U.S. Department of Transportation
Federal Highway Administration

1200 New Jersey Avenue, SE
Washington, D.C. 20590

March 15, 2010

In Reply Refer to: HSSD/CC-12Q

Mr. Steve Brown
President
Trinity Highway Products, LLC
2525 N. Stemmons Freeway
Dallas, TX 75207

Dear Mr. Brown:

This letter is in response to your request for the Federal Highway Administration (FHWA) acceptance of roadside safety devices for use on the National Highway System (NHS).

Name of devices:	ET-Plus and ET-Plus 31 with 2 Breakaway Posts
Type of devices:	W-Beam Guardrail Terminals
Test Level:	NCHRP Report 350 Test Level 3
Testing by:	Texas Transportation Institute
Date of request:	June 2, 2009
Date all information received.	October 21, 2009

You requested that we find these devices acceptable for use on the NHS under the provisions of National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

Requirements
Roadside safety devices should meet the guidelines contained in the NCHRP Report 350 FHWA Memorandum "Action: Identifying Acceptable Highway Safety Features" of July 25, 1997, provides further guidance on crash testing requirements of longitudinal barriers.

Description
The ET-Plus and ET-Plus 31 have been successfully crash tested and accepted by the FHWA, most recently in FHWA Acceptance CC-12J, dated June 24, 2002, CC-12L, dated April 11, 2003, and CC-94, dated September 2, 2005. The use of one anchor post and subsequent transition to standard line posts were the same in these two w-beam guardrail terminals. The obvious difference is the use of seven additional breakaway posts and the 27 5/8-inch rail height in the ET-Plus and five additional breakaway posts and 31-inch rail height in the ET-Plus 31.

Recent full scale crash tests have demonstrated that an 820C vehicle can safely ride down full strength W6x8.5 steel line posts that are not rigidly connected to the w-beam rail. Your present request is to replace the last six breakaway posts in ET-Plus and the last 4 breakaway posts in the ET-31with these standard W6x8.5 line posts.

Crash Testing

In the safety performance evaluation of these new designs, full-scale crash tests were not conducted on either revised design. NCHRP recommends a total of up to 7 full-scale crash tests for gating guardrail terminals. We concur that none of these tests is needed to verify the safety performance of the proposed new terminal designs, as summarized below.

Test 3-30 involves an 820C vehicle striking the end of the terminal at a speed of 100 km/hr with ¼ offset and an angle of 0°. Recent full scale crash tests have demonstrated that an 820C vehicle can safely ride down full strength W6x8.5 steel line posts. Hence, Test 3-31 is not necessary for evaluating the performance of the new terminal designs.

Test 3-31 involves a 2000P vehicle striking the end of the terminal at 100 km/h and 0°. Numerous full-scale crash tests have shown that the 2000P vehicle is capable of riding down full strength guardrail posts. Further, the previous results of test 3-30 provide a much better indication of the consequences of a vehicle striking an unmodified line post. Thus, Test 3-31 is not necessary for evaluating the performance of the new terminal designs.

Test 3-32 requires an 820C vehicle striking the end of the terminal at 100 km/h and an angle of 15°. Historically the third post in a tangent energy absorbing terminal has not been broken during this impact. Nothing was changed upstream of post #3 from the systems that were approved previously. Therefore, we concur there is no need to conduct this test.

Test 3-33 incorporates the same impact conditions as test 3-32 with a 2000P vehicle. This test is not necessary for the same reasons that Test 3-32 is not required.

Test 3-34 involves an 820C vehicle striking the terminal at its critical impact point at a speed of 100 km/h and an angle of 15°. Previous 3-34 testing was successfully conducted on ET-Plus (HSA-10/CC-12J) with W8x10 breakaway Steel Yielding Terminal Posts (SYTP)] at post locations 2 through 8. Also, this test was successfully conducted with another terminal at a greater impact angle than would be required with the ET-Plus and ET-31. Therefore, we concur there is no need to conduct this test.

Test 3-35 examines the safety performance of the terminal for impacts at the beginning of the length-of-need. This test involves a 2000P striking at the beginning of length-of-need. Previous 3-35 testing was successfully conducted on ET-Plus and ET-Plus 31 with breakaway posts (SYTP) at post locations 2 through 8 and 2 through 6 respectively. Therefore, 3-35 testing on the terminals with full strength W6x8.5 steel line posts at post location 3 and beyond is not required.

Test 3-39 involves a 2000P vehicle impacting the midpoint of the terminal in a reverse direction at a speed of 100 km/h and an angle of 20°. As mentioned above the 2000P test vehicle has been shown to be capable of riding down a full strength line post without posing serious threats to the occupants. Hence this test is also considered to be unnecessary.

