TENNESSEE
DEPARTMENT OF TRANSPORTATION

Constructability Review

Procedures Manual

PREPARED BY TENNESSEE DEPARTMENT OF TRANSPORTATION
Construction Division

Recommended by:	Signature:	Date:
CONSTRUCTION DIVISION DIRECTOR:		
ROADWAY DESIGN DIVISION DIRECTOR:		

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CHAPTER ONE

Executive Summary

The Tennessee Department of Transportation is responsible for an integrated transportation system that provides the opportunity for economic prosperity and a high quality of life for Tennessee's citizens. In order for the Department to build fiscally responsible projects and maintain this infrastructure, development of transportation projects requires the combined effort of many resources, functional areas, and partnerships. As part of the Department's Strategic Planning, Business Process Re-engineering was initiated to develop and adjust procedures, as needed, to ensure that a quality product is provided. One such initiative was the development of the Constructability Review.

Recognizing the challenges associated with highway construction, the goal of the Constructability Review is to utilize the expertise of both the Department *and* outside resources including the Road Building Industry. This allows the designer to tap into the vast wealth of knowledge and experience available from the construction industry and others alike. A constructability review is intended to improve project quality, minimize potential change orders during construction, and provide a buildable and biddable construction bid package.

This manual provides guidelines and procedures for establishing and conducting Constructability Reviews. Procedures outlined in this manual were developed by the Constructability Review Committee with input from Departmental resources.

Figure 1, in the appendix, provides a flow diagram of the overall Constructability Review process.

Comments and suggestions are welcomed and should be directed to the Constructability Review Coordinator.

CHAPTER TWO

Role of the Review Manager/Review Team

Since Regional Project Development will have the most comprehensive knowledge of project scope, they will be best suited to determine if a Constructability Review should be conducted. Not all projects will require that a Constructability Review be held. Projects that should be considered for a Constructability Review are as follows:

- Projects with unusual or critical construction sequencing
- Projects with critical traffic control, especially in the 4 major urban areas
- Projects where utilities may impact construction phasing and scheduled completion
- Projects where retaining walls, structures and grading are a major design component
- Any project that may benefit from the experience provided by outside resources

Determination of the need for a Constructability Review will be made at the Regional Site Review held for each project in development. The Site Review will be posted on the construction web-site for letting submittal to assist in informing potential bidders about the project.

Once it is determined that a Constructability Review is needed, the Project Development Director should submit a request for review to the Constructability Review Coordinator. The Project Development Director will be responsible for selecting the appropriate members from the Region to be included on the Constructability Review Team. The Constructability Review Coordinator from Headquarters Construction will be responsible for conducting the meetings, selecting a member to record the minutes of the meetings, and providing appropriate responses to information and suggestions provided. Please note that while suggestions are welcomed and encouraged, inclusion of such suggestions into the project is not guaranteed.

CHAPTER THREE

Constructability Review Participants

The Constructability Review will be conducted by the Constructability Review Coordinator. The Constructability Review Team will consist of participants that may have a stake in the project or can provide needed expertise. The following is a list of potential stakeholders:

- TDOT Personnel
- Other Government Agencies
- Utilities
- Contractors
- Suppliers

Breaking down each category, the potential stakeholders are as follows:

<u>TDOT Personnel</u>

- Structures Division
- Construction Division
- Traffic Office
- Environmental Planning
- Right of Way Division
- Materials and Tests Division (Geo-tech)
- Planning Division
- Maintenance Division
- Design Division
- Utilities Division
- Others may be included as determined by the Review Manager

<u>Other Governmental Agencies</u>

- Local public works/city engineers
- Tennessee Department of Environment and Conservation (T.D.E.C.)
- Corps of Engineers
- U.S. Fish and Wildlife Agency
- Tennessee Wildlife Resources Agency (T.W.R.A.)
- Federal Highway Administration
- Fire and Police Agencies
- School Systems
- State Archeologist
- All permitting agencies
- Others may be included as determined by the Constructability Review Coordinator

Utilities

- Various utilities affected by the project may be called in to discuss potential constraints. These may include utilities such as electric, gas, water, sewer, phone companies, cable TV, and railroads. The constructability review phase is an excellent time to work out phasing issues that may delay a project.

Contractors

- Bridge Contractors
- Paving Contractors
- Grading Contractors
- Specialty Contractors

Depending on the complexity of the project, one or more of the contractors listed may be asked to participate in the constructability review. Potential topics of discussion may involve a new type of bridge construction practice, blasting concerns, sensitive environmental issues, and traffic control restrictions, especially in the four major urban areas.

