DEVELOPMENT OF INFORMATION MANAGEMENT SYSTEM FOR BUILDING MATERIAL

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ABSTRACT: As information technologies in construction field get developed, various studies and projects are in progress for improvement of construction industry. Meanwhile, web-basis online system for building materials is tending upward. However, most of the informations about classification system for building materials and specifications are not systematic yet. Most field staffs have some troubles in making full use of the material information, repeating inefficient works from constructional design to the maintenance of it. This study designed auto-categorization system classified by materials, multi-search engines, auto-converting/creating electronic catalog as well as RFID search support to provide standardized building materials information.

Keywords: Building Material Information; classification system; Specification; Information Management System

1. INTRODUCTION

Construction Material Information is a main factor which is indispensible in the construction life cycle of Plan . Design . Construction . Maintenance, and it is related to the overall construction industry and holds the greatest part of the estimate and purchase performed in the construction service. As Information Technology is recently developed in the field of construction the system to collect . process . accumulate . provide a great deal of information deriving in the process of Construction Life Cycle tends to increase, and especially only the Online Systems providing the material information of main factors of the construction work currently numbers more than 110, which are very varied up to civil engineering . construction . equipments . fire-fighting fields. However, when we examine the information provided in such system, the standardized classification system and the standardization of information attribute is insufficient, so the staff in charge undergo many difficulties in getting information. Thus in this research we applied GDAS(Global Data Attribute System) used in the classification system of domestic construction materials and the global standard through analyzing . mapping OmniClass Part-22(hereinafter Master Format 2004), the global standard classification system developed for international standard and electronic information and UNSPSC(United Nations Standard Product & Services Classification) and defined the information data attribute of construction materials, and on the basis of this we planned and embodied the construction material information control system with the automatic production of electronic catalogue of e-book form as well as web-formed catalogue of existing system.

2. Construction Material Attribute and Classification System

In July of 2006, Ministry of Land, Transport and Maritime Affairs announced the Construction Information Classification System, which is just a general classification form widely used in the overall construction industry rendering the material classification field to use the classification of the Office of Supply. However, the classification system of the Office of Supply was also the global product classification system composed on the basis of the classification over the whole distribution control goods besides construction materials, which was not suitable to classify domestic construction materials and combined Master Format 2004 and International Product Classification System to secure domestic and foreign practical application and the compatibility with global standard. Together with this, we applied Global Data Attribute System which is the key system defining the common data set concerning product information and standardized the information of construction materials

2.1 North America Construction Information System(Master Format)

Master Format Classification System developed for the arrangement of construction material data in 1920 was rearranged with 16 classification system feasible in drawing up specifications in 1963 via the classification work by the construction type in 1933. Then based on CSI Format the bidding and contract related affairs were additionally contained besides CSI Format and supplemented in the field of civil

engineering in 1983, changing the rank of other division(field classification) besides construction types, amending UniFormat and Master Format throughout 1988, 1992, 1995, and it was being used as the Construction Information Standard Classification in the North American Area, and currently it was reformed and amended from existing 16-chapter classification to 50-chapter classification by the change of construction industry and the segmentation of infra structure based on current Master Format 2004.[1, 2, 3]

As seen in [Fig 1], the classification items of Master Format are a total of 8 digits with each two digits of large .middle . small form of decimal classification, and this material marking system is provided to use the items needed in production companies and selling companies, which grants Classification Code for the check and control in the classification system by means of this. And it contains the information such as construction products made and managed in the construction work, construction method, materials, manufacturing, suppliers, subcontractors etc. and provides the system needed in information processing to collect. classify. store . renew this in the computer system.[1]

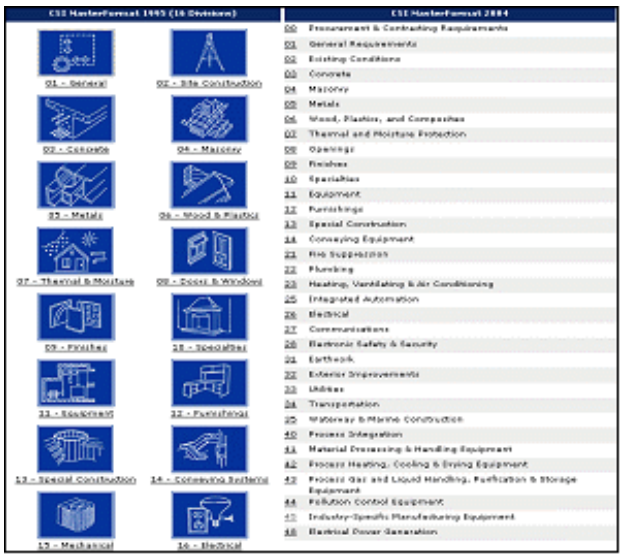


Fig. 1 Master Format 2004

2.2 United Nations Standard Product & Services Classification(UNSPSC)

UNSPSC of Global Product Information System is the international standard classification system used by 1,500 institutions all over the world, which is the code best fitted for outside compatibility out of product classification code announced up to now, supplementing the demerit [1] existing product classification code has.

