NRS

Bridge Construction Equipment

Bridging the world…

Message from
CEO / CHAIRMAN

NRS first established itself as a pioneer in bridge construction equipment in Norway in 1983. However, our company's history of supplying such equipment dates back to 1970, when we started providing our form-traveller, the reputable Bridgebuilder. Since then, we have sold several hundreds of this system to more than 30 countries.

Today, NRS has rapidly progressed to become the only company that provides the complete range of bridge construction equipment, which includes the movable scaffolding system, launching gantries and much more. We are proud to say that NRS is positioned among the top suppliers of bridge construction equipment in the world. Our range of systems has been used to build world-renowned bridges across the entire globe, from Europe to Africa and from China to Australia.

NRS has also established offices in five countries to better serve the needs of our clients. Apart from our own organisations, we operate closely with representative offices and agents in 26 other countries.

The mark of a reputable company lies in its track record and excellence in delivery. We strongly believe our reference list is the best document that proves our equipment's superior performance. And we can guarantee that our systems, technology and services will always be first class and unrivaled as we realise our vision of "Bridging the World".

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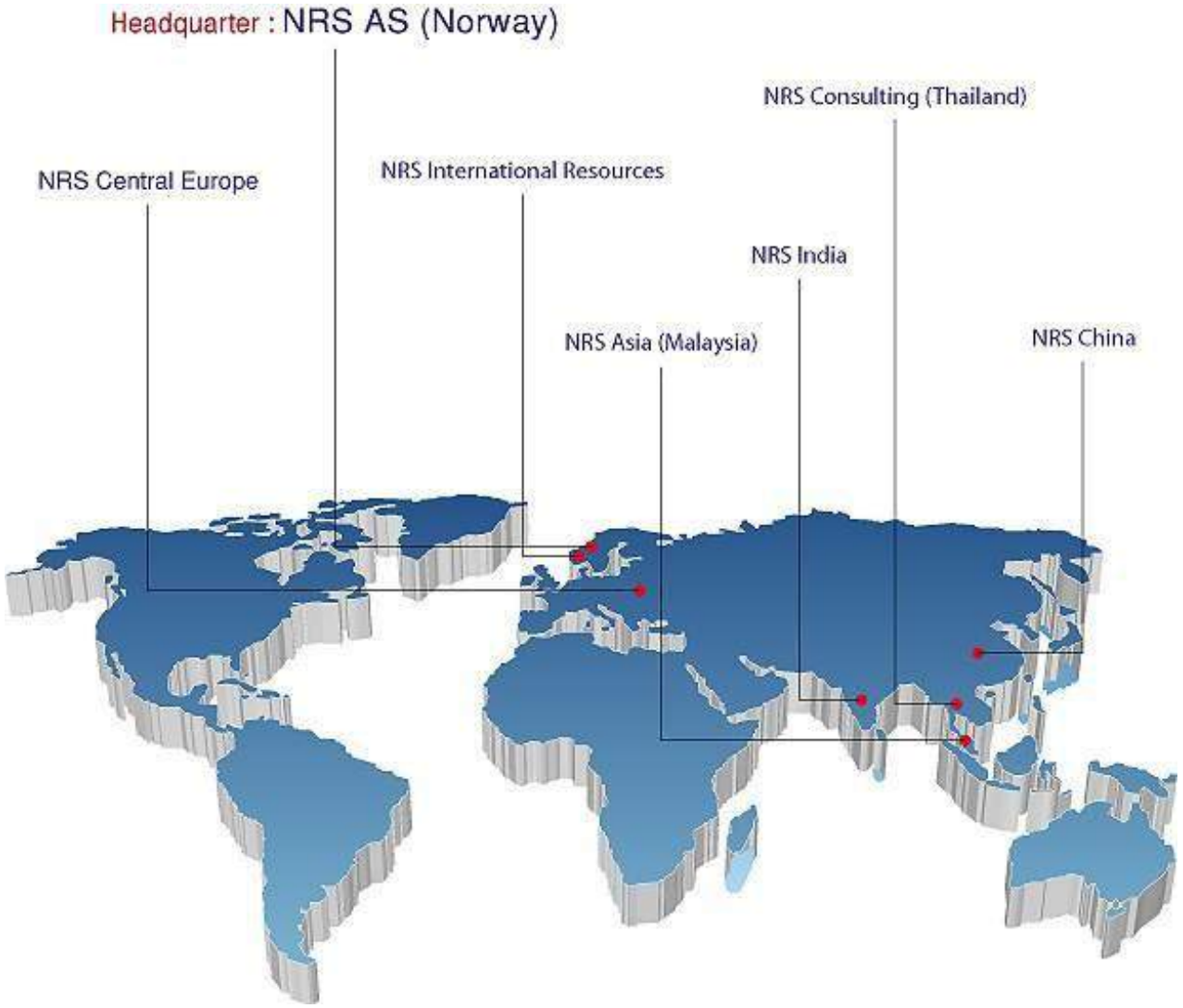
Chart Of NRS Offices Worldwide



- Dedicated to delivering first class technology
- Committed to creating innovative designs
- Ensuring efficiency and ease of use of products
- Proven in providing cost competitiveness
- Guaranteed excellence and reliability through extensive references

About NRS

NRS is a world leader in state-of-the-art construction equipment for concrete bridge super-structures. Its sophisticated systems have been used to build more than 500 bridges worldwide.

NRS headquaters is in Norway, where the company was first established in 1983. It began as a railway and bridge business called the Norwegian Rail System, which was what NRS used to be known as. From 1998, the company focused solely on the bridge construction industry.

Even though NRS's history began in the early 80s, its expertise in the Bridgebuilder form-traveller actually goes back to 1970. That was the year another Norwegian company, Høsveis AS, from which some of NRS's current business partners originated from, started supplying this form-traveller technology.

Through the years, NRS has continued to improve the Bridgebuilder system in collaboration with major contractors, resulting in the most efficient and proven form-traveller in the world today. Eight of the world's longest balanced cantilever spans have been built with NRS travellers, including the world record span of 301m in Norway. This is a marked recognition of a system comparable to none in the industry.

In addition to the Bridgebuilder, the company's stable of equipment includes the MSS, the most widely used movable scaffolding system in the world. For an outstanding innovation design the company won the Stubeco Implementation Prize 2002 for its Overhead Double Span MSS in the Utrechtboog Project in Amsterdam, The Netherlands.

Through NRS's continuous advancement of the MSS system, the company also developed its latest selflaunching MSS (or the "SL" series) in 2004. Since then, this equipment has been successfully utilised in several outstanding projects.

NRS is also world-renowned as one of the major suppliers of launching gantries for building pre-cast segmental bridges. Its launching gantries are the most extensively used in the world for building light rail transit system viaducts. Overall, the company has completed tens of kilometers of such viaducts in Malaysia, Singapore and China. NRS also designed and supplied the largest launching gantry in the world for the construction of the Paksey Bridge in Bangladesh in 2001.

Another product that supports NRS's position as a leading supplier is the bridge construction equipment designed for the full span method (FSM) of construction. For FSM projects, NRS supplies launching gantries, tyre trolleys and straddle carriers and its contract with Samsung, Korea on the prestigious 2nd Incheon Bridge Project is a confirmation of NRS's expertise in this field.

Safety and cost-effectiveness are the company's top priorities when providing its equipment systems, which are optimal solutions developed in close co-operation with some of the world's most experienced bridge contractors through the years.

The company's solid reputation in bridge building equipment and technology is further backed by its extensive reference list. To date, NRS has supplied a variety of bridge equipment to projects in over 30 countries spanning five continents.

Expanding its Expertise

Since its inception in Norway, NRS has established several offices across the globe to provide efficient and prompt services to clients worldwide, utilizing the competitive resources in the respective regions:

1. NRS Asia, based in Kuala Lumpur, was set up in 1997 to act as a regional hub. Malaysia was chosen as the location because of its excellent infrastructure, multilingual population and the use of English as the business language. With clients from both within and outside Asia, NRS Asia handles administration, design and technical support, procurement, project management, factory and site supervision, and marketing aspects.

2. With the establishment of NRS China in 1998, NRS became the first foreign company to start steel fabrication processes in China. From day one, fabrication quality has been the key focus, and the company's selected fabrication partners are continually monitored with stringent, in-house quality control. The high-tech factories, together with NRS`s dedicated team of fabrication supervisors, continually ensure that fabrication standards satisfy internationally-accepted levels. Today, most of NRS's equipment is fabricated within these factories.

   The introduction of NRS`s well-proven and technically advanced construction equipment has been highly successful, lending the company the title of market leader in China today. With offices in Beijing and Wuhan, NRS China is responsible for sales, marketing and after-sales service in the entire Chinese market.

3. In 2004, NRS Consulting (NRSC) was set up in Thailand with a team of more than 20 staff. It was established to provide expertise in design work, 3D modelling, product development of NRS's own bridge construction equipment and several other services:

    • Construction engineering and general consultancy relating to bridge building.

    • Drafting services
      - All types of structural drawings

    • 3D Modelling and animation of engineering projects

3. In 2006, NRS Eastern Europe was established as a branch office responsible for marketing, supervision and after-sales service in the eastern and central parts of Europe. This move was part of natural expansion plans as NRS has been active in these markets for more than 20 years.

4. NRS India, set up in 2006, is strategically located in New Delhi to serve the entire Indian market. NRS first entered this booming economy back in 1982 when it was involved in the Brahmaputra River Bridge project. Overall, NRS India aims to improve the company's competitiveness and services in this fast developing country.

5. Subsidiary NRS International Resources was established in 2006 to provide consultancy and quality control services related to procurement and fabrication of steel structures and other materials, especially from China. The company's proven methods of fabrication and quality control techniques in China since 1998 further strengthen its competitive edge in these areas. NRS International Resources undertakes the responsibility of fabricating steel structures for many international companies, including clients from Japan and Norway.

   The company's years of working experience in China has also resulted in the development of a strong network and know-how of doing business in the country. In addition, NRS's worldwide offices and staff readily provide relevant global resources. As a result, NRS International Resources is well positioned as a vital link between international business organisations interested in networking and other ventures.

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In total, NRS employs over 50 engineers and designers from eight countries who possess a wealth of experience among them. The multilingual team of engineers has been involved in the design and construction of some of the world's most impressive bridges.

Over the years, the company has secured a solid network of contacts through smart partnerships with reliable organisations and agents in 26 countries:

Company Milestones

1979 First project in the United States – Columbia River Bridge; Form-traveller.

1981 Construction of world's longest free cantilever bridge span - Gateway Bridge, Australia; Form-traveller.

1981 Erection of world's longest cable-stayed span - Barrios de'Luna Bridge, Spain; Form-traveller.

1982 First supplied Form-traveller to India – Brahmaputra River Bridge.

1983 First established NRS AS – based in Norway and serves as the company's headquarters.

1993 First provided MSS to Portugal – A9 C.R.E.L. Project.

1994 Introduction of MSS in Taiwan.

1994 First to supply "hinged" underlane Launching Gantry for erection of pre-cast segments - Putra LRT-2 System Project, Kuala Lumpur.

1997 Established NRS Asia – regional hub based in KualaLumpur.

1998 Established NRS China – the first foreign company to start steel fabrication processes in China, with factories and offices in Beijing and Wuhan.

1998 Construction of the world's longest free cantilever span (301m) – Stolmasundet Bridge, Norway; Form-traveller.

1999 First project in China – 2nd Nanjing Crossing Project; MSS.

2001 Won the Stubeco Implementation Prize 2002 for highly advanced development of shuttering system - Utrechtboog Project, Amsterdam, The Netherlands; Overhead Double Span MSS.

2001 Erection of longest balanced cantilever pre-cast segmental bridge span (109.5m) with NRS Launching Gantry – Paksey Bridge Project, Bangladesh.

2002 First project in Japan – Rittoh Bridge Project; Form-traveller.

2003 Introduction of MSS in Vietnam – Red River Bridge Project with Obayashi-Sumitomo JV.

2004 Established NRS Consulting – an office based in Bangkok that provides expertise in design work, 3D modelling and product development.

2004 Successful use of new Self-Launching MSS (SL-MSS) - Sutong Bridge Project, China.

2005 Construction of Colorado River Arch Bridge, US; underlane Form-traveller.

2006 Supplied Pre-cast Full Span Launching Gantry and Tyre Trolley for 2nd Incheon Bridge, Korea – world's heaviest span (1,500t) for this type of erection system.

2006 Supplied 4x20 axle (320-wheeled) 1,500t capacity Tyre Trolley - 2nd Incheon Bridge, Korea.

2006 Established NRS Eastern Europe - a branch office which handles eastern and central Europe markets.
Established NRS International Resources – a subsidiary that provides consultancy and quality control services related to procurement and fabrication of steel structures and other materials.

2006 Established NRS India – a branch office based in New Delhi set up to enhance NRS's competitiveness and services in the fast developing country.

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product

Portfolio

- Bridgebuilder Form – Traveller
- Movable Scaffolding System (MSS)
- Launching Gantries
- Pre-cast Full Span Equipment
- Beam Launcher and Other Related Equipment
- Straddle Carriers and Tyre Trolleys
- Construction Engineering and Other Services

Bridgebuilder Form-traveller

NRS's *Bridgebuilder* is the most extensively used form-traveller system in the market. The company remains the world's top supplier of form-travellers today. To date, NRS has provided more than 300 *Bridgebuilder*s, both underlane and overlane types, to projects worldwide.

The *Bridgebuilder* form-traveller system is used for free cantilever construction of post-tensioned box girder and cable-stayed concrete bridges.

