



Circumstances of Surveyor License Acquisition System in Japan

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Abstract The license acquisition system of surveyors in Japan is composed by two levels of national license; the surveyor and the assistant surveyor. The survey Act, which determines the qualifying standard for licensing, accept several routes for acquiring the license, depending on the situations of applicants. Two primary route of license acquisition are by passing the national qualifying examination and by graduating at designated universities, junior colleges, technical colleges and technical schools. The circumstances of surveyor license acquisition system in Japan were investigated from the Survey Act and the national qualifying examination. It became clear that the surveyor has been required the new technologies and a wide range knowledge for survey. So as to clarify the abilities of the surveyors who passed the national qualifying examination and of those who graduated from the above university or technical school, the ability verification test of assistant surveyors was given. As a result, it can be said that the former group performed better than the latter. In order to reduce the difference of difficulties for license acquisition, the contents of current survey educations in higher education should be improved. This paper presented the circumstances of the national license in Japan, including the details of the national qualifying examination and other routes of the license acquisition, and indicated the problems.

Keywords surveying, qualification system, surveyor, assistant surveyor, license

INTRODUCTION

For the sustainable development of developing countries, it is important to make regional development projects and to construct infrastructures. As surveying techniques play a great role in the implementation of sustainable development projects in developing countries, engineers who have basic surveying education are basically required. The knowledge on the present condition and

issues related to acquiring qualifications of surveying in Japan will be certainly helpful to implement training in surveying education in developing countries.

In Japan, there are two national qualifications: one for surveyor, and the other for assistant surveyor. The basic survey by the Geospatial Information Authority of Japan and public surveys, for which the expenses are covered by the national or local governments, are done solely by qualified surveyors and assistant surveyors. It is possible for qualified surveyors to establish their own surveying businesses. In Japan, many national qualifications in the engineering field are obtained through appropriate education and national qualifying examinations. These include the qualifications of consulting engineer, execution manager of civil engineering, and land and house investigator. The qualification of surveyor is given to those who passed the national qualifying examination, or to those who completed education at designated universities, junior colleges, technical colleges and technical schools (hereinafter: relevant schools). There are multiple routes for obtaining the surveyor qualification. It is thought that the present system for qualifying surveyors and assistant surveyors and the problems related to education and the qualifying system for surveyor and assistant surveyors require some investigations.

Koshimizu et al. (2008) investigated the qualification system for surveyors in Germany, France, Canada, the U.S.A. and Australia, and reported that the systems in these five countries were much better developed, qualitatively and quantitatively, than that of Japan. Japanese technical schools have a system whereby foreign students can learn surveying. An according to the interview for foreign students of the technical school (Chuo College of Technology), in Uganda, the surveyor qualification is able to be obtained through studies of surveying and graduation from a university, and through membership in the surveyors' association. In Nepal, the surveyor qualification is also obtained by graduation from a university that provides surveying as a subject. Basically, it is important to learn knowledge and techniques of surveying by attending schools (Dagtekin, 2012; Enemark, 2005). The objectives of this paper are to present the state of licensing in Japan and to discuss the related problems.

METHODOLOGY

The complicated Japanese qualification system for licensing surveyors and assistant surveyors, which has two routes, is investigated based on the Survey Act (Japan Association of Surveyors, 2014). The characteristics of Japan's national qualifying examination for surveyor and assistant surveyor licensing are summarized by investigating the questions of the examinations conducted in 2007 to 2014 and by using the passing rate of the examinations (Geospatial Information Authority of Japan, 2014a).

In order to clarify the abilities of the surveyors who passed the national qualifying examination and of those who graduated from the relevant schools, an ability verification test is given to verify the difference in ability. It is given to 10 assistant surveyors: five who obtained their licenses by graduating from the relevant schools, and five who obtained their licenses by passing the national qualifying examination. The abilities of the two groups are compared by checking the number of correct answers and percentage of correct answers.

