INDOT Constructability Review Process

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Constructability Review

- Constructability Guide Book
  - INDOT > About INDOT > Division Information > Project Management >
  - www.in.gov/indot/2731.htm

Constructability Review

- These plans are terrible!
- Let the guys in the field handle it!
- We have a deadline to meet
- If I don't get this turned in today, I won't get my raise

Constructability Review

- It won't matter. Those guys in construction will do what they want anyway!
- Nobody will notice
- It's a standard situation
- We can't change that now!

Constructability Review

- INDOT approved it
- The contractor will figure it out
- It’s the contractor’s responsibility

Goals and Objectives

- Enhance early planning
- Minimize scope changes
- Reduction in change orders
- Improve contractor productivity
- Reduced costs by having a more constructable / biddable project.
- Enhance quality
- Reduction in contract time
- Promote construction safety
- Reduce conflicts/disputes
- Reduction in costs (construction and maintenance costs)

Coordination and Communication

- Ownership
- Involvement / Investment
- Responsibilities
- Special Case Special Provisions
- Responsiveness
- We have the same gripes
- Examples

Responsibilities and Accountability

- Project Manager (PM)
  - Schedules reviews
  - Schedules field checks
  - Defines & maintains scope
  - Defines schedule from conception to letting
  - Responsible for project budget
  - Coordinates project funding
  - Determine budget impacts
  - Determination of errors & omissions
- Construction Manager (CM)
  - Schedules Pre-Con
  - Schedules progress meetings
  - Maintains the scope (clarifying and defining with the PM)
  - Time set performed by CM with input from PM
  - Responsible for construction schedule
  - Responsible for the construction budget & all change orders

Constructability Review Levels

- Stage 1 Constructability Review
- Preliminary Field Check
- Stage 2 Constructability Review
- Final Field Check
- Constructability/Utility Conference
- Stage 3 Constructability Review
- Preconstruction conference
- Mid-contract Review
- Post-construction Review

Purpose of Checklists

- Standardization
- Common issues
- This will be a fluid document

Review and Evaluation Process

- The Construction Manager and the Project Manager conduct the reviews
- The Project Manager schedules the reviews
- The Project Manager provides the hard copy plans and contract documents for the reviews
- Upon completion of the Review the Construction Manager and Project Manager meet to discuss the findings
- They then will both meet with the designer to discuss
- The Project Manager and Construction Manager then evaluate the performance of the designer (Engineer of Record) for the project

UTILITY COORDINATION FLOW CHART – INDOT PROJECT

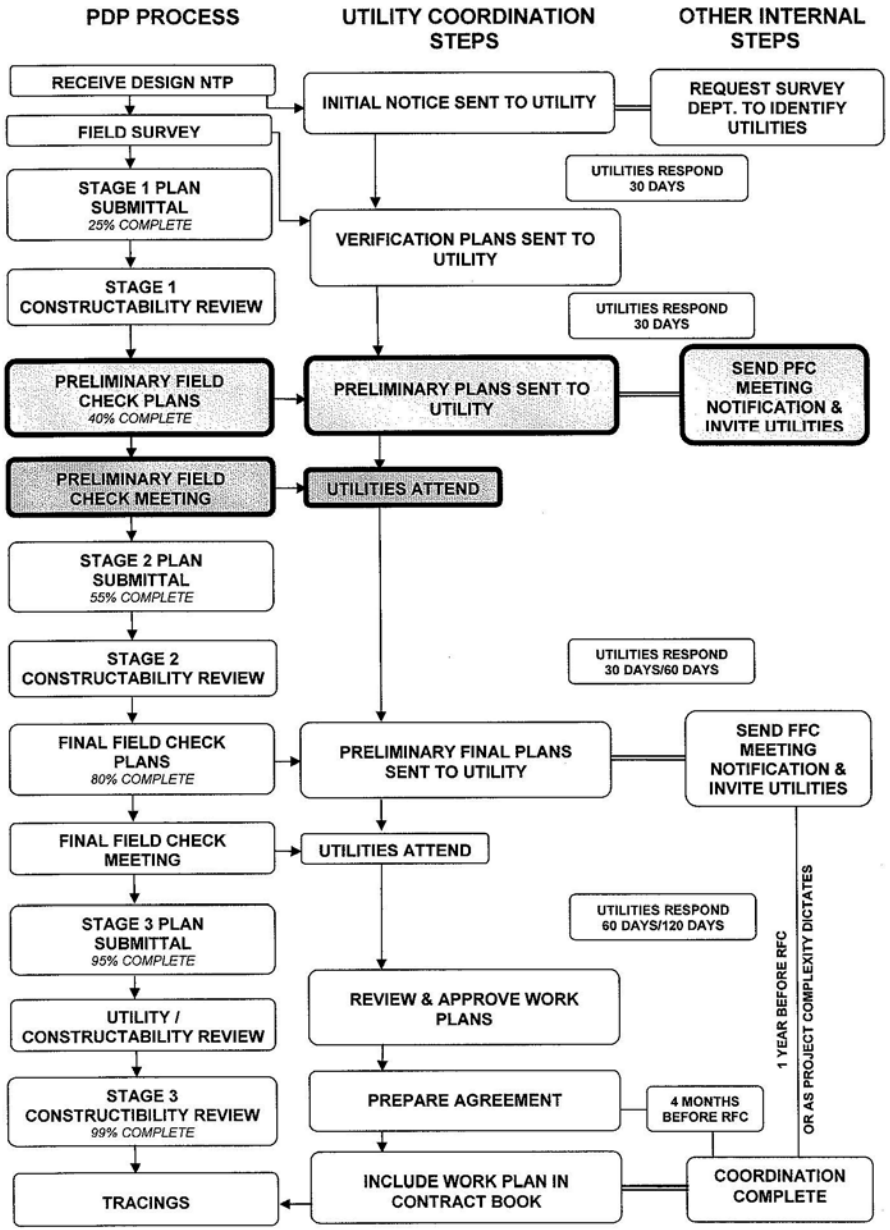


Figure U-1

Stage 1 Constructability Review

- PM contacts CM 3 weeks prior to schedule the review meeting
- Draft env document, abbreviated engineer's assessment report, plans, hydraulics report, bridge SST report, cost estimate

- 25% complete plans
  - Roadway line, grade, typical
  - Bridge layout and general plan

Stage 1 Constructability Review

- Detailed Checklists
  - Guide for designer, PM, & CM
  - Not all inclusive b/c each project is unique

- Appropriate existing field conditions shown?
  - Sufficient topography coverage w/ adequate control points
  - Previous rehab/repair work
  - Existing pavement & shoulder depths
  - Existing utilities
  - Existing R/W determined

Stage 1 Constructability Review

- Proposed features
  - Is the design appropriate based on the scope?
  - Check for major utility impacts
  - Verify site access for bridge beams
  - Any overhead utility conflicts?
  - Consider working room for equipment at bridges
  - Is the cost estimate reasonable?

Preliminary Field Check

- Communication with and accountability of each party is essential to providing quality plans and constructable contracts.

- Communication and accountability begins when the designer receives the Notice to Proceed.

The Project

Create your own cartoon at www.projectcartoon.com

How the owner requested it

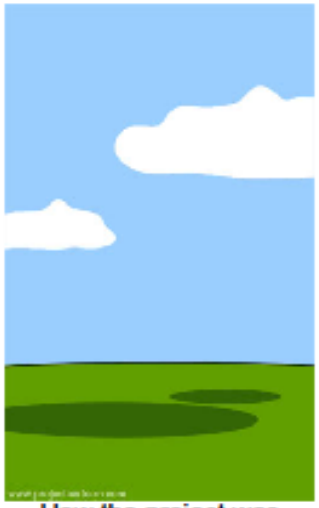
How the project manager understood it

How the architect designed it

What the contractor bid

How the marketing team described it

How the contractor installed it



How the project was documented

How the owner was billed

When it was delivered

What the owner really wanted

Preliminary Field Check

- First opportunity for the project team to coordinate efforts and examine plans and documents.
- Utilities have an opportunity to determine major impacts to their facilities.
- Project team can review field conditions against their concerns or concerns of another project team member.

