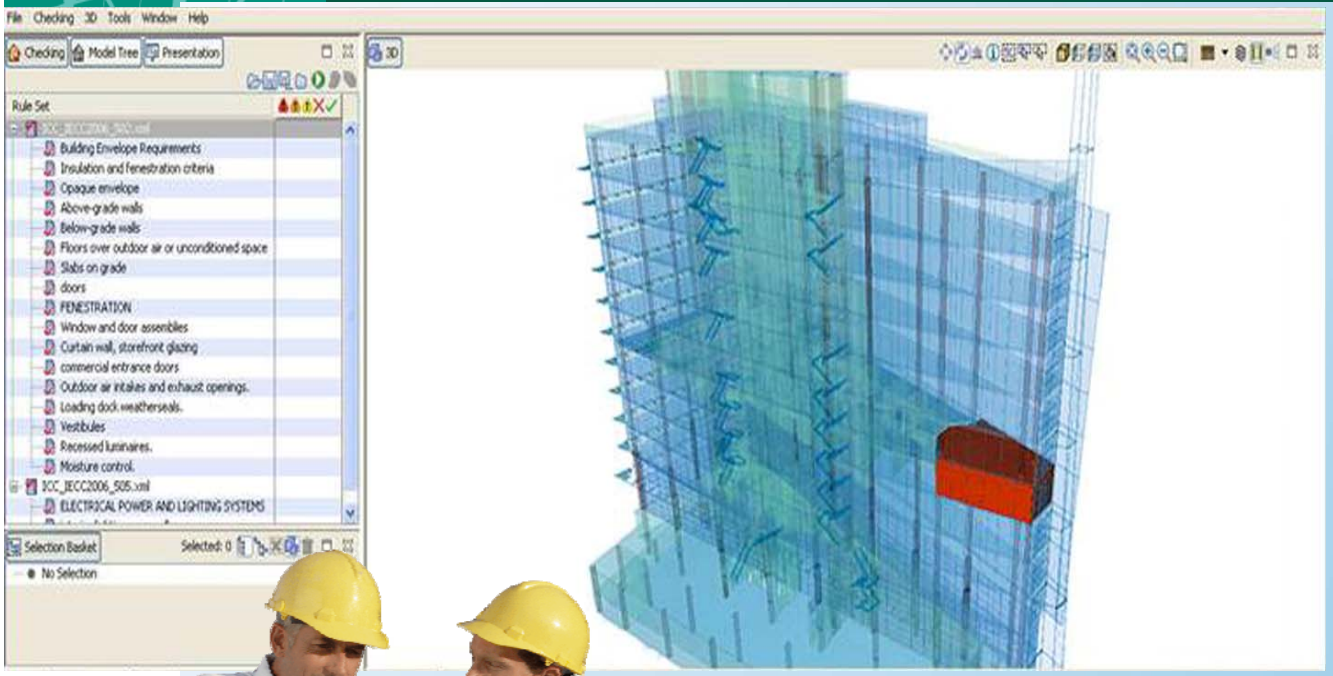
Energy Codes 2008 - Tools of the Future

SMARTcodes™



Dave Conover
July 23, 2008

ICC INTERNATIONAL CODE COUNCIL®

Purpose

To provide a view to a BIM based future where software automatically determines and validates building regulatory compliance

Building Design Approval in Minutes

By David R. Conover

Imagine submitting a plan to a building departmen
that you are certain complies with codes and getti
approval in hours instead of weeks. Think of the ti
money and resources it could save design-build team

Currently, most building departments conduct plan
reviews manually because building designs are subm

ENR

Supermodels

DESIGN-BUILD DATELINE

THE JOURNAL OF THE DESIGN-BUILD INSTITUTE OF AMERICA APRIL 2007

Wisconsin Department of Commerce Newsletter

June 2007

Looking into the Building Regulatory Future

Imagine submitting a plan that you are certain complies with the codes to the local building department and getting approval in *hours* instead of weeks. Think of the time, money and resources it could save designers, builders and code officials alike.

Currently, the majority of building departments conduct plan reviews manually because building designs are submitted on paper. Similarly, designers and builders rely on code books to ensure projects comply with local, state and federal building regulations. What if there was a different option—automated code compliance checking? It may sound too good to be true, but it could be reality in the
cutting-edge effort to automate c

With SMARTcodes, designers cou

The newsletter is issued electronically every other month.

Please send comments or questions to Barbro McGinn, editor.

Subscribe to Newsletter

Email:

CNNMoney.com

GET QUOTES SYMBOL LOOK-UP

HOME | NEWS | MARKETS | MY PORTFOLIO | TECHNOLOGY | JOBS | PERSONAL FINANCE | LUXURY | REAL ESTATE

AIA

EDGES

Newsletter of the Technology in Practice Knowledge Community

SMARTcodes Update

Imagine being able to automatically check a building design for code compliance during any facet of project development. The International Code Council (ICC) SMARTcodes project focuses on automating and simplifying code compliance checking against the ICC International Codes

May 7, 2007

COVER STORY

REGULATORY REFORM

Digital Tools Make Possible An E-Permitting

Digital trepidations aside, code officials are beginning to
e-permitting, which can cut long lines at the buildings de
and improve code enforcement. The advance pleases th
development community and protectors of public safety.

Software Incompatibility Largest Obstacle to Interoperability, According to New Report From McGraw-Hill Construction

October 24, 2007: 05:05 PM EST

PR Newswire

NEW YORK, Oct. 24 /PRNewswire/ -- McGraw-Hill Construction, part of The McGraw-Hill Companies , today released its Interoperability SmartMarket(TM) Report at McGraw-Hill Construction's ENR Construction Business Forum in Washington, DC. The report provides insight into the interoperability of software applications and platforms serving the building community - of key importance to the $1 trillion U.S. construction market, as interoperability costs add 3.1% to a typical project budget.

(Photo: http://www.newscom.com/cgi-bin/prnh/20071024/NYW145)

The 40-page SmartMarket(TM) Report reviews the results of research conducted by McGraw-Hill

Top Stories

Giant tax overhaul
Home sales: Worse
Countrywide links a
Is marriage a dumb
Wall Street in midd

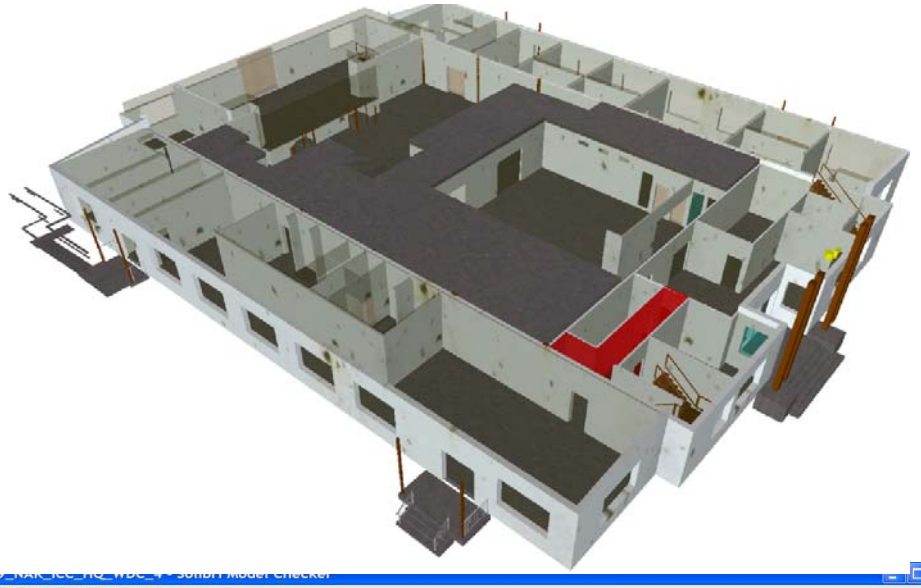
SPECIAL OFFER:

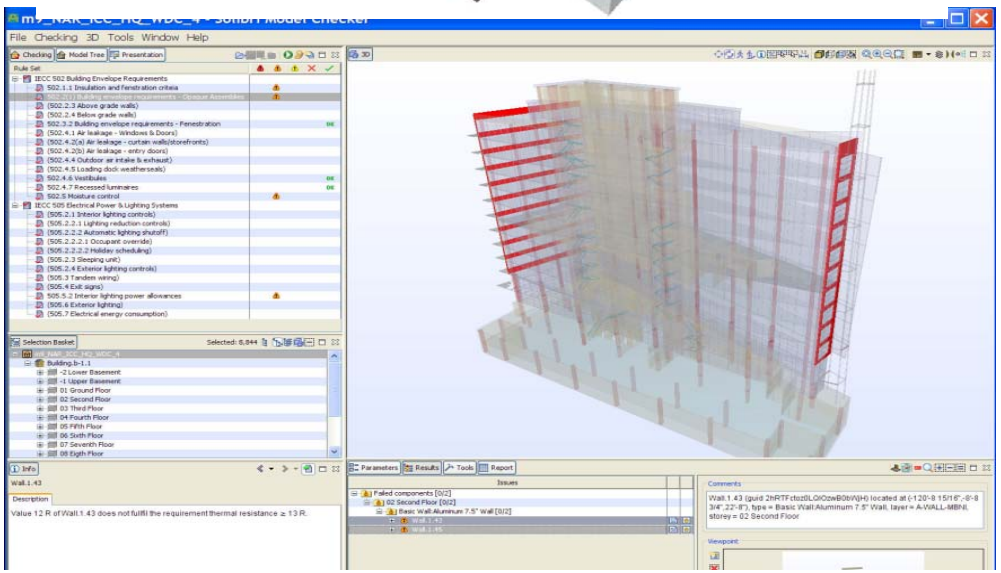
TRY 2 FR

FORTUNE Investor's Guide 2007

Expected Outcome

An understanding of how automated checking for building regulatory compliance can be implemented using building information models and integrated into an interoperable e-government environment

