

Emerging Climate and Energy Realities Require Evolutionary Regulatory Change

IRCC Workshop:
International Perspectives on Building Regulations
and Climate Change

*Our greatest responsibility
is to be good ancestors.*

- Dr. Jonas Salk

Boston
October 20, 2010

David Eisenberg
Director

Development Center for Appropriate Technology

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It is a great honor to be invited to speak here today. I want to thank the IRCC and ICC for making this possible. I also want to say that I think we are at a unique moment in human history, where we have perhaps the largest set of combined crises ever faced by humanity and, at the same time, the ability to see and understand much about their origins and the tools to plan and potentially implement remarkable solutions. However, we must recognize as well that the same level of thinking that got us here will not get us where we need to go. And it is our humanity that will, I believe, be key to evolving solutions for the short and long haul. I'm grateful to be here with all of you to explore the possibilities going forward. And in keeping with Dr. Salk's view that our greatest responsibility is to be good ancestors, I have a question for you...

This is my grandson Joe, he's 11...

Here's a serious question on Joe's behalf:

Where in our current regulatory systems or decision-making processes is there continuous and explicit representation for the safety, rights and welfare of our children's children?



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I ask this question in all seriousness on behalf of Joe and all the other children and grandchildren and great grandchildren in the world. Where in our regulatory systems do we require explicit and continuous representation of the rights and welfare of future generations? If we're to take seriously our responsibility for safeguarding public health, safety and welfare from hazards attributed to the built environment, this must be part of everything we do.

What About the Rest of the Risk Profile?

What we've been doing has looked safe *only* because we've greatly limited the risks we've been considering in the building regulatory sphere.

Addressing the risks related to climate change requires seeing them in relation to energy, water and other natural and human systems over an intergenerational timeframe.

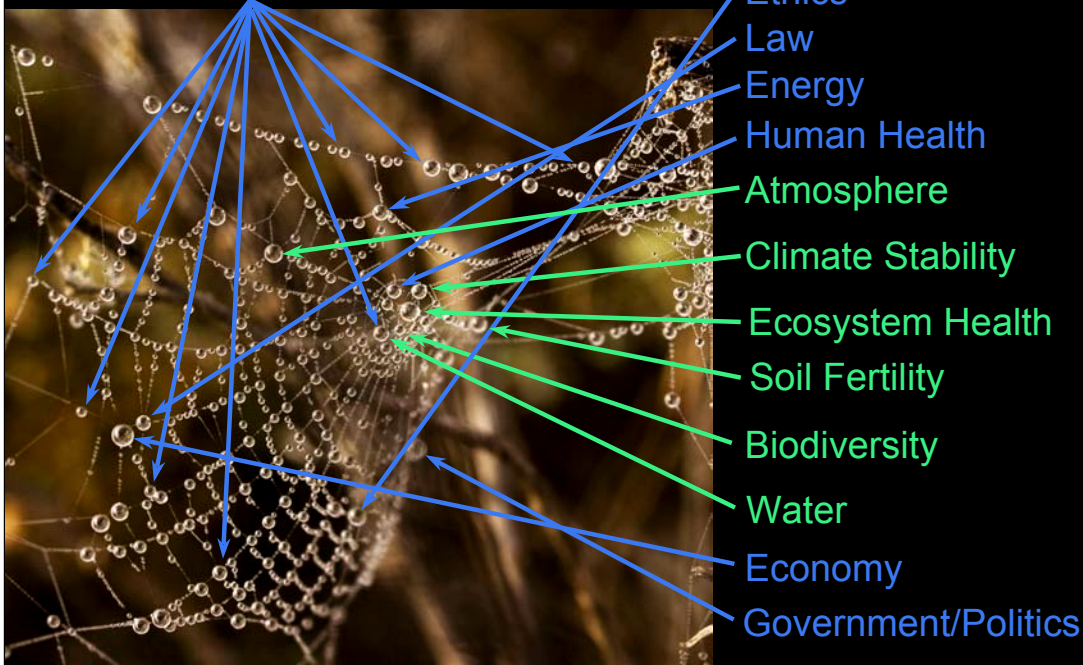


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My longstanding observation is that we have made tremendous achievements in the realms of building safety where we have focused our attention. But that focus has been rather narrow in terms of the true set of impacts of the built environment. Some of us have been trying to bring the subject of buildings' impact on the environment into the scope of concern for decades, including climate change - an issue I've been speaking about for more than 15 years. We need to see this as symptomatic of a kind of myopia in the regulatory realm that needs correction. And that means learning to see through a much larger lens across a much greater span of issues and time.

Who Is Able to Disconnect These Dots?

"Natural Resources"



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We are talking, really, about the web of life and our relationship to and place in it. As long as we keep looking at risk in fragmented and isolated ways, seeing ourselves as being independent instead interdependent with living and natural systems, we will continue to undermine our own well-being and future prospects. I put "Natural Resources" in quotes here because some of my Native American friends see everything as relations - part of their family. They've asked me if we would think of mining our children or grandmothers or using up our cousins or sisters? They've pointed out the near total lack of respect in our modern cultures for what is not manmade. Whether you find any of that of relevance, what is relevant is that these things are all connected and we've not been honoring those connections.

Life After Cheap Energy & Stable Climate

In the carbon, energy and economically constrained era we're entering, all aspects of energy dependency of our building practices must be considered.

Are the implications of our assumptions—about continuing to require high embodied energy building materials and practices—being considered?

How are we working to accelerate and enable the development and acceptance of the very low climate and energy impact alternatives we're going to need?

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The most important thing to realize right now is that because of what we know about climate change, about peak oil and gas, the next 10, 20, 30 50 years are not going to be like the last 50 years. We're entering an era of constraint. We've developed an extraordinary level of dependence on low-cost, abundant energy for virtually all of the systems we depend on for everything, and this is clearly true for creating, operating and maintaining the built environment. We have assumed that this would continue indefinitely into the future. Are we realistically examining the implications of those assumptions being false? Have we looked at our regulations from the standpoint of how those requirements can be met in a carbon and energy limited period? Are we doing anything to respond to those implications?

English does not contain a suitable word for "system of problems." Therefore I have had to coin one. I choose to call such a system a "mess." The solution to a mess can seldom be obtained by independently solving each of the problems of which it is composed. - Russell L. Ackoff

Or, more simply put...

Optimizing components in isolation tends to pessimize the whole system.

- Paul Hawken, Amory & L. Hunter Lovins

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I love these two quotes. Russell Ackoff was a thinker and innovator and professor in Systems theory and practice, design, management and more. The second quote is from the book Natural Capitalism. If we think about codes and regulations, we'll realize that they tend to be embedded at the level of the problem because they are reactions problems. Building regulations don't acknowledge that buildings are systems of systems nested in larger human and natural systems. They treat each problem as though it was isolated from everything else.