NRS's standard *Bridgebuilder* designs include:

- Underlane and overlane *Bridgebuilder*s for cantilever bridges
- Underlane and overlane *Bridgebuilder*s for cable-stayed bridges
- Underlane and overlane *Bridgebuilder*s for the construction of arch bridges

The *Bridgebuilder*'s distinctive features are:

- **Light weight** – The optimised design of the main structural components and the use of recoverable high strength bars in all stays and hangers } reduce the total steel weight to a minimum.

- **Flexibility** – The system may be adapted to almost any cross-section and is easily adjusted during operation to variations in segment length, box height, web thickness, deck width and road alignment (gradient, curvature, superelevations).

- **Small deflection** – Vertical deflection at the front of the *Bridgebuilder* is less than 25mm at maximum load. Formwork beams are designed for a maximum deflection of 1/400 of their length.

- **Ease of assembly and operation** – It takes as fast as 2 weeks to assemble one *Bridgebuilder*. During its operation, the system rolls forward on rails, making the reset time short

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Bridgebuilder Form-traveller

Rittoh Bridge, Japan

Seo Hae Bridge, South Korea

Votonossi Bridge, Greece

Lawrence Hargrave Drive
(The Gateway Bridge-Brisbane, Australia)

Bridge over Jalan Kuching, Malaysia

Colorado River BridgSe, USA
(Being constructed)

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%ULGJHEXLOGHU Form-

How The System Works

1. The *Bridgebuilder* (except the internal formwork) is launched on rails into position to a new segment.
2. The external formwork is levelled, aligned and fixed into place.
3. Bottom slab and web walls are strengthened with reinforcement steel.
4. The internal formwork is then pulled forward.
5. Concreting of bottom slab and webs takes place. After a short interval, the top slab may be cast to allow the setting of concrete in the webs. It may also be cast the next day.
6. After sufficient concrete curing, post-tensioning begins.
7. The formwork is loosened and the *Bridgebuilder* is launched forward to the next segment. Most of the time, one cycle is carried out in one week but 4-5 day cycles are also possible.

Categories:

• Standard convertible *Bridgebuilder*

The standard convertible *Bridgebuilder* is designed for a maximum segment length of 5m and load capacities (concrete and formwork) of 100t to 500t.

The steel weight depends on the cross-section of a particular bridge but normally varies from 25t to 95t per *Bridgebuilder*.

The standard *Bridgebuilder* can be adapted to suit almost any cross-section and is easily adjusted during operation to variations in segment length (up to 5m), section height, web thickness and deck width.

Traveller Backlaunching

Podkova-Makaza Bridge, Bulgaria

Typical Closure Pour

Oum Er Rbia, Morocco

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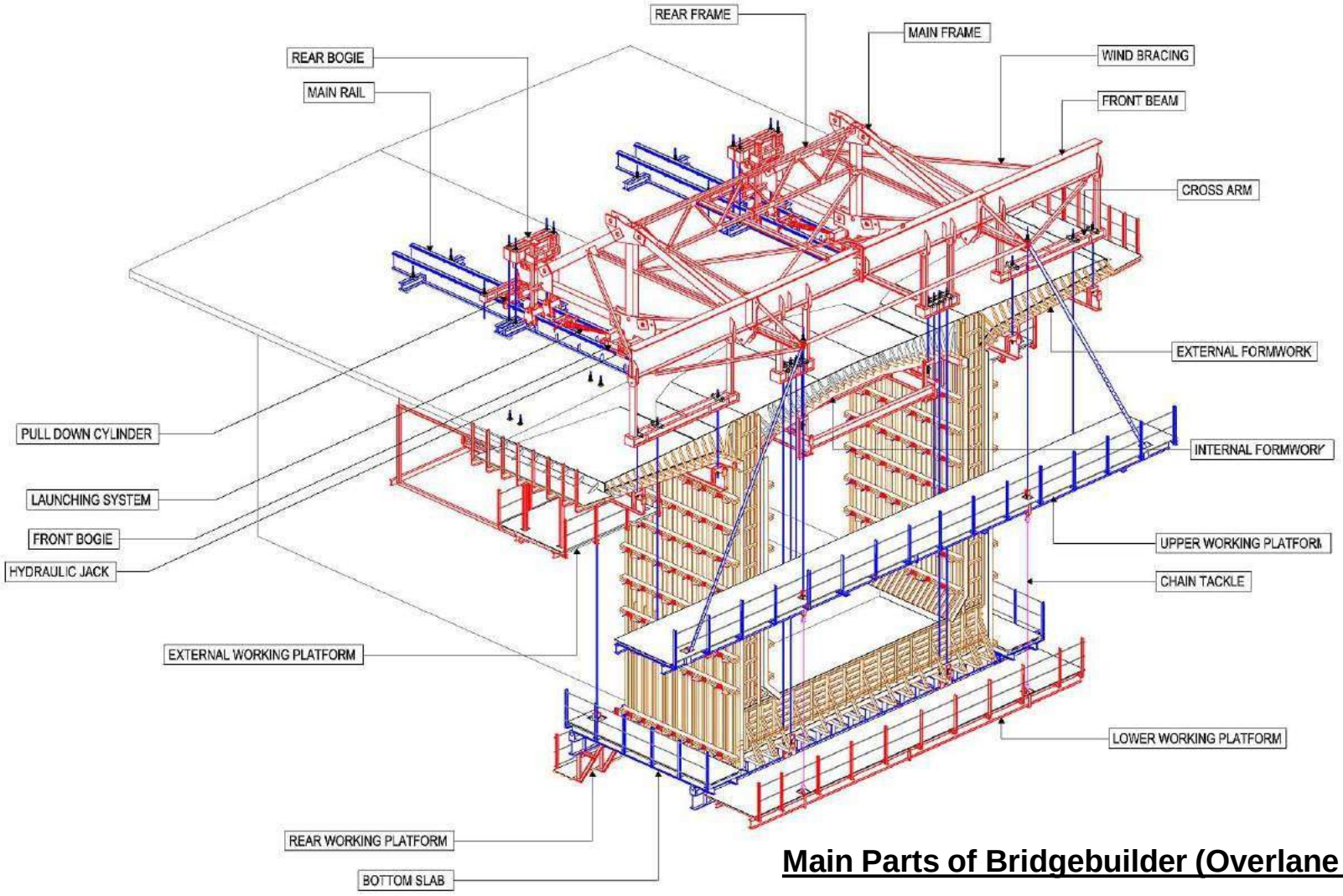
Bridgebuilder Form-traveller



Main Parts of Bridgebuilder (Overlane Type)

Bridgebuilder Form-traveller

• Tailored *Bridgebuilder*

The *Bridgebuilder* may be customised both for segment lengths beyond 5m and in other extreme conditions.

It may also be designed for maximum segment lengths of less than 5m and when there is a requirement to reduce the weight of the *Bridgebuilder* for a specific application.

Trial Assembly in factory Form-traveller for Colorado River Bridge, USA

• **Pre-cast segmental Bridgebuilder**

This type of *Bridgebuilder* is suitable for a maximum pre-cast segment length of approximately 3m to 5m and load capacities of 100t to 300t.

It is equipped with two hoists for lifting the pre-cast segments and for adjusting the cross-fall.

A manipulator allows adjustment of the longitudinal fall while hydraulic cylinders launch the device forward.

The pre-cast segmental *Bridgebuilder* can be modified to suit almost all new cross-sections for future projects.

Varodd Bridge, Norway

Key Projects

Some of the world's longest free cantilever concrete bridge spans have been built with the NRS *Bridgebuilder*:

1. The Stolmasundet Bro, Norway (main span 301m) - 1998
2. The Raftsundet, Lofoten, Norway (main span 298m) - 1998
3. The Gateway Bridge, Brisbane, Australia (main span 260m) – 1981
4. The Varodd Bro, Kristiansand, Norway (main span 260m) – 1993
5. The Kristallopigi, Greece (main span 260m) - 2002

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Bridgebuilder Form-traveller

Segment Lifter

Jalan Duta, Malaysia

Helgelands Bro, Norway

Khordad Bridge, Iran

Regua Bridge, Portugal

Suriname River Bridge, Suriname

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Movable Scaffolding System (MSS)

Overlane and underlane types

The NRS MSS system for cast in-situ bridges has been successfully utilised in over 200 projects worldwide.

It is highly efficient, lightweight, easy to assemble, practical in design, and is supported by established hydraulic systems.

It can be easily adapted to any bridge cross-section – single box, double box, double T – and span configuration. This flexibility enables the contractor to reuse the equipment in different projects.

Bouwcombinatie Utrechtboog, Amsterdam, Holland

Underlane type

Overlane type

Red River (Thanh Tri) Bridge, Vietnam

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Movable Scaffolding System (MSS)

Haihe-Bridge, China

Preparation for concreting

Taiwan High Speed Railway Project

Kyodong Bridge, Korea

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Movable Scaffolding System (MSS)

How The System Operates

1. After concreting, curing and tensioning of cables, the Main Girders are lowered by the Main Jacks at the rear Suspension Gallows and on the front Supporting Bracket.
2. The joints in the middle of the Transverse Beams are released and the Main Girders are moved transversely into a position where the Transverse Beams can pass the piers.
3. The MSS is ready for launching to the next concreting position. The two Main Girders are moved to the next span.
4. During launching, the Suspension Gallows are moved to the next position.
5. The two Main Girders are moved transversely and joined in the middle of the Transverse Beams.
6. The Main Girders are elevated to the concreting position by the Main Jacks.
7. The formwork is adjusted by screw jacks and adjustable supports.
8. For box-girder bridges: After securing the reinforcement and tendons of the bottom slab and webs, the internal formwork is moved to its next position.
9. When placing of reinforcement and tendons is finished, the MSS is ready for concreting of the next span of the structure.
10. During concreting, the rear pair of Supporting Brackets is dismounted, moved to the next front pier and re-installed.

Sutong Bridge, China

Ringroad Olomouc, Czech Republic

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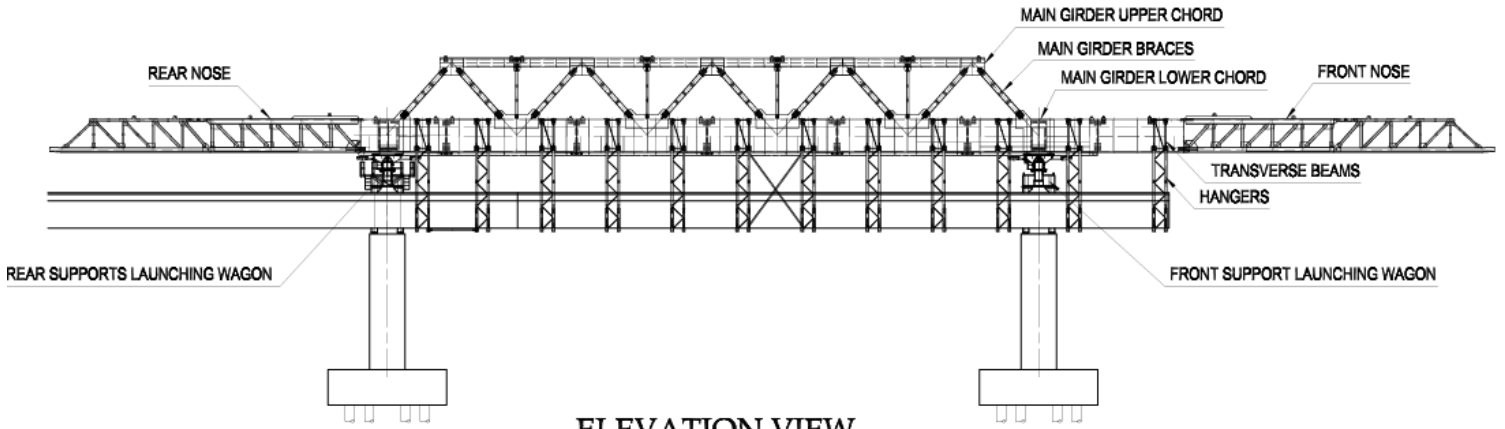
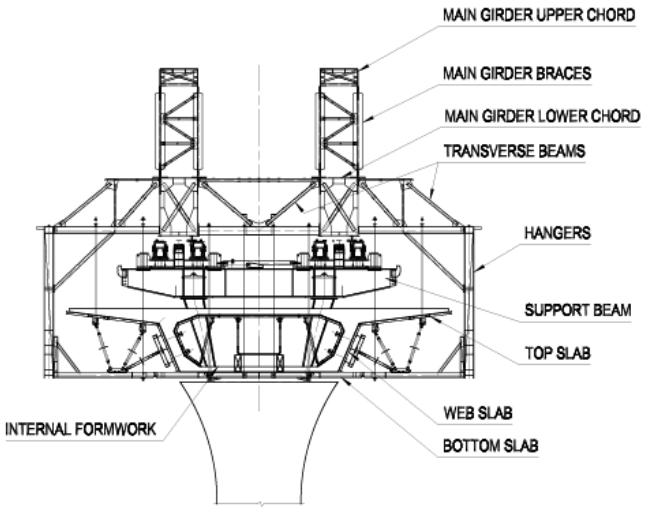
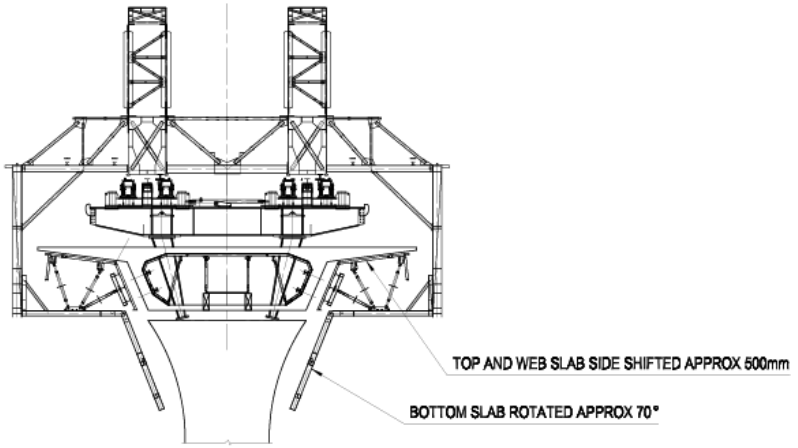
OVERLANE MOVEABLE SCAFFOLDING SYSTEM



