

PLEASE NOTE

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WARNING

This plan may require structural and other changes to meet local site conditions, climatic loads, user requirements and applicable building regulations (such as the Canadian Farm Building Code). Before construction, the user of this plan is responsible to ensure that all required changes are made.

GENERAL NOTES

1. CONCRETE CONSTRUCTION AND WORKMANSHIP SHALL CONFORM TO STANDARD SPECIFICATION CAN3-A23.1-M90
2. ALL STRUCTURAL CONCRETE SHALL HAVE A 28-DAY COMPRESSIVE STRENGTH OF 30 MPA. AND HAVE A MAXIMUM WATER-CEMENT RATIO OF 0.5. FILL CONCRETE SHALL HAVE A MINIMUM STRENGTH OF 10 MPA.
3. ALL STRUCTURAL CONCRETE SHALL BE AIR-ENTRAINED. AIR CONTENT SHALL BE $4.5 \pm 1\%$ FOR 20 mm MAXIMUM SIZE AGGREGATE, $6.0 \pm 1\%$ FOR 12 mm MAXIMUM SIZE AGGREGATE. AIR-ENTRAINING AGENT SHALL CONFORM TO THE LATEST ISSUE OF CAN3-A266.1.
4. WATER REDUCING AGENTS, IF USED, SHALL CONFORM TO THE LATEST VERSION OF CAN3-A266.2 OR CAN3-A266.4.
5. REINFORCING STEEL SHALL BE GRADE 400 CONFORMING TO THE LATEST VERSION OF STANDARD CSA G30.12.
6. CONCRETE COVER FOR REINFORCEMENT SHALL BE 50 mm EXCEPT WHERE CONCRETE IS PLACED DIRECTLY AGAINST SOIL IN WHICH CASE THE COVER SHALL BE 75 mm.
7. SPLICES IN ADJACENT REINFORCING BARS SHALL BE STAGGERED A MINIMUM OF 3 m (10 ft). THE SPLICE LENGTHS SHALL BE: 400 mm FOR 10M BARS; 500 mm FOR 15M BARS; 600 mm FOR 20M BARS.
8. WHERE INDICATED ON THE DRAWINGS, THE VERTICAL SIDES OF FOOTINGS SHALL BE PLACED AGAINST UNDISTURBED SOIL TO PREVENT LATERAL SLIDING.
9. CONSTRUCTION JOINTS SHALL GENERALLY BE KEYED. CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED AND COATED WITH A NEAT WATER-CEMENT PASTE BEFORE FRESH CONCRETE IS PLACED ON HARDENED CONCRETE.
10. JOINT FILLER SHALL BE STERNSON LTD RODOFOAM GR OR EQUAL.
11. JOINT SEALER SHALL BE A TWO-PART POURABLE SELF-LEVELLING SEALER CONFORMING TO THE LATEST VERSION OF CAN2-19.24M (STERNSON LTD MIRAFLEX 2 OR EQUAL)
