INGAL CIVIL PRODUCTS

A valmont COMPANY

Melt Terminal

with Steel Yielding Terminal Posts

Product Manual

Release 02/13

www.ingalcivil.com.au

MELT Terminal with Steel Yielding Terminal Posts

1.0 Introduction

The Modified Eccentric Loader Terminal (MELT) is designed to provide a soft gating impact to prevent the end rail from spearing an impacting vehicle. The MELT terminal is installed on a parabolic offset with rails supported on shelf angles to minimise the potential for vehicle penetration.

The MELT also introduces tensile and flexural strength necessary to ensure redirection performance of the length-of-need section.

The MELT terminal is now available with the Ingal Block and Steel Yielding Terminal Posts in order to facilitate rapid installation and reduce product inventory.

2.0 Specifications

Finish:	Galvanized in accordance with AS/NZS 4680:2006
Posts 1 & 2:	Nokout Breakaway Posts (NSW & SA)
	Posts on Slip Base Plates (Qld)
Posts 3 - 6:	Steel Yielding Terminal Posts (All States)
Post Spacing:	Posts 1 to 3 2.0m centres
	Posts 3 to 6 1.33m centres
System Length:	8m
Point of Need:	3rd Post

3.0 Technical Data

3.1 Functional Principles

The MELT Terminal is designed to prevent the end rail spearing an errant vehicle. Upon an end-on impact the rails will fold away from the impacting vehicle. Breakaway posts are designed to shear when the terminal is impacted end-on, however, these posts will redirect an errant vehicle when impacted side-on. The use of soil plates and a cable assembly assist in developing tensile strength for downstream impacts.

The end of the MELT is curved away from the traffic face and a buffered end section is installed to prevent spearing. Diaphragm plates in the buffered end section help maintain the bulb shape during impact. To further impede spearing, the rail is not bolted to posts 2 through 6. This allows the rail to bend and fold during impact.

3.2 Ingal Block

Motivation for the development of the Ingal Block was driven by field observation that steel blocking pieces often fail through lateral bending during the course of an impact. This behaviour is similar to the failure of the I-beam blocking piece that was once used in the US but discontinued after it was shown to fail NCHRP 350 Test Level 3 testing.

The main function of a guardrail blocking piece is to prevent the wheels of a colliding vehicle from snagging on a guardrail post. Traditional steel blocking pieces are vulnerable to folding and crushing on impact and therefore may fail to perform their intended function. The Ingal Block provides a significant improvement to the safety of guardrail by maintaining its geometry during impact.

3.2.1 Ingal Block Installation Benefits

The patent-pending features of the Ingal Block are designed not only for safety, but also for the convenience of the installer;

- Self-hanging fingers eliminates the requirement for 2 block bolts.
- A single M16x200mm post bolt replaces the traditional 3-bolt assembly, reducing installation time.
- The Ingal Block can accommodate a guardrail support bracket that eliminates the need for workers to bear the load of a guardrail panel.
- A 'click in' delineator receptor eliminates the need for cumbersome twin bolt attachment.
- The Ingal Block is 1/3rd the weight of traditional steel blocking pieces.

Steel Blocking Piece

Ingal Block

3.3 Steel Yielding Terminal Post (SYTP)

The Steel Yielding Terminal Post (SYTP) is a single piece I-Beam post that has been specially engineered to suit guardrail end terminals. The SYTP is manufactured with shop-fabricated holes enabling the post to yield when impacted end on and redirecting errant vehicles during side impacts.

3.3.1 SYTP Benefits

- NCHRP 350 Test Level 3 Compliant
- Interchangeable with the ET2000 PLUS Guardrail End Treatment, thus reducing product inventory.
- Yielding action minimises debris often encountered with timber or two-piece post options
- Posts can be driven directly into the ground
- Single piece construction reduces installation time

4.0 Installation

4.1 Site Preparation

The site should be prepared free of obstructing vegetation and other hazards that may interfer with the installation or operational performance of the system. Some site may require minor grading if installed beyond the edge of the pavement shoulder.

AS/NZS 3845:1999 requires that a Hazard Free Zone "immediately behind the terminal... should be reasonably traversable and free from fixed object hazards. If a clear runout is not possible, this area should be similar in character to adjacent unshielded roadside areas."

Since the MELT Terminal is a gating terminal, the 3rd post is when the barrier becomes fully redirective and is defined as the point of need.

4.2 Installation Sequence

The following written instructions should be read in conjunction with Ingal Civil Product Drawings:

CAB-STD-68	NSW Melt General Arrangement
CAB-STD-69	NSW Melt Isometric
CAB-STD-74	Qld Melt General Arrangement
CAB-STD-75	Qld Melt Isometric
CAB-STD-80	SA Melt General Arrangement
CAB-STD-81	SA Melt Isometric

4.2.1 Installation of the NSW & SA MELT

The total length of the MELT is 12m, however for schedules of quantity and payment, the MELT system extends from post 1 to post 6, a length of 8m.

1. The first two posts comprise of steel tubes with soil plates attached. Excavate or pre-bore a hole in the ground at least 400mm in diameter with the hole excavation extending no more than 100mm below the bottom of the tube. The tubes are spaced 2m centres.
2. Locate the post centrally within the hole and backfill around the post with clean, well-graded, granular material.
3. A 430mm bottom post is then inserted into the steel tubes.