ELEVATION VIEW



CONCRETING POSITION



LAUNCHING POSITION

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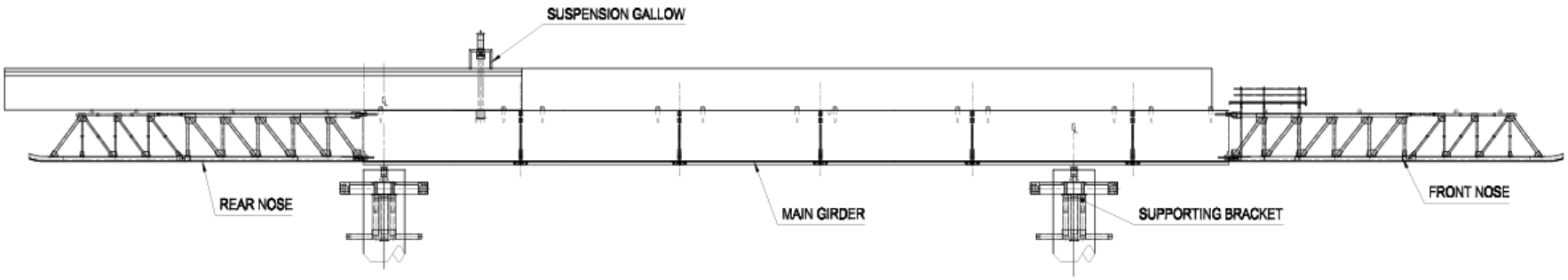
UNDERLANE MOVEABLE SCAFFOLDING SYSTEM



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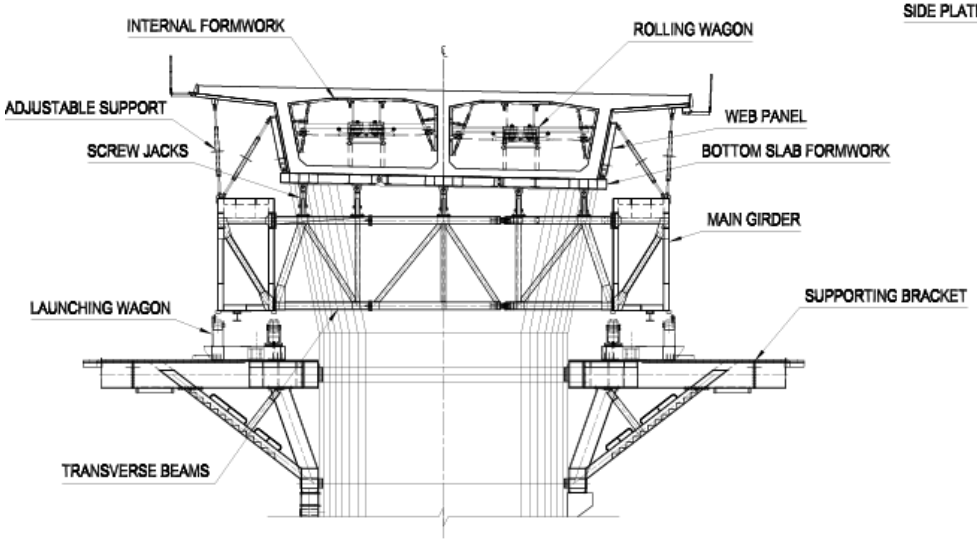
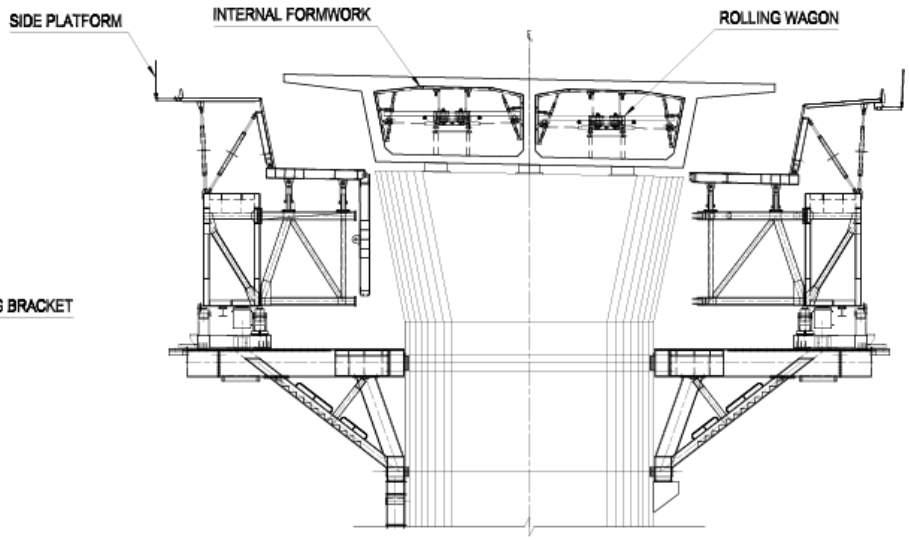


CONCRETING POSITION



LAUNCHING POSITION

Movable Scaffolding System (MSS)

Self - Launching MSS (SL-MSS)

In 2004, NRS successfully developed and unveiled the highly innovative “Self- Launching” MSS, or SL-MSS, system.

Compared to the standard underlane MSS, the SL-MSS can operate without any cranes or other external lifting equipment after the initial assembly. The handling of the support brackets during the launching of the system is done by the MSS system itself without an external crane, thus the name Self-Launching System.

While a standard MSS requires 3 sets of brackets, the SL-MSS needs only 2, and these brackets are transported to the next piers before being installed by the MSS itself. After the setting up of the MSS and during the fixing of reinforcement/concreting, the rear bracket can be moved forward to the next pier, enabling the MSS system to be launched into the next span as soon as the pre-stressing of the bridge span has been completed.

This efficient system is highly suitable for bridges over waterways as well as bridges with very high piers and other conditions where access for external cranes is difficult or impossible.

The SL-MSS system is generally made up of more machined parts and moving mechanisms – special wheels for the launching wagon and launchingtrolley, and winches for the longitudinal transport of the bracket parts.

Key projects

1. The Sutong Bridge across the Yangtze River, China (bridge length, 30km; world record main span of 1088m)

2. The Hangzhou Bay Bridge across the Hangzhou Bay, China (bridge length, 36km). With its scheduled completion in 2008, the cable-stayed bridge will be the longest trans-oceanic bridge in the world. The six-lane expressway will also be the second-longest bridge in the world after the Lake Pontchartrain Causeway in Louisiana, US.

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Movable Scaffolding System (MSS)

SL-MSS Rear View

Transfering of Bracket

Sutong Bridge, China

Hangzhou Bay Bridge, China

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Launching Gantries

The NRS Launching Gantry system for the construction of pre-cast segmental bridges was first developed in the mid 1990s, when the company was involved in Malaysia's Putra Light Rail Transit 2 project. This challenging project led to the first successful development of special 'hinged' launching gantries, which are until today the most suitable solution for the erection of pre-cast segments on very tight horizontal curves. This unique hinge technique has also led to the use of the Launching Gantry system in Light Rail Transit (LRT) projects in Singapore and China, where more than 80km of LRT viaducts have been completed so far.

Further developments in the Launching Gantry system over the years has resulted in it being used in the construction of highway bridges in US, Malaysia, China, Bangladesh, Singapore, India and Thailand. New concepts such as "glue-as-you-go" and "turn-around" were added on and are today integral parts of the NRS Launching Gantry system.

Hinged Gantries

The Hinged Gantry technology is excellent for erecting spans down to 75m in horizontal radius. It is applicable for both Overlane and Underlane Gantries, and for span-by-span and balanced-cantilever erection methods. Hydraulically-controlled hinges are used to connect main girders of the gantry system to enable the system to follow the tight curves along the bridge during construction. As many as eight hinges within a system have been used to meet the extremely tight horizontal curves of the bridge. A specially-designed gantry crane for lifting and placing pre-cast bridge segments is used to travel through the kinked hinges.

To support the pre-cast segments during the erecting process, special hydraulic cylinders are used on the Underlane Gantries. For the Overlane system, the segments are suspended by tension bars directly from the main truss.

1-90/93 C19B1, Boston, Massachusetts, USA

Guangzhou LRT, China

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Launching Gantries

LRT2 Project, Malaysia (Hinged Gantries)

MRR Package II, Malaysia

Sengkang & Punggol New Towns
LRT Project, Singapore

Paksey Bridge, Bangladesh

Launching Gantries

Glue-as-you-go & Segment Turn-around

The glue-as-you-go procedure for wet joint segmental bridges is one of the special segment erection methods introduced in segmental gantries by NRS. The method allows a limited pre-loading of the gantry, avoiding the time-consuming double handling of all the segments. Coupled with the concept of turning around the last segment within the span itself, the NRS gantry system for erecting precast segmental bridges is recognised for its efficiency.

How it works:

1. One to three segments are usually preloaded onto the Gantry at the far end of the span.

2. The erection of the span starts from the nearer end, beginning with the first segment which serves as a guide for the remaining segments.

3. Each new segment is temporarily stressed to the previously erected segment by temporary tension bars in order to obtain a minimum contact pressure between the segments (curing of the epoxy glue).

4. When using an Overlane Gantry, the last segments of the span are equipped with wider suspension beams, allowing the last segment to be turned inside the previous suspended segment.

5. The whole span is finally adjusted to the correct level (vertically) and alignment (transversely) by the Gantry, and the permanent stressing operation can take place.

Sifeng Project, China

Paksey Bridge, Bangladesh

Guangzhou LRT, China

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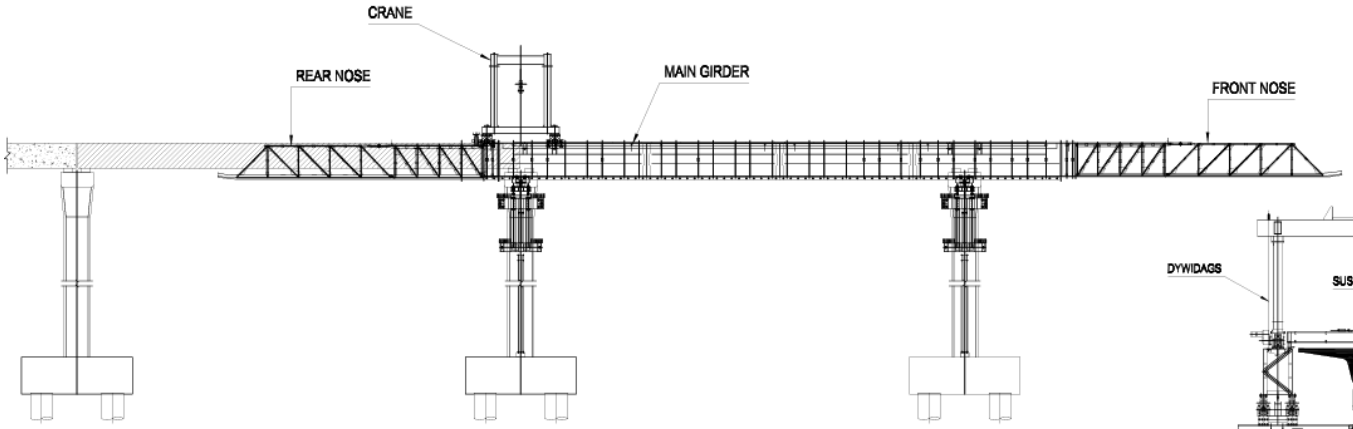
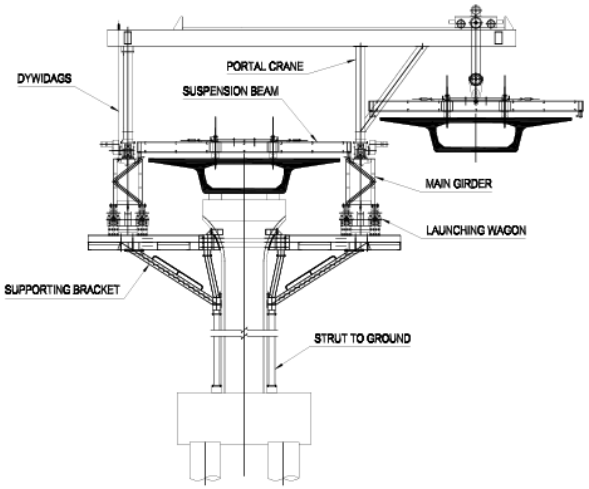
Launching Gantries

