

June 4th, 2012



Leopold product presentation

General Introduction



Index

- Who is Xylem Leopold?
- What does Leopold do for a living?
- The Leopold underdrain equipment
- The designs and installation
- Examples of projects done

Xylem Leopold

Leopold fact's:

- Located in Zelienople, USA
- Company established in 1924
- First underdrain in 1945
- Large knowledge on
 - Filter design
 - Filtration techniques
 - Filter optimalization and operation
- Product development center
- R&D department
- Service and controls
- Project management, service and controls



Xylem Leopold

Product development center (PDC)

The PDC is Leopold's in house testing and laboratory facility.

- Demonstration of different filtration technologies
- Filter research
- Testing and validation of designs
- Jar testing equipment
- Media testing
- Development of new products

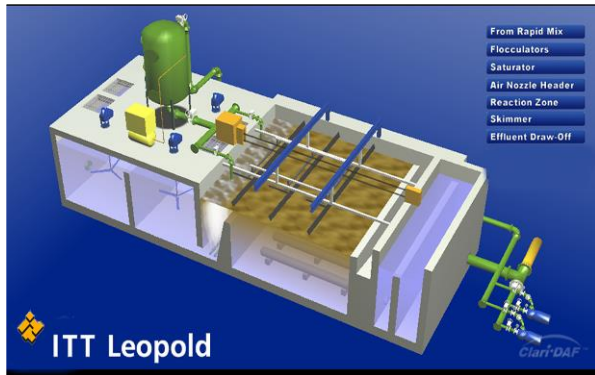


Xylem Leopold

Clarification

DAF

Dissolved air flotation



Applications:

- Wastewater
- Potable water
- Desalination pre-treatment

Filtration

Rapid gravity filtration
Leopold type S&SL

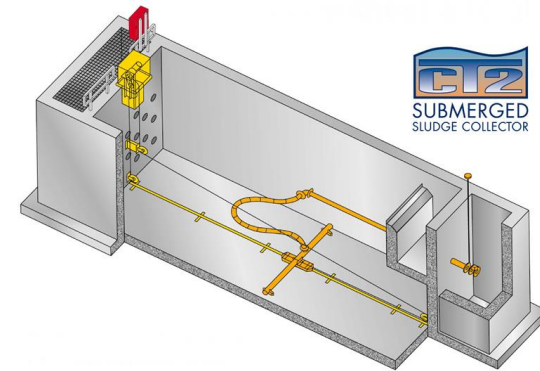


Applications:

- Potable water
- Wastewater
- Desalination pre-treatment

Sludge handling

Sludge removal
CT2 and CV



Applications:

- Potable water
- Wastewater

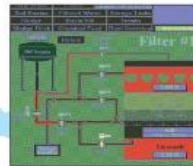
Leopold underdrain filtration system



Supervise installation to ensure long term performance



Control filters to optimise filter performance



SCADA link controls



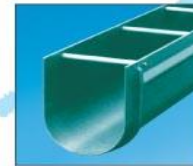
Design the Underdrain To keep the media clean



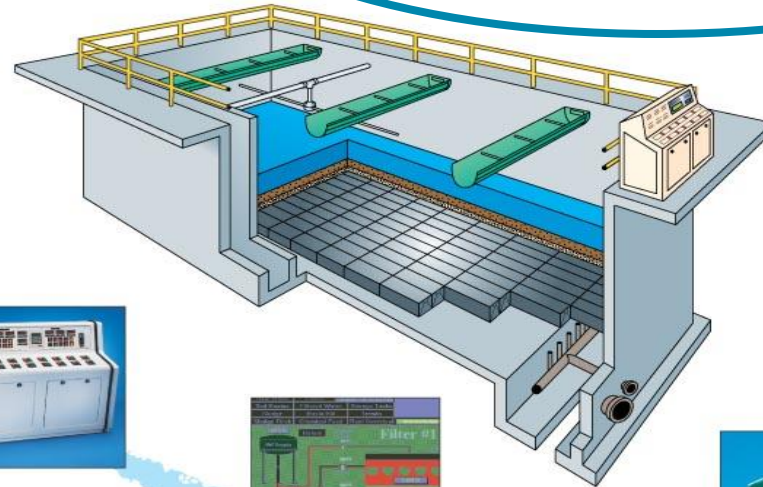
Support the media to maintain media profile always in same place



Design media to fit the application and waste constraints

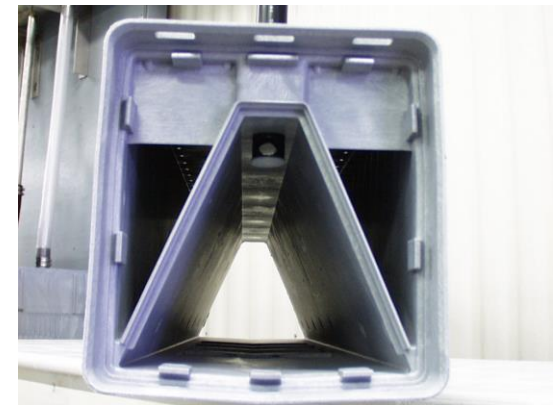
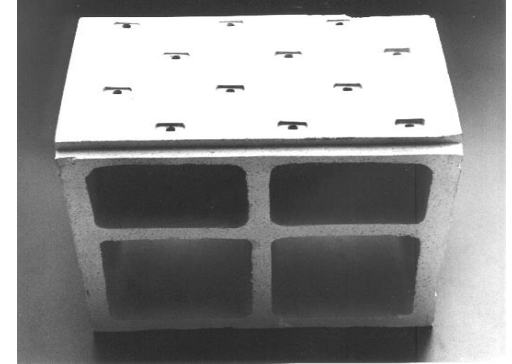


Design launders to fit the wash water rates

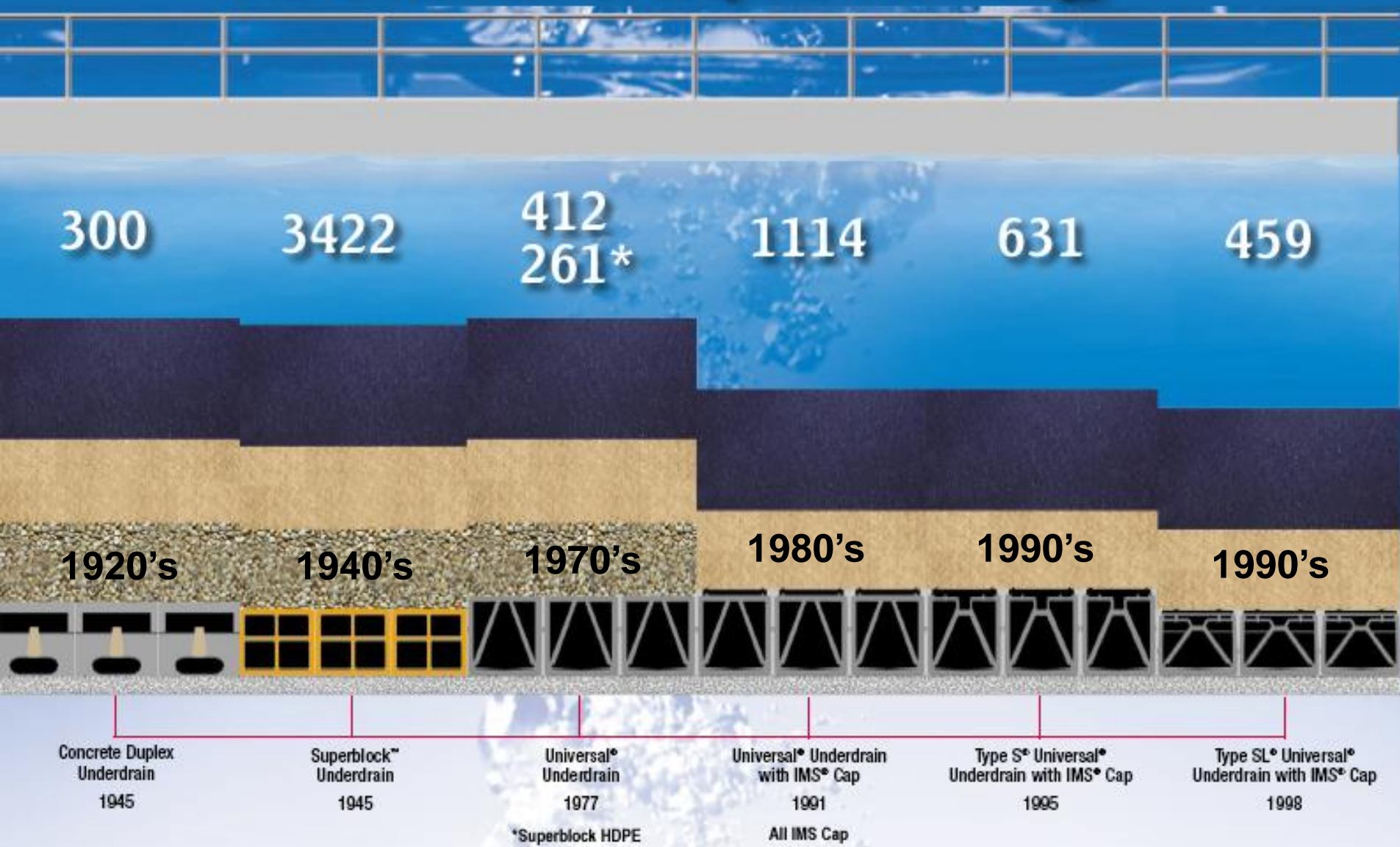


History of Innovation in Design by Leopold

- Established 1924 with Concrete Duplex Underdrain
- Began with Revolutionary New Underdrain Design in Early 1940's
 - Dual Parallel Lateral
 - Over 3000 Clay Tile Installations
- 1977 Introduced the First High Density Polyethylene (HDPE) Plastic Underdrain
 - Currently Over 1200 Installations and 300,000 sqm installed
 - Over 200 Wastewater Treatment Plants treating more than 11,000,000 m³/day

