

16 May 2007

ROEDIGER

ROEVAC® Vacuum Sewer Systems

PP_Sewer_2007_e_International Division_Ver_2.1

ROEVAC® Vacuum Sewer Systems



Location

ISO 9001 Production Facility
in Tostedt, near Hamburg



Main Office in Hanau, near Frankfurt/Main

● Regional Offices

ROEVAC® Vacuum Sewer Systems

Bilfinger Berger Umwelttechnik GmbH, Aarbergen (D)			
Water and Wastewater Technology		Remediation of Contaminated Sites and Landfill Engineering	Vacuum Technology
Engineering & Construction	Products & Services		
Passavant-Roediger Anlagenbau GmbH, Hanau (D)	Passavant-Geiger GmbH, Aarbergen (D)	Bilfinger Berger Umweltsanierung GmbH, Essen (D)	Vacuum Sewerage Solutions GmbH, Hanau (D)
Passavant-Roediger Free Zone Establishment, Fujairah (VAE)	Umat Deponietechnik GmbH, Hanau (D) ²⁾	Bilfinger Berger Entsorgung GmbH, Mannheim (D)	Roediger Vakuum- und Haustechnik GmbH, Hanau (D)
Passavant-Roediger Enviro-tech Co., Ltd., Hangzhou (CN)	Passavant-Intech GmbH, Rimpur (D)	Bilfinger Berger Entsorgung Ost GmbH, Deutzen (D)	Airvac Inc, Rochester (USA)
Roediger (Thailand) Co., Ltd., Bangkok (THA)	Noggerath France Eurl, Saint Jean le Blanc (F)	Bilfinger Berger Entsorgung Nord GmbH, Hamburg (D)	
Passavant-Roediger Bulgaria PLC, Sofia (BG)	Passavant-Geiger Hong Kong Co. Ltd., North Point (HK)	Bilfinger Berger Entsorgung Süd GmbH, Dornach (D)	
Passavant-Roediger Romania S.R.L., Bukarest (RO)	Roediger AG, Münchenstein (CH)	Bilfinger Berger Environmental Ltd., Surrey (GB)	
Passavant-Roediger Hungaria Kft., Budapest (H)	Passavant-Roediger Aquatreat LLC, Amman (JOR) ³⁾	Bilfinger Berger Ambiente S.R.L., Verona (I)	
Passavant-Roediger Controls GmbH, Aarbergen (D)			
Passavant España S.A., Barcelona (E) ¹⁾			

ROEVAC® Vacuum Sewer Systems

Project Business Fields

ROEDIGER
VAKUUM + HAUSTECHNIK

**ROEVAC® Vacuum
Sewer Systems
OUTDOOR**



**ROEVAC® Vacuum
Sanitation Systems
INDOOR**



**Evacuation Systems
for
TRAINS / AIRPLANES**



**Decaying Plants
for
HOSPITALS**



Project Business Fields

ROEVAC® Vacuum Sewer Systems (Outdoor)

- The Alternative to Gravity Sewer Systems
- More Economic and Faster Installation than Conventional Systems
- Ideal for Municipal and Industrial Wastewaters
- Standardized Technology, as per European Standard EN 1091 , DWA-ATV 116
- Recommended by many Authorities, Consultants and Operators

ROEVAC® Vacuum Sewer Systems

Typical Applications

- Flat Terrain
- Expanded Municipalities, Residential, Touristic Industrial, Commercial Areas, Harbours, Marinas
- High Ground Water Tables
- Trenching in Rocky and Sandy Environment
- Ecologically Sensitive Areas – Ground Water



