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Critical Thinking Skills for Managing Contract Changes During the Design Phase

(Participant Workbook Version)

Instructor: Roy Siegel, P.E.
Construction & Contract Administration Engineer
FHWA Resource Center Const. & Proj. Mgmt. Team

Why Are You Here?

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- To better understand how to:
  - ✓ Manage risk in the design and pre-construction phases to avoid disputes and changes during construction
  - ✓ Understand how and why a contractor interprets your contract documents differently than you intend
  - ✓ Recognize and address how legitimate disputes and changes during construction relate to design decisions
  - ✓ Present design intent in a way that maximizes a contractor's ability to bid the work in a fair & equitable manner

Introductions

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- Name
- Agency / Job Title
- Experience with highway contract design
- Primary course goal
- Favorite activity / hobby

Ground Rules

- Participate
- Share responsibility for training
- Respect the opinions and attitudes of others (you may ask for ***one*** exception) ☺
- Cell phones & Laptops on vibrate
- Use "Parking Lot" for off-topic issues
- *THERE ARE NO INTERRUPTIONS!!!*

- Break Time (BT):
  - BT < or = N + 5 where N = stated length of break in minutes
    - If unstated, assume N = 10 minutes
  - Liquidated Damages may be assessed beginning at N + 6 min and will result in a possible lunch hour reduction unless:
    1) The break extension is expressly approved by *Management* prior to commencement, or;
    2) The extended break results in the "breakee" returning with *"snack food and beverages"* for class-wide distribution, at which point all will be forgiven, or;
    3) The break extension is used for naturally occurring bodily processes when the process has advanced to the point where there is an elevated risk of participant "*losing substantial control*" over said process ☹

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Questions Before we Dig In?

Part 1: Basic Contract Terminology

- Basic understanding of the terms:
  - ✓ “Contract”
  - ✓ “Low Bidder”
  - ✓ “Change”
  - ✓ “Claim”
  - ✓ “Risk”

What is a Contract?

A contract is an agreement between parties creating legally enforceable obligations. Several essential elements are required for a binding contract: offer, acceptance, mutual assent "meeting of minds," consideration, capacity, and legality. Contracts are typically signed and in writing to confirm these elements are present.

What is a "meeting of the minds" and how does low bid contracting limit a contractor's ability to reach a "meeting of the minds" when interpreting your plans and specs?

Let's take a look…

Meeting of the Minds Example #1

- *You are a contractor bidding on a low-bid contract to paint a house. The bid document includes the following language:*

  "Prior to painting exterior surfaces, prepare the surfaces by pressure washing to remove dirt and loose paint"

- *How does homeowner interpret this language?*
- *How would you interpret this language for a low bid contract and why?*
- *What if pressure washing doesn't remove all dirt or loose paint? Do you have to remove it at no addl. Cost? Do you have to be paid to do so?*
- *What if pressure washing creates more loose paint? Are you entitled to more $$ to address?*

Meeting of the Minds Example #2

- *You are a contractor bidding on a low-bid contract to mow a yard. The bid document includes standard landscape language:*

  "Mowing includes cutting grass, picking up clippings & disposing, edging along all concrete and general clean up"

- *How does homeowner interpret this language?*
- *How would you interpret this language for a low bid contract and why?*
- *What if you arrive to mow and find grass is 10" tall? Do you have to honor your price and why?*
- *What if you arrive and find grass is soaking wet from recent watering? Do you have to honor price and why?*

Low Bidder

- If low bid process used same procedures as Roman Gladiators, how would you know who low bidder was and how is this analogy important to understand a bidder's perspective vs. DOT's perspective?

Change

- What is a contract change?

  The difference between level of effort ***understood*** *(by the Gladiator during bid)* in the bid documents and the level of effort ***required*** *(from the Gladiator)* during the contract

  Whose "understanding" of the bid documents do you think carries more weight when considering a change, the owner's, the contractor's or are they both of equal weight? Why do you think so?

Claim

- What is a Claim?

An unresolved change or dispute resulting in a demand for additional cost, time, or both based on 3 primary components:

- ✓ Entitlement – Why is payment under the contract inadequate? (i.e. is there a justifiable reason?)
- ✓ Impact – How did the justifiable reason affect your work activities?
- ✓ Cost – How much did the justifiable reason impact your direct costs?

Risk

- How do you define risk in a contract with specific focus on avoiding disputes and changes?

  What is the likelihood the contractor's "understanding" of bid documents [*intended to help them become low bidder*] is **significantly** different than the owner's intent when preparing the bid documents?

  How should a contractor address a risk in their bid if the associated cost is not mandated in the contract and represents a risk to their low bid?

  Let's take a closer look at "risk" in Part 2…

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End Part 1

Part 2
Understanding Risk

Topics

- Categorizing Risk by:
  - ✓ Nature
  - ✓ Responsibility
  - ✓ Control
  - ✓ Probability
- Risk Accessibility:
  - ✓ How does risk affect a contractor's ability to bid and a DOT Engineer's ability to manage a contract?

The Nature of Risk

- In its simplest form, the “nature” of risk to a contractor answers the question, ‘How can a risk cost me time or money?’
- The larger the magnitude of the potential cost, the greater the nature of the risk
- Let’s look at some examples to better understand the nature of risk (remember, see these through the lens of a contractor as well as a DOT contract administrator)…

Nature of Risk – Railroad X'ing

- *What risks do you see with these components?*

Nature of Risk – Urban Drainage

- *What risks could a contractor face during urban drainage construction that could impact production or complexity?*
  - *Contract indicates possibility of underground utilities being relocated during active construction and service lines in conflict with constructed drainage lines*

Responsibility for Risk

- In its simplest form, the “responsibility” for a risk to a contractor answers the question, ‘Does the contract clearly define who owns the risk?’ (if risk is shared, does the contract indicate how it will be apportioned/shared)

- The clearer the contract language, the easier it is to determine responsibility for risk

- Let’s look at some examples to better understand responsibility for risk (remember, look through the lens of a contractor, not a DOT contract administrator)…

Responsibility for Risk – Utility Conflicts

- *How does the following contract language affect responsibility for risk? What about due diligence?*

  - *"Contractor is responsible for avoiding utility connections, service lines, and other individual service lines not show on the contract plans. No additional compensation will be made for work to avoid, repair, or reconnect existing service lines, to avoid or maintain and protect existing utilities, and the contractor will ensure that utility services to all businesses and residences are maintained at all times."*

Responsibility for Risk – Wet Subgrade

- *How does the lack of contract language affect responsibility for risk of wet subgrade? The only information available is a series of subsurface bore holes with USCS soil classification and in situ moisture when tested and specification language requiring embankment be compacted to at least 95% of T-99 proctor maximum density and between -4% and +2% of optimum moisture?*

The Level of Control over Risk

- The “control” of risk to a contractor answers the question, ‘To what extent can I use choice of materials or means & methods to control the harm posed by the risk?’
- The greater the ability to control risk with materials, means or methods, the higher the level of control over the risk
- Let’s look at some examples to better understand risk “control”…

Control of Risk – Wet Drilled Shafts

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- *How can a contractor control the risk of water in drilled shafts and possible collapsible soil using means & methods?*
  - *Contract indicates possibility of water in drilled shaft construction and soils that might not hold vertical walls*

Control of Risk – Culvert Reconstruction

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- *How can contractor control risk of dealing with stream during culvert reconstruction using means & methods?*
  - *Contract indicates existing stream flows will need to be perpetuated through the active work area and isolated from channel earthwork and culvert construction*

The Probability of a Risk

- The “probability” of risk to a contractor answers the question, ‘What is the likelihood I will be forced to deal with a risk during construction of a contract?’
- The greater the likelihood the contractor will confront the risk, the higher the probability of needing to deal with the risk in the bid
- Let’s look at some examples to better understand risk “probability”…

Risk Probability – Railroad Delays

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- *How can a contractor assess the risk of railroad causing delays due to submittal reviews, track closure criteria, or railroad flagger demands not enumerated in specs?*

Risk Probability – Rock Excavation Method

- *How can a contractor assess the risk of requiring rock blasting versus ripping and excavating?*

The Impact of Risk

- How does any given risk affect a contractor's ability to bid the risk into the project?

