AB1 AND AB2 GATES

Constant downstream level control for reservoirs and channels

- Robust
- Reliable
- Automatic
- Precise
- Effective
- Without electricity

FUNCTION

These gates automatically keep a constant level immediately downstream, regardless of the circulating flow and the upstream level

- The AB1 gate is used for high head applications
- The AB2 gate is used for open channel flows

APPLICATIONS

- In an irrigation channel to achieve an on demand regulation
- In derivations of a channel or reservoir to regulate a lateral outlet
- At the intake of a pond to regulate its maximum water level
- In river diversion works, to guarantee a minimum or ecological flow
- Associated with a critical flow measuring structure, like Orifice Modules, allow the control of the derived flow (See TEMEC H-LL04.0 catalog)

OPERATING PRINCIPLE

- The Momenta acting on the gate are the weight P applied on the center of gravity of the mobile assembly and that due to the Archimedes' thrust F applied on the float. The hydrostatic thrust E on the board passes through the rotation axis O and therefore has no effect on the balance of the gate.

- Gates are ballasted and balanced so that these two torques are equal and opposite for any position on the board when the downstream level is at the height of the pivot axis (Figure No. 1 on the next page).

- If the downstream level rises, the gate closes as the float torque becomes greater than the weight. On the other hand, if the downstream level decreases, the gate will open until the downstream water level has returned to its equilibrium position.

- The diagram shown in Figure No. 2, indicates the dimensions of the water levels for extreme conditions.
The decrement (difference of the regulated downstream levels for Q=0 and Q maximum) can be adjusted during balancing; its practical value is usually r/20 (where r is the radius of the float).

