

WVDOH Standards Committee Meeting

Tuesday, August 4, 2026

Meeting Location: 190 Dry Branch Drive, Charleston, WV

Also meeting virtually via Google Meet. Email distribution includes instruction.

Approved Standard changes from the last Committee Meeting (06/02/26):

- DD-644-*Asphalt Pavement*
- DD-646-*Pavement Design Guide*

Items Removed from the Agenda:

The following items below are currently being reviewed internally by the Engineering Division and will be returned with revisions at a later date.

- DD-622-*Intersections on Rural Divided Highways*
- DD-625-*Interchange Warrants*
- DD-662-*Guardrail*

Old Business:

ITEM	Champion
5th time to Committee. Discussed in December, February, April, June, and August • DD-647-Life-Cycle Cost Analysis for Pavement Design • DD-648-Alternate Design and Alternate Bidding of Pavements The revisions include updated links and reference documents, the addition of new pavement design standards, updates reflecting AASHTO 93, adjusted analysis periods, and language for the LCCA Report. Since the last committee meeting, both Design Directives have been restructured. For DD-647, repetitive language was removed throughout, the LCCA NPV factors (Initial Cost, User Cost, and Future Activity Cost) were redefined, and the "C" factor now refers only to the Life-Cycle Cost Factor (LCC) to maintain consistency with Special Provision 103. For DD-648, repetitive language was removed throughout, and the NPV was revised to be consistent with DD-647.	K. Welch
2nd time to Committee. Discussed in June and August • Life Cycle Cost Analysis (LCCA) Report The LCCA report evaluates the long-term economic efficiency of competing pavement design alternatives (asphalt vs. concrete) in accordance with FHWA guidelines. Specifically, the report demonstrates the methodology used to calculate the Net Present Value of Future Costs (C-factor). The report will be incorporated into DD-647 and DD-648, reviewed and approved annually, and published on the Publications Page. This effort is being completed at management's request.	K. Welch

3rd time to Committee. Discussed in April, June, and August • <i>DD-105-Specification, Standards, Manuals, and Material Procedure Approval Process</i> The revision clarifies the work and standard operating procedures for the Publications. Item has been updated since the last meeting, revision requires FHWA concurrence for all approved committee items. Approval expected at the August Meeting	S. Boggs
--	----------

New Business:

ITEM	Champion
1st time to Committee • <i>DD-101-Correspondence</i> The revision updates outdated organizational and mailing information, removes references to the former Technical Support Division, streamlines correspondence requirements, and directs users to current Division and District webpages for current contact information.	J. Adkins

Housekeeping:

Next Meeting – **October 6, 2026**
Deadline for Submissions – **September 8, 2026**
Comments Due – **October 2, 2026**

Comments are requested as they help in the decision-making process. Please send comments by the deadline to [**Kristy.J.Huffman@wv.gov**](mailto:Kristy.J.Huffman@wv.gov).

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGN DIRECTIVE 647
LIFE-CYCLE COSTS ANALYSIS FOR PAVEMENT DESIGN

Insert Approval Date
Supersedes September 6, 2023

This Design Directive (DD) gives guidance for the Division of Highways' (DOH) policy on Life-Cycle Cost Analysis (LCCA) for pavements.

This DD provides a means to standardize the process required to analyze and report the pavement design Life-Cycle Costs throughout all development units of the DOH. ~~The general procedure for performing the LCCA is detailed herein.~~ References for ~~more in-depth~~ LCCA analyses resources are also given provided.

10. General

The purpose of an LCCA for a particular pavement design within a defined *pavement segment* is to evaluate the overall long-term economic efficiencies of competing design alternates. ~~Initial (construction) and discounted future (future rehabilitations, user, etc.) costs over the projected life of the pavement are added together to obtain a Net Present Value (NPV) for each pavement type selected.~~ This process improves decisions concerning the utilization of limited funding for pavement in a construction project within a *pavement segment*.

WVDOH generally follows the LCCA methodologies consistent with FHWA guidance and accepted industry practices. Supporting documents include FHWA's Life-Cycle Cost Analysis in Pavement Design (FHWA-SA-98-079). Use FHWA's recommendations for LCCA input data unless local data is available. Local input data includes, but is not limited to, traffic characterization, duration of construction, and construction costs. It is important to note that only differential costs are considered between alternates in the LCCA.

The base bid quantities for grading will be for the thicker pavement section. The designer may allow a lower profile grade but hold the cross-section to avoid additional earthwork. The profile grade can be lowered by using a straight horizontal taper rate of 0.25%. This will occur at, but not be limited to, the ends of structures and at tie-ins to existing pavements. If the designer does not allow a lower profile grade, bid items for adjusting the grade must be added to the contract and included in the LCCA for that particular alternate; however, the contractor will not be permitted to raise the profile grade above that shown for the thickest pavement alternate. Costs common to each pavement alternate such as mobilization, signing/pavement marking, grading, drainage, rights-of-way, utility relocation, etc. are not included.

20. ~~Life-Cycle Cost Analysis (LCCA)~~

~~The WVDOH generally follows the LCCA methodology recommended in the FHWA Pavement Division's interim technical bulletin *Life-Cycle Cost Analysis in Pavement Design— in Search of Better Investment Decisions*, 1998. The publication number for this document is FHWA-SA-98-079 and is available electronically at isdde.dot.gov/OLPFiles/FHWA/013017.pdf~~

~~It contains standard procedures for estimating and comparing the long-term costs of asphalt and Plain Jointed Portland Cement Concrete (PCC) pavements over an analysis period under specified traffic and environmental conditions. The WVDOT uses an analysis period of at least 40 years for both the asphalt and PCC pavements. See DD-641, *Pavement Type Selection Guide*, for more information regarding pavement type selection parameters, and DD-646, *Pavement Design Guide*, for information concerning the design of the pavement structure itself.~~

~~The WVDOT generally follows the FHWA's recommendations for LCCA input data unless local data is available. Local input data includes, but is not limited to, traffic characterization, duration of construction, and construction costs. It is important to note that only differential costs are considered between alternates in the LCCA.~~

~~The Life Cycle Cost Analysis, if required per DD-641, will be performed on each pavement segment upon receipt of necessary soils data, existing pavement cores, and traffic data.~~

~~The base bid quantities for grading will be for the thicker pavement section. The designer may allow a lower profile grade but hold the cross section to avoid additional earthwork. The profile grade can be lowered by using a straight horizontal taper rate of 0.25%. This will occur at, but not be limited to, the ends of structures and at tie-ins to existing pavements. If the designer does not allow a lower profile grade, bid items for adjusting the grade must be added to the contract and included in the LCCA for that particular alternate; however, the contractor will not be permitted to raise the profile grade above that shown for the thickest pavement alternate. Costs common to each pavement alternate such as mobilization, signing/pavement marking, grading, drainage, rights-of-way, utility relocation, etc. are not included.~~

~~User delay costs are another important element in LCCA. Estimation of user delay costs follows the procedures in *Life Cycle Cost Analysis in Pavement Design—In Search of Better Investment Decisions*, 1998. The user delay costs considered are the differential costs between competing alternates such as work zone costs including duration, setting traffic control, resetting traffic control for construction phasing, etc. User delay costs can differ by pavement type. The designer must carefully examine all facets of the planned work to accurately estimate user delay costs. Routine maintenance is not included in this analysis.~~

~~User costs are further divided into the working day and non-working day daily user costs. In most cases, the travel capacity of a construction zone on a working day is less than the capacity on a non-working day. For the purposes of this Directive, a non-working day is any day throughout the course of construction that traffic is not impeded in any way by lane/shoulder closures. User costs associated with non-working days are excluded from the analysis.~~

~~If the LCCA is performed on an entire pavement segment and the segment is not being fully constructed in one contract, then the result of the analysis will be pro-rated using the contract length divided by the entire pavement segment length. See DD-648, *Alternate Design Alternate Bidding of Pavements*, for more information on this matter.~~

30 — Alternate Design Alternate Bid (ADAB)

~~The ADAB bid process is described in greater detail in DD-648.~~

20 40. Steps in LCCA Life-Cycle Cost Analysis Procedure

A standard procedure has been developed to perform the LCCA analysis. The project manager is responsible for the LCCA, using software that is specifically designed for use with

Life-Cycle Cost Analysis in Pavement Design—In Search of Better Investment Decisions, 1998.
The following steps are to be followed:

20.1 ~~40.1~~ Project Selection

Criteria to be used for evaluating projects for inclusion in the LCCA process are described in DD-641. Necessary soils data, existing pavement cores, and traffic data for each pavement segment are required prior to the LCCA.

20.2 ~~40.2~~ Alternative Pavement Design Strategies

~~See DD-646 for~~ The designer will develop reasonable design strategies for each alternative based on past pavement performance; that is, an initial pavement structure followed by a series of rehabilitations to cover the analysis period. selection of a Alternate design and rehabilitation strategies and for information on the pavement design and rehabilitation process itself are described in DD-646.

The analysis period shall be at least fifty (450) years. The analysis period will be the same for each alternative considered.

~~The designer will develop reasonable design strategies for each alternative based on past pavement performance; that is, an initial pavement structure followed by a series of rehabilitations to cover the analysis period. The analysis period will be the same for each alternative considered.~~

Performance periods for new pavements will be selected based on past design practices and data. WVDOT's current historical data indicated an average initial performance period of twenty (20) years for original asphalt pavements and twenty-two (22) years for original Jointed Plain Concrete Pavements (JPCP).

Rehabilitation projects are based on performance periods as described below and vary by technique and original pavement types:

- Asphalt overlays over asphalt pavements have performance periods ranging from eight (8) to twelve (12) years based on historical data.
- Concrete Pavement Restoration (CPR) techniques on concrete pavements have performance period ranging from ten (10) to fourteen (14) years based on national experience.
- Asphalt overlays on concrete pavements have performance periods ranging from six (6) to ten (10) years based on historical data.

The designer is cautioned to investigate all available historical data regarding past pavement performance, including overlays, when determining pavement rehabilitations schemes for LCCA of newly constructed pavements. This is also true when considering rehabilitation schemes for existing pavements. The Pavement Management Systems Section of Operations Division is to be consulted for guidance.

20.3 ~~40.3~~ Estimate Agency Initial Cost

Initial ~~agency~~ costs of the pavement ~~section~~ segment are the construction costs incurred by the WVDOT. These are official estimates prepared by the Division's designer or project manager. See the latest issue of DD-707, Development of Engineer's Estimate, for more information regarding the development of the official cost estimate.

~~Future agency costs are the costs incurred by the WVDOT to overlay,~~

~~rehabilitate, or reconstruct the roadway in the 40 year (or longer) analysis period specified. All of these future costs must be considered in the LCCA for each pavement type considered for use.~~

20.4 ~~40.4 Estimate User Costs~~

~~User costs are estimated according to the recommendations made in *Life Cycle Cost Analysis in Pavement Design—In Search of Better Investment Decisions*, 1998. are the differential costs between competing alternates such as work zone costs including duration, setting traffic control, resetting traffic control for construction phasing, etc. User delay costs can differ by pavement type. The designer must carefully examine all facets of the planned work to accurately estimate user delay costs. Routine maintenance is not included in this analysis. As stated above, only work zone user costs are estimated in the LCCA process. Estimation of user costs requires three steps: calculate the appropriate daily user costs, determine the duration of the construction activities and apply the daily user costs to the expected duration of the construction.~~

~~The initial and future user costs are not normally included in calculating the Net Present Value (NPV) or Life-Cycle Cost factors because most projects are on new alignments, and traffic is not impeded during construction. This factor may be used if project specific information is available. Data used for computation of LCCA user delay costs will be obtained from the Traffic Engineering Division and the Planning Division. The designer will be responsible for compiling all the required information from these sources and running the aforementioned program.~~

20.5 Future Activity Costs

Future costs are all costs incurred by the WVDOT to overlay, rehabilitate, or reconstruct the roadway during the specified analysis period. These future costs shall be in conjunction with the rehabilitation schemes decided in section 20.2 of this DD.

Data used for computation of LCCA future activity costs will be obtained from the MCS&T Division and Operations Division.

20.6 Discount Rate

Once all costs and their timing have been developed, all future costs must be discounted to the year of initial construction (the base year) and added to the initial cost to determine the NPV for each LCCA alternate. Using the discount rate allows the designer to use today's dollars in the LCCA. The higher the discount rate, the lower the present value of future cash flows.

The discount rate to be utilized in all LCCA's will be the average of the five (5) most recent effective thirty (30) year value of *real treasury interest rates or treasury notes and bonds of specified maturities* as given in the United States' Office of Management and Budget's *Circular A-94, Appendix C*. Averaging five (5) interest rates reduces the impacts of short-term volatility and creates a more stable, reliable valuation. A table summarizing the history of and giving the latest years' rate can be found on the current United States Office of Management and Budget website.

20.7 ~~40.5 Compute~~ Net Present Value (NPV)

~~In the broadest sense, LCCA is a form of economic analysis used to evaluate the~~

~~long-term economic efficiency between investment options; therefore, the NPV of cash flow is calculated.~~

~~Economic analysis focuses on the relationships between costs, timings of costs, and discount rates employed. Once all costs and their timings have been developed, future costs must be discounted to the year of initial construction (the “base year”) and added to the initial cost (the construction estimate cost) to determine the NPV for each LCCA alternate. Again, more information on the calculation and use of NPV is available in *Life-Cycle Cost Analysis in Pavement Design*, 1998. The designer is encouraged to consult this publication. Software designed from this publication will be used to determine the NPV of all cash flows.~~

The Net Present Value (NPV) (Initial Cost + Future Activity Cost + User Cost) of all alternates are to be compared. Refer to section 20.4 for information regarding including user cost in the LCCA’s NPV.

Once completed, all ~~LCCA’s~~LCCAs ~~should~~ may be subjected to a sensitivity analysis. Sensitivity analysis is a technique used to determine the influence of major LCCA inputs, assumptions, projections, and estimates on the various LCCA results. In a sensitivity analysis, major input values are varied over a reasonable range of values, while all of the other variables remain constant. The input variables may then be ranked according to their effect on the results. This allows the designer to subjectively get a feel for the impact of the variability of individual inputs on overall LCCA results.

