



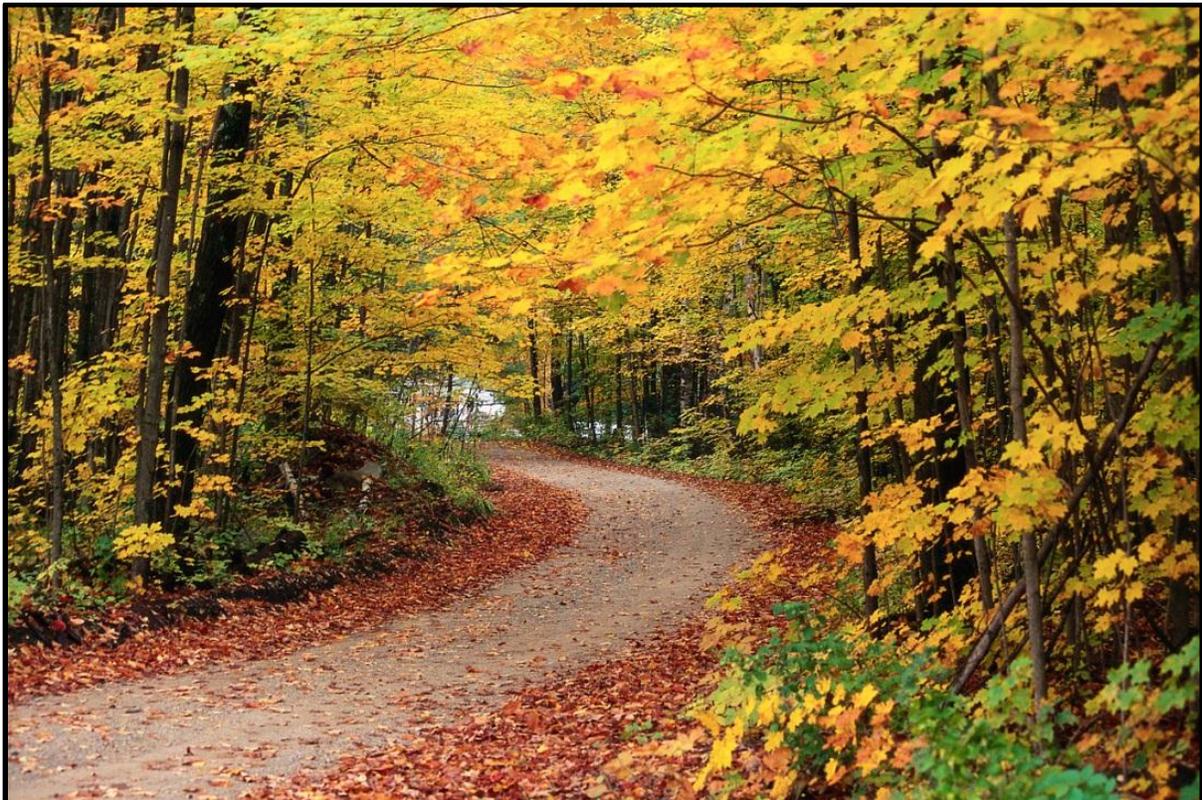
North Carolina Department of Transportation
Value Management Unit
Value Engineering Program



Bicycle & Pedestrian Greenway Design Guidelines Value Engineering Report

Date of Value Engineering Study: September 16, 2013

Date of Value Engineering Report: October 14, 2013





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EXECUTIVE SUMMARY

NCDOT Value Management, at the request of NCDOT's Bicycle and Pedestrian Division, held a Value Engineering Study to discuss design guidelines for paved, multi-use, off-road facilities (greenways). The meeting was held on September 16, 2013 in the Structures Management Conference Room C at the Century Center. The purpose of the meeting was to use FHWA's Value Engineering process to discuss greenway design issues and solutions in order to further develop NCDOT greenway design guidelines. This VE Study was the first of its kind for the NCDOT since the Value Engineering Process was used to examine a process instead of a project. At the conclusion of the study, 18 ideas were identified and 16 ideas were submitted as formal recommendations. Detailed documentation of the 16 recommendations is included in the Recommendations section of this report.

BACKGROUND

There have been efforts by the NCDOT to improve certain aspects of greenway projects in the past. However, the initiative to develop a comprehensive set of design guidelines specifically for greenway facilities originated when a legislative bill (House Bill 748) was drafted in the North Carolina House of Representatives. This bill would require the NCDOT to investigate and develop standards appropriate for greenways, bikeways, and other linear transportation projects not intended to accommodate mechanized vehicles by December 31, 2013. Beginning in January 2014, the Department would be required to use these standards in exercising any project approval and oversight required by the Surface Transportation Program of the Federal Highway Administration for greenways, bikeways, and other linear transportation projects not intended to accommodate mechanize vehicles (other than lightweight maintenance vehicles) and that are built by a metropolitan planning organization member jurisdiction using direct attributable funds. While this bill was not passed prior to the end of the 2013 legislative session, the Department continued to investigating the issue in an effort to be proactive.

The investigation began in the spring of 2013 with an outreach initiative by NCDOT's Technical Services Division. This outreach aimed to ensure that the revisions made to the greenway design policy addressed the issues that are being experienced by those who are designing, constructing and maintaining these facilities. It would also allow NCDOT to fully understand the issues, underlying causes, challenges and consequences, and a see a range of possible solutions to these issues. The first step of this outreach was a survey which was distributed in May 2013. The survey was distributed to 151 individuals representing various backgrounds, roles, and organizations. Of the 50 individuals that completed the survey, the most frequently listed problems related to design criteria. Specifically, the problematic design criteria included (1) pavement standards and related compaction standards, (2) geometric design criteria, (3) bridge design and loading requirements, (4) materials requirements, and (5) scour. A common perception amongst all participants was that greenways are subject to the standards and specification of roadways and are therefore being "over-designed".

The next phase of the outreach initiative was to organize a focus group to expand upon the responses of the survey and to discuss the issues with interested stakeholders. This meeting was on August 13, 2013 and had a team that included design engineers, construction inspection engineers, municipal representatives, metropolitan planning organizations, and state agencies from all over NC. During the focus group, individuals were able to express specific concerns and problems they had faced while using the current greenway design procedures. They were also given an opportunity to present solutions to these problems for the Department to consider.



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Prior to the distribution of the survey, several other units had begun independent investigations of possible design changes that could be allowed for greenway facilities. The Pavement Management, Materials and Tests, and Construction Units had begun researching and testing various pavement structures and compaction levels that would be considered acceptable for greenways. By the time of the Value Engineering Study, the group had tentatively agreed upon providing three pavement structure options for Local Government Agencies (LGA’s) to use when designing greenways. They had also agreed upon the percent of compaction that would be required for the surface and subgrade of greenways. The Structures Management Unit also began compiling information on pedestrian bridge designs and the current loading requirements.

PROJECT SELECTION

Soon after the conclusion of the focus group meeting, it became apparent that further discussion was needed in order to develop a complete set of greenway design guidelines. Several NCDOT units had begun working independently on solutions and had not been made aware of the outreach initiative that had just concluded. A connection needed to be made between the valuable input the Department had received and the work which was underway. Value Management was asked to hold a VE Study in order to make that connection. This meeting would use FHWA’s Value Engineering process to present all of the available information to all necessary parties, generate creative ideas as a group, evaluate those ideas to create a group consensus on the path forward, and outline the responsible parties for developing each recommendation.

