FIRST SELECTWOMAN VANDERSICE ANSWERS QUESTIONS ABOUT GUIDERAILS

Does the Town have a guiderail replacement program? If yes, why and what is it?

Yes, the Town has a program to replace the wood post/wire rail guiderails because that type of guiderail no longer meets crashworthiness standards.

A number of years ago the State issued guidelines to municipalities indicating when replacing guiderails, they should not be replaced with wood post/wire rail guiderails. A program to perform annual removal/replacement of wood post/wire rail with metal beam guiderails (MBR), which pre-dates my being first selectwoman, was implemented by the town.

Why did the Town choose MBR as the replacement guiderail?

We have yet to find records, which likely go back more than 15 years, as to the specifics of when and why someone decided the Town should exclusively use MBR as a replacement guiderail. Early on in my term, I received a complaint about the appearance of a newly installed MBR guiderail. I drove to the location and agreed that the material was not appropriate for the location and spoke with the then long-time Town Engineer. I was told that the MBR guiderail was the state standard and therefore there wasn't another option.

What changed?

Wilton's long-time town engineer retired and nine months ago a new town engineer was hired . When the wood post/wire guiderails were removed on Wild Duck and Woods End and replaced by MBR, residents contacted DPW/Facilities Director Chris Burney, new Town Engineer Frank Smergilio and me. This time when I spoke with Frank, he indicated that he didn't necessarily agree that MBR was the only option for replacement. He explained that there are two separate issues to be considered: the requirements for whether or not a guiderail placement is needed and if needed, the requirements for the appropriate material for that specific placement.

What happened next? Why were the guiderails removed?

We decided to engage a traffic-engineering firm to do the following:

- 1-Review our long-time guiderail placement standard and make a recommendation as to guiderail placement standards,

- 2-Provide us with guiderail material standards and,

- 3-Specifically look at Wild Duck and Woods End and determine what guiderail placements were necessary on the two roads.

The results are as follows and can be read about in detail in the engineering firm's report found at the end of this Q&A:

- 1-The Town's guiderail placement standards were incomplete. (The DPW department has now adopted the state's placement standards. This will be discussed at Monday night's BOS meeting.)

- 2-Depending on the circumstances, there are other guiderail material options besides than MBR. (Those guiderail material options will be presented and discussed at Monday's Board of Selectmen meeting.)

- 3-The review of Wild Duck and Woods End determined that nowhere on either road met the current state standards for placement of a guiderail, of any kind. (This is the reason that the MBR guiderails are being removed.)

How much taxpayer money was spent to install and then remove the guiderails on Wild Duck and Woods End?

The MBR guiderails installed on and then removed from the two roads were returned to stock and will be use in a more appropriate location in the future. As an FYI, there is a resale market for used guiderails. The town has purchased and installed used guiderails, so that it would have been another other option had we not felt we could reuse them somewhere else.

We don't yet have the employee labor costs for the removal, as the work hasn't been completed. The labor to install included the labor for the necessary removal of the wood post/wire guiderails, so the cost specific to only the installation must be calculated. When that information is compiled, it will be made public. Right now we don't expect it to exceed four man-days in total for the installation and removal.

How will what we have learned change the guiderail replacement program in terms of both practice and cost?

As far as practice for the ongoing program, before removing any existing guiderail, wood post/wire rail or other, we will apply the state standards to determine if a guiderail replacement is required. If not required, the existing guiderail will be removed and no replacement will be installed.

As far as cost, until we have an accurate inventory of guiderails, we do not know the long-term cost of the replacement program. It may be that there are other locations where wood post/wire rail guiderails exist and do not need replacement and others where they are needed.

Do we currently have a database of guardrails, so we know how many wood post/wire rail need to be possibly replaced and how long before that program is completed?

We don't currently have a database, but Streetscan obtained data on our guiderails at the same time they scanned our roads. We will be contracting with them to provide us with a database, similar to what they created for our roads. Our approach to guiderails will be similar to what our approach has been to paving.

Why am I using the term "guiderails", when they are "guardrails"?
That is the new terminology.

