Russell Island Bridge Inspections

Inspected By: Mike Cieslinski

Inspection Date: April 12, 2023

Calculations By: Michael J. Clark, PE

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Summary of Seminole Bridge Condition

The Seminole Bridge is in good condition. The steel stringers and sheet piling have surface rusting with evidence of minor section loss (5% of total). The wooden interior deck planking is in fair/good condition with checking and splitting on the surface of most planks from traffic. End of deck planks are in poor/fair condition with cracking, splitting & breakage (especially east end) due to lack of fill and traffic flexing unprotected wood. The section loss for the planking is calculated at 15% interior & 25% end planks. The railing is in good condition with a good paint finish.

Capacities:

The main assumption in calculating the bridge capacity is that semi-trucks cannot access this bridge due to ferry limitations. Therefore, only 1-Unit Trucks were used for load rating from 2 to 6 axle configurations as shown in the MDOT Bridge Analysis Guide.

Steel Main Bridge Beams –Maximum Normal Truck Loading = 32.0 ton (Total Truck Weight)
Maximum Occasional Overloading = 43.0 ton (Total Truck Weight)

Wood Plank Decking – Since the planking is laying with the small dimension in the vertical position, the load capacity is limited and very sensitive to the load placement on the planks. A much smaller maximum load can be carried at the mid-point between the main steel beams on the plank than directly over a steel beam.

Maximum Axle Loading at Mid-Point between Steel Beams (3'- 8" centerline to centerline of tires) = 7.7 ton
Maximum Axle Loading for Standard Truck Width (6'- 0" centerline to centerline of tires) = 10.3 ton

Foundation Piling – The previous inspection done in 2009 assumed that the bridge beams sat on the steel seawall for the foundation. The ferry operator was present at the 2009 inspection and informed us that each beam end had a 40' long by 10" diameter pipe pile for the foundation. From the field inspections, the ends of the I-beams are resting on the seawalls and there is no evidence that the beams sit on pipe pile. The maximum load the sheet piling can carry is 31 ton while the maximum load the pipe pile can carry is 21 ton. If the pipe pile exists, then they would share the carrying capacity with the sheet piling. To be safe, the assumed foundation capacity should be considered the sheet piling only since this is the only visual proof of a foundation system. Therefore the load capacity for the bridge foundation is 31 ton.

Load Recommendations:

1. Bridge load capacity was re-rated using AASHTOware Brr.
2. Rating changed slightly but were consistent with previous load rating
3. Recommend posting/restriction of truck traffic as shown on page 16

Maintenance Recommendations:

1. Place a load limit sign as follows:
   a. 2-axle Truck Maximum Load 11 ton
   b. 3-axle Truck Maximum Load 18 ton
   c. 4-axle Truck Maximum Load 21 ton
   d. 5-axle Truck Maximum Load 26 ton
   e. 6-axle Truck Maximum Load 32 ton
2. Replace rotted deck planks at ends of deck (especially east end).
3. To keep the bridge in good shape for as long as possible, it is recommended that the steel I-beams and steel angle bracing have a coat of paint applied. Estimated cost for current highway specifications type paint job would be approximately $40,000 to sand blast and apply a 3-coat paint system.
4. Long term (next 10 years), replace all deck planks due to advanced rotting by then.

<u>Seminole Bridge Picture #1</u>

<u>South elevation</u>

This view shows the view looking north from the south side of bridge.

Seminole Bridge Picture #2

North elevation

This view shows the view looking south from the north side of bridge.

Seminole Bridge Picture #3

Looking NW elevation

This view shows the steel sheet piling lining the channel and running under the bridge. The bridge superstructure is resting on the steel sheet piling which is acting as the substructure (abutment).
It is assumed that steel sheet piling is built using standard methods which would include periodic tie-backs fastened to deadman piles and an embedment of at least 1/3 the total pile length. Notice that the bridge deck has been widened (+/- 24" widening each side).

Seminole Bridge Picture #4

Looking SW elevation

View from the other side of the bridge shows the steel sheet piling lining the channel as it connects to the bridge abutments. All steel sheet piling is in very good condition in the area of the bridge. Again, notice that the bridge deck has been widened.

<u>Seminole Bridge Picture #5</u>

<u>Looking NW at west abutment</u>

This is a typical view of both abutments. All the beam ends are coped as shown. The beam ends sit on the wale cap of the steel sheet piling. All steel members are in good condition with only surface rusting.

Seminole Bridge Picture #6

West sheeting/abutment joints

This is a typical view of both abutments. Minor rusting loss at sheeting joints typical of both abutments.

Seminole Bridge Picture #7

Looking north at west abutment

This is a typical view of both abutments. Again, notice all the beam ends are coped as shown. The beam ends sit on the wale cap of the steel sheet piling. All steel members are in very good condition with only surface rusting. There is no visible weld cracking or deterioration of all coping details.

Seminole Bridge Picture #8

Looking NNE at East Beam End, Typical Exterior Cope Detail of Fascia Beams

Close-up view of beam end showing the coping and good condition of the steel. Also shows how the deck widening is cut into the existing seawall. Welds were sound and without cracks, typical of all welds.

Seminole Bridge Picture #9

Looking east at south widening

This view of the widening shows wood and steel in good condition. Typical of the north widening as well. Visible 4”x 4” x ½” L-Bracket for widening of deck. L-Bracket is welded to main beam web.

Seminole Bridge Picture #10

Looking East from West Abutment at Typical Cross Bracing Detail

Close-up view beam cross bracing between main stringers. Cross braces begin about 6 ½' from each end of bridge and are spaced about 8' apart (3 cross braces total for each stringer span). The cross braces are connected to the stringers with welds. No cracked welds were noted. Cross bracing built from 3 ½"x 4"x ½" L member.

<u>Seminole Bridge Picture #11</u>

<u>Looking West from East Abutment at Typical Cross Bracing Detail</u>

Close-up view beam cross bracing between main stringers. No cracked welds were noted. Typical.

