Base | HILTI The Foundation. Initiated by

BRIDGING KNOWLEDGE GAPS IN BAMBOO CONSTRUCTION

CLIMATE SMART HOUSING

LUIS FELIPE LOPEZ

NEED FOR SOCIALIZED HOUSING

1.6 billion

Expected to be affected by the global housing shortage in 2025 (World Bank)

96,000

The need to build new affordable homes everyday to house the estimated 3 billion people who will need access to adequate housing by 2030 (UN-Habtat)

80%

cities worldwide do not have affordable housing options for the majority of their population (World Green Building Council)

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PHILIPPINE HOUSING

22 million

Estimated housing backlog by 2040 (UN-Habitat PH Country Report 2023)

3.7 million

Estimated number of Informal settlers in the Philippines (UN-Habitat PH Country Report 2023)

22

average number of tropical cyclones that enter the Philippine Area of Responsibility each year

P388 billion

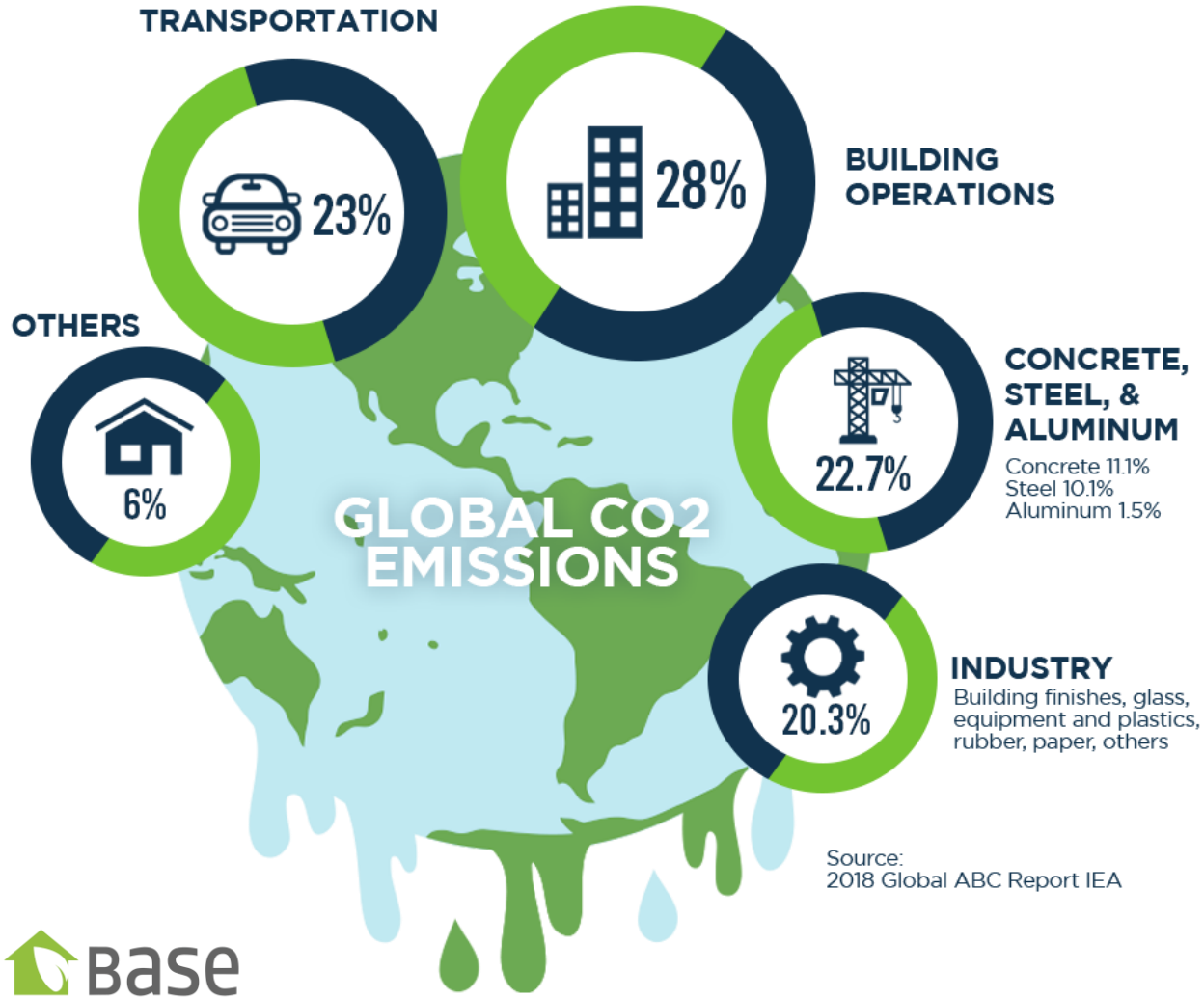
estimated cost of damages due to disaster

(UN-Habitat PH Country Report 2023)

About Base

Provides alternative building technologies to enable a network of partners that provide comfortable, affordable, resilient, eco-friendly houses with social impact.

GLOBAL CO2 EMISSIONS



Source:
2018 Global ABC Report IEA

WHY BAMBOO?

