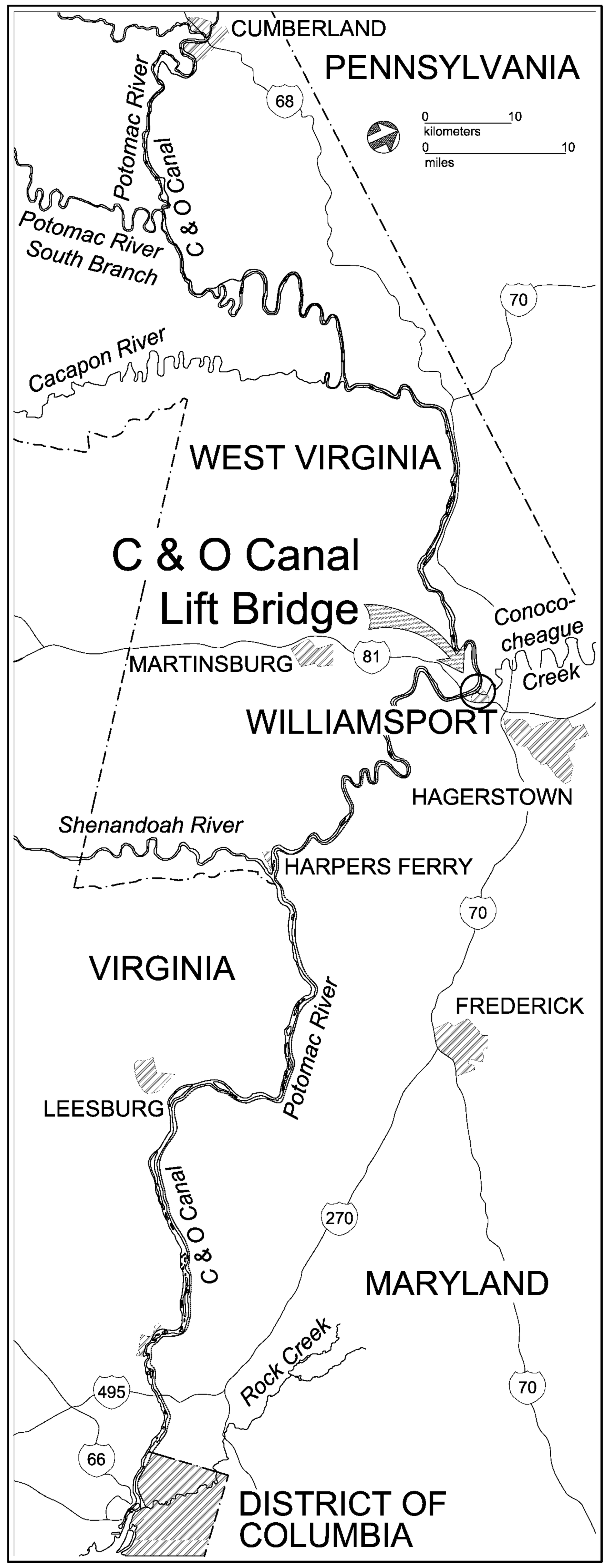
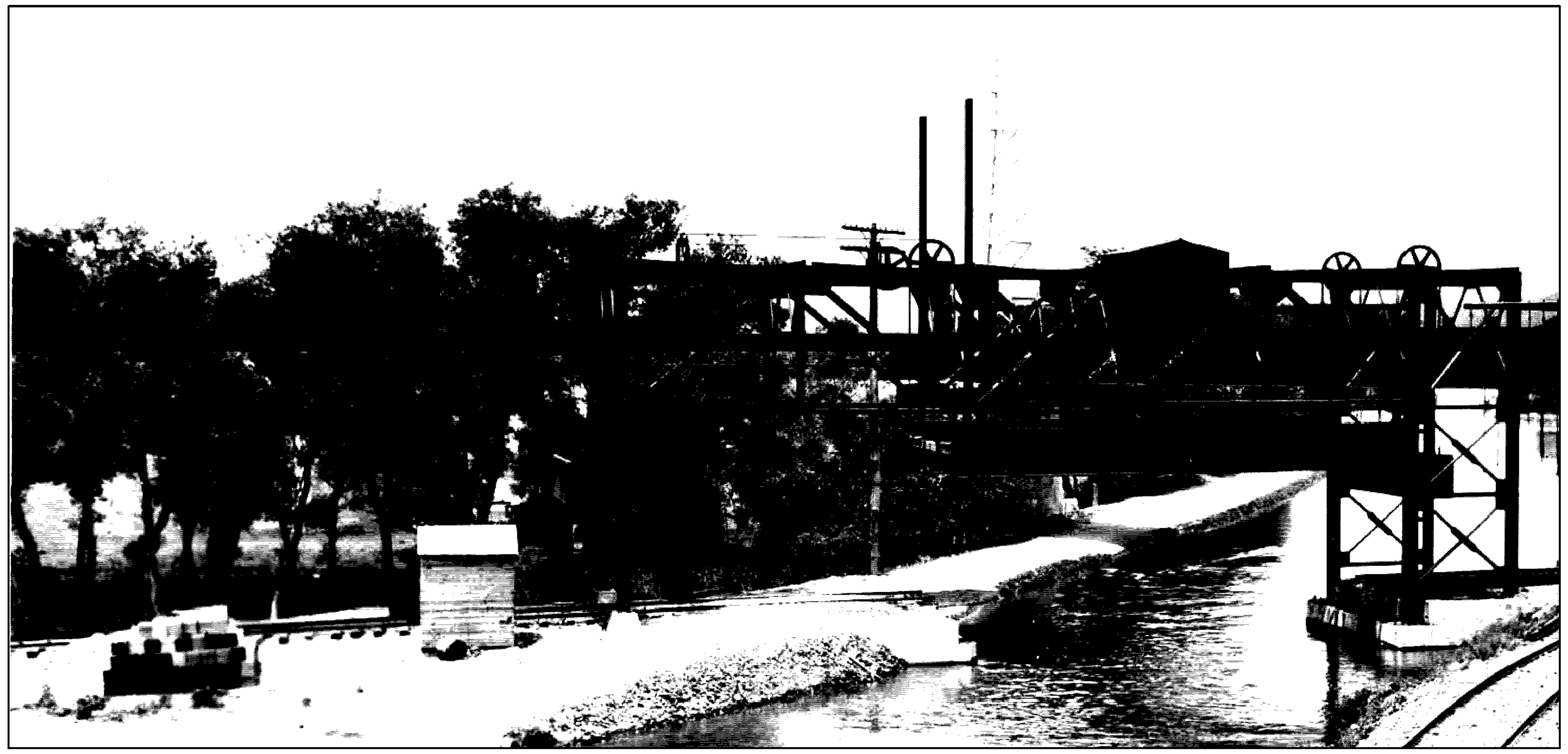
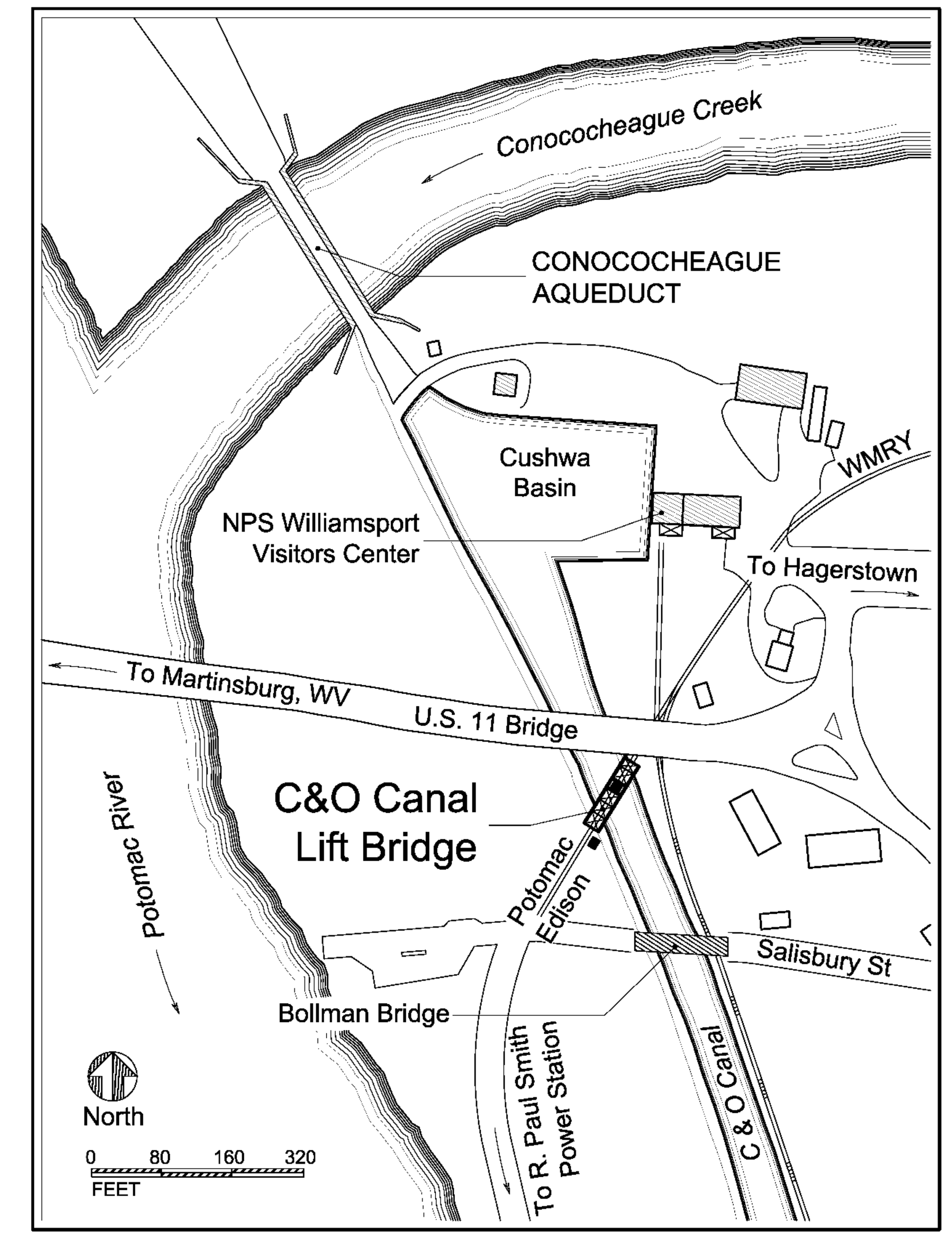
POTOMAC EDISON COMPANY
C & O CANAL LIFT BRIDGE
Williamsport, Maryland 1923





C & O Canal Lift Bridge shown in open position ca. 1924. (Image provided by Chesapeake and Ohio Canal National Historical Park)



The Chesapeake and Ohio Canal Lift Bridge is a small, steel, vertical-lift bridge designed and built to carry a single, standard-gauge railroad track across the canal.The bridge itself is a single, riveted, plate-girder span that rests on concrete abutments. The overhead structure containing the lift mechanism is a simply supported Warren truss.