The number and percentage of correct answers are used to determine ability. All the examinees are students studying at a technical school (Chuo College of Technology) to obtain the qualification of surveyor. The test is given without advance notice to know their ability without them having special preparation. The test consisted of questions from previous national qualifying examination for assistant surveyors. The national qualifying examination for licensing assistant surveyor has 28 four-choice questions.

RESULTS AND DISCUSSION

Present State of the National Qualifying Examination for the Surveyors (Assistant Surveyors)

The questions on the national qualifying examination for licensing surveyors and assistant

surveyors cover the following: “Traversing”, “Global Navigation Satellite System (GNSS)”, “Leveling”, “Topographic surveying”, “Photogrammetry”, “Map compilation”, “Engineering surveying” and “Geographic Information System (GIS)”. A wide range of knowledge is required for one to obtain a license in this field. Basically, the questions are on the items and surveying techniques described in the General Standard of Operation Specifications for Public Surveys (hereinafter: the *General Standard*).

The required knowledge has been changing with the times. In Japan, “Plane table surveying” was deleted from the *General Standard* in 2008, and the knowledge on “Topographic surveying” by total station (TS) became a requirement for the examinees. The name of the “Global Positioning System (GPS) survey” was changed to “GNSS survey” when the *General Standard* was revised in 2011. In recent years, questions related to such areas as “Digital stereo plotter”, “GIS”, “GNSS survey using GNSS-based control station” and “Airborne laser surveying” have been included in the national qualifying examination in Japan.

As stated above, new technologies and a wide range of questions that meet the needs of the times are included in the national qualifying examination. Because of the above-mentioned changes, the national qualifying examination for licensing surveyor and assistant surveyor differs from other national qualifying examinations, whose questions have not been changed greatly (Masuyama, 2009). A notable characteristic of the qualifying examination for surveyor and assistant surveyor is that the examination reflects new technologies. Therefore, the acquisition of knowledge on new surveying technologies is indispensable.

Table 1 shows the results of national qualifying examination for licensing surveyor and assistant surveyor done in the eight years from 2007 to 2014 (Geospatial Information Authority of Japan, 2014a). The number of applicants, which is about 13,000 in each year, is stable over time. The average rate of test-takers who pass is 27.7% for the assistant surveyor test and 9.7% for the surveyor test. The data shows that the examination for licensing surveyor is a national qualifying examination with a high level of difficulty in Japan.

Table 1 Results of national qualifying examinations for licensing surveyor and assistant surveyor

Class	Assistant surveyor			Surveyor			
Year	Number of examination takers	Number of passing candidates	Passing rate (%)	Number of examination takers	Number of passing candidates	Passing rate (%)	
2007	11,052	2,654	24.0	2,398	274	11.4	
2008	10,858	2,435	22.4	2,203	219	9.9	
2009	10,520	2,704	25.7	2,170	181	8.3	
2010	10,387	2,757	26.5	2,256	144	6.4	
2011	10,233	2,192	21.4	2,162	258	11.9	
2012	10,551	4,289	40.7	2,281	279	12.2	
2013	10,596	2,248	21.2	2,457	127	5.2	
2014	11,118	4,417	39.7	2,394	290	12.1	
Average of passing rate			27.7	Average of passing rate			9.7

For the national qualifying examination for licensing surveyor and assistant surveyor, there are no academic requirements. For example, a high school student can take the examination. Students at industrial and agricultural high schools nationwide are encouraged and instructed to obtain the qualification. Every year, many high school students pass the national qualifying examination (Osaka city Miyakojima technical high school; 2014, Miyazaki Prefectural Miyakonojo Agricultural High School; 2014, Tokyo metropolitan Tanashi technical high school; 2014). Figure 1 shows the routes for one to obtain surveyor and assistant surveyor licenses by passing the national qualifying examination. From this figure, it is found that it is even possible for one to obtain the qualification of surveyor even if one does not have an assistant surveyor qualification.

