

MEETING MINUTES

NFPA High-Rise Building Safety Advisory Committee (HRB-SAC)

12-13 July 2005
National Institute for Standards and Technology
Gaithersburg, MD

1. **Call to Order.** Chair Quiter called the meeting to order at 8:30 am.
2. **Introduction of Members and Guests.** Members and guests provided self-introductions.

Committee members in attendance were as follows:

Name	Representing
James Quiter (chair)	Arup
Richard Bukowski	National Institute of Standards and Technology – Building and Fire Research Laboratory
Geoff Graighead	Securitas Security Services USA, Inc.
Jon Magnusson	Magnusson Klemencic Associates / National Council of Structural Engineers
John Miller	Los Angeles City Fire Department / International Association of Fire Fighters
Jack Murphy	JJM & Associates, LLC / Fire Safety Directors Association of Greater New York
Steven Nilles	Lohan Caprile Goettsch Architects / Council on Tall Buildings & Urban Habitat
Jake Pauls	Jake Pauls Consulting Services on Building Use and Safety / American Public Health Association
Sally Regenhard	The Skyscraper Safety Campaign
Wes Shoemaker	Winnipeg Fire Paramedic Service / Metropolitan Fire Chiefs
Milosh Puchovsky (non-voting staff liaison)	NFPA

Those committee members unable to attend the meeting were as follows:

Sally Regenhard	The Skyscraper Safety Campaign
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The following guests were also in attendance:

Name	Representing
Larry Brown (Day 1 only, PM)	National Association of Home Builders
David DeVries	Firetech Engineering, Inc.
Casey Grant	NFPA

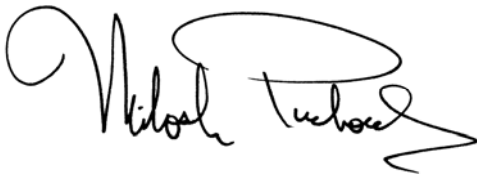
William Grosshandler (Day 2 only, AM)	NIST
Edwina Juillet	NTF/LSPwD (Fire & Life Safety for People with Disabilities)
Nadine Post	Engineering News Record (Press)
James Quintiere (Day 1 only, AM)	University of Maryland
Shyam Sunder (Day 1 only)	NIST

3. **Approval of December 14-15, 2004 meeting minutes.** The minutes were approved without modification.
4. **Review meeting schedule and key dates.** The meeting schedule and key dates were reviewed as indicated in Agenda Attachment B. Dates concerning NIST activities in August and September were revised. See Minutes Attachment A.
5. **WTC Presentation by NIST Staff.** Dr. Shyam Sunder of NIST presented an overview of NIST's investigation and report on the collapses of the World Trade Center Towers. Dr. Sunder's presentation focused on the findings and recommendations of the investigation. An overview of the NIST organization and responsibilities was also provided. Presentation materials used by Dr. Sunder are available on NIST's website. (http://wtc.nist.gov/pubs/Media_Public_Briefing_H_062305_sunder.pdf).
6. **Develop recommendations and comments for NFPA's response to the NIST-WTC report.** Following the presentation by NIST, those committee members present developed responses to 25 of NIST's 30 recommendations. The responses will be used by NFPA in its reply to the NIST report. It was agreed that the responses developed at the meeting are to be balloted through the committee. See the July 2005 HRB-SAC ballot for a copy of the committee's responses to NIST's recommendations.
7. **Status Report on incentives to exceed minimum building regulations.** Steve Nilles provided a status report on this activity as indicated in Minutes Attachment B. The committee expressed its support of the concept, and voted to establish a task group to further develop the necessary details. The task group which consists of Steve Nilles (chair), Richard Bukowski Jon Magnusson and Wes Shoemaker are to report at the committee's next meeting in October.
8. **Other Business.**
 - a. *Alternate members.* The committee discussed the concept of adding alternate members to the committee roster. It was generally agreed that this concept should be pursued with NFPA's Standards Council.
 - b. *Next meeting.* The committee suggested that only the second day of the next meeting should be open to technical committee chairs and other invitees. The first day of the meeting should be dedicated to committee business that will not directly impact other

NFPA committee projects. Due to time considerations at this meeting, the committee was unable to prioritize topics in the committee charter, and address other items.

