

SECTION 626 Energy Absorbing Terminals

626.1 Energy Absorbing Terminals

To function appropriately Energy Absorbing Terminals (EATs) must be designed, installed, and maintained properly. This section will concentrate on the proper installation of EATs. Guidance provided in this section will apply to EATs for non-MGS beam guard and for MGS beam guard. Both Non-MGS EATs and MGS EATs have the same manufacturers. Additional information about the design and operation of an EAT can be found at:

[FDM 11-30-4.1](#)

Designer notes for [SDD 14b24](#)

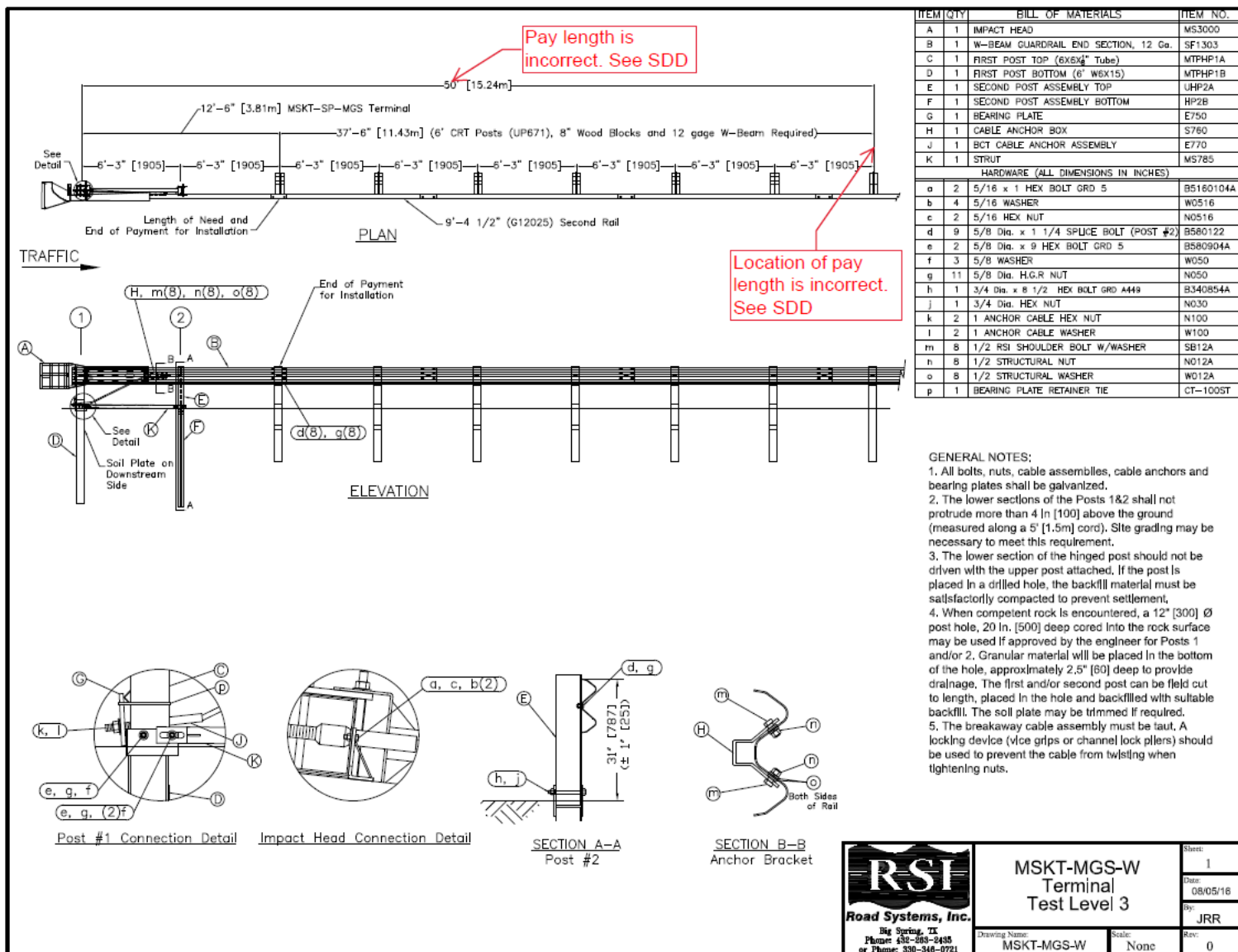
Designer notes for [SDD 14b44](#)