VALUE ENGINEERING STUDY

The Value Engineering Study consisted of a diverse Value Engineering Team with a wide variety of backgrounds to make sure all ideas and vantage points were represented during the discussion. The VE Team included representation from municipalities as well as NCDOT Engineers and Planners from various disciplines, backgrounds, and regions. Below is a list of the VE Team.

<u>NAME</u>	<u>COMPANY</u>	<u>NAME</u>	<u>COMPANY</u>
Jessica Kuse, PE	Value Management	Julie Hunkins, PE	Technical Services
Leigh Wing, PE	Value Management	Reuben Moore, PE	Division 14
Ben Johnson	Value Management	Patrick Riddle	Division 3
Ricky Greene, PE	Chief Engineer’s Office	Michelle Long, PE	Construction
Glenn Mumford, PE	Roadway Design	Clark Morrison, PE	Pavement Management
Jack Cowsert, PE	Materials & Tests	John Pilipchuk, PE	Geotechnical
Chris Peoples, PE	Materials & Tests	Scott Hidden, PE	Geotechnical
Andrew Nottingham, PE	Hydraulics	Brian Hanks, PE	Structures Management
Kumar Trivedi, PE	Bicycle & Pedestrian	Gwen Cook	Mecklenburg County
Lauren Blackburn	Bicycle & Pedestrian	Vic Lebsock	City of Raleigh

The Value Engineering Study was separated into five topics of discussion, which were identified from the responses to the survey and the focus group. These topics were pavement design and compaction, bridge loading requirements, geometric design, materials, and scour. To start the meeting, each member of the VE Study Team had the opportunity to share with the group information and work they had completed outside of the VE Study as they related to the above topics. This allowed the Value Management Team to clearly define what information was available and what work had already been accomplished. By dedicating this time to information sharing, the discussion during the Creative Phase was strictly used for generating ideas and creating a consensus on how to move forward. Once ideas were generated in the Creative Phase, the group



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began evaluating each idea and decided as a group whether it was an idea that they would like to carry forward.

RECOMMENDATIONS

At the conclusion of the VE Study, the VE Study Team proposed sixteen (16) recommendations to carry forward. These recommendations, along with their advantages and disadvantages, are summarized below:

- 1) Consider allowing slag or single-size expanded shale for base course. This material should allow tree roots to grow through without buckling the pavement.

ADV: This has the potential to reduce long-term maintenance costs and increase safety for the users by eliminating tripping hazards. The material is porous so it allows air to flow through and the internal friction of the material also provides a high degree of stabilization.

DIS: This material is expensive and there is only one available source in North Carolina. It has unknown limited uses. The material could allow silt infiltration if the base isn't wrapped properly. The unit weight of the material is close to the unit weight of water which could create problems during flood events.

- 2) Provide testing standards for greenways that are different than roadway testing standards.

NOTE: NCDOT's Materials and Tests Unit is in the process of modifying the minimum sampling guide (MSG) for commonly used materials on greenways.

ADV: This will save time by eliminating a lot of testing that has to be done on-site. Inspectors will have less responsibility. As a result, construction will become easier, faster, and potentially cheaper.

DIS: There is a potential cost increase associated with hiring a PEF to certify all of the materials. There can also be maintenance concerns if sub-par materials are used.

- 3) Provide pavement options with a pros / cons list so that all LGA's understand the benefits and limitations associated with each pavement structure. This list would only be provided with the NCDOT minimum pavement options. LGA's could choose to exceed the minimum based on local experience.

NOTE: Pavement Management agreed to add a paragraph to their memorandum to address this.

ADV: This will educate the LGA's and allow them to make an informed decision.

DIS: This list could get long if it was expanded to include all preferences from multiple LGA's.



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- 4) Consider controlled access (i.e. collapsible bollards) for bridges wider than 10' designed with a H5 truck loading.

ADV: This would allow municipalities to design an H5 load tested bridge with a deck wider than 10'.

DIS: There is the potential for purposeful or inadvertent loading of H10 vehicles which would be overweight for the design if access is not blocked by a more permanent method.

- 5) Consider allowing alternate foundations for boardwalks (i.e. Helical Piers).

ADV: This would increase the longevity of the structure as well as potentially reduce life cycle cost and construction cost. This is an environmentally friendly recommendation and it could make construction of the boardwalk easier. Helical Piers may also address uplift concerns during top down construction.

DIS: The connection design details are unproven and design standards are not yet established. There are possible issues with corrosion and the use of a proprietary product.

- 6) Provide seeding options in environmentally sensitive areas.

ADV: Takes the environment into account and potentially allows for the use of native species.

DIS: Most likely increases cost, may not control erosion as well, and could be more difficult to establish and maintain.

- 7) Include information about the Buy America Act and the exemptions that are covered. Provide the information as a link so any changes will be automatically reflected.

ADV: Education for the LGA's.

DIS: None discussed.

- 8) Provide a menu of options for concrete strengths. Include information on what to do if LGA's use a different mix design than a standard NCDOT mix. Provide a link to the NCDOT approved producer / supplier list on NCDOT's website.

ADV: Education for the LGA's.

DIS: None discussed.



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- 9) Consider allowing the use of the current North Carolina Building Code which doesn't require hand rails in instances where the distance from the top of the deck to the bottom of the creek is less than or equal to 30".

ADV: This will minimize hand rail construction cost and maintenance cost. It also is more aesthetically pleasing for users.

DIS: This could create a potential safety and liability issue. The lack of rails might allow for potential mis-use (ex: skateboarders or bikers jumping from the deck).

- 10) Consider tailoring ADA requirements towards "ADA for Recreational Trails" and not "ADA Access Route" standard requirements (i.e. less stringent grade requirements).

ADV: This will make it easier to meet existing site conditions without extensive grading in environmentally sensitive areas. It also helps keep the character of the site.

DIS: This could potentially limit access for some individuals.

- 11) Consider allowing a tighter design radius than the standard minimum of 90'.

ADV: This is a context sensitive solution that allows the design to be topographically and environmentally sensitive. Tighter radii could be used as a traffic calming measure. This will provide designers more flexibility in dealing with limited right of way, easement areas, riparian buffers, and flood regulations.

DIS: This could impact transportation options by forcing cyclists to reduce speeds. This could also create sight distance issues and other safety concerns.

- 12) Clearly communicate that if a greenway crosses a FEMA jurisdictional flood channel, Federal Regulations mandate that it must have a flood study.

ADV: This will educate the LGA's and allow them to make an informed decision.

DIS: None discussed.

- 13) Design foundations for historical scour instead of the 500 year scour. Use sub-regional tier bridge design guidelines. Do a risk assessment on evaluating scour.

ADV: This will reduce cost and will be a more practical solution. It will also allow for more substructure types.

DIS: There is a potential for increased risk.

- 14) Develop warrants that would allow for development of signalization for bicycle and pedestrian crossings.

ADV: Increased safety.

DIS: None discussed.



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15) Provide a link to the Structures Policy for pedestrian bridges.

ADV: Education for the LGA's for loading requirements and design criteria.

DIS: None discussed.

16) Consider utilization of hydraulic tunnels or box culverts for pedestrian use.

ADV: Already in place.

DIS: May increase upstream flooding.



