

# TECHNICAL DOCUMENTATION



## REINFORCED CONCRETE JACKING PIPES INTERNALLY COATED WITH HDPE LINER



$$= P_{el} \frac{3n_{arm} (\sigma_p / p) + n_{arm} (\sigma_p / p) \cdot (-\frac{1}{3} P_{isN})}{n_{arm} (3\sigma_p + \sigma_{isN}) + \sum_{other} n_{other} \sigma_{other}}$$

$$= P_{el} \cdot P_H \cdot A_p''(Q^2, W) \frac{1 + (\sigma_p A_p) / ((\sigma_p A_p) \cdot (-\frac{1}{3} P_{isN}))}{1 + \sigma_{isN} / 3\sigma_p + (\sum_{other} \sigma_{other}) / (3n_{arm} \sigma_p)}$$

In the region of the elastic peak:

$$A_{el}^{row}(Q^2) = P_{el} P_H \cdot A_p''(Q^2, W) \frac{1 + (\sigma_p A_p) / ((\sigma_p A_p) \cdot (-\frac{1}{3} P_{isN}))}{1 + \sigma_{isN} / 3\sigma_p + (\sum_{other} \sigma_{other}) / (3n_{arm} \sigma_p)}$$

Ratio:

$$A_{el}^{row}(Q^2, W) / A_{el}^{row}(Q^2) = \frac{A_p''(Q^2, W)}{A_p''(Q^2, el)} \cdot \frac{1 + (\sigma_p A_p) / ((\sigma_p A_p) \cdot (-\frac{1}{3} P_{isN}))}{1 + \sigma_{isN} / 3\sigma_p + (\sum_{other} \sigma_{other}) / (3n_{arm} \sigma_p)}$$

Quantity of interest known from el. form factor

Correction factor close to 1 can be determined theoretically

Ratio of dilution factors = RDF

$$RDF = \frac{\sigma_p}{\sigma_{el}} \cdot \frac{3n_{arm} \sigma_p + n_{arm} \sigma_{isN} + \sum_{other} \sigma_{other}}{3n_{arm} \sigma_p(Q^2, W) + n_{arm} \sigma_{isN}(Q^2, W) + \sum_{other} \sigma_{other}(Q^2, W)}$$

known from EI run

Ratio of measured counts from the full  $N_{H_2}$  target in the elastic peak region / region of interest





## DEFINITION

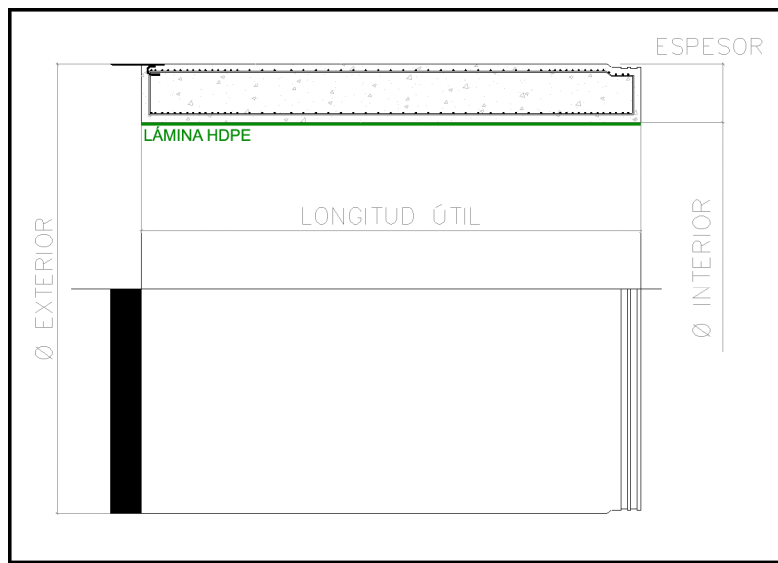
Reinforced concrete jacking pipe of circular cross-section for laying according to the method of advancement by hydraulic thrust under pressure (pipe driving method), used to form a conduit with flexible joints without opening of trench, armed with double rigid armature of 24 o 36 each armature longitudinal. Reinforcement of transverse reinforcement in the thrust transmission zone as well as shear reinforcement arrangement (formed by reinforcing UES connecting the longitudinal, inner and outer reinforcement radially at the male and female end). Quick-fit rubber gasket and MILLING with groove to hold the rubber gasket. The female part of the jacking tube has a metal ferrule. Internal polyethylene sheet with a thickness between 2.5 mm HDPE thermoplastic coating by mechanical anchoring to concrete.

