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Innovative regulation of the progress of construction of objects under conditions of severe limitation of resources

The main goal of the innovative regulation of construction production is to achieve the completion of the construction of a group of objects in the conditions of the probable nature of production within the terms determined by the calendar plan. When making management decisions, the resources used should be minimal.

In order to eliminate the lag behind the planned deadlines, the following measures are taken:

a) Increasing the intensity of work due to the available reserve of labor resources according to formula (1) [1]:

$$N_{i-j} = C_{i-j}^{\max} - C_{i-j}^{\min} \quad (1)$$

b) Changing the previously accepted methods of building construction (Fig. 1), the number of installation cranes used, etc., which in general allows to reduce the time of execution of complex works (for example, to change the method of construction of buildings according to the direction and sequence of works, etc.) .

c) Organization of parallel streams (works), if it is possible by technology and not taken into account in the initial plan.

d) Maximum connection of works in time and space due to additional division of the building into grabs.

The use of options *b*, *c* and *d* to eliminate disruptions requires changing the topology of the network model. The breakdown elimination procedure is performed in the following sequence (according to algorithm I) [1]:

I.1. Starting from the source event to the information capture line, early start times are calculated $t_{i-j}^{p.n}$ and ending $t_{i-j}^{p.з}$ works taking into account the disruptions (Fig. 5) according to the formulas (2) (3):

$$t_{i-j}^{p.n.} = \max\left(t_{h-i}^{p.n} + t_{h-i}^{'}\right) \quad (2)$$

$$t_{i-j}^{p.з} = t_{i-j}^{p.n} + t_{i-j}^{'} \quad (3)$$ I.2.

Elimination of disruptions after the line of information removal is carried out if deviations of temporary parameters from planned tasks increase the terms of construction of a group of objects. Deviations can be eliminated by one of the above methods.

At the same time, the following must be taken into account:

- not to exceed the maximum intensity of work performance set according to the

task, it is allowed to vary in duration only within the range of time estimates $D_{i-j}^{\max} - d_{i-j}^{\min}$

- first of all, reduce the time estimates of those works that lie on the critical path and simultaneously affect the maximum number of other complete paths.

- when eliminating disruptions, monitor the price of reduction, that is, add a portion of labor resources to work with the minimum price of reduction.

Fig. 1. An example of recording time parameters of a network graph taking into account disruptions to the line of information capture.

An example of elimination of disruptions is shown on a fragment of the network model, which is shown in Fig. 2.

At the second removal of information $T_2^{п.з.і} = 0{,}7T_{роз}$ elimination of disruptions is carried out on works, the late deadlines of which are behind the given line of information removal, according to the same methodology.

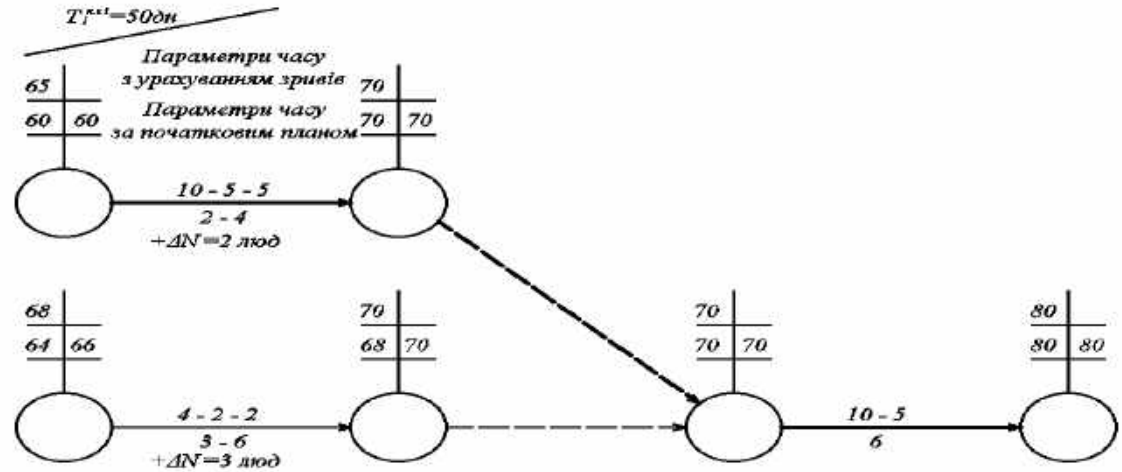

Fig. 2. An example of recording time parameters of a network graph taking into account disruptions after the line of information removal.

Therefore, the financial effectiveness of management decisions is evaluated by a criterion that characterizes the "price" of reduction in the elimination of disruptions. As you know, labor resources are limited and they are fixed in work. When eliminating disruptions, it is necessary to strive to minimize their use. At the same time, the reduction of the terms of construction of a group of objects should be maximal.

References:

1. Posternak, I. M. (2020). Orhanizatsiia vyrobnytstva rekonstruktsii budivel istorychnoi zabudovy mist: *zvit pro NDR* z 01.01.2017 po 31.12.2020 (promizhnyi) / Odeska derzh. akademiia budivnytstva ta arkhitektury; ker. I. M. Posternak. Shyfr temy 55-NDR/VI № derzhreiestratsii 0117U002172. Odesa, 74 s.