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APPENDIX



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VALUE ENGINEERING PROCESS

After project selection, each multi-disciplined Value Engineering Study Team is led by a facilitator through a systematic process which allows team members to learn about a project, discuss the project, determine alternatives, discern which alternatives are best and present recommendations to management for review and possible incorporation into the project. All the project specific details of this process are found in the appendix of this report. Below is an explanation of each of the six remaining steps in the value engineering process:

INFORMATION PHASE

During the Information Phase, team members review the information about the project. In addition, the project manager joins the team to provide project information, challenges, and answer any project related questions.

FUNCTION ANALYSIS PHASE

As information is provided, the team begins to have a better understanding of the project. Discussion is then guided to allow the team to determine what project items are worth the function provided and which elements should be reviewed for potential cost savings.

CREATIVE PHASE

Once the team determines which elements should be further analyzed for improved value, the team looks at each element to generate other alternatives which could affect the cost, delivery time, quality and operations. At this point in the process, all alternatives are considered possible solutions.

EVALUATION PHASE

During the evaluation phase, each element and the list of alternatives are discussed to determine which alternatives would be viable solutions. The advantages and disadvantages of each alternative will help the team determine if the element is viable and which solution would best enhance the element. It is common when evaluating elements and alternatives, some development is needed to determine if they are viable.

DEVELOPMENT PHASE

Once the most viable solutions are determined, team members develop these solutions into graphics, drawings and other details to have these details in a format to present to management. During this phase, the cost savings are also determined.

PRESENTATION PHASE

Each recommendation is documented on a recommendation form that is given to management to review. A presentation of the information may also be given to ensure proper understanding of the recommendation.



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Memorandum

Subject: **ACTION:** Clarification of
Manufactured Products under Buy
America

Date: **DEC 21 2012**

From: Mr. John R. Baxter 
Associate Administrator for
Infrastructure

In Reply Refer To:
HIPA-30

To: Division Administrators
Directors of Field Services

This memo clarifies the Federal Highway Administration's (FHWA) position regarding application of Buy America requirements to manufactured products. Our current Buy America policy is based upon the statutory provisions in the Surface Transportation Assistance Act of 1982, as implemented with a November 25, 1983, final rule.

In the preamble to the [1983 final rule](#) (48 FR 53099), after soliciting and considering public comments, the FHWA found that it was in the public interest to waive application of Buy America to manufactured products other than steel and iron manufactured products. As the Federal-aid Highway Program evolved and technology improved, the FHWA clarified the applicability of the standing waiver for manufactured products in a [December 12, 1997, memo](#). In this 1997 memo, the FHWA clarified that, while Buy America does not apply to manufactured products, Buy America does apply to components of "predominately steel products."

With enactment of the American Recovery and Reinvestment Act (ARRA), the FHWA formed National Review Teams (NRT) (now known as Project Management Improvement Teams) to conduct reviews and make recommendations on how to improve the delivery of ARRA funded projects. One NRT review recommended that a State's Buy America certification be clarified to ensure that all covered steel and iron meets FHWA Buy America requirements. In working to address this finding, questions have arisen regarding the scope of the application of the 1983 public interest waiver for manufactured products. For example, it has been suggested that nuts, bolts, washers, and other miscellaneous steel or iron parts used in common off-the-shelf products such as toilets and the filaments in light bulbs must be Buy America compliant. Given these questions, the FHWA is concerned that such a reading of Buy America is inconsistent with the previous 1983 waiver decision and is not cost-effective to administer. Accordingly, it has become necessary to clarify the applicability of the waiver for manufactured products.



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The FHWA continues to support the Buy America waiver for manufactured products in the 1983 final rule, as clarified by the 1997 memo. In particular, the waiver was intended to apply to all manufactured products except for steel and iron manufactured products. For example, the 1983 rule specified that traffic controllers are covered by the waiver since these products have many different components that are difficult to trace. Over time, however, some States have subjected signal heads and other traffic control equipment to Buy America and have sought project specific waivers. In reexamining the extent of the 1983 waiver in light of the NRT finding, we believe that the scope of the waiver was intended to encompass miscellaneous steel or iron components and subcomponents that are commonly available as off-the-shelf products such as faucets, door hardware, and light bulbs.

Thus, in order for a manufactured product to be considered subject to Buy America, the product must be manufactured predominantly of steel or iron. The FHWA deems a product to be manufactured predominantly of steel or iron if the product consists of at least 90% steel or iron content when it is delivered to the job site for installation. For purposes of applying Buy America and determining whether a product is a steel or iron manufactured product, the job site includes the sites where any precast concrete products are manufactured.

Examples of products that are subject to Buy America coverage include, but are not limited to, the following:

- steel or iron products used in pavements, bridges, tunnels or other structures, which include, but are not limited to, the following: fabricated structural steel, reinforcing steel, piling, high strength bolts, anchor bolts, dowel bars, permanently incorporated sheet piling, bridge bearings, cable wire/strand, prestressing / post-tensioning wire, motor/machinery brakes and other equipment for moveable structures;
- guardrail, guardrail posts, end sections, terminals, cable guardrail;
- steel fencing material, fence posts;
- steel or iron pipe, conduit, grates, manhole covers, risers;
- mast arms, poles, standards, trusses, or supporting structural members for signs, luminaires, or traffic control systems; and
- steel or iron components of precast concrete products, such as reinforcing steel, wire mesh and pre-stressing or post-tensioning strands or cables.

The miscellaneous steel or iron components, subcomponents and hardware necessary to encase, assemble and construct the above components (or manufactured products that are not predominantly steel or iron) are not subject to Buy America coverage. Examples include, but are not limited to, cabinets, covers, shelves, clamps, fittings, sleeves, washers, bolts, nuts, screws, tie wire, spacers, chairs, lifting hooks, faucets, door hinges, etc.

If you have any questions, please contact either Mr. Gerald Yakowenko at 202-366-1562 or Mr. Edwin Okonkwo at 202-366-1558.



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Memorandum

U.S. Department of Transportation
**Federal Highway
Administration**

Subject: ACTION: Revised Policy for the Approval of
Buy America Waivers

Date: March 13, 2008

Dwight B. Horne

From: Dwight Horne
Director, Office of Program Administration

Reply to
Att. of: HIPA-30

To: Associate Administrators
Directors of Field Services
Federal Lands Highway Division
Resource Center Director
Division Administrators

This memorandum rescinds my July 3, 2003 memorandum titled "[Re-Delegation of Buy America Waiver Approval Guidance](#)." Effectively immediately, all Buy America waiver requests must be submitted for review and consideration by this office. This change is necessitated by a provision in Public Law 110-161, the "Consolidated Appropriations Act, 2008." Division K, Section 130 of this law states:

"Not less than 15 days prior to waiving, under her statutory authority, any Buy America requirement for Federal-aid highway projects, the Secretary of Transportation shall make an informal public notice and comment opportunity on the intent to issue such waiver and the reasons therefore. Provided, That the Secretary shall provide an annual report to the appropriations Committees of the Congress on any waivers granted under the Buy America requirements."

Due to the statutory requirement for the Secretary of Transportation to implement an informal public notice and comment opportunity for each waiver, it is necessary for all waiver requests to be submitted to this office for review. We have established an internet Web page titled: "[Notice of Buy America Waiver Request](#)" (<http://www.fhwa.dot.gov/construction/contracts/waivers.cfm>) to provide notification and the opportunity for public comment for every Buy America waiver. We encourage interested parties to subscribe to this notification system to receive a notice regarding current waiver requests. While the statute provides for a minimum 15-day comment period, contracting agencies should recognize that coordination activities following the comment period may result in a waiver decision more than 15 days after the initial posting.

