

Hvordan man kan få hydraulikken i MikeUrban mere præcis

EVA temadag, torsdag d. 11 maj 2017

Date: 11 maj 2017

Hotel Nyborg Strand

Oversigt over præsentationen

1. Overløbskanter
2. Brønde
3. Bøjeklapper og fjederklapper
4. Vandbremser
5. Tromlesier
6. Spørgsmål

Overløb - vinkelret på overløbskanten (90 grader)

$$Q_{weir} = \frac{2}{3} C_d B \sqrt{2gh}^{3/2}$$

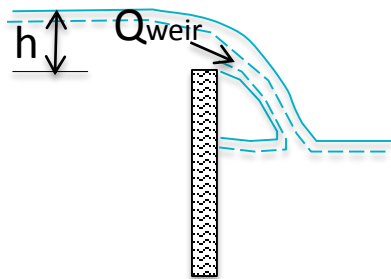
μ

Q_{weir} overløb (m³/s)

C_d : overløbskoefficient

B : kantlængde (m)

h : overløbshøjde (m)



Weirs [Base]

Identification & connectivity

Asset ID:* Data source:*

Weir ID: C11F24Yw1 Status:* Imported

Location: C11F24Y ... Network type:* <NULL>

To: C11F24X ... Weir type: Rectangular

Description:*

Model data

Comp type: Weir Formula Flap

Oper. mode: No control Crest level: 7.19

Orientation: 90 Degrees Discharge coeff.:

Crest width: 0.9000

Q-H table: ... Edit Graph

Long weir and CRS weir

Source channel: ...

Destination channel: ...

Weir crest geometry: ... Edit Graph

Weir ID *	Weir type	Flap	Comp typ	Crest level	Crest width	Orientatio	Discharge
B10F0R1w	Rectangul	False	Weir Form	6.22	7.5000	0 Degrees	0.40
B10F0R2w	Rectangul	False	Weir Form	6.22	5.7000	0 Degrees	0.40

Overløb - vinkelret på overløbskanten (90 grader)

Default beregning af Cd i MU:

$$C_d = \frac{3}{(2 + K_c)^{3/2}}$$

$K_c=0,5 \Rightarrow C_d=0,76$ ($\mu=0,51$)

- **En meget høj værdi!**
- **Formlen tager ikke hensyn til kanttype.**
- **En for høj Cd-værdi => for stort beregnet overløb.**

Typiske værdier for Cd (μ):

	μ	Cd
Stålkant	0,42	0,63
Beton, glat og smal kant	0,38	0,57
Beton, bred kant	0,35	0,53
Beton, nedbrudt	0,25-0,30	0,38-0,45

Overløb - sideoverløb (0 grader)

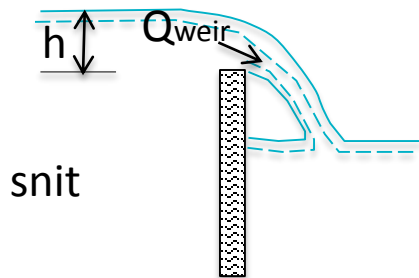
$$Q_{weir} = \frac{2}{3} C_d \mu B \sqrt{2gh}^{3/2}$$

Q_{weir} overløb (m³/s)

C_d : overløbskoefficient

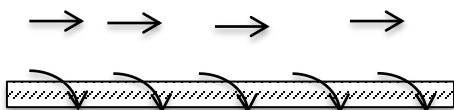
B : kantlængde (m)

h : overløbshøjde (m)



snit

plan



B

Weirs [Base]

Identification & connectivity

Asset ID*: Data source*:

Weir ID: C11F24Yw1 Status*: Imported

Location: C11F24Y Network type*: <NULL>

To: C11F24X Weir type: Rectangular

Description*:

Model data

Comp type: Weir Formula Flap

Oper. mode: No control Crest level: 7.19

Orientation: 0 Degrees Discharge coeff.:

Crest width: 0.9000

Q-H table: Edit Graph

Long weir and CRS weir

Source channel:

Destination channel:

Weir crest geometry: Edit Graph

Weir ID*	Weir type	Flap	Comp typ	Crest level	Crest width	Orientatio	Discharge
B10F0R1w	Rectangul	False	Weir Form	6.22	7.5000	0 Degrees	0.40
B10F0R2w	Rectangul	False	Weir Form	6.22	5.7000	0 Degrees	0.40

Overløb - sideoverløb (0 grader)

Default beregning af Cd i MU:

$$C_d = \frac{3}{(3 + K_c)^{3/2}}$$

$K_c=0,5 \Rightarrow C_d=0,46$ ($\mu=0,31$)

- **Formlen tager ikke hensyn til kanttype.**
- **Formlen for sideoverløb giver Cd værdier, der er ca. 60% af værdierne for et vinkelret overløb.**

Brugerspecificeret overløbskoefficient

- Når overløbskoefficienten er angivet af brugeren, tages der ikke hensyn til vinklen på tilløbet.
- Husk, det er Cd, der skal angives i feltet (dvs. $3/2 * \mu$).

