



# BURIED JOINTS

## **AGOM INTERNATIONAL SURL**

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## ***Building and engineering***

Bridges are subjected to movements and rotation caused by traffic, temperature changes, earthquakes, shrinkage, post-tensioning, creep, etc. Bridge construction requires carefully designed and manufactured bearings, anti-seismic devices, shock absorbers and expansion joints to ensure that such forces are properly dealt with throughout the life of the structure.

AGOM has over 50 years experience in design and manufacturing of bridge bearings, bridge expansion joints, anti-seismic devices and shock absorbers for the bridge-building and construction industry. All products comply with the latest European standards and all main international standards.



The quality and durability of these products are ensured by:

- our team of skilled engineers to conceptualise and design the most appropriate engineering solutions
- qualified professionals trained and continually updated in quality production techniques
- virgin raw materials that are quality assessed in our on-site testing laboratory
- ISO 9001:2008 quality standard accreditation
- strict quality control processes
- periodical external inspections by globally recognized bodies such as the Polytechnic University of Milan and Certiquality



## ***Bridge Deck Movements***

The horizontal movements of a bridge superstructure are due to :

- Temperature expansion and contraction
- Shrinkage of concrete
- Shortening of concrete due to creep effect
- Elastic shortening
- Movements due to induced external loads (e.g. earthquake, wind, vehicular braking etc.)



### Temperature

Temperature variations cause both expansion and shortening of the bridge deck and are usually computed as a plus and minus range about a mean structure temperature which occurs when the superstructure is placed on the bearings. Temperature differentials also occur in the deck from top to bottom and from one side to other side of the deck. Temperature differentials through the depth of the deck have little effect on the bearings and piers but those from one side of the deck to the other cause the deck to bend in plan which results in horizontal forces on the bearings and piers.

### Shrinkage of concrete

Shrinkage of concrete results in the shortening of the bridge superstructure. This effect depends upon factors such as quality of concrete used, size of the member, relative humidity and time after casting.

### Shortening due to creep effect

Effect of creep of concrete under post-tensioning and other permanent loads results in the shortening of the superstructure. It is a time dependent effect.

### Elastic shortening

This phenomenon occurs in case of pre-stressed superstructure during post-tensioning. The amount of shortening depends on the stage at which the superstructure is placed on the bearings and also at what stage it is post-tensioned. Sometimes, partial or complete tensioning may be carried out before the superstructure is placed on the bearings thus eliminating this shortening from affecting the bearings at least partly.

### ***Buried joints series***

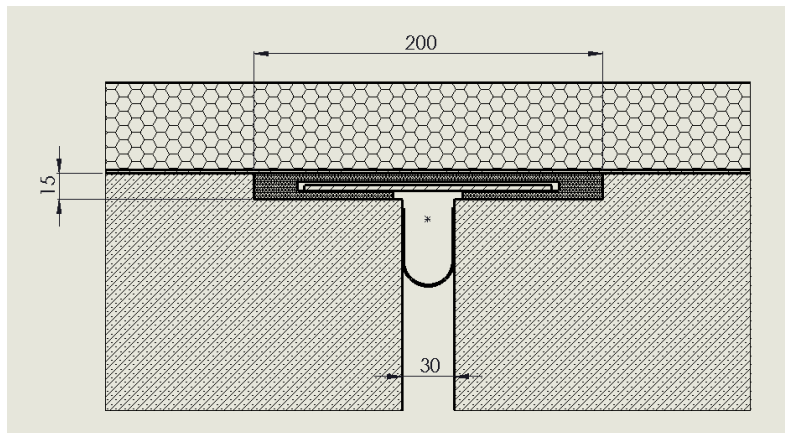
Buried expansion joints are designed and manufactured for small movements between structures, up to  $\pm 25$  mm. These joints are generally put under the asphalt, in order to guarantee the continuity of the surface of vehicle transit.

They are often associated to kinematic chain system, that will absorb the longitudinal forces.

<b>Feature</b>	<b>Benefit</b>
Quality	Made of certificated materials.
Efficiency	Minimal maintenance requirements.
Easiness	Easy to install.
Comfort	Asphalt is not interrupted, so increasing the comfort of vehicles.
Maintenance of road	No problem for snowploughs.

