

ARRANGEMENT OF SPRINKLER IRRIGATION MADE USING WATER FROM DRAINAGE CANALS IN ROMANIA, TIMIȘ COUNTY

Teodor Eugen Man¹ Robert Beilicci¹ Mihaela Cojocinescu¹
Daniela Untaru¹ Antonia Pasc¹ Marin Ilca¹ Erika Beilicci¹

Abstract: The paper presents a current example of sprinkler irrigation at "ASG", made using water from the CPE drainage channel, from the Cena area, Timiș County. In Banat, the water source for irrigation from the Timis and Bega Rivers is limited during the period of summer when it is necessary to apply irrigation in the area where there is no other source of water available, which is why it is necessary to find new sources of water available even for local facilities, such as: groundwater, sess accumulations, ponds, water from desiccation etc.

Keywords: irrigation design, water from drains, drum and hose irrigation system, mobile motor pump

1. INTRODUCTION AND GENERAL CONSIDERATIONS

About 200 years ago, the Banat was a swamp requiring the following works: - sanitation, damming and regularization of water courses; - deforestation and land clearing; - the arrangement of agricultural land on the slope; - desiccation and drainage; - the improvement of saline lands and the amendment of acidic soils; - leveling and modeling of agricultural lands; - reversible layouts; - irrigation facilities. Thus, at present, it is no longer possible to conceive a high-performance agriculture, considering the new technologies and modern agricultural equipment that appeared, without irrigation, in the conditions of the new climatic conditions characterized by prolonged droughts [4,5,6].

In the west of Romania (Banat), the old drainage systems have become non-functional or have a low yield - for the most part, maintenance and repair works in the post-revolutionary period have been greatly reduced, being sporadic, these being physically and morally worn out, currently being necessary rehabilitation/modernization measures to ensure their operation at the initially designed capacity, to ensure the conditions imposed by the application of new

technologies, agricultural machinery, new irrigation equipment in agriculture.

In this context, there is the problem of finding the water sources necessary for the realization of new local irrigation arrangements of some agricultural associations/organizations of the owners of agricultural land, for which new modern sprinkler irrigation equipment was chosen (central, lateral pivots, drums with hose, etc.), and in order to save water, drip irrigation for plantations and vegetable crops. In most of the new irrigation facilities in the west of the country, one of the problems was the water source. The main source of water is water from the surface watercourses (Bega, Timiș and Mureș), transported on the existing network of drainage canals, unclogged and adapted to serve both the drainage facilities for the evacuation of excess water and for the transport of water, during the vegetation period (of applying irrigation works), from the source to the irrigation facilities.

2. CASE STUDY: CURRENT EXAMPLE OF SPRINKLER IRRIGATION DESIGN AT "ASG", MADE USING WATER FROM THE CPE DESICCATION CHANNEL, FROM CHECEA JIMBOLIA DEVELOPMENT, TIMIȘ COUNTY

The Checea Jimbolia development is located in the Bega Veche S= 54,451 ha hydrographic basin, 684 ha of closed drainage, being put into operation in 1970. The development is part of the Bega - Veche hydrographic basin and is divided into 8 Drainage Units: UD Cenei - Checea , UD Cenei, UD Uihei – Cărpiniș, UD Clarii Vii, UD Grabați, UD Comloș and UD Iecă - Beregsău [1,2].

The network of drainage canals in total length of 828507 m is functional, but it is partially covered with aquatic, grassy and woody vegetation (Fig.1).

¹Politehnica University Timișoara, Faculty of Civil Engineering, Department of Hydrotechnical Engineering, Splaiul Spiru Haret no. 1/A, 300022, Timișoara, Romania, e-mail: eugen.man@zavoi.ro



