APPENDIX F2

CNR OVERHEAD BRIDGE STRUCTURAL EVALUATION REPORT 2009

Halton REGION

Dundas Street (Reg. Rd. 5) Class EA Study Brant Street (Reg. Rd. 18) to Proudfoot Trail

CNR Overhead Structure
Dundas Street over CN Railways
Bridge No. 005108
MTO Site No. 010-0175

STRUCTURAL EVALUATION REPORT

November 2009

MRC

A member of MMM GROUP

Global Transportation Engineering

STRUCTURAL EVALUATION REPORT

CNR OVERHEAD STRUCTURE
DUNDAS STREET OVER CN RAILWAYS
CITY OF BURLINGTON, ON
REGIONAL MUNICIPALITY OF HALTON
MTO SITE NO. 10-175

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McCormick Rankin Corporation
A member of MMM GROUP

October 2009

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1. INTRODUCTION

McCormick Rankin Corporation (MRC), a member of MMM Group, was retained by the Regional Municipality of Halton to undertake a Municipal Class Environmental Assessment (EA) for the planned widening of Dundas Street from the existing four lanes to six lanes. The study limits for the widening are from Guelph Line to Appleby Line. The CNR Overhead Structures are within the study limits and will also need to be widened to accommodate the planned increase in the number of traffic lanes.

A structural investigation of the bridges are included in the Municipal Class EA to assess the feasibility of bridge widening alternatives, existing bridge needs, and quantity of repairs required for cost analysis of the alternatives. The investigation comprised the structural evaluation and a detailed deck condition survey. This report focuses on the bridge structural evaluation. Details of the results of the condition survey may be found in the report "Dundas Street - CNR Overhead Structure, Site Number 010-0175, Bridge Deck Condition Survey Report" by MRC dated October 2009, which is bound separately.

This report includes the following:

- A summary of the rehabilitation work previously carried out;
- Results of the structural evaluation;
- Review of the barrier wall currently in place; and
- Discussions of findings from the structural evaluation.

A Key Plan showing the structure location is provided in Appendix A.

Appendices containing supplementary information such as drawings, photographs, figures, and calculations, are referenced throughout the text and included in the back of this Report.

2. EXISTING CONDITIONS

Two adjacent, yet independent, CNR Overhead bridges were constructed in 1962, one for Waterdown-bound traffic and the other for Toronto-bound traffic. Each bridge carries two (2) traffic lanes located along Dundas Street (King's Highway No.5), which crosses over the CN Railways. The superstructure layout follows along the Profile Control Line and comprises three simply-supported spans of precast, pre-stressed concrete girders supporting a cast-in-place (CIP) reinforced concrete deck, an asphalt wearing surface, and a PL2 concrete barrier wall with traffic railing and a median barrier on each deck edge. The two adjacent decks, each 11.431m wide, are separated by a 25mm longitudinal joint located between the medians.

The three spans are each 12.2± m, 17.8± m, and 12.2± m in length, supported by piers and abutments that are skewed relative to the Profile Control Line, in order to accommodate the rail lines passing underneath the bridges. Approach slabs, each 4.267m

long, flank both ends of the bridges. General views of the structure are shown in photographs found in Appendix B.

In 2003, the structure was rehabilitated. More recently, bi-annual appraisals have been carried out on the bridge. Summaries of the work and findings are presented.

2.1 2003 Rehabilitation

In 2003, the structure was rehabilitated under Contract No. R-1853B-2003. The scope of work included the following:

- Removed deteriorated concrete from deck soffit & diaphragm ends and repaired
- Removed deteriorated concrete from pier caps and repaired
- Constructed new concrete crash walls on pier columns
- Repaired concrete slope paving
- Removed traffic railings, steel beam guide rails, curbs and gutters. Removed north and south edges of approach slab.
- Installed new concrete barriers & steel beam guide rails. Modified existing approach slabs by placing new curb and gutter.
- Removed existing caulking/seal from longitudinal expansion joint
- Installed new longitudinal expansion joint
- Milled existing pavement and place surface course asphalt
- Reinstated pavement markings
- Installed asphaltic plug seals at abutment and pier expansion joints

2.2 2006 Bi-Annual Bridge Appraisal

The 2006 bi-annual was completed by TSH for the Regional Municipality of Halton. The following summarizes the findings of their inspection:

- The asphalt wearing surface is in good condition.
- Concrete barrier walls and steel barrier rails are in good condition with surface rust stains noted.
- Concrete median is in generally good condition with localized cracking.
- A longitudinal expansion joint in the median is sealed and is in poor condition. Localized leakage was noted.
- Deck expansion joints are paved over and are in poor condition with leakage noted.
- Concrete deck soffit is in good condition with localized water staining along the deck fascias at piers and longitudinal expansion joint. Localized patching was noted on both the south and north deck cantilever. Localized spalling and delaminations were

noted along longitudinal joints. Exposed corroded rebar chains were also noted along joint.

- Precast concrete girders are in generally good condition with delaminations and spalling of several girders at the support points.
- Elastomeric bearing pads are in good condition.
- Concrete piers are in generally good condition with extensive water staining, localized cracking and patching of the pier caps. The pier columns are in good condition. Railway crash walls are in good condition.
- Concrete abutments are in good condition with extensive water staining and localized vertical cracking.
- Concrete wingwalls are in good condition.
- Slope paving is in good condition.
- Steel beam guiderail and channel on the bridge approaches are in good condition with extruder end treatments complete with hazard markers in all four quadrants.
- Concrete approach slabs are in good condition
- Asphalt paved approach roads are in good condition.
- Raised concrete median on the approaches is in generally good condition.
- Concrete curb and gutter on the approaches are in good condition
- Asphalt paved boulevards are in good condition

3. ANALYSIS AND EVALUATION ASSUMPTIONS

The following points should be considered when reviewing this report:

- The structure was evaluated in accordance with the Canadian Highway Bridge Design Code, CAN/CSA-S6-06 (CHBDC), using the software program CANBAS Version 2.0.1 to determine girder demands and capacities.
- The structure was evaluated using Ultimate Limit States (ULS) with load combination factors provided in CHBDC, Table 3.1.
- CIP deck slab and AASHTO Type III girder properties were calculated based on their gross (un-cracked) section properties. The structure was evaluated based on the assumption that any and all defects have been repaired.

The following assumptions were made throughout the evaluation:

- The reinforcing steel material properties were estimated based on considering the date of bridge construction in accordance with Clause 14.7.4.4 of CHBDC. The assumed yield strength, F_y, and elastic modulus, E, of the original rebar was taken as 275 MPa and 200 GPa, respectively [Table 14.2 of CHBDC].

- According to the structural drawings, the concrete compressive strengths were:

  - 34.5 MPa for the pre-stressed girders
  - 27.6 MPa for the CIP concrete deck

4. LOADING

The dead load contributors are as follows:

- Pre-stressed girder self-weight
- 177.8 mm thick CIP deck slab

Superimposed dead load contributions include:

- 76.2 mm thick asphalt plus waterproofing
- barrier walls and curbs

Other loads include:

- Pre-stressing axial forces on girder strands

The structural drawings found in Appendix A were used to determine loads. Standard material densities in accordance with CHBDC were used.

The CNR Overhead is required to carry vehicle trains in normal traffic, for which the governing live load model is the CL1-ONT-625 Truck [CHBDC, S6.1-06 Commentary, Cl. C3.8.1].

5. ANALYSIS / MODELLING

5.1 Introduction

The bridge analysis was preformed using the structural analysis program CANBAS Version 2.0.1. Interior and exterior pre-stressed beams were analysed to determine load demands and capacities along each girder.

The resistance of the members or "Capacity" (C) have been calculated. The moment of resistance, M_r, and shear resistance, V_r, of each member is calculated based on its gross (un-cracked) sectional properties in accordance with CHBDC.

Capacity-to-demand (C/D) ratios are calculated for exterior and interior members at critical locations to evaluate the theoretical condition of the bridge. Throughout this evaluation, members with a C/D ratio less than 1.0 have been considered to be under capacity.

An evaluation check was completed to confirm the results of the above-noted evaluation calculations.

5.2 Analysis Results

The evaluation is based on the assumptions outline above. The following results at the critical sections were obtained and the results are presented in Tables 5.1 and 5.2 based on ULS loading. Interior girder C/D ratios governed in all cases. Detailed analysis results and discussions are found in Appendix C.

Table 5.1 – End Span, Interior Girder ULS Load Combination Results

Point	Capacity / Demand Ratio[1]		Location[2]
1	M_r (+) / M_f (+)	1.63	Midspan (x/L = 0.5)
	V_r / V_f	n / a	Midspan (x/L = 0.5)
2	V_r / V_f	1.35	At Piers (x/L = 0)
	V_r / V_f	1.27	Near Piers (x/L = 0.1)

Table 5.2 – Main Span, Interior Girder, ULS Load Combination Results

Point	Capacity / Demand Ratio[1]		Location[2]
1	M_r (+) / M_f (+)	1.37	Midspan (x/L = 0.5)
	V_r / V_f	n / a	Midspan (x/L = 0.5)
2	V_r / V_f	1.24	At Piers (x/L = 0)
	V_r / V_f	1.11	Near Piers (x/L = 0.1)

[1] Footnote: "Capacity/Demand Ratio" is defined as factored resistance divided by the factored response. A Demand/Capacity ratio greater than or equal to 1.0 is desirable
M_r (-) is defined as factored negative flexural resistance
M_f (-) is defined as the factored applied negative bending moment
M_r (+) is defined as factored positive flexural resistance
M_f (+) is defined as the factored applied positive bending moment
V_r is defined as factored shear resistance
V_f is defined as factored applied shear

[2] Footnote: L denotes the span length, equal to 17831mm for main spans and 12192mm for end spans.
x denotes the distance from pier supports for main spans, and abutment supports for end spans.

6. BARRIER WALL

The barrier wall currently in use was designed according to OHBDC 1991, Highway Class A. These PL-2 barriers were installed in 2003. Using information gathered from the Bi-Annual Bridge Appraisal in 2006 and the Condition Survey in 2009, it was determined that PL-2 barriers on both north and south sides are in good condition and still satisfy barrier performance level requirements in CAN/CSA-S6-06, Clause 12.4.

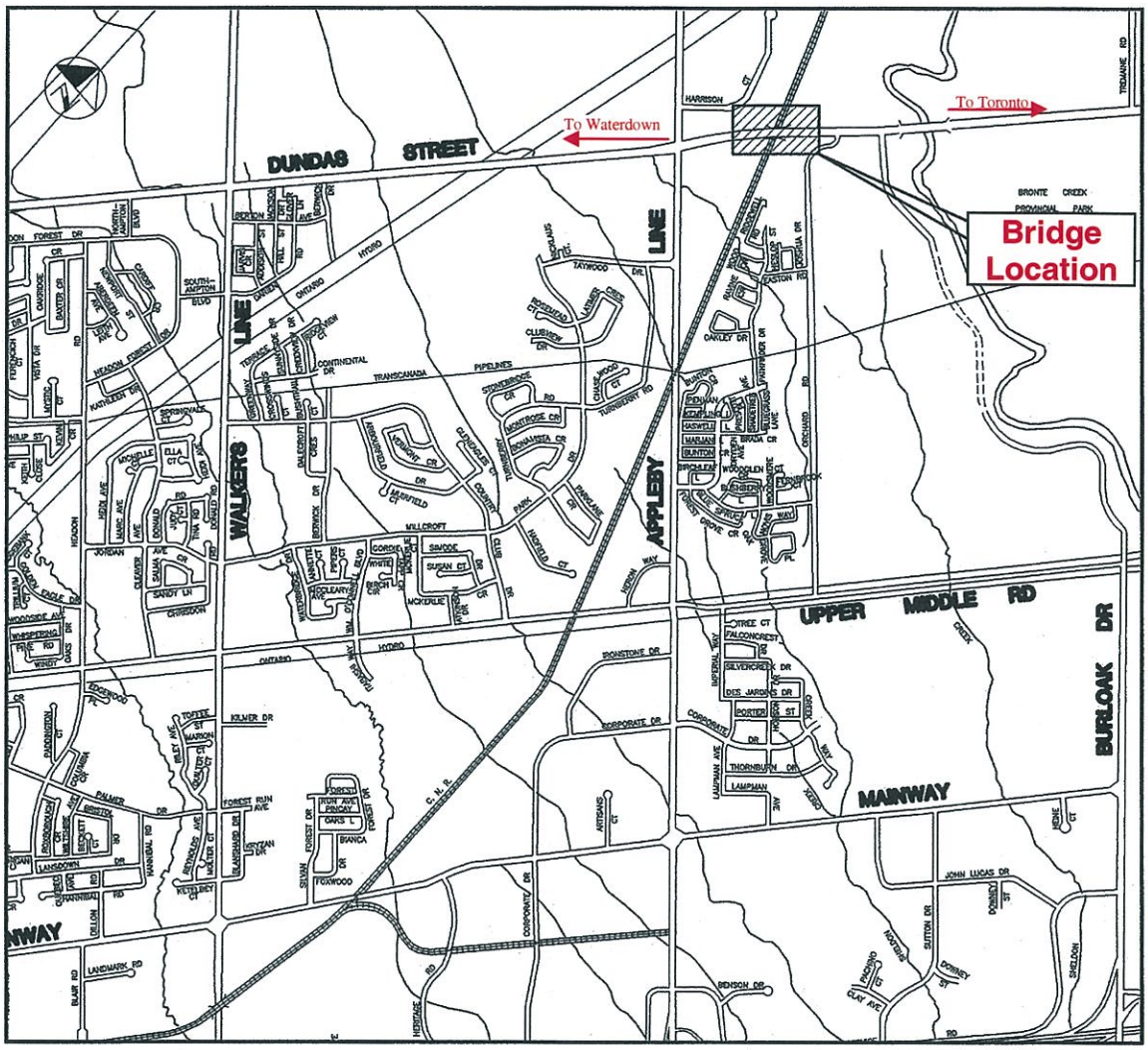
7. DISCUSSION & RECOMMENDATIONS

The results of the evaluation suggest that the CNR Overpass is theoretically adequate in bending moment and shear. Furthermore, the barrier wall currently conforms to current MTO standards and is reported to be in good condition.

The response of the structures to live load was also evaluated to determine the feasibility of increasing the concrete slab thickness from 178 mm to 225 mm with an asphalt thickness of 90 mm. Results of the analysis indicate that an increased deck slab thickness of 225 mm is feasible for the future widening of each overhead structure to carry three (3) traffic lanes.

In summary, the structural evaluation found that the pre-stressed girder structures have adequate load capacity and may be incorporated into the widening of Dundas Street.

APPENDIX A
KEY PLAN & STRUCTURAL DRAWINGS



CNR Overhead Structure, Dundas Street Over CN Railways
0.50 km East of Appleby Line

KEY PLAN
N.T.S.

PLAN
SCALE: 1"=20'-0"

HANDRAIL		
No. OF PANELS	MARK	LENGTH OF PANEL (FACE TO FACE OF POST)
24	'A'	10'-0"
1	'B'	11'-1 7/8"
1	'C'	11'-11 7/8"

SOUTH ELEVATION
SCALE: 1"=20'-0"

PRINT RECORD		
No.	FOR	DATE
3	[illegible]	[illegible]

RECORD OF BOREHOLES

1. SAND WITH GRAVEL AND ORGANIC MATTER. LOOSE-BROWN.
2. CLAYEY-SILT WITH SAND AND GRAVEL. VERY STIFF BROWN.
3. SILTY-SAND WITH GRAVEL. VERY DENSE-BROWN.
4. SANDY-SILT. VERY DENSE-BROWN.
5. RAILWAY-FILL CINDERS WITH ORGANIC MATTER. DENSE-BLACK.
6. CLAYEY-SILT WITH SAND AND GRAVEL VERY STIFF TO HARD BROWN.
7. SANDY TOPSOIL. LOOSE-BROWN.
8. CLAYEY-SILT WITH SAND AND GRAVEL HARD-BROWN.

BOREHOLE DETAILS

B.M. No 194 EL. 334.994
PLATE GIRDER BRIDGE ON C.N.R. 1 1/2 MILES NORTH-EAST OF STATION AND AT MILEAGE 24.2 FROM TORONTO, 1200 FEET NORTH EAST OF R. ROAD CROSSING, NORTH FACE OF NORTH STONE WINGWALL AT NORTH EAST END OF BRIDGE, TOP COURSE. BOLT SET HORIZONTALLY.
PUBLICATION No 19 BRONTE

CURVE DATA			SPIRAL DATA		
Δ	=	14° 34'	θ_s	=	1° 45'
Δc	=	11° 04'	L_s	=	175.00
D	=	2° LT.	T_s	=	453.70
R	=	2864.79			
Lc	=	553.33			
Es	=	23.75			

KEY PLAN
SCALE - 1 IN = 0.8 MI.

SECTION 'B'-'B'
RAILWAY CLEARANCE DIAGRAM
MEASURED ALONG LINE 'A'

HORIZONTAL ALIGNMENT LINE 'A'
N.T.S.

PROFILE OF LINE 'A'
N.T.S.

NOTE: PROFILE GRADE = 0.38' BELOW FINISHED GRADE AT PROFILE CONTROL.

SECTION A-A
SCALE: 1/8"=1'-0"

NOTES

TO DISTRICT ENGINEER

CONCRETE WORK ON THIS STRUCTURE MUST NOT BE COMMENCED UNTIL MONUMENTS TO FIX CONTROL POINTS HAVE BEEN ERECTED AND CHECKED BY THE DISTRICT ENGINEER.

TO CONTRACTOR

STRUCTURE TO BE BUILT IN ACCORDANCE WITH FORM No 9 AND THE SPECIAL PROVISIONS, EXTRA COPIES OF WHICH MAY BE OBTAINED FROM THE DISTRICT ENGINEER.

CONCRETE MIX	MIN. STRENGTH @ 28 DAYS	MAX. SIZE OF AGGREGATE
PRESTRESSED BEAMS	5000 P.S.I.	3/4"
DECK	4000 P.S.I.	3/4"
REMAINDER	3000 P.S.I.	1 1/2"

APPROVED ADMIXTURES SUPPLIED BY THE CONTRACTOR WILL BE ADDED TO ALL CONCRETE AS SPECIFIED BY THE ENGINEER.

BORING DATA

THE COMPLETE SOIL INVESTIGATION REPORT FOR THIS STRUCTURE MAY BE EXAMINED AT THE BRIDGE OFFICE AND FOUNDATION OFFICE, DOWNSVIEW, AT ANY REGIONAL OFFICE AND AT THE HAMILTON DISTRICT OFFICE. THE DEPARTMENT DOES NOT GUARANTEE THE ACCURACY OF THIS REPORT OR THE ABRIDGED VERSION SHOWN ON THESE PLANS.

CLEAR COVER ON REINFORCING STEEL

FOOTINGS	ABUTMENTS	DECK SLAB	HANDRAILS & END POST
3"	3"	1"	2"
PIER CAPS	PIER COLUMNS	DIAPHRAGMS	OR AS NOTED.
3"	3"	2"	

CONSTRUCTION NOTES

ALL EXPOSED EDGES TO BE CHAMFERED 1"x1" EXCEPT AS NOTED.
ALL CONSTRUCTION JOINTS MUST BE APPROVED BY THE BRIDGE ENGINEER.
THE GENERAL CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BRIDGE SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF PLUS OR MINUS 1/8 INCH. IF THEY ARE CAST TOO HIGH THEY SHALL BE GROUND DOWN BY THE GENERAL CONTRACTOR. IF THEY ARE CAST TOO LOW THE GENERAL CONTRACTOR SHALL PROVIDE FULL BEARING SHIMS TO BRING THEM UP TO THE CORRECT ELEVATIONS.
THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT THE FINAL DECK ELEVATIONS CONFORM WITH THE ELEVATIONS SHOWN.
NO CONCRETE SHALL BE PLACED ABOVE THE BRIDGE SEAT UNTIL EPOXY RESIN TO BE SUPPLIED BY D.H.O. AND APPLIED BY CONTRACTOR.

GRANULAR FILL

THE COMPACTION OF GRANULAR FILL UNDER BOTH ABUTMENT FOOTINGS TO BE SUPERVISED BY D.H.O. FOUNDATION BRANCH.

[illegible]

REVISIONS		
DATE	BY	DESCRIPTION
OCT 19/65	A.E.S.	REV. - AS CONSTRUCTED. SEE NOTE ADDED ON SHEET 2.
24/5/63	J.G.G.	NOTES REVISED - CONC. GUTTER ADDED TO SECT. A-A
3/1/63	J.G.G.	NOTES REVISED
3/1/63	J.G.G.	REMOVE CP. SPURLINE - ENTRANCE DETAIL
22-2-63	J.G.G.	REVISED DISTANCE BETWEEN PROFILE & FINISHED GRADE
12-2-63	J.G.G.	NOTES DELETED AND REVISED.

LIST OF DRAWINGS

D-5086-1 GENERAL LAYOUT
-2 FOOTINGS
-3 ABUTMENTS & WINGWALLS
-4 ABUTMENTS & WINGWALLS
-5 PIERS
-6 BEARINGS
-7 PRESTRESSED GIRDERS
-8 CONCRETE EL. & OFFSETS
D-5086-9 LAYOUT OF SUPERSTRUCTURE
-10 REINF. OF SUPERSTRUCTURE
-11 APPROACH SLAB
-12 HANDRAIL
-13 BELL TELEPHONE DUCTS
-14 REINF. STEEL SCHEDULE
-15 do do do
-16 do do do
-17 TRACK PROTECTION

THIS SHOULD BE SITE # 10-175

TWP # 1335-175

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

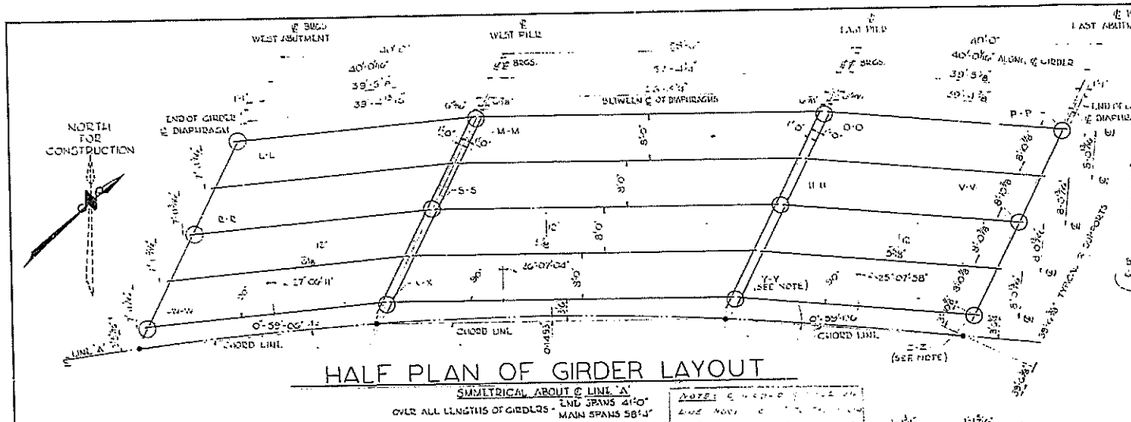
C.N.R. OVERHEAD
(2.5 MI. WEST OF E. JCT. OF HWY. # 25)

KING'S HIGHWAY No. 5 DIST. No. 4
CO. HALTON
TWP. TOWN OF BURLINGTON LOT 4 & 5 CON. 1 NDS

GENERAL LAYOUT

APPROVED [signature] BRIDGE ENGINEER		SITE No. 11-175		W.P. No. 243-61
DESIGN A.K.	CHECK J.M.R.	CONTRACT No.		63-35 63-489
DRAWING G.P.	CHECK [illegible]			
DATE NOV. 1962	LOADING H 20 S 16	DRAWING No.	D-5086-1	

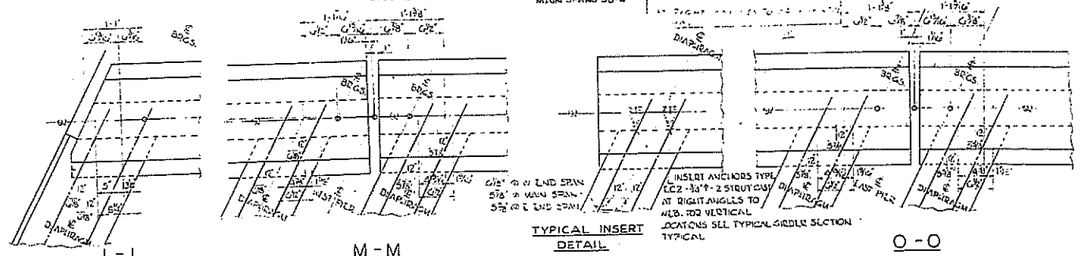
1337-68-1



HALF PLAN OF GIRDER LAYOUT

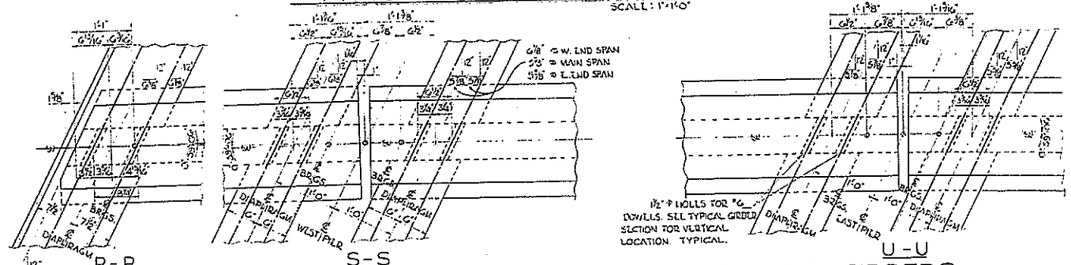
SYMMETRICAL ABOUT ℄ LINE 'A'
OVER ALL LENGTHS OF GIRDERS - END SPANS 41'-0"
MAIN SPANS 58'-4"

NOTE: ℄ GIRDER ... AT RIGHT ANGLES TO ℄ BRGS.



TYPICAL DETAILS FOR EXTERIOR OUTER GIRDER

SCALE: 1"=1'-0"



TYPICAL DETAILS FOR INTERIOR GIRDERS

SCALE: 1"=1'-0"

1½"ø HOLES FOR "G" DOWELS. SEE TYPICAL GIRDER SECTION FOR VERTICAL LOCATION. TYPICAL.

"G" DOWELS - 4'-8" LONG TYPICAL

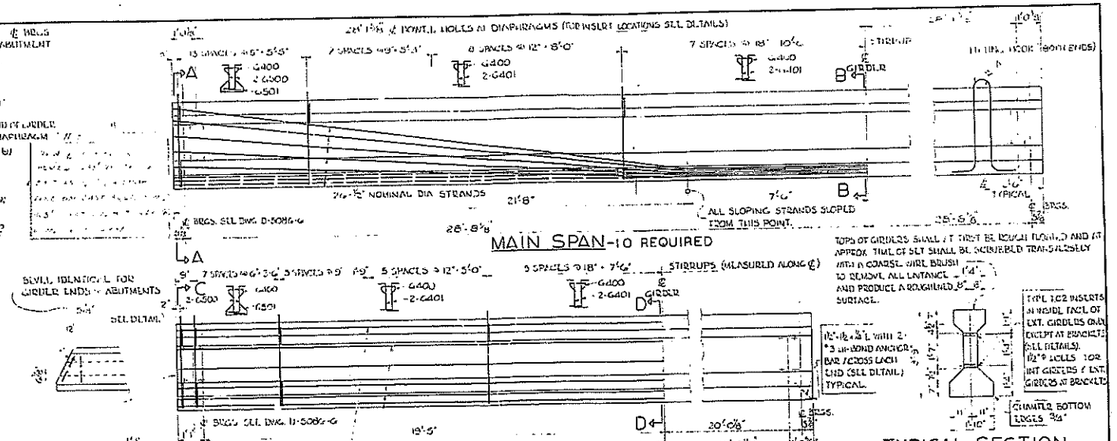
"G" DOWELS - 4'-6" LONG TYPICAL

1½"ø HOLES FOR "G" DOWELS. SEE TYPICAL GIRDER SECTION FOR VERTICAL LOCATION. TYPICAL AT BRACKETS.

DETAILS FOR EXTERIOR INNER GIRDERS AT BRACKETS

SCALE: 1"=1'-0"

NOTE - DETAILS Y-Y & Z-Z SIMILAR TO U-U & V-V RESPECT. EXCEPT WHERE MARKED ✱ ON W-W & X-X

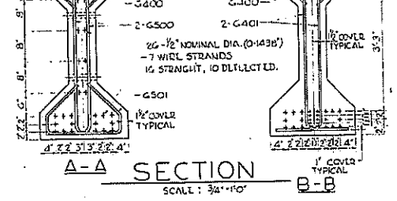


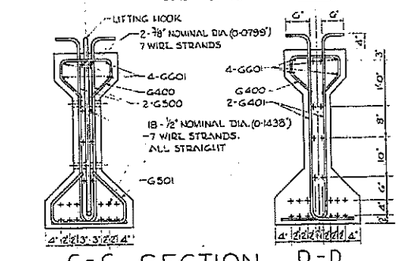
HALF ELEVATION OF GIRDER

SCALE: 3/8"=1'-0"

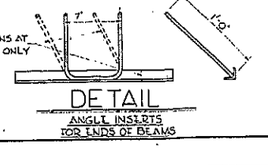
STRANDS AND REINFORCING SYMMETRICAL ABOUT ℄ GIRDER SPAN

¾"ø BOLTS - 2'-6" LONG. THREADED AT ONE END TO MATCH INSERTS. BENT TO CORRECT ANGLE AFTER SCREWING INTO INSERTS. TYPICAL.





