TAB-FLOOR™ – JOINTLESS INDUSTRIAL FLOOR BY ARCELOR

Rene Pepin [1], Oldřich Vlasák [2]

Abstract

Most major applications of steel fibre reinforced concrete are in industrial floors. Generally, there are three different types of industrial floors – saw cut joint floors, jointless floors and floors on piles. This article focuses on jointless floors, a solution developed by Arcelor under a name of TAB-Floor™.

Keywords: Steel fibre reinforced concrete, jointless industrial floor.

1 Introduction

Industrial floors are non-structural construction elements submitted to high loads – stresses, abrasion, impact, chemicals etc. Thanks to commonly known numerous advantages, SFRC is now state-of-the-art in industrial flooring – among others, it allows to increase space between joints, as well as to use sophisticated equipment like laser screeds and above all, leads to an enormous savings of time and material.

The majority of industrial floors are saw-cut joints floors. The weakest section of this type of floor is the saw cut joint. If there is some problem, then it usually occurs just in this place - for example curling due to unequal drying (see Fig. 1) or cracks near the joint due to traffic loads (see Fig. 1).

Fig. 1 Curling (left), damage near joint due to traffic

1) Arcelor Bissen, Research and development fibres, B.P. 16, L-7703 Bissen, e-mail: rene.pepin@arcelor.com
2) Arcelor Commercial Wire Drawing CZ s.r.o., Jesenice 2, 350 02 Cheb, e-mail: oldrich.vlasak@arcelor.com

TAB-Floor™, a jointless floor system developed by Arcelor, offers a possibility to solve the above-mentioned problems.

2 Jointless floor system TAB-Floor™

2.1. Advantages

This type of floor is suitable areas with high flatness requirements, heavy loadings (especially racks) and high traffic. Its first advantage is connected to the design of the floor. With standard saw cut joint floors, we have to consider three load cases (for point load) – the centre, edge and corner of the slab. For example, in the corner of the slab, stresses are 100% higher compared to centre, which leads to significantly higher slab thickness compared to a jointless floor, where the only load case we need to consider is the centre one. Other advantages include: no cracking, curling or deterioration at cutting joints, no uncontrolled cracking due to higher fibre dosage rate, no braking of wires installed in the slab for wire guided systems, higher levels of flatness are achievable, the reduction of maintenance costs of forklifts, and the flexibility for rack positioning.

2.2. How TAB-Floor™ works

In all types of industrial floors microcracks are occurring due to shrinkage during concrete hardening. In saw cut joint floors the joint generally stops micro-cracks from growing. In jointless floors, this is not a possibility, so either micro-cracks grow to macro-cracks, or there must be new micro-cracks arising. As macro-cracks are not acceptable, it is essential to stop micro-cracks at their earliest stage, which means the stresses have to be transmitted by fibres. This is possible only if the saturation of matrix with fibres is sufficient, distance between fibres is short and loadings can be transmitted by a higher number of fibres (see Fig. 2). It is also necessary to limit strength of the concrete, to decrease loads that need to be taken over by fibres.

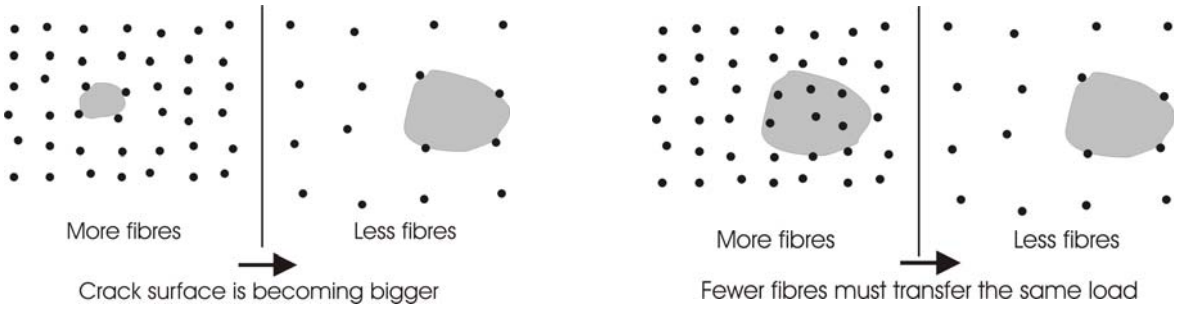

Fig. 2 Effects of higher number of fibres in the concrete matrix

2.3. General conditions

The maximum size of one panel cannot generally exceed 2,500 m^2. The construction joint should be high quality and allow horizontal movements in both directions, while vertical load transfer should be guaranteed even at big joint openings, even 20-25 mm (see Fig. 3).

