

NISTIR 6401

**COMPUTER-INTEGRATED
KNOWLEDGE SYSTEM (CIKS)
NETWORK: REPORT OF THE 2ND
WORKSHOP**



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United States Department of Commerce
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National Institute of Standards and Technology
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3. Working Group Reports

CIKS working groups met in 2 breakout sessions during the workshop. The working groups were charged with critiquing the proposed CIKS framework, identifying opportunities for partnerships, identifying user needs, and developing and prioritizing recommendations for the NIST role. Groups that met and responded to the charge were; Aluminum, Coatings, Composites, and Concrete. The responses from the working groups are summarized in this chapter. Formats vary, depending on the nature of the discussions. For example, the Coating Working Group had been meeting regularly since the 1996 workshop and had developed a mature agenda. It was most beneficial for this group to direct their attention to furthering ongoing activities and report the status of their work and plans for furthering their partnerships and projects. The Concrete Working Group had a good representation and through projects identified during their sessions, developed valuable information for future work and strong partnerships and actions directed to synergistic goals.

3.1 Aluminum

Chair: Randy Kissell, TGB Group

3.1.1 Summary of Discussion

This group's discussion focused on interactions between NIST and The Aluminum Association. The Aluminum Association's Engineering and Design Task Force has developed an Aluminum Design Manual. Primarily building designers who require design information on aluminum material properties and products use the manual. The group recommended the CIKS framework as a method for disseminating the contents of the manual. Initially, it was thought that product data could be included as a component of CIKS. However, the CIKS concept does not incorporate the resources or capabilities for creating an operational repository for data storage and access. Therefore, this project is not feasible for CIKS-residency. Rather, NIST facilities (e.g., the CIKS testbed) could be made available to assist aluminum industry organizations in the implementation of databases.

3.1.2 Current Working Group Project Status

Subsequent meetings were held with the Aluminum Association Staff and the Engineering and Design Task Force. The current activity involves a linkage between the CIKS website and the Aluminum Association website. It is expected that, through this linkage, some of the needs of building designers and other knowledge users will be served.

3.2 Coatings

Chair: Bernard Appleman, The Society for Protective Coatings

3.2.1 Preliminary

The Chairman reviewed the objectives of the meeting. This group had met several times and had previously established priorities. These priorities are documented in NISTIR 6003 [1]. Therefore, the focus of the present meeting was to review on-going programs, and identify needs for additional or expanded efforts. Representatives were present from the Coatings and Information Technology Working Groups.

3.2.2 Current Activities

The following on-going Coatings Working Group activities were discussed. Overviews of the projects were presented in addition to their status and expected results.

3.2.2.1 Technical Data Sheet Format

This activity was initiated by the working group in June of 1996, an activity chaired by Robert Kogler of the Federal Highway Administration. The proposed guide was then submitted to the SSPC, C.4.10 Committee on Knowledge Based Systems for Coatings, for discussion and balloting. The guide was published in August 1999 by SSPC as Guide 13. It is currently being distributed in printed form and is available online through the SSPC Knowledge Center at its website (www.sspc.org).

The new guide will promote consistency and improve the reporting of coating product data among coating manufacturers/suppliers and users. It is especially useful when computerized databases are developed and they aid in the search and retrieval of product data. The guide will also be used in printed form by coating manufacturers and suppliers in communicating information on printed technical data sheets.

Future work related to this project will be to develop a template for coating manufacturers to “fill-in” fields for product data sheets, and communicate this to a database maintained as a central location or at the manufacturers facility. Primary users of the guide are expected to include transportation agencies involved with maintaining performance data related to conformance testing of bridge coatings, and marine coatings users.

3.2.2.2 Internet Users Guide

Recognizing the need to provide assistance to new users of the Internet, the working group, in collaboration with the SSPC C.4.10 Committee, developed an Internet Users Guide. This guide has been converted to copyrighted SSPC tutorials that were given during the 1997 and 1998 SSPC Conventions. At each convention, an introductory and intermediate tutorial was given. Response for the tutorials was positive and generally

well accepted. This was an important step in bringing coating industry users up to speed on Internet technologies such as getting connected, website navigation and authoring, familiarity with the SSPC website and electronic commerce.

3.2.2.3 Expert Systems State-of-the-art Report

The SSPC C.4.10 Committee is conducting this project. It is in progress.