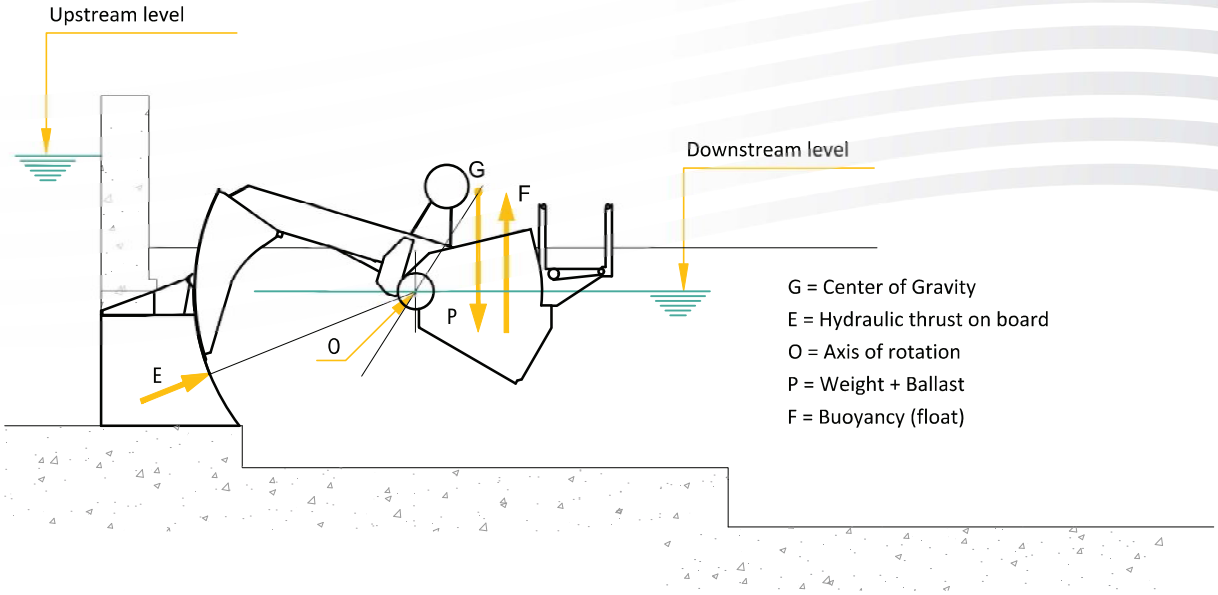


Figure N°1

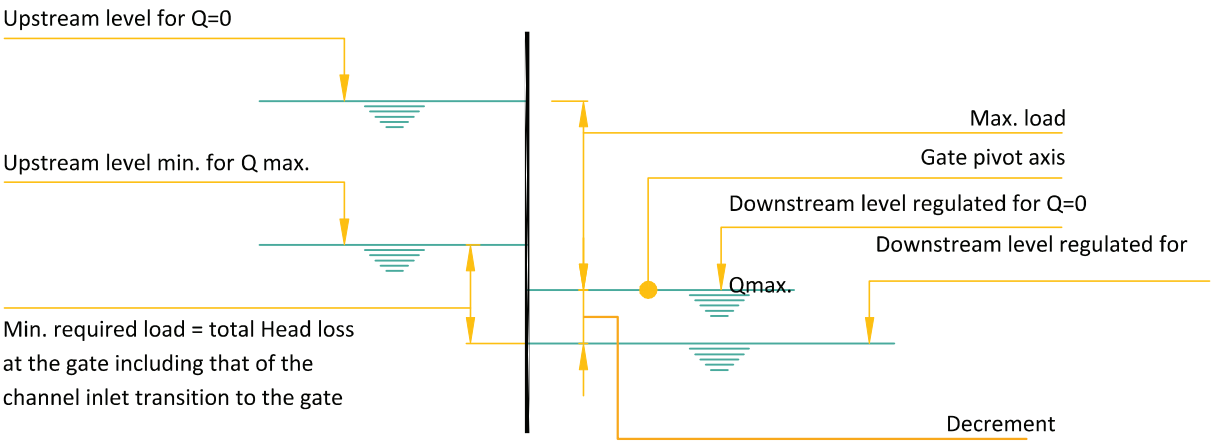


Figure N°2

CONSTRUCTION

The construction is made from normal sheet metal, tubes and profiles, assembled by welded joints and carefully protected against corrosion

The active part of the gate is constructed only by a mobile system articulated around a horizontal axis and perpendicular to the flow. This system is composed of two parts i) a cylindrical board of trapezoidal section with a rigid frame and a float located on the other side of the axis and ii) of counterweights for ballast balancing).

To avoid any blockage, there is a small clearance in the closed position, between the side edges of the board and the metal parts embedded in the concrete, supplied with the gate. In AB1 gates these pieces are the last section of the conduit and in the case of the AB2 gates they are curved profiles.

Therefore, these units are not watertight in their closed position, so if absolutely seal is required, a slide or wagon gate can be supplied to be installed upstream of the control gate.

ADVANTAGES, DISADVANTAGES AND RECOMMENDATIONS

- They do not require any external driving force; the float is the "engine" for the manoeuvres

- The precision of the regulated level is very good. Depending on the size of the gate the expected decrement varies from 5 to 15cm

- The set level is fixed, with no modification possible once installed on site. If changes in the D/S level are required during channel or outlet operation, we recommend the installation of an MXT mixed gate (See catalog TEMEC H-LL01.0)

- AB1 gates require an energy dissipation pool downstream of the gate, to protect the margins of unlined or for installing gauging structures immediately downstream of the regulator to control the flow rate

- When installing AB1 and AB2 control gates, it is necessary to know the nearby singularities (drops, curves,...) in order to guarantee stability in operation

- Float is located inside a buffer tank (supplied with the gate) but in some special conditions of high turbulence, it is recommended to connect the buffer tank at a point further downstream from the energy dissipation pool by a pipe with a gate valve

- It is also advisable to install this communication pipe when there are 2 (or more) parallel gates in order to avoid a difference in their opening, eventually produced by flow dissymmetries

- The installation of protective fencing is suggested to prevent vandalism on the gates

