Value Engineering Study Agenda

- Welcome and Introductions
- Ground Rules
- Objectives
- Understanding and applying the phases of VE
- Evaluations
- Adjourn

*There will be breaks in the morning and afternoon as well as a break for lunch.*
• **Introductions**
  – Name, job/area of expertise, years of experience

• **Ground Rules**
  Allow everyone to participate
  Take calls outside
  Catch up on work during breaks
  Don’t interrupt
  No side conversations
  Stay on task – use the parking lot
  Be respectful
VE Study Objectives

• Apply VE analysis/process
• Learn
• Generate creativity
• Develop Recommendations
• Have Fun
What is Value Engineering?

VE is an organized application of common sense and technical knowledge directed at finding and developing alternative ideas that can add value to a project.

Through this collaboration, recommendations can be developed that:

1. Provide the needed functions
2. Improve the quality
3. Reduce the Project Delivery time
4. Seek Innovative Alternatives
5. Reduce Impacts
6. Reduce Risks
7. Improve Constructability
8. Address inefficiencies
Value Engineering Program

• Federal Program

• Required on all Design-Bid-Build projects…
  • located on the National Highway System or intersecting with the National Highway System,
  • With estimate TOTAL costs >$50M or > $40M for projects with a structure.

• Support project delivery by reviewing any project with escalating costs or unique circumstances that could benefit from VE Analysis
How is Value Engineering Applied?

• A VE Team participates in a Value Engineering Study
• VE Teams are compiled of experts, in various disciplines related to the project, but who are not directly involved in the planning or development of the project.
• VE Teams can include NCDOT Staff or Consultants or a combination of both.
• A trained facilitator leads the VE Team through the VE Process.
Value Engineering Study Process

The First 5 Phases are applied during the VE Study

1. Information Phase
2. Function Analysis Phase
3. Creative Phase
4. Evaluation Phase
5. Development Phase

6. Presentation Phase
7. Resolution Phase

The last 2 phases are at later dates.
Information Phase

The Project Manager/Design Team:

- Provide project background and specifics
- Answer questions
- Confirm project concept and scope
- Identify any constraints/commitments
- Identify and prioritizes issues
Notes from Information phase:
Function Analysis

What is a Function?
- Work that an item or procedure is intended to perform

To identify functions ask:
1- What is the item’s purpose?
2- What does it do?
3- What must it do?
Function Analysis of a Pencil

**Pencil: Mark Surface**

- **Band:** Secure Eraser
- **Barrel:** Support Lead, Accommodate Grip, Transmit Force
- **Paint:** Protect Wood, Improve Appearance
- **Lead:** Mark Surface
- **Eraser:** Remove Marks
## Function Analysis Phase Example

<table>
<thead>
<tr>
<th>Project</th>
<th>Verb</th>
<th>Noun</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-2707C</td>
<td>Reduce</td>
<td>Traffic through Shelby</td>
</tr>
<tr>
<td></td>
<td>Maintain</td>
<td>RR Connectivity</td>
</tr>
<tr>
<td></td>
<td>Improve</td>
<td>Mobility</td>
</tr>
<tr>
<td></td>
<td>Ensure</td>
<td>Environmental Integrity</td>
</tr>
<tr>
<td></td>
<td>Minimize</td>
<td>Property Impacts</td>
</tr>
<tr>
<td></td>
<td>Minimize</td>
<td>R/W Takings</td>
</tr>
</tbody>
</table>
Function Analysis Phase

• Classify each identified function
  • Higher Order- Objective of project
  • Basic- Cannot Change
  • Secondary- Supporting
## Function Analysis Phase Example

<table>
<thead>
<tr>
<th>VE-4 Function</th>
<th>Project</th>
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Creative Phase

Identify creative ideas that will add value to the project— **Value Opportunities**

- What are alternative ways the functions of the project can be accomplished?
- Are there any constructability issues?
- Is this project a good candidate for an innovative idea?
- Can ROW, Environmental, Utility impacts be reduced?
# Creative Phase Example

