



DEVELOPMENT THROUGH PARTNERSHIP

Research and Innovation in Building and Construction: Trends and Emerging Issue

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cidb

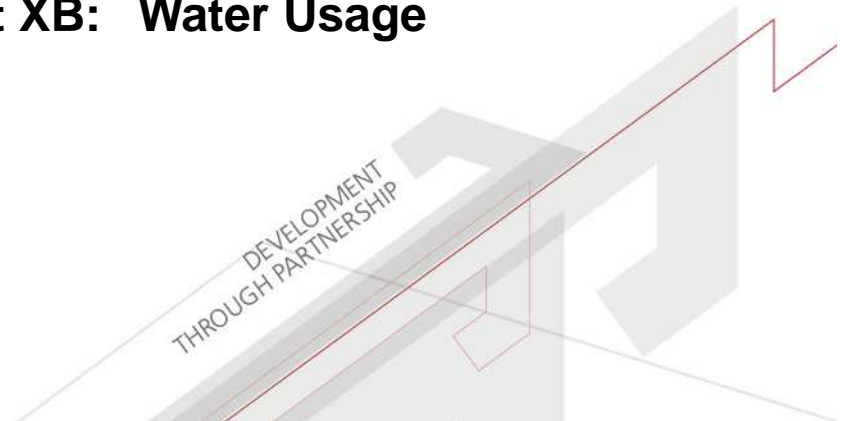
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National Building Regulations

Part A: General Principles and Requirements
Part B: Structural Design
Part C: Dimensions
Part D: Public Safety
Part E: Demolition Work
Part F: Site Operations
Part G: Excavations
Part H: Foundations
Part J: Floors
Part K: Walls
Part L: Roofs
Part M: Stairways
Part N: Glazing

Part O: Lighting and Ventilation
Part P: Drainage
Part Q: Non-water-borne Sanitary Disposal
Part R: Stormwater Disposal
Part S: Facilities for Disabled Persons
Part T: Fire Protection
Part U: Refuse Disposal
Part V: Space Heating
Part W: Fire Installation
Part XA: Energy Usage
Part XB: Water Usage



National Building Regulations & Standards

- Focus of presentation is impact of trends and emerging issues on:
 - Revisions and enhancements to Standards
 - Compliance routes:
 - Deemed to satisfy
 - Rational design
 - Agrément Certification