Spaghetti Bowl
Las Vegas, USA

UNDERLANE LAUNCHING GANTRY



ELEVATION VIEW



FRONT VIEW

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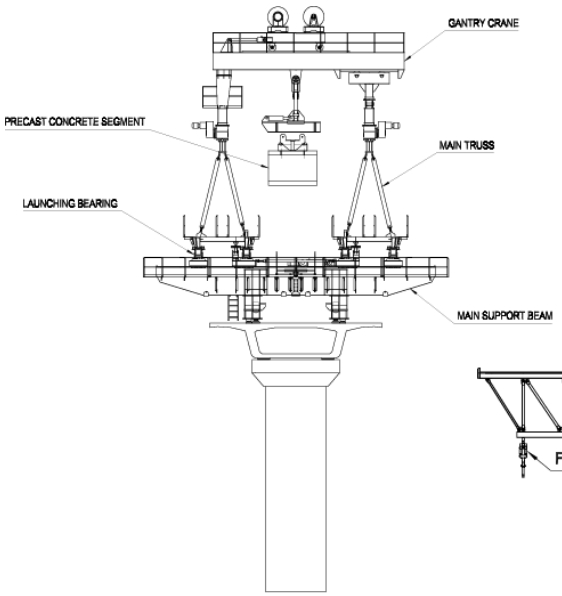
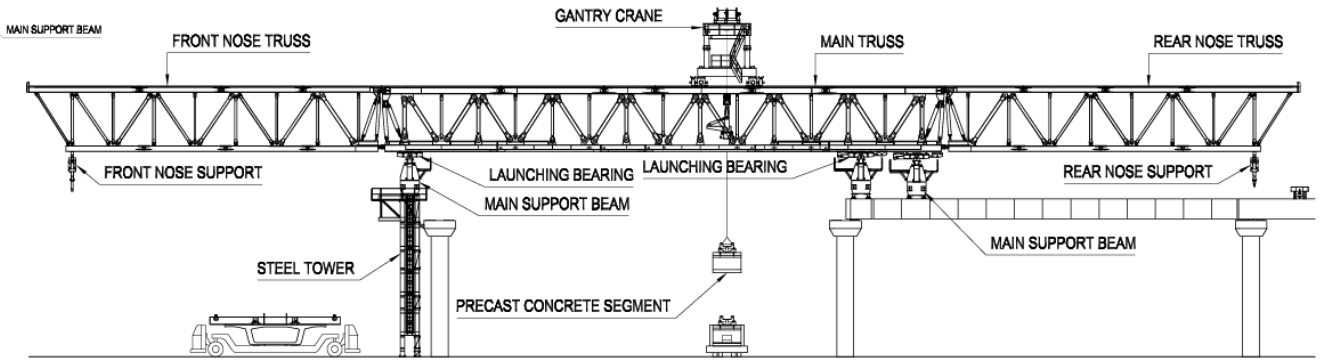
Launching Gantries



FRONT VIEW

OVERLANE LAUNCHING GANTRY



ELEVATION VIEW

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The pre-cast full span method of construction (commonly known as FSM) is one of the fastest techniques used in building viaducts. The FSM involves casting the whole bridge span, typically 30m to 55m long and between 600t and 1,500t in weight, in the casting yard and transporting the whole span with a specially designed multi-axle Tyre Trolley to the bridge site. At the bridge site, an FSM purpose-built Launcher will be used to lift and place the whole span in the final position.

NRS's scope of delivery of FSM equipment covers the design and supply of the complete range of equipment typically needed in such constructions:

- special formwork with inner mould (hydraulically manoeuvred)
- lifting cranes for pre-cast yard
- lifting cranes for pre-cast bridge span (or special straddle carriers able to manoeuvre on site and stock pre-cast bridge spans)
- multi-axle Tyre Trolley
- FSM Launcher

Our extensive experience in global projects ensures that clients will be free of the various problems generally associated with the use of the FSM Launcher. Through its strategic collaboration with PDN s.p.a. of Italy, NRS is undoubtedly one of the most recognised suppliers of the FSM system in the world today.

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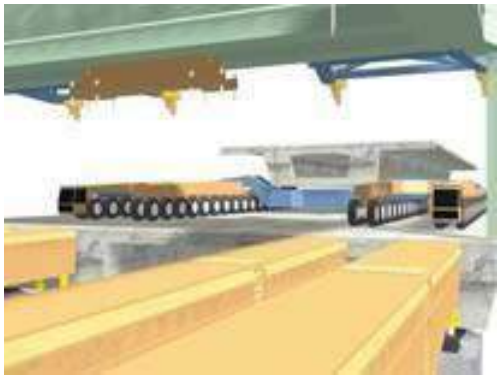
Pre-cast Full Span Equipment

How the FSM Launcher works

The typical working cycle for the FSM Launcher is asfollows:

- The bridge span is cast in a special fixed formwork in the casting yard, stressed and cured.
- The pre-cast bridge span is lifted from the formwork by means of either a gantry crane or a special straddle carrier. The pre-cast span can also be moved out of the formwork by using special trolleys placed at the bottom of the formwork.
- The pre-cast span is loaded onto the multi-axle Tyre Trolley.
- The Trolley transports the bridge span over the previously erected span to the Launcher, which is positioned at the span to be erectednext.
- The Launcher lifts the bridge span.
- The bridge span is then lowered slowly by the lifting system to its final position and the hanging devices are then released. Meanwhile, the Trolley returns to the pick-up area.
- The Launcher system is now ready for the self-launching phase. Temporary rails are laid on the recently placed span and the machine is launched to another span.



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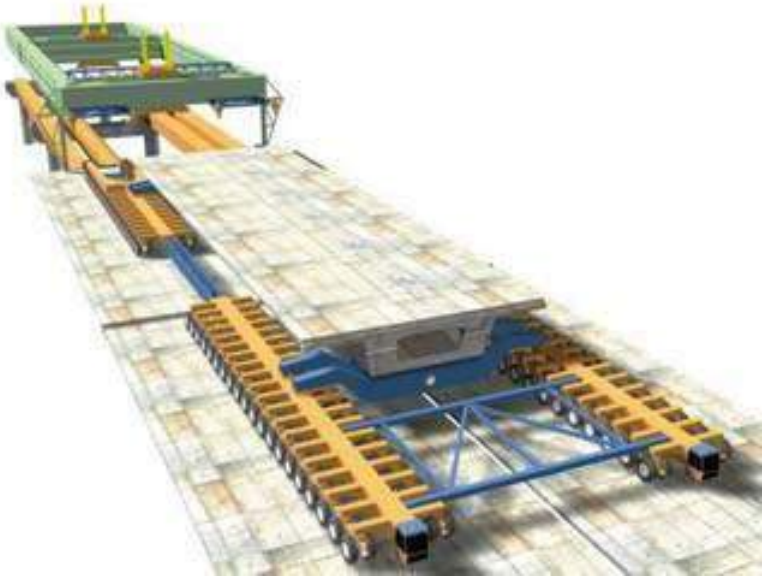
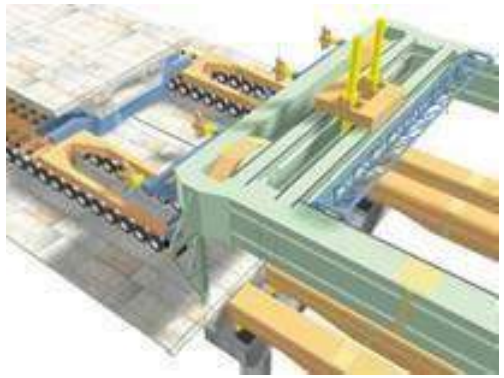
Bridge Construction Equipment

Pre-cast Full Span Equipment



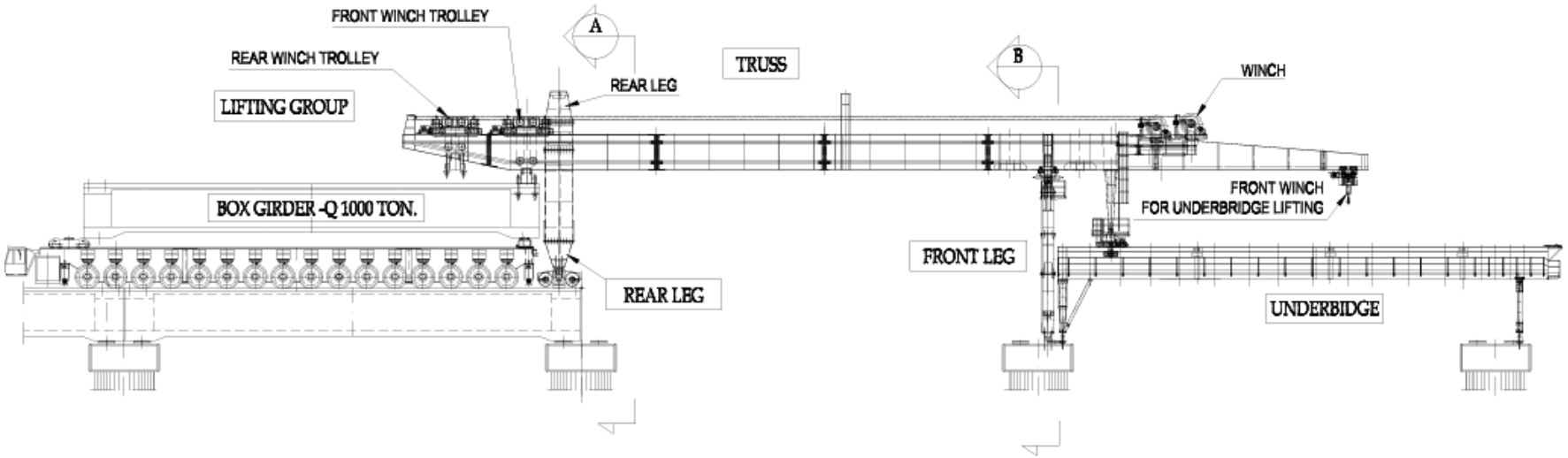


Pre-cast Full Span Equipment

Key Projects

1. 2nd Incheon Bridge, Korea - FSM Launcher and Tyre Trolley. The pre-cast span for this project was 50m long and weighed 1,500t – the heaviest span in the world erected using the FSM method. The Tyre Trolley TT-1500 consisting a total of 320 rubber tyres used to transport the bridge span, was also designed and supplied by NRS.
2. Wuhan-Guangzhou High Speed Railway, China – delivered Tyre Trolley TT-900 to Bureau No. 19, Ministry of Railways, China for transporting 33m PC bridge spans.

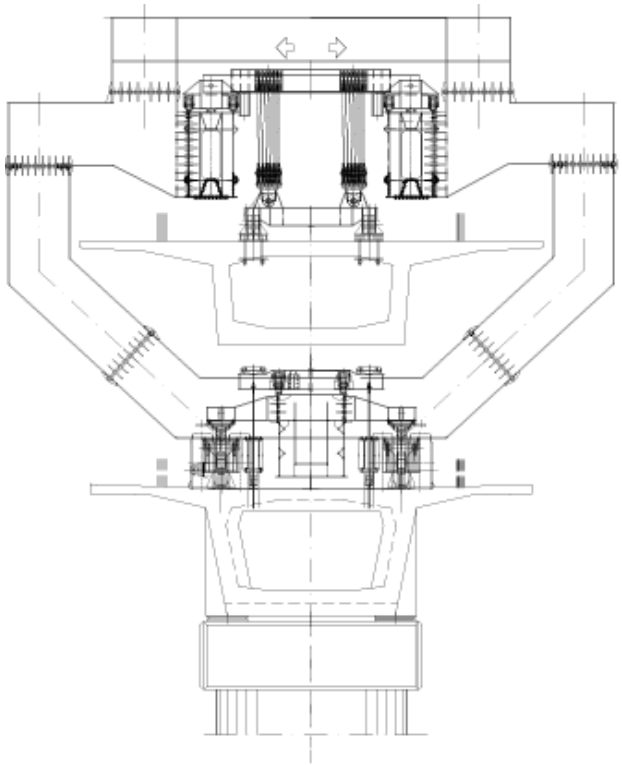
FSM LAUNCHER FOR PC BEAMS - 900 Ton
WUHAN-GUANGZHOU HIGH SPEED RAILWAY, CHINA



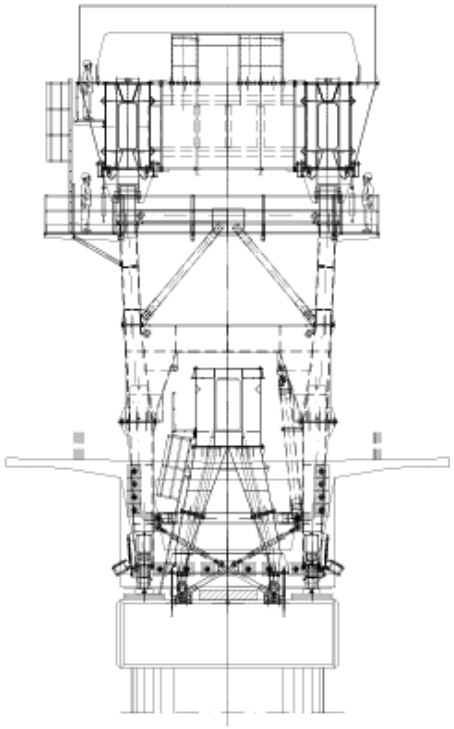
ELEVATION VIEW

NRS
Bridge Construction Equipment

Pre-cast Full Span Equipment



SECTION-A



SECTION-B

Beam Launcher and Other Related Equipment

Pre-cast concrete beam girders ('I', 'T', 'M' beams, etc) are most widely used for short span bridges and viaducts. The pre-cast beams are usually lifted and placed on the pier heads using cranes or other hoisting equipment from the ground below. However, for bridges crossing over water or viaducts with high piers and/or difficult ground condition, a Beam Launcher is commonly used to lift the pre-cast beams in place. The pre-cast beams are delivered with a Beam Trolley on top of the completed deck to the rear of the Beam Launcher, and subsequently picked up by the Launcher for placing into the final position.

There are 2 types of Beam Launchers supplied by NRS - the single-box type and the twin-truss type.

