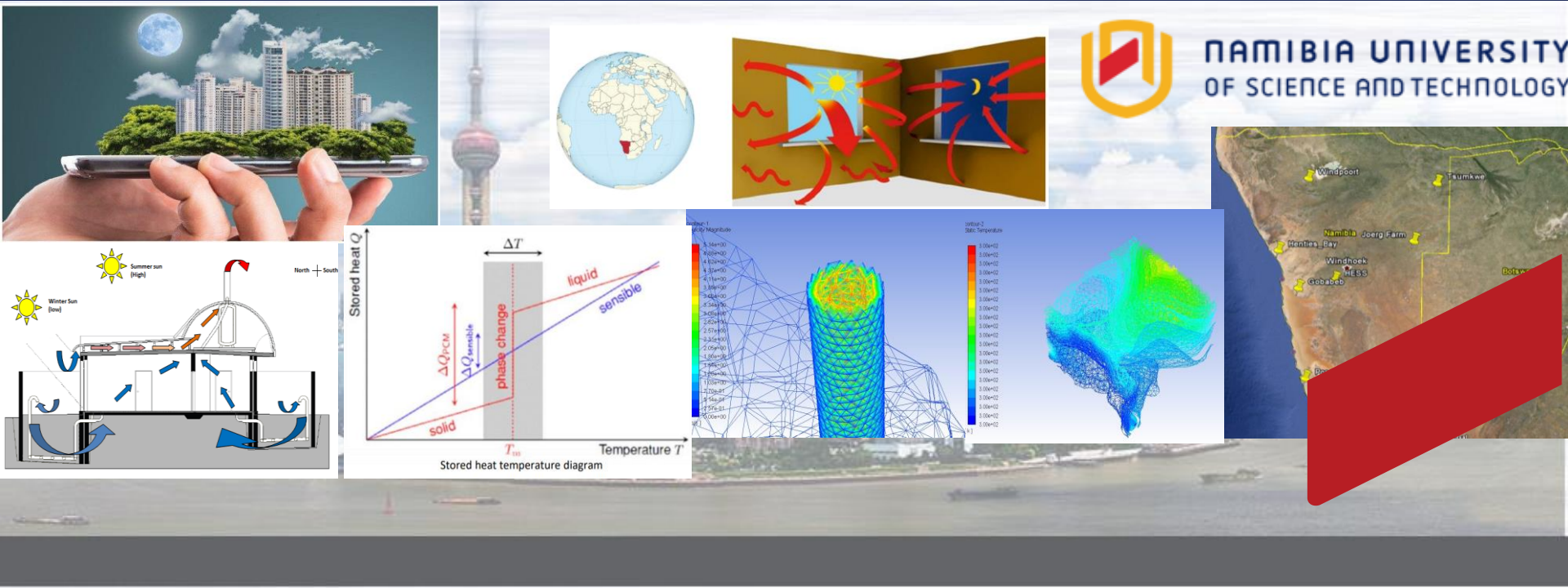




STRUCTURAL ENGINEERING: UNIQUENESS AND CHALLENGES IN AN EVER- CHANGING ENVIRONMENT

Prof Victor Kamara

Department of Civil, Mining & Process Engineering





Contents

1. Personal Details
2. Qualification Profile
3. Understanding field of specialization
4. Contribution to the field of expertise
5. Future direction of research in line with emerging challenges
5. Conclusion

INTRODUCTION

VICTOR SORIE KAMARA

**PH.D (Struct); MEng (Struct); BEng (Hons)
Pr Eng (PERC - SLIE); MSLIE; MASCE**



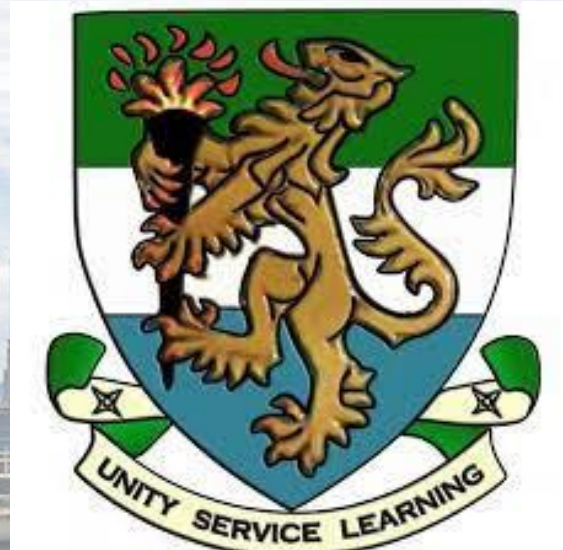
SIERRA LEONE

- British Crown Colony since 1808
- Independence – 1961
- Area – 71,740 km² (27,699 sq mi) / 824,292 km²/318,260 sq. mi) – 12 x
- Population – approx. 8 million (2021 census) / approx. 2.6 million (2022 est) – 3 x



Undergraduate

(195+ years of existence)



Postgraduate (Master's)

(126+ years of existence)



北京交通大学

BEIJING JIAOTONG UNIVERSITY



Research Focus (Master's)

Steel Structure: Analyses, Design, Monitoring and Maintenance

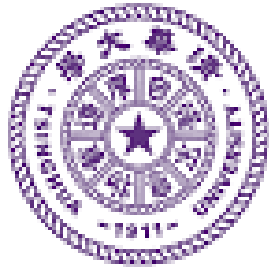
Thesis

Design and Performance Monitoring of Tensegrity / Light-weight Structures



Postgraduate (PhD)

(111+ years of existence)



清華大學

Tsinghua University



清華大學

Tsinghua University



清華大學

Tsinghua University

Research Focus

**Concrete & Reinforced Concrete: Analyses,
Design, Monitoring & Service-Life Prediction**

Dissertation

**Reinforced Concrete Infrastructure Investigation and Design in Toxic
/ Aggressive Environment (on and off-shore Structures) – Service-Life
Prediction /Sustainability**



STRUCTURAL ENGINEER

KEY EXPECTATIONS:

**SUSTAINABLE STRUCTURAL DESIGNS -
EXAMPLES**

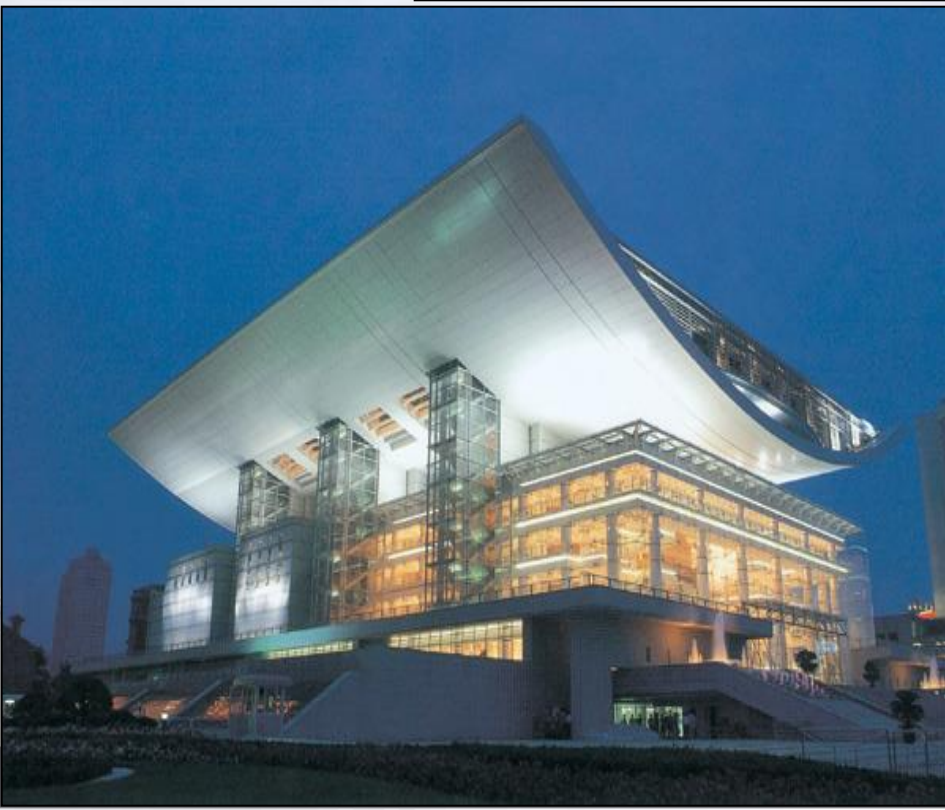
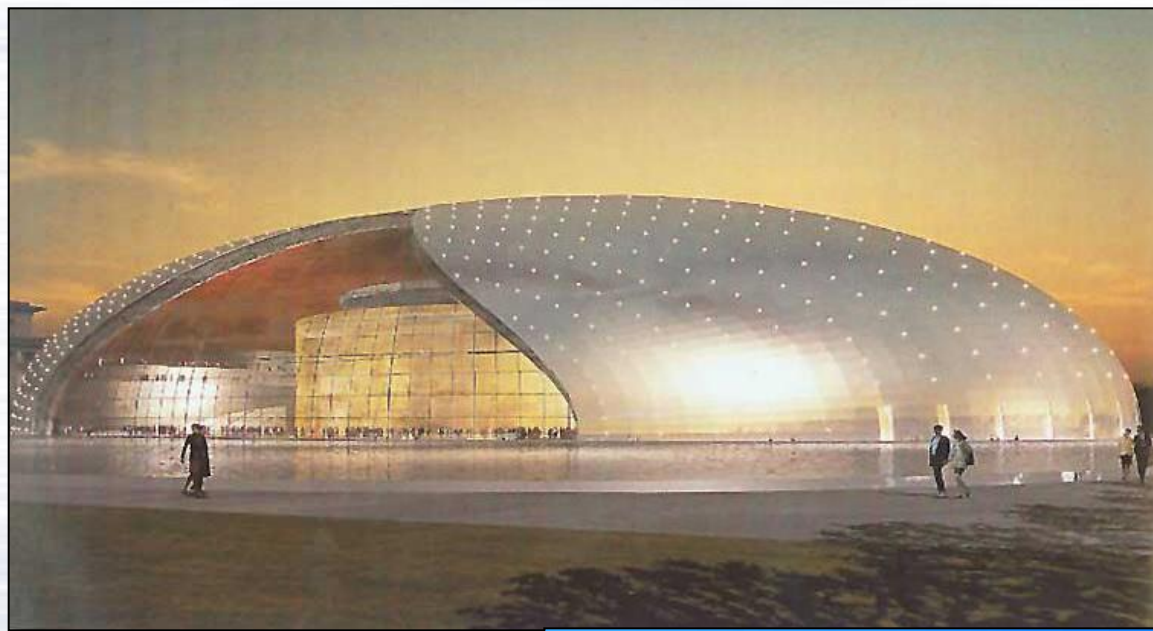


Beijing National Stadium
The Bird Nest (Plane Size 280m×320m)



Shanghai Stadium (Suspension Length 73.5m)







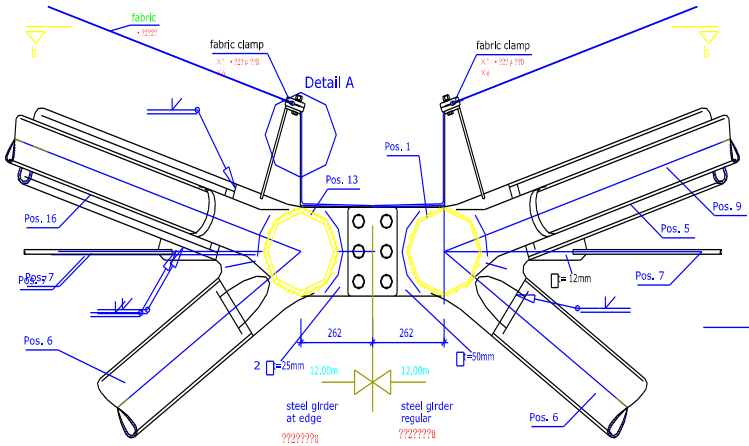
Detail 4 Sc. 1:10 $\varnothing 4(1\text{E}010)$

