

## **LESSONS LEARNED FROM POST CONSTRUCTION REVIEW MEETINGS**

**BY ROBERT SEMONES  
QUALITY ASSURANCE BRANCH  
DIVISION OF HIGHWAY DESIGN  
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The Kentucky Department of Transportation has been performing post construction reviews for approximately ten years. Over the years, mass amounts of data have been compiled. Enclosed is an attempt to relay some of the issues that seem to arise during construction of highways from the designer plans. It is very important that constructibility reviews be planned with attendance from all major players of the design and construction process. This should include the designer, construction personnel, structures personnel, drainage personnel, pavement personnel, right of way personnel, geotechnical personnel, maintenance personnel, traffic personnel, roadway review plan personnel, Division of Water personnel and any other parties associated with the development of the plans. If the project is adjacent to the railroad then the railroad representative from the Cabinet should be present. Without the cooperation and participation from the key players, then we will continue to experience the same issues of the past. Of course, this will not solve all the problems with highway plans and construction revisions. There are some problems that cannot be foreseen until construction takes place. (The most common problem being slides that appear during construction). You will notice that the comments are in very vague and in layman terms. Some comments will appear in different places depending on the situation.

### **UTILITIES**

The number one topic of just about every post construction review is utilities. This has been a problem since highway plans have been developed. Some of the comments at the post construction reviews:

1. Utility companies are being supplied plans, but are very slow in re-locating utilities. Most utility companies do not know where the utility lines are. Old utility maps are usually wrong depicting the location of utilities. There have been comments over the years that a construction job should not be let until all the utilities have been relocated. The department has paid millions of dollars to contractors in delay costs because the utilities had not been relocated at the time of construction.
2. **Relocating utilities to the wrong area.** When sanitary sewer lines are being relocated along with water lines, there needs to be a separation of about ten feet between the sanitary sewer lines and water lines. If not, then special backfill provisions have to be performed by the utility company. Utility poles have been relocated only to be relocated again due to an error in the plans.

3. **Utility companies requesting changes in water line design once construction begins.** Most municipalities want to change the water line layout and pipe types, valve types, etc. once construction begins. The contractor may decide to the work, but the department has to reimburse the contractor with money from a change order. The utility companies are supposed to reimburse the department. **Make sure that a representative from the department oversees this process. Usually this creates a headache from the time standpoint.**
4. Discuss utilities at constructibility review meetings making sure someone from the department has contacted the utility companies. Do not assume it has been done. Make a note and get in contact with the person who is responsible from contacting the utility company.
5. **Check utility lines above bridge sites.** There have been cases where utility lines have been in the way above construction cranes near end bent locations. This creates a loss in time and money and creates a change order.
6. **Check proposed pipe depths on plans.** There have been cases when pipe depths approaches fifteen feet, problems arise from open cut trenching and wrapping the pipe according to specifications. The slopes from the trenching have encroached upon private property or buildings. It would be best to go ahead and look for another way to outlet the pipe or use the bore and jack procedure. Always check pipe depths and try to keep them to a minimum when working near urban areas. Make a sketch of the trench width and see how far the disturbed limits will go.

## **MAINTENANCE OF TRAFFIC PLANS**

This has been an issue at every post construction review also. Again, this is one of those topics that seem to change with the contractor. **Some comments:**

1. MOT plans are being developed that cannot be applied to the construction sequence.
2. Some MOT plans show shifting of traffic too often. This creates numerous setups for barrel and barricades and often the contractor will file a change order to make up the losses in materials and time.
3. Some MOT plans shift traffic too close to the edge of the traveled lanes. When side slopes are 3:1 or greater, this creates a change order for temporary guardrail in the MOT area.
4. Some MOT plans shift traffic to existing shoulders without exploring the shoulder material. There have been cases where traffic was moved to the shoulder only to have the shoulder fail. This creates another change in the MOT plans while the shoulder is being upgraded to the proper pavement thickness. **Always check to see what the shoulder is comprised of before moving traffic to the shoulder.**
5. Most of the time the contractor will propose a change in the MOT plans. Let's face it. The contractor has numerous years of experience in certain areas of construction and knows exactly how to handle the traffic patterns. We can learn from the MOT plans the contractor proposes. When a particular construction job is planned in a certain area, the designer should look at the MOT plan that was proposed by the contractor before. This may save the department money in the