The twin-truss type is more commonly used worldwide while the single-box type is a special design patented by NRS's Chinese partner. The single-box system is generally more efficient and lighter in weight, and is perfect for erecting pre-cast beams on tight horizontal alignments as well as for lifting beams from the sides of the bridge.

Apart from the Beam Launcher, NRS also designs and supplies steel moulds for pre-cast beams, Beam Trolleys for delivery of pre-cast beams, and Beam Movers or Gantry Cranes for moving the pre-cast beams in the casting yard – promising a complete package of effective handling equipment to meet all clients' needs for the construction of pre-cast concrete beam bridges.

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Beam Launcher and Other Related Equipment

Steel Mould for Pre-Cast Segment

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Beam Launcher and Other Related Equipment

Key Projects

1. Athi Bridge, Kenya (2001) – twin-truss Beam Launcher used by Sumitomo for completion of two bridges.
2. Southern Transport Development Project, Sri Lanka (2004) – twin-truss Beam Launcher utilised by Kumagai, together with Beam Mover and Beam Trolley.
3. Putrajaya Highway, Malaysia (2005) – single-box Beam Launcher delivered to Leighton Contractors.
4. Al Damar Bridge, Sudan (2006) – single-box Beam Launcher supplied to A&A Engineers & Constructors, together with steel moulds, Beam Mover and Beam Trolley.

Beam Mover

Athi Bridge, Kenya

Beam trolley

Straddle Carriers and Tyre Trolleys

Straddle Carriers are basically lifting cranes mounted on tyres often used to replace gantry cranes for lifting and handling heavy loads in casting yards, factories, storage areas, ports and marinas.

Compared to normal gantry cranes which move on fixed rails, the Straddle Carrier has the flexibility to lift and steer heavy loads in any direction on motorised wheels. These Straddle Carriers' lifting capacities normally range from 50t to 900t. Each machine is custom-designed and fabricated under tight supervision to meet the client's requirements.

NRS Straddle Carriers are equipped with reliable systems of hydraulic equipment, winches, ropes, and electric and hydraulic motors. These highly mechanised machines come complete with emergency features and safety switches to ensure safe use while handling heavy loads.

Key projects

1. Golden Ears Bridge, Vancouver, Canada - supplied Straddle Carrier SC-150 (150t lifting capacity; 700t on static configuration) for 50m x 2.5m beams to Bilfinger Berger AG, Germany.

2. Wuhan-Guangzhou High Speed Railway, China - supplied 2 Straddle Carriers SC-900 (900t capacity) for PC box beams to Bureau No. 11, Ministry of Railways, China.

3. Heolic Towers, Germany – supplied TT-60 (60t) Tyre Trolley to WEC, Magdeburg, Germany for transporting concrete segments.

4. PRETERSA - PRENAVISA, Spain - supplied 1 unit of Straddle Carrier SC-50 (50ton capacity) for handling of PC Beams.

NRS
Bridge Construction Equipment

Straddle Carriers and Tyre Trolleys

Construction Engineering and Other Services

Apart from supplying cutting-edge bridge construction equipment, NRS's team of qualified and experienced structural design engineers and technicians provide a complete range of construction engineering and temporary design works related to bridge building:

- Deflection and precamber calculations
- Design of temporary supports and formwork for construction of insitu hammer-head segment (pier segment)
- Design of stabilizing systems for balanced cantilever bridges
- Design Check of bridge and equipment load interaction
- Design of staging works for bridge construction, formworks, temporary bridges and cofferdams
- Construction engineering and general consultancy related to bridge building

In addition, the company offers drafting services for all types of structural drawings; 3D modelling and animation of engineering projects.

NRS also delivers design and fabrication services for all types of steel structures used in bridges and buildings. In addition, it provides consultancy and quality control expertise relating to fabrication of steel structures in China.
Through its years of experience working in China, the company has built up a solid business network and know-how, resulting in its ability to tackle the intricacies of doing business in the country.

Quality Control & Inspection

Fabrication of Steel Structures

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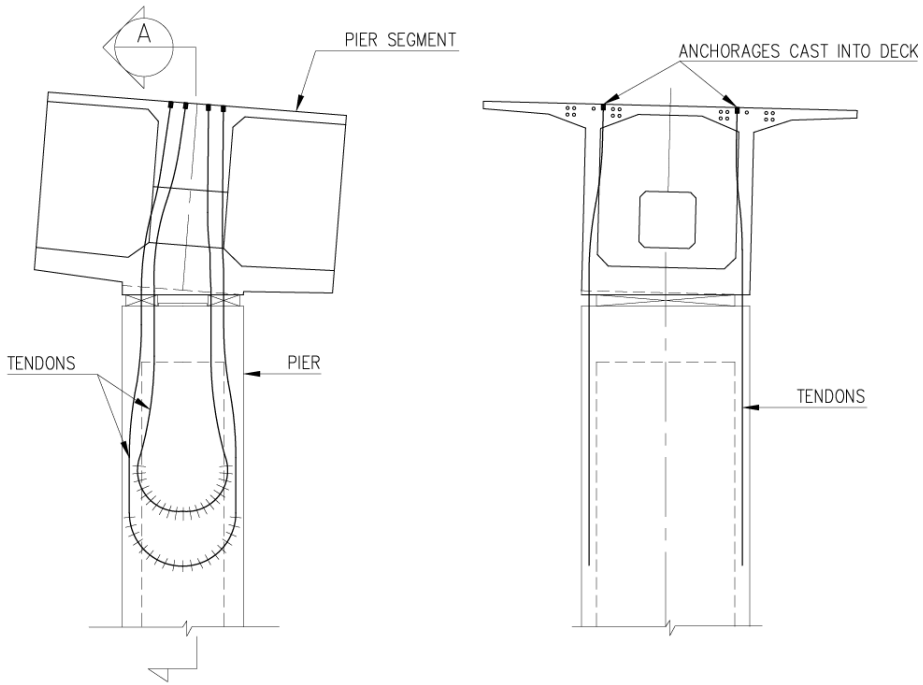
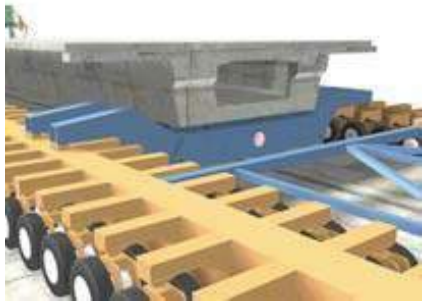
Construction Engineering and Other Services

BALANCED CANTILEVER ERECTION
LOJING-POS BLAU (CAMERON HIGHLANDS, MALAYSIA)

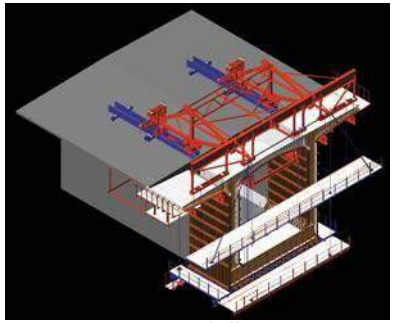


SECTION-A

STABILIZING SYSTEM FOR
PIER SEGMENT USING
U-SHAPE PRESTRESSING TENDONS



3D-modeling



3D-modeling

Prop and Ties Stabilizing System

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Bridge Construction Equipment

Reference

List

NRS
Bridge Construction Equipment

Reference List | NRS AS

Launching Gantries For Segmental Bridges

- Update 05.05.2006 -

Country/Bridge Project	Client	Length	Width	Main Features	Delivery
MALAYSIA					
Middle Ring Road Package II, (Missing Link) Kuala Lumpur	PERSYS Sdn Bhd Kuala Lumpur	Total 3.2km	12.2m	Launching girder for Pre-cast element erection. Curves with min. radius approx. 500 m. Max. Span 45 m. Single box section. 1 overhead gantry. Max. segment weight = 90 t.	2000
Light Rail Transit 2, Kuala Lumpur	PATI Sdn Bhd Kuala Lumpur	Total 30km	7.6m	Launching girders for the LRT 2 project in KL. Pre-cast element erection. Curves with min. radius approx. 100 m. Max. span 36 m. Single box section. 5 underlslung gantries.	1994/95
Light Rail Transit 2, Kuala Lumpur	PATI Sdn Bhd Kuala Lumpur	Total 30km	7.6m	Launching girders for the LRT 2 project in KL. Pre-cast element erection. Curves with min. radius approx. 100 m. Max. span 63 m. Single box section.	1994/96
Light Rail Transit 2, Kuala Lumpur	PATI Sdn Bhd Kuala Lumpur	Total 30km	7.6m	Launching girders for the LRT 2 project in KL. Pre-cast element erection. Curves with min. radius approx. 100 m. Max. span 60 m. Single box section. 1 underlslung gantry.	1994/95

Continue…

Launching Gantries For Segmental Bridges

- Update 05.05.2006 -

SINGAPORE					
C 810, LRT systems Sengkang & Punggol New Towns	BBR Singapore	Total 20km	12.1- 8.1m	Launching girder for the C810, LRT system in Singapore Curves with min. radius approx. 75 m. Max. span 37 - 40 m. Max. Segment weight = 43 tons. 2 underlslung gantries.	1999
USA					
I-90/93 C19BI, Boston, Massachusetts	Modern Continental Cambridge, Massachusetts	4km	12.1m	Overhead launching gantry for pre-cast element erection and balanced cantilever. Single box section. 1 overlane LG.	1998
Spaghetti Bowl I-15/US 95 Interchange, Las Vegas, Nevada	Walter & SCI Construction, Ltd. Seattle, Washington	4km	11.6m	Overhead launching gantry for pre-cast element erection and balanced cantilever, max. span 49 / 65 m, min. R = 130 m, single box section, 1 overlane LG.	1998

Launching Gantries For Segmental Bridges

- Update 05.05.2006 -

Country/Bridge Project	Client	Length	Width	Main Features	Delivery
BANGLADESH					
Paksey Bridge	MBEB Wuhan	1.9km	18.0m	Launching gantry for balanced cantilever construction. Max. span 109.5 m. Max. Segment weight = 165 t. 1 overhead gantry.	2001
THAILAND					
Wat Nakorn In Bridge	SRA	Several km		Design review of the overhead Launching gantries for balanced cantilever construction. Max. span 39.7 - 42 m. Max. Segment weight = 80 t. 8 bridges, 94 spans.	2001

Continue…

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Bridge Construction Equipment

Reference List | NRS AS

Launching Gantries For Segmental Bridges

- Update 05.05.2006 -

INDIA					
Delhi Metro	IJM (India) Infrastructure LTD.	32m	10.8m	Design review of the overhead Launching gantries.	2003
CHINA					
Guangzhou LRT Project	No. 4th Navigation Engineering Bureau.	35m	9.3m	Underslung launcher for span-by-span pre-cast segmental construction. Span weight 490 tonnes, radius 300m	2006
Guangzhou LRT Project	No. 13th Bureau of Ministry of Railway	35m	9.3m	Underslung launcher for span-by-span pre-cast segmental construction. Span weight 490 tonnes, radius 450m	2006
Guangzhou LRT Project	Guangdong 2nd Hydroelectric Engineering Bureau	35m	9.3m	Underslung launcher for span-by-span pre-cast segmental construction. Span weight 490 tonnes, radius 600m	2005
Sifeng Project (Beijing interchange)	Beijing Gonglian	50m	8 - 12m	Overhead launching gantry for span-by-span pre-cast viaduct erection. Max. span 50m, min R = 150m, 900 t capacity	2003

NRS
Bridge Construction Equipment

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Movable Scaffolding System (MSS) For Cast In Situ Bridges

- Update 05.05.2006 -

Country/Bridge Project	Client	Length	Width	Main Features	Delivery
CHINA					
Wenzhou-Fuzhou Railway Line	No.12th Bureau of Ministry of Railway	3km	13m	2 underslung self launching MSS (SL-MSS), Max span 32m.	2006
Tianxingzhou Bridge	No.12th Bureau of Ministry of Railway	7km	13.4m	2 underslung self launching MSS (SL-MSS), Max span 40m.	2005
Hangzhou Wan Bridge	Zhejiang Road and Bridge	Approx. 40km	15,8	2 underslung self launching MSS (SL-MSS), Max span 50m.	2004-05
Sutong Bridge	2nd Highway	Approx. 18km	16,4	2 underslung self launching MSS (SL-MSS), Max span 50m.	2004-05
Sutong Bridge	2nd Navigation	Approx. 18km		1 underslung self launching MSS (SL-MSS), Max span 50m.	2004
Dong Hai Bridge	Shanghai Tunneling Engineering Corp	Approx. 30km	15,25m	2 underslung MSS, max span = 50 m, 2 internal formwork rolling wagons	2003
Haihe-Bridge	1st Municipal Highway Eng. Company	330m	18,0m	1 overhead MSS, 55m cont. spans, int. formwork rolling wagon	2001
Beng Bu Bridge	Guangxi Highway & Bridge Engineering	Approx. 1.0km	11,0m	MSS. Single box section. 2 underslung MSS. 2 internal formwork rolling wagons. Max. span = 40 m.	2000
2nd Nanjing Crossing Nancha Bridge - Nanjing	Hunan HNBB	2,3km	15,4 - 16,9m	MSS. Single box section. 2 underslung MSS. 2 internal formwork rolling wagons. Max. span = 55 m.	1999

NRS
Bridge Construction Equipment

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Movable Scaffolding System (MSS) For Cast In Situ Bridges