In 1923, the Potomac Edison Company began building a new coal-fired power station alongside the Potomac River in Williamsport, Maryland. Coal for this plant would arrive via the Western Maryland Railway, but it was necessary to build a spur track to the power station.

That track had to cross the Chesapeake and Ohio Canal, which was still being navigated by animal-drawn canal boats, and that navigation could not be interrupted.

The solution was for Potomac Edison to build a unique lift bridge that could carry its coal traffic across the narrow canal and provide clearance for the canal boats, as well as for their towlines to mules walking the towpath. Working with the railway, power company, and canal, Sanderson & Porter Engineers designed a very basic movable bridge that satisfied the needs of all three in an economical manner. Company records indicate the bridge's total cost to have been only $19,800.

With major components fabricated by the New York Central Iron Works in nearby Hagerstown, the bridge was erected quickly and opened in 1923. Its most unique feature was how the overhead truss guided the south end of the movable span during lifts. The locations of guide columns and rollers were inverted from the usual practice, which was followed on the north end, to eliminate any obstruction between the towpath and canal. The overhead truss spanned both the canal and towpath.

Unlike many bridges that cross waterways at an angle, this bridge was not skewed. Building it with a rectangular plan instead of in a parallelogram form saved money, and the narrow canal boats allowed for this with a span of only 40 feet.

Ironically, the Potomac River flooded before the 1924 navigation season could begin, and widespread damage to the canal made repair and reopening impractical. Thus, the bridge, built to satisfy the canal's unusual requirements, rarely opened. It was raised to put the machinery house above the waters of two later floods, but no opening for a canal boat is known. While the bridge's electrical gear and wiring was later removed - likely during World War II - its structure has remained intact, and the bridge remained in rail service until the power plant switched to truck deliveries in 1970.

The C&O Canal Bridge is a rare surviving example of a small, movable bridge built at very low cost. It may lack the aesthetic grace of many larger vertical-lift bridges - structures not generally known for fine lines anyway - but it does possess a certain engineering elegance.

Everything about it is purely utilitarian, without the addition of any decorative elements. Its riveted structure and simple machinery well represent standard engineering and fabrication practices of the era using common materials and structural shapes. The design itself is efficient, meaning that it uses relatively little steel to carry its weight and that of the coal trains, even with the long overhead truss needed for towline clearance.

Recording of the C & O Canal Bridge was completed during 2007-2008 by the Historic American Engineering Record (HAER) for the Chesapeake and Ohio Canal National Historic Park (CHOH, Kevin Brandt, Superintendent). It was conducted under the general direction of Richard O'Connor, Chief, Historic Documentation Programs. Christopher Marston, HAER Architect, supervised the project. The recording team consisted of HAER Architects Marston, Dana Lockett and Anne E. Kidd; HAER Photographers Jet Lowe and Renee Bieretz; and HAER Engineer-Historian J. Lawrence Lee. CHOH Historian Sam Tamburro coordinated the project.

DELINEATED BY: CHRISTOPHER H. MARSTON, ANNE E. KIDD, 2007

WILLIAMSPORT LIFT BRIDGE RECORDING PROJECT
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

POTOMAC EDISON COMPANY, CHESAPEAKE & OHIO CANAL LIFT BRIDGE
SPANNING C & O CANAL SOUTH OF U.S. 11
WILLIAMSPORT WASHINGTON MARYLAND

SHEET 1 OF 10

HISTORIC AMERICAN ENGINEERING RECORD
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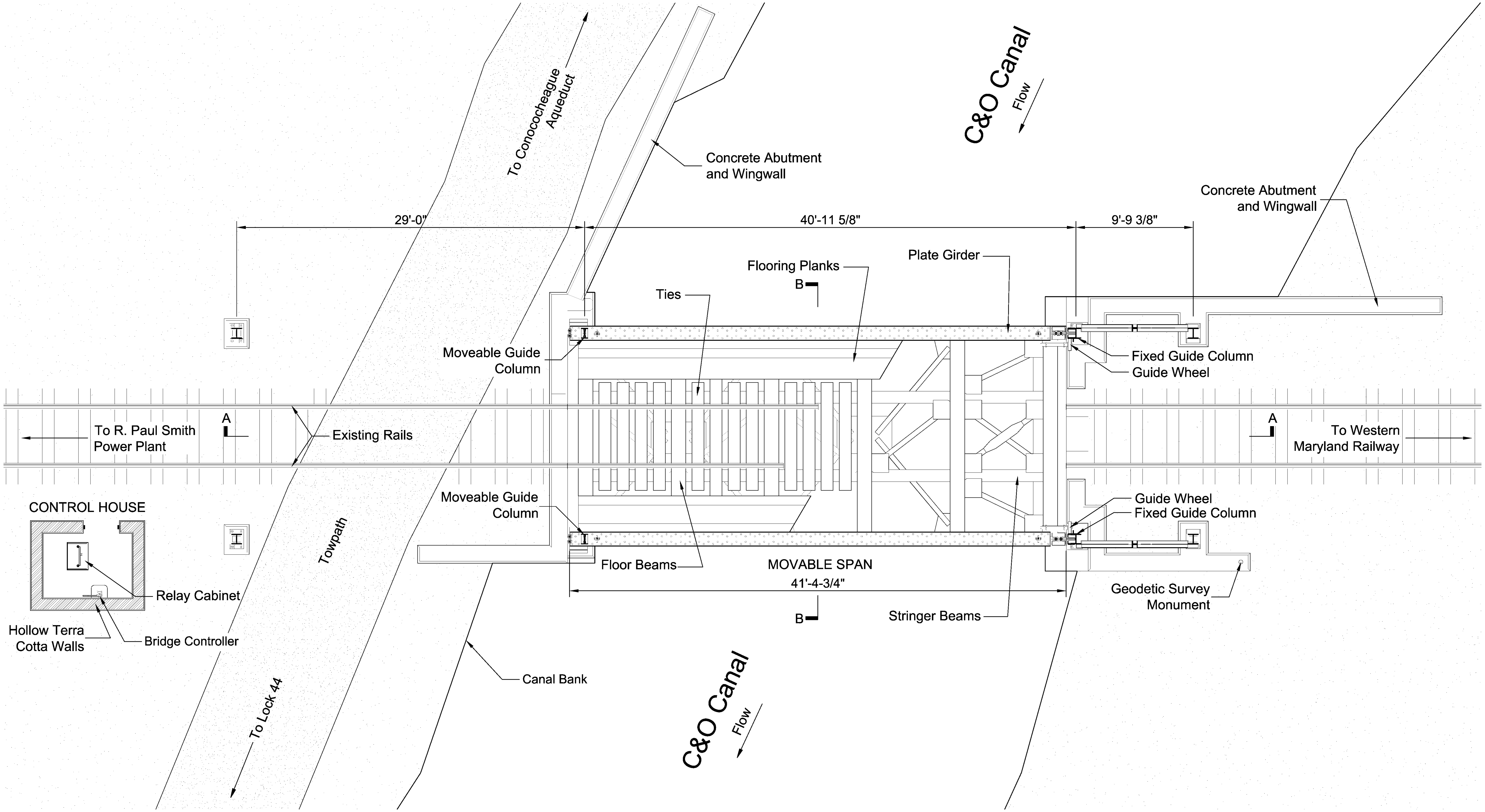
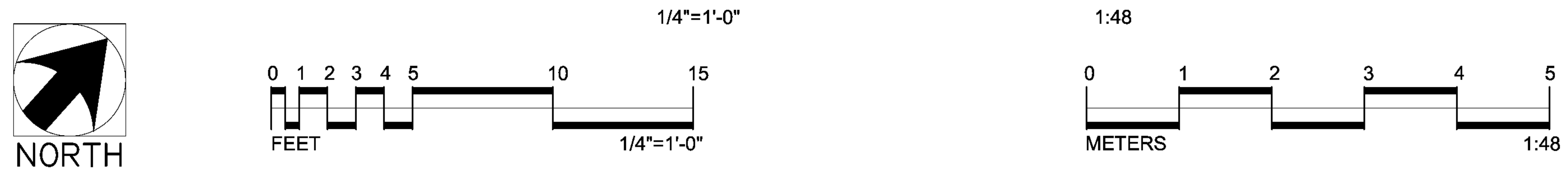