12. GRANULAR FILL UNDER FLOOR SLAB SHALL BE FREE-FLOWING CLEAN GRANULAR MATERIAL, GRANULAR "B" OR BETTER, COMPACTED TO 90% PROCTOR DENSITY.
13. WALLS MAY BE BACKFILLED AFTER THE CONCRETE HAS ATTAINED ITS SPECIFIED STRENGTH. IT IS ESSENTIAL THAT BACKFILLING BE CARRIED OUT UNIFORMLY AROUND THE TANK. THE MAXIMUM DIFFERENCE IN BACKFILL LEVEL SHALL BE 0.3 m.
14. WALLS HAVE BEEN DESIGNED FOR A LIQUID MANURE DENSITY OF 10 kN/m³ ACTING ON THE INSIDE AND, SEPARATELY, ACTING ON THE OUTSIDE, FOR AN EQUIVALENT LIQUID PRESSURE OF 16 kN/m³ WHERE UNDRAINED BACKFILL IS SPECIFIED AND 7 kN/m³ WHERE FULLY DRAINED BACKFILL IS SPECIFIED. IN ADDITION, WALLS HAVE BEEN DESIGNED FOR A UNIFORMLY DISTRIBUTED LOAD OF 5 kPa ACTING ON THE OUTSIDE TO ALLOW FOR VEHICLE LOADS. ICE LOADING HAS NOT BEEN INCLUDED IN THE DESIGN OF THE WALLS.
15. IF THE GROUNDWATER TABLE IS ALLOWED TO RISE ABOVE THE TANK FLOOR IT IS POSSIBLE THAT THE FLOOR SLAB OR THE ENTIRE TANK WILL BE LIFTED OUT OF PLACE BY THE RESULTING WATER PRESSURE WHEN THE TANK IS EMPTY OR PARTIALLY EMPTY. ADEQUATE DRAINAGE TO MAINTAIN THE GROUNDWATER LEVEL BELOW THE FLOOR SLAB WILL PREVENT GROUNDWATER UPLIFT. ALTERNATIVELY, PRESSURE RELIEF PLUGS MUST BE PROVIDED IN THE FLOOR SLAB.
16. FOOTING DRAINS SHALL BE FREE DRAINING; DISCHARGE FROM THE DRAINS SHALL BE DISPOSED OF IN SUCH A WAY NOT TO POLLUTE THE ENVIRONMENT.
17. LIQUID MANURE STORAGES WITHOUT FIXED COVERS SHALL BE ENCLOSED WITH A PERMANENT SAFETY FENCE OR WALL EXTENDING NOT LESS THAN 1.5 m ABOVE ADJACENT GRADE OR FLOOR LEVEL, ADEQUATELY SECURED AT GROUND LEVEL AND HAVING GATES WITH LATCHES TO DETER ACCESS BY CHILDREN AND LIVESTOCK.
18. AT VEHICLE ACCESS RAMPS THE HORIZONTAL AND VERTICAL WALL REINFORCEMENT SHALL BE DOUBLED. THE EXTRA HORIZONTAL BARS SHALL BE 4 m LONG, CENTERED ON THE CENTRE LINE OF THE RAMP. VERTICAL BARS SHALL BE FULL HEIGHT.

