June 1, 2008

In Reply Refer To: HSSD/CC-88A

Dean Sicking, Ph.D., P.E.
Director, Midwest Roadside Safety Facility
University of Nebraska – Lincoln
527 Nebraska Hall
Lincoln, NE 68588-0529

Dear Dr. Sicking:

This is in response to your letter dated February 28, 2007, requesting Federal Highway Administration (FHWA) acceptance of the Sequential Kinking Terminal (SKT) and the FLared Energy Absorbing Terminal (FLEAT) using wood posts when connecting to the Midwest Guardrail System (MGS). FHWA Acceptance Letter CC-88, dated March 8, 2005, accepted these combinations based on testing with steel posts. You requested that we find these modified devices acceptable for use on the National Highway System (NHS) under the provisions of National Cooperative Highway Research Program (NCHRP) Report 350 “Recommended Procedures for the Safety Performance Evaluation of Highway Features.” We provided an informal opinion accepting this device on March 15, 2007, and have been working with you to finalize the drawings for this final acceptance package.

Introduction

The FHWA guidance on crash testing of roadside safety hardware is contained in a memorandum dated July 25, 1997, titled “INFORMATION: Identifying Acceptable Highway Safety Features.”

Two different anchor designs were used in the original MGS testing, a two post, ground line strut design and a large single post with a soil plate alternative. The upper parts of these designs were identical and Test 3-34 was conducted on the FLEAT with both anchor designs. Test FLEAT-5 used the two post and strut alternative while test FLEAT -7 used the single post anchor system. Videos, photos and reports on these tests were submitted with your original request for approval. At your request we only included the double post design in its approval letter.

Our original letter also indicated that both steel and wood post options were acceptable but you did not provide a drawing of the wood post option.
Findings

Based on prior testing discussed above we find the following terminal designs as shown in the enclosed drawings acceptable for use on the NHS under the range of conditions tested, when proposed by a State:

1) SKT terminal for the MGS, steel and wood post options.
2) FLEAT terminal for the MGS, steel and wood post options.
3) SKT with two post anchor with ground strut.
4) FLEAT with two post anchors with ground strut.

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

- Our 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, it reserves the right to modify or revoke its 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 they will meet the crashworthiness requirements of FHWA and NCHRP Report 350.

- To prevent misunderstanding by others, this letter of acceptance, designated as number CC-88A shall not be reproduced except in full. This letter, and the test documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.

- The SKT and FLEAT w-beam guardrail terminals are patented devices and considered "proprietary." The use of proprietary devices specified by a highway agency for use on Federal-aid projects must meet one of the following criteria: (a) it must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that it is essential for synchronization with existing highway facilities or that no equally suitable alternative exists; or (c) it 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
TRAFFIC

PLAN

ELEVATION

GENERAL NOTES:
1. Breakaway posts are required with the FLEAT.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The lower sections of the posts shall not protrude more than 4 in above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
4. The lower sections of the hinged posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
5. When rock is encountered, a 10" Ø post hole, 20 in. into the rock surface may be used if approved by the engineer. Granular material will be placed in the bottom of the hole, approximately 2.5" deep to provide drainage. The first two posts can be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
6. The breakaway cable assembly must be taut. A locking device (via grips or channel lock [M40]) should be used to prevent the cable from twisting when tightening nuts.
GENERAL NOTES:

1. Breakaway posts are required with the FLEAT.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The foundation tubes shall not protrude more than 4 in above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
4. When rock is encountered, a 12" x 20 in post hole, 20 in into the rock surface may be used if approved by the engineer. Granular material will be placed in the bottom of the hole, approximately 2.5" deep to provide drainage. The soil tubes can be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
5. The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.
6. The soil tubes may be driven with an approved driving head. They shall not be driven with the post in the tube.
7. The wood blockouts should be "tie-nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.

