Estimation of fracture frequency on the basis of Rock Quality Designation

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Introduction
Science Council of Japan mentioned importance of establishment of technology to search rock body with minor fractures. As a first step towards this subject, it is significant to understand the fracture frequency in many rock bodies in Japan.
Therefore the data widely obtained such as by borehole investigation should be available to characterise the fracture frequency. In this study, the speaker discussed the relationship between RQD (Rock Quality Designation) and fracture frequency focused on the Toki granite, central Japan, where a large number of borehole investigations have been carried out and the data on fracture were obtained.

Method
Fracture data used in this study were obtained by investigations in the boreholes drilled from the ground surface (17 vertical and 2 declined holes) and the underground research galleries (1 vertical and 4 horizontal holes). The total length of boreholes drilled in granite is 16,180 meters. Fracture data were obtained by the BTV investigation. The total number of fractures is 43,658 including 24,737 sharply defined fractures which has clear surface with high continuity. RQD values were calculated by sum of the intact lengths that are 10 cm or longer at 1 meter intervals.

Result and Discussion
Average RQD value of each borehole ranges from 79.9 to 98.6 with fracture frequency ranging from 0.7 to 6.6 fractures per one meter (for sharply defined fracture, RQD: 79.9 to 98.6, fracture frequency: 0.5 to 3.8 fractures per one meter). There is a significant correlation between RQD value and fracture frequency. Drilling lengths of boreholes drilled in granite are, from 329 to 1,185 meters in boreholes drilled from ground surface, 331 meters in vertical borehole and from 30 to 106 meters in horizontal borehole drilled from underground galleries.
This implies that correlation between RQD and fracture frequency is not affected by drilling length. The data are then divided into 100 meters length and those RQD values are compared with fracture frequency. Average RQD values at 100 meters intervals ranges from 68.0 to 100.0 (average value: 92.9) and fracture frequencies range from 0 to 9.2 fractures per one meter (average value: 2.8). The RQD value is also associated with fracture frequency.
This result indicates that the method proposed in this study can be ubiquitously applied to various lengths of borehole. Further examination on the additional data from granitic rock besides Toki granite is required.

Keywords: fracture frequency, Rock Quality Designation, Toki granite