Preliminary Field Check

PROJECT TEAM

- Utilities
- Project Management
- District Construction
- Design
- District Traffic
- Environmental
- Geotechnical
- Real Estate
- Maintenance

RELEVANT PERSONNEL?

Preliminary Field Check

- Two meetings in one day are suggested
- Morning session is utility specific
  - Project Manager, Construction and Design
- Afternoon session is open forum
  - Traffic, Environmental, Geotechnical, Real Estate and Maintenance

Preliminary Field Check

- Notifications and 40% plans should be sent to each member of the project team and the utilities three weeks prior to Preliminary Field Check

- Utilities should also receive the “Preliminary Field Check – Utility Checklist” when they receive the 40% plans

Preliminary Field Check

Preliminary Field Check Recommendations

It is recommended this Field Check be scheduled and held in two steps. Step 1 will be conducted with the utilities to focus on their locations and concerns. Step 2 will provide review of environmental requirements, right of way issues, drainage and any MOT concerns.

In Step 1, the Project Manager will contact the Area Engineer and Designer (three weeks prior) to schedule time and place for the Field Check.

At the same time the Project Manager will contact each utility and send Preliminary Field Check Plans with the Utility Check List to be completed for the meeting.

Step 1, Preliminary Field Check

Offices involved:

- Project Management
- Construction
- Design
- Utilities

Items to review:

- How many utilities are involved with the project?
- Check for utilities not identified on the plans.
- Are utilities knowledgeable about the road design?
- Preliminary R/W layout.
- Sufficient R/W for utilities?
- If project is "limited access R/W", will utilities stay in R/W?
- Is R/W conducive to utility relocation?
- Will SUE be utilized?
- What will be the clearing requirements for the project and/or utility relocation?

Preliminary Field Check – Utility Checklist #1

Utility _____ Phone _____
Address _____
Utility Representative _____
Mobile Phone _____ Email _____

Project Manager _____ Phone _____ Mobile Phone _____
Des. No. _____ District _____
Work Type _____ RFC Date _____
Project Location: Road _____ County _____
Project Description _____

Preliminary Field Check Questions	Y	N	Note
1. Did you receive copy of plans showing all of your facilities correctly?			
2. Do you have any major facilities such as vaults?			
3. Are you aware of any utilities in the area that are not shown or listed on the plans?			
4. Do you anticipate conflicts between your facilities and the road/bridge project?			
5. Do you have any suggestion for design changes in order to avoid relocation of your facilities (especially major strategy)?			
6. Are there any possible conflicts with the traffic control plans?			
7. Are there any possible conflicts with the bridge plans?			
8. Are there any possible conflicts with the signal plans?			
9. As a preliminary estimate, how much time is needed for relocation work?			
10. Are you on easement and reimbursable?			
12. If reimbursable, what is your estimate of relocation cost.			
13. Does utility intend to stay on same side of roadway?			
14. Is R/W sufficient for utility relocation outside the clear zone?			

Preliminary Field Check

Preliminary Field Check Recommendations cont'd

For Step 2, the Project Manager will contact (three weeks prior) the following offices to schedule the Preliminary Field Check:

Offices involved:

- Project Management
- Construction
- Design
- Traffic - District
- Environmental
- Geotechnical
- Real Estate
- Maintenance

Items to review:

- What is the life expectancy of the project?
- Check on the budget. Is all of the work necessary to complete the intended purpose?
- What is the construction schedule?
- Is it an early-season project or mid-season project?
- Is R/W outside the clear zone?
- What are the expected permits required and their impact to the schedule?
- What are the expected environmental restrictions and their impact to the schedule?
- Conceptual Traffic Maintenance Plan and phasing? Any detour should be driven.
- Compare costs/feasibility of staged construction and detour.
- Check for drives not identified on plans.
- Intersection layout?
- Conceptual storm sewer layout.
- Drainage outlets meet phasing shown?
- Property relocations?
- Check for new developments and conditions not noted on the plans.
- Verify that the construction limits are reasonable. (allows enough work space)
- Landscaping and erosion control items reasonable?
- Safety concerns addressed?
- Maintenance concerns addressed?
- Any other special concerns, material, local festivals, etc.?
- Review Commitment Report.

Commonly Missed Items to Check

- Keep any existing Highway Lighting operating as long as practical during utility relocation and construction. May be practical to use temporary electrical service.
- Access/maintenance of existing drives for residents and businesses should be discussed.
- The final grades and widths of the proposed drives for residents and businesses should be discussed. The designer should try to make the existing drives either at the existing grades or less. This may show a cause for additional temporary right of way.
- Are there any existing survey monuments – such as Section Corners – that need to be maintained?
- Are there any existing castings such as survey monuments, manholes, inlets, valves, etc – that need to be adjusted to grade?

Other Considerations

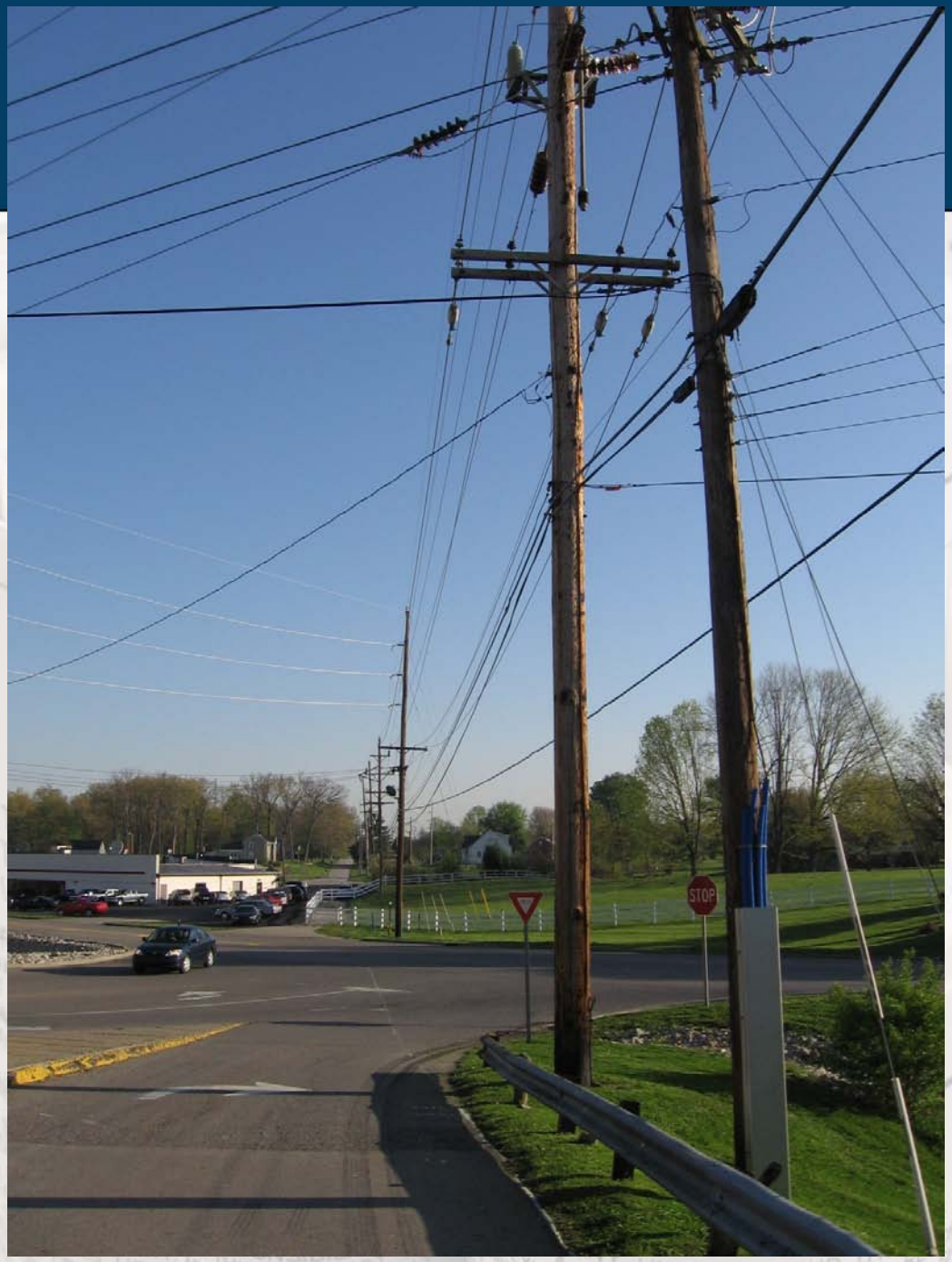
- Construction phasing should be checked to make sure that phase lines are consistent. Do proposed MOT schemes fit on the bridge decks and do the bridge construction joints work with the adjacent roadway and exiting structures.