~~Sensitivity analyses, at a minimum, evaluate the influence of the discount rate on LCCA results. The discount rate accounts for the time value of money. It takes into account fluctuations in the inflation and interest rates to show the actual rate of increase in the value of money over time. Using the discount rate allows the designer to use today’s dollars in the LCCA. The higher the discount rate, the lower the present value of future cash flows. The discount rate to be utilized in all LCCA’s will be the latest effective 30-year value of *real treasury interest rates or treasury notes and bonds of specified maturities as given in the United States’ Office of Management and Budget’s Circular A-94*, Appendix C. A table summarizing the past history of and giving the latest years’ rate is available at <http://www.whitehouse.gov/omb/circulars/a094/dischist.pdf>.~~

~~If the designer finds that any LCCA is sensitive to a particular input, then the designer is to perform LCCA’s utilizing a reasonable range of that input, and submit these results to the Chief Engineer of Development in the package required by DD-641.~~

5030. Comments Life-Cycle Cost Factor (LCC)

The Life-Cycle Cost (LCC) Factor (Future Activities Cost + User Cost) shall be used in WVDOT Special Provision 103-Award and Execution of Contract in accordance with DD-648.

Prepared annually by the MCS&T Pavement Analysis and Evaluation Section, the WVDOT LCCA Report outlines the LCCA process, in accordance with this DD, used to determine the LCC Factor. Following review and approval by the Standards and Manuals Committee, revised reports are published on the WVDOT Publications (Design Directive) webpage.

5131. Comments

As projects utilizing LCCA are *let to construction*, their associated unit bid prices will be monitored to determine any trends in costs. Also, salvage values will not be considered in the LCCA’s.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

DESIGN DIRECTIVE 648
ALTERNATE DESIGN AND ALTERNATE BIDDING OF PAVEMENTS

Insert Approval Date
Supersedes September 6, 2023

This Design Directive (DD) gives guidance on the West Virginia Division of Highways' (WVDOH) policy on *alternate design and alternate bidding* (ADAB) of pavements.

Use of this DD provides a means to standardize the process required to utilize ADAB for pavements throughout all development units of the DOH; however, this DD does not detail the procedure for designing pavements and performing life-cycle cost analyses (LCCA), but references to publications written in detail concerning these subjects are given for the *designer's* use.

10. General

The objective of the ADAB process is to promote more cost-effective usage of highway construction funds. This is achieved by allowing contractors to select the *pavement type* constructed through the bidding process; consequently, increasing competition as well as making that competition more equitable. The Federal Highway Administration's (FHWA) Technical Advisory: "Use of Alternate Bidding for Pavement Type Selection, T 5040.39 December 20, 2012 can be accessed at: <https://www.fhwa.dot.gov/pavement/t504039.cfm>. Memorandum: Clarification of FHWA Policy for Bidding Alternate Pavement Type on the National Highway System, November 13, 2008, can be accessed at: <http://www.fhwa.dot.gov/pavement/081113.cfm>.

The ADAB process requires the WVDOH to consider future roadway rehabilitation, traffic control associated with that rehabilitation, and user delay costs. The process utilizes traditional *life-cycle cost analysis* (LCCA) concepts to model the cost of pavement section alternatives over a selected performance-analysis period. ~~The selection process is then accomplished through an ADAB procedure, which essentially allows the bidder with the lowest life cycle costs (LCC) to determine which pavement type will be constructed. See DD-647, Life Cycle Cost Analysis of Pavements, for more information concerning LCCA.~~

~~The C factor utilized in the ADAB process is established in accordance with DD-647 and the current approved WVDOH LCCA Report.~~

To accomplish the ADAB process, ~~the "A + B + C" bidding method is utilized for all bids submitted. Factor "A" is the contractor's bid, factor "B" is the time in days to construct the initial pavement, and factor "C" is the net present value (NPV) of all future rehabilitation costs, plus the NPV of present and future user costs for the pavement's analysis period. The lowest bidder is identified by adding "A + C".~~

~~The time factor "B" is not normally added to the contractor's bid. This factor may be used on projects that consist of total pavement reconstruction in order to capture the user costs associated with the initial construction. This time factor is usually zero (0) because most projects are on new alignments, and traffic is not impeded during the initial construction of a project.~~

~~If a particular project is not approved by the Chief Engineer of Development or the FHWA's Special Experimental Projects No. 14—Alternative Contracting (SEP-14) for the ADAB~~

~~process, then the designer is to consider the following to recommend a pavement type only for approval:~~

- The LCCA Report, as described in DD-647
- Secondary factors as described in DD-641, *Pavement Type Selection Guide, Section 40*
- ~~Sound~~ Engineering judgment

In a contract in which the pavement is bid by the ADAB procedure, both the *asphalt* and the *Jointed plain concrete* pavements shall be bid as a *pavement system* in square yards (sy). The *pavement system* is the entire pavement section, including *fine grading, sub-grade, base and pavements*. pavements, free draining base, fabric for separation, and subgrade. This approach allows an equal bidding process. Special Provision 695-*Mainline Pavement* is used to bid these systems.

Note: The contract documents will include price adjustment factors for fuel, asphalt, and cement.

~~If the ADAB process is approved on any particular project, the designer may be required to submit a request to the FHWA headquarters, through the local office, to approve the use of ADAB on a project by project basis under the FHWA's SEP 14.~~

~~The following FHWA website contains additional information concerning SEP 14 submittals: www.fhwa.dot.gov/programadmin/contracts/sep_a.cfm~~

~~20. Criteria for Selection of Projects for the ADAB Procedure~~

~~Section 30 of DD-641 describes the criteria to be followed for selection of projects that will use the ADAB procedure for bidding of alternate pavement types.~~

~~30. Alternate Design and Alternate Bid (ADAB)~~

~~The ADAB bid model is accomplished by adding a factor "C" to each contractor's base bid factor "A". Factor "C" represents future rehabilitation and user delay costs for a particular pavement alternate. The implementation of ADAB, in general, may result in comparing multiple competing pavement structures with differing total thicknesses between the top of the sub-grade and the final pavement surface. A threshold of 20 percent in the difference of the NPV of the LCCA is a reasonable zone within which pavement types can compete.~~

~~In a contract in which the pavement is bid by the ADAB procedure, both the *asphalt* and the *Jointed plain concrete* pavements shall be bid as a *pavement system* in square yards (sy). The *pavement system* is the entire pavement section, including *fine grading, sub-grade, base and pavements*. This approach allows an equal bidding process.~~

~~The life-cycle cost adjustment factor "C" is derived from the WYDOH LCCA report in accordance with DD-647.~~

~~**Note: The contract documents will include price adjustment factors for fuel, asphalt, and cement.**~~

~~20. 40. Steps in ADAB~~

~~A standard procedure has been developed to perform the ADAB analysis. This procedure has the following steps.~~

~~20.1 40.1 Project Selection~~

~~Criteria to be used for evaluating projects for inclusion in the ADAB process are described in DD-641, as mentioned in "Section 20" above.~~

~~40.2 Alternative Pavement Design Strategies~~

~~Refer to DD-641 for selection of alternate design strategies for the chosen analysis period, and DD-646, *Pavement Design Guide* for information regarding the pavement design process.~~

~~40.3 Estimate Agency Costs~~

~~Initial agency costs are the construction costs incurred by the WVDOT. These are official estimates prepared by the Division's *designer or project manager*. See the latest issue of DD-707, *Development of Engineer's Estimate*, for more information regarding the development of the official cost estimate.~~

~~Future agency costs are the costs incurred by the WVDOT to overlay, rehabilitate, or reconstruct the roadway in the 40 fifty (year (or longer) *analysis period* specified. All of these future costs must be considered in the LCCA for each pavement type considered for use.~~

~~40.4 Estimate User Delay Costs~~

~~See DD-647 for more information concerning computation of user delay costs.~~

~~20.2~~ **40.5 Compute Net Present Value (NPV)**

The NPV for each alternative is calculated by multiplying the number of lane miles by the Life-Cycle Cost (LCC) factor and adding this to the initial cost. The LCC factor is the net present value of all future costs, in cost per lane mile. Refer to the MCS&T Publications (Design Directives) webpage for the current LCC factors within the approved LCCA Report, which follows DD-647.

$$\text{NPV} = \text{Initial Cost} + (\text{Total Lane Miles} \times \text{Life-Cycle Cost Factor})$$

- Refer to If the LCC factors are essentially equal (1% or less difference) for all the paving alternates, then the factors do not need to be added into the contractor's bid when comparing NPV.
- If the LCCA is performed on an entire pavement segment and the segment is not being fully constructed in one contract, then the LCC factors will be pro-rated using the project length divided by the entire pavement segment length.

A threshold of 20 percent in the difference of the NPV of the LCCA is a reasonable zone within which pavement types can compete. If the difference in the total NPV between the alternatives is greater than twenty (20) percent, the alternate with the lower NPV is only selected for bidding. The designer shall eliminate any pavement alternate that is considered, in the designer's judgement, to be impracticable for the project. Otherwise, alternate pavement designs will be included in the bidding documents, and the ~~Life-Cycle Cost Adjustment~~ LCC F factor will be included in the schedule of prices for each alternate.

~~40.6 Analyze Results And Calculate Life-Cycle Cost Adjustment Factor~~ ~~"C" Adjusted Contract Bid~~

~~After the total NPV for each alternate is computed, the results are then compared. If the difference in the total NPV between the lowest two alternates is greater than twenty~~

~~(20) percent, the alternate with the lower total NPV only is selected for bidding. The designer shall eliminate any pavement alternate that is considered, in the designer's judgment, to be impracticable for the project. Otherwise, alternate pavement designs will be included in the bidding documents and a *life-cycle cost* adjustment factor "C" will be included in the *schedule of prices* for each alternate.~~

~~The *life-cycle cost adjustment* factor, "C", is calculated as $C = \text{total NPV of the LCCA} - \text{construction cost}$. The C factor is established in accordance with DD-647 and the current approved WVDOT LCCA report. As part of the ADAB process, this "C" factor will be added to the contractors' bid. The lowest bidder identified by adding the "C" factor to the contractors' base bid "A" factor; thus, the lowest total is then selected.~~

~~If the LCCA is performed on an entire *pavement segment* and the *segment* is not being fully constructed in one contract, then the "C" factor will be pro-rated using the project length divided by the entire *pavement segment* length.~~

~~If the "C" factors are essentially equal (1% or less of the lowest cost initial *pavement section*) for all of the paving alternates considered, then "C" factors do not need to be added to the contractor's bids in order to determine the low bid.~~

~~Refer to "Section 30" of this DD for information on the handling of multiple pavement types in both the LCCA and bidding processes.~~

~~The adjusted contract bid shall be calculated in accordance to Special Provision 103-Award and Execution of Contract. The resulting lowest adjusted contract bidder shall be selected.~~

50 30. Comments

As Projects utilizing LCCA are *let* to construction, their associated unit bid prices are monitored to determine any trends in costs. ~~Also, s~~Salvage values are not to be considered in the LCCA's.

DRAFT

Life Cycle Cost Analysis 2025

July 23, 2025

Revised: March 18, 2026

Developed By:

Pavement Analysis and Evaluation Section
Materials Control, Soils & Testing Division
West Virginia Division of Highways

1.0. Introduction

In an effort to encourage pavement competition in West Virginia, the Division of Highways (DOH) has elected to use the Alternate Design Alternate Bid (ADAB) process as outlined in Design Directive (DD) 648 (December 2024) to assist with non-project specific cost evaluation. The Design Directives can be found online on the Materials Division's website at the following link:

<https://transportation.wv.gov/highways/mcst/Pages/specifications.aspx>

2.0. Alternate Design Alternate Bid of Pavements

As discussed in DD 648, the ADAB process uses the $A + B + C$ method. Factor A is the contractor's bid on the Letting day. Factor B is the number of days to construct the initial pavement and is not normally added to the contractor's bid. Factor B may be used on projects that consist of total pavement reconstruction in order to capture the user costs associated with the initial construction. This time factor is usually zero (0) because most projects are on new alignments, and traffic is not impeded during the initial construction of a project. Factor C is the Net Present Value (NPV) of all future maintenance and rehabilitation costs, known as the Life Cycle Cost Factor (C Factor). The lowest bidder is identified by adding $A+C$.

The C factor is governed by our DD 647. Each different pavement type and maintenance program is used to calculate a different C factor for the specific pavement and maintenance program to be used. For this general Life Cycle Cost Analysis, two pavement types were considered, full depth asphalt and plain jointed concrete pavement. Two scenarios of asphalt maintenance and rehabilitation were considered, and one scenario for the Portland cement concrete (PCC) pavement.

3.0. Life Cycle Cost Analysis

To determine the performance-based cost of a general section of roadway all maintenance, rehabilitation, and preservation work done during the expected life of the roadway must be considered in addition to the initial cost of construction. In accordance with WV DD-647, this process was done using WV DOH historical project costs and FHWA's RealCost 3.0 software.

3.1. Initial Costs

When using RealCost, the software must include an initial cost of construction. The contractor's bid amount is entered as zero since the goal is calculation of future costs.

3.2. Net Present Values

Preservation, maintenance, and rehabilitation costs were established as inputs for the life-cycle cost analysis. For concrete preservation, concrete pavement repair (CPR) projects were analyzed. Outlier projects, projects under 1 mile in length and projects dated less than 2015 were removed from calculating the average cost. It was established that a value of \$321,000 per lane-mile would be used.

The same process was also followed for micro surfacing, ultra thin overlay and high performance thin overlays (asphalt preservation) projects and mill and fill projects (rehabilitation). The resulting values established were \$87,000 per lane-mile for asphalt preservation and \$228,000 per lane-mile for 2" mill and fill, and \$398,000 per lane-mile for 4" mill and fill. The timing for these treatments is based on data, experience, and discussions with the districts and Industry.

It was also established that a routine maintenance cost of \$15,000 per lane-mile on a 4-year cycle be used on asphalt and \$30,000 per lane-mile on an 8-year cycle for concrete to account for maintenance-type work (e.g. crack sealing, minor patching, etc.).

Additional inputs for the LCCA include:

1. Using a 50-year analysis life. DD-648 requires at least 40 years, previous LCCA calculations for the WV DOH have used 50 years.
2. A discount rate of 1.4%. The Office of Management and Budget Circular A-94 was revised in 2024. The document states that programs with durations longer than 30 years may use the 30-year interest rate. Due to previous discount rates being negative, a five-year rolling average was used instead. A copy of OMB Circular A-94 as well as the discount rates of previous years can be found in Attachment 4.

The preservation, maintenance, and rehabilitation costs used to establish the inputs for the life-cycle cost analysis are listed in Attachment 1. All of this information was entered into the RealCost 3.0 software for analysis. Inputs for each pavement and maintenance type can be seen in Attachment 2. The calculations and results of the life-cycle cost analysis can also be found in Attachment 3. After the analysis, the recommended C factors are:

Table 3.1

Calculated C Factors (Rounded)

Activity	Life Cycle Cost Factor (per lane mile)
Asphalt with Preservation	\$608,000
Concrete with CPR	\$515,000
Asphalt with Mill and Fill	\$716,000

4.0. Conclusion

As this analysis is not project specific, no pavement and maintenance type will be recommended. Per DD 648, if the difference in the total NPV between the lowest two alternates is greater than 20 percent, the alternate with the lower total NPV only is selected for bidding. The designer shall eliminate any pavement alternate that is considered, in the designer's judgment, to be impracticable for the project. Otherwise, alternate pavement designs will be included in the bidding documents and a life-cycle cost adjustment factor "C" will be included in the schedule of prices for each alternate.