ABBREVIATIONS

E. F.	EACH FACE
E. W.	EACH WAY
I. F.	INSIDE FACE
O. F.	OUTSIDE FACE
T	TOP
B	BOTTOM
T&B	TOP AND BOTTOM

ONTARIO MINISTRY OF
AGRICULTURE AND FOOD
RESOURCES MANAGEMENT BRANCH

OPEN CIRCULAR MANURE
STORAGE TANKS

DESIGNED: J. JOFRIET

DATE: 92.04

DRAWN: D. DUNCAN

REVISED:

TRACED:

DETAIL NUMBER-

A

CHECKED:

ORIGINATES ON SHEET-

B

DRAWN ON SHEET-

C

PLAN

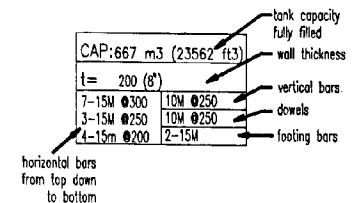
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SHEET 1 OF 5

TABLE 1— DETAILS FOR CIRCULAR TANKS

D \ H	2.45m (8')	3.05m (10')	3.65m (12')	4.25m (14')
12.2m (40')	CAP: 285 m ³ (10053 ft ³) t= 150 (6") 4-10M @300 10M @300 2-10M @250 10M @300 4-10M @200 2-10M	CAP: 356 m ³ (12566 ft ³) t= 200 (8") 5-10M @250 10M @250 3-10M @200 10M @250 8-10M @ 150 2-10M	CAP: 427 m ³ (15080 ft ³) t= 200 (8") 9-15M @300 10M @250 4-15M @250 10M @250 2-15M	CAP: 498 m ³ (17593 ft ³) t= 250 (10") 7-15M @300 15M @400 3-15M @250 15M @400 7-15M @225 2-15M
15.25m (50')	CAP: 445 m ³ (15708 ft ³) t= 150 (6") 2-10M @300 10M @300 2-10M @250 10M @300 7-10M @200 2-10M	CAP: 556 m ³ (19635 ft ³) t= 200 (8") 3-10M @250 10M @250 2-10M @200 10M @250 13-10M @150 2-10M	CAP: 667 m ³ (23562 ft ³) t= 200 (8") 7-15M @300 10M @250 3-15M @250 10M @250 4-15M @200 2-15M	CAP: 778 m ³ (27489 ft ³) t= 250 (10") 5-15M @300 15M @400 4-15M @225 15M @400 10-15M @200 2-15M
18.3m (60')	CAP: 641 m ³ (22619 ft ³) t= 150 (6") 4-10M @250 10M @300 2-10M @200 10M @300 6-10M @175 2-10M	CAP: 801 m ³ (28274 ft ³) t= 200 (8") 6-15M @300 10M @250 3-15M @250 10M @250 2-15M @225 2-15M	CAP: 961 m ³ (33929 ft ³) t= 200 (8") 3-15M @300 10M @250 3-15M @250 10M @250 12-15M @175 2-15M	CAP: 1121 m ³ (39584 ft ³) t= 250 (10") 6-15M @250 15M @400 5-15M @200 15M @400 12-15M @150 2-15M
