UDC 692.522.8

ON DEFLECTED MODE OF PRE-CAST AND IN-SITU CONSTRUCTIONS IN THE CONTACT JOINT ZONE

ALIAKSANDR KOVALENKO, ALENA KREMNEVA
Polotsk State University, Belarus

Pre-cast and in-situ constructions are widely used in building industry of the Republic of Belarus [1, 2]. Such constructions are rather various nowadays. The technology of pre-cast and in-situ slabs production came to Belarus from Europe, where mass erection of detached houses has been applied for more than 50 years already. The most known European and national construction methods, based on gilled pre-cast and in-situ slabs in Belarus and the CIS, are «Dakh», worked out in Polotsk State University and adapted for use in Belarus; pre-cast and in-situ slabs «Marko», Russia, and others [3]. All pre-cast and in-situ constructions include four units: beams of different spatial frame types, block-liners, a mesh and in-situ concrete. The principles of the usage of light-weight reinforced beams are rather similar. The differences are in their configurations and the material of block-liners: porous ceramics, haydite concrete, cellular polystyrene, etc.

Research of pre-cast and in-situ constructions proves the emergence of extra deflected mode as a result of inconsistency of shrinkage and time yield of concrete when traditional concrete, based on Portland cement, is used as an in-situ part of a built-up section.

The matter of research is the influence of shrinkage on deflected mode of the whole construction under working load and its taking into account in design [1]. The information found in literature is rather contradictory.

A great amount of national and foreign research works are devoted to the problem of concrete adherence. In-situ operations, use of permanent forms and study of pre-cast and in-situ constructions stimulate scientists' research activity. Contact joint durability has been widely studied by numerous scientific, design and educational institutes of Belarus: BNTU, BSTU, BelNIIS, PSU; and the CIS: NIIZHB, NIISP.

The concrete adherence matter comes into consideration at the process of reconstruction and newly built pre-cast and in-situ constructions, as there should not be any shift of jointing surfaces. The rate of contact joints between old and new concretes should be minimized [2]. Joints in constructions are widely stressed by bending moments, contractive, stretching and shearing forces.

Estimation of joints resistance to shearing forces, if there are reinforced rods crossing the joint, is one of the most important and complicated issue. Correct estimation of shear strength of a joint influences the combinability of units in the construction and a load-carrying capacity in general [4].

To find the influence of shrinkage strain of concrete in an in-situ unit on shearing forces it is important to find out the strength of the joint by in-situ concrete curing [4].

Figure 1 illustrates the relation of free shrinkage strain to curing.

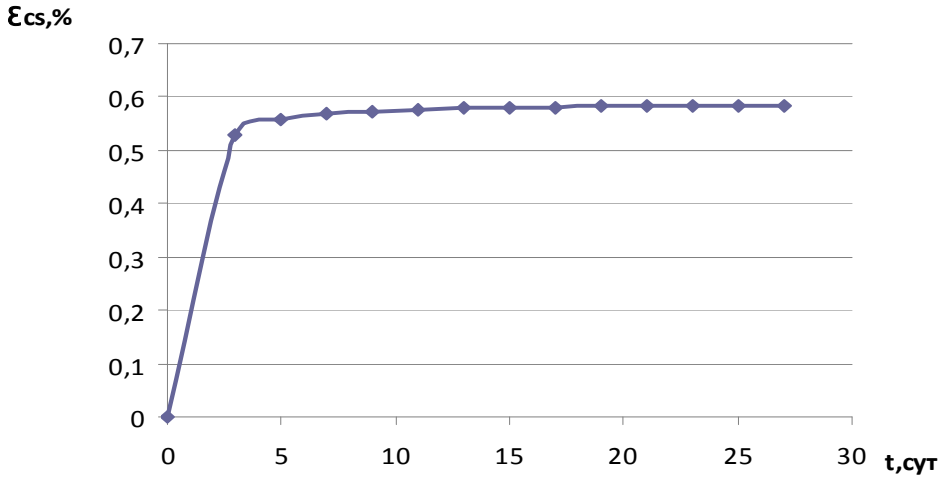

Fig. 1. Relation of free shrinkage strain to curing

Calculations of contact joints durability are carried out on the bases of a pre-cast and in-situ slab «TERIVA» (Poland). Shearing forces in the joint of a pre-cast and in-situ constructions in their performance have been found. Forces of the kind happen due to the difference in shrinkage strain of in-situ and pre-cast concretes and proper weight of a construction (Fig. 2).

