

IAI Meets as Singapore Inaugurates First Automated Code Check

The Singapore Government's unveiling of the world's first automated national building code compliance checking system—a groundbreaking practical demonstration of IFC-based Building Information Models (BIM) that has sparked interest worldwide—set the stage for International Alliance for Interoperability (IAI) meetings and events that followed in Singapore on October 28.

Members of NIBS' IAI North America Chapter taking part in discussions included IAI International Council Chair **Patrick MacLeamy**, IAI Technical Coordinator **Francois Grobler**, **Ho Wing Sit**, **Ian Howell**, and NIBS President **David Harris**.

Prior to the meetings, IAI completed a two-stage certification of the new system's ePlanCheck software, a product of novaCITYNETS (Singapore) and ArchiCAD (Graphisoft of Hungary). IAI Model



Singapore skyline

Support Group leader **Thomas Liebich** led a workshop and ePlanCheck demonstration.

The IAI International meetings coincided with a state visit to Singapore by **King Harald and Queen Sonja of Norway**, including a large trade and technical mission. At

a workshop preceding a concert and state dinner, Norwegian officials outlined their plan to emulate Singapore's automated model while surpassing both its scale (Norway has over 400 code jurisdictions) and

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Groups Will Assess HAZUS in Context of 2004 Hurricane Plans, Responses

How was NIBS-developed Federal Emergency Management Agency HAZUS^{®MH} software used before and during the August-September 2004 Florida hurricanes, and how well did it perform? Hurricane-aftermath conferences in Tampa and Charleston (see page 8) will include reviews of HAZUS both as a risk-assessment modeling tool, and as a supplement to hour-by-hour management in regional operations centers during hurricanes Charley, Frances, Ivan and Jeanne.

HAZUS' 1997 prototype applica-

tion was limited to earthquakes. The first HAZUS edition supporting integrated multihazard analysis with wind and flood damage models, plus updated earthquake software, was publicly released by FEMA in early 2004.

Improvements continue under NIBS' Multihazard Loss Estimation Program. For example, National Aeronautics and Space Administration-funded research is testing the use of HAZUS with satellite and other remotely sensed data, and developing advanced coastal risk assess-

ment tools.

Another FEMA-sponsored, NIBS-managed program, the American Lifelines Alliance (ALA), is launching

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The Civil Engineering Research Foundation (CERF) gave its 2004 Henry L. Michel Award to Massachusetts Institute of Technology architecture professor **William J. Mitchell** at a dinner in Baltimore October 21. Formerly dean of MIT's School of Architecture and Planning, and now head of its media arts and sciences program, Mitchell has explored both applications and implications of digital technology in his books and through MIT's Media Lab. CERF, a nonprofit created by the **American Society of Civil Engineers (ASCE)**, promotes practical innovation in design and construction.

The U.S. House of Representatives approved H.R. 2608, authorizing \$900 million over nine years to fund the existing **Earthquake Hazards Reduction Program (NEHRP)** plus a parallel program to mitigate windstorm damage. A National Weather Service study cited by the House Science Committee puts windstorm-related costs at \$4.5 billion each year.

The board of NIBS' **BETEC** Council elected **Wagdy Anis, AIA**, principal and director of Boston-based architects Shepley Bullfinch Richardson and Abbott, its chair-elect. Eric Burnett retains the chair until June 2005.

"XML and Web services continue to emerge as the foremost technology on the path to whole building integration," says Ron Zimmer, president of the **Continental Automated Buildings Association (CABA)**,

announcing a second annual **XML Symposium** beginning February 9 in Orlando. The HVAC-oriented meeting is linked to **AHR Expo**, billed as the world's largest HVAC/refrigeration event. Interoperability advocates note that XML (Extensible Markup Language) is not limited to the Web, but can be used to store any structured information and pass it between competing systems. See www.caba.org/ for information.