9. **Next Meeting.** The next meeting is scheduled for October 20-21, 2005 in New York City.
10. **Adjournment.** Chair Quiter adjourned the meeting at 4:10 PM, July 13, 2004.

Minutes prepared by

A handwritten signature in black ink, appearing to read "Milosh Puchovsky". The signature is fluid and cursive, with a large initial "M" and a long, sweeping underline.

Milosh Puchovsky, P.E.
Staff Liaison

Minutes Attachment A

**High-Rise Building Safety Advisory Committee
(HRB-SAC)**

**Key Dates
(revised July 2005)**

April 5, 2005	Release of NIST-WTC reports on projects 1, 7 and 8
June 3, 2005	Proposed release for remaining NIST projects
June 8, 2005	NIST staff presentation at NFPA WSCE; meeting with NFPA staff and TCC chairs – Las Vegas
June 2005	House Science Committee hearing – exact date to-be-determined
June 23, 2005	Proposed release of NIST-WTC executive summary report
July 12-13, 2005	High-Rise Building Safety Advisory Committee meeting with NIST staff – Gaithersburg, Maryland
July 26, 2005	NFPA staff briefing for Standards Council – Boston
August 4, 2005	Proposed deadline for submission of comments to NIST on WTC report
Sept. 13-15, 2005	NIST public meeting – Gaithersburg, Maryland NFPA representation: staff; Building & Life Safety Code TCC Chairs; IFMA, Fire Service, Metro Chiefs and Public Education Section Chairs; Disability Access Review and Advisory Committee
Oct. 17-19, 2005	Council on Tall Buildings & Urban Habitat Conference – New York
Oct. 20-21, 2005	High-Rise Building Safety Advisory Committee meeting & NFPA High-Rise Building Safety Forum (agenda setting meeting with TC chairs) – New York
Oct. 28, 2005	NFPA staff presentation at National Council of Structural Engineers Association Conference – Kansas City
Nov. 2005- Mar 2006	Meeting(s) of NFPA 101/5000 and other appropriate technical committees as needed to implement code-related recommendations
Mar 22-23, 2006	High Rise Safety Advisory Committee meeting (w/ NFPA's Standards Council) - Tampa

Minutes Attachment B



Core & Shell Pilot Project Checklist

111 S. Wacker
Chicago, Illinois

Yes ? No

10 | 4 | 1 Sustainable Sites 15 Points

Y			Prereq 1	Erosion & Sedimentation Control	Required
1			Credit 1	Site Selection	1
1			Credit 2	Urban Redevelopment	1
		1	Credit 3	Brownfield Redevelopment	1
1			Credit 4.1	Alternative Transportation, Public Transportation Access	1
1			Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
1			Credit 4.3	Alternative Transportation, Alternative Fuel Vehicles	1
1			Credit 4.4	Alternative Transportation, Parking Capacity	1
	1		Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
	1		Credit 5.2	Reduced Site Disturbance, Development Footprint	1
1			Credit 6.1	Stormwater Management, Rate and Quantity	1
	1		Credit 6.2	Stormwater Management, Treatment	1
1			Credit 7.1	Heat Island Effect, Non-Roof	1
1			Credit 7.2	Heat Island Effect, Roof	1
	1		Credit 8	Light Pollution Reduction	1
1			Credit 9	Tenant Design and Construction Guidelines	1

Yes ? No

1 | 3 | 1 Water Efficiency 5 Points

1			Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
	1		Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
		1	Credit 2	Innovative Wastewater Technologies	1
	1		Credit 3.1	Water Use Reduction, 20% Reduction	1
	1		Credit 3.2	Water Use Reduction, 30% Reduction	1

Yes ? No

4 | 3 | 3 Energy & Atmosphere 16 Points

Y			Prereq 1	Fundamental Building Systems Commissioning	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	CFC Reduction in HVAC&R Equipment	Required
		1	Credit 1	Optimize Energy Performance	1 to 10
		1	Credit 2.1	Renewable Energy, 1%	1
		1	Credit 2.2	Renewable Energy, 5%	1
	1		Credit 3	Additional Commissioning	1
	1		Credit 4	Ozone Depletion	1
	1		Credit 5	Measurement & Verification	1
	1		Credit 6	Green Power	1