DECK PLAN

1/4"=1'-0" 1:48



POTOMAC EDISON COMPANY, CHESAPEAKE & OHIO CANAL LIFT BRIDGE

SPANNING C & O CANAL SOUTH OF U.S. 11

WILLIAMSPORT WASHINGTON MARYLAND

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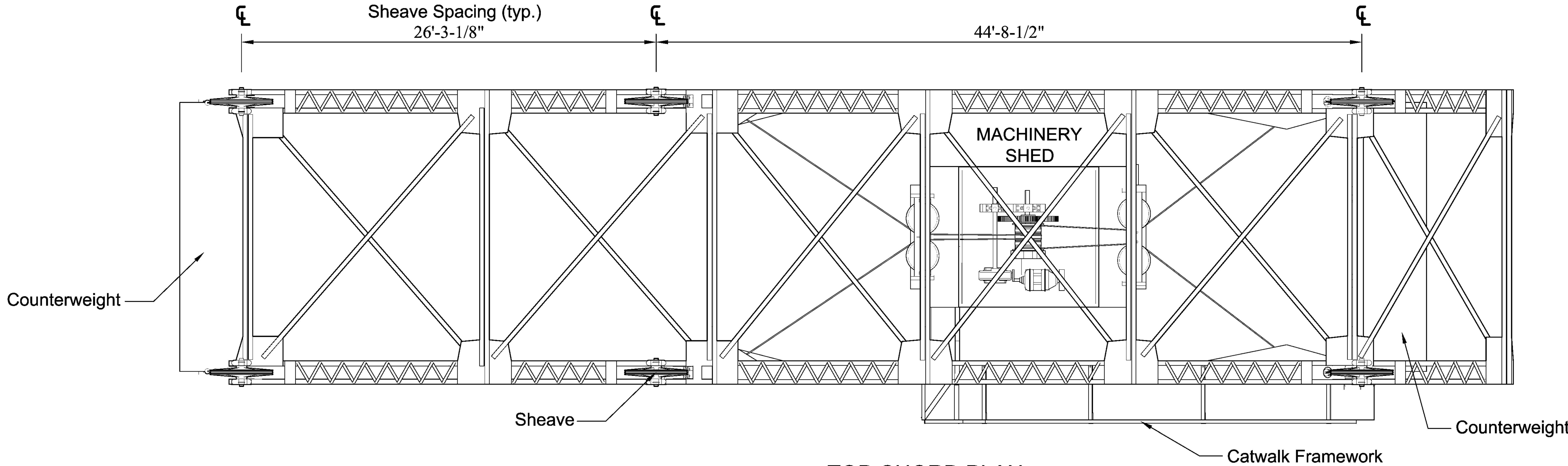
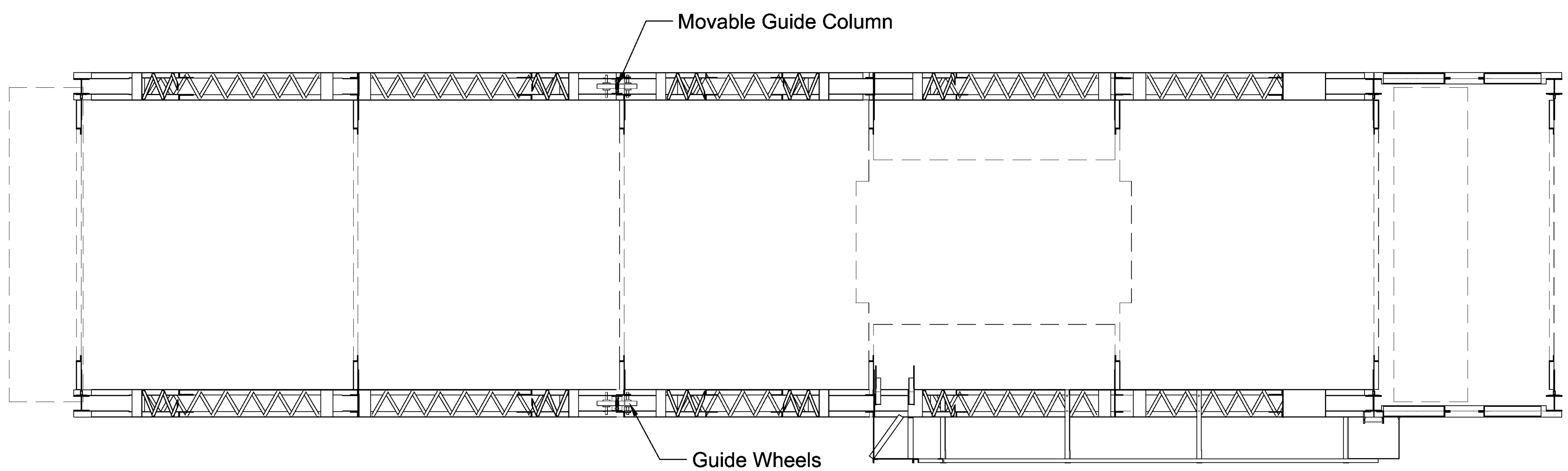


TOP CHORD PLAN



BOTTOM CHORD PLAN

CHORD PLANS

1/4"=1'-0" 1:48

NORTH

0 1 2 3 4 5 10 15 FEET 1/4"=1'-0"

0 1 2 3 4 5 METERS 1:48

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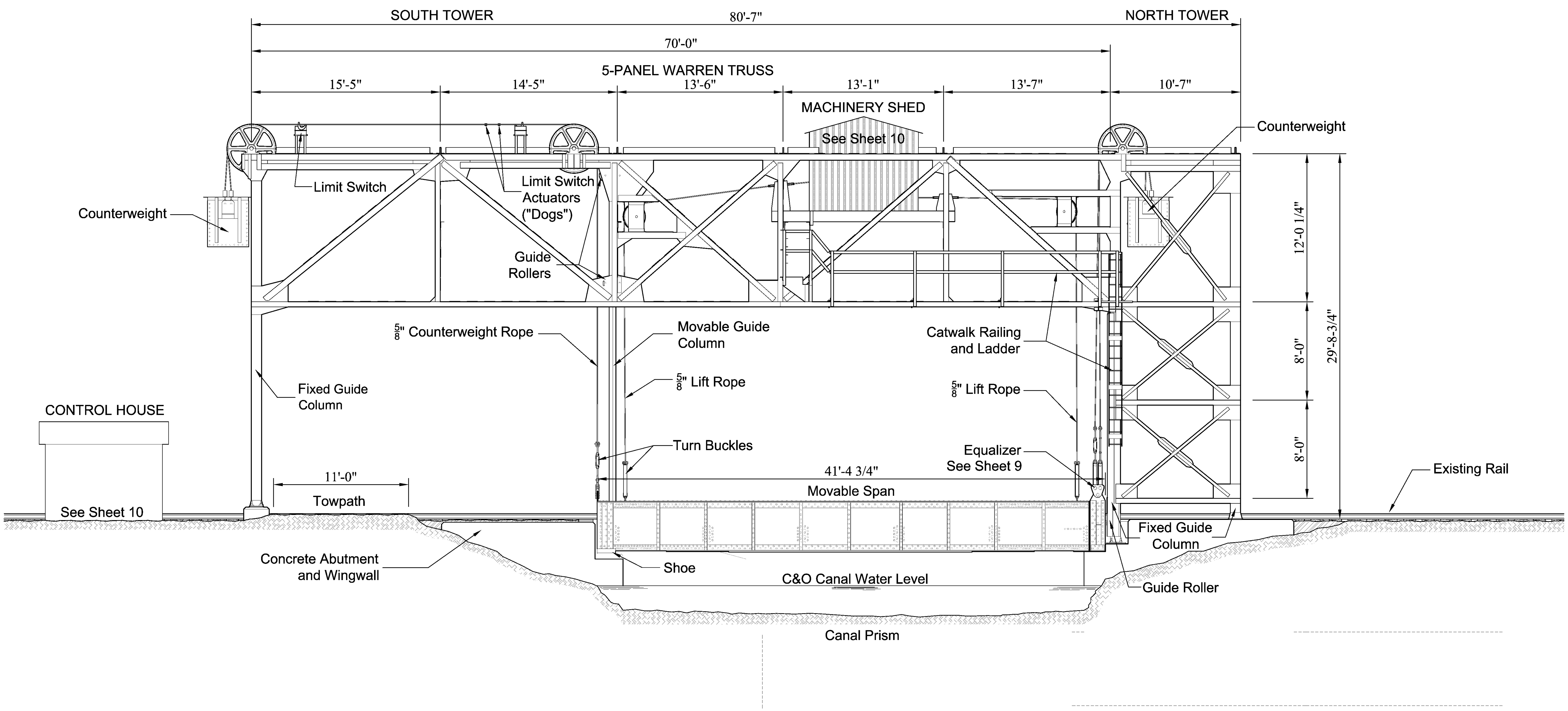

EAST ELEVATION

1/4"=1'-0" 1:48

0 1 2 3 4 5 10 15 FEET 1/4"=1'-0"

0 1 2 3 4 5 METERS 1:48

NOTES:

1 Bridge is shown in in-service condition.

2 Some wire rope is missing or disconnected, but is shown in place in the drawing.

3 The counterweights are shown without the safety ropes that were in place when surveyed.

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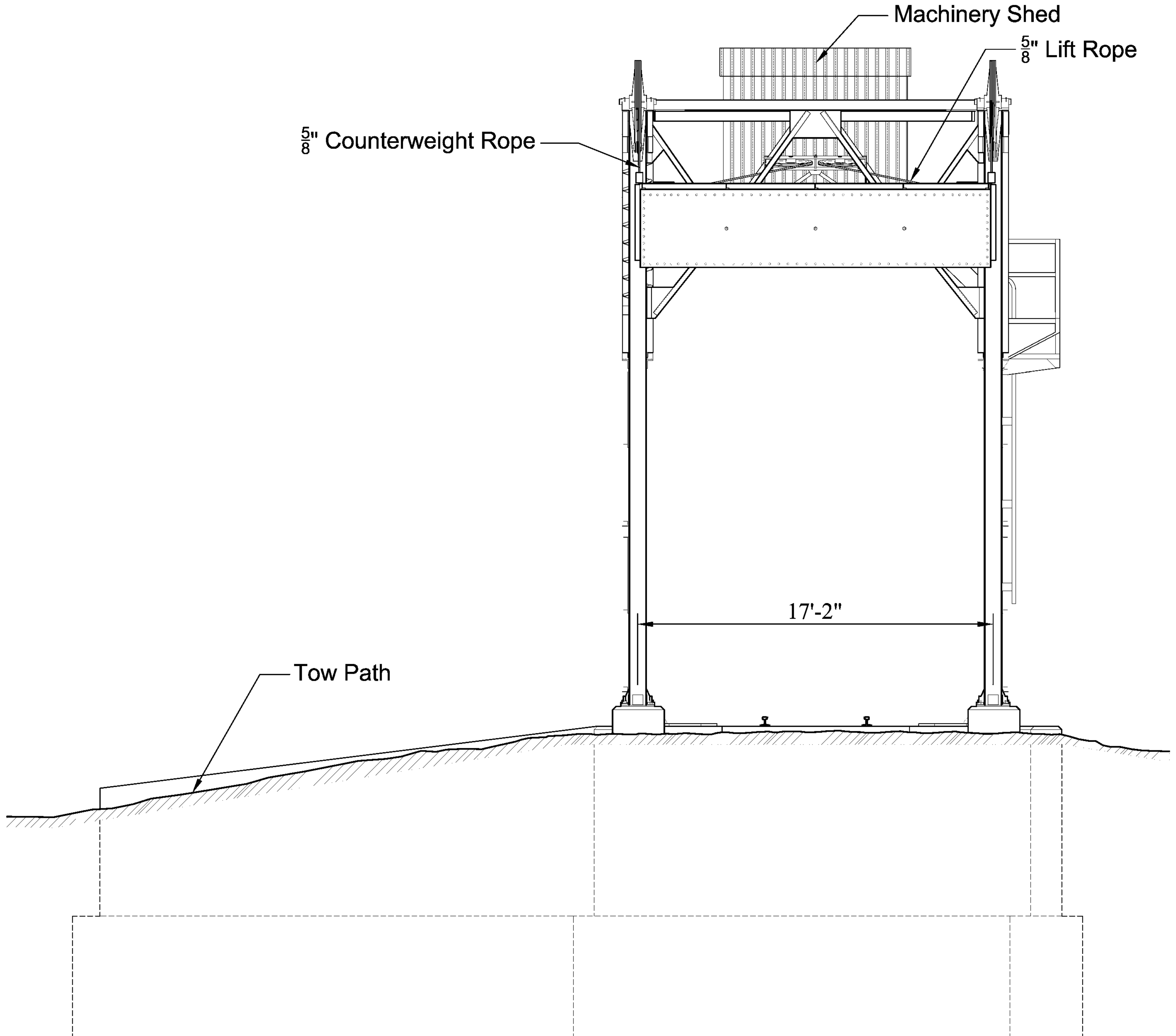
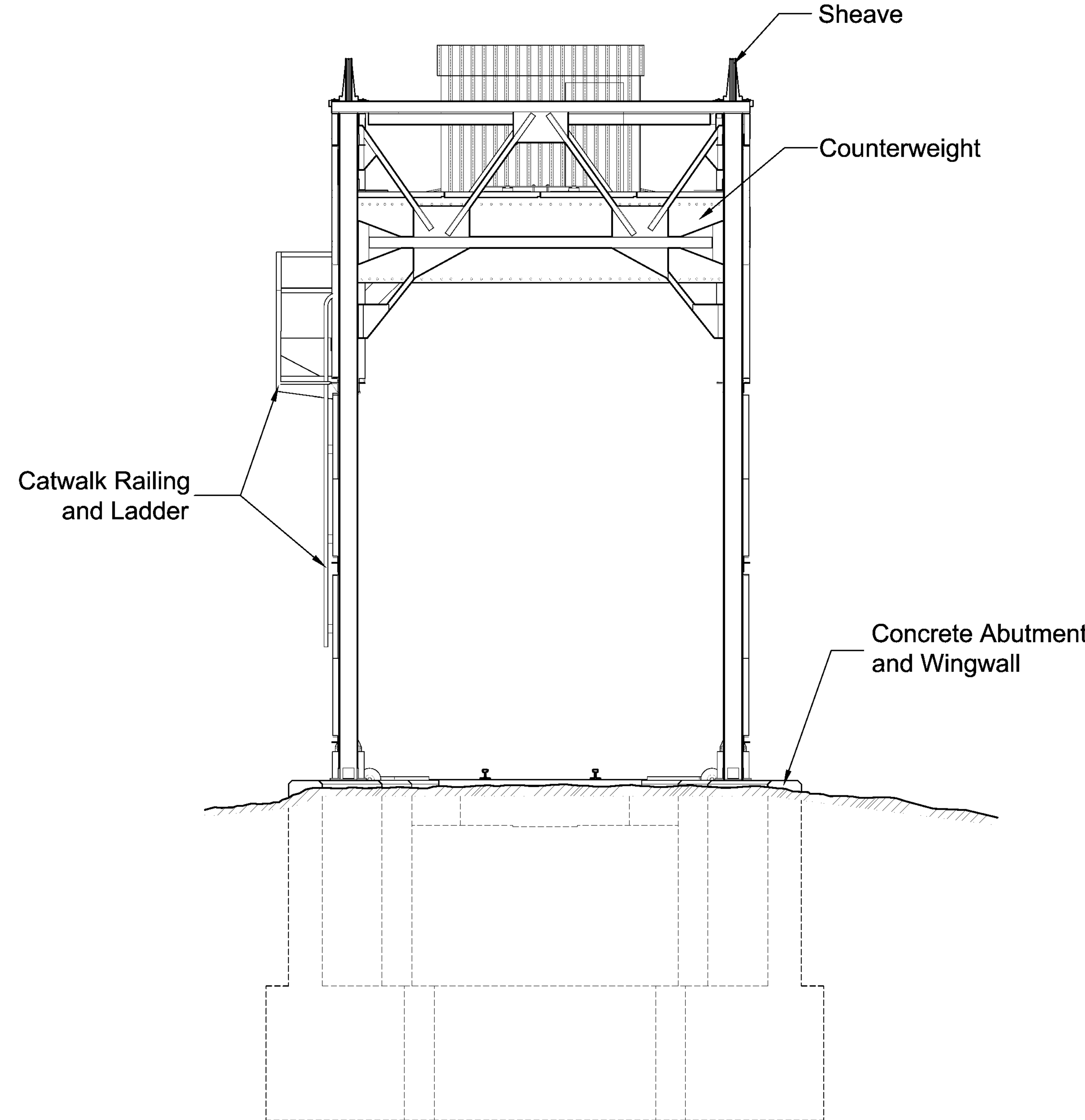


SOUTH

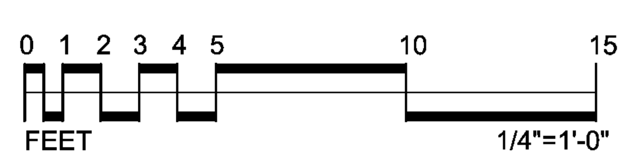


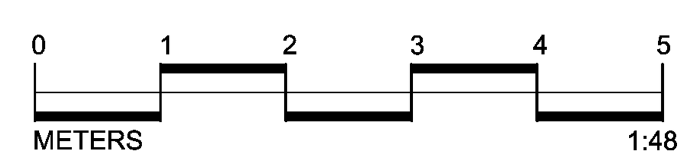
NORTH

END ELEVATIONS

1/4"=1'-0"

