Technical Interview

Design of Concrete Filled Hollow Sections

How to design concrete filled hollow section columns and connections

Paul Watson, Structural Technical Advisory Engineer at Tata Steel, has worked closely with industry and the University of Manchester to develop practical design guidance, training sessions, and tools, to aid the design of composite concrete filled hollow section columns. Paul has given guidance to leading consultants working on various projects in the UK and overseas and is available to answer queries regarding this form of construction.

Why should I consider designing and specifying concrete filled hollow section columns?

Structural hollow sections make the most efficient compression members, filling them with concrete may give further advantages, which may include higher capacity, reduced section diameter, and improved resistance to fire. In the UK, specification of concrete filled tube (CFT) columns tends to be driven by a desire to reduce the requirement of external fire protection, for visually exposed columns.

Specifying Concrete Filled Tubes (CFT) columns makes sense for my project, how can you make my life easier?

We recently published an updated version of our design guide, a comprehensive document, which describes all aspects of design and construction with CFT columns and worked example calculations. See link for more information.

Is the publication fully in line with European standards for the design of concrete filled hollow sections ?"

Yes, this new guidance document has been updated to be consistent with the requirements of Eurocode 4: Design of composite steel and concrete structures:
Part 1-1: General rules and rules for buildings (BS EN 1994-1-1:2004)
Part 1-2: General rules - Structural fire design (BS EN 1994-1-2:2005)
This includes the provisions of each standard's UK National Annex.

Do you also provide free software, which is also in line with the Eurocodes?

Yes, we've developed an Excel compatible plug-in called FireSoft that will make design calculations much easier and faster for both ambient and elevated temperature design. The front page also gives instructions on how to use FireSoft.

How can I be sure that your design tools are compliant with the latest version of the standard?

Tata Steel is represented on EN bodies so we're always up to date with any developments regarding Eurocodes. The design guide constitutes Non Conflicting Complementary Information (NCCI) to Eurocode 4 and the Firesoft software has comprehensive Quality Assurance documentation and update module.

Does your publication cover fabrication and buildability?

Yes. In order to benefit from the advantages of speed and flexibility in composite construction, it is essential to have a good understanding of the influence of external fire protection schemes, load transfer through connections, reinforcement and steelwork detailing, concrete-filling and construction sequencing. The authors of the design guide have incorporated relevant industry knowledge, based on previous projects.

Your publication includes lots of formulae. Does your software make it easier to apply these?

Yes it does. The Eurocode 4 design methodology is inherently iterative and relies on the development of software to provide solutions, whether that is in-house or third party software.

What kind of columns does the FireSoft software cover?

The FireSoft software will calculate the capacity of a plain fill or reinforced CFT column at ambient temperature and for R30, R60, R90 and R120 fire periods. The software is restricted to simple construction and is designed for application of Tata Steel Celsius® 355 NH.

Is the software easy to use?

Yes. The inputs required for the software are section size, effective length, concrete grade and any reinforcement if required. The reinforcement can be scheduled using a handy quick tool or specified manually. Although possible to change the default material parameters, it is recommended to use the Eurocode 4 defaults. The outputs are column capacities for the various fire periods.

The software is therefore easy to use. However, should you consider it necessary, we offer a free seminar that covers the use of the software and gives an in-depth insight into the design guide.
We would also suggest that you familiarise yourself with the material in the quality assurance manual, provided with the software, which has worked examples and covers the design basis of the software.

How do I access Tata Steel's design guide for Concrete Filled Tubular sections?

You can download the publication by clicking the below link:
http://www.steelconstruction.info/Design_software_and_tools#FireSoft_-_concrete_filled.2C_hot_finished_structural_hollow_section_columns_in_fire_and_ambient_conditions

How can I obtain the Tata Steel FireSoft software?

Simply email technicalmarketing@tatasteel.com requesting a copy of the software. A return email will be sent with a link to the software and simple installation instructions.

For queries on concrete filled hollow sections, in house training, or more information about Tata Steel's free design software FireSoft, please contact us at:
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