In these tests we concur that the performance of the last six breakaway posts in the ET-Plus and the last 4 breakaway posts in the ET-31 terminals would not have been adversely affected by replacing the yielding posts with standard line posts.

Findings

The modified ET-Plus and ET-Plus 31 described above and detailed in the enclosed drawings are acceptable for use on the NHS under the range of conditions tested, when acceptable to a highway agency.

Please note the following standard provisions that apply to FHWA letters of acceptance:

- This acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices.

- Any changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.

- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, we reserve the right to modify or revoke our acceptance.

- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.

- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that it will meet the crashworthiness requirements of the FHWA and the NCHRP Report 350.

- To prevent misunderstanding by others, this letter of acceptance is designated as number CC-12Q and shall not be reproduced except in full. This letter and the test documentation upon which it is based are public information. All such letters and documentation may be reviewed at our office upon request.

- The ET-Plus and ET-Plus 31 end terminals are patented products and considered proprietary. If proprietary devices are specified by a highway agency for use on Federal-aid projects, except exempt, non-NHS projects, (a) they must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with the existing highway facilities or that no equally suitable alternative exists; or (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411.

- This acceptance letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented device for which the applicant is not the patent holder. The acceptance letter is limited to the crashworthiness characteristics of the candidate device, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

Sincerely yours,

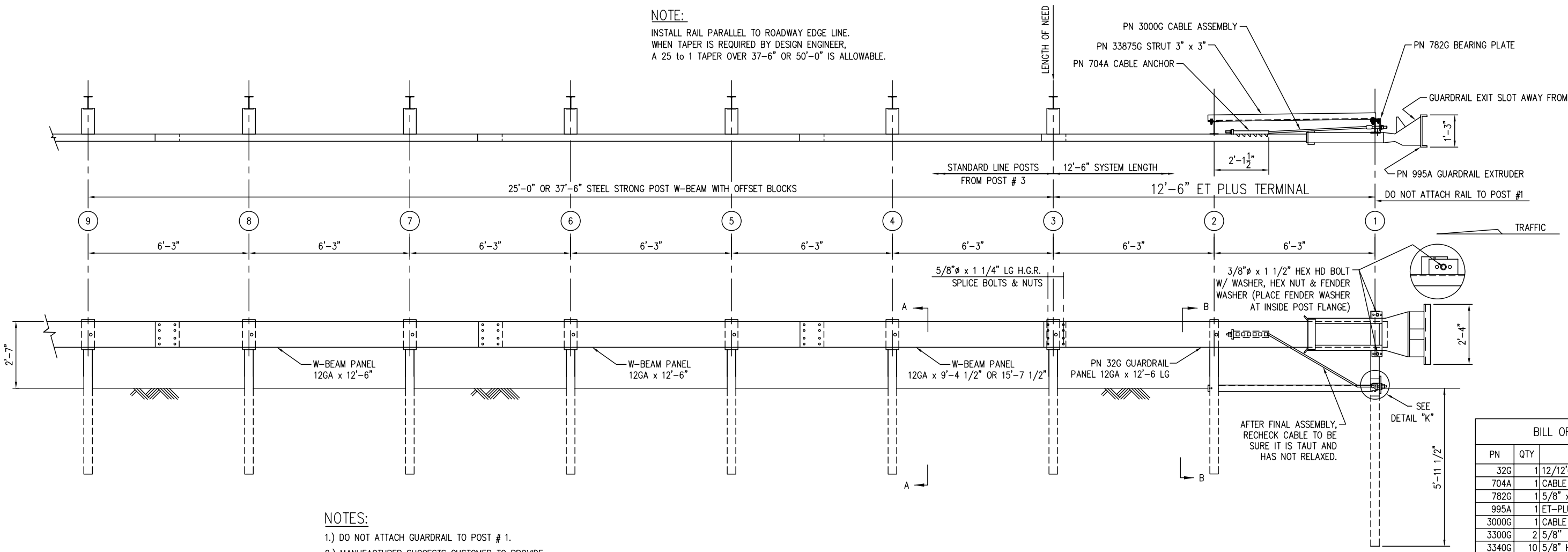
David A. Nicol
Director, Office of Safety Design
Office of Safety

Enclosures

FHWA:HSSD:NArtimovich:MB:x61795:2/26/10
File: h://directory folder/HSSD/Artimovich/CC-12Q_ET-PlueET-31_two_posts(2)
cc: HSSD (Reader, HSA; Chron File, HSSD; N.Artimovich, HSSD; D. Nicol;)

NOTE:

INSTALL RAIL PARALLEL TO ROADWAY EDGE LINE.
WHEN TAPER IS REQUIRED BY DESIGN ENGINEER,
A 25 to 1 TAPER OVER 37–6" OR 50'–0" IS ALLOWABLE.



