

# Development of labor-saving introduction of ISO management system for construction\*<sup>1</sup>

Hiroshi SAKURAI\*<sup>2</sup>, Kaneyoshi OKADA\*<sup>2</sup>, Yoshiyuki INADA\*<sup>3</sup>  
and Hideharu NAGAI\*<sup>4</sup>

## Abstract

Recently, the introduction of the ISO 9000s standards in each industry has been helpful for clarifying production processes. Also, an attempt is being made to address environmental concerns by adopting the ISO 14000s of standards.

The purpose of this study is to research and develop quality control system with labor-saving to introduce ISO 9000s and ISO 14000s. The work type and characteristics of construction are analyzed in order to study the problem of introducing ISO, especially in the construction industry. How to introduce these standards, as well as their practical application and the image of system block with labor saving are studied.

## 1. Introduction

### 1.1 Background

The circumstance is surrounding the construction industry is that of severe condition, although short-term orders are in an abundance, according to business recession measures. The market scale of construction business will decrease with only the usual public investment due to the stringent finance condition of the state and local government. And the introduction of ISO 9000s is being promoted in order to clear the process of quality and step in an order construction. Still more, a positive management of additions to the environment is attempted by the introduction of ISO 14000s.

The introduction of ISO 9000s standard is expected to result in enhanced quality, rational construction operation and rational management. But, the work quantity of companies who have introduced ISO 9000s has greatly increased such as preparing and maintaining the manual, controlling and distributing the document, drafting of records, and data control according to the ISO standard. After receiving certification to ISO standard, the success point of introducing ISO is maintaining of ISO standard process to pass the survey with as rationally minimum labor and other enforcement costs as possible. That is to say, the key point condition to survive in the 21st century for a construction company.

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\*<sup>1</sup> : A part of this report was presented at the ISO on collaboration research meeting in the KIT Regional Collaboration Research Center in June 1999, \*<sup>2</sup> : Kitami Inst. of Tech., \*<sup>3</sup> : Dopi Construction Co. Rtd., \*<sup>4</sup> : Tsuken Co. Ltd

## 1.2 Purpose of this study

The purpose of this study is to research and develop a labor saving quality control system to introduce ISO 9000s and ISO 14000s ((labor saving introduction of ISO standard system(LSI ISO system)). The research development is collaborate research to make it possible for construction companies as to be ISO compliance whole kind and size by institute of technology, company who produce correspondence facilities and computing systems, construction companies who construct prestressed concrete bridge nationwide, and other kinds of construction companies who deal in ocean civil engineering, bridge construction and foundation, and road construction, and pavement work. The problems of introducing ISO to construction industry specifically is studied. Then the labor saving introduction of ISO standard system(LSI ISO system) is researched and developed.

## 2. Method

The flowchart of this study is shown in Fig. 2. 1. In the first step (on the left side in the flowchart, the problems of introducing ISO in especially construction industry is studied by conducting discussions with the collaboration research companies and comparing the levels of their drafted manual. The other study, which is conducted in parallel (on the right side the flowchart), is to research and develop a labor saving quality control system of introducing ISO 9000s and ISO 14000s by choosing the most suitable algorithm, basic software, data-base, and Internet system. Then a tentative system for evaluation is developed at the next step. And the draft manual and controlling data for case study are installed to check the system. At the end the system is evaluated and improved in order to make it practicable. Characteristics of the 5 companies joined collaborate research and development for LSI ISO system is shown in Table 2. 1.

