



CAST-IN-PLACE REINFORCED CONCRETE BOX CULVERT (SKEW)


INDEX

TITLE	DETAIL DESCRIPTION	DETAIL No.	ISSUE DATE
GENERAL	LEGEND	2.1.1	NOV, 2007
	ABBREVIATIONS	2.1.2	NOV, 2007
COVER SHEET	TYPICAL LAYOUT	2.2.1	OCT, 2022
	DESIGN DATA	2.2.2	OCT, 2019
	LEGEND	2.2.3	OCT, 2022
	SURVEY CONTROL	2.2.4	SEPT, 2019
GENERAL ELEVATION	TYPICAL LAYOUT	2.3.1	OCT, 2022
	BORING LOGS	2.3.2	OCT, 2022
	LONGITUDINAL SECTION	2.3.3	OCT, 2022
	PLAN	2.3.4	NOV, 2007
	CROSS SECTION	2.3.5	APRIL, 2014
	NOTES, DETAIL "A"	2.3.6	APRIL, 2014
	TITLE BOX	2.3.7	NOV, 2007
SITE AND EROSION CONTROL PLAN	SITE PLAN	2.4.1	SEPT, 2019
CONCRETE DETAILS	TYPICAL LAYOUT	2.5.1	NOV, 2007
	SIDE ELEVATION	2.5.2	NOV, 2007
	END ELEVATION	2.5.3	APRIL, 2014
	SECTION A-A	2.5.4	NOV, 2007
	SECTION B-B & C-C	2.5.5	NOV, 2007
	CROSS SECTION, DETAILS OF CONSTRUCTION JOINTS	2.5.6	APRIL, 2014
	NOTES, POURING SCHEDULE	2.5.7	NOV, 2007
SLAB REINFORCING DETAILS	TYPICAL LAYOUT	2.6.1	NOV, 2007
	PLAN	2.6.2	NOV, 2007
	PLAN	2.6.3	NOV, 2007
	PART PLAN "A" & "B"	2.6.4	SEPT, 2019
	SECTION D-D	2.6.5	NOV, 2007
WALL REINFORCING DETAILS	TYPICAL LAYOUT	2.7.1	NOV, 2007
	ELEVATION	2.7.2	NOV, 2007
	ELEVATION	2.7.3	NOV, 2007
	ELEVATION	2.7.4	NOV, 2007
	SECTION E-E & F-F	2.7.5	NOV, 2007
HEADWALL REINFORCING DETAILS	TYPICAL LAYOUT	2.8.1	NOV, 2007
	ELEVATION	2.8.2	NOV, 2007
	ELEVATION	2.8.3	NOV, 2007
	PART SECTION G-G	2.8.4	NOV, 2007
	SECTION H-H	2.8.5	NOV, 2007
	BILL OF REINFORCING STEEL	2.8.6	NOV, 2007

LEGEND


-  - Information added to the drawing
-  - Data enclosed is for information only and not to be shown on the drawing

Typical Layout sheets (marked "SAMPLE") are intended for general sheet arrangement only. The following sheets show all information required in detail.

Manitoba  Infrastructure and Transportation Water Control & Structures Mid-Division	DETAIL DESCRIPTION		GENERAL LEGEND
	LOCATION		
	SITE No.	DATE	November 2007

ABBREVIATIONS

Elev	-	Elevation
T.W.	-	Tail water
H.W.	-	Head water
mm	-	millimetre
m	-	metre
sta.	-	Station
min.	-	Minimum
c. to c.	-	centre to centre
Mk.	-	Mark
cl.	-	Clearance
R.C.	-	Reinforced concrete
F.P.	-	Final pavement

 <p>Manitoba Infrastructure and Transportation</p> <p>Water Control & Structures Mid-Division</p>	DETAIL DESCRIPTION		GENERAL ABBREVIATIONS		
	LOCATION			DETAIL No.	
	SITE No.	DATE	November 2007	2.1.2	

DESIGN DATA

SPECIFICATIONS:

AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 8th EDITION, 2017

LOADING:

LIVE LOAD: MODIFIED AASHTO HSS-25 TRUCK or HSS-30 project specific
 AASHTO LRFD "HL-93" LOADING

EARTH LOAD: SOIL DENSITY = kg/m³
 ACTIVE EARTH PRESSURE K_a =
 AT REST EARTH PRESSURE K_a =

STRUCTURAL CONCRETE

COMPRESSIVE STRENGTH 35 MPa
 CEMENT CSA A23.1 CLASS C-1,
 AIR CATEGORY 1 WITH 15% FLY CI ASH

REINFORCING STEEL CAN/CSA G30.18 M92 GRADE 400W
 CLEAR COVER 50 mm UNLESS NOTED OTHERWISE

FOUNDATION DATA:

FACTORED BEARING RESISTANCE AT
 1. STRENGTH STATE LIMIT kPa
 2. SERVICE STATE LIMIT kPa

HYDRAULIC DESIGN DATA

DESIGN DISCHARGE: $Q_{2\%}$ = m³/sec
 $3d Q_{10}$ = m³/sec
 $V_{3d} Q_{10}$ = m/s
 HWL m

MANITOBA WATER STEWARDSHIP
 APPROVAL AS TO HYDRAULIC CAPACITY
 OF WATERWAY OPENINGS AND HIGHWAY DRAINAGE

CHECKED BY _____

APPROVED BY _____

Not always required
 check with hydraulic engineer
 at Water Control and Structures

ALL DIMENSIONS ARE IN MILLIMETRES (mm) AND ALL ELEVATIONS
 AND STATIONS ARE IN METRES (m) UNLESS SHOWN OTHERWISE.



Water Management and Structures

DETAIL DESCRIPTION

**COVER SHEET
 DESIGN DATA**

LOCATION

DETAIL No.

SITE No.

DATE

October 2019

2.2.2

SHEET LEGEND

1. COVER SHEET
2. GENERAL ELEVATION
3. SITE AND EROSION CONTROL PLAN
4. CONCRETE DETAILS
5. SLAB REINFORCING DETAILS
6. WALL REINFORCING DETAILS
7. HEADWALL REINFORCING DETAILS
8. REINFORCING DETAILS

AR1. APPROACH ROADWORKS	IF REQ'D TO BE SUPPLIED BY
AG1. APPROACH GUARDRAIL DETAILS	REGION OR OTHERS

TYPE Single
Double or
Triple x REINFORCED CONCRETE
BOX CULVERT ON A ° SKEW

LENGTH OUT TO OUT OF HEADWALLS

LOCATION
R.M. OF

ENVIRONMENTAL APPROVALS

MANITOBA ENVIRONMENT ACT LICENCE
DATE : _____
FILE * : _____

FISHERIES AND OCEANS CANADA - AUTHORIZATION OR REVIEW
DATE : _____
FILE * : _____

TRANSPORT CANADA - NAVIGATION ACT
DATE : _____
FILE * : _____

MANITOBA INFRASTRUCTURE ENVIRONMENTAL APPROVAL
DATE : _____
FILE * : _____

ENVIRONMENTAL REVIEW COMPLETED
DATE : _____

COMPLETED BY : _____
(PRINT NAME)



DETAIL DESCRIPTION		COVER SHEET LEGEND	
LOCATION			DETAIL No.
SITE No.	DATE	September 2019	2.2.3


SURVEY CONTROL

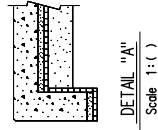
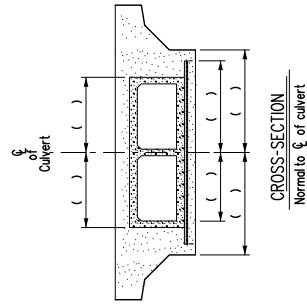
HORIZONTAL DATUM: NAD83CSRS
 VERTICAL DATUM: CGVD28
 ELLIPSOID: GRS 1980
 GEOID (HT2.0): -----
 UTM: ZONE ____
 SCALE FACTOR: -----

SITE CONTROL POINT DATA

CONTROL POINT #-----	NORTHING: -----	-----
	EASTING: -----	-----
	ELEVATION: -----	-----
	DATE: -----	-----
CONTROL POINT x-----	NORTHING: -----	-----
	EASTING: -----	-----
	ELEVATION: -----	-----
	DATE: -----	-----
CONTROL POINT #-----	NORTHING: -----	-----
	EASTING: -----	-----
	ELEVATION: -----	-----
	DATE: -----	-----

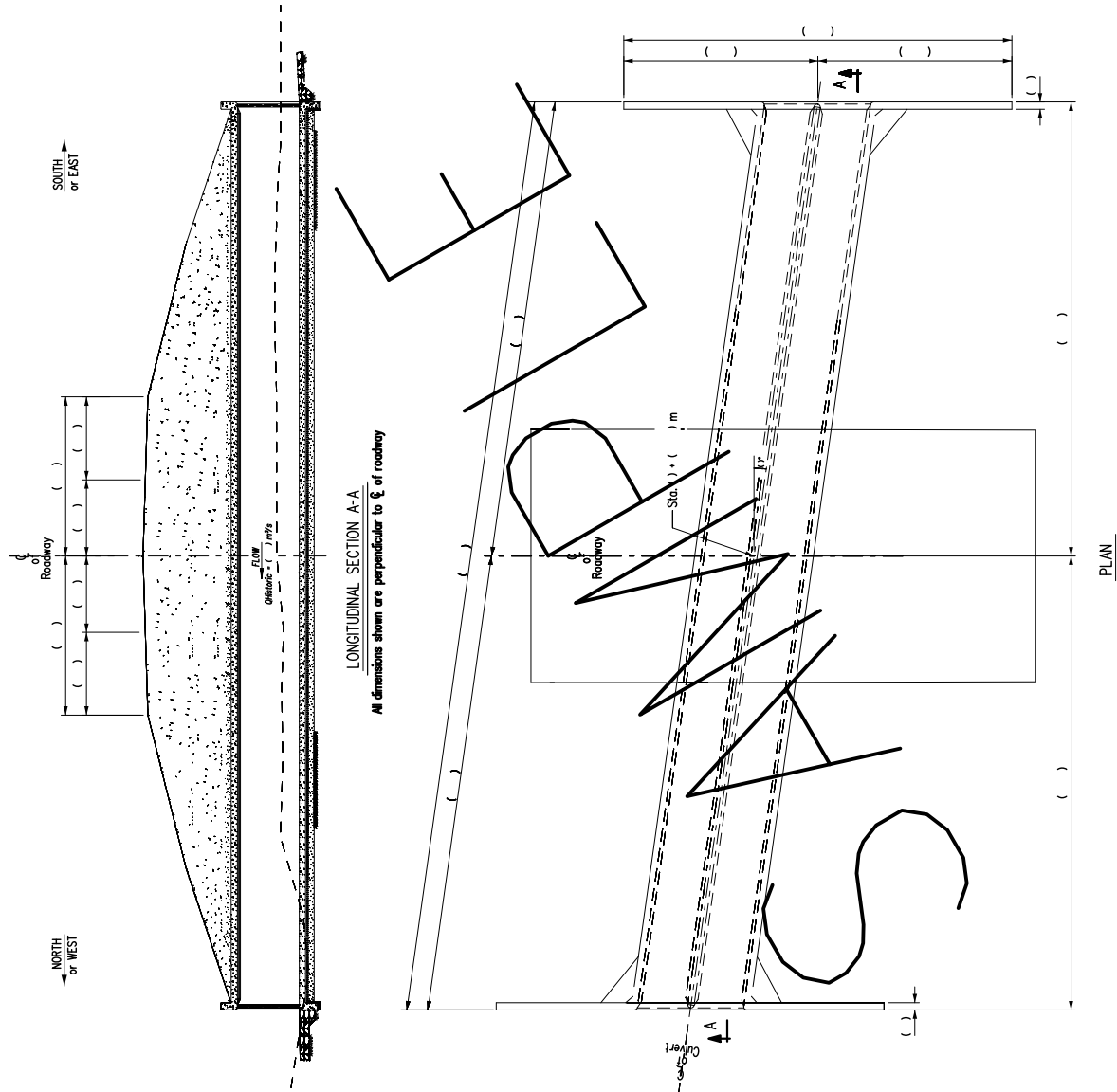
Primary survey control is established and administered by Construction Support Services (CSS) in Universal Transverse Mercator (UTM) coordinates. See Policy/Standard No. CSS-100

 Manitoba Infrastructure Water Management and Structures	DETAIL DESCRIPTION		COVER SHEET SURVEY CONTROL		
	LOCATION			DETAIL No.	
	SITE No.	DATE	September 2019	2.2.4	



RIP RAP DETAILS

NOTES:



DETAIL DESCRIPTION

GENERAL ELEVATION
 TYPICAL LAYOUT

LOCATION

DETAIL No.