- future. When a contractor proposes a different MOT plan, it should be proposed as a value engineering construction proposal (VECP). This way, the department would realize half the savings from the revised MOT plan (if time permits).
6. Check all signs for the MOT plan making sure the proper sign is used and at the proper location. Check all proposed crash cushion types and locations. There have been cases where crash cushions have been omitted from the plans or the wrong type has been setup for the phasing of traffic.
  7. Check all striping for the MOT plan. There have been several cases where striping quantities are extremely overrun. This results in huge change orders for temporary striping. Usually, there is only enough striping setup for one phase of MOT. There have been comments at past meetings to go ahead and double or triple quantities of temporary striping on complicated MOT plans.
  8. When construction ceases in the winter months on urban jobs, make sure there is enough crushed stone base setup for entrances into business and homes. It has been requested that 2 to 3 times more crushed stone base should be setup in the plans to minimize the rutting to the entrance locations. This is important in business areas of the job site.
  9. Setting up a law enforcement officer in MOT areas seem to help slow the traveling motorist. We have seen cases of 1800 hours of law enforcement at \$45.00 per hour. It is expensive, but is well worth the money if lives can be saved in MOT areas. This usually includes double fine areas also.
  10. Make sure enough variable message signs are setup in the plans to take care of phasing the traffic.

## **RAILROAD ISSUES**

Constructions near or adjacent to railroads have always been a good topic for discussion at post construction review meetings. Railroads are unpredictable and can be very difficult to work with. Again, it must be imperative that a representative from the department stay in communication with the railroad to insure the plans have been received and properly reviewed by the railroad. The railroad should respond with some type of notarized signature that the plans have been reviewed and are approved for construction. Some comments:

1. Flagman. This has been a costly item to the department and the contractor. The contractor always under bids the number of flagging hours needed to satisfy the railroad. The railroad requires a flagman every hour the contractor is near or on the railroad right of way. At \$100.00/hour for a flagman, this can result in large change orders. There have been cases where the contractor is performing work away from the railroad (not on railroad right of way) and the contractor is told to stop work by the inspector until a railroad flagman is on the job. **The railroad flagman should not be needed unless the contractor is working on the railroad right of way.** The department policy needs to be reviewed closely and make sure that the policy is being interpreted correctly by the contractor and construction personnel. The railroad liaison for the department needs to be contacted and involved with the constructibility review. Do not assume this has

- been taken care of once the plans are at the final constructibility review process. Some railroads have contracted with engineering consultants to insure the railroad policy is being adhered to while construction takes place. The number of hours for this item is very difficult to estimate thus causing thousands of dollars to the department in change orders. **The department needs to be aware of this issue because it may vary depending on the railroad company. Make sure the contact person for the railroad with a phone number is listed on the plans.**
2. Drainage onto railroad right of ways. Plans have been sent to the railroad for review by the project team. Once construction begins, the railroad always changes the drainage plan if the drainage is draining onto the railroad right of way. Try to minimize drainage onto railroad right of ways. Review the plans and devise another drainage scheme to keep any water off the railroad right of way. This will save construction time and eliminate any future change orders.
  3. When dealing with railroad crossings during construction, make sure the approved type of crossing is being used. Some railroad want the concrete panel crossing while others want the neoprene type crossing. This will depend on the ADT of the job site and the railroad. Make sure the proper type is shown on the plans.
  4. The railroad has changed the type of aggregate proposed by the department to use on the railroad bed. The department may propose a certain type of ballast to use in case of any lost ballast from the track bed during construction. The railroad will disapprove of the ballast type and demand top quality granite from the northeast resulting in a large change order.
  5. When the plans show a railroad in the vicinity, beware of the possible issues that may arise. Each railroad is unique in its own way when dealing with highway construction on its right of way.