Yes ? No

Materials & Resources **11 Points**

Y									
1				Prereq 1	Storage & Collection of Recyclables			Required	
			1	Credit 1.1	Building Reuse, Maintain 75% of Existing Shell				1
1				Credit 1.2	Building Reuse, Maintain 95% of Existing Shell				1
			1	Credit 2.1	Construction Waste Management, Divert 50%				1
	1			Credit 2.2	Construction Waste Management, Divert 75%				1
			1	Credit 3	Resource Reuse, Specify 5%				1
1				Credit 4.1	Recycled Content, Specify 5% (post-consumer + ½ post-industrial)				1
1				Credit 4.2	Recycled Content, Specify 10% (post-consumer + ½ post-industrial)				1
1				Credit 5.1	Local/Regional Materials, 20% Manufactured Locally				1
			1	Credit 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally				1
			1	Credit 6	Rapidly Renewable Materials				1
			1	Credit 7	Certified Wood				1

Yes ? No

Indoor Environmental Quality **13 Points**

Y									
Y				Prereq 1	Minimum IAQ Performance			Required	
Y				Prereq 2	Environmental Tobacco Smoke (ETS) Control			Required	
1				Credit 1	Carbon Dioxide (CO₂) Monitoring				1
			1	Credit 2	Ventilation Effectiveness				1
1				Credit 3.1	Construction IAQ Management Plan, During Construction				1
			1	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants			1 point for 2	
1				Credit 4.2	Low-Emitting Materials, Paints			2 points for 3	
1				Credit 4.3	Low-Emitting Materials, Carpet			3 points for 4	
			1	Credit 4.4	Low-Emitting Materials, Composite Wood				1
1				Credit 5	Indoor Chemical & Pollutant Source Control				1
			1	Credit 6.1	Controllability of Systems, Perimeter				1
			1	Credit 6.2	Controllability of Systems, Non-Perimeter				1
			1	Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992				1
			1	Credit 7.2	Thermal Comfort, Permanent Monitoring System				1
1				Credit 8.1	Daylight & Views, Daylight 75% of Spaces				1
1				Credit 8.2	Daylight & Views, Views for 90% of Spaces				1

Yes ? No

Innovation & Design Process **5 Points**

1				Credit 1.1	Innovation in Design: Provide Specific Title				1
1				Credit 1.2	Innovation in Design: Provide Specific Title				1
1				Credit 1.3	Innovation in Design: Provide Specific Title				1
1				Credit 1.4	Innovation in Design: Provide Specific Title				1
1				Credit 2	LEED™ Accredited Professional				1

Yes ? No

23 13 10 Project Totals (pre-certification estimates) **65 Points**

Certified 24-29 points Silver 30-35 points Gold 36-47 points Platinum 48-64 points

Concept Draft Checklist

7/10/09

	LLSD - High Rise Core & Shell LEADERSHIP IN LIFE SAFETY DESIGN	NFFH CTBUH
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Page 1 of 5

1.0 Bldg Configuration, General Conditions

- | | |
|----------|---|
| Pre Reg. | 1.1 Meet all local bldg codes & standards |
| 1 | 1.2 <u>Bldg/Site Separation</u> |
| 1 | ≥ 12'-0" lot line |
| 1 | ≥ 24'-0" lot line |
| 1.3 | <u>Bldg Height</u> |
| (1) | 0-8 Floors |
| (2) | 9-40 Floors |
| (3) | 40-80 Floors |
| (4) | 80-120 Floors |
| | > 120 Floors |
| 1.4 | <u>Bldg Use/Function</u> |
| (1) | Iconic Status |
| (1) | Critical Function |
| (1) | At Risk Users |
| 1.5 | <u>Vehicular Stand-off</u> |
| 1 | No vehicular access @ bldg footprint |
| 1 | 12'-0" vehicular separation |
| 1 | 24'-0" or greater vehicular separation |

