MINUTES OF 2006 STRUCTURE WORKSHOP

The 2006 Structure Workshop was held on April 12th in the Structure Design Unit Conference Room C in Raleigh. Those in attendance included:

Greg Perfetti	State Bridge Design Engineer
Tom Drda	FHWA Division Bridge Engineer
John Emerson	State Bridge Maintenance Engineer
Dave Henderson	State Hydraulics Engineer
Ron Hancock	State Bridge Construction Engineer
Njoroge Wainaina	State Geotechnical Engineer
Jay Bennett	State Roadway Design Engineer
Rodger Rochelle	State Alternate Delivery Systems Engineer
Ricky Keith	Assistant State Bridge Design Engineer
Ron Allen	Assistant State Roadway Design Engineer
Allen Raynor	Assistant State Bridge Design Engineer
Dan Holderman	Assistant State Bridge Maintenance Engineer
Ernesto Villalba	FWHA-Assistant Division Bridge Engineer
Rob Ayers	FHWA - Environment Program Specialist
Tom Koch	Structure Design Project Engineer
Gichuru Muchane	Structure Design Project Design Engineer
David Stark	Structure Design Engineer
Jeff Vones	Structure Design Engineer
Mike Robinson	Bridge Construction Engineer
Max Buchanan	Bridge Construction Engineer
Lee Puckett	Bridge Construction Engineer
Billy Trivette	Bridge Construction Engineer
Rick Nelson	Bridge Construction Engineer
Cameron Cochran	Bridge Construction Engineer
Moy Biswas	Research and Analysis - Assistant Branch Manager
Rich Lakata	Research and Analysis - Research Engineer
Jack Cowsert	Materials and Tests - State Materials Quality Engineer
David Greene	Materials and Tests - Structural Members Engineer
Steve Walton	Materials and Tests - Metals Engineer
Owen Cordle	Materials and Tests - Physical Testing Engineer
Chris Peoples	Materials and Tests - Chemical Testing Engineer
Trudy Mullins	Materials and Tests – Prestressed Concrete Engineer
Scott Hidden	Geotechnical Support Services Supervisor
James Batts	Geotchnical Regional Design Engineer
John Pilipchuk	Geotechnical Western Regional Manager
John Fargher	Geotchnical Regional Design Engineer
John Williams	PDEA – Project Development Unit Head
Bill Goodwin	PDEA – Bridge Development Unit Head
Bryan Kluchar	PDEA – Project Development Group Supervisor

The following items of business were discussed:

1. ***INTRODUCTION:***

Mr. Perfetti kicked off the meeting with some remarks to welcome the attendees. He noted that this is a time of change within the Department, noting the recent reorganization of the Geotechnical Engineering Unit and the ongoing preparations for implementing the Load and Resistance Factor Bridge Design Specifications.

Mr. Drda also welcomed all attendees to the meeting, noting that the Structure Workshop and Spring Tour are remarkable meetings that really open up lines of communication between various disciplines within the Department. He stated that there have been several improvements, such as more consistency in design speed criteria, and in addressing concerns for the environment. The highlights of his remarks noted:

- Over the last 5 years over 9 million square feet of bridge deck area have been added to the state transportation network.
- Over the same period the amount of deficient deck area increased by 800,000 square feet.

Mr. Drda briefly discussed the Department's future challenge of building and maintaining the state's transportation structures in a climate of rising costs.

2. ***BRIDGE OVERLAYS AND RECENT BRIDGE FAILURES,*** *(FHWA)*

Mr. Drda showed pictures of box beam and cored slab bridges with considerable damage on the underside of the beam units. The damage was attributed to application of deicing salts. The slides also showed how the bridge design could prevent collapse in the event of superstructure damage. The FHWA presentation highlighted slides showing:

- A box beam bridge that recently collapsed under its own weight only. The bridge had a bituminous wearing surface.
- A cored slab bridge that recently failed while a crane was working on the bridge. The cored slabs units had significant damage on the underside.
- A prestressed concrete girder bridge that had most of the girders severely damaged by an over-height vehicle, yet the bridge did not collapse.
- A truss bridge showing failed floor beams under the load of a single truck.
- The FHWA noted that PennDOT requires composite decks on all bridges, i.e. a positive connection between beam and decks or overlays.