More Questions? Please email me at lynne.vanderslice@wiltonct.org

CARDINAL
ENGINEERING ASSOCIATES

3 Colony Street | Meriden, CT 06451 | T 203-238-1969 | F 203-630-2056 | cardinal-engineering.com
457 Bantam Road, Suite #3 | Litchfield, CT 06759 | T 860-361-6395

September 17, 2019

Assistant Director of Public Works and Town Engineer
Town of Wilton
238 Danbury Road
Wilton, Connecticut 06897

RE: Guide Rails

Dear Mr. Smeriglio:

At the Town's request we have reviewed the guide rail installation along two roads in Town –Wild Duck Road and Woods End Drive. Specifically, Cardinal was engaged to determine if guide rail, where installed, is needed and if so, are there other types of rail that may be appropriate.

It is our understanding that the recently installed Metal Beam Rail (MBR) replaced older Town Standard (circa 1970) 2-cable wire rope on wood post. The Town has received feedback from residence of these roads who are upset and consider the new installation as "unattractive." We visited the location to observe the setting of the installations with regards conditions beyond the edge of pavement and slope conditions the rail was intended to protect. Using the State's recent (2016) aerial flight data and developed contours we plotted cross-sections at each MBR location to determine if the rail is required at that location per currant CTDOT standards. The criteria used to determine need for guide rail is based on Section 13 – Roadside Safety of the latest version of CTDOT's Highway Design Manual. The result of this exercise is attached and shows that guide rails are not required at any location. It should be noted that both of the roads are "dead-end" roads, with low traffic volumes and posted speed limits of 25 mph, well below the minimum standards used in this analysis.

In addition to the specific request above, Cardinal was also asked to provide an opinion as to the need and type of guide rail to be installed/upgraded as a Town standard. The questions posed by the Town (and/or resident) with our opinion/answer are:

Why do the old wood post/metal wire guide rails need to be replaced? **This type of guide rail does not meet current crashworthiness requirements found in NCHRP Report 350.**

Are these old wood post with metal wire guide rails truly at the end of their life? **See CTDOT Highway Design Guide, Chapter 13, Appendix A, Article 13-A.03.a paragraph 2 which states**

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"Replace rail such as two-cable on wood posts and three cable with steel brackets on wood or steel posts according to Department standards...."

Why do guide rails need to be put there in the first place? **State standards are based on Federal Highway Administration (FHWA) and the American Association of Highway and Transportation Officials (AASHTO) guidelines which require protection adjacent to slopes steeper than 4:1. Also, according CTDOT Highway Design Manual, Section 13-9.06 states "Municipalities are encouraged to use current Department guiderail standards and procedures for their roadside safety appurtenances."**

When I mentioned about the slope conditions that exists alongside the road and State requires roadways to have guide rails if slopes are steeper than 4 on 1 – I was asked why do we need to obey State requirements on a dead-end road? The town, as the owner of the facility can waive any State design criteria. **The Town as the owner of the facility can waive any design standard. The issue the Town has to come to terms with is public safety and potential liability if something occurred. The Town could be successfully sued if currant design standards are not followed. The Department standard is based the minimum TL-3 crash worthiness AASHTO Test Condition. The TL-3 Crash Test standard allows a passenger car and pickup truck traveling 60 mph and striking the barrier at 20° and 25° respectively to be redirected back into the travel way. This location, as well as other locations in Town do not need to adhere to the TL-3 standard but a lesser standard. There are other options, which are detailed, in the attached "Guiderail Consideration" document.**

We trust we have answered your concerns and the Town of Wilton will take into consideration the recommendations outlined in this letter and attachments.