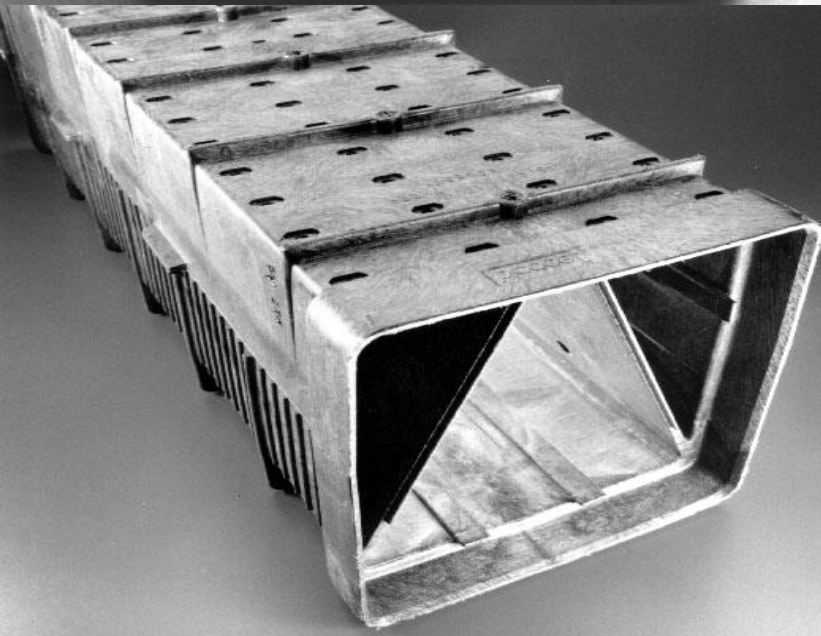
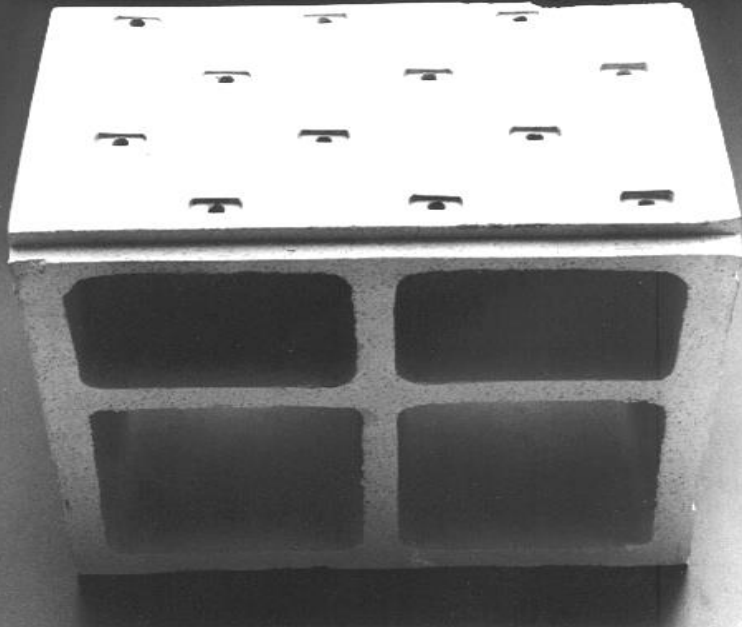


Advancement of Leopold Technology



Over 6,000 Underdrain installations, 1,889,000 sq. ft. of Type S[®] Family and over 2,200,000 sq. ft. of IMS[®] Cap installed

Leopold underdrains



Leopold underdrains



Over 8000 Installations World Wide

Xylem Leopold

Types of treatment

Xylem Leopold have worked historically in all areas of the municipal water cycle. We do not work in the industrial business unless it is large volume water processing.

POTABLE WATER:

Gravity filters; dual media, sand

GAC; Activated carbon

Mn & Fe removal

WASTEWATER:

Gravity filters; dual media, sand

GAC; Endocrine removal

P removal

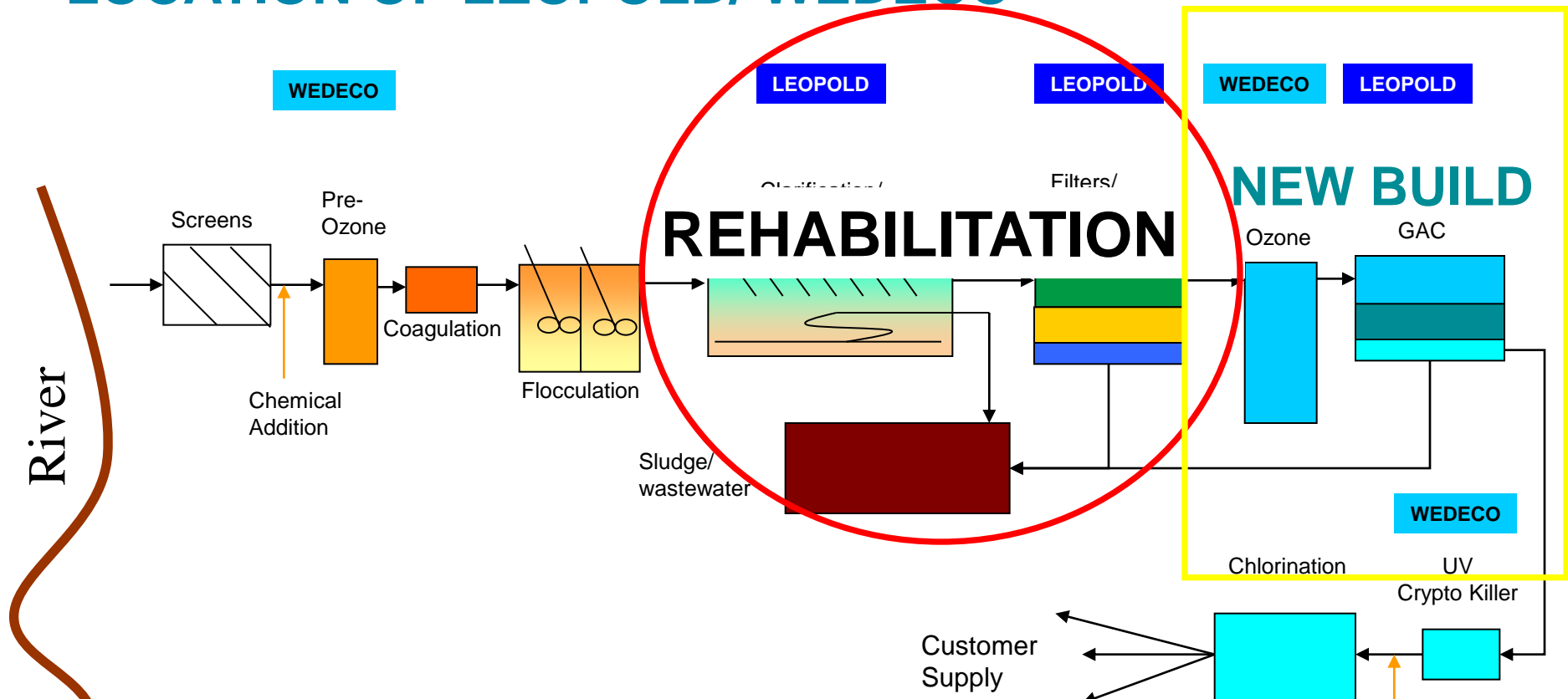
N removal (nutrients)

DESALINATION:

Gravity filters; dual media, sand

Post RO rehardening

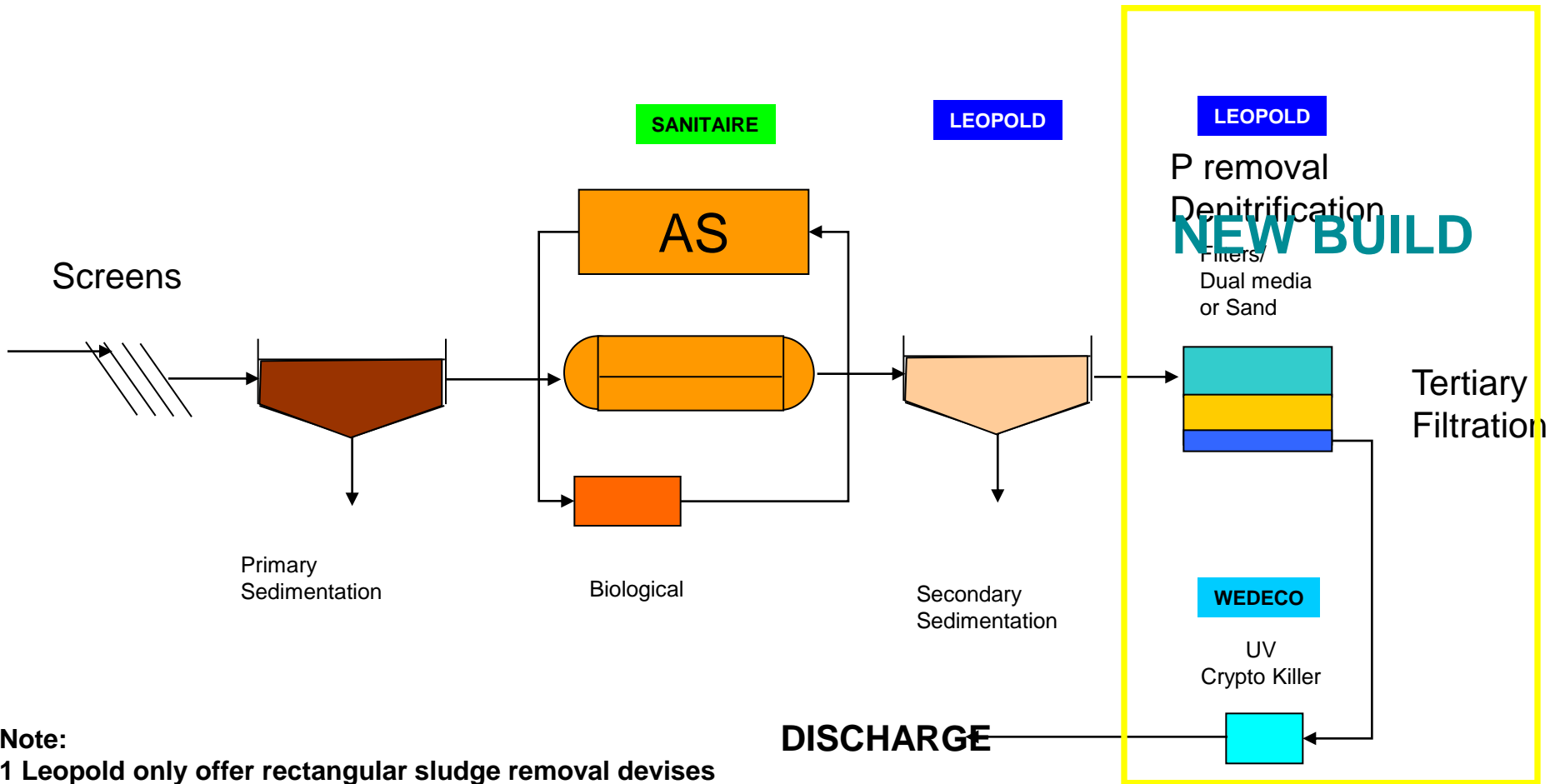
TYPICAL PROCESS TRAIN FOR POTABLE WATER – LOCATION OF LEOPOLD/ WEDECO



Note:

- 1 Pre-ozone enhances coagulation and reduces demand
- 2 Clarification: Leopold provide sludge removal device
- 3 Filters: Leopold provide design and equipment
- 4 Ozone: required for oxidation and pesticide/herbicides destruction
- 5 GAC: required to remove ozone breakdown products
- 6 UV : required to kill Crypto cysts