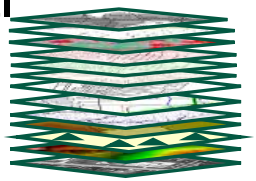




What is a BIM? – Physical & Functional Characteristics View

Legal Data

Geospatial Data



Financial Data

Designer Data

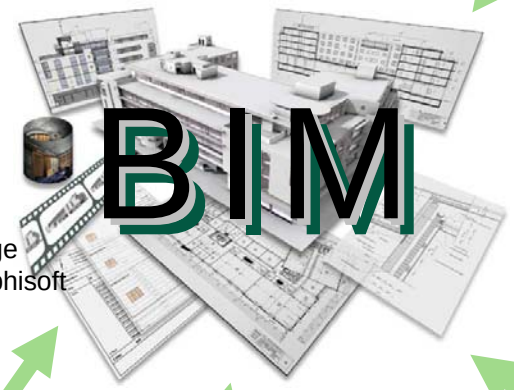


Image Graphisoft

Specifier Data

Owner / Occupier Data

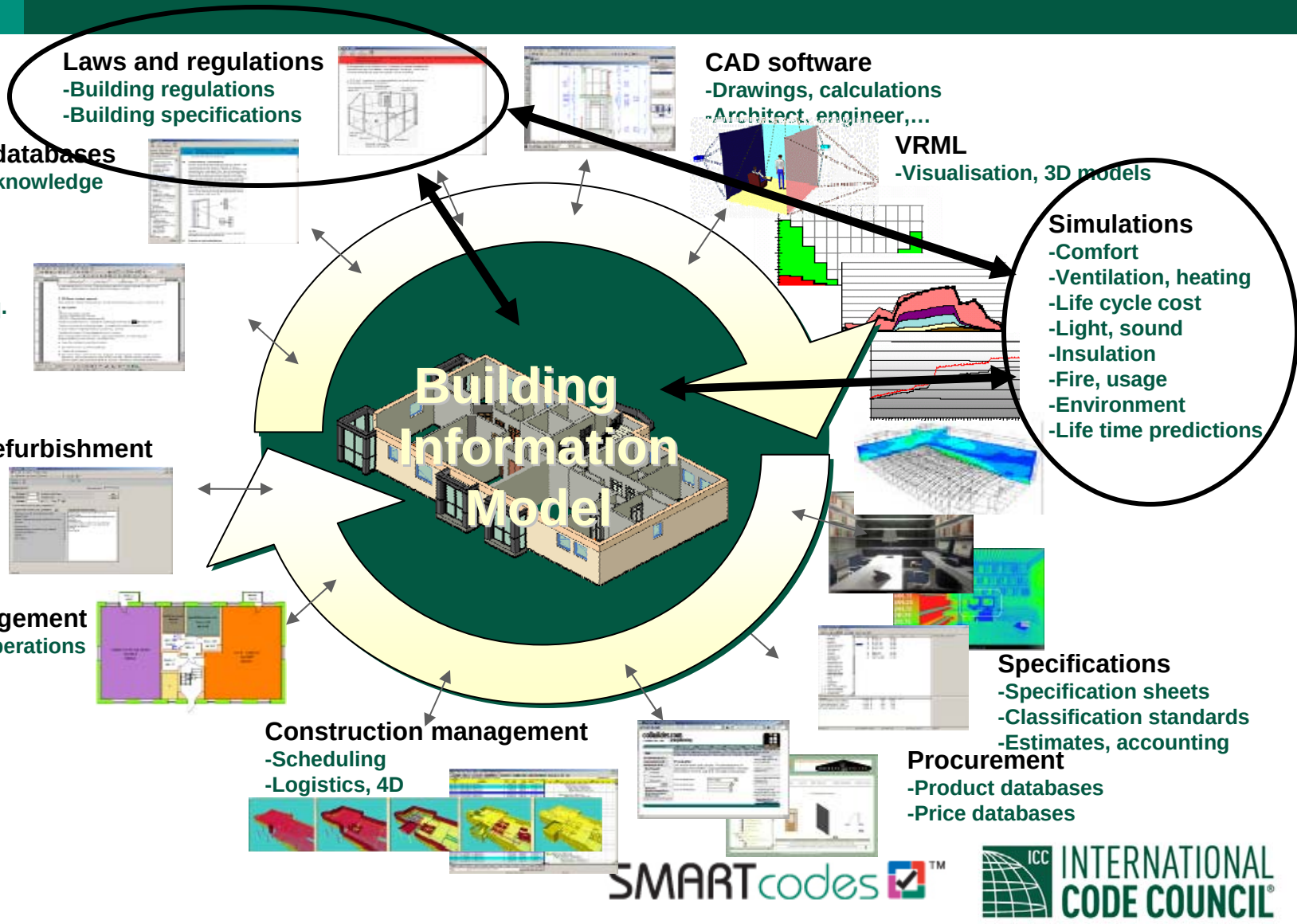
Sustainers Data

Environmentalist Data

SMARTcodes™

INTERNATIONAL CODE COUNCIL

What is a BIM? - Lifecycle Information View



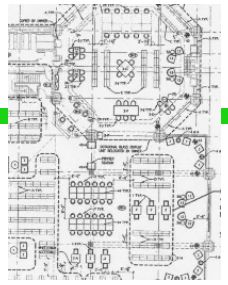
A Vision

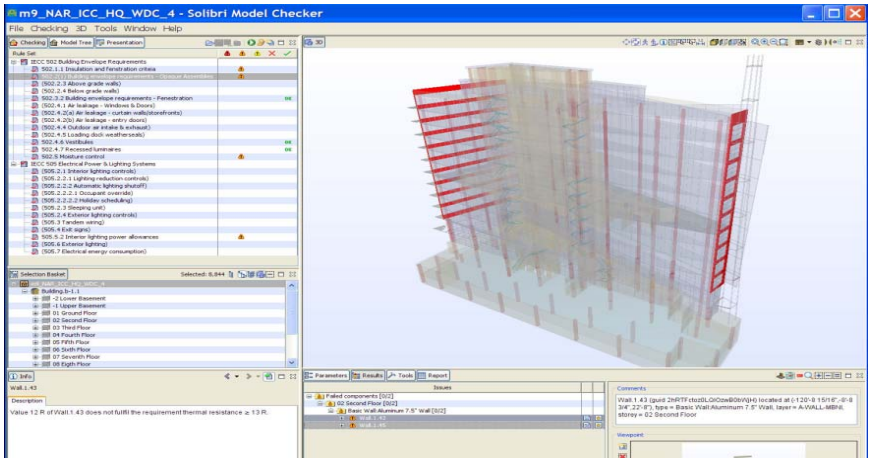
- Owners and developers support BIM for their projects
- Designers, specifiers and others collaborate on a building information model (BIM) and submit to regulatory authorities for review
- Regulatory agencies provide coordinated and automated plan review and issue a more timely determination of compliance and permit
- The BIM is a basis for collecting information during construction and can be delivered as an “as-built” and then maintained during occupancy

e-Government

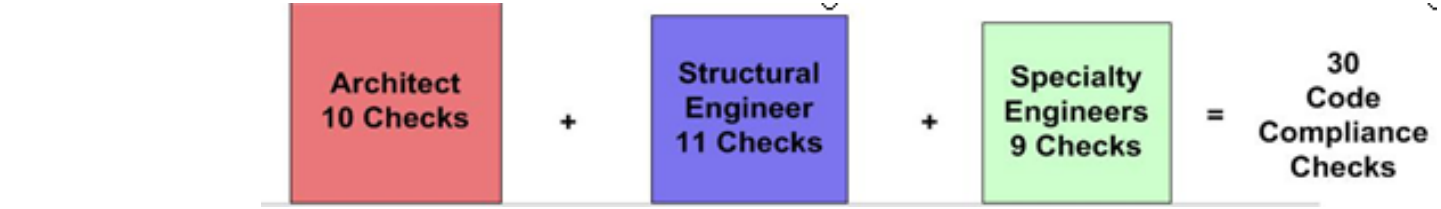
SMARTcodes™

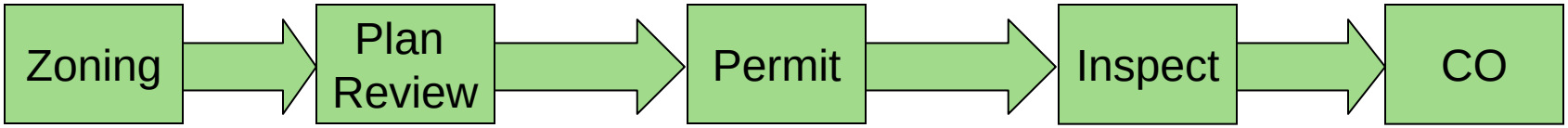
Building Information Model (BIM)





Building Regulatory Compliance Today





- Linear not circular
- Can be performed independently for each code
- Multiple agencies involved
- Difficulty sharing and collaborating on data
- Does not encourage collaboration with those regulated
- Increased probability of errors
- Less efficient use of time and manpower resources
- Limited application of what IT has to offer

BIM and IT Hold Promise

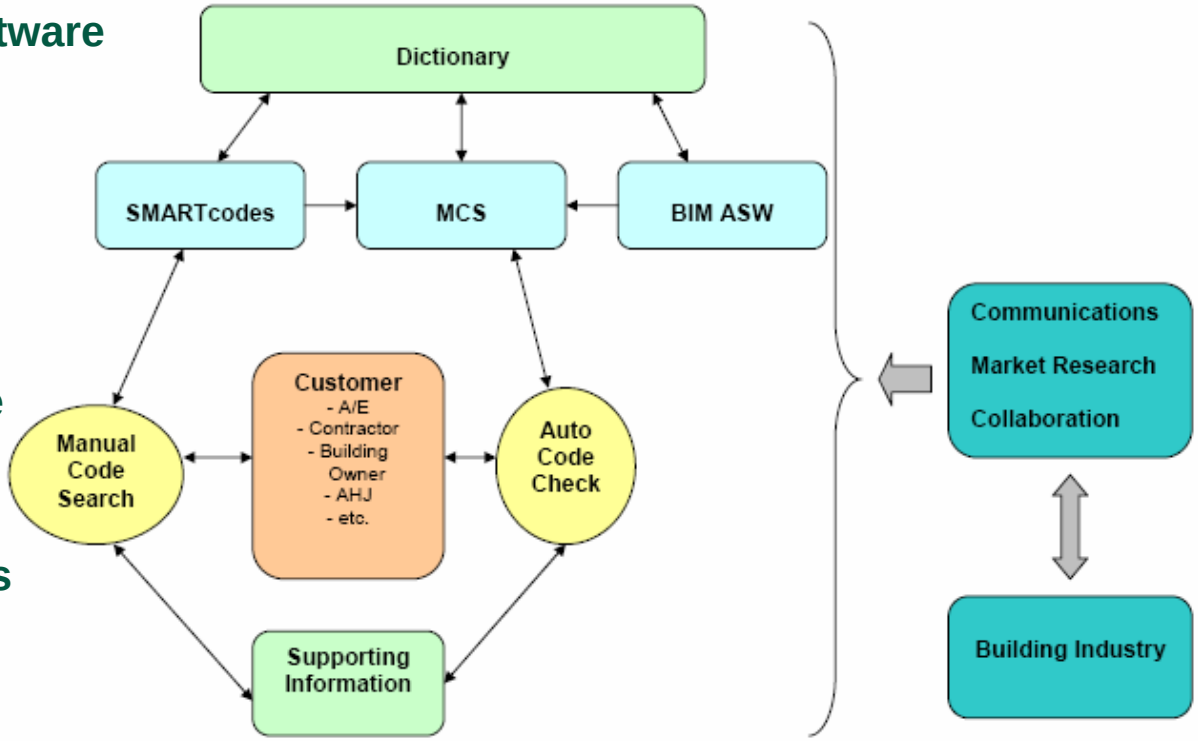
- ***The IT infrastructure provides a growing opportunity to creatively improve existing processes and create new processes***
- ***2D drawings are difficult to read, store, revise, update, etc. and do not lend themselves to complete visualization of the building***
- ***All in the building industry, code community, etc. are strapped with doing more with less that in turn affect project costs, building performance and public safety***
- ***e-permitting is becoming widespread and supported by many commercial software vendors***
- ***Everyone is waking up to the potential embodied in BIM and its potential application to validating compliance with codes, standards, regulations, design guides, etc.***