Greatest Risk = Fragmented View of Risk

How are we:

Identifying, comparing and balancing incremental versus systemic risks?

Recognizing and addressing cumulative harm?

Acknowledging and respecting the importance of ecological, human health, and other system limits?

Including an anticipatory/precautionary function to identify and address emerging hazards and risks?

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My view is that this fragmented approach to addressing and thinking about risk is the riskiest way to address risk. And, at least in the U.S., we have not developed any systematic way of identifying and balancing incremental risks, say at the building site, with systemic risks in the larger community or region or world. We have ignored the existence of cumulative harm and of limits - system limits, resource limits, ecological and human health thresholds. And we have failed to build any kind of anticipatory or precautionary functions into our regulatory processes, waiting instead for problems to grow to enormous proportions and levels of seriousness before taking regulatory action...the subject of this workshop being a perfect case in point. In the EU there has been official recognition of the precautionary principle and precautionary approaches to hazards that are not fully understood. In the US this has been very controversial but this thinking is crucial. We shouldn't need absolute scientific proof that something is hazardous when the potential harm irreversible or the risk very large, especially when we have feasible alternatives. One thing that I appreciate about the IRCC is that you are open to seeing and delving into emerging risks and issues.

Ecological Collapse = Economic Collapse

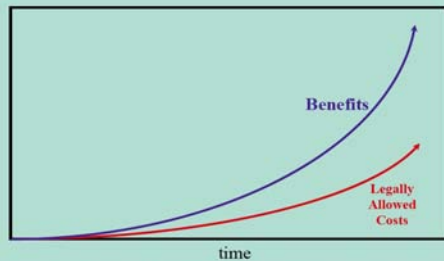


Figure 1: The law promotes all economic activity having a net benefit, allowing both benefits and costs to grow forever as the economy grows

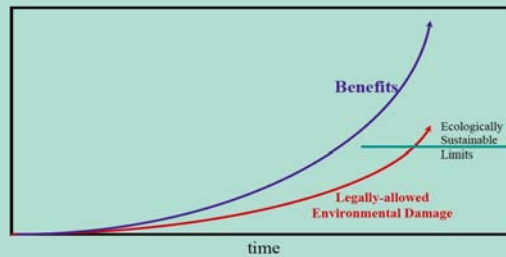


Figure 2: As the economy grows, cumulative environmental damage must eventually surpass the Earth's ecologically sustainable limits

Minimum standards typically set *acceptable levels of risk* using individual, incremental cost-benefit analyses, disregarding the existence of upper limits: unlimited increments of risk = unlimited risk.

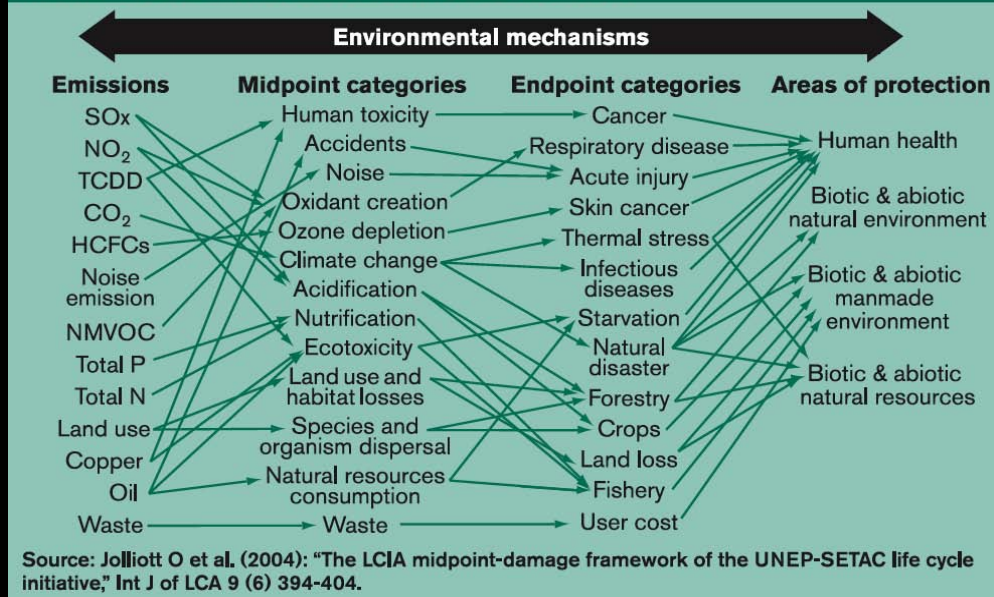
Graphics & concept: Joe Guth, Science & Environmental Health Network www.sehn.org
www.precaution.org/lib/09/ht090219.htm#Cumulative_Impacts_Death_Knell_for_CostBenefit_Analysis

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These two graphics are from a paper about on the problems of cost-benefit analysis - called "Cumulative Impacts: Death-knell for Cost-benefit Analysis in Environmental Decisions." What these show is that the bases for most cost benefit decisions about risk are based on looking at each increment of activity and judging whether, in those increments, the potential economic benefit is larger than the potential economic harm. If so, the activity is allowed. This is done with no regard to the existence of cumulative harm or of system limits, in this case ecological system harm and limits. What this means is that because we have chosen a system which uses economics as the measure, and sees economic growth and activity as an unlimited good, even though it contains an element of damage, in essence we have a system that enables unlimited harm. When the system limits are exceeded and there is ecological collapse there will be unlimited economic harm as well, but that is outside the realm that can be considered in this constructed system. This system constructs an extremely dangerous relationship to geo-bio-physical reality, based on a set of fragmented economic calculations.

Real Risks are Falling Through the Cracks

Impact Assessment: Making the Connection from LCI to Entities Needing Protection

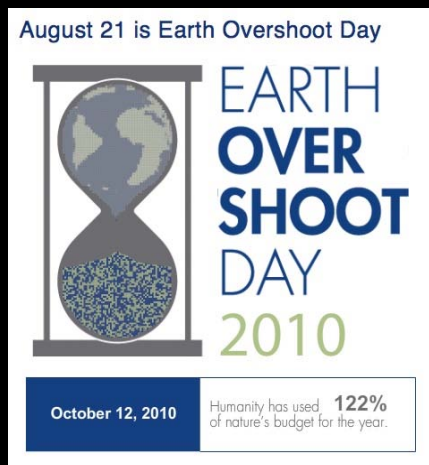


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This is chart of some of the lifecycle impacts, risks and relationships that those of us concerned with sustainable building are trying to pay attention to and address. I don't expect you to be able to read all this or to understand all the relationships that are shown here. I don't claim to. But what is clear is that very few of these things are regulated by building codes and standards. These are real and huge risks, yet those who are trying to design and build to minimize all these kinds of impacts, while also dealing with the risks that the codes address - taking on much more responsibility not less - often have a much harder time getting their projects approved than those projects contributing the most to such hazards.

