

3. Fire safety

All the elements of the system «Dobeles panelis» comply with the requirements of the Building Standard currently valid in Latvia LBN 201-96 «Fire Security Standards» [1]. New fire security standards are under development in Latvia and they are currently in the draft version. Experience of other European Union countries as well as the rules on testing structures are being taken into consideration there. It should still be noted that the Building Standard [1] has not been amended and therefore it is binding at present.

The main goal of the fire security measures is to prevent the possibility of fire. The goal of the fire protection of buildings is to create conditions for providing security to persons who may be in the building at the moment of the fire, security to fire and rescue service officers, as well as to minimise the material damages caused by fire and to prevent disastrous consequences.

For the purpose of ensuring the fulfilment of the above goals it is necessary to define the minimum fire resistance of a building and building structures, as well as to stipulate the maximum permitted fire hazard of building structures and materials.

When the system of stay-in-place forms «Dobeles panelis» is applied in building **the bearing elements of the building are made of cast concrete**. Therefore such constructions are fireproof and from the viewpoint of fire security their thickness has to comply to the Table 2.2. of LBN 201-96 [1] and the Tables 10 and 11 of the Appendix No. 4. In the Table 2.2. of LBN 201-96 the minimum fire resistance margins of structures (bearing walls, ceilings, combined roof elements) in minutes and the required combustibility groups of building materials are stipulated. The Tables 10 and 11 of the Appendix No. 4 of LBN 201-96 define how thick structures with what kind of protection ensure the required fire resistance margin in minutes, the combustibility groups of building materials are determined based upon the Table 2.1.

In the Table 3.1. there is assessment of the fire resistance margins of the bearing structures of the system «Dobeles panelis» according to the requirements of LBN 201-96. It can be concluded that the bearing walls of minimum thickness and ceilings with minimum diameter of stretched strands of bearing ribs ensure compliance with the requirements of the fire security level 1. (I). If the thickness of walls as well as diameter of stretched strands of bearing ribs of ceilings are higher compliance with the requirements of even higher fire security is ensured.

Table 3.1.

Fire resistance margin of the bearing structures of the system «Dobeles panelis» based upon LBN 201-96

Building fire security level	Bearing walls		Ceilings between storeys	
	Minimum fire resistance margins in minutes and groups of combustibility of materials	Thickness of the reinforced concrete walls, mm	Minimum fire resistance margins in minutes and groups of combustibility of materials	Thickness of the reinforced concrete walls, mm
	222	150		
1. (I)	150 Not combustible	120	60 Not combustible	With the minimum* diameters of stretched strands of the bearing ribs Ø12 mm

*) The higher the diameter of stretched strands of the bearing ribs is the higher is the fire resistance margin of the structure.

For the production of the stay-in-place forms hardly combustible expanded polystyrene foam is used. Structures of such forms must be protected with fireproof plastering with the thickness of at least 5–6 mm. For the purpose of further improvement of fire security gypsum boards or other fireproof plates or plastering can be used for the finishing of internal walls and ceiling. When designing low-storied residential buildings, multi-storeyed residential buildings, public buildings as well as industrial buildings the requirements of the fire security of buildings stipulated in the building standards valid in Latvia LBN 208-00 [2], LBN 211-98 [3], LBN 215-05 [4] un LBN 209-04 [5] shall be considered.

Appendix C «Fire security. Minimum concrete filling dimensions» of the guidelines ETAG 009 (issued in June, 2002) «Sets and systems of load bearing hollow heat insulating materials or concrete blocks or panels» of the European Organization for Technical Approvals defines the thickness of concrete filling at a certain fire security margin (Table 3.2.) [6]. The guidelines ETAG 009 define also the essential security requirements of the system «Dobeles panelis».

Table 3.2.

Minimum thickness of concrete filling when there is fire impact from one side

	Bearing wall	Non-bearing wall
Fire resistance marginal condition	REI	EI
Fire resistance margin, min	Minimum thickness of concrete filling, mm*	
30	100	90
60	110	90
90	120	100
120	150	120

*) The concrete strength class within the limits from «C16/20» to «C50/60» in compliance to prEN 206.

As the minimum thickness of the bearing concrete walls constructed with the stay-in-place forms system «Dobeles panelis» is 120 mm the minimum fire resistance margin of these walls is REI 90 and REI 120 for 150 mm thick walls according to the guidelines ETAG 009 of the European Organization for Technical Approvals.

For the time being the building structures constructed with the stay-in-place forms system «Dobeles panelis» have not been fire tested. Such tests are planned following the commencement of manufacturing. Currently the results of tests of structures of ceilings and partition walls made in Italy according to the «PLASTBAU» system which is analogous to the system «Dobeles panelis» are available. Testing of the building structures has been performed in CSI laboratory according to the legislation and standards of Italy (Tables 3.3. and 3.4.). The fire resistance of ceilings and partition walls has been tested and their fire resistance margins have been determined.

Table 3.3.

Results of testing of fire resistance margin of ceilings made of the stay-in-place forms system «Dobeles panelis», according to the legislation and standards of Italy

No.	Building structure	Type of finish	Test results	Fire resistance margin
1.	Ceiling structure	15 mm thick plastering	REI 180	REI 180
2.	Ceiling structure	Cover with 13 mm thick gypsum boards	REI 128	REI 120

Table 3.4.

Results of testing of fire resistance margin of partition walls according to the legislation and standards of Italy

No.	Building structure	Type of finish	Test results	Fire resistance margin
1.	Partition wall, thickness 100 mm	25 mm thick plastering on both sides, total thickness 150 mm	REI 150 – RE 167	REI 120 – RE 120
2.	Partition wall, thickness 100 mm	Two gypsum boards on both sides; total thickness 156 mm	REI 123 – RE 144	REI 120 – RE 120

Sources

1. Latvian Building Standard LBN 201-96 «Fire security standard».
2. Latvian Building Standard LBN 208-00 «Public constructions and buildings».
3. Latvian Building Standard LBN 211-98 «Multi-storied apartment buildings».
4. Latvian Building Standard LBN 212-05 «Industrial buildings».
5. Latvian Building Standard LBN 209-04 «Design standards of low storied buildings».
6. ETAG 009 Edition June 2002. Guideline for European Technical Approval of Non load-bearing permanent shuttering kits/systems based on hollow blocks or panels of insulating materials and sometimes concrete.