ET-2000
EXTRUDER GUARDRAIL
END-TERMINAL

Final Report
OR-EF-98-05

Final Report

by

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Prepared for

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and

Federal Highway Administration
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16. Abstract

An ET-2000 Extruder Guardrail End Terminal (GET) was installed in September 1993 along Highway 35 (ORE 42) near Roseburg, Oregon (M.P. 76). The ET-2000 GET was selected for this site to reduce accident severity and right-of-way cost. The GET was installed for a total cost of $3,000 in about two hours.

The performance of the ET-2000 GET was monitored for four years. No impacts were reported in this period. No maintenance was required.

ODOT will continue use of the ET-2000 GET or similar model. Other states, including Texas and Ohio, report large decreases in accident severity at their ET-2000 GET installations.

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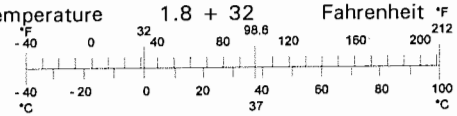
SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	millimeters squared	mm^2
ft^2	square feet	0.093	meters squared	m^2
yd^2	square yards	0.836	meters squared	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	kilometers squared	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	meters cubed	m^3
yd^3	cubic yards	0.765	meters cubed	m^3
NOTE: Volumes greater than 1000 L shall be shown in m^3.				
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5(F-32)/9	Celsius temperature	°C

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	millimeters squared	0.0016	square inches	in^2
m^2	meters squared	10.764	square feet	ft^2
ha	hectares	2.47	acres	ac
km^2	kilometers squared	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	meters cubed	35.315	cubic feet	ft^3
m^3	meters cubed	1.308	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams	1.102	short tons (2000 lb)	T
		TEMPERATURE (exact)		
°C	Celsius temperature	1.8 + 32	Fahrenheit	°F



ACKNOWLEDGMENTS

The author would like to thank the following Oregon Department of Transportation (ODOT) personnel for their contributions and help gathering information for this report: Bob Knorr, John Oltman and Sam Johnston. In addition, the author thanks the Ohio Department of Transportation for their cooperation supplying crash data on the GET installations in their state.

DISCLAIMER

ET-2000 EXTRUDER GUARDRAIL END TERMINAL

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APPENDIX

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1.0 INTRODUCTION

The ET-2000 GET was developed by the Texas Transportation Institute to eliminate spearing and vaulting effects motorists experience with other designs. Texas and Ohio report reduced accident severity in several hundred crashes at GET installations. *(Oregon DOT, 1994)* There were no collisions at ET-2000 installations in Oregon between 1993 and July 1997.

One advantage experienced by the Oregon Department of Transportation (ODOT) is a reduction in right-of-way needs. This report documents the reduced right-of-way costs at an Oregon GET installation and presents other states' accident data.

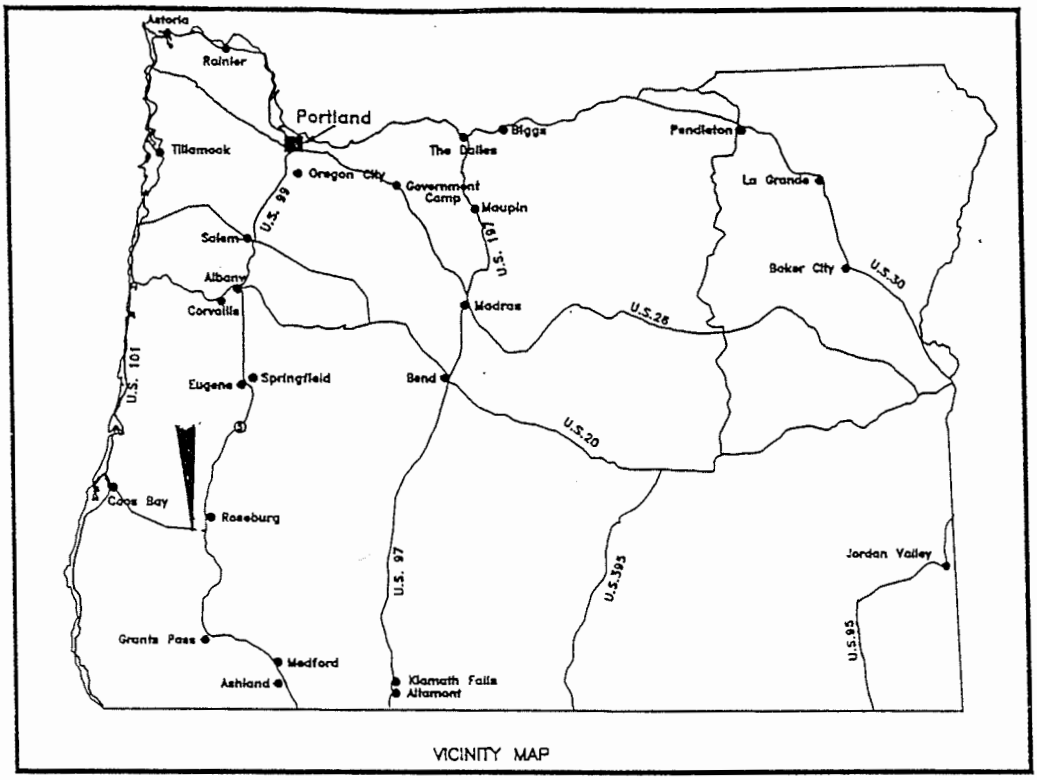
2.0 PROJECT DESCRIPTION

2.1 PROJECT LOCATION

The project is located near mile post 76 on the north side of the Coos Bay-Roseburg Highway (Ore 42), four miles (6.4 kilometers) southeast of Roseburg, Oregon as shown in Figure 2.1. This area has mild wet winters with very little ice or snow. Accidents have been reported near the GET but no hits have occurred.

