I. Construction Innovation Forum • NOVA Award Nomination

Instructions

Step 1 Enter a Descriptive Name for the Process/Method/Technique you are nominating on line A of this page.

Step 2 Complete this page,
"I. Construction Innovation Forum • NOVA Award Nomination"

a. Be sure to provide original signatures in Section B and E on this page. Your nomination cannot be reviewed without them.
b. If you need additional space for names and addresses you may attach additional pages for names and address information. You may attach extra pages only for sheet I.

Step 3 "II - Innovation Description" — attach one (one only) 8-1/2" X 11" page that gives a succinct written description of the innovation. Put the name of the innovation at top of page. Tell us what you think is innovative about this. You should include:

- What the innovation is
- Why it is innovative
- What it changed or replaced
- Where and when it originated, has been used, and is expected to be used in the future
- If the nomination is for an innovative project, specifically identify its innovation.

Please type, with 1" margins, 10 characters per inch, 6 lines per inch.

Step 4 "III - Innovation Illustration" — attach one (one only) 8 1/2" X 11" page that contains one or more photographs, drawings, tables, graphs, clauses, etc., that visually describe the innovation. Do not submit more than one page of visuals. The jurors will see only one sheet for review. Put the name of the innovation at top of page.

Other You must submit 12 (twelve) sets of sheets I, II and III (a total of 36 pages).

Nominations are due September 15 mailed or delivered to:
The Construction Innovation Forum, 1000 Campus Drive, Suite 100, Ann Arbor, MI, USA 48104-6792. Phone: 313-995-1855. Fax: 313-995-5002

A. Name of Innovation: Channel Bridge System

B. Person(s) and /or Organization(s) Primarily Responsible for the Innovation (Those to whom the NOVA Award should be presented.)

Name: J. Muller International
Title:
Affiliation:
Address: 400 N. Michigan Ave., #1500
Chicago, IL 60611
Phone: (312) 670-2100
Signature: James D. Lockwood

(Signature(s) indicate acceptance of the nomination and consent to have CIF research and make presentations on the innovation for the purpose of jurying and publicizing awards.)

C. Other Primary Sources of Information on the Innovation: (in addition to the persons nominated above.)

Name:
Title:
Affiliation:
Address:
Phone:

D. Independent Reference(s) familiar with the use of the Innovation

Name: Peter Kissinger
Title: Director
Affiliation: HITEC
Address: 1015 15th Street, #600
Washington, DC 20005
Phone: (202) 842-0555

E. Person(s) making nomination:

Name: James D. Lockwood ✓
Title: Principal
Affiliation: J. Muller International
Address: 400 N. Michigan Ave., #1500
Chicago, IL 60611
Phone: (312) 670-2100 (chi) 212-626-6920 (NYC)
Signature: James D. Lockwood

(Signature(s) indicate familiarity with the the innovation and signify that information contained in the nomination is correct to the best of one's knowledge.)

CHANNEL BRIDGE SYSTEM

The Channel Bridge System is a precast, post-tensioned, segmental concrete bridge system specifically designed to address the needs of the overpass bridge market. The most innovative feature of the Channel Bridge System is the patented cross-section that consists of a thin deck supported from above by two longitudinal edge beams cast monolithically with the deck. The edge beams also serve as the traffic barriers.

To construct a Channel Bridge, a series of precast segments, approximately eight feet long, are cast utilizing match-cast technology. This is a method by which the previously cast segment is used as the bulkhead for the subsequently cast segment. This ensures a perfect fit during erection and facilitates accommodation of any type of vertical or horizontal alignment. After a segment is cast, the deck is transversely post-tensioned in the precast plant. Once all of the segments are cast, they are transported to the bridge site and placed on two parallel erection girders running adjacent to the edge beams. The segments are supported on rollers placed under the short wings cantilevering from the tops of the concrete edge beams. Typically all of the segments are set from one abutment and pulled into there final position. Once all of the segments are in place, longitudinal post-tensioning tendons are installed in both the slab and the two edge beams. Once these tendons are stressed, the bridge becomes self-supporting and the temporary erection girders can be removed.

There are currently thousands of overpass bridges in the United States classified as either structurally deficient or functionally obsolete. The Channel Bridge System developed by J. Muller International provides solutions to the following challenges now facing the overpass bridge market:

- low clearance beneath superstructure and high expense associated with raising approach grade
- bridge deck and supporting structure deterioration
- reduction of number of piers beneath bridge to increase traffic safety below
- high expense associated with painting steel and rehabilitation; and
- lengthy construction time required to replace or rehabilitate existing bridge.