AB1 GATE

Downstream level control for orifice applications

SELECTION OF THE AB1 GATE

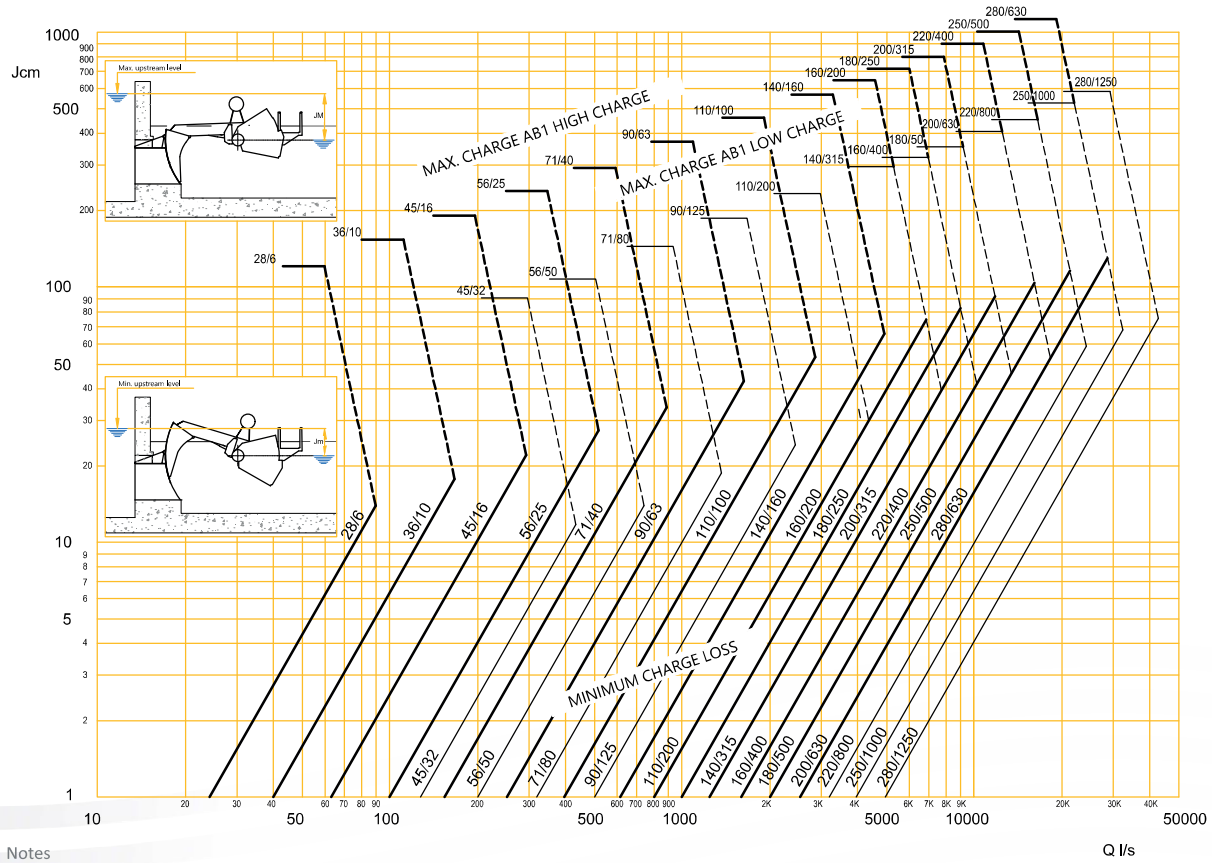
There are 2 types of AB1 gates: High load & Low load. The low load gates are derived from the high load type but have a double width board, resulting, for the same water load, a double flow rate, or for an equal flow rate a 4 times lower head loss but half maximum allowable load.

The graph Water Load vs Flow Rate allows the selection of the appropriate AB1 gate size as a function of:

- Maximum flow rate QM
- Minimum required load Jm
- Maximum permissible load JM (for Q=0)

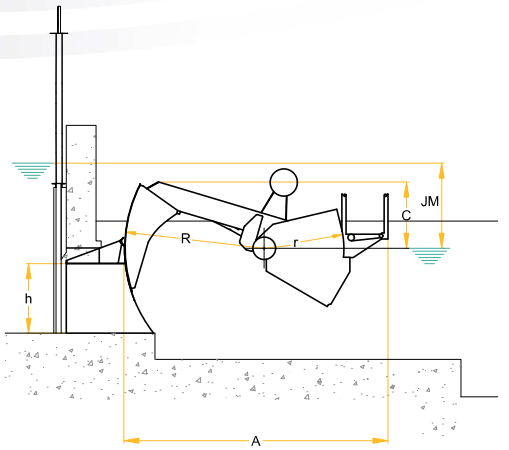
Gates must be chosen in such a way that for Qmax the head loss is less than the minimum existing load. In addition, the gate must be able to mechanically support the maximum existing load for Qmax and with the gate totally closed. Np operational point "Q / J" should be located to the right of the dashed line of the selected model on the graph.