AASHTO Roadside Design Guide Chapter 8

626.1.1 Hardware

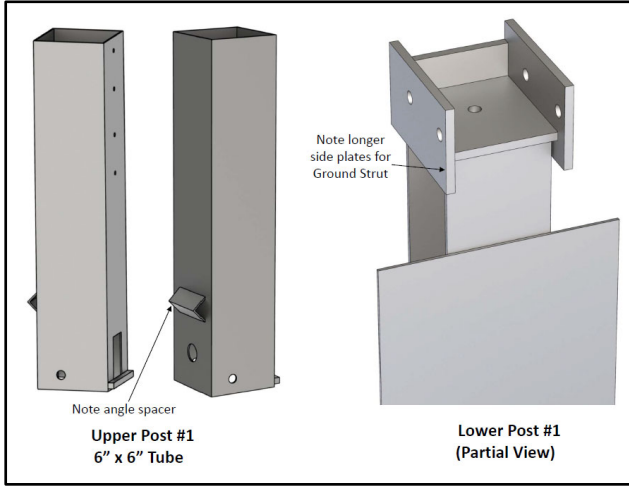
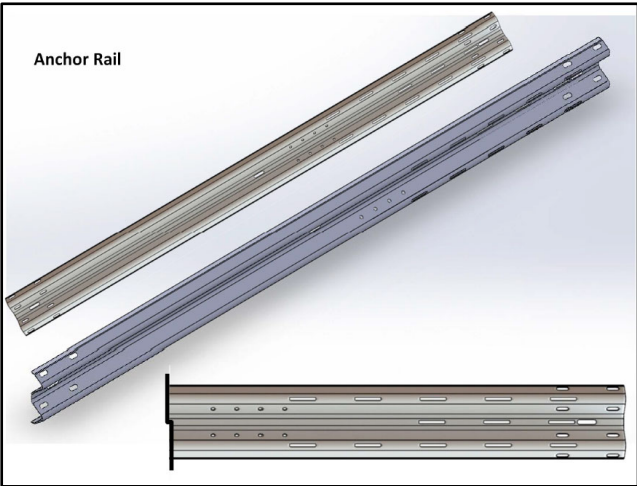
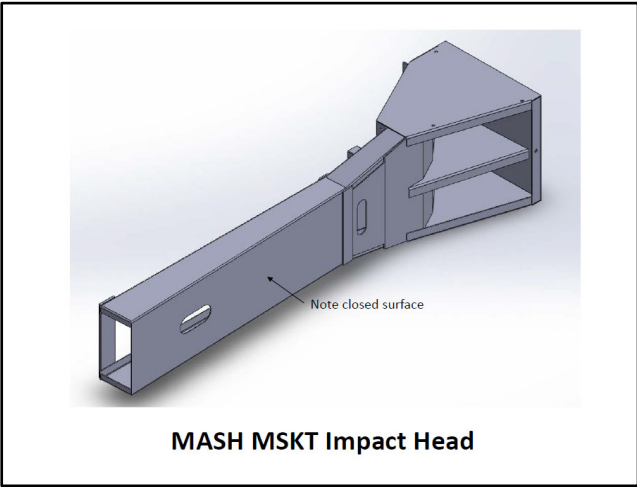
See the [APL](#) for approved manufactures of non-MGS and MGS EATs. Below are drawings and photos from the manufacturers of MGS EATs. These drawings and photos provide useful installation information:

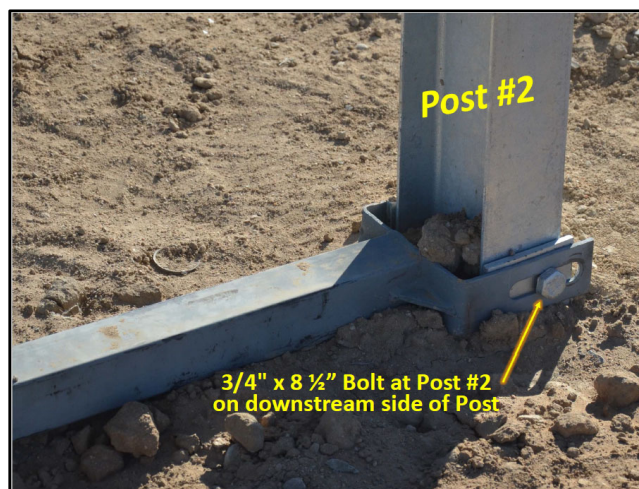
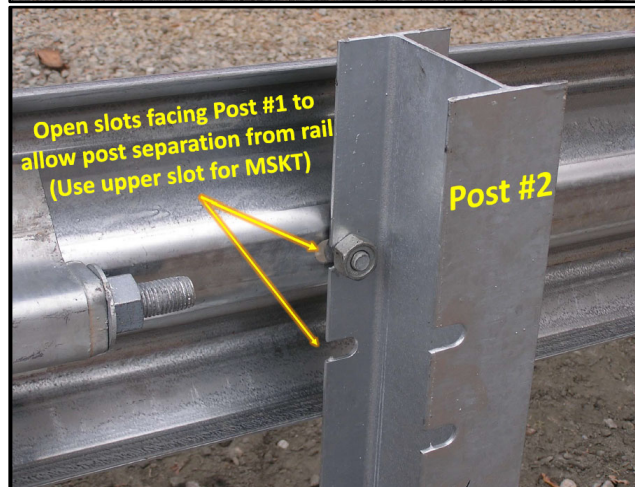
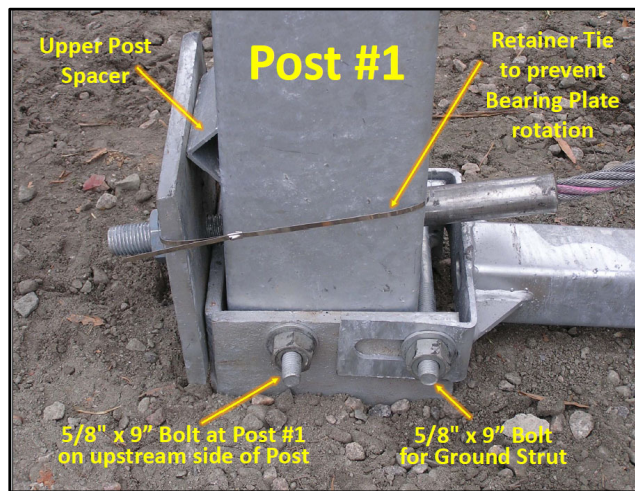
Road Systems, Inc. - Drawing: MSKT-MGS-W Terminal

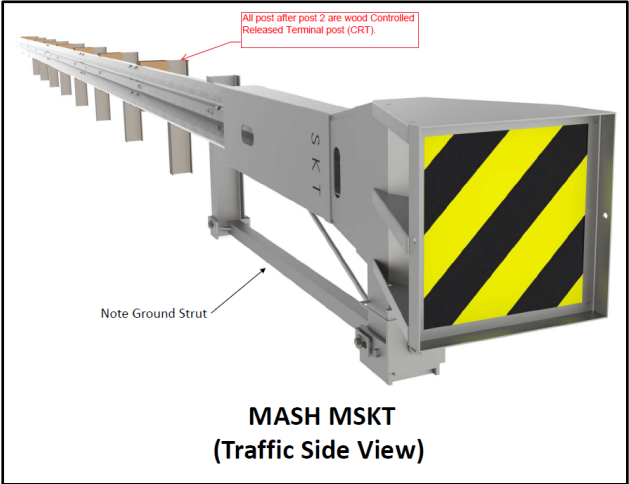
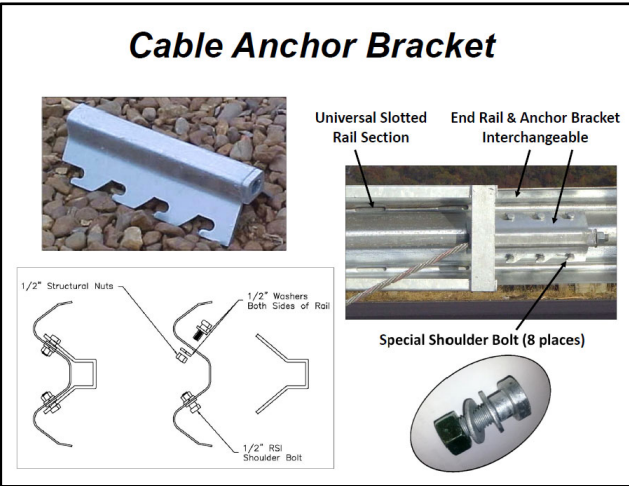
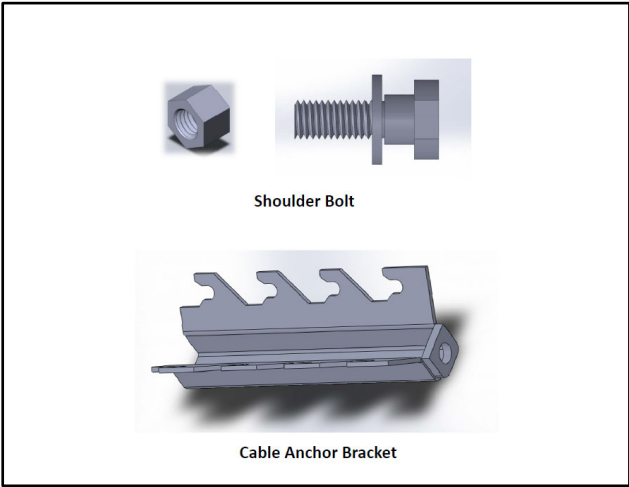


