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Behavior of full strength built-up T-stub connections for seismic areas

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This research aims at widening the applicability of T-stub connections by investigating the behavior of thick-flange built-up T-stubs needed for deep beams which meet the prequalification requirements for moment resisting frames (MRF) in seismic areas. Often the heavy rolled profiles needed to fabricate the T-stub for such deep beams are not immediately available to fabricators and so built-up sections are the only alternative. In this study, finite element (FE) simulations and experimental testing are used to provide the data set needed to develop mathematical models to predict the behavior of thick-flange T-stub connections. First, results obtained from plates tested to evaluate the influence of the whole fabrication practices show that standard drilled or standard flame cut can be used in detailing T-stub connections. Thick-flange T-stub components tested to establish design guidelines and to detail full-scale specimens for prequalification in MRF used with deep beams show that both thick-flange T-stub components built-up either by complete joint penetration (CJP) or fillet welds are acceptable. The T-stub component tests results are also used to validate the prediction of the load-deformation behavior up to failure obtained from three dimensional (3D) FE models. A failure limit state is highlighted, which is partial yielding at the K-zone followed by bolt fracture, with or without prying. Second, using the results from a parametric study, cases for thick-flange T-stub connection geometries needed for deep beams are identified, and 3D FE models are developed. Using FE results, two separate prying strength models for thick-flange T-stubs with CJP and fillet welds are developed. The models are validated by comparing with FE and experimental results obtained for connections designed for deep beams. Third, a mechanistic model based on a combination of stiffness approach modified with FE results is developed. The connection response is modeled on the basis of beam representation for the flange, multi-linear spring for the bolt forces, nonlinear torsion spring at the K-zone to account for the partial yielding, and accounting for prying phenomenon. The model shows excellent agreement with finite element results obtained for the same full-scale connections considered for the prying strength study. Fourth, 3D FE models were extended to include the column-side of the connection. The results are used to evaluate the effect of secondary prying in the T-flange/column-flange systems with and without continuity plates. Criteria for providing continuity plates are developed to guide the designer in the detailing process. Also, a model that quantifies the amount of total prying is developed. Finally, a design methodology for thick-flange T-stub connections in seismic areas which provides designers a workable option for practical application is proposed.

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Case studies in construction material of tourism in Cuba

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This paper discusses a methodology for the assessment of tourist construction located in Cuban coastal ecosystems in which the general aspects of the process are discussed, defined and characterized and examines the main processes that occur as a result of the negative impacts of construction material activities. It establishes the theoretical conceptual framework underlying the research and includes a detailed analysis and processing of a sample of tourism projects. The methodology is complemented by results that include proposed strategic lines of action and a plan for managing negative environmental impacts throughout the life cycle in construction material of tourist facilities through prevention, correction and mitigation measures. It ends with conclusions and recommendations to guide tourism development toward environmental sustainability.

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