

BRIDGE REHABILITATION  
BANFF NATIONAL PARK, ALBERTA

KM 108.6 - HIGHWAY 93N  
NIGEL CREEK BRIDGE

DRAWING LIST:

BRIDGE DRAWINGS:

- 227903-001 COVER SHEET, DRAWING LIST AND LOCATION MAP
- 227903-002 GENERAL ARRANGEMENT EXISTING CONDITION
- 227903-003 GENERAL ARRANGEMENT FINAL CONDITION
- 227903-004 DECK DIAPHRAGM AND PIER PYLON MODIFICATIONS (PHASE 1 COMPLETION)
- 227903-005 DECK JOINT MODIFICATION – SHEET 1 (PHASE 1 COMPLETION)
- 227903-006 DECK JOINT MODIFICATION – SHEET 2 (PHASE 1 COMPLETION)
- 227903-007 CAST-IN-PLACE BARRIER – LAYOUT AND REINFORCEMENT (PHASE 1 COMPLETION)
- 227903-008 BICYCLE RAILING (PHASE 1 COMPLETION)
- 227903-009 NEW SHEAR KEY AT PIER CAP – GENERAL ARRANGEMENT (PHASE 2)
- 227903-010 NEW SHEAR KEY AT PIER CAP – SECTIONS & DETAILS (PHASE 2)
- 227903-011 STRINGER BEARING REPLACEMENT – GENERAL ARRANGEMENT (PHASE 2)
- 227903-012 STRINGER BEARING REPLACEMENT – DETAILS (PHASE 2)
- 227903-013 PIER MODIFICATIONS (PHASE 2)
- 227903-014 SPANDREL COLUMN MODIFICATIONS (PHASE 2)
- 227903-015 ARCH RIB MODIFICATIONS (PHASE 2)

REFERENCE DRAWINGS

1960 ORIGINAL DESIGN DRAWINGS, NIGEL CREEK BRIDGE BANFF-JASPER  
HIGHWAY MILE 68.8 (KM 108.6), BANFF NATIONAL PARK:

- 1 OF 11 GENERAL LAYOUT
- 2 OF 11 NORTH ABUTMENT
- 3 OF 11 NORTH ABUTMENT REINFORCING
- 4 OF 11 SOUTH ABUTMENT
- 5 OF 11 SOUTH ABUTMENT STEEL REINFORCEMENT
- 6 OF 11 SKEWBACKS
- 7 OF 11 PIERS / BORE HOLES
- 8 OF 11 BEARINGS / REINFORCING STEEL SCHEDULE
- 9 OF 11 STRUCTURAL STEEL
- 10 OF 11 DECK
- 11 OF 11 STANDARD HANDRAIL

1960 ORIGINAL SHOP DRAWINGS OF NIGEL CREEK BRIDGE.

NIGEL CREEK BRIDGE 2004 REPAIRS, BANFF NATIONAL PARK, DRAWING  
REFERENCE B2004R5.

S1 NIGEL CREEK BRIDGE MISCELLANEOUS REPAIRS

2009 NIGEL CREEK BRIDGE REHABILITATION PROJECT NO. 418894 HWY 93N  
– ICEFIELDS PARKWAY KM 108.6, BANFF NATIONAL PARK:

- S-100 COVER PAGE
- S-101 GENERAL NOTES
- S-102 GENERAL LAYOUT
- S-103 EXPANSION JOINT DETAILS
- S-104 APPROACH GUARDRAILS
- S-105 MISCELLANEOUS DETAILS – SHEET 1
- S-106 MISCELLANEOUS DETAILS – SHEET 2
- S-1443-98 DECK WATERPROOFING SYSTEM WITH 80mm TWO COURSE  
HOT-MIX ASPHALT CONCRETE PAVEMENT
- S-1471 DEEP BEAM GUARDRAIL AT BRIDGE APPROACHES SHEET 1

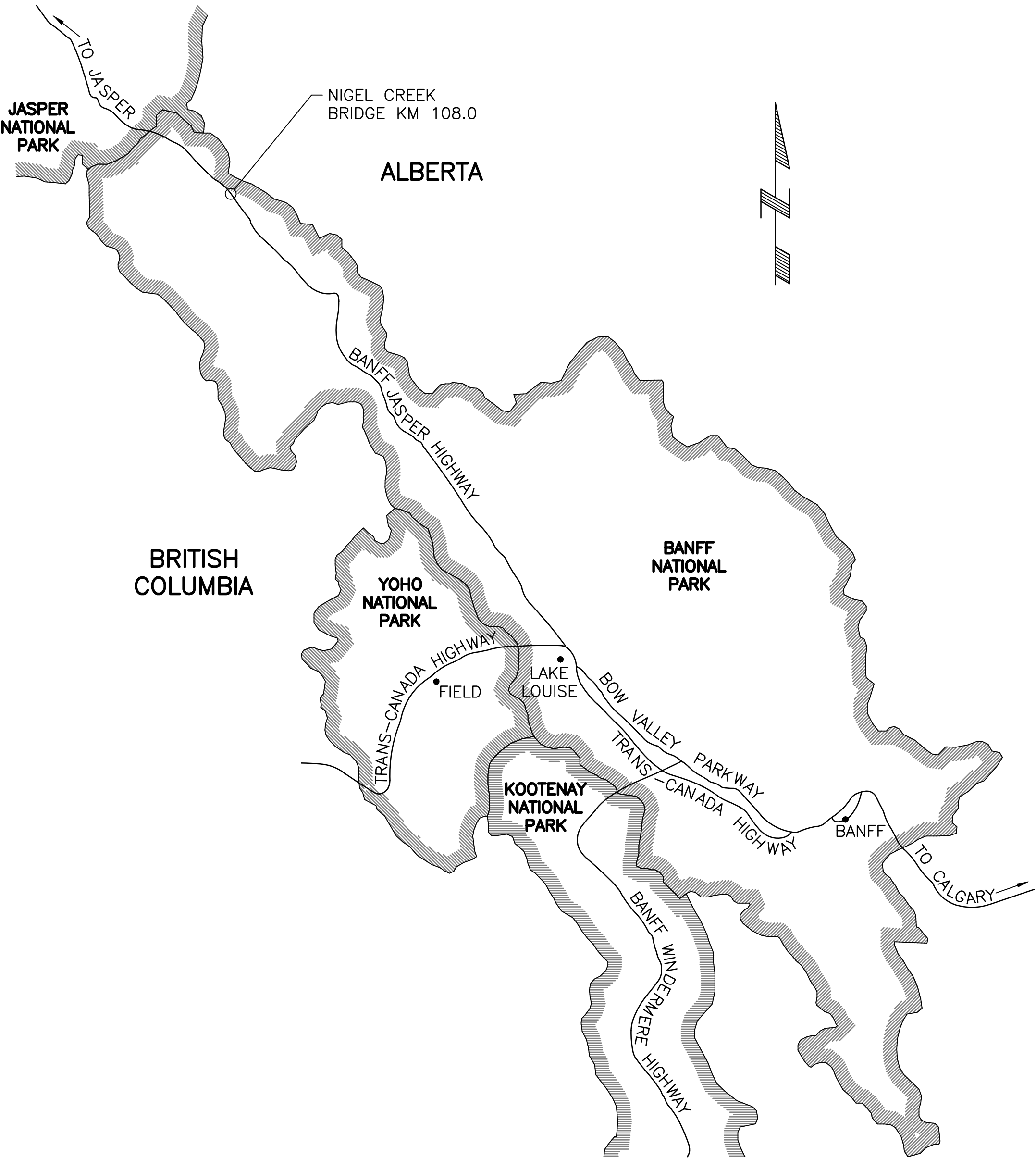
RECORD DRAWINGS – KM 108.6 – HIGHWAY 93N – NIGEL CREEK BRIDGE –  
BRIDGE REHABILITATION (2020 NIGEL CREEK BRIDGE PHASE 1 REHABILITATION  
RECORD DRAWINGS)

- 565-11-001 REV 1 COVER SHEET, DRAWING LIST AND LOCATION MAP
- 565-11-002 REV 1 GENERAL ARRANGEMENT EXISTING CONDITION
- 565-11-003 REV 1 GENERAL ARRANGEMENT FINAL CONDITION
- 565-11-004 REV 1 ABUTMENT MODIFICATIONS
- 565-11-005 REV 1 DECK DIAPHRAGM AND PIER PYLON MODIFICATIONS
- 565-11-006 REV 1 CONCRETE DECK MODIFICATIONS – SHEET 1
- 565-11-007 REV 1 CONCRETE DECK MODIFICATIONS – SHEET 2
- 565-11-008 REV 1 DECK JOINT MODIFICATIONS – SHEET 1
- 565-11-009 REV 1 DECK JOINT MODIFICATIONS – SHEET 2
- 565-11-010 REV 1 CAST-IN-PLACE BARRIER – LAYOUT AND  
REINFORCEMENT – SHEET 1
- 565-11-011 REV 1 CAST-IN-PLACE BARRIER – LAYOUT AND  
REINFORCEMENT – SHEET 2
- 565-11-012 REV 1 BICYCLE RAILING – SHEET 1
- 565-11-013 REV 1 BICYCLE RAILING – SHEET 2

REDLINE MARKUPS ROADWAY DRAWINGS – DRAWING REFERENCE  
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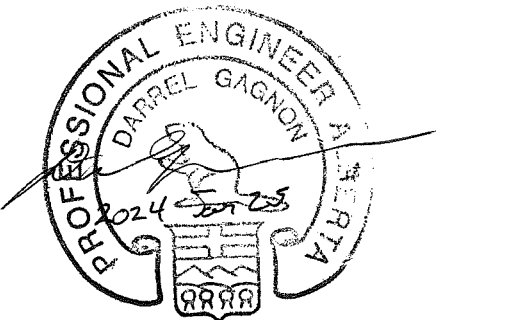
- C000 REDLINE MARKUP COVER SHEET
- C001 REDLINE MARKUP LOCALITY SKETCH, DRAWING INDEX AND LEGEND
- C101 REDLINE MARKUP PLAN BARRIER FLARES
- C301 REDLINE MARKUP TYPICAL SECTIONS
- C302 REDLINE MARKUP BICYCLE RAILING DETAILS

2020 AND 2021 SHOP DRAWINGS FOR NIGEL CREEK BRIDGE.



LOCATION MAP  
N.T.S.

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NOT FOR CONSTRUCTION



DO NOT SCALE DRAWINGS


Revision/ Révision	Description/Description	Date/Date
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Client/client		
	Parks Canada Agence	L'Agence Parcs Canada

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**BRIDGE REHABILITATION  
BANFF NATIONAL PARK, ALBERTA**  
  
**KM 108.6 HIGHWAY 93N  
NIGEL CREEK BRIDGE**

Approved by/Approuvé par

Designed by/Concept par  
TWB

Drawn by/Dessiné par  
MIAG

PWGC Project Manager/Administrateur de Projets TPSCG

PWGC, Architectural and Engineering Resources Manager/  
Ressources Architectural et de Directeur d'Ingénierie, TPSCG

Client/client  
PCA

Drawing title/Titre du dessin

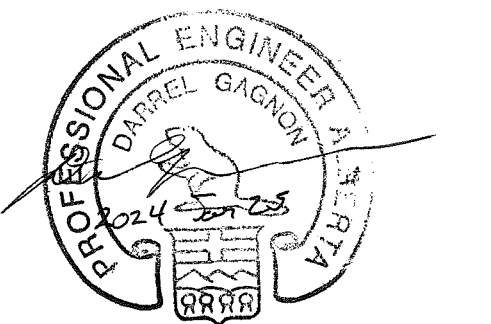
**COVER SHEET,  
DRAWING LIST  
AND LOCATION MAP**

Project No./No. du projet	Sheet/Fauille	Revision no./ La Révision no.
227903	001 OF	A





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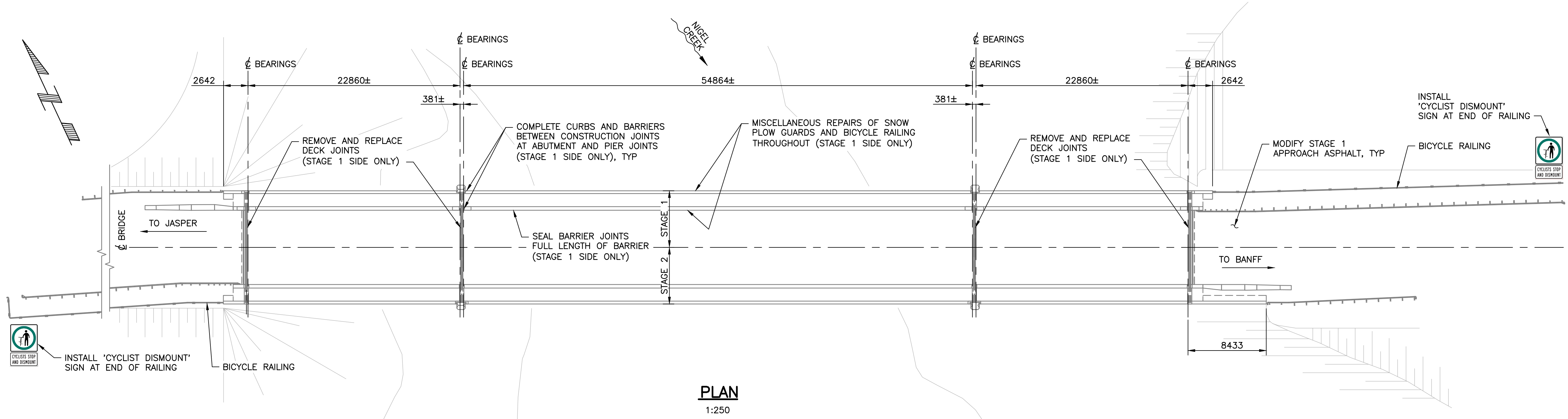
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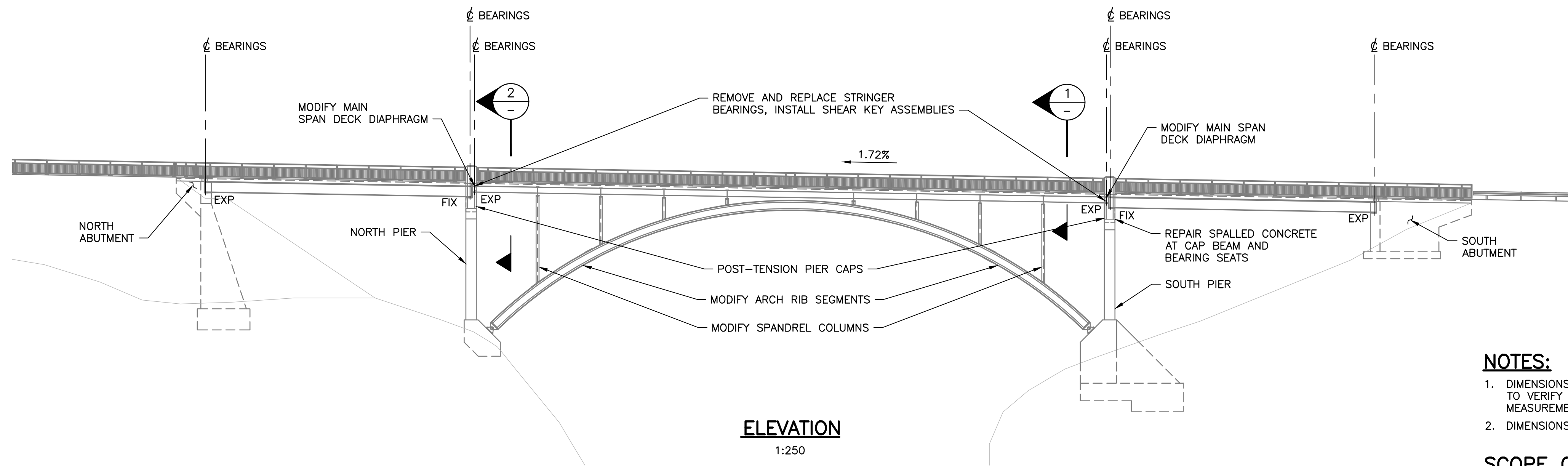
Drawing title/Titre du dessin

GENERAL ARRANGEMENT  
EXISTING CONDITION

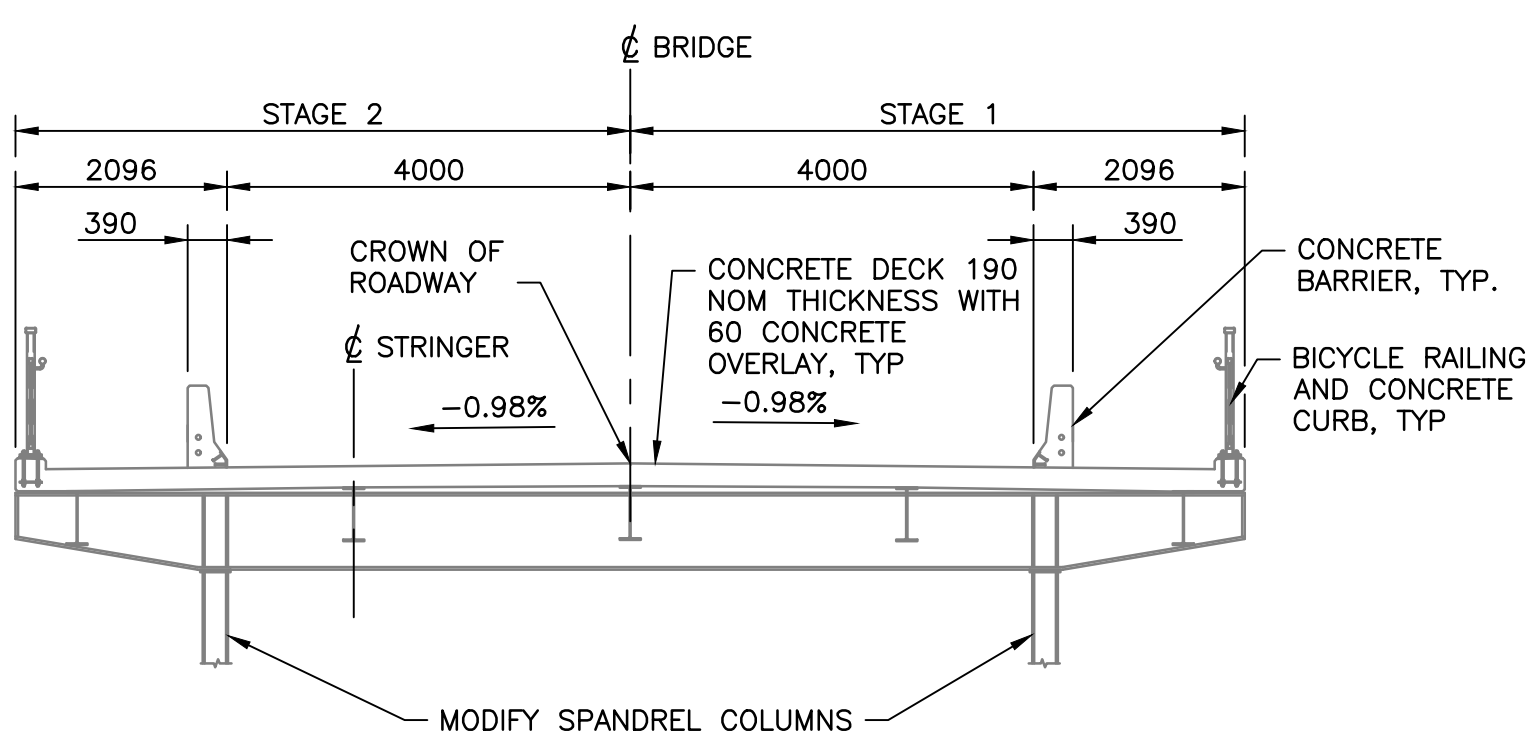
Project No./No. du projet	Sheet/Fauille	Revision no./ La Révision no.
227903	002 OF	A



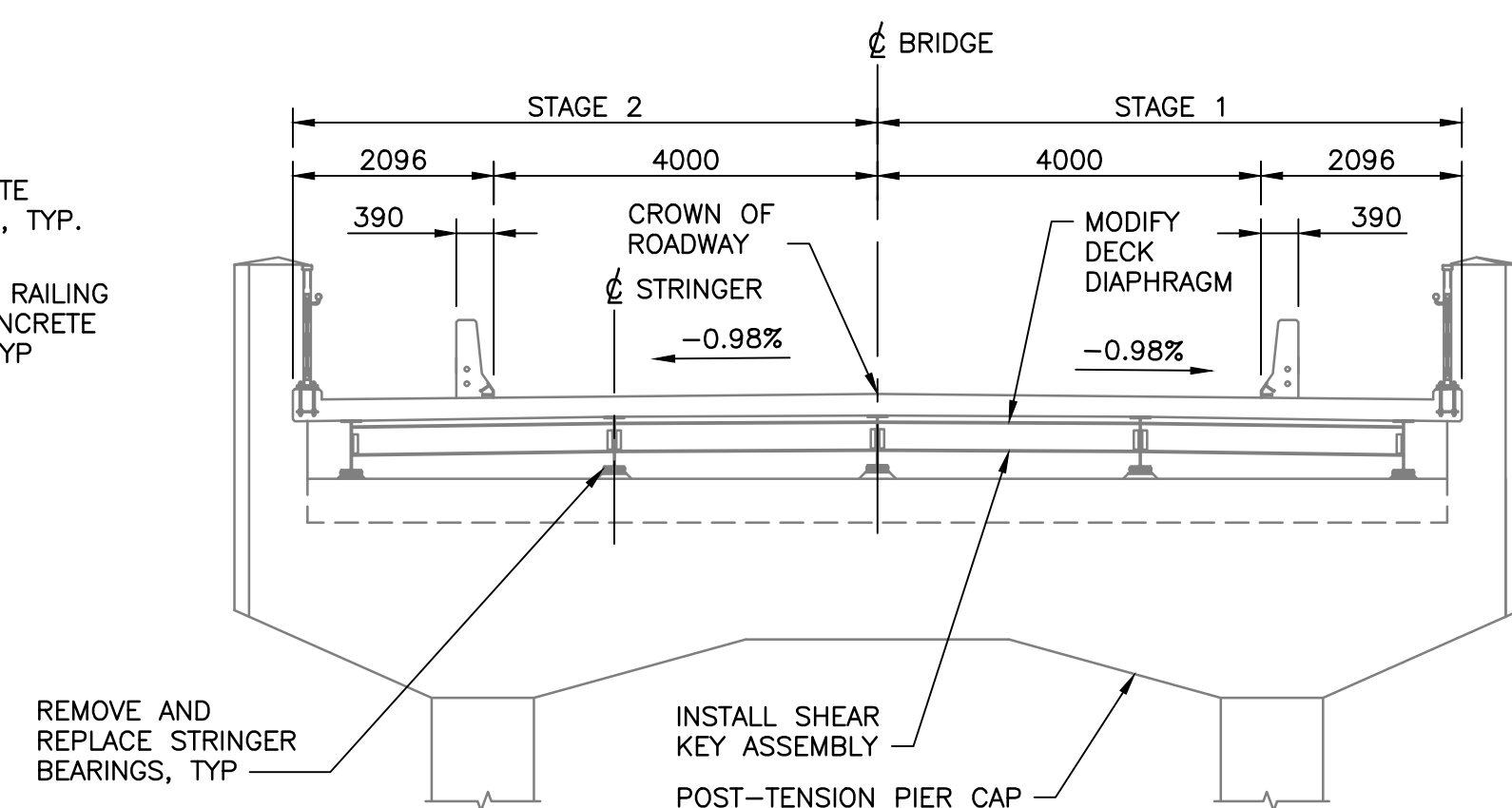
PLAN  
1:250



ELEVATION  
1:250



SECTION 1  
1:75



SECTION 2  
1:75

### CONSTRUCTION SEQUENCE REQUIREMENTS:

- PHASE 1 DECK JOINTS AND PIER DECK DIAPHRAGM MODIFICATION TO BE COMPLETED PRIOR TO STARTING PHASE 2 SCOPE OF WORK, EXCEPT AS NOTED.
- PHASE 2:
  - BEARINGS ADJACENT TO NEW SHEAR KEYS (TOTAL 4 BEARINGS, ONE ON EITHER SIDE OF SHEAR KEY AT EACH PIER) TO BE REMOVED AND REPLACED PRIOR TO INSTALLING SHEAR KEYS.
  - SHEAR KEYS TO BE INSTALLED PRIOR TO REMOVAL AND REPLACEMENT OF REMAINING BEARINGS.
  - REMAINING BEARINGS (TOTAL 6 BEARINGS) TO BE REMOVED AND REPLACED PRIOR TO REMOVING ADDITIONAL DECK JOINT STOP MOVEMENT BARS.
  - BEARING REPLACEMENT AND PARTIAL DEPTH CONCRETE REPAIRS AT PIER CAP TO BE COMPLETED PRIOR TO INSTALLATION OF PIER CAP POST-TENSIONING.
- ARCH RIBS AND ARCH SPANDREL COLUMN STRENGTHENING CAN BE COMPLETED ANY TIME DURING PHASE 1 COMPLETION OR PHASE 2 (WITHIN LIMITATIONS OF TRAFFIC RESTRICTIONS).

### NOTES:

- DIMENSIONS PROVIDED FOR REFERENCE ONLY. CONTRACTOR TO VERIFY ACCURACY OF SUCH INFORMATION BY FIELD MEASUREMENT.
- DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE.

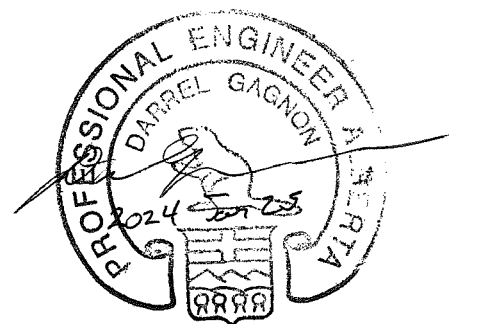
### SCOPE OF WORK:

- COMPLETION OF PHASE 1 SCOPE OF WORK:
  - REMOVAL OF EXISTING DECK JOINTS FOR STAGE 1.
  - LOCALIZED CONCRETE REMOVAL AT DECK JOINTS FOR STAGE 1.
  - SUPPLY AND CONSTRUCTION OF NEW CONCRETE RAILING CURBS AT ABUTMENT AND PIER JOINTS FOR STAGE 1.
  - CONSTRUCTION OF DECK DIAPHRAGM MODIFICATIONS AT PIERS.
  - SUPPLY AND CONSTRUCTION OF NEW CAST-IN-PLACE BARRIERS AT ABUTMENTS AND PIERS FOR STAGE 1.
  - INSTALLATION OF NEW DECK JOINTS FOR STAGE 1.
  - MISCELLANEOUS REPAIRS OF SNOW PLOW GUARD, AND BICYCLE RAILING FOR STAGE 1.
  - MODIFICATION OF STAGE 1 APPROACH PAVEMENT (INCLUDING ASPHALT MILLING AND NEW ASPHALT), APPLICATION OF LANE MARKINGS, AND INSTALLATION OF CYCLIST SIGNAGE.
- PHASE 2 SCOPE OF WORK:
  - SUPPLY AND INSTALLATION OF SHEAR KEY ASSEMBLIES AT PIER CAPS.
  - LOCALIZED CONCRETE REMOVAL BELOW EXISTING STRINGER BEARINGS AT PIERS.
  - REMOVAL AND DISPOSAL OF EXISTING STRINGER BEARINGS AT PIERS.
  - SUPPLY AND INSTALLATION OF NEW STRINGER BEARINGS AT PIERS.
  - REPAIR OF CONCRETE SPALLS AT PIER CAP AND BEARING SEATS.
  - PARTIAL DEPTH CONCRETE REPAIRS WHEN AUTHORIZED BY DEPARTMENTAL REPRESENTATIVE.
  - SUPPLY AND INSTALLATION OF PIER CAP POST-TENSIONING.
  - SUPPLY AND INSTALLATION OF SPANDREL COLUMN MODIFICATIONS.
  - SUPPLY AND INSTALLATION OF ARCH RIB MODIFICATIONS.





