

Bridge Slide

The bridge superstructure will be moved from its temporary slide table supports to its final location by using a combination of Teflon slide shoes and a mirror-finished stainless steel slide track (SL-03 & SL-04). The superstructure will be pushed along the slide track by four 50-ton, double acting, hydraulic jacks mounted on jack floats (SL-02) that will push against the abutment and pier diaphragms. Two jacks will push against the pier diaphragm and one jack will push against each abutment diaphragm. The two hydraulic pumps will be located atop the jack floats at the abutment slide tables and will be operated independently by a Jacking Engineer at each location. The hydraulic schematic of the bridge slide system is shown on SL-13.

The bridge will be moved in 19.5" increments as dictated by usable jack stroke and the pin hole spacing in the dog plates welded to the temporary slide tables (SL-05). Relative stroke distances between the abutment jacks will be monitored by the Jacking Engineers during each jacking iteration. The relative difference will be limited to 1" and will be controlled by throttling one pump or the other. Any relative stroke difference will be corrected by the end of each increment.

The bridge superstructure will be guided in the east/west direction by guide brackets at the leading and trailing ends of the pier diaphragm (SL-06 & SL-07). The guide brackets will maintain alignment of the superstructure within 0.7" of the theoretical alignment. (See "Geometry Control and Tolerances")

Pre-Sliding Activities

The following procedure prescribes the activities required to prepare the superstructure for the slide. It is assumed that the deck and diaphragms concrete has attained design strength. Incidental formwork and decking that does not interfere with the diaphragm jacking and sliding components can remain in place.

1. Remove formwork at the abutment and pier diaphragm jacking pockets.
2. Install 100-ton hydraulic jacks at the jacking diaphragms as shown on SL-04.
3. Commission the hydraulic jacking system as shown on SL-11 & SL-12.
4. Raise the bridge, removed remaining diaphragm formwork, install the slide track and slide shoes, and lower the bridge onto the slide shoes as prescribed in the Jacking Procedure on SL-11.
5. Remove the 100-ton jacks.
6. Complete the installation of the slide track.
7. Install the dog plates at the abutment and pier slide tables as shown on SL-05.
8. Install the centering guides at the north and south ends of the pier diaphragm as shown on SL-06 & SL-07.
9. Install the bridge slide pushing system as shown on SL-02.
10. Commission the hydraulic bridge slide system as shown on SL-13. The hydraulic pumps will be mounted atop the jack floats at the abutment slide tables.

Geometry Control & Tolerances

Ref. Plan Sheet 29 of 55 and SL-04:

1. Establish and preserve a line at the centerline of the pier. This line and/or offsets to it will be used as a guide to install the slide track & slide shoes, and to indicate the theoretical east/west location of the bridge during the slide.
2. Install telltales at each end of the pier diaphragm that mark the center of the diaphragm. These telltales will be used to indicate the east/west location of the bridge relative to the theoretical line during the slide.
3. Establish and preserve lines at the centerline of abutment bearings. These lines and/or offsets to it will be used as a guide to install the slide track and slide shoes.
4. Establish and preserve lines on the abutments and pier 2'-6" offset south of the Larpenteur Avenue Centerline (Beam Line 4). These lines will be used to determine the theoretical north/south location of the bridge.
5. Establish vertical lines on the face of the diaphragms at the abutments and pier that correspond to the 2'-6" offset south of the Larpenteur Avenue Centerline (Beam Line 4). These lines will be used to indicate the north/south location of the bridge relative to the theoretical line at the end of the slide.
6. Final as-built bridge location will be within a 1" radius circle of the theoretical location as defined by the layout lines above.

Bridge Sliding Activities

James (Jim) M. Ronning, P.E., will be the lead Jacking Engineer in charge of the bridge slide. David (Dave) M. Klaseus, P.E., will be the second Jacking Engineer. Assisting Jim & Dave will be four slide track tenders, one at each abutment and two at the pier. One jack float tender will be stationed at the pier to engage and disengage the jack float pins.

As the bridge slide progresses and the north slide shoes slide off the northernmost slide plate assemblies (SL-03), the slide plate assemblies will be moved to the south end of the slide track by the slide track tenders.

At the start of the last slide iteration, personnel will be stationed at the geometric control points to advise the Jacking Engineers of the remaining distance the bridge needs to slide to get to its final location.

Post-Slide Activities

Following the bridge slide, the 100-ton jacks will be reinstalled, the superstructure will be jacked up as described on SL-11, the slide shoes and slide track removed and the permanent neoprene bearings installed, completing the bridge slide operations.

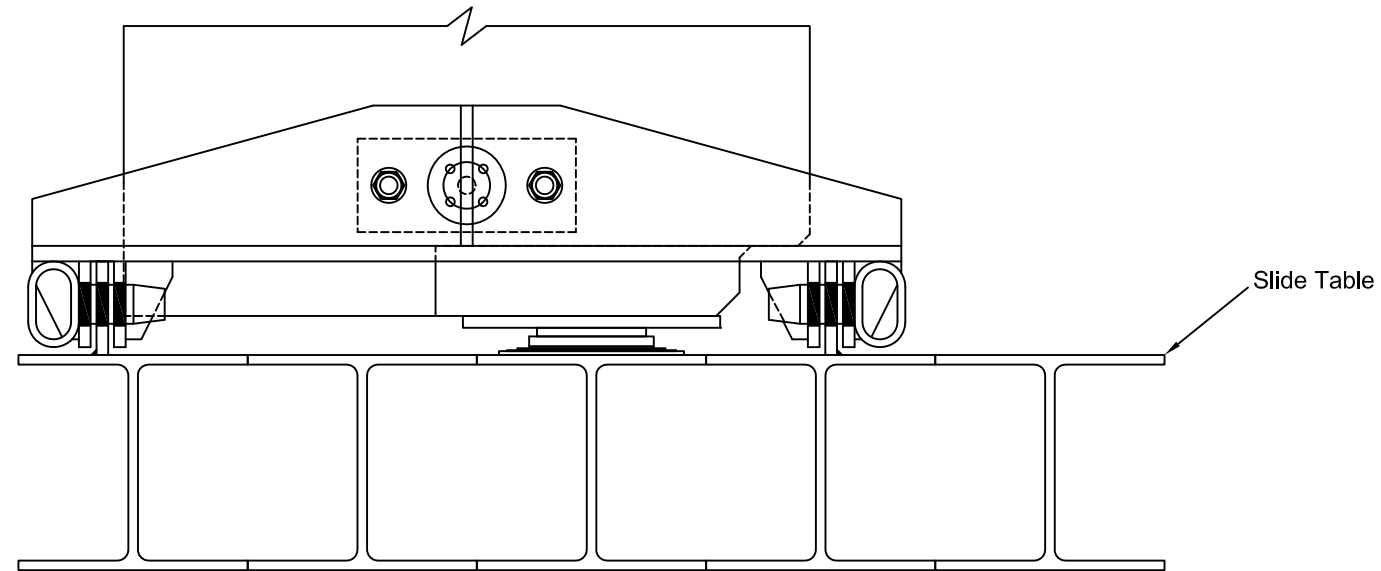
Contingency Plans

To ensure a successful bridge slide, a contingent of spare hydraulic components will be on-site during the slide operations, including but not limited to, one spare 100-ton jack, two seal kits for 100-ton jacks, one spare 50-ton pushing jack, two spare pumps, two spare hydraulic hoses, two spare quick disconnect fittings and one spare pressure gauge.

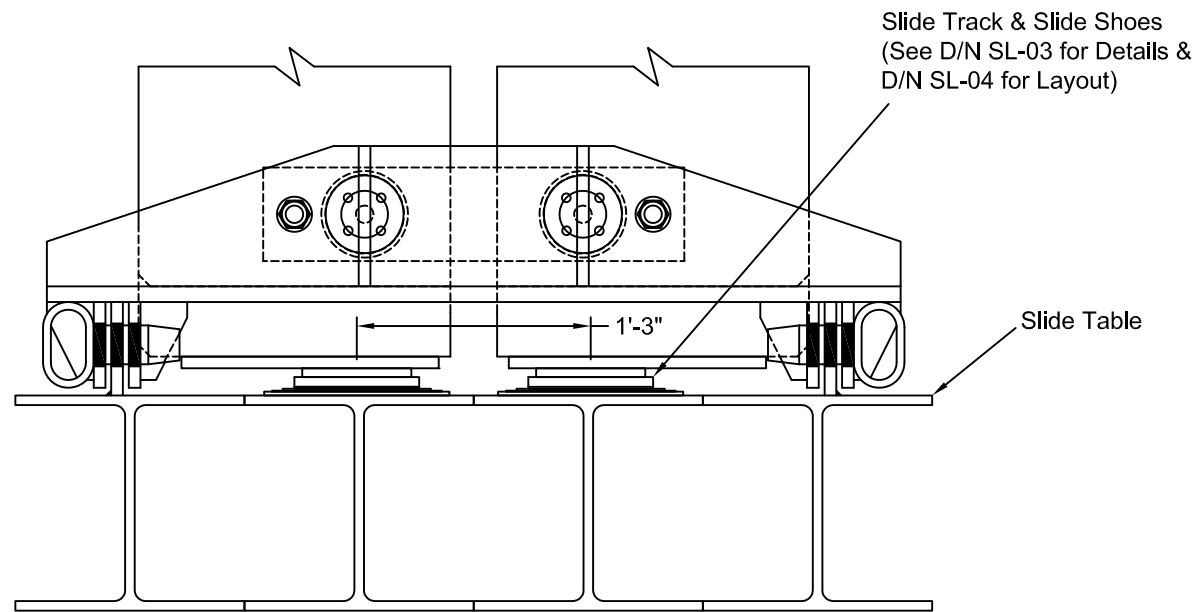
The bridge slide can be delayed or suspended at any time for expected or unexpected reasons, including but not limited to, allowing traffic to pass under the bridge on I35E, mechanical or hydraulic equipment malfunction, inclement weather or limiting crew hours.

The lead Jacking Engineer, Ames and MNDOT representatives on-site during the bridge slide will jointly determine the need to delay or suspend the bridge slide.