DRAFT

Attachments:

1. WV DOH Historical Project Costs
2. RealCost 3.0 Inputs
3. Calculated C Factors
4. OMB Circular No. A-94 and Discount Rates

DRAFT

Attachment 1:

WV DOH Historical Project Costs

Preservation									Average: \$87,000	
Proj Key	Name	Project ID	Length	Lanes	Lane Miles	Treatment	Bid Cost	Bid Cost / LM		
2015001610	ALT 10 - CEDAR CREST	1536312	1.75	2	3.5	CapeUltra-Thin	\$217,129.29	\$62,036.94		
2016001226	CHEAT RD MICROSEAL	1635436	2.19	2	4.38	CapeUltra-Thin	\$259,801.88	\$59,315.50		
2016001218	FLEMINGTON ROAD	1635428	1.5	2	3	CapeUltra-Thin	\$218,824.93	\$72,941.64		
2015001400	MELISSA - BARBOURSVILLE	1531412R1	2.56	2	5.12	CapeUltra-Thin	\$447,746.68	\$87,450.52		
2017000021	NEW HILL RD	1700526	2.11	2	4.22	CapeUltra-Thin	\$328,563.96	\$77,858.76		
2016001221	ROMINES MILL RD - WV 20 MICROSURFACE	1635431	4.65	2	9.3	CapeUltra-Thin	\$798,587.37	\$85,869.61		
2017000020	ROWLESBURG - KINGWOOD RD	1700525	4	2	8	CapeUltra-Thin	\$542,489.00	\$67,811.13		
2015001602	SALT ROCK - SMITH CREEK	1536306R1	2.13	2	4.26	CapeUltra-Thin	\$344,823.55	\$80,944.50		
2016001220	SHINNSTON - ENTERPRISE ROAD	1635430R1	3.05	2	6.1	CapeUltra-Thin	\$442,340.65	\$72,514.86		
2015001398	WAYNE COUNTY LINE - WV 10	1531408	4.36	2	8.72	CapeUltra-Thin	\$501,699.79	\$57,534.38		
2015001449	CSX O/P BR - MILTON	1532343	5.04	4	20.16	HPTO	\$1,950,543.22	\$96,753.14		
2015001437	FIFTH STREET - HAL GREER	1532331	2.26	4	9.04	HPTO	\$1,020,058.22	\$112,838.30		
2015001438	KY STATE LINE - KENOVA	1532332	1.15	4	4.6	HPTO	\$609,982.04	\$132,604.79		
2017000037	31ST STREET	1700530	2.71	4	10.84	Micro Surface (Double)	\$1,220,221.90	\$112,566.60		
2019000089	BIRCH RIVER - BRAXTON CO	2019000089	3.07	4	12.28	Micro Surface (Double)	\$1,256,081.51	\$102,286.77		
2018000249	BRADLEY - MT HOPE RD + 1	1804526	3.42	4	13.68	Micro Surface (Double)	\$953,222.53	\$69,680.01		
2016001227	BRIDGEPORT - BRUSHYFORK	1635437	1.46	2	2.92	Micro Surface (Double)	\$224,800.09	\$76,986.33		
2018000217	CLINTONVILLE - ALTA RD	1803827	3	4	12	Micro Surface (Double)	\$581,670.03	\$48,472.50		
2018000252	DEERWALK - SAND HILL	1804529	5.13	4	20.52	Micro Surface (Double)	\$1,396,468.98	\$68,054.04		
2023280030	GOODWINS CHAPEL - VA STATE LINE	2023280030	7.15	4	28.6	Micro Surface (Double)	\$2,937,628.00	\$102,714.27		
2015001445	I 70, DALLAS PIKE MICROSURFACING	1532339	2.98	4	11.92	Micro Surface (Double)	\$886,669.81	\$74,385.05		
2017000086	MARRTOWN - 7TH ST. RESURFACING	1701827R1	3.16	4	12.64	Micro Surface (Double)	\$1,596,385.36	\$126,296.31		
2017000217	MINERAL WELLS - STAUNTON RESURFACING	1703733R1	3.22	4	12.88	Micro Surface (Double)	\$1,086,392.44	\$84,347.24		
2018000817	MINGO CO LINE - HOLDEN	1818427R1	2.78	4	11.12	Micro Surface (Double)	\$1,391,045.98	\$125,094.06		
2018000216	N. MARTINSBURG - SPRING MILLS	1803826R1	3.3	4	13.2	Micro Surface (Double)	\$989,987.02	\$74,999.02		
2020000524	PEACH TREE ORCHARD - MUDDLETY	2020000524R1	1.93	4	7.72	Micro Surface (Double)	\$1,037,394.90	\$134,377.58		
2020000513	SAM BLACK - RUSTY BRIDGE	2020000513	2.45	4	9.8	Micro Surface (Double)	\$1,294,462.79	\$132,088.04		
2020000483	STONE GAP-COURTHOUSE RD	2020000483	4.71	4	18.84	Micro Surface (Double)	\$1,868,898.24	\$99,198.42		
2019000088	US 52 - MERCER MALL RD + 3	2019000088	3.15	4	12.6	Micro Surface (Double)	\$1,098,300.15	\$87,166.68		
2018000184	VIRGINIA LINE - US 52	1803728	2.9	4	11.6	Micro Surface (Double)	\$1,062,817.30	\$91,622.18		
2016001212	3RD AVENUE	1634725R2	1.61	3	4.83	Ultra-Thin	\$587,949.89	\$121,728.76		
2017000042	ADAMS AVENUE	1700535	1.07	4	4.28	Ultra-Thin	\$319,986.25	\$74,763.14		
2017000040	CEREDO - KENOVA	1700533	2.94	3	8.82	Ultra-Thin	\$1,160,167.40	\$131,538.25		

Proj Key	Name	Project ID	Length	Lanes	Lane Miles	Treatment	Bid Cost	Bid Cost / LM
2015001427	CHAPMANVILLE - BOONE COUNTY LINE	1532227	2.86	4	11.44	Ultra-Thin	\$1,627,229.72	\$142,240.36
2016000006	CHAPMANVILLE - STRIKER FORK	1536317	2.3	2	4.6	Ultra-Thin	\$373,595.23	\$81,216.35
2015001532	ELKVIEW - WALGROVE	1534124	2.9	2	5.8	Ultra-Thin	\$261,735.78	\$45,126.86
2015001428	ESTEP - TURTLETOWN	1532228	2.85	4	11.4	Ultra-Thin	\$1,345,346.01	\$118,012.81
2015001415	FOUNTAIN PLACE - LOGAN	1532113	2.27	4	9.08	Ultra-Thin	\$589,537.40	\$64,927.03
2015001443	I 470, BETHLEHEM MICROSURFACING	1532337	2.82	4	11.28	Ultra-Thin	\$816,183.00	\$72,356.65
2015001444	I 70, MIDDLE CREEK MICROSURFACING	1532338R1	5.68	4	22.72	Ultra-Thin	\$1,296,366.69	\$57,058.39
2015001533	KELLYS CREEK - SISSONVILLE	1534123	3.65	2	7.3	Ultra-Thin	\$273,938.41	\$37,525.81
2015001516	KOPPERSTON - BOLT ROAD	1526008	5.75	2	11.5	Ultra-Thin	\$924,453.76	\$80,387.28
2015000798	MCCAULEY - SINKS/MICROSURFACE	1508308	3.42	4	13.68	Ultra-Thin	\$909,153.68	\$66,458.60
2020000063	OHIO RIVER-MARRTOWN	2020000063	4.34	4	17.36	Ultra-Thin	\$2,262,959.00	\$130,354.78
2015001529	RED HOUSE HILL	1534104R1	3.18	2	6.36	Ultra-Thin	\$234,986.29	\$36,947.53
2019000094	SAULSBURY - MINERAL WELLS	2019000094	4.53	4	18.12	Ultra-Thin	\$1,400,046.90	\$77,265.28
2015001439	STAUNTON AVENUE - 7TH STREET RESURFACING	1532333R1	2.14	4	8.56	Ultra-Thin	\$920,200.80	\$107,500.09
2015001495	WALLBACK - LEFT HAND RESURFACING	1533408R2	8.35	2	16.7	Ultra-Thin	\$591,992.36	\$35,448.64

2" PWL

Average: \$228,000

Proj Key	Name	Project ID	Length	Lanes	Lane Miles	Treatment	Bid Cost	Bid Cost / LM
2015001431	ARNOLD CREEK - SMITHBURG	1532325	4.08	4	16.32	PWL/ThinOverlay	\$2,092,626.96	\$128,224.69
2020000544	BEAR RUN-ELLENBORO	2020000544	5.31	4	21.24	PWL/ThinOverlay	\$5,764,599.35	\$271,402.98
2015001426	CANEY - CHAPMANVILLE	1532226	2.61	4	10.44	PWL/ThinOverlay	\$3,171,569.41	\$303,790.17
2020000822	CHARLES TOWN - HALLTOWN	2020000822	2.35	4	9.4	PWL/ThinOverlay	\$1,264,873.35	\$134,560.99
2015000338	CRAWLEY CRK - CANEY BRANCH	1509202	3.44	4	13.76	PWL/ThinOverlay	\$3,599,425.95	\$261,586.19
2017000085	DALLISON - DEER WALK	1701826	1.83	4	7.32	PWL/ThinOverlay	\$1,099,950.60	\$150,266.48
2019000285	EAST PARK - EAST FAIRMONT	2019000285	2.09	4	8.36	PWL/ThinOverlay	\$2,112,403.63	\$252,679.86
2020000459	ELLENBORO-PENNSBORO	2020000459	3.21	4	12.84	PWL/ThinOverlay	\$3,486,086.00	\$271,502.02
2017000485	ELM GROVE - TRIADELPHIA	1705903R1	2.42	3	7.26	PWL/ThinOverlay	\$1,540,288.15	\$212,160.90
2017001522	GLEN DALE RESURFACING	1731832	1.63	2	3.26	PWL/ThinOverlay	\$950,419.68	\$291,539.78
2015001440	GOSHEN RD - UFFINGTON BRIDGE	1532334R1	3.73	4	14.92	PWL/ThinOverlay	\$2,593,587.43	\$173,832.94
2020000051	GRAND CENTRAL AVE	2020000051	2.99	4	11.96	PWL/ThinOverlay	\$2,898,089.60	\$242,315.18
2020000062	GREENWOOD-ARNOLDS RUN	2020000062	4.37	4	17.48	PWL/ThinOverlay	\$3,388,543.62	\$193,852.61
2020000515	HART'S RUN - TUCKAHOE	2020000515	1.59	4	6.36	PWL/ThinOverlay	\$2,428,649.43	\$381,863.12
2017000088	HOOKERSVILLE - POWELL MTN. ROAD	1701829	4.21	4	16.84	PWL/ThinOverlay	\$3,779,588.67	\$224,441.13
2012001472	INTERSTATE 81/RESURFACING	1234711R1	3.7	4	14.8	PWL/ThinOverlay	\$2,440,384.08	\$164,890.82
2020000473	INWOOD - TABLERS STATION	2020000473	2.67	4	10.68	PWL/ThinOverlay	\$2,420,372.44	\$226,626.63
2020000542	JACKSON CO LI-ROCKPORT	2020000542	3.38	4	13.52	PWL/ThinOverlay	\$2,510,212.85	\$185,666.63
2017000087	LEWISBURG ROAD	1701828	2.44	4	9.76	PWL/ThinOverlay	\$2,346,833.62	\$240,454.26
2015001441	LOST CREEK - QUIET DELL	1532335	4.49	4	17.96	PWL/ThinOverlay	\$2,587,823.41	\$144,088.16
2019000096	LUXEMBURG RD-BAKER	2019000096R1	5	4	20	PWL/ThinOverlay	\$3,979,853.70	\$198,992.69
2015001436	MARYLAND ROAD	1532330	2.03	5	10.15	PWL/ThinOverlay	\$1,384,566.99	\$136,410.54
2020000059	MILLER RDG MEADOW RIVER	2020000059	2.93	4	11.72	PWL/ThinOverlay	\$3,238,020.46	\$276,281.61
2020000134	N RIVER RDLUXEMBURG	2020000134	3.04	4	12.16	PWL/ThinOverlay	\$1,941,553.42	\$159,667.22
2017000209	OAKWOOD RD. - WV 61	1703725	1.24	4	4.96	PWL/ThinOverlay	\$1,875,995.73	\$378,224.95
2015000339	PARKERSBURG - DRY RUN	1509201	2.01	4	8.04	PWL/ThinOverlay	\$1,588,011.50	\$197,513.87
2020000539	PENNSBORO-GREENWOOD	2020000539	3.12	4	12.48	PWL/ThinOverlay	\$2,424,438.03	\$194,265.87
2019001270	RABBIT HILL-CROSS CREEK RD	2019001270	1.35	4	5.4	PWL/ThinOverlay	\$1,336,843.69	\$247,563.65
2020000488	REST AREA - INWOOD	2020000488R1	2.78	4	11.12	PWL/ThinOverlay	\$2,682,766.31	\$241,255.96
2015000320	ROCKPORT - SAULSBURY RESURFACING	1508402	4.77	4	19.08	PWL/ThinOverlay	\$2,780,002.20	\$145,702.42

Proj Key	Name	Project ID	Length	Lanes	Lane Miles	Treatment	Bid Cost	Bid Cost / LM
2015001447	SAM BLACK CHURCH - CLINTONVILLE	1532341	2.46	4	9.84	PWL/ThinOverlay	\$2,438,096.58	\$247,774.04
2019000091	SINKS BRIDGE-WARDENSVILLE	2019000091R1	1.98	4	7.92	PWL/ThinOverlay	\$1,504,878.00	\$190,009.85
1611810	TEAYS VALLEY - CROSS LANES	1611810R1	9.11	2	18.22	PWL/ThinOverlay	\$4,356,957.27	\$239,130.48
2015000260	TUPPERS CRK - FAIRPLAIN	1507851	10.76	4	43.04	PWL/ThinOverlay	\$12,070,744.66	\$280,454.10
2015000336	US 50 - WV 31	1508401	7.4	4	29.6	PWL/ThinOverlay	\$4,008,082.05	\$135,408.18
2015000925	WALLBACK - BIG OTTER	1520101	2.67	4	10.68	PWL/ThinOverlay	\$2,472,031.51	\$231,463.62
2015001442	WINCHESTER AVE - KING ST	1532336	1	6	6	PWL/ThinOverlay	\$614,947.53	\$102,491.26
2020000087	WOLF SUMMIT - ADAMSTON ROAD	2007000	6.38	4	25.52	PWL/ThinOverlay	\$7,029,318.70	\$275,443.52
2019000087	WSS - VIRGINIA LINE	2019000087	2.42	4	9.68	PWL/ThinOverlay	\$3,795,380.71	\$392,084.78
2023340022	YOUNGS MONUMENT-BIRCH RIVER ROAD	2023340022	4.87	5	24.35	PWL/ThinOverlay	\$9,478,437.59	\$389,258.22

