2) Architecture

The development levels described in (b) above are separated as follows. Development has currently reached Level 2.

Level 1:

Drawing displays can be reproduced accurately on-screen (paper).

Level 2:

Sufficiently satisfies requests for 2-dimensional CAD design data and usability is secured when reused, while also meeting the demands for electronic delivery.

Level 3:

Elements required to reach Level 4. For example, chained/parallel dimensions, product definitions, drawing shape models, and views.

Level 4:

Sophisticated use of drawing data is possible for not only STEP/AP202 design functions, but also for construction field-specific information.

Data that cannot be exchanged at Level 1 includes many elements that can be exchanged at Level 2. According to the future schedule, the study of Level 4 will begin first and a long-term study of Level 3 will be performed.



[SCADEC Initiative Secretariat]

Japan Construction Information Center Foundation

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Standard for the CAD data Exchange in the Japanese Construction field



1. Construction Market in Japan

The construction market in Japan covers about 70.9 trillion yen (US\$ 600 billion) (1999), which is equivalent to about 14.3% of Japan's GDP. The construction industry is one of Japan's key industries, consisting of approximately 586,000 companies that employ about 10% of the country's working population, or 6.57 million workers.

The chart on the right shows a breakdown of the construction market by public and private sector and by building construction and civil engineering projects.



2. CALS/EC

The Japanese Government is implementing a variety of IT development policies to achieve its goal of "The Achievement of an Electronic Government". One of these measures, an MLIT (the Ministry of Land, Infrastructure, and Transport) project intended to improve public works project execution processes through computerization, is called CALS/EC and is scheduled to be applied to all MLIT public works projects by 2004. A longer-term goal is to extend the system to include regional governments and all other organizations that order public works by 2010. Early innovations achieved by the CALS/EC project are Electronic Procurement and Electronic Delivery that began in 2001. Electronic Delivery is the completion and presentation of the results of public works projects (documents, photographs, charts, etc.) as electronic files in CD-R and other media. To deliver CAD data in particular, it is necessary for all concerned parties to agree to establish data exchange standards that are able to exchange accurately between various CAD software.

3. Relation with other organizations

1) JACIC (Japan Construction Information Center Foundation)

JACIC, established in 1985 under the jurisdiction of the MLIT, plays a central role in the development of the information handling capabilities of the construction industry (mainly public works projects). JACIC is developing technologies essential to provide comprehensive support for the completion of CALS/EC in 2004 that is described above. As part of its activities, it established the SCADEC Initiative in 1999 to develop CAD data exchange standards for the construction industry in Japan.

2) Organizations participating in the SCADEC Initiative

As the following figure shows, the SCADEC Initiative has cooperative relationships with various domestic and foreign organizations. SCADEC Initiative representatives have participated in ISO meetings (TC184/SC4 WG3/T22) since 1999, and the Initiative maintains close contacts with STEP-CDS (Germany). A member of the Japan chapter of the IAI (IAI and ISO TC184/SC4 have a liaison relationship) also participates in SCADEC.



4. What is SCADEC/SXF?

[SCADEC (Standard for the CAD data Exchange in the Japanese Construction field)] SCADEC is a project undertaken to develop CAD data exchange standards for the construction field in Japan. SCADEC's activities include the development of standard specifications and common software (common library, SXF browser), participation in STEP meetings, public relations and the spread of information.

[SXF (Scadec data eXchange Format)]

SXF refers to all CAD data exchange specifications developed by SCADEC. Specifically, this includes STEP/AP202 subset schema, feature specifications, and feature-based Part21 templates.SXF conforms to ISO10303 STEP/AP202, and physical files output based on SXF specifications are STEP files (Part21).

1) Standard development



Standard development was implemented under the following three principles: (a)CAD data exchange shall be adjusted to meet actual circumstances in the construction field. Aim for 2-dimensional CAD data

(b)Development shall progress in stages.