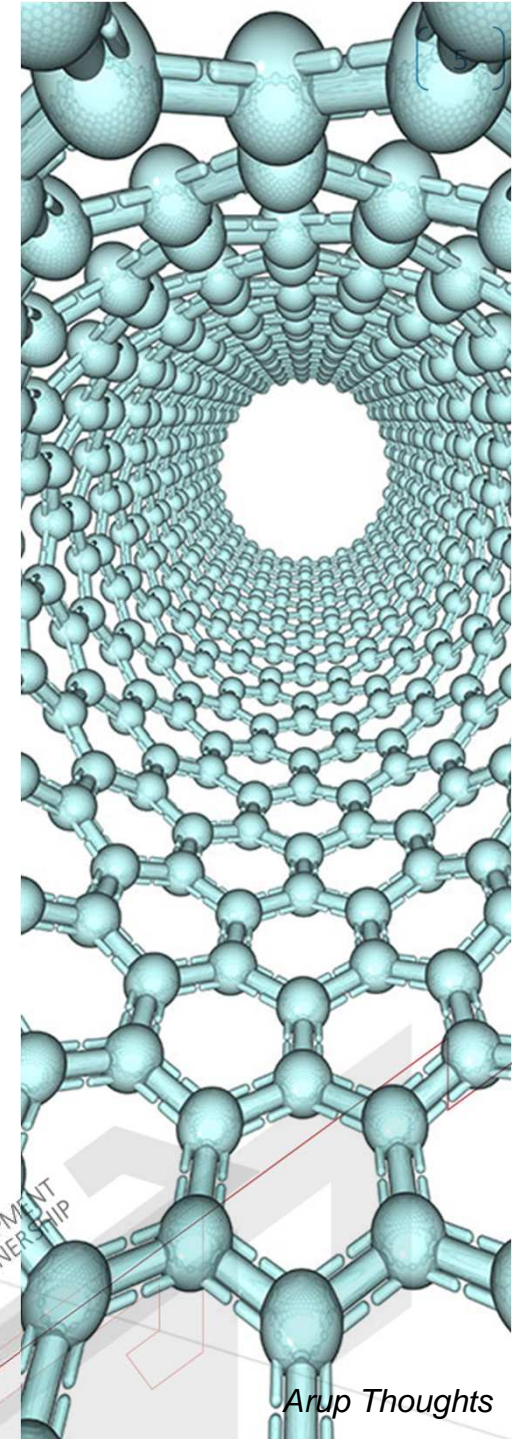
Trends and Emerging Issue

- 1) Technology
- 2) Construction methods
- 3) Sustainability (energy, water, waste, air quality, acoustics)
- 4) Smart buildings
- 5) Climate adaptation and resilience
- 6) Construction and Demolition Waste (CDW)
- 7) Submissions, approvals and inspections



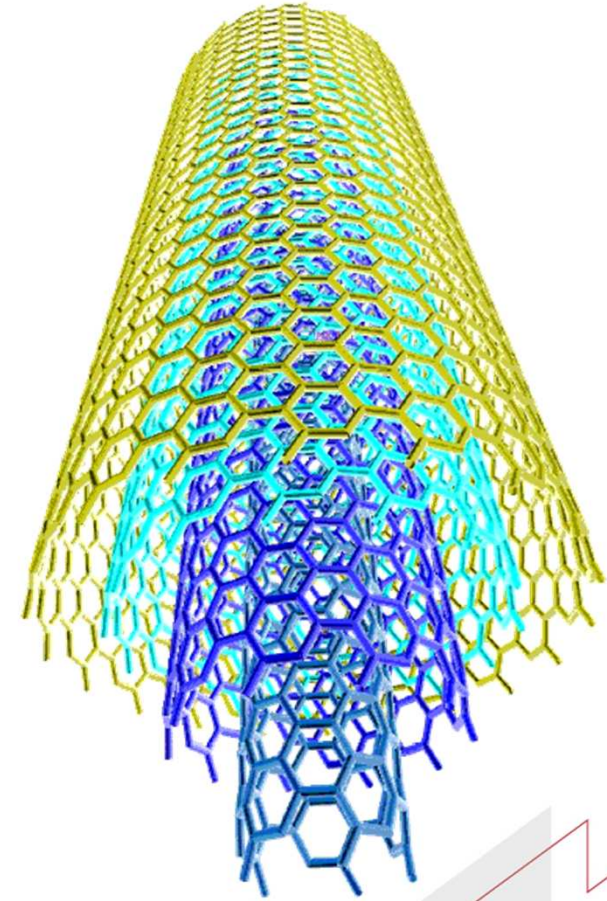
1) Technology: Nanotechnology

- A nanometer is one-billionth of a meter:
 - A sheet of paper is about 100,000 nanometers thick
- Nanotechnology:
 - improve service life and performance of building materials
 - energy efficiency
 - reduced flammability



Carbon Nanotubes

- **Performance:**
 - enhanced strength, stiffness and toughness without added weight
 - improved durability
 - increased functionality
 - reduced flammability
- **Major use: sales of carbon nanotubes projected to exceed:**
 - \$2b
 - >1000 metric tons annually in the next 4 to 7 years



Nanoadditive Fire Retardants



- **Impact on Regulations?**
- **How do we assess compliance?**

- **Use of nanoadditive fire retardants prompted by bans on halogenated flame retardants**
- **Improved flammability resistance while maintaining or improving mechanical properties**
- **Reduces heat release rate during fire event by formation of surface char which insulates underlying material**