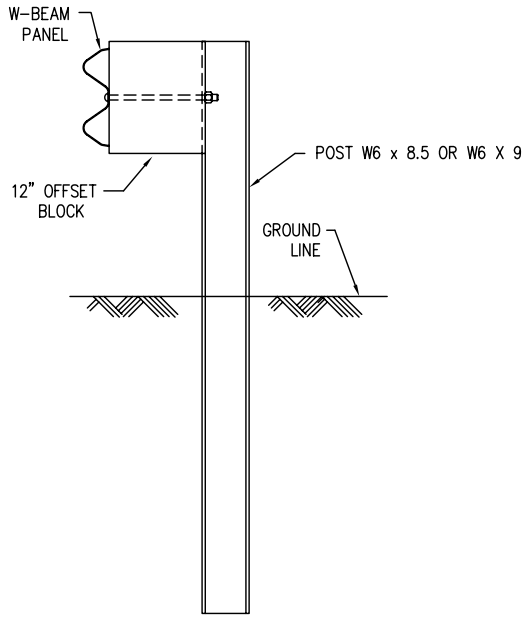
NOTES:

1.) DO NOT ATTACH GUARDRAIL TO POST # 1.

2.) MANUFACTURER SUGGESTS CUSTOMER TO PROVIDE REFLECTORIZATION OF TERMINAL.

3.) 12" PLASTIC OFFSET BLOCKS (ROUTED) ARE ACCEPTABLE ALTERNATES.

4.) 25'–0" W–BEAM PANELS ARE ACCEPTABLE ALTERNATES TO 12'–6" PANELS



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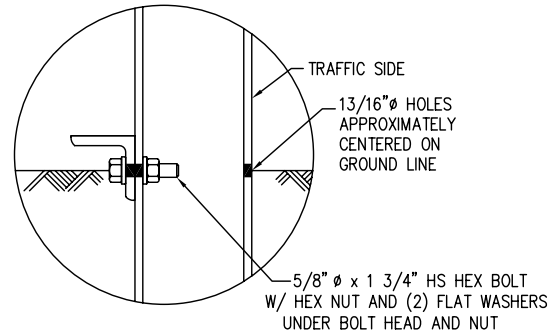
(TYP @ POSTS # 3 & BEYOND)



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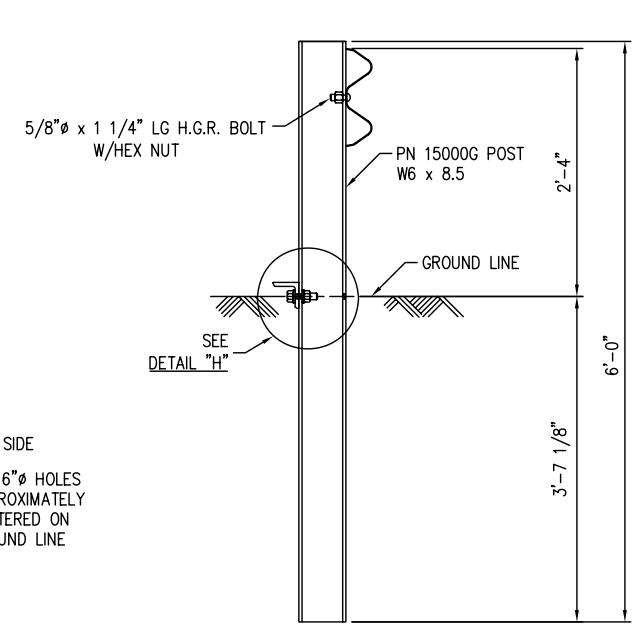

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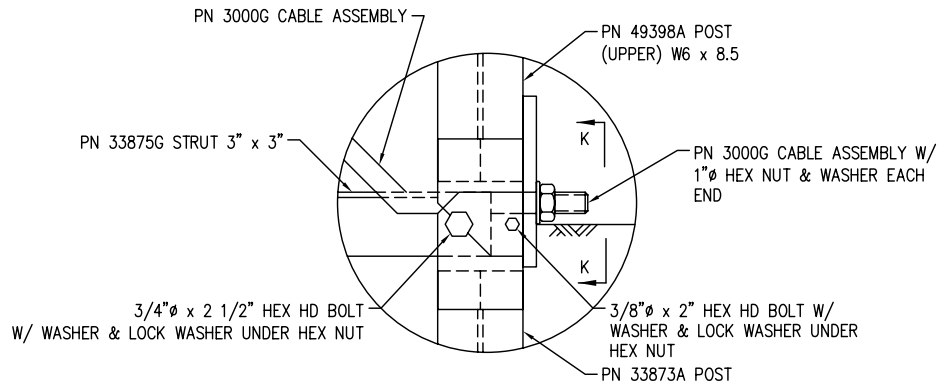