4. A strut and yoke is installed between both steel tubes.
5. A single M16x240mm bolt will pass through the steel tube, bottom post, NOKOUT and the strut and yoke.
6. The 633mm top posts are then attached, with M16x180mm bolts passing through the post and NOKOUTs.
7. For the NSW Melt, an Ingal blocking piece and shelf angle is attached to post 2 using a M16x200mm bolt.
8. For the SA Melt, a steel blocking piece is attached to the post using a M16x30mm bolt and a shelf angle is attached to the blocking piece using a M16x50mm bolt.
9. Post 3 is located 2m from post 2 and posts 3-6 are installed at 1.33m centres. Posts 3 to post 6 are 1.8m SYT posts, which can be driven directly into the ground.
10. For NSW Melt, an Ingal blocking piece & shelf angle is attached to each SYT post using a M16x200mm bolt.
11. For SA Melt, a steel blocking piece is attached to each SYT post using two M16x30mm bolts and a shelf angle is attached to each blocking piece using a M16x50mm bolt.
12. The 1st MELT rail is a part-curved rail with the curved end bolted to post 1 using an M16x50mm bolt. The 2nd MELT rail is a curved panel, which is spliced to the 1st rail using M16x32mm bolts. With the exception of post 1, the rails are not bolted to the posts and are supported on shelf angles.
13. A buffered end section with diaphragm plates is attached to the end of the 1st rail using M16x32 bolts.
14. A cable assembly is attached to the 1st rail and is anchored to the base of the 1st post with a bearing plate. The cable assembly shall be tightened to 50Nm.


NSW MELT – 1st and 2nd Post Arrangement


NSW MELT – Yoke Connection at 1st Post

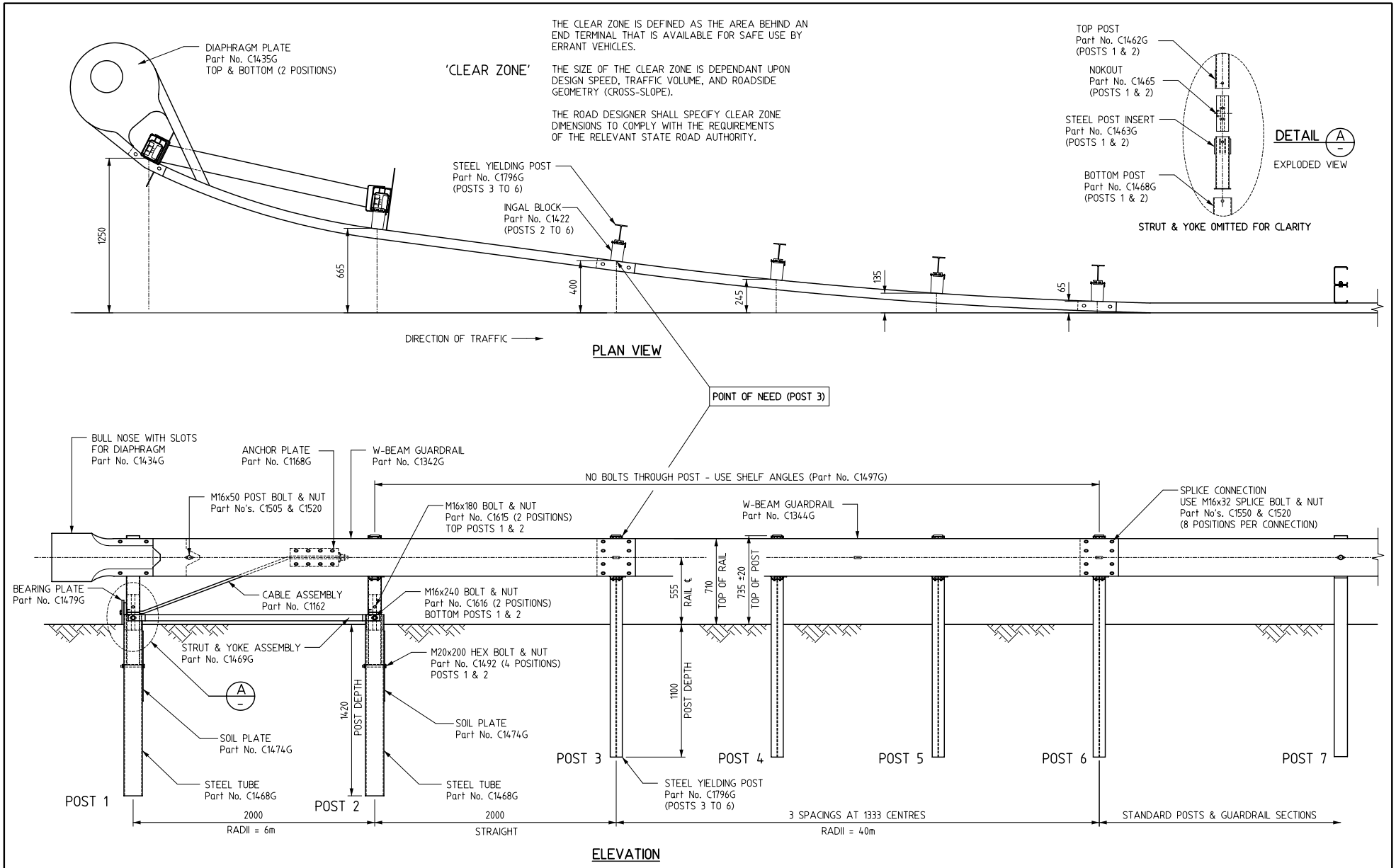
4.2.2 Installation of the Qld MELT

The total length of the MELT is 12m, however for schedules of quantity and payment, the MELT system extends from post 1 to post 6, a length of 8m.