4" PWL		Average: \$398,000						
Proj Key	Name	Project ID	Length	Lanes	Lane Miles	Treatment	Bid Cost	Bid Cost / LM
2019000093	BURNSVILLE - WESTON RD	2019000093	3.55	4	14.2	PWL/ThickOverlay	\$4,660,390.05	\$328,196.48
2023430009	WOOD COUNTY - BEAR RUN	2023430009	8.04	4	32.16	PWL/ThickOverlay	\$14,984,984.00	\$465,951.00

CPR								Average: \$321,000	
Proj Key	Name	Project ID	Length	Lanes	Lane Miles	Treatment	Bid Cost	Bid Cost / LM	
2017000944	MT PLEASANT ESTATES REHABILITATION	1722608	1.11	2	2.22	CPR	\$848,800.80	\$382,342.70	
2017000225	AIRPORT RD - GLADE CREEK BR	1703830R1	5.49	5	27.45	CPR	\$4,179,798.86	\$152,269.54	
2019000092	BRAGG - SANDSTONE RD	2019000092	4.87	5	24.35	CPR	\$3,087,499.65	\$126,796.70	
2020000448	DAVIS CR-OAKWOOD	2020000448	2.24	4	8.96	CPR	\$6,275,600.35	\$700,401.82	
2017001666	HARMON CREEK - PENNSYLVANIA STATE LINE	2017001666	2.71	4	10.84	CPR	\$5,422,568.47	\$500,236.94	
2019001341	I-77-AIRPORT RD	2019001341	4.1	4	16.4	CPR	\$5,382,600.00	\$328,207.32	
2017001423	MONONGALIA BLVD - STEWARTSTOWN RD	1729232	2.76	4	11.04	CPR	\$4,402,943.68	\$398,817.36	
2015000711	WEIRTON - HARMON CREEK	1505802	1.96	4	7.84	CPR	\$2,774,021.93	\$353,829.33	
2021000027	GREEN SULPHUR - DAWSON	2021000027	6	5	30	CPR	\$4,736,400.00	\$157,880.00	
2015001432	BUCKHANNON - ELKINS ROAD	1532326	4.52	4	18.08	CPR	\$1,915,080.51	\$105,922.59	

DRAFT

Attachment 2:

RealCost 3.0 Inputs

INPUT WORKSHEET

1. Economic Variables

Description	Value
Value of Time for Passenger Cars (\$/hour)	
Value of Time for Single Unit Trucks (\$/hour)	
Value of Time for Combination Trucks (\$/hour)	

2. Analysis Options

Description	Value
Include User Costs in Analysis	No
Include User Cost Remaining Life Value	No
Use Differential User Costs	No
User Cost Computation Method	Calculated
Include Agency Cost Remaining Life Value	No
Traffic Direction	Both
Analysis Period (Years)	50
Beginning of Analysis Period	2026
Discount Rate (%)	1.4
Number of Alternatives	3

3. Project Details

Description	Value
State Route	
Project Name	2025 Life Cycle Cost
Region	
County	
Analyzed By	Kiana Welch
Mileposts	NA
Begin	
End	
Length of Project (miles)	0
Comments	

4. Traffic Data

Description	Value
AADT Construction Year (total for both directions)	
Cars as Percentage of AADT (%)	100
Single Unit Trucks as Percentage of AADT (%)	
Combination Trucks as Percentage of AADT (%)	
Annual Growth Rate of Traffic (%)	
Speed Limit Under Normal Operating Conditions (mph)	
No of Lanes in Each Direction During Normal Conditions	
Free Flow Capacity (vphpl)	
Rural or Urban Hourly Traffic Distribution	
Queue Dissipation Capacity (vphpl)	
Maximum AADT (total for both directions)	
Maximum Queue Length (miles)	

5. Construction

Description	Value
Alternative 1	Asphalt w/Preservation & Mill&Fill
Number of Activities	6

Description	Value
Activity 1	HMA New Construction
Agency Construction Cost (\$1000)	0
User Work Zone Costs (\$1000)	
Work Zone Duration (days)	120
No of Lanes Open in Each Direction During Work Zone	1
Activity Service Life (years)	10
Activity Structural Life (years)	50
Maintenance Frequency (years)	4
Agency Maintenance Cost (\$1000)	15
Work Zone Length (miles)	
Work Zone Speed Limit (mph)	
Work Zone Capacity (vphpl)	
Traffic Hourly Distribution	Week Day 1

<i>Inbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)</i>	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

<i>Outbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)</i>	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Description	Value
Activity 2	Preservation (10)
Agency Construction Cost (\$1000)	87
User Work Zone Costs (\$1000)	
Work Zone Duration (days)	5
No of Lanes Open in Each Direction During Work Zone	1
Activity Service Life (years)	8
Activity Structural Life (years)	
Maintenance Frequency (years)	4
Agency Maintenance Cost (\$1000)	15
Work Zone Length (miles)	
Work Zone Speed Limit (mph)	
Work Zone Capacity (vphpl)	
Traffic Hourly Distribution	Week Day 1

<i>Inbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)</i>	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

<i>Outbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)</i>	Start	End
First period of lane closure		
Second period of lane closure		

Third period of lane closure		
------------------------------	--	--

Description	Value
Activity 3	Preservation (18)
Agency Construction Cost (\$1000)	87
User Work Zone Costs (\$1000)	
Work Zone Duration (days)	5
No of Lanes Open in Each Direction During Work Zone	1
Activity Service Life (years)	8
Activity Structural Life (years)	
Maintenance Frequency (years)	4
Agency Maintenance Cost (\$1000)	15
Work Zone Length (miles)	
Work Zone Speed Limit (mph)	
Work Zone Capacity (vphpl)	
Traffic Hourly Distribution	Week Day 1

Inbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Outbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Description	Value
Activity 4	4" Mill&Fill (26)
Agency Construction Cost (\$1000)	398
User Work Zone Costs (\$1000)	
Work Zone Duration (days)	30
No of Lanes Open in Each Direction During Work Zone	1
Activity Service Life (years)	10
Activity Structural Life (years)	
Maintenance Frequency (years)	4
Agency Maintenance Cost (\$1000)	15
Work Zone Length (miles)	
Work Zone Speed Limit (mph)	
Work Zone Capacity (vphpl)	
Traffic Hourly Distribution	Week Day 1

Inbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Outbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Description	Value
Activity 5	Preservation (36)
Agency Construction Cost (\$1000)	87
User Work Zone Costs (\$1000)	
Work Zone Duration (days)	5
No of Lanes Open in Each Direction During Work Zone	1
Activity Service Life (years)	8
Activity Structural Life (years)	
Maintenance Frequency (years)	4
Agency Maintenance Cost (\$1000)	15
Work Zone Length (miles)	
Work Zone Speed Limit (mph)	
Work Zone Capacity (vphpl)	
Traffic Hourly Distribution	Week Day 1

Inbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Outbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Description	Value
Activity 6	Preservation (44)
Agency Construction Cost (\$1000)	87
User Work Zone Costs (\$1000)	
Work Zone Duration (days)	5
No of Lanes Open in Each Direction During Work Zone	1
Activity Service Life (years)	8
Activity Structural Life (years)	
Maintenance Frequency (years)	4
Agency Maintenance Cost (\$1000)	15
Work Zone Length (miles)	
Work Zone Speed Limit (mph)	
Work Zone Capacity (vphpl)	
Traffic Hourly Distribution	Week Day 1

Inbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Outbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Description	Value
Alternative 2	Concrete w/CPR
Number of Activities	3

Description	Value
Activity 1	PCC New Construction
Agency Construction Cost (\$1000)	0
User Work Zone Costs (\$1000)	
Work Zone Duration (days)	120
No of Lanes Open in Each Direction During Work Zone	1
Activity Service Life (years)	26
Activity Structural Life (years)	50
Maintenance Frequency (years)	8
Agency Maintenance Cost (\$1000)	30
Work Zone Length (miles)	
Work Zone Speed Limit (mph)	
Work Zone Capacity (vphpl)	
Traffic Hourly Distribution	Week Day 1

Inbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Outbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Description	Value
Activity 2	CPR & Diamond Grind (26)
Agency Construction Cost (\$1000)	321
User Work Zone Costs (\$1000)	
Work Zone Duration (days)	30
No of Lanes Open in Each Direction During Work Zone	1
Activity Service Life (years)	14
Activity Structural Life (years)	
Maintenance Frequency (years)	8
Agency Maintenance Cost (\$1000)	30
Work Zone Length (miles)	
Work Zone Speed Limit (mph)	
Work Zone Capacity (vphpl)	
Traffic Hourly Distribution	Week Day 1

Inbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Outbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Description	Value
Activity 3	CPR & Diamond Grind (40)
Agency Construction Cost (\$1000)	321
User Work Zone Costs (\$1000)	
Work Zone Duration (days)	30
No of Lanes Open in Each Direction During Work Zone	1
Activity Service Life (years)	14
Activity Structural Life (years)	
Maintenance Frequency (years)	8
Agency Maintenance Cost (\$1000)	30
Work Zone Length (miles)	
Work Zone Speed Limit (mph)	
Work Zone Capacity (vphpl)	
Traffic Hourly Distribution	Week Day 1

Inbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Outbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Description	Value
Alternative 3	Asphalt w/Mill&Fill
Number of Activities	5

Description	Value
Activity 1	HMA New Construction
Agency Construction Cost (\$1000)	0
User Work Zone Costs (\$1000)	NA
Work Zone Duration (days)	120
No of Lanes Open in Each Direction During Work Zone	1
Activity Service Life (years)	15
Activity Structural Life (years)	50
Maintenance Frequency (years)	4
Agency Maintenance Cost (\$1000)	15
Work Zone Length (miles)	
Work Zone Speed Limit (mph)	
Work Zone Capacity (vphpl)	
Traffic Hourly Distribution	Week Day 1

<i>Inbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)</i>	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

<i>Outbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)</i>	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Description	Value
Activity 2	2" Mill&Fill (15)
Agency Construction Cost (\$1000)	228
User Work Zone Costs (\$1000)	NA
Work Zone Duration (days)	30
No of Lanes Open in Each Direction During Work Zone	1
Activity Service Life (years)	10
Activity Structural Life (years)	
Maintenance Frequency (years)	4
Agency Maintenance Cost (\$1000)	15
Work Zone Length (miles)	
Work Zone Speed Limit (mph)	
Work Zone Capacity (vphpl)	
Traffic Hourly Distribution	Week Day 1

<i>Inbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)</i>	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

<i>Outbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)</i>	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Description	Value
Activity 3	2" Mill&Fill (25)
Agency Construction Cost (\$1000)	\$228.00
User Work Zone Costs (\$1000)	NA
Work Zone Duration (days)	30
No of Lanes Open in Each Direction During Work Zone	1
Activity Service Life (years)	10
Activity Structural Life (years)	
Maintenance Frequency (years)	4
Agency Maintenance Cost (\$1000)	15
Work Zone Length (miles)	
Work Zone Speed Limit (mph)	
Work Zone Capacity (vphpl)	
Traffic Hourly Distribution	Week Day 1

Inbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Outbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Description	Value
Activity 4	2" Mill&Fill (35)
Agency Construction Cost (\$1000)	\$228.00
User Work Zone Costs (\$1000)	NA
Work Zone Duration (days)	30
No of Lanes Open in Each Direction During Work Zone	1
Activity Service Life (years)	10
Activity Structural Life (years)	
Maintenance Frequency (years)	4
Agency Maintenance Cost (\$1000)	15
Work Zone Length (miles)	
Work Zone Speed Limit (mph)	
Work Zone Capacity (vphpl)	
Traffic Hourly Distribution	Week Day 1

Inbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Outbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Description	Value
Activity 5	2" Mill&Fill (45)
Agency Construction Cost (\$1000)	\$228.00

User Work Zone Costs (\$1000)	NA
Work Zone Duration (days)	30
No of Lanes Open in Each Direction During Work Zone	1
Activity Service Life (years)	10
Activity Structural Life (years)	
Maintenance Frequency (years)	4
Agency Maintenance Cost (\$1000)	15
Work Zone Length (miles)	
Work Zone Speed Limit (mph)	
Work Zone Capacity (vphpl)	
Traffic Hourly Distribution	Week Day 1

<i>Inbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)</i>	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

<i>Outbound Time of Day of Lane Closures (use whole numbers based on a 24-hour clock)</i>	Start	End
First period of lane closure		
Second period of lane closure		
Third period of lane closure		

Attachment 3:

Calculated C Factors

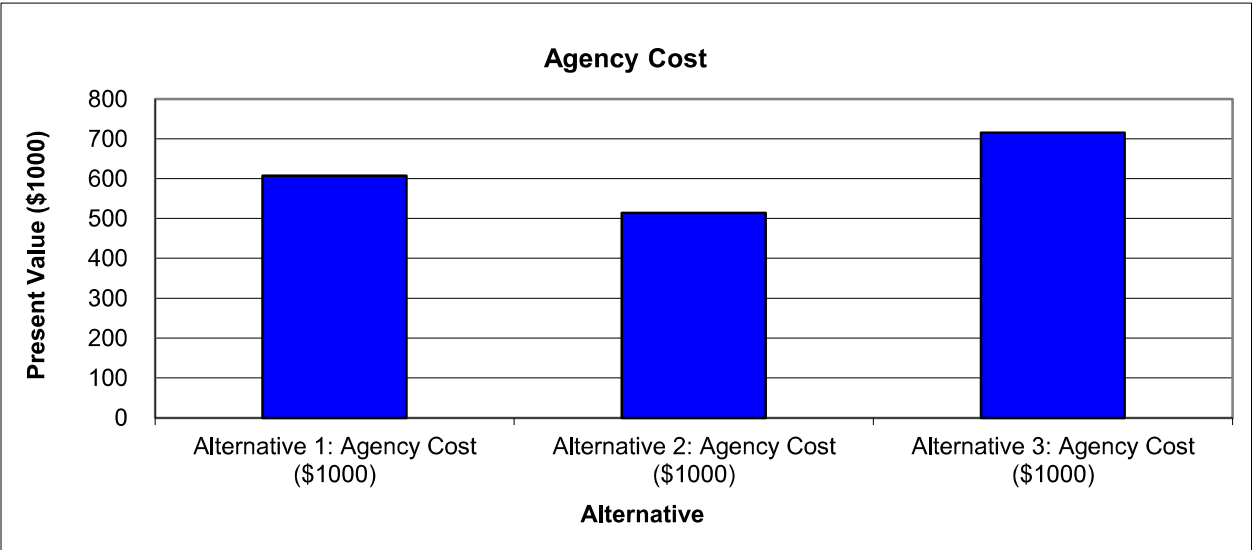
Table 1. Cost Result Summary

Description	Alternative 1: Agency Cost (\$1000)	Alternative 1: User Cost (\$1000)	Alternative 2: Agency Cost (\$1000)	Alternative 2: User Cost (\$1000)	Alternative 3: Agency Cost (\$1000)	Alternative 3: User Cost (\$1000)
Undiscounted Sum	\$866.00	\$0.00	\$792.00	\$0.00	\$1,062.00	\$0.00
NPV	\$607.18	\$0.00	\$514.13	\$0.00	\$715.04	\$0.00
EUAC	\$16.97	\$0.00	\$14.37	\$0.00	\$19.98	\$0.00