1:48





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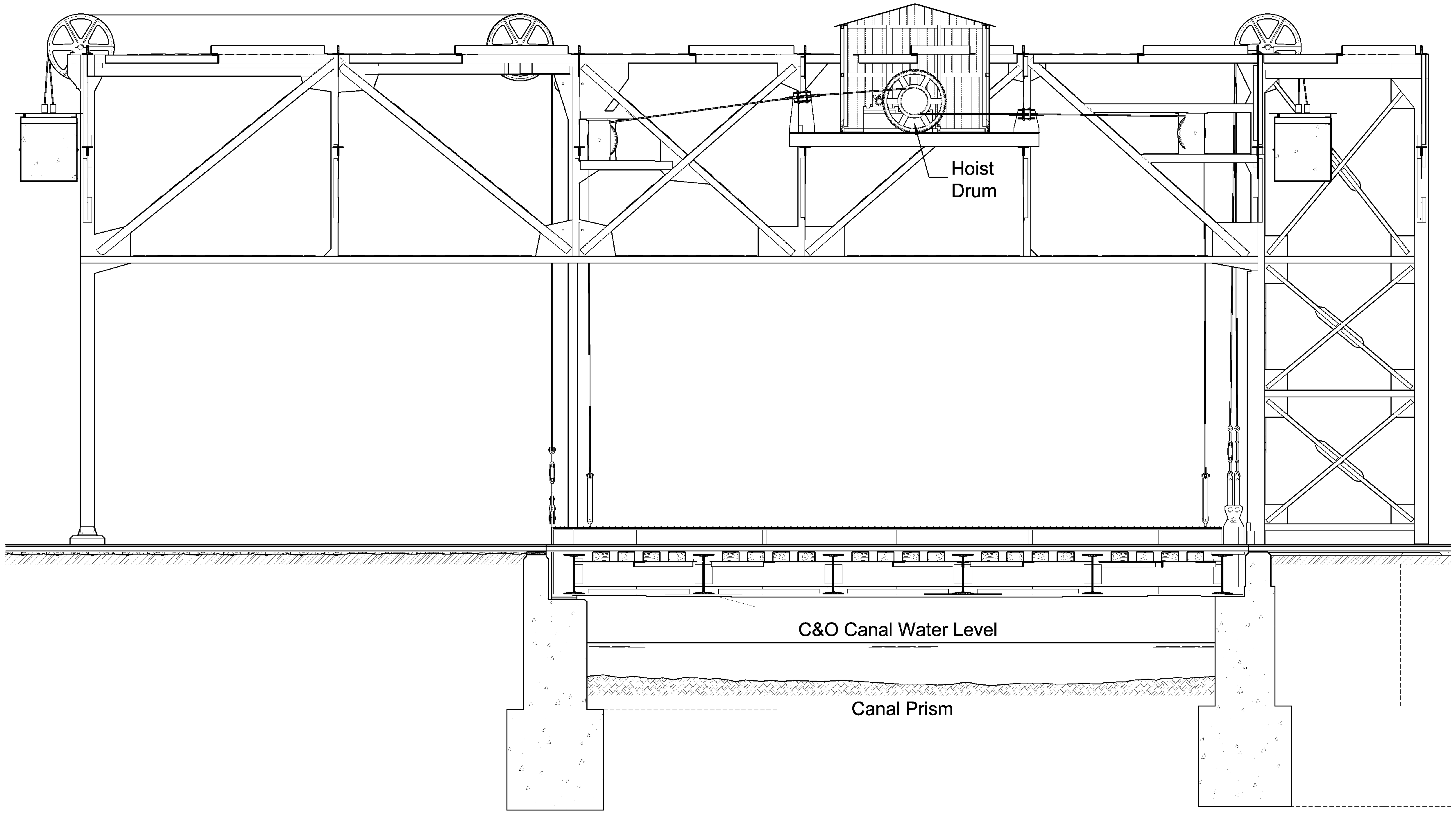
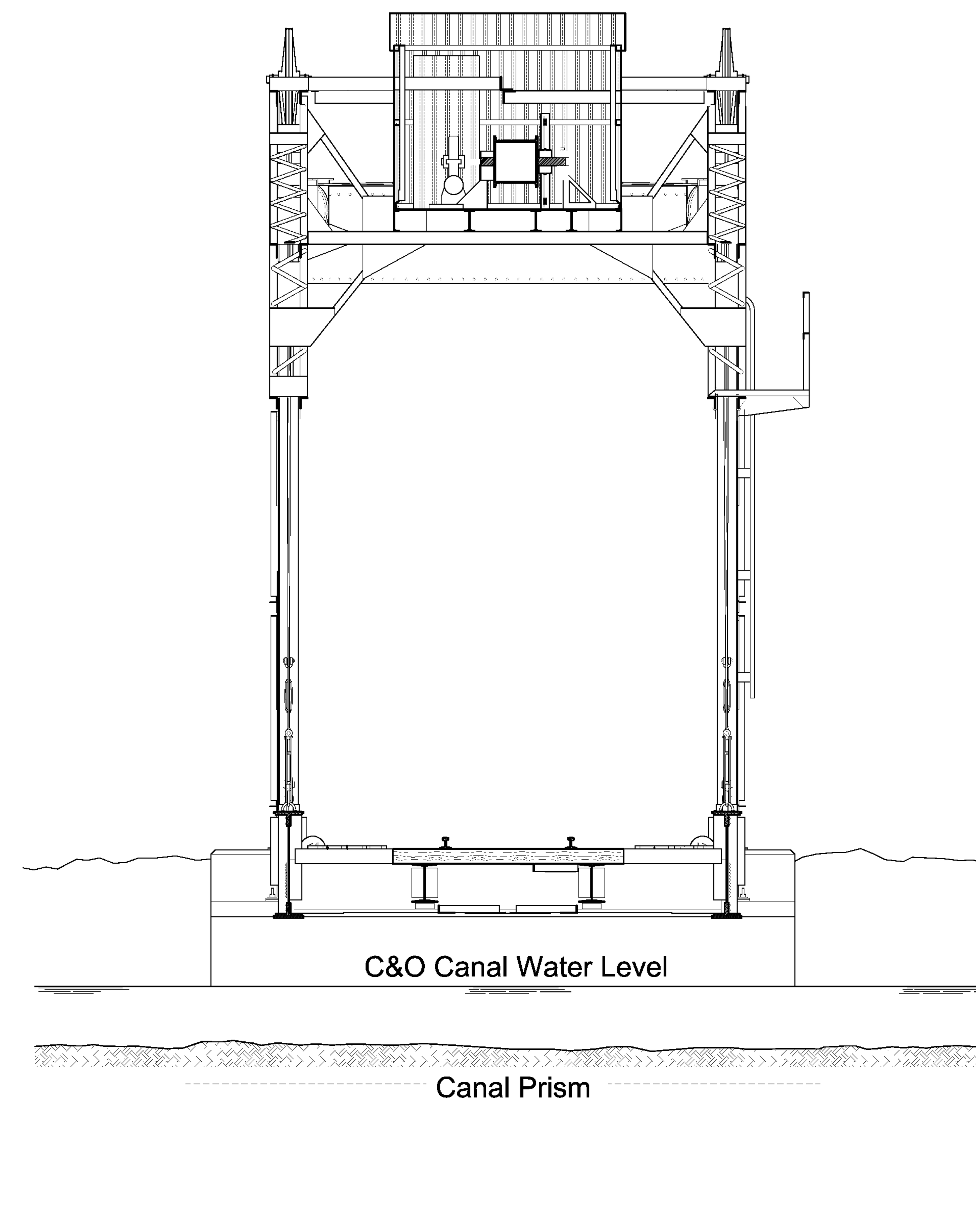


SECTION A-A



SECTION B-B

SECTIONS

1/4"=1'-0" 1:48

0 1 2 3 4 5 10 15
FEET 1/4"=1'-0"

0 1 2 3 4 5
METERS 1:48

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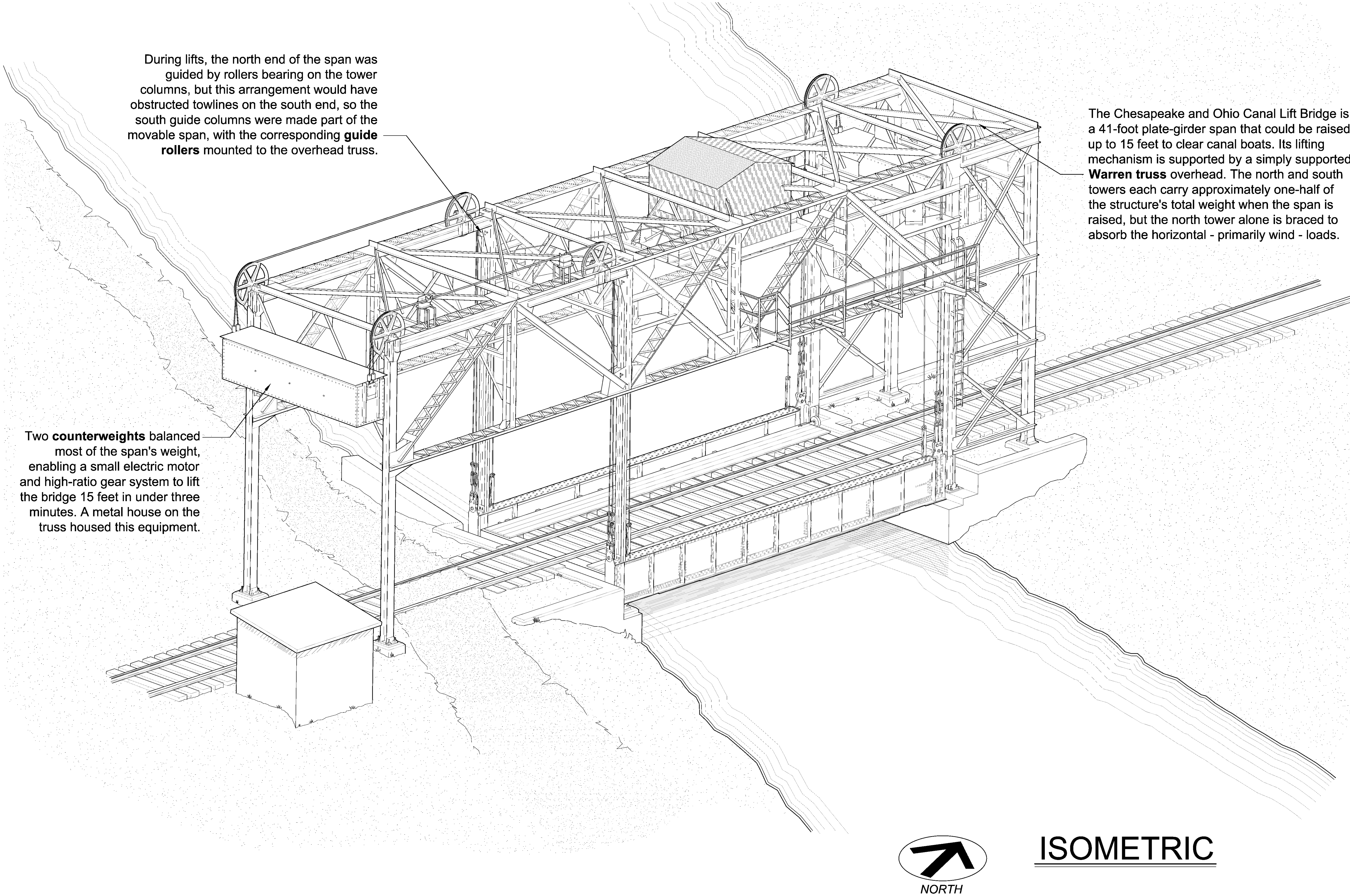

ISOMETRIC

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While it may appear to be complicated, the lifting mechanism for the C&O Canal Bridge is actually simple and straightforward, and the amount of power needed is low. The movable portions of the bridge are highlighted on this sheet, with the arrows indicating the directions of motion of the various parts during a lift, or opening, of the bridge.

