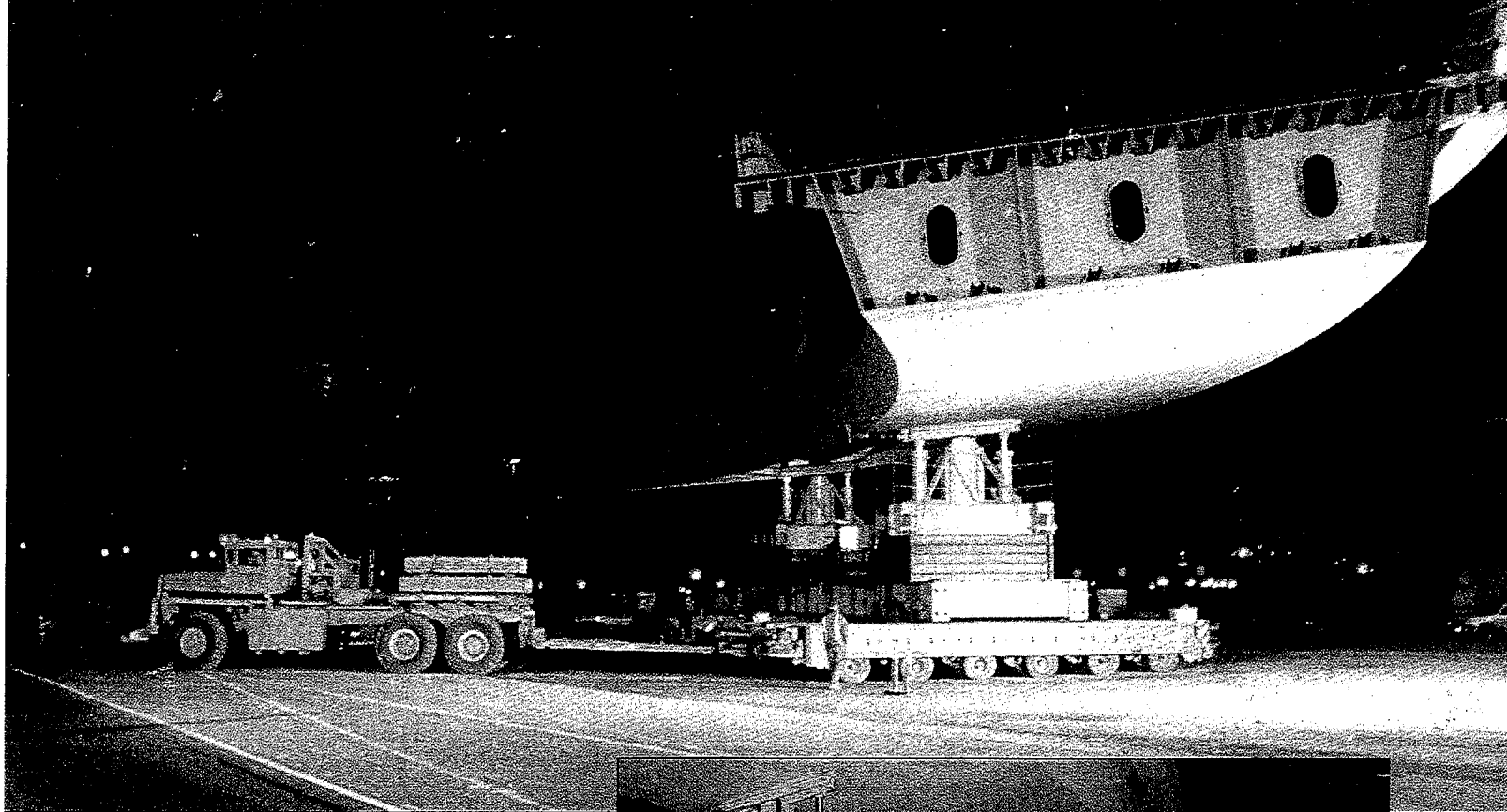


# Lifting & Transportation

JUNE 1997 INTERNATIONAL

## SHAUGHNESSY & CO.

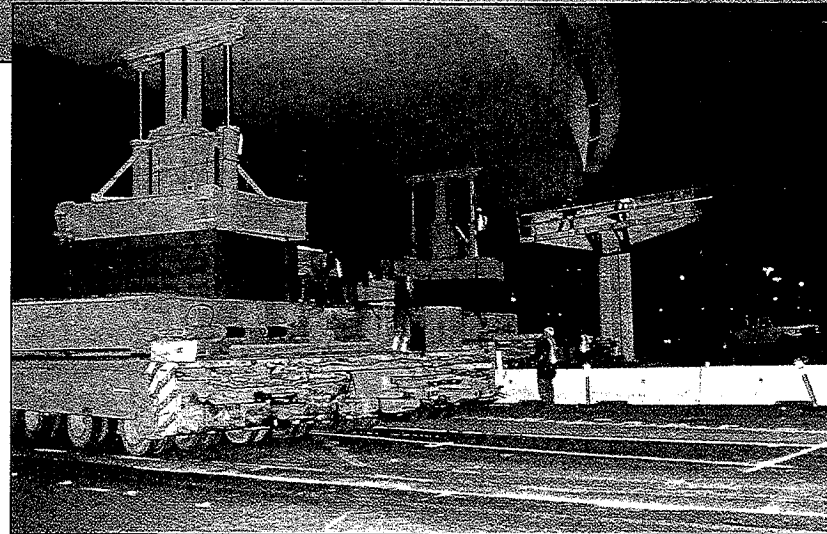
### SC&RA'S JOB OF THE YEAR WINNER



▲ The Gizmo, rolling on 24 lines of Scheuerle hydraulic trailers assembled into two six-line, four-file platforms, carries a girder into position on an overpass in the dead of night.

ing procedures was 6 hours, well under the 10-hour maximum. Unfortunately, "When you're faced with a \$36,000-per-hour penalty, all you get for getting done early is a lot of 'atta-boys,'" notes project manager Murphy.

In the end, says Murphy, all 6,500 tons of girders were delivered and installed ahead of schedule--with zero injuries or accidents. •



▲ Ironworkers prepare to secure bolts on piers as the Gizmo rolls girder into position at the necessary orientation.



### SEVEN TIME WINNER OF THE SC&RA'S OUTSTANDING RIGGING AND HAULING JOBS

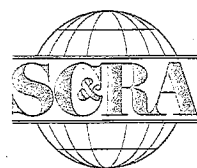


- |                               |                              |
|-------------------------------|------------------------------|
| 1996 Rigging Job of the Year  | 1985 Rigging Job of the Year |
| 1994 Rigging Job of the Year* | 1982 Rigging Job of the Year |
| 1994 Hauling Job of the Year* | 1976 Rigging Job of the Year |
| 1988 Rigging Job of the Year  | * Winner of two awards       |



## SHAUGHNESSY & CO.

A DIVISION OF THE BIGGE CORPORATION



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# Shaughnessy Dodges Traffic to Erect Mammoth Girders

*Installing the largest bridge girders ever ordered by CalTrans called for innovative equipment, minute-by-minute planning — and a willingness to risk a hefty penalty for a “traffic violation.”*

Imagine transporting 13 huge bridge girders — with dimensions up to 200 feet long by 57 feet wide, and weighing almost 500 tons each — from Vancouver, Wash., to the Oakland approach to the San Francisco Bay Bridge. That's the easy part. Then you have to place each girder onto 29-foot piers over seven of the busiest, most impatient lanes of traffic in the world.

If that hasn't raised your blood pressure, this will: Add a penalty of \$36,000 per hour for exceeding a 10-hour window for placing those girders. And there you have the challenge that Auburn, Wash., based Shaughnessy & Co. was willing to take on.

