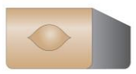
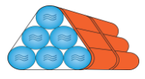
Comparison of Temporary Flood Control Systems

Analysis for putting up a barrier
65 cm x 100 m
in straight line

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
		Reliability during the flood	**Reliability** during installation	Can be installed on uneven ground and/or sloping	Watertightness	Reusable or durable	Set-up time	Ideal number of men	Current parallel to the system	Heavy equipment required	Water pump required	Fan required	Road required	Flood in progress	Set-up space	Dismantling – hours per person (H / P)	Adherence to the ground	Storage	Total weight	Vandalism and stealing	Ease of repair during a flood	Ability to bend at all angles and in all directions	Maximum recommended height	Additional height	Total number of components	Tools required	Set-up in the presence of heavy winds	A vehicle can be driven over the barrier	Materials can be transferred to the other side of the barrier	Safety standards or certified installation procedure	Cost of equipment	Cost of labour	Cost or returning the barrier to its original condition	Other costs
A		9 / 10 See **PN**	10 / 10	Yes	7 / 10 See **PN**	50 & +	1 min. to 20 min.	1	10 / 10	None	No	No	No	8 / 10 See **PN**	2.3 m	8 H / P	9 / 10 See **PN**	1.6 M³	451 kg	9 / 10 See **PN**	Yes	9 / 10	1.5 m	**Possible**	1 to 7 See **PN**	No	8 / 10 See **PN**	Yes	**Possible**	Yes	**1000**	**0.3**	**4**	**0**
B		9 / 10	8 / 10 See **PN**	Yes See **PN**	9.5 / 10 See **PN**	50 & +	5.5 hrs	4	10 / 10	Some	No	No	Yes	9 / 10	0.2 m	20 H / P ●	10 / 10	9 M³	3000 kg ●	9 / 10	**Possible**	9 / 10 See **PN**	2 m	No	±280	No	10 / 10	No	Yes	Yes	**3600** See **PN**	**10**	**± 3**	**Mainte-nance fees**
C		7 / 10	7 / 10	Limit ●	8 / 10 See **PN**	50 & +	1 to 3 hrs ●	3 to 5 ●	10 / 10	Some	No	No	Yes	9 / 10	1.3 m	30 H / P ●	9.5 / 10	4 M³ and much more	1553 kg and much more	6 / 10	No	8 / 10	2 m	No	750 and + ●	yes	4 / 10	No	**Possible**	**Possible** ●	**1050 to 2500**	**14**	**± 6**	**0**
D		6 / 10 See **PN**	8 / 10	No	7 / 10 See **PN**	50 & +	3 hrs ●	5 ●	9 / 10	Yes	No	No	Yes	10 / 10	0.5 m	6 H / P ●	9.5 / 10	40 M³	68 t	8 / 10	**Possible**	4 / 10	1.0 m	**Possible**	35 to 450 See **PN**	No	10 / 10	No	Yes	No	**790**	**20**	**± 15**	**0**
E		8 / 10	3 / 10	No	9.5 / 10	No	3.1 hrs ●	3 ●	7 / 10	Yes	No	No	Yes	9 / 10	1 m See **PN**	30 H / P ●	10 / 10	6 M³ + 65 M³	667 kg + 112 t	2 / 10	**Possible**	6 / 10	2 m	Yes	30 to 60	**Possible**	6 / 10 See **PN**	No	Yes See **PN**	No	**437** (369+68)	**47** (5+42)	**77**	**0** to **438** See **PN**
F		7 / 10 See **PN**	1 / 10	Yes	9 / 10 See **PN**	1 to 3 Max.	8 hrs	40	9 / 10	Yes	No	No	Yes	9 / 10	1.3 m	6 H / P to 500 H/P	10 / 10	2.12 M³ + 63.3 M³	315 kg + 109 t	5 / 10	**Possible**	10 / 10	2 m	Yes	±7000	No	9 / 10 See **PN**	Yes	Yes	Yes	**198** (150+48)	**154**	**181**	**36** to **500** See **PN**
G		5 / 10	6 / 10	No	7 / 10	± 6 X See **PN**	16 hrs ●	4 ●	5 / 10	Some	Yes	**Possible**	No	3 / 10	2.3 m	14 H / P ●	2 / 10 See **PN**	5 M³	730 kg	6 / 10	No	3 / 10	1.5 m	**Possible**	±25	Yes	5 / 10	No	**Possible**	Yes	**900** ●	**27**	**± 8**	**0**
H		4 / 10	6 / 10	No	7 / 10	± 3 X See **PN**	14 hrs	4	5 / 10	Some	Yes	**Possible**	No	3 / 10	2.3 m	14 H / P ●	1 / 10 See **PN**	5 M³	710 kg	6 / 10	No	6 / 10	1.5 m	No	±15	Yes	5 / 10	No	No	No	**910**	**27**	**± 8**	**0**
J		3 / 10	8 / 10	No	7 / 10 See **PN**	50 & +	1 hrs	4	3 / 10	None	No	Yes	No	1 / 10	2.8 m	8 H / P ●	4 / 10 See **PN**	5.1 M³	630 kg	9 / 10	No	1 / 10	1.0 m	No	±20	**Possible**	1 / 10	No	Yes	No	**1260**	**2**	**± 2**	**0**

