

## Laboratories

# RIAS Built Environment Control Laboratory

**Lab Manager:**

Prof. Luigi MAFFEI

**Location:**

The RIAS Lab is located in the Municipality of Frignano, in Via I Maggio, a few kilometres from the Abbey of S. Lorenzo ad Septimum, home of the Department of Architecture and Industrial Design.

**Main Laboratory Activities:**

The RIAS Built Environment Control Lab was founded from the technical-scientific synergy of professors and researchers of the Department of Architecture and Industrial Design of the University of Studies of Campania “Luigi Vanvitelli”. It carries out teaching support activities, experimental studies and scientific research. It provides services to other universities, local authorities, research institutions and Industries, through tests and experiments in the lab, in situ activities and simulation analyses.

It includes the following 4 main sectors:

1. Acoustics and Vibrations;
2. Energy and Lighting;
3. Surveying, Representation and Communication of Architecture and the Environment;
4. Structures.

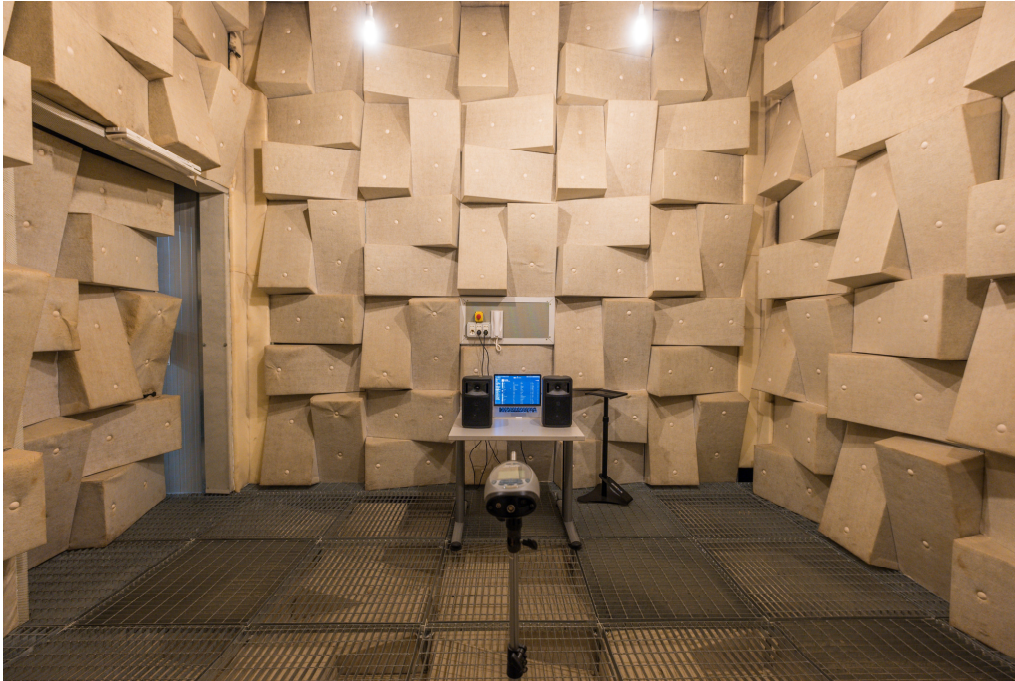
**Acoustics and Vibrations Sector:**

The “Acoustics and Vibrations” sector mainly carries out theoretical, computational, experimental and design activities in the field of acoustics and vibrations. In particular, it deals with the measurement, analysis, numerical modelling and evaluation of vibro-acoustic problems in the environmental, architectural, construction, industrial and material fields, both in a traditional way and through the development and application of new multisensory human centered design methods in real or virtual controlled environments.

The main activities can be summarized as follows:

- acoustic mapping and acoustic/vibrational monitoring;
- forecast assessment of the environmental impact of infrastructures and plants;
- assessment of exposure to noise and vibrations in the professional environment;
- development and characterization of eco-compatible materials for sound absorption, sound insulation and vibration damping;
- applications of innovative methodologies to support acoustic impact studies and urban acoustic design;
- acoustic analysis and simulation of speech and music environments;
- acoustic analysis and simulation of ancient Greek-Roman theaters and historical opera houses;
- monitoring, analysis and simulation of the soundscape of quiet areas;

- evaluation of product Sound Quality;
- noise vibration and Harshness applications;
- end of line fault diagnosis.



### Energy and Lighting Sector:

The “Energy and Lighting” sector is able to offer research and training activities in the theoretical analysis, simulation, experimentation and design in the field of energy efficiency of buildings, renewable sources and polygeneration plants as well as natural and artificial lighting. In particular, the experimental and dynamic analysis systems of domestic cogeneration systems, absorption and electric refrigeration machines, gas heat pumps (GHP), natural and artificial lighting systems for confined spaces, smart windows, double-skin facades and design of LED lighting fixtures.