- Sustainable material that provides livelihood to farmers
- Strong root network enables soil stabilization and water table rise
- Only 3-5 years growth for structural grade bamboo
- 60% less carbon footprint for each Base house compared to conventional
- More comfortable indoor climate in the houses resulting to less energy use during occupation

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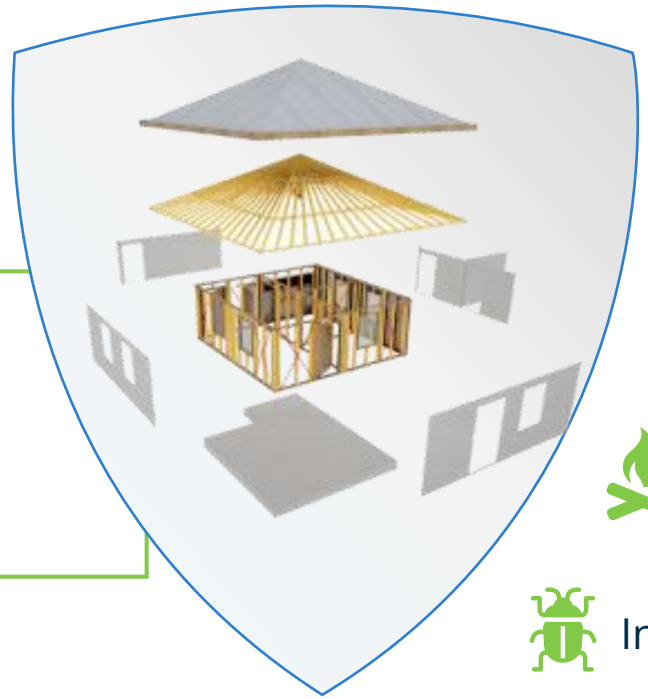
CEMENT-BAMBOO FRAME TECHNOLOGY

Accreditation of Innovative Technologies for Housing (AITECH)

Bahareque Technology, Colombian Engineering Filipino Craftsmanship



- Typhoon Resistant
- Earthquake Resistant
- Fire Resistant
- Insect Resistant

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BASE aims to help provide poor families and disaster victims with sustainable, affordable, disaster-resilient, environment-friendly, and comfortable socialized homes built with the CBFT.

CBFT CONSTRUCTION PROCESS

EXCAVATION

FOUNDATION

CBFT CONSTRUCTION PROCESS

CONCRETE SLAB

PANEL FABRICATION

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CBFT CONSTRUCTION PROCESS

PANEL INSTALLATION

ROOF STRUCTURE

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CBFT CONSTRUCTION PROCESS

FLATTENED BAMBOO INSTALLATION

PLASTERING

CBFT CONSTRUCTION PROCESS

HOUSING ECOSYSTEM

- Sustainable Material
- Built according with the National Structural Code of the Philippines
- Teaches new skill
- Same economic lifespan as a conventional permanent house
- Families lead more dignified lives

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CBFT STRUCTURES
HOUSING PROJECTS

SINGLE STOREY

Duplex Housing, Samar

Single Detached Housing, Tacloban

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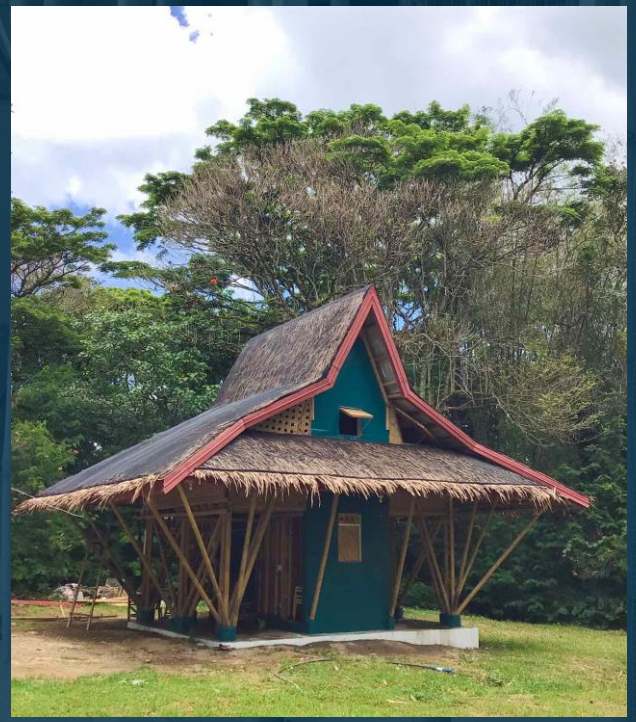
CBFT STRUCTURES
HOUSING PROJECTS

TWO-STOREY

Single Detached, Davao



Torogan House, Bukidnon

Duplex Housing, Iloilo

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CBFT STRUCTURES
HOUSING PROJECTS

TWO-STOREY MIDDLE CLASS

Single Detached with Loft of Kawayan Collective Model House, Dauin

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CBFT STRUCTURES
SPECIAL STRUCTURES

ECONOMIC EMPOWERMENT

Weaving Center, Batangas

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CBFT STRUCTURES
SPECIAL STRUCTURES