Earth Overshoot Day

How do we plan to balance this budget deficit?



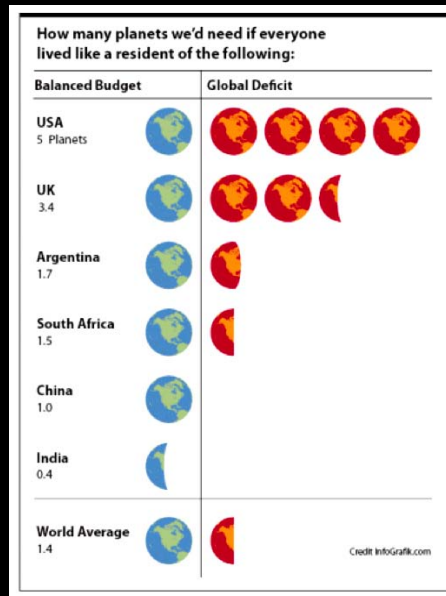
The Global Footprint Network estimates that this year, by August 21st, humans had appropriated 100% of nature's total estimated annual ecological capacity. We are eroding the Earth's ability to support us.

www.footprintnetwork.org/en/index.php/GFN/page/earth_overshoot_day

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This is a recent tool developed by the Global Footprint Network - based on their work trying to understand ecosystem capacities and human demands on them. According to their extensive research, this year humans had used the total global ecosystem productive capacity by August 21st - Global Overshoot Day. You can go to their website for more information about how they calculate this and much more, including to see of the earth's biological systems ability to provide support for us we've used on any given day of the year. If this seems impossible to you, think about it as degrading the Earth's ability to provide clean air, water, food, fibre, etc.

Big Question: How Many More Planets?

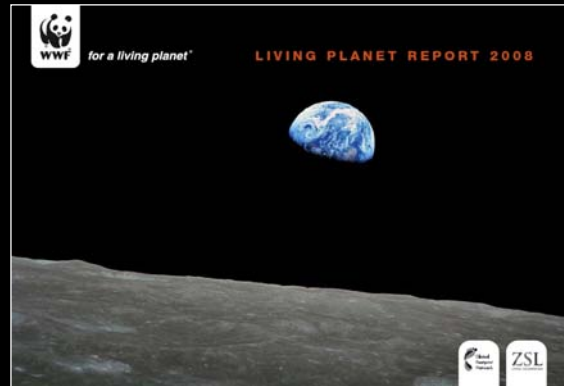
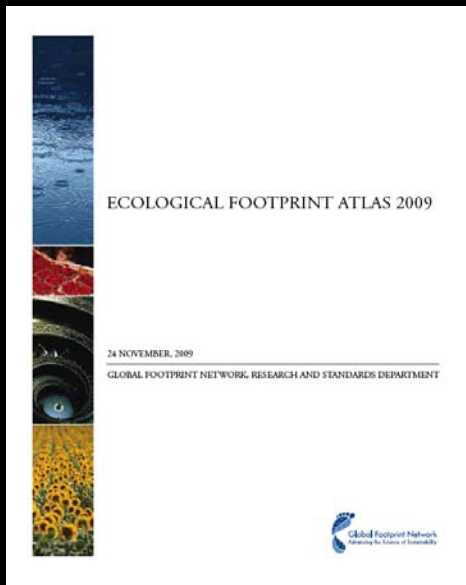


www.footprintnetwork.org

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A good tool for looking at what is happening on a planetary scale in terms of population, land, resources, pollution and nature is through a concept called ecological footprint. It is related to the concept of carrying capacity - that a certain piece of land could support a certain population or level of activity. Ecological footprint comes at it from the opposite direction, asking how much productive land it requires to provide the resources and deal with the pollution and waste of a given population, individual or activity. There is ample evidence that if everyone on the planet was consuming resources and producing waste and pollution at the rate of the average American, Canadian, Northern European, or Japanese citizen, we would need several more planets to support them. Extra planets are hard to find. This graphic shows that we are already in planetary overshoot - and what the different levels of resource consumption and impact of different countries would mean if everyone on Earth were living that lifestyle.

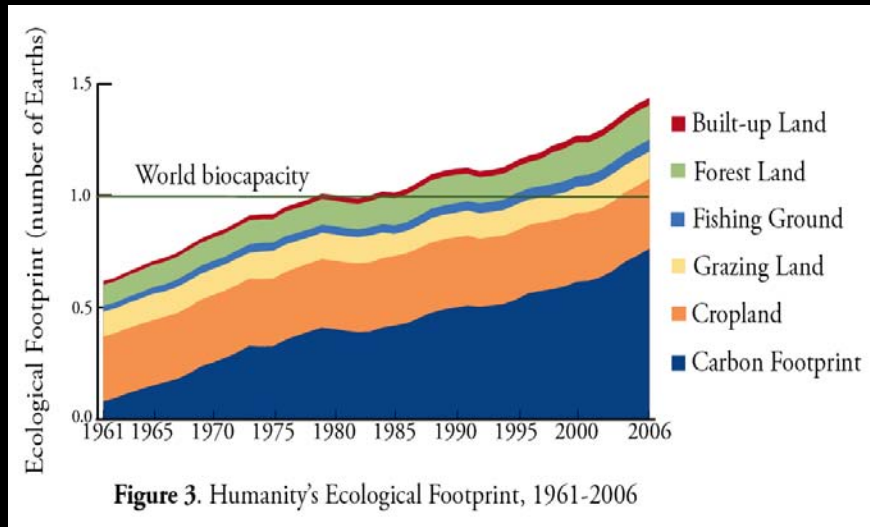
More of Us Are Living on a Finite Planet



www.footprintnetwork.org

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The Global Footprint Network offers a wealth of useful information about the concept of ecological footprint and world resources and ecosystem services. One of the great things about this site and the organization is that everything they do is transparent - you can download their reports and the data on which they are based, their methodology is meticulously described, the quality of the information is also revealed - what's missing and what is of questionable accuracy - it's all open and available. They invite people to critique their methods, to help provide better information. These are two recent reports, the 2009 Ecological Footprint Atlas and the 2008 Living Planet Report.



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This graphic shows the make up of the services and resources that nature provides - and if you notice it is our energy and carbon footprint that is the largest and growing the fastest.