PFC Items to be Reviewed

- Utilities/Railroad Agreements
- Geotechnical Review
- Permits/Erosion Control
- Scope/Design/Survey
- Drainage
- Constructability/Phasing/MOT
- Right-of-Way/Property Agreements
- Commitments/Local Involvement

Utilities/Railroad Agreements

- Electric/Power
- Telephone
- Fiber Optic
- Gas Lines/Wells
- Sanitary Sewer
- Rural and City Water
- Rail Road Flagging and Commitments
- INDOT Light Systems and Signals


STOP


E. PEARL ST.

Geotechnical Review

- Deep Foundations (Structures)
- Soils Reports (Sampling)
- Coring Existing Pavement
- Subgrade Treatment
- Peat/Rock/Unclassified Excavation


FUNNEL CAKES


CAUTION

Permits/Erosion Control

- USACE/IDEM/IDNR
- US Coast Guard
- Fish Spawning
- Clearing Requirements
- Rule 5 Permit
- Erosion Control Methods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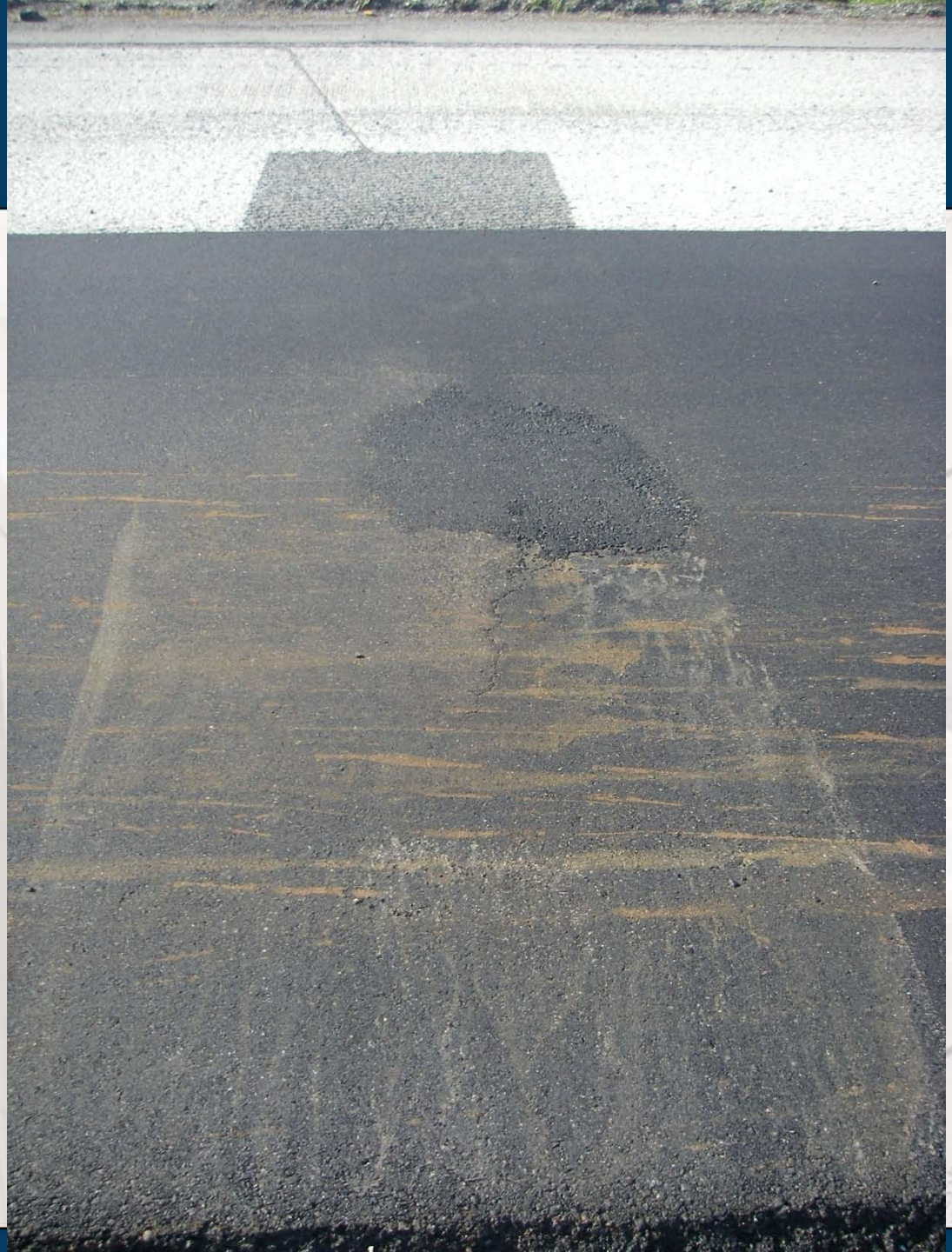
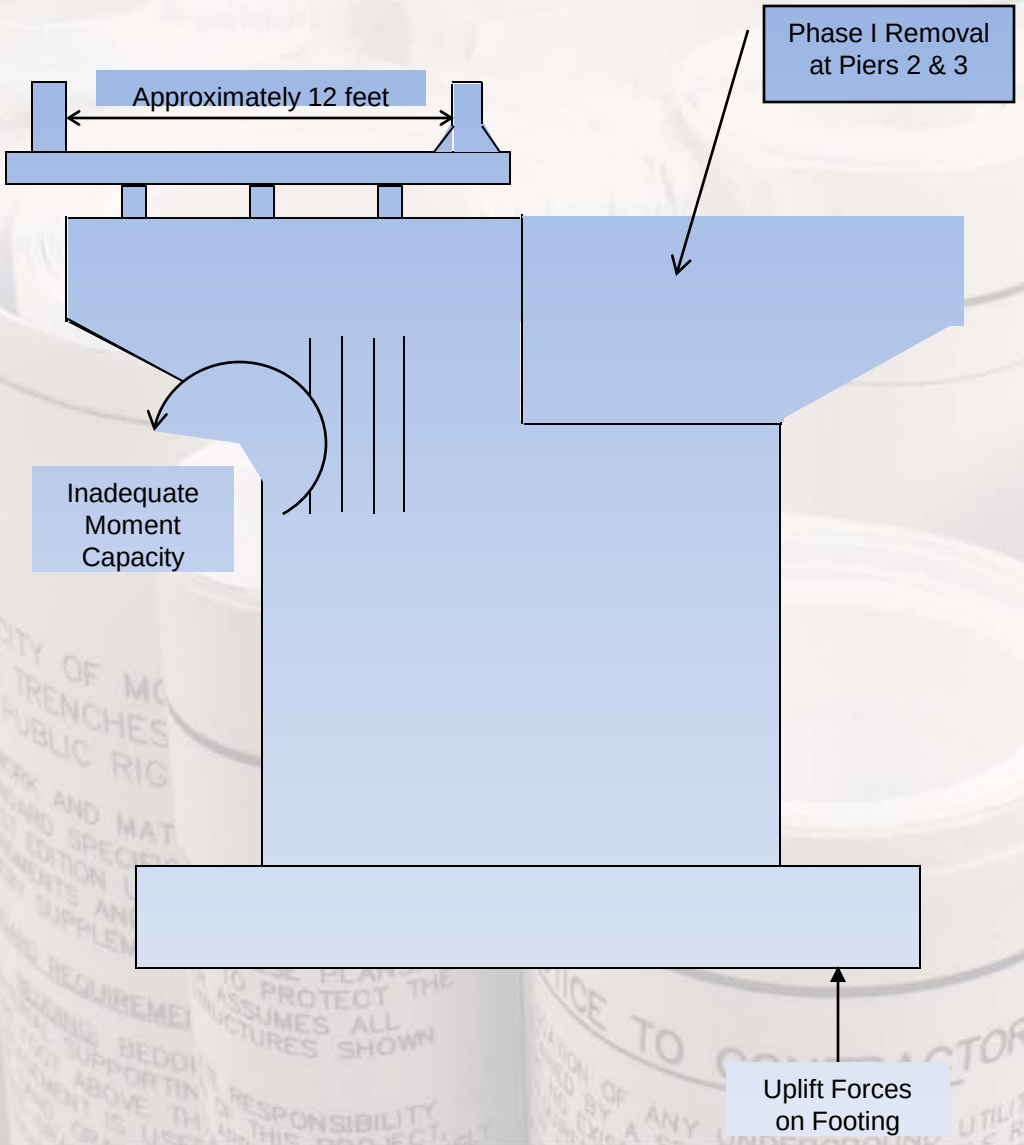
WACKER
SYKES PUMPS