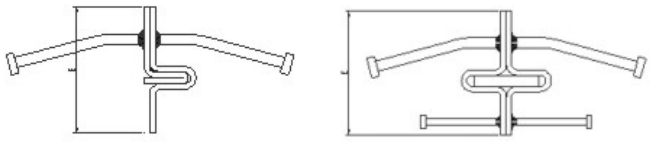

Fig. 2 Examples of suggested construction joints

It is necessary to keep maximum length to width ratio at 1:1,5; however optimal shape of the panel is square. Suggested dosage of cement is 300-360 kg/m^3. In order to limit shrinkage as much as possible, water/cement ratio has to be kept under 0,55, optimally 0,5. Therefore it is necessary to use plasticizer to obtain the right consistency. Addition of water at the jobsite is strictly forbidden. The slab has to be free to move, it cannot be tied to walls, columns, foundations etc. Local reinforcement has to be introduced to stop cracks at the earliest stage (see Fig. 3). More detailed information about additional reinforcement, sieve curves, concrete mix and technology of jointless floors, is provided by Arcelor upon request.

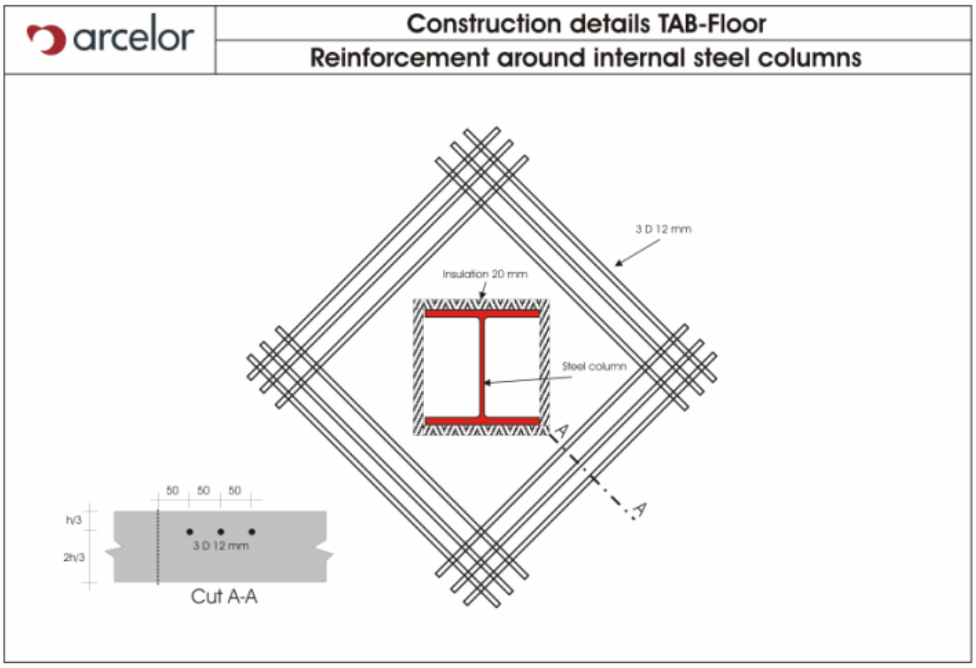

Fig. 3 Construction detail of local reinforcement

3 Conclusions

Millions of square meters of jointless industrial floors have been realized with Arcelor steel fibres all over Europe. A large number of successful projects proved that TAB-Floor™ is a suitable solution; however research is still going on and it is obvious that with newly developed steel fibres it will be possible to design and construct floors of even better quality.

Fig. 4 50.000 m^2 TAB-Floor™ realized in 2007 at Úžice u Kralup n. Vltavou

References

[1] Arcelor Bisen S.A.: *Lastenheft, TAB-FloorTM Konzept, technische Spezifikationen*, Fassung 1998.
[2] DBV: *Merkblatt "Stahlfaserbeton"*, Fassung Oktober 2001
[3] Deutscher Ausschuss für Stahlbeton (DAfStb): *Richtlinie "Stahlfaserbeton" (8. Entwurf), Ergänzung zu DIN 1045, Teile 1-4*, August 2002.