Mr. Drda stated that he thought that in the near future the FHWA would respond to the several recent incidences of bridge failures with some guidance on overlays and composite construction.

3. ***BOX BEAMS, CORED SLABS, CONCRETE OVERLAYS,*** *(STRUCTURE DESIGN)*
FLAT FACED CONCRETE RAIL, AND INTEGRAL ABUTMENTS:

Mr. Muchane gave a presentation on recent developments from the Structure Design Unit. The presentation discussed the recently adopted box beam superstructure units, concrete

overlays, the recently developed vertical concrete parapet (flat-faced rail), and the details of the draft policy on integral abutments.
The discussion on box beams noted that:

- Box beams offered a relatively shallow superstructure.
- Three girder depths are available that can each span farther than the cored slab units.
- The intended use of box beam bridges is for situations where the alternative would be a 2-3 span cored slab bridge.
- Prestressed Concrete Standard Drawings PCBB1-8 are now available for use in preparing contract plans.

The discussion on concrete overlays noted that:

- The policy on use of concrete overlays states that concrete overlays shall be specified on bridges that satisfy any of the following criteria:
  - Bridges on NHS routes
  - Bridges with design year ADT greater than 5,000
  - Bridges with design year TTST greater than 100
  - Low water bridges located in Divisions 11-14
- Bridges that do not meet the above criteria may be detailed with an asphalt overlay.
- Concrete overlays shall be reinforced with #3 (#10) bars spaced at 1'-0" (300mm) centers in both the longitudinal and transverse directions.
- When the overlay is continuous over a joint, additional 20'-0" long #4 (#13) longitudinal reinforcing steel bars spaced at 6" (150mm) shall be centered over the joint.
- 2" (50mm) clear cover shall be maintained throughout the overlay surface.

The discussion on the vertical concrete parapet noted the following:

- One of the reasons cored slab and box beam units sustain damage from deicing salts is the lack of adequate/rapid drainage.
- A flat-faced barrier rail permits the forming of larger more efficient drainage slots that cannot be formed in a New Jersey barrier rail.
- Structure design has made some modifications and updates to a crash tested flat-faced concrete rail, which has been submitted to the FHWA for TL-4 approval.

The presentation on the draft policy for integral abutments states that integral abutments shall be detailed on bridges that meet the following geometric criteria:

- Tangent alignment.
- Skews between 70^o and 110^o, inclusive ($70^o \leq$ skew $\leq 110^o$).
- Total bridge length shall not exceed:
  - 300ft. (91.44m) for steel girder bridges.
  - 400ft. (121.92m) for prestressed concrete girder bridges.

In addition, the end bent piles shall be oriented for bending about the weak axis and wing wall brace piles will not be permitted. The presentation included sketches of some of the details that will be shown on the plans.

4. *LRFD IMPLEMENTATION AND BRIDGE RATING:* *(STRUCTURE DESIGN)*

Mr. Koch discussed the Structure Design Unit's progress towards implementing the LRFD Bridge Design Specifications. He added that the Unit has also been assisting the Bridge Maintenance Unit in rating over 12,000 bridges. During the course of these two initiatives, the Unit has had the opportunity to evaluate how well the live load vehicle used to design bridges captures the force effects of North Carolina legal vehicular loads.

Mr. Koch gave a presentation on the study of the live load vehicle used for designing bridges. The presentation noted the following:

- The HS-20 design live load truck used routinely for designing bridges does not always capture the force effects of some of North Carolina's legal vehicles.
- An HS-25 design live load would capture the force effects of the majority of NC legal loads.
- The LRFD design specifications require an HL-93 design live load model that will capture the force effects of all NC legal vehicles.

As a result of the live load evaluation, Structure Design will:

- Issue a new policy requiring all superstructure primary structural members to be designed for an HS-25 truck live load, in the interim period prior to LRFD implementation. This policy will apply to all in-house and private engineering firm designs, and should also be included in design-build scopes of work.
- Perform an initial bridge rating immediately after design, upon implementation of the LRFD Bridge Design Specifications.

5. *CSL TUBES:* *(STRUCTURE DESIGN)*

Mr. Perfetti stated that over the past 11-months lettings included projects with $350,000 for CSL tubes. This cost works out to be approximately $50 per linear foot for CSL tubes. Mr. Perfetti suggested that the Department could realize some cost savings by eliminating the CSL tubes on projects that met certain criteria, such as drilled shafts socketed in rock.

