Informational Guide: Best Practices for Maintenance of Control-of-Access Fencing

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Table of Contents

List of Figures

Introduction

Background

Control-of-access (C-of-A) fencing is essential for ensuring safety around highways, serving as a barrier against unauthorized entry by people, animals, and machinery. It is recommended by the American Association of State Highway and Transportation Officials (AASHTO) for both fully and partially managed facilities [1] [2]. C-of-A fencing can be an integral part of the overall highway infrastructure and is built wherever the safety of highway operation needs it. However, maintaining these fences faces significant challenges, particularly in Louisiana, where frequent run-off-road crashes in high-volume urban areas and budgetary constraints complicate maintenance.

Warrants for C-of-A Fencing

C-of-A fencing is mandated under specific conditions to enhance security, safety, privacy, or property protection, particularly in areas prone to conflicts, such as high-speed urban roadways or locations with reported pedestrian or animal crashes. These installations are crucial for managing accessibility and mitigating potential safety or security issues, especially in areas where mobility is prioritized.

Warrants for C-of-A fencing include:

- Locations with reported pedestrian or animal crashes
- Urban roadways with high-speed traffic

AASHTO identifies traffic flow safety as the primary justification for highway fencing to prevent hazards associated with high-speed, high-AADT conditions. This includes the prevention of unauthorized access by wildlife, pedestrians, and vehicles, thereby enhancing overall roadway safety. According to AASHTO, fencing is warranted for at least one of the following reasons:

- To keep wildlife off of the road
- To prevent children, pedestrians, and bicycles from using the road
- To prevent objects from being thrown onto the road from an overcrossing structure

This targeted use of fencing, based on detailed crash data analysis, serves not only to enhance safety but also to maintain the operational efficiency of highways by managing vehicle movements and minimizing potential conflict points. Figures 1 and 2 show C-of-A fencing on fully-controlled and partially-controlled highways in Louisiana.

Figure 1. C-of-A fencing on I-10, a fully-controlled highway

Figure 2. C-of-A fencing on US 90, a partially-controlled highway

Objective

This informational guide provides concise technical information. The objectives of this informational guide are to:

- Outline the relevant practices associated with C-of-A fencing
- Discuss the maintenance issues associated with C-of-A fencing in Louisiana
- Detail the C-of-A fencing maintenance recommendations

Discussion of Practices

Current Louisiana Design and Construction Details

Policy on Placement of Fencing in Louisiana

Louisiana DOTD policy outlines specific placements for C-of-A fencing at various interchanges, each designed to prevent unauthorized vehicle entry from frontage roads and to delineate property boundaries. The fencing is strategically placed to cover necessary distances before and after interchanges, effectively managing access and maintaining secure boundaries. In addition to preventing vehicle encroachment, the fencing sometimes serves as a right-of-way marker, depending on its location relative to the interchange and frontage roads. All design cases specifically indicate that *all C-of-A and/or ROW lines shall have fences* [3].

Policy on Ownership of Fencing in Louisiana

Louisiana DOTD's Engineering Directives and Standards Manual (EDSM) outlines comprehensive guidelines for the construction, replacement, and maintenance of fences along highway rights-of-way. Detailed in Volume II, Chapter 2, Section 1, Directive 3 of the EDSM, issued on May 10, 2017 [4], this guideline mandates uniform procedures for installing and removing fences to ensure compliance with specified standards. Responsibilities are clearly defined, including DOTD’s role in maintaining C-of-A fences and the obligations of permittees in managing permitted fences. Additionally, the guidelines outline compensation for property owners affected by right-of-way acquisitions and the required removal of fences installed without proper authorization.

Design and Materials of Fencing

The height of the chain link fence can be customized to suit specific needs, ranging from 4 to 6 feet, with an additional 1 foot of barbed wire (i.e., 3 wire strands). Posts are typically spaced 6 to 8 feet apart and the fence uses 9 gauge, 2 inch diamond mesh fabric tied at 24 inch intervals, with truss rods and turnbuckles to maintain tension. Pressed steel caps per ASTM F626 are used on top of the posts. The fence’s design includes stretcher bars (3/16 inch by 3/4 flat) at each corner or pull post, with additional stretcher bar bands. Figure 3 shows a chain link fence in Louisiana.

