The information contained in Chapter Ten: Miscellaneous Design Issues dated May 2022, has been updated to reflect the **May 2025 Errata**. The errata incorporates DES 22-05: "Rural Median Maintenance Turnarounds" (approved by the Nebraska Division of the FHWA on January 19, 2023), addresses errors, changes in procedure, changes in NDOT department titles, changes in other Roadway Design Manual chapters and other reference material citations occurring since the latest publication of this chapter.

Chapter Ten presents guidance for the design of New, Reconstructed and 3R projects: additional design guidance for 3R projects is provided in Chapter Seventeen.

Chapter Ten
Miscellaneous Design Issues

1. RAILROADS

(Map at Railroad Transportation Map)

Many roadways in Nebraska are in close proximity to railroads. The designer for any roadway project that is near a railroad (within 300 feet from the centerline of the nearest track) should contact the **Highway Liaison Manager** in the **Rail Unit** in the **Local Assistance Division** as early as possible.

The applicable railroad company will review design issues such as earthwork and drainage near the railroad. Railroad insurance, purchased by the contractor, will be required for work within 50 feet of the centerline of the outside tracks. The roadway designer needs to estimate the percentage of work done in each group of work within the 50 foot limit for insurance purposes. The roadway designer will provide cost estimates for all of these items. See Chapter Twelve: Cost Estimating & Funding, Section 1.E, of this manual for further information.

The **Rail Unit** in the **Local Assistance Division** and the railroad company will need to be involved in discussions in the early planning stages for a project involving a viaduct or overpass. Roadway designers may also initiate safety improvements with improved crossing design and may expand the project by the possible consolidation of nearby crossings.

Any changes in design, such as adding a safety section, may change the level of involvement with the railroad. The **Rail Unit** in the **Local Assistance Division** should be informed of changes of this nature immediately.

1.A Railroad/Highway Grade Crossings

Railroad-highway crossing design must consider approach grades, sight distance, drainage, highway traffic volume and the frequency of train movements. The traffic volumes and frequency of train movements should be used as the basis for evaluating the exposure factor. If the current number of vehicles using the crossing multiplied by the number of trains per day is 50,000 or greater, grade separation should be considered. Existing railroad and site conditions will dictate whether an underpass or overpass should be used. For additional information, see Title 415, Nebraska Administrative Code, Chapter 5: "Rules and Regulations Concerning Administration of State and Federal Highway-Rail Grade Crossing Safety Projects (rr415, chap4 /NEW), the **FHWA** publication Highway-Rail Crossing Handbook, Third Edition (Highway-Rail Crossing Handbook - Third Edition | FHWA), Chapter Five: Interstates, Grade Separations, and Interchanges, Section 2.E, of this manual and A Policy on Geometric Design of Highways and Streets (*Green Book*) (Ref. 10.2), Chapter 9, Section 9.12.

The ideal crossing geometry at railroad/highway grade crossings is a right-angle intersection of track and highway, with slightly ascending grades on both highway approaches to reduce the flow of surface water toward the crossing. For general coordination of mainline alignment at railroad grade crossings, the following design considerations apply:

1. Horizontal Alignment. The highway should intersect the railroad at a right angle without intersections or driveways nearby. This configuration maximizes the driver's view of the tracks and minimizes conflicting vehicular movements from crossroads and driveways. Crossings should not be located on either highway or railroad curvature where practicable. Highway curvature limits the driver's sight distance and may cause the driver to concentrate on negotiating the curve rather than looking for a train. Railroad curvature may inhibit a driver's view down the tracks. Superelevation also complicates a crossing on a curve and may result in maintenance and rideability problems.

   If the intersection between track and highway cannot be made at right angles, the variation from 90° should be minimized. At skewed crossings, motorists must look over their shoulders to view the tracks. Because of this awkward movement, some motorists may only glance quickly and not take the necessary precaution. Elimination, consolidation, relocation, realignment and signalization of crossings are all options that should be considered. Early coordination with the **Highway Liaison Manager** in the **Rail Unit** in the **Local Assistance Division** is required.

2. Vertical Alignment. Preferably, vertical alignment should be as flat as possible at railroad intersections to enhance sight distance, rideability, and braking and acceleration distances. Vertical curves should be of sufficient length to ensure an adequate view of the crossing. The roadway grade shall match the railroad grade. If the roadway crosses the railroad at a superelevated track section, the roadway profile shall be designed to incorporate the railroad superelevation.

   The *Green Book* (Ref. 10.2), Chapter 9, Figure 9-66, recommends that the crossing surface be in the same plane as the top of rails for a distance of two-feet outside of the rails and that the surface of the highway shall not be more than three-inches higher nor six-inches lower than the top of the nearest rail at a point 30 feet from the rail, unless track superelevation dictates otherwise.

In cases where a railroad company has a maintenance road parallel to the tracks, it may be necessary to provide access for railroad maintenance across the highway. Cases such as this, and those involving horizontal clearances, may require special consideration. The designer should contact and coordinate with the **Highway Liaison Manager** in the **Rail Unit** in the **Local Assistance Division**.

When railroads and highways parallel each other in close proximity there is a possibility that long vehicles will not clear the railroad tracks when stopped at an access road to a state highway. The designer should provide sufficient distance along the parallel state highway for truck storage in these cases. When the highway is on new alignment, it is desirable to have 85 feet to 110 feet of storage between the railroad stop bar and the edge of the highway shoulders. This translates to about 110 feet to 145 feet from centerline of the closest railroad track to the edge of the closest through highway lane.

Where parallel railroad tracks run within 200 feet of the edge of the pavement and are intersected by surfaced roadways (highway, county or other), it is preferable to pave to the tracks instead of stopping at the end of the return. Work of this nature can only be accomplished by a special provision, as prepared by the **Rail Unit** in the **Local Assistance Division**. For additional information see Chapter Four: Intersections, Driveways, and Channelization, Section 3.A and EXHIBIT 4.24 of this manual.

Geometric design of the railroad-highway grade crossing should be done in concert with the determination of the appropriate traffic control devices (e.g., signs, pavement markings, flashing light signals and automatic gates). The **Traffic Engineering Division** should be consulted to coordinate design.

1.A.1 Railroad/Highway Crossing Surfacing

Each rail line has specific crossing requirements. Some railroads prefer crossings with high tonnage main line tracks to have at least 10 feet of asphalt surfacing between the edge of a crossing and a concrete roadway surface (See EXHIBIT 10.1). This allows replacement or installation of concrete cross ties with on-track equipment without removing concrete roadway surfacing. At other locations the concrete pavement should end at least six inches from the edge of timber or concrete crossings (See EXHIBIT 10.2). This six-inch gap is filled with asphalt to keep the expansion of concrete from moving track out of line and allows the railroad to replace crossing and timber cross ties.

Railroad crossings may be of various types, (such as timber, concrete or rubber), and widths. The railroad company will construct the railroad crossing. The designer should contact the **Highway Liaison Manager** in the **Rail Unit** in the **Local Assistance Division** to determine the type and width of railroad crossing to be used. For further information, see Chapter Twelve: Cost Estimating and Funding, Section 1.E, of this manual.

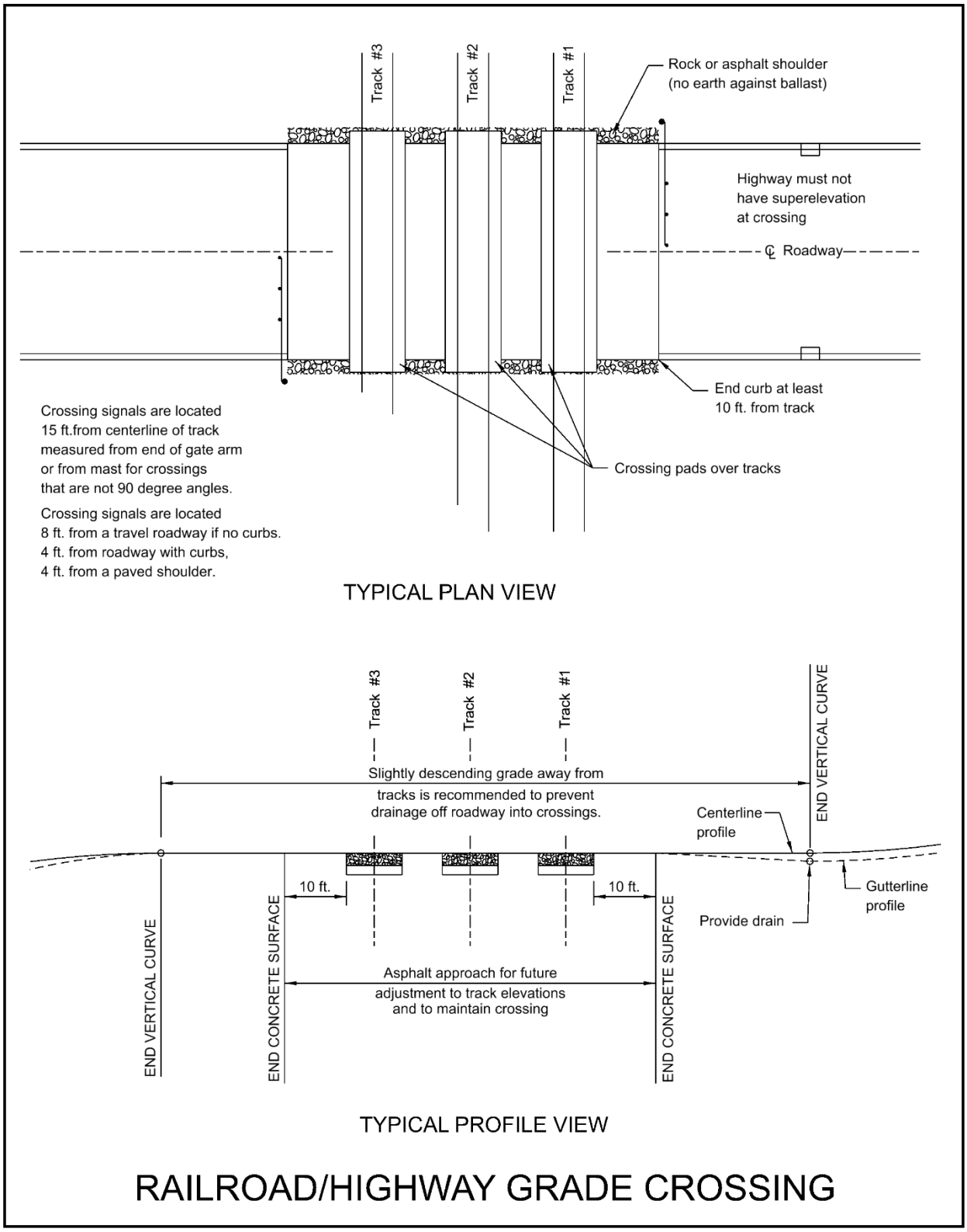
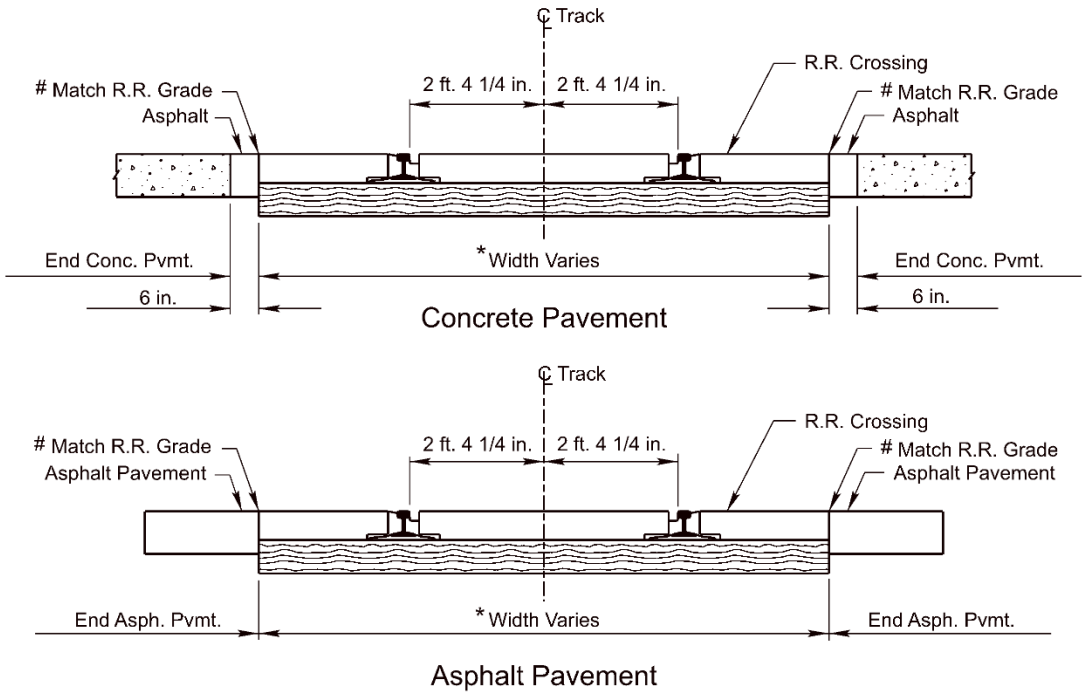


