การศึกษาเปรียบเทียบแบบจำลองความสัมพันธ์ของโมเมนต์และมุมหมุนพลาสติก ของเสาเหล็กหน้าตัดปีกกว้างรับแรงในแนวแกนร่วมกับโมเมนต์ดัด เมื่อใช้แบบจำลองจากมาตรฐาน D 74046 และ D 7404

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D

D 74046 D 7404

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1,2,3

Corresponding author; E mail address tanpan@kku ac th

บทคัดย่อ

ASCE41-13

ASCE41-17

ASCE41-13

ASCE41-17

W300x150x36.7 /

ASCE41-1

ASCE41-13

, ,

D

In this paper, model of plastic hinge for non-linear static analysis of 10 wide-flange steel column sections under axial load and bending are comparatively studied based on both ASCE41-13 and ASCE 41-17 standards. It is found that parameters affecting the backbone of plastic hinge of wide-flange steel columns comprise of size of steel sections, unbraced length of members and axial load ratios. This study shows that the backbone response of moment-plastic rotation for wide-flange steel columns according to ASCE41-13 is not always conservative in comparison with ASCE41-17. For wide-flange steel sections that are not larger than W300x150x36.7 kg/m, ASCE41-17 instead of ASCE41-13 may yield the conservative backbone response.

Keywords: steel structures, moment-rotation model, plastic hinge

41 คำนำ

ASCE

D.G.

Lignos

P_s/P_{ye})

P_s P_{ye}

(A_s)

(F_{ye})

Plastic Deformation

ASCE

Force-Controlled) P_{ye}

Bech

PEER NGA

ASCE

Yield

Rotation)

Shear Deformation)

Newell (

ASCE D.G.Lignos

(

Monotonic) Reversed Cyclic)

Parametric Study

Web Slenderness Ratio, h/t_w h

t_w)

(Flange Slenderness Ratio, $b_f/2t_f$ b_f

t_f

(Member Slenderness Ratio, L_b/r_y L_b

r_y)

(Axial Load Ratio, P_g/P_{ye}

Local Buckling)

Lateral Torsional Buckling)

ASCE a, b c

ASCE41-17

ASCE41-13 ASCE41-

17

Acceptance

Criteria)

2. แบบจำลองโมเมนต์และมุมหมุนของเสาเหล็ก

ASCE41-13

ASCE41-17 1 AB

Elastic)

BC

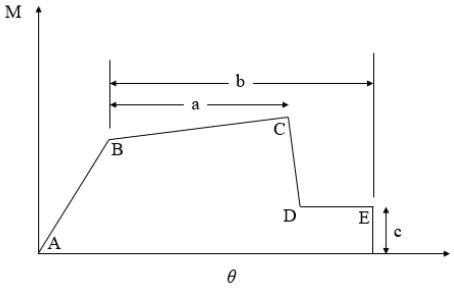
Pre-peak Plastic)

CD

Post-peak Plastic)

Stiffness) DE Residual

Strength) E



รูปที่ 1

ASCE

Yield Rotation, θ_y)

B a, b, c

ASCE41 1 ASCE41 17

ASCE

ASCE

Plastic Rotation

ASCE ASCE

ASCE

F_y

Plastic Modulus, Z) Moment of Inertia, I)

ASCE41-13

$$\theta_y = \frac{ZF_{ye}L_c}{6EI_c}\left(1-\frac{P}{P_{ye}}\right) \quad (1)$$

F_{ye} Expected Yield Stress)

E

L_c

I_c

ASCE

Z_x/I_x

ASCE41-17

$$\theta_y = \frac{M_{pce}L_c}{6\tau_b EI_c}\left(1+\frac{12EI_c}{L_c^2 GA_s}\right) \quad (2)$$

M_{pce}

G

A_s ($A_s = (d_b - 2t_f)t_w$)

τ_b 1 $\frac{|P|}{P_{ye}} \le 0.5$

$4\frac{|P|}{P_{ye}}\left(1-\frac{|P|}{P_{ye}}\right)$ $\frac{|P|}{P_{ye}} > 0.5$

