Construction Improvement Types

- Reconstruction - means total rebuilding of an existing highway to improve maintainability, safety, geometrics, and traffic service. It is accomplished basically on existing alignment and major elements may include flattening of hills and grades, improvement of curves, widening of the roadbed and elimination or shielding of roadside obstacles. Normally, reconstruction will require additional right-of-way. It includes rebuilding both the pavement structure and subgrade. It also includes widening of urban streets to widen lanes or to add parking, bicycle accommodations or auxiliary lanes or adding sidewalks. Removing parking together with pavement replacement is in this category, because this increases the traffic carrying capacity of the roadway without actually constructing new through travel lanes.

- Pavement replacement- means structural improvement to the pavement structure or removal of the total thickness of all existing asphalt and concrete paving layers from an existing roadway and providing a new paved surface without changing the subgrade. It may include restoration of the base aggregate by adding more material before repaving or adding base aggregate open-graded with drainage system. It generally *involves* no improvement in capacity or geometrics. Pavement replacement may include some elimination or shielding of roadside obstacles, culvert replacement, signals, pavement marking, signing and intersection improvements. Pavement replacement projects may require additional right-of-way.

- Reconditioning- means work in addition to resurfacing. Minor reconditioning includes pavement widening and shoulder paving. Major reconditioning includes improvement of an isolated grade, curve, intersection or sight distance problem to improve safety. Major recondition projects may require additional right-of-way.

- Resurfacing /Overlay-means placing a new surface on an existing roadway to provide a better all weather surface, a better riding surface, and to extend or renew the pavement life. It includes pavement widening and shoulder paving (without changing the subgrade shoulder points). Generally, it involves no improvement in capacity or geometrics. Resurfacing may include some elimination or shielding of roadside obstacles, culvert replacements, signals, marking, signing and intersection improvements. Usually, no add.itional right-of-way is required; except possible minor acquisition for drainage and intersection improvements

Improvement Type	Cost/Mile	Life Expectancy Years	*Justification Summary
Reconstruction	$ 1,200,000.00	20+	Highway is classified as major collector and has over 750 vehicles/ day
Reconditioning	$ 500,000.00	20+	Highway is classified as Major or Minor collector and has over 500 vehicles/ day
Pavement Replacement	$ 213,000.00	20+	Cost efficient improvement method that can be done on all classifications
Resurface/ Overlay	$ 95,000.00	15+	Subgrade is in good shape and existing pavement is in average condition

FDM 3-5-2 Highway Improvement Type Definitions

June 19, 2013

TRANS 209 identifies and defines several types of highway improvement projects. This procedure provides the TRANS 209 definition for each type that will be used in classifying projects for the Six-Year STH improvement program. It also provides additional criteria and examples of different project types. Finally, it references the geometric standards to be applied to each. In the event that the applicable standards cannot be achieved, an Exception to Standards must be requested.

Designers need to understand these descriptions to help maintain the proper scope throughout the design life of a project and to ensure that if the scope must be changed, the program classification is also changed when appropriate.

See FDM 21-5-5 for guidance on the appropriate type of environmental documentation for each type of highway improvement.

2.1 Resurfacing

2.1.1 Definition

"Resurfacing" means placing a new surface on an existing roadway to provide a better all-weather surface, a better riding surface, and to extend or renew the pavement life. It generally involves no improvement in capacity or geometrics. Resurfacing may include some elimination or shielding of roadside obstacles, culvert replacements, signals, marking, signing and intersection improvements. Usually, no additional right-of-way is required; except possible minor acquisition for drainage and intersection improvements.

2.1.2 Additional Criteria

- Overlay must be placed directly on top of existing pavement (no intervening base course)
- May include spot replacement of curb and gutter in urban areas

2.1.3 Examples

See FDM 14-15 Table 1.2.

2.1.4 Standards

Interstate: FDM 11-44-1
- Expressways and non-Interstate Freeways: FDM 11-40-1 and FDM 11-40-8.
- Non-expressway/non-freeway facilities: FDM 11-40-1 and FDM 11-40-6.

Note that "maintenance" work on connecting highways is not eligible for state funding and is therefore the responsibility of the local jurisdiction. The differentiation between a maintenance resurface (intermittent mats and mats of 2" or less) and an improvement resurface (continuous and more than 2"), as related to connecting highways, is stated in Section 6.2.5 of Chapter 09-03-02 of the Program Management Manual.

2.1.5 FIIPS Improvement Concepts

Use the following improvement concept for this task:

- RESURF Resurfacing

2.1.6 Reconditioning

2.1.6.1 Definition

"Reconditioning" means work in addition to resurfacing. Minor reconditioning includes pavement widening and shoulder paving. Major reconditioning includes improvement of an isolated grade, curve, intersection or sight distance problem to improve safety. Major recondition projects may require additional right-of-way.

2.1.6.2 Additional Criteria

- Does not include increasing the number of driving lanes
- May include replacing sections of and/or expanding existing storm sewer systems

May include continuous pavement widening or shoulder widening on rural highways

May include subgrade widening on rural highways in order to widen pavement or shoulders without steepening sideslopes, or to accommodate increased pavement structure depth due to resurfacing without steepening sideslopes, or to correct a structural problem

- Does not include adding continuous lanes
- May include reconstruction not to exceed 50% of the length of the project
- May include replacement of curb and gutter in urban areas with up to 50% of new curb and gutter or on new horizontal or vertical alignment.

2.1.6.3 Examples

- Resurfacing plus re-grading of some individual horizontal or vertical curves
- Resurfacing plus relocating parts of the project.
- Resurfacing plus continuously widening subgrade to allow pavement or shoulders to be widened along existing horizontal and vertical alignment
- Resurfacing plus adding non-continuous (turning, climbing or passing) lanes
- Resurfacing plus continuously or intermittently grading ditches and slopes to improve drainage or flatten vehicles recovery areas
- Placing "gravel lift" (new base course) over existing pavement and a new pavement on top of that
- Resurfacing plus adding parking lanes in urban areas.

2.1.6.4 Standards

- Interstate: FDM 11-44-1.
- Expressways and non-Interstate freeways: FDM 11-10-5, FDM 11-15-1, FDM 11-40-1, and FDM 11-40-8.
- Non-expressway/non-freeway facilities: FDM 11-40-1 and FDM 11-40-6.

2.1.6.5 FIIPS Improvement Concepts

Use the following improvement concept for this task:

- RECOND Reconditioning.

2.2 Pavement Replacement

2.2.1 Definition

"Pavement Replacement" means structural improvement to the pavement structure or removal of the total thickness of all existing asphalt and concrete paving layers from an existing roadway and providing a new paved surface without changing the subgrade. It may include restoration of the base aggregate by adding more material before repaving, or adding base aggregate open-graded with drainage system. It generally involves no improvement in capacity or geometrics. Pavement replacement may include some elimination or shielding of roadside obstacles, culvert replacement, signals, pavement marking, signing and intersection improvements. Pavement replacement projects may require additional right-of-way.