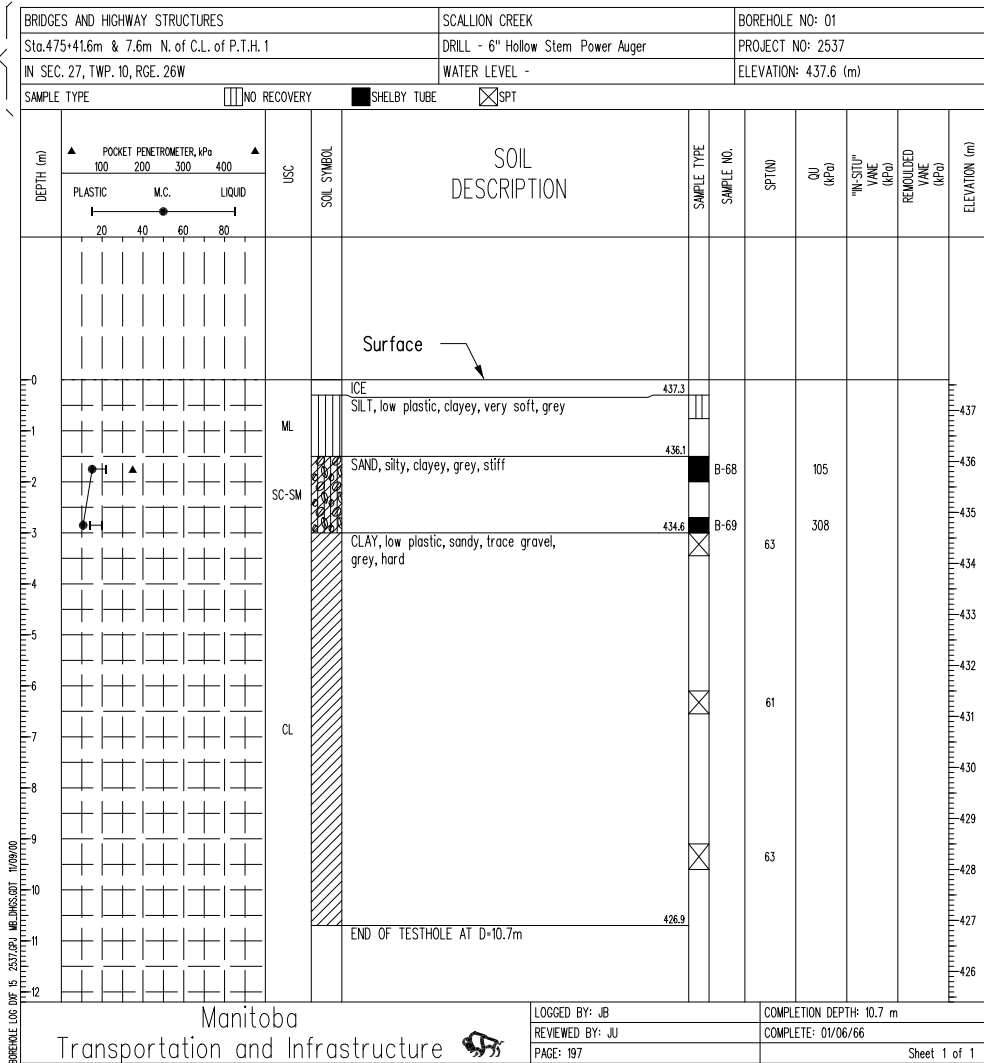
SITE No.

DATE

April 2014

2.3.1

Reference to new structure ϕ and new roadway ϕ



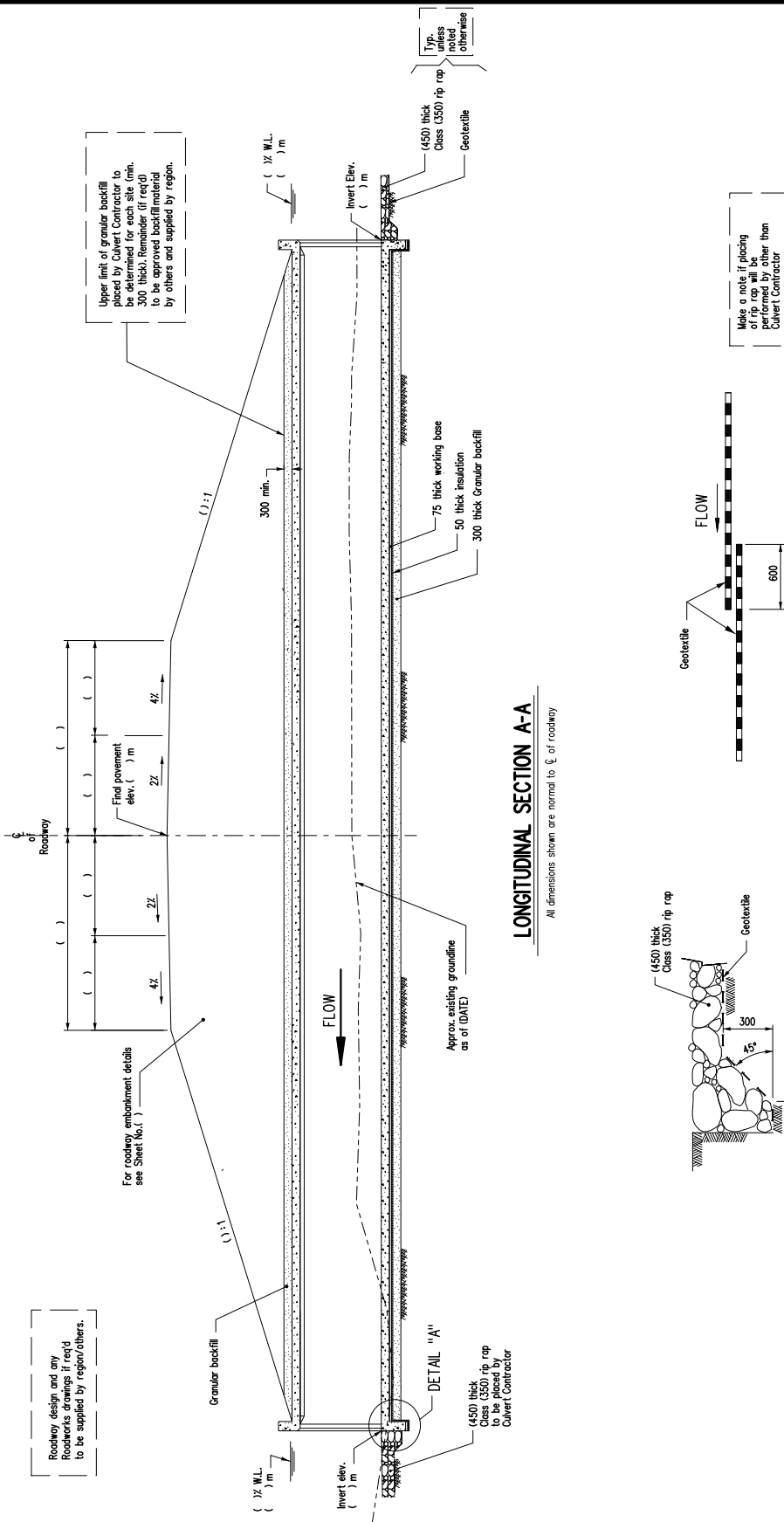
NOTES - re Boring Logs

- The Department provides log boring information shown on the Plans. This information may not be representative of the soil conditions throughout the site. Contractors may peruse all available soil information in the Bridges and Highway Structures Branch located on the 6th. floor, 215 Garry Street, Winnipeg.
- The following abbreviations apply to bore hole information:
 - Qu - Laboratory unconfined compressive strength in kPa
 - SPT(N) - Number of blows per 300 mm - Standard Penetration Test
 - USC - Unified Soil Classification
 - M.C. - Moisture Content
- All stations, elevations, offsets and depths as shown are in metres.
- All borehole locations shown in plan view are approximate.
- Elevations on boring logs are at not to scale.

For R.C box culverts detail bore holes approx. 1.5 m below bottom of granular backfill.

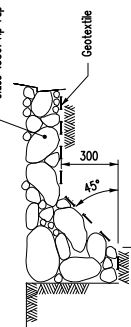
SOUTH
or EAST

NORTH
or WEST

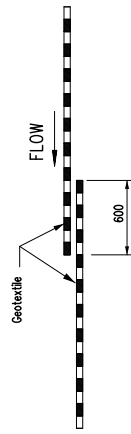


LONGITUDINAL SECTION A-A

All dimensions shown are normal to C of roadway



EDGE TREATMENT



OVERLAPPING DETAILS

NOTES :

1. All geotextile shall be Non-Woven Geotextile, Class I, (Heavy Duty) from the Manitoba Transportation and Infrastructure's Approved Product List.
2. Geotextile shall be placed under all rip rap, overlapping 600mm in direction of flow.

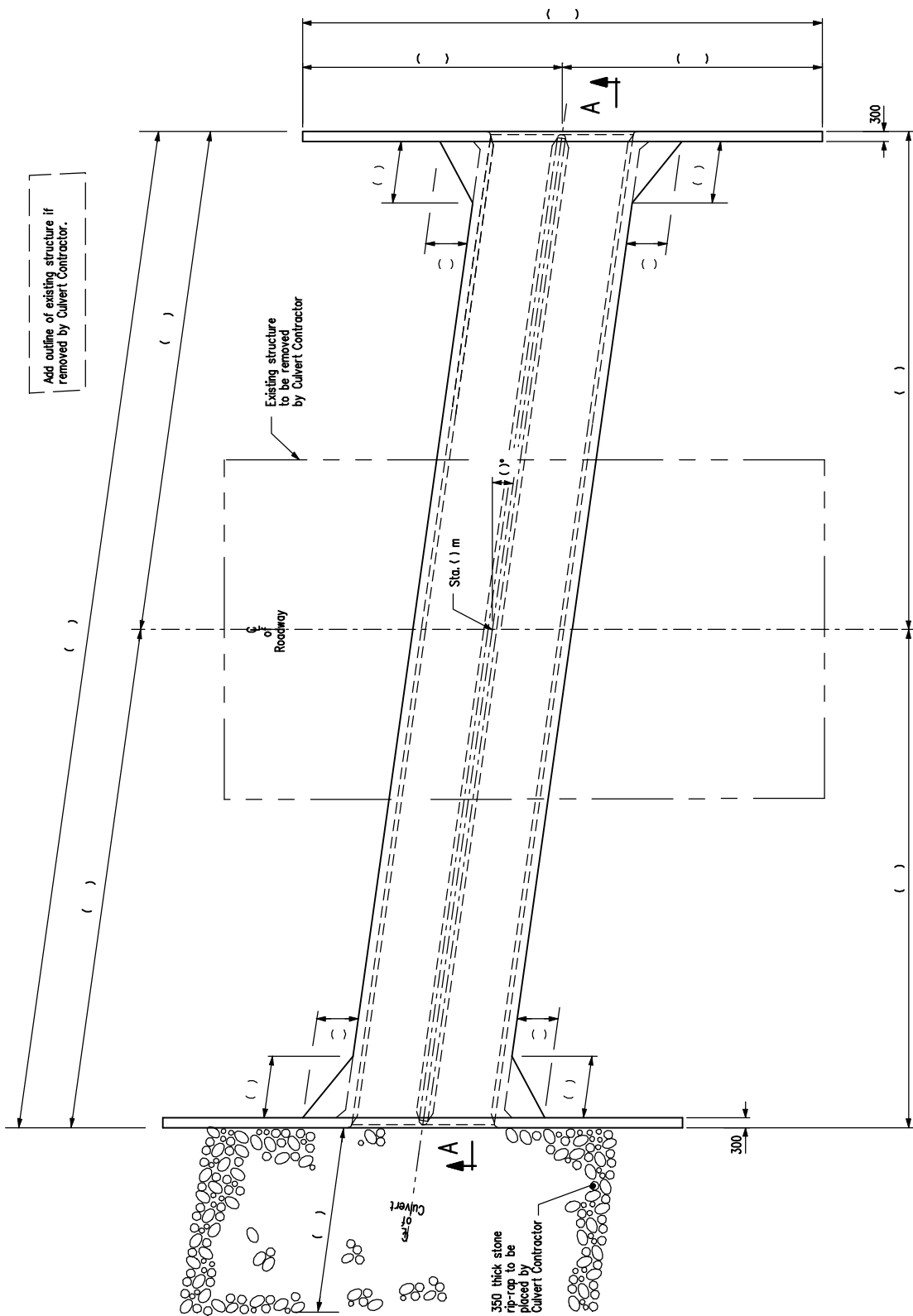
RIP RAP DETAILS

N.T.S.

2022-10-14	N.J.	Granular backfill and Roadway design by region/others
2018-11-20	N.J.	Revised Note 1 as per MI's Approved Products for geotextile
Revised Date	By	Description

REVISIONS

DETAIL DESCRIPTION	DATE DRAWN:	DETAIL No.
GENERAL ELEVATION LONGITUDINAL SECTION	April 2014	2.3.3



PLAN



Water Control & Structures Mid-Division

DETAIL DESCRIPTION

GENERAL ELEVATION
PLAN

LOCATION

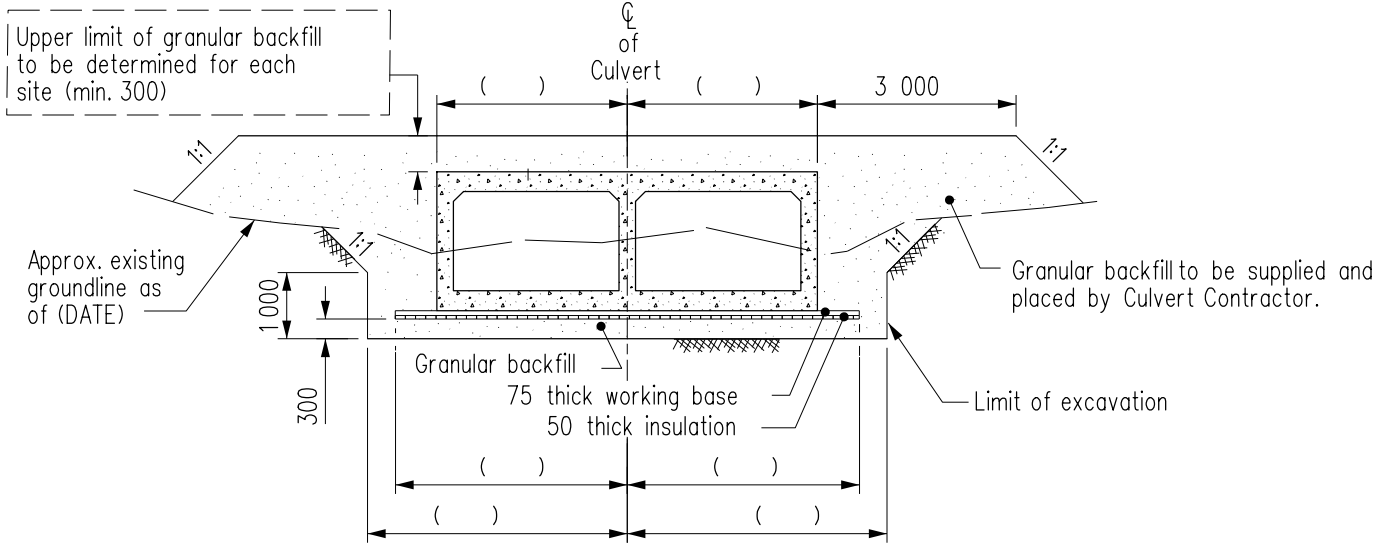
DETAIL No.

