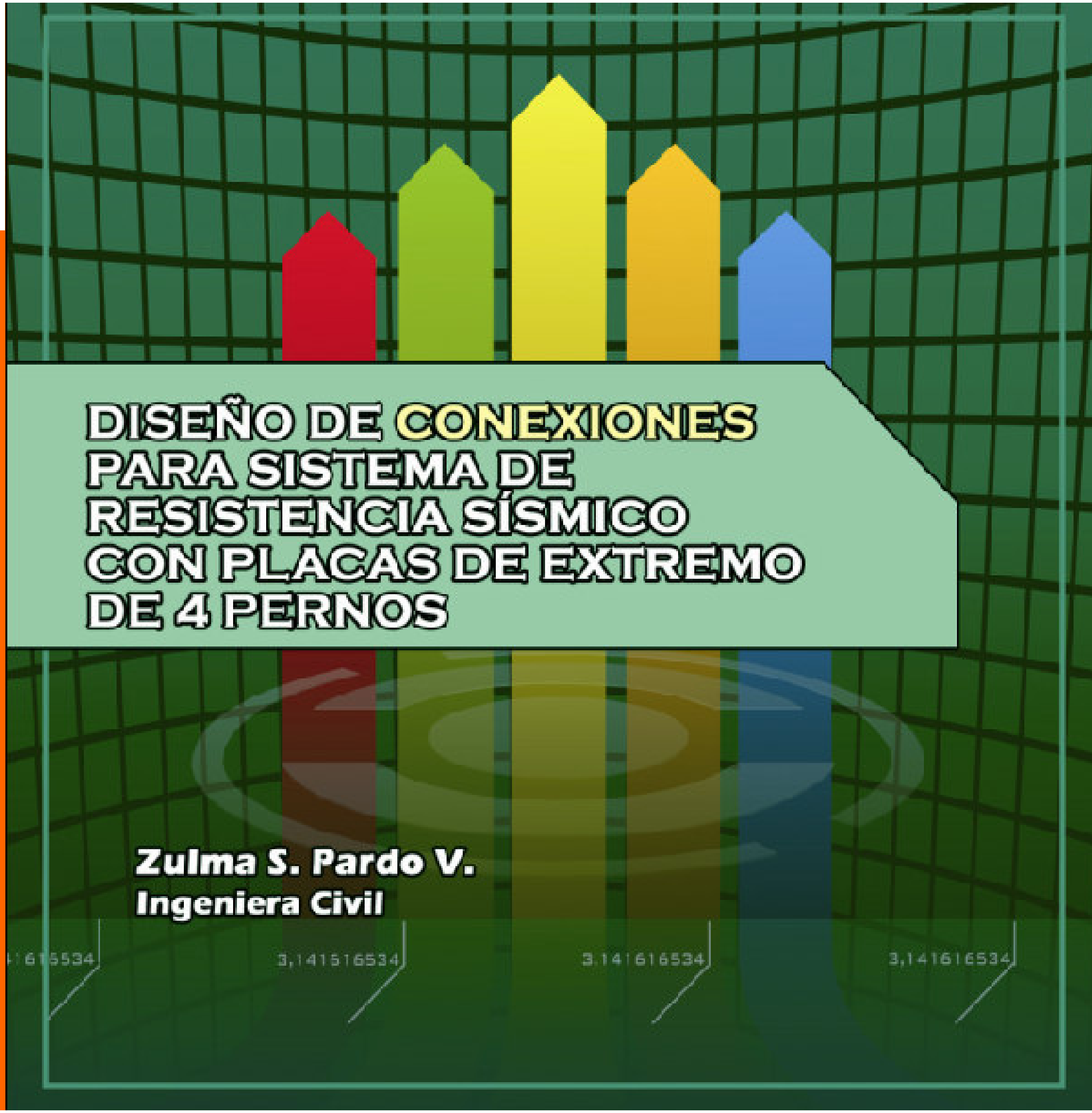
PRESENTACIÓN LIBRO:
DISEÑO DE CONEXIONES PARA SISTEMA DE RESISTENCIA SÍSMICO CON PLACAS DE EXTREMO DE 4 PERNOS.

Zulma Stella Pardo Vargas

Pontificia Universidad Católica del Perú.

Lima, Septiembre 18 de 2009

INGENIEROS
ESTRUCTURALES LTDA



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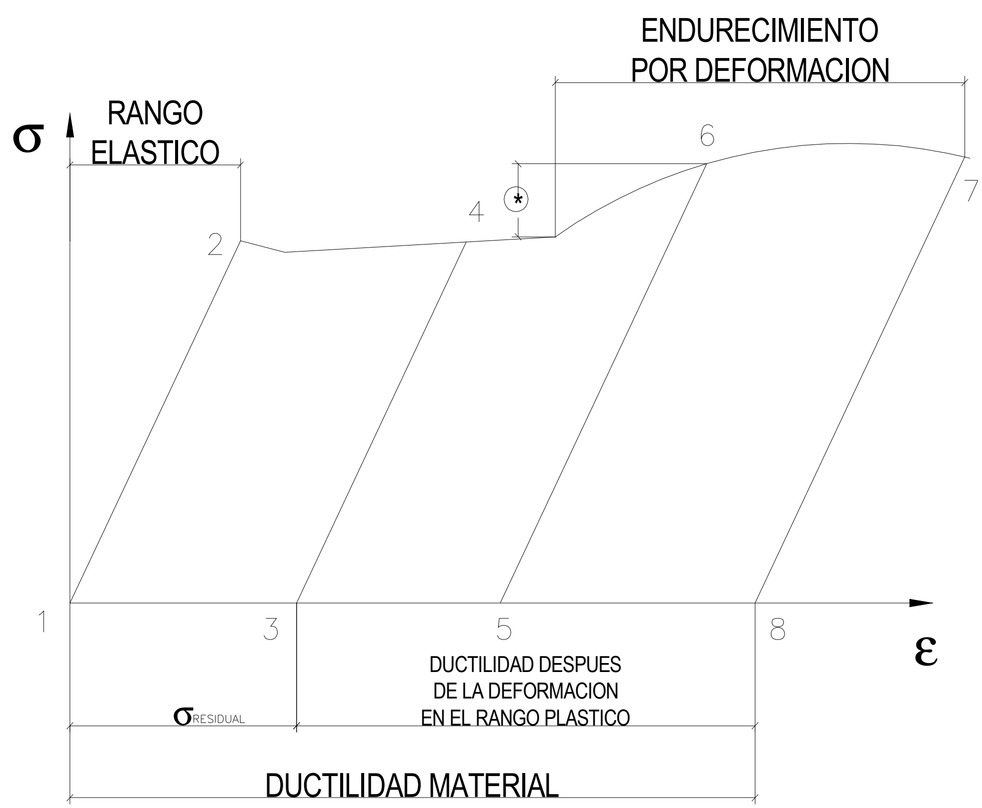
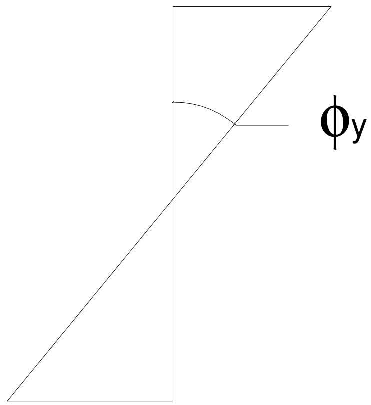
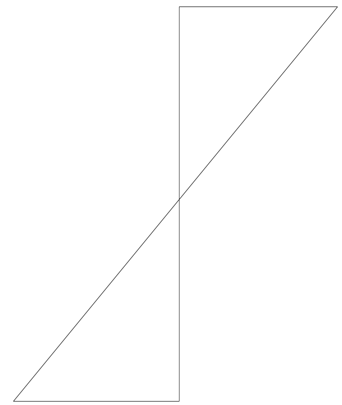
COMPORTAMIENTO ESFUERZO DEFORMACION DEL ACERO



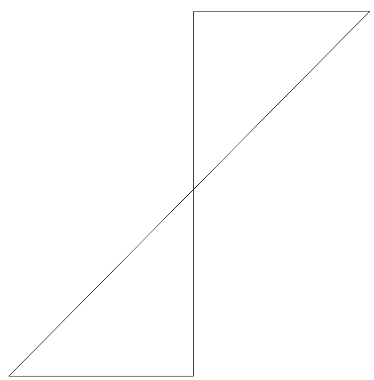
COMPORTAMIENTO SECCIONES INTERNAS
PERFIL “I” EN ACERO



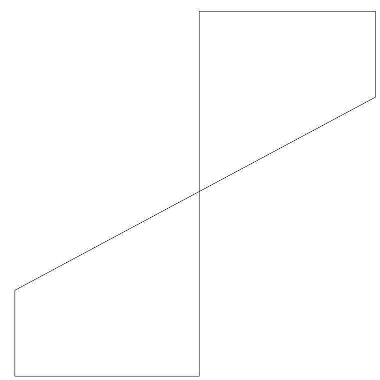
ε_y



σ_y

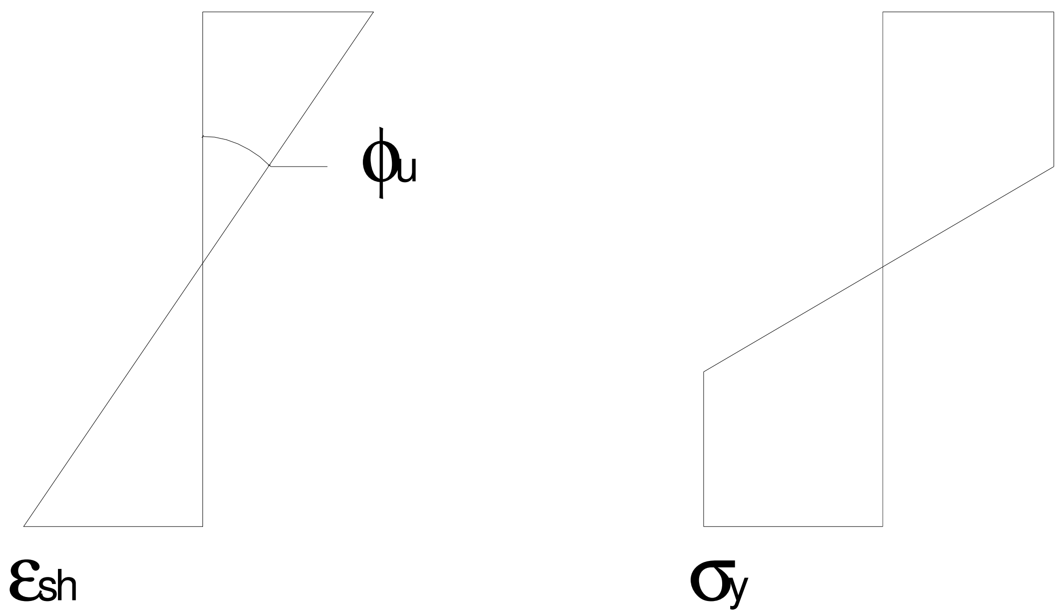


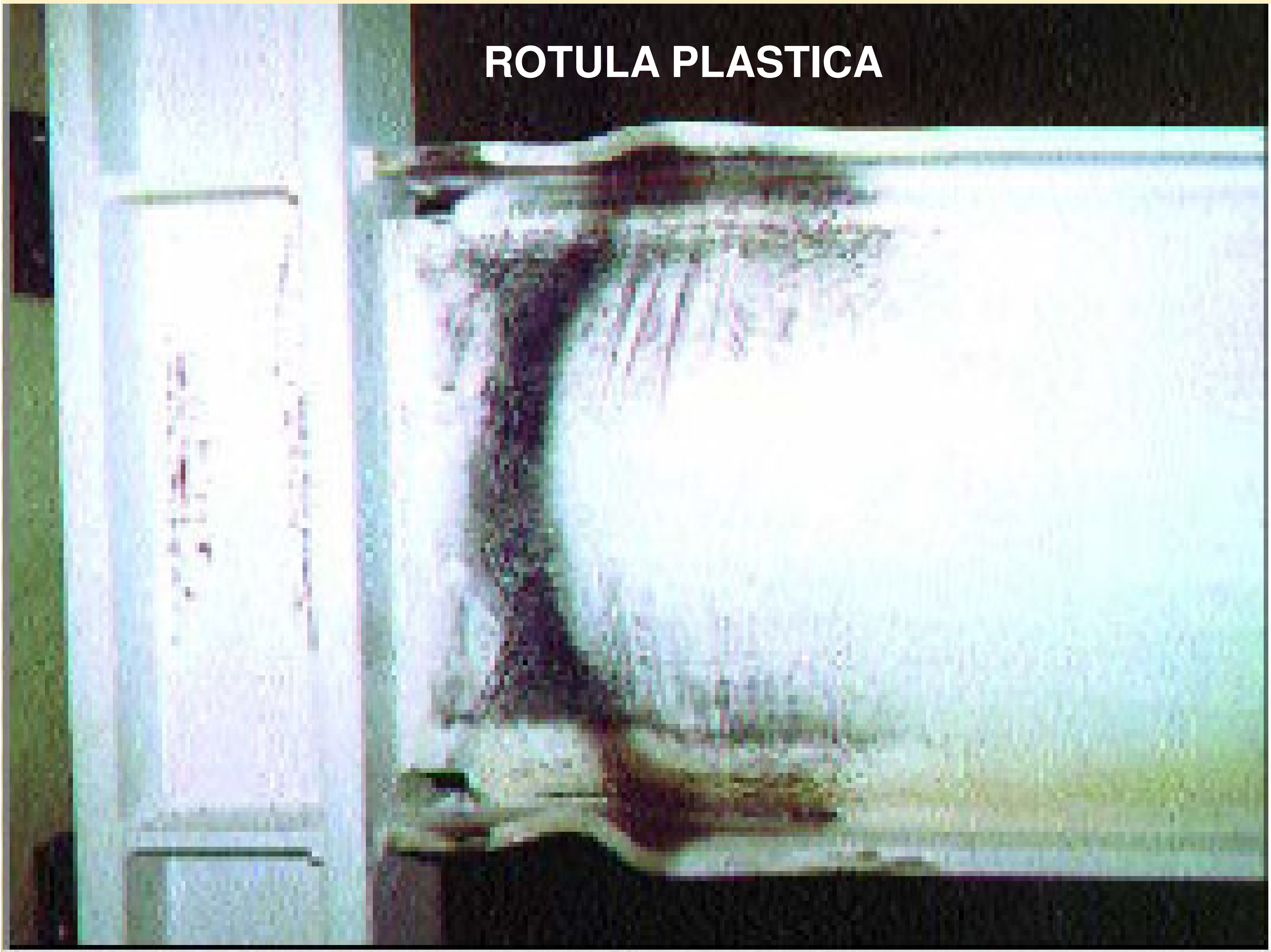
$\varepsilon_y < \varepsilon < \varepsilon_{sh}$



