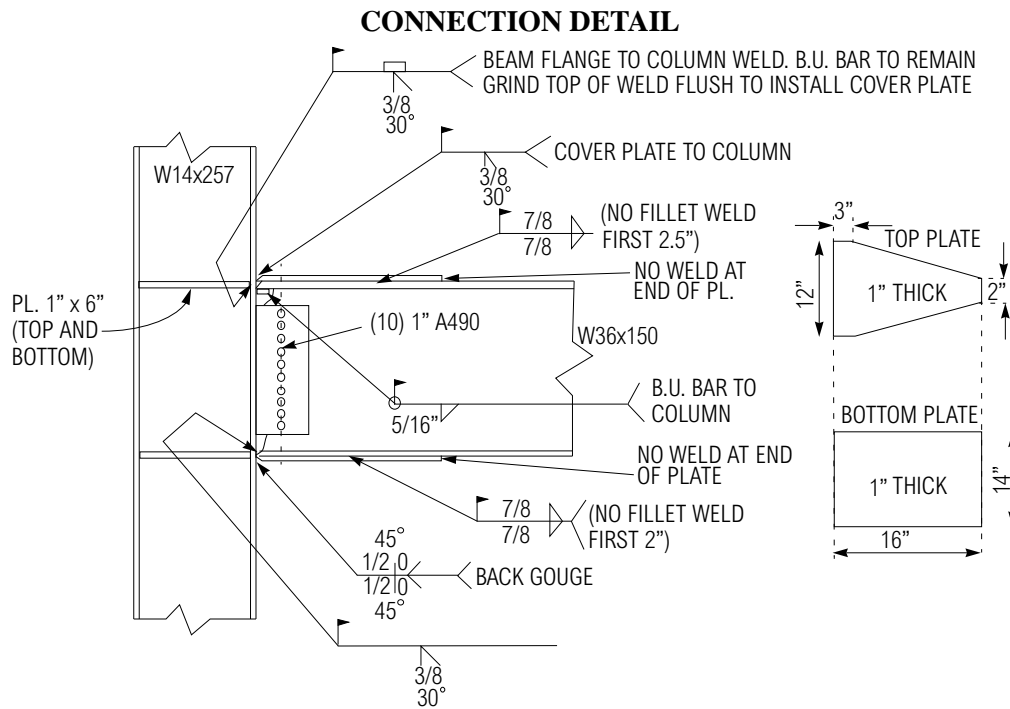


Specimen ID: UTA-4
 Keywords: New connection, top and bottom cover plates, notch tough weld material, local buckling, fillet weld crack, specimen twisting, medium rotation capacity
 Test Location: University of Texas, Austin
 Test Date: January 11, 1996
 Principal Investigator: Michael D. Englehardt; with Bradley D. Shuey and Thomas A. Sabol
 Related Summaries: None
 Reference: "Experimental Investigations of Beam-Column Subassemblages", *Report No. SAC 96-01*, March 1996.
 Funding Source: FEMA / SAC Joint Venture, Phase I



MATERIAL PROPERTIES AND SPECIMEN DETAILS

Member	Size	Grade	Yield Stress (ksi)		Ultimate Strength (ksi)	
			mill certs.	coupon tests	mill certs.	coupon tests
Beam	W30X99	A36	58.5	42.3 flange 47.7 web	67.5	61.1 flange 63.4 web
Column	W14X176	A572 Gr. 50	53.5	48.7 flange	72.5	69.0 flange
Top cover Plates	1" tapered	Gr. 50	N.A.	N.A.	N.A.	N.A.
Bottom cover plate	1" rectangular	Gr. 50	N.A.	N.A.	N.A.	N.A.
Welding Procedure Specification	All welds FCAW-SS using AWS E71T-8 electrode in conformance with AWS D1.1-94. (No further information available.)					
Shear tab	5/8" x 5" x 31" plate with ten 1" A490 bolts, 5/16" weld to the column flange					
Panel zone	No doubler plate					
Continuity plates	Gr. 50 1" plates with c.p. weld,					
Boundary conditions	Single-sided test, no floor slab, no axial load, specimen tested in upright position					
Other detailing	B.U. bars to remain at the top flange, stop cover plate fillet welds short of column flange					