The system is designed to compete with typical overpass bridges constructed using either steel girders or prestressed concrete AASHTO girders. Because the supporting edge beams are above the deck rather than below as with a conventional bridge, the Channel Bridge facilitates gaining the increased underclearance now required without having to raise the approach roadway grades.

In addition to the slender cross-section, the erection techniques used provide a major innovation to the overpass market. The speed and versatility associated with segmental erection techniques has been well established on large scale bridge projects worldwide. By developing a standardized segmental bridge system for overpass structures, this same speed and economy can now be realized on smaller bridge projects.

The Channel Bridge System was originally introduced through the French Highway Administration in 1990 on the Champfeuillet Bridge. To date, seven of these bridges have been completed in France. The first applications of the Channel Bridge System in the United States are the Route 17M and Carpenter Road bridges to be constructed for Region 8 of the New York State Department of Transportation. Route 17M consists of two spans of 105 feet on a very heavy skew of approximately 40 degrees. The Carpenter Road bridge will be a simple span of 87 feet with no skew. Both structures will be constructed in 1997.

Although the Channel Bridge System can be used for new construction, it is also particularly well-suited for replacement of existing overpass structures. The Channel Bridge System offers an innovative, versatile and economical solution to a large sector of the bridge market which has often been neglected when it comes to new technology.



HIGHWAY INNOVATIVE TECHNOLOGY EVALUATION CENTER

HITEC

Product Evaluation Bulletin

Bulletin 004-4 **Prepared: November 11, 1996**

Channel Bridge

Product Description

The Channel Bridge is a segmental concrete highway overpass system constructed using factory-cast, pre-stressed segments which are post-tensioned after installation.

Product Application

The Channel Bridge was developed for the French Highway Administration and to date seven bridges have been completed in France. It is being marketed in the U.S. primarily to replace existing short span bridges, but is suitable for new construction projects. Because of the bridge's shallow profile, it is more suitable than many conventional bridge systems where clearance is critical since the design provides increased clearance without modifying the approach grades.

Vendor Information

With offices worldwide, J. Muller International has been providing consulting services in the design and construction of pre-cast segmental and other types of bridges since 1987.

Contact: J.Muller International, 400 N. Michigan Avenue, Suite 1500, Chicago, IL, 60611; phone: (312) 670-2100; fax: (312) 670-2101

HITEC Evaluation Status

The two-phase Evaluation Plan called for a technical analysis of the bridge's design and performance history, and a full-scale field evaluation. With Phase I now complete, the evaluation will focus on the demonstration of the technology at two sites in New York state in 1997.

The Technical Evaluation Panel includes representation from New York State Thruway Authority (chair), Bayshore Concrete Products Corp., California DOT, Colorado DOT, Construction Technology Laboratories, FHWA, Florida DOT, GLF Corporation, New York DOT, North Carolina State University, Ohio DOT, Ontario Ministry of Transportation, and Texas DOT.

Report Plans

The Phase I Evaluation Report entitled, *Evaluation Findings: The Segmental Concrete Channel Bridge System,* was published in March 1996. To order a copy of the report contact ASCE Book Orders at (800)548-2723. The Phase II Evaluation Report will be completed in 1997.

HITEC is a service center of the Civil Engineering Research Foundation (CERF), the research affiliate of ASCE.

HITEC c/o CERF, 1015 15th Street, NW, Suite 600, Washington, DC 20005
Phone: (202) 842-0555 • Fax: (202) 789-5345 • email: hitec@cerf.asce.org

AWARD MANAGERS SUMMARY
Nomination 9717

CHANNEL BRIDGE SYSTEM

The Innovation

The Channel Bridge System is a precast, post-tensioned, segmental concrete bridge system specifically designed to address the needs of the highway overpass bridge market. The unique feature of the Channel Bridge System is the patented cross-section which consists of a monolithically cast thin roadway deck and two supporting edge beams. The deck is supported from above along its outside edges by the two edge beams which also serve as the traffic barriers for the completed structure. This arrangement creates a channel shaped cross section, from which the system takes its name.