The discussion on CSL tubes noted the following:

- The Department tests a small percentage of the CSL tubes that are installed.
- In general, the CSL testing and coring has shown few problems in the concrete.
- It was suggested that the Department could realize some savings by utilizing PVC tubes in lieu of steel tubes.
- PVC tubes increase the possibility of obtaining more false positives.
- Other suggestions included leaving the CSL tubes in the plans, and then eliminating them, for a credit, once the shaft is excavated/drilled and the site conditions are more apparent.
- Considerations for requiring CSL tubes may include the ground water height, the shaft depth, the type of subsurface material, whether telescoping the shaft is required, and whether the shaft terminates in hard rock.
- The potential for CSL testing serves as a deterrent to contractors providing substandard concrete and workmanship.

The Geotechnical Unit stated that the policy on the use of CSL tubes would be reviewed.

6. ACCELERATED CONSTRUCTION PROJECT / MORATORIUMS: *(STRUCTURE DESIGN)*

Mr. Koch distributed preliminary plan details for a replacement bridge, in Martin County, that will utilize a full-width precast concrete deck on steel girders. The project will be let in July 2006. Mr. Koch discussed some of the bridge's unusual features, such as the grout filled transverse shear pockets between the slab units, the leveling assembly, and longitudinal post-tensioning.

The highlights of the discussion on this topic were as follows:

- The project has been submitted for funding under the FHWA IBRD program, and it qualifies for funding under the rapid construction objective of the program.
- Rapid construction techniques are of interest to the Department because the regulatory agencies' numerous moratoriums (for sunfish, anadromous fish, and numerous other fish) have the effect of shortening construction times.
- Moratoriums can delay small rapid construction projects, which may be completed within one construction season, and they extend construction times for large projects.
- Often times the moratorium is trying to capture 2-4 week breeding or migration period, but it is difficult to predict when that period will be.

A discussion on moratoriums ensued, noting the following:

- NCDOT policy is widely cited for the Department's efforts to protect the environment.
- There is now more awareness of the moratoriums and the requirements to satisfy the regulatory agencies' concerns.
- Moratoriums for main stem or major tributaries are longer and less flexible because the likelihood of fish is greater. Conversely, moratoriums for smaller streams and creeks are more flexible.
- The Department should do a better job of demonstrating that some of the regulatory agency requirements are not reasonable.
- It was suggested that the Department become more proactive in mitigating the Agencies' concerns by proposing possible solutions, such as turbidity curtains, reducing noise from pile driving, and other protective measures.
- Agencies feel the risk is too high in the early stages of the projects because there are too many unknowns. However, there is often room for negotiation with the agencies once a contractor is selected.

7. TYPE, SIZE AND LOCATION: *(FHWA)*

Mr. Drda complimented everybody for their involvement in working through several issues within the Department over the last year. He stated that this collaboration has resulted in structure types and sizes that are more suited to the location. He cited the improved interaction between the Structure Design and Hydraulics Units that has yielded better selection of structure types. He added that the good selection of the structure type would be helpful to the operations of the Bridge Maintenance Unit.

8. TRAFFIC SIGN STRUCTURAL ISSUES: *(FHWA)*

Mr. Villalba discussed a couple of incidences where the studs used to mount traffic signs have failed, resulting in the sign falling. He posed the question -- in general, are the Department's traffic signs safe? He also inquired if there was a plan to retrofit existing signs and utilize improved mounting details for future signs. It was noted that a structural analysis of the signs showed that the studs are generally adequate in shear but need to be tested for fatigue resistance.

9. NEW TRANSPORTATION BILL PROGRAMS *(FHWA)*

Mr. Drda informed the attendees that the new highway transportation bill, known as the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), contained a little known provision that requires debris from demolished bridges and overpasses to be made available for "beneficial use" by a Federal, State, or local Government agency.

The bill also includes the following information:

- Defines "beneficial use" as the application of the debris for purposes of shore erosion control or stabilization, ecosystem restoration, and marine habitat creation.
- Requires the receiving party to bear the additional cost associated with having the debris made available.
- Requires the receiving party to assume all future legal responsibility arising from the placement of the debris, which may include entering into an agreement to hold the owner of the demolished bridge or overpass harmless in any liability action.