Seminole Bridge Picture #12

Looking west at east approach

General view of the steel box section railing and gravel road approach. Bridge railing is in very good condition and has a solid anchorage. The bridge railing has been recently painted. The wooden deck could use a water sealant.

Seminole Bridge Picture #13

Rotting plank at SW corner of deck

The last 2 deck planks at both approaches are rotted and should be replaced. No other rotted planks were noted. End planks need to be replaced.

AASHTO Brr Deck Load Rating Output:

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location
HS 20-44	Axle Load	ASD	Inventory	15.50	0.431	3.250
HS 20-44	Axle Load	ASD	Operating	20.64	0.573	3.250
Michigan 1 Unit Truck 01-NL and DL	Axle Load	ASD	Operating	11.15	0.667	3.250
Michigan 1 Unit Truck 02-DL	Axle Load	ASD	Operating	17.80	0.751	3.250
Michigan 1 Unit Truck 03	Axle Load	ASD	Operating	21.22	0.780	3.250
Michigan 1 Unit Truck 04	Axle Load	ASD	Operating	26.29	0.780	3.250
Michigan 1 Unit Truck 05-DL	Axle Load	ASD	Operating	32.65	0.777	3.250

AASHTO Brr Fascia Beam Load Rating Output:

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)
HL-93 (US)	Truck + Lane	LRFR	Inventory	34.06	0.946	14.67
HL-93 (US)	Truck + Lane	LRFR	Operating	44.16	1.227	14.67
HL-93 (US)	Tandem + Lane	LRFR	Inventory	32.27	0.896	18.33
HL-93 (US)	Tandem + Lane	LRFR	Operating	41.83	1.162	18.33
Michigan 1 Unit Truck 01-NL and DL	Axle Load	LRFR	Legal	33.17	1.986	14.67
Michigan 1 Unit Truck 02-DL	Axle Load	LRFR	Legal	33.19	1.400	18.33
Michigan 1 Unit Truck 03	Axle Load	LRFR	Legal	35.57	1.308	18.33
Michigan 1 Unit Truck 04	Axle Load	LRFR	Legal	36.96	1.097	18.33
Michigan 1 Unit Truck 05-DL	Axle Load	LRFR	Legal	50.46	1.201	18.33

AASHTO Brr Interior Beam Load Rating Output:

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)
HL-93 (US)	Truck + Lane	LRFR	Inventory	29.27	0.813	14.67
HL-93 (US)	Truck + Lane	LRFR	Operating	37.95	1.054	14.67
HL-93 (US)	Tandem + Lane	LRFR	Inventory	27.75	0.771	18.33
HL-93 (US)	Tandem + Lane	LRFR	Operating	35.98	0.999	18.33
Michigan 1 Unit Truck 01-NL and DL	Axle Load	LRFR	Legal	28.50	1.707	14.67
Michigan 1 Unit Truck 02-DL	Axle Load	LRFR	Legal	28.55	1.204	18.33
Michigan 1 Unit Truck 03	Axle Load	LRFR	Legal	30.59	1.125	18.33
Michigan 1 Unit Truck 04	Axle Load	LRFR	Legal	31.79	0.943	18.33
Michigan 1 Unit Truck 05-DL	Axle Load	LRFR	Legal	43.41	1.033	18.33

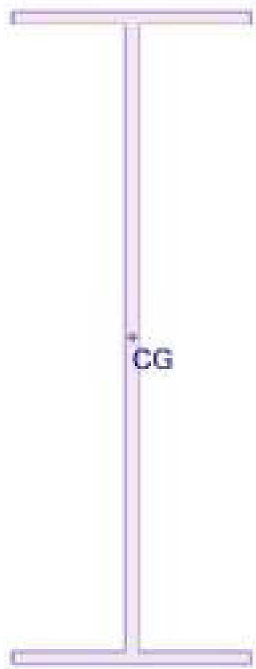
Summary:
The steel I-beams are capable of carrying fully leaglly loaded straight trucks up to and including 6-axle concrete delivery trucks.

The limiting factor for load capacity is the wood deck planks. Since each plank is independent (not cross connected), this along with the plank thickness controls the load carrying capacity and therefore the overall bridge capacity.

Recommended Load Posting:

- 2-axle Truck = 11 ton
- 3-axle Truck = 18 ton
- 4-axle Truck = 21 ton
- 5-axle Truck = 26 ton
- 6-axle Truck = 32 ton

Michael Clark
St. Clair County Road Commission



Dimensions	
Width	9.50 in
Height	26.0 in
Perimeter	89 in
Geometric Properties	
Iy	71.7 in^4
Ix	2196 in^4
ry	1.81 in
rx	9.99 in
A	22.0 in^2
Sy Right	15.1 in^3
Sy Left	15.1 in^3
Sx Bottom	169 in^3
Sx Top	169 in^3
Centroid Y	5.68434e-014 in
Centroid X	1.61487e-014 in
Plastic Properties	
Zy	24.1 in^3
Zx	199 in^3
PNA-Y	5.68434e-014 in
PNA-X	1.61487e-014 in
Polar Properties	
Ip	2267 in^4
rp	10.2 in

Principal Properties	
I2	71.7 in^4
I1	2196 in^4
Ixy	-2.27374e-013 in^4
Theta	0 deg

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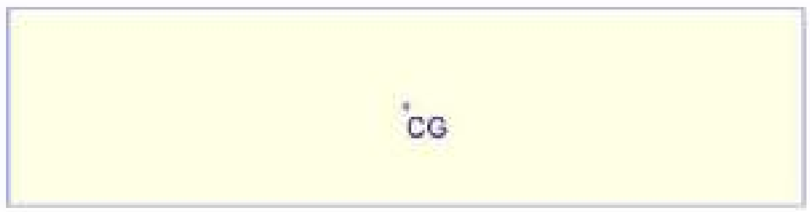
Section Properties as measured from site of main stringers of Seminole Bridge

