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U.S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS

625 North Robert Street
St. Paul, Minnesota

April 20, 1964

IN REPLY REFER TO:

Mr. James C. Marshall
Commissioner of Highways
Department of Highways
St. Paul, Minnesota

Re: Project I 35-3(47)112, Bridge No. 9340 - Proposed Bridge over Mississippi River near 10th Street in Minneapolis

Dear Sir:

In furtherance of discussions held March 3 and 4 between representatives of your bridge and metals sections, the consultant, and Public Roads' Division, Regional and Washington offices we wish to make the following comments and suggestions.

The use of the various types of steel which should be employed in the design of these trusses came up again at the above meeting, as had been discussed in previous meetings and through correspondence. During this meeting you objected to the use of ASTM A441 steel which had previously been proposed. Your objection to the use of this steel now was that recent experience had indicated that certain flaws developed during fabrication of this steel, such as splitting, laminations and an excessive amount of inclusions. Your recommendation, therefore, was the use of A242 steel instead of the ASTM-A441 steel.

However, upon further review we still believe that the members of the trusses for subject bridge should be of A36 or A441 steel until thicknesses over 1-1/2 inches are required - unless the detailing has advanced to the stage that this is not possible.

If additional atmospheric corrosion resistance is desired, 0.20 percent minimum copper may be specified for A36 steel. The greater ease of welding the A36 and A441 steels, the increased rigidity of the box sections with the thicker plates of A36 steel and the price differential make these steels more desirable in the truss members carrying the lower loads.

It is not considered necessary to specify that the A441 steel be fully killed. While we have had occasional reports of plates splitting during welding and cutting, it has not been frequent nor has any evidence pointed to A441 steel as being more susceptible or to the deoxidizing practice as being the cause. It would be appreciated if you would send us a list of all of the steel that you have rejected due to laminations or splitting. The list should give the date, project, grade of steel, silicon content, thickness, weight of steel

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rejected, total weight of that grade of steel on the project, type of defect and cause of defect if initiated during erection or fabrication. This will provide some evidence with which to evaluate future considerations of this problem when the use of high strength low alloy steel is proposed.

Attached is one copy of Mr. Martin Deuterman's notes on the March 3 and 4 meetings. If you have further questions please do not hesitate to get in touch with us.

Very truly yours

(R) [redacted]

For W. W. Fryhofer
Division Engineer

Enclosure

COMMENTS ON MEETING WITH MINNESOTA BRIDGE DEPARTMENT
RELATIVE TO STRUCTURAL STEELS

Tuesday morning March 3 with Mr. Ranta visited sites of Mississippi River Bridges including I-035-4(47)112 and IG 094-3(12), Dartmouth Bridge. Noted on Dartmouth Bridge that form supporting clip channels, about 1-1/2" x 3" x 1/4", welded to the upper flanges of the two interior stringers to support the floor forms. These stringers were continuous and the clips were welded at the tension and compression areas. The intersections of the lateral bracing were supported by angles welded across the lower flanges of the stringers at the center of spans in the north approaches. These two notch causing conditions were called to the State's attention later in the day.

With Mr. Ranta and Mr. Johnson visited Mr. Fryhofer in the Division Office. Went to State Bridge Office and met Mr. LaBonte and some of his staff.

Tuesday afternoon March 3. Discussed with State the problem of structural steel specifications. Present: LaBonte, Dills and Molsether of the State Highway Department; Ranta, Johnson and Deuterman of Bureau.

I explained our general objection to changes to ASTM as:

1. Expensive as the mills charge for changes.

2. Deviations from routine tend to promote errors.

3. Weakens the position of other States and the Bureau to get needed changes if exceptions are required by the States.

4. The ASTM Structural Steel Specifications are used practically without revision by 49 States, D.C., Puerto Rico and the Bureau.