2.2.2 Additional Criteria

- Pavement replacement includes the pavement treatments under the heading of "Pavement Replacement" in **FDM 14-15-1** Table 1.2.
- Does not include increasing the number of driving lanes
- Does not include adding continuous lanes
- May include reconstruction not to exceed 50% of the length of the project
- No change to subgrade means the subgrade profile and cross slope are not changed
- May include continuous pavement widening or shoulder widening on rural highways
- May include subgrade widening on rural highways in order to widen pavement or shoulders without steepening sideslopes, or to accommodate increased pavement structure depth without steepening sideslopes, or to correct a structural problem
- May include improvement of an isolated grade, curve, intersection or sight distance problem to improve safety
- May include curb and gutter replacement to same line and grade
- May include replacement of curb and gutter in urban areas with up to 50% of new curb and gutter on new horizontal or vertical alignment.
- For urban roadways, may include removing up to 50% of existing aggregate, by the length of the project, to accommodate increased pavement structure depth.

For urban roadways, may include minor subgrade changes for up to 50% of project, by length, due to increased pavement structure depth.

Does not include new storm sewer construction

May include replacing sections of and/or expanding existing storm sewer systems

May include transfer of width between pavement and shoulders

May include shoulder paving

May include adding or replacing sidewalks

May include adding or replacing bikeways.

2.2.3 Examples

See FDM 14-15 Table 1.2.

Pavement replacement plus re-grading of some individual horizontal or vertical curves

Pavement replacement plus relocating parts of the project

Pavement replacement plus continuously widening subgrade to allow pavement or shoulders to be widened along existing horizontal and vertical alignment

Pavement replacement plus adding non-continuous (turning, climbing or passing) lanes

Pavement replacement plus continuously or intermittently grading ditches and slopes to improve drainage or flatten vehicle recovery areas

Pavement replacement plus adding parking Janes in urban areas.

2.2.4 Standards

Interstate: FDM 11-44-1.

- Expressways and non-Interstate freeways: FDM 11-10-5, FDM 11-15-1., FDM 11-40-1 and FDM.11-40-8.

Non-expressway/non-freeway facilities: FDM 11-40-1 and FDM 11-40-6.

2.2.5 Fl/PS Improvement Concepts

Use the following improvement concept for this task:

- PVRPLA Pavement Replacement

2.3 Reconstruction

2.3.1 Definition

"Reconstruction means total rebuilding of an existing highway to improve maintainability, safety, geometrics and traffic service. It is accomplished basically on existing alignment, and major elements may include flattening of hills and grades, improvement of curves, widening of the roadbed, and elimination or shielding of roadside obstacles. Normally, reconstruction will require additional right-of-way.

It includes rebuilding both the pavement structure and subgrade. It also includes widening of urban streets to· widen lanes or to add parking, bicycle accommodations or auxiliary lanes, or adding sidewalks. Removing parking together with pavement replacement is in this category, because this increases the traffic carrying capacity of the roadway without actually constructing new through travel lanes.

2.3.2 Additional Criteria

- Work that either changes the location of the existing subgrade shoulder points or removes all of the existing pavement and base course for at least 50% of the length of the project.

2.3.3 Examples

Re-grading to improve horizontal or vertical alignment for more than 50% of the length of the project.

Replacing pavement structure and widening subgrade to widen lanes and/or shoulders.

Upgrading existing interchanges (i.e., realigning or re-profiling ramps, lengthening ramp tapers, etc.)

Adding continuous parking or auxiliary lanes

Replacing existing urban pavement, curb and gutter and storm sewer

Converting a rural roadway to an urban roadway with the same number of driving lanes.

2.3.4 Standards

- New construction standards in FDM 11-10-5 and FDM 11-15-1 or FDM 11-20-1.

2.3.5 FIIPS Improvement Concepts

Use the following improvement concepts for these tasks:

- RECST Reconstruction Preservation
- BRNEW New Bridge

2.4 Expansion

2.4.1 Definition

"Expansion" includes the same types of work associated with reconstruction, but also involves the construction of additional through travel lanes. In some cases, expansion may include construction of an entirely new street or highway on new alignment. Substantial land acquisitions may occur with these types of projects. Major projects are excluded from this definition.

2.4.2 Additional Criteria

- Same as Reconstruction
- Additional travel lanes may be either on existing or new location
- May or may not include rebuilding the existing roadway.
- Relocation, as used below, means changing the horizontal alignment sufficiently so that the old and new right-of-way are no longer contiguous.

2.4.3 Examples

- Relocating a roadway for more than 50% of the length of the project
- Adding one or more travel lanes for more than 50% of the length of the project
- Constructing a 2-lane or 4-lane community bypass
- Converting a rural 2-lane roadway to an urban roadway with four driving lanes
- Constructing new interchanges or adding lanes to existing interchange ramps.

2.4.4 Standards

- New construction standards in <u>FDM **11-1**0-5</u> and <u>**FDM** 11-15-1</u> or <u>**FDM** 11-20-1</u>.

2.4.5 FIIPS Improvement Concepts

Use the following improvement concepts for these tasks:

- RECSTE Reconstruction Expansion
- BRNEW New Bridge

2.5 Bridge Rehabilitation

2.5.1 Definition

"Bridge Rehabilitation" means the preservation or restoration of the structural integrity of an existing bridge as well as work to correct safety defects.

"Bridge Rehabilitation" includes repair, restoration or replacement of the components of the existing structure, including asphaltic surfacing or concrete overlays, as well as work to correct safety defects. Additional right-of-way will typically not be required, except minimal acquisitions may be necessary to accommodate ancillary improvements for drainage or for the construction of an abutment or pier.

2.5.2 Additional Criteria

- Includes widening of superstructure and substructure components
- Includes replacement of any superstructure component
- May include replacement of portions of abutments or piers

2.5.3 Examples

- Initial or replacement concrete or asphalt/membrane deck overlay
- Replace parapets with or without widening the deck
- Replace deck
- Replace deck and girders
- Widen deck and substructure units and add girders
- Replace or repair joints; replace delaminated concrete; strengthen structural steel by adding plates, re-welding or re-bolting

Add fencing

- Raise deck to improve vertical clearance below

2.5.4 Standards

Interstate: FDM 11-44-1

- All Other Highways: FDM 11-40-1

2.5.5 FIIPS Improvement Concepts

Use the following improvement concept for this task:

- BRRHB Bridge Rehabilitation

2.6 Bridge Replacement

2.6.1 Definition

"Bridge Replacement" means the building of a new bridge to replace an existing bridge.

The new bridge is either at the location of the existing structure or at a new location usually contiguous to the existing structure. A minor acquisition of additional right-of-way may be required.