Manufacture based on standard ASTM C 76 M, EN 1916, UNE EN 127.916, ASCE 27-00, and Specific Technical Specification Sheets (ACUAES, C.A.B.B, EMASESA, D.F.G, C.H.N, etc.) as well as the EC Certificate of Conformity.

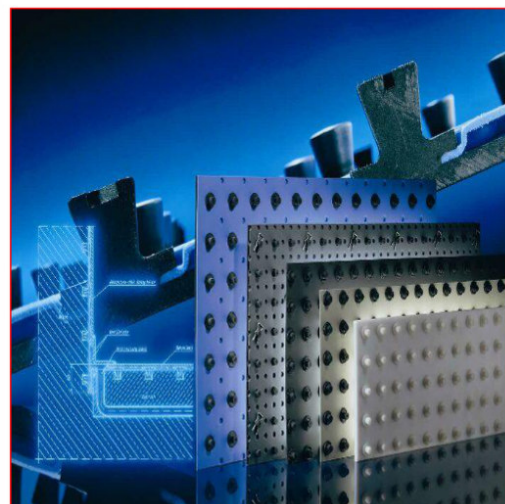




## GEOMETRY, DIMENSIONS AND WEIGHT



ØInside [mm]	Luseful [m]	e[mm]	ØExt [mm]	Weight[Kg]
1200	2,4	145	1490	5000
1400	2,4	143	1686	4248
1500	2,4	180	-1860	5894
600	2,4	170	-1940	5720
1800	2,5	195	-2190	7651
2000	2,4	200	-2400	8326
2500	2,35	250	-3000	12827
3000	Consult	300	-3600	Consult







## CONCRETE

The materials used in the manufacture of the sanitation pipes will comply with the conditions required in the current Instructions for the design and execution of concrete and / or reinforced concrete works (EHE).

COMPONENT	DEFINITION
CEMENT	CEM III / A 42.5 (45) / SR (resistant to sulphates and seawater).
AGGREGATES	Not organics impurities. Material finer than 75µm
WATER	Potable water network, Town Hall of Logroño.
ADDITIVES	No additives
CONCRETE	Resistance in cylindrical specimen Ø15 x 30cm not less than 40 N / mm <sup>2</sup> at 28 days. <ul style="list-style-type: none"> <li>Water-cement ratio will be &lt;0.45.</li> <li>Concrete absorption &lt;6%.</li> <li>Concrete alkalinity &gt; 0.85 (on request).</li> <li>Type HA-40 / S / 18 / Qb.</li> </ul>
REINFORCEMENT	Diameters of 8, 10 and 12 mm. Quality B 500 harmonizable with ASTM A 615 ES 60. Longitudinal reinforcement is of smooth wire of diameter 7mm.

## LINER COATING - HDPE

Polyethylene sheets have the following characteristics:

- Material thickness: 2.5 - 4.0 mm.
- Design anchors: conical.
- Number of anchors :> 400 Units / m<sup>2</sup>.
- Height anchors: ≥12 mm.
- Distance anchors: ≥50 mm.
- Peel strength of anchors according to manufacturing standards: ≥.2200N.
- Cutting force of anchors: ≥1,400N.
- Density: ≥0.95 kg / m<sup>3</sup>.
- Black carbon content: ≥2%.
- Water absorption: <1%.
- Tensile strength at the yield point: 18N / mm<sup>2</sup>.
- Elongation at the point of yield: 9%.
- Elongation at break (23 °)> 700%.
- Modulus of elasticity: 800.
- Shore hardness D: 60.

