

Review of Plans and Specs from a Constructability Perspective

The Program Manager and the Project Manager, with approval of the Director of Project Management, may request the Constructability function personnel to perform a review of plans and specifications.

Separate lists are provided to accomplish formal reviews of Plans and Specifications. Each list includes specific categories with considerations and questions that are to be addressed during the review.

Not all items listed for consideration or questions identified will be applicable to each project. The Constructability Engineer should use the list during the review as an aid. Each item reviewed that causes concern from a constructability point of view should be noted and a comment should be included in a report to the Project Manager who requested the review.

Plan Review

The Constructability categories included under Plan review include Structures, Roadways, Staging and Traffic Control, Demolition, Environmental, Drainage/Soil Erosion/Sediment Control, Utilities, and Miscellaneous.

Structures

1. Ensure beam erection can be done within ROW, Staging, and Allowable Closures. Consider size of beam, crane location, dimension, and working range of available cranes. Ensure there is room for construction equipment to work near stage line or existing structures (e.g. overhead clearance, working range of cranes). Ensure there are no overhead utilities that will interfere with the equipment for pile driving operations, bridge erection, construction of noise walls, retaining walls, overhead signs, and culverts.
2. If a structure is being replaced by one with a new alignment, did the Designer provide sheeting to maintain the integrity of the existing roadway embankment while constructing the substructure of the new structure?
3. Did the Designer specify Temporary Shielding for a deck being demolished or constructed over every active roadway, waterway, and railroad?
4. Quantities for Bridge deck repairs tend to overrun. Ensure accurate quantities so that the maximum percentage of repair is not exceeded thereby requiring entire deck replacement. Designer should visit site just prior to Final Design Submission to arrive at accurate quantities. Utilizing As-Built Plans should be avoided.
5. Ensure borings are taken at substructure foundation, sheeting, and cofferdam locations to determine drivability.
6. Provide bottom tip and cutoff elevation and Designation for sheeting left in place.

7. Ultimate Pile Capacity, Ultimate Capacity during driving, if greater than Ultimate Capacity, Damping and Quake factors and % skin friction must be provided on the plans in order for contractor to run the WEAP to size the pile driving hammer.
8. Mean High Water (MHW) elevation, 100-year flood elevation and hydraulic data need to be provided on the Elevation View for cofferdam design.
9. For bridges over navigable waterways, determine whether a relocated channel is feasible. If a temporary closure of the channel is possible, determine if allowable closures are of sufficient duration to allow for construction within the channel area. Allowable dates for closures must be considered to see how they impact the schedule. Marinas and Boating Clubs must be notified. This information will need to be included in the Special Provisions. Ensure the Coast Guard and the NJ State Police Marine Division are taken into account. The Coast Guard has control of work hours. The State Police may be the authorized party for stopping water traffic. Both parties need to know the work is in the planning stage. It is not satisfactory to tell the contractor that he is to contact the Coast Guard for work times. It is not satisfactory to tell the NJ State Marine Police at the last minute that they are needed, they have limited resources. The Agreement must be done with the NJ State Police Marine Division, not through the NJ State Police Traffic Unit.
10. Basic footprint and footings (new/old) of all structures must be shown on the plans.
11. Does waterway have sufficient depth for barging equipment to the construction site?
12. Look for shallow overhead and cantilever sign foundations that conflict with guide rail posts.
13. Are there conflicts in the construction joints?
14. Do battered piles conflict with the cofferdam sheeting?
15. Cantilever Steel Sheet Pile walls higher than 15 feet (5 m) need to be anchored/tied back.
16. When deck pours are staged, check to see if reinforcing steel is tied together through the joints. When it is tied together, problems have occurred with the concrete coverage. Have Designer determine the impact of the stage pours and its impact on the beams and the clearance of the rebar.
17. If the staging joint is on a girder, is the girder's deflection too much to tie in rebar during the second stage? (While pouring concrete, the rebar bends due to live traffic on the girder, deflection of rebar shows through concrete to the surface.)
18. If the staging joint is between girders, is the deck deflection and slope too much to tie in rebar during the second stage?
19. Verify there is a 1' space between the Jersey Barrier and the stage construction work area.
20. Provide typical section at decks?

21. Bridge drainage to where?
22. No middle stages, no small middle stages (15' absolute minimum), consider staging width vs. worker safety, and consider staging width vs. equipment sizes.

Roadways

1. Make sure staging allows construction of super-elevated curves and that grade changes don't cause problems with surface drainage and driveways.
2. Ensure the basic footprint (Alignment, Widths, Toe of Slopes, Profile, etc.) of the roadway (Mainline & Ramps, all side effected Side Streets & Major driveways, etc.) is shown.
3. Ensure use of shoulder for active lane can structurally support traffic and any rumble strips are dealt with.
4. Ensure Barrier Curb is used at radii that are attainable based on minimum barrier lengths.
5. Ensure all easements are provided and ensure access to all of the work is available.
6. Ensure all cross sections for entire length of project including zero/end sections are shown on plans.
7. Ensure proper sight distances (horizontal/vertical) when lane closure tapers are used.
8. Ensure Superpave thickness requirements are met when consideration is given to staged paving on allowable drop-offs. Minimum thickness is difficult to maintain.
9. Check for connections to existing residential driveways. Will maximum grades be exceeded?
10. Ensure appropriate storage locations for embankment are available if excavation is used in later stages.
11. Typical section for all work when required.
12. If sheeting is required for excavation, make sure it is possible to drive given, utility conflicts, conflicts with old footings, overhead clearances for driving equipment.