1. The first two posts comprise of bottom posts with soil plates attached. These two posts are spaced at 2m centres.
2. A strut and yoke is installed between the first two posts using M20x200mm bolts.
3. Top posts are bolted to the bottom posts using 3 off M16x80mm bolts. Rectangular washers are also used.
4. An Ingal blocking piece and shelf angle is attached to post 2, using an M16x200mm bolt.
5. Repeat steps 8 to12 as described in the NSW Melt installation procedure.


QLD MELT - Strut connection at Post 2


QLD MELT - Strut connection at Post 1



Rev.	Description	Chkd	Date
0	INITIAL ISSUE	T.C.	7/10/05

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☒NSW ☒ACT ☐QLD ☐NT ☐VIC ☐TAS ☐WA ☐SA ☐SNG ☐HK ☐___

PROJECT MELT TERMINAL
STEEL YIELDING TERMINAL POST SYSTEM
WITH INGAL BLOCK

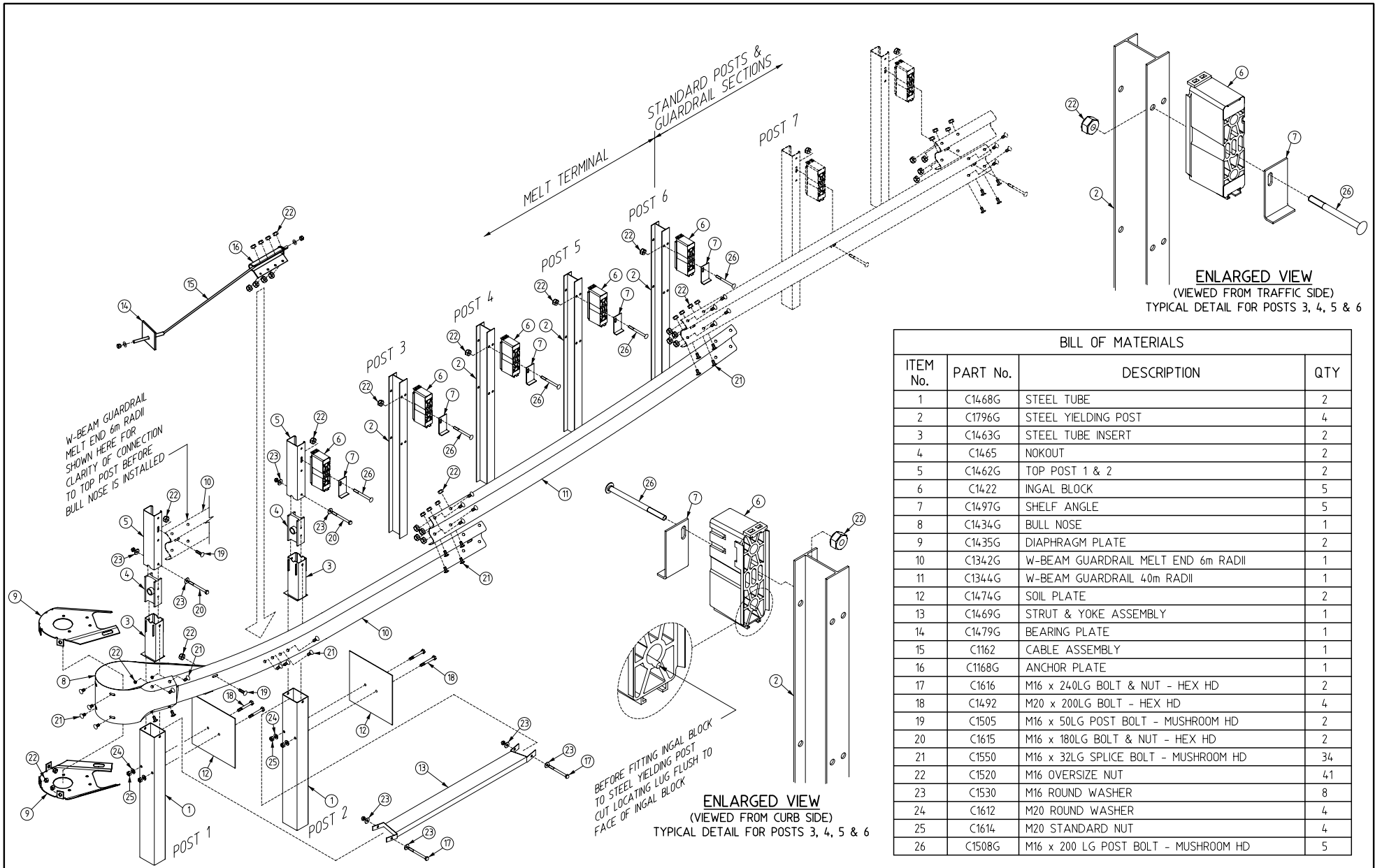
TITLE GENERAL ARRANGEMENT

DATE	7/10/05
DRAWN	B.FREEMAN
DESIGNED	I.C.P.
CHECKED	T.C.
MATERIAL	AS SHOWN
FINISH	H.D.GALV.
SCALE	N.T.S.