Chain-link fabric, posts, rails, ties, bands, bars, rods, and other fittings and hardware covered by this specification shall be composed of the following types of material, as specified: Type

I – Zinc-coated steel; Type II – Aluminum-coated steel; Type III – Aluminum alloy; Type IV – Polyvinyl Chloride (PVC)-coated steel. Zinc-5 Percent Aluminum-Misch-metal alloy metal meeting the requirements of ASTM B 750 may be substituted for zinc coating (hot-dipped) at the application rate specified herein for hot-dip zinc coating. Figure 4 shows a picture of a gate with chain link fence. Three types of gates are used for chain link fences: Single-Swinging Walkgate, Single-Swinging Driveway Gate, and Double-Swinging Driveway Gate.

Figure 3. Chain link fence in Louisiana

Field and line type fences are also used in Louisiana; these are more prevalent on rural interstate highways. Wooden gates are typically used for this kind of fence. Details of the fence design can be found in Louisiana DOTD's design manual [5] [6].

Figure 4. Chain link fence gate in Louisiana

C-of-A Fencing Maintenance

Maintenance Practices in Other States

State Departments of Transportation (DOTs) and other agencies managing roads and highways are primarily responsible for maintaining fences along their infrastructure to ensure safety and security. The maintenance includes timely repairs and keeping the fencing in good condition regardless of the overseeing body. States have specific practices and policies related to C-of-A fencing maintenance involving responsibilities, inspection prerequisites, and design standards that affect how maintenance tasks are prioritized and executed. DOTs across the United States have updated their fencing policies to reflect evolving safety requirements, environmental considerations, land use changes, technological advancements, and legal obligations. These updates aim to enhance safety and security while meeting the dynamic needs of communities.

For example, CALTRANS (California Department of Transportation) maintains fences within its rights-of-way, using various types of barriers for freeway and expressway access control, and incorporates special designs for wildlife control or aesthetic integration [11]. Similarly, KYTC (Kentucky Transportation Cabinet) has adapted its policies to include more decorative fencing options in response to aesthetic requests and practical concerns such as damage and vegetation overgrowth [8]. TxDOT (Texas Department of Transportation) emphasizes the importance of uniform C-of-A fencing along rights-of-way to ensure traffic safety and manage

unauthorized access, with responsibilities for construction and maintenance clearly defined, including during land acquisition processes [9].

Summary of Current Louisiana Maintenance Issues

Maintenance of C-of-A fencing in Louisiana faces several challenges highlighted by widespread neglect. Observations and discussions with maintenance personnel reveal several key issues:

- **Damages from roadway departure crashes:** The functionality of C-of-A fencing includes deterring illegal vehicle entry from outside; however, these fences are vulnerable to damage from impacts due to run-off-road incidents, particularly near urban areas.

- **Damages by growing vegetation:** Growing vegetation on rural interstate highway C-of-A fences near interchanges appears to be a common issue (see Figure 5). Louisiana DOTD has a specific policy document for roadside vegetation management approaches [10]. “Bare Ground,” or Complete Vegetation Control, uses soil-active herbicides to maintain clear areas where plant growth risks safety or efficiency, with careful management to protect desirable vegetation. “Selective Weeding” targets specific undesirable species with herbicides that preserve surrounding flora, applied before or after plant emergence. “Chemical Mowing” controls unwanted vegetation near valuable plants and is suitable for areas under fences.

Figure 5. C-of-A fencing with growing vegetation on I-10 in Louisiana

- **Budgetary constraints and less prioritized maintenance in rural areas:** Fencing often receives maintenance only through requests from local agencies and feedback from road users, with reactive maintenance prioritized in urban areas due to budgetary constraints. Maintenance in rural areas is less frequent, and damages from large animals like deer, which primarily result in property damage, are not well-studied.

- **Insufficient documentation of current fence inventory:** There is a lack of comprehensive documentation of existing C-of-A fencing locations, which complicates maintenance efforts.