Construction contractors Kiewit and Marmolejo originally planned to erect the bridge girders with cranes. The more they looked into the task, however, the more they realized they had a tiger by the tail. Among the knottiest problems was how to attach to the girders for lifting. Any modification to the girders, such as attaching lifting lugs, would require a complete design review before fabrication could begin.

A Shaughnessy team led by Heavy Haul Manager Bob Murphy conceived and presented a creative plan for tackling the installation problems. The proposal involved designing an innovative transporter to carry the girders from a staging area into position, and tweak the alignment from underneath to allow the splice plates, with their 2000-plus bolts, to be precisely lined up. Kiewit was sold on the proposal, and awarded Shaughnessy a contract that included responsibility for the transport of the girders from the fabrication facilities at Vancouver, Wash., to final position on the piers, including barging and sea fastening.

## Football Field Barge

The bridge girders were the largest prefabricated sections that the California Department of Transportation (CalTrans) had ever specified. The first five girders make up a 250-foot radius horseshoe-shaped overpass spanning 14 lanes of traffic. The girders have a

built-in grade of six percent and a 12 percent side slope. The girders varied in length from 130 feet to a maximum length of almost 200 feet.

Although each girder was 37 feet across, their curvature added another 20 feet, effectively making them 57 feet wide. The curvature and length combined to move the center of gravity to the outside edge of the bottom flange, which complicated handling significantly. With such large dimensions, the 13 girders took up a lot of real estate — not to mention barge space.

Three barge trips were conducted using one of the largest barges available in the U.S. — a 400-foot long by 100-foot wide behemoth with a deck large enough to play regulation football. Even with all this space, the second of two barge trips required one of the five girders to hang over the end of the barge by 30 feet. Specially designed supports and restraints were required.

The loadouts from the girder manufacturing site, on the Columbia River across from Portland, Ore, began shortly after Thanksgiving, 1995. When the barge arrived, the Columbia River water level was eight feet below the dock.

In preparation for loading, the barge was ballasted until the deck would be two feet above the dock level based on the predicted river water level for the following morning. While the barge was being ballasted, the first girder was loaded on a 20-line Scheuerle platform trailer and a transition ramp was set up.

However, heavy rain during the night turned to a downpour, and project workers were greeted the next morning by a barge two feet higher than expected. When the last girder went aboard, the water level was over the dock and less than three feet of barge freeboard remained. With the welding progressing in the downpour, preparations began for departure. The crew completed the tie-down and deballasting in time to depart just before the river was officially shut down to commercial traffic because of high water, the first time in recent history.

## Enter the 'Gizmo'

The offload of the girders at Oakland was accomplished using a 20-line, two-file Scheuerle hydraulic trailer with a custom-designed spacer frame. The frame between the axles distributed the load over a wider path on the dock to meet structural requirements.

The offload had to be completed over a weekend, because the barge stern blocked boat traffic, and because the move had to cross over an active off-ramp

railroad line. Extremely tight quarters between light towers, power poles and structures made the offload an adventure.

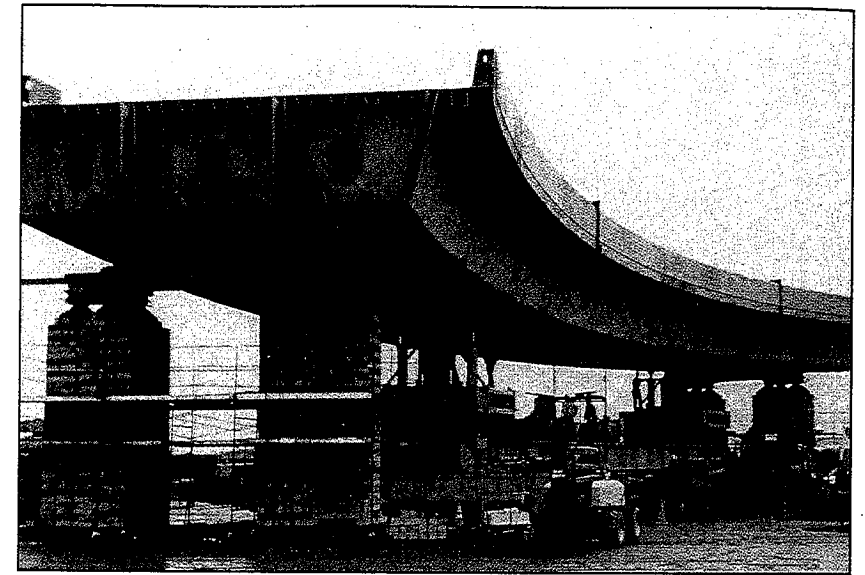
The girders were set on temporary blocking in a staging area. Careful planning went into the offload sequence and staging locations, since the girders could not pass each other once they were offloaded into the staging area.