- This is the "accessibility" of the risk to the bidder, is different than its categorization, and can be understood by answering 2 questions:

  1) Is the risk obvious enough to be understood by all bidders and is it quantifiable enough to estimate?

  2) What is the likelihood all bidders will add cost to cover the risk, and if so, what is minimum cost likely to be added?

- Let's look at some examples to better understand risk "accessibility"…

Risk Accessibility – Simple Examples

- Accessible Risk Examples:
  - ✓ Contractor must protect existing sewer lines where shown in the plans during subgrade excavation/compaction activities?
  - ✓ Boulders will be encountered during pile driving activities and contractor must use pre-bore as needed to avoid pile damage
- Inaccessible Risk Examples:
  - × *Boulders "may be encountered" during pile driving operations*
  - × *Some excavated materials will be unsuitable for embankment and need to be removed and wasted (no indication of how much unsuitable material or where it is located)*

Risk Accessibility – Service Lateral and Utility Conflicts for Storm Drain Pipe

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- Contractor installing storm drain lines and manholes in town (suburban setting), and is trying to determine the accessibility to risk of conflicting utilities including service laterals to businesses and residences…

- First, the contractor must understand how is the risk addressed in the contract documents and is the risk expressly apportioned to the owner or the contractor?

- Let's say in this contract, the relevant language is as follows:

  - *"Contractor is responsible for avoiding existing utilities as well as utility connections, service lines, and other individual lines not shown on the contract plans. No additional compensation will be made for work to avoid, repair, or reconnect existing service lines, to avoid or maintain and protect existing utilities, and the contractor will ensure that utility services to all businesses and residences are maintained at all times."*

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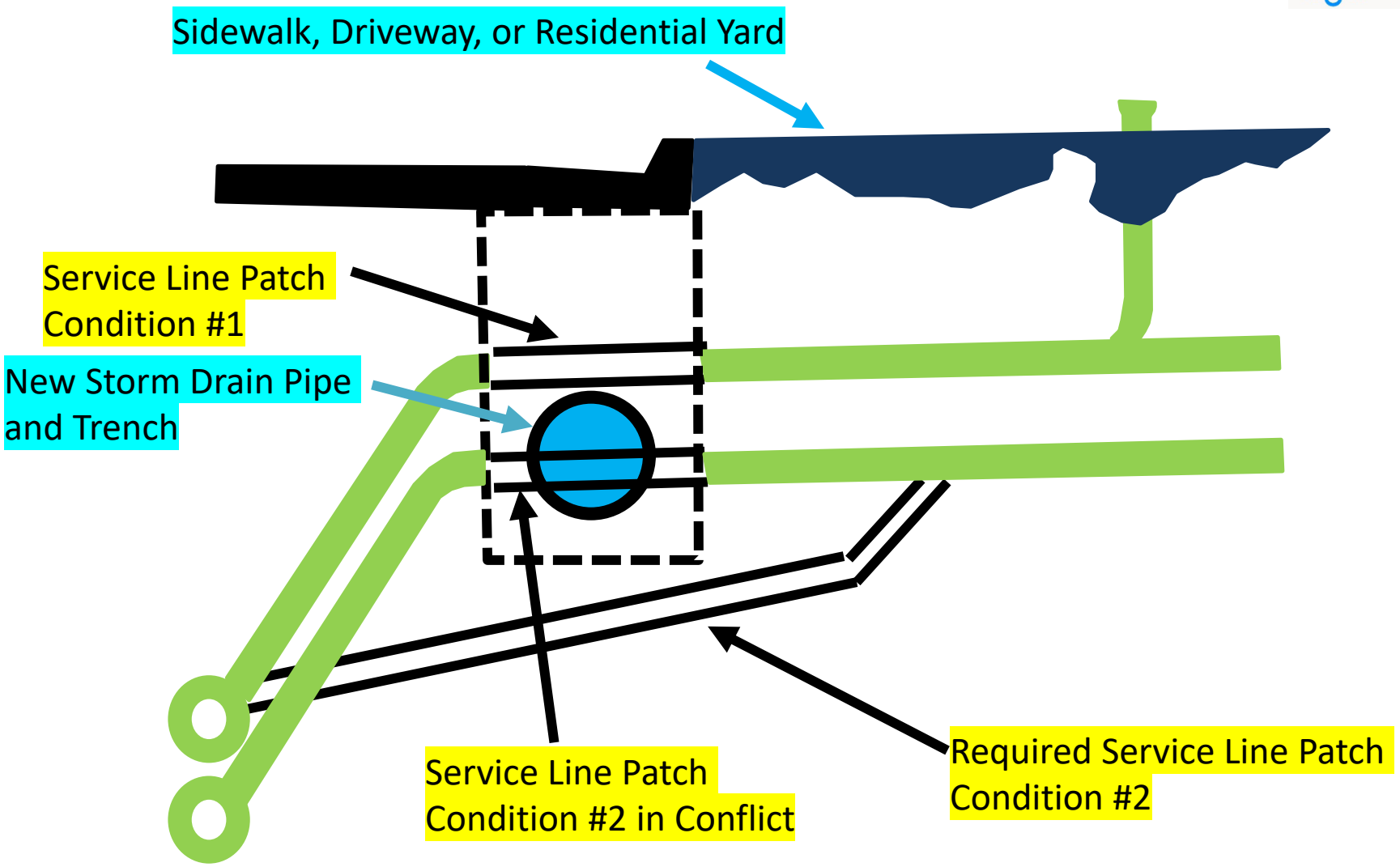
Service Lateral Conflict



Risk Categorization

- Does the contract assign responsibility for this risk?
- What is the nature of the risk for utility and service line conflicts?
- What ability does the contractor have to control the risk using materials, means & methods, or other techniques?
- What is the probability the contractor will need to deal with utility and service line conflicts while constructing storm drainage pipe and manholes?
- Now the risk is categorized, let's see about how accessible the risk is for bidding this contract…

Risk Accessibility Analysis

1) Is risk obvious enough to be understood by all bidders and is quantifiable enough to estimate?

   ✓ Do you think all bidders understand the risk of dealing with existing utilities belongs to contractor? Do you think there is enough information in plans or specifications to quantify the number of conflicts?

2) What is likelihood all bidders will add cost to cover risk, and what is minimum cost added?

   ✓ How do you think a prospective bidder will make this determination and what will be added to pipe work?

Risk Accessibility Analysis (cont.)

- In this type of downtown (suburban) setting, let's use the following normal production rates for drainage pipe installation:
  - ✓ 750 LF/day (open trench and no trench box required)
  - ✓ 500 LF/day (trench box required but no utility conflicts)
  - ✓ 300 LF/day (trench box & intermittent utility conflicts)
  - ✓ 150 LF/day (trench box & significant (continuous) utility conflicts expected)
- The cost for a pipe laying crew with 2 excavators, backhoe, 2-3 operators, and 3 pipe laying crew members is about $7,500 per 10-hour shift

Risk Accessibility Analysis (cont.)