INGAL CIVIL PRODUCTS REFERENCE No.

DRAWING No.
CAB-STD-68
REV.0

CAD FILE - CABSTD68.DGN 7/10/05



ENLARGED VIEW
(VIEWED FROM CURB SIDE)
TYPICAL DETAIL FOR POSTS 3, 4, 5 & 6

ENLARGED VIEW
(VIEWED FROM TRAFFIC SIDE)
TYPICAL DETAIL FOR POSTS 3, 4, 5 & 6

BILL OF MATERIALS

ITEM No.	PART No.	DESCRIPTION	QTY
1	C1468G	STEEL TUBE	2
2	C1796G	STEEL YIELDING POST	4
3	C1463G	STEEL TUBE INSERT	2
4	C1465	NOKOUT	2
5	C1462G	TOP POST 1 & 2	2
6	C1422	INGAL BLOCK	5
7	C1497G	SHELF ANGLE	5
8	C1434G	BULL NOSE	1
9	C1435G	DIAPHRAGM PLATE	2
10	C1342G	W-BEAM GUARDRAIL MELT END 6m RADII	1
11	C1344G	W-BEAM GUARDRAIL 40m RADII	1
12	C1474G	SOIL PLATE	2
13	C1469G	STRUT & YOKE ASSEMBLY	1
14	C1479G	BEARING PLATE	1
15	C1162	CABLE ASSEMBLY	1
16	C1168G	ANCHOR PLATE	1
17	C1616	M16 x 240LG BOLT & NUT - HEX HD	2
18	C1492	M20 x 200LG BOLT - HEX HD	4
19	C1505	M16 x 50LG POST BOLT - MUSHROOM HD	2
20	C1615	M16 x 180LG BOLT & NUT - HEX HD	2
21	C1550	M16 x 32LG SPLICE BOLT - MUSHROOM HD	34
22	C1520	M16 OVERSIZE NUT	41
23	C1530	M16 ROUND WASHER	8
24	C1612	M20 ROUND WASHER	4
25	C1614	M20 STANDARD NUT	4
26	C1508G	M16 x 200 LG POST BOLT - MUSHROOM HD	5

Rev.	Description	Chkd	Date
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PROJECT MELT TERMINAL
STEEL YIELDING TERMINAL POST SYSTEM
WITH INGAL BLOCK