As seen in [Table 1], the code system of UNSPSC is compose a total of 8 digits of Segment(2), Family(2), Class(2), Commodity(2), and if necessary, it can be composed of 10 digits by adding BTI(Business Type Identifier) in the form of Business Function..[2, 3]

	Segment	Family	Class	Commodity	Business
Digit	N0, N1	N2, N3	N4, N5	N6, N7	N8, N9
Definition	Analysis & Logic Group	Product Group	Common Attribute	Liaison Product	Handling Method Role
Example	Structure& Material, Manufacturing	Structure and Basic Section Steel	Angle	Alloy Steel	Purchase Lease Omission possible

Table. 1 Structure of UNSPSC

Such Product Classification Code can group various similar items into a common category, out of which similar items belong to a Class. And similar Classes are composed of the rank structure belonging to the Category of the higher concept than Class, so one can use the information to search and manage the goods such as the relation between the goods, goods and upper class.

2.3 Global Data Attribute System(GDAS)

GDAS was defined by International Product Code Control Institution concerning the common data set on the product information needed in building an electronic catalogue targeting the industry supplied with EAN/UCC System of each country , which describes the definition concerning Global Transaction Unit Number(GTIN) to express product information, Global Location Number(GLN), UNSPSC, Product Attribute(size, unit, packing, logistics, rank information) etc. and mapping to exchange such data.

Domestically on May 27, 2003 ECIF(Electronic Commerce Integration Forum) of Korean Agency for Technology & Standards of Ministry of Knowledge and Economy amended GDAS fitted for domestic situations and regularly enacted . noticed Electronic Catalogue Product Common Attribute National Standard(KS).

Section	GDAS Original Plan	Korean-styled GDAS
Number of Groups	12 pcs	10 pcs
Number of Data Field	114 pcs	52 pcs

Table. 2 Existing GDAS and Korean-styled GDAS

As seen in [Table 2], GDAS Original Plan developed/distributed by European Product Number

[1] In mapping already built classification system and standard classification system, certain products lack in compatibility not connected to detailed items, it has mapping with a n upper group.(ex, 0201, oil-painted paint↔ 02,vessel-purpose paint ≠ Paint)

Managing Body(EAN International) was composed of 12 Groups, 114 Data Fields and ECIF drew out 33 data fields out of 112 data fields of GDAS original plan and composed a total of 52 data fields by adding 19 data fields considering domestic situation.[3]

3. Design of Information Control System of Construction Materials

Prior to building information system of construction materials we defined domestic construction material classification system and attribute information based on global standard classification system and attribute information mentioned in Chapter 2..

As for Construction Material Classification System we compared . analyzed Master Format and UNSPSC and mapped it, and defined Construction Material Classification System as in [Fig. 2].[4, 7]