Young

McGraw-Hill Construction president **Norbert W. Young Jr., FAIA**, who chairs the board of the International Alliance for Interoperability-North America (**IAI-NA**, a NIBS Council), and serves on the board and executive committee of the **ACE Mentor Program of America**, will receive the 2005 American **Institute of Architects** Edward C. Kemper Award, which recognizes contributions to architecture through service to the Institute. AIA Executive Vice President/CEO Norman L. Koonce, FAIA, lauded Young as "a constant and persuasive voice for understanding and using new technologies to advance the profession." Ceremonies take place in May at AIA's National Convention in Las Vegas. Read more at www.aia.org/aiarchitect/thisweek04/tw1210/1210kemperyoung.htm.

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Building Sciences

Authorized by Congress in 1974, the National Institute of Building Sciences (NIBS) provides an authoritative, consensus-based resource, advancing security, safety, economy and performance through public and private sector volunteer members representing the building community and the public interest.

Robert L. Miller, FAIA, Editor (rmiller@nibs.org)

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Why Building Owners Should Care About Interoperability



Khemlani

The following is adapted by Building Sciences from an article by **Lachmi Khemlani, Ph.D.**, for the International Alliance for Interoperability (IAI). Ms. Khemlani is founder and editor of

the online publication AECbytes (www.aecbytes.com) and heads Arcwiz, a consulting and training firm. Her article *The IFC Building Model: A Look Under the Hood* appeared in June 2004 Building Sciences. She can be reached at lachmi@arcwiz.com.

Current computer-aided design (CAD) technology does little to reduce the waste, errors and cost overruns that plague building design, construction and operation. A new, industry-specific approach, building information modeling (BIM), streamlines operations and processes by creating a full, virtual 3D representation of a facility. BIM's information-rich simulation lets users extract data for many purposes, from 2D documents and 3D graphics to non-spatial analysis. To realize BIM's potential, however, the diverse applications used by different industry disciplines must be able to talk to each other and seamlessly share data. A proven path to this interoperability is for all applications to use the IFC (Industry Foundation Classes) open standard. Building owners need to push for adoption of open-standard, IFC-based BIM in the projects they commission, or leave a source of significant cost savings untapped.

Inefficiency and Waste in Building/Construction

In a world where information technology has revolutionized nearly all processes and industries, the building industry seems to have been bypassed. Facilities are planned, designed, built and operated using manual and paper-based processes little changed by computers. While architects, engineers, construction managers and building operators can choose from many software applications, most of these address very specific tasks and are used ad hoc. Meanwhile buildings become more complex, and specialization leads to even greater fragmentation among the players, their processes and their software. Lacking the technology to integrate operations and processes, managers encounter waste, inefficiency, errors and escalating costs at all phases of the building life cycle.

All this adds up to huge costs for owners. Industry experts, starting with Sir Michael Latham in his 1994 report "Constructing The Team," have estimated the industry could save up to 30% on the design-build-operate cycle if it managed information better. Corroborating this, a 2004 study sponsored by the National Institute of Standards and Technology puts annual losses to the U.S. capital facilities industry due to inadequate interoperability between computer-aided design, engineering, and software systems at \$15.8 billion.

Although NIST focuses on commercial/institutional buildings and industrial complexes, its findings apply to the industry at large. Researchers compared costs related to manual data reentry, duplication of business functions, and continued reliance on paper-based information

management, with an ideal scenario of fluid and seamless electronic data exchange, management, and access, to arrive at their \$15.8 billion estimate. They call this figure conservative, citing other inefficiencies beyond the scope of the survey.

Tracking these "interoperability gap" costs across stakeholder groups, NIST finds owners and operators pay the steepest price: \$10.6 billion, about two-thirds of the total. A breakdown by life cycle phase shows the highest cost at the operations and maintenance phase: \$9.1 billion, or more than half. Clearly the burden of inadequate interoperability falls mostly on owners and operators during the life of a facility—a logical finding, considering how problems with information management and retrieval can hamper facility operation, and how upstream inefficiencies in design and construction add to downstream expenses.