Michael Clark
St. Clair County Road Commission



Dimensions	
Width	12 in
Height	3 in
Perimeter	30 in
Geometric Properties	
Iy	432 in^4
Ix	27.0 in^4
ry	3.46 in
rx	0.87 in
A	36.0 in^2
Sy Right	72.0 in^3
Sy Left	72.0 in^3
Sx Bottom	18.0 in^3
Sx Top	18.0 in^3
Centroid Y	0.00 in
Centroid X	-0.00 in
Plastic Properties	
Zy	108 in^3
Zx	27.0 in^3
PNA-Y	0.00 in
PNA-X	-0.00 in
Polar Properties	
Ip	459 in^4
rp	3.57 in

Principal Properties	
I2	27.0 in^4
I1	432 in^4
Ixy	7.10543e-015 in^4
Theta	90 deg

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Section Properties as measured from site of deck planking of Seminole Bridge

Steel Sheet Pile Abutments

Assumptions:

1. Driven sheets are 20’ long (normal for this area)
2. Tiebacks to deadman piles are evenly spaced for vertical stability
3. Approximately 7’ of sheet piling exposed
4. 20’ – 7’ = 13’ embedment depth
5. Length of abutment wall for bearing, 12.5’, being the distance from angle to angle where abutment portion of wall turns back to the remaining seawall.
6. Soil standard penetration equals 3 blows per foot (n) from tests in surrounding area

F = n/50 -> 3/50 = 0.06 ton per Sft or 120 Lbs per Sft

Area of wall in soil times skin friction from above

13’ x 12.5’ x 2 x 120 lbs/ft2 = 39,000 lbs for each abutment

39,000 x 2 = 78,000 lbs for total capacity of foundation.

78,000 lbs – 15,323 lbs total dead load of superstructure = 62,677 lbs or 31.3 tons carrying capacity

Steel Pipe Pile Abutments

Assumptions:

1. Pipe Piles are 40’ long (per ferry operator)
2. Approximately 8’ of sheet piling exposed
3. 40’ – 8’ = 32’ embedment depth
4. Surface area for bearing is calculated using 10” diameter circumference per foot times the embedded length: (10/12) x pi= 2.618 Sft/Ft
5. Soil standard penetration equals 3 blows per foot (n) from tests in surrounding area

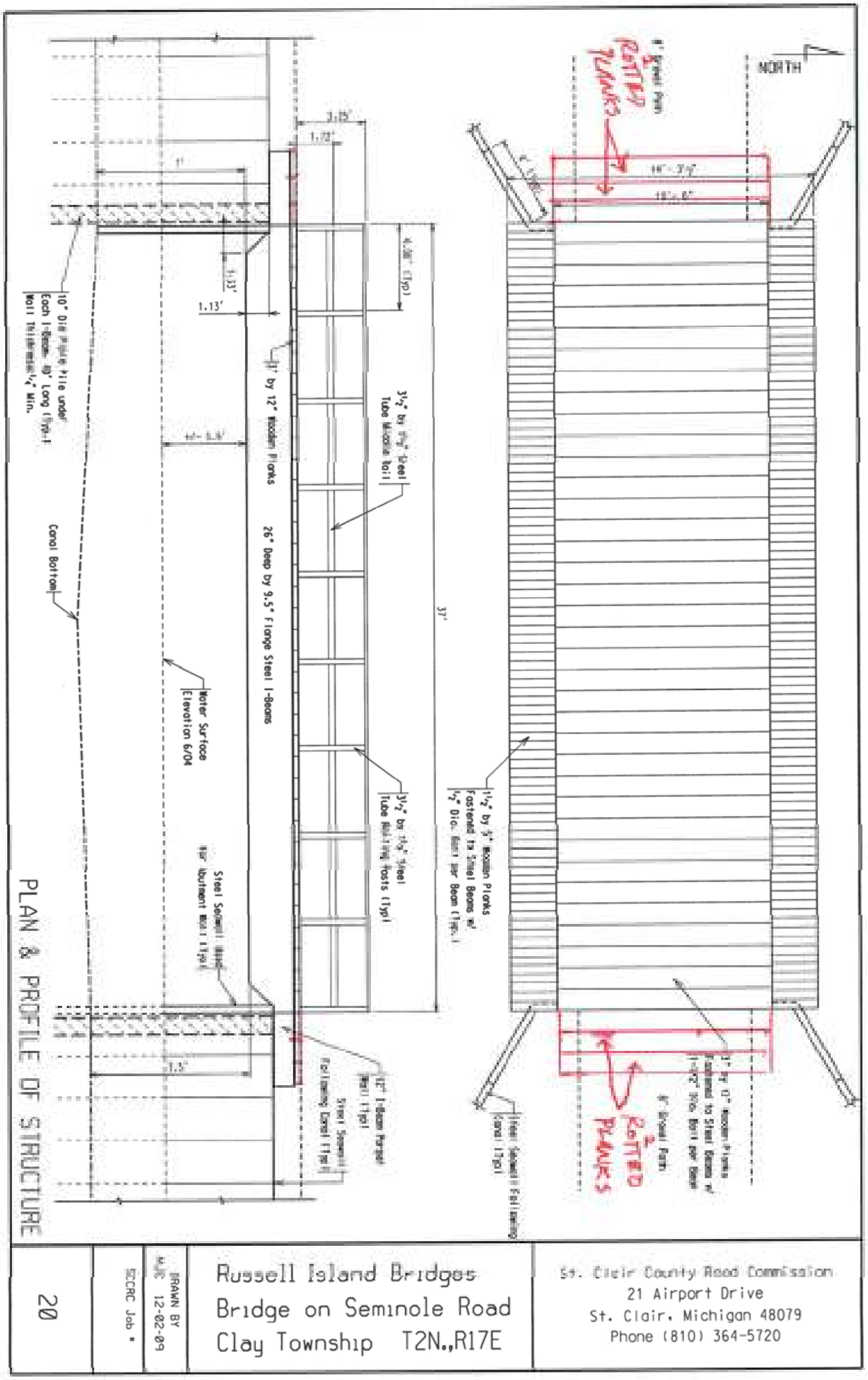
F = n/50 -> 3/50 = 0.06 ton per Sft or 120 Lbs per Sft