## **GEOTECHNICAL ISSUES**

Kentucky is a unique state when dealing with subsurface material. You travel from the western part of the state where the soils are deep, sandy with bank gravel (District 1 and some in District 2), sink holes in District 3, limestone and clay seams in District 4 and begins to get somewhat mountainous as we approach the eastern part of the state. We are also blessed with mining operations in western and eastern Kentucky. The state is a geologist dream or nightmare depending on how you look at it. With this come all types of geotechnical issues. Some issues arising from different post construction reviews:

1. As stated earlier, we have learned that landslides will appear during construction. This happens all over the state. We need to look at the jobs that have had slides in the past, see what types of slopes are shown on the plans and see if we can modify the slopes in any way to prevent future slides. Some of the slides are quite small and some are quite large and are very costly to repair not to mention the losses in time for the construction project. Discuss the job with the Geotechnical Branch and see what measures can be taken to minimize the slide area.

2. Check the construction site and see what type of soil stabilization is being performed (if any). In the case of lime stabilization, make sure the subgrade soils are suitable for lime stabilization. We have had cases in the past where the contractor has proposed using two feet of rock roadbed in lieu of lime stabilization. There have been some cases where the lime would not work at all. This is the same case for cement stabilization. Check to make sure that there is enough rock on the job site to use rock roadbed. If there is, use the rock roadbed if possible.
3. Settlement platforms are being omitted from the bridge plans. Someone from the Structures Division needs to be in communication with the Geotechnical Branch to see if settlement platforms have been recommended at the bridge site.
4. There have been numerous cases where mass concrete has been used at abutments due to the rock line being in a different location than shown on the plans. We need to make sure we are using a sufficient amount of drill locations at proposed bridge abutments. In some places throughout the state, the rock line has varied from two to twelve feet at some abutment locations. This is one of those situations where it may be difficult to obtain the proper drill data due to the proposed abutment location. This issue can be costly in delay costs.
5. There have been some projects showing two feet of rock roadbed. The rock roadbed material is proposed to come from the job site. After digging and blasting, it has been determined that not enough suitable material cannot be found to use as rock roadbed at the job site resulting in large change orders. The most common remedy for this has been one foot of crushed aggregate, size number 2 for the rock roadbed and geotextile fabric Type IV on top and bottom of the number 2 stone. We need to look at the core samples closer and double check the amount of quality rock we can recover from the site. It may be safe to cut the proposed quantity of rock roadbed in half and use that amount at the job site along with another solution. In one case, the rock roadbed was eliminated entirely. The pavement design was revised using a high strength geosynthetic material.
6. There have been many cases where unstable areas have been found during construction. These areas had to be excavated and backfilled with Granular Embankment. Some of these areas are difficult to find until construction is underway.
7. Solid rock locations shown on bridge plans have been found to be two to four feet lower in the field resulting in change orders for mass concrete and time delays.
8. There have been cases where Channel Lining Class IV has been shown on the plans. Material from the site has been intended to use for the Class IV Channel Lining. Once construction begins, it has been determined that the material to be used for the Class IV Channel Lining contained high volumes of non durable shale. This usually happens around the Scott, Fayette, Madison County areas. Be aware of this issue on projects near these areas.
9. The design team needs to check all geotechnical notes on the plans and communicate with the Geotechnical Branch at the final constructibility review meeting.
10. Make sure proper blasting notes are set up in the plans.

## **THE PERMIT PROCESS AND EROSION CONTROL ISSUES**

Most of the problems falling under this category deal with communications (OR MIS-COMMUNICATION) with Division of Water and Fish and Wildlife.

