Stage-by-stage construction approach in developing railway station complexes

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Abstract. Developing modern-day railway stations as a rule goes along with their working. While being reconstructed, the arranged activity of railway stations has to be in-process. Railway stations have to function consistently and continue their work when providing services. To realise large-scale concepts, developing and building activities are implemented through a step-by-step approach with each building stage being autonomous. It means that the functioning of the reconstructed object is in-process when the developing works are under way. The process requires that there should be a close-cut separation of the functional zones, as well as there should be a coherent scheme to serve passengers.

When developing the project documentation, it is common for both customers and building designers to tackle the problem of identifying building process phases for staged commissioning.

This is a particularly serious issue for creating investment programs and decreasing failed construction projects. This is quite urgent either for reconstructing working railway stations, since the completing and commissioning of first stages of the planned reconstruction ensure for the proper working process of the stations and give an opportunity to continue realising the building project.

In compliance with the Urban Development Code of the Russian Federation (article 48, para.12.1), working on the project documentation can be done relating to different construction phases of improving the capital facilities by the project developer or project owner’s initiative.

The project documentation for a certain phase of the construction is prepared to the extent required for putting the part of the planned building activities into practice. The requested documentation has to meet the requirements of the structure and the contents obligatory for capital construction facilities documentation formalized by the Government Decree of the Russian Federation dated 16.02.2008 № 87.

The construction stage is understood as constructing one of the capital construction facilities. According to the arrangements, the capital construction facility is to be built on one land area if such a facility can be commissioned and function independently (in other words, AUTONOMOUSLY from building additional capital construction facilities on this land area); or the construction stage is understood as constructing a part of the capital construction facility, which can be commissioned and used AUTONOMOUSLY (in other words, it can be used independently from other parts of this capital construction facility) [1].
When developing projects for railway station complexes consisting of several buildings (existing and new ones) on one land area, there appears a pre-requisite for identifying different construction stages / steps within one project. The stage-by-stage approach (staged / stepwise approach) in the construction process is tailored within the Construction method statement. However, it is required that a full set of permitting design documentation should be prepared to receive approval from the State Expert Evaluation Department of the Russian Federation (Glavgosexpertiza), to get staged investment and go through phased commissioning.

It is crucial to understand that the stage-by-stage approach in realisation of the project is impossible without having developed the complete project. The end-to-end project is of great significance for planning all the staged building activities. That is the reason why identifying the stages of the construction process is necessary through analysing all the package of measures.

Under the circumstances, when developing the project documentation, it is necessary to set the project objective correctly and allow identifying the stages / phases of the construction process in all sections of the project documentation. There are a lot of problems raised within the construction project documentation: the issues of development patterns of the building site; of the workings of technology the railway station is engaged in; of the networks of engineering infrastructure and fire safety measures should be the focus of special attention.

Let us consider the example of identifying and planning the sequent construction stages of developing the railway station complex "Irkutsk – Passazhirskii". Each of the stages requires receiving approval from the State Expert Evaluation Department of the Russian Federation (Glavgosexpertiza) and goes through phased commissioning (fig.1).

![Figure 1. Example of allocation of construction stages in the design of the Irkutsk Passenger station complex](image)

In 2010 a cooperation agreement in the area of joint implementation of the project on organising a passenger transport hub in Irkutsk and developing the surrounding land area was signed by Irkutsk Region government, Irkutsk city authorities and open joint-stock company (OJSC) "Russian Railways". The facility at a glance. The railway station "Irkutsk-Passazhirskii" is located in Sverdlovskii administrative district of Irkutsk, along Chelnokov Street, along the embankment of the Angara River. The modern-day building of the railway station "Irkutsk – Passazhirskii" is a cultural heritage site of regional significance. Its chronologically first building was constructed in 1897-1898 upon the project of the architect Macievich. In 1904-1907 another building was constructed upon the project of the engineer V. I. Kolyanovsky. In the railway station complex there were two concourses where passengers...
travelling first, second and third class were served. In 1936 the railway station was reconstructed. The buildings which were constructed in 1907 and 1898 were reconstructed to be one building. The passenger in-built corridor connecting the two buildings blended with the whole concept since it was of the same architectural style. In 1964 the concourse for going through to take suburban trains was built on to the railway station building; the pedestrian tunnel was constructed; the railway station forecourt was enlarged and landscaped properly. The architectural style peculiarities of the first buildings remained intact after the reconstructions of 1998 and 2004. The railway station "Irkutsk – Passazhirskii" is a transit station of riverside type [2]. The characteristic feature of any transit station is its heavy passenger and freight traffic. At the present time the railway station "Irkutsk – Passazhirskii" is a point of departure for more than 2800 passengers travelling long-distance and 5600 commuters per day. The overall area of the railway station is two times smaller than it is required for the existing passenger traffic flow [3]. The area is not sufficient for a waiting lounge, left-luggage room, luggage offices, as well as for mother-and-child room [4]. No measures for organising service accessibility for physically challenged people is one of the most crucial downside of the railway station [5].

For developing the concept, a far-seeing urban planning project has been worked out in liaison with the Institute of Urban and Investment-driven Development "Giprogor" to improve the railway station adjacent territory within Profsoyuznaya Street, Chelnokov Street, Tereshkova Street and Majakovskii Street. The development concept is aimed at reconstructing the embankment of the Angara River, at rearranging the transport infrastructure and developing the adjacent territory (fig.2) [7].

