HAMBRO D500 COMPOSITE FLOOR SYSTEM:
DESCRIPTION, INSTALLATION AND ADVANTAGES OF THE SYSTEM

By Marie-Ève Dorion, P.Eng.

June 2013

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SUMMARY

A floor system composed of two elements, i.e. steel joists and a concrete slab reinforced with wire mesh, that's easy to install and ideal for multiresidential buildings. Advantages include simplified execution at different stages of the installation process and during optimization of the slab.

THE HAMBRO D500 COMPOSITE FLOOR SYSTEM

The Hambro D500 composite floor system is composed of steel joists and a concrete slab reinforced with wire mesh. Together, these components form a composite T-beam that runs in the direction of the joist spans while the continuous, one-way slab runs perpendicular to the joists (Figure 1).

This floor system is designed to carry both gravity and lateral loads. Lateral forces must be transferred to the concrete slab only (the concrete slab must be designed by the consulting engineer).

Joists are installed according to the standard 49 ¼ in. (1,251 mm) spacing requirement to allow use of full size plywood. Non-standard spacing is permitted to avoid the various openings in the concrete slab. It is important to have a minimum space of 6 in. (152 mm) on each side of the joist to allow for composite action to take place.

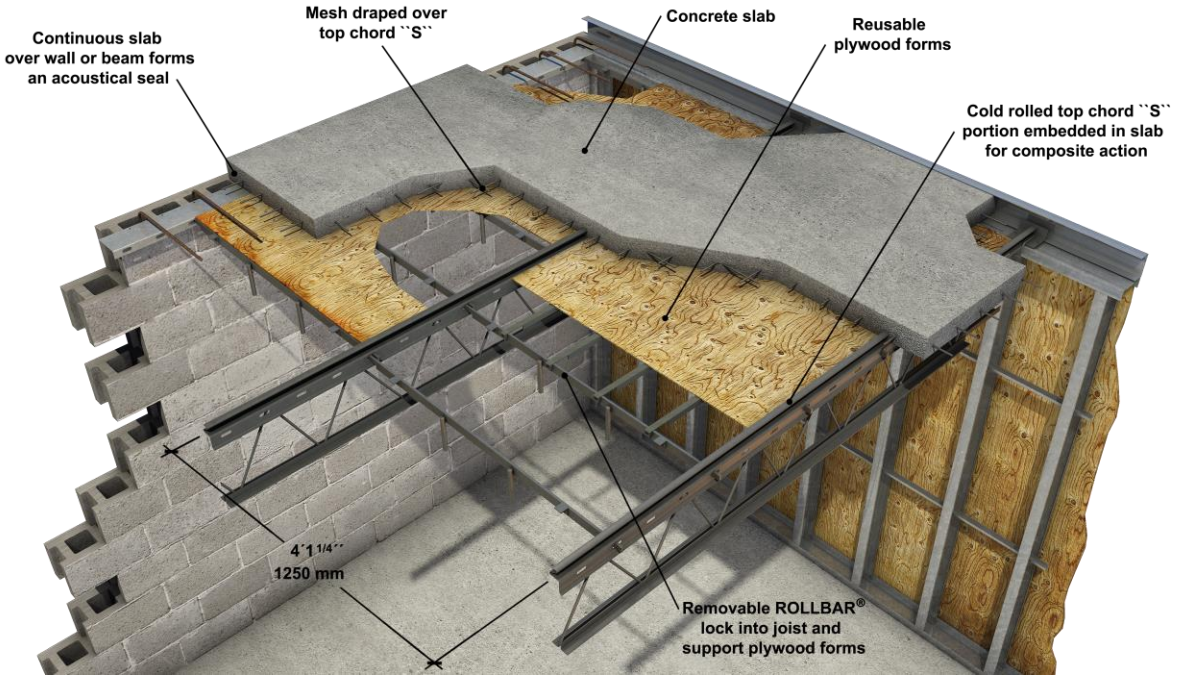

Figure 1
Hambro D500 composite floor system

NON-COMPOSITE PHASE

During the formwork installation and pouring process, Hambro joists initially play a non-composite role. They will support construction dead loads (concrete, joist weight, wire mesh, formwork, rollbars) and a construction live load of 20 psf (1 kPa).

Load distribution

At this stage, the different joist members behave in distinct ways:

- the bottom chord, composed of double angles, acts as a tension member;
- the web, made of bent steel rods, resists the vertical shear;
- the "S" top chord, which is withheld by rollbars, acts as a compression member.

Lateral stability

Joists must be braced with rollbars during the non-composite stage in order to prevent lateral buckling. These lateral supports are temporary. Rollbars, in addition to ensuring a platform on which to install the plywood forms, create the lateral stability of both the top and bottom chords.