SITE No.

DATE

November 2007

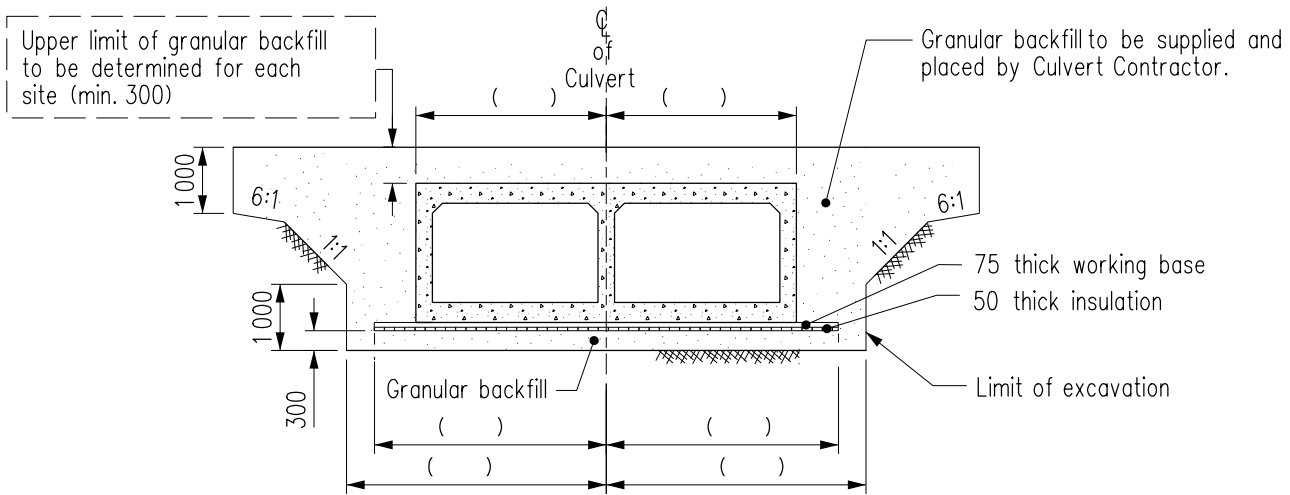
2.3.4



CROSS SECTION

-Use in new grade

- Insulation Width
 - Insulation shall project a min. 450 each side of culvert (for frost protection) and rounded up to nearest increment of 2ft. (610) widths.
- Excavation Width
 - Excavation width at the base shall be a min. 1000 to 1500 on each side of box culvert



CROSS SECTION

-Use in existing grade

- Excavation
 - Excavation thru any existing grade (P.R. or P.T.H.) shall conform to MB Workplace Health and Safety requirements.
 - Vertical face for bottom 1 m with 1:1 side slopes until 2 m in remaining vertical height is reached and then 6:1 for 1 m in height with last 1 m vertical face.



Infrastructure and Transportation
 Water Management and Structures

DETAIL DESCRIPTION

GENERAL ELEVATION
 CROSS SECTION

LOCATION

DETAIL No.

SITE No.

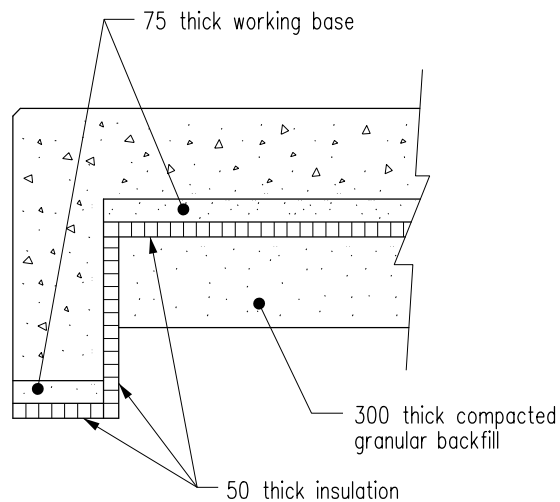
DATE

April 2014

2.3.5

NOTES:

1. Granular backfill shall be used within minimum limits as shown on "CROSS SECTION".
2. Insulation shall be supplied and placed by Culvert Contractor as follows:
 - a) Insulation shall be placed under all working base concrete including headwalls and shall extend vertically behind cut off wall as shown in DETAIL "A"
 - b) Insulation shall be 50 mm thick extruded polystyrene placed with staggered joints.
 - c) Insulation shall be completely enclosed in 6 mil. polyethylene with all joints poly-vinyl taped.
3. Working base shall be lean mix concrete 75 mm thick.



DETAIL "A"

Scale 1:1

	DETAIL DESCRIPTION		GENERAL ELEVATION NOTES, DETAIL "A"
	LOCATION		DETAIL No.
	SITE No.	DATE	April 2014
			2.3.6

GENERAL ELEVATION

FOR DOUBLE 1 500 x 2 500 R.C. BOX CULVERT
 IN BACHMAN DRAIN
 ON P.T.H. No. 44 PROPOSED WEST BOUND LANES
 N. OF N.W. 1/4 SEC. 2-13-7E

R.M. OF BROKENHEAD

Manitoba 
 Infrastructure and Transportation

Water Control & Structures Mid-Division

RELEASED FOR CONSTRUCTION
 BY: _____

DESIGN	BY: _____ M.B.C.	DIRECTOR _____ DATE _____	
	CHECKED: _____ B.L.	STRUCTURES, DESIGN AND CONSTRUCTION BRANCH	
DETAILS	BY: _____ E.F.	SCALE: _____	SHEET No. _____ 2 _____
	CHECKED: _____ M.B.C.	As Shown	SITE No. _____ 2251-01 _____

Manitoba 
 Infrastructure and Transportation

Water Control & Structures Mid-Division

DETAIL DESCRIPTION

GENERAL ELEVATION
 TITLE BOX

LOCATION

DETAIL No.

SITE No.

DATE

November 2007

2.3.7

Place Plan of site and include the minimum of the following:

- proposed structure outline
- overlay contour plan if available
- show extent of rip rap
- show proposed silt barrier location
- show limits of construction area
- show right of way limits
- show river/stream centreline
- show roadway centreline and width

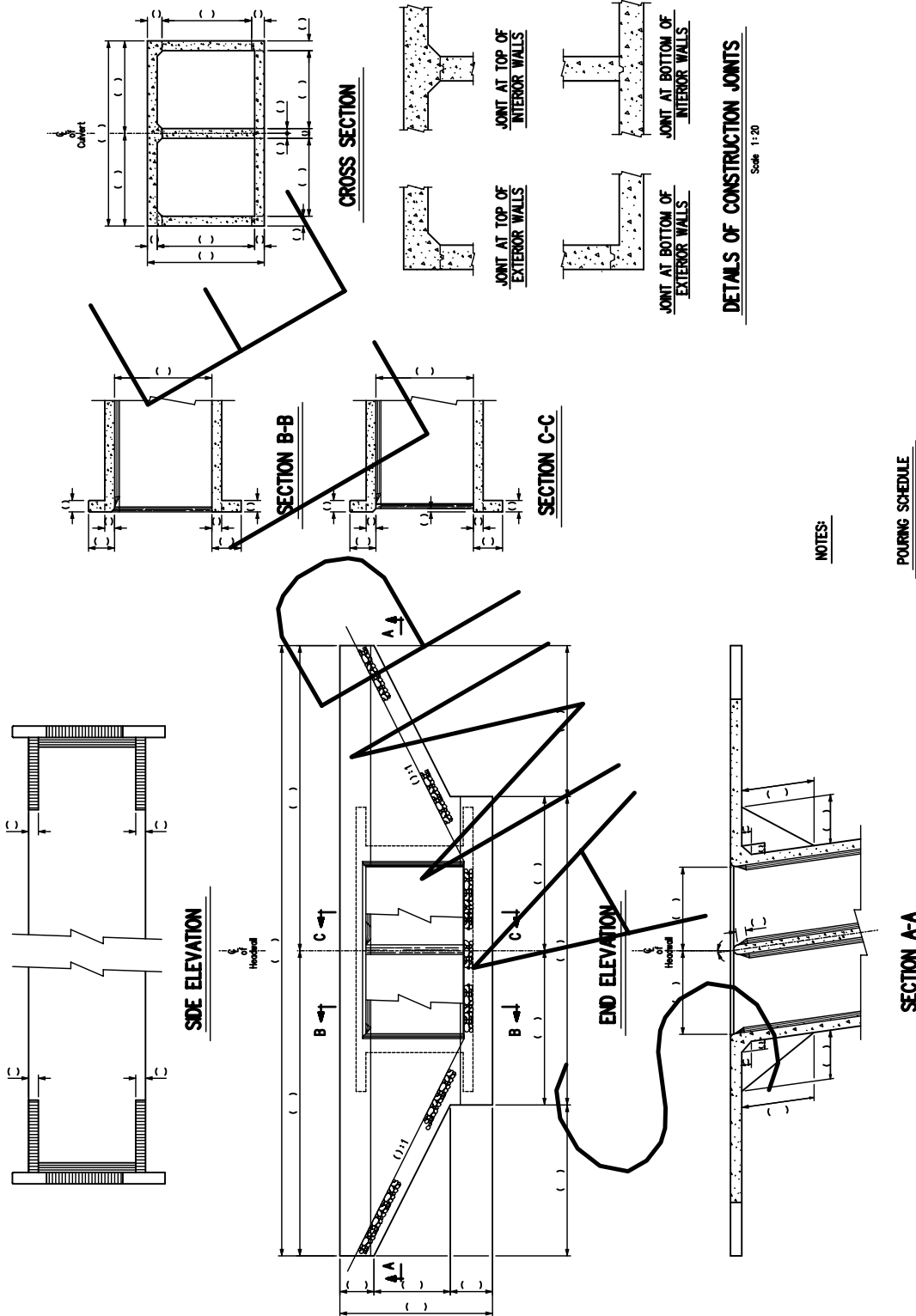
NOTES

Place any relevant notes as it pertains to the placement of silt barriers and or cofferdams for the Contractor to follow.

SITE PLAN

LEGEND

- ◆ — ◆ — ◆ — Limits of laydown, staging and access areas & limits of construction and access area
- ■ — ■ — Proposed sediment barrier
- ==== Proposed cofferdam (as req'd)

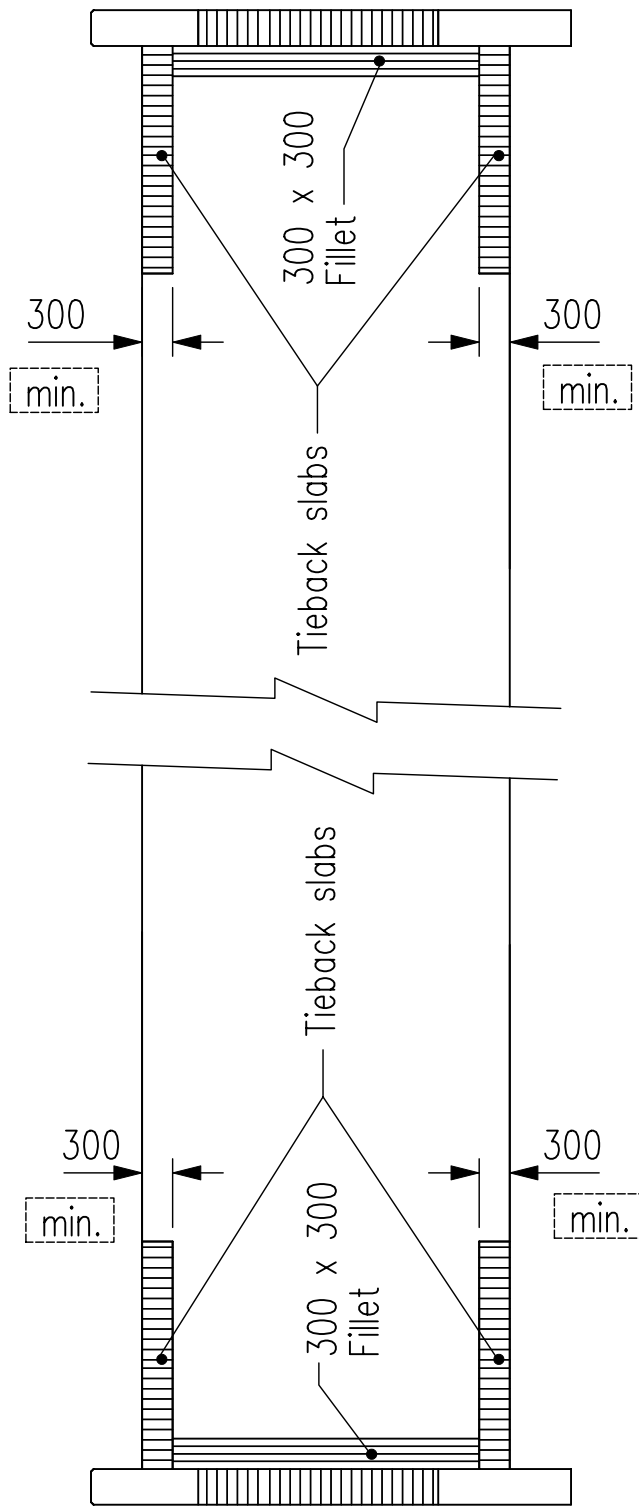


Scale 1:20

NOTES:

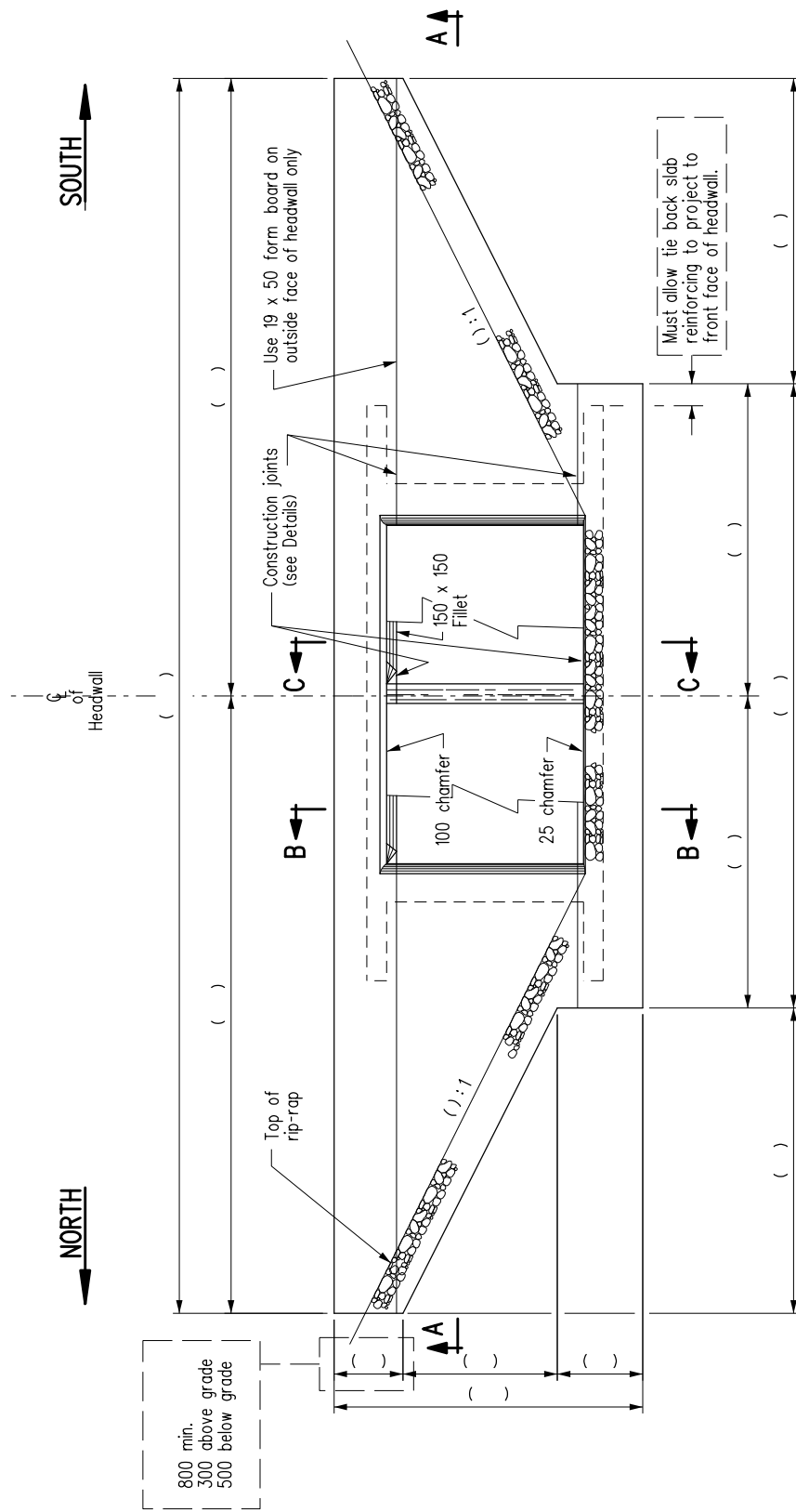
POURING SCHEDULE

DETAIL DESCRIPTION		CONCRETE DETAILS	
LOCATION		DETAIL No.	
SITE No.	DATE	November 2007	2.5.1



SIDE ELEVATION

Normal to ϕ of roadway



END ELEVATION



Infrastructure and Transportation
Water Management and Structures

DETAIL DESCRIPTION

CONCRETE DETAILS
END ELEVATION

LOCATION

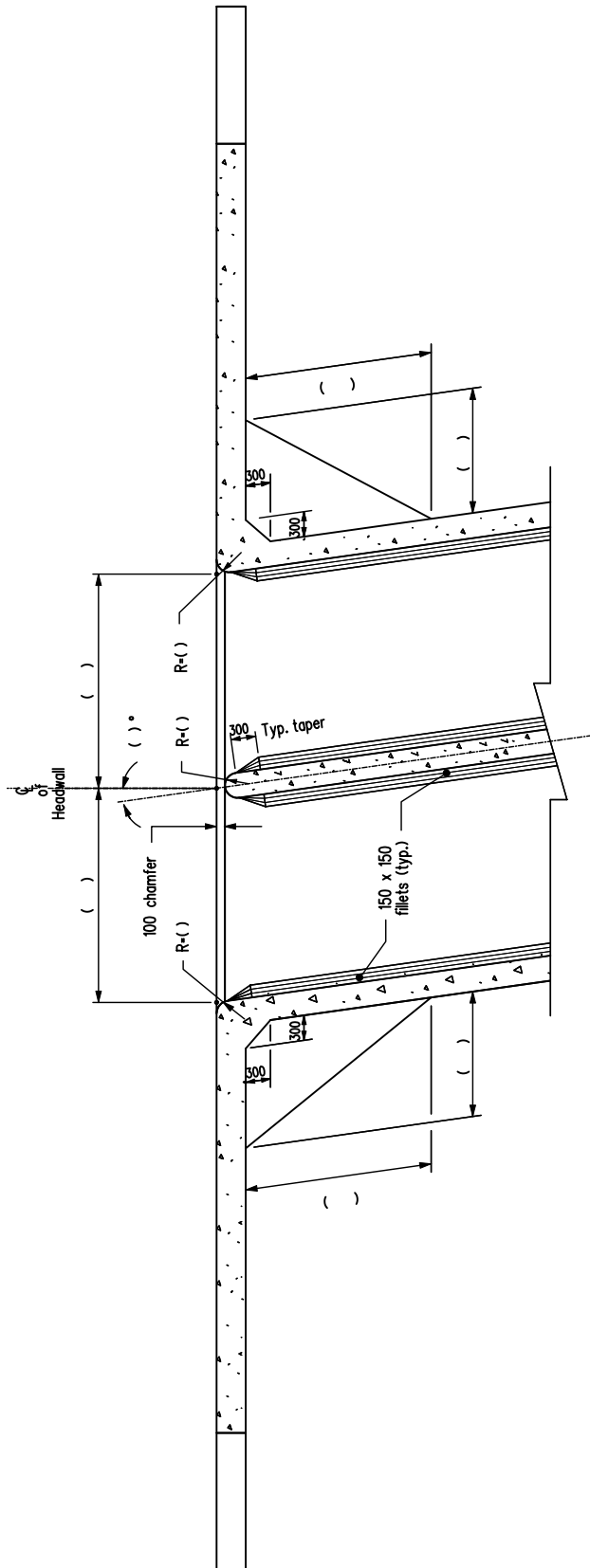
DETAIL No.

SITE No.

DATE

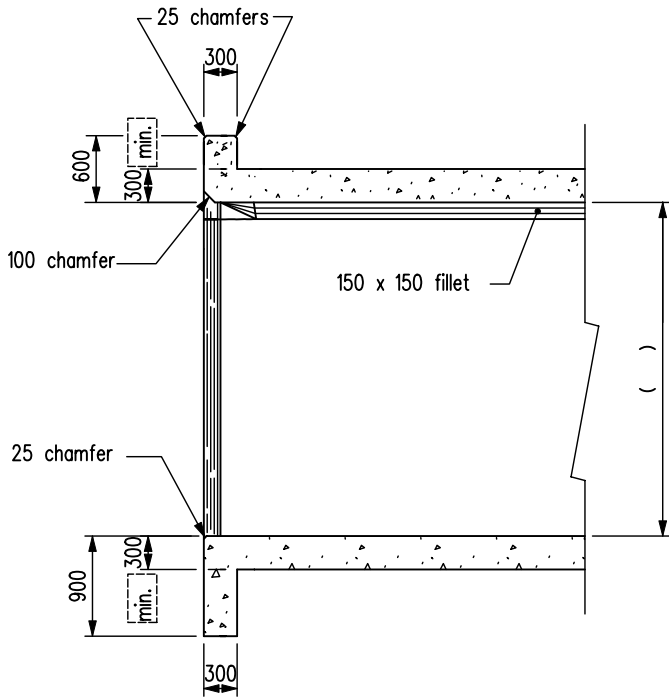
April 2014

2.5.3

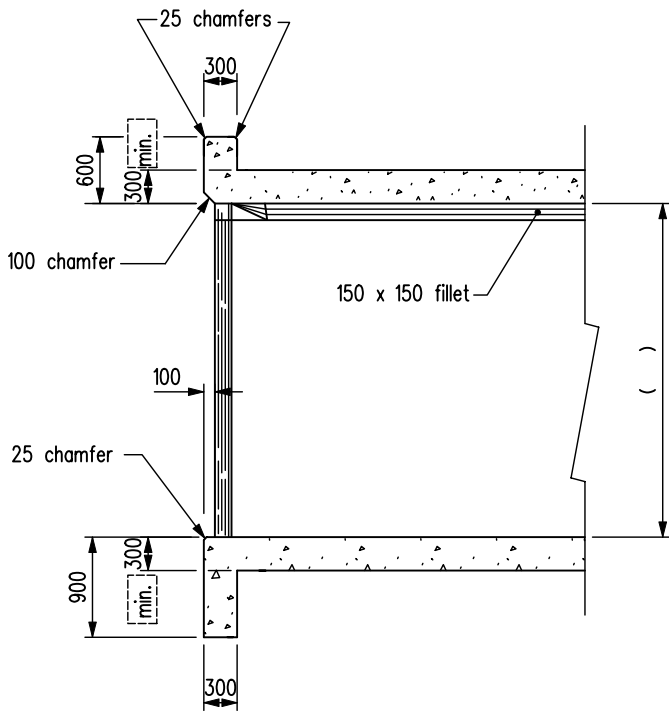


SECTION A-A

Suggested tieback slab dimensions
 1. 1.00 x 1.50 - for $h \leq 2.50$ m
 2. 1.50 x 2.25 - for $h > 2.50$ m
 h = vertical opening of barrel



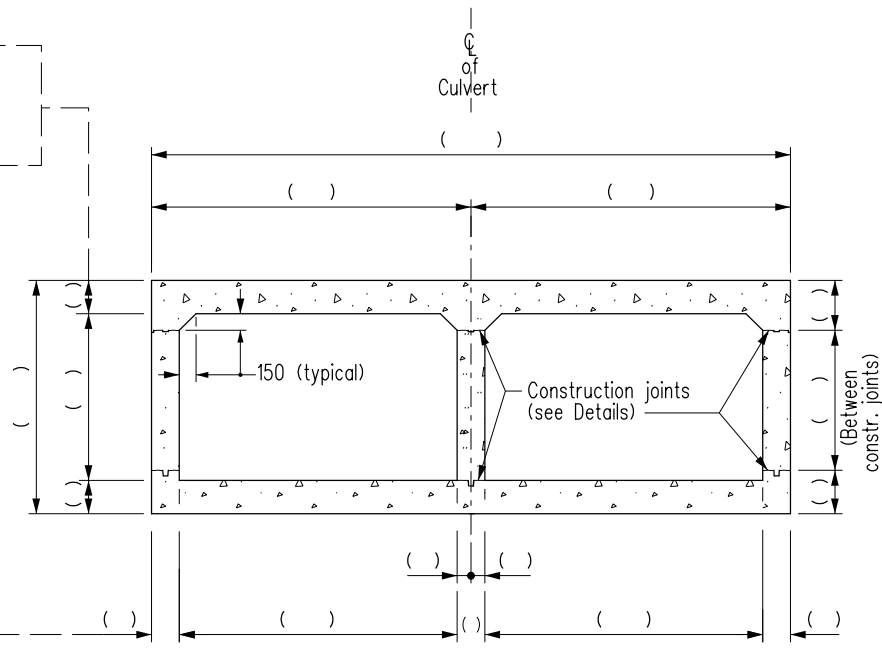
SECTION B-B



SECTION C-C

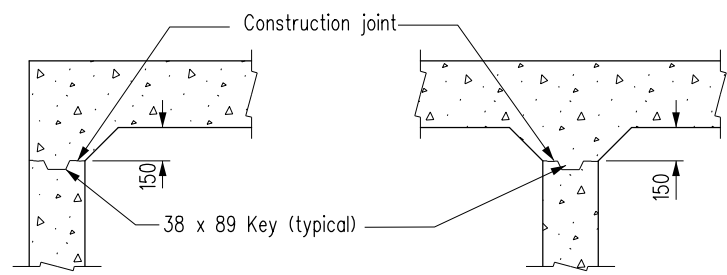
DETAIL DESCRIPTION		CONCRETE DETAILS SECTION B-B & C-C
LOCATION		DETAIL No.
SITE No.	DATE	2.5.5

Top & bottom slabs must be 300 thick min. to accept 6 layers of reinforcing steel at tieback slabs



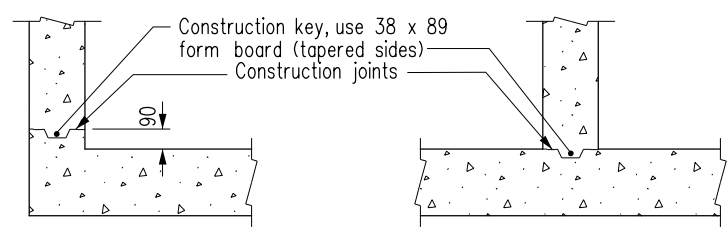
All walls to be 300 mm thick min. to accommodate concrete placement

CROSS SECTION



JOINT AT TOP OF EXTERIOR WALLS

JOINT AT TOP OF INTERIOR WALLS



JOINT AT BOTTOM OF EXTERIOR WALLS

JOINT AT BOTTOM OF INTERIOR WALLS

DETAILS OF CONSTRUCTION JOINTS

Scale 1:20



DETAIL DESCRIPTION		CONCRETE DETAILS	
CROSS SECTION, DETAILS OF CONSTRUCTION JOINTS			
LOCATION			DETAIL No.
SITE No.	DATE	April 2014	2.5.6

NOTES:

1. All exposed edges of barrel and headwalls to be chamfered 25 mm except where noted otherwise.
2. Construction joints as per details. Construction joints extending into headwall must be neat and level.
3. Areas to be Permeable Formwork Liner Finish;
 - a) All exposed surfaces of headwalls
 - b) All round faces of entrance and exit to culvert
4. All surfaces in contact with backfill material to be asphalt waterproofed.