Sincerely,
Cardinal Engineering Associates

Gary J. Giroux, P.E.
Senior Project Engineer

GUIDERAIL CONSIDERATIONS

Installation of guiderails requires careful consideration and design. Improperly sited or designed guiderails can increase the severity of potential accidents, which in turn can increase the liability of the owner or installer of the guiderail. Guiderails should only be installed in locations where there is specific criteria that justifies the installation. Costs associated with the barrier installation (installation costs, maintenance costs and accident costs) are compared to similar costs without barriers. The cost benefit analysis is typically used to evaluate three options: 1) remove or reduce the area of concern so that it no longer requires shielding, 2) install an appropriate barrier, or 3) leave the area of concern unshielded. Guiderails or other roadside barriers should only be installed where, after careful review, a warrant requires their installation.

Roadside Development

Clear-Zone Considerations

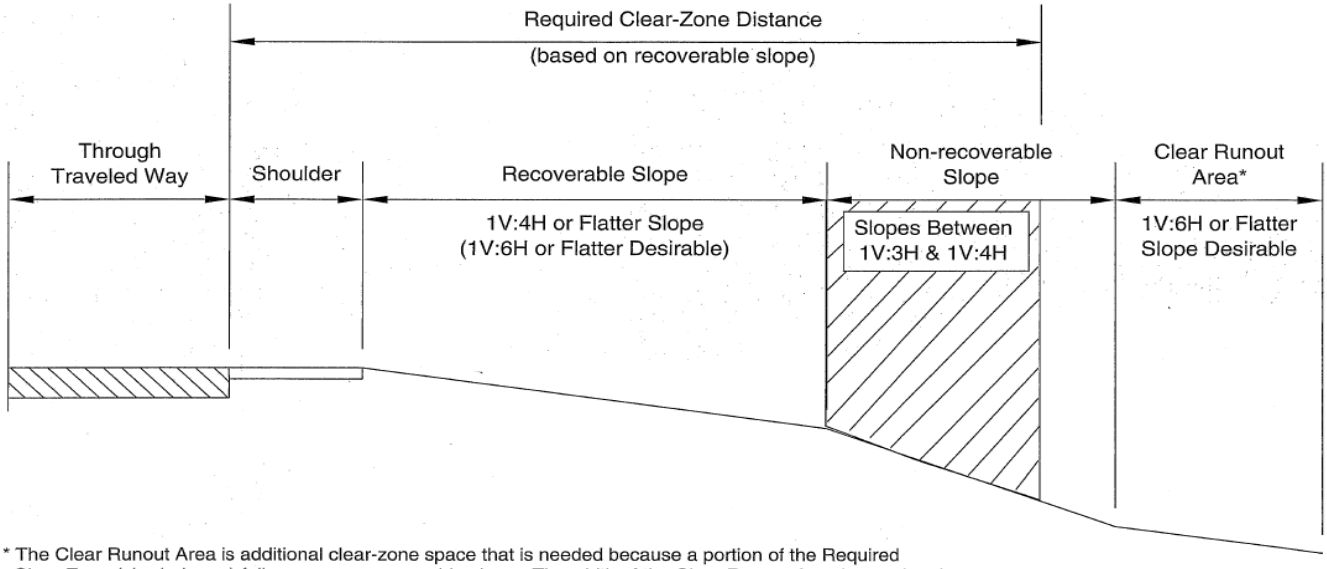
If a roadside is not flat, a motorist leaving the roadway will encounter a foreslope, a backslope, or a transverse slope. Each of these features has an effect on a vehicle's lateral encroachment and trajectory. Foreslopes parallel to the flow of traffic may be identified as recoverable, non-recoverable, or critical.

Recoverable foreslopes are 1V:4H or flatter. Motorists who encroach on recoverable foreslopes can generally stop their vehicles or slow them enough to return to the roadway safely. From AASHTO Roadside Design Guide, the clear-zone for a roadway with speed of < 40mph and an ADT <750 is 7-10 feet.

A non-recoverable foreslope is defined as one that is traversable, but from which most vehicles will be unable to stop or to return to the roadway easily. Vehicles on such slopes typically can be expected to reach the bottom. Foreslopes between lV:4H and 1V:3H generally fall into this category. Since a high percentage of encroaching vehicles will reach the toe of these slopes, the clear-zone distance cannot logically end on the slope and a clear runout area at the base is desirable.

