Session 6

[Thursday 1st period 1.0 hours - plenary]

Wood in architecture: what can be done?

Speakers

Speaker:
Michael Green

Topic:
The Role of Wood in the Challenge of Housing in the World

Speaker:
Dustin Tusnovics

Topic:
Building for a Better World: How Timber Architecture Can Make a Difference

Speaker:
Andrew Waugh

Topic:
A Short Talk on Tall Timber Buildings

The Future of Urban Structures

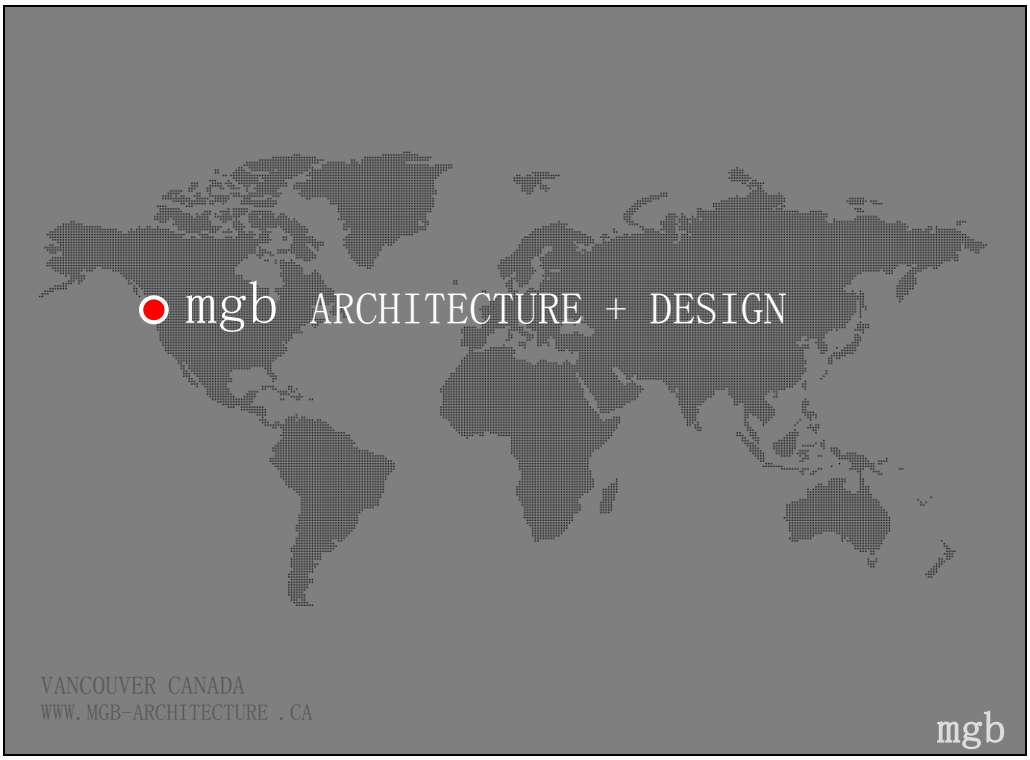
Michael Green[1]

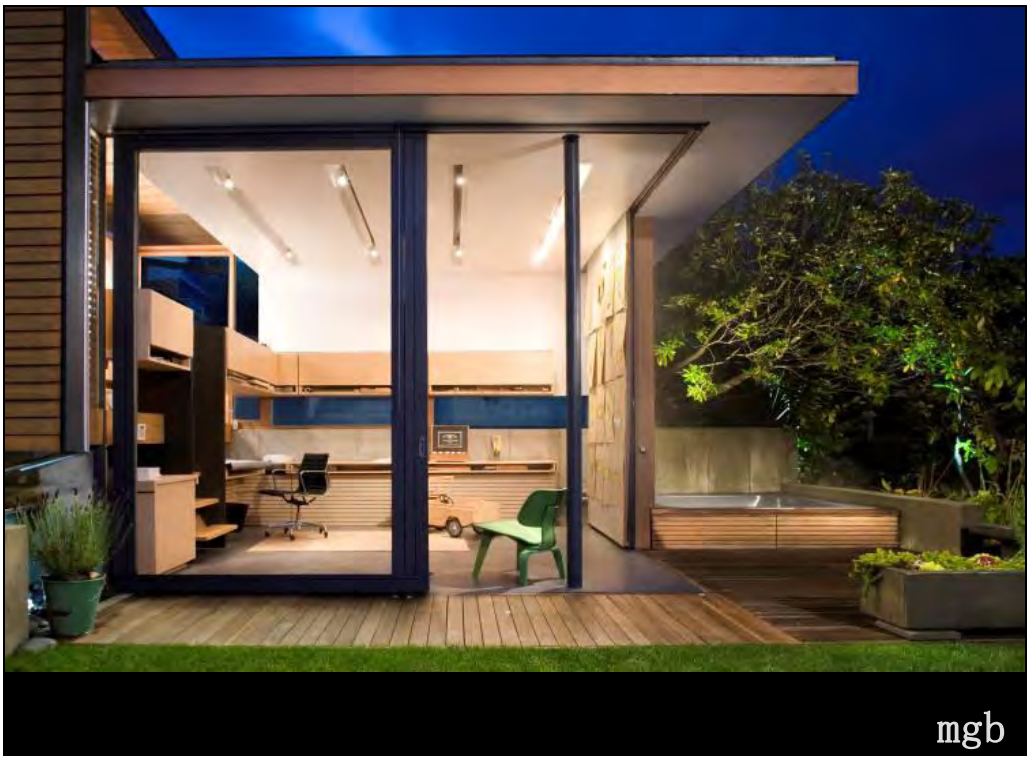
[1] Architect, MGB Architecture (mgreen@mgb-architecture.ca)

EVOLUTION | REVOLUTION

THE FUTURE OF URBAN STRUCTURES
ART AND THE JOY OF WOOD
UN FAO 2011 CONFERENCE
MICHAEL GREEN

mgb

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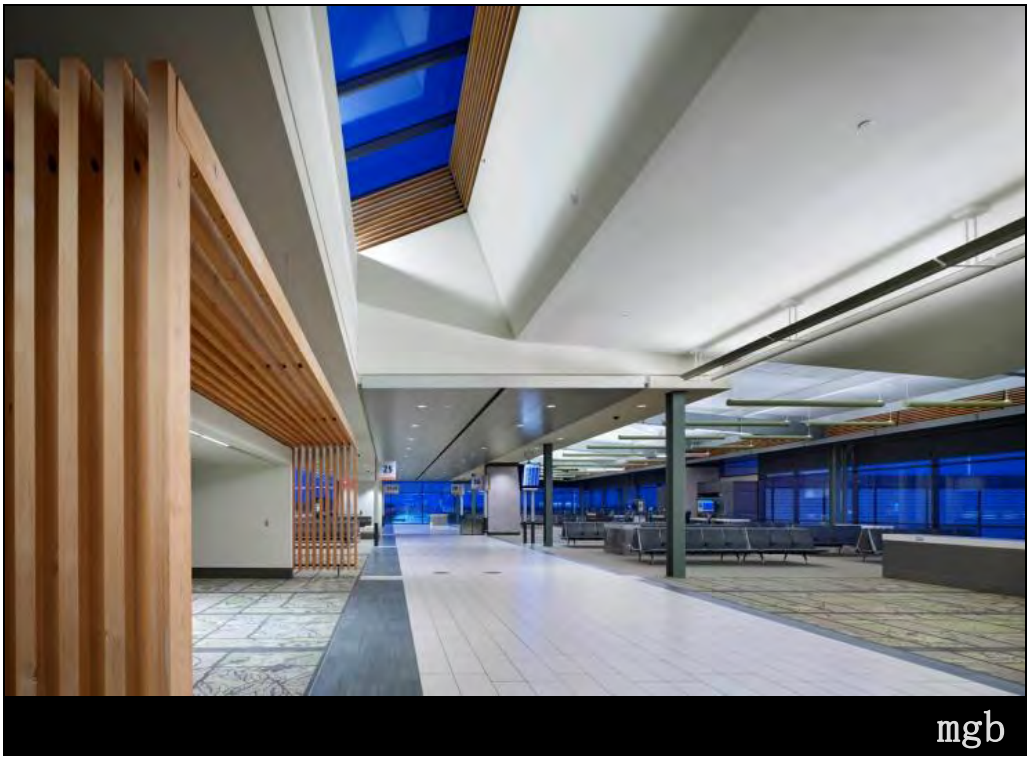
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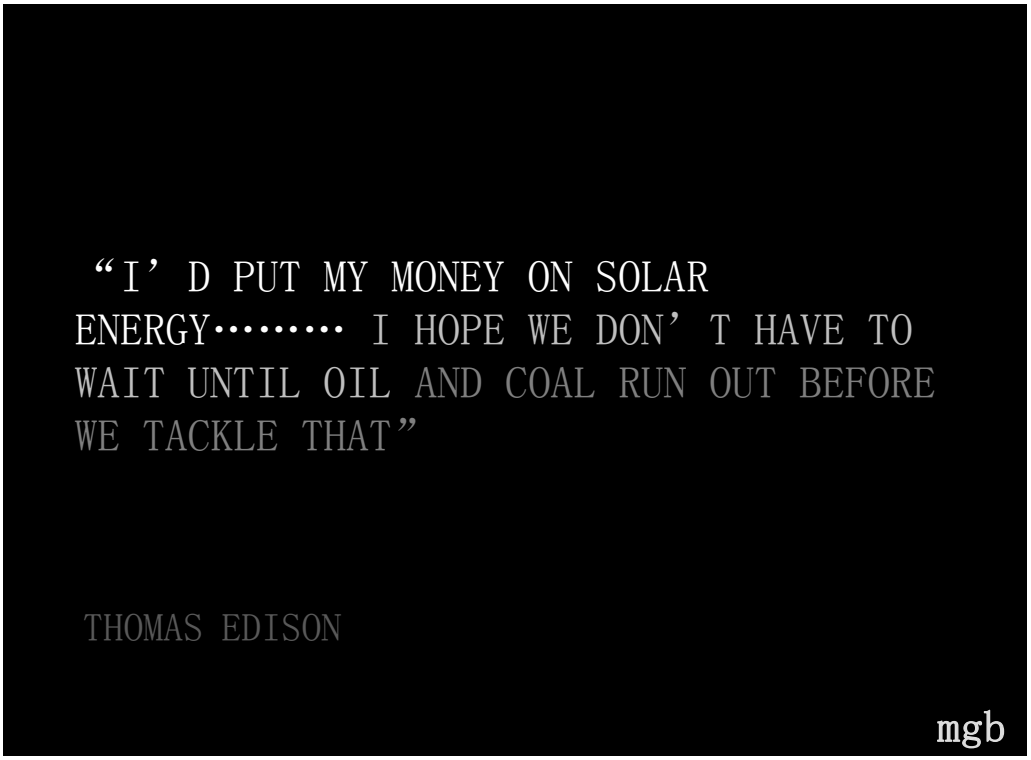
“I’ D PUT MY MONEY ON SOLAR ENERGY…… I HOPE WE DON’ T HAVE TO WAIT UNTIL OIL AND COAL RUN OUT BEFORE WE TACKLE THAT”
THOMAS EDISON
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80
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TRILLIONS SPENT

ON GREEN ENERGY

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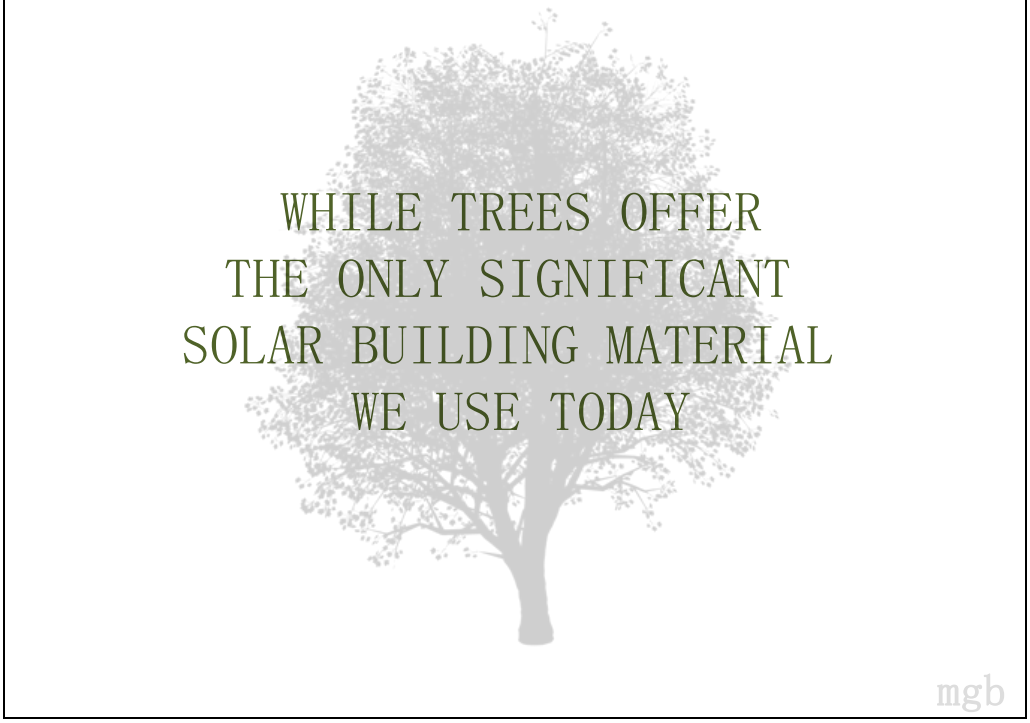

WHILE TREES OFFER
THE ONLY SIGNIFICANT
SOLAR BUILDING MATERIAL
WE USE TODAY

mgb

MAN CAN NOT
COMPETE WITH
PHOTOSYNTHESIS

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EVOLUTION

WHAT CHANGED?

