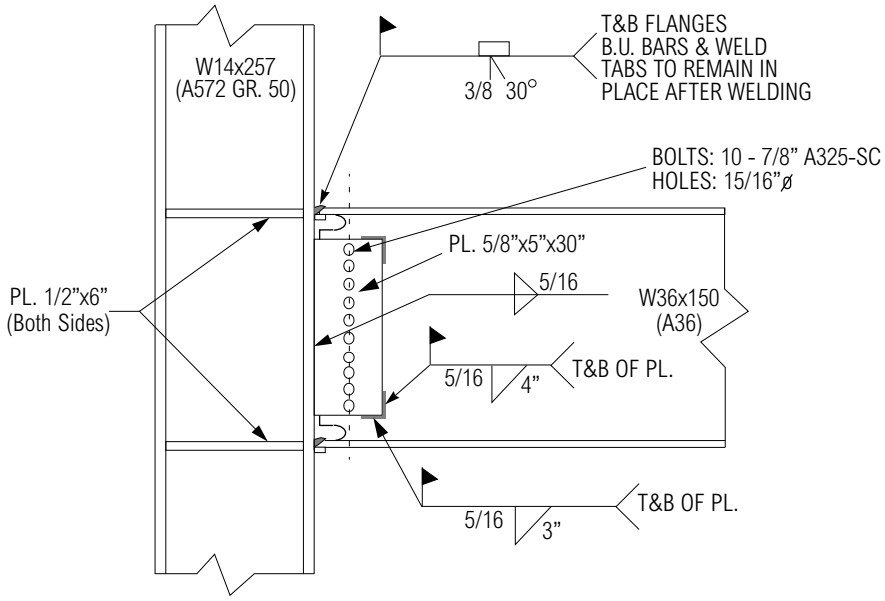
Specimen ID:	UTA-3
Keywords:	Pre-Northridge, simulated field welding, weld fracture, column flange fracture, shear tab fracture, small rotation capacity
Test Location:	University of Texas, Austin
Test Date:	March 16, 1995
Principal Investigator:	Michael D. Englehardt; with Bradley D. Shuey and Thomas A. Sabol
Related Summaries:	23
Reference:	"Experimental Investigations of Beam-Column Subassemblages", *Report No. SAC 96-01*, March 1996.
Funding Source:	FEMA / SAC Joint Venture, Phase 1

CONNECTION DETAIL



MATERIAL PROPERTIES AND SPECIMEN DETAILS

Member	Size	Grade	Yield Stress (ksi)		Ultimate Strength (ksi)	
			mill certs.	coupon tests *	mill certs.	coupon tests *
Beam	W36x150	A36	58.5	42.3 flange 47.7 web	67.5	61.1 flange 63.4 web
Column	W14x257	A572 Gr. 50	53.5	48.7 flange	72.5	69.0 flange

Welding Procedure Specification	Fillet Weld: FCAW-SS; 0.072" diameter AWS E71T-8 electrode; conforms with AWS 5.20 specification and Section 4.2 of AWS D1.1-94 CJP groove weld: FCAW-SS; 0.120" diameter AWS E70T-4 electrode; conforms with AWS 5.20 specification and Section 4.2 of AWS D1.1-94
Shear tab	5/8"x30"x5" plate with ten 7/8" A325 bolts
Panel zone	No doubler plates
Continuity plates	1/2" plates with c.p. weld
Boundary conditions	Single-sided test, no floor slab, axial force in lower half of column equal to beam shear force, specimen tested in upright position
Other detailing	Leave backup bars and weld tabs in place, root defects determined from UT inspection left in place