- Update 05.05.2006 -

Country/Bridge Project	Client	Length	Width	Main Features	Delivery
KOREA					
Gusungpu & Hong Chun Bridges	Jinsung Contruction Co. Ltd	Approx. 3km	13.6m	2 nos overlane 50m span MSS	2006
Nam-Chun	VSL-Korea	Approx. 345m	14,0m	1MSS for double span box section.	2003
Ky-Dong	CCL-Korea	Approx. 450m		I underslung MSS for Double T cross section.	2003
High Speed Railway, Seoul – Pusan	VSL Korea, Ltd. Seoul	Total approx. 100km	14,0m	All spans 40 m, single box section. 3 underslung MSS.	1999
High Speed Railway, Seoul – Pusan	Dae-Woo Ind. Co. Ltd., Seoul	Total approx. 100km	14,0m	MSS. Many railway bridges. All spans 25 m, single box section. 3 overhead 2-span MSS.	1994
High Speed Railway, Seoul - Pusan	Sun-Kyong Ind. Co. Ltd., Seoul	Total approx. 100km	14,0m	MSS. Many railway bridges. All spans 40m. Single box section. 4 underslung MSS.	1994
High Speed Railway, Seoul - Pusan	Lee Stronghold Co. Ltd., Seoul	Total approx. 100km	14,0m	MSS. Many railway bridges. All spans 40m. Single box section. 2 underslung 2-span MSS.	1994
High Speed Railway, Seoul - Pusan	Hyundai Precision & Ind. Co. Ltd., Seoul / Pusan	Total approx. 100km	14,0m	4 Nos. MSS. Many railway bridges. All spans 40 m. Single box section. 5 underslung MSS.	1993
High Speed Railway, Seoul - Pusan	Hanjin Heavy Industries Co. Ltd., Seoul / Pusan	Total approx. 100km	14,0m	MSS. Many railway bridges. All spans 40 m. Single box section. 2 underslung MSS.	1992

Movable Scaffolding System (MSS) For Cast In Situ Bridges

- Update 05.05.2006 -

Country/Bridge Project	Client	Length	Width	Main Features	Delivery
NORWAY					
Kvisti Suspension Bridge, Oslo	Eeg-Henriksen Anlegg A/S, Oslo	600m		MSS for the viaducts. Single box section. Max. span 35 m. 1 overhead MSS.	1994
Askøy Suspension Bridge, Bergen	Public Roads Administration Hordaland	1.057m		Main span 850 m. Near city of Bergen. Viaduct near Bergen. Max. span 42 m. Single box section. 1 underslung MSS.	1991
Menstad Bridge, Skien	Public Roads Administration Telemark	433m		Bridge in pre-stressed concrete. Totally 9 spans, the longest span 60 m. 3 foundations in sea, the rest on land. Approx. 3000 m steel pipes 700 mm for foundations. 5.200 m^3 concrete, 800 tons reinforcement steel and 7.500 m tension cables. Single box section. 1 underslung MSS.	1991
Bolsøya Bridge, Molde	Aker Group, Oslo	250m		Concrete girder bridge, span 40 m. Near the city of Molde. Single box section. 1 underslung MSS.	1990
Storeklubben Viaduct, Bergen	Public Roads Administration Hordaland	300m		2 ramps as access to the Askøy Bridge, near the city of Bergen. 11.000 m^2 formwork, 3.900 m^3 concrete, 550 ton reinforcement, 5465 m NM pre-stressing steel. Max. span 42 m, single box section. 1 underslung MSS	1990

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Bridge Construction Equipment

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Movable Scaffolding System (MSS) For Cast In Situ Bridges

- Update 05.05.2006 -

Country/Bridge Project	Client	Length	Width	Main Features	Delivery
Lodalen Bridges, Oslo.	Public Roads Administration Oslo	1.100m		Motorway/intersection on E6. Bridges over railway area with heavy traffic. Max. span 40m, single box section. 1 underslung MSS.	1998
Gartnerløkka Bridge, Kristiansand	Public Roads Admnistration Oslo	680m	11m	Highway bridge on European highway E18 with main spans 45 m over city center streets. Foundations partly in rock, driven and bored piles. Max. span 40 m 1 underslung MSS.	1980
Drammen Bridge, Drammen	Public Roads Administration Oslo	2.000m		Highway bridge on European highway E18. Reinforced, post-tensioned concrete box girder. Span lengths 48 m and 60 m over heavily developed areas, rivers, railway and streets to be kept functioning during construction. Single box section. 1 2-span (2x60m) underslung MSS	1975
Drammen Bridge, Drammen0	Public Roads Administration Oslo	600m		Extension of Drammen Bridge with 600 m. Max. span 48 m. 1 underslung MSS.	1973

NRS
Bridge Construction Equipment

Reference List | NRS AS

Movable Scaffolding System (MSS) For Cast In Situ Bridges

- Update 05.05.2006 -

Country/Bridge Project	Client	Length	Width	Main Features	Delivery
PORTUGAL					
Viaduto da ribeira da Moita	Construtora do Tâmega S.A. Lisbon	987m	15,5m	MSS for freeway viaduct. Max. span 35 m, double - T section. 1 underslung MSS, Rebuilt from Albufeira.	2000
Viaduto Rio Maior	Zagope S.A. Lisbon	2x 0,6km	15,4m	MSS for freeway bridge. Max. span 40 m, double T-section, incl. folding of int. FW. 1 new underslung MSS and rental of our overhead MSS..	2000
Viaduto de Alcobertas,	Conduril, S.A. Ermesinde	2x 0,8km	16,1m	MSS for freeway bridge. Max. span 40 m, double T-section. New folding of int. FW. Rebuilt from Santarem.	2000
Viaduto de Alfeizarão	Construtora do Tâmega S.A. Lisbon	660m	15,3m	MSS for freeway viaduct. Max. span 50/45 m, single box section. 1 underslung MSS, Rebuilt from Alcarrache.	2000
A3 –Autostrada Lisboa - Faro Viaduto de Alcarrache	Construtora do Tâmega S.A. Lisbon	965m	10,5m	MSS for freeway viaduct. Max. span 62,5 m, single box section. 1 underslung MSS, Rebuilt from Lousado.	1999
A3-Autostrada Lisboa - Faro Viaduto de Albufeira	Construtora do Tâmega, Lisbon	840m	17,3m	MSS for freeway viaduct. Max. span 35 m. Double T-section. 1 underslung MSS. Rebuilt from St. Cristina.	1998/99

Continue…

NRS
Bridge Construction Equipment

Reference List | NRS AS

Movable Scaffolding System (MSS) For Cast In Situ Bridges

- Update 05.05.2006 -

Country/Bridge Project	Client	Length	Width	Main Features	Delivery
Alcàcer do Sal Ponte Sobre o Rio Sado	Teixeira Duarte, S.A. Lisbon	Total 1,5km	18,5m	MSS for freeway viaduct – A3. Max. span 44 m. Folding of int. + web slab formwork by hydraulics. Double T-section. 1 underslung MSS.	1998
A3-Autostrada Lisboa - Faro Viaduto Alcàcer do Sal (Rio Sado)	Engil Sociedade de Civil, S.A., Lisbon	1,5km	18,5m	Re-design of MSS for freeway viaduct (A9-CREL). Max. span 44 m. Folding of int. + web formwork by hydraulics. Double T-section. 1 underslung MSS.	1997/98
IC10 – Ponte S/O Rio Tejo, Santarem	Conduril, S.A. Ermesinde	2x 1,2km	27,7m	MSS for freeway bridge. Max. span 42 m, double T-section. Variable angle between bottom slab and web. 1 underslung MSS.	1997
A3 – Autostrada Lisboa – Faro Viaduto Sobre a Ribeira de Grandola	OPCA Obras Publicas e Cimento Armado, S.A. Lisbon	1,3km	21,1m	Re-design of MSS for freeway viaduct (Viga de Lancamento) double T-section. Max. span 42,5 m. 1 overhead MSS.	1997
A3 – Autostrada Lisboa – Faro Viaduto Sobre a Ribeira de Grandola	OPCA Obras Publicas e Cimento Armado, S.A. Lisbon	1,3km	21,1m	MSS for freeway viaduct. Double T-section. Max. span 42,5 m. 1 overhead MSS.	1997

Continue…

NRS
Bridge Construction Equipment

Reference List | NRS AS

Movable Scaffolding System (MSS) For Cast In Situ Bridges

- Update 05.05.2006 -

Country/Bridge Project	Client	Length	Width	Main Features	Delivery
A3 –Autostrada Porto/Valenca Sublanco Ponte de Lima / EN303 – Trecho 2 Viaduto de St. Cristina	Construtora do Tâmega S.A. Lisbon	620m	15,0m	MSS for freeway viaduct. Max. span 36 m, double T-section. 1 underslung MSS.	1966
A3-Autostrada Porto/Valenca Sublanco Ponte de Lima / EN303 – Trecho 2 Viaduto do Lousado	Construtora do Tâmega S.A. Lisbon	1,7km	15,0m	MSS for freeway viaduct. Max. span 56 m, single box section. 1 underslung MSS.	1996
A3-Autostrada Porto/Valenca Sublanco Ponte de Lima / EN303 – Trecho 2 Viaduto de Espinheiros	Novopca Construtores Associados, Lda. Oporto	1,8km	17,6m	MSS for freeway viaduct. Max. span 42 m, double T-section, 1 underslung MSS.	1996
Governo Regional da Madeira, Bridges Amoreira and Melões	C. Tâmega Contractor Co Lisbon	1,6km	10,65m	MSS for motorway bridges. Spans 45,0 m and 42,5 m. Single box section. 1 underslung MSS.	1995
A9-C.R.E.L. (Estàdio National – Alverca) Sublanco Loures – Bucelas Viaduto Sobre A.E.N. 115 Lisbon	Engil-Sociedade de Construcao Civil, S.A. Lisbon	450m	2x17,5m	MSS. Twin motorway bridge. Spans 42,0 – 53,75 m. Double T-section. 1 underslung MSS.	1993

Reference List | NRS AS

Movable Scaffolding System (MSS) For Cast In Situ Bridges

- Update 05.05.2006 -

Country/Bridge Project	Client	Length	Width	Main Features	Delivery
SWEDEN					
Obbola Bridge	Road Administration of the City of Umeå	976 and 402m		Two highway bridges. Concrete box girder spans 66 m. Double T-section. 1 underslung MSS.	1989
Skrei Bridge	Public Roads Administration of Sweden	350m		Highway bridge on European Highway E6. Concrete box girder span 49 m.	1986
Johanneshov Bridge, Stockholm	Svenska Industribyggen AB, Stockholm	750m	25m	Twin reinforced post-tensioned concrete box girders. Spans 42 – 55 m over heavily developed areas in Stockholm city. 1 underslung MSS.	1983

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Bridge Construction Equipment

Reference List | NRS AS

Movable Scaffolding System (MSS) For Cast In Situ Bridges

- Update 05.05.2006 -

Country/Bridge Project	Client	Length	Width	Main Features	Delivery
TAIWAN R.O.C.					
Section C230/C240 Taiwan High Speed Railway Project	Hyundai Eng. & Constr. (Halla Speco Heavy Ind.)		13.0m	2 MSS for THSR viaducts. Max. span 45m, simply supported 2 internal formwork rolling wagon 2 nos. underslung MSS	2001
Section C230/C240 Taiwan High Speed Railway Project	Hyundai Eng. & Constr. (Halla Speco Heavy Ind.)		13.0m	4 MSS for THSR viaducts. Max. span 40m, simply supported 4 internal formwork rolling wagon 4 nos. underslung MSS	2001
Bid C 325a 2nd Freeway Ext. Project Lung-Kang Nan-Ken Viaduct Ta-Tu Bridge	EVERGREEN Construction Co. Taipei	2,1km 2,8km	18,55m 16,1m	3 MSS for freeway viaduct. Max. spans 46/55 m. Single box section, varying width. 3 int. formwork rolling wagons. 3 underslung MSS.	1999
Bid C312-14, 2nd Freeway Ext. Hsi-Hu Ta Cha Section, Tung-Hsiao Viaduct & Yen-Li Viaduct	New Asis Construction & Development Corp., Taipei	2,5km 1,1km 950m	16,1m 16,0m 16,2m	MSS for freeway viaduct. Max. spans 48-50 m. Double and single box section, varying width. 2 internal formwork rolling wagons. 1 underslung and 1 re-built MSS.	1999

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NRS
Bridge Construction Equipment

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Movable Scaffolding System (MSS) For Cast In Situ Bridges

- Update 05.05.2006 -

Country/Bridge Project	Client	Length	Width	Main Features	Delivery
Bid C313, 2nd Freeway Ext. Hsi-Hu Ta Cha Section, Ta-Cha Interchange	Evergreen Construction Co., Taipei	3,5km	16,1m	MSS for freeway viaduct. Max. spans 45 m. 1 internal formwork rolling wagon. Single box section, inclined piers. 2 underslung MSS.	1999
Bid C361, 2nd Freeway Ext. Pai-Ho Hsin-Hua Section, Zen-Wen-Hsi river bridge	Der Pao Construction, Taipei	3,5km	16,1m	MSS for freeway viaduct. Max. spans 45 m. Folding of bottom slab formwork by hydraulics. 2 int. formwork rolling wagons. Single box section, asymmetric piers. 2 underslung MSS.	1998
East-West Expressway E303 Taiwan Area National Expressway	BES Engineering Corporation, Taipei	4km	22,7m	MSS for freeway viaduct. Max. spans 37 m. Folding of bottom slab formwork by hydraulics. 4 int. formwork rolling wagons. Double box section, asymmetric piers. 2 underslung MSS.	1998
East-West Expressway E206 Taiwan Area National Expressway	Chiu Ta Construction, Taipei	4km	19,7m	MSS for freeway viaduct. Max. spans 37 m. Bottom slab hydraulically foldable. Double box section, 4 int. formwork rolling wagons. 2 underslung MSS.	1997/98
East-West Expressway E604 Taiwan Area National Expressway	Chang Hung Engineering Co., Ltd., Taipei	4km	12,0m	MSS for freeway viaduct. Max. spans 40,5 m. Single box section, 2 int. formwork rolling wagons. 2 underslung MSS.	1997