2.2 DESIGN

The ET-2000 GET is comprised of eight standard guardrail posts which continue in-line with the guardrail section. The posts are made to fit into eight steel foundation tubes with soil plates. In Figure 2.2, parts of the GET are shown, including seven "crushable" spacer blockout blocks, two standard 0.61 m long deep beam guardrails, one cable assembly with cable anchor and bearing plate, one offset strut, and the guardrail extruder terminal head. Note, no flare is shown on the plan view. The constructed ET-2000 GET is shown in Figure 2.3. The GET was installed at the Roseburg site because of the limited right-of-way (see Figure 2.4).



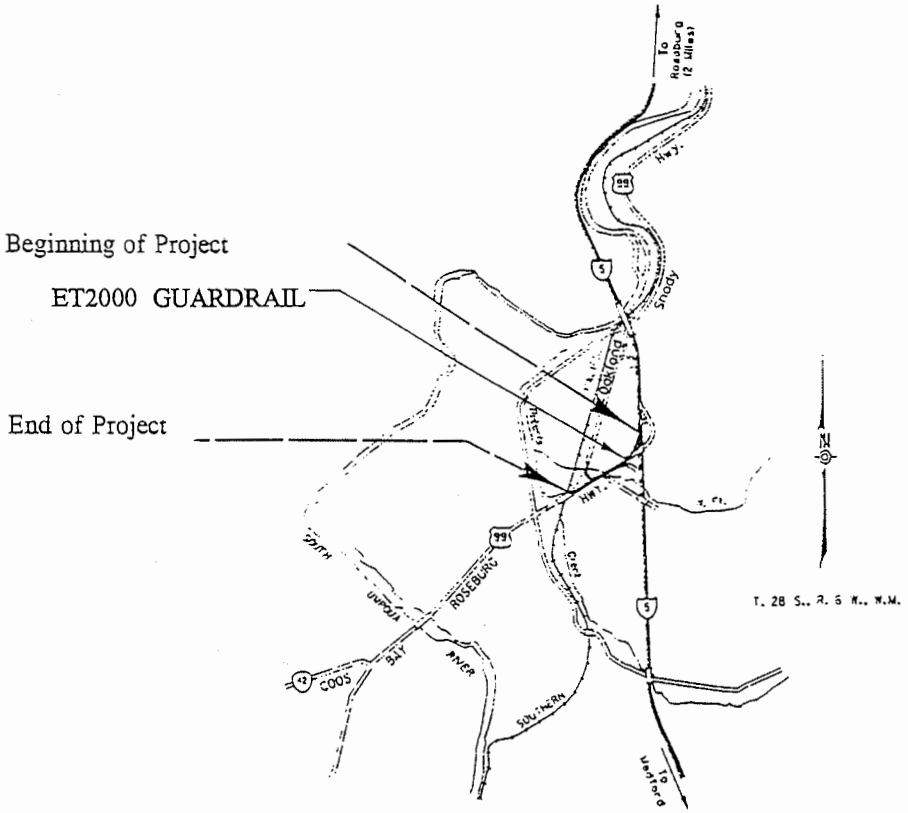
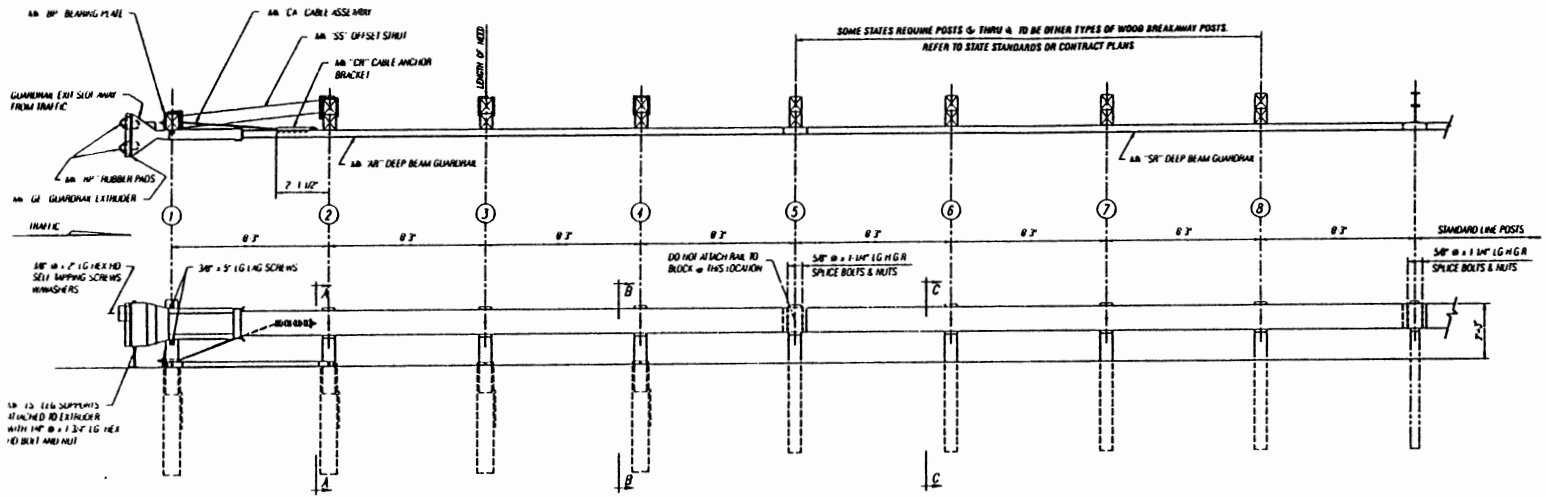
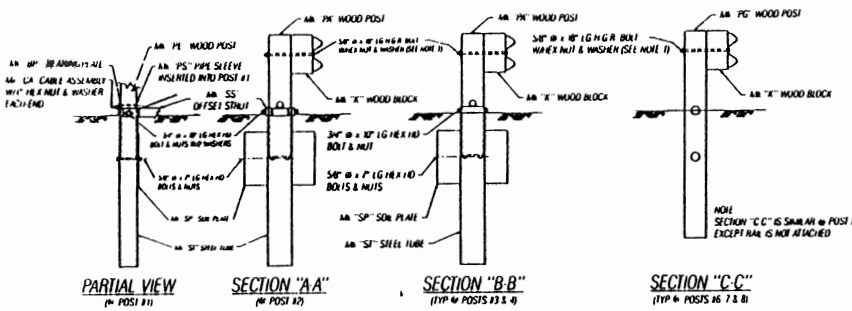
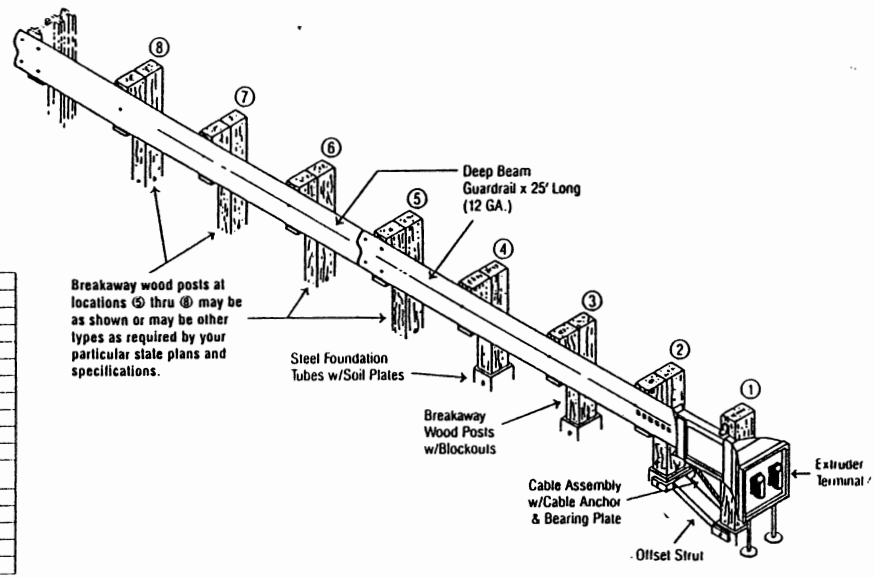