FHWA's policy provides for the consideration of a Buy America waiver when it is consistent with the public interest or when satisfactory quality domestic steel and iron products are not sufficiently available.

**MOVING THE
AMERICAN
ECONOMY**





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Please inform your respective State DOTs and local public agencies that waiver requests that are based on an adverse impact to a contractor's construction schedule will not be accepted when domestic material is available.

With the implementation of this system, it will be even more important that contracting agencies assess the availability of domestic iron and steel products during the design stage of a project so that unanticipated delays will not take place once construction starts.

Please consider making the appropriate changes to your stewardship and oversight agreements to ensure that Buy America waiver requests are submitted to this office for all Federal-aid construction projects, regardless of any other oversight agreement that is in effect for that project. You may contact Mr. Edwin Okonkwo, our Buy America coordinator (202-366-1558), should you have any questions on this matter.



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mitigate the risk from vehicle collisions with the superstructure. Should the owner desire additional mitigation, the following steps may be taken:

- Increasing vertical clearance in addition to that contained in *AASHTO LRFD*
- Providing structural continuity of the superstructure, either between spans or with the substructure
- Increasing the mass of the superstructure
- Increasing the lateral resistance of the superstructure

2—PHILOSOPHY

Pedestrian bridges shall be designed for specified limit states to achieve the objectives of safety; serviceability, including comfort of the pedestrian user (vibration); and constructability with due regard to issues of inspectability, economy, and aesthetics, as specified in *AASHTO LRFD*. These Guide Specifications are based on the LRFD philosophy. Mixing provisions from specifications other than these referenced herein, even if LRFD based, should be avoided.

3—LOADS

3.1—PEDESTRIAN LOADING (PL)

Pedestrian bridges shall be designed for a uniform pedestrian loading of 90 psf. This loading shall be patterned to produce the maximum load effects. Consideration of dynamic load allowance is not required with this loading.

3.1

This article modifies the pedestrian loading provisions of the Fourth Edition of *AASHTO LRFD*, through the 2009 Interim. The previous edition of these Guide Specifications used a base nominal loading of 85 psf, reducible to 65 psf based on influence area for the pedestrian load. With the LRFD load factors, this results in factored loads of $2.17(85) = 184$ psf and $2.17(65) = 141$ psf. The Fourth Edition of *AASHTO LRFD* specified a constant 85 psf regardless of influence area. Multiplying by the load factor, this results in $1.75(85) = 149$ psf. This falls within the range of the previous factored loading, albeit toward the lower end.

European codes appear to start with a higher nominal load (approx 105 psf), but then allow reductions based on loaded length. Additionally, the load factor applied is 1.5, resulting in a maximum factored load of $(1.5)105 = 158$ psf. For a long loaded length, this load can be reduced to as low as 50 psf, resulting in a factored load of $(1.5)50 = 75$ psf. The effect of resistance factors has not been accounted for in the above discussion of the European codes. There are



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however, warnings to the designer that a reduction in the load based on loaded length may not be appropriate for structures likely to see significant crowd loadings, such as bridges near stadiums.

Consideration might be given to the maximum credible pedestrian loading. There is a physical limit on how much load can be applied to a bridge from the static weight of pedestrians. It appears that this load is around 150 psf based on work done by Nowak (2000) from where Figures C1 through C3 were taken. Although there does not appear to be any available information relating to the probabilistic distribution of pedestrian live loading, knowing the maximum credible load helps to define the limits of the upper tail of the distribution of load. The use of a 90 psf nominal live load in combination with a load factor of 1.75 results in a loading of 158 psf, which provides a marginal, but sufficient, reserve compared with the maximum credible load of 150 psf.



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Figure C3.1-1—Live Load of 50 psf



Figure C3.1-2—Live Load of 100 psf



Figure C3.1-3—Live Load of 150 psf

3.2—VEHICLE LOAD (LL)

Where vehicular access is not prevented by permanent physical methods, pedestrian bridges shall be designed for a maintenance vehicle load specified in Figure 1 and Table 1 for the Strength I Load Combination unless otherwise specified by the Owner.

C3.2

The vehicle loading specified is equivalent to the 14-trucks shown in Article 3.6.1.6 of *AASHTO LRFD 2009 Interim* and contained in previous versions of the *AASHTO Standard Specifications for Highway Bridges*.



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A single truck shall be placed to produce the maximum load effects and shall not be placed in combination with the pedestrian load. The dynamic load allowance need not be considered for this loading.

Table 3.2-1—Design Vehicle

Clear Deck Width	Design Vehicle
7 to 10 ft	H5
Over 10 ft	HTU

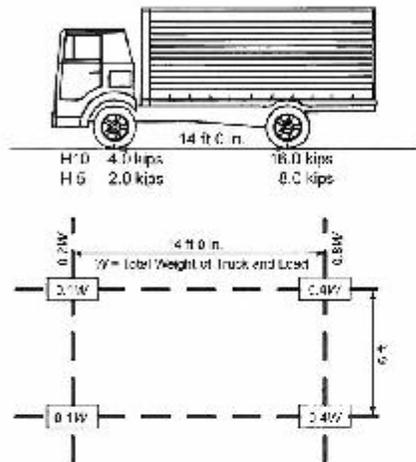


Figure 3.2-1—Maintenance Vehicle Configurations

3.3—EQUESTRIAN LOAD (EL)

Decks intended to carry equestrian loading shall be designed for a patch load of 1.00 kip over a square area measuring 4.0 in. on a side.

C3.3

The equestrian load is a live load and intended to ensure adequate punching shear capacity of pedestrian bridge decks where horses are expected. The loading was derived from hoof pressure measurements reported in Roland et al. (2005). The worst loading occurs during a center where the loading on one hoof approaches 100 percent of the total weight of the horse. The total factored load of 1.75 kips is approximately the maximum credible weight of a draft horse. This loading is expected to control only deck design.

3.4—WIND LOAD (WS)

Pedestrian bridges shall be designed for wind loads as specified in *AASHTO Signs*, Articles 3.8 and 3.9. Unless otherwise directed by the Owner, the Wind Importance Factor, I_w , shall be taken as 1.15. The loading shall be applied over the exposed area in front

C3.4

The wind loading is taken from *AASHTO Signs* specification rather than from *AASHTO LRFD* due to the potentially flexible nature of pedestrian bridges, and also due to the potential for traffic signs to be mounted on them.

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Bike and Ped Design Guidelines Focus Group (August 13, 2013)

The NCDOT Technical Services Division held a meeting on August 13, 2013 to discuss the development of design guidelines for multi-use, off-road bicycle and pedestrian facilities. The purpose of the meeting was for various project stakeholders to discuss the design-related issues and problems they are facing with current greenway projects. This allowed the Department to become familiar with their concerns and incorporate their comments into the new multi-use, off-road bicycle and pedestrian facility design policy.

Prior to the meeting, a survey was distributed in order to give the Department a better understanding of the general issues stakeholders were having with the current greenway practices. The design related issues were categorized into one of five design criteria categories. These categories were pavement design and compaction standards, geometric design criteria, bridge design and loading requirements, materials, and scour. These categories were each discussed in detail during the meeting. The following summarizes the results of the discussion.