Our Challenge

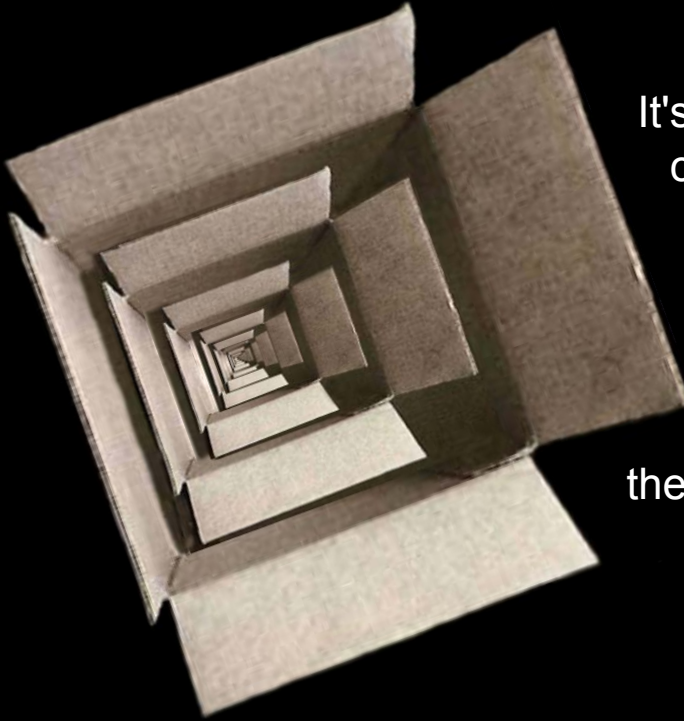
"You cannot solve a problem from the same consciousness that created it. You must learn to see the world anew."

Albert Einstein

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As I mentioned at the start, you can't solve a problem with the same thinking that created it. One of the problems in the regulatory realm is that it tends to be fully embedded at the level of the problems that the regulations are trying to solve. We need systems that are designed to operate at least one level above that...higher if we can manage it.

Out of the Box?



It's an infinite set of concentric boxes. Learn something new and maybe you'll get out of the box you're in, and get into the next bigger box.

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People talk about the need to think outside the box - especially with all the daunting challenges we're facing today. My experience is that it is really an infinite series of concentric boxes. We expand our thinking and understanding and climb into the next bigger box. I love this image because it reminds me, when I get in paradigm wars, you know, "my paradigm is bigger than your paradigm," that they're all tiny inaccurate versions of reality. It keeps me open to learning more. If someone has a bigger picture, a bigger map, or they can draw in parts that I haven't figured out yet, I'm ready to go look. I may decide I like my version better but I want to have a look at your map. Our job is to make the largest and most accurate map of reality that we can in our time here. We have to be willing to redraw your map constantly...

What's your frame of reference?

What you see depends on where you look...



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It's also important to know whether you're working in the details or the big picture or some intermediate level, in the past, the present, the future, always trying to understand the context of our focus. They teach artists and architects to shift their focus back and forth all the time. Focus is an act of exclusion - you focus on something and by definition, you exclude everything else. If you don't know that, if you don't pay attention to that you get lost in the details or you lose sight of them.

What's your frame of reference?

What you see depends on where you look...

If we want to see things *in context* — we have to constantly shift our focus between the *details* and *big picture* so we see the *things* and their *relationships*.



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We all need to develop the habit of constantly shifting our focus and looking for the patterns and the spaces between things and their relationships, not just things themselves. This is how we learn to keep things in perspective and proportion.

We've Done Well With the Risks We Know...



Modern building codes enable us to design and build structures that are safe for their occupants, making it seem that we've eliminated or greatly reduced the risks associated with buildings.

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Our modern building codes are extraordinarily good at enabling us to design and build buildings that rarely burn down, fall down, trap people in emergencies, expose them to raw sewage, electrocute them, let them fall from high places, suffocate them too quickly, and so forth. Thus we think we've eliminated or greatly reduced the risks associated with buildings.

But What About Systemic and Future Risks?

In reality, we've just moved those risks in space and time:

- away from the building site into the natural systems that support us, and
- into the future.



What we've actually done is move those risks in space and time. We've moved them away from the building site out into all the natural systems on the planet - our life support systems, and from the present to our children and grandchildren and all the future generations of all the other species on whose welfare our welfare also depends.


Enormous Hazards Hidden in Plain View



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Regulatory thinking is often like looking through a microscope. We can see important risks to people in and around buildings. But important as they are, these building or project scale risks completely fill our field of view. They're very important because they are risks to real people. But outside the field of view are risks being created that are many orders of magnitude greater - generalized and distributed risks to billions of people that can't be seen through that lens.

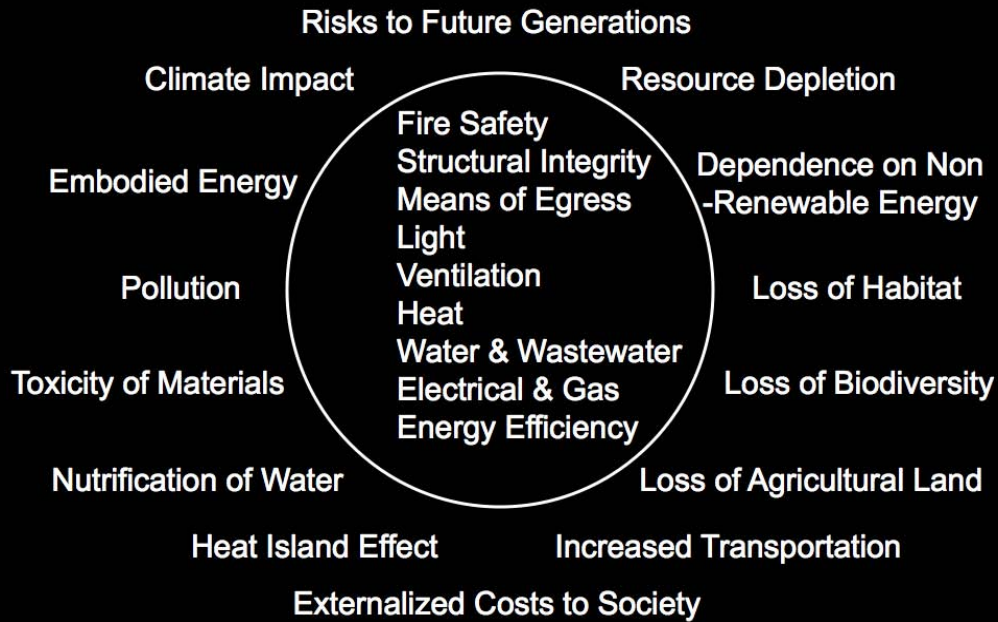
Risk - Through the Microscope of Codes...