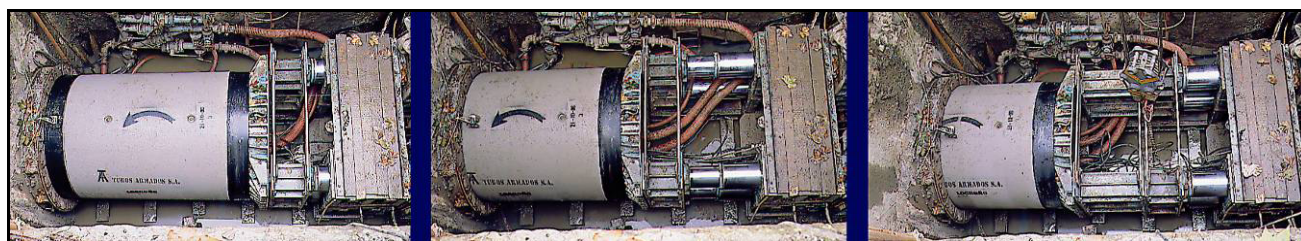


## PHYSICAL CHARACTERISTICS

Given the manufacturing process by vibrocompression, it allows us to achieve a perfectly compact concrete that allows to guarantee a necessary hydrostatic tightness and guarantee of the resistance of the concrete. Curing of the tubes can be done naturally or by generating steam.

## MECHANICAL CHARACTERISTICS

Pipes are classified by their nominal diameter and their resistant class. The pipe, once manufactured, will withstand the cracking and breaking load according to the selected classification.



## MACHINING THE PIPE

### MACHINING

Once the pipe is cured, one groove are milling in the male where the rubber gasket will be housed. This groove guarantees a perfect sealing, in addition to an improvement in the performance of placement in the tasks of joining pipes with others. In addition, when the joint is housed in a groove (box), in works under water table, the movement of said joint is prevented, also guaranteeing in these difficult conditions, the tightness of the joint. These processes of grinding and milling of the pipe are carried out with numerical control machines, achieving in all the machined dimensions minimum tolerances.





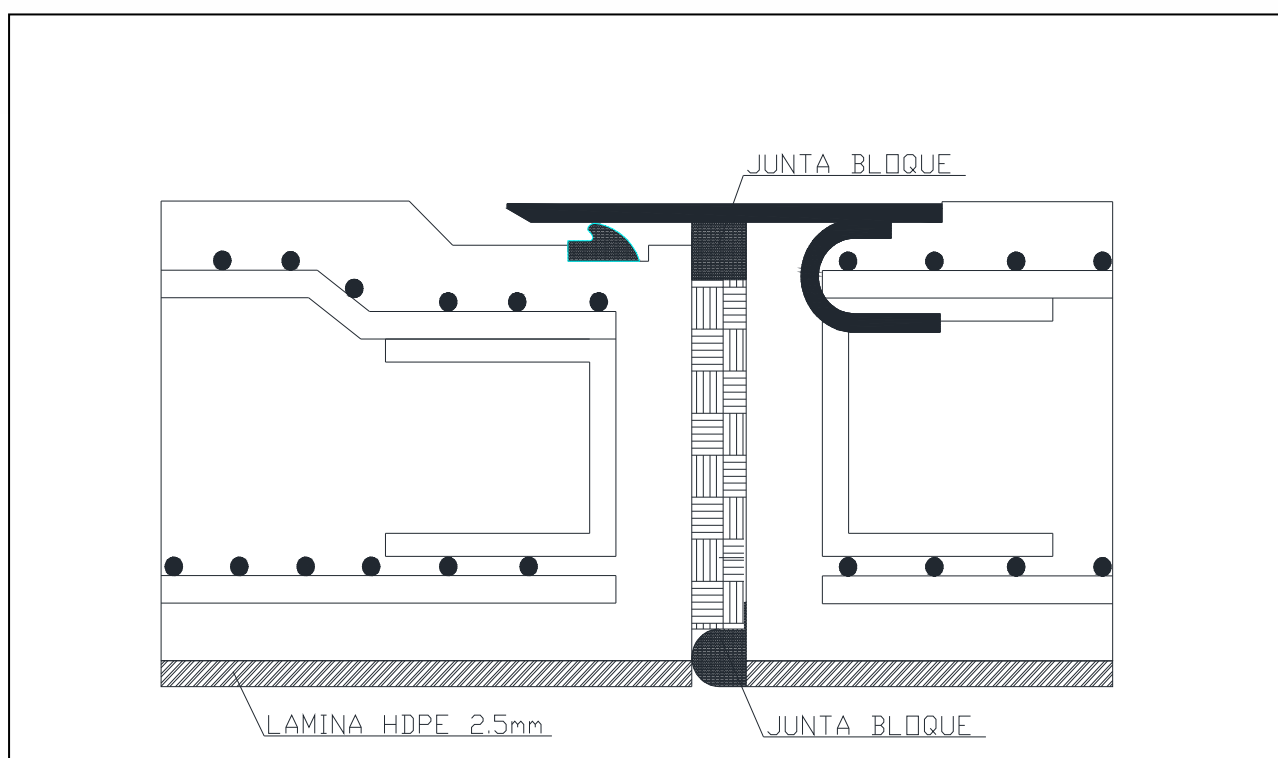
# ARENZANA PREFABRICADOS S.L.