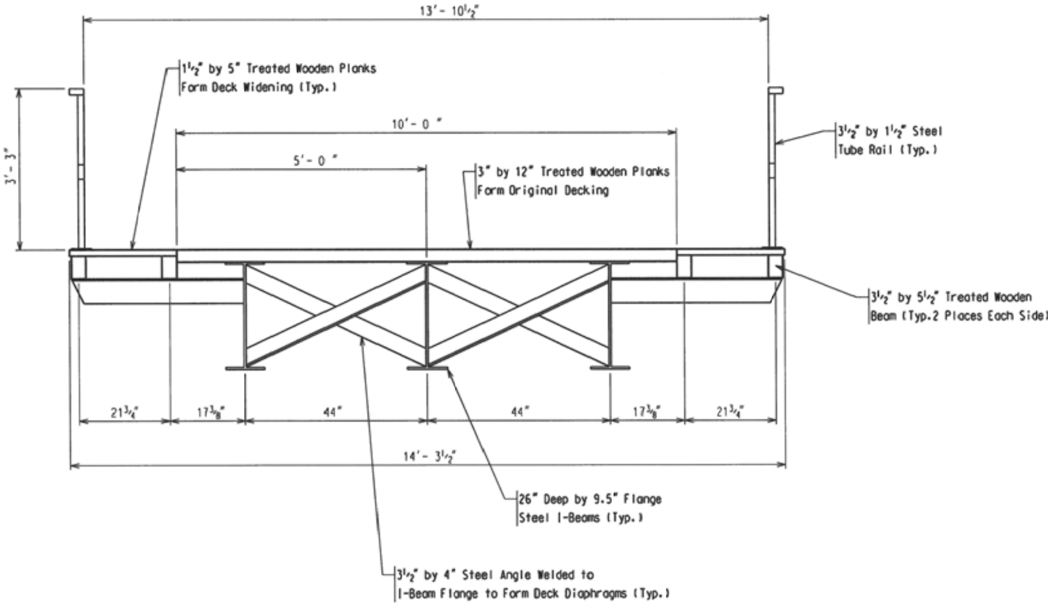
Area of wall in soil times skin friction from above

32’ x 2.618 ft2/ft x 3 x 120 lbs/ft2 = 30,159 lbs for each abutment

30,159 x 2 = 60,318 lbs for total capacity of foundation.

60,318 lbs – 17,617 lbs total dead load of superstructure = 42,701 lbs or 21.4 tons carrying capacity


PLAN & PROFILE OF STRUCTURE
NORTH
Russell Island Bridges
Bridge on Seminole Road
Clay Township T2N.,R17E
St. Clair County Road Commission
21 Airport Drive
St. Clair, Michigan 48079
Phone (810) 364-5720
DRAWN BY
12-02-09
SCRC Job #
20



STRUCTURE DETAILS

St. Clair County Road Commission
21 Airport Drive
St. Clair, Michigan 48079
Phone (810) 364-5720

Russell Island Bridges
Bridge on Seminole Road
Clay Township T2N.,R17E

DRAWN BY
MJC 12-02-09

SCCRC Job #

21

Summary of Russell Bridge Condition

The Russell Bridge is in fair condition. The wood stringers and pile caps are in fair condition with minor checking and splitting (calculated 10% section loss). The wood decking is in good condition with 23 planks having been replaced since the last inspection. The wood railing has been reconstructed and is in very good condition. The wood piling is in generally good to fair condition with evidence of vehicle hits on at least three of the pile. The piling has minor end splitting with a couple of piles having larger splits running about a third of their length. The piling was tested using a hammer and felt sound with the exception of two pile (see bridge plan for location).

Capacities:

The main assumption in calculating the bridge capacity is that semi-trucks cannot access this bridge due to ferry limitations. Therefore, only straight trucks were used with 2 to 6 axle configurations as shown in the MDOT Bridge Analysis Guide

Wood Main Bridge Beams – Maximum Normal Truck Loading = 8.0 ton (Total Truck Weight)
Maximum Occasional Overloading = 16.0 ton (Total Truck Weight)

Wood Plank Decking – Since the planking is laying with the small dimension in the vertical position, the load capacity is limited. The beams spacing is fairly close together (average 2.98’) but load capacity is still minimal but higher than the beam capacity.

Maximum Axle Loading at Mid-Point between Largest Span Wood Beams (4’- 1 1/2” centerline to centerline of tires) = 8.7 ton

Maximum Axle Loading for Standard Truck Width (6’- 0” centerline to centerline of tires) = 11.6 ton

Wood Pile Cap – The beam used for the pile cap is the same size as the main bridge beams.
Maximum Normal Truck Loading = 13.7 ton (Total Truck Weight)
Maximum Occasional Overloading = 18.8 ton (Total Truck Weight)

Wooden Piling – With the assumed total length of a pile at 30 feet (leaving 16 feet of soil embedment). The load capacity for the northerly span is lowest but still much higher capacity than pier cap and therefore piles do not limit total load capacity.

Load Recommendations:

1. Bridge load capacity was re-rated using AASHTOware Brr.
2. Rating changed slightly but were consistent with previous load rating
3. Recommend posting/restriction of truck traffic as shown on page 44
4. This bridge was never designed to carry heavy traffic. The condition of the structure is good, but the load carrying capacity is low. The bridge will function fine for many years as long as the load weights are restricted.