2.0 Building Enclosure

- | | |
|----------|---|
| Pre Reg. | 2.1 Non-Combustible, fire rating & smoke seal |
| 1 | 2.2 3'-0" high lhr rated spandrel separation |
| 1 | 2.3 Laminated glazing |
| 1 | 2.4 Fire rated glazing |

2.0 Bldg Enclosure Cont.

- 1 2.5 Blast resistant wall system
- 1 2.6 Increase lot line Rating thru

3.0 Fire Resistive Construction

- Pre Req. 3.1 Superstructure Columns, Girders, Beams
3hr rated. Design for fire load turnout
- 1 3.2 Increase slab construction thru
- 1 3.3 Increase @ stair, elevators, vestibule
shafts, & corridors thru
- 1 3.4 Use of impact resistant/adhesion
enhanced fireproofing (equal to
cementitious spray fp)

4.0 Elevators

- Pre Req. 4.1 Fire Command Elevator serve all floors
w/ rated vestibule enclosure
- 1 4.2 All elevators provided w/ 1hr vestibules
- 1 4.3 Elevator vestibule pressurization
- 1 4.4 Shaft & vestibules & machine rooms
structurally enhanced w/ smoke proof vestib.

5.0 Stairs & Enclosure

- Pre Req. 5.1 Separation 30'0" min
- 1 5.2 Increase exiting width 12"
- 1 5.3 Additional stair tower beyond
exiting requirements (may be stagger)
- 1 5.4 Stair pressurization

	5.0	Stairs (cont.)
1	5.5	stair pressurization w/ smokeproof vestibules
1.	5.6	Structurally enhanced impact resistant stair & vestibule enclosure
1.	5.7	stair separation \geq 1/2 diagonal floor plate distance
1	5.8	Reduce max travel distance to stair per code req. 50%
1	5.9	Direct rated egress to exterior
1	5.10	Photo luminescent markings & pathways

	6.0	Area of Refuge / Special Access / Egress
Pre	6.1	2'-6" x 4'-0" clear space @ each stair floor landing w/ communication system
1	6.2	Refuge floor . Stair rated pressurized w/ direct access to fire command elevator(s) w/ rated corridor to all egress stairs
1.	6.3	Refuge floor stair rated. Egress per 6.2 w/ fire rated spandrel glass
1	6.4	Roof top access (Helipad req'nts sim to I.A. municipal code)
1.	6.5	Exterior Evacuation System

	7.0	HVAC / Fire Protection / Elect
Pre	7.1	Per code. emergency power. dual source

7.0 HVAC / Fire Protection / Elect.

- Pre Fire Command center Bldg Management System.
- 7. 7.2 Dual feed sprinkler w/ alt. backup water source (Water storage tanks)
- 7 7.3 Floor pressurization / smoke evac system (purge)
- 1 7.4 Increase fire protection (sprinkler design area) by 100%
- 7. 7.5 Structurally enhanced. impact resistant enclosures for sprinkler intake pipe risers, pump & water storage & emergency electrical risers
- 7 7.6 Fire brigade cache rooms.
Direct access to express stairs

8.0 Education / Information / Operations

- 1 8.1 LSD accredited design professional
- 1 8.2 3rd Party Bldg Commissioning
- 1 8.3 Yearly full floor evacuation drills
- 1 8.4 Full audit document off site
- 1 8.5 Off site or black box recording of communication Bldg Management Syst

9.0 Innovation & Special Design

- 1/4 9.1 Special or innovative life safety features (MAX 4 points)

10.0 Structures

- Pre 10.1 Wind tunnel analysis
- 7 10.2 Redundant structural design features to mitigate progressive collapse
- 1 10.3 Blast resistant design features
- 10.4 Other.....

Project Totals

- XX pts LLSD Certified
- XX + 5 LLSD Silver
- XX + 10 LLSD Gold
- XX + 15 LLSD Platinum

Local Code Equilization

- Base NFPA 5000 / NFPA XX / NFPA XXX
- (XX) Chicago High Rise Bldg Code
- () NYC
- (+?) Other National Bldg Codes

Steve Nilles

From: Steve Nilles
Sent: Thursday, June 02, 2005 2:35 PM
To: 'Puchovsky, Milosh'
Cc: Richard Bukowski
Subject: RE: Conf call

Dear Richard,
 Excellent!
 I will add additional items, develop further and send back for discussion.
 Steve

From: Puchovsky, Milosh [mailto:mpuchovsky@NFPA.org]
Sent: Thursday, June 02, 2005 2:01 PM
To: Steve Nilles
Cc: Richard Bukowski
Subject: FW: Conf call

Steve,

I hope all is well. This e-mail is with respect to NFPA's High-Rise Building Safety Advisory Committee (HRB-SAC) and pertains to the incentives for voluntarily exceeding building code requirements.