- How does the production rate for pipe installation affect bid price (ignoring matl.):
  - ✓ 750 LF/day ($10 per LF to install)
  - ✓ 500 LF/day ($15 per LF to install)
  - ✓ 300 LF/day ($25 per LF to install)
  - ✓ 150 LF/day ($50 per LF to install)
- Assuming contract includes 3,000 LF of pipe, installation cost ranges from $30,000 to $150,000…how will contractors bid this work and how accessible is risk to a contractor?
- What could you do as a designer to make this risk more accessible to bidding contractors? (End of Example #1 Analysis)

Risk Accessibility – Temporary Detour

- Contractor widening roadway temporarily to allow for maintenance of traffic using the widening as a temporary detour while reconstructing the existing roadway…the anticipated timeframe for this detour is approximately 6-months…

- First, the contractor must understand how is the risk addressed in the contract documents and is the risk expressly apportioned to the owner or the contractor?

- Let's say in this contract, the relevant language is as follows:

  - *"Construction of temporary detour includes all necessary earthwork, drainage, roadway base, asphalt paving, temporary striping, and any other work necessary to carry construction detour traffic. Payment for item "Temporary Detour" includes all labor, equipment, materials, and incidentals necessary to construct, maintain, and remove temporary detour. No additional compensation will be made for work to repair temporary detour, and Engineer reserves the right to suspend other work to facilitate immediate repairs to the temporary detour when deemed necessary."*

Risk Categorization

- Does the contract clearly define responsibility for risks associated with detour construction?
- What is the nature of the risk for constructing the temporary detour? What about railroad & clear zone?
- What ability does the contractor have to control the risk using materials, means & methods, or other techniques?
- What is the probability the contractor will need to deal with significant cost due to poor soil conditions, railroad complications, or clear zone issues?
- Now the risk is categorized, let's see about how accessible the risk is for bidding this contract…

Risk Accessibility Analysis

1) Is risk obvious enough to be understood by all bidders and is quantifiable enough to estimate?

   ✓ Do you think all bidders understand the risk of dealing with unsuitable subgrade for detour construction? What about railroad and/or clear zone issues? Do you think there is enough information in plans or specifications to quantify these issues?

2) What is likelihood all bidders will add cost to cover risk, and what is minimum cost added?

   ✓ How do you think a prospective bidder will make this determination and apply it to the detour item?

Risk Accessibility Analysis (cont.)

- In this type of detour construction, cost for earthwork, roadway base, and asphalt are well-known. What isn't as well known is:
  - ✓ Cost of de-watering area prior to earthwork?
  - ✓ Cost of constructing soft soil working pad
  - ✓ How long will subgrade support traffic before failing?
  - ✓ What is necessary to address railroad/clear zone issues?
- The cost for excavating unsuitable soil in roadside ditch and replacing it with granular material could easily be $20-$30 per CY on top of normal detour construction…

Risk Accessibility Analysis (cont.)

- Other things that might not be as obvious include the following:
  - ✓ Where can contractor dispose of unsuitable material?
  - ✓ If de-watering is necessary, is it paid or incidental and does the pumped water require treatment?
  - ✓ What will railroad require for modifying crossing?
  - ✓ Is contractor responsible for clear zone issues?
- Each of these items includes additional risk, potential additional time and/or cost, and more work unlikely to be captured in all bids…therefore, how do you think others will bid detour and how accessible is this risk to a bidding contractor?

Risk Accessibility Analysis (cont.)

- What could you do as a designer to make this risk more accessible to bidding contractors?
- If you do nothing to address the accessibility of this risk, how might this risk manifest itself into a disagreement, dispute, or claim?

End of Example #2 Analysis…

Risk Accessibility Owner Considerations

- How can these non-quantifiable or significant cost/time-based risks affect the owner's ability to administer a contract with these risks?
  - ✓ What if contract language is ambiguous?
  - ✓ What if contract language is clear but unreasonable?
  - ✓ What if unanticipated challenges arise during construction? (i.e., who owns the risk and why)
  - ✓ What design responsibilities (including EOR) can be given to a contractor without clear direction in the contract documents?

Risk Accessibility Owner Considerations

- What happens to an owner when a contractor believes they are experiencing a risk that is greater than anticipated or different than represented in the contract?
  - ✓ Contractor can use significant changes clause
  - ✓ Contractor can claim differing site conditions
  - ✓ Contractor can argue that requirements are unreasonable and therefore not enforceable
  - ✓ Contractor can argue legal positions like the *Spearin Doctrine* to claim a contract is "defective"
- In part 3, let's look at *Spearin Doctrine…*

End Part 2

Part 3

Spearin Doctrine

(impact on design)

Who Has Heard of *Spearin Doctrine*

- What have you heard?

- How do you think it affects your design?

Key Dispute Point for Each Party

- Navy argued Spearin's requirement to visit site and inform themselves of project conditions assigned risk of all detrimental site conditions to Spearin, including pipe blockage that caused rupture (pipe blockage was within dry dock site but outside of actual pipe relocation work area)…

- Spearin argued they followed details in plans for reconstructing sewer, so failure can't be assigned to contractor because they were hired to construct the sewer per plan, not to design it or confirm its adequacy…

What is Your Opinion?

- Which argument do you support and why?

- Who do you think won the argument and why?

Spearin Doctrine

- U.S. Supreme Court (SCOTUS) 1918 decision in ***United States v. Spearin*** (248 U.S. 132)
  - ✓ The owner impliedly warrants the constructability of the plans and specifications provided to a contractor. The contractor is not liable for loss or damage due to defects in the plans and specifications

Excerpt of SCOTUS Majority Opinion

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- The general rules of law applicable to these facts are well *136 settled. Where one agrees to do, for a fixed sum, a thing possible to be performed, he will not be excused or become entitled to additional compensation, because unforeseen difficulties are encountered. *Day* v. *United States*, 245 U.S. 159; *Phoenix Bridge Co.* v. *United States*, 211 U.S. 188. Thus one who undertakes to erect a structure upon a particular site, assumes ordinarily the risk of subsidence of the soil. *Simpson* v. *United States*, 172 U.S. 372; *Dermott* v. *Jones*, 2 Wall. 1. But if the contractor is bound to build according to plans and specifications prepared by the owner, the contractor will not be responsible for the consequences of defects in the plans and specifications. *MacKnight Flintic Stone Co.* v. *The Mayor*, 160 N.Y. 72; *Filbert* v. *Philadelphia*, 181 Pa. St. 530; *Bentley* v. *State*, 73 Wisconsin, 416. See *Sundstrom* v. *New York*, 213 N.Y. 68. This responsibility of the owner is not overcome by the usual clauses requiring builders to visit the site, to check the plans, and to inform themselves of the requirements of the work, as is shown by *Christie* v. *United States*, 237 U.S. 234; *Hollerbach* v. *United States*, 233 U.S. 165, and *United States* v. *Utah &c. Stage Co.*, 199 U.S. 414, 424, where it was held that the contractor should be relieved, if he was misled by erroneous statements in the specifications.

  In the case at bar, the sewer, as well as the other structures, was to be built in accordance with the plans and specifications furnished by the Government. The construction of the sewer constituted as much an integral part of the contract as did the construction of any part of the dry-dock proper. It was as necessary as any other work in the preparation for the foundation. It involved no separate contract and no separate consideration. The contention of the Government that the present case is to be distinguished from the *Bentley Case, supra,* and other similar cases, on the ground that the contract with reference to the sewer is purely
- collateral, is clearly without *137 merit. The risk of the existing system proving adequate might have rested upon Spearin, if the contract for the dry-dock had not contained the provision for relocation of the 6-foot sewer. But the insertion of the articles prescribing the character, dimensions and location of the sewer imported a warranty that, if the specifications were complied with, the sewer would be adequate. This implied warranty is not overcome by the general clauses requiring the contractor, to examine the site,[1] to check up the plans,[2] and to assume responsibility for the work until completion and acceptance.[3] The obligation to examine the site did not impose upon him the duty of making a diligent enquiry into the history of the locality with a view to determining, at his peril, whether the sewer specifically prescribed by the Government would prove adequate. The duty to check plans did not impose the obligation to pass upon their adequacy to accomplish the purpose in view. And the provision concerning contractor's responsibility cannot be construed as abridging rights arising under specific provisions of the contract.