Road Systems, Inc.
Midwest Guardrail System
Universal Wood Posts

04/24/2008
TRAFFIC

PLAN

ELEVATION

ITEM

QTY

A 1 IMPACT HEAD
B 1 N-BEAM GUARDRAIL END SECTION, 12 G. SF1303
C 2 N-BEAM GUARDRAIL, 12 G. SF1303
D 1 FIRST POST ASSEMBLY TOP UNP1A
E 1 FIRST POST ASSEMBLY BOTTOM HP1B
F 1 SECOND POST ASSEMBLY TOP UNP2A
G 1 SECOND POST ASSEMBLY BOTTOM HP2B
H 1 BOXING PLATE E750
J 1 CABLE ANCHOR BOX S/750
K 1 CABLE ANCHOR ASSEMBLY E770
L 1 GROUND STRUT PINNED POST S775
M 5 ROUTED TIMBER BLOCKOUT OR PREC. G. PIN. P419

ITEM NO.

F300A
SF1303
SF1303
UNP1A
HP1B
UNP2A
HP2B
E750
S750
S775
P419

NOTE:

1. Breakaway posts are required with the FLEAT.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The lower sections of the posts shall not protrude more than 4 in above the ground (measured along a 5° cord). Site grading may be necessary to meet this requirement.
4. The lower sections of the hinged posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
5. When rock is encountered, a 10” x 10” post hole, 20” in into the rock surface may be used if approved by the engineer. Granular material will be placed in the bottom of the hole, approximately 2.5” deep to provide drainage. The first two posts can be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
6. The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.

FLEAT Terminal
Metric Height
Universal Steel Posts
Hinged and Welded Options

R-SI
Road Systems, Inc.

BL-M-UP

04/24/2008
**GENERAL NOTES:**

1. Breakaway posts are required with the SKT.
2. All bolts, nuts, cable anchors and bearing plates shall be galvanized.
3. The SKT can be flared at a rate of up to 25:1 to prevent the impact head from encroaching on the shoulder.
4. The lower sections of the posts shall not protrude more than 4" above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
5. The lower section of the hinged posts shall not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
6. When rock is encountered, a 10" x 20" post hole, 20" into the rock surface may be used if approved by the engineer. Granular material will be placed in the bottom of the hole, approximately 2.5" deep to provide drainage. Posts 1 & 2 can be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
7. The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.
8. A site evaluation should be considered if there is less than 25' between the outlet side of the terminal and any adjacent driving lane.

**HARDWARE (ALL DIMENSIONS IN INCHES):**

- 2 1/4 x 4 HEX BOLT GRD 5
- 4 1/4 WASHER
- 2 1/4 HEX NUT
- 17 5/8 Dia. x 1 1/4 SPLICE BOLT, POST #2
- 4 5/8 16' BOLT (POSTS 3 THRU 6)
- 1 5/8 Dia. x 9 HEX BOLT GRD 5
- 7 5/8 WASHER
- 22 5/8 Dia. H.G.R NUT
- 2 ANCHOR CABLE HEX NUT
- 2 ANCHOR CABLE WASHER
- 8 CABLE ANCHOR BOX SHOULDER BOLT
- 16 1 1/16 OD x 9/16 ID A325 STR. WASHER

**WELDED POST QUANTITIES:**

- WELDED BREAKAWAY POST
- 1 3/4 Dia. x 8 1/2 HEX BOLT GRD 5
- 1 3/4 HEX NUT

**HINGED POST QUANTITIES:**

- 4 BREAKAWAY LINE POST TOP
- 1 HINGED POST
- 4 BREAKAWAY LINE POST BOTTOM

- 1 3/4 Dia. x 8 1/2 HEX BOLT GRD 5
- 1 3/4 HEX NUT

**BILL OF MATERIALS:**

- SKT-LITE
- Midwest Guardrail System
- Universal Steel Posts
- Hinged and Welded Options
TRAFFIC CONNECTION DETAILS

End payment for installation

ELEVATION

W-Beam Guardrail
72"

IMPACT HEAD CONNECTION DETAIL SECTION A-A, Post #2

BILL OF MATERIALS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>BILL OF MATERIALS</th>
<th>QTY</th>
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<tbody>
<tr>
<td>A</td>
<td>IMPACT HEAD</td>
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<tr>
<td>B</td>
<td>W-Beam Guardrail</td>
<td>1</td>
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<tr>
<td>C</td>
<td>W-Beam Guardrail</td>
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<td>D</td>
<td>FOUNDATION TUBE</td>
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<td>F</td>
<td>GROUND STRUT</td>
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<td>G</td>
<td>UNIVERSAL CPT WOOD POST</td>
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<td>H</td>
<td>BEARING PLATE</td>
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</tr>
<tr>
<td>I</td>
<td>PIPE SLEEVE</td>
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<tr>
<td>J</td>
<td>CABLE ANCHOR BOX</td>
<td>1</td>
</tr>
<tr>
<td>K</td>
<td>BCT CABLE ANCHOR ASSEMBLY</td>
<td>1</td>
</tr>
<tr>
<td>L</td>
<td>W-Timber (blockout or recyl. equiv.)</td>
<td>5</td>
</tr>
</tbody>
</table>

