Table 1 Wide flange beam and box column sizes

Spec.	SW1	SW2
Beam Section	H 600x400x20x30 mm	
L*(mm)	6000	
Column Section	BOX 550x550x30 mm	
H(mm)	4000	
Diaphragm Thickness(mm)	30	
t of shear tab(mm)	22	
Bolts(M24-S10T)	3x5	
Backing Bar	Steel	
a (mm)[@]	400(T：425、B：400)[#]	400(395)[#]
b (mm)[@]	330(329)[#]	120(T：117、B：112)[#]
c (mm)[@]	-	350(347)[#]
d (mm)[@]	-	450(448)[#]
Thickness of cover plate(mm)	32	12
$\alpha^{\&}$	0.70	0.92
Diaphragm to Column Welding	ESW	FP

Table 2 Material strengthes of beam

Spec.	Location	F_y (MPa)	F_{yf} / F_{yw}	F_u (MPa)	F_{uf} / F_{uw}	Elongation (%)*	ε_f / ε_w	YR= F_u / F_y	YR_f / YR_w
SW1	Flange	415.36	1.14	531.64	1.07	30.02	1.08	1.28	0.94
SW2	Web	364.30		495.25		27.74		1.36	

* Gauge Length = 200 mm

Table 3 Key test results

Spec.	SW1		SW2	
	+	−	+	−
θ (% rad.)	1.5	1.5	6.0	6.0
θ_{bp} (% rad.)	0.036	0.610	3.81	3.82
P_b (kN)	532	499	735	712
F_{Pr} (kN)	623		623	
F_{Pc} (kN)	1018		780	
P_b / F_{Pr}	0.85	0.80	1.18	1.14
P_b / F_{Pc}	0.52	0.49	0.94	0.91
Failure mode	Fracture of diaphragm to column welds		No	

F_{pr}: yield force based on the bending capacity (*Mp* computed from flange and web tensile coupon strengths) of the steel beam at the tip of the cover plates.

F_{pc}: yield force based on the bending capacity of the stiffened beam section at the column face.