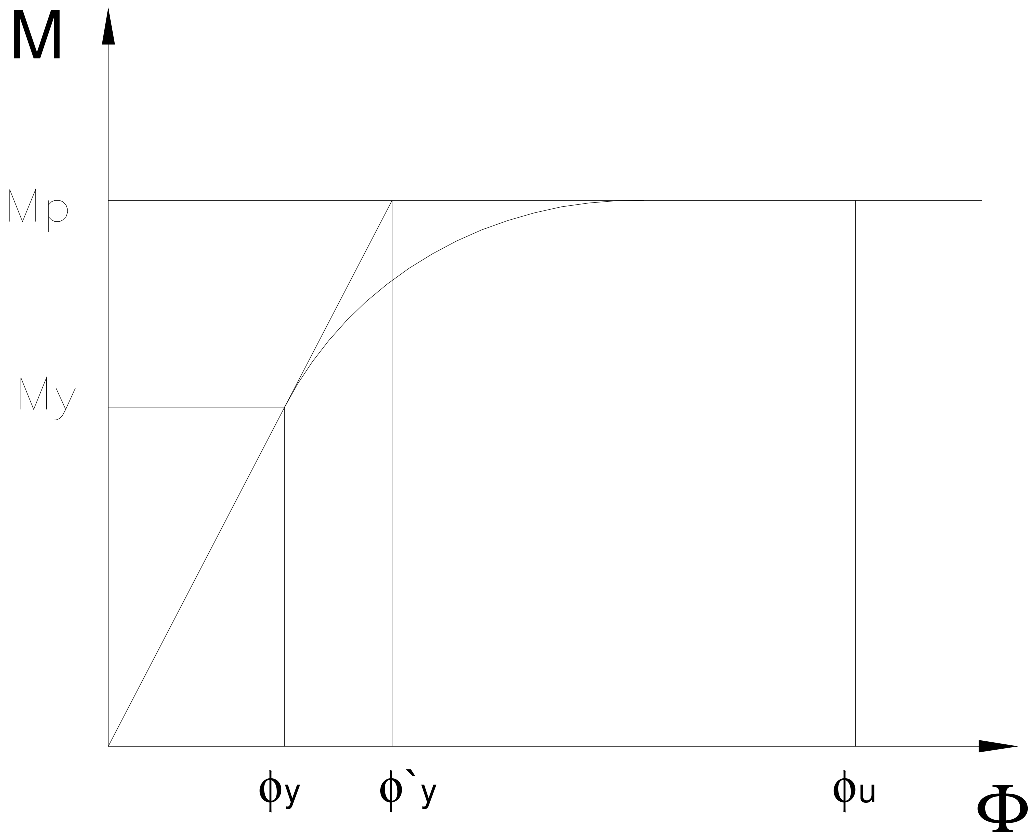
σ_y

COMPORTAMIENTO SECCIONES INTERNAS
PERFIL “I” EN ACERO




ROTULA PLASTICA

GRAFICA MOMENTO VS CURVATURA



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DUCTILIDAD POR FLEXION. LIMITES PRACTICOS

La ductilidad por flexión permite definir tres estados límites a saber:

•Pandeo lateral torsional: cuya prevención depende de un buen arriostramiento.

•Pandeo local: que se previene con unas adecuadas relaciones ancho espesor para elementos a compresión.

•Fractura: que se previene con un adecuado detallamiento en planos.

$$\sigma_{cr} = \frac{k \cdot \pi^2 \cdot E}{12(1-\mu^2)(b/t)^2} \leq \sigma_y$$

Los valores de K oscilan entre 0.42 y 0.76.

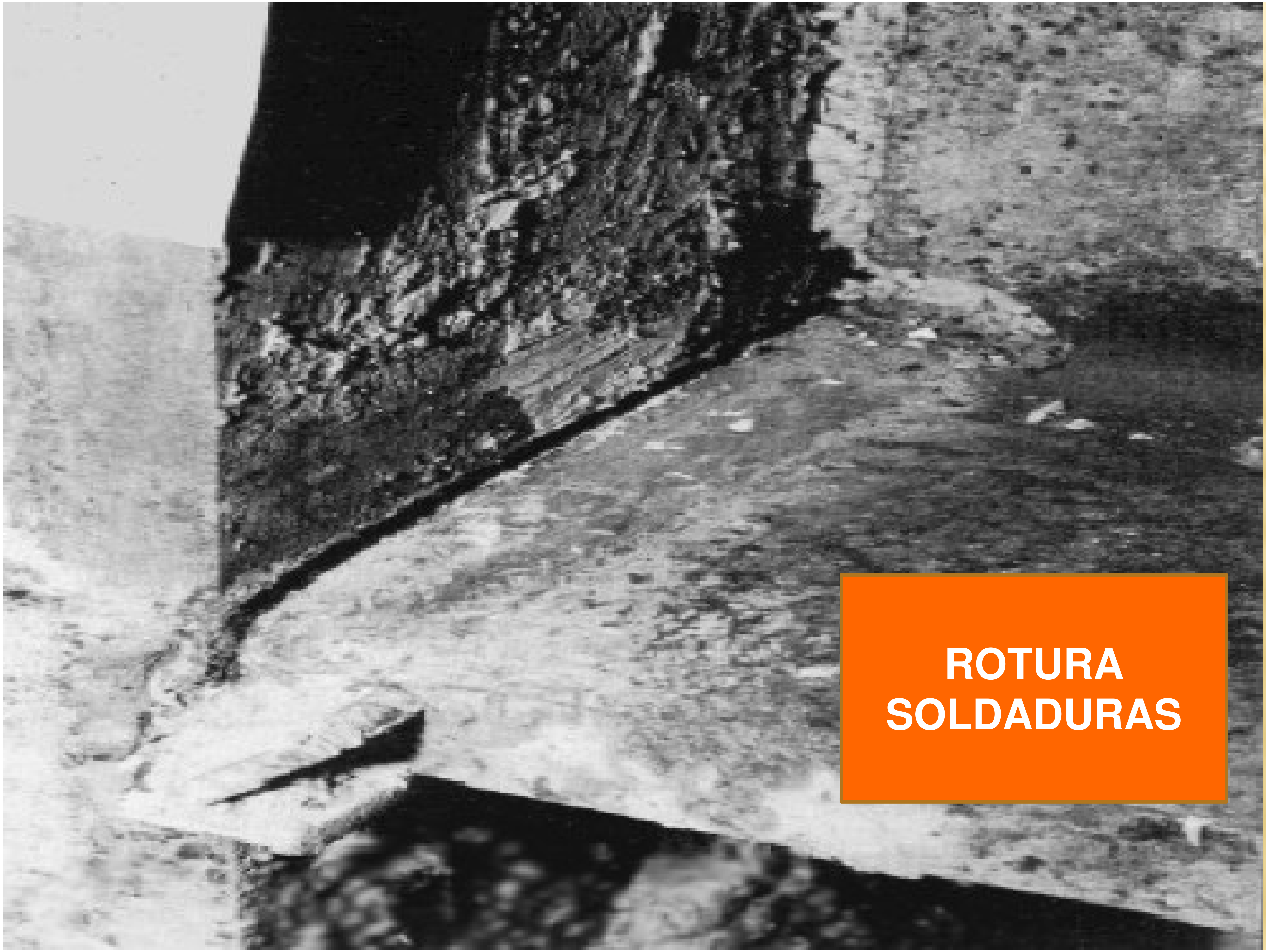
ESFUERZOS CRÍTICOS DE PANDEO - TIMOSHENKO


PANDEO LOCAL

PANDEO LATERAL

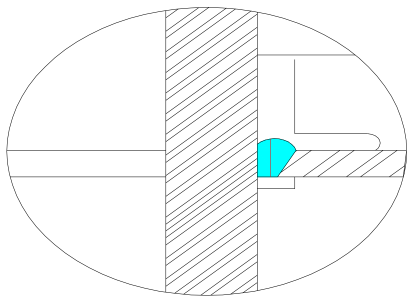

FRACTURA
CONEXIÓN A
MOMENTO


FRACTURA ALMA
COLUMNA

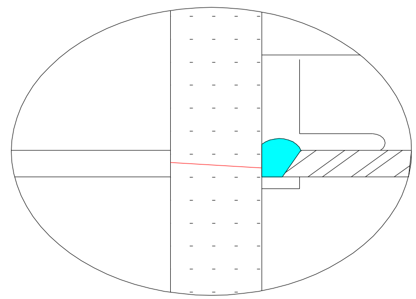

ROTURA SOLDADURAS

INGENIEROS
ESTRUCTURALES LTDA

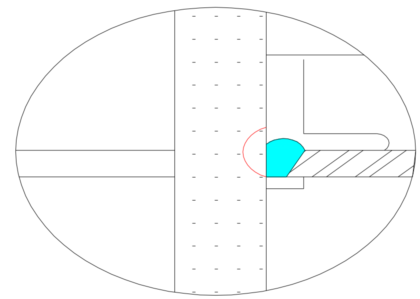
FALLAS EN LAS CONEXIONES NORTHRIDGE 1994