SMARTcodes™ ICC INTERNATIONAL CODE COUNCIL®

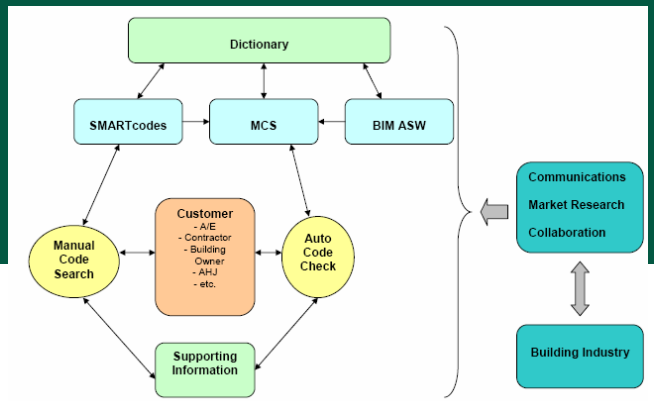
Building Regulatory Compliance Tomorrow

ICC Efforts

- Dictionary
- SMARTcodes protocol and software
- Created SMARTcodes
- On line demonstration
- Working with relevant software applications
- Manual access to SMARTcodes
- Collaboration
- Communications and outreach
- Market research



Dictionary



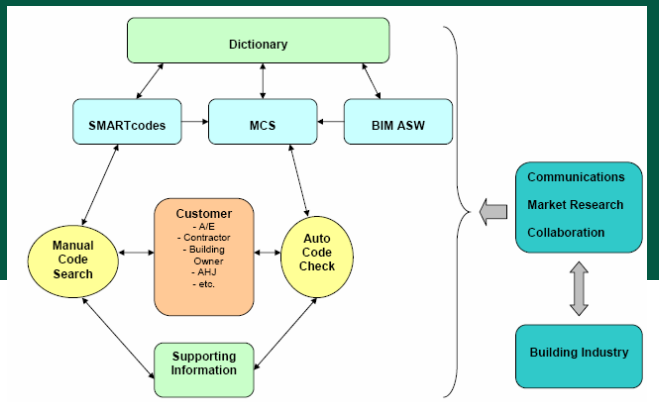
- *Terms*
- *Properties associated with each term*
- *Enumerations of properties*
- *Data type*
- *Units associated with each property*

Insulation

- *Type*
- *Material*
- *Density*
- *STC*
- *FS*
- *SDR*
- *Thickness*
- *R-value*
- *continuity*

Model View Definition (MVD)

Dictionary



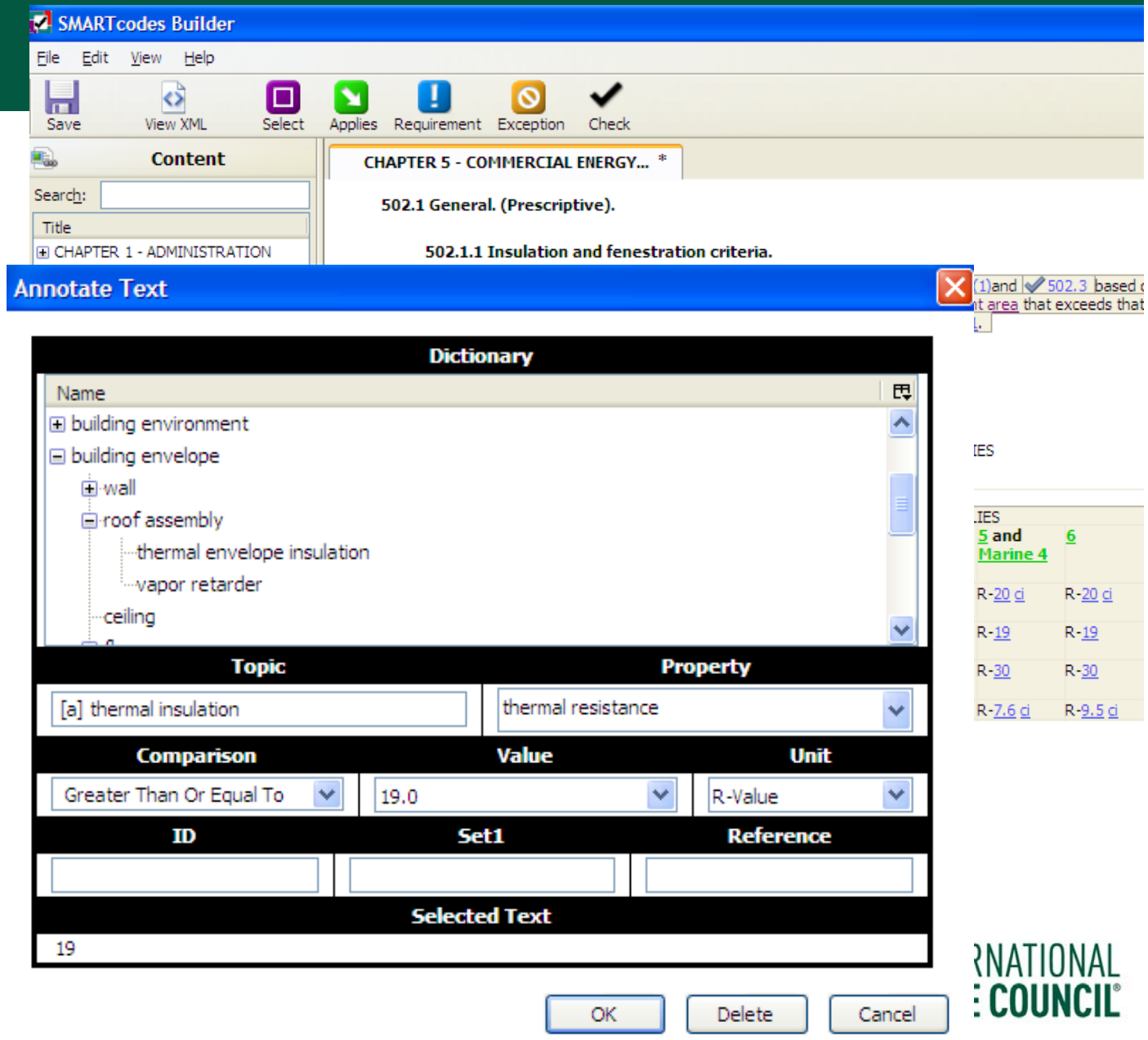
- ✓ ***Energy***
- ✓ ***Coordinated with CSI OnmiClass and global IFD efforts***