Figure 1. Situation plan of the development of Checea Jimbolia

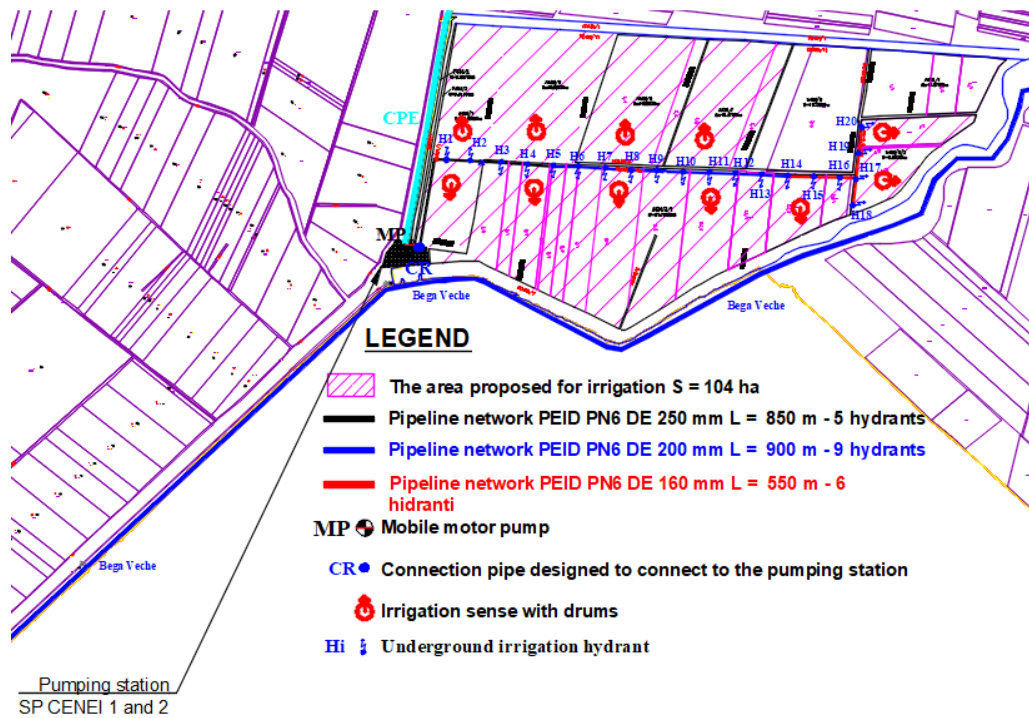


Fig 2. Situation plan with the irrigated surface.

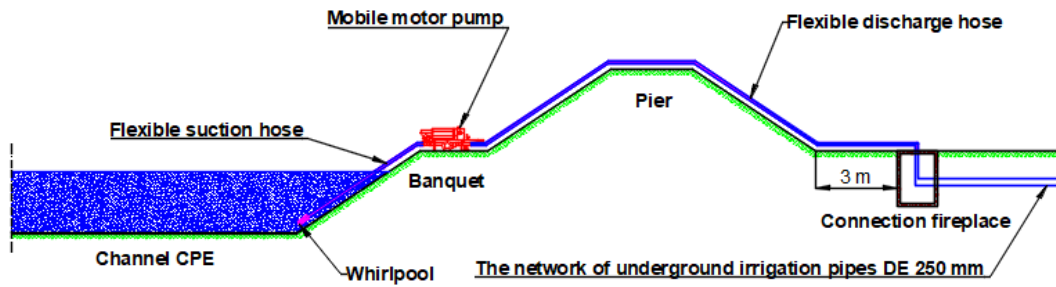
The project includes the following components:

- the establishment of a network of underground pipes from PEID PN6 (with a total length of 2,300 m provided with 20 hydrants). The pipelines will be located underground next to the drainage channel HC 436/5-6 m outside its protection zone (over 2.5 m in front of the channel), on the lands owned by the beneficiary;
- purchase of mobile pumps with high efficiency and soundproofing, which will suck from the ANIF

(National Land Improvement Agency) CPE channel (identical to HC55/1) and discharge into the connection chamber on the underground network of pipes (antennas) by means of flexible hoses, from where through mobile watering equipment will be supplied through the hydrants;

- the purchase of mobile sprinkler irrigation equipment - drum and hose irrigation installations with watering sprinklers, these will be connected to the hydrants on the underground pipe network.

The mobile motor pump will be located on the bench of the CPE channel (identical to HC55/1).



NOTE

The mobile motor pump and the flexible suction and discharge hoses will only be installed during the irrigation period. In case of high water, they will be transported to the beneficiary.

