10.4 CONSTRUCTION ZONE GUIDANCE

One of the most challenging roadside design problems is the design of appropriate safety features for construction work zones. The system must be designed to provide for the safety of the workers as well as the motorists, bicyclists, and pedestrians. Most of the barriers and many of the other system components need to be designed as temporary features. Where traffic is maintained through the work zone, conditions are usually quite constricted. The traffic control problem may be complicated by the need to complete the project as a staged construction effort. Safety in the work zone is addressed separately in Chapter 16 - Maintenance and Protection of Traffic. Signage, channelization, and a few typical configurations are covered in the New York State Manual of Uniform Traffic Control Devices (NYS MUTCD). In the following sections, discussion will focus on the much narrower issue of the availability and use of barrier systems in construction zones.

10.4.1 Temporary Concrete Barriers

The shape of these barriers is very similar to the Jersey-shape concrete median barriers. The main differences relate to the need to make the installation temporary. To accomplish this, the temporary units are cast without the 230 mm of base depth normally provided for embedded anchorage. The ends of each unit include vertical 100 mm x 100 mm steel tubes with a continuous vertical slot to accommodate a small built-up I-section that may be dropped into facing slots as a connection key. Units are cast with 40 mm x 140 mm openings through the base to serve as drainage pockets. To limit deflections on impact, grout may be placed between the base portions of successive units as shown on the Standard Sheets for 619 series items. To permit further reduction in the deflection, the units are provided with 32 mm holes through the shoulders (outside portion of the base) so that alternate units can be anchored in place by 25 mm steel anchor rods at approximately 0.6 m centers on alternate sides of the units. Table 10-3 shows the standard deflection for each case. Note that the areas where these deflection-limiting measures are desired should be shown on the Maintenance and Protection of Traffic Plan. Details of the units, connection keys, and anchoring details are shown on the Standard Sheets for 619 series items. Also shown on the sheet are details of the tapered end sections. At a minimum, delineation consisting of approved reflectors mounted on each connection key is recommended.

The recommended flare rates will differ depending on whether the temporary concrete barrier is being placed (1) to merge traffic, (2) to divert traffic at signal-controlled one-lane reversible operations, or (3) adjacent to the traveled way. The recommended minimum flare rates are shown in Table 10-8. In some situations, the proximity of driveways or other features may make the use of more abrupt flares necessary.
Approach terminal ends of temporary concrete barriers should be flared away from the road at the following rates:

**Table 10-8 Recommended Maximum Flare Rates for Temporary Concrete Barrier**

<table>
<thead>
<tr>
<th>Barrier Location</th>
<th>Anticipated Operating Speed (km/h)</th>
<th>Recommended Maximum Flare Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>In travel lane as merging taper</td>
<td>110</td>
<td>1:20</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>1:18</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>1:16</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>1:14</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>1:12</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>1:10</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>1:08</td>
</tr>
<tr>
<td>In travel lane at signal-controlled one-lane-reversible operations</td>
<td>(50)</td>
<td>1:08</td>
</tr>
<tr>
<td>(May assume due to signalization. If higher speeds are expected, use flare rates for above speeds.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 0.6 m beyond currently delineated edge of traveled way</td>
<td>110</td>
<td>1:14</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>1:13</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>1:12</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>1:11</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>1:10</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>1:09</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>1:08</td>
</tr>
</tbody>
</table>

Where practical, the approach ends should be embedded into a back slope or started behind an existing barrier and beyond its deflection distance. (Consideration may be given to temporarily reducing the deflection of the existing rail system by the placement of additional back-up posts up to the spacing limits shown in Table 10-3.) If approach ends can not practically be embedded, shielded, or carried beyond the clear zone, the ends must be suitably treated. Impact attenuators should be provided and ramped concrete end sections should not be used if the anticipated operating speeds are 70 km/h or greater, the ends can not be conveniently embedded or shielded, and the ends are closer than 3.6 m to approaching traffic lanes. Where sand barrel arrays are used for shielding and traffic will only be on one side of the array, the barrels on the traffic side of the array should be in a straight line to minimize the potential for errant vehicles to crash directly into one of the heavily loaded barrels in the back of the array without first impacting the lighter barrels in front. Where used, sand barrels should extend laterally towards approaching traffic to fully shield the end of the concrete barrier as discussed in Section 10.2.5.2 A.

If the first full-height section of barrier will be 3.6 m or more removed from approaching traffic
ROADSIDE DESIGN

lanes or if the anticipated operating speeds will be less than 70 km/h, a tapered end section may be used where embodiment or shielding is not practical. Impact attenuators may be warranted for ends over 3.6 m from traffic in areas where sharp curves, short sight distances, high-volume weaves, merges or other traffic conflict situations increase the possibility of vehicles leaving the traveled way.

In certain circumstances, such as rural bridge redecking jobs with driveways immediately upstream from the bridge, it may not be possible to use the desired flare rates on the barrier, or even to adequately bury or extend the lead end of the concrete barrier. If it is judged that temporary concrete barriers (TCB) are needed to protect the workers, then the TCB should be placed on as much of a skew as possible to minimize the severity of impact for errant vehicles. Right angle alignments should not be used unless there is no other alternative. If the recommended flare can't be achieved, more than the minimum delineation should be used and the channelization should be emphasized.