Fire Safety
Structural Integrity
Means of Egress
Light
Ventilation
Heat
Water & Wastewater
Electrical & Gas
Energy Efficiency

These are the categories of risk and responsibility laid out in the codes.
This is the view through that microscope...

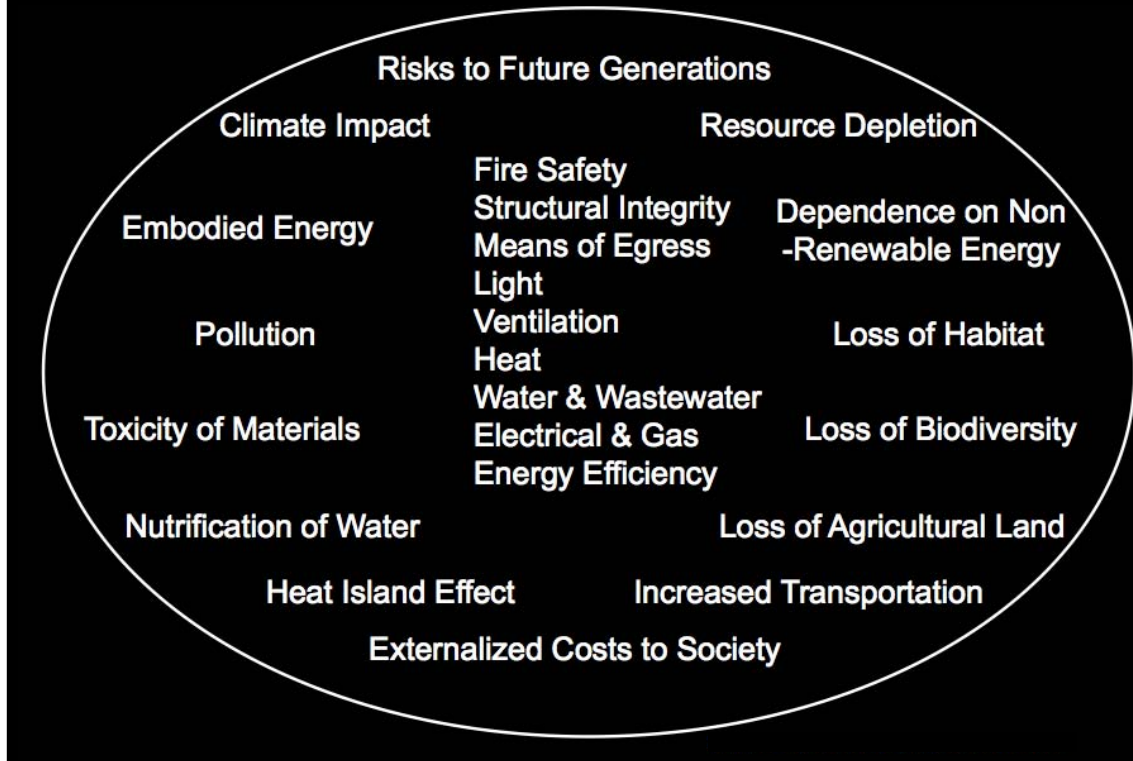
Risk - The Bigger Picture...



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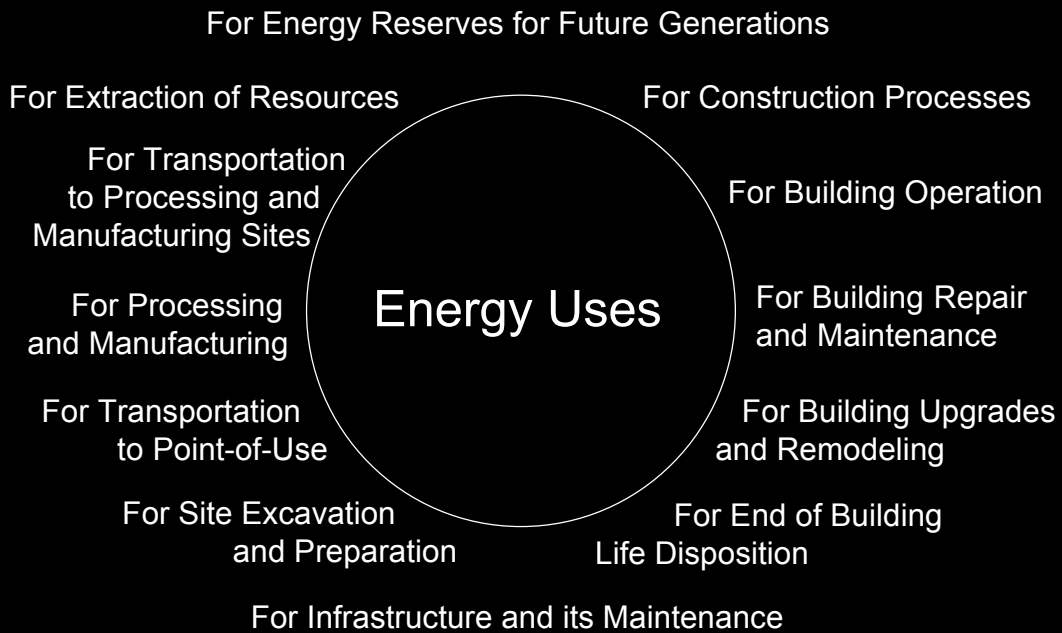
Here are some of the larger risks which are also attributable to the built environment and therefore part of the responsibility for safeguarding the public, most of which are currently unregulated.

Risk - We Need to Balance them All...



It isn't either-or... we have to learn to address all these risks at the same time. What is needed is a more complete and balanced regulatory response to address and balance all these risks together. The real breakthrough in my thinking and my work came when I realized that I wanted everything that the building officials wanted and more, not less. The last thing any of us want are unsafe buildings, but there are much larger risks that need to be addressed as well. If the purpose of regulations for the built environment is to safeguard the public, that has to include all this and our children and their children as well.

Will We Be Able To Continue To Do This?



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If we just consider energy and look at how it's used in relation to the built environment we see enormous dependencies. What happens if we can't do these things the way we now require?

If Not, Then What?

Whether the constraint is energy supply or price, or carbon/greenhouse gas restrictions and their cost, the result will be the same when our business-as-usual assumptions can't be achieved.

What will the new "usual" become, and what will that mean for buildings and building regulation? More importantly, what are we doing now to prepare for that eventuality?

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We are rapidly approaching a time when we'll need to face this question. And it won't really matter if the constraint is supply and price or paying for carbon emissions. If we can't continue business as usual, what will become the new usual?

The Current Situation...

We don't get regulations until we have big, serious, persistent problems - serious enough to demand an official response. So the main navigational tool in the regulatory realm is...

