

SAPPCO  
سابكو

# POLYETHYLENE PIPE SYSTEM

## for Infrastructure

**KRAH**<sup>TM</sup>  
krah-pipes.com PIPES  
TECHNOLOGY





**SAFE, HUGE & DESIGNED TO PERFORM ACCORDING TO YOUR REQUIREMENTS**

## **INTRODUCTION**

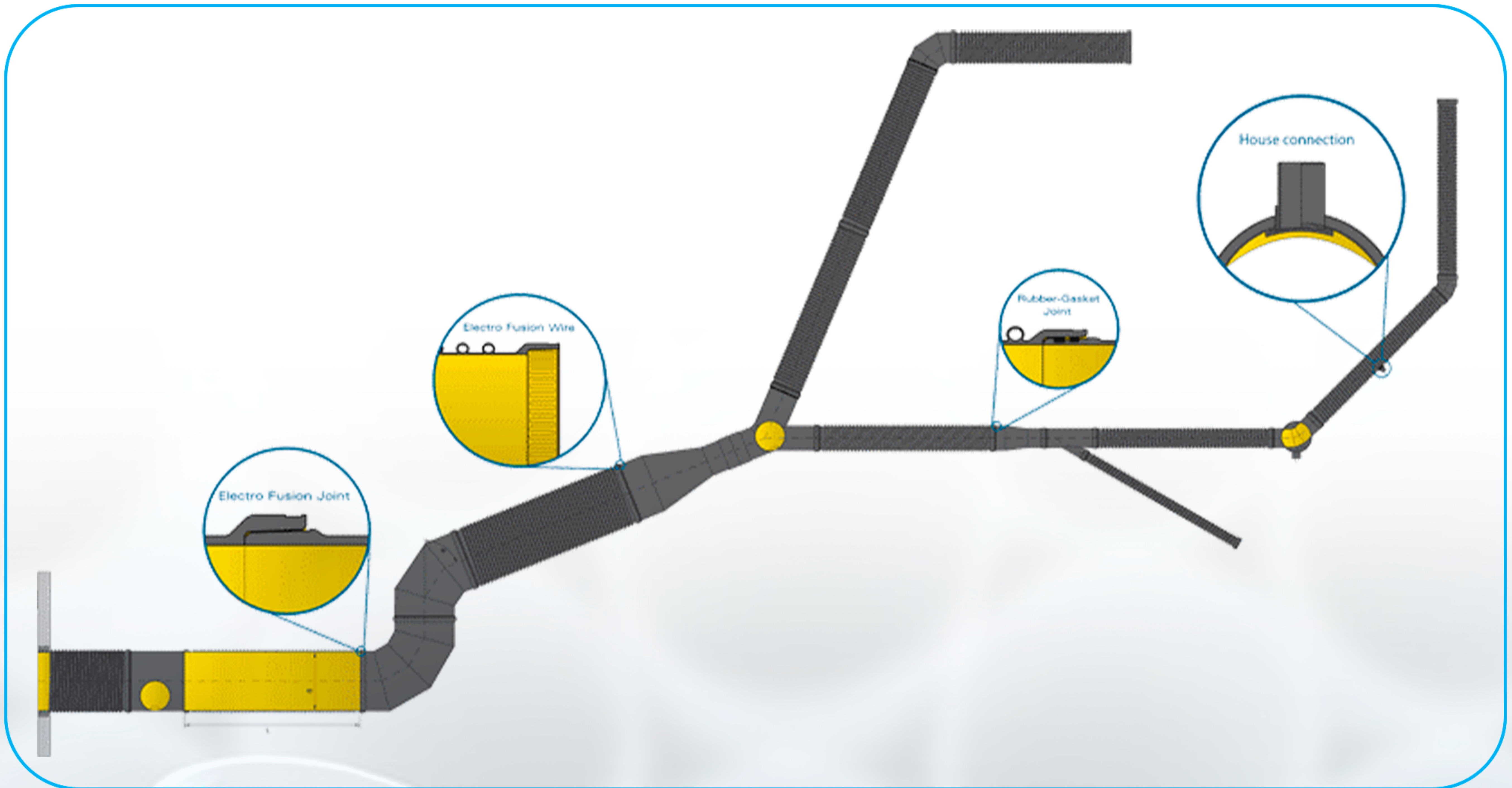
Most sewage and waste water systems in Middle East and Asia are still designed in conventional materials such as concrete, clay and asbestos cement. However, with the introduction of thermoplastics like HDPE, a versatile material, there are many benefits offered, which needs to be considered for building a sustainable infrastructure.

Saudi Plastic Products Company (SAPPCO), located in First Industrial City, Dammam was established 50 years ago in Kingdom of Saudi Arabia, is now the largest manufacturer of PVC, CPVC, HDPE pipes.

