1 – INTRODUCTION

1

1.1 – BACKGROUND

APU（Ritsumeikan Asia Pacific University)

- About 50% of the student body comprises of international students
- Students from 109 countries and regions (as of May 1, 2024)
- One in two faculty members is of foreign nationality
- The official languages of the campus are English and Japanese

Study in Three Distinctive Colleges

College of Asia Pacific Studies

College of International Management

College of Sustainability and Tourism

open April 2023

“Green Commons” was built for the opening of College of Sustainability and Tourism

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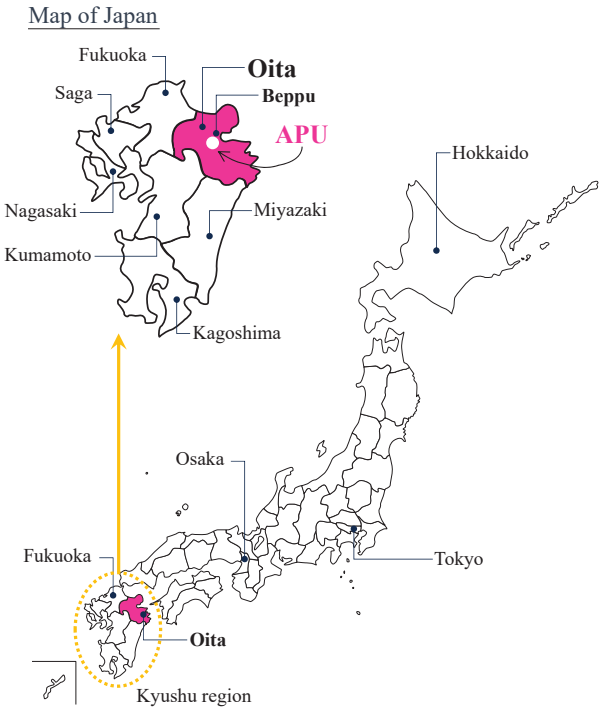
1 – INTRODUCTION

1.2 – SITE

APU is located on a hill at an altitude of 330m, about 10km from the city center of Beppu City, Oita Prefecture



Campus Overview(from the north)

Beppu hot spring

2 – ARCHITECTUAL CONCEPT

2.1 – BUILDING OVERVIEW

Main structure	: **Steel structure・Wooden structure**
Number of floors	: **3 floors**
Maximum height	: **15.0m**
Site area	: **345,137.26m²**
Building area	: **2,802.02m²**
Total floor area	: **6,495.95m²**
	（Wooden structure：1430.28 m²）

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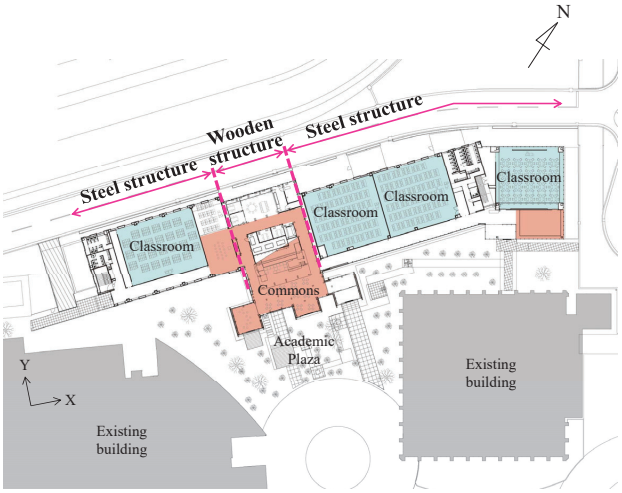
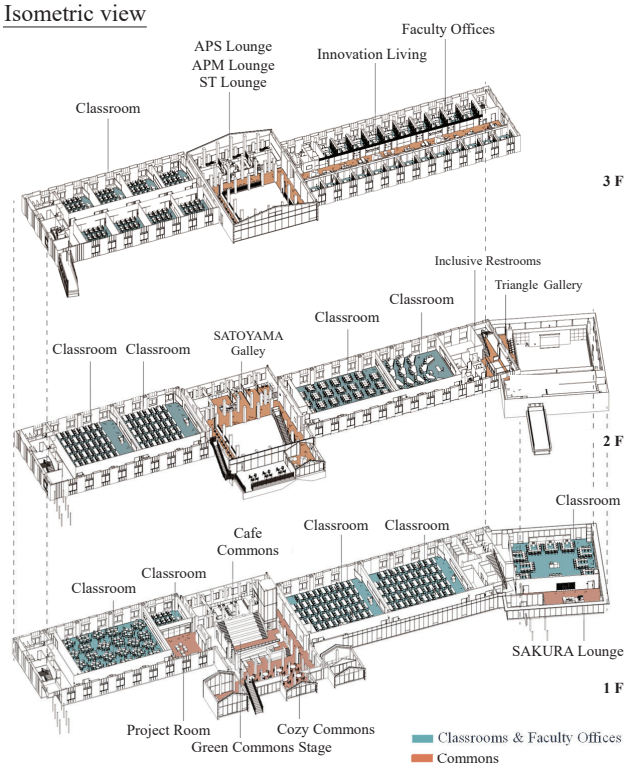
2.2 – PLAN

