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研究テーマ－帯鋼補強土壁の地震時補強メカニズムの解明

研究背景と目的

コンクリートパネル・帯状鋼製補強材・盛土から構成される帯鋼補強土壁は，地震時に三者が一体となって挙動するために高い耐震性を示すとされている．しかしながら，帯鋼補強土壁の一体性を詳細に検討した例は少ない．そこで，本構造物の地震時補強メカニズムを補強材張力の発現状態や一体性という観点から明らかにすることを目的に研究を実施している．

研究手法

本研究では，乾燥豊浦砂を盛土に用い 1/20 模型の帯鋼補強土壁を作製した後，遠心力載荷装置に設置し，重力加速度 20 G を適用し，加振を行うことで帯鋼補強土壁の地震時挙動を解明する．本研究では，帯鋼補強土壁の補強メカニズムを地震時の一体性から検討するために，帯鋼補強土壁と帯鋼補強土壁全体を同体積，同質量となるように剛体に置き換えた擁壁との挙動を比較している(Figure.1).

研究成果

Figure.2 に入力加速度と帯鋼補強土壁および剛体擁壁の最大変形量の関係を示す．帯鋼補強土壁(Case-1)は，各加振後に変形量が蓄積し，靭性に富む挙動となった．一方で，剛体擁壁(Case-2)は，約 8.0 m/s^2 加振後に変形量が急増し脆性的に崩壊した．これより，帯鋼補強土壁の構造が地震時に高い耐震性を示す要因であることを明らかにした．Figure3 に加振前後の変形量，補強材張力，壁面に作用する土圧を示す．補強材に発生する張力を精緻に計測することにより，地震時補強メカニズムの一因となる補強材張力の発現状態を定量的に議論することが可能となった．

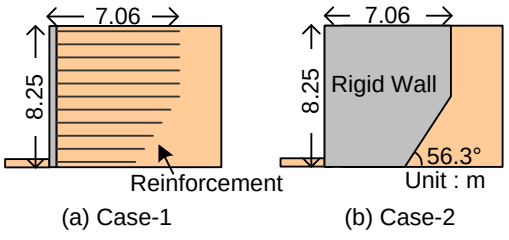

Figure.1 Experiment case

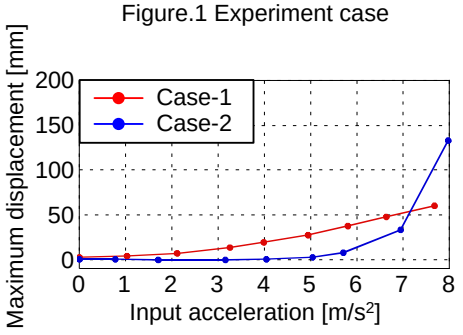

Figure.2 Comparison of the maximum displacement

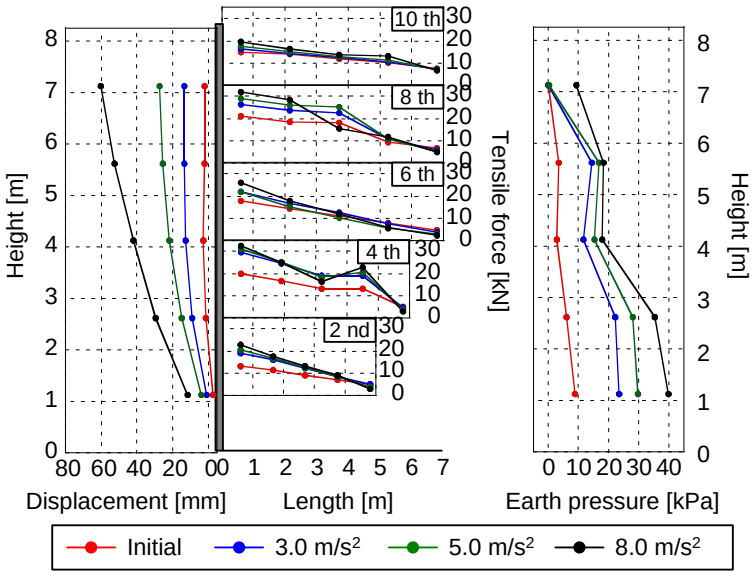

Figure.3 Displacement, Tensile force and Earth pressure

Research theme －Elucidation of seismic reinforcement mechanism of Reinforced earth wall