NON-RESIDENTIAL

Kanya Kawayan, Batangas

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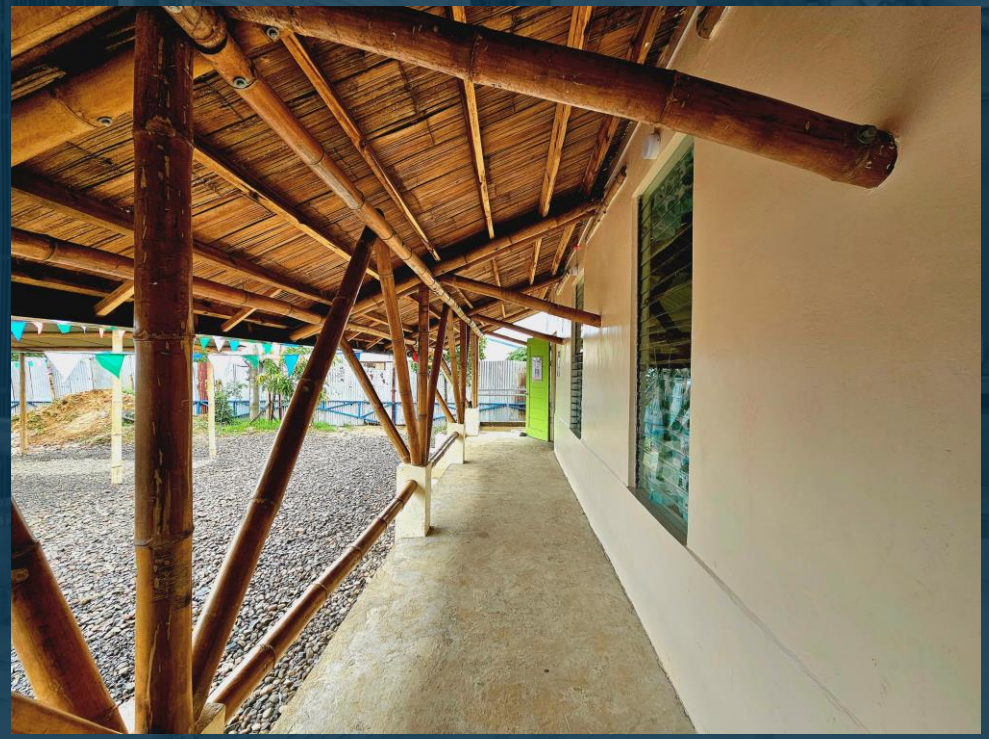
CBFT STRUCTURES
SPECIAL STRUCTURES

NON-RESIDENTIAL



School Building, Tacloban

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Projects

BASE has built over **2,000 homes** in **25+ communities** in the Philippines and over **400 homes** in **4 communities** in Nepal, and has **6 bamboo supply facilities**

Jaro

Lanit

Quezon City

Tacloban

Basey

Cabug

E. Samar

Sorsogon

Silay

Sicogon

Davao

San Carlos

2,000+
Houses

200
TESDA Certified Workers

6
Supply Facilities

25+
Communities

RESEARCH & INNOVATION

At BASE, innovation is at the forefront, with continuous research and development through the Base Innovation Center to optimize technology and explore new applications beyond standard housing models.

BASE INNOVATION CENTER

RESEARCH & DEVELOPMENT

Committed to continuous improvement and optimization of construction processes and procedures.

TRAINING & LEARNING

Conducting a series of training on CBFT and other housing solutions with an emphasis on quality and resiliency.

TECHNOLOGY TRANSFER

Providing and sharing the expertise on CBFT with partners.

BASE INNOVATION CENTER

Serves as a venue for numerous research and testing programs as well as training courses that engage other institutions and professionals with the objective of further propelling bamboo-based technology and other alternative building technologies.

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MATERIAL AND COMPONENTS TEST

Material

Connection

System

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PARTNER ORGANIZATIONS

Hilti Group

Local Universities

International Universities

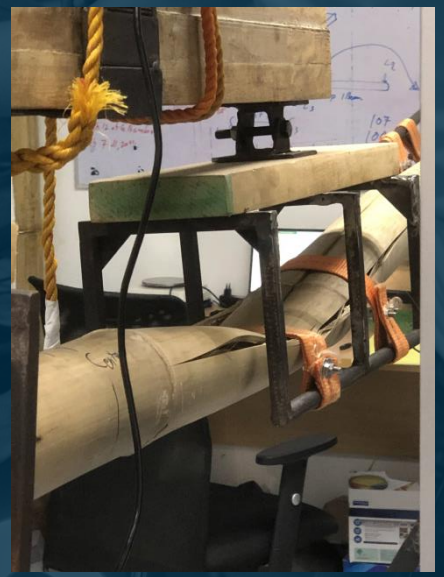
Other Institutions

BASE INNOVATION CENTER

CHARACTERIZATION OF MECHANICAL PROPERTIES

Mechanical properties of Bambusa Blumeana conducted with ISO 22157:2021

	fc	ft	fm	fv	ft,90	Em,0.05	Em,0.75	ρ
Characteristic Value	41.4	62.1	55.2	5.8	0.5	13.2	19,763.5	760.5
Allowable Value	20.7	31.1	27.6	1.5	0.1			
Samples Tested	322	60	159	217	101	147	147	900



