

PLEASE NOTE

This document was designed to meet the building code standards in effect at the time of printing. The Ontario Ministry of Agriculture and Food does not assume any liability for any loss caused by the use of any information contained in this document and does not in any way warrant or guarantee that it meets the user's needs, local climatic loads or applicable building requirements. The user is responsible for ensuring that all necessary requirements are met.

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 MRAFLEX 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. TANK COVERS HAVE BEEN DESIGNED FOR A TOTAL LIVE LOAD OF:
3 kPa WHERE NORMAL SNOW IS SPECIFIED;
5 kPa WHERE HEAVY SNOW IS SPECIFIED;
10 kPa WHERE VEHICLES ARE PERMITTED ON THE COVER.
18. COVERS PROVIDING ACCESS TO LIQUID MANURE STORAGE TANKS SHALL EITHER BE DESIGNED THEM FROM BEING DROPPED THROUGH THEIR OPENINGS OR SHALL BE PERMANENTLY SECURED WITH SAFETY CHAINS.
19. LADDERS SHALL NOT BE INSTALLED IN COVERED LIQUID MANURE TANKS.

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

COVERED CIRCULAR
MANURE STORAGE TANKS

DESIGNED: J. JOFRIET

DATE: 92.04

DRAWN: D. DUNCAN

REVISED:

TRACED:

DETAIL NUMBER-

ORIGINATES ON SHEET-

DRAWN ON SHEET-

PLAN

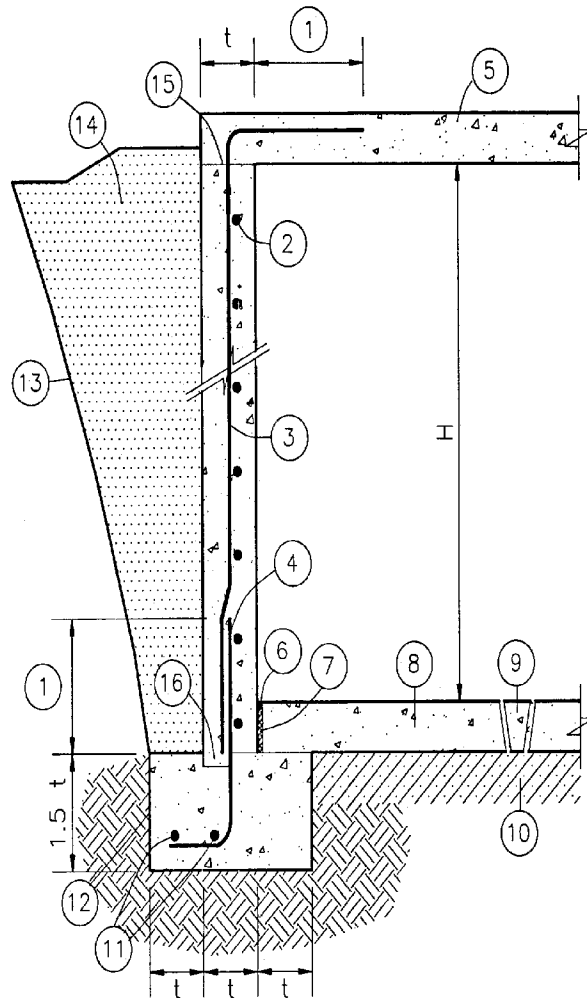
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SHEET 1 of 9

TABLE 1- DETAILS FOR RECTANGULAR MANURE STORAGE TANKS, WALL SUPPORTED BY COVER BACKFILL NOT DRAINED

WALL HEIGHT (H)	2.45m (8ft) WALL	3.05m (10ft) WALL
WALL THICKNESS (t)	200	250
①	400	500
②	10M @ 250	15M @ 400
③	15M @ 225	20M @ 225
④	15M @ 225	20M @ 225