FROM LOG CABIN TO BURJ DUBAI

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INDUSTRIAL REVOLUTION

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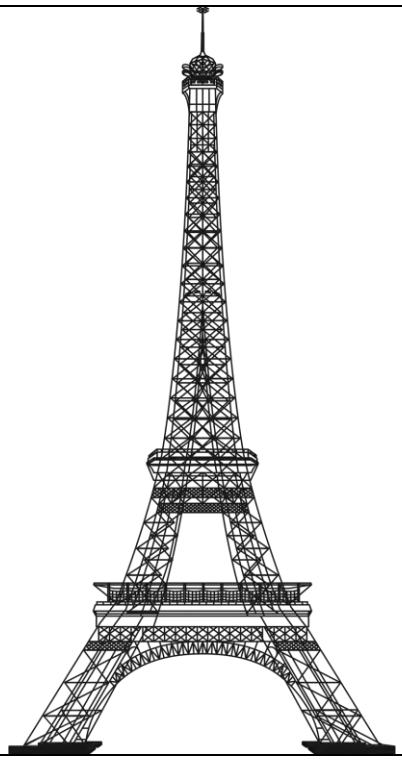


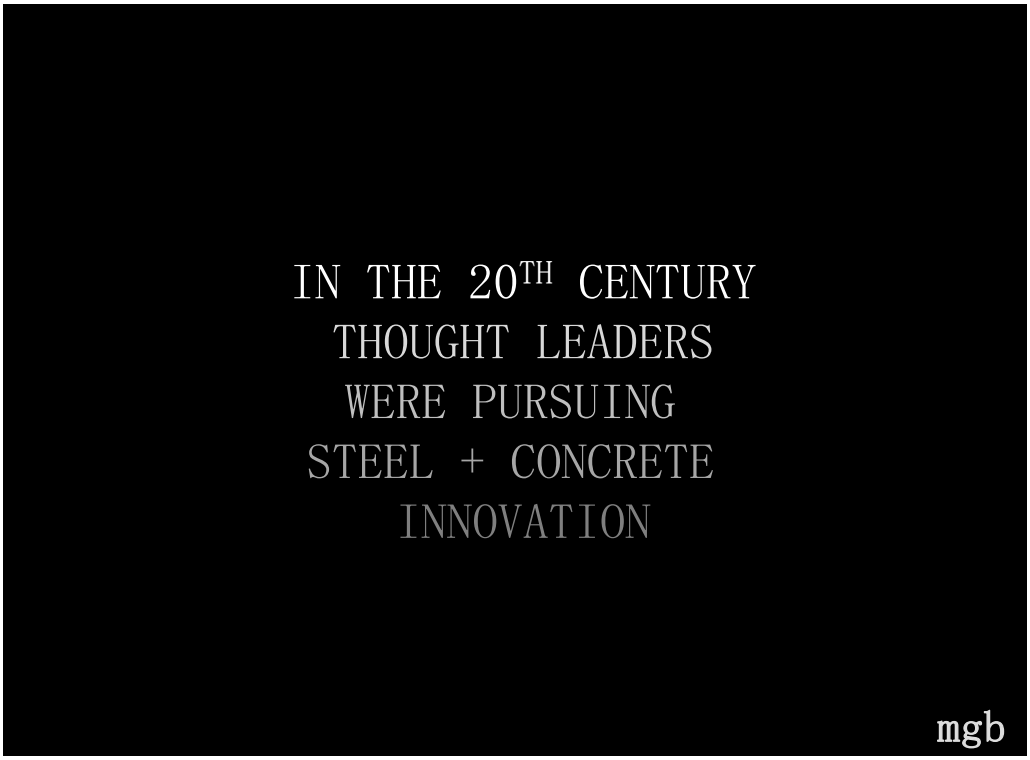
1889

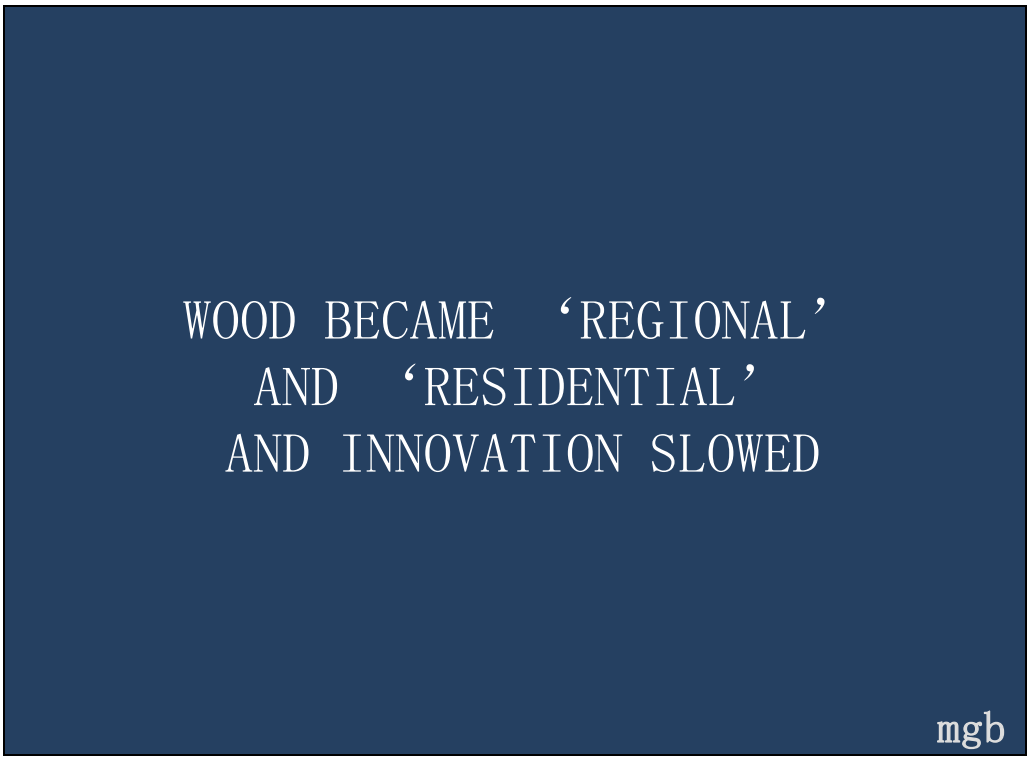
EIFFEL TOWER

324 METERS

81 STOREYS

mgb


IN THE 20TH CENTURY
THOUGHT LEADERS
WERE PURSUING
STEEL + CONCRETE
INNOVATION
mgb


WOOD BECAME 'REGIONAL'
AND 'RESIDENTIAL'
AND INNOVATION SLOWED
mgb

2008
BCBC

4

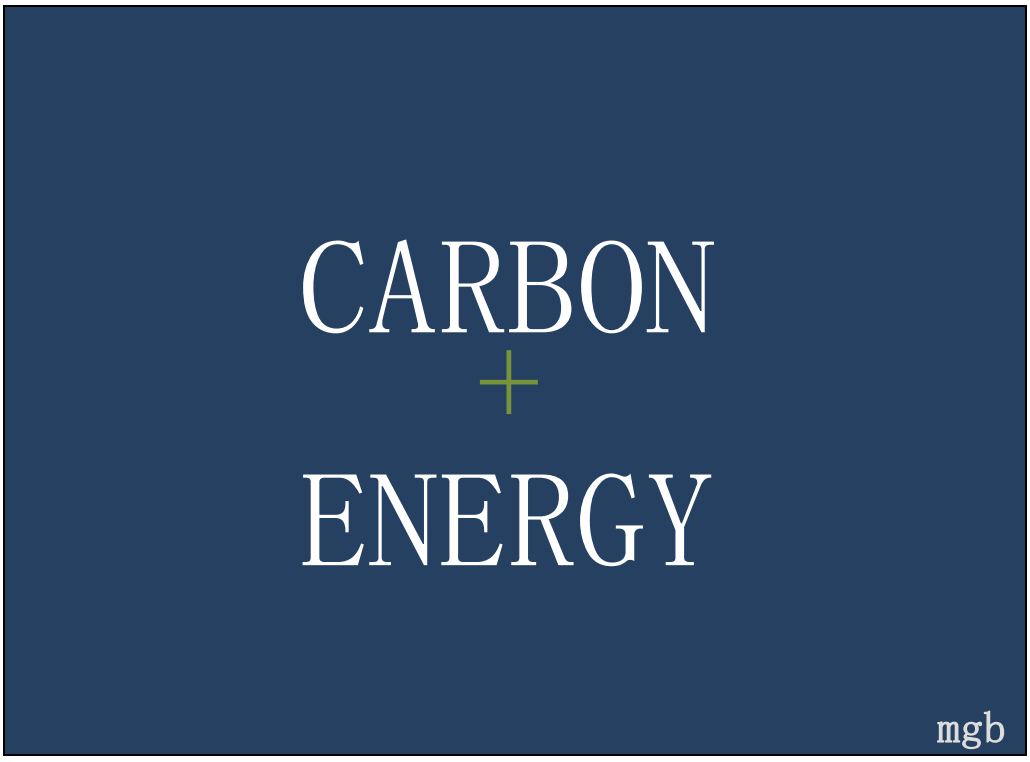
12 M

mgb

WHY CHANGE NOW?

mgb


CLIMATE
CHANGE
mgb


CARBON
+
ENERGY
mgb

AND IN THE NEW GLOBAL
CLIMATE CONVERSATION
WOOD IS OUR BEST CHOICE

mgb

IF….

IT IS SOURCED FROM SUSTAINABLE FOREST PRACTICES

AND….

WE DESIGN WITH MORE RAPIDLY RENEWABLE WOOD SOLUTIONS

mgb

ONE M^3

ONE TONNE
(UP TO 1.6 TONNES)

mgb

WHAT ARE WE UP TO?

mgb

+30

mgb

NEW WOOD PRODUCTS AND INNOVATION ARE CHANGING THE POSSIBILITIES

mgb

MASS TIMBER

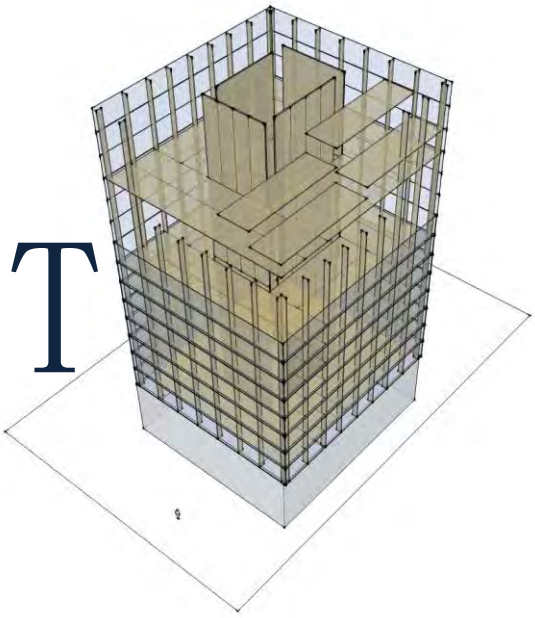
mgb

CLT
CROSS LAMINATED TIMBER
12 X 3 METERS

LSL
LAMINATED STRAND LUMBER
20 X 2.4 M

LVL
LAMINATED VENEER LUMBER
20 X 2.4 M

FFTT



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A NEW ALTERNATIVE TO STEEL + CONCRETE IN TALL BUILDINGS

mgb

WHY?

