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TYPICAL SET OUT DIMENSIONS & QUANTITY CALCULATIONS FOR REINFORCED CONCRETE PIPES UP TO 35° SKEW & UP TO 1800mm DIAMETER

TABLE 1: CULVERT SKEW ANGLE 0° TO 20°
(WINGWALL ANGLES α AND β = 45°) (BATTER SLOPE OF 1V:2H)

SETOUT DIMENSIONS						QUANTITIES	
D	H	A	B	E	C	Q (TOTAL)	AQ (TOTAL)
450	735	1070	1070	1070	W+2140	1.45	0.53
600	900	1400	1400	1400	W+2800	2.22	0.79
750	1065	1730	1730	1730	W+3460	3.17	1.37
900	1230	2060	2060	2060	W+4120	4.26	2.77
1050	1395	2390	2390	2390	W+4780	7.9	2.71
1200	1560	2720	2720	2720	W+5540	9.91	3.32
1350	1725	3050	3050	3050	W+6100	12.2	3.98
1500	1880	3360	3360	3360	W+6720	14.5	4.65
1650	2045	3690	3690	3690	W+7380	17.1	5.44
1800	2210	4020	4020	4020	W+8040	20.04	6.28

TABLE 2: CULVERT SKEW ANGLE 0° TO 20°
(WINGWALL ANGLES α AND β = 45°) (BATTER SLOPE OF 1V:4H)

SETOUT DIMENSIONS						QUANTITIES	
D	H	A	B	E	C	Q (TOTAL)	AQ (TOTAL)
450	735	2140	2140	2140	W+4280	3.35	0.8
600	900	2800	2800	2800	W+5600	5.29	1.2
750	1065	2460	2460	2460	W+6920	7.68	2.13
900	1230	4120	4120	4120	W+8240	10.49	2.77
1050	1395	4780	4780	4780	W+9560	18.12	4
1200	1560	5440	5440	5440	W+10880	22.89	4.92
1350	1725	6100	6100	6100	W+12200	28.24	5.93
1500	1880	6720	6720	6720	W+13440	33.74	6.95
1650	2045	7380	7380	7380	W+14760	40.16	8.14
1800	2210	8040	8040	8040	W+16080	47.12	9.42

TABLE 3: CULVERT SKEW ANGLE 0° TO 20°
(WINGWALL ANGLES α AND β = 45°) (BATTER SLOPE OF 1V:6H)

SETOUT DIMENSIONS						QUANTITIES	
D	H	A	B	E	C	Q (TOTAL)	AQ (TOTAL)
450	735	3120	3120	3120	W+6420	5.94	1.07
600	900	4200	4200	4200	W+8400	9.54	1.62
750	1065	5190	5190	5190	W+10380	14	2.89
900	1230	6180	6180	6180	W+12360	19.27	3.78
1050	1395	7170	7170	7170	W+14340	31.76	5.28
1200	1560	8160	8160	8160	W+16320	40.3	6.51
1350	1725	9150	9150	9150	W+18300	49.9	7.87
1500	1880	10080	10080	10080	W+20160	57.79	9.24
1650	2045	11070	11070	11070	W+22140	71.38	10.84
1800	2210	12060	12060	12060	W+24120	83.87	12.56

TABLE 4: CULVERT SKEW ANGLE 20° TO 30°
(WINGWALL ANGLES α = 9.5° AND β = 51°) (BATTER SLOPE OF 1V:2H)

SETOUT DIMENSIONS						QUANTITIES	
D	H	A	B	E	C	Q (TOTAL)	AQ (TOTAL)
450	735	1070	180	1330	W+1510	1.26	0.53
600	900	1400	240	1730	W+1970	1.92	0.79
750	1065	1730	290	2140	W+2430	2.72	1.37
900	1230	2060	350	2550	W+2900	3.66	1.77
1050	1395	2390	400	2960	W+3360	6.97	2.71
1200	1560	2720	460	3360	W+3820	8.73	3.32
1350	1725	3050	520	3770	W+4290	10.72	3.98
1500	1880	3360	570	4150	W+4720	12.73	4.65
1650	2045	3690	620	4560	W+5180	15.1	5.44
1800	2210	4020	680	4970	W+5650	17.64	6.28

TABLE 5: CULVERT SKEW ANGLE 20° TO 30°
(WINGWALL ANGLES α = 9.5° AND β = 51°) (BATTER SLOPE OF 1V:4H)

SETOUT DIMENSIONS						QUANTITIES	
D	H	A	B	E	C	Q (TOTAL)	AQ (TOTAL)
450	735	2140	360	2650	W+3010	2.75	0.81
600	900	2800	470	3460	W+3930	4.32	1.2
750	1065	2460	580	4280	W+4860	6.26	2.13
900	1230	4120	690	5090	W+5780	8.53	2.77
1050	1395	4780	800	5910	W+6710	15.23	4
1200	1560	5440	920	6720	W+7640	19.21	4.92
1350	1725	6100	1030	7540	W+8570	23.68	5.93
1500	1880	6720	1130	8300	W+9430	28.26	6.95
1650	2045	7380	1240	9120	W+10360	33.62	8.14
1800	2210	8040	1350	9930	W+11280	39.41	9.42

