I-06.01 Design Philosophy

The basic philosophy to consider when designing new or existing roadway facilities is to do so in accordance with AASHTO A Policy on Geometric Design of Highways and Streets; hereinafter referred to as *A POLICY.* In using *A POLICY,* generally start with the minimum values provided and then adjust them as the need would dictate. There may be circumstances where it may be in the best interest to use the minimum or desirable values. There may be circumstances where it may not be in the best interest to use the values in *A POLICY.* In those instances, it would be necessary to develop different values and process a design exception. Design exceptions are defined in more detail in Section I-06.04 of the Design Manual.

The philosophy to consider when applying *A POLICY* design values is to do so in accordance with NDDOT DESIGN GUIDELINES for Preventive Maintenance, Minor Rehabilitation, Structural Improvement, Major Rehabilitation, and New/Reconstruction Projects, March 2007; hereinafter referred to as *DESIGN GUIDELINES.* The *DESIGN GUIDELINES* are FHWA approved and recognized as of March 19, 2007. The *DESIGN GUIDELINES* have been referenced in the Design Manual in Section I-06.03 of the Design Manual.

The Director may designate and post special areas of state highways where lower speeds are required by condition. The design speeds for those segments are to be determined during the Project Development process.

Safety measures and issues will be identified and addressed as part of the Statewide Safety Program. The Statewide Safety programs will consist of four different types of analysis: Critical Rate Analysis, High Crash Analysis, Project Level Analysis, and Strategic Highway Safety Plan. Safety measures will be implemented with a safety project that will be scheduled and included in the Statewide Transportation Improvement Program (STIP), or if cost effective to be included with other projects. The Statewide Safety Program is defined in more detail in Section I-06.05 of the Design Manual.

I-06.02 Investment Strategies

The North Dakota Department of Transportation, NDDOT, in conjunction with the Federal Highway Administration, FHWA, has developed a series of investment strategies outlined in the *DESIGN GUIDELINES* that will ensure the life expectancy of the roadway is met. These investment strategies are Preventive Maintenance, Minor Rehabilitation, Structural Improvement, Major Rehabilitation, and New/Reconstruction Projects. Below is a brief summary of each investment strategy:

Preventive Maintenance – The intended purpose of this strategy is to protect the pavement structure, slow the rate of pavement deterioration, and/or correct deficiencies in the pavement surface. The surface defects may be caused by the environment, and by daily wear and tear of traffic. This type of project may occur on the same roadway as frequently as supported by a cost effectiveness determination. A detailed definition of Preventive Maintenance can be found in Section I-06.03.01, which also includes examples of projects that can be considered Preventive Maintenance. An overlay is considered to be Preventive Maintenance when the maximum thickness is two inches (no allowance for rut filling).

Minor Rehabilitation – This strategy aims to correct the structural integrity of the pavement without necessarily changing the existing alignment and profile geometrics. A detailed definition of Minor Rehabilitation can be found in Section I-06.03.02, which also includes examples of projects that can be considered Minor Rehabilitation. When an overlay is between two and three inches the project is considered to be Minor Rehabilitation.

Structural Improvement – A Structural Improvement restores the structural integrity of the pavement without necessarily changing the existing alignment and profile geometrics. In addition, the load carrying capacity should be increased to meet the HPCS guidelines. A detailed definition of Structural Improvement can be found in Section I-06.03.03. A Structural Improvement is a surfacing/base material recommendation based upon an engineering analysis.

Major Rehabilitation – Major Rehabilitation requires a large amount of work to bring the condition of the highway up to a level that will extend the service life. This strategy also provides the opportunity to perform operational improvements. A detailed definition of Major Rehabilitation can be found in Section I-06.03.04, which also includes examples of projects that can be considered Major Rehabilitation.

New/Reconstruction – There may be extensive changes to the existing route such as relocating on a new alignment, or completely removing the roadway down to the subgrade and rebuild from the bottom up. Everything from ADA requirements to signing must be addressed when performing a new or reconstruction project. A detailed definition of New/Reconstruction can be found in Section I-06.03.05.

I-06.03 Design Guidelines

These guidelines apply to linear rural roadway corridor projects.

The intent of the roadway width guidelines is not to reduce the roadway width to the minimum width shown in the guidelines, but rather to maintain or enhance based upon corridor needs. Select the appropriate strategy for the desired width.

1. If a District Corridor is on the NHS system the roadway will be designed to meet the minimum design guidelines for a State Corridor.

2. Design features that do not meet the minimum design guidelines but are incorporated into a project will require a design exception or appropriate documentation.

3. Safe pavement sloughs will be maintained as described in the Department's shoulder/slough guidelines. If there is no shoulder the slough should have a minimum slough of 3:1.

4. The traffic volumes shown are general guidelines. A 10% tolerance in the volumes may be allowed without requiring the designer to move to the next level of standard or the need for a design exception.

5. If a rural community or a location(s) with different needs fall within a corridor project and is identified in the scoping process, another strategy may be used. Rural communities may include items such as Complete Streets concepts, Rural Community Enhancements Projects (RCEP) or other enhancements that federal funding may allow.

6. A rail system is defined as both the bridge and/or roadway facility rail system servicing as one entire rail system protecting an individual structure or obstruction, which may include the following items:

    - end treatments and end terminals
    - linear guardrail runs
    - transition sections
    - bridge rails

    A mainline roadway strategy and individual structure strategy within the mainline project limits may be different. The mainline roadway strategy dictates the minimum safety work throughout the corridor unless a structure strategy is higher. The higher structure strategy safety work shall be used for that structure's rail system.

    If the roadway strategy requires the bridge rail to be in compliance with MASH, the bridge rail at a minimum shall comply with MASH Test
    Level 3. However, if a portion of the bridge deck needs to be removed in order to upgrade the bridge rail to be in minimum compliance with MASH Test Level 3, the bridge rail will instead be required to be in minimum compliance with NCHRP Report 350 Test Level 3.

    On Minor Rehabilitation and Structural Improvement roadway projects, the rail system may be left in place if the rail system was originally installed in compliance with NCHRP

Report 350 or MASH performance criteria, and has been maintained in a condition that is in reasonably close conformity to NCHRP Report 350 or MASH performance criteria.

I-06.03.01 Preventive Maintenance

Design Guidelines for Preventive Maintenance Projects

Traffic Data	Use current ADT
Roadway Width	Use appropriate width to meet or exceed NDDOT Guidelines for Minimum Roadway Width.
Superelevations	Use existing.
Design Speed	Use posted speed limit.
Cross Slope	Use existing.
Horizontal Curvature	Use existing.
Vertical Curvature	Use existing.
Obstruction Clearance	Use existing.
Foreslope	Use existing.
Roadway Shoulder/Slough Cross Slope	Use Department Shoulder/Slough Guidelines.
Safety	Safety issues will be identified and addressed as part of the Statewide Safety Program. Safety features will remain as they exist unless a need is identified.
ADA	Curb ramps adjacent to the project shall be addressed in accordance with the Departments "ADA Transition Plan" and decision document for "Curb Ramp Improvements on Alteration Projects".

The purpose of the Preventive Maintenance program is to protect the pavement structure, slow the rate of pavement deterioration and/or correct pavement surface deficiencies. Surface treatments used for preventive maintenance are targeted at pavement surface defects primarily caused by the environment and by the daily wear and tear of traffic. Structural deficiencies caused by traffic loading are not corrected by using these treatments.

Preventive Maintenance treatments may be applied as frequently as supported by a cost effectiveness determination Most preventive maintenance projects will be conducted on the top of the existing roadway and will have no impact to wetlands or cultural resources. Miscellaneous features such as mailboxes, signing, delineators and others will not be required to be upgraded as part of these projects unless identified by the Statewide Safety Program. Signage not in compliance with the MUTCD will be updated if engineering judgment indicates that:

- One compliant device in the midst of a series of adjacent non-compliant devices could potentially be confusing to road user.
- The anticipated schedule for replacement of the whole series of non-compliant devices will result in achieving timely compliance with the MUTCD.

All railroad crossings will have adequate warning/protective devices in place or be otherwise addressed in the State Railroad Crossing Improvement Program.

Typical scope of work items, including but not limited to, for Preventive Maintenance treatments are: Crack Pouring/Sealing, Route and Seal, Seal Coats, Micro-Milling, Micro-Surfacing, Pavement Patching, Milling and/or Asphalt Overlay 2" Maximum with or without Full Depth Pavement Repair*, Repair of depressed cracks, Minor Concrete Pavement Repair (less than 10% of the pavement surface area per mile), Dowel Bar Retrofit, Diamond Grinding, Rumble Strips, Pavement Marking, Signals, etc.

*Milling and/or Asphalt Overlay 2" Maximum except at full depth pavement repair areas. These areas are limited to matching the existing pavement depth plus the 2" overlay.

- The full depth pavement repair shall be limited to a maximum of 2% of the total square yards of the project, and a maximum of 1000 square yards per mile.
- The full depth pavement repair shall be limited to 12" maximum depth below the bottom of existing asphalt layer.
- The full depth pavement repair will not be allowed at reoccurring frost heaves or in areas with an existing pipe.
- The full depth pavement repair work shall be performed from on top of the roadway. The adjacent foreslope topsoil shall not be disturbed, and no construction equipment or traffic is allowed in the ditch bottom. The pavement/aggregate slough shall be re-established to match existing.
- No allowance for rut filling. Consider milling. If rut filling is needed, the quantity shall be taken from the overall mainline quantity.