ROEVAC® Vacuum Sewer Systems



Typical Applications



ROEVAC® Vacuum Sewer Systems

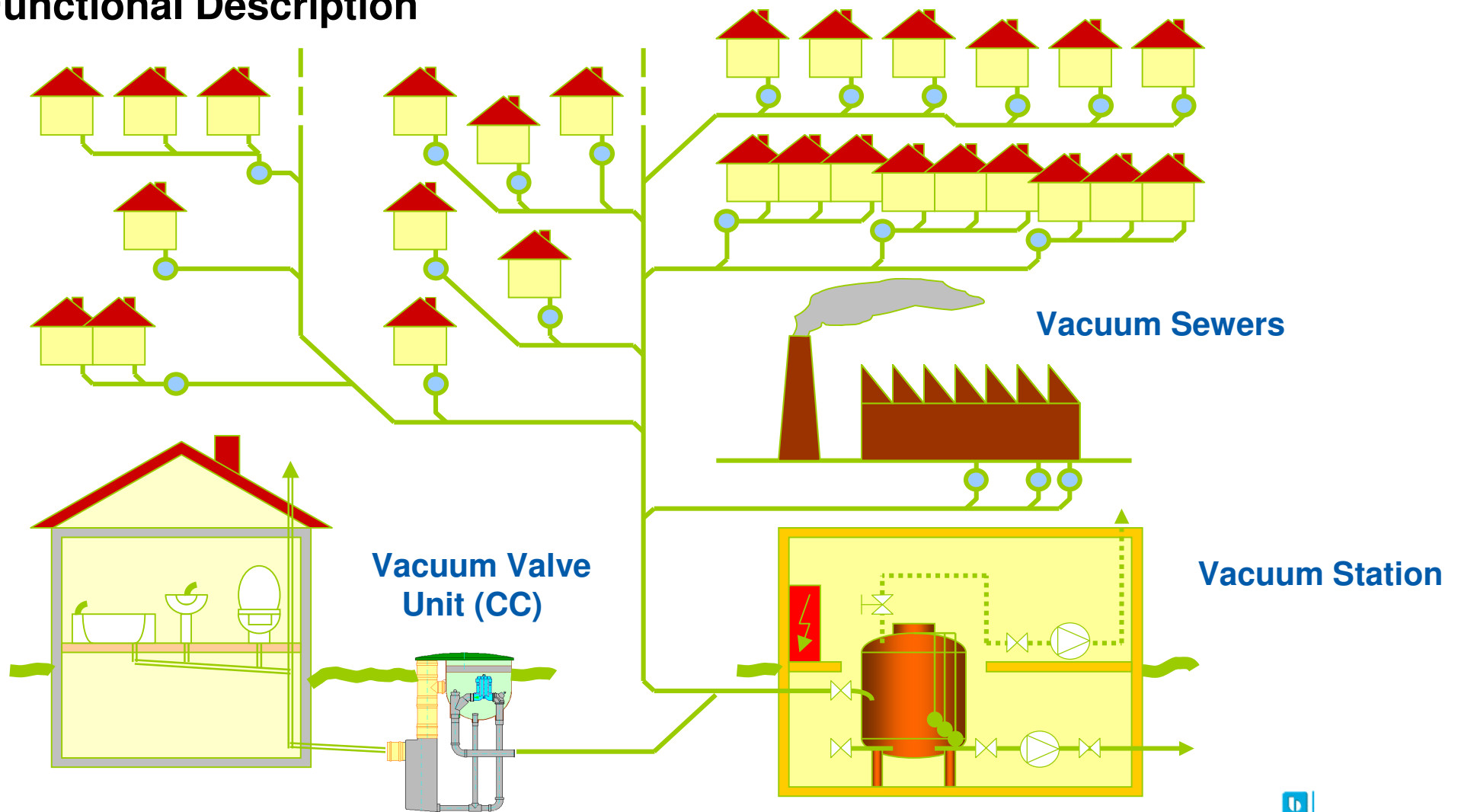


Typical Applications



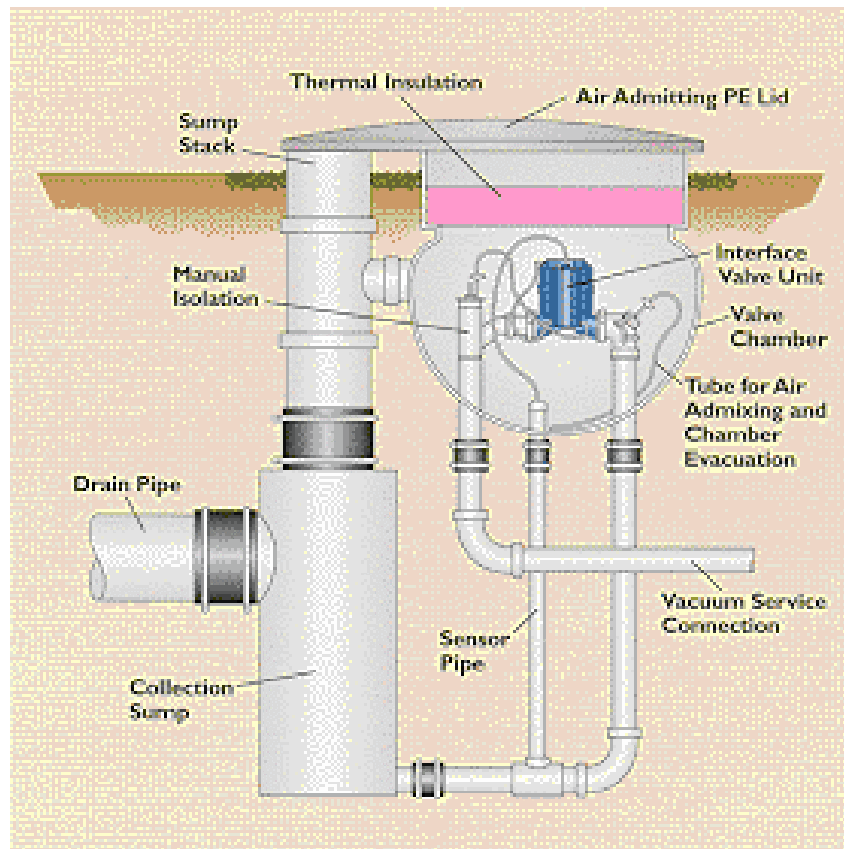
ROEVAC® Vacuum Sewer Systems

Functional Description

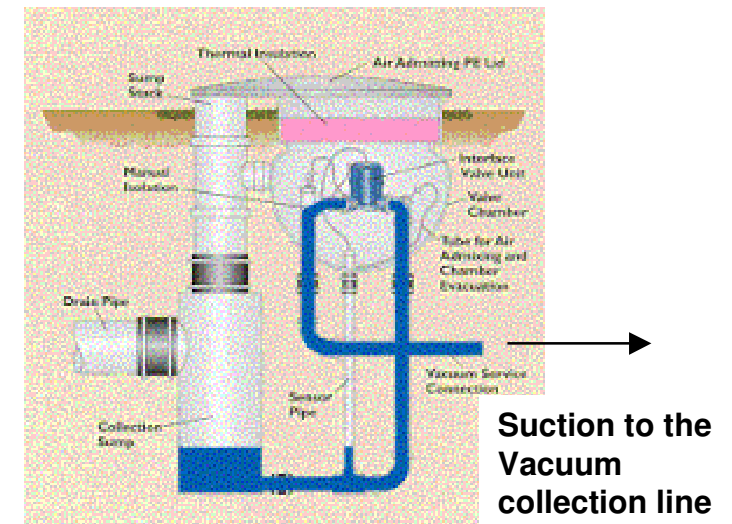


ROEVAC® Vacuum Sewer Systems

Functional Description : ROEVAC® Collection Chambers

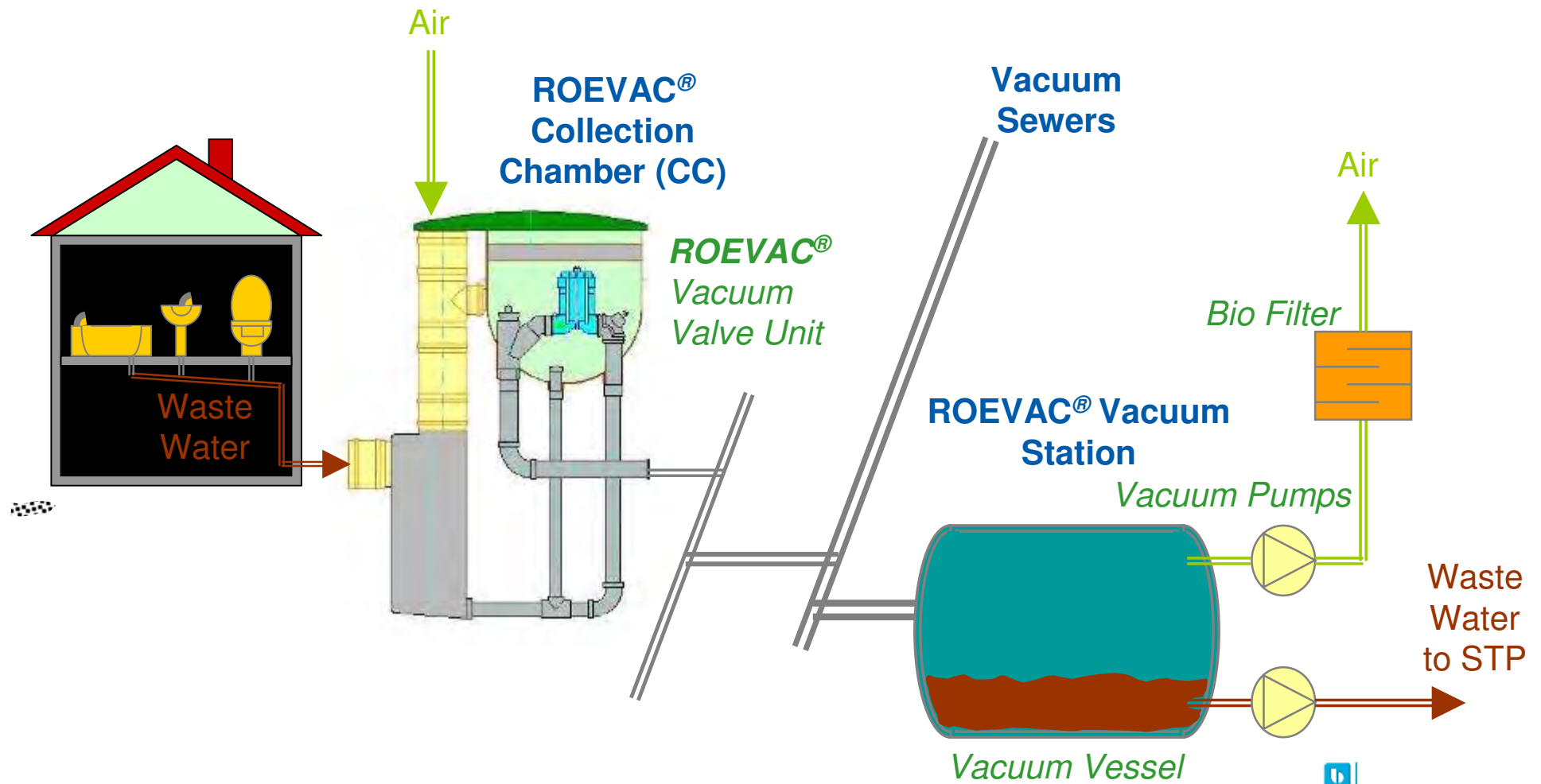


The chamber is fully emptied when the vacuum (interface) valve opens



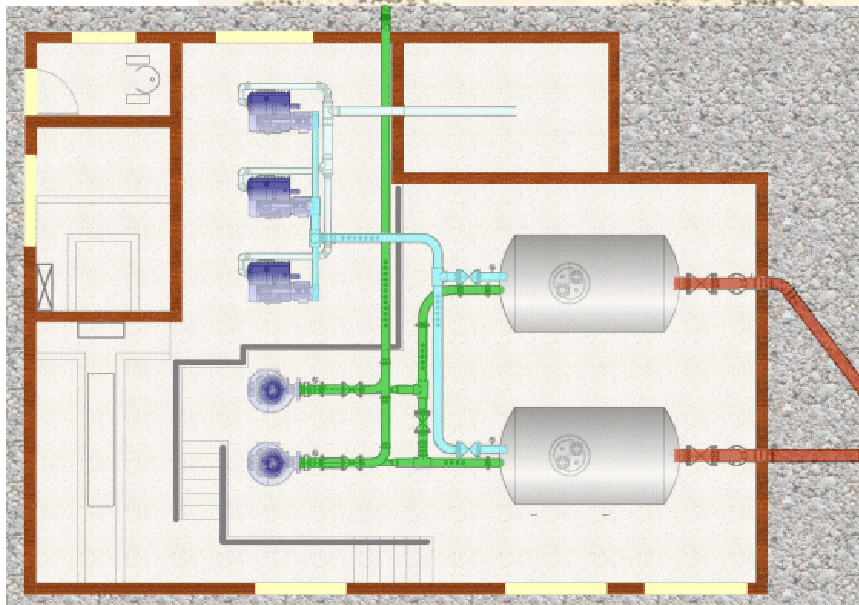
ROEVAC® Vacuum Sewer Systems

Functional Description



ROEVAC® Vacuum Sewer Systems

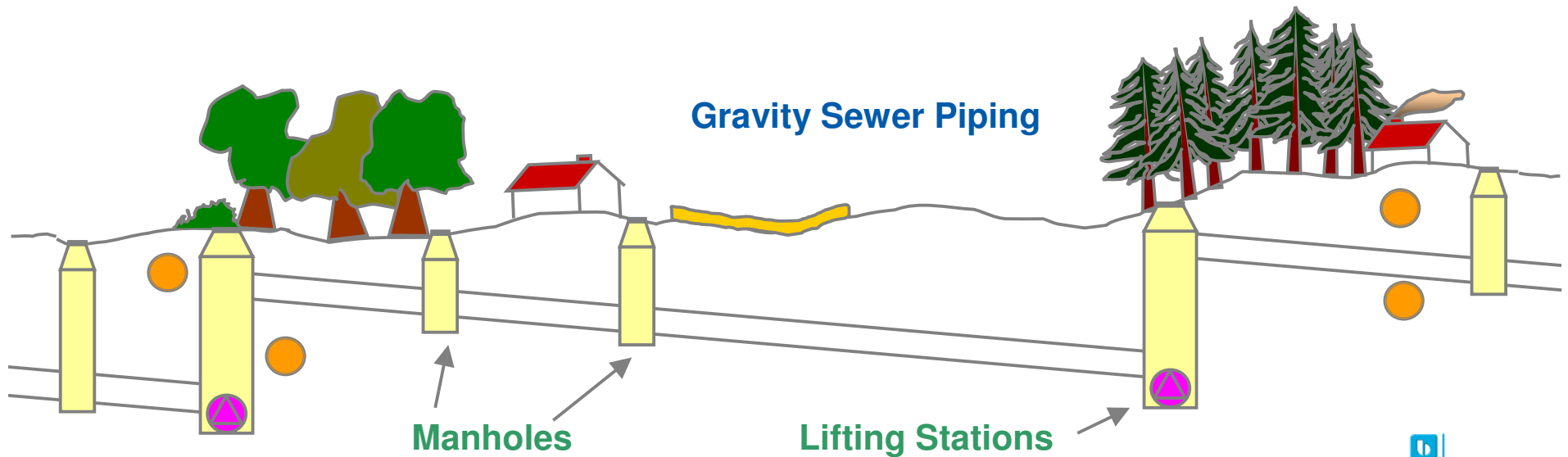
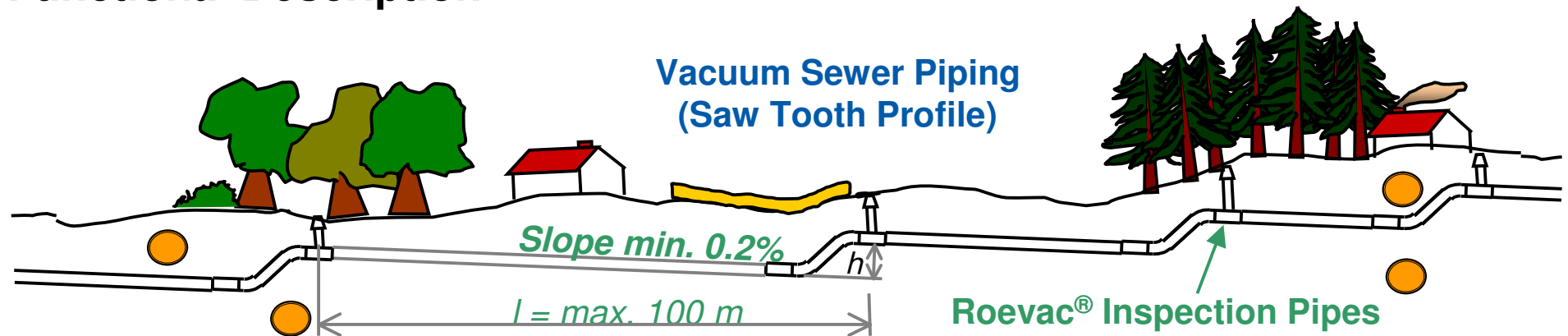
Functional Description and Wastewater Flow Diagram



