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"For Detail Design"

HES Hartel Tank Terminal

FUNCTIONAL DESCRIPTION SEWER SYSTEMS

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1	Block Diagram Sewer	67620-D-1416-1100-310	4
2	Aanvraag Waterwet	I&BBE4185-1010102R001F02	
3	Beschikking Ontwerp watervergunning van HES Hartel Tank Terminal B.V. voor het brengen van stoffen in de Mississippihaven	Zaaknummer: RWSZ2017-00009677.	17 mei 2018

1 Introduction

HES International B.V. intends to construct a new tank terminal at the Hartel Canal. The project will be further indicated as HHTT (HES Hartel Tank Terminal) Project. The scope of the project is based on the Statement of Requirements of the client and consists of the Engineering Procurement Construction and Commissioning of a fit for purpose marine terminal for liquid bulk petroleum products.

The project scope consists basically of: several tank pits for the storage, handling and blending of clean petroleum products including tanks, pumps, manifolds, valves, jetty lines and marine loading arms, additive delivery and unloading, utilities and the necessary facilities / installations/ infrastructure.

This document sets out the functional description of the several sewer systems required at the Terminal.

2 Starting Points

For the HHTT project, a permit application for water act has been drafted and submitted by HES. Report number: I&BBE4185-101-102R001F02 Rev 02 dd. 14 June 2017. This permit application indicates the starting points of the various sewers.
The concept permit Water Act has been received, "Ontwerp Beschikking watervergunning, RWSZ2017-00009677 dd. 17 mei 2018"

Due to design development the sewer philosophy has changed in respect to the Permit Application. In this Functional Description the sewer philosophy and basic design will be laid down.
The starting point is that the amended sewerage philosophy relates to an environmental neutral amendment to the Permit.

Based on this Functional Description a Block Diagram has been generated for the Block Diagram see document 67620-D-1416-1100-310.

The hydraulic design of the sewer system is based on the calculation method according to the Urban Water Knowledge Bank (Kennisbank Stedelijk water/RioNed). A non-static design shower T10 is simulated in the calculation, statically this shower occurs once every 10 years. The rain intensity is 35,7 mm/h with a peak of 6,3 mm/5 min.

The intermediate storage capacity is based on a rainfall of 71,2 mm in two days according to the STOWA publication "Actualisatie meteogegevens voor waterbeheer 2015"

The following sewer systems are foreseen:
HWA - Clean rain water sewer, discharge directly to public water
VWA - Foul (Light oily polluted) water sewer, runs through an OBAS (oil separation unit) for treatment and is afterwards discharged to public water
WW - Waste water sewer collects polluted water which is not suitable for treatment in a OBS and runs to the RWB pit.
SW - Sanitary sewer from office buildings routed to the public sewer (existing sewer system), no new connections are foreseen to the public sewer system.
RWB - Rainwater Basin

The principle is that clean rainwater is immediately discharged via the HWA sewage to the surface water. For water with light oil pollution, the rainwater is discharged to an OBAS via the VWA sewer.

Rain water in areas where contamination with soluble components may occur will be collected in a buffer system. Before disposal to the OBAS the water quality shall be tested (Cuvette test) to ensure that there are no soluble components present in the water to be discharged. If soluble components are encountered the effluent will be trucked to an external processer.

The discharge points to the surface water are laid down in the quay design of Port of Rotterdam and consist of a discharge point with a deep transition pit. The sewers will tie-in to these pits.

For the intermediate storage of rainwater that is collected on the concrete paved areas the following STOWA quantities are used
- T10 : 58,5 mm /m^2/day for storage design
- T10 : 71,2 mm /m^2/2 days for storage if sample testing is required and
- Year : 875 mm/m^2 conform aanvraag Waterwet Ref. I&BBE4185-1010102R001F02 Tabel 4.3.

