

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 STORAGE 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.

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.

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 RECTANGULAR MANURE
STORAGE TANKS WITH
BUTTRESSED WALLS

DESIGNED: J. JOFRIET

DATE: 92.04

DRAWN: D. DUNCAN

REVISED:

TRACED:

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DETAIL NUMBER-

CHECKED:

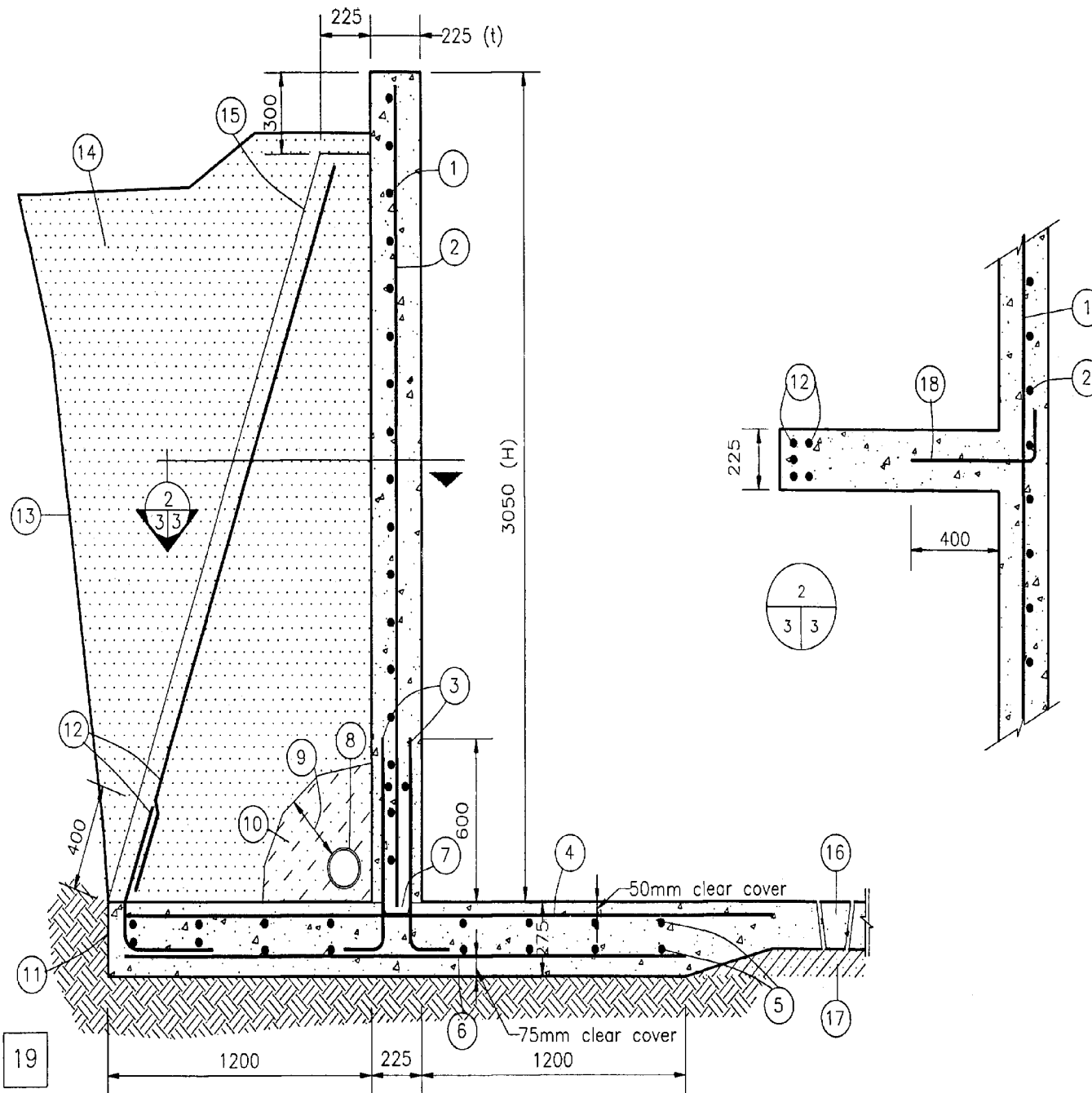
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ORIGINATES ON SHEET-
DRAWN ON SHEET- C