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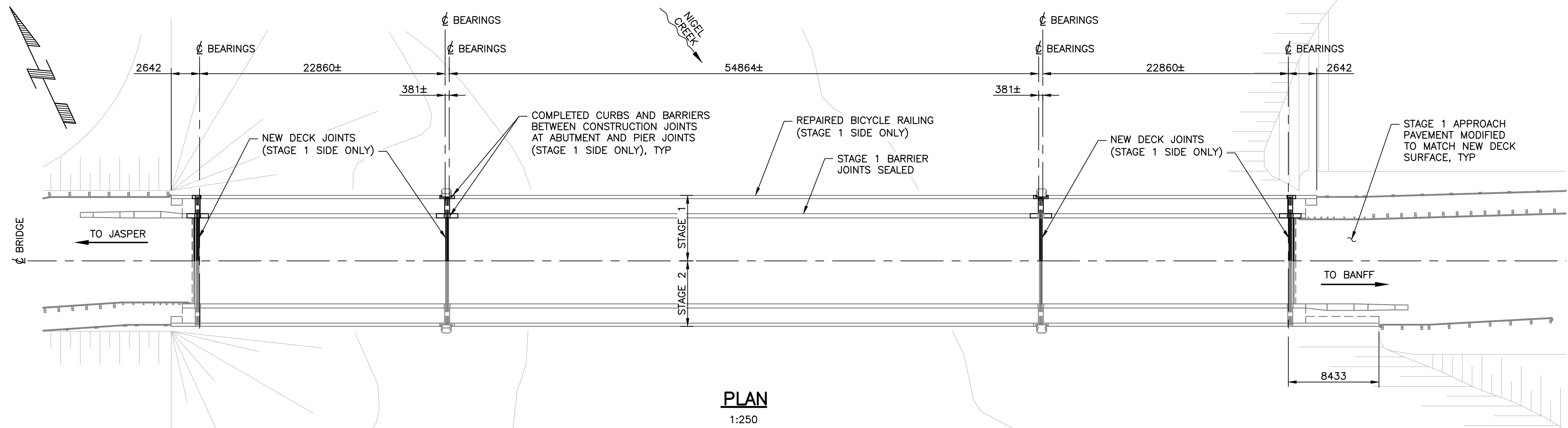
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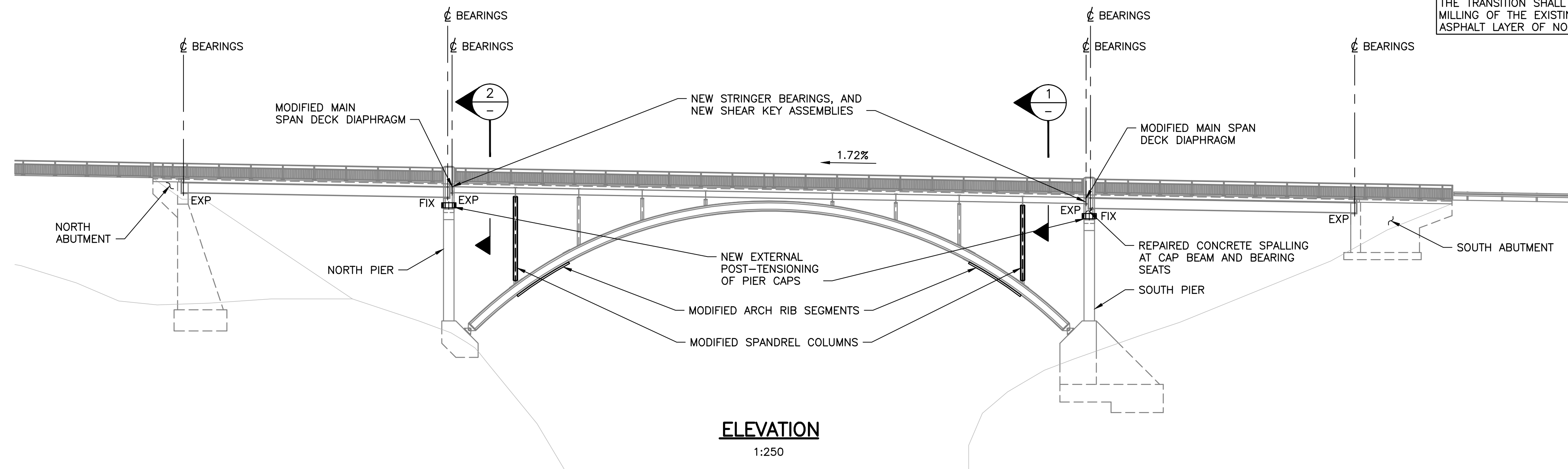
**GENERAL ARRANGEMENT  
FINAL CONDITION**

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227903	003 OF	A

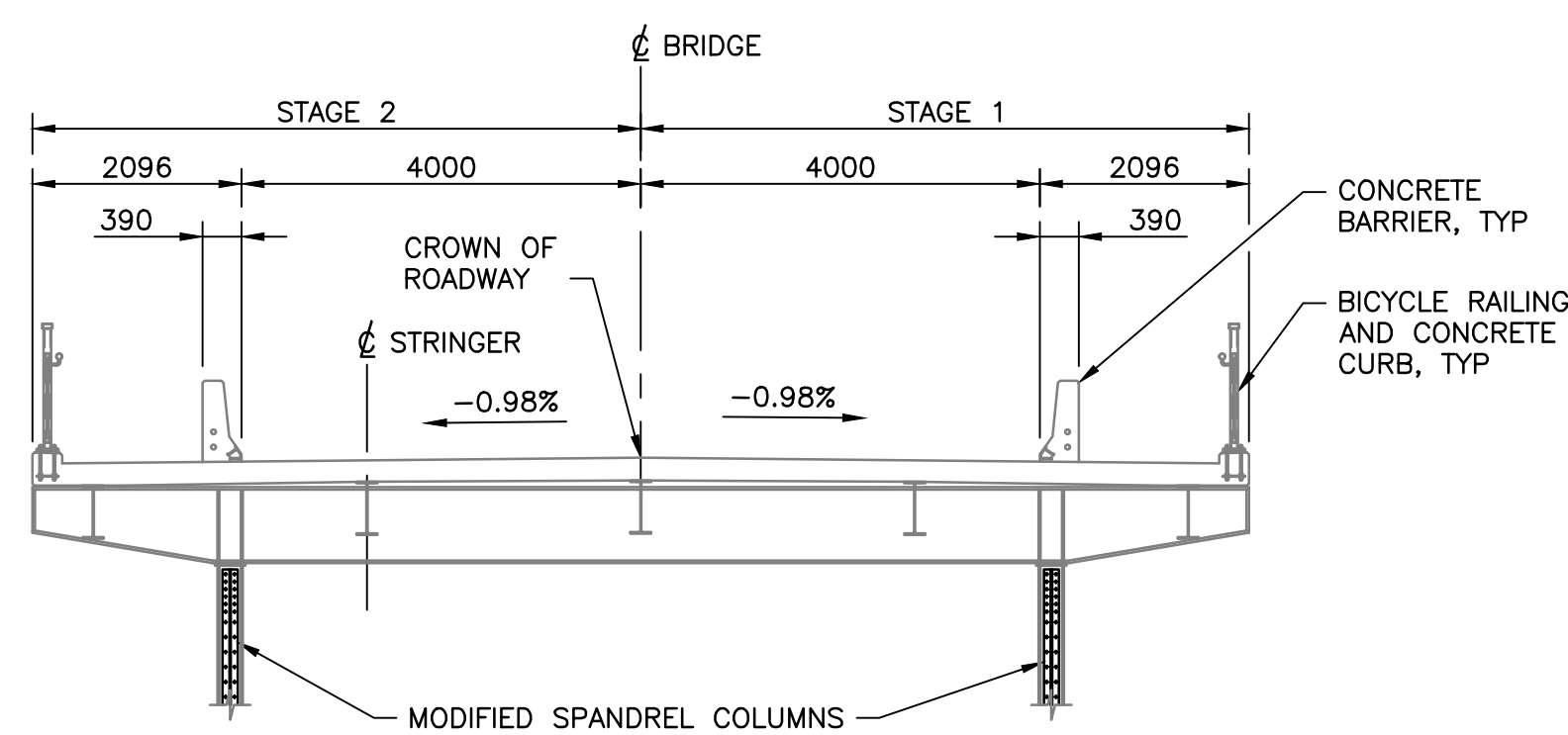


**PLAN**  
1:250

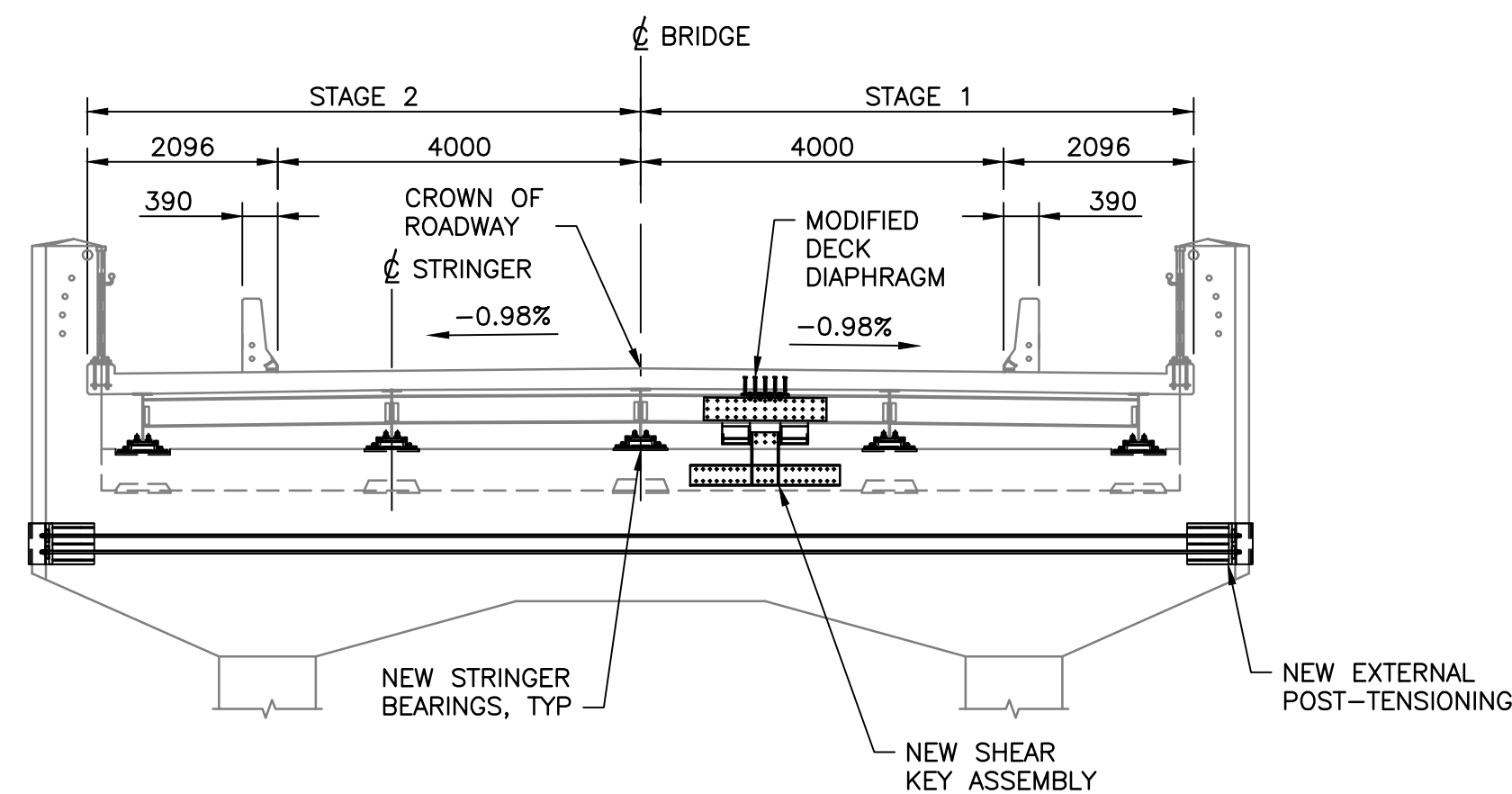
**NOTE:**  
THE GRADE AND CROSS SLOPE OF THE COMPLETED DECK SHALL BE TRANSITIONED TO THE GRADE AND CROSS SLOPE ON THE EXISTING APPROACH ROADWAY OVER A DISTANCE OF AT LEAST 20m PAST THE DECK AT EACH END OF THE COMPLETED BRIDGE STRUCTURE. THE TRANSITION SHALL BE DONE BY PARTIAL DEPTH MILLING OF THE EXISTING PAVEMENT AND PLACING AN ASPHALT LAYER OF NO LESS THEN 50mm THICKNESS.



**ELEVATION**  
1:250



**SECTION 1**  
1:75



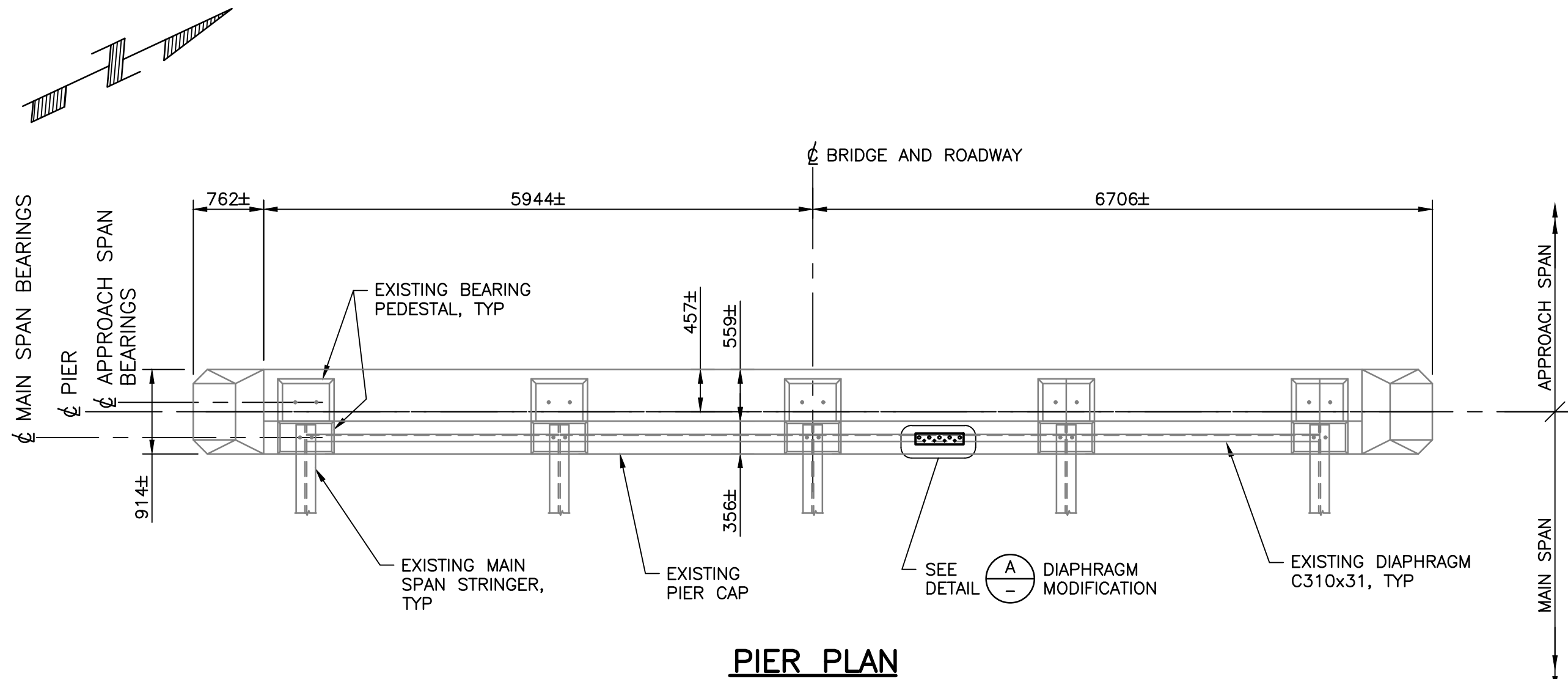
**SECTION 2**  
1:75

**NOTES:**

- DESIGN STANDARDS: CANADIAN STANDARDS ASSOCIATION CSA S6:19.  
DESIGN LIFE: 30 YEARS
- DESIGN LOADS:
  - UNIT MATERIAL WEIGHTS
    - REINFORCED CONCRETE: 24.0 kN/m<sup>3</sup>
    - STEEL: 77.0 kN/m<sup>3</sup>
  - LIVE LOADS:
    - VEHICLE LOADING: CL1-625 TRUCK
    - LANE LOADING AND DYNAMIC LOAD ALLOWANCE AS PER CSA S6:19.
  - WIND LOADS
    - REFERENCE WIND PRESSURE q = 455 kPa for 50 YEAR RETURN PERIOD
    - 20% INCREASE OF WIND PRESSURE DUE TO POSSIBLE FUNNELING EFFECT.
  - TEMPERATURE DATA:
    - MAXIMUM MEAN DAILY TEMPERATURE: 26°C
    - MINIMUM MEAN DAILY TEMPERATURE: -40°C
  - SEISMIC DESIGN PARAMETERS:
    - RETURN PERIOD : 475 YEARS
    - IMPORTANCE CATEGORY : OTHER BRIDGES
    - SITE CLASS : A



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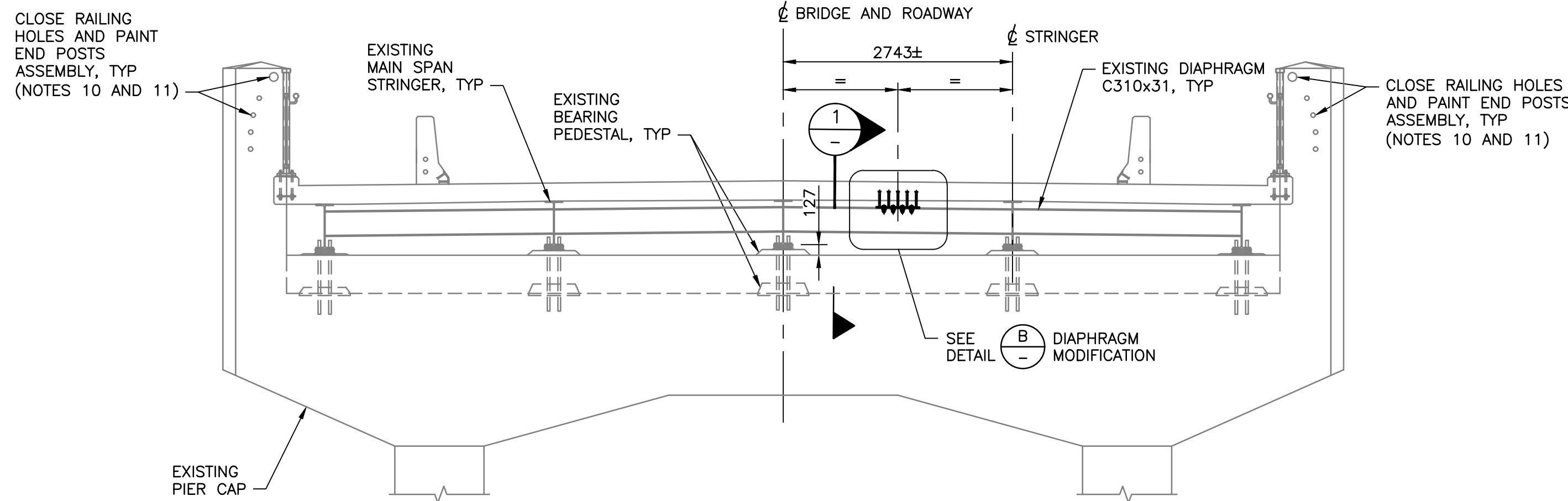


PIER PLAN

1:50

(NORTH PIER SHOWN - SOUTH PIER SIMILAR  
DECK AND APPROACH SPAN GIRDERS NOT SHOWN FOR CLARITY)

PHASE 2 PIER MODIFICATIONS  
NOT SHOWN. SEE SHEETS 9 TO 13



PIER ELEVATION FINAL CONDITION

1:50

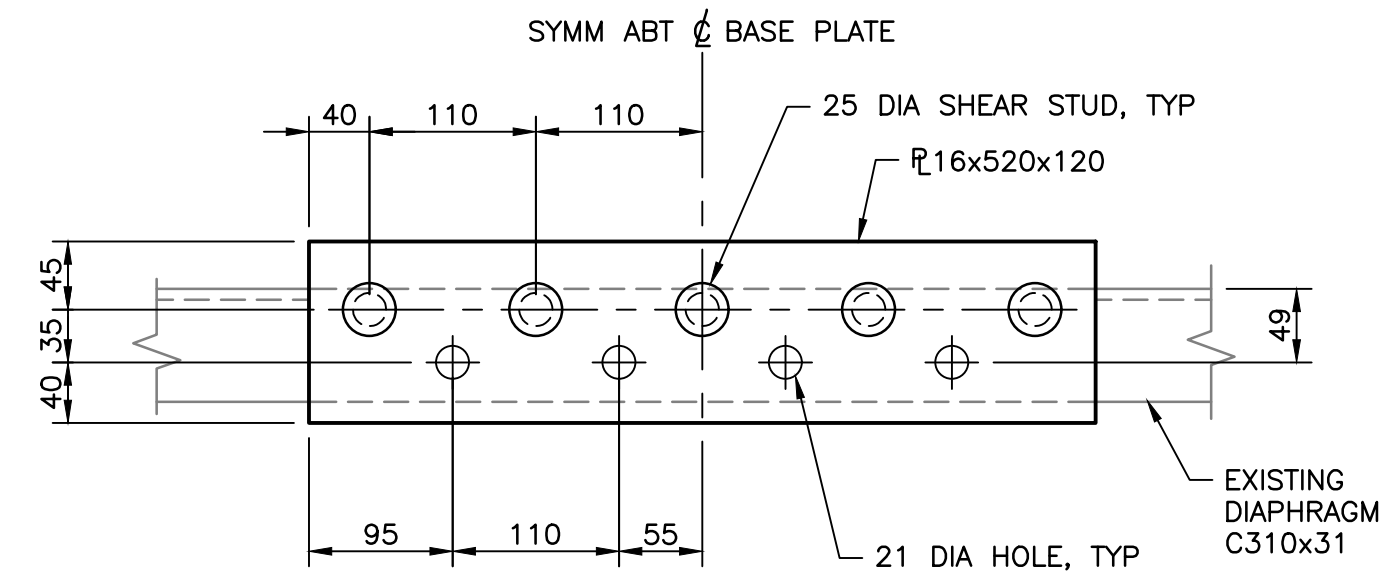
(NORTH PIER - LOOKING NORTH)

PHASE 2 PIER MODIFICATIONS  
NOT SHOWN. SEE SHEETS 9 TO 13

NOTES:

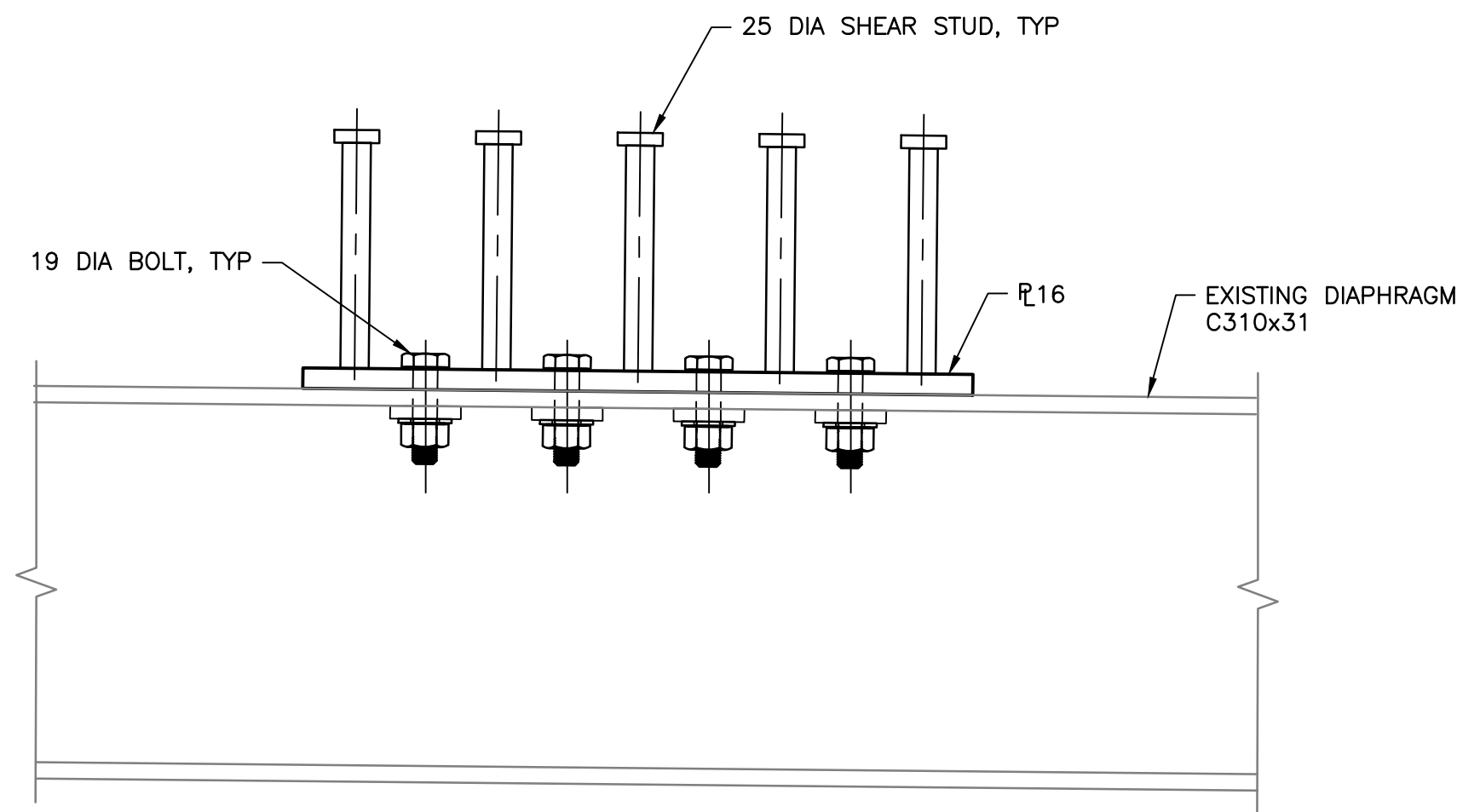
- ALL DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE.
- SUPPLIED BY OWNER:
  - DECK DIAPHRAGM MODIFICATIONS (BASE PLATES C/W SHEAR STUDS AND BEVELED WASHERS)
- OWNER SUPPLIED MATERIALS:
  - STEEL TO CAN/CSA G40.21 GRADE 350W.
  - STUDS TO CSA W59 ANNEX H, TYPE B.
  - WELDING TO CAN/CSA W59.
  - GALVANIZED AFTER FABRICATION TO ASTM A123/123M.
- BOLTS: ASTM F3125, GRADE A325.
- BOLT THREADS SHALL BE EXCLUDED FROM SHEAR PLANE.
- USE TURN-OF-NUT METHOD FOR TIGHTENING THE BOLTS.
- THE FAYING SURFACE AT T/O CHANNEL FLANGE SHALL BE ZINC METALLIZED IN ACCORDANCE WITH ASTM B833. SURFACE SHALL BE BLAST CLEANED BEFORE APPLICATION. THICKNESS OF ZINC METALLIZING SHALL NOT EXCEED 16 mil.
- FIELD WELDING IS NOT PERMITTED.
- PLACE DIAPHRAGM MODIFICATION BEFORE PLACING NEW DECK JOINT.
- FILL HOLES OF REMOVED RAILING PIPES IN PIER PYLONS WITH CONCRETE REPAIR MORTAR. SEAL PERIMETER OF INFILL WITH SIKAFLEX 15LM SEALING COMPOUND OR APPROVED EQUIVALENT.
- CLEAN STEEL RAILING ANCHOR ASSEMBLY IN PIER PYLON AND APPLY TWO COATS OF ZINC-RICH PAINT. PAINT COLOUR TO MATCH COLOUR OF PIER CONCRETE.