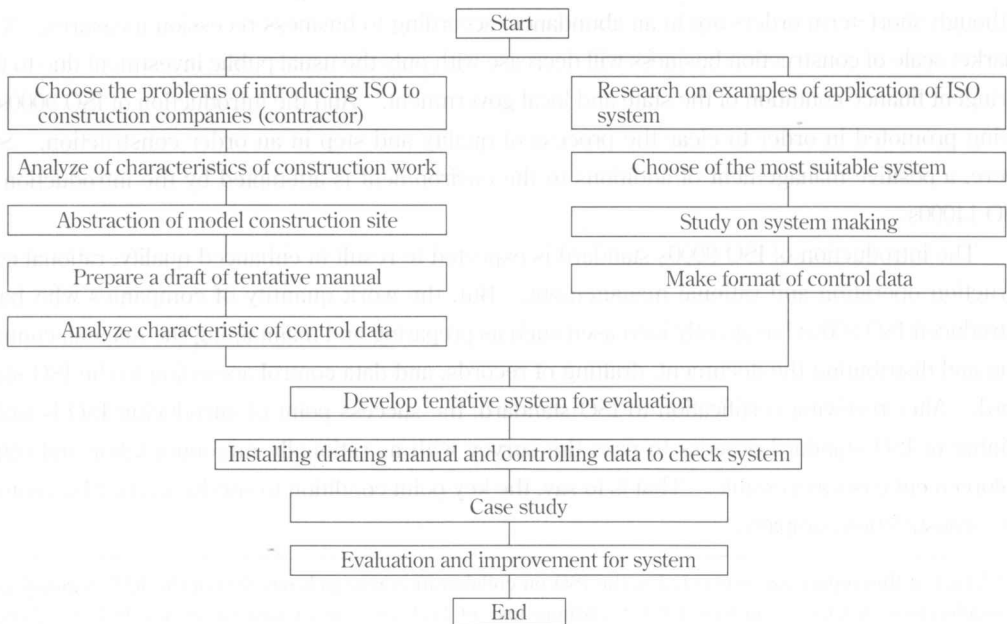


Fig. 2. 1 Flow of this study

**Table. 2. 1** Characteristic of the 5 companies who have joined collaborate research and development for LSI ISO system

Company	Characteristic
A	Contractor with many branches offices.
B	Communications contractor
C	Contractor identified headquarter and branch
D	Ocean and harbor contractor
E	Pavement contractor

### 3. Study result

#### 3. 1 Research in introducing ISO 9000s for construction company

Recently, many companies and enterprises want to obtain certification to ISO 9000s standard to secure competitiveness ability with bases of introducing ISO as shown in Table. 3. 1. 1. There are many merits of introducing ISO as shown in Table 3. 1. 2. But there are problems of introducing ISO for construction company as shown in Table 3. 1. 3. It is especially feared that processes will require much labor work and time than the usual construction quality process.

**Table. 3. 1. 1** Bases of introducing ISO

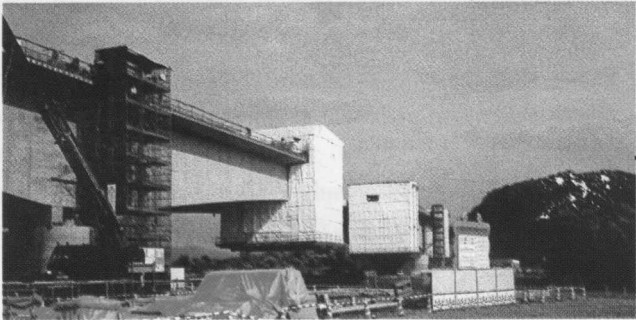

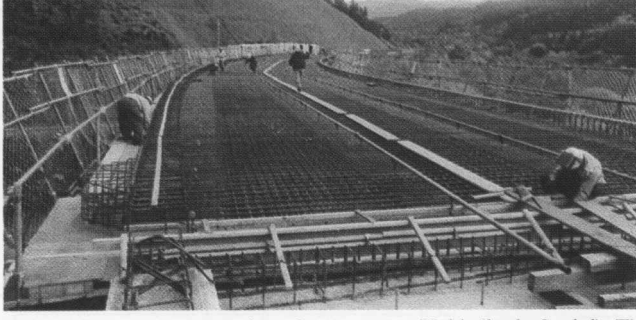

- ① Standard for system (regarding document and record)
- ② Standard for customer satisfaction index
- ③ Demand item is left to each company's scale and policy
- ④ Correspond with not full width change way of work to certify
- ⑤ Most reliable way to carry out production without making mistakes