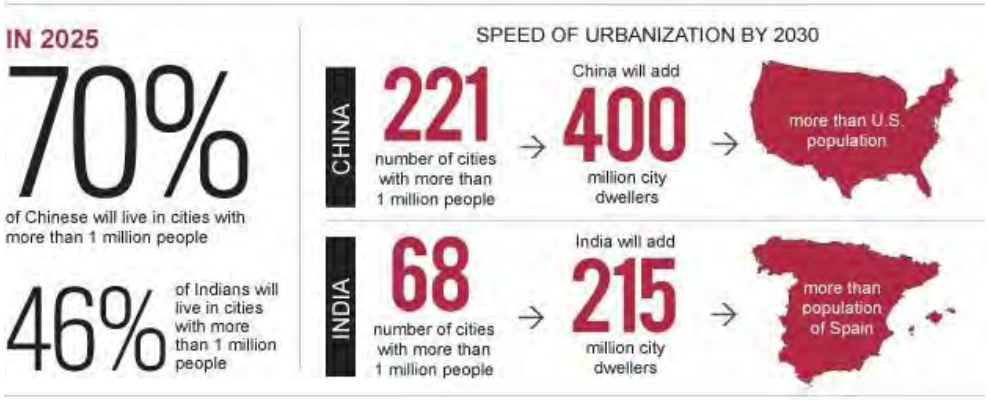
mgb

SOLVING ONE HUMAN NEED FOR SHELTER

WILL CAUSE A BIGGER HUMAN CHALLENGE
THROUGH CLIMATE CHANGE

THE WORLD WILL BE
70% URBAN
BY 2050

mgb



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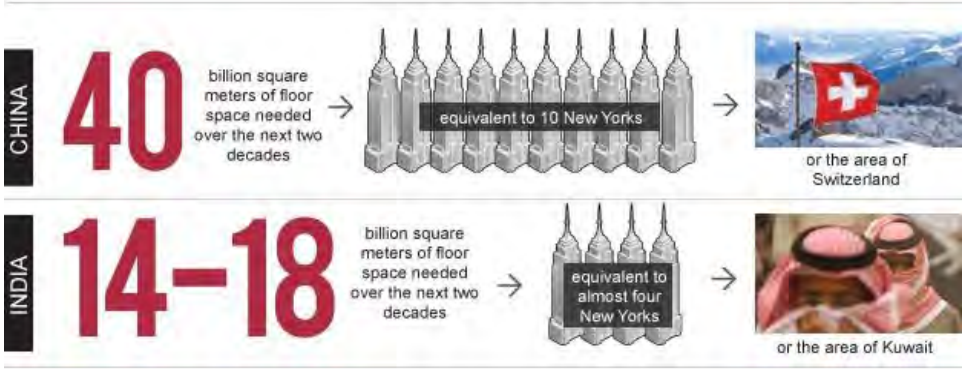

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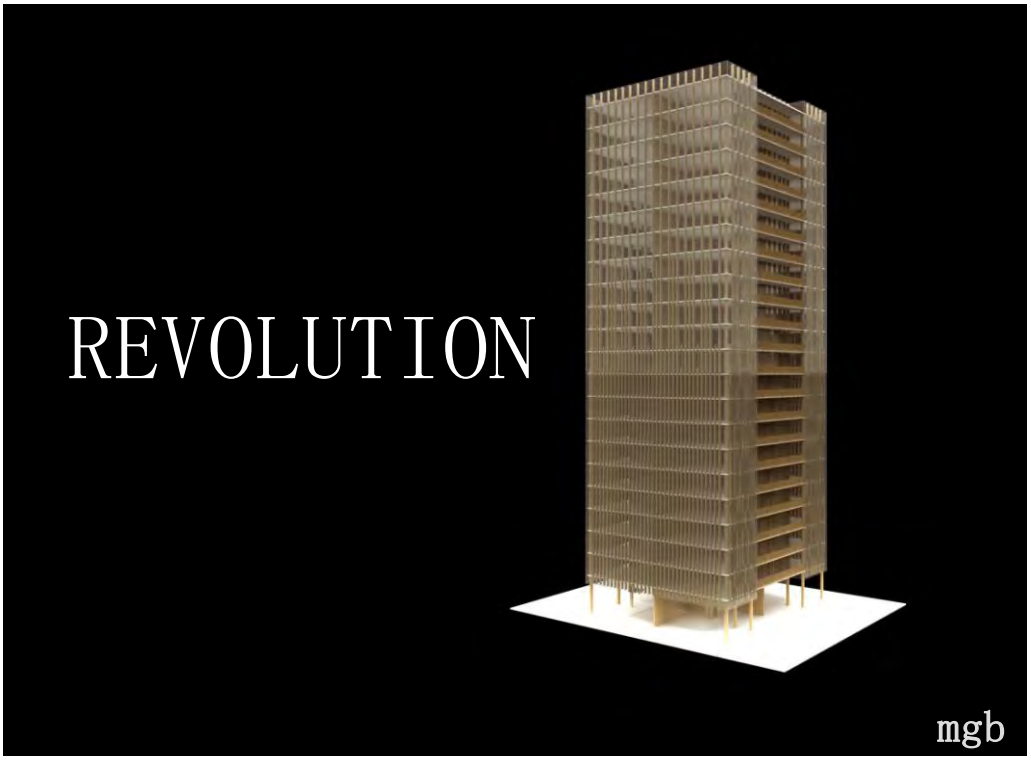
REVOLUTION
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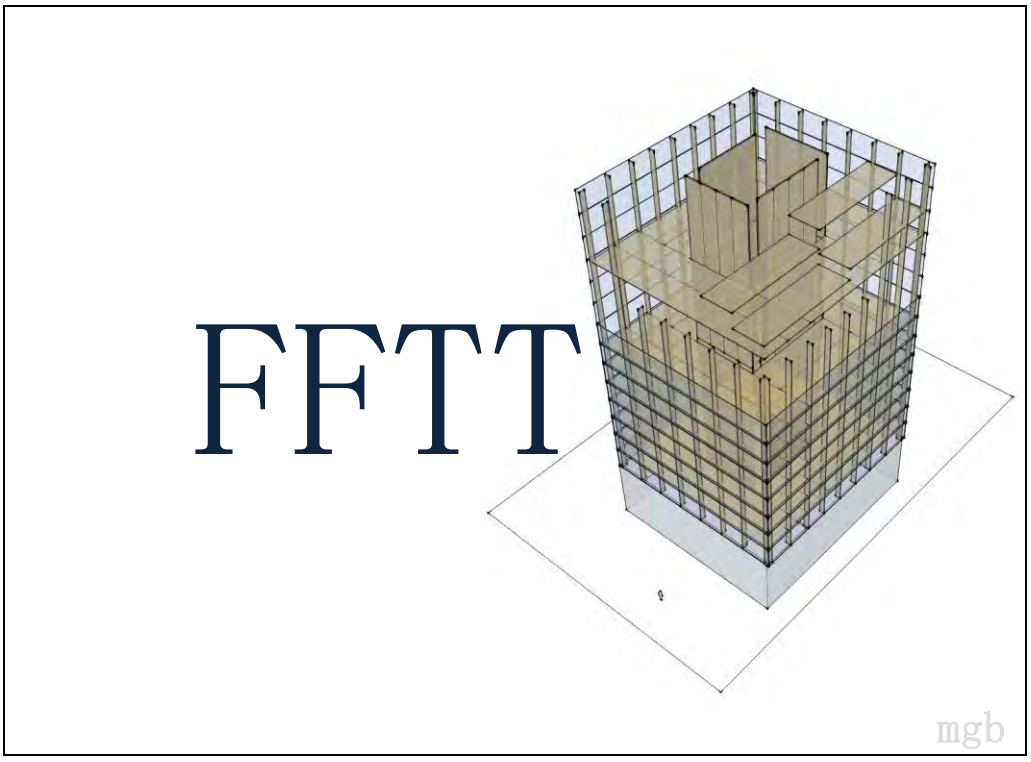
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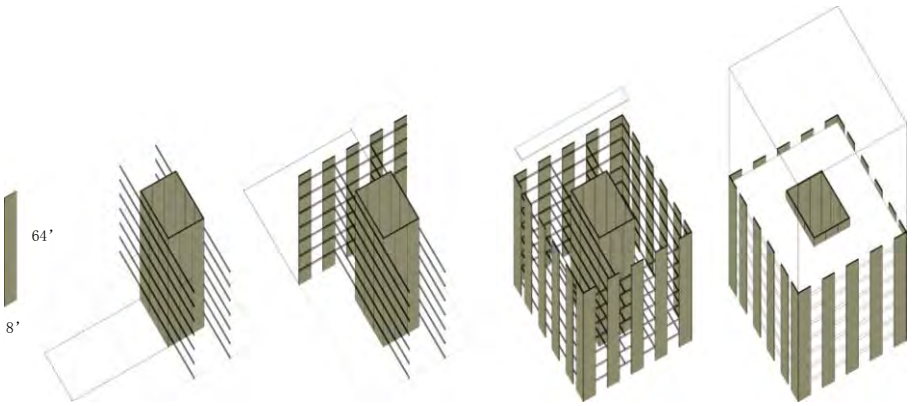

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FFTT

Option 1 Option 2 Option 3 Option 4

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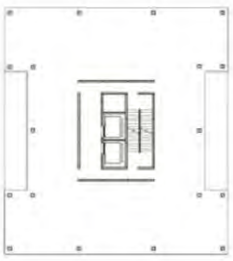
FFTT



A
6 TO 15 STOREYS

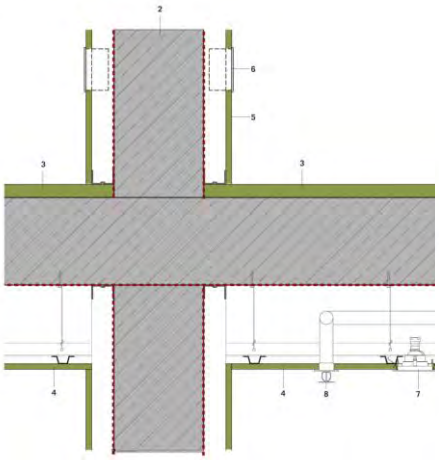
C
6 TO 30 STOREYS

B
6 TO 20 STOREYS

D
30+ STOREYS

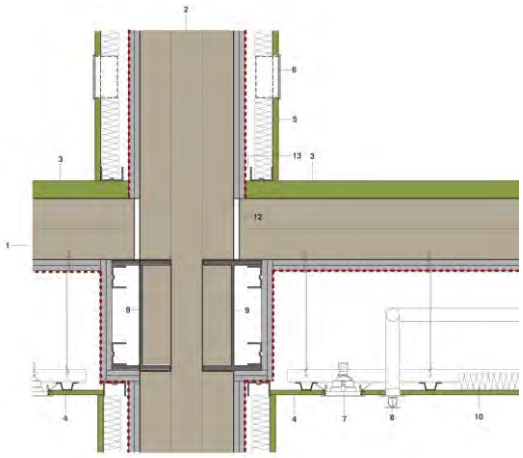
mgb

Typical Details



1 Cast in place concrete floor (2HR FRR)
2 Cast in place concrete wall (2HR FRR)
3 Finish floor
4 Finish ceiling
5 Furring and finish wall
6 Electrical outlet
7 Pot light
8 Sprinkler

Typical concrete tower typical load bearing interior partition



1 2 layer LVL or LSL + 2 Layer 5/8" type X gypsum board (2HR FRR)
2 3 layer LVL or LSL + 2 Layer 5/8" type X gypsum board (2HR FRR)
3 Finish floor
4 Finish ceiling
5 Furring and finish wall
6 Electrical outlet
7 Pot light
8 Sprinkler (plastic pipe)
9 Steel beam
10 2" loose mineral wool insulation for sound absorption (ceiling)
11 2" loose mineral wool insulation for sound absorption (wall)
12 Airspace to reduce sound transmission between floor and wall
13 Gap between drywall and stud to reduce sound transmission

