3. Clarification System of Natural Heavy Metals Containing Soil in Shield Tunneling Site - Purge of Arsenic-contaminated Soil in Slurry Shield Tunneling with Classification and Magnetic Separation -

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In recent years, there have been a growing number of shield tunneling projects in which naturally occurring heavy metals such as arsenic and lead are encountered during tunnel excavation. Removing such contaminated soil from the construction site is very expensive, and the resulting increase in the burden on landfill sites is also problematic. This study was conducted, therefore, to develop a new technique for decontaminating soil containing heavy metals encountered during shield tunneling work and evaluate the usefulness of the new technique. The newly developed technique decontaminates slurry shield muck by adding soil classification and washing equipment and equipment for mixing contaminated soil with iron powder to adsorb heavy metals such arsenic and lead to the conventional muck treatment plant used in the slurry shield method. Laboratory tests and full-scale experiments using an experimental plant were conducted by using muck samples taken from a shield tunnel construction site in the Tohoku region which contain arsenic in quantities exceeding the limit specified in the soil leachate standard. As a result, it has been confirmed that the newly developed technique reduces the arsenic content of the muck to a level lower than the standard-specified level. In this study, requirements for a muck treatment plant necessary for full-scale shield tunneling work were identified, and treatment cost was calculated accordingly. The results thus obtained have shown that construction cost can be made lower than in the method of removing contaminated soil from the construction site by decontaminating muck by the new technique in a volume greater than a certain level.

Key words: slurry shield, muck removal, naturally occurring, heavy metal, arsenic, decontamination, classification and washing, iron powder, magnetic separation