Figure 3. Arrangement/location diagram of the motor pump

A flexible hose fitted at the end with a siphon that will be located in the CPE channel will be connected to the suction of the motor pump. A flexible hose will be connected to the discharge of the motor pump, which will cross the dike by simply placing it and protecting it on the crown for the crossing of agricultural machinery, and will be connected in the connection chamber to the network of underground pipes according to the plans.

mobile motor pump during the watering period based on an ANIF approval. The application of irrigation watering will be done according to the volume of water available in the drainage channel, respectively according to the agreement with ANIF, the Timiș Territorial Branch of Land Improvements.

The underground pipe network was located on the lands owned by the beneficiary outside the protection zone of the existing canals, underground at an average depth of 1.5 m.

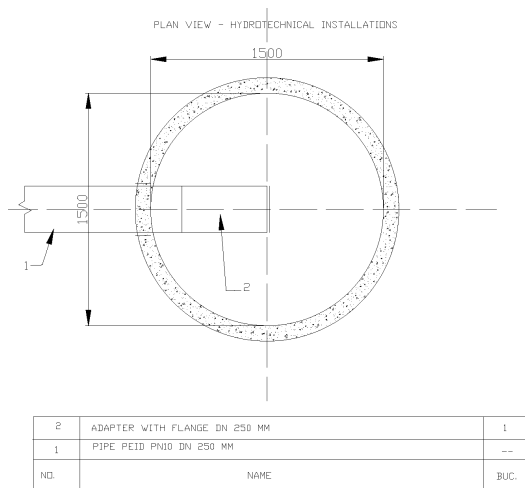


Figure 4. Connection chimney - hydrotechnical installations

The drum and hose irrigation system with watering sprinklers will be of the PLSMP CASELLA type:

Flow capacity for 1 roll: 2400 lit/min = 144 mc/hour

Nozzles: 38 mm

Jet pressure: 7 bar = 71,38 mca

Pressure in the car: 11 bar = 112,17 mca (losses in the car about 4 bar = 40,79 mca)

Irrigation diameter: 130 meters

The mobile motor pump will be of the GMP CASELLA type

Engine Iveco FPT 126 hp

Rovatti SN4E125/400/H pump, 1450 rpm: 6000 lit/min = 360 mc/hour at a pressure of 30 mca = 2,94 bar, 1750 rpm: 6000 lit/min = 360 mc/hour at a pressure of 50 mca = 4,9 bar.

The water supply will be made from the ANIF CPE channel (identical to HC55/1) by means of a

Section	L (m)	DE (mm)
CR - H1	50	250
H1 - H2	100	250
H2 - H3	500	250
H3 - H4	100	250
H4 - H5	100	250
H5 - H6	100	200
H6 - H7	100	200
H7 - H8	100	200
H8 - H9	100	200
H9 - H10	100	200
H10 - H11	100	200
H11 - H12	100	200
H12 - H13	100	200
H13 - H14	100	200
H14 - H15	100	160
H15 - H16	100	160
H16 - TEU	50	160
TEU - H17	10	160
H17 - H18	100	160
TEU - H19	90	160
H19 - H20	100	160

The pipes chosen are made of PEID PN6 intended for conducting irrigation water to irrigation facilities.

Pipe PN6	L (m)	DE (mm)	DN (mm)
MP	850	250	231.8
	900	200	185.4
	550	160	148.4
Total MP	2300		

All canals (canals owned by ANIF R.A) have ensured protection zones according to the legislation in force of 2.5 m on both banks.

The designed pipe network does not intersect irrigation or drainage channels on the site. Thus there are no under-crossings or over-crossings of channels. The pipelines are not located in their protection zone.

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All channels (channels managed by ANIF) have ensured protection zones according to the legislation in force.

The designed pipe network does not intersect irrigation or drainage channels on the site. Thus there are no under-crossings or over-crossings of channels. The pipelines are not located in their protection zone. The mobile motor pump and the flexible suction and discharge hoses were placed in position only during the

watering period. During the rest of the periods, they will be kept at the beneficiary's premises.

The works designed within this project fall, in accordance with STAS 4273/83, in category 4, according to the duration of operation they are definitive, and according to importance they are part of class IV. According to HG 766/97, expert works are part of the category of normal importance (C).

Below are the execution details for above-ground hydrants, manhole, anchoring massif and reductions, as well as an overall picture of the drum and hose irrigation installation.