TABEL 3.1 NEERSLAGHOEVEELHEDEN BIJ VERSCHILLENDE HERHALINGSTIJDEN VAN DE NEERSLAG TE DE BILT (IN MM) OP JAARBASIS VOOR HET KLIMAAT ROND 2014 VOOR NEERSLAGDUREN TUSSEN 2 UUR EN 8 DAGEN

Herhalingstijd (jaar)	Neerslagduur							
	2 uur	4 uur	8 uur	12 uur	24 uur	2 dagen	4 dagen	8 dagen
0.5	14.6	17.6	21.4	24.2	30.0	37.9	49.1	65.6
1	19.0	22.2	26.4	29.5	36.0	45.1	58.2	77.9
2	23.6	27.1	31.7	35.1	42.4	52.6	67.4	89.7
5	30.1	34.1	39.2	43.0	51.4	63.0	79.8	104.8
10	35.5	39.7	45.3	49.5	58.5	71.2	89.3	115.9
20	41.1	45.7	51.8	56.2	66.1	79.7	99.0	126.5
25	43.0	47.7	53.9	58.5	68.6	82.5	102.1	129.9
50	49.2	54.2	60.9	65.8	76.7	91.5	112.0	140.1
100	55.7	61.1	68.3	73.6	85.1	100.9	122.0	150.0
200	62.6	68.4	76.1	81.8	94.1	110.6	132.2	159.6
500	72.5	78.8	87.1	93.3	106.6	124.0	145.9	171.9
1000	80.5	87.2	96.1	102.6	116.6	134.6	156.5	180.8

For the T10 situation an overflow of the storage basin to the adjacent slab/floor is acceptable if no spill to the environment will occur and if the water level at the slab/floor is less than 70 mm.

3 Regulations and Codes

Each type of water discharge is subject to a permit or regulation. Some discharges are regulated by permit acc. the Water Act. Others are described in the so called Activity Degree.

According to "Aanvraag Waterwet" Ref. I&BBE4185-1010102R001F02 Tabel 3.1.

Discharge type	Legislation	Art. and description
Rain water	Activity Degree	Article 3.3 sub 1. Rain water at roofs can directly be discharged to surface water
Rain water	Activity Degree	Article 3.3 sub 1. Rain water from roads can be infiltrated into subsoil
(Possibly) Contaminated rain water	Water Act	(Possibly) contaminated rain water from tank pits, tank roofs, truck loading areas and jetties to be discharged by oil separator (OBAS). Rainwater from tank pits which is clean can after inspection directly be discharged to public water. Discharge of rainwater from soil protection slabs will be regulated in the Permit.
Sanitary waste water	Activity Degree	Sanitary waste water to be discharged to the public sewer
Fire water	Activity Degree	Flow rate < 0,3 m3/s

The quality requirement for waste water to be discharged to public surface water is defined in the concept water board permit:

Beschikking RWS-2018/Ontwerpvergunning van HES Hartel Tank Terminal B.V. voor het aanbrengen van stoffen in de Mississippihaven. Zaaknummer:RWSZ2017-00009677
Voorschrift 2 Lozingseisen.

Discharge flow	Component	Discharge limits
Effluent from OBAS Clean rain water from tank pits	CZV	< 125 mg/l
	Mineral oil	< 5 mg/l
	Insoluble components	< 20 mg/l
	BTEX	< 0.5 mg/l

(CZV = Chemical oxygen usage, BTEX = Benzene, toluene, ethylbenzene and xylene)

The OBAS shall be such that the effluent will always meet the above requirements.
A Declaration Of Performance (DOP) shall be issued to guarantee the correct performance of the OBAS.

The quantity of discharge to the surface water (Mississippihaven) is related to the collected rainwater on the paved and contained areas that are connected to the underground sewer systems. A classification of the different type of paved areas is made according to the rainwater quality expected.

The table with areas indicated below replaces the table as included in the concept water board permit.

Source	Discharge	Area m2	Discharge quantity m3/year
Clean rainwater from tankpits Estimated 90% not contaminated	Clean	132.304	104.190
Foul water from tankpits Estimated 10% contaminated	Foul	132.304	11.576
Rainwater from vessel - and barge loading areas via buffering system and OBAS	Foul	3.450	3.020
Rainwater from pigging and manifold locations via buffering system and OBAS	Foul	2.275	1.990
Rainwater from pigging location see going lines	Foul	170	150
Rainwater from pump manifolds PV01-PV02-PV03 Estimated 70% not contaminated	Clean	9407	5762
Rainwater from pump manifolds PV01-PV02-PV03 Estimated 30% contaminated	Foul	9407	2469
Rainwater from VRU foundation slab via buffering system and OBAS VRU 1, 2 and 3 (future)	Foul	1545	1352
Rainwater from RTO foundation RTO 1, 2 and 3	Clean	375	328
Rainwater from additive unloading area iso-container PV01-PV02-PV03 via bufferpit PV's Estimated 90% not contaminated	Clean	190	150
Rainwater from additive unloading area iso-container PV01-PV02-PV03 via bufferpit PV Estimated 90% not contaminated	Foul	190	17
Rainwater from unloading areas for vacuum trucks and release of IBC's	Foul	1064	931
		Total	131.935 m3

Total area off all surfaces connected to the different discharge points is 150.780 m²
Resulting in a yearly discharge of approx. 150.780 m² * 0.875 m/m²/year = 131.932 m^3.