**Table. 3. 1. 2** Merit of introducing ISO

- ① Improves quality management awareness in the office
- ② Improves efficiency and avoids troubles for management of document
- ③ Prevents uneven distribution of know-how
- ④ Improving level of measurement and management
- ⑤ Maintenance of regulation, general standard and so on
- ⑥ Corresponding globalization

**Table. 3. 1. 3** Problem of introducing ISO

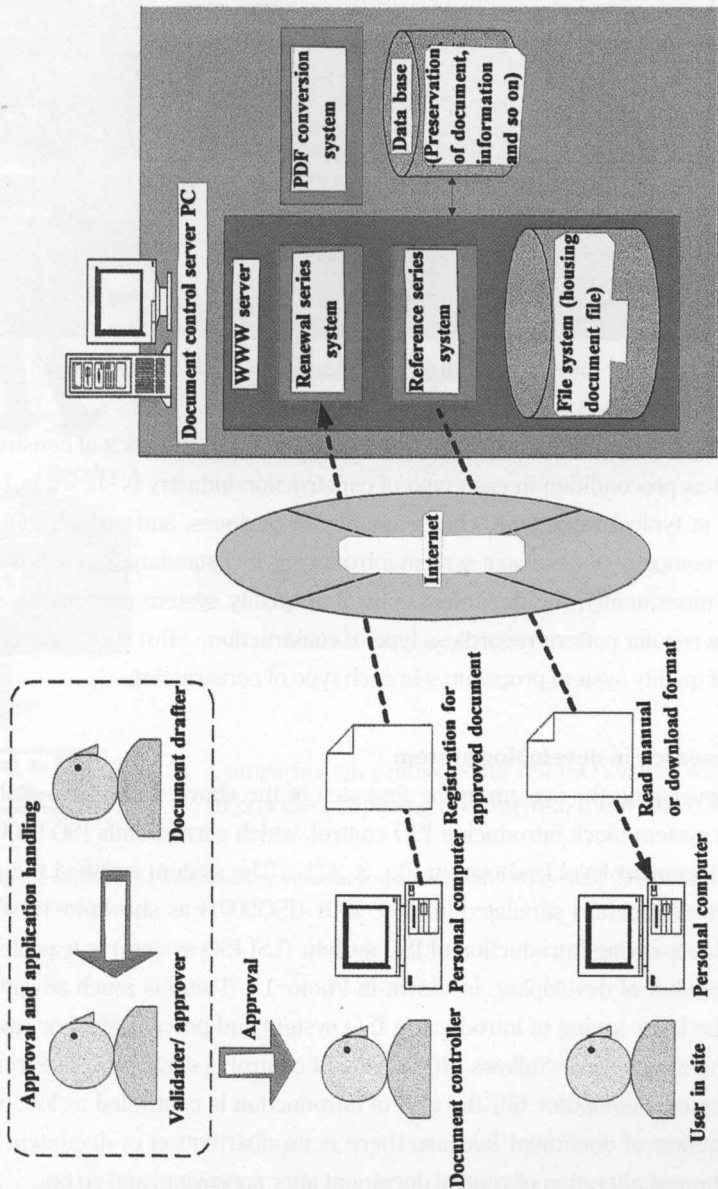
- ① Necessity of examining documents for distribution document to work station and the handling method of records and documentation after completion of construction.
- ② Difficult to systematize at a same level because the project sizes way vary widely.
- ③ Prepare paper in accordance with ISO increases work amount and as difficult to distinguish
- ④ Because it is not adaptive easy to contractor owing to prepare demand item of ISO for goods manufactures, there are scattering to apply in contractors by each certification organization.
- ⑤ The enterprise structure is cleared to correspond to ISO quality system procedure in condition relayed on multi layer of subcontractors.
- ⑥ Necessity of understanding by the ordering customer side for introducing ISO quality system procedure as regards orders, contract and design changes.
- ⑦ Evaluation validity for purchasing product in existing in-between trading company
- ⑧ Difficulty in reviewing and disposing of nonconforming product as in the case of structure
- ⑨ Revision work for Manuals and procedural documents must be revised whenever there is a revision on ISO 9000s standard code.