Mr. Drda noted that the bill does not address how the Department should make the materials available, so a process for advertising the materials, such as a web site, would be worked out prior to contract bids.

10. COST OF IMPROVING OFF-SITE DETOURS: *(FHWA)*

Mr. Drda stated that there has been an increase in the number of requests for funds to improve off-site detours. In addition, the costs for such improvements have been increasing.

Mr. Drda stated that the funds available for such improvements are intended for minor improvements that would eliminate hazards associated with speed and added traffic. He added that the funds were not intended for a "road betterment" program.

Mr. Drda suggested that the costs associated with improvements to off-site detours should be included early in the project so that these costs can be included in the total cost of the project.

11. NEW CERTIFICATION & TRAINING PROGRAMS: *(MATERIALS & TESTS)*

The Materials and Tests Unit reported that they had initiated several certification and training programs. A brief synopsis of these programs is as follows:

- Bridge Coatings Inspection
  - More than ten people have completed the program.
  - Class schedule and applications materials are available on the Materials and Tests Unit web site.
- Field Welder Certification
  - The Materials and Tests Unit has had problems with some of the credentials of externally certified welders.
  - The certification will include several certification levels based on the skill level required, e.g. for bridges, pipes, and SIP forms.
  - An identification card will be issued for DOT certified welders, and Resident Engineers will keep a record.
  - The program will facilitate better communication of DOT expectations and welding requirements.
  - More detailed information and application materials are available on the Materials and Tests Unit web site.
- Field Welding Inspection
  - A 1-day pilot class providing lots information will be held on April 24th, 2006 in Division 9.

12. ELECTROSLAG WELDING: *(MATERIALS AND TESTS)*

The Materials and Tests Unit reported that fabricators have raised questions on the use of electroslag welding (ESW). The Unit gave a presentation that discussed a brief history of ESW noting that it was developed in the 1940's and widely used in the 1960s. However, there were problems with the toughness of the welds, resulting in the FHWA issuing a moratorium on ESW. The research that ensued developed Narrow Gap Improved – Electro Slag Welding (NGI-ESW). He noted that the current AASHTO/AWS Bridge welding code does not permit ESW in tension areas. The Unit expected that NGI-ESW would be more widely used in the future, remarking that it was a very good welding process when performed correctly.

13. ANCHOR BOLTS ON OVERHEAD SIGN STRUCTURES: *(MATERIALS AND TESTS)*

The Materials and Tests Unit reported that they are inspecting anchor bolts on overhead sign structures. In addition, M&T is developing a Special Provision for Anchor Bolts for Overhead Signs, which will address requirements for the required torque in the leveling nuts, wax lubrication of the bolts, and anchor bolt projection above the foundation.

14. CONCRETE ISSUES: *(MATERIALS AND TESTS)*

The Materials and Tests Unit reported that the Special Provision for Sand Lightweight Concrete was only partially included in the 2006 Standard Specifications. The Specifications

include some, but not all, the necessary information on sand lightweight concrete. As such, the Provision will still be necessary. It was noted that the Provision contains a table on aggregate gradation, which is redundant since the same information is included in the Specifications.

The Materials and Tests unit suggested the Department standardize concrete mixes used in foundation systems. It was noted that, in general, drilled shaft concrete, which is defined in the Standard Specifications, is used. However, Class AA concrete is used in foundations for signals and high-mast lighting towers. The Materials and Tests Unit suggested utilizing drilled shaft concrete in all foundation situations.

15. CURING COMPOUNDS: *(MATERIALS AND TESTS)*

The Materials and Tests Units reported that some manufacturers are under the impression that the Department does not permit the use of wax-based curing compounds. It was noted that the wax-based compounds curtail bonding to concrete, which could be a problem, for example, when pavement markings are required. The Materials and Tests Unit floated the idea of requiring only resin-based curing compound.

The discussion on this item resulted in a consensus on the following points:

- A special provision is needed to provide guidance on use of curing compounds.
- Wax based curing compound is recommended for use on roadway items, and should be disallowed on structures.
- Resin based curing compound is recommended for use on structure items.
- Consult with the Pavement Management Unit for questions related to use of curing compound on pavement.

16. BARRIER RAIL STEEL: *(MATERIALS AND TESTS)*

The Materials and Tests Unit reported that there was a lack of uniformity in box beam units designed by the Structure Design unit, the Bridge Maintenance Unit, and by private engineering firms (PEFs). Most of the variations are observed in the reinforcing bar types and spacing detailed in the barrier rails.