2.6.2 Additional Criteria

Includes replacement bridges with wider lanes and shoulders or additional lanes

Includes eliminating grade separations and replacing with at-grade crossings

Includes box culverts or a series of pipes wide enough to be classified as a bridge

A bridge of any length or type may be replaced by any other

2.6.3 Examples

Remove and rebuild a 2-lane bridge

Replace a 2-lane bridge with a 4-lane bridge

Replace a 4-lane bridge carrying counter directional traffic with a pair of bridges, each carrying traffic ina single direction.

Replace a small bridge with a triple-cell box culvert 20' (6.0 m) long

- Remove a railroad/highway grade separation and install an at-grade crossing

2.6.4 Standards

- Interstate: **FDM 11-44-1**
- All Other Highways: **FDM 11-15-1.**

2.6.5 FIIPS Improvement Concepts

Use the following improvement concepts for these tasks:

- BRELIM Bridge Elimination

BRRPLE Bridge Replacement Expansi_on

BRRPL Bridge Replacement Preservation

FDM 3-5-5 Federally Funded Preventive Maintenam:e Projects *June 24, 2016*

5.1 Introduction

Preventive Maintenance (PM) is the planned strategy of cost effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition and safety of the system without increasing structural or operational capacity. The work on a PM project must not degrade existing roadway geometrics or appurtenances.

The criteria used to develop the Streets and Highways agreement are based on guidance issued by FHWA on October 8, 2004, "Preventive Maintenance Eligibility", http://www.fhwa.dot.gov/preservation/100804.cfm; and followed-up on September 12, 2005, "Pavement Preservation Definitions", http://www.fhwa.dot.gov/pavement/preservation/091205.cfm); as well as current AASHTO guidance on Preventive Maintenance.

An agreement between WisDOT and the FHWA Wisconsin Division allows for the use of Federal-aid Highway Funding for Preventive Maintenance activities as authorized in 23 USC 116 (d), "Preventive Maintenance" on all eligible Federal-aid highways in the State of Wisconsin. WisDOT and FHWA have signed two documents that

1.5.4 Be Sensitive To Environmental Issues

The impact of roadways on the environment need not be negative. Design and enhancement opportunities exist if creatively sought. The main principle is to identify, avoid, minimize, and mitigate social, environmental or economic impacts.

1.5.5 Provide an Aesthetically Pleasing Quality Product

The aesthetic and visual quality of highways and transportation facilities are key elements in a community sensitive design approach. Scenic views, community image, and roadside landscaping play an important part in the driving experience. The aesthetic design of bridges can leave a lasting impression on communities, daily users, and tourists. Aesthetics are not, as sometimes thought, a "strain on the project budget" when more essential road building needs exist. The demand for this type of design has become an expectation of society.

Comprehensive aesthetics planning is a process that integrates the roadway with the community and creates a wealth of goodwill. Aesthetic design and design excellence must flow directly from the design process so that transportation public works projects complement communities, provide safety and mobility, and enhance visual quality.

1.5.6 Provide Safe and Efficient Facilities

Concern about customers, stakeholders, the environment, and aesthetics must not preclude safe and efficient design. The project and its elements must all be designed and constructed so that they function well and last through their design life.

The challenge is to be flexible, so that safety and operational integrity are in proper balance with other contextual factors. The use of the full range of available design standards and the design exception process, where appropriate, are ways to increase flexibility.

1.5.7 Deliver Quality Projects On Time and Within Budget

Program delivery in a timely and cost effective manner is a department objective. There is some concern about whether a community sensitive design approach will add to the time and cost of project delivery. Quality in the customer's eyes may be enhanced, but at what cost? The main goal is to make wise decisions during project development. Designers must consider the context of the project from the outset and to budget accordingly. This may include planning for aesthetic or trail improvements. It may include a less costly design if a lower design speed is appropriate for the project.

The time to develop the project is likely to be longer in the early stages but quicker in the labor-intensive detail design/right-of-way acquisition phase. This is because the rework cycle is minimized through better involvement and agreement early in the process.

The cost and time elements need to be carefully considered so that the CSD approach is in balance with the project complexity and context. There probably isn't a single formula one can apply since the tradeoffs between quality, cost, and time will largely be project and situation dependent.

FDM 11-3-5 Decision Making Guidance

March 28, 2014

5.1 Introduction

As described in **FDM 11-3-1,** an important aspect of Community Sensitive Design (CSD) is to deliver transportation projects that not only provide safety and mobility, but are also in harmony with communities and the environment. This requires balancing design, construction and safety standards with impacts to the natural, social, economic and cultural environment.

Pursuant to Wis. Stat. 85.0205 **(https://docs.legis.wisconsin.gov/statutes/statutes/85/0205/2)** there is a limit on how much of the cost of a highway improvement project can be spent on elements determined to be aesthetic preferences of a community impacted by the improvement project. Refer to the Program Management Manual document number 03-25-15 **(http://dotneUpmm/03/03-25-15e.pd!)** for additional information and a list of eligible items.

This procedure provides guidance for making the appropriate design choices. Attachments 1 through 14 consist of decision-making matrices showing the following:

- Steps to follow,
- Project information and data to collect,
- Types of analyses to be completed, and
- Things to consider when applying flexibility in design, construction and safety standards.

Consult MSHTO's GDHS, FHWA's "Flexibility in Highway Design" and the MSHTO Bridging Document for additional guidance.

5.2 Decision Making Steps

The appropriate decision making steps are as follows:

1. Use desirable FDM design criteria for initial preliminary designs and design alternative alignments. Layout the horizontal and vertical alignments to best fit the "lay of the land," and to reduce or soften impacts to community and environmentally sensitive areas. The design must meet the safety and mobility needs of the project at a financially feasible cost.
2. Consider using less-than-desirable, but at least minimum FDM design criteria only if further flexibility in design criteria is needed to reduce impacts and to develop the best overall design. The use of less-than-desirable design criteria values shall be justified, documented and approved in the Design Study Report. This documentation shall include a description of the impacts that are being avoided or reduced, and a description of the crash history and other analyses completed to address safety concerns.
3. Consider using less-than-minimum FDM design criteria only for unique situations where even minimum FDM design criteria will cause excessive impacts to community or environmentally sensitive areas, and where it can be proven from the crash history that safety problems do not exist. For controlling criteria, the use of less-than-minimum design criteria requires an approved exception to standards. See **FDM** 11-1-2 for information on preparing Exceptions to Standards Reports, and **FDM 11-1-4** for information on Programmatic Exception to Standards (PES) for 3R projects. For non-controlling criteria the use of less-than-minimum design criteria shall be justified, documented and approved in the Design Study Report. This documentation shall include a description of the impacts that are being avoided or reduced, and a description of the crash history and other analyses completed to address safety concerns.

