ИСКУСТВА ИЗ ПРАКСЕ

ПРАКТИЧЕСКИЕ ОПЫТЫ

PROFESSIONAL PRACTICE

ORGANIZATION OF ENGINEERING WORKS IN DEPLOYING A BRIDGE CROSSING POINT MADE OF CLASS 20 PONTOON MATERIAL

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http://dx.doi.org/10.5937/vojtehg65-8634

FIELD: Combat Engineering
ARTICLE TYPE: Professional Practice
ARTICLE LANGUAGE: English

Abstract:

When using pontoon material for deploying a bridge crossing point and/or some other type of crossing of water obstacles (ferry, landing), it is very important to organize works during the preparation, construction and disengagement of pontoon units and materials for the deployment and maintenance of already deployed crossing points. In the Serbian Armed Forces (SAF) there are specialized units for such works within military engineering, pontoon battalions, and within the River Flotilla (brigade units). The organization of engineering works given in the article represents a method for finding solutions to the use of movable assets and personnel in establishing bridge crossing points (BCPs) made of pontoon materials with a capacity of 20 t. The lack of contemporary literature in drafting the basic documents for the establishment of BCPs (existing literature dates from the 70s and 80s of the last century) is only one of the problems encountered when working in this area so, in the preparation of project documentation, experience from practice is heavily relied upon.

Key words: engineering units, engineering works, river crossing, pontoon materials.

Introduction

A place for crossing a water obstacle, in principle, is a part of a certain type of water barrier, bank and hinterland on both banks to be used in order to ensure a smooth and continuous delivery of people and movable assets (MAs) of all categories over any kind of water barriers (such as rivers, canals, or lakes).

The crossing point is different in size, type of crossing organized, conditions of access and exit roads to the river, forestation and camouflage conditions, units, number of MAs needed to be transferred to the other bank and a number of other factors. Depending on the ways of overcoming water obstacles, there are different crossing points as follows:

- ford crossing point,
- swimming crossing point,
- place of crossing the ice,
- amphibious crossing point,
- ferry crossing point,
- bridge crossing point (BCP),
- underwater crossing point (Pifat, 1980).

It is important to make a distinction between the terms *bridge* and *BCP.* The bridge is only one element of a BCP, namely just an artificial object on the water barrier, while a BCP is a regulated part of the river with its banks and the hinterland (part of the crossing section) where the river is crossed thus enabling continuous movement of units from one bank to the other. A BCP generally includes:

- starting (output) line,
- the access roads to the river,
- land or water points of pontoon material delivery,
- points of installation of bridge elements,
- axis of the bridge,
- upstream and downstream anchor lines,
- location for the deployment of empty cars,
- organs of control and protection services (CPSs) for BCPs,
- reserves of the crossing commander in crossing assets,
- fortified objects for the protection of personnel and resources,
- dams (barrier, obstacles) on the river for the protection of the bridge from vessels,
- group for building a bridge opening (only on navigable rivers),
- landmine obstacles at BCP access points (Generalštab JNA, 1974).

Commanders at a brigade level or higher have the right to decide on bridge elevation. A BCP can be organized immediately after the successful

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completion of a violent crossing, deployed bridgehead, and when a BCP is out of reach of enemy fire. Bridge assembling starts, in principle, between 0.5 - 2 h after the start of fording water barriers.This de facto means that the bridge construction starts immediately after establishing a bridgehead and, for a specified time period, it is necessary to ensure that the bridge construction site is out of reach of enemy fire (from small arms or direct artillery). BCPs are generally established at night, while the crossing is performed during the daylight at ferry crossing points (FCPs). The bridge is disassembled for FCPs and the sections of the bridge are used as ferries. During the day, a bridge can also be displaced and tied to the bank, camouflaged until the end of daylight.