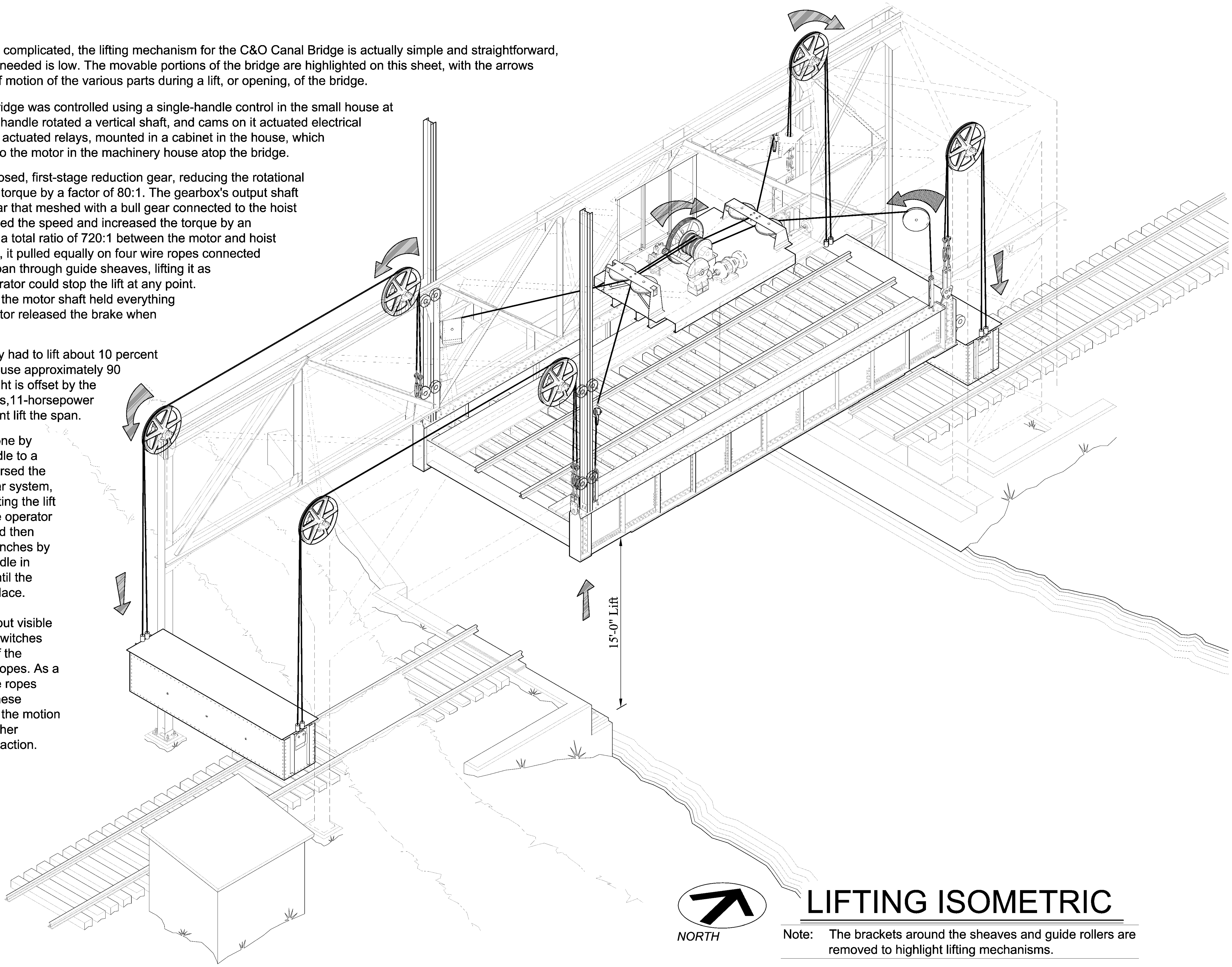
Lifting and lowering the bridge was controlled using a single-handle control in the small house at the lower left. Moving the handle rotated a vertical shaft, and cams on it actuated electrical switches. These switches actuated relays, mounted in a cabinet in the house, which directed electrical power to the motor in the machinery house atop the bridge.

The motor turned an enclosed, first-stage reduction gear, reducing the rotational speed and increasing the torque by a factor of 80:1. The gearbox's output shaft turned an open pinion gear that meshed with a bull gear connected to the hoist drum. This gear set reduced the speed and increased the torque by an additional 9:1, making for a total ratio of 720:1 between the motor and hoist drum. As the drum turned, it pulled equally on four wire ropes connected to the corners of the lift span through guide sheaves, lifting it as much as 15 feet. The operator could stop the lift at any point. A spring-loaded brake on the motor shaft held everything in place. An electric actuator released the brake when the motor was energized.

The lifting mechanism only had to lift about 10 percent of the span's weight, because approximately 90 percent of the span's weight is offset by the two counterbalances. Thus,11-horsepower electric motor was sufficient lift the span.

Lowering the span was done by moving the controller handle to a different position that reversed the direction of the motor, gear system, and drum. Just before setting the lift span on the abutment, the operator would stop the motion, and then ease it down the last few inches by working the controller handle in quick, brief movements until the span was safely back in place.

Not shown on this sheet, but visible on Sheet 7, are two limit switches along the horizontal run of the southeast counterweight ropes. As a safety device, dogs on the ropes would, if necessary, trip these electrical switches to stop the motion before it went too far in either direction without operator action.



LIFTING ISOMETRIC

Note: The brackets around the sheaves and guide rollers are removed to highlight lifting mechanisms.

