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Damming Opportunities in Case of Natural Calamities

This paper deals with technical matters relating to the protection of existing and innovative riverbanks, farmland and homes in case of natural disasters. Also includes comparative presentation of proposed solutions regarding the advantages and disadvantages occurring during developments.

Keywords: *disaster, opportunities, metal cofferdam, piling Polyvinyl Chloride*

1. Introduction

In case of natural calamities, the majority of bank's defense, damming and regularizations projects are made from concrete, enrockment, gabions, pile planks of steel or wood.

The disadvantages are the followings:

- the concrete wall cracks, due to the soil settlement
- in time the gabions protection net is breaking
- the chemically treated wood releases chemical substances in water

In this way we propose two new solutions:

- metallic bulkhead as an innovator solution where the water is the carrying element
- pile planks of vinyl polychloride

2.Working's alternatives proposed for the damming execution elements in case of natural calamities

We propose two alternatives in order to achieve the damming, in case of natural calamities, which replace the classical method of sand bags, concrete or gabions.

2.1. Metallic cofferdams

Starting from the natural events often meet in Caras Severin and Timis county due to the relief, the river bed of the main rivers Timis, Bega, Barzava widens towards shedding in Danube and causes in the months with intense rain-falls real calamities on the riverside localities and crops, I have begun the documenting in order to make this theme.

The study and the reality from the field regarding these events has showed that we are opposing to nature with the "classic" sand bags, for achieving additional damming to protect the localities, highways and crops grounds.

In order to make these embankments with short existence, are used large financial resources, great physical and mechanical effort, not always with good results, and after danger has passed, it's not recovered even 5% from the used materials.

In this sense, by studying specialized literature, the practice made during faculty, various events determined by flood at which I effectively participated, was born the idea of achieving these metallic cofferdams.

I observed that at the sudden increase of the rivers altitude over the alert one, all the affected people of the localities enter in alert, lots of people are mobilized, lots of vehicles, frontal loaders, huge sand quantities and textile material.

The operation needs a lot of manual labor, in hard conditions of intervention and not always has the expected result.

In order to achieve this, I proposed for the replacement of the classical means, the execution of light metallic dams, from corrugated plate, inter changeable, easy to fix on and to disassemble, in the Domino system, of variable height and length based on defence shore dimensions. The solution is an innovatory type, which replaces with 90% the classical solution.

The properly execution is from corrugated plate of 1, 25 mm thickness with reinforcement of angle steel on the system of cofferdam rooms. Each element of closing the flooding shore is assembled with the followings, on length and height through light and watertight mechanical attachments and the truss on soil is made by mechanical elements attachments.

The effective newness constitutes the fact that this cofferdam rooms will be laded with the aid of motor pumps just with the water from the river. After use, the water is evacuated through the bleeders used on each element.

The cofferdams are interchangeable, re-used, the costs with 30% higher than in use of sandbags, amortized after 2, 3 uses.

The constitutive elements used are commons, scaled plate protect with anticorrosive plaster, angle bar with equal wings, classical joint elements, linen gum.

For the improvement of the bearing capacity, the plate is folded through reinforcement with the aid of some SDV.

The assembling is fast due to the assembling elements and elastic linens. The stability element of the cofferdams is done by the river water.

The costs are for the properly execution, transport, assembling and the carburant for motor pumps.

Concerning the research theme we wish to study the strain's status and deformation which appears in the executed modules, in effective conditions, based on flow, speed, pressure on this metallic elements for attain to a form near to ideal.

In this sense we propose the effective execution of some modules on a small scale to make the experiments.

Studying specialized literature and effectively the practical solutions used in domain, imposed an innovatory solution, with high degree for interchangeability and great efficiency regard the classical solutions namely "the inevitable sandbags".

In the first stage I proposed the achievement of some experimental models at a scale of 1:1, the effective verification of the cofferdams in effective work conditions, with multiple assembling and dismantling, study of used materials conduct, obtaining of the necessary SDV for the execution of an optimal form of these and only in the second stage the effective study of tension status and strains in the cofferdams modules in laboratory conditions and in the same time through simulation.