LOCATION	No. DIAPHRAGM MODIFICATION ASSEMBLIES
APPROACH SPAN - NORTH ABUTMENT	N/A
APPROACH SPAN - NORTH PIER	N/A
MAIN SPAN - NORTH PIER	1
MAIN SPAN - SOUTH PIER	1
APPROACH SPAN - SOUTH PIER	N/A
APPROACH SPAN - SOUTH ABUTMENT	N/A



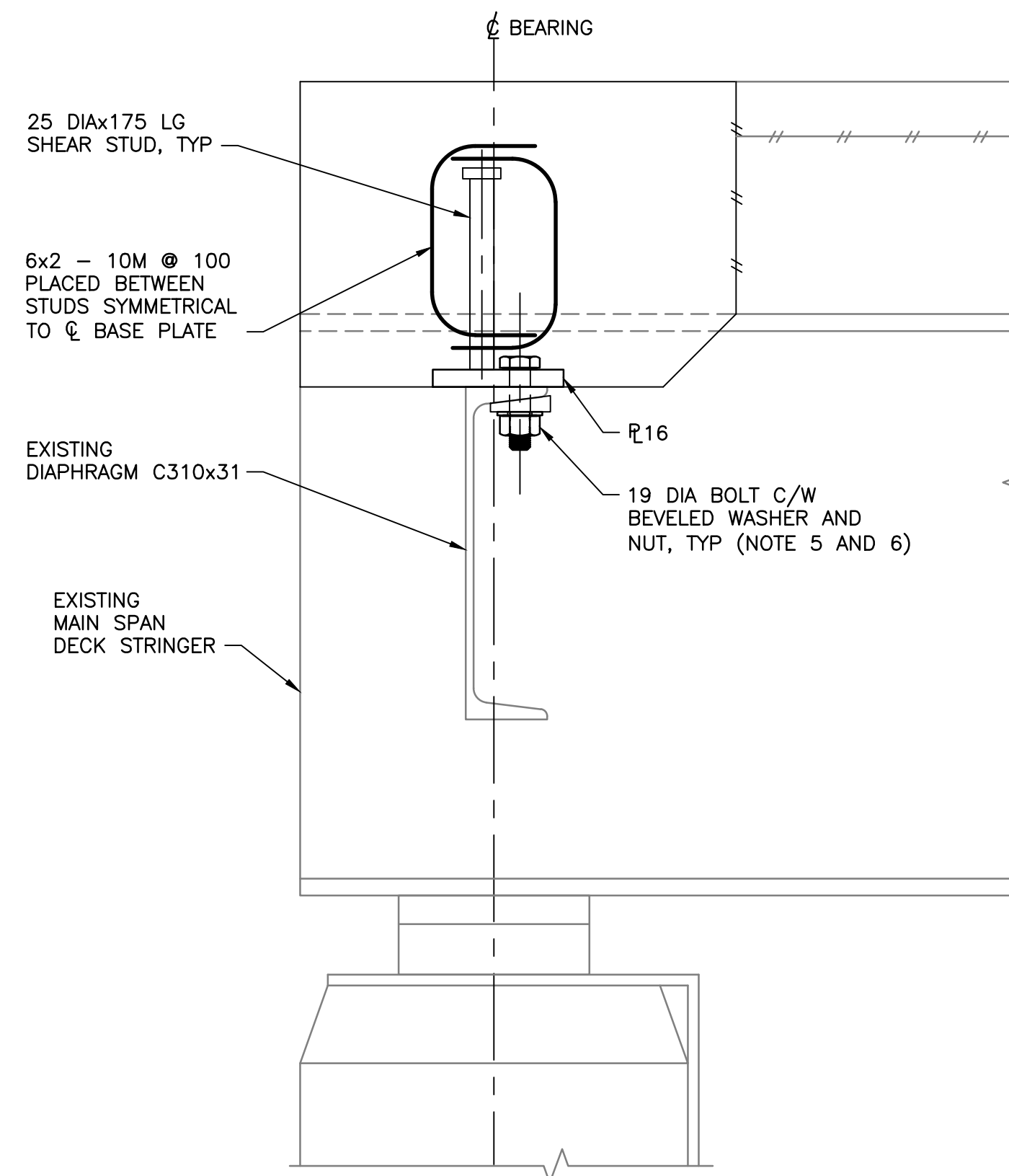
DETAIL A BASE PLATE

1:5



DETAIL B

1:5



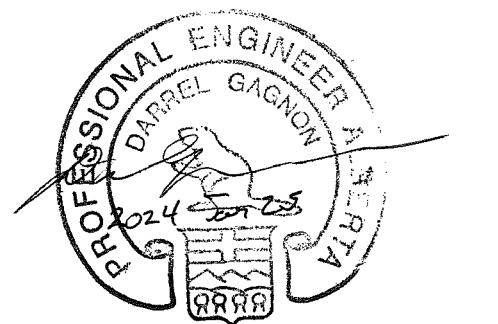
SECTION 1

1:5

PHASE 2 PIER MODIFICATIONS  
NOT SHOWN. SEE SHEETS 9 TO 13

(DECK JOINT, DECK REINFORCEMENT, AND APPROACH SPAN GIRDER NOT SHOWN)

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DECK DIAPHRAGM AND  
PIER PYLON MODIFICATIONS

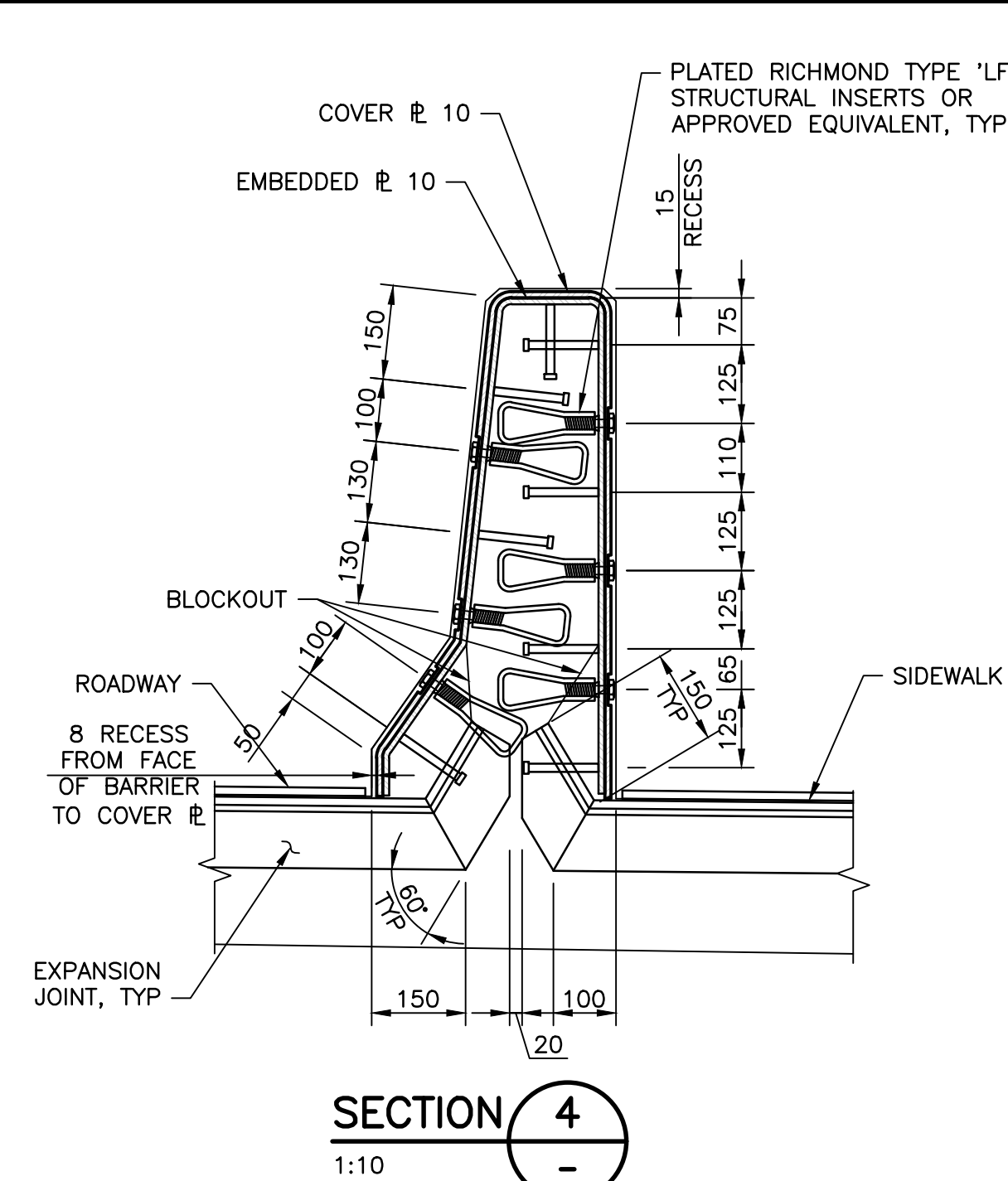
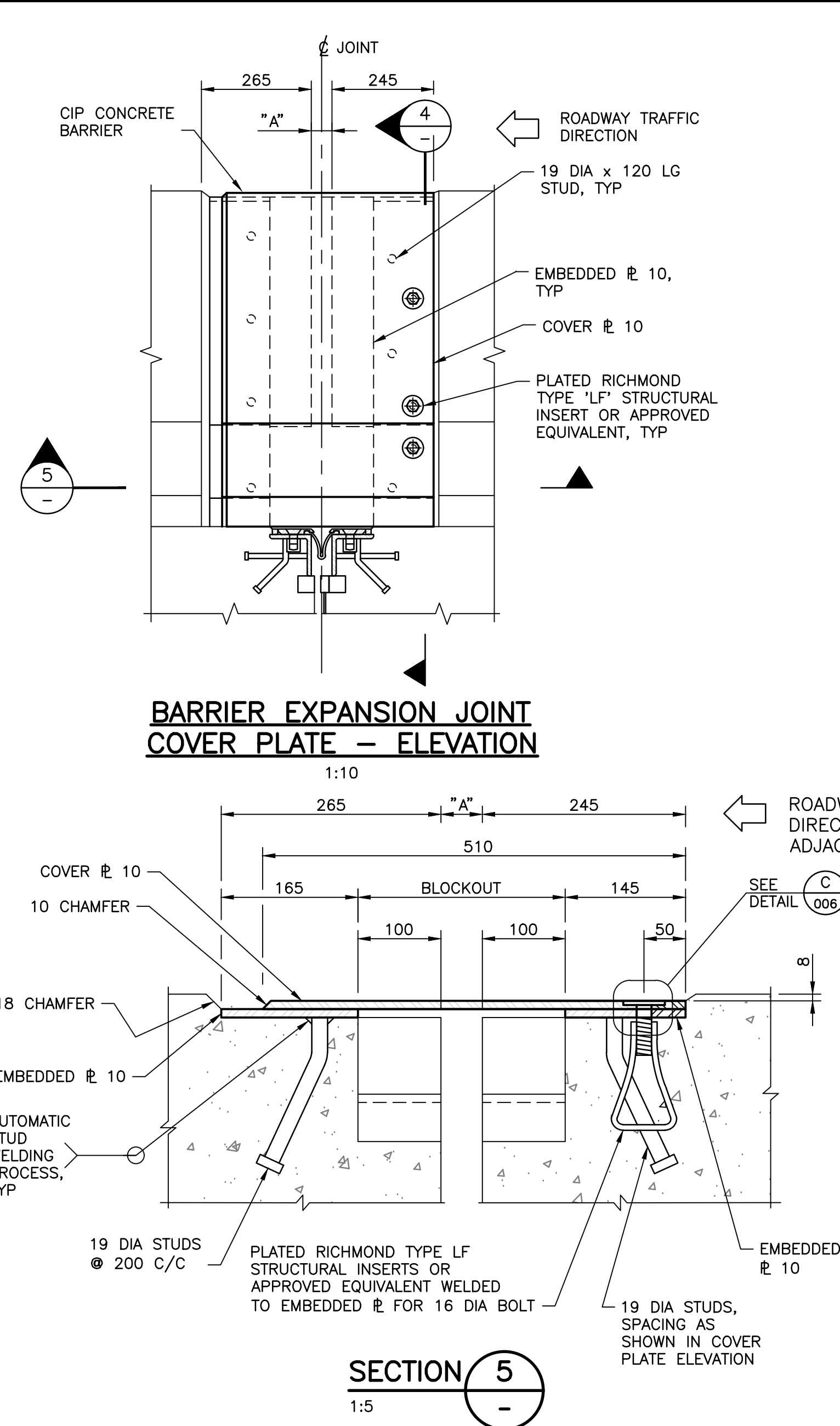
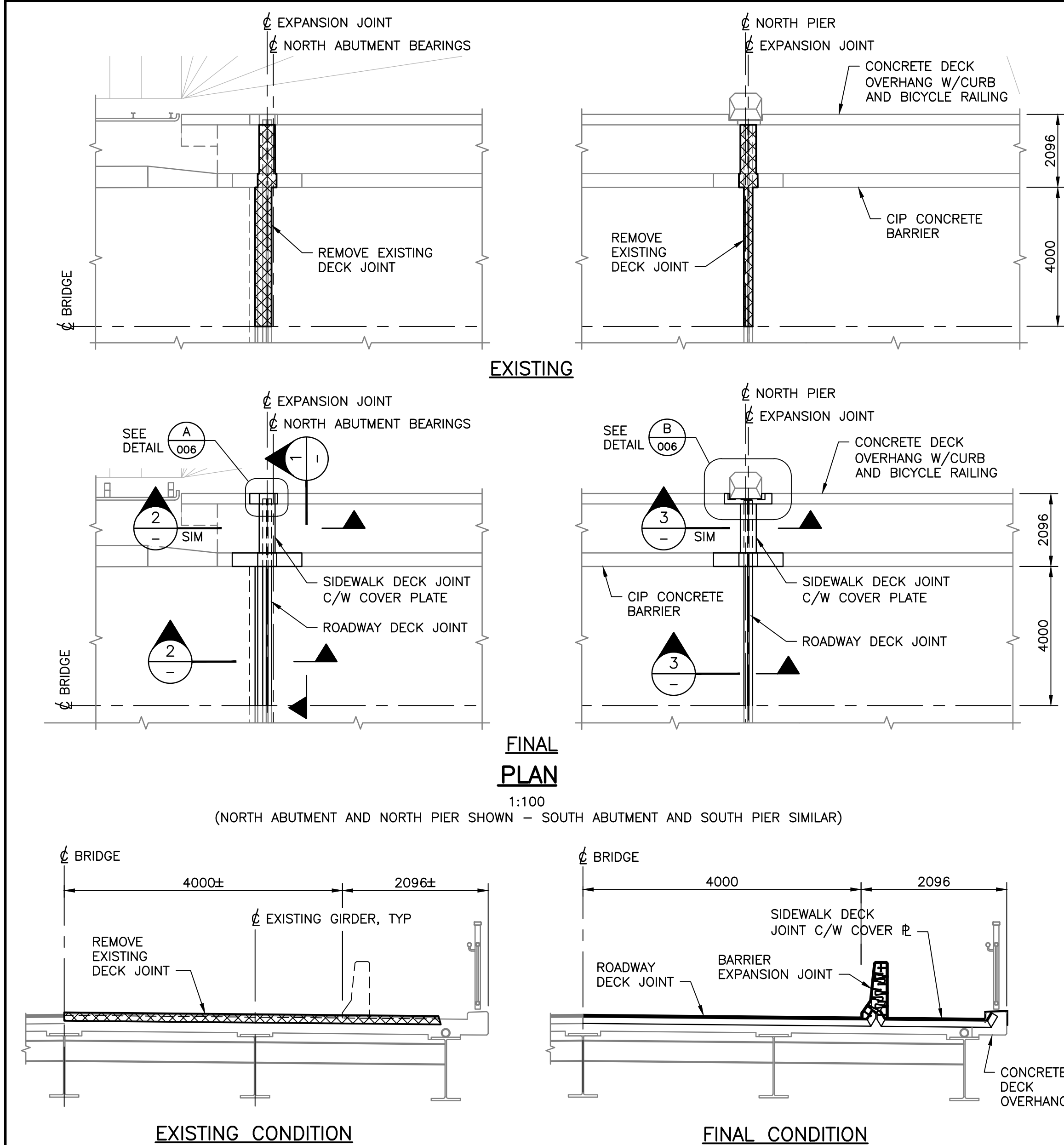
(PHASE 1 COMPLETION)

Project No./No. du projet 227903	Sheet/Fauille 004 OF	Revision no./ La Révision no. A
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#### NOTES:

- SUPPLIED BY OWNER:
    - NEW ROADWAY AND SIDEWALK DECK JOINTS AT ABUTMENTS. SUPPLIED DECK JOINTS FABRICATED BY LCL ARE AN APPROVED EQUIVALENT TO "GOODFLEX SERIES 1100 BY GOODCO Z-TECH" C/W JOINT NEOPRENE SEAL "GOODCO FL-75"
    - NEW ROADWAY AND SIDEWALK DECK JOINTS AT PIERS. SUPPLIED DECK JOINTS FABRICATED BY LCL ARE AN APPROVED EQUIVALENT TO "GOODFLEX SERIES 1100 BY GOODCO Z-TECH" C/W JOINT NEOPRENE SEAL "GOODCO FL-125"
    - NEW SIDEWALK DECK JOINT COVER PLATES. SUPPLIED SIDEWALK DECK JOINT COVER PLATES "WABO SAFETYFLEX BY WATSON BOWMAN ACME CORP"
    - BARRIER AND CURB COVER PLATES. SUPPLIED BARRIER AND CURB PLATES FABRICATED BY LCL IN ACCORDANCE WITH DETAILS PROVIDED ON THIS DRAWING
  - SUPPLIED BY OWNER MATERIALS:
    - STEEL: CSA G40.21M GRADE 300W, GALVANIZED AFTER FABRICATION
    - STUDS: CAN/CSA W59 ANEX H, TYPE B, GALVANIZED AFTER FABRICATION
    - WELDING: CAN/CSA W59
    - HOT DIP GALVANIZED TO ASTM A123/123M
  - ALL SUPPLIED BY OWNER ITEMS TO BE INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS. STAGE 1 JOINTS TO BE SPLICED TO PREVIOUSLY INSTALLED STAGE 2 JOINTS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND JOINT SHOP DRAWINGS.
  - MINIMUM COMPRESSIVE STRENGTH OF CONCRETE: 45 MPa AT 28 DAYS
  - REINFORCING STEEL: CAN/CSA G30.18 GRADE 400W
  - MINIMUM COVER: 50 UNO.
  - MINIMUM LAP:
    - 10M: 325mm UNO.
    - 15M: 600mm UNO.
    - 25M: 1200 UNO.
- STAGGER LAP SPLICES BY 1.3 TIMES THE LAP LENGTH. USE EXISTING REBAR COUPLERS INSTALLED IN PHASE 1-STAGE 2 FOR TRANSVERSE BARS AS REQUIRED AT STAGE 1/STAGE 2 CONSTRUCTION JOINT.
- TRIM TOP OF VERTICAL BARS IF REQUIRED TO MAINTAIN CONCRETE COVER.
  - CONSTRUCTION JOINTS TO BE CLEAN, FREE OF LAITANCE AND ROUGHENED TO AN AMPLITUDE OF 5mm.
  - INSTALLATION GAP "A" IN ACCORDANCE WITH TABLE.
  - PROVIDE 5mm GAP TO T/O CURB.
  - CHAMFER EDGES OF CURB COVER PLATES 5mm.
  - ADDITIONAL STOP MOVEMENT BAR ASSEMBLIES TO BE PLACED IN AREAS BETWEEN GIRDERS/STRINGERS ONLY. BARS SHALL BEAR EVENLY ON JOINT SQUARE BARS.
  - CONCRETE SCREW ANCHOR TO BE FULLY REMOVABLE.
  - PROVIDE 5mm RECESS OF DECK CONCRETE FASCIA IN REFERENCE TO STOP MOVEMENT BARS.
  - JOINT GAP FOR STOP MOVEMENT BARS 40x150: "A"-15mm.

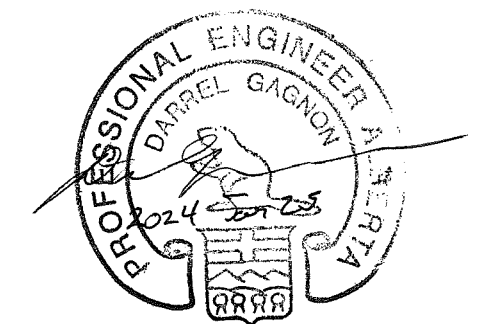
#### GAP SETTING TABLE DIMENSION "A"

TEMPERATURE (°C)	-15	-10	-5	0	5	10	15	20	25
JOINT GAP "A" AT ABUTMENT	62	60	59	58	56	55	53	52	51
JOINT GAP "A" AT PIER	65	64	62	60	59	57	55	54	52

#### LEGEND:

REMOVALS

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Drawn by/Dessiné par LT
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PWGC, Architectural and Engineering Resources Manager/ Ressources Architectural et de Directeur d'Ingénierie, TPSCG
Client/client PCA
Drawing title/Titre du dessin

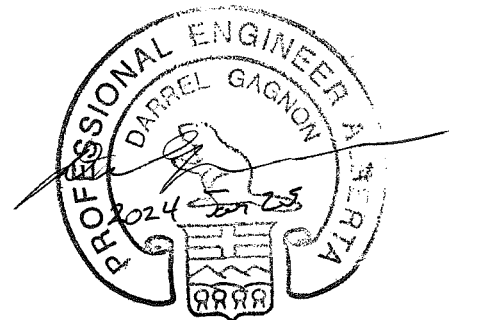
#### DECK JOINT MODIFICATION SHEET 1

(PHASE 1 COMPLETION)

Project No./No. du projet	Sheet/Fauille	Revision no./La Révision no.
227903	005 OF	A



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	<div>Parks Canada Agency</div> <div>L'Agence Parcs Canada</div>

# COWI

Project title/Titre du projet  
**BRIDGE REHABILITATION  
BANFF NATIONAL PARK, ALBERTA**

**KM 108.6 HIGHWAY 93N  
NIGEL CREEK BRIDGE**

Approved by/Approuvé par  
DPG

Designed by/Concept par  
TWB

Drawn by/Dessiné par  
LT

PWGSC Project Manager/Administrateur de Projets TPSGC

PWGSC, Architectural and Engineering Resources Manager/  
Ressources Architectural et de Directeur d'ingénierie, TPSGC

Client/client	
PCA	

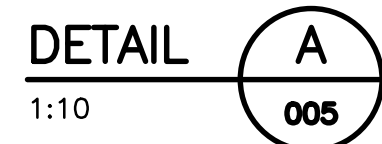
Drawing title/Titre du dessin

**DECK JOINT MODIFICATION  
SHEET 2**

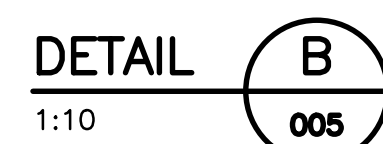
(PHASE 1 COMPLETION)

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision
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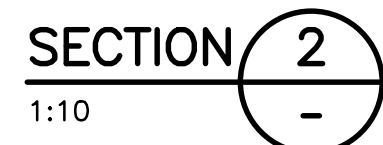
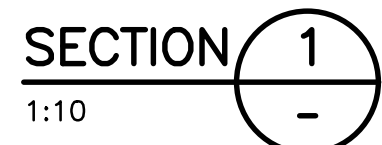
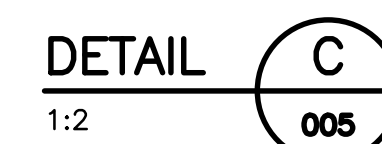
227903	006	no. A
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(NORTH SIDEWALK OF NORTH ABUTMENT SHOWN. OTHER SIDEWALK ABUTMENT JOINTS SIMILAR)



(NORTH SIDEWALK OF NORTH PIER SHOWN. OTHER SIDEWALK PIER JOINTS SIMILAR)



NOTE: DECK JOINT BLOCK OUT  
REINFORCEMENT NOT SHOWN,  
SEE SHEET 005 FOR DECK  
JOINT REINFORCEMENT



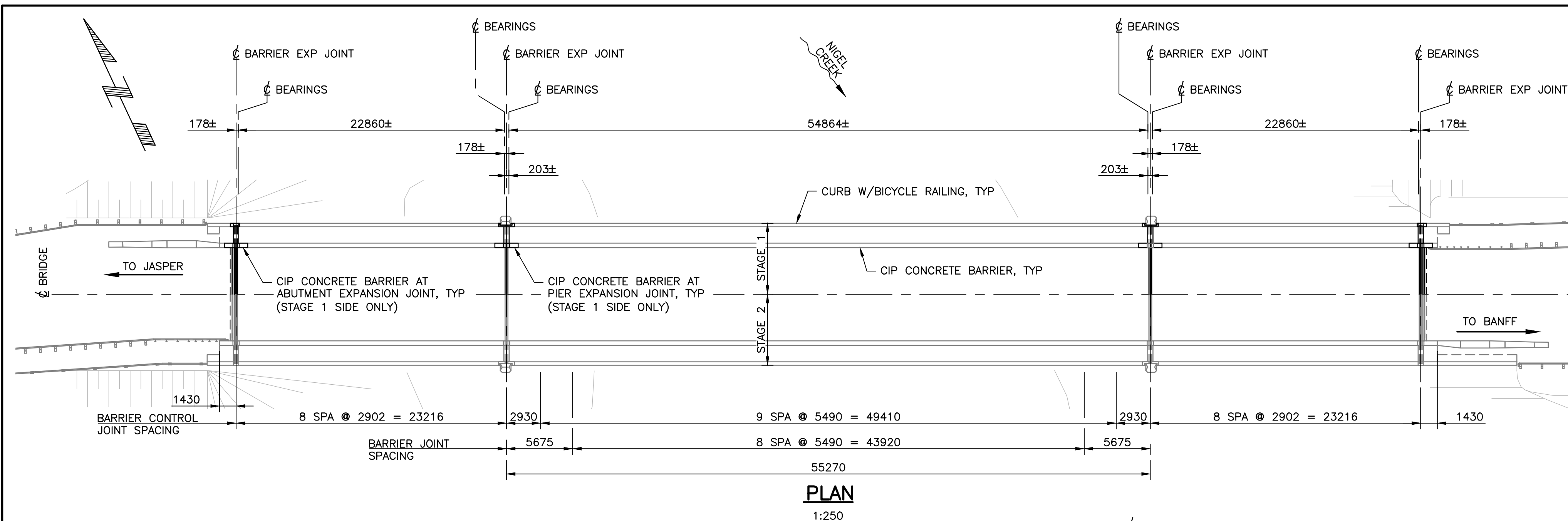
NOTES:

1. FOR NOTES, SEE SHEET 005.



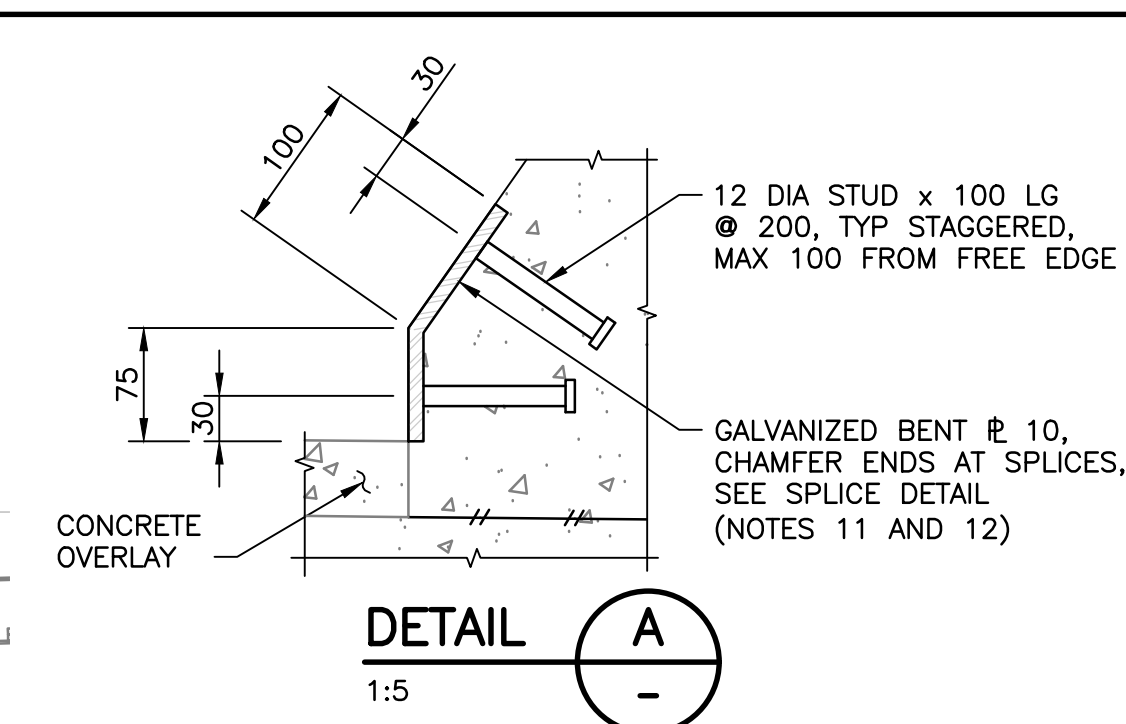


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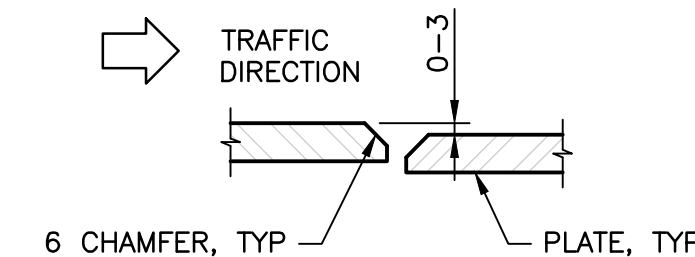
PLAN