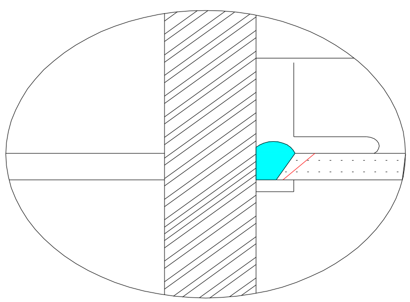
ROTURA
SOLDADURA



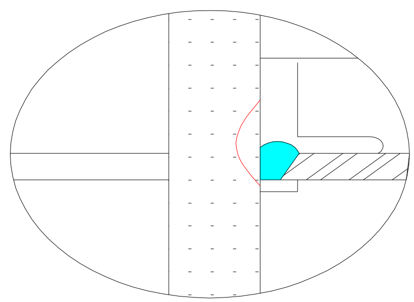
ROTURA
ALETA
COLUMNA



DESGARRE
COLUMNA



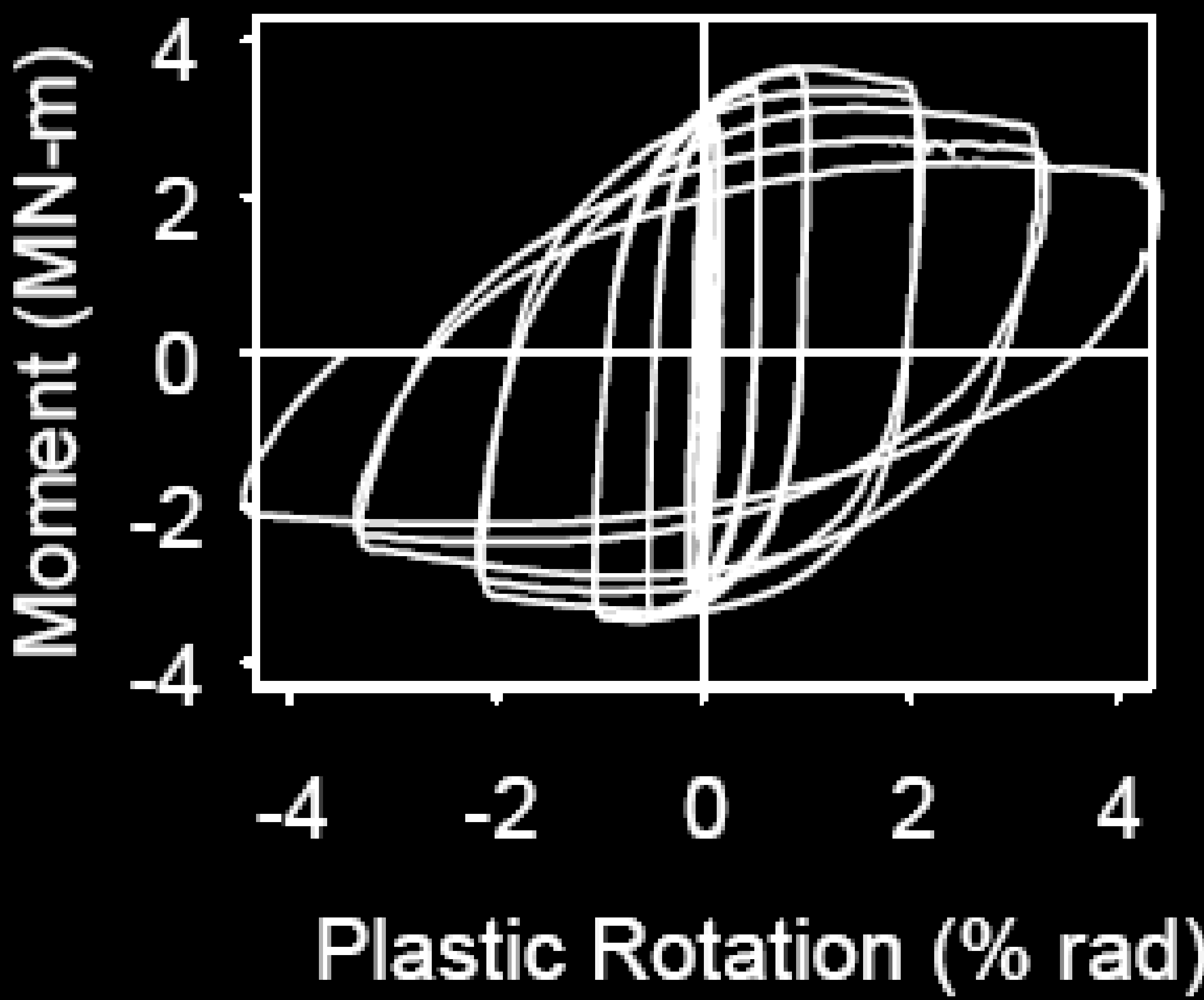
ROTURA
ALETA
VIGA



DELAMINACION
ALETA
COLUMNA

Profesor Chia-Ming Uang.
Universidad de California (San Diego)

Profesor Chia-Ming Uang.
Universidad de California (San Diego)



NEVADO PARINACOTA

INGENIEROS
ESTRUCTURALES LTDA

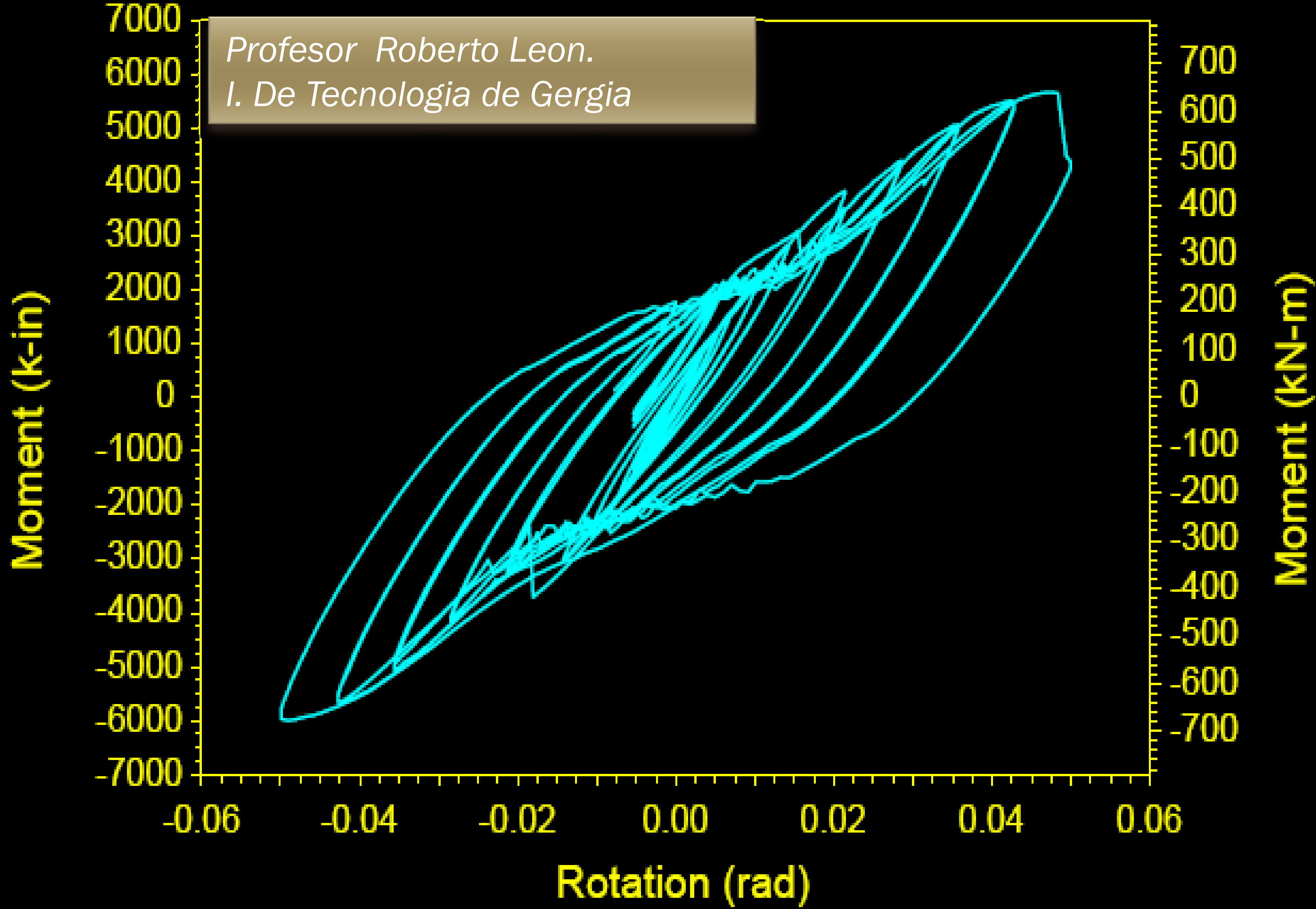
FRACTURA EN LA SECCION NETA

Profesor Roberto Leon.
Instituto de Tecnologia de Georgia

FORMACION ROTULA PLASTICA
PANDEO LOCAL ALETA Y ALMA

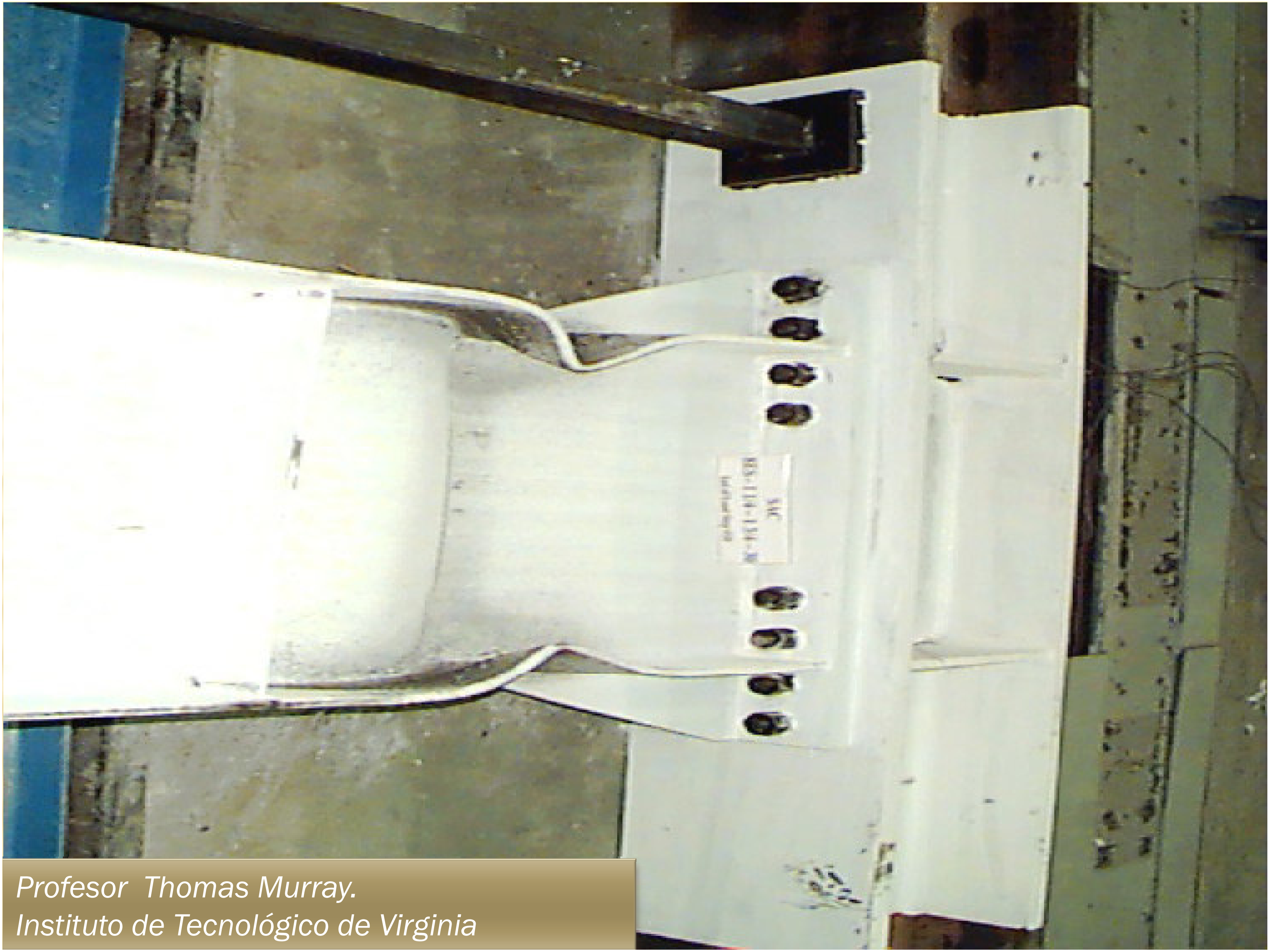
Profesor Roberto León.
Instituto de Tecnología de Georgia

FS-03 - Moment/Rotation



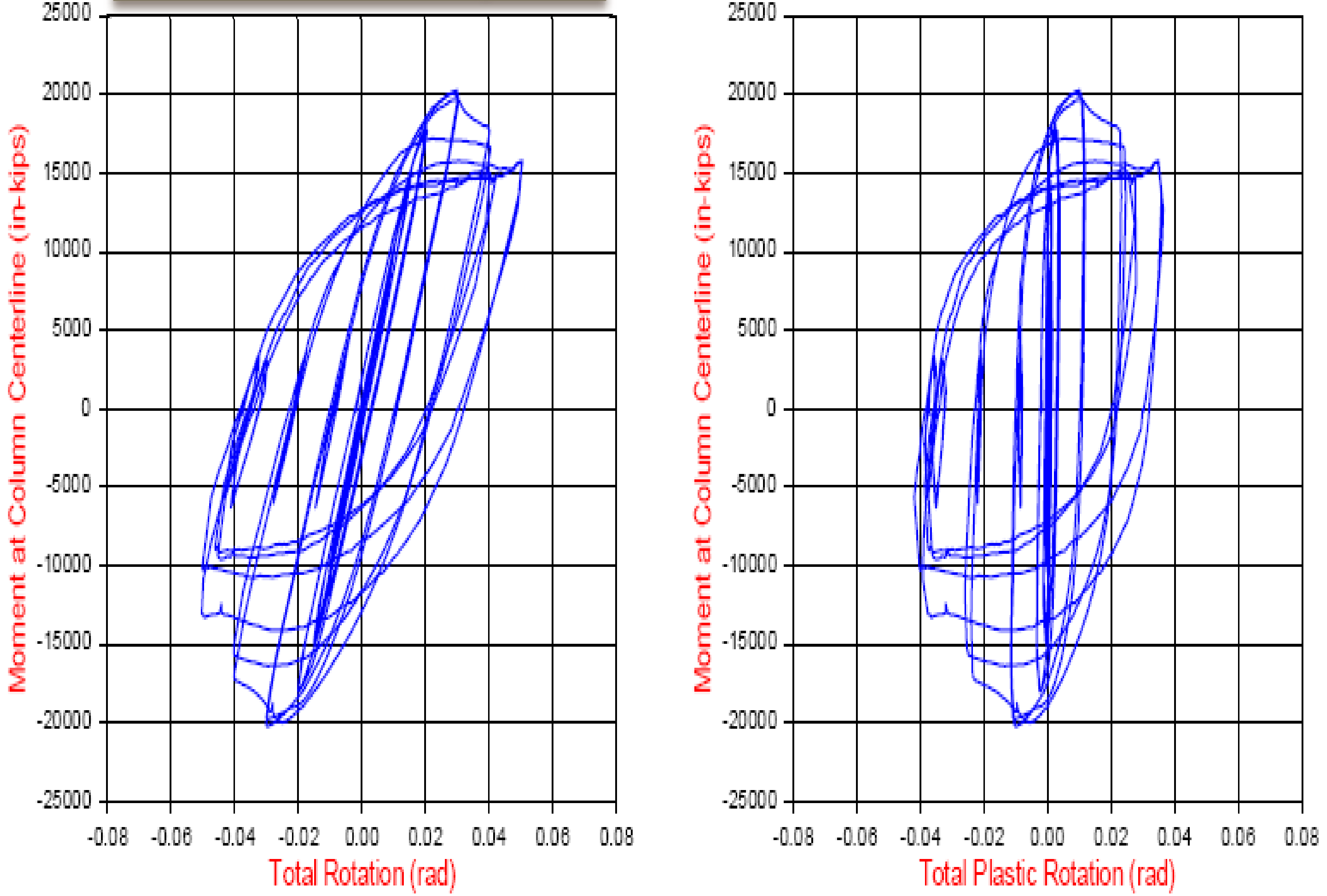
VIRACACHA

INGENIEROS ESTRUCTURALES LTDA



Profesor Thomas Murray.
Instituto de Tecnológico de Virginia

Profesor Thomas Murray.