Lowest NPV Agency Cost	Alternative 2
Lowest NPV User Cost	Alternative 1

Table 2. Expenditure Stream

Year	Alternative 1: Agency Cost (\$1000)	Alternative 1: User Cost (\$1000)	Alternative 2: Agency Cost (\$1000)	Alternative 2: User Cost (\$1000)	Alternative 3: Agency Cost (\$1000)	Alternative 3: User Cost (\$1000)
2026	-	-	-	-	-	-
2027	-	-	-	-	-	-
2028	-	-	-	-	-	-
2029	-	-	-	-	-	-
2030	\$15.00	-	-	-	\$15.00	-
2031	-	-	-	-	-	-
2032	-	-	-	-	-	-
2033	-	-	-	-	-	-
2034	\$15.00	-	\$30.00	-	\$15.00	-
2035	-	-	-	-	-	-
2036	\$87.00	-	-	-	-	-
2037	-	-	-	-	-	-
2038	-	-	-	-	\$15.00	-
2039	-	-	-	-	-	-
2040	\$15.00	-	-	-	-	-
2041	-	-	-	-	\$228.00	-
2042	-	-	\$30.00	-	-	-
2043	-	-	-	-	-	-
2044	\$87.00	-	-	-	-	-
2045	-	-	-	-	\$15.00	-
2046	-	-	-	-	-	-
2047	-	-	-	-	-	-
2048	\$15.00	-	-	-	-	-
2049	-	-	-	-	\$15.00	-
2050	-	-	\$30.00	-	-	-
2051	-	-	-	-	\$228.00	-
2052	\$398.00	-	\$321.00	-	-	-
2053	-	-	-	-	-	-
2054	-	-	-	-	-	-
2055	-	-	-	-	\$15.00	-
2056	\$15.00	-	-	-	-	-
2057	-	-	-	-	-	-
2058	-	-	-	-	-	-
2059	-	-	-	-	\$15.00	-
2060	\$15.00	-	\$30.00	-	-	-
2061	-	-	-	-	\$228.00	-
2062	\$87.00	-	-	-	-	-
2063	-	-	-	-	-	-
2064	-	-	-	-	-	-
2065	-	-	-	-	\$15.00	-
2066	\$15.00	-	\$321.00	-	-	-
2067	-	-	-	-	-	-
2068	-	-	-	-	-	-
2069	-	-	-	-	\$15.00	-
2070	\$87.00	-	-	-	-	-
2071	-	-	-	-	\$228.00	-
2072	-	-	-	-	-	-
2073	-	-	-	-	-	-
2074	\$15.00	-	\$30.00	-	-	-
2075	-	-	-	-	\$15.00	-
2076	-	-	-	-	-	-
-	-	-	-	-	-	-



DRAFT

Attachment 4:

OMB Circular No. A-94 and Discount Rates

APPENDIX C
(Revised November 14, 2024)

DISCOUNT RATES FOR COST-EFFECTIVENESS, LEASE PURCHASE,
AND RELATED ANALYSES

Effective Dates. This appendix is updated annually. This version of the appendix is valid for calendar year 2025. A copy of the updated appendix can be obtained in electronic form through the OMB home page at <https://www.whitehouse.gov/wp-content/uploads/2025/01/CircularA-94AppendixC.pdf>. The text of the Circular is found at <https://www.whitehouse.gov/wp-content/uploads/2023/11/CircularA-94.pdf>, and a table of past years’ rates is located at <https://www.whitehouse.gov/wp-content/uploads/2025/01/CircularA-94DiscountHistory.pdf>. Updates of the appendix are also available upon request from OMB’s Office of Economic Policy (a94@omb.eop.gov).

Nominal Discount Rates. A forecast of nominal or market interest rates for calendar year 2025 based on the economic assumptions for the 2026 Budget is presented below. These nominal rates are to be used for discounting nominal flows, which are often encountered in lease-purchase analysis.

**Nominal Interest Rates on Treasury Notes and Bonds
of Specified Maturities (in percent)**

<u>3-Year</u>	<u>5-Year</u>	<u>7-Year</u>	<u>10-Year</u>	<u>20-Year</u>	<u>30-Year</u>
3.7	3.8	3.9	4.1	4.4	4.4

Real Discount Rates. A forecast of real interest rates from which the inflation premium has been removed and based on the economic assumptions for the 2026 Budget is presented below. These real rates are to be used for discounting constant-dollar flows, as is often required in cost-effectiveness analysis.

**Real Interest Rates on Treasury Notes and Bonds
of Specified Maturities (in percent)**

<u>3-Year</u>	<u>5-Year</u>	<u>7-Year</u>	<u>10-Year</u>	<u>20-Year</u>	<u>30-Year</u>
1.5	1.6	1.8	1.9	2.2	2.3

Analyses of projects with terms different from those presented above may use a linear interpolation. For example, a four-year project can be evaluated with a rate equal to the average of the three-year and five-year rates. Projects with durations longer than 30 years may use the 30-year interest rate.

November 14, 2024

APPENDIX C

BUDGET ASSUMPTIONS

Nominal Treasury Interest Rates for Different Maturities
(from the annual budget assumptions for the first year of the budget forecast)

Calendar Year	3-Year	5-Year	7-Year	10-Year	20-Year	30-Year
1979	9.7	9.2	9.1	9.0	N/A	8.9
1980	10.9	10.6	10.6	10.6	N/A	10.4
1981	13.4	12.8	12.6	12.2	N/A	11.8
1982	12.8	13.1	13.2	13.3	N/A	13.0
1983	9.5	9.8	10.0	10.2	N/A	10.3
1984	9.8	10.0	10.1	10.3	N/A	10.4
1985	10.3	10.7	10.8	11.0	N/A	11.0
1986	8.6	8.8	8.8	8.9	N/A	9.1
1987	6.3	6.5	6.6	6.7	N/A	7.0
1988	7.3	7.7	7.8	8.0	N/A	8.1
1989	7.8	8.1	8.2	8.3	N/A	8.2
1990	7.4	7.5	7.6	7.7	N/A	7.8
1991	7.2	7.4	7.4	7.5	N/A	7.7
1992	6.1	6.5	6.7	7.0	N/A	7.1
1993	5.6	6.0	6.3	6.7	N/A	6.8
1994	5.0	5.3	5.5	5.7	N/A	5.8
1995	7.3	7.6	7.7	7.9	N/A	8.1
1996	5.4	5.5	5.5	5.6	N/A	5.7
1997	5.8	5.9	6.0	6.1	N/A	6.3
1998	5.6	5.7	5.8	5.9	N/A	6.1
1999	4.7	4.8	4.9	4.9	N/A	5.0
2000	5.9	6.0	6.0	6.1	N/A	6.3
2001	5.4	5.4	5.4	5.4	N/A	5.3
2002	4.1	4.5	4.8	5.1	N/A	5.8
2003	3.1	3.6	3.9	4.2	N/A	5.1
2004	3.0	3.7	4.2	4.6	5.4	5.5
2005	3.7	4.1	4.4	4.6	5.2	5.2
2006	4.7	4.8	4.9	5.0	5.3	5.2
2007	4.9	4.9	4.9	5.0	5.1	5.1
2008	4.1	4.3	4.4	4.6	4.9	4.9
2009	2.7	3.3	3.7	4.2	4.7	4.5
2010	2.3	3.1	3.5	3.9	4.4	4.5
2011	1.4	1.9	2.4	3.0	3.9	4.2
2012	1.6	2.1	2.5	2.8	3.5	3.8
2013	0.5	1.1	1.5	2.0	2.7	3.0
2014	1.0	1.9	2.5	3.0	3.6	3.9
2015	1.7	2.2	2.5	2.8	3.1	3.4
2016	2.0	2.4	2.7	2.9	3.2	3.5
2017	1.4	1.7	1.9	2.1	2.5	2.8
2018	2.3	2.5	2.6	2.6	2.8	3.0
2019	3.3	3.3	3.4	3.4	3.5	3.6
2020	1.6	1.7	1.8	2.0	2.3	2.4
2021	0.2	0.3	0.6	0.8	1.5	1.7
2022	1.3	1.6	1.9	2.1	2.5	2.6
2023	4.0	3.8	3.8	3.9	4.2	4.2
2024	4.5	4.4	4.4	4.4	4.7	4.7
2025	3.7	3.8	3.9	4.1	4.4	4.4

Real Treasury Interest Rates

Calendar Year	3-Year	5-Year	7-Year	10-Year	20-Year	30-Year
1979	2.8	3.4	4.1	4.6	N/A	5.4
1980	2.1	2.4	2.9	3.3	N/A	3.7
1981	3.6	3.9	4.3	4.4	N/A	4.8
1982	6.1	7.1	7.5	7.8	N/A	7.9
1983	4.2	4.7	5.0	5.3	N/A	5.6
1984	5.0	5.4	5.7	6.1	N/A	6.4
1985	5.9	6.5	6.8	7.1	N/A	7.4
1986	4.6	5.1	5.6	5.9	N/A	6.7
1987	2.8	3.1	3.5	3.8	N/A	4.4
1988	3.5	4.2	4.7	5.1	N/A	5.6
1989	4.1	4.8	5.3	5.8	N/A	6.1
1990	3.2	3.6	3.9	4.2	N/A	4.6
1991	3.2	3.5	3.7	3.9	N/A	4.2
1992	2.7	3.1	3.3	3.6	N/A	3.8
1993	3.1	3.6	3.9	4.3	N/A	4.5
1994	2.1	2.3	2.5	2.7	N/A	2.8
1995	4.2	4.5	4.6	4.8	N/A	4.9
1996	2.6	2.7	2.8	2.8	N/A	3.0
1997	3.2	3.3	3.4	3.5	N/A	3.6
1998	3.4	3.5	3.5	3.6	N/A	3.8
1999	2.6	2.7	2.7	2.7	N/A	2.9
2000	3.8	3.9	4.0	4.0	N/A	4.2
2001	3.2	3.2	3.2	3.2	N/A	3.2
2002	2.1	2.8	3.0	3.1	N/A	3.9
2003	1.6	1.9	2.2	2.5	N/A	3.2
2004	1.6	2.1	2.4	2.8	3.4	3.5
2005	1.7	2.0	2.3	2.5	3.0	3.1
2006	2.5	2.6	2.7	2.8	3.0	3.0
2007	2.5	2.6	2.7	2.8	3.0	3.0
2008	2.1	2.3	2.4	2.6	2.8	2.8
2009	0.9	1.6	1.9	2.4	2.9	2.7
2010	0.9	1.6	1.9	2.2	2.7	2.7
2011	0.0	0.4	0.8	1.3	2.1	2.3
2012	0.0	0.4	0.7	1.1	1.7	2.0
2013	-1.4	-0.8	-0.4	0.1	0.8	1.1
2014	-0.7	0.0	0.5	1.0	1.6	1.9
2015	0.1	0.4	0.7	0.9	1.2	1.4
2016	0.3	0.6	0.8	1.0	1.2	1.5
2017	-0.5	-0.3	0.0	0.1	0.5	0.7
2018	0.6	0.6	0.7	0.7	0.9	1.0
2019	1.3	1.3	1.3	1.4	1.5	1.5
2020	-0.4	-0.3	-0.2	0.0	0.3	0.4
2021	-1.8	-1.6	-1.4	-1.1	-0.5	-0.3
2022	-1.2	-0.6	-0.3	0.0	0.4	0.5
2023	1.2	1.3	1.4	1.5	2.0	2.0
2024	2.2	2.2	2.2	2.3	2.5	2.5
2025	1.5	1.6	1.8	1.9	2.2	2.3

APPENDIX D

Real Discount Rates

Years	Risk-Free Rate	Social Discount Rate	
1972-1991	N/A	10.0	Note: This rate appeared in the main Circular.
1992-2022	N/A	7.0	Note: This rate appeared in the main Circular.
2023-2025	2.0	3.1	

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS**

**DESIGN DIRECTIVE 105
PUBLICATION DEVELOPMENT AND APPROVAL PROCESS**

Insert Date

Supersedes November 6, 2024

1. PURPOSE

This Design Directive establishes procedures for preparing, reviewing, approving, and publishing West Virginia Division of Highways (WVDOH) Specifications, Special Provisions (SPs), Standards, Manuals, and Material Procedures (MPs). These publications define the technical requirements, procedures, and policies used by the Division for planning, design, construction, maintenance, and materials management.

The directive applies to the following publication types:

- Specifications & Special Provisions
- Standards (e.g., Design Directives, Standard Details, Structure Directives, etc.)
- Manuals (e.g., Construction Manual, Drainage Manual, Consultant Services Manual, etc)
- Material Procedures

2. ADMINISTRATIVE AUTHORITY

All WVDOH publications shall be administered by the Materials Control, Soils & Testing Division (MCS&T). MCS&T is responsible for:

- Coordinating review of proposed publications and revisions
- Administering the applicable review committees
- Coordinating approval through the Division and review with the Federal Highway Administration (FHWA), when applicable
- Publishing approved documents on the Division's webpage

3. CHAMPION RESPONSIBILITIES

A Champion is responsible for developing and presenting proposed publication(s) or revision(s), including:

- Preparing the draft and electronically submitting it to the Committee Chairperson, along with information on the provision and a brief description of the proposed revision for inclusion in the agenda packet.
- Coordinating with subject matter experts, internal staff, industry, and public comments and updating the draft as necessary. The Champion may need to work outside of committee meetings to address comments and progress the item through the review process.
- Presenting it to the committee for review and approval. The Champion may designate a knowledgeable proxy to attend meetings if unavailable.