Steel girder at end

??????a

Section a-a

???? a-a



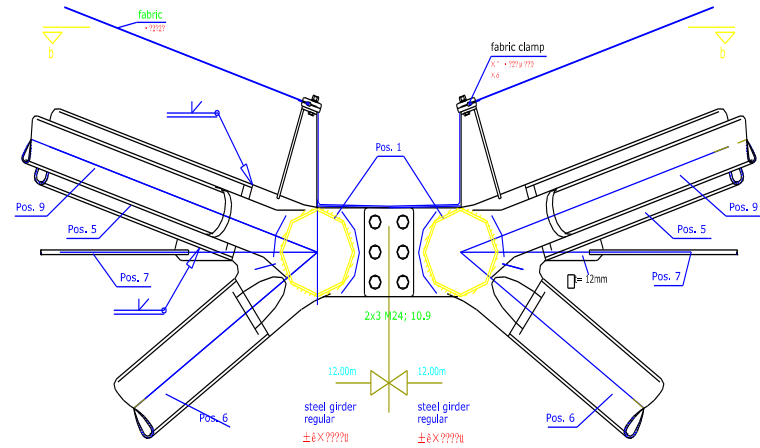
Detail 5 Sc. 1:10 $\varnothing 5(1\text{E}010)$

Steel girder regular

$\pm \text{E} \times \text{????} \varnothing \text{????}$

Section a-a

???? a-a



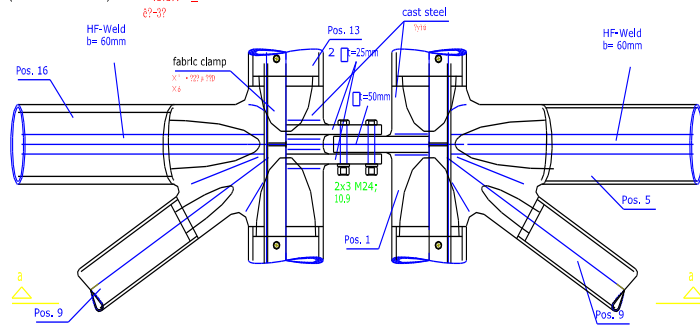
Section b-b

???? b-b

(shown without fabric)

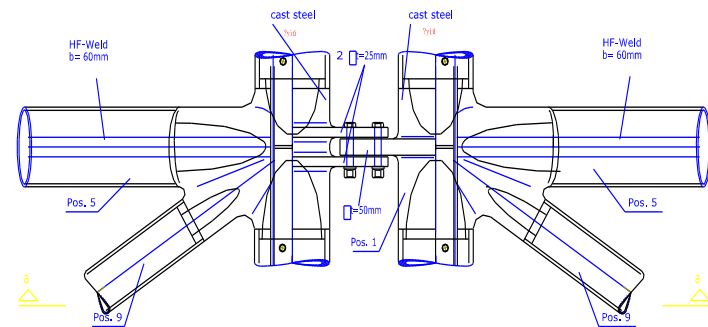
????? ±

69-07



Section b-b

???? b-b



Structural Engineer - Attribute

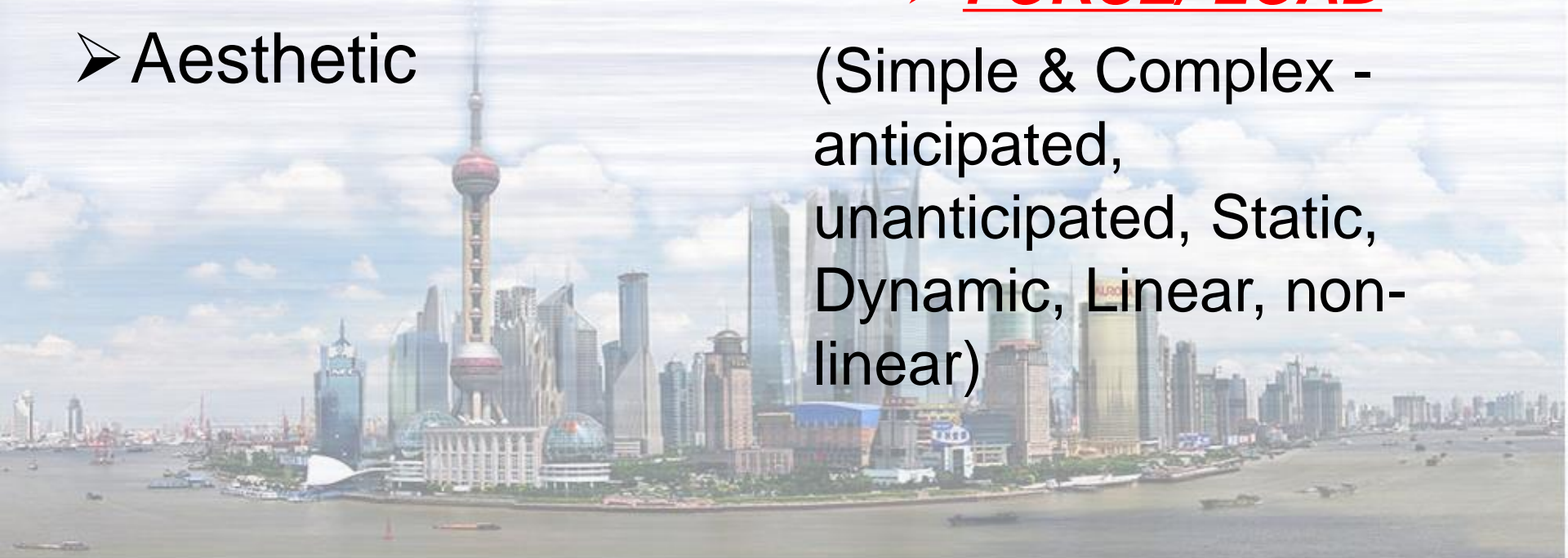
- Client needs
- Environment Influence
- Material
- Aesthetic

