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Application of REACH-BACK Concept for Assessment of Wood Structure on KFOR Šajkovac Base

M. Benda[1*]

[1]*Department of Engineer Technologies, University of Defence, Brno, Czech Republic*

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Abstract:

The main topic of the paper is to present using the Reach-Back concept during operation called "STODOLA". This operation included assessment of temporary wood structure on KFOR base Šajkovac. The operation included also project of reinforcement of construction. There was cooperation between expert team of Department of Engineer Technologies and staff officer on base Šajkovac in Kosovo.

Keywords:

Reach-Back, engineer, temporary construction, wood structure

1. Introduction

It is suitable to present Reach-Back concept at the first and explain the main possibility how to use it. It is the new model of cooperation and communication among the units deployed directly in action and main corps supporting them. This concept supposes units used for tasks compliance (for example in foreign mission) the units does not have to consist of all components as well as home. The components staying "home" serve tasks for "in theatre" units as support team [1].

This support has different ways. In this particular case it gave special advice and consultation of building industry areas and structural analysis engineering construction.

Concept REACH-BACH together with Information Portal of Engineer Corps was used for action called "STODOLA". The main goal of this action was to check and modify wood structure of temporary construction on KFOR base Šajkovac.

* *Corresponding author: Department of Engineer Technologies, University of Defence, Kounicova 65, CZ-662 10 Brno, Czech Republic, phone: +420 973 442 626, E-mail: martin.benda@unob.cz*

2. Objectives

2.1. Initial situation and original condition of structure

There was built up a temporary wood construction at Czech KFOR base Šajkovac. The construction is using for parking two fire trucks. The construction was built up by soldiers under specific conditions and does not comfortable with structural standard and custom practice valid in Czech Republic. The building material used for super-structure (green sawn wood) was the main problem of the construction. This wood had undetected mechanical character. Low stiffness of the whole construction was another problem. It means that construction could have lead to breakdown under extreme load.

2.2. Current state of construction

Material available from local sources was used for supporting structure of construction. There were used mainly wooden beams of different cross-section. These beams were made of green sawn wood. The construction was heating up in winter and that is why the wood was drying and supporting structure was deforming.

Particular bearing elements were joined to each other by carpenter cramp iron, nails and imperfect carpenter connections.

Construction was founded on concrete panels. Supporting columns were untimely anchored to concrete panel by sheet-steel L shape. The cladding was made of four meter long planks that are 2÷2.5 cm thick and 25 cm width. Polystyrene and chipboard were used as thermal insulation in cover of construction. The system of ONDULINE boards was used as a roof structure. There were used wood boards 2 cm thick and 25 cm width in place of roof crating. The board was placed with axial distance ±0.5 m.

It can be identified that the state and mean of structure is not optimal according mentioned above and information on Fig. 1. The construction was made under temporary conditions and those determined its state. This state was necessary to check and modify eventually.

Fig. 1 Current construction

2.3. Requirement of assessment

Foreign operation department of Joint Operational Centre asked Department of Engineers Technologies at University of Defence about problems mentioned above. The Department of Engineer Technologies was asked for assessment of current construction. Idea of the possible reinforcement of structure was the next task for Department. The staff of Department got maximum information about problem and then they tried to solve it the most effectively. Their solution was presented to Kosovo through the Information Portal of Engineer Corps.

3. Solution implementation

There was established the expert team on Department of Engineer Technologies. The teachers of Department were the members of expert team. Reporting about current construction was the main task of the team. Description current construction from

static and structural engineering views was the main goal of report. The expert team cooperated with officer at KFOR base Šajkovac.

The expert team is very significant part of REACH-BACK concept in this case. This team is the part of concept that obtains and analyses information and then suggests the solution based on the information.

3.1. Expert team

Senior lecturer OF 5 Pavel Maňas was charged as a leader of expert team. He is commander of Engineer Construction section at Department of Engineer Technologies. There were nominated experts of structural analysis construction, wooden construction, civil engineering, thermal specification of building and build-up camp in foreign mission into expert team. The all of them are lectures of Department of Engineer Technologies and have many experiences with application of REACH-BACK concept. But the experiences are only from exercises because the concept has been used in real situation never before. Staff officer OF 1 Martin Kuna on KFOR base Šajkovac in Kosovo managed the building operation on construction of hall.