Tall wood case study typical load bearing interior partition

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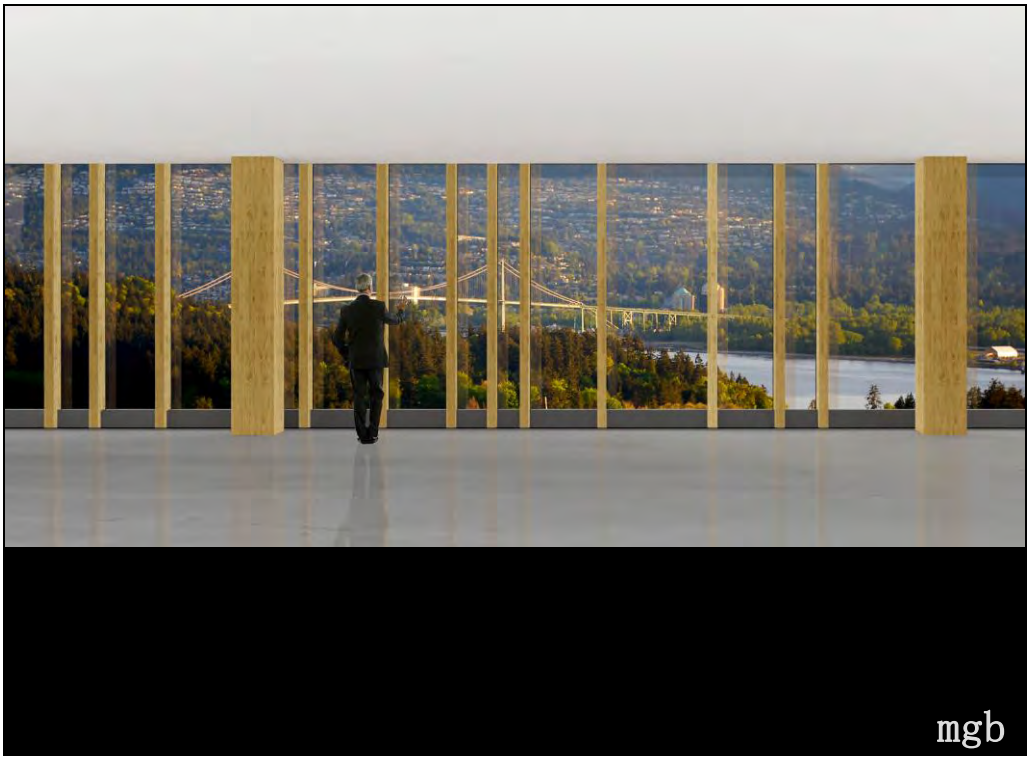
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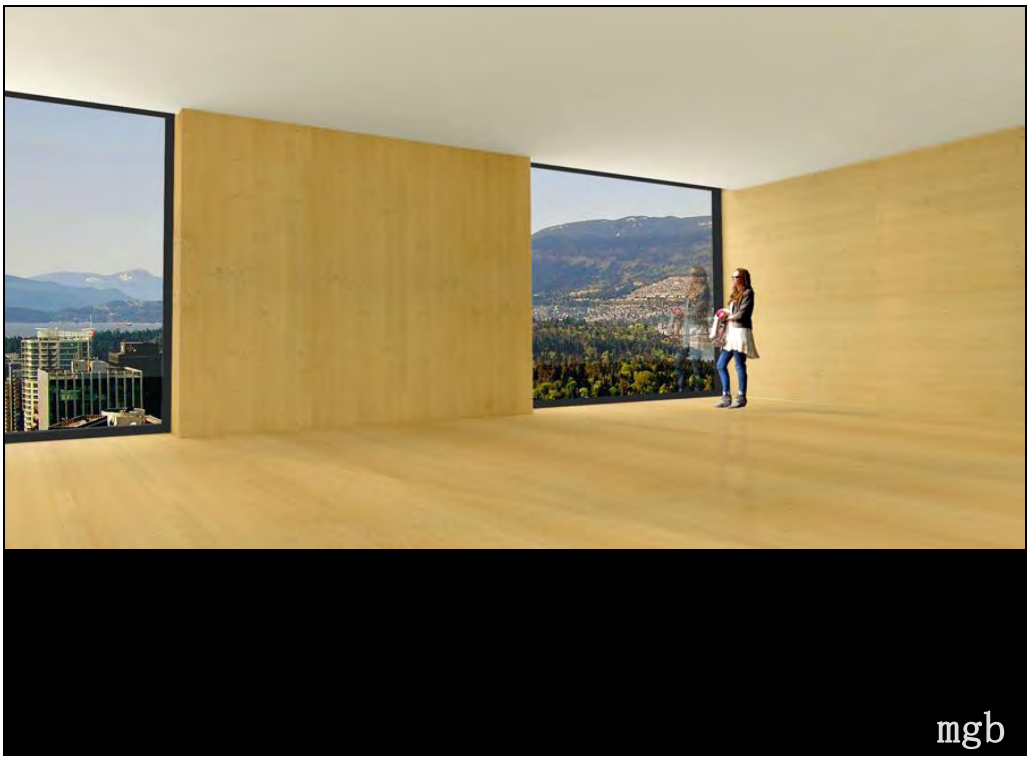
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FOOTPRINT

FFTT VERSUS CONCRETE

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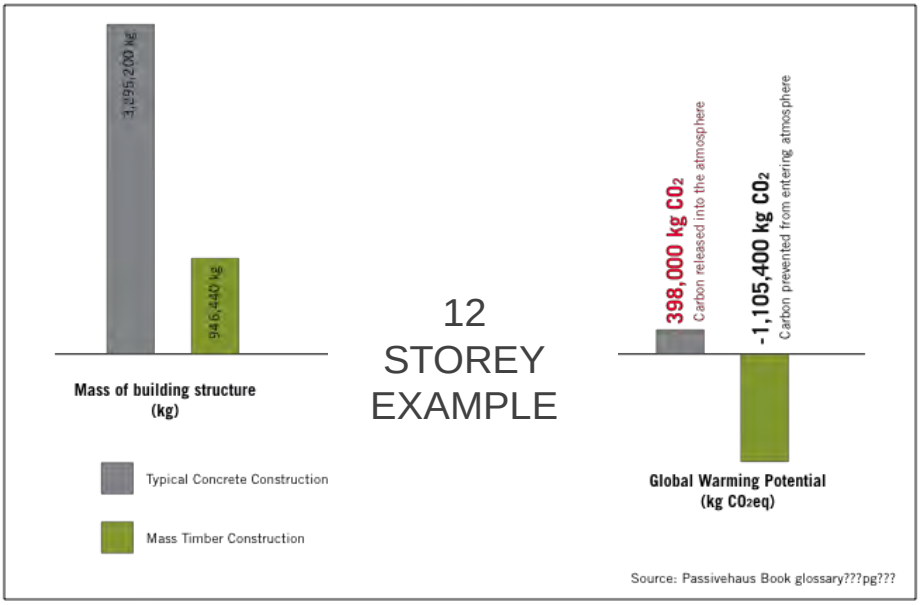

Environmental Impacts - Concrete vs Mass Timber
initial and long term impacts

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COST

FFTT VERSUS CONCRETE

mgb

COST

Building Model	Vancouver	Northern BC	Interior BC	Fraser	Vancouver Island
12 Storey Concrete Frame	$283	$320	$303	$283	$302
12 Storey FFTT Charring Method	$283	$311	$297	$283	$297
12 Storey FFTT Encapsulation	$288	$317	$303	$288	$303
20 Storey Concrete Frame	$292	$330	$312	$292	$311
20 Storey FFTT Charring Method	$294	$323	$308	$294	$308
20 Storey FFTT Encapsulation Method	$300	$330	$315	$300	$315

mgb

Building for a Better World: How (Timber) Architecture Can Make a Difference

Dustin A. Tusnovics[2]

Abstract

With his 1921 design for a glass high-rise on the Friedrichstrasse in Berlin, Ludwig Mies van der Rohe defined the modernist paradigm. Going against the neoclassical conception of architecture, he separated the shell from the core and the skin from the bones creating an environment whose transparency signified freedom and honesty. This architecture fully exploited the available technical possibilities in construction and was premised on HVAC systems that were only developed later. The technological development was harnessed with the goal of emancipating humankind and ushering in a just society that could provide decent housing for the workers. This is why the functionalists proudly declared, "the ethical necessity of the New Architecture can no longer be called in doubt." (Gropius, 1935)

It was with the same humanist interest in mind that Giancarlo de Carlo, in the revolutionary year of 1968, openly questioned the values of a society that would not hesitate to spend billions of dollars on wars and moon projects, and demanded the right to ask "why housing should be as cheap as possible and not, for example, rather expensive…" (Quoted by Frampton, 1982) Still, today, housing is not particularly cheap and we are still designing buildings after the same Miesian paradigm, and it is costing us dearly. The building sector is the largest consumer of energy, and its share increases if we also consider the indirect energy, the grey energy, involved for building materials, transport and eventually dismantling or recycling of buildings. If we look at the entire life cycle of each element of a built structure we will see that architecture, in a broad sense, is responsible for two thirds or more of the world energy consumption.

The success of modern architecture has put an enormous stress o resources. Now it is the turn of Miesian architecture to face a crisis. This crisis is also an opportunity for today's architects to prove their worth by switching the paradigm – and heading for the use of more renewable resources, in particular the increased use of timber based products.

This paper aims to describe why, the public at large accepts the necessity to reduce energy consumption, but does not support the usage of alternative or less energy intensive building materials; social aspects leave most people indifferent and cultural aspects are ignored since they are always subject to interpretation and judgement; affordability and appropriateness are seldom talked about; and building technology is seen as too complex to comprehend and therefore decisions are left to specialists.

Keywords: architecture, paradigm shift, cognitive, sustainability, timber, ethics

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1. PARADIGM SHIFT

The situation can be described in terms of Thomas S. Kuhn's (1962) classic study of how science evolves. In Kuhn's theory a paradigm describes the basic assumptions within the ruling theory of science. With ‘paradigm’ he means more than just the dominant theory. The concept refers to the entire worldview, the abstract structure that sets the limits of thought. During periods of normal science, researchers do not question the paradigm but gradually and cumulatively work out its implications. According to Kuhn, however, all paradigms contain anomalies, which will gradually surface as normal science patiently proceeds. Once the problems in the paradigm become unbearably clear, a scientific revolution follows: this requires a change in the worldview like the switch of Gestalt. (Kuhn, 1962)

Global warming, coupled with frequent natural catastrophes and the current economic recession have alerted many people to the necessity of sustainable practices in every domain of society. Architecture is no different. The old paradigm of modern architecture has been forced into a crisis by the increasing realization that we need sustainable and energy-efficient architecture. What we as architects must bear in mind is that the decision to reject one paradigm is always simultaneously the decision to accept another, “and the judgement leading to that decision involves the comparison of both paradigms with nature and with each other.” (Kuhn, 1962) While the old paradigm was centred on single buildings, the new one will necessarily deal with the built environment as a system.

One of the most influential early definitions of sustainability was offered by the Brundtland Report in 1987. It focused not only on ecology but addressed sustainability in all aspects of human life, thus shifting the interest from One Earth to One World. The report defined sustainability as follows: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” It contains within it two key concepts: the concept of 'needs' (see chapter 6 – Cognitive Urbanity), in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of ‘limitations’ imposed by the state of technology and social organization on the environment's ability to meet present and future needs." The limitation issue can be reasonably addressed with the increased usage of renewable building resources, as timber for example.

Despite the persuasive case that the Report made, it was not able to effect radical change. Two decades later, the number of people living in slums has increased substantially. The UN Slum Upgrading Facility reports in its SUF Handbook (2006) of one billion slum dwellers today and it is projected that in the next 30 years, the global number of slum dwellers will increase to about 2 billion. (UN Challenge of Slums, 2003) This illustrates the difficulties of providing housing in the poorer communities of the world as the population keeps rapidly growing. Ian Banerjee (2006) has calculated that until 2030 we should be building a city for one million people every week. The growing number of civil action organizations testifies of the ineffectiveness of governments on such urgent issues as poverty, environmental protection, human rights and democracy. (UN State of World’s Cities, 2008)

2. ARCHITECTURAL PRACTICE

This is where architects need to get involved and, in so doing, demonstrate the true value of architecture. A paradigm shift is called for – ‘sustainability 2.0’ as it were. (Salmon, 2009) The constantly rising energy demand and the increasing costs call for radical initiatives. An

example is the Wireless House concept (Wimmer, 2009) that aims to create an energy-network independent solution for an energetically self-sufficient house. It focuses on the whole system 'house', integrating the demand side as well as the production side, but not developing a singular technical solution. This approach will have far-reaching consequences in housing, in both, industrialized and developing countries.

But it is widely assumed that the problem is not a purely technical one. Brian Cody, for one, defines energy efficient architecture as “a triad from minimum energy consumption, optimal room climate and architectural quality.” (Cody, 2005) In including the concept of architectural quality in the definition of energy efficiency, Cody’s parallels the Brundtland Report’s extension of sustainability into the social realm. On the home page of the Academy of Applied Arts in Vienna Cody stresses the importance of architectural values, insisting that “the world cannot be changed with reason and insight, but with staggering design”; hence, they call for an "architecture with an exceptional aesthetic power to convince."(Akademie f. Angewandte Kunst, 2009) In both cases, Cody introduces an essentially subjective, aesthetic element in the equation, thus cancelling any possibility of a scientific and measurable concept of either sustainability or energy efficiency. If the experts are offering such heterogeneous definitions, it is not very surprising that the general public seems to be confused about sustainability. Today it is evident that the public at large accepts the necessity to reduce energy consumption, but does not support the usage of alternative or less energy intensive building materials for they are often more expensive; social aspects leave most people indifferent as the example of the South African RDP (Reconstruction and Development Program) shows and the new town ships are realised far away from our vision, and cultural aspects are ignored since they are always subject to interpretation especially when referring to ‘rich’ and/or ‘poor’; what is necessary and what is not; affordability and appropriateness are seldom talked about

like spatial qualities seem more often not to affect the state of mind; instead we still have ‘cheap’ as a synonym for ugly and oppressive; and building technology is seen as too complex to comprehend and therefore decisions are left to so called specialists, that are not necessarily interested in raising the architectural quality.

It is this dilemma that often has made use of the so-called alternative or new building technologies a field of ongoing experiments.