Scope/Survey/Design

- Meeting Scoping needs?
- Visit site throughout development stages.
- Actually survey and design the project.
- Survey monuments and section corners
- Check bridge capacity for phasing.
- Use of existing as-builds.
- New developments since designer Notice to Proceed.



Moment Capacity/Uplift Forces

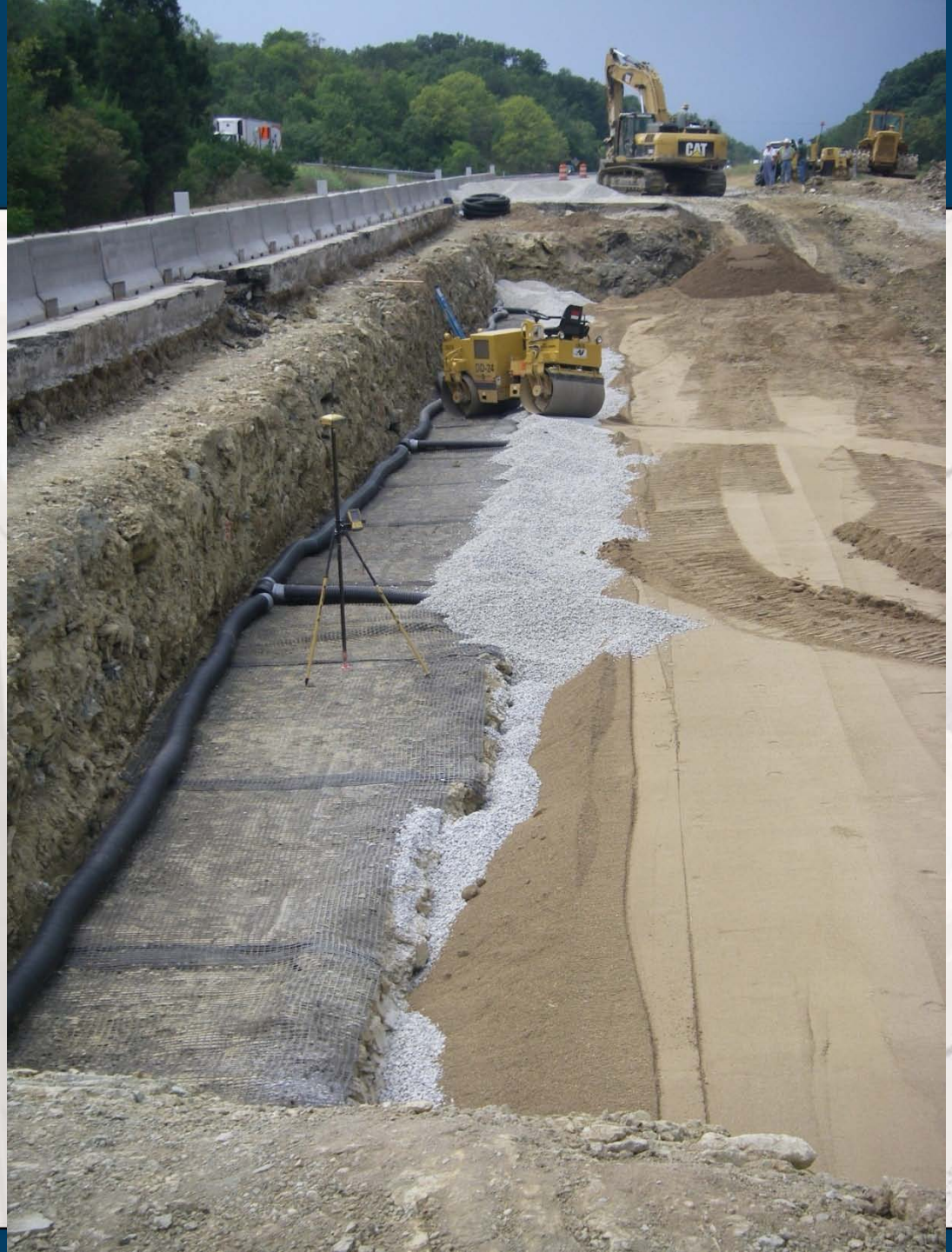


Drainage

- Impacts to adjacent properties
- Impact to newly constructed roadway
- Relationship to existing terrain

