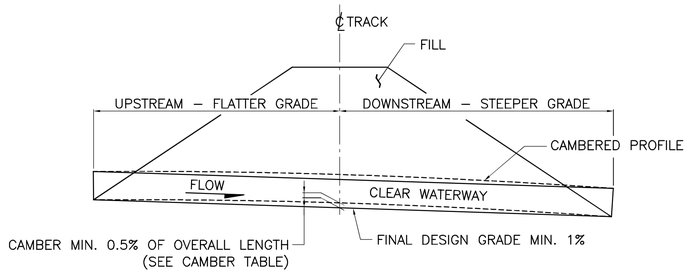
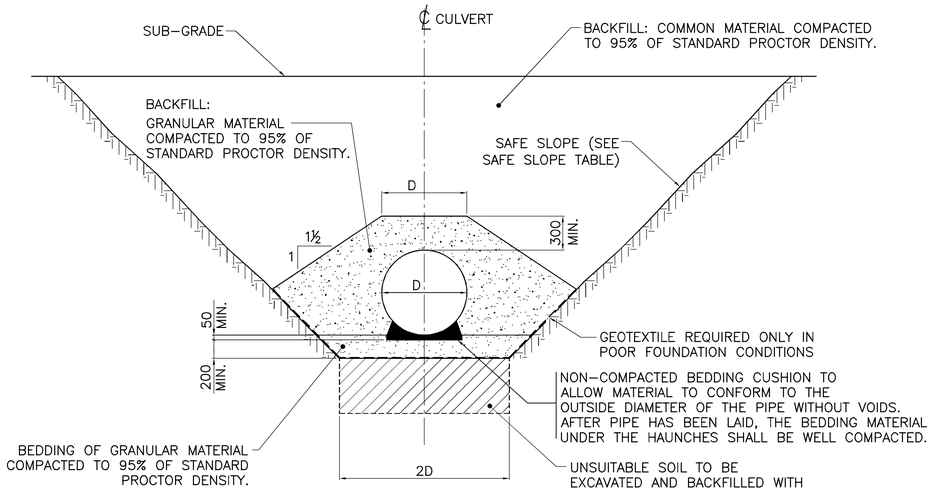


TABLE 1: CAMBER TABLE

LENGTH (m)	CAMBER (mm)
6.0	30
9.0	45
12.0	60
15.0	75
18.5	90
21.5	105
24.5	120
27.5	135
30.5	150

MINIMUM GRADE AND CAMBERING REQUIREMENTS FOR CULVERT INSTALLATION



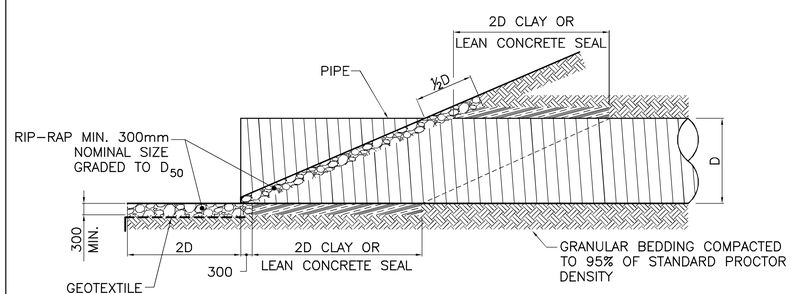
GRANULAR MATERIAL FOR BEDDING AND BACKFILLING TO BE APPROVED BY THE ENGINEER.
IN GENERAL, PIT–RUN SAND AND GRAVEL, REASONABLY WELL GRADED FROM MAXIMUM SIZE 100mm TO NOT MORE THAN 8% FINER THAN SIEVE No. 200.