James M. Ronning, P.E. 16436 Ringer Road Wayzata, Minnesota 55391 Phone: 952 470 6399	Rev. 0: For Construction	05/28/14	Ames Construction, Inc. 2000 Ames Drive Burnsville, Minnesota 55306 Phone: 952 435 7106	Larpenteur Avenue Bridge No. 62646 New Bridge Slide St. Paul, Minnesota	BRIDGE SLIDE GENERAL NOTES	DRAWN JMR	CHECKED MAS
						APPROVED JMR	DATE 05/28/14
	DRAWING NO. 132408 - SL - 01						
	REV. 0						

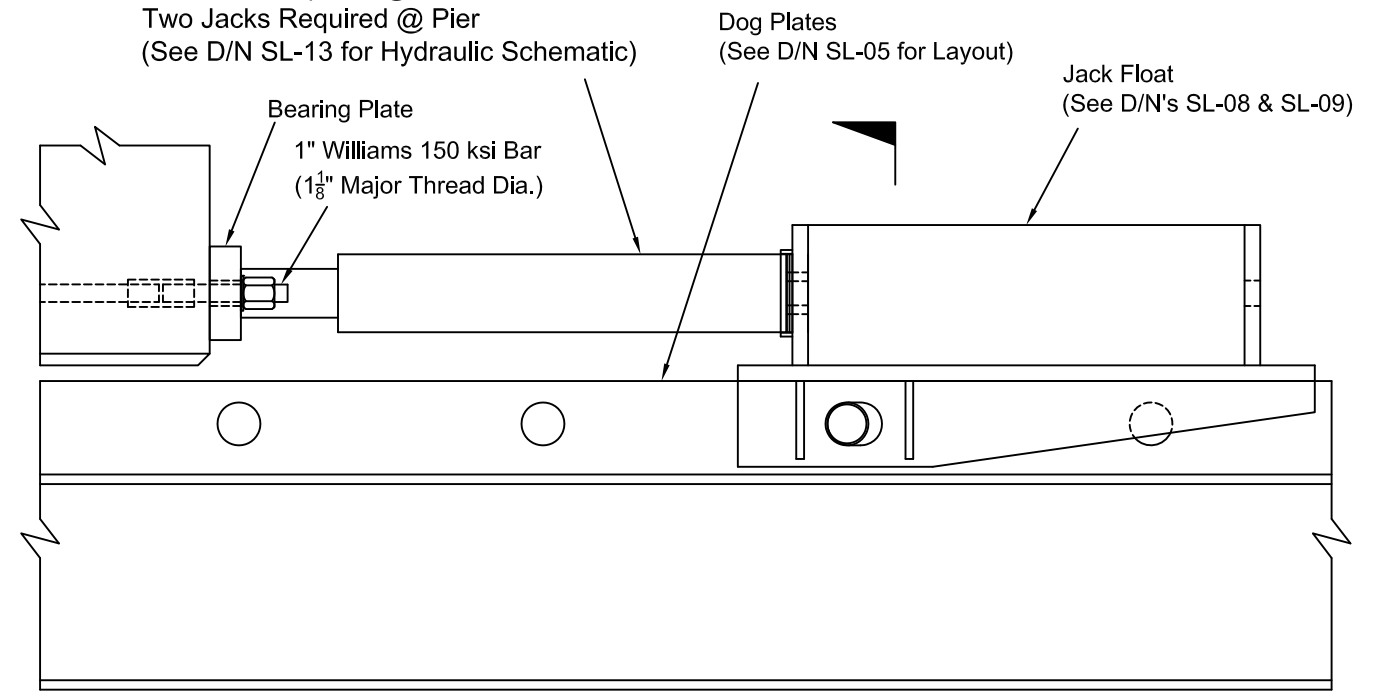


Section @ Abutments Looking South
East Abutment Shown
West Abutment Opp. Hand



Section @ Pier Looking South

Enerpac RR-5020
50-Ton Double Acting Jack w/
20.13" Stroke, Eff. Area = 11.06 sq. in.
One Jack Required @ Abutments
Two Jacks Required @ Pier
(See D/N SL-13 for Hydraulic Schematic)



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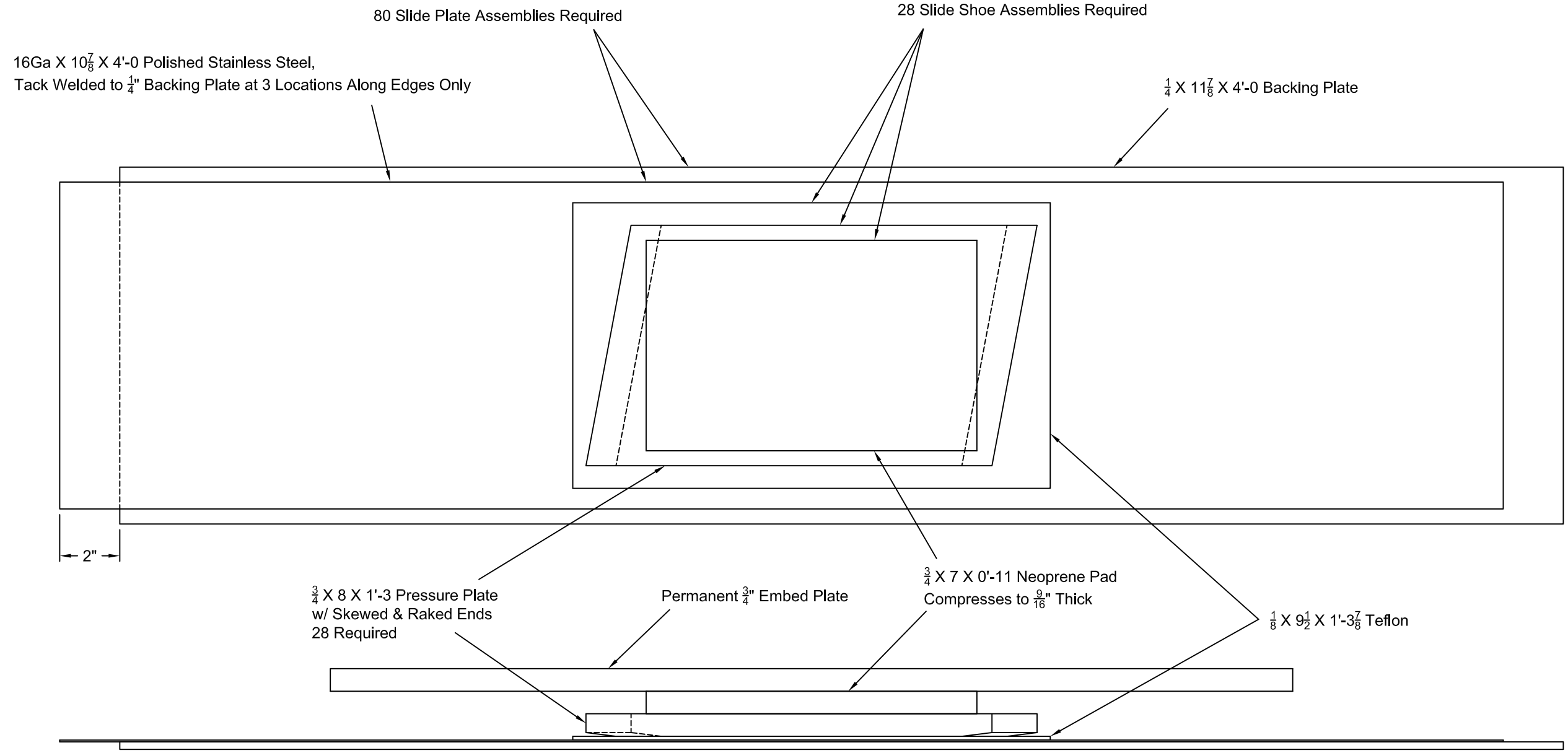
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New Bridge Slide
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BRIDGE SLIDE
PUSHING SYSTEM

DRAWN JMR	CHECKED MAS
APPROVED JMR	DATE 05/28/14
DRAWING NO. 132408 - SL - 02	
REV. 0	



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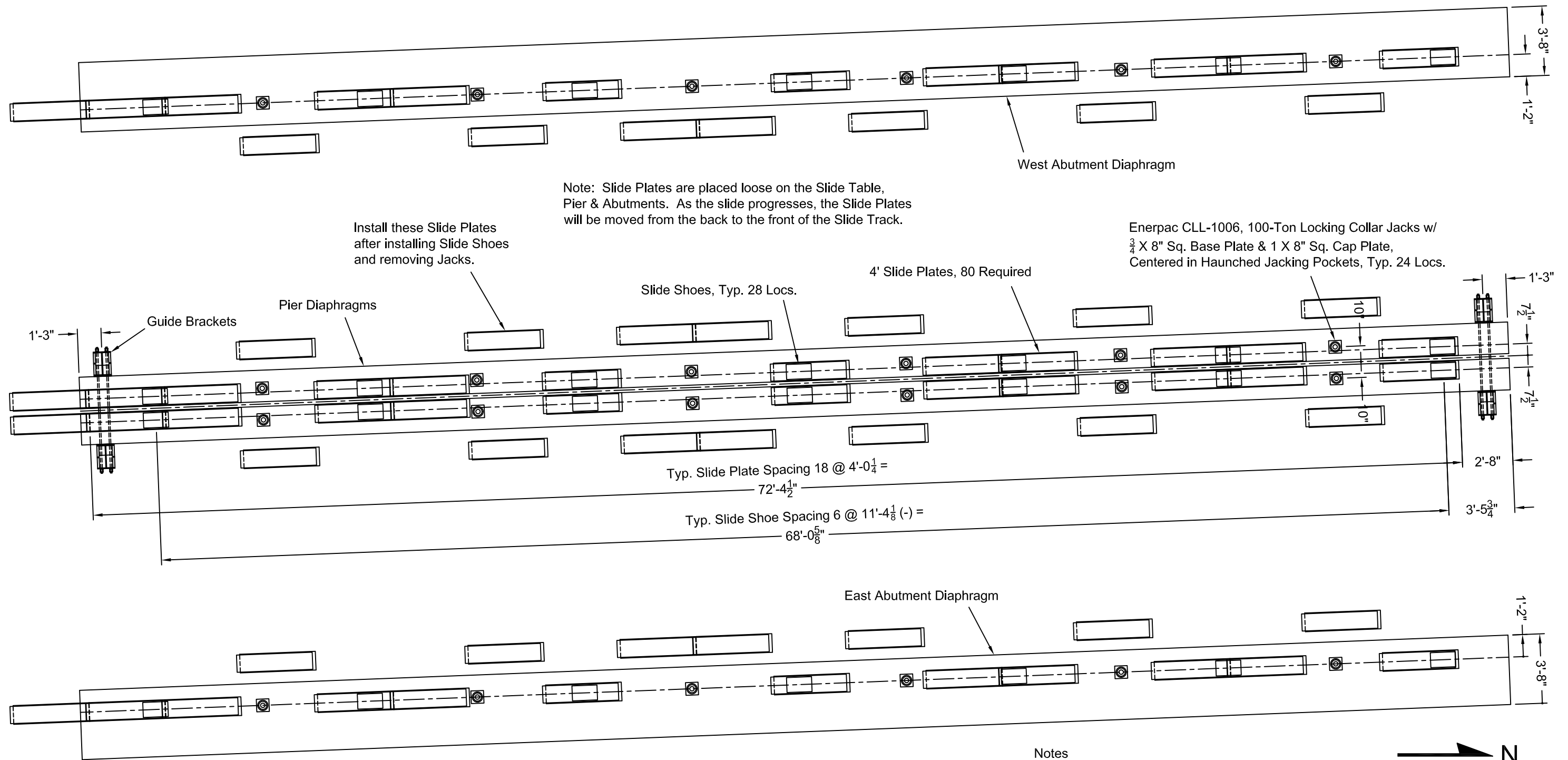
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**SLIDE PLATE &
 SLIDE SHOE
 DETAILS**