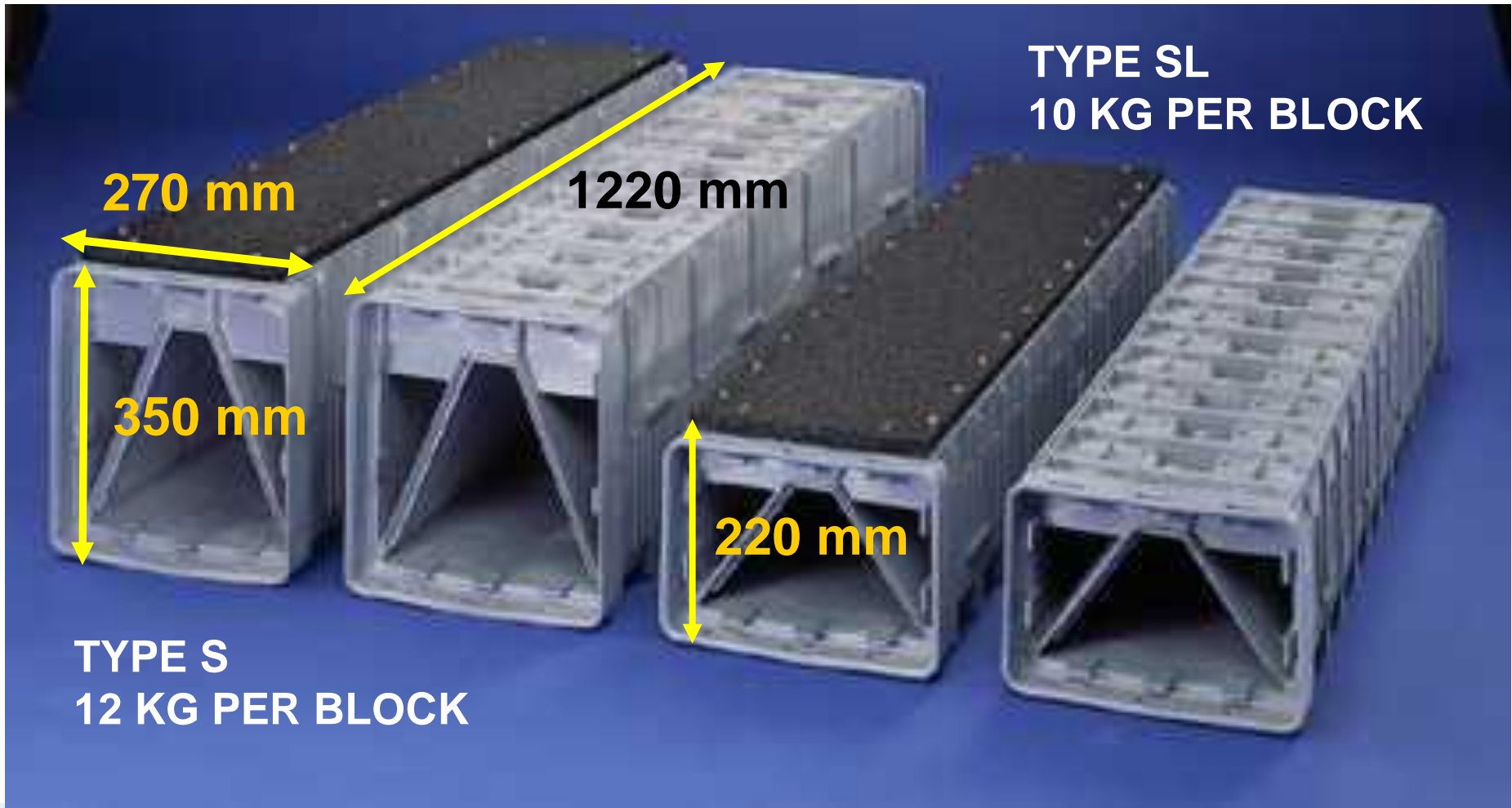
SIMPLIFIED WASTEWATER PROCESS



Note:

- 1 Leopold only offer rectangular sludge removal devises
- 2 Filters can be for P,N or TSS removal
- 3 WEDECO UV is a big synergy potential
- 4 Sanitaire diffusers are a big synergy potential
- 5 Leopold only work on the back of the works, no primary equipment at all

Leopold underdrain filtration system



Leopold underdrain filtration system

Why to use an air water backwash?

- More treated water to sell
- Less backwash water to handle

Effective bed cleaning

- Eliminates mud-balling in the system
- Longer filter runtimes
- Increase of effluent efficiency

Water only

- High rate water 13min
- Low rate water 1min

Total water usage: **270m³**

Air/water separate

- Air scour 2-3min
- High rate water 10min

Total water usage: **208m³**

Air/water combined

- Air scour 2-3min
- Air water combined 2-3min
- High rate water 7min
- Total water usage: **160m³**

Leopold underdrain filtration system

TYPE S

Lateral maximum length = 30m

- Maximum air scour rate = 120 m/hr
- Maximum backwash rate = 90 m/hr

MAIN MARKET = NEW BUILD BIG FILTERS



TYPE SL

Lateral maximum length = 12m

- Maximum air scour rate = 90 m/hr
- Maximum backwash rate = 75 m/hr

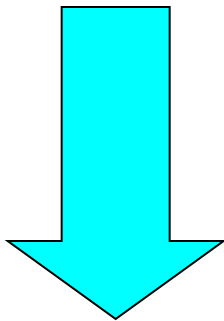
MAIN MARKET = RETROFIT SMALL FILTERS



Leopold underdrain filtration system

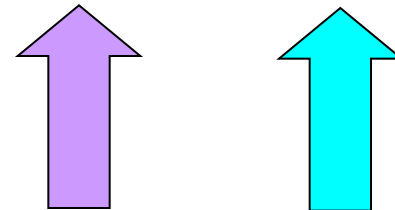
EASY

Collecting the filtered water after the filter media and removing it from the filters to disinfection, holes in a pipe can do this.



DIFFICULT

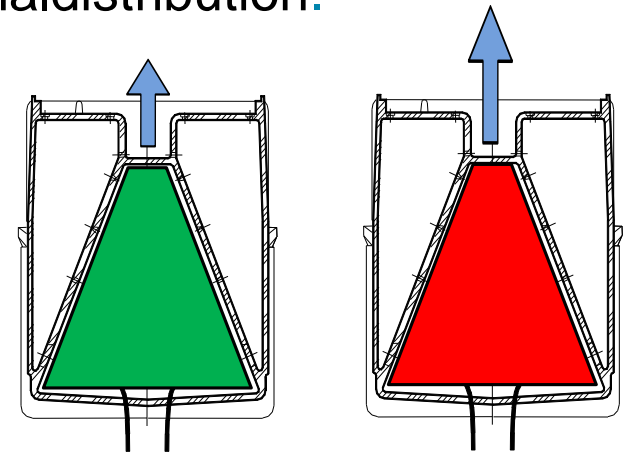
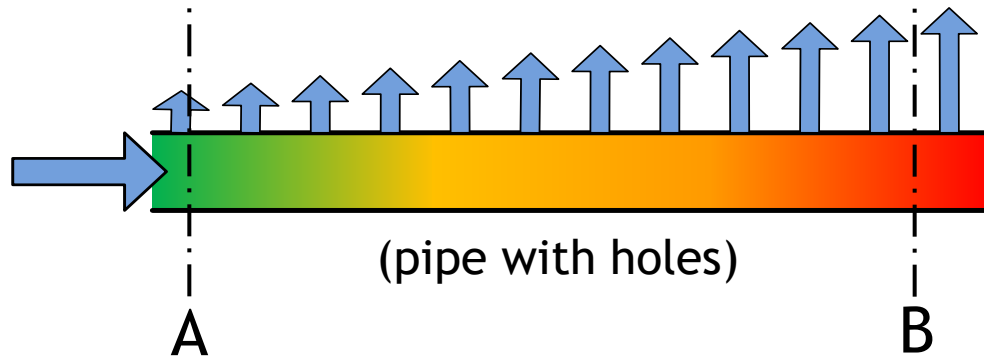
Backwashing the filter for complete regeneration of the filter media must have even distribution of **AIR** and **WATER** in a **COMBINED** method for efficient filter performance over life of filter



Leopold underdrain filtration system

Pipe lateral systems:

A water flow into a pipe with equal orifices will have a pressure/flow pattern according to the picture below, this results in high maldistribution.



Section A and B

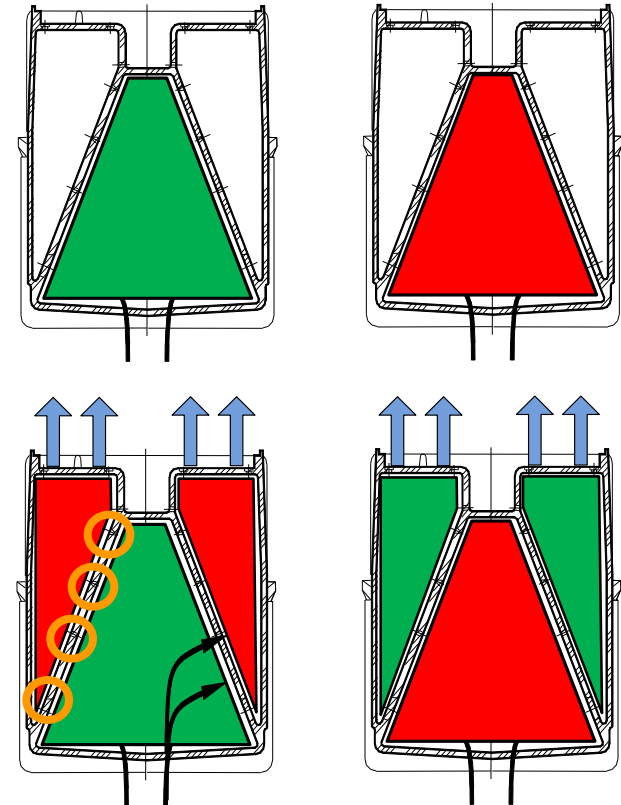
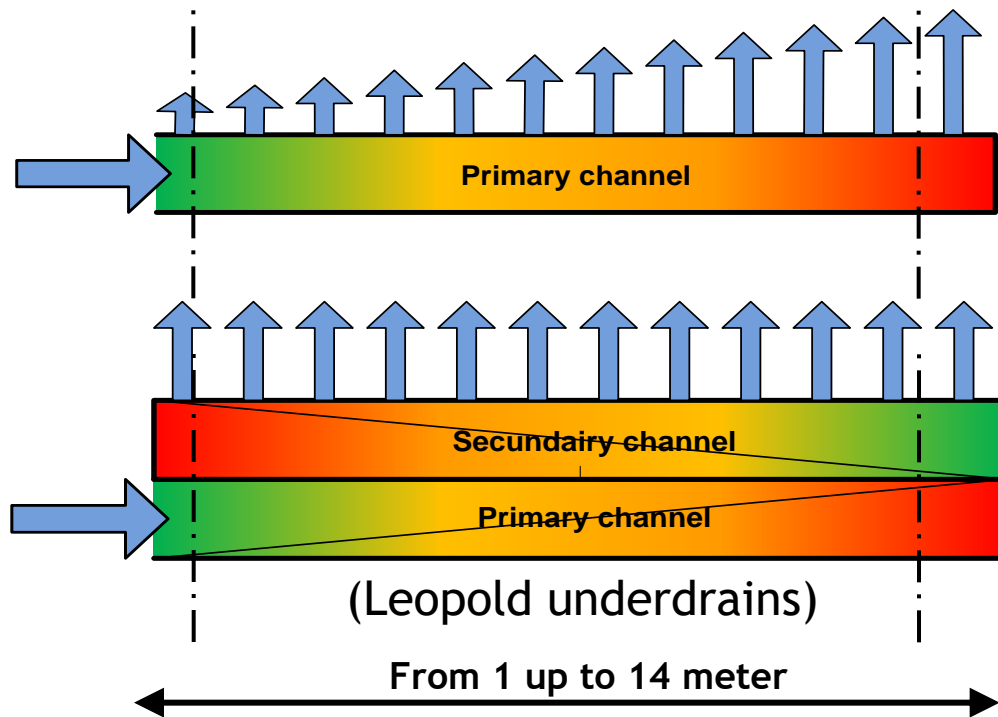
Leopold underdrain filtration system



Leopold underdrain filtration system

Dual parallel underdrain:

With the use of two channels connected together a opposite effect will be created of the situation shown before.