<table>
<thead>
<tr>
<th>VE #</th>
<th>VE Opportunity / Description / Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Investigate realigning NC 180 to the east of Spake Concrete. Straighten NC 180 from Centerfield Dr. to the existing NC 150 intersection and make the NC 150/ NC 180 an at grade intersection instead of an interchange. Provide a connection from this new intersection to the Bypass.</td>
</tr>
<tr>
<td>2</td>
<td>Investigate realigning NC 180 to the north of the bypass interchange.</td>
</tr>
<tr>
<td>3</td>
<td>Investigate ways to balance earthwork to reduce unclassified excavation cost.</td>
</tr>
<tr>
<td>4</td>
<td>Change proposed grade elevation to hit the minimum required clearance (~17' or 18') at all structures.</td>
</tr>
<tr>
<td>6</td>
<td>Investigate -Y4rev- typical to see if new pavement is needed. Consider widening/wedging to eliminate the need for detouring traffic.</td>
</tr>
<tr>
<td>7</td>
<td>Consider stream realignment and culvert realignment around 553+50.</td>
</tr>
</tbody>
</table>
Evaluation Phase

• Clarify and categorize each idea to develop a shared understanding

• Consider how ideas affect project cost and performance parameters

• List the disadvantages and advantages of the idea

• Rate and select ideas for further development.
  -1: When the disadvantages outweigh the advantages
  1: When the idea is worth developing
## Evaluation Phase Example

<table>
<thead>
<tr>
<th>VE #</th>
<th>VE Opportunity / Description / Notes</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Investigate realigning NC 180 to the east of Spoke Concrete. Straighten NC 180 from Centerfield Dr. to the existing NC 150 intersection and make the NC 150/ NC 180 an at grade intersection instead of an interchange. Provide a connection from this new intersection to the Bypass.</td>
<td>Potentially eliminates the roundabouts</td>
<td>Bridges would have to be lengthened and potentially be steel girders, or there would need to be a place to put the center bents. Potential business relocations and ROW access issues.</td>
<td>-1</td>
</tr>
<tr>
<td>2</td>
<td>Investigate realigning NC 180 to the north of the bypass interchange.</td>
<td>Allows for shortened/ lowered bypass structures over the railroad. Potentially simpler and cheaper traffic control. Allows contractor to use existing NC 180 to transfer earth material from one side of the project to the other.</td>
<td>Long realignment. Possible additional traffic, possible increased environmental impacts. Potential increased impacts to Spoke Concrete.</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Investigate ways to balance earthwork to reduce unclassified excavation cost.</td>
<td>Minimize footprint, less environmental and human impacts, substantially lowers cost</td>
<td>Less consistent / slightly steeper grade, slight increases in drainage structure (box culvert and cross drains) costs</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Change proposed grade elevation to hit the minimum required clearance (~17 or 18) at all structures</td>
<td>Shorten bridge length and potentially allow concrete girders, minimize footprint, lowers cost</td>
<td>Could possibly affect earthwork</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Investigate V4rev typical to see if new pavement is needed. Consider</td>
<td>Can maintain traffic onsite</td>
<td>Additional construction time</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Consider stream realignment and culvert realignment around 653+50.</td>
<td>Eliminate pipe, possible mitigation credit, possible reduction in culvert length</td>
<td>Slight increase in box culvert size, possible increase in stream impact</td>
<td>1</td>
</tr>
</tbody>
</table>
Development Phase

• Value Opportunities that received a “1” during Evaluation phase are now Recommendations that need development.

• Development is additional information provided that:
  1- Indicates how the recommendation is a better choice for the project than current design
  2- Includes a sketch, picture, or visualization for clarification purposes (if needed).
  3- Provides a cost estimate of any monetary changes
Questions to Ask During Development Phase

- How will the recommendation work?
- Can the design engineers clearly understand the concept of the recommendation?
- Are there existing projects that have this same scenario?
- How can potential issues be overcome?
- Why is the innovation better?
- Will it meet the requirements?
- What will be the total cost?
- What are the life cycle costs?
- What documents contain the item/idea being altered?
Presentation Phase (handled by VMO)

- VE Study information is compiled into a VE Report

- Report is distributed to Project Manager and the VE Team (or Oral Presentation is given)

- Recommendations with development information is given to the project design engineers for evaluation
The Time between Presentation and Resolution

• The project design engineers review the recommendations and provide comments to the project manager.

• The project manager reviews the documentation and comments then makes the final decision to either:
  – Accept the recommendation,
  – Accept the recommendation with some modifications, or
  – Reject the recommendation.

• Justification is provided as to why a decision to reject or modify is made.
Resolution Phase

This phase occurs at Final Design stage.

- **Project Manager**
  - Provides document(s) relevant to accepted recommendation
  - Signs off on Implementation Section of form

- **Value Management Office**
  - Verifies that accepted recommendations have been implemented into final plan document
Your Input and Expertise is Appreciated…

Please let us know of any projects that:
• have estimates over $20 Million.
• have the potential to be advanced
• are nearing 25% plans