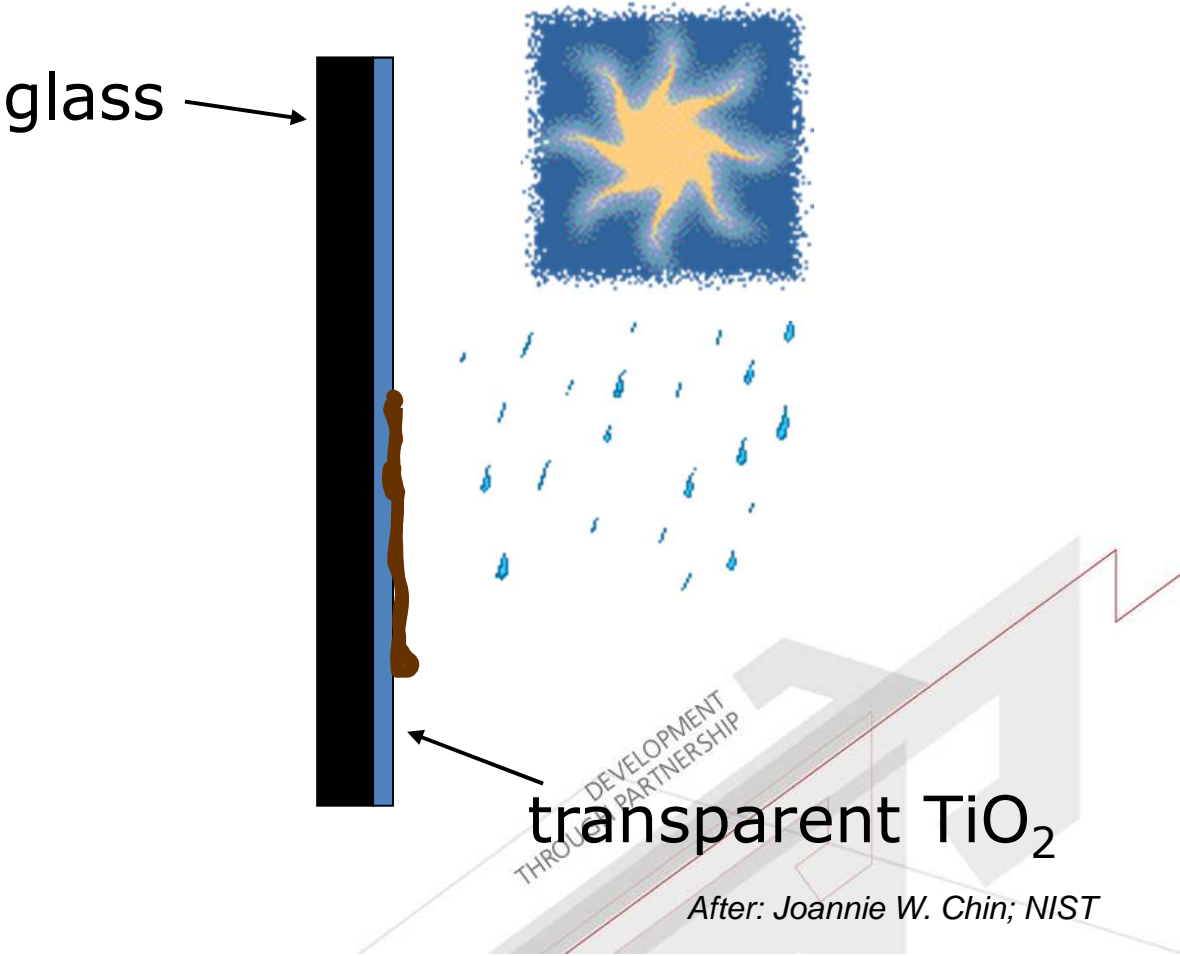
Coatings - Inorganic



conventional glass

self-cleaning glass

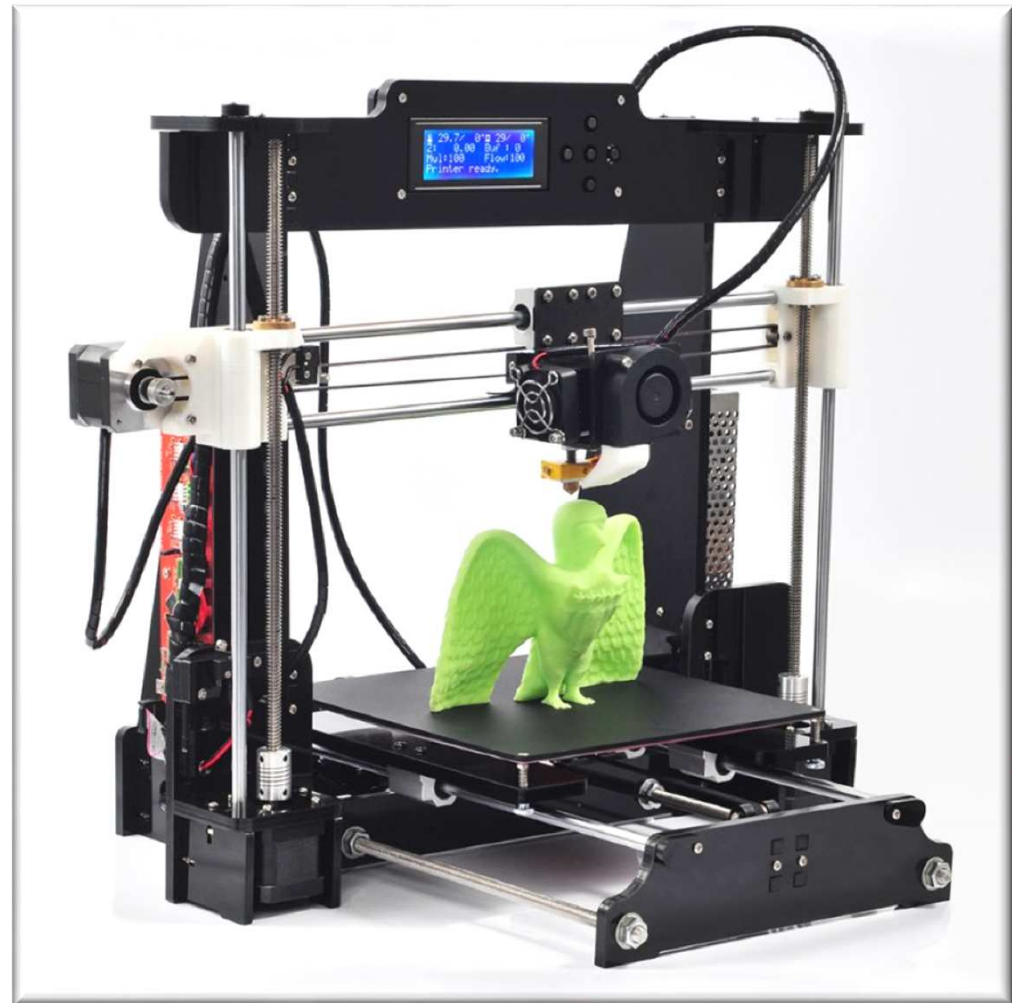
Self-cleaning glass Nano-TiO₂ coated



After: Joannie W. Chin; NIST

2) Construction Methods

- Off-site manufacturing:
 - precast
 - prefabricated
- 3-D printing



3D Printing



3D Printing



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Dubai's Museum of the Future

- Dubai unveils world's first 3D-printed office building
- Basic building took 17 days to print (but then needed to be finished both internally and externally)
- The project is part of a push to make Dubai and the wider United Arab Emirates a leader in 3D-printed construction:
 - 30% by 2030
- **How do we assess compliance?**



3) Sustainability (SANS 10400X)

- **Increasing regulatory requirements for:**
 - energy efficiency (10400XA)
 - water efficiency (10400XB)
 - waste management
 - indoor air quality
 - acoustics