Set development levels from 1 - 4, according to the difficulties with exchanging and complexities of use

(c)Standards shall comply with international standards. Employ ISO (International Organization for Standardization) standard STEP/AP202

As the following General Outline of Development shows, SCADEC has developed an SXF specifications and other parts of a common library installed on each translator, the SXF browser that will be used to represent SXF data, and so on.



(Including announcements abroad)

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1) Developing Standard for CAD data Exchange

As the following General Outline of Development shows, SCADEC has developed the SXF Specifications, as well as Common Library to be mounted on each translator and an SXF Browser to display SXF data.



Standard development was implemented under the following three principles:

(a) CAD data exchange shall be adjusted to meet actual circumstances in the construction field.

- → Aim for 2-dimensional CAD data
- (b) Development by stages.
- → Set development levels from 1 4, according to the difficulties with exchanging and complexities of use (c) Standards shall comply with international standards.
 - → Employ ISO (International Organization for Standardization) standard STEP/AP202

The development levels described in (b) above are separated as follows. Development has currently reached Level 2.



2) Image of CAD data exchange

The following figure shows the image of CAD data exchange operation in public works projects. First, the design office that received an order from the MLIT (the Ministry of Land, Infrastructure, and Transport), local government, or other public works purchaser prepares the design drawings using commercially available CAD software and delivers them to the public works purchaser in an SXF (p21) file format. Next, the public works purchaser uses an SXF browser to check the SXF format design drawings it has been provided, and finally gives them to the contractor as the order drawings. The contractor uses commercially available CAD software to prepare the completed work drawings based on the order drawings received in an SXF (p21) file format, and delivers the completed work drawings to the public works customer in an SXF (p21) file format. The completed work drawings delivered are used by a public body to maintain and manage the completed facility.

The design office and the contractor do not need to use the same CAD software; they can each select the CAD that is easiest to use in their field from SXF compatible CAD software. A verification project conducted by a private sector group to verify the quality of SXF compatible CAD has begun.



3) Vendors List

Far more kinds of CAD software are used by the construction industry in Japan than in other countries. Many of these CAD vendors will provide SXF compatible CAD. The following table introduces some of these CAD vendors who have announced to distribute SXF compatible CAD software.

A&A Co.,Ltd.	Index System Consultants Co.,Ltd.	Sanei Co.,Ltd.	
ACCESS SOFTWARE TECHNOLOGY Co.,Ltd	Informatix Incorporated	Sanotec Corporation	
Autodesk Ltd.	Integrated Software Products Cortporation	Santech Co., Ltd.	
Be System Co.,Ltd.	Intelli Japan Co.,Ltd.	Sanukite Japan Inc.,	
Bentley Systems Co.,Ltd.	ITOCHU TECHNO-SCIENCE Corporation	SITZ Co.,Ltd.	
BIGVAN INC.	JEC Co.,Ltd.	sotsuzen.com	
CHUDEN ENGINEERING CONSULTANTS Co.,Ltd	KAWADA TECHNOSYSTEM Co.,Ltd.	Steps Ahead Co.,Ltd.	
Civil Soft Developments Co.,Ltd.	KENCHIKU SHIRYOU KENKYUSHA Co.,Ltd.	SYSTEM-I Inc.	
Cosmo Electronics Corp.	Komoda Industry Co.,Ltd	SystemMetrix Co.,Ltd.	
CRC Solutions Corp	KOZO KEIKAKU ENGINEERING Inc.	Takukyo Engineering Co., Ltd.	
DAITEC Co.,Ltd.	KOZO SYSTEM, INC.	UCHIDA DATA CORPORATION	
Dynaware Corporation/EbaTech Co., Ltd.	KyowaJapan Co., Ltd.	UlTriangle.Co.,Ltd.	
Faith Co.,Ltd.	Matsushita Electric Works, Ltd.	UTO INDUSTRY INC.	
FORUM8 Co.Ltd.	Micro CAD Co.,Ltd.	Wise Corporation	
Fujitsu Ehime Information Systems Limited	MYZOX Co.,Ltd	YAMAICHI-KOGYO Corporation	
FUJITSU LIMITED/FUKUICOMPUTERInc.	NACOS COMPUTER SYSTEMS CORP.	YOKOGAWA TECHNO-INFORMATION SERVICE, Inc.	
FUSO SYSTEM RESEARCH Co.,Ltd.	OSK Corporation	YONDENKO CORPORATION	
GODAI Development Corporation	Peacenet Co.Ltd	÷	
G-TEC	PHOTRON.itd		
Hitachi,Ltd.	Primesoft Limited Company		

