



Swing Bridge Repairs to the Approach Spans

Bermuda

Annex D Drawings

Drawing List

1. MMD-353865-C-SK-00-XX-003-B Swing Bridge Cross Beams, interim Repairs, General Notes
2. MMD-353865-C-SK-00-XX-008-B Approach Spans Cross Beams, typical Interim Strengthening
3. AS-1 Approach Span Repair Locations
4. AS-2 Approach Span Repair Locations
5. AS-3 Approach Span Repair Locations
6. AS-4 Approach Span Repair Locations
7. S4 Girder Layout and Details

Date: December 15, 2016

Project No. 44-02-77

1.0 GENERAL

All dimensions are in millimetres unless stated otherwise.

Do not scale any items or information from this drawing set.

~~This drawing set supersedes cross girder interim repair drawings MMD-353865-C-SK-00-XX-001 and MMD-353865-C-SK-00-XX-002.~~

Interim repair measures have been designed for 2 running lanes of traffic limited to a maximum axle weight of 10T and a maximum gross vehicle weight of 29T. The repairs are assumed to be in place for no more than 5 years.

Any procedures or methods of carrying out the work as defined in the general notes or drawings will not exonerate the contractor from undertaking work in a safe manner.

The Contractor is responsible for all traffic safety and management as specified in the general notes and drawings.

The Contractor is to take full responsibility for the works, permitting, applications, arrangements, agreements and procurement.

The Contractor is to undertake a detailed dimensional survey of the existing structure to establish/verify the following dimensions prior to commencement of the works:

- Dimensions marked * in this drawing set.
- Dimensions t_{tr}, t_w, t_{w,sup,vb} and t_{w,sup,tig} as defined on drawing MMD-353865-C-SK-00-XX-004 for determination of the required repair type.

Whilst undertaking the dimensional survey the contractor is to review details with respect to erection methodology and highlight any potential problems such as inadequate access for grinding, drilling, bolting, welding, plate and section installation.

Procedures for site cutting, drilling, bolting and welding to be agreed with the Client Representative prior to commencement of the site works.

2.0 STEELWORK

All steel for Type 3 and Type 4 repairs to be grade S355 J0 in accordance with BS EN 10025-2:2004 unless noted otherwise. As an alternative, ASTM A709 grade 50T1 may be used.

All steel for Type 1 repairs, Type 2 repairs, temporary support beams and temporary stool beams to be grade S275 J0 in accordance with BS EN 10025-2:2004. As an alternative, ASTM A709 grade 36T1 may be used.

Bolting assemblies shall be HSFG grade 8.8 HRC to BS EN 14399-10. Alternatively ASTM A325M Class 8.8 type 1 bolts may be used. Bolts should be pre-loaded to 0.7 f_{ub} in accordance with BS EN 1993-1-8.

~~All faying surfaces to be class C as a minimum in accordance with BS EN 1090-2 with a min slip factor μ = 0.3 (surfaces cleaned by wire brush or flame cleaning with loose rust removed).~~

Holes for bolts shall be drilled standard clearance holes with a diameter 2mm greater than the bolt shank unless noted otherwise. Any burrs to be removed.

If the existing plate surface beneath the proposed HSFG bolt head is severely corroded, the surface is to be made even with devcon epoxy putty or similar approved.

All welds to be undertaken by a qualified welder. Any zinc coating in the vicinity of the weld zone should be removed by grinding prior to welding. Site welds should be inspected for visible signs of cracking prior to removal of diagonal strut bolts.

Fabrication drawings to be supplied to the Designer for review prior to fabrication.

3.0 PROTECTIVE TREATMENTS

All existing steelwork may be left unpainted. However, in areas where thickness measurements are close to reaching trigger levels (defined on drawing MMD-353865-C-SK-00-XX-004), it may be prudent to apply a holding coat to ensure any un-strengthened cross girders will remain adequate over 5 years. These painted areas are to be determined by the Client Representative.

All new steelwork to be supplied with blast primer.

~~Unless noted otherwise faying surfaces shall have a minimum friction coefficient of 0.3 and shall be unpainted.~~

4.0 ERECTION METHODOLOGY

During cross girder repair works all traffic over the swing bridge should be limited to:

- A central single 3m wide running lane
- A 15mph speed limit
- Single axle load of 6T
- Gross vehicle weight of 10T

For all repair types, any loose rust, paint or debris associated with the works should be appropriately contained and removed from site.

~~Repair Type 1/Type 4 - Channel Repair (Intermediate Cross Girders)~~

- 1a. Any required Type 2A/2B/2C repair should be installed before commencement of Type 1 and Type 4 repairs.
1b. Adjacent cross girders must not be repaired concurrently.
1c. Cut an opening through the fascia plate in each bay adjacent to a cross girder identified as requiring a Type 1/Type 4 repair.
1d. Remove any M&E equipment attached to the cross girders that will clash with the repair.
1e. If cross girder is located below a troughing joint, weld inner diagonal strut connection to cross girder bottom flange (refer to drawing MMD-353865-C-SK-00-XX-020).
1f. Slide channel sections, temporary stool beams and temporary support beams (if required) through each fascia plate opening and pack out temporary beams with folding wedges to ensure troughing soffit and main girder top flanges are fully engaged (refer to drawing MMD-353865-C-SK-00-XX-020).
1g. Remove bolts from support zone connections which coincide with a Type 1/Type 4 repair. For diagonal strut connections, bolts must not be removed whilst the bridge is subject to traffic (traffic is only permitted for a complete connection or no connection). The contractor is responsible for the temporary support of any diagonal struts with connection bolts removed.
1h. Where required over the main girder support zones, grind out any existing cross girder web stiffeners, previous strengthening repairs or any rippled cross girder bottom flanges.
1i. Remove any loose paint and corrosion deposits from the repair area and prepare any faying surfaces.
1j. Apply devcon putty over required regions proud of anticipated final level and install shims as appropriate.
1k. Land channel sections onto shims and putty beds before allowing putty to go off. Note temporary support may be required at this stage to secure channel sections in position before any flange bolts are installed. If the contractor decides to provide this temporary support by early installation of any web bolts, they should be "finger tight" only.
1l. Install bolts through channel section bottom flange. Bolts shall be fully torqued only after putty has reached full strength. For diagonal strut connections, bolts must not be torqued whilst the bridge is subject to traffic (traffic is only permitted for a complete connection or no connection).
1m. Drill web holes (except any holes covered by any temporary stool beams over the main girders) and torque the bolts starting from the centre of the channel section beams and working towards the ends.
1n. If a central channel splice is to be provided, all holes should be drilled and the web bolts first torqued starting from the outside of the splice connection and working inwards. The flange bolts should then be torqued starting from the outside of the splice connection and working inwards.
1o. Disengage temporary support beams/ stool beams by removing folding wedges and slide back out through fascia plate opening.
1p. Drill remaining web holes over the main girders and torque bolts.

~~1a. Reinstate any previously removed M&E equipment.~~

~~Repair Type 2 - Web Strengthening Plate~~

- 2a. Remove any loose paint and corrosion deposits from the repair area and prepare any faying surfaces.
2b. For Type 2A and Type 2B repairs, land strengthening plates and drill bolt holes before installing bolts.
2c. For Type 2C repairs, install temporary stool beams (refer to drawing MMD-353865-C-SK-00-XX-020) before grinding out corroded web stiffener. Land strengthening plates, drill holes and install bolts for outer 2 bolts on either side of the temporary stool beams. Remove temporary stool beams and drill remaining holes and install remaining bolts.

~~Repair Type 3 - Channel Repair (End Cross Girders)~~

- 3a. Penultimate cross girders must not be repaired concurrently with end cross girders.
3b. Cut an opening through the fascia plate on either side of the end cross girder web.
3c. Remove any M&E equipment attached to the cross girders that will clash with the repair.
3d. Slide channel sections through fascia plate openings. Slide temporary support beams and temporary stool beams (refer to drawing MMD-353865-C-SK-00-XX-020) through fascia plate opening in first cross girder bay and pack out with folding wedges to ensure troughing soffit and main girder top flanges are fully engaged.
3e. Install a contractor designed temporary bridging plate (to be reviewed by Designer) between the last cross girder of the approach span and the temporary support beam on the swing span.
3f. Remove bolts from support zone connections. The contractor is responsible for the temporary support of the diagonal struts with connection bolts removed.
3g. Where required grind out any existing cross girder web stiffeners, previous strengthening repairs or any rippled cross girder bottom flanges.
3h. Remove any loose paint and corrosion deposits from the repair area and prepare any faying surfaces.
3i. Apply devcon putty over required regions proud of anticipated final level and install shims as appropriate.
3j. Land channel sections onto shims and putty beds before allowing putty to go off. Note temporary support may be required at this stage to secure channel sections in position before any flange bolts are installed. If the contractor decides to provide this temporary support by early installation of any web bolts, they should be "finger tight" only.
3k. Install bolts through channel section bottom flange. Bolts shall be fully torqued only after putty has reached full strength.
3l. Drill web holes (except any holes covered by any temporary stool beams over the main girders) and torque the bolts starting from the centre of the channel section beams and working towards the ends.
3m. Remove temporary bridging plate.
3n. Disengage temporary support beams and stool beams by removing folding wedges and slide back out through fascia plate opening.
3o. Drill remaining web holes over the main girders and torque the bolts.
3p. Reinstate any previously removed M&E equipment.

Notes

Note: Items crossed out by red lines are not part of the Approach Span Repair contract

Reference drawings

Table with 5 columns: Rev, Date, Drawn, Description, Ch'kd, App'd. Contains revision history for Erection Methodology Updated, For Construction, and Preliminary stages.



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Client



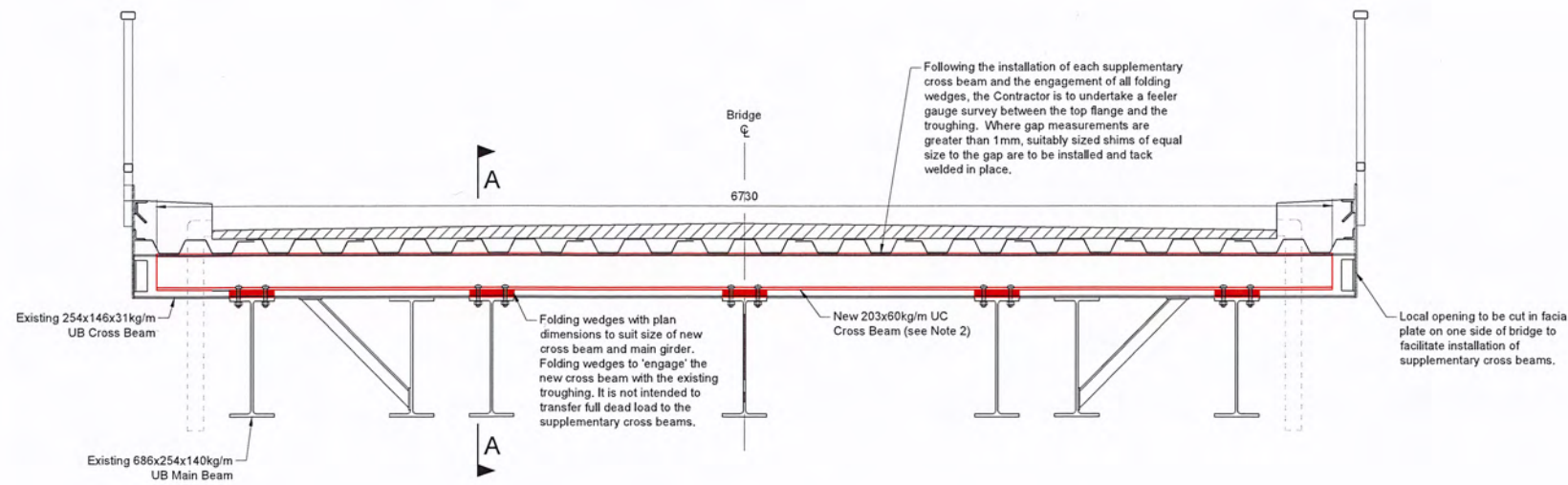
Government of Bermuda
Ministry of Public Works
3rd Floor
Post Office Building
56 Church Street
Hamilton HM12
Bermuda

Title: Swing Bridge, St. George's
Bermuda
Swing Bridge Cross Beams
Interim Repairs General Notes

Table with 4 columns: Role, Name, Signature, Date. Lists project roles including Designer, Drawn, Dwg check, Eng check, Coordination, and Approved.