(a) Moment vs Total Rotation

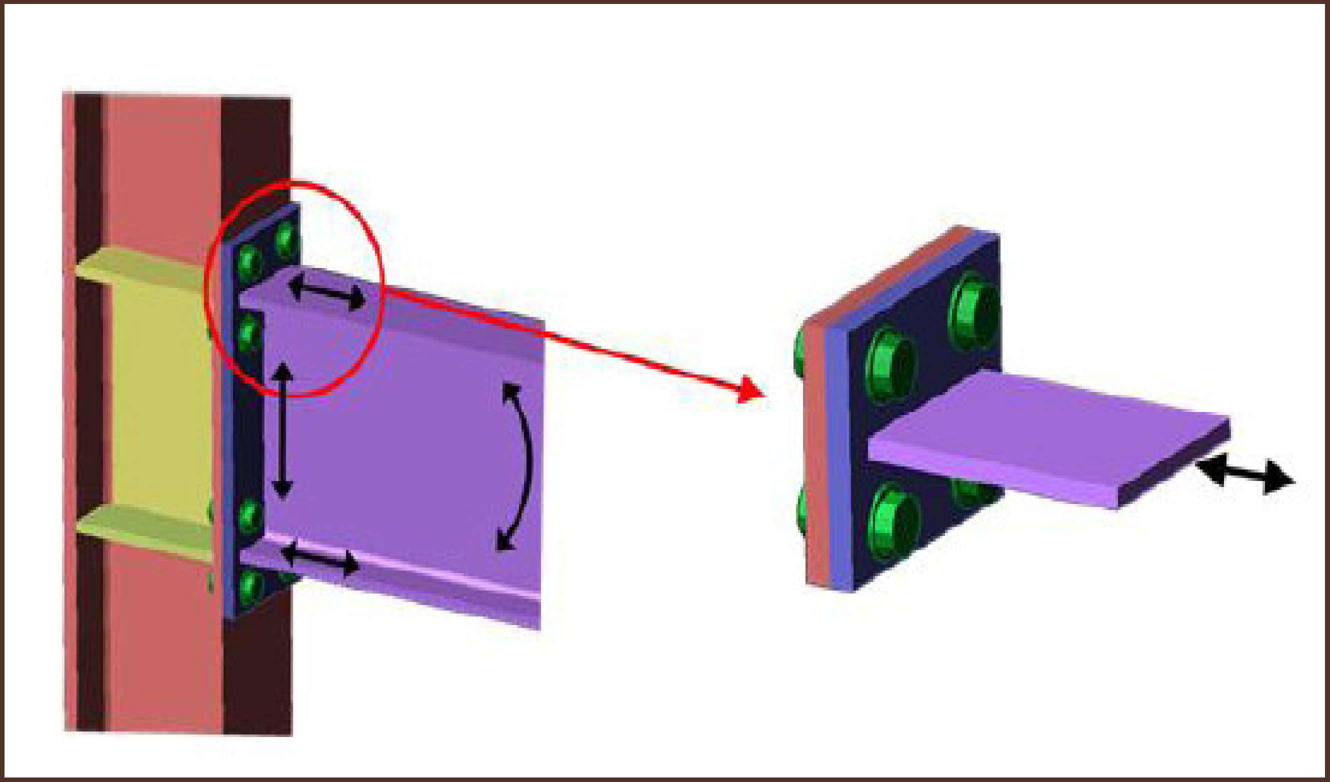
(b) Moment vs Plastic Rotation

ARQUITECTURA DE LOS NAVAJOS

INGENIEROS
ESTRUCTURALES LTDA

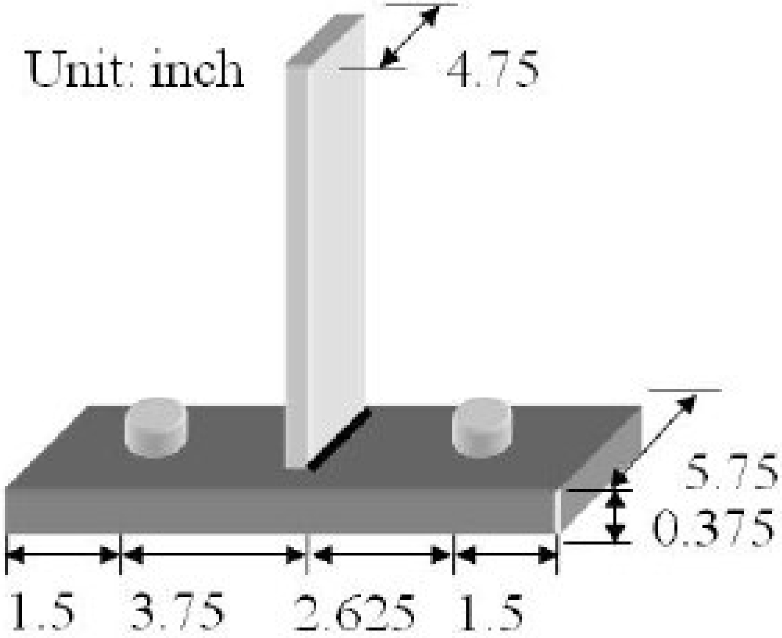
UN ENSAYO SOBRE CONEXIONES A CICLOS BAJOS DE CARGAS DE FATIGA

ANALOGIA DE LA T. PARA FUERZAS DE PALANCA.



Chemin Lim. U.
Carolina del Norte. 2009.

ENSAYOS CON LA ANALOGIA DE LA TE
FUERZAS DE PALANCA.



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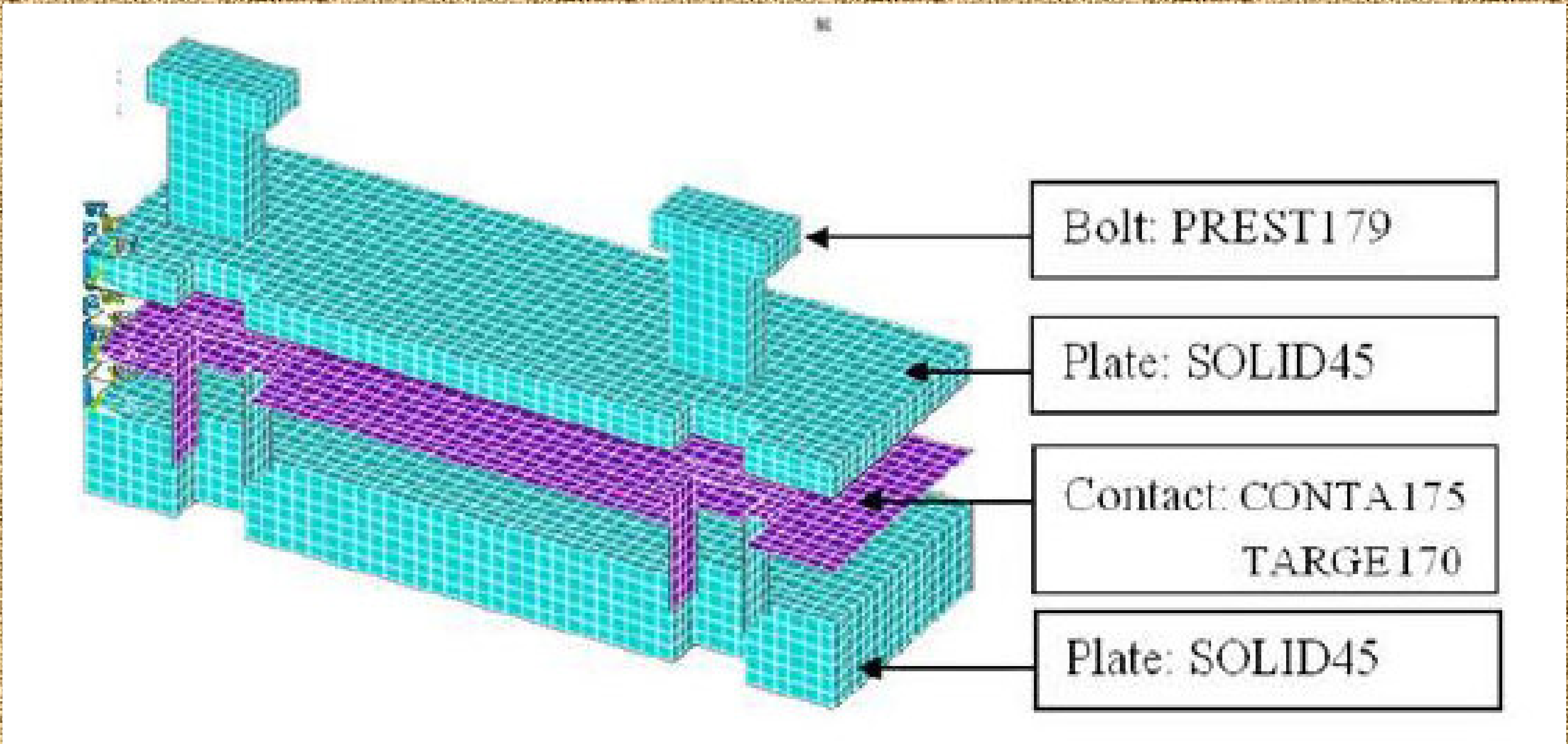
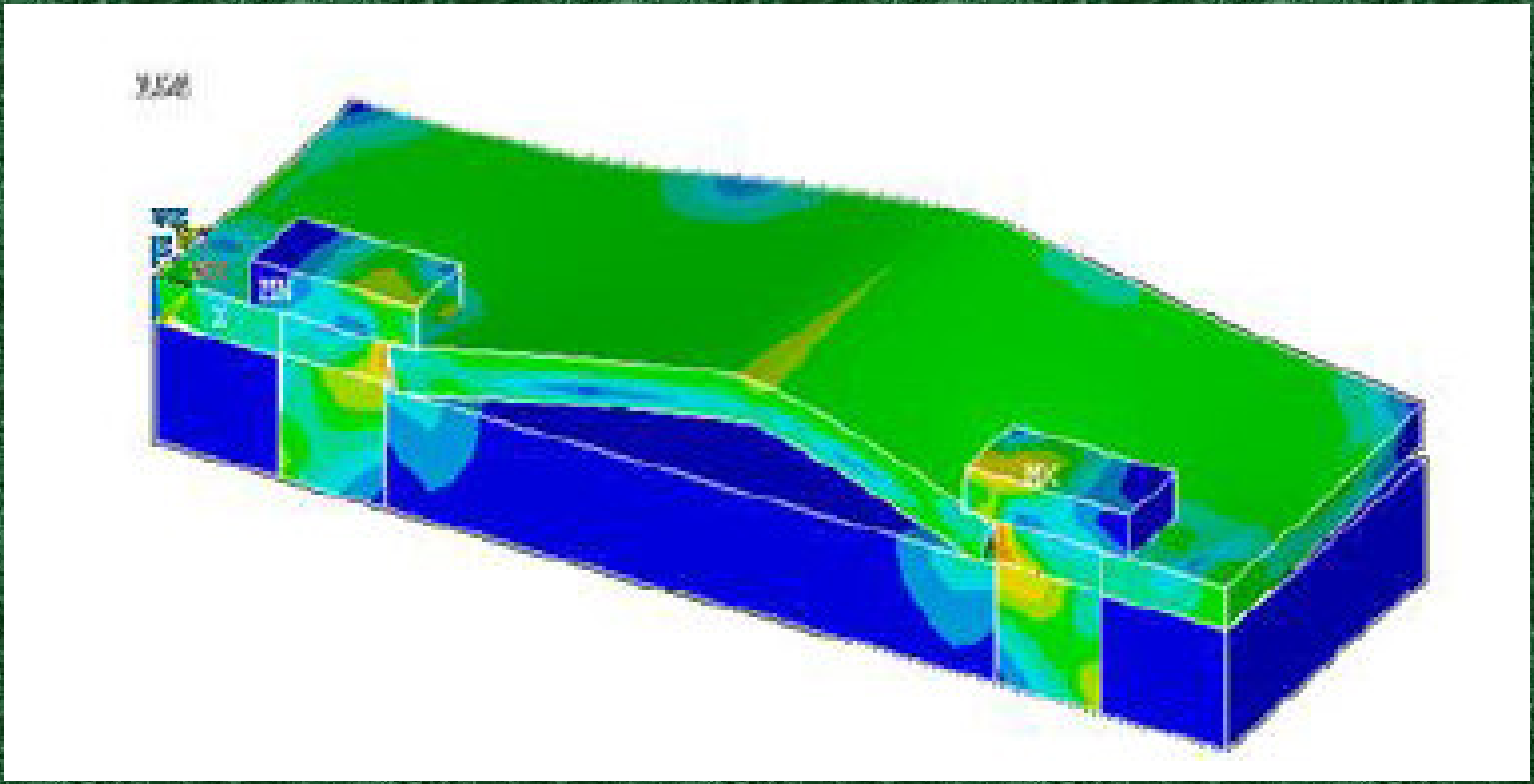
MODELACIÓN ANSYS



Chemin Lim. U.
Carolina del Norte. 2009.