3. MEASURING SUSTAINABILITY

The need for a scientific and measurable definition of sustainability has been recognized. (Detail, 2009) The development of sustainability assessment tools such as the American LEED, or the English BREEAM, as well as the Indian IGBC, all accredited by the World Green Building Council, are a step towards a scientific approach. However, these tools need to be evaluated in the future as they only consider single buildings according to a defined use. Office buildings are the main focus at the moment, and the results leave many questions open. The future will be the evaluation of the ‘house’ and in particular the urban conglomerations. Todays assessment tools are clearly aimed to demonstrate the 'reduction' of energy consumption of buildings and are basically used for marketing, focusing on demonstrating achieved 'qualities' towards clients and users, gaining better prices for rent or selling, increasing the acquisition capacity of architects and planners, serving as a

communication tool for enterprises of investors and owners aiming to demonstrate their engagement in the field of sustainability, as the main page of the German DGNB puts it.

In order to overcome the debacle within the ongoing sustainability discussion, we need to comprehend the complexity and diversity of the involved issues of the field of architecture and respond to real-world needs, as the provision of housing. This is only possible with an open 'cognitive system', an idea that led to the cognitive city concept, a 'learning framework' for urban habitat transformation. (Tusnovics, 2007)

An approach that can accelerate change in practice and institutions, as required by the Brundtland Report (1987), can be found in the transdisciplinary research method defined by Pohl und Hirsch-Hadorn in 2008. (Tusnovics, 2009) Transdisciplinary research is needed to compensate for the uncertainty of knowledge in socially relevant fields or when the concrete nature of the problems is disputed, and particularly challenging those concerned and involved, like the example of housing within existing urban settings, and the establishment of a sustainable building industry.

We are still focusing on 'keeping' the existing by 'reducing', instead of shifting towards a concept of 'changing' the existing by, for example, re-using. Wilfried Wang (2009) recently proposed a similar approach in a lecture entitled 'Paradigmenwechsel' giving emphasis to the 'old' tradition of reuse and transformation of buildings. In the future, evaluation and assessment tools will consequently shift from short term to long-term observation periods. Not only the actual phase of 'use' of a building will be considered but also the production phase and particularly the 'after' use period and this is where the employed materials will have to proof what they are worth. Timber, for one, has been defined as 'parked energy' "as you can burn the building material once it is dismantled, generating energy at a later stage". Timber is also a 'container' for CO2 from the atmosphere, and for this Julius Natterer (2004) suggests an ever-increasing use of timber in the building industry to reduce the age of our forests, as the ultimate protectors of nature, preventing erosion and increasing CO2 absorption.

4. PROJECTS AND 'EVALUATABLES'

From 2004 to 2008 I was Head of School for the faculty 'Timber Construction and Design' at the University of Applied Sciences in Salzburg. A faculty set up by the Austrian Timber Industry to promote and develop specialists able to increase development, the use and the application of timber and timber based products in the building industry.

The course had a strong focus on practical experience and therefore the students where offered projects that would be combined with a real building experience. I will be discussing some of the projects we got involved in hereafter.

4.1. BGH – Timber-construction and Design, Salzburg, Austria

Timber has a long tradition and is well integrated in the industry taking second place after tourism in the Austrian economy. Yet also Austria needs specialists to bring timber and timber based products from today's approx. 35-40% to cover 60-65% of the entire building sector and the involved materials as in the Scandinavian countries.

One of the ways decided by the Timber Industry was to train young specialists at University level to act as professional link between the industry and the users, the planners and specifiers, the municipalities and the lawmakers and to bring acceptance further.

The curriculum of the Salzburg based course I had the great opportunity to assess and further develop was focussed on four specialisations all equally necessary in the market. Technical – Creative – Economic and Communication: the basic studies in the first two years were equal far all students, as each needed to know and understand what each competency meant and how to interact with each other – the entire curriculum was project oriented and envisaged various phases of interaction as teams focused on resolving all four aspects that make up a project as it would occur in the professional life.

Out of this specific focus we decided to offer students every year the chance to choose from three above discussed projects. For the second year students one would be a poverty relief project in Africa, which was to be realised during the winter holiday break 'in situ'.

This engagement has been a chance for me to do a lot of research and field work and to engage with the assessment of the needs of the underprivileged communities and the incredible challenge for affordable housing realised with appropriate materials and need based design.

4.2. Montic Skills Training Facility, Magagula Heights, Zonk'Iziswe, South Africa

This project was the first involvement in a 'Design & Build' project that brought me and 27 Students from Europe to South Africa in 2006, We designed and prepared over 8 months to build the structure for a Skills Training Facility on the premises of the Montic School, a public primary school in the small informal settlement of Magagula. The skills envisaged were cooking and sewing as well as wood- and metal-working. The project therefore comprised a kitchen and a sewing room in one wing and an open workshop in the second wing linked by an open pergola structure that forms the fourth side of the paved courtyard of the school.

The primary building material for the structural elements was locally sourced South African pinewood, from which the students realised the frames including the roof structure for all buildings. The choice of material had two reasons. Firstly, the students were from the then Salzburg based course on Timber-Construction and Design. The other reason was that we needed to realise the entire building in five weeks only.

When used in the right way, timber architecture is a fast way to realise structures and having designed all the joining details with SA-standard dimensions (different to European) and after eight months of preparation at the University, we were well equipped to build fast. We had brought a lot of skills with us and shared them with the 27 volunteers from the local informal settlement that helped realise their centre. The crucial part of the idea was that the 'builders' of the structure would then be equipped with skills and could then transfer the skills for wood and metal working to the rest of the community.

4.3. Slum-upgrading – Modular Timber-Units, Mathare, Kenya

In the second year of my engagement with Salzburg, we decided to engage with a partner institution in Nairobi and develop a prototypical solution for a street kids centre. Unfortunately the time scheme we Europeans had was not flexible enough to cope with some of the problems we encountered and we had to redefine the project focusing on the informal settlement of Mathare. Mathare Valley is one of the most devastating and desperate places on the African continent. It is made of a series of slums that have grown together to host some 500.000 people with a high grade of drug problems and alcohol abuse coupled with a violence and criminality due to the bad condition of the buildings and the density of the entire area. It requires an experimental approach on how to alleviate the enormous ecological problems and hygienic conditions for the density of the shacks and the non-existence of any kind of sewerage system.

The challenge is to develop housing schemes on the very premises of were people are living today for the reduced space resources available as well as for respect for the often well functioning social structures that have been established out of the need of living so close to another. The developed projects were to envisage "modern" and sustainable building techniques combined with the "traditional requisites" such as space that allows the enlarged families interaction. Other aspects that we wanted to address in the design of the dwellings were the flexibility and transformability of space especially as we would be hosting the same amount of people as before but with two or three storeys to host them.

An amazing brief for students and with the experience from the year before and authentic cooperation with local people that came to visit us in Salzburg, we started to develop single units and combinations of these envisaging the needed density. Appropriate materials were openly discussed as a major challenge and the solutions varied from timber frames to be filled with non-perishable waste, timber structures covered with plastic and/or metal shingles made out of bottles and cans, and basically the main building element would again be timber.

4.4. Lesedi Nhahle Training Crèche, Haenertsburg, South Africa

Similar to the skills training facility two years earlier we got invited to develop a training crèche that would constitute a model Kindergarten, realised with elements that can be easily copied. The aim was to showcase how good architecture would show what sustainability is in a well-designed building. How heating and cooling can be resolved without air-conditioning and heating or how to use locally available materials as much as possible.

The building realised had a roof of 400 m2 and was again built entirely by my Salzburg based students. From the foundation to the roof including all the furniture elements needed for the project to be considered operative, we had seven weeks to go.

The orientation of the building was set out to capture the sun in winter especially in the early morning (north-east facing) to warm the spaces and the roof's cantilever and inclination was designed to keep out the summer heat (the height and the cantilever designed to keep out the sun standing at 80°). Being the roof a separate layer above the ceilings of the rooms enables a cross ventilation that adds to the cooling as a natural air-conditioner. Each and every part of the entire project was realised again locally by 31 students from Europe and only 3 local volunteers in the time frame we had. Again we did all preparations in Salzburg over 9

months, developed all joinery details, all 2-D and 3-D details had been well designed and put on paper.

Light - fast – clean is a good way of describing a building realised in timber. It would be practically impossible to realise anything similar in that time frame with any other material than wood.

4.5. Ideas for an evaluation tool based on more social involvement.

I believe that New and Alternative Building Materials and Technologies will be a key in the change of building process. Timber and timber based products must play a fundamental role in this process. Yet, I believe that we need to develop timber products to be simpler to use.

I have been consulting some timber industries to get their initial 'product' through a redesign process. Good ideas are not complex technological inventions only, for instance an insulated roofing element, it must be easy to use, to mount, to join, to seal and to extend. We need good technologically sound products that for a building kit that anybody can learn to use, otherwise we have an exclusive club of timber freaks. The clear goal must be a broader acceptance and that can easily achieved with clearer and easier application methods. Timber is standing up against bricks and steel and concrete – any of these products we 'all know' how to use today. That is were timber needs to win and fight for its share in the building industry.

Off course we will employ more natural and local resources, ideally renewable ones that can be harvested with non-invasive exploiting methods. We will have to understand and respect coherent cultural applications and learn from these. In Sumatra you would have a problem if you wanted to build with anything but bamboo, in New York that would be a real sensation and would require some convincing arguments.

Timber and timber based products today face all kinds of prejudice, I have been dealing with these aspects in Austria and I am facing similar criteria in South Africa. I am sure it will not be much different in India. We need to show the capacities of timber, we will need to understand were timber is the better material and were other materials are better and employ the best material for the job. The technological aspects will need to be communicated, the economic advantages need to be evidenced, and the actual material qualities need to be understood. Timber burns! But is burns safely as we know how fast a section or beam burns until it collapses, and that makes timber much more predictable than it seams. Timber dislikes water! So when used, we need to protect timber from water, or make sure that if it does get wet, that it can dry off again.

The trend towards more lightweight materials is very valuable as it enables women to actively participate in the entire building process. In the African culture men are often in charge of the erection of the structure and women do the filling. Obviously our future building materials will be non-harmful for the end-user. Building materials will have a more than one life cycle (in the sense of usage), once the first usage cycle is over, it may be re-used in another different building or it will be used as energy source or it will be simply reintegrated into the natural cycle of that material.

But besides these considerations that we can give for future materials we will also need to change the assessment concept to one that takes social and community criteria serious and will be integrated in the BREEAMS and LEADs of the world. Today these aspects are not

part of the evaluation, currently they are entirely based on the reduction of firstly - energy consumption and secondly - economically viable materials that will achieve that, leaving the third side of the sustainable triangulation, the social aspect, untouched. I am elaborating and developing criteria, my "evaluatables", which could be for example:

- **Involvement**: was the community part of idea, brief, design, realisation and finally the evaluation?
- **Participation**: was the user part of idea, brief, design, realisation and finally the evaluation?
- **Life condition**: were community conditions considered, melioration aspects envisaged and implemented?
- **Sanitation**: have cultural aspects been considered, have they been meliorated and implemented
- **Health**: have cultural aspects been considered, have they been meliorated and implemented
- **Opportunity generation**: how and what new opportunities have the community gained through the project?
- **Social cohesion**: how has this aspect reflected in the project; prior existing/non existing?
- **Demographic change**: does the project take this in consideration?
- And further we could look at **Integration, tolerance, gender, work opportunities**, etc.

I am currently trying this assessment method on my own projects. But this is material for a few more papers to be elaborated.

5. TIMBER IN NUMBERS

As a reflection we could start of with an analysis of the ecological footprints of countries (Nation Master, 2011), where the United Arab Emirates lead with 15,99 followed by the USA with 12,22, Austria at position 27 with 5,45, South Africa at 4,04, India at position 108 with an almost equilibrated value of 1,06 and finally at last position we find Bangladesh at 141 with a value of 0,6 times the allowed footprint of 100 % as defined by the Global Footprint Network

We are today looking very much at the so-called BRICS countries (Wikipedia, 2011) with Brazil, Russia, India, China and recently also South Africa, where the ecological challenge of the future lies and gets evident looking at the Oil consumption where the USA lead with 18.690.000 bbl/day, followed by China, down 50%, at 8.200.000 bbl/day and India at position 4 with 2.980.000 bbl/day. South Africa is at position 28 with a consumption of 579.000 bbl/day and the small Austria (approx. a fifth of SA's population) with 247.700 bbl/day.

This evidences that in the year 2010 the world population was projected to use 150 % of the resources the earth can generate in one year!

These numbers are relevant when looking at the use of alternative resources, as geothermal power, wind and eventually timber with great potential for future development.

For Geothermal Power the BRICS countries are in the lead with China 8.724 GWh/yr and the USA in position 2 with 5.640 GWh/yr. India takes position 15 with 699 followed by Austria at position 21 with 447 GWh/yr.