PN = Personal notes (on back) ● Assessment requested Advantage Average Disadvantage **1 / 10** = Not recommended or difficult **10 / 10** = Excellent or easy

● Assessment based on the experience of one or two people. We would like to know what you think of the product.

Systems Shown and References

 **A –** Made from PVC fabric, polyethylene, and built-in ballast weights, this system works like a parachute and is automatically deployed when water flows into it.
www.water-gate.com
http://www.funayama.co.jp/product/4kizai/4-1watergate.html

 **B –** Semi-temporary or semi-permanent system. Anchor plates first have to be installed in the ground and demountable aluminum posts are fitted into these. Watertightness is ensured by rubber joints.
www.demflood.com www.blobel.de www.floodcontrol.co.uk
www.hochwasserschutz.de www.floodcontrolam.com

 **C –** The pressure of the water against the structure provides the necessary adherence to stop the water. Made from aluminum or galvanized steel. The structure is covered by a PVC membrane and a chain is used to provide weight at the front.
www.portadam.com or www.geodesign.se (from Aqua Barrier)
www.hochwasserschutz.de www.inero.se

 **D –** Most New Jersey barriers are made of concrete, but there are also some plastic or fiberglass models that are filled with water or sand. In the above example, we simulated a medium size, concrete barrier.
New Jersey barrier www.soacorp.com

 **E –** These containers are made of wood or a pliable steel or aluminum structure with a geotextile membrane inside installed. After they are deployed and installed, they must be filled up with sand using a mechanical shovel, or with water using a pump. In the example shown above, we used sand instead of water, as sand is by far more efficient.
www.quick-damm.de www.bigbagsusa.com www.defencellusa.com

 **F –** Sandbags, usually made from cheap polyethylene.
www.floodready.org/sandbags.htm

 **G –** Combination of several PVC tubes filled with water and tied together. www.altoo-protec-flood.fr www.rcy.fr www.usfloodcontrol.com
www.beaver-ag.ch www.egow.be

 **H –** Large PVC tube filled with water, equipped with an internal baffle.
www.aquabarrier.com www.waterstructures.com www.aquadam.com

 **J –** Large piece of fabric attached to an air-filled tube, sitting on an airy, honeycomb fabric skirt for better adherence. A chain at the front serves as ballast weights.
www.noaq.com

Definition of Terms

1 – Reliability during the flood: System that can be safe when the amount of flood water reaches the maximum capacity of the barrier. The following occurrences are taken into consideration:
- A pile of debris or tree trunk floating in the water and hitting the barrier;
- A tree or wall from a building falling on the barrier;
- A wave constantly hitting the barrier and taking it apart after some time;
- A tear in the barrier caused by debris in or out of the water and threatening to make the barrier give way;
- A water level having reached the limits of the barrier and making it unstable;
- A joint between barriers that can be dangerous or a crack in one or more joints.