- **Other issues:** Local governments sometimes request the replacement of fencing for aesthetic reasons.

Examples of Maintenance Strategies Utilized in Other States

State DOTs are continuously refining strategies to optimize the maintenance costs of C-of-A fencing, adapting to specific safety standards, environmental concerns, and financial constraints. These strategies include:

- **Natural Barriers:** Instead of installing fences, some states choose to utilize natural barriers like forests or terrain features where feasible, significantly reducing both installation and maintenance costs.
- **Preventive Maintenance:** This includes regular inspections and timely repairs, using quality materials to extend the life of the fencing and minimize future expenses.
- **Innovative Materials:** Introducing materials like PVC alongside fences to prevent damage from animals, as experimented by Wyoming DOT, enhances durability and reduces repair needs [11].
- **Defining Work Limits:** States such as Alabama define clear work limits for fence installations to streamline operations and avoid legal complications, improving cost efficiency [12].
- **Prioritizing High-Quality Materials:** States such as Kentucky and Connecticut use durable materials like vinyl and treated wood to reduce the frequency of fence repairs and replacements [2] [8] [13].
- **Use of Local Materials:** Using locally sourced materials, such as wood in Connecticut, cuts down on transportation costs and supports local industries [2] [14].

- **Alternative Fencing Options:** Exploring non-standard fencing materials that require less maintenance, such as composite or recycled materials, helps maintain aesthetics and functionality without frequent maintenance [11].

Survey

Survey Results

A survey was designed using Qualtrics and distributed to DOT maintenance personnel across all 50 U.S. states. It was structured to enhance understanding in four key areas: Construction and Maintenance Practices; Alternative Fencing and Practices; Informational Guide and Policy; and Design. The survey achieved an 84% response rate, offering valuable insights into national fencing practices. Key findings are highlighted below:

Construction and Maintenance Practices

- **Diverse Installation Practices:** States show varied levels of requirement for C-of-A fencing installation; 29% have recommended installations, 21% required, and 18% mandatory, with 32% reporting unique or situational requirements.
- **Responsibility for Maintenance:** 76% of states assign the responsibility for C-of-A fencing maintenance to their DOT, with some states sharing this responsibility with other entities.
- **Maintenance Frequency:** Approximately 60% of states only inspect and maintain fencing in response to damage, while 17% conduct annual inspections.
- **Maintenance Prioritization:** The condition of the fence and financial considerations are major factors in prioritizing maintenance, with 45% citing damage and 11% influenced by cost.
- **Approach to Damage:** States vary in their response to fencing damage; 46% complete repairs within a few months, while 34% respond immediately to damage.

Alternative Fencing and Practices

- **Innovative Materials:** Wyoming DOT's use of PVC alongside fences prevents animal damage and reduces maintenance costs.
- **Budgetary Constraints:** States explore cost-effective materials and installation techniques to manage budget limitations in fencing maintenance.

Informational Guide and Policy

- **State-Specific Legislation:** Some states mandate C-of-A fencing along all highway rights-of-way, while others make determinations on a case-by-case basis, often linked to specific state or local statutes.

Design

- **Common Heights for Fencing:** 49% of jurisdictions favor 6 foot high chain link fences, while heights for woven wire fences vary based on specific state requirements.
- **Common Post Spacing for Fencing:** 50% of jurisdictions use a 6 foot post spacing for chain link fences, and 38% report using a 6 foot post spacing for woven wire fences.
- **Criteria for Maintenance Frequency:** Budget availability, fence age, and material type are crucial in determining the frequency of maintenance.
- **Essential Maintenance Activities:** Regular vegetation control and prompt restoration are considered essential for maintaining the functionality and longevity of C-of-A fencing.

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Recommendations

The key recommendations for effective C-of-A fencing maintenance include adopting proactive maintenance for both unscheduled and scheduled repairs alongside strategic construction approaches. States should consider prioritizing the maintenance of C-of-A fencing as a standalone task, rather than treating it as a supplementary component of construction and maintenance, to maintain the effectiveness of existing and future fences.