Pontoon bridges represent a kind of bridges on floating supports (pontoons). They are designed to overcome water obstacles where there are no permanent bridges. A pontoon itself is a vessel with a hull with the upper deck mainly closed. It is intended for the construction of floating support for pontoon bridges or some types of ferries. A set of a pontoon bridge consists of a certain number of floating elements with cars, road surfaces on cars, tugboats to tow cars, sets of auxiliary equipment, tools and spare equipment and motor vehicles for the pontoon transport. Their basic feature is the reinforcement of the upper surface of the pontoon that serves as a carriageway for traffic (Gardijan, 2001).

Modern pontoon bridges, which are found in the armed forces of almost all countries (including the armament of the Serbian Armed Forces), represent a structural version of the Soviet PMP pontoon bridge which the armed forces of Israel captured from Egypt in war in 1973. The Serbian Armed Forces have 3 sets of pontoon bridges (pontoon stock 3) which are arranged in 2 pontoon battalions, and in 6 pontoon companies (each company is responsible for 0.5 pontoon stock).

In order to establish a BCP, the activities of more specialties and units from a pontoon battalion must be engaged and synchronized, including: reconnaissance and diving, pontoon and road as well as certain parts of the logistics battalion.

The paper describes an example of organizing engineering works in deploying a BCP with a capacity of 20 t made of pontoon material, with the calculation of the necessary manpower, pontoon material, the required time and a dynamic parallel plan of deployment works.

Set of a pontoon bridge M71

The set of the pontoon bridge SPB M71 is intended for setting up ferry and bridge crossings in overcoming water barriers. It can be used to construct:

– pontoons of a carrying capacity of 60 and 20 t (Class 60 and 20), and

– ferries of a carrying capacity of 20 to 170 t. The main types of ferries are 40, 60, 80, 110 and 150 t.

The SPB M71 (park) is constructed so that it can be divided into two halves and each half consists of a separate unit (two halfparks) with which a bridge or ferry crossing can be set independently. It is clear from the above why one pontoon company is responsible for one halfpark, precisely for the reason that it could independently deploy a BCP. The SPB M71 basic features are:

– bridge is constructed of floats (4 prefabricated pontoons) which represent the ready-made sections of the bridge or the ferry;
– in structural terms, bridge and ferry floats are identical;
– for ferry landing, unloading and/or loading MAs, slipways are not needed;
– float decks represent roadways of bridges and ferries with 4 lanes;
– for loads up to 20 t and a width of up to 3 m, two lanes can be used.

The capacity of each float, i.e. floating article (FA) is 20 t, and the capacity of the end (bank) float article (EFA) is 10 t.The time required for the assembly of a bridge/ferry is calculated from the moment when the first military vehicle (m/w) with a laden article arrives at the water (this method of calculating time is performed only in the case where articles can be immediately lowered to the water). In case of bad weather conditions, high-speed waterflow, shortage of personnel, enemy fire and the like, the time norm increases by 1.5 to 2 times.

For the transport of FAs and EFAs, motor vehicles FAP 2026 BDS are used. For the transportation or towing, the RPP M68/88 (river pusher propeller, or tug, which represents the structural version of the Soviet tugboat BMK-130M) is used as well as the AB M70 (aluminum boat) with an OBM (outboard motor). In addition, the FAP AVG 2026 motor vehicle is used for carriage with the OBM AB M70 and accessories for navigation.

Table 1 shows the basic tactical and technical data relating to the SPB M71, as well as the possibility to assemble bridges from this set standards and necessary manpower.

Table 1 – List of tactical and technical data for the SPB M71
Таблица 1 – Тактические и технические данные ПМП М71
Табела 1 – Тактичко-технички подаци КПМ М71

No.	Part of set	Quantity	Weight /kg/
1.	FA on m/w	32	/
2.	EFA on m/w	4	/
3.	Pavement surfacing on m/w	2	/
4.	RPP with m/w	12	/
5.	Support equipment, tools and spare parts - set	1	/
6.	FA on m/w	/	17840

No.	Part of set	Quantity	Weight /kg/
7.	EFA on m/w	/	18170
8.	FA	/	7230
9.	EFA	/	7860
10.	RPP M68	/	4350
Possibilities of assembling bridges			
Bridge capacity 60 t (Class 60)			
No.	Length/width of the bridge roadway in m	Number of people for construction (pontoniers+driver)	The time required for the construction at day/night in min
1.	227 / 6.50	68+34	30 / 50
Bridge capacity 20 t (Class 20)			
1.	382 / 3.30	68+34	50 / 80

Figure 1 shows two float articles assembled into a bridge section, in Figure 2 there is a RPP M88 attached to the bridge section with a tug, and Figure 3 shows a class 20 bridge which connects the Great War Island in Belgrade with the bank.