Leopold underdrain filtration system

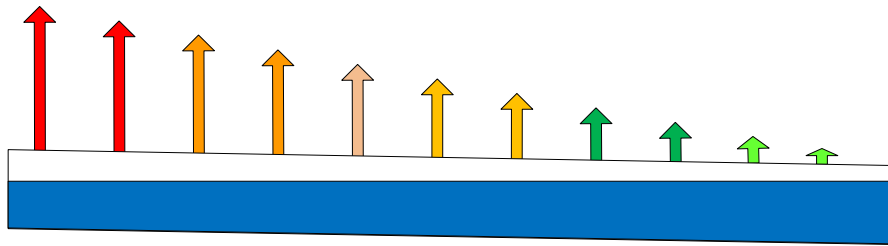


Leopold underdrain filtration system

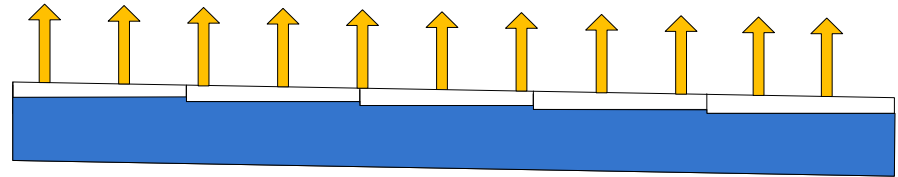
Internal baffles:

Once the underdrain is connected and installed separate segments are created for a better distribution of air.

- Correct installation tolerances
- Absorb air movements in underdrain lateral



Wrong



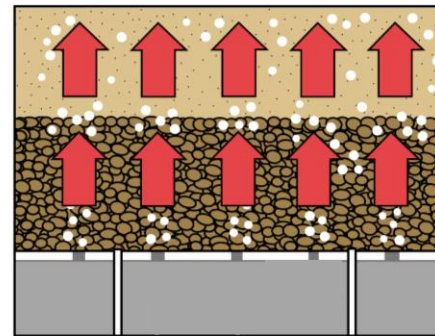
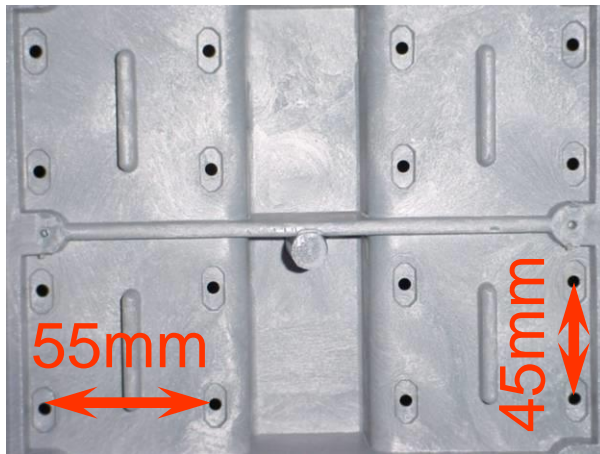
Right



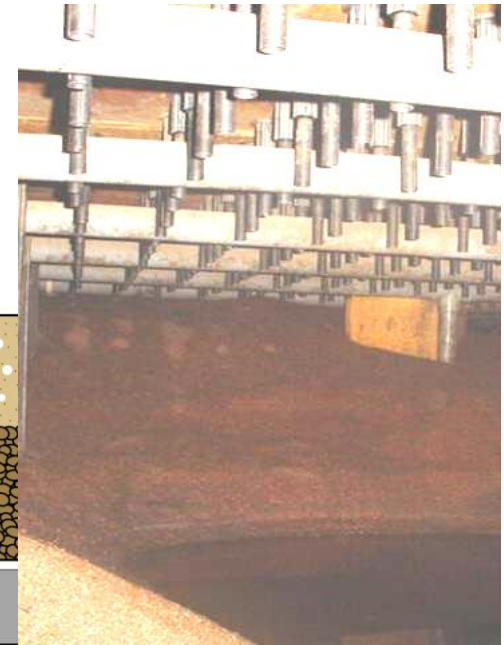
Leopold underdrain filtration system

The underdrain top surface

- Orifices 5,5mm in diameter
- 248 orifices per m²
- Center to center not more than 55mm
- Block coverage is 90% of total filter area
- No items which can break



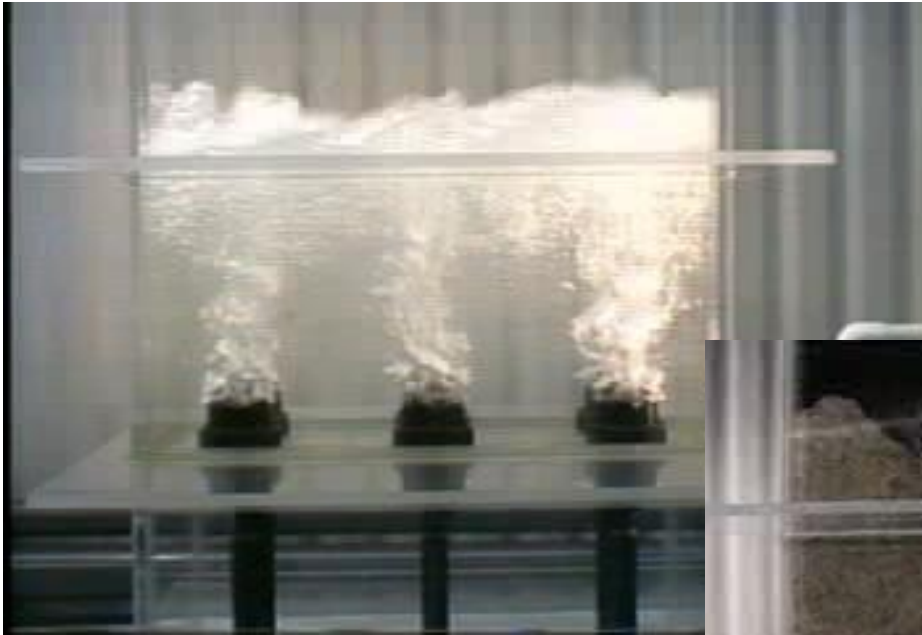
Leopold type S and SL
underdrain system



Alternative backwash
system

Leopold underdrain filtration system

Nozzles



Nozzles with media



Leopold underdrain filtration system

Leopold underdrain lateral



Leopold underdrain filtration system

IMS Cap or Support gravel?

A barrier between the media and the underdrain is required, there are two options: support gravel or an Intergraded media support cap.

Support gravel

- Different silica gravel layers
- For potable water
- For waste water
- For desal pre treatment
- Maximum 375mm in height



IMS cap

- Sintered PE beads.
- For potable water s
- For desal pre treatment
- More freeboard (+275mm)
- Corrosion resistant



Leopold underdrain filtration systems

Because there is no false floor required height can be saved in the filtration system, this will allow for:

- Better hydraulic plant profile
- None complex civil structure (reduce cost)
- Energy friendly design*

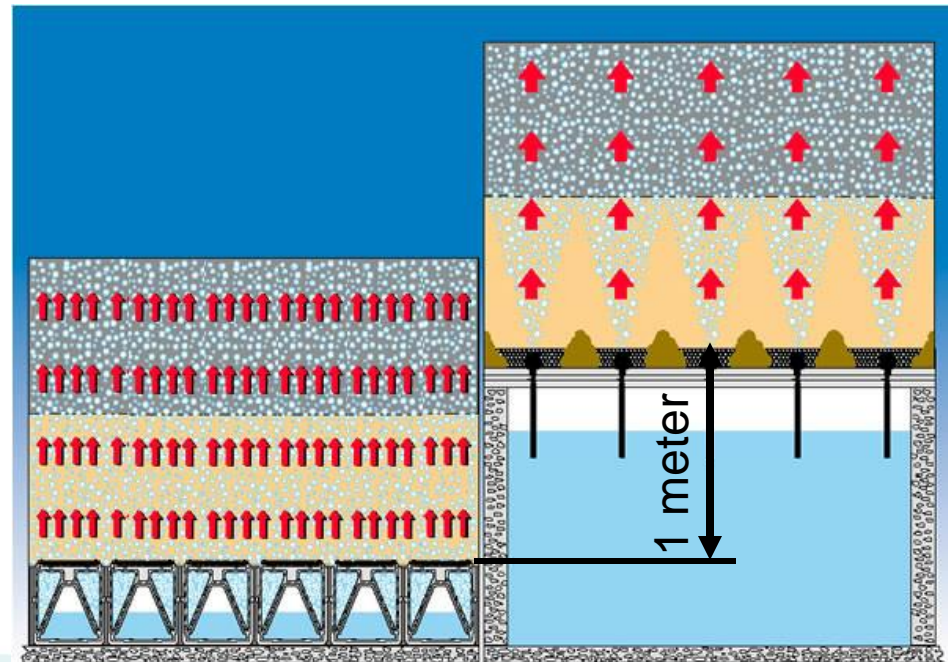
*Example:

Plant flow: 1250m³/hr
KWh price: \$0,3125 KWh
Life time: 10 years

Leopold design: 30KW
Conventional: 40KW

Saving in 10 years: **\$27.300 USD**

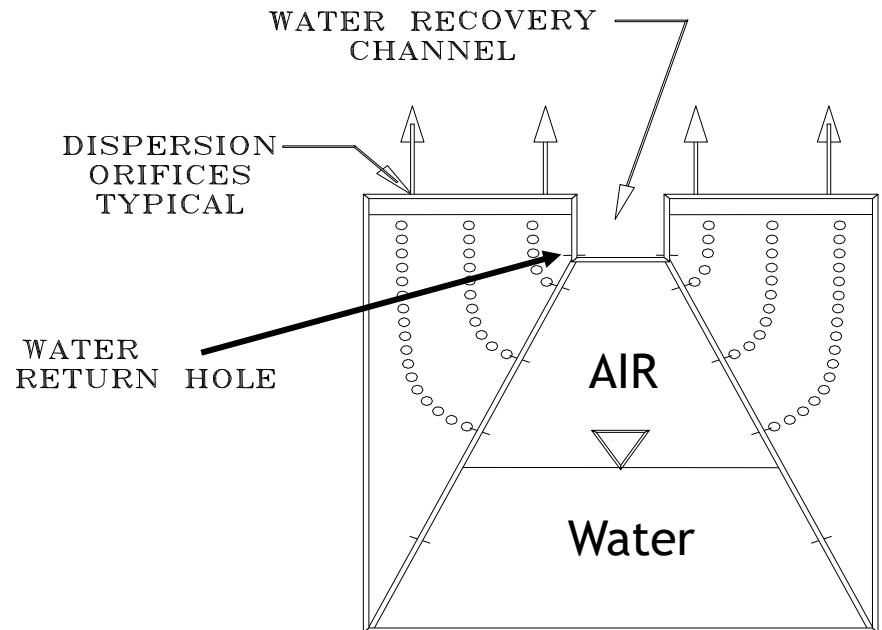
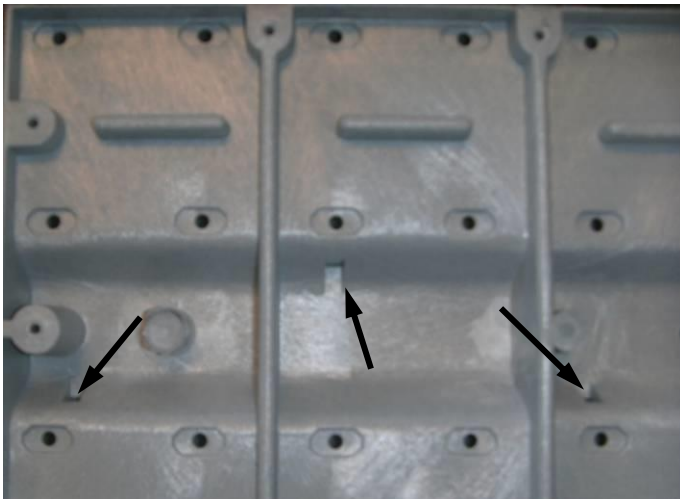
Win of 25% PER PUMP



Leopold underdrain filtration system

Water recovery channel:

By the use of the water return holes is an even distribution of air established.



