To: SUPERSEDED BY EB 06-057 EFFECTIVE 5/3/07		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 02-028

Title: **REVISIONS to STANDARD SPECIFICATIONS, TYPE C END ASSEMBLY FOR BOX BEAM MEDIAN BARRIER and TYPE III END ASSEMBLY FOR BOX BEAM GUIDE RAIL**

Distribution:		Approved:
☒ Manufacturers (18)	☐ Surveyors (33)	P.J. CLARK, Deputy Chief Engineer Design — 09/11/02 Date
☒ Main Office (30)	☒ Consultants (34)	
☒ Local Govt. (31)	☒ Contractors (39)	
☒ Regions/Agencies (32)	☐ _____ ( )	

ADMINISTRATIVE INFORMATION:

- This Engineering Instruction (EI) is effective with projects submitted for the letting of 01-16-03. The shelf note may be used in contracts let previously, including awarded contracts.
- This EI does not supersede any issuances.
- The contents of this EI will be incorporated into the next Addendum to or printing of the *Standard Specifications*.
- This EI requires no new actions from designers.

PURPOSES. The purposes of this EI are to :

- Issue revised standard materials and manufacturing specifications for Box Beam Median Barrier End Assemblies, Type C and Type C (Rustic). Pay items affected are:
  606.1403 (M) Box Beam Median Barrier End Assembly, Type C, and
  606.1453 (M) Box Beam Median Barrier End Assembly, Type C (Rustic)
- Standardize the distance between pay limits for the Type III and Type C end assemblies to be 15 meters from their previous 14.980 and 15.065 meters, respectively.

TECHNICAL INFORMATION:

Changes. These revised specifications provide for optional use of either the *Wyoming box beam end terminal* style or the *box beam bursting energy absorbing terminal* style end assemblies for use with the box beam median barrier systems. The revisions authorize the use of box beam bursting style end assemblies in the pay items indicated above. Previously only the Wyoming style was permitted for use as a Type C median barrier end assembly. Either style was previously acceptable for use as end terminals for box beam guide rail.

Layout and Grading Information. See HDM § 10.2.2.1.

Estimated Cost. The installed cost of Wyoming Box-Beam End Terminal (WYBET) in recent past has been $4000 based on bid prices. Rustic versions will cost ± $2500 more. The introduction of BEAT is expected to stabilize or decrease these prices because of increased competition.

Usage. See HDM 10.2.5.4D.

Functional Description of the System. See HDM 10.2.5.4C and D.

Structural Description of the System. See the drawing attached.

IMPLEMENTATION.

Design

- Starting with the effective letting date, DQAB will insert the shelf notes into the proposals containing the above items.
- Designers wishing to allow the alternative median barrier end assembly earlier than the effective letting date must either include the attached shelf note with their PS&Es or provide it with their amendment request.

Construction

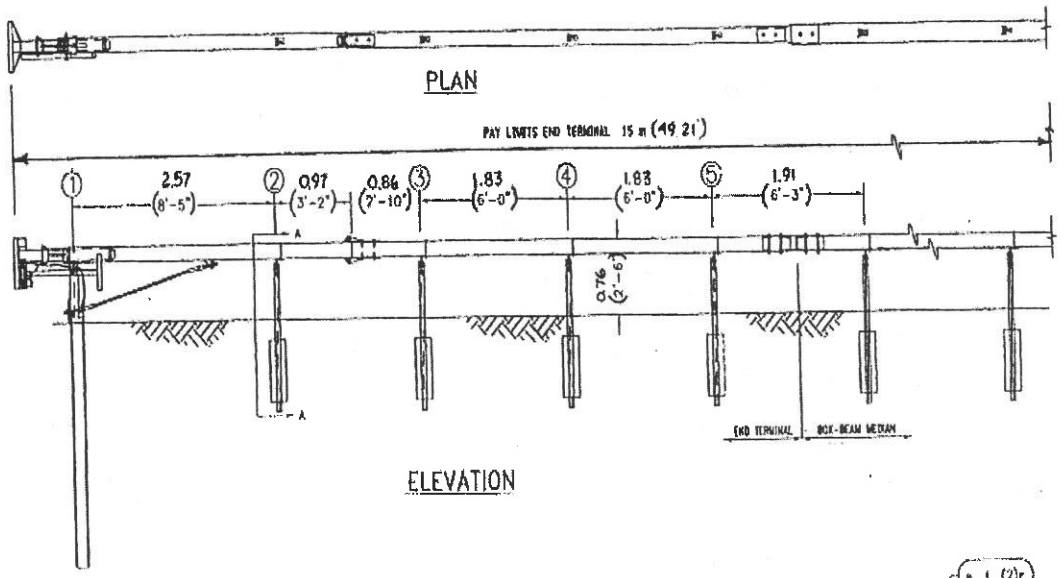
- On existing contracts in the pre-award phase or already in construction, the changes may be incorporated into the Contract, if requested, as a "minor change to specifications" in accordance with §104-03 of the *Contract Administration Manual.* This is also known as *Murk Part I A.* A copy of this engineering instruction should be filed in the project files to serve as documentation instead of the Engineering Bulletin mentioned in that reference.
- EICs should provide the extra copies of the manufacturer's drawings and literature required to be provided with the product to the Maintenance Group for use by that group and the Residency.