SCALE: 3/4"=1'-0"



NOTES

1. WORKING FORCE PER GIRDER AFTER ALL LOSSES INCLUDING THOSE DUE TO CREEP AND SHRINKAGE OF CONCRETE AND CREEP OF STEEL SHALL BE:
   FOR MAIN SPAN - 2Q = 18-67 + 500-22 KIPS
   FOR END SPANS = (18 + 19-39) + (2 × 10-781) = 370-58 KIPS.
   THE TOTAL LOSS IN STEELS IN PRETENSIONING STEEL SHALL BE ASSUMED TO BE
   FOR MAIN SPAN - 35,000 p.s.i.
   FOR END SPANS - 28,000 p.s.i.
2. CONCRETE STRENGTH AT 28 DAYS 5,000 p.s.i., 4,000 p.s.i. AT TIME OF STRAND RELEASE.
3. PRESTRESSING STEEL - SEE ONT. HIGHWAY BRIDGE DESIGN CODE, 1966 AND SPECIAL PROVISIONS.
4. ANCHOR INSERTS FOR ¾"ø DOWELS SHALL BE CAPABLE OF DEVELOPING FULL STRENGTH OF DOWELS. ¾"ø DOWELS FOR EXTERIOR GIRDERS SHALL BE THREADED AT ONE END TO MATCH INSERTS. ALL DOWELS AND INSERTS SHALL BE SUPPLIED AND SET (OR GROUTED) BY THE PRESTRESSED CONCRETE CONTRACTOR.
5. ENDS OF STRANDS SHALL BE BURNED AND GROUND FLUSH WITH THE GIRDER END AND PAINTED WITH ROOFING ASPHALT OR COAL TAR.
6. GIRDERS MUST BE MAINTAINED HORIZONTAL AND IN AN UPRIGHT POSITION AT ALL TIMES. THEY SHALL BE HANDLED ONLY BY MEANS OF THE LIFTING HOOKS WHICH ARE PROVIDED AT ENDS.
7. CAMBER - GIRDER SOFFIT TO BE CAST STRAIGHT.
8. NON-PRESTRESSED REINFORCING SHALL BE INTERMEDIATE OR STRUCTURAL GRADE III BOND.
9. ALL GIRDER ENDS ARE TO BE CUT STRAIGHT.
10. ALL GIRDERS ARE A.A.S.H.O. TYPE III.
11. PRESTRESSED CONCRETE CONTRACTOR TO GROUT ALL 1½"ø HOLES IN INTERIOR GIRDERS AFTER REINFORCING FOR DIAPHRAGMS HAVE BEEN PLACED. DOWEL HOLES IN GIRDERS MAY BE PLACED AT 5⅞" : 12" BEVEL.

REVISIONS			
DATE	BY	DESCRIPTION	
SEPT/1965	A.E.S.	REVISED - AS CONSTRUCTED	⚠

TWP# 1337-175-7-19

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

C.N.R. OVERHEAD

2·5 MILES WEST OF E. JUNCTION OF HIGHWAY No. 25

KING'S HIGHWAY No. 5 — DIST. No. 4
CO. HALTON
EXCEPT TOWN OF BURLINGTON — LOT 4 & 5 — CON. INDS.

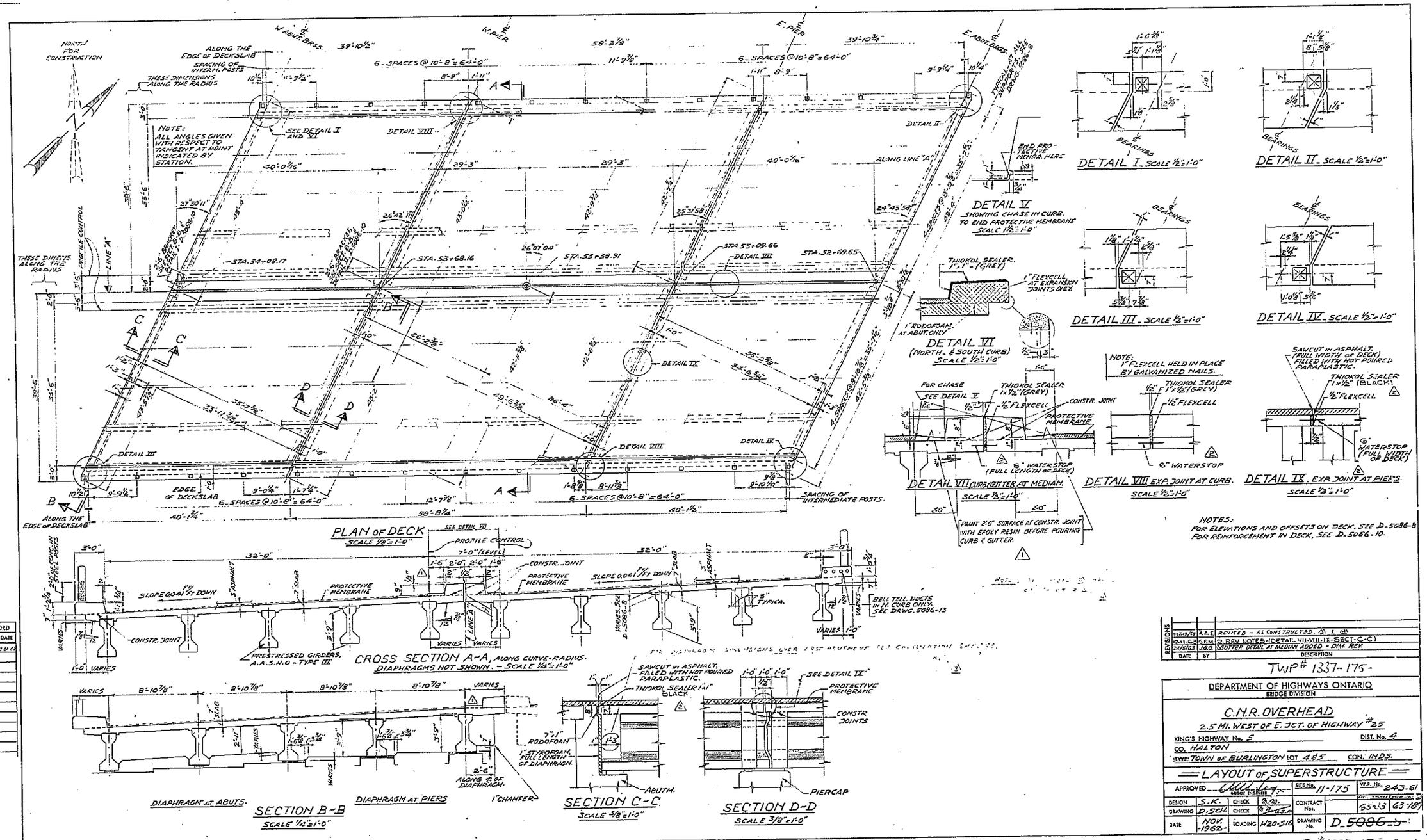
— PRESTRESSED GIRDERS —

APPROVED ... BRIDGE ENGINEER				SITE No. 11-175	W.P. No. 243-61
DESIGN	S.K.	CHECK	M.M.	CONTRACT No.	63-33 63-189
DRAWING	J.H.I.	CHECK			
DATE	NOV. 1962	LOADING	H20 S16	DRAWING No.	D-5086-7

7-68-7

PRINT RECORD
No. | FOR | DATE
3 Ve.5 1100

N.W.G.A. CRONAFLEX 1003-3-65



PRINT RECORD		
No.	FOR	DATE
3	TO C. & E.	3 OCT. 63

REVISIONS		
SEPT. 19/63	A.E.S.	REVISED - AS CONSTRUCTED. (2) & (3)
DEC. 11-63	S.E.M.	2. REV. NOTES (DETAIL VII-VIII-IX-SECT. C-C)
JAN. 15/63	J.G.G.	GUTTER DETAIL AT MEDIAN ADDED - DIM. REV.
DATE	BY	DESCRIPTION

TWP # 1337-175-

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

C.N.R. OVERHEAD
2.5 MI. WEST OF E. JCT. OF HIGHWAY #25

KING'S HIGHWAY No. 5 — DIST. No. 4
CO. HALTON
TWP. TOWN OF BURLINGTON — LOT 4 & 5 — CON. IN D.S.

LAYOUT OF SUPERSTRUCTURE

APPROVED ____ BRIDGE ENGINEER
SITE No. 11-175 — W.P. No. 243-61

DESIGN	S.K.	CHECK	A.M.	CONTRACT Nos.	63-33 / 63-78
DRAWING	D.SCH.	CHECK	A.M. / A.E.S.		
DATE	NOV. 1962	LOADING	H20-S16	DRAWING No.	D-5086

TWP # 1337-175-2-1

N.W.C.L. ENGRAFLEX 12th ed

NORTH FOR CONSTRUCTION

CURB STEEL TO FOLLOW CURVE OF CURB - BENT IN FIELD - TYPICAL -

W. ABUT. ℄ BRGS.

℄ WEST PIER

℄ EAST PIER

26 - DC 503 @16, STIRRUPS IN NORTH CURB
26 - DC 503 @18, STIRRUPS IN SOUTH CURB

38 - DC 502 @18, STIRRUPS IN NORTH CURB
39 - DC 503 @18, STIRRUPS IN SOUTH CURB

DETAIL III

DC 501, IN CURB

2 - D505 - TOP & BOTT. CUTS, BARS TO FOLLOW CURVE OF DECK (BENT IN FIELD) - TYPICAL -

2 - DC 504 IN CURB

DC 505, IN CURB

DC 505, IN CURB

1 - DC 504 IN CURB

1 - DC 504, IN CURB

MIN. LAP 1'-9"

2 - D503, TOP & BOTT.

2 - B601 TYP. PIER DIA'S.

2 - D504, TOP & BOTT.

2 - D505 - TOP & BOTT.

2 - D503, TOP & BOTT.

1 - D509, TOP

6 - D506 - @15, TOP
6 - D504 - @15, BOTT.

6 - D505 - TOP & BOTT. @15

6 - D506 - @15, TOP
6 - D504 - @15, BOTT.

6 - D503, TOP & BOTT. @15

TYPICAL DETAIL OF TRANSVERSE REINFORCEMENT

2 - B601 TYPICAL

5 - B501 @15, AT SUPPORTS - TYPICAL -

DIRECTION OF SPACING

5 - B501 @15, AT SUPPORTS - TYPICAL -

MIN. LAP 1'-9"

MIN. LAP 1'-9"

MIN. LAP 1'-9"

MIN. LAP 2'-0" TYPICAL

GIRDER

4 FT. MEDIAN CURB

1 - D503, TOP ON ℄ GIRDERS

1 - D506, TOP ON ℄ GIRDERS

2 - B601 TYPICAL

1 - D505 TOP ON ℄ GIRDERS

1 - D506 TOP ON ℄ GIRDERS

69 - D507 @6, TOP

99 - D507 @6, TOP

6" TYPICAL

2 - B 601 IN ABUT. DIAPH. SEE SECT D-D - TYPICAL -

69 - D501 @6, BOTT

99 - D501 @6, BOTT

69 - D508 @6, TOP

1 - D509 TOP

99 - D508 @6, TOP

1 - DC 507 IN MEDIAN CURB

LINE "A"

1 - DC 507 IN MEDIAN CURB

3 - D503 - T & B

3 - D504 - T & B

3 - D504 - T & B

3 - D505 - T & B

3 - D503 - T & B

DETAIL I

69 - D502 @6, BOTT.

2 - DC 501 - IN MEDIAN CURB

DETAIL II

99 - D502 @6, BOTT.

2 - DC 507, IN MEDIAN CURB

2 - DC 505 - IN MEDIAN CURB

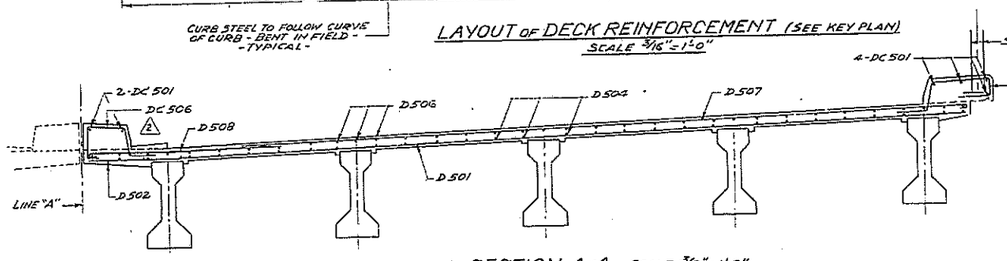
2 - DC 505 - IN MEDIAN CURB

26 - DC 506 - @18, STIRRUPS IN MEDIAN

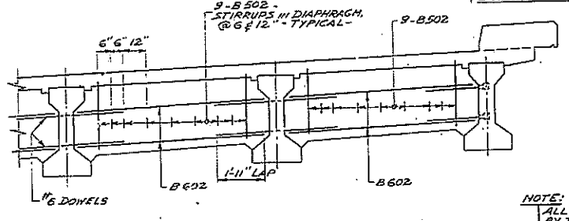
38 - DC 506 - @18, STIRRUPS IN MEDIAN

CURB STEEL TO FOLLOW CURVE OF CURB - BENT IN FIELD - TYPICAL -

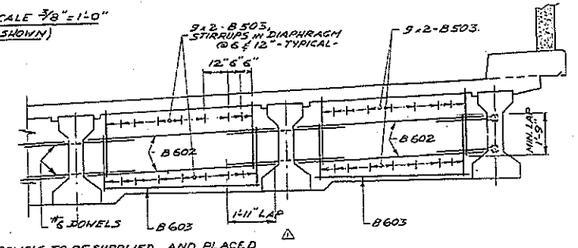
LAYOUT OF DECK REINFORCEMENT (SEE KEY PLAN)
SCALE 3/16" = 1'-0"



SECTION A-A - SCALE 3/8" = 1'-0"
(DIAPHRAGMS NOT SHOWN)

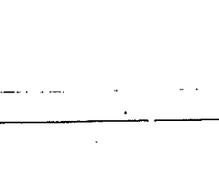


SECTION B-B, SCALE 3/8" = 1'-0"
DIAPHRAGMS AT ABUTMENTS

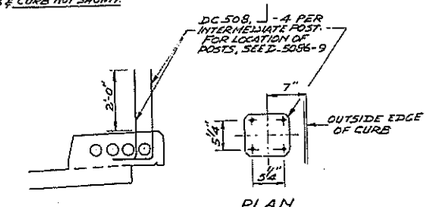


NOTE: ALL #6 DOWELS TO BE SUPPLIED AND PLACED BY THE PRESTRESSED CONCR. CONTRACTOR

SECTION C-C, SCALE 3/8" = 1'-0"
DIAPHRAGMS AT PIERS.

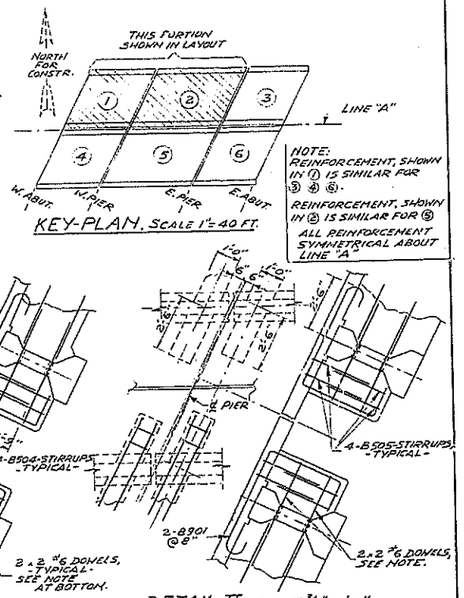


DETAIL III - SCALE 1" = 1'-0"
SHOWING DIAPHRAGM & EXTERIOR GIRDER AT ABUTMENT. DECKSLAB & CURB NOT SHOWN.



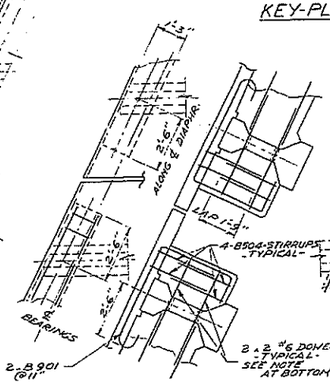
DETAIL IV
SCALE 1/2" = 1'-0"

PLAN
SCALE 1" = 1'-0"



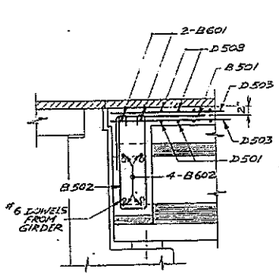
NOTE: REINFORCEMENT, SHOWN IN ① IS SIMILAR FOR ③ ④ ⑥.
REINFORCEMENT, SHOWN IN ② IS SIMILAR FOR ⑤
ALL REINFORCEMENT SYMMETRICAL ABOUT LINE "A"

KEY-PLAN, SCALE 1" = 40 FT.

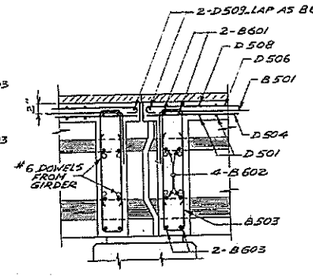


DETAIL I, SCALE 3/8" = 1'-0"

DETAIL II, SCALE 3/8" = 1'-0"



SECTION D-D, SCALE 1/2" = 1'-0"



SECTION E-E, SCALE 1/2" = 1'-0"

REVISIONS			
DEC 13/62	A.E.S.	REVISED - AS CONSTRUCTED.	
24 5 63	J.G.G.	Δ GUTTER ADDED	
20 2 64	J.G.G.	Δ NOTE REVISED RE. DOWELS IN SECTION "C-C"	
DATE	BY	DESCRIPTION	

TWP. # 1337-175- : -A

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

C.N.R. OVERHEAD
2.5 MI. WEST OF E. JCT. OF HIGHWAY No. 25

KING'S HIGHWAY No. 5 — DIST. No. 4
CO. HALTON
TWP. TOWN OF BURLINGTON LOT 4 & 5 CON. IN DS.

REINFORCEMENT OF SUPERSTRUCTURE

APPROVED _____ BRIDGE ENGINEER

SITE No. 11-175 — W.P. No. -61

DESIGN	S.K.	CHECK		CONTRACT No.	63-33	63-189
DRAWING	D.SCH.	CHECK				
DATE	NOV. 1962	LOADING	M20-S16	DRAWING No.	D-5086-10	

PRINT RECORD		
No.	FOR	DATE
3	CO. E.	JULY

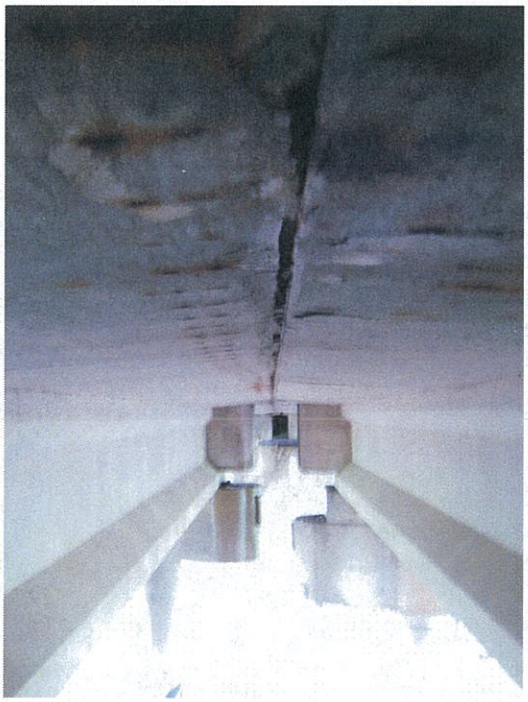
N.W.C.L. CROMAFLEX 2000-1-44

APPENDIX B
SITE PHOTGRAPHS

DECK LAYOUT

ELEVATION VIEW

UNDERSIDE VIEW



LONGITUDINAL EXPANSION JOINT

APPENDIX C
ANALYSIS RESULTS

RUN #1: END SPAN, INTERIOR GIRDER, 3 LANES LOADED

	ULS1 Results, calculated using Section 3 design load factors.									
x/L	$M_{max,f}$ kNm	$M_{min,f}$ kNm	$M_{max,R}$ kNm	$M_{min,R}$ kNm	|Mr/Mf|	$V_{max,f}$ kN	$V_{min,f}$ kN	$V_{max,R}$ kN	$V_{min,R}$ kN	|Vr/Vf|
0.0						784	162	1206	1206	1.54
0.1						661	103	842	842	1.27
0.2						538	28	713	713	1.33
1.0						784	157	1057	1206	1.35
0.5	2071	446	3368	3368	1.63					

RUN #2: END SPAN, EXTERIOR GIRDER, 3 LANES LOADED

	ULS1 Results, calculated using Section 3 design load factors.									
x/L	$M_{max,f}$ kNm	$M_{min,f}$ kNm	$M_{max,R}$ kNm	$M_{min,R}$ kNm	|Mr/Mf|	$V_{max,f}$ kN	$V_{min,f}$ kN	$V_{max,R}$ kN	$V_{min,R}$ kN	|Vr/Vf|
0.0						779	159	1206	1206	1.55
0.1						658	100	842	842	1.28
0.2						536	26	713	713	1.33
1.0						779	154	1059	1206	1.36
0.5	2057	436	3358	3358	1.63					

RUN #3: MAIN SPAN, INTERIOR GIRDER, 3 LANES LOADED

	ULS1 Results, calculated using Section 3 design load factors.									
x/L	$M_{max,f}$ kNm	$M_{min,f}$ kNm	$M_{max,R}$ kNm	$M_{min,R}$ kNm	|Mr/Mf|	$V_{max,f}$ kN	$V_{min,f}$ kN	$V_{max,R}$ kN	$V_{min,R}$ kN	|Vr/Vf|
0.0						977	223	1209	1209	1.24
0.1						827	162	919	919	1.11
0.2						669	66	773	773	1.16
0.3										
0.4										
0.5	3868	1031	5308	5308	1.37					

RUN #4: MAIN SPAN, EXTERIOR GIRDER, 3 LANES LOADED

	ULS1 Results, calculated using Section 3 design load factors.									
x/L	$M_{max,f}$ kNm	$M_{min,f}$ kNm	$M_{max,R}$ kNm	$M_{min,R}$ kNm	|Mr/Mf|	$V_{max,f}$ kN	$V_{min,f}$ kN	$V_{max,R}$ kN	$V_{min,R}$ kN	|Vr/Vf|
0.0	-75	-127	-1843	-1843	14.50	994	236	1209	1209	1.22
0.1	1497	334	4559	4559	3.05	822	158	919	919	1.12
0.2	2552	628	4833	4833	1.89	665	63	773	773	1.16
0.3	3349	838	5105	5105	1.52	522	-34	728	-661	1.39
0.4	3763	966	5293	5293	1.41	380	-138	503	-624	1.32
0.5	3843	1012	5293	5293	1.38	241	-241	569	-624	2.36

CNR OVERHEAD STRUCTURE: CANBAS IKODES

CANBAS IKODE 35: Shear @ x/L=1.0 for End Span Girder (Run 9)

CL.8.9.3.11 Longitudinal reinforcement on the flexural tension side

Longitudinal reinforcement on the flexural tension side shall be proportioned so that at all sections the factored resistance of the reinforcement, taking account of the stress that can be developed in this reinforcement, is greater than or equal to $F_{\ell t}$, calculated as follows:

$$F_{\ell t} = \frac{M_f}{d_v} + 0.5N_f + \left(V_f - 0.5V_s - V_p\right)\cot\theta$$

where M_f and V_f are taken as positive quantities and N_f is positive for axial tension and negative for axial compression. In this equation, d_v may be taken as the flexural lever arm at the factored resistance.

CL.8.9.3.12 Longitudinal reinforcement on the flexural compression side

Longitudinal reinforcement on the flexural compression side of the section shall be proportioned so that the factored tensile resistance of this reinforcement, taking account of the stress that can be developed in this reinforcement, shall be greater than or equal to the force $F_{\ell c}$, calculated as follows:

$$F_{\ell c} = 0.5N_f + \left(V_f - 0.5V_s - V_p\right)\cot\theta - \frac{M_f}{d_v}$$

where M_f and V_f are taken as positive quantities and N_f is positive for axial tension and negative for axial compression.

Discussion of IKODE 35:

The pre-stressed girders do not have any longitudinal reinforcement on the flexural tension side. Check if the prestressed strands can handle F_{lt} at x/L=1.0:

F_{lt} = 187.4[T]+0.5*233.1[C]+(814.4-0.5*885-0)cot 42°
F_{lt} = 70.85[T]+413.04[T]
F_{lt} = 483.89 kN [T]

Working force per girder after all losses including those due to creep and shrinkage of concrete of steel is 370.58 kips = 1648.42 kN. Therefore, longitudinal reinforcement on flexural tension side is not required.

The pre-stressed girders have longitudinal reinforcement on the flexural compression side. Check adequacy of longitudinal reinforcement for F_{lc} at x/L=1.0:

F_{lc} = 0.5*233.1[C]+(814.4-0.5*885-0)cot 42°-187.4[T]
F_{lc} = -116.55+413.04-187.4
F_{lc} = 109.09 kN [T]

$T_r = 4(0.95)(275MPa)(284mm^2)$
T_r = 296.78 kN

Therefore, longitudinal reinforcement on flexural compression side is adequate.

Lastly, since the span is simply supported, bending moment and shears should be similar at locations x/L=0.0 and x/L=1.0. Both ends of the girder are also designed to have the same number of prestressing

strands and top girder rebar. However, CANBAS does not report problems with x/L=0.0, rather only with x/L=1.0. Thus, this violation may not be valid.

CANBAS IKODE 36: Stirrup spacing = 305mm @ various locations

8.14.6 Maximum spacing of reinforcement for shear and torsion

If V_f is less than or equal to ($0.10\ \phi_c f_c' b_v d_v + V_p$) and T_f is less than or equal to $0.25T_{cr}$, the spacing of the transverse reinforcement, s, measured in the longitudinal direction, shall not exceed the lesser of 600 mm or $0.75d_v$.

If V_f exceeds ($0.10\ \phi_c f_c' b_v d_v + V_p$), or if T_f exceeds $0.25T_{cr}$, s shall not exceed the lesser of 300 mm or $0.33d_v$.

The spacing of the transverse reinforcement, s, measured in the longitudinal direction shall not exceed the lesser of
(a) 600 mm or $0.75d_v$ if the nominal shear stress is less than $0.10\phi_c f_c'$; and
(b) 300 mm or $0.33d_v$ if the nominal shear stress equals or exceeds $0.10\phi_c f_c'$.

The spacing of longitudinal bars for torsion distributed around the perimeter of the stirrups shall not exceed 300 mm. At least one longitudinal bar with a diameter not less than 0.06 times the spacing of the stirrups and not smaller than 15M shall be placed inside each corner of the closed stirrups. The corner bars shall be anchored in accordance with Clause 8.15.2 or 8.15.5.

Discussion of IKODE 36:
Since the girder locations in violation of CAN/CSA-S6-06, Cl. 8.14.6 have a stirrup spacing of 305 mm instead of 300 mm, it is considered a minor discrepancy and not a cause for concern.

CANBAS IKODE 40: @ x/L=0.10 & others, End Span, Interior Girder (Run 9)

8.9.5.1 General

A crack shall be assumed to occur along the shear plane and the relative displacement shall be considered to be resisted by cohesion and friction maintained by the shear-friction reinforcement crossing the crack.

In lieu of more detailed calculations, the shear resistance of the plane, v, may be calculated as $\phi_c (c + \mu\sigma)$, but v shall not exceed $0.25\phi_c f_c'$ or 6.5 MPa. c and μ shall be as specified in Clause 8.9.5.2 and σ shall be as specified in Clause 8.9.5.3.

8.9.5.2 Values of c and μ

8.9.5.2.1

The following values shall be taken for c and μ in Clause 8.9.5.1:
(a) For concrete placed against hardened concrete, with the surface clean and free of laitance but not intentionally roughened, c shall equal 0.25 MPa and μ shall equal $0.60\lambda_1$.
(b) For concrete placed against hardened concrete, with the surface clean and free of laitance and intentionally roughened to a full amplitude of about 5 mm and a spacing of about 15 mm, c shall equal 0.50 MPa and μ shall equal $1.00\lambda_1$.
(c) For concrete placed monolithically, c shall equal 1.00 MPa and μ shall equal $1.40\lambda_1$.
The values of λ_1 shall be as specified in Clause 8.9.5.2.2.

8.9.5.2.2 Values of λ_1

The values of λ_1 shall be as follows:
(a) normal-density concrete: 1;
(b) semi-low-density concrete: 0.85; and

(c) low-density concrete: 0.75.

8.9.5.3 Value of σ

The value of σ in Clause 8.9.5.1 shall be calculated as follows:

$$\sigma = \rho_v f_y + \frac{N}{A_{cv}}$$

where

$$\rho_v = \frac{A_{vf}}{A_{cv}}$$

Discussion of IKODE 40:

Calculate shear resistance of the plane, v, @ x/L=0.10, End Span, Interior Girder and check for adequacy against shear stress.

f'_c= 34.5MPa for prestressed girders
f'_c= 27.6MPa for deck slab

For surface intentionally roughened, c=0.50MPa; $\mu=1.00\lambda_1$
λ_1=1.00 for normal density concrete

$v = 0.75(0.50MPa+\sigma)$ < min{0.25*0.75*27.6MPa,6.5MPa}
< 5.175MPa

$\sigma = \rho_v f_y + N/A_{cv}$
$\sigma = f_y * A_{vf}/A_{cv} + N/A_{cv}$

where f_y = 275MPa
A_{cv} = area of concrete resisting shear transfer = sb
A_{vf} = area of shear friction rebar = 258 mm^2 at x/L=0.10
v = shear resistance of shear friction plane
N = unfactored permanent load normal to the interface area

s = 228.6 mm
b = 406.4 mm
A_{cv} = 92903.04 mm^2

ω (deck slab) = 13.165 kN/m for t = 225mm
ω (asphalt) = 5.157 kN/m for t = 90 mm
$\Sigma\omega$ = 18.322 kN/m
$N = \Sigma\omega(L/2-x)$
N = 18.322kN/m(12.192m/2-1.2192m)
N = 89.35kN

σ = 275MPa*258/92903.04 + 89.35kN/92903.04mm^2
σ = 0.764MPa + 0.962MPa

v = 0.75(0.50 + 0.764 + 0.962)MPa
∴ v = 1669.5 kPa @ x/L=0.10, End Span, Interior Girder, rehab. Scenario
CANBAS results give v = 981MPa.

Let τ denote interface shear stress.

V_f = 563 kN {from CANBAS Run 9 results}
Q = (225mm)(2422mm)(225/2+184mm) = 1.6158 x 10^8mm^3
I = 171162 x 10^6 mm^4

τ = 563 kN x 1.6158 x 10^8mm^3/(171162 x 10^6 mm^4 x 406.4mm)

$\therefore$ τ = 1307.8 kPa

$\tau = V_fQ/(Ib)$ = 1276 kN {from CANBAS Run 9 results}

Thus, according to hand calculations, v > τ, indicating that reinforcement provided for the interface shear transfer is adequate.

Run # 1, Filename : 7108.1b1
End Span, Interior Girder, 3 lanes loaded

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - FLEXURE

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.