Use of values outside of FDM and MSHTO standards requires great care to ensure that the safety operational characteristics of the new roadway design are compatible with the operational characteristics of the original roadway. These operational characteristics consist of such things as meeting driver expectations and maintaining existing vehicle operating speeds and consistency of operating speeds throughout the project. Appropriate mitigation measures must be used to warn drivers and to maintain consistent operating characteristics. Examples of mitigation measures for various design features are listed in Attachments 5.1 through 5.13.

5.3 Project Information, Data Collection and Analyses

To ensure that design criteria are used appropriately, the following project information and data are collected and analyzed:

5.3.1 Project Information

5.3.1.1 Type of construction

Choose the type of construction (new construction, reconstruction or 3R). that est reflects the purpose and need of the project. Design criteria flexibility is generally greater for 3R projects than for new construction and reconstruction projects.

5.3.1.2 Roadway Functional Classification

Flexibility in design criteria increases as the functional classification of roadways decreases. Based on functional classifications the following philosophies in applying design criteria are followed:

Interstates, Other Freeways, and Expressways

There is very little design criteria flexibility for these facilities. CSD is applied only to the extent that the safety and mobility needs and desirable design criteria allow. CSD is achieved on these projects through roadway location selection, horizontal and vertical alignments that follow the "lay of the land," aesthetic features that soften roadway impacts, and by using roadside and median safety barriers to reduce roadway widths. Both FDM and MSHTO guidance requires the use of the highest design criteria. Exceptions to design standards are rarely justified, and then only under the most unique circumstances.

Corridors 2020 Multilane and Two-lane Roadways

Follow the same philosophy as the Interstate, Freeways and Expressways; but include urban roadway design criteria in addition to rural roadway design criteria. Exceptions to design standards may be submitted for unique circumstances on a limited basis. Design criteria flexibility for these facilities are limited to some minimum widths for median shoulders on rural projects, some minimum median and outside shoulder/curb offset widths on transitional/high speed urban roadways and some minimum travel and parking lane and median widths on low speed urban roadways.

Non-Corridors 2020 Principal and Minor Arterials

The CSD philosophy is applied by making careful choices between the safety and mobility needs of the roadway with the social and environmental needs. Crash history is analyzed on these projects to determine where safety improvements are required. Crash history and other data, such as vehicle operating speeds, should also be used to make careful choices between geometric upgrades and social and environmental impacts.

Less-than-desirable design criteria should not be used if safety will be degraded as an outcome or if driver expectations will be violated. For example, upgrading lane and shoulder widths on a highway without upgrading the horizontal or vertical features may give drivers the impression that the entire roadway has been upgraded. This may encourage them to drive faster than the horizontal and vertical features can handle and thereby potentially increasing crash rates.

Design criteria flexibility for rural roadways includes minimum shoulder widths and, in rolling terrain conditions, minimum lane widths on roadways with lower volumes or lower design speeds. Design criteria flexibility for urban roadways includes minimum median and outside shoulder/curb offset widths and narrower lane widths on lower volume transitional/high speed urban roadways and minimum travel and parking lane and median widths on low speed urban roadways.

Increased levels of congestion, above AASHTO guidance, are allowed in **FDM** 11-5-3. Exceptions to design standards may be submitted for approval when needed to avoid or reduce impacts in socially or environmentally sensitive areas.

Collectors, Locals and Town Roadways

Apply the same CSD Philosophy to collectors, locals and town roads as described above for the Non-Corridors 2020 principal and minor arterials. The difference is that collectors, locals and town roads have additional flexibility in design criteria, and are allowed to operate at even higher congestion levels. Exceptions to design standards may be submitted as needed to avoid or reduce impacts to socially or environmentally sensitive areas.

5.3.1.3 Type of Terrain

The AASHTO policy for level, rolling, and mountainous terrain conditions reflects design practices related to cost and operational efficiency. Steep upward grades reduce vehicle operating speeds at the approach to crest vertical curves. The lower design speeds provided in the rolling terrain tables reflect these lower operating speeds and the economical constraints that are imposed in the construction of roadways under these conditions. Exercise caution in the design of sag vertical or sharp horizontal curves at the bottom of steep down grades, because vehicle operating speeds at these locations tend to increase. This can create difficulties, especially for large trucks, affecting their ability to decelerate safely. Level terrain is the predominant terrain in Wisconsin, but there are areas in the state that have rolling terrain.

5.3.1.4 Project Design Speed

Horizontal; vertical and cross sectional design features are all affected by the project design speed. Lower design speeds allow increased flexibility in the ranges of design criteria. The selection of design speed must be compatible with the operating characteristics, functional classification and predominant use (e.g., high mobility, local access, "Scenic Byway," etc.) of the highway. See **FDM** 11-10-1 for guidance on the selection of design speed.

5.3.2 Data Collection

5.3.2.1 Existing and Projected Traffic Volumes

Traffic volumes affect the flexibility available in cross sectional design criteria. As traffic volumes increase the potential number of conflicts between vehicles and between vehicles and objects increases. This, in turn, increases the potential for a crash. Wider lane and shoulder widths are needed to provide additional lateral separation between vehicles and vehicles and roadside objects. This provides drivers with more room to perform avoidance and deceleration maneuvers. Carefully review projected traffic volumes to be sure that they adequately reflect future development plans.

5.3.2.2 Operating Speeds

These indicate how a highway is being driven and whether individual geometric elements meet driver expectations. Use this data when selecting project design speeds, and when considering the use of less than desirable design criteria. Consult with district traffic sections when collecting and analyzing operating speed data.

5.3.2.3 Crash History

This indicates the types of safety improvements that need to be considered in the design of a project. It also indicates the relative safety performance of various geometric elements or roadside safety features. Crash history information and analysis must be documented in all Exceptions to Standards reports, and in Design Study Reports when the use of less than desirable design criteria is proposed.

5.3.2.4 Roadside Conditions

Field reviews and photo log observations of roadside conditions can help to identify and evaluate potential safety impacts of existing geometric elements or roadside features. Such things as vehicle tracks and skid marks and damage to roadside barriers or other roadside objects may indicate potential safety hazards that may not show up in the crash history data.

5.3.2.5 Pavement Friction

An assessment of existing or proposed pavement surface friction can help to evaluate the safety impacts associated with the use of minimum or less-than-desirable curve radii or superelevation. If a decision is made to retain or use a minimum or less-than-minimum radius curve based on a thorough analysis of crash history, operating speeds and roadside conditions, construction of a pavement surface with an increased coefficient of friction in combination with the use of maximum superelevation is a good mitigation measure.