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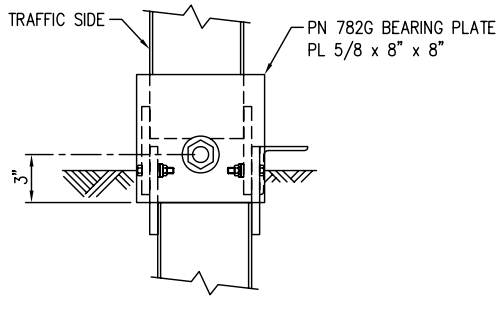


VIEW "K–K"

BILL OF MATERIAL

PN	QTY	DESCRIPTION
32G	1	12/12'6/6'3/S ANC (GUARDRAIL)
704A	1	CABLE ANCHOR BRACKET
782G	1	5/8" x 8" x 8" BEARING PLATE
995A	1	ET–PLUS EXTRUDER
3000G	1	CABLE 3/4 x 6'6
3300G	2	5/8" FLAT WASHER
3340G	10	5/8" HEX NUT
3360G	9	5/8"ø x 1 1/4" SPLICE BOLT
3391G	1	5/8"ø x 1 3/4" HS HEX HD BOLT
3701G	2	3/4" FLAT WASHER
3704G	2	3/4" HEX NUT
3717G	2	3/4"ø x 2 1/2" HEX HD BOLT
3900G	2	1" FLAT WASHER
3910G	2	1" HEX NUT
4254G	4	3/8" FLAT WASHER
4255G	2	3/8" FENDER WASHER (1 1/2 OD)
4258G	2	3/8" LOCKWASHER
4261G	2	3/8"ø x 1 1/2" HEX HD BOLT
4699G	2	3/4" LOCK WASHER
6321G	2	3/8"ø x 2" HEX HD BOLT
6405G	4	3/8" HEX NUT
15000G	1	POST SYT #2
33875G	1	ANGLE STRUT (ET/SYTP/HBA)
49398A	1	POST ET PLUS HBA #1 TOP
33873A	1	POST ET PLUS #1 BOTTOM

REV.	CHK'D	BY	DATE	REMARKS

ET–PLUS

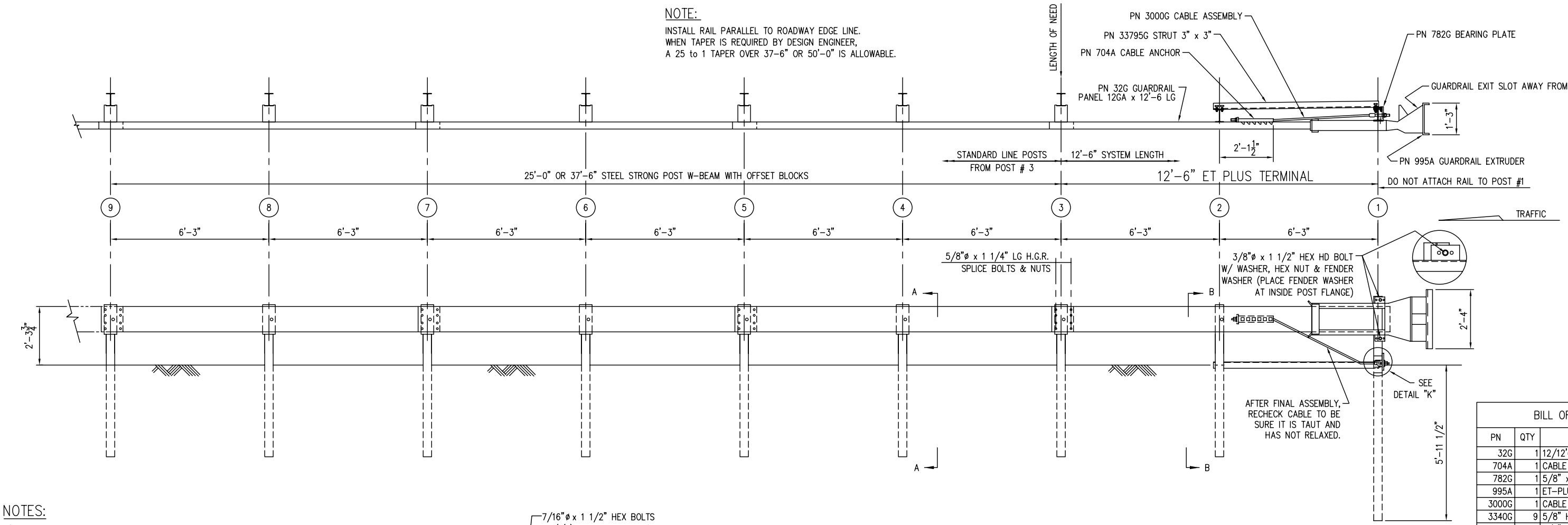
ET–PLUS – 12'–6"
31" HIGH WITH TWO POSTS
1 HBA POST & 1 SYTP
PLAN, ELEVATION & SECTIONS