Spearin Doctrine Refined

- *Spearin Doctrine* encompasses 2 specific warranties from Fed/State court rulings:

  1) Plans and specifications are accurate

  2) Plans and specifications are suitable for their intended use

- Attempting to avoid *Spearin* liability by minimizing the amount of information provided in the contract documents might not work. Why not?

Key Distinction for Designers

- What is the difference between the role of a contractor in a highway construction contract and the role of a designer in the contract?
- What are the contractor's responsibilities in a highway construction contract if they have concerns regarding the adequacy of the design for a work item?
- Does the contractor's level of control over the work have any bearing on their responsibility for difficulties encountered during construction?

Minimizing *Spearin* Risk

- Contractors focus on *Spearin* because it is unambiguous that all consequences of defective documents are owner's responsibility

- *Spearin Doctrine* only applies to "design specifications" and not to "performance specifications"

  - ✓ Design specifications are "prescriptive" in nature and require more rigidity concerning materials, means, and methods

  - ✓ Performance specifications are "end result" driven and allow flexibility and innovation to achieve performance objectives

- When specs "blur" line between "design" and "performance" specifications it is helpful to ask the following question:

  - ✓ What level of discretion is given to the contractor to control materials, means, and methods?...the greater the discretion, the less likely it will be considered a "design specification"

Spearin Doctrine Case Study

- Project-Specific Case Study (SR 520 Floating Bridge in Bellevue, WA)
  - ✓ Design-Build project for a floating bridge (1 of 9 in the world at the time it was constructed)
  - ✓ WSDOT gave most design responsibility to the design-build contractor, but retained responsibility for the floating pontoon design
  - ✓ What was the warranty implied by *Spearin* with respect to the floating pontoon design?

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Spearin Doctrine Case Study

Cracks developed in the pontoons…does the *Spearin Doctrine* help define who owns the responsibility? If so, how?

Spearin Scenario

How might the *Spearin Doctrine* affect the design for a deteriorated structure repair such as the Umauma Bridge in Hilo, Hawaii?

Spearin Doctrine Case Study

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- Contract documents indicate sand, silt, and cobbles in a bridge abutment requiring a driven pile foundation and warn of potential boulders. Contractor finds large boulders damaging the pile and preventing minimum tip elevation at several pile design locations…
  - ✓Can *Spearin* help determine who is responsible?

Spearin Scenario

New pavement rutting, contractor mix design, although DOT required ½” aggregate size & PG64-22 asphalt binder

Is it possible to have a *Spearin* issue for this failure…why or why not?


End Part 3

Part 4
Payment Method & Design Details

Payment Method

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- Payment Methods Considered:
  - ✓ Single Payment - [Lump Sum (LS)]
  - ✓ Unit Count – [Each (EA)]
  - ✓ Length – [Linear Foot (LF) or Mile (Mi)]
  - ✓ Mass – [Ton (Tn) or Pound (Lb)]
  - ✓ Volume – [Cubic Yard (CY) or Cubic Feet (CF)]
  - ✓ Surface Area – [Sq Yd (SY) or Sq Ft (SF)]
  - ✓ Actual Cost – Time & Materials or Force Account
  - ✓ Incidental – Paid Through Other Items

Payment Method Question

- Are your Agency's payment method standards designed primarily to create consistency while protecting your Agency from disputes or are they designed primarily to create "equity" and minimize excess risk to contractor while administering construction contracts and why does it matter?

Single Payment – Lump Sum

- What does the term “lump sum” mean?
- What are the advantages of bidding items as lump sum? Disadvantages?
- What if an estimated quantity provided as part of a lump sum bid item is significantly in error?
- Let’s look at some examples to better understand potential risks or issues with lump sum payment method…

Lump Sum Temporary Detour

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- How can you determine what work is included in a lump sum item and what work is not included if the work in question isn't enumerated in the description of work?

Lump Sum Traffic Signal

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- How do you determine what portion of a lump sum traffic signal is paid in a progress estimate payment prior to signal completion and turn on and what changes are considered compensable under the item?

Unit Payment – Each

- What are the disadvantages of bidding items as each and what conditions can cause problems?
- Let's look at an example to better understand the payment method…

Each – Paved Approaches

- How does a significant size difference between individual paved approaches make the use of “each” as a payment method more challenging and more likely to cause disputes?

Length Payment – Linear Foot

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- What does the term “linear foot” mean?
- What are the advantages and disadvantages of bidding items by the linear foot?
- Let’s look at an example to better understand the payment method…

Linear Foot – Scope of Work

- Project has multiple items for temporary concrete barrier, including “Place Temp Conc Barrier” and “Move Temp Conc Barrier” both paid by LF. How can item definition help create potential disputes?

Linear Foot – Drilled Shaft

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- What is difference between bidding drilled shaft work by linear foot (LF) versus each (EA) shaft versus lump sum (LS) for all shaft work?

Mass Payment – Ton

- What does the term “by the ton” mean?
- What are the advantages of bidding items by the ton? Disadvantages?
- What items do you bid by the ton?

Mass Method – Tare Weight Issues

- When paying by the ton in a haul vehicle, how does the tare weight affect payment?
- Do you address how to deal with partial loads of asphalt or concrete in your contract documents?
- How can an unscrupulous contractor use tare weight to obtain improper payments?
- What can you do as a designer to address these potential concerns?

Volume Payment – Cubic Yard

- What is difference between CY-in-truck and a CY-in-place & why does it matter?
- How does “shrink” & “swell” affect volume-based quantities on large earthwork project and how do you represent this in bid documents?

Volume Method – Neat vs Actual

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- What does the term “neat” mean?
- What are the advantages and disadvantages of paying volume “neat” versus “actual?”
- How might “neat” vs. “actual” payment affect bidding for structure excavation (CY) below?

Surface Area Payment – Square Yard/Foot

- What does the term “by the SY/SF” mean?
- What are the advantages and disadvantages of bidding items by the SY/SF?
- Are large areas paid by surface area measured in 2-dimensions or in 3-dimensions? (e.g., seeding by acre on rough terrain)

Actual Cost Payment – Time & Materials or Force Account

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- What does the term “actual cost” mean?
- What are the advantages of paying actual cost? Disadvantages?
- How does actual cost payment affect bidding and contract administration?
- What level or risk or unknown conditions would you consider justifying payment of actual cost and why?

Actual Cost Example - Shoring

- What is risk of paying for required shoring item as actual cost? Benefits?
- How does actual cost method affect bidding?

Actual Cost Example – Erosion & Sediment Control

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- What is risk of paying for required erosion and sediment control item as actual cost versus lump sum or by item? Benefits?
- How does actual cost method affect bidding?

Incidental – Payment Tied to Another Item

- What does the term “incidental” mean?
- What are the advantages of making items incidental to other items? Disadvantages?
- How does incidental payment affect bidding and contract administration?
- What items do you typically make incidental to other items and why?

Risk of Incidental Status - Dewatering

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- What is risk of dewatering as a pay item versus incidental to drainage pipe item?
- How does level of effort & risk affect bidding if incidental?

Temp Striping – Incidental or Paid?

- Contract specifications for maintenance of traffic includes the following statement:

  "When no pay item for temporary striping is included in the schedule of bid items, any temporary striping required should be considered incidental to other Maintenance of Traffic items"

- A large paving project does not contain a pay item for temporary striping, and the estimated quantity of temporary striping is 10 miles (53,000 LF)

- Is it an error or a contract requirement? What is your opinion of the designer's intent given there has never been (and normally never would be) this much striping as incidental in previous contracts?

Incidental – Creating the Condition

- Does the following contract language create an incidental condition with respect to unlocated utilities?