Failure to participate or provide required updates in a timely manner may result in removal of the item from the committee agenda.

4. COMMITTEE STRUCTURE

Each publication type is reviewed by its designated committee.

- Specification Committee
- Standards Committee
- Manuals Committee
- Materials Procedure Committee

Voting Members: One representative from:

- Contract Administration Division
- Engineering Division
- Materials Control, Soils and Testing Division
- Operations Division
- Traffic Engineering Division

Quorum: Minimum of three (3) voting members present.

Approval: Majority vote of present voting members; Chairperson may break tie votes.

Non-Voting Members: May include FHWA, industry representatives, contractors, and technical experts.

Open Government Compliance: All committees shall operate in accordance with the West Virginia Open Government Meeting Act. Meetings shall be properly noticed, agendas published in advance, votes recorded, minutes maintained, and open to the public.

5. COMMITTEE REVIEW PROCESS

5.1 Two-Meeting Minimum: Proposed items shall normally be presented at a minimum of two (2) committee meetings before being voted upon. Depending upon their complexity, controversy, or the level of comments, items may be held for additional review and updates as needed to address comments, revisions, or other required steps to ensure proper committee review.

5.2 Minor or Editorial Changes: Changes determined to be minor or editorial may be approved after one (1) meeting. Minor changes do not alter technical intent and include:

- Editorial corrections (spelling, grammar, formatting)
- Updated references, links, or organizational titles
- Clarifications that do not change technical intent

Any voting member or FHWA representative may request that a minor change be treated as substantive, requiring two (2) meetings.

5.3 Chairperson Authority: The Committee Chairperson manages meetings, determines readiness for vote, and may designate changes as minor or substantive. The Chairperson ensures the review process remains efficient while maintaining compliance with policy.

5.4 Comment Deadlines: Committee members shall review proposed items prior to the scheduled meeting. Comments must be submitted to the Chairperson in advance to allow the Champion time to address them. Late comments may be addressed during the meeting at the Chairperson's discretion, and, if appropriate, may be subject to a vote.

6. FHWA COORDINATION

FHWA is invited to participate in committee meetings and is provided meeting notices and agenda packets for review. FHWA may attend meetings and provide comments as part of the review process.

Following committee action, the publication is forwarded through the Division and submitted to FHWA for approval, ~~as applicable.~~

7. EMERGENCY OR EXCEPTIONAL APPROVAL PROCESS

When urgent circumstances or project needs do not allow sufficient time for the committee review process, as defined in subsection 5 of this DD, a proposed item may be submitted through the Division chain of command to the State Highway Engineer for approval.

This process should be used only in exceptional circumstances when delaying the change would negatively impact project delivery, safety, or operations.

The submission shall include:

- Description of the proposed change
- Reason the standard committee process cannot be followed
- Project(s) affected
- Draft language of the proposed provision or revision
- Supporting background or justification

Items approved through this process should be presented by the Champion at the next meeting for information and record and may be incorporated into the next formal revision.

Emergency or exceptional approval process items are to be used only for the singular project for which it was approved. If the emergency or exceptional approved item is desired to be used among other projects, it must pass through the normal committee processes.

8. PUBLICATION AND DISTRIBUTION

Approved publications will be posted to the appropriate WVDOT webpages and distributed to district offices and impacted stakeholders. Materials Control, Soils & Testing Division shall maintain current electronic access to all publications.

SECTION BREAK

NEW BUSINESS ITEMS

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS**

DESIGN DIRECTIVE 101

CORRESPONDENCE

Insert Approval Date

Supersedes June 18, 2014

The purpose of the ~~d~~Design ~~d~~Directive is to provide guidance for the addressing and subject reference information for all correspondence prepared by West Virginia Division of Highways Responsible Divisions, and all letters prepared by Consultants for submission to the Division of Highways.

- I. All correspondence pertaining to Engineering Agreements / Project Submittals and work thereunder shall be addressed as follows:

For letters dealing with *administrative* and *technical* matters,

Original copy to Correspondence shall be addressed to the Manager of the Responsible Division:

Manager: "Responsible Division" *

Address: "Responsible Division" *

* NOTE: A listing of "Responsible Divisions", ~~and District Offices with their associated addresses, is contained provided~~ in Appendix A ~~of this Directive~~. Current mailing address, telephone numbers, email address, and leadership information are maintained on respective Division and District webpages.

Additional copies to **both** of the following:

Mr. ~~C. Elwood Penn IV, P.E.~~ Timothy Sedosky
Director, Planning Division
~~West Virginia Department of Transportation~~
West Virginia Division of Highways
1900 Kanawha Boulevard, East
Building ~~Five 6~~, Room ~~740220~~
Charleston, West Virginia 25305

~~Mr. Kenneth T. Given~~ Ms. Carla Rotsh
Director ~~—~~, Programming Division
~~West Virginia Department of Transportation~~
West Virginia Division of Highways
1900 Kanawha Boulevard, East
Building 5, Room 450
Charleston, West Virginia 25305

These copies are to be mailed directly to the addressee.

- II. All letters prepared by West Virginia Division of Highway Responsible Divisions, and all letters prepared by Consultants for submission to the Division of Highways, shall have a subject reference which shall contain the following information:

- A. Project Number (State and Federal where applicable),

- Shall be the project number for engineering as programmed by the Division and shown on the Engineering Agreement. If the letter has particular reference to other phases of work, e.g., right of way or construction, these project numbers may also be

- shown following the engineering number but shall be properly identified by "Construction" or "Right of Way."
- B. Route Number (and Bridge Number where applicable),
- Will be the route number as designated by the Division on Interstate Projects, the project number renders sufficient identification of route so that no further clarification is needed on all but Interstate Projects.
- C. Description of Project and Section or Contract Number, if applicable,
- Shall give the description name of the project or project termini, i.e. US 52 Location and Design Studies, or Greenbrier Street Lighting.
- D. Subject of Letter (condensed), and
- Shall give the subject of the letter, i.e. Drainage.
- E. County or Counties in which project is located.

~~Bullet A: Shall be the project number for engineering as programmed by the Division and shown on the Engineering Agreement. If the letter has particular reference to other phases of work, e.g., right of way or construction, these project numbers may also be shown following the engineering number but shall be properly identified by "Construction" or "Right of Way."~~

~~Bullet B: Will be the route number as designated by the Division on Interstate Projects, the project number renders sufficient identification of route so that no further clarification is needed on all but Interstate Projects.~~

~~Bullet C: Shall give the description name of the project or project termini, i.e. US 52 Location and Design Studies, or Greenbrier Street Lighting.~~

~~Item D: Shall give the subject of the letter, i.e. Drainage.~~

An example of a typical presentation is shown as follows below:

Mr. ~~Raymond J. "R.J." Seites,~~ Dave Bodnar, P.E.
Director, Engineering Division
West Virginia Division of Highways
1900 Kanawha Boulevard, East
Building 5, Room 920
Charleston, West Virginia 25305

State Project S325-250-6.22
Federal Project BRF-0250(036)
Watson Bridge Replacement
Supplemental Agreement #1
Marion County

APPENDIX A

<u>Division</u>	<u>Address</u>
Contract Administration Division	Mr. Shawn A. Smith, P. E. Director, Contract Administration Division West Virginia Department of Transportation Division of Highways Building 5, Room 840 1900 Kanawha Boulevard, East Charleston, West Virginia 25305
Engineering Division	Mr. Raymond J. "R.J." Seites, P. E. Director, Engineering Division West Virginia Department of Transportation Division of Highways Building 5, Room 920 1900 Kanawha Boulevard, East Charleston, West Virginia 25305
Materials Control, Soils & Testing Division	Mr. Ron L. Stanevich, P. E. Director, Materials Control, Soils & Testing Division West Virginia Department of Transportation Division of Highways 190 Dry Branch Road Charleston, West Virginia 25306
Operations Division Director, Operations Division	Mr. Jacob M. Bumgarner, P. E. West Virginia Department of Transportation Division of Highways Building 5, Room 350 1900 Kanawha Boulevard, East Charleston, West Virginia 25305
Planning Division	Mr. C. Elwood Penn IV, P. E. Director, Planning Division West Virginia Department of Transportation Division of Highways Building 5, Room 740 1900 Kanawha Boulevard, East Charleston, West Virginia 25305

<u>Division</u>	<u>Address</u>
Programming Division	Mr. Kenneth T. Given Director, Programming Division West Virginia Department of Transportation Division of Highways 1900 Kanawha Boulevard, East Building 5, Room 450 Charleston, West Virginia 25305
Right of Way Division	Mr. Chad Toney, P.E. Director, Right of Way Division West Virginia Department of Transportation Division of Highways Building 5, Room 820 1900 Kanawha Boulevard, East Charleston, West Virginia 25305
Technical Support Division	Mr. Travis Long Director, Technical Support Division West Virginia Department of Transportation Division of Highways 1334 Smith Street Charleston, West Virginia 25301
Traffic Engineering Division	Mrs. Cindy L. Cramer, P. E. Acting Director, Traffic Engineering Division West Virginia Department of Transportation Division of Highways Building 5, Room 550 1900 Kanawha Boulevard, East Charleston, West Virginia 25305

DISTRICT ADDRESSES**DISTRICT ONE**

~~Mr. Arlie Matney
District Manager
West Virginia Department of Transportation
Division of Highways
District 1
1340 Smith Street
Charleston, West Virginia 25301~~

DISTRICT TWO

~~Mr. Robert Pennington, P.E.
District Engineer
West Virginia Department of Transportation
Division of Highways
District 2
Post Office Box 880
Huntington, West Virginia 25712~~

DISTRICT THREE

~~Mr. Justin B. Smith, P.E.
District Engineer
West Virginia Department of Transportation
Division of Highways
District 3
624 Depot Street
Parkersburg, West Virginia 26101~~

DISTRICT FOUR

~~Michael Cronin, P.E.
District Engineer/Manager
West Virginia Department of Transportation
Division of Highways
District 4
Post Office Box 4220
Clarksburg, West Virginia 26302-4220~~

DISTRICT FIVE

~~J. Lee Thorne, P.E.
District Engineer
West Virginia Department of Transportation
Division of Highways
District 5
Post Office Box 99
Burlington, West Virginia 26710~~

DISTRICT SIX

~~Tony E. Clark, P.E.
District Engineer/Manager
West Virginia Department of Transportation
Division of Highways
District 6
1 DOT Drive
Moundsville, West Virginia 26041~~

DISTRICT SEVEN

~~Brian K. Cooper, P.E.
District Engineer
West Virginia Department of Transportation
Division of Highways
District 7
Post Office Drawer 1228
Weston, West Virginia 26452~~

DISTRICT EIGHT

~~James Rossi, P.E.
District Engineer
West Virginia Department of Transportation
Division of Highways
District 8
Post Office Drawer 1516
Elkins, West Virginia 26241~~

DISTRICT NINE

~~James F. Moore, P.E.
District Engineer
West Virginia Department of Transportation
Division of Highways
District 9
146 Stonehouse Road
Lewisburg, West Virginia 24901~~

DISTRICT TEN

~~Mr. Ryland Musiek, Jr., Ph.D., P.E.
District Engineer/Manager
West Virginia Department of Transportation
Division of Highways
District 10
270 Hardwood Lane
Princeton, West Virginia 24740~~

APPENDIX A
WVDOH Division And District Contact Information

Current contact information for WVDOH Divisions and District Offices is maintained on the Department's official website. Users should refer to the webpages below for the most up-to-date contact information.

<u>Divisions</u>	<u>Official Webpage *</u>
<u>Contract Administration Division</u>	https://transportation.wv.gov/highways/contractadmin
<u>Engineering Division</u>	https://transportation.wv.gov/highways/engineering
<u>Materials Control, Soils & Testing Division</u>	https://transportation.wv.gov/highways/mcst
<u>Operations Division</u>	https://transportation.wv.gov/highways/maintenance
<u>Planning Division</u>	https://transportation.wv.gov/highways/planning
<u>Programming Division</u>	https://transportation.wv.gov/highways/programming
<u>Right of Way Division</u>	https://transportation.wv.gov/highways/right-of-way
<u>Traffic Engineering Division</u>	https://transportation.wv.gov/highways/traffic

<u>Districts</u>	<u>Official Webpage *</u>
<u>District 1</u>	https://transportation.wv.gov/highways/districts/district-one
<u>District 2</u>	https://transportation.wv.gov/highways/districts/district-two
<u>District 3</u>	https://transportation.wv.gov/highways/districts/district-three
<u>District 4</u>	https://transportation.wv.gov/highways/districts/district-four
<u>District 5</u>	https://transportation.wv.gov/highways/districts/district-five
<u>District 6</u>	https://transportation.wv.gov/highways/districts/district-six
<u>District 7</u>	https://transportation.wv.gov/highways/districts/district-seven
<u>District 8</u>	https://transportation.wv.gov/highways/districts/district-eight
<u>District 9</u>	https://transportation.wv.gov/highways/districts/district-nine
<u>District 10</u>	https://transportation.wv.gov/highways/districts/district-ten

* Current mailing addresses, phone numbers, email addresses, and leadership information are maintained on the respective Division webpages.

WVDOH Manuals Committee Meeting

Tuesday, August 4, 2026

Meeting Location: 190 Dry Branch Drive, Charleston, WV

Also meeting virtually via Google Meet. Email distribution includes instruction.

Approved Manual changes from the last Committee Meeting (06/02/26):

- *Drainage Manual – Chapter 6: Ditches*

Old Business:

ITEM	Champion
2nd time to Committee. Discussed in June and August • <i>Construction Manual: Section 110 – Change Orders</i> The revision makes changes to ensure cohesive communication between FHWA, the WVDOH, and the project during the review and approval procedure by outlining the chain of command. Approval expected at the August meeting.	D. Jarvis

New Business:

- None

Housekeeping:

Next Meeting – **October 6, 2026**

Deadline for Submissions – **September 8, 2026**

Comments Due – **October 2, 2026**

Comments are requested as they help in the decision-making process. Please send comments by the deadline to Kristy.J.Huffman@wv.gov.

SECTION 110 CHANGE ORDERS

(Amended XX/XX/XXXX)

Section 110 presents DOH policies and procedures on documenting, preparing, and processing Change Orders. Adherence to these procedures will ensure that agreements on the scope, necessity, and basis of payment for all modifications and extra work are properly documented. See Section 105.6 of this manual for information on how AASHTOWare Project and SiteManager is used to prepare and process Change Orders.