1. Check stream mitigation plans to make sure the mitigation will work in the area. Mitigation plans are being designed by the project design team designee and approved by the Division of Water in areas where the stream mitigation will not work. There have been areas where trees and certain plants have been proposed for highways constructed of rock embankments. We need to quit wasting time and money designing stream mitigation plans in areas where it will not work and this message needs to be relayed to the Division of Water. It is ludicrous to pay in-lieu fees to Division of Water for stream mitigation violations when the stream mitigation would not work anyway. This is beginning to be a problem on other highway projects also. Large change orders are being produced to reimburse the contractor for purchasing trees, channel lining, plants and other materials and then not being able to use them. Instead of communicating with Division of Water on the front end, the department would rather pay in-lieu fees to the Division of Water.
2. Environmental Laws are causing major change orders in erosion control items. Make sure ditches are being assigned the proper material for lining. There have been cases where the ditches have been too sandy and highly erodible to sustain an erosion control blanket as stated in Section 212.03.03 part (E) of the Standard Specifications. These type of ditches had to be lined with Channel Lining, Class II and Geotextile fabric, Type III. Check all soil parameters on cut slopes and ditches and embankments and make sure the proper erosion control items are being utilized.
3. There have been numerous comments concerning seeding. Comments have been stated that we need to double the quantity of proposed temporary and permanent seeding on all jobs. For some reason, the calculated quantities are not enough to cover the exposed areas causing payment by change order.
4. Make sure that Crown Vetch and Lespedeza quantities are being setup in the proper areas. The soil types and slopes need to be checked to make sure the proper ground cover is being specified. There have been many cases where the ground cover has not survived because of the soil type and slopes. If the slopes are excessive, the slopes may not provide the proper water to the ground cover.
5. Make sure all erosion control is in compliance with the current specifications.
6. Excelsior blanket seems to be the favorite way to minimize erosion especially in urban jobs around houses and businesses.
7. Make sure all permits are completed before the job goes to letting.

## **FUEL AND ASPHALT ADJUSTMENTS AND LOT PAY ADJUSTMENTS**

1. Needless to say, we all know what these pertain to and these items have cost the department millions of dollars.

## PAVEMENT ISSUES

1. The design team needs to communicate with the pavement branch to make sure the most current pavement design is being implemented. Some plans have set on the shelf for awhile causing pavement designs to be outdated due to an increase in truck traffic particularly coal traffic in eastern Kentucky.
2. Major intersections may be consideration for concrete pavement to minimize rutting from high truck travel.
3. Areas that have traffic signals on downhill slopes should be constructed of concrete pavement to prevent raveling of the pavement due to the braking force from truck traffic.
4. An edge key detail for joining existing pavement with proposed pavement has been left off the design plans. Make sure the edge key detail is shown on part width construction plans where additional pavement will be added. This is a small item, but it shows up quite a bit in a change order.
5. There have been numerous changes orders compensating the contractor for utilizing the MTV for asphalt placement. Is this something we need to clarify on the plans if asphalt pavement is being used throughout the project? The contractor claims they can minimize aggregate and thermal segregation during the asphalt placement enhancing the pavement quality.
6. Check quantities of Asphalt Seal Aggregate and Emulsified Asphalt from the Paving Areas and Paving Summary sheets. Typical sections from some jobs have shown partial rock shoulders. Make sure that asphalt seal aggregate and emulsified asphalt be applied on both shoulders and the areas between the guardrail and shoulders where a Type III guardrail end treatment is being used. There have been a few cases where the quantity for Emulsified Asphalt RS-2 has been half of the amount actually needed. It must be noted that these materials are usually put down at a rate of two applications each.
7. Asphalt mixtures with the 0.38 rock are being preferred over the 0.50 rock. The 0.38 rock produces a less porous asphalt mix.
8. Some entrances with heavy truck traffic may require the use of JPC 24hr mix. This has been used at a few locations where no other option was feasible due to the volume of heavy truck traffic. Use of this mix will minimize down time of constructing the entrance pavement. This mix may want to be considered around truck stop areas and heavy industrial areas.
9. Asphalt Leveling and Wedging: Placement of level and wedging over existing pavement to maintain drainage during the different construction phases was discussed. Also, the determination of quantities established for the project was discussed.