Research background and objective

Reinforced earth walls are composed of a concrete panel, steel bar reinforcement and embankment. They are thought to exhibit high earthquake resistance because the three parts behave together as an earthquake. However, there are not many studies that have examined the integrity of the reinforced earth wall in detail. We have conducted research in order to clarify the reinforcement mechanism of this structure during earthquakes from the viewpoint of design philosophy.

Research method

In this study, a 1/20 model reinforced earth wall is made backfilled with dry Toyoura sand. It is set in a centrifugal load device and subjected to gravity acceleration of 20 G. We elucidate the seismic behavior of the reinforced earth wall by a shaking model. To examine the reinforcement mechanism of reinforced earth walls from the rididity at the time of the earthquake, we compare the reinforced earth wall with a rigid body of the same volume and the same mass as the reinforced earth wall (Figure.1).

Results & Discussion

Figure.2 shows the relationship between the input acceleration and maximum displacement of the reinforced earth wall and the rigid retaining wall. While Case-1 exhibited ductility, Case-2 collapsed suddenly. By precisely measuring the tensile force, it has become possible to quantitatively discuss the state of development of the reinforcing material tension, which is one factor of the reinforcement mechanism during the earthquakes (Figure.3).

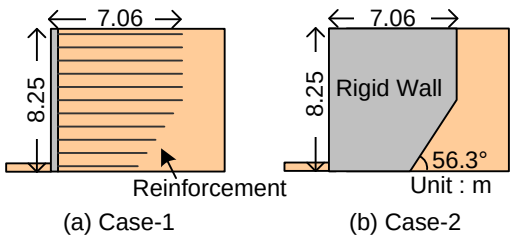

Figure.1 Experiment case

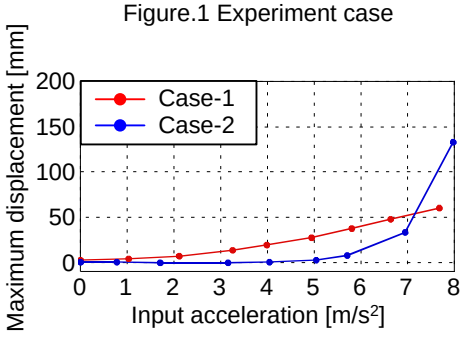

Figure.2 Comparison of the maximum displacement

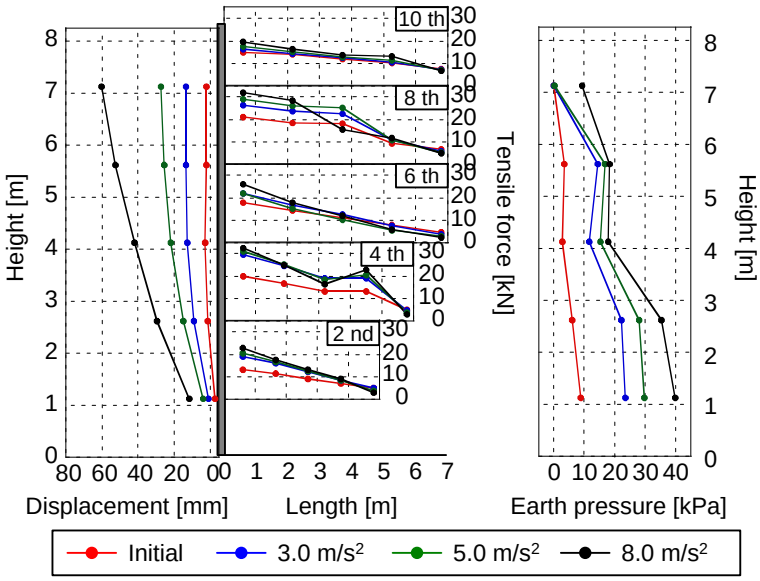

Figure.3 Displacement, Tensile force and Earth pressure