Permeable Formwork Liner Finish:


- Exposed area of front face of headwall to invert and 300 (perpendicular) below groundline on wingwalls
- Top 300 on rear face of headwalls
- Ends of headwall 300 below groundline
- Total area should be rounded to nearest m² and shown to two decimals (for computer) eg. 74.00 m²

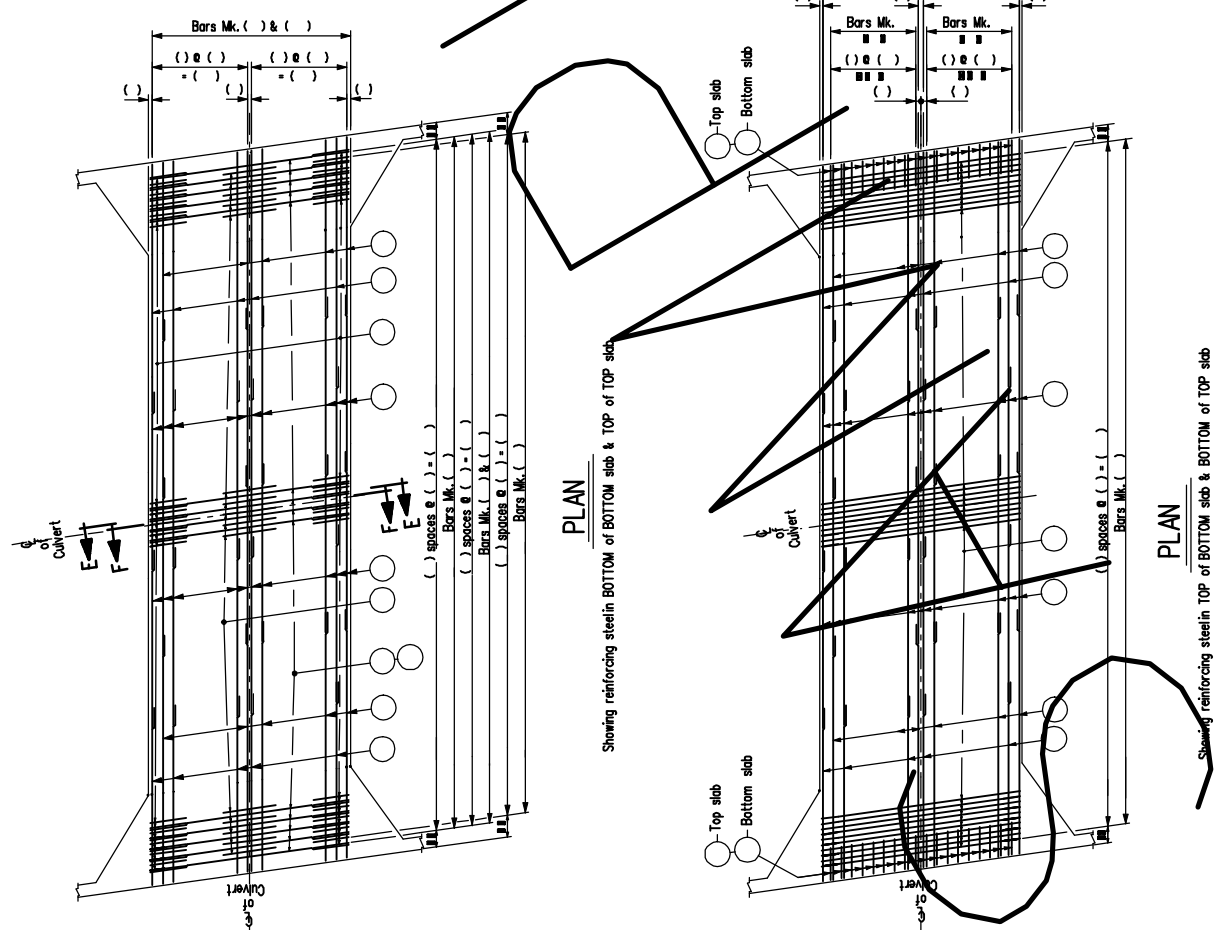
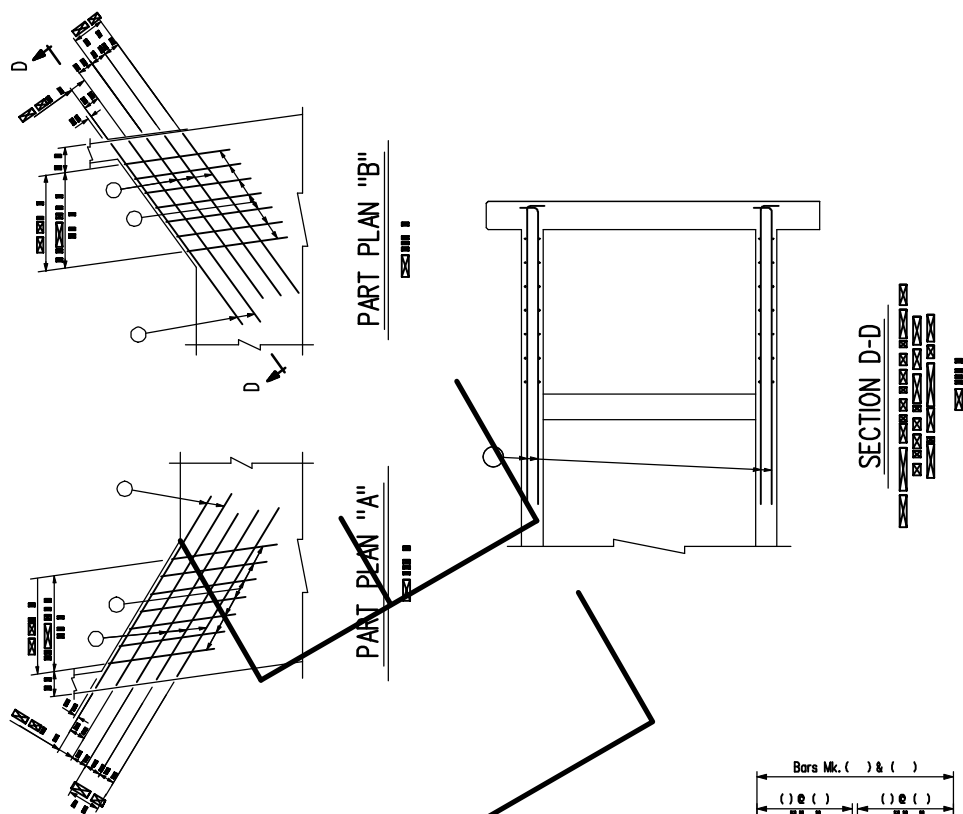
POURING SCHEDULE

1.	POUR 1	Below lower construction joint	() m ³
2.	POUR 2	Between construction joints	() m ³
3.	POUR 3	Above the upper construction joint	() m ³
			Total () m ³

Volume of concrete

- Volume of structural concrete to be rounded to first decimal place and shown to two decimals (for computer) eg. 39.50 m³

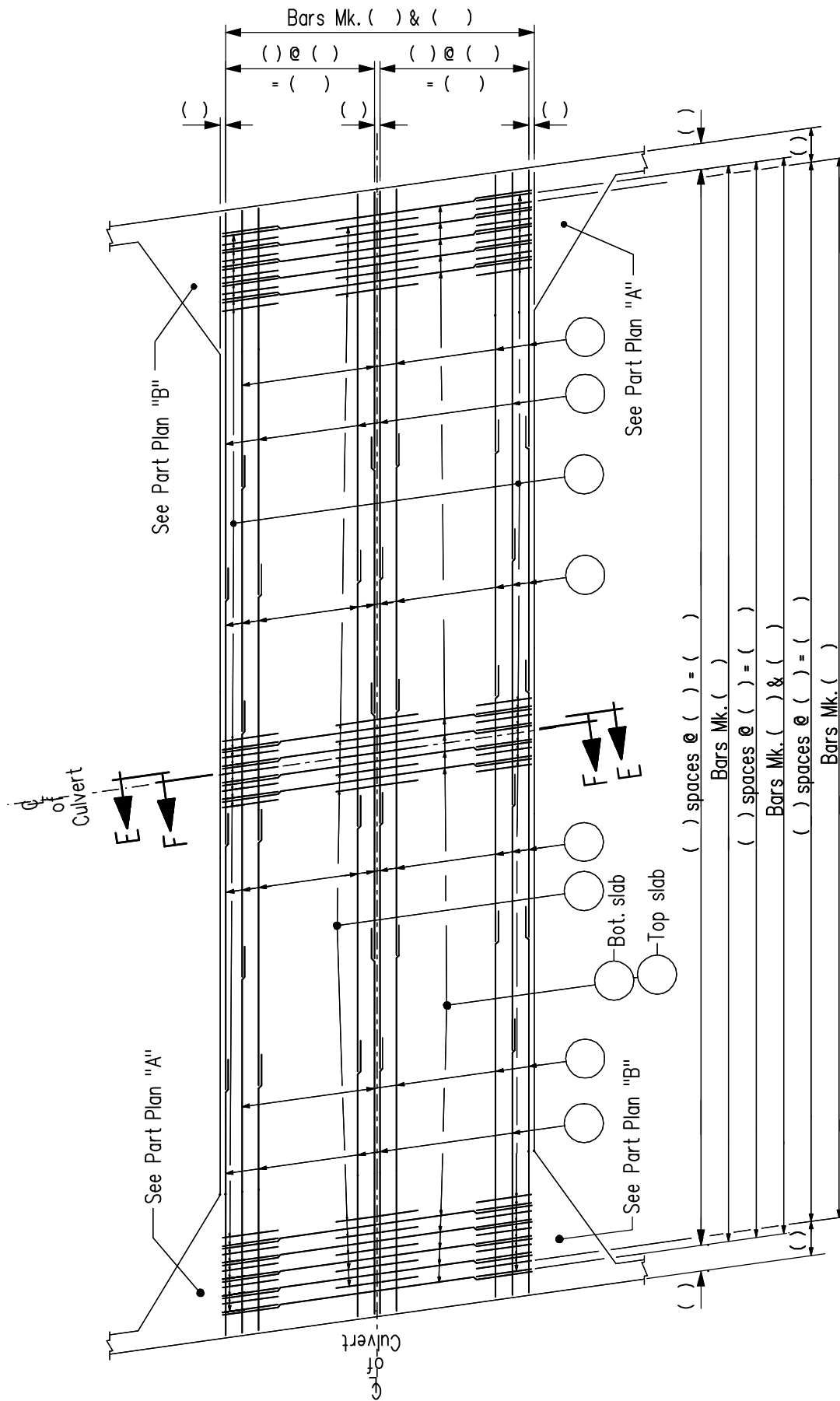
 Manitoba Infrastructure and Transportation Water Control & Structures	DETAIL DESCRIPTION		CONCRETE DETAILS	
	LOCATION		NOTES, POURING SCHEDULE	
	SITE No.	DATE	November 2007	DETAIL No. 2.5.7



NOTE:
For Sections E-E & F-F see sheet No. ()

Manitoba
Infrastructure and Transportation
Water Control & Structures Mid-Division

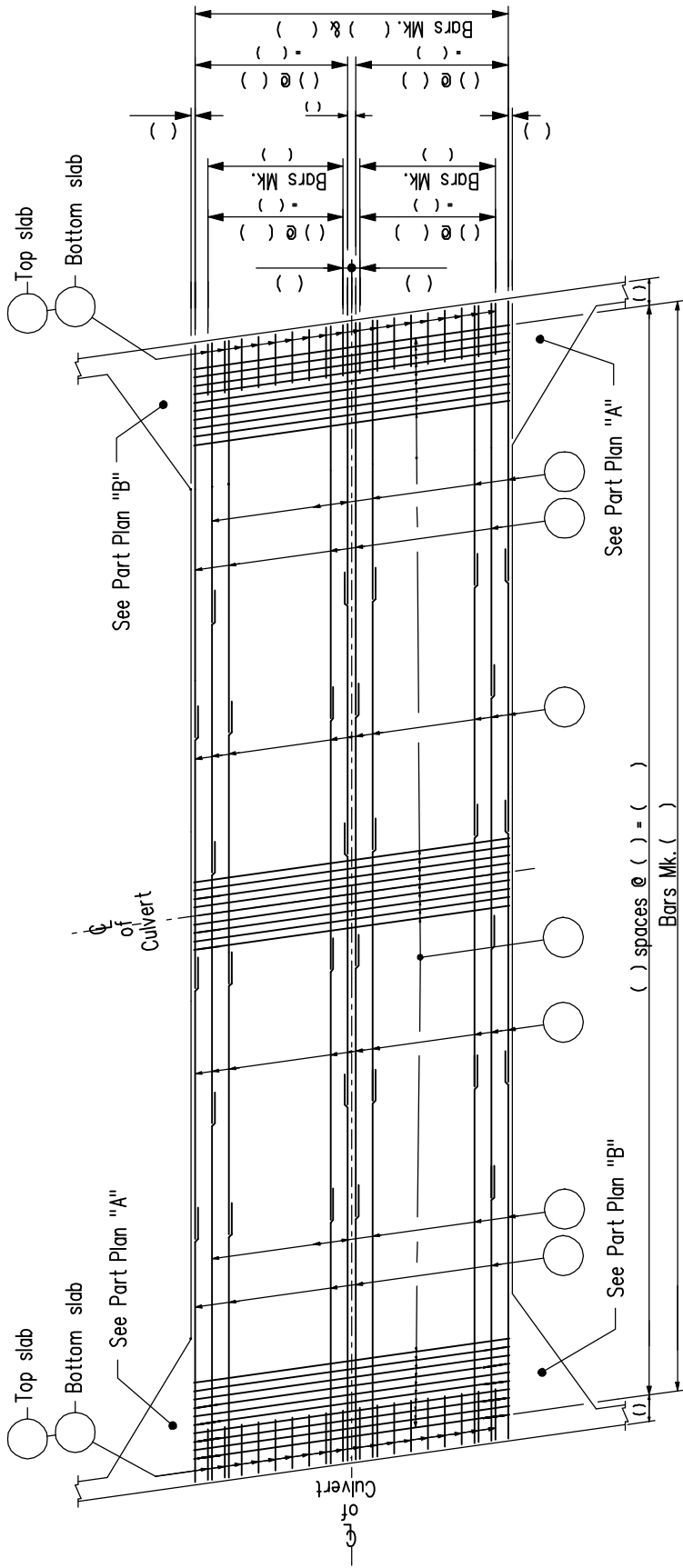
DETAIL DESCRIPTION		SLAB REINFORCING DETAILS TYPICAL DETAILS	
LOCATION		DETAIL No.	
SITE No.	DATE	November 2007	2.6.1