IKODE NO.	CODE CLAUSE
30	8.8.4.3 MIN. LONGITUDINAL R/F
31	8.8.4.5 MAX. LONGITUDINAL R/F
32	|Mr/Mf| < 1.0

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION
|Mr/Mf| = ABSOLUTE VALUE OF Mr/Mf
c/d = FACTOR DEFINED IN 8.8.4.5 ; A NEGATIVE VALUE OF c/d INDICATES Asc > As

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
LC/ 2	0.000	CHBDC	1 MIN	-33.	-1629.	-785.	0.214	49.8	0.578	0.027	0.22	
		CHBDC	1 MAX	-30.	-1629.	-785.	0.214	55.0	0.578	0.024	0.22	
		CHBDC	1	-33.	-1629.	-785.	0.214	49.8	0.578	0.027	0.22	
		CHBDC	1	-30.	-1629.	-785.	0.214	55.0	0.578	0.024	0.22	
		CHBDC	1	-30.	-1629.	-785.	0.214	55.0	0.578	0.024	0.22	
		CHBDC	1	-33.	-1629.	-785.	0.214	49.8	0.578	0.027	0.22	
LC/ 3	1.000	CHBDC	1 MIN	-134.	-1706.	-785.	0.208	12.7	0.552	0.105	0.23	
		CHBDC	1 MAX	-30.	-1706.	-785.	0.208	57.1	0.552	0.023	0.23	
		CHBDC	1	-129.	-1706.	-785.	0.208	13.3	0.552	0.100	0.23	
		CHBDC	1	-33.	-1706.	-785.	0.208	51.9	0.552	0.026	0.23	
		CHBDC	1	-30.	-1706.	-785.	0.208	56.1	0.552	0.024	0.23	
		CHBDC	1	-134.	-1706.	-785.	0.208	12.7	0.552	0.105	0.23	
1/ 3	0.000	CHBDC	1 MIN	-146.	-1723.	-785.	0.212	11.8	0.547	0.113	0.25	
		CHBDC	1 MAX	-40.	-1723.	-785.	0.212	42.6	0.547	0.031	0.25	
		CHBDC	1	-40.	-1723.	-785.	0.212	42.6	0.547	0.031	0.25	
		CHBDC	1	-45.	-1723.	-785.	0.212	38.2	0.547	0.035	0.25	
		CHBDC	1	-41.	-1723.	-785.	0.212	42.0	0.547	0.032	0.25	
		CHBDC	1	-146.	-1723.	-785.	0.212	11.8	0.547	0.113	0.25	
1/ 4	0.100	CHBDC	1 MIN	87.	3368.	1611.	0.086	38.8	0.574	0.034	0.10	
		CHBDC	1 MAX	820.	3368.	1611.	0.086	4.1	0.574	0.324	0.10	
		CHBDC	1	500.	3368.	1611.	0.086	6.7	0.574	0.197	0.10	
		CHBDC	1	820.	3368.	1611.	0.086	4.1	0.574	0.324	0.10	
		CHBDC	1	244.	3368.	1611.	0.086	13.8	0.574	0.096	0.10	

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
		CHBDC	1	178.	3368.	1611.	0.086	18.9	0.574	0.070	0.10	
1/ 5	0.200	CHBDC	1 MIN	237.	3368.	1545.	0.086	14.2	0.551	0.093	0.10	
		CHBDC	1 MAX	1401.	3368.	1545.	0.086	2.4	0.551	0.553	0.10	
		CHBDC	1	1004.	3368.	1545.	0.086	3.4	0.551	0.397	0.10	
		CHBDC	1	1401.	3368.	1545.	0.086	2.4	0.551	0.553	0.10	
		CHBDC	1	435.	3368.	1545.	0.086	7.7	0.551	0.172	0.10	
		CHBDC	1	317.	3368.	1545.	0.086	10.6	0.551	0.125	0.10	
1/ 5	0.300	CHBDC	1 MIN	346.	3368.	1498.	0.086	9.7	0.534	0.137	0.10	
		CHBDC	1 MAX	1780.	3368.	1498.	0.086	1.9	0.534	0.703	0.10	
		CHBDC	1	1418.	3368.	1498.	0.086	2.4	0.534	0.560	0.10	
		CHBDC	1	1780.	3368.	1498.	0.086	1.9	0.534	0.703	0.10	
		CHBDC	1	572.	3368.	1498.	0.086	5.9	0.534	0.226	0.10	
		CHBDC	1	417.	3368.	1498.	0.086	8.1	0.534	0.165	0.10	
1/ 6	0.400	CHBDC	1 MIN	416.	3368.	1470.	0.086	8.1	0.524	0.164	0.10	
		CHBDC	1 MAX	1995.	3368.	1470.	0.086	1.7	0.524	0.788	0.10	
		CHBDC	1	1679.	3368.	1470.	0.086	2.0	0.524	0.663	0.10	
		CHBDC	1	1995.	3368.	1470.	0.086	1.7	0.524	0.788	0.10	
		CHBDC	1	654.	3368.	1470.	0.086	5.1	0.524	0.258	0.10	
		CHBDC	1	477.	3368.	1470.	0.086	7.1	0.524	0.188	0.10	
1/ 6	0.500	CHBDC	1 MIN	446.	3368.	1461.	0.086	7.5	0.520	0.176	0.10	
		CHBDC	1 MAX	2071.	3368.	1461.	0.086	1.6	0.520	0.818	0.10	
		CHBDC	1	1836.	3368.	1461.	0.086	1.8	0.520	0.725	0.10	
		CHBDC	1	2020.	3368.	1461.	0.086	1.7	0.520	0.798	0.10	
		CHBDC	1	682.	3368.	1461.	0.086	4.9	0.520	0.269	0.10	
		CHBDC	1	497.	3368.	1461.	0.086	6.8	0.520	0.196	0.10	
1/ 6	0.600	CHBDC	1 MIN	437.	3368.	1470.	0.086	7.7	0.524	0.172	0.10	
		CHBDC	1 MAX	1995.	3368.	1470.	0.086	1.7	0.524	0.788	0.10	
		CHBDC	1	1995.	3368.	1470.	0.086	1.7	0.524	0.788	0.10	
		CHBDC	1	1679.	3368.	1470.	0.086	2.0	0.524	0.663	0.10	
		CHBDC	1	655.	3368.	1470.	0.086	5.1	0.524	0.258	0.10	
		CHBDC	1	477.	3368.	1470.	0.086	7.1	0.524	0.188	0.10	
1/ 7	0.700	CHBDC	1 MIN	386.	3368.	1498.	0.086	8.7	0.534	0.152	0.10	
		CHBDC	1 MAX	1780.	3368.	1498.	0.086	1.9	0.534	0.703	0.10	
		CHBDC	1	1780.	3368.	1498.	0.086	1.9	0.534	0.703	0.10	
		CHBDC	1	1419.	3368.	1498.	0.086	2.4	0.534	0.560	0.10	
		CHBDC	1	573.	3368.	1498.	0.086	5.9	0.534	0.226	0.10	
		CHBDC	1	418.	3368.	1498.	0.086	8.1	0.534	0.165	0.10	
1/ 7	0.800	CHBDC	1 MIN	282.	3368.	1545.	0.086	12.0	0.550	0.111	0.10	
		CHBDC	1 MAX	1402.	3368.	1545.	0.086	2.4	0.550	0.554	0.10	
		CHBDC	1	1402.	3368.	1545.	0.086	2.4	0.550	0.554	0.10	
		CHBDC	1	1005.	3368.	1545.	0.086	3.4	0.550	0.397	0.10	

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
		CHBDC	1	436.	3368.	1545.	0.086	7.7	0.550	0.172	0.10	
		CHBDC	1	318.	3368.	1545.	0.086	10.6	0.550	0.126	0.10	
1/ 8	0.900	CHBDC	1 MIN	138.	3368.	1610.	0.086	24.5	0.574	0.054	0.10	
		CHBDC	1 MAX	821.	3368.	1610.	0.086	4.1	0.574	0.324	0.10	
		CHBDC	1	821.	3368.	1610.	0.086	4.1	0.574	0.324	0.10	
		CHBDC	1	501.	3368.	1610.	0.086	6.7	0.574	0.198	0.10	
		CHBDC	1	245.	3368.	1610.	0.086	13.7	0.574	0.097	0.10	
		CHBDC	1	179.	3368.	1610.	0.086	18.8	0.574	0.071	0.10	
1/ 9	1.000	CHBDC	1 MIN	-89.	-1690.	-785.	0.205	19.0	0.557	0.070	0.22	
		CHBDC	1 MAX	-39.	-1690.	-785.	0.205	43.0	0.557	0.031	0.22	
		CHBDC	1	-43.	-1690.	-785.	0.205	38.9	0.557	0.034	0.22	
		CHBDC	1	-39.	-1690.	-785.	0.205	43.0	0.557	0.031	0.22	
		CHBDC	1	-39.	-1690.	-785.	0.205	42.9	0.557	0.031	0.22	
		CHBDC	1	-89.	-1690.	-785.	0.205	19.0	0.557	0.070	0.22	
RC/ 9	0.000	CHBDC	1 MIN	-8.	-1690.	-785.	0.205	****	0.557	0.006	0.22	
		CHBDC	1 MAX	42.	3361.	747.	0.085	79.5	0.267	0.017	0.10	
		CHBDC	1	42.	3361.	747.	0.085	79.5	0.267	0.017	0.10	
		CHBDC	1	38.	3361.	747.	0.085	88.2	0.267	0.015	0.10	
		CHBDC	1	42.	3361.	747.	0.085	79.7	0.267	0.017	0.10	
		CHBDC	1	-8.	-1690.	-785.	0.205	****	0.557	0.006	0.22	
RC/ 9	1.000	CHBDC	1 MIN	-43.	-1629.	-785.	0.214	38.3	0.578	0.035	0.22	
		CHBDC	1 MAX	-39.	-1629.	-785.	0.214	42.3	0.578	0.031	0.22	
		CHBDC	1	-39.	-1629.	-785.	0.214	42.3	0.578	0.031	0.22	
		CHBDC	1	-43.	-1629.	-785.	0.214	38.3	0.578	0.035	0.22	
		CHBDC	1	-39.	-1629.	-785.	0.214	42.3	0.578	0.031	0.22	
		CHBDC	1	-43.	-1629.	-785.	0.214	38.3	0.578	0.035	0.22	

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - SHEAR

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.
VIOLATION OF CL 8.9.3.11/12 MAY NOT BE CRITICAL IF USER ENSURES THAT CL 8.9.3.10 IS SATISFIED BY PROPER REBAR DETAILING.

IKODE NO.	CODE CLAUSE	N/C ---> NOT CALCULATED, STIRRUPS NOT REQUIRED AS PER CHBDC CLAUSE 8.9.1.2 FOR Vf
33	8.9.3.2	
35	8.9.3.11/12	
36	8.14.6	NOTE: THE APPLICABILITY OF IKODES 36 & 37 FOR SOLID SLAB SECTIONS MUST BE ASCERTAINED BY THE USER.
37	8.9.1.3	

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
LC/ 2	0.000	**** OPTIMIZED SHEAR = 0.0 - RESISTANCE NOT DONE ****												
LC/ 3	1.000	CHBDC	1	-310.	-1206.	1204.	320.	0.	1685.	398.	152.	35.	600.	
		CHBDC	1	-9.	-1206.	1208.	326.	0.	50.	398.	152.	N/C	N/C	
		CHBDC	1 MIN	-310.	-1206.	1202.	318.	0.	1687.	398.	152.	35.	600.	
		CHBDC	1 MAX	-9.	-1206.	1208.	326.	0.	50.	398.	152.	N/C	N/C	
		CHBDC	1	-12.	-1206.	1208.	326.	0.	68.	398.	152.	N/C	N/C	
		CHBDC	1	-310.	-1206.	1204.	320.	0.	1685.	398.	152.	35.	600.	
1/ 3	0.000	CHBDC	1	236.	1206.	1208.	326.	0.	1282.	398.	152.	35.	600.	
		CHBDC	1	166.	1206.	1208.	326.	0.	902.	398.	152.	35.	600.	
		CHBDC	1 MIN	162.	1206.	1208.	326.	0.	882.	398.	152.	35.	600.	
		CHBDC	1 MAX	784.	1206.	1032.	176.	0.	4267.	398.	152.	35.	300.	
		CHBDC	1	227.	1206.	1208.	326.	0.	1238.	398.	152.	35.	600.	
		CHBDC	1	236.	1206.	1208.	326.	0.	1282.	398.	152.	35.	600.	
1/ 4	0.100	CHBDC	1	141.	842.	517.	325.	0.	770.	258.	229.	53.	600.	
		CHBDC	1	423.	842.	517.	325.	0.	2315.	258.	229.	53.	600.	
		CHBDC	1 MIN	103.	842.	517.	325.	0.	563.	258.	229.	53.	600.	
		CHBDC	1 MAX	661.	842.	517.	325.	0.	3617.	258.	229.	53.	300.	
		CHBDC	1	182.	842.	517.	325.	0.	995.	258.	229.	53.	600.	
		CHBDC	1	133.	842.	517.	325.	0.	726.	258.	229.	53.	600.	
1/ 5	0.200	CHBDC	1	108.	713.	388.	325.	0.	589.	258.	305.	70.	600.	
		CHBDC	1	300.	713.	388.	325.	0.	1643.	258.	305.	70.	600.	
		CHBDC	1 MIN	28.	713.	388.	325.	0.	154.	258.	305.	N/C	N/C	
		CHBDC	1 MAX	536.	713.	388.	325.	0.	2945.	258.	305.	70.	300.	36

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
		CHBDC	1	137.	713.	388.	325.	0.	747.	258.	305.	70.	600.	
		CHBDC	1	100.	713.	388.	325.	0.	544.	258.	305.	70.	600.	
1/ 5	0.300	CHBDC	1	75.	713.	388.	325.	0.	408.	258.	305.	70.	600.	
		CHBDC	1	188.	713.	388.	325.	0.	1028.	258.	305.	70.	600.	
		CHBDC	1 MIN	-53.	-713.	388.	325.	0.	288.	258.	305.	N/C	N/C	
		CHBDC	1 MAX	426.	636.	372.	264.	0.	2330.	258.	305.	70.	600.	
		CHBDC	1	91.	713.	388.	325.	0.	498.	258.	305.	70.	600.	
		CHBDC	1	66.	713.	388.	325.	0.	363.	258.	305.	70.	600.	
1/ 6	0.400	CHBDC	1	41.	584.	259.	325.	0.	226.	258.	457.	N/C	N/C	
		CHBDC	1	86.	584.	259.	325.	0.	473.	258.	457.	105.	600.	
		CHBDC	1 MIN	-133.	-584.	259.	325.	0.	730.	258.	457.	105.	600.	
		CHBDC	1 MAX	324.	457.	237.	220.	0.	1775.	258.	457.	105.	600.	
		CHBDC	1	46.	584.	259.	325.	0.	249.	258.	457.	N/C	N/C	
		CHBDC	1	33.	584.	259.	325.	0.	182.	258.	457.	N/C	N/C	
1/ 6	0.500	CHBDC	1	8.	584.	259.	325.	0.	45.	258.	457.	N/C	N/C	
		CHBDC	1	-41.	-584.	259.	325.	0.	222.	258.	457.	N/C	N/C	
		CHBDC	1 MIN	-223.	-584.	259.	325.	0.	1218.	258.	457.	105.	600.	
		CHBDC	1 MAX	223.	495.	245.	250.	0.	1219.	258.	457.	105.	600.	
		CHBDC	1	0.	584.	259.	325.	0.	1.	258.	457.	N/C	N/C	
1/ 6	0.600	CHBDC	1	-25.	-584.	259.	325.	0.	136.	258.	457.	N/C	N/C	
		CHBDC	1	-86.	-584.	259.	325.	0.	471.	258.	457.	105.	600.	
		CHBDC	1 MIN	-324.	-457.	237.	220.	0.	1773.	258.	457.	105.	600.	
		CHBDC	1 MAX	134.	584.	259.	325.	0.	731.	258.	457.	105.	600.	
		CHBDC	1	-45.	-584.	259.	325.	0.	248.	258.	457.	N/C	N/C	
		CHBDC	1	-33.	-584.	259.	325.	0.	181.	258.	457.	N/C	N/C	
1/ 7	0.700	CHBDC	1	-70.	-713.	388.	325.	0.	382.	258.	305.	70.	600.	
		CHBDC	1	-188.	-713.	388.	325.	0.	1027.	258.	305.	70.	600.	
		CHBDC	1 MIN	-426.	-636.	372.	264.	0.	2329.	258.	305.	70.	600.	
		CHBDC	1 MAX	53.	713.	388.	325.	0.	289.	258.	305.	N/C	N/C	
		CHBDC	1	-91.	-713.	388.	325.	0.	497.	258.	305.	70.	600.	
		CHBDC	1	-66.	-713.	388.	325.	0.	362.	258.	305.	70.	600.	
1/ 7	0.800	CHBDC	1	-103.	-713.	388.	325.	0.	563.	258.	305.	70.	600.	
		CHBDC	1	-300.	-713.	388.	325.	0.	1642.	258.	305.	70.	600.	
		CHBDC	1 MIN	-538.	-713.	388.	325.	0.	2943.	258.	305.	70.	300.	36
		CHBDC	1 MAX	-28.	-713.	388.	325.	0.	153.	258.	305.	N/C	N/C	
		CHBDC	1	-136.	-713.	388.	325.	0.	745.	258.	305.	70.	600.	
		CHBDC	1	-99.	-713.	388.	325.	0.	543.	258.	305.	70.	600.	
1/ 8	0.900	CHBDC	1	-136.	-842.	517.	325.	0.	745.	258.	229.	53.	600.	
		CHBDC	1	-423.	-842.	517.	325.	0.	2313.	258.	229.	53.	600.	

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
		CHBDC	1 MIN	-661.	-842.	517.	325.	0.	3615.	258.	229.	53.	300.	
		CHBDC	1 MAX	-103.	-842.	517.	325.	0.	562.	258.	229.	53.	600.	
		CHBDC	1	-182.	-842.	517.	325.	0.	994.	258.	229.	53.	600.	
		CHBDC	1	-132.	-842.	517.	325.	0.	724.	258.	229.	53.	600.	
1/ 9	1.000	CHBDC	1	-231.	-1206.	1032.	326.	0.	1256.	398.	178.	41.	600.	35
		CHBDC	1	-166.	-1206.	1032.	326.	0.	901.	398.	178.	41.	600.	35
		CHBDC	1 MIN	-784.	-1057.	881.	176.	0.	4266.	398.	178.	41.	300.	35
		CHBDC	1 MAX	-157.	-1206.	1032.	326.	0.	857.	398.	178.	41.	600.	35
		CHBDC	1	-227.	-1206.	1032.	326.	0.	1236.	398.	178.	41.	600.	35
		CHBDC	1	-231.	-1206.	1032.	326.	0.	1256.	398.	178.	41.	600.	35
RC/ 9	0.000	CHBDC	1	303.	1206.	997.	277.	0.	1648.	398.	178.	41.	600.	35
		CHBDC	1	4.	1200.	1027.	325.	0.	22.	398.	178.	N/C	N/C	35
		CHBDC	1 MIN	4.	1200.	1027.	325.	0.	22.	398.	178.	N/C	N/C	35
		CHBDC	1 MAX	303.	1200.	1027.	325.	0.	1658.	398.	178.	41.	600.	35
		CHBDC	1	6.	1200.	1027.	325.	0.	31.	398.	178.	N/C	N/C	35
		CHBDC	1	303.	1206.	997.	277.	0.	1648.	398.	178.	41.	600.	35
RC/ 9	1.000	CHBDC	1 MAX	298.	1206.	1032.	326.	0.	1619.	398.	178.	41.	600.	35

Run #2, Filename: 7108.2b1
End Span, Exterior Girder, 3 lanes loaded

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - FLEXURE

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.

IKODE NO.	CODE CLAUSE
30	8.8.4.3 MIN. LONGITUDINAL R/F
31	8.8.4.5 MAX. LONGITUDINAL R/F
32	|Mr/Mf| < 1.0

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION
|Mr/Mf| = ABSOLUTE VALUE OF Mr/Mf
c/d = FACTOR DEFINED IN 8.8.4.5 ; A NEGATIVE VALUE OF c/d INDICATES Asc > As

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
LC/ 2	0.000	CHBDC	1 MIN	-33.	-1629.	-749.	0.214	49.8	0.552	0.027	0.22	
		CHBDC	1 MAX	-30.	-1629.	-749.	0.214	55.0	0.552	0.024	0.22	
		CHBDC	1	-30.	-1629.	-749.	0.214	55.0	0.552	0.024	0.22	
		CHBDC	1	-30.	-1629.	-749.	0.214	55.0	0.552	0.024	0.22	
		CHBDC	1	-30.	-1629.	-749.	0.214	55.0	0.552	0.024	0.22	
		CHBDC	1	-33.	-1629.	-749.	0.214	49.8	0.552	0.027	0.22	
LC/ 3	1.000	CHBDC	1 MIN	-134.	-1706.	-749.	0.208	12.7	0.527	0.105	0.23	
		CHBDC	1 MAX	-30.	-1706.	-749.	0.208	57.2	0.527	0.023	0.23	
		CHBDC	1	-129.	-1706.	-749.	0.208	13.3	0.527	0.100	0.23	
		CHBDC	1	-33.	-1706.	-749.	0.208	52.0	0.527	0.026	0.23	
		CHBDC	1	-30.	-1706.	-749.	0.208	56.2	0.527	0.024	0.23	
		CHBDC	1	-134.	-1706.	-749.	0.208	12.7	0.527	0.105	0.23	
1/ 3	0.000	CHBDC	1 MIN	-146.	-1723.	-749.	0.212	11.8	0.522	0.113	0.25	
		CHBDC	1 MAX	-40.	-1723.	-749.	0.212	42.6	0.522	0.031	0.25	
		CHBDC	1	-40.	-1723.	-749.	0.212	42.6	0.522	0.031	0.25	
		CHBDC	1	-45.	-1723.	-749.	0.212	38.2	0.522	0.035	0.25	
		CHBDC	1	-41.	-1723.	-749.	0.212	42.0	0.522	0.032	0.25	
		CHBDC	1	-146.	-1723.	-749.	0.212	11.8	0.522	0.113	0.25	
1/ 4	0.100	CHBDC	1 MIN	83.	3358.	1603.	0.092	40.4	0.573	0.033	0.10	
		CHBDC	1 MAX	815.	3358.	1603.	0.092	4.1	0.573	0.323	0.10	
		CHBDC	1	496.	3358.	1603.	0.092	6.8	0.573	0.196	0.10	
		CHBDC	1	815.	3358.	1603.	0.092	4.1	0.573	0.323	0.10	
		CHBDC	1	239.	3358.	1603.	0.092	14.1	0.573	0.095	0.10	

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
		CHBDC	1	174.	3358.	1603.	0.092	19.3	0.573	0.069	0.10	
1/ 5	0.200	CHBDC	1 MIN	230.	3358.	1541.	0.092	14.6	0.550	0.091	0.10	
		CHBDC	1 MAX	1392.	3358.	1541.	0.092	2.4	0.550	0.551	0.10	
		CHBDC	1	997.	3358.	1541.	0.092	3.4	0.550	0.395	0.10	
		CHBDC	1	1392.	3358.	1541.	0.092	2.4	0.550	0.551	0.10	
		CHBDC	1	426.	3358.	1541.	0.092	7.9	0.550	0.169	0.10	
		CHBDC	1	311.	3358.	1541.	0.092	10.8	0.550	0.123	0.10	
1/ 5	0.300	CHBDC	1 MIN	337.	3358.	1496.	0.092	10.0	0.535	0.134	0.10	
		CHBDC	1 MAX	1768.	3358.	1496.	0.092	1.9	0.535	0.700	0.10	
		CHBDC	1	1410.	3358.	1496.	0.092	2.4	0.535	0.558	0.10	
		CHBDC	1	1768.	3358.	1496.	0.092	1.9	0.535	0.700	0.10	
		CHBDC	1	560.	3358.	1496.	0.092	6.0	0.535	0.222	0.10	
		CHBDC	1	408.	3358.	1496.	0.092	8.2	0.535	0.162	0.10	
1/ 6	0.400	CHBDC	1 MIN	406.	3358.	1469.	0.092	8.3	0.525	0.161	0.10	
		CHBDC	1 MAX	1981.	3358.	1469.	0.092	1.7	0.525	0.785	0.10	
		CHBDC	1	1669.	3358.	1469.	0.092	2.0	0.525	0.661	0.10	
		CHBDC	1	1981.	3358.	1469.	0.092	1.7	0.525	0.785	0.10	
		CHBDC	1	641.	3358.	1469.	0.092	5.2	0.525	0.254	0.10	
		CHBDC	1	467.	3358.	1469.	0.092	7.2	0.525	0.185	0.10	
1/ 6	0.500	CHBDC	1 MIN	436.	3358.	1460.	0.092	7.7	0.522	0.173	0.10	
		CHBDC	1 MAX	2057.	3358.	1460.	0.092	1.6	0.522	0.815	0.10	
		CHBDC	1	1825.	3358.	1460.	0.092	1.8	0.522	0.723	0.10	
		CHBDC	1	2006.	3358.	1460.	0.092	1.7	0.522	0.795	0.10	
		CHBDC	1	668.	3358.	1460.	0.092	5.0	0.522	0.264	0.10	
		CHBDC	1	486.	3358.	1460.	0.092	6.9	0.522	0.193	0.10	
1/ 6	0.600	CHBDC	1 MIN	427.	3358.	1469.	0.092	7.9	0.525	0.169	0.10	
		CHBDC	1 MAX	1982.	3358.	1469.	0.092	1.7	0.525	0.785	0.10	
		CHBDC	1	1982.	3358.	1469.	0.092	1.7	0.525	0.785	0.10	
		CHBDC	1	1669.	3358.	1469.	0.092	2.0	0.525	0.661	0.10	
		CHBDC	1	641.	3358.	1469.	0.092	5.2	0.525	0.254	0.10	
		CHBDC	1	467.	3358.	1469.	0.092	7.2	0.525	0.185	0.10	
1/ 7	0.700	CHBDC	1 MIN	377.	3358.	1496.	0.092	8.9	0.535	0.149	0.10	
		CHBDC	1 MAX	1769.	3358.	1496.	0.092	1.9	0.535	0.700	0.10	
		CHBDC	1	1769.	3358.	1496.	0.092	1.9	0.535	0.700	0.10	
		CHBDC	1	1410.	3358.	1496.	0.092	2.4	0.535	0.558	0.10	
		CHBDC	1	561.	3358.	1496.	0.092	6.0	0.535	0.222	0.10	
		CHBDC	1	409.	3358.	1496.	0.092	8.2	0.535	0.162	0.10	
1/ 7	0.800	CHBDC	1 MIN	275.	3358.	1540.	0.092	12.2	0.550	0.109	0.10	
		CHBDC	1 MAX	1393.	3358.	1540.	0.092	2.4	0.550	0.552	0.10	
		CHBDC	1	1393.	3358.	1540.	0.092	2.4	0.550	0.552	0.10	
		CHBDC	1	998.	3358.	1540.	0.092	3.4	0.550	0.395	0.10	

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
		CHBDC	1	427.	3358.	1540.	0.092	7.9	0.550	0.169	0.10	
		CHBDC	1	311.	3358.	1540.	0.092	10.8	0.550	0.123	0.10	
1/ 8	0.900	CHBDC	1 MIN	134.	3358.	1602.	0.092	25.1	0.573	0.053	0.10	
		CHBDC	1 MAX	816.	3358.	1602.	0.092	4.1	0.573	0.323	0.10	
		CHBDC	1	816.	3358.	1602.	0.092	4.1	0.573	0.323	0.10	
		CHBDC	1	497.	3358.	1602.	0.092	6.8	0.573	0.197	0.10	
		CHBDC	1	240.	3358.	1602.	0.092	14.0	0.573	0.095	0.10	
		CHBDC	1	175.	3358.	1602.	0.092	19.2	0.573	0.069	0.10	
1/ 9	1.000	CHBDC	1 MIN	-89.	-1690.	-749.	0.205	19.0	0.532	0.070	0.22	
		CHBDC	1 MAX	-39.	-1690.	-749.	0.205	43.0	0.532	0.031	0.22	
		CHBDC	1	-43.	-1690.	-749.	0.205	38.9	0.532	0.034	0.22	
		CHBDC	1	-39.	-1690.	-749.	0.205	43.0	0.532	0.031	0.22	
		CHBDC	1	-39.	-1690.	-749.	0.205	42.9	0.532	0.031	0.22	
		CHBDC	1	-89.	-1690.	-749.	0.205	19.0	0.532	0.070	0.22	
RC/ 9	0.000	CHBDC	1 MIN	-8.	-1690.	-749.	0.205	****	0.532	0.006	0.22	
		CHBDC	1 MAX	42.	3350.	741.	0.091	79.3	0.265	0.017	0.10	
		CHBDC	1	42.	3350.	741.	0.091	79.3	0.265	0.017	0.10	
		CHBDC	1	38.	3350.	741.	0.091	87.9	0.265	0.015	0.10	
		CHBDC	1	42.	3350.	741.	0.091	79.5	0.265	0.017	0.10	
		CHBDC	1	-8.	-1690.	-749.	0.205	****	0.532	0.006	0.22	
RC/ 9	1.000	CHBDC	1 MIN	-43.	-1629.	-749.	0.214	38.3	0.552	0.035	0.22	
		CHBDC	1 MAX	-39.	-1629.	-749.	0.214	42.3	0.552	0.031	0.22	
		CHBDC	1	-39.	-1629.	-749.	0.214	42.3	0.552	0.031	0.22	
		CHBDC	1	-43.	-1629.	-749.	0.214	38.3	0.552	0.035	0.22	
		CHBDC	1	-39.	-1629.	-749.	0.214	42.3	0.552	0.031	0.22	
		CHBDC	1	-43.	-1629.	-749.	0.214	38.3	0.552	0.035	0.22	

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - SHEAR

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.
VIOLATION OF CL 8.9.3.11/12 MAY NOT BE CRITICAL IF USER ENSURES THAT CL 8.9.3.10 IS SATISFIED BY PROPER REBAR DETAILING.