Exhibit 10.1 Railroad/Highway Grade Crossing



If the railroad track is in a superelevated section, the highway grade line will match the railroad superelevation.
* Contact the Highway Liaison Manager for the type and width of railroad crossing being used.

Example Railroad/Highway Grade Crossing

Exhibit 10.2 Railroad/Highway Grade Crossing

2. BRIDGE STRUCTURES

The **Federal Highway Administration** defines a bridge as "*A structure, including supports, erected over a depression or an obstruction, such as water, a highway, or a railway, having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of the openings for multiple boxes; it may include multiple pipes where the clear distance between openings is less than half of the smaller contiguous opening*." If a multiple span concrete box culvert, as measured from the inside surface of the outer wall to the inside surface of the outer wall, is less than 20 feet along the centerline of the roadway it is a culvert and shall be designed by the roadway designer, (See the Drainage Design and Erosion Control Manual, Ref. 10.3). If a multiple span concrete box culvert measures more than 20 feet along the roadway centerline it is a bridge and its' design shall be referred to the **Bridge Division Hydraulics Unit**. The designer shall pay particular attention to the effect of a skew on a box culvert as the skew may increase the length of a multiple span concrete box culvert, as measured along the roadway centerline, to bridge length.

The **Bridge Division** (**Bridge**) may determine that an existing bridge structure will be replaced with a concrete box culvert (See Chapter Seven: Earthwork, Section 3.A, of this manual for the demarcation between the culvert and grading contractor's responsibilities).

The design of horizontal and vertical roadway alignments must be carefully coordinated with any bridges or other structures located within the project limits. Proper coordination may eliminate undesirable bridge characteristics.

2.A Horizontal Curvature

Horizontal curves and superelevation transitions should be avoided on bridges. However, safety is the primary consideration and introducing sharp horizontal curvature on approaches to avoid placing a curve on a bridge is not considered practical. Where a curve is required on a bridge, developing the superelevation on the approaching roadways and carrying the fully superelevated section continuously across the structure can simplify both bridge design and bridge construction. Due to the prevailing snow and ice conditions, the maximum superelevation rate permitted by **NDOT** on bridge structures is 6%.

In some cases, superelevation transitions are unavoidable on bridges and, while less desirable, can still be properly designed and constructed. The designer should coordinate the superelevation design with **Bridge** in the early stages of design.

Superelevated roadways on bridges should not have a break in cross slope where the travel lane meets the shoulder. In other words, shoulder rollover is not permitted on bridge decks. If a break is provided between shoulder and roadway on the superelevated approach to the bridge, the section should transition to a continuous plane prior to the bridge structure.

See Chapter Three: Roadway Alignment, Section 2, of this manual for further information

2.B Skewed Structures

EXHIBIT 10.3 illustrates the method for defining the crossing angle, or skew, between the mainline facility and the feature intersected (e.g., topographic anomalies, railways, waterways, etc.). When a bridge structure intersects a feature at a skew, the bridge abutments and piers are usually constructed parallel to the feature intersected to provide adequate horizontal clearances and reduce span lengths. Piers for structures over waterways are set parallel to the direction of the flood flow. Skewed intersections increase structure length, complexity and costs.

For bridge structures over roadways, railways and waterways, the maximum practical skew is 45°. Larger skews can be accommodated for facilities intersecting roadways and railways but require additional design and construction work. For culverts, the maximum desirable skew is 35°.

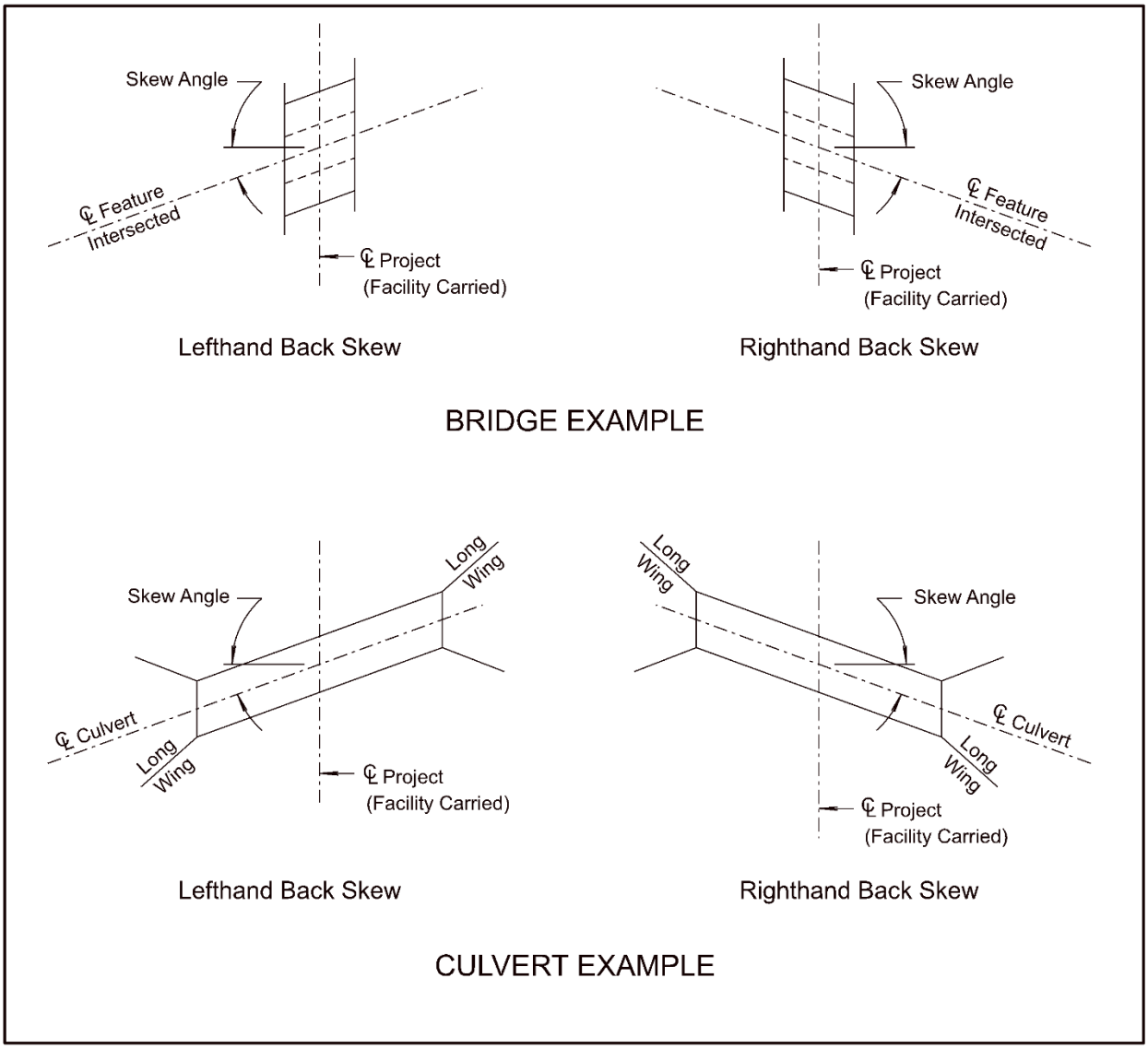


Exhibit 10.3 Skew Angle Definition

2.C Bridge Grades

Avoid vertical profile grades on bridges in excess of 5% to 6% as this can complicate the bearing design for certain types of bearing devices. Also, unanticipated movement can occur on bridges that are built to a steep grade. The grade line on bridge decks should preferably be tangent. For long bridges where drainage is confined to the bridge deck, a 0.5% grade is the desirable minimum.

2.D Vertical Curvature

Avoid placing bridges on crest and sag vertical curves with K values in excess of 143 U.S. Customary as they may have an inadequate longitudinal slope to drain the bridge deck. Longitudinal drainage is not a significant concern for bridges with open, free-draining rail systems. See Chapter Three: Roadway Alignment, Section 3, of this manual for further information.

Where practicable, the low point of a sag vertical curve for a roadway under a bridge should be located at least 100 feet from the limits of the bridge structure. This will help to reduce the need for drainage structures under the bridge and will reduce the ponding of water that may weaken the earth foundation beneath the bridge. Ice accumulation on the roadway would also be minimized since the low point of the sag vertical curve would not be located within the shadow of the bridge structure.

2.E Vertical Clearances

2.E.1 Grade Separations

Minimum vertical clearances for various conditions are shown in EXHIBIT 10.4. The minimum vertical clearance shall be measured from the high point of the roadway, including shoulders, which may or may not be at the profile grade point. For new structures, it is desirable to include a 0.50 foot allowance in addition to the minimum clearance for future resurfacing. The values provided are intended for general guidance only. Final grade decisions should be coordinated with **Bridge**.

Vertical alignment will need to be coordinated with structural requirements for superstructure depth to allow for proper clearance between grade separations. **Bridge** will provide a preliminary estimate of superstructure depth for the types of structures to be used so that preliminary grades can be designed.