3.2.2.4 CIKS/SSPC Activities at SSPC Conferences

In addition to preparing the tutorials described in Section 3.2.2, the CIKS Coatings Working Group and SSPC Committee C.4.10 have worked together on several projects and held several joint meetings:

- An SSPC '96 Technical Seminar [4] on “Doing Business On-Line: Internet Applications and Resources” was held in 1996. The seminar was intended to provide coating industry representatives with information on accessing and using the Internet from a user and business perspective. Talks in the seminar included:
 - “Coating Industry Knowledge Base Systems: An Introduction to the SSPC Knowledge Center and the NIST Computer-Integrated Knowledge Systems Network” by Simon K. Boocock, SSPC, and Lawrence Kaetzel, NIST
 - “Internet How To’s” by Michael F. McLampy, KTA-Tator, Inc.
 - “Does the Internet Belong in Your Business Future?” by Renee E. McHenry, Northwestern University, Infrastructure Technology Institute
 - “SSPC On-Line: Electronic Communication and the SSPC Member” by Simon K. Boocock, SSPC
 - “A Brief Guide to Internet Resources for Coatings-Related Regulations and Associated Coating Information” by Mary E. McKnight, NIST
 - “Electronic Commerce and Intellectual Property on the Internet: An Overview of the Concepts” by Lawrence Kaetzel and Sandra Padilla, NIST.
- For fee SSPC tutorials were developed by the CIKS Coating Working Group members and presented during the 1997 and 1998 SSPC Conventions. These included:
 - SSPC Tutorial T-45, “Using the Internet for Coatings Business and Technology I” presented by Renee McHenry, Northwestern University, Infrastructure Technology Institute

- SSPC Tutorial T-49, “Using the Internet for Coating Business and Technology II” presented by Renee McHenry, Northwestern University, Infrastructure Technology Institute, and Lawrence Kaetzel and Thomas Kurihara, NIST
- SSPC Tutorial T-58, “Accessing and Using Industrial Coatings Information on the Internet” by Lawrence Kaetzel, K-Systems (formerly of NIST)
- SSPC Tutorial T-59, “Using the Internet as a Tool for Coating Industry Business” by Lawrence Kaetzel, K-Systems (formerly of NIST)

3.2.2.5 Project to Improve Intragroup Communication

The coatings working group has also developed and published procedures for improving the communication of documents. The CIKS testbed was utilized to install and test a mailing list server (LISTSERVER) and store documents for review and comment. These facilities resulted in the reduction in review times for documents and helped keep working group members informed of activities through electronic means. The project was documented and published as an article titled “Using the Internet for Group Communication” in the Journal of Protective Coatings and Linings [5]. In 1999, SSPC adopted this procedure in their Knowledge Center to improve the feedback and information dissemination to their members.

3.2.2.6 SSPC Knowledge Center on Coatings

Chairman Appleman briefly described the concept and plans for the SSPC Knowledge Center which is a key portion of SSPC’s mission. He stated that CIKS through NIST is a critical component of this knowledge center.

3.2.3 New Activities

3.2.3.1 FHWA/NIST Coating Selection Expert System

A joint project conducted by NIST and funded by the Federal Highway Administration (FHWA) involves the development of a bridge coating expert system (BRCOAT). The system involves the selection of coating materials for shop applied and field applied coatings. It pertains to both new bridges and maintenance of existing bridges. The intended user is a civil engineer who has little or no knowledge on coatings. Decisions are currently made based on expert opinion and FHWA research on coatings. Currently, the system is in its second version and will be placed in use at one of the FHWA districts for further testing and implementation. The system was described in the paper “A Systematic Approach to Coating System Selection for Highway Bridges Using the BRCOAT Knowledge Based System” [6]. Further work on the system is expected to involve the addition of product and research data on coating performance and accessibility through a website.

3.2.3.2 Infrastructure Technology Institute Coating Maintenance Expert System

This system is being developed to assist state engineers in the decision process. It includes pre- and post-inspection of the bridge surface. The decision is based on condition assessment and includes economic analysis of alternatives. The working model was expected to be presented in the Spring of 1998.