Action Needed: Add note to Maintenance of Traffic plans indicating positive drainage of roadway pavement should be maintained at all times. Level and Wedging of existing pavement utilizing part width construction techniques may be required to accomplish this.

On pavement rehabilitation jobs, it has been requested at many meetings that a full set of plans be provided to the contractor. The proposal method is a quick way to get the job completed, but many items are usually misinterpreted.

## DRAINAGE ISSUES

1. Drainage onto railroad right of ways. Plans have been sent to the railroad for review by the project team. Once construction begins, the railroad always changes the drainage plan if the drainage is draining onto the railroad right of way. Try to minimize drainage onto railroad right of ways. Review the plans and devise another drainage scheme to keep any water off the railroad right of way. This will save construction time and eliminate any future change orders.
2. There have been a few cases where surface water from the roadway surface has eroded newly constructed DGA shoulders and fill embankments. These areas have required a change order to construct a special header curb or concrete wedge curb along with Flume Inlet Type I and Flume Inlet Type II. Make sure provisions are setup in the plans taking care of embankments that are susceptible to erosion from surface runoff.
3. **Check proposed pipe depths on plans.** There have been cases when pipe depths approaches fifteen feet, problems arise from open cut trenching and wrapping the pipe according to specifications. The slopes from the trenching have encroached upon private property or buildings. It would be best to go ahead and look for another way to outlet the pipe or use the bore and jack procedure. Always check pipe depths and try to keep them to a minimum when working near urban areas. Make a sketch of the trench width and see how far the disturbed limits will go.
4. Usually drainage issues arise during the construction process. Some cases include adding some ditches and pipe to divert the drainage away from adjacent property owner's homes. This type of drainage issues are hard to predict until construction takes place. Check the plans during the final constructibility review meeting and make sure proper quantities of pipes and headwalls are setup. There have been cases where safety grates have not been specified near entrances in urban areas and in clear zone areas in rural jobs. Check the plans to make sure the proper drop and curb boxes have been specified. There have been cases where the plans showed a twenty foot long Type A Curb Box in a radius and the contractor had to shift the box into a tangent section to accommodate the box. It has been suggested that curb boxes be left out of radius areas due to turning movements from truck traffic.
5. There was a discussion about how to properly handle abandoned pipes that will no longer be in use, whether to remove or safe-load them. This includes the 24" water main. It was decided to leave the existing removal notes as is on plans but add a note stating that the Contractor shall have the option of either removing or safe loading the pipes with the approval of the Engineer. A bid item and quantity for safe loading shall be added to plans. For the purpose of removing the abandoned pipes, a bid item for removing pipe, granular backfill and fabric should be added to plans. A special note for this decision shall be added in the proposal. This note has been clarified to read that abandoned cross-drain pipes shall be safe-loaded, and the water main shall be removed with a note to say that the Contractor has the option of removing or safe loading the pipe. Both bid items for removing the pipe (granular backfill and fabric) and safe-loading the pipe shall be added to

the summary. Whichever method the Contractor uses will determine how he/she will be paid for the work.

6. Flowable fill shall be considered on pipe sections. On all pipes under existing roadway use flowable fill and on new roadway when close to subgrade. Flowable fill is incidental to the length of pipe. The flowable fill limits shall be shown on the pipe sections.
7. Precast culverts have been used in part width construction jobs with satisfactory results, although the consensus of the group is the use of cast in place box culverts when possible. Quality of the final product seems to be the main factor for this decision.
8. Make sure pipe outlets and inlets are placed enough distance from the edge of shoulder, especially in phasing of traffic schemes. There have been cases where the pipe had to be extended to provide enough room for guardrail when shifting traffic.
9. Always double check the drainage calculations. There have been a few cases where property owners have been flooded once the roadway is constructed. During post construction review field inspections, the property owner always says "I never had any water in my house until this road was constructed".