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SCADEC Initiative ISO/STEP Meeting in Seattle, USA

Katsuhiro Miyanaga CALS/EC Department / Standard Department , JACIC

Outline

- The development plan in the current fiscal year
 - SXF Ver3.0 development
 - SXF Level 4 development
- Related theme
 - The new three-year plan of standardization of construction information
 - New CALS/EC plan
- Future Schedule



SXF Ver3.0 Development(1)

- The development of new attribute set and actual proof experiment
 - Concrete structure quantity calculation
 - Substructure of bridge(Abutment, Pier)
 - Steel structure quantity calculation
 - Superstructure of bridge
 - Temporary structure quantity calculation
 - Earth retaining / Sheet pile / ...



SXF Ver3.0 Development(2)

- Establishment of a guideline for decision of attribute set
 - For specialist of each domain
 - They will develop attribute sets



SXF Ver3.0 Development(3)

- Purpose of actual proof experiment
 - Availability examination in real work
 - Change of business process (BPR)
 - Effect
 - Technical issue
 - Institutional issue



SXF Ver3.0 Development(4)

Organization

- Owners
 - Chugoku district maintenance office (MLIT)
- Contractors
 - Japan Civil Engineering Consultants Association
 - Japan Civil Engineering Contractor's Association
 - National General Contractors Association of Japan
- CAD vendors
 - 9 companies
 - Open CAD Format Council (OCF)



New Version of SXF Browser

• Display of attribute set



NCIC

SXF Level4 Development(1)

- Actual proof experiment with Marketing CAD
 - Availability examination in real work
- Target domain (design, construct, maintenance...)
 - Road
 - Steel bridge



SXF Level4 Development(2)

- Members of actual proof experiment
 - Owners
 - Chugoku district maintenance office (MLIT)
 - Contractors
 - Japan Civil Engineering Consultants Association
 - Japan Civil Engineering Contractor's Association
 - National General Contractors Association of Japan
 - CAD vendors
 - KLS(IFC), YTI (Road, Steel bridge), Autodesk (Earthworks), Informatix (GIS)



SXF Level4 Development(3)

- Decision of SXF level 4 specifications (initial version)
 - Expansion of Requirement definition document



Related theme(1)

- The new three-year plan of standardization of construction information
 - Construction Information Standard Committee
 - From fy2004 to fy2006
 - SCADEC is positioned as one of subcommittees



Associated theme(2)

New CALS/EC Action Plan

- Ministry of Land, Infrastructure and transport (MLIT)
- From fy2005 to fy2010
- It is under decision now
- The plan of new CALS/EC and the development of SXF is associated mutually



Schedule of Future Activity

	FY2004	FY 2005	FY 2006
SXF ver3 : Develop Property Sets		Target Range	Enhancement
SXF ver3 : Software Mounting			
SXF ver3 : Common Library Remodeling	\bigstar	N	ot be determined
Level4 : Demonstration Test			
Level4 : Common Resource Construction		Target Range	Enhancement
Level4 : Develop the Next field object model (Bridge model ?)		prototyping	



Standard for the CAD Data Exchange in the Japanese Construction Field (SCADEC)

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CALS/EC Department