Proprietary attenuator systems have been developed specifically to shield temporary concrete end sections and other rigid objects in narrow construction zones where the use of sand barrels is not feasible. The systems include the ADIEM (Section 10.2.6.6 A), the Construction Zone REACT 350 (Special Specification Item 15619.420X, where X varies from 1 through 4, depending on the model selected as based on the guidance in Section 10.2.6.4) and the QuadGuard - Construction Zone (Special Specification Items 15619.41XXYY or 15619.41XXYY M). The latter is a narrow variant of the QuadGuard and is the NCHRP 350 compliant replacement for the GREAT-CZ. The XX is the width of the unit in inches for both the English and metric units, and YY is the number of bays in the completed unit. See Section 10.2.6.3 for selection guidance. The designer should note that this specification is proprietary and a justification for its use must be submitted with the PS&E package.

10.4.2 Temporary Timber Safety Curb and Median Barriers

As explained in EI 03-001, designers should no longer specify timber items 15619.1401 M or 15619.1402 M in project proposals.
10.4.3 Dragnets

Dragnets are proprietary net-type Vehicle Arresting Barrier (VAB) devices that have performed well at safely stopping speeding vehicles with a minimum of damage. The system consists of a net stretched across the approach path of the vehicle to be stopped and a reel that dispenses a tough steel tape. The net may be either chain link or high visibility plastic fencing. The fence is held upright by light posts. The ends of the fence are fastened to steel tape dispensers that force the tape to drag around a series of heavy pins. The drag imparts the force that slows the vehicle. The dispensers swivel on the top of a post that is anchored a minimum of 1 m into the ground. By sleeving the anchor posts, Dragnets may be conveniently erected and removed on a daily basis such as during nighttime construction.

Dragnets should be considered where full-width closures are to be made. To allow construction vehicle access, provisions may be made to lower the net so vehicles may pass over it. Refer to EI 92-39 Vehicle Arresting Barrier (Net Type) for detailed guidance on usage and design computations.

10.4.4 Moveable Concrete Barriers

Moveable concrete barriers (MCBs) have already been discussed in Section 10.2.4.9 B under the heading of innovative median barriers for permanent installations. The MCBs are more commonly justified for use on construction projects in congested areas where it is beneficial to change the number of lanes available during each working day.

The advantages of using MCBs on congested construction projects include the following.

- Construction workers in temporary lane closures are protected behind positive physical barriers and are better able to concentrate on their work without being concerned about vehicles entering the work zone through lines of barricades, cones, and barrels.
- The public is better shielded from intrusion into hazardous work zones.
- Routine and repetitive lane closures can be accomplished quicker than by using typical channelizing devices and without exposing workers to traffic.
- Congestion and air quality impacts can be reduced during construction by opening travel lanes during peak traffic times.
- The Contractor's lane rental costs and/or construction schedule duration may be significantly reduced.

Since construction projects are temporary, it is not necessary to house the transfer vehicles.

The use of MCBs should be considered on long-duration projects (such as lane addition, bridge, or shoulder reconstruction) on very busy roads where positive separation is highly desirable for protection of the workers but where additional lanes should be made available for peak traffic conditions. Factors that would favor the use of MCBs include the following:
• Peak direction traffic operates at or near capacity (Level of Service E or F) during peak periods.
• Peak period traffic is expected to exhibit levels of construction congestion judged unacceptable by the Region.
• Site constraints preclude temporary or permanent widening.
• Traffic must be managed on-site since alternate routes lack sufficient excess capacity or other operational concerns exist.
• Traffic flow is highly directional and conducive to use of a reversible lanes.
• Nighttime construction conditions warrant the added worker protection of a positive barrier.
• Significant construction quality, efficiency or schedule benefits can be obtained by widening the work area during off-peak periods.

10.4.5 Warrants for Work Zone Barriers

There are a variety of situations in which the use of work zone barriers may be warranted. As of this writing, EI 01-015, Two-Lane, Two-Way Operations in Construction Work Zones, provides a good example of the guidance and considerations that should be applied to many of those situations, even if the EI is intended specifically for the Department's policy, standards, and guidelines on two-lane, two-way operations on one roadway of a normally divided highway.

For additional details on the use of barriers in construction work zones and roadside design in work zones, refer to Chapter 16.
10.5 SPECIAL TOPICS

10.5.1 Mailboxes

Mailboxes may pose safety problems as a result of either their placement or their construction. Placement problems may arise from several factors.

- There may be inadequate sight distance due to proximity to crest vertical curves or right horizontal curves.
- Due to proximity to intersections, vehicles at the mailbox could distract other motorists or interfere with sight distances. Stopped vehicles might also obstruct stop signs.
- Offset from the road might not be sufficient to allow vehicles to stop far enough out of the traveled way.
- Placement in or near the sidewalk may reduce the usable sidewalk width below standards.

Construction problems would include three categories.

- A mailbox attached to or surrounded by a structure that will function as a fixed object may be capable of producing a serious impact for an errant vehicle.
- A mailbox assembly containing elements that can separate upon impact and may produce injury if these elements enter the passenger compartment. A serious and not uncommon example of this is the arrangement where one horizontal plank supports several mailboxes at about the height of a motorist's head.
- The arrangement of mailboxes could produce ramping and overturning of an errant vehicle. The problem arrangements would typically consist of several closely spaced mailbox posts or a small number of yielding metal posts.