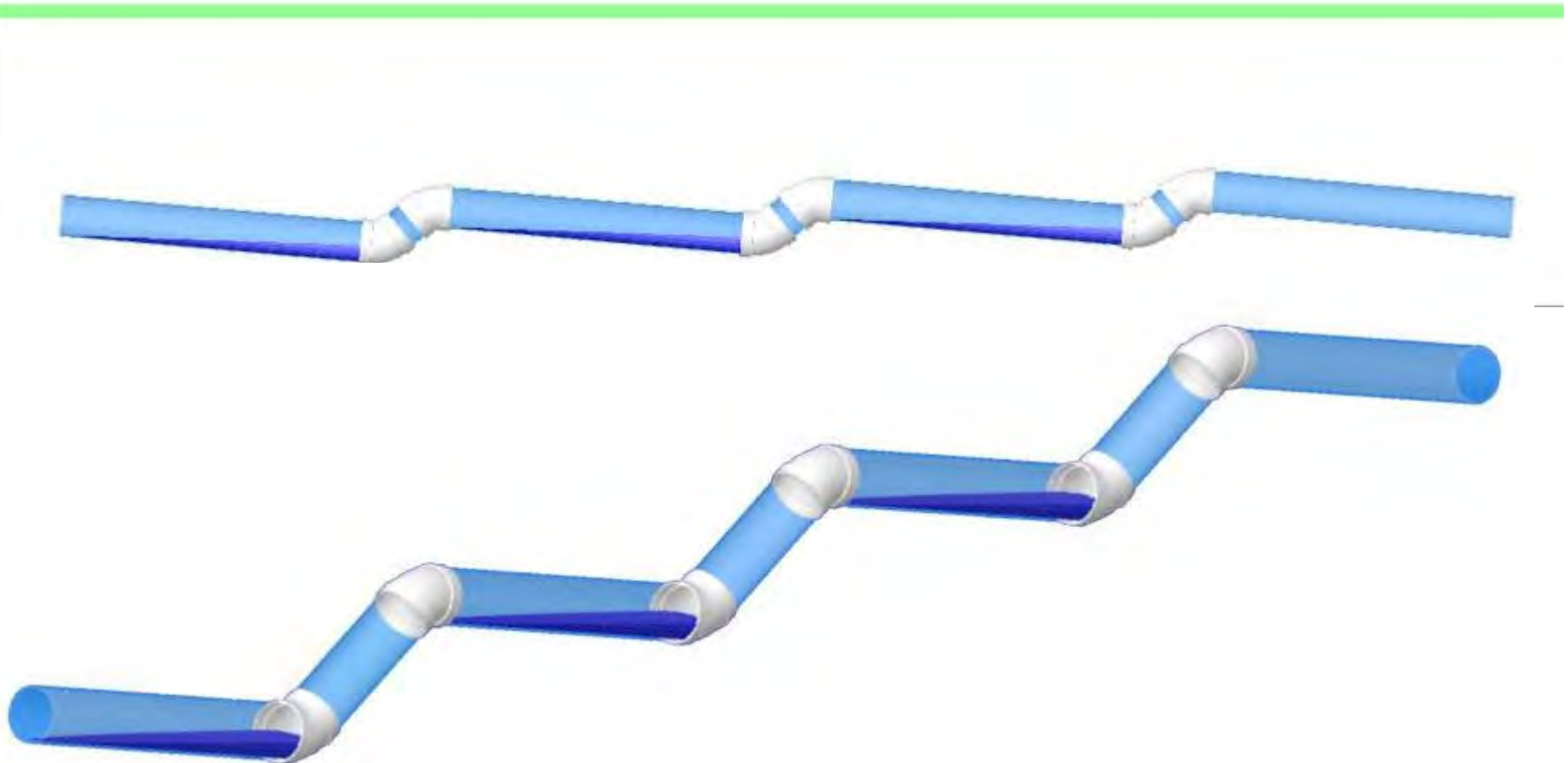
The Collection Chambers and Vacuum Collection Line

ROEVAC® Vacuum Sewer Systems

Functional Description



Functional Description – Sawtooth Profiles



ROEVAC® Vacuum Sewer Systems

Functional Description

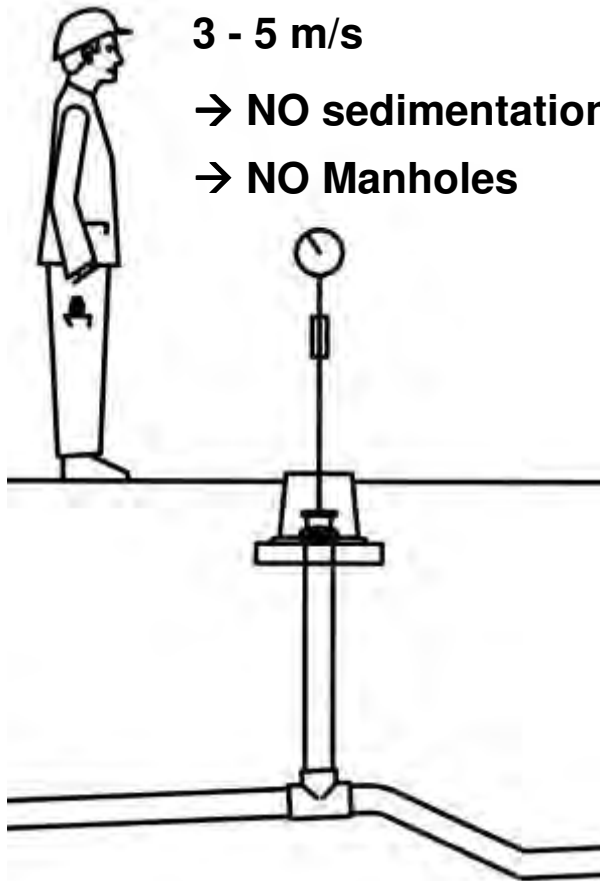


Recommended Inspection Pipes for Pressure Testing

Flow Velocities about
3 - 5 m/s

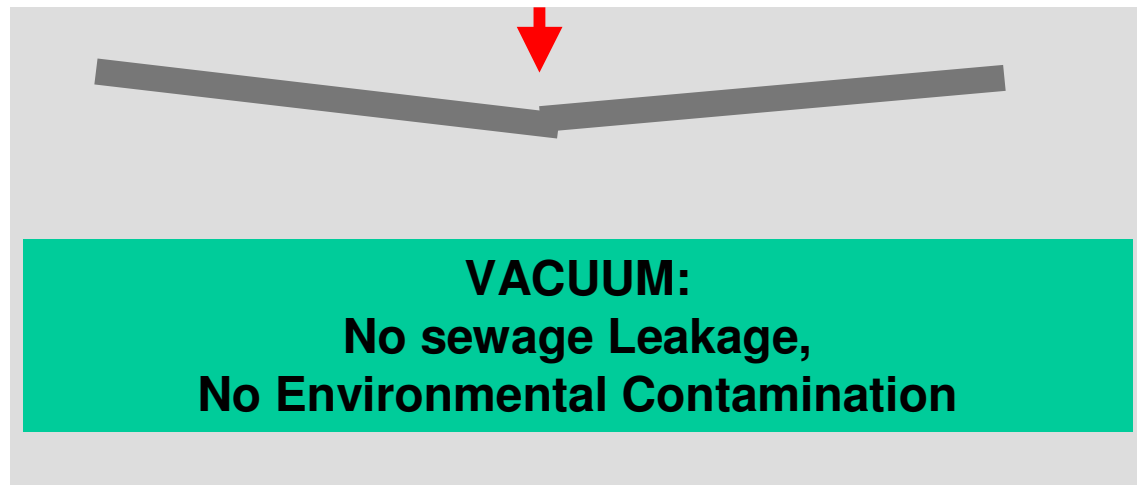
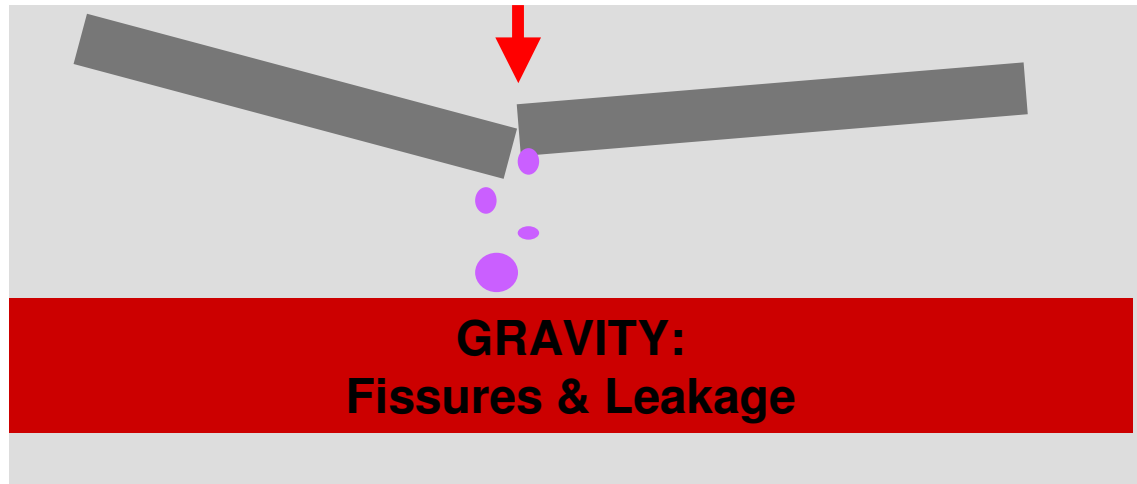
→ NO sedimentation

