutions, such as accelerated corrosion test machines for steel materials and organic coated steel materials and exposure corrosion test fields for underground and atmospheric environments, and (4) analytical facilities for surface characterization (ultra-low voltage scanning electron microscopy, auger electron spectroscopy (AES), X-ray photoelectron spectroscopy (XPS), secondary ion mass spectrometer (SIMS)), analytical facilities for micro structural characterization (field emission transmission electron microscopy (FE-TEM)), focused ion beam (FIB) system), chemical analyzers, and analytical facilities for the structural characterization of organic materials.

Tsurumi and Chiba Districts have testing facilities with servo-actuator systems for high speed loading, 10 MN structural testing facilities, fatigue testing machines for large scale steel structure.

### 3. Advantages of THiNK SMART

In connection with the opening of this group of laboratory facilities, JFE Steel, Steel Res. Lab., and JFE R&D established a system which enables joint experiments and joint research in collaboration with customers. As advantages of this new system, (1) JFE Group is able to discuss the problems which customers confront and propose solutions based on the customer's direct experience of advanced structural material products, processing and construction technologies, and

testing apparatus at THiNK SMART, and (2) technical exchanges with customers on these recent products and technologies help JFE anticipate latent customer needs and accelerate development of new steel structure products, processing technologies, and solution technologies which better satisfy market needs.

#### **4. Conclusion**

JFE Steel, JFE R&D, and related JFE Group companies intend to carry out research activities at THiNK

SMART as a key research centre in Japan in the field of steel structures so that solving problems which customers confront can contribute to progress in steel structural materials, design and construction technologies, and maintenance control technologies.

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