Type	Minimum Clearance
Structures over the Interstate	See Chapter One: Roadway Design Standards, EXHIBITS 1.5 & 1.14 (1)
Structures over roadways	See the Minimum Design Standards (Ref. 10.5)
Roadway or pedestrian bridge over railroad	23.50 feet (2)
Roadway under pedestrian bridge	See the Minimum Design Standards (Ref. 10.5)

1. If the minimum vertical clearance cannot be achieved on Interstate projects, coordinate with the Military's Surface Deployment & Distribution Command Transportation Engineering Agency (see Chapter 11 of Design Decision Documentation and Mitigation Strategies for Design Exceptions, Design Decision Documentation and Mitigation Strategies for Design Exceptions (dot.gov))
2. Measured above the plane of the top-of-rails. If the required vertical clearance cannot be met, a minimum vertical clearance of 23.00 feet may be used with the approval of the **Assistant Bridge Engineer** in **Bridge**.

Note: Minimum vertical clearances apply to the entire roadway width, including auxiliary lanes, shoulders, ramps, and collector-distributor roads.

Exhibit 10.4 Minimum Vertical Clearances for Structures

2.E.2 Stream Crossings

Bridges over meandering rivers, streams and other natural waterways preferably should not be located on a bend in the channel. This can result in less than desirable stream flow characteristics and may require excessive rock embankment to protect the structure from erosion and scour. Divided roadway facilities intersecting with a bend in a natural waterway may require construction of parallel bridges with different span configurations in lieu of the more desirable twin bridge configuration.

The vertical profile design in the vicinity of a stream crossing and the allowable overtopping frequency for the roadway dictate the required waterway opening for a bridge structure. The **Bridge Hydraulics Section** determines required waterway openings. Prior to "Roadway Design" (Clarity Task 5350), the roadway designer will provide **Bridge** with horizontal and vertical alignments at bridge locations for use in hydraulic analysis and bridge design (Clarity Task 5240, "Planning Alignment", as in the Design Process Outline (*DPO*), Design Process Outline). For some conditions required waterway openings may consist of the combined bridge opening and roadway overtopping. EXHIBITS 10.5 AND 10.6 illustrate the basic criteria used to establish bridge length and vertical profile for crest and sag or level profiles, respectively.

2.F Intersections

Avoid placing bridges close to intersections if practicable, particularly where guardrail is required.

2.G High Embankments

Embankment for grade separation structures should be of sufficient height to ensure that adequate vertical clearance is provided over the facility intersected. Excessive embankment height will increase span length thus increasing costs.

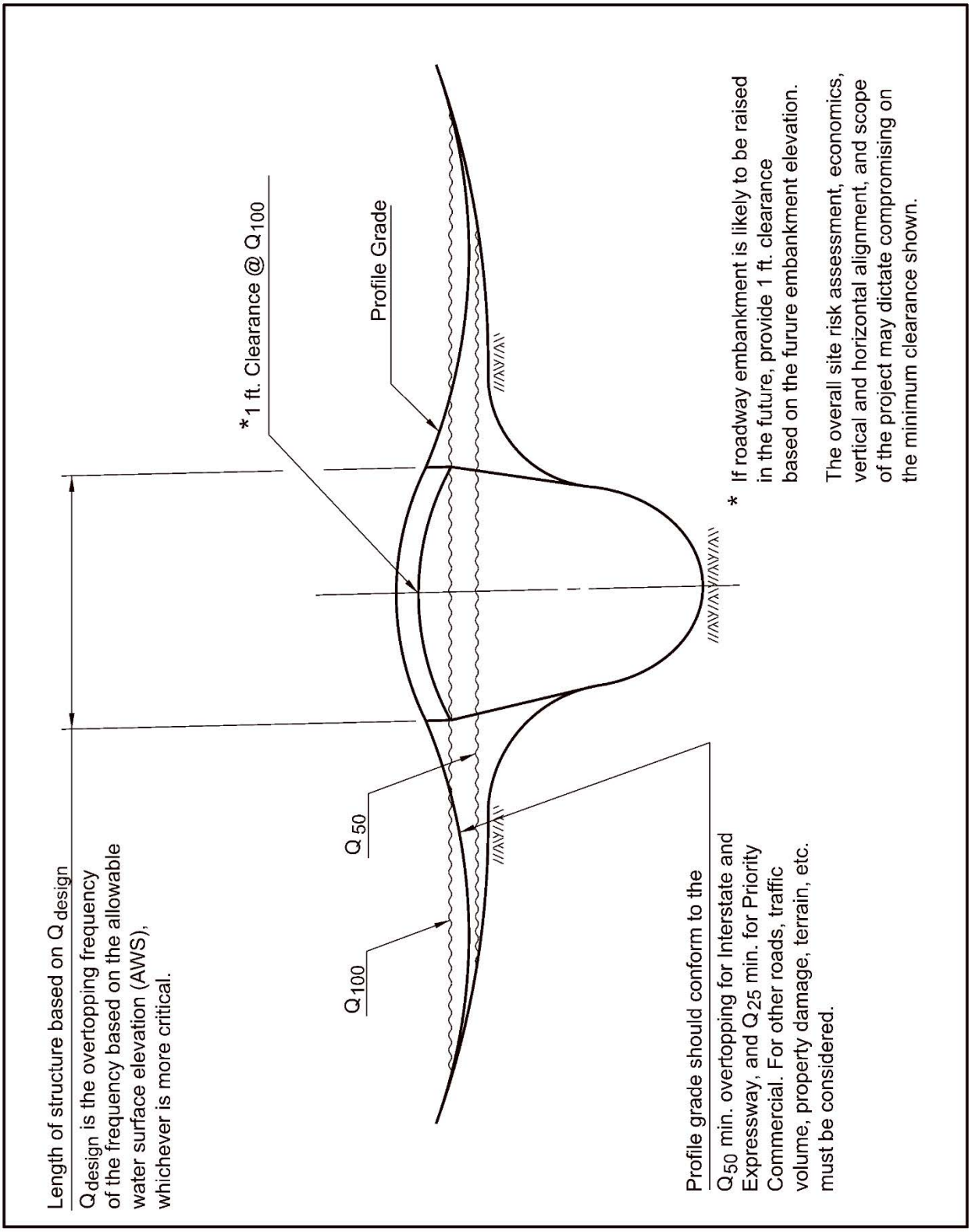


Exhibit 10.5 Vertical Stream Clearances for Crest Profile

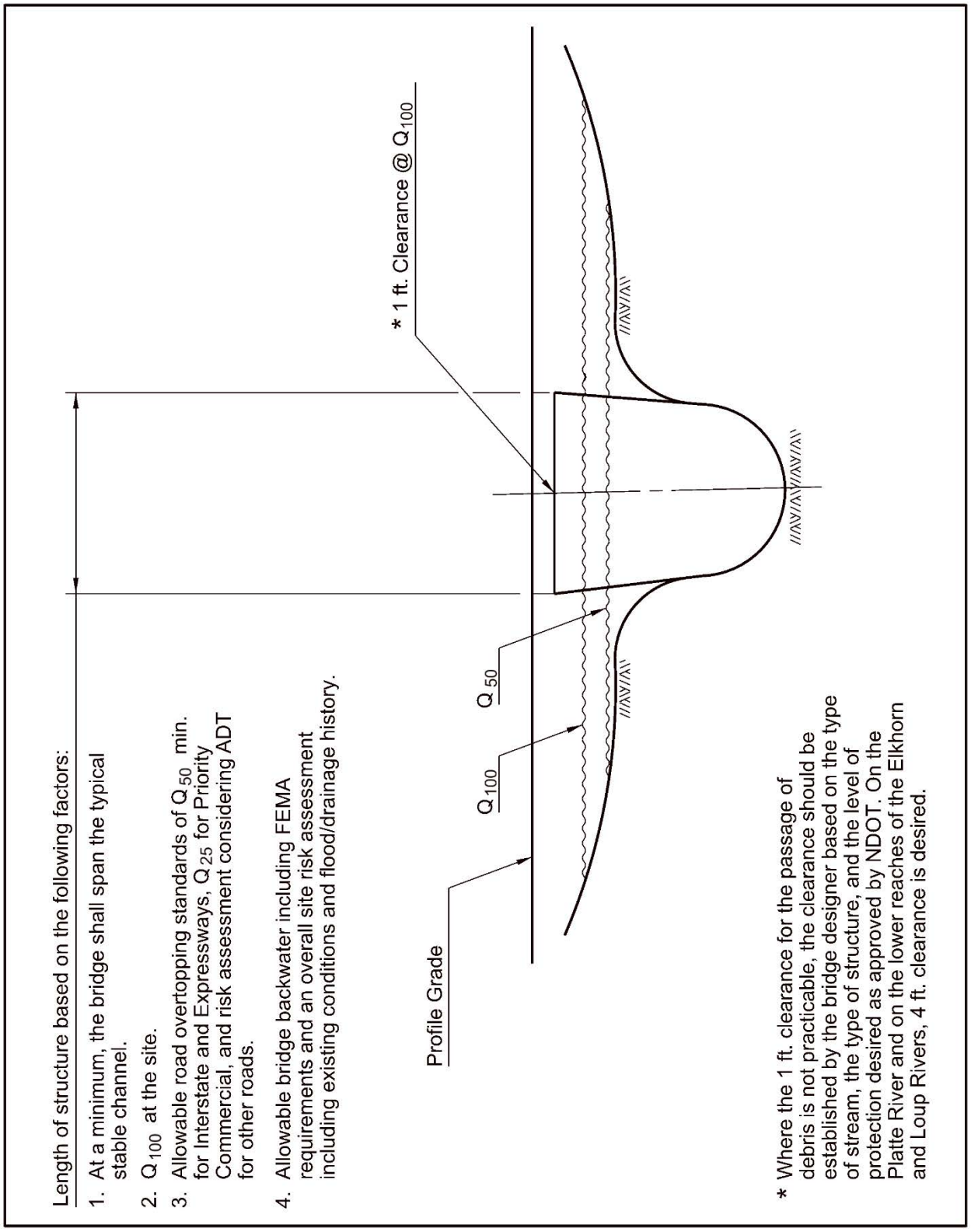


Exhibit 10.6 Vertical Stream Clearances for Sag or Level Profile

3. AIRPORT COORDINATION

When a roadway project may impact the operation of an airport, the roadway designer will coordinate with the **NDOT Division of Aeronautics** (**Aeronautics**) who will work with the **Federal Aviation Administration** (**FAA**) on any necessary permitting that may be required. **Aeronautics** should be consulted early in the design process for current regulations and notification requirements related to highway projects near public-use airports and for information on future growth planned at the airport.

Airports which may trigger coordination between **Roadway Design** and **Aeronautics** should be identified prior to the plan-in-hand. Public-use airports may be identified using the Airport Buffer KMZ at \\dotfs\Design\Google Earth KMZ.

There are two triggering events requiring coordination with **Aeronautics**.