I-06.03.02 Minor Rehabilitation

Design Guidelines for Minor Rehabilitation Projects

Traffic Data	Use current ADT
Roadway Width	Use appropriate width to meet or exceed NDDOT Guidelines for Minimum Roadway Width. May widen each side 2' to 4' based upon corridor needs.
Superelevations	Use existing.
Design Speed	Use posted speed limit
Cross Slope	Use existing.
Horizontal Curvature	Use existing.
Vertical Curvature	Use existing.
Obstruction Clearance	Use existing.
Foreslope	Use existing when not widening. Use 4:1 or flatter when widening.
Roadway Shoulder/Slough Cross Slope	Use Department Shoulder/Slough Guidelines.
Safety	Safety issues will be identified and addressed as part of the Statewide Safety Program. Safety features will remain as they exist unless a need is identified. Safety hardware that is not in compliance with NCHRP Report 350 performance criteria will be upgraded to be in compliance with MASH* performance criteria. Existing guardrail that is in compliance with NCHRP Report 350 except for rail height, may be reset to correct rail height for compliance with NCHRP Report 350.
ADA	Curb ramps adjacent to the project shall be addressed in accordance with the Departments "ADA Transition Plan" and decision document for "Curb Ramp Improvements on Alteration Projects".

***** *If safety hardware is not available for MASH performance criteria, safety hardware shall instead be required to be in compliance with NCHRP Report 350 performance criteria.*

Minor Rehabilitation is a planned strategy to extend the useful life of a highway by restoring the pavement structure without necessarily improving existing alignment and profile geometrics. The minor rehabilitation of roadways will use repair techniques designed to repair pavement distress areas primarily caused by the environment and by the daily wear and tear of traffic. A minor rehabilitation strategy will restore the load carrying capacity to its original condition. The appropriate NEPA process will be followed to address any environmental impacts.

Miscellaneous features such as mailboxes, signing, delineators and others will not be required to be upgraded as part of these projects unless identified by the Statewide Safety Program. Signage not in compliance with the MUTCD will be updated if engineering judgment indicates that:

- One compliant device in the midst of a series of adjacent non-compliant devices could potentially be confusing to road user.
- The anticipated schedule for replacement of the whole series of non-compliant devices will result in achieving timely compliance with the MUTCD.

All railroad crossings will have adequate warning/protective devices in place or be otherwise addressed in the State Railroad Crossing Improvement Program.

Typical scope of work items, including but not limited to, for Minor Rehabilitation treatments are: Asphalt Overlay up to 3", Distress Area Repairs and Asphalt Overlay, Mill & Overlay up to 3", Cold In-Place Recycling (CIR), Widening 2' to 4' on each side of the roadway to meet or exceed NDDOT Guidelines for Minimum Roadway Width, etc.

The intent of this strategy is to fit widening within the right of way and limit ditch widening to addressing wetland mitigation, borrow, snow problem areas, etc.

I-06.03.03 Structural Improvements

Design Guidelines for Structural Improvements Projects

Traffic Data	Use 20 year projected
Roadway Width	Use appropriate width to meet or exceed NDDOT Guidelines for Minimum Roadway Width. May widen each side based upon corridor needs.
Superelevations	Attempt to correct to AASHTO Standards. (6% max superelevation)
Design Speed	Use posted speed limit
Cross Slope	Driving Lanes 1.5% - 2.5%.
Horizontal Curvature	Use existing, sign when less than posted speed.
Vertical Curvature	Use existing.
Obstruction Clearance	20 feet.
Foreslope	Use existing when not widening unless a need is identified in the Safety Review. Use 4:1 or flatter when widening.
Roadway Shoulder/Slough Cross Slope	Use Department Shoulder/Slough Guidelines.
Safety	Safety issues will by identified and addressed as part of the Statewide Safety Program. Safety features will remain as they exist unless a need is identified. Safety hardware that is not in compliance with NCHRP Report 350 performance criteria will be upgraded to be in compliance with MASH* performance criteria. Existing guardrail that is in compliance with NCHRP Report 350 except for rail height, may be reset to correct rail height for compliance with NCHRP Report 350. Replace mailbox supports where necessary.
ADA	Curb ramps adjacent to the project shall be addressed in accordance with the Departments "ADA Transition Plan" and decision document for "Curb Ramp Improvements on Alteration Projects".

* *If safety hardware is not available for MASH performance criteria, safety hardware shall instead be required to be in compliance with NCHRP Report 350 performance criteria.*

Structural improvement is a planned strategy to extend the useful life of a highway by restoring or enhancing the pavement structure without necessarily improving existing alignment and profile geometrics.

Typical scope of work items, including but not limited to, for Structural Improvement treatments are: white topping, major concrete repair (greater than 10% of the pavement surface area per

mile), full depth reclamation, crack and seat or break and seat and HMA overlay or an HMA overlay based on an engineering analysis. Structural Improvements also include widening each side of the roadway to meet or exceed NDDOT Guidelines for Minimum Roadway Width. A structural improvement will increase the load carrying capacity to meet the HPCS guidelines. The appropriate NEPA process will be followed to address any environmental impacts. All regulatory and warning signs and pavement markings will be verified to comply with current MUTCD standards or brought up to MUTCD standards if necessary, and all railroad crossings will have adequate warning/protective devices in place or be otherwise addressed in the State Railroad Crossing Improvement Program.

I-06.03.04 Major Rehabilitation

Design Guidelines for Major Rehabilitation Projects

Traffic Data	Use 20 year projected
Roadway Width	Use appropriate width to meet or exceed NDDOT Guidelines for Minimum Roadway Width.
Superelevations	Correct to AASHTO Standards. (6% max superelevation)
Design Speed	Use posted speed limit.
Cross Slope	Driving lanes 1.5 – 2.5%.
Horizontal Curvature	Use existing, sign when less than posted speed. On State and Interregional Corridors with ADT >750, if existing horizontal curvature is designed for less than 15 mph less than the posted speed make cost effective improvement or sign accordingly.
Vertical Curvature	**Interregional System:** ADT < 2000 maintain existing. ADT > 2000 use stopping sight distance for crest curve design and comfort curve design for sag curves. Decision sight distance should be considered in areas where complex driver decisions are required such as intersections with major collectors or higher, interchanges, lane drops or additions, etc. Passing areas should be provided at reasonable intervals based on terrain and traffic volumes. A rule of thumb would be a passing area every 3 to 5 miles when the ADT <2000 and every 3 miles when the ADT >2000. **State Corridors, District Corridors & Collectors:** ADT < 2000, existing vertical curves should meet a design speed of no less than 20 mph below the overall project design speed. ADT > 2000 use stopping sight distance for crest curve design and comfort curve design for sag curves. Passing areas should be provided at reasonable intervals based on terrain and traffic volumes. A rule of thumb would be a passing area every 3 to 5 miles when the ADT <2000 and every 3 miles when the ADT >2000.
Obstruction Clearance/Clear Zone	Upgrade safety work to 20 feet obstruction clearance except when ADT >2000 use AASHTO roadside design clear zone.
Foreslope	4:1** minimum, on Interregional system > 2000 ADT a 6:1 foreslope is desirable where grading or roadway widening is required.
Roadway Shoulder/Slough Cross Slope	Use Department Shoulder/Slough Guidelines.
Safety	A 90-1 survey will be completed and areas needing safety improvements will be addressed. Upgrade safety hardware to be in compliance with MASH* performance criteria.
ADA	Curb ramps adjacent to the project shall be addressed in

	accordance with the Departments "ADA Transition Plan" and decision document for "Curb Ramp Improvements on Alteration Projects".

***** *If safety hardware is not available for MASH performance criteria, safety hardware shall instead be required to be in compliance with NCHRP Report 350 performance criteria.*

***Foreslope rates often have variations along the existing slope due to normal wear and tear, flexibility is allowed in determining the overall foreslope rate to account for these variations.*

Major Rehabilitation is a planned strategy in which major work is performed to bring a highway up to an acceptable condition to extend the service life and provide operational improvements (i.e. adding turn lanes).

Major rehabilitation projects may include reclaiming the existing surface material and base along with the placement of additional surface material and/or other work necessary to return an existing roadway, including shoulders, bridges, the roadside, and appurtenances to a condition of structural or functional adequacy. On these projects the roadway elevation may change, shoulders may be added, and foreslope corrections may be made. The roadway will be resurfaced and safety improvements will be completed as required. A crash analysis will be completed and cost effective enhancements will be addressed. All regulatory and warning signs and pavement markings will be verified to comply with current MUTCD standards or brought up to MUTCD standards if necessary, and all railroad crossings will have adequate warning/protective devices in place or be otherwise addressed in the State Railroad Crossing Improvement Program.

Typical scope of work items, including but not limited to, for Major Rehabilitation treatments are: HMA, Widening, Geometric Upgrades, etc.

