
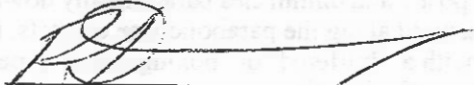


<p style="text-align: center;">SUPERSEDED BY EB 02-019 EFFECTIVE 9/12/02</p>	<p style="text-align: center;">MODIFIED BY EI 99-032 EFFECTIVE 5/4/00</p>		<p><i>New York State</i> <i>Department of</i> <i>Transportation</i></p> <p>ENGINEERING INSTRUCTION</p>	<p style="font-size: 2em; font-weight: bold;">EI</p>	<p style="font-size: 1.5em; font-weight: bold;">98-016</p>
<p>Title: END TERMINALS FOR HEAVY POST BLOCKED OUT CORRUGATED GUIDE RAIL-SLOTTED RAIL TERMINAL (SRT)</p>					
<p>Distribution:</p> <p><input type="checkbox"/> Manufacturers (18) <input type="checkbox"/> Surveyors (33)</p> <p><input checked="" type="checkbox"/> Main Office (30) <input checked="" type="checkbox"/> Consultants (34)</p> <p><input type="checkbox"/> Local Govt. (31) <input type="checkbox"/> Contractors/AGC(39)</p> <p><input checked="" type="checkbox"/> Regions/Agencies (32) <input type="checkbox"/> _____ ()</p>			<p>Approved:</p> <div style="text-align: center;">  <hr style="width: 80%; margin: 0 auto;"/> <p>R. Dennison, Deputy Chief Engineer Design Division</p> </div> <div style="text-align: right; margin-top: 10px;"> <p><u>8/1/98</u> Date</p> </div>		

ADMINISTRATIVE INFORMATION. This instruction modifies §10.2.5.2 of the *Highway Design Manual*. No engineering instructions are superseded hereby. It will become effective with the letting of September 10, 1998. The contents of this instruction ultimately will be incorporated into the *HDM*. The specifications may be used earlier.

- PURPOSES.** The purposes of this instruction are to:
- issue a usage and selection policy for the use of the Slotted Rail Terminal (SRT) for use with heavy post blocked out corrugated guide rail (HPBO); and,
 - issue specifications for these articles.

TRANSMITTED MATERIALS. This instruction transmits specifications for the Slotted Rail Terminal. These will be main office inserts. They are proprietary specifications, but, if used in accordance with this instruction, no justifications need be submitted. Materials Details for these units will be transmitted under separate cover, as is customary for Materials Details. The transmitted specifications are:

- | | |
|---------------------|--|
| ITEM 15606.37 (M) | SLOTTED RAIL TERMINAL, STEEL POSTS |
| ITEM 15606.3701(M) | SLOTTED RAIL TERMINAL, WOOD POSTS |
| ITEM 15606.3750 (M) | SLOTTED RAIL TERMINAL, STEEL POSTS, (RUSTIC) |
| ITEM 15606.3751 (M) | SLOTTED RAIL TERMINAL, WOOD POSTS, (RUSTIC) |

Note: The (M) indicates that both the metric and U.S. Customary unit specifications are referred to.

BACKGROUND. §10.2.5.2, W-Beam Anchorages of the *HDM* indicates that, because HPBO Guide Rail is so unyielding, its terminal section is to be flared away from the highway. §10.2.5.2 also references Standard Sheet M606-9R1, which was issued under EI 97-016. Note 5 of that sheet indicates that, on highways with operating speeds in excess of 70 km/h (45 MPH), approach ends of the HPBO guide rail shall either be anchored outside the clear zone, and converge with the highway at a flare rate not to exceed 1:15; or, alternatively, be preceded or replaced by properly designed crash cushions.