The main activities can be summarized as follows:

- experimental analysis and dynamic simulation of double skin facades, with particular reference to systems based on the use of innovative materials and production processes;

- experimental analysis and simulation, with the aid of software and scale models, of buildings and devices for the correct use of natural light;
- experimental analysis and simulation of artificial lighting systems for confined spaces and public lighting;
- experimental analysis and simulation of LED lighting equipment;
- experimental analysis and dynamic simulation of smart windows, with particular reference to electrically controlled glasses;
- experimental analysis and dynamic simulation of micro-cogeneration systems, machine small absorption, bivalent gas heat pumps and related components;
- dynamic simulation of integrated building-plants systems under varying conditions operational and control logics.



**Survey, Representation and Communication Sector of Architecture and the Environment:**

The activities carried out in the field of “Survey, Representation and Communication of Architecture and the Environment” are functional to the knowledge, multi-scale and multidimensional, material and immaterial, of architecture, industrial design, the city, the landscape, the environment both in terms of survey and representation of data, and design of visual and/or multimedia communication systems for the organization of data acquired in a technical, educational and informative environment. In particular, disciplinary skills, moving from the awareness of scientific sources and cultural trends regarding the innovation of ways and techniques of knowledge and representation, can be summarized both in relation to studies on historical and contemporary heritage:

- graphic analysis of architecture, city, environment, object;
- multidimensional survey of architecture, city, environment, object;



- representation of architectural, urban, environmental and object data;
- management and visualization of databases;
- design of graphic and multimedia environments.

#### Structures Sector:

The sector is able to offer research and training activities in numerical analysis, experimentation and design in the field of seismic safety, structural adjustment, consolidation and static restoration of artefacts and infrastructures. In particular, it deals with the design, processing and experimental verification of the most appropriate solutions, and/or targeted research actions, using the results obtained through specific laboratory equipment.

The main activities can be summarized as follows:

- theoretical and experimental behaviour of masonry structures;
- experimental behaviour and damage to reinforced concrete structures;
- analysis of steel structures and seismic protection techniques of structures through metal devices;
- analysis of wooden structures;
- survey and vulnerability of cultural assets (churches, large statues, archaeological sites);
- testing of isolation devices at the base;
- evaluation of the deterioration of the structures;
- materials and techniques for the consolidation of structures.

#### **Main Equipment:**

##### Acoustics and Vibration Sector

- Anechoic chamber 5m x 5m x 5m;
- Analyzer sound level meters SOLO + calibrators CAL01;
- Acoustic outdoor monitoring systems SCS S003,
- Long term acoustic monitoring system WEB oriented Opera;
- Multichannel card: Symphonie (2ch); Sqobold Head Acoustic (2ch); NI USB 4432 (4ch);
- Audio recorders: ZOOM H6 (6ch); Microtrack II;
- Mannequin Mk1 Cortex;
- Binaural headphones BHS II Head Acoustic;
- Microphone Soundfield SP200;
- Directional microphone Røde NTG 2;
- Sound reproduction systems: MOTU 828 Mk3 Hybrid Firewire; db Opera 415; db Active Speakers; Monitors Dynaudio - Bm5a Mk2; Sub Dynaudio BM9S; Omni Pecker Sound;
- Kundt tube (Impedance) ISO/ASTM. SCS 9020B. Measurement of the absorption coefficient, reflection, impedance  $Z_s$ , admittance.  $D = 100\text{mm}$  (60-1200 Hz) e  $45\text{ mm}$  (80-4000 Hz);
- System for determining the elastic modulus and damping SCS 9021. Oberst Method;
- System for the determination of the damping factor SCS 9022. SAE method;
- System for determining the flow resistance of porous materials (ISO standard) SCS 9023;
- Dosimeter Wed 007 01dB;
- Whole body accelerometer. Whole Body Vibration Set AP5211;
- Hand / Arm accelerometer. Hand/Arm Adapter Set AP5221/3;



- Intensimetric Probe Probe 50AI 31334 + Intensity Calibrator;
- Impact noise generator;
- Labat clinical audiometer;
- Acquisition and analysis software: NI developer Suite; NI Sound and Vibration Toolkit;
- ARTEMIS Suite 7.3; dB ENV; dB Bati; dBFA Suite; dB Sonic; MATLAB 2018; OriginLAB;
- Modeling software and acoustic forecasting: SOUNDPLAN; ODEON;
- WorldViz Vizard Virtual Reality Software;
- Viewers for Virtual Reality: Oculus Rift; eMagin Z800;
- Motion tracking system: Polhemus Patriot 6 gdl, kinect.