I-06.03.05 New/Reconstruction Projects

Design Guidelines for New/Reconstruction Projects

Traffic Data	Use 20 year projected
Roadway Width	Use AASHTO Standards.
Superelevations	Use AASHTO Standards. (6% max superelevation)
Design Speed	Use posted speed limit.
Cross Slope	Driving lanes 1.5 – 2.5%.
Horizontal Curvature	Use AASHTO Standards.
Vertical Curvature	**Interregional System:** Use stopping sight distance for crest curve design and comfort curve design for sag curves. Decision sight distance should be considered in areas where complex driver decisions are required such as intersections with major collectors or higher, interchanges, lane drops or additions, etc. Passing areas should be provided at reasonable intervals based on terrain and traffic volumes. A rule of thumb would be a passing area every 3 to 5 miles when the ADT <2000 and every 3 miles when the ADT >2000. **State Corridors, District Corridors & Collectors:** Use stopping sight distance for crest curve design and comfort curve design for sag curves. Passing areas should be provided at reasonable intervals based on terrain and traffic volumes. A rule of thumb would be a passing area every 3 to 5 miles when the ADT <2000 and every 3 miles when the ADT >2000.
Clear Zone	Use AASHTO roadside design clear zone.
Foreslope	Use 4:1 except Interregional system > 2000 ADT and Interstate use 6:1
Pavement Shoulder/Slough Cross Slope	Use AASHTO Standards.
Safety	Safety hardware will be in compliance with MASH* performance criteria.
ADA	Pedestrian facilities adjacent to the project shall be addressed in accordance with the Departments “ADA Transition Plan”.

***** *If safety hardware is not available for MASH performance criteria, safety hardware shall instead be required to be in compliance with NCHRP Report 350 performance criteria.*

New/Reconstruction is a planned strategy in which a new road is constructed. This work may include work items such as relocating an existing route on new alignment, or completely removing the old pavement structure and restoring the roadbed and surfacing, or major widening on an existing roadway to increase traffic capacity (excludes realigning horizontal curves).

On New/Reconstruction projects a crash analysis will be completed and cost effective enhancements will be addressed. All safety hardware will be in compliance with MASH* performance criteria. All regulatory and warning signs and pavement markings will be verified

to comply with current MUTCD standards or brought up to MUTCD standards if necessary, and all railroad crossings will have adequate warning/protective devices in place or be otherwise addressed in the State Railroad Crossing Improvement Program.

I-06.03.06 Minimum Roadway Width on Four Lane Highways

Minimum Roadway Width on Four Lane Highways

Interstate 4 - Lane	<400	400-750	750-1500	1500-2000	>2000
New / Reconstruction	AASHTO STDS	AASHTO STDS	AASHTO STDS	AASHTO STDS	AASHTO STDS
Major Rehabilitation	AASHTO STDS	AASHTO STDS	AASHTO STDS	AASHTO STDS	AASHTO STDS
Structural Improvement	Maintain Existing	Maintain Existing	Maintain Existing	Maintain Existing	Maintain Existing
Minor Rehabilitation	Maintain Existing	Maintain Existing	Maintain Existing	Maintain Existing	Maintain Existing
PM	Maintain Existing	Maintain Existing	Maintain Existing	Maintain Existing	Maintain Existing

Interregional 4 - Lane	<400	400-750	750-1500	1500-2000	>2000
New / Reconstruction	AASHTO STDS	AASHTO STDS	AASHTO STDS	AASHTO STDS	AASHTO STDS
Major Rehabilitation	36	36	36	36	36
Structural Improvement	32	32	32	32	32
Minor Rehabilitation	32	32	32	32	32
PM	31	31	31	31	31

I-06.03.07 Minimum Roadway Width on Two Lane Highways

Minimum Roadway Width on Two Lane Two Way Highways

Interregional 2 - Lane	<400	400-750	750-1500	1500-2000	>2000
New / Reconstruction	32	36	36	36	40
Major Rehabilitation	30	30	36	36	36
Structural Improvement	26	26	28	30	32
Minor Rehabilitation	26	26	28	30	32
PM	26	26	28	28	30

State Corridor	<400	400-750	750-1500	1500-2000	>2000
New / Reconstruction	32	36	36	36	40
Major Rehabilitation	*28	*28	*32	36	36
Structural Improvement	24	24	28	28	32
Minor Rehabilitation	24	24	26	28	32
PM	24	24	26	26	28

District Corridor	<400	400-750	750-1500	1500-2000	>2000
New / Reconstruction	32	36	36	36	40
Major Rehabilitation	*26	*28	*30	32	36
Structural Improvement	22	24	26	26	28
Minor Rehabilitation	22	24	26	26	28
PM	22	24	24	26	26

District Collector	<400	400-750	750-1500	1500-2000	>2000
New / Reconstruction	32	36	36	36	40
Major Rehabilitation	*26	*26	*28	30	30
Structural Improvement	22	22	24	26	26
Minor Rehabilitation	22	22	24	26	26
PM	22	22	24	26	26

- The intent of these guidelines is not to reduce the roadway width to the minimum guidelines, but rather to maintain the width as close as possible to the existing width. Roadway widths shown are the minimum recommended widths, actual allowable widths should be determined on a case by case basis.
- A design exception is only needed on a Preventive Maintenance Thin Lift Overlay (TLO) that does not meet the minimum roadway width requirement. All other Preventive Maintenance types of work do not require a design exception for minimum roadway width.
- District Corridor routes on the National Highway System (NHS) will be designed to State Corridor Guidelines
- Numbers in the shaded areas are ADT. Roadway widths are in feet.

* Minimum roadway widths for “Major Rehabilitation” strategies will be the same as “Minor Rehabilitation” strategies, unless widening is required. If widening is required to meet “Minor Rehabilitation” strategies minimum widths, widening will be sufficient to meet “Major Rehabilitation” strategies minimum widths.

Revised 10/24/2022

I-06.03.08 Minimum Interstate and Four Lane Divided Highway Bridge Widths

Interstate & Four Lane Divided Highway	All ADT
*New or Reconstructed	40'
*Rehabilitation	Approach Roadway Width
Preventive Maintenance	Existing Bridge Width

* This bridge width is for a two lane roadway. Bridge widths will be determined on an individual bases, where there are 3 lanes or more, ramps or auxiliary lanes impacting the bridge.

The bridge widths in the above table are dimensions measured from face-to-face of curb or face-to-face of rail whichever is less.

The minimum bridge width shall be as shown in the table or the approach roadway width (traveled lanes plus shoulders), whichever is greater.

Deck replacements and deck overlays are in the Rehabilitation category.

Any new or reconstructed two lane bridge over railroad tracks shall be a minimum of 40’ wide.

For Interstate System bridges longer than 200’, the traveled lanes plus 4’ on each side is an acceptable bridge width when considering new or reconstruction.

In assessing acceptable Interstate System bridge widths for rehabilitation of bridges or bridges to remain in place without rehabilitation within the limits of paving or re-grading projects: 1) bridges longer than 200’, that are as wide as the traveled lanes plus 3.5’ on each side are acceptable, 2) bridges shorter than 200’, that are as wide as the table less 4’ are acceptable; if there are no reported crash problems at that site.

For other four lane divided rural bridges longer than 200’, the traveled lanes plus 4’ on each side is an acceptable bridge width when considering new or reconstruction.

In assessing other four lane rural divided bridge widths for rehabilitation of bridges or bridges to remain in place without rehabilitation within the limits of paving or regarding projects: 1) bridges longer than 200’, that are as wide as the traveled lanes plus 2’ on each side are acceptable, 2) bridges shorter than 200’, that are as wide as the table less 4’ are acceptable; if there are no reported crash problems at that site.

Bridge Rail:

- For bridge New or Reconstruction category projects, the bridge rail shall be in compliance with MASH Test Level 4 performance criteria.
- For bridge Rehabilitation category projects, the existing bridge rail can remain in place if in minimum compliance with NCHRP Report 350 Test Level 3 performance criteria. If the existing bridge rail is not in minimum compliance with NCHRP Report 350 Test Level 3 performance criteria, the bridge rail will be upgraded to be in minimum compliance with MASH Test Level 3 performance criteria. However, if a portion of the bridge deck needs to be removed in order to upgrade the bridge rail to be in minimum compliance with MASH Test Level 3 performance criteria, the bridge rail will instead be required to be in minimum compliance with NCHRP Report 350 Test Level 3 performance criteria. Bridge Approach Repair, Bridge Rail Repair, Deck Overlay, Deck Replacement, etc. are all examples of bridge rehabilitation.
- For bridge Preventive Maintenance category projects, the existing bridge rail can remain. Slope Protection repair, joint repair, painting, scour repair, abutment repair, pier repair, damaged railing repair, etc. are all examples of bridge preventive maintenance.

I-06.03.09 Minimum State Route Bridge Widths

Interregional 2 Lane	< 400**	400-750**	750-1500**	1500-2000**	> 2000**
New or Reconstructed	32'	36'	36'	36'	40'
Rehabilitation	28'	30'	30'	32'	32'
Preventive Maintenance	Existing Bridge Width				

State Corridor	< 400*	400-750*	750-1500*	1500-2000**	> 2000**
New or Reconstructed	32'	36'	36'	36'	40'
Rehabilitation	28'	30'	30'	32’	32'
Preventive Maintenance	Existing Bridge Width				

District Corridor	< 400*	400-750*	750-1500*	1500-2000**	> 2000**
New or Reconstructed	32'	36'	36'	36'	40'
Rehabilitation	28'	30'	30'	32'	32'
Preventive Maintenance	Existing Bridge Width				

District Collector	< 400*	400-750*	750-1500*	1500-2000**	> 2000**
New or Reconstructed	32'	36'	36'	36'	40'
Rehabilitation	28'	30'	30'	32'	32'
Preventive Maintenance	Existing Bridge Width				

* Existing bridge widths can remain if there is no crash history.