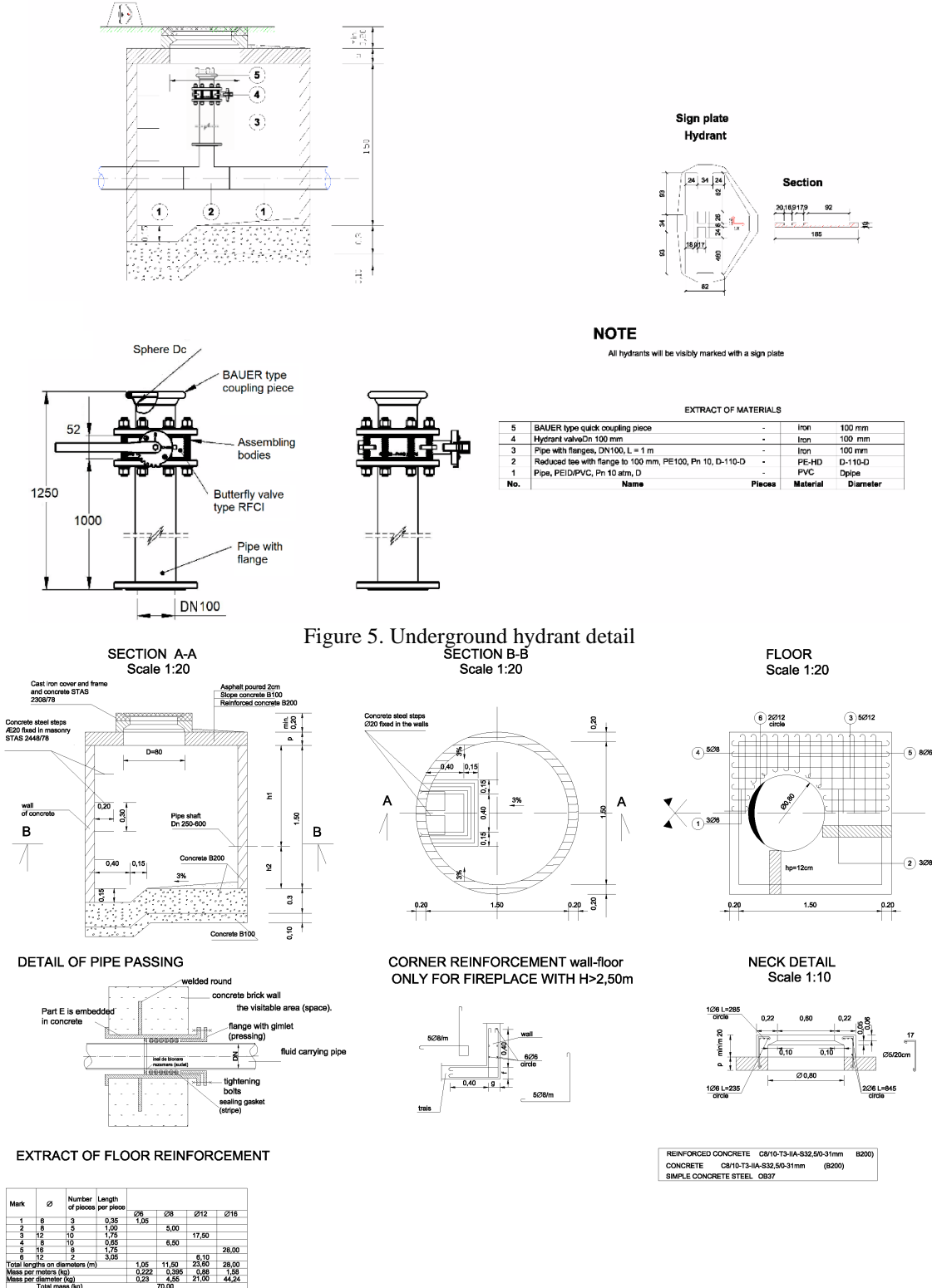
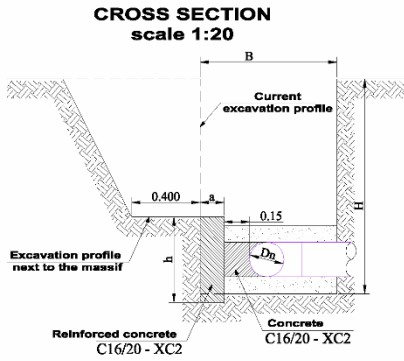