The designer should refer to AASHTO's 1994 publication A Guide for Erecting Mailboxes on Highways (Mailbox Guide) or subsequent publications for further guidance on identifying mailbox problems and for designs which address these concerns.

10.5.1.1 Inspections

Inspections for problem mailboxes should be performed as part of a project's site inspection. The location and condition of suspected problem mailboxes should be documented and addressed during the design process.
10.5.1.2 Location Details

In most cases, mailboxes will already have been located along the highways and will remain in their approximate locations, offset as needed to accommodate highway and shoulder widenings. Nonetheless, some relocations will be necessary or possible. When making relocations, the information given below should be considered. The pay item Mailboxes in §619 of the Standard Specifications may be used whenever it is necessary to provide, remove, set back, or relocate a mailbox or to replace its support if not crashworthy. (Note: “Crashworthy”, as used herein, means that the feature has been judged to perform in an acceptable manner when impacted by an errant vehicle.) It is not necessary to use item “Mailboxes” for an existing mailbox if the construction does not require its removal, set back, or relocation.

The following information is taken from the previously mentioned AASHTO Mailbox Guide and represents good practice with respect to locating mailboxes. In general, mailboxes should be located on the right-hand side of the roadway in the direction of the delivery route except on one-way roadways where they may be located left or right. When feasible, they should be located on the far side of intersections and at locations where there is sufficient clearance for vehicles to be able to pull entirely off the pavement. A 2.4 m or preferably wider shoulder or turnout will enable this.

The placement of mailboxes along high-speed highways should be avoided if possible. If this is not possible and traffic is heavy and speeds are high, consideration should be given to installing mailboxes on both sides of the road so that postal patrons do not have to cross the road to receive their mail. Discuss this with the local postmaster. In no case should mailboxes be located where access to the box must be made from the lanes of an expressway or where access, stopping, or parking is prohibited. In areas where there is guide rail, the mailboxes should be located behind the railing.

10.5.1.3 Structural Details

Mailboxes and their supports shall be in conformance with U.S. Postal Service requirements. They may be made of a variety of materials including steel, aluminum, or plastic. Mailboxes are most frequently mounted on individual supports, the most common of these made from pressure treated dimension lumber nominally 100 x 100 mm, round treated posts 115 mm in diameter, or 50 mm or less steel or aluminum pipes. All these are crashworthy. Railroad rails, milk cans filled with concrete, old metal plows and similar supports are not crashworthy. Noncrashworthy mailboxes and those which do not conform with Postal regulations should not be permitted to be used or remain on projects.

Mailboxes gang-mounted on horizontal planks can present an especially hazardous condition and should be remounted on crashworthy individual posts having not more than two mailboxes per post. Individual posts should be installed with a 0.8 m separation between posts since posts more closely spaced may cause ramping. In the unusual circumstance where there are so many mailboxes being relocated that there will not be room for all while still maintaining the
above mentioned post spacing, "cluster boxes" may be a solution. Contact the local postmaster to discuss. "Cluster boxes" are not crashworthy and so may not be located where they may be hit.

It is acceptable for newspaper boxes to be mounted on the supports, if constructed of plastic or light gage sheet metal.

For additional guidance, refer to Section 10.5.6, Public Relations.
10.5.2 Fencing

It is the general policy of the Department that fences which constitute a hazard, whether privately or State-owned, are to be removed from the clear zone.

Fences within the right of way may have been erected either by the Department or by the adjoining property owner. In either case, the designer should be aware that the fences may be a hazard. The next section provides guidance for private fences. The current guidance for the Department's fences, presented in the subsequent sections, is intended to ensure that fences erected at our direction are warranted and are reasonably safe. Details of fencing used to contain rockfall should be developed in conjunction with the Regional Geotechnical Engineer. Unless designed as breakaway features, such fences should be treated as fixed objects with respect to clear zone determinations.

10.5.2.1 Private Fences

It is DOT policy that fences that constitute a hazard within the clear zone, whether private or state-owned, are to be removed. Private fences may pose serious hazards. While most fences are not substantial enough to wreck an impacting vehicle, they may contain elements that could enter the passenger compartment and cause serious injury or death. The most dangerous elements are long horizontal components, roughly 1 to 2 m above grade, that can separate on impact and "spear" through windshields. Typical examples include split-rail fences and pipe rails on the top of chain link fences.

A few fences may be strong enough or heavy enough to constitute a significant fixed object hazard. When fences that are considered potentially hazardous are found to be within the State’s right of way, the fences are to be removed, treated, or documented as a nonconforming feature. Positions opposite points of entry or on the outside of curves after a long straight section or long hill are more likely to experience accidents. If, in the professional opinion of the engineer, a particular fence represents a significant hazard, the engineer should notify the owner in writing. The letter should request remediation and suggest appropriate alternatives. It is important that documentation of the effort to remediate be retained in Regional files. Refer to Section 10.5.6, Public Relations, for additional guidance.