DRAWN JMR	CHECKED MAS
APPROVED JMR	DATE 05/28/14
DRAWING NO. 132408 - SL - 03	
REV. 0	



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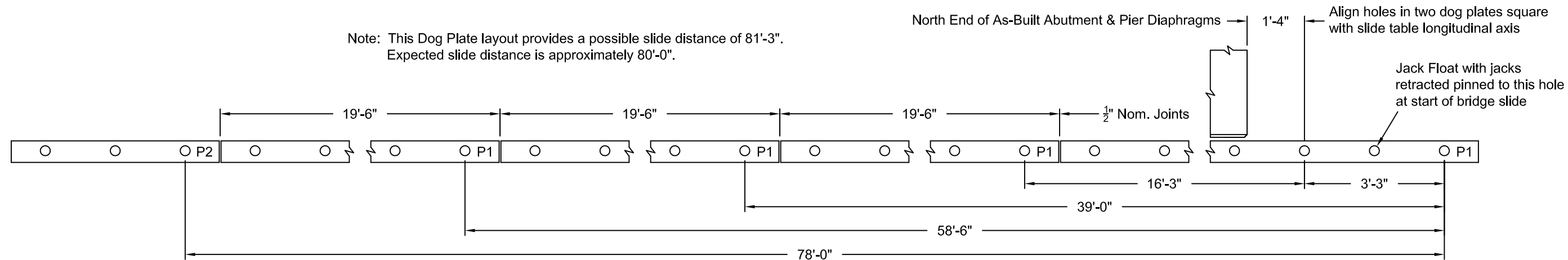
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Larpenteur Avenue Bridge No. 62646
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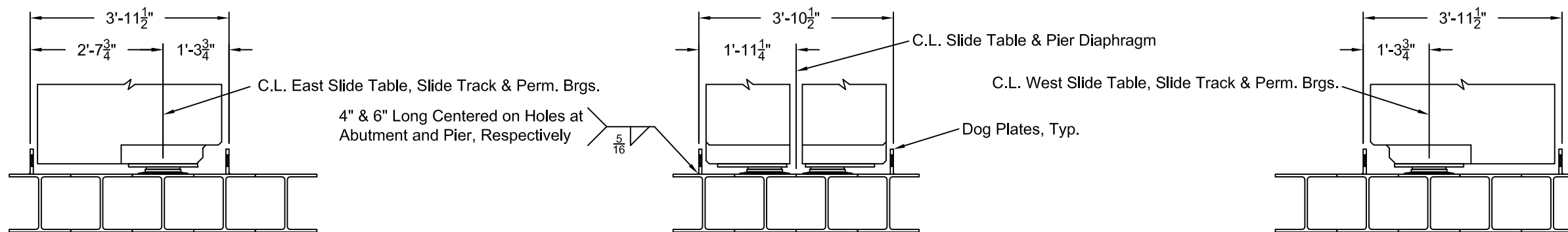
SLIDE TRACK &
 SLIDE SHOE
 LAYOUT

DRAWN JMR	CHECKED MAS
APPROVED JMR	DATE 05/28/14
DRAWING NO. 132408 - SL - 04	
REV. 0	

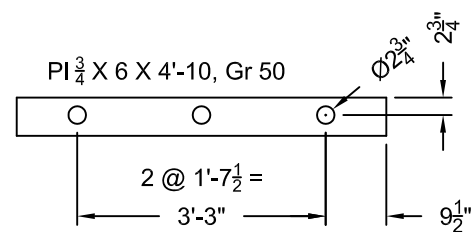
Note: This Dog Plate layout provides a possible slide distance of 81'-3".
Expected slide distance is approximately 80'-0".