3.2.3.3 Partnership on Coatings for Highway Structures

From the above project descriptions, it is evident that there are several different groups working on developing knowledge sources and databases for highway bridges. There is interest among four key groups from NIST, FHWA, ITI, and SSPC to coordinate these activities and to provide tools for the bridge agencies and others in need of this knowledge. One goal is to establish procedures for mapping different data forms and accounting for their different structures and levels of granularity. It is noted that it is important to have common definitions (e.g., the term “thermal coatings” had different meanings to different individuals in the group). The question of copyright arose because some organizations generate substantial revenue from selling their copyrighted glossaries or dictionaries. The framework for the partnership is shown in Figure 3.1.

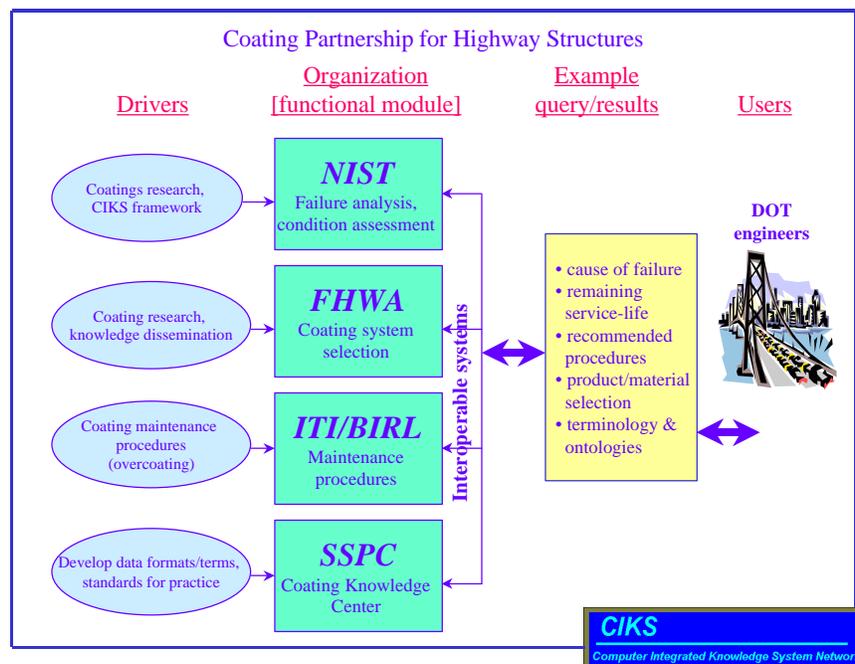


Figure 3.1: Coating Partnership for Highway Structures.

3.2.4.4 Survey on Needs for Coating Knowledge

This was an area that was suggested by the organizers of the CIKS workshop. The SSPC Strategic Planning Committee had conducted several surveys in 1996 on this need in the

area of coatings knowledge. SSPC will provide summaries of those surveys to the working group. On the basis of this information, additional surveys could be developed and discussed during SSPC/CIKS Group meeting at the SSPC '97 Convention in San Diego.

3.2.5 Partnerships

A discussion was held on the need to work with other organizations that have a need or have an interest in protective coatings. This would result in broadening the scope of CIKS/SSPC Working Group. This would encourage access to other construction industry databases. Examples of other organizations and databases are as follows:

- National Bridge Inventory,
- The MasterSpec database of the Construction Specification Institute and the American Institute of Architects,
- Materials Testing Institute (MTI),
- American Association of State Highway and Transportation Officials (AASHTO),
- Individual engineering firms.

It was noted that some organizations (e.g., Amoco) have large in-house databases, but these are very expensive to maintain. Organizations would benefit by having access to an accurate, comprehensive, up-to-date, and easily accessed industry wide database. One approach is for SSPC to develop a multi-use web base database format. An example of an existing form would be from the material safety data sheet database that has been established. It is not known how often these are updated or the degree of validity.

3.3 Composites and Geosynthetics

Chair: Douglas Barno, Market Development Alliance

The Composites and Geosynthetics Working Groups met jointly during the breakout sessions. Discussion during their sessions followed closely the charge to working groups. This is largely due to the fact that the composites working group had not met since the 1996 workshop and the Geosynthetics working group was newly formed.

3.3.1 Summary of discussions

The group had some difficulty characterizing the CIKS concept. However, user needs, a conceptual approach and a critique of CIKS was discussed and reported. The group summarized user needs as follows:

Short-term computer based needs (3-6 months)

- ❑ FAQ's (frequently asked questions)
- ❑ Bulletin board
- ❑ List of experts and resources
- ❑ List of applicable software & hardware
- ❑ CIKS strawman
- ❑ Guidance/ interactive versus static.