Note: Dimensions are in mm unless otherwise specified



- 1 Lap dimension of reinforcing steel
- 2 Horizontal bars
- 3 Vertical bars
- 4 Dowels
- 5 Roof slab
- 6 Two component joint sealer
- 7 Joint filler
- 8 Floor slab
- 9 Pressure relief plug
- 10 Compacted sand and/or gravel 100 mm min.
- 11 Footing bars 2-10M
- 12 Outside edge of footing to be placed against undisturbed soil
- 13 Line of excavation
- 14 Backfill not drained
- 15 Joint left rough
- 16 40 mm deep key
- 17 Typical wall and footing section backfill not drained

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COVERED CIRCULAR
MANURE STORAGE TANKS
TYPICAL WALL AND FOOTING
SECTION BACKFILL NOT
DRAINED

DESIGNED: J. JOFRIET

DATE: 92.04

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DETAIL NUMBER-

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CHECKED:

ORIGINATES ON SHEET-

B

DRAWN ON SHEET-

C

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SHEET 2 OF 9

WALL HEIGHT (H)	2.45m (8ft) WALL	3.05m (10ft) WALL	3.65m (12ft) WALL
WALL THICKNESS (t)	200	200	250
①	300	400	500
②	10M @ 250	10M @ 250	15M @ 400
③	10M @ 200	15M @ 200	20M @ 250
④	10M @ 200	15M @ 200	20M @ 250

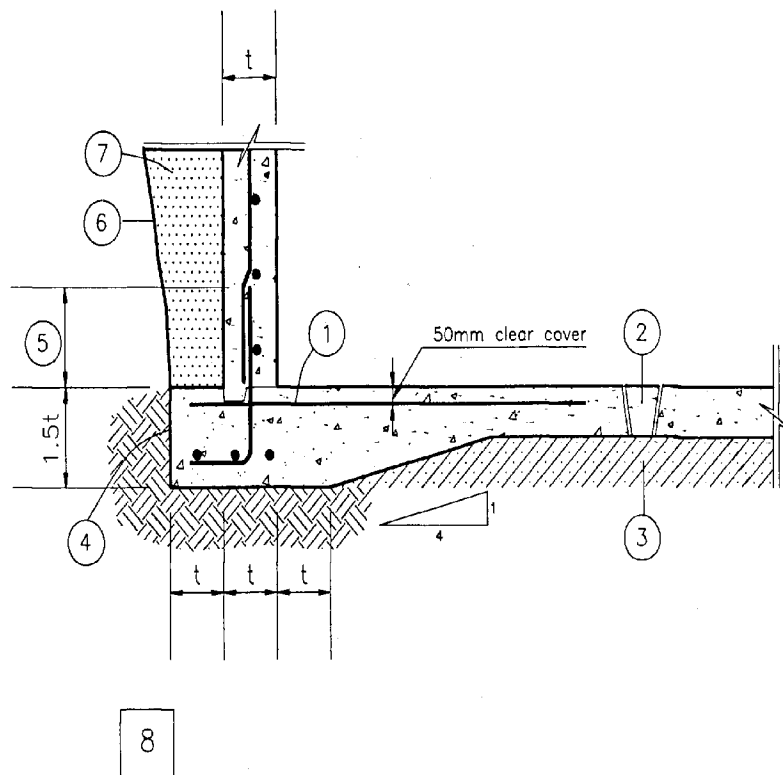
This technical drawing illustrates a corner joint between a vertical wall and a horizontal floor slab. The wall is shown on the left, and the floor slab is on the right. The wall has a thickness t and a height H . The floor slab has a thickness t and a width $1.5t$. The drawing includes various reinforcement details and dimensions:

- 1**: Horizontal distance from the wall face to the center of the reinforcement bar.
- 2**: Vertical distance from the floor slab top to the center of the reinforcement bar.
- 3**: Vertical distance from the floor slab top to the center of the reinforcement bar.
- 4**: Vertical distance from the floor slab top to the center of the reinforcement bar.
- 5**: Horizontal distance from the wall face to the center of the reinforcement bar.
- 6**: Horizontal distance from the wall face to the center of the reinforcement bar.
- 7**: Horizontal distance from the wall face to the center of the reinforcement bar.
- 8**: Horizontal distance from the wall face to the center of the reinforcement bar.
- 9**: Horizontal distance from the wall face to the center of the reinforcement bar.
- 10**: Horizontal distance from the wall face to the center of the reinforcement bar.
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- 17**: Horizontal distance from the wall face to the center of the reinforcement bar.
- 18**: Horizontal distance from the wall face to the center of the reinforcement bar.
- 19**: Horizontal distance from the wall face to the center of the reinforcement bar.