Identification & connectivity

Asset ID:* Data source:*

Weir ID: C11F24Yw1 Status:* Imported

Location: C11F24Y Network type:* <NULL>

To: C11F24X Weir type: Rectangular

Description:*

Model data

Comp type: Weir Formula Flap

Oper. mode: No control Crest level: 7.19

Orientation: 0 Degrees Discharge coeff.: 0.4

Crest width: 0.9000

Q-H table: Edit Graph

Long weir and CRS weir

Source channel:

Destination channel:

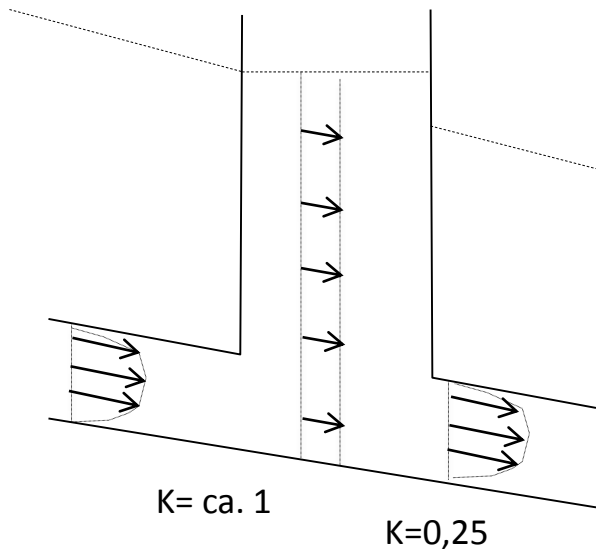
Weir crest geometry: Edit Graph

Weir ID *	Weir type	Flap	Comp typ	Crest level	Crest width	Orientatio	Discharge
B10F0R1w	Rectangul	False	Weir Form	6.22	7.5000	0 Degrees	0.40
B10F0R2w	Rectangul	False	Weir Form	6.22	5.7000	0 Degrees	0.40

Brønde I

Standard-energitabsberegning: Engelund,
med $K_m=0,25$

Brøndtab = indløbstab + udløbstab



Nodes [Base]

Identification & connectivity

Asset ID:*		Data source:*	DANDAS
Node ID:	A10F040	Status:*	<NULL>
Model:*	<NULL>	Network type:*	Combined
Description:*		X coordinate:	588797.83
<input type="checkbox"/> RM Tail node		Y coordinate:	6139921.69
Tail level:		Links:	3

Geometry | Q-H and head loss | 2D overland

Q-H relation

1 ... Graph

Outlet head loss

ID: **MOUSE Classic(Engelund)** ... Method: Classic

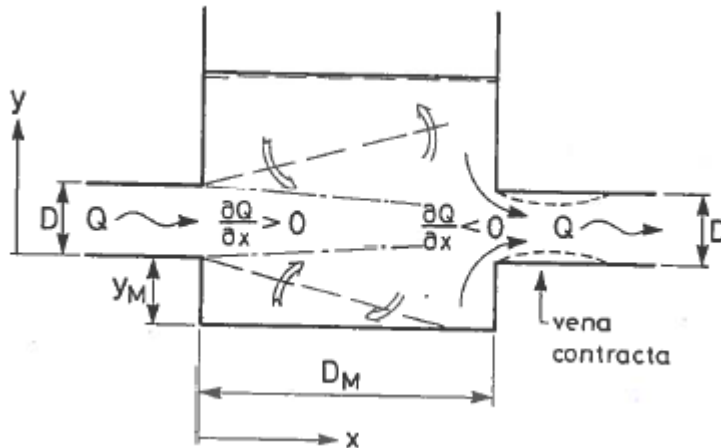
Use local data Coeff.: Km 0.25

Eff. flow area: Full Node Area

Node ID *	Node type	Bottom le	Ground le	Diameter	Critical le	ID	Use local	Coeff t
1041710	Manhole	14.18	16.86	1.2500	<Null>	MOUSE Cl	False	

Brønde II

- Tager ikke hensyn til banketter
- Overvurderer brøndtabene
- Brøndtabet kan reduceres ved at vælge Calculated Eff. Area eller Reduced calculated Eff. Area.



Nodes [Base]