→ NO Manholes



ROEVAC® Vacuum Sewer Systems

Advantages



ROEVAC® system :

**Any Leakage will be identified
a priori through an extended
Pump Run Time.**

**NO Exfiltration in vacuum
systems.**

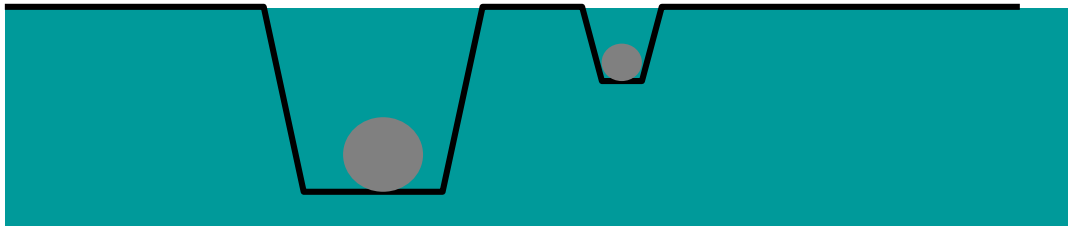
**Optional Inspection Pipes
allow for complete
supervision.**

**The Use of the ROEVAC®
Vacuum Sewer System
is recommended by many
Authorities especially for
Water Protection Areas.**

ROEVAC® Vacuum Sewer Systems

Advantages

Gravity Piping

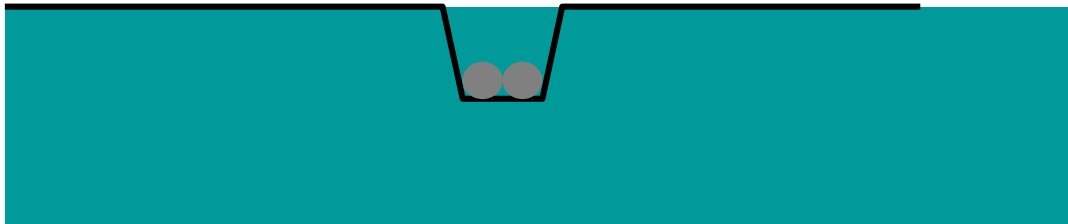


The fresh water pipeline must be installed in a separate trench and on a higher level than the sewer pipe

Fresh Water and Sewer Pipes :

The Fresh Water Pipe / Irrigation Pipe can be laid together in **ONE** trench with the Vacuum Sewer Pipe !

Vacuum Piping



It is possible and allowed to locate both the potable water pipe as well as the vacuum sewer pipe within one single trench

ROEVAC® Vacuum Sewer Systems

Advantages



**Water and
Sewer Pipes
in the same Trench :**

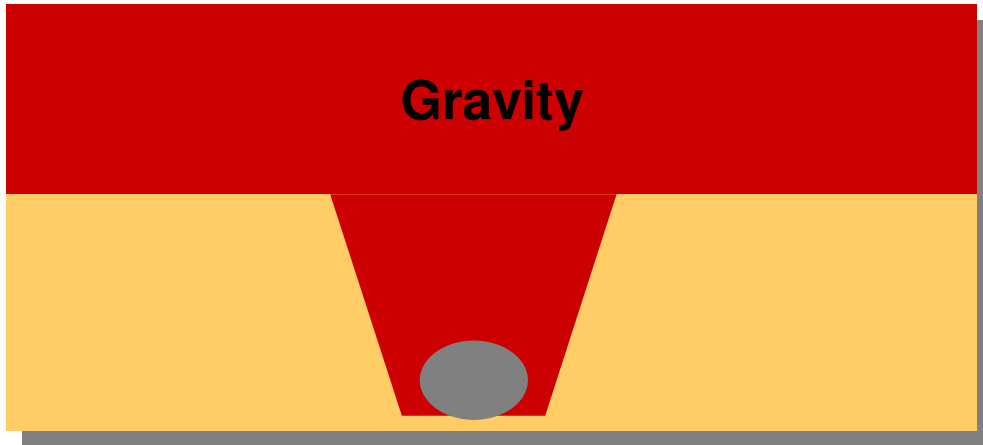
**ROEVAC® Vacuum Sewer
with Inspection Pipe
(black, small diameter, HDPE)**

Fresh Water Pipe (blue)

**Stormwater Sewer (grey,
large Diameter, concrete)**

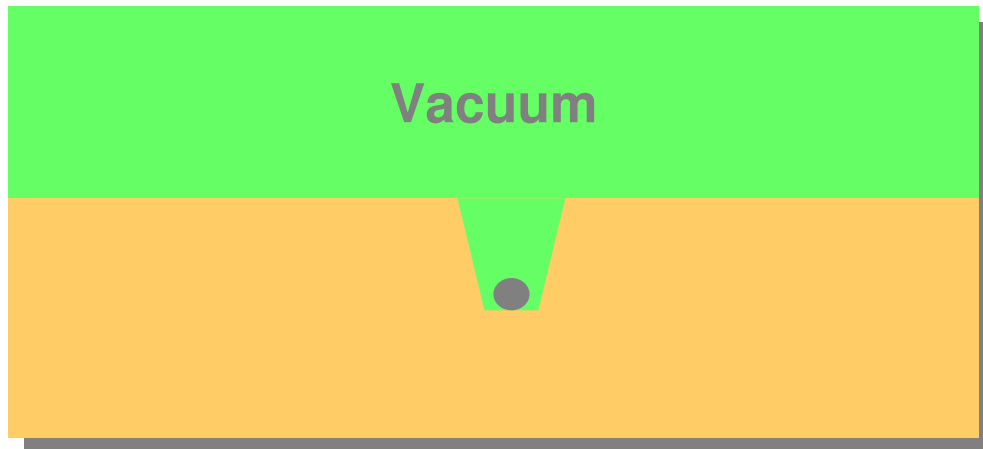
ROEVAC® Vacuum Sewer Systems

Advantages



High Costs

- deep Trenches (3 – 8 m)
- complicated Excavation
- large Pipe Diameters
- difficulties in Case of a high Ground Water Table and static Charges
- heavy Machinery required

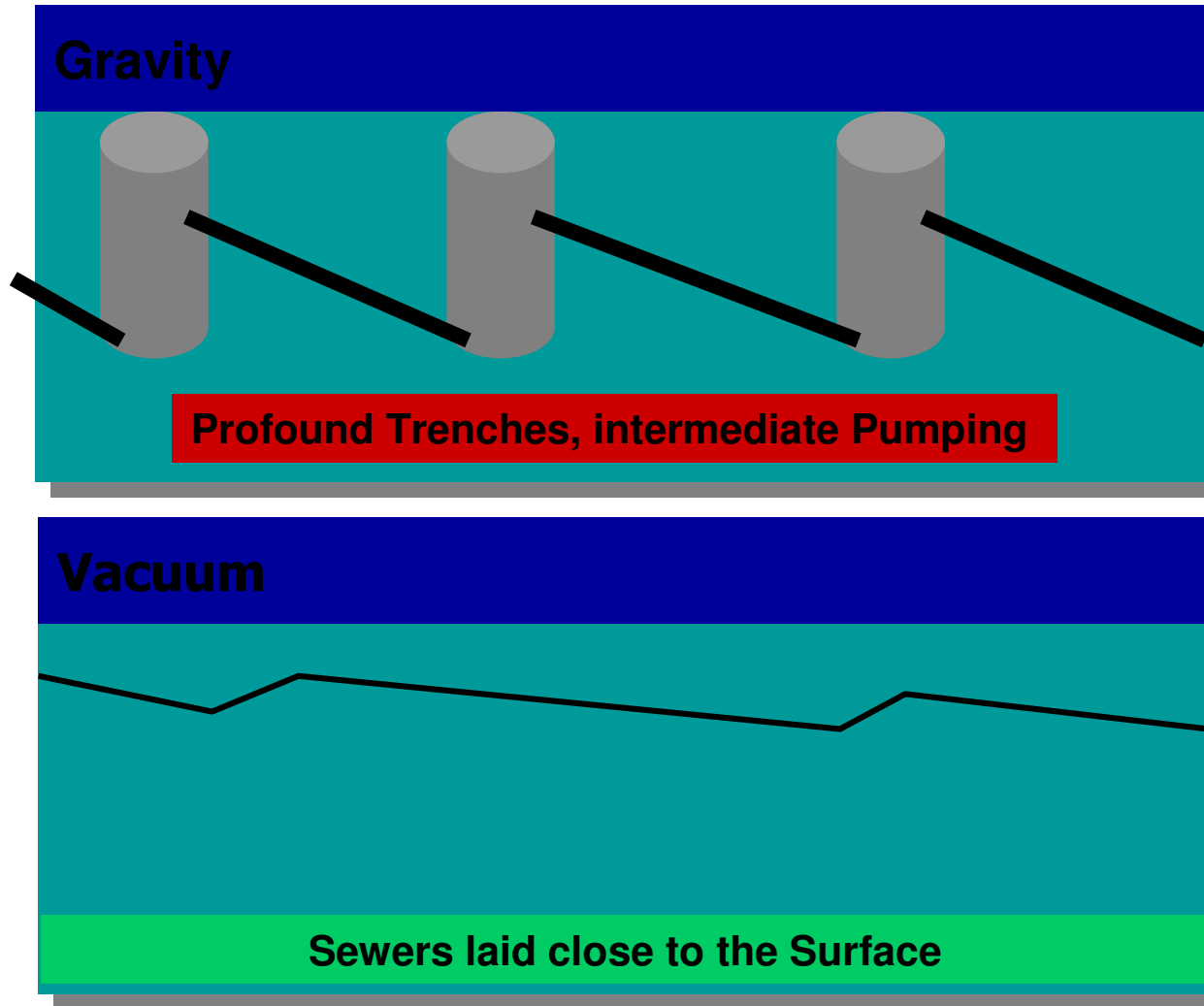


Low Costs

- narrow and shallow Trenches
- Depth of 1 - 1.2 m
- small Diameter (80 - 250 mm)
- Plastic Pipes (PE or PVC), SDR11
- simple or even no Machinery for Excavation
- fast Trenching