** For rehabilitation strategies or for bridges to remain in place within paving or re-grading projects, bridge widths are acceptable if the following criteria are met and there is no crash history

1. The existing width is no more than 4’ less than shown in the table; and,
2. The existing width is no more than 6’ less than the approach roadway.

All bridge widths in the above table are dimensions measured from face-to-face of curb or face-to-face of rail whichever is less.
Deck replacements and deck overlays are in the Rehabilitation category.
Any new or reconstructed two lane bridge over railroad tracks shall be a minimum of 40’ wide.
For bridges longer than 200’, the traveled lanes plus 4’ on each side is an acceptable bridge width when considering new or reconstruction.

Bridge Rail:

- For bridge New or Reconstruction category projects, the bridge rail shall be in compliance with MASH Test Level 4 performance criteria.
- For bridge Rehabilitation category projects, the existing bridge rail can remain in place if in minimum compliance with NCHRP Report 350 Test Level 3 performance criteria. If the existing bridge rail is not in minimum compliance with NCHRP Report 350 Test Level 3 performance criteria, the bridge rail will be upgraded to be in minimum compliance with MASH Test Level 3 performance criteria. However, if a portion of the bridge deck needs to be removed in order to upgrade the bridge rail to be in minimum compliance with MASH Test Level 3 performance criteria, the bridge rail will instead be required to be in minimum compliance with NCHRP Report 350 Test Level 3 performance criteria. Bridge Approach Repair, Bridge Rail Repair, Deck Overlay, Deck Replacement, etc. are all examples of bridge rehabilitation.
- For bridge Preventive Maintenance category projects, the existing bridge rail can remain. Slope Protection repair, joint repair, painting, scour repair, abutment repair, pier repair, damaged railing repair, etc. are all examples of bridge preventive maintenance.

OTHER ROUTES

For county route traffic bridges that are State owned bridges that do not carry state route traffic, widths will be addressed on an individual basis.

For State owned bridges on county roads. i.e. county roads over the Interstate:

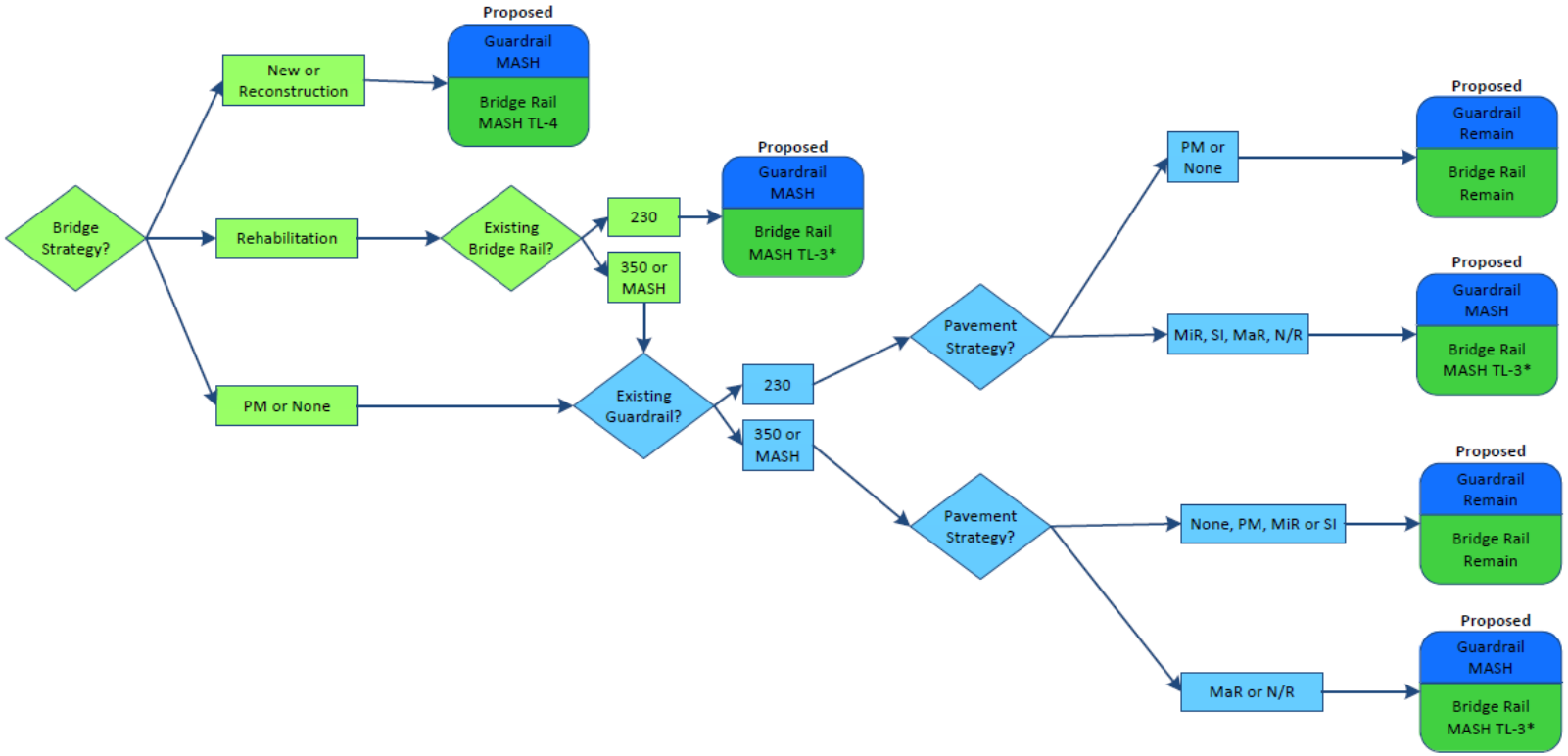
<= 750 ADT, existing width adequate, if no crash history

> 750 ADT, existing width adequate if no more than 6’ less than the width of the approach roadway, if no crash history.

For Preventive Maintenance projects existing bridge widths can remain.

Slope Protection repair, joint repair, painting, scour repair, abutment repair, pier repair, damaged railing repair, etc. are all examples of bridge preventive maintenance. For these types of preventive maintenance projects, the existing railing system can remain.

Applying the NDDOT Design Guidelines to Rail Systems
Section I-06 of the NDDOT Design Manual

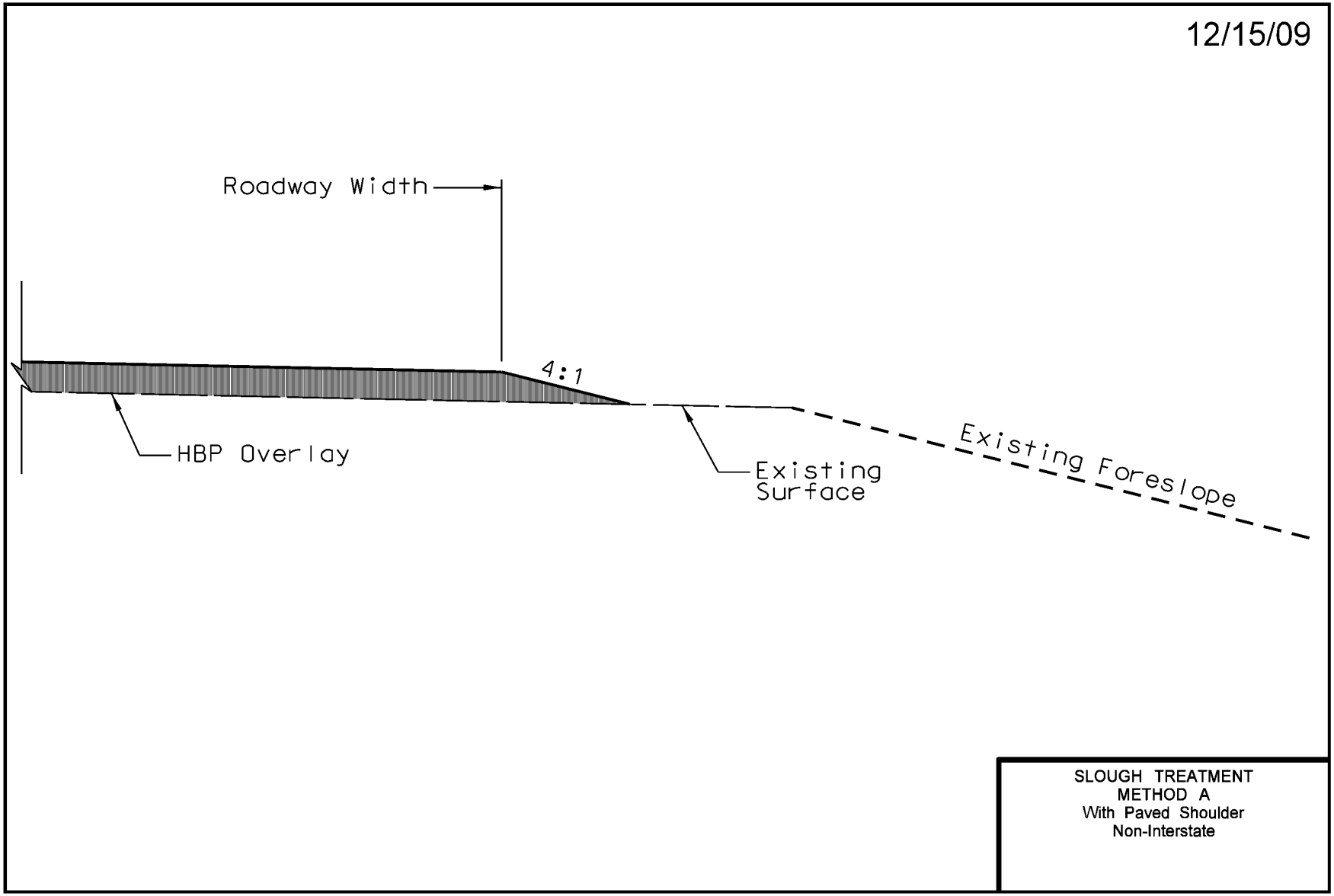


*Note 1: If bridge rail retrofit to MASH TL-3 is not available, update to NCHRP Report 350 TL-3
*Note 2: If Jersey Barrier is in place, the Jersey barrier may remain in place since it meets MASH TL-3