A critical foreslope is one on which a vehicle is likely to overturn. Foreslopes steeper than IV:3H generally fall into this category. If a foreslope steeper than 1V:3H begins closer to the through traveled way than the suggested clear-zone distance for that specific roadway, a barrier might be warranted.

Roadside Design Guide

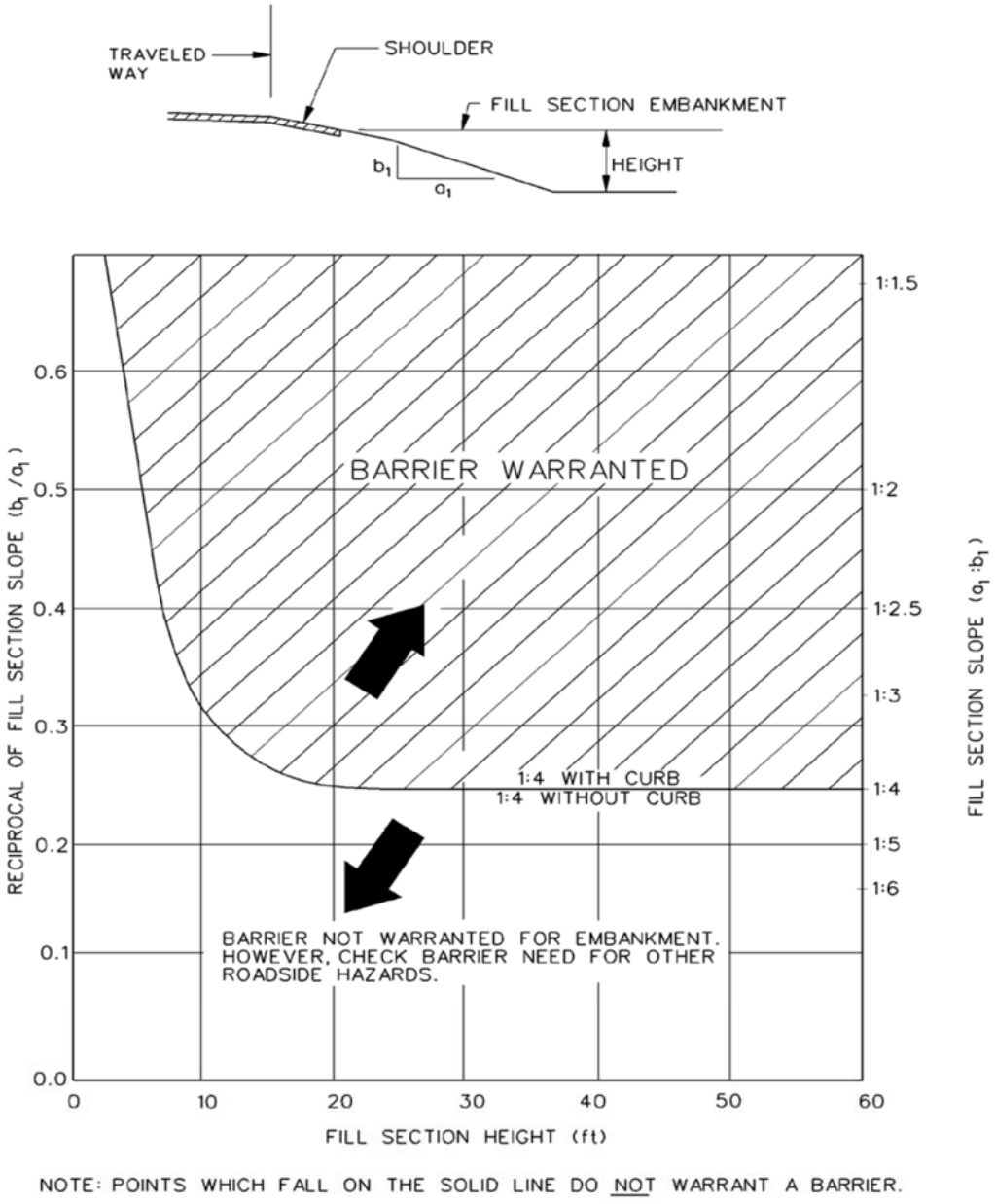


* The Clear Runout Area is additional clear-zone space that is needed because a portion of the Required Clear Zone (shaded area) falls on a non-recoverable slope. The width of the Clear Runout Area is equal to that portion of the Clear Zone Distance that is located on the non-recoverable slope.