ASCE

h/t_w, $b_f/2t_f$, L_b/r_y P_g/P_{ye}

$\theta_{p,u}$

b Z_x/I_x

Strong Axis)

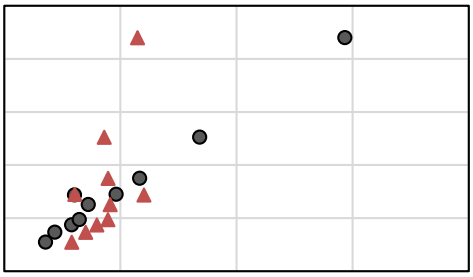
F_y , / P_g/P_{ye}

ASCE41-13

ASCE41-17

ตารางที่ 1

	Z_x/I_x	$b_f/2t_f$	h/t_w	$\theta_{p,u}$ (ASCE41-13)	$\theta_{p,u}$ (ASCE41-1)
W x x	0.0274	5.77		0.0178	
W x x	0.0367	8.82			
W x x	0.0437	8.33			
W x x	0.0486	8.33			
W x x	0.0627	8.93			
W x x	0.0718	10.00			
W x x	0.0724	8.33			
W x x	0.0874	7.95			
W x x	0.1261	7.81			
W x x	0.2198	6.25			

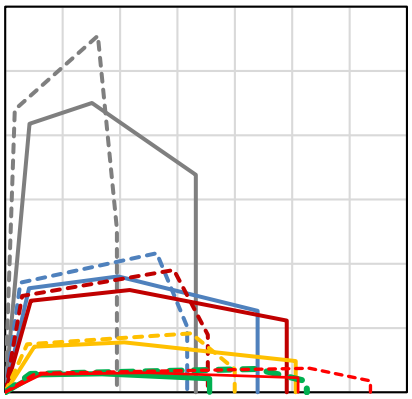


$\theta_{p,u}$



รูปที่ 2 Z_x/I_x

ASCE41-1 ASCE41-17

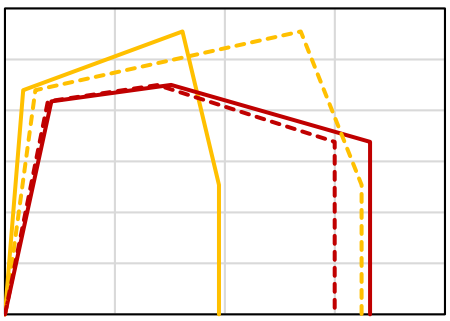


รูปที่ 3

W x , W x , W450x300 W350x250
ASCE
ASCE W300x150
W x ASCE
ASCE

h/t_w r_y
P_e/P_{ye}
L_b)
ASCE
ASCE
ASCE
h/t_w, L_b/r_y, $b_f/2t_f$ P_e/P_{ye}

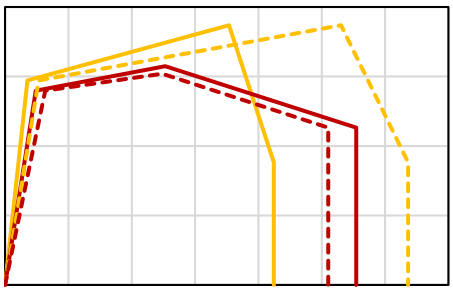
W x
P_e/P_{ye}
L_b
ASCE
ASCE
ASCE
ASCE



รูปที่ 4 ASCE
ASCE W x

W x

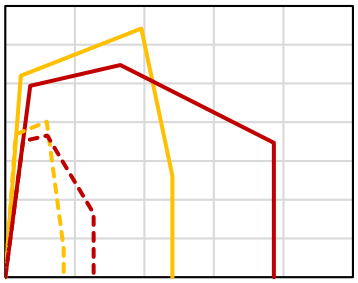
P_e/P_{ye} 0. L_b
300
ASCE41 00
ASCE41-13
ASCE41-1
ASCE41



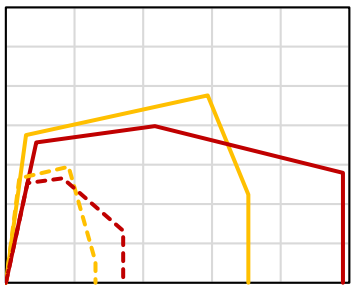
รูปที่ 5 ASCE41-13
ASCE41-17 W250x175

Axial Load Ratio)