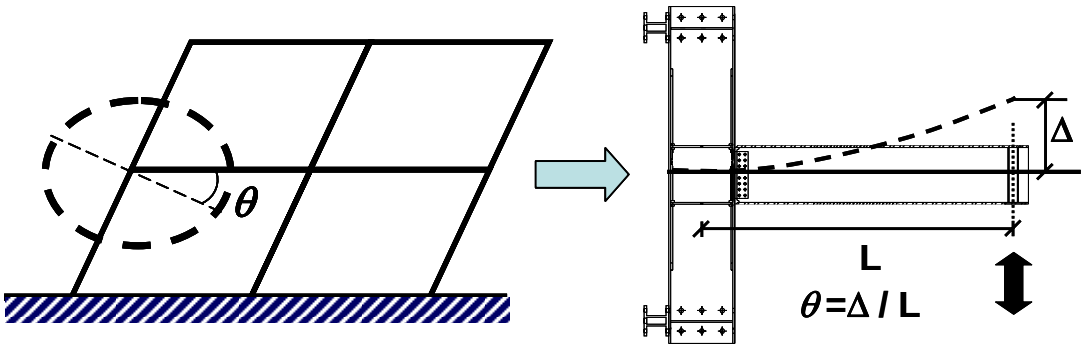


Fig. 1 Schematic of steel-to-column connection subassembly

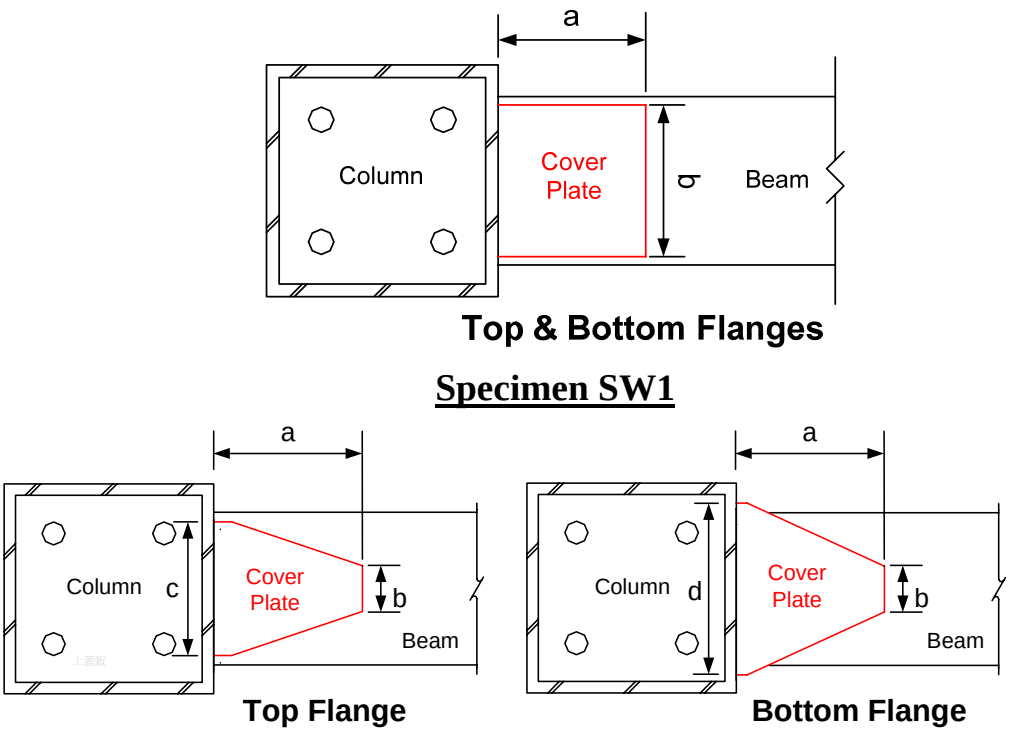


Fig. 2 Flange connection details

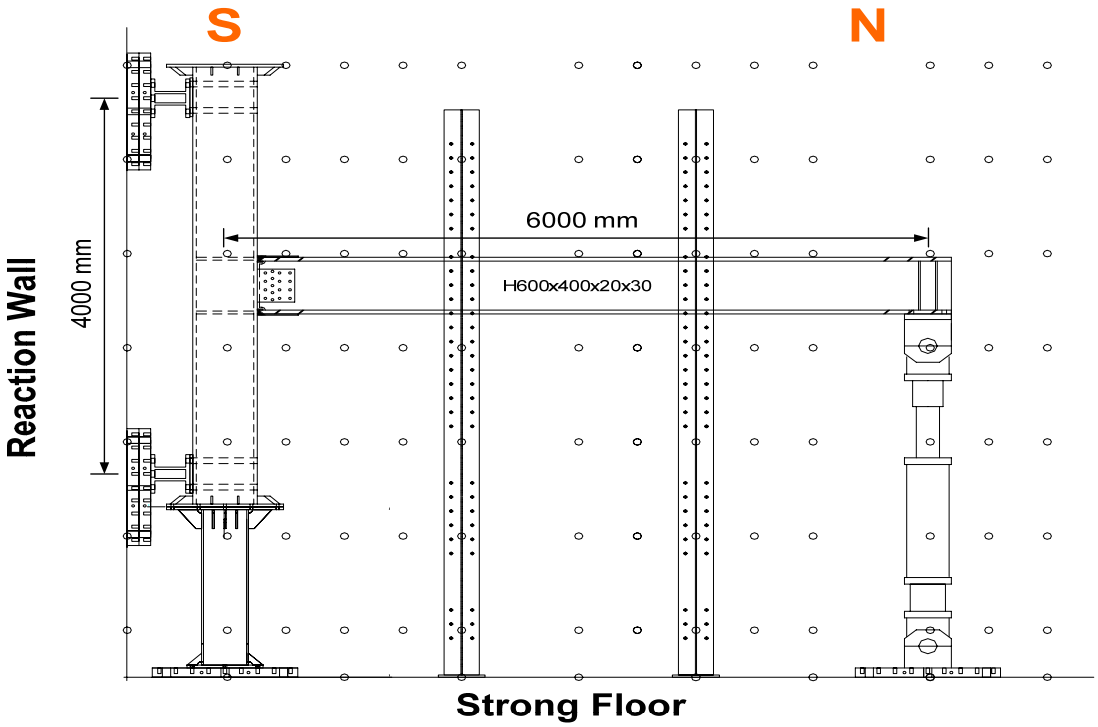


Fig. 3 Experimental setup