Figure 1 – Float on water
Рис. 1 – Плот на воде
Слика 1 – Пловни чланак на води

Figure 2 – Tug RPP M88
Рис. 2 – Буксирное судно РПП М88
Слика 2 – Реморкер РПП М88

Figure 3 – Pontoon bridge class 20
Рис. 3 – Понтонный мост класс 20
Слика 3 – Понтонски мост класе 20

The concept of organization of engineering works

Organization of engineering works is a purposeful activity focused on synchronysing human and material resources of an engineering unit in time, area and type of work, in order to complete quality engineering tasks, with the most rational use of time, manpower, resources and energy (Hristov,1978).

In many aspects, the organization of engineering works is very similar to the organisation of construction works (similar concepts, principles, methods of work, etc.), and because of this similarity in the realization and development of tasks, the literature in the field of civil engineering is very often used. Despite the similarity of the above organizations, engineering works are different, mainly because they are based on the military rules of use, resources, personnel, military logistics support system and the like.

Organization of engineering works is a remarkable method of „networking" or combining theoretical and practical capabilities of an engineering unit (technical and human), as well as a way of finding the best solution to apply these capabilities in realizing assigned tasks in the most cost-effective way. Commanders of engineering units, as well as their superiors, are a special type of managers. Since there are eight specialties within military engineering, we can only imagine how much knowledge and skills this group of people must have.

In accordance with the principles of the organization of engineering works, prior to any engagement of one engineering unit or its part, there is preparation of engineering works consisting of the following elements:

– Study of the task with supporting data and information:

- exploring the content, volume, difficulty level and conditions,
- the study of the Technical Solution, and
- development of a plan of reconnaissance and preparation of units for the execution of the task.

– Situation Assessment:
  - enemies (closeness, activity),
  - one's own power (availability of manpower and MAs),
  - characteristics of the water barriers (speed, width, depth of the water flow, coverage of the coastal area in greenery, the slope and height of the banks, access roads and the composition of the bottom),
  - speed of the water flow, because of the drift of vessels, and, consequently, their reduced capacity, and
  - time (increase in the norms because of the enemy, the meteorological conditions, human factor).
– Reconnaissance of works area - depending on the type of work being performed;
– Arranging the camp and/or the site;
  - done according to the following principles: grouping, environ mental quality, technological priorities and succession, gravity, communication and security.
– Organization of material preparation - depending on the type of work being performed;
– Organization of transport;
  - external and
  - internal.
– Operational order (OPORD) depends on the work being performed, but, in principle, it should have the following elements:
  - task for each subordinate unit according to the project documentation (manufacture, repair, maintenance of the road section, and the like),
  - sites for the reserves of pontoon material,
  - the method of traffic regulation in the work area,
  - production facilities, plants (for ferries, platforms, access roads, ramps, etc.),
  - safety measures,
  - measures of combat security, and
  - deadlines for individual phases and tasks in general.

Establishment of a BCP with a capacity of 20 t from the SPB M-71 with the organization of engineering works

Irrespective of the type of water obstacle crossing, prior to the BCP establishment, the pontoon unit commander is handed the OPORD, with the appendix “F" - OPORD Engineering, prepared by the engineering officer in the brigade command and/or unit of the same rank, where the Plan of engineering operations is given in detail, with the engineering plan of actions and the specific task of establishing the BCP. The Plan also specifies MAs and the personnel. The explanation of the Plan of engineering operations is provided in the Guidelines for operational planning and command operations in the SAF - Annexes page I-59 (Generalštab Vojske Srbije, 2013).