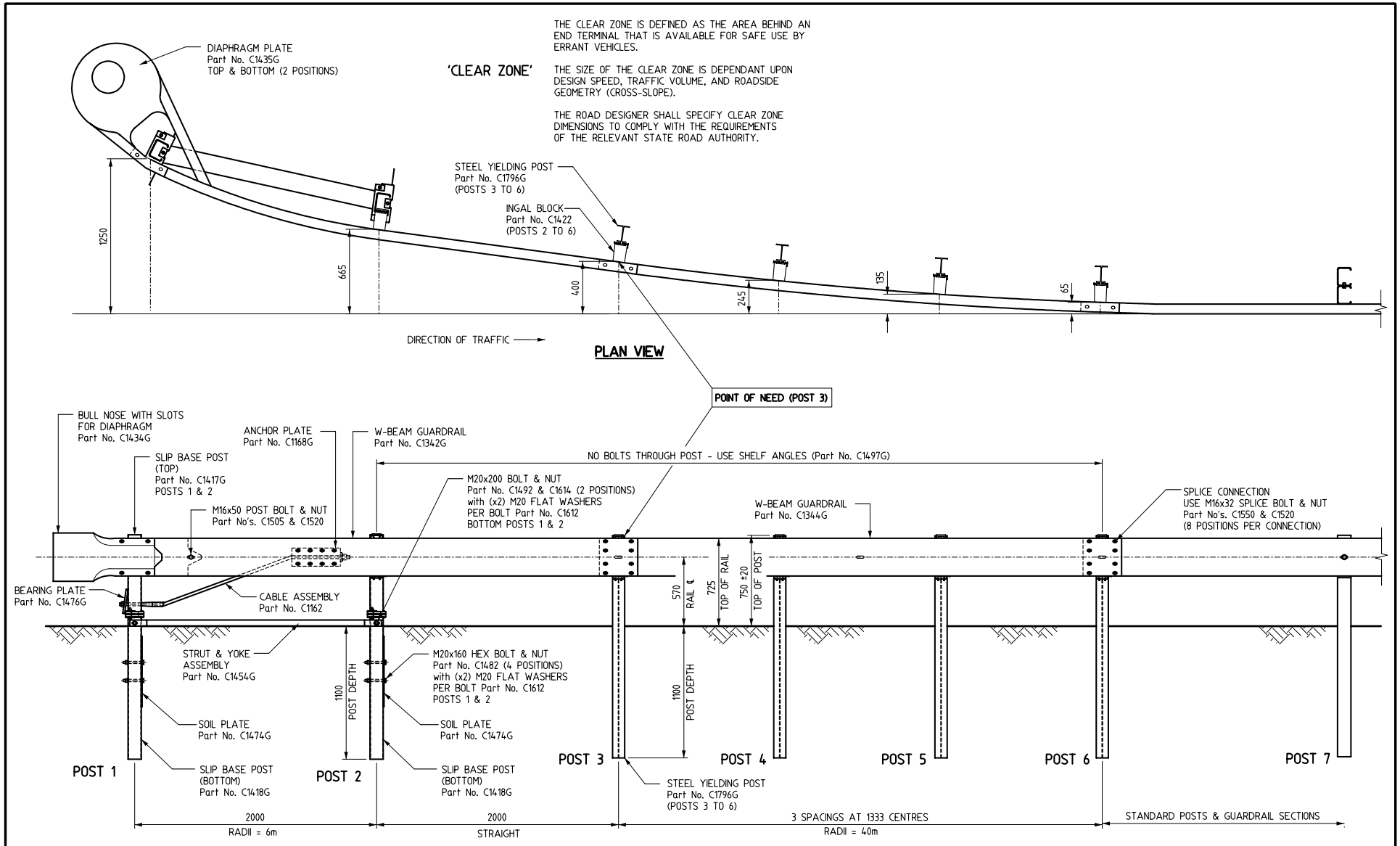
TITLE ISOMETRIC ASSEMBLY DETAILS

DATE	7/10/05
DRAWN	B.FREEMAN
DESIGNED	I.C.P.
CHECKED	T.C.
MATERIAL	AS SHOWN
FINISH	H.D.GALV.
SCALE	N.T.S. (A3)

INGAL CIVIL PRODUCTS REFERENCE No.

DRAWING No.
CAB-STD-69
REV.0

CAD FILE - CABSTD69.DGN 7/10/05



Rev.	Description	Chkd	Date
0	INITIAL ISSUE		

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PROJECT: QLD. DMR - MELT TERMINAL
STEEL YIELDING TERMINAL POST SYSTEM
WITH INGAL BLOCK