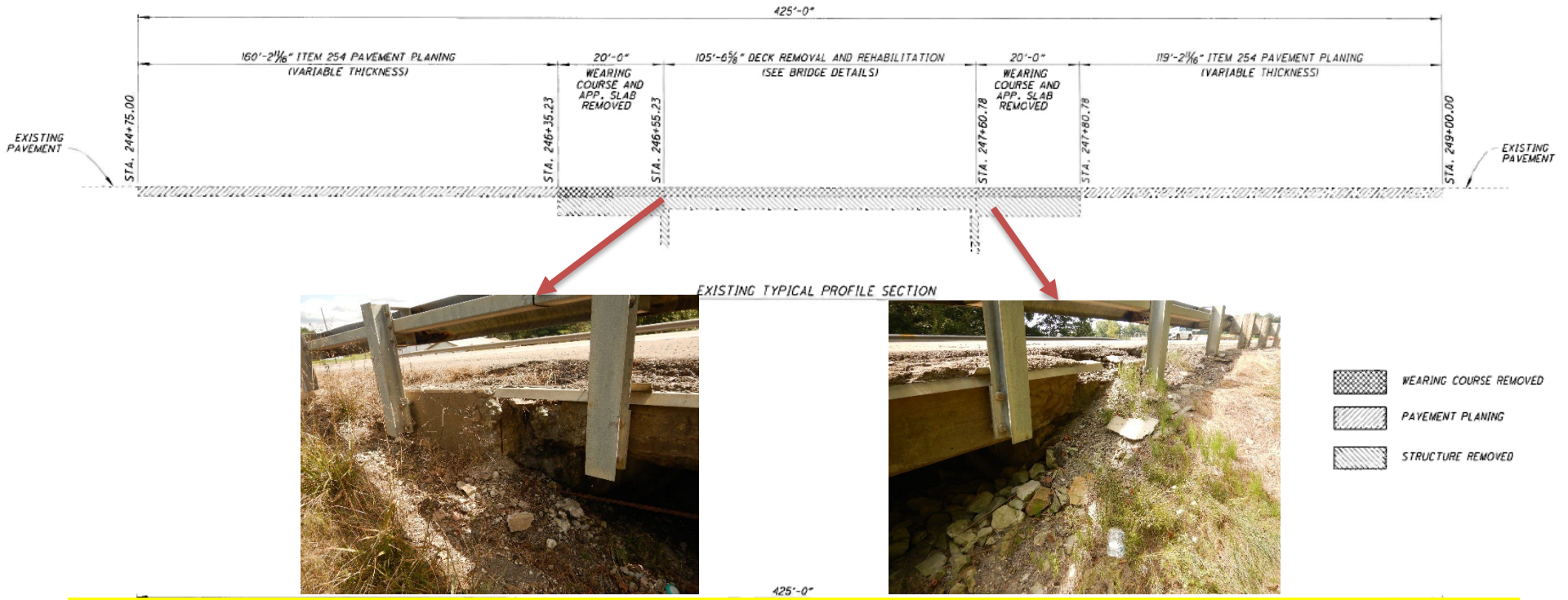
- How is this condition likely to affect bidding and risk of performing paid storm drainage work?

  - *"Contractor is responsible for avoiding utility connections, service lines, and other individual service lines not show on the contract plans. No additional compensation will be made for work to avoid, repair, or reconnect existing service lines, to avoid or maintain and protect existing utilities, and the contractor will ensure that utility services to all businesses and residences are maintained at all times."*

Design Details – Level of Detail

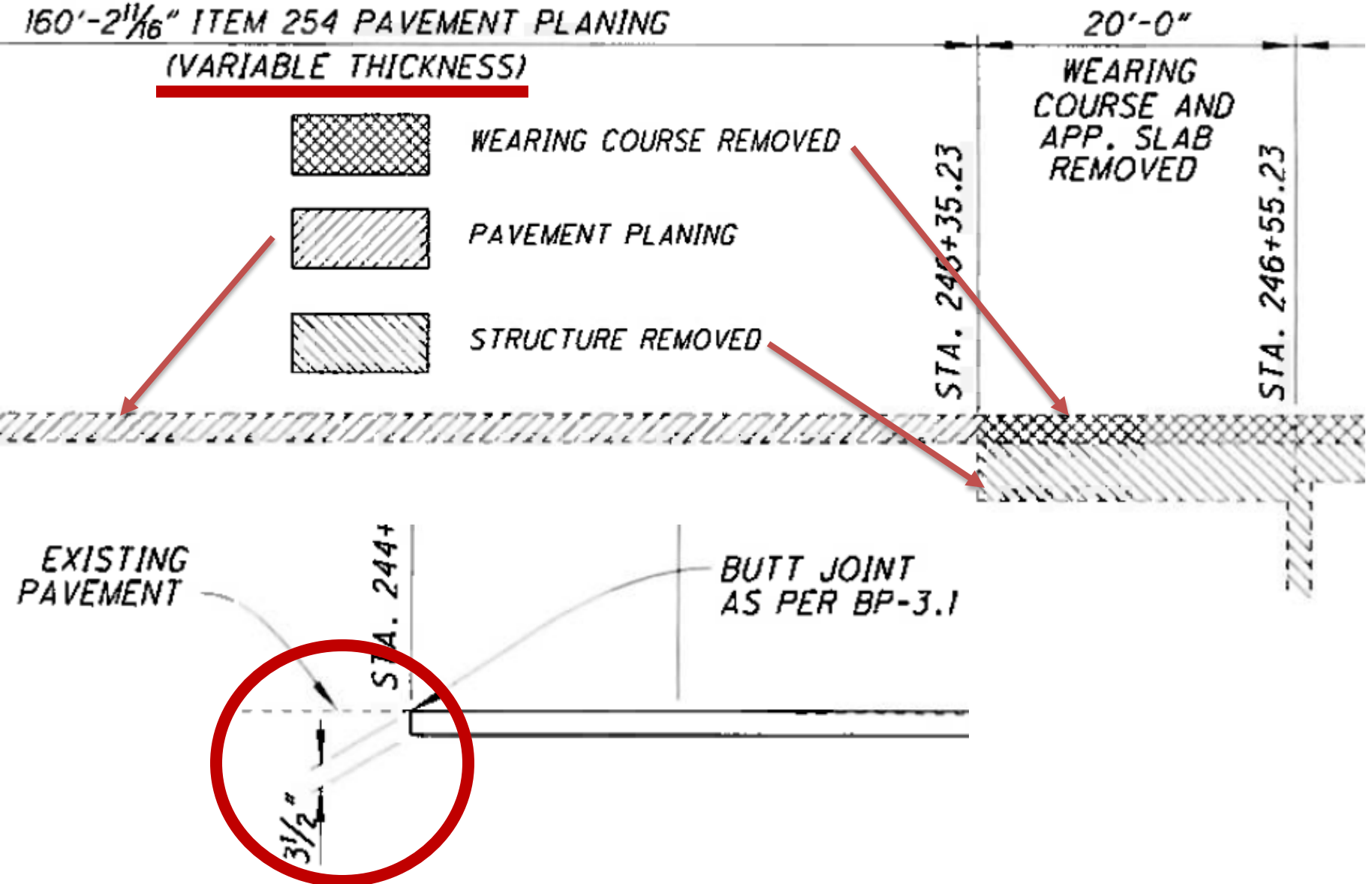
- What is the purpose of design details in a set of contract plans?
- What are the advantages and disadvantages of adding more design details?
- What items do you often find challenging to determine an appropriate level of detail?
- Let's look at an example to better understand level of detail…

Contract Plan Design Details - Asphalt Removal for Bridge Demo



Structures Removed: *"If removing a bridge or portion of a bridge with an asphalt wearing course, remove the wearing course separately before removing the bridge or portion of the bridge."* Pay Item: **Structure Removal (Lump Sum)**

Asphalt Depth Details



Interpretations of Design Details

- Is it clear to you that removal of asphalt is part of the item ‘Structure Removal?’
- Does the note “variable thickness” affect your interpretation of structure wearing course depth?
- What about the fact the detail shows 3-1/2” at the butt joint and the drafting appears to show a uniform thickness for the pavement planing and the wearing course removal?