Upon receipt and understanding of the task, the commander issues a preparation order to subordinate commanders, and with the command members he organises reconnaissance. In pontoon battalions, there is a specialty, reconnaissance and diving, which forms the core of the reconnaissance patrol (from a group to a platoon) whose task is to collect data about the characteristics of the water obstacle in the allocated crossing point area. The patrol can walk or use an m/w depending on the distance of the crossing point region. In practice, since reconnaissance-diving squads (RECO) have not been developed, i.e. in no pontoon battalion the RECO organization and establishment structure has such personnel but only RECO equipment, the commander forms a reconnaissance patrol from the existing personnel.

In practice, there is usually no time for this activity; instead, information is obtained from the superior command and/or government institutions dealing with these issues (such as the Directorate of Waterways). Then the commander develops a technical solution for the bridge construction and organizes the work for the entire BCP. To solve this task, the commander may engage some other persons from his unit (deputies, experienced non-commissioned officers or professional soldiers).

The norms for the assembly of the bridge class 20 are listed in Table 1, page 221, the Combat Rules for pontoon and amphibious units (Generalštab JNA, 1974), and refer to a pontoon company and a battalion. According to this rule, a pontoon company can assemble a bridge class 20 with a maximum length of:

- 193.25 m at water speed ≤ 1,5 m/s and,
- 173 m at water speed > 1.5 m/s.

The basic problem here is the fact that there is currently no recent literature, or current standards for the assembly and the establishment of BCPs, as well as that the current norm relates to the organizational-formation structure and the capabilities of a pontoon company from the

time of the then-JNA, which represents the difference in the terms of structure and capabilities of the SAF pontoon companies. It is true that the SPB M71has not changed much (for example, under the existing rules, float carriers or RPP and CA M70 are m/w FAP 2220 BDS and AVG, and now the m/w are FAP 2026 BDS and AVG, with the difference in the number of RPP and RPP OBM departments in the pontoon companies and the like), but there is a change in the structure in terms of manpower of pontoon units. Literature relating to the organization of engineering works dates from the end of the 70s of the last century, and there is not one kind of recent literature that deals with this issue. It is important to emphasize the fact that a road plotoon is also engaged in deploying BCPs, primarily for building access roads to the bridge and slipways for ramps; however, the standards in the current literature refer to engineering machines that have been out of use for a long time.

Organization of engineering works is a very important element when performing any kind of engineering work, as a good knowledge of these issues can result in maximum optimization in terms of stress of any kind of resources (both material and technical, and human), affecting not only the work duration time, but also the cost of the works. It is important to emphasize that this would reduce the possibility of injury to personnel and frequent failures of equipment. In practice, most often engineering officers rely on experience and many actions are performed based on the experience of decades of practice in dealing with pontoons.

In order to overcome the above mentioned problems and to meet the existing norms, it is necessary to: change the material structure of the SAF pontoon units through a system of lessons learned; start work on the literature relating to the organization of engineering works, where, in addition to experience-based knowledge, it is necessary to implement knowledge from other „related" areas – economics, civil engineering, mechanical engineering, hydrology and meteorology.

The following part of the paper gives an example of a task, i.e. project documentation consisting of: the data from the engineering reconnaissance (Table 2), calculation for the required pontoon material, the specification of the required MA and the people (Tables 3 and 4) and a part of the organization of engineering works in deploying a BCP, i.e. a concrete product of all calculations is illustrated through a parallel dynamic plan (Table 5).

APPROVAL:
COMMANDER
Brigadier General
N.N.

Numeral designation according to
the records of 03 / 20XX

TASK

1. Execute the march of the 1st pontoon company, and the 1st squad/ road construction platoon/ 111th pontoon battalion from the village of Neradovac into the village of Rataje and establish a BCP, by assembling a bridge, class 20, with a length of approximately 150 m in accordance with the technical solution given with the task.

2.Organize a reconnaissance patrol at a squad level and send it to collect information on the characteristics of the water obstacle.

3. Construct a bridge class 20, no later than 12:00 o'clock on: XX.03.20XX. The crossing of the technical workload across the bridge is to be finished no later than 12:30 on: XX.03.20XX.