Figure 5. Underground hydrant detail

Figure 6. Concrete fire place hydrants

ANCHOR MASSIVES FOR T



DIMENSIONS OF THE ANCHOR MASSIVE AT T

Massive type	Dimensions (cm)			The reinforcement extract								Total steel on massive		
	a	h	l	1				2				Ø	Total length (m)	Total weight (kg)
				Ø	II	Bar length	No of piece	Ø	II	Bar length	No of piece			
T	43	170	255	10	247	280	15	10	162	195	15	10	71.30	44.00

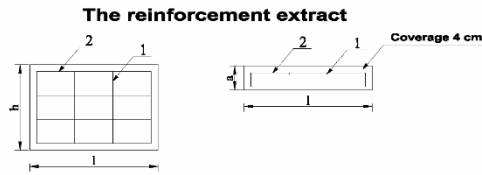
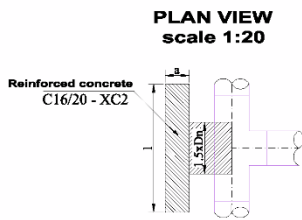
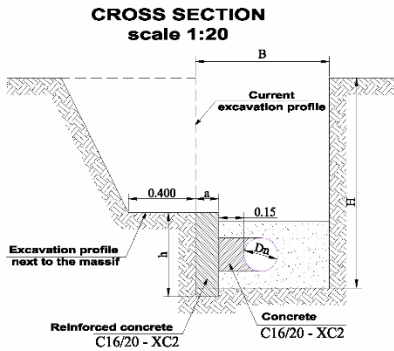


Figure 7. Massive anchoring Ts

ANCHOR MASSIVES FOR ELBOW



DIMENSIONS OF THE ANCHOR MASSIVE AT T

Massive type	Dimensions (cm)			The reinforcement extract								Total steel on massive		
	a	h	l	1				2				Ø	Total length (m)	Total weight (kg)
				Ø	II	Bar length	No of piece	Ø	II	Bar length	No of piece			
Elbow	28	110	165	12	157	200	7	12	102	145	7	12	24.10	21.50

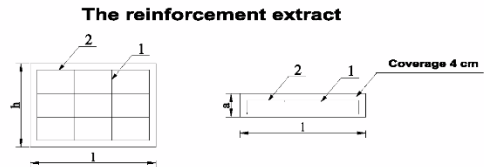
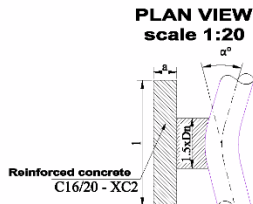


Figure 8. Massive anchorage elbow



Figure 9. Overview of irrigation system with drum and hose



Figure 10. Motor pump overview



Figure 11. Overview of the drum and hose irrigation system in operation

In order to promote the project, the beneficiary obtained the approvals requested through the town planning certificate (ANIF Technical Agreement – Territorial Branch of Land Improvements Timiș, ABA Banat approval, APM approval) and the Construction Authorization.

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3. CONCLUSIONS

From the analysis of this work, the following conclusions result:

- presentation of measures and solutions for the reversible use of water from desiccation for irrigation (storage of water from desiccation in reservoirs, in the canal network, etc.);

- the use of a state-of-the-art MIKE11 software for the hydraulic modeling of flows and sediment transport in open channels – case study of the CPE desiccation channel;

- the presentation of the variation of the water level over time according to the hydrograph of the input flows in various scenarios of the use of canals for drainage or irrigation purposes - case study of the CPE drainage canal;

- the presentation of the evolution over time of deposits/erosion in channels for different scenarios of their use – case study of the CPE drainage channel;

- presentation of the hydraulic modeling of the water storage capacity in open channels for various exploitation scenarios;

- establishing the areas that can be irrigated from the water coming from the desiccation (the case study of the development of Cena).

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[6] xxx - Law no. 138/2004 - Law on land improvements

[7] www.http - Irrigation system on drum and hose with PLSMP CASELLA watering sprinklers

the following style for the references used in the paper. It is recommended to limit the number of references to a reasonable one.