### **AGEJS buried joint**

AGEJS buried expansion joint is made of a rubber extruded profile that is reinforced with a steel plate. It can accommodate movements between structures up to  $\pm 17.5$  mm. This joint is generally put under the asphalt, in order to guarantee the continuity of the surface of vehicle transit.



*Typical current section*

### **MATERIALS**

The rubber used for this kind of joint is EPDM.

The reinforcement plate is made of steel S235JR EN10025, zinc coated to resist to corrosion.

Waterproofing can be increased by a strip stuck on the vertical edges of the opposite structures.

### **INSTALLATION**

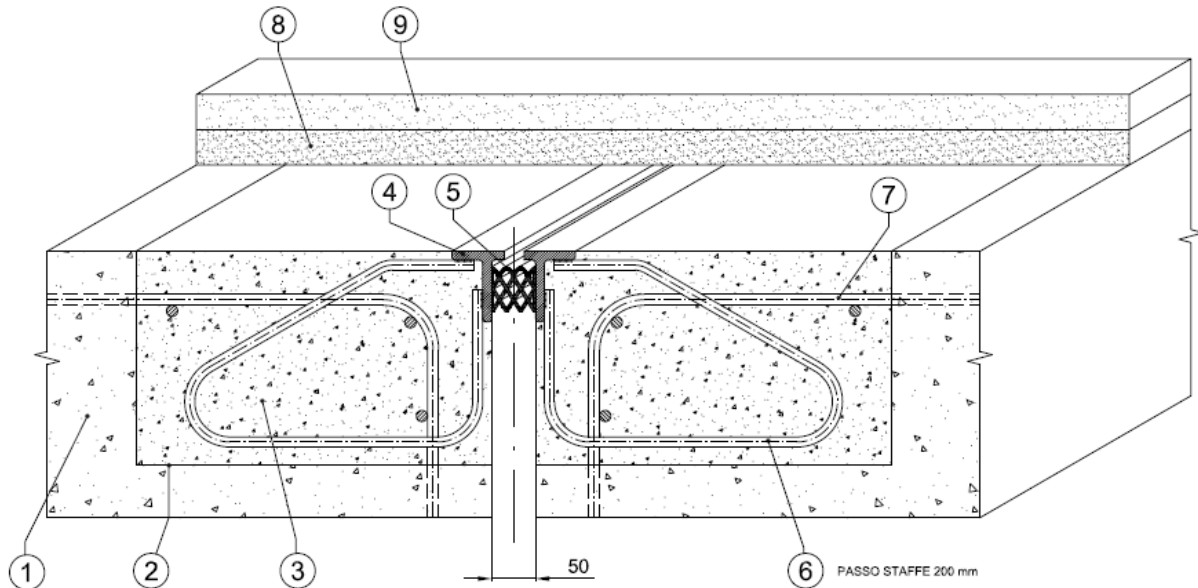
The phases of installation are briefly described here below.

1. Prepare the space for the joint, by leaving adequate blocks during concrete casting.
2. If necessary, cut and stick the waterproofing strip to the opposite concrete structures by using an adequate adhesive (Kimitech EP-TX or equivalent).
3. Clean the upper surface of concrete.
4. After inserting the reinforcement plates, put the joint in its definitive position.
5. Seal possible clearances between joint and concrete.
6. If necessary perform the continuous waterproofing over the joint.
7. Spread the asphalt.



## AGFJS buried joint

AGFJS buried expansion joint is made of a couple of steel profiles connected to the concrete structures, with a rubber extruded profile inserted in the gap. It can accommodate movements between structures up to  $\pm 25$  mm. This joint is generally put under the asphalt, in order to guarantee the continuity of the surface of vehicle transit.