IKODE NO.	CODE CLAUSE	
33	8.9.3.2	N/C ---> NOT CALCULATED, STIRRUPS NOT REQUIRED AS PER CHBDC CLAUSE 8.9.1.2 FOR Vf
35	8.9.3.11/12	
36	8.14.6	NOTE: THE APPLICABILITY OF IKODES 36 & 37 FOR SOLID SLAB SECTIONS MUST BE ASCERTAINED BY THE USER.
37	8.9.1.3	

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED RESISTANCE SHEAR Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
LC/ 2	0.000			**** OPTIMIZED SHEAR = 0.0 - RESISTANCE NOT DONE ****										
LC/ 3	1.000	CHBDC	1	-309.	-1206.	1204.	320.	0.	1684.	398.	152.	35.	600.	
		CHBDC	1	-9.	-1206.	1208.	326.	0.	48.	398.	152.	N/C	N/C	
		CHBDC	1 MIN	-310.	-1206.	1202.	318.	0.	1686.	398.	152.	35.	600.	
		CHBDC	1 MAX	-9.	-1206.	1208.	326.	0.	48.	398.	152.	N/C	N/C	
		CHBDC	1	-12.	-1206.	1208.	326.	0.	67.	398.	152.	N/C	N/C	
		CHBDC	1	-309.	-1206.	1204.	320.	0.	1684.	398.	152.	35.	600.	
1/ 3	0.000	CHBDC	1	231.	1206.	1208.	326.	0.	1257.	398.	152.	35.	600.	
		CHBDC	1	162.	1206.	1208.	326.	0.	883.	398.	152.	35.	600.	
		CHBDC	1 MIN	159.	1206.	1208.	326.	0.	863.	398.	152.	35.	600.	
		CHBDC	1 MAX	778.	1206.	1034.	177.	0.	4242.	398.	152.	35.	300.	
		CHBDC	1	223.	1206.	1208.	326.	0.	1212.	398.	152.	35.	600.	
		CHBDC	1	231.	1206.	1208.	326.	0.	1257.	398.	152.	35.	600.	
1/ 4	0.100	CHBDC	1	138.	842.	517.	325.	0.	755.	258.	229.	53.	600.	
		CHBDC	1	420.	842.	517.	325.	0.	2294.	258.	229.	53.	600.	
		CHBDC	1 MIN	100.	842.	517.	325.	0.	547.	258.	229.	53.	600.	
		CHBDC	1 MAX	658.	842.	517.	325.	0.	3596.	258.	229.	53.	300.	
		CHBDC	1	178.	842.	517.	325.	0.	975.	258.	229.	53.	600.	
		CHBDC	1	130.	842.	517.	325.	0.	710.	258.	229.	53.	600.	
1/ 5	0.200	CHBDC	1	106.	713.	388.	325.	0.	577.	258.	305.	70.	600.	
		CHBDC	1	298.	713.	388.	325.	0.	1628.	258.	305.	70.	600.	
		CHBDC	1 MIN	26.	713.	388.	325.	0.	142.	258.	305.	N/C	N/C	
		CHBDC	1 MAX	536.	713.	388.	325.	0.	2930.	258.	305.	70.	300.	36

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
		CHBDC	1	134.	713.	388.	325.	0.	731.	258.	305.	70.	600.	
		CHBDC	1	97.	713.	388.	325.	0.	533.	258.	305.	70.	600.	
1/ 5	0.300	CHBDC	1	73.	713.	388.	325.	0.	400.	258.	305.	70.	600.	
		CHBDC	1	186.	713.	388.	325.	0.	1018.	258.	305.	70.	600.	
		CHBDC	1 MIN	-54.	-713.	388.	325.	0.	296.	258.	305.	N/C	N/C	
		CHBDC	1 MAX	424.	645.	374.	271.	0.	2320.	258.	305.	70.	600.	
		CHBDC	1	89.	713.	388.	325.	0.	488.	258.	305.	70.	600.	
		CHBDC	1	65.	713.	388.	325.	0.	355.	258.	305.	70.	600.	
1/ 6	0.400	CHBDC	1	41.	584.	259.	325.	0.	223.	258.	457.	N/C	N/C	
		CHBDC	1	86.	584.	259.	325.	0.	468.	258.	457.	105.	600.	
		CHBDC	1 MIN	-134.	-584.	259.	325.	0.	734.	258.	457.	105.	600.	
		CHBDC	1 MAX	324.	464.	239.	225.	0.	1769.	258.	457.	105.	600.	
		CHBDC	1	45.	584.	259.	325.	0.	244.	258.	457.	N/C	N/C	
		CHBDC	1	33.	584.	259.	325.	0.	178.	258.	457.	N/C	N/C	
1/ 6	0.500	CHBDC	1	8.	584.	259.	325.	0.	45.	258.	457.	N/C	N/C	
		CHBDC	1	41.	584.	259.	325.	0.	224.	258.	457.	N/C	N/C	
		CHBDC	1 MIN	-223.	-584.	259.	325.	0.	1218.	258.	457.	105.	600.	
		CHBDC	1 MAX	223.	502.	246.	256.	0.	1219.	258.	457.	105.	600.	
		CHBDC	1	0.	584.	259.	325.	0.	1.	258.	457.	N/C	N/C	
1/ 6	0.600	CHBDC	1	-24.	-584.	259.	325.	0.	132.	258.	457.	N/C	N/C	
		CHBDC	1	-85.	-584.	259.	325.	0.	466.	258.	457.	105.	600.	
		CHBDC	1 MIN	-323.	-464.	239.	225.	0.	1768.	258.	457.	105.	600.	
		CHBDC	1 MAX	134.	584.	259.	325.	0.	735.	258.	457.	105.	600.	
		CHBDC	1	-44.	-584.	259.	325.	0.	243.	258.	457.	N/C	N/C	
		CHBDC	1	-32.	-584.	259.	325.	0.	177.	258.	457.	N/C	N/C	
1/ 7	0.700	CHBDC	1	-68.	-713.	388.	325.	0.	374.	258.	305.	70.	600.	
		CHBDC	1	-186.	-713.	388.	325.	0.	1017.	258.	305.	70.	600.	
		CHBDC	1 MIN	-424.	-645.	374.	271.	0.	2318.	258.	305.	70.	600.	
		CHBDC	1 MAX	54.	713.	388.	325.	0.	297.	258.	305.	N/C	N/C	
		CHBDC	1	-89.	-713.	388.	325.	0.	486.	258.	305.	70.	600.	
		CHBDC	1	-65.	-713.	388.	325.	0.	354.	258.	305.	N/C	N/C	
1/ 7	0.800	CHBDC	1	-101.	-713.	388.	325.	0.	552.	258.	305.	70.	600.	
		CHBDC	1	-297.	-713.	388.	325.	0.	1626.	258.	305.	70.	600.	
		CHBDC	1 MIN	-535.	-713.	388.	325.	0.	2928.	258.	305.	70.	300.	36
		CHBDC	1 MAX	-26.	-713.	388.	325.	0.	141.	258.	305.	N/C	N/C	
		CHBDC	1	-133.	-713.	388.	325.	0.	730.	258.	305.	70.	600.	
		CHBDC	1	-97.	-713.	388.	325.	0.	532.	258.	305.	70.	600.	
1/ 8	0.900	CHBDC	1	-133.	-842.	517.	325.	0.	729.	258.	229.	53.	600.	
		CHBDC	1	-419.	-842.	517.	325.	0.	2293.	258.	229.	53.	600.	

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
		CHBDC	1 MIN	-657.	-842.	517.	325.	0.	3595.	258.	229.	53.	300.	
		CHBDC	1 MAX	-100.	-842.	517.	325.	0.	546.	258.	229.	53.	600.	
		CHBDC	1	-178.	-842.	517.	325.	0.	973.	258.	229.	53.	600.	
		CHBDC	1	-130.	-842.	517.	325.	0.	709.	258.	229.	53.	600.	
1/ 9	1.000	CHBDC	1	-226.	-1206.	1032.	326.	0.	1231.	398.	178.	41.	600.	
		CHBDC	1	-162.	-1206.	1032.	326.	0.	882.	398.	178.	41.	600.	
		CHBDC	1 MIN	-778.	-1059.	883.	177.	0.	4240.	398.	178.	41.	300.	
		CHBDC	1 MAX	-154.	-1206.	1032.	326.	0.	838.	398.	178.	41.	600.	
		CHBDC	1	-222.	-1206.	1032.	326.	0.	1211.	398.	178.	41.	600.	
		CHBDC	1	-226.	-1206.	1032.	326.	0.	1231.	398.	178.	41.	600.	
RC/ 9	0.000	CHBDC	1	303.	1206.	997.	277.	0.	1647.	398.	178.	41.	600.	
		CHBDC	1	4.	1200.	1027.	325.	0.	22.	398.	178.	N/C	N/C	
		CHBDC	1 MIN	4.	1200.	1027.	325.	0.	22.	398.	178.	N/C	N/C	
		CHBDC	1 MAX	303.	1200.	1027.	325.	0.	1657.	398.	178.	41.	600.	
		CHBDC	1	6.	1200.	1027.	325.	0.	30.	398.	178.	N/C	N/C	
		CHBDC	1	303.	1206.	997.	277.	0.	1647.	398.	178.	41.	600.	
RC/ 9	1.000	CHBDC	1 MAX	297.	1206.	1032.	326.	0.	1619.	398.	178.	41.	600.	

Main Span, Interior Girder, 3 lanes loaded

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - FLEXURE

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.

IKODE NO.	CODE CLAUSE
30	8.8.4.3 MIN. LONGITUDINAL R/F
31	8.8.4.5 MAX. LONGITUDINAL R/F
32	|Mr/Mf| < 1.0

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION
|Mr/Mf| = ABSOLUTE VALUE OF Mr/Mf
c/d = FACTOR DEFINED IN 8.8.4.5 ; A NEGATIVE VALUE OF c/d INDICATES Asc > As

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED [redacted] (kN-m)	(FACTORED) RESISTANCE [redacted] Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	[redacted]	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
LC/ 2	0.000	CHBDC	1 MIN	-55.	-1748.	-785.	0.250	31.7	0.539	0.042	0.25	
		CHBDC	1 MAX	-50.	-1748.	-785.	0.250	35.0	0.539	0.038	0.25	
		CHBDC	1	-55.	-1748.	-785.	0.250	31.7	0.539	0.042	0.25	
		CHBDC	1	-50.	-1748.	-785.	0.250	35.0	0.539	0.038	0.25	
		CHBDC	1	-50.	-1748.	-785.	0.250	35.0	0.539	0.038	0.25	
		CHBDC	1	-55.	-1748.	-785.	0.250	31.7	0.539	0.042	0.25	
LC/ 2	1.000	CHBDC	1 MIN	-100.	-1728.	-785.	0.248	17.2	0.545	0.077	0.25	
		CHBDC	1 MAX	-51.	-1728.	-785.	0.248	34.1	0.545	0.039	0.25	
		CHBDC	1	-100.	-1728.	-785.	0.248	17.2	0.545	0.077	0.25	
		CHBDC	1	-51.	-1728.	-785.	0.248	34.1	0.545	0.039	0.25	
		CHBDC	1	-51.	-1728.	-785.	0.248	34.0	0.545	0.039	0.25	
		CHBDC	1	-100.	-1728.	-785.	0.248	17.2	0.545	0.077	0.25	
1/ 2	0.000	CHBDC	1 MIN	-127.	-1843.	-785.	0.226	14.5	0.511	0.092	0.24	
		CHBDC	1 MAX	-75.	-1843.	-785.	0.226	24.6	0.511	0.054	0.24	
		CHBDC	1	-83.	-1843.	-785.	0.226	22.3	0.511	0.060	0.24	
		CHBDC	1	-75.	-1843.	-785.	0.226	24.6	0.511	0.054	0.24	
		CHBDC	1	-75.	-1843.	-785.	0.226	24.6	0.511	0.054	0.24	
		CHBDC	1	-127.	-1843.	-785.	0.226	14.5	0.511	0.092	0.24	
1/ 3	0.100	CHBDC	1 MIN	339.	4576.	2227.	0.107	13.5	0.584	0.099	0.11	
		CHBDC	1 MAX	1504.	4576.	2227.	0.107	3.0	0.584	0.437	0.11	
		CHBDC	1	871.	4576.	2227.	0.107	5.3	0.584	0.253	0.11	
		CHBDC	1	1504.	4576.	2227.	0.107	3.0	0.584	0.437	0.11	
		CHBDC	1	520.	4576.	2227.	0.107	8.8	0.584	0.151	0.11	

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
		CHBDC	1	379.	4576.	2227.	0.107	12.1	0.584	0.110	0.11	
1/ 4	0.200	CHBDC	1 MIN	639.	4849.	2318.	0.107	7.6	0.574	0.175	0.10	
		CHBDC	1 MAX	2567.	4849.	2318.	0.107	1.9	0.574	0.704	0.10	
		CHBDC	1	1777.	4849.	2318.	0.107	2.7	0.574	0.487	0.10	
		CHBDC	1	2560.	4849.	2318.	0.107	1.9	0.574	0.702	0.10	
		CHBDC	1	925.	4849.	2318.	0.107	5.2	0.574	0.254	0.10	
		CHBDC	1	674.	4849.	2318.	0.107	7.2	0.574	0.185	0.10	
1/ 4	0.300	CHBDC	1 MIN	854.	5121.	2449.	0.107	6.0	0.574	0.222	0.10	
		CHBDC	1 MAX	3369.	5121.	2449.	0.107	1.5	0.574	0.875	0.10	
		CHBDC	1	2459.	5121.	2449.	0.107	2.1	0.574	0.639	0.10	
		CHBDC	1	3271.	5121.	2449.	0.107	1.6	0.574	0.850	0.10	
		CHBDC	1	1214.	5121.	2449.	0.107	4.2	0.574	0.315	0.10	
		CHBDC	1	885.	5121.	2449.	0.107	5.8	0.574	0.230	0.10	
1/ 5	0.400	CHBDC	1 MIN	984.	5308.	2552.	0.107	5.4	0.577	0.247	0.09	
		CHBDC	1 MAX	3787.	5308.	2552.	0.107	1.4	0.577	0.949	0.09	
		CHBDC	1	2948.	5308.	2552.	0.107	1.8	0.577	0.739	0.09	
		CHBDC	1	3590.	5308.	2552.	0.107	1.5	0.577	0.899	0.09	
		CHBDC	1	1387.	5308.	2552.	0.107	3.8	0.577	0.347	0.09	
		CHBDC	1	1011.	5308.	2552.	0.107	5.3	0.577	0.253	0.09	
1/ 5	0.500	CHBDC	1 MIN	1031.	5308.	2532.	0.107	5.1	0.572	0.258	0.09	
		CHBDC	1 MAX	3868.	5308.	2532.	0.107	1.4	0.572	0.969	0.09	
		CHBDC	1	3158.	5308.	2532.	0.107	1.7	0.572	0.791	0.09	
		CHBDC	1	3550.	5308.	2532.	0.107	1.5	0.572	0.889	0.09	
		CHBDC	1	1445.	5308.	2532.	0.107	3.7	0.572	0.362	0.09	
		CHBDC	1	1053.	5308.	2532.	0.107	5.0	0.572	0.264	0.09	

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - SHEAR

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.
VIOLATION OF CL 8.9.3.11/12 MAY NOT BE CRITICAL IF USER ENSURES THAT CL 8.9.3.10 IS SATISFIED BY PROPER REBAR DETAILING.

IKODE NO.	CODE CLAUSE
33	8.9.3.2
35	8.9.3.11/12
36	[illegible]
37	8.9.1.3

N/C ---> NOT CALCULATED, STIRRUPS NOT REQUIRED AS PER CHBDC CLAUSE 8.9.1.2 FOR Vf

NOTE: THE APPLICABILITY OF IKODES 36 & 37 FOR SOLID SLAB SECTIONS MUST BE ASCERTAINED BY THE USER.

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
LC/ 2	0.000	CHBDC	1	-11.	-1192.	1430.	322.	0.	59.	398.	127.	N/C	N/C	
		CHBDC	1	-10.	-1192.	1430.	322.	0.	53.	398.	127.	N/C	N/C	
		CHBDC	1 MIN	-11.	-1192.	1430.	322.	0.	59.	398.	127.	N/C	N/C	
		CHBDC	1 MAX	-10.	-1192.	1430.	322.	0.	53.	398.	127.	N/C	N/C	
		CHBDC	1	-10.	-1192.	1430.	322.	0.	53.	398.	127.	N/C	N/C	
		CHBDC	1	-11.	-1192.	1430.	322.	0.	59.	398.	127.	N/C	N/C	
LC/ 2	1.000	CHBDC	1	-314.	-1190.	1427.	322.	0.	1730.	398.	127.	29.	600.	35
		CHBDC	1	-14.	-1190.	1427.	322.	0.	75.	398.	127.	N/C	N/C	
		CHBDC	1 MIN	-314.	-1190.	1427.	322.	0.	1730.	398.	127.	29.	600.	35
		CHBDC	1 MAX	-14.	-1190.	1427.	322.	0.	75.	398.	127.	N/C	N/C	
		CHBDC	1	-15.	-1190.	1427.	322.	0.	83.	398.	127.	N/C	N/C	
		CHBDC	1	-314.	-1190.	1427.	322.	0.	1730.	398.	127.	29.	600.	35
1/ 2	0.000	CHBDC	1	318.	1209.	1427.	322.	-19.	1646.	398.	127.	29.	600.	
		CHBDC	1	227.	1209.	1427.	322.	-19.	1146.	398.	127.	29.	600.	
		CHBDC	1 MIN	[illegible]	[illegible]	1427.	322.	-19.	1124.	398.	127.	29.	600.	
		CHBDC	1 MAX	[illegible]	[illegible]	1225.	177.	-19.	5283.	398.	127.	29.	300.	
		CHBDC	1	317.	1209.	1427.	322.	-19.	1640.	398.	127.	29.	600.	
		CHBDC	1	318.	1209.	1427.	322.	-19.	1646.	398.	127.	29.	600.	
1/ 3	0.100	CHBDC	1	195.	919.	519.	326.	-75.	659.	258.	229.	53.	600.	
		CHBDC	1	589.	919.	519.	326.	-75.	2805.	258.	229.	53.	300.	
		CHBDC	1 MIN	[illegible]	[illegible]	519.	326.	-75.	474.	258.	229.	53.	600.	
		CHBDC	1 MAX	[illegible]	[illegible]	519.	326.	-75.	4103.	258.	229.	53.	300.	
		CHBDC	1	264.	919.	519.	326.	-75.	1036.	258.	229.	53.	600.	
		CHBDC	1	193.	919.	519.	326.	-75.	645.	258.	229.	53.	600.	

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
1/ 4	0.200	CHBDC	1	147.	773.	381.	318.	-75.	405.	258.	305.	70.	600.	
		CHBDC	1	430.	773.	381.	318.	-75.	1984.	258.	305.	70.	600.	
		CHBDC	1 MIN	66.	773.	381.	318.	-75.	49.	258.	305.	70.	600.	
		CHBDC	1 MAX	669.	773.	381.	318.	-75.	3314.	258.	305.	70.	300.	36
		CHBDC	1	198.	773.	381.	318.	-75.	691.	258.	305.	70.	600.	
		CHBDC	1	145.	773.	381.	318.	-75.	391.	258.	305.	70.	600.	
1/ 4	0.300	CHBDC	1	99.	811.	401.	335.	-75.	129.	258.	305.	70.	600.	
		CHBDC	1	279.	790.	397.	318.	-75.	1081.	258.	305.	70.	600.	
		CHBDC	1 MIN	-32.	-661.	401.	335.	-75.	566.	258.	305.	70.	600.	
		CHBDC	1 MAX	525.	719.	381.	264.	-75.	2384.	258.	305.	70.	600.	
		CHBDC	1	132.	811.	401.	335.	-75.	306.	258.	305.	70.	600.	
		CHBDC	1	96.	811.	401.	335.	-75.	116.	258.	305.	70.	600.	
1/ 5	0.400	CHBDC	1	51.	624.	277.	347.	0.	260.	258.	457.	N/C	N/C	
		CHBDC	1	-52.	-548.	265.	283.	0.	268.	258.	457.	N/C	N/C	
		CHBDC	1 MIN	-137.	-624.	277.	347.	0.	699.	258.	457.	105.	600.	
		CHBDC	1 MAX	381.	496.	255.	241.	0.	1951.	258.	457.	105.	600.	
		CHBDC	1	66.	624.	277.	347.	0.	339.	258.	457.	N/C	N/C	
		CHBDC	1	48.	624.	277.	347.	0.	247.	258.	457.	N/C	N/C	
1/ 5	0.500	CHBDC	1	-3.	-624.	277.	347.	0.	13.	258.	457.	N/C	N/C	
		CHBDC	1	34.	527.	261.	266.	0.	172.	258.	457.	N/C	N/C	
		CHBDC	1 MIN	-241.	-624.	277.	347.	0.	1233.	258.	457.	105.	600.	
		CHBDC	1 MAX	241.	559.	267.	292.	0.	1233.	258.	457.	105.	600.	

Run # 4, Filename: 7108.4b1
Main Span, Exterior Girder, 3 lanes loaded

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - FLEXURE

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.

IKODE NO.	CODE CLAUSE
30	8.8.4.3 MIN. LONGITUDINAL R/F
31	8.8.4.5 MAX. LONGITUDINAL R/F
32	|Mr/Mf| < 1.0

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION
|Mr/Mf| = ABSOLUTE VALUE OF Mr/Mf
c/d = FACTOR DEFINED IN 8.8.4.5 ; A NEGATIVE VALUE OF c/d INDICATES Asc > As

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
LC/ 2	0.000	CHBDC	1 MIN	-55.	-1748.	-749.	0.250	31.7	0.514	0.042	0.25	
		CHBDC	1 MAX	-50.	-1748.	-749.	0.250	35.0	0.514	0.038	0.25	
		CHBDC	1	-55.	-1748.	-749.	0.250	31.7	0.514	0.042	0.25	
		CHBDC	1	-50.	-1748.	-749.	0.250	35.0	0.514	0.038	0.25	
		CHBDC	1	-50.	-1748.	-749.	0.250	35.0	0.514	0.038	0.25	
		CHBDC	1	-55.	-1748.	-749.	0.250	31.7	0.514	0.042	0.25	
LC/ 2	1.000	CHBDC	1 MIN	-100.	-1728.	-749.	0.248	17.2	0.520	0.077	0.25	
		CHBDC	1 MAX	-51.	-1728.	-749.	0.248	34.1	0.520	0.039	0.25	
		CHBDC	1	-100.	-1728.	-749.	0.248	17.2	0.520	0.077	0.25	
		CHBDC	1	-51.	-1728.	-749.	0.248	34.1	0.520	0.039	0.25	
		CHBDC	1	-51.	-1728.	-749.	0.248	34.0	0.520	0.039	0.25	
		CHBDC	1	-100.	-1728.	-749.	0.248	17.2	0.520	0.077	0.25	
1/ 2	0.000	CHBDC	1 MIN	-127.	-1843.	-749.	0.226	14.5	0.488	0.092	0.24	
		CHBDC	1 MAX	-75.	-1843.	-749.	0.226	24.6	0.488	0.054	0.24	
		CHBDC	1	-83.	-1843.	-749.	0.226	22.3	0.488	0.060	0.24	
		CHBDC	1	-75.	-1843.	-749.	0.226	24.6	0.488	0.054	0.24	
		CHBDC	1	-75.	-1843.	-749.	0.226	24.6	0.488	0.054	0.24	
		CHBDC	1	-127.	-1843.	-749.	0.226	14.5	0.488	0.092	0.24	
1/ 3	0.100	CHBDC	1 MIN	334.	4559.	2216.	0.113	13.6	0.583	0.098	0.11	
		CHBDC	1 MAX	1497.	4559.	2216.	0.113	3.0	0.583	0.437	0.11	
		CHBDC	1	866.	4559.	2216.	0.113	5.3	0.583	0.253	0.11	
		CHBDC	1	1497.	4559.	2216.	0.113	3.0	0.583	0.437	0.11	
		CHBDC	1	514.	4559.	2216.	0.113	8.9	0.583	0.150	0.11	

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
		CHBDC	1	374.	4559.	2216.	0.113	12.2	0.583	0.109	0.11	
1/ 4	0.200	CHBDC	1 MIN	628.	4833.	2313.	0.113	7.7	0.574	0.173	0.11	
		CHBDC	1 MAX	2552.	4833.	2313.	0.113	1.9	0.574	0.702	0.11	
		CHBDC	1	1766.	4833.	2313.	0.113	2.7	0.574	0.486	0.11	
		CHBDC	1	2545.	4833.	2313.	0.113	1.9	0.574	0.700	0.11	
		CHBDC	1	910.	4833.	2313.	0.113	5.3	0.574	0.250	0.11	
		CHBDC	1	663.	4833.	2313.	0.113	7.3	0.574	0.182	0.11	
1/ 4	0.300	CHBDC	1 MIN	838.	5105.	2447.	0.113	6.1	0.575	0.218	0.10	
		CHBDC	1 MAX	3349.	5105.	2447.	0.113	1.5	0.575	0.872	0.10	
		CHBDC	1	2443.	5105.	2447.	0.113	2.1	0.575	0.637	0.10	
		CHBDC	1	3251.	5105.	2447.	0.113	1.6	0.575	0.847	0.10	
		CHBDC	1	1193.	5105.	2447.	0.113	4.3	0.575	0.311	0.10	
		CHBDC	1	869.	5105.	2447.	0.113	5.9	0.575	0.226	0.10	
1/ 5	0.400	CHBDC	1 MIN	966.	5293.	2552.	0.113	5.5	0.579	0.243	0.10	
		CHBDC	1 MAX	3763.	5293.	2552.	0.113	1.4	0.579	0.946	0.10	
		CHBDC	1	2930.	5293.	2552.	0.113	1.8	0.579	0.736	0.10	
		CHBDC	1	3565.	5293.	2552.	0.113	1.5	0.579	0.896	0.10	
		CHBDC	1	1362.	5293.	2552.	0.113	3.9	0.579	0.342	0.10	
		CHBDC	1	993.	5293.	2552.	0.113	5.3	0.579	0.249	0.10	
1/ 5	0.500	CHBDC	1 MIN	1012.	5293.	2533.	0.113	5.2	0.574	0.254	0.10	
		CHBDC	1 MAX	3843.	5293.	2533.	0.113	1.4	0.574	0.966	0.10	
		CHBDC	1	3139.	5293.	2533.	0.113	1.7	0.574	0.789	0.10	
		CHBDC	1	3524.	5293.	2533.	0.113	1.5	0.574	0.886	0.10	
		CHBDC	1	1419.	5293.	2533.	0.113	3.7	0.574	0.357	0.10	
		CHBDC	1	1034.	5293.	2533.	0.113	5.1	0.574	0.260	0.10	

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - SHEAR

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.
VIOLATION OF CL 8.9.3.11/12 MAY NOT BE CRITICAL IF USER ENSURES THAT CL 8.9.3.10 IS SATISFIED BY PROPER REBAR DETAILING.

IKODE NO.	CODE CLAUSE
33	8.9.3.2
35	8.9.3.11/12
36	8.14.6
37	8.9.1.3

N/C ---> NOT CALCULATED, STIRRUPS NOT REQUIRED AS PER CHBDC CLAUSE 8.9.1.2 FOR Vf

NOTE: THE APPLICABILITY OF IKODES 36 & 37 FOR SOLID SLAB SECTIONS MUST BE ASCERTAINED BY THE USER.

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av (mm^2)	SPACING (mm)	MIN AREA REQD (mm^2)	MAX SPACING (mm)	IKODE NOS.
LC/ 2	0.000	CHBDC	1	-11.	-1192.	1430.	322.	0.	59.	398.	127.	N/C	N/C	
		CHBDC	1	-10.	-1192.	1430.	322.	0.	53.	398.	127.	N/C	N/C	
		CHBDC	1 MIN	-11.	-1192.	1430.	322.	0.	59.	398.	127.	N/C	N/C	
		CHBDC	1 MAX	-10.	-1192.	1430.	322.	0.	53.	398.	127.	N/C	N/C	
		CHBDC	1	-10.	-1192.	1430.	322.	0.	53.	398.	127.	N/C	N/C	
		CHBDC	1	-11.	-1192.	1430.	322.	0.	59.	398.	127.	N/C	N/C	
LC/ 2	1.000	CHBDC	1	-313.	-1190.	1427.	322.	0.	1729.	398.	127.	29.	600.	35
		CHBDC	1	-13.	-1190.	1427.	322.	0.	74.	398.	127.	N/C	N/C	
		CHBDC	1 MIN	-313.	-1190.	1427.	322.	0.	1729.	398.	127.	29.	600.	35
		CHBDC	1 MAX	-13.	-1190.	1427.	322.	0.	74.	398.	127.	N/C	N/C	
		CHBDC	1	-15.	-1190.	1427.	322.	0.	83.	398.	127.	N/C	N/C	
		CHBDC	1	-313.	-1190.	1427.	322.	0.	1729.	398.	127.	29.	600.	35
1/ 2	0.000	CHBDC	1	335.	1209.	1427.	322.	-19.	1741.	398.	127.	29.	600.	
		CHBDC	1	240.	1209.	1427.	322.	-19.	1217.	398.	127.	29.	600.	
		CHBDC	1 MIN	236.	1209.	1427.	322.	-19.	1195.	398.	127.	29.	600.	
		CHBDC	1 MAX	994.	1209.	1219.	174.	-19.	5378.	398.	127.	29.	300.	
		CHBDC	1	334.	1209.	1427.	322.	-19.	1735.	398.	127.	29.	600.	
		CHBDC	1	335.	1209.	1427.	322.	-19.	1741.	398.	127.	29.	600.	
1/ 3	0.100	CHBDC	1	191.	919.	519.	326.	-75.	636.	258.	229.	53.	600.	
		CHBDC	1	584.	919.	519.	326.	-75.	2776.	258.	229.	53.	300.	
		CHBDC	1 MIN	157.	919.	519.	326.	-75.	452.	258.	229.	53.	600.	
		CHBDC	1 MAX	822.	919.	519.	326.	-75.	4073.	258.	229.	53.	300.	
		CHBDC	1	259.	919.	519.	326.	-75.	1006.	258.	229.	53.	600.	
		CHBDC	1	189.	919.	519.	326.	-75.	622.	258.	229.	53.	600.	