Identification & connectivity

Asset ID:* Data source:* DANDAS

Node ID: A10F040 Status:* <NULL>

Model:* <NULL> Network type:* Combined

Description:* X coordinate: 588797.83

RM Tail node Y coordinate: 6139921.69

Tail level: Links: 3

Geometry Q-H and head loss 2D overland

Q-H relation

1 ... Graph

Outlet head loss

ID: MOUSE Classic(Engelund) ... Method: Classic

Use local data Coeff.: Km 0.25

Eff. flow area: Full Node Area

<NULL>

Full Node Area

Calculated Eff. Area

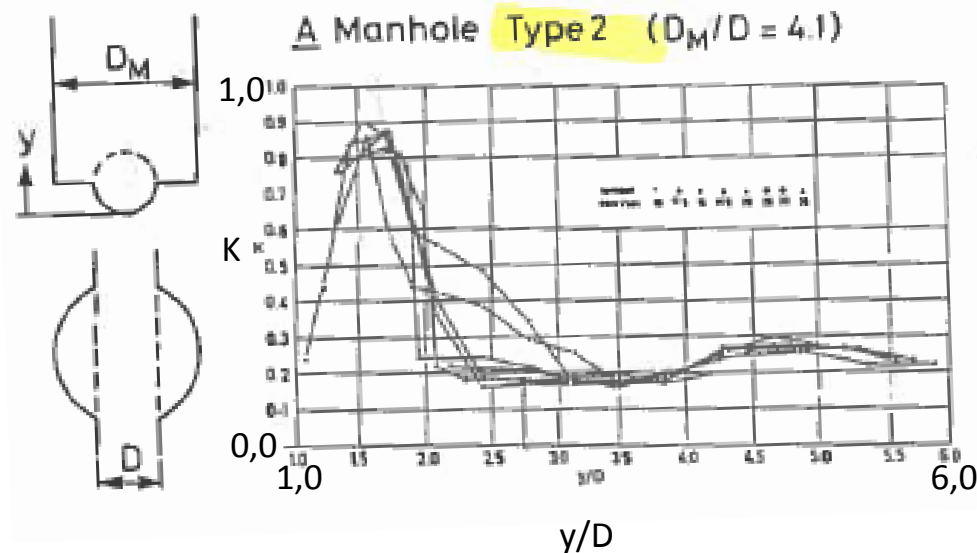
Reduced calculated Eff. Area

Node ID *	Node type	Bottom le	Ground le	Diameter	Critical le	ID	Use local	Coeff t
1041710	Manhole	14.18	16.86	1.2500	<Null>	MOUSE Cl	False	

Brønde III

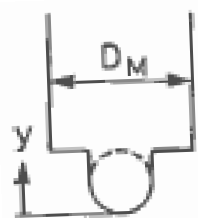
Ole Mark og Fl. Bo Pedersens artikel om brøndtab (ASCE 1990):

- Banketter betyder meget for brøndtabet
- Brøndtabet størst ved $y/D=1,5$ (se figurer)

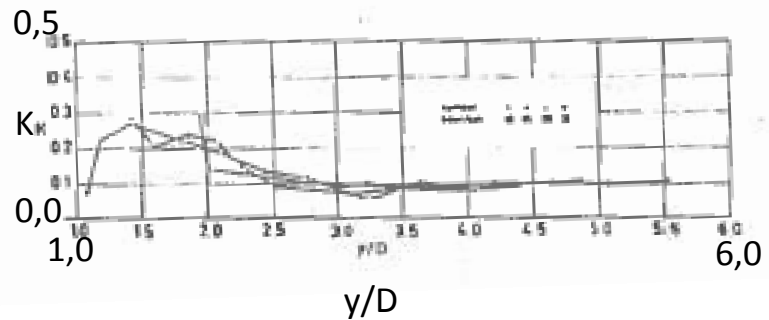
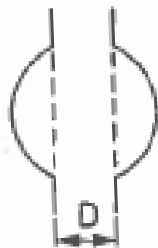


Maks. værdi 0,85.
Asymptotisk værdi 0,25

Brønde IV



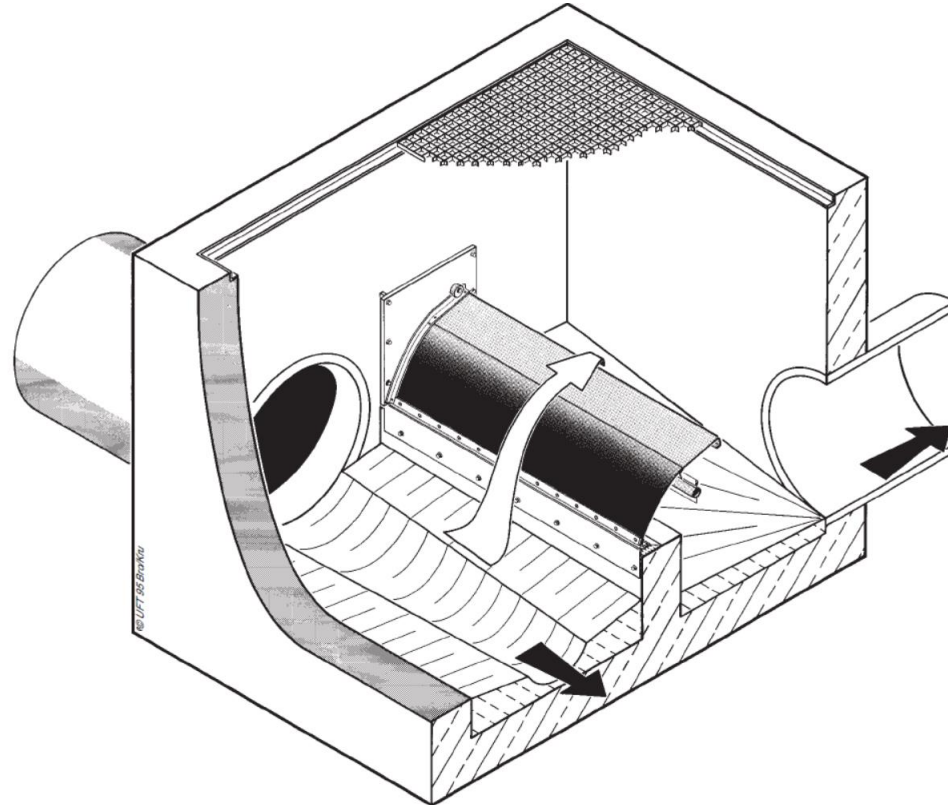
B Manhole Type 3 ($D_M/D = 4.1$)