Even a person with sufficient work experience has to pass the national qualifying examination to obtain the surveyor license if that person has not graduated from the relevant schools as illustrated in Fig. 2. However, if a person with an assistant surveyor license graduates from a technical school whose purpose is to educate surveyors, that person is able to obtain the surveyor license without passing the national qualifying examination. In Japan, there are two technical schools that fall into the above-described category (Geospatial Information Authority of Japan, 2014b). One of these two schools graduates more than 90% of its students every year. Generally, graduating from a relevant school is the shortest route for obtaining the surveyor license for adults and high school students who have obtained the assistant surveyor license.

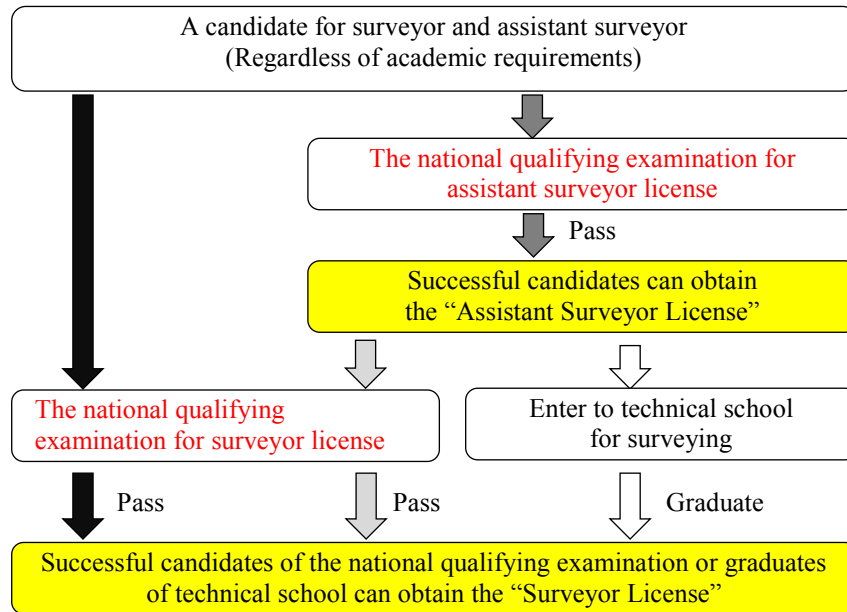


Fig. 1 Flow chart of acquisition of surveyor license via national qualifying examination

Acquiring Qualification of Surveyor / Assistant Surveyor at Relevant Schools

Figure 2 shows the routes for obtaining the qualifications of surveyor and assistant surveyor by graduating from the relevant schools. It is possible for the graduate of a relevant school who has earned required number of credits to register as an assistant surveyor with the Geospatial Information Authority of Japan. If a person who graduated from the relevant school has the required years of work experience in surveying, then that person is able to obtain the qualification of surveyor without passing the national qualifying examination, even the person does not have the qualification of assistant surveyor. The range of work related to surveying does not necessarily need to cover a range as wide as that of the national qualifying examination for licensing surveyors. The requirement in this case is simply surveying experience. Given that an average of only 9.7% of those who take the national qualifying examination for surveyors pass, it is advantageous for someone who wishes to acquire the qualification to graduate from a relevant school and to work for some years, rather than taking the national qualifying examination. A person who acquires the qualification of assistant surveyor and then graduates from a relevant school is able to obtain the qualification of surveyor without any work experience.

The surveyor licensing system is liable to create surveyors without balanced knowledge. Therefore, it is desirable for the relevant schools to educate their students by providing subjects that address domestic and international regulations, which are included in the questions of the national qualifying examination, and that address a wide range of items covered in the national qualifying examination, including traversing, GNSS and GIS.