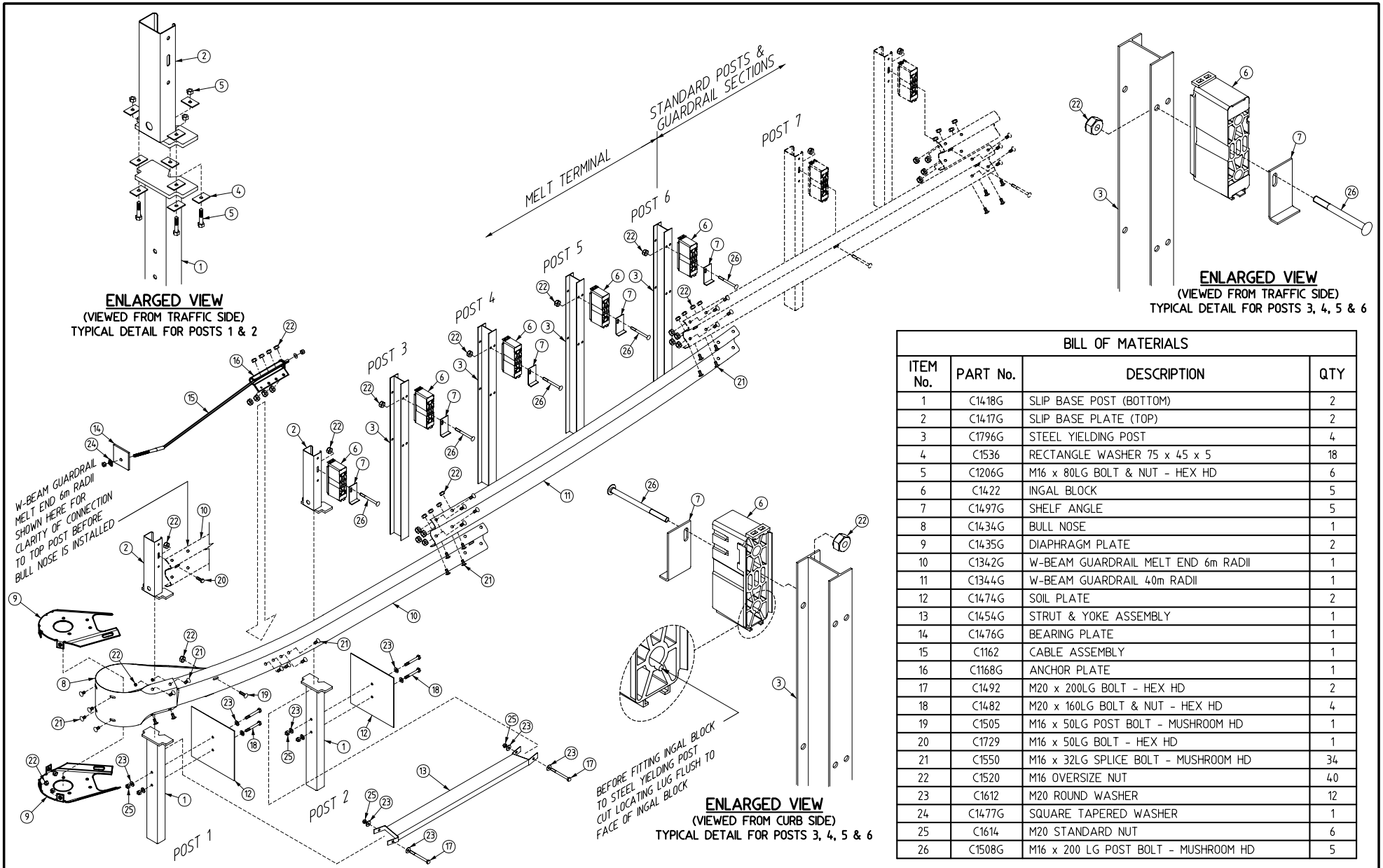
TITLE: GENERAL ARRANGEMENT

DATE	5/4/06
DRAWN	B.FREEMAN
DESIGNED	QLD. DMR
CHECKED	
MATERIAL	AS SHOWN
FINISH	H.D.GALV.
SCALE	N.T.S.

INGAL CIVIL PRODUCTS REFERENCE No.

DRAWING No.
CAB-STD-74
REV.0

CAD FILE - CABSTD74.DGN 5/4/06



ENLARGED VIEW
(VIEWED FROM TRAFFIC SIDE)
TYPICAL DETAIL FOR POSTS 1 & 2

ENLARGED VIEW
(VIEWED FROM TRAFFIC SIDE)
TYPICAL DETAIL FOR POSTS 3, 4, 5 & 6

ENLARGED VIEW
(VIEWED FROM CURB SIDE)
TYPICAL DETAIL FOR POSTS 3, 4, 5 & 6

BILL OF MATERIALS

ITEM No.	PART No.	DESCRIPTION	QTY
1	C1418G	SLIP BASE POST (BOTTOM)	2
2	C1417G	SLIP BASE PLATE (TOP)	2
3	C1796G	STEEL YIELDING POST	4
4	C1536	RECTANGLE WASHER 75 x 45 x 5	18
5	C1206G	M16 x 80LG BOLT & NUT - HEX HD	6
6	C1422	INGAL BLOCK	5
7	C1497G	SHELF ANGLE	5
8	C1434G	BULL NOSE	1
9	C1435G	DIAPHRAGM PLATE	2
10	C1342G	W-BEAM GUARDRAIL MELT END 6m RADII	1
11	C1344G	W-BEAM GUARDRAIL 40m RADII	1
12	C1474G	SOIL PLATE	2
13	C1454G	STRUT & YOKE ASSEMBLY	1
14	C1476G	BEARING PLATE	1
15	C1162	CABLE ASSEMBLY	1
16	C1168G	ANCHOR PLATE	1
17	C1492	M20 x 200LG BOLT - HEX HD	2
18	C1482	M20 x 160LG BOLT & NUT - HEX HD	4
19	C1505	M16 x 50LG POST BOLT - MUSHROOM HD	1
20	C1729	M16 x 50LG BOLT - HEX HD	1
21	C1550	M16 x 32LG SPLICE BOLT - MUSHROOM HD	34
22	C1520	M16 OVERSIZE NUT	40
23	C1612	M20 ROUND WASHER	12
24	C1477G	SQUARE TAPERED WASHER	1
25	C1614	M20 STANDARD NUT	6
26	C1508G	M16 x 200 LG POST BOLT - MUSHROOM HD	5

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PROJECT QLD. DMR - MELT TERMINAL STEEL YIELDING TERMINAL POST SYSTEM WITH INGAL BLOCK