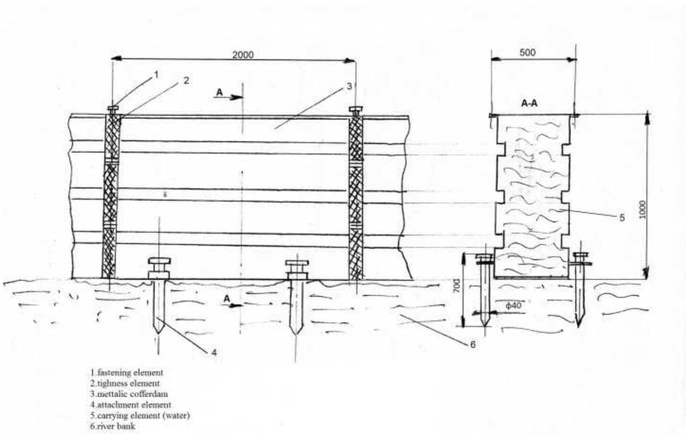

Figure 1. Metallic cofferdam

Advantages:

- rapid achievement in a production series with a small number of SDV
- rapid assembling – dismantling
- low cost
- use the water as carrying element, which reduce the costs

Disadvantages:

- without a coverage in immersion with special paint, appears rapid the phenomenon of corrosion

2.2. Pile planks of vinyl polychloride or composite materials

This method appeared recently, in the 70s, as an alternative in case of damming or regularizations.

The fabrication is made through extrusion of vinyl polychloride, is then treated with additives for the durability at bad weather.

The duration use is to 50 years, with a great range of temperature in which the vinyl polychloride keep its properties.

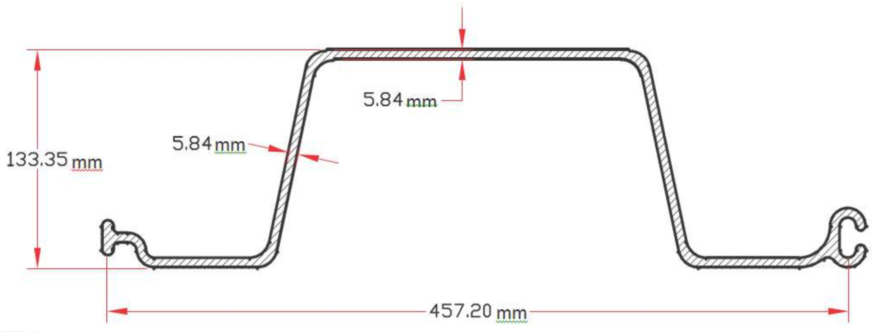

Figure2. Pile plank vinyl polychloride

Table 1.

The maxim point admitted (M)	kN-m	9,5	Elasticity module (E)	N/mm^2	2620,1
Strength cutting(V)	kN	28,6	Impact strength	J	79,1
Thickness (t)	mm	5,6	Height in section	cm	13,34
Module of strength (W)	cm^2	413,7	Width in section	cm	45,72
Inertia momentum (I)	cm^4	2771	Stabilized UV		Yes
Stretch strength	N/mm^2	43,4	Standard packing	Pc/pack	22

The maxim point admitted (M)	kN-m	9,5	Elasticity module (E)	N/mm^2	2620,1
Flowing limit	N/mm^2	27,6	Weight	Kg\mt	6,6

Technical data figure2

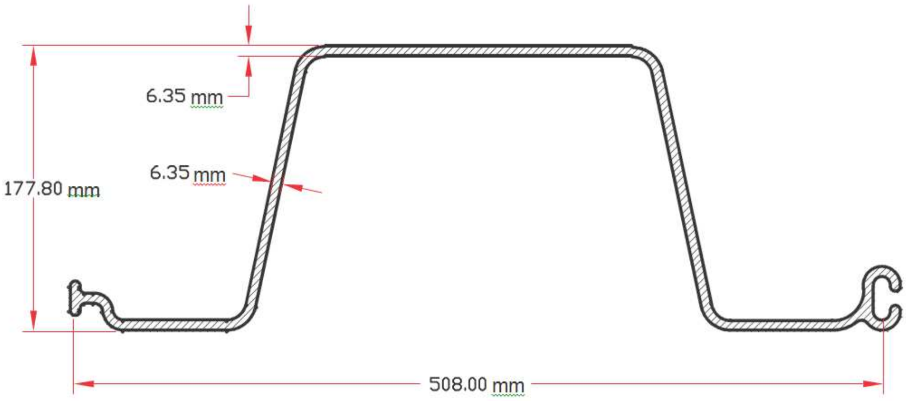

Figure 3. Pile plank vinyl polychloride

Table 2

The maxim point admitted (M)	kN-m	13,9	Elasticity module (E)	N/mm^2	2620,1
Strength cutting(V)	kN	36,9	Impact strength	J	101,7
Thickness (t)	mm	6,3	Height in section	cm	17,70
Module of strength (W)	cm^2	612,4	Width in section	cm	50,8
Inertia momentum (I)	cm^4	5433	Stabilized UV		Yes
Stretch strength	N/mm^2	43,4	Standard packing	Pc/pack	20//10
Flowing limit	N/mm^2	27,6	Weight	Kg\mt	8,06