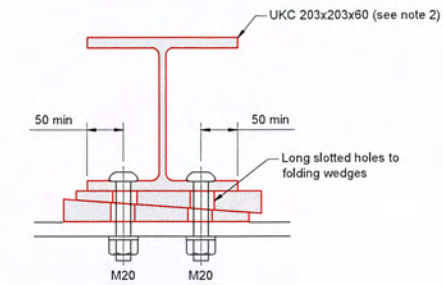
Table with 4 columns: Scale at A1, Status, Rev, Security. Shows scale as 'As Shown', status as 'CON', revision as 'B', and security as 'STD'.

Drawing Number: MMD-353865-C-SK-00-XX-003



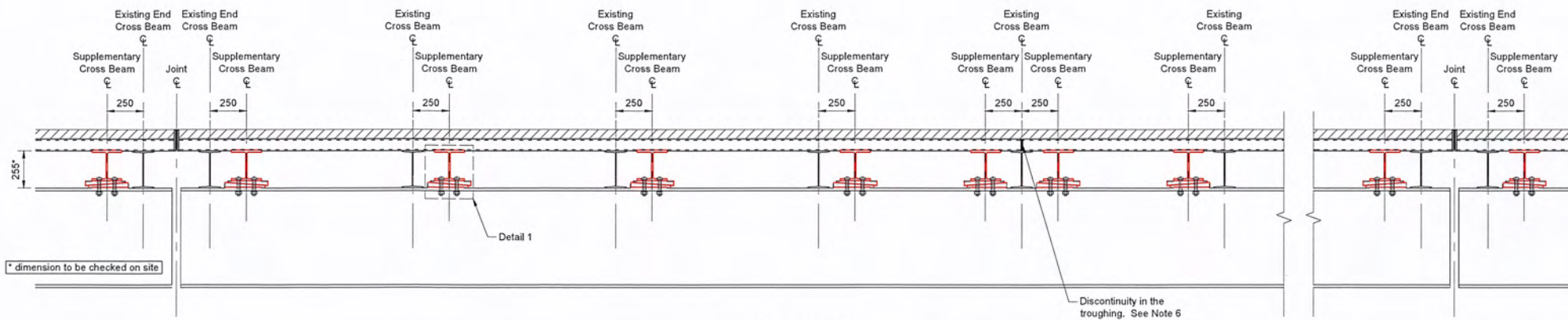
Typical Cross Section (Approaches)

1:20



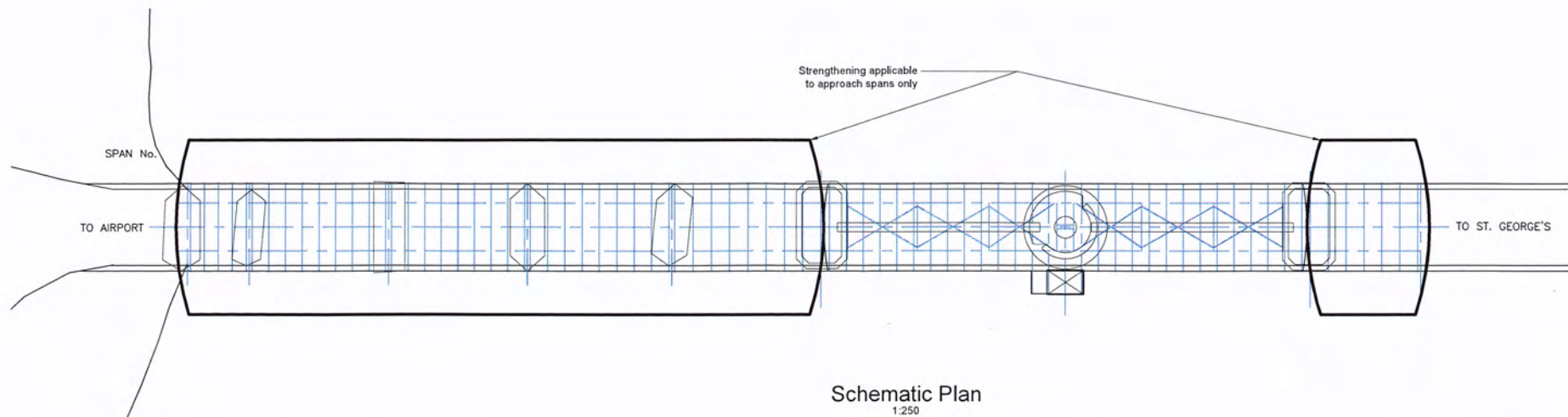
Detail 1

1:5



Section A-A

(Other Main Beam Sections Similar)
1:20



Schematic Plan

1:250

- Notes
- For general notes refer to drawing No. MMD-353865-C-SK-00-XX-003.
 - As an alternative to UKC203x203x60 kg/m (404 kg total) universal column sections, wide flange beams W8x8x40 (397 kg total) may be used.
 - All bolts are to be fully tightened under dead load only (i.e. no traffic on the bridge)
 - All folding wedges are to be tack welded in place once the cross beam has been sufficiently engaged with the troughing.
 - Folding wedges to be minimum steel grade S275J0
 - Contractor to confirm location of troughing joints on site. 1 no. supplementary cross beam to be provided at end cross beams and cross beams with continuous troughing. 2 no. supplementary cross beams to be provided at locations of troughing discontinuity.

Reference drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
A	26/09/16	RF	For Construction	SR	TA
P1	02/09/16	SR	Preliminary	AB	TA



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Client



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Ministry of Public Works
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Title
Swing Bridge, St. George's
Bermuda
Approach Spans Cross Beams
Typical Interim Strengthening Detail

Designed	A. Caristo	Eng check	T. Rusmi
Drawn	A. Scott	Coordination	S. Robinson
Dwg check	S. Robinson	Approved	T. Abbott
Scale at A1	Status	Rev	Security
As Shown	CON	A	STD

Drawing Number
MMD-353865-C-SK-00-XX-008

Notes:

Beam numbering starts from the south side of the bridge. Where beam #1 is on the St. David's side and beam #46 is on the St. George's side.

All new beams to be UKC 203x203x60 or W8x8x40.

New beams to be tack welded to the existing steel troughing deck. (TYP)

ISSUED FOR: REFERENCE DRAWINGS

AMENDMENTS:

NO	REVISION	BY	APPL	DATE

REVISÉ DRAWINGS RGW MM 09.12.2016

SCALE: AS SHOWN

SURVEY

PREPARED BY: DATE:

DESIGN

PREPARED BY: R.GRAHAM-WARD DATE: 10.11.2016
CHECKED BY: J.SAMARASEKERA DATE: 16.11.2016

DRAWING

PREPARED BY: R.GRAHAM-WARD DATE: 09.12.2016
CHECKED BY: M. MURPHY DATE: 09.12.2016
APPROVED BY: Y.LORTIE DATE: 12.12.2016

PROJECT NUMBER:

PROJECT NAME:

ST. GEORGE'S
SWING BRIDGE
APPROACH SPAN

SHEET TITLE:

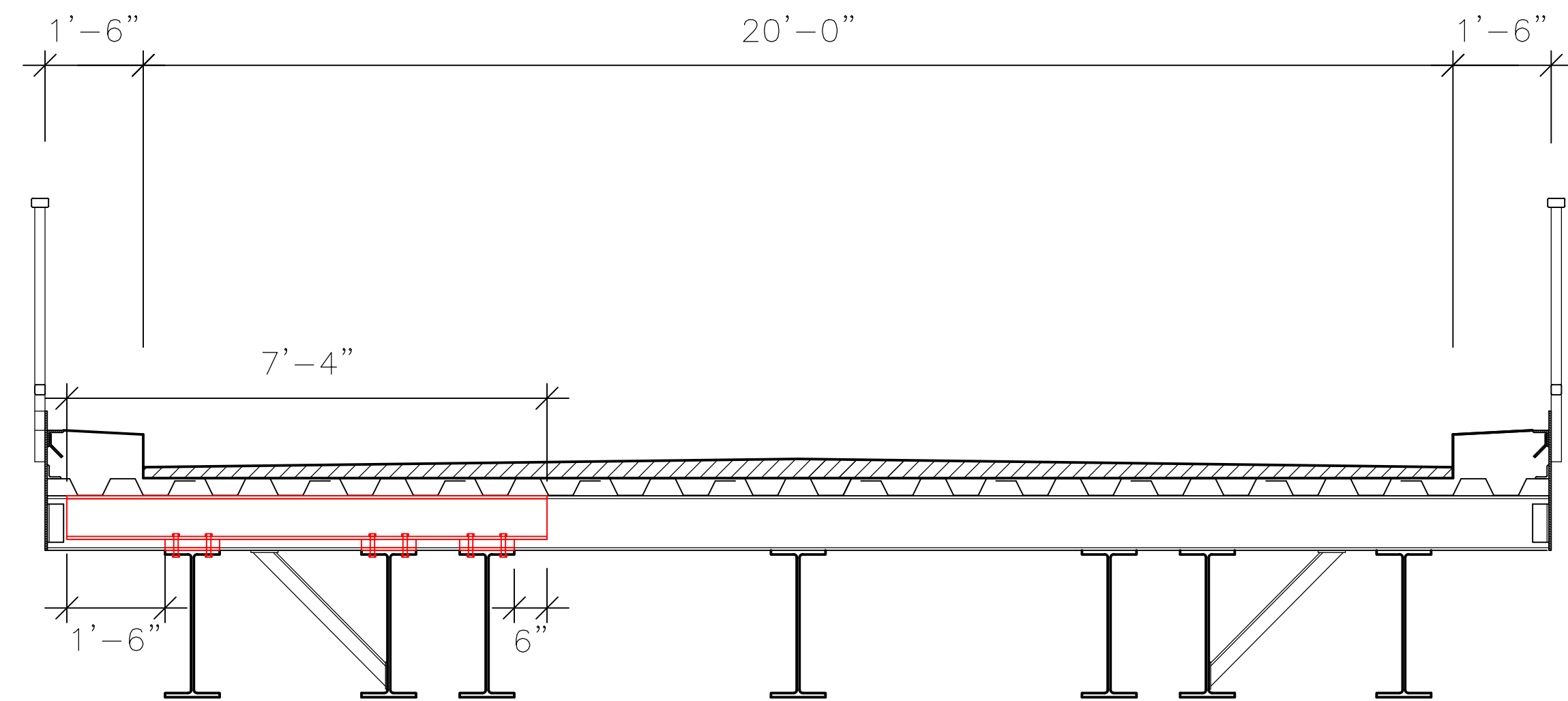
APPROACH SPAN
REPAIR LOCATIONS

SHEET NUMBER:

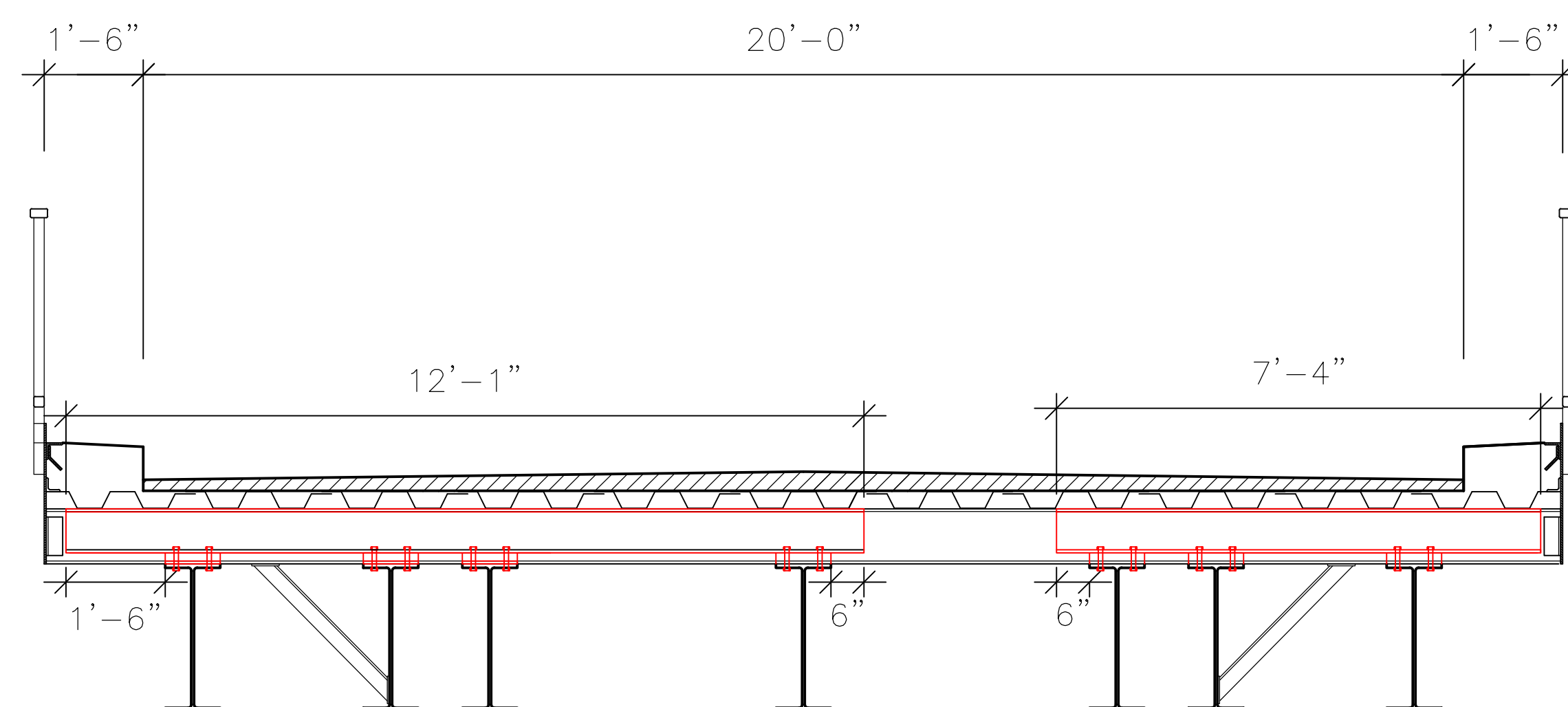
AS - 1

REVISION

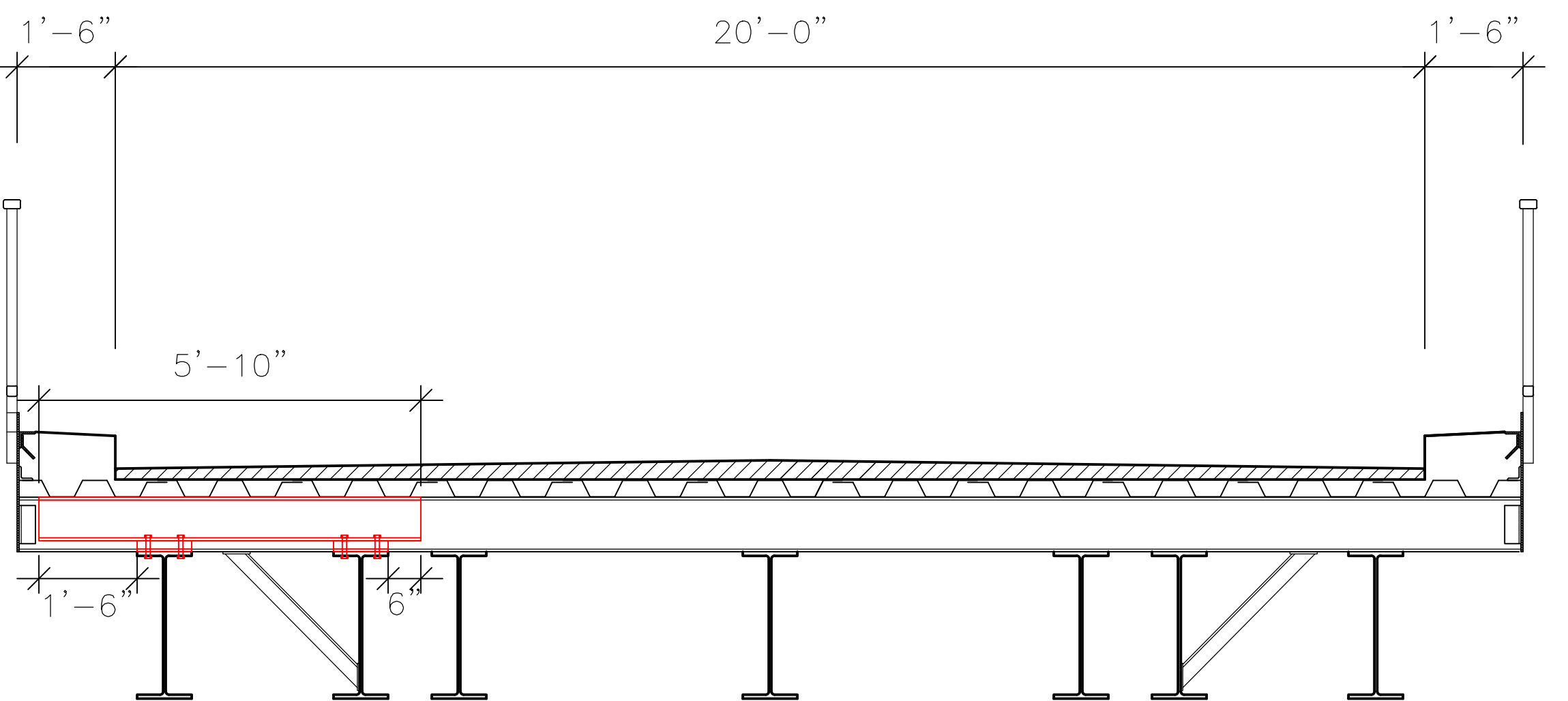
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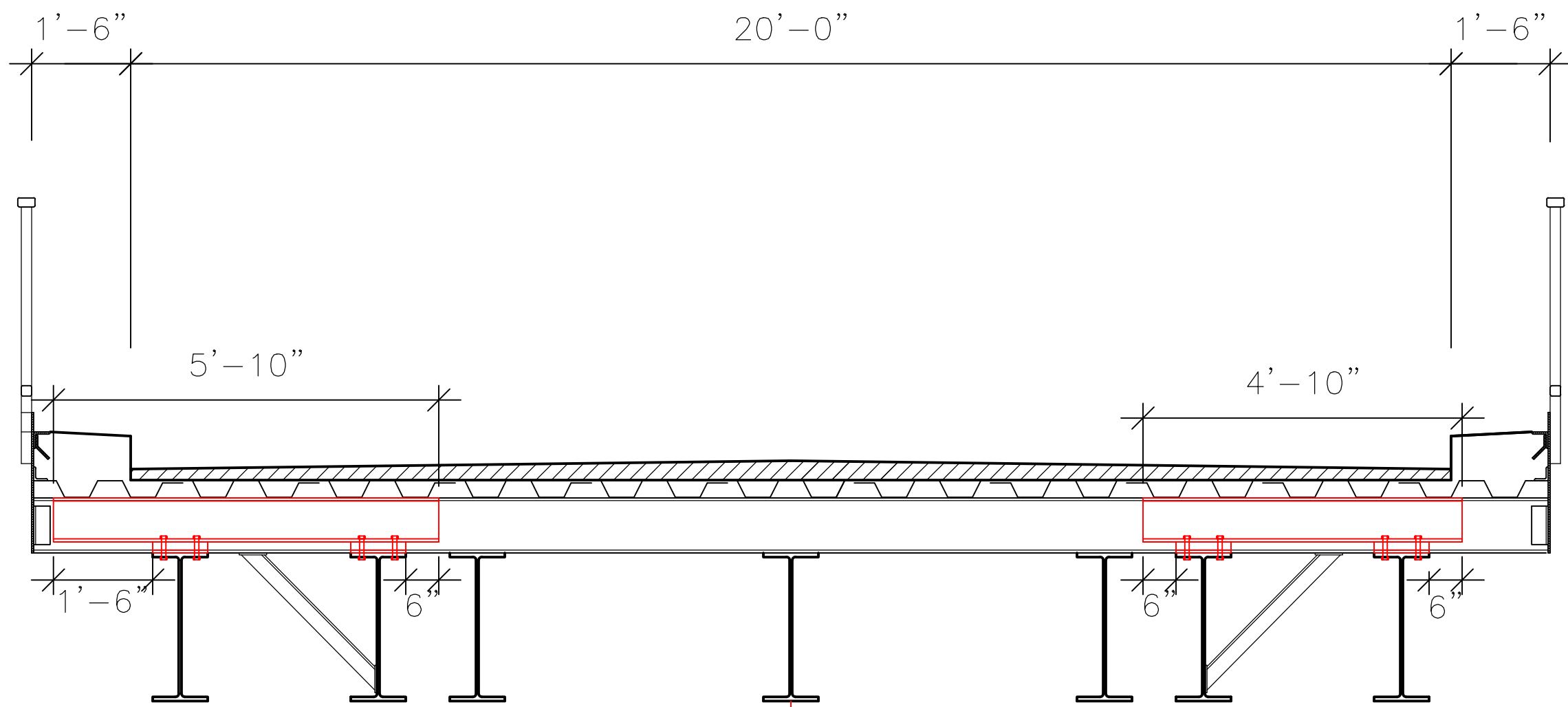
APPROACH SPAN REPAIRS CROSS SECTION - BEAMS 1,2,3,4,5 and 32
1/2" = 1'-0"