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	**Type**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Definition**	**Code Sections**	**Synonyms**	**Data Type**	**Units**	**OmniClass Classification**	**IFC Object/Property**	**Code Atom Diffs**
39	term	**building envelope**								The basement walls, exterior walls, floor, roof, and any other building element that enclose conditioned space. This boundary also includes the boundary between conditioned space and any exempt or unconditioned space.	IECC 502						
40	term		**wall**									above grade wall, below grade wall				IfcWall -- attached Pset_Wall_IECC_2006 with the following properties (except is_external)	
41	property			is external									boolean	n/a		Pset_WallCommon	
42	property			location relative to grade									integer index into enumeration wall_location_relative_to_grade	n/a		simple property in pset	
43	property			primary material						The primary material giving shape/strucutre to the wall. Note: this property applies to all walls -- even non structural walls. See enumeration of possible values.			integer index into enumeration wall_primary_material	n/a		simple property in pset	
44	term			[a] thermal envelope insulation								thermal block, secondary insulation				Pset_InsulationLayer_IECC_2006 -- attached to IfcMaterialLayer	
45	property				type					physical configuration of the insulation			integer index into enumeration thermal_envelope_insulation_type	n/a		simple property in pset	
46	property				material					material from which the insulation is made			integer index into enumeration thermal_envelope_insulation_material	n/a		simple property in pset	
47	property				density								real number				

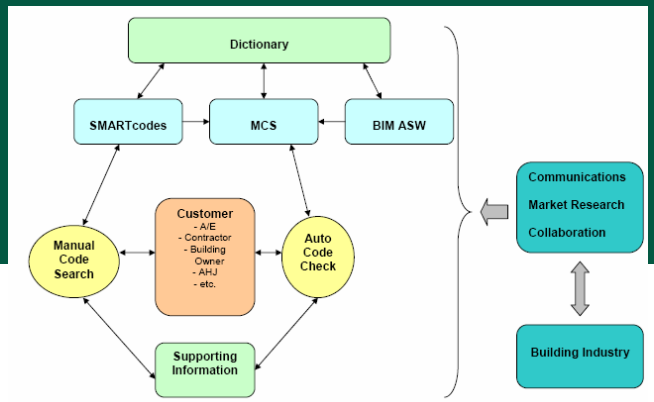
MVD

SMARTcodes Protocol and Software

- ✓ ***SMARTcodes protocol - completed and validated***
- ✓ ***SMARTcodes builder - beta version completed and tested***



SMARTcodes



- ✓ ***IECC SMARTcodes – envelope and lighting drafted and "plug and play" with different MCS validated***
- ✓ ***Successful collaboration with two MCS for their application and use of SMARTcodes***
- ✓ ***Development of model views for energy and pilot project with BIM vendors for their implementation***

502.4 Air leakage. (Mandatory)

502.4.1 Window and door assemblies.

The air leakage of window and sliding or swinging door assemblies that are part of the building envelope shall be determined in accordance with AAMA/WDMA/CSA 101/I.S.2/A440, or NFRC 400 by an accredited, independent laboratory, and labeled and certified by the manufacturer and shall not exceed the values in Section 402.4.2.

Exception:

Site-constructed windows and doors that are weatherstripped or sealed in accordance with Section 502.4.3.

502.4.2 Curtain wall, storefront glazing and commercial entrance doors.

Curtain wall, storefront glazing and commercial-glazed swinging entrance doors and revolving doors shall be tested for air leakage at 1.57 pounds per square foot (psf) (75 Pa) in accordance with ASTM E 283. For curtain walls and storefront glazing, the maximum air leakage rate shall be 0.3 cubic foot per minute per square foot (cfm/ft ^{2}) (5.5 m ^{3}/h f#151; m ^{2}) of fenestration area. For commercial glazed swinging entrance doors and revolving doors, the maximum air leakage rate shall be 1.00 cfm/ft ^{2} (18.3 m ^{3}/h f#151; m ^{2}) of door area when tested in accordance with ASTM E 283.

502.4.3 Sealing of the building envelope.

Openings and penetrations in the building envelope shall be sealed with caulking materials or closed with gasketing systems compatible with the construction materials and location. Joints and seams shall be sealed in the same manner or taped or covered with a moisture vapor-permeable wrapping material. Sealing materials spanning joints between construction materials shall allow for expansion and contraction of the construction materials.

502.4.4 Outdoor air intakes and exhaust openings.

Stair and elevator shaft vents and other outdoor air intakes and exhaust openings integral to the building envelope shall be equipped with not less than a Class I motorized, leakage-rated damper with a maximum leakage rate of 4 cfm per square foot (6.8 L/s · C m ^{2}) at 1.0 inch water gauge (w.g.) (1250 Pa) when tested in accordance with AMCA 500D.

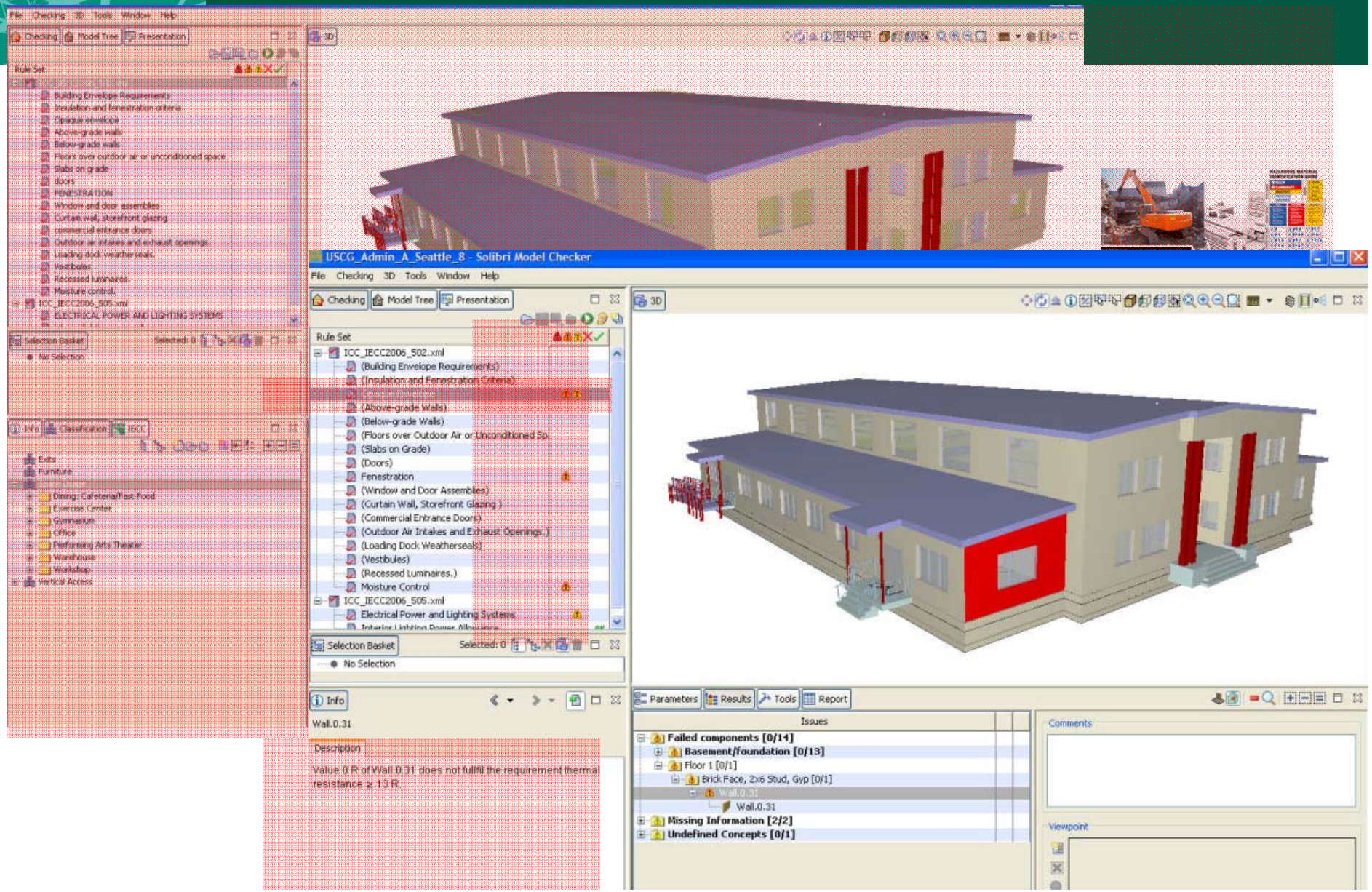
Exception:

Gravity (nonmotorized) dampers are permitted to be used in buildings less than three stories in height above grade.

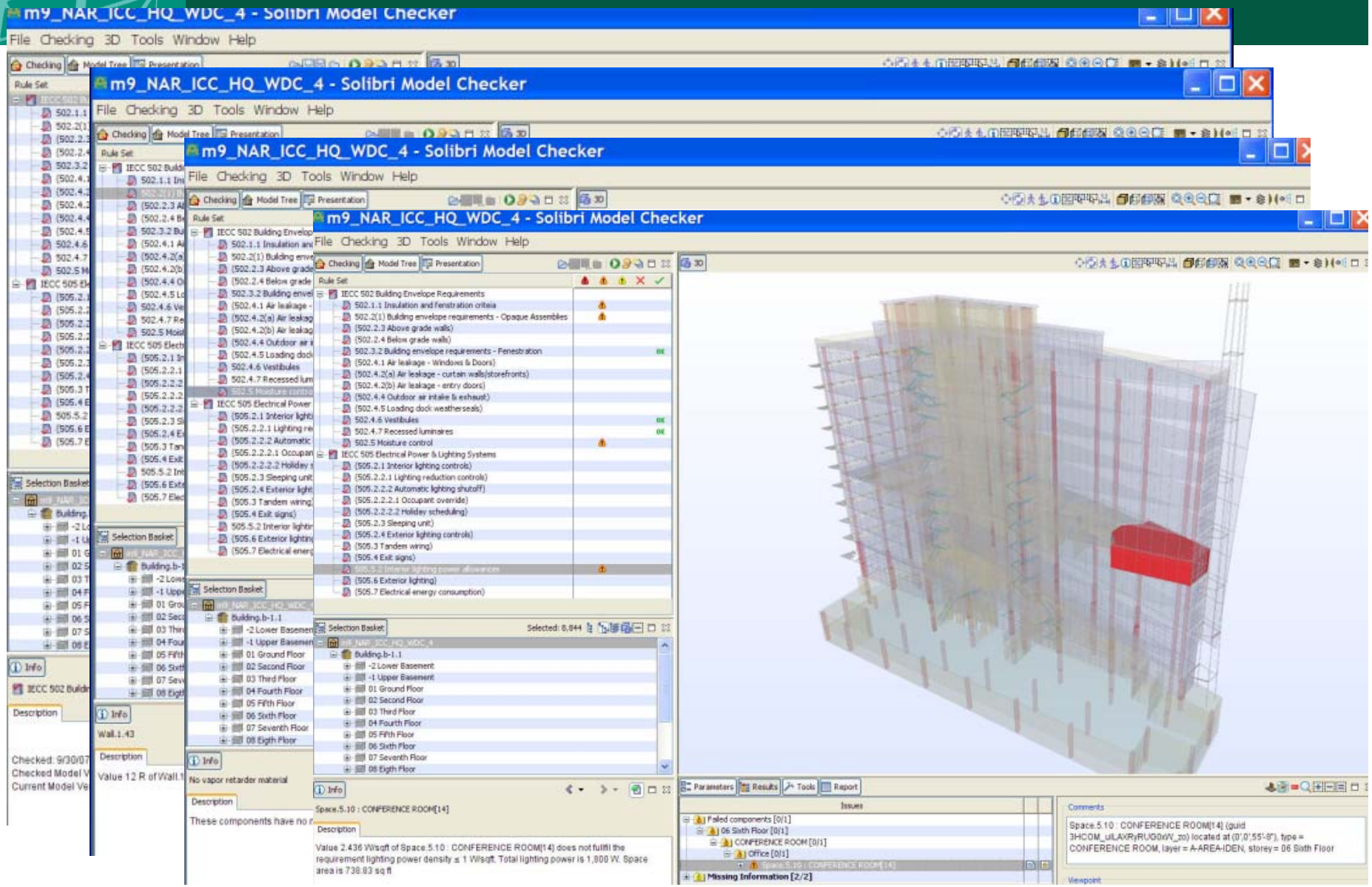
SMARTcodes™

ICC INTERNATIONAL CODE COUNCIL®

Automated Code Checking



Automated Code Checking



Automated Code Checking

IECC 505 Electrical Power & Lighting Systems

505.5.2 Interior lighting power allowances

Results

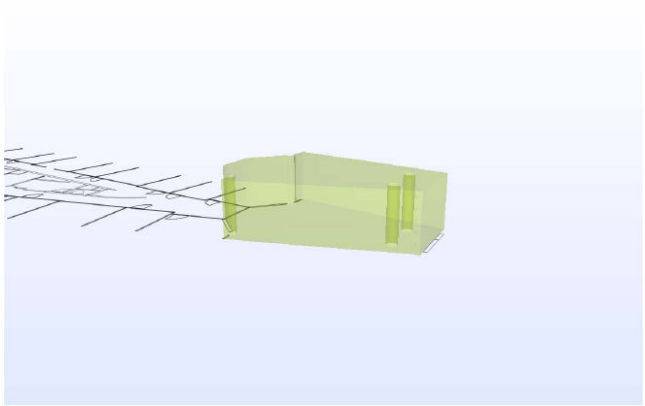
Failed components

06 Sixth Floor

Office

Space.5.10 : CONFERENCE ROOM[14]

Value 2.436 W/sqft of Space.5.10 : CONFERENCE ROOM[14] does not fulfill the requirement lighting power density ≤ 1 W/sqft. Total lighting power is 1,800 W. Space area is 738.83 sq ft



Space.5.10 : CONFERENCE ROOM[14] (GUID 3HCOM_ulLAXRyRUG0xW_zo) located at (0',0',55'-8"), type = CONFERENCE ROOM, layer = A-AREA-IDEN, storey = 06 Sixth Floor