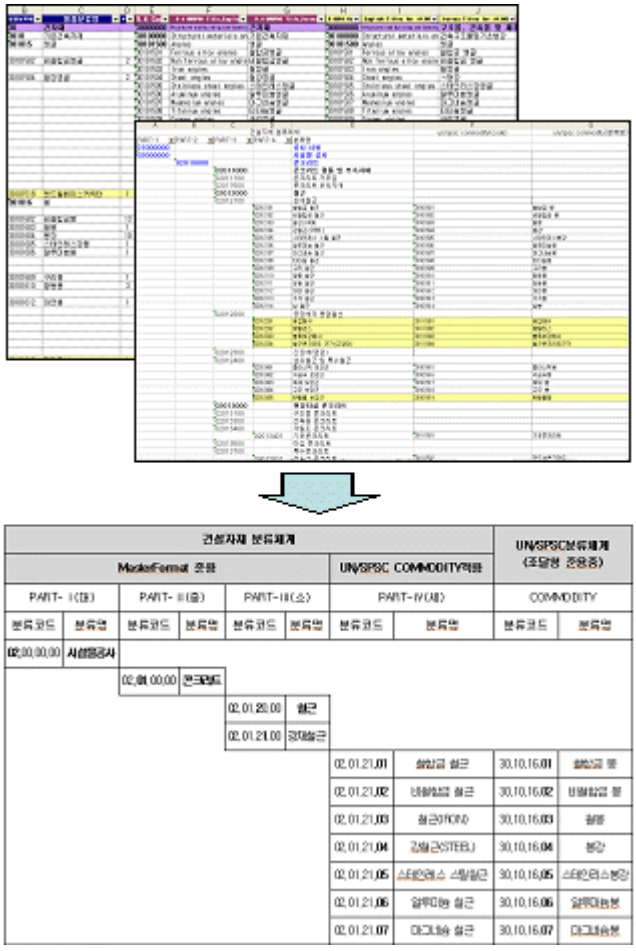


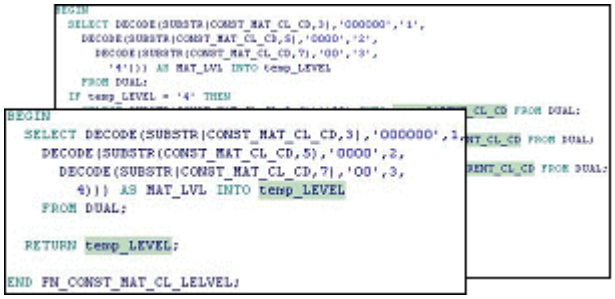
Fig. 2 Defining Work of Construction Material Classification System

The classification system defined in the method above is composed of Large . Middle . Small . Fine rank level of 4 step and the kinds of whole classification system are composed and classified with a total of 2,515 pieces making the object table of construction material classification system composed of 5 Attributes and 8 Entities through Data Modeling Work in designing the system.

COLUMN 명	COLUMN ID	DATA TYPE	PK	FK
건설 자재 분류 코드	CONST_MAT_CL_CD	VARCHAR2(10)	Yes	No
건설 자재 분류 명	CONST_MAT_CL_NM	VARCHAR2(100)	No	No
상위 분류 코드	UP_CL_CD	VARCHAR2(10)	No	Yes
코드 레벨	CD_LVL	NUMBER	No	No
Master Format 코드	Master_Format_CD	VARCHAR2(10)	No	Yes
UNSPSC 코드	UNSPSC_CD	VARCHAR2(10)	No	Yes
수정자 ID	MODR_ID	VARCHAR2(10)	No	No
수정 일시	MOD_DATE	DATE	No	No

Fig. 3 Object Table of Construction Material Classification System

Upper classification code and code level entity in the name of Column defined in [Fig. 3] are to analyze the code of upper/down relation of relevant code concerning newly added classification system and enable to register it automatically with relevant classification system, and the function thereon was designed as in [Fig. 4].



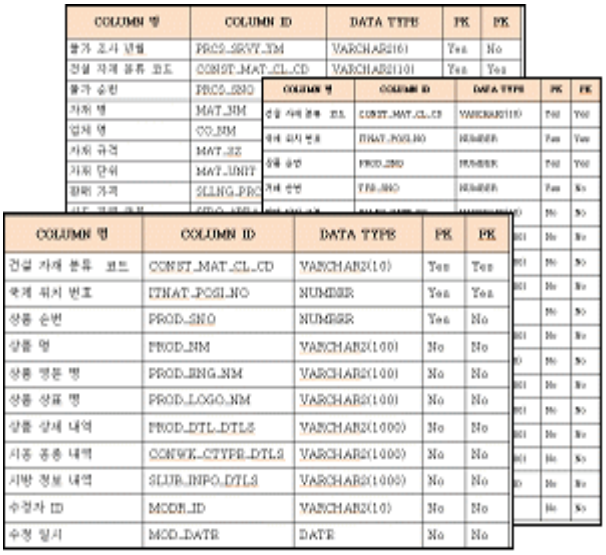
```
BEGIN
  SELECT DECODE(SUBSTR(CONST_MAT_CL_CD,3),'000000','1',
    DECODE(SUBSTR(CONST_MAT_CL_CD,5),'0000','2',
      DECODE(SUBSTR(CONST_MAT_CL_CD,7),'00','3',
        '4'))) AS MAT_LVL INTO temp_LEVEL
    FROM DUAL;
  RETURN temp_LEVEL;
END FN_CONST_MAT_CL_LELVEL;
```

Fig. 4 Upper Classification Code and Road Level function

[Fig. 5] shows the construction material classification system embodied in the construction material information system which was materialized in the form of Tree Structure stored in relation-typed Database.

Fig. 5 Construction Material Classification System

In the meantime, as for Construction Material Information Attribute we compared . analyzed the catalogue of existing construction materials and GDAS and standardized the common attributes (7 groups 35 items) and individual attributes (30 kinds 405 items) of construction materials, on which we designed Object Table [Fig. 6] of material information. This time, in case of material information, we designed it by dividing into Basic Information, Price Information, Detailed Information considering the embodiment of electronic catalogue of relevant materials.