Leopold underdrain filtration system

No water recovery channel



No other underdrain block except Leopold has an water recovery channel to improve air distribution.

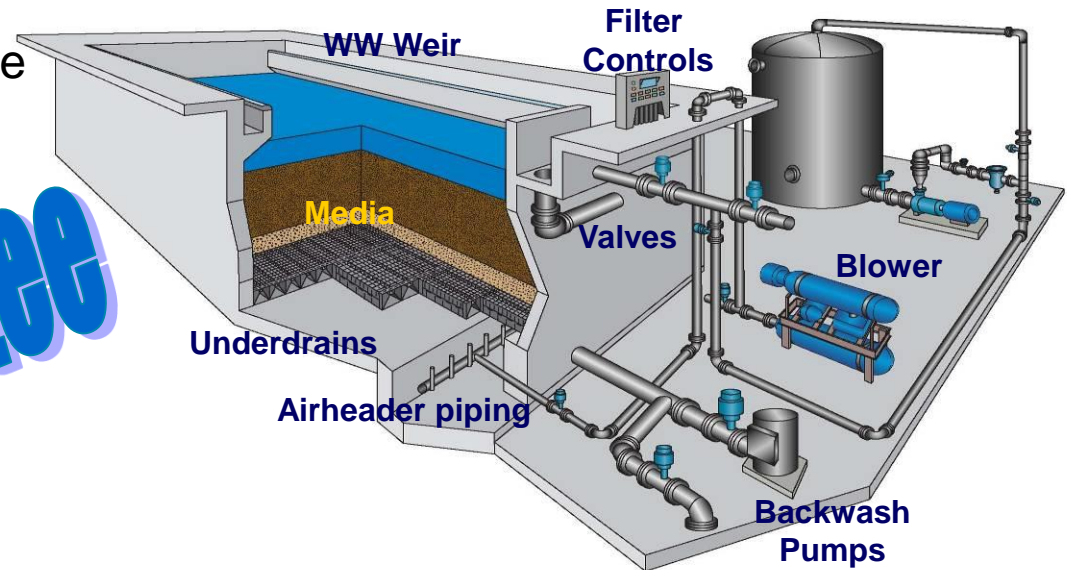


Design and installation

What does Leopold offers more?

We are **NOT** only a underdrain block supplier, the strength of a well designed filtration system is the **engineering** of it.

- System integration
- Media selection
- Valves and piping
- Filter controls
- Coagulation/ chem. dosage
- Underdrain floor design



Process guarantee

Design and installation

What does this exactly imply?

System integration:

- Pretreatment → **Leopold** → Post treatment
- How to design the filters in the hydraulic profile of the plant
- System headloss calculations
- Pump design
 - Backwash pumps
 - Influent pumps
- Piping/channel design combined with valve sizing
- Media selection
 - Waste water coarse media
 - Potable water mono/dual media
 - Desalination Dual media



Design and installation

What does this exactly imply?

Media selection:

	Potable water	Waste water	
Design:	Dual media	Mono media	<i>Dual</i>
Effective size:	0,5-1,15mm	1,7-3.0mm	0,6-2.0mm
Media depth:	700mm	1800mm	1200mm
L/D ratio	>1100	>900	>900
Water rate:	±50m/hr	20m/hr	50m/hr
Air rate:	60m/hr	90m/hr	60m/hr
Comments:	--	<ul style="list-style-type: none">- High solids capture rate- Effluent TSS 5mg/l- Low backwash energy	

Design and installation

How to control the filters:

Control system:

- Filter control panels
- Application/design/software engineering
- PLC based touch screen integration
- Full time field service representatives

Plant control and monitoring

- PLC and computer networks
- Computer operator interface terminals
- Report generation
- Optimize performance
- Reduce operating cost

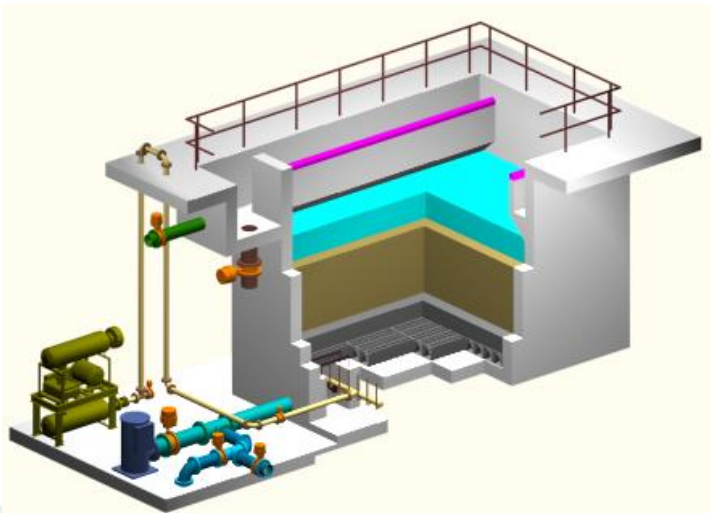
More that 80years of experience



Design and installation

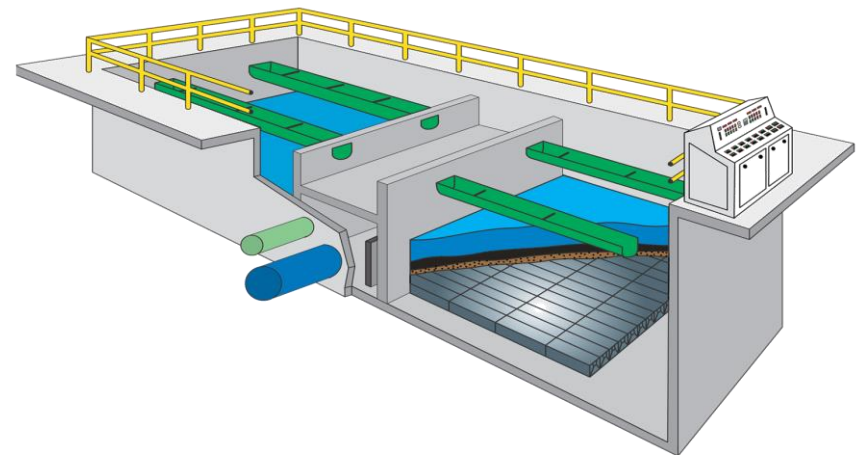
Front flume filter lay-out:

- Flume on the short side of the filter
- Water and air introduction from underneath
- Long small filters
- Suitable for type S and SL
- Plain civil design



Flat bottom flume filter lay-out:

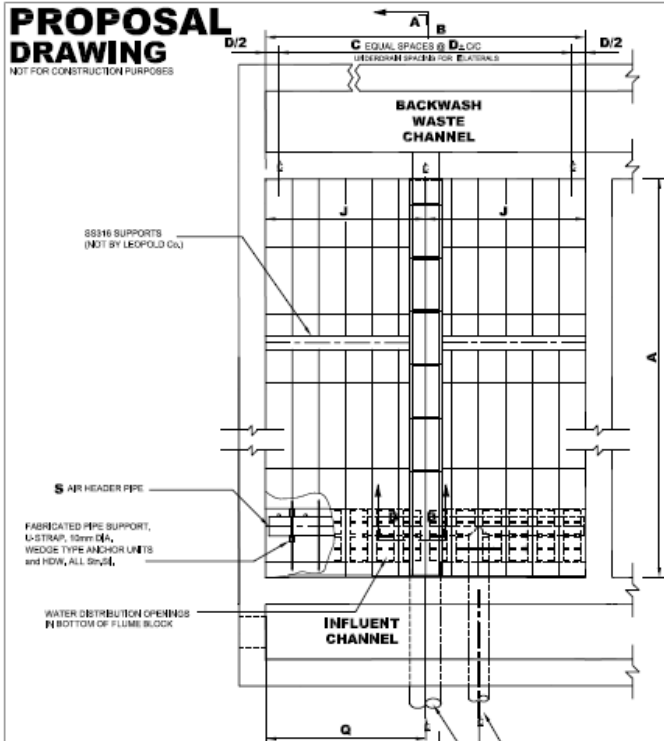
- Flume on the long side of the filter
- No excavation needed
- Suitable for large filter
- Suitable for type S and SL
- Great design for salt water applications.



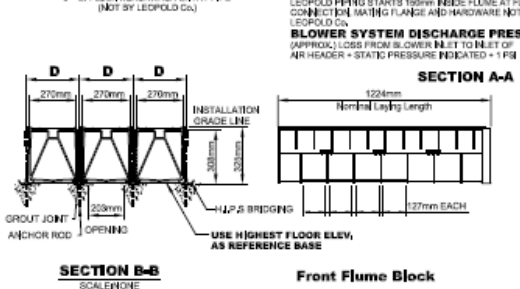
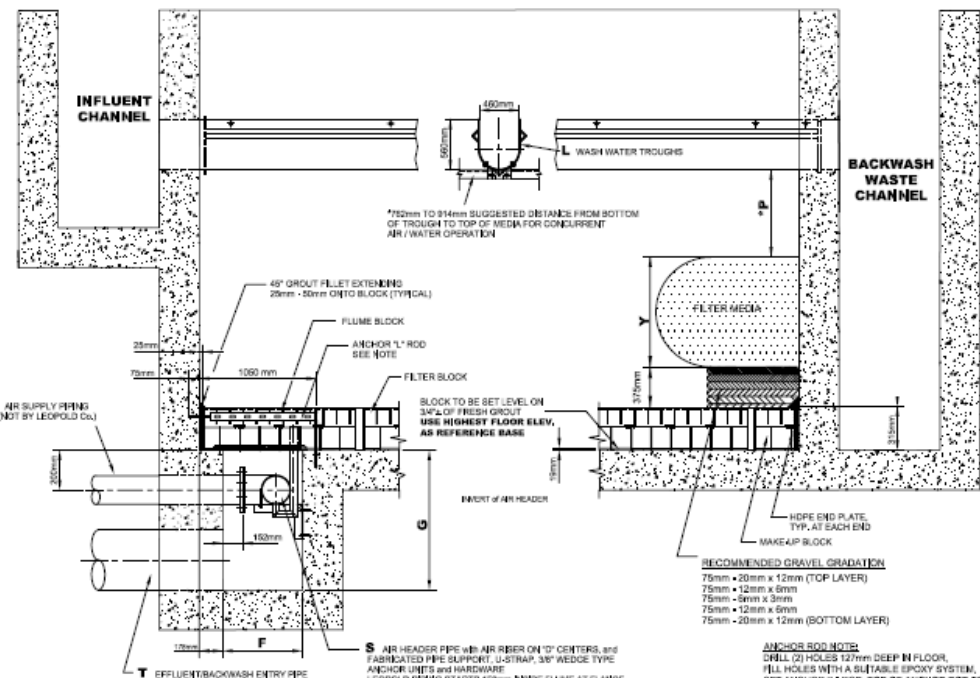
Design and Installation