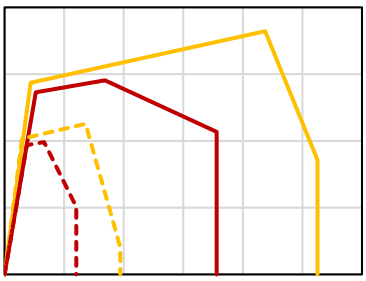
ASCE ASCE



รูปที่ 6 ASCE41-13
ASCE41-17 P_s/P_{ye} W x



รูปที่ 7 ASCE41-13
ASCE41-17 P_s/P_{ye} W x



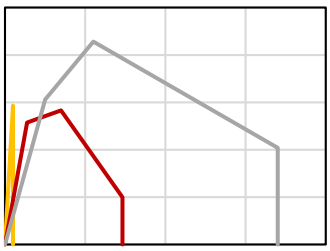
รูปที่ 8 ASCE41-13
ASCE41-17 P_s/P_{ye} W x

ASCE41-13
0.5

Macrae
P_s/P_{ye}
ASCE41-13
ASCE41-17

P_s/P_{ye} 0.

ASCE41-13 ASCE41-1



รูปที่ 9
ASCE41-13, ASCE41-17 MacRae et al., 1990)
CA-250UC73 (W254x254)
0.5

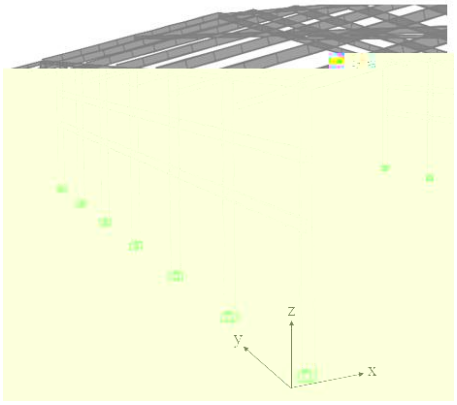
3. เสากรณีศึกษาโครงสร้างโรงงานอุตสาหกรรมเหล็ก

W300x150x36.7 /
A36 ASCE41-
17
ASCE41-13
ASCE41-17 ASCE41-13
ASCE41-13
ASCE41-17
a b

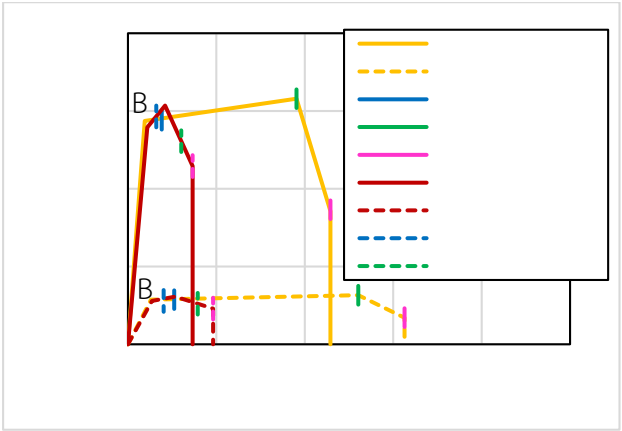
ASCE41-13 ASCE41-17

X
Strong axis)
Y Weak axis)

ASCE41-13
ASCE41-17 ASCE41-17



รูปที่ 10



รูปที่ 11 ASCE41-13
ASCE41-17
W300x150x36.7 / 0.02
(B)
Z_x)
3 (Z_y) 3
(I_y)
(I_x)

7. บทสรุป

ASCE41
ASCE41 17
ASCE41-13 ASCE41-17
ASCE41-17

W3 x 0x / Z/I ASCE41-1
ASCE41-1

W3 0x150x36.7 / Z/I
ASCE41-1 ASCE41-13

ASCE41-13
ASCE41-17

ASCE41-13
ASCE41-17

กิตติกรรมประกาศ

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