Constructability/Phasing MOT

- Are current plans constructable?
- Are phases consistent and feasible? Multi-year phasing and stopping points.
- Do MOT schemes fit bridge decks.
- Can shoulders accept traffic?
- Highway Lighting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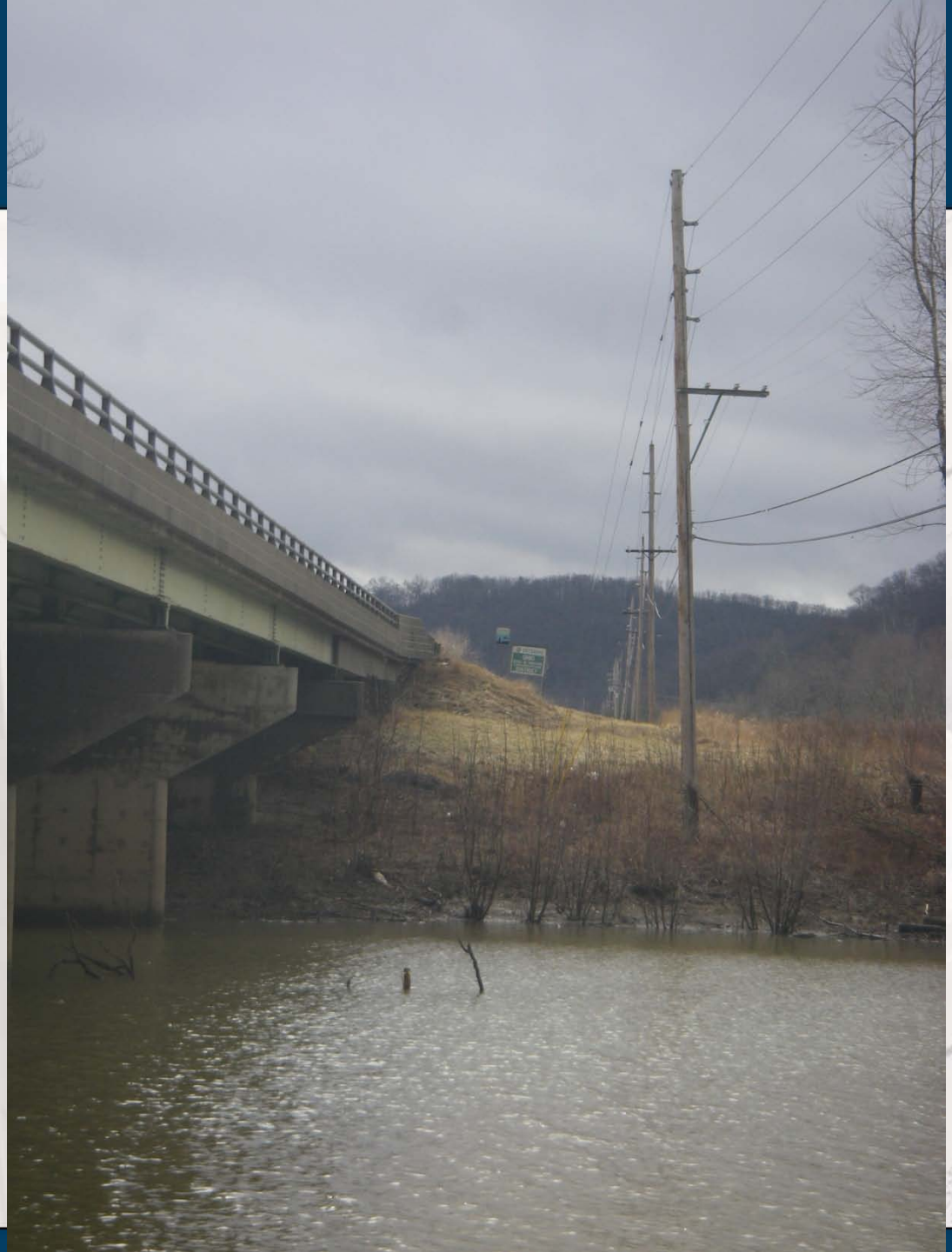
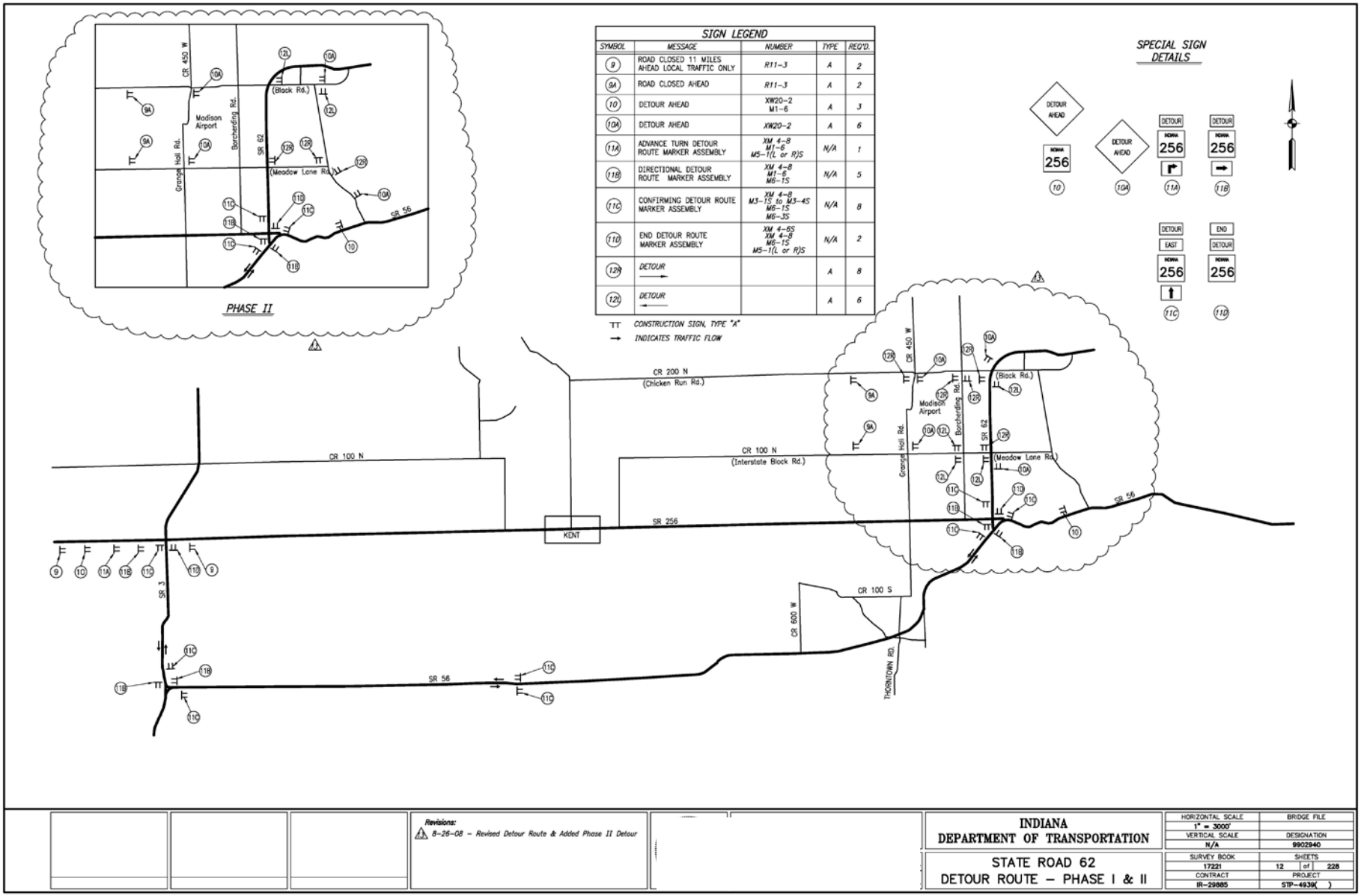


Detour Route



SEQUENCE OF OPERATIONS

PHASE 1

- LINCOLN STREET TRAFFIC SHALL BE SHIFTED TOWARD THE SOUTHBOUND LANES. THREE 10-FOOT LANES SHALL BE MAINTAINED.
- TEMPORARY PAVEMENT WIDENING SHALL BE CONSTRUCTED ON LINCOLN STREET FROM STA. 77+00 TO STA. 121+05 ALONG THE EXISTING NORTHBOUND EDGE OF TRAVEL LANE.
- TEMPORARY PAVEMENT WIDENING SHALL BE CONSTRUCTED ON BARACHEL LANE FROM STA. 46+50 TO STA. 54+41. TWO WAY TRAFFIC SHALL BE MAINTAINED.
- LINCOLN STREET SHALL BE CLOSED TO THRU TRAFFIC FROM STA. 75+35 TO STA. 77+95. TRAFFIC SHALL BE DETOURED ALONG WALNUT AVENUE, EAST STREET, AND FIRST STREET.
- STORM SEWER MAINLINE ALONG S-12-A SHALL BE CONSTRUCTED