ESFUERZOS VON MISES CUANDO EL ESFUERZO ES 36Ksi.



Chemin Lim. U.
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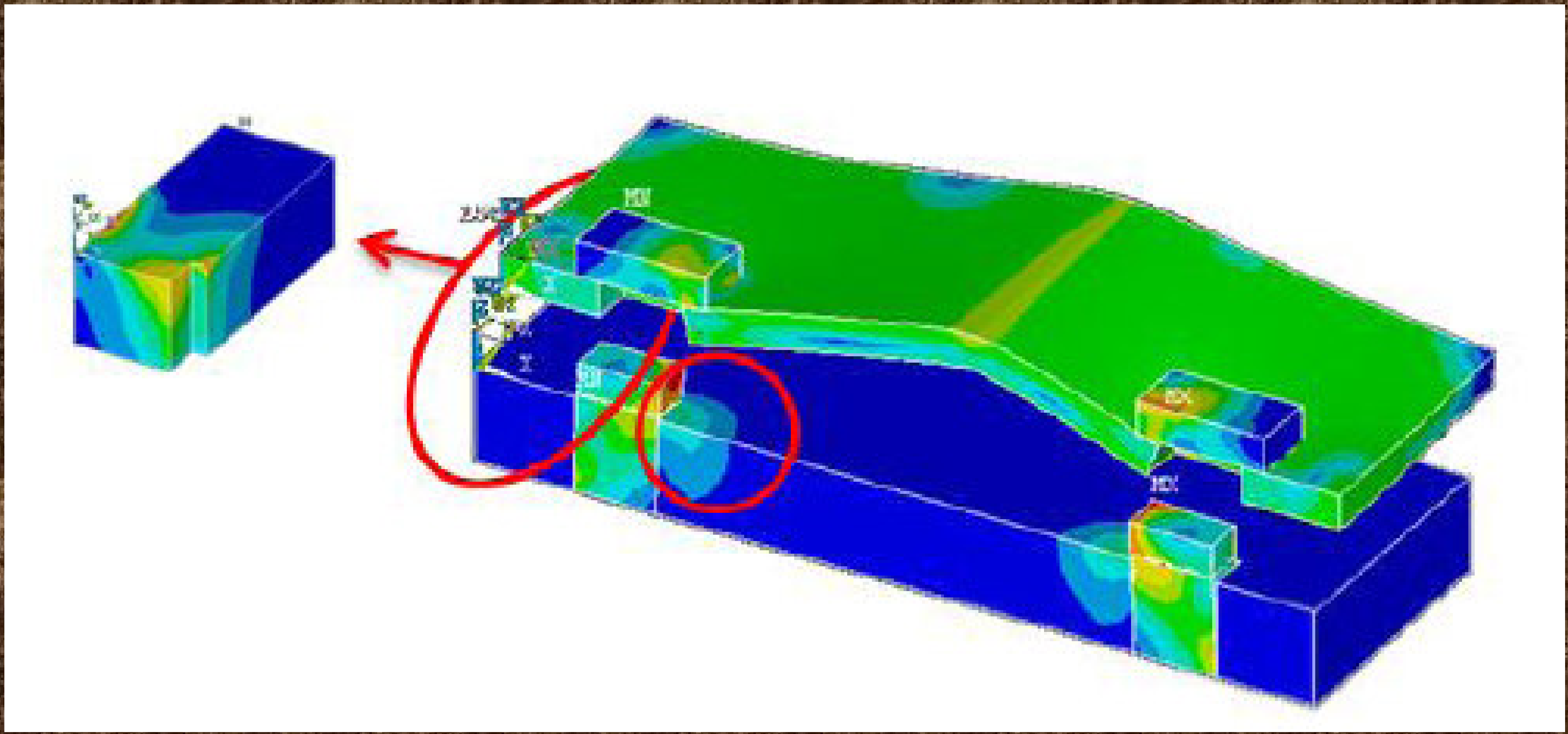
EFECTO POR CONTACTO Y POR FUERZAS DE PALANCA



Chemin Lim. U.
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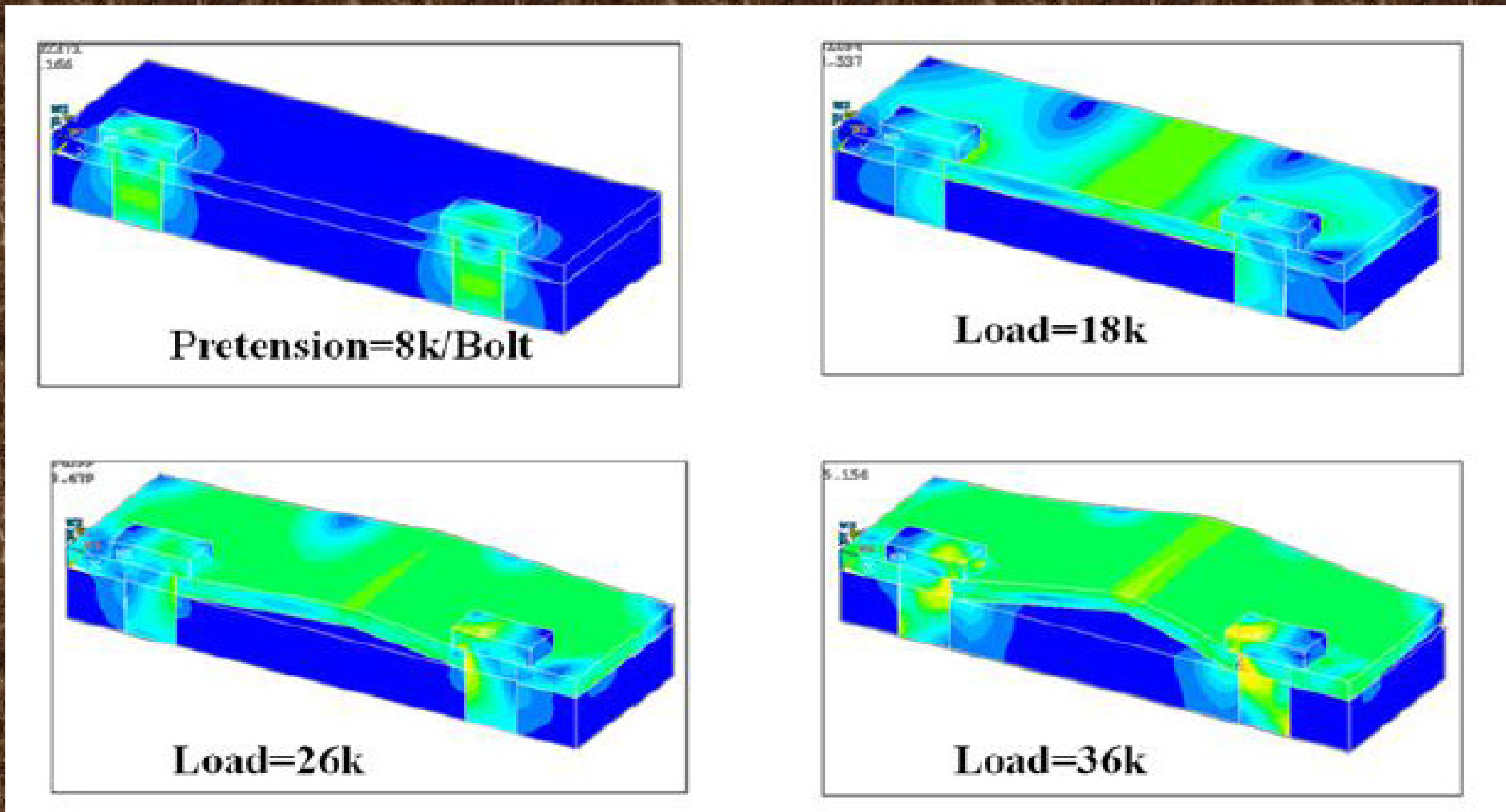
ESFUERZOS DE VON MISES Y DEFORMACIONES



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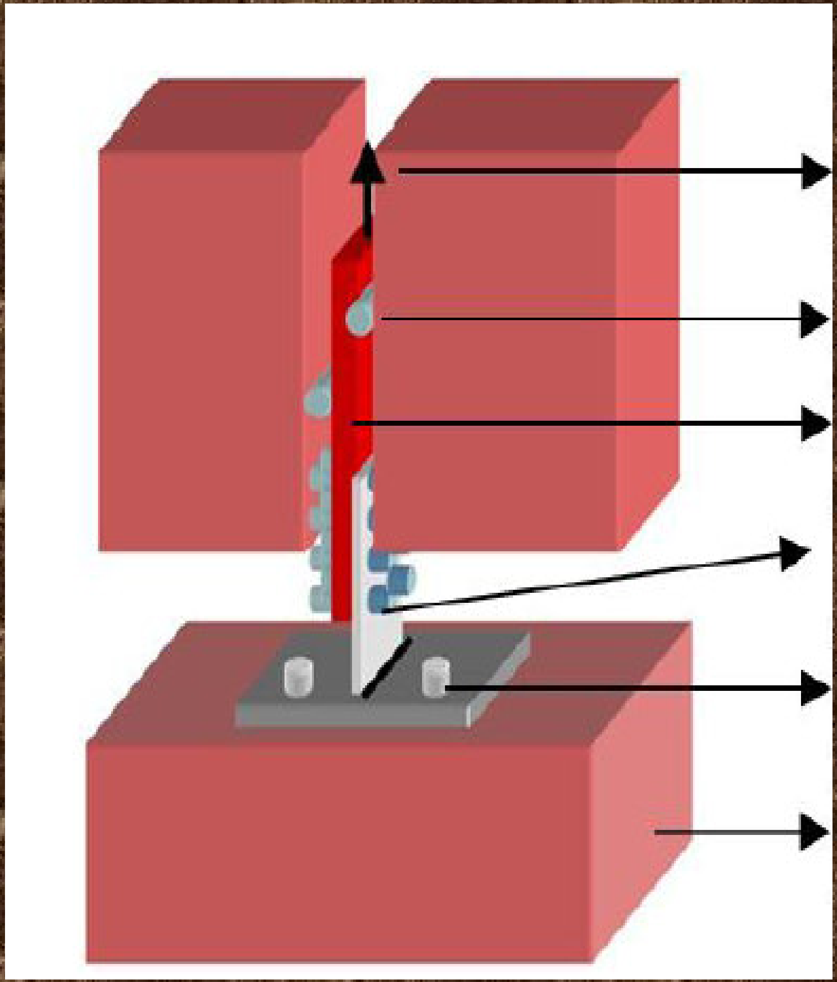
ENSAYO ANALOGIA DE LA TE



FUERZA APLICADA

ARRIOSTRAMIENTO

PLATINA DE 51mm

"TE"

ANCLAJES

VIGA SOPORTE

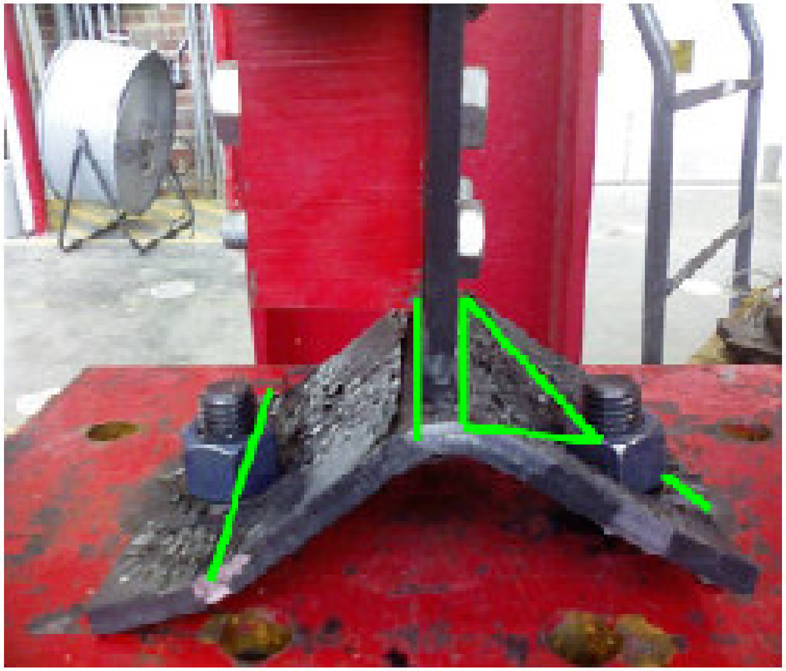
Chemin Lim. U.
Carolina del Norte. 2009.