Maintenance Recommendations:

1. Place a load limit sign as follows:
    a. 2-axle Truck Maximum Load 8 ton
    b. 3-axle Truck Maximum Load 9 ton
    c. 4-axle Truck Maximum Load 10 ton
    d. 5-axle Truck Maximum Load 11 ton
    e. 6-axle Truck Maximum Load 16 ton
2. "Touch-up" painting should be performed annually on the bridge railing to extend the railing life.
3. Paint/waterproof the top of the deck planks each fall. This will seal out moisture from the winter and spring to preserve the planks for as long as possible.
4. An additional 7 ½" by 7 ½" pile cap has been added to the most southerly pile line and secured to the existing pile cap. However, the floor beams are not in contact with this pile cap "widening." It is recommended that shims be installed so that all pile caps are in full contact with their associated piles.
5. A few of the floor beam to pier cap and pier cap to pile bearing surfaces are not in full contact. It is recommended that all bearing surfaces be restored to full contact using shims.
6. Most of the piles have checks and splits. It is recommended that banding be installed around all piles to mitigate the propagation of these checks and splits.

Russell Bridge Picture #1

West elevation

There are six lines of wooden piling (five shown in this view) supporting the deck sections. The bridge railing is supported by 5” by 2 ½” wooden posts with a top rung made of 4” by 4” timbers set at a 45° angle to horizontal and the middle rung made of standard 2” by 4” studding set on edge.

Russell Bridge Picture #2

Looking SE

Another view from the west.

Russell Bridge Picture #3

Looking west elevation

In this view all six pile lines can be seen. Note that the farthest pile line to the south is very close to the seawall. The seawall on both ends of the bridge does not support the bridge.

Russell Bridge Picture #4

Looking SW

Another view from the east.

Russell Bridge Picture #5

Looking south at south bearing beam

Southern span floor beams supported by a transverse beam on bare earth.

Russell Bridge Picture #6

Looking north at north bearing beam

Northern span floor beams supported by a transverse beam on bare earth.

Russell Bridge Picture #7

Looking east at underside of PC1

The pile cap that is on the farthest pile line to the south (PC1) has shifted approximately 3/4 the pile diameter south (no change from the previous inspection). Since the last inspection, an additional 7 ½” by 7 ½” pile cap has been added to the most southerly pile line and secured to the existing pile cap.

Russell Bridge Picture #8

Looking east at PC1/P1 with no contact of FB to PC1 repair

However, the floor beams are not in contact with this pile cap “widening.” The gaps are approximately ½” tapering down to ¼” (typical of all floor beams at PC1).

Russell Bridge Picture #9

Close-up looking east at PC1/P1 with no contact of FB to PC1 repair

Close-up of the gap between this additional pile cap and existing floor beam.

Russell Bridge Picture #10

Looking SE at PC1

Added pile cap secured to existing pile cap. Note that the 5 floor beams visible have gaps.

Russell Bridge Picture #11

Span 3 looking east between FB3 & FB4

Two beams appear to have had repair work done with the 7 ½" by 7 ½" beam missing and replaced with two 7 ½" by 4" timbers attached to either side of the adjacent square beam as shown (See detailed drawing for exact location). No change from previous inspection.

Russell Bridge Picture #12

Looking south at PC3

Typical view of floor beams. The beam are mainly 7 ½” by 7 ½” square timbers spaced anywhere from 2’-3” to 4’-3” apart.

Russell Bridge Picture #13

Looking east at PC4/P1

Shows typical checks and splits of the wood piles.

Russell Bridge Picture #14

Looking SW at PC4/P1

Shows typical checks and splits of the wood piles. Flip side of Picture #13.

Russell Bridge Picture #15

Looking SW at PC3/FB5 repaired floor beam stack

Since the last inspection, the stack of planking has been replaced with two, 7 ½” by 7 ½” square timbers secured together (see bridge plans for location).

Russell Bridge Picture #16

Looking NE at railing and deck

A good view of the bridge railing attachment of post to deck, steel brackets are lag screwed to post and deck to hold things together. The posts sit on top of the deck. The railing is in very good condition.

Russell Bridge Picture #17

Looking NW at railing and deck

The bridge railing is supported by 5" by 2 ½" wooden posts with a top rung made of 4" by 4" timbers set at a 45° angle to horizontal and the middle rung made of standard 2" by 4" studding set on edge.

Russell Bridge Picture #18

Looking SE at railing and deck

A view of the bridge railing and deck planks.

Russell Bridge Picture #19

Looking SW at railing and deck

Another view of the bridge railing and deck planks.

Russell Bridge Picture #20

Looking south from north approach

8-foot gravel road approach in very good condition. The steel seawall around bridge is in very good condition. The deck is composed of 2 ½" by 9" planking set with wide dimension horizontal. Planks are in generally very good condition with some minor wear along center from golf cart tires. Since the previous inspection, loose planks have been secured and rotted planks have been replaced.

AASHTO Brr Deck Load Rating Output:

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location
HS 20-44	Axle Load	ASD	Inventory	8.74	0.243	8.190
HS 20-44	Axle Load	ASD	Operating	11.64	0.323	8.190
Michigan 1 Unit Truck 04	Axle Load	ASD	Operating	15.21	0.451	8.190
Michigan 1 Unit Truck 05-DL	Axle Load	ASD	Operating	18.77	0.447	8.190
Michigan 2 Unit Truck 17-DL	Axle Load	ASD	Operating	32.89	0.434	8.190
Michigan 2 Unit Truck 18-DL	Axle Load	ASD	Operating	29.74	0.386	8.190
Michigan 3 Unit Truck 23-DL	Axle Load	ASD	Operating	30.94	0.402	8.190

AASHTO Brr Fascia Beam Load Rating Output:

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)
HL-93 (US)	Truck + Lane	LRFR	Inventory	17.56	0.488	62.80	7 - (60.0)
HL-93 (US)	Truck + Lane	LRFR	Operating	22.76	0.632	62.80	7 - (60.0)
HL-93 (US)	Tandem + Lane	LRFR	Inventory	15.95	0.443	62.80	7 - (60.0)
HL-93 (US)	Tandem + Lane	LRFR	Operating	20.68	0.574	62.80	7 - (60.0)
Michigan 1 Unit Truck 01-NL and DL	Axle Load	LRFR	Legal	19.90	1.192	62.80	7 - (60.0)
Michigan 1 Unit Truck 02-DL	Axle Load	LRFR	Legal	21.33	0.901	62.80	7 - (60.0)
Michigan 1 Unit Truck 03	Axle Load	LRFR	Legal	23.58	0.867	62.80	7 - (60.0)
Michigan 1 Unit Truck 04	Axle Load	LRFR	Legal	27.17	0.806	62.80	7 - (60.0)
Michigan 1 Unit Truck 05-DL	Axle Load	LRFR	Legal	39.41	0.938	62.80	7 - (60.0)

AASHTO Brr Interior Beam Load Rating Output:

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)
HL-93 (US)	Truck + Lane	LRFR	Inventory	7.25	0.201	62.80	7 - (60.0)
HL-93 (US)	Truck + Lane	LRFR	Operating	9.40	0.261	62.80	7 - (60.0)
HL-93 (US)	Tandem + Lane	LRFR	Inventory	6.59	0.183	62.80	7 - (60.0)
HL-93 (US)	Tandem + Lane	LRFR	Operating	8.54	0.237	62.80	7 - (60.0)
Michigan 1 Unit Truck 01-NL and DL	Axle Load	LRFR	Legal	8.22	0.492	62.80	7 - (60.0)
Michigan 1 Unit Truck 02-DL	Axle Load	LRFR	Legal	8.81	0.372	62.80	7 - (60.0)
Michigan 1 Unit Truck 03	Axle Load	LRFR	Legal	9.74	0.358	62.80	7 - (60.0)
Michigan 1 Unit Truck 04	Axle Load	LRFR	Legal	11.22	0.333	62.80	7 - (60.0)
Michigan 1 Unit Truck 05-DL	Axle Load	LRFR	Legal	16.27	0.387	62.80	7 - (60.0)

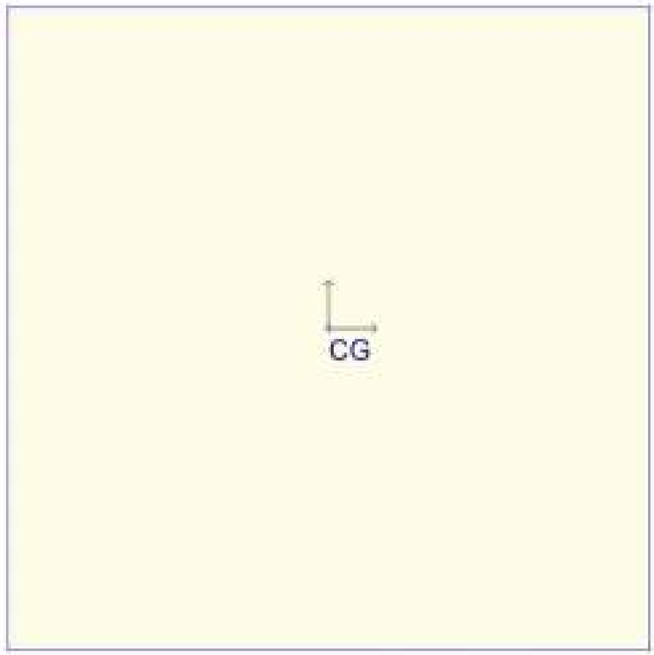
Summary:
The load capacity is the wood deck planks exceeds the wood beams. Each plank is independent (not cross connected) and with variable beam spacing limts any extra capacity but can still carry about double the load as the beams.

Wooden pier caps and wood piling are not a limiting factor.

The limiting factor for load capacity is the wood beams. The most restricting factors are the most northerly span (longest free span) and the beam spacing (wide spread at bridge C/L).

Recommended Load Posting:
- 2-axle Truck = 8 ton
- 3-axle Truck = 9 ton
- 4-axle Truck = 10 ton
- 5-axle Truck = 11 ton
- 6-axle Truck = 16 ton

Michael Clark
St. Clair County Road Commission



Dimensions		**Principal Properties**	
Width	7.50 in	I2	264 in^4
Height	7.50 in	I1	264 in^4
Perimeter	30 in	Ixy	-3.26753e-014 in^4
Geometric Properties		Theta	0 deg
Iy	264 in^4		
Ix	264 in^4		
ry	2.17 in		
rx	2.17 in		
A	56.2 in^2		
Sy Right	70.3 in^3		
Sy Left	70.3 in^3		
Sx Bottom	70.3 in^3		
Sx Top	70.3 in^3		
Centroid Y	3.78956e-016 in		
Centroid X	-4.93432e-019 in		
Plastic Properties			
Zy	105 in^3		
Zx	105 in^3		
PNA-Y	3.78956e-016 in		
PNA-X	-4.93432e-019 in		
Polar Properties			
Ip	527 in^4		
rp	3.06 in		

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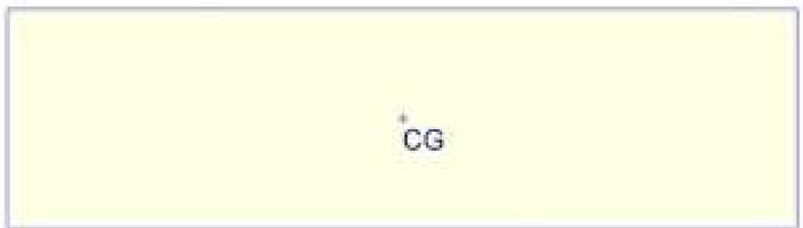
Section Properties as measured from site of main stringers and pile caps of Russell Bridge