- 1 Lap dimension of reinforcing steel
- 2 Horizontal bars
- 3 Vertical bars
- 4 Dowels
- 5 Roof slab
- 6 Two component joint sealer
- 7 Joint filler
- 8 Floor slab
- 9 Pressure relief plug
- 10 Compacted sand and/or gravel
100 mm min.
- 11 Footing bars 2-10M
- 12 Outside edge of footing to be placed
against undisturbed soil
- 13 300 mm min. cover
- 14 150 mm dia. perforated drain. See
general note 16., Sheet 1
- 15 19 mm clear washed stone
- 16 Line of excavation
- 17 Fully drained backfill
- 18 Joint left rough
- 19 40 mm deep key
- 20 Typical wall and footing section backfill
fully drained

COVERED CIRCULAR
MANURE STORAGE TANKS
TYPICAL WALL AND FOOTING
SECTION BACKFILL FULLY
DRAINED

SHEET 4 OF 9



- 1 Welded wire fabric 152 x 152
MW 18.7 x MW 18.7, around the
perimeter of storage
- 2 Pressure relief plug
- 3 Compacted sand and/or gravel 100 mm
min.
- 4 Outside edge of footing to be placed
against undisturbed soil
- 5 Lap 300 mm for 10M dowels,
400 mm for 15M dowels and 500 mm
for 20M dowels
- 6 Line of excavation
- 7 Backfill
- 8 Section of alternate footing

WALL THICKNESS (t)

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

Note: Refer to sheets 2,3,4 for details not
shown on this sheet.

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COVERED CIRCULAR
MANURE STORAGE TANKS
ALTERNATE FOOTING SECTION

DESIGNED: J. JOFRIET

DATE: 92.04

DRAWN: D. DUNCAN

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DETAIL NUMBER- A
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DRAWN ON SHEET- C

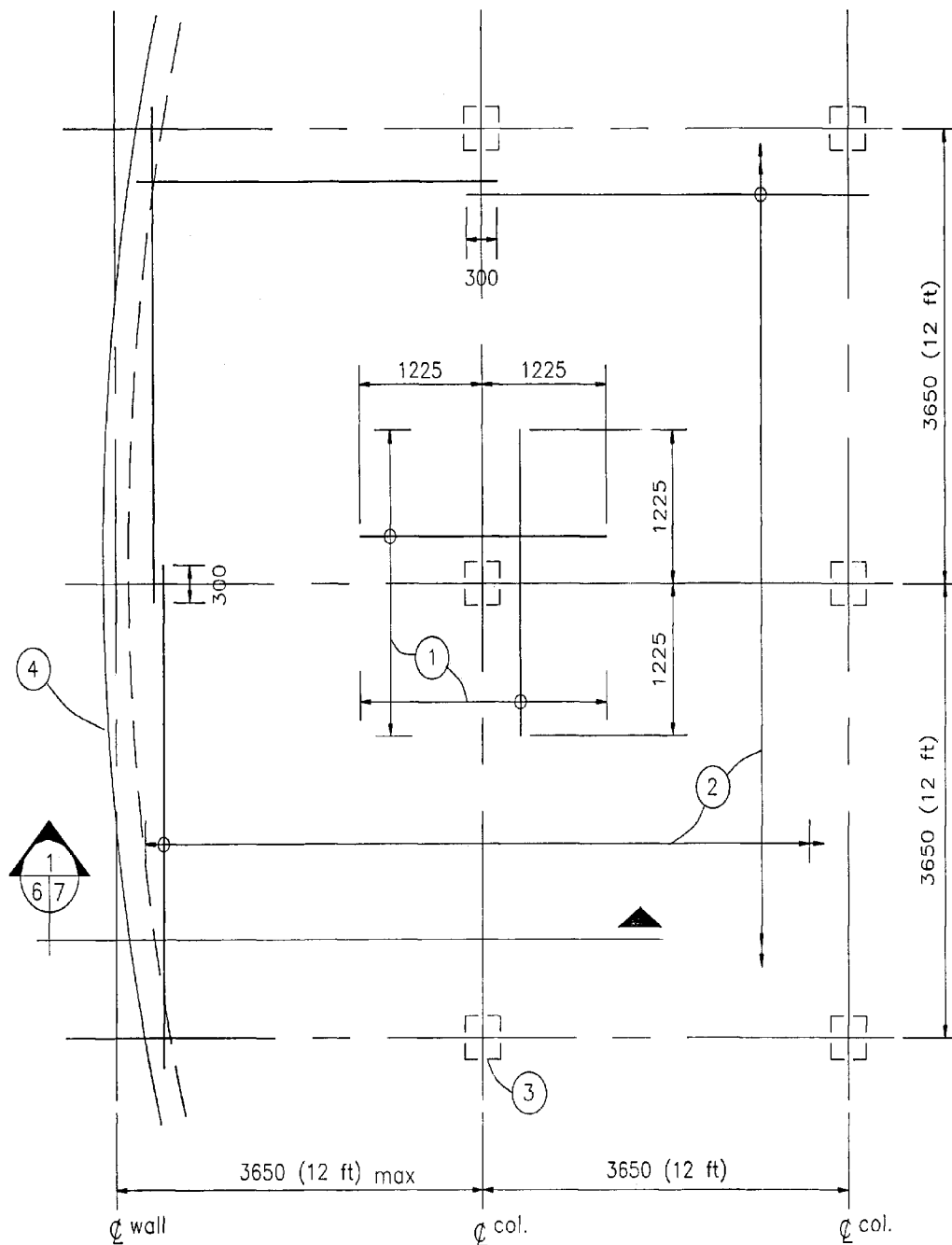
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SHEET 5 OF 9