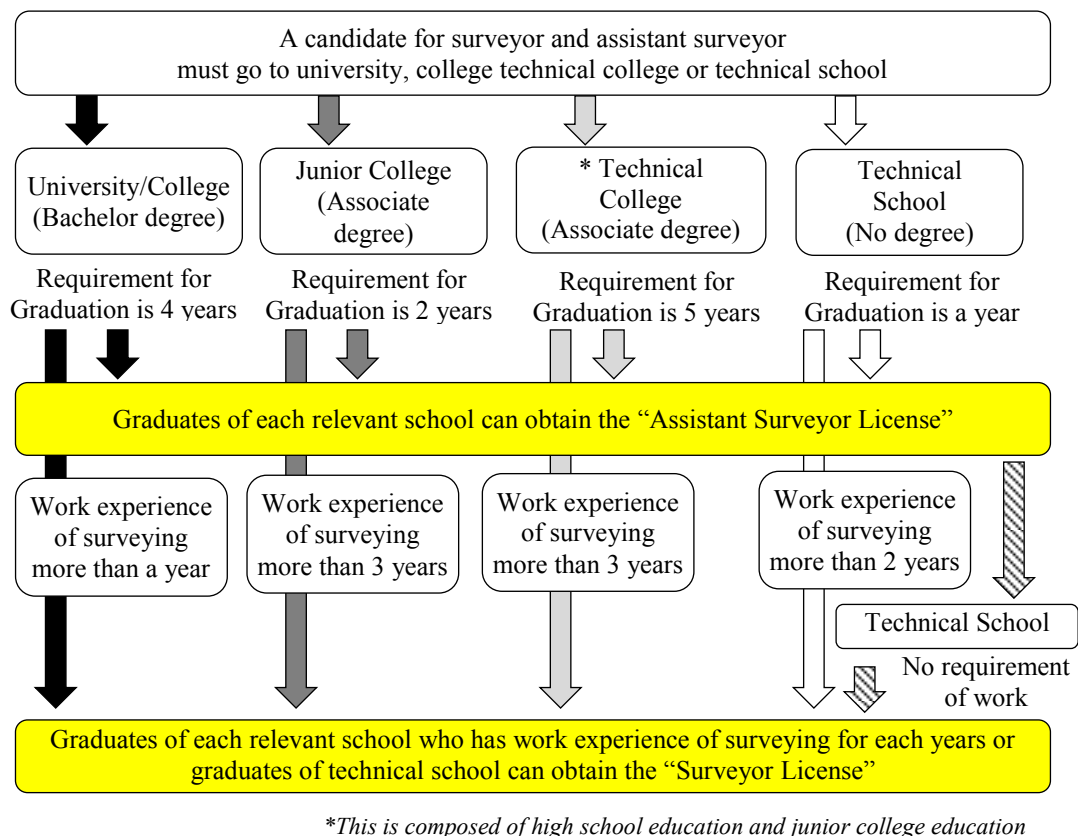


Fig. 2 Flow chart of acquisition of surveyor license without national qualifying examination

Results of Ability Verification Test

Roughly, there are two routes for obtaining the assistant surveyor qualification; one is by passing the national qualifying examination and the other is by graduating from a relevant school. To assess the relative ability of assistant surveyors qualified through the two different routes, 10 students were given an ability verification test: five who had obtained their qualification by passing the national qualifying examination, and five who had obtained their qualification by graduating at a relevant school.

The results of the ability verification test are shown in Table 2. The average number of correct answers for the group of assistant surveyors who obtained their licenses by passing the national qualifying examination was 14.2, and that for the group of examinees who obtained their licenses by studying at a relevant school was 13.0. The number of correct answers of the former group was 1.2 higher than that of the latter group. The standard deviation for the former group was 4.0, and that for the latter group was 4.7. The scores for the former were more narrowly distributed than those of the latter. Therefore, the coefficient of variation for the former was 27.9%, and that for the latter was 36.1%. The variance of the scores of the former was smaller than that of the latter. Correct answers as a percent of all questions averaged 50.7% for the former and 46.4% for the latter was. The former is higher.