CULVERT INSTALLATION

TABLE 2: SAFE SLOPE TABLE

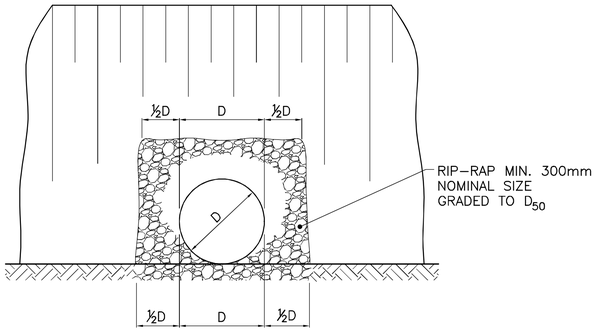
TYPE	SOIL CONDITION	SAFE SLOPE
A	HARD, DENSE AND STIFF SOILS WITH A LOW MOISTURE CONTENT	1 HORIZ: 1 VERT
B	MEDIUM DENSITY SOILS WHICH ARE OF LOOSECONSISTENCY, HAVE BEEN PREVIOUSLY EXCAVATED OR EXHIBIT SIGNS OF WATER SEEPAGE	1.5 HORIZ: 1 VERT
C	SOFT, VERY LOOSE, WET AND MUDDY SOILS	3 HORIZ: 1 VERT

THE SAFE SLOPE SHALL BE REDUCED WHEN THE FOLLOWING CONDITIONS OCCUR:
- SIGNS OF DISTRESS APPEAR AT THE FACE OF THE CUT OR AT THE GROUND ADJACENT TO THE OPEN EXCAVATION
- SURCHARGE LOADS FROM STORED MATERIAL OR EQUIPMENT OPERATE AT TOP OF CUT
- HIGH WATER TABLE
- INADEQUATE OR UNCERTAIN SOIL PROPERTIES DATA.



INORGANIC CLAY OR LEAN CONCRETE SEAL TO BE PLACED AT BOTH ENDS OF CULVERTS FOR A LENGTH OF TWICE THE DIAMETER (2D). THE CLAY OR LEAN CONCRETE SEAL SHALL EXTEND FROM THE BOTTOM OF THE EXCAVATION TO 300mm ABOVE THE CROWN OF THE PIPE AND FOR THE FULL WIDTH OF THE EXCAVATION.

SEEPAGE CUT-OFF DETAIL



RIP-RAP PROTECTION

TABLE 3: STEEL ROUND CORRUGATED PIPE (CSP)
MINIMUM AND MAXIMUM HEIGHT OF COVER
ASSUMED NORMAL SITE CONDITION
PH > 6–8, MINIMUM RESISTIVITY > 2000 ohm–cm

CULVERT SIZE ID (mm)	MIN COVER (mm)	MAXIMUM COVER (m)								
		CORRUGATION PROFILE								
		68 x 12				125 x 25				
		1.6mm	2.0mm	2.8mm	3.5mm	1.6mm	2.0mm	2.8mm	3.5mm	4.2mm
600	1200	7.0	9.0	14.0	15.0					
700	1200	5.5	7.0	12.0	13.0					
800	1200	5.0	6.5	10.0	11.0					
900	1200	4.0	6.0	9.0	10.0					
1000	1200		5.0	8.0	9.0					
1200	1200			13.0		5.5	8.0	16.0	20.0	23.0
1400	1600			12.0		5.0	7.0	13.0	17.0	20.0
1600	1600					4.0	6.0	11.0	15.0	17.0
1800	2400						5.5	10.0	13.0	15.0
2000	2400						5.0	9.0	12.0	14.0
2200	2400							7.0	10.5	12.0
2400	2400							5.5	10.0	11.0

NOTES: MINIMUM SIZE OF CSP CULVERTS TO BE 900mm DIA.
60mm AND 750mm DIA. CSP CULVERTS ARE TO BE USED WHERE EXISTING COVER DOES NOT PERMIT A 900mm DIA. SIZE CULVERT.
SELECTION OF CULVERTS SHALL BE BASED ON MINIMUM WALL THICKNESS FOR ANY GIVEN DIAMETER.
IN POOR GROUND CONDITIONS, IT IS RECOMMENDED THAT RIVETED PIPES BE USED.

