

## Neighboring Construction

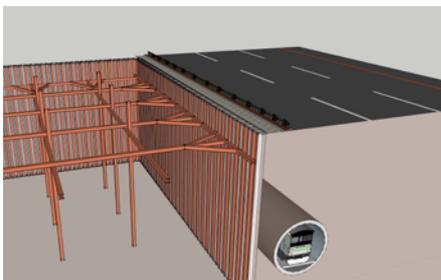
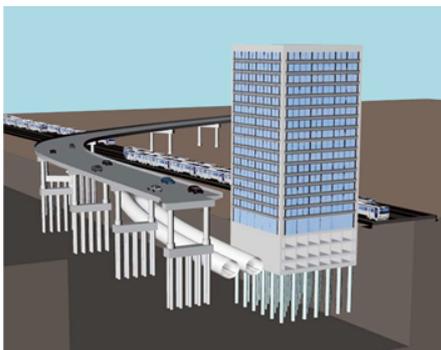
Most social infrastructure facilities including buildings are built on top of the ground. In cases where artificial materials are used such as reinforced concrete and iron frames, their quality is assured and it is clear how they're handled in design. On the other hand, grounds that supports facilities differs characteristics according to the place of construction, and the physical properties of materials vary greatly. This means that a careful response is required for each project in design, which becomes a factor that largely impacts construction periods and costs.

For any and all facilities, the foundation structure constitutes the base of superstructures. As such, it needs to have specs which can ensure the settlement prevention and safety for superstructures against large scale earthquakes. Ground design is often for underground that will be not seen after completion. Therefore, it may seem to be an inconspicuous process, but its level of importance can be stated as very high within the entirety of the facility design process.

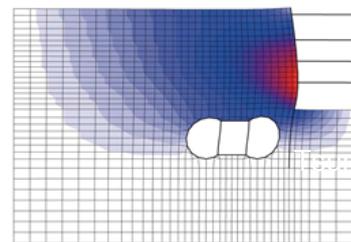
Railroads, highways, subways and other traffic networks along with utilities like communications, electric power, gas, and water and sewage facilities are concentrated in urban spaces. In this context, if conducting large scale excavation (neighboring construction) right next to railroad lines, the large displacement of periphery ground is caused, which may hinder railway operation and others.

For this reason, at Nikken Sekkei Civil Engineering, we conduct finite element (FEM) analyses for the ground and structures and use methods for forecasting the displacement and stress to be experienced by existing structures, and in cases where construction conditions are complex, we confirm the impact thereof on structures through construction step analyses. Furthermore, during the actual construction stage, we also have charge of observation procedure in which we measure displacement of railroad rails and the distortion of structural materials, and then, while constantly comparing displacement and stress resulting from construction with forecast values, we confirm safety of the structure.

As such, close discussion with railway companies must be held after investigating construction methods in order to prevent harmful impacts by beforehand conducting analyses and forecasts regarding the extent of impacts on existing structures from neighboring construction. At Nikken Sekkei Civil Engineering, we have an extensive track record in numerical analysis and measurements related to this kind of neighboring construction.



Example of excavation work right next to the shield  
Overview of neighboring construction and analysis case example



FEM analysis leading to realization of subway (horizontal load)

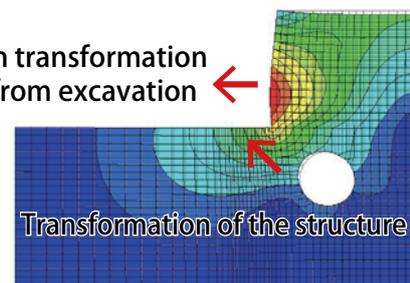


Displacement diagram



Bending moment diagram

Foundation transformation  
resulting from excavation



Transformation of the structure

Analysis of influence on the shield tunnel  
Analysis case example