- Pre-construction and contract administration issues are just as important, if not more important, than design-related issues.
- The Department needs to develop a set of flexible, greenway specific design guidelines that will allow designers to incorporate context sensitive solutions into the design. The “type of use” of the facility should be taken into account when determining the design criteria.
- Greenway specific special provisions should be developed for cases when greenway designs should be allowed to deviate from the current roadway standards. Using roadway standards for greenways drives up costs and context sensitive solutions are needed.
- Roadway standards dictate greenway design which is often unfit for the facility. Roadway standards indicate large curve radii which for some greenways may be a bit excessive. When designing on private easements property owners may require that trees be saved meaning sharper curves will be needed. The width of the path should also vary by location and use.
- The Department needs to be consistent when determining who will be reviewing the projects. Municipalities currently have projects that are being reviewed by district offices, division offices, and central NCDOT units. The Department also will hire a private firm to handle project oversight which in some cases leads to confusion. The source of the projects funding should not determine who the reviewing party is. Consistent administration of bike/ped projects is needed.
- The special provisions change frequently and there is no mechanism in place to alert designers to these changes.
- The Department should test alternate pavement designs for greenway projects. Testing should include allowing a 2” lift of S9.5A instead of S9.5B and pavement interlayer geo-fabric. These pavements should be tested on both 95% and 100% compacted subgrade.
- The current bridge loading requirements are excessive and unnecessary.
- Need flexibility in materials that may be used. In addition, more products should be kept on the APL so that new innovative materials can be incorporated into designs.
- Bridge and Roadway projects should accommodate future greenway plans.
 - Need a procedure for review and approval of alternative construction methods or design.



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DRAFT GREENWAYS AND MULTI-USE PATHS:

(TBD) (9-13-13)

TBD

Description

“Greenway” is defined as **the paved** multi-use path intended to carry primarily pedestrians, bicyclists, and light maintenance vehicles, but not designed or intended to carry typical highway traffic. Structures, such as footbridges or pedestrian bridges, are not included in this provision.

Materials

Refer to the *2012 Standard Specifications* except as noted in these Special Provisions.

Item	Section
Asphalt Concrete Surface Course	1020
Portland Cement Concrete	1000
Select Material	1016
Aggregate for Stabilization	1008
Asphalt Binder	1000
Reclaimed Asphalt Pavement (RAP)	1016
Reclaimed Asphalt Shingles (RAS)	1006, 1010, 1012, 1014
Coarse Aggregate	1020-2
Fine Aggregate	1012-1(F) 1012-1(E) 1012-1(B) 1012-1(C)
Geotextile for Soil Stabilization, Type 4	1056
Welded Wire Mesh	

For treated timber, use preservatives and retention of preservative as required by the contract.
For steel and iron products, conform to **Subarticle** 106-1(B) of the *Standard Specifications*.

Use materials on the NCDOT Approved Products List (APL) where **applicable**.

Construction Methods

Construct Greenway in accordance with the contract plans, NCDOT *2012 Standard Specifications*, and this Special Provision.

Perform clearing and grubbing on this project for a distance of 5 feet on either side of the greenway. Trees greater than 15” in diameter may remain, provided they are at least 2 feet clear of the greenway. Provide 10-foot vertical clearance from the greenway to the tree canopy. Grade greenway shoulders to drain and seed at least 2 feet on both sides in accordance with Section 1660 of the *Standard Specifications*.



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Construct greenway in compliance with the Americans with Disabilities Act of 1990 (ADA) as amended, the NCDOT's *North Carolina Bicycle Facilities Planning and Design Guidelines* and the *AASHTO Guide for the Development of Bicycle Facilities*.

Perform shallow undercut up to 12 inches as necessary to remove unsuitable material in accordance with Section 505 of the *Standard Specifications*. The Contractor may elect to use Class III Select Material in lieu of ABC.

For all embankments, compact each layer to a density equal to at least 90% of that obtained by compacting a sample of material in accordance with AASHTO T99 as modified by NCDOT. Copies of these modified testing procedures are available upon request from the Materials and Tests Unit.

Embankment testing for density shall be performed to verify equipment and roller patterns to achieve maximum density during initial embankment construction and test results shall be submitted to the Engineer. Subsequent testing will be required if equipment changes, compactive effort changes, or stability issues are observed. Embankments shall be visually stable under construction equipment.

Perform fine grading of the subgrade in accordance with Section 500 of the *Standard Specifications*. Compact the subgrade to a density of 92% of that obtained by compacting a sample of material in accordance with AASHTO T99 as modified by NCDOT. A tolerance of \pm one inch will be permitted after the subgrade has been graded to a uniform surface.

Subgrade density testing shall be performed to verify density during initial subgrade construction and test results shall be submitted to the Engineer. Subsequent testing will be required if equipment changes or stability issues are observed.

If applicable, install geotextile for soil stabilization in accordance with Article 270-3. Do not operate heavy equipment on geotextiles until geotextiles are covered with ABC.

Place ABC in accordance with Section 520 of the *Standard Specifications*, except sampling and acceptance of ABC shall be in accordance with *Aggregate QC/QA Program Manual* only and a mechanical spreader is not required. Minimum compaction thickness and sand seal requirements are waived. The QA/QC program results will be used for acceptance. Roadway samples will not be required, unless material is visually segregated or density cannot be achieved. If Roadway samples become necessary, use proper sampling procedures in accordance with the *Aggregate Sampling Manual* on the Materials and Tests Unit's website:

<https://connect.ncdot.gov/resources/Materials/MaterialsResources/ABC%20Sampling%20Manual.pdf>.

Compact the ABC to a density of 92% of that obtained by compacting a sample of material in accordance with AASHTO T180 as modified by NCDOT for both nuclear and ring test.

ABC density testing shall be performed to verify density during initial ABC construction and test



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results shall be submitted to the Engineer. Subsequent testing will be required if equipment changes or material source changes.

Place asphalt in accordance with Section 610 of the *Standard Specifications*. Compact the asphalt plant mix to at least 85% of the maximum specific gravity. For asphalt mix placed at a rate of less than 100 lb/sy, use an established roller pattern in lieu of minimum density requirement. All density acceptance of asphalt mix shall be in accordance with Article 105-3 of the *Standard Specifications*.

Asphalt mix density testing shall be performed to verify density during first day of production and test results shall be submitted to the Engineer. Subsequent testing will be required if equipment changes, compaction method changes or asphalt mix changes.

Final surface testing will not be required.

Measurement and Payment

Greenway will be measured and paid as the actual number of square yards of *Greenway* completed and accepted. The square yard unit price for *Greenway* will be full compensation for providing clearing and grubbing, undercut, embankments, placement of pavement, quality control testing, repairs as required, submittals and materials, excavating, backfilling, hauling and removing excavated materials and supplying all labor, tools, equipment and incidentals necessary to construct the greenway.

Payment will be made under:

Pay Item
Greenway

Pay Unit
Various Pay Items in
accordance with NCDOT
Pay items



North Carolina Department of Transportation Value Management Unit Value Engineering Program



Greenways and Multi-use Paths Summary of Changes for Construction & Materials Standards September 13, 2013

DRAFT

Items proposed by Construction and Materials & Tests for Locally Administered Greenway and Multi-use Path Projects:

- Embankment Density requirements reduced to 90% from 95%.
- Subgrade Density requirement reduced to 92% from 100%.
- Aggregate Base Course Density requirements reduced to 92% from 100%.
- Asphalt compaction requirements equal a minimum of 85%.
- Materials
 - Reduced Minimum Sampling Requirements – developed Modified MSG for Greenways and Multi-use paths.
 - Use of materials on Approved Products List, where applicable.
- Pavement recommendations (See memorandum from Pavement Management)
- Minimized inspection requirements. Reduced the number of situations where daily inspection reports and daily asphalt reports are required.
- Local Government Agency provides a certification letter from a licensed professional engineer to the NCDOT State Materials Engineer certifying that the materials incorporated into the construction were in conformity with all applicable standards, specifications and plans. This will be used in lieu of NCDOT State Materials Engineer certifying each project.