5.3.3 Analyses

5.3.3.1 Operating Speed Analysis

Close inspection of vehicle operating speeds is important in evaluating how the existing roadway is being driven and as to how well existing geometrics are meeting driver expectations. An ideal analysis would include the measurement of existing operating speeds at various locations throughout the project with special measurements made at locations where geometric features are of most concern. On projects with a complex or controversial decision-making process, actual measurements of operating speeds may be needed to generate or defend a final decision. In many cases however, the time and effort required to collect this data may not be cost effective. In those cases the designer can get a feel for the effects of existing geometric features on vehicle operating speeds by:

- Driving the roadway or soliciting comments from other staff who have driven the roadway,
- Making field observations of vehicle operating speeds on various sections of the project or at individual geometric features that are of particular concern,
- Soliciting comments from law enforcement officials, other local officials or public citizens that drive or live near the highway,
- Calculating the average running speed from driving the project and comparing it to the posted speed limit and design speed,
- Reviewing crash history reports for those crashes in which excessive operating speeds were cited as a cause of the crash; ·

5.3.3.2 Crash History Analysis

Close inspection of crash history data is required to evaluate the overall safety improvements needed on a project and when considering the use of less-than-desirable design criteria. The analysis shall go beyond the customary project crash rate comparisons to statewide averages to include a performance based crash analysis. Performance based crash analyses consist of looking at individual crash types at concentrated locations and levels of severity. For instance, when evaluating the decision to use a less-than-desirable curve radius, review the crash history at the curve location being analyzed to see if a crash history exists and to determine what specifically caused the crashes. Documentation for exceptions to standards, or for the use of less-than-desirable design criteria in the Design Study Report, shall include an analysis of crash history as one of the justifications for approval.

The safety screening analysis performed for 3R projects (see **FDM 11-1-4)** could be useful in this effort.

5.3.3.3 Traffic Capacity and Level of Service Analysis

An analysis of a highways capacity and level of service is needed to determine a highways ability to handle current and future traffic volumes. As a highway nears its capacity and the level of service decreases, the safety and mobility of a highway can become compromised. Use accepted traffic analysis formulas and models, such as the Highway Capacity Manual, to determine the incremental improvements or level of capacity expansion needed to meet the traffic needs for the project. See FDM 11-5-3 for more guidance on traffic analyses and recommended traffic analysis models and software

5.4 Things to Consider When Making Decisions on Design Criteria

Under Community Sensitive Design, designers make geometric and other design elements conform to the "lay of the land" in order to minimize community and environmental impacts. These design elements are listed in Table 5.1.

Table 5.1 Design Elements

Design Elements	Description	
Highway Capacity and Traffic Control	Level of service (LOS) requirements, intersection traffic control warrants, signing and marking criteria and requirements	
Horizontal	Tangents, curves, superelevation and transition, sight distances	
Vertical	**Grades, vertical curves, vertical clearance, sight distances**	
Sight Distance	Stopping sight distance (SSD), intersection sight distance (ISO), passing sight distance (PSD), decision sight distance (DSD), approach sight distance (ASD), driveway sight distance (DWSD)	
Cross section	Lanes and Shoulders	Number of lanes, lane widths, shoulder widths, cross slopes, superelevation, lateral clearance, curb and gutter, auxiliary lanes, passing and climbing lanes, horizontal clearance, shy distance, clear roadway width of bridges, pavement structure, truck route requirements
	Medians	Type (raised, flush, or ditched), width, slopes, lateral clearance, barrier **requirements and criteria**
	Roadside	Side slopes, clear zones, sidewalk width, sidewalk cross slope, driveway side slopes, driveway culverts, terrace slopes, side ditches, culvert end **treatments, retaining wall requirements, barrier requirements and criteria, fencing requirements and criteria**
Intersections, RR Crossings, Interchanges, and Driveways	Location, intersection angles, turning radii, horizontal and vertical roadway alignments, left/right turn lanes and tapers, median openings, channelization, approach grades, traffic control, approach sight distance, intersection sight distance, vision triangle, design vehicle, parking, frontage road offsets	
Clearances	Clear roadway width of bridges, clear zone, lateral clearance, horizontal clearance, vertical clearance, shy distance	
Drainage and Erosion Control	Design storm, drainage basin size and characteristics, hydrology, hydraulic characteristics and requirements (ditches, gutters, culverts, storm sewer pipes and inlets)	
Access Control	Controls (Ch. 84.09, 82.25, 84.295 stats, Trans 233, driveway permits, state access management system plan), access spacing, intersections, driveway location, driveway use, driveway design vehicle	
Bicycle **accommodations**	Location, width, cross slope, longitudinal slope, pavement structure, sight distances, vertical **clearance, road crossing, driveway crossing, grates, median refuge**	
Pedestrian and Handicap Accommodations	ADA requirements, location, width, cross slope, longitudinal slope, landings, handicap accessibility, pedestrian characteristics, curb zone, planter/furniture zone, pedestrian zone, frontage zone, surface texture, ramp design, road crossing, driveway crossing, grates, median refuge	
Bridge	Clear Roadway Width of Bridges, cross slopes, superelevation, Horizontal Clearance, Vertical Clearance, Structural Capacity, freeboard, Hydraulic Capacity, Railings and Barriers.	
Other	Trail crossings	Trail use, hourly exposure factor

Design Elements	Description	
	Cattle passes	Number of cattle, size of opening, longitudinal grade, length of structure
	Construction traffic control	Speed, detour routes, requirements of traffic control devices: size, spacing and placement, delays, traffic control zone components: advance warning area, transition area, activity area (longitudinal and lateral buffer spaces, work space, traffic space), termination area, all applicable previously discussed design elements

A decision to use design criteria outside the FDM desirable design criteria must be made very cautiously, and be based on a thorough consideration of many factors. The type of factors that could be considered for all of the various geometric features involved on a project can be numerous, and not always readily apparent. To help guide designers through this decision-making process, Attachments 5.1 through 5.14 provide a checklist of factors, titled "Things To Be Considered." These are a list of factors to consider when making these design criteria decisions.

LIST OF ATTACHMENTS

Design Criteria for Rural State Trunk Highways

Functionally Classified As Arterials (Level Terrain)

Traffic Volume		Roadway Width Dimensions				Bridges	
Design Class	**Design AADT**	**Design Speed (mph)**	**Traveled Way Width (feet)**	**Shoulder Width (feet)**	**Roadway Width (feet)[2]**	**Minimum Design Loading**	**Clear Roadway Width of Bridges (feet)[2,3]**
A1	Under 3500	**60**	**24**	**6**	**36**	[5]	**36**
A2' (2 lanes)	3,500-8,?00A 3,500-15,000C	**60**	**24**	**10** (8)	**44** (40)	[5]	**44** (40)
A3[1] (4 lane divided)	8,?OOA - 44, OOOA 8,700[8] - 53,500[8] 15,000c-60,000c	**70 [4]**	**2 at24**	**6LT (4)** **10RT[6]**	**2 at40** (38)	[5]	**2 at40**
A3[1] (6 lane divided)	44,000A - 69,000A 53,500[8] - 85,000[8] 60,000C - 90,000C	**70[4]**	**2 at36**	**10 LT and RT7**	**2 at56**	[5]	**2 at56**

A For non-freeway Corridors 2020 backbone and connector route, LOS threshold is *CID* or 4.0.