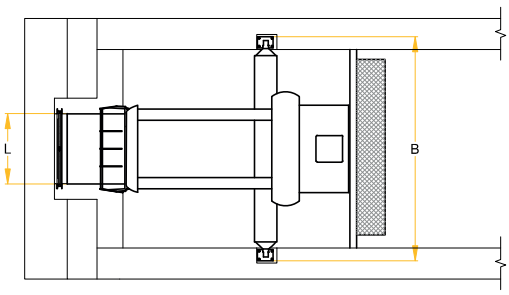
AB1 PRESSURE DROP CHART



Notes

1. No operating point (Q,J) of a gate, should be located to the right of the line that characterizes it.2. Bold lines refer to "high load" gates, while dashed lines correspond to "low load" gates (except for partial overlapping with "high load" gates)





AB1 r/s		DIMENSIONS				INTAKE		GUARD GATE		
High load	Low load	A	B	C	J_M	h	L	Type (*)	Dim.	Disp.
28/6		90	70	35	112	25	25	CPE4	25x25	25
36/10		110	85	45	140	32	32	CPE4	32x32	32
45/16		140	103	55	180	40	40	CPE4	40x40	40
	45/32	140	103	55	90	40	80	CPE4	80x40	40
56/25		170	120	70	224	50	50	CPE4	50x50	50
	56/50	170	120	70	112	50	100	CPE4	100x50	50
71/40		210	160	90	280	63	63	CPE4	63x63	63
	71/80	210	160	90	140	63	125	CPE4	125x63	63
90/63		265	200	110	355	80	80	CPE4	80x80	80
	90/125	265	200	110	180	80	160	CPE4	160x80	80
110/110		380	320	140	450	100	100	CPE4	100x100	100
	110/200	390	320	140	224	100	200	CPE4	200x100	100
140/160		470	410	180	560	125	125	(**)	125x125	125
	140/315	470	410	180	280	125	250	CPE4	250x125	125
160/200		520	450	200	630	140	140	CPE4	140x140	140
	160/400	520	450	200	315	140	280	(***)	280x140	140
180/250		280	510	220	710	160	160	(****)	160x160	160
	180/500	580	510	220	355	160	315	CPE4	315x160	160
200/315		640	560	250	800	180	180	CPW4	180x180	180
	200/630	640	560	250	400	180	355	CPW4	355x180	180
220/400		710	635	280	900	200	200	CPW4	200x200	200
	220/800	710	635	280	450	200	400	CPW4	400x200	200
250/500		790	710	320	1000	220	220	CPW4	220x220	220
	250/1000	790	710	320	500	220	450	CPW4	450x220	220
280/630		870	800	350	1100	250	250	CPW4	250x250	250
	280/1250	870	800	350	560	250	500	CPW4	500x250	250

Dimensions in centimeters

(*) See catalog TEMEC H-LL05.0 CPE4 = Four-sided watertight sliding gate; CPW4 = Four-sided watertight wagon gate

