To: Members, Lehigh Project Subcommittee

CONNECTION TESTS AT UNIVERSITY OF TEXAS

Gentlemen:

Mr. Topractsoglou is anxious to continue the kind of research in Texas that he was doing with me at Lehigh. In Chicago at the time of the AWS meeting we discussed a program which he has now developed and is sending to you for your suggestions.

He is arranging his financing separately. Whenever we can loan equipment to him we shall do so in order that his work may proceed with as little expense as possible.

Sincerely yours,

Lynn S. Beedle
Assistant to the Director

LSB: fs

CC: LeMotte Grover
    William Spraragen
To: Mr. T. R. Higgins  
Director of Engineering  
American Inst. of Steel Construction  
101 Park Avenue  
New York 17, New York

PROPOSAL FOR CONNECTION TESTS

Dear Mr. Higgins:

I hereby submit a proposal for test of connections for welded rigid portal frames. This proposal does not discuss details such as fabrication, financing, etc. It is hoped that it will be considered for discussion during the forthcoming meeting of the Lehigh Project Subcommittee and will be criticized by you and the members of the committee.

PURPOSE

The general purpose of the proposed investigation is the obtaining of additional information on the behavior in the elastic and plastic range of type 8B square knees and type 4 bracketed knees.

The Lehigh investigations showed the square knees of type 8B and 2F (Fig. 1) to be less rigid than the "equivalent length" of beam (Fig. 2). However, this type, being the least expensive connection to fabricate, deserves further investigation.

Type 4 (Fig. 3) connections showed greater rigidity and strength (Fig. 2). The cost of fabrication of this compares favorably with the cost of square knees and is far less than the cost of curved knees. Consequently, its further consideration for investigation is recommended especially in view of the fact that the proposed designs of this type of connection would result in additional economy in cost of fabrication.

PROGRAM OF TESTS

A total of six tests are proposed. Specimens recommended for investigation are shown in Fig. 4. The information obtained from these tests will supplement previous studies on the same types. An 8B13 may be used in order to compare results obtained with those of previous investigations.
DISCUSSION OF SPECIMENS

The dotted lines in Fig. 1 show where yield lines first appear in square knees. The shear stress induced by the tension flange force accounts for the large rotations of this type (Fig. 2). Rotations in such knees are reduced considerably by the diagonal stiffener (compare with knee without diagonal stiffener. See Fig. 13, Progress Report D, June 1, 1949). However, the diagonal stiffener cannot prevent shear yield completely. (Fig. 1).

Specimen "L".

It is identical to specimen "L" tested at Lehigh (see "Revised Proposal for Connection Tests", September 9, 1949). This specimen will be used as a check. (Fig. 1).

Specimen "R".

It is proposed as a better design of square type knees. Shear fold may be avoided because of the arrangement of stiffeners. This design should result in less rotation in the knee.

Specimen "S", "T", "U", "V".

These specimens (modifications of type 4) are recommended to determine the effect of stiffeners. They should be considered because: a. of their high strength and rigidity. These may be due to the ample knee web area applied, which is enough to avoid early shear yield. b. The vertical stiffeners (shown with S in Fig. 3) do not have any obvious structural function because of the ample web area and they are omitted. In this way the cost of fabrication would be reduced and this type of knees will be in a favorable position when compared to square knees on cost basis.

cc: Members, Lehigh Project Subcommittee Structural Steel Committee Welding Research Council

Phil Ferguson
Noils Thompson
R. F. Dawson
Lynn Boodle
LaMotte Grover
William Spraragen
John Griffiths

Sincerely yours,

A. A. Topraktsoglou
Assistant Professor
Civil Engineering Dept.
Dear Mr. Higgins:

I hereby submit a proposal for tests of connections for welded rigid portal frames. This proposal does not discuss details such as fabrication, financing, etc. It is hoped that it will be considered for discussion during the forthcoming meeting of the Lehigh Project subcommittee and will be criticized by you and the members of the committee.

PURPOSE: To obtain more information on the behavior of certain welded connections in the elastic and plastic range.

The Lehigh investigations showed the square knees Type 88, Fig. 2, (Fig. 1) as less rigid than the equivalent length of rolled sections, see Fig. 2. On the other hand, Type 4, Fig. 3) connections were more rigid & stronger. See Fig. 2.

The cost of fabrication of Type 4 to Type 2 is in the ratio of about 2.5 to 1.5 which shows that this is not very expensive compared to square knees and it is less expensive compared to flanged & other built-up knees. Consequently, it is further consideration for investigation should be is recommended.

PROGRAM OF TESTS: A total of 6 tests are proposed as shown in Fig. 4 (Specimens 1 to 6). The information obtained from these tests will supplement previous studies on the same types. An 8813 is done at Lehigh University.

DISCUSSION OF SPECIMENS: The dotted lines in Fig. 1 show where yield lines first appear in square knees. Obviously, the shear stress induced by the tension flange force accounts for the large reductions of this type (See Fig. 2). Although rotations in the knee are reduced by the diagonal stiffener which strengthens the knee (Compare Figs. 2 with knee without diagonal stiffener. See Progress Report 2, June 1, 1949) it is the diagonal stiffener cannot prevent the shear yield completely (Fig. 1).

Specimen 1: It is proposed for investigation as a type of square knee that will be more rigid than the ones investigated.

Specimen 2: It is identical to specimen "L" tested at Lehigh.
(See Revised Proposal for Connection Tests, Sept. 9, 1949)

This specimens will furnish be used as a check.

Specimens 3, 4, 5, 6: These specimens (modifications of Type 4) are recommended for investigation to determine the effect of stiffeners. They are considered because previous tests have shown Type 4 as stronger and more rigid (compared to rolled section) which may be due to the fact that there is ample web area in the knee to avoid early shear yield.

b. The vertical stiffeners (Fig. 3, 5) do not have any obvious structural function, and they are omitted thus reducing the cost of fabrication and putting this type of knees to more favorable position when compared to square knees.

Sincerely yours,

C.C. Members, Lehigh Project Subcommittee
Structural Steel Committee
Welding Research Council
Asst. Prof.
C.E. Dept.

Dean W. Wolfrom, Director
Bureau of Eng. Research
Univ. of Texas

W. Spranagen
La Motte Grover
Friar Eng. Lab

To whom else?

Dear Lynn,

I overlooked and did not read carefully your letter of Nov. 9. Here is the proposal I cooked. What are you going to do with it? Look at it over and send it back? I have a copy. Do you want me to go and do everything there? I guess if you criticize and return it by air mail, I shall get them out the same day I receive your answer or word. That would be more appropriate, I think. But do what you like.

Tony