## **ROADWAY ISSUES (DESIGN ISSUES)**

For the most part, the "in house" designer and the design consultant do an excellent job when designing our roadway systems. There is still that statement, "Communication skills could be better between Central Office and the Districts". We need to listen to district construction personnel (resident engineer especially) when construction issues arise in the field. There have been some cases where the contractor and resident had to wait for decisions from Central Office pertaining to certain issues on the job site. The resident will provide suggestions for the problem, only to wait. We need to listen to our resident engineers and contractors. Some of many years of experience we can all learn from.

1. Check grades of roadway and make sure the grade is not too flat in certain urban areas. The use of slotted drains have been used on some project when this problem arises. This will help keep ponding to a minimum.
2. Turning radius needs to be looked at a little closer. There have been numerous times when the radius of an entrance or side road had to be increased to accommodate the movement of trucks. Make sure no curb box inlets are located within radius areas.
3. Check guardrail location at entrances. There have been cases where the guardrail has actually impeded the driver's eye when trying to enter the main highway. This issue has occurred in curved areas of the mainline when intersection side roads or entrances. Check the geometry of the plans at the final constructibility review meeting.
4. Can slopes be flattened to 4:1? If so, we can eliminate guardrail in many areas.
5. Check plans and make sure all sidewalks, bike lands, etc. are shown on the plans and are shown at the correct location. If the project is located in an urban area,

- make sure all sidewalks are compliant with current ADA specifications. Check the grade and width of sidewalks. Make sure all wheel chair ramps are adequate at intersections and make sure the pedestrian button is accessible from the wheel chair. We have had cases where the pedestrian button had to be relocated to accommodate the wheel chair user.
6. Check drainage around the pedestrian ramps and make sure positive drainage is achieved. This will keep water off the ramps and will eliminate any freezing of water in the area.
  7. Make sure all necessary items are setup in the plans to mark pedestrian crossings, turning lane movements, stop bars, etc. Check bid items also.
  8. Request that a survey field crew double check all control loops and verify all elevations of benchmarks before construction. There have been cases where elevation busts have occurred during construction. This can create a huge problem in curb and gutter jobs. Make sure the field crew performs other spot checks also. The flown data we receive from our statewide surveying consultant needs to be verified in the field prior to construction. A certified field survey of all benchmarks should be presented to the Division of Construction before the job is let.
  9. Check cross sections and quantities. Check vertical and horizontal geometry. Check all grades on entrances. There have been cases where some entrances are constructed on excessive grades causing a problem for the property owner. Try to keep entrance grades twelve percent or less if all possible.
  10. Can the surfacing be let separate? This may save some money on certain jobs. Of course, it depends on the location of the job and size of the job. This may be an option to discuss at the final constructibility review meeting.
  11. Are truck climbing lanes necessary? Are rumble strips necessary?
  12. The design team needs to consult with the right of way agent to make sure all entrances into private property match with the property owner's right of way contract. There have been some cases where right of way was purchased by right of way consultants and certain promises made to the property owner without relaying the message to the design team. The problem was not detected until construction was underway. The plans may show a twelve foot wide gravel entrance while the property owner proudly displays his promise from the right of way agent that shows a 24 foot wide concrete entrance. Double check and discuss at the final constructibility review meeting.
  13. Check balances for cut and fill. There have been some cases where the job was bid embankment or borrow and during construction, the case had changed. This changed the pricing of how the job was built. Do not get the cut and fill volumes too close, because they may change during construction because of shrinkage and swell. Consult with the construction person on this issue at the final constructibility review meeting.
  14. Detours are needed on each end of the job during part width construction. It has been discussed that diversions are not carried far enough, thus causing traffic to interfere with construction.

