

# Structural Engineering Laboratory

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Key words	Shell, Spatial structures, Seismic design, Buckling, FRP, Hybrid structures, FBG, SHM

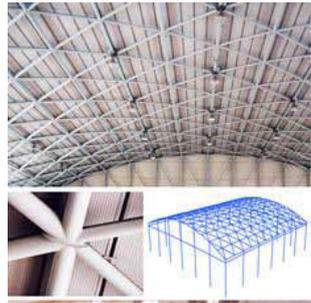
Research topics are as follows:

- 1) Seismic and Buckling Design Methodology of Shell & Spatial Structures
- 2) Structural Design of FRP Structures
- 3) Reinforcement and Strengthening for Steel Members using CFRP
- 4) Structural Health Monitoring using Fiber Bragg Grating Sensor

## Theme 1 ▶ Buckling and seismic response behavior of shell and spatial structures

For the design of shell-like space frames located in seismic area, it is very important to give considerable attention to the dynamic and buckling behavior. However, for single layer latticed cylindrical roof structures, it has not been enough to make clear their dynamic responses during earthquake and to estimate the load carrying capacities. Also, it is well-known that metal shells and shell-like lattice frame structures have buckling behavior which is very sensitive to initial geometric imperfections. Our research interests are as follows.

- 1) Buckling behavior of thin-walled cylinders
- 2) Buckling behavior of latticed shell structures
- 3) Seismic response behavior of shell and spatial structures and its seismic design methodology



Single layer latticed cylindrical shell structure

## Theme 2 ▶ Fundamental study on FRP material for building and civil structures

FRP material has good characteristics such as light-weight, high-strength and high-corrosion resistance. Light-weight structure possesses some advantages over the seismic load and rational constructing procedure. Our research interests are as follows.

- 1) Mechanical characteristics of bolted and adhesively bonded joint for FRP
- 2) Effects of reinforcement using CFRP
- 3) Design method of FRP structures
- 4) Long-term characteristics of FRP materials and FRP structures



Bolted joint consisting of FRP and steel gusset plate

## Theme 3 ▶ Structural health monitoring

Structural health monitoring (SHM) is developed in order to detect the degradation of the structural mechanical performance.

We have been performing the vibration monitoring by using the recently developed fiber Bragg grating (FBG) sensors. Our research interests are as follows.

- 1) SHM using FBG accelerometers for buildings
- 2) SHM using FBG sensors for steel bridges
- 3) SHM using FBG sensor for adhesively bonded layer
- 4) SHM using wireless sensor system



SHM system using FBG accelerometer in Toyohashi Tech.