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
1/ 4	0.200	CHBDC	1	144.	773.	381.	318.	-75.	388.	258.	305.	70.	600.	
		CHBDC	1	426.	773.	381.	318.	-75.	1961.	258.	305.	70.	600.	
		CHBDC	1 MIN	63.	773.	381.	318.	-75.	66.	258.	305.	70.	600.	
		CHBDC	1 MAX	665.	773.	381.	318.	-75.	3291.	258.	305.	70.	300.	36
		CHBDC	1	194.	773.	381.	318.	-75.	668.	258.	305.	70.	600.	
		CHBDC	1	142.	773.	381.	318.	-75.	374.	258.	305.	70.	600.	
1/ 4	0.300	CHBDC	1	97.	811.	401.	335.	-75.	118.	258.	305.	70.	600.	
		CHBDC	1	276.	802.	399.	328.	-75.	1067.	258.	305.	70.	600.	
		CHBDC	1 MIN	-34.	-661.	401.	335.	-75.	577.	258.	305.	70.	600.	
		CHBDC	1 MAX	522.	728.	383.	270.	-75.	2370.	258.	305.	70.	600.	
		CHBDC	1	130.	811.	401.	335.	-75.	291.	258.	305.	70.	600.	
		CHBDC	1	94.	811.	401.	335.	-75.	105.	258.	305.	70.	600.	
1/ 5	0.400	CHBDC	1	50.	624.	277.	347.	0.	255.	258.	457.	N/C	N/C	
		CHBDC	1	-54.	-556.	267.	290.	0.	275.	258.	457.	N/C	N/C	
		CHBDC	1 MIN	-138.	-624.	277.	347.	0.	704.	258.	457.	105.	600.	
		CHBDC	1 MAX	380.	503.	257.	247.	0.	1944.	258.	457.	105.	600.	
		CHBDC	1	65.	624.	277.	347.	0.	332.	258.	457.	N/C	N/C	
		CHBDC	1	47.	624.	277.	347.	0.	242.	258.	457.	N/C	N/C	
1/ 5	0.500	CHBDC	1	-3.	-624.	277.	347.	0.	13.	258.	457.	N/C	N/C	
		CHBDC	1	34.	536.	263.	273.	0.	172.	258.	457.	N/C	N/C	
		CHBDC	1 MIN	-241.	-624.	277.	347.	0.	1233.	258.	457.	105.	600.	
		CHBDC	1 MAX	241.	569.	269.	301.	0.	1233.	258.	457.	105.	600.	

Run # 4, Filename: 7108.4b1
Main Span, Exterior Girder, 3 lanes loaded

UNFACTORED RESPONSE - FORCES AND MOMENTS DUE TO NON-MOVING LOADS FOR BRIDGE TYPE 1

STAGE NUMBER = 1

RESPONSE IS GIVEN WITH RESPECT TO ELEMENT AXES.

FOR COLUMN SUPPORTS IN BRIDGE TYPE 3, THE X1 AXIS IS IN THE DIRECTION FROM THE TOP OF COLUMN TO BOTTOM, WITH THE X2 AXIS IN THE SAME DIRECTION AS THE AXIS OF THE BRIDGE (GLOBAL X1) AND THE X3 AXIS IN THE SAME DIRECTION AS THE GLOBAL X2.

LC = LEFT CANTILEVER.
RC = RIGHT CANTILEVER.
LSC = LEFT SPAN CONTRIBUTION (BRIDGE TYPE 1 ONLY).
RSC = RIGHT SPAN CONTRIBUTION (BRIDGE TYPE 1 ONLY).
COL = ELEMENT IS A COLUMN (BRIDGE TYPE 3 ONLY).
SPR = ELEMENT IS A SPRING (BRIDGE TYPE 3 ONLY).

SPAN ID	SEC ID	SPAN X/L	LOAD #	LOAD KIND	FORCE (kN) FX1	FORCE (kN) FX2	FORCE (kN) FX3	MOMENT (kN m) MX1	MOMENT (kN m) MX2	MOMENT (kN m) MX3
LC	2	0.000	1	D1	0.0		-0.1		0.0	
			2	P	-287.9		-10.2		-52.6	
			3	D2	0.0		0.0		0.0	
LC	2	1.000	1	D1	0.0		-1.3		-0.1	
			2	P	-287.9		-10.2		-54.1	
			3	D2	0.0		-1.5		-0.1	
1	2	0.000	1	D1	0.0		77.3		-0.1	
			2	P	-1003.8		-35.1		-188.5	
			3	D2	0.0		105.4		-0.1	
1	3	0.100	1	D1	0.0		61.8		121.5	
			2	P	-2257.9		-78.5		-563.4	
			3	D2	0.0		68.3		137.8	
1	4	0.200	1	D1	0.0		46.4		216.1	
			2	P	-2257.9		-78.5		-700.7	
			3	D2	0.0		51.2		242.3	
1	4	0.300	1	D1	0.0		30.9		283.7	
			2	P	-2257.9		-78.5		-837.9	
			3	D2	0.0		34.1		316.9	
1	5	0.400	1	D1	0.0		15.5		324.2	
			2	P	-2262.0		-0.1		-934.5	
			3	D2	0.0		17.1		361.7	
1	5	0.500	1	D1	0.0		-0.1		337.8	
			2	P	-2262.0		0.0		-934.6	

SPAN ID	SEC ID	SPAN X/L	LOAD #	LOAD KIND	FORCE (kN) FX1	FX2	FX3	MOMENT (kN m) MX1	MX2	MX3
			3	D2	0.0		0.0		376.6	

UNFACTORED RESPONSE - FORCES AND MOMENTS DUE TO NON-MOVING LOADS FOR BRIDGE TYPE 1

STAGE NUMBER = 2

RESPONSE IS GIVEN WITH RESPECT TO ELEMENT AXES.

FOR COLUMN SUPPORTS IN BRIDGE TYPE 3, THE X1 AXIS IS IN THE DIRECTION FROM THE TOP OF COLUMN TO BOTTOM, WITH THE X2 AXIS IN THE SAME DIRECTION AS THE AXIS OF THE BRIDGE (GLOBAL X1) AND THE X3 AXIS IN THE SAME DIRECTION AS THE GLOBAL X2.

LC = LEFT CANTILEVER.
RC = RIGHT CANTILEVER.
LSC = LEFT SPAN CONTRIBUTION (BRIDGE TYPE 1 ONLY).
RSC = RIGHT SPAN CONTRIBUTION (BRIDGE TYPE 1 ONLY).
COL = ELEMENT IS A COLUMN (BRIDGE TYPE 3 ONLY).
SPR = ELEMENT IS A SPRING (BRIDGE TYPE 3 ONLY).

SPAN ID	SEC ID	SPAN X/L	LOAD #	LOAD KIND	<--- FORCE (kN) ---> FX1	FX2	FX3	<--- MOMENT (kN m) ---> MX1	MX2	MX3
LC	2	0.000	2	P	-287.9		-10.2		-52.6	
			5	D2	0.0		-0.1		-0.1	
			6	D4	0.0		-0.1		-0.1	
LC	2	1.000	2	P	-287.9		-10.2		-54.1	
			5	D2	0.0		-1.2		-0.1	
			6	D4	0.0		-0.6		-0.1	
1	2	0.000	2	P	-1003.8		-35.1		-188.5	
			5	D2	0.0		69.9		-0.1	
			6	D4	0.0		35.0		-0.1	
1	3	0.100	2	P	-2257.9		-78.5		-563.4	
			5	D2	0.0		55.9		109.9	
			6	D4	0.0		28.0		55.0	
1	4	0.200	2	P	-2257.9		-78.5		-700.7	
			5	D2	0.0		42.0		195.5	
			6	D4	0.0		21.0		97.8	
1	4	0.300	2	P	-2257.9		-78.5		-837.9	
			5	D2	0.0		28.0		256.6	
			6	D4	0.0		14.0		128.3	
1	5	0.400	2	P	-2262.0		-0.1		-934.5	
			5	D2	0.0		14.0		293.3	
			6	D4	0.0		7.0		146.7	
1	5	0.500	2	P	-2262.0		0.0		-934.6	
			5	D2	0.0		-0.1		305.5	

SPAN ID	SEC ID	SPAN X/L	LOAD #	LOAD KIND	FORCE (kN) FX1	FX2	FX3	MOMENT (kN m) MX1	MX2	MX3
			6	D4	0.0		-0.1		152.8	

UNFACTORED RESPONSE - FORCES AND MOMENTS DUE TO MOVING LOADS FOR BRIDGE TYPE 1

STAGE NUMBER = 2

RESPONSE IS GIVEN WITH RESPECT TO ELEMENT AXES.

FOR COLUMN SUPPORTS IN BRIDGE TYPE 3, THE X1 AXIS IS IN THE DIRECTION FROM THE TOP OF COLUMN TO BOTTOM, WITH THE X2 AXIS IN THE SAME DIRECTION AS THE AXIS OF THE BRIDGE (GLOBAL X1) AND THE X3 AXIS IN THE SAME DIRECTION AS THE GLOBAL X2.

OPTIMIZED COMPONENT IS MARKED BY "*".
IN SOME CASES OPTIMIZATION MAY NOT PRODUCE BOTH A MAXIMUM (POSITIVE) AND MINIMUM (NEGATIVE) VALUE.

LC = LEFT CANTILEVER.
RC = RIGHT CANTILEVER.
LSC = LEFT SPAN CONTRIBUTION (BRIDGE TYPE 1 ONLY).
RSC = RIGHT SPAN CONTRIBUTION (BRIDGE TYPE 1 ONLY).
COL = ELEMENT IS A COLUMN (BRIDGE TYPE 3 ONLY).
SPR = ELEMENT IS A SPRING (BRIDGE TYPE 3 ONLY).

GOV LD = GOVERNING LOAD
TR = TRUCK LOAD
LA = LANE LOAD
PE = PEDESTRIAN LOAD (CLAUSE 3.8.9)
MTR = MAINTENANCE TRUCK LOAD

SPAN ID	SEC ID	SPAN X/L	LOAD #	LOAD KIND	<-GOV LD-> DECK SDWLK		<--- FORCE (kN) ---> FX1	FX2	FX3	<--- MOMENT (kN m) ---> MX1	MX2	MX3
LC	2	0.000	7	L		MAX:	0.0*		0.0			0.0
						MIN:	0.0*		0.0			0.0
						MAX:	0.0		0.0*			0.0
						MIN:	0.0		0.0*			0.0
						MAX:	0.0		0.0			0.0*
						MIN:	0.0		0.0			0.0*
			8	L		MAX:	0.0*		0.0			0.0
						MIN:	0.0*		0.0			0.0
						MAX:	0.0		0.0*			0.0
						MIN:	0.0		0.0*			0.0
						MAX:	0.0		0.0			0.0*
						MIN:	0.0		0.0			0.0*
			9	L		MAX:	0.0*		0.0			0.0
						MIN:	0.0*		0.0			0.0
						MAX:	0.0		0.0*			0.0
						MIN:	0.0		0.0*			0.0
						MAX:	0.0		0.0			0.0*
						MIN:	0.0		0.0			0.0*

SPAN ID	SEC ID	SPAN X/L	LOAD #	LOAD KIND	<-GOV LD-> DECK	SDWLK		<---------- FORCE (kN) ----------> FX1	FX2	FX3	<--------- MOMENT (kN m) ----------> MX1	MX2	MX3
			10	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
							MAX:	0.0		0.0*		0.0	
							MIN:	0.0		0.0*		0.0	
							MAX:	0.0		0.0		0.0*	
							MIN:	0.0		0.0		0.0*	
LC	2	1.000	7	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
							MAX:	0.0		0.0*		0.0	
						TR	MIN:	0.0		-165.9*		-19.2	
							MAX:	0.0		0.0		0.0*	
						TR	MIN:	0.0		-165.9		-19.2*	
			8	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
							MAX:	0.0		0.0*		0.0	
						TR	MIN:	0.0		-174.8*		-25.1	
							MAX:	0.0		0.0		0.0*	
						TR	MIN:	0.0		-174.8		-25.1*	
			9	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
							MAX:	0.0		0.0*		0.0	
						TR	MIN:	0.0		-174.8*		-25.1	
							MAX:	0.0		0.0		0.0*	
						TR	MIN:	0.0		-174.8		-25.1*	
			10	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
							MAX:	0.0		0.0*		0.0	
						TR	MIN:	0.0		-175.0*		-26.1	
							MAX:	0.0		0.0		0.0*	
						TR	MIN:	0.0		-175.0		-26.1*	
1	2	0.000	7	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		328.8*		0.0	
						TR	MIN:	0.0		-1.4*		0.0	
							MAX:	0.0		0.0		0.0*	
						TR	MIN:	0.0		1.4		-19.2*	
			8	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		346.5*		0.0	
						TR	MIN:	0.0		-1.5*		0.0	
							MAX:	0.0		0.0		0.0*	
						TR	MIN:	0.0		1.5		-25.1*	

SPAN ID	SEC ID	SPAN X/L	LOAD #	LOAD KIND	<-GOV LD-> DECK	SDWLK		FORCE (kN) FX1	FX2	FX3	MOMENT (kN m) MX1	MX2	MX3
			9	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		346.5*		0.0	
						TR	MIN:	0.0		-1.5*		0.0	
							MAX:	0.0		0.0		0.0*	
						TR	MIN:	0.0		1.5		-25.1*	
			10	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		388.5*		0.0	
						TR	MIN:	0.0		-1.5*		0.0	
							MAX:	0.0		0.0		0.0*	
						TR	MIN:	0.0		1.5		-26.1*	
1	3	0.100	7	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		280.2*		380.6	
						TR	MIN:	0.0		-16.2*		198.0	
						TR	MAX:	0.0		161.7		380.6*	
						TR	MIN:	0.0		1.4		-17.3*	
			8	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		295.2*		496.5	
						TR	MIN:	0.0		-17.1*		258.2	
						TR	MAX:	0.0		170.3		496.5*	
						TR	MIN:	0.0		1.5		-22.6*	
			9	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		295.2*		496.5	
						TR	MIN:	0.0		-17.1*		258.2	
						TR	MAX:	0.0		170.3		496.5*	
						TR	MIN:	0.0		1.5		-22.6*	
			10	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		331.0*		578.6	
						TR	MIN:	0.0		-18.4*		289.3	
						TR	MAX:	0.0		191.0		578.6*	
						TR	MIN:	0.0		1.5		-23.5*	
1	4	0.200	7	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		234.2*		632.8	
						TR	MIN:	0.0		-40.8*		443.9	
						TR	MAX:	0.0		115.4		635.6*	
						TR	MIN:	0.0		1.4		-15.4*	

SPAN ID	SEC ID	SPAN X/L	LOAD #	LOAD KIND	<-GOV LD-> DECK	SDWLK		FORCE (kN) FX1	FX2	FX3	MOMENT (kN m) MX1	MX2	MX3
			8	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		246.7*		825.5	
						TR	MIN:	0.0		-43.0*		579.0	
						TR	MAX:	0.0		121.6		829.0*	
						TR	MIN:	0.0		1.5		-20.0*	
			9	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		246.7*		825.5	
						TR	MIN:	0.0		-43.0*		579.0	
						TR	MAX:	0.0		121.6		829.0*	
						TR	MIN:	0.0		1.5		-20.0*	
			10	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		276.6*		961.9	
						TR	MIN:	0.0		-46.4*		648.8	
						TR	MAX:	0.0		136.3		966.1*	
						TR	MIN:	0.0		1.5		-20.9*	
1	4	0.300	7	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		195.4*		796.4	
						TR	MIN:	0.0		-66.6*		633.5	
						TR	MAX:	0.0		72.9		834.2*	
						TR	MIN:	0.0		1.4		-13.4*	
			8	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		205.9*		1038.8	
						TR	MIN:	0.0		-70.2*		826.3	
						TR	MAX:	0.0		76.8		1088.2*	
						TR	MIN:	0.0		1.5		-17.5*	
			9	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		205.9*		1038.8	
						TR	MIN:	0.0		-70.2*		826.3	
						TR	MAX:	0.0		76.8		1088.2*	
						TR	MIN:	0.0		1.5		-17.5*	
			10	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		230.8*		1210.5	
						TR	MIN:	0.0		-75.7*		925.9	
						TR	MAX:	0.0		86.1		1268.1*	
						TR	MIN:	0.0		1.5		-18.3*	

SPAN ID	SEC ID	SPAN X/L	LOAD #	LOAD KIND	<-GOV LD-> DECK	SDWLK		FORCE (kN) FX1	FX2	FX3	MOMENT (kN m) MX1	MX2	MX3
1	5	0.400	7	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		156.9*		852.5	
						TR	MIN:	0.0		-95.7*		779.8	
						TR	MAX:	0.0		-59.0		928.9*	
						TR	MIN:	0.0		1.4		-11.5*	
			8	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		165.3*		1112.0	
						TR	MIN:	0.0		-100.8*		1017.2	
						TR	MAX:	0.0		-62.2		1211.7*	
						TR	MIN:	0.0		1.5		-15.0*	
			9	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		165.3*		1112.0	
						TR	MIN:	0.0		-100.8*		1017.2	
						TR	MAX:	0.0		-62.2		1211.7*	
						TR	MIN:	0.0		1.5		-15.0*	
			10	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		185.3*		1295.8	
						TR	MIN:	0.0		-108.7*		1139.8	
						TR	MAX:	0.0		-69.7		1412.0*	
						TR	MIN:	0.0		1.5		-15.6*	
1	5	0.500	7	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		124.7*		847.2	
						TR	MIN:	0.0		-124.7*		847.2	
						TR	MAX:	0.0		16.7		937.9*	
						TR	MIN:	0.0		-1.4		-9.6*	
			8	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		131.4*		1105.1	
						TR	MIN:	0.0		-131.4*		1105.1	
						TR	MAX:	0.0		17.6		1223.4*	
						TR	MIN:	0.0		-1.5		-12.5*	
			9	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
						TR	MAX:	0.0		131.4*		1105.1	
						TR	MIN:	0.0		-131.4*		1105.1	
						TR	MAX:	0.0		17.6		1223.4*	
						TR	MIN:	0.0		-1.5		-12.5*	

SPAN ID	SEC ID	SPAN X/L	LOAD #	LOAD KIND	<-GOV LD-> DECK	SDWLK		<--------- FORCE (kN) ----------> FX1	FX2	FX3	<-------- MOMENT (kN m) ----------> MX1	MX2	MX3
			10	L			MAX:	0.0*		0.0		0.0	
							MIN:	0.0*		0.0		0.0	
					TR		MAX:	0.0		141.7*		1238.3	
					TR		MIN:	0.0		-141.7*		1238.3	
					TR		MAX:	0.0		19.8		1425.6*	
					TR		MIN:	0.0		-1.5		-13.0*	

Run 9; Filename 7108.9b1

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - FLEXURE

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.

IKODE NO.	CODE CLAUSE
30	8.8.4.3 MIN. LONGITUDINAL R/F
31	8.8.4.5 MAX. LONGITUDINAL R/F
32	|Mr/Mf| < 1.0

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION
|Mr/Mf| = ABSOLUTE VALUE OF Mr/Mf
c/d = FACTOR DEFINED IN 8.8.4.5 ; A NEGATIVE VALUE OF c/d INDICATES Asc > As

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
LC/ 2	0.000	CHBDC	1 MIN	-33.	-1645.	-901.	0.214	50.3	0.657	0.026	0.21	
		CHBDC	1 MAX	-30.	-1645.	-901.	0.214	55.6	0.657	0.024	0.21	
		CHBDC	1	-30.	-1645.	-901.	0.214	55.6	0.657	0.024	0.21	
		CHBDC	1	-30.	-1645.	-901.	0.214	55.6	0.657	0.024	0.21	
		CHBDC	1	-30.	-1645.	-901.	0.214	55.6	0.657	0.024	0.21	
		CHBDC	1	-33.	-1645.	-901.	0.214	50.3	0.657	0.026	0.21	
LC/ 3	1.000	CHBDC	1 MIN	-135.	-1722.	-901.	0.208	12.8	0.628	0.104	0.23	
		CHBDC	1 MAX	-30.	-1722.	-901.	0.208	57.3	0.628	0.023	0.23	
		CHBDC	1	-129.	-1722.	-901.	0.208	13.4	0.628	0.100	0.23	
		CHBDC	1	-33.	-1722.	-901.	0.208	52.2	0.628	0.025	0.23	
		CHBDC	1	-31.	-1722.	-901.	0.208	56.1	0.628	0.024	0.23	
		CHBDC	1	-135.	-1722.	-901.	0.208	12.8	0.628	0.104	0.23	
1/ 3	0.000	CHBDC	1 MIN	-146.	-1739.	-901.	0.212	11.9	0.622	0.112	0.24	
		CHBDC	1 MAX	-41.	-1739.	-901.	0.212	42.8	0.622	0.031	0.24	
		CHBDC	1	-41.	-1739.	-901.	0.212	42.8	0.622	0.031	0.24	
		CHBDC	1	-45.	-1739.	-901.	0.212	38.3	0.622	0.035	0.24	
		CHBDC	1	-41.	-1739.	-901.	0.212	42.1	0.622	0.032	0.24	
		CHBDC	1	-146.	-1739.	-901.	0.212	11.9	0.622	0.112	0.24	
1/ 4	0.100	CHBDC	1 MIN	108.	3558.	1687.	0.086	33.0	0.569	0.040	0.09	
		CHBDC	1 MAX	853.	3558.	1687.	0.086	4.2	0.569	0.319	0.09	
		CHBDC	1	521.	3558.	1687.	0.086	6.8	0.569	0.195	0.09	
		CHBDC	1	853.	3558.	1687.	0.086	4.2	0.569	0.319	0.09	
		CHBDC	1	277.	3558.	1687.	0.086	12.9	0.569	0.103	0.09	

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
		CHBDC	1	199.	3558.	1687.	0.086	17.9	0.569	0.074	0.09	
1/ 5	0.200	CHBDC	1 MIN	274.	3558.	1601.	0.086	13.0	0.540	0.102	0.09	
		CHBDC	1 MAX	1460.	3558.	1601.	0.086	2.4	0.540	0.546	0.09	
		CHBDC	1	1042.	3558.	1601.	0.086	3.4	0.540	0.389	0.09	
		CHBDC	1	1460.	3558.	1601.	0.086	2.4	0.540	0.546	0.09	
		CHBDC	1	494.	3558.	1601.	0.086	7.2	0.540	0.185	0.09	
		CHBDC	1	355.	3558.	1601.	0.086	10.0	0.540	0.133	0.09	
1/ 5	0.300	CHBDC	1 MIN	396.	3558.	1539.	0.086	9.0	0.519	0.148	0.09	
		CHBDC	1 MAX	1857.	3558.	1539.	0.086	1.9	0.519	0.694	0.09	
		CHBDC	1	1468.	3558.	1539.	0.086	2.4	0.519	0.549	0.09	
		CHBDC	1	1857.	3558.	1539.	0.086	1.9	0.519	0.694	0.09	
		CHBDC	1	649.	3558.	1539.	0.086	5.5	0.519	0.243	0.09	
		CHBDC	1	466.	3558.	1539.	0.086	7.6	0.519	0.174	0.09	
1/ 6	0.400	CHBDC	1 MIN	473.	3558.	1502.	0.086	7.5	0.507	0.177	0.09	
		CHBDC	1 MAX	2083.	3558.	1502.	0.086	1.7	0.507	0.779	0.09	
		CHBDC	1	1735.	3558.	1502.	0.086	2.1	0.507	0.649	0.09	
		CHBDC	1	2083.	3558.	1502.	0.086	1.7	0.507	0.779	0.09	
		CHBDC	1	742.	3558.	1502.	0.086	4.8	0.507	0.278	0.09	
		CHBDC	1	533.	3558.	1502.	0.086	6.7	0.507	0.199	0.09	
1/ 6	0.500	CHBDC	1 MIN	505.	3558.	1490.	0.086	7.0	0.502	0.189	0.09	
		CHBDC	1 MAX	2163.	3558.	1490.	0.086	1.6	0.502	0.809	0.09	
		CHBDC	1	1894.	3558.	1490.	0.086	1.9	0.502	0.708	0.09	
		CHBDC	1	2112.	3558.	1490.	0.086	1.7	0.502	0.790	0.09	
		CHBDC	1	774.	3558.	1490.	0.086	4.6	0.502	0.289	0.09	
		CHBDC	1	556.	3558.	1490.	0.086	6.4	0.502	0.208	0.09	
1/ 6	0.600	CHBDC	1 MIN	493.	3558.	1502.	0.086	7.2	0.507	0.184	0.09	
		CHBDC	1 MAX	2083.	3558.	1502.	0.086	1.7	0.507	0.779	0.09	
		CHBDC	1	2083.	3558.	1502.	0.086	1.7	0.507	0.779	0.09	
		CHBDC	1	1735.	3558.	1502.	0.086	2.1	0.507	0.649	0.09	
		CHBDC	1	743.	3558.	1502.	0.086	4.8	0.507	0.278	0.09	
		CHBDC	1	533.	3558.	1502.	0.086	6.7	0.507	0.199	0.09	
1/ 7	0.700	CHBDC	1 MIN	435.	3558.	1539.	0.086	8.2	0.519	0.163	0.09	
		CHBDC	1 MAX	1858.	3558.	1539.	0.086	1.9	0.519	0.694	0.09	
		CHBDC	1	1858.	3558.	1539.	0.086	1.9	0.519	0.694	0.09	
		CHBDC	1	1468.	3558.	1539.	0.086	2.4	0.519	0.549	0.09	
		CHBDC	1	650.	3558.	1539.	0.086	5.5	0.519	0.243	0.09	
		CHBDC	1	467.	3558.	1539.	0.086	7.6	0.519	0.175	0.09	
1/ 7	0.800	CHBDC	1 MIN	319.	3558.	1600.	0.086	11.1	0.540	0.119	0.09	
		CHBDC	1 MAX	1461.	3558.	1600.	0.086	2.4	0.540	0.546	0.09	
		CHBDC	1	1461.	3558.	1600.	0.086	2.4	0.540	0.546	0.09	
		CHBDC	1	1042.	3558.	1600.	0.086	3.4	0.540	0.390	0.09	

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
		CHBDC	1	495.	3558.	1600.	0.086	7.2	0.540	0.185	0.09	
		CHBDC	1	356.	3558.	1600.	0.086	10.0	0.540	0.133	0.09	
1/ 8	0.900	CHBDC	1 MIN	159.	3558.	1686.	0.086	22.4	0.569	0.059	0.09	
		CHBDC	1 MAX	854.	3558.	1686.	0.086	4.2	0.569	0.319	0.09	
		CHBDC	1	854.	3558.	1686.	0.086	4.2	0.569	0.319	0.09	
		CHBDC	1	522.	3558.	1686.	0.086	6.8	0.569	0.195	0.09	
		CHBDC	1	278.	3558.	1686.	0.086	12.8	0.569	0.104	0.09	
		CHBDC	1	200.	3558.	1686.	0.086	17.8	0.569	0.075	0.09	
1/ 9	1.000	CHBDC	1 MIN	-89.	-1707.	-901.	0.205	19.1	0.634	0.069	0.22	
		CHBDC	1 MAX	-39.	-1707.	-901.	0.205	43.4	0.634	0.031	0.22	
		CHBDC	1	-44.	-1707.	-901.	0.205	39.2	0.634	0.034	0.22	
		CHBDC	1	-39.	-1707.	-901.	0.205	43.4	0.634	0.031	0.22	
		CHBDC	1	-39.	-1707.	-901.	0.205	43.3	0.634	0.031	0.22	
		CHBDC	1	-89.	-1707.	-901.	0.205	19.1	0.634	0.069	0.22	
RC/ 9	0.000	CHBDC	1 MIN	-8.	-1706.	-901.	0.205	****	0.634	0.006	0.22	
		CHBDC	1 MAX	42.	3554.	792.	0.086	84.2	0.267	0.016	0.09	
		CHBDC	1	42.	3554.	792.	0.086	84.2	0.267	0.016	0.09	
		CHBDC	1	38.	3554.	792.	0.086	93.4	0.267	0.014	0.09	
		CHBDC	1	42.	3554.	792.	0.086	84.4	0.267	0.016	0.09	
		CHBDC	1	-8.	-1706.	-901.	0.205	****	0.634	0.006	0.22	
RC/ 9	1.000	CHBDC	1 MIN	-43.	-1645.	-901.	0.214	38.6	0.657	0.034	0.21	
		CHBDC	1 MAX	-39.	-1645.	-901.	0.214	42.7	0.657	0.031	0.21	
		CHBDC	1	-39.	-1645.	-901.	0.214	42.7	0.657	0.031	0.21	
		CHBDC	1	-43.	-1645.	-901.	0.214	38.6	0.657	0.034	0.21	
		CHBDC	1	-39.	-1645.	-901.	0.214	42.7	0.657	0.031	0.21	
		CHBDC	1	-43.	-1645.	-901.	0.214	38.6	0.657	0.034	0.21	

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - SHEAR

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.
VIOLATION OF CL 8.9.3.11/12 MAY NOT BE CRITICAL IF USER ENSURES THAT CL 8.9.3.10 IS SATISFIED BY PROPER REBAR DETAILING.