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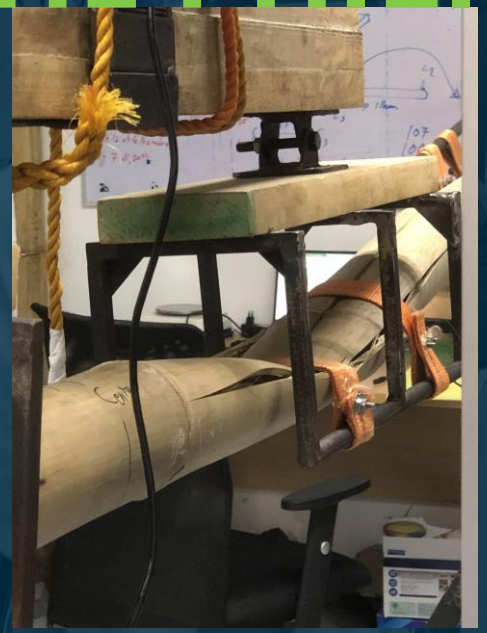
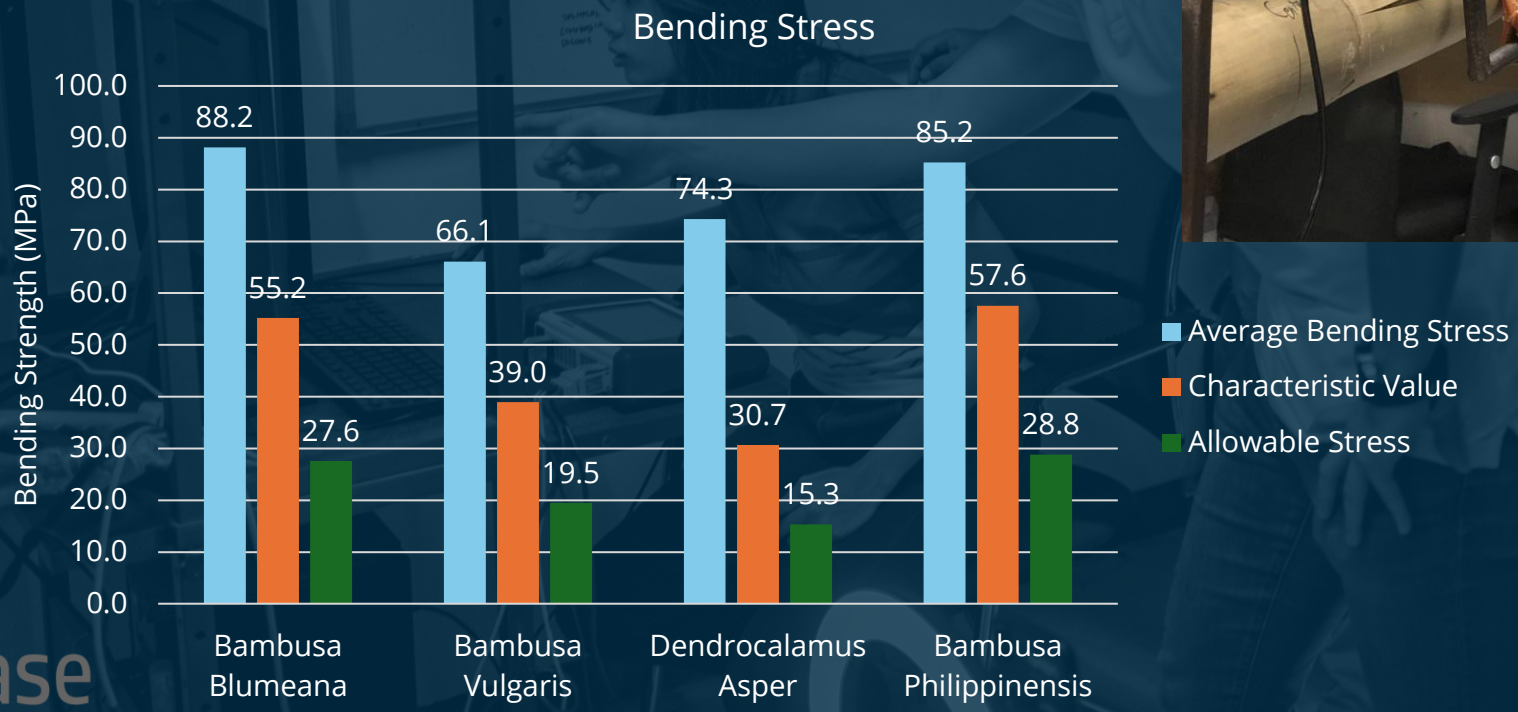
BENDING STRENGTH OF BAMBOO SPECIES IN THE PHILIPPINES

Total number of Samples Tested:

- 159 Bambusa Blumeana
- 32 Bambusa Vulgaris
- 30 Dendrocalamus Asper
- 30 Bambusa Philippinensis