Building Information Modeling (BIM): A Better Technology for AEC/FM

A key reason computing in the building industry does little to streamline operations and processes, compared with industries like manufacturing, is its basis in computer aided design technology. Traditional CAD programs for 2D drafting and 3D design programs represent buildings using points, lines, rectangles and planes. Such applications can describe any geometry, but they cannot capture information about entities the geometry represents—data needed for design, analysis, construction management and operation.

Today almost nothing is drawn

manually, but the ubiquity of CAD has not transformed building. CAD perpetuates many problems formerly associated with hand drafting:

- Creating separate plans, sections, elevations, and details of the same building remains tedious and time-consuming.
- In general, changes must be manually updated on all drawings and reports.
- Automation per se provides no guarantee of accuracy, consistency, or completeness.
- Coordinating CAD-based work among different professionals is still a difficult, error-prone process.
- Conflicts and errors are detected in abundance at the construction site, necessitating expensive fixes.
- In the end, the owner/operator has little more than a dumb 2D representation of the building on which to base a lifetime of management, operation, and maintenance.

Fortunately, a different approach gaining ground in the AEC/FM industry can alter this dismal scenario.

Building information modeling, a building-specific technology, represents facilities using intelligent 3D objects that are “aware” of themselves and their relation to other objects. Unlike generic CAD, BIM applications are tailored to facility design. BIM creates a full 3D representation of a facility as it would function in real life, a digital prototype from which data can be extracted and used for various purposes, from 2D documents and 3D visuals to qualitative analysis.

Because BIM is optimized for building/facility design, it allows faster creation and editing of the building model than does CAD. And because all drawings, reports, renderings and so on derive from the same model, any change made is automatically updated on all documents, eliminating inconsistencies

and minimizing errors. Most conflicts are flagged in the building model, reducing expensive fixes later on.

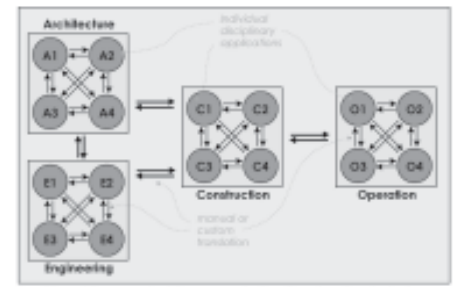
BIM’s immediate payoff is that it makes building design and construction faster, cheaper, more accurate and better coordinated. Its long-term benefits extend to operation, maintenance, renovation and rebuilding. The model created during design also supports facility management, and provides a “live” model for building control and maintenance, reducing operating costs for the life of the building.

BIM’s potential also includes improving building quality. Less drafting means more time and attention for design. Interdisciplinary collaboration works better with a shared building model. And BIM easily supports analysis and evaluation tools.

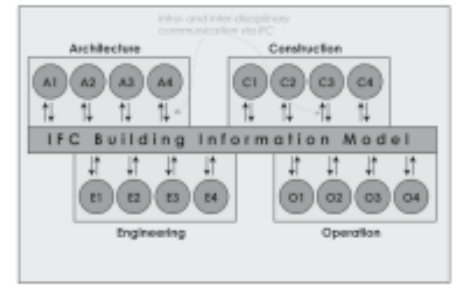
This last advance is crucial. While CAD has made it somewhat easier, building evaluation still isn’t integral to the design process, because it is extremely tedious to re-enter data manually in the format required by today’s analysis tools. BIM promises a whole new category of technology that will extract data directly from the building model to evaluate the design for energy efficiency, habitability, optimal space use, or code compliance. BIM will allow rigorous preconstruction testing of simulated building systems and facilities, resulting in much higher standards of quality control.

