
Study on Application of Geophysical Exploration Method in Civil Engineering Construction

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In this research, we examined the application of geophysical exploration technology as a support tool for the construction management of civil engineering projects.

In the first chapter of this thesis, I explained the background and purpose of this research in the introduction and described the relation with the past research and the currently used geophysical exploration method.

In Chapter 2, I proposed a method that uses excavation blasting as a method of elastic wave exploration that can be implemented in the construction of mountain tunnel projects. This method showed that it is possible to perform exploration ahead of the tunnel face by the reflective method. The measurement characteristics of this method were evaluated by comparison with the conventional method, and it was shown that geological evaluation can be performed with the accuracy required for tunnel construction management.

In Chapter 3, I proposed a three component reflection method that acquires elastic wave propagation inside the rock by a simple measurement method. By verification tests, comparison with the conventional method to measure in the deeper part of the bedrock, visual observation of a Hodogram on the obtained data and P wave detection by time - frequency domain expression were performed, and the measurement characteristics of this method were clarified. We also considered the reflected waves obtained by this method and the conventional method, assuming that the geological boundary confirmed by actual construction is a reflecting surface. In addition, I proposed a measurement arrangement and analytical method on the tunnel wall of the triple component reflection method.

In Chapter 4, I proposed a method using electromagnetic waves as a monitoring method for slopes in cutting work. The results of long-term application clarified that the displacement detection accuracy is comparable to that of the conventional GNSS displacement measurement system. Discussions on the effect of applying this method and the current problem are in progress. In addition, I propose a face monitoring system on mountain tunnels using this method.

In Chapter 5, I presented the findings and results obtained in this research as a conclusion. In addition, as a rational construction management tool for civil engineering projects, the effect of applying geophysical exploration technology was considered.

These methods proposed in this research can be carried out during construction work, and it is possible to evaluate continuous geological conditions. In addition, since it is possible for civil engineers to use these methods, operation and evaluation by experts is unnecessary. With this method, as changes in geological conditions can be confirmed during daily construction, it is possible to promptly examine additional investigations and countermeasures to enable rational construction management.