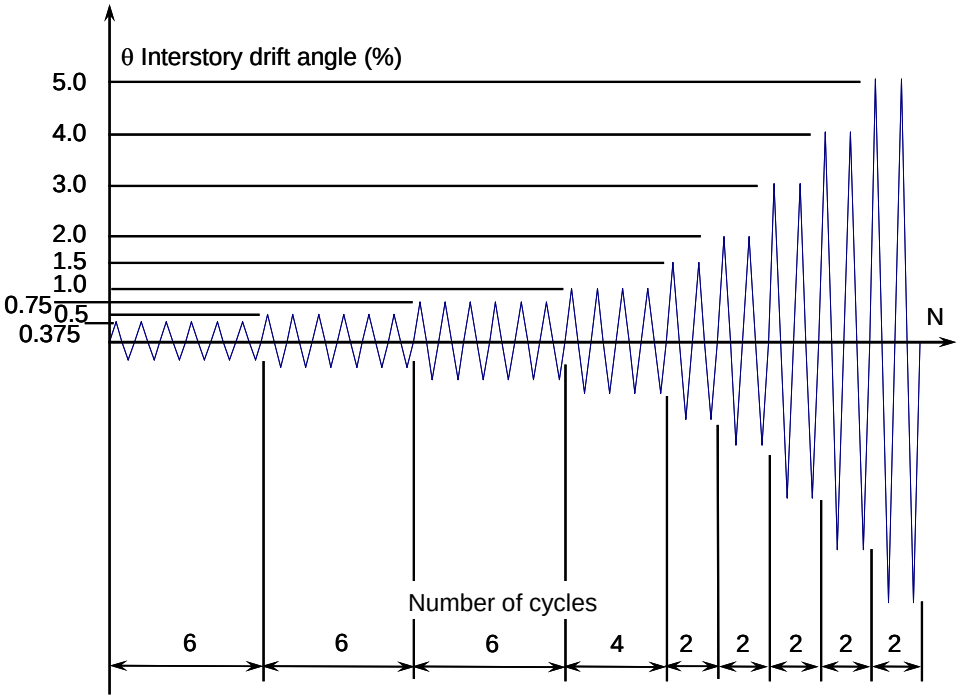
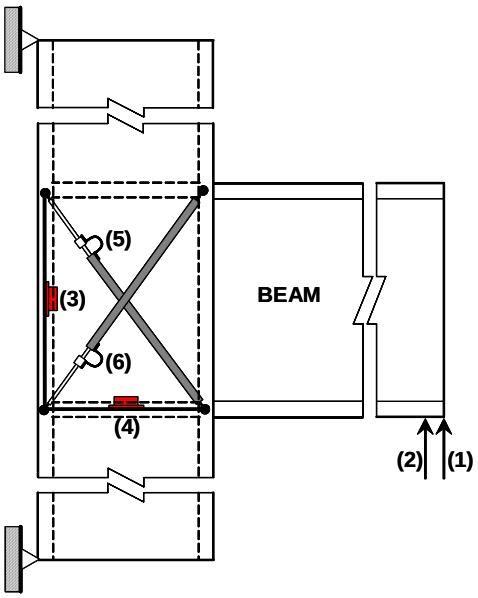


Fig. 4 Loading Protocol



(1) LVDT interior gauge in the actuator.

(2) Load cell, in the actuator.

(3)&(4) Tiltmeters, measure column deformations.

(5)&(6) π-gauges, measure PZ deformations.