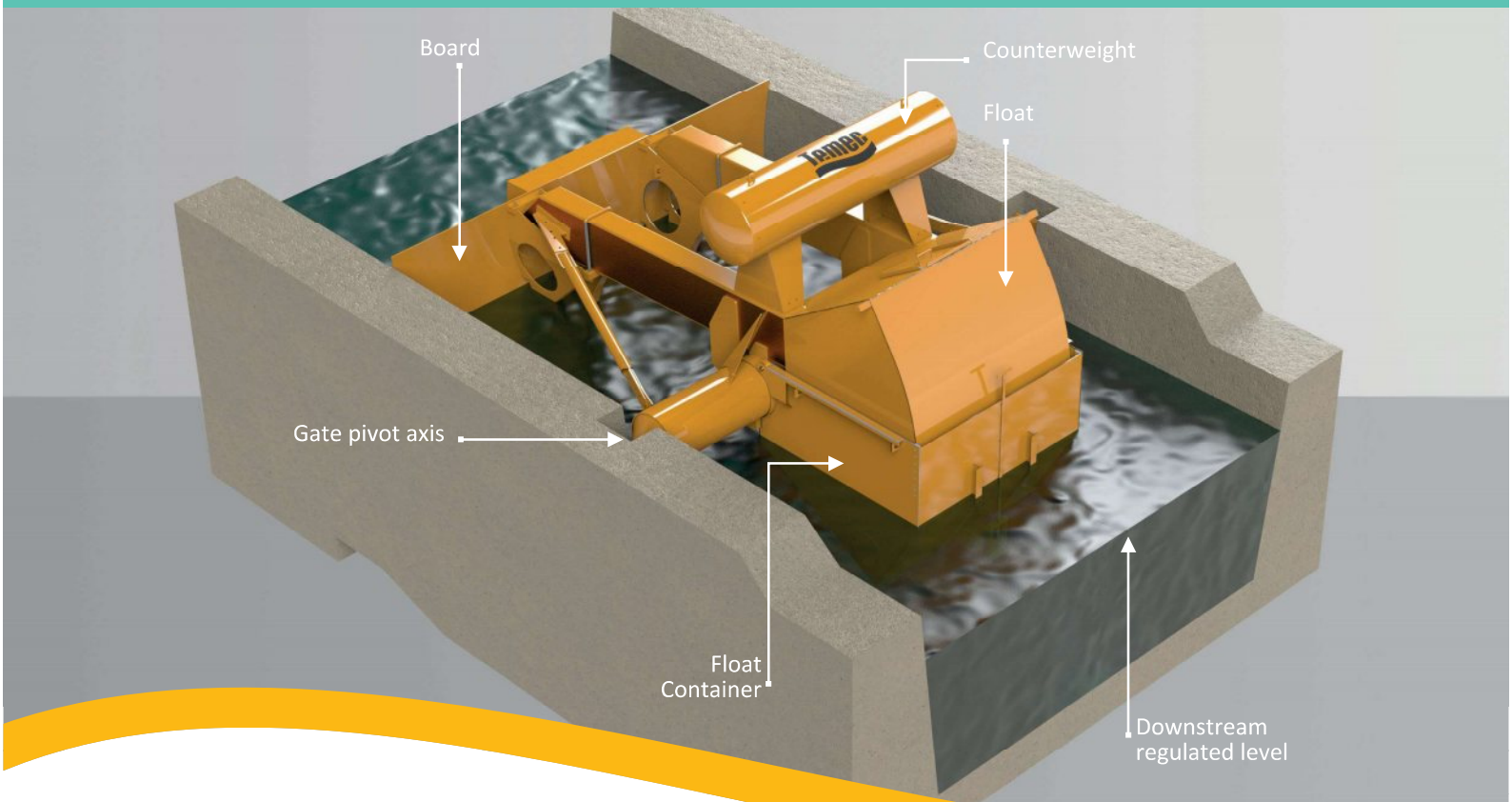
(**)CPE4 for J<560cm; CPW4 for J≥560cm

(***)CEP4 for J<315cm; CPW4 for J≥315cm

(****) CPE4 for J<430 cm; CPW4 for J≥430 cm

AB2 GATE

Downstream level control for open channel flows



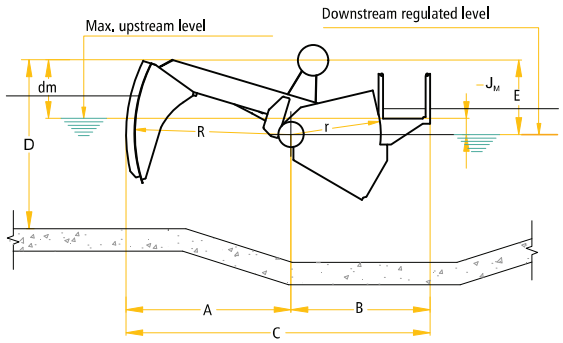
SELECTION OF THE AB2 GATE

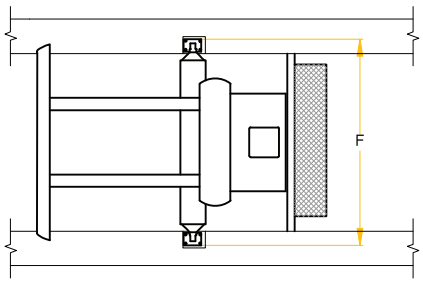
There are two types of AB2 gates: High load & Low load. The "low load" gates are derived from "high load" type but have a double width board, resulting for the same water head, a double flow, or for an equal flow rate a four times lower head loss, but half maximum allowable load.