GENERAL NOTES:
1. Breakaway posts are required with the FLEAT.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The foundation tubes shall not protrude more than 4 in above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
4. When rock is encountered, a 12" Ø post hole, 20 in into the rock surface may be used if approved by the engineer. Granular material will be placed in the bottom of the hole, approximately 2.5" deep to provide drainage. The soil tubes can be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
5. The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.
6. The soil tubes may be driven with an approved driving head. They shall not be driven with the post in the tube.
7. The wood blockouts should be "toe-nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
LENGTH OF NEED H, J(Hinged) OR PW(Welded) POSTS 3 THRU B

GENERAL NOTES:
1. Breakaway posts are required with the SKT.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The SKT can be flared at a rate of up to 25:1 to prevent the impact head from encroaching on the shoulder.
4. The lower sections of the hinged posts shall not protrude more than 6" above the ground (measured along a 9 in. cord). Side geotextile may be necessary to meet this requirement.
5. The lower section of the hinged posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
6. When rock is encountered, a 10" Ø post hole, 20" into the rock surface may be used if approved by the engineer. Granular material will be placed in the bottom of the hole, approximately 2.5" deep to provide drainage. Posts 4 & 6 can be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
7. The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.
8. A site evaluation should be considered if there is less than 25’ between the outlet side of the terminal and any adjacent driving line.

ITEM NO. | DESCRIPTION | QUANTITY | ITEM NO. | DESCRIPTION | QUANTITY
--- | --- | --- | --- | --- | ---
A | IMPACT HEAD | 1 | S3000 | IMPACT HEAD | 1
B | W-BEAM GUARDRAIL END SECTION, 12 Ga. | 1 | S1103 MGS | W-BEAM GUARDRAIL END SECTION, 12 Ga. | 1
C | W-BEAM GUARDRAIL, 12 Ga. | 1 | G1203 MGS | W-BEAM GUARDRAIL, 12 Ga. | 1
D | FIRST POST ASSEMBLY TOP | 1 | U4F1A | FIRST POST ASSEMBLY TOP | 1
E | FIRST POST ASSEMBLY BOTTOM | 1 | H1T1B | FIRST POST ASSEMBLY BOTTOM | 1
F | SECOND POST ASSEMBLY TOP | 1 | U4F2A | SECOND POST ASSEMBLY TOP | 1
G | SECOND POST ASSEMBLY BOTTOM | 1 | H1T2B | SECOND POST ASSEMBLY BOTTOM | 1
H | BEARING PLATE | 1 | E750 | BEARING PLATE | 1
I | CABLE ANCHOR BOX | 1 | S760 | CABLE ANCHOR BOX | 1
J | CABLE ANCHOR BOX | 1 | S760 | CABLE ANCHOR BOX | 1
K | GROUND STRUT HINGED POST | 1 | S780 |G | GROUND STRUT WELDED POST | 1 | S780
L | GROUND STRUT WELDED POST | 1 | S780 | E | GROUND STRUT WELDED POST | 1 | S780
M | CABLE ANCHOR BOX | 1 | S760 | CABLE ANCHOR BOX | 1 | S760
N | CABLE ANCHOR BOX | 1 | S760 | CABLE ANCHOR BOX | 1 | S760
O | CABLE ANCHOR BOX | 1 | S760 | CABLE ANCHOR BOX | 1 | S760

HARDWARE (ALL DIMENSIONS IN INCHES)