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Letter of Certification by Licensed Professional Engineer

DRAFT 9-13-2013

The responsible licensed Professional Engineer, designated by the county or municipality administering the contract and agreed upon by the Department's designee assigned to oversee the contract administration, shall submit a letter to the State Materials Engineer certifying that the materials incorporated in the construction work, and the construction operations controlled by sampling and testing were in conformity with all applicable standards, specifications and plans. This shall include but is not limited to NCDOT Standard Specifications for Roads and Structures, NCDOT Special Provisions, NCDOT Standard Drawings and the NCDOT Minimum Sampling Guide. The Engineer must also verify and certify that all sampling and testing was conducted by qualified technicians who hold current appropriate NCDOT certifications for the applicable testing and inspections they performed on the project. Any exceptions or shortages in required number of tests shall be noted in a separate attachment to the letter and may be deemed as non-participatory by the State Materials Engineer.

No further materials certification is required; however, the State Materials Engineer or designee may perform random project audits to insure compliance with all applicable standards and may designate any irregularities, deficiencies or non-compliances as non-participatory.

See attachment XXX for examples of exceptions and shortages reports.



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Modified Minimum Sampling Guide (MSG) for Greenways and Multi-use Paths			DRAFT 9-17-13
MSG Group	How Accepted	Additional Requirements	Other
Aggregate	Must come from a plant on the NCDOT approved list and participating in the Aggregate Quality Control / Quality Assurance Program	Roadway Assurance is Optional for Aggregate Base Course	92% (Nuclear or Conventional) for Aggregate Base Course
Asphalt	Must come from a plant on our approved list and participating in the NCDOT Quality Management System; Must use a NCDOT Approved Mix Design and Job Mix Formula that has been used on a NCDOT project.	610-9 revised mix per QMS	Compaction - 85% every 5,000 ft, minimum of one per project
Cementitious Materials	Must come from a NCDOT approved source; Type 3 certification		
Concrete (Class B only)	Must come from a concrete plant on the NCDOT approved list; Must use a Concrete Mix Design that has been used on a NCDOT project. Project specific mix approval is not required.	Minimum of one set of cylinders per project to test compressive strength	All other classes per Standard MSG
Fencing Materials	Type 6		Buy America
Grading	N/A (Sampling and/or Visual)	Visual Inspection plus minimum of one embankment and one subgrade per project.	Embankment 90%; Subgrade 92%
Guardrail	Must come from a plant on the NCDOT approved list.	Guardrail markings should be visually inspected to insure that it came from NCDOT approved source	Buy America
Landscape	Type 6 certification		North Carolina Department of Agriculture Nursery
Paints and Coatings	Type 3, Type 4, Type 6		
Pipe	Drainage- NCDOT Approved Plant, NCDOT Stamped, tagged, sticker. Water/Sewer- Type 3 certification or Type 6	Product markings should be visually inspected to insure that it came from NCDOT approved source	Buy America
Precast	Must come from a NCDOT Approved Plant. NCDOT stamped, tagged or stickered; For incidental items only need Type 6	Product markings should be visually inspected to insure that it came from NCDOT approved source	Buy America
Prestress	Must come from NCDOT Approved Plant and be NCDOT stamped	Field Inspection Report conducted at plant by NCDOT personnel	Buy America
Steel	Various req. NCDOT Approved Producers, Type 1, Type 3, Type 4, Type		Buy America
Traffic Control	Type 3, Type 4, Type 7		
Utilities	Type 3, Type 6		Buy America

Note - Materials received that are not listed on this table should be received in accordance with the NCDOT Minimum Sampling Guide.



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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PATRICK L. MCCRORY
GOVERNOR

ANTHONY J. TATA
SECRETARY

September 16, 2013

MEMO TO: Ricky Greene, PE
Jay Bennett, PE
Roger Rochelle, PE

MEMO FROM: Judith Corley-Lay, PE
State Pavement Management Engineer

SUBJECT: **DRAFT** Minimum Design Recommendations for Greenways

For pavement on greenways and multi-use paths, Pavement Management recommends the following as minimum pavement designs:

Option 1
1.5" SF9.5A
6" ABC

Option 2
1.5" SF9.5A
4" ABC
Soil Stabilization Geotextile Fabric.

Option 3
4" concrete with welded wire mesh.

The materials used in the construction of the greenway should meet the requirements given in the Special Provision titled "Greenways and Multi-Use Paths".

Please call Clark Morrison, State Pavement Design Engineer at 919-835-8202 if you have specific questions.

JCL/esm

MAILING ADDRESS:
North Carolina Department of Transportation
Pavement Management Unit
1698 Mail Service Center
Raleigh, NC 27609-1698

TELEPHONE: 919-835-8200
FAX: 919-839-6350

LOCATION:
4809 BERRY ROAD
RALEIGH, NC 27606-1406



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Project Details

Project	Greenway Guidelines	Date Sent: 10/14/2013	Return By: 01/10/2014
WBS No.	N/A	Project Description Develop design guidelines for paved, multi-use, off-road facilities (greenways) by December 31, 2013.	
County	N/A		
Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 1 Description

Original Design / Material	ABC or base course will be used as a base.
Proposed Change	Consider allowing slag or single-size expanded shale for base course. This material should allow tree roots to grow through without buckling the pavement.
Justification	This has the potential to reduce long-term maintenance costs and increase safety for the users by eliminating tripping hazards. The material is porous so it allows air to flow through and the internal friction of the material also provides a high degree of stabilization.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 1 Review

Affected Business Unit(s)	<input type="checkbox"/> Roadway	<input type="checkbox"/> Planning	<input type="checkbox"/> Division
	<input type="checkbox"/> Structures	<input type="checkbox"/> Traffic Operations	<input type="checkbox"/> Maintenance
	<input type="checkbox"/> Hydraulics	<input type="checkbox"/> Right of Way	<input type="checkbox"/> Construction
	<input type="checkbox"/> Geotechnical	<input type="checkbox"/> Utilities	<input checked="" type="checkbox"/> Other: Pvmt Mgmt
Conceptual Review	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		



North Carolina Department of Transportation Value Management Unit Value Engineering Program



Project Details

Project	Greenway Guidelines	Date Sent: 10/14/2013	Return By: 01/10/2014
WBS No.	N/A	Project Description Develop design guidelines for paved, multi-use, off-road facilities (greenways) by December 31, 2013.	
County	N/A		
Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 2 Description

Original Design / Material	Greenways are tested to roadway standards.
Proposed Change	Provide testing standards for greenways that are different than roadway testing standards.
Justification	This will save time by eliminating a lot of testing that has to be done on-site. Inspectors will have less responsibility. As a result, construction will become easier, faster, and potentially cheaper.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 2 Review