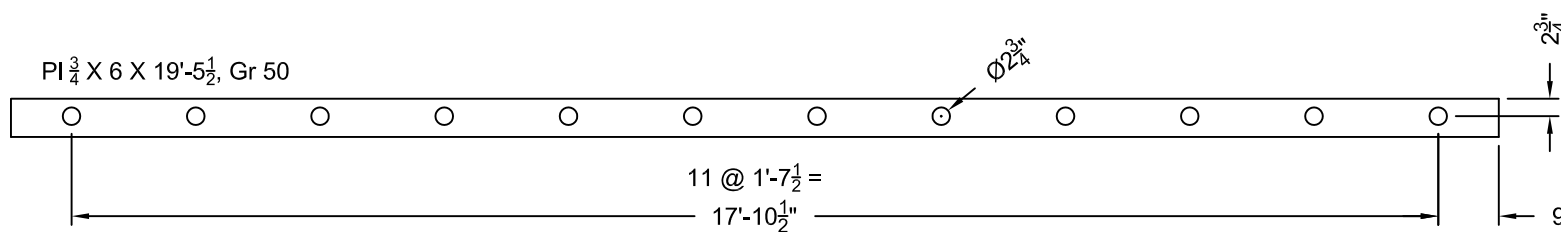
Dog Plate Layout
Looking West



Slide Table End Elevation
Looking South



Dog Plate P2, 6 Required



Dog Plate P1, 24 Required

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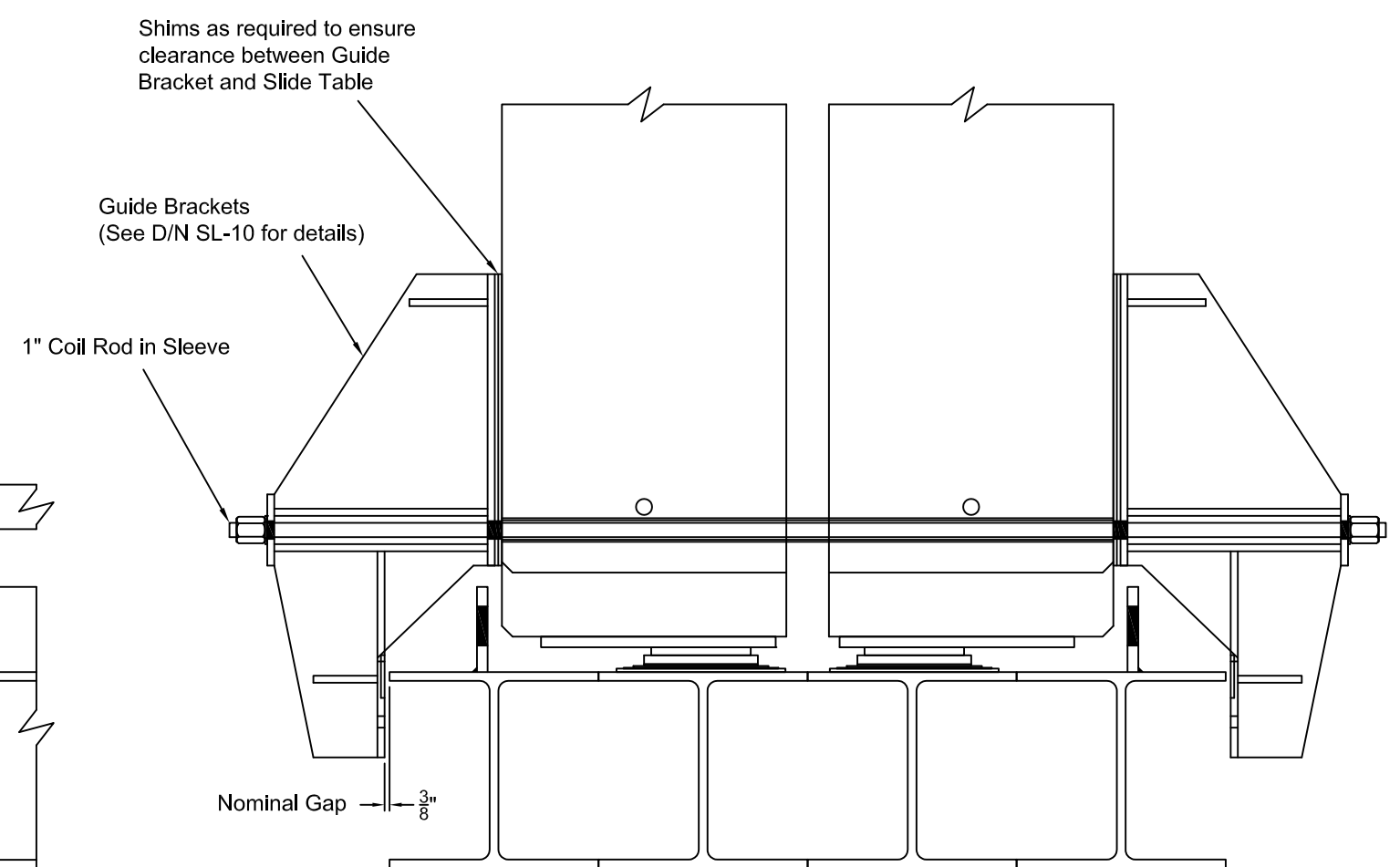
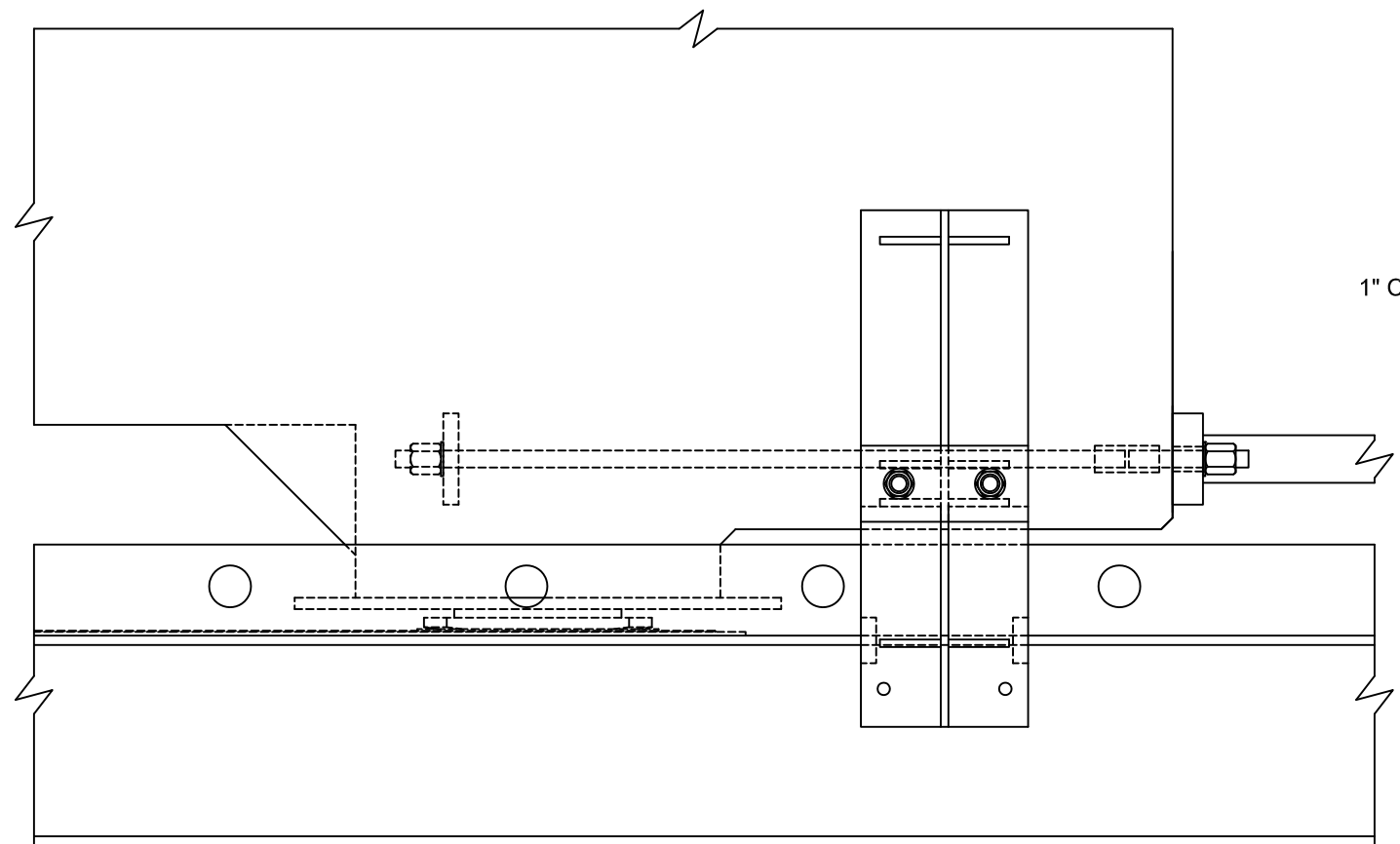
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DOG PLATE
LAYOUT

DRAWN JMR	CHECKED MAS
APPROVED JMR	DATE 05/28/14
DRAWING NO. 132408 - SL - 05	
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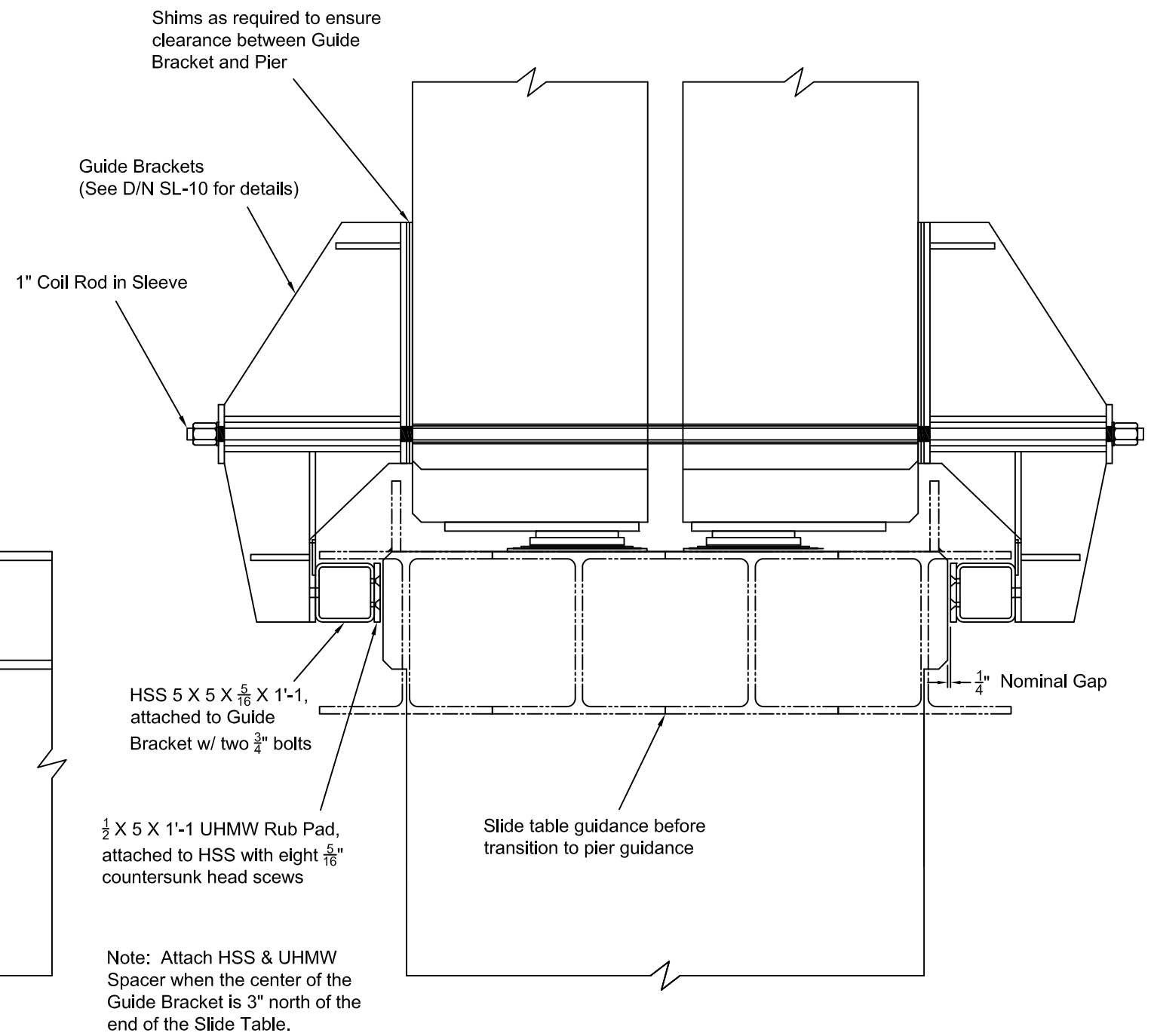
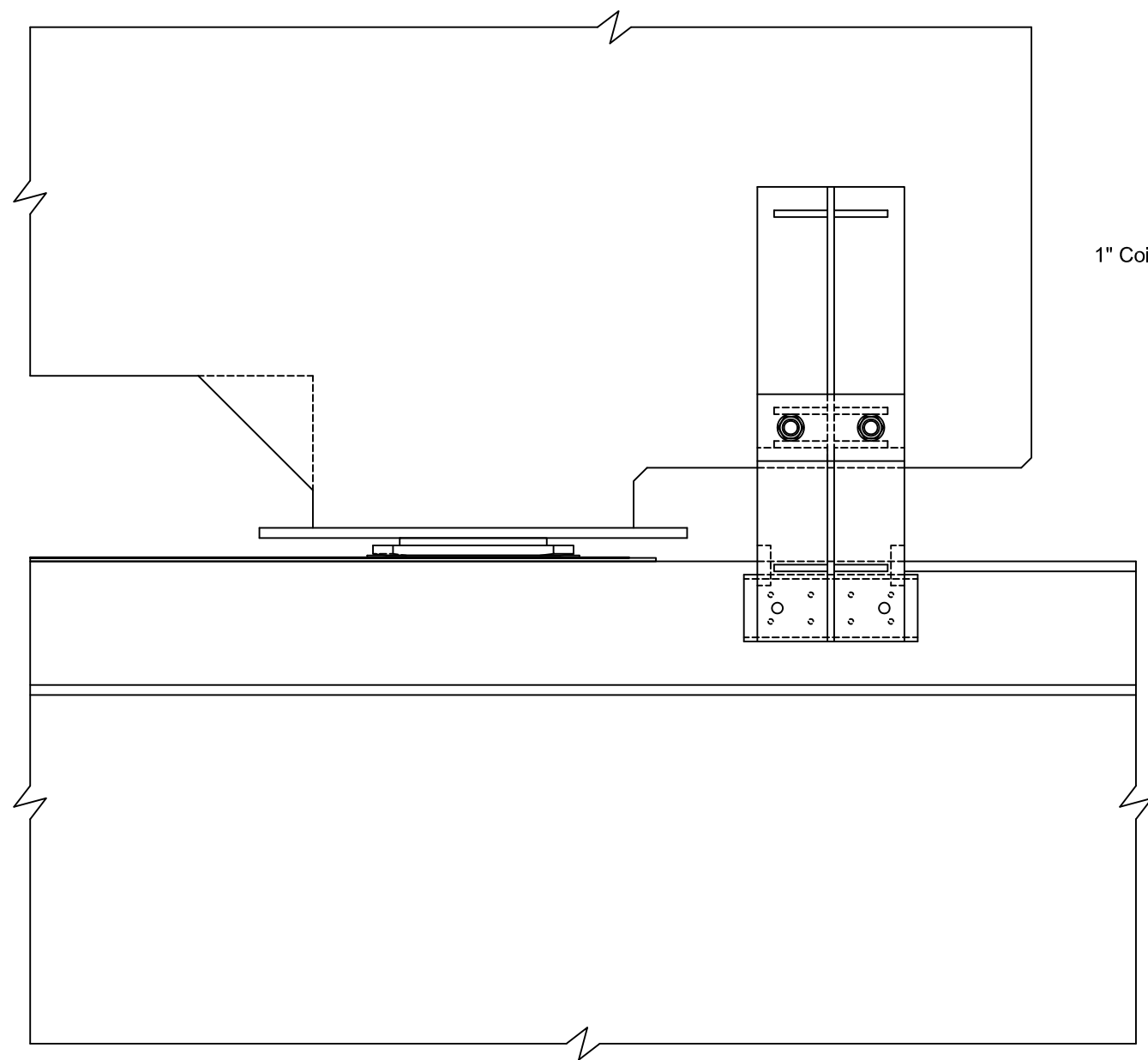
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CENTERING GUIDE
 @
 SLIDE TABLE