Recent engineering instructions, including EI 97-016, have discussed an FHWA policy that requires that after July 1998¹, safety articles installed on the National Highway System (NHS) must pass, or be judged able to pass, National Cooperative Highway Research Program Report 350 (NCHRP 350) test criteria. The turned-down end section depicted on the standard sheets for heavy post blocked out corrugated guide rail was recently tested for the FHWA at Test Level 1, and it failed. Test Level 1 is conducted at 50 kmh. The implication of this is that these turned down end sections cannot be used within the clear zone at the approach ends of the guide rail at locations where they can be impacted by on-coming traffic.

The Slotted Rail Terminal, a guide rail end terminal for HPBO guide rail, however, is one such safety article that meets this criteria. This end terminal was developed at Texas Transportation Institute, and is now marketed by Syro Steel Company. The Slotted Rail Terminal is a Test Level 3 device, which means that it passed various crash tests prescribed by NCHRP 350, including a 100 km/h, 25° impact with a 2000 kg pickup truck. Test Level 3 devices are required on high speed (> 45 mph) highways but may also be used on the slower facilities, as well.

Description of the Slotted Rail Terminal. There is a total of eleven posts in the Slotted Rail Terminal.

¹ Date has been changed to 9-30-98, and now applies to projects advertised for letting after that date and to work on contracts done under force account after that date.

Starting from the free end, post 1 and post 2 are short (1143 mm) breakaway timber posts weakened by 90 mm holes bored through them near the ground line. These two posts are installed in steel foundation tubes, which are linked together by a steel strut. The next eight posts, posts 3 through 10, are also weakened breakaway timber posts. Options are available under which these posts may be either the same as the first two posts, and be placed in steel foundation tubes, or they may be longer (1830 mm) breakaway posts directly embedded in the earth. The remaining post, post 11, is a standard heavy guide rail post and may be either steel or timber matching the system to which the SRT is attached. Block outs are standard timber block outs throughout the Slotted Rail Terminal.

Post spacing is variable: between posts 1 through 3, post spacing is 1.905 m (6'-3"); between posts 3 through 11 the post spacing is 0.952 m (3'-1½"). All these posts follow a parabolic curve. The offset from the line of the guide rail is 1.22 m (4'-0") at post 1 and diminishes parabolically down the length of the Slotted Rail Terminal. Length of the Slotted Rail Terminal, measured along the parabolic line of posts, is 11.43 m (37'-6.") The free end of the Slotted Rail Terminal is itself "finished" with a "buffered" or "boxing glove" type end terminal, which overhangs the first post 0.45± m (1'-6"±) and adds that much to the length.

Anchorage of the rail is provided by a 19 mm (0.75") diameter, 1.98 m (6'-6") long cable anchor assembly. Both ends of the cable anchor assembly are threaded rod swaged onto the cable. One end of the cable anchor assembly passes through a cable anchor bracket, which is bolted to the first length of rail in the Slotted Rail Terminal. The other end of the cable anchor assembly passes through the hole at the ground line in the first of the breakaway posts at the free end of the terminal. A notched bearing plate prevents the cable anchor assembly from releasing, unless the first post in the Slotted Rail Terminal is broken off, such as occurs during an end-on impact.

If impacted downstream of the third post from the free end, Slotted Rail Terminals redirect.

When impacted between the free end and the third post, Slotted Rail Terminals function by "gating." The first post at the free end breaks off near the ground line at the bored-through hole. This releases the cable assembly and prevents any tension from developing in the rail. The next four posts, also being breakaway timber posts, simply break. With the posts broken and the rail no longer tensioned, the vehicle simply passes behind the Slotted Rail Terminal with very little energy dissipation. The vehicle is able to travel comparatively long distances behind the rail. For example, in one head-on test, the 4500 pound test vehicle traveled 51.8 m (170 feet) downstream behind the barrier before coming to rest near the back of a guide rail post.

To facilitate "gating" action and to help prevent impalement, sets of three (3) 12.7 mm (½") slots are cut into the peaks and valleys of the corrugated beam at four locations within the first 7.62 m (25') of the Slotted Rail Terminal. These slots do not affect the tensile strength of the rail because they don't reduce the section below the effective section provided at the rail splices. They do significantly weaken the column strength of the rail element, however, which facilitates the controlled buckling of that element, and thereby lessens the impact on the impacting vehicle.