In addition to the safety aspects of fencing, the designer should be aware of the implications of private fences to land use patterns. While the Department may tolerate casual land use within the right of way, the presence of a private fence within the R.O.W should not be allowed to justify construction of substantial encroachments. Although it is very difficult to detect such activity, suspected problems should be brought to the attention of the Regional Real Estate Group. Prompt action at the start of encroaching construction activity may allow adjustment before the problem involves a completed project.
10.5.2.2 Purposes for DOT Barrier Fencing

The primary purpose for installing barrier fencing is to enhance the safety of the motorist and to enhance the safety of those that the fencing is meant to exclude.

In some locations, the fencing additionally serves to delineate the right of way. However, in many instances it is more convenient to erect the fences in continuous lines leaving irregular right of way corners outside the fence line.

Fencing is intended to exclude pedestrians, bicyclists, unauthorized vehicles, and domesticated animals. Among wild animals, deer are the major hazard in New York State, due to their number, size, and range requirements. Fencing is not warranted or effective for deer control. Deer routinely vault or crawl under most practical types of fencing. Fencing may cause deer to spend more time within the right of way while searching for a way out of the fencing. Where deer hits have been a problem, consideration should be given to (1) clearing vegetation well back from the road to improve visibility and reduce the potential for surprise, (2) placement of appropriate warning signs and (3) special treatments, such as underpasses at concentrated crossing areas.

The two most common types of fencing used by the Department are chain link and right of way (R.O.W. or cattle) fencing shown on the Standard Sheets for 607 series items.

Because of the potential for "spearing" accidents and the lack of any offsetting cost advantage, the chain link fence with top rail is generally not to be used on State contracts. Exceptions may be made only in special cases where supporting justification is submitted with the P.S. and E. or the fencing does not border an established roadside clear area. Exceptions may be approved by the Regional Director in cases where there is a compelling reason, such as:

- where top rail fencing with insert slats is required for visual screening,
- where trespassing or vandalism problems are anticipated and top rail fencing would be more durable and/or easier to repair, or
- on structures in accordance with Bridge Detail Sheets.

Unless excepted by the Regional Director, existing top rails are to be replaced with tension wires whenever the fence is in the clear zone or in a location where it could easily be struck by an errant vehicle and either:

- Repair, replacement, or realignment of the fence is required.
- The fence adjoins, or is within, a reconstruction or 3R project.
- A sufficient amount of related work is being done in the immediate vicinity to justify including top rail removal within the scope of work.

Other types of fencing are described in special and Regional specifications. For built-up areas, the Regional Landscape Architect can provide options and should be consulted to recommend fence styles that are reasonably safe and compatible with adjacent land uses.
Selection might include:

- cattle fences in rural areas,
- high, nonclimbable fences (25 mm mesh) on urban freeways,
- black or green vinyl-clad chain link fences in sensitive residential areas, or
- ornamental fencing in historically designated areas.

Changes in the type of fencing should occur at natural break points to minimize the visual impact.

10.5.2.3 Vandalism and Trespassing

In areas of high crime, vandalism, or risk, a higher quality security fence may be warranted. The Regional Landscape Architect should be consulted on different styles of fencing and more vandal-resistant materials, such as picket and rail fencing and nonclimbable meshes. Fencing will not exclude the determined trespasser. In developed areas, vandals may cut holes or pedestrians may enter at required fencing gaps, such as at exit ramps, to take short cuts across limited access highways. In rural areas, snowmobilers and All-Terrain-Vehicle (ATV) operators sometimes cut holes in the fence to gain access to the right of way. The miles of continuous clear zone with mild grades offer ideal conditions for these kinds of unauthorized vehicles.

There are three measures that can be taken to combat the hazards posed by trespassers. The first is to regularly repair the fencing. Where repeated vandalism is a problem, consideration may be given to repositioning fencing where it will be easily observed or where it works in concert with other obstacles.

The second measure is to request increased enforcement efforts from police agencies in the area.

The third measure is to reduce the desirability of entering the right of way. The addition of a sufficient length of continuous fencing in a median may eliminate a pedestrian shortcut. In rural areas, the continuity of the clear zone may be eliminated by using guide rail to extend from roadside barriers to connect to natural barriers. For instance, where roadside guide rail is used to shield a culvert, clear zone continuity may be interrupted by extending the roadside guide rail down to the drainage feature. While corrugated or box beam guide rails are highly resistant to vandalism, their use may constitute a hazard to errant vehicles and should only be installed at locations that are already shielded, require shielding, or contain other hazards.
10.5.2.4 Warrants for Barrier Fencing

The primary guidance for barrier fencing is AASHTO's November 1990 booklet An Informational Guide on Fencing Controlled Access Highways. The guide is used by the Federal Highway Administration and many state agencies. The guide is subject to differences of interpretation. One passage states, "All portions of a controlled access highway should be continuously fenced unless it can be established that a fence is not warranted; such as in areas of precipitous slopes or natural barriers." In a subsequent paragraph, the guide indicates that, "The cost of a continuous fence of this height... (sufficient to deter deer)...would be excessive and the biologic effects on animal life would be undesirable." The Department's interpretation of this guidance is that fencing is not warranted for the control of wildlife (ineffective) or the exclusion of the occasional hunter (not cost effective for small risks involved). Natural barriers are therefore interpreted to mean ones that would generally inhibit or preclude passage by ATVs and snowmobiles. While continuous fencing of limited access highways may not be warranted, it is considered desirable as a legal means of establishing trespass.

The installation of barrier fencing may be warranted for long-term conditions or temporary conditions as described below.