TRINITY HIGHWAY PRODUCTS, LLC.
2525 STEMMONS FREEWAY
DALLAS, TX 75207

DRAWN	BT
CHECKED	BS
SCALE	N.T.S.
DATE	03–16–09
ENG. FILE #	SS557–01E
SHT.No.	E1 OF 1
DRAWING NO.	SS–557
REV.	0

NOTE:

INSTALL RAIL PARALLEL TO ROADWAY EDGE LINE.
WHEN TAPER IS REQUIRED BY DESIGN ENGINEER,
A 25 to 1 TAPER OVER 37–6" OR 50'–0" IS ALLOWABLE.



NOTES:

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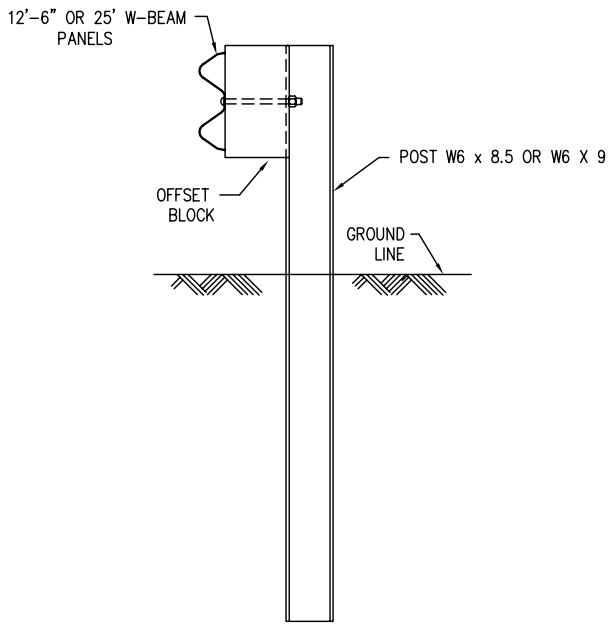
2.) MANUFACTURER SUGGESTS CUSTOMER TO PROVIDE REFLECTORIZATION OF TERMINAL.

3.) PLASTIC OFFSET BLOCKS (ROUTED) ARE ACCEPTABLE ALTERNATES.



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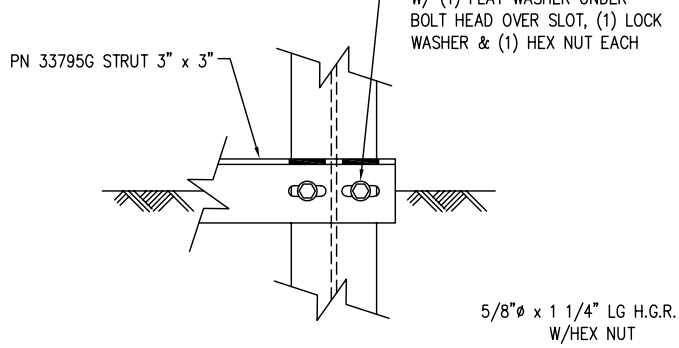
(TYP @ POSTS # 3 & BEYOND)



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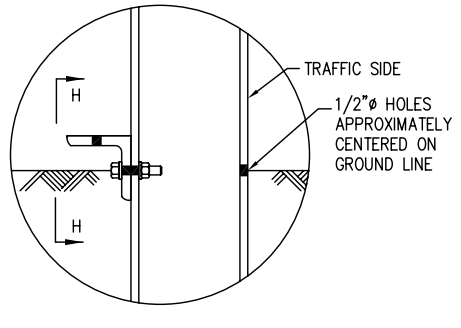

