研究テーマ－継手部の形状を模擬した鋼管矢板基礎の水平抵抗特性

研究背景と目的

　鋼管矢板基礎は，鋼管矢板の継手部を嵌合させて閉鎖形状に打設し，継手管内にモルタルを充填することで，基礎全体として支持力を有する．そのため，基礎全体の水平支持力特性を把握するためには，継手部が有する引張・圧縮・せん断方向の力学特性を適切に評価する必要がある．

　本研究の目的は，鋼管模型継手部の引張・圧縮・せん断特性を各種力学試験により把握した上で，鋼管矢板基礎の水平抵抗特性および変形挙動を遠心場での水平載荷試験により確認することである．

研究手法

　本研究では，Figure.1 に示すような，継手形状を実構造に一致させることに主眼を置いた鉄製の鋼管模型を用い，充填材にはステンレス製丸棒を用いる．各種力学試験では，一軸圧縮試験機を用いて，鋼管模型継手部の各種力学特性を定量的に把握する．さらに，遠心加速度 50 G 場において，矩形型鋼管矢模型を対象に水平載荷試験を実施することで，水平支持力特性を定量的に把握する．

研究成果

　Table.1 は模型継手部の各種力学試験結果であり，継手部の各種力学抵抗特性を定量的に把握した．Figure.2 には，水平載荷試験で得られた鋼管模型のひずみ分布を示す．矩形型鋼管矢板模型では，隅角部に応力が集中することを確認した．
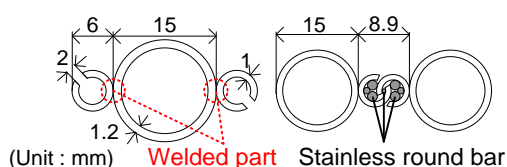

(Unit : mm)　Welded part　Stainless round bar

Figure.1 Sectional view of the SPSP model

Table.1 The results of mechanical test

Tensile properties		Compression properties		Shear properties	
Stiffness	Yield strength	Stiffness	Yield strength	Stiffness	Yield strength
[kN/m²]	[kN/m]	[kN/m²]	[kN/m]	[kN/m²]	[kN/m]
2.6×10^5	25.6	2.8×10^5	17.2	1.4×10^4	0.99

3×3 square SPSP model

⇨ Loading direction
■ Strain gauge positions
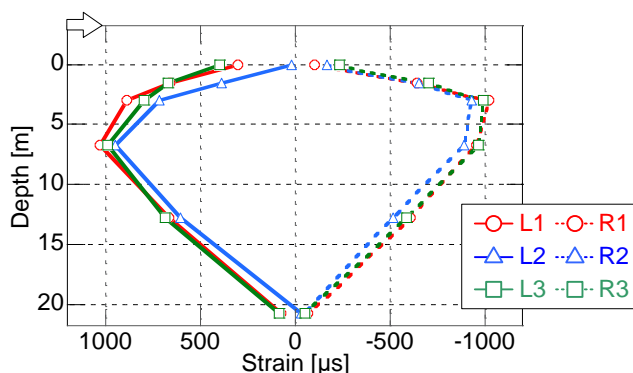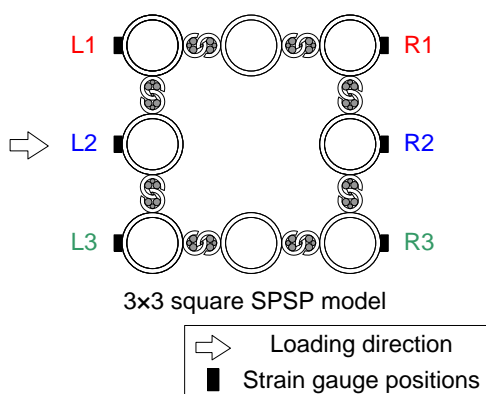
(a) at 50% Normalized displacement

Figure.2 Bending strain distribution

Research theme－Lateral resistance characteristics of steel pipe sheet pile foundation by simulating the joint part

Research background and objective

The steel pipe sheet pile (SPSP) foundation, is a structure that by interlocking the couplings of SPSPs, installing in a closed shape and injecting mortar in the joints, can exert bearing capacity as one whole foundation. Therefore, in order to understand the lateral bearing capacity of the foundation, it is necessary to properly evaluate the mechanical properties of the joints.

The purpose of this research is to understand the mechanical properties of the joint of SPSP by various mechanical tests and confirm the lateral resistance properties by lateral load test in centrifugal field.

Research method

As shown in Figure.1, iron SPSP model focusing in the joint shape to conform with the actual structure joint is used, with stainless round bars used as filling material of the joint. By performing uniaxial compression test, mechanical properties of the joint of the model can be quantified. By performing lateral load test at centrifugal acceleration of 50 G, lateral resistance property of square SPSP model can be understood quantified.

Results & Discussion

Table.1 shows the results of mechanical tests of the joint of the model. Figure.2 shows the strain distribution of the square SPSP model obtained by the lateral load test. It was confirmed that stress concentrates on the corners in the model.
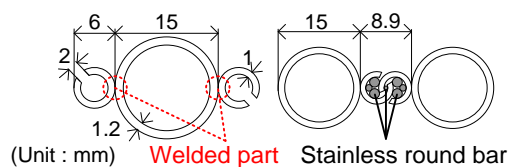
Figure.1 Sectional view of the SPSP model

Table.1 The results of mechanical test

Tensile property		Compression property		Shear property	
Stiffness	Yield strength	Stiffness	Yield strength	Stiffness	Yield strength
[kN/m^2]	[kN/m]	[kN/m^2]	[kN/m]	[kN/m^2]	[kN/m]
2.6×10^5	25.6	2.8×10^5	17.2	1.4×10^4	0.99

3×3 square SPSP model

⇨ Loading direction
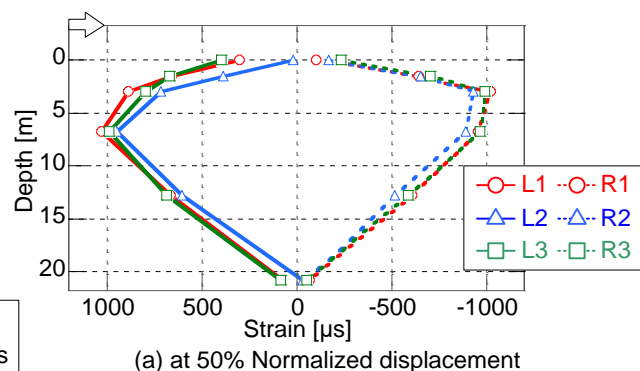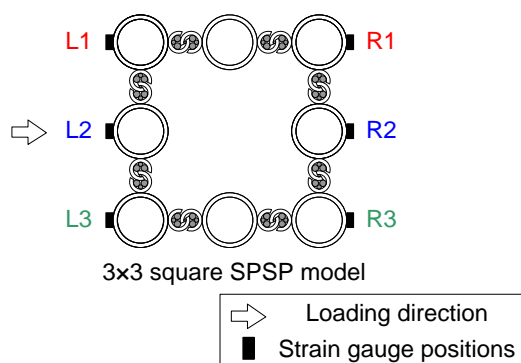■ Strain gauge positions

L1 ○ R1
L2 △ R2
L3 □ R3

(a) at 50% Normalized displacement

Figure.2 Bending strain distribution