A. Long-Term Conditions

Since a fence may remain in place and be functional for many years, the selection of a type should take into consideration the potential development of the area.

Most long-term condition warrants relate to limited access highways. The remainder relate to hazardous conditions that may be encountered within the right of way of any state highway.

1. The use of continuous 2 m high chain link fencing is warranted along the right of way line of any portions of limited access highways in urban areas, towns, or population centers where trespassing pedestrians may be anticipated. Where the limited access highway is flanked by a frontage road with access to adjoining properties, the fencing should be installed between the frontage road and the limited access highway.

2. The use of 1.2 m high right of way fencing (as shown on the Standard Sheets) may be warranted along limited access highways in agricultural areas where livestock, particularly cows, are present. In all cases, however, the livestock owners have primary responsibility for providing fencing for their livestock. Any fencing provided by the Department is strictly a secondary barrier to protect highway patrons from escaped livestock. Livestock owners should not be permitted to connect their fences to the Department's fences.

3. The use of either chain link or R.O.W. fencing is warranted along limited access highways in open country to restrict access for snowmobilers, hunters, ATV operators, and others who may be casual users of the R.O.W.

4. The use of chain link fencing may be warranted to inhibit access to hazardous features within the right of way, such as steep rock cuts, recharge basins, transmission towers (owner's responsibility), and some hazardous waterways.
5. The use of 2.5 m high chain link fencing may be warranted along the right of way line adjacent to any school play grounds where formal access is not provided and where adequate access control has not been furnished by the school.

In areas that would normally exclude motorized vehicles, such as mountainous, densely wooded or swampy areas, the use of fencing is not warranted for the exclusion of snowmobilers or ATV operators. The high cost of fencing is also not warranted for the exclusion of the occasional hunter or others.

While they are not warranting conditions and not DOT responsibilities, the presence of the following facilities adjacent to the right of way may be taken into consideration when fencing decisions are being made: public water supplies, military bases, mental institutions, state prisons, and power plants.

B. Temporary Conditions

Temporary condition warrants will normally be related to construction work. The contractor may elect to use fencing to reduce rates of theft and vandalism from the construction site. Additionally, fencing may be, and in urban areas is, warranted in an attempt to preclude pedestrians from entering the work zone. Where pedestrian access must be permitted through or immediately adjacent to the work zone, the path or sidewalk may warrant being fenced to guide pedestrians and to isolate foot traffic from hazards within the work zone. The details of the types and specific locations of work zone barrier fencing should be developed with consideration given to the concerns identified in this chapter and in EI 01-019 Maintenance and Protection of Pedestrian and Bicycle Traffic and should be subject to the approval of the EIC. Use of horizontal rails in fences adjacent to traffic should not be permitted. The designer should refer to OSHA's requirements for fencing of additional hazards, such as high visibility plastic fencing around excavations.

10.5.2.5 Visual Screen Fencing

Visual Screen Fencing is defined as fencing whose primary purpose is to serve as a visual barrier. The most common uses are to intercept headlight glare, to mask unsightly areas such as junk yards and to screen high-speed or limited access highways from residences. Consult the Regional Landscape Architect for guidance on the selection and placement of appropriate fencing for the latter purposes.

Various types of glare screens have been tested in actual use. Few have proven satisfactory. Fabric screens have proven vulnerable to vandalism and wind damage. Many of the plastic fabrics are susceptible to ultraviolet deterioration. Although wind forces are a concern, one successful option has been the use of aluminum insert slats which may be slid into the weave of chain link fencing. The Special Specifications list requirements for the heavier posts needed to resist wind loads. Consult the Regional Landscape Architect for warrants and details of glare fencing options along the sides of the right of way.
One general type of glare fencing has been found satisfactory for reducing glare between lanes of opposing traffic. Paddle-type glare fencing is designed for mounting on top of concrete barriers and may be adapted to mount on box beam or heavy-post W-beam median barriers or guide rails. The system consists of vertically oriented paddles approximately 215 mm in width mounted every 0.6 m on 3.0 m continuous runners. Paddle heights are available in lengths of 0.6 m, 0.75 m, 0.9 m, and 1.2 m. The paddles face at a 45° angle to the direction of traffic.

Glare fencing may be warranted on curves on high-volume, narrowly divided highways where headlights can shine directly into the eyes of drivers in the outside of the curve. Glare fencing may also be warranted where close frontage roads or railroads carry opposing traffic. It is warranted wherever headlight glare is listed as a contributing factor to a significant number of accidents on divided highways.

10.5.2.6 Noise Barriers

Placement of noise barriers so that they form the border of the clear zone should be avoided. Where it is deemed necessary to place noise barriers so that they border the clear zone, the barriers should be of a crashworthy design. At a minimum, they should not contain elements that would be likely to enter the passenger compartment and, if designed to deflect vehicles, they should not contain projections in excess of 100 mm. If such a design is not acceptable, any noise barriers that border the clear zone width shall be shielded with suitable roadside barriers.