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SHEET 1 of 5



- 1 Horizontal bars 10M @ 175
- 2 Vertical bars 10M @ 200 in centre of wall
- 3 Dowels 10M @ 225
- 4 Top steel 15M @ 300
- 5 Footing bars 10M @ 300
- 6 Bottom steel 15M @ 200
- 7 40 mm deep key
- 8 150 mm dia. perforated drain. See general note 16., Sheet 1
- 9 300 mm min. cover
- 10 19 mm clear washed crushed stone
- 11 Outside edge of footing to be placed against undisturbed soil
- 12 Buttress bars and dowels 5-15M in 2 layers
- 13 Line of excavation
- 14 Fully drained backfill
- 15 225 mm buttress @ 4600 mm o.c.
- 16 Pressure relief plug
- 17 Compacted sand and/or gravel fill 100 mm min.
- 18 Buttress reinforcing bars, perpendicular to wall 15M @ 350
- 19 Section of 3.05m (10ft) wall, backfill fully drained

Note: For other wall heights see Table 1 on sheet 4

ONTARIO MINISTRY OF
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OPEN RECTANGULAR MANURE
STORAGE TANKS WITH
BUTTRESSED WALLS
SECTION OF 3.05m (10ft) WALL
BACKFILL FULLY DRAINED

DESIGNED: J. JOFRIET

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A

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ORIGINATES ON SHEET-

B

DRAWN ON SHEET-

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SHEET 3 OF 5

TABLE 1- DIMENSIONS AND REINFORCEMENT DETAILS OF BUTTRESSED MANURE STORAGE TANK WALLS

	BACKFILL FULLY DRAINED			BACKFILL NOT DRAINED		
WALL HEIGHT (H) IN m (ft)	2.45 (8'-0")	3.05 (10'-0")	3.65 (12'-0")	2.45 (8'-0")	3.05 (10'-0")	3.65 (12'-0")
WALL THICKNESS (t) IN mm (inches)	200 (8")	225 (9")	250 (10")	200 (8")	225 (9")	250 (10")
BUTTRESS THICKNESS IN mm (inches)	200 (8")	225 (9")	250 (10")	200 (8")	225 (9")	250 (10")
BUTTRESS SPACING IN m (ft)	3.65 (12'-0")	4.60 (15'-0")	5.50 (18'-0")	3.65 (12'-0")	4.60 (15'-0")	5.50 (18'-0")
FOOTING THICKNESS IN mm (inches)	250 (10")	275 (11")	300 (12")	250 (10")	275 (11")	300 (12")
FOOTING PROJECTIONS IN mm (inches)	1000 (40")	1200 (48")	1500 (60")	1200 (48")	1500 (60")	1800 (72")
DOWEL PROJECTIONS IN mm (inches)	450 (18")	600 (24")	750 (30")	450 (18")	600 (24")	750 (30")
WALL REINF. VERTICAL BARS (in centre of wall)	10M @ 250	10M @ 200	15M @ 300	10M @ 250	10M @ 200	15M @ 300
WALL REINF. HORIZONTAL BARS	10M @ 250	10M @ 175	15M @ 225	10M @ 150	15M @ 175	20M @ 175
DOWELS I.F.	10M @ 300	10M @ 225	15M @ 250	10M @ 300	10M @ 225	15M @ 250
DOWELS O.F.	10M @ 300	10M @ 225	15M @ 250	15M @ 300	15M @ 225	20M @ 250
FOOTING REINF.- TOP, PERPENDICULAR TO WALL	10M @ 250	15M @ 300	15M @ 200	10M @ 200	15M @ 200	20M @ 200
FOOTING REINF.- BOTTOM, PERPENDICULAR TO WALL	15M @ 350	15M @ 200	20M @ 225	15M @ 225	20M @ 200	25M @ 225
FOOTING REINF.- T&B, PARALLEL TO WALL	10M @ 300	10M @ 300	10M @ 250	10M @ 300	10M @ 300	10M @ 250
BUTTRESS REINF. IN TWO LAYERS	4-15M	5-15M	5-20M	5-15M	5-20M	6-20M
BUTTRESS DOWELS	4-15M	5-15M	5-20M	5-15M	5-20M	6-20M
BUTTRESS REINF.- PERPENDICULAR TO WALL	15M @ 350	15M @ 350	15M @ 350	15M @ 350	15M @ 350	15M @ 350

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OPEN RECTANGULAR MANURE
STORAGE TANKS WITH
BUTTRESSED WALLS
REINFORCING DETAILS