Creating and maintaining a clear-zone option for roadside safety should be considered primary in the design of the facility. If conditions exist for the proper sloping and enough ROW is available then this option is the safest and least expensive

Height of Embankment Considerations

Depending on the height of fill slope, guiderail may be needed to shield a fill slope steeper than 1V:4H.



COMPARATIVE RISK WARRANTS FOR EMBANKMENTS

Guiderail Options

Guiderails are used to prevent errant vehicles from leaving the traveled way and from colliding with objects that have a greater crash severity potential than the barrier itself. Guiderails may also be used to protect bicyclists and pedestrians from

vehicular traffic. Since guiderails introduce an additional potential object to crash into, their placement should be carefully considered. The function of a guiderail is to redirect errant vehicles. There are three types of longitudinal barriers: flexible, semi-rigid, or rigid. The main difference in these types of barriers is the amount of deflection that they undergo upon vehicle impact.

There are six test levels (TL's) for evaluating longitudinal barriers. Testing was performed by the National Cooperative Highway Research Program (NCHRP) and the standard that is refered to is NCHRP Report No. 350. Although this documentation does not contain objective criteria for where each TL is to be used, it is common to associate the lower TL's to lower service level roadways (Local/Town) and the higher TL's for higher service level roadways (State/Interstate). The table below highlights the standards for each TL.

NCHRP 350 TL	Impact Conditions			
	Small Car 1,800 lbs	Pickup Truck 4,400 lbs	Single Unit Truck 18,000 lbs	Tractor Trailer 80,000 lbs
1	30 mph @ 20°	30 mph @ 25°		
2	45 mph @ 20°	45 mph @ 25°		
3	60 mph @ 20°	60 mph @ 25°		
4	60 mph @ 20°	60 mph @ 25°	60 mph @ 15°	
5	60 mph @ 20°	60 mph @ 25°	60 mph @ 15°	60 mph @ 15°
6	60 mph @ 20°	60 mph @ 25°	60 mph @ 15°	60 mph @ 15°

Vehicle Class	NCHRP 350
Small car 	820C Weight: **1,809 lb**
Pickup Truck 	2000P Weight: **4,409 lb**
Single Unit Truck 	8000S Weight: **17,636 lb**
Tractor Trailer 	36000V Weight: 79,366 lb

Taking into account cost and aesthetics of the preferred barrier systems (listed in decreased order of preference) are:

No Barrier
No barrier should be provided unless warranted and the barrier installation, including end treatments, has been properly designed. Prior to the design and installation of any barrier system, the area of concern should be reviewed to see if the hazard could be reduced or removed.

Cable Guiderail
Cable guiderail has the lowest initial cost and is the least visually intrusive of all the barrier options.

Wood Guiderail with Steel Plate Backing
Wood guiderail is less visibly intrusive than metal guiderails but has a higher initial cost as well as long-term maintenance cost.

Corten (Weathering) Steel
Corten steel guiderails are slightly less visibly intrusive than galvanized steel guiderails. Corten steel guiderails cost 10-15% more than galvanized steel.

Galvanized Steel
Galvanized Steel is the most visibly intrusive barrier system and costs twice as much as a cable guiderail system.

The six preferred barrier systems with qualifying attributes are:

3-Cable Guiderail with Steel Posts (TL-3)
Cable guiderail has the lowest initial cost and is the least visually intrusive of all the barrier options.

Metal Beam Rail – Galvanized (TL-3)

Galvanized Steel is the most visibly intrusive barrier system and costs twice as much as a cable guiderail system.