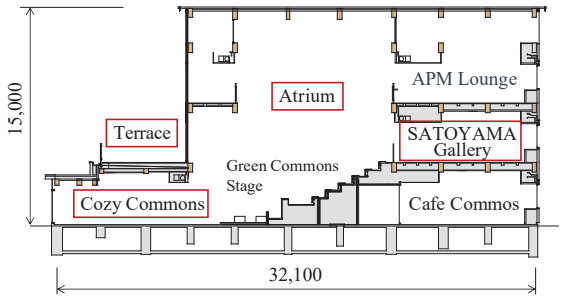
Layout Plan



Isometric view



2.3 – Section(Wooden structure)



Atrium

Cozy Commons

Terrace

SATOYAMA Gallery

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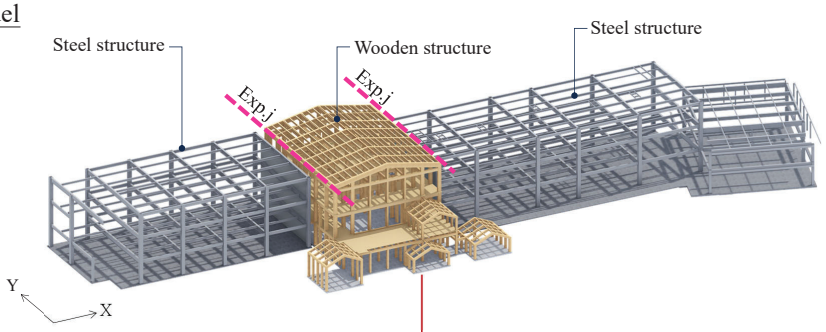
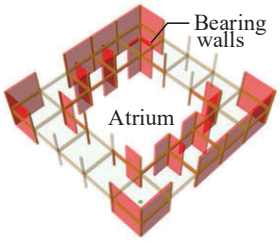
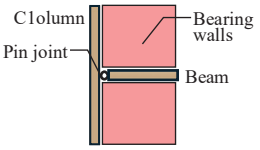
3.1 – STRUCTURAL CONCEPT