DESIGNED: J. JOFRIET

DATE: 92.04

PLAN

DRAWN: D. DUNCAN

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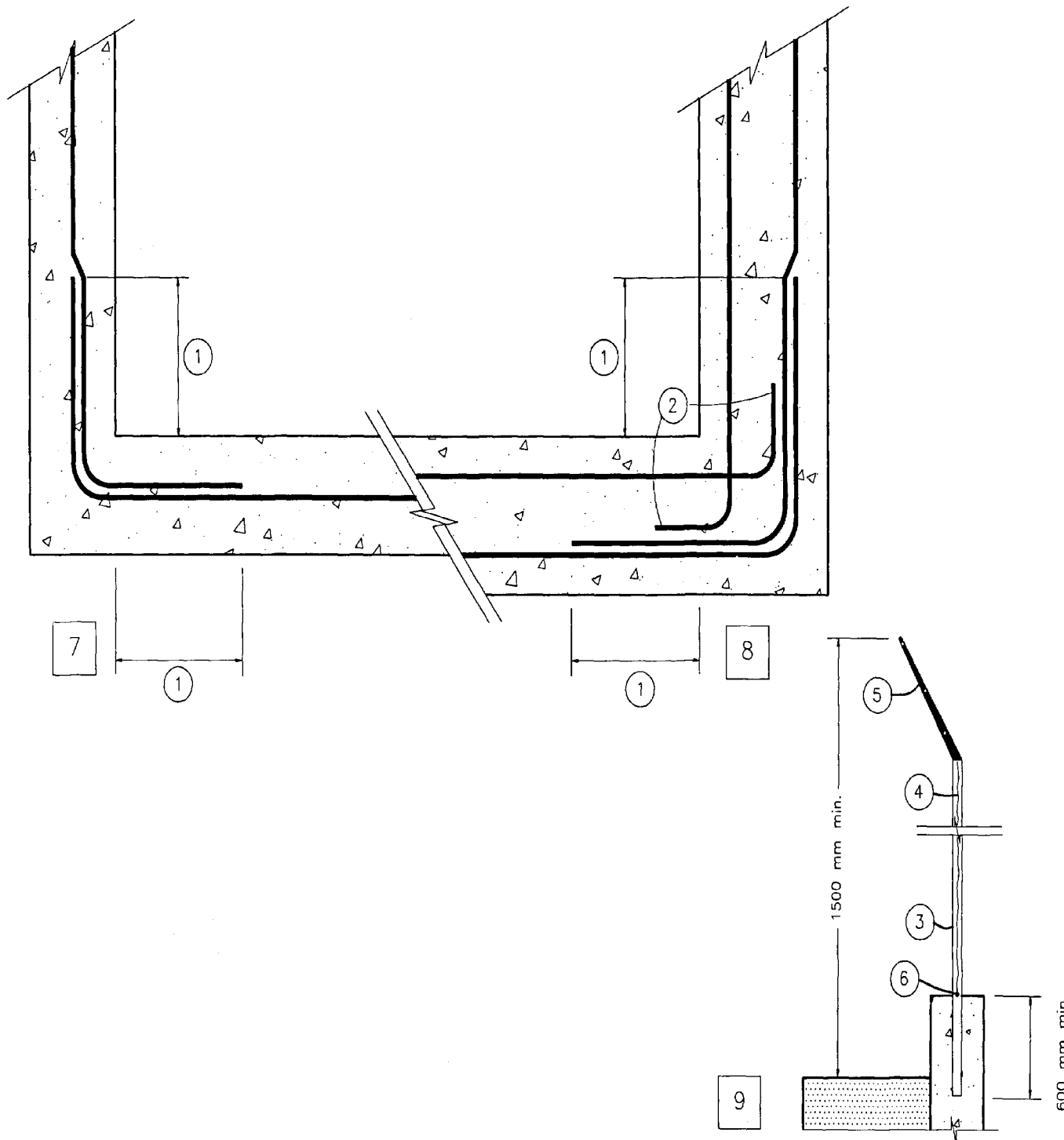
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DETAIL NUMBER- A
ORIGINATES ON SHEET- B
DRAWN ON SHEET- C

CHECKED:

SHEET 4 OF 5



- 1 Horizontal reinforcing bars lap:
300 mm for 10M
400 mm for 15M
500 mm for 20M
- 2 Standard hook
- 3 89 mm heavy-wall galvanized pipe
embedded min. 600 mm (2 ft) into
concrete. All posts must be capped
- 4 min. 9 gauge chain link fence with
38 mm (1 1/2") openings
- 5 Outwardly sloped bracket strung with
3 strands of barbed wire
- 6 Bottom bar or heavy cable tied to
base of chainlink fencing to prevent
lateral movement
- 7 Corner detail single layer of steel
- 8 Corner detail double layer of steel
- 9 Safety fence detail

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OPEN RECTANGULAR MANURE
STORAGE TANKS WITH
BUTTRESSED WALLS
CORNER DETAILS
SAFETY FENCE

DESIGNED: J. JOFRIET

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A

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ORIGINATES ON SHEET--

B

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SHEET 5 OF 5