Develop appropriate remedial measures to:

- ❖ Overcome – Greatest Unavoidable Enemy

➤ **FORCE/LOAD**

(Simple & Complex - anticipated, unanticipated, Static, Dynamic, Linear, non-linear)



Expectation & Uniqueness

- ❖ Analyse/Investigate, Design, Monitor, Provide advice on usage (Facility Management) and maintenance
- ❖ To avoid premature and long-time collapse at minimal cost
- ❖ To protect/guarantee Lives & Property (ABSOLUTE SAFETY)
- ❖ To ensure Absolute Occupancy Comfort (AOC) with little or no cost (Emerging Thought) – Energy Efficiency (Green Building)

Overall Research Focus

- Service-Life Prediction of Steel and Reinforced Concrete Structures Under Normal and Aggressive/Toxic Environments

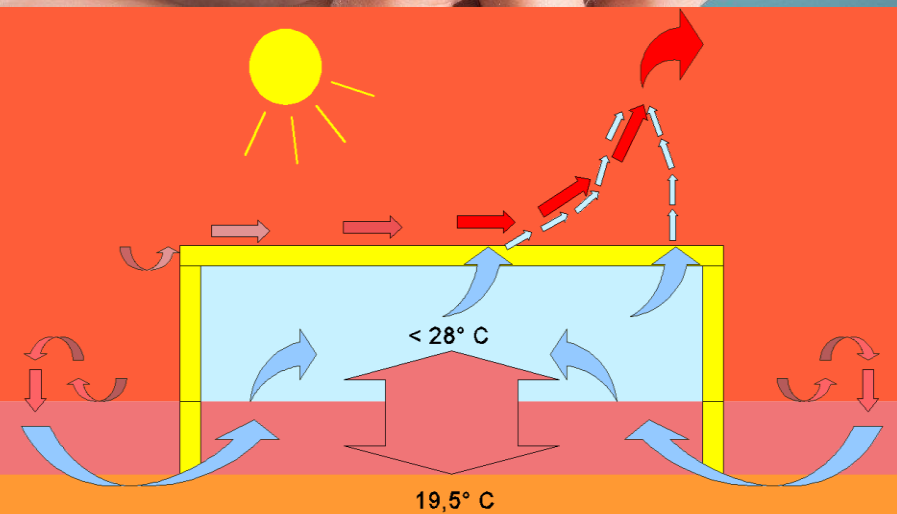
- **MATERIAL VIABILITY**

Identification, analysis, design - to ensuring Safe, durable, sustainable, affordable and energy efficiency civil infrastructure (Pavements, buildings)

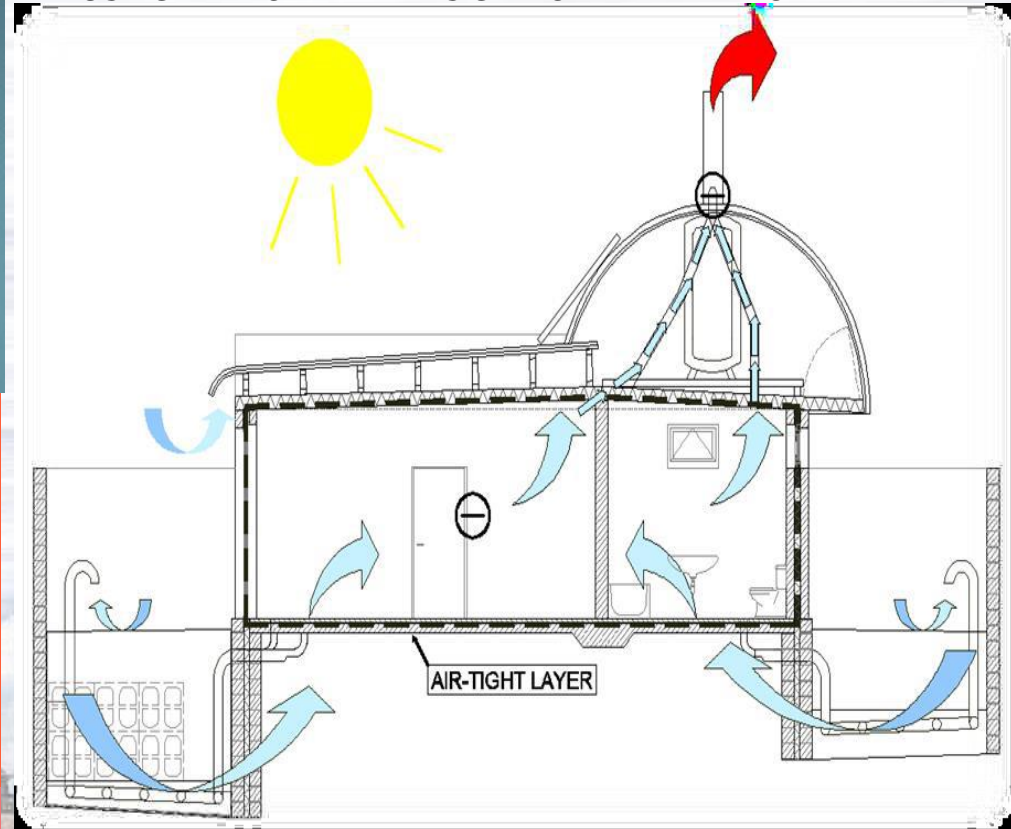


Current Research

(Energy Efficiency Buildings – Green/Smart)