TABLE 4: STRUCTURAL PLATE PIPE (MULTI PLATE/SPCSP)
MINIMUM AND MAXIMUM HEIGHT OF COVER
ASSUMED NORMAL SITE CONDITION
PH > 6–8, MINIMUM RESISTIVITY > 2000 ohm–cm

CULVERT SIZE ID (mm)	MIN COVER (mm)	CORRUGATION PROFILE 152x51			
		MAXIMUM COVER (m)			
		3mm	4mm	5mm	6mm
2120	2430	7.0	12.0	18.0	26.0
2280	2430	6.0	11.5	17.0	24.0
2430	2430	5.5	11.0	16.0	23.0
2590	2430	5.0	10.0	15.0	21.0
2740	2430		9.5	14.0	20.0
3050	2430		9.0	13.0	18.0
3360	2430		8.0	12.0	16.0
3670	2430		7.0	11.0	15.0
3990	2430			10.0	13.5
4300	2430			9.0	13.0
4610	2430			8.0	12.0

TABLE 5: CULVERTS IN CORROSIVE CONDITIONS

SOIL TYPE	DESCRIPTION	DEGREE OF CORROSIVENESS	UPGRADES	
			WALL THICKNESS	COATINGS
1	SANDY SILT	LOW	NONE	NONE
2	CLAYEY SOIL	MODERATE	INCREASE IN WALL THICK.	ALUMINIZED/POLYMER/INCREASE GALVANIZING THICKNESS 910/1220 g/m^2 (ONLY SPCSP)
3	MARSH AND PEATY SOIL	SEVERE	INCREASE IN WALL THICK.	ALUMINIZED/POLYMER/INCREASE GALVANIZING THICKNESS 1220 g/m^2 (ONLY SPCSP)

NOTE:
1. RECOMMENDED ALTERNATIVE COATINGS ARE:
   - ALUMINIZED STEEL TYPE 2 IN ACCORDANCE WITH ASTM A929 AND AASHTO M–274 WITH 305 g/m^2
   - POLYMER COATING SUCH AS TRENCHCOAT OR EQUIVALENT IN ACCORDANCE WITH ASTM A742 AND AASHTO M525 WITH 10/10 FINISH.
2. ABRASION IS A COMBINATION OF STREAM VELOCITY AND BED LOAD. IN GEOGRAPHIC AREAS WHERE HEAVY LOADS OF SAND AND SMALL GRAVEL POSE AN ABRASION PROBLEM, AND FLOW VELOCITY IS HIGH, INCREASE RECOMMENDED THICKNESS BY ONE SIZE WALL THICKNESS.
3. SELECTION OF UPGRADES OR COMBINATION OF UPGRADES SHALL BE DETERMINED BY THE SEVERITY OF SITE CONDITIONS.

GENERAL NOTES:

SCOPE:
CULVERT SIZES IN TABLE 3 AND 4 HAVE BEEN DEVELOPED BASED ON STRENGTH AND DURABILITY REQUIREMENTS FOR NORMAL SITE CULVERT INSTALLATIONS.

DESIGN LOAD: E80 + IMPACT

DURABILITY BASED ON 75 YEAR SERVICE LIFE.

CULVERT DURABILITY:
SITE SPECIFIC DESIGN IS REQUIRED WHERE WATER AND/OR SOIL IS CORROSIVE OR ABRASIVE.
WATER AND/OR IN CLAY, CLAY LOAM, PEAT AND ORGANIC SOILS SHOULD BE TESTED FOR WATER AND SOIL CORROSIVENESS. TESTS TO BE CARRIED OUT ARE RESISITIVITY AND PH TESTING IN ACCORDANCE WITH CALIFORNIA TEST METHOD 6438 AND SHALL BE PERFORMED BY A QUALIFIED MATERIALS TESTING COMPANY.

INSTALLATION:
PIPE SHALL BE INSTALLED IN ACCORDANCE WITH CN ENGINEERING RECOMMENDED METHOD OF INSTALLATION OF CULVERTS RM4402.