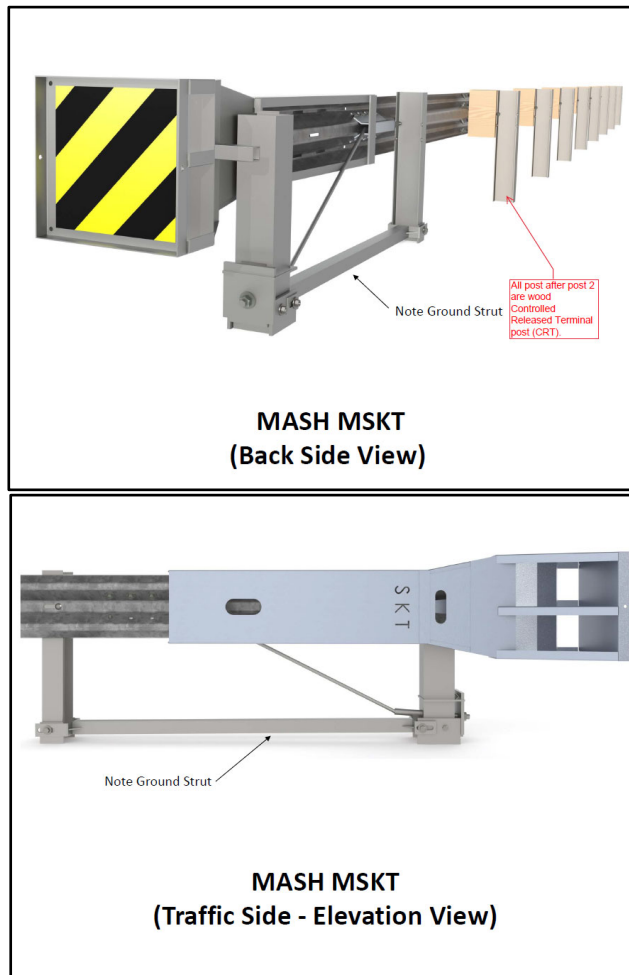
Road Systems, Inc. - Photos: MASH MSKT Components











626.1.1.1 Installation Issues

This section will discuss typical hardware installation issues.

FIGURE 626-1 Breakaway Post



The breakaway holes in figure 626-1 are too high. During a head-on impact, the undercarriage of a vehicle could snag on a post.^[7] Objects taller than 4 inches on a 5-foot chord are potential snag hazards. The second post from the left also appears to be out of plumb and may not absorb

enough impact energy or an errant vehicle may vault over the EAT. In either case, the errant vehicle may engage a roadside hazard that the EAT was installed to protect.

- ^[1] Object taller than 4 inches on a 5 foot chord are considered to be potential snag hazards.

FIGURE 626-2 Close Up of EAT Post 1



The steel foundation tube in figure 626-2 is too high and may snag a vehicle during an impact with an EAT. Also, the cable has slack in it which can cause excessive deflection or rail failure for the whole installation of semi-rigid barrier. Finally, the bearing plate is not installed correctly.

FIGURE 626-3 Poor Compaction/Visible Gaps



Visual gaps, seen in figure 626-3, between foundation tubes and soils or improper compaction around the foundation tube can reduce the amount of force the whole semi-rigid barrier system can absorb.

FIGURE 626-4 Ground Strut and Bearing Plate Problems



In figure 626-4, the ground strut is too high and can spear into a vehicle cab or cause a vehicle to roll over during an impact. Also, the bearing plate is not installed correctly.

Other hardware issues and missing or damaged components are discussed in [CMM 625](#), and [FDM 11-45-30.5](#).

626.1.2 Grading Issues

Grading is critical to the function of the EAT and the entire semi-rigid barrier system. Grading around an EAT is broken down into three primary areas:

- Approach grading- Is grading leading to the EAT. This grading allows a vehicle to avoid impacting an EAT.
- Adjacent grading- Is grading next to the EAT. This grading allows for vehicle stability during impact and provides structural strength to the entire barrier installation.
- Runout grading- Is grading behind the EAT. This grading allows for a vehicle to traverse a slope and stop after impacting an EAT.