SAPPCO along with KRAH has now established a partnership to introduce the large diameter pipes using a unique technology from Germany to be produced in Saudi Arabia and to market as “Made in Saudi” product.



SAPPCO is the sole owner of the technology in the Kingdom to produce the large diameter pipes for infrastructure and other associated products to build a sustainable and resilient infrastructure as shown.



**Figure 1:** Complete Solution for the sustainable infrastructure using KRAH technology

## **PRODUCTS**

With the introduction of KRAH Technology, which is very unique, SAPPCO has added new products in the portfolio as mentioned below:

1. Manhole and Chambers
2. Structural Wall Pipes or Solid Wall Pipes
3. Storage Tanks
4. Fittings – standard or tailor made
5. Special fabrications

Due to flexibility in the manufacturing process, the products can be designed and manufactured based on the customer's requirement for various applications.

To facilitate the calculation, a special software program "Easy Schacht", and "Easy Pipe" are used to design based on the conditions like ground water, traffic loads that are considered to calculate the optimum structure is used. The wall thickness is designed to according to the static requirements and due to the helical extrusion technology, the wall is completely monolithic and homogeneous.

## APPLICATIONS

Versatility in the manufacturing of KRAH pipes or shafts, allows the possibility of manufacturing various products that can be used for various applications

## MANHOLES & CHAMBERS

- House Connection Chambers.
- Manholes for sewer and storm water network.
- Lifting Station.
- Pressure breaker chambers.
- Vacuum Valve chambers.
- Valve chambers.



Manholes or Chambers are tailormade for the network. The shafts for the manholes or chambers are designed to withstand hydrostatic pressure due to ground water, and the radial loads due to soil and live loads considering and other conditions.

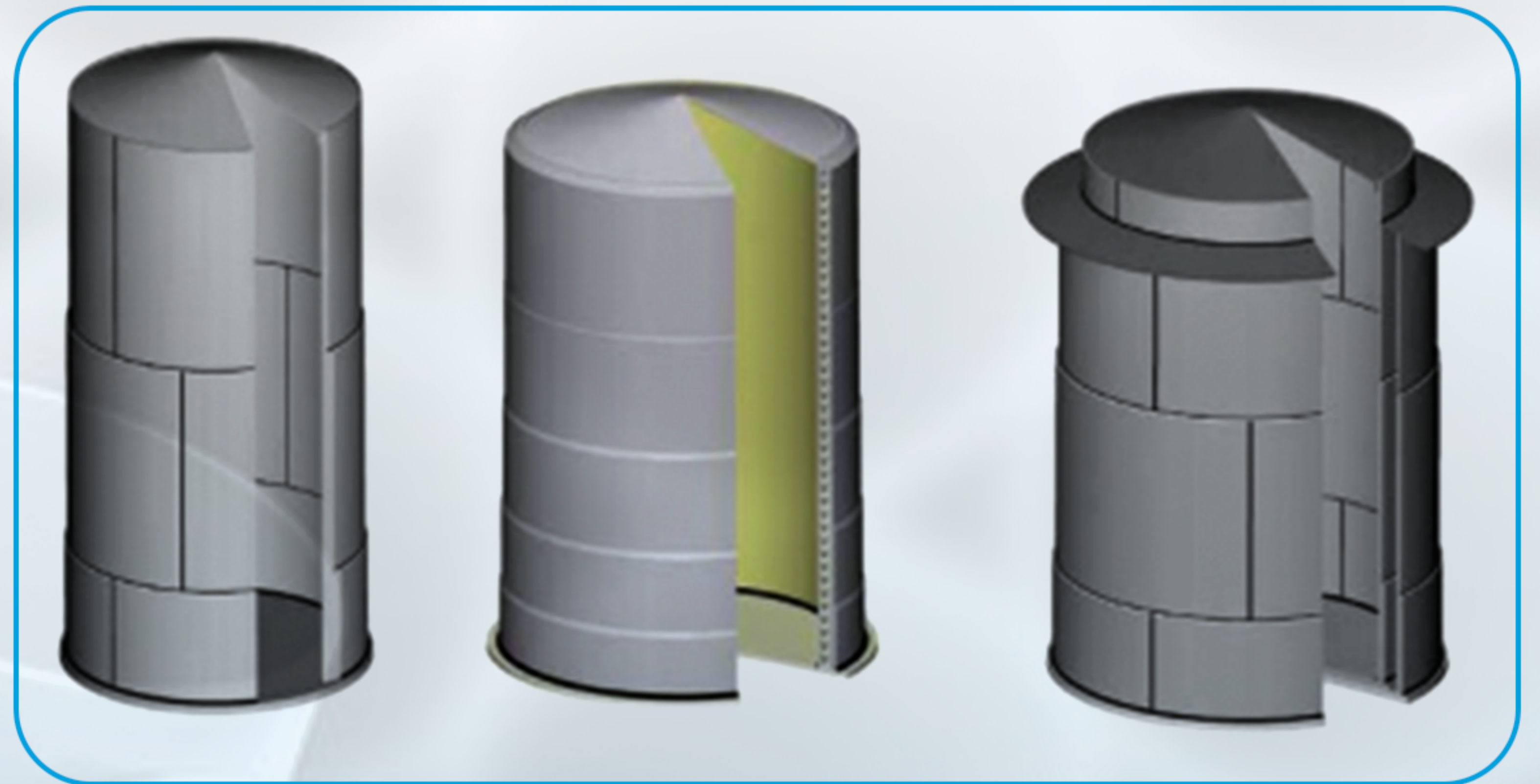
Tangential Manholes can also be manufactured depending on the requirement.