PROPOSAL DRAWING

NOT FOR CONSTRUCTION PURPOSES



- NOTES**
1. FILTER BLOCK TO BE STRUCTURAL HDPE
 2. BRIDGES TO BE INSTALLED BETWEEN FLUME BLOCK TO RETAIN GROUT OVER FLUME
 3. EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE INSTALLATION INSTRUCTIONS AND TOLERANCES SHOWN ON THE DRAWINGS AND O&M MANUAL. READ ALL INSTRUCTIONS PRIOR TO RECEIVING, STORING, INSTALLING AND OPERATING FILTER EQUIPMENT.
 4. ALL MOUNTING BRACKETS TO BE STAINLESS STEEL, TYPE 304 AND ALL HARDWARE TO BE STAINLESS STEEL, TYPE 304 EXCEPT AS NOTED.
 5. ALL FILTER FLOORS, NEW OR EXISTING, MUST HAVE A ROUGH SURFACE EQUIVALENT TO A MINIMUM 3mm GROOVE ROOM FINISH PRIOR TO PLACING THE BASE GROUT.
 6. BLOWER SYSTEMS WITH PD TYPE BLOWERS MUST INCLUDE AN AUTOMATIC VENT TO ATMOSPHERE VALVE TO CONTROL AIR INTRODUCTION INTO THE FILTER.
 7. THE FILTER MUST NOT INCLUDE EXPANSION JOINTS WITHIN THE FILTER BOX.
 8. THERE MUST BE A HIGH LOOP IN THE PIPING BETWEEN THE FILTER AND BLOWER LOCATION. THE LOOP SHOULD BE A MINIMUM OF 2.1 meter ABOVE THE FILTER OVERFLOW ELEVATION.
 9. DIMENSIONS AND OTHER INFORMATION PRESENTED ON THE LEOPOLD PROJECT DRAWINGS REPRESENT LEOPOLD'S BEST INTERPRETATION OF THE PROJECT PLANS AND SPECIFICATIONS AS PREPARED BY OTHERS, AS SUCH, DURING THE APPROVAL PROCESS, THE PURCHASER SHALL THOROUGHLY REVIEW AND VERIFY ALL DIMENSIONS WITH RESPECT TO ACTUAL FIELD CONDITIONS.
 10. ANCHOR RODS AND ANCHOR ROD EPOXY MUST BE INSTALLED IN ACCORDANCE WITH THE INSTALLATION INSTRUCTIONS AND TOLERANCES SHOWN ON ALL DRAWINGS, THE O&M MANUAL AND THE EPOXY MANUFACTURER'S INSTRUCTIONS. ENSURE PROPER ANCHOR ROD LOCATION, HOLE SIZES, HEIGHTS, EMBEDMENT DEPTHS, AND EPOXY PENETRATION.



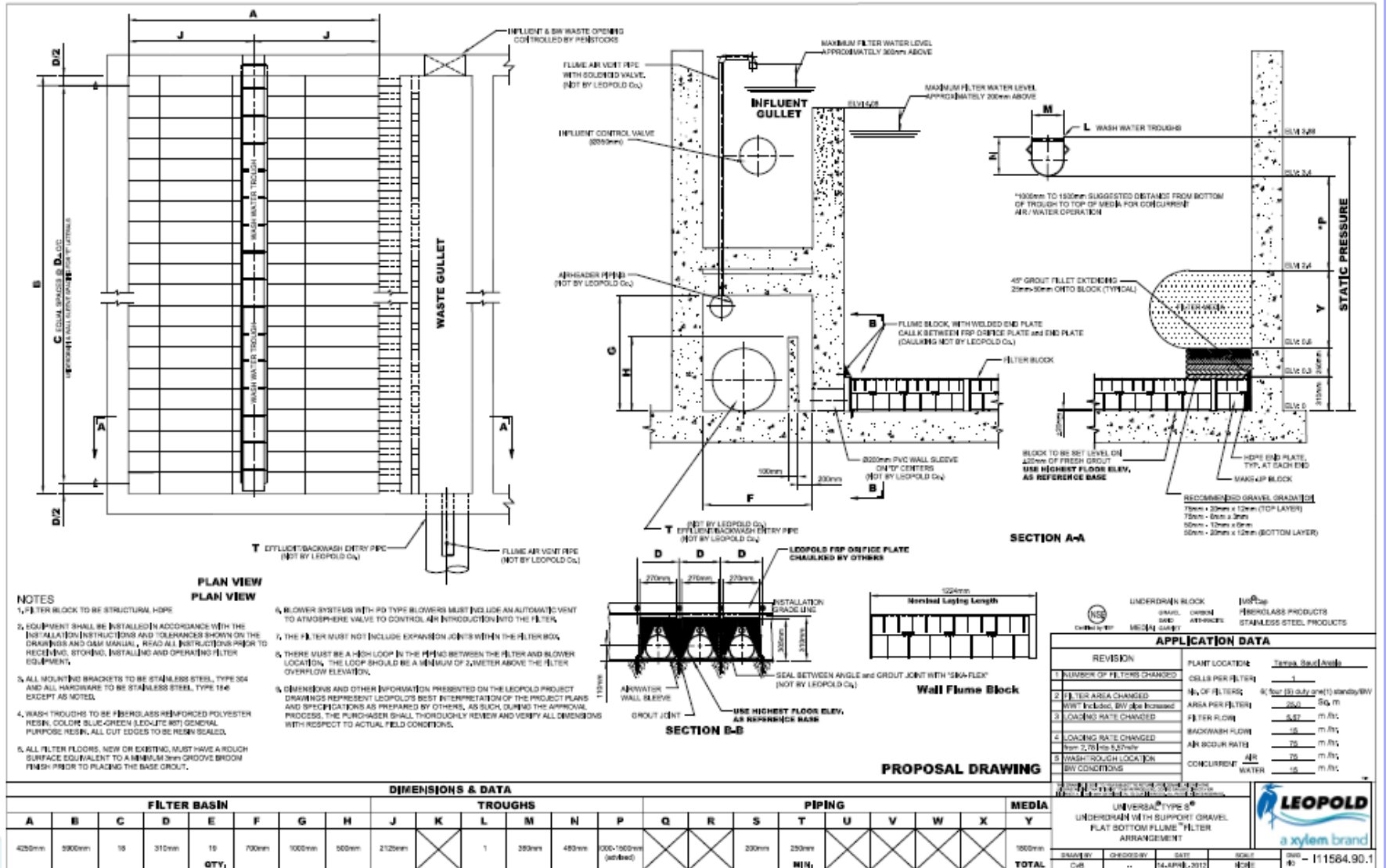
NSF
CERTIFIED
ANSI 61

UNDERDRAIN BLOCK
MEDIA: SAND/GRITRAC
STAINLESS STEEL 304 PRODUCTS

APPLICATION DATA	
PLANT LOCATION:	TABUK Refin 2nd Stage Area, JUBA ENGINEERING
Nr. OF FILTERS	2 CELLS PER FILTER: 1
AREA PER FILTER	2.32 Sq.m
FILTER FLOW	2.22 m ³ /hr
BACKWASH FLOW	20 m ³ /hr
AIR SCOUR RATE	90 m ³ /hr
CONCURRENT AIR	90 m ³ /hr
CONCURRENT WATER	20 m ³ /hr

FILTER BASIN													DIMENSIONS & DATA													PIPING		MEDIA		UNIVERSAL TYPE S® UNDERDRAIN FRONT FLUME FILTER ARRANGEMENT	
A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	REVISION	DATE	SCALE	DWG NO.					
5900mm	4325mm	13	302mm	14	760mm	400mm		215mm					QTY 1.	550-300mm ADJ. 5ED	215mm	3000mm	150mm	250mm					1500mm (assumed) TOTAL	1		NONE	112092,50,0,1				

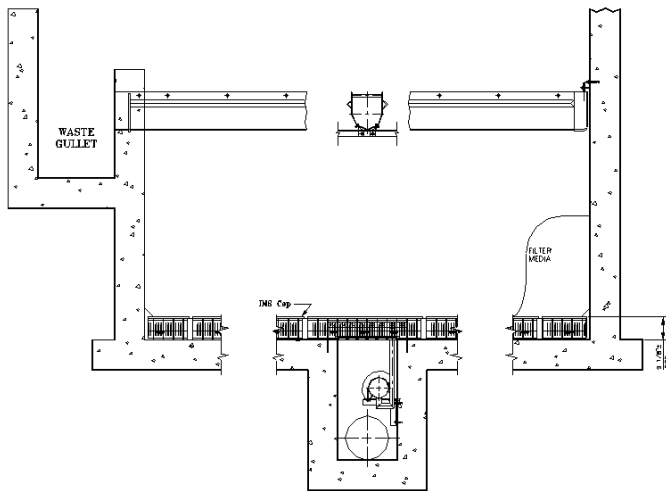
Design and Installation



Design and installation

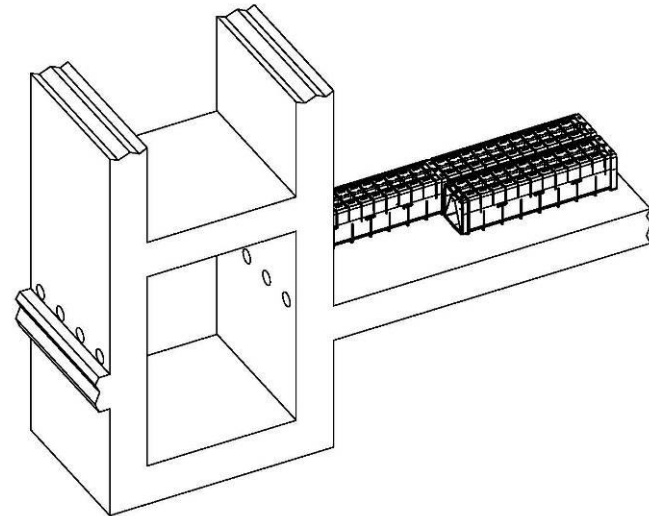
Center flume filter lay-out:

- Flume in the middle of the filter
- Water and air introduction from underneath
- (very) Long narrow filters
- Suitable for type S and SL
- Often used for filter rehabilitations