- 1 Typical top bars over each column
- 2 Bottom bars throughout
- 3 Column below
- 4 Manure storage wall
- 5 Plan view of cover

	SLAB THICKNESS mm	BOTTOM BARS	TOP BARS
NORMAL SNOW LOAD 3 kPa (INCL. RAIN)	150	10M @ 250 E.W.	12-10M @ 200 E.W.
HEAVY SNOW LOAD 5 kPa (INCL. RAIN)	175	10M @ 250 E.W.	16-10M @ 150 E.W.
VEHICLE TRAFFIC 10 kPa LIVE LOAD	225	10M @ 200 E.W.	16-10M @ 150 E.W.

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COVERED CIRCULAR
MANURE STORAGE TANKS
PLAN VIEW OF COVER

DESIGNED: J. JOFRIET

DATE: 92.04

DRAWN: D. DUNCAN

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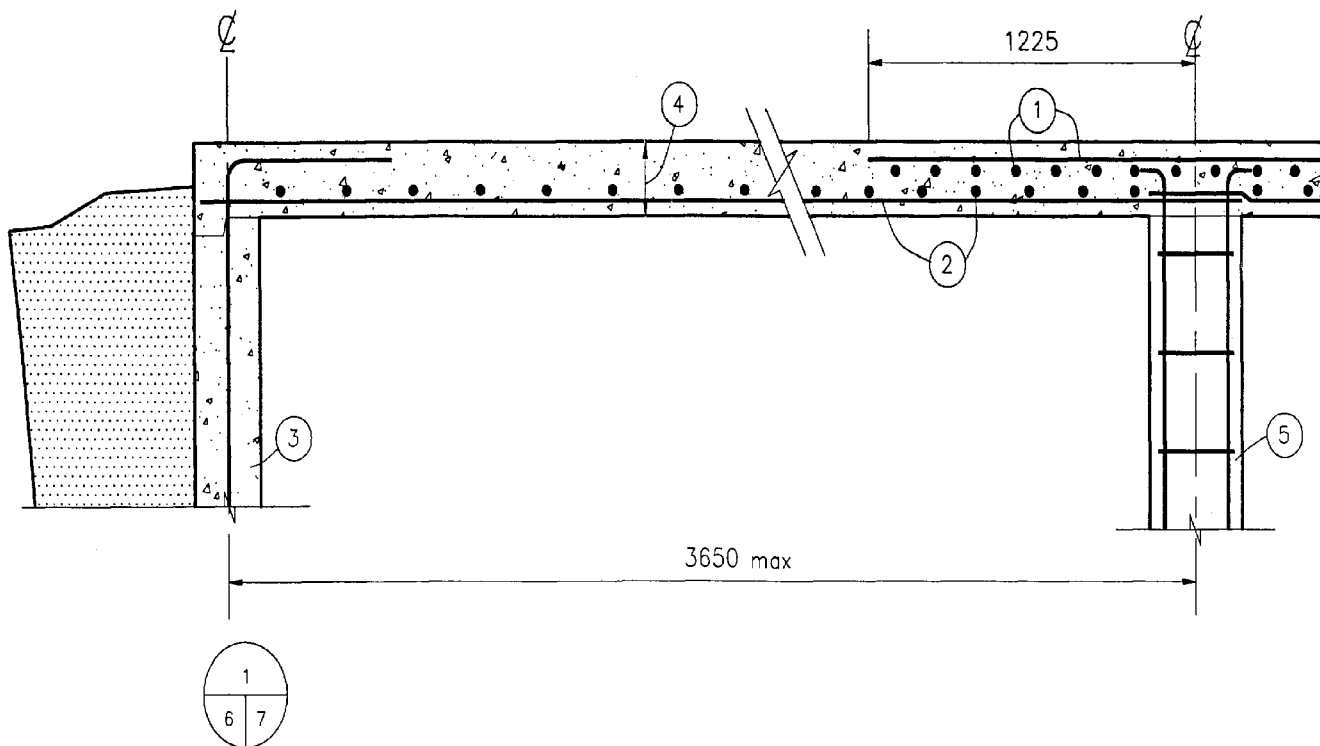
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SHEET 6 OF 9



- 1 Top bars
- 2 Bottom bars
- 3 Tank wall
- 4 Slab thickness
- 5 Columns @ 3650 mm o.c.