ROEVAC® Vacuum Sewer Systems

Advantages



ROEVAC® Vacuum System :

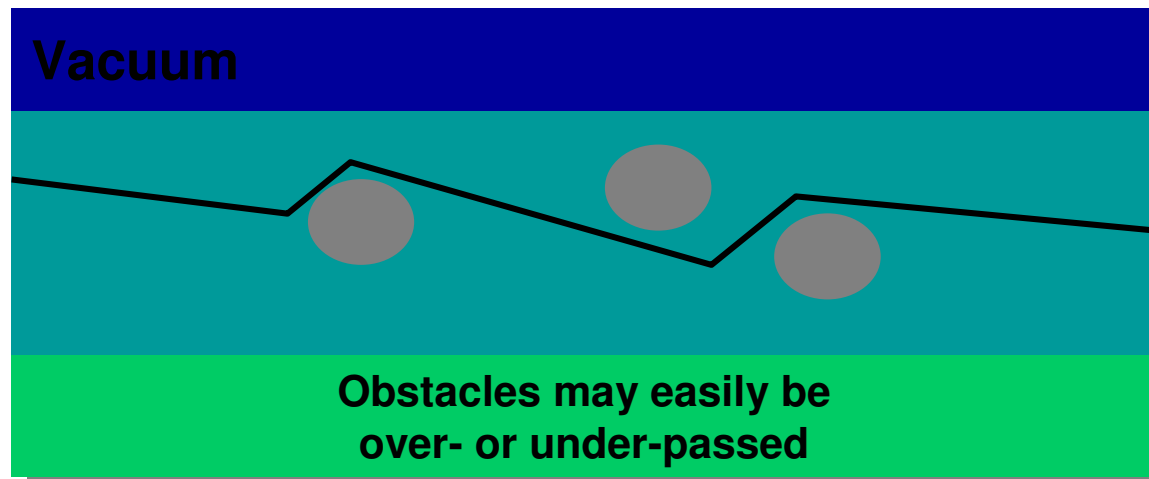
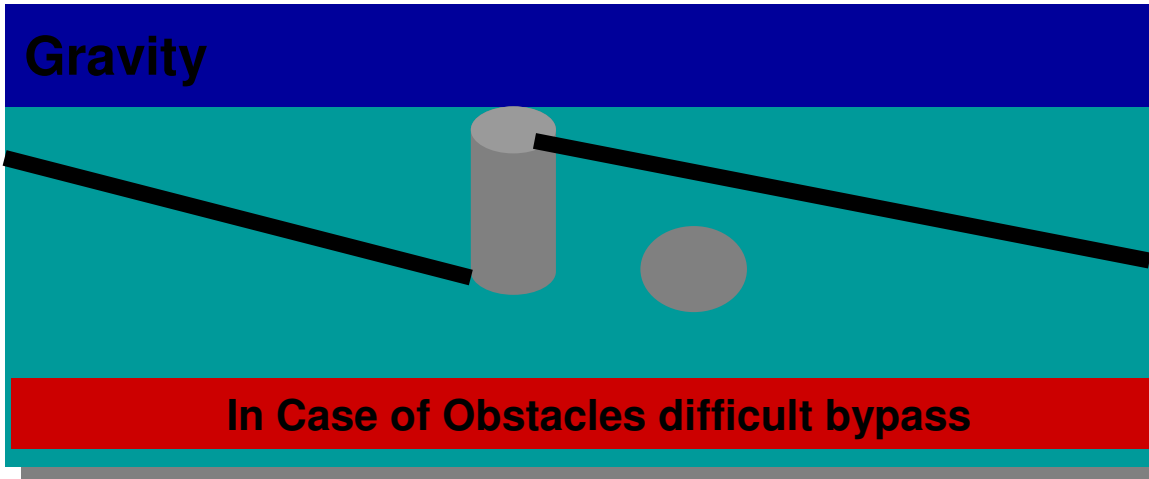
No Sedimentation
(even for fluctuating flows
in touristic areas)

No Smell / No Fouling
(less H₂S)

**No Infiltration of Ground
Water**

ROEVAC® Vacuum Sewer Systems

Advantages



ROEVAC® Vacuum System :

Even unexpected Obstacles
discovered during
Construction Works can
easily be bypassed by a
modified and more flexible
Vacuum Sewer Pipe Laying

ROEVAC® Vacuum Sewer Systems

Advantages **ROEVAC® Vacuum Sewer System : easy Excavation with shallow trenches**



Advantages

NO deep and wide trenching with heavy machinery
Photos below : difficult excavation with GRAVITY System



Advantages

NO deep excavation under rocky ground conditions



Advantages

No deep excavation in sandy or swampy grounds
Photos below : Risky **Gravity** Pipe Installation



ROEVAC® Vacuum Sewer Systems

Advantages

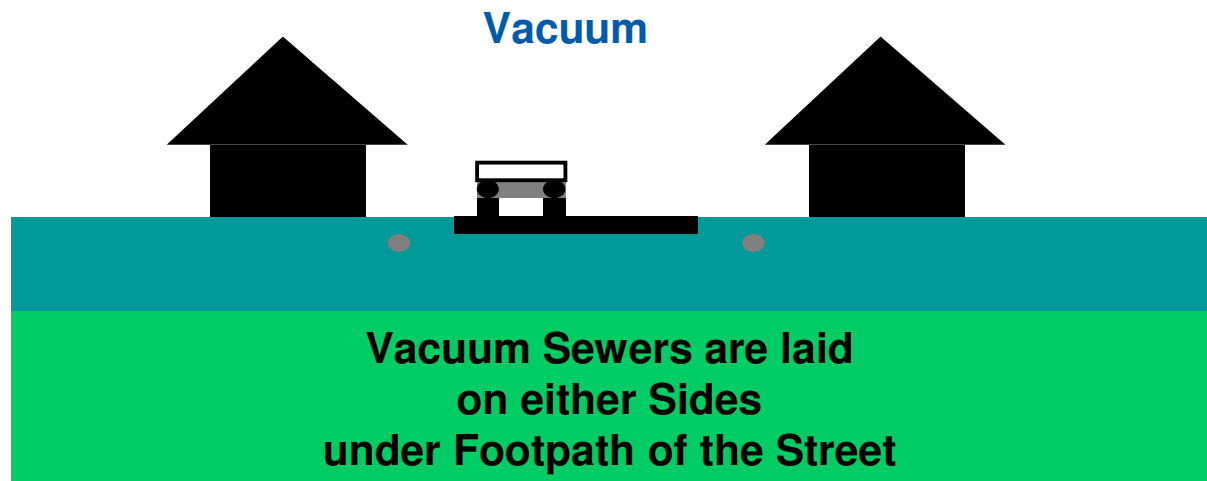
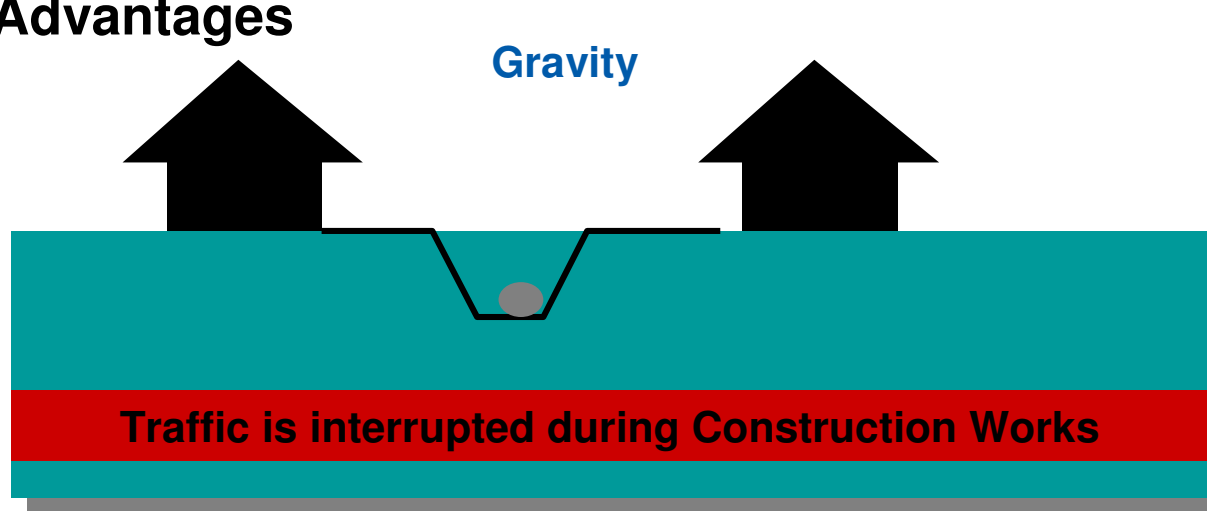
Easy and Fast Trenching for ROEVAC® Vacuum Sewers in Africa and Asia