8 For freeway Corridors 2020 backbone route, LOS threshold is *CID* or 4.0.

c For other principal and minor arterials, LOS threshold is DIE or 5.0.

Desirable values are shown in bold and minimum values are shown in parentheses.

1 The top of the traffic volume range for design class A2 is 8,700 AADT for a Corridors 2020 route and 15,000 AADT for a non-corridors 2020 route. These volumes are based on the 2000 Highway Capacity Manual assuming; level terrain, 12-foot lanes, 2c 6-foot shoulders, 80% passing, 10% trucks, K30 design factor, and 60/40 directional split. In cases where a reduced level of service is determined to be acceptable and the use of passing lanes is found to be adequate treatment for the facility, the 8,700 AADT value for C2020 Connector routes may be increased to 12,000 AADT. Design class A3 assumptions: level terrain, 12-foot lanes_.:::. 6-foot shoulders, 10% trucks, K30 design factor, 61/39 directional split, 2 access points per mile, except freeway. See FDM 11-5-3 for additional information on level of service thresholds for different facility types and the respective numerical value.

2 Normally provide full width of approach roadways across all new bridges. Exceptions may be made when the bridge is considered a major structure on which design dimensions are subject to individual economic studies because of high unit cost.
See FDM 11-26-30.5.13.3 for Roadway Width, Clear Roadway Width of Bridges, and Underpasses between Closely Spaced Roundabouts.

3 Lateral clearance requirements for underpass bridges are included in FDM 11-35-1.

4 See FDM 11-10-1.

5 See WisDOT Bridge Manual and consult with Bureau of Structures for appropriate Bridge Design Loading.

6 Use a 12 ft paved shoulder (right) on 4-lane freeways if truck traffic >250 DHV, or if the facility experiences a high degree of congestion and incidents. The roadway width and clear roadway width on bridges are increased accordingly.

7 Use 12 ft paved shoulders (left & right) on 6-lane freeways if truck traffic> 250 DHV or if the facility experiences a high degree of congestion and incidents. The roadway width and clear roadway width on bridges are increased accordingly.

Design Criteria for Rural State Trunk Highways Functionally Classified As Arterials (Rolling Terrain)

Traffic Volume		Roadway Width Dimensions						Bridges[3,4]	
			Traveled Way width Based On Design Speed (feet)			Roadway Width Based On Design Speed (feet)[3]			
Design Class	**DesignADT**	**Design Speed (mph)'**	**55 mph or less**	**60 mph or greater**	**Shoulder Width (feet)**	**55 mph or less**	**60 mph or greater**	**Design Loading**	**Bridge Clear Roadway Width (feet)**
A1	0-1500	**60**	**24** (22)	**24**	**6**	**36** (34)	**36**	5	**36**
	1500-3500	(50)	**24**	**24**	**6**	**36**	**36**	5	**36**
A2' (2 lanes)	3,500-8,700A 3,500-15,000C	**60** (50)	**24**	**24**	**10** (8)	**44** (40)	**44** (40)	5	**44** (40)
A3[1,8] (4 lane divided)	8,700 -40,000A 15,000-55,000C	**70**[6] (60)		**2 at24**	**6 LT** (4) **10 RT**[7]		**2 at40** (38)	5	**2 at40**
A3[1,8] (6 lane divided)	40,000-63,000A 55,000 - 82,000C	**70** (60)		**2 at36**	**10 LT& RT**[8]		**2 at56**	5	**2 at56**

A For non-freeway Corridors 2020 backbone and connector route, LOS threshold is C/D or 4.0.
8 Level terrain standards apply to freeway Corridors 2020 backbone route, LOS threshold is C/D or 4.0.
c For other principal and minor arterials, LOS threshold is D/E or 5.0.

Desirable values are shown in bold and minimum values are shown in parentheses.

1 The top of the traffic volume range for design class A2 is 8,700 AADT for a Corridors 2020 route (LOS threshold of 4.0) and 15,000 AADT for a non-corridors 2020 route (LOS threshold of 5.0). These volumes are based on the 2000 Highway Capacity Manual assuming; rolling terrain, 12-foot lanes,>: 6-foot shoulders, 80% passing, 10% trucks, K30 design factor, and 60/40 directional split. In cases where a reduced level of service is determined to be acceptable and the use of passing lanes is found to be adequate treatment for the facility, the 8,700 AADT value for C2020 Connector routes may be increased to12,000 AADT. Design class A3 assumptions: rolling terrain, 12-foot lanes, > 6-foot shoulders, 10% trucks, K30 design factor, 61/39 directional split, 2 access points per mile, except freeway. See FDM 11-5-3 for additional information on level of service thresholds for different facility types and the respective numerical value.

2 Desirable Design Speed is 5 mph greater than the posted speed. A minimum design speed equal to the posted speed limit is acceptable.

3 Normally provide full width of approach roadways acrpss a!! new bridges. Exceptions may be made when the bridge is considered a major structure on which design dimensions are subject to individual economic studies because ofhigh unit cost
See FDM 11-26-30.5.13.3 for Roadway Width, Clear Roadway Width of Bridges, and Underpasses between Closely Spaced Roundabouts.

4 Lateral clearance requirements for underpass bridges are included in FDM 11-35-1.

5 See WisDOT Bridge Manual and consult with Bureau of Structures for appropriate Bridge Design Loading.

6 See FDM 11-10-1.

7 Use a 12 ft paved shoulder (right} on 4-lane freeways if truck traffic >250 DHV, or if the facility experiences a high degree of congestion and incidents. The roadway width and clear roadway width on bridges are increased accordingly.

8 Use 12 ft paved shoulders (left & right) on 6-lane freeways if truck traffic> 250 DHV or if the facility experiences a high degree of congestion and incidents. The roadway width and clear roadway width on bldges are increased accordingly.

Design Criteria for Rural State Trunk Highways

Functionally Classified As Collectors {Level Terrain)

Traffic Volume			Roadway Width Dimensions ,[1,6]						Bridges [3,4]	
				Traveled Way Width Based On Design Speed (feet)			Roadway Width[3] Based On Design Speed (feet)			
Design Class	Current ADT	DesignADT	Design Speed (mph)[2]	50 mph or less	55 mph or greater	Shoulde r Width (feet)	50 mph or less	55 mph or greater	Min. Design Loading	Clear Roadway Width of Bridges
C1	0-400		**60** (40)	**22-24** (20)	**22-24**	**2-4**	**26-32** (24)	**26-32**	[5]	**26-30**
CZ	401 - 750	Under1500	**60** (50)	**22-24**	**22-24**	**6** (5)	**34-36** (32)	**34-36** (32)	[5]	**28-30**
C3		1500-2000	**60** (50)	**24** (22)	**24**	**6**	**36** (34)	**36**	[5]	**32-34**
		2000-3500	**60**		**24**	**6**		**36**	[5]	**36**
C4		Over3500	**60**		**24**	**8**		**40**	[5]	**40**

Desirable values are shown in bold and minimum values are shown in parentheses.

