



## QUICK START GUIDE 8: HYDROCARBON FEATURES

This note guides users on the hydrocarbon specific features of Quantifire. Note that users of this guide are assumed to be familiar with Quantifire and the contents of guides 1 and 2.

### 1. OVERVIEW

Quantifire version 1.7.0.0 introduced a dedicated hydrocarbon mode, bringing together existing HC features, introducing new features, and giving more control over whether these features are enabled.

The HC mode is enabled via the main menu. Click the HC mode button and enabled it on the *Hydrocarbon Mode Options* form as shown below. This form is shown automatically when products with hydrocarbon certification are loaded.

Quantifire main menu

Import section list Save job Create report Change products loaded

MTO columns visible Base units Steel weight unit DFT units

Hydrocarbon Mode Options

Hydrocarbon mode  
 On  Off

Calculation options

Use column certification for beams when no beam certificate is available  
 Note: applies to all products loaded

Enable UL 1709 single thickness mode  
 Note: only applies to certificates with a single A/V (W/D) value

View options

Replace 'Duration' with 'Total duration' on reports

Show bracing, composite and decking options

DFT units

millimetres  mils  
 inch fractions  inches

Beam options

Beams default sides:  
 3 sides

3 sided beams calculated as:  
 1. Top flange not exposed to fire

Description:  
 Appropriate for beams supporting concrete slabs or other materials with a significant heat sink and fire resistance

NOTE:  
 Top flange exposed options only apply to serial I-sections, custom PG sections and both serial and custom SHS/RHS sections.  
 Options 3 and 4 are not applicable to box design (inc. RHS/SHS) and option 2 will be used instead.

MTO Builder formatting

Show line formatting

Move controls with scroll

Show DFTs as fractions

HC mode: on

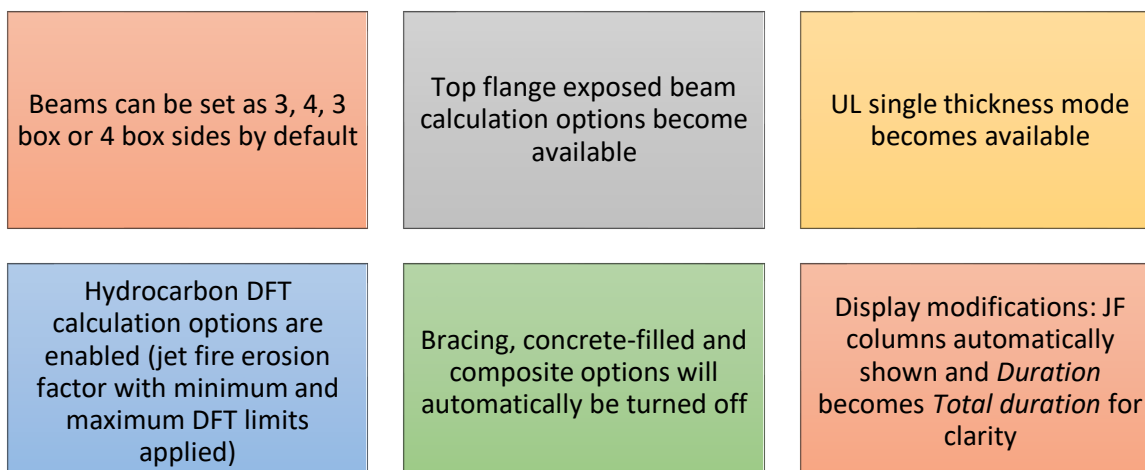
Tcrit calc default settings

Proceed

Note: default sides also applies to imports if the no. of sides isn't given

## 2. HYDROCARBON MODE FEATURES

Enabling the hydrocarbon mode has the following effects:



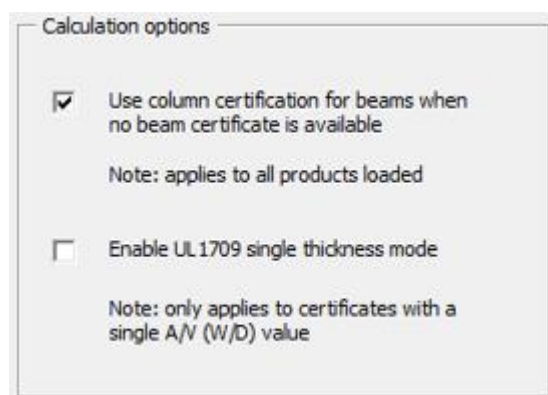
Note: that the options apply across the entire job. Therefore it is not possible to enter a mix of options (for example it is not possible for some sections to 3 sided composite beams with the ASFP void handling method and further sections as top flange-exposed).

