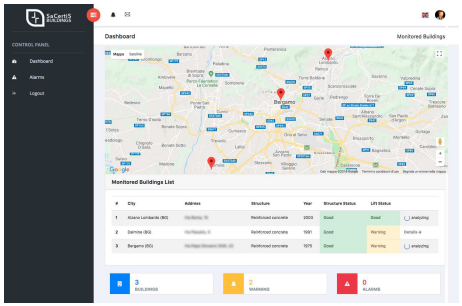
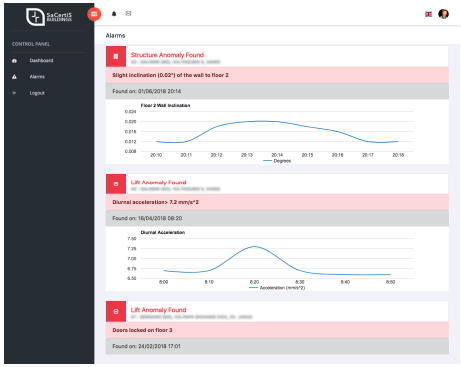
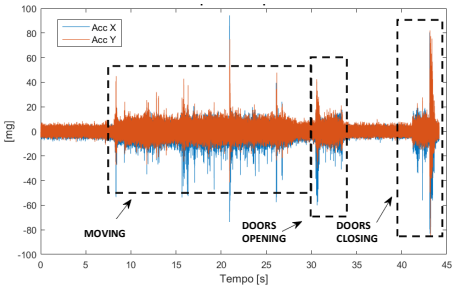
SAFE CERTIFIED STRUCTURE

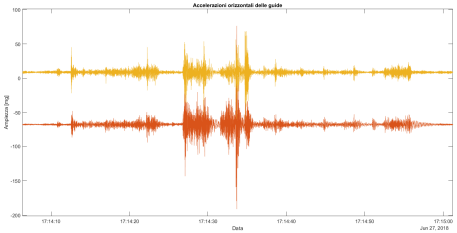
Building static and dynamic monitoring







Example of monitoring of an elevator.



Example of monitoring for a residential building.

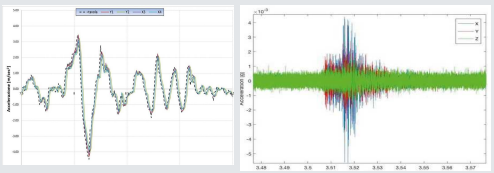
Sacertis has developed two types of monitoring for a typical concrete high rise building: static, to observe the variation in time of the stress distribution inside the individual pillars, and the Dynamic Identification of the structure to highlight any variation in normal vibration modes as well as to monitor any environmental vibration.

Such analysis allows to verify the severity of any damage caused by ordinary events (aging, excessive vibration induced by urban infrastructures) or extraordinary (earthquake, accidental or voluntary abatement of a pillar, a supporting wall etc.) and to accelerate the post-event evaluation of the safety standards compliance.

For this purpose, Sacertis is able to propose two low cost solutions:

- a set of accelerometers and clinometers to be installed on the main structural frame of the building to detect its vibrations and modal response
- patented sensor system to be inserted inside the columns and beams cross-section to measure the internal stress distribution.

These systems have been tested in University Excellence labs and are already installed in various facilities thanks to an important ecosystem of world leading companies in their reference markets (AXA, IBM , STMicroelectronics). A cloud communication system, coupled with real-time analysis of the retrieved data, allows to trigger alarms within a few seconds of the critical event. The cloud environment assures the scalability of the entire system.



Sacertis sensors recording of the Amatrice earthquake.

Of particular importance is the possibility to verify the state of the building during and immediately after any accidental events, such as earthquakes or floods, accelerating the post event evaluation of the building safety.

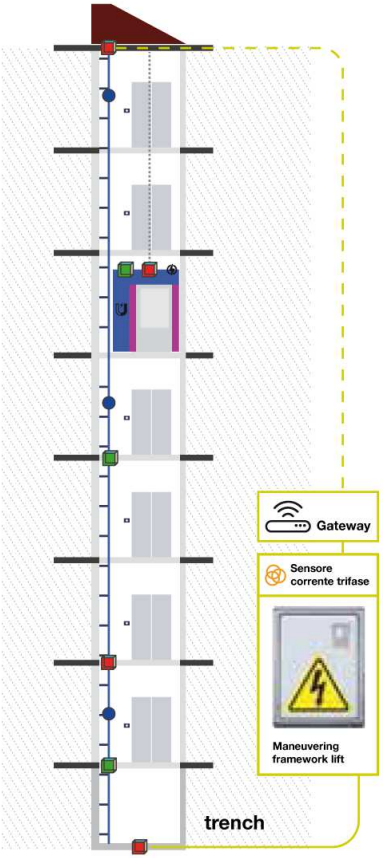
Data is processed on a cloud platform, where noise and all other external environmental influences (temperature, humidity, etc.) are immediately filtered; clean data are then compared to historical data to pre-set alarm thresholds. The analysis results are to be sent to the civil engineer responsible for the structural monitoring.

Thanks to the arrangement of the sensors along the elevator shaft and on the liftcage, schematically shown in the figure, it is possible to monitor both the static and dynamic response of the building and the performance of the elevator. In this way, through a 'real time' remote monitoring of all the operating conditions, it is possible to optimize the maintenance process of the elevator.

In addition to the continuous measurement of the operating parameters, the system is able, thanks to sophisticated algorithms, to statistically highlight potential and probable malfunctions which may degenerate to failures, potentially stopping the elevator.

Based on the data collected, sophisticated mathematical models can be developed and calibrated with the possibility to simulate variations in loads as well as catastrophic events, including seismic actions, by verifying the correspondence between the measured response and the expectations of the mathematical model. The cost of such analysis will depend on their complexity.

Predictive Maintenance strategies based of the proposed system will take advantage of the collection, elaboration, and analysis of the installed sensor data in the territory, reducing the risks of faults, failures, but most importantly, accidents.



Standard configuration

s-BB 3 | 3 floors
s-BB 6 | from 4 to 6 floors
s-BB 9 | from 7 to 9 floors

LEGEND

- Accelerometer sensor
- Accelerometer sensor
- Inclinometer sensor
- Magnetometer
- Powerline
- Gateway
- Three-phase current sensor

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