Suppliers

- This is a stakeholder that may not be called upon often but may be of great benefit. As new products are developed, vendor participation in the proper application of required specific products is vital. Benefits, limitations, and availability of various products could greatly affect phasing.

Selection of any of the participants should depend on what benefit or expertise that participant can bring to the review. The Team should be limited to a manageable size of 10 to 15 persons. On large projects, especially those with many utilities, this may not be practical. Not all participants may be asked to each review on a particular project. Some reviews may focus on a particular issue thus eliminating the need for a large group. (See figure 2 in the appendix for a sample participant invitation letter).

CHAPTER FOUR

Selection of Construction Industry Participants

One of the greatest benefits of the Constructability Review is the knowledge and experience that the construction industry can provide. Information regarding construction sequencing, conflicts with utilities, traffic control, and construction methods can help in reducing cost overruns, construction delays, construction changes, and traffic delays.

The Constructability Review Coordinator will determine the number and make the selection of members from the construction industry from a list of willing participants, which the Department's Construction Division will maintain from a solicitation of all pre-qualified contractors. (See figure 3 in the appendix for a sample solicitation letter). A letter will be posted as part of the pre-qualification process. The letter will also be posted on TDOT and TRBA's website. Three contractors will be chosen each for Review Team as follows:

- TDOT's Headquarters Construction Director will select one
- TRBA will select one
- One contractor will be randomly selected from the list of willing participants

Selection will be dependent on the contractor's bonding capacity in comparison to the project cost estimate of the project. The first year of initiating this process will require a letter of interest from the contractor. Participation in the Constructability Review will not preclude the Contractor from bidding for the job and is non-compensable.

CHAPTER FIVE

Construction Review Schedule

The intent of the Constructability Review is to apply new ideas, make corrections, and determine the most appropriate design approach early in the development of the project. This will reduce potential problems and associated plan revisions after the project is let to contract. In order to allow adjustments in the design, it is important that Constructability Reviews be held as early as practical. It is suggested that a review be held, as recommended by the Regional Site Review, once the ROW field review comments have been addressed. In order for the review to be most effective, bridge, utility, and geotechnical plans should be at least 50% complete. If value engineering is included in the project, it should be completed before the Constructability Review process. The Construction Division Director reserves the right to decide if the review schedule needs to be adjusted to provide industry representatives the needed information to benefit the project. Additional reviews may be incorporated and tailored to a specific topic if needed.

Approximately two weeks before the Review Meeting, the three selected contractors will receive a hard copy of the plans in the mail. Once the plans are mailed, they will also be posted on TDOT's website for review. These plans will be stamped for Constructability Review only; they are not suitable for bidding.

CHAPTER SIX

Conducting the Constructability Review

The Constructability Review is dependent upon the role of the attendees and meeting coordinator to ensure the meetings success. The purpose of the meeting is to provide an open forum for comments and discussion of the project. It is important that all participants have an opportunity to provide input. Review of plans and reports by the attendees prior to the meeting is essential.

The following is a suggested sequence of events conducted during the Constructability Review:

- Welcome/Introduce Participants
- Agenda Topics
- Overview of project and the proposed letting schedule
- Begin discussion topics
- Address other issues
- Open the floor to allow for any presentations
- Discuss follow up and action items

It is suggested that the Project Development Director ensure phasing plans, layouts, and earth imagery is available for the meeting.

CHAPTER SEVEN

Record Keeping

The Constructability Review requires the input from many resources within the Department as well as outside stakeholders. It is important that all comments or suggestions be recorded into the minutes of the meeting. The Constructability Review Coordinator should designate a record keeper to capture all information discussed and by whom. Action items and the responsible party shall be noted and recorded.

Each participant provides valuable and diverse input to the team. However, it is not practical to incorporate all comments or suggestions into a project. Some issues may be discussed and resolved quickly in the review. Others may require further discussions with management staff and, thus, be resolved outside the Constructability Review. Each participant in the review shall, therefore, receive a copy of a summary of the meeting. The Department shall not be required to make meeting minutes available, so as to protect the participant's comments and/or suggestions. Figure 5, in the appendix, will serve as a sample of the proper form of minutes.

The summary of each Constructability Review may provide valuable information to potential bidders of a project. This information will be made available to those potential bidders on the TDOT Construction Division webpage with all other pertinent project information. The Constructability Review Coordinator shall coordinate the availability of the review summary.