Technical data fig.3

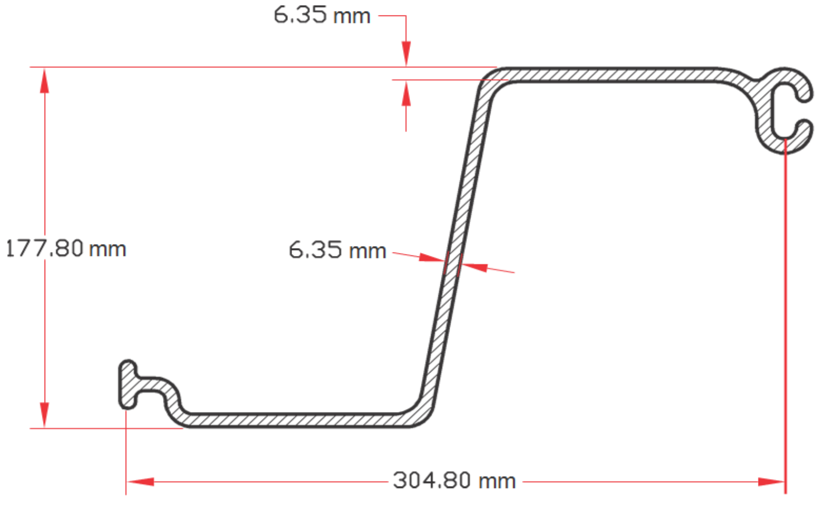

Figure4. Pile plank vinyl polychloride

Table 3

The maxim point admitted (M)	kN-m	15,5	Elasticity module (E)	N/mm^2	2620,1
Strength cutting(V)	kN	31,1	Impact strength	J	101,7
Thickness (t)	mm	6,3	Height in section	cm	17,78
Module of strength (W)	cm^2	682,8	Width in section	cm	30,5
Inertia momentum (I)	cm^4	6063	Stabilized UV		Yes
Stretch strength	N/mm^2	43,4	Standard packing	Pc/pack	40
Flowing limit	N/mm^2	27,6	Weight	Kg\mt	5,07

Technical data fig.4

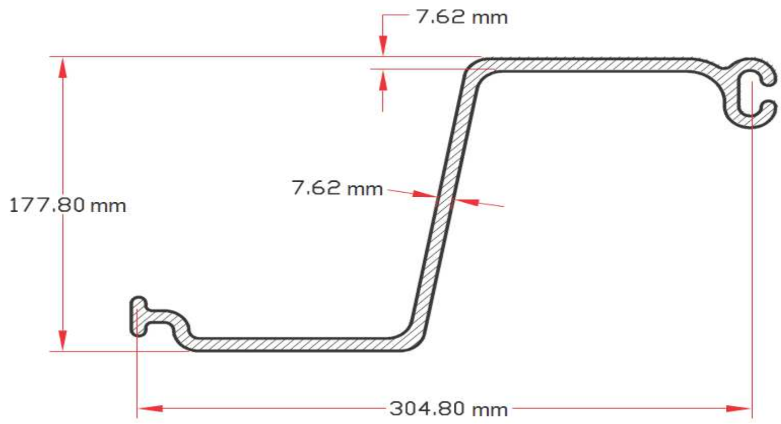

Figure5. Pile plank vinyl polychloride

Table 4

The maxim point admitted (M)	kN-m	17,3	Elasticity module (E)	N/mm^2	2620,1
Strength cutting(V)	kN	37,2	Impact strength	J	113
Thickness (t)	mm	7,6	Height in section	cm	17,78
Module of strength (W)	cm^2	779	Width in section	cm	30,5
Inertia momentum (I)	cm^4	6906	Stabilized UV		Yes
Stretch strength	N/mm^2	43,4	Standard packing	Pc/pack	40/20
Flowing limit	N/mm^2	27,6	Weight	Kg\mt	5,96

. Technical data fig.5

Figure 6. Application at dams

Figure 7. Application at dams

Figure 8. Application at dams

Advantages:
- great use duration
- lower cost than from steel
- reduced weight
- easy assembling

Disadvantages:
- high cost of SDV used at fabrication of pile planks
- reduced possibilities of soil truss in case of rapid interventions at calamities

3. Conclusions

From the presentation of these two opportunities of embankment in case of natural calamities we make the following conclusions:
- both alternatives are suited to the rapid assembling and dismantling
- the production costs are approached
- the solution of metallic cofferdams presents a newness degree and a fast achievement with commons SDV

We propose the experimental execution of both alternatives and also the achievement of comparative laboratory studies of strain status and deformations in the elements of the proposed alternatives.

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