Each bridge is made from a series of approximately eight foot long precast segments that have a width equal to the roadway and edge beams. These segments are cast in a plant and use match-cast technology, a method by which the segment that is cast first is used as a form bulkhead for a subsequently cast segment. Match casting ensures a perfect fit during erection and facilitates vertical or horizontal alignments. After a segment is cast in the casting plant, the deck is transversely post-tensioned. It is then moved to a storage yard to await transportation to the bridge site.

At the bridge site, two parallel erection girders that are to receive the precast segments are positioned with a distance between them that is somewhat greater than the width of a bridge segment. Each bridge segment has short wings cantilevering from the tops of their concrete edge beams, and when they arrive at the bridge site, they are placed on the two previously positioned parallel erection girders. Rollers are placed between the bottums of the short wings and the tops of the erection girders to allow the segments to be positioned. Typically, all of the segments for a bridge are set from one abutment and pulled into their final positions. Then longitudinal post-tensioning tendons are installed in both the slab and the two edge beams. After these tendons are stressed, the bridge becomes self-supporting and the temporary erection girders are removed.

Background

Segmental bridge systems were developed by Jean Muller in the 1960s. These systems were designed and used for relatively large, one-of-a-kind bridges. They were expensive and there was a limited market for them. The Channel Bridge System was conceived by Mr. Muller as a way to introduce this segmental bridge technology into the highway overpass bridge market. It was reasoned that since the speed and

versatility associated with segmental erection techniques is well established for large-scale bridge projects, the same speed and economy can now be realized by developing a standardized segmental bridge system for smaller overpass bridge structures,

The Channel Bridge System was originally introduced through the French Highway Administration in 1990 with the construction of the Champfeuillet Bridge. To date, seven of these overpass bridges have been completed in France.

There are currently thousands of overpass bridges in the United States classified as either structurally deficient or functionally obsolete. The Channel Bridge System developed by J. Muller International, Jean Muller's company, has the potential to provide solutions to the challenges of this large US market. J. Muller International holds the US patents on the system.

Application

The first two applications of the Channel Bridge System in the United States are the Route 17M bridge and Carpenter Road bridge that are to be constructed for Region 8 of the New York State Department of Transportation. These two new Channel Bridges are located in the mid-Hudson valley, about 60 to 80 miles north of New York City. The Route 17M bridge will consist of two spans of 105 feet each with a very heavy skew of approximately 40 degrees. The Carpenter Road bridge will be a simple span of 87 feet with no skew.

These bridges are being let as one project during the week of December 16-20, 1996. Construction can start about 45 days later or about the beginning of February, 1997. Both bridges are reasonably close together and are experimental, so they can be considered as one project by NYDOT, in contrast to the usual practice which would require each bridge to be bid as a separate project. The two bridges are being built under an Applied Research Technology Grant received by J. Muller International.

The Channel Bridge System competes with typical overpass bridge construction which uses either steel girders or prestressed concrete AASHTO girders. Because the supporting edge beams are above the deck rather than below as with a conventional bridge, the Channel Bridge provides the increased underclearance often required without having to raise the approach roadway grades.

On highway bridges, the underclearance can be raised by about two or three feet to accommodate larger trucks and their loads. On railroad bridges, the increased underclearance permits the railroad to use the new type of large rail cars, and on bridges across waterways, it allows the newer and larger vessels to pass underneath. All these advantages can be realized with minimal adjustment of the approach grades.

Additional advantages claimed for the Channel Bridge include:

A decrease in construction time.
A decrease in traffic interruption during construction.
A reduction in the number of piers beneath the bridge to increase traffic safety.

In the USA and Canada, regional precasting plants are to be licensed to cast the Channel Bridge segments. It is expected that a bridge contractor will competitively bid for a bridge project that specifies the use of the Channel Bridge technology. The winning contractor can then buy the bridge from the precaster. To keep costs down, J. Muller International provides casting equipment and technical support to the licensed precasting company. J. Muller also provides the erection beams and specialized equipment used on the job site.

Notes on Nominated persons

In the nomination the organization named as responsible for the Channel Bridge is J. Muller International of Chicago, Illinois. Mr. Jean Muller is the inventor of the Channel Bridge System, and he and Mr. James D. Lockwood are principals in the company. The company also has an office in New York.