Thermoformed benching with standard orientation for 3 or 5 inlets or fabricated benching channels with variable angles can be supplied.



## STORAGE TANKS

- Chemical storage and process tanks
- Process tanks
- Scrubber
- Process tanks
- CO2 Stripper
- Tanks for water treatment
- Silos for agriculture
- Silos for food industry
- Biogas plants / composting plants
- Fodder storage
- Storage tanks for textile industry
- Drinking water tanks / reservoirs Overflow



HDPE Tanks can be produced

- In single layer solid wall or with variable wall thickness
- In double structural wall, where the entire wall is monolithic part that enables us to offer an intermediate leak detecting chamber.
- In double containment, which is primarily a tank in tank system, that houses 100% of the tanks content in the event of leakages or rupture of the primary tank.

## STRUCTURAL OR SOLID WALL PIPES

- Sewerage networks
- Storm water networks
- Intakes and Outfalls
- Relining
- Above ground
- Landfills
- Special applications
- Industrial
- Mining
- Sub surface drainage



Structural wall pipes can be designed and produced with inner layer with different colored layer for visualization or identification.



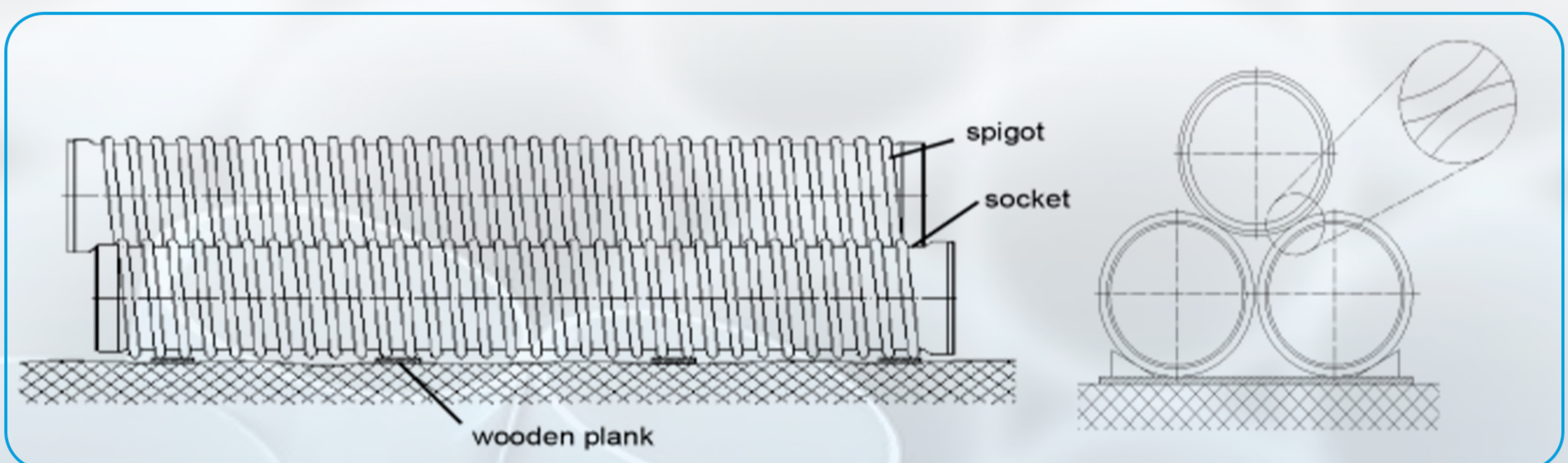
## HANDLING & TRANSPORTATION

Pipes and fittings have to be transported with appropriate vehicles. During the transport and especially during the loading and unloading they have to be protected against damages.