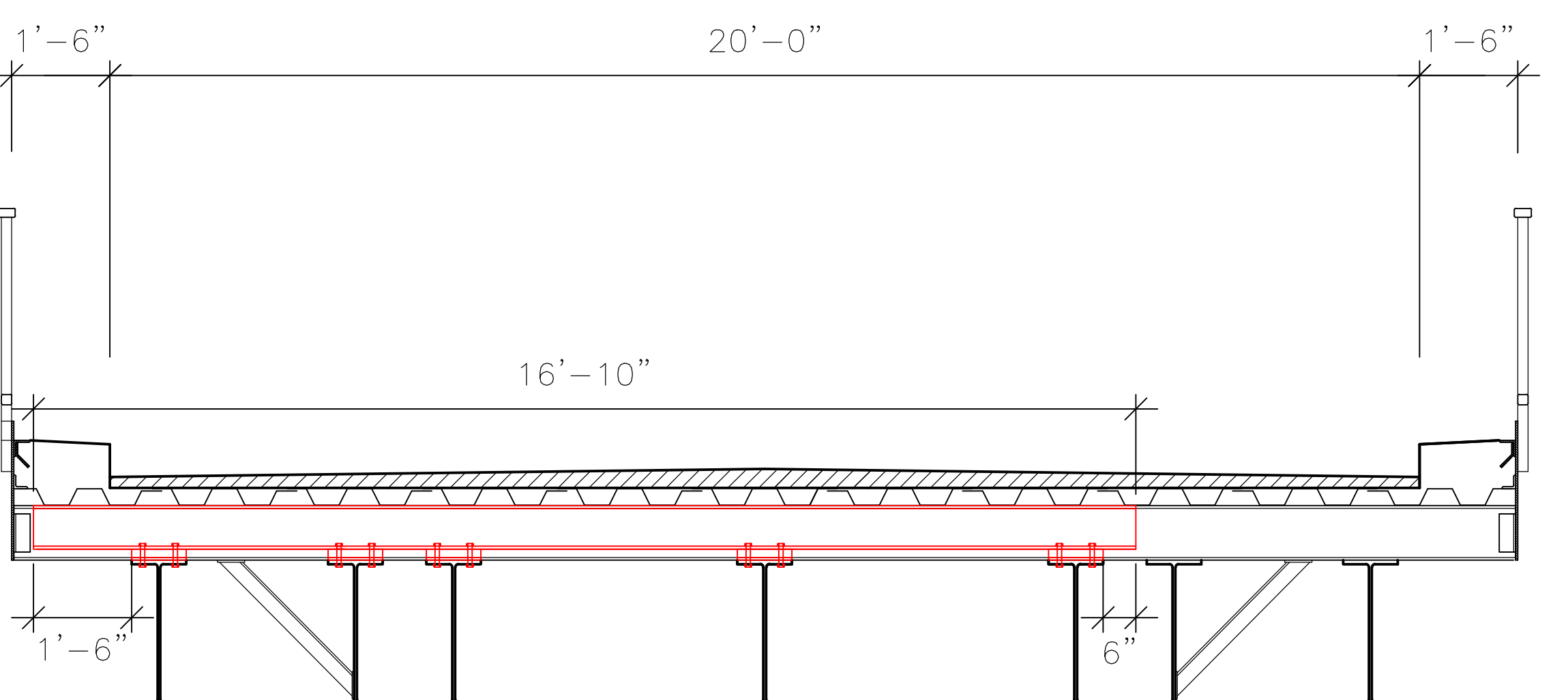
APPROACH SPAN REPAIRS CROSS SECTION - BEAM 6
1/2" = 1'-0"



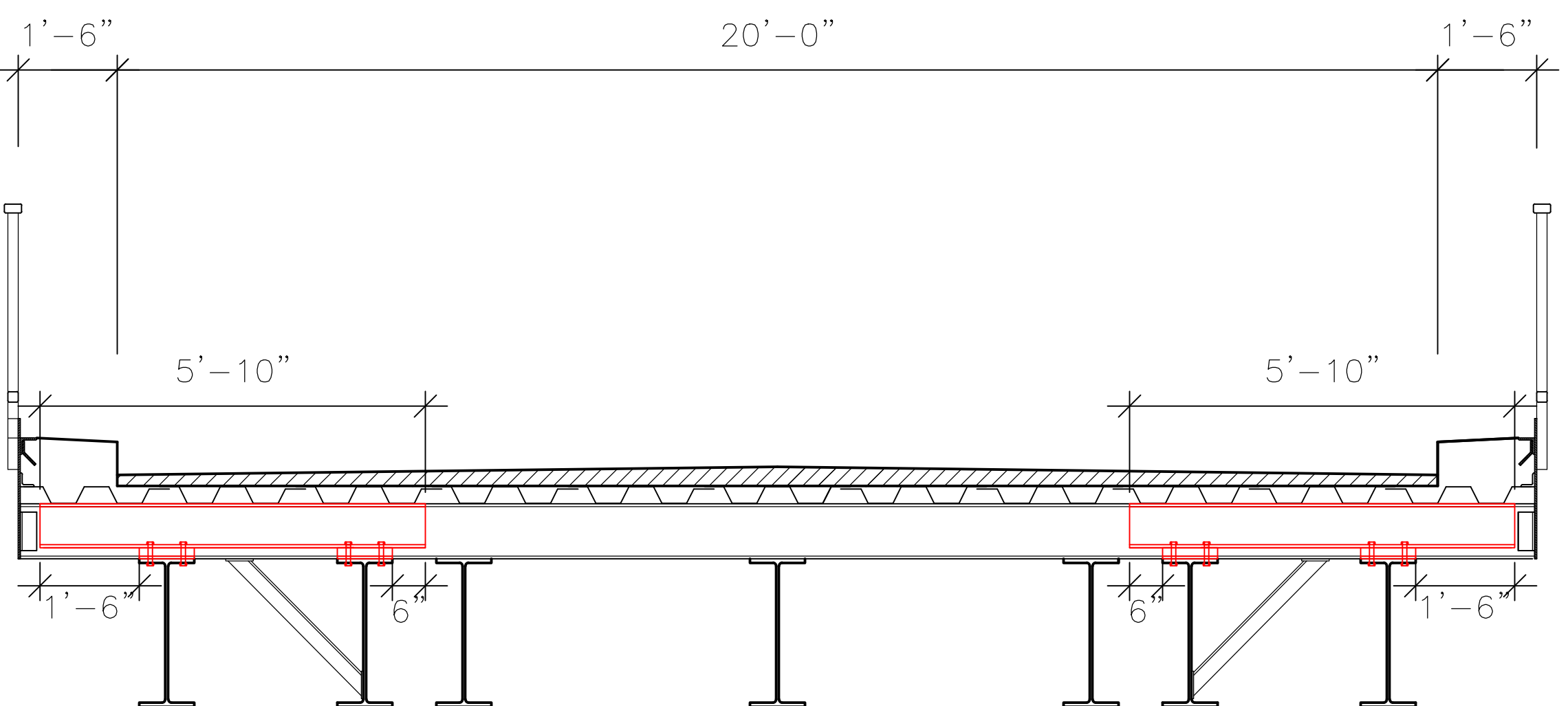
APPROACH SPAN REPAIRS CROSS SECTION - BEAMS 7, 22 AND 35
1/2" = 1'-0"



APPROACH SPAN REPAIRS CROSS SECTION - BEAMS 8, 11, 12 and 36
1/2" = 1'-0"

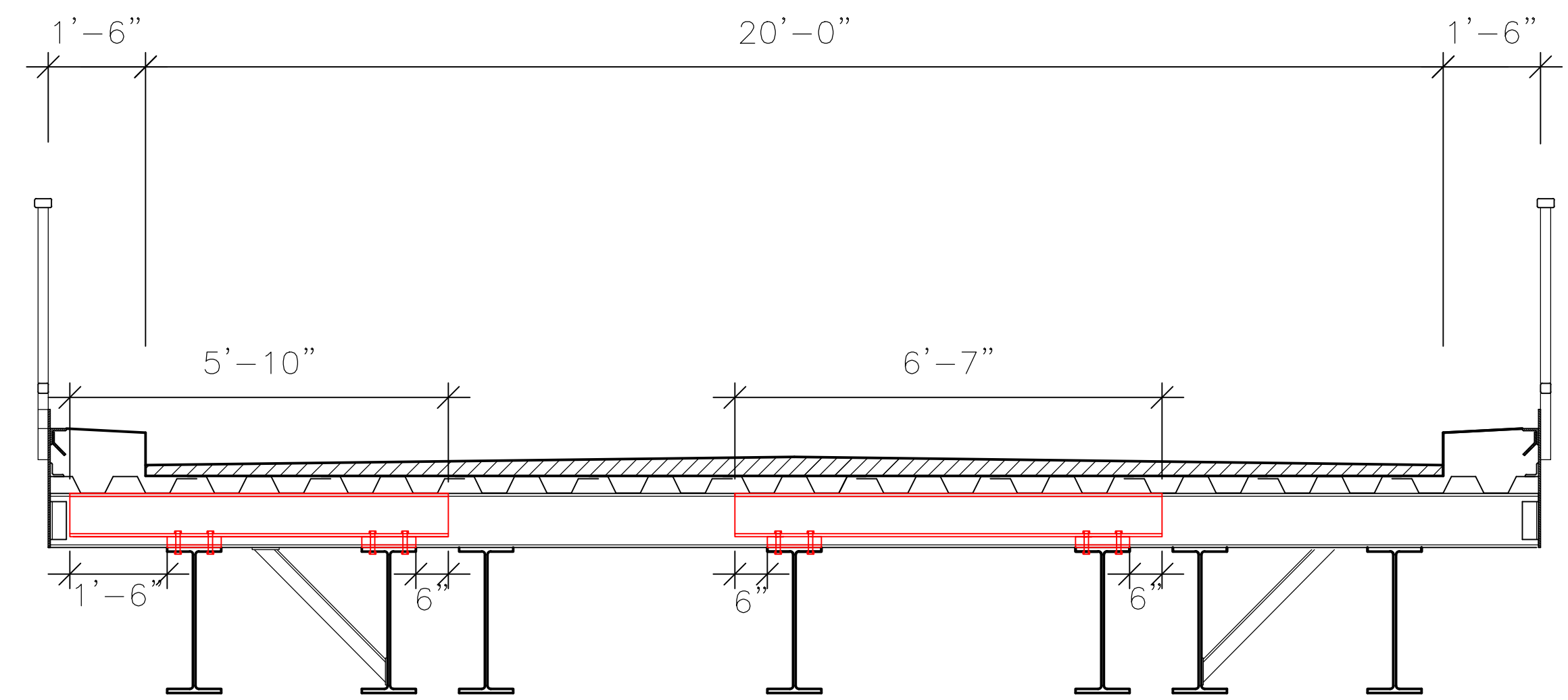


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1/2" = 1'-0"