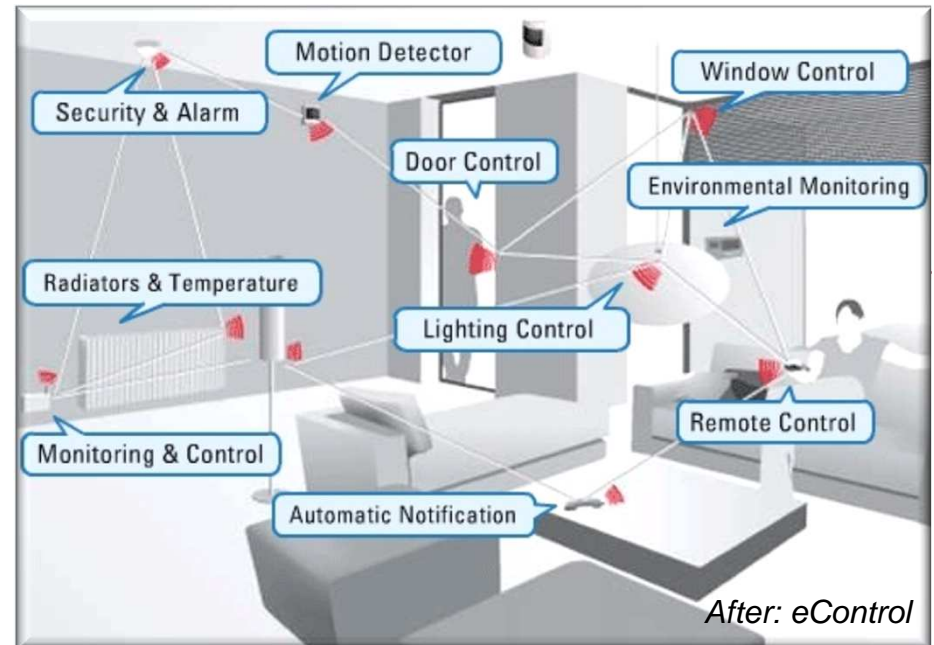
- **Compliance assessments:**
 - experience?
 - capacity?



4) Smart Buildings

- Incorporates connectivity, automated lighting, heating, ventilation and cooling, energy management, surveillance, security, access control, alarm activation, renewable energy, building management, etc.
- Increasing regulatory requirements for components:
 - lighting, heating, ventilation and cooling, energy management, renewable energy, etc.

- **Compliance assessments:**
 - integration
 - systems
 - dependencies



5) Climate Adaptation and Resilience

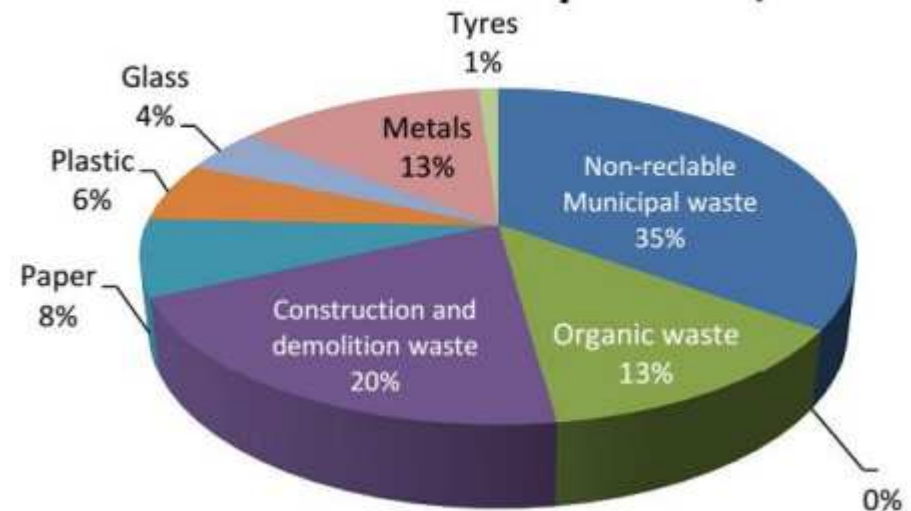
- Changing requirements for building Standards and Regulations