Figure 2.1: Project Location in Oregon







BILL OF MATERIAL

MK	QTY	DESCRIPTION
PE	1	WOOD POST x 3'-10" LG
LS	2	LEG SUPPORT
RP	2	RUBBER PAD
SR	1	DEEP BEAM GUARDRAIL (12 GA)
AR	1	DEEP BEAM GUARDRAIL (12 GA)
PS	1	PIPE SLEEVE
SP	4	SOIL PLATE
X	7	WOOD BLOCK x 1' 2" LG
PG	4	WOOD POST x 8'-0" LG
PA	3	WOOD POST x 3' 6" LG
ST	4	STEEL FOUNDATION TUBE
BP	1	BEARING PLATE
CR	1	CABLE ANCHOR BRACKET
CA	1	CABLE ASSEMBLY
SS	1	OFFSET STRUT (LEFT OR RIGHT)
GE	1	GUARDRAIL EXTRUDER

QTY	HARDWARE
4	3/4" @ x 10" HEX HD BOLT
4	3/4" HEX NUT
4	3/4" WASHER
7	5/8" @ x 18" H.G.R. POST BOLT
16	5/8" @ x 1-1/4" H.G.R. SPLICE BOLT
8	5/8" @ x 7" HEX HD BOLT
16	5/8" H.G.R. NUT
15	5/8" HEX NUT
7	5/8" WASHER
2	3/8" @ x 5" LAG SCREW
4	3/8" @ x 2" HEX HEAD SELF TAPPING SCREW
4	3/8" WASHER
2	1/4" @ x 1-3/4" HEX HD BOLT
2	1/4" HEX NUT
2	1" HEX NUT
2	1" WASHER

NOTES:
1) THE 5/8" FLAT WASHER IS USED UNDER THE NUT, BEHIND THE POST. ONLY NO WASHER IS USED AT THE RAIL.
2) MANUFACTURER SUGGESTS CUSTOMER TO PROVIDE REFLECTORIZATION OF TERMINAL.
3) LEFT HAND SHOULDER APPLICATION SHOWN.

Figure 2.2: ET-200 Extruder Guardrail End Terminal Design

Figure 2.3: ET-2000 GET.