1:250



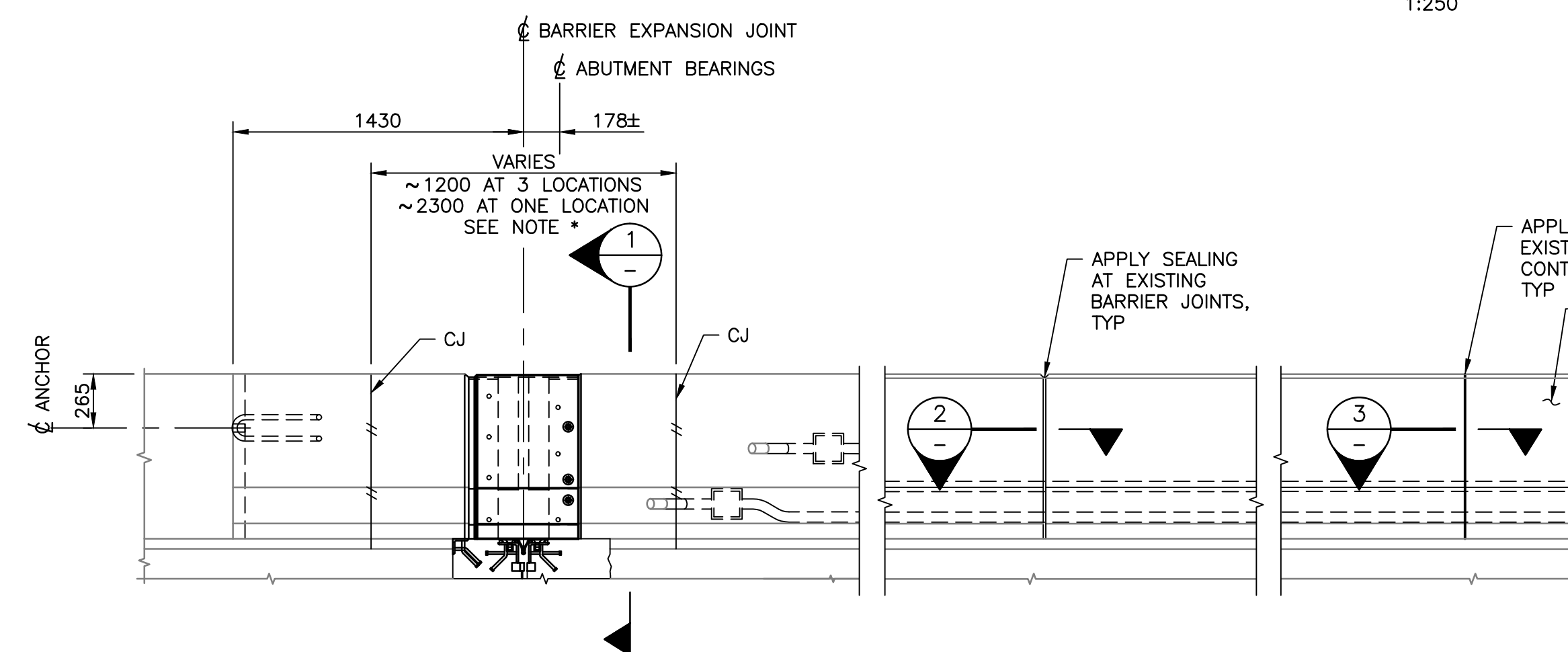
DETAIL A

1:5



SPLICE DETAIL

1:2

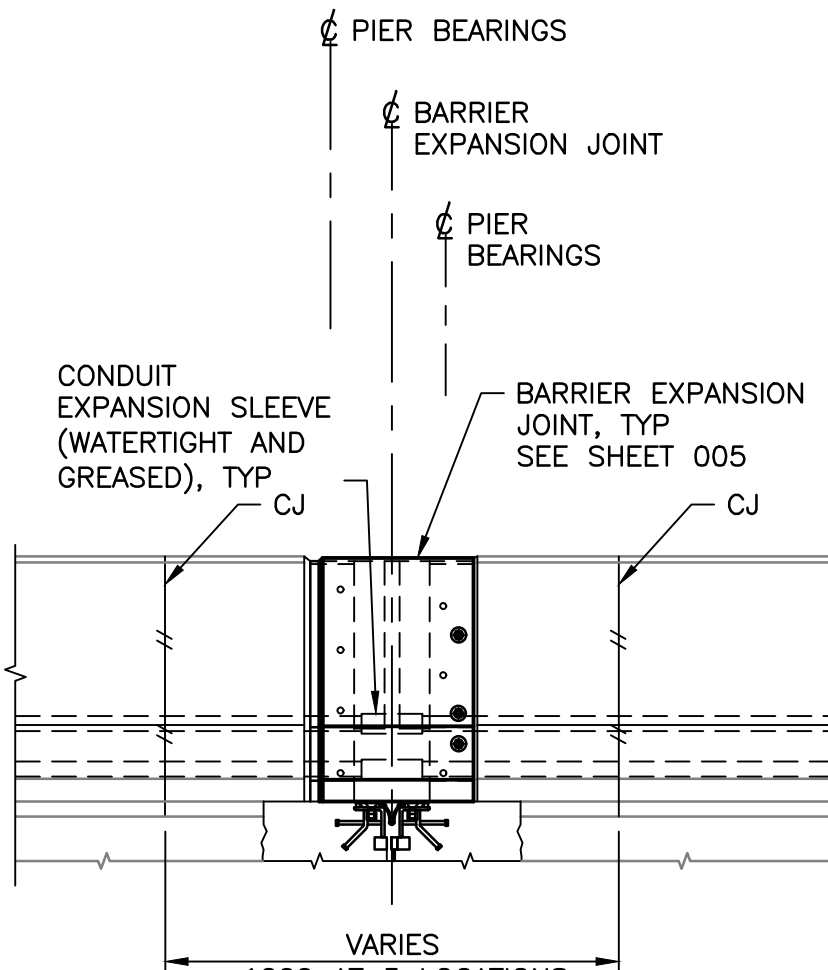


ELEVATION - BARRIER AT BRIDGE ENDS

1:25  
(NORTH BARRIER SHOWN)

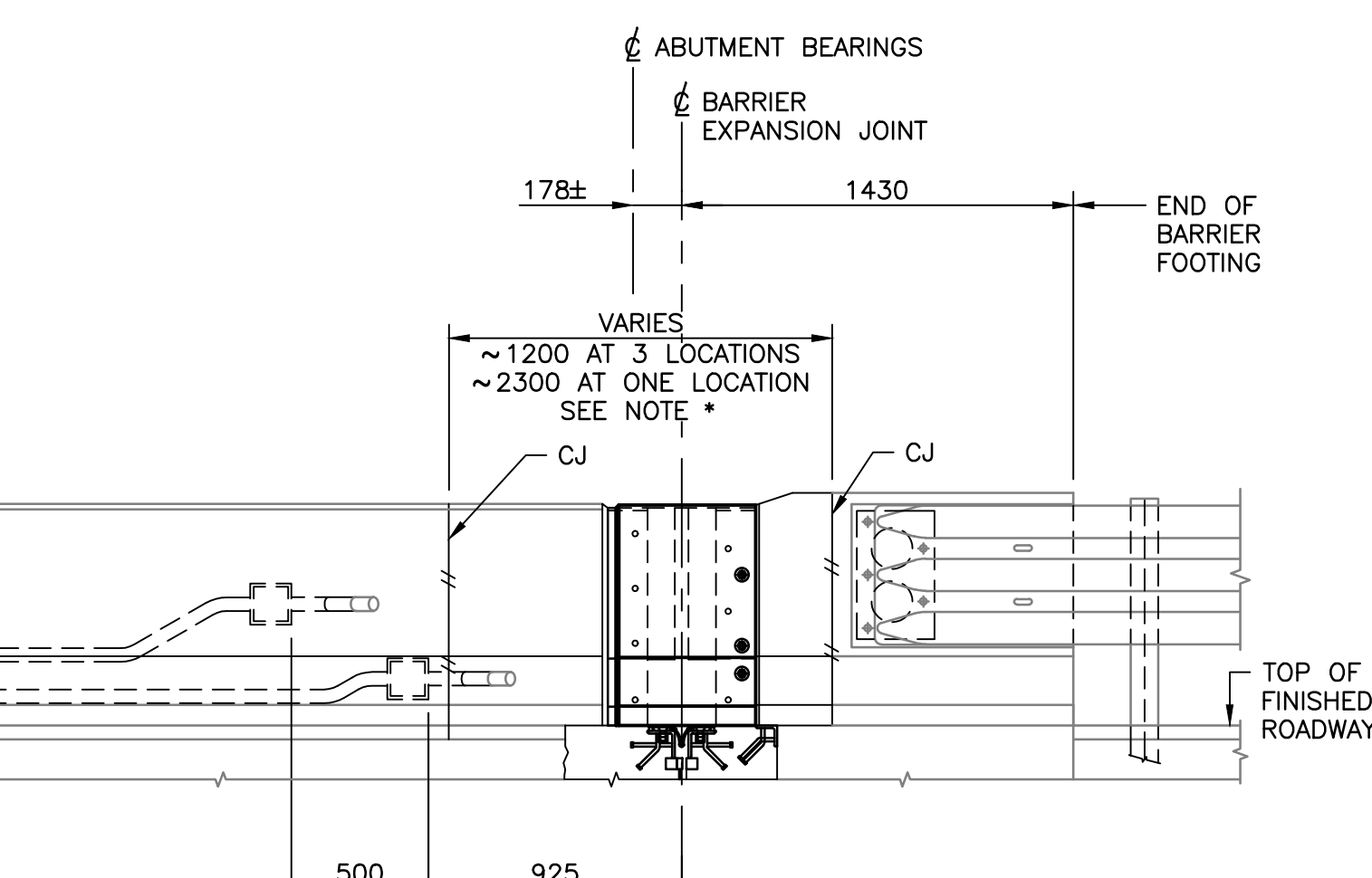
ELEVATION - TYPICAL BARRIER

1:25



ELEVATION - BARRIER AT PIERS

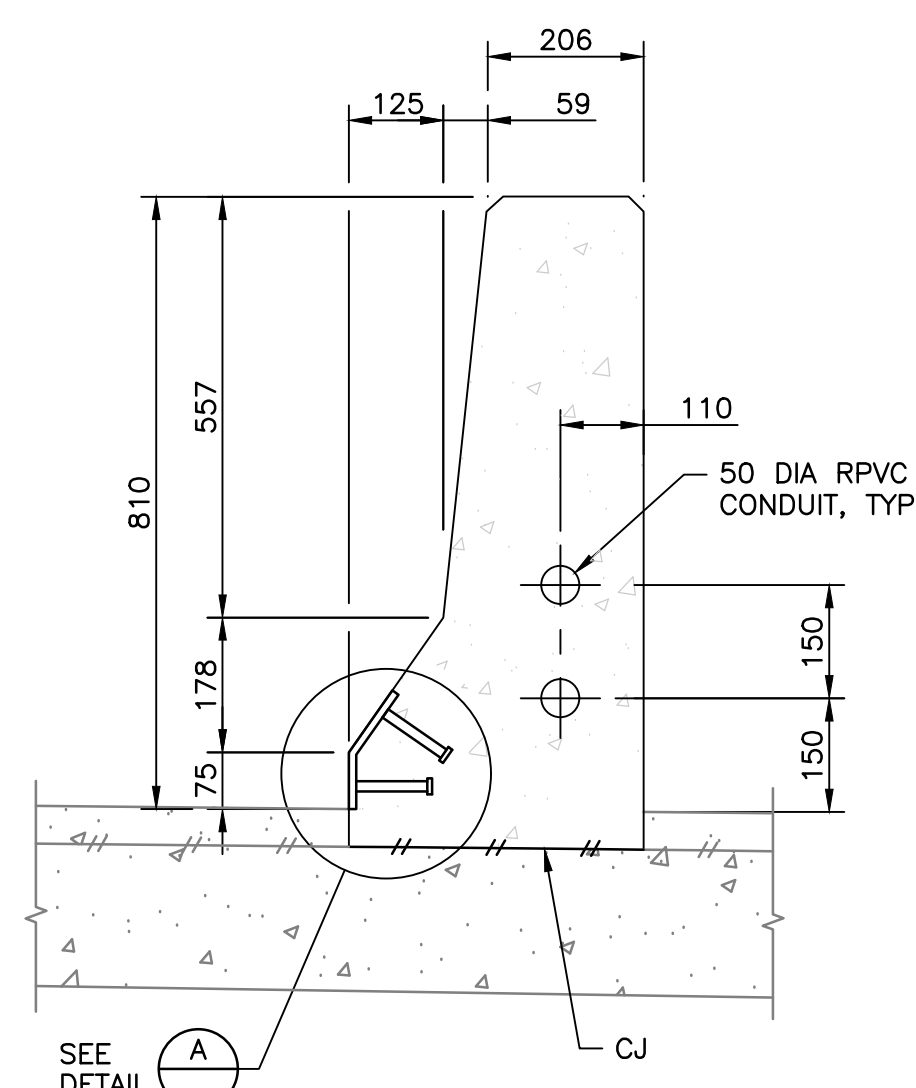
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ELEVATION - BARRIER AT BRIDGE ENDS

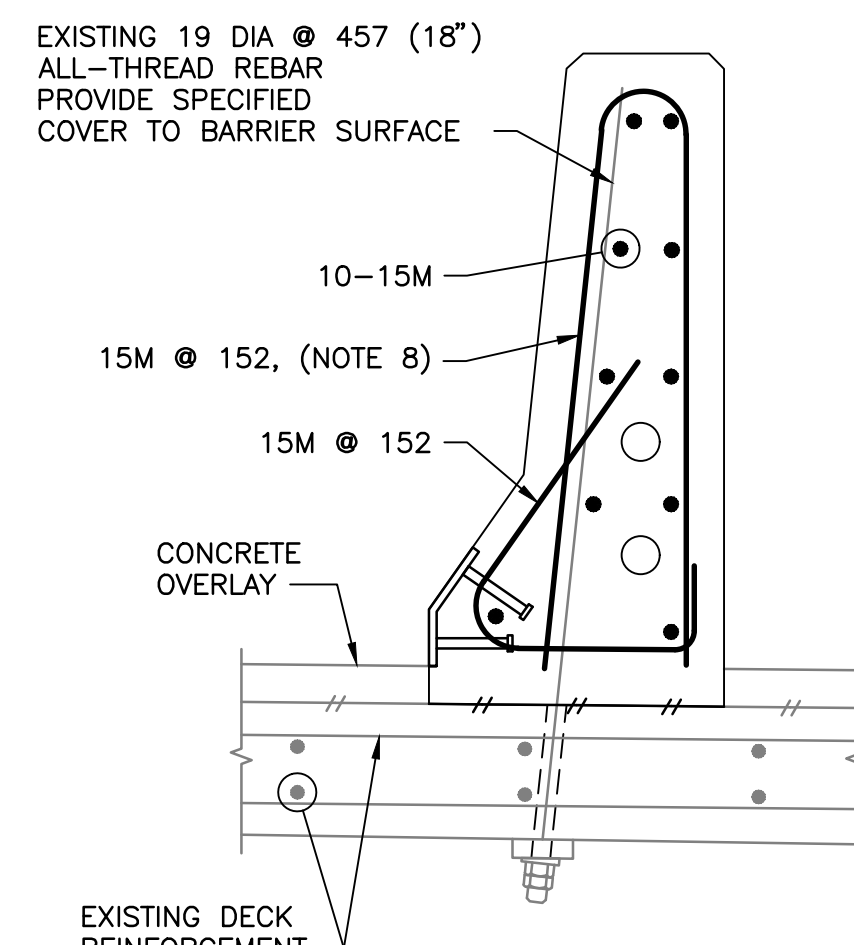
1:25  
(NORTH BARRIER SHOWN)

\* TEMPORARY BARRIER COVER PLATES TO BE REMOVED AND DISPOSED, AND BARRIER CONCRETE, REINFORCEMENT AND SNOW PLOW GUARD BETWEEN CONSTRUCTION JOINTS AT EACH BARRIER EXPANSION JOINT TO BE COMPLETED (STAGE 1 BARRIER ONLY)



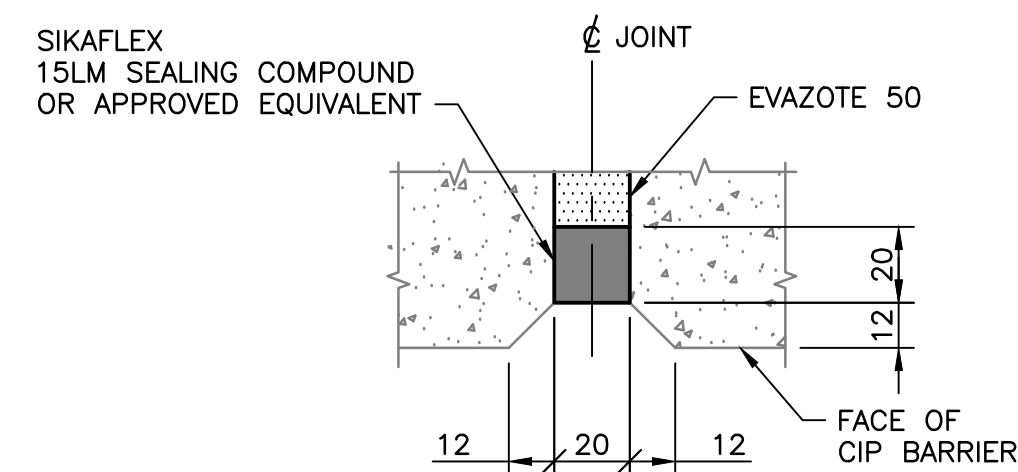
SECTION 1 TYPICAL BARRIER

1:10



SECTION 1 REINFORCEMENT

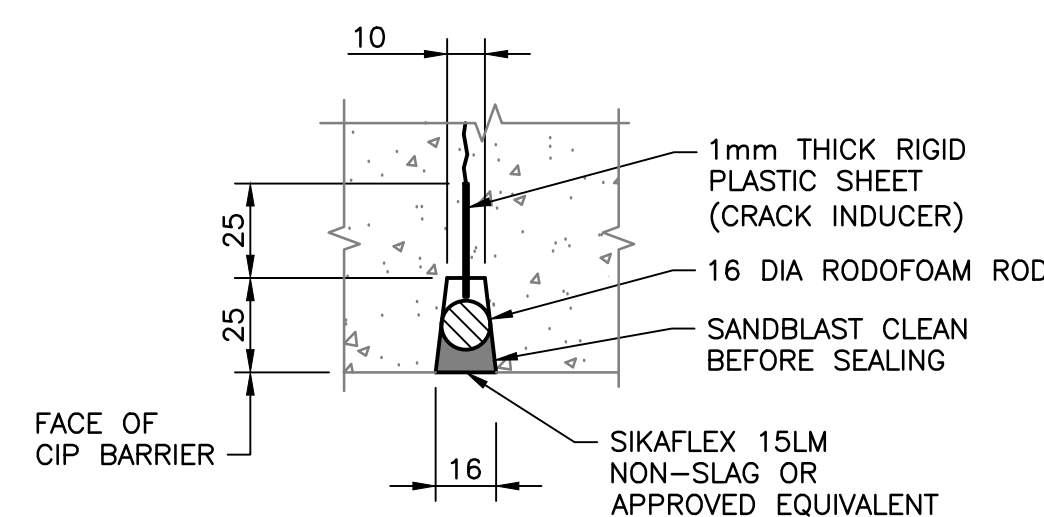
1:10



SECTION 2 TYPICAL BARRIER JOINT

1:2

(NOTES 9 AND 11)



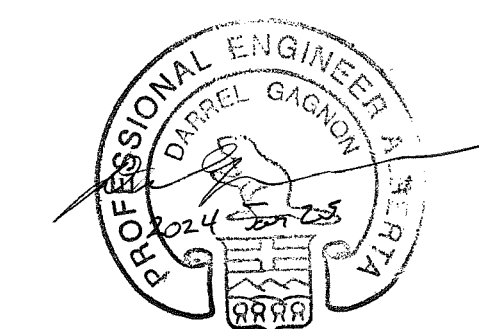
SECTION 3 TYPICAL BARRIER CONTROL JOINT

1:2

NOTES:

1. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE: 45 MPa AT 28 DAYS.
2. CHAMFER EXPOSED EDGES 20.
3. REINFORCING STEEL: CAN/CSA G.30.18M GRADE 400W.
4. MINIMUM COVER: 50 UNO.
5. MINIMUM LAP: 15M - 600 UNO.
6. SUPPLIED BY OWNER:
  - SNOW PLOW GUARDS IN ACCORDANCE WITH DETAILS ON THIS DRAWING.
7. OWNER SUPPLIED MATERIALS:
  - STEEL: CAN/CSA G40.21M GRADE 300W, GALVANIZE AFTER FABRICATION.
  - STUDS: CSA W59 ANNEX H, TYPE B, GALVANIZE AFTER FABRICATION.
  - HOT DIP GALVANIZE TO ASTM A123/A123M9.
8. PROVIDE REDUCED BEND DIAMETER OF 81 (MEASURED ON THE INSIDE OF THE BAR) AND PLACE BAR ON SKEW TO SATISFY COVER REQUIREMENTS. USE 2-10M BUNDLED BARS INSTEAD OF 1-15M BAR AT BARRIER END WITH INCREASED HEIGHT.
9. DISCONTINUE LONGITUDINAL REINFORCEMENT AT BARRIER JOINTS. PROVIDE 50mm CONCRETE COVER TO THE REBAR ENDS.
10. PLACE HORIZONTAL HAIRPINS 10M @ 100 VERTICALLY AT BARRIER END FACES AT JOINTS.
11. PLOW GUARD PLATES TO BE DISCONTINUED AND SPLICED AT ALL BARRIER JOINTS.
12. FIELD METALLIZE EXPOSED ENDS OF INSTALLED FIELD TRIMMED BENT PLATE AT EACH DECK JOINT.

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COWI

Project title/Titre du projet  
BRIDGE REHABILITATION  
BANFF NATIONAL PARK, ALBERTA

KM 108.6 HIGHWAY 93N  
NIGEL CREEK BRIDGE

Approved by/Approuvé par  
DPG

Designed by/Concept par  
TWB

Drawn by/Dessiné par  
JAETILT

PWGC Project Manager/Administrateur de Projets TPSCG

PWGC, Architectural and Engineering Resources Manager/  
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PCA

Drawing title/Titre du dessin

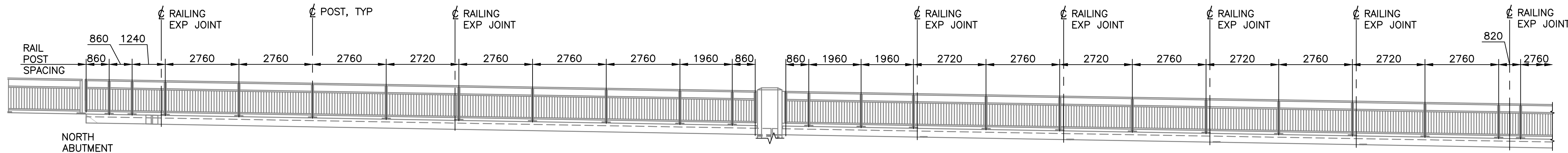
CAST-IN-PLACE BARRIER  
LAYOUT AND REINFORCEMENT

(PHASE 1 COMPLETION)

Project No./No. du projet 227903	Sheet/Fauille 007 OF	Revision no./ La Révision no. A
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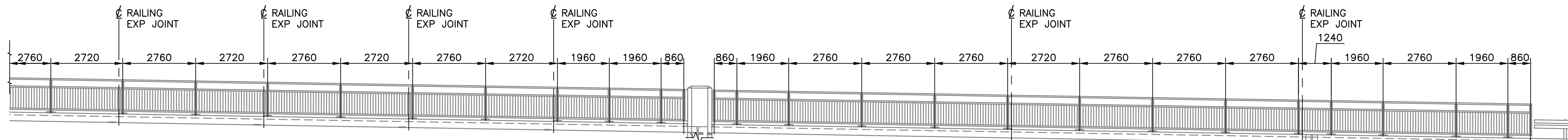


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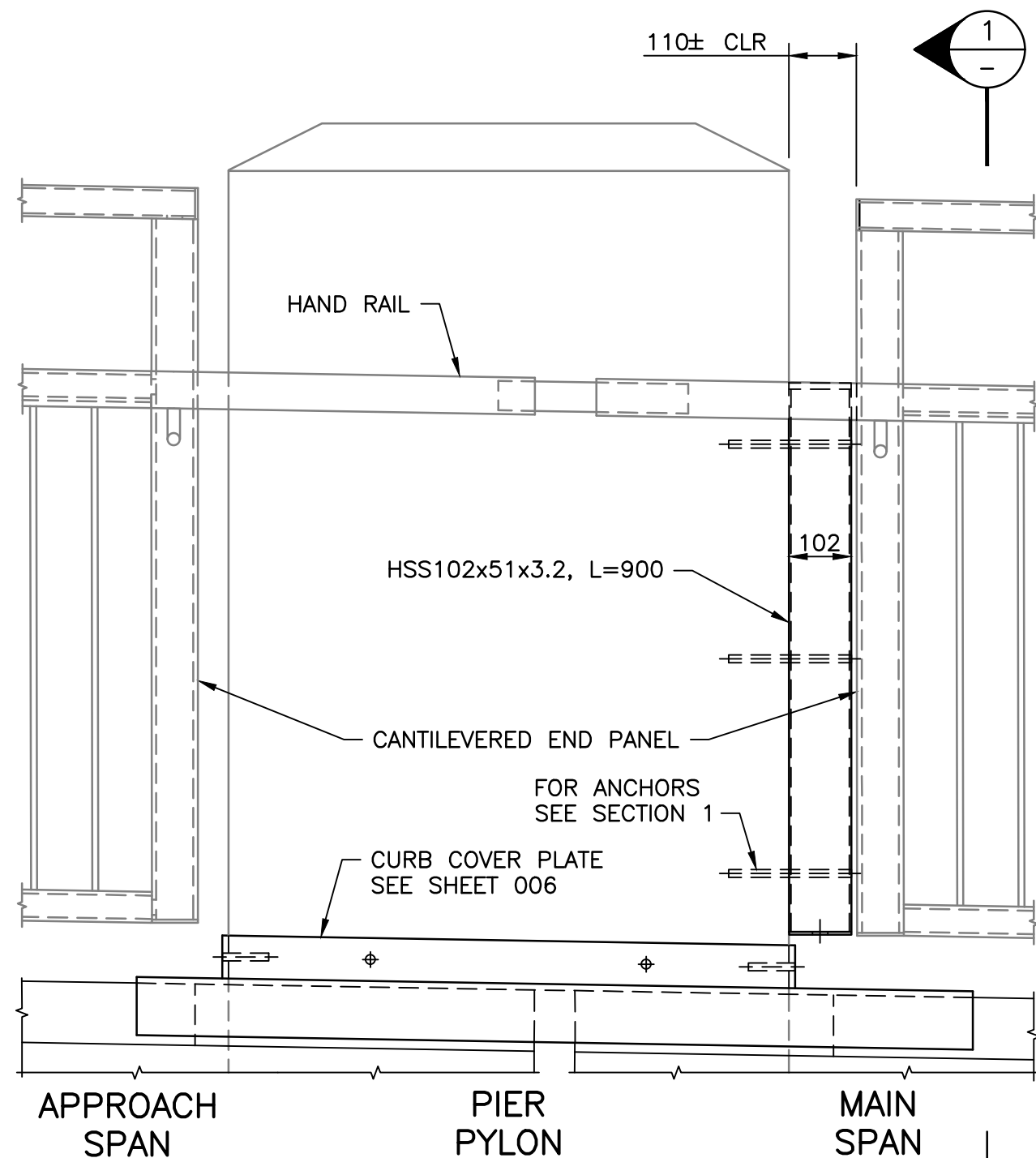
### ELEVATION

1:100  
(BICYCLE RAILING ON SOUTH SIDE (STAGE 2) SHOWN - BICYCLE RAILING ON NORTH SIDE (STAGE 1) SIMILAR UNO)  
PHASE 1 COMPLETION CONCERNS BICYCLE RAILING ON NORTH SIDE (STAGE 1) ONLY



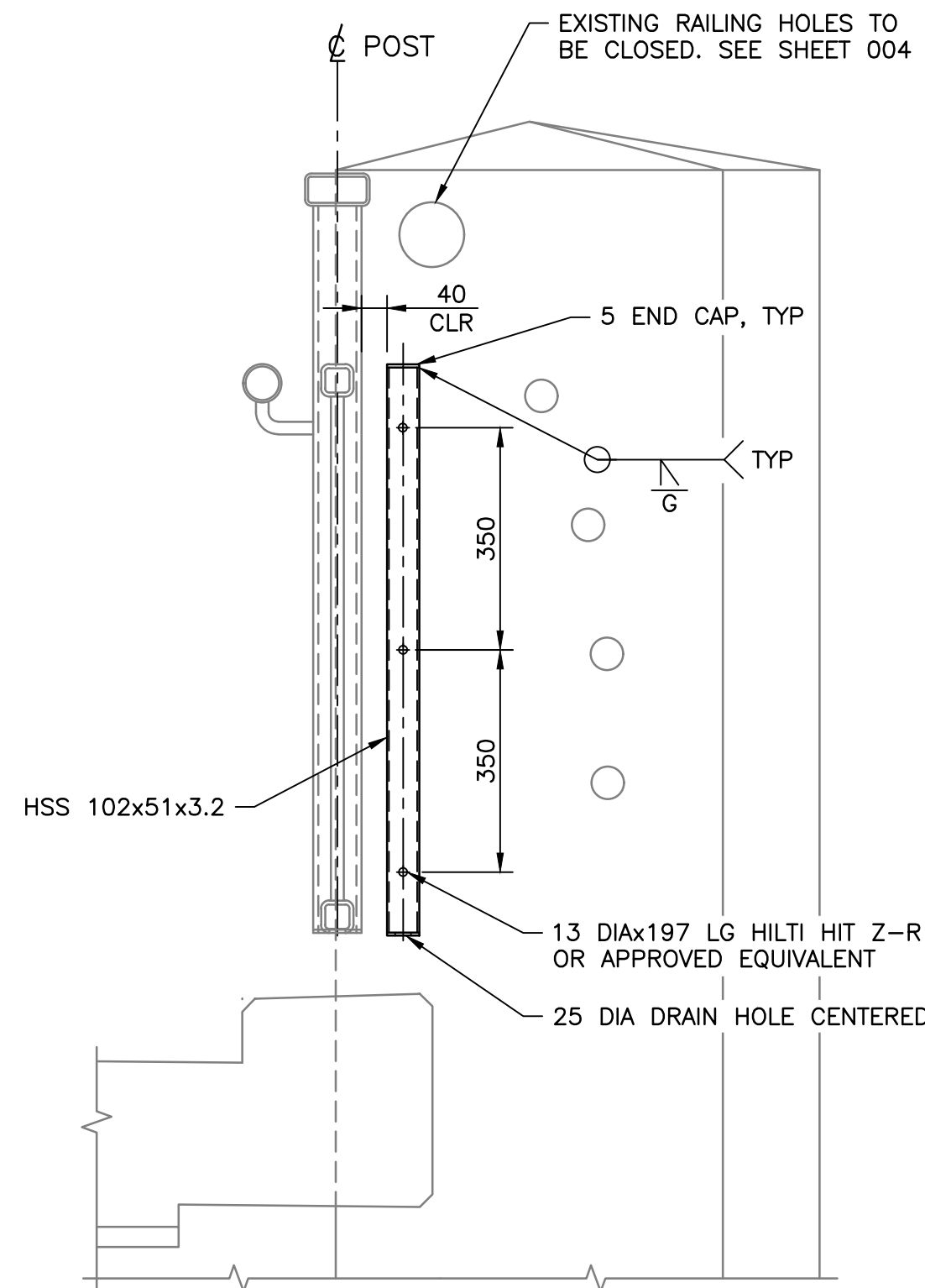
### ELEVATION

1:100  
(BICYCLE RAILING ON SOUTH SIDE (STAGE 2) SHOWN - BICYCLE RAILING ON NORTH SIDE (STAGE 1) SIMILAR UNO)  
PHASE 1 COMPLETION CONCERNS BICYCLE RAILING ON NORTH SIDE (STAGE 1) ONLY



### TYPICAL DETAIL AT PIER PYLON

1:10  
(2 LOCATIONS - NORTH AND SOUTH PIERS, STAGE 1)



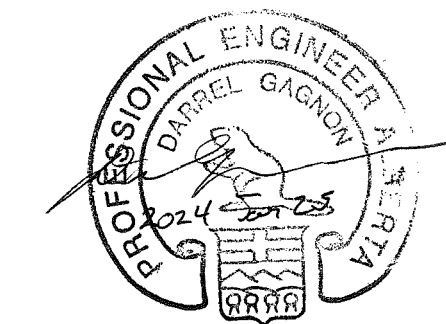
### SECTION 1

1:10  
(CURB COVER PLATE NOT SHOWN)

### NOTES:

- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
- SUPPLIED BY OWNER:
  - HSS 102x51x3.2 C/W END CAPS, FABRICATED IN CONFORMANCE WITH DETAILS ON THIS DRAWING.
- OWNER SUPPLIED MATERIALS:
  - STEEL TO CSA G40.21M GRADE 350W.
  - WELDING TO CAN/CSA W59.
  - POWDER COATED COMPONENTS HOT DIP GALVANIZED AFTER FABRICATION TO ASTM A123/123M WITH SURFACE FINISH AND PREPARATION TO ASTM D7803/D7803M AND POWDER COATED IN ACCORDANCE WITH THE SPECIFICATIONS.
- REPAIR OF GALVANIZING SHALL BE COMPLETED AS PER ASTM A780.
- ALL POSTS TO BE TRUE VERTICAL.