IKODE NO.	CODE CLAUSE	N/C ---> NOT CALCULATED, STIRRUPS NOT REQUIRED AS PER CHBDC CLAUSE 8.9.1.2 FOR Vf
33	8.9.3.2	
35	8.9.3.11/12	
36	8.14.6	NOTE: THE APPLICABILITY OF IKODES 36 & 37 FOR SOLID SLAB SECTIONS MUST BE ASCERTAINED BY THE USER.
37	8.9.1.3	

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
LC/ 2	0.000			**** OPTIMIZED SHEAR = 0.0 - RESISTANCE NOT DONE ****										
LC/ 3	1.000	CHBDC	1	-311.	-1223.	1220.	324.	0.	1671.	398.	152.	35.	600.	
		CHBDC	1	-10.	-1223.	1225.	331.	0.	55.	398.	152.	N/C	N/C	
		CHBDC	1 MIN	-312.	-1223.	1218.	321.	0.	1673.	398.	152.	35.	600.	
		CHBDC	1 MAX	-10.	-1223.	1225.	331.	0.	55.	398.	152.	N/C	N/C	
		CHBDC	1	-14.	-1223.	1225.	331.	0.	76.	398.	152.	N/C	N/C	
		CHBDC	1	-311.	-1223.	1220.	324.	0.	1671.	398.	152.	35.	600.	
1/ 3	0.000	CHBDC	1	266.	1223.	1225.	331.	0.	1429.	398.	152.	35.	600.	
		CHBDC	1	185.	1223.	1225.	331.	0.	995.	398.	152.	35.	600.	
		CHBDC	1 MIN	182.	1223.	1225.	331.	0.	975.	398.	152.	35.	600.	
		CHBDC	1 MAX	815.	1223.	1036.	173.	0.	4373.	398.	152.	35.	300.	
		CHBDC	1	258.	1223.	1225.	331.	0.	1385.	398.	152.	35.	600.	
		CHBDC	1	266.	1223.	1225.	331.	0.	1429.	398.	152.	35.	600.	
1/ 4	0.100	CHBDC	1	156.	876.	539.	338.	0.	822.	258.	229.	53.	600.	
		CHBDC	1	448.	876.	539.	338.	0.	2352.	258.	229.	53.	600.	
		CHBDC	1 MIN	119.	876.	539.	338.	0.	623.	258.	229.	53.	600.	
		CHBDC	1 MAX	684.	876.	539.	338.	0.	3603.	258.	229.	53.	300.	
		CHBDC	1	207.	876.	539.	338.	0.	1085.	258.	229.	53.	600.	
		CHBDC	1	148.	876.	539.	338.	0.	779.	258.	229.	53.	600.	
1/ 5	0.200	CHBDC	1	119.	742.	404.	338.	0.	627.	258.	305.	70.	600.	
		CHBDC	1	319.	742.	404.	338.	0.	1675.	258.	305.	70.	600.	
		CHBDC	1 MIN	40.	742.	404.	338.	0.	209.	258.	305.	N/C	N/C	
		CHBDC	1 MAX	557.	742.	404.	338.	0.	2925.	258.	305.	70.	300.	25

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
		CHBDC	1	155.	742.	404.	338.	0.	814.	258.	305.	70.	600.	
		CHBDC	1	111.	742.	404.	338.	0.	584.	258.	305.	70.	600.	
1/ 5	0.300	CHBDC	1	82.	742.	404.	338.	0.	433.	258.	305.	70.	600.	
		CHBDC	1	200.	742.	404.	338.	0.	1052.	258.	305.	70.	600.	
		CHBDC	1 MIN	-45.	-742.	404.	338.	0.	235.	258.	305.	N/C	N/C	
		CHBDC	1 MAX	438.	652.	385.	267.	0.	2302.	258.	305.	70.	600.	
		CHBDC	1	103.	742.	404.	338.	0.	543.	258.	305.	70.	600.	
		CHBDC	1	74.	742.	404.	338.	0.	390.	258.	305.	70.	600.	
1/ 6	0.400	CHBDC	1	45.	608.	270.	338.	0.	238.	258.	457.	N/C	N/C	
		CHBDC	1	93.	608.	270.	338.	0.	487.	258.	457.	105.	600.	
		CHBDC	1 MIN	-130.	-608.	270.	338.	0.	680.	258.	457.	105.	600.	
		CHBDC	1 MAX	331.	471.	246.	225.	0.	1737.	258.	457.	105.	600.	
		CHBDC	1	52.	608.	270.	338.	0.	272.	258.	457.	N/C	N/C	
		CHBDC	1	37.	608.	270.	338.	0.	195.	258.	457.	N/C	N/C	
1/ 6	0.500	CHBDC	1	8.	608.	270.	338.	0.	43.	258.	457.	N/C	N/C	
		CHBDC	1	-41.	-603.	269.	334.	0.	214.	258.	457.	N/C	N/C	
		CHBDC	1 MIN	-223.	-608.	270.	338.	0.	1170.	258.	457.	105.	600.	
		CHBDC	1 MAX	223.	511.	254.	256.	0.	1171.	258.	457.	105.	600.	
		CHBDC	1	0.	608.	270.	338.	0.	1.	258.	457.	N/C	N/C	
		CHBDC	1	0.	608.	270.	338.	0.	1.	258.	457.	N/C	N/C	
1/ 6	0.600	CHBDC	1	-29.	-608.	270.	338.	0.	151.	258.	457.	N/C	N/C	
		CHBDC	1	-92.	-608.	270.	338.	0.	485.	258.	457.	105.	600.	
		CHBDC	1 MIN	-330.	-471.	246.	225.	0.	1735.	258.	457.	105.	600.	
		CHBDC	1 MAX	130.	608.	270.	338.	0.	682.	258.	457.	105.	600.	
		CHBDC	1	-51.	-608.	270.	338.	0.	270.	258.	457.	N/C	N/C	
		CHBDC	1	-37.	-608.	270.	338.	0.	194.	258.	457.	N/C	N/C	
1/ 7	0.700	CHBDC	1	-78.	-742.	404.	338.	0.	408.	258.	305.	70.	600.	
		CHBDC	1	-200.	-742.	404.	338.	0.	1051.	258.	305.	70.	600.	
		CHBDC	1 MIN	-438.	-651.	385.	267.	0.	2301.	258.	305.	70.	600.	
		CHBDC	1 MAX	45.	742.	404.	338.	0.	237.	258.	305.	N/C	N/C	
		CHBDC	1	-103.	-742.	404.	338.	0.	541.	258.	305.	70.	600.	
		CHBDC	1	-74.	-742.	404.	338.	0.	389.	258.	305.	70.	600.	
1/ 7	0.800	CHBDC	1	-115.	-742.	404.	338.	0.	603.	258.	305.	70.	600.	
		CHBDC	1	-319.	-742.	404.	338.	0.	1673.	258.	305.	70.	600.	
		CHBDC	1 MIN	-557.	-742.	404.	338.	0.	2924.	258.	305.	70.	300.	36
		CHBDC	1 MAX	-40.	-742.	404.	338.	0.	208.	258.	305.	N/C	N/C	
		CHBDC	1	-155.	-742.	404.	338.	0.	812.	258.	305.	70.	600.	
		CHBDC	1	-111.	-742.	404.	338.	0.	583.	258.	305.	70.	600.	
1/ 8	0.900	CHBDC	1	-152.	-876.	539.	338.	0.	797.	258.	229.	53.	600.	

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
		CHBDC	1	-448.	-876.	539.	338.	0.	2351.	258.	229.	53.	600.	
		CHBDC	1 MIN	-686.	-876.	539.	338.	0.	3601.	258.	229.	53.	300.	
		CHBDC	1 MAX	-118.	-876.	539.	338.	0.	622.	258.	229.	53.	600.	
		CHBDC	1	-206.	-876.	539.	338.	0.	1083.	258.	229.	53.	600.	
		CHBDC	1	-148.	-876.	539.	338.	0.	778.	258.	229.	53.	600.	
1/ 9	1.000	CHBDC	1	-261.	-1223.	1046.	331.	0.	1404.	398.	178.	41.	600.	35
		CHBDC	1	-185.	-1223.	1046.	331.	0.	994.	398.	178.	41.	600.	35
		CHBDC	1 MIN	-814.	-1058.	885.	173.	0.	4372.	398.	178.	41.	300.	35
		CHBDC	1 MAX	-177.	-1223.	1046.	331.	0.	950.	398.	178.	41.	600.	35
		CHBDC	1	-258.	-1223.	1046.	331.	0.	1384.	398.	178.	41.	600.	35
		CHBDC	1	-261.	-1223.	1046.	331.	0.	1404.	398.	178.	41.	600.	35
RC/ 9	0.000	CHBDC	1	304.	1223.	1011.	280.	0.	1630.	398.	178.	41.	600.	35
		CHBDC	1	5.	1249.	1069.	338.	0.	24.	398.	178.	N/C	N/C	35
		CHBDC	1 MIN	5.	1249.	1069.	338.	0.	24.	398.	178.	N/C	N/C	35
		CHBDC	1 MAX	304.	1249.	1069.	338.	0.	1596.	398.	178.	41.	600.	35
		CHBDC	1	6.	1249.	1069.	338.	0.	34.	398.	178.	N/C	N/C	35
		CHBDC	1	304.	1223.	1011.	280.	0.	1630.	398.	178.	41.	600.	35
RC/ 9	1.000	CHBDC	1 MAX	-297.	-1225.	1046.	331.	0.	1597.	398.	178.	41.	600.	35

Run A: Filename: 7108.ab1

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - FLEXURE

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.

IKODE NO.	CODE CLAUSE
30	8.8.4.3 MIN. LONGITUDINAL R/F
31	8.8.4.5 MAX. LONGITUDINAL R/F
32	|Mr/Mf| < 1.0

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION
|Mr/Mf| = ABSOLUTE VALUE OF Mr/Mf
c/d = FACTOR DEFINED IN 8.8.4.5 ; A NEGATIVE VALUE OF c/d INDICATES Asc > As

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
LC/ 2	0.000	CHBDC	1 MIN	-33.	-1645.	-860.	0.214	50.3	0.627	0.026	0.21	
		CHBDC	1 MAX	-30.	-1645.	-860.	0.214	55.6	0.627	0.024	0.21	
		CHBDC	1	-30.	-1645.	-860.	0.214	55.6	0.627	0.024	0.21	
		CHBDC	1	-30.	-1645.	-860.	0.214	55.6	0.627	0.024	0.21	
		CHBDC	1	-30.	-1645.	-860.	0.214	55.6	0.627	0.024	0.21	
		CHBDC	1	-33.	-1645.	-860.	0.214	50.3	0.627	0.026	0.21	
LC/ 3	1.000	CHBDC	1 MIN	-135.	-1722.	-860.	0.208	12.8	0.599	0.104	0.23	
		CHBDC	1 MAX	-30.	-1722.	-860.	0.208	57.4	0.599	0.023	0.23	
		CHBDC	1	-129.	-1722.	-860.	0.208	13.4	0.599	0.099	0.23	
		CHBDC	1	-33.	-1722.	-860.	0.208	52.2	0.599	0.025	0.23	
		CHBDC	1	-31.	-1722.	-860.	0.208	56.3	0.599	0.024	0.23	
		CHBDC	1	-135.	-1722.	-860.	0.208	12.8	0.599	0.104	0.23	
1/ 3	0.000	CHBDC	1 MIN	-146.	-1739.	-860.	0.212	11.9	0.593	0.112	0.24	
		CHBDC	1 MAX	-41.	-1739.	-860.	0.212	42.9	0.593	0.031	0.24	
		CHBDC	1	-41.	-1739.	-860.	0.212	42.9	0.593	0.031	0.24	
		CHBDC	1	-45.	-1739.	-860.	0.212	38.4	0.593	0.035	0.24	
		CHBDC	1	-41.	-1739.	-860.	0.212	42.2	0.593	0.032	0.24	
		CHBDC	1	-146.	-1739.	-860.	0.212	11.9	0.593	0.112	0.24	
1/ 4	0.100	CHBDC	1 MIN	102.	3548.	1680.	0.092	34.8	0.568	0.038	0.10	
		CHBDC	1 MAX	844.	3548.	1680.	0.092	4.2	0.568	0.316	0.10	
		CHBDC	1	515.	3548.	1680.	0.092	6.9	0.568	0.193	0.10	
		CHBDC	1	844.	3548.	1680.	0.092	4.2	0.568	0.316	0.10	
		CHBDC	1	268.	3548.	1680.	0.092	13.3	0.568	0.100	0.10	

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
		CHBDC	1	193.	3548.	1680.	0.092	18.4	0.568	0.072	0.10	
1/ 5	0.200	CHBDC	1 MIN	263.	3548.	1599.	0.092	13.5	0.541	0.099	0.10	
		CHBDC	1 MAX	1444.	3548.	1599.	0.092	2.5	0.541	0.541	0.10	
		CHBDC	1	1031.	3548.	1599.	0.092	3.4	0.541	0.386	0.10	
		CHBDC	1	1444.	3548.	1599.	0.092	2.5	0.541	0.541	0.10	
		CHBDC	1	478.	3548.	1599.	0.092	7.4	0.541	0.179	0.10	
		CHBDC	1	344.	3548.	1599.	0.092	10.3	0.541	0.129	0.10	
1/ 5	0.300	CHBDC	1 MIN	381.	3548.	1540.	0.092	9.3	0.521	0.143	0.10	
		CHBDC	1 MAX	1835.	3548.	1540.	0.092	1.9	0.521	0.688	0.10	
		CHBDC	1	1454.	3548.	1540.	0.092	2.4	0.521	0.545	0.10	
		CHBDC	1	1835.	3548.	1540.	0.092	1.9	0.521	0.688	0.10	
		CHBDC	1	628.	3548.	1540.	0.092	5.7	0.521	0.235	0.10	
		CHBDC	1	452.	3548.	1540.	0.092	7.8	0.521	0.170	0.10	
1/ 6	0.400	CHBDC	1 MIN	456.	3548.	1505.	0.092	7.8	0.509	0.171	0.10	
		CHBDC	1 MAX	2058.	3548.	1505.	0.092	1.7	0.509	0.772	0.10	
		CHBDC	1	1719.	3548.	1505.	0.092	2.1	0.509	0.644	0.10	
		CHBDC	1	2058.	3548.	1505.	0.092	1.7	0.509	0.772	0.10	
		CHBDC	1	718.	3548.	1505.	0.092	4.9	0.509	0.269	0.10	
		CHBDC	1	517.	3548.	1505.	0.092	6.9	0.509	0.194	0.10	
1/ 6	0.500	CHBDC	1 MIN	488.	3548.	1493.	0.092	7.3	0.505	0.183	0.10	
		CHBDC	1 MAX	2137.	3548.	1493.	0.092	1.7	0.505	0.801	0.10	
		CHBDC	1	1877.	3548.	1493.	0.092	1.9	0.505	0.704	0.10	
		CHBDC	1	2086.	3548.	1493.	0.092	1.7	0.505	0.782	0.10	
		CHBDC	1	748.	3548.	1493.	0.092	4.7	0.505	0.280	0.10	
		CHBDC	1	539.	3548.	1493.	0.092	6.6	0.505	0.202	0.10	
1/ 6	0.600	CHBDC	1 MIN	477.	3548.	1505.	0.092	7.4	0.509	0.179	0.10	
		CHBDC	1 MAX	2059.	3548.	1505.	0.092	1.7	0.509	0.772	0.10	
		CHBDC	1	2059.	3548.	1505.	0.092	1.7	0.509	0.772	0.10	
		CHBDC	1	1719.	3548.	1505.	0.092	2.1	0.509	0.645	0.10	
		CHBDC	1	718.	3548.	1505.	0.092	4.9	0.509	0.269	0.10	
		CHBDC	1	517.	3548.	1505.	0.092	6.9	0.509	0.194	0.10	
1/ 7	0.700	CHBDC	1 MIN	421.	3548.	1540.	0.092	8.4	0.521	0.158	0.10	
		CHBDC	1 MAX	1836.	3548.	1540.	0.092	1.9	0.521	0.688	0.10	
		CHBDC	1	1836.	3548.	1540.	0.092	1.9	0.521	0.688	0.10	
		CHBDC	1	1454.	3548.	1540.	0.092	2.4	0.521	0.545	0.10	
		CHBDC	1	628.	3548.	1540.	0.092	5.6	0.521	0.236	0.10	
		CHBDC	1	453.	3548.	1540.	0.092	7.8	0.521	0.170	0.10	
1/ 7	0.800	CHBDC	1 MIN	308.	3548.	1598.	0.092	11.5	0.541	0.116	0.10	
		CHBDC	1 MAX	1445.	3548.	1598.	0.092	2.5	0.541	0.542	0.10	
		CHBDC	1	1445.	3548.	1598.	0.092	2.5	0.541	0.542	0.10	
		CHBDC	1	1032.	3548.	1598.	0.092	3.4	0.541	0.387	0.10	

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
		CHBDC	1	479.	3548.	1598.	0.092	7.4	0.541	0.179	0.10	
		CHBDC	1	345.	3548.	1598.	0.092	10.3	0.541	0.129	0.10	
1/ 8	0.900	CHBDC	1 MIN	153.	3548.	1680.	0.092	23.2	0.568	0.057	0.10	
		CHBDC	1 MAX	845.	3548.	1680.	0.092	4.2	0.568	0.317	0.10	
		CHBDC	1	845.	3548.	1680.	0.092	4.2	0.568	0.317	0.10	
		CHBDC	1	516.	3548.	1680.	0.092	6.9	0.568	0.193	0.10	
		CHBDC	1	269.	3548.	1680.	0.092	13.2	0.568	0.101	0.10	
		CHBDC	1	194.	3548.	1680.	0.092	18.3	0.568	0.073	0.10	
1/ 9	1.000	CHBDC	1 MIN	-89.	-1707.	-860.	0.205	19.1	0.605	0.069	0.22	
		CHBDC	1 MAX	-39.	-1707.	-860.	0.205	43.4	0.605	0.031	0.22	
		CHBDC	1	-44.	-1707.	-860.	0.205	39.2	0.605	0.034	0.22	
		CHBDC	1	-39.	-1707.	-860.	0.205	43.4	0.605	0.031	0.22	
		CHBDC	1	-39.	-1707.	-860.	0.205	43.3	0.605	0.031	0.22	
		CHBDC	1	-89.	-1707.	-860.	0.205	19.1	0.605	0.069	0.22	
RC/ 9	0.000	CHBDC	1 MIN	-8.	-1706.	-860.	0.205	****	0.605	0.006	0.22	
		CHBDC	1 MAX	42.	3543.	786.	0.092	83.9	0.266	0.016	0.10	
		CHBDC	1	42.	3543.	786.	0.092	83.9	0.266	0.016	0.10	
		CHBDC	1	38.	3543.	786.	0.092	93.1	0.266	0.014	0.10	
		CHBDC	1	42.	3543.	786.	0.092	84.2	0.266	0.016	0.10	
		CHBDC	1	-8.	-1706.	-860.	0.205	****	0.605	0.006	0.22	
RC/ 9	1.000	CHBDC	1 MIN	-43.	-1645.	-860.	0.214	38.6	0.627	0.034	0.21	
		CHBDC	1 MAX	-39.	-1645.	-860.	0.214	42.7	0.627	0.031	0.21	
		CHBDC	1	-39.	-1645.	-860.	0.214	42.7	0.627	0.031	0.21	
		CHBDC	1	-43.	-1645.	-860.	0.214	38.6	0.627	0.034	0.21	
		CHBDC	1	-39.	-1645.	-860.	0.214	42.7	0.627	0.031	0.21	
		CHBDC	1	-43.	-1645.	-860.	0.214	38.6	0.627	0.034	0.21	

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - SHEAR

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.
VIOLATION OF CL 8.9.3.11/12 MAY NOT BE CRITICAL IF USER ENSURES THAT CL 8.9.3.10 IS SATISFIED BY PROPER REBAR DETAILING.

IKODE NO.	CODE CLAUSE	
33	8.9.3.2	N/C ---> NOT CALCULATED, STIRRUPS NOT REQUIRED AS PER CHBDC CLAUSE 8.9.1.2 FOR Vf
35	8.9.3.11/12	
36	8.14.6	NOTE: THE APPLICABILITY OF IKODES 36 & 37 FOR SOLID SLAB SECTIONS MUST BE ASCERTAINED BY THE USER.
37	8.9.1.3	

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
LC/ 2	0.000			**** OPTIMIZED SHEAR = 0.0 - RESISTANCE NOT DONE ****										
LC/ 3	1.000	CHBDC	1	-311.	-1223.	1220.	324.	0.	1669.	398.	152.	35.	600.	
		CHBDC	1	-10.	-1223.	1225.	331.	0.	53.	398.	152.	N/C	N/C	
		CHBDC	1 MIN	-311.	-1223.	1218.	321.	0.	1670.	398.	152.	35.	600.	
		CHBDC	1 MAX	-10.	-1223.	1225.	331.	0.	53.	398.	152.	N/C	N/C	
		CHBDC	1	-14.	-1223.	1225.	331.	0.	73.	398.	152.	N/C	N/C	
		CHBDC	1	-311.	-1223.	1220.	324.	0.	1669.	398.	152.	35.	600.	
1/ 3	[illegible]	CHBDC	1	258.	1223.	1225.	331.	0.	1383.	398.	152.	35.	600.	
		CHBDC	1	180.	1223.	1225.	331.	0.	965.	398.	152.	35.	600.	
		CHBDC	1 [illegible]	[illegible]	[illegible]	1225.	331.	0.	945.	398.	152.	35.	600.	
		CHBDC	1 [illegible]	[illegible]	[illegible]	1039.	175.	0.	4327.	398.	152.	35.	300.	
		CHBDC	1	249.	1223.	1225.	331.	0.	1339.	398.	152.	35.	600.	
		CHBDC	1	258.	1223.	1225.	331.	0.	1383.	398.	152.	35.	600.	
1/ 4	[illegible]	CHBDC	1	152.	876.	539.	338.	0.	798.	258.	229.	53.	600.	
		CHBDC	1	441.	876.	539.	338.	0.	2316.	258.	229.	53.	600.	
		CHBDC	1 [illegible]	[illegible]	[illegible]	539.	338.	0.	599.	258.	229.	53.	600.	
		CHBDC	1 [illegible]	[illegible]	[illegible]	539.	338.	0.	3566.	258.	229.	53.	300.	
		CHBDC	1	200.	876.	539.	338.	0.	1049.	258.	229.	53.	600.	
		CHBDC	1	144.	876.	539.	338.	0.	756.	258.	229.	53.	600.	
1/ 5	[illegible]	CHBDC	1	116.	742.	404.	338.	0.	610.	258.	305.	70.	600.	
		CHBDC	1	314.	742.	404.	338.	0.	1648.	258.	305.	70.	600.	
		CHBDC	1 [illegible]	[illegible]	[illegible]	404.	338.	0.	192.	258.	305.	N/C	N/C	
		CHBDC	1 [illegible]	[illegible]	[illegible]	404.	338.	0.	2898.	258.	305.	70.	300.	[illegible]

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
		CHBDC	1	150.	742.	404.	338.	0.	787.	258.	305.	70.	600.	
		CHBDC	1	108.	742.	404.	338.	0.	567.	258.	305.	70.	600.	
1/ 5	0.300	CHBDC	1	80.	742.	404.	338.	0.	421.	258.	305.	70.	600.	
		CHBDC	1	197.	742.	404.	338.	0.	1034.	258.	305.	70.	600.	
		CHBDC	1 MIN	-47.	-742.	404.	338.	0.	247.	258.	305.	N/C	N/C	
		CHBDC	1 MAX	435.	667.	388.	279.	0.	2284.	258.	305.	70.	600.	
		CHBDC	1	100.	742.	404.	338.	0.	525.	258.	305.	70.	600.	
		CHBDC	1	72.	742.	404.	338.	0.	378.	258.	305.	70.	600.	
1/ 6	0.400	CHBDC	1	44.	608.	270.	338.	0.	232.	258.	457.	N/C	N/C	
		CHBDC	1	91.	608.	270.	338.	0.	477.	258.	457.	105.	600.	
		CHBDC	1 MIN	-131.	-608.	270.	338.	0.	686.	258.	457.	105.	600.	
		CHBDC	1 MAX	329.	482.	248.	234.	0.	1728.	258.	457.	105.	600.	
		CHBDC	1	50.	608.	270.	338.	0.	263.	258.	457.	N/C	N/C	
		CHBDC	1	36.	608.	270.	338.	0.	189.	258.	457.	N/C	N/C	
1/ 6	0.500	CHBDC	1	8.	608.	270.	338.	0.	43.	258.	457.	N/C	N/C	
		CHBDC	1	-41.	-608.	270.	338.	0.	214.	258.	457.	N/C	N/C	
		CHBDC	1 MIN	-223.	-608.	270.	338.	0.	1170.	258.	457.	105.	600.	
		CHBDC	1 MAX	223.	524.	257.	268.	0.	1171.	258.	457.	105.	600.	
		CHBDC	1	0.	608.	270.	338.	0.	1.	258.	457.	N/C	N/C	
		CHBDC	1	0.	608.	270.	338.	0.	1.	258.	457.	N/C	N/C	
1/ 6	0.600	CHBDC	1	-28.	-608.	270.	338.	0.	145.	258.	457.	N/C	N/C	
		CHBDC	1	-91.	-608.	270.	338.	0.	476.	258.	457.	105.	600.	
		CHBDC	1 MIN	-329.	-482.	248.	234.	0.	1726.	258.	457.	105.	600.	
		CHBDC	1 MAX	131.	608.	270.	338.	0.	687.	258.	457.	105.	600.	
		CHBDC	1	-50.	-608.	270.	338.	0.	261.	258.	457.	N/C	N/C	
		CHBDC	1	-36.	-608.	270.	338.	0.	188.	258.	457.	N/C	N/C	
1/ 7	0.700	CHBDC	1	-75.	-742.	404.	338.	0.	396.	258.	305.	70.	600.	
		CHBDC	1	-197.	-742.	404.	338.	0.	1033.	258.	305.	70.	600.	
		CHBDC	1 MIN	-435.	-667.	388.	279.	0.	2283.	258.	305.	70.	600.	
		CHBDC	1 MAX	47.	742.	404.	338.	0.	248.	258.	305.	N/C	N/C	
		CHBDC	1	-100.	-742.	404.	338.	0.	523.	258.	305.	70.	600.	
		CHBDC	1	-72.	-742.	404.	338.	0.	377.	258.	305.	70.	600.	
1/ 7	0.800	CHBDC	1	-111.	-742.	404.	338.	0.	585.	258.	305.	70.	600.	
		CHBDC	1	-313.	-742.	404.	338.	0.	1646.	258.	305.	70.	600.	
		CHBDC	1 MIN	-551.	-742.	404.	338.	0.	2896.	258.	305.	70.	300.	36
		CHBDC	1 MAX	-36.	-742.	404.	338.	0.	190.	258.	305.	N/C	N/C	
		CHBDC	1	-149.	-742.	404.	338.	0.	785.	258.	305.	70.	600.	
		CHBDC	1	-108.	-742.	404.	338.	0.	566.	258.	305.	70.	600.	
1/ 8	0.900	CHBDC	1	-147.	-876.	539.	338.	0.	774.	258.	229.	53.	600.	

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
		CHBDC	1	-441.	-876.	539.	338.	0.	2315.	258.	229.	53.	600.	
		CHBDC	1 MIN	-679.	-876.	539.	338.	0.	3565.	258.	229.	53.	300.	
		CHBDC	1 MAX	-114.	-876.	539.	338.	0.	598.	258.	229.	53.	600.	
		CHBDC	1	-199.	-876.	539.	338.	0.	1047.	258.	229.	53.	600.	
		CHBDC	1	-144.	-876.	539.	338.	0.	754.	258.	229.	53.	600.	
1/ 9	1.000	CHBDC	1	-253.	-1223.	1046.	331.	0.	1357.	398.	178.	41.	600.	35
		CHBDC	1	-180.	-1223.	1046.	331.	0.	964.	398.	178.	41.	600.	35
		CHBDC	1 MIN	-806.	-1062.	887.	175.	0.	4325.	398.	178.	41.	300.	35
		CHBDC	1 MAX	-171.	-1223.	1046.	331.	0.	920.	398.	178.	41.	600.	35
		CHBDC	1	-249.	-1223.	1046.	331.	0.	1337.	398.	178.	41.	600.	35
		CHBDC	1	-253.	-1223.	1046.	331.	0.	1357.	398.	178.	41.	600.	35
RC/ 9	0.000	CHBDC	1	303.	1223.	1011.	280.	0.	1628.	398.	178.	41.	600.	35
		CHBDC	1	4.	1249.	1069.	338.	0.	23.	398.	178.	N/C	N/C	35
		CHBDC	1 MIN	4.	1249.	1069.	338.	0.	23.	398.	178.	N/C	N/C	35
		CHBDC	1 MAX	304.	1249.	1069.	338.	0.	1595.	398.	178.	41.	600.	35
		CHBDC	1	6.	1249.	1069.	338.	0.	32.	398.	178.	N/C	N/C	35
		CHBDC	1	303.	1223.	1011.	280.	0.	1628.	398.	178.	41.	600.	35
RC/ 9	1.000	CHBDC	1 MAX	298.	1223.	1046.	331.	0.	1597.	398.	178.	41.	600.	35

Run B, Filename: 7108.bb1

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - FLEXURE

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.

IKODE NO.	CODE CLAUSE
30	8.8.4.3 MIN. LONGITUDINAL R/F
31	8.8.4.5 MAX. LONGITUDINAL R/F
32	|Mr/Mf| < 1.0

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION
|Mr/Mf| = ABSOLUTE VALUE OF Mr/Mf
c/d = FACTOR DEFINED IN 8.8.4.5 ; A NEGATIVE VALUE OF c/d INDICATES Asc > As

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
LC/ 2	0.000	CHBDC	1 MIN	-55.	-1764.	-901.	0.250	32.0	0.613	0.042	0.25	
		CHBDC	1 MAX	-50.	-1764.	-901.	0.250	35.3	0.613	0.038	0.25	
		CHBDC	1	-55.	-1764.	-901.	0.250	32.0	0.613	0.042	0.25	
		CHBDC	1	-50.	-1764.	-901.	0.250	35.3	0.613	0.038	0.25	
		CHBDC	1	-50.	-1764.	-901.	0.250	35.3	0.613	0.038	0.25	
		CHBDC	1	-55.	-1764.	-901.	0.250	32.0	0.613	0.042	0.25	
LC/ 2	1.000	CHBDC	1 MIN	-101.	-1744.	-901.	0.248	17.3	0.620	0.077	0.25	
		CHBDC	1 MAX	-51.	-1744.	-901.	0.248	34.4	0.620	0.039	0.25	
		CHBDC	1	-101.	-1744.	-901.	0.248	17.3	0.620	0.077	0.25	
		CHBDC	1	-51.	-1744.	-901.	0.248	34.4	0.620	0.039	0.25	
		CHBDC	1	-51.	-1744.	-901.	0.248	34.3	0.620	0.039	0.25	
		CHBDC	1	-101.	-1744.	-901.	0.248	17.3	0.620	0.077	0.25	
1/ 2	0.000	CHBDC	1 MIN	-127.	-1859.	-901.	0.226	14.6	0.582	0.091	0.24	
		CHBDC	1 MAX	-75.	-1859.	-901.	0.226	24.8	0.582	0.054	0.24	
		CHBDC	1	-83.	-1859.	-901.	0.226	22.5	0.582	0.059	0.24	
		CHBDC	1	-75.	-1859.	-901.	0.226	24.8	0.582	0.054	0.24	
		CHBDC	1	-75.	-1859.	-901.	0.226	24.8	0.582	0.054	0.24	
		CHBDC	1	-127.	-1859.	-901.	0.226	14.6	0.582	0.091	0.24	
1/ 3	0.100	CHBDC	1 MIN	384.	4818.	2316.	0.111	12.6	0.577	0.106	0.11	
		CHBDC	1 MAX	1574.	4818.	2316.	0.111	3.1	0.577	0.434	0.11	
		CHBDC	1	916.	4818.	2316.	0.111	5.3	0.577	0.253	0.11	
		CHBDC	1	1574.	4818.	2316.	0.111	3.1	0.577	0.434	0.11	
		CHBDC	1	590.	4818.	2316.	0.111	8.2	0.577	0.163	0.11	

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
		CHBDC	1	424.	4818.	2316.	0.111	11.4	0.577	0.117	0.11	
1/ 4	0.200	CHBDC	1 MIN	718.	5091.	2377.	0.111	7.1	0.560	0.188	0.10	
		CHBDC	1 MAX	2692.	5091.	2377.	0.111	1.9	0.560	0.703	0.10	
		CHBDC	1	1857.	5091.	2377.	0.111	2.7	0.560	0.485	0.10	
		CHBDC	1	2684.	5091.	2377.	0.111	1.9	0.560	0.701	0.10	
		CHBDC	1	1049.	5091.	2377.	0.111	4.9	0.560	0.274	0.10	
		CHBDC	1	754.	5091.	2377.	0.111	6.8	0.560	0.197	0.10	
1/ 4	0.300	CHBDC	1 MIN	958.	5363.	2491.	0.111	5.6	0.557	0.238	0.10	
		CHBDC	1 MAX	3533.	5363.	2491.	0.111	1.5	0.557	0.876	0.10	
		CHBDC	1	2563.	5363.	2491.	0.111	2.1	0.557	0.636	0.10	
		CHBDC	1	3435.	5363.	2491.	0.111	1.6	0.557	0.852	0.10	
		CHBDC	1	1377.	5363.	2491.	0.111	3.9	0.557	0.342	0.10	
		CHBDC	1	989.	5363.	2491.	0.111	5.4	0.557	0.245	0.10	
1/ 5	0.400	CHBDC	1 MIN	1104.	5550.	2586.	0.111	5.0	0.559	0.264	0.10	
		CHBDC	1 MAX	3974.	5550.	2586.	0.111	1.4	0.559	0.952	0.10	
		CHBDC	1	3068.	5550.	2586.	0.111	1.8	0.559	0.735	0.10	
		CHBDC	1	3777.	5550.	2586.	0.111	1.5	0.559	0.905	0.10	
		CHBDC	1	1574.	5550.	2586.	0.111	3.5	0.559	0.377	0.10	
		CHBDC	1	1130.	5550.	2586.	0.111	4.9	0.559	0.271	0.10	
1/ 5	0.500	CHBDC	1 MIN	1155.	5550.	2560.	0.111	4.8	0.553	0.277	0.10	
		CHBDC	1 MAX	4063.	5550.	2560.	0.111	1.4	0.553	0.974	0.10	
		CHBDC	1	3282.	5550.	2560.	0.111	1.7	0.553	0.787	0.10	
		CHBDC	1	3744.	5550.	2560.	0.111	1.5	0.553	0.897	0.10	
		CHBDC	1	1639.	5550.	2560.	0.111	3.4	0.553	0.393	0.10	
		CHBDC	1	1177.	5550.	2560.	0.111	4.7	0.553	0.282	0.10	

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - SHEAR

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.
VIOLATION OF CL 8.9.3.11/12 MAY NOT BE CRITICAL IF USER ENSURES THAT CL 8.9.3.10 IS SATISFIED BY PROPER REBAR DETAILING.