*Typical current section*

## MATERIALS

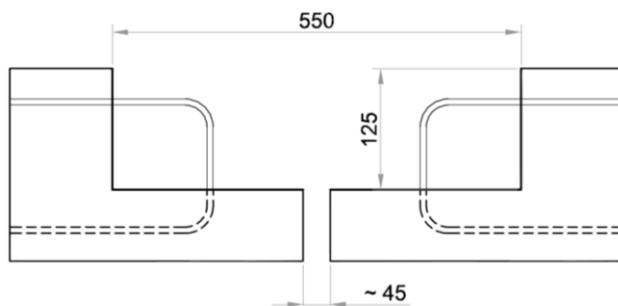
The rubber used for the extruded profile is EPDM.

The angular profiles are made of steel S235JR EN10025, to whom stirrups are welded to guarantee connection with concrete structures.

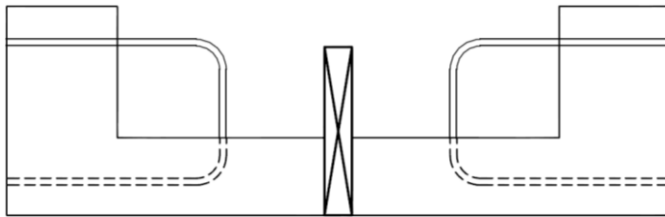
## INSTALLATION

The phases of installation are described here below.

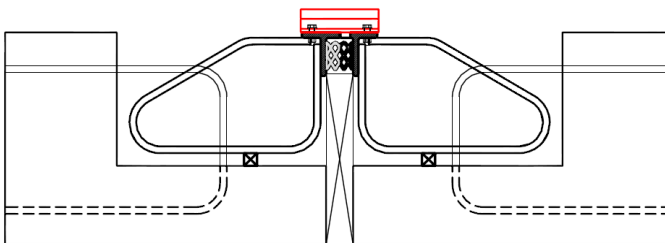
1. Prepare the zones for anchoring with the dimensions shown in the drawings of the project, by leaving adequate blocks during concrete casting (or partially demolishing existing structures).



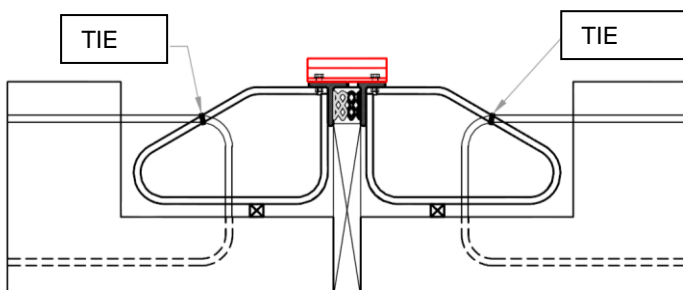
2. Position a template between structures (polystyrene) with the width of design gap.



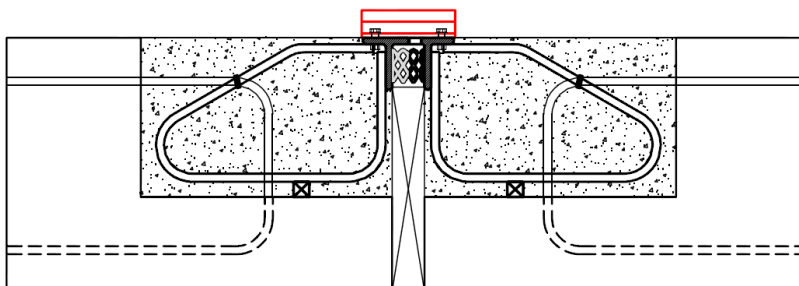
3. Position the steel modulus on adequate supports (i.e. wooden), using the template as reference for final gap. Don't remove the red plates in this phase.



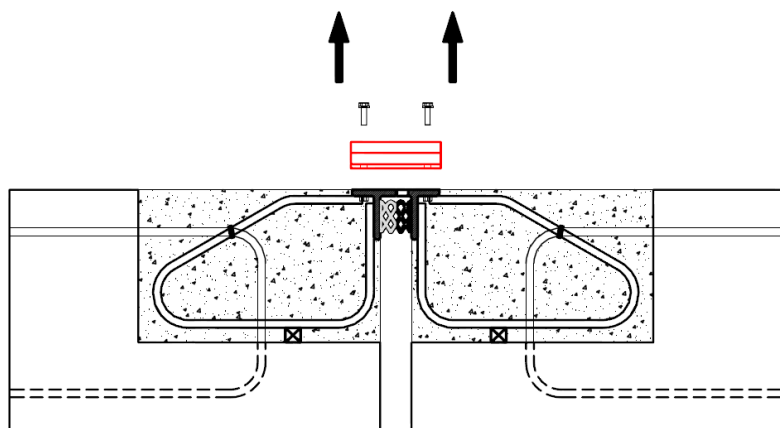
4. Tie the stirrups of the joint with the existing rebars.