Digital Alchemy Building Code Checking:

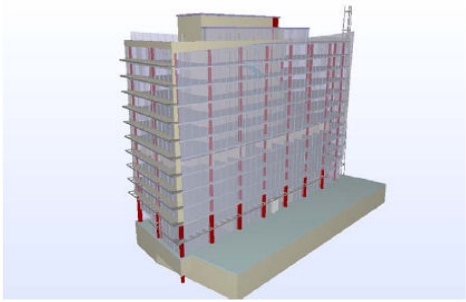
SMARTcodes Code Checking Report for BIMstorm LAX

Building Model: National Association of Realtors - National Headquarters

Jurisdiction: Los Angeles, CA

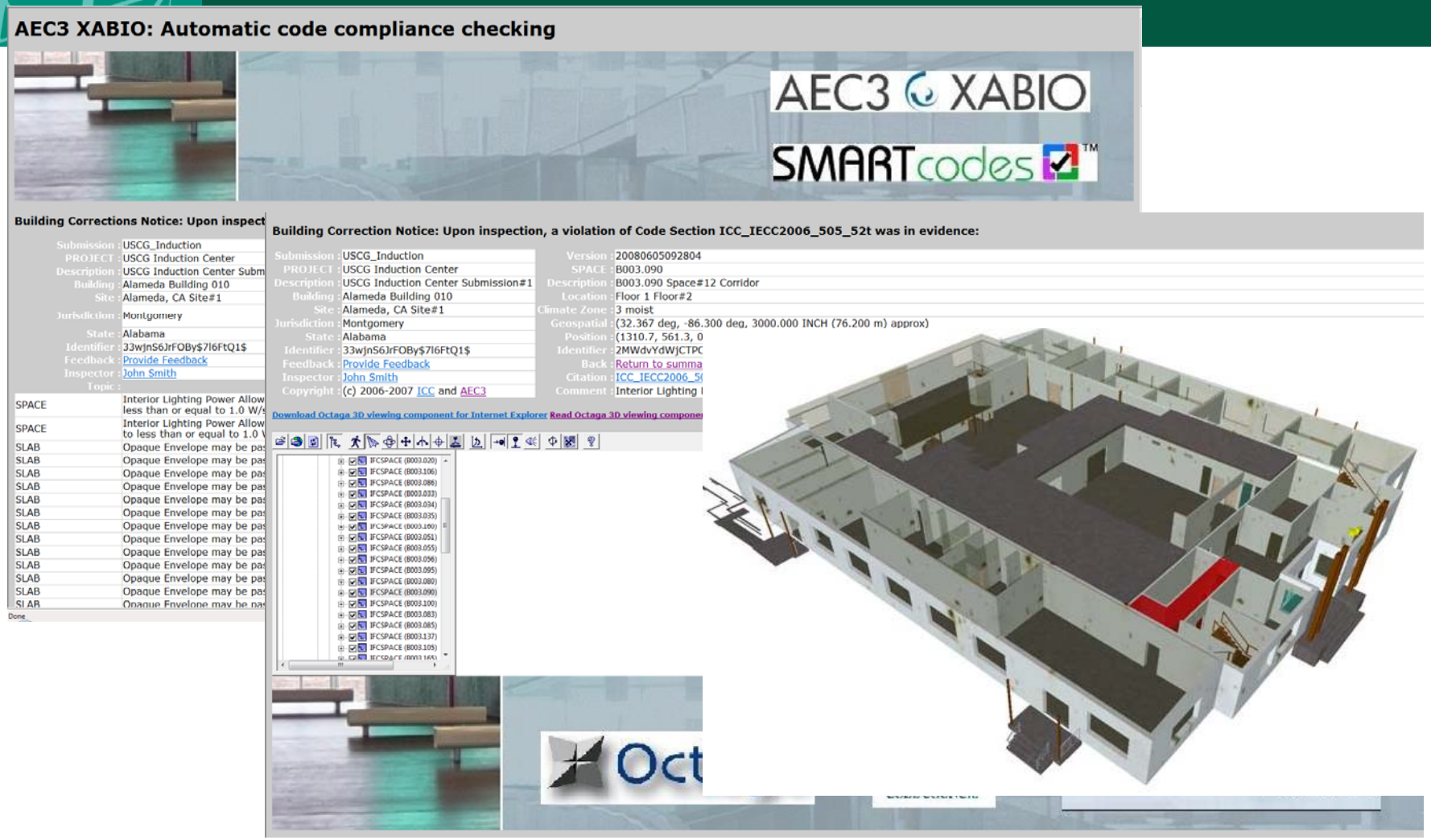
Organization: International Code Council

Date: 31-Jan-08



Rule	Result
IECC 502 Building Envelope Requirements	
502.1.1 Insulation and fenestration criteria	Issues
502.2(1) Building envelope requirements - Opaque Assemblies	Issues
(502.2.3 Above grade walls)	Not checked
(502.2.4 Below grade walls)	Not checked
502.3.2 Building envelope requirements - Fenestration	Passed
(502.4.1 Air leakage - Windows & Doors)	Not checked
(502.4.2(a) Air leakage - curtain walls/storefronts)	Not checked
(502.4.2(b) Air leakage - entry doors)	Not checked
(502.4.4 Outdoor air intake & exhaust)	Not checked
(502.4.5 Loading dock weather seals)	Not checked
502.4.6 Vestibules	Passed
502.4.7 Recessed luminaires	Passed
502.5 Moisture control	Passed
IECC 505 Electrical Power & Lighting Systems	
(505.2.1 Interior lighting controls)	Not checked
(505.2.2.1 Lighting reduction controls)	Not checked
(505.2.2.2 Automatic lighting shutoff)	Not checked
(505.2.2.2.1 Occupant override)	Not checked
(505.2.2.2.2 Holiday scheduling)	Not checked
(505.2.3 Sleeping unit)	Not checked
(505.2.4 Exterior lighting controls)	Not checked
(505.3 Tandem wiring)	Not checked
(505.4 Exit signs)	Not checked
505.5.2 Interior lighting power allowances	Issues
(505.6 Exterior lighting)	Not checked
(505.7 Electrical energy consumption)	Not checked