USAGE. The approach ends of HPBO guide rail on facilities of all operating speeds that cannot be carried to a point outside the clear zone, shielded by another barrier, buried in the back slope or in a suitable berm, shall be terminated with a Slotted Rail Terminal or protected by another approved end terminal² or crash cushion³. *The turned down end terminal shown on the standard sheets is not an approved end terminal within the clear zone at locations subject to impact by approaching traffic.* When determining where to locate the Slotted Rail Terminal in relation to the shielded object, refer to EI 98-004 Point of Need Determination for Guide Rail Runs That Use Gating End Terminals. For ease of maintenance, and despite the extra cost, we will use Slotted Rail Terminals utilizing only 1143 mm long, weakened, timber posts placed within steel foundation tubes for the first ten posts of the Slotted Rail Terminal. The remaining post in the Slotted Rail Terminal is a directly embedded standard steel or timber guide rail post, depending on the rail system to which the SRT is attached.

APPLICABILITY. The usage policy included in this instruction is applicable to new installations of end terminals whether on new construction projects, reconstruction projects, or on 3R projects. The policy also requires replacements of non-conforming end terminals on reconstruction projects but does not require (ie. is silent on) replacements of non-conforming end terminals on 3R projects. That matter will be separately addressed in a future instruction on replacement of existing end terminals on 3R projects.

MISCELLANEOUS INFORMATION.

Obstacle free area. Slotted Rail Terminals require a longer obstacle free area behind the rail than the 6 m by

² The ET 2000 end terminal is also an approved terminal. See EI 98-015 End Terminals for Heavy Post Blocked Out Corrugated Guide Rail-ET2000.

³ Inertial modules arrays may be used on one-way roads and at other locations where they cannot be struck from the rear.

22.5 m obstacle free area described in EI 98-004 Point of Need Determination for Guide Rail Runs That Use Gating End Terminals. As indicated above, in one crash test, the impacting vehicle traveled 51.9 m (170 feet) from the free end of the Slotted Rail Terminal before coming to rest near the back of the guide rail. Therefore, an obstacle free area 6 m (20') wide by 45-50 m (150'-165') long, instead of 6 m by 22.5 m, should be considered from the free end of the Slotted Rail Terminal. The presence of embankments and ditches within the obstacle free area, however, will tend to modify the path of the vehicle and consequently the obstacle free area should be either reduced or expanded as a result of the existence of these features. In general, embankments will guide the vehicle away from obstacles that are located "uphill" of the probable vehicle path while a ditch or backslope may direct the path of the vehicle toward an obstacle, such as a head wall, indicating an increase in the length of the obstacle free area.

If the 45-50 m long obstacle free area cannot be achieved in applications where the area behind the rail is essentially flat, consider the use of an alternative end terminal.⁴

Special Grading Requirements. Slopes between the road and the Slotted Rail Terminal should be 1:10 or flatter. This slope should be carried underneath the Slotted Rail Terminal to a point beyond the back of the posts, at which point the slopes may break; preferably to a 1:4 slope, 1:3 maximum. Between post 11 through 6, the slope break point should be 1000 mm, 600 mm minimum, behind the back of the posts. From Post 6 through post 1, the distance to the slope break either increases from 600 mm (24") at post 6 to 1000 mm (40") at post 1 or is maintained at 1000 mm, whichever is appropriate. From that point, the slope break point transitions back to the normal slope break point. Transition length, longitudinally, should be 15 times the difference in widths between the slope break points opposite post 1 and the normal width. These details will be shown on a pending standard sheet but the details should be included in the Contract Plans until the standard sheet is issued.