FOR MULTIPLE PIPE INSTALLATIONS, THE CLEARANCE BETWEEN CULVERTS SHALL NOT BE LESS THAN ½ THE PIPE DIAMETER, BUT NEED NOT BE GREATER THAN 1.0m UNLESS REQUIRED FOR SPECIFIC CONSTRUCTION COMPACTION METHODS AND EQUIPMENT.

FOR PIPES SIZES GREATER THAN 1.5m, TEMPORARY STRUTTING SPACED AT MAX. 3.0m SPACING SHALL BE PROVIDED.

FOR VERTICAL FACE CUTS, SHORING TO BE PROVIDED AND SHALL BE ENGINEERED TO SUIT HEIGHT OF EMBANKMENT AND VERTICAL FACES.

COVER:
THE MINIMUM HEIGHT AND MAXIMUM HEIGHT OF COVER FOR VARIOUS CULVERT SIZES AND SPECIFIED WALL THICKNESS ARE GIVEN IN TABLES 3 AND 4.

END TREATMENT:
WHERE REQUIRED TO PREVENT, EROSION, UNDERMINING, DRIFT AND DEBRIS DETENTION AT THE INLET AND/OR OUTLET, OR WHERE REQUIRED TO INCREASE HYDRAULIC CAPACITY, THE ENGINEER SHALL SPECIFY AN APPROPRIATE CULVERT PIPE END TREATMENT. END TREATMENT MAY CONSIST OF SLOPE RIP–RAP, GABIONS, STANDARD STEEL CULVERT APRONS, BEVELLED PIPE ENDS OR CONCRETE HEADWALLS WITH RIP–RAP APRONS.

SPECIFICATIONS:

CULVERTS:
CSP SHALL BE PLAIN GALVANIZED CORRUGATED STEEL PIPE IN ACCORDANCE WITH CSA STANDARD CAN3–G401, AASHTO M–218 OR ASTM A929.

SPCSP SHALL BE PLAIN GALVANIZED STRUCTURAL PLATE PIPE IN ACCORDANCE WITH CSA STANDARD CAN3–G401, AASTHO M–167 OR ASTM A761.

GALVANIZING SHALL BE NOT LESS THAN 610 g/m^2 OF SURFACE (TOTAL BOTH SIDES)

ALTERNATIVE COATINGS:
ALUMINIZE STEEL TYPE 2 – ASTM A929 AND AASHTO M–274 WITH 305 g/m^2 COATING WEIGHT.
POLYMER COATING SUCH AS TRENCHCOAT OR EQUIVALENT – ASTM A742 OR AASHTO M–525 WITH 10/10 GRADE FINISH.

GEOTEXTILE FILTER FABRIC:
WHEN IN THE OPINION OF THE ENGINEER, FOUNDATION CONDITIONS ARE CONSIDERED SOFT AND UNSTABLE, WOVEN GEOTEXTILE FILTER FABRIC SHALL BE INSTALLED AT THE BASE OF THE EXCAVATION AND SHALL CONFORM WITH THE FOLLOWING:
- GRAB STRENGTH 1275 N
- ELONGATION (FAILURE) 15%
- PUNCTURE STRENGTH 275 N
- BURST STRENGTH 3.6 MPa
- TRAPEZOIDAL TEAR 475 N
- MINIMUM FABRIC LAP TO BE 1 m

Original Drawing Signed by George Nowak Sept. 29/2003
SENIOR STRUCTURAL ENGINEER

No.	Date	Revision	By/Par

Division | Sub–division | Mile Mille

CORRUGATED STEEL PIPE (CSP) AND STRUCTURAL PLATE CORRUGATED STEEL PIPE (SPCSP) CULVERTS CANADA

Drawn Dessin JC | Checked Verification | Approved Approbation | Scale Echelle NONE | Date 03/09/29

Office of Chief Engineer
Bureau de l'Ingénieur en Chef

File Reference | Drawing Number Dessin Numero R7A-80.2

TECHNI-GESTION J.C. Inc. (514) 425-3630