Wind energy gives a different picture, based on the investment that is needed. Germany leads with 16.828,8 MW followed by Spain 50% behind arriving at 8.263 MW. India takes 5. Place with 2.985 MW and China is 10 with 764, followed directly by Austria and 606 MW. South Africa holds position 37 and 16,6 MW.

The numbers on the forests show a third dimension of the equation. Russia has the biggest forest in numbers, 8.097.900 km2, being 49,37% of the Russian territory. Brazil still is the second biggest forest with 4.776.980 km2. India has the 10th biggest forest (677.010 km2) with 618,6 km2/1.000 people or 22,77% of its territory covered with forest. Austria is the 77th in forest size (38.620 km2) but reserves 4.690,7 km2/1.000 citizens.

Austria, with its relatively 'small' forest of approx. 38.000 km2 generates very interesting numbers from an economical point of view. The Austrian timber industry today comprises 1.513 businesses with 27.413 employees generating a production value of 6,87 billion € per year thus being the second biggest industry after tourism. Export accounts for 70% of the production and three quarters of which go into the EU.

These statistics show that the BRICS countries have a great potentiality to make the leap towards a more sustainable energy policy as well as a great chance to re-implement timber not as a simple alternative building material but as the building material with the correct decisions and the right mind set, the chances for change are very big.

6. COGNITIVE URBANITY PROCESS

Following the discourse on measuring sustainability, the complexity of the issues (see the 'evaluatables') and the dynamics of modern processes (i.e. housing) are clearly in search for a model, that will reflect these intrinsic challenges for real assessment. Needs Based Design (Brundtland Report, 1987), is a design approach based on the understanding of human needs and enabling high living standards within cultural and natural boundaries. The approach is inspired by the principles of an –appropriate technology where human needs and natural boundaries are in the centre of developing technical solutions. However, this complex task requires a strong transdisciplinary approach where 'technology' needs to be seen as a tool for problem solving, not as the solution in itself.

The need for sustainable, affordable and environmentally sound housing is among the major problems worldwide with approximately 2 billion people in need of a real house. (UN Challenge of Slums, 2003) It is therefore of high importance to reduce environmental strain, promote and initiate resource efficient and appropriate solutions for the building sector, resulting not only in reduction of environmental pressure, but also in improvement of living conditions and poverty alleviation respecting existing cultural conditions. This aim needs to be supported by exchange of knowledge and best practise incorporating high-end technology as well as locally available indigenous know-how and resources. Timber use as shown above involves issues of how it is created, harvested and used. It then is processed and sorted into various qualities that eventually lead to different components in the timber industry. Then it is engineered from half-products to high-tech finished products that then need to be sold to

the right client or user. In the implementation phase we need to make sure that timber is used where best suitable and also protected in such a way that its durability, normally 80 years, is assured and guaranteed.

The key question is to find appropriate strategies in addressing the 'framework', enabling practical action and outlining possibilities to evaluate the results.

Transdisciplinary principles will help address problem definitions that directly focus on actual 'needs'. (Brundtland, 1987) The use of common sense is beyond disciplinary language and stabilises the stakeholder management-processes during the transformation progress towards innovation. I have elaborated more in detail on the Cognitive Urbanity process in a few papers so far. (Tusnovics, 2009, 2010)

Transdisciplinarity as such is not going to remove the core problem in the Brundtland type definition of sustainability but it helps involving both physical and social dimensions and compensates the uncertainty of knowledge in this field. While there exists a broad consensus among scientists, at the very least, concerning the physical, ecological, biological and other scientific issues relating to sustainability, the social, cultural and political aspects continue to be debated, and the fact that the latter aspects cannot be objectively measured does not help.

Wolfgang Welsch (2003) finds that the concentration on human(-ist) interests is at the root of our present problems with urbanism and architecture. He recognizes that ". . . stunning buildings are being constructed here and there," but goes on to argue that "this is already a sign of the dilemma. The emphasis is on show pieces (which can very well serve as architects' business cards), but the context, the urban and environmental as a whole are being taken into account far too little." Welsch continues by recalling the urge of modernist architecture and their call for a new paradigm which did not lead to " . . . paradise but rather to disaster in aesthetic, urban, social and ecological regard."

The anthropocentric idea, intrinsic to concepts that urge for 'human measure' as meter for everything and an architecture that is to 'serve humanity' leading to belief in the creation of a 'city that would perfectly satisfy us'. "And yet, such a perfectly human city never emerged out of the anthropic model." Welsch wants to develop a paradigm "of human existence no longer aligned to citizenship in the first place but to our primordial world-connectedness and our relatedness to other beings". The idea of the trans-human perspective in urbanism and architecture is a chance to reconsider so-called 'human needs' and to avoid traditional 'humanistic' concepts. Urbanism will no longer be considered an exclusively human ambience.

7. FROM UNIT TO UNITY

Patrick Curry (2007) remarks that the concept of 'ethics' is not something optional or something to be addressed after one's belly is full, debts settled, and lodging secured. Rather, 'ethics' cuts directly to the core of all human activity. This applies also to the practice of architecture. Sustainability cannot be considered a solving instrument or a technical appliance; rather, it is a way of doing things that focuses on complex systems and long-term processes instead of single buildings and isolated aspects.

The projects listed and the 'evaluatables' in chapter 4 demonstrate the logics and lacunas that need to be taken into account when envisaging a wider implementation of alternative and/or new building technologies and in particular timber in the building sector. Recent studies show that the interest in these alternative and/or new building technologies is growing, but the experience also shows the challenges involved. All parties involved will need to make usability more simple and clear, finding usage for locally available natural and primarily renewable resources that need to be 'elaborated' through non-invasive exploiting methods. Building materials traditionally come from a cultural background and we will need to revisit some of them maintaining coherence in that cultural application and further developing these traditional skills and knowledge. Furthermore we will need to go for more light weight materials to facilitate the involvement of women in the building process, with simple-to-use product designs that enable unskilled labourers to employ these building materials and technologies which if widely accepted are bound to generate entrepreneurial models to eventually also uplift the living conditions of the underprivileged dwellers of the many of the informal urban aggregations where the biggest number of 'home-builders' is to be found and it is these people that will need to profit from an appropriate technology accompanied by a need based design generating a broad appreciation for new and/or alternative building materials.

With the cognitive project rules (Tusnovics, 2009, 2010) or similar principles, it is possible to compare alternative solutions in their complex context of ecology, economy, community, urbanism, technology, culture and politics. This will ultimately make a narrow definition of sustainability obsolete, or as Ardeshir Mahdavi (2009) recently remarked: "What is 'sustainability'? Let us talk about 'good architecture'; it is based on good sense and an approach that will be sustainable anyhow." The value of architecture is less about striking aesthetics or impressive technology than about its ability to enable involvement, generate awareness, deal with uncertainty, accept complexity, comprehend diversity and respect the needs of the future.

8. REFERENCES

Banerjee, I, 2008, Der Aufsteig einer Parallel-Welt, das Konstruktif 269, www.daskonstruktiv.at/pdfs/konstruktive/k269/16-19.pdf , 9.02.2009

BREEAM-Building Research Establishment Environmental Assessment Method, UKGBC-United Kingdom Green Building Council, London, http://www.breeam.org/page.jsp?id=66 , 9.05.2009

The Brundtland Commission, 1987, formally the World Commission on Environment and Development (WCED); 'Our Common Future: Report of the World Commission on Environment and Development', United Nations, http://www.worldinbalance.net/agreements/1987-brundtland.php , 14.11.2008

The Challenge of Slums: Global Report on Human Settlements 2003, United Nations Human Settlements Programme, p. xxv, www.unhabitat.org/downloads/docs/GRHS.2003.0.pdf , 12.02.2009

Cody, B, 2005, Form follows Energy, Building Energy Performance and Architecture, uia 2005 Istanbul Congress, http://www.worldarchitecture.org/cities-uia-2005/?rec=139 , 9.06.2009

Curry, P, 2007, Ecological Ethics: An Introduction. Malden, Massachusetts: Polity Press, p. 5. Quoted after Keller.

De Carlo, G, Quoted by Frampton, K, 1982, Modern Architecture. A Critical History, London, Thames and Hudson, p. 278;

DETAIL green, 2009, Sonderasugabe z
- nchen, 2009

- r Nachhaltiges Bauen e.V., Stuttgart, http://www.dgnb.de/de/zertifizierung/vorteile/index.php?edit_document=1 , 9.05.2009

Energie Design, 2009, r Angewandte Kunst, Wien, http://www.dieangewandte.at/jart/prj3/angewandte/main.jart?rel=de&content-id=1236066402619&reserve-mode=active , 9.06.2009

Global Footprint Network, Footprint Basics, Geneva Office, CH, http://www.footprintnetwork.org/en/index.php/GFN/page/footprint_basics_overview/ 1.9.2011

Gropius, W, 1935, The New Architecture and the Bauhaus, translated by Morton Shand, with an introduction by Franck Pick, Great Britain, Charles T. Brandford Co, p. 112.

Hirsch-Hadorn, G, Pohl, C, 2008. Core Terms in Transdisciplinary Research, rich, www.transdisciplinarity.ch/d/Transdisciplinarity/documents/HB_Core_terms.pdf , 12.01.2009

IGBC-Indian Green Building Council, Hyderabad, http://www.igbc.in/site/igbc/index.jsp 1.9.2011

Kuhn, T S, 1962, The Structure of Scientific Revolutions, University of Chicago Press

Mahdavi, A, 2009, Director of the Department of Building Physics and Building Ecology, Vienna University of Technology, in a conversation in Vienna on the Sustainability Issue, 2.4.2009

Salmon, P, 2009, “Birth of Sustainability 2.0 … “, http://idealog.co.nz/magazine/20/birth-of-sustainability-2.0 , 1.9.2011

State of the World’s Cities 2008/2008 HARMONIOUS CITIES, United Nations Human Settlements Programme, http://www.unhabitat.org/pmss/getPage.asp?page=bookView&book=2562 11.06.2009

The SUF Handbook – Design Phase: United Nations Human Settlements Programme, 2006, p. xxv, http://www.unhabitat.org/pmss/getPage.asp?page=promoView&promo=2358f ,12.02.2009

Tusnovics, D, 2007, Cognitive City: interdisciplinary approach reconsidering the process of (re)inventing urban habitat, Corp 2007 Conference, Vienna, http://www.cityfutures2009.com/program.html , 11.06.2009

Tusnovics, D, 2009, BUILDING FOR A BETTER WORLD: THE TRANSDISCIPLINARY PLANNING PROCESS, City Futures 2009 Conference, Madrid, http://www.cityfutures2009.com/program.html , 11.06.2009

Tusnovics, D, 2010, How Architecture Can Save the World, UmBau 25 Architecture for Sale, Österreichische Gesellschaft für Architektur & Institut für Architekturwissenschaften, Abteilung für Architekturtheorie, TU Wien (Hgg.) Verlag Anton Pustet, Salzburg

USGBC-United States Green Building Council, Washington D.C., LEED – Leadership in Energy and Environmental Design, http://www.usgbc.org/DisplayPage.aspx?CategoryID=19 , 9.05.2009

Wang, W, 2009, Paradigmenwechsel, lecture at the Project Space Kunsthalle,, Vienna, 12. Oct. 2009, http://www.oegfa.at/event.php?item=5323 , 12.10.2009

Welsch, W, 2003, Spaces for Humans?, U
r Architektur & r Architekturw
r Architekturtheorie, TU Wien (Hgg.) Edition Selene, Vienna

WGBC-World Green Building Council, Toronto, http://www.worldgbc.org/green-building-councils/member-green-building-councils , 9.05.2009

Wimmer R, Drack, M, Rehse, L, 2003, Suitability and usability of evaluation tools for sustainable development, Berichte aus Energie und Umweltforschung, Bundesministerium für Verkehr Innovation und Technologie, Vienna

Wimmer, R, 2009, The Wireless House, Grat, TU Vienna

A Short Talk on Tall Timber Buildings

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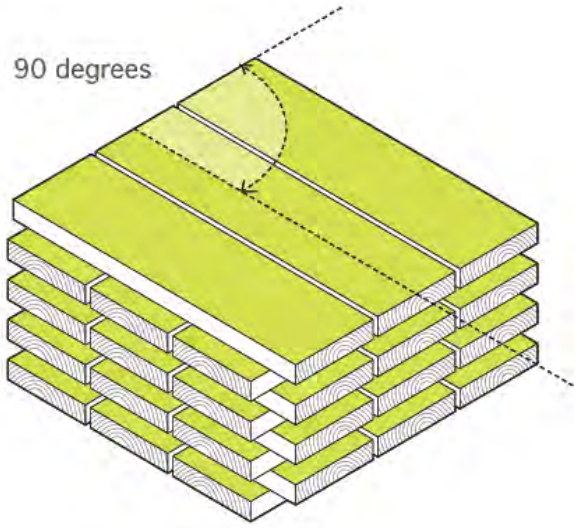
architects Waugh Thistleton