PLAN

Showing reinforcing steel in BOTTOM of BOTTOM slab & TOP of TOP slab

<p>Manitoba Infrastructure and Transportation</p> <p>Water Control & Structures Mid-Division</p>	<p>DETAIL DESCRIPTION</p> <p>SLAB REINFORCING DETAILS PLAN</p>		<p>DETAIL No.</p> <p>2.6.2</p>
	<p>LOCATION</p>	<p>SITE No.</p>	



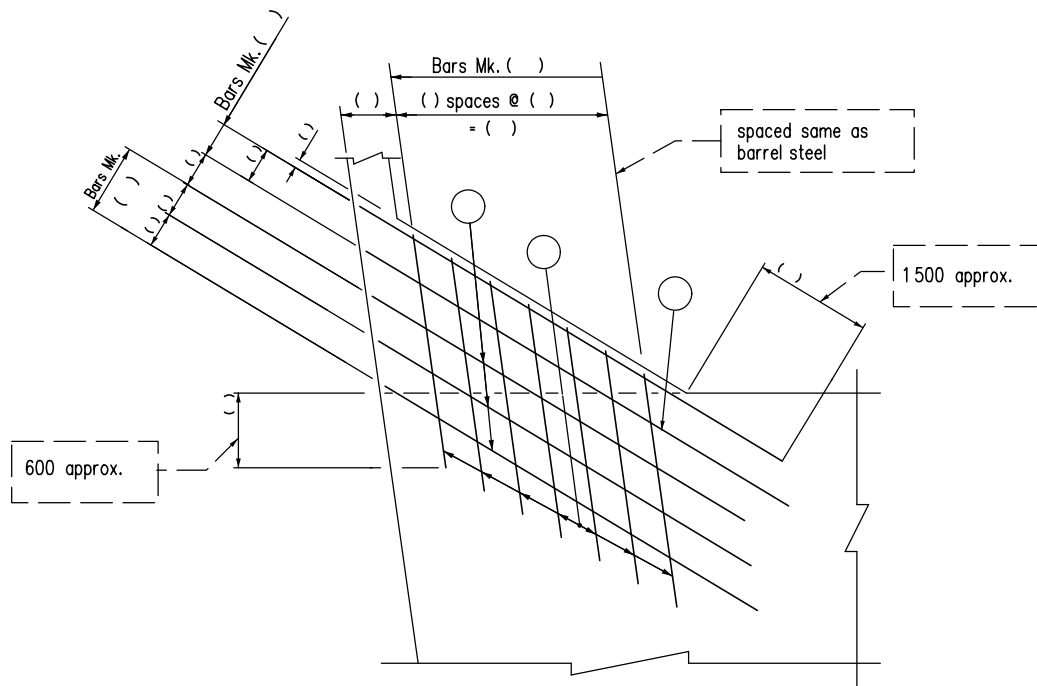
PLAN

Showing reinforcing steel in TOP of BOTTOM slab & BOTTOM of TOP slab

- Stock lengths of reinforcing steel = 6 m, 12 m, & 18 m
- preferable max. length of reinforcing steel to be used for ease of shipping & handling = 12 m.
- All longitudinal reinforcing bars in slabs shall be straight bars.

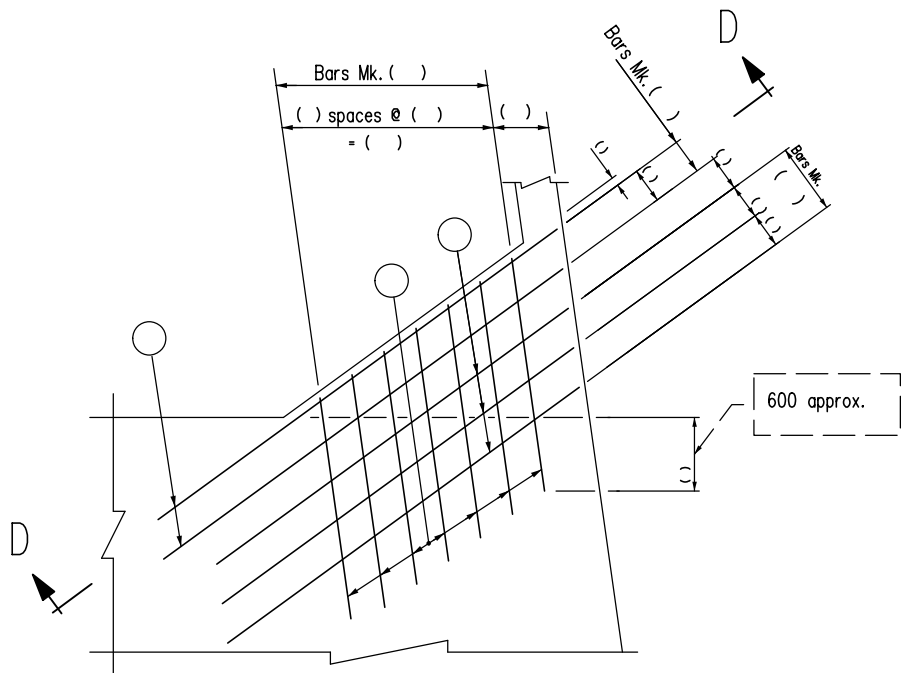
NOTE:

For Sections E-E & F-F see sheet No. ()



PART PLAN "A"

Scale 1: ()



PART PLAN "B"

Scale 1: ()



Water Management and Structures

DETAIL DESCRIPTION

SLAB REINFORCING
DETAILS PART PLAN A & B

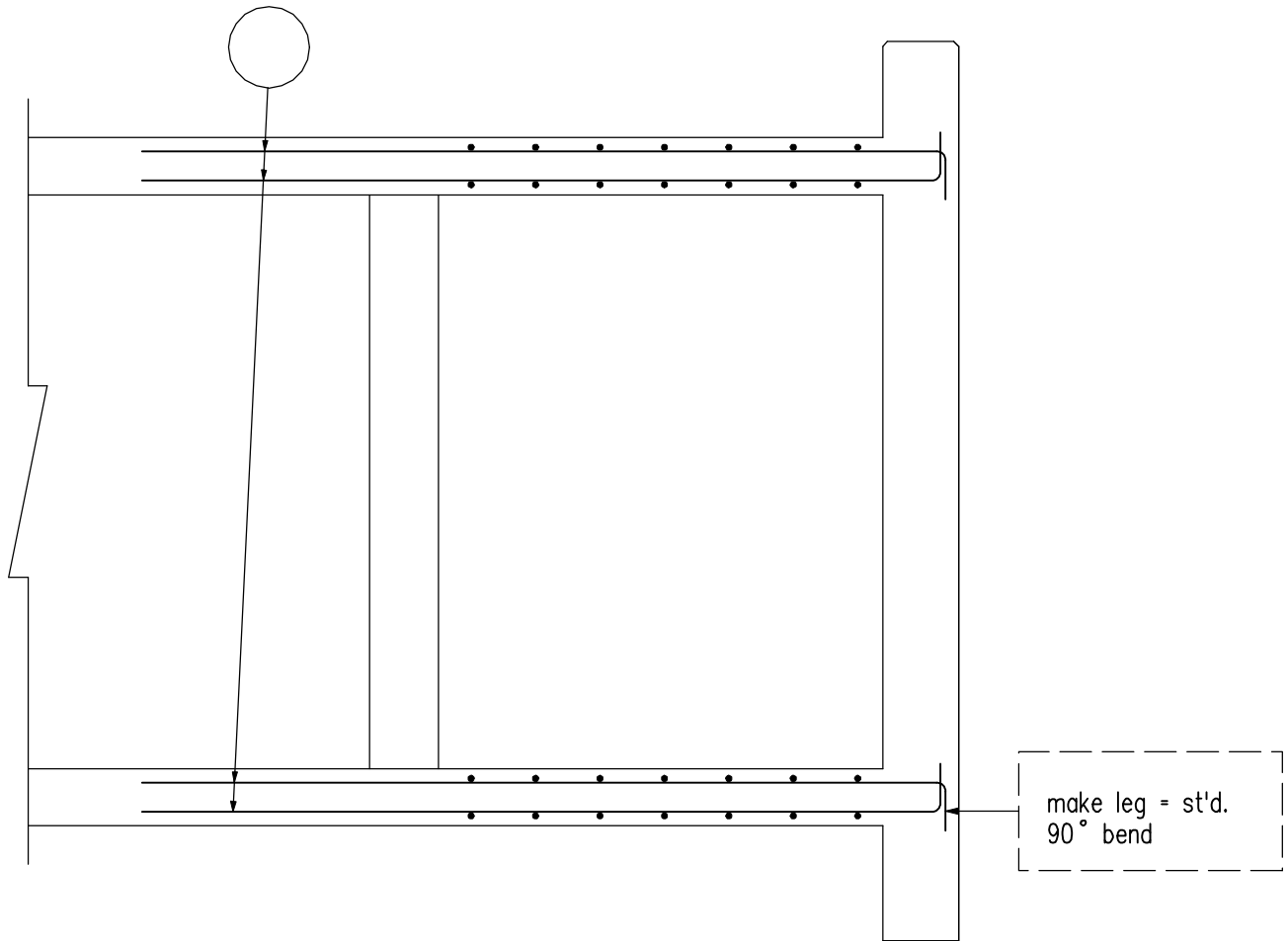
LOCATION

DETAIL No.

SITE No.

DATE September 2019


2.6.4

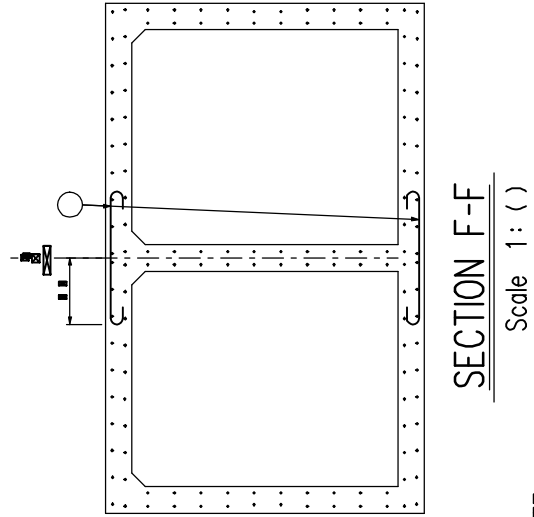
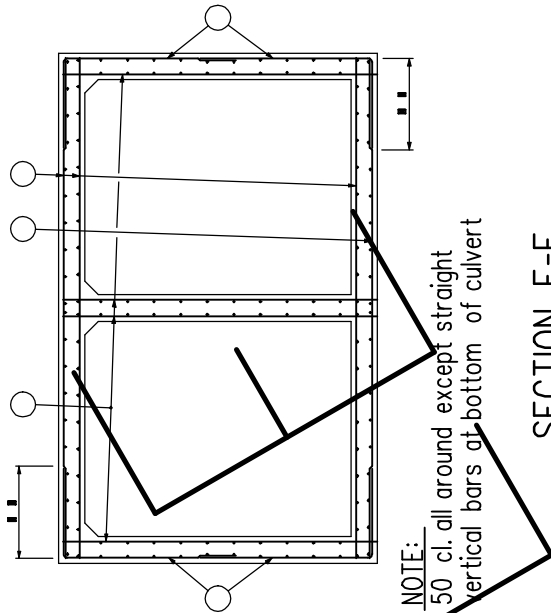