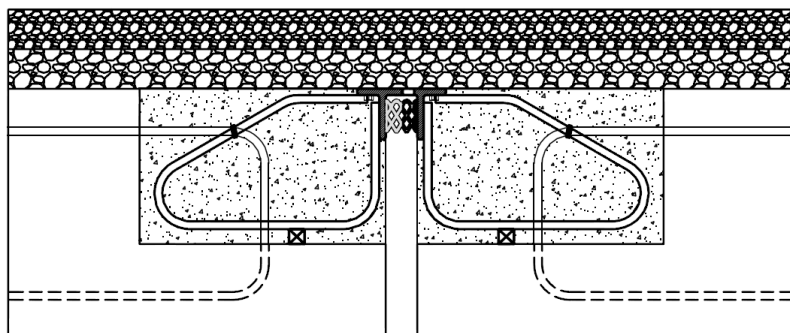
5. Cast the completing concrete.



6. Remove the red temporary plates and the polystyrene template. The rubber profile can be inserted also at this step: it's crucial it's compressed between the angular steel profiles.



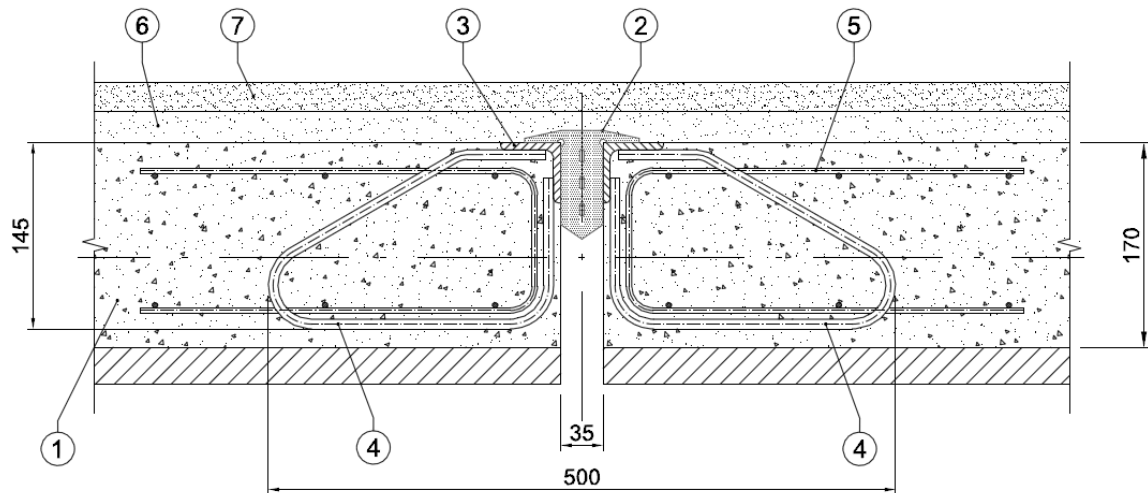
7. Spread the asphalt.





## AGKJS buried joint

AGKS buried expansion joint is made of a couple of steel profiles connected to the concrete structures, with a rubber extruded profile inserted in the gap. It can accommodate movements between structures up to  $\pm 20$  mm. This joint is generally put under the asphalt, in order to guarantee the continuity of the surface of vehicle transit.