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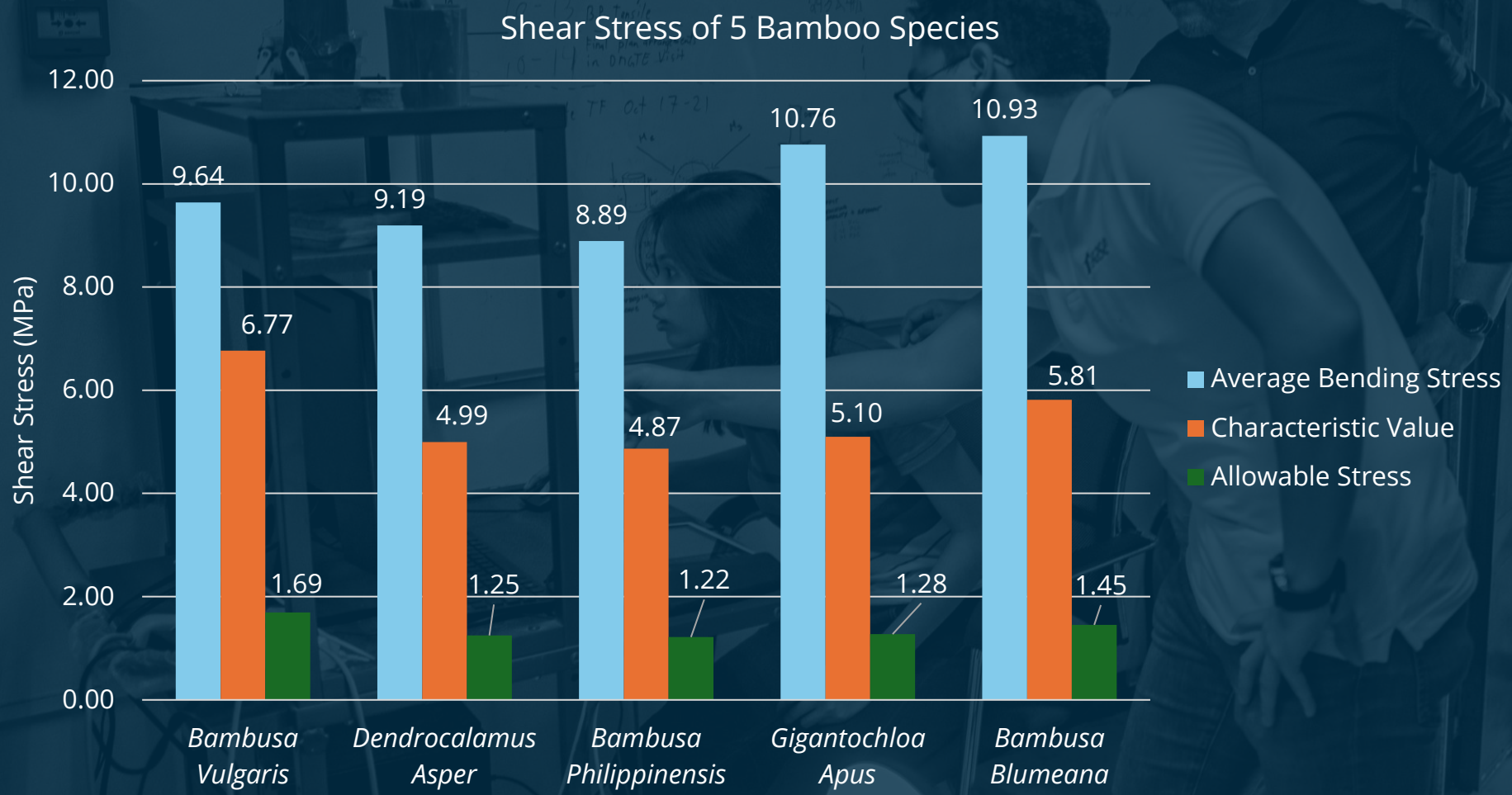
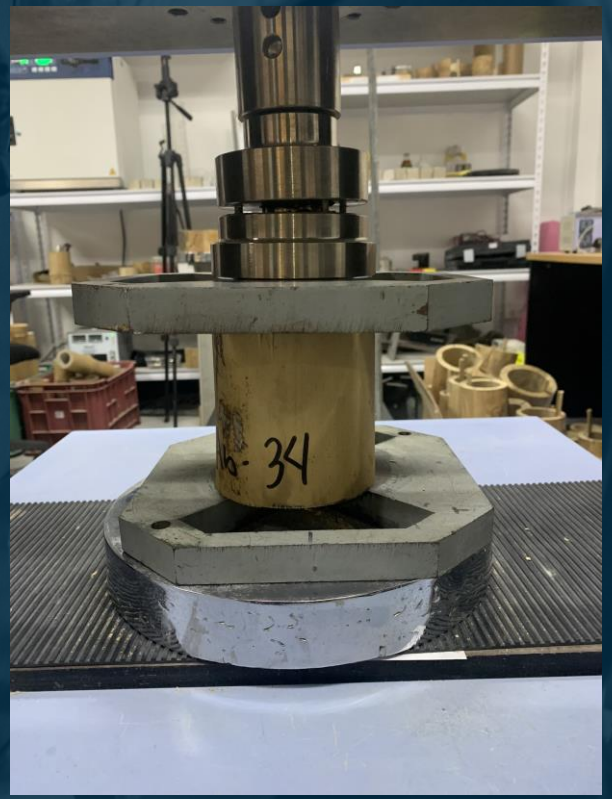
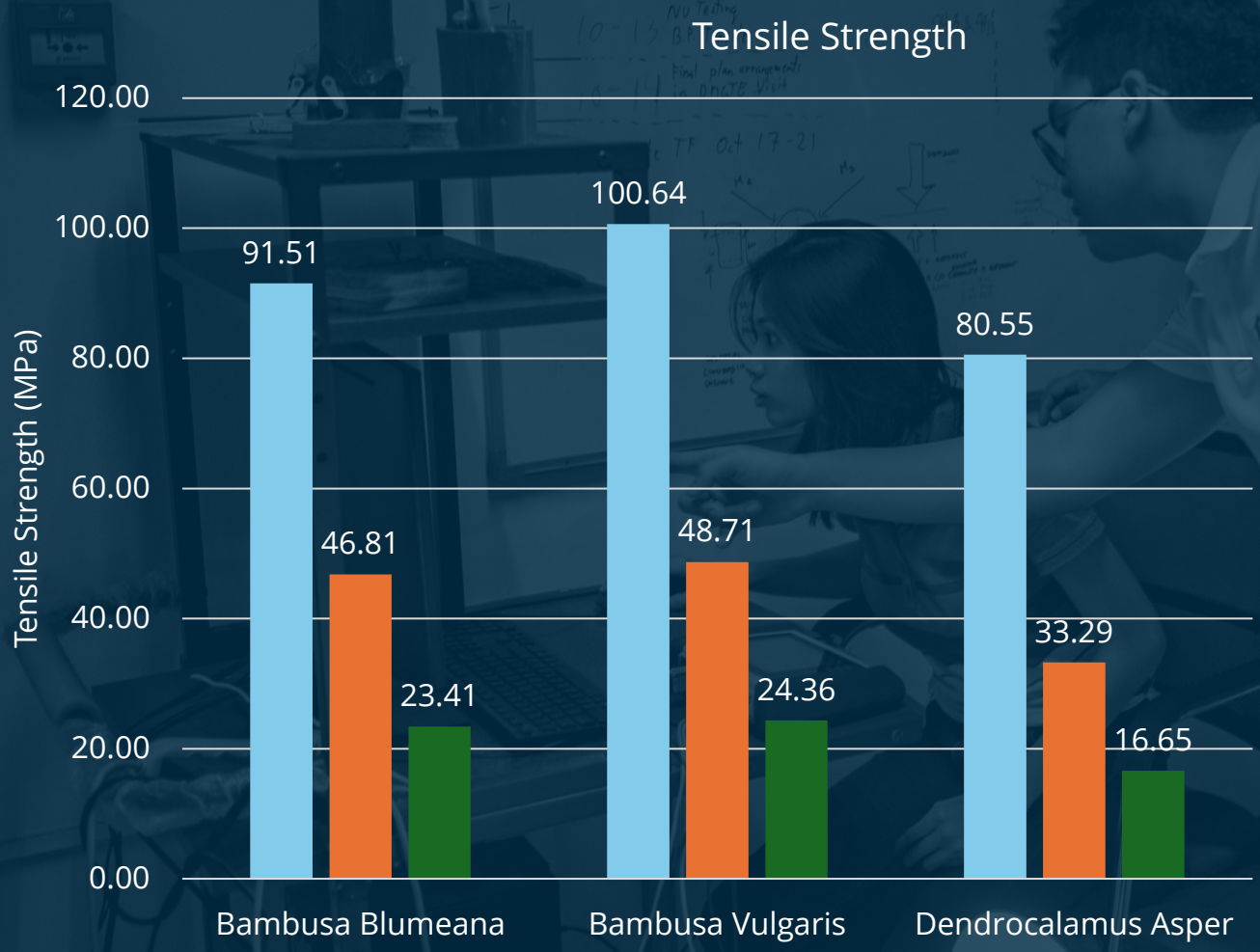
COMPARISON OF 5 BAMBOO SPECIES IN SHEAR PARALLEL



