

November 25, 2009
Nippon Steel Corporation

The World' Longest 38m-Straight-web-type Sheet Piles
Adopted for A Large-Scale Infrastructure Project Overseas
--- The Incheon Bridge of the Republic of Korea ---

The world's longest, 38m "straight web-type sheet pile" developed by Nippon Steel Corporation (president: Shoji Muneoka) has been adopted, in massive quantities, for the bridge protection facilities from vessel collision of the "Second Connecting Bridge of the Incheon International Airport (Inchon Bridge)" (execution: JV of the construction department of Samsung C & T Corporation, Korea). This is the first project to use 38m-long straight-web-type sheet pile.

(Outline of the project)

This large-scale project was for construction of the second connecting bridge between the Incheon International Airport (Yeongjongdo) and the Songdo special free economic zone (Inchon Metropolitan City). Extending 21.38km in total length (the longest in Korea and the seventh in the world), including the access road, this bridge is 12.34km long in its sea-crossing section alone and, four years and four months after the start of construction in June 2005, was put into service on Monday, 19th of last month.

(Outline of the structures adopted)

Our sheet piles are used for the collision-protection structures for the foundations of the piers around this Bridge's navigation-channel section (center span: 800m), for protection against ship impact. For this cellular type structure, a number of straight web-type sheet piles are interlocked together to form a giant circular cell and then driven into required depths of the seabed, followed by the filling of the inside with sand and gravels so that the sheet piles and the fill form an enormous monolith to resist external forces. Of a total of 40 structures requiring about 18,000 tons of steels, we received orders for about 16,000 tons, which were manufactured at the rail & shape mill of Yawata Works (Kitakyushu City, Fukuoka Prefecture) not far from Korea, and made deliveries over a period of one and a half years from October 2007 to March 2009.

(Features of the straight web-type sheet pile)

Our straight web-type sheet pile (standards: YSP-FXL, YSP-FL) possess the following outstanding features:

- ① Sheet-pile length of 38m (the world's longest, our previous longest size available: 25m).
 - Permits single-pile use, eliminating intermediate welding joint to satisfy

the required sheet pile length in projects involving great depths, either offshore or overland.

- Greatly enhances the quality and reliability of the cellular structure and the ease of its execution because of eliminated welded zones.
- ② Maximum interlock strength of 5,880kN/m (the world's greatest)
- The interlock (clutch) sections' great tensile strengths secure high structural reliability of the cell.
 - The use of this sheet pile makes possible the increased diameters of the cell, thus permitting the shortened depth of embedment into the seabed and reduced weight of steels used.
- ③ Wide size variations available
- At present, pile thickness (web thickness) is available in two types: 9.5mm (FL) and 12.7mm (FXL), and the manufacture of intermediate sizes, from 11.0mm to 12.7mm, is now being planned.
 - By making a broader range of sizes available in future, we shall continue efforts to realize economic designs most suited to various construction sites and steel weight reduction (clients' prior consultation with us requested).

(Solutions proposed, including methods of construction)

From the early design stages of the Incheon Bridge project, we proposed various solutions for steel products and steel structures so that the characteristic features of the straight web-type sheet piles could be combined to the best advantage, with better results in steel procurement and construction methods as well as shorter terms of construction. By finding solutions to various problems arising at the site, we provided indirect support.

On this project, in a place at some distance reasonably protected from sea waves, using this "Prefabricated Sheet Pile Cell Method," sheet piles were joined preliminarily to form a cellular structure, which was then transported to the site, for on-site placement. In this way, it is possible to substantially shorten the term of construction and the period disrupting sea traffic.

Nippon Steel, based on a wealth of engineering expertise related to this Method and its delivery records in Japan, is now aggressively carrying out steel-solutions activities by integrating R&D, manufacture, quality, technical service, and sales. In future, in overseas construction markets where major-scale infrastructure-improvement projects are expected to be undertaken, mainly in newly industrializing countries and resources-producing countries, we intend to contribute to their social infrastructure improvement as we continue efforts to further expand the sale of our straight web-type sheet pile.

**For further information, please contact:
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Collision protection structures

**Fig. 1: Artist's sketch of the collision protection structures in service
(Courtesy: Construction department of Samsung C & T Corp.)**

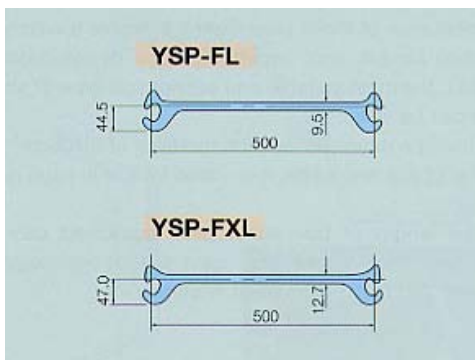


Fig. 2: Straight web-type sheet piles used for the shell of the cellular structure

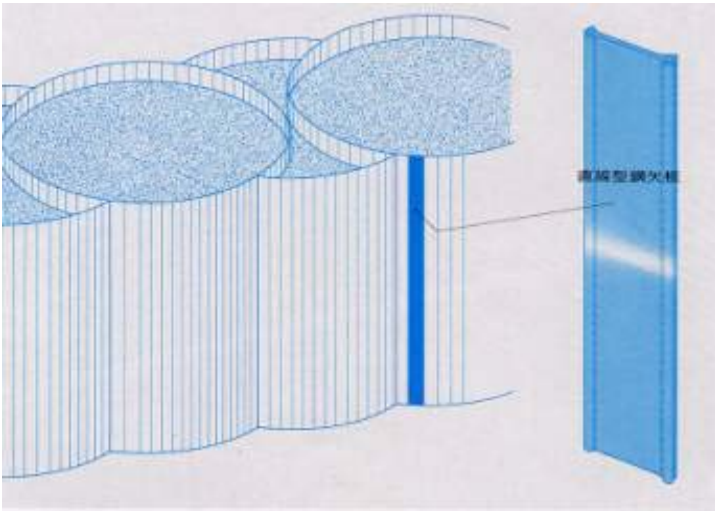


Fig. 3: Schematic diagram showing the construction of the cell



**Fig. 4: Photo showing the cell under construction
(Photographed by Nippon Steel)**