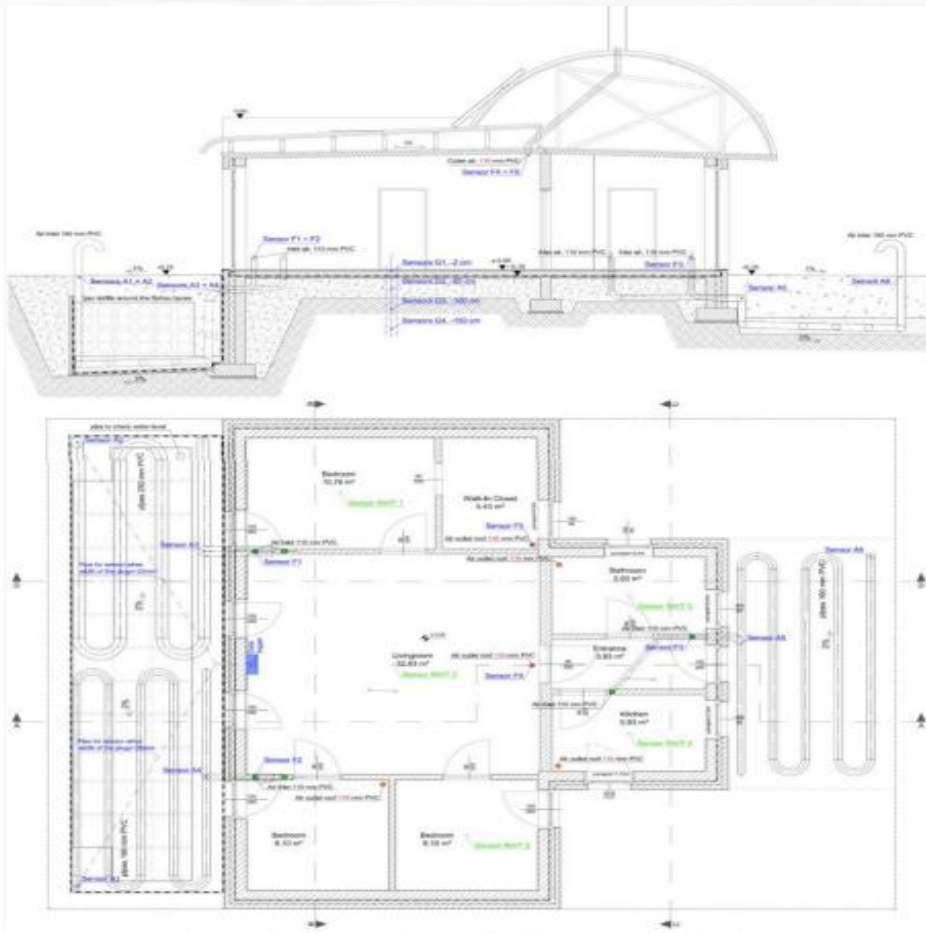
*EEBN PROTOTYPE HOUSE - NATURALLY CONTROLLED AIRFLOW
USING APPROPRIATE DESIGN – CHIMNEY EFFECT*