BIM, Interoperability and IFCs

Building information modeling can revolutionize how buildings are designed, constructed, and operated. Basing all building-related tasks on one shared, information-rich building model can bring together disparate players and processes and control the waste highlighted in the NIST report. But this potential can only be realized if the different BIM-based applications used by individual players can talk to each other and seamlessly share data. This is where the IFC (Industry Foundation Classes) come in.



Traditional Fragmented Processes in the Construction Industry



Integration enabled by Building Information Modeling based on IFC

Figure 1. Traditional processes in the building/construction industry versus those enabled by IFC-based BIM.

BIM applications by commercial vendors—for example Autodesk Revit, Graphisoft’s ArchiCAD, Nemetschek’s AllPlan, and Bentley Architecture—use proprietary internal data models. They cannot share their rich building information directly with each other unless they develop specific translators for this purpose. Nor can they communicate with third-party analysis or evaluation tools, unless a link has been custom-developed, or the product has an API (application programming interface). Without free flow of building information across the various applications used by the individual players, the very purpose and promise of BIM largely evaporates. The job of IFC is to allow these applications to “interoperate.”

The IFC is an object-based building data model like that of commercial BIM applications, except that it is non-proprietary. Guiding its development is the IAI (International Alliance for Interoperability), a global consortium of companies and research groups formed in 1995.

The IFC model supports interoperability across the individual, discipline-specific applications used to design, construct and operate buildings by capturing information about a project throughout its life cycle (see Figure 1). It was specifi-

cally developed for exchanging model-based data between model-based applications in the AEC and FM world, and is now supported by all major CAD/BIM vendors, plus an increasing number of downstream analysis application vendors. Fourteen IAI chapters in 19 countries, funded by 650 member companies, make the IFC a truly global effort.

Because the IFC is an open data exchange format that captures building information, commercial BIM applications can use it to share data. The applications must be “IFC-compliant,” that is, capable of importing and exporting IFC files. Applications undergo an IAI-supervised product certification process to get the IFC-compliant tag. The IFC model specification is publicly posted and accessible to anyone, so software developers can build IFC import and export capabilities into their applications.

IFC-Enabled Building Projects

Commercial software using BIM can improve productivity and quality within a single design firm. For BIM to transform a whole project, however, IFC-based interoperability is needed to bridge the disciplines that make up the project team.

In designing the Helsinki University of Technology’s new 600-seat auditorium, the architects led in creating an intelligent 3D building model, sharing data with other consultants for producing cost and life cycle evaluations, acoustic models and 4D construction planning (the fourth dimension being time). IFC-based interoperability helped integrate over 22 different software applications used in the project. It also let the model be intelligently linked with the construction schedule and cross checked with construction activities, improving accuracy and efficiency. A reported 50 per cent saving on routine work such as design documents gave the project team time for value-added comparisons of thermal performance, operating costs, energy consumption and environmental impact. The IFC-enabled,

model-based approach also fostered communication among the end-users, owners and project team, effectively translating the client’s intent into a valuable end product. The project was completed in 2002.

In Birmingham, England, the Digbeth College of Further Education served from 2002 to 2004 as a pilot project testing IFC model-based building operation and maintenance. The study focused on design coordination of spaghetti-like HVAC systems at Digbeth’s auditorium and heating plant to control both construction and maintenance costs. IFC-compliant applications helped detect and avoid HVAC clashes with the building structure, and improved the handover of detail generated during design and construction to the operator and facility manager. Other pluses included fast setup of facility management operations, and a dynamic, easily updated building model that can chart the environmental and financial impacts of changing uses. Because UK law makes company directors personally liable for safe operation of their facilities, the validated, audited data captured in the building model also creates a valuable compliance tool.

In the United States, the federal General Services Administration Public Buildings Service (GSA/PBS), managing some 200 current projects worth over \$10 billion, has mandated the use of standardized BIM processes based on IFCs. A December, 2003 policy directive calls for IFC-based BIM to support concept reviews for projects receiving design funding in 2006, including checking designs against program requirements and cost estimates. The U.S. Coast Guard has also chosen IFC-compliant building modeling technology for their new generation of strategic facility deployment.