The installation can easily be done by local contractors and pipe suppliers

ROEVAC® Vacuum Sewer Systems

Advantages

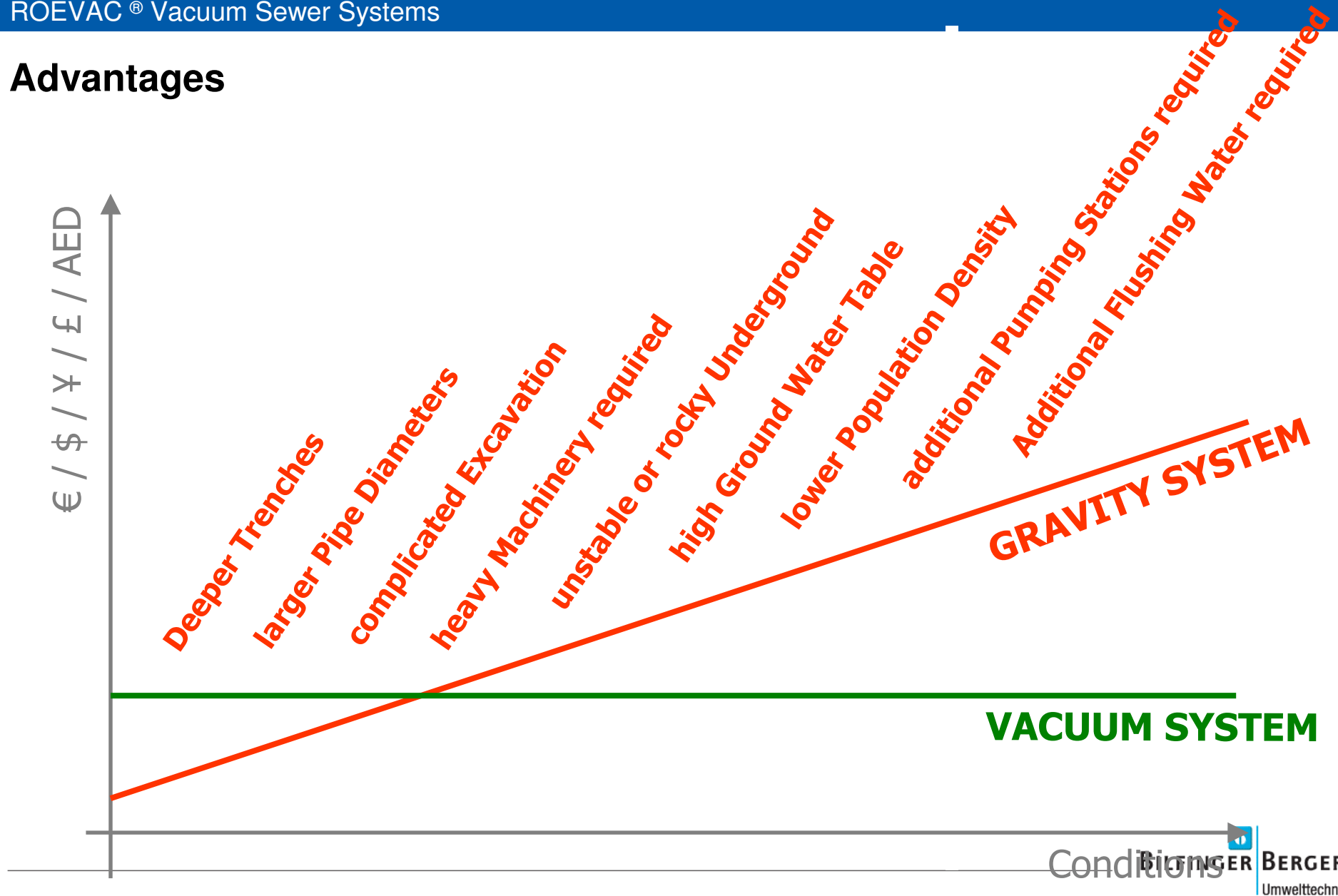


ROEVAC® Vacuum
System :

Little Impact on local
Traffic

Small Pipes and Trenches

Advantages



References

Formula 1 Speedway in Shanghai, CHINA



References

Touristic Areas along the Rhine lakes, GERMANY



2 vacuum
stations

For approx.
5000 PE
in summer

References

University Sabak Bernam, MALAYSIA



References

Residential Area in MALAYSIA

(8,000 PE)



References

Hotel Ressorts and Cottages in Langkawi, MALAYSIA



References

Storical City of Potidea, GREECE

2 ROEVAC® vacuum stations, 3500 PE



References

Olympic Sailing Centre, Athens, GREECE



**ROEVAC® Boat
Evacuation Units
for Wastewater
resp. Bilgian
Water from Ships
and from Marina
buildings**

References



Palm Island Jumeirah, Dubai



ROEVAC® Vacuum Sewer Systems

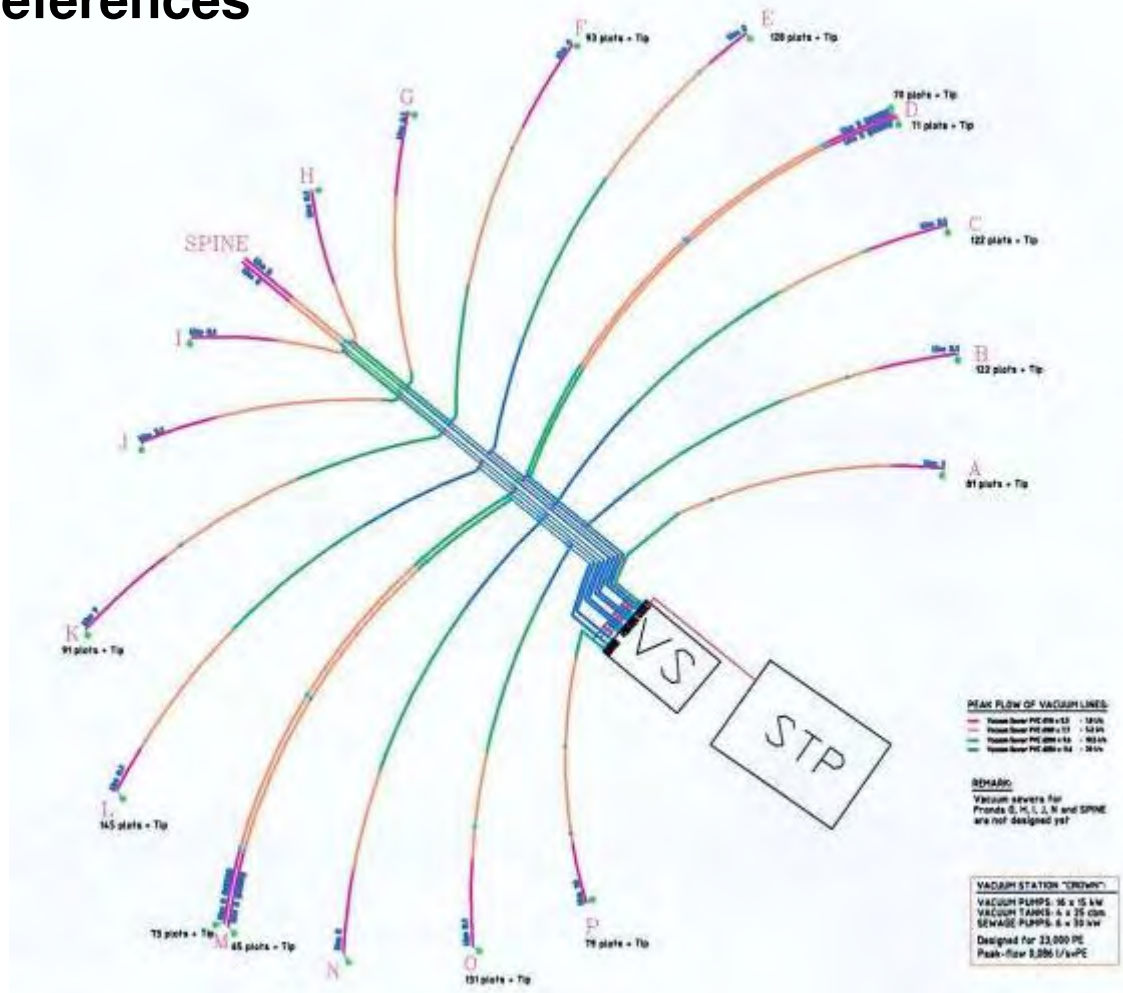
References

Palm Island Jumeirah : 2300 villas (23,000 PE), app. 40 km vacuum sewer lines, 1050 collection chambers, 1 Central ROEVAC® Vacuum Station



ROEVAC® Vacuum Sewer Systems

References



References



Palm Island Jumeirah, Dubai



References

Durrat Al Bahrain, 400 x G75 Chambers, 3 Vacuum Stations



References

**Occidental Mukhaizna, OMAN
Oilfield Labour Camp**

130 x G75 Chambers, 1 Vacuum Station



References

MOROCCO: sites under construction

Port De Saidia Marina with Restaurants and Bungalows



Vacuum Stations

Different Buildings for the Vacuum Station



Vacuum Stations

Tailored (left) and Compact (right) Vacuum Stations



ROEVAC® Vacuum Sewer Systems

Vacuum Stations

Small Vacuum Station Building with vertically installed buried Vacuum Tanks, Bio-Filter and Collection Chamber



Vacuum Stations



Vacuum Vessels with Reserve Volumes



Vacuum Stations

Wastewater Discharge Pumps



ROEVAC® Vacuum Sewer Systems

Vacuum Stations

Air Suction with Duty and Standby Vacuum Pumps (here 15 KW)