PHASE 2

- LINCOLN STREET TRAFFIC SHALL BE SHIFTED ONTO EXISTING NORTHBOUND LANES AND TEMPORARY PAVEMENT CONSTRUCTED IN PHASE 1. TWO 10-FOOT TRAVEL LANES SHALL BE MAINTAINED.
- ROADWAY ALONG SOUTHBOUND LINCOLN STREET SHALL BE CONSTRUCTED FROM STA. 77+95 TO STA. 121+20.
- ALL STREET APPROACHES ALONG SOUTHBOUND LINCOLN STREET SHALL BE CLOSED TO THRU TRAFFIC AND CONSTRUCTED.
- BARACHEL LANE TRAFFIC SHALL BE SHIFTED ONTO TEMPORARY PAVEMENT CONSTRUCTED IN PHASE 1. TWO 10-FOOT TRAVEL LANES SHALL BE MAINTAINED.
- ROADWAY ALONG WESTBOUND BARACHEL LANE SHALL BE CONSTRUCTED FROM STA. 47+00 TO STA. 53+50.
- STORM SEWER MAINLINE SHALL BE CONSTRUCTED.

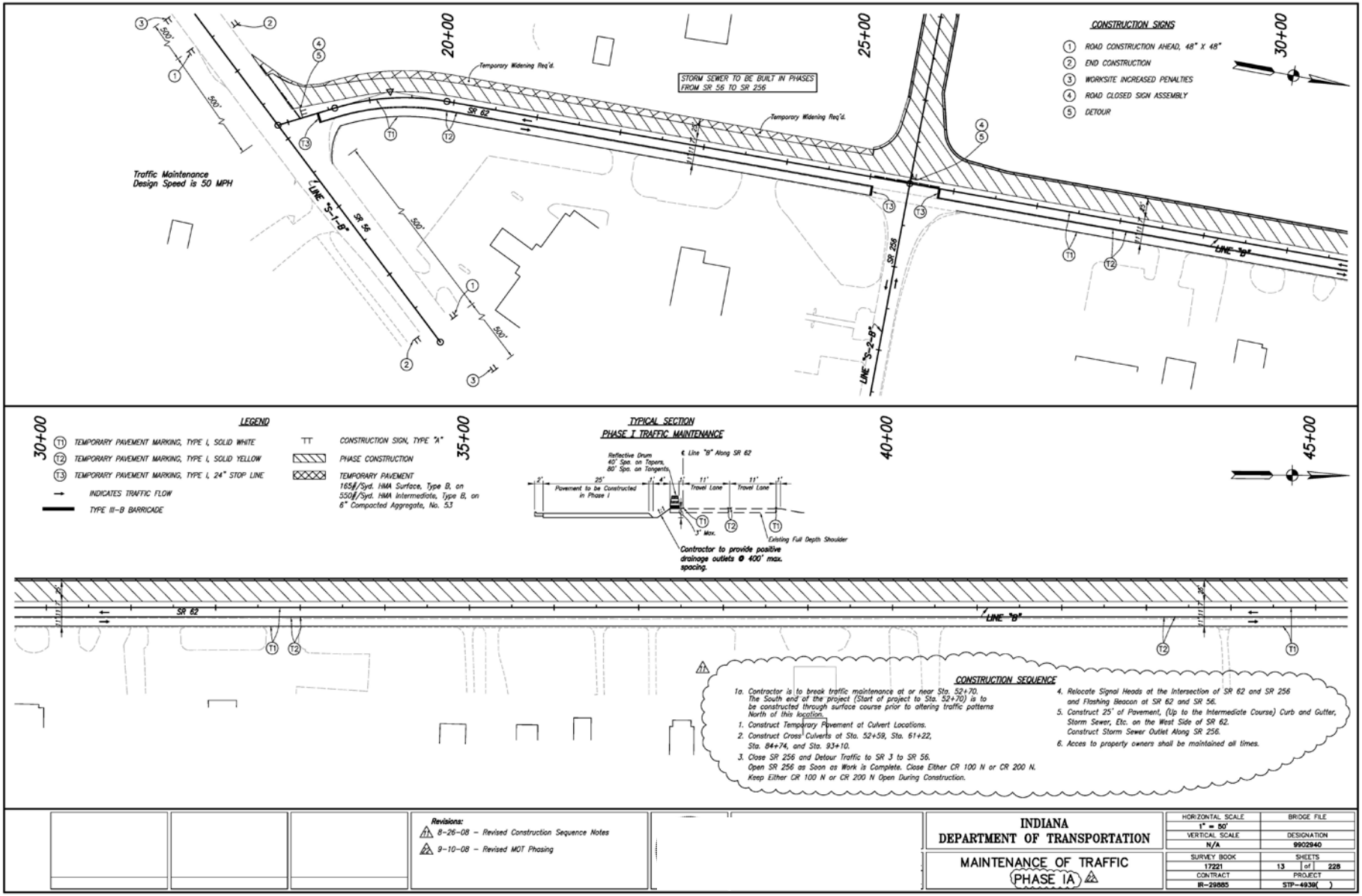
PHASE 3

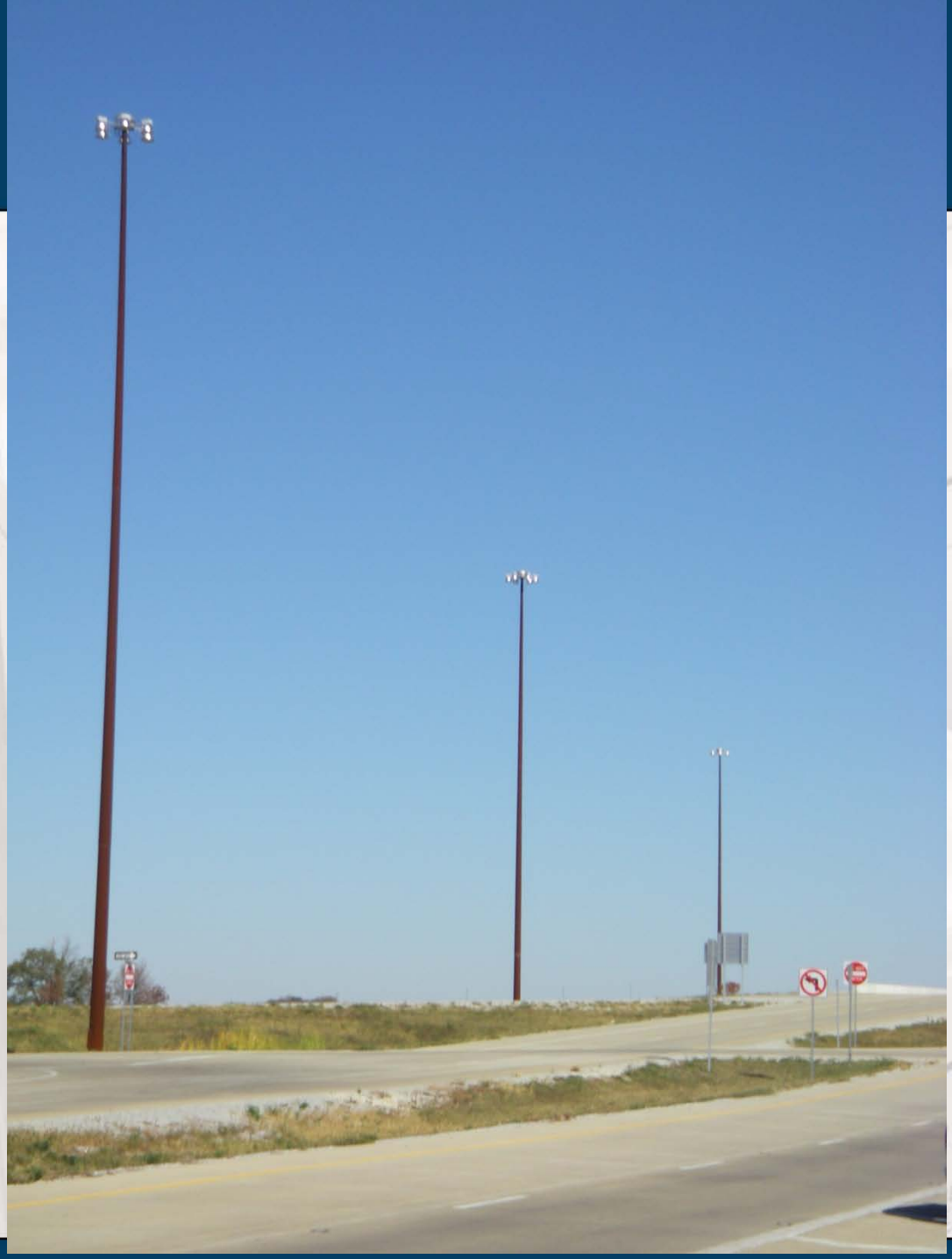
- LINCOLN STREET TRAFFIC SHALL BE SHIFTED ONTO NEW ROAD CONSTRUCTED IN PHASE 2. TWO 10-FOOT TRAVEL LANES SHALL BE MAINTAINED.
- ROADWAY ALONG NORTHBOUND LINCOLN STREET SHALL BE CONSTRUCTED FROM STA. 77+00 TO STA. 121+20.
- ALL STREET APPROACHES ALONG NORTHBOUND LINCOLN STREET SHALL BE CLOSED TO THRU TRAFFIC AND CONSTRUCTED.
- BARACHEL LANE TRAFFIC SHALL BE SHIFTED ONTO NEW ROAD CONSTRUCTED IN PHASE 1. TWO 10-FOOT TRAVEL LANES SHALL BE MAINTAINED.
- ROADWAY ALONG EASTBOUND BARACHEL LANE SHALL BE CONSTRUCTED FROM STA. 47+00 TO STA. 53+50.
- WATERLINE MAINLINE SHALL BE CONSTRUCTED.