Total number of Samples Tested: 603 Bamboo Culms



COMPARISON OF 3 BAMBOO SPECIES IN TENSION PARALLEL



Total Samples tested: 262

- 101 Bambusa Blumeana
- 101 Dendrocalamus Asper
- 60 Bambusa Vulgaris

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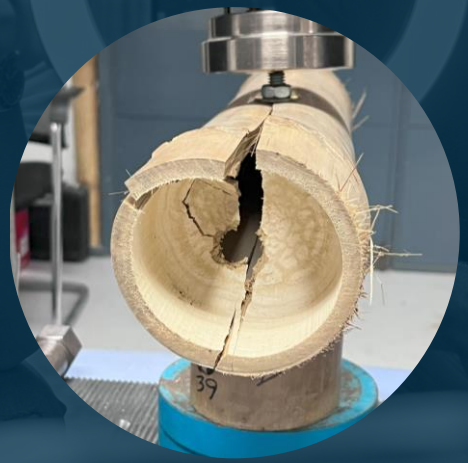
BAMBOO CONNECTIONS RESEARCH

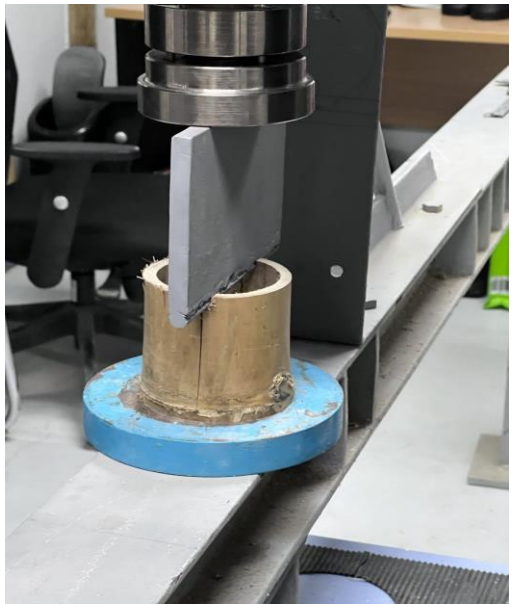
Research on Bamboo Connections:

- Characterization of Various Steel bolted Connections
- Steel plate for foundation connections
- Embedded Rebar Strength Connections
- Dowel Bearing Strength Resistance of Bamboo
- T-connections



