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**APPLICATION OF STUFFING BOXES AND SLEEVES FOR THE PASSAGE OF PIPELINES THROUGH THE WALLS OF FOUNDATIONS**

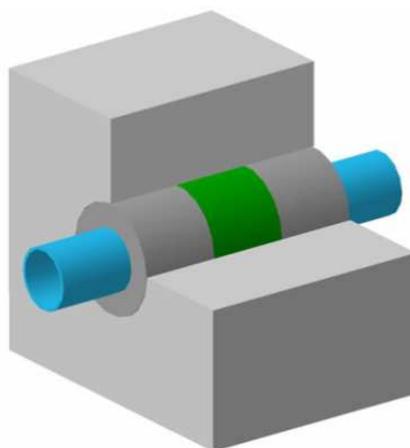
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*The article analyzes the existing options for pipe penetration through the foundation or basement wall. The main methods of the setting joints using sleeves and stuffing boxes are considered. The main advantages and disadvantages of each technology used are highlighted.*

**Keywords:** pipeline, glands, nodes, tightness, efficiency, sleeve.

The technology of setting a passage for a pipeline through a wall depends on the materials used and the type of structure. An incorrect executed pipeline assembly, is a potential hazard of accidents leading to losses. When laying a pipeline during the construction of various structures, the passage of pipes through walls is set by using sleeves and stuffing boxes. This part prevents the penetration of moisture into the structure. At the moment, the use of stuffing boxes and sleeves is in the first place for constructing a sealed joint. The setup of stuffing boxes and sleeves are quite reliable and fully comply with the requirements for them. On the other hand, it can be said that these two methods, despite their cost, are quite laborious, in addition to this, the probability of poor-quality installation of the node itself is high.

During the installation of such joints, a layer-by-layer filling of a seam with special compositions is used, which in turn prevents the ingress of moisture. The gaps that remain between the passable pipes and the bodies of the installed stuffing boxes in the future must be tightly packed. The thickness of the previously received packing should exceed the size of the gap. Packing material should be compacted layer by layer by strong blows of the hammer on the caulk or with the help of pneumatic tools. To a crucial degree, the functionality and efficiency of the packing is determined by the material properties of the packing itself. To ensure the efficient operation of the packing seals, they need to be given a whole range of qualities, the most important of which, along with the lowest possible friction coefficient, is resistance to various influences. The chemical resistance to compacted fluids, thermal resistance to high and low temperatures, mechanical resistance to wear and other mechanical stresses. The easiest way to protect the pipeline from transferring the load of walls and foundations, is to use a "sleeve" (Figure 1).



**Figure 1. – A joint using a metal sleeve**

Most often, the sleeve is a piece of pipe having a larger diameter than the diameter of the pipeline being passed through the wall, sometimes with additional reinforcement elements. This type is used in cases where the probability of deformation of the hole or displacement of the wall or ceiling is sufficiently small. In most cases, when using sleeves, a packing is used that fills the free space between the outer surface of the pipeline and the inner surface of the sleeve itself. A sleeve for the pipeline is a main element. This applies to communications of various facilities – residential, offices or industrial. The item performs a number of functions: mechanical, protective, waterproofing, fire-resisting, sanitary, and also increases the service life of pipelines and facilitates their replacement.

The appliance of sleeves for the pipeline depends on its type: cold and hot water supply; drainage system; heat conduit.

The reasons for using cases (sleeves) when laying main lines through “barriers”:

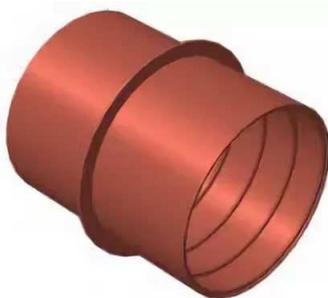
- the mobility and sensitivity of the direct sections of the compound to temperature extremes;
- the sleeve will protect the structure from seasonal or due to increased strain deformation;
- hypothetical need for the repair, dismantling or replacement of a fragment of the main line; the sleeve allows to carry out these manipulations without destroying the building elements [1].

The main advantages of sleeves:

- speed of installation and cheapness of this node;
- element maintains its integrity when exposed to dynamic loads;
- high degree of protection of the main pipe from various kinds of defects.

Among the disadvantages are such points as:

- the complexity of sealing the joint between the pipe and the sleeve;
- high probability of moisture penetration when working in moisture-saturated soils.