Proactive Maintenance for Unscheduled Repair Approaches

- It is recommended to broaden damage identification by including proactive checks alongside mandatory inspections, which can enhance the detection and resolution of issues.
- Consider prioritizing immediate repairs in areas where regular maintenance or construction is not planned, moving from viewing these tasks as supplementary to making them a priority.

Proactive Maintenance for Scheduled Repair Approaches

- Routine inspections should be conducted, and issues should be addressed promptly, integrating regular vegetation control, timely restorations, and the maintenance of fencing hardware.
- Developing a comprehensive maintenance framework that aligns with existing resources is advisable. This should incorporate systematic vegetation management and include training for personnel to ensure consistent maintenance practices.

Construction and Other Strategies

- Assessing the necessity of fencing in specific locations can help prevent unnecessary installations, especially in areas where natural barriers or adequate clear zones exist.
- It is advisable to adjust fencing height and post spacing based on local needs and observed damage scenarios, focusing on enhancing safety for pedestrians and animals.

- Employing strategic data collection and technology to identify and mitigate high-risk areas for pedestrian and wildlife activity is recommended. This strategy can help optimize the use of fencing materials and explore cost-effective alternatives.

References

[1] AASHTO—American Association of State Highway and Transportation Official, “An Informational Guide on Fencing Controlled Access Highways,” Washington DC, 1990.

[2] Connecticut Department of Transportation, “Connecticut Department of Transportation Highway Design Manual Revised January 2023,” January 2023.

[3] Louisiana DOTD, “Memorandum: Control of Access Policy.” Louisiana Department of Transporation and Development, October 16, 2018. Accessed: October 8, 2024. [Online]. Available: http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/Traffic_Engineering/Design%20Development/Control%20of%20Access%20Policy.pdf

[4] Louisiana Department of Transportation and Development, “Engineering Standards,” vol. II, October 2017, [Online]. Available: http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/EDSM/EDSM/EDSM_II_2_1_3.pdf

[5] Louisiana DOTD, “Field and line type fence - wood post,” Louisiana Engineering Standard Plans: C-of-A Fencing. Accessed: October 11, 2024. [Online]. Available: http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/Standard_Plans/Standard%20Plans/Standard%20Plans/FN-02%20(2%20of%202)%20(11-03-2011).pdf

[6] Louisiana DOTD, “Field and line type fence - steel post,” Louisiana Engineering Standard Plans: C-of-A Fencing. Accessed: October 11, 2024. [Online]. Available: http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/Standard_Plans/Standard%20Plans/Standard%20Plans/FN-02%20(2%20of%202)%20(11-03-2011).pdf

[7] California Department of Transportation, “Highway Design Manual—Fencing Policy,” July 2020.

[8] Commonwealth of Kentucky Transportation Cabinet, “Amended KY Policy—Control of Access Fence Removal and Replacement,” November 2017.

[9] Texas Department of Transportation, “ROW Acquisition Manual—Fencing Policies and Procedures (Control of Access Fences for state),” April 2021, [Online]. Available: http://onlinemanuals.txdot.gov/txdotmanuals/acq/control_of_access_fences_for_state.htm#i998931

[10] Louisiana DOTD, “Policy for roadside vegetation Management,” Louisiana Department of Transportation and Development, Baton Rouge, Policy Document, January 2014. Accessed: October 14, 2024. [Online]. Available: http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/Misc%20Documents/Policy%20For%20Roadside%20Vegetation%20Management.pdf

[11] C. Paige, “A Wyoming Landowner’s Handbook to Fences and Wildlife—Practical Tips for Fencing with Wildlife in Mind,” Wyoming, 2015.

[12] F. James and J. Jimmy Butts Governor, “Maintenance Manual—Alabama Department of Transportation,” 1995.

[13] Kentucky Department of Transportation, “Permit Manual—Commonwealth of Kentucky Transportation Cabinet Frankfort, KY 40622,” September 2021.

[14] Henry W. Hicock and Olson A. Richard, “The Preservation Treatment of Fence Posts and other Structural Materials,” July 1947.