Continue…

NRS
Bridge Construction Equipment

Reference List | NRS AS

Movable Scaffolding System (MSS) For Cast In Situ Bridges

- Update 05.05.2006 -

Country/Bridge Project	Client	Length	Width	Main Features	Delivery
Second Freeway Extension Project, Bid E812-16, Taiwan Area National Expressway	Koukai JDC Taiwan, Taipei	8km	22,6m	MSS for freeway viaduct. Max. span 35 m 38 t/m. Double box section. 6 int. formwork rolling wagons. 3 underslung MSS.	1997
Second Freeway Extension Project, Bid 370 Tainan Interchange	B.E.S. Taipei	3km	12,0m	MSS for freeway viaduct. Max. span 50 m. Single box section. 2 int. formwork rolling wagons. 2 underslung MSS.	1996
Second Freeway Extension Project, Bid 370 Tainan Interchange	B.E.S. Taipei	30m	12,0m	Rebar transport system (cage). Hydraulic motors, steering and adjustment / lifting. Max. span 45 m, max. transport load 35 tons. 2 units.	1996
Motorway Viaduct C374 Taiwan Area National Development Expressway	New Asia Construction & Development Corp., Taipei	2,5km	16,1m	MSS for freeway viaduct. Max. spans 50 m. Double and single box section, varying width. 3 int. formwork rolling wagons. 1 underslung and 1 overhead MSS.	1995
Motorway Viaduct E404 Taiwan Area National Expressway	Koukai Constr. Co., Taipei	4,0km	12,0m	MSS for freeway viaduct. Max. spans 42 m. Single box section, 2 int. formwork rolling wagons. 2 underslung MSS.	1994

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Bridge Construction Equipment

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Movable Scaffolding System (MSS) For Cast In Situ Bridges

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Country/Bridge Project	Client	Length	Width	Main Features	Delivery
GREECE					
Kristallopigi Crossing Ioannina – Igomenitsa	Michaniki S.A., Athens	1,4km	12,8m	Single box section. 1 underslung MSS, max. span 55m. 1 int. FW rolling wagon.	2000 / 2001
THE NETHERLANDS					
Utrechtboog	Bouwcombinatie Utrechtboog, Amsterdam	3,5km	10,0m	Solid cross section, railway bridge. 1 double span overhead MSS, max. span 2x50m. Hydraulic folding of formwork. Side shifting of MSS between bridges. Erection of "elevated spans".	2001
CZECH REPUBLIC					
Ringroad Olomouc D 202 & D 204	Dopravni Stavby Holding, Olomouc	1,5km	15,7m	Solid cross section, railway bridge. 1 underslung MSS, max. span 45m.	2001
VIETNAM					
Thu Thiem Bridge	General Co. Construction No. 1	45m	13,5m	Continuous Boxgirder bridge with max. span length of 45 m.+12.5 m. cantilever	2005
Red River (Thanh Tri) Bridge	Obayashi-Sumitomo JV	1,4km	16,1m	MSS. River crossing. Max. spans 50 m. Double box section. 2 underslung MSS	2003

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Bridge Construction Equipment

Reference List | NRS AS

"Bridgebuilder" For Free Cantilever Construction

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Bridge Project (Contractor)	No.	Type	Load Cap. Ton	Max. road width m	Max. box width m	Max. segm. length	Delivery Date
AUSTRALIA							
Lawrence Hargrave Drive Link (LHD Link Alliance)	4	IV-A12-51	260	13,41	6,0	5,045	2004
Gateway Bridge, Brisbane (VSL)	2	VI-A12-51 d/g	410	15,0-22,0	13,0	5,0	1981
EUROPE							
AUSTRIA							
Twimberg (Steiner)	2	IV-A12-51 e/f	250	16,0-18,0	10,0	5,0	1981
Arge, Suben (Mayreder, Züblin)	4	II-A12-51 c/e	165	12,0-16,0	6,0-7,5	5,0	1979
Eisentratten (Steiner)	1	II-A12-51 c/d	155	12,0-15,0	6,0-7,5	5,0	1979
Eisentratten (Steiner)	2	II-A12-51 c/d	155	12,0-15,0	6,0-7,5	5,0	1978
Wiener Reichsbrücke (ArgeJohan Nestroy)	4	III-A12-51 c/d	200	12,0-15,0	6,5-7,85	5,0	1978
Umfahr.Reutte (Innerebner & Mayer)	1	II-A12-51	155	12,0-14,0	6,5-7,5	5,0	1978
Kremsbrücke (Rella-Arge L23)	2	II-A12-51 c/d	155	12,0-14,0	6,5-7,5	5,0	1978
Bernbachbrücke (Rella-Arge P13)	2	II-A10-50 d/f	155	14,0-18,0	6,5-7,5	5,0	1977
BULGARIA							
Podkova-Makaza Bridge (Kiska)	2	II-A12-51 b	145	10,5	6,8	5,0	2004
Hemus Bridge (Ministry of Road & Transp.)	2	IV-B12-50 g/h	285	22,0	11,0	5,0	1990

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Bridge Construction Equipment

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"Bridgebuilder" For Free Cantilever Construction

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Bridge Project (Contractor)	No.	Type	Load Cap. Ton	Max. road width m	Max. box width m	Max. segm. length	Delivery Date
CZECHIA REPUBLIC							
Chumotov-Krimov Bridge (Max Bogl)	1	V-A12-50g	310	21,8	10,0	5,0	2006
Chumotov-Krimov Bridge (Max Bogl)	2	V-A12-50g	310	21,8	10,0	5,0	2005
ENGLAND							
Taw Bridge, (Edmund Nuttall Ltd)	4	II-A12-51	175	12,2	6,8	5,0	2005
New Redheug Bridge, England (Nuttal HMB)	4	II-B12-31 c/d	155	12,0-16,0	10,0	3,0	1981
Orwell River Bridge (Stevin)	4	III-A12-51 c/d	200	12,0-15,0	6,0-7,85	5,0	1980
FINLAND							
Norrströmmen Bridge (Lemminkäinen Oy)	2	II-A12-51 a/b	170	8,5-12,0	4,2	5,0	1985
GREECE							
Metsovo Bridge (Aktor SA)	8	IV-A12-51-c	260	13,45	7,0	5,0	2006
Bridge G3 Panagia (Ionios SA)	4	V-A12-50 c/d	300	13,7	7,6	5,0	2005
New Pefkis (Michaniki SA)	4	IV-A12-50	200	10,33	5,0	5,0	2004
Corinth Channel Railway (Michaniki SA)	4	IV-A12-50	260	12,2	6,6	5,0	2003
Votonossi Bridge (Michaniki SA)	4	IV-A12-50 d	250	13,5	7,0	5,0	2002
Polimilos, Gamma 10 (TEGK SA)	2	III-A12-50	200	13,5	7,8	5,0	2001
J/V Polimilos – Section A (Aegek SA + CIS)	4	III-A12-51 d	200	13,5	7,80	5,0	2001
Grevena, Egnatia (Alpha A.T.E.)	8	II-A12-5,15-1 c	144	12,5	6,0	5,15	2001
Crete Island (Ergokat S.A.)	2	II-A12-51	165	14,5		5,0	1999
Thissavros bridges (TEV S.A.)	2	II-A12-51 c	150	10,4	5,8	5,0	1995
Thissavros bridges (TEV S.A.)	2	II-A12-51 c	150	10,4	5,8	5,0	1993

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Bridge Construction Equipment

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"Bridgebuilder" For Free Cantilever Construction

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Bridge Project (Contractor)	No.	Type	Load Cap. Ton	Max. road width m	Max. box width m	Max. segm. length	Delivery Date
HOLLAND							
2nd Stichte Brug (Van Drunen)	2	III-B12-50 h	251	21,9	13,9	5,0	1996
Noorderbrug (H.B.G.)	2	IV-B13-51 i	225	27,0	17,0	5,0	1983
NORWAY							
Varodd bridge, Norway (AS Anlegg)	4	IV-A12-51 d	250	16,7	8,0	5,0	1993
Jernbeton A/S,	2	II-A11-51 a/b	155	6,0-11,3	4,0-5,4	5,0	1977
Gjerme & Hårklau	1	II-A10-50 b	155	11,3	5,4	5,0	1976
Dybvik A/S	2	II-A10-50 b	155	11,3	5,4	5,0	1976
Furuholmen A/S	2	II-A11-50 b	155	11,3	5,4	5,0	1976
Höganäs & Co. A/S	2	II-A10-51 a/b	155	6,5-10,0	4,5-5,0	5,0	1976
Dybvik A/S	2	I-rebuilt	130	10,0	5,4	4,0	1975
Selmer A/S	2	II-A0-38	155	10,0	5,4	5,0	1975
Eeg-Henriksen A/S	4	II-A0-38	155	10,0	5,4	5,0	1974
Eeg-Henriksen A/S	2	II-A0-27	155	10,0	5,4	5,0	1972
Dybvik A/S	2	II-A0-33	155	10,0	5,4	5,0	1972
Furuholmen A/S, Norway	2	I-A0-07	130	10,0	5,4	4,0	1970

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Bridge Construction Equipment

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Bridge Project (Contractor)	No.	Type	Load Cap. Ton	Max. road width m	Max. box width m	Max. segm. length	Delivery Date
SLOVENIA							
Crni Kal (SCT Slovenija)/ ISC)	6	IV-A12-51 c	225	12,5	6,0	5,0	2002
PORTUGAL							
Amieira (Zagope S.A.)	4 red.	III-A12-51 b	200	11,00	5,2	5,0	2000
Alqueva (Edifer S.A.)	8	II-A12-51 c	155	12,50	6,0	5,0	2000
Varosa-Balsemao (Engil)	4	III-A12-51 c	200	12,85	5,2	5,0	1995
Trancao bridge (Teixeira Duarte)	2	III-A12-51 b	200	12,0	6,0	5,0	1995
Regua bridge (Soares da Costa)	4	VIII-A12-50 i	530	25,7	12,0	5,0	1995
Regua bridge (Soares da Costa)	2	VI-A12-51 i	330	25,7	12,0	5,0	1995
Tamega bridge (Novopca)	4	III-A12-51 e	250	17,35	7,1	5,0	1994
Freixo bridge (Ferdouro)	4	III-A12-51 e	220	17,85	6,0	5,0	1994
Viaducto South Loures (Moniz da Maia/Somague)	6	III-A12-51 e	200	17,35	7,1	5,0	93/94
Freixo bridge (Ferdouro)	4	III-A12-51 e	220	17,85	6,0	5,0	1993
Tinhela bridge (Zagope)	2	III-A12-51 e	200	16,7	8,6	5,0	1993
Rio Minho Em Moncao bridge (Technopul)	2	III-A12-51 b/c	200	11,6	6,0	5,0	1991
Sado bridge (Construcoes Tecnicas)	4	II-A12-51 c/d	155	14,5	7,2	5,0	1991
Tejo-Pego bridge (Soares da Costa)	2	I-A12-40 b/c	100	10,6	6,05	4,0	1990
Arade River bridge (Conduril Constr.)	2	II-C12-40 e	155	17,0	1,7	4,0	1990
Tejo-Pego bridge (Soares da Costa)	4	II-A12-40 b/c	150	8,0	3,8	4,0	1990
Rio Minho bridge (Somague Cubiertas)	2	III-A12-50 c/d	200	12,8	7,0	5,0	1990
Guadiana River bridge (Teixeira-Hasa-Huarte)	4	II-C12-45 f	155	18,0	11,0	4,5	1989
Ribeira do Porto bridge (Zagope-Empresa Geral)	2	II-A12-4,25 e/f	135	17,85	7,0-7,6	4,25	1988
Arade River bridge (Conduril Constr. Duriense)	2	II-C12-40 e	155	17,0	1,7	4,0	1988
Fagilde bridge (Soares da Costa)	2	II-A12-51 d/e	155	14,0-16,0	8,0	5,0	1982

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Bridge Construction Equipment

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Bridge Project (Contractor)	No.	Type	Load Cap. Ton	Max. road width m	Max. box width m	Max. segm. length	Delivery Date
AFRICA							
ALGERIA							
Rhumel Bridge (E.N.G.O.A.)	4	II-A12-51 c	165	10,4	6,0	5,0	1995
ETHIOPIA							
Abay Bridge (Kajima / PSM)	4	II-A12-41 c	115	12	8,628	4,0	2006
MOROCCO							
Oum Er Rbia (Freyssinet)	4	I-A12-3.61 b	115	11,22	6,0	3,61	2004
AMERICA							
MEXICO							
Puente Tampico (Freyssinet)	2	II-A12-51 d/f	155	14,0-18,0	10,0	5,0	1982
Puente Coazacoalcos (Freyssinet)	2	II-A12-51 d/f	155	14,0-18,0	10,0	5,0	1981
Puente Tampico (Freyssinet)	2	II-A12-51 d/f	155	14,0-18,0	10,0	5,0	1981
Puente Coazacoalcos (Freyssinet)	6	II-A12-51 d/f	155	14,0-18,0	10,0	5,0	1981
Puente Tampico (Freyssinet)	2	II-A12-51 d/f	155	14,0-18,0	10,0	5,0	1980

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Bridge Construction Equipment