Figure 2.4: Note how close the GET is to the house in the background.

3.0 CONSTRUCTION

The construction of the ET-2000 GET is documented in the construction report *(Oregon DOT, 1994)*. Following is a summary of the construction.

The ET-2000 GET was installed along the Coos Bay-Roseburg Highway in accordance with the special provisions and specifications for the "O'xing S.P.R.R. - I-5 Section" project *(Oregon DOT, 1993)*. Syro Steel delivered the entire ET-2000 GET system as a complete package to the installation site. Construction of the ET-2000 GET began at approximately 10:35 a.m. and was completed at approximately 11:45 a.m. on September 8, 1993. The work was performed by Coral Construction Company (Wilsonville, OR), Inc. Coral Construction utilized one drill and auguring rig/truck, one operator, and two laborers to perform the installation. The installation went as planned, much the same as any typical guardrail system.

Some state agencies have experienced difficulties in installing the MK-ST steel foundation tubes, however. The foundation tubes are bolted to the MK-SP soil plates and under certain soil conditions, driving this assembly could create deformations which make it challenging to insert and/or remove the wood posts. In addition, occasionally, "one or both of the bolts that are intended to hold the soil plate to the tube sometimes break, as may be evidenced by the plate's presence at ground level." *(Oregon DOT, 1994)*

When inserted into the tube, the wood posts stand atop these two bolts. The soil level inside the tube after driving is often above the level of the soil plate's bolts. This soil should be scooped out before the post is placed in the tube, for it may otherwise contribute to the bolts' breakage and to the greenwood fractures that sometimes occur alongside of the drilled breakaway hole when the wood post must be driven into place. (Oregon DOT, 1994)

Further changes and considerations to improve the installation and operation of the ET-2000 GET design are being submitted by agencies that use the terminal unit. Again, the installation of ET-2000 GET in Oregon went quite smoothly.

4.0 COSTS AND PERFORMANCE

4.1 COSTS

The total cost of the Roseburg installation, including the contractor's profit, was $3,000. Other states report an average installed cost of $2,500 *(Oregon DOT, 1994)*. Two other contracts let by Oregon in 1995 specified the ET-2000 GET. Bid prices were $2,500 and $4,000. However, Corral Corporation was allowed to substitute the BRAKE system on both jobs. Thus, the Roseburg installation remains the only ET-2000 GET on the Oregon state highway system.

Repair costs reported by Ohio are about 70% of the new installation cost with half of the cost being for traffic control and contractor profit *(Ohio DOT, 1996)*. Oregon has three other extruder guard rail installations. None have been hit, so no maintenance cost data are available for Oregon.

Right-of-way costs at the Roseburg installation would have been very high because an installation of a conventional guardrail with a flared end section (see Figure 4.1) would have required more space. The state right-of-way fence is now adjacent to a residence (see Figure 2.3). Taking this residence could have cost the State of Oregon over $60,000. The original job plans called for a modified installation with no flare (see Figure 4.2). The GET was substituted for its greater safety value.

4.2 PERFORMANCE

Because no Oregon installations have been hit, performance data is not available. However, the State of Ohio recorded 306 hits on 1,485 units from 1992 through 1995. None of the accidents were fatal, and only 1.5% involved serious injuries. Most of the hits were at speeds exceeding 60 kilometers per hour (40 miles per hour) *(Ohio DOT, 1996)*.

Initial concerns in Ohio about injuries due to posts flying upon impact did not materialize. Posts broken on impact were hurled ahead on line, but remained on the shoulder rather than impacting vehicles in other travel lanes *(Ohio DOT, 1996)*.