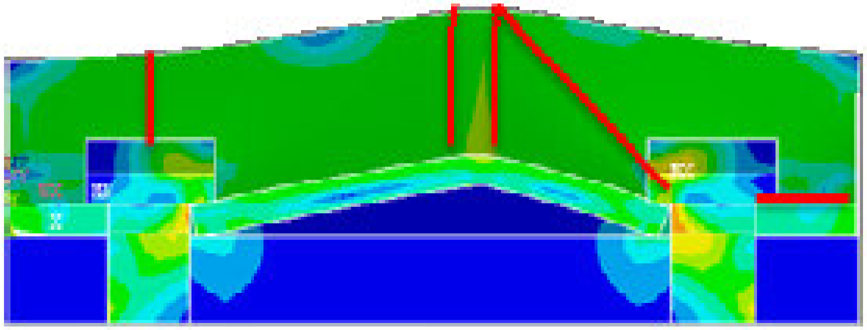
FALLA DE LA PROBETA

ETAPA 1

ETAPA 2

FALLA DE LA PROBETA

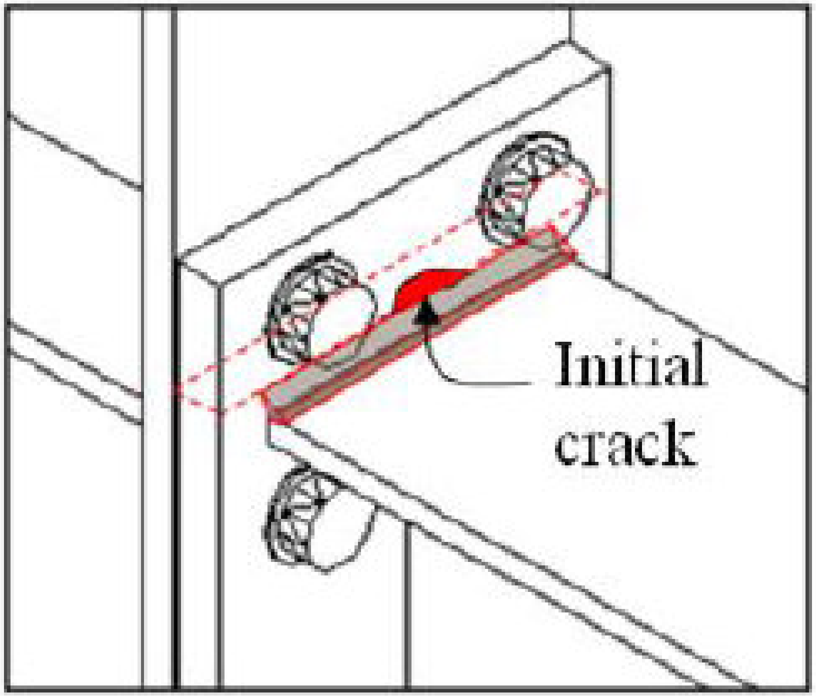




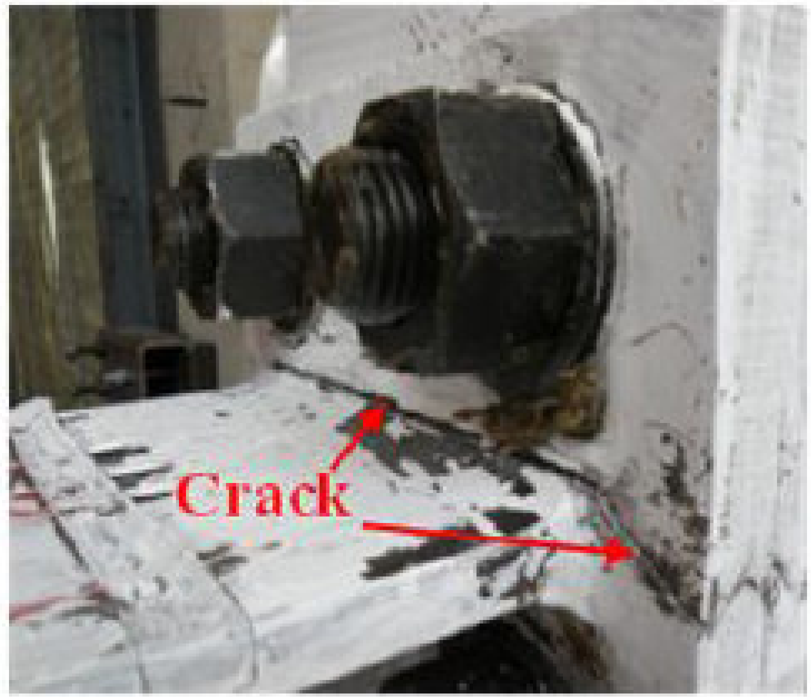
LINEAS DE FLUENCIA

VON MISES A 36Ksi

FALLA POR ROTURA



(a) FEM Illustration



(b) Experimental test

**Chemin Lim. U.
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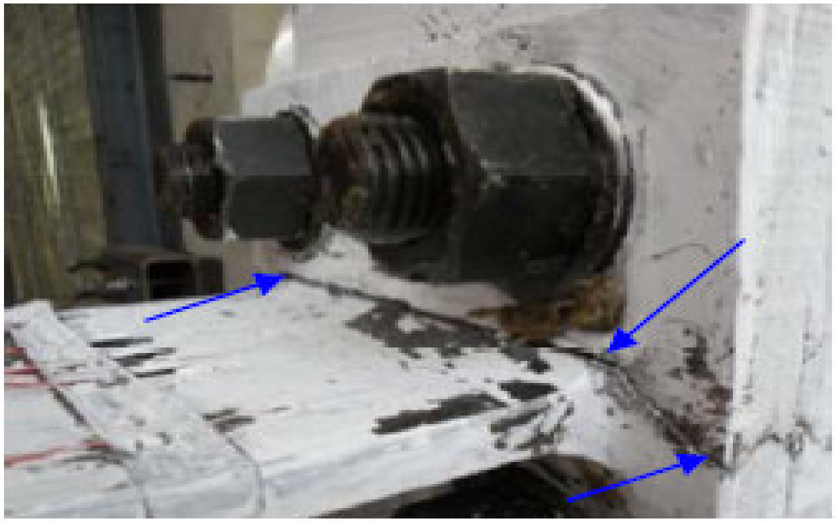
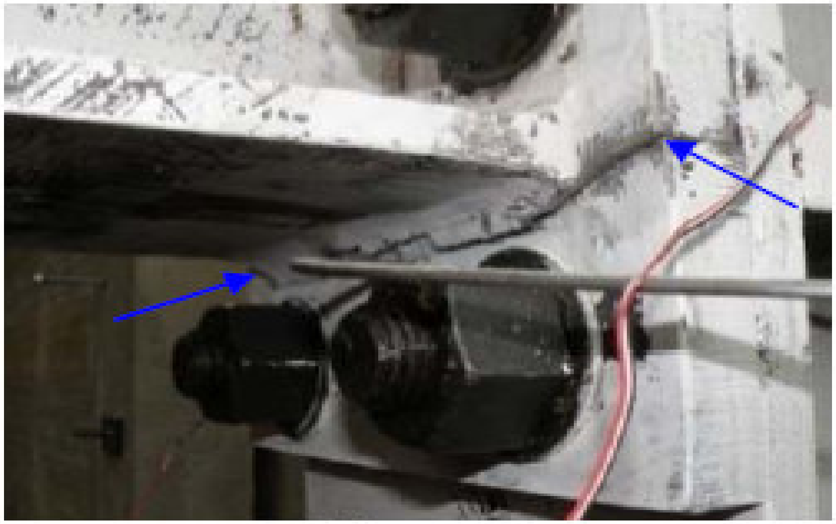
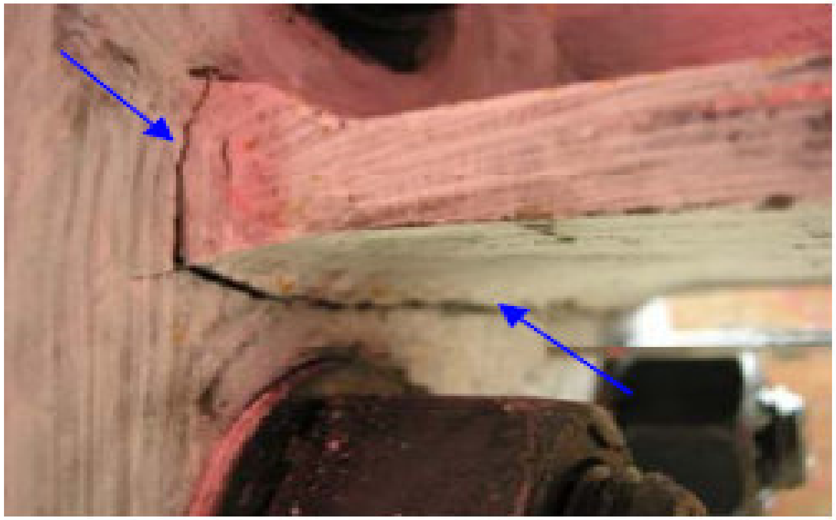
FALLA POR ROTURA



(a) LCF01



(b) LCF02



(c) LCF03

(d) LCF04

FALLA POR FUERZA DE PALANCA. PLATINA DELGADA

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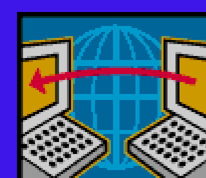
CONEXIONES

PRECALIFICADAS

VIDEO ENSAYO



CONEXIÓN PREFABRICADA 1

CONEXIÓN PREFABRICADA 1

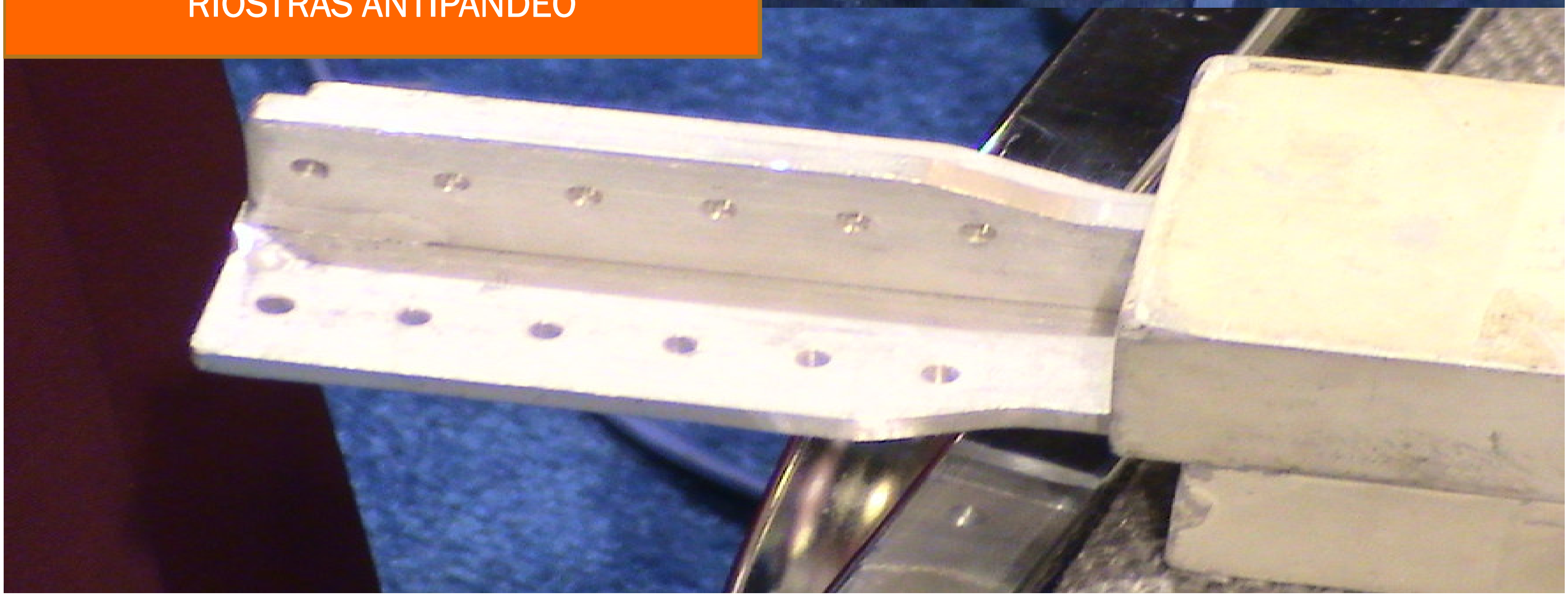
CONEXIÓN PREFABRICADA 2

CONEXIÓN PREFABRICADA 3

CONEXIÓN PREFABRICADA 4

RIOSTRAS ANTIPANDEO

RIOSTRAS ANTIPANDEO



INGENIEROS
ESTRUCTURALES LTDA

¿Y ENTONCES QUÉ PASÓ?