TABLE 6: CULVERT SKEW ANGLE 20° TO 30°
(WINGWALL ANGLES α = 9.5° AND β = 51°) (BATTER SLOPE OF 1V:6H)

SETOUT DIMENSIONS						QUANTITIES	
D	H	A	B	E	C	Q (TOTAL)	AQ (TOTAL)
450	735	3120	540	3970	W+4510	4.73	1.07
600	900	4200	710	5190	W+5900	7.56	1.62
750	1065	5190	870	6410	W+7280	11.05	2.89
900	1230	6180	1040	7640	W+8680	15.2	3.78
1050	1395	7170	1200	8860	W+10060	25.88	5.28
1200	1560	8160	1370	10080	W+11450	32.79	6.51
1350	1725	9150	1540	11300	W+12840	40.54	7.87
1500	1880	10080	1690	12450	W+14140	48.53	9.24
1650	2045	11070	1860	13680	W+15540	57.89	10.84
1800	2210	12060	2020	14900	W+16920	67.98	12.56

TABLE 7: CULVERT SKEW ANGLE 31° TO 35°
(WINGWALL ANGLES α = 8.5° AND β = 54°) (BATTER SLOPE OF 1V:2H)

SETOUT DIMENSIONS						QUANTITIES	
D	H	A	B	E	C	Q (TOTAL)	AQ (TOTAL)
450	735	1070	160	1480	W+1640	1.31	0.53
600	900	1400	210	1930	W+2140	2	0.79
750	1065	1730	260	2390	W+2650	2.84	1.37
900	1230	2060	310	2840	W+3150	3.82	1.77
1050	1395	2390	360	3290	W+3650	7.24	2.71
1200	1560	2720	410	3750	W+4160	9.08	3.32
1350	1725	3050	460	4200	W+4660	11.13	3.98
1500	1880	3360	510	4630	W+5140	13.24	4.65
1650	2045	3690	560	5080	W+5640	15.7	5.44
1800	2210	4020	610	5540	W+6150	18.34	6.28

TABLE 8: CULVERT SKEW ANGLE 31° TO 35°
(WINGWALL ANGLES α = 8.5° AND β = 54°) (BATTER SLOPE OF 1V:4H)

SETOUT DIMENSIONS						QUANTITIES	
D	H	A	B	E	C	Q (TOTAL)	AQ (TOTAL)
450	735	2140	320	2950	W+3270	2.9	0.81
600	900	2800	420	3860	W+4280	4.56	1.2
750	1065	3460	520	4770	W+5290	6.6	2.13
900	1230	4120	620	5680	W+6300	9	2.77
1050	1395	4780	720	6580	W+7300	16	4
1200	1560	5440	820	7490	W+8310	20.18	4.92
1350	1725	6100	920	8400	W+9320	24.86	5.93
1500	1880	6720	1010	9250	W+10260	29.69	6.95
1650	2045	7380	1110	10160	W+11270	35.32	8.14
1800	2210	8040	1210	11070	W+12280	41.4	9.42

TABLE 9: CULVERT SKEW ANGLE 31° TO 35°
(WINGWALL ANGLES α = 8.5° AND β = 54°) (BATTER SLOPE OF 1V:6H)

SETOUT DIMENSIONS						QUANTITIES	
D	H	A	B	E	C	Q (TOTAL)	AQ (TOTAL)
450	735	3210	540	3970	W+4510	4.73	1.07
600	900	4200	710	5190	W+5900	7.56	1.62
750	1065	5190	870	6410	W+7280	11.05	2.89
900	1230	6180	1040	7640	W+8680	15.2	3.78
1050	1395	7170	1200	8860	W+10060	25.88	5.28
1200	1560	8160	1370	10080	W+11450	32.79	6.51
1350	1725	9150	1540	11300	W+12840	40.54	7.87
1500	1880	1000	1690	12450	W+14140	48.53	9.24
1650	2045	11070	1860	13680	W+15540	57.89	10.84
1800	2210	12060	2020	14900	W+16920	67.98	12.56