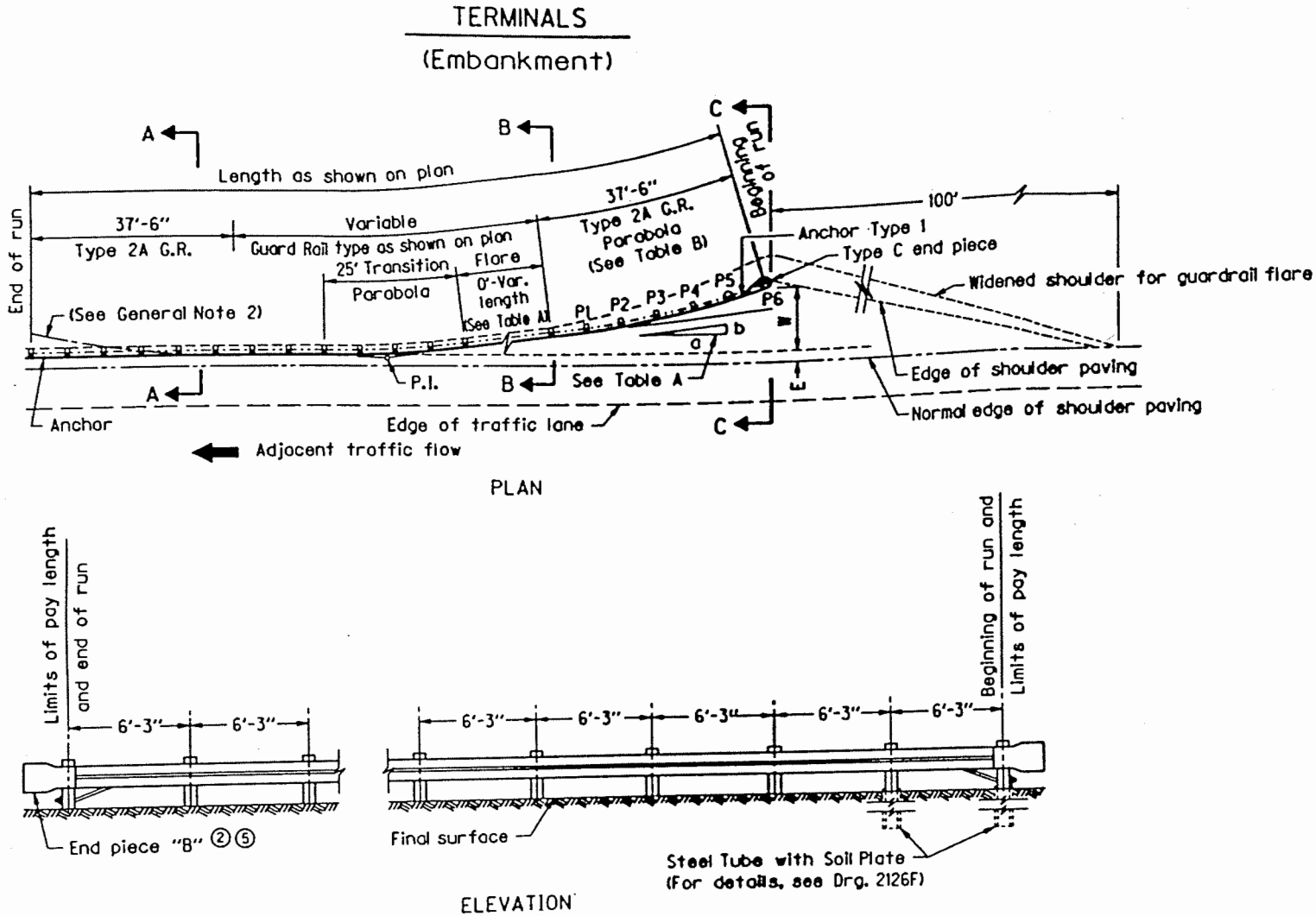


Figure 4.1: Standard Guardrail Installation

GENERAL NOTES:

1. For details not shown, see Drgs. No. 2126, 2126A, 2126D, 2126F, 2126G & 2126H.

2. On two way two lane highways, both ends of guard rail runs will be provided with Type 1 anchors and Type C end piece and be flared a minimum of 4' with a 37'-6" parabola. Paving of widened shoulder on both ends of guard rail runs is required.

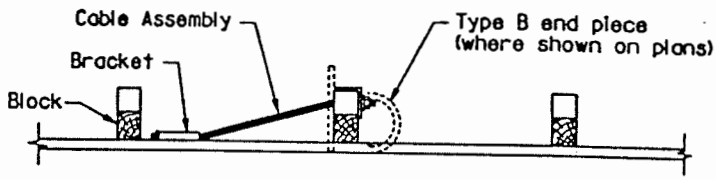
3. Types 2 & 2A guard rail shown. Face of rail to be in same location for Types 1 & 1A.

4. Only blocked-out guard rail will be used with drainage curbs.

5. Trailing ends (freeway, multilane and similar oneway facilities) not exposed to opposing traffic:
   (a.) Guard rail terminals, use a type 1 modified anchor, Type B end piece and do not flare.
   (b.) At bridge ends, omit Transition Guard Rail & Type 3 guard rail and substitute the normal required guard rail.

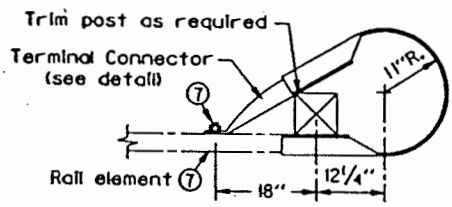
6. (a.) All bolts except adjustment bolts shall be drawn tight on rails and components on initial installation.
   (b.) Final tightness check on rail and components bolts and retightening as required to be done 30 days after initial installation.

TYPE 1 MODIFIED

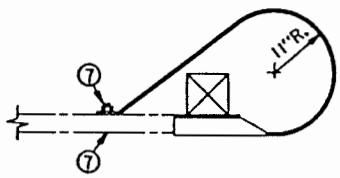


PLAN

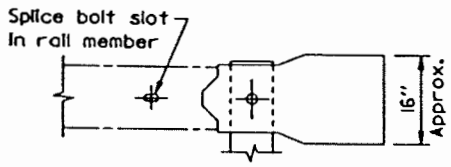
TYPE B END PIECE



ALTERNATE 1



ALTERNATE 2



ELEVATION

TYPE C END PIECE

For details not shown see Type B End Piece

NOTE: All material and workmanship shall be in accordance with the current State of Oregon Standard Specifications for Highway Construction.

STATE OF OREGON
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY DIVISION
STANDARD

GUARD RAIL INSTALLATION
TERMINALS (EMBANKMENT)

JUNE 1984

REVISIONS		APPROVED
DATE	DESCRIPTION	
JULY, 1988	DELETE SHOULDER SLOPES	SPECIFICATIONS ENGINEER
JULY, 1990	REV. ELEVATION VIEW	
JUNE, 1992	REV. BOLT HOLE LOCATION FOR WOOD POST	DRG. NO. 2126G

Figure 4.2: Original Plans

5.0 CONCLUSIONS

The ET-2000 GET is a reliable alternative for end treatments when space is not available to construct flared terminal ends. Accident histories from Texas and Ohio indicate reduced injuries after impact with the ET-2000. ODOT (Oregon) will continue to use the ET-2000 or the BRAKE system. Both meet NCHRP 350 standards.