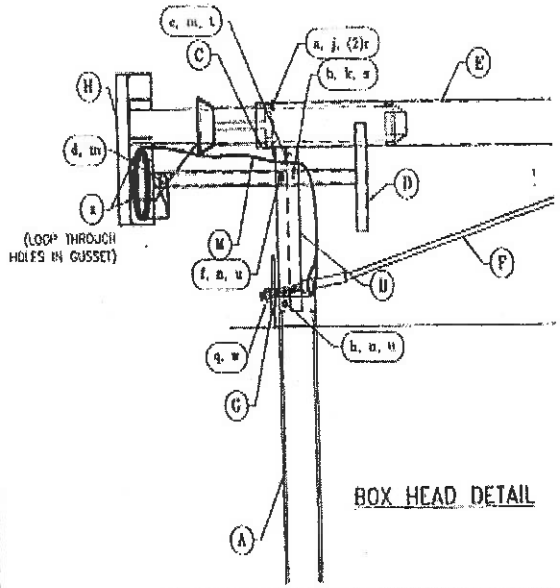
TRANSMITTED MATERIALS. This Instruction transmits a shelf note that includes modifications/additions to § 710-24, *Box Beam End Assembly, Type III; and Box Beam Median Barrier End Assembly, Type C* and § 606-4, *Methods of Measurement.* It also transmits a drawing of the Type C End Assembly using Box Beam Bursting Mandrel.

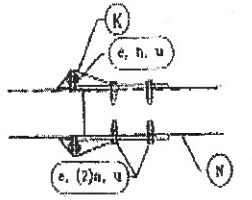
BACKGROUND. Prior to this engineering instruction, the Wyoming style *Box Beam Median Barrier Type C End Assembly* was the only federally approved NCHRP 350 Test Level 3 end assembly for box beam median barrier. Road Systems, Incorporated, however, in cooperation with the Midwest Roadside Safety Facility has obtained federal approval for another Test Level 3 end assembly for use with box beam median barrier. This is called the Box-Beam Burster Energy Absorbing Terminal - Median Terminal (BEAT-MT.)

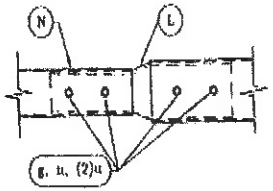
VENDOR INFORMATION. Road Systems, Inc. 1507 East 4th Street, Big Spring, TX. 79720. Phone - (915) 263-2435.

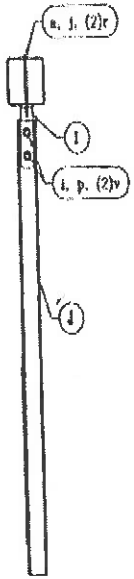
CONTACT PERSON. Larry Brown, Design Quality Assurance Bureau, M.O. Bldg 5, Room 410, (518) 457-4093, lbrown@gw.dot.state.ny.us.