B 1/4 x 4 HEX BOLT GRD 5 | 2 | B140404A
C 1/4 HEX NUT | 2 | B140404A
D 5/8 Dia. x 1 1/4 SPLICE BOLT, POST #2 | 6 | B58122
E 5/8 Dia. x 14 H.G.R. BOLT (POSTS 3 THRU 8) | 6 | B581402
F 5/8 Dia. x 9 HEX BOLT GRD 5 | 6 | B589294A
G 5/8 WASHER | 2 | B580122
H 5/8 Dia. H.G.R NUT | 2 | B581402
I 1/2 ANCHOR CABLE HEX NUT | 2 | B580122
J 1/2 ANCHOR CABLE WASHER | 2 | B580122
K 3/4 Dia. x 1/2 HEX BOLT GRD 5 | 6 | B340B54A
L 3/4 Dia. HEX NUT | 6 | B340B54A
M 3/4 Dia. x 1/2 HEX BOLT GRD 5 | 6 | B340B54A
N 3/4 Dia. HEX NUT | 6 | B340B54A
O 1 1/16 Dia. x 9/16 A325 STRUCT. NUT | 16 | B325 A325 STR. WASHER
P 1 1/16 Dia. x 9/16 A325 STRUCT. NUT | 16 | B325 A325 STR. WASHER
Q 1 1/16 Dia. x 9/16 A325 STRUCT. NUT | 16 | B325 A325 STR. WASHER
R 1 1/16 Dia. x 9/16 A325 STRUCT. NUT | 16 | B325 A325 STR. WASHER
S 1 1/16 Dia. x 9/16 A325 STRUCT. NUT | 16 | B325 A325 STR. WASHER
T 1 1/16 Dia. x 9/16 A325 STRUCT. NUT | 16 | B325 A325 STR. WASHER
U 3/4 Dia. HEX BOLT GRD 5 | 6 | B340B54A
V 3/4 Dia. HEX NUT | 6 | B340B54A
W 3/4 Dia. HEX BOLT GRD 5 | 6 | B340B54A
X 3/4 Dia. HEX NUT | 6 | B340B54A
Y 3/4 Dia. HEX BOLT GRD 5 | 6 | B340B54A
Z 3/4 Dia. HEX NUT | 6 | B340B54A

WELDED POST QUANTITIES

M/W 6 WELDED BREAKAWAY POST | 6 | U13021
P 1 3/4 Dia. x 8 1/2 HEX BOLT GRD 5 | 6 | B340B54A
Q 1 3/4 Dia. HEX NUT | 6 | B340B54A
R 1 3/4 Dia. HEX NUT | 6 | B340B54A
S 1 3/4 Dia. HEX NUT | 6 | B340B54A
T 1 3/4 Dia. HEX NUT | 6 | B340B54A
U 1 3/4 Dia. HEX NUT | 6 | B340B54A
V 1 3/4 Dia. HEX NUT | 6 | B340B54A

HINGED POST QUANTITIES

H 6 BREAKAWAY LINE POST TOP | 6 | U13021
J 6 BREAKAWAY LINE POST BOTTOM | 6 | U13021
K 7 3/4 Dia. x 8 1/2 HEX BOLT GRD 5 | 6 | B340B54A
L 7 3/4 Dia. HEX NUT | 6 | B340B54A
M 7 3/4 Dia. HEX NUT | 6 | B340B54A

ARCHIVED
FOR RESEARCH AND HISTORICAL PURPOSES ONLY

Road Systems, Inc.
Sequential Kinking Terminal
SKT-MGS Height
Steel Post System
Hinged and Welded Options

Sheet: 1
Date: 04/24/2008
Scale: NONE

By: JNR

Road Systems, Inc.
Phone: 423-502-3065
Fax: 423-502-3011

SKT-MGS-S UP
**GENERAL NOTES:**

1. Breakaway posts are required with the SKT.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The SKT can be flared at a rate of up to 25:1 to prevent the impact head from encroaching on the shoulder.
4. The foundation tubes shall not protrude more than 4' above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
5. When rock is encountered, a 12' 0 post hole, 20'' into the rock surface may be used if approved by the engineer. Granular material will be placed in the bottom of the hole, approximately 2.5'' deep to provide drainage. The soil tubes can be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
6. The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.
7. A site evaluation should be considered if there is less than 25' between the adjacent side of the terminal and any adjacent driving line.
8. The soil tubes may be driven with an approved driving head. They shall not be driven with the post in the tube.
9. The wood blocks should be "tie-nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.