IKODE NO.	CODE CLAUSE	N/C ---> NOT CALCULATED, STIRRUPS NOT REQUIRED AS PER CHBDC CLAUSE 8.9.1.2 FOR Vf
33	8.9.3.2	
35	8.9.3.11/12	
36	8.14.6	NOTE: THE APPLICABILITY OF IKODES 36 & 37 FOR SOLID SLAB SECTIONS MUST BE ASCERTAINED BY THE USER.
37	8.9.1.3	

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2 (mm)	SPACING (mm)	MIN AREA REQD mm^2 (mm)	MAX SPACING (mm)	IKODE NOS.
LC/ 2	0.000	CHBDC	1	-11.	-1208.	1449.	327.	0.	58.	398.	127.	N/C	N/C	
		CHBDC	1	-10.	-1208.	1449.	327.	0.	52.	398.	127.	N/C	N/C	
		CHBDC	1 MIN	-11.	-1208.	1449.	327.	0.	58.	398.	127.	N/C	N/C	
		CHBDC	1 MAX	-10.	-1208.	1449.	327.	0.	52.	398.	127.	N/C	N/C	
		CHBDC	1	-10.	-1208.	1449.	327.	0.	52.	398.	127.	N/C	N/C	
		CHBDC	1	-11.	-1208.	1449.	327.	0.	58.	398.	127.	N/C	N/C	
LC/ 2	1.000	CHBDC	1	-314.	-1206.	1446.	326.	0.	1711.	398.	127.	29.	600.	35
		CHBDC	1	-14.	-1206.	1446.	326.	0.	77.	398.	127.	N/C	N/C	
		CHBDC	1 MIN	-314.	-1206.	1446.	326.	0.	1711.	398.	127.	29.	600.	35
		CHBDC	1 MAX	-14.	-1206.	1446.	326.	0.	77.	398.	127.	N/C	N/C	
		CHBDC	1	-16.	-1206.	1446.	326.	0.	86.	398.	127.	N/C	N/C	
		CHBDC	1	-314.	-1206.	1446.	326.	0.	1711.	398.	127.	29.	600.	35
1/ 2	0.000	CHBDC	1	362.	1225.	1446.	326.	-19.	1867.	398.	127.	29.	600.	
		CHBDC	1	256.	1225.	1446.	326.	-19.	1286.	398.	127.	29.	600.	
		CHBDC	1 MIN	[illegible]	[illegible]	1446.	326.	-19.	1264.	398.	127.	29.	600.	
		CHBDC	1 MAX	[illegible]	[illegible]	1225.	172.	-19.	5456.	398.	127.	29.	300.	
		CHBDC	1	361.	1225.	1446.	326.	-19.	1861.	398.	127.	29.	600.	
		CHBDC	1	362.	1225.	1446.	326.	-19.	1867.	398.	127.	29.	600.	
1/ 3	0.100	CHBDC	1	218.	954.	540.	339.	-75.	752.	258.	229.	53.	600.	
		CHBDC	1	625.	954.	540.	339.	-75.	2882.	258.	229.	53.	300.	
		CHBDC	1 MIN	[illegible]	[illegible]	540.	339.	-75.	575.	258.	229.	53.	600.	
		CHBDC	1 MAX	[illegible]	[illegible]	540.	339.	-75.	4128.	258.	229.	53.	300.	
		CHBDC	1	300.	954.	540.	339.	-75.	1182.	258.	229.	53.	600.	
		CHBDC	1	216.	954.	540.	339.	-75.	739.	258.	229.	53.	600.	

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
1/ 4	0.200	CHBDC	1	164.	803.	397.	331.	-75.	480.	258.	305.	70.	600.	
		CHBDC	1	457.	803.	397.	331.	-75.	2047.	258.	305.	70.	600.	
		CHBDC	1 MIN	-3.	803.	397.	331.	-75.	44.	258.	305.	70.	600.	
		CHBDC	1 MAX	457.	803.	397.	331.	-75.	3324.	258.	305.	70.	300.	16
		CHBDC	1	225.	803.	397.	331.	-75.	806.	258.	305.	70.	600.	
		CHBDC	1	162.	803.	397.	331.	-75.	466.	258.	305.	70.	600.	
1/ 4	0.300	CHBDC	1	110.	840.	417.	348.	-75.	182.	258.	305.	70.	600.	
		CHBDC	1	296.	795.	408.	312.	-75.	1131.	258.	305.	70.	600.	
		CHBDC	1 MIN	-21.	-691.	417.	348.	-75.	486.	258.	305.	N/C	N/C	
		CHBDC	1 MAX	542.	726.	391.	260.	-75.	2384.	258.	305.	70.	600.	
		CHBDC	1	150.	840.	417.	348.	-75.	385.	258.	305.	70.	600.	
		CHBDC	1	108.	840.	417.	348.	-75.	169.	258.	305.	70.	600.	
1/ 5	0.400	CHBDC	1	56.	648.	288.	360.	0.	278.	258.	457.	N/C	N/C	
		CHBDC	1	-44.	-558.	273.	285.	0.	214.	258.	457.	N/C	N/C	
		CHBDC	1 MIN	-131.	-648.	288.	360.	0.	645.	258.	457.	105.	600.	
		CHBDC	1 MAX	390.	500.	261.	238.	0.	1923.	258.	457.	105.	600.	
		CHBDC	1	75.	648.	288.	360.	0.	370.	258.	457.	105.	600.	
		CHBDC	1	54.	648.	288.	360.	0.	266.	258.	457.	N/C	N/C	
1/ 5	0.500	CHBDC	1	-3.	-648.	288.	360.	0.	13.	258.	457.	N/C	N/C	
		CHBDC	1	34.	533.	269.	265.	0.	166.	258.	457.	N/C	N/C	
		CHBDC	1 MIN	-241.	-648.	288.	360.	0.	1187.	258.	457.	105.	600.	
		CHBDC	1 MAX	241.	560.	274.	286.	0.	1187.	258.	457.	105.	600.	

Run C; Filename: 7108.cb1

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - FLEXURE

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.

IKODE NO.	CODE CLAUSE
30	8.8.4.3 MIN. LONGITUDINAL R/F
31	8.8.4.5 MAX. LONGITUDINAL R/F
32	|Mr/Mf| < 1.0

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION
|Mr/Mf| = ABSOLUTE VALUE OF Mr/Mf
c/d = FACTOR DEFINED IN 8.8.4.5 ; A NEGATIVE VALUE OF c/d INDICATES Asc > As

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
LC/ 2	0.000	CHBDC	1 MIN	-55.	-1764.	-860.	0.250	32.0	0.585	0.042	0.25	
		CHBDC	1 MAX	-50.	-1764.	-860.	0.250	35.3	0.585	0.038	0.25	
		CHBDC	1	-55.	-1764.	-860.	0.250	32.0	0.585	0.042	0.25	
		CHBDC	1	-50.	-1764.	-860.	0.250	35.3	0.585	0.038	0.25	
		CHBDC	1	-50.	-1764.	-860.	0.250	35.3	0.585	0.038	0.25	
		CHBDC	1	-55.	-1764.	-860.	0.250	32.0	0.585	0.042	0.25	
LC/ 2	1.000	CHBDC	1 MIN	-100.	-1744.	-860.	0.248	17.4	0.592	0.077	0.25	
		CHBDC	1 MAX	-51.	-1744.	-860.	0.248	34.4	0.592	0.039	0.25	
		CHBDC	1	-100.	-1744.	-860.	0.248	17.4	0.592	0.077	0.25	
		CHBDC	1	-51.	-1744.	-860.	0.248	34.4	0.592	0.039	0.25	
		CHBDC	1	-51.	-1744.	-860.	0.248	34.3	0.592	0.039	0.25	
		CHBDC	1	-100.	-1744.	-860.	0.248	17.4	0.592	0.077	0.25	
1/ 2	0.000	CHBDC	1 MIN	-127.	-1859.	-860.	0.226	14.6	0.555	0.091	0.24	
		CHBDC	1 MAX	-75.	-1859.	-860.	0.226	24.8	0.555	0.054	0.24	
		CHBDC	1	-83.	-1859.	-860.	0.226	22.5	0.555	0.059	0.24	
		CHBDC	1	-75.	-1859.	-860.	0.226	24.8	0.555	0.054	0.24	
		CHBDC	1	-75.	-1859.	-860.	0.226	24.8	0.555	0.054	0.24	
		CHBDC	1	-127.	-1859.	-860.	0.226	14.6	0.555	0.091	0.24	
1/ 3	0.100	CHBDC	1 MIN	374.	4802.	2308.	0.118	12.8	0.577	0.104	0.12	
		CHBDC	1 MAX	1558.	4802.	2308.	0.118	3.1	0.577	0.432	0.12	
		CHBDC	1	906.	4802.	2308.	0.118	5.3	0.577	0.251	0.12	
		CHBDC	1	1558.	4802.	2308.	0.118	3.1	0.577	0.432	0.12	
		CHBDC	1	575.	4802.	2308.	0.118	8.4	0.577	0.159	0.12	

SPAN/ SEC	X/L	COMB. TABLE	ULS GROUP NO.	MAX/MIN APPLIED MOMENT Mf (kN-m)	(FACTORED) RESISTANCE MOMENT Mr (kN-m)	CRACKING MOMENT Mcr (kN-m)	N.A FROM EXT.COMP FIBRE c (m)	|Mr/Mf|	1.2Mcr/Mr	1.33Mf/Mr	c/d	IKODE NOS.
		CHBDC	1	414.	4802.	2308.	0.118	11.6	0.577	0.115	0.12	
1/ 4	0.200	CHBDC	1 MIN	699.	5076.	2377.	0.118	7.3	0.562	0.183	0.11	
		CHBDC	1 MAX	2661.	5076.	2377.	0.118	1.9	0.562	0.697	0.11	
		CHBDC	1	1837.	5076.	2377.	0.118	2.8	0.562	0.481	0.11	
		CHBDC	1	2654.	5076.	2377.	0.118	1.9	0.562	0.695	0.11	
		CHBDC	1	1018.	5076.	2377.	0.118	5.0	0.562	0.267	0.11	
		CHBDC	1	734.	5076.	2377.	0.118	6.9	0.562	0.192	0.11	
1/ 4	0.300	CHBDC	1 MIN	931.	5347.	2496.	0.118	5.7	0.560	0.232	0.11	
		CHBDC	1 MAX	3491.	5347.	2496.	0.118	1.5	0.560	0.868	0.11	
		CHBDC	1	2536.	5347.	2496.	0.118	2.1	0.560	0.631	0.11	
		CHBDC	1	3393.	5347.	2496.	0.118	1.6	0.560	0.844	0.11	
		CHBDC	1	1335.	5347.	2496.	0.118	4.0	0.560	0.332	0.11	
		CHBDC	1	962.	5347.	2496.	0.118	5.6	0.560	0.239	0.11	
1/ 5	0.400	CHBDC	1 MIN	1073.	5535.	2594.	0.118	5.2	0.562	0.258	0.10	
		CHBDC	1 MAX	3926.	5535.	2594.	0.118	1.4	0.562	0.943	0.10	
		CHBDC	1	3037.	5535.	2594.	0.118	1.8	0.562	0.730	0.10	
		CHBDC	1	3728.	5535.	2594.	0.118	1.5	0.562	0.896	0.10	
		CHBDC	1	1525.	5535.	2594.	0.118	3.6	0.562	0.367	0.10	
		CHBDC	1	1099.	5535.	2594.	0.118	5.0	0.562	0.264	0.10	
1/ 5	0.500	CHBDC	1 MIN	1123.	5535.	2569.	0.118	4.9	0.557	0.270	0.10	
		CHBDC	1 MAX	4012.	5535.	2569.	0.118	1.4	0.557	0.964	0.10	
		CHBDC	1	3250.	5535.	2569.	0.118	1.7	0.557	0.781	0.10	
		CHBDC	1	3694.	5535.	2569.	0.118	1.5	0.557	0.888	0.10	
		CHBDC	1	1589.	5535.	2569.	0.118	3.5	0.557	0.382	0.10	
		CHBDC	1	1145.	5535.	2569.	0.118	4.8	0.557	0.275	0.10	

COMPOSITE PRESTRESSED GIRDER - ULTIMATE LIMIT STATES - SHEAR

STAGE NUMBER = 2

THE IKODE NUMBER IS GIVEN WHEN A CODE CLAUSE IS VIOLATED.
VIOLATION OF CL 8.9.3.11/12 MAY NOT BE CRITICAL IF USER ENSURES THAT CL 8.9.3.10 IS SATISFIED BY PROPER REBAR DETAILING.

IKODE NO.	CODE CLAUSE	N/C ---> NOT CALCULATED, STIRRUPS NOT REQUIRED AS PER CHBDC CLAUSE 8.9.1.2 FOR Vf
33	8.9.3.2	
35	8.9.3.11/12	
36	8.14.6	NOTE: THE APPLICABILITY OF IKODES 36 & 37 FOR SOLID SLAB SECTIONS MUST BE ASCERTAINED BY THE USER.
37	8.9.1.3	

LC = LEFT CANTILEVER SECTION
RC = RIGHT CANTILEVER SECTION

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
LC/ 2	0.000	CHBDC	1	-11.	-1208.	1449.	327.	0.	58.	398.	127.	N/C	N/C	
		CHBDC	1	-10.	-1208.	1449.	327.	0.	52.	398.	127.	N/C	N/C	
		CHBDC	1 MIN	-11.	-1208.	1449.	327.	0.	58.	398.	127.	N/C	N/C	
		CHBDC	1 MAX	-10.	-1208.	1449.	327.	0.	52.	398.	127.	N/C	N/C	
		CHBDC	1	-10.	-1208.	1449.	327.	0.	52.	398.	127.	N/C	N/C	
		CHBDC	1	-11.	-1208.	1449.	327.	0.	58.	398.	127.	N/C	N/C	
LC/ 2	1.000	CHBDC	1	-314.	-1206.	1446.	326.	0.	1710.	398.	127.	29.	600.	[illegible]
		CHBDC	1	-14.	-1206.	1446.	326.	0.	76.	398.	127.	N/C	N/C	
		CHBDC	1 MIN	-314.	-1206.	1446.	326.	0.	1710.	398.	127.	29.	600.	35
		CHBDC	1 MAX	-14.	-1206.	1446.	326.	0.	76.	398.	127.	N/C	N/C	
		CHBDC	1	-16.	-1206.	1446.	326.	0.	85.	398.	127.	N/C	N/C	
		CHBDC	1	-314.	-1206.	1446.	326.	0.	1710.	398.	127.	29.	600.	35
1/ 2	0.000	CHBDC	1	374.	1225.	1446.	326.	-19.	1929.	398.	127.	29.	600.	
		CHBDC	1	265.	1225.	1446.	326.	-19.	1339.	398.	127.	29.	600.	
		CHBDC	1 MIN	261.	1225.	1446.	326.	-19.	1317.	398.	127.	29.	600.	
		CHBDC	1 MAX	1033.	1225.	1220.	170.	-19.	5518.	398.	127.	29.	300.	
		CHBDC	1	373.	1225.	1446.	326.	-19.	1924.	398.	127.	29.	600.	
		CHBDC	1	374.	1225.	1446.	326.	-19.	1929.	398.	127.	29.	600.	
1/ 3	0.100	CHBDC	1	212.	954.	540.	339.	-75.	718.	258.	229.	53.	600.	
		CHBDC	1	615.	954.	540.	339.	-75.	2829.	258.	229.	53.	300.	
		CHBDC	1 MIN	1.76	954.	540.	339.	-75.	541.	258.	229.	53.	600.	
		CHBDC	1 MAX	853.	954.	540.	339.	-75.	4076.	258.	229.	53.	300.	
		CHBDC	1	290.	954.	540.	339.	-75.	1129.	258.	229.	53.	600.	
		CHBDC	1	209.	954.	540.	339.	-75.	704.	258.	229.	53.	600.	

SPAN/ SEC	X/L	COMB. TABLE	ULS GRP	MAX/MIN APPLIED SHEAR Vf (kN)	FACTORED SHEAR RESISTANCE Vr (kN)	STIRRUP CAPACITY Vs (kN)	CONCRETE CAPACITY Vc (kN)	PRESTRESS COMPONENT FOR SHEAR Vp (kN)	NOMINAL SHEAR STRESS (v) (kPa)	<- STIRRUPS-> TOTAL AREA Av mm^2	SPACING (mm)	MIN AREA REQD mm^2	MAX SPACING (mm)	IKODE NOS.
1/ 4	0.200	CHBDC	1	159.	803.	397.	331.	-75.	454.	258.	305.	70.	600.	
		CHBDC	1	449.	803.	397.	331.	-75.	2007.	258.	305.	70.	600.	
		CHBDC	1 MIN	78.	803.	397.	331.	-75.	18.	258.	305.	70.	600.	
		CHBDC	1 MAX	688.	803.	397.	331.	-75.	3284.	258.	305.	70.	300.	36
		CHBDC	1	218.	803.	397.	331.	-75.	766.	258.	305.	70.	600.	
		CHBDC	1	157.	803.	397.	331.	-75.	440.	258.	305.	70.	600.	
1/ 4	0.300	CHBDC	1	107.	840.	417.	348.	-75.	166.	258.	305.	70.	600.	
		CHBDC	1	291.	817.	413.	330.	-75.	1105.	258.	305.	70.	600.	
		CHBDC	1 MIN	-24.	-691.	417.	348.	-75.	503.	258.	305.	N/C	N/C	
		CHBDC	1 MAX	537.	743.	396.	273.	-75.	2358.	258.	305.	70.	600.	
		CHBDC	1	145.	840.	417.	348.	-75.	359.	258.	305.	70.	600.	
		CHBDC	1	105.	840.	417.	348.	-75.	153.	258.	305.	70.	600.	
1/ 5	0.400	CHBDC	1	55.	648.	288.	360.	0.	270.	258.	457.	N/C	N/C	
		CHBDC	1	-46.	-574.	276.	298.	0.	227.	258.	457.	N/C	N/C	
		CHBDC	1 MIN	-132.	-648.	288.	360.	0.	653.	258.	457.	105.	600.	
		CHBDC	1 MAX	388.	513.	264.	249.	0.	1911.	258.	457.	105.	600.	
		CHBDC	1	73.	648.	288.	360.	0.	358.	258.	457.	105.	600.	
		CHBDC	1	52.	648.	288.	360.	0.	258.	258.	457.	N/C	N/C	
1/ 5	0.500	CHBDC	1	-3.	-648.	288.	360.	0.	13.	258.	457.	N/C	N/C	
		CHBDC	1	34.	549.	272.	277.	0.	166.	258.	457.	N/C	N/C	
		CHBDC	1 MIN	-241.	-648.	288.	360.	0.	1187.	258.	457.	105.	600.	
		CHBDC	1 MAX	241.	578.	277.	301.	0.	1187.	258.	457.	105.	600.	

Existing Bridge Load Evaluation Summary

	Analysis Case					
A)	7108.1b1	End Span	Interior Girder	3 Lanes	Loaded	
)	7108.2b1	End Span	Exterior Girder	"	"	"
C)	7108.3b1	Main Span	Interior Girder	"	"	"
)	7108.4b1	Main Span	Exterior Girder	"	"	"
E)	7108.5b1	End Span		2	"	"
F)	7108.6b1	End Span		"	"	"
)	7108.7b1	Main Span		"	"	"
H)	7108.8b1	Main Span		"	"	"

Results

A) S6-06, Cl. 8.9.5.1 violated. Insufficient interface shear transfer near supports, from $x = 0.1$ to 2.5m. and from $x = 10.0$m to 12.4m. (Report 76). If deck slab & girders were poured monolithically, problem may be avoided.

B) S6-06, Cl. 8.14.6 violated. Maximum spacing of reinforcement for shear and torsion exceeded at $x = 2.5$m and $x = 10$m. (Report 75)
spacing provided = 305 mm max. permissable = 300 consider ok.
S6-06, Cl. 8.9.5.1 violated, from $x = 0.1$ to 2.5m. and from $x = 10$m to 12.4m. If diaphragms & girders were poured monolithically, problem may be avoided. (Report 76)

S6-06, Cl. 8.9.3.11/12 : (Report 75)

C) S6-06, Cl. 8.14.6 violated. Maximum spacing of reinforcement for
D) shear and torsion exceeded at $x = 3.556$m & $x = 14.224$m. (Report 75)
see B)
S6-06, Cl. 8.9.5.1 violated. See A & B. $x = 0.-7.112$m & $x = 10.668-17.78$m.

Deck Rehabilitation Design (t_s = 225mm, t_a = 90mm)

	Analysis	Span	Girder	Live Load
A)	7108.9b1	End	Interior	3 lanes loaded
B)	7108.ab1	End	Exterior	" " "
C)	7108.bb1	Main	Interior	" " "
D)	7108.cb1	Main	Exterior	" " "

Results:

A) End Span, Interior Girder code violations:

- S6-06, Cl. 8.14.6: maximum spacing of reinforcement for shear & torsion exceeded $0.2L_s$ & $0.8L_s$. (Report 75)
  Spacing provided = 305mm Max. Permissible = 300mm ∴ okay
- 8.9.3.11/12: (Report 75)
  i) Long. rebar on flexural tension side insufficient; or,

$$F_{lt} = \frac{M_f}{d_v} + 0.5N_f + (V_f - 0.5V_s - V_p)\cot\theta$$

Should be 0 when $0.5V_s > V_f$

$$= \frac{426}{d_v} + 0.5(230) + (261 - 0.5(1046\ kN) - 0))\cot 42° \quad @\ x/L = 1.000,\ \text{Sec. 9}$$

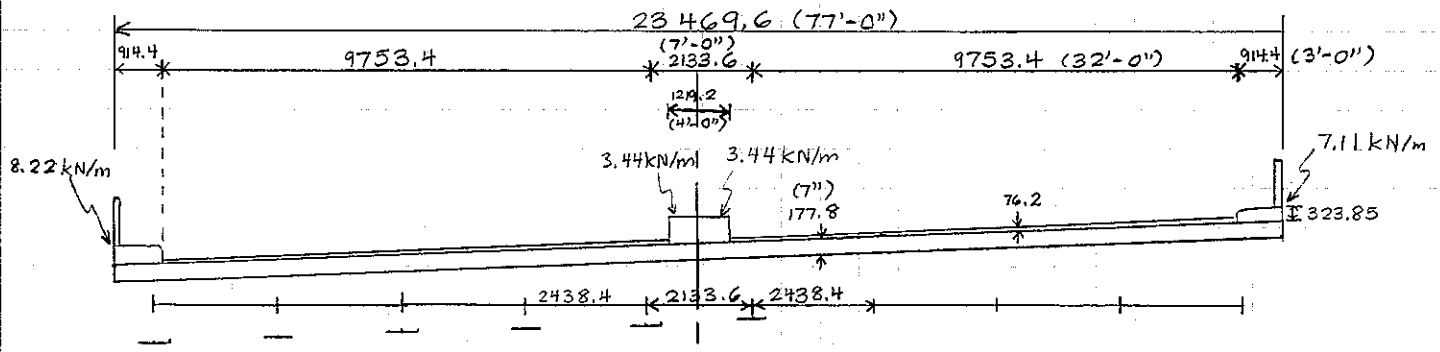
Note that long. rebar in flexural tension does not exist. Long. rebar is only provided in the top flange of girder. CANBAS doesn't consider this type of configuration. ∴ Not applicable

ii) Long. rebar on flexural comp. side insufficient

$$F_{lc} = 0.5N_f + (V_f - 0.5V_s - V_p)\cot\theta - \frac{M_f}{d_v}$$

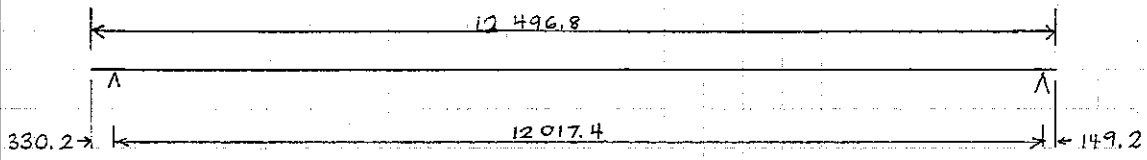
Why is this clause violated only at: Span 1, $x/L = 1.000$;
Span RC, $x/L = 0.000$; and,
Span RC, $x/L = 1.000$?