2 - R e l i a b i l i t y during installation: Ability of the flood control system to be installed in time and without problems in an emergency situation. The following are taken into consideration:
- Availability of heavy equipment and/or labour.
- Condition of the flood control system if it hasn't been used or set up for quite some time.
- Accessibility of raw material (water or sand).
- All components required to completely assemble the barrier (bolts, tools, etc.).
- Required energy sources (electrical power, gas, etc.).
- Bad weather conditions (i.e. high winds, abundant rainfall, etc.).

3 - Can be installed on uneven ground and/or sloping: Ground with abrupt slopes of several decimeters over a length of one meter or more.

4 - Watertightness: Represents the ability to prevent water from flowing through or under the temporary barrier.

5 – Reusable and durable: System that can be easily removed without getting damaged.

6 – Set-up time: Approximate time taken to set up a barrier 65 cm high x 100 m long.

7 – Ideal number of men: Number of men ideally required to set up the temporary barrier.

8 – Current parallel to the system: Assessment of a strong water current parallel to the system, including large debris in and on the water around this system.

9 – Heavy equipment required: Heavy equipment is required to bring the temporary barrier to the location of the flood.

10 – Water pump required: One or more water pumps are required to erect the barrier.

11 – Fan required: One or more fans are required to erect the barrier.

12 – Road required: A path or road is required to bring the equipment to the location.

13 – Flood in progress: The water has started to flood the area where the barrier will be erected. It is moving at a speed of 5 km/h and has already reached a level of at least 10 cm.

14 – Set-up space: Width required to set up the barrier.

15 – Dismantling: Includes removing and washing all the flood control equipment and putting it back in proper working condition.

16 – Adherence to the ground: Ability of the barrier to stay in place when the maximum water retention capacity has been reached.

17 – Storage: Cubic volume of the stored barrier.

18 – Total weight: Weight of the barrier when stored (kg = kilogram, MT = metric ton)

19 – Vandalism and stealing: Vandalism and stealing can only occur if the barrier is left unattended. We took into consideration how long it would take and how easy it would be to do serious damage that would require a long time to repair.

20 - Ease of repair during a flood: Possibility of repairing or replacing some components of the barrier should extensive damage occur during a flood.

21 – Ability to bend at all angles and in all directions: The barrier can curve or be bent at all possible angles and in all directions.

22 – Maximum recommended height: Maximum height specified by the manufacturer or representative. We consider that trying to control a flood at a height of over 2 m would be too ambitious.

23 – Additional height: The ability to raise the barrier after it has been set up.

24 – Total number of components: All the different equipment and hardware required to build the barrier (assembly tools not included).

25 – Tools required: Need to use tools to assemble the barrier.

26 – Set-up in the presence of heavy winds: Ability to set up the barrier with winds over 60 km/hour and to make sure it stays in place.

27 – A vehicle can be driven over the barrier: Ability to cross with a vehicle when the barrier is already holding back 20 cm of flood water.

28 – Materials can be transferred to the other side of the barrier: Possibility of moving boxes and materials and to get to the other side of the barrier without too much trouble.

29 - Safety standards or certified installation procedure: Certification from the manufacturer, based on calculations and trials, as to the product's safety and efficiency.

30 – Cost of equipment: The figures shown are not precise amounts, but can be used to get an idea of the differences in cost between different systems. The real cost of the equipment includes the cost of the complete system, including all the components required for proper installation.

31 – Cost of labour: The figures shown are not precise amounts, but can be used to get an idea of the differences in the cost of labour. (The rate used for general labour was approx. 20% more than the minimum wage and that for heavy machinery operators was about 8 times more than the minimum wage.)

32 - Cost or returning the barrier to its original condition: Only the labour and heavy machinery required to return the barrier to its original condition were taken in consideration. Reference is made to the costs in #31.