(Editor’s note: see front page story on IFC use in Singapore and Norway.)

The Message For Building Owners

Building information modeling’s revolutionary technology promises

to reintegrate the building industry’s traditionally fragmented players and processes and control its notorious inefficiency. Unlike generic CAD systems, BIM is custom-built for the construction industry and injects much-needed intelligence across the entire process of designing, constructing, and operating facilities. The IAI has already certified a diverse range of IFC-based, interoperable applications, enabling BIM for an array of building-related tasks. More will be developed, employing BIM intelligence to deliver undreamed-of capabilities.

But moving to a new technology involves change. For AECs who grew up professionally with CAD drafting, switching to a new way of working will take time, effort, and a significant push. Some forward-thinking professionals may be self-motivated to change. But for the majority, this push will have to come from the client: primarily building owners, who, as NIST shows, have by far the most to gain. Just as critical, it is owners who must insist that BIM implementation be based on an open standard like the IFC that enables real interoperability. This will afford owners the benefits of using BIM data developed during the design-construct phase, adding new data as renovations and equipment changes occur, and applying it to distant downstream O&M and other software applications throughout the facility’s life-cycle. Otherwise they will again see only the modest benefits of proprietary software, instead of the project-scale, industry-wide leap in quality and profits that BIM can deliver.

Owners must take an active role in demanding the most powerful, cost-saving technology available to design, construct and operate their facilities. Without owners’ leadership to drive the adoption of open-standards-based BIM in the projects they commission, the pace of change will slow again, and the potential for better buildings will remain untapped.



Patrick MacLeamy

scope, with BIMs covering land use planning, zoning, and all aspects of building permitting. Norway's ByggSok (www.byggsok.no) aims to be processing at least 20 per cent of building applications by late 2005.

IAI meeting agendas ranged from specialized technical interests to the broad concerns of vendors and end users:

IAI's International Technical Management Summit # 28, led by ITM chair Francois Grobler, challenged attendees to draft a technical roadmap for IAI's future. Both individually assigned "think tank topics" and committee-generated recommendations are slated for February's IAI/ITM summit in Madrid, as are guidelines for software makers, product library publishers, and end users on how to develop a BIM and populate it with data.

A **VIU Workshop**, the second of a scheduled series, brought together vendors, ITM members, and users to compare notes and identify needs. Featured examples came from novaCITYNETS, the developer of the new ePlanCheck code compliance software. As at the ITM Summit, the workshop concluded that the IFC data model is performing well, but that user guidelines on how to populate the BIM with data are needed.

The **International Council (IC) Workshop on Education and Training** chose Peter Scuderi, Development Manager for CRC Construction Innovation of Australia, to chair an IC

Committee on Education and Training.

Entitled "OOPS it's here" (for Object Oriented Practice and Solutions), the **IAI Singapore Industry Day** marked the formal debut of Singapore's ePlanCheck code compliance system and several related tools, including a new measurement standard to guide electronically based cost estimating.

Wong Wai Ching of the Singapore Building and Construction Authority discussed ePlanCheck in the context of CORENET, the government's 12-year-plus effort to re-engineer construction business procedures for quality and efficiency.



Francois Grobler

Describing how owners can submit building models in IFC file format to Singapore regulatory agencies for automated processing using ePlanCheck, Wong called the system "one of the largest IFC-based projects ever undertaken by a government agency" and noted that its success depends on timely IFC implementation by CAD developers and the entire building-related software industry.

Representing novaCITYNETS, **Wawan Solihin** covered the basics: ePlanCheck's definition and scope; differences it will make in the building process; and user requirements for submitting models for review. Enumerating its benefits, he claimed the new automated check

- enables faster response and faster turnaround.
- is more comprehensive (less limited by self-reporting and time constraints).