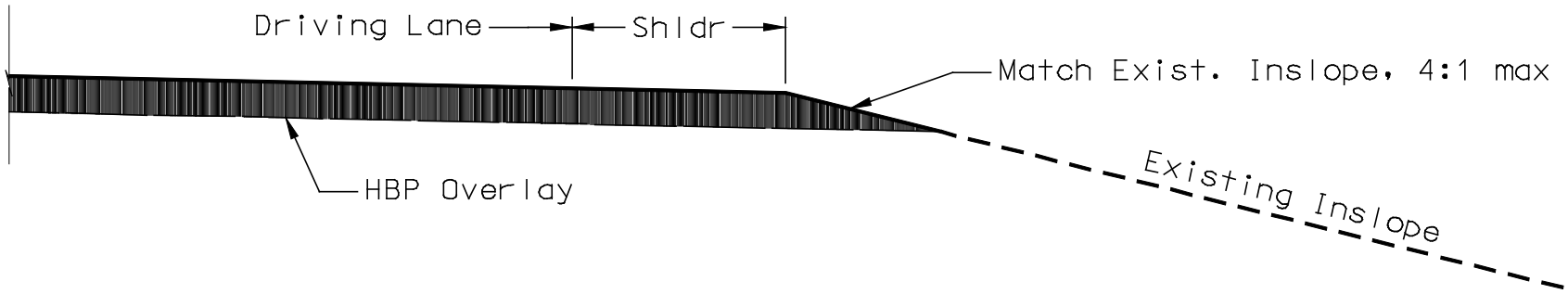
Acronyms:
230 = NCHRP Report 230
350 = NCHRP Report 350
PM = Preventive Maintenance
MiR = Minor Rehab
SI = Structural Improvement
MaR = Major Rehab
N/R = New/Reconstruction

May 10, 2017

I-06.03.10 Department Shoulder/Slough Guidelines



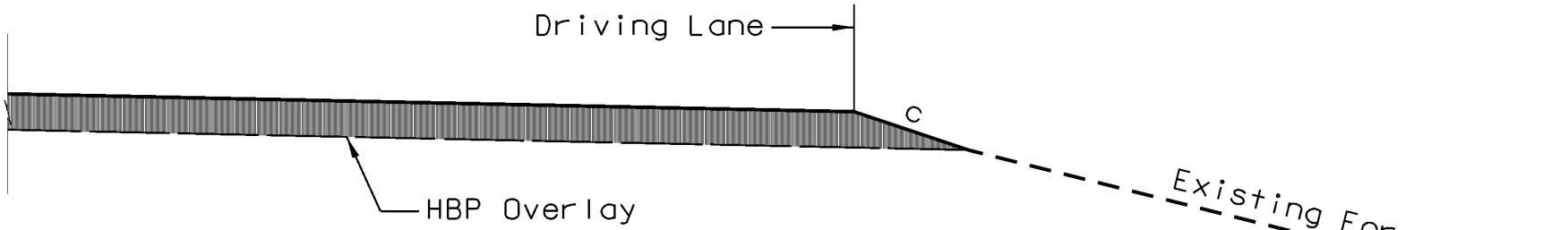
3/9/07



* This is the only Slough Treatment that will be applied to Interstate Overlays

SLOUGH TREATMENT
METHOD B
With Paved Shoulder
Match Existing Inslope, 4:1 max
Non-Interstate & Interstate*

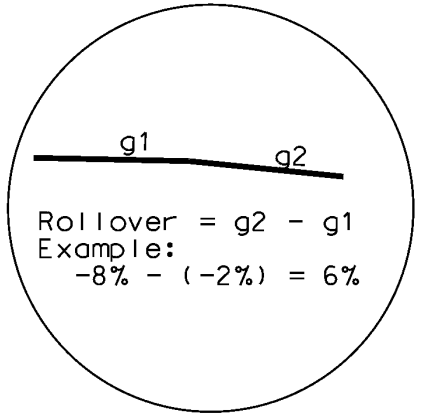
12/15/09



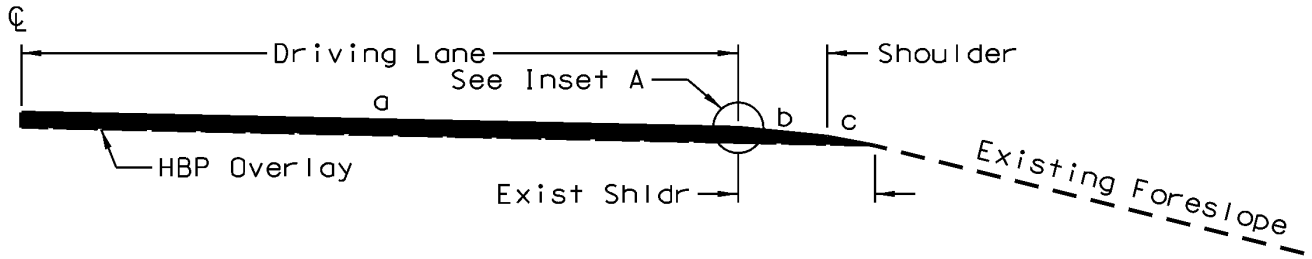
Existing Foreslope	Slough (c)
4:1 or flatter	4:1 max
< 4:1 to 3:1	match existing

SLOUGH TREATMENT
METHOD C
No Paved Shoulder
Non-Interstate

12/15/09



Inset A



1. a = Driving lane cross-slope

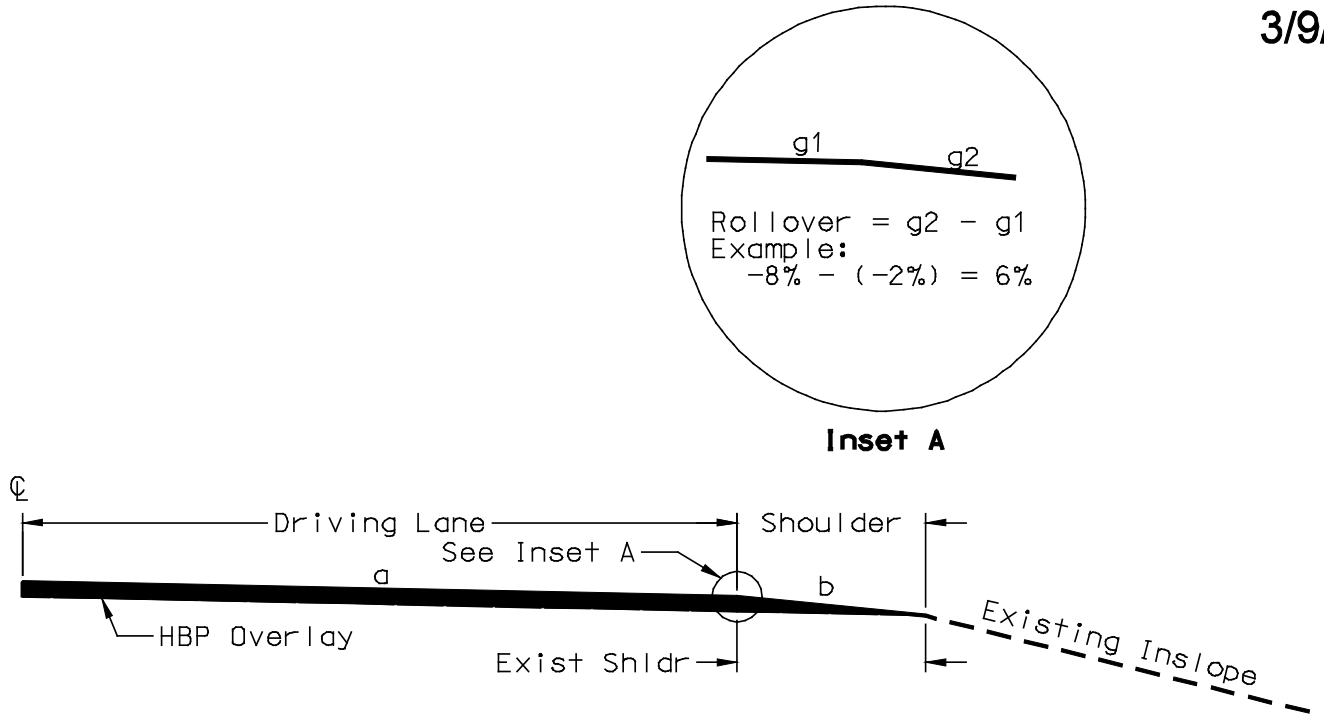
2. b = PM, Mir, SI: Non-Interstate: 8% max, with 6% max rollover
   Mar: 6% max, with 5% max rollover
   Interstate: 6% max, with 5% max rollover