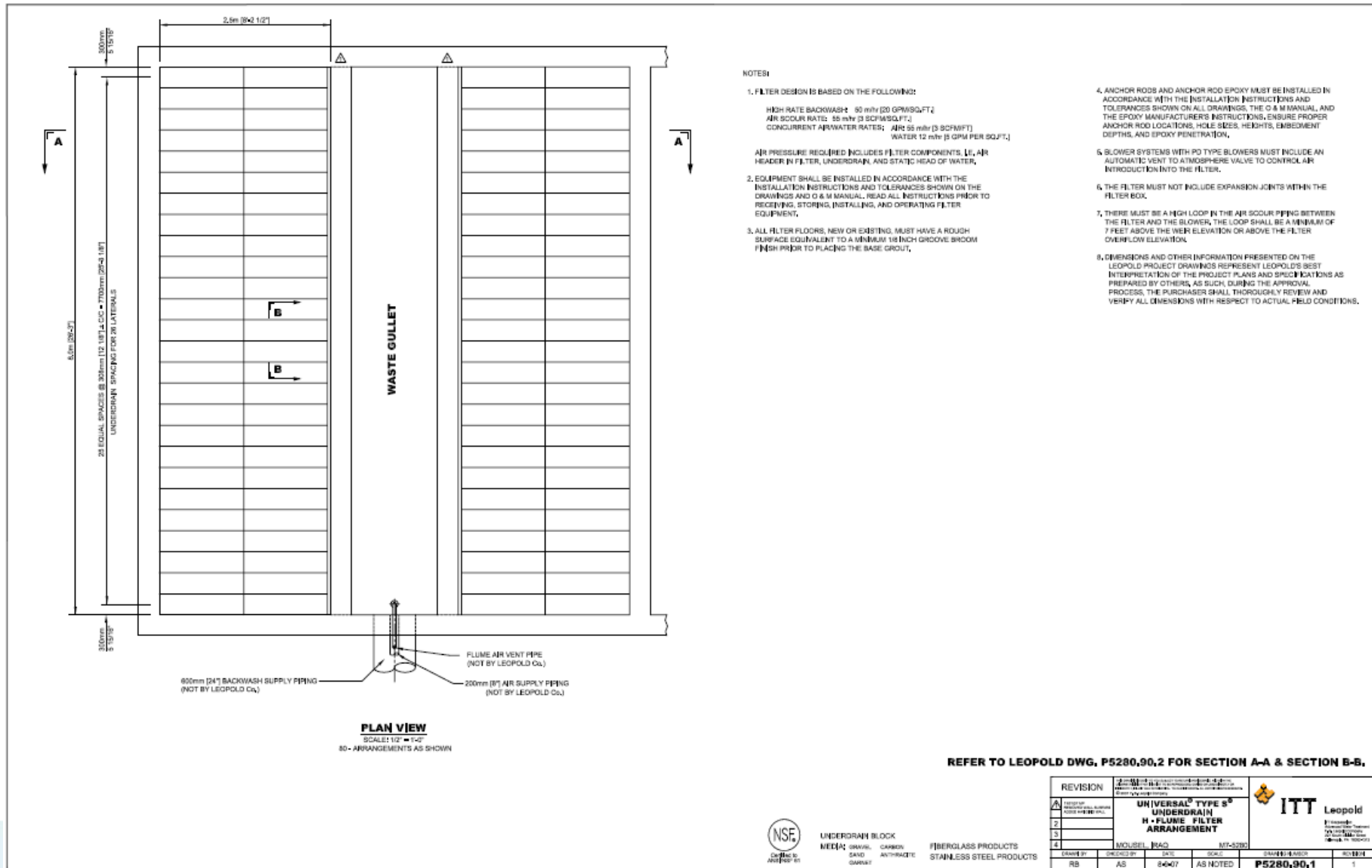


H-flume filter lay-out:

- Flume on the long side of the filter
- Better in footprint than a Flat bottom flume filter
- Suitable for large filters
- Suitable for type S and SL
- Great design for salt water applications.



Design and installation



REFER TO LEOPOLD DWG, P5280,90,2 FOR SECTION A-A & SECTION B-B.



UNDERDRAIN BLOCK
 MEDIA: GRAVEL, CARBON, FIBERGLASS PRODUCTS, SAND, ANTHRACITE, STAINLESS STEEL PRODUCTS

REVISION	DATE	SCALE	DATE	SCALE	DATE	SCALE
A						
2						
3						
4						

UNIVERSAL TYPE S[®] UNDERDRAIN
 H • FLUME FILTER ARRANGEMENT

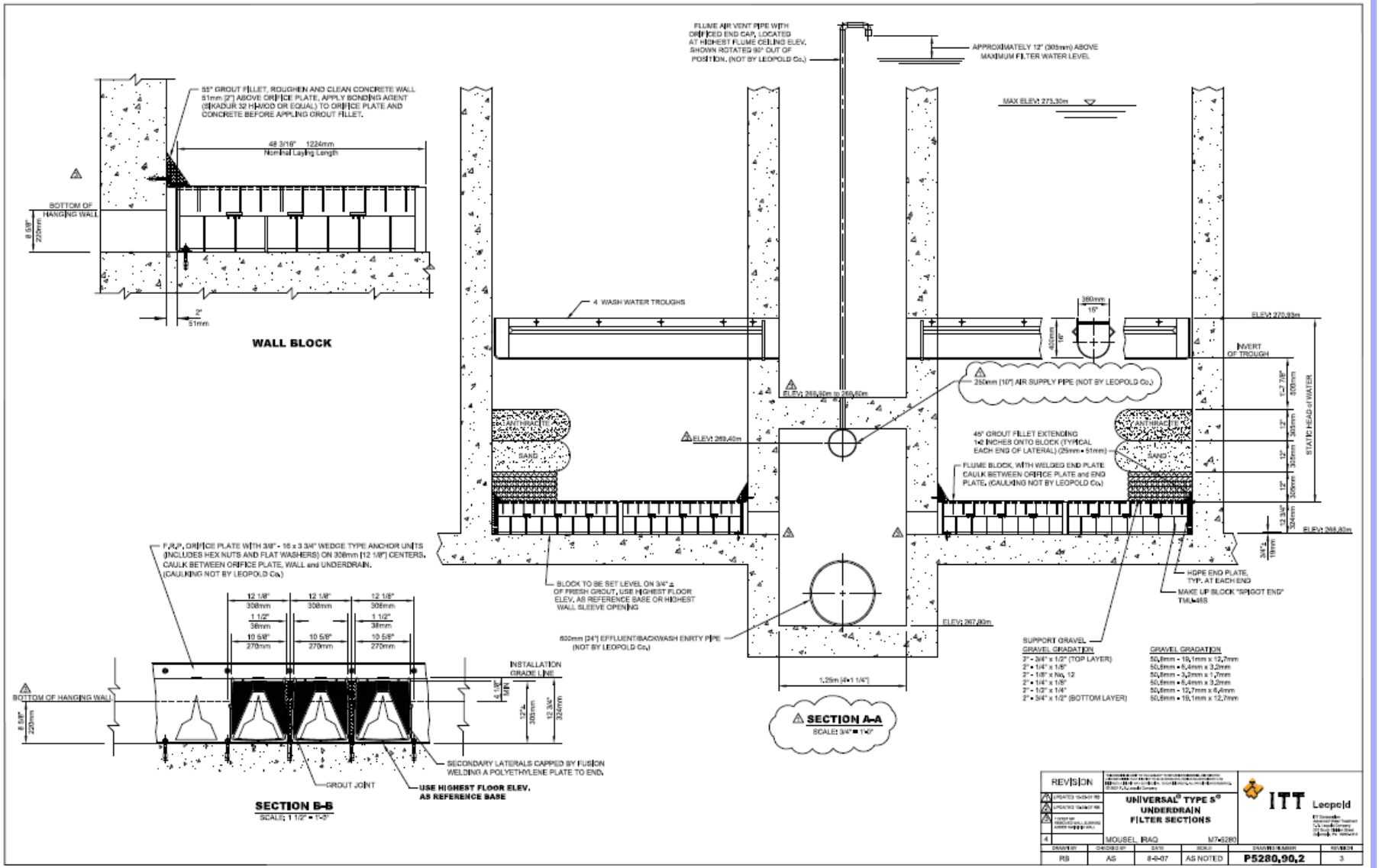
ITC Leopold

MT-5280

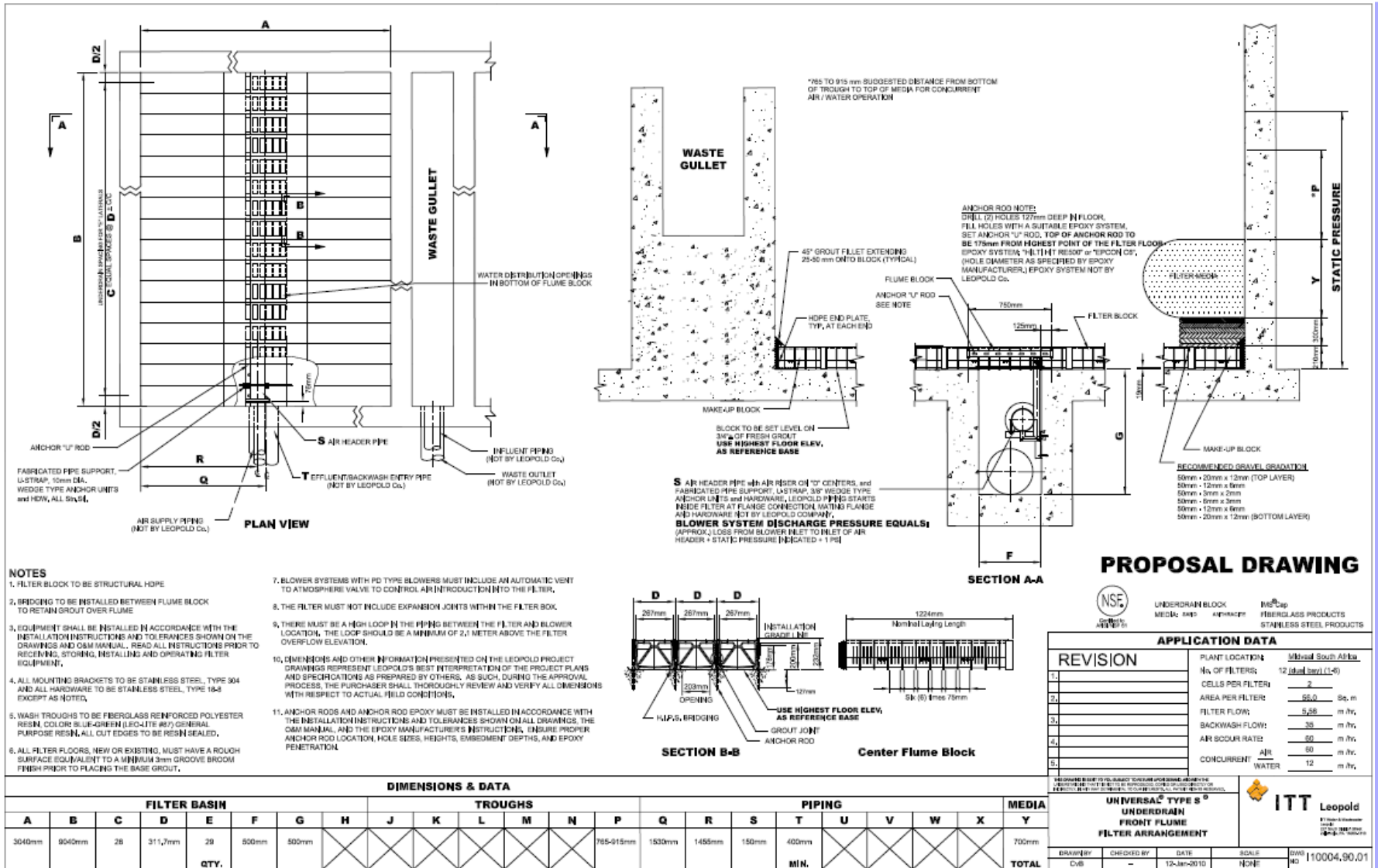
DRAWN BY	DESIGNED BY	DATE	SCALE	DATE	SCALE
RB	AS	8/6/07	AS NOTED		

DRAWING NUMBER: P5280,90,1
 REVISION: 1

Design and installation



Design and Installation



Design and installation



Paterosn Candy
D Floor – refit

Low air rates of 20
m/hr available from
existing blowers

Design and installation

Check

Leopold will supervise the installation of the underdrains to guarantee a strong construction that will last the life time of the plant.

Train

The supervisor is there to train the local personnel in the correct installation method and assembly of the underdrains

Start!

The supervisor will inspect the delivered equipment and makes sure nothing is missing or damaged before installation to save time during installation.