I am forwarding the enclosed information on behalf of Dick Bukowski from NIST.

Milosh Puchovsky, P.E.
 Principal Fire Protection Engineer
 NFPA

From: Richard Bukowski [mailto:bukowski@nist.gov]
Sent: Thursday, June 02, 2005 11:27 AM
To: Puchovsky, Milosh; 'Jim Quiter'
Cc: Solomon, Robert
Subject: RE: Conf call

I have attached the BSES table that contains some initial ideas. Ron Klemencic and Faridah Shafii have reviewed the concept and are interested in pursuing the development. I don't have Steve's email handy, so could you forward a copy to him and ask if this will serve his purpose? We can discuss it further in July.

Dick

From: Puchovsky, Milosh [mailto:mpuchovsky@NFPA.org]
Sent: Thursday, June 02, 2005 9:39 AM
To: Jim Quiter; Richard Bukowski
Cc: Solomon, Robert
Subject: Conf call

Are you available for a short conf call today? If so what time works best?

Assessment System for Buildings – Following FSES Model

For the purpose of updating the CTBUH guidebooks, Dick and I have been considering the possibility of developing a scoring system for buildings. This kind of work has been implemented in the past through the use of a FSES system (Fire Safety Evaluation System) developed by Bud Nelson at NIST. However, it is understood that since Nelson's FSES deals only with fire safety, that his system would have to be expanded to assess buildings in the event of different types of emergency situations.

Purpose of an FSES:

The FSES (Fire Safety Evaluation System) is a grading system "designed to determine the relative level of overall fire safety of existing or proposed facilities¹." A comparison of the current design/building is made to a hypothetical facility that matches the requirements of a particular regulation (in the case of the FSES constructed by Nelson, the particular regulation is NFPA 101, Life Safety Code).

This is essentially a scoring system for ways to provide equivalent safety from fire to a building by using alternative methods, comparable to what is specified in the NFPA 101, Life Safety Code. A designer would use this method if they wanted to design a building in a certain way OTHER than what is specified by NFPA 101 and get "equivalency" to the code.

In the case of this building assessment for different types of emergencies, the first step is to obtain the objectives of evaluating the building. These objectives could be, for instance, general safety, life safety, and asset protection. With these objectives in mind, there will be several parameters and corresponding options (i.e. Does the building have sprinkler protection?) which will help to score the building depending upon the objective in mind. The next section helps to explain the scoring system of the FSES.

Explanation of the scoring system using the FSES system:

Each parameter has to be assigned a certain score for its options/categories, which is decided upon by a panel of experts that makes judgments on the level of safety that each parameter provides. For instance, negative numbers represent an item "detrimental" to life safety and positive numbers represent items "additive" to life safety." Generally, 0 to 10 is a score that shows a parameter that adds to

safety and -10 to 0 is a score that shows a parameter that detracts from safety. Below, there are lists of general parameters (independent of emergency) that will need to be assigned certain options. In the tables below, these parameters have been separated out to represent general parameters, fire parameters, and life safety parameters, and we have begun to assign each parameter a series of options (which will then need to be scored). There are definitely areas that need to be added to, such as wind, CBR, and seismic emergencies.