INGENIEROS
ESTRUCTURALES LTDA

RESISTENCIA A LA TENACIDAD DE LA SOLDADURA

7.3. Welded Joints

Welding shall be performed in accordance with Appendix W. Welding shall be performed in accordance with a welding procedure specification (WPS) as required in AWS D1.1 and approved by the engineer of record. The WPS variables shall be within the parameters established by the filler metal manufacturer.

7.3a. General Requirements

All welds used in members and connections in the SLRS shall be made with a filler metal that can produce welds that have a minimum Charpy V-Notch toughness of 20 ft-lb (27 J) at 0 °F (minus 18 °C), as determined by the appropriate AWS A5 classification test method or manufacturer certification. This requirement for notch toughness shall also apply in other cases as required in these *Provisions*.

Provisiones Sísmicas AISC 2005

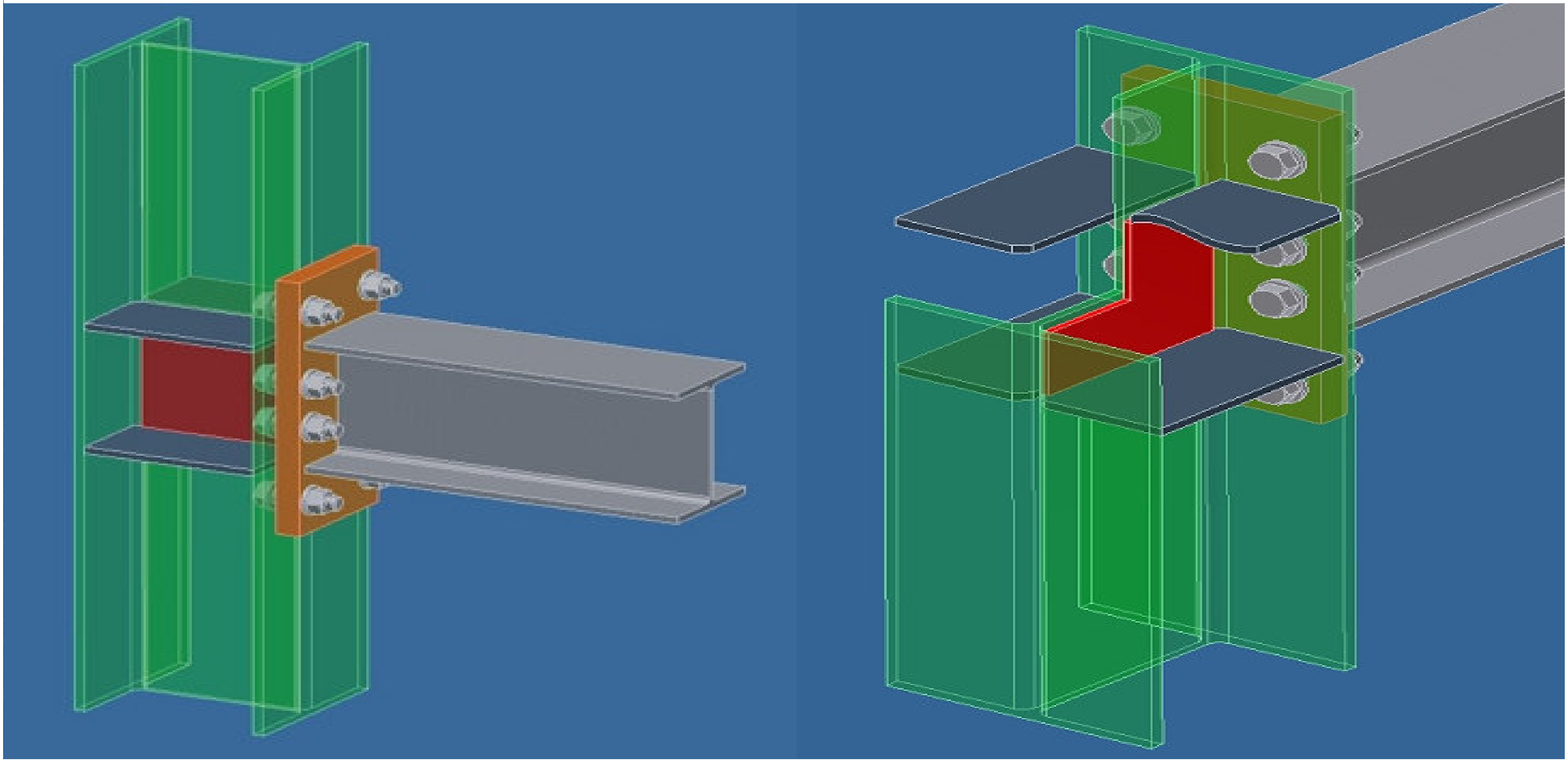
7.3b. Demand Critical Welds

Where welds are designated as *demand critical*, they shall be made with a filler metal capable of providing a minimum Charpy V-Notch (CVN) toughness of 20 ft-lb (27 J) at −20 °F (−29 °C) as determined by the appropriate AWS classification test method or manufacturer certification, and 40 ft-lb (54 J) at 70 °F (21 °C) as determined by Appendix X or other approved method, when the steel frame is normally enclosed and maintained at a temperature of 50 °F (10 °C) or higher. For structures with service temperatures lower than 50 °F (10 °C), the qualification temperature for Appendix X shall be 20 °F (11 °C) above the *lowest anticipated service temperature*, or at a lower temperature.

SMAW electrodes classified in AWS A5.1 as E7018 or E7018-X, SMAW electrodes classified in AWS A5.5 as E7018-C3L or E8018-C3, and GMAW solid electrodes are exempted from production lot testing when the CVN toughness of the electrode equals or exceeds 20 ft-lb (27 J) at a temperature not exceeding −20 °F (−29 °C) as determined by AWS classification test methods. The manufacturer's certificate of compliance shall be considered sufficient evidence of meeting this requirement.

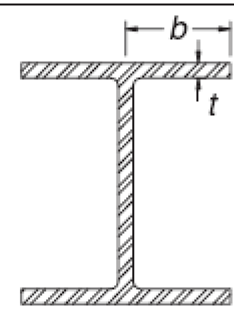
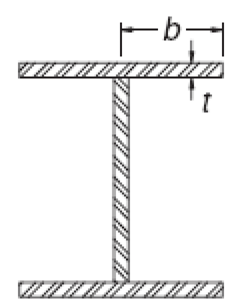
7.5. Continuity Plates and Stiffeners

Corners of *continuity plates* and stiffeners placed in the webs of rolled shapes shall be clipped as described below. Along the web, the clip shall be detailed so that the clip extends a distance of at least 1½ in. (38 mm) beyond the published k detail dimension for the rolled shape. Along the flange, the clip shall be detailed so that the clip does not exceed a distance of ½ in. (12 mm) beyond the published k_1 detail dimension. The clip shall be detailed to facilitate suitable weld terminations for both the flange weld and the web weld. If a curved clip is used, it shall have a minimum radius of ½ in. (12 mm).

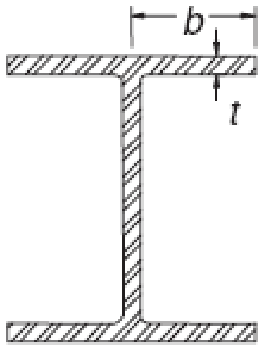
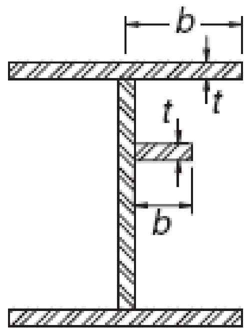


AISC-360-05 (2005)

TABLE B4.1
Limiting Width-Thickness Ratios for Compression Elements

Case	Description of Element	Width Thick-ness Ratio	Limiting Width-Thickness Ratios: λ_p (compact)	Limiting Width-Thickness Ratios: λ_r (noncompact)	Example
1	Flexure in flanges of rolled I-shaped sections and channels	b/t	$0.38\sqrt{E/F_y}$	$1.0\sqrt{E/F_y}$	
2	Flexure in flanges of doubly and singly symmetric I-shaped built-up sections	b/t	$0.38\sqrt{E/F_y}$	$0.95\sqrt{k_c E/F_L}$ [a],[b]	

AISC-360-05 (2005) TABLA B4.1

Unstiffened Elements	3	Uniform compression in flanges of rolled I-shaped sections, plates projecting from rolled I-shaped sections; outstanding legs of pairs of angles in continuous contact and flanges of channels	b/t	NA	$0.56\sqrt{E/F_y}$	
	4	Uniform compression in flanges of built-up I-shaped sections and plates or angle legs projecting from built-up I-shaped sections	b/t	NA	$0.64\sqrt{k_c E/F_y}$ [a]	

AISC 341-05 PROVISIONES SÍSMICAS

TABLE I-8-1
Limiting Width-Thickness Ratios for Compression Elements

	Description of Element	Width-Thickness Ratio	Limiting Width-Thickness Ratios: λ_{ps} (seismically compact)
Unstiffened Elements	Flexure in flanges of rolled or built-up I-shaped sections [a], [c], [e], [g], [h]	b/t	$0.30\sqrt{E/F_y}$
	Uniform compression in flanges of rolled or built-up I-shaped sections [b], [h]	b/t	$0.30\sqrt{E/F_y}$
	Uniform compression in flanges of rolled or built-up I-shaped sections [d]	b/t	$0.38\sqrt{E/F_y}$
	Uniform compression in flanges of channels, outstanding legs of pairs of angles in continuous contact, and braces [c], [g]	b/t	$0.30\sqrt{E/F_y}$
	Uniform compression in flanges of H-pile sections	b/t	$0.45\sqrt{E/F_y}$
	Flat bars [f]	b/t	2.5

AISC 358-05 CONEXIONES PLACA DE EXTREMO

TABLE 6.1.
Parametric Limitations on Prequalification

Parameter	Four-Bolt Unstiffened (4E)		Four-Bolt Stiffened (4ES)		Eight-Bolt Stiffened (8ES)	
	Maximum in. (mm)	Minimum in. (mm)	Maximum in. (mm)	Minimum in. (mm)	Maximum in. (mm)	Minimum in. (mm)
t_p	2 1/4 (57)	1/2 (13)	1 1/2 (38)	1/2 (13)	2 1/2 (64)	3/4 (19)
b_p	10 3/4 (273)	7 (178)	10 3/4 (273)	10 3/4 (273)	15 (381)	9 (229)
g	6 (152)	4 (102)	6 (152)	3 1/4 (83)	6 (152)	5 (127)
p_{fi}, p_{fo}	4 1/2 (114)	1 1/2 (38)	5 1/2 (140)	1 3/4 (44)	2 (51)	1 3/4 (44)
p_b	—	—	—	—	3 3/4 (95)	3 1/2 (89)
d	55 (1400)	25 (635)	24 (610)	13 3/4 (349)	36 (914)	18 1/2 (470)
t_{bf}	3/4 (19)	3/8 (10)	3/4 (19)	3/8 (10)	1 (25)	19/32 (16)
b_{bf}	9 1/4 (235)	6 (152)	9 (229)	6 (152)	12 1/4 (311)	7 3/4 (197)

AISC 360-05

TABLE J2.4
Minimum Size of Fillet Welds

Material Thickness of Thinner Part Joined, in. (mm)	Minimum Size of Fillet Weld,[a] in. (mm)
To $^{1}/_{4}$ (6) inclusive	$^{1}/_{8}$ (3)
Over $^{1}/_{4}$ (6) to $^{1}/_{2}$ (13)	$^{3}/_{16}$ (5)
Over $^{1}/_{2}$ (13) to $^{3}/_{4}$ (19)	$^{1}/_{4}$ (6)
Over $^{3}/_{4}$ (19)	$^{5}/_{16}$ (8)

[a] Leg dimension of fillet welds. Single pass welds must be used.

Note: See Section J2.2b for maximum size of fillet welds.

AISC 358-05

6.7 Continuity Plates

Continuity plates shall satisfy the following limitations:

(1) The need for continuity plates shall be determined in accordance with Section 6.10.

(2) When provided, continuity plates shall conform to the requirements of Section 6.10.

(3) Continuity plates shall be attached to columns by welds in accordance with Section 2.4.4b and Section 3.6.

Exception: Continuity plates less than or equal to $^3/_8$ in. (10 mm) shall be permitted to be welded to column flanges using double-sided fillet welds. The required strength of the fillet weld shall not be less than $F_y A_c$, where A_c is defined as the contact areas between the continuity plate and the column flanges that have attached beam flanges and F_y is defined as the specified minimum yield stress of the continuity plate.

AISC 358-05

6.9.7 Welding Details

Welding of the beam to the end-plate shall conform to the following limitations:

(1) Weld access holes shall not be used.

(2) The beam web to end-plate joint shall be made using either fillet welds or *complete joint penetration (CJP) groove welds*. When used, the fillet welds shall be sized to develop the full strength of the beam web in tension from the inside face of the flange to 6 in. (150 mm) beyond the bolt row farthest from the beam flange.