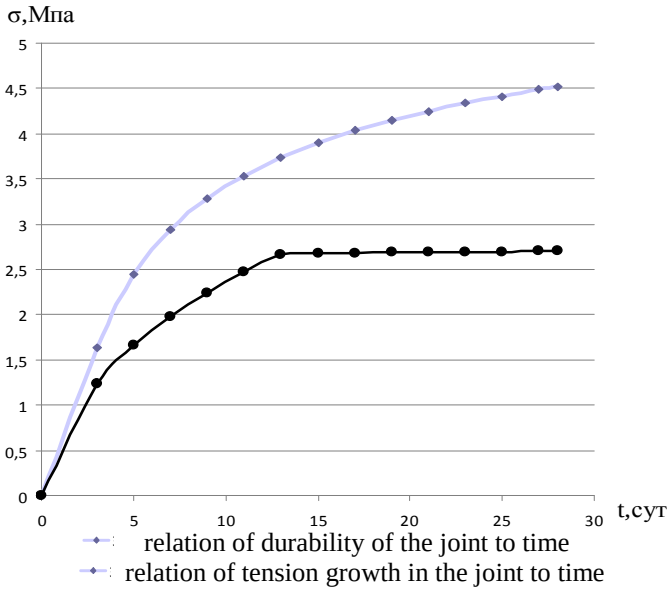

Fig. 2. Data comparison

The data received guarantee the durability of the contact joint because of the stress by in-situ concrete curing. The durability of the joint is almost 27 per cent higher than working shearing stress. So we are sure that shrinkage strain of in-situ concrete influences a pre-cast beam as well as the whole construction. The rate of influence of shrinkage strain on the deflected mode of a construction during its operation requires additional studies.

REFERENCES

1. Чикалина, О.П. Усиление железобетонных конструкций намоноличиванием с применением модифицированных бетонов : дисс. … магистра техн. наук / О.П. Чикалина. – 2003.
2. Голышев, А.Б. Расчёт сборно-монолитных конструкций с учётом фактора времени / А.Б. Голышев, В.П. Полищук, Ю.А. Колпаков. – 1969.
3. Современные строительные технологии [Электронный ресурс]. – Режим доступа: http://parthenon-house.ru/content/articles/index.php?article=7649. – Дата доступа: 14.02.2014.
4. Тур, В.В. Прочность и деформации бетона в расчетах конструкций / В.В. Тур, Н.А. Рак. – 2003.

UDC 697: 721.011.25

TECHNOLOGICAL AND METHODOLOGICAL WORKING-OUTS IN THE SCOPE OF GRADUAL REDUCTION IN POWER CONSUMPTION BY HEATING AND VENTILATION SYSTEMS OF BUILDINGS DURING THEIR MODERNIZATION

SVETLANA LANKOVICH, VLADIMIR LIPKO
Polotsk State University, Belarus

The working-out refers to the technique of heating and ventilation and is proposed for use in the town-planning industry for energy- and resource- saving in heating and air supply to buildings with modern warm attics and ventilated transparent facade systems.

According to current regulations, the ventilation of residential buildings is carried out by means of infiltration through unorganized arrival of outside fresh air into the living space through leaks in the exterior walling, vent or any other ventilation devices. In this case, all the power inputs to heat outdoor air are compensated by the heating systems, which exceed the heat loss through the exterior envelope of buildings. The removal of the ventilation air flow from areas of maximum allocation hazards (kitchens, bathrooms and toilets) is organized through exhaust openings in the volume of warm attics, with the subsequent release of warm air into the atmosphere through the sectional exhaust shafts. This technological scheme of heat and air supply to buildings is too power-consuming, as it does not use the secondary and natural energy sources.