The desired CIKS system for composites/geosynthetics was further characterized as follows:

- ❑ Interactive
- ❑ User friendly
- ❑ Quality assurance
- ❑ Compatible
- ❑ Organizational stamp (validity & accuracy)
- ❑ Time sensitive (just in time delivery)
- ❑ Provide both free information and electronic commerce

A developmental approach for the CIKS system that would apply to the working group's needs would take the following form:

<u>Phase</u>	<u>% cost</u>	<u>Organization(s)</u>
Strawman Define CIKS (features, benefits)	10	NIST/construction industry/CONMAT(CERF)
DEMO (working site that acts out the strawman)	60	NIST (server ACI, SSPC)
BETA Commercialization	30	NIST/Commercial entity NIST/CONMAT(CERF)/ Not-for-profit/MEP

3.3.2 Critique of the CIKS System

The group discussions resulted in the following statements and assumptions for a CIKS system for composites/geosynthetics industries.

- ❑ End-user (ultimate customer) is under-represented
- ❑ The assumption that associations represent their industry(s) varies by organization. Need process to validate (peer review or refereed protocol).
- ❑ Impedence mismatch between information and construction industry communities
- ❑ CIKS needs a permanent ownership (sustained commitment and capability)
- ❑ Participants role is directly proportional to the size and fragmentation of the industry segment
- ❑ Information technology potential to filter or modify data
- ❑ Derived benefits are represented in the information infrastructure
- ❑ CIKS development is an evolutionary process:
 - ❑ Staged capabilities

- Match application of information technology to market

3.3.3 Conclusions and Recommendations

- CIKS is clearly a capability that can benefit an emerging material technology like fiber reinforced composites even more than traditional materials.
- The Market Development Alliance (MDA) should stay active in the development and monitoring of CIKS
- Dr. Bernard Appleman should be invited to speak to either the MDA or STEERCOM at an upcoming meeting in order to bring their success story to our attention. It is a model that MDA can use to great effect.

3.4 Concrete and Masonry

Chair: David Fowler, University of Texas at Austin

The Concrete and Masonry Working Group was represented primarily by members of the concrete industry. This group followed the working charge closely which resulted in a structured discussion and presentation of prioritized pilot projects and workflow recommendations. Results of the group were very synergistic, suggestion that strong partnerships could be formed among the representative organizations and NIST. The following represents a summary of the projects identified and presented by the group.

Priority #1: Develop a Highway Materials Database

Duration: 1 year to 4 years

Starting date: 1 September 1997

Sponsor: TxDOT/FHWA

Research Agency: Center for Transportation Research/University of Texas at Austin

NIST Role: Consultant

Priority #2: Extend Concrete Repair (CONREP) Expert System

Duration: 4 years

Start date: 1994

Sponsor: Waterways Experiment Station/NIST

Research Agency: NIST

NIST Role: Research/Funding

Priority #3: Develop Masonry Materials Database for the World Wide Web

Duration: 1 year to 2 years

Start Date: Tentatively Fall 1998

Sponsor: American Concrete Institute Committee 531/Council for Masonry Research

3.4.1 CIKS Concrete Working Group Status and Activities

Since the 1997 workshop, the Concrete Working Group has met during the Spring and Fall Conventions of the American Concrete Institute (ACI). During the Spring 1999 meeting the working group merged with the ACI Committee 235 on “Knowledge Based Systems and Mathematical Modeling for Materials.” A new subcommittee 235-A on “Knowledge Interoperability” was formed and it is anticipated that the working groups members will be active members of the ACI subcommittee. This process follows closely the role assumed by the CIKS Coatings Working Group. Like the Coatings Working Group the Concrete Working Group has developed similar strategies for partnerships. Priorities 1 and 2 described above are currently being implemented by NIST, Waterways Experiment Station, and the University of Texas at Austin. ACI Committee 235 has developed a journal article to be published in the December 1999 edition of Concrete International that describes the partnership and the role of Committee 235 in addressing the knowledge needs of the concrete industry. Technical Sessions are being conducted during the ACI Fall 1999 Convention in Baltimore and, pending final approval and review, the proceedings will be published as an ACI Special Publication.