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Bridge Project (Contractor)	No.	Type	Load Cap. Ton	Max. road width m	Max. box width m	Max. segm. length	Delivery Date
SURINAME							
Suriname River (Ballast Nedam)	2	Segmental	100	10,0	5,6	3,0	1999
U.S.A.							
Colorado River Bridge (Obayashi – PS Mitsubishi JV)	2	III+-A12-80-0	180	14,0	6.096	7,931	2005
SR 182 Colombia River (Johnson Brothers)	2	V-A12-51 a	280	7,0-20,0	7,0-10,0	5,0	1982
West Seattle Freeway (Kiewit & Grace)	2	V-A12-51 a/e	285	7,0-16,0	7,0-10,0	5,0	1981
Gastineau River Bridge (Moseman)	2	IV-A12-51 c/d	250	12,0-15,0	6,0-7,5	5,0	1980
Columbia River Bridge	4	V-B13-51 d/g	360	15,0-22,0	6,5-8,0x2	5,0	1979
ASIA							
INDIA							
Thane Creek Bridge (UP State Bridge Corp.)	12	II-A12-51 b/c	155	12,35	6,5	5,0	1989
Bramaputra River Bridge (Hindu. Constr.)	4	11-A12-51 b/c	155	10,9-13,0	4,0-6,0	5,0	1982
IRAN							
Khordad Bridge (Technic Constr. Co.)	2	I-A12-4,6-1 d/e	200	15,50	7,5	4,6	2005
Dezfoul Bridge (Hamoon Constr. Co.)	4	III-A12-51 c/d	200	11,0	5,5	4,75	1992
Karaj River Bridge (Paradise Constr. Co.)	2	II-A12-51 c/d	155	12,0-15,0	5,5-7,0	5,0	1981
Karaj-Viaduct (Paradise Constr. Co.)	2	II-A12-51 c/d	155	12,0-15,0	5,5-7,0	5,0	1978

NRS
Bridge Construction Equipment

Reference List | NRS AS "Bridgebuilder" For Free Cantilever Construction

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Bridge Project (Contractor)	No.	Type	Load cap Ton	Max. road width m	Max. box width m	Max. segm. length	Delivery date
ISRAEL							
Railroad Bridge 1.1 (Solel Boneh)	2	III-A12-50 b	200	11,0	6,0	4,25	2004
Wadi Akbaral Bridge (Shapir Marine & Civil Eng.)	2	II-A12-45-0	150	13,7	5,5	4,50	1999
MALAYSIA							
Jalan Duta, KL (Persys Sdn. Bhd.)	1	Segmental	120	18,0	-	3,0	2005
Bridge 2 Over Jln. Kuching, KL (YTL)	2	III-B12-40 f	180	18.442	11,0	4,0	2004
Sd. Dungun, Terengganu (Strike Achievement S/B)	4	III-A12-50 c	200	15,4	8,0	5,0	2004
Lenggong Sauk, Perak (Hasrat Sedaya S/B)	4	II-A-12-4,75-0	150	13,75	7,0	4,75	2003
Batang Kayan Bridge,Sarawak (Twin Guard Holdgs)	4	III-A12-51 c	190	11,5	6,5	5,0	2002
Baram Bridge, Miri, Sarawak (BBR Constr. Sys S/B)	2	V+-A12-40 f	350	19,9	9,0	4,0	2002
Simpang Pulai-Gua Musang Pk3/1A (Latimer Corp.)	8	II-A12-40 b	100	10,0	4,5	4,0	2003
Sg. Kelantan Project (Concrete Empire S/B)	2	III-A12-50 c	200	11,8	5,5	5,0	2001
Package 3/2 Gua Musang (Twin Guard Holdings)	2	III-A12-50 C	200	11,80	5,5 – 6,4	5,0	2001
Package 3/2 Gua Musang (Twin Guard Holdings)	4	III-A12-50 C	200	11,80	5,5 – 6,4	5,0	2000
2nd Kuching Bridge	4	II-A-12-4,75-0	150	13,75	7,0	4,75	1999
Johore Bridge (PPC Malaysia)	4	II-A12-50 b	150	10,4	5,5	5,0	1991
Sungai Santubong Bridge (Shimizu Peremba)	2	I-A12-51 a/b	155	8,5-12,0	5,5	5,0	1987

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Bridge Construction Equipment

Reference List | NRS AS "Bridgebuilder" For Free Cantilever Construction

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Bridge Project (Contractor)	No.	Type	Load cap Ton	Max. road width m	Max. box width m	Max. segm. length	Delivery date
CHINA							
Sutong Bridge (MBEC)	8	VI-A12-50 e	380	16,4	7,5	5,0	2005
Yuanmo Bridge (Guangxi Highway & Bridge Eng.)	2	V-A12-50	300	22,5	11,5	5,0	2000
Beng Bu Bridge (Guangxi Highway & Bridge Eng.)	2	III-A12-50	200	11,0	5,0	5,0	2000
Tianjing Crossing (1st Municipal Highway Eng. Co.)	8	II-A12-50 d	136	13,50	6,80	5,0	2000
Khairabad bridge (Beijing 4th Municipal Eng. Co.)	4	III-A12-50 b	210	10,85	6,0	5,0	1994
SOUTH KOREA							
Nak-San Bridge (Sukwoo, Ltd.)	2	II-B-12-41-f	150	18,0	11,0	4,0	2000
Seo Hae Bridge (LG Construction)	6	III-A12-50	200	15,7	7,2	5,0	1998
Nuk Do (Lee Stronghold)	4	III+-A12-51 d	235	15,1	8,5	5,0	1996
Sang Dae (VSL Korea)	12	III-A12-50 c	200	14,3	8,0	5,0	1996
Shin-Mae (Lee Stronghold)	4	IV-B12-51 h	250	21,0	11,0	5,0	1996
Sam Ho Bridge (Lee Stronghold)	4	II-B12-30 e/f	150	17,5	10,0	3,0	1991
TAIWAN							
2nd Freeway Ext.Proj. BID 812-16 (Koukai)	6	VI-D12-50 k	350	35,4	28,0	5,0	1997
THSR section C230 (Hyundai – Chung Lin ZEN)	6	II-A12-40 c	150	13,0	6,0	4,0	2001
VIETNAM							
Non Nuoc Bridge (Vinaconex)	4	III-A12-50 b	200	11,70	6,50	5,0	2000
JAPAN							
Rittoh Bridge (PS Corporation)	2	IV-C-14-4,8-0	300	19,6	13,8	4,8	2002

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Bridge Construction Equipment

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"Bridgebuilder" For Free Cantilever Construction

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Bridge Project (Contractor)	No.	Type	Load Cap. Ton	Max. road width m	Max. box width m	Max. segm. length	Delivery Date
SLOVAKIA							
Lafranconi Bridge (Doprastav)	2	V-A12-51 c/d	300	15,0	8,4	5,0	1986
SPAIN							
Montabliz Bridge (Ferrovial SA)	2	VI-A12-50 d	450	15,7	11,903	5,0	2005
Montabliz Bridge (Ferrovial SA)	4	VI-A12-50 d	450	15,7	11,903	5,0	2004
Viaducto de los Peares (Huarte y Cia.)	2	II-A12-51 c	135	12,0	6,5	5,0	1991
Bac de Divi bridge, Grexa bridge (Sala Amat)	2	II-A12-51 c/d	155	12,0-15,0	6,0-7,5	5,0	1982
Barrios de'Luna (Aucalasa)	2	II-C12-41 g	155	22,5	14,5	4,1	1981
SWEDEN							
Hammarsundet bridge (NCC-Eeg-Henriksen)	2	IV-A12-50 d	250	13,0	7,5	5,0	1992
Igelstabron (NCC-Eeg-Henriksen-Aker)	4	III-A12-50 c	200	12,0	5,5	5,14	1992
SWITZERLAND							
Viadotto d'Biaschina (Züblin)	2	II-A12-51 c/d	155	12,0-14,0	6,5-7,5	5,0	1980
TURKEY							
Komürhan bridge (S. Türkes F. Akkaya)	2	III-A12-51 a/b	200	8,5-12,0	8,5	5,0	1983

NRS
Bridge Construction Equipment

NRS AS Bridgebuilder Type Legend

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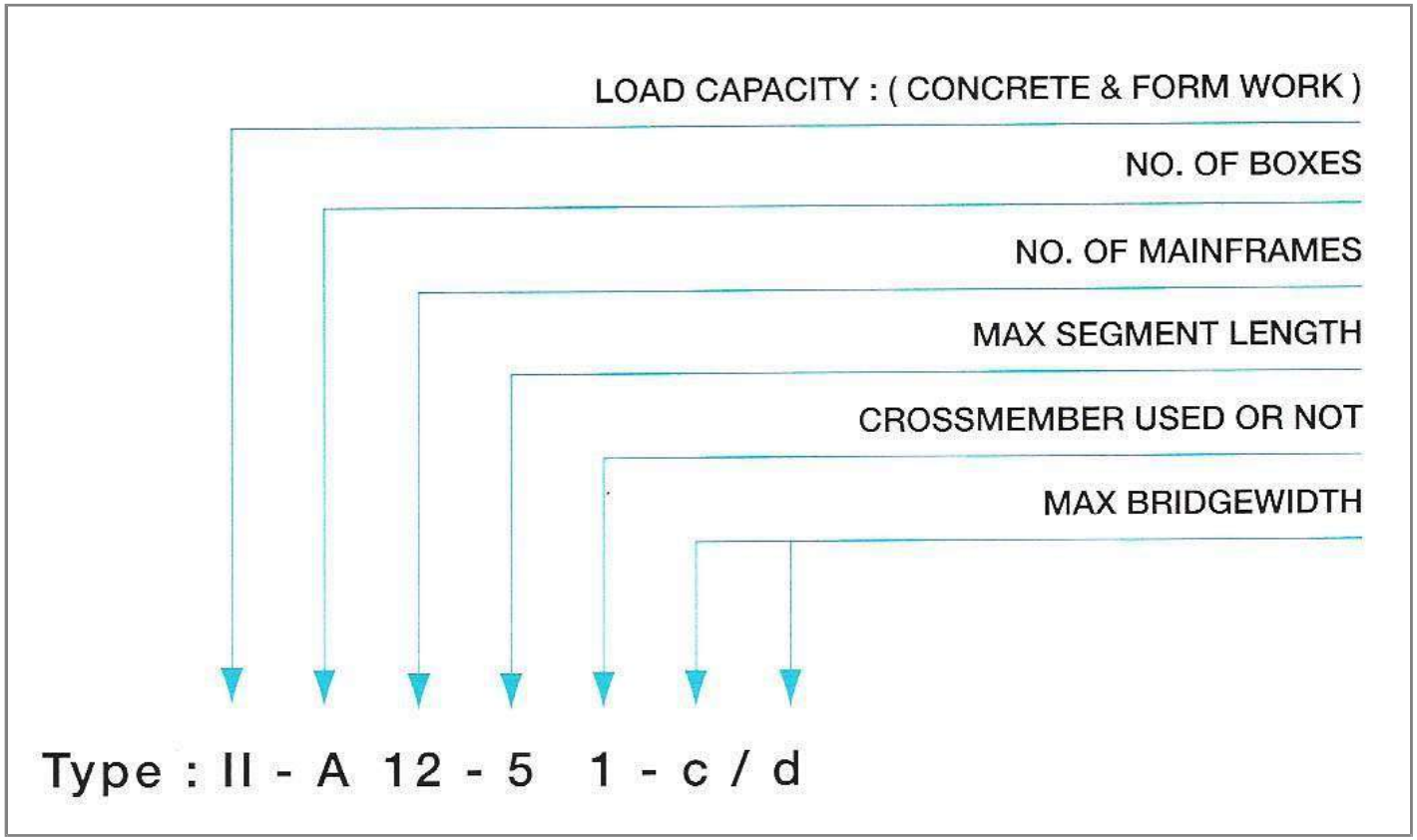

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Bridge Construction Equipment

NRS AS Bridgebuilder Type Legend

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Load Capacity

No.	I	II	III	IV	V	VI	VII	VIII	IX	X
tonns	100	155	200	250	300	400	500	600	700	800

Number of Boxes

No.	A	B	C
Number of boxes	1, single	2, twin	3, triple

Number of Mainframes

No.	12	13	14
No. of mainframes	2	3	4

Bridge Width

No.	a	b	c	d	e	f	g	h	i	j
width	8 - 9	10 - 11	12 - 13	14 - 15	16 - 17	18 - 19	20 - 22	23 - 26	27 - 29	30 - 32

NRS Bridge Construction Equipment

NRS AS Free Cantilever Bridges – World's Longest Spans

- Update 05.05.2006 -

No.	Project	Country	Span in m	Construction	Supplier
1	Stolmasundet bro	Norway	301	1998	NRS
2	Raftsundet, Lofoten	Norway	298	1998	NRS
3	Humen, Pearl River	China	270	1997	
4	Varodd bro, Kristiansand	Norway	260	1993	NRS
4b	Kristallopigi	Greece	260	2002	NRS
5	Gateway bridge, Brisbane	Australia	260	1986	NRS
6	Skye bridge	UK	250	1995	
7	Ponte San Joao , Porto	Portugal	250	1991	NRS
8	Talübvergang Schottwien	Austria	250	1989	
9	Northumberland Strait Crossing	Canada	250	1997	
10	Chevire Viaduct, Nantes	France	242	1991	
14	Norddalsfjord bro	Norway	231	1987	NRS
19	Stovset bro	Norway	220	1993	NRS

NRS Is represented in North America by:

JH3

JH3 Heavy Civil Equipment LLC
95 West Main Street Suite 5-151
Chester, NJ 07930 USA
Phone: 201-259-6614
Email: jhughes@jh3gear.com