Typical work type	Characteristic of control
▼Company constructs prestressed concrete bridge nationwide (Dopi construction Co. ltd) (A)	
	<div style="border: 1px solid black; padding: 10px;"> <p>A system which branch office controls the management office activity and work station</p> </div>
▼Company mainly constructs in ocean civil engineering. (Nishimuragumi Co. ltd) (C)	
	<div style="border: 1px solid black; padding: 10px;"> <p>A system where the head office controls to concentrate and has characteristic control item of ocean civil engineering</p> </div>
▼Company mainly constructs bridges and foundations. (Hokushindoken Co. ltd) (D)	
	<div style="border: 1px solid black; padding: 10px;"> <p>A system whose the head office controls to concentrate and has characteristic control item of many types of bridge construction work</p> </div>
▼Company constructs roads and pavements. (Hokkaiholdo Co. ltd) (E)	
	<div style="border: 1px solid black; padding: 10px;"> <p>A system where the head office controls to concentrate and has characteristic control item of roads and pavements.</p> </div>

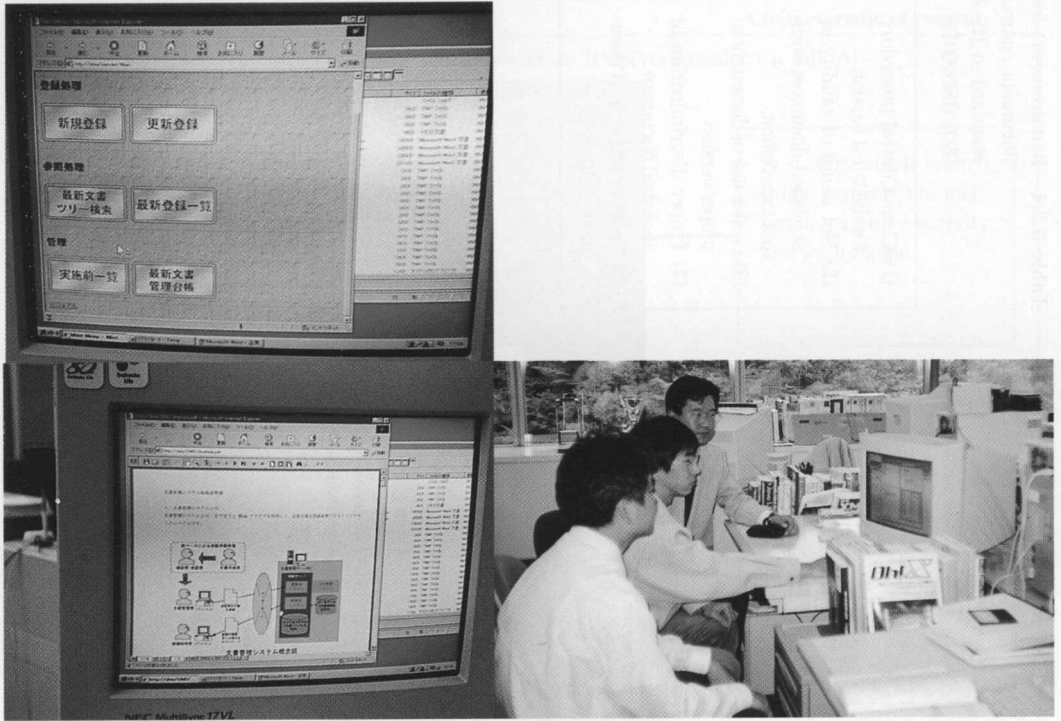
**Fig. 3. 1** System analysis of work type and characteristic of construction in order to introduce ISO in each type construction industry (typical work type, characteristic of business and organization)