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Another pervasive problem in the regulatory paradigm is that because we don't get regulations until problems are large, serious and persistent...

The Rear View Mirror



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...the main navigational tool in the regulatory realm is the rear-view mirror. And since we rarely have preventive or precautionary regulatory structures with anticipatory capabilities built into them, we lose the chance to deal with new risks when they're small and manageable – or better yet – avoidable. Worse, emergent risks or new kinds of risk tend to be problematic for the regulators and so they are often reluctant to acknowledge them or respond to the need for change.

Going Forward

It seems increasingly clear that the new minimum standard for safeguarding the public is to enable the most rapid transformation of our systems that we can reasonably manage.

Our thinking must evolve because now, in order to keep the worst things from happening, we'll need to be enabling the best things.

We know that change entails risk. But I think the most dangerous thing we can do is to keep doing what we've been doing.

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At this point in time, it seems increasingly clear that in order to safeguard the public from hazards attributable to the built environment the new minimum standard must be to enable the most significant and rapid transition to sustainable practices that we can manage, not to maintain the status quo. Change is risky but I don't think it's nearly as risky as continuing to do what we've been doing. So we need to get used to constant change and to evolve our regulatory systems to be responsive to what's needed.

Going Forward

We need an outcome-based approach for the whole regulatory and approvals process, as focused on ensuring comprehensive beneficial performance as on setting higher standards.

Solutions are going to need to be more regionally based, requiring more local knowledge and engagement on everyone's part.

The shift taking place at the leading edge of the design, development and building communities must be mirrored in the building regulatory realm.

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Our regulatory systems need to become much more outcome and performance based, with the goal of enabling the best outcomes rather than just preventing the worst ones. We will need to relocalize many things as we find it increasingly difficult to drag resources around the planet and process them to whatever standards we used to consider essential. We will need to find ways to use more local and regional resources, reuse buildings and materials, and overall, be much more careful with what we use. The regulatory realm will need to mirror the shifts happening at the leading edge of integrative design and sustainable and regenerative building and development.

The Living Building Challenge



www.ilbi.org

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New stretch standards are starting to pull us far beyond where we were just a few years ago. The Living Building Challenge is one such tool.

The Living Building Challenge

The LBC aims to inspire the shift toward truly regenerative projects. To be certified, projects must meet 20 Imperatives and have been in operation for a year. They must:



- harvest all of their own energy and water
- offset their land use and carbon impacts
- be adapted to their site and climate
- be free of toxics and operate pollution free
- provide healthy and humane indoor environments
- and be beautiful, inspirational and educational

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The Living Building Challenge 2.0 is a set of 20 imperatives - requirements - aimed at encouraging the creation of projects that go beyond net-zero in all areas. It includes site, energy, water, materials, and also beauty and inspiration and education. These are there because many of us believe that people don't take care of things they don't care about - they don't care for what they don't love - and people love beautiful buildings and so they last longer - which is much more sustainable.

The Living Building Challenge

SUMMARY MATRIX

The 20 Imperatives of the Living Building Challenge:
Follow across the row associated with each Typology to see which Imperatives apply.

Imperative omitted from Typology

Scale Solutions beyond project footprint are permissible

	Neighborhood	Building	Landscape + Infrastructure	Renovation	Site	Water	Energy	Health	Materials	Equity	Beauty
Limits to Growth											
Urban Agriculture											
Habitat Exchange											
Car Free Living											
Net Zero Water											
Ecological Water Flow											
Net Zero Energy											
Civilized Environment											
Healthy Air											
Blophilia											
Red List											
Embodied Carbon Footprint											
Responsible Industry											
Appropriate Sourcing											
Conservation + Reuse											
Human Scale + Humane Places											
Democracy + Social Justice											
Rights to Nature											
Beauty + Spirit											
Inspiration + Education											

Living Building Challenge™ 2.0

13


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I don't have time to go into this, but this is a matrix of the 20 imperatives and the categories into which they are grouped. There is also a way to address some of these at larger scales than individual projects. I encourage you to go have a look at this system.

The Living Building Challenge


The International Living Building Institute just announced the certification of the first two Living Building Projects: the Tyson Living Learning Center in Missouri and the Omega Center for Sustainable Living in New York. More info at: <http://ilbi.org>

TYSON LIVING LEARNING CENTER Eureka, Missouri
 Tyson provides a landscape-scale experiential venue for studies on ecosystem sustainability, an outdoor laboratory for important research and teaching opportunities from Washington University and other institutions, and research and educational opportunities for undergraduate and graduate students related to the environment and sustainability. "One of the most rewarding aspects of receiving Living Building Certification is that it formally recognizes the exceptional commitment it took to complete this project. From design and construction through over 18 months of commissioning and performance monitoring, achieving its goal required the full dedication of everyone involved in the project." - Kevin G. Smith, Associate Director, Tyson Research Center



General Information	Location: Eureka, MO, USA	Project Team	Owner: Washington U in St. Louis
Biogenic: Heartland	Living Transit: L3	Geotechnical: Grimes Consulting	Geotechnical: Grimes Consulting
Typology: Building	Occupancy Type: Education/Research	Civil: Williams Creek Consulting	Civil: Williams Creek Consulting
Project Area: 2,299 sqm / 24,781 sq ft	Building Area: 276 sqm / 2,968 sq ft	Landscaping: A300, LLC	Landscaping: A300, LLC
Start of Construction: 12/2008	Start of Occupancy Period: 6/2009	Architectural: Helmut + Bicknese Architects	Architectural: Helmut + Bicknese Architects
		Plumbing: Solutions AEC	Plumbing: Solutions AEC
		Mechanical: Solutions AEC	Mechanical: Solutions AEC
		Electrical: Solutions AEC	Electrical: Solutions AEC
		Specialty Consultant(s):	Specialty Consultant(s):
		Stationer Systems: Chris Kuthum	Stationer Systems: Chris Kuthum
		Solar Energy: Straight Up Solar	Solar Energy: Straight Up Solar
		Contractor: Bingham Construction Company	Contractor: Bingham Construction Company

THE OMEGA CENTER FOR SUSTAINABLE LIVING Rhinebeck, New York
 Omega provides innovative educational experiences that awaken the best in the human spirit. The Center for Sustainable Living is a wastewater filtration facility that is designed to use the treated water for garden irrigation and in a greywater recovery system. Omega will use the system and building as a teaching tool in their educational program designed around the ecological impact of their campus. "Omega is proud to have attained the finish line, and hopeful that projects like ours will mark a new era in sustainable design, one that reflects a truly integrated approach to creating built environments that are in harmony with the natural world." - Skip Backus, CEO at Omega