Opinions of Outside persons

The Channel Bridge System has been evaluated by the Highway Innovation Technology Evaluation Center (HITEC) which is a service center of the Civil Engineering Research Foundation (CERF). HITEC evaluates new technologies in civil engineering. They have produced a favorable report that analyzes the System's design and performance history. This was done by a volunteer panel of outside engineers, many of which were from Departments of Transportation. This is the first of two reports that are planned. The second report will analyze the technology from a field and economic perspective. It will be prepared after the results of the two experimental bridges to be built in New York are received.

Award Managers Comments

It should be noted that the Channel Bridge has a limited application history and that it is still in the experimental stages of development.

SELECTED INTERVIEW SUMMARIES
Nomination 9717

James D. Lockwood, Principal
J. Muller International
Chicago, Illinois
Phone interview by RB Harris on 10/29/96

Mr. Lockwood says that he believes the most innovative thing about the Channel Bridge System is the transfer of technology from large segmental bridges to small bridges. The segmental systems were conceived in the 1960s by Jean Muller for long bridges. They were expensive, one of a kind structures, and there was a small market for the technology. Mr. Muller wanted to adopt the technology to a market which needs many, small bridges as represented by the replacement of overpass structures.

The Channel Bridge System uses segmental technology and increases the underclearance significantly when used for overpass structures. The underclearance can be easily increased from 14'-6" to about 17"-0". This increase in underclearance is achieved without raising the approach grades. This saves large costs.

The system is designed so that the edge beam is also the traffic barrier, and if the edge beam is "knocked out" the bridge would not fail. The cross section is designed to act as a diaphram under these conditions.

Another real advantage of the system is its rapid installation. For a typical highway overpass, replacement time can be shortened from about 12 months to about 3 1/2 months. The segmental deck can be installed in about one week.

J. Muller holds the patents on the system. In the USA and Canada, there are certain regional precasting plants that are licensed. A contractor actually buys the bridge from the precaster. To keep costs down, Muller provides equipment and technical support to the licensee precasting company. They also provide the erection beams to be used on the job.

Muller has received an Applied Research Technology Grant and this allows the New York DOT to be the first to use the technology in the USA. It will be used for two bridges. The contracts are to be awarded on December 12, 1996. There have been seven bridges built in France. Mr. Lockwood has been involved in all of them.

Mr. Lockwood will have Mr. Jean Muller call me either Thursday pm, October 31, or Friday. I can then ask him any questions I might have.

Mr. Lockwood will send me a package of information and some names of users that I might contact.

Peter Kissinger, Director
Highway Innovation Technology Center (HITEC)
Washington, DC
Phone interview by RB Harris on 12/02/96

Mr. Peter Kissinger is Director, HITEC in Washington, DC. HITEC (Highway Innovation Technology Evaluation Center) is a service center of the Civil Engineering Research Foundation (CERF).

Kissinger says that the Center evaluates new technologies Among these is the Channel Bridge System. They have produced a report on the evaluation of the System from a design point of view and an analysis of its performance history. They brought together a volunteer panel of outside people, many of which were from Departments of Transportation, to make the analysis. This is the first of two reports that are planned. The second report will analize the technology from the field. There are two bridges planned in New York to serve to prrovide the needed information. Kissinger will send a copy of the report.

The HITEC is set up to not only provide information about new technoologies but to serve the potential user, generally the state DOTs.

When asked about the economics of the system, Kissinger said that this is to come out of the field analysis. The panel had raised some questions about it.

Kissinger says that he feels the main advantage of the Channel Bridge System is that it eliminates girders below the slab by using the parapets for support. This allows for increasing the underclearance without raising the approach grades. this saves much in both time and cost.

Kissinger says that Kathleen Almond in his office was the Project Manager for this project. If there are further questions, please call her.

Jim O'Connell, Chief Bridge Engineer
New York Department of Transportation (NYDOT)
Albany, New York
Phone interview by RB Harris on 12/13/96

Mr. Jim O'Connell is Chief Bridge Engineer for the New York Department of Transportation in Albany, NY.

O'Connell says that the two new Channel Bridges are located in the mid-Hudson valley, about 60 to 80 miles north of New York City. These bridges are being let as one project next week. (the week of December 16-20, 1996) Construction can start about 45 days later or about the beginning of February, 1997. The bridges are reasonably close together and are experimental, so they can be considered one project in contrast to usual practice which would have required two projects.

When asked about economic trade-offs, O'Connell said that there will be an evaluation of this when these bridges are built. The up-front costs are considerably more than conventional construction, but it is hoped that they can be reduced in the future, if the precaster can cast additional bridges with the forms acquired for these two structures. The new bridges are in highly populated areas and there is a real advantage in not having the bridges out of service for very long.