#### Energy and Lighting Sector:

- 2 Twin Cell Tests for thermal, visual and acoustic characterization of smart windows and double-skin façade systems in real scale;
- Darkroom for photometric characterization of small lighting devices Artificial sky capable of reproducing the CIE "overcast sky";
- Heliodon for analysis of carried shadows;
- Heat Flow;
- Thermal Imaging Camera;
- Digital thermo-hygrometer with datalogger;
- Multifunction thermo-anemometer with datalogger;
- Combustion analyzer;
- Luminance;
- Multi-head Luxmeter;
- Video-photometer;
- Spectroradiometer;
- Spectrophotometer;
- Color meter;
- Microclimatic station for solar radiation detection and meteorological conditions Sensors ind speed sensor, Wind direction sensor, Barometer, Thermo-hygrometer, Pyranometer, Hot wire anemometer);
- Modeling and energy analysis software: TRNSYS 18, TerMus;
- Modeling software and lighting analysis: RADIANCE, DaySIM, DIALux.

#### Complex Representation Area of the Territory and Environment Sector:

- Digital aero-photogrammetric camera LEICA ADS40;
- Sensor LIDAR LEICA ALS50II;
- Hyperspectral and thermal sensors ITRES CASI 1500 e TABI 320;
- SLAR Terma sensor;
- Trimble GPS station 5700RTK;
- Trimble Space Station VX;
- Laser Scanner Sensor 3D RADAR Z+F Imager 5006h;
- Laser Scanner Sensor 3D TOF Trimble GX;
- Laser Scanner 3D CAM2 Platinum FaroArm;

- Thermal Imaging Camera FLIR SC3000;
- Reson multibeam sensor Seabat 8125;
- Nautec Persian ROV underwater;
- Sonardyne Scout USBL;
- Sub-bottom profiler Innomar SES2000.

**Structures Sector:**

- Machine for static/dynamic tests on structural elements and seismic isolation devices;
- Universal machine for tensile or compression tests, monotone and cyclic, on specimens;
- Machine for compression tests on samples/specimens in different material;
- System for sonic and ultrasonic investigations;
- SPR multi-frequency geo-radar system, geo-radar system for the acquisition of high-resolution 3D images;
- High precision digital pacometer;
- Concrete hammer for concrete structures;
- Instrumentation for corrosion analysis;
- Station for tests with flat jacks on masonry structures;
- Digital video-endoscope;
- High resolution and high sensitivity thermographic systems;
- Units and sensors for displacement and acceleration measurements.

The list includes some equipment purchased with funds constituting CRdC Benecon, Regional Competence Center for Cultural Ecology Economy, located at the same site as the RIAS Laboratory.

**Associated Research Groups**

- ACOUVI - Acoustics, Vibration and Multisensory Interactions;
- E3 - Energy Efficiency & Environment;
- Drawing, Survey, Representation, Structure, Communication of cultural heritage;
- Mechanics and Structural Safety.

**Reference Scientific Subject Areas:**

ING-IND/11; ING-IND/10; ICAR/17; ICAR/08; ICAR/09.

**Laboratory certifications:**

UNI EN ISO 9001: 2015

**Sector:**

IAF 35-34

**First certification:**

24 may 2007

**Last certification:**

Certificate n. 374aSGQ07 of the 29 may 2019

**Field of application:**

Multidisciplinary design and services for technical advice, research and teaching support to manage and control the built environment.



**CERTIFICATO N° 374aSGQ09**

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Si certifica che il  
This is to certify that

**Sistema di Gestione per la Qualità**

Quality Management System

messo in atto da  
implemented by

**UNIVERSITA' DEGLI STUDI DELLA CAMPANIA**

**"Luigi Vanvitelli"**

Viale Abramo Lincoln, 5 – IT 81100 CASERTA (CE)

**Centro per la Qualità di Ateneo**

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Sede Operativa di  
Operative Unit

**Dipartimento di Architettura e Disegno Industriale (D.A.D.I.): Laboratorio  
per il Controllo dell'Ambiente Costruito – Ricerca Applicata e Servizi Ri.A.S.**

Via San Lorenzo – 81031 AVERSA (CE)

Via I Maggio, 1 – 81030 FRIGNANO (CE)

per il seguente Servizio  
concerning the following Service

**Progettazione ed erogazione di servizi multidisciplinari di consulenza, ricerca, supporto alla  
didattica e prestazioni di servizi per il controllo dell'ambiente costruito**

Multidisciplinary design and services for technical advice, research and teaching support  
to manage and control the built environment

è conforme alla norma  
is in compliance with the standard

**UNI EN ISO 9001-2015 (ISO 9001-2015)**

Il presente Certificato è soggetto al rispetto delle condizioni stabilite dai Regolamenti per la Certificazione in vigore applicabili.

The Certificate shall satisfy the requirements established in the Rules for the certification in force applicable.

La validità del presente certificato è vincolata a quella del certificato n. 374aSGQ09

The validity of this certificate is bound by the certificate 374aSGQ09

In caso di discordanza tra le lingue utilizzate nella traduzione del contenuto del presente certificato, fare riferimento alla lingua italiana

In case of discrepancy between the languages used in the translation of the content of this certificate, please refer to the Italian language

**L'AMMINISTRATORE DELEGATO**

MANAGING DIRECTOR

*Roberto Cusolito*

Dr. Ing. Roberto Cusolito

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**ACCREDIA**

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