Design and installation

Plant fact's:

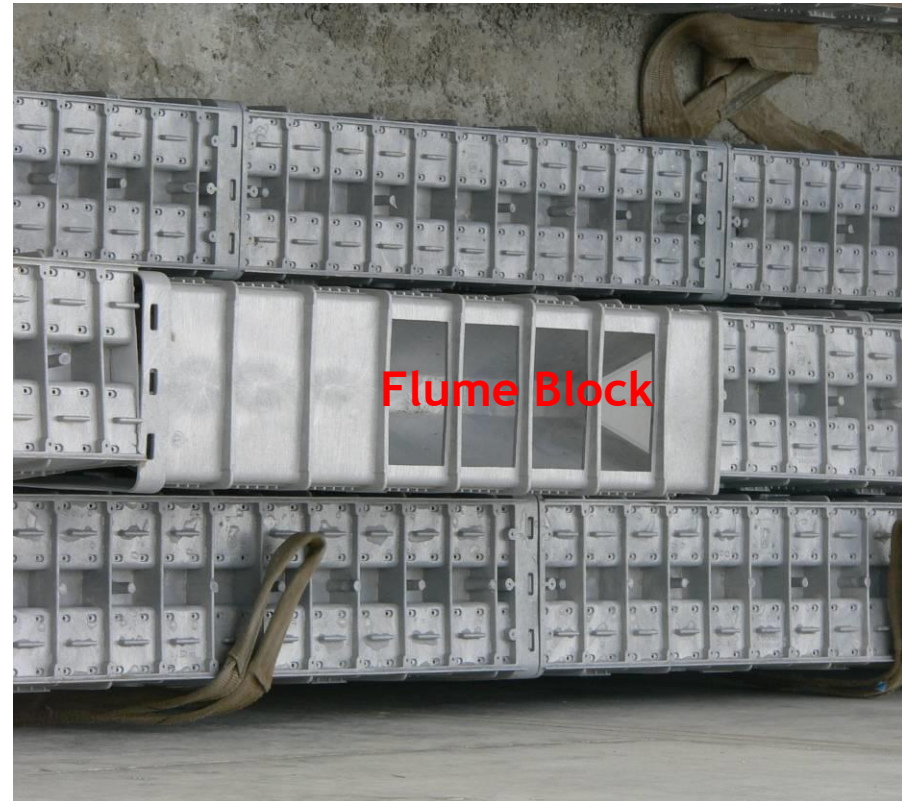
- Plant: Zeist (Holland)
- Type: STP
- Flow: 1.250m³/hr
- Loading rate: 10m/hr
- Cells: 4
- Filter cell area: 37,5m²
- Design: front flume
- Length: 12.0meter
- Width: 3,12meter
- Media: 1,8meter (coarse)
- Application:
 - TSS removal
 - Phosperus removal < 0,15mg/l



Design and installation



Design and installation



Design and installation



Design and installation



Design and installation

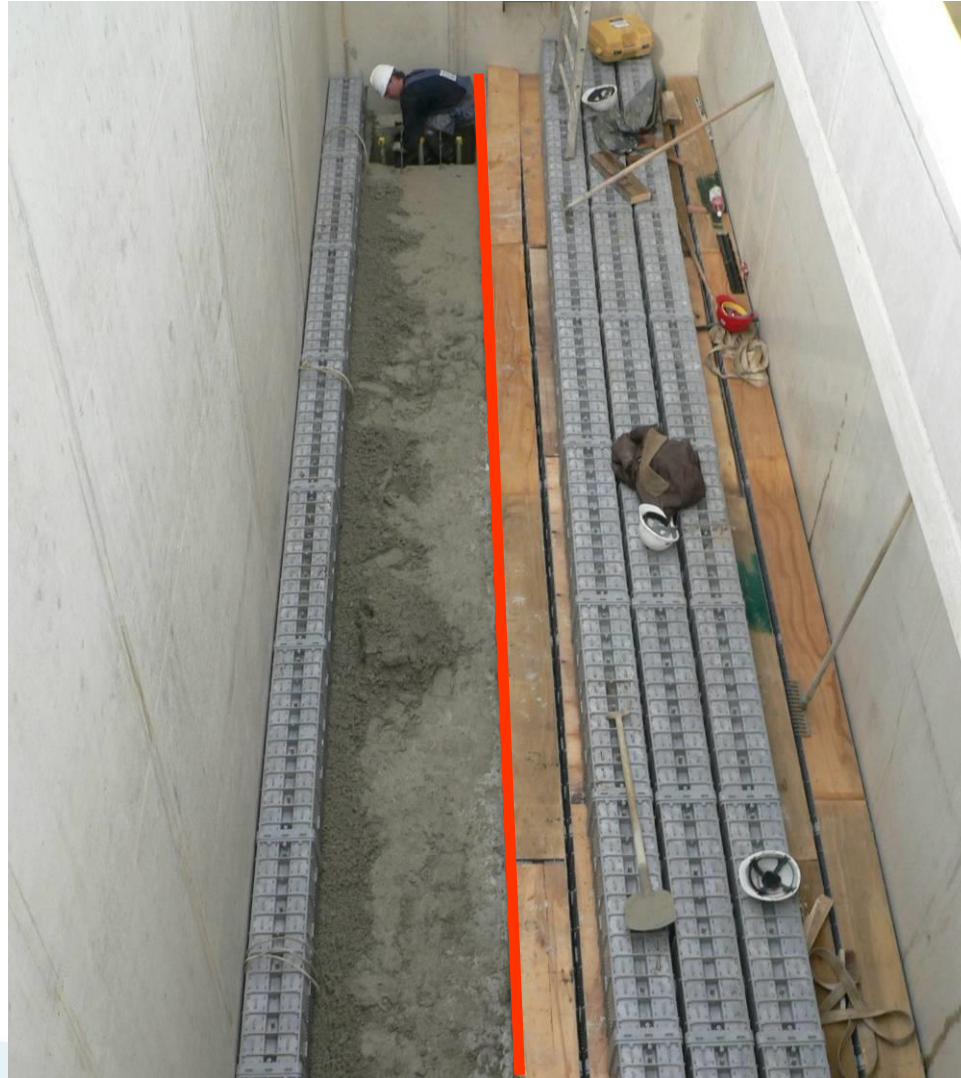
Installation of underdrains two days included grout curing (4cells)



Design and installation



Design and installation



Design and installation



Filling up underdrain spacing
0,5 hours per cell

Design and installation

Visual inspection



Design and installation

Air scour test with 100mm of water @ 90m/hr air



Design and installation

Combined air water wash @ 90m/hr air-15m/hr water



High rate backwash @20m/hr



Design and installation



Placement of support gravel

Design and installation



Design and installation



Ready for operation

Examples of projects done

Woudenberg, The Netherlands (new)



Examples of projects done

WTP Onnen, The Netherlands (rehab)



Examples of projects done

Ukmerge, Lithuania (Rehab)



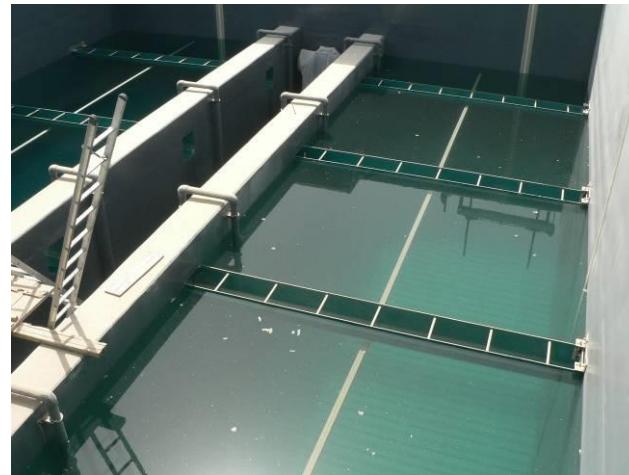
Examples of projects done

Ukmerge, Lithuania (Rehab)




Examples of projects done

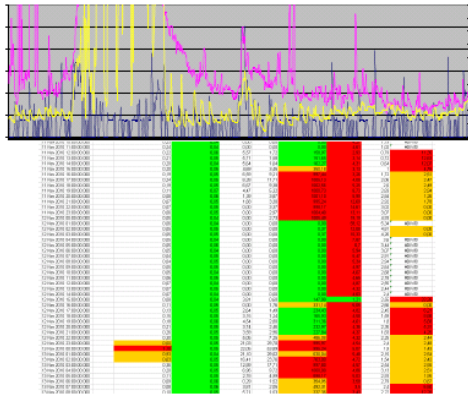
Jebel Ali, STP (New)



Examples of projects done

Bennekom effluent improvement

 ITT Water and Wastewater Leopold, Inc.	Filter Performance Evaluation	Job Number	
	Phosphorus Removal Filter Bennekom NL	REV.	01
		May 9 2011	
		Page 1 of 17	



Author: Christian van Boxtel
 Reviewer: Ivan Zhu
 Tom Getting

Table 2: Total phosphorus measurements

Day	Total P influent	Total P effluent	Total P - "DOP"	Percentage off:
2-08-2010	0.58	0.15	0.1	-50%
9-08-2010	0.42	0.14	0.09	-67%
17-08-2010	0.54	0.16	0.11	-36%
24-08-2010	0.56	0.24	0.19	21%
1-09-2010	0.98	0.14	0.09	-67%
8-09-2010	0.65	0.32	0.27	44%
16-09-2010	0.42	0.17	0.12	-25%
23-09-2010	0.30	0.15	0.1	-50%
1-10-2010	0.26	0.19	0.14	-7%
8-10-2010	0.30	0.12	0.07	-114%
11-10-2010	0.31	0.11	0.06	-150%
13-10-2010	0.25	0.13	0.08	-88%
16-10-2010	0.44	0.21	0.16	6%
18-10-2010	X	0.14	0.09	-67%
20-10-2010	X	0.16	0.11	-36%
23-10-2010	0.48	0.23	0.18	17%
28-10-2010	X	0.09	0.04	-275%
1-11-2010	0.38	0.1	0.05	-200%
2-11-2010	X	0.22	0.17	12%
4-11-2010	X	0.15	0.1	-50%
8-11-2010	0.51	0.17	0.12	-25%
16-11-2010	0.64	0.21	0.16	6%
16-12-2010	X	0.35	0.30	50%

Figure 5: MeP and influent flow shown for 15th and 16th October

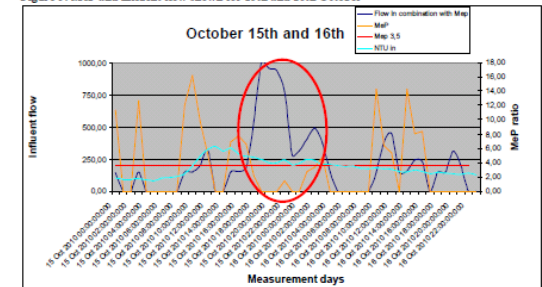
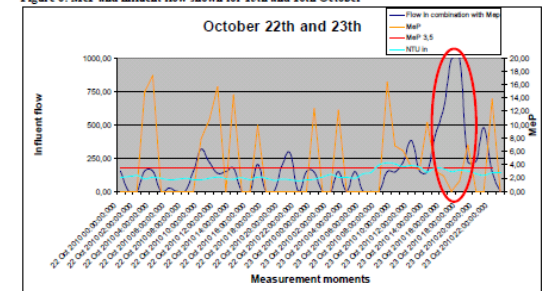


Figure 6: MeP and influent flow shown for 15th and 16th October



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Conclusion

Why to buy Leopold filtration equipment?

- **We guarantee you the best underdrain design**
 - We are the inventors of the underdrain and we help you to design the best filter for the project
 - More than 85 years of experience to support you.
- **The best equipment for filtration and backwashing**
 - Leopold HDPE underdrain blocks
 - Effective media cleaning to achieve effluent and save on backwashing
- **Reduction of cost in civil design**
 - None complex civil structure
 - Easy and effective installation
- **Install and “forget”**
 - Very low maintenance required

Thank you for your time



For questions and support
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