4. Establish a BCP with all the elements no later than 16:00 o'clock on: XX.03.20XX. and submit a written report by courier.

5. Directly secure the BCP during the works executed with one's own forces and resources, on the commander's orders. In terms of combat security of a wider BCP, rely on combat security measures.

6. Regulate the movement across the bridge with one's own forces.

7. At the crossing point, there have not been any preparations.

DATA

from the engineering reconnaissance across the river *Južna Morava*
at village *Rataje*

Reconnaissance start: 06.00 XX.03.20XX. year
Reconnaissance end: 08.00 XX.03.20XX. year

Table 2 – Data from the engineering reconnaissance
Таблица 2 – Данные инженерной разведки
Табела 2 – Подаци са инжињеријског извиђања

The required data	Reconnaissance results
Width of the water level at various water levels	LWL = 145 m
	MWL = 135 m
	HWL = 125 m
Water speed at various water levels	LWL = 1.3 m/s
	MWL = 1.2 m/s
	HWL = 0.7 m/s
The depth of water at various water levels	LWL = 4.5 m
	MWL = 2.8 m
	HWL = 1.8 m
Composition of bottom and banks	clay + sand; shore is gently sloping
Access roads to the site with information on the type of road and objects on the road: – on this bank, they are well kept and coated with asphalt; – on the other bank, it is necessary to repair a road section 300 m long	
Point for unloading material, possibility of approach and possibility of camouflage	unloading point - 150 m from the bank; approach possibility - 1 ramp downstream from the axis of the bridge - the possibility to throw 2 FAs in one go and 1 ramp upstream from the axis of the bridge - the possibility to throw 5 FAs in one go
Existence of local materials and floating assets	no
Change of water level	poor, no large shifts in changes in water level
Existence of facilities on the river	no
Data on forests in the BCP region	Bank covered with trees
Convenient location for assembling ferry – bridge parts	downstream 1 ramp-throwing 2 FAs upstream 1 ramp-throwing 5 FAs
Number of workshops in the BCP region	no
Possibility to use the RPP and OBM	good
Water level ≥ 0.4 m	left bank = 3.2 m
	right bank = 1.2 m
Note: The data relating to the water level - high, medium and low (HWL, MWL and LWL) are taken from relevant civilian structures and/or based on experience; since it takes long to acquire this information, and since there is no time for that, especially in combat conditions, the current values are taken. Data relating to the water level are experiential or taken from the field when raising a bridge.	

CALCULATION OF A PONTOON BRIDGE CLASS 20

a) Calculation of the length of the bridge

Calculation of the required length of FAs is carried out based on the formula:

$$B = \frac{\check{S} - 2 * M}{6.75} = \frac{145 - 23{,}5}{6.75} = 18$$

adopt 18 FA lengths

where:

B – number of the required FA lengths

Š – width of the river in meters (m)

M – is a length of EFAs and FAs, that is, the bank sections on both sides of the river i.e.. 2*(6.75 +5) = 23.5 m

b) length of the pontoon bridge made of FAs => 18*6.75 = 121.5 m

c) width of the river, the depths bigger than 0.4 m (for assembling floats, the water depth must be bigger than 0.4 m)

$$\check{S}_1 = \check{S} - (a+b) = 145 - (3.2 + 1.8) = 140 \text{ m}$$

where:

Š – width of the river in meters (m)

Š1 – required width of the river in meters

a – data obtained from the reconnaissance of this bank

b – data obtained from the reconnaissance of the other bank

d) total length of the bridge made of pontoon material:

$$18*6.75 + 2*M = 121.5 + 23.5 = 145 \text{ m}$$

e) withdrawing EFAs:

- left bank – 0.5 m
- right bank – 0.5 m

g) length of the bridge with the road (the length of the bridge + ramps made of EFAs):

$$145 + 2*2 = 149 \text{ m}$$

h) calculation of the number of complete floating articles:

$$B_1 = 2 + \frac{B_2 * (k+1)}{2 * k} = 2 + \frac{18 * 6}{10} = 12.8$$

adopt 13 complete FAs

where:

B1 - the required number of complete FAs

B2 - adopted length of the number of required FAs

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k – coefficient of the influence of water flow, for the water flow speed of 1 to 1.5 m/s, is 5. (Pifat, 1980)

The calculation shows that there is a difference between the number of the required lengths and the number of complete articles (the values obtained in the formulas ,,a" and ”h"), because *for the bridge class 20, every third FA is complete, and the two previous ones are disassembled to halves* (as it can be seen in Figure 3). The total length of the bridge is 149 m, which is longer than the width of the river (145 m), and thus we conclude that the calculation is correct and applicable in practice, i.e. manageable.

Table 3 – List of needed assets
Таблица 3 – Перечень необходимых средств
Табела 3 – Попис потребних средстава

No.	Name of MA	Unit	Amount
From the 1st pontoon company			
1.	FA with m/w FAP 2026 BDS	piece	13
2.	EFA with m/w FAP 2026 BDS	piece	2
3.	RPP with m/w FAP 2026 AVG	piece	4
4.	AB M70	piece	3
5.	OBM Johanson 40	piece	3
Reserve			
6.	FA with m/w FAP 2026 BDS	piece	3
7.	RPP with m/w FAP 2026 AVG	piece	2
8.	AB M70	piece	2
9.	OBM Johanson 40	piece	2
From a road-construction platoon			
1.	Dozer TG 220	piece	1
2.	ULT 160C	piece	1
3.	Tipper 6.5 t	piece	1
4.	Rig	piece	1

Table 4 – List of required manpower
Таблица 4 – Перечень необходимых специалистов
Табела 4 – Списак потребног људства

No.	Name of duties	Personnel category	Number of persons
From the 1st pontoon company			
1.	Company commander	officer	1
2.	Platoon commander	officer	2
3.	Squad commander	non-commissioned officer	4
4.	Attendant SPB M71	professional soldier	30
5.	Driver attendant SPB M71		19
6.	Attendant RPP		8
7.	Attendant OBM		6
Total: 3 officers, 4 non-commissioned officers and 63 professional soldiers			
Reserve			
6.	Attendant SPB M71	professional soldier	6
7.	Driver attendant SPB M71		5
8.	Attendant RPP		4
9.	Attendant OBM		4
Total: 19 professional soldiers			
From a road-construction platoon			
1.	Squad commander	non-commissioned officer	1
2.	Attendant ULT 160C	professional soldier	1
3.	Tipper driver		1
4.	Rig driver		1
5.	Attendant TG 220		1
Total: 1 non-commissioned officer and 4 professional soldiers			
Total: 3 officers, 5 non-commissioned officers and 86 professional soldiers			

TIME CALCULATION

a) Road preparation:
   – company march: village of Neradovac - village of Rataje = 12 km => 0.50 h;
   – assembling a 40 t carrying capacity ferry and transporting the engineering machinery to the other bank (TG-220; ULT 160C; –Tipper 6.5) => 1.00 h;
   – repair of the section of the exit road, a distance of 300 m => 2.00 h;
   – total required time: 3.50 h = 3h 30 min.

b) Assembling the bridge:
   – company march: village of Neradovac - village of Rataje = 12 km =>0.50 h;
   – assembling a bridge class 20 t
     • lowering the floating articles in two waves at h = 0.12>0.24 h;
     • lowering the RPP in water in one wave after 0.12 h => 0.12 h;
     • assembling articles (bridge sections) => 0.50 h;
     • linking bridge sections into the bridge axis => 0.50 h;
     • technical inspection of the bridge and test load crossing => 0.50 h;
     • Total time required for the bridge assembly: 2.36 h = 2 h 21 min
c) Total time required**:** 5.36 = h 5 h 21 min.
d) The total required time for the BCP deployment with parallel activities (adequate organization of engineering works): 3.50 = h 3 h 30 min - This difference occurs because the preparation of the access roads and ramps should begin prior to the bridge installation; namely, after the arrival at the crossing point, the assembly of a class 40 ferry should start immediately and the engineering machinery should be transported to the other bank where the exit section of the road is prepared, while on this bank there are parallel ongoing works on lowering SPB M71 parts into water and their assembly.