DRAWN JMR	CHECKED MAS
APPROVED JMR	DATE 05/28/14
DRAWING NO. 132408 - SL - 06	
REV. 0	



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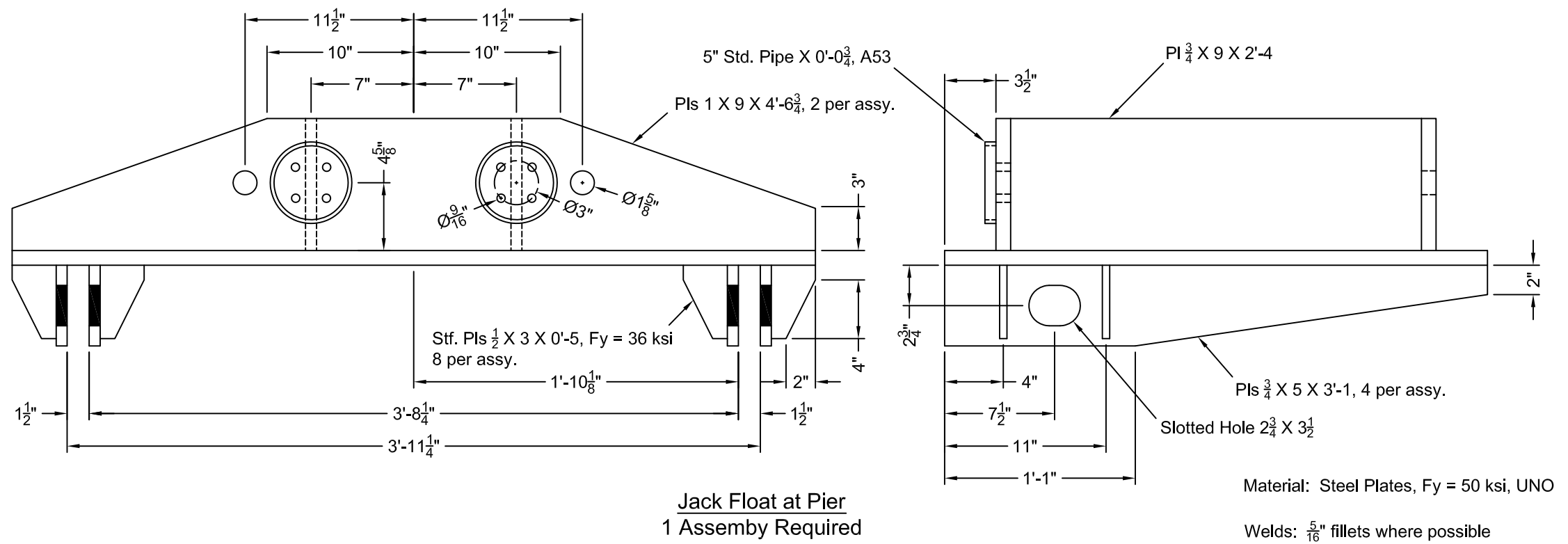
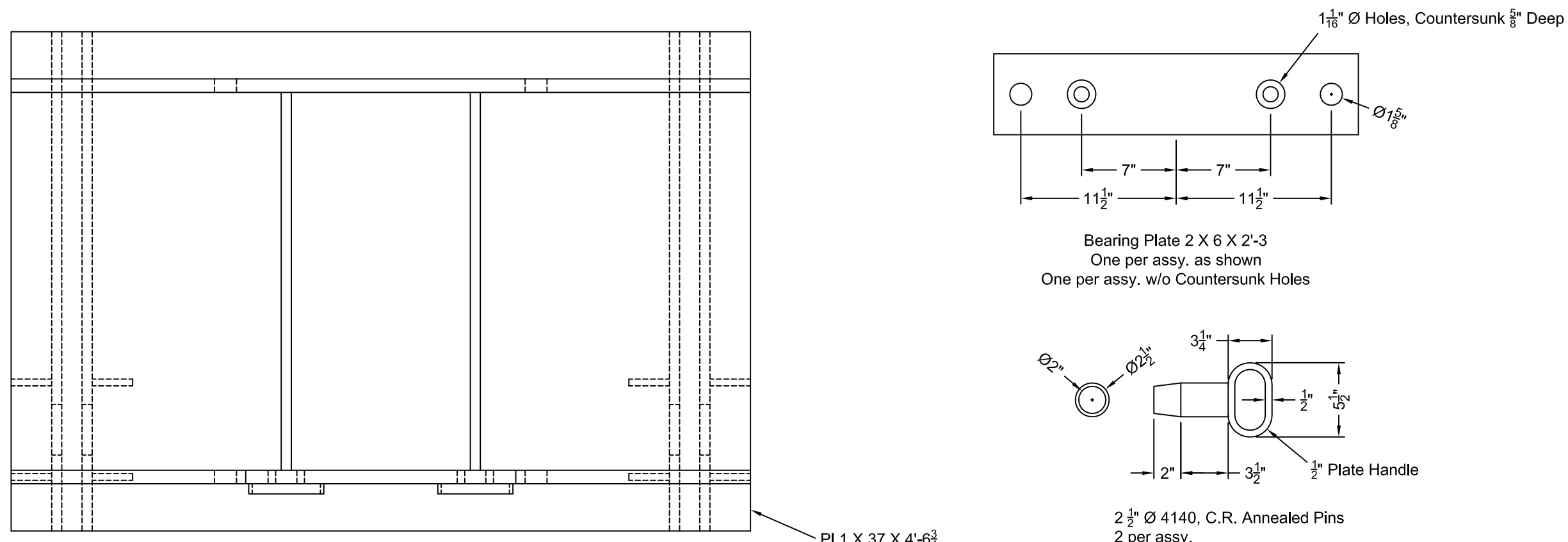
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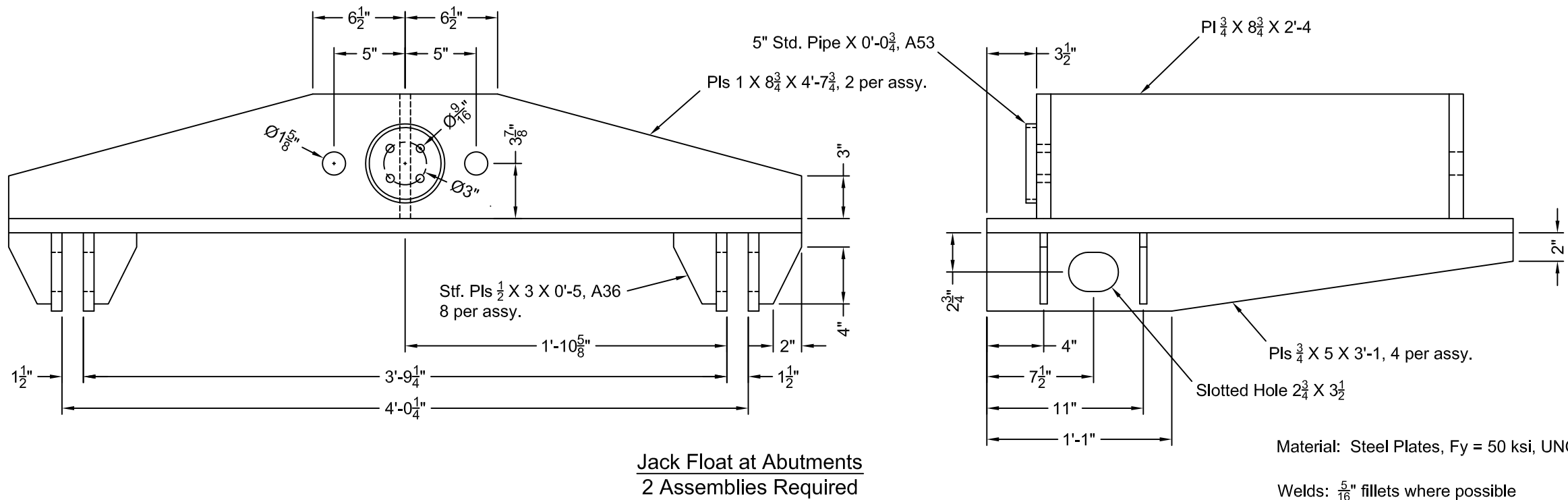
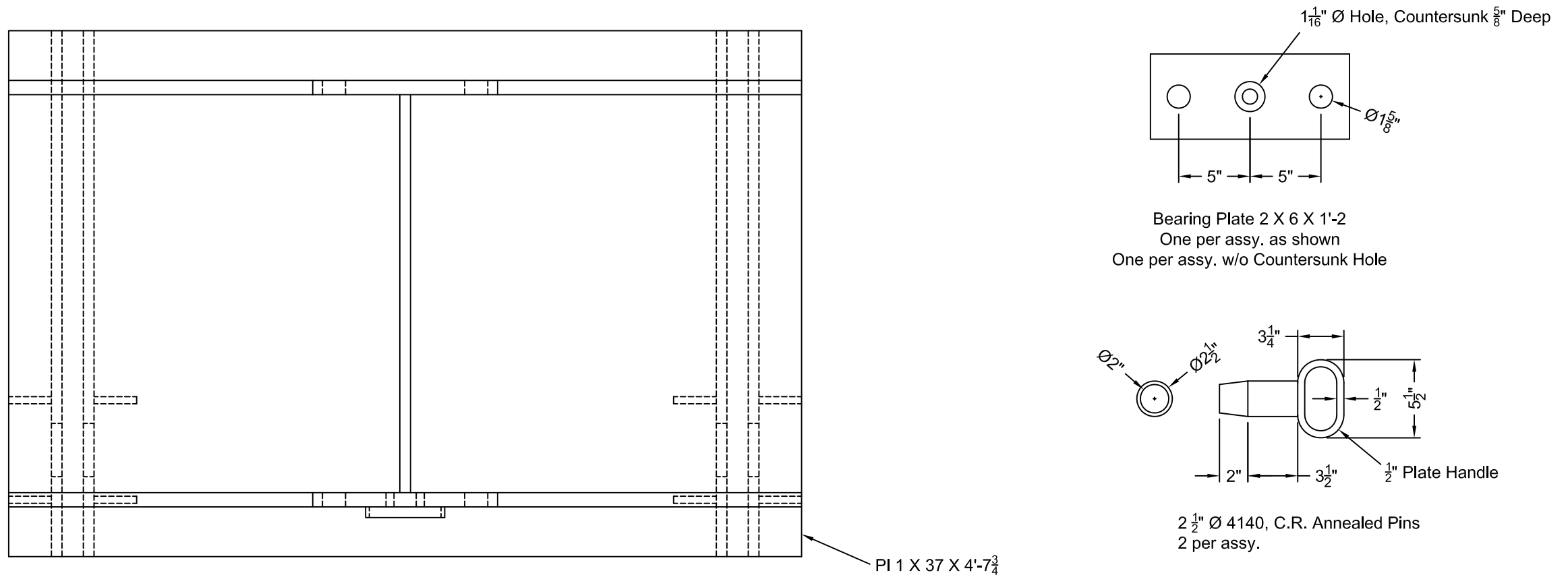
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 New Bridge Slide
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CENTERING GUIDE
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 PIER