Michael Clark

St. Clair County Road Commission



Dimensions	
Width	9 in
Height	2.50 in
Perimeter	23 in
Geometric Properties	
Iy	152 in^4
Ix	11.7 in^4
ry	2.60 in
rx	0.72 in
A	22.5 in^2
Sy Right	33.7 in^3
Sy Left	33.7 in^3
Sx Bottom	9.37 in^3
Sx Top	9.37 in^3
Centroid Y	0.38 in
Centroid X	0.14 in
Plastic Properties	
Zy	50.6 in^3
Zx	14.1 in^3
PNA-Y	0.38 in
PNA-X	0.14 in
Polar Properties	
Ip	164 in^4
rp	2.70 in

Principal Properties	
I2	11.7 in^4
I1	152 in^4
Ixy	8.88178e-016 in^4
Theta	90 deg

IES ShapeBuilder 4.0 06/22/2005 13:44

Section Properties as measured from site of deck planks of Russell Bridge

Wooden Pile Supports and End Bearing

Assumptions:

1. Driven piles are 30' long (length adjusted from last rating as from old records a pile exposed 14' above ground line would be at least 30' long)
2. Average Diameter of Piling 10"
3. 23 Piles are bearing load (one is not)
4. Approximately 14' of wood piling exposed
5. 30' – 14' = 16' embedment depth
6. Soil standard penetration equals 3 blows per foot (n) from tests in surrounding area

F = n/50 -> 3/50 = 0.06 ton per Sft or 120 Lbs per Sft

Area of piling in soil times skin friction from above

(10/12) x pi x 16' x 23 x 120 lbs/ft2 = 115,610 lbs for Total Capacity of All Piles

Structure Dead Load of 69.0' by 16.0' superstructure =

69' x 16' x (2.5/12)' x 50 = 11,500 Lbs deck planks
69' x 0.625' x 0.625' x 50 x 6 = 8,086 Lbs wood stringers
69' x 9 x 2 = 1,242 Lbs wood railing
15' x 0.625' x 0.625' x 50 x 6 = 1,758 Lbs pile caps
22,586 Lbs Total

115,610 lbs – 22,586 lbs total dead load of superstructure = 93,025 lbs or 46.5 tons carrying capacity of entire foundation

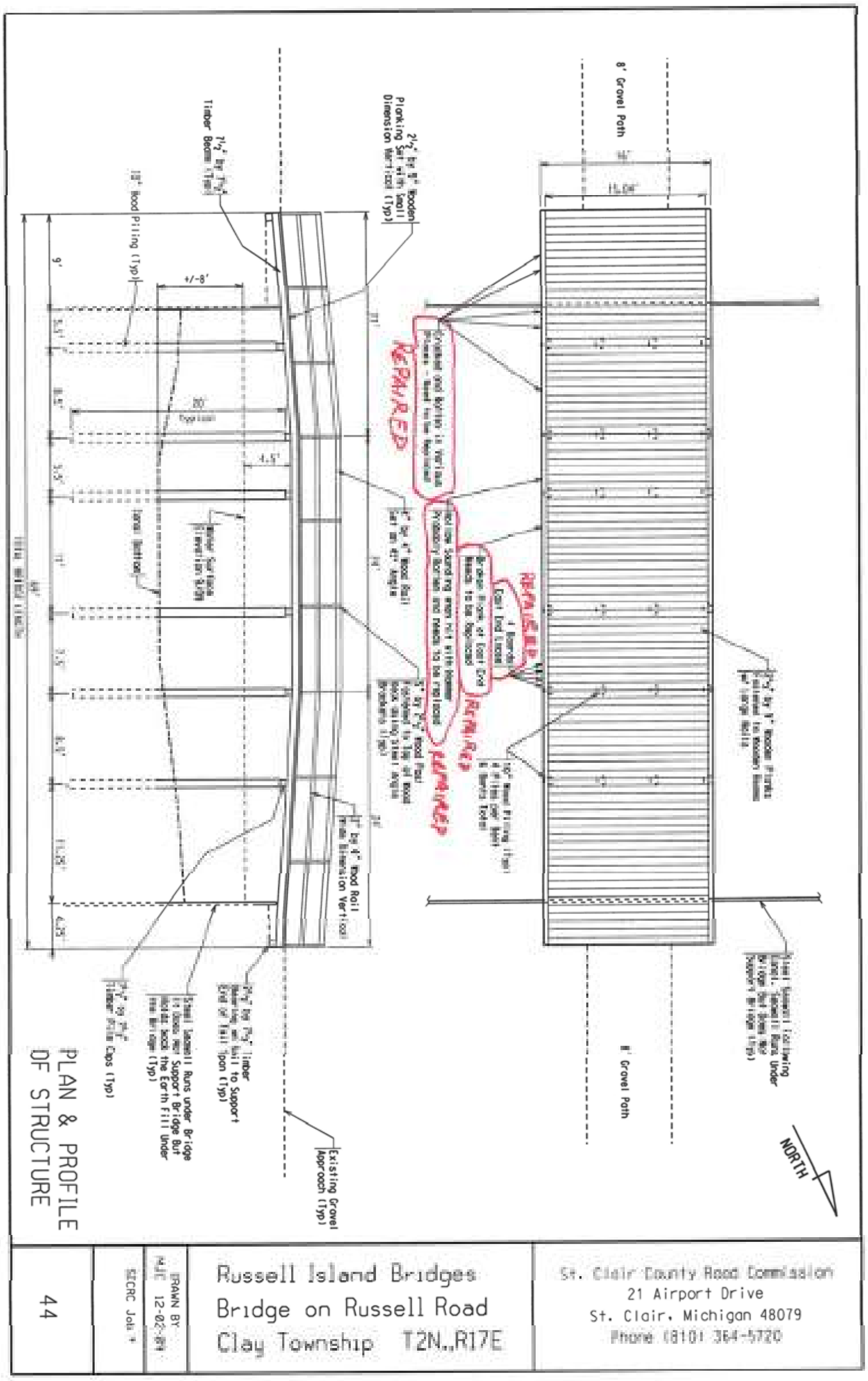
Carrying Capacity of One Span (Northerly Span Weakest)