6) Construction and Demolition Waste

- 20% of landfill waste in 2011 was construction and demolition waste
- Will increasingly be re-used:
 - concrete products
 - fill
 - etc
- **Standards need to be developed**

General waste composition, 2011



7a) Electronic Building Plan Submissions

- 1) **Toronto: mandatory electronic submission of all documents including forms, reports, specifications, calculations and plans:**
 - pdf
 - email / DVD / SFTP
- 2) **Singapore: goal “ to implement the fastest building permitting in the world”**
 - a) **from 2003: CORENET e-Submission System (internet based)**
 - b) **from 2016/17: voluntary BIM e-submissions in Native BIM format.**



CORENET e-Submission

CORENET e-Submission System

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On Behalf of NEA

CORENET e-Submission System no longer support IE version 8.0 & below browser with effect from 30 September 2016

In-line with the supported version of the IE browser by Microsoft, CORENET e-Submission System will no longer support IE version 8.0 & below browser with effect from 30 September 2016. We strongly encourage all users to upgrade their web browsers to the latest version to ensure optimal user experience.

EGOV Excellence Awards Distinguished Winner

PRO ENTERPRISE PANEL

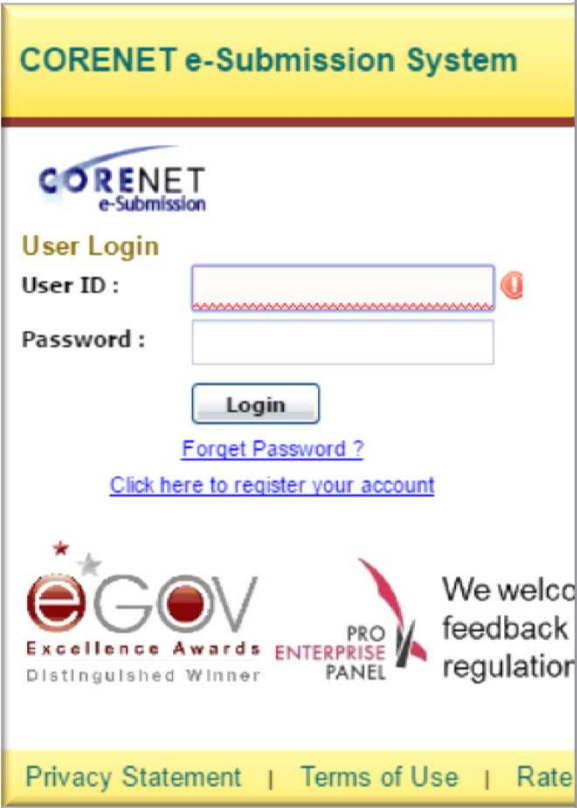
We welcome feedback on regulations

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CORENET e-Submission



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(min. 8 to max. 20 of A-Z, 0-9, - and _ characters)

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(as stated in NRIC/ Passport)

Password * :
(min. 8 to max. 20 of A-Z, 0-9, - and _ characters) (case sensitive)

Re-enter Password * :
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(e.g. for NRIC, S1234567D)

Country * :

Email Address * :
(e.g. ray@hotmail.com)

Tel No. * :

Ext :

Fax No. :

Pager No. :

Mobile Phone No. :



Who will develop South Africa's system and mandate its use?

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7b) Building Information Modeling

- **Generation and management of digital representations of physical and functional characteristics of places**
- **Building information models (BIMs) are files which can be extracted, exchanged or networked to support decision-making regarding a building or other built asset:**
 - **includes spatial relationships, light analysis, geographic information, and quantities and properties of building components**
- **When will BIM be mandated?**
- **Who will mandate BIM?**
 - **cidb monitoring trends**



7c) Drones for Building Inspections

- Used increasingly by architects and contractors
- **Will definitely impact on building inspections and approvals:**
 - especially for tall buildings



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Some will emerge sooner than later





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Thank You