There are three areas of advantage to the Channel Bridge System. One is that there is the possibility of an increased underclearance on highway bridges. Raising the underclearance from 14 to 16 feet, for example. Another advantage that O'Connell sees is that underclearance can be raised for railroad traffic. This would allow for the use of the new type of rail cars. The third possible advantage is that the Channel Bridge can increase the underclearance for barge canals. All these appear economical because the crossing grades do not need to be raised as much as would be the case if conventional replacement bridges were used.

The two new bridges are being fabricated by one supplier in the area. O'Connell doesn't know who that is until the letting. It is clear that supplier will have to compete on a cost basis in the future if the new technology becomes accepted.

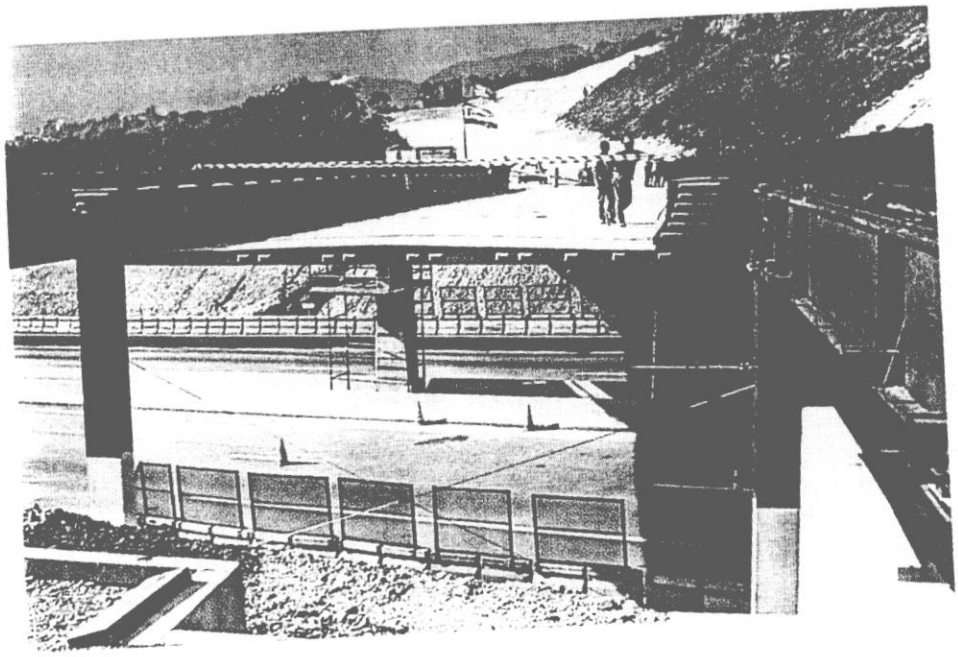
O'Connell says that the Channel Bridge System gave NYDOT an opportunity to use a new product for some special situations. He says that the benefit to them is the speed of construction, especially the short shut-down of traffic in the populous area and the non-interruption of the traffic with lane closures, etc.