Maks. værdi 0,27.
Asymptotisk værdi 0,1

Bøjeklappe og fjederklappe

Eksempel på en fjederklap:



Bøjeklap, dimensionering 300 l/s

The screenshot shows the FluidBend software interface. The window title is "FluidBend - [Unbenannt2]". The menu bar includes "File", "Document", "View", "Language", "Window", and "Help". The toolbar contains various icons for file operations and navigation. The main text area contains the following content:

The UFT-FluidBend bending weir is a self-regulating overflow device for use at overflow weirs or combined sewer overflows and overflow tanks. It allows large overflow discharges while keeping the water level nearly constant. For more details see product information BK 0182.

The definition of symbols can be seen from the system sketch. This hydraulic quotation is performed using the computer program FluidBend, written by Merschdorf, checked by Dr. Weiß, copyright © by UFT 2011.

This design procedure and the laboratory data involved are our protected property. It is prohibited to pass on data to any third party without our consent. Patents pending.

1 Input data

Design flow rate	Q_b	=	300.0	l/s
Nr. of flaps in parallel	n	=	1	pieces
Length of one flap with side shield	L_1	=	2.00	m
Water level at design flow rate	W_b	=	10.00	m+NN

2 Device type selection

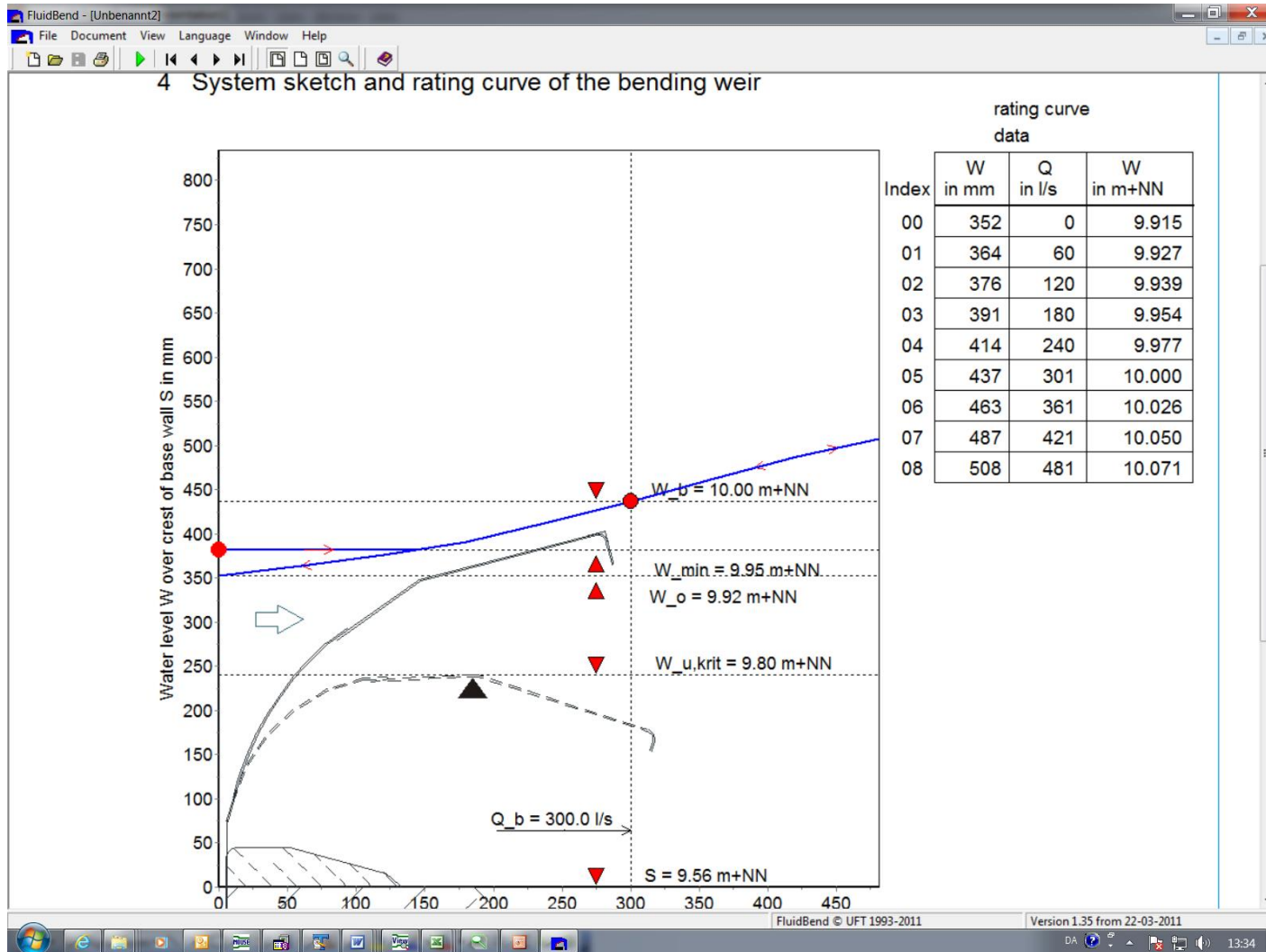
Size of UFT-FluidBend	Type	=	10
Upper sealing for backflow protection		=	no