TUBERÍA DE HORMIGÓN - HINCA - SANEAMIENTO  
 BLOQUES Y BOVEDILLAS  
 PAVIMENTOS  
 ADOQUINES Y LOSAS

## UNIONS (STAINLESS STEEL)

Shaft pipes will be provided with flexible joints by vulcanized rubber elastomeric joint complying with UNE-EN 681-1 standard which will be compressed by 8 cm stainless steel.

Jacking forces will be transmitted by knodless pine wood rings.







In order to increase the performance and performance of the pipe, the possibility of adding the following improvements:

- ☐ Safety boards to increase the degree of Sealing.
- ☐ Knotless pine wood holders with a Greater degree of compressibility.
- ☐ Bolted handling system Sausages in concrete (DEHAS).
- ☐ 1 "or 3/4" benthic slurry nozzles.
- ☐ Non-return plugs for injectors.





## SPECIAL PIPES FOR INTERMEDIATE STATIONS WITH ACTIVE JOINT

At the request of our clients and of the companies we have incorporated to our production process the manufacture of special pipes tubes with Active joint to fit the stations intermediates.



Male shield.



Recessed male with active joint.

## INNOVATIONS

Improvements applied to reinforced concrete pipes for Jacking and especially those used for the execution of "Underwater Works - Emissaries" and jacking works under water table.

## SEALING TESTS

Arenzana Prefabricados adapts to the most extreme conditions through the milling of the double-groove grooves in the male end to accommodate two rubber seals and to guarantee the tightness in the most unfavorable conditions.

In order to simulate situations of water-tight sealing at outlet levels in submarine emissaries between -10 and -30m, equipment is available to check the tightness of the joint simulating these conditions.







# ARENZANA PREFABRICADOS S.L.

ERÍA DE HORMIGÓN - HINCA - SAN  
BLOQUES Y BOVEDILLAS  
PAVIMENTOS  
ADOQUINES Y LOSAS

## UNION WATERPROOFING TEST

The sealing test of the joint shall be carried out according to the British Standard, in which it is verified that the connection between two tubes subjected to angular deflection and shear defined both by the standard does not produce leaks under the pressure of 1 atmosphere.



## TRIAL OF CONTROLLED AND BREAK

The gasket tightness test shall be carried out according to the British Standard, in which the resistant class of the tube is checked. The tube, supported by sleepers, is subjected to a load by a third sleeper at the speed and pressure indicated by the standard, exceeding the figure-controlled load and the breaking load.