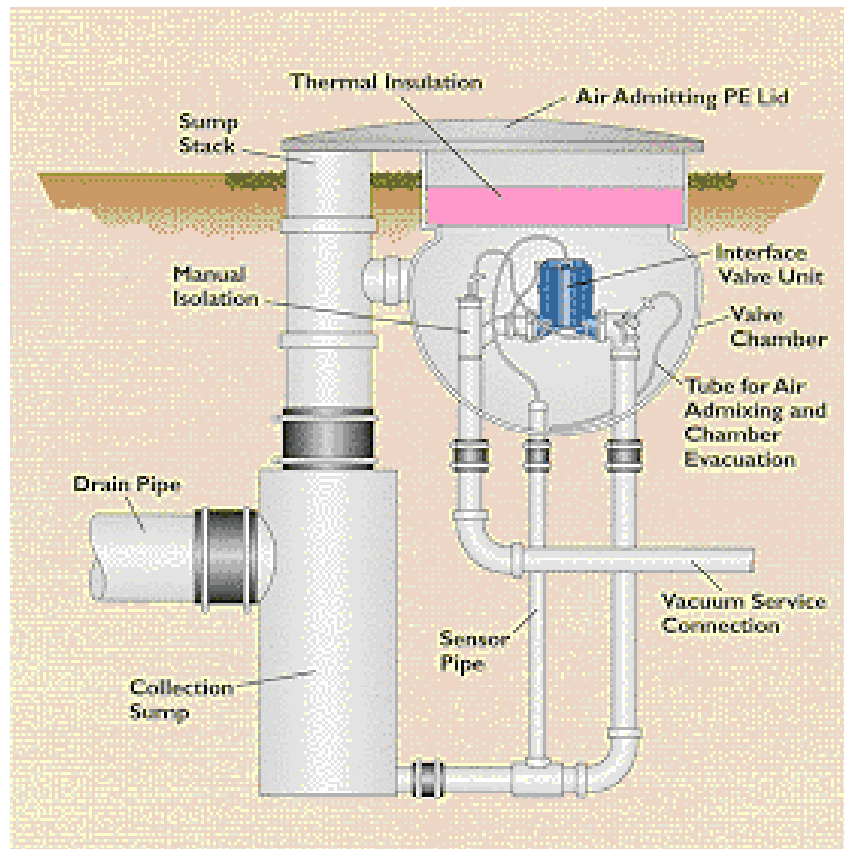
Vacuum Stations

Optional Biofiltre for the Suction Air with Bark Refill

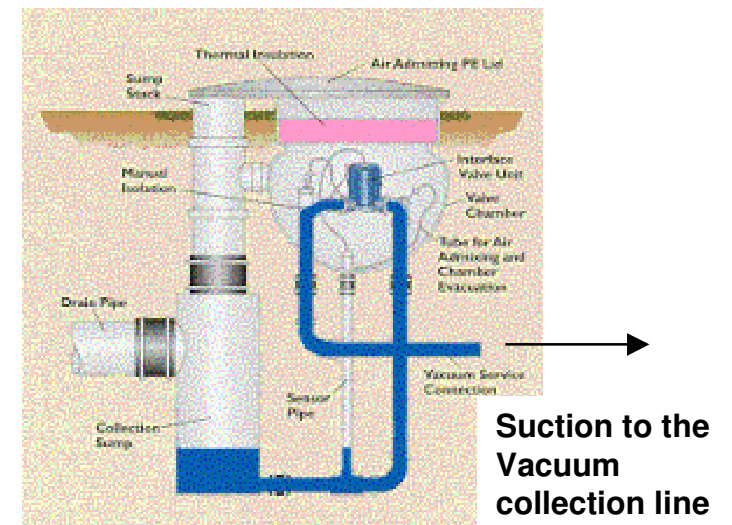


ROEVAC® Vacuum Sewer Systems

ROEVAC® Collection Chambers



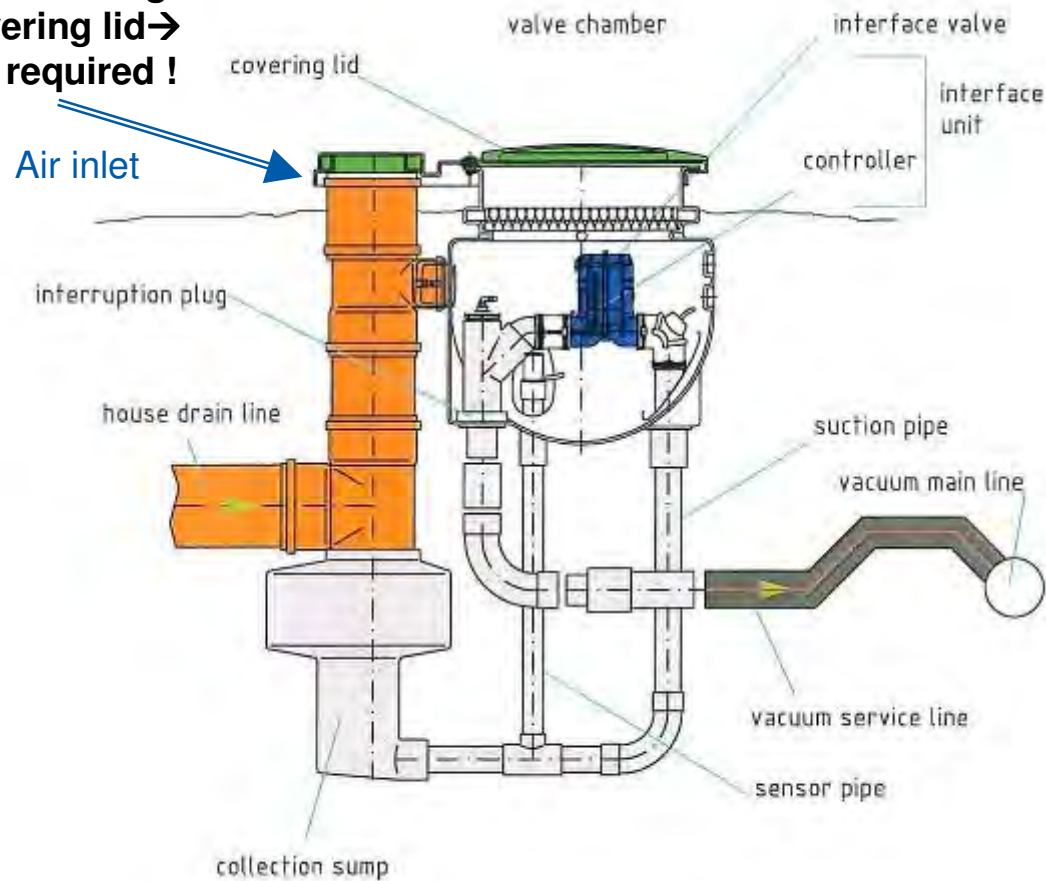
The chamber is fully emptied when the vacuum (interface) valve opens



ROEVAC® Vacuum Sewer Systems

ROEVAC® Collection Chamber, Type „G“ 65 (passable)

**Chamber Ventilation through
the (passable) covering lid→
no extra vent pipe required !**



ROEVAC® Collection Chambers, type „G“ : Advantages 1/4

Collection chamber body:

- **Body of collection chamber is made of PE**
Durable, water-tight, light weight, easy-to install
- **Vacuum valve unit is completely separated from the wastewater collection sump**
No flooding of controller and valve monitoring unit, the vacuum valve unit remains always clean and hygienic
- **Flexible installation depths**
Easy adjusting depending on gravity inlet and for installation on site
- **Self-cleaning sensor pipe, due to installation perpendicular to suction pipe !**
→ no fat-clogging
- **Patented**

ROEVAC® Collection Chambers, type „G“ : Advantages 2/4



Collection chamber body:

- Aimed “Bottle-neck” construction
Limitation of the size of sucked solid pieces;
simply cleaning of the sump and collection
chamber with cleaning lance (bypass) and
without getting “dirty hands”
- Each chamber/valve can be isolated from the
main line, by inserting a handy interruption
plug

ROEVAC® Collection Chambers, type „G“ : Advantages 3/4

Vacuum valve and Controller unit:

- Membrane Valve with no sensitive piston (could clog with sand, due to direct contact with wastewater)
- Valve opening not until -0.22 bar
(European Norm: “opening limit -0.15 bar or higher)
Prevention of flooding of the lines
- Complete opening of the vacuum valve as well as in the vacuum low range
(Situation: valve always fully open or fully closed – never half open !)
- In low range vacuum (-0.3 bar) the controller unit opens earlier (lower sensor pressure needed)
Fewer amount of sucked waste water
→ optimized recovery of the vacuum collection lines, e.g. highest system performance due to optimized Air-Liquid-Ratio

In high range vacuum (-0.6 bar) the controller unit opens later
→ minimized air suction, e.g. minimized energy costs !

ROEVAC® Collection Chambers, 65 (2.5“) Vacuum Valve : Advantages 4/4

2.5” (65) ROEDIGER Standard Vacuum Valve unit, Membrane Type :

- Smart dimensions and clear design with few pieces
- No clogging
- Simple and tough construction
- Easy maintenance
Exchange only of the membrane, very simple (time for exchange: app. 3-5 min)



Simple valve opening tools

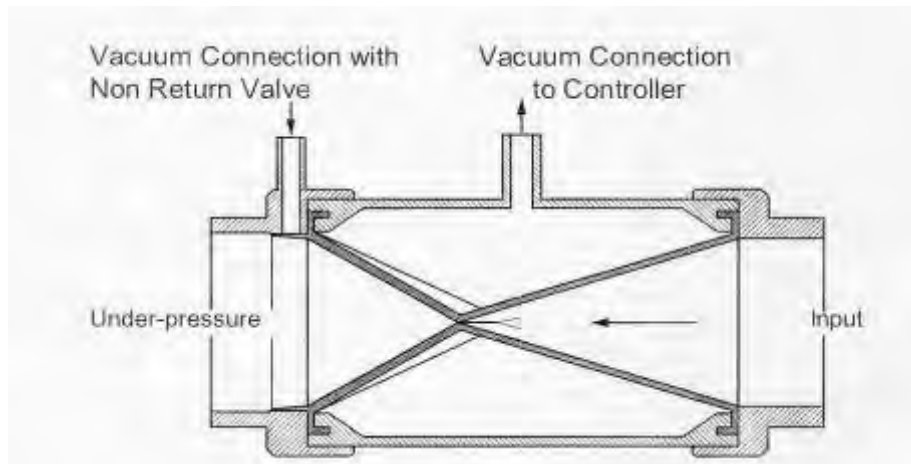


ROEVAC® Vacuum Sewer Systems

ROEVAC® Collection Chambers, 75 (3“) Vacuum Valve

The 3“ (75) Roediger Vacuum Valve unit,
Pinch type :

For special applications on demand



ROEVAC® Collection Chambers

Passable, Heavy-duty and Floodable Version



ROEVAC® Collection Chambers

Installations in France and Spain



ROEVAC® Vacuum Sewer Systems

ROEVAC® Project Support with International Partners

Examples :

Southern Africa



South East Asia



Summary of Advantages

- **Closed System – no Leakage, no Odour**
- **Only one central Vacuum Station – no further Lifting Stations required**
- **No Blockage – No Flushing (Water Saving effect)**
- **No Clogging due to high Velocity in the Sewer Pipes**
- **Flexible System**
- **No electrical Connection except at the Vacuum Station**
- **Small Diameter Pipes (DN 80 to DN 250); HDPE or PVC SDR11 (PN10)**
- **Shallow, fast and easy Trenching**