3 Calculated data

Length of one flap without side shield	L	=	1.90	m
Water level at the beginning of overflow	W_{min}	=	9.95	m+NN
Water level at end of overflow	W_o	=	9.92	m+NN
Crest of base wall	S	=	9.56	m+NN
Max. admissible downstream water level without impairment of the hydraulic behaviour	$W_{u,krit}$	=	9.80	m+NN
Weir comparison ratio i.e. the bending flap has at W_b the same overflow Q_b as an about k times longer fixed weir.	k	=	3.177	dim. less

FluidBend © UFT 1993-2011 Version 1.35 from 22-03-2011

Bøjeklap, dimensionering 300 l/s



Bøjeklap, dimensionering, 500 l/s

program FluidBend, written by Merscheidt, checked by Dr. Vreis, copyright © by UFT 2011.

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1 Input data

Design flow rate	Q_b	=	500.0	l/s
Nr. of flaps in parallel	n	=	1	pieces
Length of one flap with side shield	L_1	=	2.00	m
Water level at design flow rate	W_b	=	10.08	m+NN

2 Device type selection

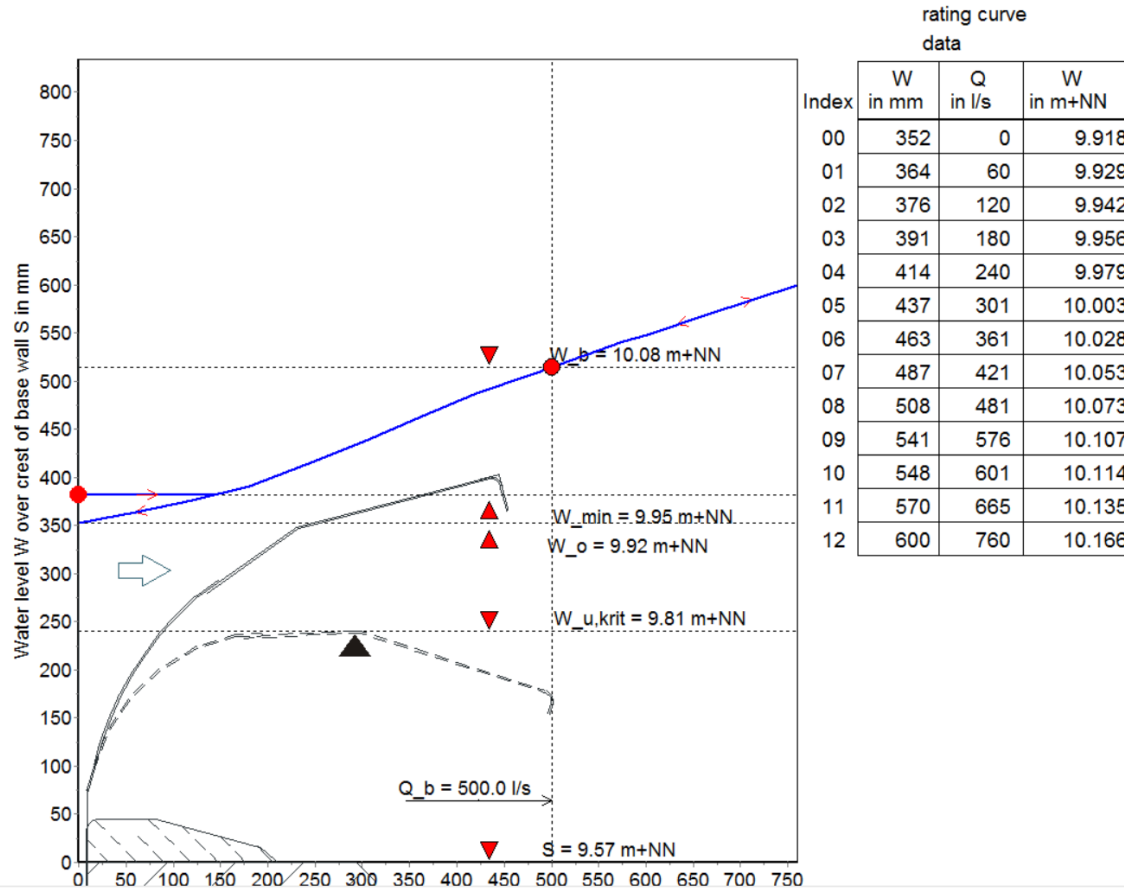
Size of UFT-FluidBend	Type	=	10
Upper sealing for backflow protection		=	no

