

# Development of Ductile Cast Iron Components to Shorten On-site Assembly of Existing Steel Earth-Retaining Beams

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## Abstract

Nowadays, reducing on-site construction period is a major issue in Japan. Since joining of structural members is always conducted on-site, reducing joint parts contributes to a reduction of on-site construction period. This study examines a new joint structure of Steel Earth-Retaining Beams (SERBs) used during excavation work. Many bolts are used in a connection of SERBs. To reduce the number of bolts in SERBs while reusing the existing SERBs, this study developed ductile cast iron components which are installed SERB connections with FE analysis. Particular, we proposed the shape of the ductile cast iron components to improve the joint strength performance, and clarified the applicability of the cast iron parts in the SERB connection.

**Keywords:** Steel earth-retaining beams; ductile cast iron; connections; high strength bolts; tensile type bolted joints; FE analysis.

## 1 Introduction

Owing to decline in the number of construction workers from a decrease in the birth-rates and an aging population in Japan[1], improving the working environment to prevent certain types of accidents has become essential. A reduction in the number of structural members aimed at reducing the on-site construction time has contributed to an improved working environment. Since the joining of structural members is always conducted on-site, reducing the joint parts contributes to a reduction of the construction time in the field. This study examines a new joint structure of Steel Earth-Retaining Beams (SERBs) and its connections which are temporary structure used during excavation work shown in Figure 1.

Since a number of connections are required when SERBs are used in the field, reducing the number of bolts per connection will contribute to shortening construction time. The current connections

between SERBs are used many bolts because these connections combined by two joint methods: (i) bearing type bolted joint with splice plates; (ii) tensile type bolted joint butting end plates. Here, if the SERB connections are joined only by tensile type bolted joint, the number of bolts can be significantly reduced and the construction time can be shortened. However, the end plates in current beams are too thin to apply a tensile type bolted



Figure 1. An application example of steel earth-retaining beams during excavation work