**ITEM NO.**

- A 1 IMPACT HEAD S3000
- B 1 W-BEAM GUARDRAIL END SECTION, 12 Ga. S1303 MGS
- C 2 W-BEAM GUARDRAIL, 12 Ga. G1203 MGS
- D 2 FOUNDATION TUBE E73730
- E 2 UNIVERSAL DOT WOOD POST UP629
- F 1 GROUND STRUT E790
- G 4 UNIVERSAL DOT WOOD POST UP971
- H 1 BEARING PLATE E740
- J 1 PIPE SLEEVE E740
- K 1 CABLE ANCHOR BOX S769
- L 1 DET CABLE ANCHOR ASSEMBLY E770
- M 4 MGS TIMBER BLOCKOUT OR EQUIV. P877

**HARDWARE (ALL DIMENSIONS IN INCHES):**

- A 16 5/8 x 1 1/4 SPICE BOLT E659122
- B 2 5/8 x 8 HEX BOLT E659204
- C 2 5/8 x 10 HEX BOLT E659204
- D 1 5/8 x 10 H.G.R. BOLT E659202
- E 4 5/8 x 22 H.G.R. BOLT E658202
- F 25 5/8 H.G.R. NUT N050
- G 2 5/8 H.G.R. WASHER W050
- H 2 5/8 ANCHOR CABLE HEX NUT N100
- J 2 5/8 ANCHOR CABLE WASHER W100
- K 2 1/4 x 3 LAG SCREW E350
- M 2 CABLE ANCHOR BOX SHOULDER BOLT S9058A
- N 1/2 x 10 A325 STRUCTURAL NUT N055A
- O 16 1/16 x 8/14 10 A325 STR. WASHER W050A

**OPTIONAL FLARED INSTALLATION:**

25:1 maximum flare rate
GENERAL NOTES:
1. Breakaway posts are required with the SKT.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The SKT can be flared at a rate of up to 25:1 to prevent the impact head from encroaching on the shoulder.
4. The lower sections of the posts shall not protrude more than 4" above the ground (measured along a 9' cord). Site grading may be necessary to meet this requirement.
5. The lower section of the hinged posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
6. When rock is encountered, a 10" Ø post hole, 20" into the rock surface may be used if approved by the engineer. Granular material will be placed in the bottom of the hole, approximately 2.5" deep to provide drainage. Posts 1 & 2 can be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
7. The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.
8. A site evaluation should be considered if there is less than 25' between the outlet side of the terminal and any adjacent driving lane.

**BILL OF MATERIALS**

**PART NO.**

- IMPACT HEAD
- FIRST POST ASSEMBLY TOP
- FIRST POST ASSEMBLY BOTTOM
- SECOND POST ASSEMBLY TOP
- SECOND POST ASSEMBLY BOTTOM
- BEARING PLATE
- CABLE ANCHOR BOX
- CABLE ANCHOR ASSEMBLY
- GROUND STRUT HINGED POST
- WELDED POST QUANTITIES

**PARTS LIST**

- Impact Head
- First Post Assembly Top
- First Post Assembly Bottom
- Second Post Assembly Top
- Second Post Assembly Bottom
- Bearing Plate
- Cable Anchor Box
- Cable Anchor Assembly
- Ground Strut Hinged Post
- WELDED POST QUANTITIES

**SEQUENTIAL PINNING TERMINAL**

- SKT LITE Metric Height
- Steel Post System
- Hinged and Welded Options

**BILL OF MATERIALS**

- Impact Head
- First Post Assembly Top
- First Post Assembly Bottom
- Second Post Assembly Top
- Second Post Assembly Bottom
- Bearing Plate
- Cable Anchor Box
- Cable Anchor Assembly
- Ground Strut Hinged Post
- WELDED POST QUANTITIES

**PARTS LIST**

- Impact Head
- First Post Assembly Top
- First Post Assembly Bottom
- Second Post Assembly Top
- Second Post Assembly Bottom
- Bearing Plate
- Cable Anchor Box
- Cable Anchor Assembly
- Ground Strut Hinged Post
- WELDED POST QUANTITIES
TRAFFIC PLAN

GENERAL NOTES:
1. Breakaway pasts are required with the SKT.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The SKT can be flared at a rate of up to 25:1 to prevent the impact head from encroaching on the shoulder.
4. The foundation tubes shall not protrude more than 4" above the ground. Site grading may be necessary to meet this requirement.
5. When rock is encountered, a 12" post hole, 20" into the rock surface may be used. Gravel or crushed stone shall be placed in the bottom of the hole, approximately 2.5" deep to provide drainage. The soil tubes can be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
6. The breakaway cable assembly must be fastened. A locking device (e.g., a vice grip or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.
7. A site evaluation should be considered if there is less than 25' between the outlet side of the terminal and any adjacent driving lane.
8. The soil tubes may be driven with an approved driving head. They shall not be driven with the post in the tube.
9. The wood blockouts should be "toe-nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.