3 Calculated data

Length of one flap without side shield	L	=	1.90	m
Water level at the beginning of overflow	W_{min}	=	9.95	m+NN
Water level at end of overflow	W_o	=	9.92	m+NN
Crest of base wall	S	=	9.57	m+NN
Max. admissible downstream water level without impairment of the hydraulic behaviour	$W_{u,krit}$	=	9.81	m+NN
Weir comparison ratio i.e. the bending flap has at W_b the same overflow Q_b as an about k times longer fixed weir.	k	=	1.999	dim. less

Bøjeklap, dimensionering, 500 l/s

4 System sketch and rating curve of the bending weir



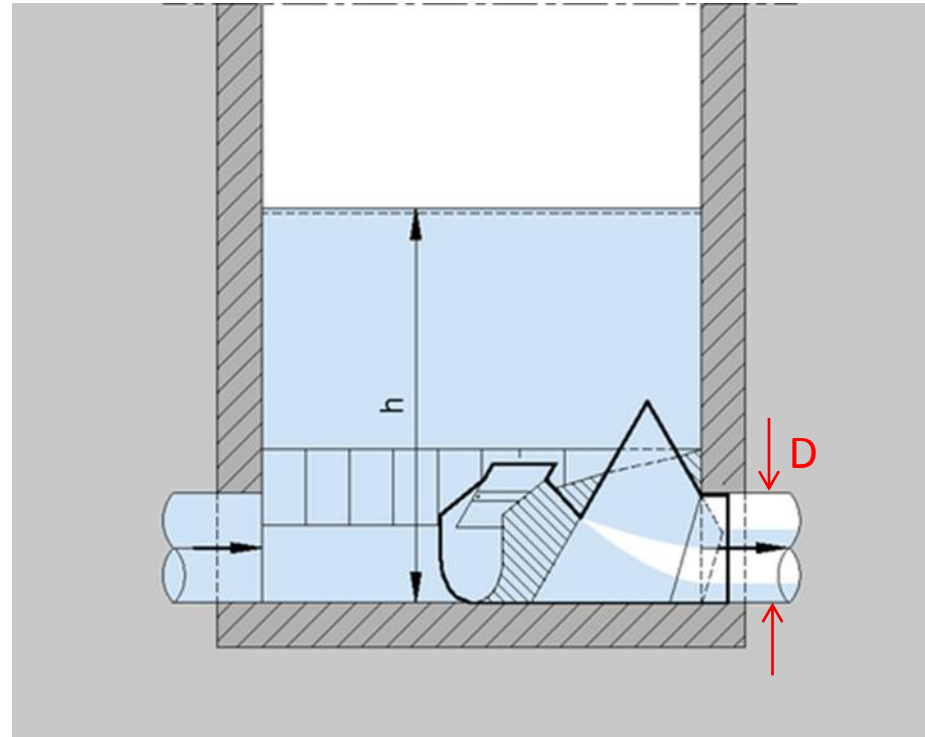
Bøjeklap, dimensionering

En bøjeklap kan tilnærmet modelleres som en 2-3 gange så lang fast kant, men faktoren afhænger af det dimensionsgivende flow.