ROEVAC® Vacuum Sewer Systems

Summary of Advantages

- **No Manholes required – no possibility of throwing rubbish into the sewer**
- **No Flushing Tanks required – Significant Water Saving**
- **Reduction in Maintenance & Operating Equipment Infrastructure**
- **No Ground Water Pollution – No Exfiltration**
- **No Storm / less Ground Water Infiltration**
- **Smaller Sewage Treatment Plants possible**
- **Low Maintenance Works to be done**



Project – specific Design Support

- **Feasibility Studies**
- **Cost Estimations**
- **Hydraulic and Hydro–Pneumatic Calculations**
- **Technical Support, Analysis of critical Situations**
- **Arrangement of Longitudinal Piping–Profiles**
- **Design of Vacuum Station**
- **Delivery of Drawings and Documentation, Installation and Commissioning of Vacuum Systems**
- **Construction Field Training and Service**
- **Maintenance Support / Training / Optimization and After Sales**
- **Marketing Support with over 400 Reference Sites worldwide**

Further ROEVAC® Systems : Airplane Evacuation Devices



**Evacuation Pits for
flexible and
optimized Airport
Management**



Further ROEVAC® Systems : Evacuation Devices for Trains

Drop-Free and Fast Evacuation



Further ROEVAC® Systems : Decaying Plants for Hospitals



**Minimization of
Decaying Vessels
when using
Vacuum Toilets for
Radioactive Urine**



ROEVAC® Vacuum Sewer Systems

Further ROEVAC® Systems : Vacuum Sanitation Systems (INDOOR)

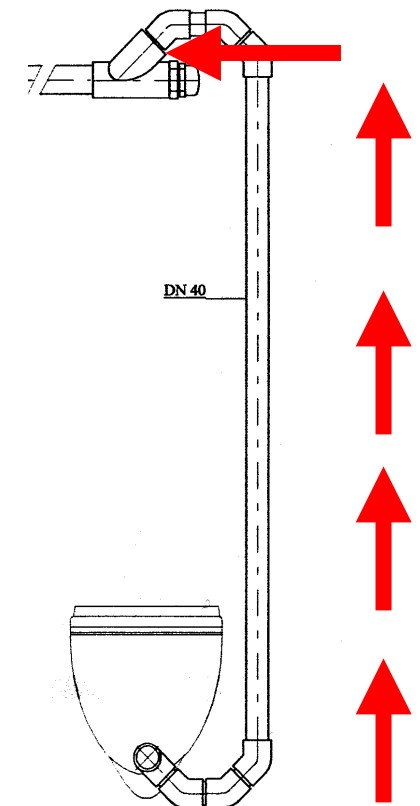
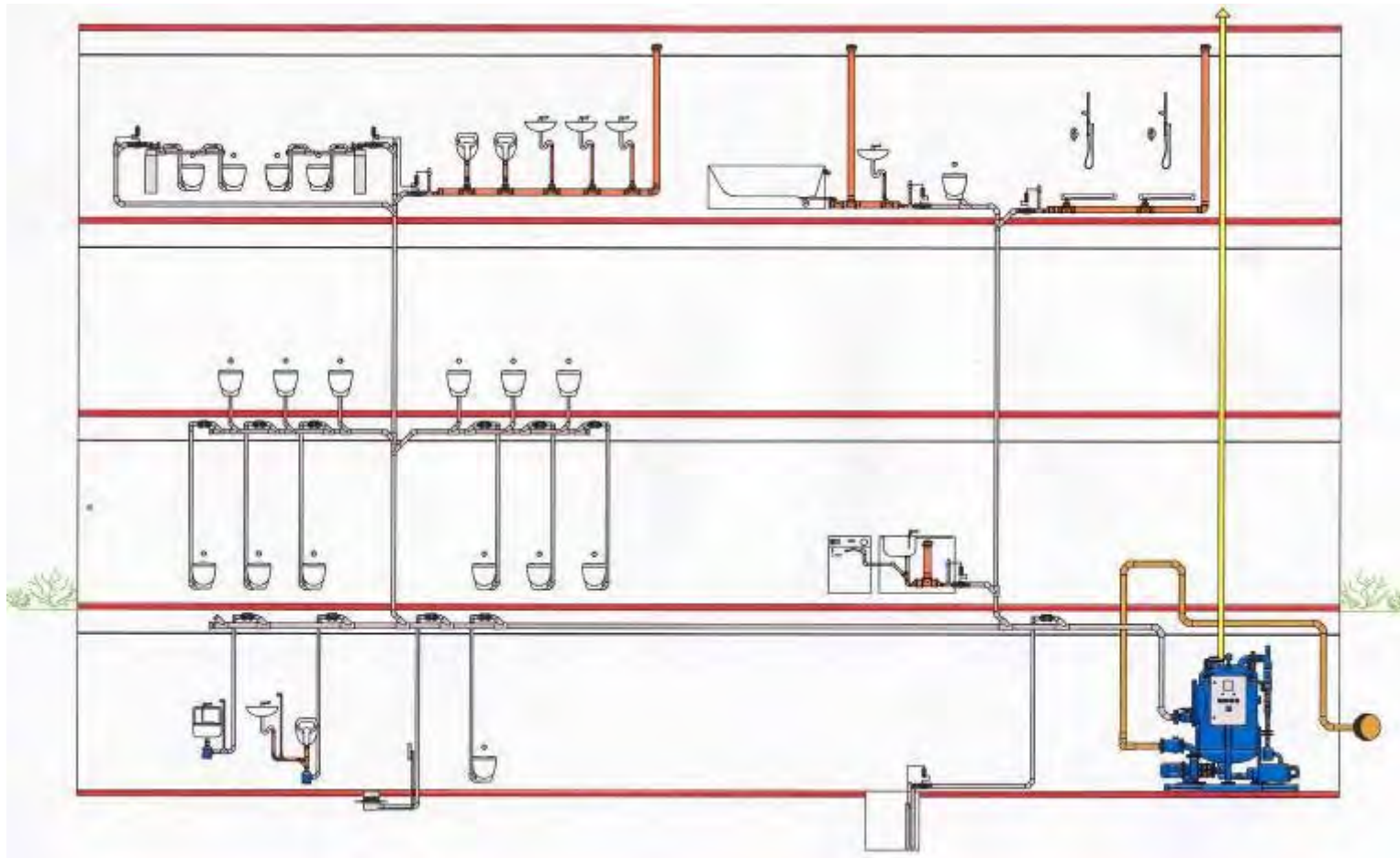
The ROEVAC® Vacuum Toilets flush efficiently with just 1 (!) litre of water



ROEVAC® Vacuum Sewer Systems

Further ROEVAC® Systems : Vacuum Sanitation Systems (INDOOR)

Flexible Indoor Pipings with small diameters for Complex Buildings

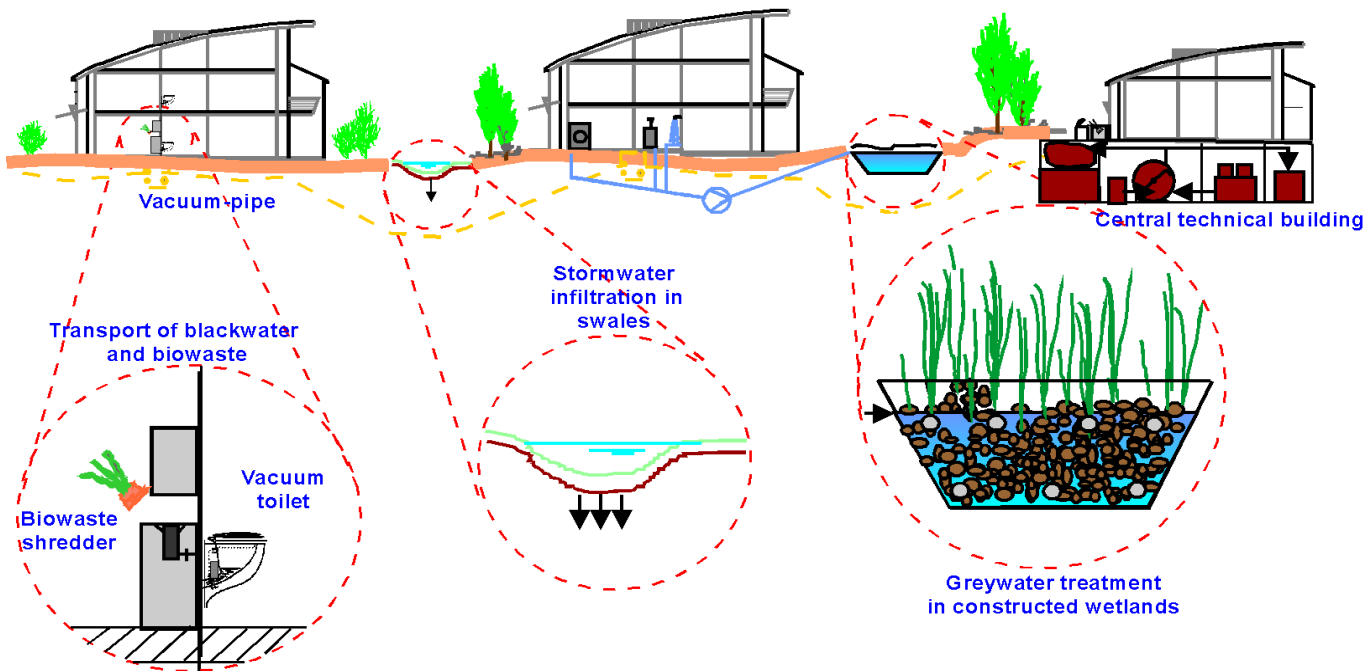


ROEVAC® Vacuum Sewer Systems

Further ROEVAC® Systems : ECOSAN (decentralized Solutions)

Vacuum Toilets are the key technology for great Water Savings.

Thus decentralized collection of Concentrated Brownwater becomes possible and provides the possibility to install Anaerobic Treatment with Biogas reactors (Ecological Sanitation = ECOSAN).



16 May 2007

ROEDIGER

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Thank you for the attention !