COLUMN 명	COLUMN ID	DATA TYPE	PK	PK
건설 자재 분류 코드	CONST_MAT_CL_CD	VARCHAR2(10)	Yes	Yes
국제 위치 번호	ITNAT_POSI_NO	NUMBER	Yes	Yes
상품 순번	PROD_SNO	NUMBER	Yes	No
상품 명	PROD_NM	VARCHAR2(100)	No	No
상품 영문 명	PROD_ENG_NM	VARCHAR2(100)	No	No
상품 상표 명	PROD_LOGO_NM	VARCHAR2(100)	No	No
상품 상세 내역	PROD_DTL_DTLS	VARCHAR2(1000)	No	No
시공 종류 내역	CONSWK_CTYPE_DTLS	VARCHAR2(1000)	No	No
시방 정보 내역	SUBR_INFO_DTLS	VARCHAR2(1000)	No	No
수정자 ID	MODR_ID	VARCHAR2(10)	No	No
수정 일시	MOD_DATE	DATE	No	No

Fig. 6 Object Table of Construction Material Information Attribute

4. Building Management System of Construction Material Information

We built the construction material information management system [Fig. 7] to search and manage domestic construction material information. This system can provide diverse services differentiated from existing system such as the basic and detailed information of materials and the information of producers of relevant materials, automatic materialization of classification system and electronic catalogue, the provision of information of RFID-applied materials, the support of e-commerce etc. In addition, the system users can be easily supplied with desired material information using diverse searching system such as key words and reference words, category, classification system, names of business, names of materials etc.

Fig. 7 Main Portal Screen of Construction Material Information System

Meanwhile, E-catalogue can be automatically created using the information of materials and businesses registered in the system, and in case there occurs the renewal of the information of materials and businesses registered in the system DB, the information of E-catalogue created was embodied to be automatically changed.

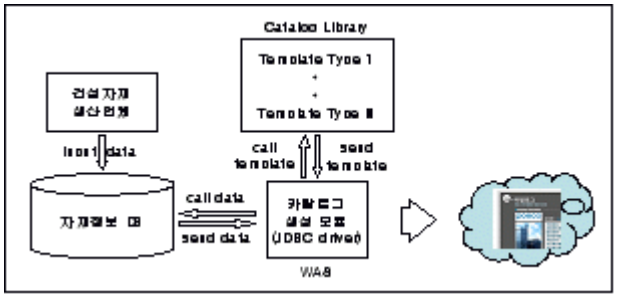


Fig. 8 Production Process of Electronic Catalogue

As shown in [Fig. 8], E-catalogue of construction materials calls relevant material information to DB using Catalogue-creating module provided by WAS Server, searches for classification system of called information, calls relevant catalogue template in catalogue library and creates construction material e-catalog[Fig. 9].

Fig. 9 E-catalogue of created Construction Materials

5. Conclusion

In this research we built the information control system of construction materials to provide the information of the construction materials regularized and standardized in the field of construction industry. In this system, we shall build the construction material classification system by means of Master Format and UNSPSC classified by construction process and standardize construction material information based on GDAS and ECIF and embody it with relation-typed DB, and further we shall provide the function differentiated from existing system such as diverse searching of stored information and automatic creation of e-catalogue and RFID-applied material information, support of e-commerce and contribute to the betterment of domestic construction industry.

In future, we'll proceed with the study of Standard DTD(Document Type Definition) of construction material information for the information exchanges between different systems in the field of construction industry and the research on RFID Standard System for the use in the field of construction.

REFERENCES

[1] Dennis, H. etc., "Master Format™ 2004 Edition", CCI, 2004

[2] Stephen C. W. Kong. etc., "Enabling information sharing between E-commerce systems for construction material procurement", *Automation in Construction*, Vol 13-2, 2004, Pages 261-276

[3] Leen S. kang etc., "Information Classification for Civil Engineering Projects by UniClass", *Journal of Construction Engineering and Management*, Vol. 126, NO. 2, 2000

[4] Korea E-commerce Association, “E-catalogue Product Classification Code(UNSPSC) Korean·English Code Collection Size”, 2003

[5] Korea E-commerce Association, “E-catalogue Standardization Guideline”, 2003

[6] J. Constr. Engrg. and Mgmt, etc., "Internet-Based Geographical Information Systems System for E-Commerce Application in Construction Material Procurement", *Information Technologies,* Vol 129-6, 2003, pp. 689-697

[7] Han Choong-Han et al. “A Study of the Betterment Method of Construction Material Classification System considering Global Product Classification Attribute Code”, *Construction Management Society*, 2007

[8] An Ho-Joon et al, “The Construction of Information System of Plant Equipments using ISO 15926 Global Standard”, *Korea Information Process Society*, Vol 14-1, 2007