## 3. CALCULATION OPTIONS

The hydrocarbon industry commonly uses column certification for beams as well (e.g. UL certification) on the basis that most beams are treated as 4-sided, and use of column is hence widely accepted. By default, the hydrocarbon mode will enable the option to use column certification for beams (in the absence of dedicated beam certification).

A historical, albeit common, approach to using UL 1709 certification was to test a W10x49 column and to apply the thickness derived for a given period of fire resistance to all sections, regardless of section factor (and despite this practice never being endorsed by UL and UL1709 certification always stating the applicability to heavier sections only). PFP Specialists do not endorse this approach in any way, however, and recognising that the approach is still common in some areas, the option is provided in Quantifire to enable a single-thickness approach.

Note the UL1709 single-thickness methodology is only applicable to certificates with a single section factor value. Certificates with multiple section factor values will be unaffected by this option.



### Divisions

Divisions must be entered as custom sections. See section 24.7 of the main manual (Iss. 10) for the method of entry and calculation.

#### 4. THREE-SIDED BEAM CALCULATION OPTIONS FOR HYDROCARBON

Four different options are available for the calculation of surface area and section factor of beams:

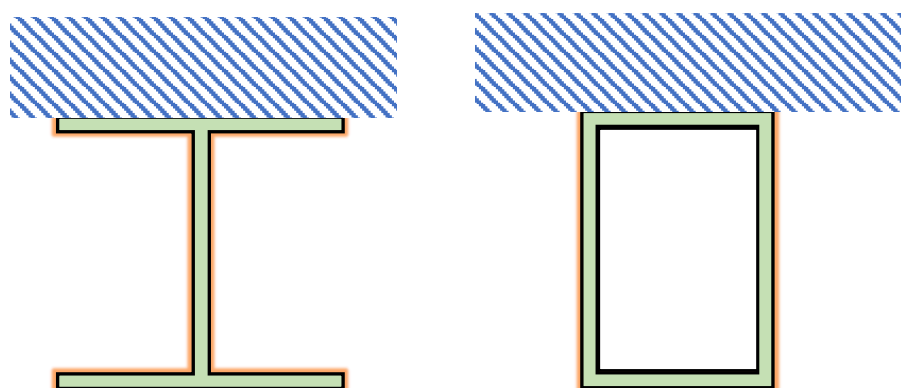
##### 1. Top flange not exposed to fire

This can be considered the 'standard' 3-sided approach for cellulosic fires, whereby the top flange is in contact with concrete or other material that is insulative and has fire resistance equivalent to, or better than, the protected section. This option would be suitable for a protected deck plate.

*Protected area:* 3-sides

*Section factor:* 3-sided exposure with a concrete slab on top

*Applicable to:* all section types, box and profile design.



*Beam calculation method 1 – traditional 3-sided protection of the shape shaded in green (3 sides protected surface area and section factor based on 3 sided exposure of the shape shaded blue)*

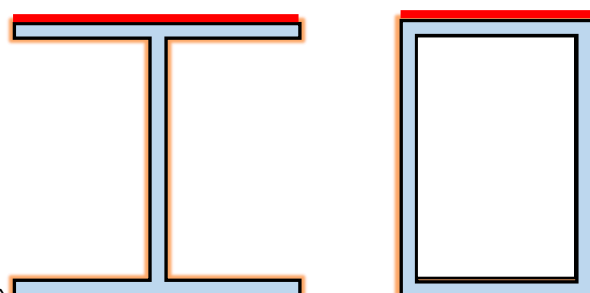
##### 2. Top of top flange exposed but unprotected

This represents a typical hydrocarbon scenario where the top of the top flange is left unprotected, as discussed in API 2218 as an option.