1 Where a range of widths is shown, the smaller number is the minimum desirable width and the larger number is the maximum desirable width eligible for federal or state project participation.

2 Desirable Design Speed is 5 mph greater than the posted speed. A minimum design speed equal to the posted speed limit is acceptable.

3 Bridges in Design Classes C3 and C4 with a total length over 100 feet may be designed with a clear roadway with of 30 feet. See FDM 11-26-30.5.13.3 for Roadway Width, Clear Roadway Width of Bridges, and Underpasses between Closely Spaced Roundabouts.

4 Lateral clearance requirements for roadways under bridges are included in FDM 11-35-1.

5 See WisDOT Bridge Manual and consult with Bureau of Structures for appropriate Bridge Design Loading.

6 Lane widths shall be 12 feet on Federally Designated Long Truck routes (i.e. the "National Network" as defined in 23 CFR Part 658).

Design Criteria for Rural State Trunk Highways

Functionally Classified As Collectors (Rolling Terrain)

Traffic Volume			Roadway Width Dimensions[1,6]						Bridges[3,4]	
Design Class	Current ADT	DesignADT	Design Speed (mph)[2]	Traveled Way Width Based On Design Speed (feet): 50 mph or less	Traveled Way Width Based On Design Speed (feet): 55 mph or greater	Shoulder Width (feet)	Roadway Width 3 Based On Design Speed (feet): 50 mph or less	Roadway Width 3 Based On Design Speed (feet): 55 mph or greater	Design Loading	Clear Roadway Width of Bridges
C1	0-400		**60** (30)	**22-24** (20)	**22-24**	**2-4**	**26-28** (24)	**26-28**	5	**26-30**
C2	401-750	Under1500	**60** (40)	**22-24**	**22-24**	**6** (5)	**34-36** (32)	**34-36** (32)	5	**28-30**
C3		1500-2000	**60** (40)	**24** (22)	**24**	**6**	**36** (34)	**36**	5	**32-34**
		2000-3500	**60** (50)	**24**	**24**	**6**	**36**	**36**	5	**36**
C4		Over 3500	**60** (50)	**24**	**24**	**8**	**40**	**40**	5	**40**

Desirable values are shown in bold and minimum values are shown in parentheses.

Approval through the exception to standards process.

1 Where a range of widths is shown, the smaller number is the minimum desirable width and the larger number is the maximum desirable width eligible for federal or state project participation.

2 Desirable Design Speed is 5 mph greater than the posted speed. A minimum design speed equal to the posted speed limit is acceptable.

3 Bridges in Design Classes C3 and C4 with a total length over 100 feet may be designed with a clear roadway with of 30 feet. Bridges in Design Classes C3 and C4 with a total length over 100 feet may be designed with a clear roadway with of 30 feet. See FDM 11-26-30.5.13.3 for Roadway Width, Clear Roadway Width of Bridges, and Underpasses between Closely Spaced Roundabouts.

4 Lateral clearance requirements for roadways under bridges are included in FDM 11-35-1.

5 See WisDOT Bridge Manual and consult with Bureau of Structures for appropriate Bridge Design Loading.

6 Lane widths shall be 12 feet on Federally Designated Long Truck routes (i.e. the "National Network" as defined in 23 CFR Part 658).truck routes.

Design Criteria for Rural State Trunk Highways

Functionally Classified As Local Roads (Level Terrain)

Traffic Volume			Roadway width Dimensions [1]								Bridges [1,3,4]		
				Traveled Way Width Based On Design Speed (feet)				Roadway Width [3], Based On Design Speed (feet)				Clear Roadway Width of Bridges Based on Design Speed (feet)	
Design Class	**Current ADT**	**DesignADT**	**Design Speed (mph)** [2]	**40mph or less**	**45-50 mph**	**55mph or more**	**Shoulder Width (feet)**	**40 mph or less**	**45-50 mph**	**55mph or more**	**Design Load**	**50 mph or less**	**55mph or more**
L1	0-250		**60** (30)	**20-22** (18)	**20-22**	**22**	**2-4**	**24-26** (22)	**24-26**	**26**	5	**24-28**	**26-28**
L2	250-400		**60** (40)	**22** (18)	**22** (20)	**22**	**2-4**	**26-30** (22)	**26-30** (24)	**26-30**	5	**26-30**	**26-30**
L3	400-750	Under 1500	**60** (50)		**22-24**	**22-24**	**6** (5)		**34-36** (32)	**34-36** (32)	5	**28-30**	**28-30**
L4		1500-2000	**60** (50)		**24** (22)	**24**	**6**		**36** (34)	**36**	5	**30-34**	**30-34**
		2000-3500			**24**	**24**	**6**		**36**	**36**	5	**36**	**36**
L5		Over 3500	**60** (50)		**24**	**24**	**8**			**40**	5	**40**	**40**

Desirable values are shown in bold and minimum values are shown in parentheses.

1 Where a range of widths is shown, the smaller number is the minimum desirable width and the larger is the maximum desirable width eligible for federal or state project participation.

2 Desirable Design Speed is 5 mph greater than the posted speed. A minimum design speed equal to the posted speed limtt is acceptable.

3 Bridges in Design Classes L4 and L5 with a total length over 100 feet may be designed with a clear roadway width of 30 feet. See FDM 11-26-30.5.13.3 for Roadway Width, Clear Roadway Width of Bridges, and Underpasses between Closely Spaced Roundabouts.

4 Clearance requirements for underpass bridges are included in FDM 11-35-1.

- See WisDOT Bridge Manual and consult with Bureau of Structures for appropriate Bridge Design Loading.

