**PROBLEM**

The case study selected is a parallelepiped service building with two levels, located in an urban context, to function as a museum. The architects wanted to create an articulated truss type structure to support the entire span of the coverage slab of the building. It was desired that the height dimension of the truss solution adopted would be the less possible depth.

**SELF-WEIGHT OF THE STRUCTURE – LOAD**

Table 2 Self-weight of the concrete slab and of the steel S275.

|  |  |  |
| --- | --- | --- |
| Material | Metric | Value |
| Concrete slab (coverage) | Specific weight (gconcrete) | 25 KN/m3 |
| Volume (Vslab) | 290,16 m3 |
| Self-weight (ppslab) | 7254 KN |
| Steel S275 (truss) | Specific weight (gsteel) | 76,5 KN/m3 |
| Volume (V steel) | variable (depends on depth) |
| Self-weight (ppS275) | variable (depends on depth) |

Vslab=0,5m\*37,2m\*15,6m

**REGULATION – MAXIMUM DISPLACEMENT LIMIT**

The different truss type solutions were evaluated according to the regulation EN1993-1-1, adopted by European countries (Standardisation, 2005). The national annex for the vertical deflections defines that in the case of a service building with multi-story, a limit of L/250 can be adopted, where L is the horizontal span of the building at the floor level of about 6,4 m. This translates into a limit of 2,56 cm.

**RESULTS**

Table 1 shows the maximum displacement results obtained.

Table 1 The maximum displacement obtained for each of the case study variations evaluated.

|  |  |  |  |
| --- | --- | --- | --- |
| Case Study | Depth (m) | Load (KN per node) | Maximum displacement on node (UZ / cm) |
| Spacial Warren with verticals with 6 modules | 0,81 | -9,8347 | -5,8783 |
| 1,00 | -9,8631 | -4,0105 |
| 1,10 | -9,8790 | -3,3924 |
| 1,13 | -9,8839 | -3,2384 |
| 1,22 | -9,8989 | -2,8431 |
| 1,23 | -9,9006 | -2,8045 |
| 1,30 | -9,9125 | -2,5591 |
| 1,33 | -9,9177 | -2,4658 |
| 1,34 | -9,9195 | -2,4361 |
| 1,41 | -9,9318 | -2,2459 |
| 1,45 | -9,9389 | -2,1497 |
| 1,68 | -9,9811 | -1,7266 |
| 2,12 | -10,0661 | -1,2819 |
| Spacial Warren with verticals with 8 modules | 0,63 | -5,7344 | -7,2321 |
| 0,81 | -5,7624 | -4,5465 |
| 1,00 | -5,7948 | -3,1298 |
| 1,05 | -5,8037 | -2,8790 |
| 1,12 | -5,8164 | -2,5832 |
| 1,14 | -5,8201 | -2,5086 |
| 1,17 | -5,8257 | -2,4040 |
| 1,18 | -5,8275 | -2,3709 |
| 1,23 | -5,8369 | -2,2177 |
| 1,30 | -5,8502 | -2,0329 |
| 1,50 | -5,8893 | -1,6442 |
| 1,76 | -5,9419 | -1,3323 |
| Spacial Warren with verticals with 10 modules | 0,89 | -3,8528 | -3,2163 |
| 0,96 | -3,8659 | -2,8242 |
| 1,00 | -3,8735 | -2,6364 |
| 1,01 | -3,8754 | -2,5930 |
| 1,02 | -3,8773 | -2,5508 |
| 1,03 | -3,8792 | -2,5099 |
| 1,05 | -3,8831 | -2,4316 |
| 1,10 | -3,8929 | -2,2546 |
| 1,25 | -3,9228 | -1,8478 |
| 1,42 | -3,9577 | -1,5390 |
| Spatial Pratt with 6 modules | 0,85 | -9,8405 | -5,4514 |
| 0,91 | -9,8494 | -4,8395 |
| 1,00 | -9,8631 | -4,1200 |
| 1,11 | -9,8807 | -3,4675 |
| 1,26 | -9,9057 | -2,8392 |
| 1,36 | -9,9230 | -2,5318 |
| 1,49 | -9,9461 | -2,2226 |
| 1,64 | -9,9736 | -1,9557 |
| 1,69 | -9,9830 | -1,8828 |
| 1,87 | -10,0172 | -1,6701 |
| 1,96 | -10,0346 | -1,5869 |
|  |  |  |  |
| Spatial Pratt with 8 modules | 0,83 | -5,7657 | -4,7190 |
| 0,97 | -5,7895 | -3,6341 |
| 1,00 | -5,7948 | -3,4584 |
| 1,05 | -5,8037 | -3,1981 |
| 1,21 | -5,8332 | -2,5707 |
| 1,25 | -5,8407 | -2,4504 |
| 1,36 | -5,8618 | -2,1735 |
| 1,53 | -5,8953 | -1,8606 |
| 1,60 | -5,9094 | -1,7614 |
| 1,74 | -5,9378 | -1,6006 |
| 1,81 | -5,9522 | -1,5355 |
| Spatial Pratt with 10 modules | 0,86 | -3,8472 | -3,9051 |
| 0,95 | -3,8640 | -3,3209 |
| 1,00 | -3,8735 | -3,0616 |
| 1,05 | -3,8831 | -2,8381 |
| 1,13 | -3,8988 | -2,5404 |
| 1,33 | -3,9391 | -2,0201 |
| 1,43 | -3,9598 | -1,8409 |
| 1,51 | -3,9765 | -1,7243 |
| 1,58 | -3,9912 | -1,6381 |
| 1,71 | -4,0189 | -1,5089 |
| 1,85 | -4,0490 | -1,4046 |
| 1,97 | -4,0751 | -1,3371 |