Contract Docs – What is Right Amount of Detail

- How much detail is appropriate for removal of asphalt on top of the bridge slabs and why?
- What are some options for additional details to assist with understanding level of effort in removing asphalt on the structure from this project?

Granular Sub-Base (GSB)

- Bid schedule includes bid item “Granular Subbase” (GSB) with an estimated quantity of 20,000 tons and an item for “Embankment in Place” with an estimated quantity of 50,000 CY

- Contract specs include a specification for both “Granular Subbase” and “Embankment in Place” including acceptance criteria, required material properties, and required construction method

- Plans include typical sections showing “Embankment” underneath asphalt & road base materials, but no information regarding the placement location of “Granular Subbase”

GSB – Required or Optional Work?

- Contractor bids $1/ton for “Granular Subbase”
- Owner directs placement of “Granular Subbase” and Contractor contends this direction is a change to the contract…Contractor is willing to place “Granular Subbase” but not at bid price of $1/ton
- What do you think the Contractor’s position is and how do they justify directing the use of an existing bid item as a compensable contract change?

End Part 4

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Part 5
Unbalanced Bidding

Topics

- Risk of design decisions creating opportunities for unbalanced bidding
  - Mathematical vs. Material unbalancing
  - Why does unbalanced bidding occur?
  - How can design decisions either encourage or discourage unbalanced bidding?

Mathematical vs. Material

- Two types of unbalanced bids
  - Mathematically unbalanced bid
    - ✓ Bid item prices do not reflect actual cost, but awarding contract as bid will likely result in lowest total cost to owner
  - Materially unbalanced bid
    - ✓ Bid item prices do not reflect actual cost, and there is a legitimate concern whether awarding contract as bid will result in lowest total cost to owner due to the unbalancing
  - How do you identify materially unbalanced bids?

Mathematical Unbalanced Bidding

- Once you award a contract with mathematical unbalanced bid items, a few questions:
  - What control does the owner have over the unbalanced item in the contract?
  - Why not just eliminate over-priced unbalanced items from the contract post-award?
  - If items cannot be eliminated, why not simply renegotiate unbalanced items post-award?
  - If unsure whether item might be mathematical unbalanced, when do you leave item out of contract and add in by change order and why?

Why Contractors Unbalance Bids Relative to the Engineer's Estimate?

- Contractors unbalance bids to:
  - ✓ Take advantage of items with inaccurate bid quantity
  - ✓ Position themselves for bid item changes/challenges
  - ✓ Increase potential bonus or escalation
  - ✓ Generate early $$ to limit credit usage (line-of-credit)
  - ✓ Remove mark-up to improve chance as lowest bidder
  - ✓ Capture increased subcontractor cost (including DBE)
  - ✓ Shift $$ from unit price into lump sum items to guarantee revenue regardless of final quantities

Unbalanced Bidding Example

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- A contractor believes the hot mix asphalt (HMA) bid item is low and the flagging bid item is high?
  - ✓ Owner estimates 3 weeks of paving plus 3 weeks of related work (20,000 tons HMA & 2,500 hours flagging)
  - ✓ Contractor estimates 4 weeks total paving and related work
  - ✓ Contractor estimates using 1,000 of 2,500 flagging hours
  - ✓ Contractor estimates small HMA overrun (21,000 vs. 20,000 tons) based on rock densities and the amount of required ride correction
- Let's take a look…

Unbalanced Bidding Example

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Item	Traditional Bid	Unbalanced Bid	Difference
HMA Flagging	$50 per ton $40 per hour	$55 per ton $1 per hour	> $5 per ton < $39 per hour
Bid quantities	$50 x 20,000 = $1.0 M	$55x 20,000 = $1.1 M	HMA
Bid quantities	$40 x 2,500 = $100,000	$1 x 2,500 = $2,500	flagging
Actual quantities Anticipated	$50 x 21,000 = $1.05 M	$55 x 21,000 = $1.155 M	HMA
Actual quantities Anticipated	$40 x 1,000 = $40,000	$1 x 1,000 = $1,000	flagging
Bid total	$1.1 M	$1.102 M	same “effective” bid
Revenue total	$1.09 M	$1.156 M	6% higher revenue

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Unbalanced Bidding Question

- Why might each of the following work items in the photos below be susceptible to an unbalanced bid?

Small Quantities & Unbalanced Bidding?

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- Do small quantity bid items encourage or discourage unbalanced bidding?
  - Quantity of 10-20 cubic yards of bark mulch intended to spread over landscaped areas…
  - Small quantity temporary traffic control signs used in construction maintenance of traffic (MOT)…
  - Small quantity (< 100 CY) of rock excavation included in a large earthwork project…

Contingency Items & Unbalanced Bidding?

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- "Contingency" items 'as directed by Engineer' encourage or discourage unbalanced bidding?
  - Pavement repair areas included as bid item, not located, used only as directed by the Engineer…
  - Additional survey work to be paid by the hour for extra survey work required for a bridge…
  - Hot mixed asphalt in leveling used as directed for modifying the roadway profile…

Quantity Errors & Unbalanced Bidding?

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- How do quantity calculation errors impact unbalanced bidding? (too low vs. too high)
  - Estimated subgrade stabilization (SY @ depth) quantity significantly different than anticipated by a bidding contractor…
  - Estimated hot mixed asphalt paving quantity uses an aggregate specific gravity lower than several private rock sources in the area…
  - Let's look at a few more detailed examples…

Drilled Shafts – To Case or Not

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Advantages/Disadvantages of Each Approach

1) Require all shafts to be constructed using a temporary casing, even if all shafts may not require a casing

2) Install temporary casing only when directed by Engineer but have several casings on site before shaft work begins

3) Spec that doesn't require temporary casing & direction that if casings required, modify contract to procure & install casings

4) Provide subsurface information that might justify need for temporary casings but don't mention casings in shaft specs

Topsoil – Virgin or Salvage?

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Advantages/Disadvantages of Each Approach

- ✓ One bid item – topsoil (can be salvage or virgin)
  - ➢ Contract silent as to when salvage or virgin required?
- ✓ Two bid items – one for virgin, one for salvage
  - ➢ Option for contract specifications to require use of available salvage before allowing virgin topsoil?

Paving Issues – Asphalt & Grinding

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- ✓ Two bid items –grinding & paving

  1) How might contractors unbalance bid items if they think delamination is likely and why?

  2) How might delamination on mill-and-fill [partial width] affect bidding differently than on mill-and-overlay [full width]?

Pavement Repair Areas

- ✓ Single bid item – asphalt pavement repair (paid by SY)

1) Do you add language “as directed by Engineer” and why/why not?
2) Should quantity calculations be accurate or conservative…why?
3) Should you create a location table for repairs…why/why not?
4) What is most important factor to prevent unbalanced bidding?
5) When might you consider 2 bid items (HMA + Milling)?

End Part 5

Part 6
Basis of Construction Changes
(Not Part of 1-Day Version)

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Part 7
Managing Risk as a Designer

Managing Risk as a Designer

- The contract you help prepare as a designer lays the foundation for what issues can be disputed by a contractor and what is a proper basis for such a dispute
- One of your challenges is to create a contract that is “fair” to bidders, and that exposes neither the owner nor the contractor to unnecessary risks
- To be clear, there is nothing easy about this task…let’s look at a normal DOT perspective

What Are We Going to Discuss?