The purpose of noise barriers is to provide an efficient system of noise control. This may be achieved with either a wall, a berm, or a combination of the two. The Environmental Analysis Bureau should be consulted to help determine the need for a noise barrier. Noise barriers can have a substantial effect on the visual environment of a highway and the surrounding community. Ideally, any wall or fence option should achieve continuity with the design styles in the neighborhood. The Regional Landscape Architect should also be involved early in the process to review the potential need for a noise barrier and to assess the historic, aesthetic, and cultural heritage of the neighborhood and the affected community's consensus on whether or not to build the proposed noise barrier. When a timber noise wall is appropriate for either the entire barrier or in conjunction with other materials or earth berms, Noise Barrier Wall, Item 15607.99XX may be specified. These specifications are for wooden noise wall, but allow approved alternates as well. The wooden noise wall is shown on Standard Sheet 607-5 Noise Barrier Wall Details (Horizontal Sheathing) and 607-6 Noise Barrier Wall Details (Vertical Sheathing). Upon request, the Geotechnical Engineering Bureau will design the footing depths and diameters for noise wall installations.
10.5.3 Cattle Passes

Cattle passes are tunnels that allow cattle to move from one side of a road to the other without occupying the traveled way. They were historically provided as mitigation when new roads separated significant quantities of pasture land from the remainder of an active dairy farm. Their rate of installation has declined dramatically in recent years due to the reduction in the number of new state roads and the decline in the dairy industry within the state. The situation is complicated by the provisions of the Farmlands Protection Act which strives to minimize direct or indirect (hindered access) loss of farmland.

In general, the use of cattle passes has proven to be problematical and has not produced one of the desired results: preventing subsequent damage claims. As a consequence, their use should only be approved after close examination confirms the justification. The Regional Real Estate Officer should be involved as soon as possible when installation of a cattle pass is given consideration.

10.5.3.1 Conditions Required for Use

The primary condition required for use of a cattle pass is that the owner actually wants one. Cattle passes should not be forced on farm owners.

Generally, all of the following conditions must also be met for a cattle pass to be warranted.

- The size of the herd should be at least 25.
- The design year AADT should be at least 500 vehicles.
- The separated parcel of pasture should be at least 4 ha (4 hectares = 10 acres) in area.

The following conditions are contributing factors that could increase the justification for installation of a cattle pass.

- The present cattle crossing is located where the sight distance is close to or less than the minimum allowed for the particular class of highway.
- The present cattle crossing is located on a grade in excess of 5%.
- The topography is favorable to the installation of an underpass.

The final determination of the need for a cattle pass should be made by the Regional Real Estate Officer after all other options have been examined. Before construction of the cattle pass is approved, the Regional Real Estate Officer must obtain the owner's signature on an Agreement of Adjustment that restricts subsequent claims and on a Maintenance Agreement (Section 10.5.3.3).
10.5.3.2 Design Details

The standard cattle pass options are shown on the Standard Sheets for 603 items. Lengths should generally be limited to 15 m as cows have shown reluctance to enter longer tunnels. The relatively narrow cross-sections are designed to prevent cattle from trying to turn around inside the tunnel. Wider box culvert cattle passes may be designed to permit easier cleaning and the passage of farm equipment. The specific geometry will be the result of negotiations between the owner, the Department of Agriculture and Markets, and the Real Estate Officer, with cost input from the designer. Because of the danger of cattle breaking legs after falling on ice and other problems, cattle passes are not to be designed to serve as a dual purpose cattle pass and drainage culvert. Entry slopes should be 1:4 or flatter. If possible, the inlet end should be placed above existing ground to minimize entry of runoff. The design should preclude standing water. The placement and back filling should provide for a minimum cover of 0.3 m between the top of the cattle pass and the subgrade of the roadway.

10.5.3.3 Maintenance

Cattle passes, by their nature, require periodic cleaning. This is not a proper function of the Highway Maintenance Division. It is recommended that, prior to a final decision to include a cattle pass in the contract plans, a signed agreement be obtained, where the recipient of the cattle pass agrees to clean the proposed facility. However, the structural maintenance of the cattle pass must remain with the agency having highway maintenance jurisdiction.

10.5.4 Guide Posts

Guide posts are short, unconnected posts whose purpose is to prevent the willful movement of vehicles into restricted areas. Guide posts are not safety features for errant vehicles. In general, the use of guide posts is discouraged. While the use of guide posts may be warranted for special circumstances within low-speed locations, such as rest areas and other parking areas, preference should be given to the use of curbing and parking bumpers. Guide posts should not be used within the clear zone of any roadway.
10.5.5 **Barriers on Dead-End Roads and Streets**

The Department's barriers for use at dead ends consist of three (formerly two) corrugated W-beam rails mounted at heights of 350 mm, 860 mm, and 1370 mm on heavy-posts. Details are shown on the Standard Sheets for 630 items, "Highway Barrier and Highway-Railroad Barricade".

These barriers are significant hazards whose use must be carefully warranted and for which thorough warning must be provided. Warning sign requirements are specified in the NYS MUTCD. At a minimum, signage should include an advance "DEAD END" sign (Part 233.7) and at least one "end of roadway" marker (Part 237.9) above the barrier. Each rail of the barrier should be covered by a strip of the type C4-1 red and white striped barricade sheeting (Part 292.2).