CHAPTER EIGHT

Follow Up and Lessons Learned

Transportation projects require the functional area expertise of many Divisions within the Department. Significant benefits can be realized when construction expertise is also incorporated early into Project Development. These benefits include reduced project cost, improved construction duration, and quality of bidding documents. The results of the constructability review process in these three key areas will be evaluated for each project providing tools for the Department to utilize on all projects in Development.

Lessons learned from these reviews will be consolidated and posted to maximize the rate of return on future projects evaluated by the Department minimizing risk and providing an improved quality product to the Industry as a whole. NCHRP Report 390, *"Constructability Review Process for Transportation Facilities"*, 1997 further identifies the benefits of the Constructability Review Process. An additional resource is the AASHTO *"Constructability Review Best Practices Guide"*, 1997.

APPENDIX

Constructability Review Diagram

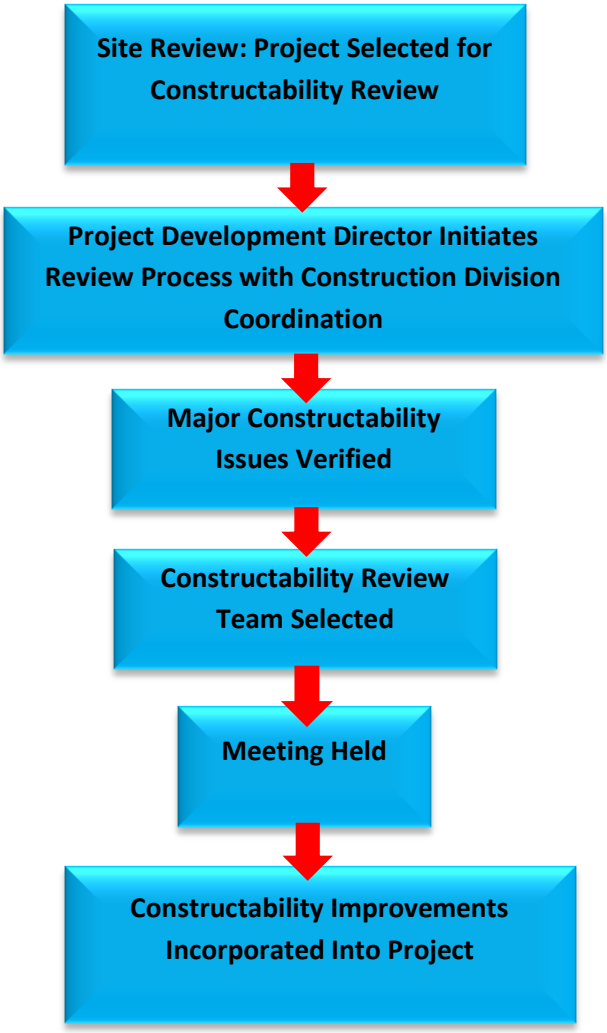

Figure 1

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION DIVISION
SUITE 700, JAMES K. POLK BUILDING
505 DEADERICK STREET
NASHVILLE, TENNESSEE 37243-1402
(615) 741-2414

JOHN C. SCHROER
COMMISSIONER

BILL HASLAM
GOVERNOR

Date

Mr. XXXX
XXXXX Construction Co, Inc.
XXXXX
XXXXXX, TN XXXXX

Re: Constructability Review: XXXX County – XXXX XXXXX

Dear Mr. XXXXX,

Thank you for agreeing to participate in the constructability review for the upcoming XXX County project on XXXXX. Please note that participation in this review is voluntary, non-compensable, and will not prevent you from submitting a bid for the project. Anything that you choose to share will remain in confidence. The Department would like to conduct the review with you on an individual basis in person. The review will be XXXX XX at Xpm EST at Region X in XXXXX.

(Specific Topics and Project Questions Generated from Site Review)

Some of the topics for the review should be:

- Project Phasing & Timing
- Retaining Walls Constructability
- Utility Relocation and Coordination with other work

Specific Questions:

1. Will the phasing provided by the utility plans coincide with the contractors suggested phasing of construction (maintenance of traffic)?

2. Does the contractor have enough means to begin bridge construction in light of the existing utility and rights of way proposed for the project?

3. In reviewing the maintenance of traffic plans, do the plans presented allow for motorists to travel as needed, but allow all work to be accomplished as designed?