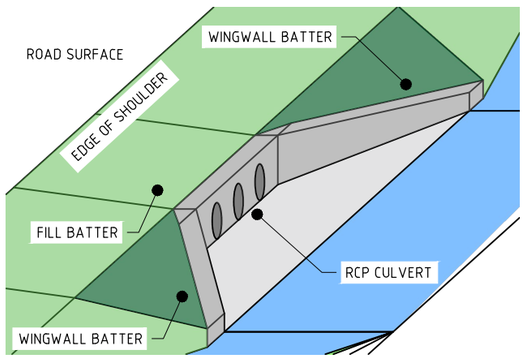
NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED ELSEWHERE
2. ALL QUANTITIES ARE IN CUBIC METRES
3. STANDARD DRAWING REFERENCES:
   - 3.1. CS3101 - INSTALLATION, BEDDING AND FILLING / BACKFILLING AGAINST / OVER CULVERTS
   - 3.2. CS3103 - RCP UP TO 900 DIA & 20° SKEW
   - 3.3. CS3104 - RCP UP TO 900 DIA & BETWEEN 20 & 45° SKEW
   - 3.4. CS3105 - RCP UP TO 1800 DIA & 20° SKEW
   - 3.5. CS3106 - RCP UP TO 1800 DIA & BETWEEN 20 & 45° SKEW
4. QUANTITY CALCULATIONS & TYPICAL VALUES BEEN PROVIDED TO ASSIST PROJECT DESIGN, TENDERING & CONSTRUCTION PURPOSES OF RCP CULVERTS. IT IS THE RESPONSIBILITY OF THE DESIGNER / CONSULTANT / CONTRACTOR TO VERIFY THE BELOW FORMULAS AND CALCULATIONS PRIOR TO ADOPTING FOR DESIGN. WHERE A DISCREPANCY IS IDENTIFIED, INFORM THE DEPARTMENT AS SOON AS PRACTICAL.
5. FOR SETOUT DIMENSIONS & QUANTITY CALCULATION REFERENCES AND VALUES, REFER TO BELOW STANDARD DRAWINGS:
   - 5.1. CS3101 - SPACING [S*] FOR MULTIPLE RCP CELLS
   - 5.2. CS3103 TO CS3106 - SETOUT FOR [H], [A], [B], [E], [T], [α] , [β] AND HEADWALL DEPTH
   - 5.3. CS3105 & CS3106 - SETOUT FOR FOOTING
   - 5.4. [AQ] REPRESENTS THE CONCRETE QUANTITIES FOR EACH ADDITIONAL CELL BEYOND THE FIRST
   - 5.5. CS3127 - VALUES FOR [α] & [β]

QUANTITY CALCULATIONS FOR RCP CULVERTS

CULVERT COMPONENT	FORMULA
HEADWALL	$Q_{HEADWALL}$ = (([W] x [H]) - ((π x (ED/2)^2) x NUMBER OF CELLS) x [T]
WINGWALL 1 LENGTH - A_{W1}	A_{W1} = [A] / COS (α)
WINGWALL LENGTH 2 - A_{W2}	A_{W1} = [A] / COS (β)
WINGWALL - Q DUE TO A_{W1}	Q_{AW1} = ([A_{W1}] x 200mm x [T]) + (([A_{W1}] x (H - 200mm) x 0.5 x [T])
WINGWALL - Q DUE TO A_{W2}	Q_{AW2} = ([A_{W2}] x 200mm x [T]) + (([A_{W2}] x (H - 200mm) x 0.5 x [T])
APRON	Q_{APRON} = 150mm x (([A] x [W]) + (0.5 x [B] x [A]) + (0.5 x [E] x [A])
CUT OFF WALL - INLET	Q_{CUT-IN} = (([W] + [B] + [E]) x 200mm x 150mm)
CUT OFF WALL - OUTLET	$Q_{CUT-OUT}$ = (([W] + [B] + [E]) x 450mm x 150mm)
FOOTING DUE TO A_{W1}	Q_{F1} = ([A_{W1}] x 300mm x 100mm) + ((0.75[H] - 300mm) x [A_{W1}] x 0.5) x 0.1)
FOOTING DUE TO A_{W2}	Q_{F2} = ([A_{W2}] x 300mm x 100mm) + ((0.75[H] - 300mm) x [A_{W2}] x 0.5) x 0.1)
TOTAL PER CULVERT	Q_T = 2 x ($Q_{HEADWALL}$ + Q_{AW1} + Q_{AW2} + Q_{APRON} + Q_{F1} + Q_{F2}) + Q_{CUT-IN} + $Q_{CUT-OUT}$

NOTES:
1. QUANTITY CALCULATIONS ARE PROVIDED AND INCLUDE THE FOLLOWING: HEADWALL, WINGWALLS, APRON, CUT OFF WALL & FOOTINGS



ISOMETRIC ILLUSTRATION
NOT TO SCALE

No.	AMENDMENT DESCRIPTION	DATE	INIT.	DEPT/COMPANY
0	ISSUED AS A STANDARD DRAWING	APR 2023	J. COOK	TCS / DIPL

Drawn: J. COOK, Date: MAR 2023	Checked: S. HATZI, Date: APR 2023		
Designed: J. COOK, Date: MAR 2023	Checked: S. HATZI, Date: APR 2023		
Design Project Leader: DIPL, Date: APR 2023	NTG Project Manager: DIPL, Date: APR 2023		

Northern Territory Government

STANDARD DRAWINGS
DRAINAGE

RCP - 450DIA TO 1800DIA & 1V:2H TO 1V:6H BATTER
SETOUT DIMENSIONS & QUANTITIES - 0° TO 35° SKEW

NTG Project No.	NTG Asset No.	Sheet Reference	NTG Drawing No.	Amendment	
-	-	01 OF 6	CS3127	0	A1

Version: January 2022

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