3.A Trigger Event One: Proximity to Public-Use Airports Applicability

Coordination with **Aeronautics** is required for any construction or alteration that meets the following criteria:

- **Within Four Miles of a Public-Use Airport:**
  The project falls within a defined four-mile buffer area created by swinging arcs with a four-mile radius from the center of each runway end and connecting the arcs with tangent lines. (See EXHIBIT 10.7)
- **Within Ten Miles of a Runway End of a Public-Use Airport:**
  The project lies within a ten-mile corridor extending outward from the end of any runway at a public-use airport. This corridor is three miles wide, centered on the runway, and includes protected airspace defined by a 100:1 slope for the first three miles, a flat elevation for the next four miles, and another 100:1 slope for the final three miles. (See EXHIBITS 10.8 & 10.9)

Information Required from Roadway Design

- Email request for coordination sent to **Aeronautics**
- Current KMZ design file
- Project description
- Current and entire project plan set, to include elevations of structures

Timing for Coordination

- Initiate coordination at least 75 calendar days prior to the date by which **Roadway Design** requires completion of the review

Aeronautics Responsibilities

- Verify the project's proximity to public-use airports
- Evaluate potential impacts using FAA Notice Criteria Tool and **Aeronautics** data
- If required, file FAA Form 7460-1 “Notice of Proposed Construction or Alteration” and coordinate with the roadway designer for any additional information
- Obtain a determination letter from **FAA**, if applicable

Deliverables from Aeronautics to Roadway Design

- **If No Impact is Identified:**
  Aeronautics will provide a determination letter confirming that the project does not impact protected airspace
- **If an Impact is Identified:**
  Aeronautics will provide a determination letter accompanied by:
  - FAA determination letter, and
  - Summary of **FAA** requirements to be included in the project's special provisions. *Example: If FAA Form 7460-2 "Supplemental Notice" is required, the contractor must coordinate with NDOT to ensure timely submission to the FAA.*

3.B Trigger Event Two: Construction or Alteration Exceeding 150 Feet in Height

A separate permit must be obtained from **Aeronautics** for any structure, permanent or temporary, that exceeds 150 feet above ground level at the point of installation, unless otherwise authorized by a federal agency license or permit, see Nebraska Revised Statutes 3-401 (Nebraska Legislature).

Examples of Permanent Construction or Alterations:

- Structures
- Elevated Signs
- Fences
- Light Fixtures
- Power and Cable Lines
- Roadways

Examples of Temporary Construction or Alterations:

- Construction Equipment (if construction equipment breaks the slope protection elevation, the contractor or **NDOT** can propose an amendment to the slope protection study)
- Haul Routes
- Staging Areas
- Stockpiles
- Temporary Lights

An "Application for Permit to Build", NDOT Form HP1 (permittobuild-individual.pdf), must be requested from **Aeronautics** for:

1. All new permanent or temporary structures throughout the **State of Nebraska** (**State**) which exceed 150 feet in height above ground level at the point of installation.
2. Increasing the height of existing structures which results in a final height exceeding 150 feet above ground level at the point of installation.

Follow the instructions provided on the permit application for filling out the permit and for submittal to **Aeronautics**.

Coordination Requirements from Roadway Design Division

Coordination with **Aeronautics** to determine the best course of action prior to submitting any forms (i.e. NDOT Form HP1).

Timing for Coordination

This form must be submitted to **Aeronautics** at least 60 days prior to the date that construction or alteration is to begin.

Deliverables from Aeronautics to Roadway Design

Either a “Notification of a Permit to Build” or a “Declination of Permit to Build”.

3.C Special Provisions

Roadway Design will provide copies of all official correspondence with the **FAA**, **Aeronautics**, and/or the **Local Airport Authority**, including any responses or comments, to the **Construction Division – Plans, Specifications, & Estimates** (**PS&E**) **Specifications Engineer** for use in writing the special provisions for the project.

The contractor commitment will be included in the special provision for all public-use airports. Commitments will be specific to the individual project.