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RESOURCES MANAGEMENT BRANCH

COVERED CIRCULAR
MANURE STORAGE TANKS
SECTION OF COVER

DESIGNED: J. JOFRIET

DATE: 92.04

DRAWN: D. DUNCAN

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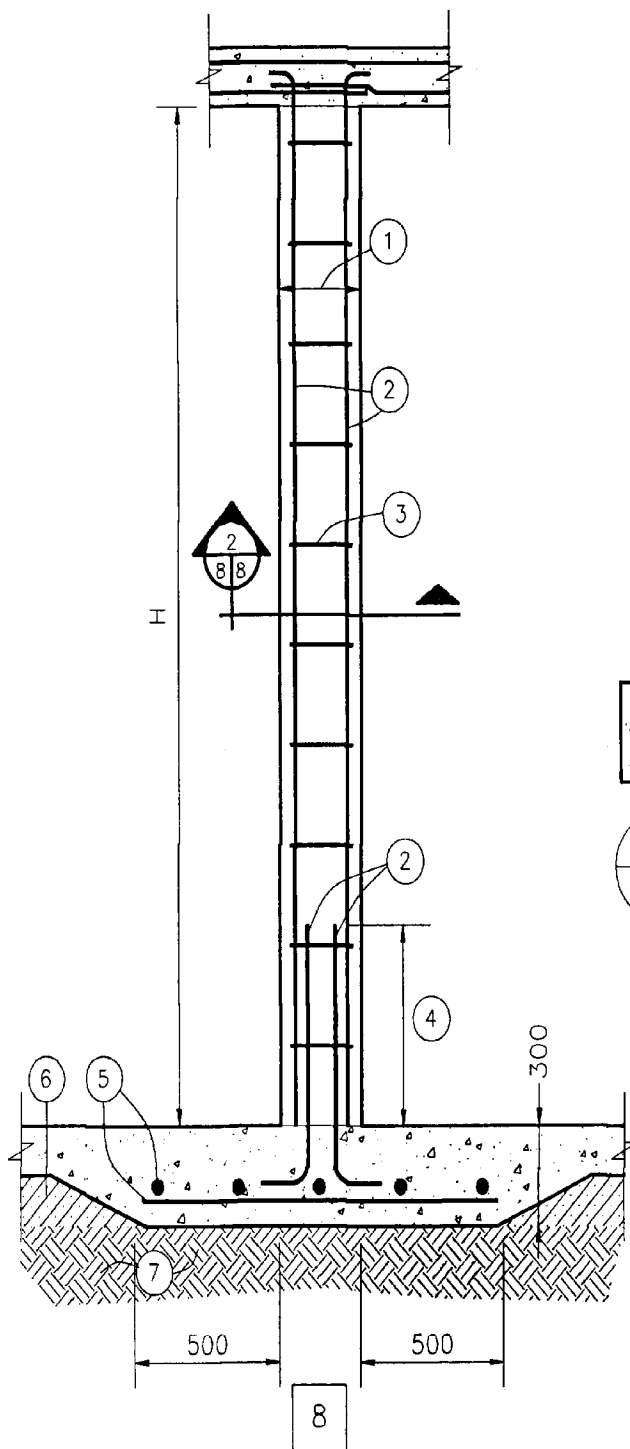
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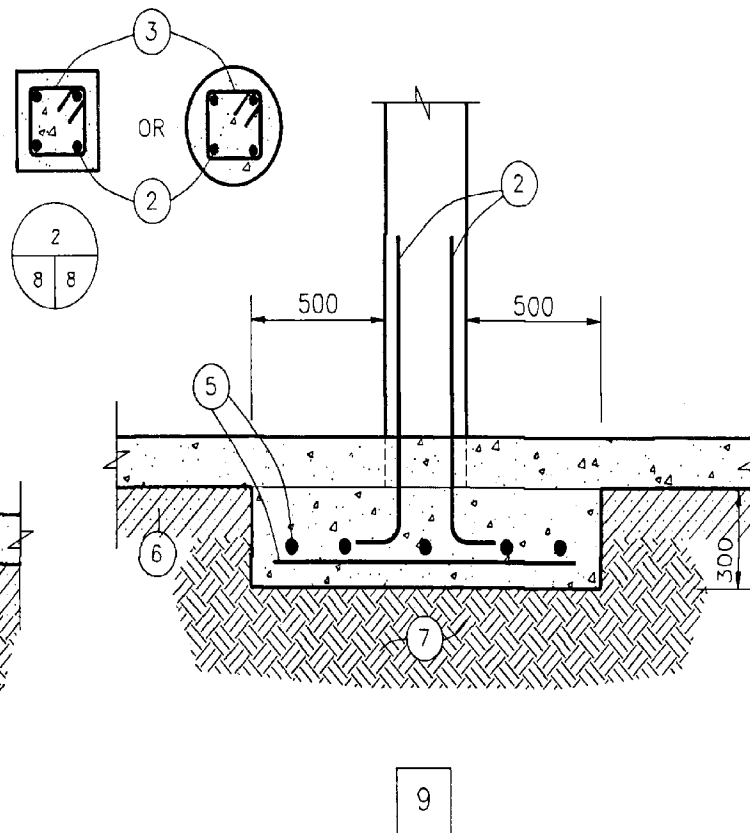
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SHEET 7 OF 9



H	2.45 m (8ft)	3.05 m (10ft)	3.65 m (12ft)
①	300 x 300 or 355 Dia.	350 x 350 or 405 Dia.	400 x 400 or 455 Dia.
②	4-20M	4-20M	4-25M
③	10M @ 300	10M @ 300	10M @ 400
④	600 mm	600 mm	750 mm
⑤	5-15M E.W.	5-15M E.W.	5-15M E.W.