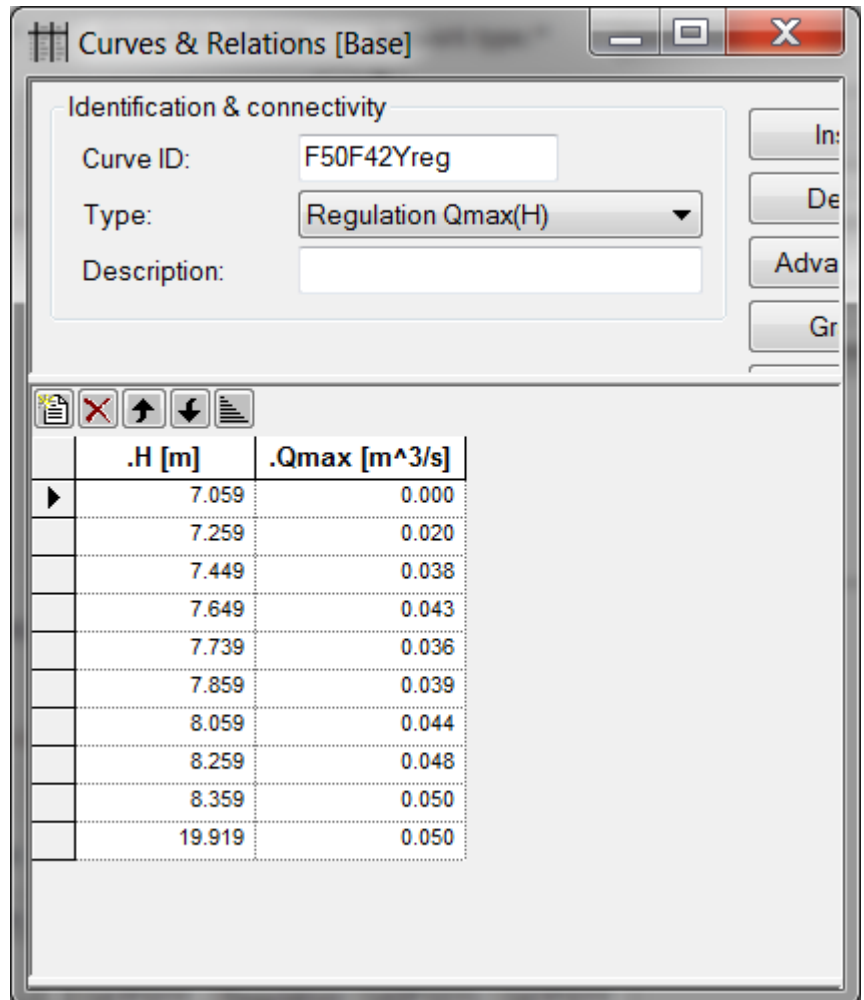
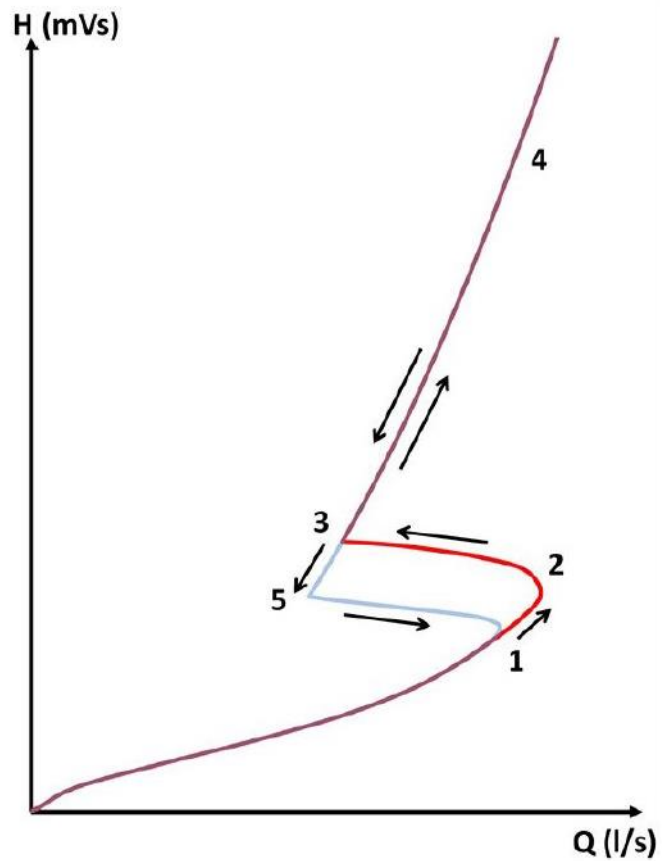
Q-H tabel er bedre, men kan ikke beskrive effekten af evt. tilbagestuvning.

Samme konklusioner gælder for fjederklapper.