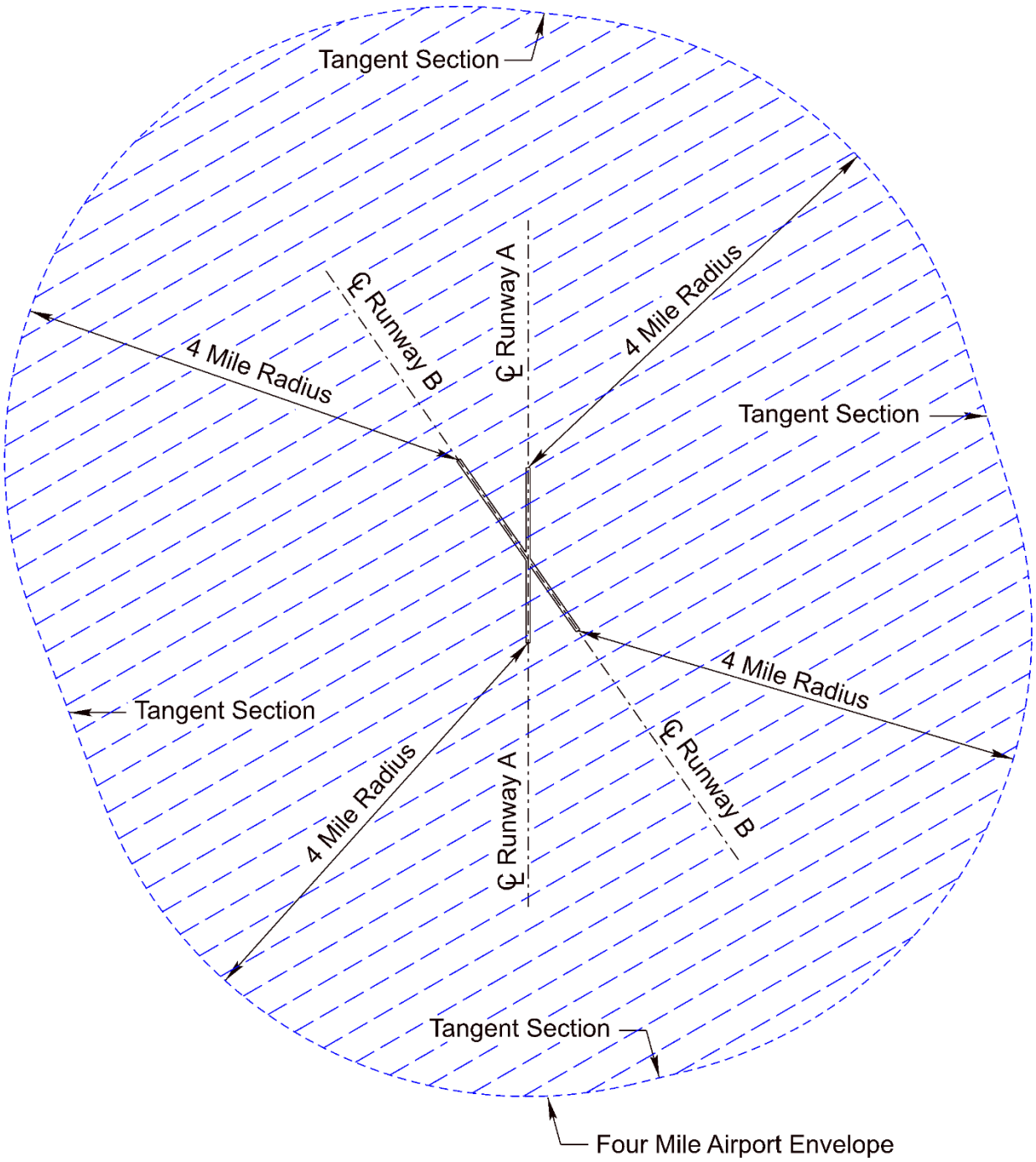


Exhibit 10.7 Four Mile Airport Envelope

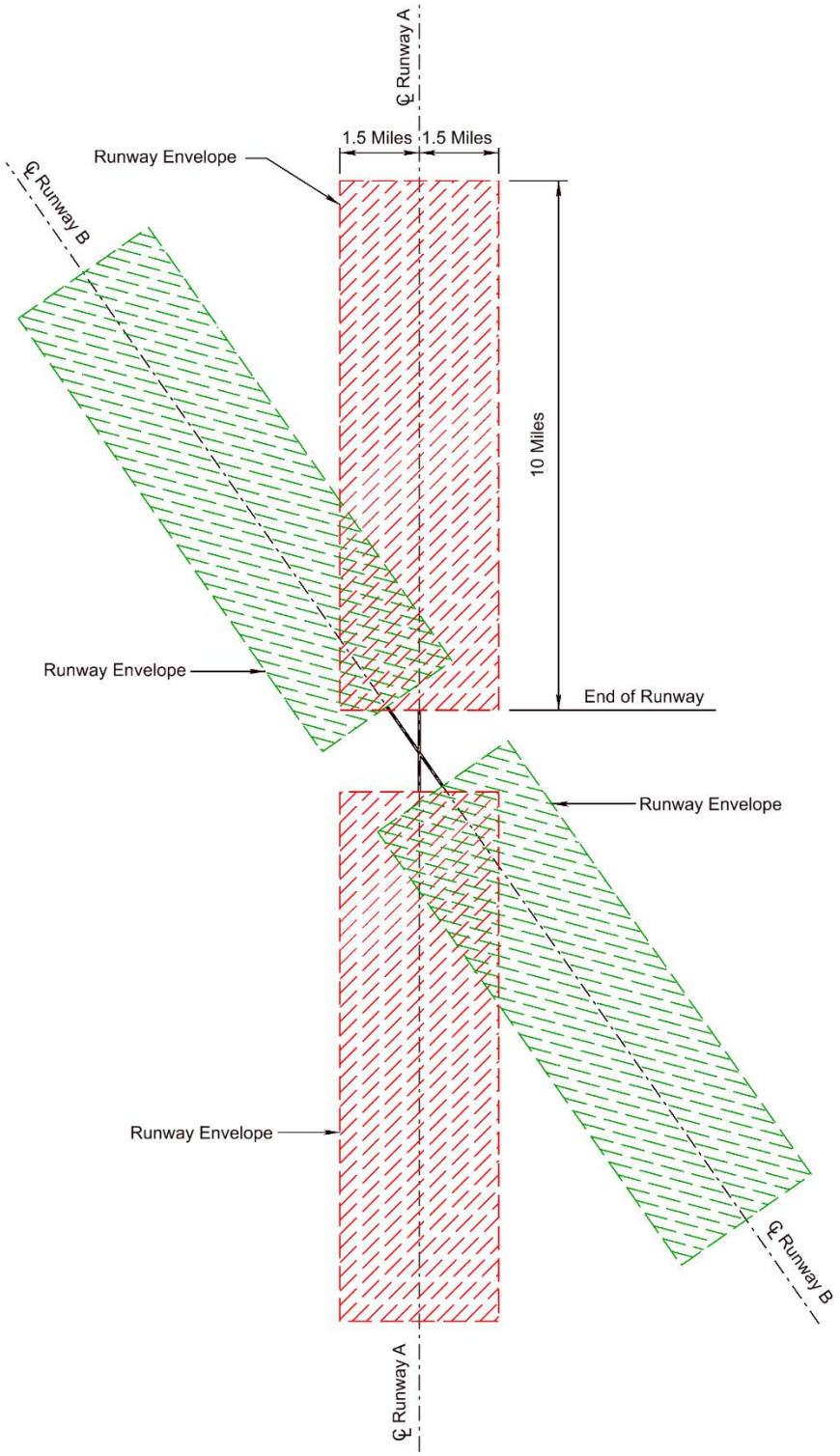


Exhibit 10.8 Runway Protected Area

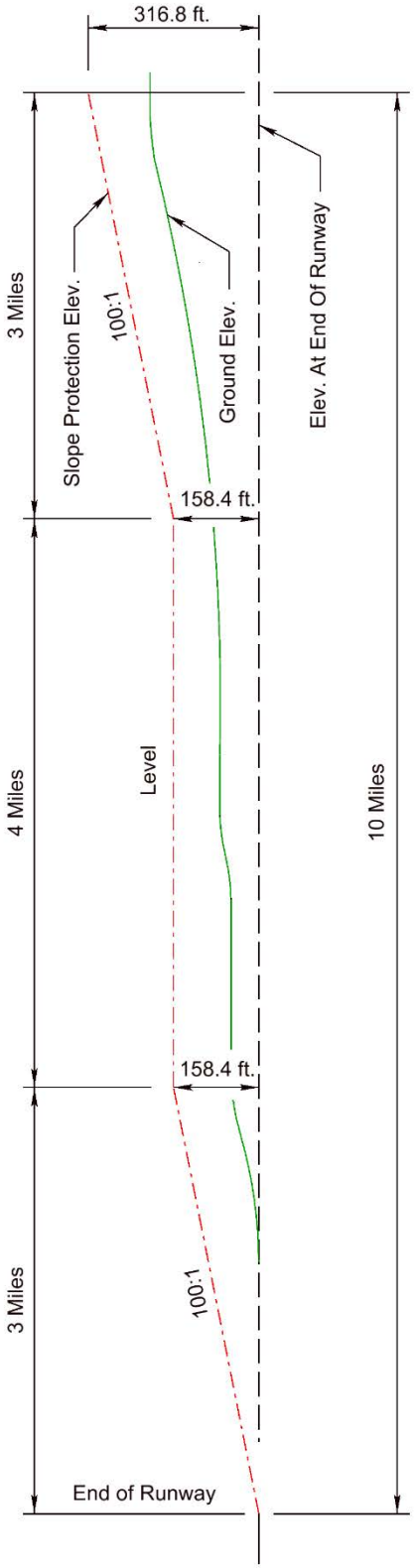


Exhibit 10.9 Runway Slope Protection

4. LANDSCAPING

Landscaping is an ongoing and essential part of **NDOT's** Six-Year Plan and is the responsibility of the **Roadside Development & Compliance Unit** (**RDC**) in **PDD**. Landscaping includes, but is not limited to, plantings, scenic view development, use of retaining walls, median treatments, slope rounding, berms, aesthetic treatment for noise walls, and other treatments for environmental, functional or aesthetic purposes.

Landscaping provides many functional and aesthetic benefits that are as integral to good roadway design as are geometrics. Landscaping should enhance the visual quality of the roadway environment, thus reducing the impact of the roadway on the adjacent area. The goals of landscaping include:

- Enhance the safety of the roadway by maintaining recovery areas for errant vehicles.
- Accentuating the roadway features with appropriate plantings.
- Reduce maintenance costs by the use of living snow fences, erosion control, limited mowing, and the prompt removal of tree seedlings.
- Conserve, enhance and effectively display the natural environment and beauty of the roadway landscape, providing a pleasant driving experience for the traveler.
- Encourage wildlife conservation and habitat improvement, within the roadway right-of-way, through selected plantings and limited mowing.

Implementation of the landscaping policy includes the following activities:

1. During the development of major (normally <u>not</u> resurfacing, lighting, etc.) roadway projects, urban or rural, **PDD RDC** will review and recommend an appropriate landscaping treatment for each project.
2. **RDC** involvement will begin at the engineering review or corridor study stage of project development to promote early identification of the potential for landscaping. Landscaping recommendations will be included in the engineering review report, corridor study report and in the design public hearing engineering statement.
3. **RDC** will review design plans prior to the plan-in-hand and will furnish written landscaping and erosion control recommendations to the roadway designer for evaluation during the plan-in-hand.
4. **RDC** will review the plan-in-hand report to estimate specific erosion control needs and to make further landscaping recommendations, as necessary.
5. Landscaping recommendations will be included in the design public hearing engineering statement.
6. **RDC** will review the limits of construction plans and forward final landscaping recommendations and specifications and final erosion control recommendations to the roadway designer.
7. Erosion control specifications will be sent to the roadway designer after a joint review of final cross-sections with the designer is completed.

4.A Tree Planting and Removal

Every effort will be made to minimize disruption to the surrounding environment. Where trees and other desirable flora can be saved, consistent with sound engineering judgment, they will be. Normally, trees and other flora located within the clear zone (See Chapter Six: The Typical Roadway Cross-Section, Section 9.A, of this manual) or within the limits of construction will be removed, however, the retention of healthy trees and other desirable flora will be reviewed on a case-by-case basis by **RDC** and the **District Engineer** to determine appropriate action. Guardrail, retaining walls, and other alternatives may be considered before healthy trees are removed. The cost of protecting trees should not be the only determining factor when considering their removal. Tree removal may be a factor in determining the need for tree planting.

When a significant amount of additional right-of-way is required for a project that would not otherwise be classified as "major," **RDC** should review the project for appropriate landscaping treatment, even if the latter would require the purchase of additional right-of-way outside of the proposed construction limits. Right-of-way will not be acquired solely for tree planting, unless needed to comply with Section 404 Permit requirements, (See Chapter Thirteen: Planning and Project Development, Section 5.B.4, of this manual).

A special provision is required for removing and resetting trees from the construction zone with the appropriate size tree spade. **RDC** will determine the feasibility of tree removal and tree spade size.

4.B Roundabout Landscaping

Landscaping for a roundabout should be selected and strategically placed to help improve the overall operation of the roundabout when possible. Plantings in the central island can help provide recognition of the roundabout by approaching drivers and aid in reducing their approach speeds. While allowing adequate sight distance to the left, these plantings help drivers make better judgments concerning the distance to approaching vehicles in the roundabout by filtering out other distracting movements.

All guidelines for intersection sight lines and roadside safety must be followed. The central island plantings must be of sufficient volume to be visible in advance of the intersection and reduce headlight glare across the roundabout, but not infringe on necessary sight distances for motorists and pedestrians. This is accomplished by deliberate positioning of plant material to maximize the view between vegetative elements and minimize the view of opposing vehicles. Plantings also need to address snow drifting concerns and the shedding of deciduous vegetation on the circulatory roadway. Plant types should be selected to limit excessive maintenance when possible.

5. SNOW CONTROL

Snow drifting may be a problem when the prevailing winds are from the north or west. Snowdrifts on roadways can be minimized by several different methods, including:

- Cross-section modification
- Structural snow fencing, both temporary and permanent
- Living snow fencing

The **District's** input regarding the location of existing snow fences will help to identify locations susceptible to drifting snow. If aerial photos were taken in late fall or early winter they may show the location of existing snow fence. Designers are responsible for contacting the **District Engineer** to see if snow shots are desired for the plan-in-hand inspection. Snow shots are cut stations where the top of the backslope is less than 60 feet from the roadway centerline and the backslope elevation is greater than the centerline elevation.

Allowing a greater ditch area for the accumulation of snow at locations susceptible to drifting can minimize snowdrifts on roadways. Normally snowdrifts on a roadway occur at the ends of cut sections. Ditches may be widened to provide more area for snow accumulation. The backslope, especially at the ends of high cuts, should be laid back from its normal 1:3 slope (See Chapter Six: The Typical Roadway Cross-Section, Section 10.H, of this manual).

Structural snow fencing is often used to reduce snow drifting. Annually, maintenance units will place temporary snow fence along the right-of-way in areas of known snow drifting. Along roadways with limited right-of-way, temporary snow fencing may be placed on private property. Permanent snow fencing panels may be needed where a cut section becomes a fill section. Living snow fencing may also be used to reduce snow drifting. If the right-of-way is sufficient, shrubs and trees can be planted along right-of-way or fence lines. Contact **RDC** for the possibility of using living snow fence at the right-of-way line.

6. FENCING

Interstates and freeways shall be fenced and some expressways may be fenced. Chainlink fencing is used in urban, developing urban, and suburban areas. When fencing is specified (as it is on Interstate and freeway projects), the fencing is run along the right-of-way line according to the Standard Specifications for Highway Construction (*Spec Book*), Section 910 (Ref. 10.12) (https://dot.nebraska.gov/media/g4qp4y0d/2017-specbook.pdf). The following exceptions and criteria should be kept in mind:

- Where there is a frontage road, the fence is placed between the frontage road and the mainline
- Fences should tie into the ends of box culverts or cattle passes
- Fences should tie into the ends of existing fences and grade separation structures. Where the crossroad runs underneath, fences may run underneath the structure
- If a portion of a utility line within the right-of-way is left undisturbed, the access fence may be run just inside of the utility line
- At rural interchanges, fencing should extend 500 feet along the cross road from the ramp termini

Chainlink fencing is also used for pedestrian barriers on bridges, (**Bridge** will provide details). The need for fencing expressway projects should be discussed at the plan-in-hand inspection. Refer to the Standard/Special Plan Book (Ref. 10.4), Standard Plan 710, (Standard/Special Plans Manual - NDOT) for fencing details.

In rural areas, depending on the function and use of the adjoining property, barbed wire or woven wire fences will be erected. The responsibility for removing, resetting, or rebuilding fences and cattle guards rests with the property owner, who is compensated by **NDOT** as necessary.

Interstate fencing is a construction item and will be included in the cost estimate. Other fencing is generally a right-of-way item, the roadway designer should contact the **Right-of-Way Division** for assistance. For further information see Chapter Five: Interstates, Grade Separations, and Interchanges, Section 1.H.1, Chapter Twelve: Cost Estimating & Funding, EXHIBIT 12.2 and Section 7.B.2, and Chapter Fifteen: Right-of-Way, Section 7.C, of this manual.

For additional information, see Section 8 of this chapter for fencing adjacent to retaining walls and Chapter Sixteen: Pedestrian and Bicycle Facilities, Section 4.A, of this manual for fencing behind sidewalks adjacent to steep slopes.

7. CATTLE PASSES

New cattle passes should be built if either of the following criteria is met:

- The appraised segregation damages equal or exceed the cost of constructing the structure
- The property owner pays for the difference in the cost of the structure and any segregation damages

Existing cattle passes should be perpetuated if either of the following criteria is met:

- The property owner's title or any other legal document indicates that the owner has a non-revocable right to use the existing structure as a livestock crossing
- It is apparent that the structure was built to alleviate damage to a segregated property and is being used for a livestock crossing

The design of cattle passes shall give the contractor the option of furnishing a precast unit, provided that the fill height is within the structural limits of the unit. It is important that cattle passes be designed without bends or grade breaks. If cattle cannot see out the other end of the passage, they will not enter it.

8. RETAINING WALLS

The need for a retaining wall may be determined during any of the following activities:

- Engineering review
- Preliminary design
- Plan-in-hand
- Roadway design

When a retaining wall with a height of three-feet or greater is built in an urban area, a chain link fence with a nominal height of four-feet shall be erected adjacent to the retaining wall (just behind it) on public right-of-way.

Section 2.2.11 of the Bridge Office Policies and Procedures (*BOPP*) Manual (Microsoft Word - 2008 BOPP Cover+Intro.docx) outlines **NDOT's** basic procedure to be followed in the design of retaining walls.