110.1-GENERAL

110.1.1-Legal Basis The Division reserves the right to make any necessary alterations to the Contract Plans and Specifications or to the quantities of work provided they are within the scope of the original Contract. Although the Specifications provide for changes in quantities and performance of unforeseen work for which there is no price included in the Contract, Federal and State laws specifically require that no work be performed unless funds have been properly authorized for payment. The District will not pay the Contractor for extra work until the District receives a Supplemental Authorization.

110.1.2-Overview of Purpose It is impractical to specify in Contract documents exact quantities of labor, materials, and equipment. Therefore, procedures have been established for necessary changes for modifications and extra work through Change Orders. Consider the following:

1. **Change Order**. A Change Order authorizes an increase, decrease, addition, or deletion of an item(s) or adds prices not included in the original Proposal. These documents are normally developed in cooperation with the Contractor, the Division, and FHWA, as applicable, and reflect all changed items that would affect Contract costs and the completion date. See Section 110.3 of this manual for information on Change Orders.
2. **Contract Time**. Any additional time required due to a Change Order will be documented on a separate Change Order and will be considered for a Contract Time Extension (see Section 105.3 of this manual).

110.1.3-Types of Change Orders A Change Order is a general term referring to either a Supplemental Agreement or a Force Account Work Order. These terms are defined in Section 101 of the Specifications. Each type is used for a different purpose and is based primarily on the extent and nature of the changed condition as follows:

1. **Supplemental Agreement**. A Supplemental Agreement is a type of Change Order used for the following purposes:
 - a. To provide a unit price for items not included in the original Proposal;
 - b. If major Contract items require a change in quantity in excess of 25% of the

- original and there is a demonstrable change in cost to the Contractor;
 - c. If there is an addition, deletion, or revision of the contract specifications;
 - d. If any item is non-performed; and/or
 - e. For any changes to the contract time.
2. **Force Account Work Order.** A Force Account Work Order will only be initiated and used when it is necessary to accomplish work not described by the contract specifications and which a price cannot be agreed upon by the Division and Contractor. This type of work can most effectively be described by hours of Labor, the furnishing of Material, and hours of Equipment use, plus a percentage (LME) as detailed in the Specifications. The Project Engineer/Supervisor must exercise strict controls and detailed records to administer this type of Change Order.

Section 109.4 of the Specifications specifies the provisions. See Section 104.1.2.1 of the Construction Manual, for justification of the Force Account work and Section 110.3.3 for additional information.

110.1.4-AASHTOWare Project (AWP) Change Orders, if required, must be prepared and processed as described in Sections 110.2 and 110.3 of this manual. AASHTOWare Project is used to generate Change Orders, either Supplemental Agreements or Force Account Work Orders.

110.2-DRAFT OF CHANGE ORDER

110.2.1-Need If a condition warrants a contract modification or extra work, the Project Engineer/Supervisor will immediately notify the District Construction Engineer before taking further action. District personnel will notify the Contract Administration Division. All proposed Contract modifications and extra work require a Change Order.

Change Orders are required on non-exempt Federal-Aid projects under either of the following two conditions:

1. **Major Changes/Extra Work.** On non-exempt and concurrence Federal-aid projects, FHWA must provide advance written approval of all major changes or major extra work in the Contract Plans and Specifications except, when emergency or unusual conditions warrant, FHWA may provide advance verbal approval with subsequent binding written concurrence. A major change or major extra work is defined as a project change or extra work that would significantly affect the cost to the Federal Government or alter the termini, character, or scope of the work. See Section 110.3.2.1 for types of modifications that represent major changes and major extra work including required documentation.
2. **Minor Changes/Extra Work.** On non-exempt and concurrence Federal-aid projects, FHWA must approve all minor changes and minor extra work. This includes modifications in construction items within the scope of the Contract Plans and Specifications when such modifications are required during the normal progress of construction. Approval may be given retroactively at the discretion of FHWA.

110.2.2-Preparation The Project Engineer/Supervisor is responsible for preparing Change Orders and employing the requisite features of AASHTOWare Project. See Section 105.6 of this manual. The following discusses documentation requirements.

110.2.2.1-Contacts On the General Change Order explanations, list the name and organization of all District, Division, and FHWA (if applicable) personnel contacted relative to the proposed modification or extra work. On non-exempt and concurrence Federal-aid projects, the Change Order must document agreements by FHWA personnel.

110.2.2.2-Items, Quantities, Unit Prices List each item of work entailed by the proposed modification or extra work, the estimated quantity, and the agreed unit price. Also list any Contract item underrun(s) resulting from the proposed modification or extra work (e.g., payment of material taken into Division inventory should include a decrease in the planned items of work that caused the unused material).

110.2.2.3-Location and Necessity of Work List the following related to the location and necessity of work on the Change Order:

1. **Location**. Indicate stations with applicable baseline and offset notations for each item of work entailed by the proposed modification or extra work. Modifications or extra work, resulting from revision of the planned project termini, require evidence that the Contract Administration Division has been advised of the revision.
2. **Necessity**. Indicate the reason in sufficient detail to ensure that the proposed modification or extra work is necessary.
3. **Federal-Aid Reimbursement**. Include the status of eligibility for Federal-aid reimbursement for each Contract modification. The following options are available:
 - a. Eligible for Federal funds pending submission and evaluation of cost data;
 - b. Partially eligible for Federal funds pending submission and evaluation of cost data;
 - c. Ineligible for Federal funds; or
 - d. Other (explain).

On exempt Federal-aid projects, the eligibility for Federal-aid reimbursement indicated for each Contract modification will follow FHWA policy.

4. **Contract Time Evaluation Method**. Include the method of Contract time evaluation for each Contract modification. The following options are available for each Contract modification:
 - a. Additional working days to the Contract time allowance are not applicable; or
 - b. Additional working days to the Contract item allowance will be granted on the basis of the actual working days charged for performing the work under the agreement provided the work is judged to be the controlling operation.

See Section 105.3 of this manual for additional information on documenting Contract time extensions.

110.2.2.4-Justification of Quantities The documentation required to substantiate estimated quantities is dependent upon the method of measurement of the proposed modification or extra work. Consider the following guidelines:

1. **Area or Volume Measurement.** Include calculations to substantiate added, increased or decreased quantities. A sketch or drawing is often necessary to show the details of the proposed modification or extra work. As applicable, include the following additional information:
 - a. **Proposal Quantity Items.** Calculations must contain signatures, not just initials, of District Office and project personnel verifying the accuracy of dimensions, computation method and resultant quantity. Detailed drawings must accompany the calculations.
 - b. **Unclassified Excavation/Borrow Items.** Calculations must include a volume breakdown station by station.
2. **Linear Measurement.** Include data such as stationing and applicable baseline and offset notations, top and bottom elevations, bar details, etc.
3. **Weight Measurement.** Include data such as stationing, average widths and depth, typical sections, application rates, conversion factors, etc. As-built quantities require notation that properly executed tickets are in the project file.
4. **Unit Measurement.** Include data such as stationing and applicable baseline and offset notations for each unit.
5. **Lump Sum Measurement.** The following documentation requirements will apply to lump sum measurements:
 - a. **Contract Item Revision.** Include calculations based upon proposal bid amount, plan quantity, and the proposed extra or deducted quantity to substantiate the proposed payment or deduction.
 - b. **Force Account Work Basis.** Include reason for performance of work on a Force Account Work basis in addition to applicable Labor, Materials Used, and Equipment (LME) records. Use Force Account Work procedures to establish the method of measurement for contract modifications or extra work only when necessary. Possible reasons for the performance of work on a Force Account Work basis are:
 - i. Negotiations with the Contractor fail to produce agreement on the price of a new work item;
 - ii. The extent of work is unknown;
 - iii. The work is of such character that determination of a reasonably accurate price is not achievable; and/ or
 - iv. Emergency in nature.
6. **Revised Method of Measurement.** This applies to such situations as “original versus in-place” and “volume versus weight.” Include data to substantiate that applicable shrink/swell or other conversion factors are representative of the applicable material and verification of the Contractor’s agreement with the factors. Revision of the method of measurement from volume to weight also revises the type of payment documentation required from calculations to properly executed weigh tickets.

However, the material and construction method documentation required to substantiate compliance with the original Contract Plans and Specifications remains unchanged.

7. Inventoried Material. For payment for material incorporated into DOH inventory, include a copy of an executed DOH-5 documenting that the material was received by DOH and invoices showing the Contractor's actual cost of the material. Payment of this type should include a decrease in the planned item(s) of work that caused the unused material. See Section 109.2.4 of this manual for additional information.

110.2.2.5-Justification of Unit Prices The documentation required to substantiate unit prices is dependent upon the type of action taken for each item of the proposed modification or extra work. Consider the following guidelines:

1. Adjustment at Unit Price. Modifications or extra work resulting in increased or decreased quantities of major contract items at unit bid price require evidence that the provisions set forth in Section 104.11 of the Specifications were considered, if applicable.
2. Addition of Items. If items are added to the original Contract, include detailed provisions for material requirements, construction methods, method of measurement, and basis of payment for all added items not included in the contract specifications. Attach a copy of any written evidence submitted by the Contractor or prepared by DOH to support the unit prices. Include a cost analysis that verifies that unit prices for added items are reasonable. Examples of methods used to justify unit prices are as follows:
 - a. Verification of the accuracy of the cost breakdown submitted by the Contractor noting any special conditions;
 - b. Comparison with unit prices of similar Contract items noting any special conditions;
 - c. Comparison with average bid prices noting any special conditions;
 - d. Comparison with unit prices of same Contract items(s) on other projects (indicate project numbers) within the area or DOH prices on Purchase Order Contracts for similar work and/or materials noting any special conditions; and
 - e. Preparation of a cost breakdown for estimated labor, material, equipment, and administrative costs required to perform the work.

110.2.3-Review and Approval ~~In order to ensure that any proposed modification or extra work as detailed in Section 110.3.1 follows Division and FHWA (if applicable) policies, the following approval levels will be followed~~~~Project personnel may not be fully aware of the nature or magnitude of the comments made by Division or FHWA personnel regarding the proposed modification or extra work. Therefore, the following procedures will apply for the review and approval of the Change Order:~~

1. The Project Engineer/Supervisor will ~~generate submit a draft of ththe~~ Change Order, including necessary attachments, according to established procedures and then Submit for Approval ~~to the following personnel for review, approval, and/or comments.~~

2. The District Area Engineer/Supervisor will review, ~~District Construction Office Manager, District Construction Engineer, Regional Finalization Coordinator, FHWA Regional Engineer (if applicable) and Regional Construction Engineer will review~~ the Change Order, in a timely manner, for accuracy and compliance with established procedures. The Change Order will then be Approved or Rejected as necessary.
3. The District Construction Engineer will continue to review the Change order and Approve or Reject as necessary.~~The Regional Construction Engineer will verify that the agreements reached, and comments made by Division and FHWA personnel are accurately represented on the Change Order.~~
4. The Regional Construction Engineer will continue to review the Change Order, verifying that agreements reached and comments made by the Division personnel are accurately represented and Approve or Reject as necessary.~~The District Construction Office Manager will verify that the Change Order complies with the documentation procedures noted in Section 110.2.2 including the verification of applicable calculations.~~
5. The District Office Manager will verify that the Change order complies with the documentation procedures noted in Section 110.2.2 including verification of applicable calculations and Approve or Reject as necessary.~~Upon approval of the Draft Change Order, the Office Manager will place the Change Order into Pending Status.~~
6. FHWA will Approve or Reject non-delegated Federal projects or Project of Division Interest (PODI) as necessary. All other Change Orders will be approved or rejected at this level by the Regional Contract Management role.
7. The Contractor will review the Change Order and Approve or Reject as necessary.
8. The Regional Contract Management Coordinator will review the Change order and Approve or Reject as necessary. For monetary changes less than \$200,000.00 and Time extensions less than 30 days this will be the final approval level.
9. The Director of Contract Administration will review monetary changes greater than or equal to \$200,000.00 and Time Extensions greater than or equal to 30 days to Approved or Reject as necessary.
- 5-10. The Deputy State Highway Engineer – Construction will review monetary changes greater than or equal to \$200,000.00 and Time Extensions greater than or equal to 30 days to Approve or Reject as necessary. This will be the final approval of these Change orders.

110.3-CHANGE ORDERS

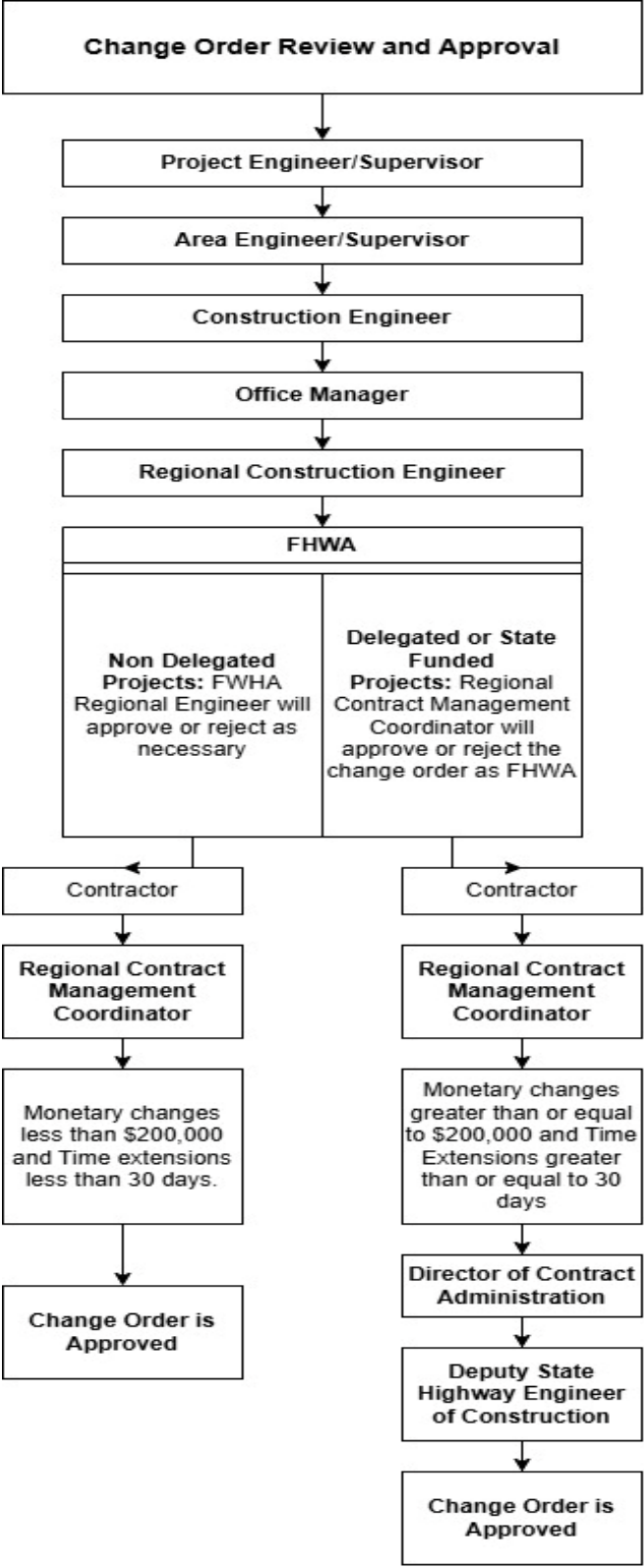
This section outlines DOH procedures for preparing and processing Change Orders. Adherence to these procedures will ensure that Change Orders are properly executed. Every Change Order must be approved in Draft (see prior section, Section 110.2).