*Typical current section*

## MATERIALS

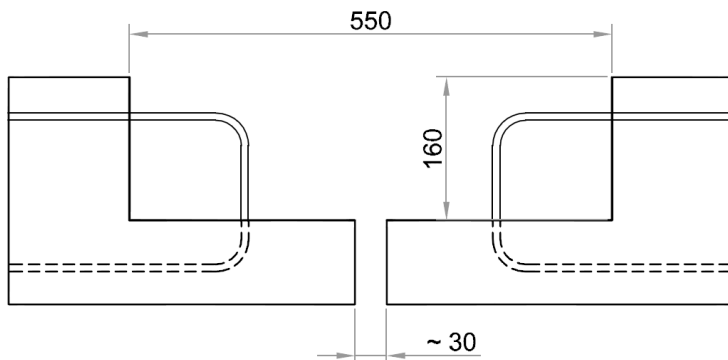
The rubber used for the extruded profile is EPDM.

The angular profiles are made of steel S235JR EN10025, to whom stirrups are welded to guarantee connection with concrete structures.

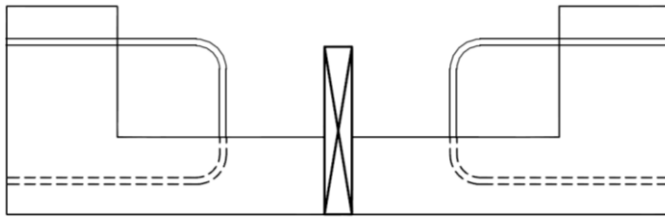
## INSTALLATION

The phases of installation are described here below.

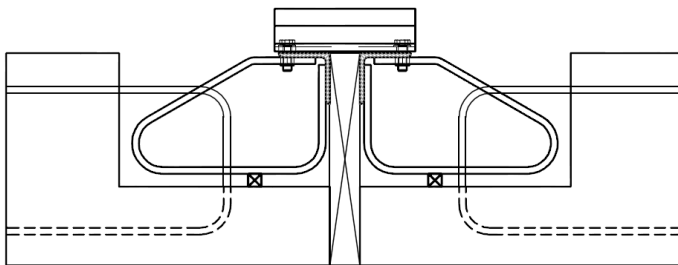
1. Prepare the zones for anchoring with the dimensions shown in the drawings of the project, by leaving adequate blocks during concrete casting (or partially demolishing existing structures).



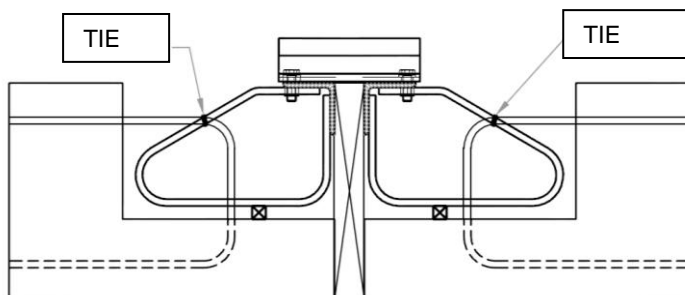
2. Position a template between structures (polystyrene) with the width of design gap.



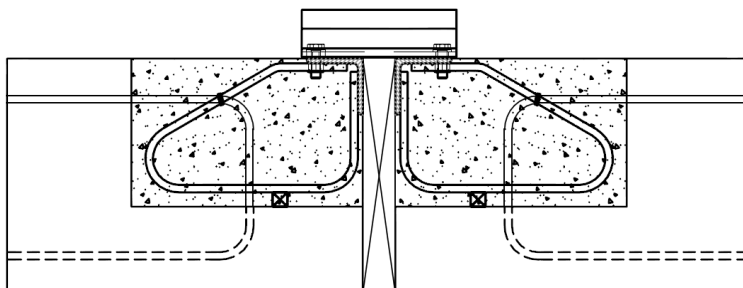
3. Position the steel modulus on adequate supports (i.e. wooden), using the template as reference for final gap. Don't remove the red plates in this phase.