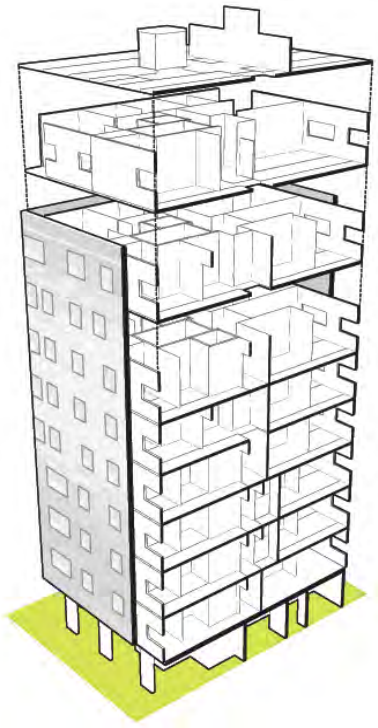


KLH Cross-laminated Panel

architects Waugh Thistleton

1 cubic metre of timber stores
0.8tonnes of Carbon

architects Waugh Thistleton



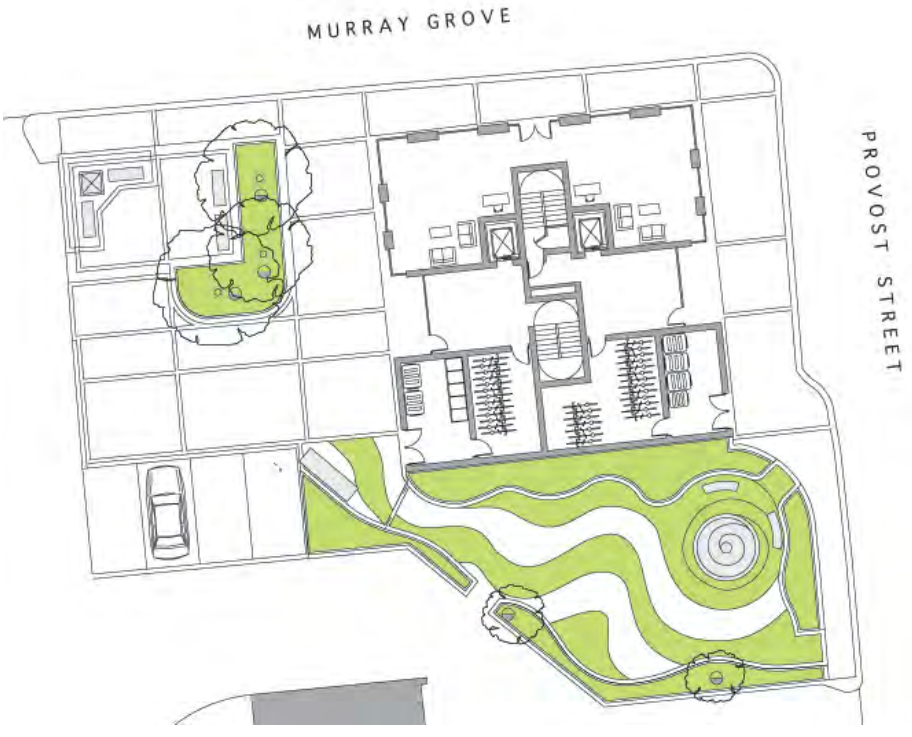
Honeycomb structure

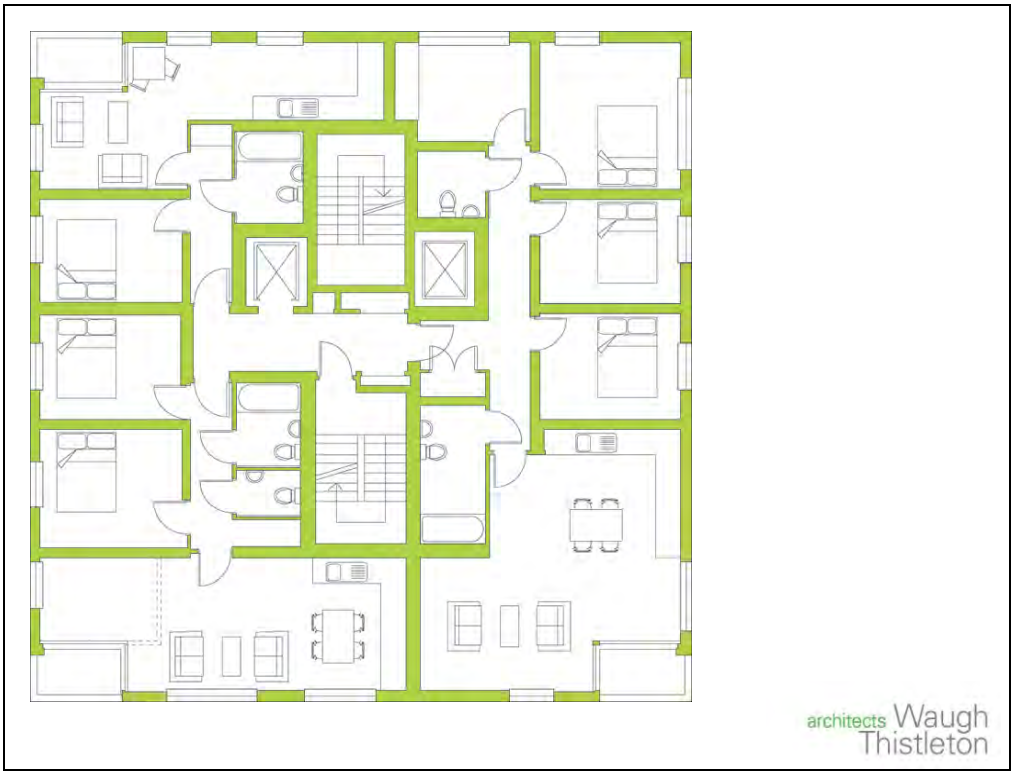
Rotated plans

Load-bearing walls, floors and cores

Tallest timber building in the world

architects Waugh Thistleton

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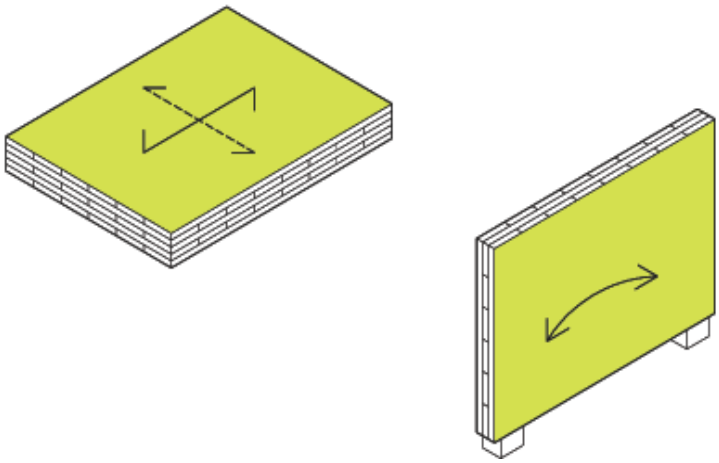
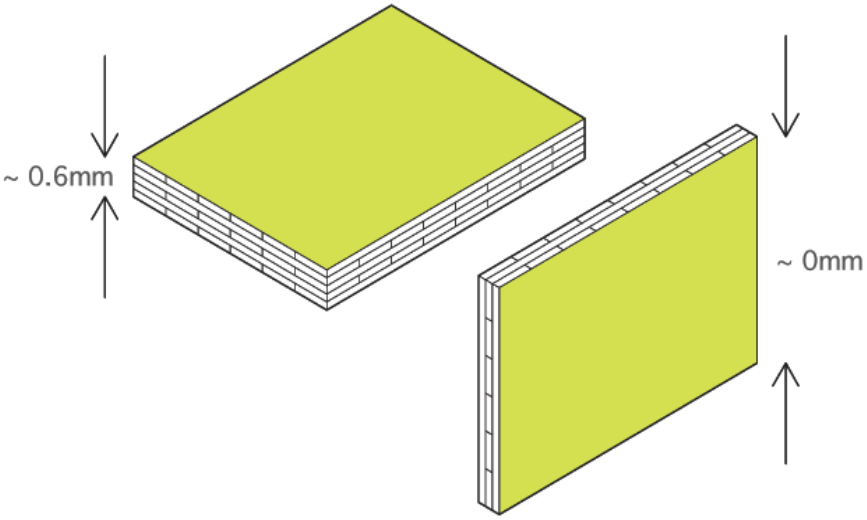


3D advantages of KLH
Horizontal panel - 5 ply

architects Waugh Thistleton



Creep - shortening due to compression under load

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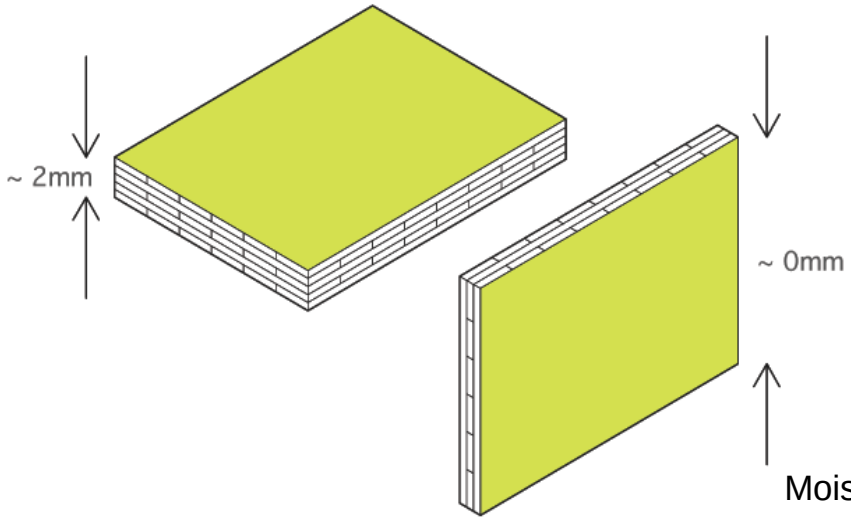

Moisture

Maximum moisture content at erection: 14 - 16%
Minimum moisture content in use: 8 - 10%

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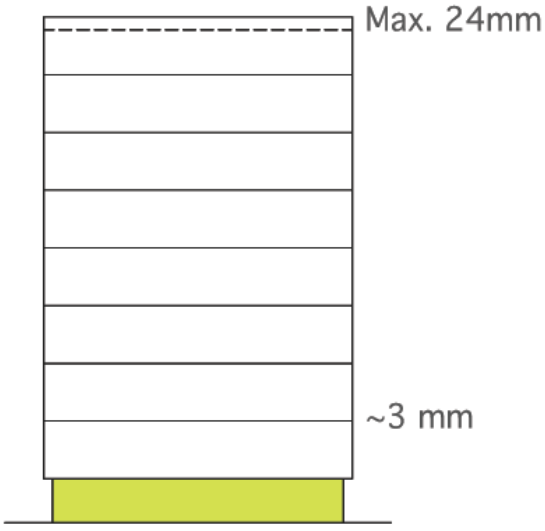

Total

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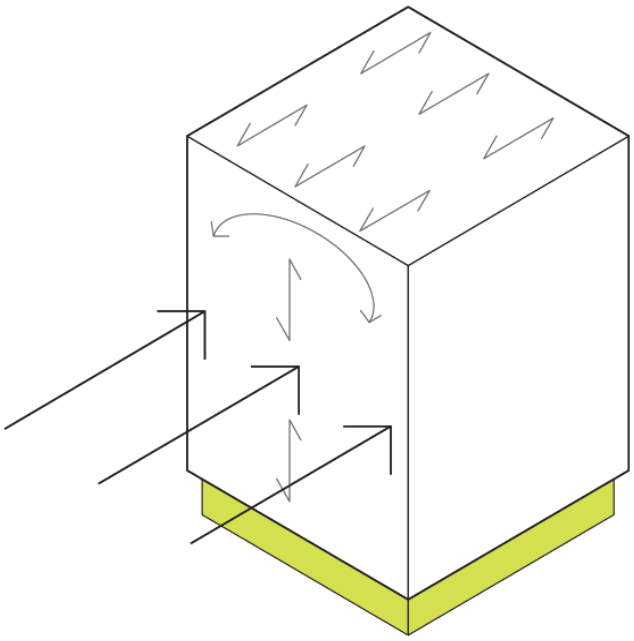