Beginning length-of-need. Slotted Rail Terminals redirect impacting vehicles starting at post 3. This post is the beginning length of need and it should be located upstream of the shielded obstacle the distance indicated by the formulas indicated in EI 98-004. The last 7.62 m (25') of the Slotted Rail Terminal downstream of post 3, being capable of redirection, may be included in the length-of-need⁵.

Selection Guidelines. There are several types of end terminals that have passed crash testing, and could be used at the approach end of heavy post blocked out guide rail. See the Highway Design Manual and Engineering Bulletin 98-021, Selection Guidelines for End Terminals for Heavy Post Blocked out Guide Rail. The principal advantage to the Slotted Rail Terminal, opposed to the alternative ET 2000, is that its end will naturally be placed farther away from the snow plowing. Thus, there should be fewer interferences with maintenance operations, and there should be fewer nuisance type hits on the end.

ESTIMATED COST. Slotted Rail Terminals are expected to cost \$2100 installed in the upstate regions, perhaps somewhat more in the downstate regions, and more for the rustic versions. This estimate is based on \$1500 parts cost and an installation rate of four (4) Slotted Rail Terminals installed per day by a good guide rail crew. Grading costs are not included in this estimate, and would vary based on location and region. Slotted Rail Terminals with the rustic appearance will cost more.

CONTACT PERSON. Larry Brown, Design Quality Assurance Bureau, (MO. Bldg 5, Room 410) (518)-457-4093.

C:\TERMINAL\SLOTRAIL\ENG_INST.WPD

⁴ ET 2000 is one such terminal. See EI 98-015 End Terminals for Heavy Post Blocked Out Corrugated Guide Rail-ET 2000.

⁵ The minimum 45-50 m long obstacle free area will control until the difference in offsets between the protected obstacle and the front face of the guide rail exceeds 4.76 m when the 10° criteria is used and 7.30 m when the 15° criteria is used.

ITEM 15606.37 M
ITEM 15606.3701 M
ITEM 15606.3750 M
ITEM 15606.3751 M

SLOTTED RAIL TERMINAL, STEEL POSTS
SLOTTED RAIL TERMINAL, WOOD POSTS
SLOTTED RAIL TERMINAL, STEEL POSTS, (RUSTIC)
SLOTTED RAIL TERMINAL, WOOD POSTS, (RUSTIC)

DESCRIPTION.

Under this work, the Contractor shall furnish and install Slotted Rail Terminals and Slotted Rail Terminals (Rustic) at the locations indicated in the contract documents or where directed by the Engineer in accordance with these specifications, manufacturer's directions, and the approved Materials Details.

MATERIALS.

The Slotted Rail Terminals and Slotted Rail Terminals (Rustic) shall be fabricated by the Syro Steel Company, Girard, Ohio (800-321-2755). All parts and the configuration of the Slotted Rail Terminals and Slotted Rail Terminals (Rustic) shall be as indicated on the approved Materials Details except as modified in these specifications.

Steel foundation tubes shall be provided for posts 1 through 10, which are the break away posts, and shall meet the requirements of §710-21 Box Beam Guide Railing and Median Barrier. Post number 1 is the post located at the free end of the slotted rail terminal. The breakaway timber posts and blockouts shall be short (1143 mm) posts of the dimensions indicated on the approved Materials Details and additionally shall meet the requirements of §710-13, Wood and Timber Posts and Timber Blockouts. Deep beam guide rail shall meet the requirements of §710-20 Corrugated Beam Guide Railing and Median Barrier and additionally shall have slots cut into it of the number, size, and location shown on the approved Materials Details. Soil plates, struts, and bearing plates shall meet the requirements of ASTM A36 or ASTM A36M. Fasteners shall be as indicated on the Materials Details.

Reflective sheeting shall be provided by the manufacturer for the free end of the terminal. The reflectorization shall consist of alternating 100 mm reflectorized yellow and 115 mm non-reflectorized black stripes oriented at a 45 degree angle, with the lower edge of the stripes near the traveled way. The reflective material shall meet the requirements of §730-05, Reflective Sheeting, Class B.