The Structure Design Unit noted that the plans for the projects currently under fabrication were prepared before the box beam standards were completely developed. As such, in the future there will be more consistency in the box beam details.

The Construction Unit suggested that the vertical reinforcing in the flat faced parapet be detailed in two pieces, similar to the New Jersey barrier rail, to allow for field adjustments.

17. RESEARCH TOPICS: *(RESEARCH)*

The research and Development Unit gave a presentation, which reported that over the past year there have been 21 bridge and geotechnical research projects; 16 that are currently in

progress, 2 that have recently been completed, and 3 additional projects will be start in July 2006. The details of the research are as follows:

- Bridge Design (5)
  - Starting:
    - Truck Trips (+ truck weights, axle spacings)
    - Lateral Flange Bending (skewed bridges)
  - In Progress:
    - Analyze Overhang Falsework Design
    - Falsework Hangers for MBT Girders
  - Completed:
    - HPC Bridge US 401 over Neuse R.
- Substructures and Geotechnical (5)
  - In Progress:
    - Pile Jetting Techniques
    - Earth Pressure Model - Piedmont
    - Fuzzy Neural Network Models
    - Pile Bent Design Criteria
    - Post and Beam Bents with D-Shafts
- Construction (2)
  - Starting:
    - Elastomeric Concrete (Bridge Joints)
  - In Progress:
    - Girder Deflection in Steel Bridges
- Bridge Maintenance and Materials (3)
  - In Progress:
  - Corrosion Inhibitors
  - Diffusion Coefficients (chlorides in deck)
  - Fast Clad Paint (steel bridge rehabilitation)
- Innovative Materials (6)
  - In Progress:
    - FRP Repair Techniques - Part I
    - MMFX Steel Rebar for Bridge Decks
    - GFRP Rebar for Bridge Decks
    - FRP Repair Techniques - Part II
    - Integral Deck / AASHTO Girder Bridge
  - Completed:
    - Self-Consolidating Concrete (SCC)

The Unit thanked everyone for their involvement in the very active research program, discussed the anticipated results of projects near conclusion, and reiterated the importance of implementing the research findings upon completion of the projects.

The Unit also reported that the results of the Department's applications to the FHWA 2005 IBRC program had not yet been announced.

18. PARTIAL REMOVAL OF SUBSTRUCTURE UNITS: *(CONSTRUCTION)*

The Construction Unit discussed the need to address when and how much of an existing substructure needs to be removed. The discussion on this topic noted the following:

- Sometimes there are problems with acquiring permits to work in the water in order to remove the existing substructure.
- Sometimes it is necessary to leave the existing substructure in place for bank stabilization.
- Sometimes the Hydraulics Unit requires the existing substructure be removed in order to increase the available conveyance opening and eliminated the potential for debris collection.
- There are situations were some cost savings could be realized by leaving the existing substructure in place.

The discussion on this topic resolved that:

- The Department should discuss the issue with the regulatory agencies on a project by project basis.
- The Department needs to clearly identify on the plans the extent of removal of existing substructure.

19. EXPANSION JOINT DETAILS: *(CONSTRUCTION)*

The Construction Unit discussed the intent of not rigidly connecting the armor angle to the deck. The following modifications to the details for expansion joints were suggested:

- Omit the section view of the tab detail from the plans. This change will isolate the angle from the deck, thereby allowing the joint system to perform as intended with the benefit of the flexibility of the elastomeric concrete.
- Provide a hanging armor angle detail on the plans. This change will provide a method for positioning the armor angle prior to placing the elastomeric concrete. If contractors would like to use a different method for positioning the armor angle, then they can make a submittal.
- Omit the detail showing the welded armor angle pieces, thereby eliminating the requirement to weld the angles together. The anchor assembly segments are required to be no shorter than 12 ft. nor longer than 20ft.

It was also suggested that the plans show no detail for installing the armor angle, in which case the contractor would always have to make a submittal.

The Construction Unit also suggested showing a blockout for expansion joint seals similar to that shown on modular joint details.

