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Geotechnical zoning of urban foundations: Avilés case study (N Spain)

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The purpose of this paper is to carry out a geotechnical evaluation of the underground within an urban setting in relation to types of foundations, and particularly at expansion zones. The ultimate aim is to produce a foundation zonation map at the scale 1:10,000. Furthermore, a general methodology that way be extrapolated to other cities is proposed. This work focused on the city of Aviles like a case study; a medium-sized city which has significant industrial and port areas and singular equipment in its surroundings.
This city is located in the Spanish north coast and spread out on both flanks of the Avilés stuary. This means that there are an important development of recent deposits that implies different geotechnical units with a highly variable behavior, generally poor. In contrast, the bedrock is more homogenous, formed by Permo-Triassic red clay and marl. Locally there are also outcrops of carbonates and conglomeratic Jurassic levels. Also, on the whole area is important to note the presence of heterogeneous anthropic deposits along the whole area as a consequence, mainly, of an intense industrial activity.
Permo-Triassic clayey and marly materials imply special engineering issues in foundations as a consequence of their composition (likely weathering, presence of gypsum, low bearing capacity). Moreover, recent deposits (marine and alluvial origin) show different geotechnical behaviors depending on their geometry and grain size. Hence, many areas of the city are especially problematic when designing and implementing foundations.
The methodology followed in this study consisted in elaborating a geological-geotechnical exhaustive survey of the urban underground on a scale of 1/10.000. Based on this, a multi criteria analysis of the identified geotechnical units was carried out taking into consideration all the lithological, geomorphological, hidrogeological and geotechnical aspects. Taken into account all of these criteria, a number of areas are defined based on their foundation conditions: i) good ground conditions (rocks: UCS > 25 MPa); ii) acceptable ground conditions (rocks: UCS 5-25 MPa); iii) bad ground conditions (soils and rocks: UCS < 5 MPa and sulfate rich soils) and iv) problematic ground conditions (special geological hazards).
A foundation zonation map is a basic document for adequate land-use planning for instrastructures and edification, being useful to society, industrial and public sectors.