Design Criteria for Rural State Trunk Highways

Functionally Classified As Local Roads (Rolling Terrain)

Traffic Volume			Roadway width Dimensions [1]								Bridges [1,3,4]		
				Traveled Way Width Based On Design Speed (feet)				Roadway Width [3], Based On Design Speed (feet)				Clear Roadway Width of Bridges Based on Design Speed (feet)	
Design Class	Current ADT	Design ADT	Design Speed (mph) [2]	40 mph or less	45-50 mph	55mph or more	Shoulder Width (feet)	40mph or less	45-50 mph	55 mph or more	Design Load	50 mph or less	55 mph or more
L1	0-250		**60** (30)	**20-22** (18)	**20-22**	**22**	**2-4**	**24-26** (22)	**24-26**	**26**	5	**24-28**	**26-28**
L2	250-400		**60** (40)	**22** (18)	**22** (20)	**22**	**2-4**	**26** (22)	**26** (24)	**26**	5	**26-30**	**26-30**
L3	400-750	Under 1500	**60** (40)	**22-24** (20)	**22-24**	**22-24**	**6** (5)	**34-36** (30)	**34-36** (32)	**34-36** (32)	5	**28-30**	**28-30**
L4		1500-2000	**60** (40)	**24** (22)	**24** (22)	**24**	**6**	**36** (34)	**36** (34)	**36**	5	**30-34**	**30-34**
		2000-3500		**24**	**24**	**24**	**6**	**36**	**36**	**36**	5	**36**	**36**
L5		Over 3500	**60** (40)	**24**	**24**	**24**	**8**	**40**	**40**	**40**	5	**40**	**40**

Desirable values are shown in bold and minimum values are shown in parentheses.

1 Where a range of widths is shown, the smaller number is the minimum desirable width and the larger is the maximum desirable width eligible for federal or state project participation.

2 Desirable Design Speed is 5 mph greater than the posted speed. A minimum design speed equal to the posted speed limit is acceptable.

3 Bridges in Design Classes L4 and L5 with a total length over 100 feet may be designed with a clear roadway width of 30 feet. See FDM 11-26-30.5.13.3 for Roadway Width, Clear Roadway Width of Bridges, and Underpasses between Closely Spaced Roundabouts.

4 Clearance requirements for underpass bridges are included in FDM 11-35-1.

5 See WisDOT Bridge Manual and consult with Bureau of Structures for appropriate Bridge Design Loading.

Minimum Design Standards for Town Roads

(New Construction Only)

Design Class	Traffic Volume AADT Current	Roadway: Roadway Width (feet)	Roadway: Surfacing Width (feet)	Roadway: Minimum Shoulder Width (feet)	Roadway: Horizontal Curve (degrees) Desired Max	Roadway: Horizontal Curve (degrees) Max	Roadway: % Grade Des. Max	Roadway: % Grade Max	Structure: Highway Load	Structure: Clear Roadway Width for Structures (feet)**
T1	**Local Service** Intermittent Traffic	20, 22·	16, 13•	2					•	24
T2	Under100	24	18	3			9	11	•	24
T3	100-250	26	20	3			8	11	•	24
T4	251 - 400	32	22	5	50	12.25°	6	8	•	26
TS	401 -1000	34	22	6	50	12-25°	5	8	•	28
T6	1001-2400	44	24	10	**4.5°**	**7.5°**	5	7	•	30
n	Over 2400	USE STATE TRUNK STANDARDS								

* See WisDOT Bridge Manual and consult with Bureau of Structures for appropriate Bridge Design Loading.

** For federal-aid funded projects with a design hourly volume greater than 400, the clear roadway width for structures shall equal the approach roadway width.

Source: Section 82.50(1) Wisconsin Statutes Except Maximum

Horizontal Curve Values are from Table V-6, Page 424, GDHS

DESIGN CRITERIA FOR RECONSTRUCTION* OF TOWN ROADS[1]

TRAFFIC		DESIGN SPEED' (MPH)	ROADWAY WIDTH DIMENSIONS		
Design Class	**Current AADT**		**Traveled Way Width (feet)**	**Shoulder Width (feet)**	**Roadway Width (feet)**
RT1	**0 -250**	**40 or less** (30)	**20** (18)	**3** (2)	**26** (22)
		45-50	**20**	**3** (2)	**26** (24)
		55 or greater	**22**	**3** (2)	**28** (26)
RT2	**251 -400**	(40)	**22** (18)	**4** (2)	**30** (22)
		45-50	**22** (20)	**4** (2)	**30** (24)
		55 or greater	**22**	**4** (2)	**30** (26)
	401 - 750	(50)	**22**	**6**	**34**
		55 or greater	**22**	**6**	**34**
RT3	**Over750**	(50)	**24** (22)	**6**	**36** (34)
		55 or greater	**24**	**6**	**36**

Desirable values are shown in bold and minimum values are shown in parentheses.

* Note: Reconstruction means tota! rebuilding of an existing town road to improve maintainability, safety, geometrics and traffic service. Design standards for construction of new town roads are shown on page 1 of this attachment. To avoid confusion in the tenminology used to label design classes for the two design criteria, the design classes for town road "Reconstruction" begin with the letter "R".

1 Source: TRANS 204, Existing Town Road Improvement Standards.

2 Desirable Design Speed is 5 mph greater than the posted speed. A minimum design speed equal to the posted speed limit is acceptable.

RURAL STATE TRUNK HIGHWAY
PAVED SHOULDER WIDTH REQUIREMENTS [1]

DESIGN CLASS		PAVED SHOULDER WIDTH (resurfacing, restoration, and rehabilitation projects)	PAVED SHOULDER WIDTHS (reconstruction, new construction, or pavement replacement projects)
A1		3 ft	3 ft. on concrete roadways 5 ft. on asphalt roadways
C3, L4		3 ft	3 ft. on concrete roadways 5 ft. on asphalt roadways
A2		3 ft.	3 ft. on concrete roadways 5 ft. on asphalt roadways
C4, LS		3 ft.	3 ft. on concrete roadways 5 ft. on asphalt roadways
A3	4 - LANE DIV1DED EXPRESSWAY	R[2] - 8 ft. L-3 ft.	R[2] - 8 ft. L-3 ft.
A3	6- LANE DIV1DED EXPRESSWAY	R-811. L-8ft.	R-8ft. L-8ft.
A3	4-LANE INTERSTATE OR FREEWAY	R-1Dft L-4ft.	R[3] -1,0 ft. L-4ft.
A3	6 - LANE INTERSTATE OR FREEWAY	R-10ft. L-1011.	R'-1Dft. L[4] - 10 ft.
A3	1 - LANE RAMPS	R-511. L-3 ft.	R-Sft. L-3 ft.

1 See FDM 11-15-5 for shoulder width criteria for projects on the Great River Road. See FDM 11-46-15 for shoulder criteria to accommodate bicycles.

2 These shoulder widths also apply to the initial two-lane roadways of ultimate four-lane highways except when construction of the second roadway is not expected for at least six years. ln these cases, initially pave only 3 ft R along concrete roadways and 5 ft R along asphaltic roadways.

3 Use a 12-ft paved shoulder (right) on 4-lane freeways if truck traffic >250 DHV, or if the facility experiences a high degree of congestion and incidents. The roadway width and clear roadway width on bridges are increased a ordingly.

4 Use 12-ft paVE!d shoulders (left and right) on 6-lane freeways if truck traffic> 250 DHV or if the facility experiences a high degree of congestion and incidents. The roadway width and clear roadway width on bridges are increased accordingly.