6.0 REFERENCES

Indiana Department of Transportation (INDOT). 1993. *Construction Report for the ET-2000 Guardrail End Terminal.* By D. Gendron, West Lafayette.

Ohio Department of Transportation (Ohio DOT). 1996. *Final Evaluation of Performance of the Type E Guardrail Anchor Assembly.* Columbus.

Oregon Department of Transportation (Oregon DOT). 1993. *Special Provisions and Supplemental Standard Specifications For Highway Construction 24V-102: O'xing S.P.R.R. - 1-5 Section, Coos Bay - Roseburg.* Salem.

Oregon Department of Transportation (Oregon DOT). 1994. *ET-2000 Extruder Guardrail End-Terminal Construction Report.* By R. E. Knorr. Salem.

APPENDIX

EXCERPTS FROM:

FINAL PERFORMANCE EVALUATION OF THE TYPE E GUARDRAIL ANCHOR ASSEMBLY
Published by the Ohio Department of Transportation 1996

OHIO DEPARTMENT OF TRANSPORTATION
CENTRAL OFFICE, 25 S. FRONT STREET, P.O. BOX 899, COLUMBUS, OHIO 43216-0899

July 24, 1996

Mr. William Jones
Division Administrator
Federal Highway Administration
200 N. High Street
Columbus, Ohio 43215

Re: Final Performance Evaluation of the Type E Guardrail Anchor Assembly
(Office of Roadway Engineering)

Dear Mr. Jones:

The purpose of this correspondence is to provide a comprehensive final report on the safety performance of the Ohio Type E guardrail end terminal based on findings from accident investigations conducted over a 3-year period. This report summarizes accidents in terms of injury severity, point of impact, and speed. It also includes comparisons of average installation and repair costs.

The Ohio Department of Transportation is very pleased with the safety performance of the ET-2000. The fact that it has also met the testing requirements for NCHRP 350 test level 3 will ensure that it continues to be a part of our overall end treatment policy.

Please address any comments or questions that you may have to the Office of Roadway Engineering.

Respectfully,

Jerry Wray

Jerry Wray
Director

JW:et2fhwa2
RC:DKH:LJS:MRE:DAF
Encl. DKH

c: Runyan - Conaway - Swearingen - Yankovich - Boes - All District Deputy Directors - All District Production Administrators - All District Highway Management Administrators - Roadway Engineering Administrator, 4 copies - File

SUMMARY OF DATA

Data was collected on 306 Type E accidents from October 1992 to January 1996. Cost data was available form October 1992 to December 1995.

- No fatalities were reported.
- Of the 83 reports that contained information on the occupant's usage of seat belts, 71 reported that they were wearing their seat belt. None of these sustained any injuries.
- 12.8% (39) of all the reports involved injuries, with only 1.6% (5) listed as either moderate of serious.
- 82% (32/39) of the reported injury accidents involved impact speeds of 55 mph or more.
- 72% (192/265) involved an end-on impact.
- The average installation cost for a new ET-2000 is $2,205.
- The average cost to rebuild a damaged ET-2000 is $1,640 (74% of the cost of anew unit).

Data from the other end terminals associated with ODOT's policy on guardrail end treatment (the Type B End Terminal and the Type 1 Impact Attenuator), although promising, was not of sufficient quality to summarize.

CONCLUSIONS

The Ohio Department of Transportation has monitored the performance of the ET-2000 end terminal for slightly more than three years. During that time we have collected data on 306 reported impacts. The data collected from these reports indicates that the ET-2000's safety performance is excellent. The ET-2000 works as designed, in a variety of accident scenarios. The best performance indicator is the low injury rate in accident involving the terminal. The terminal has been tested according to NCHRP 350 and meets test level 3 criteria.

The installation cost and particularly the high repair costs are an ongoing concern. these cost have remained relatively stable due to the lack of an economically priced comparably designed alternative. We anticipate that the costs associated with the installation and repair of the ET-2000 will decrease when a product is provided that can be compete in terms of performance as well as cost. Even though the Sentre by Energy Absorption is a comparable design alternative, its stringent grading requirements often limit its use.

Our finding is that the ET-2000 has performed extremely well form a safety standpoint and has proven to be an effective end treatment. Its use on Ohio roadways will continue to be a part of our overall end treatment policy.