Automated Code Compliance Checking



SMARTcodes

INTERNATIONAL CODE COUNCIL

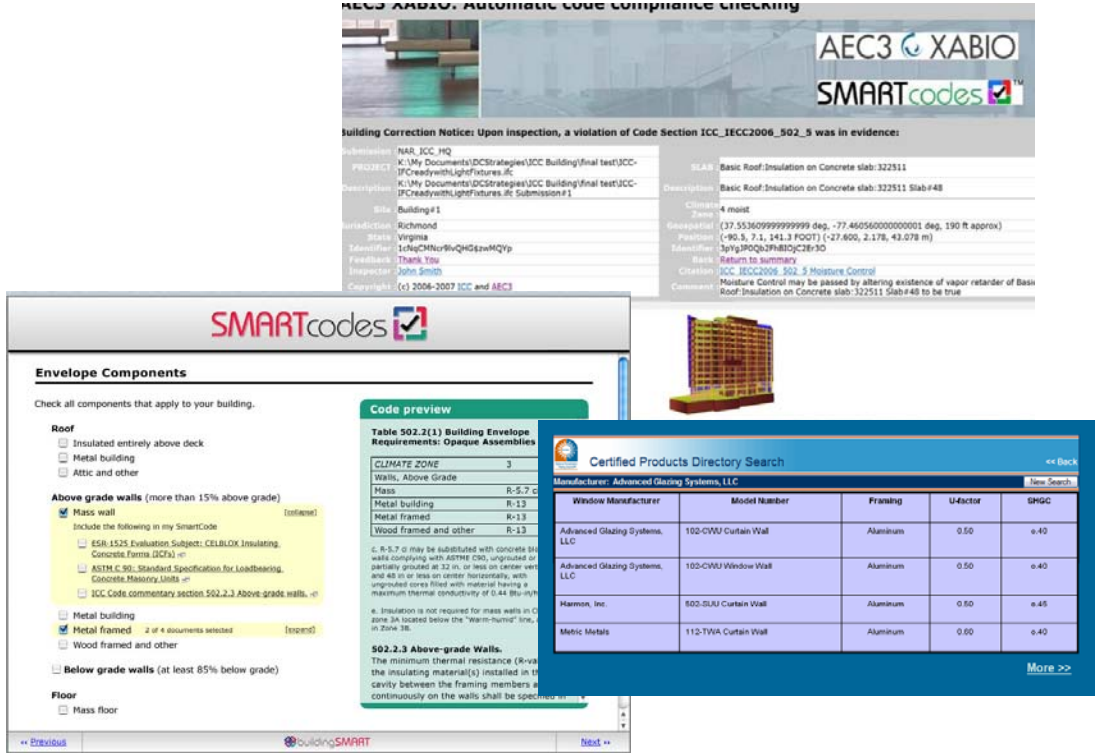
Possibilities using SMARTcodes

Auto code check

- Output reports
- Inspection checklists
- Mini-codes
- Reference materials
- Links to E&T resources

Manual code search

- Specific code answers
- Reference standards
- Support information



Custom Reports

- Standardize designs for national accounts
- Code change impact analysis

SMARTcodes™

ICC INTERNATIONAL CODE COUNCIL®

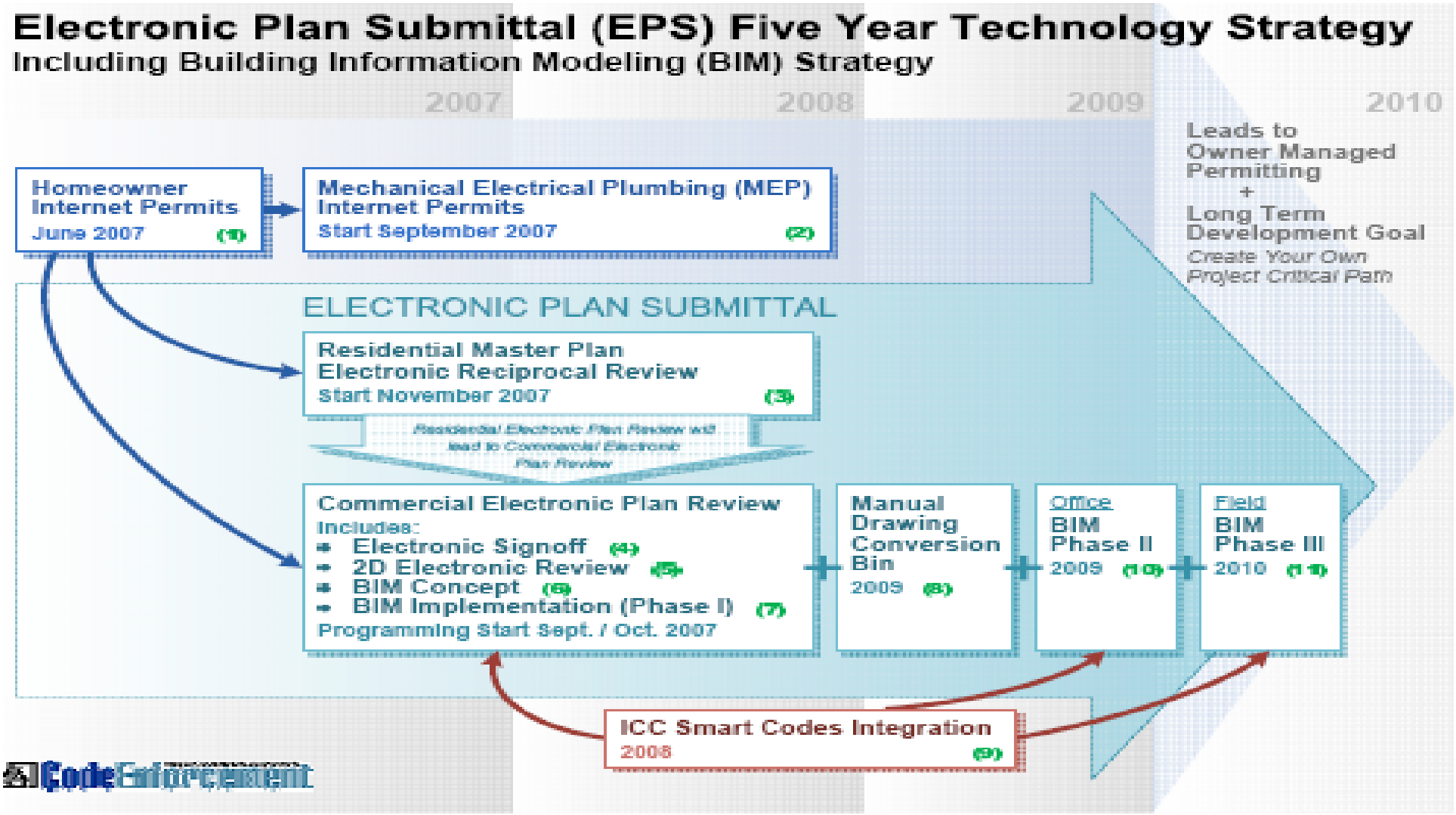
E-government Connection

- **Facilitate current processes and develop new processes based on application of IT**
- **Plans will evolve from hard copy to e-submission of 2Ds to BIMs**
- **Conduct virtual reviews in 3D and 4D automatically**

E-government Connection

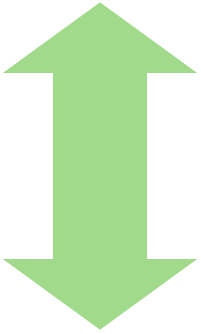
- **Apply IT to facilitate construction inspection and availability of “as-built” data**
- **Government agency development and implementation of Strategic Plans focused on greater use of IT**
- **Apply IT to develop and implement new building regulatory methods and processes**

ePermitting Strategy
Mecklenburg County, NC



Summary

Availability of BIMs creates an opportunity for auto code checking and related products and services



Availability of SMARTcodes and auto code checking can drive demand for and use of BIMs

SMARTcodes™

ICC INTERNATIONAL CODE COUNCIL®

Thank You!
Any Questions?

ICC
500 New Jersey Avenue
6th Floor
Washington, DC 20001

dconover@iccsafe.org
www.smartcodes.org

SMARTcodes™

ICC INTERNATIONAL CODE COUNCIL®