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Project title/Titre du projet  
**BRIDGE REHABILITATION  
BANFF NATIONAL PARK, ALBERTA**  
**KM 108.6 HIGHWAY 93N  
NIGEL CREEK BRIDGE**

Approved by/Approuvé par  
DPG

Designed by/Concept par  
TWB

Drawn by/Dessiné par  
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BICYCLE RAILING

(PHASE 1 COMPLETION)

Project No./No. du projet	Sheet/Fauille	Revision no./ La Révision no.
227903	008 OF	A

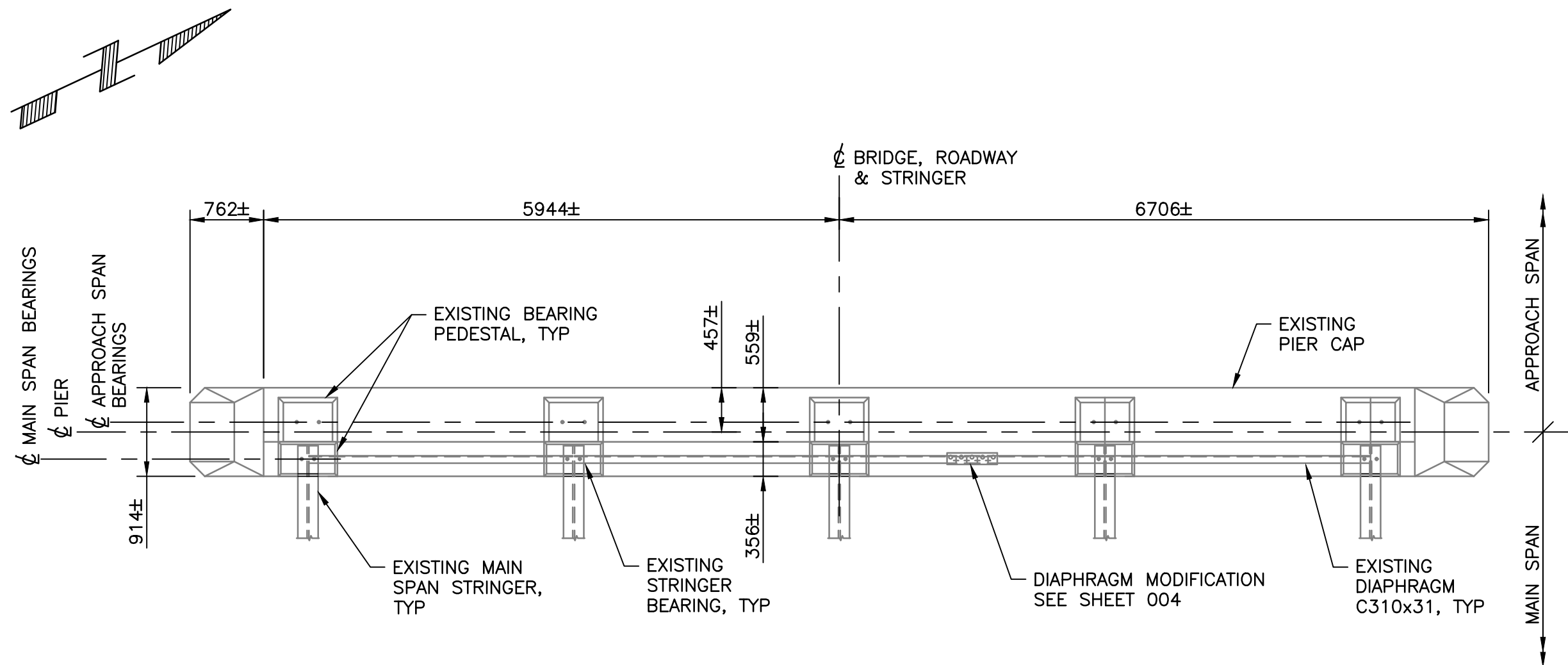




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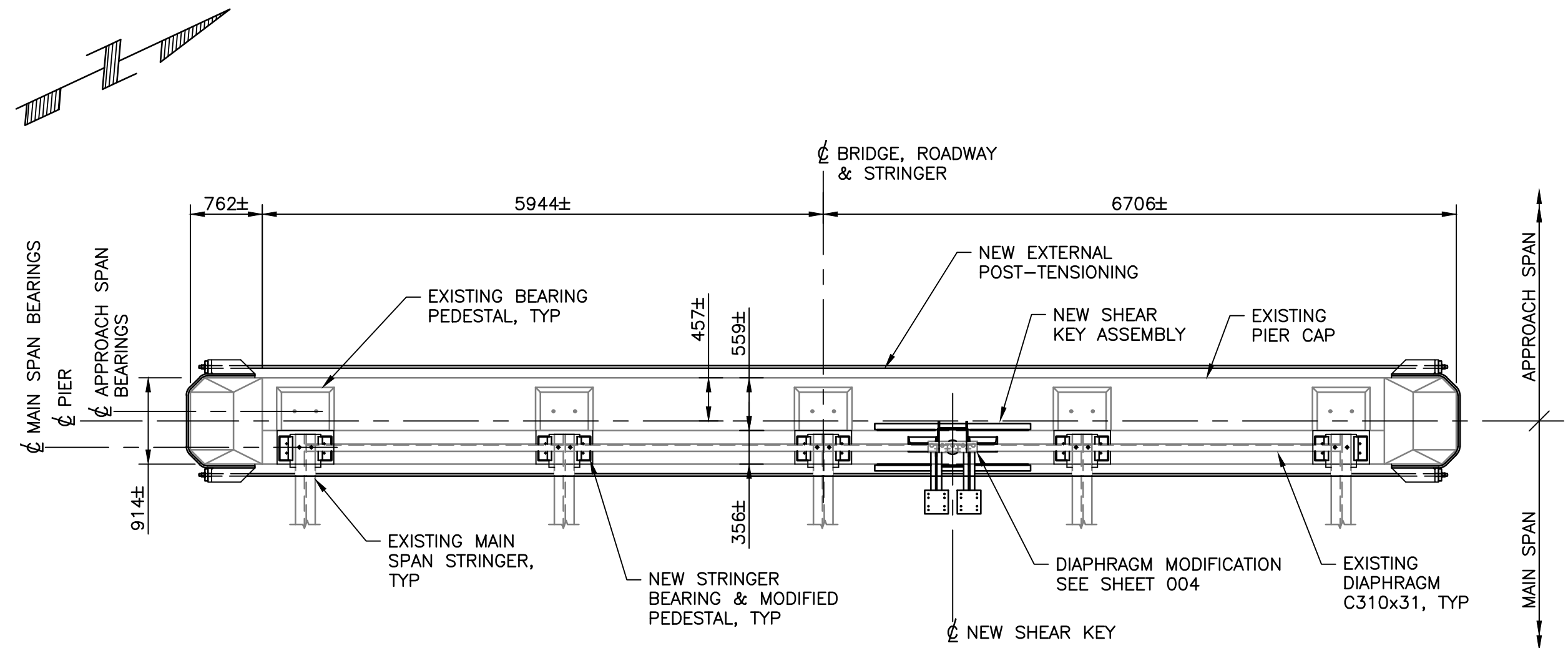
PWGC - A1 - 841X594

0 10 20 30 40 50 60 70 80 90 100mm



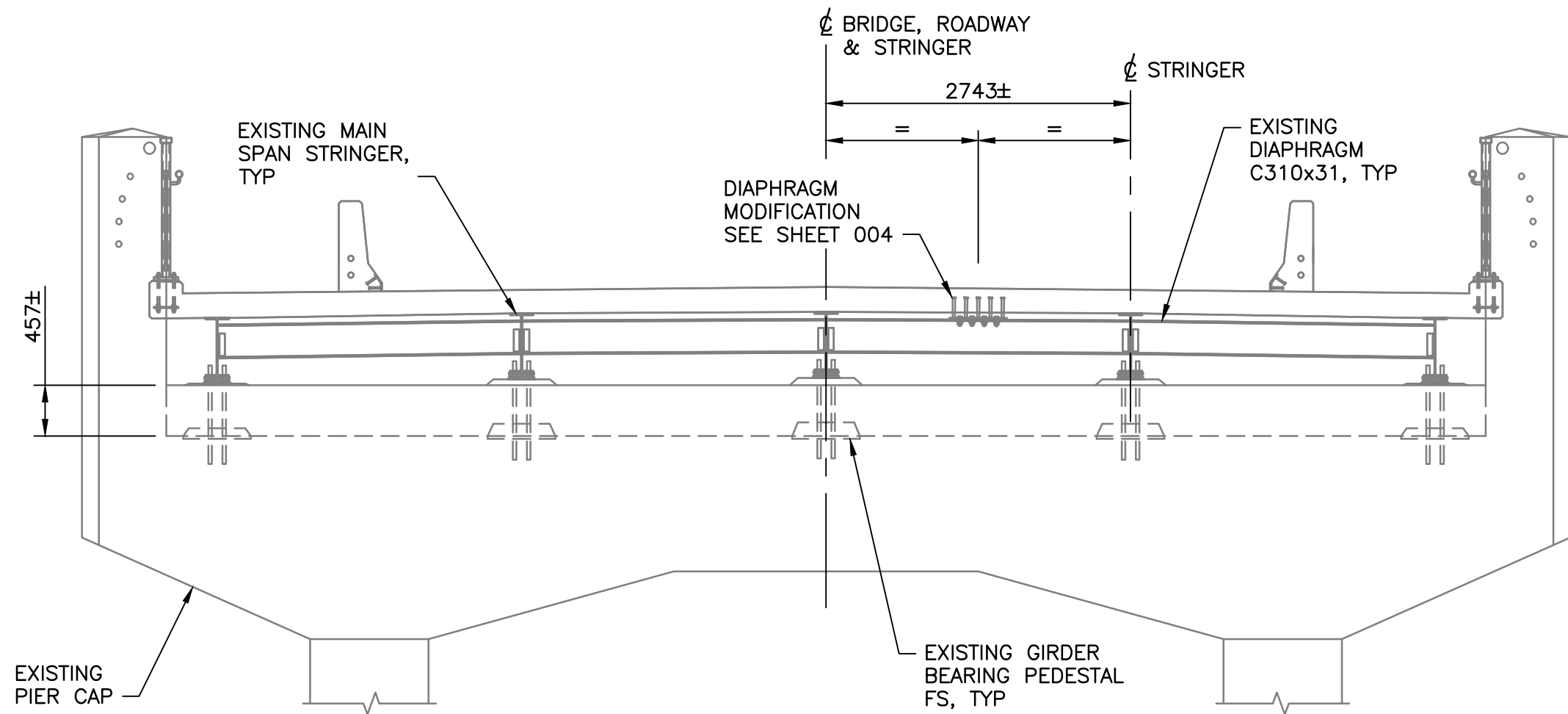
**PIER PLAN – CONDITION AFTER COMPLETION OF PHASE 1 WORK**

1:50  
(NORTH PIER SHOWN – SOUTH PIER SIMILAR  
DECK AND APPROACH SPAN GIRDERS NOT SHOWN FOR CLARITY)



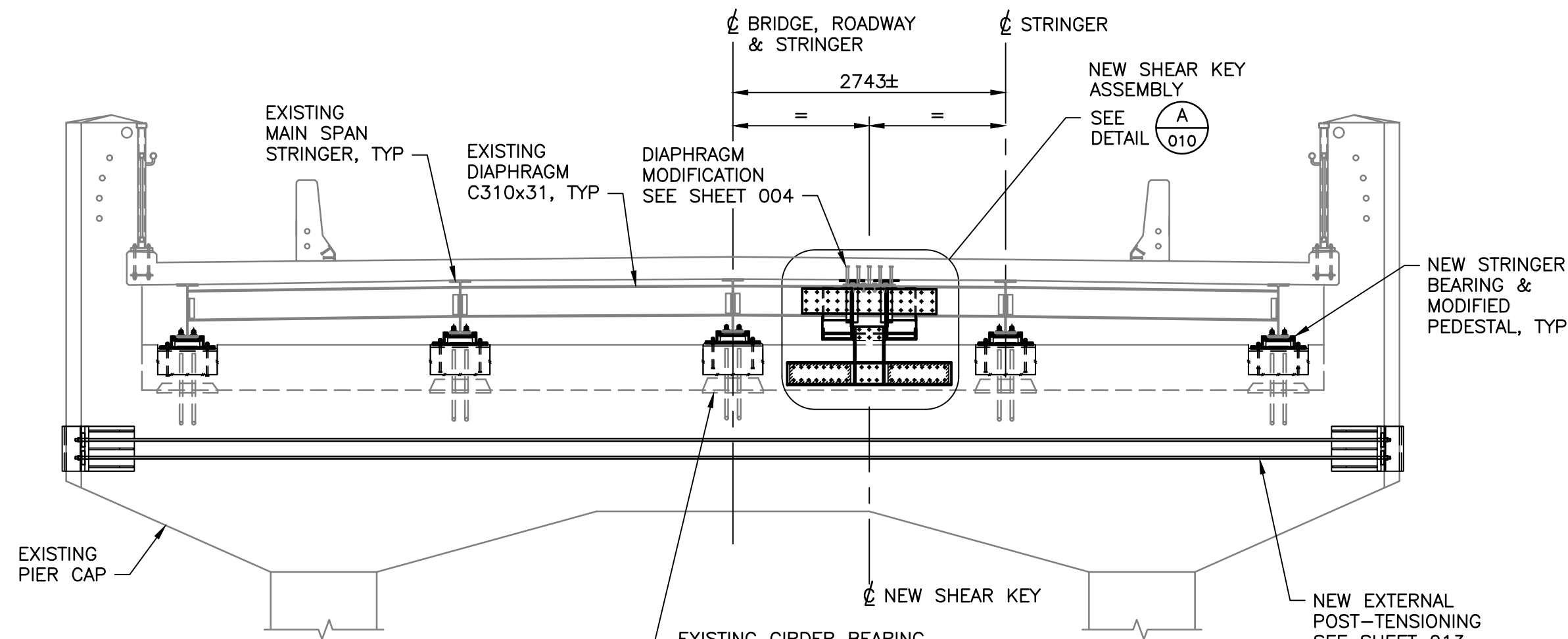
**PIER PLAN – FINAL CONDITION**

1:50  
(NORTH PIER SHOWN – SOUTH PIER SIMILAR  
DECK AND APPROACH SPAN GIRDERS NOT SHOWN FOR CLARITY)



**PIER ELEVATION – CONDITION AFTER COMPLETION OF PHASE 1 WORK**

1:50  
(NORTH PIER – LOOKING NORTH, SOUTH PIER SIMILAR)



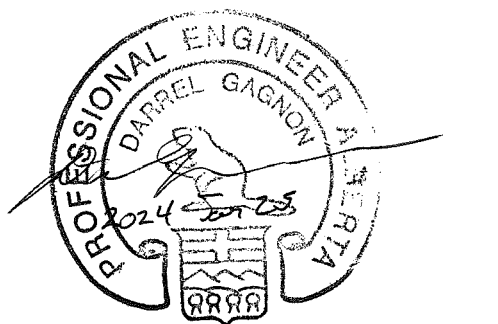
**PIER ELEVATION – FINAL CONDITION**

1:50  
(NORTH PIER – LOOKING NORTH, SOUTH PIER SIMILAR)

**NOTES:**

- DIMENSIONS MARKED ± ARE PROVIDED FOR REFERENCE ONLY. CONTRACTOR TO VERIFY ACCURACY OF SUCH INFORMATION BY FIELD MEASUREMENTS BEFORE PRODUCTION OF SHEAR KEY UNIT. LOCATE AND MEASURE POSITIONS OF VERTICAL REBARS BEHIND SHEAR KEY BEFORE PRODUCTION OF LOWER SHEAR KEY ASSEMBLY.
- PLACE SHEAR KEY UNIT IN ACCORDANCE WITH PROCEDURE DESCRIBED FOR REPLACEMENT OF STRINGER BEARINGS, SEE SHEET 011.
- NEW STEEL: CAN/CSA G40.21 GRADE 350W, GALVANIZE AFTER FABRICATION.
- GALVANIZE IN ACCORDANCE WITH ASTM A123/A123M. REPAIR OF GALVANIZING SHALL BE COMPLETED AS PER ASTM A780.
- WELDING: CAN/CSA W59. PERFORM UT EXAMINATION OF FILLET WELDS AT FRICTION STRUT ANCHOR PLATE FOR LAMELLAR TEARING.
- BOLTS SHALL BE ¾" DIAMETER CONFORMING TO ASTM F3125, GRADE A325, TYPE 1.
- BOLT THREADS SHALL BE EXCLUDED FROM THE SHEAR PLANE FOR ALL BOLTED CONNECTIONS.
- DIAMETER OF BOLT HOLES SHALL BE DRILLED NOT MORE THAN 2mm GREATER THAN THE NOMINAL BOLT SIZE, UNLESS NOTED OTHERWISE.
- THE FAYING SURFACES OF THE BOLTED CONNECTIONS SHALL PROVIDE A MEAN SLIP COEFFICIENT (ks) OF AT LEAST 0.30 IN ACCORDANCE WITH CSA S6:19, TABLE 10.8. THE FAYING SURFACES AT THE EXISTING DIAPHRAGM SHALL BE ZINC METALLIZED IN ACCORDANCE WITH ASTM B833. THICKNESS OF ZINC METALLIZING SHALL NOT EXCEED 16 mil. SURFACE PREPARATION BEFORE ZINC APPLICATION ACCORDING TO SPECIFICATIONS.
- THE TURN-OF-NUT METHOD SHALL BE USED FOR TIGHTENING THE BOLTS.
- PTFE: SHEET PTFE SHALL BE MADE FROM PURE VIRGIN PTFE RESIN SATISFYING THE REQUIREMENTS OF ASTM D 4894. SHEAR KEY SLIDING CONTACT SURFACE SHALL USE UNLUBRICATED UNFILLED FLAT PTFE SHEETS WITH A MAXIMUM DESIGN FRICTION COEFFICIENT OF 8% AT +20°C AND 20% AT -25°C BASED ON AVERAGE SLS PRESSURE LESS THAN 3.45 MPa UNDER PERMANENT LOADS AS PER TABLE 11.4 IN CSA S6:19. SUPPLIER TO CONFIRM THE FRICTION COEFFICIENT VALUE.
- STAINLESS STEEL: ASTM A240/A240M. ALL STAINLESS STEEL SLIDING SURFACES SHALL CONFORM TO AISI TYPE 304 WITH No. 8 MIRROR FINISH.
- ANCHORS TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
- MAINTAIN EXISTING REINFORCEMENT.
- PLACE ONE ANCHOR AT EACH CORNER IN HOLES OF LINE 1 OR OF LINE 2 FOR A TOTAL OF 4 ANCHORS. PROVIDE SYMMETRICAL ANCHOR PATTERN ABOUT CL GUSSET PLATE.
- CONSTRUCTION REQUIREMENTS SHALL COMPLY WITH CSA S6:19, ANNEX A10.1.
- FIELD WELDING IS NOT PERMITTED.
- ANCHORS SHALL BE PLACED IN HOLES OF LINE A (20 ANCHORS PER CHANNEL), SOLELY IN CASE OF CONFLICT WITH REBARS, PLACE ANCHORS IN HOLES OF LINE B (18 ANCHORS PER CHANNEL). EVERY OTHER PLACEMENT PATTERN TO BE APPROVED BY ENGINEER.
- THE VERTICAL POSITION OF THE BOLT HOLES IN THE C310 SHEAR KEY SECTIONS CAN BE DETERMINED BASED ON FIELD MEASUREMENTS TO VERTICALLY CENTRE THE PTFE ON THE STAINLESS STEEL PLATE.

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Project title/Titre du projet  
**BRIDGE REHABILITATION  
BANFF NATIONAL PARK, ALBERTA**

**KM 108.6 HIGHWAY 93N  
NIGEL CREEK BRIDGE**

Approved by/Approuvé par

Designed by/Concept par  
TWB

Drawn by/Dessiné par  
MIAG

PWGC Project Manager/Administrateur de Projets TPSC

PWGC, Architectural and Engineering Resources Manager/  
Ressources Architectural et de Directeur d'Ingénierie, TPSC

Client/client  
PCA

Drawing title/Titre du dessin

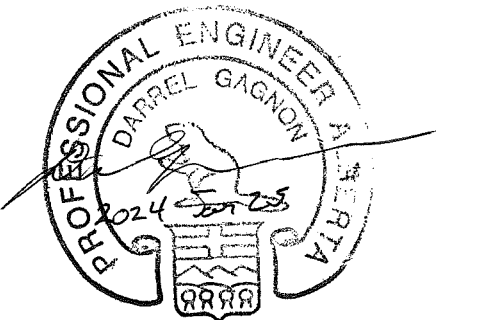
**NEW SHEAR KEY  
AT PIER CAP  
GENERAL ARRANGEMENT  
(PHASE 2)**

Project No./No. du projet <b>227903</b>	Sheet/Feuille <b>009</b> OF	Revision no./ La Révision no. <b>A</b>
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revision/	Description/Description	Date/Date

Client/client	
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TWB

Drawn by/Dessiné par  
MIAG

PGWSC, Architectural and Engineering Resources Manager/  
Ressources Architectural et de Directeur d'Ingénierie, TPSGC

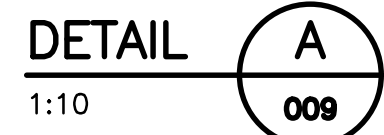
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Drawing title/Titre du dessin

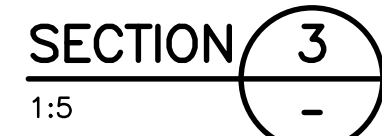
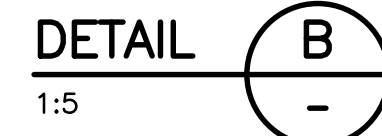
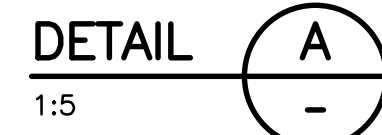
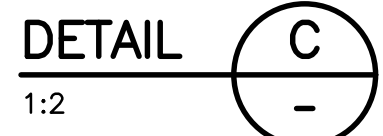
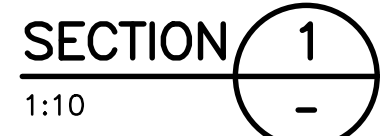
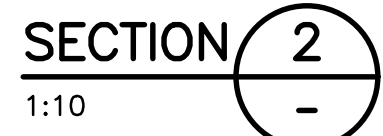
### NEW SHEAR KEY AT PIER CAP SECTIONS & DETAILS

**PHASE 2)**

Project No./No. du projet	Sheet/Feuille	Revision no./La Révision no.
227903	010 OF	A



(FRICTION STRUTS NOT SHOWN FOR CLARITY)



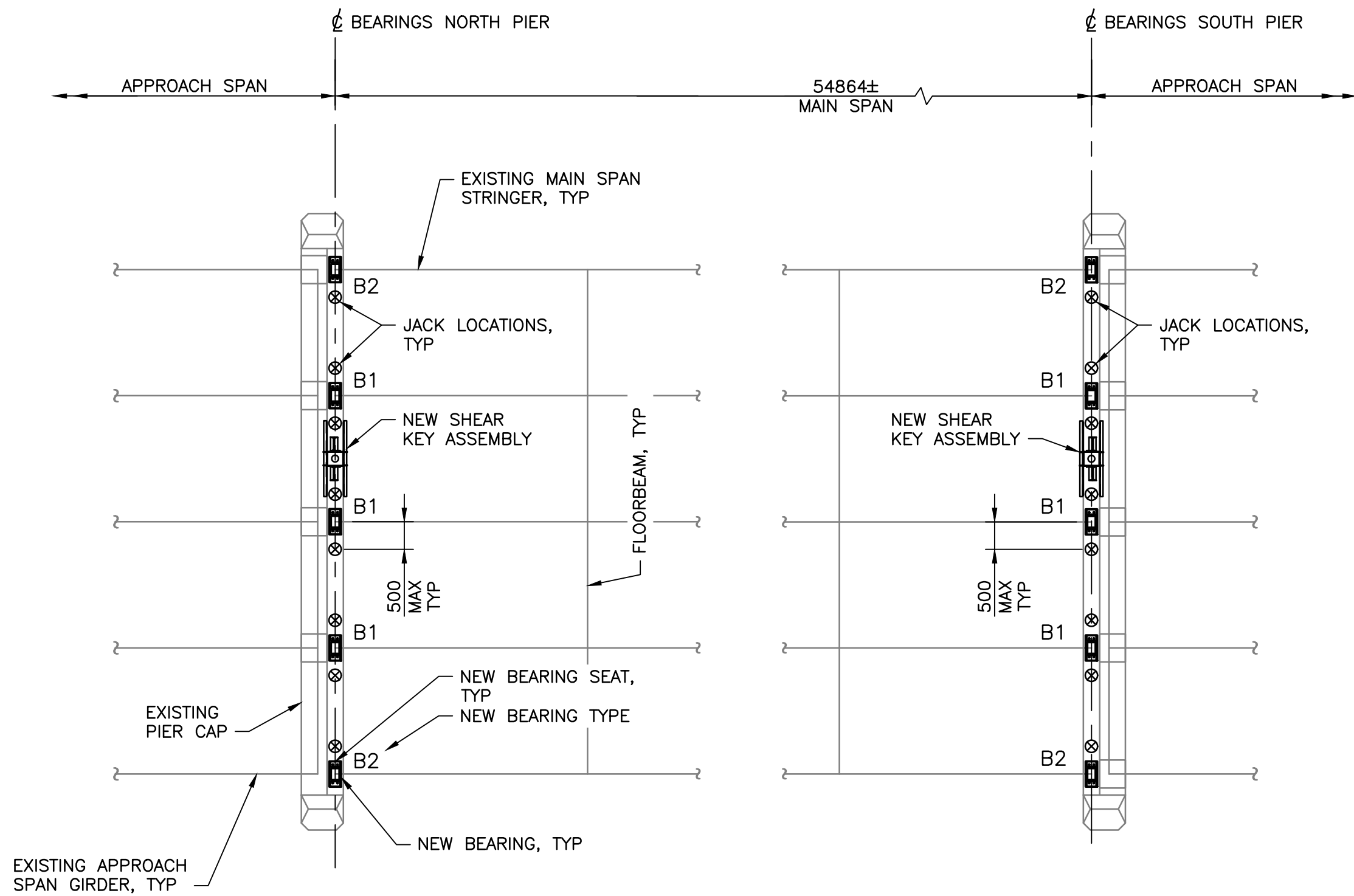
NOTES:

1. FOR NOTES SEE DRAWING 009.

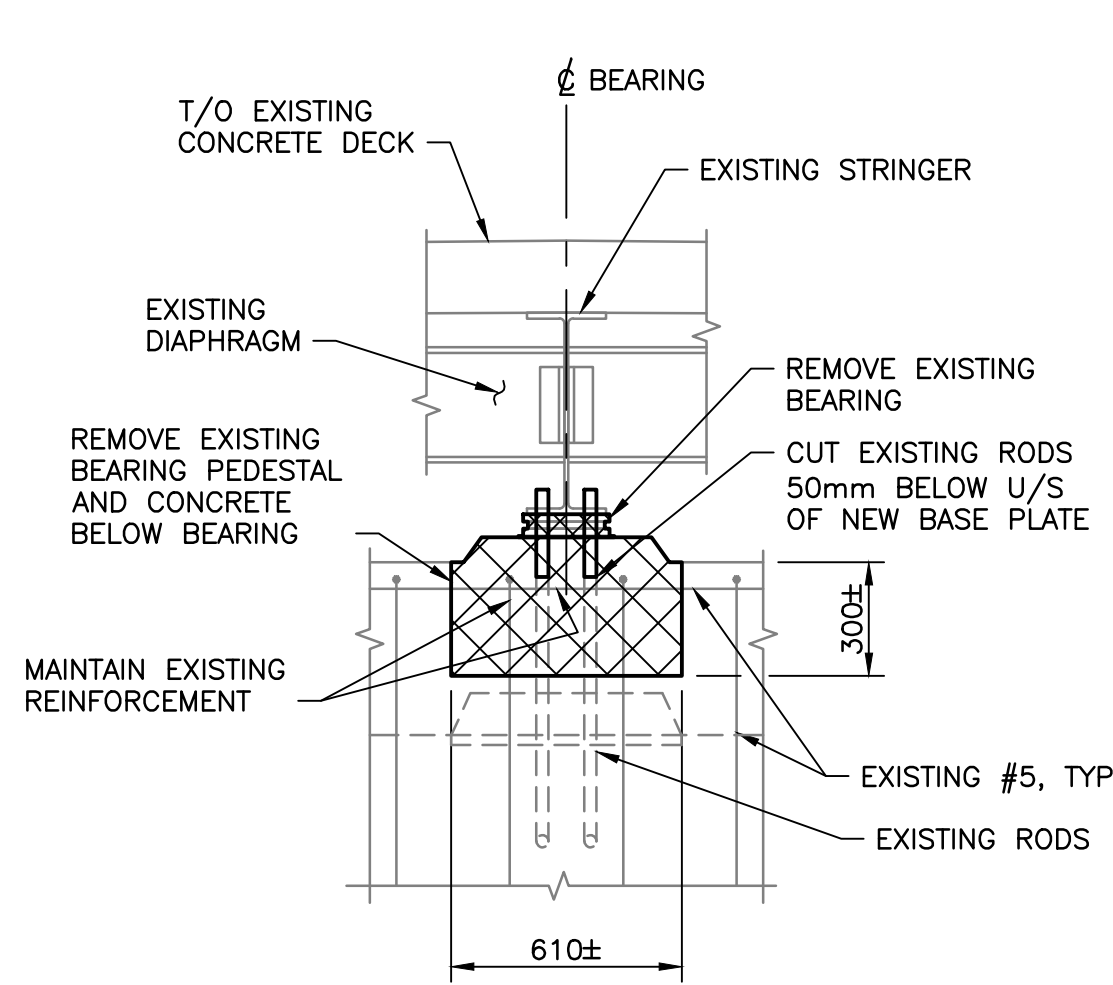




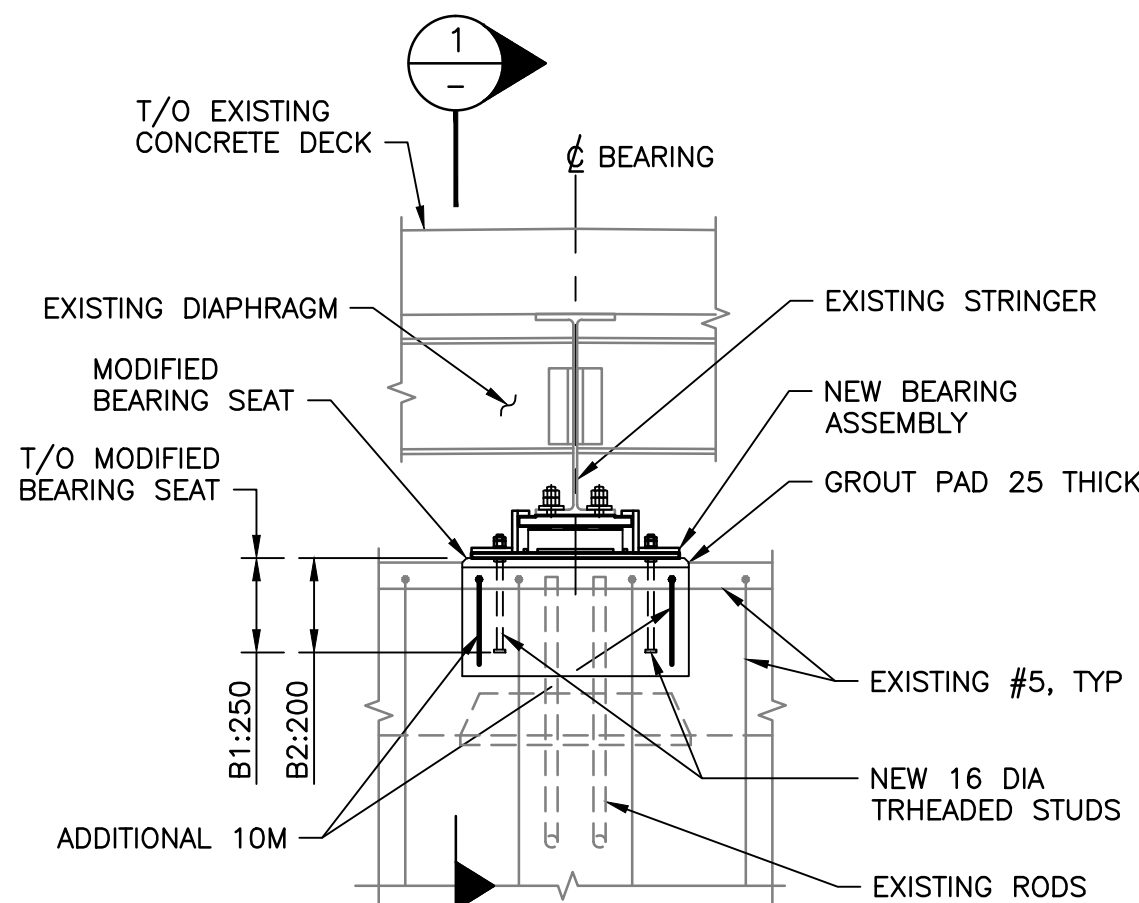
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**MAIN SPAN BEARING LAYOUT**  
1:100



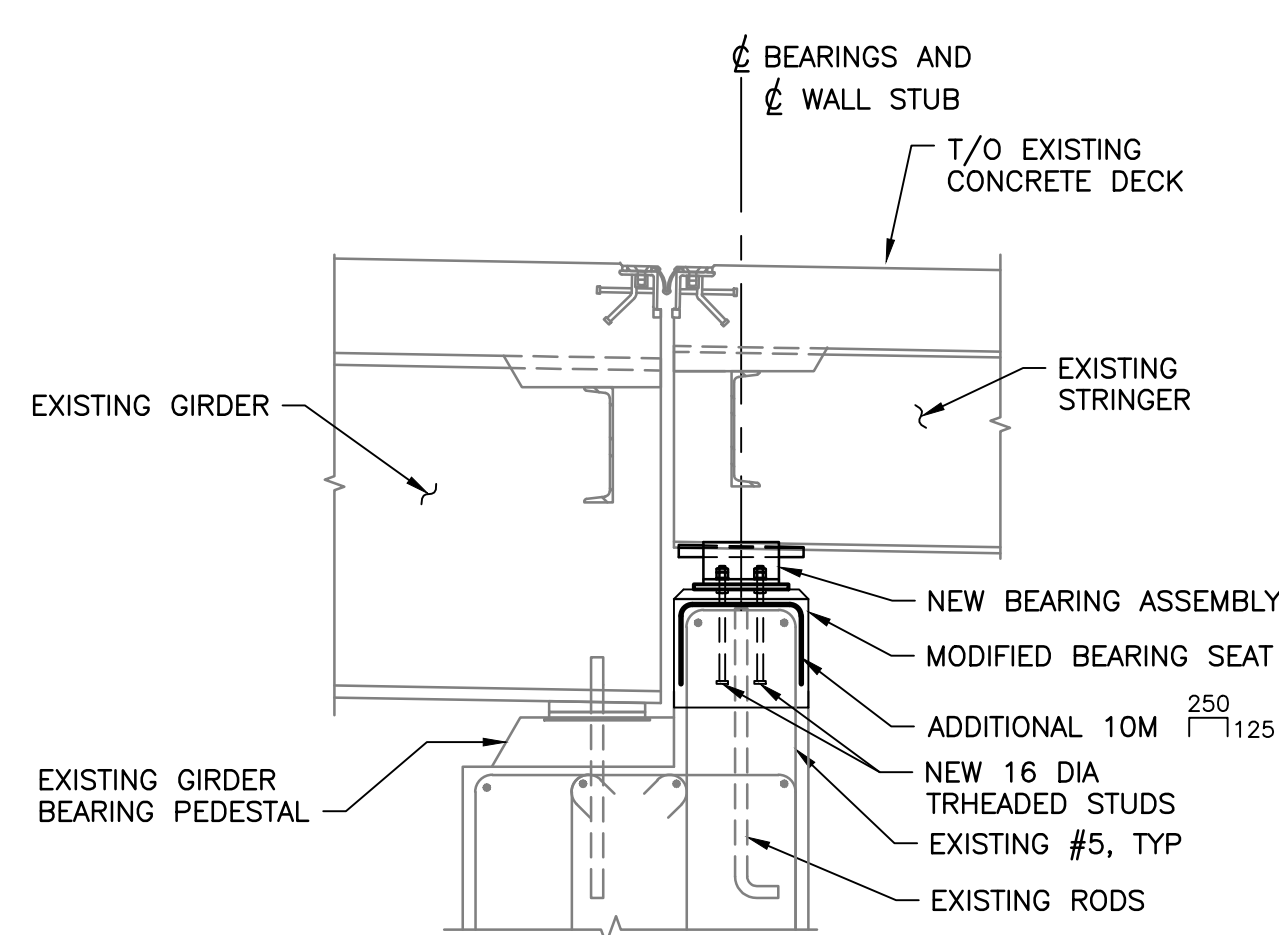
**EXISTING CONDITIONS**



**FINAL CONDITION**

**BEARING REPLACEMENT**  
(NORTH PIER SHOWN, SOUTH PIER SIMILAR)  
1:20

SEE SHEET 012 FOR ADDITIONAL CONCRETE REPAIRS AT SOUTH PIER



**SECTION 1**  
1:20

**LEGEND:**

- REMOVALS

**FABRICATION AND INSTALLATION:**

- REPLACE BEARINGS ADJACENT TO NEW SHEAR KEYS FIRST. REPLACE THEREBY ONLY ONE BEARING PER PIER CAP AT A TIME. INSTALL NEW SHEAR KEYS BEFORE REPLACING REMAINING STRINGER BEARINGS. BEARING REPLACEMENTS AT NORTH AND SOUTH PIER CAN BE DONE CONCURRENTLY.
- THE WIND SPEED INCLUDING GUST SHALL NOT EXCEED 85 km/h UNTIL SHEAR KEY INSTALLATION IS COMPLETED. SHOULD THE WIND SPEEDS EXCEED THIS LIMIT BEFORE SHEAR KEY INSTALLATION, THE CONTRACTOR SHALL PROVIDE TEMPORARY LATERAL RESTRAINT TO THE MAIN SPAN.
- ALL BEARINGS SHALL BE DESIGNED, FABRICATED AND INSTALLED IN ACCORDANCE WITH CSA S6:19. COMPLETED LAMINATED BEARINGS SHALL BE TESTED PER TABLE 11.9 OF CSA S6:19.
- STAINLESS STEEL AND PTFE SURFACES SHALL BE PROTECTED FROM ABRASION OR SCRATCHING AND KEPT CLEAN AT ALL TIMES DURING CONSTRUCTION.
- ALL BEARINGS SHALL BE INSTALLED SUCH THAT THE BOTTOM OF THE BASE PLATE IS HORIZONTAL.
- ELEVATION OF U/S STRINGER SHALL REMAIN UNCHANGED DURING AND AFTER BEARING REPLACEMENT.
- TRAFFIC LANE ON THE SIDE OF THE DECK WHERE BEARINGS ARE BEING REPLACED SHALL BE CLOSED. WHEN REPLACING THE BEARINGS LOCATED AT THE BRIDGE CL, THE BRIDGE SHALL BE FULLY CLOSED TO TRAFFIC UNTIL THE JACKS ARE MECHANICALLY LOCKED. AFTER LOCKING THE JACKS, ONE LANE MAY BE OPENED TO TRAFFIC IN ACCORDANCE WITH THE SPECIFICATIONS.
- SUPPORT STRINGERS AT SPECIFIED JACK LOCATIONS BEFORE BEARING REPLACEMENT. PROVIDE TWO JACKS (ONE ON EITHER SIDE OF STRINGER) FOR BEARINGS B1. PROVIDE SLIDING SURFACE WITH LOW FRICTION COEFFICIENT TO ACCOMMODATE BEARING MOVEMENTS AND BRACE DIAPHRAGM CHANNEL FOR HORIZONTAL FRICTION DEMANDS. JACKS AT STRINGER TO BE HYDRAULICALLY LINKED AND EQUALIZED BEFORE BLOCKING. MINIMUM JACK CAPACITY: 180kN. ALTERNATIVE STRINGER SUPPORT TO BE APPROVED BY CONTRACTOR'S ERECTION ENGINEER AND SUBMITTED TO DEPARTMENTAL REPRESENTATIVE FOR REVIEW. FIELD WELDING TO EXISTING STEELWORK IS NOT PERMITTED.
- NEW CONCRETE AND GROUT UNDERNEATH STRINGER BEARING SHALL HAVE REACHED AT LEAST 25 MPa BEFORE REMOVING JACKS.
- DO NOT DAMAGE STRINGERS AND GIRDERS DURING INSTALLATION OF NEW STRINGER BEARINGS.
- CONSTRUCTION REQUIREMENTS SHALL COMPLY WITH CSA S6:19, ANNEX A10.1.

**NOTES:**

- CONCRETE AT MODIFIED BEARING SEATS:
  - AT CENTRELINE BEARING: SIKAGROUT 212 (ADJUSTED FOR APPLICATIONS GREATER THAN 150MM THICKNESS), OR APPROVED EQUIVALENT CEMENTITIOUS, HIGH EARLY STRENGTH, SHRINKAGE COMPENSATING MORTAR. MINIMUM 25 MPa COMPRESSIVE STRENGTH AT 24 HOURS.
  - ALL OTHER BEARINGS: CONCRETE 35 MPa AT 28 DAYS MINIMUM. CONCRETE TO BE SHRINKAGE-COMPENSATING.
- CHAMFER EXPOSED EDGES TO MATCH TOP OF PIER CAP.
- REINFORCING STEEL: G30.18 GRADE 400W.
- MINIMUM COVER: 50 mm UNLESS NOTED OTHERWISE.
- SAWCUT 25 DEPTH ALONG EDGES OF CONCRETE REMOVALS.
- MAINTAIN EXISTING REINFORCEMENT.
- CONSTRUCTION JOINTS TO BE CLEAN, FREE OF LAITANCE AND ROUGHENED TO AN AMPLITUDE OF 5 mm.
- GROUT BASE PLATES WITH SIKA 212 OR APPROVED EQUIVALENT CEMENTITIOUS, NON-SHRINK GROUT.
- NEW STEEL: CAN/CSA G40.21 GRADE 350W UNLESS NOTED OTHERWISE. GALVANIZE AFTER FABRICATION.
- ELASTOMER: VIRGIN NATURAL RUBBER (POLYISOPRENE), WITH SHEAR MODULUS IN ACCORDANCE WITH TABLE 11.5 OF CSA S6:19. ELASTOMERIC COMPOUND SHALL RETAIN FLEXIBILITY UP TO A SERVICE TEMPERATURE OF -40 DEG CELSIUS.
- STEEL LAMINAE: CAN/CSA-G40.21 GRADE 260W.
- PTFE: SHEET PTFE SHALL BE MADE FROM PURE VIRGIN PTFE RESIN SATISFYING THE REQUIREMENTS OF ASTM D 4894. BEARINGS SHALL USE UNFILLED UNLUBRICATED FLAT PTFE SHEETS WITH A MAXIMUM DESIGN FRICTION COEFFICIENT VALUE OVER THE LIFE OF THE BEARING OF 8% AT +20°C AND 20% AT -25°C BASED ON AVERAGE SLS PRESSURE LESS THAN 3.45 MPa UNDER PERMANENT LOADS AS PER TABLE 11.4 IN CSA S6:19. SUPPLIER TO CONFIRM THE FRICTION COEFFICIENT VALUE.
- STAINLESS STEEL: ASTM A240/A240M. ALL STAINLESS STEEL SLIDING SURFACES SHALL CONFORM TO AISI TYPE 304 WITH No.8 MIRROR FINISH.
- SOLE PLATE TO BE TAPERED UNDERNEATH STRINGER FLANGE; SOLE PLATE CONTACT SURFACE WITH TIE DOWN PLATES TO BE OF UNIFORM THICKNESS AND HORIZONTAL. BEARING B1: T min = 25 mm  
BEARING B2: T min = 16 mm  
UNDERSIDE OF STRINGER FLANGE IN CONTACT WITH SOLE PLATE SHALL BE CLEANED TO SSPC-SP 15 AND THEN COATED WITH ZINC RICH PRIMER BEFORE INSTALLATION OF THE SOLE PLATE.  
GALVANIZED TOP SURFACE OF BEARING SOLE PLATES TO BE ROUGHENED BEFORE BEARING INSTALLATION.
- FULL BASE THREADED STUDS C/W NUTS AND WASHERS. STUDS SHALL CONFORM TO CSA W59 ANNEX H, TYPE B. TOP NUTS TO BE SNUG TIGHT AND SECURED. BEARING B1 - 315 mm LONG  
BEARING B2 - 265 mm LONG
- FULL BASE THREADED STUDS ON SOLE PLATE SHALL BE 22 DIA CONFORMING TO CSA W59 ANNEX H, TYPE B, C/W FINISHED HEX NUTS AND JAM NUTS. STUDS TO BE STUD WELDED ON SOLE PLATE AND SHALL BE LOCATED IN MIDDLE OF SLOTTED STRINGER HOLE. THREADS SHALL BE EXCLUDED FROM SHEAR PLANE. HEX NUTS TO BE SNUG TIGHT.
- GALVANIZING IN ACCORDANCE WITH ASTM A123/A123M. REPAIR OF GALVANIZING SHALL BE COMPLETED AS PER ASTM A780.
- WELDING: CAN/CSA W59.  
PERFORM UT EXAMINATION AT CJP WELDS AT BEARING TIE DOWN PLATES FOR LAMELLAR TEARING.
- REMOVE ADDITIONAL STOP MOVEMENT BAR ASSEMBLY AT DECK JOINTS AFTER STRINGER BEARING REPLACEMENT IS COMPLETED AT NORTH AND SOUTH PIER. (REFER TO SHEETS 005 AND 006 AND PHASE 1 RECORD DRAWINGS 565-11-008 AND 565-11-009 FOR ADDITIONAL STOP MOVEMENT BAR LOCATIONS AND DETAILS.)

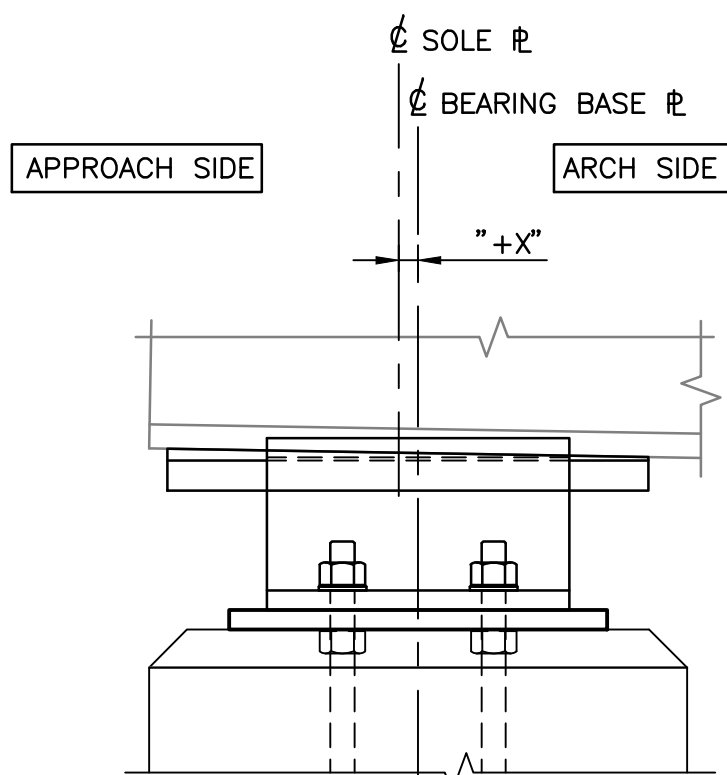
**EXPANSION BEARING SETTING CHART**

DECK TEMPERATURE	-15°C	-10°C	-5°C	0°C	5°C	10°C	15°C	20°C	25°C
DIMENSION "X" (mm)	-3.0	-2.0	0	2.0	3.0	5.0	7.0	8.0	10.0

**BEARING LOAD AND MOVEMENT TABLE**

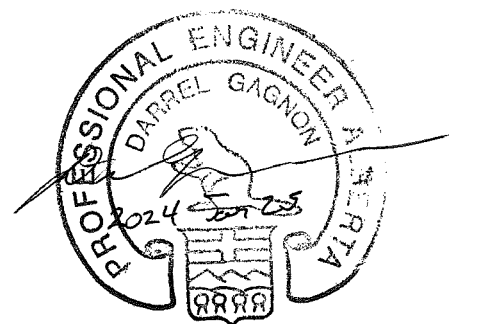
TYPE	QUANTITY	LIMIT STATE	LOADS (kN)						MOVEMENTS (mm)	
			VERTICAL PERMANENT		VERTICAL PERMANENT + TRANSITORY		HORIZONTAL		LONGITUDINAL	ROTATION ABOUT TRANSVERSE AXIS
							LONGITUDINAL	TRANSVERSE		
			MAX	MIN	MAX	MIN	MAX	MAX	MAX	MAX
B1	6.0	SLS	57	51	257	0	41	9	± 40	5.56
		ULS	69	46	450	-18	59	14	± 72	-
B2	4.0	SLS	49	49	106	0	18	8	± 40	5.56
		ULS	59	45	166	-4	26	12	± 72	-

NOTE: HORIZONTAL TRANSVERSE BEARING DEMANDS ARE BASED ON A FRICTION COEFFICIENT OF 20% AND ON THE MAXIMUM VERTICAL BEARING REACTION UNDER PERMANENT DEAD LOADS.  
HORIZONTAL LONGITUDINAL BEARING DEMANDS ARE BASED ON A FRICTION COEFFICIENT OF 18.4% (B1) OR 20% (B2) AND ON THE MAXIMUM VERTICAL BEARING REACTION UNDER PERMANENT + TRANSITORY LOADS.  
BEARING MOVEMENTS RELATE TO A SETTING TEMPERATURE OF -5 DEGREE CELSIUS.



NOTE: THE BEARING SETTING POSITION "X" IS POSITIVE WHEN THE SLIDING PLATE IS OFFSET TOWARDS THE APPROACH SPAN SIDE.

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Project title/Titre du projet  
**BRIDGE REHABILITATION**  
**BANFF NATIONAL PARK, ALBERTA**

**KM 108.6 HIGHWAY 93N**  
**NIGEL CREEK BRIDGE**

Approved by/Approuvé par

Designed by/Concept par  
TWB

Drawn by/Dessiné par  
MIAG

PWGSC Project Manager/Administrateur de Projets TPSPC

PWGSC, Architectural and Engineering Resources Manager/  
Ressources Architectural et de Directeur d'Ingénierie, TPSPC

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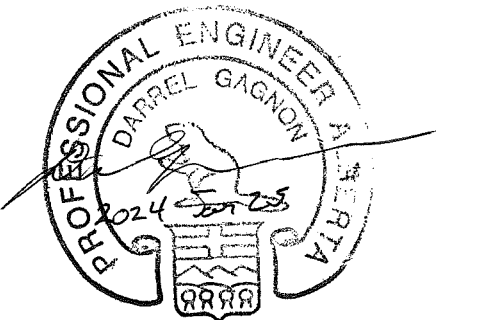
**STRINGER BEARING**  
**REPLACEMENT**  
**GENERAL ARRANGEMENT**  
**(PHASE 2)**

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227903	011 OF	A





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Ressources Architectural et de Directeur d'Ingénierie, TPSGC**

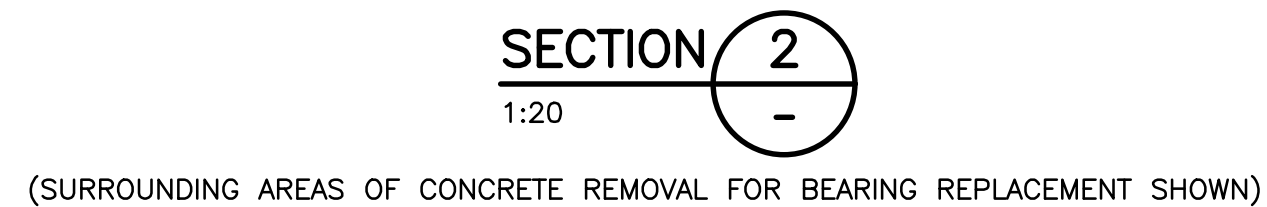
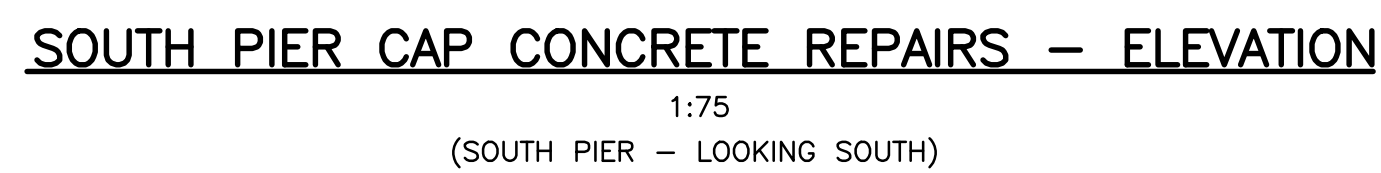
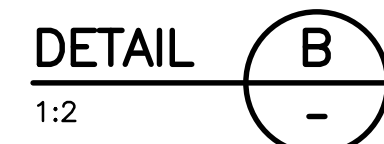
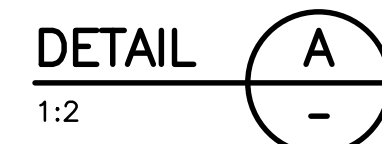
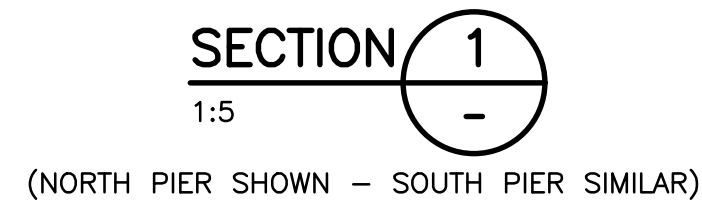
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## STRINGER BEARING REPLACEMENT - DETAILS

(PHASE 2)

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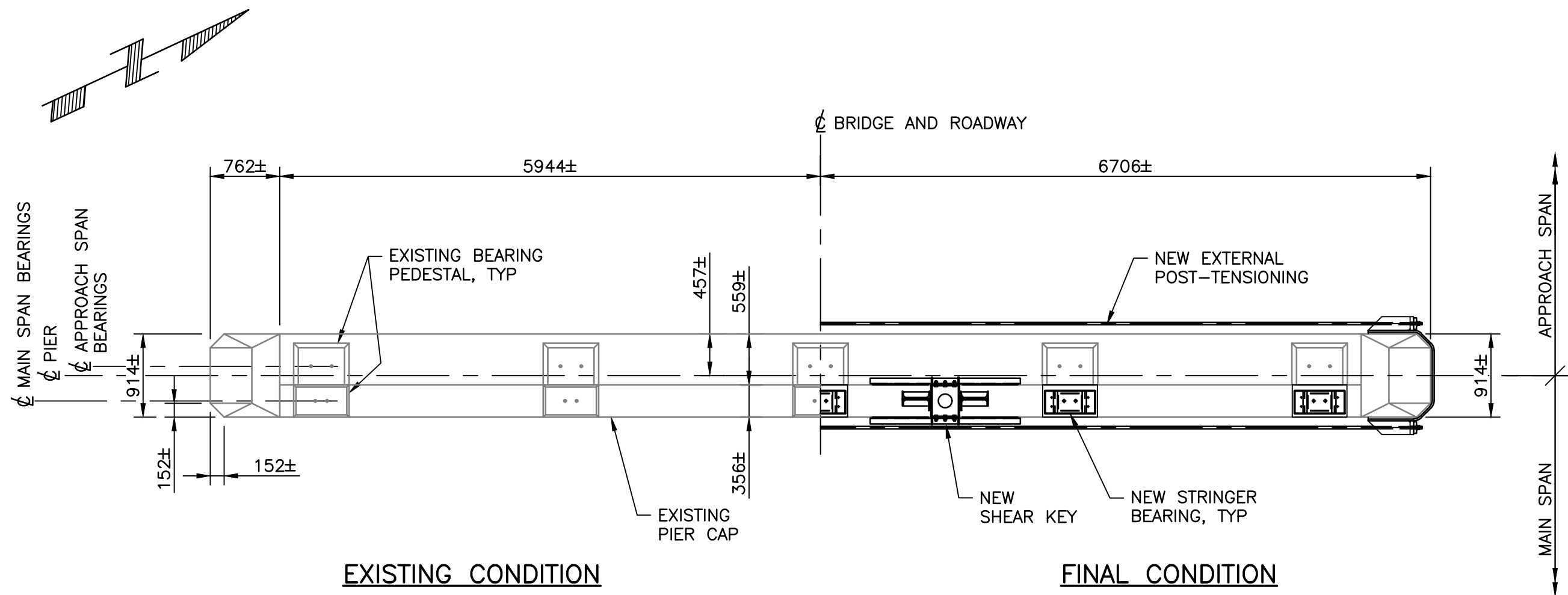
NOTES:

1. COMPRESSIVE STRENGTH OF REPAIR CONCRETE: 35MPa AT 28 DAYS MINIMUM.
2. CHAMFER OF EXPOSED EDGE 20.
3. REINFORCING STEEL: G30.18M GRADE 400W.
4. MINIMUM COVER: 50 UNO
5. MINIMUM LAP: 500 UNO.
6. SAWCUT 20 DEPTH ALONG EDGE OF CONCRETE REPAIR.
7. CONSTRUCTION JOINTS TO BE CLEAN, FREE OF LAITANCE AND ROUGHENED.
8. SUPPORT STRINGER BEFORE CONCRETE REMOVAL.