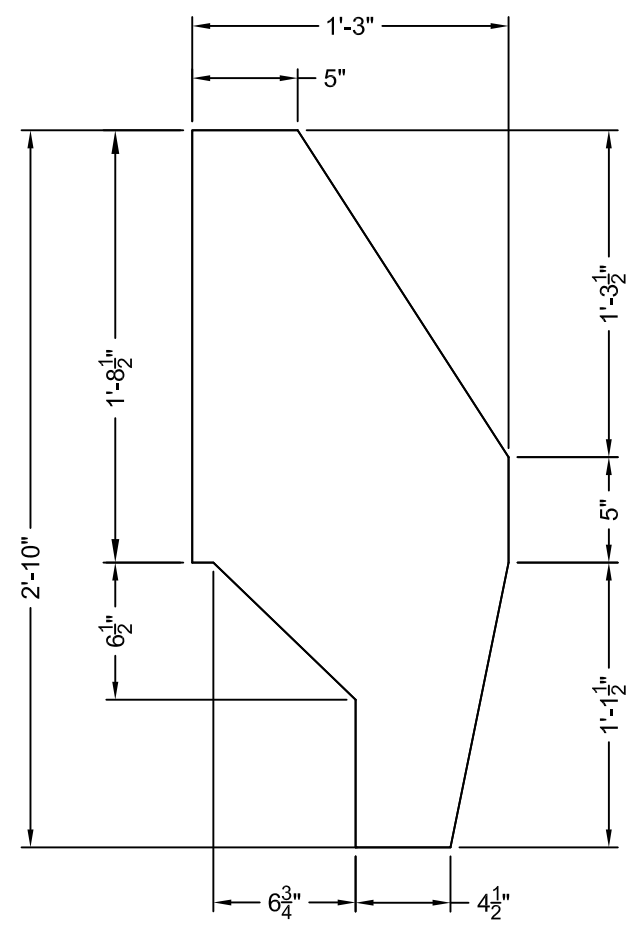
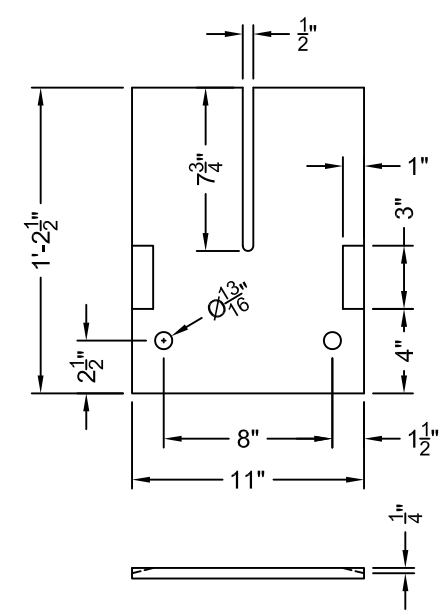
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APPROVED JMR	DATE 05/28/14
DRAWING NO. 132408 - SL - 07	
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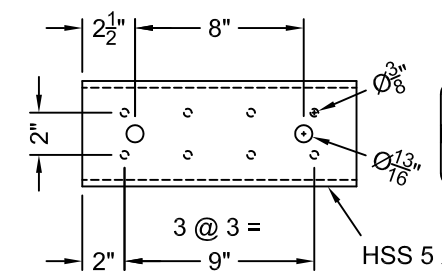
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						APPROVED JMR	DATE 05/28/14
	DRAWING NO.					132408 - SL - 08	
	REV. 0						



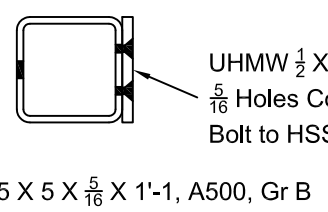
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						APPROVED JMR	DATE 05/28/14
	DRAWING NO. 132408 - SL - 09						
	REV. 0						



Material: $\frac{1}{2}$ " Steel Plates, $F_y = 36$ ksi, UNO
 Welds: $\frac{5}{16}$ " fillets where possible



Guide Bracket Spacer
 4 Assemblies Required



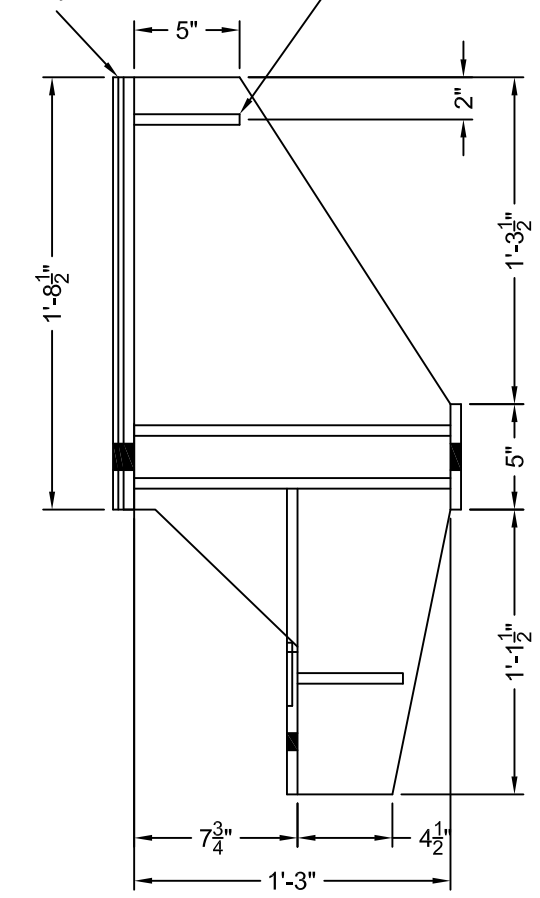
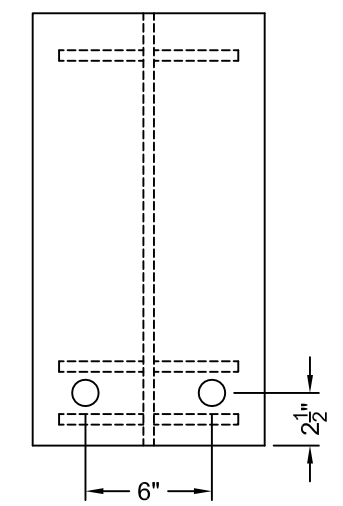
UHMW $\frac{1}{2}$ " X 5 X 1'-1" w/
 $\frac{5}{16}$ " Holes Countersunk $\frac{3}{8}$ " Deep,
 Bolt to HSS w/ $\frac{5}{16}$ " Countersunk Bolts

Hidden Lines Omitted

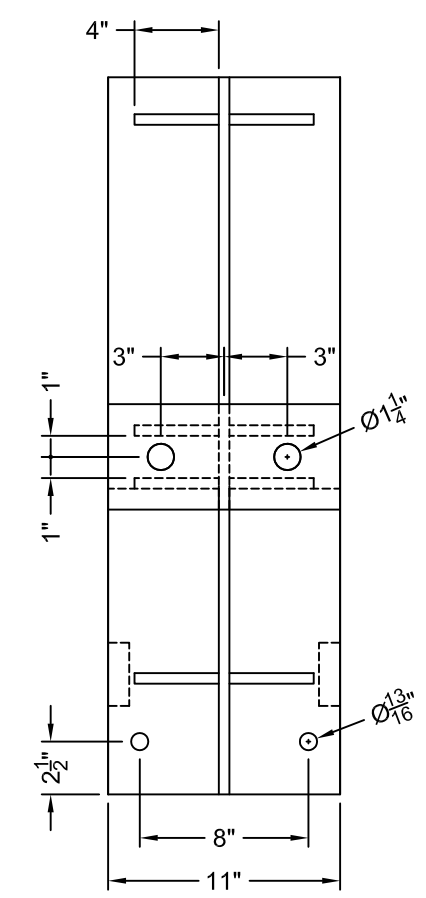
Hidden Lines Omitted

Furnish two $\frac{1}{4}$ " Shims w/ each
 Guide Bracket Assembly

Stiff. Pls $\frac{1}{2}$ " X 4 X 0'-5, Typ.