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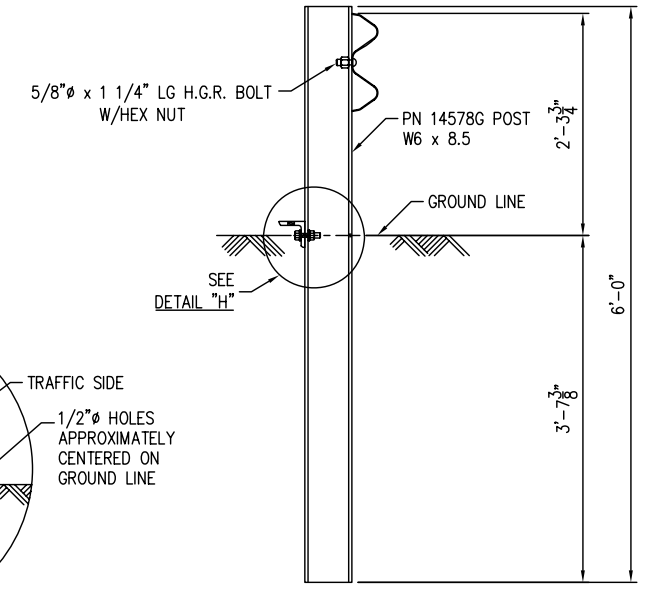

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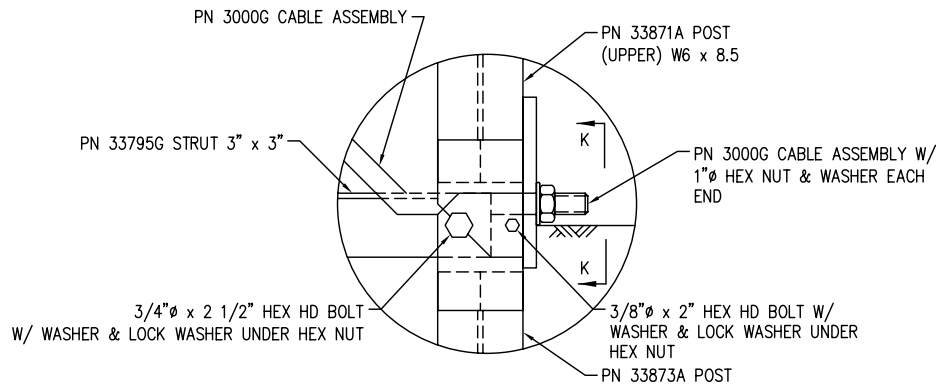

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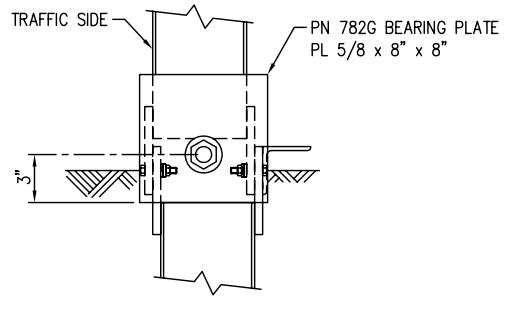

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3360G	9	5/8"ø x 1 1/4" SPLICE BOLT
3701G	2	3/4" FLAT WASHER
3704G	2	3/4" HEX NUT
3717G	2	3/4"ø x 2 1/2" HEX HD BOLT
3900G	2	1" FLAT WASHER
3910G	2	1" HEX NUT
4254G	4	3/8" FLAT WASHER
4255G	2	3/8" FENDER WASHER (1 1/2 OD)
4258G	2	3/8" LOCKWASHER
4261G	2	3/8"ø x 1 1/2" HEX HD BOLT
4389G	2	7/16" FLAT WASHER
4390G	2	7/16"ø x 1 1/2" HEX HD BOLT
4393G	2	7/16" LOCK WASHER
4396G	2	7/16" HEX NUT
4699G	2	3/4" LOCK WASHER
6321G	2	3/8"ø x 2" HEX HD BOLT
6405G	4	3/8" HEX NUT
14578G	1	POST SYT #2
33795G	1	ANGLE STRUT (ET/SYTP/HBA)
33871A	1	POST ET PLUS HBA #1 TOP
33873A	1	POST ET PLUS #1 BOTTOM

REV.	CHK'D	BY	DATE	REMARKS

ET–PLUS

ET–PLUS – 12'–6"
WITH TWO POSTS
1 HBA POST & 1 SYTP
PLAN, ELEVATION & SECTIONS

TRINITY HIGHWAY PRODUCTS, LLC.
2525 STEMMONS FREEWAY
DALLAS, TX 75207

DRAWN	BT
CHECKED	BS
SCALE	N.T.S.
DATE	03–16–09
ENG. FILE #	SS556–01E
SHT.No.	E1 OF 1
DRAWING NO.	SS–556
REV.	0

NOTE:

INSTALL RAIL PARALLEL TO ROADWAY EDGE LINE.
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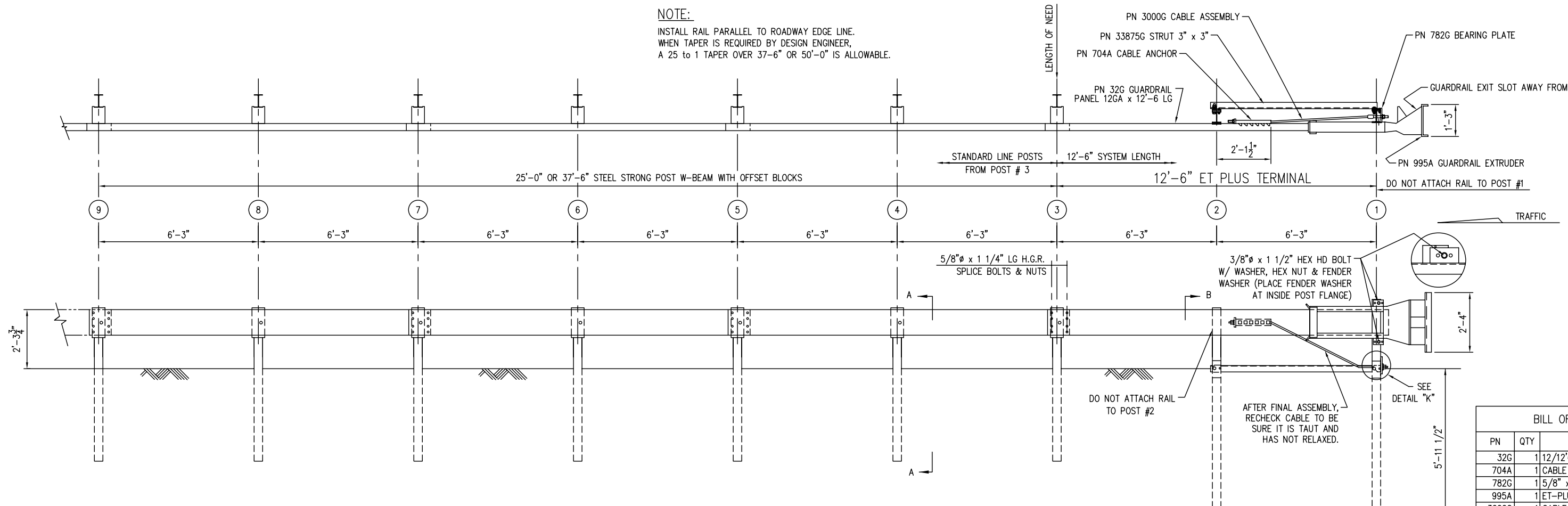

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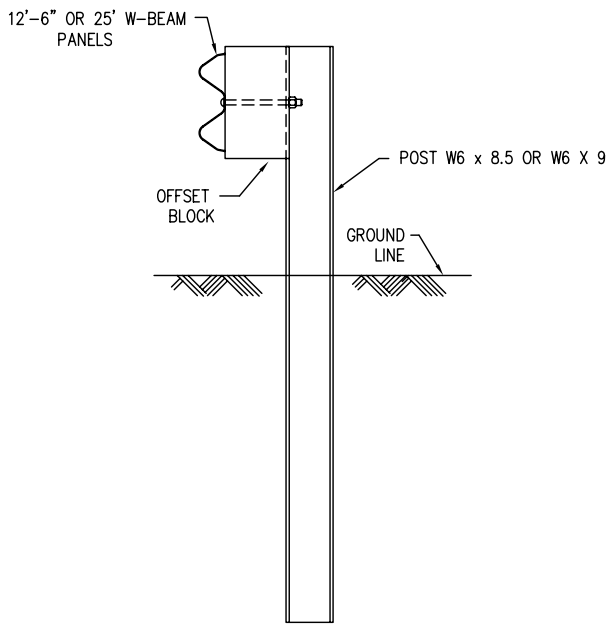

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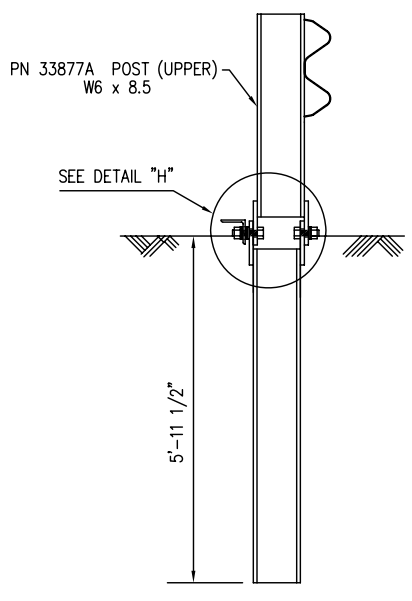
(TYP @ POSTS # 3 & BEYOND)