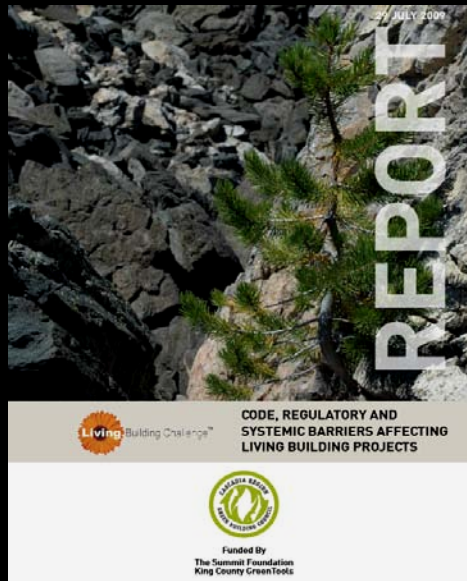


General Information	Location: Rhinebeck, NY, USA	Project Team	Owner: Omega Institute
Biogenic: Northeast	Living Transit: L3	Geotechnical: Chazen	Geotechnical: Chazen
Typology: Building	Occupancy Type: Business/Education	Civil: Conservation Design Forum	Civil: Conservation Design Forum
Project Area: 13,132 sqm / 141,360 sq ft	Building Area: 901 sqm / 9,746 sq ft	Landscaping: Tipping-Mar + Associates	Landscaping: Tipping-Mar + Associates
Start of Construction: 11/2007	Start of Occupancy Period: 5/2009	Architectural: BHM Architects	Architectural: BHM Architects
		Interior Design: BHM Architects	Interior Design: BHM Architects
		Plumbing: BGR Consulting Engineers	Plumbing: BGR Consulting Engineers
		Mechanical: BGR Consulting Engineers	Mechanical: BGR Consulting Engineers
		Electrical: BGR Consulting Engineers	Electrical: BGR Consulting Engineers
		Lighting Design: BHM Architects / BGR Consulting Engineers	Lighting Design: BHM Architects / BGR Consulting Engineers
		Specialty Consultant(s):	Specialty Consultant(s):
		Reclaimed Materials: Planet Rescue	Reclaimed Materials: Planet Rescue
		Water Systems Engineer: Natural Systems International	Water Systems Engineer: Natural Systems International
		Ecological Design: John Todd Ecological Design	Ecological Design: John Todd Ecological Design
		Contractor: David Sembler Construction	Contractor: David Sembler Construction

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Just within the past couple of weeks the first Living Building projects have been certified including these two in Missouri and New York.

The Living Building Challenge



This 2009 report that DCAT produced for the Cascadia Green Building Council examines the spectrum of building regulatory issues related to LBC and other deep green projects in both the U.S. and Canada.

www.dcat.net/resources/index.php

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DCAT, my organization was hired by the Cascadia Region Green Building Council to produce a report on the code and regulatory barriers to Living Building Challenge projects. This report, which was published in 2009, covers a wide range of regulatory issues in depth, and offers many recommendations. One of the key observations was that there is no flexibility in most regulatory systems to allow any increase in one area or category of specific risk to gain large reductions in systemic risk.

Going Forward

We need to accelerate knowledge and application of passive design strategies. The emerging Passive House (Passivhaus in Europe) Standard is literally pushing the envelope (and more) in design and building. This is great, however...

We also need to recognize that achieving net zero energy using mainstream materials and systems tends to greatly increase embodied energy.

Speaking of embodied energy, existing buildings have a huge amount and are some of the worst climate offenders, so need much more focus.

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Passive strategies need to move to a place of predominance. The European developed Passive House Standard and design tools are having an impact on there and in the U.S. now. This is great but it's worth considering the embodied energy investments that we're tending to make in net zero energy buildings. The trend is for embodied energy to go way up as operating energy comes down using conventional materials and systems and approaches. And we should pay attention to the reality of the embodied energy and resources in existing buildings and the fact that they are some of the worst in terms of climate performance, meaning that improving them has the highest energy and economic return on investment.

Going Forward

Here are a few more specific recommendations:

Develop funding for Research, Development and Deployment of very-low-impact and low embodied energy building materials and systems.

In the U.S. we have a program in the national laboratories - Small Business Innovation Research (SBIR) Grants. They're only available to for-profit companies with proprietary products, processes, systems, etc. We need the Public Benefit Innovation Research (PBIR) Grant program for public benefit, public domain, non-profit R, D & D in these labs.

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And just to round out my suggestions, we need to find ways to fund much more R&D and not just for higher-tech solutions. The SBIR grant program in the U.S. national labs needs a public benefit version as well for non-profit organizations and public benefit and public domain R&D for alternatives that aren't commercializable - like off the shelf systems for passive design, water harvesting and greywater systems, traditional materials like earth and straw and other waste steam resources.

Going Forward

The insurance sector could help by being willing to insure innovative projects and supporting research and development of low-impact solutions.

As it stands, insurance is often as big a hurdle as regulatory barriers to cutting-edge projects and technologies, especially low-tech solutions.

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And the insurance sector, which has had a close relationship with the building regulatory sector has a role to play in lessening their own exposure to climate impacts by supporting both research and development of low-impact solutions and by being willing to insure innovative projects.

Going Forward

The re-insurance sector could make a huge contribution by requiring insurers to take these non-regulatory, market-based steps:

Require all key decision-makers to take continuing education in climate realities and sector-specific best practices as a prerequisite for getting or renewing insurance for entities with significant climate impacts; and develop climate-performance-based insurance rate structures so that high GHG emitters pay higher rates for the risks they're creating for everyone.

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Though this is a bit out of the strictly regulatory realm, the reinsurance sector could make a major contribution by requiring the key decision-makers in any company with big climate impacts to take continuing education courses in climate realities and sector specific best practices as a prerequisite to issuing insurance to those companies. That would be the insurers, not environmentalists sitting those folks down and explaining what is actually happening and what they need to be doing about it to reduce their own risk and exposure. And if they coupled that with developing climate-performance based rates, they could drive rapid change in industry.

Going Forward

Begin focusing on appropriate tech solutions that will be affordable and adopted by communities following natural disasters like floods and hurricanes, which will likely increase in frequency and intensity with climate change, and earthquakes.

Those in international relief agencies know that importing alien technologies and building systems has been a failed strategy for decades. There is an opportunity to develop appropriate, low-impact, high-performance, place-based solutions which can also reduce negative climate impacts.

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We need to shift from the trend toward ever higher tech solutions back to looking at what is appropriate to do in every place based on local and regional resources, conditions and traditions. This is especially true following natural disasters. This is a big opportunity to shift toward solutions that will be affordable and embraced by people in their communities. We hear this frequently from people working in the development and relief sector. Imposing alien building systems and technologies in places where there is a lack of supporting resources, infrastructure, economic base, skills, etc. is too often a failed approach. There are alternatives that are being developed and evolved that should be supported more thoroughly.