The use of barriers should be limited to those situations where a road ends, such as a dead end at a railroad (Highway-Railroad Barricade) or dead ends against limited access highways or where bridges are out (Highway Barriers). Because the barriers are fixed obstacles, they should only be used when a serious accident is likely to result if a vehicle passes beyond the end of the road. Examples would include dead ends at bodies of water, highway cuts, and other drop-offs. Also included would be cases where the errant vehicle would be likely to cause injury to other people, such as by entering onto highways with volumes in excess of 10,000 vehicles per day or areas where people are likely to congregate. In these latter cases, the barriers would not be warranted if other obstacles such as trees, ditches, or guide rail are present to prevent passage into the critical areas. The barriers would also not be warranted where the end-of-road signage will be clearly visible both day and night and the length of approach is short enough to limit approach speeds to less than 50 km/h.

Where the end of the road is followed by conditions that do not exceed the hazard of the barrier, only the signage described in the NYS MUTCD should be provided.

10.5.6 **Public Relations**

The New York State Department of Transportation has a duty to construct and maintain its roads so that they are reasonably safe for users. Unfortunately, the details of meeting that duty sometimes meet determined opposition from local residents. Typically, these problems involve historical monuments, large trees, fences, landscaping features, or structures, often fronting private residences, but on State right of way. Whenever projects are considered that would involve potentially sensitive features such as these, the Regional Landscape Architect should be consulted, early in the process, to address the complex aesthetic and environmental issues and the protests that may develop. The Regional Real Estate Office should also be consulted early in any discussions regarding potentially sensitive right of way encroachments. It is the Real Estate negotiator's responsibility to be of as much assistance as possible to those affected by the State's acquisitions. They are prepared to explain the rights and responsibilities of the State and adjacent property owners. Any potentially controversial actions should be called to the attention of the Regional Public Information Officer so the Department can be prepared to deal with any bad publicity.

§10.5.6 4/19/02
10.5.7 Resetting Guide Rail

Frequently, maintenance or construction work requires that existing guide rail be taken down. On any projects that require the temporary removal of guide rail, the designer and EIC should try to minimize the amount of time that roadside hazards are unshielded. The plans should note that, "Portions of runs should not be removed until it is necessary to remove them. Any portions of a run should be restored to service as soon as it is practical to do so. Leading ends of guide railing should not be left exposed to traffic without any shielding."

Often, the guide rail is suitable for resetting. This section provides the guidance to be followed for resetting, salvaging, or rejecting existing guide rail. The term "guide rail" is here meant to cover posts, cable, rail elements, anchor assemblies, and splices for both median barriers and guide railing.

As noted previously in Section 10.3.1.2 B, the adequacy of a guide rail's type, placement (including point of need), anchorage, etc. must be carefully reviewed before specifying its resetting to existing conditions.

10.5.7.1 Railing Unsuitable for Resetting

Box beam guide rail or median barrier installed on contracts let before June 12, 1975, shall not be reset and shall not be retained on projects where any significant amount of construction work is to be performed. This rail can be recognized by any one of the following conditions.

- The rail is joined by external couplings.
- The rail is joined by two-bolt internal couplings.
- It lacks an imprinted heat number and manufacturer's symbol to indicate the material met the requirements of ASTM E436 - Standard Method for Drop-Weight Tear Test of Ferritic Steels. The imprint is generally opposite the weld at intervals not exceeding 1.2 m.

The designer should field inspect all the existing guide rail installations within the project limits and determine which sections are not suitable for resetting. If any rail (that is otherwise suitable for resetting) has lost its galvanized coating it should either be rejected as unsuitable for resetting or it may be field galvanized at the Contractor's option and reset. Conversely, galvanized steel guide rail in the Adirondack and Catskill Parks, unless painted brown, should not be reset except in short runs as a maintenance activity. Outmoded corrugated shapes can not be reset. "C" posts were discontinued by El 82-49 and are not suitable for resetting. "Z" posts, rarely encountered now, are also not to be reused.
10.5.7.2 Rail/Barrier Suitable for Resetting

When the designer has determined that a run (section) of guide rail, including cable guide rail, is not outmoded and that most of the lengths are suitable for resetting, it shall be so designated in a schedule on the plans. In the case of existing cable that will be reused, new splice couplings and wedges are to be used.

After contract award and prior to the dismantling of sections of the installation, the Engineer-in-Charge and the Contractor shall jointly survey those sections to be reset and determine and record the amount of visible damage. Such damage to the installation includes but is not limited to posts, cable, rail elements, anchor assemblies, and splices. When these elements are damaged beyond repair, the cost of replacing this material will be borne by the State. Payment will be made under an appropriate item when included in the contract; otherwise payment will be made by agreed price or force account.

When the damage survey is completed, the installation shall be dismantled and the acceptable material stored for later resetting. The material previously catalogued as damaged, and also that damaged by the Contractor’s removal operation, shall be removed by the Contractor from the site. The cost of all additional inventory required to replace material damaged by the Contractor’s operation shall be borne by the Contractor. This replacement inventory material shall be equal in kind and quality of that stockpiled for resetting as determined by the Engineer.

10.5.7.3 Salvaging or Removing Railing not Suitable for Resetting

When the designer determines which runs of guide rail are predominantly not suitable for resetting, the Regional Maintenance Engineer should be notified. The Regional Maintenance Engineer should determine whether a given run should be designated as Remove and Dispose, Item 606.71 to 606.80 or as Remove and Store, Items 606.61 to 606.70.

The designer should include a schedule on the plans indicating which runs of guide rails are "Suitable for Resetting", and which are suitable to "Remove and Store", or "Remove and Dispose".