Note: Standards for lowering SPB M71 parts, as well as for their assembly, are taken from the book Pontoon Bridge M71, pp. 23-24 (Generalštab JNA, 1976).

ORGANIZATION OF WORKS

The 1st pontoon company:
Company command:
– monitors and controls the work of subordinates and deals with any issues on the spot;
– improves documentation necessary for the functioning of the BCP;
– determines the personnel for the BCP (in terms of determining the number of persons needed for specific BCP organs).

The 1st pontoon platoon:
– regulates the exit section of the road in a length of 300 m
– lowers 4 RPPs (1 for the downstream river guard, and 3 for linking the bridge sections into the axis);
– assembles a part of the bridge out of 10 FAs and 1 EFA - the downstream part;

– with the available manpower, establishes a part of the CCS - the bridge crew, maintenance of the ramp on the right bank, traffic regulation station on the right bank;
– establishes a post for observing the water level.

The 2nd pontoon platoon:
– lowers 3 AB M70 with 3 OBM;
– assembles a part of the bridge out of 3 FAs and 1 EFA - the upstream part;
– with the available manpower, establishes a part of the CCS - the maintenance of the ramp on the left bank, the station to regulate traffic on the left bank, downstream and upstream river guard, rescue station, emergency squad;

Table 5 – Parallel dynamic plan
Таблица 5 – График параллельной динамики
Табела 5 – Паралелни динамички план

No.	Activity	Duration in h					
		1	2	3	4	5	6
1.	Company march						
2.	Assembling a ferry and transporting machinery						
3.	Preparation of access roads						
4.	Assembling bridge sections						
5.	Linking the bridge sections into the axis						
6.	Load testing and technical inspection						

Table 5 provides an overview of the budget for the establishment of a CBP through a parallel dynamic plan, where it can be seen how much a quality organization of engineering works affects the duration of works and the consumption of resources. The dashed line shows the duration of the process when activities are not performed concurrently, and the solid line shows the process duration when the activities run simultaneously.

Optimizing the organization of engineering works for this task could be achieved primarily by applying or introducing into operational use contemporary engineering earthmoving machines.

Conclusion

In accordance with the current concept of warfare and the concept of air-ground operations which has become a „cliché” of combat operations, especially in the US Armed Forces and NATO member countries, it is easy to notice that the speed of maneuvering has become one of the decisive

factors for successful execution of any military operation. Whether it is a question of offensive combat operations, which are the main type of operations in the US Armed Forces and NATO member countries, or defensive combat actions, it is evident that, in addition to modern techniques and good planning, speed and ability to perform a maneuver are a prerequisite for retaining initiatives during action, and for achieving the goal. Therefore, today all modern armies of the world have a large number of various means for overcoming water obstacles (Milojević, 2010, p.129).

A big problem in the allocation of tasks and the estimation of time for their implementation is the fact that there are no contemporary norms and adequate literature that could serve as an orientation to determine the time required for the organization of works of preparation, establishment and maintenance of BCPs. It is necessary in the future, based on the current (real) conditions of the units and means, to carry out standardization of works in the establishment of BCPs, i.e. to elaborate a comprehensive and detailed organization of engineering works during the realization of these tasks; in other words, to start dealing with prevention, not just the consequences, because BCPs can also be used in peacetime for Domain 3 tasks in the SAF mission.

Tactically and technically speaking, crossing over water obstacles is an exclusive activity of specialized engineering units - pontoon units. The order to establish some kind of crossing over water obstacles of certain objects can only and exclusively be issued by operating level unit commanders (Kitanović, 2000).

In all armed forces of the world, pontoon bridges are the backbone of overcoming water obstacles. The armed forces of the Russian Federation are the leaders in this area. The data which proves this fact is that the Russian troops have had a pontoon rail bridge in their operational use since 2005.