Metal Beam Rail – Corten (Weathering) Steel (TL-3)

Corten Steel guiderails are slightly less visibly intrusive than galvanized steel guiderails – color allows blending into background at many locations. Corten steel guiderails cost 10-15% more than galvanized steel.

Metal Beam Rail - Powder Coated Galvanized Steel (TL-3)

Powder Coated Galvanized Steel guiderails are slightly less visibly intrusive than galvanized steel guiderails. Similar to weathering steel, the color chosen can allow it to blend into many locations. Powder Coated Galvanized Steel guiderails cost 15-20% more than galvanized steel.

Box Beam Rail – Galvanized and Corten (Weathering Steel) (TL-3)

Box beam rail is less intrusive physically than metal beam rail because its size, however the final exterior protective coating can create a similar condition as the Metal Beam Rail. Galvanized systems are more intrusive than weathering steel or powder coated steel systems.

Galvanized

Weathering Steel

Timber Rail with Steel Plate Backing (Steel Posts or Wood Posts) (TL-3)
The wood members provide a more rustic appearance than the steel normally used in barriers. Wood guardrail is recommended for use on low volume roadways with design speeds under 60 miles per hour.

SUMMARY

Each type of barrier system has its pros and cons, and when it comes to longitudinal barrier systems, a "one size fits all" approach cannot be employed. Out of the five alternatives, the least expensive system to install is the three-cable system, the second least expensive system is the steel galvanized guiderail system, the third least expensive system is the Corten steel guiderail system, and the most expensive system is the timber guiderail with steel plate backing system with wood posts.

Based on initial installation cost, the three-cable steel post system is the least expensive and the timber rail with wood posts is the most expensive whereas based on aesthetics, the least intrusive is the timber guiderail with wood posts and the most intrusive system is the galvanized steel metal beam rail.

	Expense Ranking	Cost per LF	Aesthetic Ranking
Three-cable steel post	1	$16.00	3
Galvanized steel metal beam rail	2	$25.00	5
Corten (weathering) steel metal beam rail	3	$28.00	4
Powder Coated Galvanized metal beam rail	4	$30.00	4
Timber rail with steel plate backing (steel posts)	5	$80.00	2
Timber rail with steel plate backing (wood posts)	6	$100.00	1
Timber rail w/o steel plate backing (steel post)*	7	$50.00	1
Timber rail w/o steel plate backing (wood post)*	8	$70.00	1

* no test ratings available

Each type of barrier system has its pros and cons, and when it comes to longitudinal barrier systems, a "one size fits all" approach cannot be employed. Barrier systems add an additional maintenance burden on their owners, and, when improperly sited, can create an increased hazard to the public. Carefully documenting the need for a barrier through the use of accident data and site evaluation should done before any installation is considered.

Depending on the individual site and roadway characteristics, any of the barriers discussed in the report may be the optimal choice. The most important factors to be considered when selecting a barrier system, for either a new barrier, or replacement of an existing barrier, are performance capability, deflection, site conditions, compatibility, cost, aesthetics, and maintenance (both routine and collision). CTDOT's Highway Design Manual, Section 13 should be consulted for more detailed information on the selection, design, and installation of barrier systems.

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Town of Wilton

GUIDERAIL CONSIDERATIONS

Wild Duck Road

Location	Clear Zone	Height of Fill	Req'd / NR
Sta 0+00 to 1+10 LT	< 4:1	< 10 feet	Not Required
Sta 23+75 to 24+50 LT	< 4:1	< 10 feet	Not Required
Sta 23.25 to 24.75 RT	< 4:1	> 10 feet	Not Required

Woods End Drive

Location	Clear Zone	Height of Fill	Req'd / NR
Sta 10+00 to 11+00 LT	< 4:1	> 10 feet	Not Required
Sta 17+70 to 18+40 LT	< 4:1	< 10 feet	Not Required
Sta 17+30 to 18+30 RT	< 4:1	< 10 feet	Not Required
Sta 24+10 to 25+25 LT	< 4:1	< 10 feet	Not Required
Sta 23+10 to 25+25 RT	< 4:1	< 10 feet	Not Required