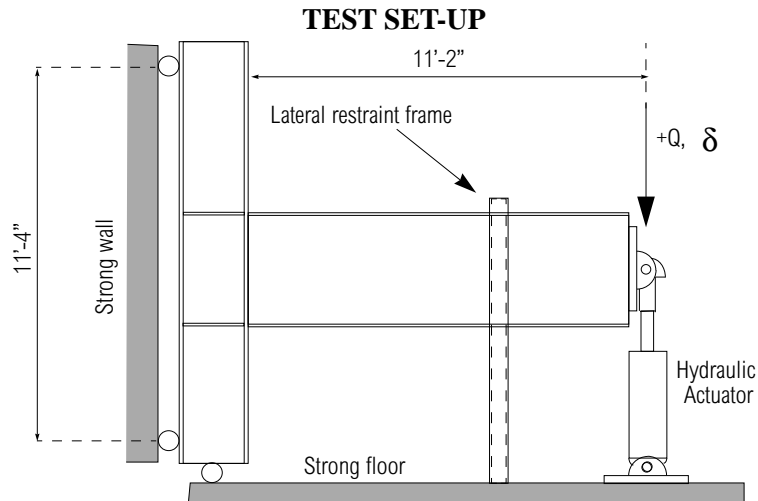
N.A. = not available

*Flange coupon tests measured dynamically per ASTM E8.

BACKGROUND

Specimen UTA-4 was tested to evaluate the cyclic response of a new connection incorporating cover plates. The beam and column were the same size as those used in other specimens tested at the University of Texas, Austin (UTA). The connection was detailed to force plastic deformations away from the face of the column through the addition of cover plates to the top and bottom flanges of the beam. The design objective was to limit the flexural stresses in the cover-plated joint to 50 ksi at the face of the column.

The beam was welded to the column using full-penetration groove welds. The top cover plate was tapered to facilitate down-hand welding to the column and the beam top flange. The bottom cover plate was rectangular and wider than the top plate. The cover plates were groove welded to the column and fillet welded to the beam flanges with notch-tough weld metal. The far ends of the cover plates were not welded. The standard SAC/ATC-24 loading history was used. The cyclic tests were performed quasi-statically. The reference displacement (δ_y) was assumed to be 1.00 in., to provide consistency with the other specimens tested at UTA.



DISPLACEMENT HISTORY AND KEY EXPERIMENTAL OBSERVATIONS

Applied Displacement History	Key Observations of the Test	
	Point	Description
	1	Yielding of the beam flanges at the tips of cover plates
	2	Panel zone yielding, progress of yielding into the cover plates, and visible column joint rotation
	3	Web yielding outside the cover plate region and increased flange yielding, small crack observed at the beam end of one of the cover plate to beam bottom flange fillet welds
	4	Beam flange and web buckling
	5	Growth of the fillet weld tear due to flange buckling
6	Test termination due to severe beam flange and web buckling and specimen twisting	

DETAILED TEST RESULTS

Quantity (see Introduction for definitions used in UTA tests)		Maxima
Force/Displacement Properties	Peak actuator force (kips):	~345
	Beam tip displacement (in.):	6.0
	Experimental yield displacement (in.):	NA
Rotation Capacity	Maximum plastic rotation at column face (% radian):	3.7
	Cumulative plastic rotation (% radian):	NA
Energy Dissipation Properties	Cumulative energy dissipated (k-in.):	NA

Mode of failure: No material failure was observed in the specimen, and there was not a substantial loss of strength. The test was stopped after the $6\delta_y$ displacement cycle due to severe twisting of the specimen.

DISCUSSION

The test of specimen UTA-4 was terminated after the displacement cycles to $6\delta_y$ to avoid damaging to the loading ram and test apparatus. Severe beam flange and web buckling combined with twisting of the specimen was apparent. During the $1\delta_y$ cycles, the first significant yielding was noted at the beam flanges at the tips of the cover plates. The yielding increased and progressed into the cover plates during the later cycles. Panel zone yielding was observed during the first $2\delta_y$ cycle and was accompanied by slight bending in the column. This bending/panel zone action increased during the later cycles. After the completion of the $3\delta_y$ cycles, a small crack was discovered at the end of one of the fillet welds between the beam bottom flange and the cover plate. During the $4\delta_y$ cycles, flange and web buckling was visible and increased during the $5\delta_y$ and $6\delta_y$ cycles. The bottom flange fillet weld tear grew due to flange buckling during the later cycles. The weld tear had a final length of approximately 10 in. The specimen had substantial strength at the end of testing. The maximum plastic rotation of the connection was 3.7% radians. The contributions of the beam and the panel zone to this rotation were approximately 80% and 20%, respectively.

DISCLAIMER

This summary has been prepared from the cited reference. The SAC Joint Venture has not verified any of the results presented herein, and no warranty is offered with regard to the results, findings, and recommendations presented, either by the Federal Emergency Management Agency, the SAC Joint Venture, the individual joint venture partners, their directors, members, or employees. These organizations and individuals do not assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any of the information, products, or processes included in this publication. The reader is cautioned to carefully review the material presented herein. More detailed information is available in the cited reference.