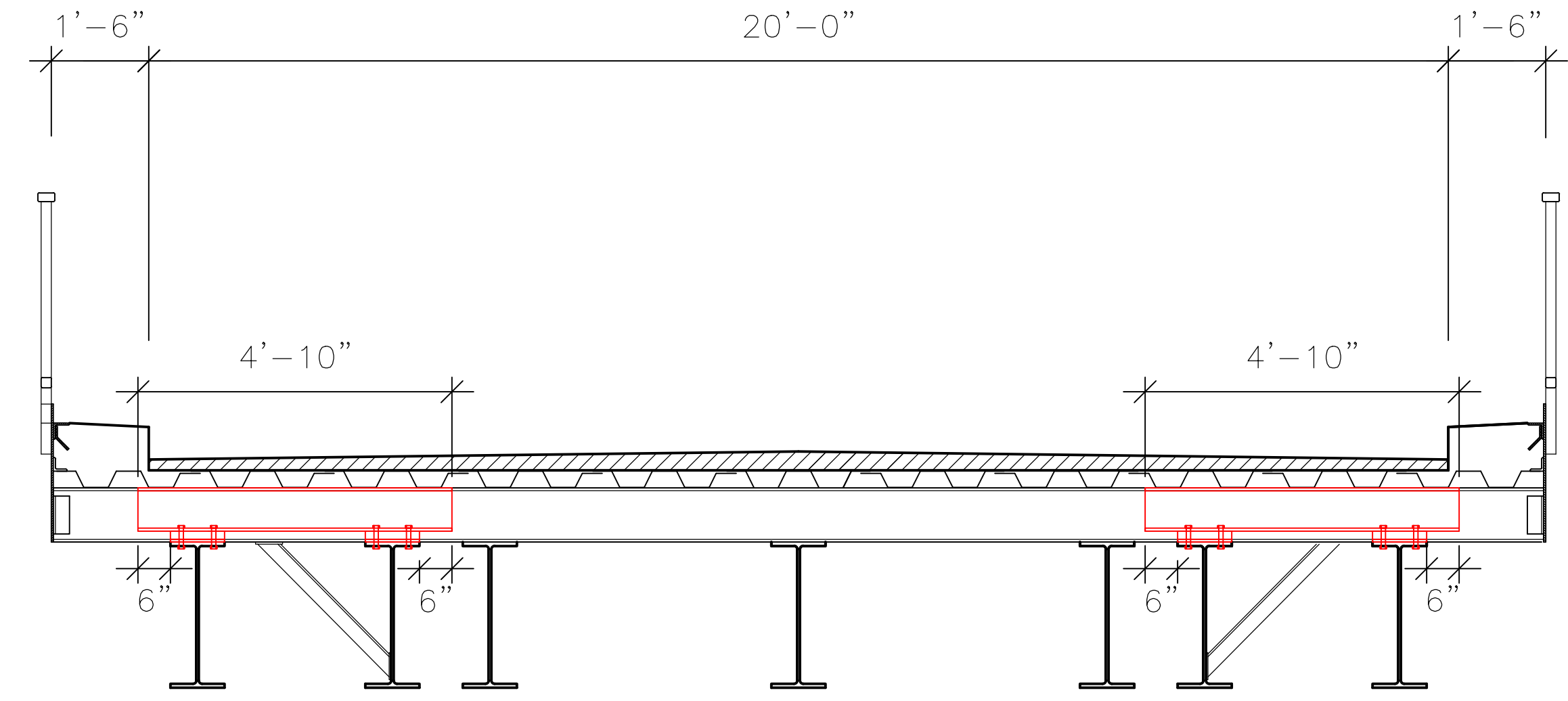


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1/2" = 1'-0"

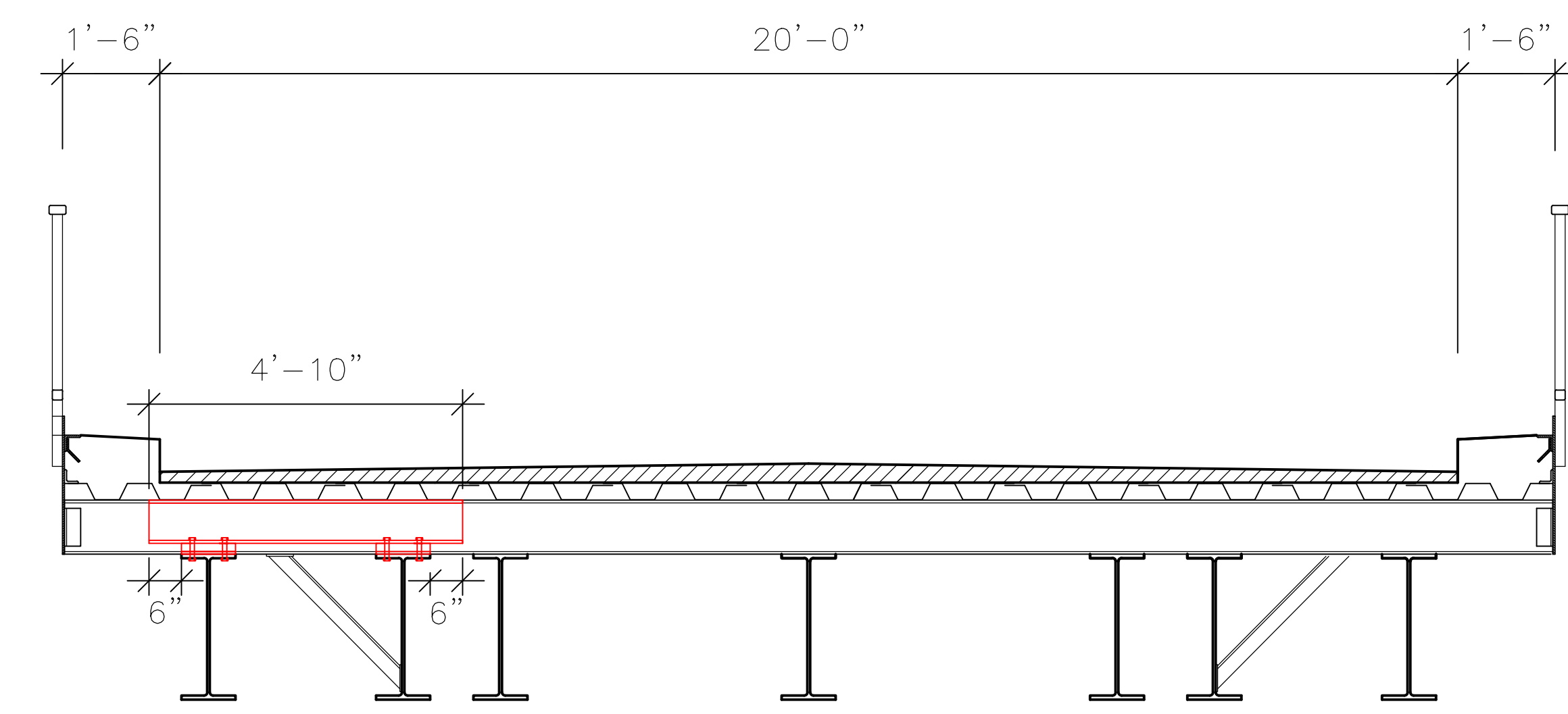
Notes:
Beam numbering starts from the south side of the bridge. Where beam #1 is on the St. David's side and beam #46 is on the St. George's side.
All new beams to be UKC 203x203x60 or W8x8x40.



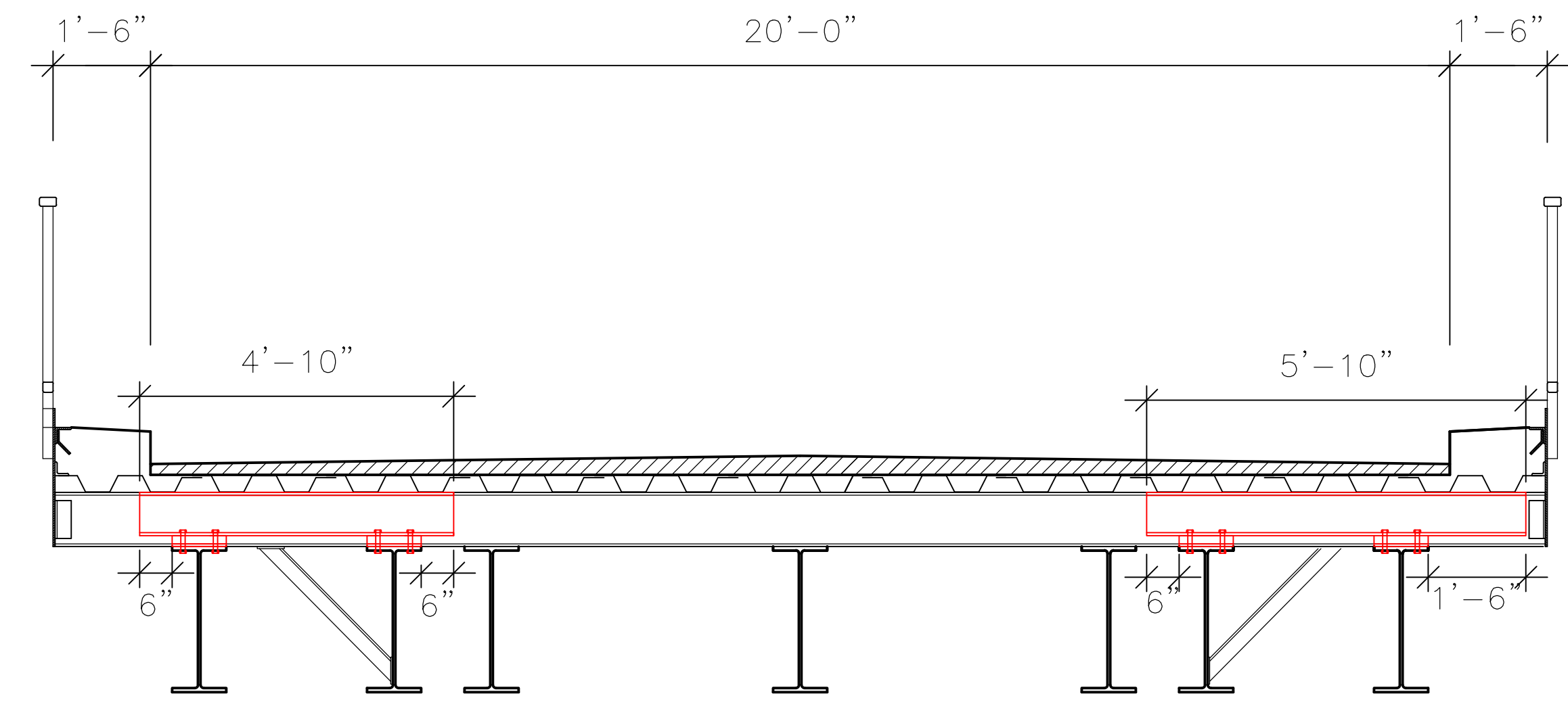
APPROACH SPAN REPAIRS CROSS SECTION – BEAM 15
1/2" = 1'-0"