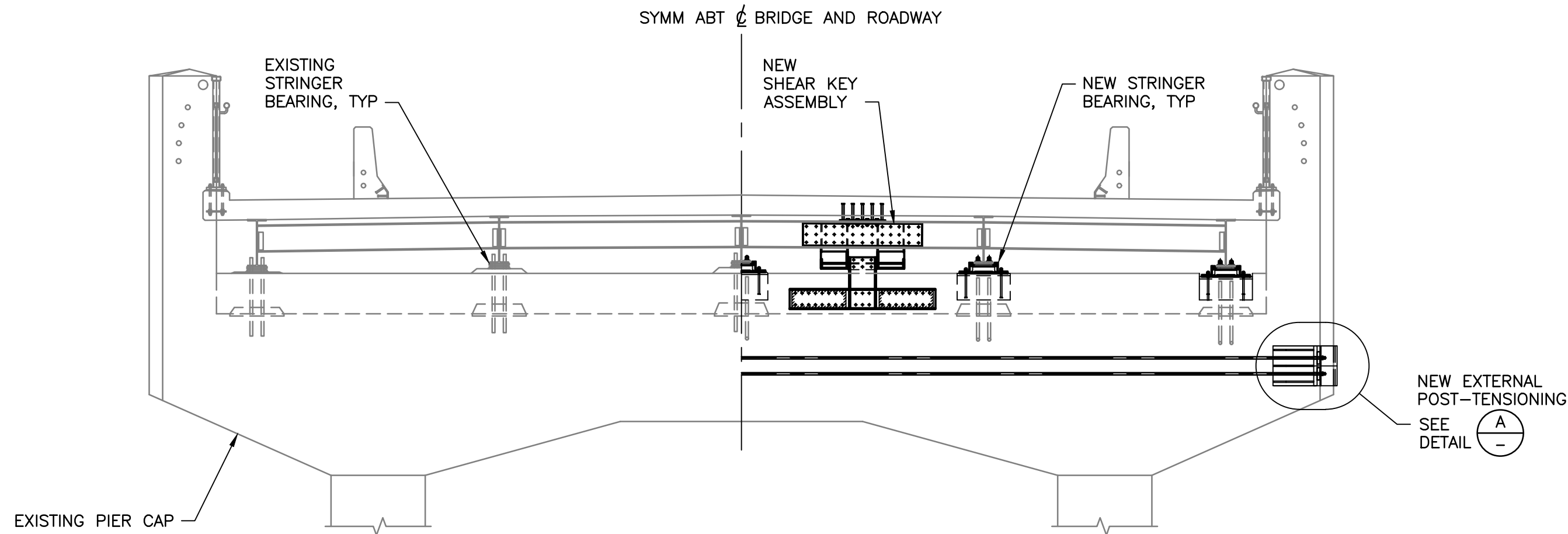




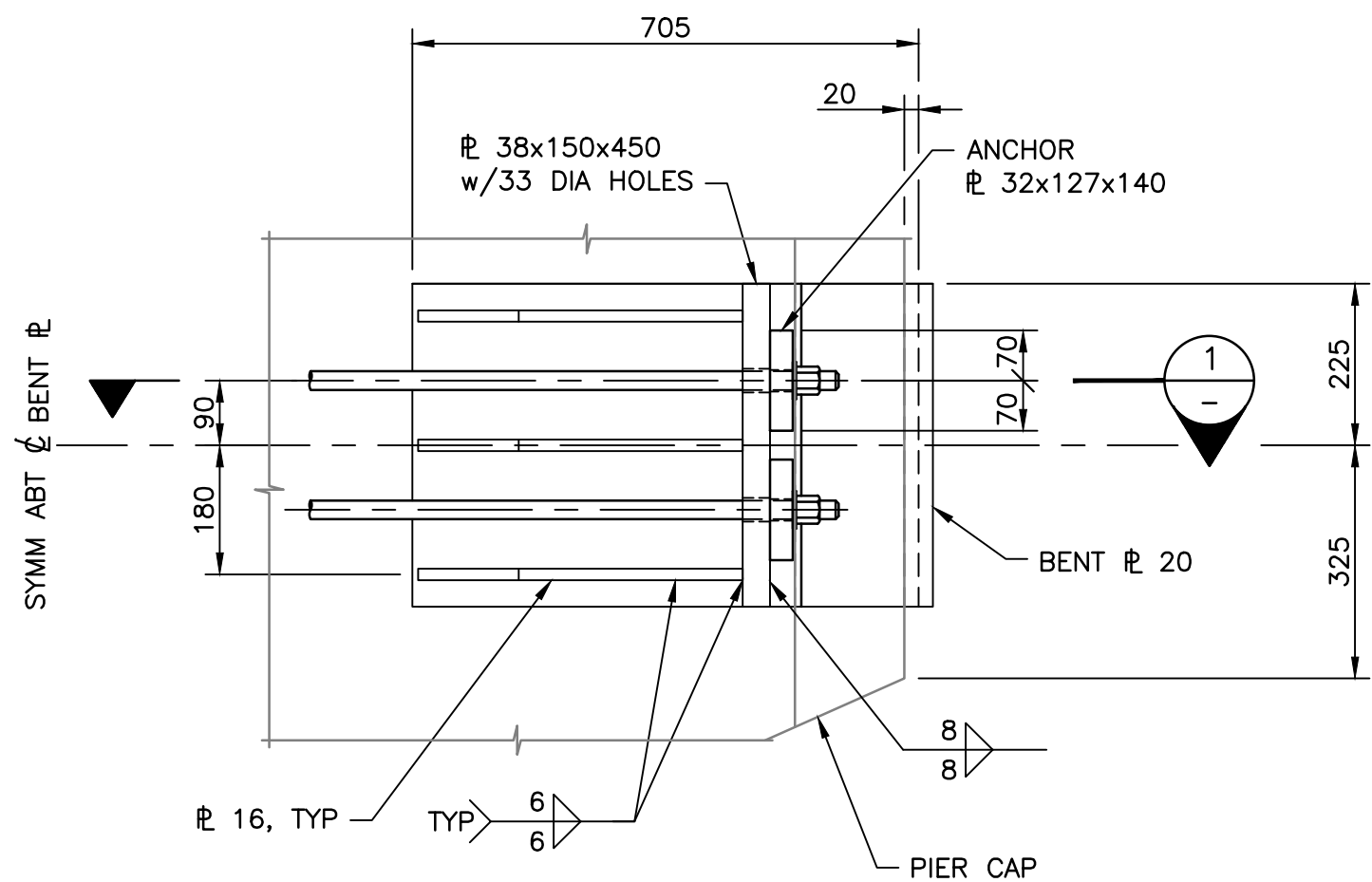
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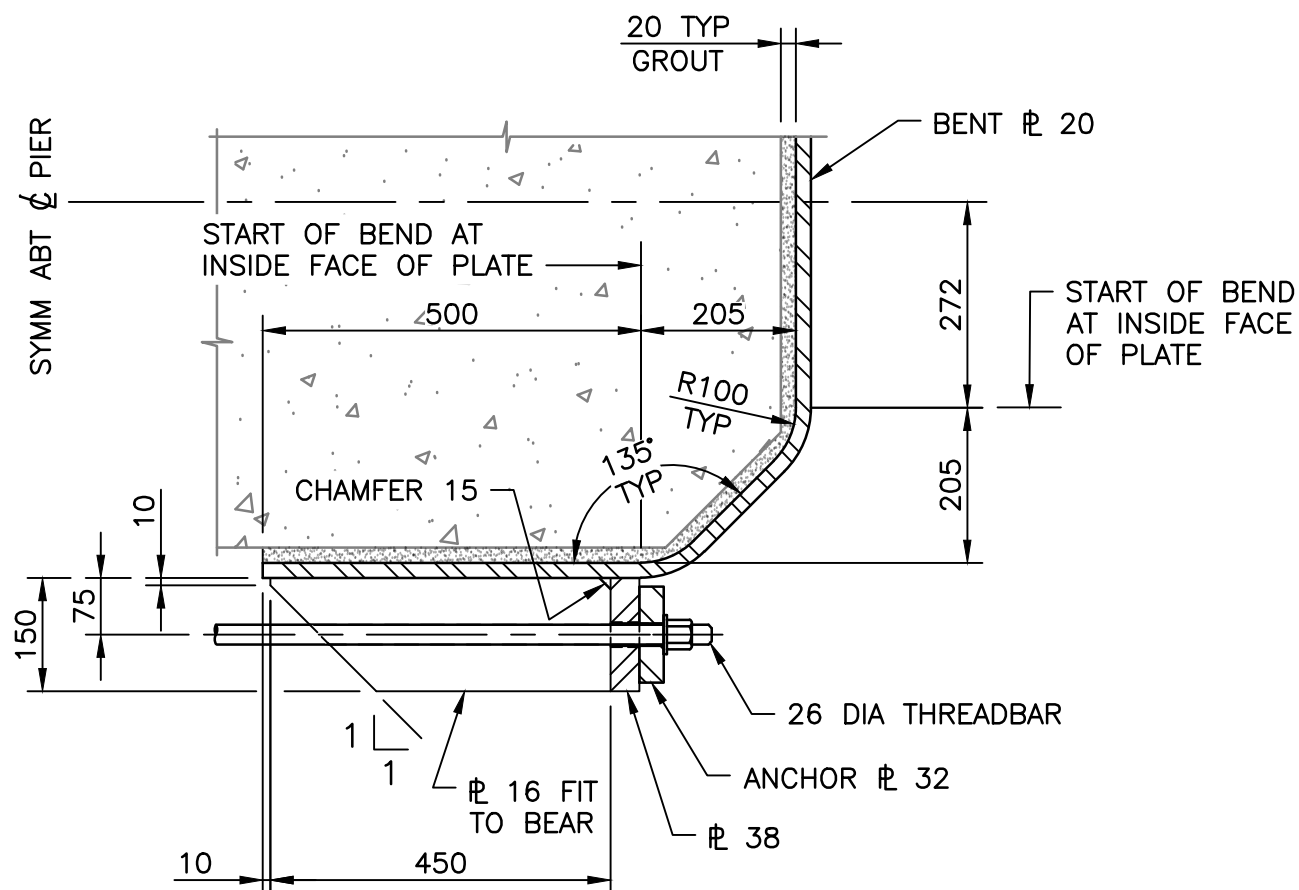
**PIER PLAN**  
1:50  
(NORTH PIER SHOWN - SOUTH PIER SIMILAR)  
DECK, STRINGERS AND GIRDERS NOT SHOWN FOR CLARITY



**PIER ELEVATION**  
1:50  
(NORTH PIER - LOOKING NORTH)  
(SOUTH PIER SIMILAR)



**DETAIL A**  
1:10



**SECTION 1**  
1:10

**LEGEND:**

- REMOVALS

**PIER CAP POST-TENSIONING:**

- ALL DIMENSIONS ARE PROVIDED FOR REFERENCE ONLY. CONTRACTOR TO VERIFY DIMENSIONS BY FIELD MEASUREMENT PRIOR TO FABRICATION.
- BEARING REPLACEMENT, SHEAR KEY INSTALLATION AND PIER CAP PARTIAL DEPTH CONCRETE REPAIRS TO BE COMPLETED PRIOR TO INSTALLATION OF PIER CAP EXTERNAL POST-TENSIONING SYSTEM.
- SHOP DRAWINGS DETAILING POST-TENSIONING PROCEDURES, ELONGATIONS, LOSSES, GAUGE PRESSURES AND STRESSING SCHEDULE SHALL BE SUBMITTED TO THE DEPARTMENTAL REPRESENTATIVE FOR APPROVAL PRIOR TO FABRICATION.

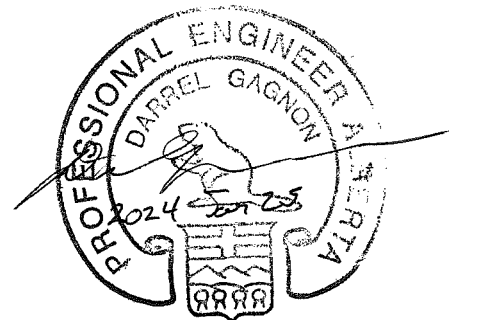
**MATERIALS AND FABRICATION:**

- NEW STEEL: CAN CSA G40.21 GRADE 350W.
- POST-TENSIONING RODS SHALL BE 1035 MPa (fpu) DYWIDAG THREADBAR (OR APPROVED EQUIVALENT) CONFORMING TO THE REQUIREMENTS OF ASTM A722.
- POST-TENSIONING RODS ANCHORAGE NUTS, WASHERS AND ANCHOR PLATES TO BE SUPPLIED BY THE POST-TENSIONING RODS MANUFACTURER.
- POST-TENSIONING RODS, PIER CAP STEEL ANCHORAGE ASSEMBLY, ANCHOR PLATES, NUTS AND WASHERS SHALL BE HOT DIP GALVANIZED AFTER FABRICATION.
- GALVANIZING SHALL CONFORM TO THE REQUIREMENTS OF ASTM A123/123M.
- ALL WELDING SHALL CONFORM TO CAN/CSA W59. FIELD WELDING IS NOT PERMITTED. PERFORM UT EXAMINATION FOR LAMELLAR TEARING.
- GROUT ANCHOR PLATE ASSEMBLIES WITH SIKAGROUT-300PT OR APPROVED EQUIVALENT CEMENTITIOUS, NON-SHRINK GROUT.
- CONSTRUCTION REQUIREMENTS SHALL COMPLY WITH CSA S6:19, ANNEX A10.1.

**SYSTEM INSTALLATION:**

- PIER CAP CONTACT AREAS TO BE CLEAN AND SOUND. ROUGHEN CONTACT SURFACES PRIOR TO INSTALLATION OF PIER CAP ANCHORAGE ASSEMBLIES.
- PLACE AND TEMPORARY SUPPORT ANCHORAGE ASSEMBLIES. PROVIDE UNIFORM GAP TO PIER CAP. CONTRACTOR MAY USE CONCRETE ANCHORS AS TEMPORARY SUPPORT.
- PREPARE CONCRETE SURFACE (SATURATED, SURFACE-DRY CONDITION) AND PLACE GROUT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS ENSURING NO VOIDS BETWEEN ANCHORAGE PLATE AND PIER CAP AND THAT FORMS RETAIN GROUT WITHOUT LEAKAGE.
- INSTALL POST-TENSIONING RODS AS SHOWN ON THE DRAWINGS AND IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- GROUT SHALL ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 25 MPa BEFORE TENSIONING PT-BARS.
- APPLY STRESSING FORCE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AS FOLLOWS:
  - POST-TENSIONING FORCE AT TRANSFER = 330 kN PER ROD.
  - MAXIMUM JACKING FORCE = 375 kN PER ROD.
- STRESSING FORCES SHALL BE APPLIED SIMULTANEOUSLY TO BOTH SIDES OF PIER CAPS.
- PRESTRESS TOP AND BOTTOM RODS TO 165 kN PER ROD BEFORE FINAL PRESTRESSING.
- CLEAN EXCESS GROUT MATERIAL FROM PIER CAPS AND ANCHORAGE PLATES.

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BANFF NATIONAL PARK, ALBERTA**

**KM 108.6 HIGHWAY 93N  
NIGEL CREEK BRIDGE**

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**PIER MODIFICATIONS**

**(PHASE 2)**

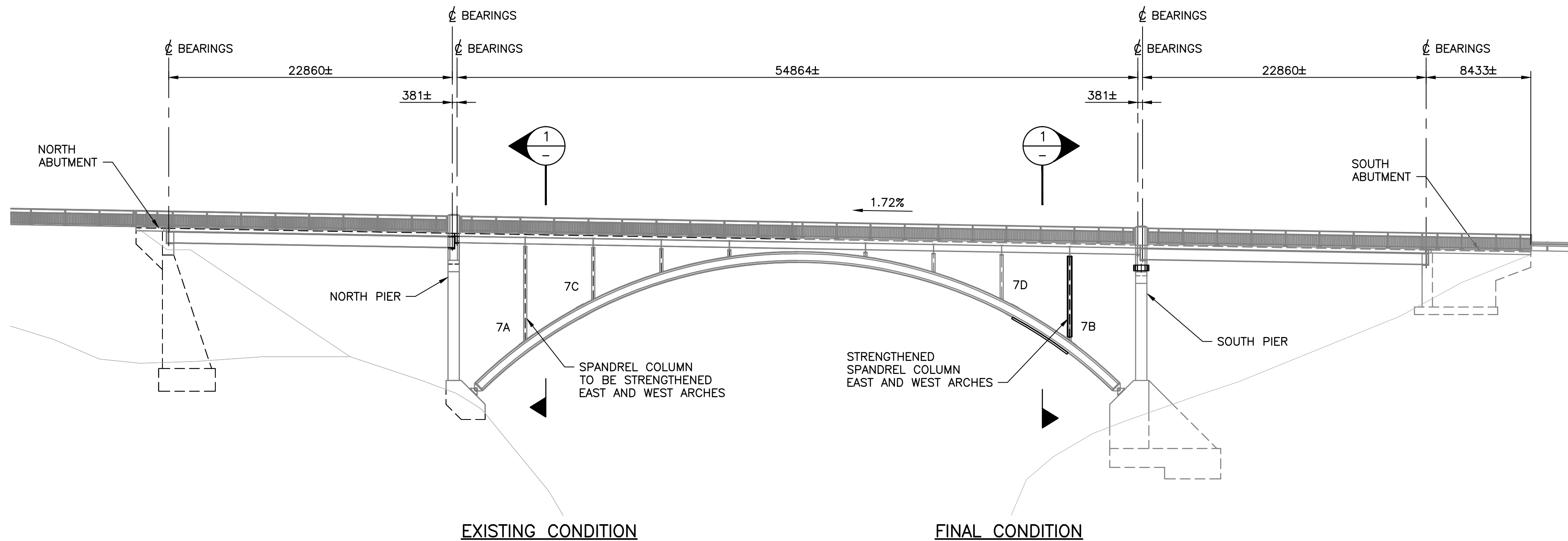
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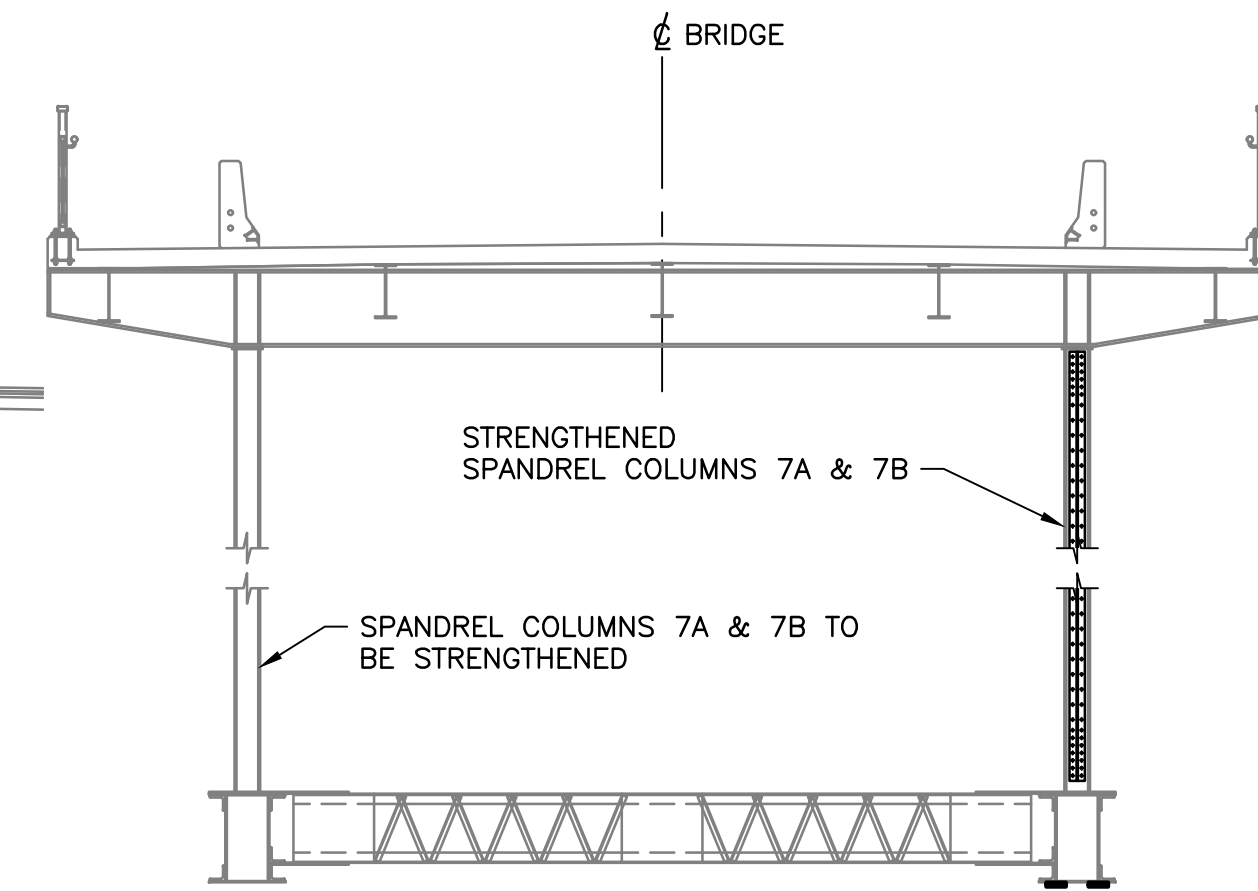


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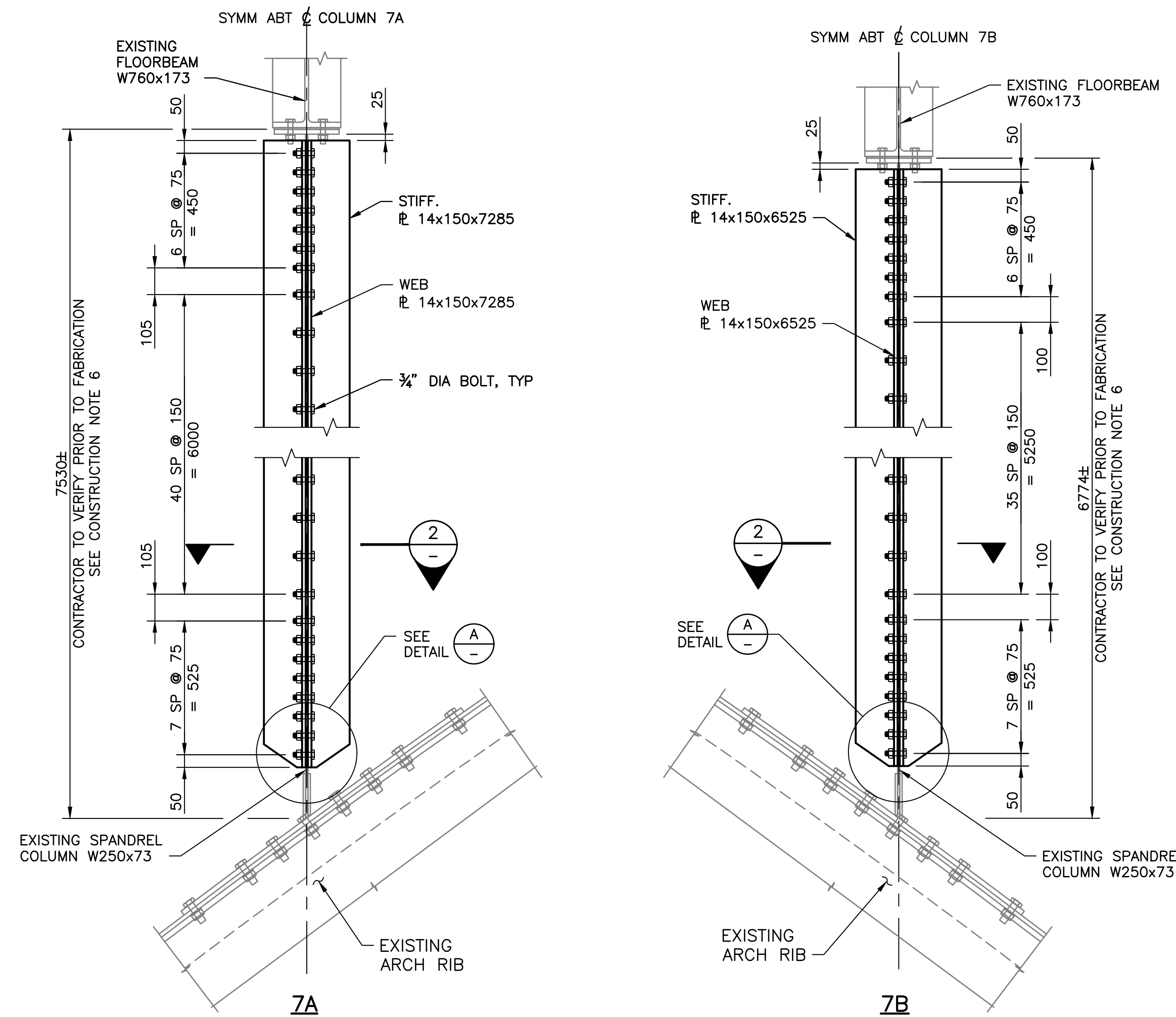