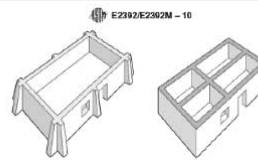
ASTM Earthen Building Standards



Designation: E2392/E2392M - 10

Standard Guide for Design of Earthen Wall Building Systems¹

This standard is issued under the fixed designation E2392/E2392M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last approval. A superscript (1) indicates an editorial change since the last revision or approval.



Note 1—Exterior fillets (fillets) should be built at corners and intermediate locations, with projections cover from the roof and support at the foundation. Fillets can be sloped as shown or vertical, but should project from the face of the wall by a distance at least as great as the wall thickness. Alternatively, the setback depth of a wall between corner areas should be limited to eight times the wall thickness. In either case, facing fillets should be of the same construction as the wall, interlocked with the wall, not be farther apart than 15 times the wall thickness (medium seismic risk), and no more than 10 times the wall thickness (high seismic risk).

FIG. 7 Wall Fillets or Wall Density for Out-of-Plane Stability

E 2392

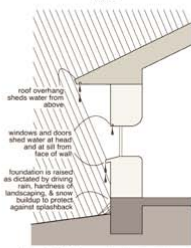
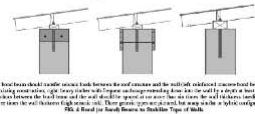
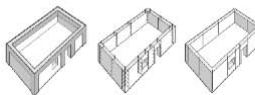


Figure 7a Moisture protection strategies. Unstabilized earthen walls should be protected by every means possible from rain, drifting or splashing rain, snow, and other sources of moisture and erosion.

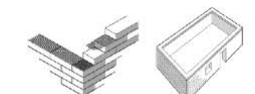
E2392/E2392M - 10



Note 1—The base flashings (or other vertical flashings) between the roof eaves and the wall (all exterior) should have a cover, installed between the flashing and the wall, to prevent water from seeping under the flashing. The wall should be built up a height at least equal to the thickness of the wall between the roof eaves and the wall flashings. In the case of a wall with a base flashing, the wall should be built up a height at least equal to the thickness of the wall between the roof eaves and the wall flashings. In the case of a wall with a base flashing, the wall should be built up a height at least equal to the thickness of the wall between the roof eaves and the wall flashings.



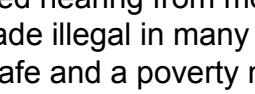
Note 1—Joints across bays and through the wall, corner vertical flashing and through the wall, edge corner vertical flashing, a ground anchor system (see Note 2), and a 12-in. (305-mm) vertical steel rod embedded in each bay through the center of an unreinforced wall should be installed in a wall to provide a means of lateral support for the wall. The wall should be finished with a light-colored finish on the exterior and painted or stained or glazed on the interior.



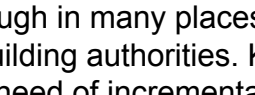
Note 1—Directional walling can be achieved by using a wall (or panels) and through the wall, or the walling can be corner ribs and corner ribs or corner ribs. Spacing of walling should be determined by the design of the wall.



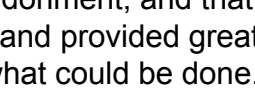
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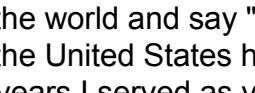
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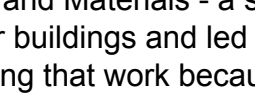
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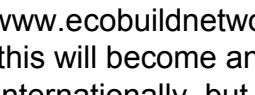
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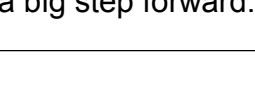
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Note 1—A wet mass of soil is worked in the hand so as to extrude a ribbon of damp soil about the size of a finger. The ribbon should be able to hang from the hand without breaking for at least the same length as the hand. This test will establish plasticity and cohesion of the earth mixture, but not the strength or durability of the cured earthen material.

FIG. 2 Ribbon Test



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About 8 or 9 years ago, I started hearing from more and more people that earthen building was being made illegal in many developing countries because it was viewed as unsafe and a poverty material. At the same time, wealthy people in the U.S. and elsewhere were building beautiful buildings of adobe and rammed earth, though in many places they struggled to get their buildings approved by local building authorities. Knowing that these materials and building systems were in need of incremental improvement and better design and detailing, not abandonment, and that they usually had a much smaller environmental impact and provided greater comfort and beauty as well, I started thinking about what could be done. I thought if we could create new, appropriate standards for earthen building in the U.S., you could take those standards anywhere in the world and say "If these are inferior, unsafe building methods, why would the United States have just created new standards for them?" For five years I served as vice-chair of an ASTM (American Society for Testing and Materials - a standards organization) sub-committee on sustainability for buildings and led the effort to create such new standards. We had to stop doing that work because of lack of funding, but it was resumed under the guidance of our colleague Bruce King of the Ecological Building Network (www.ecobuildnetwork.org) and the new standard now finalized! It is hoped that this will become an ISO standard which will make it more easily available internationally, but having this standard developed and in the world is a big step forward.

This is a New Starting Point

We need new, more collaborative partnerships to accelerate learning about innovative and alternative approaches. We need to know how they work *and* how they fail in the real world, in processes designed to continually improve and transform both practice and regulations. We need to be able to try, and fail, and be able to try again with the benefit of what we've learned.

And this must be done in a state of awareness of the full risk profile of what we are doing.

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Among the things that needs to happen is that we need to develop ways to support innovation, demonstration, and experimentation - at scale in real projects, not in laboratories alone. We need to open the door to much more rapid change and we have the technology to do real-time monitoring of projects, providing feedback about what works and what isn't working. We need to be able to research why and how things fail and have the chance to improve them and try again - not be told that because that since a demonstration project didn't work perfectly we can't use those materials or systems again. We need a system that is designed for change and advancement that improves both practice and regulations at the same time.

This is a New Starting Point

I honor you all for your work and as the caring community of deeply committed leaders that you represent.

And, I challenge us all to rethink our regulatory systems to be fully responsive to both emerging realities and to our responsibilities to present and future generations.



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I want to honor the work and the commitment of all of you as leaders in a global community that cares about safeguarding the public. And I want to call us all to the challenge of rethinking what we're doing and how we're doing it for the long haul, for both the present and future generations. Thank you!



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Okay, I opened with a question, so I'll close with one... what if climate change is a big hoax and we create a better world for nothing?



Thank you!

www.dcat.net/resources/index.php

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Thank you!