

# Trend of Research for Transportation Geotechnics in Japan (TC202 Japanese Domestic Committee Activity)

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## 1 Introduction

"Transportation Geotechnics" is a study to examine the practical problems including design & construction and the maintenance management of the traffic infrastructure such as a road, a railroad and an airport from a viewpoint of the geotechnics. Japanese domestic committee for TC202 is a committee to support TC202 which is one of the technical committees (TC) of ISSMGE of 2013-2017 quarters. One of its purposes is to gather the Japanese latest study for Transportation Geotechnics and the latest study trend in the foreign countries, and to deliver them to the domestic ground engineer. The performance-based design of the road and the railway has been established in Japan, but it is necessary to evaluate the dynamics behavior of roadbed and its materials under the examination conditions that are close to the actual phenomenon in order to propose a rational design as much as possible.

Therefore, in this report, we surveyed the Japanese latest study trend in Transportation Geotechnics based on the papers relating to the research subjects of Japanese national committee for TC202.

## 2 Papers survey

We performed a survey of the papers in the field of geotechnical engineering, pavement engineering and railway engineering which are published in Japan within the past five years. And the survey papers related to the research subjects ①~③ of Japanese national committee for TC202 (Table 1).

As a result, we extracted 47 papers / 169 keywords relating to the studies for the subject ①, 112 papers / 431 keywords relating the studies for the subject ②, 43 papers / keywords 147 relating the studies for the subject ③ (Table 2). We systematized these keywords and analyzed them to survey the study contents of the papers relating to each subject. We classified these keywords roughly; "Structure and materials", "Examination kind and test equipment", "Strength and deformation characteristic", "Water properties", "Modeling and analysis", "Freeze characteristic", "Physics characteristic", "Standard" and "Other". We classified them into nine cases and indicate the classification summary of each subject in Figure 1 - Figure 3.

The keyword relating to the "structure/ materials" accounted for the highest rates 22% of the total keywords for the subject 1, and there were the number of papers relating to "unsaturated soil" and "roadbed, embankment, laying earth on the ground, the ground" was the most and 12 for each of these topics (Figure 1(a)). According to the paper 1), the representative literature relating to "the unsaturated soil", strength, the transformation characteristic of the roadbed materials compacted under an optimum water content are used in the current design of the road pavement structure. However the influence of water conditions such as the rain on the materials characteristic is not considered. Therefore subsection of mechanical examination of material with the use of unsaturated triaxial test equipment was suggested, and its effectiveness was indicated.

The keyword relating to the "property of strength and deformation" accounted for highest 24% of the total keywords for the subject 2, and the number of "FWD" keyword of "test type and test equipment" was 22 and the most (Figure 1(b)). According to the papers 2), in conjunction with "FWD", health evaluation of road pavement using FWD (Falling Weight Deflectometer) was implemented widely. However it takes much time to evaluate the road deflectometer had been developed, and high correlation between measurement result using FWD and moving wheel deflectometer was confirmed.

The keyword relating to the "structure/ materials" classification was accounted for the highest rates, 26% of total keywords for the subject 3, and the number of papers relating to "roadbed, a roadbed, and embankment" was 22 and

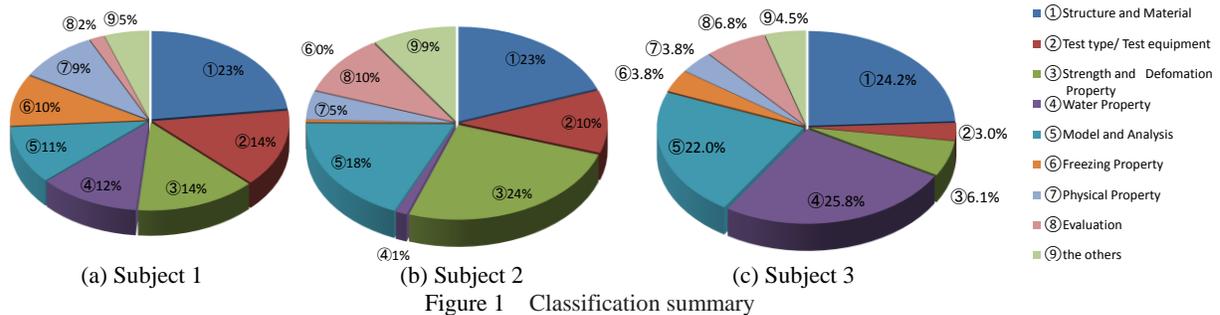
the relating to the most (Figure 1(c)). The number of papers relating to "pavement" was 8 of its second layout. According to the paper 3), the representative paper relating to "pavement" support bearing capacity of the concrete pavement decreases. It is because plastic deformation occurs by cyclic loading at the wheel running position. Therefore an analytical method predicting the plastic deformation of roadbed and subgrade on the concrete pavement was suggested. And it was shown that by simulating loading test of the test pavement, the gap between concrete pavement and roadbed surface was possible to be evaluated.

### 3 Conclusions

We surveyed the Japanese latest study trend for Transportation Geotechnics based on the papers relating the scientific research subjects of Japanese national committee for TC202. Moreover, we have systematized each keyword and analyzed it to survey the study contents of the papers relating to the respective subjects. We will arrange keywords for every classification of each subject and analyze the latest study trend for transportation geotechnics engineering in detail and will create an environment to send the relative information to all the civil engineers concerned.

Table 1 Survey research items and the number of survey papers

Subject		The Number	
		Special Document	Keyword
1	Study for the standardization of the materials properties test method of roadbed and roadbed materials	47	169
2	Evaluation method of soundness and seismic performance for structure of transportation and ground	112	431
3	Preparation of the structure analysis technique to establish the performance based design of the traffic ground structure	43	147



### 4 References

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