The graph Water Loads versus Flow Rate allows the selection of the appropriate AB2 gate size as a function of:

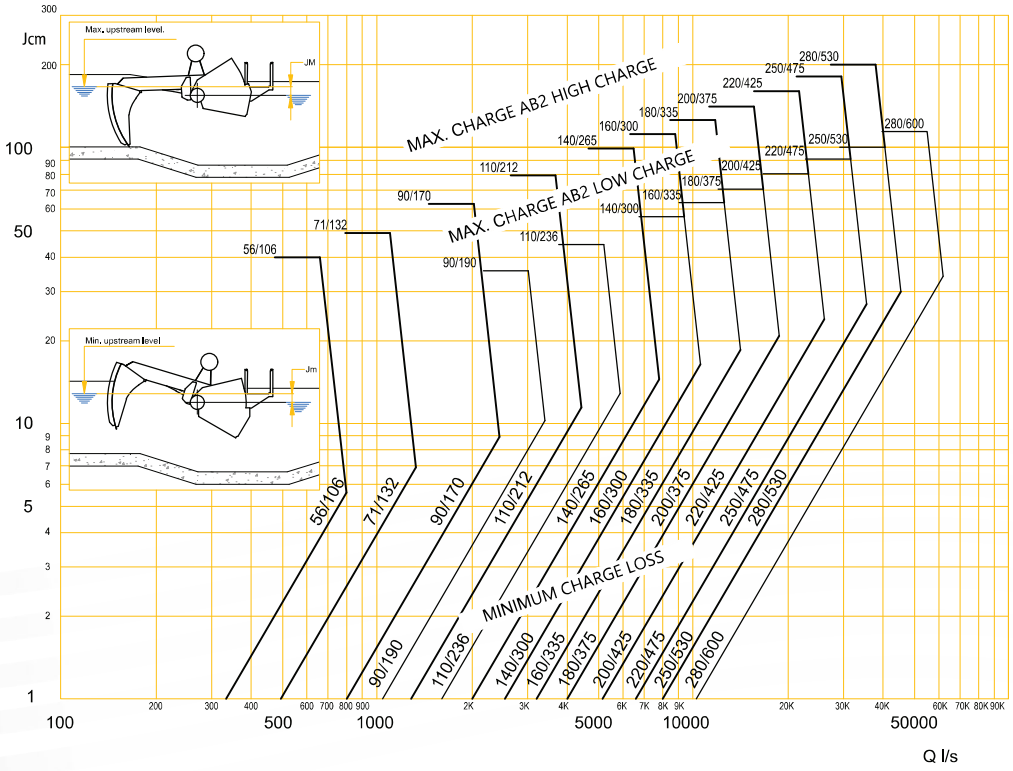
- Maximum flow rate QM
- Minimum required load Jm
- Maximum permissible load JM

Gate must be chosen in such a way that for Qmax the head loss is less the the minimum existing load. No operation point "Q / J" should be located to the right of the dashed line of the selected model on the graph. In addition, the gate must able to support the maximum existing load for Qmax and with the gate totally closed.



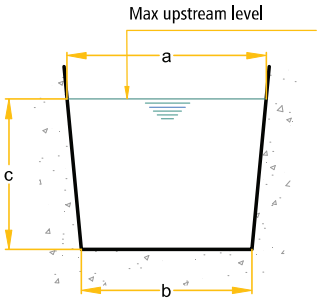


AB2 PRESSURE DROP CHART

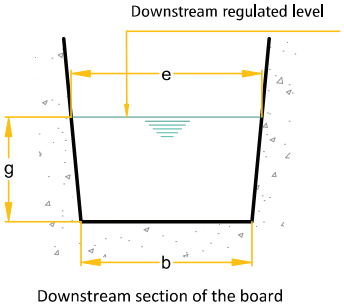


NOTES

1. No operating point (Q, J) of a gate should be to the right of the line that characterizes it
2. Bold lines refer to "high load" gates, while dashed lines correspond to "low load" gates (except for partial overlapping with "high-load" gates).
3. The head losses indicated on the abacus are considered to be between upstream and downstream of a channel having the same section as the gate.