3. If final shoulder < 2',
   then use driving lane cross-slope

Existing Foreslope	c = Non-Interstate	c = Interstate
4:1 or flatter	4:1 max	4:1 max
< 4:1 to 3:1	match existing	N/A

SHOULDER TREATMENT
METHOD 1
PM, MiR, SI, MaR
Non-Interstate & Interstate

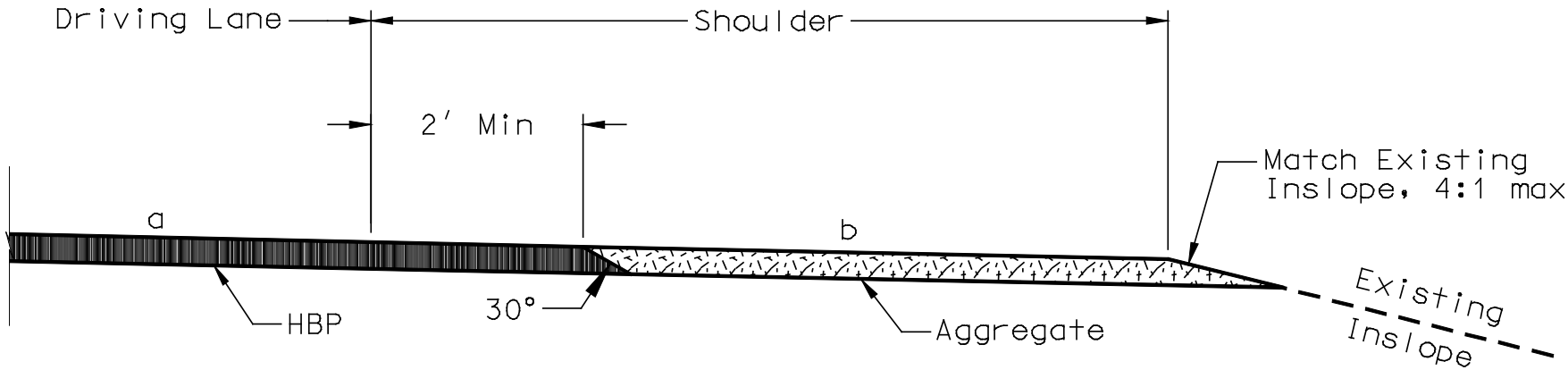
3/9/07



1. a = Driving lane cross-slope
2. b = Non-Interstate: 8% max, with 6% max rollover
   Interstate: 6% max, with 5% max rollover

SHOULDER TREATMENT
METHOD 2a
PM, MiR, SI
Non-Interstate & Interstate

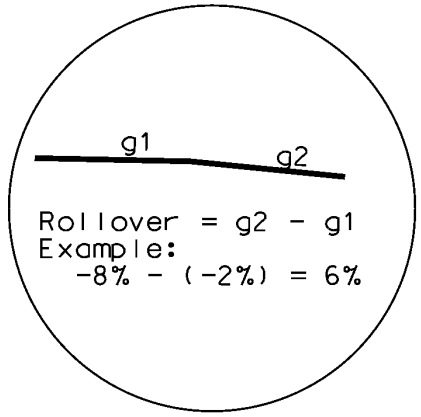
3/9/07



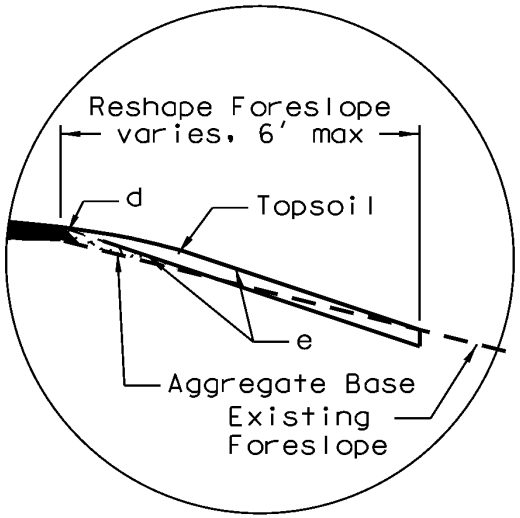
1. a = Driving lane cross-slope
2. b = PM, Mir, SI: Non-Interstate: 8% max, with 6% max rollover
   Mar: 6% max, with 5% max rollover

SHOULDER TREATMENT
METHOD 2b
SI, MaR
Aggregate Shoulders
Non-Interstate

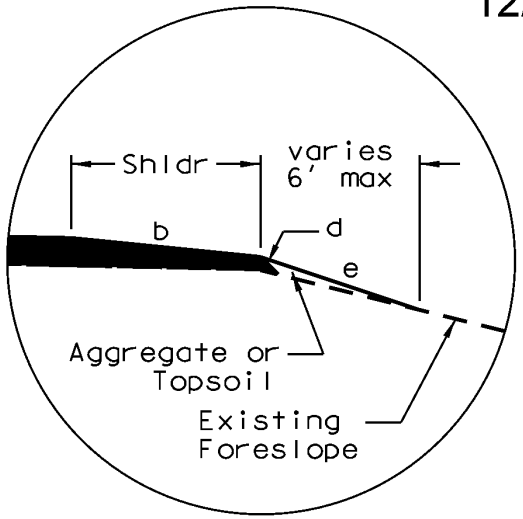
12/15/09



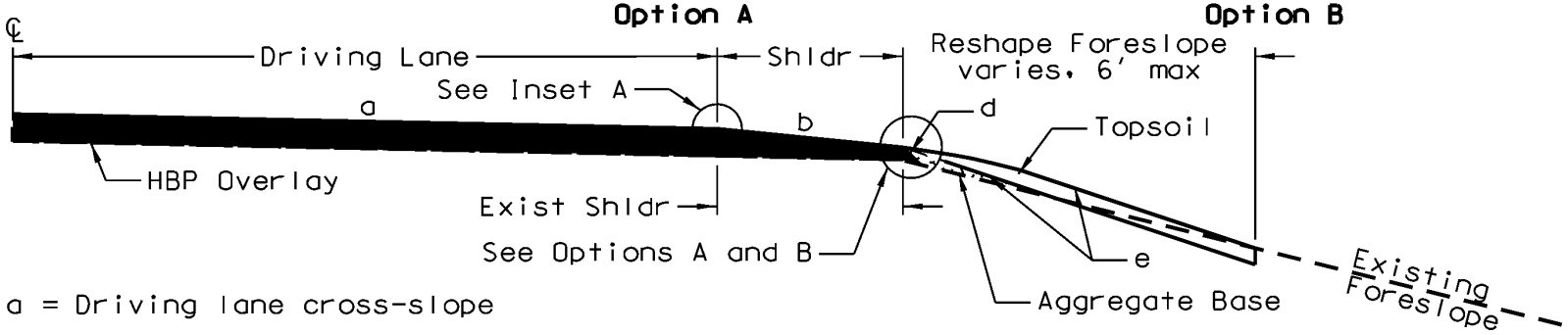
Inset A



Option A



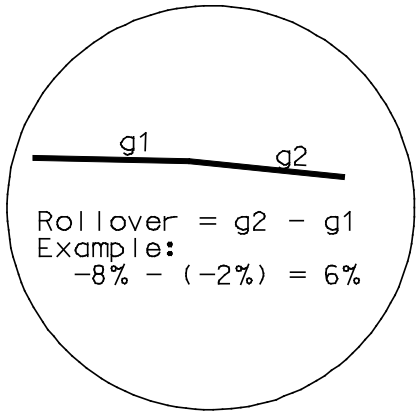
Option B



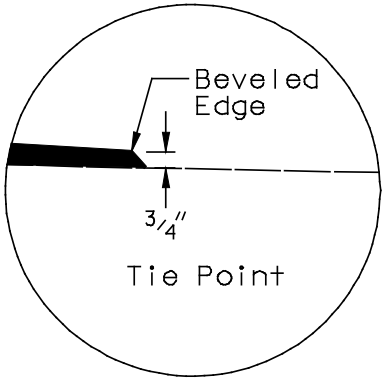
1. a = Driving lane cross-slope
2. b = Non-Interstate: 8% max, with 6% max rollover
   Interstate: 6% max, with 5% max rollover
3. If final shoulder < 2',
   then use driving lane cross-slope
4. d = 30°
5. e = Non-Interstate: 4:1 max
   Interstate: 4:1 max

SHOULDER TREATMENT
METHOD 3
PM, MiR, SI
Non-Interstate & Interstate
Original Overlay
Existing shoulder is flush