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- How do we Make it Easier for Contractors to Bid What we Actually Want them to Do?
  - ✓ Avoid Requesting a Fixed Price for a Non-Fixed Scope of Work to the Greatest Extent Possible
  - ✓ Use Bid Assumptions to Control Risk
  - ✓ Consider Controlling Means & Methods to avoid significant risks
  - ✓ Avoid “improper” Exculpatory Language

Fixed Price for Non-Fixed Scope

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- When we ask a contractor for a fixed price or a fixed unit price for work with unknown conditions, how can a contractor account for unknowns?
  - ✓ Would you offer a low bid price to dig a hole without knowing what was below the surface? Why?
  - ✓ What if there was a bore hole taken a few hundred feet away from the proposed hole location?
  - ✓ How much risk would you consider putting into a low bid for digging a hole and why?
  - ✓ *Let's look at some examples…*

Non-Fixed Scope – Urban Drainage

- Contractor must provide a single unit price for each size drainage pipe installed in urban area…

  - ✓ What are knowns in contractor's bid?

    1) Cost of pipe
    2) Cost of bedding/backfill materials
    3) Cost of labor & equipment (per hour)
    4) Rate of Unimpeded production (LF per hour or per day)

  - ✓ What are unknowns in contractor's bid?

    1) Impact of utilities on rate of progress (production)
    2) Necessary safety equipment (trench box, etc.)
    3) Coordination effort/time for utilities being adjusted

Non-Fixed Scope – Urban Drainage (cont.)

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- Why are there so many unknowns in DOT plans?
  - ✓ Utilities can be easily identified using Subsurface Utility Engineering (SUE)…

    1) Would locating utilities eliminate many unknowns?
    2) If so, why don't DOTs perform SUE to identify all utilities that could impact drainage pipe installation?
    3) If DOTs don't want to spend $$ to locate utilities, should DOT own risk of impact of unlocated util.?
    4) Why should contractor own risk of unknown utilities DOT could easily identify but chose not to?

Non-Fixed Scope – Railroad Bridge

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- Contractor must provide a single unit price to construct a structure on railroad right-of-way…

  - ✓ What are knowns in contractor's bid?

    1) Cost of structural materials
    2) Cost of railroad requirements (liability insurance, etc.)
    3) Cost of labor & equipment (per hour) to build bridge
    4) Timeframe to build bridge without railroad impact

  - ✓ What are unknowns in contractor's bid?

    1) Ability to access railroad ROW (track time)
    2) Railroad review of proposed construction details
    3) Railroad flagger constraints on construction progress

Non-Fixed Scope – Railroad Bridge (cont.)

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- Why are there so many unknowns in DOT plans?

  - ✓ DOTs do not control railroads because they don't have eminent domain over railroads who have senior rights

    1) How do DOTs know what track time will be given to contractor?
    2) How do DOTs know what constraints railroads will place on the contractor's operation?
    3) Do contractors have better control over railroad?
    4) Why should contractor own risk of railroad impacts when DOT cannot control railroads even if they need to?

Bid Assumptions When Appropriate

- If risk is unclear or uncertain, consider providing bidding assumptions to provide a baseline bidding condition
- Not doing so when the risk is undefined is likely unreasonable and may lead to a dispute
- Let's look at a few examples to better understand how providing bidding assumptions affects the bidding process…

Bid Item: 6” Asphalt Concrete Pavement Repair (paid by SY)
>> includes grinding, sweeping, tack coat, and 6” HMA (different HMA mix than mainline placed in 2 – 3” lifts)

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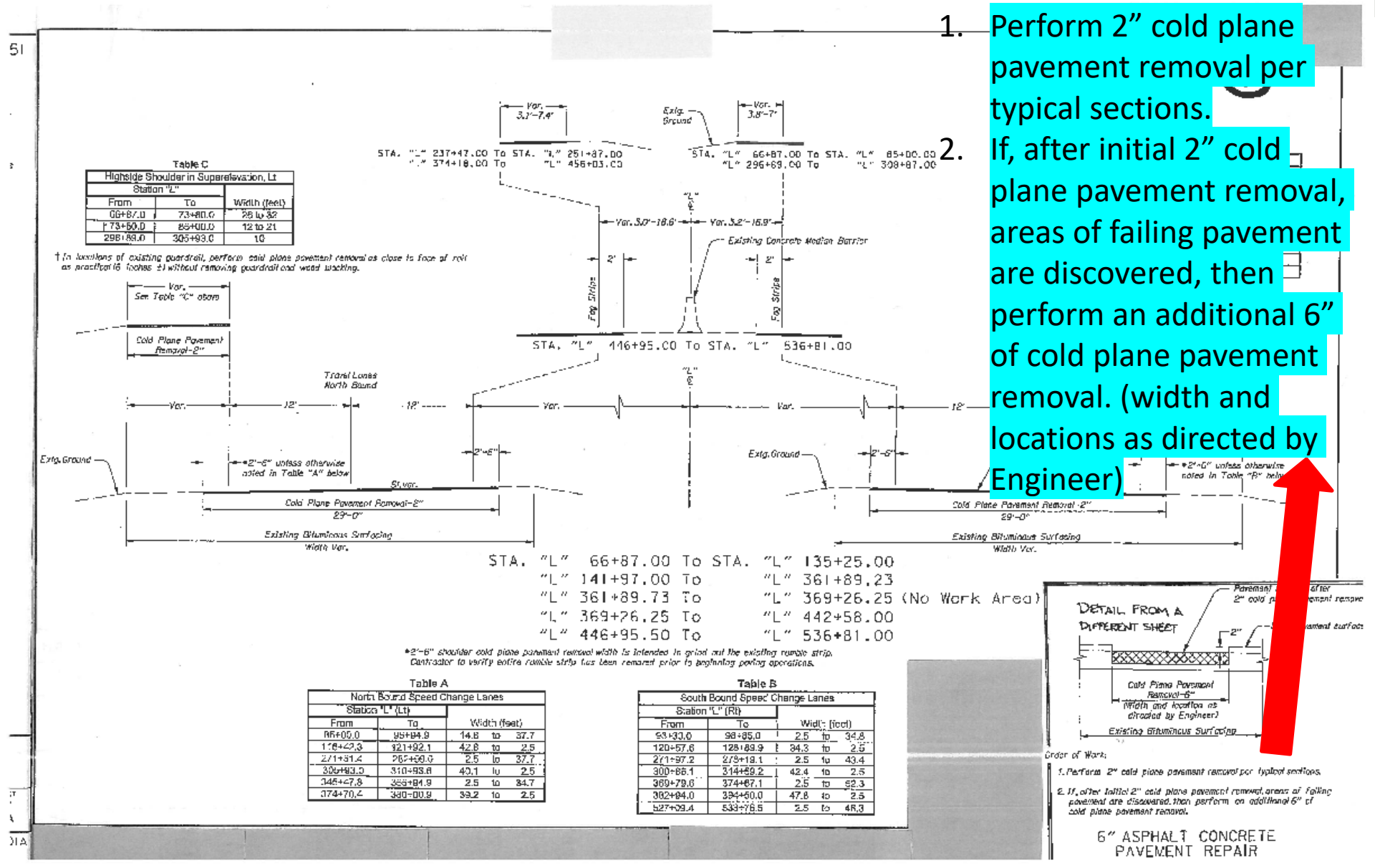
1. Perform 2” cold plane pavement removal per typical sections.
2. If, after initial 2” cold plane pavement removal, areas of failing pavement are discovered, then perform an additional 6” of cold plane pavement removal. (width and locations as directed by Engineer)



How could you reduce bidding risk with the use of bidding assumptions?