PHASE 4

- LINCOLN STREET TRAFFIC SHALL BE MAINTAINED ON NEWLY CONSTRUCTED ROADWAY.
- BARACHEL LANE SHALL BE CLOSED TO THRU TRAFFIC FROM STA. 53+50 TO STA. 59+50. TRAFFIC SHALL BE DETOURED ALONG MONTGOMERY ROAD AND FREELAND ROAD.
- ROADWAY ALONG BARACHEL LANE SHALL BE CONSTRUCTED FROM STA. 53+50 TO STA. 59+50.

MOT Phasing

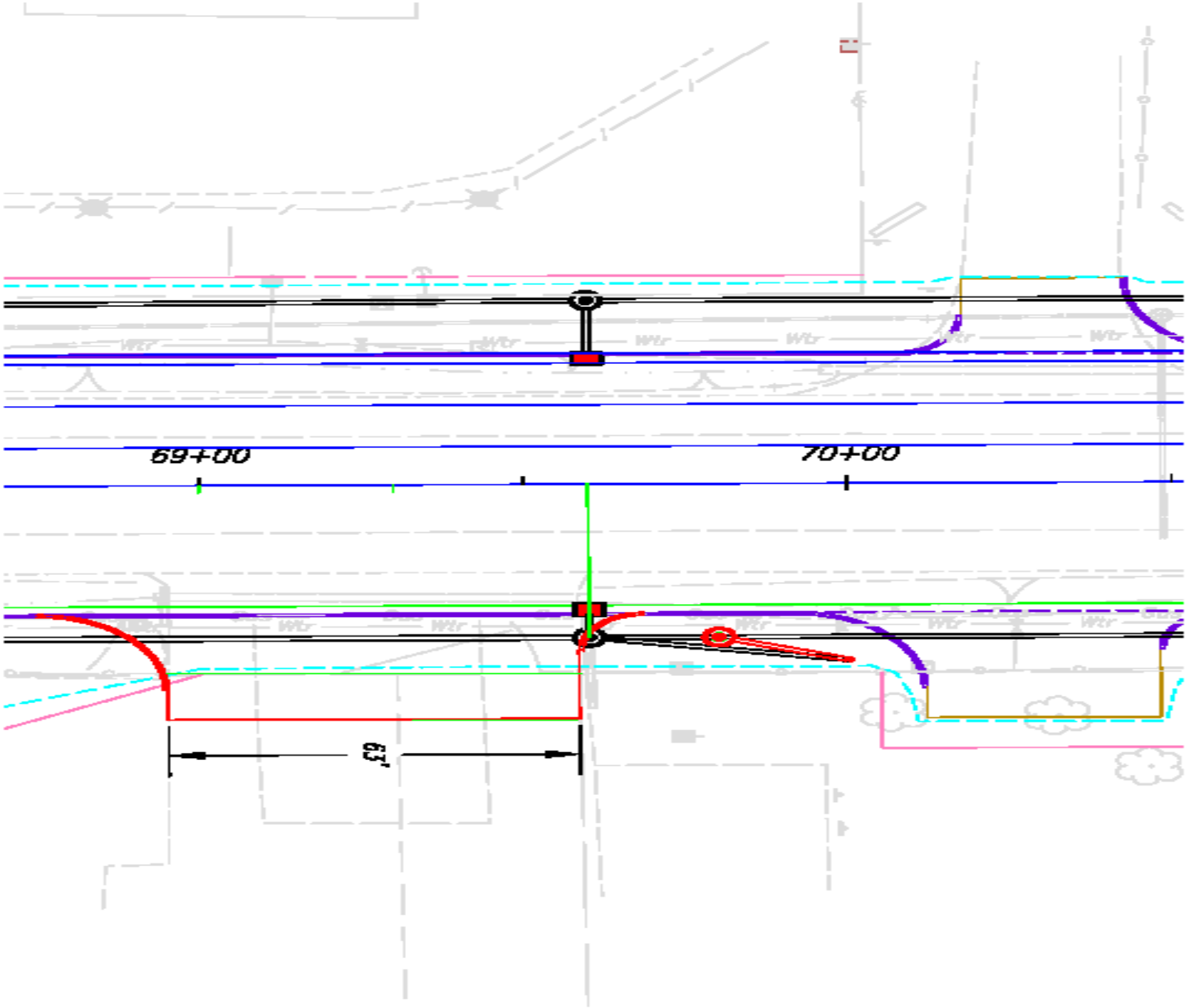

CONSTRUCTION SIGNS
1 ROAD CONSTRUCTION AHEAD, 48" X 48"
2 END CONSTRUCTION
3 WORKSITE INCREASED PENALTIES
4 ROAD CLOSED SIGN ASSEMBLY
5 DETOUR
20+00
25+00
30+00
35+00
40+00
45+00
STORM SEWER TO BE BUILT IN PHASES FROM SR 56 TO SR 256
Temporary Widening Req'd.
SR 62
SR 56
SR 256
LINE "S-1-B"
LINE "S-2-B"
LINE "B"
Traffic Maintenance Design Speed is 50 MPH
500'
LEGEND
T1 TEMPORARY PAVEMENT MARKING, TYPE I, SOLID WHITE
T2 TEMPORARY PAVEMENT MARKING, TYPE I, SOLID YELLOW
T3 TEMPORARY PAVEMENT MARKING, TYPE I, 24" STOP LINE
INDICATES TRAFFIC FLOW
TYPE III-B BARRICADE
TT CONSTRUCTION SIGN, TYPE "A"
PHASE CONSTRUCTION
TEMPORARY PAVEMENT
165#/Syd. HMA Surface, Type B, on
550#/Syd. HMA Intermediate, Type B, on
6" Compacted Aggregate, No. 53
TYPICAL SECTION
PHASE I TRAFFIC MAINTENANCE
Reflective Drum
40' Spa. on Tapers,
80' Spa. on Tangents
℄ Line "B" Along SR 62
Pavement to be Constructed in Phase I
Travel Lane
Travel Lane
3" Max.
Existing Full Depth Shoulder
Contractor to provide positive drainage outlets @ 400' max. spacing.
CONSTRUCTION SEQUENCE
1a. Contractor is to break traffic maintenance at or near Sta. 52+70. The South end of the project (Start of project to Sta. 52+70) is to be constructed through surface course prior to altering traffic patterns North of this location.
1. Construct Temporary Pavement at Culvert Locations.
2. Construct Cross Culverts at Sta. 52+59, Sta. 61+22, Sta. 84+74, and Sta. 93+10.
3. Close SR 256 and Detour Traffic to SR 3 to SR 56. Open SR 256 as Soon as Work is Complete. Close Either CR 100 N or CR 200 N. Keep Either CR 100 N or CR 200 N Open During Construction.
4. Relocate Signal Heads at the Intersection of SR 62 and SR 256 and Flashing Beacon at SR 62 and SR 56.
5. Construct 25' of Pavement, (Up to the Intermediate Course) Curb and Gutter, Storm Sewer, Etc. on the West Side of SR 62. Construct Storm Sewer Outlet Along SR 256.
6. Acces to property owners shall be maintained all times.
Revisions:
1 8-26-08 – Revised Construction Sequence Notes
2 9-10-08 – Revised MOT Phasing
INDIANA DEPARTMENT OF TRANSPORTATION
MAINTENANCE OF TRAFFIC
PHASE 1A 2
HORIZONTAL SCALE 1" = 50'
VERTICAL SCALE N/A
BRIDGE FILE
DESIGNATION 9902940
SURVEY BOOK 17221
SHEETS 13 of 228
CONTRACT R-29885
PROJECT STP-4939( )




EL REPARO
Speedway

R/W Property Agreements

- Has enough right-of-way been procured?
- What right-of-way does INDOT or the LPA own?
- What has been promised to property owners?
- Are buyers giving accurate information?
- Are agreements making plans and/or special provisions.


69+00
70+00
63

Commitments/Local Involvement

- Permits
- Property Owners
- Section 106/Historical and Environmental
- LPAs
  - Festivals, Parades, Fairs
  - City Ordinances
  - Adjacent or conflicting LPA or Utility work


DEERE

Preliminary Field Check - Summary

- Open Communication
- Address Issues
- Accountability
- Thorough on-Site Review
- Plan of Action
- Assigned Tasks

Stage 2 Constructability Review

- Final env document w/ commitments, geotechnical report, VE report, plans, cost estimate

- 55% complete plans
  - Utility impacts have been minimized as much as possible
  - Drainage design is complete
  - Bridge structure foundation types determined
  - Ground improvement measures identified
  - R/W design is complete
  - Traffic maintenance and construction phasing is developed

- Once Stage 2 plans are approved, it is difficult to make major revisions

Stage 2 Constructability Review

- Proposed Right-of-Way
  - Sufficient for construction operations?
  - Are access and staging needs met?
  - Conducive to utility relocates?
  - Room to build drainage structures?

Stage 2 Constructability Review

- Maintenance of Traffic
  - Appropriate phasing?
  - TMP being developed?
  - Adequate turn lanes?
  - Work area big enough for equipment access?
  - Temporary lighting?

Stage 2 Constructability Review

- Construction Phasing
  - Is drainage maintained?
  - Does proposed drainage function in phases?