9. OLD ROAD OBLITERATION

Once existing pavement on an abandoned alignment is no longer needed, (such as for phasing or property access), the pavement may be removed. The quantities of removed pavement shall be paid for by the sq. yd. The plans for old road obliteration should be put on General Information sheets (See Chapter Eleven: Highway Plans Assembly, Section 4.G, of this manual). The "Typical X-Section" portion of the Standard/Special Plans Book (Ref. 10.4), Plan 1110, illustrates cross-sections for old road obliteration.

10. MAILBOX TURNOUTS AND SUPPORTS

On one-way streets, mailboxes may be on the left side if designated by the local postmaster. Where a mailbox is located at a driveway, it shall normally be placed 17 feet beyond the driveway surfacing on the right hand side of the road in the direction of travel as designated by the local postmaster for each delivery route. A mailbox should not be located on urban roadways where through driving lanes are adjacent to the curb. **FIGURE 11.4** of the Roadside Design Guide (Ref. 10.11) shows minimum clearance distances for mailboxes near intersections with county roads.

Asphalt surfacing shall be used for mailbox turnouts, if available. New and Reconstructed projects shall have a minimum eight-foot-wide mailbox turnout (or a total of 20 feet of surfacing width from the centerline). See Chapter Seventeen: Resurfacing, Restoration and Rehabilitation (3R) Projects, Section 6.E, of this manual for 3R project design guidance. The Standard/Special Plans Book (Ref. 10.4), Standard Plan 307, illustrates mailbox turnouts for various roadway types, (these plans provide surfacing quantities for typical mailbox turnouts, but additional surfacing will be needed for turnouts that have more than one mailbox support post).

No more than two mailboxes may be mounted on a single support structure, (See the Standard/Special Plans Book, Ref. 10.4). **NDOT** provides mailbox supports to the contractor, so the roadway designer needs to have a mailbox support count. The plan build note shall include the number of supports, the mailbox location(s) and, if used as a pay item, the required area of special mailbox surfacing (usually off-system projects).

Quantities for Surfacing for Mailbox Turnouts:

Concrete: Paid for by the square yard.
Asphalt: Tons of Asphalt
(paid for by roadway tonnage, include in asphalt totals given to **M&R**)
Preparation of Intersections and Driveways (paid for by the square yard)
Placement of Intersections and Driveways (paid for by the square yard)

For additional information see a Guide for Erecting Mailboxes on Highways (Ref. 10.7), the Roadside Design Guide (Ref. 10.11), and Title 412, Nebraska Administrative Code, Chapter 2 (Chapter 2 - The Accommodation of Mailboxes and Newspaper Delivery Boxes and Support Posts on Highway Rights Of-Way | State Regulations | US Law | LII / Legal Information Institute).

11. RURAL MEDIAN MAINTENANCE TURNAROUNDS

To provide consistency, maintenance turnarounds for rural Interstates, freeways, and expressways (Access only at interchanges) with depressed medians should exhibit the following characteristics:

Location

Any proposed maintenance turnaround should be placed at a location following the criteria below:

- Spacing should be at three-to-four-mile intervals (where interchange spacing is greater than five miles)
- Turnarounds may be placed at one or both ends of an interchange to facilitate snow removal operations
- Turnarounds should not be located within 1,500 feet of the end of the taper of a ramp entrance or exit lane
- Turnarounds should not be located within 1,500 feet of a structure
- Turnarounds should provide stopping sight distance along the freeway/expressway (see Section 3.2.2, “Stopping Sight Distance”, in Chapter 3 of the *Green Book* (Ref. 10.2))

Geometrics

- The turnaround width should be 40 feet
- The turnaround will be surfaced with type and thickness of surfacing determined by **M&R**
- The turnaround should provide a cross-slope of 2%
- The grade of the turnaround should be -2% towards the center of the median
- The sideslopes of the turnaround should be 1:10 or flatter
- If median barriers are present, crashworthy terminals will be provided (see Chapter Nine: Guardrail and Roadside Barriers, Section 6, of this manual)

Drainage

- Drainage should be reviewed to determine if the turnaround would impede flows within the median
- Turnarounds should be placed adjacent to median drains to ensure proper drainage; if no median drain exists, a median drain should be constructed, or a culvert should be installed

For additional information, see Section 8.3.2, “Medians”, in Chapter 8 of the *Green Book* (Ref. 10.2) and the Standard/Special Plans Book (Ref. 10.4), Typical X-Sections 1910 and 1911.

12. UTILITIES

For additional information, see Chapter Seventeen: Resurfacing, Restoration and Rehabilitation (3R) Projects, Section 10.F, of this manual.

12.A Utility Liaison

Highway construction projects frequently require the revision and relocation of utilities. The **Utilities Unit** of **Roadway** (**Utilities Unit**) is responsible for providing liaison with public and privately owned utilities. This includes:

- Reviewing plans and performing field inspections to determine utility ownership and identify potential conflicts
- Providing utility input to help determine the most satisfactory and economical location or design adjustments versus utility adjustments
- Requesting input from utility companies and reviewing and approving their plans, specifications, and estimates
- Coordinating with municipalities for the rehabilitation of their owned and operated utilities on highway projects
- Reviewing utility billings and submitting them for payment and subsequent audit review

It is the responsibility of the roadway designer to work with the **Utility Coordinator** in the **Utilities Unit** in identifying and resolving utility conflicts. As soon as the designer identifies a possible conflict, he/she should meet with the **Utility Coordinator** to determine the best rehabilitation procedure. If utility relocation is required, the **Utility Coordinator** will notify the utility owner.

The **Utility Coordinator** submits preliminary design plans, received from the roadway designer, to the utility owners at the time of plan-in-hand, for the identification of any utilities not shown on the plans. When the **Utility Coordinator** sends plans to the utility owners on a project, the **Utility Coordinator** will furnish **Roadway** with a memo indicating when and to whom the plans were sent. At the plan-in-hand it is important that the roadway designer notes any utilities not located on the plans and identifies any potential conflicts. As right-of-way appraisal plans are nearing completion, the **Utility Coordinator** sends right-of-way and limits of construction plans to the utility owners for preparing utility rehabilitation plans and cost estimates. Throughout the development of the project it is very important that the roadway designer notifies the **Utility Coordinator** whenever design changes occur. This will enable proper coordination with the affected utility owners (See “Utility Rehabilitation Negotiations”, Ref. 10.13). Failure to inform the **Utility Coordinator** of design changes may result in a utility relocating their facility and then being informed they will have to move again because they are still in conflict with the proposed construction. This could result in a delay to the contractor and additional expense to the **State**.

12.B Utility Rehabilitation Plan Review

The **Utility Coordinator** will submit utility rehabilitation plans, as the utility owners return them, to the **Roadway Design Unit Head** for review unless the utility work is minor. The **Utility Coordinator** will have previously reviewed the plans and will indicate any comments from his/her review. The **Roadway Design Unit Head** and/or designer will review the plans and return them to the **Utility Coordinator** with any comments regarding the plans on the transmittal letter received from utilities.

12.C City/County Utility Cost Reimbursement

Responsibility for determining cost sharing to relocate city utilities is also a joint effort by both the **Utilities Unit** and the appropriate **Roadway Design Section**. However, any financial commitment to a city for a utility relocation shall be submitted by the **Utilities Unit** in agreement form. Reimbursable costs represent the eligible non-betterment expenditures of the utility required to install, revise, and/or relocate utilities. Municipally owned utility facility non-betterment relocation costs are 100% reimbursable whether they are on public or private right-of-way inside the corporate limits. Outside the corporate limits the eligible reimbursement is based on the right-of-way/private easement criteria.

Not all utility relocation costs are reimbursable. Utilities located within existing state right-of-way that must be moved for a project are not eligible for reimbursement and the utility owner must bear the cost of the relocation expense. If a utility line is outside of existing state right-of-way and additional right-of-way is to be acquired necessitating relocation of the utility, the relocation expense is reimbursable. The utility may stay within the new right-of-way but must obtain a permit to occupy state right-of-way. The **Right-of-Way Division** (**ROW**) maintains a computerized listing of all utility permits by utility type in ARMS.

On all projects, especially federal-aid projects not on the state highway system, the **District Project Manager** shall notify **Roadway Design** or the **Secondary Roads Unit** and the proper **City** or **County Officials** (if necessary) if utility work not originally anticipated is required during construction. If the utility work is eligible for reimbursement and the **City/County** wants federal aid, the **City/County** should contact the **Urban Design Engineer** or the **Highway Local Liaison Coordinator**. The **District Project Manager** will coordinate with the utility involved to expedite the utility work to minimize delays to the construction contractor.

12.D Utility Accommodation on State Highway Right-of-Way

Utilities are permitted to occupy public highway right-of-way at the discretion of **NDOT**. On state highways, **NDOT** is responsible for regulating utility right-of-way occupancy. All requests to place utilities within state right-of-way are submitted to the **Utilities Unit**. See the Utility Accommodation Policy, (Ref. 10.14), (ndot-utility-accommodation-policy-january-2024_for-signatures.pdf) for additional information.

Any underground utility facility that crosses a drainage course within the right-of-way must be installed a minimum of four feet below the flow line of the drainage structure or drainage course, whichever is lower. Underground utility lines that cannot be installed with minimum cover due to natural conditions or conflict with other utilities may be required to protect the lines with suitable bridging, concrete slab, casing or other appropriate means. Utility route and line markers shall be placed on the right-of-way line identifying the name, address, and telephone number of the utility owner in case of emergency.

12.D.1 Aerial Lines

Aerial electrical power and communication lines constructed within the public right-of-way must be constructed in accordance with the current National Electric Safety Code (Ref. 10.15). The alignment of the overhead lines shall be as near the right-of-way line and parallel to the highway centerline as is practicable, ignoring minor irregularities in the right-of-way line. Joint use of utility poles is encouraged to avoid placing additional poles within the right-of-way. All poles and anchors shall conform to the following horizontal clearances:

1. In rural areas, all rigid poles and anchors must be located beyond the Horizontal Clear Zone, right-of-way permitting, (See Nebraska Minimum Design Standards, Ref. 10.5) (nac-428-rules-regs-nbcs.pdf). If sufficient right-of-way is not available, **NDOT** may require the use of breakaway design or a regrading of the right-of-way.
2. On urban or suburban highways with 45 mph or lower speed limits and rural cross-sections, all rigid poles and anchors shall be located at least 15 feet from the edge of the traveled way, preferably near the right-of-way line.
3. On city, town and urban highways with curbed sections, rigid poles and anchors may be located at the back of the sidewalk or at a minimum of six feet from the back of the curb where feasible.
4. Exceptions to these clearances may be made where curbside parking is permitted or where poles and anchors can be placed at locations behind guardrails, beyond deep ditches or on top of high banks, or at other similar locations that would not present additional hazards to the traveling public.

Poles located closer than the limits shown above should contain breakaway bases or other breakaway characteristics to permit the pole to collapse upon sharp impact or should be shielded. If poles are in urban conditions with high pedestrian traffic, breakaway bases should not be used (See the Roadside Design Guide, Ref. 10.11).