5. Most of the State's revisions are minor and unnecessary.

Mr. LaBonte and Mr. Dills stated their position as:

1. The State had difficulty obtaining steel of the quality they considered necessary under the ASTM as written.

2. The amount of steel rejected because of lamination and non-metallic inclusions was such that they were apprehensive that some of the substandard material would get by and be used in the structure.

3. ASTM A441 steel was splitting under the heat of welding and cutting. Also, some of this steel contained excessive amounts of inclusions and laminations. These defects were blamed on the ASTM Specification due to a lack of a minimum specified silicon content.

4. The State considered that the surface of A242 corrosion resistant steel to be superior to other structural steels for painting, the paint lasted longer and there was less rust when repainting was done. They do not consider that the maintenance crews do a very good job of removing rust and dirt when repainting.

The various aspects of the ideas were discussed during the afternoon with no conclusions reached.

Wednesday March 4. Present were LaBonte, Dills, Somerset?, and Redden? for the State, Mannes for the Consultant and Gibson, Ranta, Johnson and Deutermann for the Bureau.

The discussions of the specifications and types of ASTM steels continued through the morning. Since there seemed to be no meeting of minds, I suggested that the A242 type of steel be used on Project I-035-3(47)112, Bridge No. 9340, and on future bridges subject to Mr. Erickson's approval. This was agreed to by the State. The State agreed to set up special provisions for qualification tests, including impact tests at the fussion plane, for the weldability of the steel and to determine the proper procedures for welding.

The exceptions to the ASTM included in the States standard specificatinn were then considered.

Section 3306.2A(1), 3309.2A(2), 3310.2A(1) and 3317.2A(2). (Spalling out of defects) It was agreed to omit these sections by special provision.

Section 3306.2A(2), 3310.2A(3) and 3317.2A(3). (Maximum depth of imperfection limit of 1/2" is added for plates and changed from 30 percent to 20 percent for shapes. Maximum length of imperfection limited to 1/3 length of material.) No change was made.

Section 3309.2A(4) (Permits welding of minor defects. No definition of minor defects.) This item was not discussed. It should have been revised to allow the welding of defects to the limitations given in ASTM A6 or Minn. 3306.2A(2).

Section 3309.2B (Requirement for fine grain practice) It was agreed to remove this section by special provision.

Section 3306.2C(1) (Limits manganese to 1.20 percent for shapes with thickness over 1" and provides 0.15 to 0.30 percent silicon for plates over 1" to 1-1/2", inclusive.) It was agreed to retain this item. Although the subject was not broughtup, these requirements are not necessary for riveted and bolted construction so that this section should be limited by special provision to welded construction.

Section 3306.2D(1) (Requires tension tests for small bar shapes and plates when used for frames carrying calculated stress) Agreed to retain this section.

Section 3306.2D(2) (Requires chemicals consistent with physicals when tension tests are waived) Agreed to omit this section by special provision.

Section 3306.2D(3) and 3310.2A(5) (Requires furnishing of mill test reports) Agreed to retain.

Table 3309.1 Agreed to change Type C steel maximum thickness from 2-1/2" to 3/4" by special provision.

3317. It was brought out that MD 3317 is not included as a weldable steel under AWS specification D2.0-63 so that special provisions would be required on welded structure.

The preliminary plans for the bridge over the Mississippi River, Project I-035-3(47)112, Bridge No. 9340 were partially reviewed. It was suggested that the sections with thin plates of quenched and tempered steel be revised to use regular low alloy steel where feasible. It was determined that the low alloy steel could be used for all of the members with the possible exception of members L7L8, L8L9, U8U9 and the corresponding members over the other main pier. With the thicker plates of low alloy steel it was found that the interior webs could be left off of all the box members except L7L8, L8L9, U8L8 and the corresponding members over the other main pier. The omission of the interior webs permitted designs that would give access to the interior of the box members for painting, thus eliminating the question of painting on the inside of sealed sections. The State agreed that diaphragms would be used inside the box sections. The method of connecting the diaphragms to the inside of tension members with considerable fluctuating stress was not determined.