Structural model



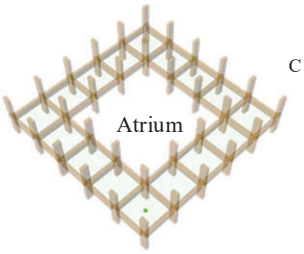
Japanese conventional wooden structure

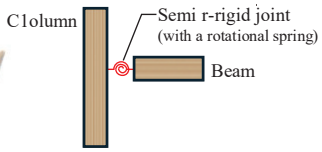




Japanese conven tional wooden frame

Wooden semi-rigid frame structure

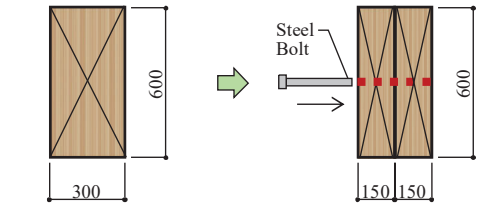




Semi-rigid frame

3.1 – STRUCTURAL CONCEPT

Example of combined member



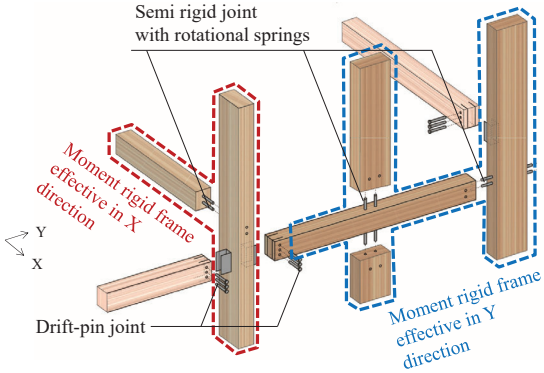
wide 300 × depth 600

(1) difficult to procure

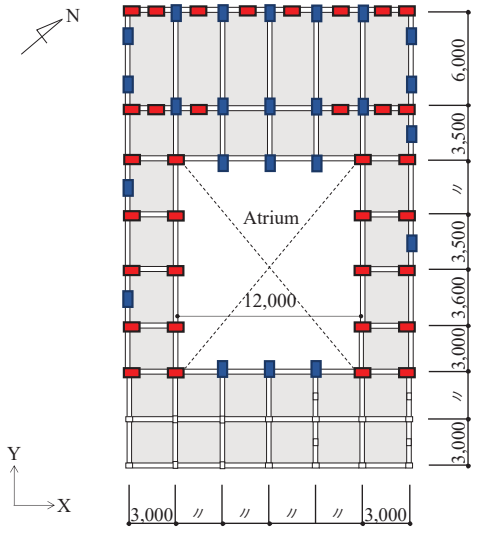
two combined members wide 150 × depth 600

(2) Easy to procure

Diagram of semi-rigid frame



Column layout plan



Legend
Moment rigid frame effective in X direction
Moment rigid frame effective in Y direction

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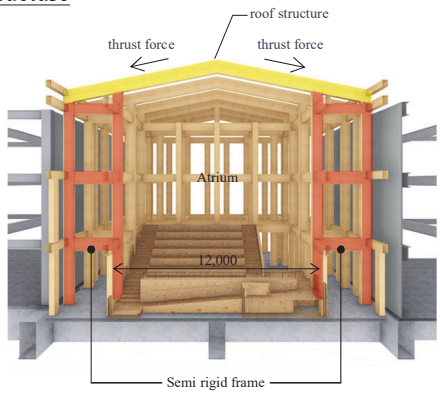
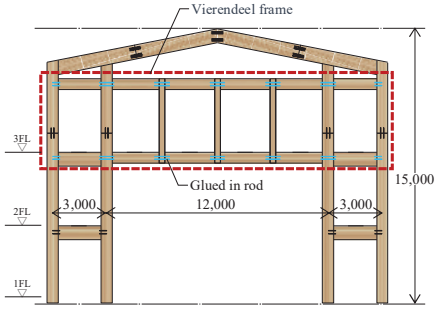
3.1 – STRUCTURAL CONCEPT

Roof structure



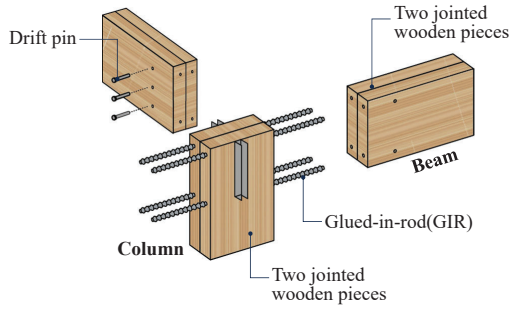
Vierendeel frame structure



View of three-story open atrium

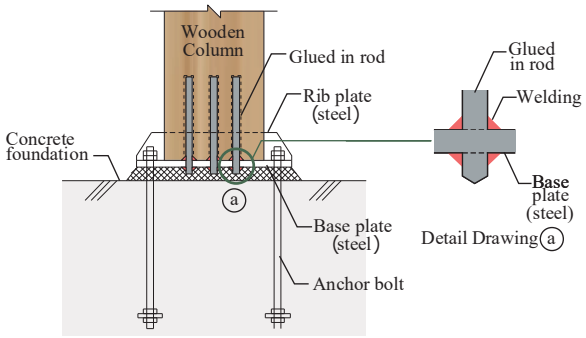
3.2 – CONNECTIONS

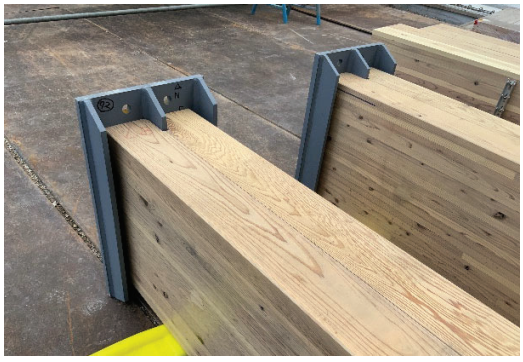
Column-beam joint



Rod(Steel bolt)