The following vertical clearances for utilities above the traveled way are required:

1. Aerial lines with 750 volts or less shall have a minimum clearance of 18 feet above the traveled way (the minimum clearance shall be measured from the high point of the roadway, including the shoulders).
2. Installation of aerial lines within and crossing public highway right-of-way and having 750 or more volts of electrical power shall comply with the regulations in the National Electric Safety Code (Ref.10.15) for vertical clearances and conductor sizes.

Longitudinal utility occupancy inside the fenced right-of-way of an Interstate or freeway is considered only as a "last resort" when no other feasible route can be followed by the utility facility or when such utility facility exclusively serves a highway facility. Specific details for each installation will be determined at the time the utility occupancy is authorized.

New aerial installations should be avoided at scenic locations and will be considered only if installation in alternative locations is unusually difficult and unreasonably costly, where installing the line underground is not technically or economically feasible, or if the installation can be made in such a manner that adequate attention to the visual qualities of the area will be addressed.

12.D.2 Underground Electrical Power and Communication Lines

Underground electrical power and communication lines constructed within highway right-of-way shall conform to the current electrical safety regulations (National Electric Safety Code, Ref. 10.15) and the Nebraska Standard Specifications for Highway Construction (Ref.10.12).

1. In villages and cities, the preferred location of parallel underground electrical power and communication lines installation is near the right-of-way line. They may be installed under the shoulder however this may cause possible conflicts with future construction.
2. On highways in villages and cities without sufficient right-of-way or a suitable location for underground lines outside of the traveled way, lines may be placed under the surfacing if it is determined to be in the best interest of the traveling public.
3. Installations of underground electrical power and communication lines may occupy a position near the toe of the fill slope or the top of back slope if insufficient right-of-way exists or if topography prohibits placement near the right-of-way line. **NDOT** shall designate the specific location of such facilities and any additional conditions concerning the right-of-way occupancy.
4. All manholes shall be placed outside of the traveled way where possible and shall not protrude more than four inches above the surrounding ground or shall comply with the horizontal clearances listed in Section 12.D.1 of this chapter.
5. Underground electrical power and communication lines within right-of-way with large cut and fill sections shall be placed at or near the toe of the fill or top of back slope.
6. Installation of underground electrical power and communication lines under the traveled portion of an existing highway must be performed by jacking, tunneling or dry boring from the toe of the fill slope to the toe of the opposite fill slope.
7. The utility shall be placed at a minimum depth of four-feet below the bottom elevation of the parallel road ditch or, in the absence of ditches, a minimum depth of cover of three-feet below the elevation of the natural ground. Additional cover may be required to protect the traveling public.
8. In areas with scenic designation, new underground utility installations may be permitted where they do not require extensive removal or alteration of trees or other natural features visible to the highway user or do not impair the visual quality of the lands being traversed.

12.D.3 Pipelines

Pipelines include sewer, water, gas, petroleum products, chemicals and irrigation lines. Approved materials for the construction of pipelines shall include cast iron, ductile iron, steel pipe with protective coating, vitrified clay, concrete, specially treated concrete, composite pipe (truss pipe), copper pipe and flexible pipe with some restrictions. Pipeline and casing construction within highway right-of-way shall conform to current appropriate standards.

1. The preferred location of pipeline installation parallel to the highway is near the right-of-way line.
2. Installations within villages and cities may require the use of shoulders or driving lanes and should take into consideration the provisions discussed for underground electrical and communication lines in Section 11.D.2 of this chapter.
3. Where insufficient right-of-way or topographic features prevent pipeline installation near the right-of-way line, pipelines may be installed near the toe of the fill or top of back slope at locations designated by **NDOT**.
4. Pipelines located within right-of-way with large cut or fill sections shall be placed at or near the toe of the fill or top of back slope.
5. All manholes and shutoffs shall be placed outside of the traveled way where possible and shall not protrude more than four inches above the surrounding ground or shall comply with the horizontal clearances listed in Section 11.D.1 of this chapter.
6. The minimum depth of earth cover over pipelines shall be three feet unless polyvinyl chloride (PVC) pipe is used. PVC pipelines carrying liquids shall be installed a minimum depth of five-feet, PVC pipelines carrying natural gas shall be installed a minimum depth of three-feet, however additional cover may be required.
7. Backfill of pipeline trenches shall conform to the standard specifications (Nebraska Specifications for Highway Construction, Ref. 10.12).
8. All pipelines attached to structures shall be placed in a neat manner beneath the structure's floor and inside of the outer girders or beams or in cells specifically designed for the installation.

12.D.4 Water Mains

Water mains shall be laid at least 10 feet horizontally from any existing or proposed storm sewer, sanitary sewer, or sanitary sewer force main. The distance shall be measured edge to edge. In cases where it is not practical to maintain a 10 foot separation, the **Nebr. Dept. of Health** may allow deviation on a case-by-case basis, if supported by data from the designer. Such deviation may allow installation of the water main closer to a sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer or at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer.

Water mains crossing storm sewers, sanitary sewers, or sanitary sewer force mains shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer. This shall be the case whether the water main is above or below the sewer. At crossings, one full length of water pipe shall be located so that both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.

The **Nebr. Dept. of Health** must specifically approve any variance from the requirements of these instructions when it is impossible to obtain the specified separation distances. Where sewers are being installed and these instructions cannot be met, the sewer materials shall be water main pipe or equivalent and shall be pressure tested to ensure water tightness.

Water pipe shall not pass through or come into contact with any part of a sewer manhole. For additional information see Recommended Standards for Water Works, (Ref. 10.16), (2022_Recommended_Standards_for_Water_Works.pdf.

13. ROADWAY LIGHTING

Roadway lighting systems on all **NDOT** projects will conform to the requirements of the **Illuminating Engineering Society of North America** (**IESNA**) Standard RP-8. The **Roadway Design Intelligent Transportation Systems/Lighting Unit** (**ITS/Lighting Unit**), using the warrants as outlined in this manual and any lighting recommendation(s) from the project plan-in-hand report, is responsible for determining if roadway lighting is warranted for a project. If lighting is found to be warranted, the **ITS/Lighting Unit** is responsible for its design and inclusion into the project. The roadway designer shall promptly notify the **Lighting Engineer** if the plan-in-hand lighting recommendation is, in any manner, changed by the **District**.

13.A Guidelines for the Installation Of Roadway Lighting

Highway projects that have existing roadway lighting will continue to have roadway lighting. City agreements will need to include the operational and maintenance costs of the system. Requests for new roadway lighting should be forwarded to the **Lighting Engineer**, who will conduct a study for each request received. If the results of the study satisfy the conditions of one of the following warrants **NDOT** may, subject to the availability of funds, add lighting to an already programmed project or schedule a lighting project to design and build a system at the requested location. The **ITS/Lighting Unit** will determine the type and style of the lighting system that will be provided. Even though a lighting request meets appropriate lighting warrants, the **State** is not obligated to provide roadway lighting. **NDOT** will own all lighting systems within state highway right-of-way.

13.A.1 Urban Lighting

13.A.1.a Warrants

Warrant I **Accident History (Continuous or Intersection):** The number of nighttime accidents (N) per year is greater than two times the number of daytime (D) accidents in a three-year accident history study with more than four nighttime accidents per year per intersection or per mile ($N > 2 \times D$, & $N > 4$).

Warrant II **Traffic Signals:** All intersections warranting traffic signals will also warrant roadway lighting.

Warrant III **Two Way Left Turn Lane (TWLTL):** Continuous lighting may be warranted with a two way left turn lane when there is 80% or more of commercial lighting along the state highway and more than 15 driveways per mile. Consideration will be given to continuous lighting when the mainline curves have a radius of less than 573 feet with a two way left turn lane.

Warrant IV **Local Responsibility:** If none of the previous warrants are met the local governing authority (**City**, **Town**, **Village**, or **S.I.D.**) can choose to install lighting if sufficient benefits are found in the form of convenience, safety, policing, community promotion, or public relations. The local governing authority will pay 50% of the installation cost and 100% of the operation and maintenance cost of the lighting system.

13.A.1.b Festoon Outlets

Festoon outlets (electrical outlets for holiday decorations) will be installed on urban projects as a project cost with a prior written request from the **City/Village**. Festoon outlets will only be installed in the core business area. If additional festoon outlets are requested, their cost will be the sole responsibility off the **City/Village**.

13.A.1.c Costs

When roadway lighting is scheduled for an urban project, the **Roadway Unit Head** or designer will ensure that local government officials are aware that the maintenance and operating costs of the lighting system will be the sole responsibility of the **City/Village**. Maintenance and operating cost estimates should be obtained from the **ITS/Lighting Unit** and presented to the local officials, prior to the signing of an agreement, to allow the **City/Village** to plan and budget for the expense. The local officials should also be informed that the lighting design, in order to be complete, may include a few poles that are outside of their corporate limits that they will be asked to be responsible for. A signed covenant agreement is required before a public hearing can be scheduled.

Roadway lighting projects within corporate limits meeting lighting warrant I, II or III and NOT installed as part of a New or Reconstructed, 3R, or Maintenance project will have **City/Village** participation as follows:

> The local governing authority will pay for 50% of the installation cost and 100% of the operation and maintenance costs of the lighting system.

Roadway lighting projects within corporate limits meeting lighting warrant I, II or III and installed as part of a New or Reconstructed, 3R, or Maintenance project will have **City/Village** participation as follows:

> Installation will be a project cost. 100% of the operation and maintenance costs of the lighting system will be the responsibility of the local governing authority.

13.A.2 Rural Intersection Lighting

13.A.2.a Warrants

Warrant A **Accident History:** The number of nighttime accidents per year is greater than one-third the number of daytime accidents per year and the average number of nighttime accidents per year is greater than three in a three year accident history study, or since the intersection was last modified ($N > D/3$, & $N > 3$).

Warrant B **ADT/Topography/Geometrics:** A current ADT greater than 2500 vehicles/day at the intersection (combine all traffic ADTs from all legs and divide by two, with a minimum 250 ADT at each leg) combined with two or more of the following conditions would be sufficient to warrant lighting:

1. Complex or unusual geometrics.
2. Intersection sight distance less than 660 feet.
3. Pedestrian traffic of more than 200 per day.
4. Confusing background lighting from adjacent development.
5. Raised medians on the mainline highway.

Warrant C **Traffic Signals:** All locations meeting warrants for traffic signals will warrant roadway lighting.

Warrant D **Local Responsibility:** If none of the warrants A, B, or C are met the local governing authority (**City**, **Town**, **Village**, or **S.I.D.**) can choose to install lighting if sufficient benefit is found in the form of convenience, safety, policing, community promotion, or public relations. The local governing authority will pay for 50% of the installation cost and 100% of the operation and maintenance costs of the lighting system.

Warrant E **Four-Lane Bypass:** Whenever a four-lane highway bypasses a **City**, **Town**, or **Village**, access roads which intersect the bypass but do not meet lighting warrants may have lighting installed as a project cost if the local governing authority feels that such lighting is necessary. The local governing authority is responsible for 100% of the operation and maintenance costs of the lighting system.

13.A.2.b Costs

Roadway lighting projects outside of corporate limits and meeting warrant A, B or C will require no **City/Village** participation. The **State** will assume total responsibility for the costs of installation, operation, and maintenance of the lighting system.