Embedded Rebar

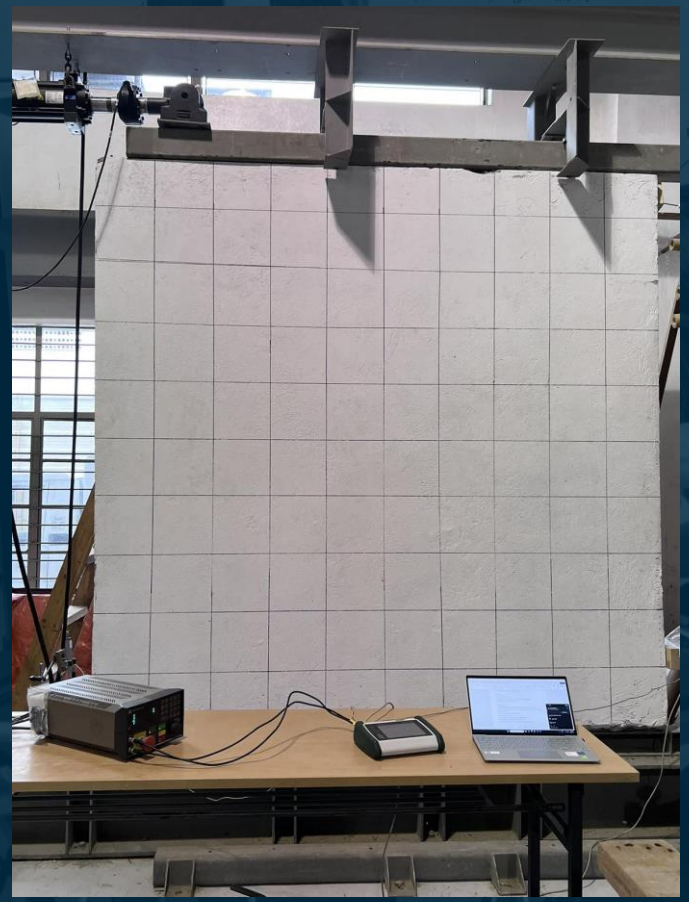
Dowel Bearing Strength

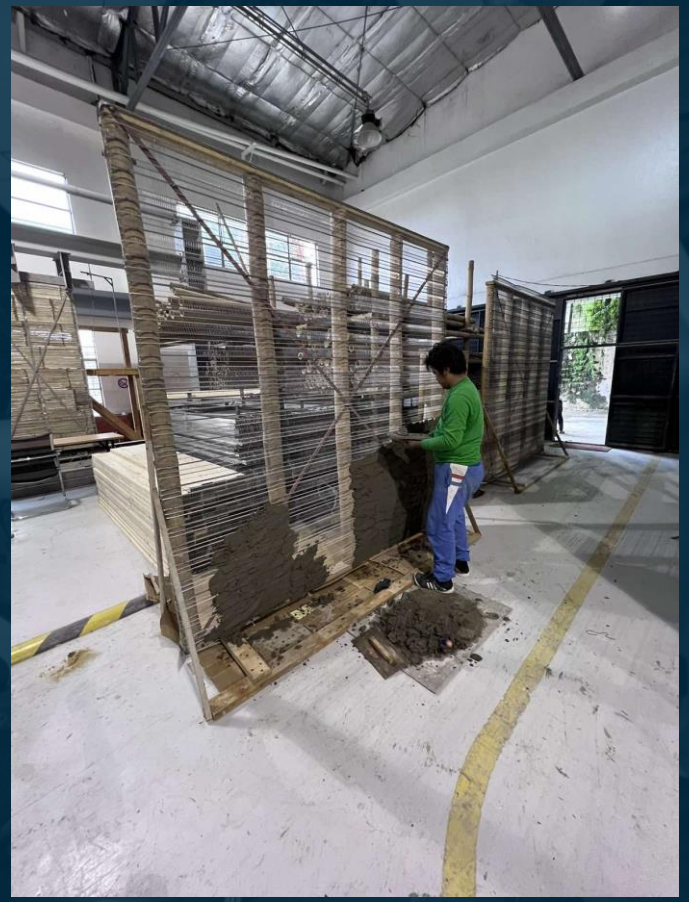


Steel Plate Connections

BAMBOO SHEAR WALL TEST

Cement Bamboo Shear wall 2.4m by 2.4m tests





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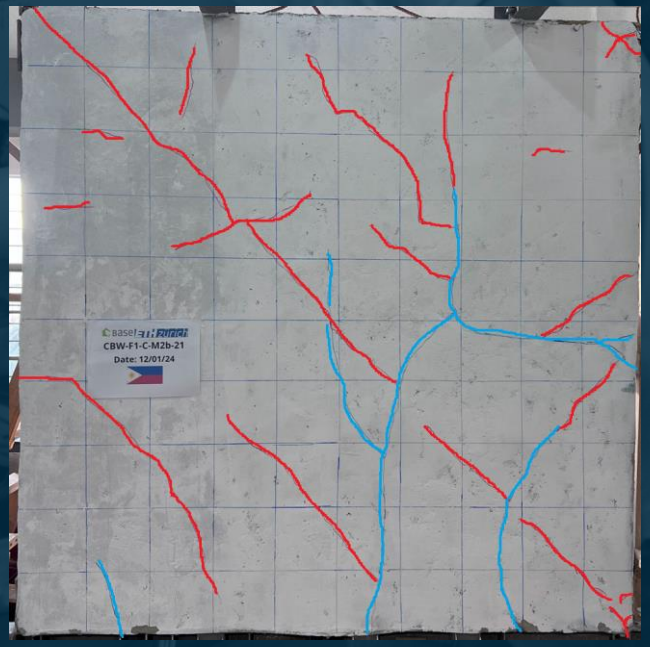
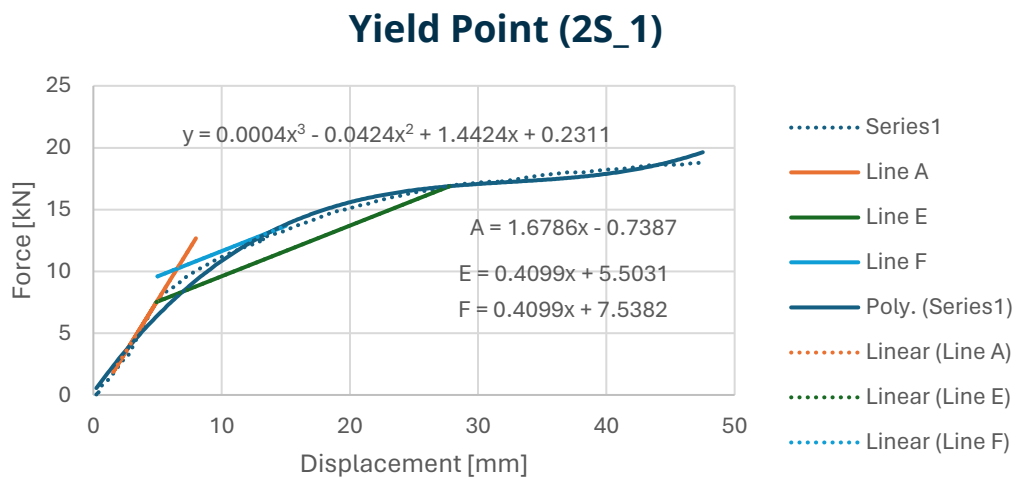
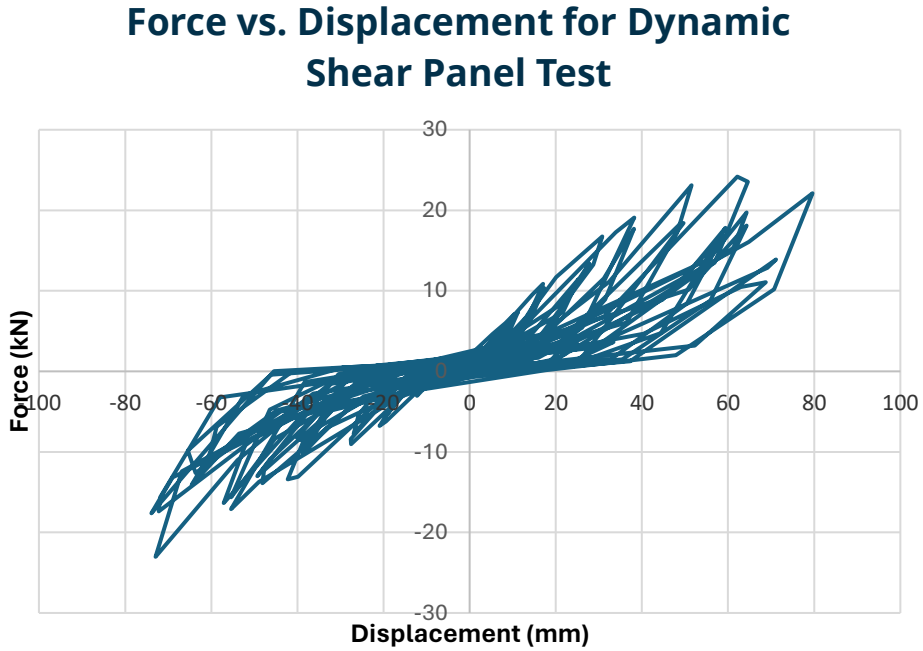
BAMBOO SHEAR WALL TEST RESULTS