Channel definition



Downstream section of the board

AB2 r/s		DIMENSIONS						MAX LOAD	CHANNEL DIMENSIONS				
High load	Low load	A	B	C	D	E	F	J_M	a	b	c	e	g
56/106		102	62	164	98	90	140	40	138,5	106	96	125	56
71/132		127	78	205	123,5	110	181	50	180	132	121	160	71
90/170		158	100	258	156	135	222	63	221	170	153	200	90
	90/100	180	100	280	138,5	130	237	35,5	236	190	135,5	224	100
110/212		202	190	392	196	175	286	80	277,5	212	192	250	112
	110/236	225	190	415	174,5	165	315	45	296	236	170	280	125
140/265		252	210	462	245	215	360	100	350,5	265	240	315	140
	140/300	282	210	492	221	205	400	56	374,5	300	216	355	160
160/300		282	233	515	275,5	240	402	110	393	300	270	355	160
	160/335	315	233	548	248,5	230	447	63	422,5	335	243	400	180
180/335		315	254	569	311	270	455	125	445	335	305	400	180
	180/375	355	254	609	276	260	505	740	476,5	375	270	450	200
200/375		355	274	629	347	300	507	140	502,5	375	340	450	200
	20/425	400	274	674	311	290	557	80	527	425	304	500	224
220/425		400	302	702	392	340	571	160	553,5	425	384	500	224
	220/475	450	302	752	348	235	631	90	590,5	475	340	560	250
240/425		450	331	781	439	380	634	180	621,5	475	430	560	250
	250/530	500	331	831	389	365	704	100	666	530	380	630	280
280/530		500	360	860	490	430	713	200	701,5	530	480	630	280
	280/600	565	360	925	435	405	793	110	748,5	600	425	710	315

EXAMPLES OF APPLICATION

Regulation from Downstream ("on demand")

A long channel with downstream control is divided into successive sections by regulators, which can be AB1 or AB2 gates. A downstream control i) allows fully automatic operation of the channel, ii) ensures significant water savings since the flow rate taken upstream corresponds exactly to the flow rate requested downstream, iii) allows flexible distribution without prior programming of the flow rates. All you have to do is open an outlet, to immediately obtain the desired flow rate (see diagram Figure N°3)

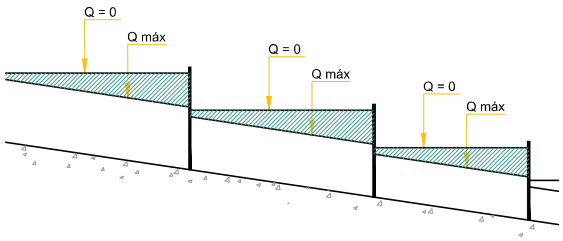


Figure N°3

For example,if the flow demanded downstream increases, the AB1/AB2 gates will open successively, starting with the one that controls the pool where the lateral outlet is located. If the flow is reduced, the reverse movement will also occur from D/S to U/S.

According to the principle of operation, the water level will remain constant just downstream of each gate, increasing the variation of the level as we move away, because the hydraulic profiles pivot on that point.

Reserve volume can be stored in the channel itself, which correspond to the volume of the water "wedges" between the level at Q=0 (horizontal) and Qmax (inclined).

Gates typeAB1 and AB2 are particularly well adapted to regulate irrigation channels on demand, specially those ones with a low longitudinal slope or the transport capacity exceeds the flow actually demanded.

Secundary channel supply

Along a channel regulated from downstream, the optimal location for the supply of a secundary channel or lateral outlet corresponds to the sections immediately downstream of the gate AB1 or AB2, installed in the main channel (see Figure N°4). Thus, a constant flow rate can be extracted , by means of Orifice Modules (see catalog TEMEC H-LL04.0), e.g. installed in derivations.

If it is necessary to supply other downstream lateral outlets where the water level fluctuates more than the range allowed by the Orifice Modules, an AB1 gate can be installed between the main channel and the derivation outlet gauge structure (see Figure N°5).

Figure N°5

CONCLUSION

These equipments inspired by a simple hydraulic conception are totally autonomous, robust and free from any mechanical complication, which allows them to adapt to the most severe working conditions.

The TEMEC AB1 and AB2 gates do not require any external power source, allowing an economical operation and maintenance of the channel networks.