**Table 3.2.1** Requirements for document control standard in JIS Z 9901 (ISO9001)

- (1) Clear Control procedure for the latest version.
- (2) Not using of validity or abolished document without expectation.
- (3) Proper use of document of proper version
- (4) Proper discrimination of abolished document
- (5) Clearing property of document change



**Fig. 3. 2. 1** The image of construction system block introducing ISO control, which is in accordance with ISO 9000s, with labor saving



**Photo-1** The labor-save introduction of ISO standard system (LSI ISO system) and the snapshot of developing

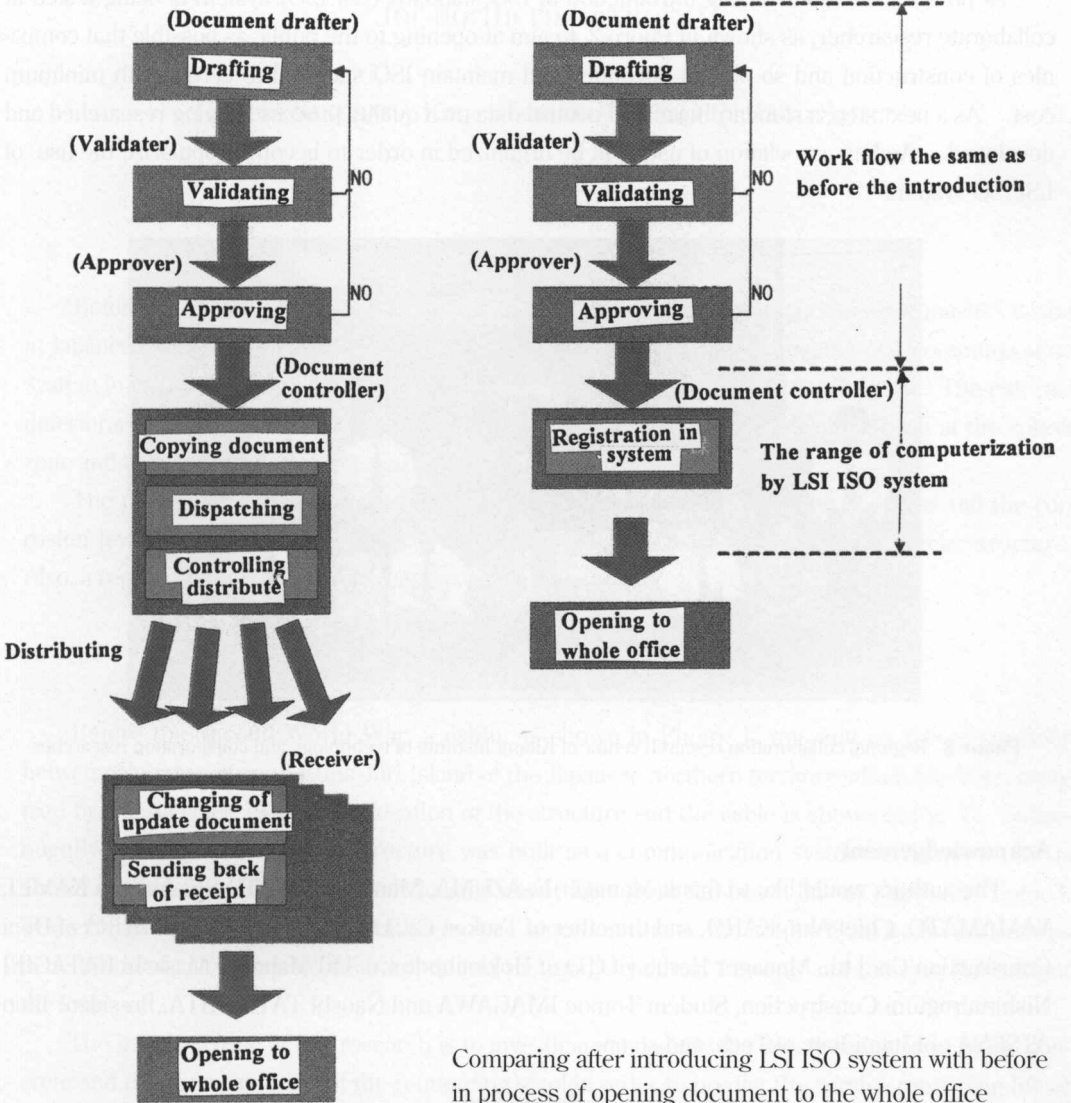
The result of system analysis by work type and characteristics of construction in order to introduce ISO as precondition in each type of construction industry is shown in Fig. 3. 1. This analysis is aimed at typical work type, characteristics of business, and organization of each collaboration research company to develop a system introducing ISO standard for each type of construction company. Consequently, the document control of quality system procedures according ISO 9000s is made of a regular pattern regardless type of construction. But there are characteristics in the data control of quality system procedures in each type of construction.