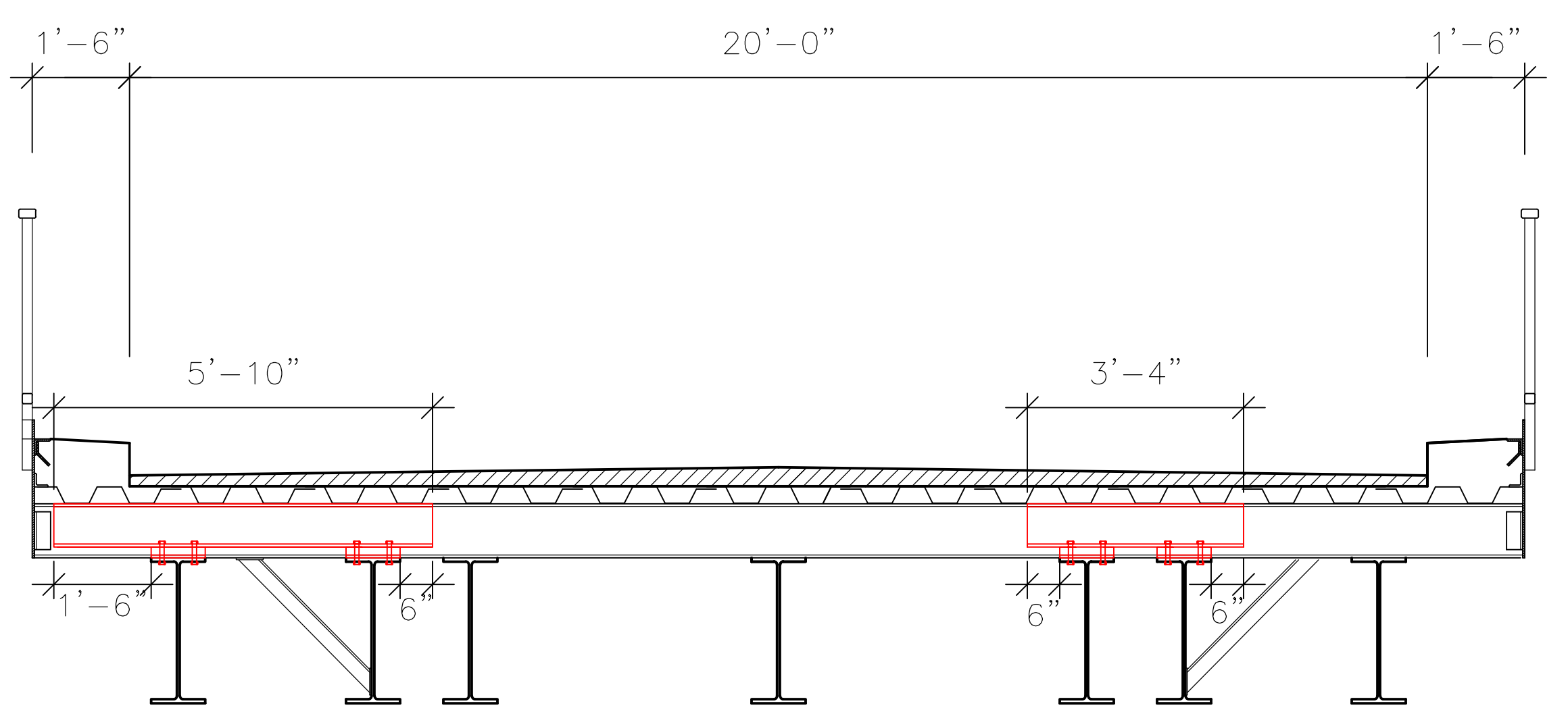
APPROACH SPAN REPAIRS CROSS SECTION – BEAM 16, 25 and 26
1/2" = 1'-0"



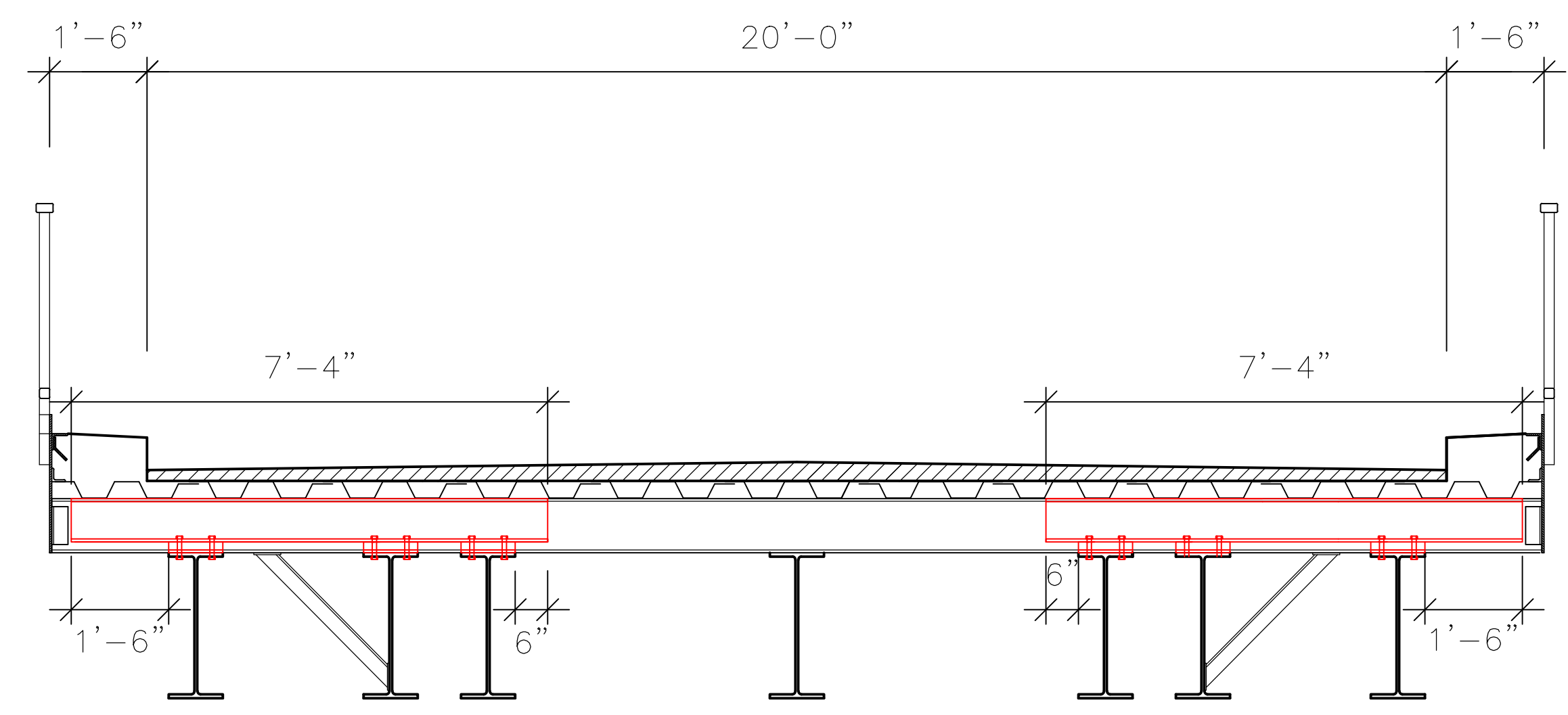
APPROACH SPAN REPAIRS CROSS SECTION – BEAMS 17, 18, 20 and 27
1/2" = 1'-0"



APPROACH SPAN REPAIRS CROSS SECTION – BEAM 21
1/2" = 1'-0"



APPROACH SPAN REPAIRS CROSS SECTION – BEAM 23 and 37
1/2" = 1'-0"



APPROACH SPAN REPAIRS CROSS SECTION – BEAM 24
1/2" = 1'-0"

ISSUED FOR: REFERENCE DRAWINGS

AMENDMENTS:

NO	REVISION	BY	APPL	DATE

REVISED DRAWINGS RGW MM 09.12.2016

SCALE: AS SHOWN

SURVEY
PREPARED BY: DATE:

DESIGN
PREPARED BY: R.GRAHAM-WARD DATE: 10.11.2016
CHECKED BY: J.SAMARASEKERA DATE: 16.11.2016

DRAWING
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CHECKED BY: M. MURPHY DATE: 09.12.2016

APPROVED BY: Y.LORTIE DATE: 12.12.2016

PROJECT NUMBER:

PROJECT NAME:
**ST. GEORGE'S
SWING BRIDGE
APPROACH SPAN**

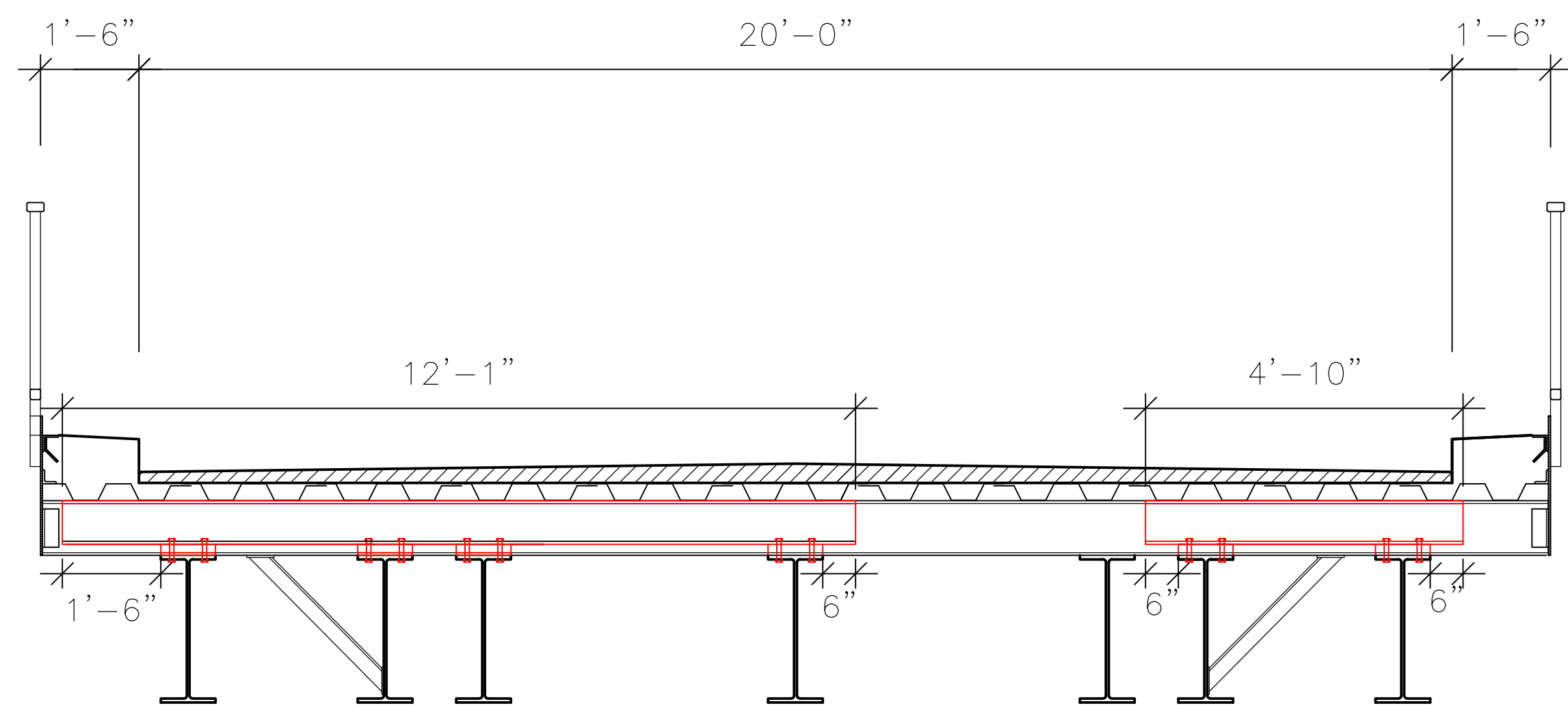
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**APPROACH SPAN
REPAIR LOCATIONS**

SHEET NUMBER: AS - 2 REVISION: 3

Notes:

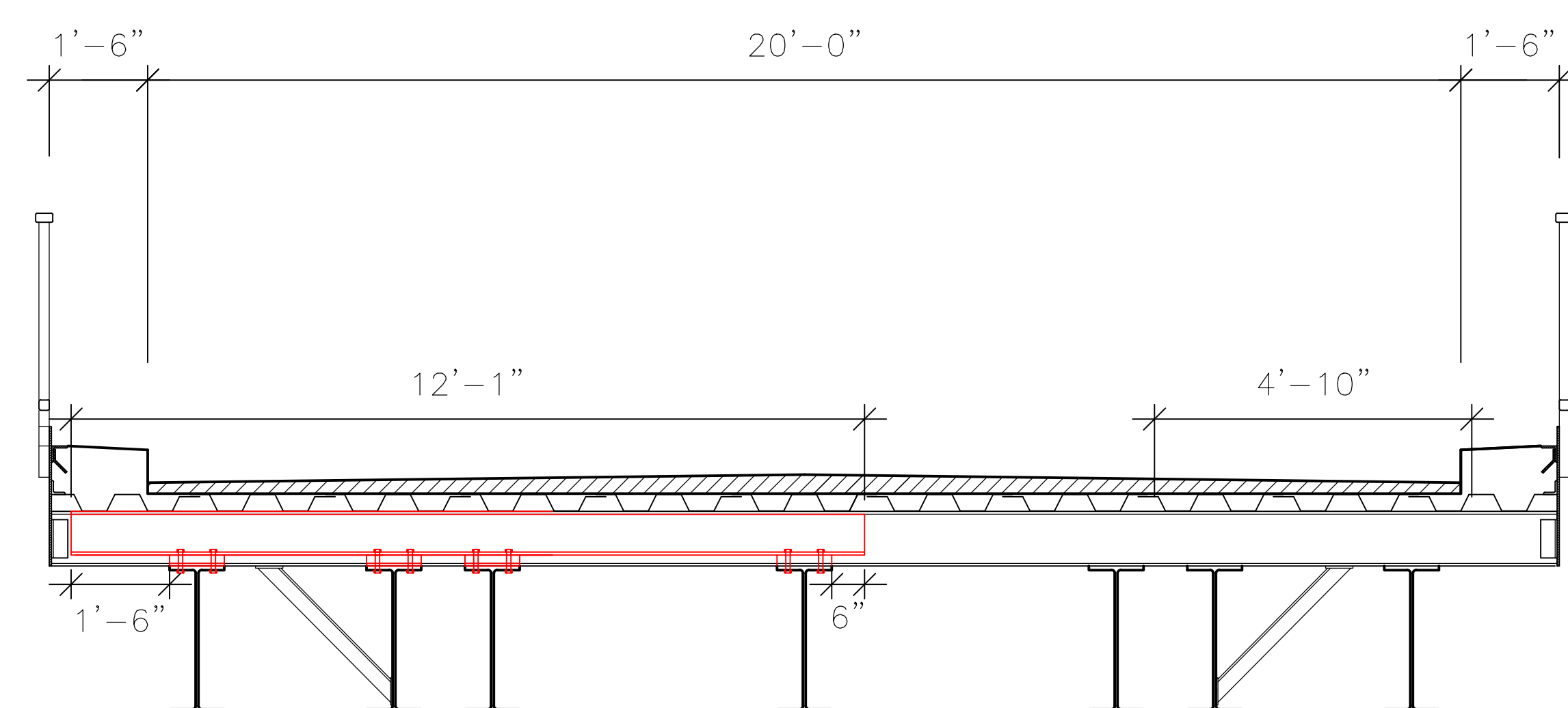
Beam numbering starts from the south side of the bridge. Where beam #1 is on the St. David's side and beam #46 is on the St. George's side.

All new beams to be UKC 203x203x60 or W8x8x40.



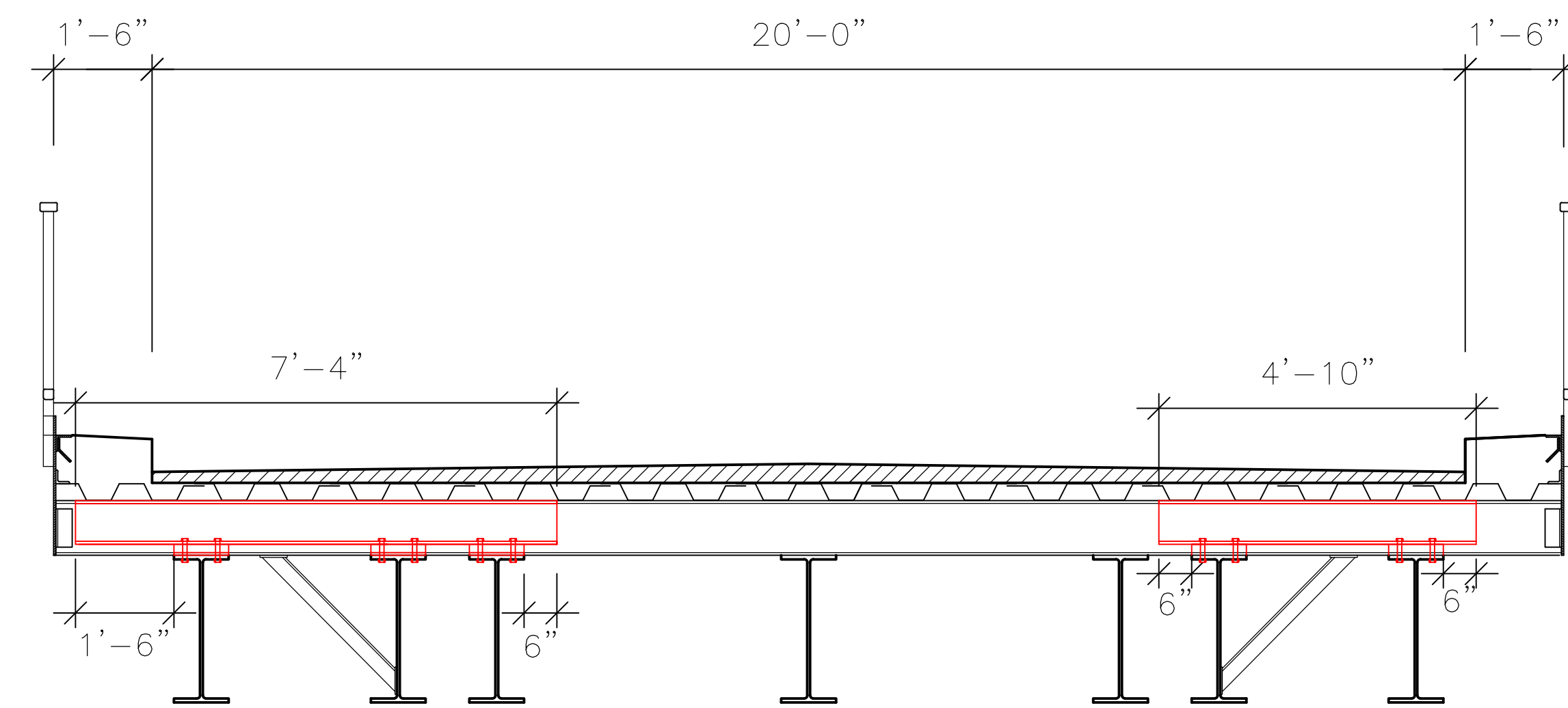
APPROACH SPAN REPAIRS CROSS SECTION – BEAM 29

1/2" = 1'-0"



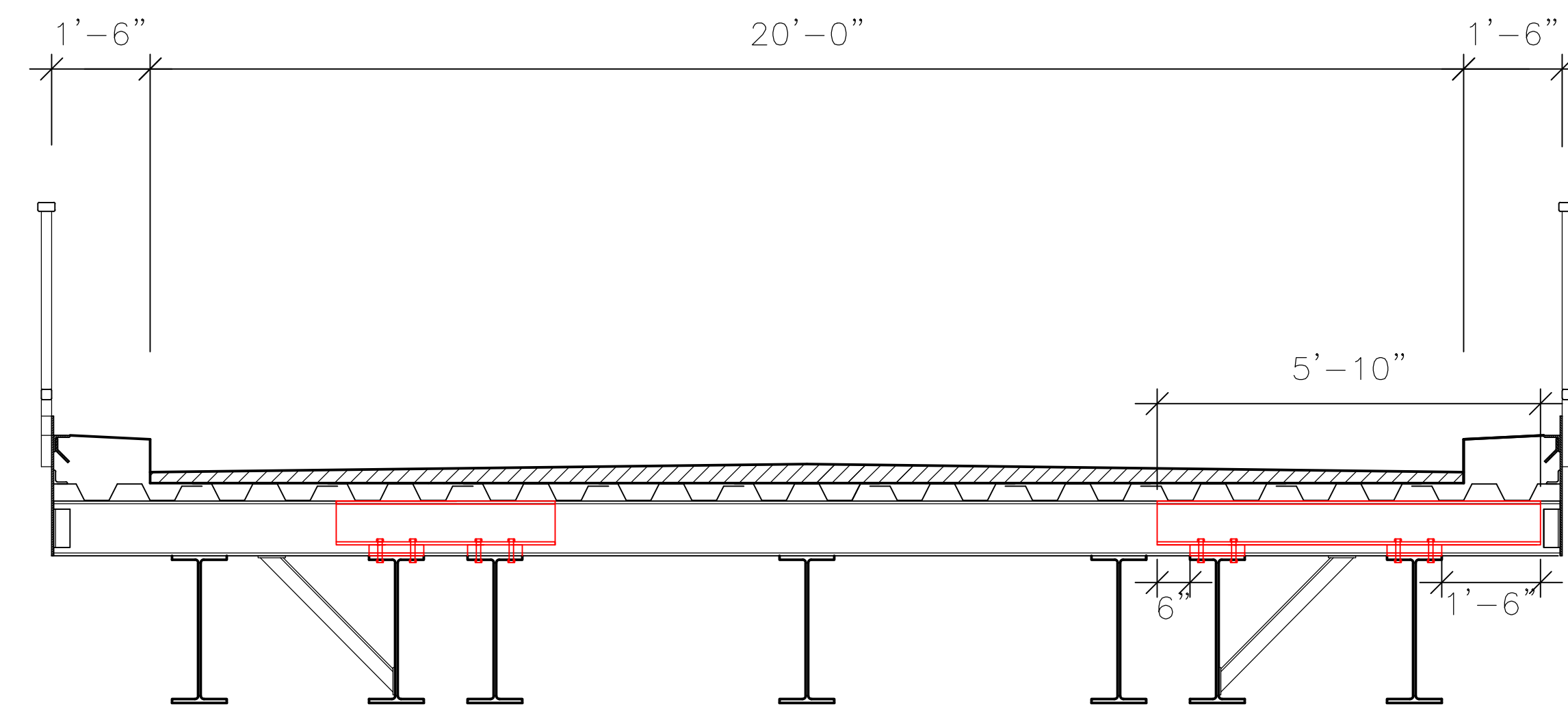
APPROACH SPAN REPAIRS CROSS SECTION – BEAM 30

1/2" = 1'-0"