13.A.3 Rural Continuous Lighting

Rural continuous lighting is only warranted when it is an extension of a continuous urban lighting system being installed as part of an urban project and the lighting extension meets an urban lighting warrant. The installation of warranted lighting extensions will be a project cost and 100% of the operation and maintenance costs will be the responsibility of the **State**. If the extended lighting is at the request of the local governing authority, 100% of the operation and maintenance costs of the lighting system will be the responsibility of the local governing agency. **NDOT** will not pay for unwarranted rural continuous lighting located outside of the corporate limits and which was built at the request of the local governing authority.

13.A.4 Interchange Lighting

Warrants for interchange lighting on Interstates or Expressways will be as outlined in the **AASHTO** publication Roadway Lighting Design Guide (Ref. 10.8). The operational and maintenance costs of interchange lighting that falls within the corporate limits of a **City/Village** will be the sole responsibility of that **City** or **Village**. See NDOT Operating Instruction 60-11, “Municipal Cost Sharing” (Appendix B, “Selected NDOT Operating Instructions”, of this manual) for additional information.

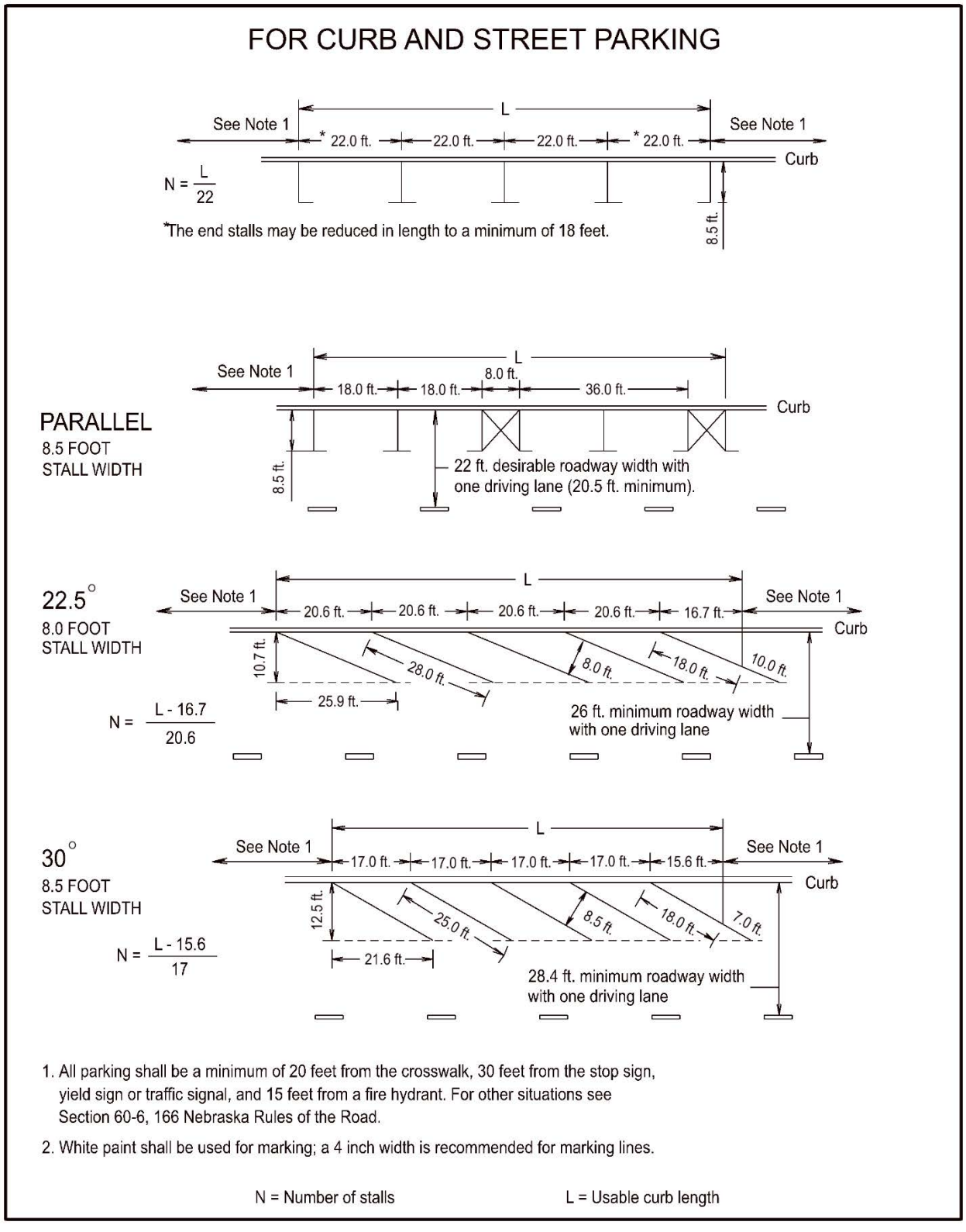
14. PARKING

EXHIBITS 10.10 & 10.11 provide parking stall dimensions for curb/street parking and for parking lot/parking garage designs for passenger cars. The designer should check local standards before designing parking facilities. Parking modifications should be discussed with local officials, especially if existing parking is eliminated on the proposed facility. This should be done as early as possible in the design process. The designer should check with the **Traffic Engineering Division** if there is a need to provide for longer or wider vehicles. For further information see the Nebraska Revised Statutes, Chapter 60, Section 60-6,164 and Section 60-6,166 (Nebraska Legislature - Revised Statutes Chapter 60).

14.A Accessible Parking

When the **Nebraska Department of Transportation** constructs or re-stripes parking spaces, it must provide accessible parking spaces as required by the Architectural and Transportation Barriers Compliance Board Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (2023) (Ref. 10.6) (§ 1190.1 Accessibility Guidelines). Accessible parking spaces must be located to provide the shortest possible accessible route of travel to an accessible facility.

Additional guidance may be found in the U.S. Access Board Technical Guide “Parking Spaces” (Chapter 5: Parking Spaces).



1. All parking shall be a minimum of 20 feet from the crosswalk, 30 feet from the stop sign, yield sign or traffic signal, and 15 feet from a fire hydrant. For other situations see Section 60-6, 166 Nebraska Rules of the Road.
2. White paint shall be used for marking; a 4 inch width is recommended for marking lines.

N = Number of stalls L = Usable curb length

Exhibit 10.10 Parking Stall Dimensions for Curb and Street Parking

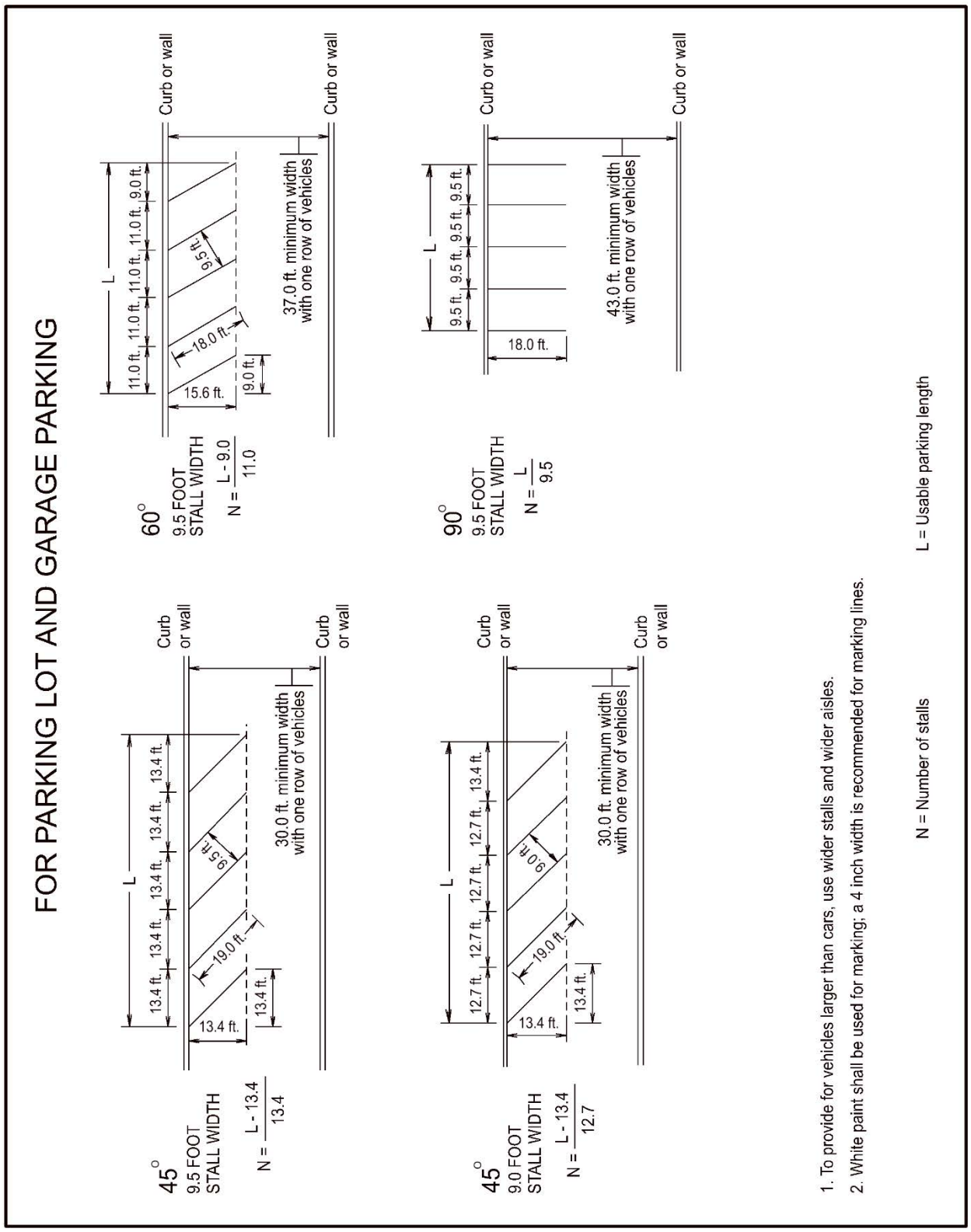


Exhibit 10.11 Parking Stall Dimensions for Parking Lots and Garages

15. REFERENCES

10.1 Nebraska Department of Transportation, Design Process Outline (*DPO*), Current Edition. (Design Process Outline)

10.2 American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets (*Green Book*), Washington, D.C., 2018.

10.3 Nebraska Department of Transportation, Drainage Design and Erosion Control Manual, Current Edition.

10.4 Nebraska Department of Transportation, Standard/Special Plans Book, Current Edition. (Standard/Special Plans Manual - NDOT)

10.5 Board of Public Roads Classifications and Standards, Nebraska Minimum Design Standards (*MDS*), Current Edition. (nac-428-rules-regs-nbcs.pdf)

10.6 Architectural and Transportation Barriers Compliance Board, Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way, Washington, D.C., August 8, 2023. (§ 1190.1 Accessibility Guidelines)

10.7 American Association of State Highway and Transportation Officials, Guide for Erecting Mailboxes on Highways, Washington, D.C., 1985.

10.8 American Association of State Highway and Transportation Officials, Roadway Lighting Design Guide, Washington, D.C., 2018.

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