33 - Other costs: These can include maintenance costs, environmental costs, decontamination, or subsistence costs such as meals and overnight accommodations.

Personal Notes

1-A For total reliability, it is important to have no water at the back of the barrier. In addition, special care must be taken to make sure no water flows over the barrier.

1-D Concrete New Jersey barriers differ from one country to another. Often the footing is so narrow that the concrete barrier can fall when the level of the flood water gets close to the maximum height.

1-F For greater reliability, the sandbag barrier must be built according to instructions, which is far from obvious for volunteers who erect this type of barrier for the first time.

2-B The anchor plates in the ground can wear down over time if no regular maintenance is done. (Also see our definition of RELIABILITY during installation)

3-B It is possible to set up this system on uneven ground, but this type of installation is more expensive.

4-A 7/10 if the barrier is installed without any precautions, but 9/10 if the front of the bib is buried in the ground or forms a tight seal.

4-B When the system is new, watertightness can be 10/10, but the joints are made of rubber and annual lubrication of all the joints is required for a service life of 12 to 15 years.

4-C 8/10 if the barrier is installed without any precautions, but 10/10 if the front of the bib is buried in the ground or forms a tight seal.

4-D Can vary from 4/10 to 10/10 depending on the method and materials used to seal the numerous joints.

4-F If the sandbags are properly piled up with polyethylene sheeting installed on the flood side, their performance is 10/10, otherwise it is 7/10.

4-J This system is too unstable to successfully bury or seal the front of the skirt.

5-G and **5-H** It is very hard to empty out all the water. There is a high risk that the material will tear, right from the first use.

13-A Any water at the back must immediately be pumped, especially if it is stagnant.

14-E This system is about as wide as it is high and only seems to come in a height of 1 m.

16-A The barrier has no problem staying in place on normal or rough surfaces, but additions must be installed on very smooth surfaces.

16-G and **16-F** This system becomes dangerous when the water level of the flood reaches 65% of the height of the barrier.

16-J This is the limit beyond which the barrier can slip if the ground is too smooth.

19-A and **19-J** Because of their deployment speed, these systems are only set up at the time of a flood and are always kept under observation.

21-B Additional costs are associated with this type of configuration.

24-A The barriers can be tied together to form a single component or seven individual barriers.

24-D This great variation is mainly due to the method used to make the concrete barriers watertight. Sandbags are often used to stop leaks.

26-A High winds blow higher up, not on the ground. When there is a lot of wind, installation can be a bit more difficult, but with a net covering the barrier, the system gets a rating of 10/10 for installation on uneven ground.

26-E Very light structure before there is sand inside.

26-E and **26-F** Wind and sand don't mix, especially when it comes to protecting your eyes.

28-E Yes, if the container is filled with sand; No, if it is filled with water.

30-B The masonry work required to set the anchor plates in the ground is included in this cost.

30-E Cost of equipment: 369. Cost of sand: 68. Total of 437.

30-F Cost of empty bags: 150. Cost of sand and equipment: 48. Total of 198.

31-E Cost of labour: 5. Cost of heavy machinery: 42. Total of 47.

33-E and **33-F** Due to increasingly stricter environmental regulations, in many places sandbags can no longer be taken to the dump because the polyethylene is not biodegradable.

WATER GATE™

Year 2017 Edition

Comparison of Temporary Flood Control Systems

This assessment of different flood control systems was made by MegaSecur S.E. Inc., manufacturers of the Water-Gate barrier. We were as impartial as possible in our assessment and rating of each product, as in comparison to the other systems, the Water-Gate barrier leaves nothing to be desired.

The results shown not only come from our own experience, but also from the information available on the Internet or in user manuals, as well as information supplied by customers and users of these systems, by certified organizations and associations, and in some cases, by the manufacturers themselves.

We believe that we have taken into account all the essential factors to enable you to make an informed choice. If you notice incorrect information or have questions that are not answered in this leaflet, we invite you to contact us directly. If need be, we will make the necessary corrections in our next edition.

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