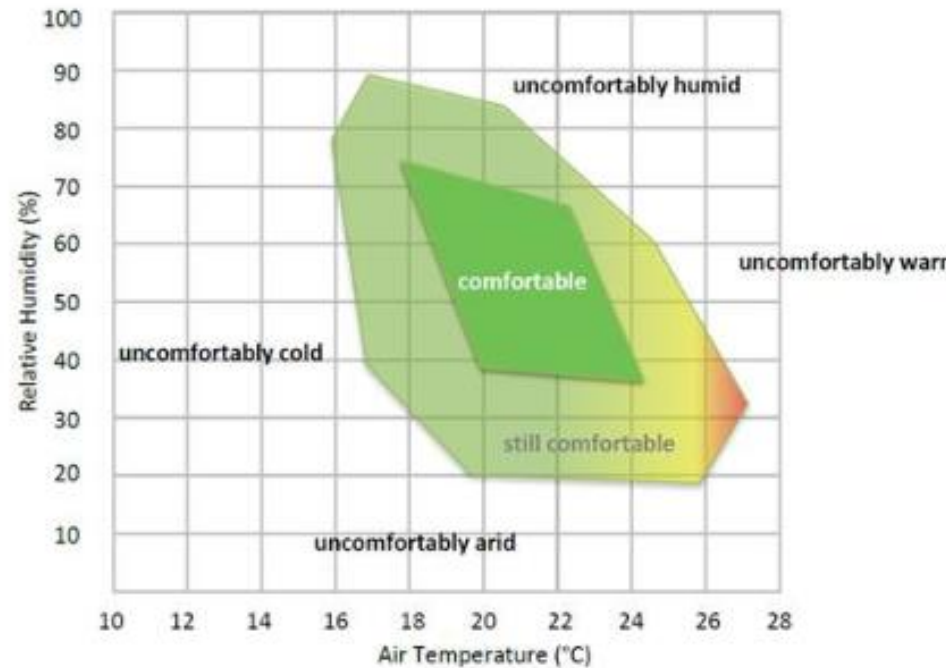
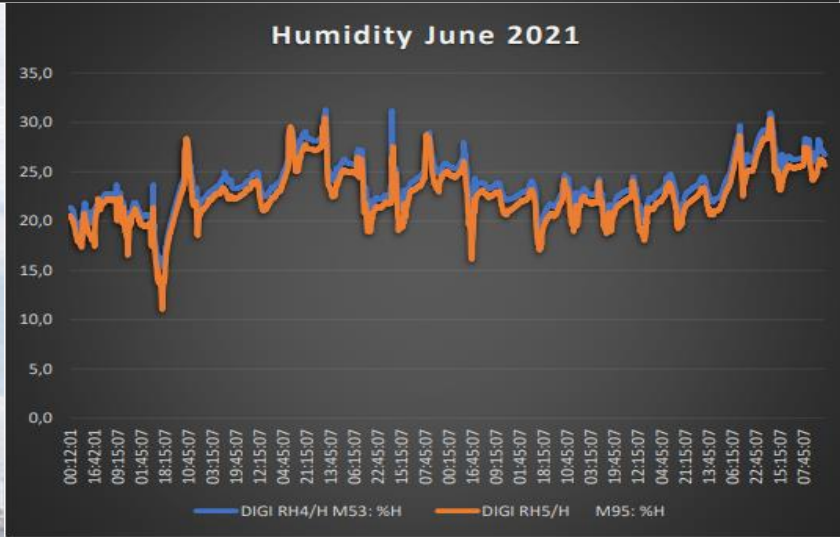
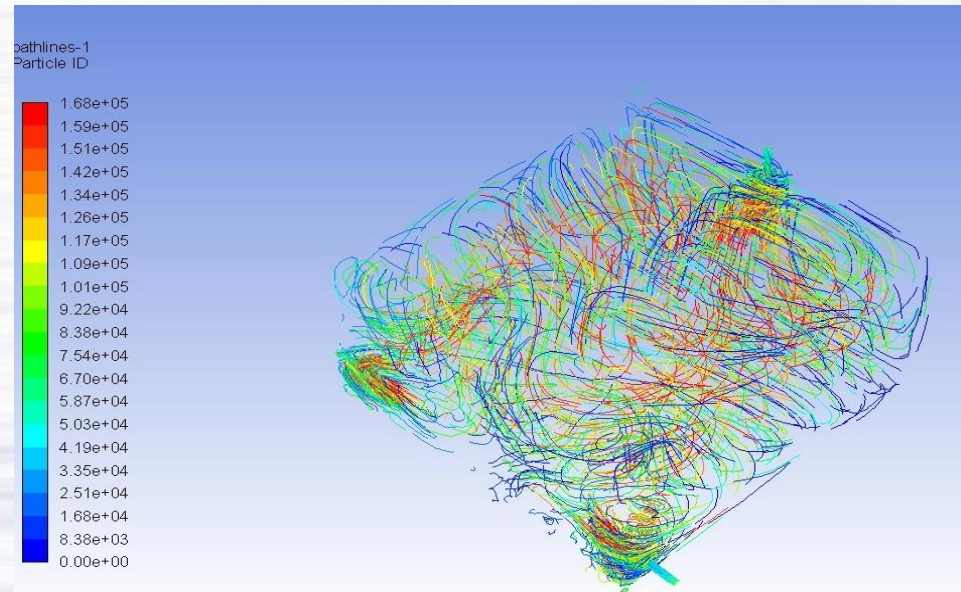
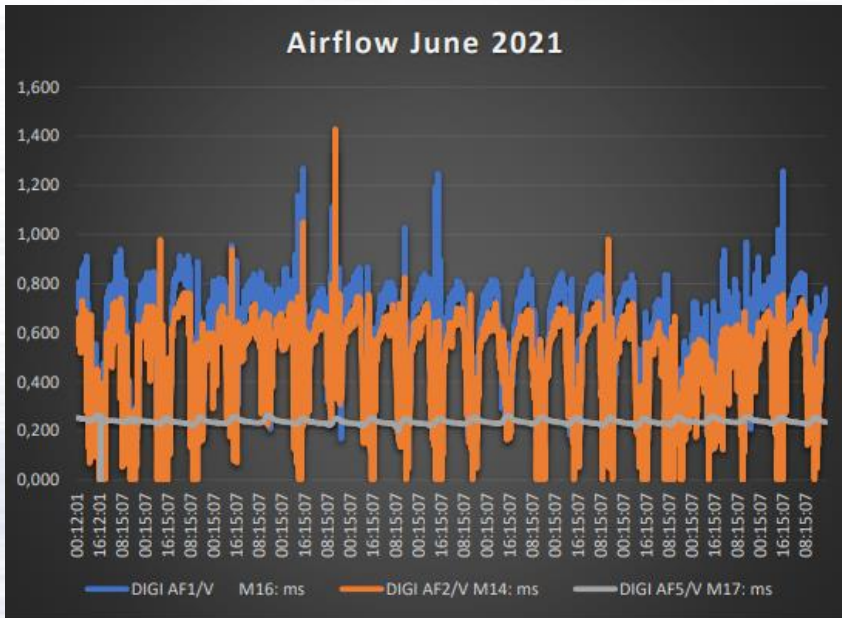
Outside Air - Heat Exchanger System

**STRATEGY TO ENSURE CONSTANT OCCUPANCY COMFORT
TEMPERATURE AT NO OR LESS ENERGY COSTS – NATURAL OPERATING
CONDITIONS**

EEBN PROTOTYPE HOUSE - 2015



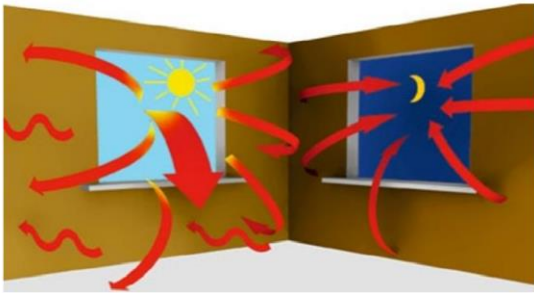
FINDINGS – CURRENT RESEARCH



Published 4 journal Papers: highly rated Journals
 1ST EVER PhD Graduate – Structures/Materials Produced in 2020

Emerging Research

(Climatisation: Phase Change Material – PCM)