Affected Business Unit(s)	<input type="checkbox"/> Roadway <input type="checkbox"/> Structures <input type="checkbox"/> Hydraulics <input type="checkbox"/> Geotechnical	<input type="checkbox"/> Planning <input type="checkbox"/> Traffic Operations <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities	<input type="checkbox"/> Division <input type="checkbox"/> Maintenance <input type="checkbox"/> Construction <input checked="" type="checkbox"/> Other: Materials & Tests
Conceptual Review	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		



North Carolina Department of Transportation Value Management Unit Value Engineering Program



Project Details

Project	Greenway Guidelines	Date Sent: 10/14/2013	Return By: 01/10/2014
WBS No.	N/A	Project Description Develop design guidelines for paved, multi-use, off-road facilities (greenways) by December 31, 2013.	
County	N/A		
Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 3 Description

Original Design / Material	No minimum pavement options are provided.
Proposed Change	Provide pavement options with a pros / cons list so that all LGA's understand the benefits and limitations associated with each pavement structure. This list would only be provided with the NCDOT provided minimum pavement options. LGA's could choose to exceed the minimum based on local experience.
Justification	This will educate the LGA's and allow them to make an informed decision.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 3 Review

Affected Business Unit(s)	<input type="checkbox"/> Roadway <input type="checkbox"/> Structures <input type="checkbox"/> Hydraulics <input type="checkbox"/> Geotechnical	<input type="checkbox"/> Planning <input type="checkbox"/> Traffic Operations <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities	<input type="checkbox"/> Division <input type="checkbox"/> Maintenance <input type="checkbox"/> Construction <input checked="" type="checkbox"/> Other: Pvmgt Mgmt
Conceptual Review	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		



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Project Details

Project	Greenway Guidelines	Date Sent: 10/14/2013	Return By: 01/10/2014
WBS No.	N/A	Project Description Develop design guidelines for paved, multi-use, off-road facilities (greenways) by December 31, 2013.	
County	N/A		
Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 4 Description

Original Design / Material	Bridges wider than 10' designed with a H5 truck loading require permanent bollards.
Proposed Change	Consider controlled access (i.e. collapsible bollards) for bridges wider than 10' designed with a H5 truck loading.
Justification	This would allow municipalities to design an H5 load tested bridge with a deck wider than 10'.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 4 Review

Affected Business Unit(s)	<input type="checkbox"/> Roadway <input checked="" type="checkbox"/> Structures <input type="checkbox"/> Hydraulics <input type="checkbox"/> Geotechnical	<input type="checkbox"/> Planning <input type="checkbox"/> Traffic Operations <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities	<input type="checkbox"/> Division <input type="checkbox"/> Maintenance <input type="checkbox"/> Construction <input type="checkbox"/> Other
Conceptual Review	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		



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Project Details

Project	Greenway Guidelines	Date Sent: 10/14/2013	Return By: 01/10/2014
WBS No.	N/A	Project Description Develop design guidelines for paved, multi-use, off-road facilities (greenways) by December 31, 2013.	
County	N/A		
Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 5 Description

Original Design / Material	Alternate foundations are not permitted for boardwalks.
Proposed Change	Consider allowing alternate foundations for boardwalks (i.e. Helical Piers).
Justification	This would increase the longevity of the structure as well as potentially reduce life cycle cost and construction cost. This is an environmentally friendly recommendation and it could make construction of the boardwalk easier. Helical Piers may also address uplift concerns during top down construction.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 5 Review

Affected Business Unit(s)	<input type="checkbox"/> Roadway <input checked="" type="checkbox"/> Structures <input type="checkbox"/> Hydraulics <input type="checkbox"/> Geotechnical	<input type="checkbox"/> Planning <input type="checkbox"/> Traffic Operations <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities	<input type="checkbox"/> Division <input type="checkbox"/> Maintenance <input type="checkbox"/> Construction <input type="checkbox"/> Other
Conceptual Review	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		



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Project Details

Project	Greenway Guidelines	Date Sent: 10/14/2013	Return By: 01/10/2014
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County	N/A		
Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 6 Description

Original Design / Material	The current seeding and mulching procedure does not provide any options.
Proposed Change	Provide seeding options in environmentally sensitive areas.
Justification	Takes the environment into account and potentially allows for the use of native species.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 6 Review

Affected Business Unit(s)	<input type="checkbox"/> Roadway	<input type="checkbox"/> Planning	<input type="checkbox"/> Division
	<input type="checkbox"/> Structures	<input type="checkbox"/> Traffic Operations	<input type="checkbox"/> Maintenance
	<input type="checkbox"/> Hydraulics	<input type="checkbox"/> Right of Way	<input type="checkbox"/> Construction
	<input type="checkbox"/> Geotechnical	<input type="checkbox"/> Utilities	<input checked="" type="checkbox"/> Other: Roadside Envr.
Conceptual Review	Reviewed By / Date		Comments
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date		Comments
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		



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Project Details

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County	N/A		
Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 7 Description

Original Design / Material	No information regarding the exceptions under the Buy America Act are given to the LGA's.
Proposed Change	Include information about the Buy America Act and the exemptions that are covered. Provide the information as a link so any changes will be automatically reflected.
Justification	Education for the LGA's.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 7 Review

Affected Business Unit(s)	<input type="checkbox"/> Roadway <input type="checkbox"/> Structures <input type="checkbox"/> Hydraulics <input type="checkbox"/> Geotechnical	<input type="checkbox"/> Planning <input type="checkbox"/> Traffic Operations <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities	<input type="checkbox"/> Division <input type="checkbox"/> Maintenance <input type="checkbox"/> Construction <input checked="" type="checkbox"/> Other: Materials & Tests
Conceptual Review	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		



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County	N/A		
Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 8 Description

Original Design / Material	Only standard concrete strength options are provided.
Proposed Change	Provide a menu of options for concrete strengths. Include information on what to do if LGA's use a different mix design than a standard NCDOT mix. Provide a link to the NCDOT approved producer / supplier list on NCDOT's website.
Justification	Education for the LGA's.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 8 Review

Affected Business Unit(s)	<input type="checkbox"/> Roadway <input type="checkbox"/> Structures <input type="checkbox"/> Hydraulics <input type="checkbox"/> Geotechnical	<input type="checkbox"/> Planning <input type="checkbox"/> Traffic Operations <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities	<input type="checkbox"/> Division <input type="checkbox"/> Maintenance <input type="checkbox"/> Construction <input checked="" type="checkbox"/> Other: Materials & Tests
Conceptual Review	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		



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Project Details

Project	Greenway Guidelines	Date Sent: 10/14/2013	Return By: 01/10/2014
WBS No.	N/A	Project Description Develop design guidelines for paved, multi-use, off-road facilities (greenways) by December 31, 2013.	
County	N/A		
Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 9 Description

Original Design / Material	Instances where the distance from the top of the deck to the bottom of the creek is less than or equal to 30" currently requires handrail.
Proposed Change	Consider allowing the use of the current North Carolina Building Code which doesn't require hand rails in instances where the distance from the top of the deck to the bottom of the creek is less than or equal to 30".
Justification	This will minimize hand rail construction cost and maintenance cost. It also is more aesthetically pleasing for users.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 9 Review

Affected Business Unit(s)	<input type="checkbox"/> Roadway <input checked="" type="checkbox"/> Structures <input type="checkbox"/> Hydraulics <input type="checkbox"/> Geotechnical	<input type="checkbox"/> Planning <input type="checkbox"/> Traffic Operations <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities	<input type="checkbox"/> Division <input type="checkbox"/> Maintenance <input type="checkbox"/> Construction <input type="checkbox"/> Other
Conceptual Review	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		