21.35m (70')	CAP: 872 m ³ (30788 ft ³) t= 150 (6") 2-10M @250 10M @300 3-10M @200 10M @300 9-10M @150 3-10M	CAP: 1090 m ³ (38485 ft ³) t= 200 (8") 4-15M @300 10M @250 3-15M @250 10M @250 6-15M @200 2-15M	CAP: 1308 m ³ (46181 ft ³) t= 200 (8") 6-15M @250 10M @250 4-15M @200 10M @250 9-15M @150 2-15M	CAP: 1526 m ³ (53878 ft ³) t= 250 (10") 6-20M @300 15M @400 3-20M @250 15M @400 9-20M @200 2-20M
24.4m (80')	CAP: 1139 m ³ (40212 ft ³) t= 200 (8") 5-10M @200 10M @250 2-10M @175 10M @250 8-10M @150 3-10M	CAP: 1423 m ³ (50265 ft ³) t= 200 (8") 2-15M @300 10M @250 3-15M @250 10M @250 9-15M @200 2-15M	CAP: 1708 m ³ (60319 ft ³) t= 250 (10") 4-15M @250 15M @400 3-15M @200 15M @400 14-15M @150 3-15M	CAP: 1993 m ³ (70372 ft ³) t= 250 (10") 5-20M @300 15M @400 4-20M @225 15M @400 11-20M @175 2-20M
30.5m (100')	CAP: 1779 m ³ (62832 ft ³) t= 250 (10") 3-15M @300 15M @400 3-15M @250 15M @400 4-15M @225 2-15M	CAP: 2224 m ³ (78540 ft ³) t= 250 (10") 4-15M @250 15M @400 3-15M @200 15M @400 10-15M @150 3-15M	CAP: 2669 m ³ (94248 ft ³) t= 250 (10") 4-20M @300 15M @400 3-20M @250 15M @400 9-20M @200 3-20M	CAP: 3114 m ³ (109956 ft ³) t= 300 (12") 6-15M @300 EF 10M @300 E.F. 3-15M @250 EF 15M @300 9-15M @200 EF 3-20M
36.6m (120')	CAP: 2562 m ³ (90478 ft ³) t= 250 (10") 5-15M @225 15M @400 3-15M @200 15M @400 5-15M @150 3-15M	CAP: 3203 m ³ (113097 ft ³) t= 250 (10") 4-20M @300 15M @400 3-20M @250 15M @400 7-20M @175 3-20M	CAP: 3843 m ³ (135717 ft ³) t= 300 (12") 6-15M @ 300 E.F. 10M @300 E.F. 2-15M @ 250 E.F. 15M @300 7-15M @ 200 E.F. 3-20M	CAP: 4484 m ³ (158336 ft ³) t= 300 (12") 7-15M @250 EF 10M @300 E.F. 3-15M @200 EF 15M @300 11-15M @175 EF 4-20M
42.7m (140')	CAP: 3487 m ³ (123150 ft ³) t= 300 (12") 5-15M @ 300 E.F. 10M @300 E.F. 4-15M @ 250 E.F. 15M @300 3-20M	CAP: 4359 m ³ (153938 ft ³) t= 300 (12") 3-15M @ 300 E.F. 10M @300 E.F. 4-15M @ 250 E.F. 15M @300 6-15M @ 200 E.F. 3-20M	CAP: 5231 m ³ (184726 ft ³) t= 300 (12") 4-15M @300 EF 10M @300 E.F. 3-15M @250 EF 15M @300 9-15M @200 EF 4-20M	CAP: 6103 m ³ (214413 ft ³) t= 300 (12") 7-15M @250 EF 10M @300 E.F. 2-15M @200 EF 15M @300 14-15M @150 EF 5-20M