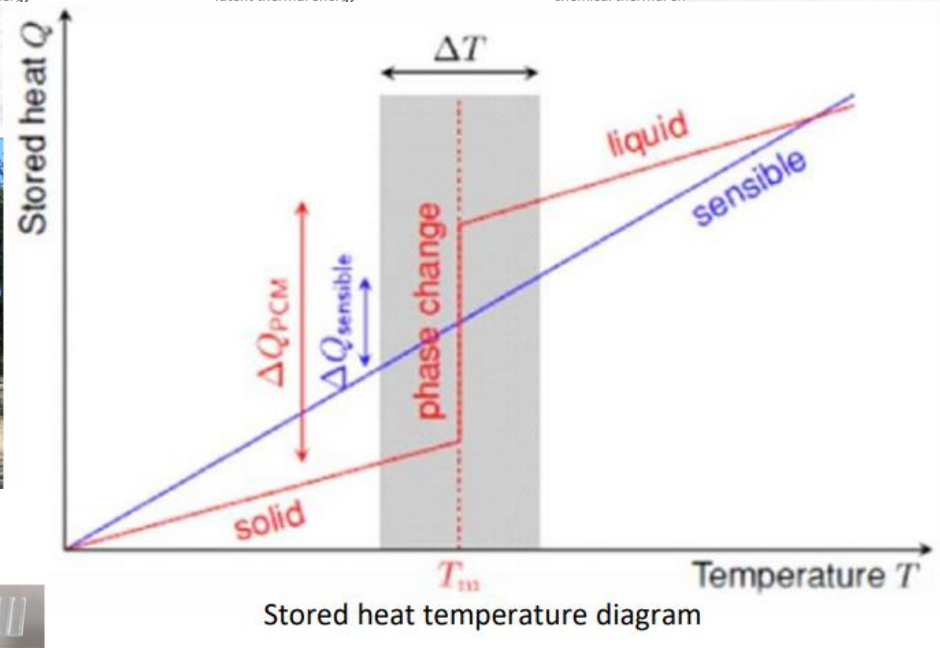
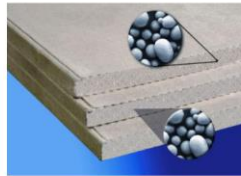
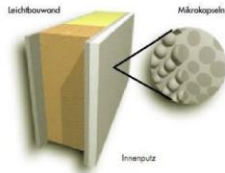
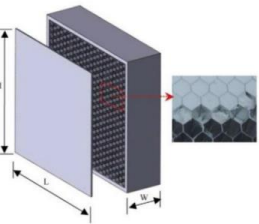
sensible thermal energy



latent thermal energy

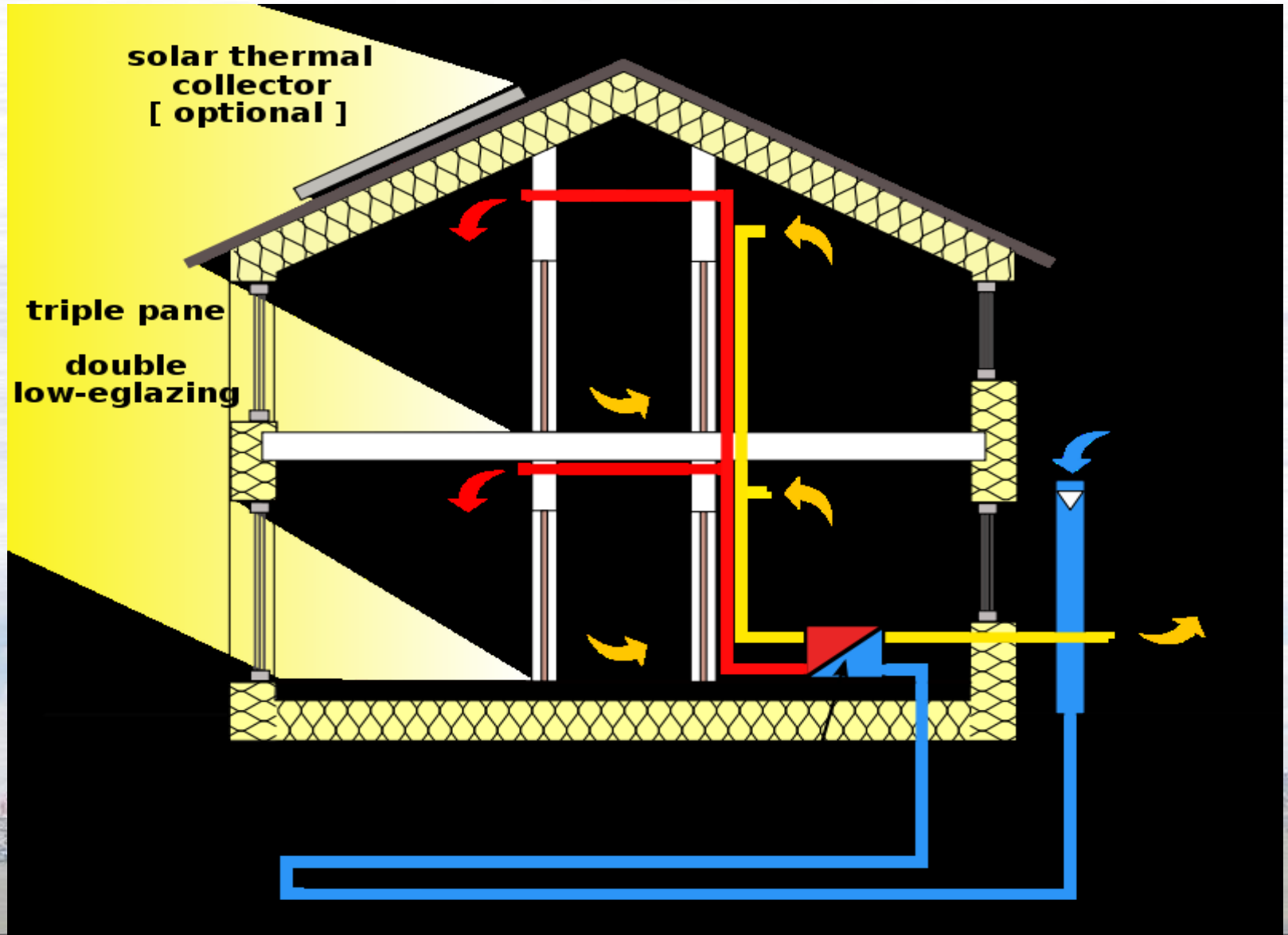


chemical thermal en



APPLICATION - Interior plaster, gypsum; fibreboard; insulating foils; insulation board; false ceiling or floor; glasses; partition walls; furniture

BASIC HEAT CAPTURE / STORAGE AND UTILIZATION PHENOMENA IN STRUCTURES



PUBLICATIONS



EMERGING CHALLENGES

- Unprecedented Climate Variability (Global Warming): *unimaginable /excessive temperature fluctuations*; Devastating and uncontrollable floods, wide fires, tropical storms, Tsunamis, earthquakes, draughts - **COMPROMISING STRUCTURAL INTEGRITY & SAFETY**
- Unimaginable Changes in human Thoughts – Terrorism – **COMPROMISES STRUCTURAL INTEGRITY**