20. SCREEDING ON SKEWS: *(CONSTRUCTION)*

The Construction Unit discussed the increasing number of situations where contractors are required to screed the bridge deck on a bridge that has a severe skew. To compound the

problem, some of these bridges also have a superelevation rollover on the bridge. The discussion explained the difficulties in planning and setting up the screeding operations. In some of these situations the bridge deck has ended up with low areas, and the desired rideability on the bridge has not been achieved. The Construction Unit suggested eliminating any rollover on the bridge wherever possible.

The Roadway Unit stated that on many urban interchanges the geometric conditions might not allow avoiding a changing superelevation on the bridge.

21. GEOTECHNICAL SUB-CONTRACTORS: *(GEOTECHNICAL)*

The Geotechnical Engineering Unit stated that they would be working with the Contractual Services Unit to develop and categorize a list of prequalified geotechnical sub-contractors. This action will provide consistency with the existing prequalification requirements for prime contractors.

22. ABUTMENT SCOUR: *(GEOTECHNICAL)*

The Geotechnical Engineering Unit discussed a recent Bridge Survey Report that showed deep abutment scour, which was attributed to the lack of rip-rap. In this case the, replacement bridge could not be lengthened to span the scour zone. The discussion noted that HEC-18 allows for failure of the approaches without a bridge collapse. However, the Department's practice is to design for stability of the approach fill and the structure. The Geotechnical Engineering Unit proposed alternate solutions to preserve the approaches, such as building fabric walls for the approaches, which would be "self-healing," or installing sheet piling in front of the drilled shaft substructure.

23. INCREASING PILE TONNAGES AND LRFD PILE LOADS: *(GEOTECHNICAL)*

The Geotechnical Engineering Unit discussed a pilot study of anticipated pile loads for bridges designed in accordance with the LRFD Bridge Design Specifications. The piles in the study were on projects where the piles were not driven to rock. The pilot study showed:

- Piles for LRFD designs will have increased loads.
- LRFD will require a slightly higher safety factor than current practice.
- If the Department maintains current pile tonnages, then bridges will require more piles or longer piles to support the increased LRFD loads.

The Geotechnical Unit noted that for piles driven to rock or very dense subsurface material, the piles have additional capacity that the Department does not verify and utilize. The Unit proposes that the Department increase the design pile tonnages. In addition, The Geotechnical Unit suggested letting a few trial projects with the increased pile tonnages.

24. AUGER CAST PILES AND MICROPILES: *(GEOTECHNICAL)*

The Geotechnical Engineering Unit (GEU) gave a presentation on micropiles. The presentation described mircropile installation and gave an overview of 4 retrofit and repair projects (Proj.1,Proj.2,Proj.3,Proj.4) that have utilized micropiles. A cost analysis of the repairs showed that the Department saved money by utilizing micropiles.
The Unit also gave a presentation on continuous flight auger (CFA) piles. The presentation described CFA piles, their installations, advantages and disadvantages, and discussed some common applications. GEU Support Services is considering CFA piles for use in sound barrier wall foundations, end bents or footings on piles and pile bents.

The Department's experience with micropiles suggests that additional savings could be realized if micropiles and continuous flight auger piles are considered as viable foundation alternates. GEU Unit is interested in investigating whether these foundation types could be used for new bridge construction where the subsurface conditions are favorable.

GEU also discussed a Grout for Structures special provision that will be included in projects that are let with micropiles or CFA piles as alternate substructure types. In addtion, GEU will be applying for funding, under the FHWA IBRD program, for a trial project that will utilize micropile substrcutre.

25. OTHER: *(GENERAL)*

The Geotechnical Engineering Unit reported that the section on gravity retaining walls has been removed from the Standard specifications. The gravity retaining wall is now a structure standard drawing. The Geotechnical Unit is developing special provisions for retaining walls, which will streamline the method of payment for all walls.

The Roadway Unit reported that the proposal to eliminate the barrier rail transition is in the final stages prior to implementation. The Implementation Committee recently approved implementation of the Type B-77 Guardrail Anchor Unit, which will replace the New Jersey barrier rail transition. The approval allowed for a 6-week comment period from all units within the Department. The target effective date is the September or October 2006 letting date.

26. SPRING FIELD REVIEW ITINERARY: *(STRUCTURE DESIGN)*

Mr. Koch distributed a proposed itinerary for the Spring Field Review tour. He gave a brief overview of the itinerary. He also welcomed suggestions for additional sites of interest that were in the vicinity of the basic itinerary.