Figure 2. The concept of arrangement of the Angara embankment

Putting the concept into practice will contribute to having convenient traffic intersections, shopping centres, as well as appealing city sites for city residents and its visitors [8].

The panorama of the railway station complex is well seen from the embankment, Gagarin Avenue. The place with the railway station panorama is one of the most attractive tourist sites in the city [9].

The executive management of the company "Russian Railways" has already begun to implement the agreement reached in 2010. In 2018 the reconstruction of the railway station complex commenced. The design project is referred to as "The reconstruction of the railway station complex "Irkutsk – Passazhirskii". Taking into account the limited area intended for building and construction works, the Russian Railways authorities decided to demolish the commuter service concourse and integrate it as a part of the union railway station when constructing a new building. The building and construction works will be divided into several stages:
1. *Stage* of the building process comprises the reconstruction of the subway crossing and platforms (fig.3).

![Figure 3. I stage of construction](image)

2. *Stage* of the building process comprises the reconstruction of the commuter service concourse. The reconstruction will change the geometry parameters of the building. The new building is supposed to be called the union railway station passenger concourse (fig.4).

![Figure 4. II stage of construction](image)

3. *Stage* of the building process comprises the reconstruction of the modern-day railway station building to undergo restoration works (fig.5).
4. **STAGE** of the building process comprises the construction of the concourse leading from the existing railway station building to 15 tourist route, to the embankment of the Angara River (fig.6).

![Figure 6. IV stage of construction](image)

For the project at autonomous STAGE 1 engineering infrastructure permits were the core issue to receive approval from the State Expert Evaluation Department of the Russian Federation (Glavgosexpertiza). It was required that the connection to engineering networks should be done before moving on to the subsequent stages of the project. The project at stage 1 received the positive conclusion. The reconstruction of the the subway crossing has been completed.

For the development project at autonomous STAGE 2 the key problem was the workings of technology of the railway station. It was necessary to develop the workings of technology autonomously. The process must not be based on the subsequent stages of the development project. The building of the union passenger concourse abuts upon (southern) gable facade of the building of the railway station referred to as the cultural heritage site of regional significance "Complex of railway station buildings". The railway car shed is famous for its working people who were active participants of the revolutions.
Reconstructing the railway car shed is not referred to cultural heritage preservation building works. There appeared a special plan to restore this existing building at this stage of the project. But the two buildings are independent technologically. Each of the stages provides passengers with all necessary within the stage services. For the reason the development project of each building describes their different passenger capacity. Within the second stage the passenger capacity was 200 passengers for the suburban traffic service and 700 long-distance passengers.

Later on after completing STAGE 3 of the development project the passenger capacity will be equal to 1100 people in total.

Within STAGE 4 of the building process it is expected to construct the concourse leading from the existing railway station building to 15 tourist route and to the embankment of the Angara River.

Irkutsk Region government has done nothing to fulfil the obligations under the agreement so far. At this stage it is essential to develop and improve transport routes along Profsouznaya Street [10, 11]. It is necessary to analyse different variants of building a pedestrian overpass from Profsouznaya Street, across Chelnokov Street to the embankment of the Angara River as well. This pedestrian overpass will suit either passengers' and city residents' convenience. The development of the embankment along the railway station from the Glazkovskii Bridge to the existing left-luggage office. All the measures are necessary to put the development concept into existence; however, all the measures can be taken autonomously. The railway station development project including the improvement of the territory near the station is a part of the project which is aimed at improving the city environment [12].

The first thing to be done before the project commences is relocating the post office. It has to move outside the railway station adjacent territory, but still be at a walking distance from it. The authorities have already initiated the negotiations with the company Russian Post. In August 2019 an urban planning meeting with the city authorities, railway authorities, as well as the Institute "Irkutskzheldorproekt" and Russian Post authorities was held to discuss different possible variants of relocating the Russian Post office, and creating a working advisory group affiliated with the city authorities.

The issues to tackle are ranked in the following way: the most urgent one is to improve the service conditions for people arriving to the station; then the issues of rerouting of traffic arteries and assignment of the land parcel within the adjacent to the railway station complex streets will be paid attention to. Within the preparation process of building STAGE 2 a temporary scheme to serve passengers in the existing building of the railway station was elaborated. The scheme involves organising temporary railway ticket offices and sanitary conveniences. The ways of movement of passengers inside the railway station to get all the necessary services were assessed. According to the assessment the decision to make a revision of the development stages was taken. The reconstruction and improvement of the existing buildings of the railway station (the architectural monument) is not advantageous under the conditions of the increasing passenger throughput. The harm committed to the architectural values of the interior and facade will outweigh the potential benefits. The working space of the building will not remain functional. The servicing areas (the existing building is expected to house additional waiting lounges, sleeping rooms and a first-aid station) will remain cramped. But the most important disadvantage is that it will take passengers a lot of time to go through the pedestrian tunnel to the platforms. In some places the tunnel is not as broad as it is necessary. All the things will prevent achieving the goal to divide the passenger flow. The proposal to develop the railway station layout in order to tackle the problem has been initiated.

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