3.2. Communication – Information Portal of Engineer Corps

The expert team tried to get the most information about current construction at first. The information was provided by OF 1 Martin Kuna. The sketches, photos and describes of construction were the form of provided information. Then these data were placed on server iProject which works as a part of Information Portal of Engineer Corps. This communication system was founded and used in past for similar action too. The expert team took materials placed on server and started work with them. This communication system and exchange information among elements of process was described and verified in past – see [2, 3].

The system mentioned above is Reach-Back concept in principle. The expert team at University of Defence is support team for 12th contingent KFOR of the Czech Republic which represent "in theatre" unit in this system.

3.3. Assessment of construction

The construction was checked by proper CAE software. It was necessary to create model of construction at the first. Basic three-dimensional model of construction was created according to drawing documentation. The dimension of the model was the same as the real dimension of construction (Fig. 2).

Expert team chose the suitable method of assessment of construction because of some differences between real state and model.

The expert team checked the total deformation of construction in all directions. They also checked total stress on every wooden element of construction. The results had been discussed and then there was designed reinforcement of construction.

The expert team chose the four most probably load cases for construction load. There were applied dead-weight, snow load and two wind load on construction.

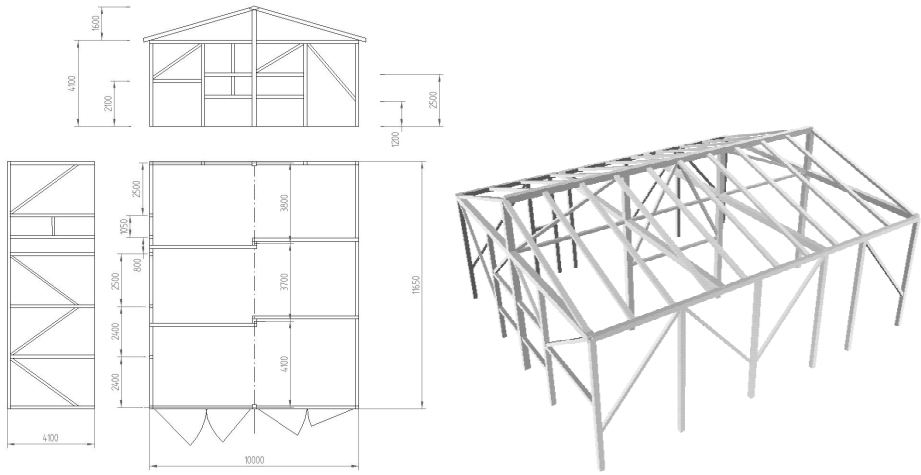

Fig. 2 Drawing documentation and three dimensional analysis model

3.4. Analysis of model

Expert team chose software IDA Nexis for assessment of construction. The experts of Department of Engineer Technologies have very good experience with this software. Software is used for static and dynamic analysis of construction and for designing by relevant specification too. Software is based on Finite Element Method. It does not work directly with finite element but it uses structural members (links, beams, columns etc.). There is generated a mesh from final structural element on each member.

This software was used for design three-dimensional model of construction. Each part of construction was created from wood category S2 with density 350 kg/m^3. Then load cases were applied on this model of construction. Snow load was computed for maximal value of snow cover 100 cm. Wind load was assumed for maximal speed of wind 26 m/s = 94 km/h. Calculation was performed after applying load cases. The calculation was linear and static. The wind load was the most limit load. It induced the most value construction deformation. It was 116 mm.

3.5. Designed construction reinforcement

The expert team performed the calculation and got in deformation of construction. Then they designed some versions of construction reinforcement. The version of reinforcement you can see on Fig. 3. It was the most effective one. There was designed load carrying stiffeners in two section planes – horizontal and vertical. Horizontal plane in roof level was first and vertical plane in central part of construction was second (the both of them are in dark colour). There was recommended to use plank 5 cm thick for reinforcement in central part. The expert team designed beams of cross-section 100×100 cm for reinforcement in horizontal plane. The beams could be fixed to column in central part and to upper beams in side wall. The designed beams could redistribute the stress in construction and reduce deformation. The system of fixation could be modified with reference to local specification and state of construction.

This modification was also carried out by OF1 Martin Kuna, because there was not possibility to obtain as long beams as was designed. The modification was consulted by the help of Information Portal of Engineer Corps with experts at Department of Engineer technology.