Under the Remove and Store option, the Contractor is to remove the guide rail and neatly store the components in separate piles so that Department forces can salvage usable parts. Prior to project completion, salvage shall be performed and the Contractor shall be notified by the Regional Maintenance Engineer that salvage has been performed, so that the Contractor may begin to dispose of all remaining material as required by the specifications. Salvaged parts may be used for maintenance work on outmoded systems, current systems, or temporary detours as appropriate. However, outmoded (see 10.5.7.1) box beam should only be used for spot repair work. Outmoded box rail elements (lacking imprint of heat number and manufacturer's symbol) which are accepted by the Regional Maintenance Engineer as Remove and Store must be accompanied by written instructions from the EIC that the rail elements must be drop weight tear tested in accordance with ASTM E 436 before being installed in the normal maintenance operation. Where applicable, the designer should note this requirement on the plans.
Materials Bureau, through the Regional Materials Engineer, should be contacted for lot stocking and sampling instructions of box rail elements which are desired to be salvaged.

Contact the Design Quality Assurance Bureau should resetting or salvaging situations be encountered that are not covered by the above instructions.

10.5.7.4 Guide Rail Resetting Time Allowances

Guide rail provides an important safeguard that is lost during the time that it is removed for resetting. To minimize the exposure period when this protective feature is not available, guide rail should not be taken down earlier than necessary and should be put back in service as soon as possible. As this Chapter 10 revision went to press, efforts were underway to provide Standard Specifications covering the installation time requirements for guide rail. When those are in place, the designer will have the responsibility of reviewing the time durations specified as defaults in the Standard Specifications and determining if they are appropriate for the specific conditions of the project under consideration. If they need to be modified, the designer should place a note in the proposal and with the guide rail tables indicating the special duration limits.

Until such time as the above Standard Specification requirements (or a temporary Shelf Note) are issued, the designer should include notes in the contract documents alerting the contractor to the duration requirements for any project where guide rail replacement, resetting, or new installations are required. Recommended durations for a variety of guide rail installation conditions are shown below in Table 10-9.

<table>
<thead>
<tr>
<th>Work Operation</th>
<th>Allowable Out-of-Service Time Durations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AADT &gt; 40,000</td>
</tr>
<tr>
<td>Resurfacing/Roadside Safety</td>
<td>14 Calendar Days</td>
</tr>
<tr>
<td>Guide Rail Replacement Projects</td>
<td>2 Calendar Days</td>
</tr>
<tr>
<td>Reconstruction of Shoulder, Pavement, or Minor Culvert ( &lt; 1.8 m diam.) Embankment Work</td>
<td>21 Calendar Days</td>
</tr>
<tr>
<td>Median Barrier/Rail, Pier Protection, or Bridge Approaches Major Culvert Reconstruction</td>
<td>Same Day, unless temporary protection provisions made.*</td>
</tr>
<tr>
<td>New Guide Rail Locations**</td>
<td>14 Calendar Days</td>
</tr>
</tbody>
</table>

*Must be satisfactory to E/C. Consult with Traffic & Safety for further guidance.
** Not extensions of existing runs.

The designer should identify special situations, such as high accident locations, bodies of water, cliffs, etc., that may warrant shorter time durations or positive protection at all times. These
areas should be described separately in the Special Notes, referenced by station or reference marker, and their allowable replacement durations specified.

The designer should include the following notes, as needed, in the proposal as a Special Note.

SPECIAL NOTE

GUIDE RAIL DOWNTIME RESTRICTIONS

This contract contains restrictions on the amount of time that any run of guide rail may be out of service or that installation of new runs may be deferred. The Contractor is advised to be aware of these restrictions when preparing bids and scheduling work for this contract. Failure, as determined by the Engineer, to comply with the time frames specified will result in assessment of nonpayment for Item 619.01 Basic Maintenance & Protections of Traffic (or the appropriate item for special project types) for each calendar day during which the cited guide rail installation is not complete. In addition, liquidated damages will also be assessed at rates shown in Table 108-1 of Section 108.03.

Guide rail shall not be removed from any location where traffic is being maintained until the Contractor or Sub-Contractor is prepared to fully install the new section of rail and its terminals. The Contractor shall schedule operations to replace all rail on the same day as removed unless subsequent construction operations make it impractical to do so. Installation of the new rail shall begin as soon as practical after removal of the existing rail. Installation work on any individual location shall continue until all the railing at that location has been installed. When guide rail cannot be replaced on the same day as removed, (1) the work area shall be delineated using the Overnight Shoulder Closure Details shown in the plans and (2) the guide rail shall be replaced within the guide rail replacement time duration for this contract, which is XX calendar days, except as noted below:

- The guide rail replacement duration shall be YY days for the following runs of rail:
  Station \( aa+bbb \) to \( cc+ddd \), Right (or Left)

- The guide rail duration for installing the following runs of new guide rail shall be
  Station \( ee+fff \) to \( gg+hhh \), Right (or Left), ZZ days from Beginning of mobilization or Creation of feature to be shielded.

The guide rail replacement duration for a given existing run shall be measured from the first day that dismantling of the run begins to the day of complete installation of the rail and its end assemblies.

The designer should note the downtime restrictions below the guide rail tables on project plans that have such tables.