- is more consistent (less dependent on human interpretation).
- allows preliminary self-checks and partial checks in advance of a formal submission.
- can be done anytime (24/7), anywhere.

In other Industry Day talks, U.S. Coast Guard representative **David Hammond** stressed the great value of organization-wide use of the IFC model to large institutional owners, a theme also raised by IAI International Council Chair and HOK CEO **Patrick MacLeamy, AIA**.

In his illustrated presentation, IAI UK Chapter Chair **Nick Terry**, Chairman of Building Design Partnership (BDP), invoked the "rebirth of an industry," relating IAI's view of cross-industry information sharing and open standards to his own vision for "the industry formerly known as construction." Recalling his firm's roots in the interdisciplinary, collaborative model epitomized by the original Bauhaus, Terry linked that early 20th century idealism to the practical interactivity of today's information technology with its "common processes centered on a common data environment." Ultimately, he said, the mission of the industry, given shared data and a constantly improved data baseline, must be to add value for consumers and society. Terry quoted Sir John



David Hammond

Fairclough's call for construction "to be seen as central to a better quality of life for everyone and concerned with a sustainable future."

BETEC, NFRC Plan Spring Fenestration Forum

Fenestration—a decisive factor in occupant security, safety, comfort and productivity, as well as in building energy performance—is the topic of a symposium being planned for June 8, 2005, in Washington, DC. NIBS' Building Environment and Thermal Envelope Council (BETEC) and the National Fenestration Rating Council (NFRC) will collaborate on the conference, to be chaired by BETEC board financial officer **Herbert Yudenfriend**.

Historically focused on construc-

tion technology, BETEC has long supported NFRC's program of energy ratings for doors, windows and skylights. Similar BETEC efforts include a uniform window installation standard developed with ASTM and a technical guideline for building performance created by BETEC's Building Enclosure Commissioning Committee, the subject of an October, 2004, ASHRAE workshop.

In addition to providing product-specific information, the planned symposium, like recent BETEC

programs on mold and air quality, will highlight broader building performance issues, examining comfort and productivity from the occupant's point of view in school, office and other environments.

Program and location details will be announced soon. Some exhibit and sponsorship opportunities remain available. For information contact Pat Cichowski at NIBS headquarters, via email at pcichowski@nibs.org.

International Code Council Honors Sealy

Dallas architect **Jim. Sealy, FAIA**, received the International Code Council's top honor, the Bobby J. Fowler Award, in September at ICC's annual conference in Salt Lake City. An American Institute of Architects news account called Sealy, who chairs NIBS' Building Seismic Safety Council (BSSC), "an icon of the code development process."

In the 1970s and 80s Sealy joined Fowler, a fellow Texan and

AIA Fellow who at one time chaired the International Council of Building Officials (ICBO), in traveling the country to promote the fledgling ICC and build support for a single model building code. After Fowler's death, Sealy helped create a joint AIA/ICC Bob Fowler Memorial Scholarship Fund.

At the same ICC conference:

- Sealy briefed attendees on FEMA/BSSC's forthcoming

homeowner's guide to earthquake-resistant design.

- Sealy and NIBS immediate past board chair **Henry Green** represented NIBS at ICC's Partnership Organizations Luncheon.
- NIBS president **David Harris** met with ICC Foundation CEO **Paul Myers** and took part in a planning meeting of the ICC Disaster Response Committee.

Marshall Elected to NIBS Board



Marshall

An acknowledged leader in both private sector and military design and construction, architect Mortimer M. Marshall, Jr., FAIA, FCSI, NOMAC, rejoins the NIBS Board of

Directors on January 27, 2005. Marshall previously served on the NIBS Board from 1981 to 1987 and was its treasurer from 1983 to 1987.

Marshall is president of The Marshall Group, an architecture, engineering, and construction management firm in Reston, Virginia.