Post 11 for Slotted Rail Terminals, Steel Posts, shall be a standard 150 mm by 13 or 14 kg/m heavy (strong) steel guide rail post with standard timber block-outs of the size and type indicated in the standard sheets or plans and shall comply with the requirements of §710-14 Galvanized Steel Barrier Posts if the Slotted Rail Terminal is to be connected to heavy post blocked out guide rail with steel posts. If the guide rail to which the Slotted Rail Terminal is to be connected uses timber posts, then the Post 11 shall be a timber post.

Slotted Rail Terminals, Steel Post, (Rustic) shall comply with the above requirements except metal parts exposed to view and post 11, if steel, shall meet the requirements of §710-25 Guide Rail and Median Barrier Systems (Rustic).

Posts 11 for Slotted Rail Terminals, Timber Post and Slotted Rail Terminals, Timber Post, (Rustic) shall be a standard preservative treated guide rail post of the dimensions indicated on the Plans and shall conform with the requirements of §710-13, Wood and Timber Posts and Timber Blockouts.

Silicone sealant. Silicone sealant shall be commercially available silicone sealant capable of adhering to wood and galvanized steel.

Basis of Acceptance. The Department requires the submission of Materials Details as defined in §101-34.1. The supplier shall prepare and submit the appropriate material in accordance with the procedural directives of the Design Quality Assurance Bureau (DQAB). Upon approval by DQAB, the name of the product and/or supplier, and the unique reference number assigned to the approved Materials Details by the supplier will be placed on the Approved List. Such products will then be accepted on the basis of their brand name and conformance to the approved Materials Details.

The supplier shall provide two copies of the approved Materials Details through the Contractor to the Engineer as part of the evidence of acceptability for the material at least ten (10) days prior to the use of the product.

Slotted Rail Terminals, Steel and Wood Post and Slotted Rail Terminals, Steel and Wood (Rustic) will be accepted at the project site on the basis of 1) Appearance of the manufacturer's name on the Approved List, 2) Compliance of the delivered articles with the approved Materials Details, 3) Manufacturer's certificate of compliance with these specifications.

<u>ITEM 15606.37 M</u>	<u>SLOTTED RAIL TERMINAL, STEEL POSTS</u>
<u>ITEM 15606.3701 M</u>	<u>SLOTTED RAIL TERMINAL, WOOD POSTS</u>
<u>ITEM 15606.3750 M</u>	<u>SLOTTED RAIL TERMINAL, STEEL POSTS, (RUSTIC)</u>
<u>ITEM 15606.3751 M</u>	<u>SLOTTED RAIL TERMINAL, WOOD POSTS, (RUSTIC)</u>

CONSTRUCTION DETAILS.

§606-3.01 General of the Standard Specifications shall apply. Foundation tubes shall be driven unless otherwise approved by the Engineer. The manufacturer shall provide written installation instructions and two copies of the approved Materials Details ten days prior to installation of the units.

Slotted Rail Terminals and Slotted Rail Terminals (Rustic) shall be installed after grading is completed at the locations indicated in the Plans, or where directed by the Engineer. They shall be installed in accordance with the manufacturer's instructions and the directions of the Engineer. The space between the wooden posts and the steel foundation tubes shall be sealed using a commercially available silicone caulking material compatible with both steel and wood.

The work, including the necessary grading work, shall be coordinated with the installation of the guide rail or removal of existing anchorage units to minimize the time the traveling public is exposed to unanchored runs of guide rail. In the event that the Slotted Rail Terminal is damaged, it shall be promptly repaired. Unless a different period is indicated in the Contract Documents, the periods of exposure to unanchored rail or the time to repair it on impact shall not exceed fourteen calendar days. During periods when the public is exposed to unanchored guide rail or damaged Slotted Rail Terminals, plastic drums or other devices approved by the Engineer shall be placed in advance of the unanchored run of rail or the damaged slotted rail terminal. Ends of unanchored W-beam shall be temporarily turned down to the ground level, twisted over to lay flat, and pinned in place.