List of general parameters for scoring independent of emergency (based on fire, egress, explosion, bio-chemical, earthquakes, and windstorms):

- 1) Building height
- 2) Construction type/age of the building
- 3) Separations
- 4) Vertical openings
- 5) HVAC systems; air filtration system
- 6) Fire alarm/detection/voice communication
- 7) Smoke control/pressurization
- 8) Egress design/components
- 9) Elevators
- 10) Emergency power/lighting
- 11) Sprinklers
- 12) Interior finish
- 13) Emergency program/drills
- 14) Standpipe systems
- 15) Emergency equipment
- 16) Fire command center
- 17) Building contents – flammable, anchorage to the building (heavy items)
- 18) Areas of refuge
- 19) Location of building/neighborhood buildings
- 20) Security and air filtration – entrance, lobby, mailroom, loading dock
- 21) Leakiness of building components
- 22) Occupant training

Scope of system limited to Office and Residential buildings over 9 stories in height

Parameter				Links to other parameters/ Notes
Building Height One table for each	10-39	40-79	80+	Taller buildings – need more safety redundancy
Construction Type	Protected non-combustible	Fire Resistive Steel frame	Fire Resistive RConcrete frame	Deduction if structural frame concept not followed
FR Ratings ÷ Total Evacuation Time	1.25	1.5	2.0	Relate to total egress time; FR ratings are for members supporting gravity loads or bracing such members against buckling (structural frame)
Floors/Fire Separations	1 hr	2 hr	3 hr.	Includes shaft walls, corridor separations, and stair enclosures
Vertical Openings	Connects 2 floors	> 2 floor no atrium	Atrium	
Doors	Unrated	rated no closer	rated with closer	
Facade	Combustible	Combustible with balconies	Noncombustible	÷ if it's an external exposure (if a building is close by)
Emergency Power	None	On-site generators	Dual utility feeds plus on site generators	
Seismic (building in a seismically active area)	Not considered			
Wind	Not considered	100 year peak gust	Loads determined by wind tunnel tests	
Chemical, Biological, and Radiological threats	No preparations	HVAC intakes high, mail rooms on separate system	Active sensors and alarms provided for specific threats	Requires alarm system

Mitigation of bomb attacks	Not considered	Access control	Blast resistant features	
Fuel Load	Low <500 MJ/m ² or 5 lb/ft ²	Medium 500-1000 MJ/m ² or 5-10 lb/ft ²	High >1000 MJ/m ² or 10 lb/ft ²	
Hazardous Areas	Exposes egress system	Separated from egress system	None or individually protected	
Interior Finish	No controls	Controlled only in exits	Controlled throughout	
Alarm	Manual system with sounders	Automatic system with voice communication	Automatic system with voice communication and continuously staffed fire command center	
Automatic Sprinklers	none	Partial or limited water supply	Complete, supervised, adequate water supply	Requires alarm system for supervision
Standpipes	None	Wet standpipes with occupant hose reels	Wet standpipes for fire brigade use in every stairway	Credits require private or public fire brigade
HVAC	Single floor	Multiple floor	Multi-floor with smoke management	Also – for CBR – we are interested in the location of the intakes
Stairs	Deficient number, remoteness, or capacity	Number, remoteness, and capacity adequate for single floor	Designed for accumulating flows of multiple floors evacuating simultaneously	
Travel Distance	>1/2 diagonal	<1/2 diagonal	<1/3 diagonal	
Dead Ends	>30 m or 100 ft	<30 m or 100 ft	<15 m or 50 ft	
Elevators	No special arrangement	Equipped with emergency recall	Protected elevators for fire department access and occupant egress	

Emergency Lighting	Stairs only	Stairs and corridors	Lighting plus Photoluminescent markings
Plans/Drills	No written plans nor drills	Written emergency evacuation plans	Written plans and full drills at least annually
Areas of Refuge	A designated room	Rooms on each floor or space in stairways	Designated refuge floors
Wardens/fire safety director	none	Every floor with dedicated communication means (telephones or radios)	Every floor with systems to manage occupant evacuation from fire command center
Fire Brigade	None	In-house brigade, trained and equipped	Public fire brigade staffed and equipped to provide adequate rescue and suppression operations

Additional issues:

- Are we missing any parameters?
- Are there additional objectives to focus on, other than General Safety, Life Safety, and Asset Protection?
- How are we factoring in the cost associated with alternatives?

References:

1. Nelson, H. E. (1982). An Approach to Enhancing the Value of Professional Judgment in the Derivation of Performance Criteria. Lisbon, Portugal. Proceedings of the 3rd ASTM/CIB/RILEM Symposium on the Performance Concept in Building. 4-1-1982.