4. What are the timeframes for each phase of work? Can this work be done in XX months?

5. Are any cross or longitudinal drains included that seem impossible under traffic due to depths or maintenance of water flow at locations within the project?

Figure 2

6. Understanding the businesses are required to have their entrances open and unobstructed, do any business accesses along the corridor pose issues to the construction of the roadway?

7. How would the contractor minimize impacts to ingress/egress to neighborhood access?

8. How would the contractor sequence construction of the large box culvert and channel?

9. How would the contractor sequence the construction of the main storm sewer system?

10. How could the contractor get creative and balance the earthwork and minimize the amount of borrow needed.

11. What are the greatest challenges of the project? What are the greatest opportunities for improvement?

Again, thank you for your help.

If you have any questions, please feel free to call me at 615-741-1158.

Sincerely,

Lori Lange, P.E.
Assistant Director, Construction Division

Cc: Construction Division Director
Construction Division Assistant Director
Region Director
Region Director Operations
Region Director Project Development
Operations Engineer

Figure 2 (continued)

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION DIVISION
SUITE 700, JAMES K. POLK BUILDING
505 DEADERICK STREET
NASHVILLE, TENNESSEE 37243-1402
(615) 741-2414

JOHN C. SCHROER
COMMISSIONER

BILL HASLAM
GOVERNOR

Date

TDOT is planning a Constructability Review for the following Region X project that is currently scheduled for a Spring/Winter/Fall/Summer 20XX Construction Turn-In;

PROJECT:	**PIN _____.__ XXXX County**
	SR 115 (U.S. 129, Alcoa Highway) From XXX to XXX S.P. XXXXXX, NH-XXX(XX)
SUBJECT:	**CONTRACTOR REQUEST FOR PARTICIPATION**
MEETING DATE:	XXXXXXXXXXXXX
CONTACT:	Lori Lange, P.E., Assistant Director, TDOT Construction Division Lori.lange@tn.gov (615)741-1158

PROJECT DESCRIPTION:

FOCUS OF MEETING: The meeting will focus on comments from the Site Review, Construction Staging Plans, Utility Relocation and Coordination of Other Work, Construction Completion Date, Retaining Wall Constructability, Bridge Phasing/Construction and Innovation in Design. The ultimate goal is a biddable, buildable, cost-effective and maintainable project.

If you are interested in participating in this review, please contact Ms. Lori Lange at (615)741-1158 or by e-mail lori.lange@tn.gov by **Month, Day, and Year.**

Please note that participation in this review is voluntary, non-compensable, and will not prevent you from submitting a bid for the project. Anything that you choose to share will remain in confidence.

Figure 3

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION DIVISION
SUITE 700, JAMES K. POLK BUILDING
505 DEADERICK STREET
NASHVILLE, TENNESSEE 37243-1402
(615) 741-2414

JOHN C. SCHROER
COMMISSIONER

BILL HASLAM
GOVERNOR

November 13, 2015

MEMORANDUM

PROJECT:	**PIN 100241.01 Knox County**
	SR 115 (U.S. 129, Alcoa Highway) From North of Maloney Road to Woodson Drive S.P. 47026-3279-14, NH-115(54)
SUBJECT:	**CONSTRUCTABILITY REVIEW MEETING NOTES**
DATE:	Tuesday October 28, 2015 Wednesday October 29, 2015
NOTES BY:	Jay Norris, P.E., Assistant Director, TDOT Construction Division

A Constructability Review meeting was held on the SR 115 (U.S. 129, Alcoa Highway) Project with Construction Industry Representatives, the Consultant Design Team, TDOT Headquarters Construction, and TDOT Region 1 Operations and Project Development staff. The scope of the review was to integrate construction expertise early into the project development process for the 1.69 mile project that includes three bridges, nine retaining walls, complex construction phasing, and numerous utility relocations.

The construction field review plans, utility layout and traffic control phasing were reviewed as part of the meeting.

SPECIFIC QUESTIONS:

1. Will the phasing provided by the utility plans coincide with the contractors suggested phasing of construction (maintenance of traffic)?

2. Does the contractor have enough means to begin bridge construction for Bridges 1, 2 & 3 in light of the existing utility and rights of way proposed for the project?

3. KUB currently has electric included with roadway plans with the ability to opt out of contract and perform the work themselves after bid. What concerns are presented if KUB Electric is moved in conjunction with the roadway contractor's grading operation?