The total discharged volume mentioned in the Permit application Water *Act ('Aanvraag': 20 juni 2017 geregistreerd onder nummer RWSZ2017-00009677)* is 128.202 m^3.

The calculated discharge volume exceeds the permit volume by 2,9%.

In the concept permit Water Act no total discharge volumes are mentioned. Only the discharge rates per OBAS are mentioned. In total 145 m^3/h can be discharged.

4 Sewer systems

4.1 Rain water infiltration

Rainwater at the unpaved areas is directly infiltrated into the subsoil like:
- quay gravel area,
- gravel areas along fences,
- gravel areas at north and south side of barge loading

All rainwater which falls at roads and paved areas along the quay of the sea going vessels and buildings is collected and infiltrated into the subsoil. This is excluding the parking area.
Rainwater from the buildings and substations is routed by the down sprouts to the gravel pits near the down sprouts for infiltration.

Rainwater at the roads will be infiltrated along the shoulder of the roads. Non-paved areas will have a gravel site finishing.
At places where there the road has a slope to the culverts rainwater runoff will collect at the bottom of the slope. Here street gully's with an infiltration pipe are projected to accommodate the infiltration.
The paved areas under the mooring lines along the quay of the sea going vessels are foreseen with street gully's which are connected with a infiltration pipe.

4.2 Clean water sewer HWA

The clean water sewer (HWA) is designed as a filled free gravity flow system. This to prevent gasses and/or flames to be transported from hazardous (EX) zone to non-hazardous zones.
The HWA header will be connected to the discharge pits provided by PoR.
At maximal 100 m1 intervals concrete inspection pits will be installed. At these pits incoming sewer lines will be connected.

Rain water from hard surfaces which have no risk for contamination of the rainwater is directly connected to the HWA sewer. Currently this is only applicable for the parking area where the street sumps can be connected to the HWA sewer.

If contamination is possible the rain water have to be stored and after (visual) inspection released to the HWA header if clean. This requirement is laid down in the PGS 29 art.2.3.10 and art. 4.2.47 regarding the tank pits.
If the water is not clean it shall be routed to the VWA or RWB sewer.

4.3 Foul water sewer VWA

The foul water sewer (VWA) is designed as a filled free gravity flow system. This to prevent gasses and/or flames to be transported from hazardous (EX) zone to non-hazardous zones.

At maximal 100 m1 intervals concrete inspection pits will be installed. At these pits incoming sewers will be connected.

Lightly polluted rainwater has to be treated before discharge. The VWA sewer is connected to oil separation units (OBAS). In these units sediments and oil will be separated from the rain water.
The VWA sewer header to the OBAS runs via a equalization pit which feeds the OBAS. The effluent of the OBAS is discharged to the existing discharge pits of PoR.

4.4 Waste water sewer to RWB

All the rainwater at the vessel berths is routed via the waste water sewer (WW) to the RWB. This is designed as a filled free gravity flow system. This to prevent gasses and/or flames to be transported from hazardous (EX) zone to non-hazardous zones.

The barge loading and adjacent pigging areas are connected by a pressurized system due to the distances. All the rainwater from the barge loadings will be pumped either to the RWB-03 or RWB-02 for inspection and further treatment.
The corridor manifolds at the head of the inner harbor (barge area) are connected by a gravity flow sewer to these RWB's.

The content of the RWB's will be inspected and tested.
If the water is contaminated with soluble products then it cannot be treated in the OBAS and has to be trucked to a certified processor. If it only contains some oil it will be pumped to the OBAS for cleaning and discharge.
There are 3 RWB's located at the site and these can be interconnected.

4.5 Sanitary sewer SW

The office building (former Falck building) has a sanitary sewer. The sanitary waste is collected in a storage pit and pumped into the public sewer.