## **RIGHT OF WAY ISSUES**

1. The design team needs to consult with the right of way agent to make sure all entrances into private property match with the property owner's right of way contract. There have been some cases where right of way was purchased by right of way consultants and certain promises made to the property owner without relaying the message to the design team. The problem was not detected until construction was underway. The plans may show a twelve foot wide gravel entrance while the property owner proudly displays his promise from the right of way agent that shows a 24 foot wide concrete entrance. Double check and discuss at the final constructibility review meeting.
2. We, as a design team, try not purchase anymore right of way than needed. There have been cases where we did not purchase dwellings and business during the right of way stage because the disturbed limits from the plans did not warrant such action. **But**, once construction started, it was quite evident that the house or business should have been purchased. This has been the case on jobs in all parts of the state. There have been claims filed by the homeowners and businesses due to utilities being cut off because of the construction, blasting issues where the blast has actually sent rocks thru the roof of houses.
3. Check dwellings that are purchased during right of way negotiations. There have been cases where construction was delayed because of asbestos paint and asbestos pipes had to be removed under an abatement plan. This is costly in money and time. This needs to be discussed at the final constructibility review meeting.
4. Make sure all right of way is clear before letting the project. We all know the headaches from this. When the project is near an old service station, make sure the site has been cleared of any contaminants before construction begins. This will help avoid costly cleanup surprises during construction. Make sure all underground storage tanks have been removed.

## **STRUCTURE ISSUES**

1. Recently, there have been many cases where the guardrail shown on the plans do not correspond with the guardrail tying into the bridge. Make sure the guardrail shown on the bridge plans tie into the guardrail on the roadway plans.
2. There have been some cases where bridge plans do not provide enough superstructure reinforcement. The reinforcement is shown on the plans, but the proper amount is not provided on the bid item sheet.
3. There have been a few cases where the bearing devices had to be modified on precast concrete bridge beams due to the grade of the roadway. The lead plates or cork had to be modified to accommodate the bridge beam angle on the abutment.
4. It has been recommended at many meetings to use flowable fill behind bridge end bents and abutments to minimize settlement at the bridge. These details would have to be discussed and approved through the Structures Division. Meetings in District 1 and District 2 have recommended using creek gravel behind end bents. The creek gravel has good interlocking characteristics causing less movement in the fill.

5. There have many change orders for applying masonry coating on the exterior barriers of bridges. Any portion of the bridge viewed by the public has to be masonry coated in accordance with the specifications. This applies to cast in place retaining walls also.
6. There have been some concerns of prestressed beams being cast too early. The beams are being left in pre-stressing yards for long period of times causing excessive camber. The excessive camber is causing problems in the haunch area of the bridge during construction. This is causing problems with “X” dimensions also.

## **TRAFFIC**

1. Check with Traffic and make sure signal plans are ready in advance. There have been many cases where signals have been added by a change order.
2. Check with Traffic and make sure the proper type of lighting is setup on the plans. High mast lighting has been proposed on some jobs only to have the bid items left off the plans. High mast lighting should be placed so no light interferes with adjacent neighborhoods.
3. Make sure enough cobra heads are setup on lighting plans.
4. For signalized intersections, make sure all the proper type of wire, conduit, strain poles, etc. are specified in the plans. Some of these items had been modified by change orders in the past. Make sure the local municipality reviews the plans to make sure they do not change the light pole types at a later date. There have been cases where the local government wanted decorative type of poles at urban intersections.
5. Elevation checks need to be made in the field at lighting locations. Many times, light poles have been installed on bases on side slopes. The required distance from the roadway to the light is inadequate because the light pole length was not based on the slope of the fill. It was assumed that the light pole would be installed near the shoulder. This results in a large change order because the length of the pole has to be recalculated and the diameter of the pole changes with height.

As stated earlier, this is a list of comments that are quite frequent at post construction review meetings. This is an informal list and it is written to help the designer and other project team members at constructibility review meetings. Please take the time to review the list and go thru each item at the final constructibility review meeting. This list is not intended to catch all issues as we all know each highway design project is unique in its own way.