METHOD OF MEASUREMENT

The work will be measured as the number of Slotted Rail Terminals and Slotted Rail Terminals (Rustic) satisfactorily furnished and installed in accordance with these specifications. The payment limits for these units extend from the front of the boxing glove buffered end terminal to the center of the eleventh guide rail post which is located approximately 11.9 m distant from the front of the boxing glove buffered end terminal.

BASIS OF PAYMENT.

The unit bid price per Slotted Rail Terminals and Slotted Rail Terminals (Rustic) shall include the cost of all labor, materials, and equipment necessary to satisfactorily furnish and install the units between the above described payment limits. The cost of earthwork, grading, top soiling, and seeding shall be measured and paid for separately. The cost to repair Slotted Rail Terminals damaged by public travel will be borne by the Contractor or the by State in accordance with the provisions of §107-09 Damage.

<u>ITEM 15606.37</u>	<u>SLOTTED RAIL TERMINAL, STEEL POSTS</u>
<u>ITEM 15606.3701</u>	<u>SLOTTED RAIL TERMINAL, WOOD POSTS</u>
<u>ITEM 15606.3750</u>	<u>SLOTTED RAIL TERMINAL, STEEL POSTS, (RUSTIC)</u>
<u>ITEM 15606.3751</u>	<u>SLOTTED RAIL TERMINAL, WOOD POSTS, (RUSTIC)</u>

DESCRIPTION.

Under this work, the Contractor shall furnish and install Slotted Rail Terminals and Slotted Rail Terminals (Rustic) at the locations indicated in the contract documents or where directed by the Engineer in accordance with these specifications, manufacturer's directions, and the approved Materials Details.

MATERIALS.

The Slotted Rail Terminals and Slotted Rail Terminals (Rustic) shall be fabricated by the Syro Steel Company, Girard, Ohio (800-321-2755). All parts and the configuration of the Slotted Rail Terminals and Slotted Rail Terminals (Rustic) shall be as indicated on the approved Materials Details except as modified in these specifications.

Steel foundation tubes shall be provided for posts 1 through 10, which are the break away posts, and shall meet the requirements of §710-21 Box Beam Guide Railing and Median Barrier. Post number 1 is the post located at the free end of the slotted rail terminal. The breakaway timber posts and blockouts shall be short (45 inch) posts of the dimensions indicated on the approved Materials Details and additionally shall meet the requirements of §710-13, Wood and Timber Posts and Timber Blockouts. Deep beam guide rail shall meet the requirements of §710-20 Corrugated Beam Guide Railing and Median Barrier and additionally shall have slots cut into it of the number, size, and location shown on the approved Materials Details. Soil plates, struts, and bearing plates shall meet the requirements of ASTM A36. Fasteners shall be as indicated on the Materials Details.

Reflective sheeting shall be provided by the manufacturer for the free end of the terminal. The reflectorization shall consist of alternating four inch (4") reflectorized yellow and 4.5 inch non-reflectorized black stripes oriented at a 45 degree angle, with the lower edge of the stripes near the traveled way. The reflective material shall meet the requirements of §730-05, Reflective Sheeting, Class B.

Post 11 for Slotted Rail Terminals, Steel Posts, shall be a standard 6 inch by 8.5 or 9 pound per linear foot heavy (strong) steel guide rail post with standard timber block-outs of the size and type indicated in the standard sheets or plans and shall comply with the requirements of §710-14 Galvanized Steel Barrier Posts if the Slotted Rail Terminal is to be connected to heavy post blocked out guide rail with steel posts. If the guide rail to which the Slotted Rail Terminal is to be connected uses timber posts, then the Post 11 shall be a timber post.

Slotted Rail Terminals, Steel Post, (Rustic) shall comply with the above requirements except metal parts exposed to view and post 11, if steel, shall meet the requirements of §710-25 Guide Rail and Median Barrier Systems (Rustic).