*Protected area:* as per 3-sided exposure

*Section factor:* as per 4-sided exposure

*Applicable to:* I-sections, RHS sections, SHS sections. These can be serial or custom, box and profile design.



*Beam calculation method 2 – red line exposed to fire and excluded from protected surface area, section factor based on 4 sided exposure of shape shaded blue*

### 3. Top and sides of top flange exposed but unprotected

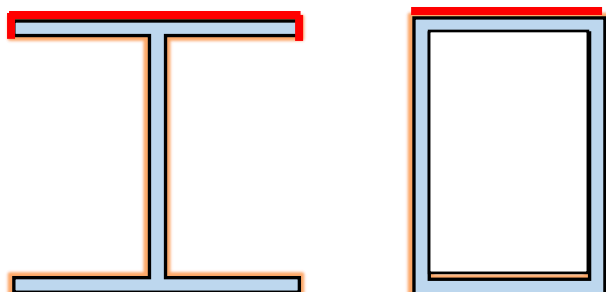
As option two, but with the sides of the top flange unprotected, representing termination on the underside of the bottom flange as is common for intumescent.

*Protected area:* as per 3-sided exposure less the sides of the top flange

*Section factor:* as per 4-sided exposure

Applicable to: I-sections with profile design only. These can be serial or custom.

NOTE: RHS, SHS and I-section box designs will revert to option 2



*Beam calculation method 3 – red line exposed to fire and excluded from protected surface area, section factor based on 4 sided exposure of shape shaded blue*

### 4. Top flange exposed and entirely ignored

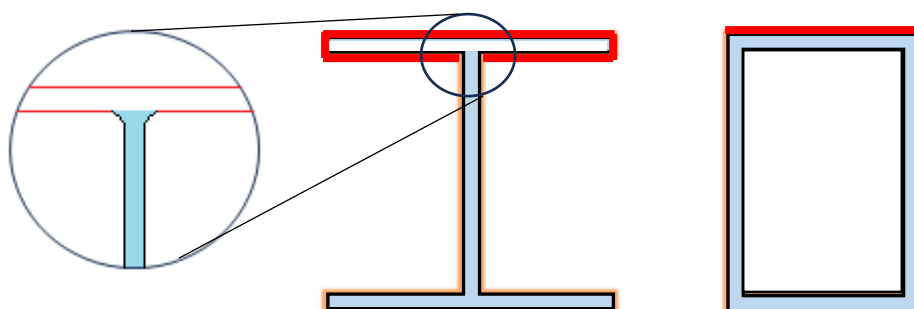
This option ignores the top flange for the purposes of both surface area and section factor calculation, thereby giving a more conservative DFT. The section is essentially treated as an inverted tee, ignoring any root radius at the web/top flange interface.

*Protected area:* as per tee (web and bottom flange only)

*Section factor:* as per the 4-sided section factor of the bottom tee

Applicable to: I-sections with profile design only. These can be serial or custom.

NOTE: RHS, SHS and I-section box designs will revert to option 2.



*Beam calculation method 4 – red line exposed to fire and excluded from protected surface area, section factor based on 4 sided exposure of shape shaded blue (expansion showing root radius including in protected surface area and section factor calc).*

Please note the following on three-sided beam calculation methods

- When any method other than 1. *Top flange not exposed to fire* will not permit beams to be entered as composite. Changing the 3-sided beam method from method 1 to any other

method will change any composite beams to be non-composite. This change cannot be undone.

- When any method other than *1. Top flange not exposed to fire* is used, the advanced  $T_{crit}$  calculation will be disabled. Changing the 3-sided beam method from method 1 to any other method will change the temperature calculation setting of any sections entered as advanced  $T_{crit}$  to be User-set. The given temperature will not change.
- Hydrocarbon product certification should not be used for cellular beams as the RT 1356 structural model and the web-post factors are, by definition, for cellulosic fire exposures. Users should be aware, however, that 3-sided beam modifications (methods 2 to 3 above) will not apply to cell beams.

Finally, please note that these beam methods are provided in good faith by PFP Specialists but the calculation methodology is not described in any referenceable publication or standard. Use of the methods is at the discretion of the user, and the methods may be added to, changed, or removed in the future.

**Questions? Please refer to the main user guide, or contact us at PFP Specialists.**