Guide Bracket Assembly
 4 Assemblies Required



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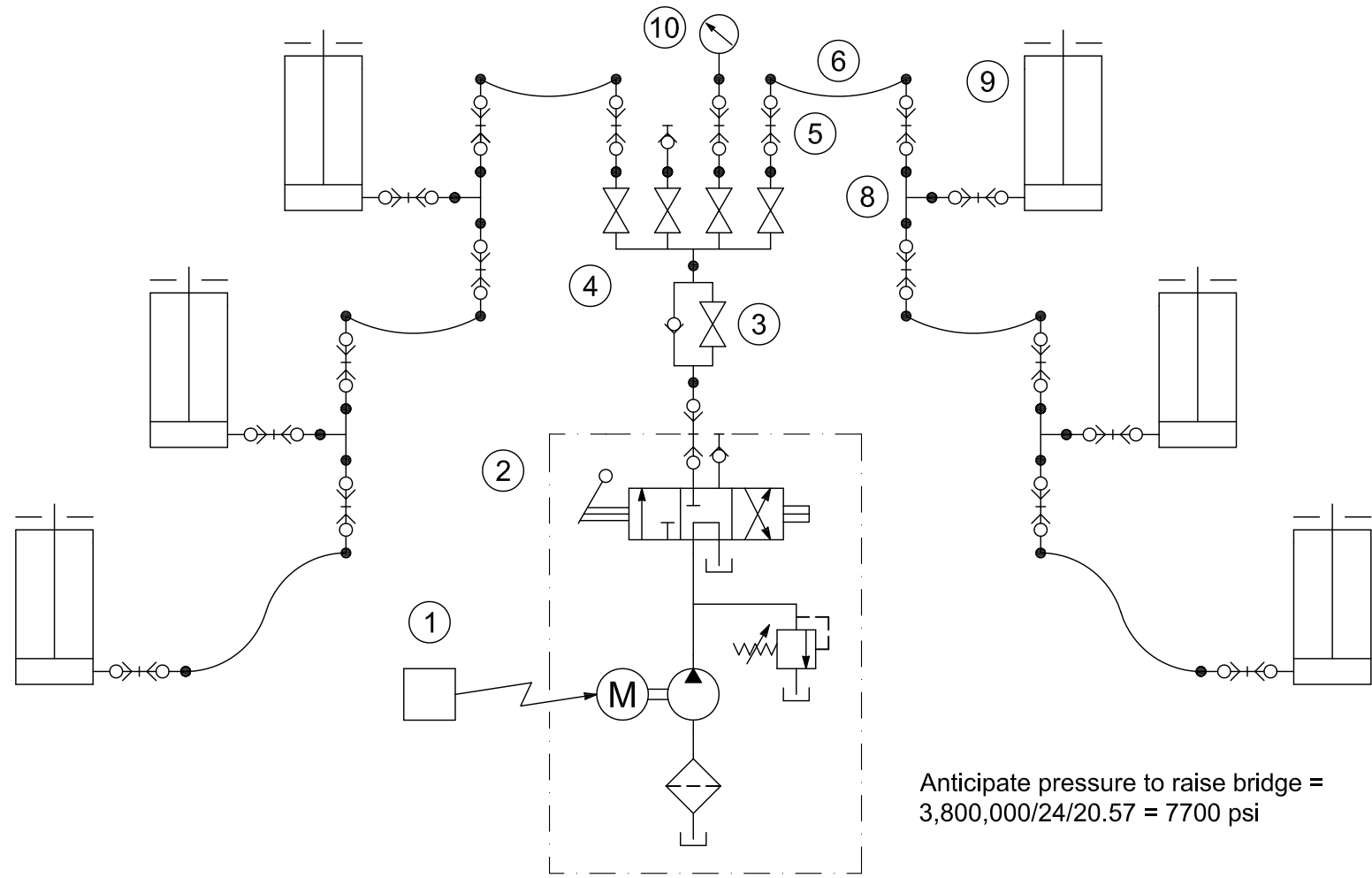
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Larpenteur Avenue Bridge No. 62646
 New Bridge Slide
 St. Paul, Minnesota

**GUIDE BRACKET
 DETAILS**

DRAWN JMR	CHECKED MAS
APPROVED JMR	DATE 05/28/14
DRAWING NO. 132408 - SL - 10	
REV. 0	

Jacking Procedure



The following procedure prescribes the jacking operations to raise the bridge from the slide table form support system to install the skid shoes in preparation for bridge sliding operations, and to raise the bridge from the skid shoes to install the permanent bearing. The approximate pressure required to raise the bridge is as follows:

$$3,800,000 \text{ lbs} / 24 \text{ jacks} / 20.57 \text{ sq. in. per jack} = 7,700 \text{ psi}$$

1. Configure 6 jacks at east and west abutments as shown and 12 jacks at pier as shown on D/N SL-12. See D/N SL-04 for jack locations.
2. Extend and pre-load all jacks to a pressure of 5,000 psi. Check for hydraulic leaks and rectify as necessary. Engage all locking collars.
3. Simultaneously start the pumps at the east abutment and the pier. The 6 jacks at the east abutment will raise the bridge at twice the speed of the 12 jacks at the pier.
4. When the bridge has been raised $\frac{1}{2}$ " at the east abutment and $\frac{1}{4}$ " at the pier, stop the pumps and once again engage all locking collars. Continue jacking in $\frac{1}{2}$ " and $\frac{1}{4}$ " increments at the abutment and pier respectively until the bridge has been raised 4" and 2" at the east abutment and pier respectively and the slide track and skid pads can be installed at the east abutment.
5. Engage all locking collars and release the pressure.
6. Install the slide track and slide shoes at the east abutment as shown on D/N SL-04.
7. As the slide track and slide pads are being installed at the east abutment, simultaneously start the pumps at the west abutment and the pier. The 6 jacks at the west abutment will raise the bridge at twice the speed of the 12 jacks at the pier.
8. When the bridge has been raised $\frac{1}{2}$ " at the west abutment and $\frac{1}{4}$ " at the pier, stop the pumps and once again engage all locking collars. Continue jacking in $\frac{1}{2}$ " and $\frac{1}{4}$ " increments at the abutment and pier respectively until the bridge has been raised 4" and 2" at the west abutment and pier respectively and the slide track and skid pads can be installed at the west abutment and pier. The bridge should now be raised 4" at abutments and piers.
9. Install the slide track and slide shoes as shown on D/N SL-04.
10. Lower the bridge in incremental fashion as prescribed above at the west abutment and pier until the bridge lands on the slide shoes at the west abutment.
10. Lower the bridge in incremental fashion as prescribed above at the east abutment and pier until the bridge lands on the skid pads at the east abutment and pier.
11. Remove all jacks and complete installation of the slide track.

Item No.	Description	Qty.
1	Electrical Power Source, 115 VAC, Single Phase, 17 Amps Continuous	1
2	Hydraulic Pump w/1.7 HP Electric Motor & 3 Pos., 4 Way Valve (ZU4440JB)	1
3	Load Holding / Load Lowering Valve (V-66)	1
4	Valve Manifold Assembly (AM-41)	1
5	3/8" Quick-Disconnect Coupler w/ Dust Caps (C-604)	18
6	1/4" Hydraulic Hose (H-92XX)	6
7	3/8" Cross (FZ-1613) w/ One (1) 3/ 8" Hex Nipple (FZ-1617)	0
8	3/8" Tee (FZ-1612) w/ One (1) 3/ 8" Hex Nipple (FZ-1617)	4
9	100-Ton, 6" Stroke, Locking-Collar Jack, Eff. Area = 20.57 sq. in. (CLL-1006)	6
10	6" Pressure Gauge, 0 - 10,000 psi, Type 312.20 (Wika 9747015)	1
11	Needle Valve (Rego FFG2003T)	0

Unless noted otherwise, the numbers in parentheses are part numbers from the Enerpac® Catalog E327. Components of equal quality and functionality from another manufacturer may be substituted for those specified.

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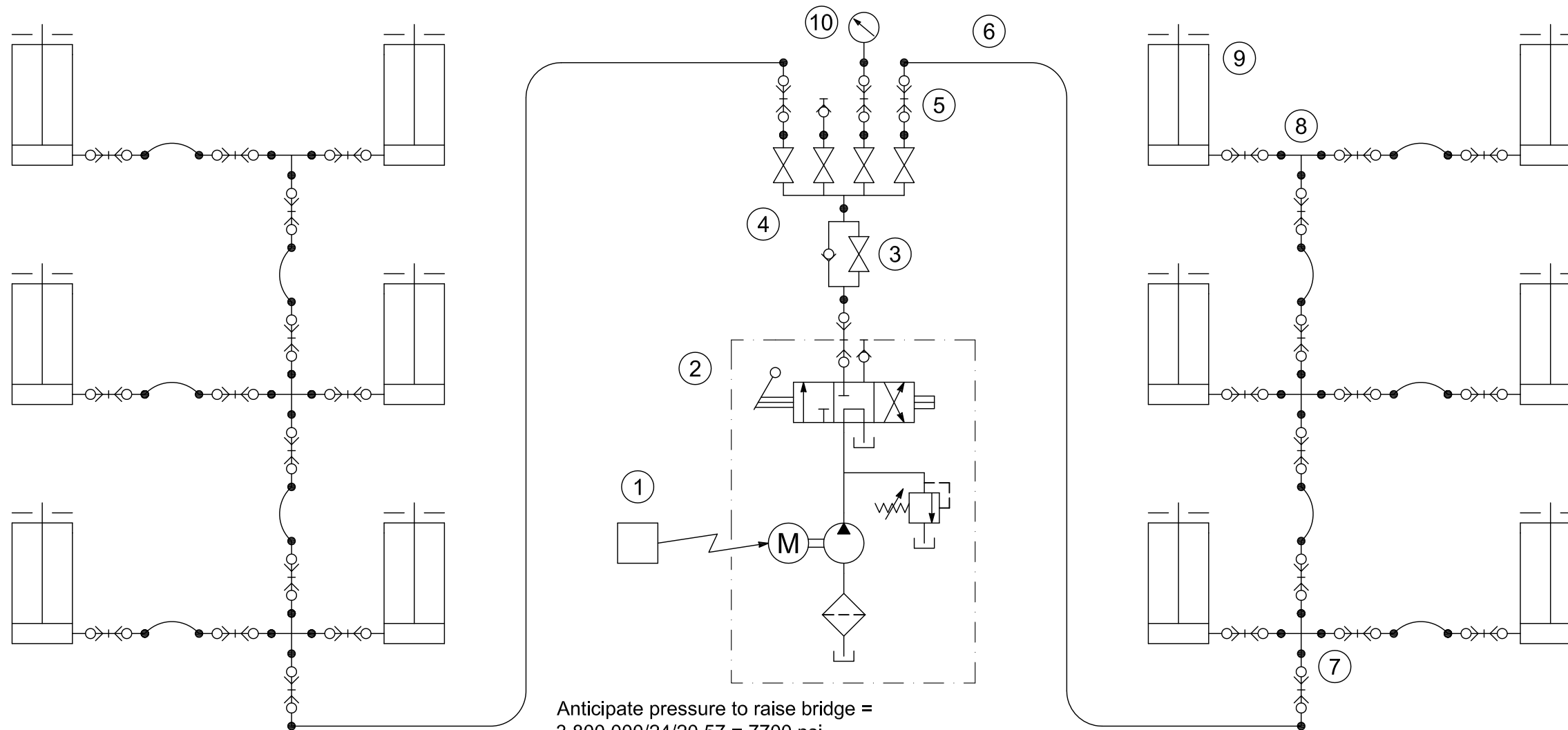
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Larpenteur Avenue Bridge No. 62646
New Bridge Slide
 St. Paul, Minnesota