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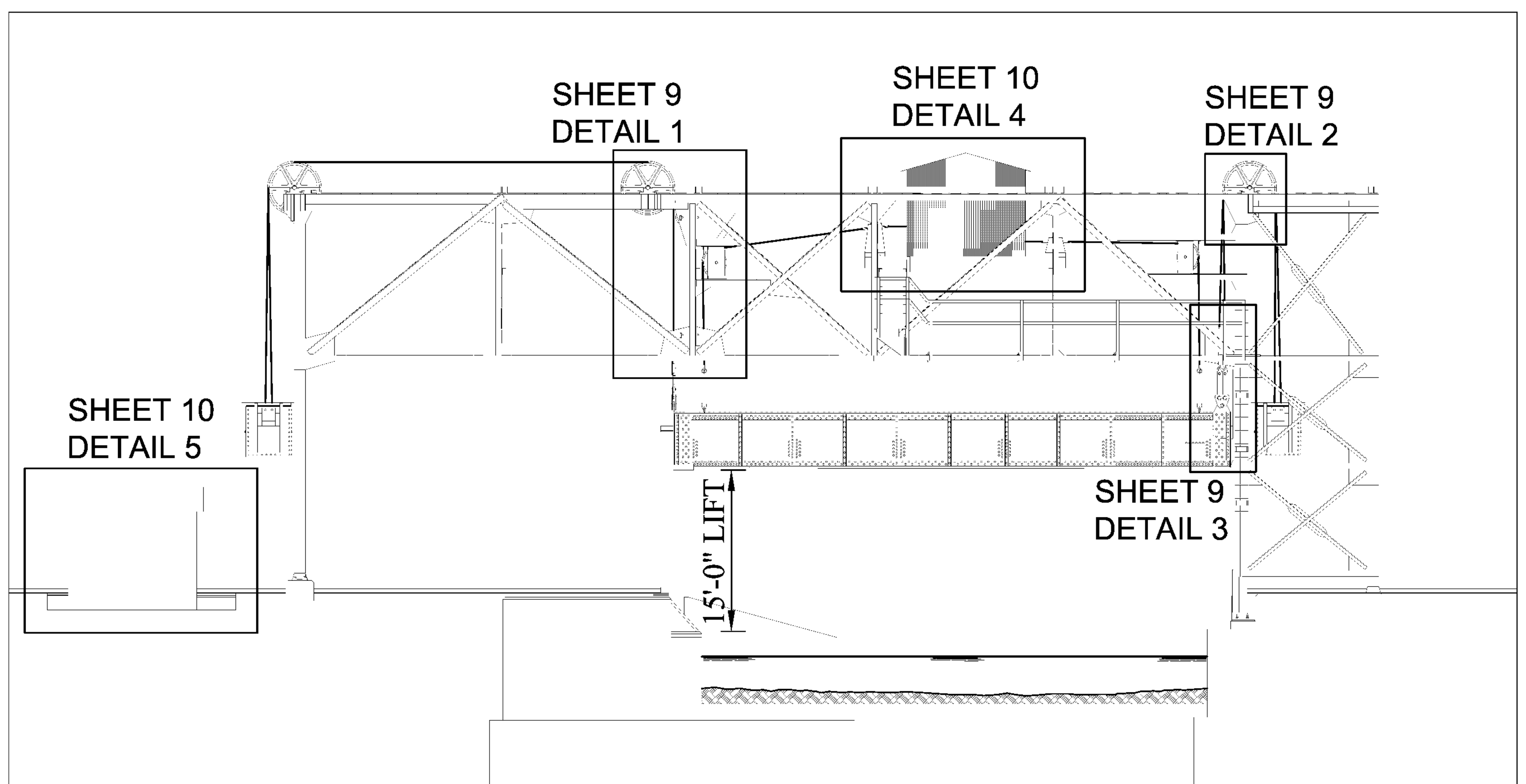
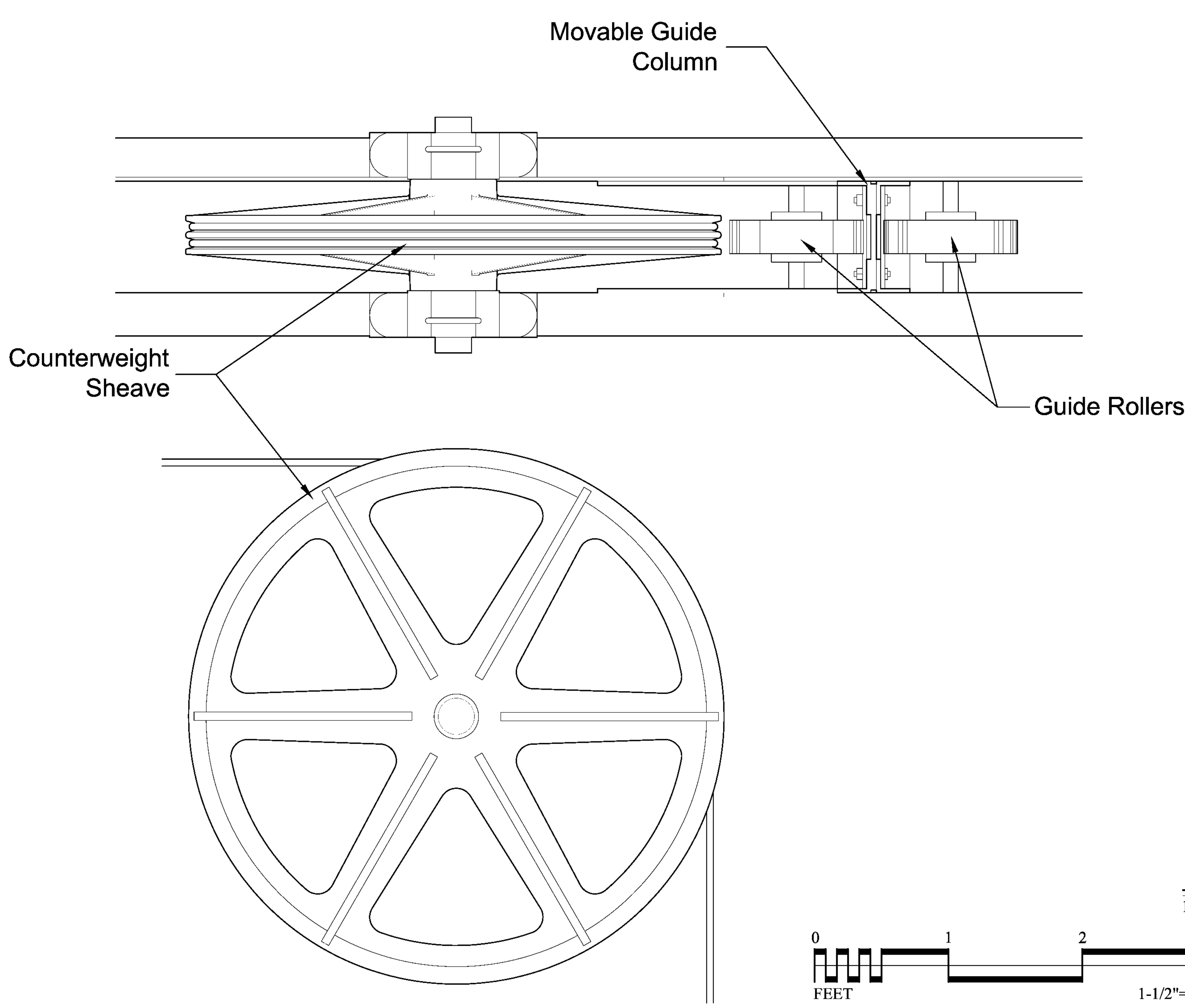
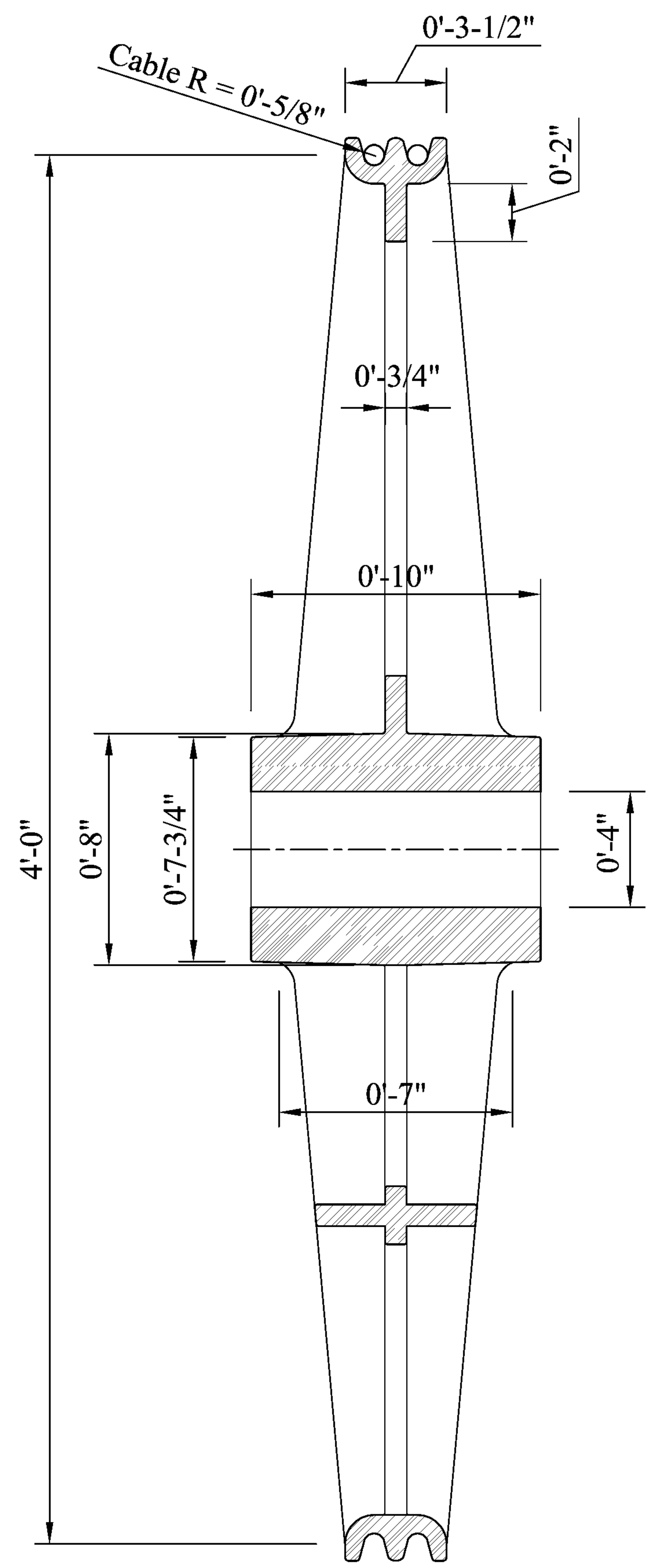