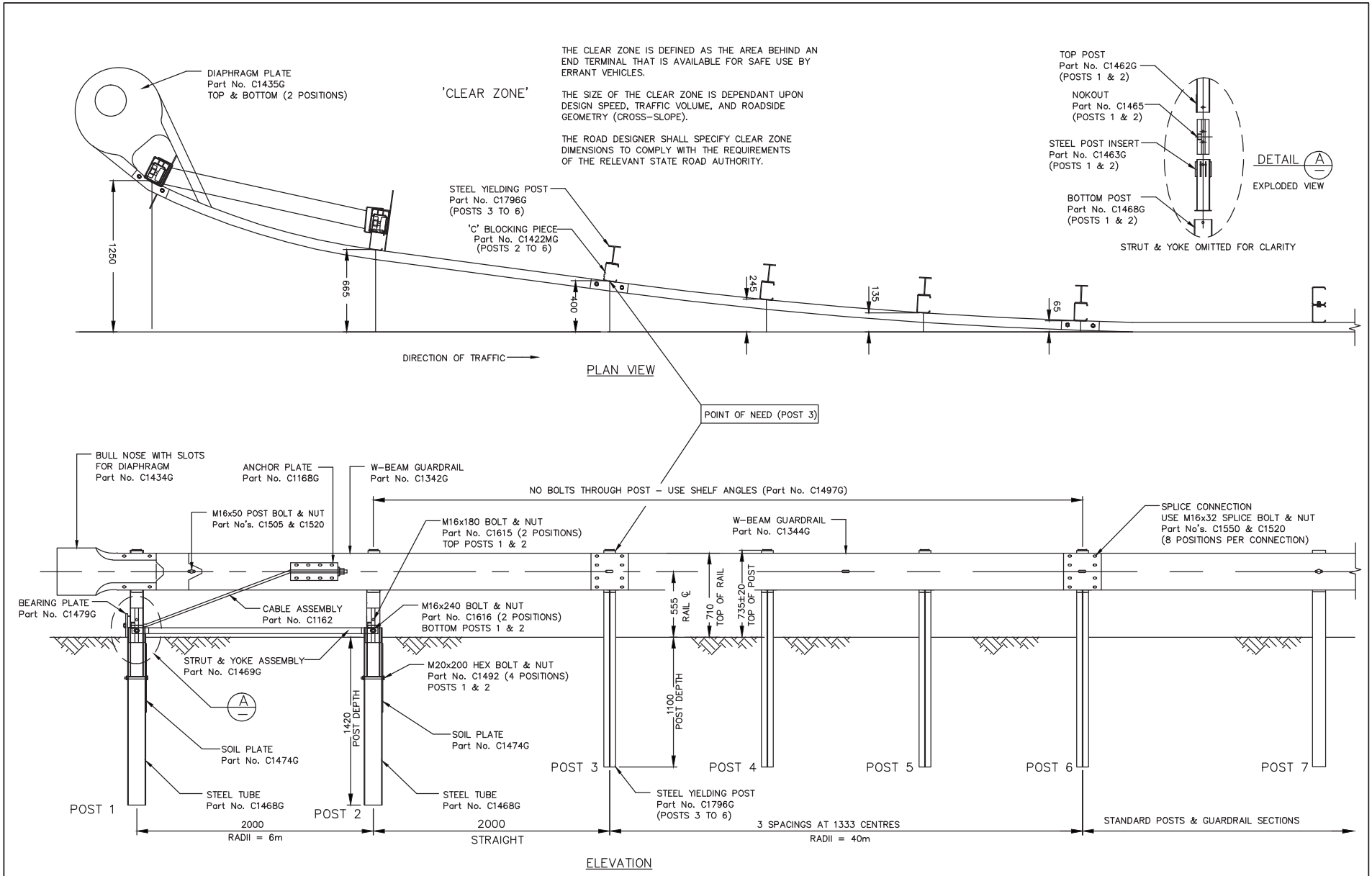
TITLE ISOMETRIC ASSEMBLY DETAILS

DATE	5/4/06
DRAWN	B.FREEMAN
DESIGNED	QLD. DMR
CHECKED	
MATERIAL	AS SHOWN
FINISH	H.D.GALV.
SCALE	N.T.S. (A3)

INGAL CIVIL PRODUCTS REFERENCE No.

DRAWING No.
CAB-STD-75
REV.0

CAD FILE - CABSTD75.DGN 5/4/06



Rev	Description	Chkd	Date
0	INITIAL ISSUE	MS	13/08/09

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PROJECT: S.A MELT TERMINAL
STEEL YIELDING TERMINAL POST SYSTEM
WITH STEEL BLOCK