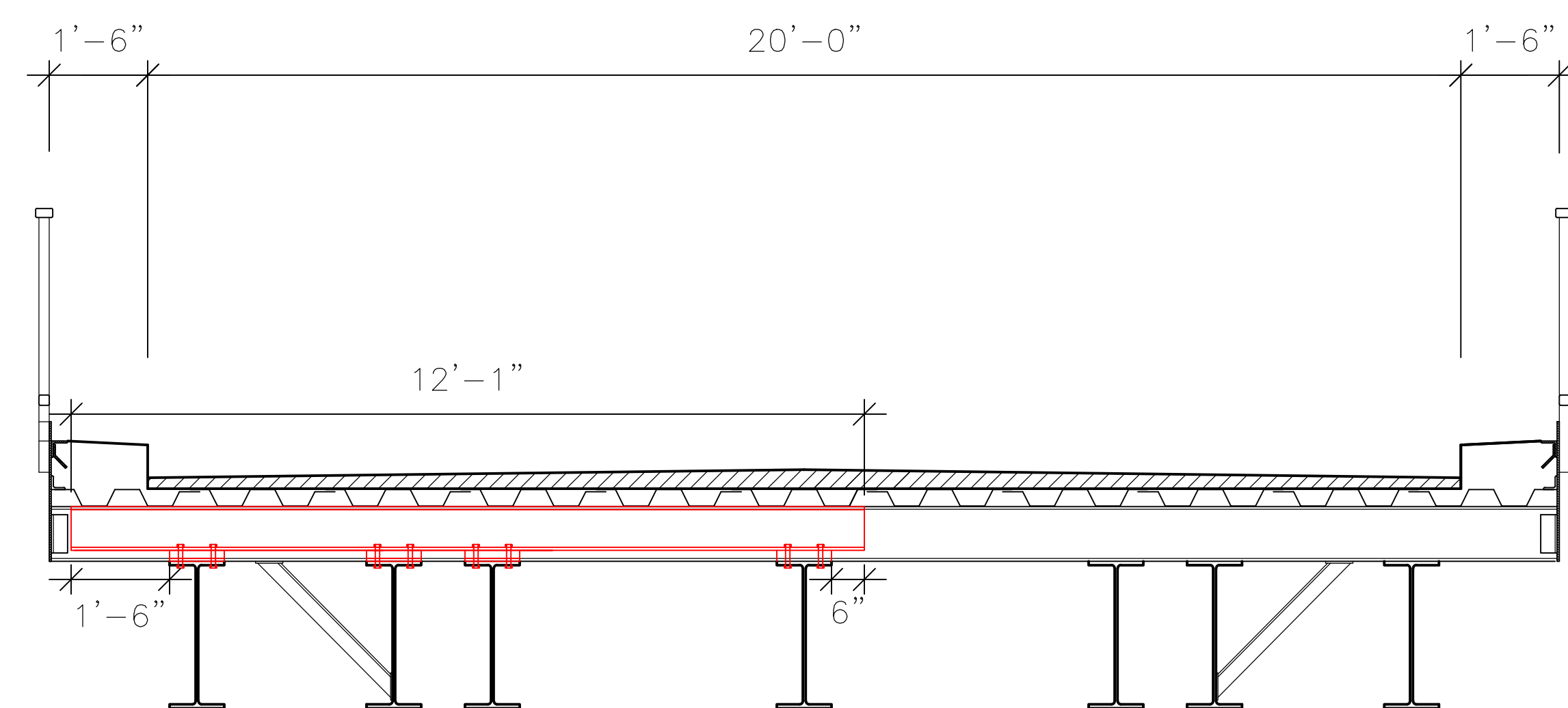
APPROACH SPAN REPAIRS CROSS SECTION – BEAM 31

1/2" = 1'-0"



APPROACH SPAN REPAIRS CROSS SECTION – BEAM 38

1/2" = 1'-0"



APPROACH SPAN REPAIRS CROSS SECTION – BEAMS 40, 41, 42,43
44, 45 and 46

1/2" = 1'-0"

ISSUED FOR: REFERENCE DRAWINGS

AMENDMENTS:

NO	REVISION	BY	APPL	DATE

REVISED DRAWINGS RGW MM 09.12.2016

SCALE: AS SHOWN

SURVEY

PREPARED BY: DATE:

DESIGN

PREPARED BY: R.GRAHAM-WARD DATE: 10.11.2016
CHECKED BY: J.SAMARASEKERA DATE: 16.11.2016

DRAWING

PREPARED BY: R.GRAHAM-WARD DATE: 09.12.2016
CHECKED BY: M.MURPHY DATE: 09.12.2016
APPROVED BY: Y.LORTIE DATE: 12.12.2016

PROJECT NUMBER:

PROJECT NAME:

ST.GEORGE'S
SWING BRIDGE
APPROACH SPAN

SHEET TITLE:

APPROACH SPAN
REPAIR LOCATIONS

SHEET NUMBER:

AS - 3

REVISION

3

THE MINISTRY OF
PUBLIC WORKS

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DEPARTMENT OF
WORKS AND ENGINEERING

Structures Section

ISSUED FOR: REFERENCE 09/12/2016

AMENDMENTS:

NO	REVISION	BY	APP	DATE

SCALE: 1/16" = 1'-0"

SURVEY
PREPARED BY: DATE:

DESIGN
PREPARED BY: DATE:

CHECKED BY: DATE:

DRAWING
PREPARED BY: R.GRAHAM-WARD DATE: 09/12/16
CHECKED BY: M.MURPHY DATE: 09/12/16

APPROVED BY: M.MURPHY DATE: 09/12/16

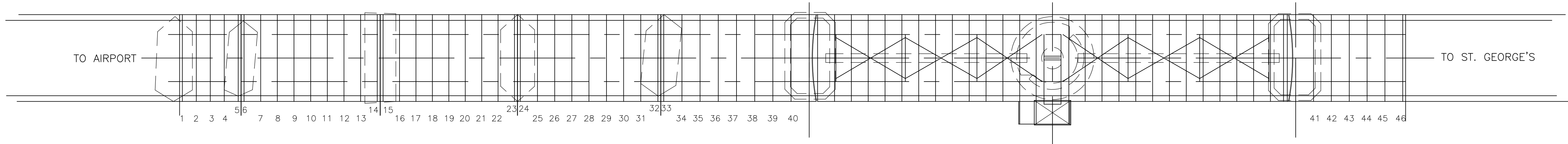
PROJECT NUMBER:

PROJECT NAME:

ST. GEORGE'S
SWING BRIDGE
APPROACH SPAN

SHEET TITLE:
APPROACH SPAN
CROSS GIRDER NUMBER

SHEET NUMBER: AS - 4 REVISION



FOR CONSTRUCTION

THE MINISTRY
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ENGINEERING

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Phone: (441)295-5151

DELCA
INTERNATIONAL
Toronto

GENERAL NOTES:
FOR GENERAL NOTES SEE
GENERAL ARRANGEMENT DRAWING

ISSUED FOR: TENDER

NO.	REVISION	APP.

AMENDMENTS:

SCALE: AS SHOWN

SURVEY
PREPARED BY:
N/A

DESIGN
PREPARED BY:
B.I.A.
CHECKED BY:
W.M.M.

DRAWING
PREPARED BY:
A.F.N.
CHECKED BY:
B.I.A.

APPROVED BY:

PROJECT NUMBER:
44/02/01

PROJECT NAME:
**SWING BRIDGE
REHABILITATION
APPROACH SPAN**

DRAWING FILE NO:

SHEET TITLE:
**GIRDER LAYOUT
AND DETAILS**

SHEET NUMBER:

S 4

TO AIRPORT

TO ST. GEORGE'S

SPAN No. 1 2 3 4 5 7 (SWING SPAN) 6

KEY PLAN
1" = 10'-0"

SYMMETRICAL ABOUT
APPROACH SPAN

MAIN GIRDER (EXISTING)

MAIN GIRDER (EXISTING)

DIAPHRAGM LOCATIONS
@ BEARINGS, SEE
DETAILS THIS DWG.

EXISTING DIAGONAL
BRACING AT ALTERNATE
CROSS BEAMS. (TYP.)

MAIN GIRDER (NEW)

MAIN GIRDER (NEW)

1/2" = 1'-0"

EXPANSION END

4-13/16" DIA. HOLES (TYP.) FOR
3/4" DIA. BOLTS IN TOP FLANGE
(FIELD DRILL HOLES THROUGH EXISTING
CROSS BEAMS)

3 3/8" c.c. (TYP.)

FIXED END

1/2" = 1'-0"

BEARINGS & CROSS BEAM

CROSS BEAM

CROSS BEAM

CROSS BEAM

CROSS BEAM

BEARING & CROSS BEAM

1/2" STIFFENER PLATE (TYP.)

8"

SEE DETAIL OF
EXPANSION BEARING
ON BEARING DETAILS (SS)
DRAWING

MAIN GIRDER
SEE TABLE FOR
DETAILS

SEE DETAIL OF
FIXED BEARING ON
BEARING DETAILS (SS)
DRAWING

8"

SPAN	1	2	3	4	5	6
				4 @ 3'-8 5/16"		
		2 @ 4'-4 7/8"		4 @ 4'-4 15/16"		2 @ 4'-4 7/8"
				8 @ 4'-4 3/16"		
				8 @ 4'-6 5/8"		
		2 @ 4'-9 3/4"		4 @ 4'-9 13/16"		2 @ 4'-9 3/4"
				4 @ 4'-8 11/16"		4'-8 5/8"

NEW MAIN GIRDER
1/2" = 1'-0"

LEGEND

- ⊕ INDICATES LOCATION OF NEW HOLE REQUIRED IN EXISTING AND/OR NEW STEEL. COMPONENTS TO BE FASTENED WITH NEW BOLT.
- ⦿ INDICATES LOCATION OF EXISTING BOLT TO BE REMOVED AND REPLACED WITH NEW BOLT THROUGH EXISTING STEEL AND NEW CONNECTION STEEL
- + INDICATES LOCATION OF EXISTING BOLT TO REMAIN IN PLACE. (SHOWN FOR INFORMATION PURPOSES ONLY)

DIAPHRAGM

COPE FLANGE ONE SIDE ONLY

1" x 1" COPE (TYP.)

1/2" STIFF. BOTH SIDES

NEW W 16 x 45

5"

5"

6" Ø OPENING IN WEB

3/8" STIFF. (ONE SIDE ONLY)

15/16" Ø HOLES FOR 7/8" Ø BOLTS (TYP.)

EXISTING W 16 x 45

3/16" (TYP.)

1 1/2" = 1'-0"

NEW MAIN GIRDER TABLE

SPAN	GIRDER LENGTH 'L'	'G'	GIRDER SIZE
1	16'-1 1/4"	4"	W16 x 45
2	36'-7 1/4"	7"	W27 x 94
3	36'-1 1/2"	7"	W27 x 94
4	37'-9"	7"	W27 x 94
5	39'-10 1/4"	7"	W27 x 94
6	29'-8"	6"	W24 x 76

DIAPHRAGM

COPE FLANGE ONE SIDE ONLY

1" x 1" COPE (TYP.)

1/2" STIFF. BOTH SIDES

NEW W 27 x 94

5"

5"

7" Ø OPENING IN WEB

3/8" STIFF. (ONE SIDE ONLY)

EXISTING W 27 x 94

5 @ 3" = 15"

3/16" (TYP.)

1 1/2" = 1'-0"

DIAPHRAGM

COPE FLANGE ONE SIDE ONLY

1" x 1" COPE (TYP.)

1/2" STIFF. BOTH SIDES

NEW W 24 x 76

5"

5"

6" Ø OPENING IN WEB

3/8" STIFF. (ONE SIDE ONLY)

EXISTING W 24 x 76

4 @ 3" = 12"

3/16" (TYP.)

1 1/2" = 1'-0"

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