110.3.1-Need All modifications or extra work require an approved Change Order. The Contract modifications and extra work that require the preparation and approval of a properly executed Change Order are as follows:

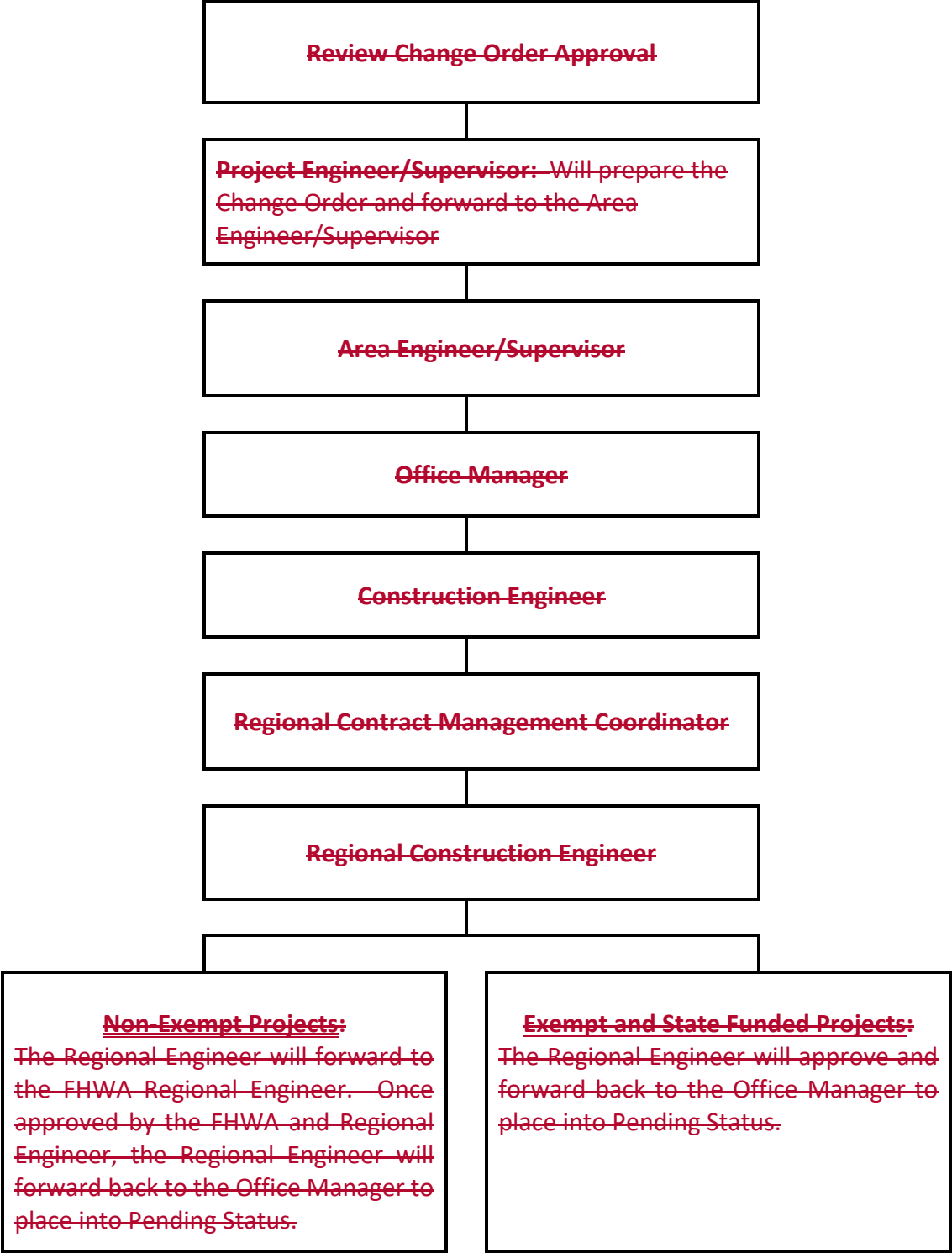
1. Addition of items not included in the original Contract including items of work performed on an LME Force Account Work basis;
2. Revisions to Contract item quantities under either of the following two conditions:

- a. As needed to update the original funding authorized for contingencies; or
- b. As required in conjunction with approved Value Engineering/Practical Design Proposals;
3. Revisions to the contract specifications and/or Plans that, in the opinion of the District Construction Engineer, will significantly change the cost or alter the termini, character, or scope of the work under the Contract. See Section 104.11 of the Specifications for circumstances that constitute a significant change;
4. Assessment of price reductions that were established by District Materials Reports and/or special evaluations by DOH; and
5. Modifications that include a Contract time extension.

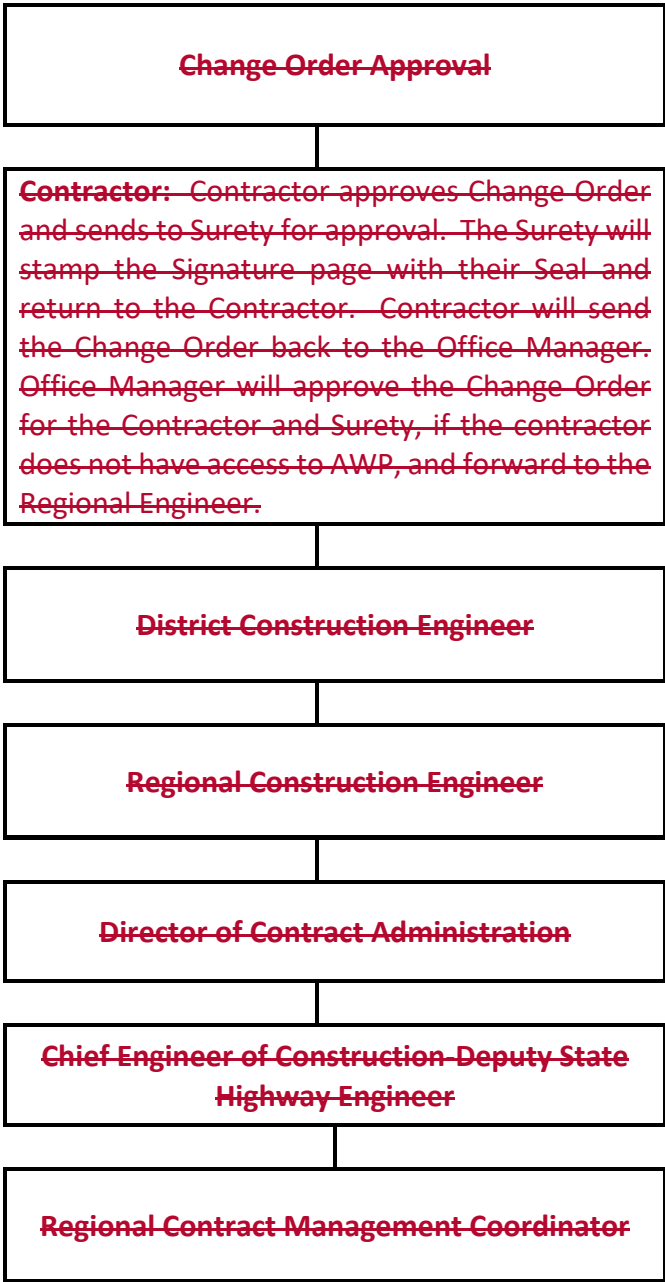
110.3.2-Processing and Approval Figure 110 illustrates the processing flowchart for Change Orders on Federal-aid projects or State funded projects.~~Figures 110A and 110B illustrate processing flowcharts for Change Orders for non-exempt Federal-aid projects or State funded and exempt aid projects. The following subsections presents further discussion on processing and approval procedures.~~



PROCESSING FLOW CHART FOR CHANGE REVIEW / APPROVAL
Figure 110



PROCESSING FLOW CHART FOR
CHANGE ORDERS IN REVIEW STATUS
Figure 110A



PROCESSING FLOW CHART FOR
CHANGE ORDERS
Figure 110B

110.3.2.1-Exempt/Non-Exempt Federal-Aid Projects Modifications and extra work on ~~exempt/non-exempt~~ Federal-aid projects generally require prior written concurrence ~~and before preparing a~~ Change Order. However, there are exceptions as follows:

1. Emergency Conditions. In emergency situations or unusual conditions, it may be necessary to request advance verbal approval from FHWA with the intent that FHWA provide the Division with a subsequent binding written concurrence in the form of a Change Order for the modification or extra work. The basis of the verbal agreement will be acceptable rates, and the basis of the Change Order.
2. Minor Changes/Extra Work. Retroactive formal FHWA approval with a Change Order is permissible for minor changes and Minor extra work on non-exempt Federal- aid projects.
3. Major Changes/Extra Work. For the discussion that follows, major change or major extra work will be defined as a change that will significantly affect the cost of the project or alter the termini, character, or scope of the work. The following actions represent major changes or major extra work for which prior written approval from WVDOT management is required:
 - a. revision of design details (including standard details) pertaining to geometry, drainage, structures, excavation, embankment, signing, and safety appurtenances, or pavement (main roadway, ramps, frontage roads, cross roads, or detours);
 - b. revision of planned access control, project termini, right-of-way limits and/or easements;
 - c. revision of the Standard Specifications, Supplemental Specifications, and/or project specific Special Provisions, including any change in material type or quality;
 - d. revision of contract time resulting from contract changes or extra work;
 - e. LME Force Account Work, Value Engineering Proposals, and contract claim settlements; and
 - f. revision of the Contract value by a monetary value of \$200,00.00 or more. ~~of any item by an amount greater than ±\$12,500.~~

~~For major changes and major extra work on non-exempt Federal-aid projects, a Change Order (i.e., prior written FHWA concurrence) is necessary to ensure consideration of Federal participation. When applicable, submit revised plan sheets to FHWA for approval prior to distribution. Before commencement, a Change Order must be executed to formally document agreement between the Division and FHWA in the following areas:~~

- ~~a. Necessity of the proposed work;~~
- ~~b. Scope of the proposed work; and~~
- ~~c. Basis of payment.~~

See Figure ~~110110B~~ for approval process.

~~**110.3.2.2-Sequencing** Change orders are submitted sequentially for each project as shown by the following example:~~

~~Change Order No. 1 -- Supplemental Agreement No. 1~~
~~Change Order No. 2 -- LME Force Account Work Order No. 1~~
~~Change Order No. 3 -- Supplemental Agreement No. 2~~
~~Change Order No. 4 -- LME Force Account Work Order No. 2~~

110.3.2.2110.3.2.3-Administrative Charges Administrative charges will not be required for Change Orders necessitated by price reductions or increases for changes in the work or materials requested by the Contractor or DOH. However, many contract specifications provide for non-conforming materials to be accepted and remain in place with an appropriate price adjustment. These price adjustments fall into one of the following two categories:

1. **Within Specification Limits.** Price reductions that fall within the Price Adjustment Limits of the contract specifications are placed on an Estimate as an adjustment without an administrative charge.
2. **Outside Specification Limits.** A special evaluation of the non-conformance must be made if the non-conforming material is outside the limits of the contract specifications. Price reductions that fall outside the Price Adjustment Limits require further effort by DOH. Thus, a \$200.00 administrative fee will be charged for each adjusted price.

110.3.3-Labor, Materials, and Equipment (LME) Force Account Work Orders

110.3.3.1-Purpose A LME Force Account Work Order will be used only when it is necessary to accomplish work not covered by contract specifications but most effectively described by hours of Labor, the furnishing of Material, and hours of Equipment use, plus a percentage as detailed in the Specifications. Section 109.4 of the Specifications details the provisions and responsibilities associated with LME Force Account Work.

110.3.3.2-Processing and Approval See Section 110.2 of this manual for the documentation needed, and Section 105.6 for the AASHTOWare Project processing features related to Change Orders. Prior DOH and, on Federal-aid projects, FHWA concurrence as well as approval of equipment rental rates must be obtained in accordance with the procedures discussed in Section 110.3.2 of this manual. In accordance with the specifications, supporting data for the amount of insurance, B&O taxes, and bond will be submitted by the Contractor with the properly executed Change Order.

110.3.3.3-Daily Report Records When work is performed on an LME Force Account Work basis, the Project Engineer/Supervisor must exercise strict controls to ensure that the work is being performed properly and as efficiently and rapidly as is practical. The Project Engineer/Supervisor must ensure that the labor and equipment being charged to the work are actually needed and efficiently employed, and that the materials being charged are actually and properly placed. Consider the following guidelines when administering LME Force Account Work Orders:

DRAFT

1. Daily Work Report. LME Force Account Work records will be maintained daily on specific LME Force Account Work worksheets. The DWR LME worksheets should include separate daily entries on LME Force Account Work labor, materials, and equipment. Each LME worksheet will contain the following minimum information:
 - a. Location of the work;
 - b. Quantity and type of labor and equipment being used;
 - c. Type and quantity of materials used;
 - d. Hours worked;
 - e. Description of work performed;
 - f. Estimate of the amount of work completed each day; and
 - g. Any additional information helpful in describing the work accomplished.
2. Records of Work Performed. At the end of each day's operation, the Contractor's representative and the Project Inspector will compare their records for agreement on the work performed and materials used that day. The Project Inspector must make duplicate copies of these records, and each copy should be signed by both the Project Inspector and the Contractor's Project Superintendent, or designee. One (1) copy will be forwarded to the Project Engineer/Supervisor and one (1) copy to the Contractor. To comply with these provisions, records of LME Force Account Work must be maintained daily, and representatives of both DOH and the Contractor must agree to each day's work by signature. See Section 105.5 of this manual for additional information.
3. Estimates. Generally, payment for LME Force Account work will be paid for by a Change Order. However, for larger Force Accounts, partial payments may be made by Contract Adjustments and then subtracted off after the Change Order has been approved. Such payments are substantiated by information on the LME Force Account Work Order. Refer to AASHTOWare manual for more information and requirements of Force Account Work. The approved LME Force Account Work Order must be placed in ProjectWise to support payment.