SUMMARY OF ACCIDENTS INVOLVING THE ET-2000

NO. OF ACCIDENTS	DATE:	COUNTY/ ROUTE:	MM:	DIRECTION/ SIDE	DISTRICT:	VEHICLE:			POINT OF IMPACT	ANGLE OF IMPACT	SPEED	SPEED > 55 mph	RAIL EXTRUDED	OCCUPANT INJURIES	SEAT BELT USED ?	ESTIMATED REPAIR COST
						MAKE	MODEL	YEAR								
80	Nov-93	RIC/I-71	177.5	SB/R	3	--	--	--	--	--	--	--	--	--	--	--
81	Nov-93	MRW/I-71	156.8	NB/R	6	GMC	S-15	1987	END ON	0	55	X	24	MINOR	YES	$900
82	Nov-93	MRW/I-71	139	NB/R	6	KENNETH	CAB OVER	1991	SIDE	--	55	X	1	MINOR	YES	$1,000
83	Nov-93	FRA/I-270	31.53	NB/R	6	HONDA	CRX	1987	SIDE	--	65	X	7	MINOR	NO	$500
84	Nov-93	AUG/I-75	111.8	NB/R	7	VOLVO	145	1973	END ON	10	65	X	--	NONE	YES	--
85	Nov-93	MUS/I-70	130.3	--	5	--	--	--	END ON	0	--	--	1	--	--	$375
86	Nov-93	HAN/I-75	17.53	--	1	CHEVROLET	CORSICA	1988	END ON	15-20	60	X	10	MINOR	YES	$1,000
87	Nov-93	MUS/I-70	145.6	WB/R	5	--	--	--	END ON	--	--	--	2	--	--	$800
88	Nov-93	LIC/I-70	127.4	WB/R	5	--	--	--	END ON	--	--	--	10	--	--	$800
89	Nov-93	FAI/I-70	111.9	EB/R	5	--	--	--	END ON	--	--	--	12	--	--	$1,200
90	--	WAR/I-75	4.35	SB/R	8	--	--	--	--	--	--	--	--	--	--	--
91	Nov-93	HAN/I-75	0	--	1	OLDS	CUTLASS	1991	SIDE	5-10	65	X	--	NONE	YES	$350
92	Nov-93	TUS/I-77	--	SB/R	11	DODGE	RAM	1984	END ON	0	50	--	24	NONE	YES	--
93	Nov-93	HAN/I-75	5	--	1	PETERBLT.	CONVENT.	1994	SIDE	5-10	55	X	3	NONE	YES	$1,000
94	Nov-93	CUY/I-77	15.88	NB/L	12	--	--	--	END ON	10	40	--	2	--	--	$500
95	Dec-93	WAY/SR-83	7	SB/R	3	--	--	--	SIDE	0	--	--	--	--	--	--
96	Dec-93	FRA/I-270	39.5	NB/R	6	--	--	--	END ON	--	--	--	9	--	--	$2,100
97	Dec-93	FRA/I-71	22.39	NB/R	6	GM	--	1988	END ON	0	55	X	24	MINOR	YES	$1,600
98	Dec-93	RIC/I-71	158.9	NB/R	3	--	--	--	END ON	--	--	--	3	MINOR	YES	--
99	Dec-93	FRA/I-71	108.9	SB/R	6	--	--	--	SIDE	--	55	X	0.5	--	--	$1,000
100	Dec-93	MRW/I-71	145.2	NB/R	6	PONTIAC	PHOENIX	1982	END ON	0	65	X	24	NONE	YES	$500
101	Dec-93	FRA/I-70	5.35	WBL	6	FORD	150 PU	1982	END ON	0	50	--	12	NONE	YES	$300
102	Dec-93	RIC/I-71	177.2	SB/R	3	--	--	--	END ON	0	--	--	--	--	--	--
103	Dec-93	ASD/I-71	183.3	SB/R	3	--	--	--	END ON	0	--	--	--	--	--	--
104	Dec-93	FRA/I-70	100.5	WB/R	6	--	--	--	SIDE	--	--	--	9	--	--	$300
105	Dec-93	CUY/I-480	7.32	WB/R	12	--	--	--	SIDE	20	--	--	0	--	--	--
106	Dec-93	CUY/I-480	15.77	EB/R	12	--	--	--	SIDE	10	--	--	3	--	--	$300
107	Dec-93	JEF/SR-7	11.6	NB/R	11	FORD	F-350	1993	END ON	0	50	--	--	NONE	YES	--
108	Dec-93	CUY/I480	21.26	EB/R	12	--	--	--	END ON	0	--	--	6	--	--	$300
109	Dec-93	CUY/I-71	14.82	NB/R	12	--	--	--	END ON	10	--	--	2	--	--	$300
110	Jan-94	ASD/I-71	181.3	NB/R	3	--	--	--	SIDE	--	--	--	0.5	--	--	--
111	Jan-94	FRA/I-71	116.35	NB/R	6	--	--	--	END ON	--	55	X	20	--	--	$500
112	Jan-94	FRA/I-70	100.21	EB/R	6	--	--	--	SIDE	--	--	--	0	--	--	$33
113	Jan-94	TUS/I-77	89.55	NB/R	11	MERCEDES	500 SEL	1993	END ON	0	60	X	20	NONE	YES	--
114	Jan-94	CUY/I-77	13.75	NB/R	12	--	--	--	END ON	0	10	--	0.5	--	--	$300
115	Jan-94	CUY/I-77	15.88	NB/L	12	--	--	--	SIDE	20	40	--	1	--	--	$1,350
116	Jan-94	STA/I-77	101.8	SB/R	4	CHEVROLET	S-10	1979	END ON	0	55	X	25	--	--	--
117	Jan-94	CUY/I-71	14.69	NB/R	12	CHRYSLER	--	--	SIDE	10	55	X	1	--	--	$1,350
118	Feb-94	ASD/I-71	193	SB/R	3	NISSAN	300 ZX	1984	END ON	--	--	--	7	NONE	--	--
119	Feb-94	MRW/I-71	145.7	SB/R	6	FORD	BLAZER	1993	END ON	0	65	X	25	NONE	YES	$800