KEY TO THE TABLE



- Notes: 1. Dimensions in mm unless otherwise shown
 2. For typical cross sections of 150, 200 and 250 mm thick walls see sheet 3.
 3. For cross section of 300 mm thick wall see sheet 4.

ONTARIO MINISTRY OF
AGRICULTURE AND FOOD
RESOURCES MANAGEMENT BRANCH

OPEN CIRCULAR MANURE
STORAGE TANKS
REINFORCING DETAILS

DESIGNED: J. JOFRIET

DATE: 92.04

DRAWN: D. DUNCAN

REVISED:

TRACED:

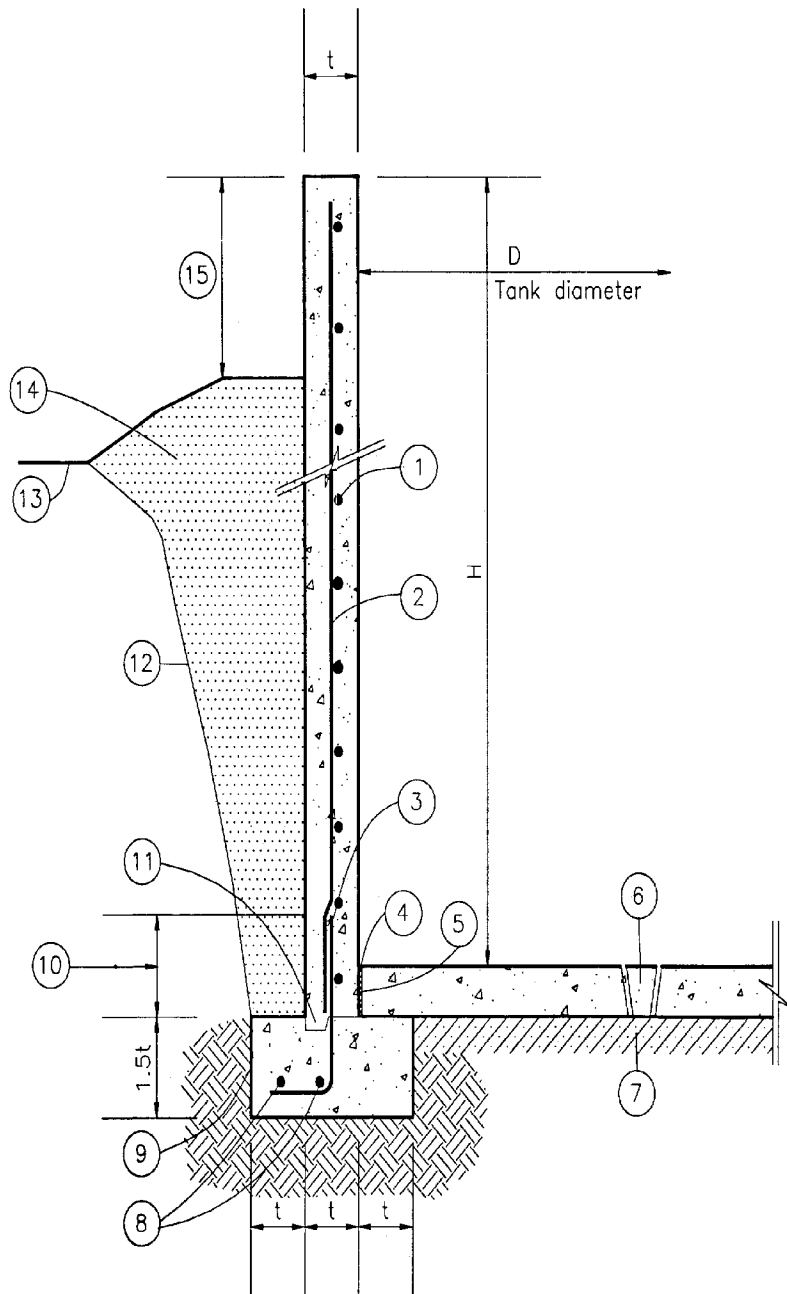
DETAIL NUMBER— A
 ORIGINATES ON SHEET— B
 DRAWN ON SHEET— C

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SHEET 2 OF 5



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- 1 Horizontal bars in centre of wall (see Table 1)
- 2 Vertical bars (see Table 1)
- 3 Dowels (see Table 1)
- 4 Two component joint sealer
- 5 Joint filler
- 6 Pressure relief plug
- 7 Compacted sand and/or gravel fill 100 mm min.
- 8 Footing bars (see Table 1)
- 9 Outside edge of footing to be placed against undisturbed soil
- 10 Overlap 350 mm for 10M dowels, 500 mm for 15M dowels
- 11 40 mm deep key
- 12 Line of excavation
- 13 Original soil level
- 14 Compacted backfill
- 15 600 mm maximum; this maximum may be exceeded if no vehicle access ramp is used and ice pressures are prevented (see note 14, sheet 1)
- 16 Typical wall and footing section

WALL THICKNESSES (t)

150 mm (6"), 200 mm (8"), 250 mm (10"),

WALL HEIGHTS (H)

2450 mm (8'-0"), 3050 mm (10'-0"),
3650 mm (12'-0"), 4250 mm (14'-0")

TANK DIAMETERS (D)

12,200 mm (40'-0"), 15,250 mm (50'-0"),
18,300 mm (60'-0"), 21,350 mm (70'-0"),
24,400 mm (80'-0"), 30,500 mm (100'-0"),
36,600 mm (120'-0")

ONTARIO MINISTRY OF
AGRICULTURE AND FOOD
RESOURCES MANAGEMENT BRANCH

OPEN CIRCULAR MANURE
STORAGE TANKS
TYPICAL WALL AND FOOTING
SECTION

DESIGNED: J. JOFRIET

DATE: 92.04

DRAWN: D. DUNCAN

REVISED:

TRACED:

DETAIL NUMBER—

A

CHECKED:

ORIGINATES ON SHEET—

B

DRAWN ON SHEET—

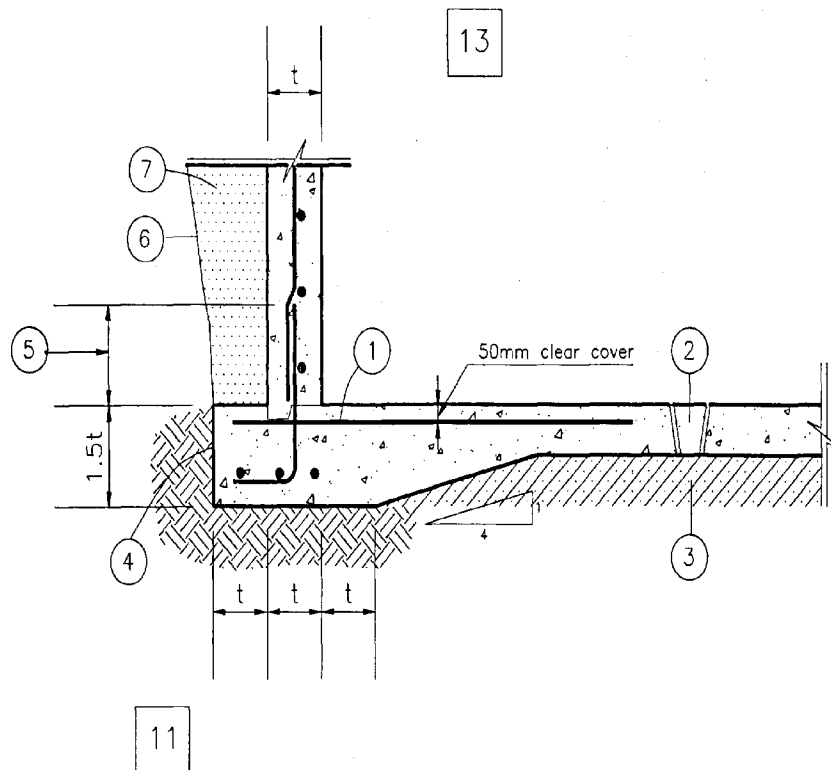
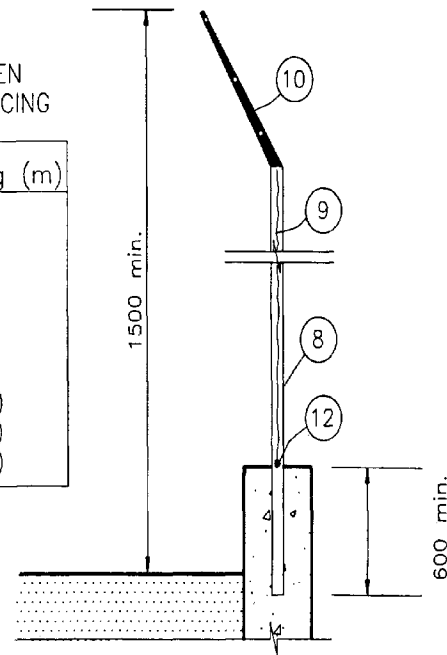
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SHEET 3 OF 5

Tank diameter (m)	Post spacing (m)
9.15 (30 ft)	1.2 (4 ft)
12.2 (40 ft)	1.2 (4 ft)
15.3 (50 ft)	1.8 (6 ft)
18.3 (60 ft)	1.8 (6 ft)
21.4 (70 ft)	2.5 (8 ft)
24.4 (80 ft)	2.5 (8 ft)
30.5 (100 ft)	3.0 (10 ft)
36.6 (120 ft)	3.0 (10 ft)
42.7 (140 ft)	3.0 (10 ft)



- Note: Dimensions and Details not shown are identical to those on sheet 3 or 4

150 mm (6"), 200 mm (8"), 250 mm (10")
300 mm (12")

OPEN CIRCULAR MANURE
STORAGE TANKS

ALTERNATE FOOTING SECTION

SAFETY FENCE DETAILS

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DETAIL NUMBER- A
ORIGINATES ON SHEET- B
DRAWN ON SHEET- C

SHEET 5 OF 5