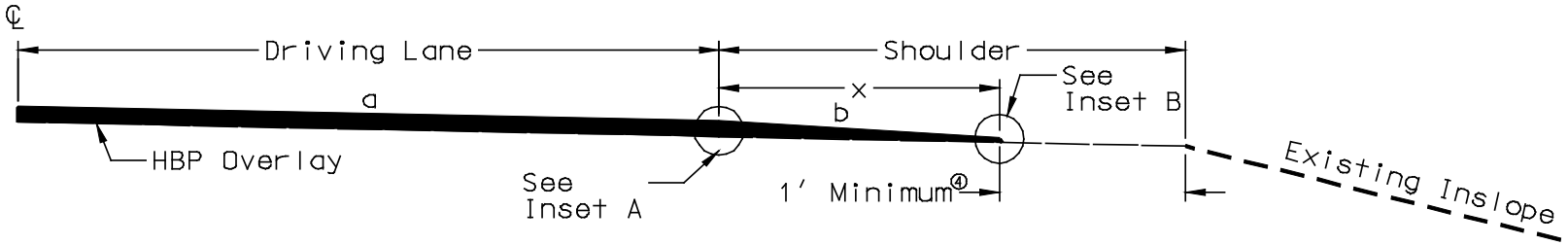
3/9/07



Inset A



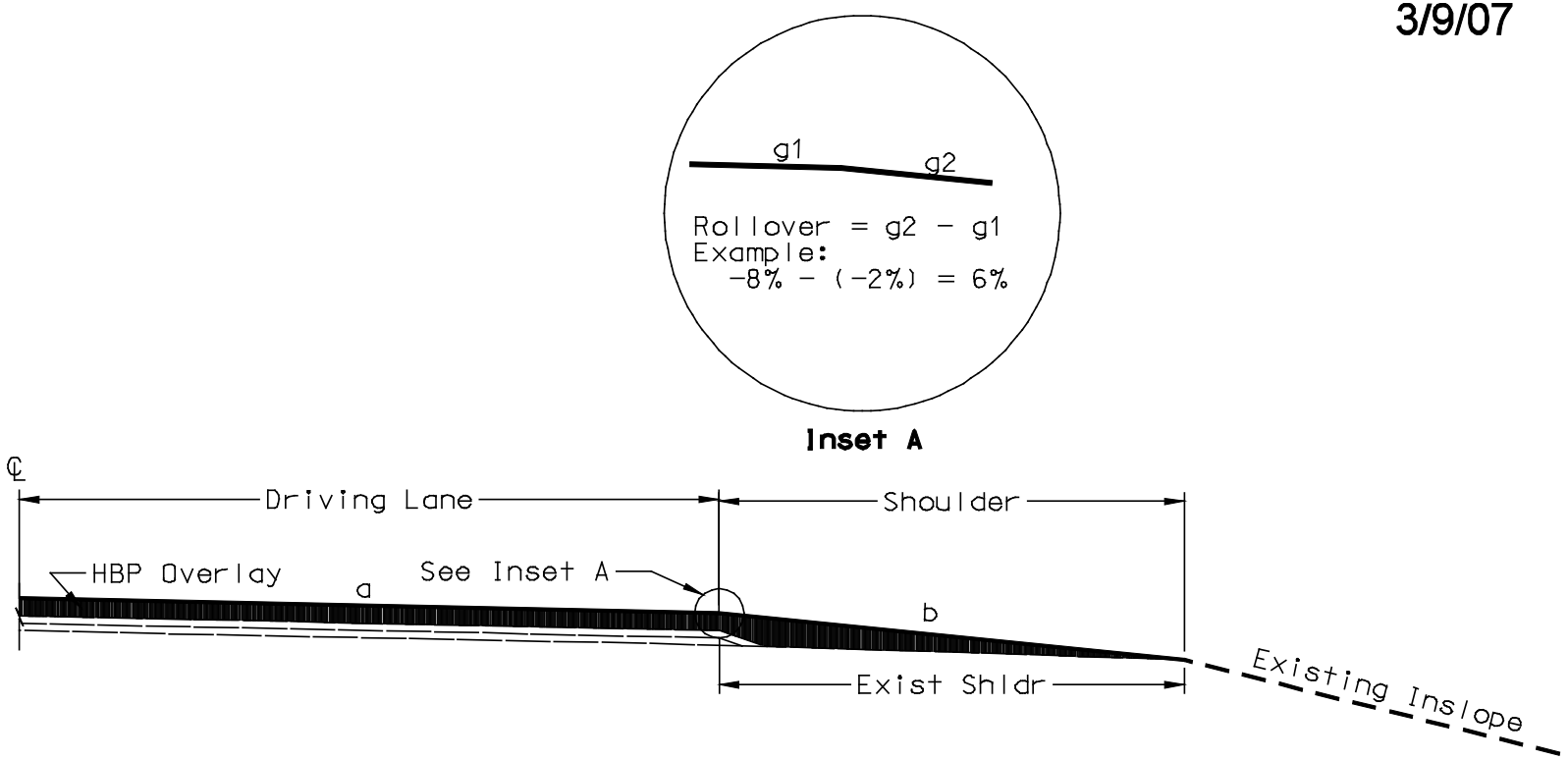
Inset B



1. a = Driving lane cross-slope
2. b = Proposed shoulder cross-slope
3. $x = x(ft) = \frac{\text{overlay thickness (ft)} - (3/4'' \times 1'/12'')}{\text{"b" ('/') - slope of existing shoulder ('/')}}$
4. If the distance from the edge of the overlay to the pavement is less than 1' then consider a different Shoulder Treatment.

SHOULDER TREATMENT
METHOD 4
PM, MiR
Non-Interstate & Interstate

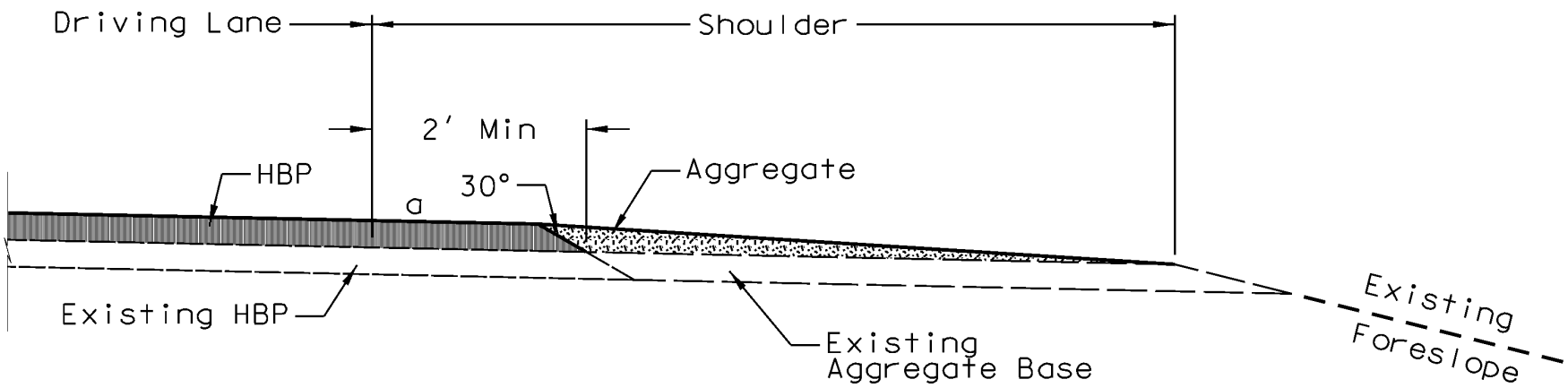
3/9/07



1. a = Driving lane cross-slope
2. b = PM, MiR, SI: 8% max, with 6% max rollover
   MaR: 6% max. with 5% max rollover