(3) The beam flange to end-plate joint shall be made using a CJP groove weld without *backing*. The CJP groove weld shall be made such that the *root* of the weld is on the beam web side of the flange. The inside face of the flange shall have a 5/16-in. (8-mm) fillet weld. These welds shall be demand critical.

(4) Backgouging of the *root* is not required in the flange directly above and below the beam web for a length equal to $1.5k_1$. A full-depth PJP groove weld shall be permitted at this location.

(5) When used, all end-plate stiffener joints shall be made using CJP groove welds.

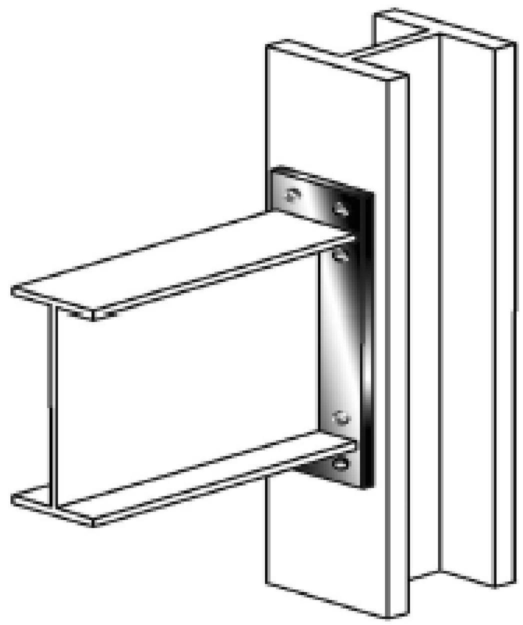
Exception: When the stiffener is 3/8-in. (10-mm) thick or less, it shall be permitted to use fillet welds that develop the strength of the stiffener.

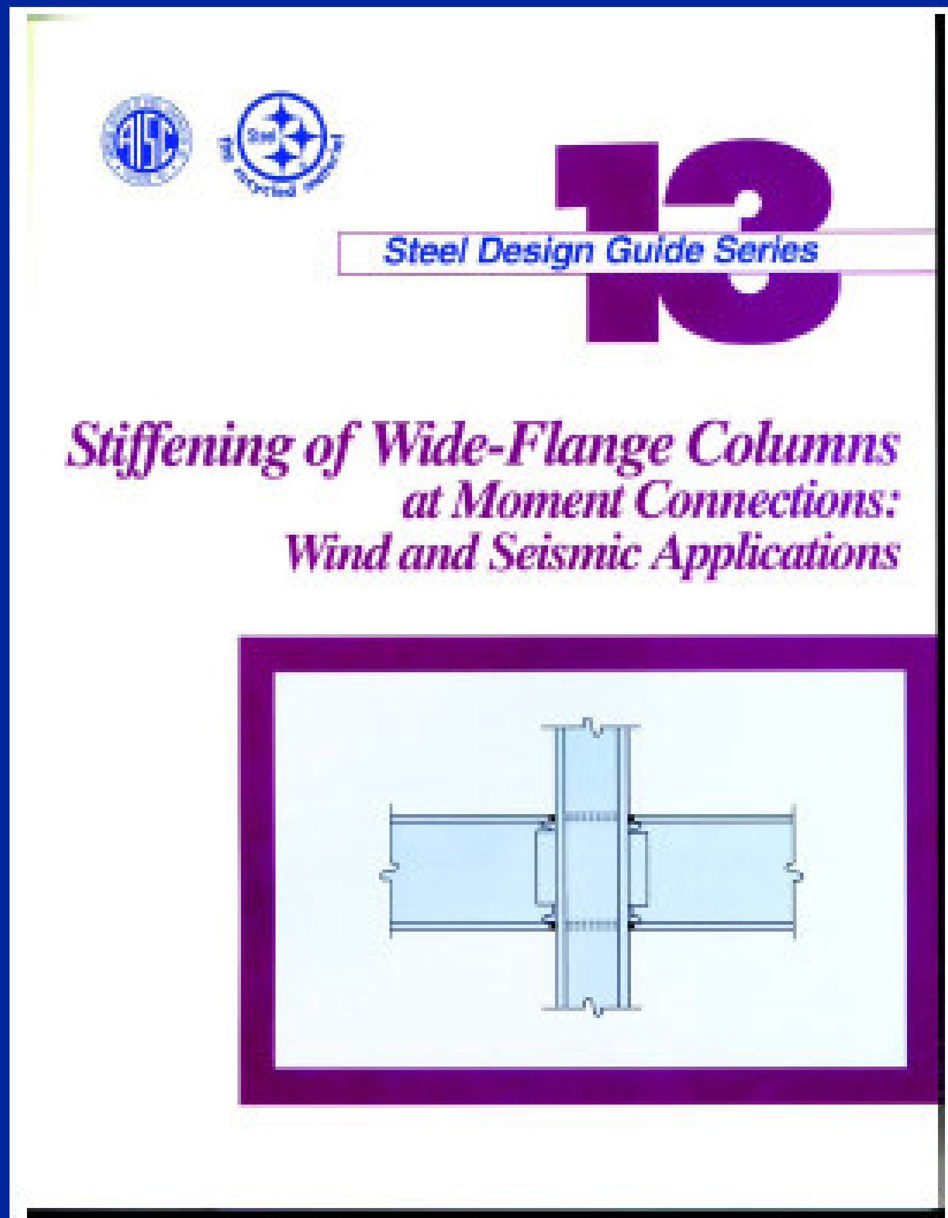
Steel Design Guide 4

Extended End-Plate Moment Connections

Seismic and Wind Applications

Second Edition

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March 9, 2005

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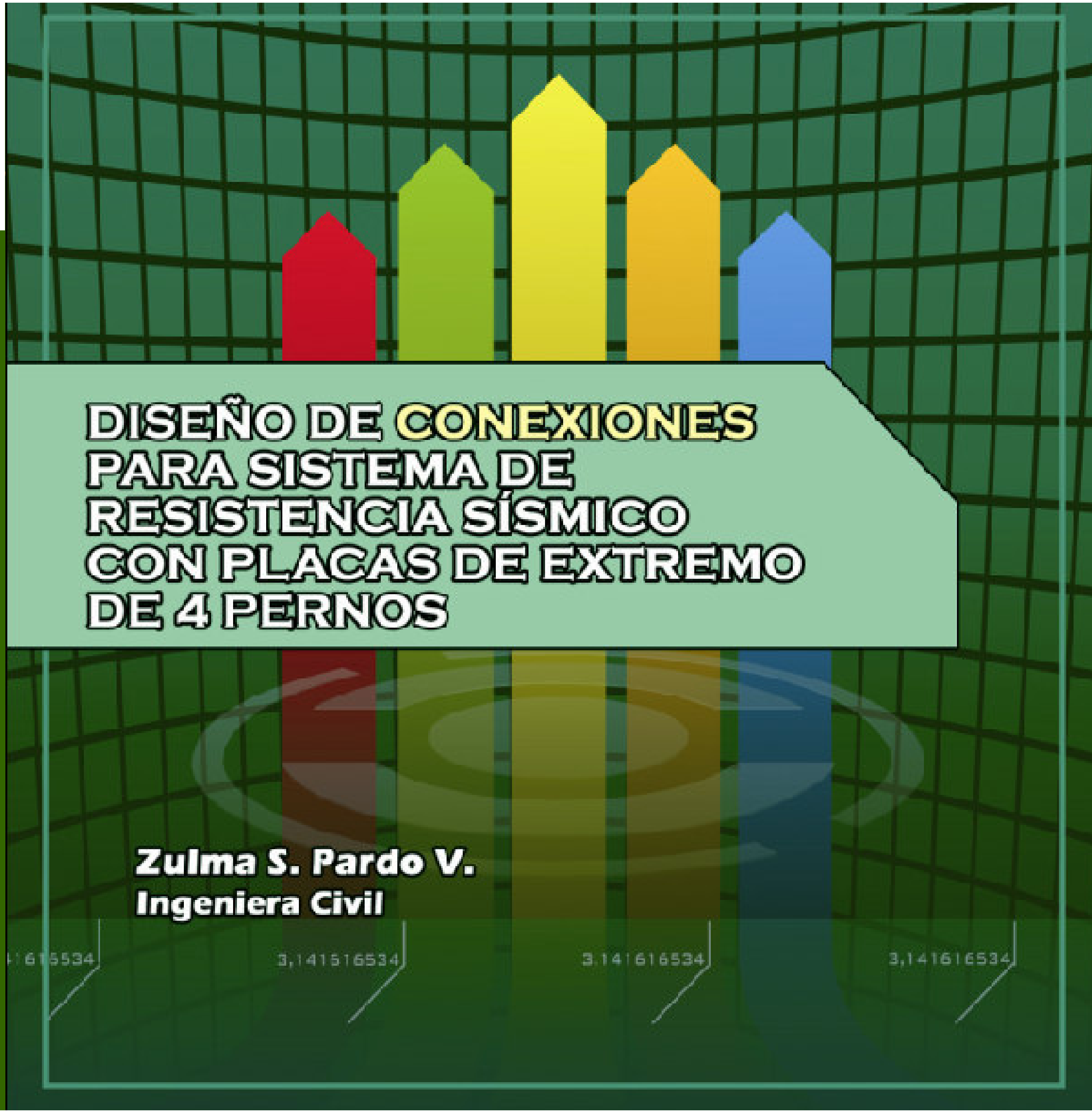

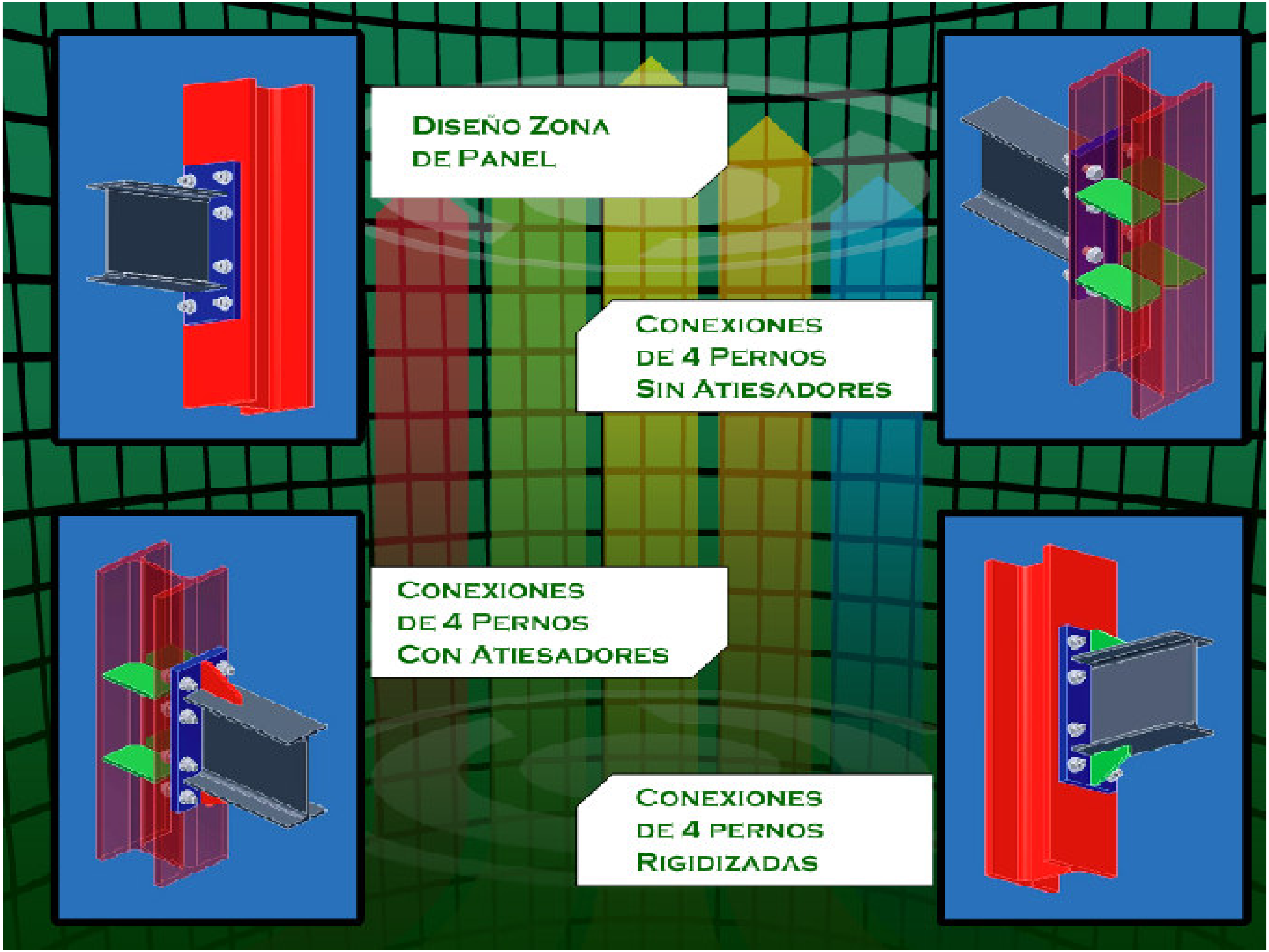
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