Stability

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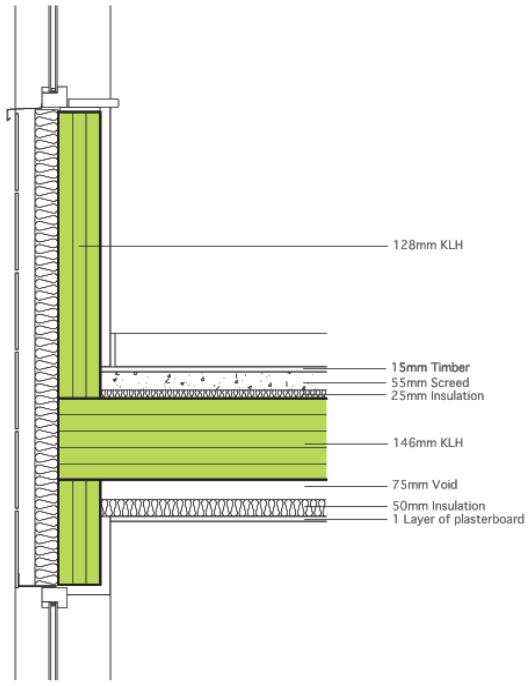
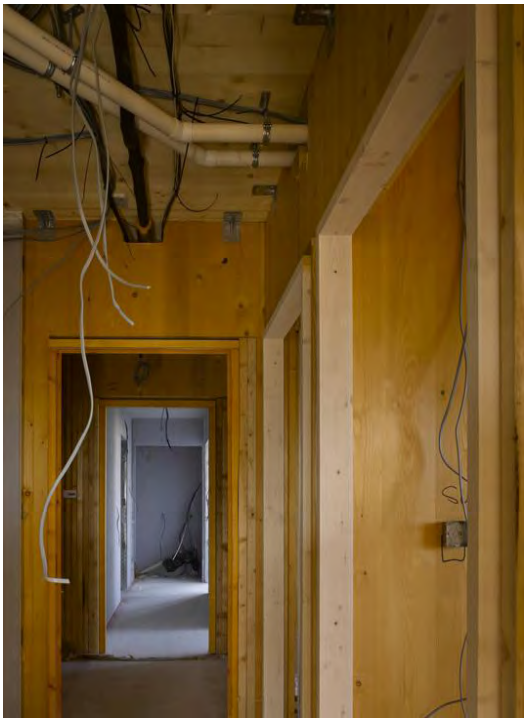


Acoustics


30 mins
60 mins
120 mins
Fire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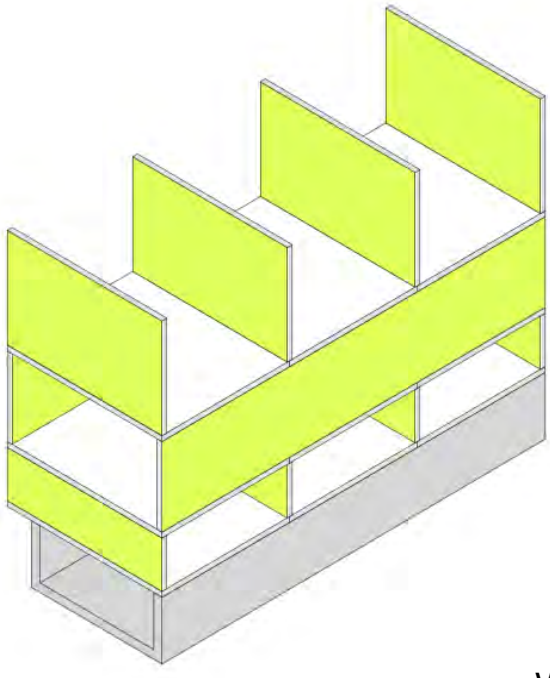

Whitmore Road

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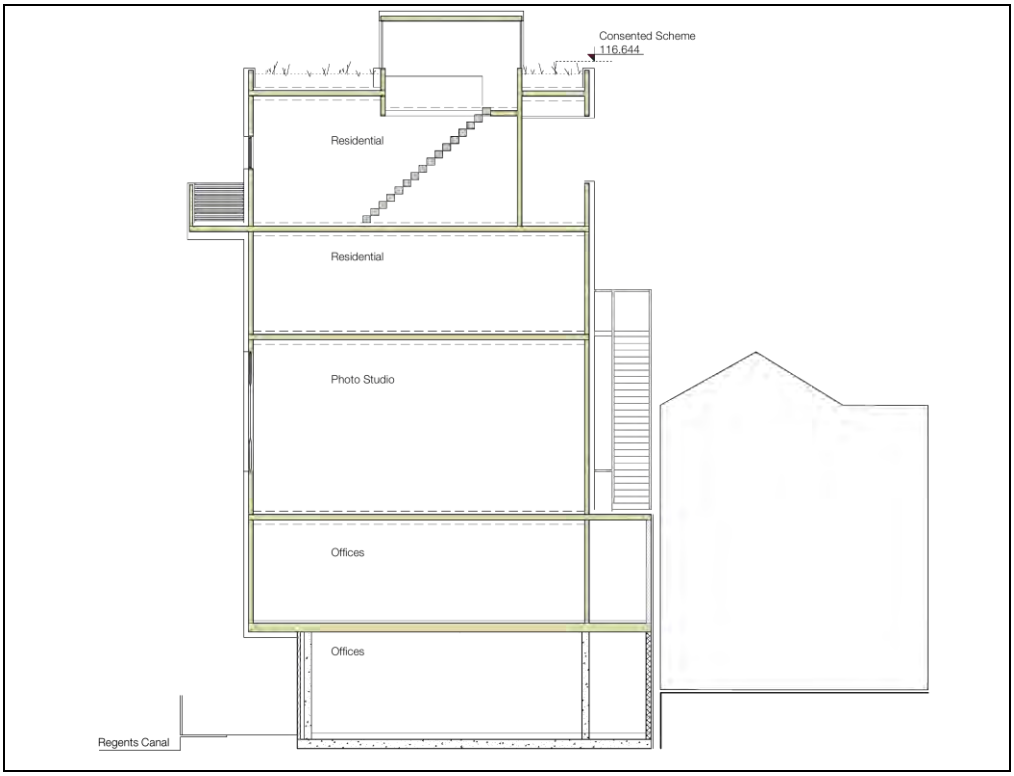

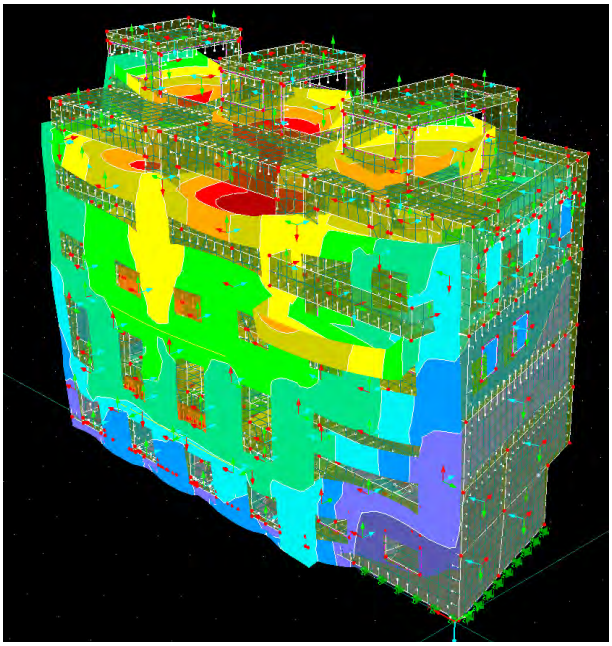

Overall deflection

Self weight
Live load
Dead load

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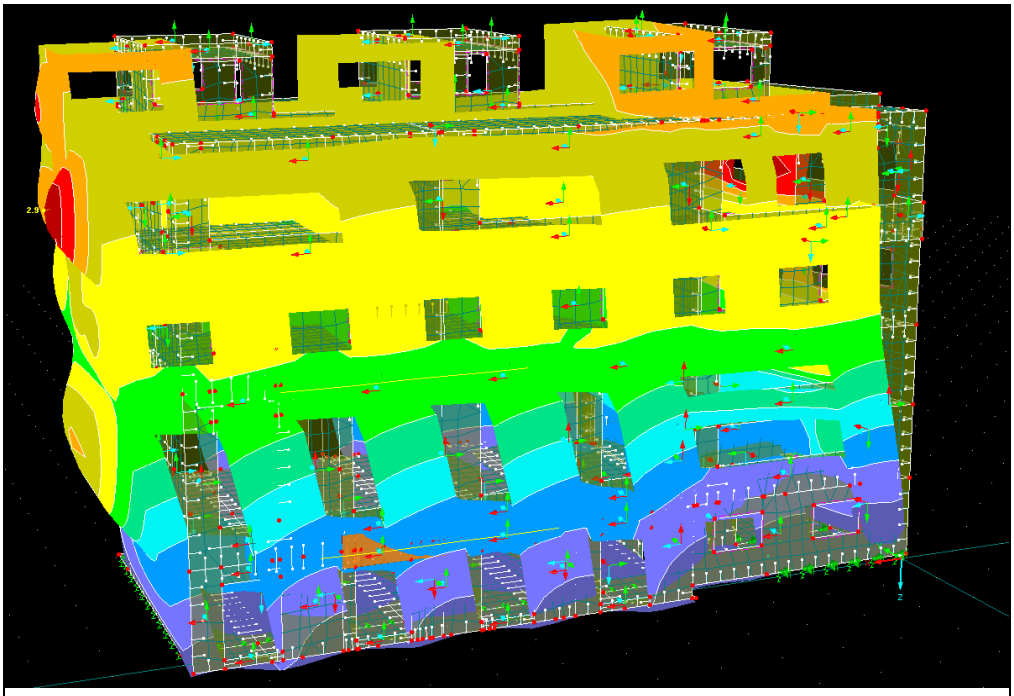
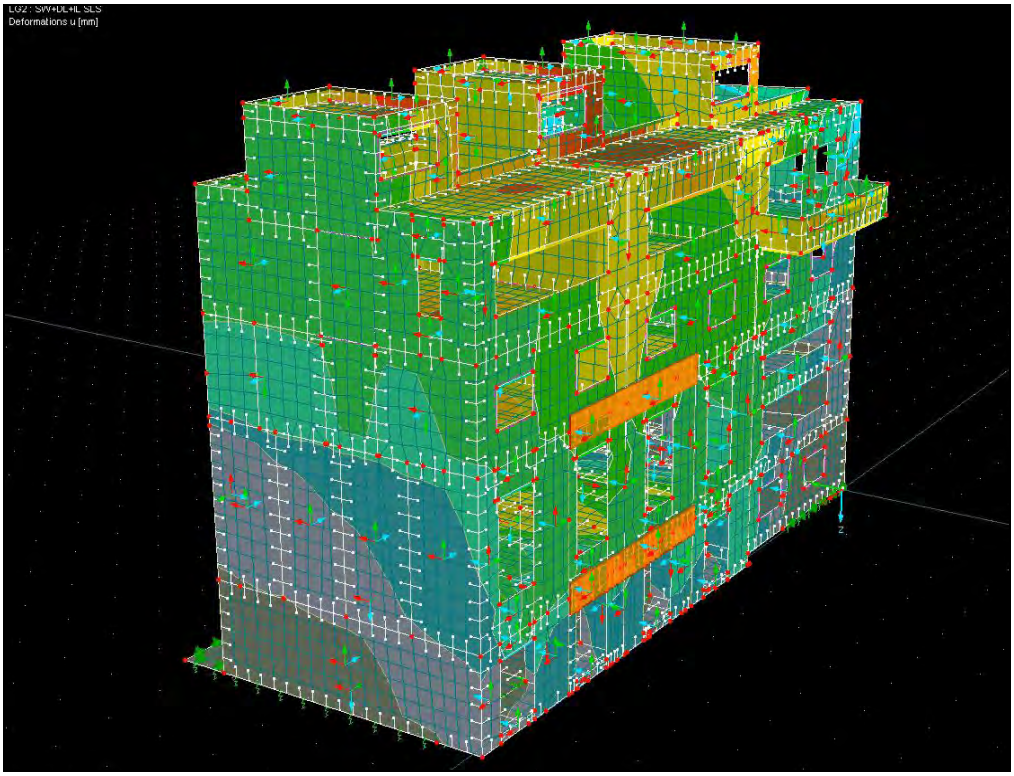
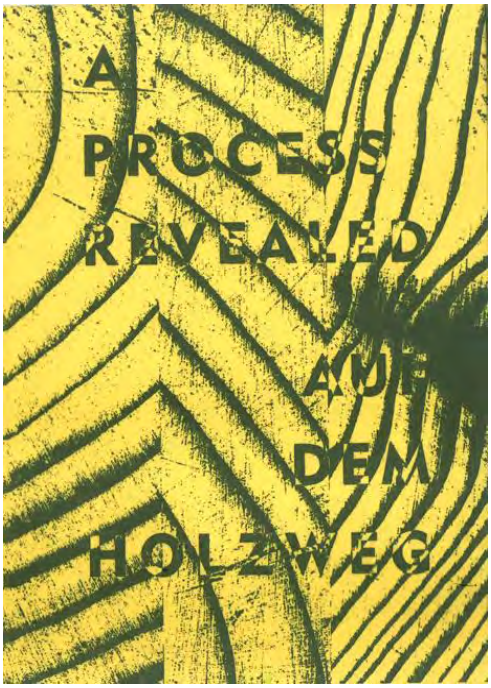


Horizontal displacement from wind load




IVENBECK



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