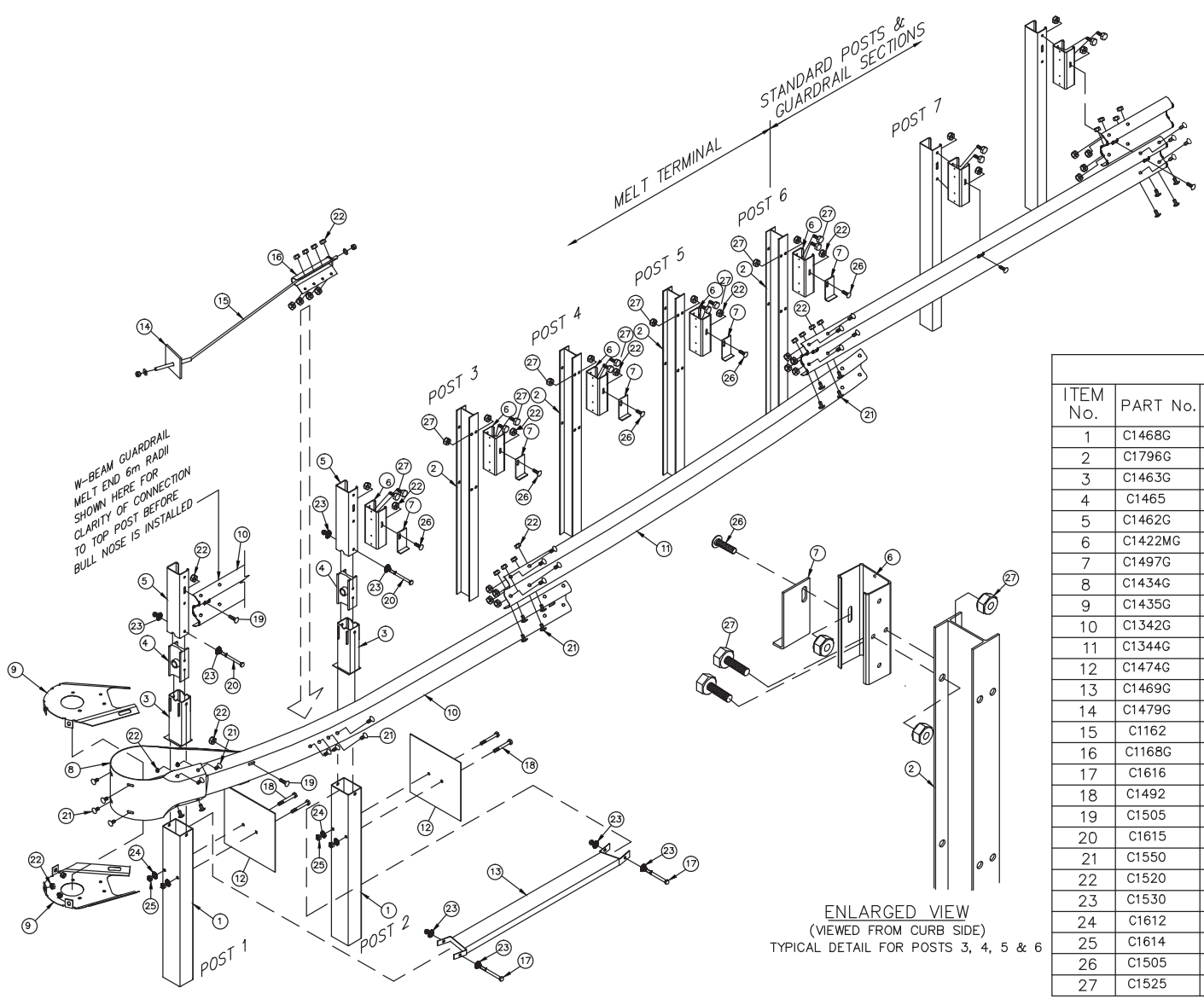
TITLE: GENERAL ARRANGEMENT

DATE	13/08/09
DRAWN	M.S
DESIGNED	I.C.P
CHECKED	T.C
MATERIAL	AS SHOWN
FINISH	H.D GALV
SCALE	N.T.S

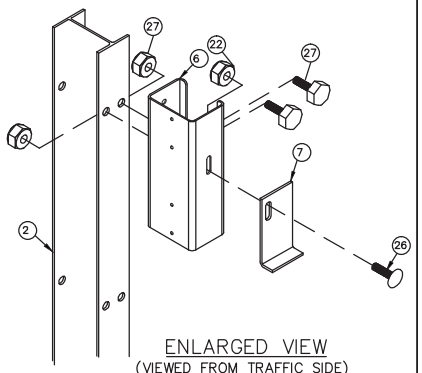
INGAL CIVIL PRODUCTS REFERENCE No.

DRAWING No. CAB-STD-080
REV.0

CAD FILE - CAB-STD-080.DWG 13/08/09



ENLARGED VIEW
(VIEWED FROM CURB SIDE)
TYPICAL DETAIL FOR POSTS 3, 4, 5 & 6



ENLARGED VIEW
(VIEWED FROM TRAFFIC SIDE)
TYPICAL DETAIL FOR POSTS 3, 4, 5 & 6

BILL OF MATERIALS

ITEM No.	PART No.	DESCRIPTION	QTY
1	C1468G	STEEL TUBE	2
2	C1796G	STEEL YIELDING POST	4
3	C1463G	STEEL TUBE INSERT	2
4	C1465	NOKOUT	2
5	C1462G	TOP POST 1 & 2	2
6	C1422MG	'C' BLOCKING PIECE	5
7	C1497G	SHELF ANGLE	5
8	C1434G	BULL NOSE	1
9	C1435G	DIAPHRAGM PLATE	2
10	C1342G	W-BEAM GUARDRAIL MELT END 6m RADII	1
11	C1344G	W-BEAM GUARDRAIL 40m RADII	1
12	C1474G	SOIL PLATE	2
13	C1469G	STRUT & YOKE ASSEMBLY	1
14	C1479G	BEARING PLATE	1
15	C1162	CABLE ASSEMBLY	1
16	C1168G	ANCHOR PLATE	1
17	C1616	M16 x 240LG BOLT & NUT – HEX HD	2
18	C1492	M20 x 200LG BOLT – HEX HD	4
19	C1505	M16 x 50LG POST BOLT – MUSHROOM HD	2
20	C1615	M16 x 180LG BOLT & NUT – HEX HD	2
21	C1550	M16 x 32LG SPLICE BOLT – MUSHROOM HD	34
22	C1520	M16 OVERSIZE NUT	41
23	C1530	M16 ROUND WASHER	8
24	C1612	M20 ROUND WASHER	4
25	C1614	M20 STANDARD NUT	4
26	C1505	M16 x 50LG POST BOLT – MUSHROOM HD	5
27	C1525	M16 X 30LG HEX HD BOLT/NUT	10

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PROJECT: S.A MELT TERMINAL
STEEL YIELDING TERMINAL POST SYSTEM
WITH STEEL BLOCK

TITLE: ISOMETRIC ASSEMBLY DETAILS

DATE	13/08/09
DRAWN	M.S
DESIGNED	I.C.P
CHECKED	T.C
MATERIAL	AS SHOWN
FINISH	H.D GALV
SCALE	N.T.S (A3)

INGAL CIVIL PRODUCTS REFERENCE No.

DRAWING No.
CAB-STD-081
REV.0

CAD FILE – CAB-STD-081.DWG 13/08/09

For more information

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A valmont COMPANY

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