- ✓ Establish minimum width and minimum length to help with labor and equipment selection
- ✓ Location table based on existing surface deterioration to understand mobilization requirements and to estimate impact on mainline paving production and required HMA production for repair areas

No Bid Assumptions – Drilled Shafts

- Without Bid Assumptions:
  - DOT provides subsurface drilling data as well as a Geotechnical report for reference
  - Specifications and/or Geotechnical report may provide guidance for likelihood of encountering water or collapsible soils in shaft excavation
  - Based on contract information, it may be unclear to contractor to what extent they own the risk of wet shaft construction or collapsible soils
  - What can bid assumptions do to change this?...

Bid Assumptions – Drilled Shafts

- Possible Bid Assumptions:
  - Contractor must bid to construct all shafts using wet shaft construction methods and equipment
  - Contractor's bid assumes all shafts constructed outside Summer months will require wet shaft construction methods and equipment
  - Contractor shall bid based on dry shaft construction methods and equipment…if wet shaft construction methods are required, the Engineer will compensate for additional cost and time associated with wet shaft construction

Controlling Means & Methods…Why?

- If risk is clear and there is a concern contractors will not take a specific risk into consideration or may bid using means & methods that might be problematic…
- Controlling, limiting, or disallowing certain means & methods may actually avoid significant project risks
- Let's look at a few examples to better understand how controlling means & methods can affec the bidding process…

Rock Excavation Means & Methods

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- DOT project is laying back slope to widen roadway
  - ✓ Lower-level rock is likely competent and likely requires drilling and blasting, but it is not a certainty
  - ✓ Intermediate-level rock is likely softer and may allow ripping
  - ✓ Upper-level is primarily soil and has a clear natural angle of repose

Rock Excavation Means & Methods (cont.)

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- If DOT doesn't limit or control means & methods, what risks might get bid into the project?
  - ✓ How could this risk adversely impact project & DOT?
- What if DOT…
  1) ***Requires*** drilling & blasting in lower-level rock
  2) ***Requires*** ripping in intermediate-level rock
  3) Allows standard excavation for upper-level soil

Installing Drilled Shaft Casing

- DOT project is building new bridge close to existing bridge while traffic stays on existing bridge
  - ✓ New bridge requires drilled shafts with installation of steel casings for each shaft
  - ✓ Steel casings can be installed using vibratory method or auger method
  - ✓ Vibratory method is more common and is typically cheaper, but might undermine foundation of adjacent piers in existing structure

Installing Drilled Shaft Casing (cont.)

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- If DOT doesn't limit or control means & methods, what risks might get bid into the project?
  - ✓ How could this risk adversely impact project & DOT?
- What if DOT…
  1) ***Requires*** auger method for installing casings
  2) ***Disallows*** vibratory method for installing casings
  3) Allows any other method that will not put existing bridge foundation at risk…

Avoid Improper Exculpatory Language

- "Improper" Exculpatory language (as used here) is language allowing an owner to avoid liability and preventing the contractor from holding the owner liable for damages resulting from an issue the contractor has no control over nor any reasonable ability to bid

- Generally, exculpatory language is enforceable if it is "clear" and "reasonable"

- Let's look at an example to better understand "improper" exculpatory language…

Responsibility for Railroad Impacts

- Exculpatory language indicating that regardless of the reason, the DOT shall not be responsible for damages caused by actions or inactions of the railroad, regardless of the underlying basis…why would this be considered "improper?"
  - Does the contractor have control over the railroad?
  - Can the railroad act unilaterally in a way that is damaging to the contractor's cost basis?
  - Is there any reasonable way a contractor can anticipate or account for such impacts in a low bid contract?

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End Part 7

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Part 8
Design Scenarios – A Synthesis

Managing Risk as a Designer

- The purpose of this part is to “synthesize” everything we have talked about today and discuss how to apply this knowledge to real design scenarios
- Ultimately, there are no right or wrong answers, only your opinion and your justification for your opinion
- Please provide your opinion and your reasoning…understanding the perspective of others will make us all better designers ☺

What Do I Want to Know?

- For each of the following scenarios, I would like to understand your answer to the following questions:

  - ✓ What is (in your opinion) a compromise to represent the risk associated with this work that is both biddable and reasonable…and why?

Scenario #1

- ✓ Contract plans include urban storm drainage work – including manholes, catch basins, and drainage pipe (multiple pipe materials). There are multiple underground utilities including potable water, sanitary sewer, natural gas (both low pressure and high pressure), communication lines (both copper and fiber optic). Current plan is for potable water, sewer, and natural gas conflicts to be relocated by others during active construction. In addition to main lines, there are service laterals for many of these utilities to businesses and residences. The new storm drain lines include shallow lateral lines as well as deeper trunk lines connected via manholes…

Scenario #2

- ✓ Contract plans include a skewed structure with steel girders and steel diaphragms requiring high-strength structural bolting. The structure spans a major railroad mainline track and requires a railroad flagger and coordinated track closures for setting girders and all structural bolting. Special provisions require Total Dead Load Fit condition. Although some coordination with the railroad has been done, final details will need to be coordinated with the contractor after award. It appears the contractor will have limited timeframes for full track closure as well as other times when the track will be controlled under a Form B (local controlled access condition)…

Scenario #3

- ✓ Contract plans include a large amount of earthwork including both excavation and embankment. Subsurface boreholes taken during geological exploration include a wide variety of soil conditions (everything from silt or clay to sand or cobbles) as well as a wide variation in both moisture conditions and groundwater elevations. It appears there is a large upward movement of groundwater elevation during late-Fall, Winter, and early-Spring. The contract requires completion of all contract work by the end of September, which may require completing earthwork activities before Summer months to allow adequate time for rock base, asphalt and concrete paving, proper cure before permanent striping, guardrail, permanent signs, illumination, and signals…all requiring completion of embankment to install…

Scenario #4

- ✓ Contract plans include a series of drilled shafts to support multiple structures. Subsurface bore holes indicate significant variability in soil conditions as well as the presence of shallow bedrock with a highly variable depth profile. Groundwater conditions vary significantly throughout the year so it is unclear whether shafts will require dealing with water. For shafts in bedrock, the shaft will require a 5-foot socket into competent bedrock. Because of the proximity to a river with sensitive aquatic species, any water pumped out of shaft excavations will require treatment before allowing it to release back into the river…

Scenario #5

- ✓ Contract plans include construction of a multi-barrel concrete culvert to pass a large creek under a roadway. In order to remove the existing culverts and construct new culverts, the creek water will need to be passed through the work area without creating turbidity or other contamination while allowing adequate fish passage. The new culvert will be constructed at a lower elevation than the existing culvert to allow for a 2' deep "natural" stream bed to be constructed on the bottom surface of the concrete culvert. The new culvert also spans a wider width than the existing culvert, requiring the creek to undergo a channel modification as part of the project…

Scenario #6

- ✓ Contract plans include construction of a new deep storm drain line including depths of up to 20-feet. It is unclear how much water will be encountered during construction, so the amount and type of de-watering are unknown. If de-watering is required, the water will require treatment prior to releasing into a nearby stream to satisfy water quality permit conditions. Treatment could consist of a series of settling tanks, or construction of a treatment swale with special water quality soil, or construction of a treatment pond…

Scenario #7

- ✓ Contract plans include construction of significant repairs of a deteriorated Portland cement concrete Interstate pavement. Construction scope includes removing an estimated 6” of asphalt pavement on top of the slabs where directed followed by concrete repairs varying from grouting to fill voids under concrete slabs, repairing slab corner breaks as well as entire slab replacements. In addition, load transfer devices will be retroactively installed into repaired slab joints. Based on a review of the exposed slab condition, the DOT may choose to rubblize areas if deemed more cost effective. Once all concrete repairs are complete, new asphalt will be placed over the concrete slabs (6” over repaired slabs – 10” over rubblized slabs)…


THE END
IS ~~NEAR~~
HERE !