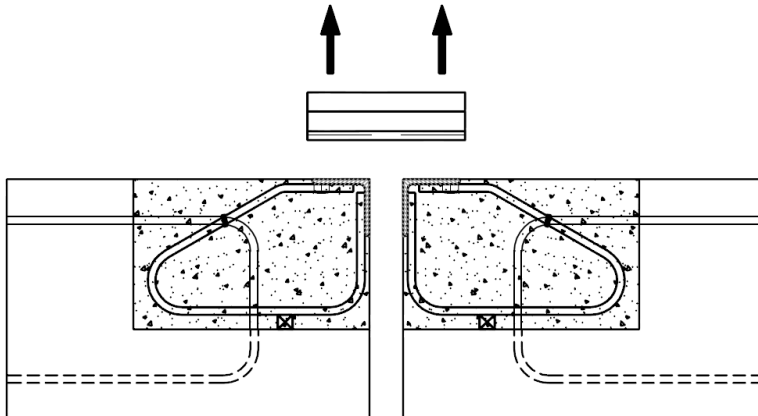
4. Tie the stirrups of the joint with the existing rebars.



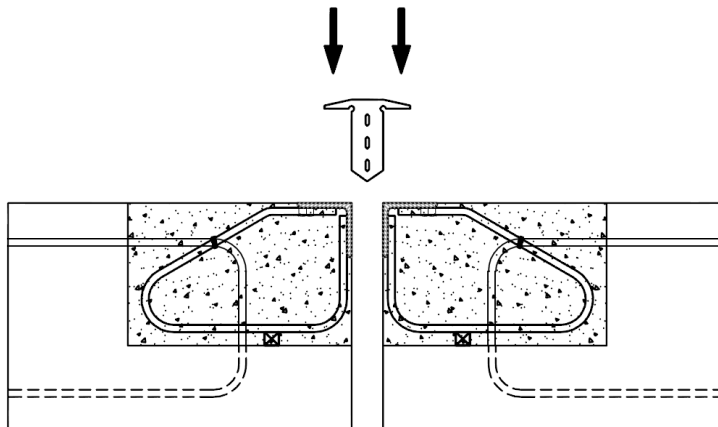
5. Cast the completing concrete.



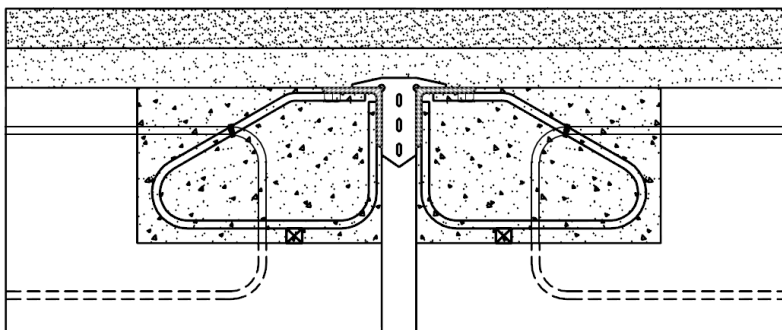
6. Remove the red temporary plates and the polystyrene template. The rubber profile can be inserted also at this step: it's crucial it's compressed between the angular steel profiles.



7. Insert the rubber profile: it's crucial it's compressed between the angular steel profiles.



8. Spread the asphalt.



## Materials

Structural steel properties comply with EN 10025.

grade	resiliency min (20°C) [J]	elasticity modulus [MPa]	tensile strength [MPa]	yielding stress min $F_y$ [MPa]						
				<i>nominal thickness [mm]</i>						
				≤16	>16	>40	>63	>80	>100	>150
					≤40	≤63	≤80	≤100	≤150	≤200
S235JR	27	206000	360÷510	235	225	215	215	215	195	185
S275JR	27	206000	410÷580	275	265	255	245	235	225	215

Welded stirrups are made of Fe B44 K.

Rubber profile are made of compound EPDM 65, whose typical properties are the following.