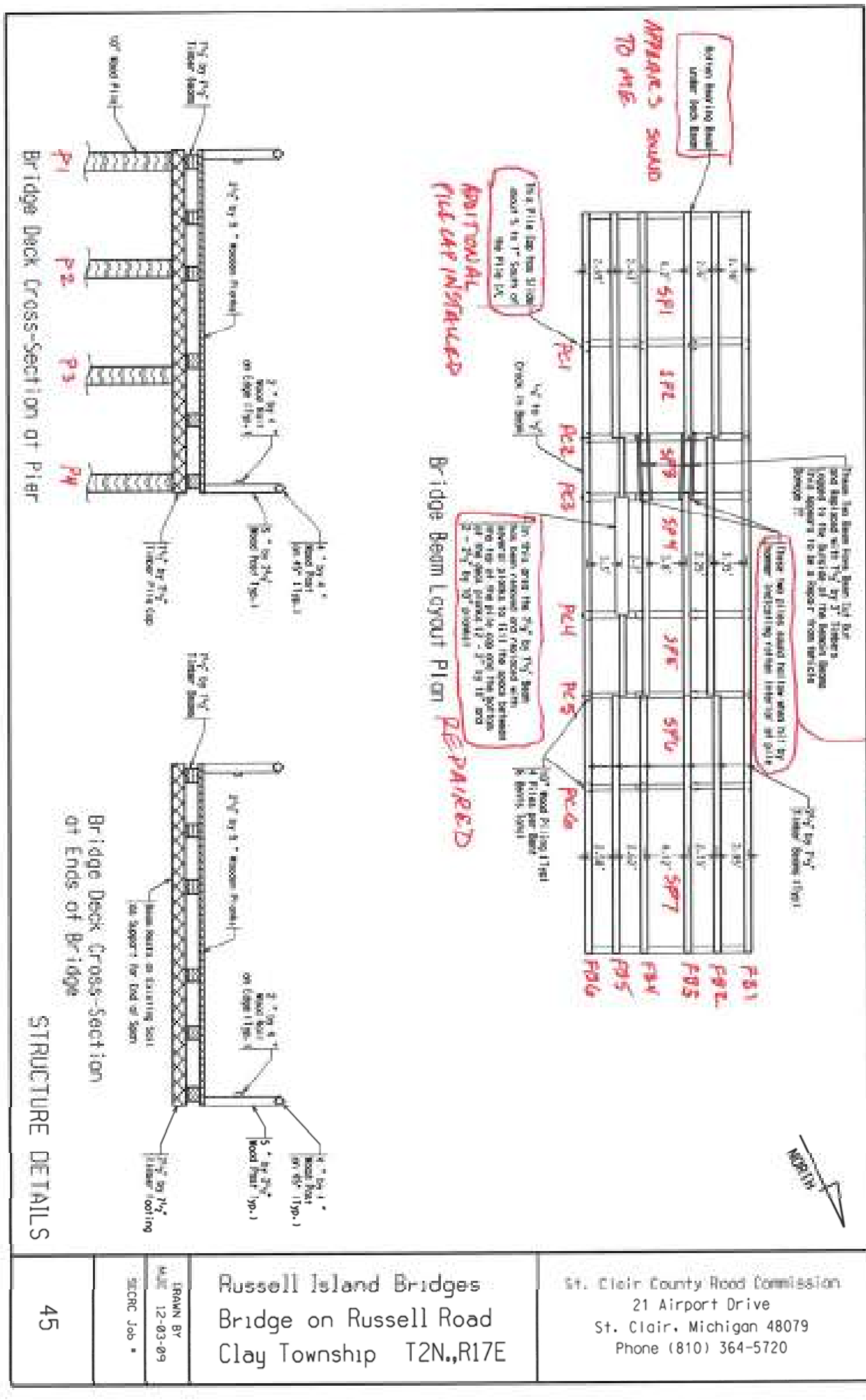
(10/12) x pi x 16' x 8 x 120 lbs/ft2 = 40,212 lbs for Piles in Span

Structure Dead Load of 15.0' by 16.0' superstructure =

15' x 16' x (2.5/12)' x 50 = 2,500 Lbs deck planks
15' x 0.625' x 0.625' x 50 x 6 = 1,758 Lbs wood stringers
15' x 9 x 2 = 270 Lbs wood railing
15' x 0.625' x 0.625' x 50 x 2 = 586 Lbs pile caps
5,114 Lbs Total for Span

40,212 lbs – 5,114 lbs total dead load of superstructure = 35,098 lbs or 17.5 tons


PLAN & PROFILE OF STRUCTURE
44
SICRC Job #
DRAWN BY
MJE 12-02-09
Russell Island Bridges
Bridge on Russell Road
Clay Township T2N.,R17E
St. Clair County Road Commission
21 Airport Drive
St. Clair, Michigan 48079
Phone (810) 364-5720
NORTH
REPAIRED


Bridge Beam Layout Plan
REPAIRED
NOT REPLACED
ADDITIONAL PILE CAP INSTALLED
APPEARS SOUND TO ME
Bridge Deck Cross-Section at Pier
Bridge Deck Cross-Section at Ends of Bridge
STRUCTURE DETAILS
NORTH
Russell Island Bridges
Bridge on Russell Road
Clay Township T2N.,R17E
St. Clair County Road Commission
21 Airport Drive
St. Clair, Michigan 48079
Phone (810) 364-5720
DRAWN BY
12-03-09
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