Rollbars are inserted into slots along the vertical portion of the "S" top chord and spaced according to the slab thickness at every 7, 14 or 21 in. (178, 356 or 533 mm).

Also rollbars can be installed in clips welded to the bottom chords to provide temporary bracing. The number of rollbar rows depends on the joist length with 1 to 4 rows necessary for spans between 18 ft. (5,480 mm) and 40 ft. (12,190 mm). The bottom chord bracing shall be installed in continuous. At the end of the bay, the bridging must be firmly secured to a wall or steel beam with a section of wood such as a two-by-four. If there is no wall or floor at the end of the bay then the bottom chord can be braced temporarily to the subfloor.

FORMWORK REMOVAL AND LOADING THE CONCRETE SLAB

Formwork may be stripped before the slab has reached its maximum compressive strength. Formwork removal depends on the amount of time needed for the concrete to cure, which can range from 24 to 48 hours or once the concrete has reached a compressive strength of 0.5 ksi (3.5 MPa). Construction loading, which also depends on the curing status, may be applied from 48 to 72 hours after pouring the concrete or once it has reached a compressive strength of 1 ksi (7 MPa).

COMPOSITE PHASE

Once the concrete has reached the specified strength, the floor system becomes fully composite and the reinforced slab acts as the compression member. The floor system then functions as a T-beam in order to carry the total load specified by the consulting engineer.

Composite action
Composite action is achieved by two methods:

1. Horizontal bearing forces
   The ends of the joist consist of angles that are embedded in the concrete. They act as bearing shoes as well as anchorage for the first diagonal member producing a horizontal bearing force when the joist is loaded (Figure 2).

2. Steel/concrete interface
   Once embedded in the slab, the top chord bonds with the concrete in order to provide shear-friction resistance. There are also slots in the "S" top chord, which help reinforce the bond between the steel/concrete interface.

Figure 2
Hambro D500 standard joist shoe

Lateral stability
Once embedded in the slab, the top chord bonds with the concrete in order to provide shear-friction resistance. There are also slots in the "S" top chord, which help reinforce the bond between the steel/concrete interface.

REINFORCED CONCRETE SLAB

The concrete slab is designed as a continuous, one-way slab in order to carry loads transversely to the joists. The negative moment is carried by the slab where it intersects with the joists while the positive moment is carried between the joists. The wire mesh is draped directly over the top chord, which acts as a high chair to build negative moment capacity (Figure 3).

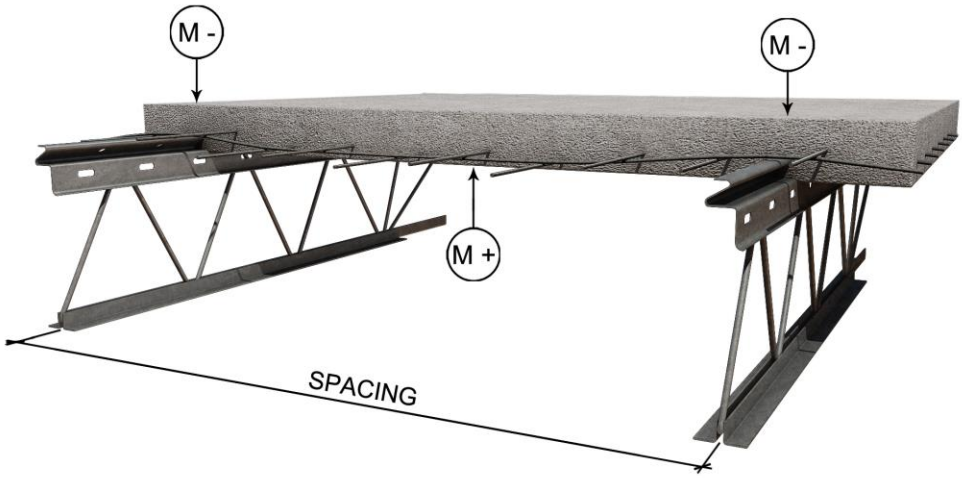

Figure 3
Distribution of moments

CONCLUSION

If you are looking for a composite floor system that is simple to install and that offers fast track project execution, a product that does not require shoring and allows for easy installation of HVAC, electricity and plumbing systems, a fire-resistance rated system with great acoustical benefits, Hambro D500 is your solution of choice.

Should you require additional information, wish to meet with one of our representatives or experts to learn more about our products and services or to organize a lunch and learn, please call:
1-866-466-8769

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www.canam-construction.com
Canam-Buildings
270, chemin Du Tremblay
Boucherville (Québec)
J4B 5X9

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