During the unloading the pipes using hoists, only belts, that is safe to handle, should be used. Steel wire ropes, chains as well as sharp-edged lifting devices should be avoided.

While unloading of the pipes with a fork-lift, the forks that carry the pipes should be examined for any sharp edges. It is recommended to wrap the forks with a protecting foil or to use a suitable pipe inside the pipes that have to be unloaded.

The pipes should be stored on even ground which is free of stones or sharp-edged objects. The pipes are to be stored in such a way that they cannot deform and are protected against dirt, mechanical damages, and pointed load and this applies especially for the spigot and the socket that is integrated with the electrofusion wires.



HDPE Manholes are usually equipped with lifting lugs that welded homogeneously to ensure safe loading and unloading on the site as shown in the picture.

All these lugs are homogeneously welded to the pipe.



**Storage of HDPE Manholes.**



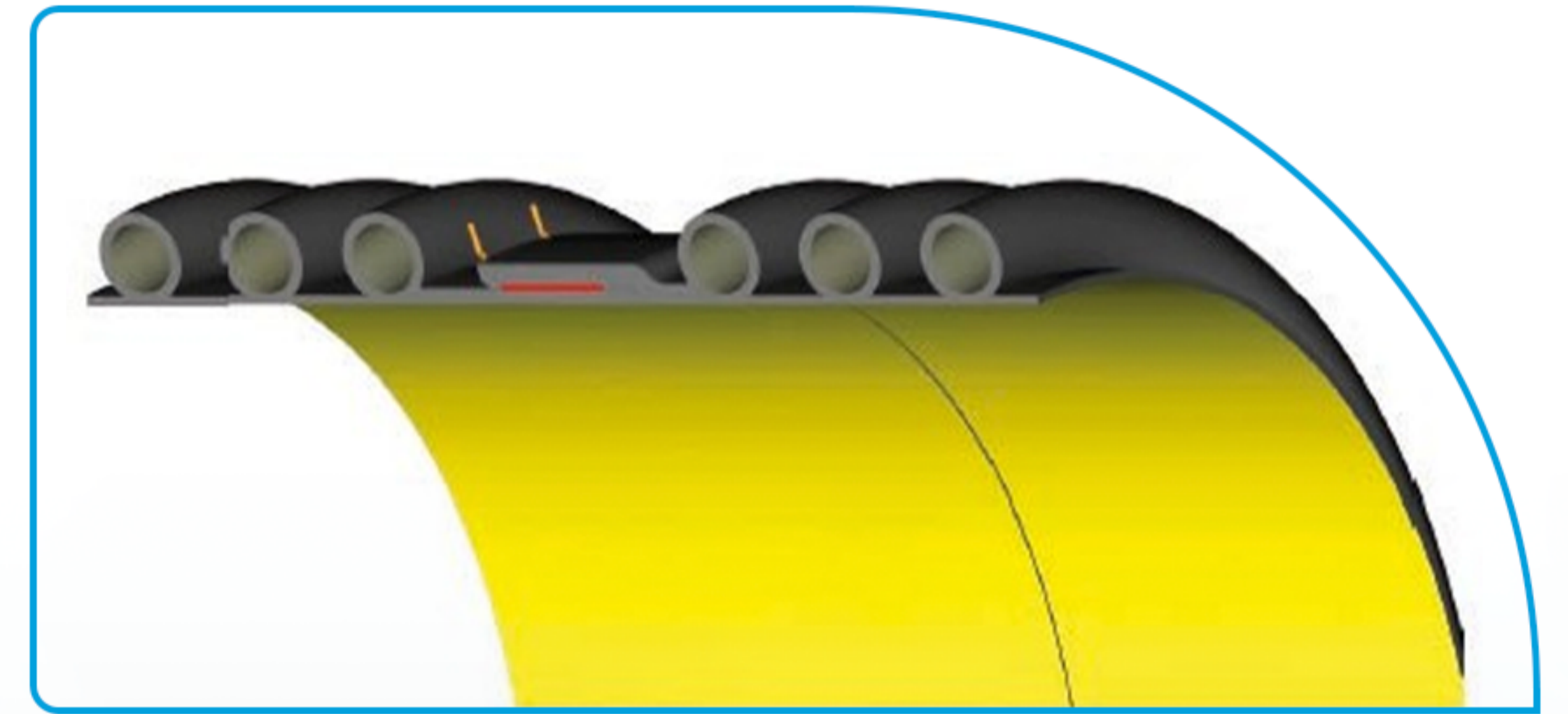
**Unloading of Manholes**

## **JOINTING**

All KRAH pipes are produced with an integrated socket and spigot, which are adaptable to the following kinds of jointing techniques:

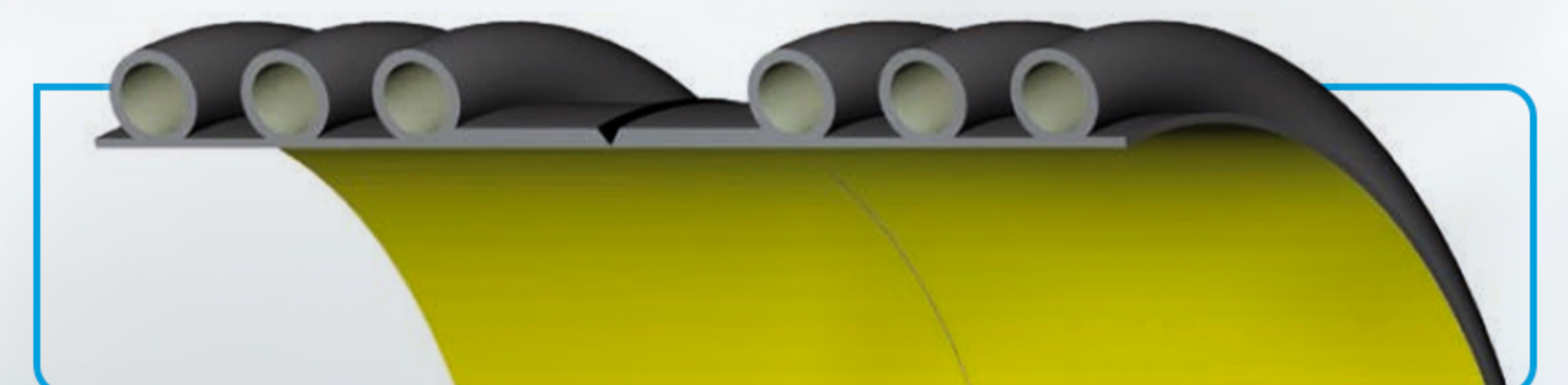
### **ELECTRO FUSION JOINT**

This is the most preferred jointing system for the gravity applications, as the whole pipe system becomes a homogenous unit. The heating wire that is integrated into the socket is heated with the help of a special welding device whereby the two pipe ends (socket and spigot) are jointed together. The electro-fusion jointing technique is a very simple and safe method to install pipes in even very narrow trenches in a short time.



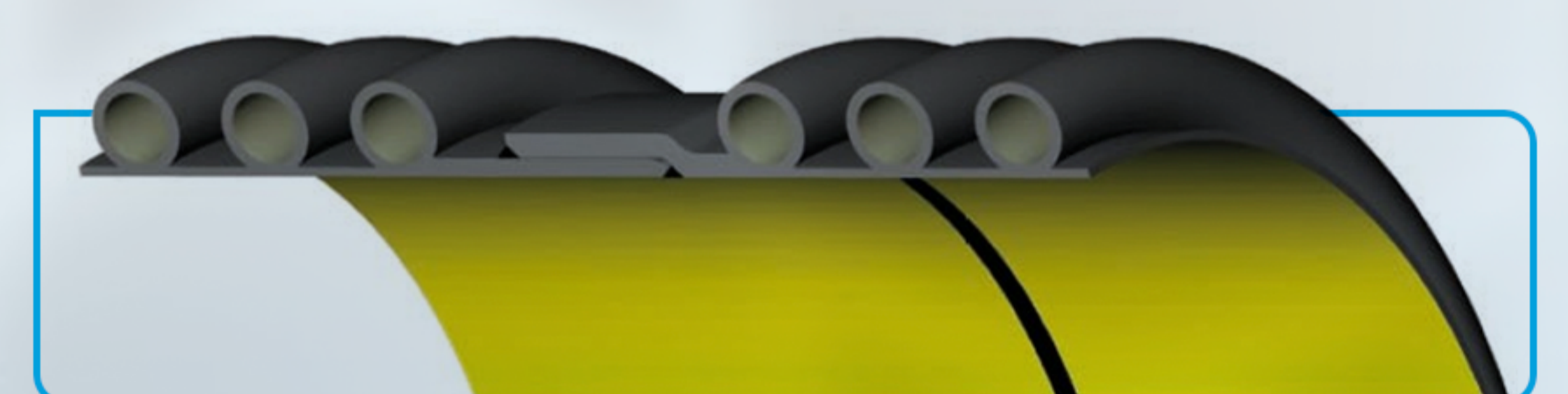
### **V SEAM EXTRUSION WELDING**

The pipes and/or fittings are jointed with the help of an extrusion welding extruder. The outside of each end is milled off forming a “V” groove on which manual extrusion is done by welder according to DVS 2207:4. Normally pipes with both end spigot is used.



