INTEROFFICE MEMORANDUM

DATE: November 13, 1990

TO: Mr. Veral Pinkerton, Bridge Engineer

FROM: Jim Tribo, Senior Bridge Design Engineer

SUBJECT: Field Trip to F-S Prestress Plant
Hampton, Arkansas

David Plugge, Dennis Vire, Glenn Cheatham and myself recently visited with Mr. Harris Hearnesberger, on an AHTD inspection at the plant, along with Wayne Casteel of the Materials Division. I came away from the plant with a better understanding of some of the problems of construction and inspection of P/S girders.

P/S concrete girders require a greater degree of construction inspection than normal cast-in-place work and some methods of construction can influence their long term performance. Small cracks may develop in the girder due to restraint in the forms, misalignment of reinforcing, leakage of forms and mishandling. The increased use of P/S concrete on highway bridges in Arkansas will require a better understanding of quality control both by designers and inspectors.

Mr. Hearnesberger expressed his concerns to us about a lack of specifics in our plans and specifications and I tend to agree with him. An inspector manual for prestressing should be developed. One, like the Louisiana DOT has, could be a start.

The following is a list of items of interest noted from this trip:

1. AHTD does not have specific guidelines for the manufacture and inspection of P/S concrete girders. (Mr. Hearnesberger has a copy of Louisiana's manual).

2. The use of spacers between parallel strands to keep strands from being sandwiched during pouring needs to be specified. Also bar bolsters to keep strands off bottom near mid-span. (They were using a piece of steel angle to space strands and slab bolsters).

3. The use of 2-P/S strand @ 5000# is better than rebar because this braces the top of the stirrup cage better than rebar or using lesser tension.

4. Manufacturer prefers to use LA DOT alternate one-piece stirrup because he can keep concrete off projection easier and he only has to tie one car. (We should show alternate).

5. We need to specify how often strands are to be tied to stirrups. (They were typing all stirrups to each strand in face of web. This stiffens the cage and keeps it in line).

6. The confining reinforcing for the bottom flange at the ends of girder should be tied to a longitudinal rebar on each side of the web to keep it in line and avoid clearance problems.

7. Debonded strands may be easier and safer for some plants. The hold-down bolts sometimes give-way during tensioning. (At Hampton these bots are cast in a concrete bed. In Shreveport, they use steel rails for bolting).

8. The inspector felt that the use of the embedded plate in bottom for shoes tended to prevent the development of diagonal cracking on the bottom of ends. It was noted that LA DOT does not use these plates but erects girder directly on rubber pads, using angles with embedded inserts.

9. The Metal forms for Type III girders that the manufacturer was using were in 72' lengths. (Our girders were 71' long). This makes it easier to align form at each girder without worrying about an offset at the joint.

10. Contractor prefers single bolts to "U" bolts at expansion devices but noticed that bolts were not installed plumb in most cases. (Contractor had wood template).

11. Problem with worn holes in angled face of bottom flange (inspector requiring patching -rubbing- of larger holes. (Contractor wants to leave along). This may come back to us. We may need to add note about finishing to plans.

12. Problem at ends of a few girders where steel embedded plate is angled in bottom. This has occurred before and they ended up having to do a lot of grinding and then weld a shin. This will be coming back for us to solve.

13. Inspector noted that some designs were using different spacing of bars at ends so they would mesh.

14. Inspector noted that holes for diaphragm need to be inside stirrups to prevent a horizontal crack from developing during curing. (our detail good).

15. He noted that during curing, concrete changes in temperature exert pressures on form. They usually loosen up forms from opposite end after girder is poured. This allows girder to expand slightly without uneven binding on forms causing cracking. (Items such as these need to be addressed for inspectors).

16. Tightness of forms at bottom and ends is critical to keep grout from leaking. Contractor apparently had some problems at ends of first girders poured.

17. Inspector has not measured camber on girders already poured. Top surface is left rough and could influence accuracy of measurement. (I recommend smooth trowel finish at ends with expansion devices. Looks like it could be a problem getting right in field).

18. The manufacturer's crane can barely lift one 71' girder by itself (41,400#). He will have to use something else for Type IV's.

19. No. 6 continuity bars in ends will be bent at plant. Inspector does not feel that concrete needs protection from heat since bend is 10" from end.

20. Manufacturer wants to leave 1" of strand protruding from end of girder at fixed bents instead of cutting smooth. (I see no problem where this is embedded in concrete) This needs to be noted on drawings.

JGT:bw