- 8.9.5.1: (Report 76) Insufficient interface shear transfer near supports



Left curb: $\omega_{CL} = 24(914.4)(374.65)/1 \times 10^6 = 8.22$ kN/m

End Span



Girder Long. Rebar:

ID	L (mm)	Spacing	Area	CG	Cover
1	12496.8	286	568	60.3	50.8
2	12496.8	286	568	162	50.8 (or 153)

Girder Stirrups:

ID	From (mm)	To (mm)	Spacing (mm)	Total Area (mm^2)
1	0	228.6	177.8	398
2	228.6	1295.4	152.4	398
3	1295.4	2438.4	228.6	258
4	2438.4	3962.4	304.8	258
5	3962.4	8534.4	457.2	258
6	8534.4	10058.4	304.8	258
7	10058.4	11201.4	228.6	258
8	11201.4	12268.2	152.4	398
9	12268.2	12496.8	177.8	398

Prestressed Straight Cables:

$$CG_2 = \frac{2(304.8)+2(558.8)+2(762.0)}{6}$$

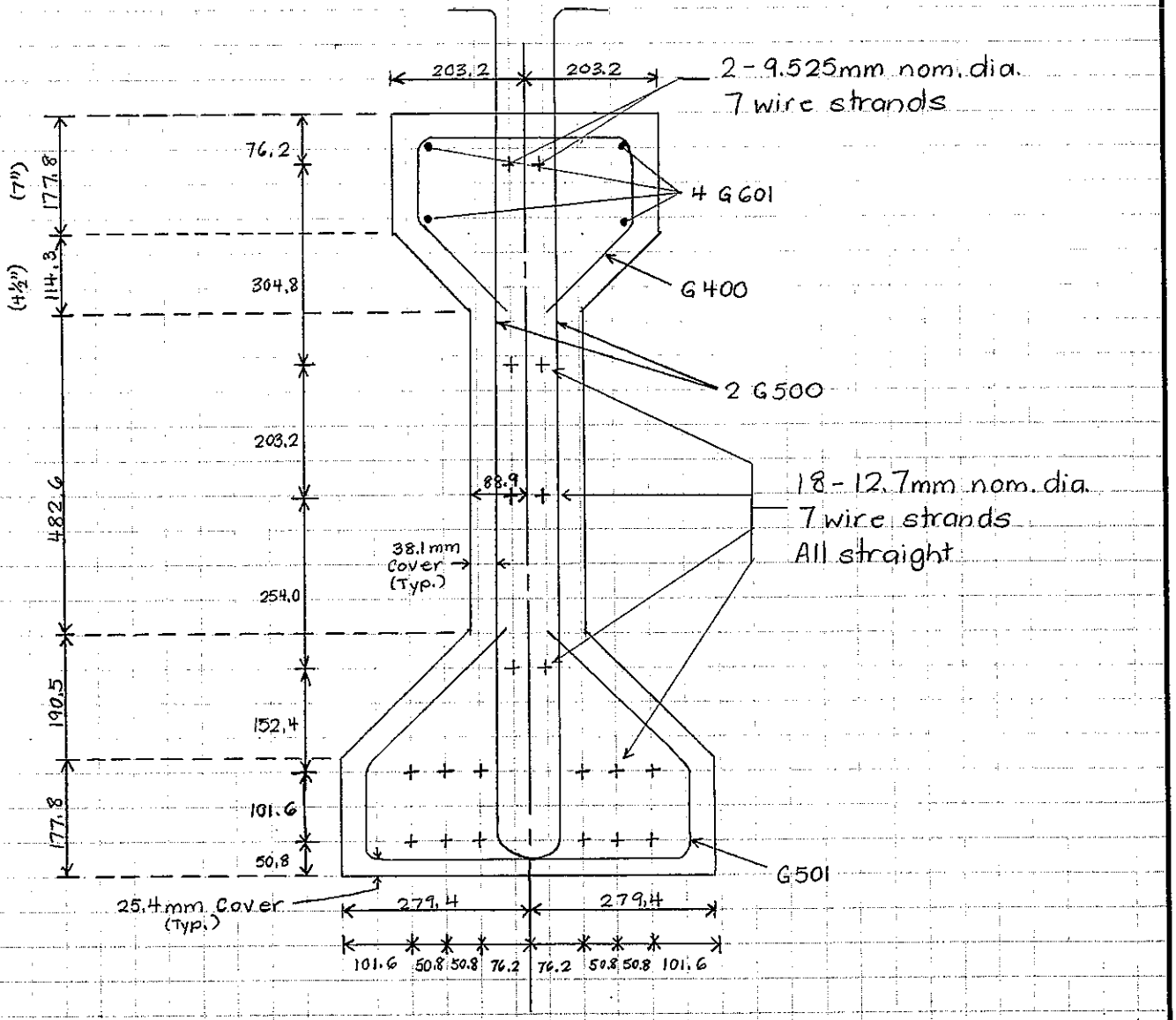
$CG_2 = 541.9mm$

ID	Span#	#strands	d_c (mm)
1	1	12	101.6
2	1	6	541.9
3	1	2	1066.8

Slab Reinforcement

		Spacing (mm)	Area (mm^2)	CG
TOP	0 - 12497 mm	348	7(199) = 1393	49

End Span - Prestressed Girders



C-C

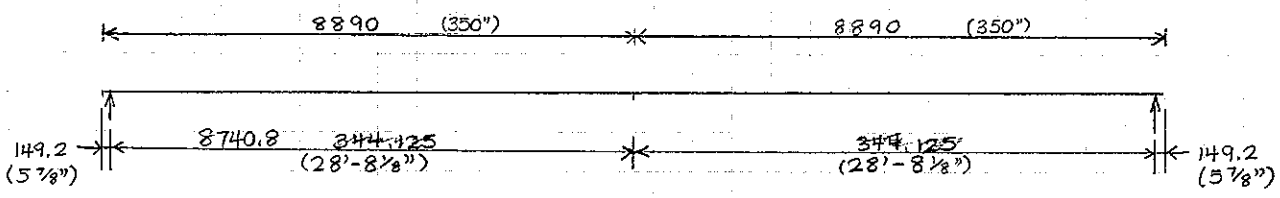
McCORMICK RANKIN CORPORATION

PROJECT CNR Overhead W.O. No. 7108.300

DESIGNED KWS DATE Aug

CHECKED _____ DATE _____ PAGE ____ OF ____

Main Span



Girder Long. Rebar:

ID	L (mm)	Spacing (mm)	Area (mm²)	CG (mm)	Cover
1	17780	286	568	60.3	51
2	17780	286	568	162.0	51 (or 153)

Girder Stirrups:

ID	From (mm)	To (mm)	Spacing (mm)	Total Area (mm²)
1	0	1651.0	127.0	2(199mm²) = 398
2	1651.0	3251.2	228.6	2(129mm²) = 258
3	3251.2	5689.6	304.8	2(129mm²) = 258
4	5689.6	8890.0	457.2	2(129mm²) = 258
5	8890.0	12090.4	457.2	= 258
6	12090.4	14528.8	304.8	= 258
7	14528.8	16129.0	228.6	= 258
8	16129.0	17780.0	127.0	398

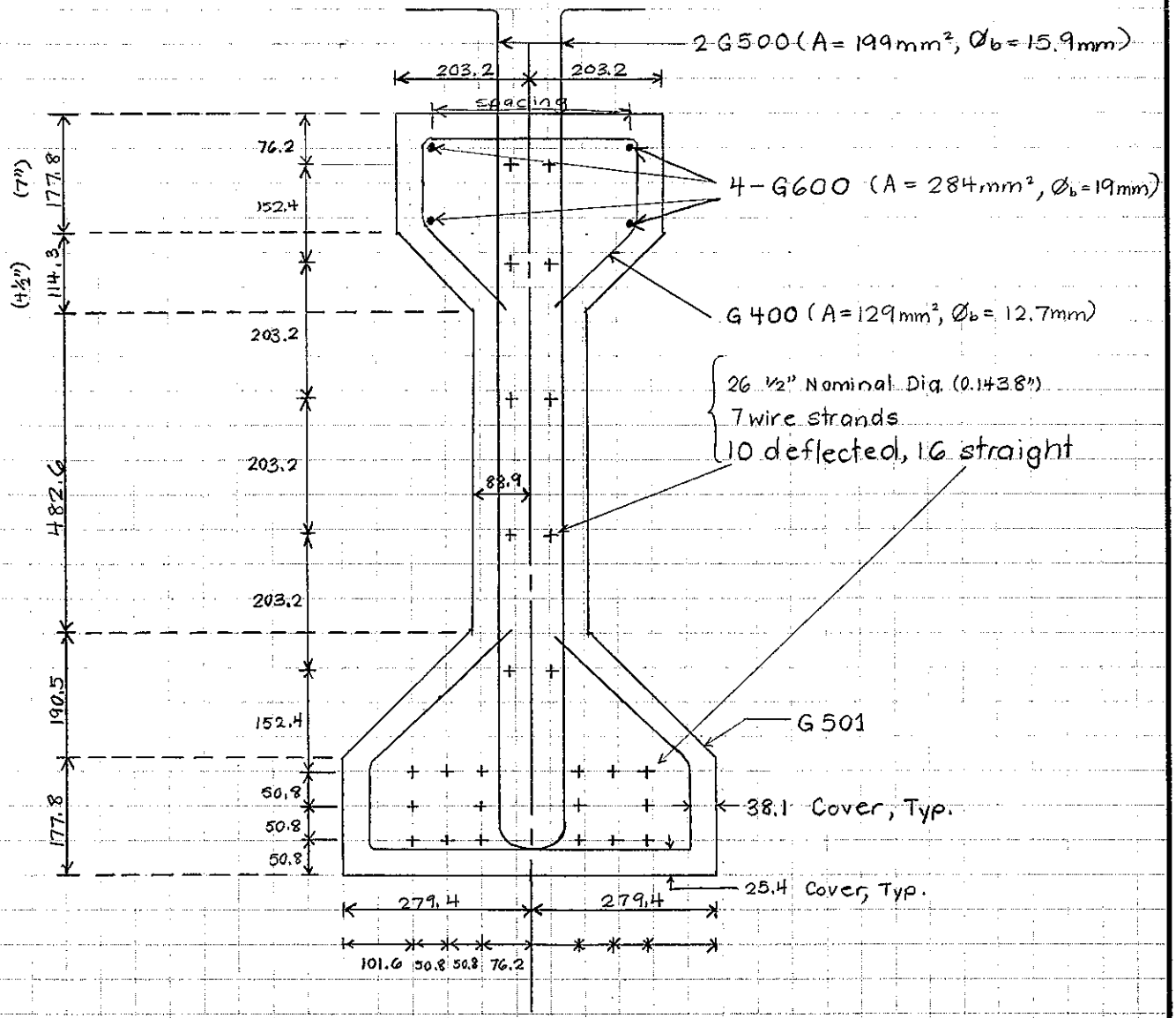
Prestressed Straight Cables

ID	Span #	# Strands	d_c (mm) from bottom	From (mm)	To (mm)
1	1	16	101.6	0	17780
2	1	6	76.2	6604	11176
3	1	4	139.7	6604	11176

Prestressed Deflected Cables

ID	Span #	# Strands	d_{c1} (mm)	d_{c2} (mm)
1	1	6	101.6	508.0
2	1	2	127.0	914.4
3	1	2	152.4	1066.8

Main Span - Prestressed Girders



A - A

McCORMICK RANKIN CORPORATION

PROJECT CNR Overhead Pass W.O. No. 7108.300

DESIGNED KWS DATE Aug. 24/09

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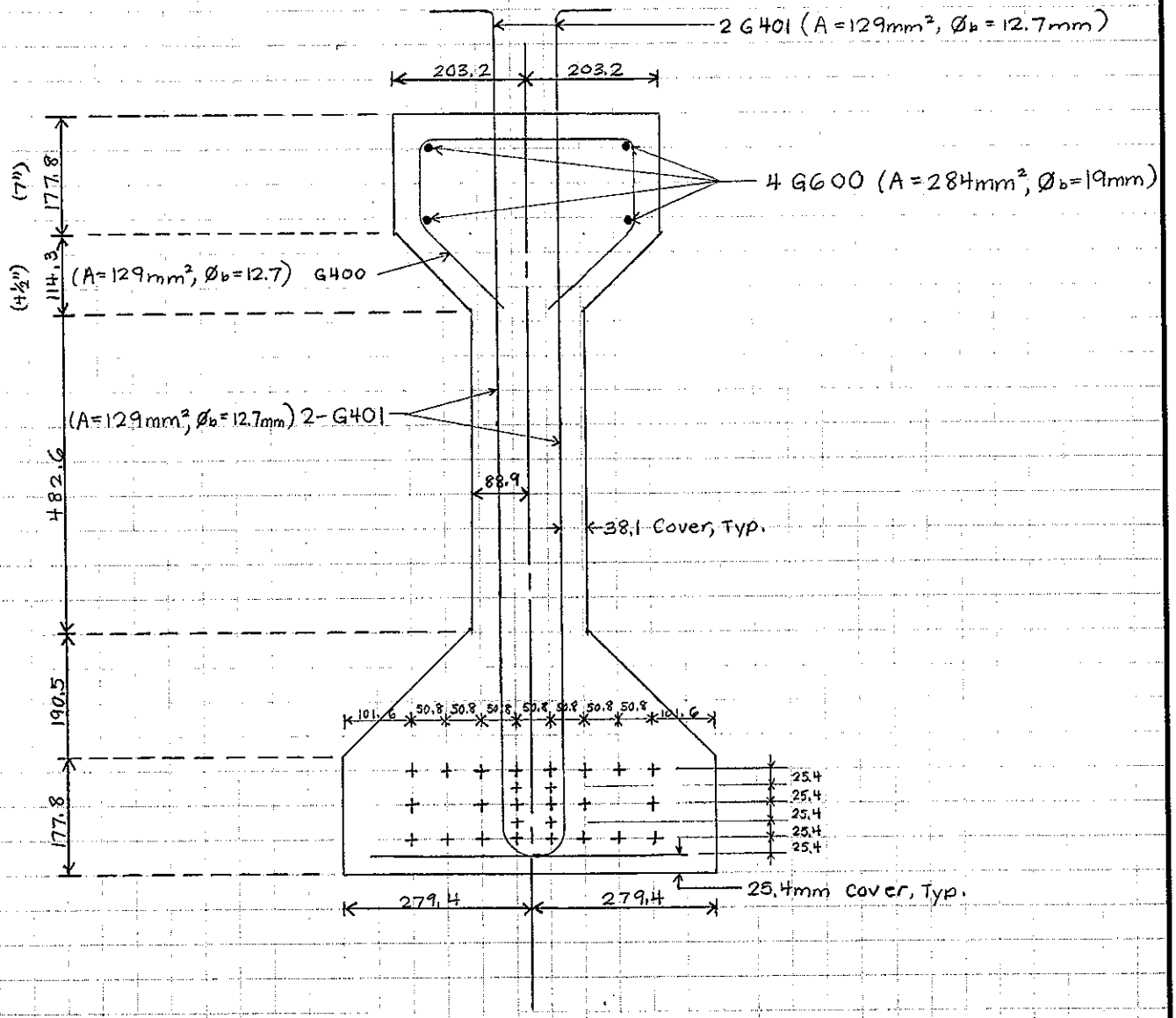
Main Span - Prestressed Girders



B - B

McCORMICK RANKIN CORPORATION

PROJECT CNR Overpass W.O. No. 7108.300

DESIGNED KWS DATE Aug. 24/09

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Working Force Per Girder After All Losses
i) for main span = 2251.779 kN
ii) for end spans = 1648.422 kN

Concrete	f_c'	Aggregate Size (Max)
Prestressed Beams	5000 psi = 34.5 MPa	3/4" = 19.05mm
Deck (t = 7" = 177.8mm)	4000 psi = 27.6 MPa	19.05mm
Remainder	3000 psi = 20.7 MPa	19.05mm
Beams @ strand release	4000 psi = 27.6 MPa	

Clear Cover

Deck Slab	1" = 25.4mm
Diaphragms	2" = 50.8mm

Total loss in stress in pretensioning steel:
i) for main span = 35000 psi
ii) for end spans = 28000 psi

Girders are A.A.S.H.T.O. Type III

Rebar: f_y = 275 MPa assumed {S6-06, Cl. 14.7.4.4, Table 14.2}

Commentary Table C.8.2

Analyze
Generate DOL file for CANBAS
Run CANBAS complete
↓
Reports

Check effective slab widths

Effective Flange Width {S6-06, Cl. 5.8.2.1}

1) End Spans: $L = 12\,192\text{mm}$ & $b = (2438.4\text{mm} - 406.4\text{mm})/2 = 1016\text{mm}$
$b_{OH} = 610.4\text{mm} - 203.2\text{mm} = 407.2\text{mm}$

$$\frac{b_e}{b} = 1 - \left[1 - \frac{L}{15b}\right]^3 \quad \text{for } \frac{L}{b} \le 15$$
$$= 1 \text{ for } L/b > 15$$

$$\frac{L}{b} = \frac{12\,192}{1016} = 12.0 \qquad b_e = 0.992\,b = 1007.872\text{ mm}$$

∴ effective width = 2422 mm for interior girders
" " = 1821 mm for exterior girders

2) Main Span: $L = 17831\text{mm}$ & $b = 1016\text{mm}$
$b_{OH} = 407.2\text{mm}$

$$\frac{L}{b} = \frac{17831}{1016} = 18 \qquad b_e = 1016\text{mm}$$

∴ effective width = 2438.4mm for interior girders
" " = 1829.6mm for exterior girders

END SPANS

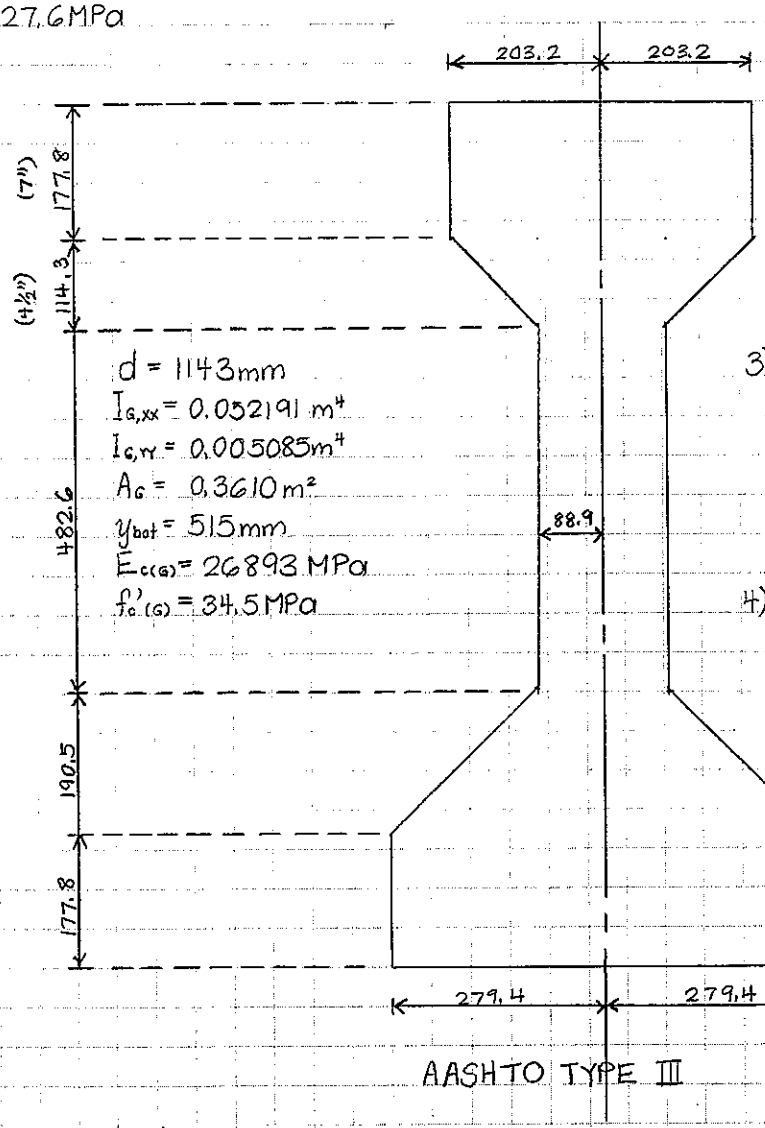
Composite In Girder Properties

Slab thickness = 177.8mm

$E_{c(slab)} = (3000\sqrt{27.6} + 6900)(2446/2200)^{1.5} = 24852 MPa$

$f'_{c(slab)} = 27.6 MPa$

Interior Effective Slab Width = 2422.0mm
Interior Trib. Slab Width = 2438.4mm
Exterior " " " = 1829.6mm
Exterior Effective " " = 1821.0mm



AASHTO TYPE III

1) Modular Ratio, $n = 0.924$

2) Comp. Slab Width = $n \cdot W_{eff}$

$= \begin{cases} 2238mm \text{ for effective interior} \\ 2253mm \text{ " tributary interior} \\ 1690.6mm \text{ " tributary exterior} \\ 1682.6mm \text{ " effective exterior} \end{cases}$

3) Slab Area (1n):

$= \begin{cases} 397916.4\ mm^2 \text{ for eff. interior} \\ 400583.4\ mm^2 \text{ " trib. "} \\ 300588.7\ mm^2 \text{ " trib. exterior} \\ 299166.3\ mm^2 \text{ " eff. "} \end{cases}$

4) Distance to bot:

$y_{slab,b} = 1231.9mm$

$y_{G,b} = 515mm$

$y_{1n} = \begin{cases} 890.9mm \text{ for eff. interior} \\ 892.1mm \text{ " trib. "} \\ 840.7mm \text{ " trib. exterior} \\ 839.9mm \text{ " eff. "} \end{cases}$

5) $I_{xx,slab}$:

$I_{xx,slab} = \begin{cases} 1048.272 \times 10^6 mm^4, \text{ eff. interior} \\ 1055.298 \times 10^6 mm^4, \text{ trib. "} \\ 791.872 \times 10^6 mm^4, \text{ " exterior} \\ 788.125 \times 10^6 mm^4, \text{ eff. "} \end{cases}$

6) $I_{1n,xx} = \Sigma(I_{xx} + Ay^2)$

$$I_{1n} = \begin{cases} 52191 \times 10^6 + 1048.272 \times 10^6 + 361000(515 - 890.9)^2 + 397916.4(1231.9 - 890.9)^2 = 150.519 \times 10^6\ mm^4 \\ 52191 \times 10^6 + 1055.298 \times 10^6 + 361000(515 - 890.9)^2 + 400583.4(1231.9 - 890.9)^2 = 150.836 \times 10^6\ mm^4 \\ 52191 \times 10^6 + 791.872 \times 10^6 + 361000(515 - 890.9)^2 + 300588.7(1231.9 - 890.9)^2 = 138.945 \times 10^6\ mm^4 \\ 52191 \times 10^6 + 788.125 \times 10^6 + 361000(515 - 890.9)^2 + 299166.3(1231.9 - 890.9)^2 = 138.776 \times 10^6\ mm^4 \end{cases}$$

a) Interior Girder:
Asphalt weight = $23.5\ kN/m^3 (8 \times 304.8\ mm)(76.2mm) = 4.4\ kN/m$
Curb = 0

b) Exterior Girder
Asphalt weight = $4.1\ kN/m = 23.5(2286)(0.0762)$
Curb = 8 kN/m

Diaphragms

Weight	Location	
19.82 kN	330mm	} End Span
20.39 kN	12348mm	

Prestressing

For main span = 2251.8 kN → 87 kN / cable
" end spans = 1648.5 kN → 83 kN / cable

Rehabilated Deck - Design C/D

Analysis Case

A)	7108.9 b1	End Span	Interior Girder	3 Lanes	Loaded
B)	7108. a b1	End Span	Exterior "	3 "	"
C)	7108. b b1	Main Span	Interior "	3 "	"
D)	7108. c b1	Main Span	Exterior "	3 "	"

New Deck:

	w_I kN/m	w_E kN/m
Slab thickness, t_s = 225mm Asphalt thickness, t_a = 90 mm	5.16	4.84

8.9.5 Interface Shear Transfer

8.9.5.1

① $V = \phi_c (c + \mu \sigma') \leq \min\{0.25 \phi_c f'_c, 6.5\,MPa\}$ where $\phi_c = 0.75$

8.9.5.2.1

$\lambda_1 = 1$ (normal-density concrete)

② (a) $c = 0.25\,MPa$; $\mu = 0.60\lambda_1$ (surface not roughened)
(b) $c = 0.50\,MPa$; $\mu = 1.00\lambda_1$ (" intentionally roughened)
(c) $c = 1.00\,MPa$; $\mu = 1.40\lambda_1$ (monolithic concrete)

8.9.5.3

$\sigma = \rho_v f_y + \frac{N}{A_{cv}}$ where $f_y = 275\,MPa$

③ $\sigma = \frac{A_{vf}}{A_{cv}} f_y + \frac{N}{A_{cv}}$

A_{cv} = area of concrete resisting shear transfer
A_{vf} = area of shear friction rebar
V = shear resistance of shear friction plane
N = unfactored permanent load normal to the interface area

Sub ③ into ①:

$$V = \phi_c \left[c + \mu \left(\frac{A_{vf}}{A_{cv}} f_y + \frac{N}{A_{cv}} \right) \right]$$

$$V = 0.75 \left[0.50\,MPa + \frac{A_{vf}}{A_{cv}} f_y + \frac{N}{A_{cv}} \right]$$

$$V = 0.75 \left[0.50\,MPa + \frac{A_{vf}}{A_{cv}} (275\,MPa) + \frac{N}{A_{cv}} \right]$$

$x = 1219.2\,mm$
$x = 1532\,mm$
@ $\frac{x}{L} = 0.10$, $s = 228.6\,mm$, $A_{vf} = 258\,mm^2$, $A_{cv} = 406.4\,mm * s = 92903.04\,mm^2$

$t = 225 \rightarrow \omega_{Deck\ slab} = 13.165\,kN/m$
$t = 90 \rightarrow \omega_{Asphalt} = 5.157\,kN/m$
$\Sigma\omega = 18.322\,kN/m$

$N = \Sigma\omega(\frac{1}{2} - x)$
$= \Sigma\omega\left(\frac{12.0174\,m}{2} - 1.2192 - 1532\,m\right)$
$N = 82.02\,kN$

$V = 0.75\left(0.50\,MPa + 0.002777(275)\,MPa + \frac{82.02\,kN}{92903.04\,mm^2}\right)$
$V = 0.75(1.2637\,MPa + 0.883\,MPa)$
$\therefore V = 1610\,kPa$
@ $\frac{x}{L} = 0.10$, End Span, Deck Rehab. Case
Interior Girder
Analysis Case: 7108.9b1

Deck Rehabilitation Design (Main Span)

$l = 17481.6\,mm$
Interior Girder
Analysis: 7108.bb1

Interface Shear Transfer

$$v = 0.75\left[0.50\,MPa + \frac{A_{vf}}{A_{cv}}(275\,MPa) + \frac{N}{A_{cv}}\right]$$

@ $\frac{x}{L} = 0.10$, $s = 228.6\,mm$, $A_{vf} = 258\,mm^2$, $A_{cf} = 406.4mm * s = 92903.04\,mm^2$

$w_{slab} = 13.165\,kN/m$
$w_{asphalt} = 5.157\,kN/m$
$\Sigma w = 18.322\,kN/m$

$N = \Sigma w(1/2 - x)$
$= 18.322\,kN/m\,(8740.8 - 1748.16)mm$
$N = 128.1\,kN$

$$v = 0.75\left[0.50MPa + \frac{258}{92903.04}(275MPa) + \frac{128.1kN}{92903.04}\right]$$

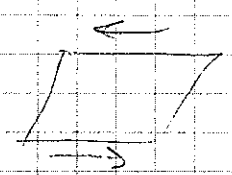
$\therefore v = 1982\,kPa$

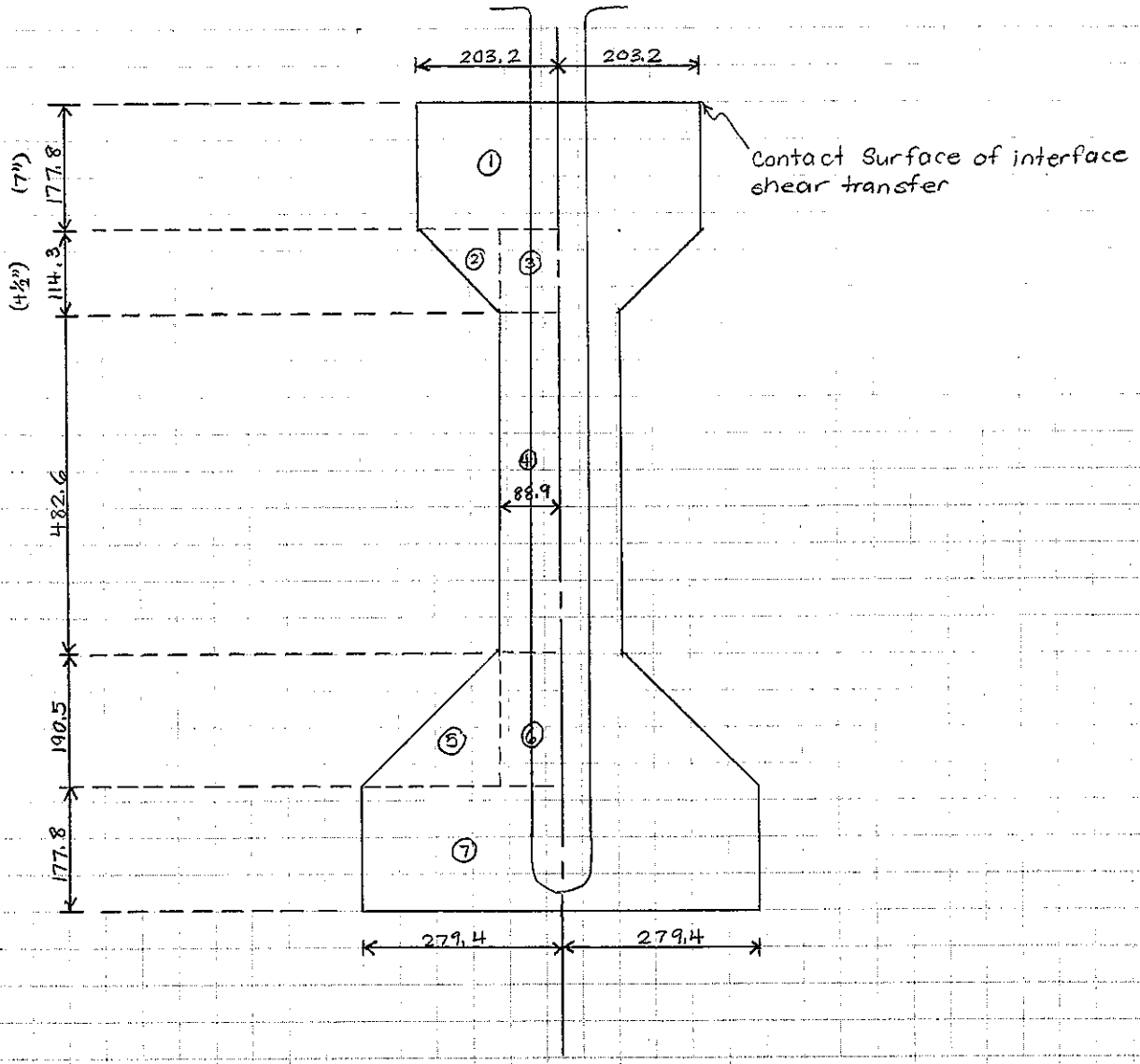
Interface Shear Stress

$$\tau = \frac{V_f Q}{b I} \qquad Q = (225mm)(2438.4mm)\left(\frac{225mm}{2} + 184mm\right) = 1.627\times10^8 mm^3$$

$$= \frac{684\,kN\,(1.627\times10^8 mm^3)}{406.2mm\,(0.171335m^4)}$$

$\tau = 1.599\,MPa$
$\tau = 1599\,kPa$





McCORMICK RANKIN CORPORATION

PROJECT CNR Overhead Structure W.O. No. 7108.300

DESIGNED KWS DATE Aug. 27/09

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Barrier Wall

1) Barrier Exposure Index

Design Speed = 80km/h

SS height = 540.22
- 513.00
= 27.22m

$AADT_1$ = interpolation of 2005 - 2015 AADT forecast

$= AADT_{2005} + \frac{AADT_{2015} - AADT_{2005}}{10yrs}(5yrs)$

$= 29620 + (44430 - 29620)(5)/10$

$AADT_1$ = 37025 forecasted for 2010 assuming rehabilitation completes in 2010

$B_e = \frac{(AADT_1)\,K_h K_c K_g K_s}{1000}$ = Barrier Exposure Index

$= \frac{(37025)(1)(1)(1.5)(2.85)}{1000}$

$\therefore B_e = 158.3$

$K_h = 1.00$ {S6-06, Table 12.1}
$K_c = 1.00$ { " , Table 12.2}
$K_g = 1.50$ { " , Table 12.3}
$K_s = 2.85$

2) Performance Level

Barrier clearance = 2589mm {see Table 12.6, CHBDC S6-06}
PL-2 Barriers with railings
Truck % = 4

Barrier exposure index = B_e = 158.3, falls within the range 8.4 to 247.3 {S6-06, Table 12.6}. ∴ PL-2 barriers satisfy CAN/CSA-S6-06 requirements on CNR Overhead.

Run # 4: Main Span, Exterior Girder, 3 Lanes Loaded

Bridge Type: Deck-on-girder (Slab-on-girder), Type C

Highway Class A

deck width = 11431mm
barrier width = 455mm
median " = 610mm
barrier o/h = 610mm
median o/h = 1067mm
S = girder spacing = 2438.4mm

Shallow superstructure
L_{main} = 17831mm

N = 5 girders
n = 3 lanes loaded
R_L = 0.8
W_e = (11431 - 455 - 610)/3 = 3455mm

$$\mu = \frac{W_e - 3.3m}{0.6} \leq 1.0$$

μ = 0.259

$F = 2.70 - 4/L$
= 8.476m

$C_f = 10 - 25/L$
= 8.598 %

} S6-06 Table 5.3

1) M_L: (ULS & SLS) {S6-06, Cl. 5.7.1.2}

$M_g = F_m M_{g,avg}$

$$F_m = \frac{SN}{F\left[1 + \frac{\mu C_f}{100}\right]} \geq 1.05$$

$$= \frac{2438.4mm\,(5)}{8.476m\left[1 + \frac{0.259(8.598)}{100}\right]}$$

F_m = 1.407

$M_{g,avg} = n M_T R_L / N$
$= (3)(M_T)(0.8)/5$
$= 0.48 M_T$