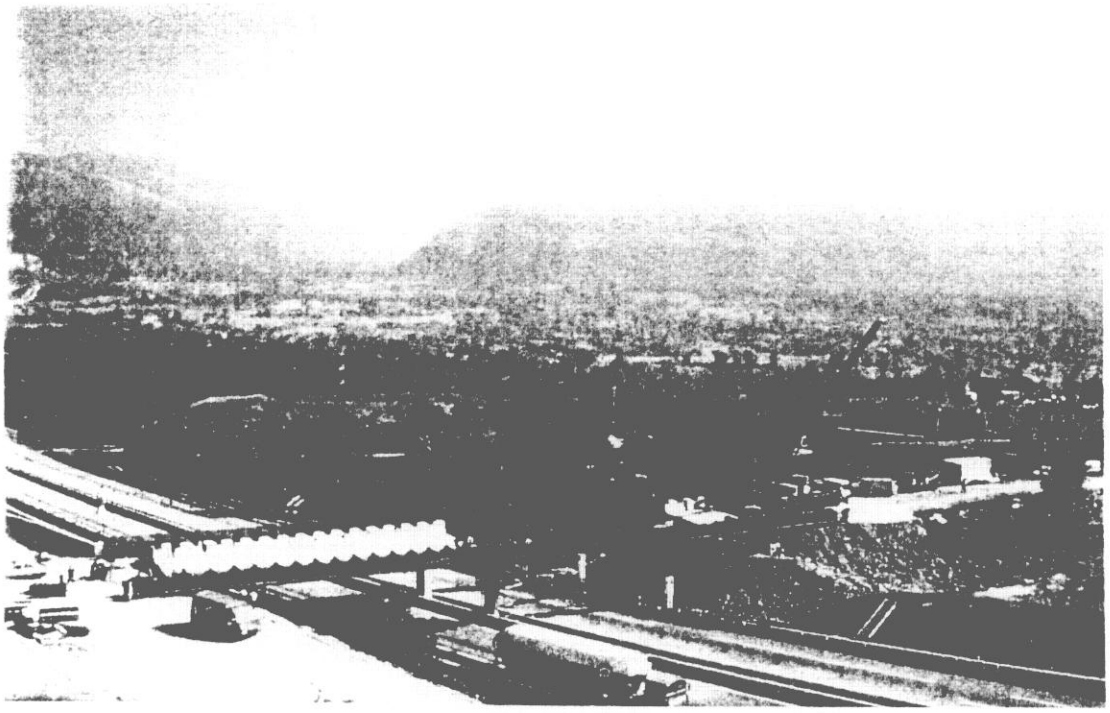
EXHIBITS
Nomination 9717

1. Picture of Champfeuillet Bridge in France. This is the first Channel Bridge erected.

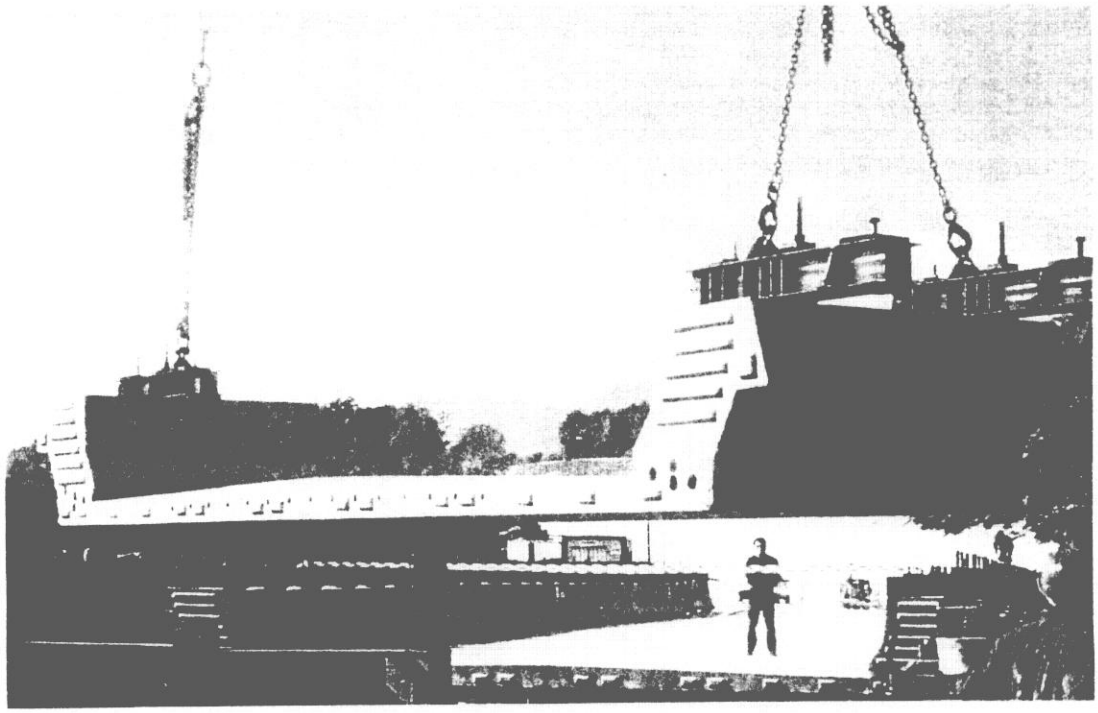
2. Technical Evaluation Summary of the Channel Bridge System by HITEC.

EXHIBIT 1





Segments are placed sequentially on erection beams with no disruption to traffic.



View of precast Channel Bridge segment being placed on erection beams.