ITEM	QTY	DESCRIPTION
A	1	LOWER FIRST POST W6x15 x 8'-0" LG.
B	1	UPPER FIRST POST W6x8 1'-9 3/4" LG.
C	1	SUPPORT BRACKET
D	1	POST BREAKER
E	1	END TUBE RAIL TS6x6x1/4 x 12'-0" LG.
F	1	CABLE ASSEMBLY
G	1	BEARING PLATE
H	1	BOX BEAM HEAD
I	4	MEDIAN BARRIER SUPPORT BRACKET
J	4	WEAK BOX BEAM POST w/ SOIL PLATE
K	2	END TUBE SECTION TIE PLATE
L	1	TS6x6 to 6x8 CONNECTION SLEEVE
M	1	3/8" GALV. CABLE x 20'-0"
N	1	2nd RAIL TS6x6x3/16 x 18'-0" LG.
		HARDWARE
a	5	7/16 x 7 1/2" LG. A307 BOLT
b	1	1/4 x 3" LG. GRADE 2 BOLT
c	1	1/2 x 7" LG. GRADE 5 BOLT
d	1	1/2 x 5" LG. GRADE 5 BOLT
e	8	5/8 x 2 1/2" LG. GRADE 5 BOLT
f	1	5/8 x 3" LG. GRADE 5 BOLT
g	4	5/8 x 7" LG. GRADE 5 BOLT
h	1	5/8 x 8" LG. GRADE 5 BOLT
i	8	3/4 x 1 1/2" LG. GRADE 5 BOLT
j	5	7/16" HEX NUT
k	1	1/4" HEX NUT
m	2	1/2" HEX NUT
n	18	5/8" HEX NUT
p	8	3/4" HEX NUT
q	2	1" ANCHOR CABLE HEX NUT
r	10	7/16" WASHER
s	1	1/4" WASHER
t	1	1/2" WASHER
u	18	5/8" WASHER
v	16	3/4" WASHER
w	2	1" ANCHOR CABLE WASHER
x	7	CABLE TIE

NOTE:
USE 3/8" CABLE USING CABLE TIES ON OPPOSITE SIDE OF THE POST BREAKER

RSI Road Systems, Inc.
Big Spring, TX
Phone: 915-263-2435
or Phone: 800-946-9741

BEAT-MT Box-Beam Median Terminal Layout

Scale:	Date:	Sheet:
NONE	12-05-01	A1
Drawn by: SML	Drawing Name: BEAT-MT-US	

Box Beam Guide Rail End Assembly, Type III ; And Box Beam Median Barrier End Assembly, Type C

Make the following changes to the *Standard Specifications of January 2, 2002*:
Volume II, Page 6-24, line 37. (New second paragraph of §606-3.01D), *add* as a new second paragraph:

> "Prior to installing guide rail, median barrier, transitions, or end terminals, the Contractor shall determine the locations of all structures, including underground structures, that may be affected by the installation. If the determinations disclose that there are conflicts between the proposed installation of guide rail, median barrier, transition, or end terminal and other structures, including underground structures, the Contractor shall discuss with and recommend to the Engineer alternative locations or types of guide rail, median barrier, transition, or end terminal, subject to the approval of the Engineer, that will not be in conflict with the structure, including underground structure."

Volume II, Page 6-34, lines 20 to 25. (§606-4.02, second paragraph.) Replace the text with the following:

> " The payment limits for the Box Beam Guide Rail End Assembly Type III and Box Beam Median Barrier End Assembly, Type C will be separated by a distance of 15 meters extending along the end assembly from the front of the Nose Assembly to a point 15 meters removed. These payment limits apply regardless of whether the Type III End Assembly or Type C End Assembly employs crushable fiberglass elements or beam bursting type mandrels to absorb the energy of the impacting vehicle."

Volume III, Page 7-115, lines 20 to Page 7-116, line 36. Replace the text with the following:

"710-24 Box Beam Guide Rail End Assembly, Type III; and Box Beam Median Barrier End assembly, Type C

SCOPE. These specifications cover the material and quality requirements for Box Beam Guide Rail End Assembly Type III and Box Beam Median Barrier End Assembly, Type C. These end assemblies are manufactured articles requiring federal approval as Test Level 3 end terminals for box beam guide rail and median barrier. They function by absorbing energy either through crushing of fiberglass elements or by splitting the beam element at the corners of the box beam. When specified, these end assemblies are used to terminate the ends of box beam guide rails and box beam median barriers. Box Beam Guide Rail End Assembly Type III and Box Beam Median Barrier End Assembly, Type C are fabricated in accordance with these specifications, the manufacturer's instructions, and the manufacturer's drawings. They are available in two styles. These are Wyoming style and another style that uses a box beam splitting mandrel.

MATERIALS REQUIREMENTS.

A. GENERAL. Soil plates, struts, bearing plates shall meet the requirements of ASTM A36 or ASTM A36 M. All metal components shall be hot dip galvanized in accordance with §719-01, Galvanized Coatings and Repair Methods.