Fig. 5 Instrumentation

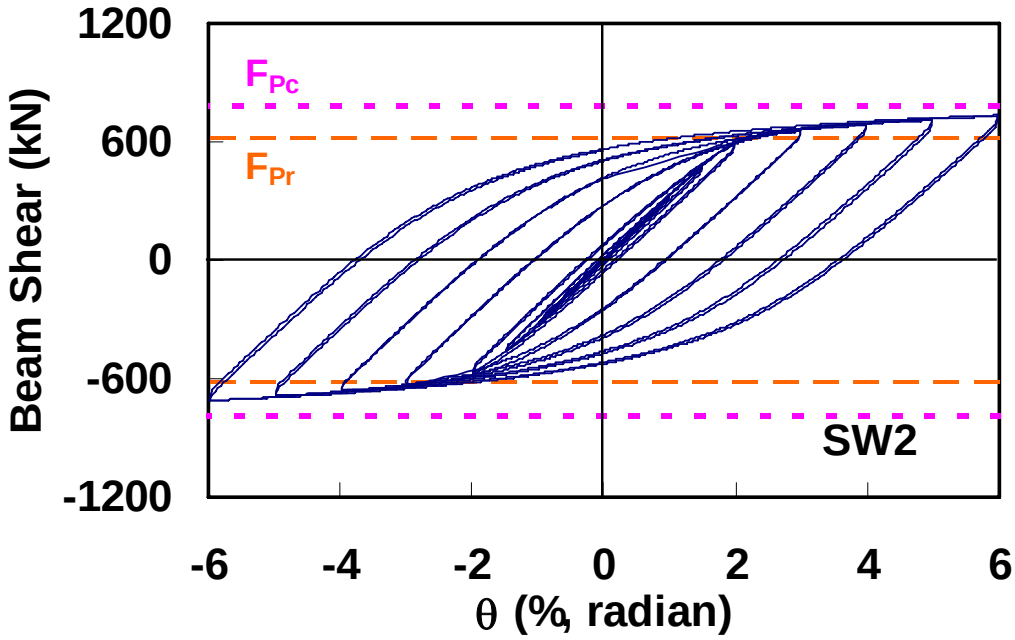


Fig. 6 Cantilever beam force versus total deformation relationships

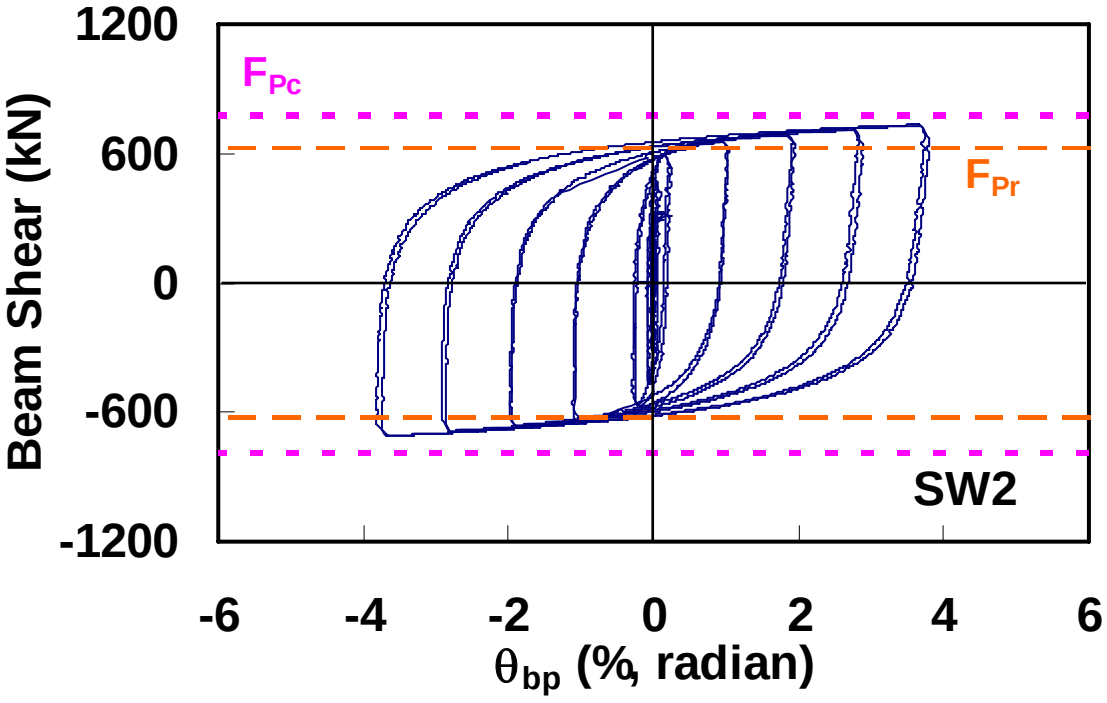


Fig. 7 Cantilever beam force versus plastic deformation relationships

Photo 1 Experimental setup