North Carolina Department of Transportation Value Management Unit Value Engineering Program



Project Details

Project	Greenway Guidelines	Date Sent: 10/14/2013	Return By: 01/10/2014
WBS No.	N/A	Project Description Develop design guidelines for paved, multi-use, off-road facilities (greenways) by December 31, 2013.	
County	N/A		
Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 10 Description

Original Design / Material	ADA Access Route standards are currently being used.
Proposed Change	Consider tailoring ADA requirements towards “ADA for Recreational Trails” and not “ADA Access Route” standard requirements (i.e. less stringent grade requirements).
Justification	This will make it easier to meet existing site conditions without extensive grading in environmentally sensitive areas. It also helps keep the character of the site.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 10 Review

Affected Business Unit(s)	<input checked="" type="checkbox"/> Roadway <input type="checkbox"/> Structures <input type="checkbox"/> Hydraulics <input type="checkbox"/> Geotechnical	<input type="checkbox"/> Planning <input type="checkbox"/> Traffic Operations <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities	<input type="checkbox"/> Division <input type="checkbox"/> Maintenance <input type="checkbox"/> Construction <input type="checkbox"/> Other
Conceptual Review	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		



North Carolina Department of Transportation Value Management Unit Value Engineering Program



Project Details

Project	Greenway Guidelines	Date Sent: 10/14/2013	Return By: 01/10/2014
WBS No.	N/A	Project Description Develop design guidelines for paved, multi-use, off-road facilities (greenways) by December 31, 2013.	
County	N/A		
Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 11 Description

Original Design / Material	The minimum allowable design radius is 90'.
Proposed Change	Consider allowing a tighter design radius than the standard minimum of 90'.
Justification	This is a context sensitive solution that allows the design to be topographically and environmentally sensitive. Tighter radii could be used as a traffic calming measure. This will provide designers more flexibility in dealing with limited right of way, easement areas, riparian buffers, and flood regulations.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 11 Review

Affected Business Unit(s)	<input checked="" type="checkbox"/> Roadway <input type="checkbox"/> Structures <input type="checkbox"/> Hydraulics <input type="checkbox"/> Geotechnical	<input type="checkbox"/> Planning <input type="checkbox"/> Traffic Operations <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities	<input type="checkbox"/> Division <input type="checkbox"/> Maintenance <input type="checkbox"/> Construction <input type="checkbox"/> Other
Conceptual Review	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		



North Carolina Department of Transportation Value Management Unit Value Engineering Program



Project Details

Project	Greenway Guidelines	Date Sent: 10/14/2013	Return By: 01/10/2014
WBS No.	N/A	Project Description Develop design guidelines for paved, multi-use, off-road facilities (greenways) by December 31, 2013.	
County	N/A		
Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 12 Description

Original Design / Material	No information is provided to LGA's regarding FEMA flood study requirements.
Proposed Change	Clearly communicate that if a greenway crosses a FEMA jurisdictional flood channel, Federal Regulations mandate that it must have a flood study.
Justification	This will educate the LGA's and allow them to make an informed decision.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 12 Review

Affected Business Unit(s)	<input type="checkbox"/> Roadway	<input type="checkbox"/> Planning	<input type="checkbox"/> Division
	<input type="checkbox"/> Structures	<input type="checkbox"/> Traffic Operations	<input type="checkbox"/> Maintenance
	<input checked="" type="checkbox"/> Hydraulics	<input type="checkbox"/> Right of Way	<input type="checkbox"/> Construction
	<input type="checkbox"/> Geotechnical	<input type="checkbox"/> Utilities	<input type="checkbox"/> Other
Conceptual Review	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		



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Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 13 Description

Original Design / Material	Foundations are designed for the 500 year scour.
Proposed Change	Design foundations for historical scour instead of the 500 year scour. Use sub-regional tier bridge design guidelines. Do a risk assessment on evaluating scour.
Justification	This will reduce cost and will be a more practical solution. It will also allow for more substructure types.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 13 Review

Affected Business Unit(s)	<input type="checkbox"/> Roadway <input type="checkbox"/> Structures <input checked="" type="checkbox"/> Hydraulics <input type="checkbox"/> Geotechnical	<input type="checkbox"/> Planning <input type="checkbox"/> Traffic Operations <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities	<input type="checkbox"/> Division <input type="checkbox"/> Maintenance <input type="checkbox"/> Construction <input type="checkbox"/> Other
Conceptual Review	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		



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Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 14 Description

Original Design / Material	No guidance is provided regarding signalization of bicycle and pedestrian crossings.
Proposed Change	Develop warrants that would allow for development of signalization for bicycle and pedestrian crossings.
Justification	Increased safety.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 14 Review

Affected Business Unit(s)	<input checked="" type="checkbox"/> Roadway <input type="checkbox"/> Structures <input type="checkbox"/> Hydraulics <input type="checkbox"/> Geotechnical	<input type="checkbox"/> Planning <input type="checkbox"/> Traffic Operations <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities	<input type="checkbox"/> Division <input type="checkbox"/> Maintenance <input type="checkbox"/> Construction <input type="checkbox"/> Other
Conceptual Review	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		



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Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 15 Description

Original Design / Material	LGA's are required to search and find the Structures Policy for pedestrian bridges.
Proposed Change	Provide a link to the Structures Policy for pedestrian bridges.
Justification	Education for the LGA's for loading requirements and design criteria.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 15 Review

Affected Business Unit(s)	<input type="checkbox"/> Roadway <input checked="" type="checkbox"/> Structures <input type="checkbox"/> Hydraulics <input type="checkbox"/> Geotechnical	<input type="checkbox"/> Planning <input type="checkbox"/> Traffic Operations <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities	<input type="checkbox"/> Division <input type="checkbox"/> Maintenance <input type="checkbox"/> Construction <input type="checkbox"/> Other
Conceptual Review	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date	Comments	
	Decision		
	<input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		



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Let Date	N/A		
R/W Est.	N/A		
Const. Est.	N/A		

Recommendation No. 16 Description

Original Design / Material	Hydraulic tunnels and box culverts may be considered for pedestrian use.
Proposed Change	Consider utilization of hydraulic tunnels or box culverts for pedestrian use.
Justification	Already in place.

Cost Analysis

	VE Initial Cost	Initial Future Cost	Final Total Cost
Original Design / Material			
Proposed Change			
Life Cycle Costs (If Applicable)			
Savings			

Recommendation No. 16 Review

Affected Business Unit(s)	<input type="checkbox"/> Roadway <input type="checkbox"/> Structures <input checked="" type="checkbox"/> Hydraulics <input type="checkbox"/> Geotechnical	<input type="checkbox"/> Planning <input type="checkbox"/> Traffic Operations <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities	<input type="checkbox"/> Division <input type="checkbox"/> Maintenance <input type="checkbox"/> Construction <input type="checkbox"/> Other
Conceptual Review	Reviewed By / Date	Comments	
	Decision <input type="checkbox"/> Accept <input type="checkbox"/> Modify (<i>see comments</i>) <input type="checkbox"/> Reject (<i>specify</i>)		
Final Disposition	Reviewed By / Date	Comments	
	Decision <input type="checkbox"/> Accept <input type="checkbox"/> Accept as Modified <input type="checkbox"/> Reject (<i>add comments</i>)		