Rustic versions of box beam bursting style Type III End Assembling shall comply with the above requirements except the metal parts exposed to view shall be painted in accordance with §740-03 Painting Galvanized Surfaces

Reflective sheeting pre-mounted on a frangible material shall be provided by the manufacturer for the free end of the end assembly. If approaching traffic will be permitted on one side only, reflectorization shall consist of alternating reflectorized 100 mm yellow and non-reflectorized 115 mm black stripes oriented at a 45 degree angle, with the lower edge of the stripes near the traveled way to be

used by the approaching traffic. The reflective material shall meet the requirements of §730-05, Reflective Sheeting, Class B. If approaching traffic will be permitted on both sides of the end assembly reflectorization shall be upward pointing chevrons of the same dimensions.

B. END ASSEMBLIES USING CRUSHABLE FIBERGLASS ELEMENTS (WYOMING STYLE): Materials used in the fabrication of the Box Beam Guide Rail End Assemblies Type III and Box Beam Median Barrier End Assembly, Type C (Wyoming style) shall conform with the following requirements:

Wood and Timber Post Posts and Timber Blockouts	§710-13
Foundation Tubes, Nose Assembly, Outer Tube, Telescoping Section and Intermediate Spacer Block	§710-21
Fasteners, except shear bolts on posts 6,7, & 8	ASTM A307
Shear bolts on posts 6, 7, & 8	SAE Grade 0
Rubber Pad	Hard Rubber Division II Sect18.2
Steel Posts, Shelf Angles, and other metal parts	ASTM A36M
Galvanized Coatings and Repair Methods	§719-01

The Cable Assembly shall consist of galvanized steel cable, 6 X 19 mm, with 19 mm threaded rod swaged to both ends.

The composite tube shall be MMFG Extren series 500 pulltruded fiberglass structural tubes and shall exhibit the following properties:

1. Composite tubing shall be manufactured using the pulltrusion process. Tubing shall be manufactured of glass fiber reinforced resin with a glass resin ratio of 50%. The resin shall be isophthallic polyester. Glass reinforcement shall include the following three varieties:
   - A. Surface mat shall be used on all exterior surfaces.
   - B. Continuous glass strand rovings shall be used internally.
   - C. Continuous strand mats shall be used internally.
2. The composite material shall exhibit the following minimum mechanical properties:
   - A. Ultimate Tensile Strength: Ultimate Tensile strength shall be longitudinally 207 MPa and transversely 48.3 MPa measured from coupons. Bending strength of the full section shall be 138 MPa.
   - B. Ultimate Compressive Strength shall be as given above except Transversely shall be 105.5 MPa.
   - C. Ultimate Shear Strength shall be 31 MPa.
   - D. Modulus of Elasticity shall be 17 300 MPa
   - E. Barcol Hardness shall be 50.
3. The energy dissipation properties of the alternate fiberglass epoxy composite tube shall be evaluated using staticcompressive testing. Each test specimen shall be 610 mm long with a 102 mm long tulip shape cut into one end of the test specimen. The test specimen shall be crushed statically at a rate of 50 mm per minute and the total crush length shall be not less than 305 mm . A minimum of three static compressive tests shall be conducted. The results of each test shall meet the following static energy dissipation properties:

First Stage Energy Absorber	
Average Crush Force	80 kN ± 9kN
Maximum Compressive Force	115 kN
Allowable Compressive Force Variation	± 11 kN
Second Stage Energy Absorber	
Average Crush Force	182 ±13 kN
Maximum Compressive Force	245 kN
Allowable Compressive Force Variation	± 22.3 kN

Box Beam Guide Rail End Assembly, Type III ;
And Box Beam Median Barrier End Assembly, Type C

C. END ASSEMBLIES USING BOX BEAM BURSTING MANDREL :

Materials used in the fabrication of the Box Beam Guide Rail End Assemblies Type III (BEAT) shall conform with the following requirements:

Mandrel Tube, Box Beam rail	§710-21
Impact Head and components, including face plate, top and bottom plates, lower and upper support boxes, Gussets	10 Ga. ASTM A36M
Steel post, guide plates and mandrel support block, gusset plate, guide support, bent and front guide plates, and all metal parts	ASTM A36M

Mandrel Plate shall be ASTM A514, with Brinell hardness number of 250, min.

Ordinary box beam guide rail and ordinary box beam median barrier included within the pay limits for the bursting style Type III End Assembly for guide rail and Type C End Assembly for median barrier shall conform to the same specifications as box beam guide rail to which the Type III or Type C bursting style end assembling is attached.

BASIS OF ACCEPTANCE. Box Beam Guide Rail End Assembly Type III and Box Beam Median Barrier End Assembly, Type C will be accepted at the site of the work by the Engineer on the basis of conformance of the delivered articles with the manufacturer's drawings, and upon the manufacturer's certification of compliance with these specifications."