  - Grade change issues between phases?
  - Is bridge phasing consistent with road phasing?
  - Do utility relocation plans work with phasing?

Final Field Check – Step 1

- Project Manger gives 3 weeks notice to the utilities and INDOT offices when scheduling the Final Field Check.
- Conducted in 2 steps
- Utility coordination with Project Manager, Construction Manager and Designer
  - Project manager distributes plans to utilities.
  - Identification of risks
  - The intent of the Final Field Check Plans is that they are far enough along that the utility can prepare their work plan for relocation
  - Decide sequencing of utility relocations and timeframes

Final Field Check – Step 2

- Review bridge design and requirements
- Final Maintenance of Traffic Plans
- Signalization
- Signs and Striping Plans
- Construction Restrictions
- Traffic and Community impact
- Review and update necessary permits
- Obtain Right of entry
- Any changes
- Check commitment report

Constructability/Utility Conference

- The Project Manager, Construction Manager, Designer and Utility Coordinator
- Status of Utilities
- Utility Work Plan Approvals
- Notice to Proceeds for Utilities
- Project Manager and Construction Manager assess risks

Time Set

- Is R/W Clear?
- R/W Status
- Impact of letting with exception
- Status of Permits
- Utility Special Provisions
- Quantities

Defending the Plans

- Phasing for Utilities
- Where are we going to land for winter?
- Winter work and accommodations.
- Contractor innovation/defending our interests
- Pre-Phase for drainage outlets

Common Letting Questions

- Mobilization and demobilization for seeding
- Temporary seeding
- Temporary striping
- Quantities
- Missed items
- Conflicting items
- Clearing of R/W
- Pavement removal
- Unique special provisions that are needed
- Line removal
- Check commitment report
- Approved equals / Proprietary items
- Basis of Acceptance of Material

Stage 3 Constructability Review

- A completed design project ready for final review
- Plans, special provisions, cost estimate in final form
- Pavement design, hazardous materials report, Rule 5, permits
- R/W acquisition complete and certified clear
- Utility and RR permits complete and NTP with relocation issued
- Review focused on Bidability and Constructability

Stage 3 Constructability Review

- Special Provisions
  - Do SPs agree with plans and pay items?
  - Are all work items covered?
  - Proprietary items approved?
  - Required lanes and closure periods identified?
  - Utility relocation status accurate?
  - R/W acquisition status accurate?

Stage 3 Constructability Review

- Schedule
  - Environmental restriction periods addressed?
  - Local events, holidays addressed?
  - Any special material procurement time needed?
  - Utility relocation timeline addressed?
  - Construction sequencing vs. seasonal limitations reasonable?

Pre-Letting

- From the Final Tracing submittal to the bid letting
- Project Manager and Construction Manager works with the Designer
- Check Contract Information Book and final cost estimate
- Answer questions from prospective bidders

Pre-Construction Conference

- Construction Manager organizes
- Project Manager and Designer attends
- Project Engineer/Supervisor attends

- As project moves into construction, the PE/S works with the CM, PM, and designer on all issues with a potential need for a change order

Mid-Contract Constructability Review

- Construction Management will evaluate change order history
- Project Management will evaluate scope and budget implications
- Identify change order causes and accountability
- Validate the risk decision regarding letting with exceptions
- Learning opportunity

Post Construction Review

- Conducted when construction is 90% complete
- Issues are still “hot” in the minds of all
- Contractor involved
- Opportunity to critique design and construction
- Goal is to eliminate repeated mistakes on future projects

Lessons Learned Dissemination

- Knowledge of past problems can identify potential future problems earlier
- INDOT developing a data collection process
- Reference for designers, INDOT staff, and local agencies
- Goal to improve design by sharing lessons learned

Conclusion

- Evaluation of designer's performance
- Involving designers in the change order process
- Errors & Omissions process
- Training