SECTION D-D

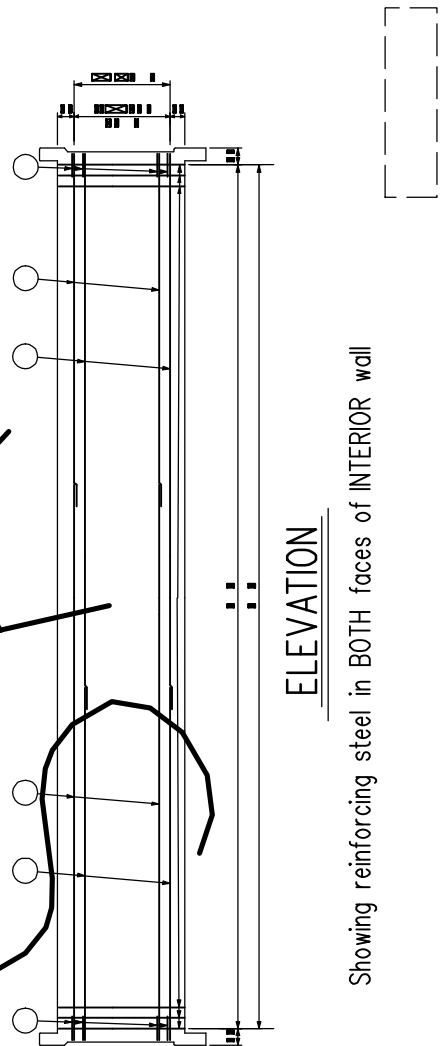
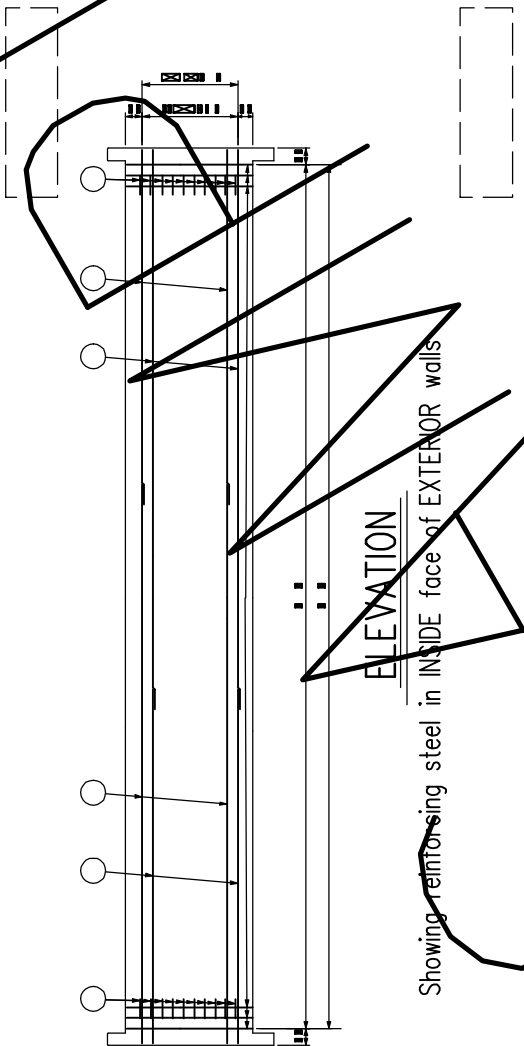
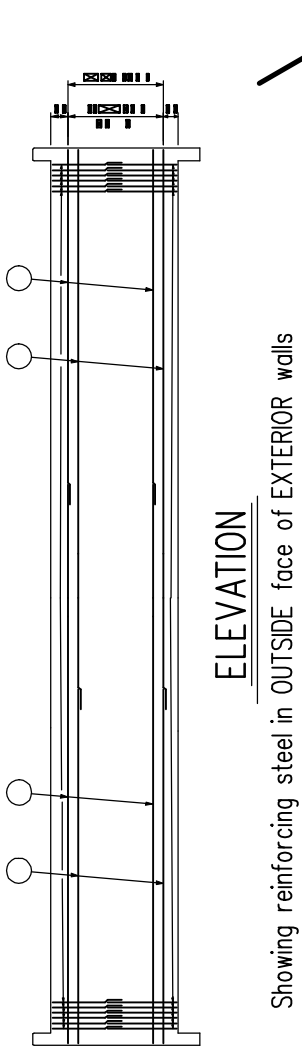
Showing reinforcing steel in N.() and S.(), tieback slabs
 N.() and S.(), tieback slabs similar.
 Headwall & barrel reinforcing not shown.

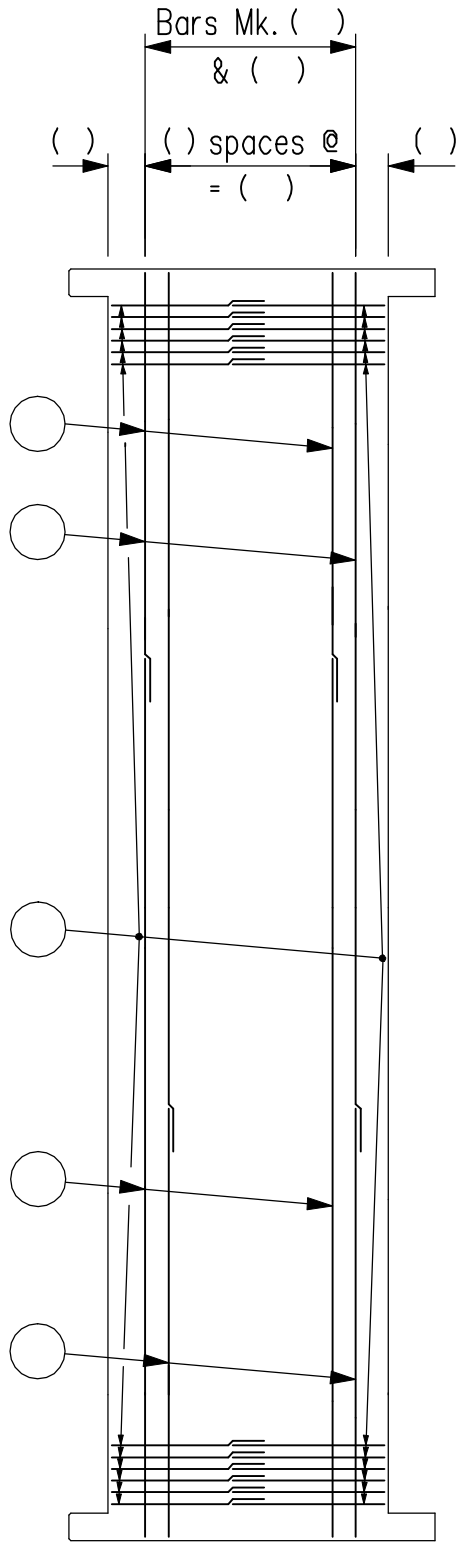
Scale 1:()

 Manitoba Infrastructure and Transportation Water Control & Structures Mid-Division	DETAIL DESCRIPTION		SLAB REINFORCING DETAILS SECTION D-D
	LOCATION		DETAIL No.
	SITE No.	DATE	November 2007
			2.6.5



NOTE:
For location of Section E-E & F-F see sheet No. ()






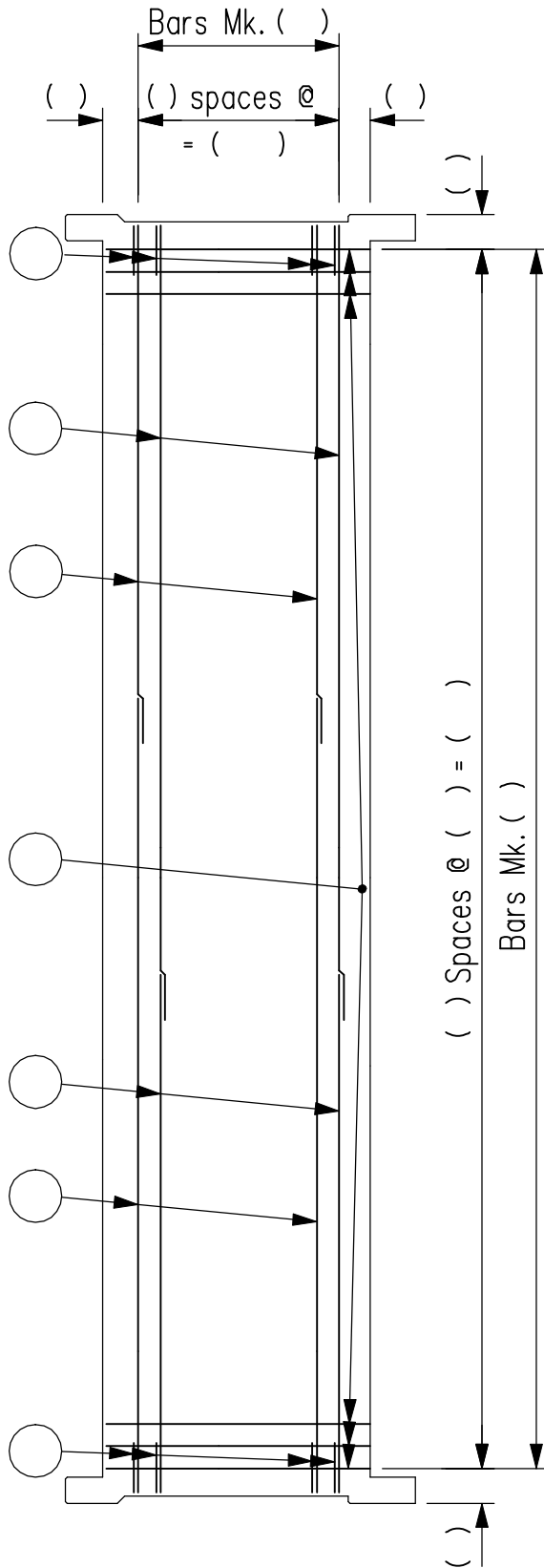
ELEVATION

Showing reinforcing steel in OUTSIDE face of EXTERIOR walls

For clarity, headwall reinforcing is not shown

All longitudinal reinforcing bars in walls shall be straight bars

 <p>Manitoba Infrastructure and Transportation</p> <p>Water Control & Structures Mid-Division</p>	DETAIL DESCRIPTION		WALL REINFORCING DETAILS ELEVATION
	LOCATION		DETAIL No. 2.7.2
	SITE No.	DATE	

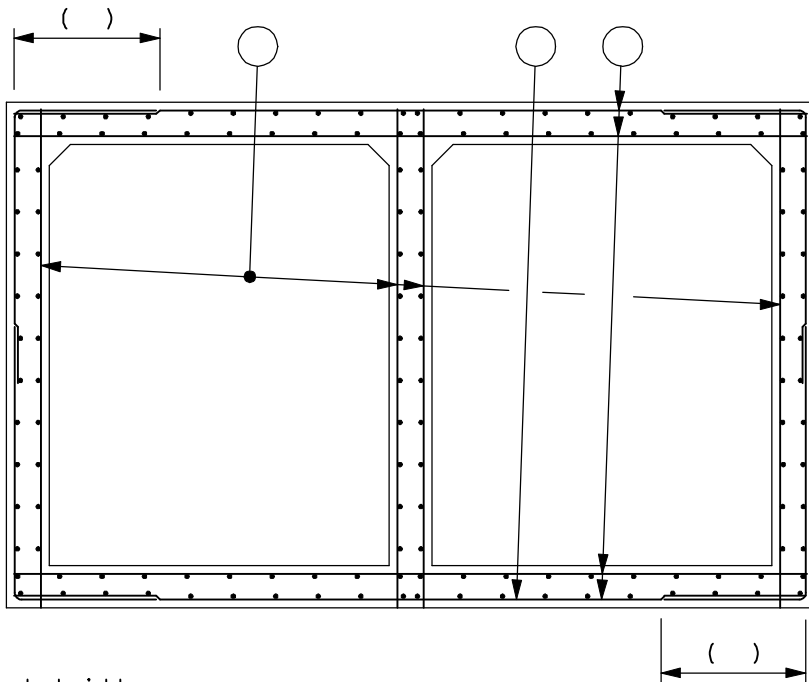


ELEVATION

Showing reinforcing steel in BOTH faces of INTERIOR wall

For clarity, headwall reinforcing is not shown.
All longitudinal bars in walls to be straight bars

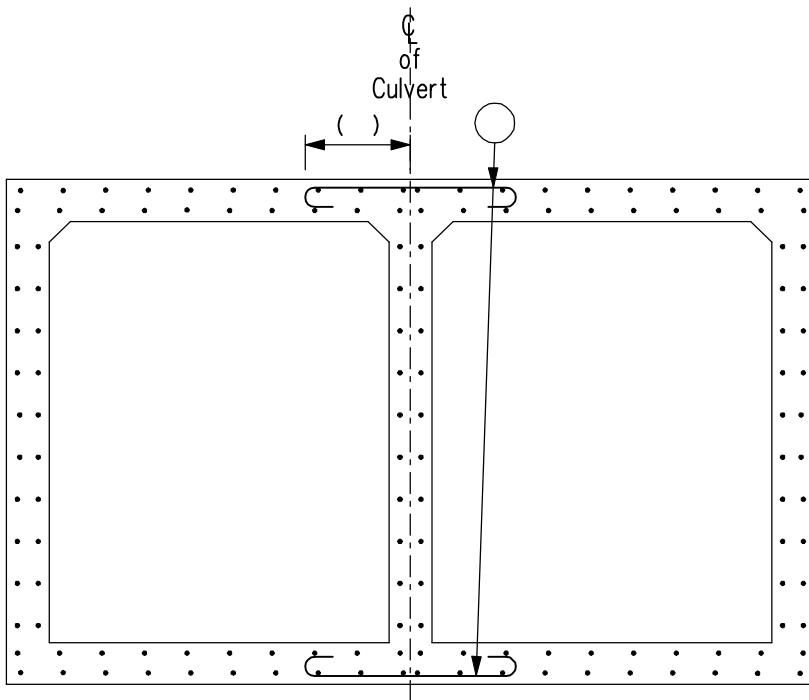
<p>Manitoba Infrastructure and Transportation</p> <p>Water Control & Structures Mid-Division</p>	<p>DETAIL DESCRIPTION</p> <p>WALL REINFORCING DETAILS ELEVATION</p>	
	<p>LOCATION</p>	
	<p>SITE No.</p>	<p>DATE</p> <p>November 2007</p>



NOTE:
50 cl. all around except straight
vertical bars at bottom of culvert

SECTION E-E

Scale 1 : ()



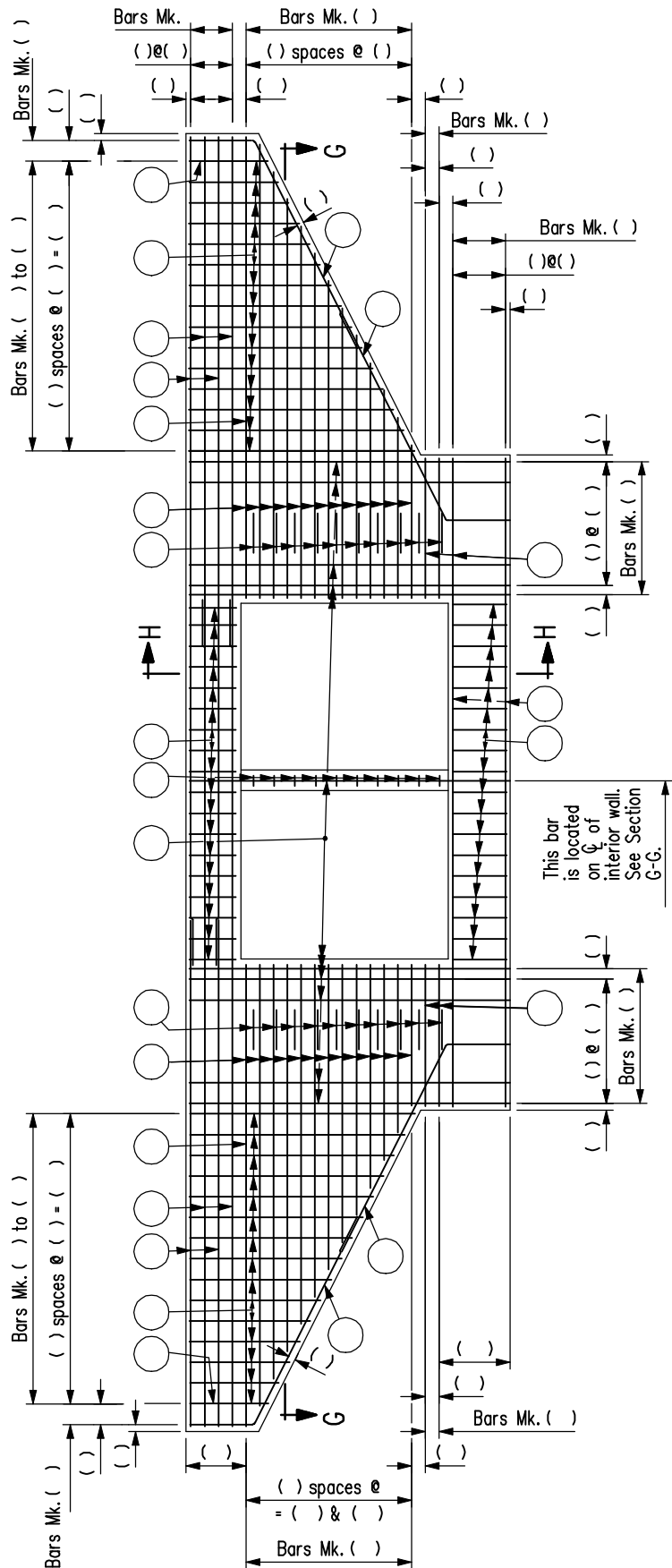
SECTION F-F

NOTE:
For location of Section E-E & F-F
see sheet No. ()