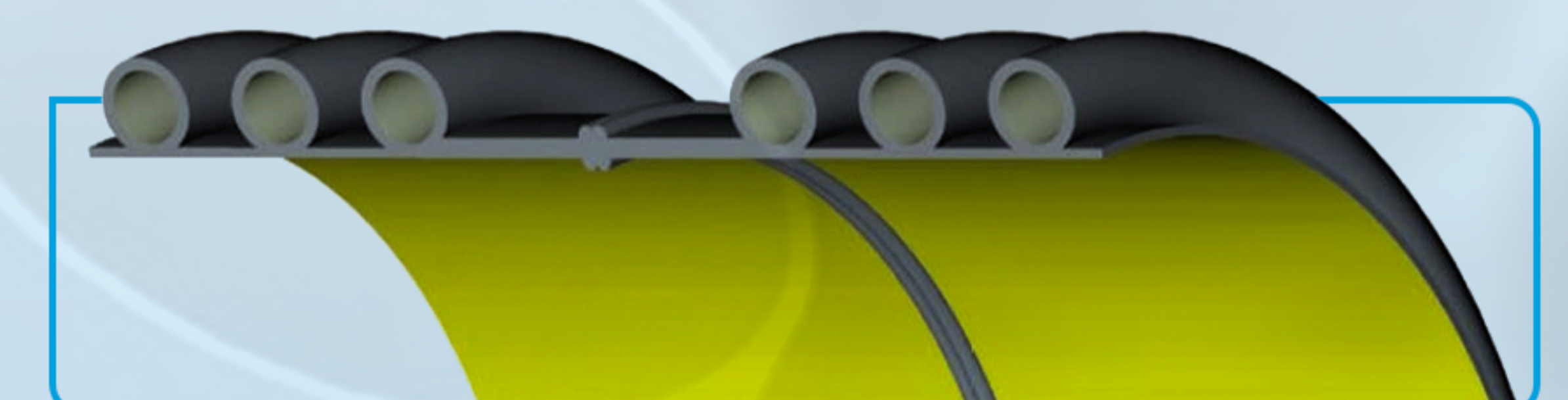
### **EXTRUSION WELDING**

The pipes and/or fittings which are to be connected are jointed by a socket and spigot joint, similar to a V-seam connection, the two pipe ends are connected with the help of an extrusion welding done according to DVS 2207:4. The jointing can be carried out inside and/or outside of the pipe and is most suitable for low-pressure gravity pipes and manholes.



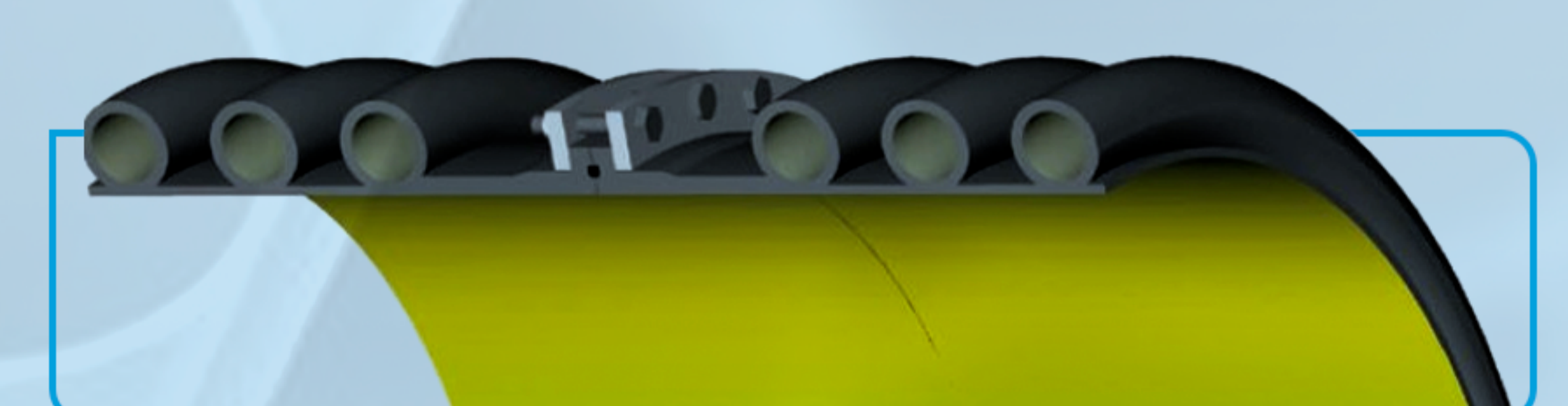
### **HEAT ELEMENT BUTT FUSION**

The pipes and fittings are jointed with the help of a butt fusion machine. The ends of the pipes and fittings are solid. This kind of jointing method is only recommended for pipes and fittings having a higher wall thickness of more than 50 mm and with diameters from DN/ID300 to DN/ID 3000. The welding has to be done according to DVS 2207 part 1 or equivalent welding standard.