### 3.2 Research in developing system

In developing the system in the first step of the above-mentioned analysis, the image of construction system block introducing ISO control, which corresponds ISO 9000s, with labor saving on manual document level is shown in Fig. 3. 2. 1. The system satisfied the requirements for document control standard stipulated in JIS Z 9901 (ISO9001) as shown in Table 3. 2. 1. It is possible that the labor-saving introduction of ISO system (LSI ISO system) is feasible. The LSI ISO system and a snapshot of developing is shown in Photo-1. There is much advantageous merits in introducing the labor saving of introduction ISO system and process of labor saving as shown in Fig. 3. 2. 1. The merits are as follows ; (i) document control is simple, (ii) use from site office is possible with a personal computer (iii) the cost of introduction is controlled as low (iv) there is no time-lag of distribution of document because there is no distribution of document process (v) protection from dishonest alteration of control document after approving, and so on.

**Before introducing LSI ISO system**

**After introducing LSI ISO system**



Comparing after introducing LSI ISO system with before in process of opening document to the whole office

**Fig. 3. 2. 2** The merit of introducing the labor-saving introduction of ISO standard system (LSI ISO system) and process of labor saving

#### 4. Future problem

At present, the labor-saving introduction of ISO standard (LSI ISO) system is being tested in collaborate researcher, as shown in Phoro 2, to aim at opening to the public as possible that companies of construction and so on can introduce and maintain ISO standard to certify with minimum cost. As a next step, a standard format of control data on a quality process is being researched and developed. And an association of user will be organized in order to become popularize the use of LSI ISO system.



**Photo-2** Regional collaboration research center of Kitami Institute of technology and collaboration researcher

#### Acknowledgement

The authors would like to thank Manager E. AZUMA, Manager K. SATO SE, Akiyuki KAMEI, YAMAMATO, Chief Akio KAHO, and the other of Tsuken Co. Ltd., Chief Masakazu IMURA of Dopi Construction Co. Ltd., Manager Haruo GOTO of Hokkaihodo Co. Ltd Manager Masashi KATAGIRI Nishimuragumi Construction, Student Tomoe IMAGAWA and Naoshi TATESHITA, President Ikuo ATSUYA of Kitami Inst. of Tech. and so on.

#### Reference

- 1) H. SAKURAI : Support to pass certification of ISO standard and collaboration research to develop the labor-saving introduction of ISO system in KIT, NEX-US, Vol. 8, No. 6, pp. 14~15, IAS Co. ltd, June, 1999 (in Japanese)