TUBERÍAS DE HORMIGÓN, BORDILLOS, BLOQUES, BOVEDILLAS, LOSAS Y ADOQUINES

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# ARENZANA PREFABRICADOS S.L.

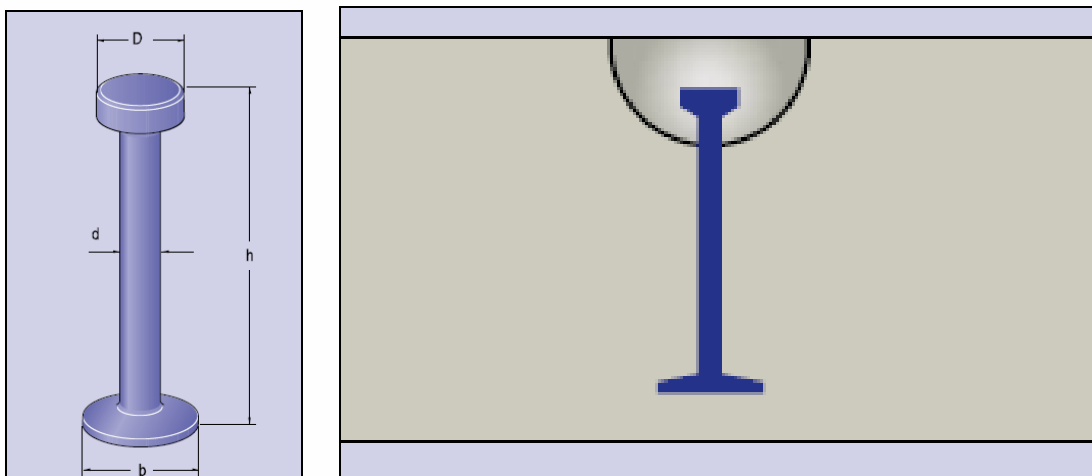
ERÍA DE HORMIGÓN - HINCA - SANE  
BLOQUES Y BOVEDILLAS  
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## DOWNLOAD SYSTEM

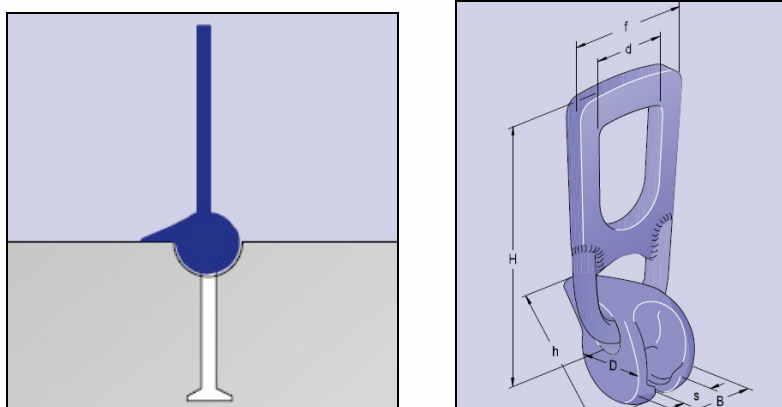
Lifting bolts (also called Dehas) are discharge elements used to transport precast concrete slabs and tubes.

### Geometry and use

The bolts are embedded in the concrete tube at the time of its manufacture, as shown in the following figure, ensuring its good anchoring in the prefabricated.



Its geometry allows to use Lifting claws that are hooked to the bolt to be able to transport the tube. With the flange facing up, the claw is inserted into the bolt inside the concrete hollow intended for its housing. Once it has been inserted the flange is turned until it is horizontal towards the outside of the tube (not towards the center of it), in this way the bolt remains inside the claw and secured, as shown in the following figure.







The tube has two units aligned longitudinally \*. For the handling of the pipe a two-hand chain is supplied as well as the lifting jaws. During the handling of the tube there should be no personnel under or within a radius of 5m around the tube.



Note: ARENZANA PREFABRICADOS, S.L reserves the right to alter the dimensions and characteristics of the products outlined in this sheet due to technological improvements and regulatory requirements.