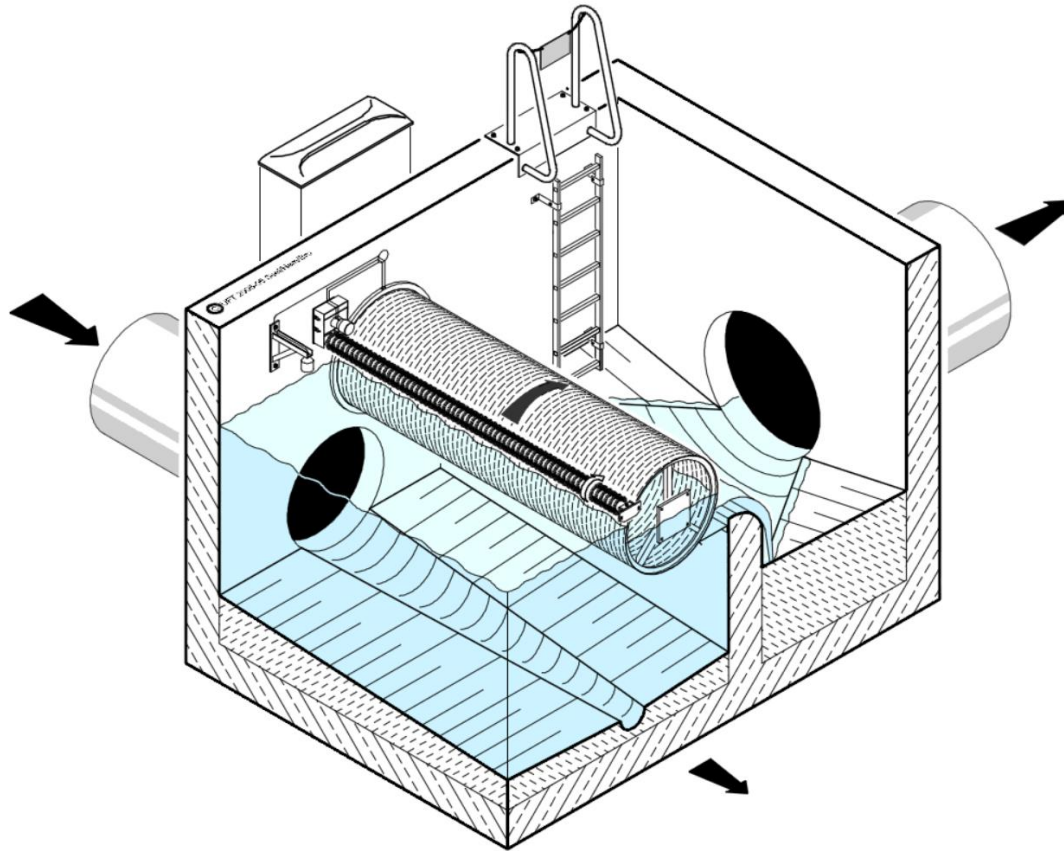
Vandbremser



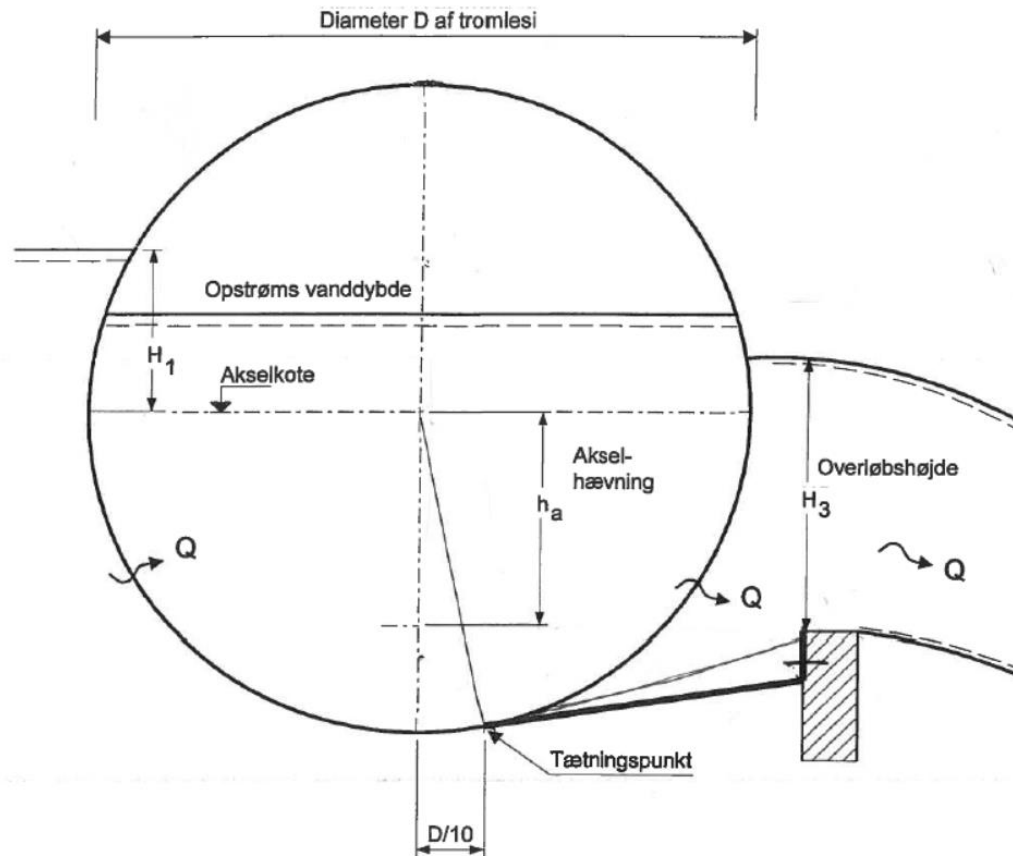
Vandbremser



Tromlesier



Tromlesier, snit



Tromlesier, specielle forhold

- Max 75% neddykning pga børsten
- Jo større akselhævning, jo større tryktab gennem sien men jo større kapacitet.
- Max anbefalet akselhævning $0,4 \cdot D$
- Hvis tromlesien ikke roterer er den tilstoppet og vandet løber ovenover.

Tromlesier, modellering

Metode 1

- Som fast kant men med den halve længde
- Ved max. akselhævning ($0,4 \cdot D$) f.eks. kantlængde $0,4 \cdot L$
- Ved min. akselhævning (0) f.eks. kantlængde $0,6 \cdot L$

Metode 2

Få leverandøren til at levere en Q-H kurve, som indtastes.

Tak for jeres opmærksomhed.

Er der nogle spørgsmål?