4.6 Selection of discharge

The contamination can consist of oily products or soluble additives.
At the tank pits, berths of vessels and barges and pigging area soluble additives are part of the oil products. So if at these locations no visual oil contamination is present than no soluble will be present in the water.
Only at the pump pits and additive storage/ loading area soluble additives can be spilled in pure form.

Lab testing of the water samples take about 24 hr. So the storage capacity shall be minimal sized for the 1/10 years 2-days rainfall.

The following surfaces are subject to inspection before discharging water into a sewer:

Item	Visual Inspection	Sample testing	Action/Discharge
Tank pits	No oil layer	-	To HWA
	Thin oil layer	-	To VWA
	Thick oil layer	-	Removal of oil layer then to VWA
Tank pit with soluble components	No oil layer	On spec	To HWA
		Off spec	Truck removal to processor
	Thin oil layer	On spec	To VWA
		Off spec	Truck removal to processor
	Thick oil layer	On spec	Removal of oil layer then to VWA
		Off spec	Truck removal to processor
Pump pits	No oil layer	On spec	To VWA
		Off spec	Truck removal to processor
	Thin oil layer	On spec	To VWA
		Off spec	Truck removal to processor
	Thick oil layer	On spec	Removal of oil layer then to VWA
		Off spec	Truck removal to processor
Additive storage/ loading area	-	-	Directly into pump pit
	Only inspection during loading/unloading	-	Removal of spill
Berth manifold vessels	Normally	-	To RWB
	Only visual inspection during loading	-	Removal of oil layer then to RWB
Berth manifold barges (pumped)	Normally	-	To RWB
	Only visual inspection during loading	-	Oil layer pumped to RWB and removed there
VRU with soluble components (glycerol)	No oil layer	-	To RWB
	Thin oil layer	-	To RWB
	Thick oil layer	-	Removal of oil layer then to RWB
Pigging area	-	-	To RWB

	Only inspection during pigging	-	Removal of spill

4.7 Rain water basin RWB

The rainwater basin will store effluent from the berth manifolds. The water will be tested at the RWB before discharge. If the effluent meets the discharge requirement the effluent can be pumped into the VWA sewer otherwise the effluent has to be trucked to a certified processer.

5 Technical lay-out

Tank pits
The floor of the tank pits slopes to the side where the water runoff will be collected in an open gutter. This gutter is connected to a sump pit.
The sump pit has an underground pipe connection through the tank pit wall.
At the outside of the tank wall two manual valves are located which are normally closed. The valves have a visual position indicator. One of these connections is for discharge into the HWA sewer the other is connected to the VWA sewer.
After the quality inspection of the collected rain water the valve will be opened if the water meets the requirements for the HWA or VWA sewer. After draining of the tank pit the valve has to be closed.

Pump manifold pits
The floor of the pump pits slopes to the sides where the water runoff will be collected in an open gutter. The rainwater is collected via the gutter system in a basin. The basin is divided into two compartments, sluice gate is provided between the two compartments. In the event of any contamination, it is collected in the first compartment. In this way the total content of the buffer is not contaminated and can be disposed separately.
Sufficient buffer capacity is available to prevent frequent start-stop actions of the pump.

In the second compartment a discharge pump is located. Directly after the pump two parallel gate valves are present to discharge to the HWA or the VWA sewer. Based on the water quality inspection the pump is locally started if it meets the requirements for the HWA or VWA. Pump will be stopped automatically at low level. If the water in the basin is off spec it has to be discharged by vacuum truck to a qualified processer.

The pumps are controlled by the DCS in the control room. A high level alarm in the downstream inspection pit near the OBAS will stop or prevent the start of the pump.

The volume of the basin shall be able to store minimal the 1/10 year 2-days rainfall. For the T10 situation an overflow of the basin can be acceptable with a small layer of water on the floor (liquid tight).

Additive storage/ truck loading area
The storage and loading the area will drain the (rain) water directly into the basin of the pump pit. Also spills occurring during the truck loading will drain into the pump pit. The pump pit shall be capable to store a spill of 40 m^3.

Vessel berths
The rainwater at the vessel berth manifolds area will be collected and routed to the RWB. During loading the valve will be closed. After a visual check it can be drained to the WW sewer for intermediate storage in the RWB-01 or 02. If a spill occurs during loading it has to be cleaned.