Scale 1 : ()

N.() & S.(). CORNERS

N.() & S.(). CORNERS



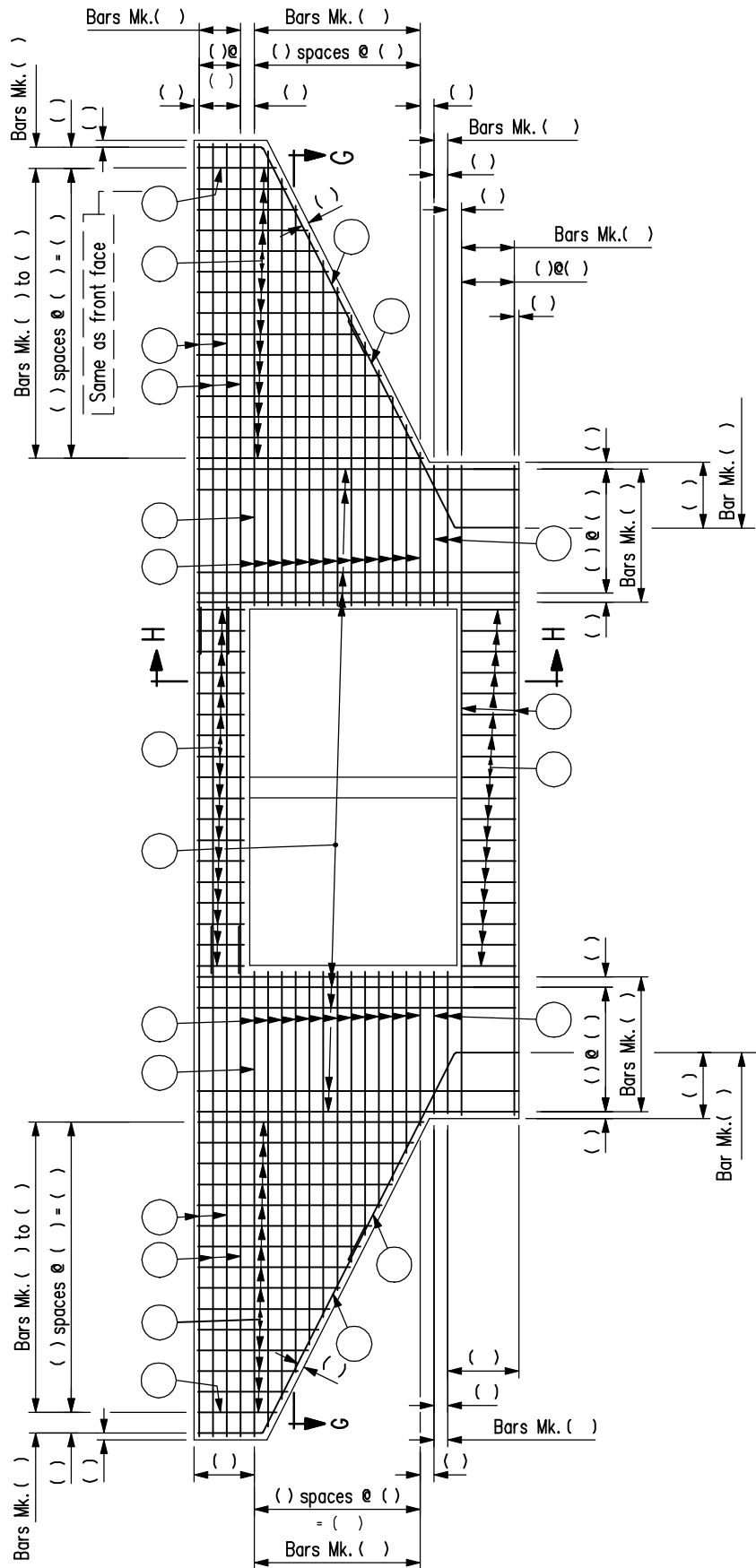
Fillet bars spaced same as headwall horizontally to simplify detailing

ELEVATION

Showing reinforcing steel in FRONT face of headwall.

N.(.) & S.(.) CORNERS

S.(.) & N.(.) CORNERS

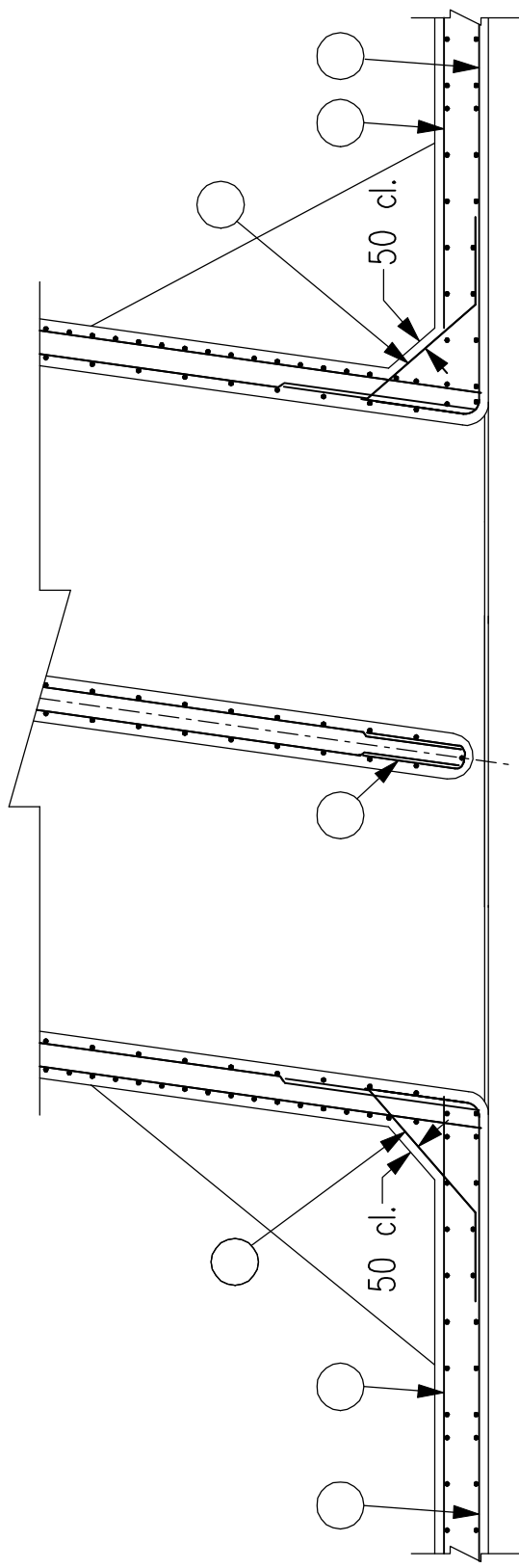


ELEVATION

Showing reinforcing steel in REAR face of headwall.

N.E. & S.W. CORNERS

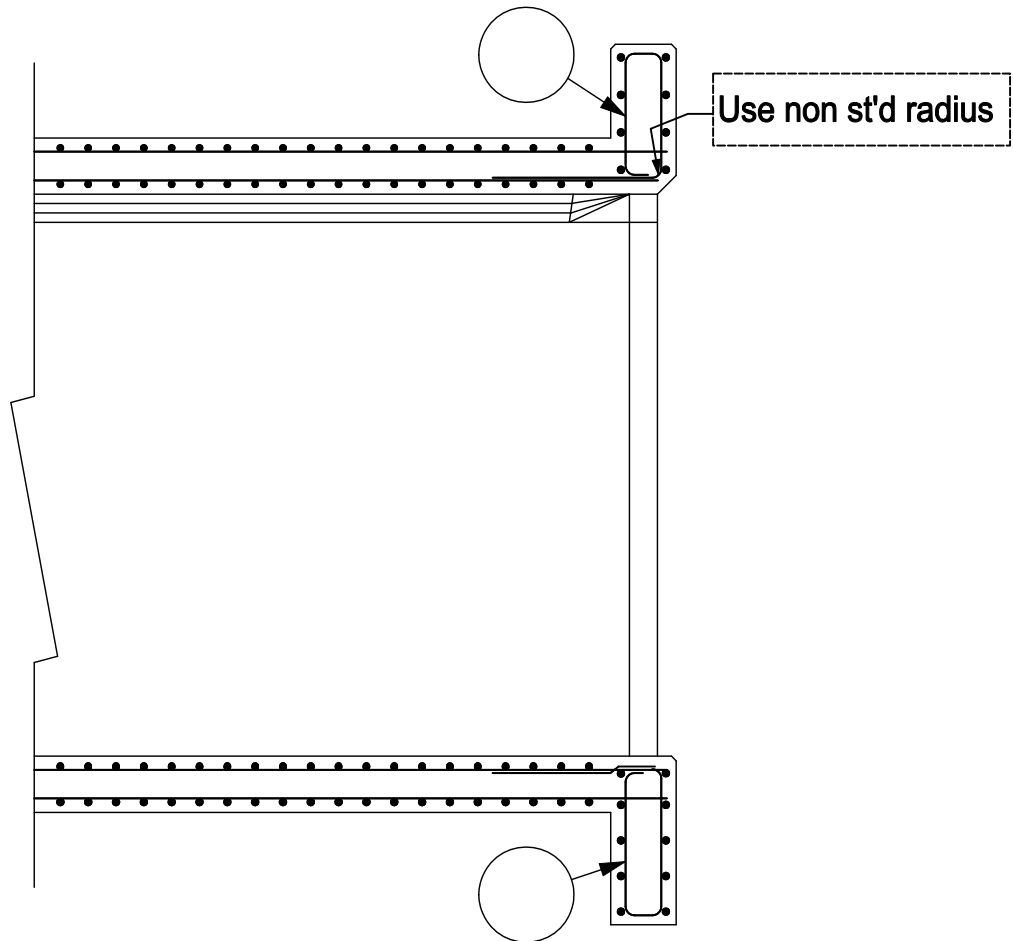
S.E. & N.W. CORNERS




PART SECTION G-G

Scale 1: ()

DETAIL DESCRIPTION		HEADWALL REINFORCING DETAILS PART SECTION G-G	
LOCATION			DETAIL No.
SITE No.	DATE	December 2007	2.8.4



SECTION H-H

 <p>Manitoba Infrastructure and Transportation</p> <p>Water Control & Structures</p>	DETAIL DESCRIPTION		HEADWALL REINFORCING DETAILS SECTION H-H	
	LOCATION			DETAIL No.
	SITE No.	DATE	December 2007	2.8.5

BILL OF REINFORCING STEEL

Site No.
2736-12

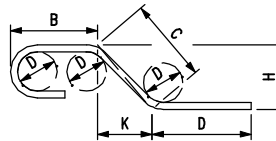
MARK	TYPE	PIN DIAMETER	LENGTH	No.	MASS	BENDING DIAGRAM
1522	BENT	90	3 000	8	37.68	
1523	BENT	90	2 470	8	31.02	
1524	BENT	90	2 190	12	41.26	
1525	BENT	90	2 440	12	45.97	
1526	BENT	90	1 590	24	59.91	
1527	STR		5 690	48	428.80	
2001	STR		5 580	139	1826.59	
2002	STR		2 970	139	972.21	
2003	STR		10 400	2	48.98	

Total mass of reinforcing steel 21 165.10 kg

Total volume of structural concrete m³

NOTES:

- All dimensions given in bending diagram are out to out, except radii and extensions on 90°, 135° & 180° hooks. Extensions on 90°, 135° & 180° hooks are the "A" or "G" dimensions for the standard 90°, 135° & 180° hooks referenced from the RSIC "Manual of Standard Practice". Radii are inside dimensions. All reinforcing steel bends and hooks shall conform to Clause 6.6.2 of C.S.A. A23.1-04, unless noted otherwise in the BILL OF REINFORCING STEEL.
- All reinforcing steel shall be deformed steel, unless noted otherwise in the BILL OF REINFORCING STEEL.
- All reinforcing steel shall conform to CSA G30.18-M92 "Billet Steel Bars for Concrete Reinforcement" Grade 400W, unless noted otherwise in the BILL OF REINFORCING STEEL.
- Like bars shall be bundled, securely tied and identified as to Mark and Site No. by appropriate means. All other items to be identified in a similar fashion.
- All bars shall be bent in accordance with the following detail:



- all lengths shall be to the nearest 10 mm
- all mass shall be rounded off to two decimals
- total volume of structural concrete to be rounded to first decimal & shown to two decimals eg. 74.10 m³
- total area of permeable formwork liner finish shall be to the nearest m² & shown to two decimals eg. 74.00 m²