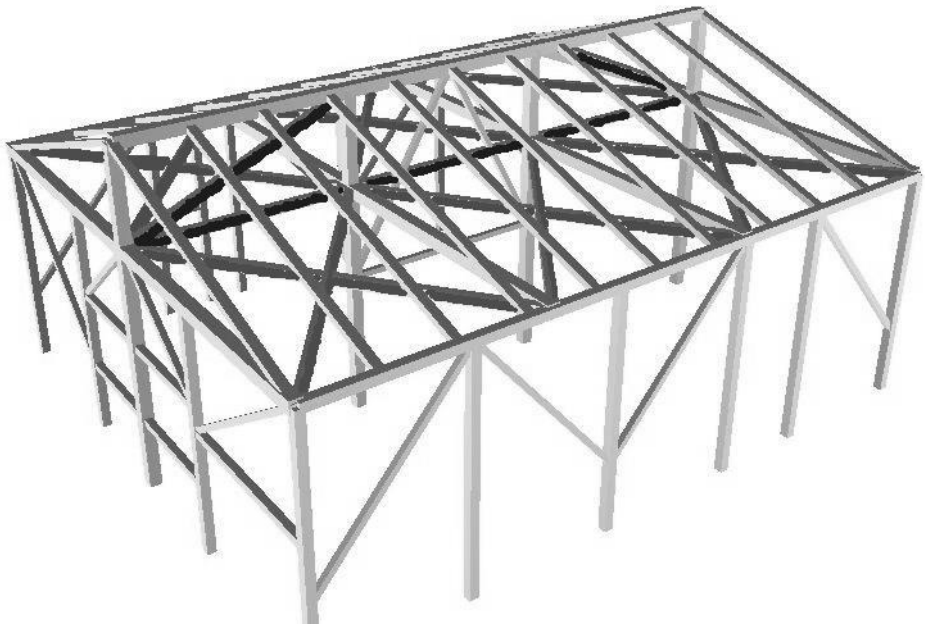

Fig 3 Designed construction reinforcing

There were applied load carrying stiffeners into model and assessment of construction was calculated again. The results of new calculation showed that the values of deformation were reduced approximately about 40 %. For this reason designed construction reinforcement was recommended to implementation.

3.6. Next proposal for construction modification

The expert team designed also other drafts how to modify the construction. The way of making better fixation of column to concrete panels was one of them. There was recommended use eaves to avoid the damage of wood construction and erosion of concrete panels because of absence eaves on roof. The next recommendation was to remove snow cover if it reaches more than 50 cm height.

3.7. Final report

The expert team summarized all their conclusions and designed solutions into Final report. This report was transfer to OF1 Martin Kuna through server iProject. The expert team consulted their conclusion and solutions with Martin Kuna. Then they designed and sent him modified solutions. Final report was sent by official way to Kosovo from higher headquarter Joint Operational Centre too. The communication by the iProject was very useful. The process of transfer information between support team (Expert team) and supported team (12th contingent KFOR in Kosovo) was quicker

because of using the concept Reach-Back by the help of Information Portal of Engineer Corps.

4. Problems during realization

There were many obstacles during the whole process of assessment and communication between units. There were problems with internet connection at KFOR base Šajkovac. It is very significant problem for efficient using of Reach-Back concept. It was sometimes necessary to send some information by e-mail or communicate by phone in this case. This problem was sometimes solved during exercise at using Reach-Back concept in past but not in real situation like this case.

The high-quality and continual connection to internet is necessary condition for efficient work with REACH-BACK concept by the iProject. We have to pay attention to this problem in future. The process of communication can be slowed-down without possibility of this connection. The speed of the decision can be determinant. That is why we have to improve this system in future.

5. Conclusion

The concept REACH-BACK is still in progress. The action described in this paper can help to find the negatives of concept and take them away. We also get experiences for members which will work with system iProject within Information Portal of Engineer Corps. The concept should help units sent to foreign mission. The system is specialized in engineer technologies.

The commanders and members of units have a chance to solve and consult their problems with the experts from support team. Then they can obtain the solution or advice which they can apply. The system will be also use as a source of the technical materials. These materials are producing by the members of Department of Engineers Technologies.

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