Column base detail





Installation of base Plate

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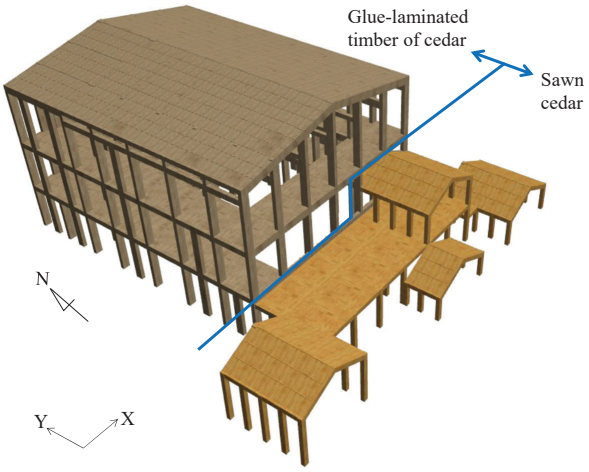
3.3 – MATERIALS

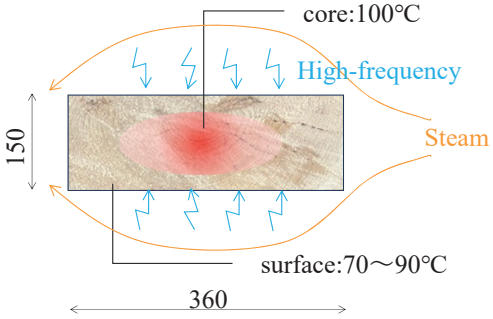
Diagram uses of wood

- ***Japanese cedar*** (Sugi) constitutes ***the majority of tree*** species cultivated in western Japan
- ***Glue-laminated timber*** for the three-story parts
- ***Sawn cedar*** for the single-story parts
- ***Size 150mm-wide***, lumber in the Kyushu region
- ***95% of the wood*** used in the structure is cedar from Oita Prefecture
- The process from ***timber harvesting to processing*** in the Kyusyu region



3.4 – WOOD DRYING ON SAWN CEDAR

- Lumber with *a moisture content of* ***15% or less***
- Cross-section ***150mm wide ×360mm depth***
- Lumber contain pith
- Lumber with pith is known that it causes cracks on its surface
- ***"Hybrid Drying by High-frequency Heating"*** a method that combines steam drying through heating and internal heating through high-frequency heating
- ***Reduction of wood drying cracks***
- Checking for ***internal drying cracks***



Cutting test pieces

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3.5 – FIRE RESISTANT DESIGN

Building Control in Japan

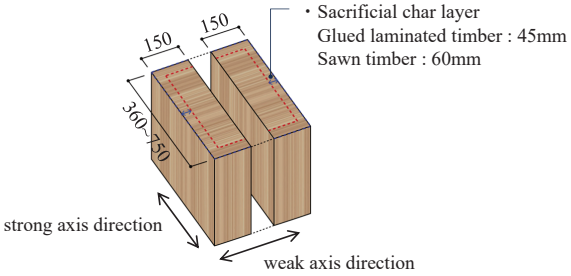
Fire Safety

- **Fire- resistive construction**
  It is required not to collapse in case of fire（1～3 hours heating)

- **Quasi fire-resistive construction**
  It is required *not to collapse for required time*※ while people evacuate in case of fire
  ※45 minutes, 60 minutes
  It is *allowed to collapse* after the fire

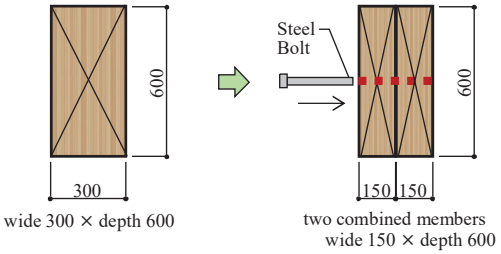
Char layer design for 60 minutes
The structure is not collapse even if the timber burns and carbonizes for 60 minutes