Desirable grading has:

- Compacted material
- Traversable slopes that blend into the surrounding
- A flat area between head of EAT and hinge slope
- Room for errant vehicle to traverse (see runout grading SDDs: [SDD 14b24](#) and [SDD 14b44](#)).

Marginal grading has:

- Poorly compacted materials
- Slopes that do not blend into surroundings
- No flat area between EAT and hinge point
- Restricted room for an errant vehicle

Grading adjacent to the EAT is consider marginal if a vehicle can slowly drive around the terminal and park directly behind or adjacent to EAT end section. Runout grading is considered marginal If a vehicle can drive at slow speeds behind the terminal for a distance of 75 feet without running into fixed object or losing control.

Figures 626-5 to 626-10 show examples of desirable grading, marginal grading and EAT with little to no grading.

FIGURE 626-5 Desirable Grading



Side slopes match into other slopes - side slopes are relatively flat and well compacted.

FIGURE 626-6 Desirable Grading



Good distance from hinge point to EAT, good compaction of materials, slopes are relatively flat.

FIGURE 626-7 Marginal Grading



Side slopes don't match into existing slopes, side slopes are too steep, materials are not compacted.

FIGURE 626-8 Marginal Grading



Side slopes are not compacted; side slopes do not blend with surrounding slopes.

FIGURE 626-9 Little to No Grading



Minimum to no grading; no flat area behind the EAT; material not compacted near the foundation tube.

FIGURE 626-10 Little to No Grading



Minimum to no grading; ditch check is in the runout area.

626.1.3 Curb and Gutter Issues

Curb and gutter can degrade the performance of an EAT. Curbs can make it difficult for an errant vehicle to engage an EAT properly. Curbs could trip a vehicle into an EAT. Installations similar to figure 626-11 are problematic because of the curb.

Typically curb and gutter is installed before installing an EAT. Review [FDM 11-45-30.4.1.6](#) for guidance on installing curb and gutter near an EAT.

FIGURE 626-11 Use of Curb Near EAT



626.1.4 Fixed Object Issues

Collisions into multiple fixed objects are more likely to have negative consequences, especially with EATs. A fixed object in front of an EAT may channel drivers into an EAT (figures 626-12 and 626-13). On the other hand, fixed objects installed within the adjacent or runout areas can be struck by an errant vehicle after it has impacted an EAT (figures 626-14 and 626-15).

FIGURE 626-12 Sign Could Funnel Vehicles into EAT **FIGURE 626-13 Pole and EAT Will Likely be Hit**

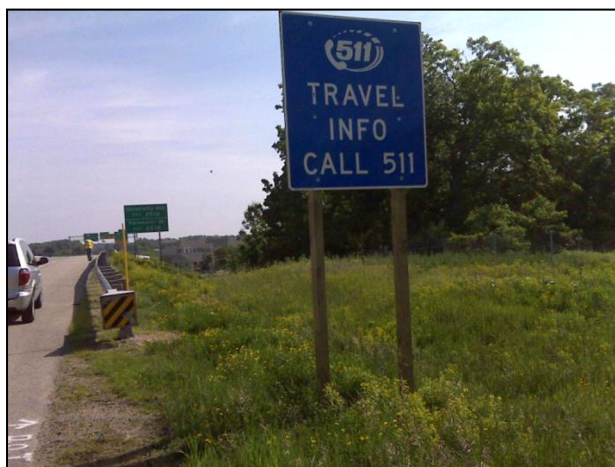




FIGURE 626-14 Rock Wall Can Still be Hit

FIGURE 626-15 ITS Pole Can Still be Hit



After post 3 an EAT reacts like other semi-rigid barriers. The working width is similar to the semi-rigid barrier system it is connected to. Placing fixed objects too close to an EAT may allow a vehicle to hit those objects. [FDM 11-45-30.3.4.1.6](#) discusses working width and what can happen when working width is not provided.

626.1.5 Block Height Issues

If a contractor drives the post where the 3.5" hole of the universal post is flush to the ground, blocks of the EAT may need to be raised to get the rail to the required height. This problem is more likely to happen with the MGS EAT.

FIGURE 626-16 Block Height Adjustments



Based manufacturer's information, it is acceptable to modify the block height as show in figure 626-16. A note has been added to the SDD indicating that installing the block this way is acceptable.