From 1967 to 1982, he served as Director of Design on the staff of the Secretary of Defense, with responsibility for developing and implementing the design policies and criteria used in DOD's annual multi-billion dollar, worldwide design and construction program. His duties included visits to U.S. military schools, family housing, hospitals, clinics and other facilities around the globe to evaluate their compliance with DOD standards. Marshall also led the program development team

for the Uniformed Services University of Health Services at the National Naval Medical Center, and he held key positions with the Naval Facilities Engineering Command (then the Bureau of Yards and Docks).

"Mort Marshall brings a remarkable mix of top management experience from his public and private sector background in architecture and construction, plus his extensive knowledge of NIBS," said Thomas B. McChesney, NIBS board chair. "It's an honor and a pleasure to have him back on the Board."

An architecture graduate of Tuskegee University, Marshall is one of some 20 individuals who are Fellows of both the American Institute of Architects and the Construction Specifications Institute.

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a study of another key casualty of the 2004 hurricanes, the damage to Florida's utility and transportation systems. A request for proposals issued November 15 calls for a study of how these systems' interdependencies affected their post-hurricane response-and-recovery performance. The new Florida project complements existing ALA draft guidelines designed to help owners and operators of electric power systems, oil and gas pipelines, and wastewater systems develop risk management plans for a variety of hazards. ALA documents are available at www.americanlifelinesalliance.org.

Hurricane Symposium Meets in Tampa

On February 11-13 in Tampa, the International Code Council will join FEMA and other organizations concerned with structural and occupant safety to sponsor *Hurricane Symposium: Impact of the 2004 Hurricanes on the Built Environment*. Organizers are invit-



Devastation from Hurricane Ivan.

ing owners, disaster response professionals, code and regulatory officials, government managers and design professionals to hear and discuss "initial observations, lessons learned and unmet research needs." While stressing building standards, the symposium, moderated by NIBS president **David Harris, FAIA**, is also expected to consider the risk assessment/risk management approach represented by HAZUS. Contact

symposium coordinator David Bowman at 1-800-214-4321 x 323, or see the ICC website, www.iccsafe.org.

HAZUS Users Convene in Charleston

The third annual conference of the **Southeastern HAZUS User Group (SEHUG)** is slated for March 7-11 in Charleston, South Carolina. Presenters will give firsthand accounts of working with HAZUS during the 2004 hurricane season and discuss its future use in response, recovery and planning. After keynote and review sessions and presentations on FEMA's Map Modernization Program on the first day, the second day will be split into management and technical tracks covering GIS (Geographic Information System) tools. The remaining three days will offer basic and advanced HAZUS training at the College of Charleston. Information on the conference and on SEHUG, a public-private group formed to coordinate risk management activities for all stakeholders, is online at www.hazus.org/SEHUG.

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The **IAI-NA** (International Alliance for Interoperability-North America, a NIBS Council) Board met in Las Vegas January 17 in conjunction with the Technology for Construction show, where **Francois Grobler, Robert Johnson, and Sandy Shaw** led a panel on Building Information Models. The Board welcomed

Chuck Williams representing new member Architectural Data Systems, installed **Scott Frank** of Jaros, Baum, and Bolles as Treasurer, and discussed IAI's new "Building Smart" campaign. **Joe Dietrich**, staff vice president of the **American Institute for Steel Construction**, presented an interoperability success story: six years after AISC began promoting the CIS/2 open standard for steel

design, 15 commercial CIS/2 applications are on the market, 74 per cent of U.S. steel fabricators surveyed use interoperable software, and 25 per cent are using electronic data exchange. Studies show schedule savings of 20-40 per cent or more. AISI technical and marketing goals include data compatibility between CIS/2 and IAI's IFC.

ACE-DC receives \$60,000 from The Builders Ball.

Christopher Reseigh (2nd from left), president and Bruce Bowman, executive director (4th from right) of the ACE Mentor Program of the Greater Washington Metropolitan Area, accompanied by several ACE supporters, accept "the check" from Builders Ball officials.