LOCAL & INTERNATIONAL CONTRIBUTIONS

EXTERNAL EXAMINER – POSTGRADUATE PROGRAMMES

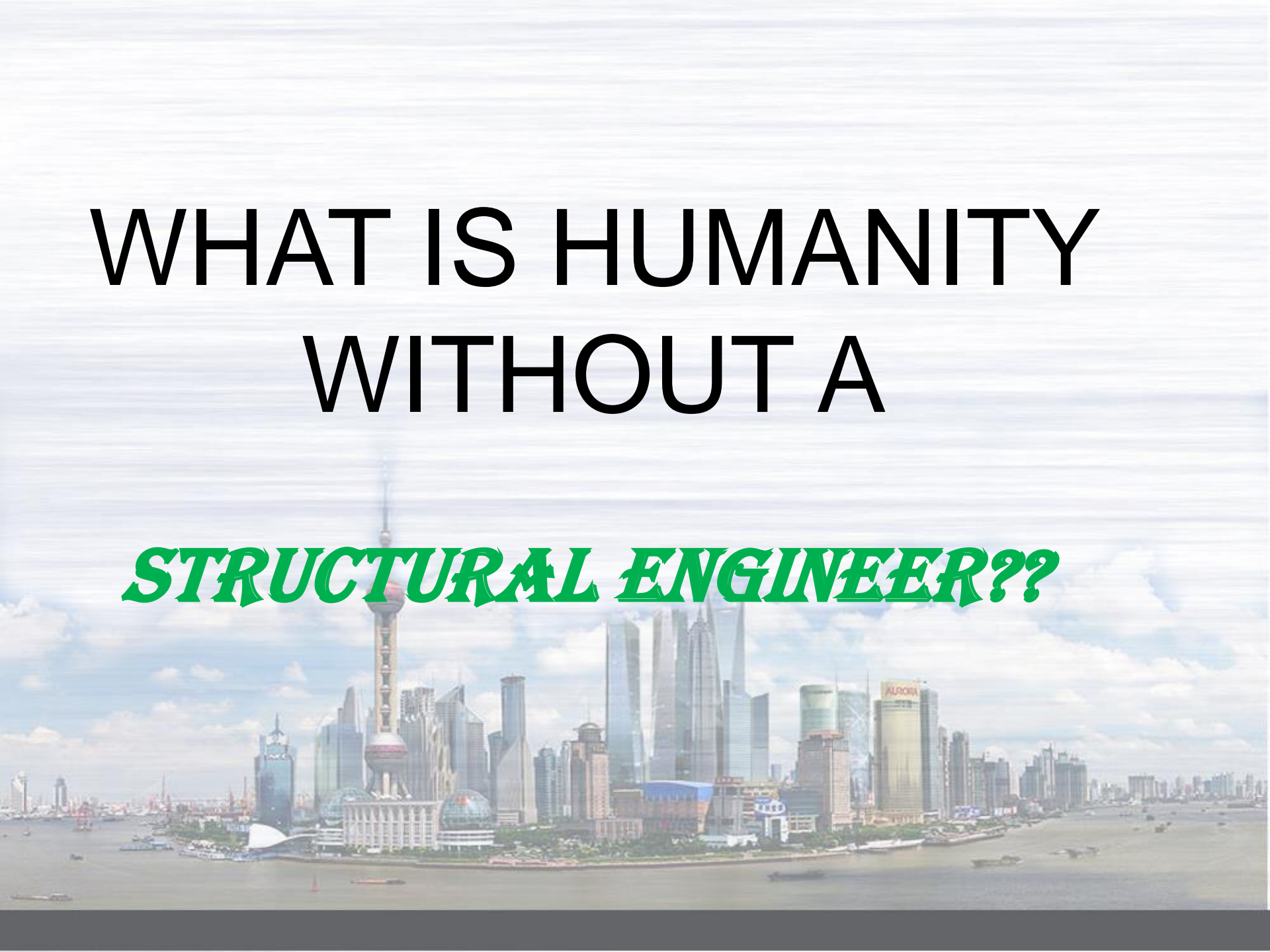
| Institution | faculty | Department/ School | PROGRAMME | comment |
|--|---------------------------------|---------------------------|----------------------|------------|
| University of Johannesburg, South Africa | Engineering & Built Environment | Civil & Built Environment | Masters & PhD Theses | Since 2020 |
| University of Ilorin, Nigeria | Engineering | Civil | MSc (Structures) | Since 2018 |

LOCAL COMMUNITY SERVICE/ENGAGEMENTS

| Institution | SECTOR | RESPONSIBILITY | comment |
|--|------------------------------------|---|------------|
| Namibia Standard Institute, NSI | Technical Committee, TC6 | Advice on the Development of Standards and certification of Building / Construction Materials | Since 2015 |
| Engineering Council of Namibia, ECN | Civil / Structural Engineering | Key Membership Application Evaluator | Since 2014 |
| Ministry of Works, Ministry of Education, etc. | Invited Technical Committee Member | Technical Evaluation panelist for promotions and critical job applications | Since 2014 |

WHAT IS HUMANITY
WITHOUT A

STRUCTURAL ENGINEER??



CONCLUSION

I am aware of the degree of academic, professional and ethical responsibilities and integrity attached to this rank.

With the support of NUST and my close collaboration with its international partner universities, better results/outputs are assured



A photograph of a group of people, likely at a graduation or formal event. In the foreground, a woman with dark hair, wearing a black blazer and red beaded bracelets, holds a large orange folder. To her left, a man in a striped shirt looks off to the side. In the background, other people are visible, including a woman wearing a purple headscarf and a blue top. The scene is brightly lit, suggesting an outdoor or well-lit indoor setting.

THANK YOU

(Prof. Kamara - 10.11.2022)