TRAFFIC

OPTIONAL FLARED INSTALLATION
25:1 maximum flare rate

Sequential Kinking Terminal
Midwest Guardrail System
Universal Wood Posts
GENERAL NOTES:
1. Breakaway posts are required with the SKT.
2. All baits, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The SKT can be flared at a rate of up to 25:1 to prevent the impact head from encroaching on the shoulder.
4. The lower sections of the posts shall not protrude more than 4" above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
5. The lower section of the hinged posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
6. When rock is encountered, a 10" x 2" post hole, 20" into the rock surface may be used if approved by the engineer. Granular material will be placed in the bottom of the hole, approximately 2.0' deep to provide drainage. Posts 3 & 4 can be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
7. The breakaway cable assembly must be fitted with a locking device (vice grips or channel lock pliers) to prevent the cable from twisting when tightening nuts.
8. A site evaluation should be considered if there is less than 25' between the outlet side of the terminal and any adjacent driving lane.

TRAFFIC PLAN

CR @ 0
751n T 751n
G) @ @
(j)
Standard

ELEVATION

POST #1 CONNECTION DETAILS

SIDE VIEW

FRONT VIEW

OPTIONAL FLARED INSTALLATION
25:1 maximum flare rate
End payment for installation

TRAFFIC PLAN

ELEVATION

OPTIONAL FLARED INSTALLATION
25:1 maximum flare rate

GENERAL NOTES:
1. Breakaway posts are required with the SKT.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The SKT can be flared at a rate of up to 25:1 to prevent the impact head from encroaching on the shoulder.
4. The foundation tubes shall not protrude more than 4" above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
5. When rock is encountered, a 12'Ø post hole, 20' into the rock surface may be used if approved by the engineer. Granular material will be placed in the bottom of the hole, approximately 2.5' deep to provide drainage. The soil tubes can be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
6. The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.
7. A site evaluation should be considered if there is less than 25' between the outlet side of the terminal and any adjacent driving lane.
8. The soil tubes may be driven with an approved driving head. They shall not be driven with the post in the tube.
9. The wood blackouts should be "Toe-nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.

ELEVATION

SECTION A-A

SECTION B-B

Posts 3 thru 6

ROAD SYSTEMS, INC.
Bryan, TX
Phone: 979-822-4668
Fax: 979-822-6926

Sequential Kinking Terminal
SKT-LITE Metric Height
Universal Wood Posts

#04/24/2008

JRB

Unchanged

FOR RESEARCH AND HISTORICAL PURPOSES ONLY

Archived

For Research
and Historical Purposes
Only

BILL OF MATERIALS

<table>
<thead>
<tr>
<th>ITEM No.</th>
<th>BIL OF MATERIALS</th>
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<tbody>
<tr>
<td>A 1</td>
<td>IMPACT HEAD</td>
<td>S1000</td>
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<td>B 1</td>
<td>W-BEAM GUARDRAIL END SECTION, 12 Go.</td>
<td>S1303/5</td>
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<tr>
<td>C 1/1</td>
<td>W-BEAM GUARDRAIL, 12 Go.</td>
<td>D1823</td>
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<td>D 2</td>
<td>FOUNDATION TUBE</td>
<td>E730 / S730</td>
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<td>E 2</td>
<td>UNIVERSAL BCT WOOD POST</td>
<td>UP600</td>
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<tr>
<td>F 1</td>
<td>GROUND STRUT</td>
<td>E790</td>
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<tr>
<td>G 4</td>
<td>UNIVERSAL CRT WOOD POST</td>
<td>UP671</td>
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<tr>
<td>H 1</td>
<td>BEARING PLATE</td>
<td>Z750</td>
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<td>J 1</td>
<td>PIPE SLEEVE</td>
<td>E740</td>
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<td>K 1</td>
<td>CABLE ANCHOR BOX</td>
<td>Z790</td>
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<td>L 1</td>
<td>BCT CABLE ANCHOR ASSEMBLY</td>
<td>E770</td>
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<tr>
<td>M 4</td>
<td>6&quot;x8&quot; TIMBER BLOCKOUT OR EQUIVALENT</td>
<td>E767</td>
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HARDWARE (ALL DIMENSIONS IN INCHES)