As a result, it can be said that the former student group performed better than the latter. The reason for the difference in test results is thought to be that the latter group of students had not been taught a wide range of subjects in surveying or, even if they had been taught the subjects, they had not learned sufficiently, and the sense of purpose in studying surveying of the students in the latter group was more diverse than that of the former.

Table 2 Results of ability verification test for surveying that practiced at a technical school (Chuo College of Technology)

(a) Students who obtained assistant surveyor license by passing the national qualifying examination			(b) Student who obtained assistant surveyor license by graduating at a relevant school		
Subjects (5 students)	Number of correct answers (28 questions)	Correct answer rate (%)	Subjects (5 students)	Number of correct answers (28 questions)	Correct answer rate (%)
A	15	53.6	F	17	60.7
B	9	32.1	G	11	39.3
C	14	50.0	H	9	32.1
D	13	46.4	I	19	67.9
E	20	71.4	J	9	32.1
Average	14.2	50.7	Average	13.0	46.4
S.D. *	4.0	-	S.D. *	4.7	-
C.V. ** (%)	27.9	-	C.V. ** (%)	36.1	-

* : standard deviation **: coefficient of variation

Requiring New Materials for Teaching Surveying at the Relevant Schools

If the relevant schools are providing technical education that produces surveyors and assistant surveyors who have poor knowledge, then the situation is problematic. It is unfortunate for society and for surveyors who obtain licenses by graduating from relevant schools if their knowledge and techniques are insufficient. To solve this problem, it is necessary to further enhance the educational content qualitatively and quantitatively at the relevant schools. New educational materials need to be created by taking into consideration the latest technologies, which address the changes of the times, and the questions on the national qualifying examination, including previous questions. Licensing via school education has an advantage over licensing via national qualifying examination, in that the students are able to learn how to use surveying equipment in their practice training and how to produce documents, drawings and other materials after the training; they are also able to learn how to work as members of a team, as their training is done in groups. The development of new educational materials is required to take into consideration the above characteristic advantages of school education.

CONCLUSION

The circumstances of surveyor license acquisition system in Japan were investigated from the Survey Act and the national qualifying examination. Further, in order to clarify the abilities of the surveyors who passed the national qualifying examination and of those who graduated from the relevant schools, the ability verification test of assistant surveyors was given. As the results, the following points are summarized.

- (1) As the results of the investigation on Japan's national qualifying examination for surveyor and assistant surveyor licensing for seven years, it became clear that the characteristic of the national qualifying examination. Namely, new technologies and a wide range knowledge for survey has been setting in the national qualifying examination. The percentage of examination-takers who pass was 27.7% for the assistant survey examination and 9.7% for the surveyor examination. The surveyor has been required the new technologies and a wide range knowledge for survey.
- (2) Given that an average of only 9.7% of those who take the national qualifying examination for surveyors pass, it is advantageous for someone who wishes to acquire the qualification to graduate from a relevant school and to work for some years, rather than taking the national qualifying examination.

(3) As the results of the ability verification test, the students who obtained the assistant surveyor qualification by graduating from passing the national qualifying examination were higher correct answer rate, lower standard deviation and coefficient of variation than the students who obtained that qualification by graduating from a relevant school. The differences in test results are following reasons. The latter group of students had not been taught a wide range of subjects in surveying. Even if they had been taught the subjects, they had not learned sufficiently. The sense of purpose in studying surveying of the students in the latter group was more diverse than that of the former.

(4) Licensing via school education has an advantage over licensing via national qualifying examination, in that the students can learn how to use surveying equipment in their practice training and how to produce documents, drawings and other materials after the training; they can also learn how to work as members of a team, as their training is done in groups. In order to enhance the educational content qualitatively and quantitatively at the relevant schools, the development of new educational materials is required to take into consideration the latest technologies, which address the changes of the times, and the questions on the national qualifying examination, including previous questions, while taking into consideration the above characteristic advantages of school education.

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