INFORMATION ONLY

Figure 4

4. In reviewing the maintenance of traffic plans, do the plans presented allow for motorists to travel as needed, but allow all work to be accomplished as designed? Are there any concerns that 2 lanes of traffic in each direction may not be able to be accomplished during the course of the contract?

5. What are the timeframes for each phase of work? Can this work be done in 24 months?

6. Are any cross or longitudinal drains included that seem impossible under traffic due to depths or maintenance of water flow at locations within the project?

7. Understanding the businesses are required to have their entrances open and unobstructed, do any business accesses along the corridor pose issues to the construction of the roadway?

8. How would the contractor minimize impacts to ingress/egress to neighborhood access especially Mt. Vernon Road and Montlake Dr?

9. How would the contractor sequence construction of the large box culvert and channel at Sta. 10+880?

10. How would the contractor sequence the construction of the main storm sewer system that runs along Alcoa Highway and eventually into the reservoir?

11. How could the contractor get creative and balance the earthwork and minimize the amount of borrow needed.

12. What are the greatest challenges of the project? What are the greatest opportunities for improvement?

ITEMS OF DISCUSSION:

The following is a summary of the items discussed.

A. Project Phasing, Timing and Constructability

- Challenges associated with work involving excavation and embankment in regards to traffic control phasing and availability of material will be reviewed as it relates to the estimated roadway quantities. Access to the area of excavation and the feasibility of use for embankment further complicates the phasing and duration of construction.

- Phasing of traffic should consider center pier construction early in the traffic control sequencing. This is considered a critical path item of work.

- Consider adding shoring at specific locations for safety of traveling public.

- Consideration of revised access to Montlake Drive during phasing would assist in constructability of the roundabout and Bridge 3 over SR 115.

Figure 4 (continued)

- The proposed full-depth paving schedule on SR 115 increases complexity and phasing of traffic. Full-depth paving construction may require undercut.
- A Smart Work Zone should be considered due to traffic volumes and anticipated project duration.
- Consider allowing long weekend closures for traffic phase shifts and tying in grades.
- Constructability of the deep structures as related to phasing of traffic may require one lane closures.
- Consider specifying pre-cast drainage structures for some drainage work.
- Consideration of jack and bore is needed at several locations.
- The ½ mile stream encapsulation will require diversion or suspended pipe quantities to be set up on the project.
- Construction access along with temporary paving is needed at numerous locations to accommodate phasing of traffic.
- A Metric to English Conversion table would aid in the understanding of the payment of quantities.
- A calculation of excavation and embankment as related to phasing of construction would benefit the contractor in completing the estimate.
- Consideration of utilizing the existing 1800 mm CMP to be replaced as a temporary phasing measure was discussed.

B. Retaining Wall, Bridge Constructability

- The construction of the retaining walls is considered a critical path item of work. The number of anchors and soil subsurface will extend the construction duration.
- Shoring considerations are needed for the wall and drainage construction based on concern for loose rock on the east side of SR 115.
- Additional borings would assist in constructability and planning of schedule.
- Bridge 3 pier construction will require close coordination with the phasing of traffic.
- Accessibility for wall construction requires coordination with phasing of traffic control plans. Retaining wall preparation should be considered early in phasing.

Figure 4 (continued)

- It was discussed that a breakdown of bid items on walls (to include additional sub-items) would reduce risk to the project and contractor.

- Construction of the Phase 1 Bridge directly relates to the ramp work, and utility relocations.

- Consider adding item for tie back anchor grout

- There may be conficts with Bridge 2 Pier and traffic phasing.

C. Utility Relocation and Coordination with Other Work

- The KUB plans address potential conflicts along the corridor with temporary items, and re-location outside of the bridge construction.Overhead clearance for mobilization of construction equipment is a potential challenge.

- A potential gas conflict is apparent at Bridge #1.

- Concern was expressed over the need to ensure coordination of utility sequencing with traffic control phasing was thoroughly vetted in the Project Development Phase.

- The phasing of the KUB lines as related to the Phase 1 Construction Limits should be identified in the Traffic Control phasing notes.

SUMMARY:

The attendees were in agreement that the project appears constructible as shown; however, could be improved upon by incorporation of the Items of Discussion. All Contractors reviewing the project saw this as a two phased project. Phase 1 would be utility relocation, wall, bridge and frontage road construction. Phase 2 would consist of widening Alcoa Highway. Based on findings during the review, the construction duration would likely extend beyond the 24 months initially anticipated for this project. The consensus of the group was that this project would take between 3 and 4 years to construct.

Figure 4 (continued)