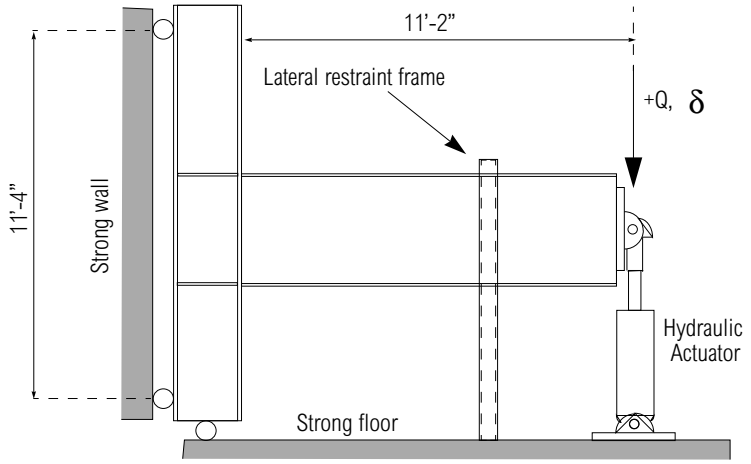
* dynamic stresses; see reference for additional details of coupon tests

BACKGROUND

The objectives of testing the Pre-Northridge specimens were to replicate in the laboratory the failure modes observed in the field after the Northridge earthquake to develop a better understanding of the failure mechanisms, and to acquire data on the likely deformation characteristics of beam-column connections constructed to industry standards before 1994. The specimen described in this summary was fabricated under controlled conditions by a local commercial steel fabricator to details specified by SAC and the principal investigator. It was intended to be identical to the specimens described in Test Summaries No. 7 and 8. In addition, these were intended to be nearly identical to the specimens described in Test Summaries No. 10, 11, and 12 which were tested at U.C. Berkeley. Because each of these were fabricated under controlled conditions, however, it is possible that their quality is superior to typical moment connections fabricated in the field prior to the Northridge earthquake. As such, some field-fabricated moment connections may exhibit less rotation capacity than these test specimens.

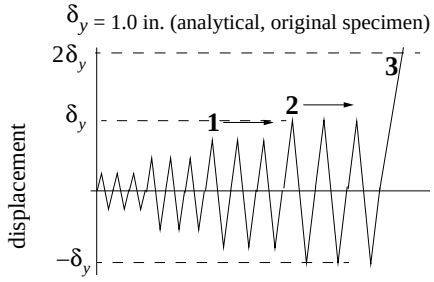
The standard SAC/ATC-24 loading history was used in the testing, and the testing was performed quasi-statically. The yield displacement (δ_y) of the specimen was determined to be 1.00 in., from analysis.

TEST SET-UP



DISPLACEMENT HISTORY AND KEY EXPERIMENTAL OBSERVATIONS

Applied Displacement History



Key Observations of the Test

Point	Description
1	Minor yielding of beam flanges
2	Beam flange yielding becoming more pronounced
3	Fracture across weld between beam bottom flange and column flange, becoming a column "divot" fracture on one side of beam web; fracture of lower part of the shear tab extending to the first bolt hole

DETAILED TEST RESULTS

Quantity (see Introduction for definitions used in UTA tests)		Maxima
Force/Displacement Properties	Peak actuator force (kips):	~155
	Beam tip displacement (in.):	1.81
	Experimental yield displacement (in.)	NA
Rotation Capacity	Maximum plastic rotation (% radian):	0.3
	Cumulative plastic rotation (% radian):	0.3
Energy Dissipation Properties	Cumulative energy dissipated (k-in.):	~0

Mode of failure: Fracture of the beam bottom flange connection during the first positive displacement excursion to $2\delta_y$.

DISCUSSION

Specimen UTA-3 failed in the first half of the first cycle to $2\delta_y$ at a beam tip displacement of 1.81 in. Prior to failure, yielding of the beam flanges was noted during the displacement excursions to $0.75\delta_y$ and $1\delta_y$. Failure occurred when a fracture developed in the welded connection between the beam bottom flange and the column flange at a displacement of 1.81 in. On the left half of the beam bottom flange, the fracture propagated along the weld-column interface; on the right half of the beam flange, the fracture propagated into the column flange face in a crescent/divot shape. The divot fracture extended from the weld root and terminated inside the column flange. The fracture appeared to reach a depth of 1 in. in the column flange. The shear tab also fractured from the bottom edge to the first bolt hole. The specimen experienced negligible yielding, and the maximum plastic rotation of joint was approximately 0.3% radian.