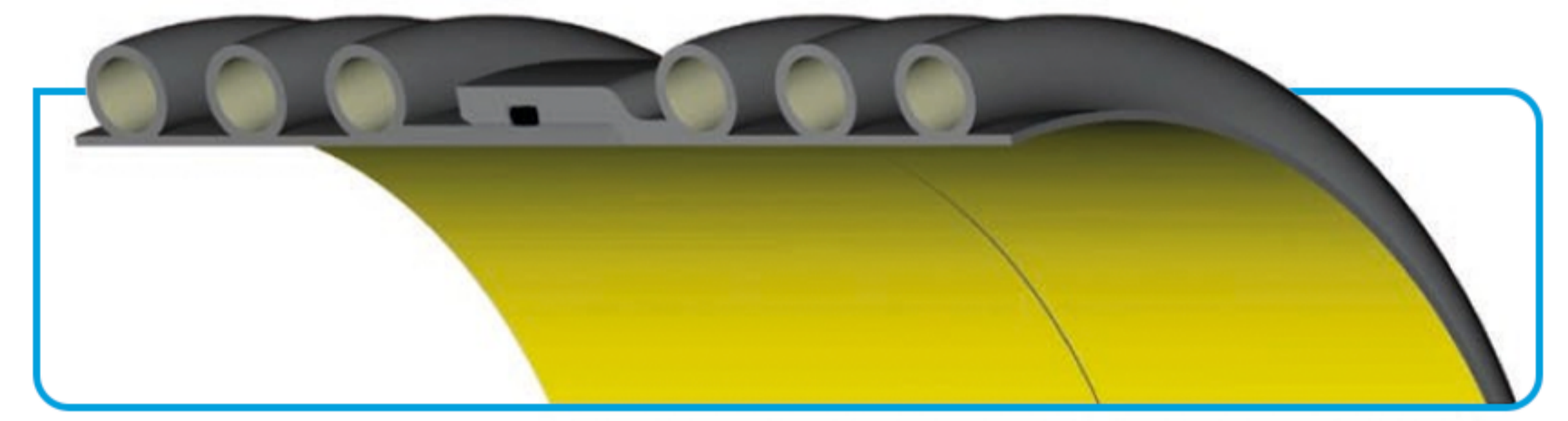
### **FLANGE CONNECTION**

The ends of the pipes and fittings are jointed with the help of a steel flange and a rubber gasket. Depending on the type of pipe, the flange adapters are completely manufactured from the pipe, or the flanges are available as separate fitting. This kind of jointing method is mostly used for open sea discharge applications and for tank connections. The greatest advantage of this connection is the facility of disjoining.



## **GASKET CONNECTION**

The rubber sealing system consist of a solid plain socket or bell and spigot, with integrated EPDM gaskets. The special double gasket design provides maximum safety for leak-free joints. Gaskets can be an alternative solution if detachable connection or a temporary joint is requested.



## **INSTALLATION & TESTING**

KRAH pipelines are engineered products. The basic installation for these pipes is based on the worksheet ATV A 127. The basis of the installation procedure is:

- DIN EN 1610
- DWA A 139 E

According to EN 1610, the load carrying capacity pipe / ground for earth-laid pipes has to be checked before the start of the installation. This can be verified by the static calculation ATV A 127.

While making the trenches, ensure that it is protected from its stability due to the impact of ground water, or other neighboring ground works. The trenches are to kept free of water that may affect the installation process.

Trench widths indicated in EN 1610 irrespective as shown in the static calculations are sufficient, which shows that the welding machines can be used without any problem.

The embedding of the pipes considerably rules the load distribution and the pressure distribution on the pipe to prevent from any deformation. It is always recommended to use a compactor to compact the soil to the desired level. All materials which are defined in the EN 1610 can be used for embedding the pipes, materials like washed gravel, crashed gravel, sand, granular ground. The mechanical compaction of the main backfilling directly above the pipe should only be started when a layer of minimum 300 mm is above the apex of the pipe.

### **NOTE:**

The compaction which is determined in the static calculation cannot be reached with wet compaction material with less than 11% of humidity.



