

Escuela Técnica Superior de Ingenieros de Caminos, Canales y Puertos.

Elastic Lateral Orsional Buckling Girders with Corrugated Web Equivalent Section Properties Approach (EIDEIO

Introduction

1-Purposeof the paper

Determine the Critical lateral-torsional buckling moment of girder with corrugated webs



2- Equivalents ection properties

Similar behavior to flat web girders



Theoretical formula of critical moment

Appropriate values for section properties.

$$M_{cr,co} = \frac{\pi^2 EI_{z,co}}{L^2} \sqrt{\frac{w,co}{I_{z,co}}} + \frac{L^2 CI_{t,co}}{\pi^2 EI_{z,co}}$$

2- Equivalents ection properties

FEM \implies numerical results



2- Equivalents ection properties

Bending properties

$$F \qquad \Longrightarrow \qquad I_{z,\infty} = \frac{FL^3}{3E\delta}$$



2- Equivalentsectionproperties FEMnumerical results

closed-form formulas

I_{z,co,NP} I_{t,co,NP} I_{w,co,NP}



$$M_{cr,co,NP} = \frac{\pi^2 E I_{z,co,NP}}{L^2} \sqrt{\frac{I_{w,co,NP}}{I_{z,co,NP}} + \frac{L^2 G I_{t,co,NP}}{\pi^2 E I_{z,co,NP}}}$$

2- Equivalentsection properties



Previous approaches

Theoretical formula of critical moment

Change some of the section properties values

Author	Approach
Lindner	$I_{w,\infty} = I_{w0} + C_w \frac{L^2}{\pi^2 E}$ $I_{t,\infty} = I_{t0}$ $I_{z,\infty} = I_{z0}$
Larsson and Persson	$I_{t,\infty} = I_{t0} + \frac{C_w}{G} \qquad \qquad I_{w,\infty} = I_{w0} \qquad \qquad I_{z,\infty} = I_{z0}$
Moon et al.	$I_{w,\infty} = \frac{1}{3} \sum \left(W_{ni}^2 + W_{ni} W_{nj} + W_{nj}^2 \right) t_{ij} L_{ij} \qquad I_{t,\infty} = I_{t0} \qquad I_{z,\infty} = I_{z0}$
Zhang et al.	$I_{w,\infty} = I_{w0} + \frac{t_w h_m^3 d^2 (3a+b)}{72(a+b)} \qquad I_{t,\infty} = I_{t0} \qquad I_{z,\infty} = I_{z0}$
Sayed-Ajmed	$t_{w,eq} = \frac{a+c}{a+b} t_{w} \qquad \Longrightarrow \qquad I_{t,\infty}; I_{w,\infty}; I_{z,\infty}$
Nguyen et al.	$I_{z,\infty} = \frac{t_t b_t (2t_t b_t^3 + t_w h_m b_t^2 + 12d^2 t_w h_m)}{6(2t_t b_t + t_w h_m)} t_w \qquad I_{t,\infty} = I_{t0} \qquad I_{w,\infty} = I_{z0}$

EIDEIC contents:



COMPETENCES





ESTIMATED DATE



Date

CORE COMPETENCES of a PHD STUDENT

- CB11 Systematic understanding of a field of study and mastery of the skills and research methods associated with that field.
- CB12 Ability to conceive, design, or create, implement, and adopt a substantial research or creative process.
- CB13 Ability to contribute to the expansion of the boundaries of knowledge through original research.
- CB14 Ability to critically analyze, evaluate, and synthesize new and complex ideas.
- CB15 Ability to communicate with the academic and scientific community and with society in general about their areas of knowledge in the modes and languages commonly used in their international scientific community.
- CB16 Ability to promote scientific, technological, social, artistic, or cultural advancement within a knowledge-based society, in academic and professional contexts.



CB12

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CB11

Potential Work on it Adquisition

CB14

CB13

CB15

CB16

2







- 2024 january: analysis and numerical results
- 2024 june: 2nd important paper
- 2025 june: final text
- 2025 december: PhD presentation



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THANKS

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