Char layer design for 60 minutes



4.1 – PROCUREMENT

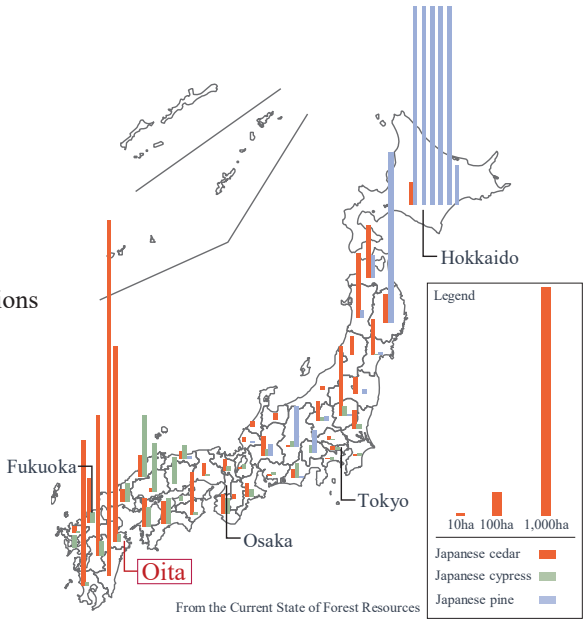
- There are *many Japanese cedar* in Oita Prefecture
- Focus on ***local production for local consumption***
- Collaborating with *local lumber companies*
- Developing a system that
  maximizes the use of ***local wood materials***
- *Rectangular cross-sections with* ***150mm width***
- ***Combining two to three pieces*** of rectangular cross-sections



wide 300 × depth 600

two combined members
wide 150 × depth 600

Distribution of forest in Japan



From the Current State of Forest Resources

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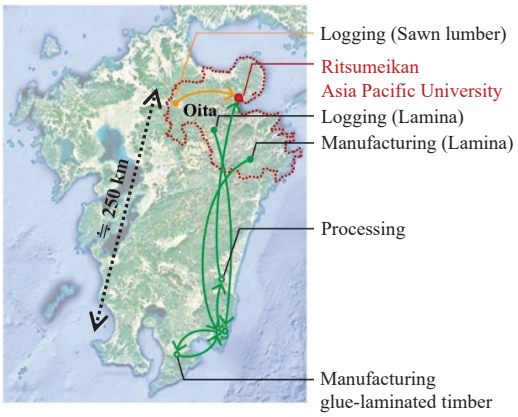
4.1 – PROCUREMENT

- ***Efficient wooden component production***
- Cost reduction, *minimization of* ***transportation distance***
- Materials from Oita Prefecture
  for ***more than 95%*** *of the about 450m³*
- Not only the structure,
  but also ***finishing materials, furniture, and signage***
- ***Traditional bamboo crafts*** from Oita Prefecture

Flow of timber



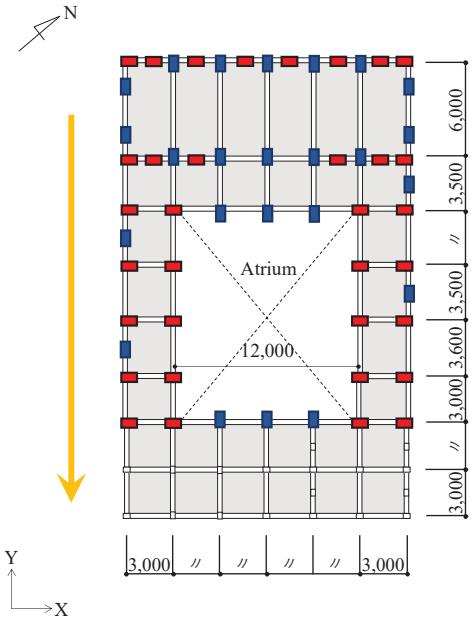
Finishing materials

Furniture(table)

Bamboo crafts(lighting fixtures)

4.2 – CONSTRUCTION

Construction from north to south



Mock-up of adhesive injection

Installation of glued-in-rod (beam)

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4.2 – CONSTRUCTION

- ***Pre-assembling roof beams*** of the top of the atrium
- ***Traceability*** and thoroughly manage everything ***from logging to processing and construction***
- ***International forest certification*** for project(FSC)

Construction of roof beams

Pre-assembly yard

Providing students with opportunities for observation and hands-on experience

Forest tour

Traditional frame work completion ceremony

Japanese saw experience

Traditional frame work completion ceremony (Mochi maki)

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Bright and open atrium space

Three-story open atrium

Providing the attractive Japanese wooden space for multinational students

Seats around the atrium

Cafe

Cozy Commons

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