This article is an attempt to take a comprehensive look at all the specific characteristics in the establishment of BCPs for a bridge class 20 made of CPB M71 and its components, i.e. to point out the importance of timely and quality organization of engineering works in this task. Also, the article seeks to point out the possibility of the CPB M71 (its parts - RPP, OBM, BA M70) multiuse which was (unfortunately) confirmed during the catastrophic floods in Serbia in May 2014, and during the NATO aggression on the Federal Republic of Yugoslavia in 1999. Consequently, the SAF must urgently start the modernization of the existing CPB M71, or acquire new types of sets of pontoon bridges from abroad.

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ОРГАНИЗАЦИЯ ИНЖЕНЕРНЫХ РАБОТ ПРИ УСТРОЙСТВЕ ПОНТОННОГО МОСТА КЛАССА 20 НА МЕСТЕ ПЕРЕХОДА

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ОБЛАСТЬ: инженерные войска
ВИД СТАТЬИ: практический опыт
ЯЗЫК СТАТЬИ: английский

Резюме:

При использовании понтонов для устройства мостов или прочих видов перехода через водные преграды (паромы, десантные переправы) чрезвычайно важно разработать такие этапы работ как: организация подготовительных работ, организация производства работ, а также распределение подразделений и материалов для сооружения и содержания места переправы. Производством данного вида работ занимаются специальные подразделения инженерных войск Вооруженных сил Республики Сербия – понтонно-мостового батальона, являющегося частью Речной флотилии (объединение - бригада). Описанная в данной статье организация инженерных работ представляет собой

целесообразную разработку всех процессов, задействованных в области переправы через водные преграды, в том числе распределение нагрузки на понтеров при устройстве понтонномостовых переправ, грузоподъемностью 20 тонн. Одной из насущных проблем, с которой сталкиваются военные инженеры при оформлении основной документации по устройству ПМП, является отсутствие современной литературы (существующая литература относится к 70-80-ым годам прошлого века), таким образом, разработчики вынуждены опираться исключительно на практический опыт как в оформлении проектной документации, так и в самом процессе производства работ.

Ключевые слова: инженерные войска, инженерные работы, переправа через реку, понтоны.

ОРГАНИЗАЦИЈА ИНЖИЊЕРИЈСКИХ РАДОВА ПРИ УСПОСТАВЉАЊУ МОСНОГ МЕСТА ПРЕЛАСКА ОД ПОНТОНСКОГ МАТЕРИЈАЛА КЛАСЕ 20

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ОБЛАСТ: инжињерија
ВРСТА ЧЛАНКА: искуства из праксе
ЈЕЗИК ЧЛАНКА: енглески

Сажетак:

Приликом употребе понтонског материјала за успостављање мосног и/или неке друге врсте преласка преко водене препреке (скелског, десантног), врло је важна организација извођења радова приликом припреме, у току успостављања, али и при дезангажовању јединица и понтонског материјала за успоставу и одржавање места преласка. За извођење ових радова у Војсци Србије постоје специјализоване (наменске) јединице. То су јединице једне од специјалности у оквиру рода инжињерије, понтонирске специјалности, које егзистирају у оквиру понтонирских батаљона, односно у оквиру Речне флотиле (јединица ранга бригаде). Организација инжињеријских радова која је описана у чланку представља, у ствари, изналажење најцелисходнијег решења у погледу употребе покретних ствари, али и напрезања људства, при успостављању мосног места преласка од понтонског материјала, носивости 20 т. Недостатак савремене литературе само је један у низу проблема са којима се срусрећу старешине приликом израде основних докумената за успостављање

ММП-а (постојећа литература је из 70-их и 80-их година прошлог века), те се при раду са овим средствима и при изради пројектне документације углавном ослањају на практична искуства.

Кључне речи: инжињеријске јединице, инжињеријски радови, прелаз преко река, понтонски материјал.

Paper received on / Дата получения работы / Датум пријема чланка: 30.06.2015.
Manuscript corrections submitted on / Дата получения исправленной версии работы / Датум достављања исправки рукописа: 31.03.2017.
Paper accepted for publishing on / Дата окончательного согласования работы / Датум коначног прихватања чланка за објављивање: 02.04.2017.

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