ELEVATION  
1:250

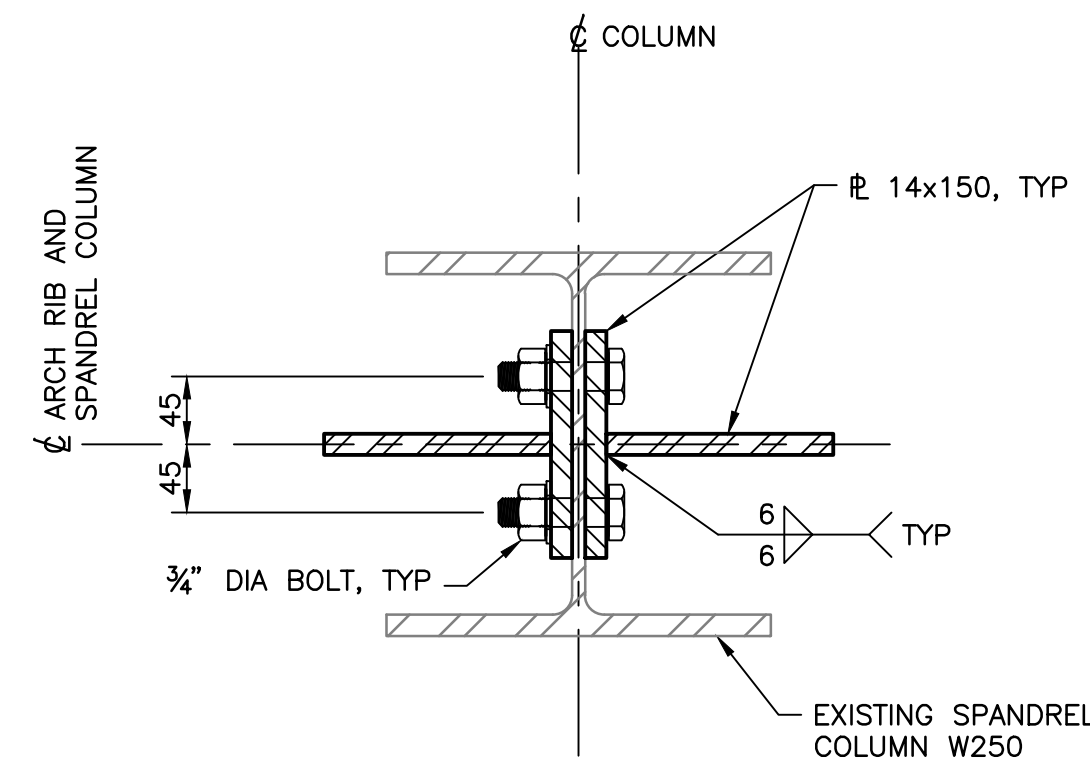


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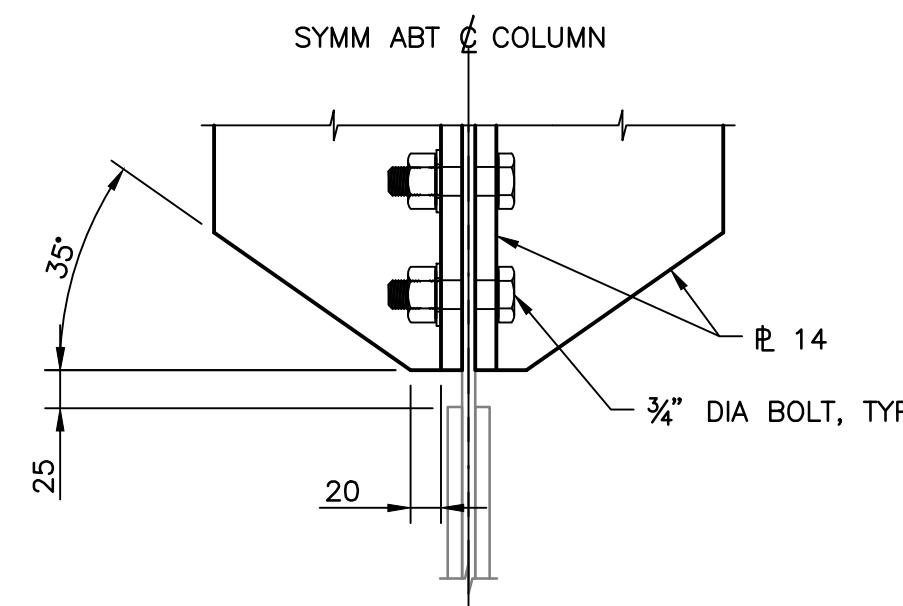
SECTION 1  
1:75



SPANDREL COLUMN MODIFICATIONS  
1:15



SECTION 2  
1:5



DETAIL A  
1:5

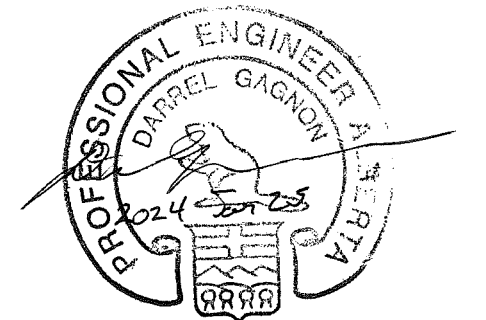
#### CONSTRUCTION:

1. THE SPANDREL COLUMN STRENGTHENING IS TO BE CARRIED OUT IN STAGES.
2. ONLY THE SPANDREL COLUMNS (7A, 7B) ON THE SAME ARCH RIB SIDE MAY BE STRENGTHENED AT THE SAME TIME. THE TRAFFIC LANE ON THIS SIDE OF THE BRIDGE SHALL BE CLOSED FOR TRAFFIC DURING THE INSTALLATION PROCEDURE.
3. THE DECK AREA AROUND THE SPANDREL COLUMNS IN THE CLOSED HALF OF THE DECK (NORTH PIER TO COLUMN 7C AND SOUTH PIER TO COLUMN 7D) SHALL BE KEPT FREE OF ADDITIONAL (CONSTRUCTION) LOADS.
4. EXTERIOR SURFACES OF NEW STEEL TO BE COATED ACCORDING TO SPECIFICATIONS. COLOUR TO MATCH COLOUR OF EXISTING STRUCTURE.
5. CONSTRUCTION REQUIREMENTS SHALL COMPLY WITH CSA S6:19, ANNEX A10.1.
6. LENGTH OF SPANDREL COLUMNS ARE BASED ON ORIGINAL DESIGN DRAWINGS. CONTRACTOR TO VERIFY ACCURACY OF SUCH BY FIELD MEASUREMENTS.

#### NOTES:

1. NEW STEEL: CSA G40.21 GRADE 300W.
2. BOLT SHALL BE 3/4\"/>

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SPANDREL COLUMN  
MODIFICATIONS

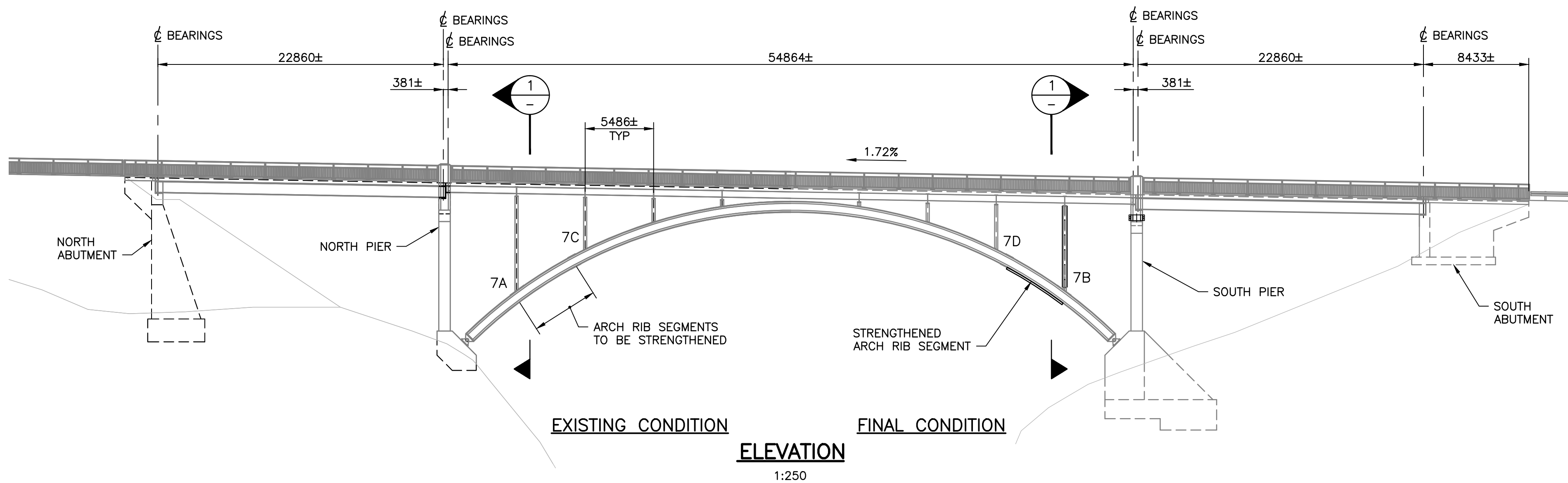
(PHASE 2)

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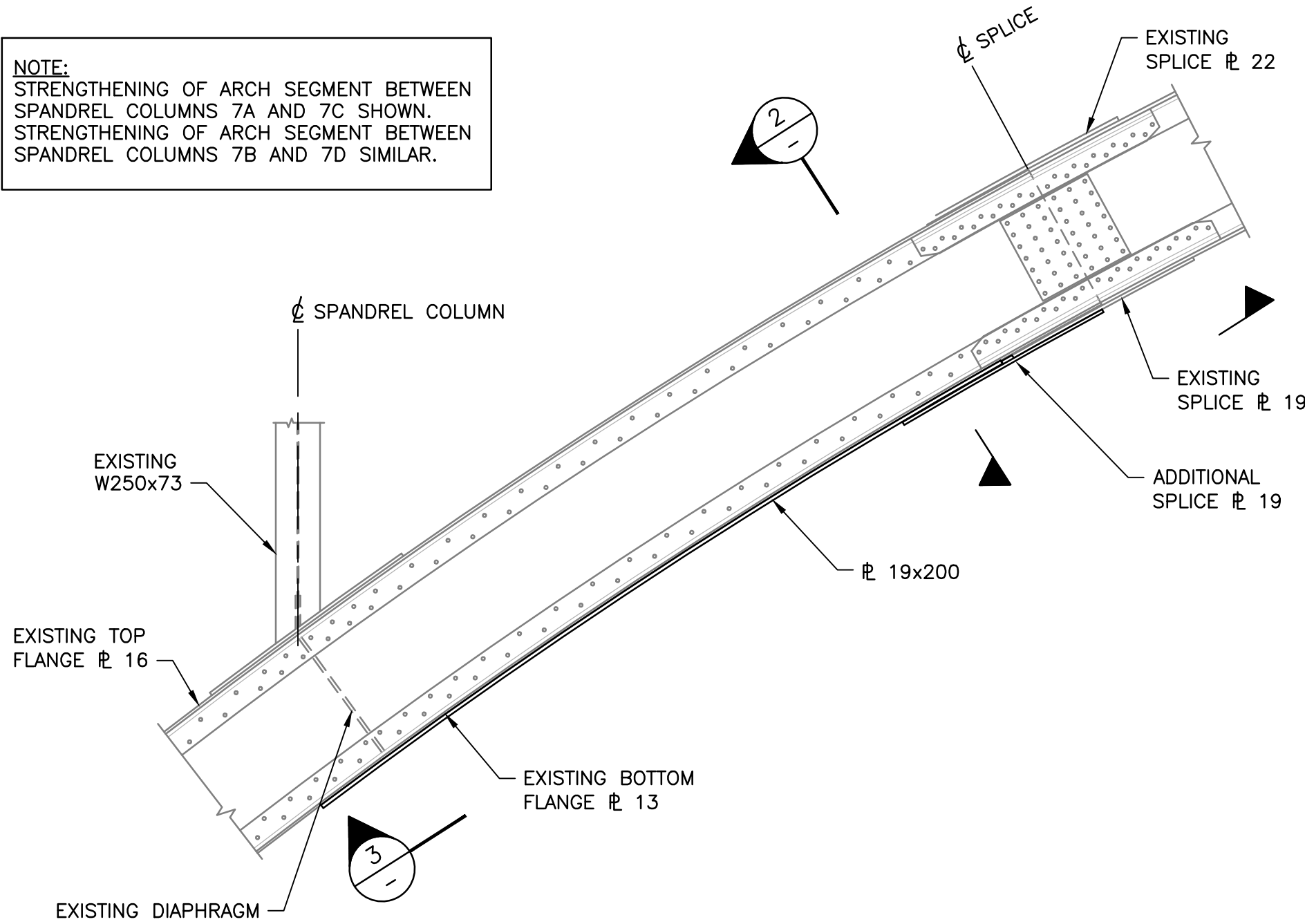




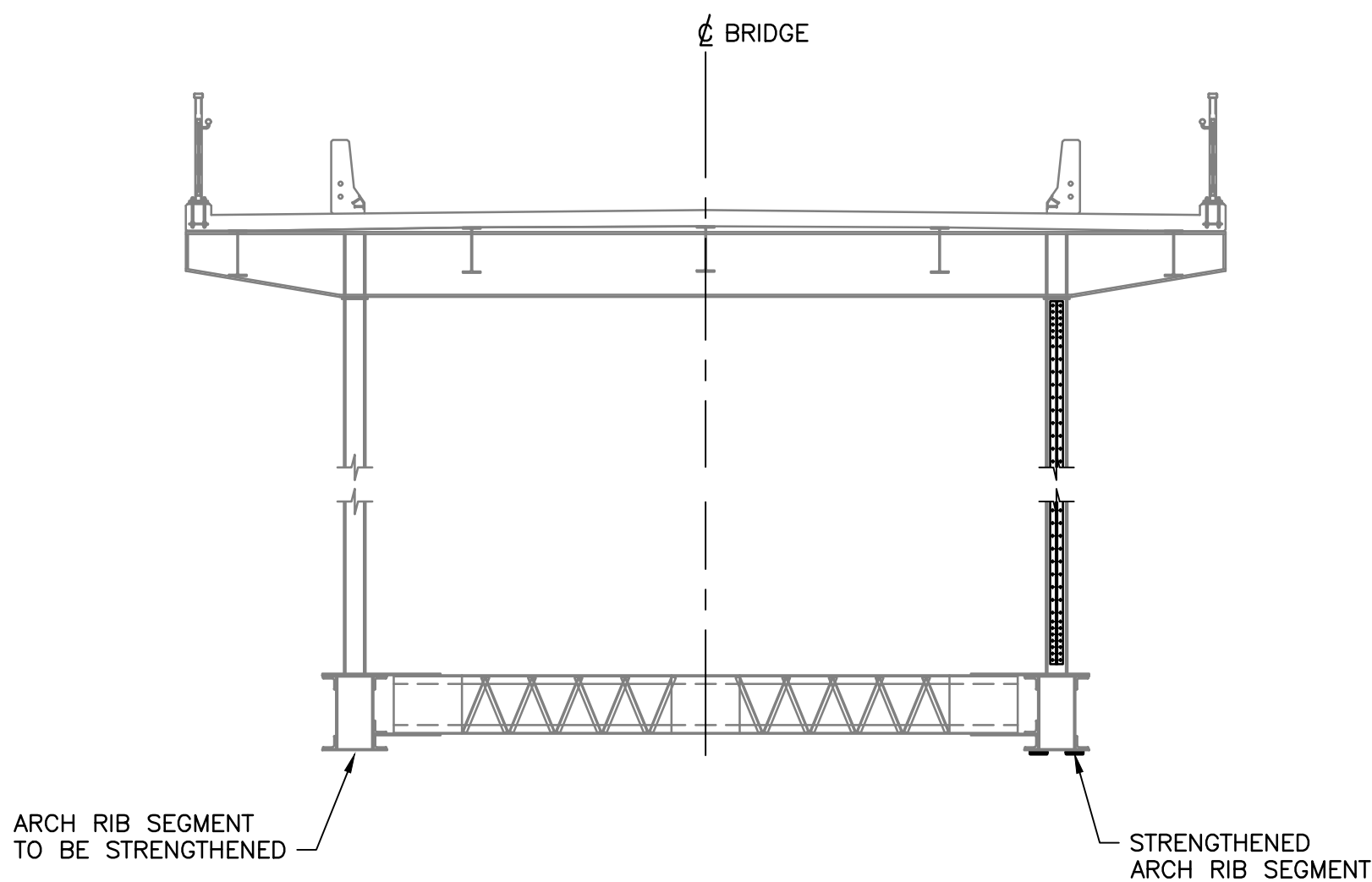
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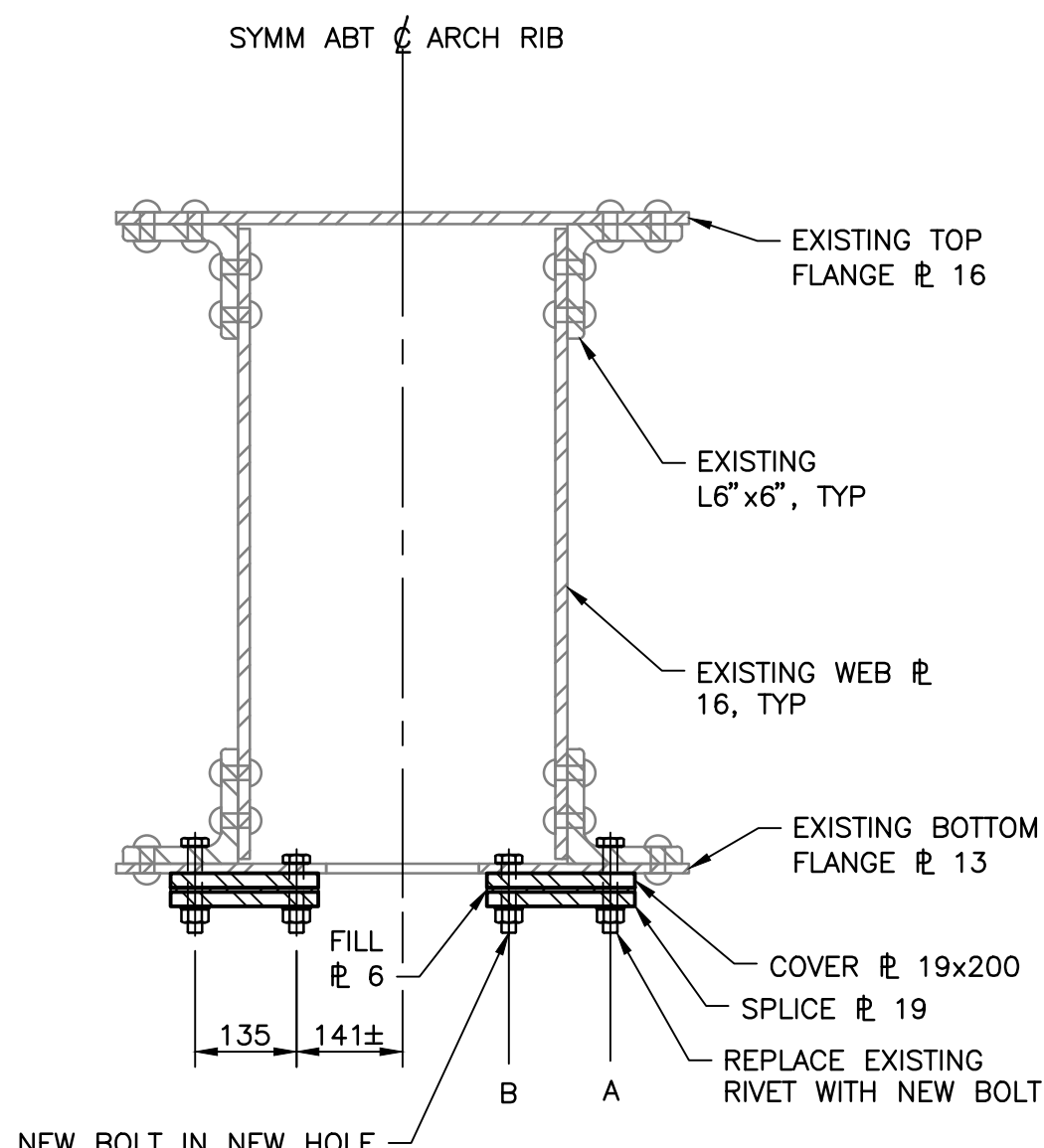
NOTE:  
STRENGTHENING OF ARCH SEGMENT BETWEEN SPANDREL COLUMNS 7A AND 7C SHOWN. STRENGTHENING OF ARCH SEGMENT BETWEEN SPANDREL COLUMNS 7B AND 7D SIMILAR.



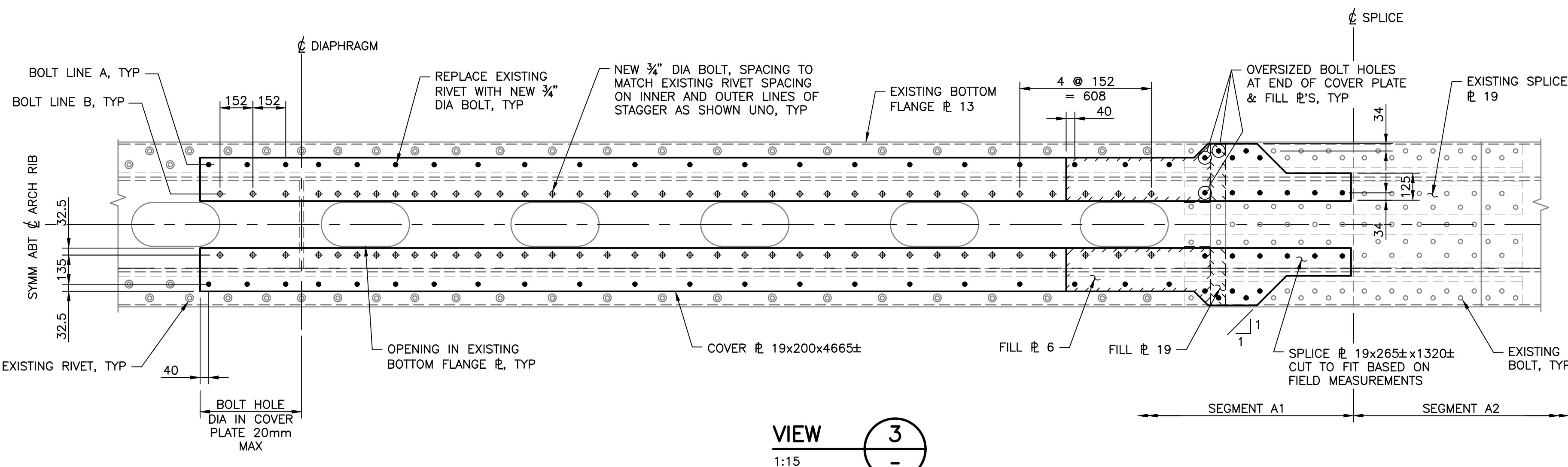
ARCH RIB MODIFICATION-ELEVATION  
1:30



SECTION 1  
1:75



SECTION 2  
1:10



VIEW 3  
1:15

#### CONSTRUCTION:

1. THE ARCH RIB STRENGTHENING IS TO BE CARRIED OUT IN STAGES. ARCH RIB STRENGTHENING ON AN INDIVIDUAL ARCH SHALL BE COMPLETED BEFORE PROCEEDING ONTO THE NEXT ARCH.
  2. REPLACE RIVET WITH BOLT AT COVER PLATE LOCATIONS ONE AT A TIME AHEAD OF COVER PLATE INSTALLATION.
  3. REPLACE EXISTING BOLTS IN THE AREA OF THE ADDITIONAL SPLICE PLATES ONE BY ONE AHEAD OF NEW SPLICE PLATE INSTALLATION.
  4. THE REPLACEMENT OF SINGLE RIVETS OR SINGLE BOLTS SHALL ONLY BE PERFORMED WITH THE TRAFFIC LANE ADJACENT TO THE ARCH RIB CLOSED DURING THAT TIME.
  5. INSTALL NEW COVER PLATES BEFORE INSTALLING NEW SPLICE PLATES.
  6. THE INSTALLATION OF NEW COVER PLATES AND NEW SPLICE PLATES SHALL ONLY BE PERFORMED WITH THE TRAFFIC LANE ADJACENT TO THE ARCH RIB CLOSED DURING THAT TIME.
- ADDITIONALLY, DURING THE FOLLOWING WORK ACTIVITIES, THE TRAFFIC LANE ON THE OTHER SIDE OF THE BRIDGE SHALL BE LIMITED TO ONE SINGLE VEHICLE WITH A GVW OF LESS THAN 4550 kg ON THE BRIDGE AT A TIME. THE ENTIRE DECK OF THE ARCH SPAN SHALL ALSO BE KEPT FREE OF CONSTRUCTION LOADS:
- DURING REMOVAL AND REINSTALLATION OF NEW BOLTS IN BOLT LINE A FOR NEW COVER PLATE INSTALL
  - DURING INSTALLATION AND TIGHTENING OF NEW BOLTS IN BOLT LINE B FOR NEW COVER PLATE INSTALL
  - DURING INSTALLATION OF NEW FILL PLATE AND NEW SPLICE PLATE
7. EXTERIOR SURFACES OF NEW STEEL TO BE COATED ACCORDING TO SPECIFICATIONS. COLOUR TO MATCH COLOUR OF EXISTING STRUCTURE.
  8. LENGTH OF COVER PLATES ARE BASED ON ORIGINAL DESIGN DRAWINGS. CONTRACTOR TO VERIFY ACCURACY OF SUCH BY FIELD MEASUREMENTS.

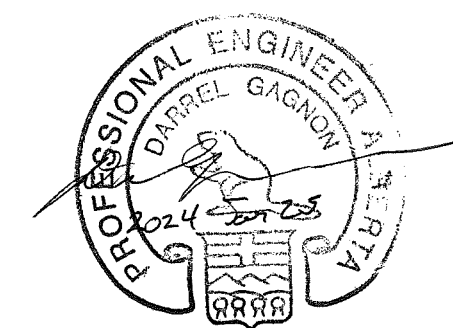
#### SUGGESTED SEQUENCE:

1. FIELD MEASURE EXISTING RIVET SPACING PRIOR TO FABRICATION.
2. REPLACE EXISTING RIVETS WITH NEW BOLTS AND - AT LOCATIONS OF NEW SPLICE PLATES - EXISTING BOLTS WITH NEW BOLTS (ADJACENT TRAFFIC LANE CLOSED). PREPARE FAYING SURFACES.
3. INSTALL NEW COVER PLATE, INCLUDING REMOVAL AND REINSTALLATION OF NEW BOLTS IN BOLT LINE A. (ADJACENT TRAFFIC LANE CLOSED AND RESTRICTED TRAFFIC IN LANE ON OTHER SIDE OF THE BRIDGE IN ACCORDANCE WITH CONSTRUCTION NOTE 6).
4. DRILL NEW HOLES FOR BOLTS IN BOLT LINE B USING COVER PLATE AS A TEMPLATE (ADJACENT TRAFFIC LANE CLOSED).
5. INSTALL AND TIGHTEN BOLTS IN LINE B (ADJACENT TRAFFIC LANE CLOSED AND RESTRICTED TRAFFIC IN LANE ON OTHER SIDE OF THE BRIDGE IN ACCORDANCE WITH CONSTRUCTION NOTE 6).
6. INSTALL NEW FILL PLATE AND NEW SPLICE PLATE (ADJACENT TRAFFIC LANE CLOSED AND RESTRICTED TRAFFIC IN LANE ON OTHER SIDE OF THE BRIDGE IN ACCORDANCE WITH CONSTRUCTION NOTE 6).
7. REPEAT STEPS 1 TO 6 (INCLUDING TRAFFIC RESTRICTION) AT EACH ARCH RIB SEGMENT TO BE STRENGTHENED.

#### NOTES:

1. NEW STEEL: CSA G40.21 GRADE 300W.
2. PLATES TO BE BENT IN THE SHOP TO MATCH CURVATURE OF ARCH RIB.
3. BOLTS SHALL BE  $\frac{3}{4}$ " DIA CONFORMING TO ASTM F3125, GRADE A325, TYPE 1.
4. BOLT THREADS SHALL BE EXCLUDED FROM THE SHEAR PLANE FOR ALL BOLTED CONNECTIONS.
5. DIAMETER OF HOLES SHALL BE DRILLED NOT MORE THEN 2mm GREATER THAN THE NOMINAL BOLT SIZE, UNLESS NOTED OTHERWISE.
6. THE FAYING SURFACES OF THE BOLTED CONNECTIONS SHALL BE CLEANED AS SPECIFIED AND SHALL HAVE CLASS A COATINGS ACCORDING CSA S6:19, TABLE 10.8.
7. THE TURN-OF-NUT METHOD SHALL BE USED FOR TIGHTENING THE BOLTS.
8. CONSTRUCTION REQUIREMENTS SHALL COMPLY WITH CSA S6:19, ANNEX A10.1.
9. FIELD WELDING IS NOT PERMITTED.

ISSUED FOR TENDER  
NOT FOR CONSTRUCTION



DO NOT SCALE DRAWINGS

A	ISSUED FOR TENDER	2024/01/25
Revision/	Description/Description	Date/Date

Client/client	Parks Canada Agency	L'Agence Parcs Canada
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COWI

Project title/Titre du projet  
BRIDGE REHABILITATION  
BANFF NATIONAL PARK, ALBERTA

KM 108.6 HIGHWAY 93N  
NIGEL CREEK BRIDGE

Approved by/Approuvé par

Designed by/Concept par  
TWB

Drawn by/Dessiné par  
MIAG

PWGC Project Manager/Administrateur de Projets TPSCG

PWGC, Architectural and Engineering Resources Manager/  
Ressources Architectural et de Directeur d'Ingénierie, TPSCG

Client/client

Drawing title/Titre du dessin

ARCH RIB MODIFICATIONS

(PHASE 2)

Project No./No. du projet 227903	Sheet/Fauille 015 OF	Revision no./La Révision no. A
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