MasterSeries Webinar: Composite Design in MasterSeries: From Beam Design to Full Structural Models

Questions & Answers

Date: Tue, 27th May 2026
Time: 1:00 PM – 2:00 PM BST

Q: Does the background calculation include the contribution of mesh/reinforcement in compression during the optimisation process?

A: No. The automated design process does not consider reinforcement or mesh in compression resistance. Compression resistance is provided by the concrete slab. The primary role of the mesh reinforcement (top, additional top, or bottom) in the background calculations is to act as transverse shear reinforcement. This reinforcement is used to transfer longitudinal shear forces from the steel beam into the concrete slab via the shear connectors.

In composite design, reinforcement in the slab is therefore used to transfer shear form the shear studs into the concrete. The design checks include verification that the specified transverse reinforcement is adequate.

During the optimization, the software will also try to find the optimum balance of steel section size, number of shear studs and amount of transverse reinforcement.

Q: Web Openings and Local Strengthening

1. For web openings, does the calculation include checks and strengthening requirements around the opening perimeter for web buckling and the weakened zone of the member?
2. If strengthening is required, does the software design the necessary reinforcement measures, such as welded plates or other strengthening arrangements?
3. Additionally, does the software provide a detailed calculation report showing how these checks and strengthening requirements are derived?

A:

1. Web buckling and weakened zone checks:

   Yes. The software performs detailed checks for the weakened zone around web openings, including:

   - Vierendeel bending effects
   - Axial and shear forces in the remaining upper and lower steel tees
   - Local web buckling
   - Web post buckling

   These calculations are based on SCI guidance, including SCI P355 (Design of Composite Beams with Large Web Openings) and relevant Eurocode/UK National Annex provisions.

   The software also provides options to include strengthening via edge stiffeners where required.

2. Strengthening Requirements (Stiffeners)

   The software does not fully design or optimise strengthening automatically.

   Where an opening fails, the engineer is required to define the required stiffener area (mm^2). The software then uses this input to reassess capacity and may provide indicative plate and weld suggestions.

3. Calculation Reports

   Yes. Calculation reports are generated depending on the status of the opening, which is color-coded on the beam graphic:

   - Green (Critical): Full detailed calculation report including all derived checks
   - White (Non-Critical): Summary calculation report
   - Blue (Dimensional Failure): Error report identifying invalid opening geometry

Q: What happens when loading is non-uniform or includes point loads, shifting the maximum bending moment away from mid-span? Does the software optimise stud distribution accordingly?

A: Yes. The software accounts for the actual bending moment distribution, including effects from point loads and non-uniform loading.

The design process identifies the true location of maximum bending moment, which governs the required shear connection. The number of shear studs is then determined based on the moment demand from the nearest support to that point.

However, stud spacing is not varied along the beam. Instead, the software:

- adopts a uniform stud arrangement along the available length
- checks that this arrangement satisfies shear transfer requirements

If the maximum moment shifts closer to a support, the available length for shear transfer is reduced, which may make compliance more difficult.

During optimisation, the software will attempt to achieve a compliant uniform stud layout. If this is not feasible due to geometric or construction constraints, the beam may revert to a non-composite design.

Q: Can composite design be used for fixed-end beams in sway frame structures?

A: Composite beam design in the software assumes simply supported conditions for composite action, to ensure the concrete slab remains in compression as intended in standard composite behaviour assumptions.

Fixed-end or moment-resisting beams can still be modelled within the global structural model (e.g. MasterFrame), but they are designed as non-composite steel members using the steel design modules.

Q: Can other types of shear connectors be used instead of headed studs?

A: Yes. The software supports alternative shear connection methods, including:

- Raised rib pattern
- Hilti X-HVB connectors
- User-defined shear connector (headed shear studs)

At present, Hilti X-HVB is the only additional proprietary connector type included as a standard option.

Q: How is restraint from decking modelled when no shear studs are present?

A: Where decking is fixed to the steel beam without shear studs, the member should be calculated as **non-composite**.

In this case:

- The composite action is not activated in design
- The beam is designed as a steel member
- Lateral restraint provided by decking is checked during construction stage design in accordance with EN 1993-1-1 (Annex BB)

Q: Does selecting "Composite = True" mean all beams at that level are designed as composite?

A: Yes. When a level is set to Composite = True, all qualifying beams at that level are considered for composite design within the Composite Design Module.

If this setting is not enabled, members default to standard steel design within the appropriate steel design module.

Q: How can composite design be disabled for upper floors in a multi-storey model?

A: Composite behaviour can be controlled at level or member level.

To exclude entire floors:

- Set Composite = False in level construction defaults

This ensures beams on those floors are not automatically treated as composite.

To exclude individual members:

- Assign members to a Non-Composite Member Group

This allows mixed behaviour within the same floor level, where some beams are composite and others are designed as steel-only members.

Q: Is ponding load automatically included in the design?

A: No. Ponding effects are not automatically added as load cases.

The software does:

- Perform construction stage deflection checks
- Highlight potential ponding risk where deflection limits are exceeded

If ponding loads are required, they must be added manually as additional load cases within the model.

Q: Which metal decking systems are supported?

A: A range of common decking profiles are included in the standard library, including systems such as Tata Steel ComFlor, Kingspan Multideck and SMD.

Additional proprietary or project-specific deck profiles can also be added to the library by the user.

Q: Do load cases need updating when using Composite Pro load generation?

A: Yes. Only the first five predefined composite design load cases are used in the integrated composite design workflow.

If additional load groups (e.g. construction or secondary imposed loads) are introduced, they must be manually included in the relevant composite load cases with appropriate load factors.

This ensures all relevant actions are included in both analysis and composite design checks.

Q: Is it possible to please share the presentation as the screen was too small to follow the cursor.

A:

Q: Does the software calculate global deflections using superposition of primary and secondary beams?

A: No. The software does not perform a single automated global floor deflection check based on superposition of a full grillage system.

Instead:

- The Composite Beam Design module calculates member deflections individually, including staged construction effects, creep, and partial shear connection.
- Global behaviour is assessed separately in the MasterFrame analysis model using nodal and member results.

Because the two approaches use different modelling assumptions:

- MasterFrame assumes elastic analysis with full shear connection stiffness
- Composite design uses a staged, partial interaction model

As a result, deflection values may differ between the two outputs and should be interpreted accordingly.

Q: Which equations are used to determine minimum degrees of shear connection for heavy loading?

A: The software determines the minimum degree of shear connection using guidance and derived expressions from SCI P405, incorporating code-based limits for composite beam behaviour under heavy loading conditions.

Q: Will it be possible to add the knowledge base link that was shown during the webinar?

A: Yes. The article demonstrated during the webinar can be accessed here:

https://help.masterseries.com/knowledge/article/2610

Please note that this knowledge base is still under development and will continue to be expanded with additional guidance and worked examples over time.