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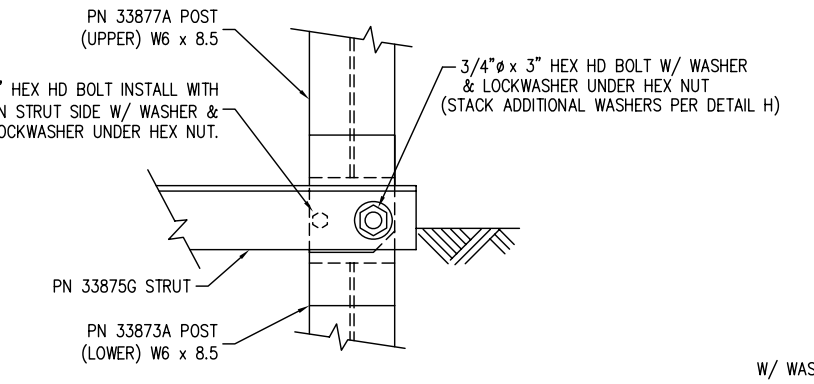

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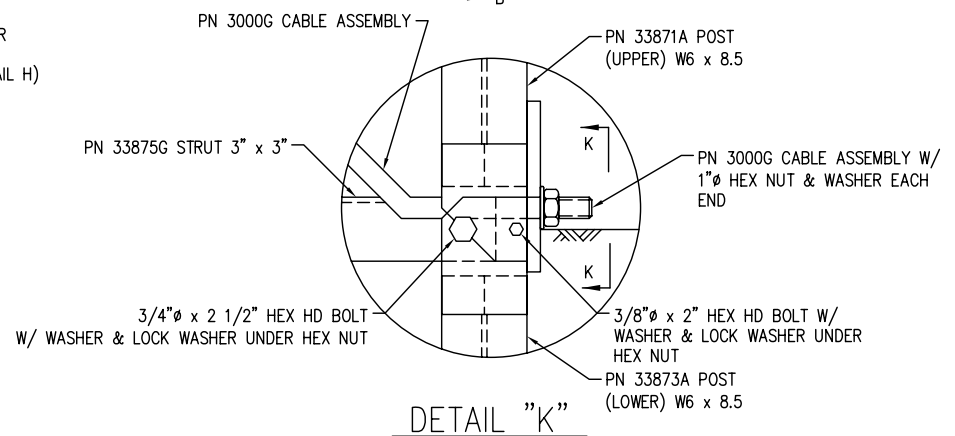

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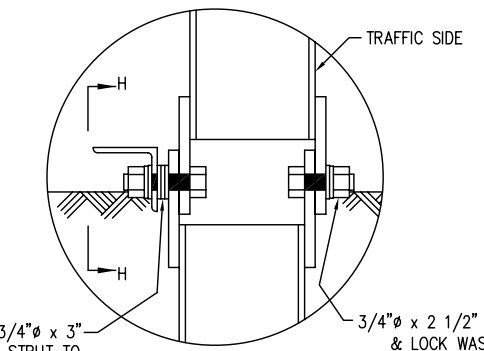

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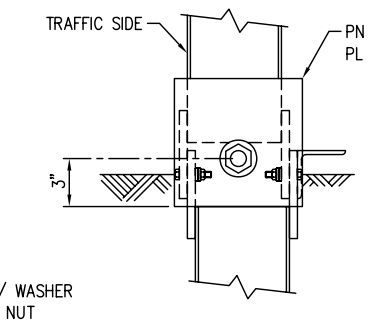

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6321G	4	3/8"ø x 2" HEX HD BOLT
6405G	6	3/8" HEX NUT
33875G	1	ANGLE STRUT (ET/HBA)
33871A	1	POST ET PLUS HBA #1 TOP
33873A	2	POST ET PLUS #1–2 BOTTOM
33877A	1	POST ET PLUS HBA #2 TOP

REV.	CHK'D	BY	DATE	REMARKS

ET-PLUS

ET–PLUS – 12'–6"
WITH TWO HBA POSTS
PLAN, ELEVATION & SECTIONS

DRAWN	BT
CHECKED	BS
SCALE	N.T.S.
DATE	03–16–09
ENG. FILE #	SS558–01E
SHT.No.	E1 OF 1
DRAWING NO.	SS–558
REV.	0

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