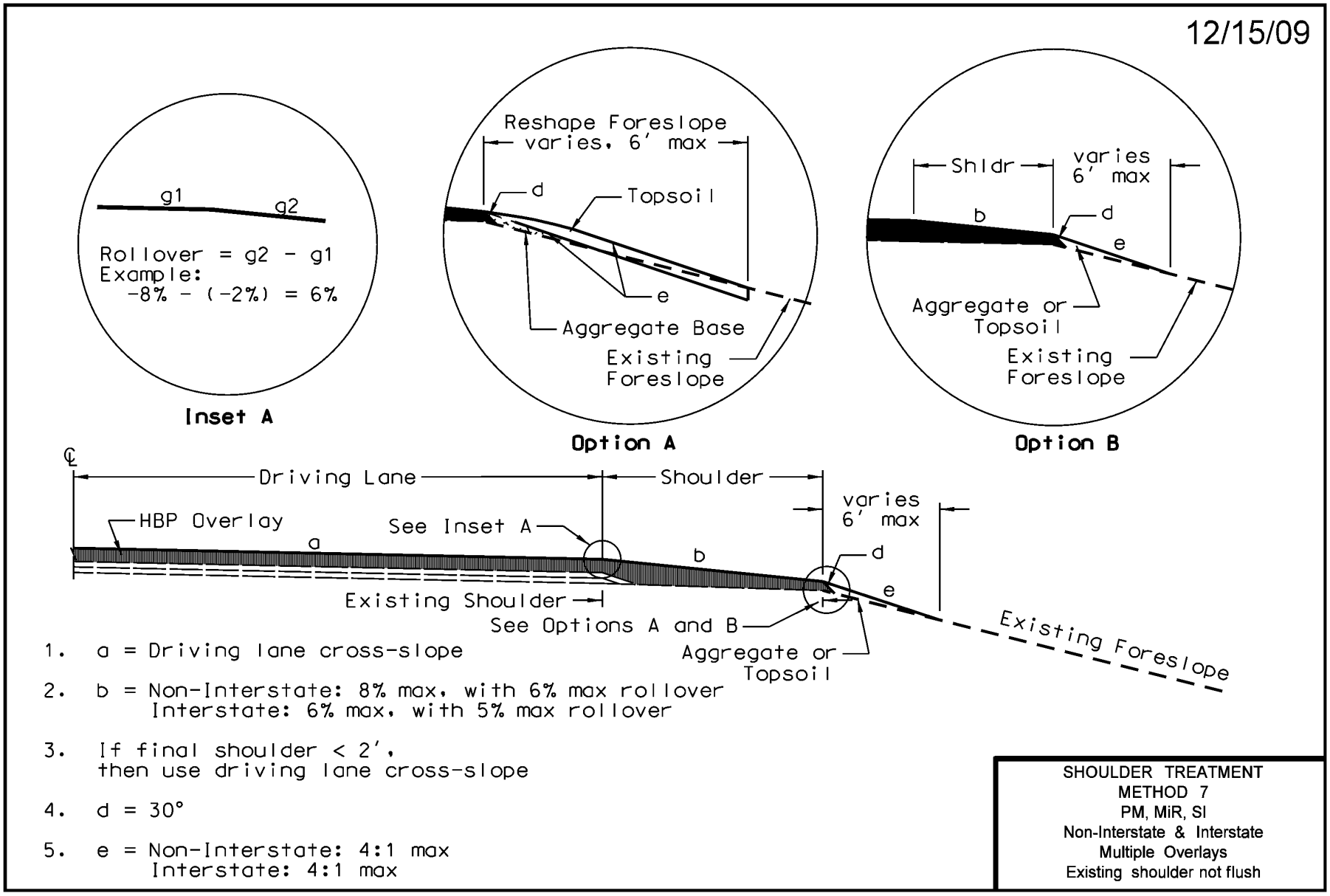
SHOULDER TREATMENT
METHOD 6a
PM, MiR, SI, MaR
Non-Interstate

12/15/09

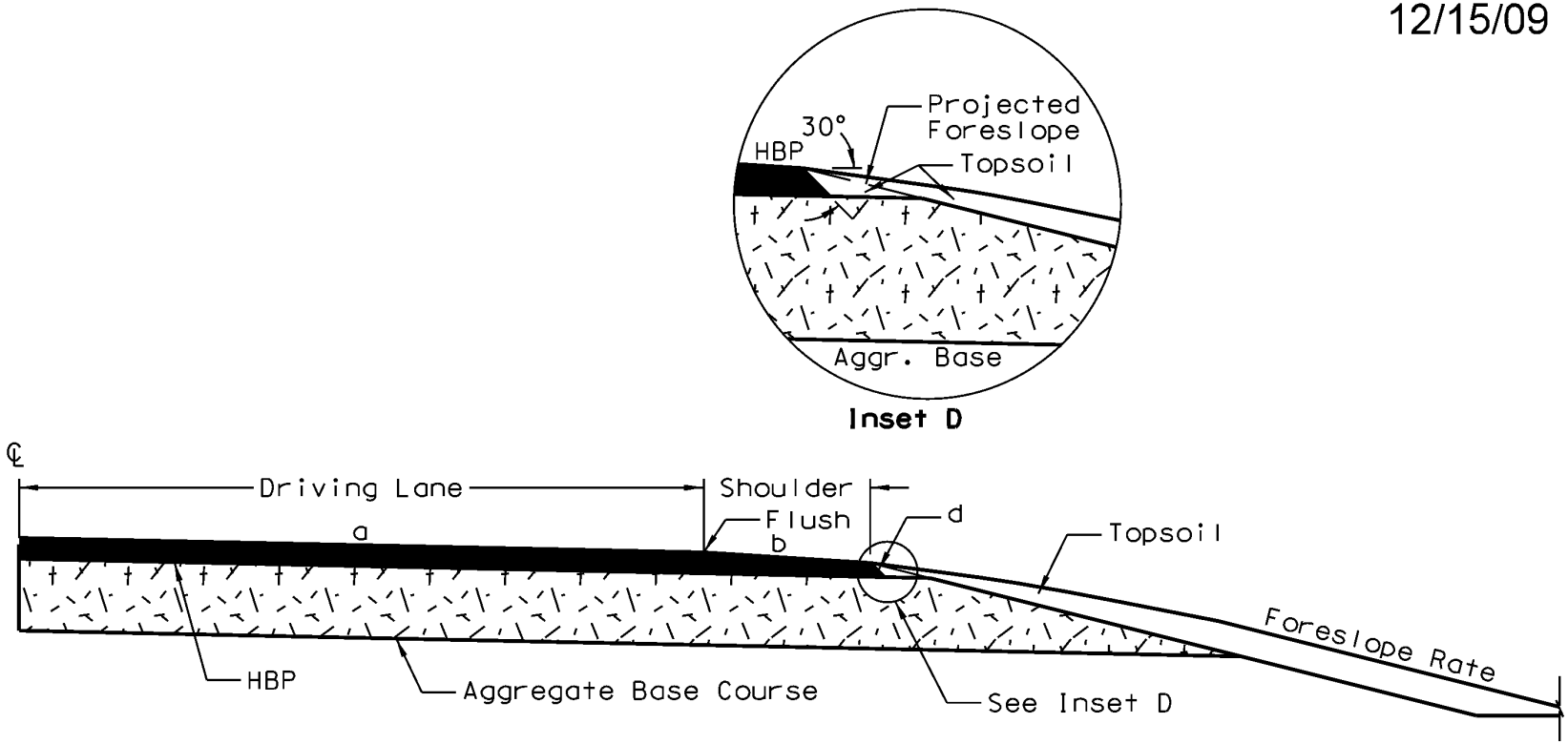


1. a = Driving lane cross-slope

SHOULDER TREATMENT
METHOD 6b
PM, MiR, SI, MaR
Aggregate Shoulders
Non-Interstate


12/15/09
g1
g2
Rollover = g2 - g1
Example:
-8% - (-2%) = 6%
Inset A
Reshape Foreslope
varies, 6' max
d
Topsoil
e
Aggregate Base
Existing
Foreslope
Option A
Shldr
varies
6' max
b
d
e
Aggregate or
Topsoil
Existing
Foreslope
Option B
℄
Driving Lane
Shoulder
HBP Overlay
See Inset A
a
b
varies
6' max
d
e
Existing Shoulder
See Options A and B
Aggregate or
Topsoil
Existing Foreslope
1. a = Driving lane cross-slope
2. b = Non-Interstate: 8% max, with 6% max rollover
Interstate: 6% max, with 5% max rollover
3. If final shoulder < 2',
then use driving lane cross-slope
4. d = 30°
5. e = Non-Interstate: 4:1 max
Interstate: 4:1 max
SHOULDER TREATMENT
METHOD 7
PM, MiR, SI
Non-Interstate & Interstate
Multiple Overlays
Existing shoulder not flush

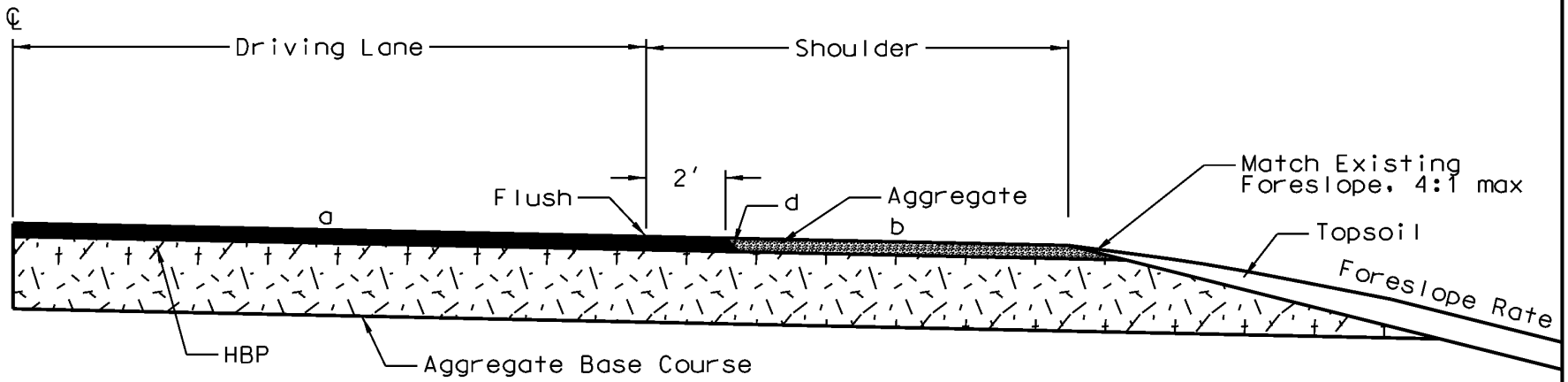
12/15/09



1. a = 1.5% to 2.5% Driving lane cross-slope
2. b = Recommend 3%, 6% max, with 5% max rollover
3. d = 30°

SHOULDER TREATMENT
METHOD 8a
NR
Non-Interstate

12/15/09



1. a = 1.5% to 2.5% Driving lane cross-slope
2. b = 4%-6%
3. d = 30°

SHOULDER TREATMENT
METHOD 8b
NR
Non-Interstate
Aggregate Shoulders