SUMMARY OF ACCIDENTS INVOLVING THE ET-2000

NO. OF ACCIDENTS	DATE:	COUNTY/ ROUTE:	MM:	DIRECTION/ SIDE	DISTRICT:	VEHICLE:			POINT OF IMPACT	ANGLE OF IMPACT	SPEED	SPEED > 55 mph	RAIL EXTRUDED	OCCUPANT INJURIES	SEAT BELT USED ?	ESTIMATED REPAIR COS
						MAKE	MODEL	YEAR								
120	Feb-94	MRW/I-71	145.2	NB/R	6	FORD	MUSTANG	1985	END ON	0	65	X	24	MINOR	YES	$750
121	Feb-94	FRA/I-70	109	NB/L	6	--	--	--	SIDE	--	--	--	2	--	--	$230
122	Feb-94	FRA/I-270	161 WB	RAMP	6	--	--	--	--	--	--	--	0	--	--	$170
123	Feb-94	FRA/I-270	30.4	NB/R	6	--	--	--	--	--	--	--	0	--	--	$200
124	Feb-94	RIC/I-71	161.4	NB/R	3	INT.	9870	1989	END ON	0	--	--	20	NONE	--	--
125	Feb-94	RIC/I-71	174.8	SB/R	3	--	VAN	--	END ON	--	--	--	--	NONE	--	--
126	Feb-94	SUM/I-76	17.5	EB/R	4	--	--	--	END ON	0	--	--	15	--	--	--
127	Feb-94	SUM/I-76	17	EB/R	4	--	--	--	SIDE	--	--	--	0	--	--	--
128	Feb-94	MRW/I-71	145	NB/R	8	--	--	--	--	--	--	--	--	--	--	--
129	Feb-94	MRW/I-71	146	SB/R	6	--	--	--	--	--	--	--	--	--	--	--
130	Feb-94	STA/I-77	105	SB/R	4	--	--	--	--	--	--	--	--	--	--	--
131	Feb-94	ASD/I-71	193	SB/R	3	--	--	--	--	--	--	--	--	--	--	--
132	Feb-94	MED/I-76	11.5	WB/R	3	--	--	--	--	--	--	--	--	--	--	--
133	Feb-94	SUM/I-76	24	WB/R	4	--	--	--	--	--	--	--	--	--	--	--
134	Feb-94	SUM/I-76	23.2	WB/R	4	--	--	--	--	--	--	--	--	--	--	--
135	Feb-94	FRA/I-270	24.01	WB/R	6	CHRYSLER	5TH AVE.	1987	SIDE	0	55	X	2	NONE	YES	$300
136	Feb-94	FRA/I-270	27.38	WB/R	6	--	--	--	END ON	0	--	--	4	--	--	--
137	Feb-94	CUY/I-77	15.88	NB/L	12	--	--	--	SIDE	10	40	--	1	--	--	$850
138	Feb-94	CUY/I-480	16.83	EB/R	12	--	--	--	SIDE	10	35	--	0	--	--	$850
139	Feb-94	CUY/I-77	2.82	NB/R	12		--	--	END ON	C	50	--	1	--	--	--
140	Feb-94	CUY/I-480	5.69	EB/R	12		--	--	SIDE	45	40	--	1	--	--	$850
141	Feb-94	HAM/I-75	15.2	NB/R	8	--	--	--	SIDE	20	55	X	--	NONE	--	--
142		SUM/I-76	17.5	EB/RAMP	4	--	--	--	SIDE	--	--	--	0	--	--	--
143		SUM/I-77	22.31	SB/R	4	--	--	--	SIDE	--	--	--	0	--	--	--
144		SUM/I-77	21	SB/R	4	--	--	--	END ON	0	--	--	15	--	--	--
145		STA/I-77	105.3	NB/R	4	--	--	--	END ON	0	--	--	10	--	--	--
146		STA/I-77	9.1	NB/R	4	--	--	--	END ON	0	--	--	20	--	--	--
147		STA/I-77	104	NB/RAMP	4	--	--	--	SIDE	--	--	--	1	--	--	--
148		STA/I-77	13	SB/R	4	--	--	--	END ON	0	--	--	5	--	--	--
149		SUM/I-77	22.31	SB/R	4	--	--	--	SIDE	--	--	--	0	--	--	--
150		SUM/I-77	22.29	SB/L	4	--	--	--	END ON	0	--	--	0	--	--	--
151		STA/I-77	9.23	SB/R	4	--	--	--	END ON	0	--	--	0	--	--	--
152		SUM/I-77	22.3	NB/R	4	--	--	--	END ON	0	--	--	0	--	--	--
153	Mar-94	FAY/I-71	75	SB/R	6	--	--	--	SIDE	--	--	--	2		--	$200
154	Mar-94	RIC/I-71	161.8	NB/R	3	--	--	--	END ON	--	--	--	3	--	--	--
155	Mar-94	MED/I-271	1.5	SB/L	3	--	--	--	END ON	0	--	--		--	--	--
156	Mar-94	WAR/I-71	30.8	NB/R	8	DATSUN	SENTRA	1982	END ON	--	65	X	--	NONE	YES	--
157	Mar-94	TUS/I-77	66.7	NB/R		DODGE	OMNI	1980	BACK	5	--	--	8	NONE	YES	--
158	Mar-94	SUM/I-271	0.5	NB/R	3	--	--	--	END ON	0	--	--	10	--	--	--
159	Mar-94	FRA/I-270	--	RAMP	6	--	--	--	END ON	--	--	--	--	--	--	--