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<td>b 2 5/8 x 6 HEX BOLT</td>
<td>S890804</td>
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<td>c 2 5/8 x 10 HEX BOLT</td>
<td>S891004</td>
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<td>d 1 5/8 x 8 H.G.R. BOLT</td>
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<td>e 4 5/8 x 18 H.G.R. BOLT</td>
<td>S891802</td>
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<td>f 2 3/8 x 3 LAG SCREW</td>
<td>0380</td>
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<tr>
<td>g 5 H.G.R. WASHER</td>
<td>W50</td>
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<tr>
<td>h 2 1 ANCHOR CABLE HEX NUT</td>
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<tr>
<td>i 2 1 ANCHOR CABLE WASHER</td>
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<td>k 2 3/8 x 3 LAG SCREW</td>
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<td>m 8 CABLE ANCHOR BOX SHOULDER BOLT</td>
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<tr>
<td>n 8 1/2 A325 STRUCTURAL NUT</td>
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<td>o 16 1-1/8 OD x 5/16 ID A325 SW. WASHER</td>
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</table>
TRAFFIC

MGS Height

Metric Height

Universal Hinge Post Comparison

Road Systems, Inc.
Big Spring, TX
Phone: 432-362-2438
or Phone: 330-346-0721

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GENERAL NOTES:
1. Breakaway posts are required with the SKT.
2. A total of four breakaway assemblies, cable anchors and bearing plates shall be required.
3. The SKT shall be driven at a rate of up to 25:1 to prevent the impact head from anchoring the shoulder.
4. The foundation tubes shall not protrude more than 75 mm from the ground. Use of a drilling tool along a straight line.
5. Site grading may be necessary to meet specific requirements.
6. Granular material will be placed in the bottom of the hole, approximately 75 mm deep to provide drainage.
7. Site evaluation should be considered if there is less than 25' between the outlet side of the terminal and any adjacent driving lane.
8. The soil tubes should be driven to the specified depth and backfilled with adequately compacted material excavated from the hole.
9. The wood blocks should be "toe-nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.

OPTIONAL FLARED INSTALLATION
25:1 maximum flare rate

TRAFFIC CD Q)

PLAN

ELEVATION

ITEM | BILL OF MATERIALS | ITEM NO.
--- | --- | ---
A | IMPACT HEAD | S3000
B | W-BEAM GUARDRAIL END SECTION, 12 Ga. | 51393/5
C | W-BEAM GUARDRAIL, 12 Ga. | 51393/5
D | FOUNDATION TUBE | EP3X5
E | UNIVERSAL BCT WOOD POST | UP4X6
F | GROUND STRUT | E780
G | UNIVERSAL CTR WOOD POST | UP4X7
H | BEARING PLATE | E750
J | PIPE SLEEVE | E740
K | CABLE ANCHOR BOX | E770
L | CABLE ANCHOR ASSEMBLY | E770
M | 5/8" TIMBER BLOCKOUT OR EQUIV. | P675
N | IMPACT HEAD CONNECTION DETAIL | P675
O | W-BEAM GUARDRAIL | EPW122
P | 5/8" x 1 1/4" SLEEVE BOLT | BS580122
Q | 5/8" x 8 HEX BOLT | BS580804
R | 5/8" x 10 HEX BOLT | BS581004
S | 5/8" x 12 H.G.R. BOLT | BS581202
T | 6/8" x 3/8" H.G.R. NUT | N050
U | 7 H.G.R. WASHER | W050
V | 1 ANCHOR CABLE HEX NUT | N100
W | 1 ANCHOR CABLE WASHER | W100
X | 2 3/8 x 3 LAG SCREW | E350
Y | CABLE ANCHOR BOX SHOULDER BOLT | S658A
Z | 1 1/16 OD x 6/16 ID A325 STR. WASHER | W050A
NOTE:
All holes locations should reference the bottom of the post.

NOTE:
All hole locations should reference the top of the post.