Posts 11 for Slotted Rail Terminals, Timber Post and Slotted Rail Terminals, Timber Post, (Rustic) shall be a standard preservative treated guide rail post of the dimensions indicated on the Plans and shall conform with the requirements of §710-13, Wood and Timber Posts and Timber Blockouts.

Silicone sealant. Silicone sealant shall be commercially available silicone sealant capable of adhering to wood and galvanized steel.

Basis of Acceptance. The Department requires the submission of Materials Details as defined in §101-34.1. The supplier shall prepare and submit the appropriate material in accordance with the procedural directives of the Design Quality Assurance Bureau (DQAB). Upon approval by DQAB, the name of the product and/or supplier, and the unique reference number assigned to the approved Materials Details by the supplier will be placed on the Approved List. Such products will then be accepted on the basis of their brand name and conformance to the approved Materials Details.

The supplier shall provide two copies of the approved Materials Details through the Contractor to the Engineer as part of the evidence of acceptability for the material at least ten (10) days prior to the use of the product.

Slotted Rail Terminals, Steel and Wood Post and Slotted Rail Terminals, Steel and Wood (Rustic) will be accepted at the project site on the basis of 1) Appearance of the manufacturer's name on the Approved List, 2) Compliance of the delivered articles with the approved Materials Details, 3) Manufacturer's certificate of compliance with these specifications.

ITEM 15606.37 SLOTTED RAIL TERMINAL, STEEL POSTS
ITEM 15606.3701 SLOTTED RAIL TERMINAL, WOOD POSTS
ITEM 15606.3750 SLOTTED RAIL TERMINAL, STEEL POSTS, (RUSTIC)
ITEM 15606.3751 SLOTTED RAIL TERMINAL, WOOD POSTS, (RUSTIC)

CONSTRUCTION DETAILS.

§606-3.01 General of the Standard Specifications shall apply. Foundation tubes shall be driven unless otherwise approved by the Engineer. The manufacturer shall provide written installation instructions and two copies of the approved Materials Details ten days prior to installation of the units.

Slotted Rail Terminals and Slotted Rail Terminals (Rustic) shall be installed after grading is completed at the locations indicated in the Plans, or where directed by the Engineer. They shall be installed in accordance with the manufacturer's instructions and the directions of the Engineer. The space between the wooden posts and the steel foundation tubes shall be sealed using a commercially available silicone caulking material compatible with both steel and wood.

The work, including the necessary grading work, shall be coordinated with the installation of the guide rail or removal of existing anchorage units to minimize the time the traveling public is exposed to unanchored runs of guide rail. In the event that the Slotted Rail Terminal is damaged, it shall be promptly repaired. Unless a different period is indicated in the Contract Documents, the periods of exposure to unanchored rail or the time to repair it on impact shall not exceed fourteen calendar days. During periods when the public is exposed to unanchored guide rail or damaged Slotted Rail Terminals, plastic drums or other devices approved by the Engineer shall be placed in advance of the unanchored run of rail or the damaged slotted rail terminal. Ends of unanchored W-beam shall be temporarily turned down to the ground level, twisted over to lay flat, and pinned in place.

METHOD OF MEASUREMENT

The work will be measured as the number of Slotted Rail Terminals and Slotted Rail Terminals (Rustic) satisfactorily furnished and installed in accordance with these specifications. The payment limits for these units extend from the front of the boxing glove buffered end terminal to the center of the eleventh guide rail post which is located approximately 39 feet distant from the front of the boxing glove buffered end terminal.

BASIS OF PAYMENT.

The unit bid price per Slotted Rail Terminals and Slotted Rail Terminals (Rustic) shall include the cost of all labor, materials, and equipment necessary to satisfactorily furnish and install the units between the above described payment limits. The cost of earthwork, grading, top soiling, and seeding shall be measured and paid for separately. The cost to repair Slotted Rail Terminals damaged by public travel will be borne by the Contractor or the by State in accordance with the provisions of §107-09 Damage.