The final transport vehicle for the girders, dubbed the 'Gizmo' for lack of a more scientific term, consisted of 24 lines of Scheuerle hydraulic trailers assembled into two six-line, four-file platforms. An adjustable frame with two hydraulic support towers was mounted on hydraulic powered sliding turntables. The various motions that the Gizmo was capable of making allowed the girder to be moved on six axes.

Two-thirds of the transport frame was made up of recycled components from other projects, while the remaining third, notably the lift cylinders and towers, were new components.

To give fine control of the fore and aft motion of the platform trailers and eliminate jerking of the equipment as the prime movers shifted from forward to reverse, hydraulic telescoping drawbars were designed and fabricated. These drawbars proved invaluable in making smooth adjustments for lining up the boltholes. If the ironworkers wanted a 1/16 of an inch they got it in one smooth move.

As luck would have it, the first three girders to be placed were the longest and heaviest of the baker's dozen. In order to test the Gizmo and provide everyone with experience in handling the equipment — and to smooth out any kinks in the traffic control plan — the Shaughnessy team planned and executed a dry run, timed on a minute-by-minute schedule. The test went significantly better than state officials, there to oversee the project, expected, and had far less impact on traffic than feared.



▲ One of 13 massive bridge girders is raised up on cribbing to allow the Shaughnessy 'Gizmo' to move underneath.

The next step was to load the first girder on the transporter, which involved jacking the girder up from the four-foot carrying height at which it had been staged to the 16-foot clearance required for the Gizmo. For this operation, 12 of our 50-ton stepping jacks were mounted on two beams with three jacks in each corner. Once the girder was jacked up, the Gizmo was maneuvered under the girder and positioned at the calculated center of gravity location. The girder was then lifted and tilted to the appropriate side slope of up to 12 percent.

During the tilting operation, the center of gravity shifted as much as 10 inches, and was taken into account when selecting the location of the transporter. Pressure readings were taken to verify the correct positioning.

With a girder loaded, it was finally time to move the girder into position. The setting of the first three girders required closures of various approaches to the San Francisco Bay Bridge, which could only take place in a 10-hour window, starting at midnight on a Saturday night. A \$600 per minute penalty was stipulated for exceeding the time limit.

## Cameras Rolling

With several news cameras rolling to capture the action, the first Gizmo-mounted girder swung onto the freeway, following paths which were laid out on the roadway. Despite the rain, the work was completed one hour before the freeway closure window expired.

The second and third girders connected to the previous girder by way of some 2,000 bolts, 25 percent of which had to be torqued before the Gizmo could be released. With traffic stopped and diverted onto ramps and frontage roads, the girders were moved onto the roadway and into final position on successive weekends.

Each girder was brought to within a few inches of its final location on the support pier using eyesight. The surveyors then began calling out offsets as Gizmo's six degrees of hydraulic-activated controls were utilized to align the bolt holes and set the other end for station and grade. All holes had to be lined up before the first bolt could be secured.

In less than two hours from the start of the operation, the bolting process began and was completed in another three hours. Total time for the girder placement and bolt-