Compaction of main backfilling



Compaction work with a vibratory plate

## **STANDARDS**

Gravity Pipes	- EN 13476, DIN 16961
Statistical dimensions	- ATV A127
Hydraulic dimensioning	- ATV A 110
Pipe Installation	- EN 1610, ATV 139
Jointing of the pipes	- DVS 2207
Vertical shafts for manholes	- BS EN 13598, ASTM F1759 & ATV 127

## **AVAILABILITY**

The following products are available for your infrastructure:

1. Gravity Pipe (Structural or Solid) from DN 300 – DN 4000, with various stiffness class. Available with all standard fittings or customized. Kindly contact the manufacturer for more details.
2. Manholes and Chambers for Sewer or Storm water network using straight shaft from DN 600 to DN 3000, with benching channels oriented according to the requirements for any depth. Where the manholes are used for large diameter directional changes, Tangential manholes can also be fabricated. All the accessories required can be customized according to the needs.

## **10 REASONS TO USE HDPE PIPES FOR YOUR INFRASTRUCTURE PROJECTS IN PLACE OF CONVENTIONAL MATERIALS**

HDPE Structural Wall Pipes produced using KRAH technology have the advantages over the conventional material. The structure can be optimized to give an increased load bearing capacity and a lower weight compared to Solid wall pipes of similar load bearing capacity. Below you can find the other advantages, that helps to build a sustainable infrastructure.

### **DESIGN FREEDOM**

The pipes produced by KRAH technology can be designed with optimum stiffness to weight ratio in sizes from 300 to 4000 mm using solid wall or structural wall designs. The pipes can be used to fabricate manholes or tanks according to the requirements. An optimized design is possible.

### **LIGHT WEIGHT AND EASY TO INSTALL**

The specific weight of the material is lighter than the conventional material. This means a lower cost for transportation and handling equipment costs. Pipes can be welded above the trench in long lengths and lowered into the trench.

No special bedding required while installation.

### **FLEXIBLE AND ABLE TO ABSORB EXTERNAL LOAD**

Flexible pipes absorb external loads by deformation. This small amount of deformation transfers stress to the side fill material around the pipe with negligible reduction in the flow capacity of the medium, compared to rigid material, where the stresses are retained in the pipe wall which eventually leads to cracks and failure. Flexibility is a safety.

Due to flexibility, no special fittings are required for a smaller curve.

## **TOUGH BUT UNBREAKABLE**

HDPE pipes and accessories are resistant to impact during transportation, handling and installation.

## **HYDRAULICALLY SMOOTH BORE**

The pipes have a very smooth internal surface, this a very low friction factor. Typically the C – coefficient is 150 and this remains same throughout the lifetime compared to concrete which decreases over a period of time. This means capacity reduces and flow velocity increases.

## **EASY TO JOINT – ALSO TO OLD PIPE SYSTEMS**

Jointing can be done by the electrofusion, extrusion or butt fusion welding. This prevents any leakages and forms a homogeneous system, thus eliminating any exfiltration or infiltration or any threat of root intrusion, thus reducing the chance of any maintenance or replacement of the system

## **RESISTANT TO CORROSION**

Corrosion is a major problem in the network for the failure of the system in the conventional materials. This is more common in the waste water network where the formation of sulphuric acid on the pipe wall due to oxidation of H<sub>2</sub>S gas in the system. This leads to the loss of wall thickness and eventual collapse of the pipe.

## **ABRASION RESISTANT**

Tests result from the so-called Darmstadt procedure acc. to DIN EN 295-1 have shown that HDPE have much higher resistance to abrasion than concrete, clay or asbestos cement pipes. It is for this reason HDPE pipes are used to carry slurries in mining industries, a property equally important for sewers in Middle East where sand is often carried.

## **DURABLE SYSTEMS WITH A LONG MAINTENANCE FREE LIFE**

The KRAH pipe systems are totally resistant to corrosion and do not loose wall thickness or the hydraulic capacity in operation, therefore it still retains the strength, unlike concrete and asbestos cement. Studies have shown that risk in failure is negligible. HDPE pipe systems will resist cracks even under deformations much higher than those that could be experienced in practice.

## **RECYCLABILITY & SUSTAINABILITY**

HDPE pipes after its lifetime can be recycled and reprocessed without the structure of the resin having to be modified dramatically. The reprocessed material can be used to manufacture same or other products

## **ABOUT SAPPCO**

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# CERTIFICATES & APPROVALS



## GENERAL CERTIFICATES & APPROVALS





50 YEARS OF HISTORY..

Built to Sustain..



[www.sappco.com.sa](http://www.sappco.com.sa)

@ Email: [sales@sappco.com.sa](mailto:sales@sappco.com.sa)



S A P P C O G R O U P

**Riyadh head office**

☎ 966114480448

📍 P.O Box 40042, Riyadh 11499, Saudi Arabia



**Dammam office**

☎ 966138471703/ 3323

📍 P.O Box 1703, Dammam 31412, Saudi Arabia

**Jeddah Office**

☎ 966122864284/4285