Failure modes

Diagram of Cement Bamboo Frame Panel with markings on Crack Propagation:

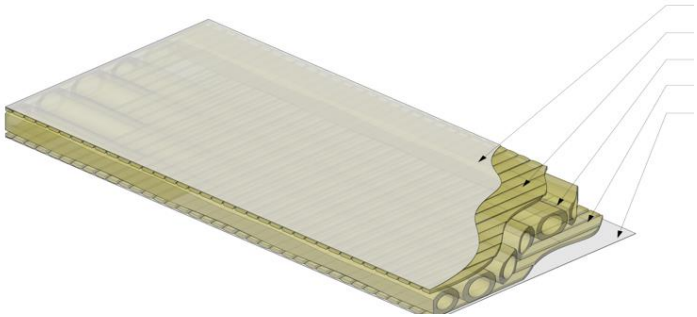




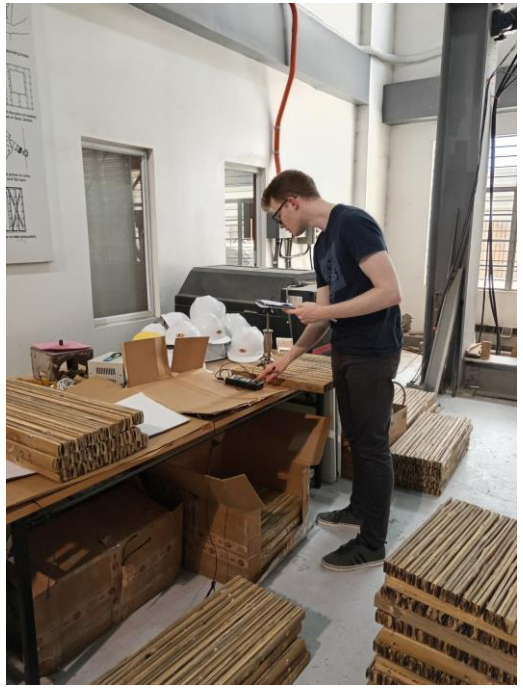


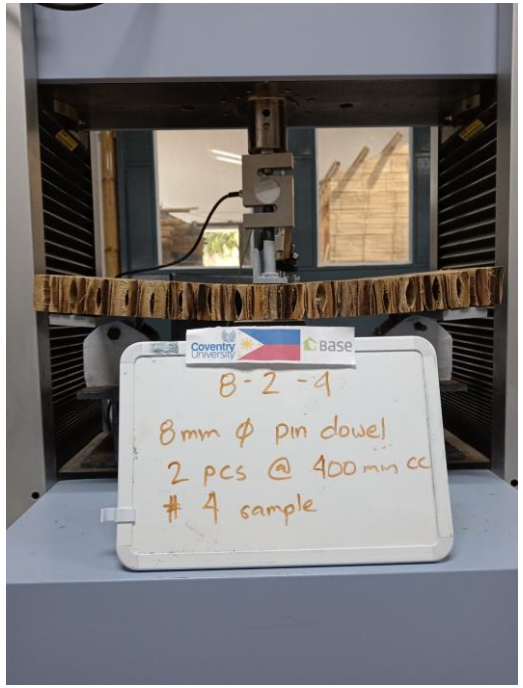
RESEARCH PARTNERSHIP
ALTERNATIVE BUILDING TECHNOLOGIES

Mass Bamboo research



Slat-dowel bearing panel (Pinboo) Research





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VIRGINIA TECH

KAWAYAN COLLECTIVE

AOF FOUNDATION

Coventry University

Universidad del Valle

RESEARCH PLANS

- Completion of Characteristic Value for Bambusa Vulgaris - **MAPUA**
- Static and Dynamic Tests on Bamboo Shear walls with Riblath and Flattened Bamboo mesh - **ETH Zurich**
- Tests on most common bamboo connections
  - P – Connection
  - T – Connection
  - Q – Connection

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