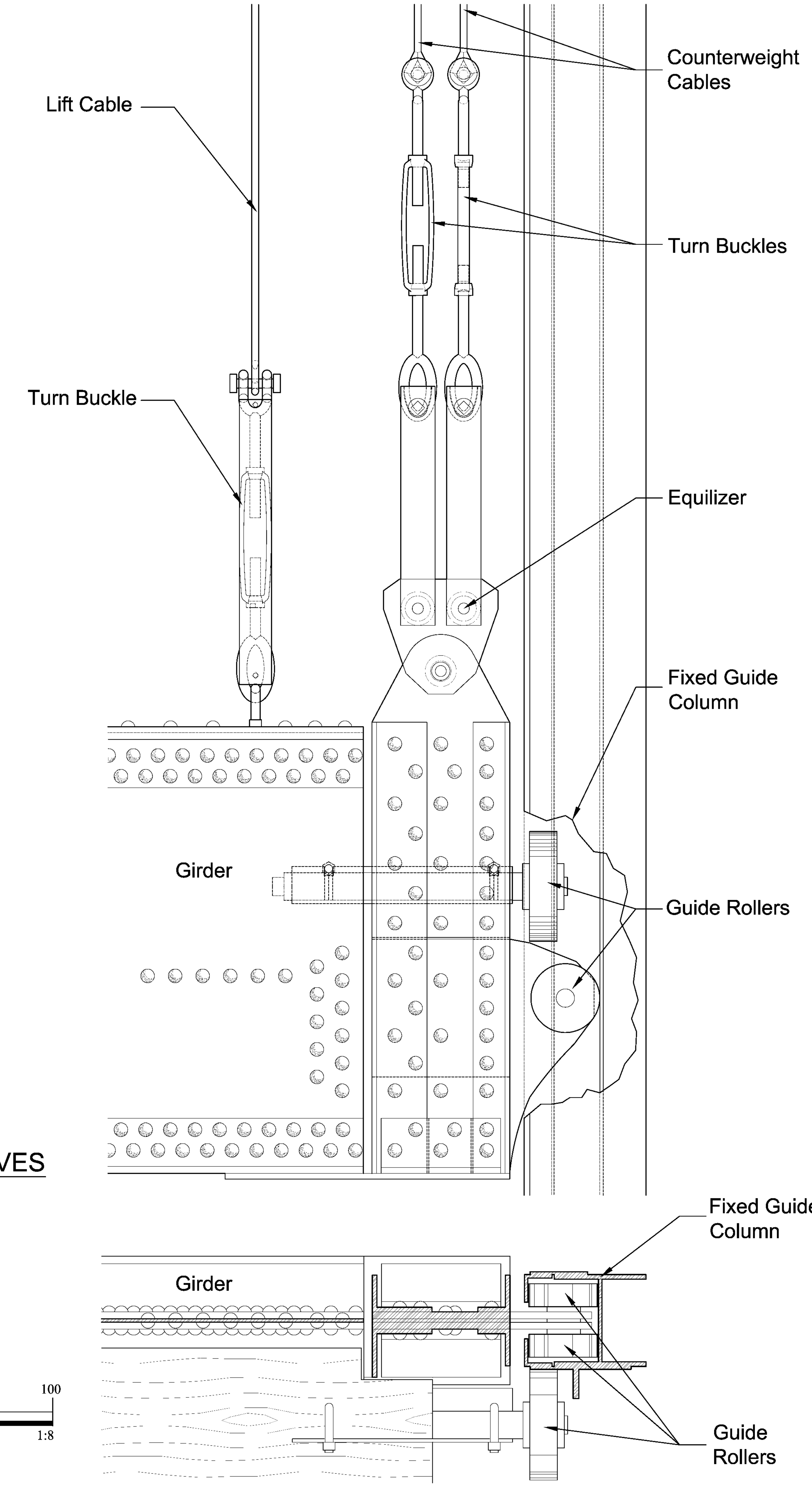
KEY TO DETAILS



DETAIL 1: GUIDE COLUMNS AND WHEELS
South End



DETAIL 2: COUNTERWEIGHT SHEAVES
SCALE: 1:4
Typical for Six



DETAIL 3: GUIDE COLUMNS, WHEELS, AND CABLE CONNECTIONS
North End

DETAILS

1-1/2"=1'-0" 1:8

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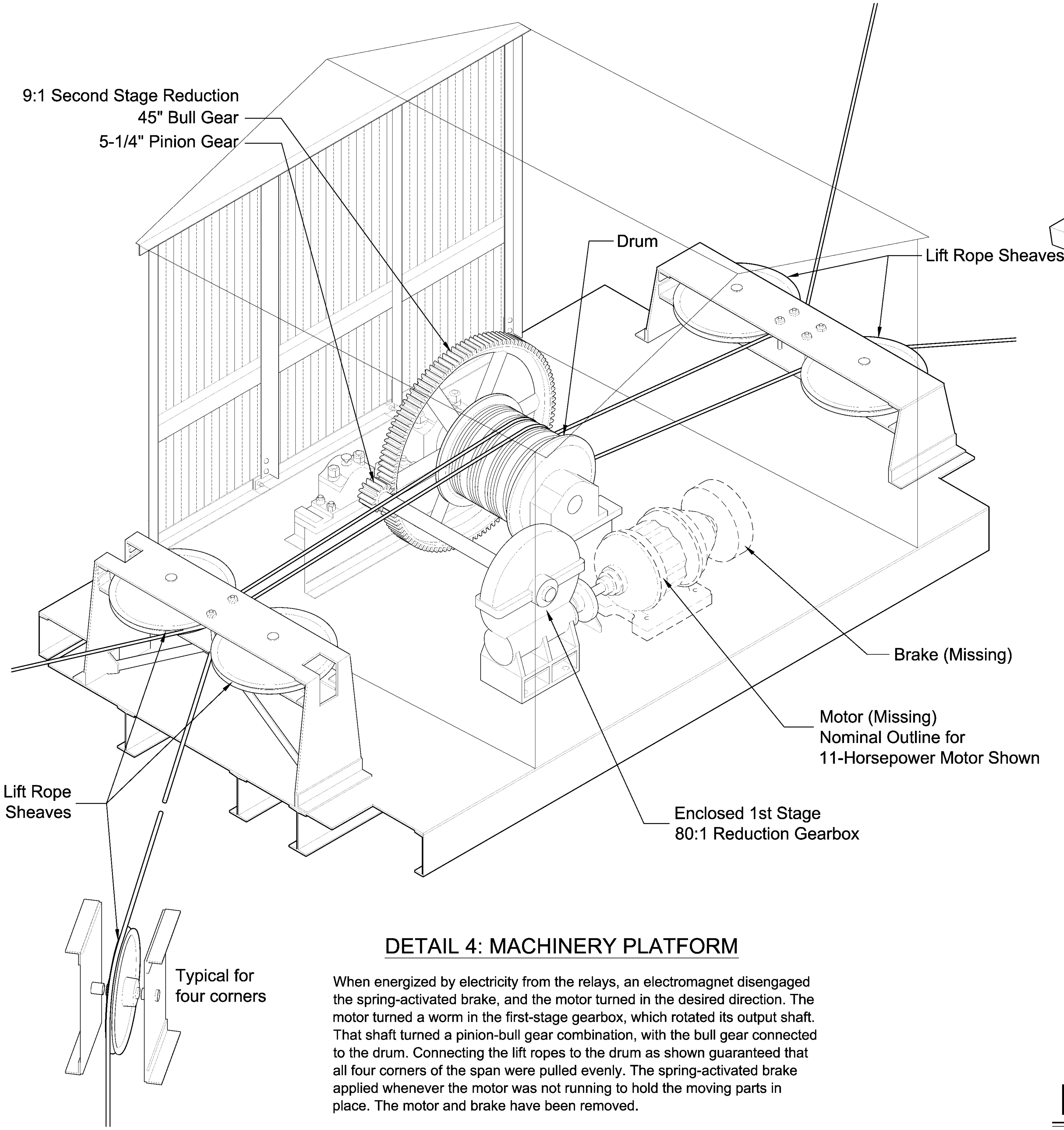
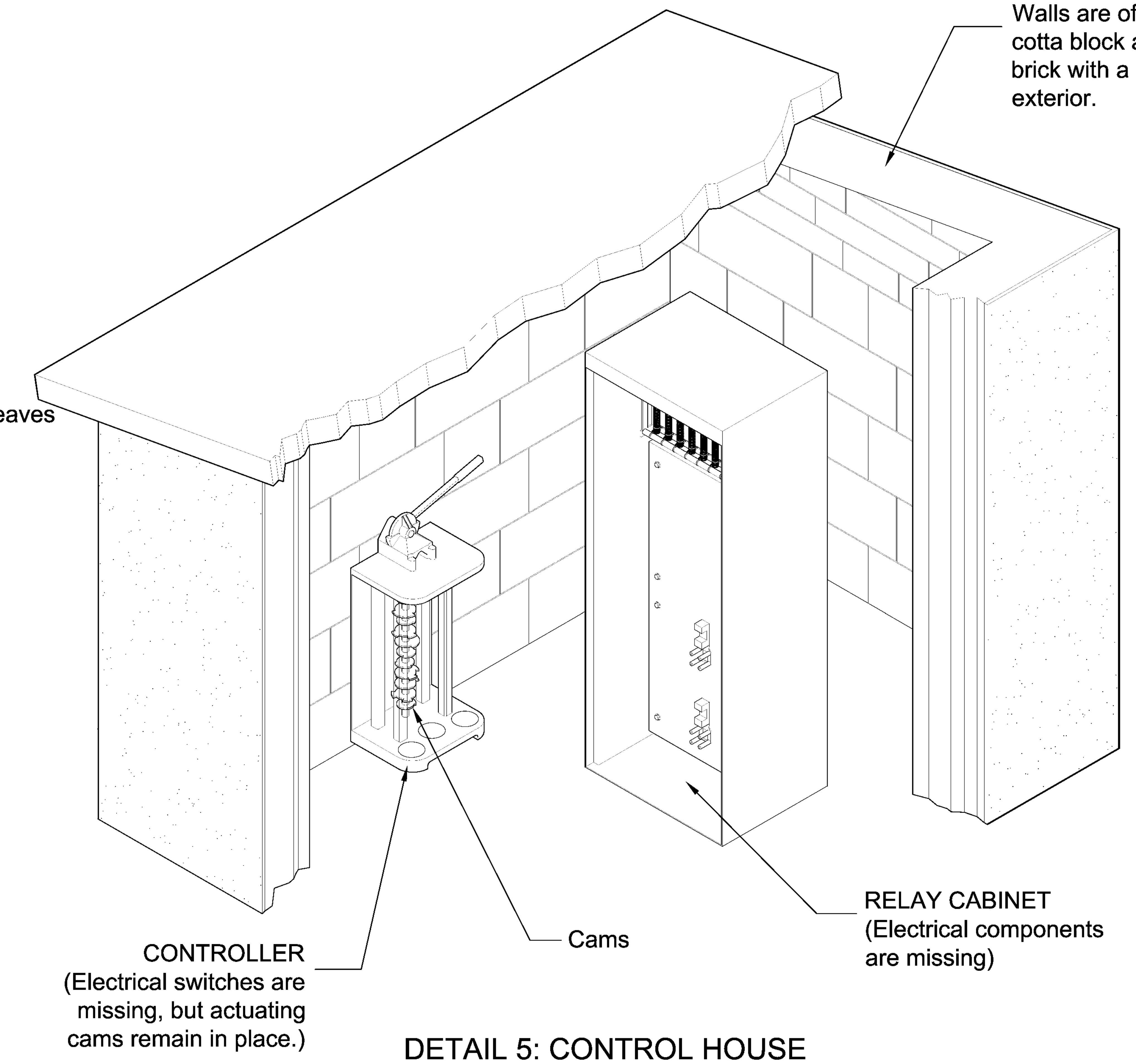


DETAIL 4: MACHINERY PLATFORM

When energized by electricity from the relays, an electromagnet disengaged the spring-activated brake, and the motor turned in the desired direction. The motor turned a worm in the first-stage gearbox, which rotated its output shaft. That shaft turned a pinion-bull gear combination, with the bull gear connected to the drum. Connecting the lift ropes to the drum as shown guaranteed that all four corners of the span were pulled evenly. The spring-activated brake applied whenever the motor was not running to hold the moving parts in place. The motor and brake have been removed.



DETAIL 5: CONTROL HOUSE

An operator moved the controller handle to control the lifting and lowering of the bridge. Except for two safety switches that prevented movement beyond safe limits, all operation was manually controlled. Moving the controller's handle rotated its vertical shaft, and the cams on it activated electrical switches. To minimize their size, these switches handled very little power. When closed by the cams, they energized relays in the relay cabinet. Relays were larger magnetic switches designed to handle the voltage and power needed by the motor and brake. All of the electrical equipment and wiring has been removed.

MECHANICAL DETAILS

1"=1'-0" 1:12

0 1 2 3 FEET 1"=1'-0"

0 50 100 CENTIMETERS 1:12

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