<i>Property</i>	<i>Test method</i>	<i>Typical certificate value</i>
Density	ISO 2781 A	1,24 g/cm <sup>3</sup>
Hardness	ASTM D 2240	67 ShA
Tensile strength	ISO 37 - tipo 1	10,6 N/mm <sup>2</sup>
Elongation at break	ISO 37 - tipo 1	350%
Brittleness	ISO 812	-52°C

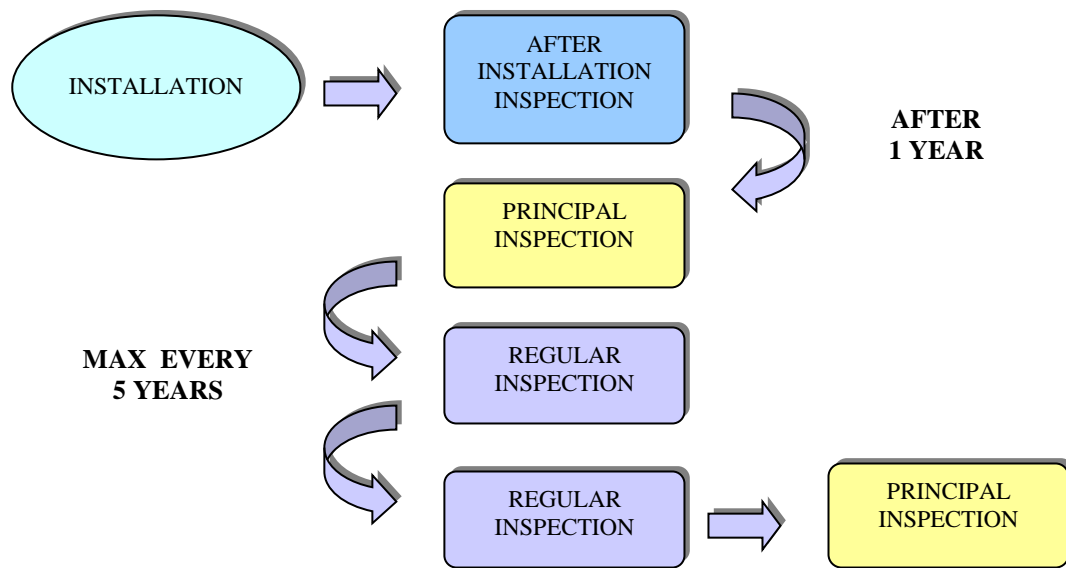
### ***Maintenance and replacement***

AGOM AG\_JS expansion joints are designed to be free from maintenance, as they are put in a zone generally not reachable.

We suggest to perform the following inspections to guarantee the joint right functioning:

1. a first inspection just at the end of installation to verify the right positioning;
2. an inspection after a year of service, in order to visually detect any eventual damage of the asphalt in the adjacent zones of joint; during inspection, the asphalt surface must be checked in order to verify there are no significant damages due to transit of unexpected vehicles (example excavator vehicle) or damages due to crashes (lost of fuel or surface burning). If joint elements damages occurred, AGOM technicians must be contacted and eventually the element shall be replaced.
3. a visual inspection per five years in order to detect damages due to traffic. During this inspection the same items already described at point 2 of this procedure (inspection after one year) shall be repeated to ensure the expansion joint right functioning.

In any case if any particular problems are detected, the inspector shall call AGOM International to have a guidance to correctly operate.



If replacement is necessary, installation phases shall be repeated, after demolishing the concrete parts included in the blockout and removing the existing joint.



**MORE THAN 50 YEARS EXPERIENCE DESIGNING AND MANUFACTURING DEVICES FOR CONSTRUCTION, OFFSHORE AND INDUSTRIAL MARKETS**



**Bridge bearings**

- Elastomeric Bridge bearings
- Pot bearings
- Spherical bearings
- Incremental Launching bearings
- Horizontal load bearings
- Special bearings

**Seismic Isolators**

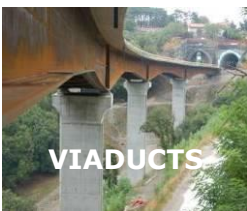
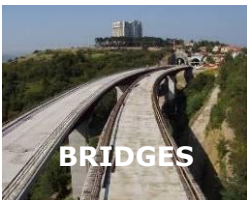
- High damping rubber bearings
- Lead core rubber bearings
- Multilayer rubber bearings
- Shock transmitters
- Shock absorber
- Rubber dampers

**Expansion joints**

- Elastomeric joints
- Joints for high movements
- Finger joints
- Buried joints
- Railway joints

**Services**

- Design
- Consulting
- On site assistance
- Installations
- Tests
- Inspection



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