

## Complete Calculation of Lame Plinth at Constant Height

In the technique of structures, a foundation plinth rendered incomplete by the removal of a part, is known as 'lame'. This operation is sometimes appropriate due to constructional requirements, mainly related to the particular conditions of the site in which the foundation must be lodged. This is particularly relevant for reinforced concrete buildings, which must be constructed in adherence to a pre-existent building.

The atypicalness of this structure – even if efficacious – relates to both its geometric configuration (on account of its location however, this aspect is quite negligible) and, above all, to the fact that, with respect to a complete plinth of similar dimensions and with soil of similar soil load-bearing capacity, the lame plinth can support a substantially lower load, or the same load as a complete plinth of a similar size and with a considerable increase in the soil load-bearing capacity, or – again – the same load with the same soil load-bearing capacity and with a considerable increase in plinth dimensions. On the basis of the above observations, this structure should be used in exceptional circumstances.

I have developed the complete calculation for lame plinth, with the following aims:

- to fill in the gaps in how this topic is treated in the technical literature consulted;
- to introduce prescriptive considerations for establishing the shear creep stress. In fact, this calculation may be made with respect to the foundation part alone, defined – in the shears diagram – from the maximum operating value in the fixed joint section in correspondence with the pier and from the minimum prescriptive value, below which the shear reinforcement is not required.

The method adopted is the classic 'Trapezium', the applicability of which (as is widely known) is based on the condition that the span of the individual brackets, into which the plinth can be disassembled, is greater than the height of the fixed joint section (principle of Saint-Venant) and on the hypothesis of the linearity of the soil pressures diagram, consequent to the condition that the contact surface between the foundation and the soil remains level during operation.

The more rigid the foundation, the more closely this schematization resembles real behavior. A completely innovative aspect of the proposed study concerns dividing up the bracket structure by actual cuts – rather than virtual – according to the vertical planes between the edges of the upper pier and the corresponding edges of the foundation. In this way, each bracket can really buckle freely and independently from the others due to the useful reaction.

Each bracket, bending according to a cylindrical surface, behaves like a cantilever truss, with the difference that the inflexional rigidity of the transverse section is equal to  $EJ/(1 - \nu^2)$ , meaning that it is affected by the Poisson coefficient, due to the fact that since the section is not narrow but varies linearly from  $a$  to  $A$  and from  $b$  to  $B$ , its side contraction is prevented.

However, since the reinforced concrete is  $\nu = 0.1$  on average – therefore, very small – its influence is negligible and, so rigidity may be assumed equal to  $EJ$ . The real division of the plinth into brackets independent from one another releases them from the obligation of respecting mutual congruence, without invalidating – in compliance with the equilibrium – the essential hypothesis of continuity and linearity of the soil pressures diagram.

In practice, the division of the plinth may be carried out easily by placing diaphragms – for example, polystyrene slabs – between the adjacent contact surfaces of the brackets when the concrete is laid. This study examines the situation of a constant height plinth with rectangular basis. I think that the proposed study is interesting from the theoretical-teaching aspect and useful from technical-professional aspect.