HYDRAULIC SCHEMATIC
ABUTMENT JACKING
&
JACKING PROCEDURE

DRAWN JMR	CHECKED MAS
APPROVED JMR	DATE 05/28/14
DRAWING NO. 132408 - SL - 11	
REV. 0	



Anticipate pressure to raise bridge = $3,800,000/24/20.57 = 7700$ psi

Item No.	Description	Qty.
1	Electrical Power Source, 115 VAC, Single Phase, 17 Amps Continuous	1
2	Hydraulic Pump w/1.7 HP Electric Motor & 3 Pos., 4 Way Valve (ZU4440JB)	1
3	Load Holding / Load Lowering Valve (V-66)	1
4	Valve Manifold Assembly (AM-41)	1
5	3/8" Quick-Disconnect Coupler w/ Dust Caps (C-604)	30
6	1/4" Hydraulic Hose (H-92XX)	12
7	3/8" Cross (FZ-1613) w/ One (1) 3/ 8" Hex Nipple (FZ-1617)	4
8	3/8" Tee (FZ-1612) w/ One (1) 3/ 8" Hex Nipple (FZ-1617)	2
9	100-Ton, 6" Stroke, Locking-Collar Jack, Eff. Area = 20.57 sq. in. (CLL-1006)	12
10	6" Pressure Gauge, 0 - 10,000 psi, Type 312.20 (Wika 9747015)	1
11	Needle Valve (Rego FFG2003T)	0

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05/28/14

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Larpenteur Avenue Bridge No. 62646

New Bridge Slide

St. Paul, Minnesota

HYDRAULIC SCHEMATIC
PIER JACKING

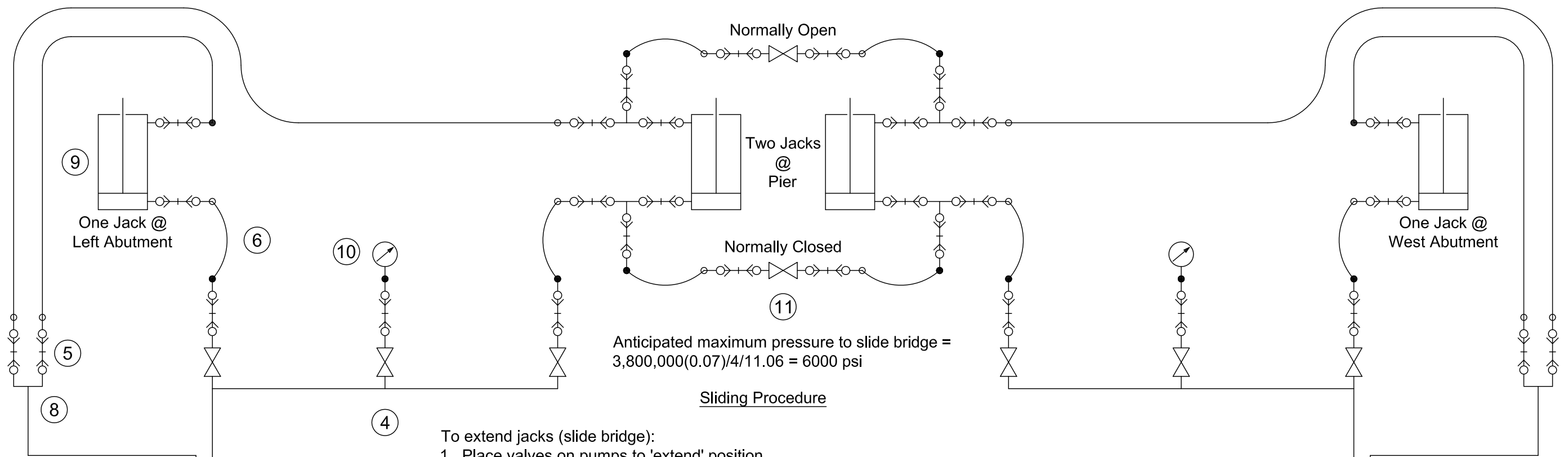
DRAWN
JMR

CHECKED
MAS

APPROVED
JMR

DATE
05/28/14

DRAWING NO.
132408 - SL - 12
REV. 0



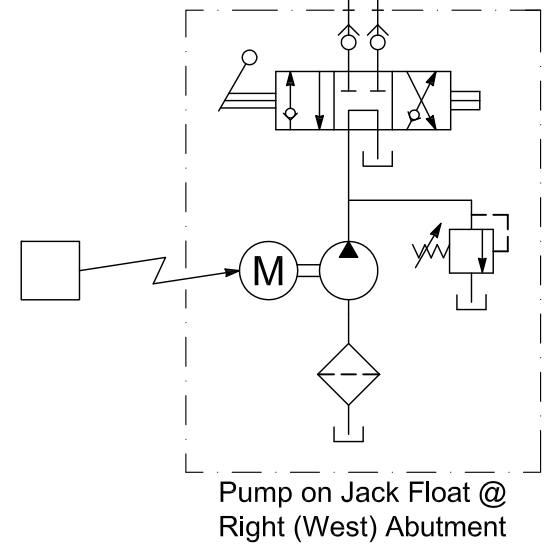
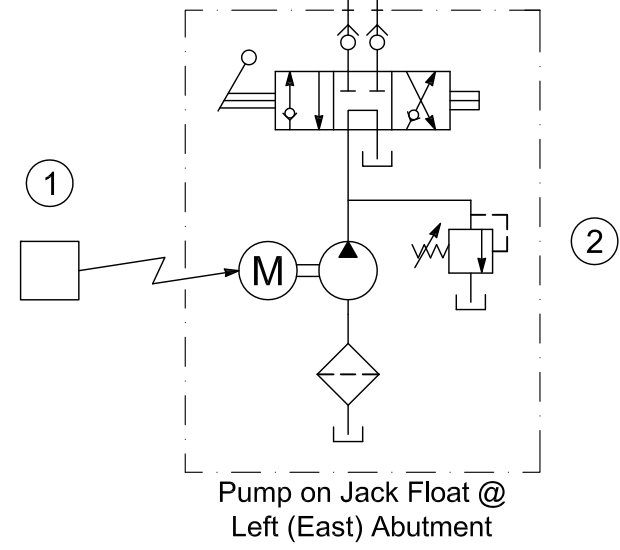
Sliding Procedure

To extend jacks (slide bridge):

1. Place valves on pumps to 'extend' position.
2. Simultaneously start both pumps.
3. Monitor and synchronize movements at each abutment by throttling needle valves.
4. Stop the pumps at the end of the jack strokes, indicated by a slight pressure increase.

To retract jacks in preparation for another stroke:

1. Pull the pins from the Jack Floats.
2. Place valves on pumps to 'retract' position.
3. Simultaneously start both pumps.
4. Retract jacks until pins can be re-engaged in the Jack Floats.



Item No.	Description	Qty.
1	Electrical Power Source, 115 VAC, Single Phase, 17 Amps Continuous	2
2	Hydraulic Pump w/1.7 HP Electric Motor & 3 Pos., 4 Way Valve (ZU4440JB)	2
3	Load Holding / Load Lowering Valve (V-66)	0
4	Valve Manifold Assembly (AM-41)	2
5	3/8" Quick-Disconnect Coupler w/ Dust Caps (C-604)	32
6	1/4" Hydraulic Hose (H-92XX)	12
7	3/8" Cross (FZ-1613) w/ One (1) 3/ 8" Hex Nipple (FZ-1617)	0
8	3/8" Tee (FZ-1612) w/ One (1) 3/ 8" Hex Nipple (FZ-1617)	6
9	50-Ton, 20" Stroke, Double-Acting Jack, Eff. Area = 11.06 sq. in. (RR-5020)	4
10	6" Pressure Gauge, 0 - 10,000 psi, Type 312.20 (Wika 9747015)	1
11	Needle Valve (Rego FFG2003T)	2

Unless noted otherwise, the tabulated numbers in parentheses are part numbers from the ENERPAC® Catalog E327. Components of equal quality and functionality from another manufacturer may be substituted for those specified. Unless noted otherwise, all components and fittings shall have a rated working pressure of 10,000 psi.

James M. Ronning, P.E. 16436 Ringer Road Wayzata, Minnesota 55391 Phone: 952 470 6399	Rev. 0: For Construction	05/28/14	Ames Construction, Inc. 2000 Ames Drive Burnsville, Minnesota 55306 Phone: 952 435 7106	Larpenteur Avenue Bridge No. 62646 New Bridge Slide St. Paul, Minnesota	HYDRAULIC SCHEMATIC BRIDGE SLIDE & SLIDING PROCEDURE	DRAWN JMR	CHECKED MAS
						APPROVED JMR	DATE 05/28/14
						DRAWING NO. 132408 - SL - 13	
						REV. 0	