Barge berths
The rainwater at the barge berth manifolds area will be collected and automatically pumped to the RWB-03 pit. During loading the pump is shut/off. If a spill occurs during loading it has to be cleaned.
The pumps, 10 resp. 20 m3/h are automatically started and stopped based on water levels in the sump.
A level control in the RWB will prevent overfill by controlling the discharge pumps at the berth manifolds.
The loading manifolds at the jetty will also have a direct connection to the VWA sewer. This connection by means of two parallel installed gate valves will be normally open to either the VWA sewer or WW system.
In case soluble products will be loaded the sewer has to be diverted to the RWB-03.

VRU area
The rainwater at the VRU unit has a low risk for pollution and will be drained to the RWB. The hand valve is normally closed. Buffer area is provided. To prevent overflow a level indicator with a remote signal is present.
During maintenance the valve will be locked and any spill has to be cleaned.

Pigging area
The rainwater at the pigging area can consist oily products with soluble additives. Therefor the pigging stations are connected to the WW sewer system. The hand valve is normally open. During a pigging operation the valve will be closed. After the pigging operation the area will be cleaned of any spillage.

RWB pits
The storage capacity off the RWB pits shall be such that at least the 1/10 years rainfall can be stored including a delay for testing and mobilizing the disposal by truck.
RWB-1 and 2 are the end section of the free flow gravity sewer system. The elevation of these RWB's shall be such that sufficient flow is generated. A discharge pump is installed at the RWB to empty the RWB into the VCA sewer if the content is tested and on-spec. Otherwise the content has to be trucked to a certified processor.
Inside the RWB a skimmer wall to be installed to concentrate the oil so it can easily be removed by suction.

Oil separation units (OBAS)
For the purpose of the design of the OBAS, the following scenarios are identified:

a discharge of RWB
b discharge of pump manifold
c discharge of the largest tank pit only

The areas are connected to the different oil separators. Normally these areas are separated by a closed valve. Each of the OBAS units has a capacity based on the amount of expected effluent. The capacities are respectively 37,50 m^3/hr, 37,50 m^3/hr and 70 m^3/hr. If necessary the valve can be opened to connect the OBAS with each other.

Waste water pumps must have a capacity that is less than the capacity of the OBAS otherwise the OBAS can be overloaded with the risk of oil spillage.
In addition to prevent overloading the OBAS, upstream of each OBAS an inlet restrictor, type Q-Brake is installed and is designed for the maximum discharge that is permitted. The capacity of the OBAS is one size larger in order to have a certain safety margin.

The discharge of the different contaminated tank pits can take place simultaneous into the VWA sewer. The simultaneity of discharge whether it is a pump manifold or tank pit will affects the lead time of drainage.

Upstream of the OBAS an equalization pit will be installed to reduce the turbulence of the water flow and to separate the sediment. The capacity has to be approx. 2000 ltr.
After the OBAS downstream a sample pit has to be installed. OBAS will automatically shut-off if the oil level is reach the maximum. A continuous effluent measurement (flow indicator transmitter) is required after the OBAS.

Automation
The sewer system is manually operated. Valves are manually opened and closed. Each valve has a visual and digital position indicator.
Pumps will locally be started manually but shut-off automatically at low level. Pumps at the barge loadings are fully automatic operated. Each pump has a corresponding level indicator which stops the pump if the downstream discharge causes an unexpected high level.
Each tank pit is equipped with an oil layer detection. An alarm from this detector has to initiate an action to close (manually) all the discharge valves (if open) and to investigate the source of the oil spill.

Each OBAS is equipped with a control unit which give an (pre)alarm if the oil level reach the maximum level.

In the inspection pit directly upstream of each OBAS a level indicator is present. This level indicator will at high alarm stop the several discharge pumps connected to this system.
Each RWB has a level indicator transmitter to initiate sampling and discharge.

A DCS control philosophy has to be detailed.

Operating sequences
After a severe shower or rainy period the accumulated rainwater has to be discharged of each surface.
Each pump pit has a dedicated OBAS and can therefore be operated independently.
Due the discharge restriction the following sequence shall be respected.

- Discharge RWB's, VRU, pigging and manifold locations to VWA (if maintenance take place valve shall be closed and will only be opened after visual inspection)
- Discharge all tank pits (without soluble components) to HWA after visual inspection. Simultaneous discharge is possible.
- Discharge Pump pits (without soluble components) to VWA or HWA after visual inspection
- For all locations applies if soluble substance may be present sampling and testing shall take place, if soluble components are found, removal by vacuum truck to certified processor.