- 1 Column size
- 2 Vertical bars and matching dowels
- 3 Ties
- 4 Dowel projection
- 5 Footing reinforcing
- 6 Compacted sand and/or gravel
- 7 Undisturbed earth
- 8 Side view and section of typical column
- 9 Alternative footing for columns

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RESOURCES MANAGEMENT BRANCH

COVERED CIRCULAR
MANURE STORAGE TANKS
COLUMN AND COLUMN
FOOTING

DESIGNED: J. JOFRIET

DATE: 92.04

DRAWN: D. DUNCAN

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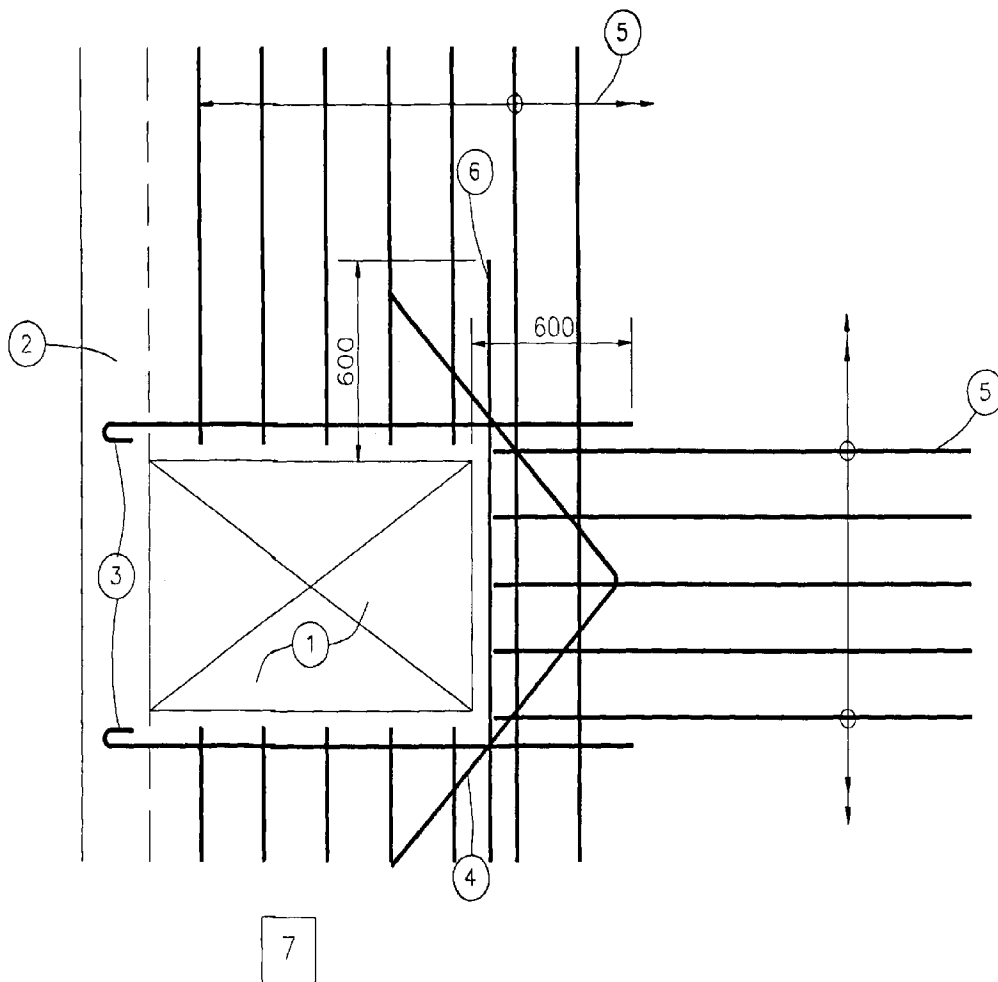
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ORIGINATES ON SHEET- B
DRAWN ON SHEET- C

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SHEET 8 OF 9



- 1 Access opening
- 2 Tank wall
- 3 Extra bottom bars 2-20M
- 4 1-20M reinforcing bar 2400 mm long in middle of slab
- 5 Bottom bars 10M
- 6 Extra bottom bar 1-20M
- 7 Reinforcement detail for typical access open in cover

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RESOURCES MANAGEMENT BRANCH

COVERED CIRCULAR
MANURE STORAGE TANKS
ACCESS OPENING IN COVER

DESIGNED: J. JOFRIET

DATE: 92.04

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

PLAN

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SHEET 9 OF 9