**Figure 2. – Stuffing box**

The next type, the stuffing box – stuffed (Figure 2). It has a more complex structure compared to the sleeve. Unlike a sleeve, a stuffing box always has reinforcement elements – this is the outer ring and the inner ribs. Stuffed glands are designed to pass metal pipes through the walls of water supply and sewage facilities in wet and dry soils. Stuffing boxes can be used with a pressure drop on it of not more than 0.1 MPa (10 m of column water), a temperature not higher than +50 ° C in non-aggressive media [2].

The outer ring is used to secure the gland in the wall and prevent its displacement. Internal ribs play a dual role: first, they are additional stiffening ribs, and secondly they keep the stuffing box. The presence of internal ribs in the stuffing box allows you to tamp

the packing more tightly, which reduces the permeability of the whole structure, and, accordingly, reduces the likelihood of moisture inside the room.

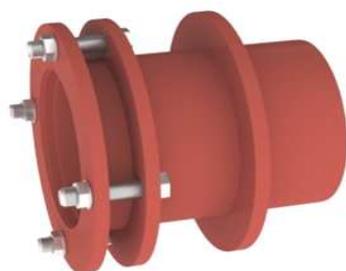
The advantages include:

- high tightness of this joint with moisture saturated soils;
- reliable fixation of the gland in the design.

The main disadvantages are:

- the need to use a special technology of stuffing the joint;
- the cost of this gland is much higher than the liner.

The most complex design has – pressure gland (Figure 3). A product of this type is a double case (rather than a single case, like a sleeve or a stuffed box gland). Both the one and the second housing of the pressure gland have welded flanges with matching holes on one side.



**Figure 3. – Pressure stuffing box**

Such design features, allow even more dense pressing of the stuffing box and, accordingly, almost completely exclude moisture from the external soil through the structure into the room. To facilitate the installation of the inner part of the housing pressure gland often made split, that is, with a cut along the body [3].

Pressure seals are presented in a fairly extensive model range with different diameters and lengths. These are such products for pipeline installation as special metal sealing devices, due to which it is possible to pass sewage, water and sewer pipes easily and quickly through absolutely any structures in wet and dry soils.

Pressure seals of various series are able to withstand increased loads, to work for a long time without failing, ensuring the normal functioning of the pipeline.

At the same time, the glands withstand pressure drops of 0.1...5 MPa, as well as temperatures from –50 to +400 degrees [4].

The advantages include:

- high tightness when exposed to groundwater, and other unfavorable factors;
- extensive range.

The main disadvantages are:

- high price category;
- the design is not complete, consists of numerous details.

A gas-tight seal is used for individual structures. The installation site of the gas-tight gland is the foundation (with minor axial movements). Structurally, the gland is made on the basis of the gland compensator series 4.903-10 issue 7, with a modified length of the body (adjusted depending on the wall thickness) and the replacement of the internal pipe by the heating main pipe. An anti-corrosion coating is applied on the gas-tight seal T1 outside and inside (with BT-177 paint in two layers on the primer GF-020). The price of the gas-tight seal is formed depending on the model chosen, as well as the conditional diameter of the product and the material of execution [5].

The advantages include:

- high tightness in liquid and gaseous media;
- extensive range.

The main disadvantages are:

- high price;
- the design is not complete, consists of numerous details;
- the need to comply with high accuracy when installing the gland in the design.

The analysis of the options of sleeves and stuffing boxes for passing pipes through the foundation showed that the main point is the sealing of this site. The use of various structural models is not advisable without the use of modern sealing materials, which play an important role in preserving the integrity of the pipe and protecting the ingress of moisture into the interior of the structure. At the moment, with the appearance on the market of the newest sealing compounds, the technology for stuffing such joints is very outdated, and requires consideration of this issue from another side.

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#### ПРИМЕНЕНИЕ САЛЬНИКОВЫХ КОРОБОК И ВТУЛОК ДЛЯ ПРОХОЖДЕНИЯ ТРУБОПРОВОДОВ ЧЕРЕЗ СТЕНКИ ФУНДАМЕНТОВ

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*Анализируются существующие варианты прохождения труб через фундамент или стену подвала. Рассмотрены основные способы установки стыков с использованием втулок и сальников. Определены основные преимущества и недостатки каждой из используемых технологий.*

**Ключевые слова:** *трубопровод, сальники, узлы, герметичность, эффективность, втулка.*