Staging and Traffic Control

1. Ensure that if staging of the project utilizes a shoulder as an active lane of traffic and a new shoulder is NOT built, that the impact of mail delivery, garbage pickup, and school buses is taken into consideration (turning radii, stopping in an active lane for children pick up/drop off, garbage collection, etc.)
2. Ensure detour route and roadway, especially shoulders when used as a travel lane, can support (width, vertical clearance and structural capacity) increased volume.

3. Can a detour route be devised to simplify the staging and speed up the project?
4. Check traffic considerations: Available lane hours, and/or are full closures expected? If there are potential detours, give basic routes. Also, must indicate pedestrians and mass transit user effects.
5. When constructing an intersection in stages that is signalized or has a temporary signal, do the plans adequately address the lane shifts and any moves of the signal heads required? Is a temporary signal necessary?
6. Has the Designer considered how traffic is to be switched from Stage to Stage when there is a grade differential? Safety and protection of vehicular and pedestrian traffic must be maintained when changes in the vertical profiles are proposed.
7. Make sure there is access at all times to residents and businesses.
8. If an accelerated stage is required for a project, has the Designer researched the available working hours and specified a time frame to complete the stage? (e.g., maximum number of days as well as minimum number of hours to be worked in a day).
9. Ensure staged lanes provide sufficient width for all traffic (trucks). If barrier curb is required, make sure enough space is provided between barrier curb for snow plowing and oversized loads exiting highway ramps.
10. Ensure work zones include sufficient space to perform the work. Take into account equipment sizes, boom swing, etc.
11. Ensure staging and Traffic Control Plan are coordinated. Examine locations and size of devices. Also ensure closure hours are the same between both.
12. Ensure that stage construction (particularly bridge construction) provides sufficient space between stages to perform the work. More demolition than construction should occur in first stage to allow for a neat line constructible connection between stages.
13. Cantilevering existing sections of deck is not desirable. Demolition should continue to the nearest centerline of the beam.
14. Ensure Designer accounts for temporary highway lighting for all applicable staging.
15. Check to see if night time work can realistically be performed in the time frame provided.
16. Ensure construction vehicles can safely enter and exit construction work areas. If not, project duration will be effected and must be considered in construction completion dates.
17. Can stages be built per staging plan by width of stage?
18. No middle stages, no small middle stages (15' absolute minimum), consider staging width vs. worker safety, and consider staging width vs. equipment sizes.

19. Temporary sheeting at staging line is not temporary because it cannot be removed. Label it permanent and do the extra work for the sheeting design as permanent sheeting.
20. Staging -- can it be built (elevation & going from Stage 1 to Stage 2 transition) If high, does it either have adequate slopes or sheeting?
21. How are structure parts being removed without endangering the traffic below?

Environmental

1. If Regulated Material is encountered, use as much on site as is practical, considering staging.
2. Are there wetland, riparian or flora/fauna restrictions? Coast Guard requirements? Historic considerations?
3. Can project be constructed on time with conditions and within staging conditions?
4. Are permit restrictions properly accounted for?

Drainage/Soil Erosion/Sediment Control

1. Is there sufficient time in lane closure to construct drainage, especially if rock removal is required?
2. Check for conflicts between underground utilities and cross drains or inlets.
3. Check for drainage staging to ensure that the system is functional during all phases of the project (critical in projects with major grade changes or where existing drainage is being abandoned). Ensure the staging does not trap water or push water down side streets or driveways.

Utilities

1. If Utility Agreements are required, are there any conflicts? Check status of Utility agreements.
2. Do the railroads have limitations on work hours? If so, railroad must provide limitations in writing to Designer and included in specification.
3. Ensure utility poles can be accommodated within ROW. Can work be completed within window provided?
4. Utility relocations (and who will do them) must be shown on plans.
5. Any Utility work within railroad ROW? If so, Department should acquire utility permit during Design.
6. Compare Utility staging vs. construction staging.
7. Was advanced utility relocation considered? If not possible that it was documented as to why not.
8. Consider conflicts between utilities & construction (overhead and under ground).

9. Make sure room is available to construct large (need to be lifted by crane) utility chambers under aerial utilities.
10. Has subsurface investigation of utilities (SUE) been performed?

ROW

1. If guy wires are needed, is there sufficient ROW or have easements been provided?
2. Have adequate construction or slope easements been provided?

Miscellaneous

1. Pedestrians have safe access to open sidewalks.
2. Excavation is in 3-D, with adequate length, width, depth, and side slopes or sheeting. Make sure adequate ROW is available if sheeting is required.
3. Access to work: equipment requirements and stockpiling.
4. Cranes lifting arm vs. overhead wires, trees, nearby structure, or under a structure. Cranes front and back swing space vs. near live traffic or trees
5. Driveway access is possible in staging?
6. Do roadway grade changes affect the flow of storm water runoff out of driveways and parking lots or create an overly steep driveway or sidewalks?
7. Materials available: night time work, shortages?
8. Check access for maintenance to Variable Message Signs, poles, communication panels, meter cabinets, etc
9. Electric power has a source.

Specifications Review (where applicable)

The Constructability Specifications Review consists of the following items:

1. Special Provisions and Details (if necessary) must be provided for Non-Standard Pay Items.
2. Non-Standard Items - description of item, order of work, restrictions on handling.
3. Utility durations included in the schedule?
4. Do the Substantial Completion, Final Completion, and Interim Completion dates match the schedule?
5. Ensure Utility notice requirements and duration match the Special Provisions.
6. Ensure that the Designer has included the information from both the project specific utility mod & utility checklist in both the Special Provisions and the Plans.