QUAKELOGIC

When earthquake hits
let your building react SMART

structural
health
monitoring

TDG

e-QUAKE®-SMART

Earthquake Warning and Automatic Reaction System

QUAKELOGIC

EARTHQUAKE EARLY WARNING SYSTEMS

P and S waves: When earthquake waves start propagating from its center and reach to a certain location on earth, they are sensed in 2 different types, called P waves and S waves. As P waves move faster, they arrive at a certain location earlier then the S waves. Time difference between the arrival of P and S waves increase, as the distance from the center of the earthquake increases. Early Warning Systems are based on sensing the smaller amplitude P-waves, seconds before the higher amplitude S waves arrive, and generating a warning in terms of seconds before the main shock strikes, which may be very important for taking a precaution.

E-QUAKE-SMART for BUILDINGS: Complicated early warning and general precaution systems can be designed for cities or geographical regions. E-QUAKE-SMART, on the other hand is rather a less complicated, easy to use earthquake warning and automatic reaction system, much more aims to trigger basic precaution reactions in a building when it senses the excessive shaking.

RECORDING DURING AN EARTHQUAKE: In addition to the early and emergency warning solution, the system automatically switches to recording mode in case of an earthquake, records the floor accelerations, top floor accelerations, and displacements of the building according to the sensor locations. The shaking level of the building during an earthquake can be viewed and analyzed in real-time from the control panel or via the web-based interface.

seconds matter
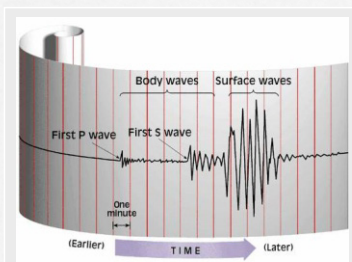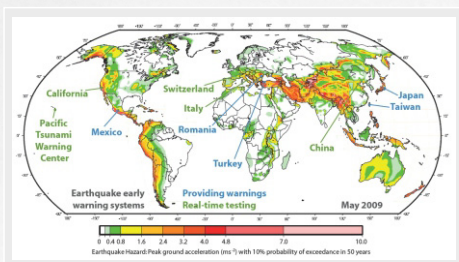
SCENARIO 1
RED ALARM
3 OF THE 4 SENSORS HAS BEEN TRIGGERED
17:23:46:992 11.12.2012
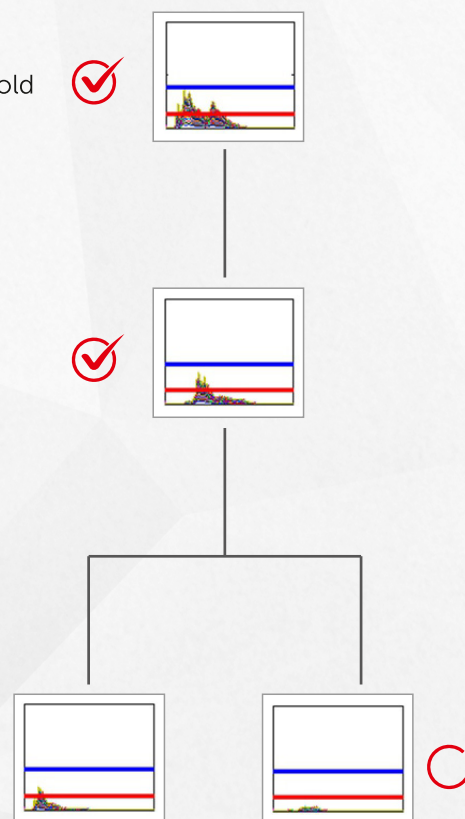
TYPICAL ALARM OUTPUT

If 3 North-South acceleration components of 4 sensor nodes passes the threshold value within a period of 2 seconds, Activate Red Alarm

QUICK & EASY INSTALLATION OVER ETHERNET
Ready to setup over the existing Ethernet network in the buildings

ARM
The system is online / Ready to Trigger

ETHERNET

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e-QUAKE® ARM

Triaxial Seismic Accelerometer Node
for e-QUAKE-SMART System

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STATUS

POWER   RELAY OUT

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TYPICAL INSTALLATION

eQUAKE-ARM: They are the sensors of the system. Generally, 4 sensors are installed in a typical high-rise building, one is located at the uppermost floor of the building, 1 at one of the middle floors and 2 at the basement. Up to 16 sensors may be located. ARMS also include relay outputs.

eQUAKE-SMARTBOX: This central control and alarm output unit is installed at the automation center or any other suitable location in the building.

PROGRAMMING AND ALARM OUTPUT: Pre-defined or user-defined alarm scenarios including different alarm levels, can easily be uploaded to the system either from a remote connection or locally.

7/24 REMOTE MONITORING: ADSL, Fiber, Mobile internet connections can be used to send the data to remote servers to be used by authorized people. Optionally a computer can be connected to the system for local monitoring

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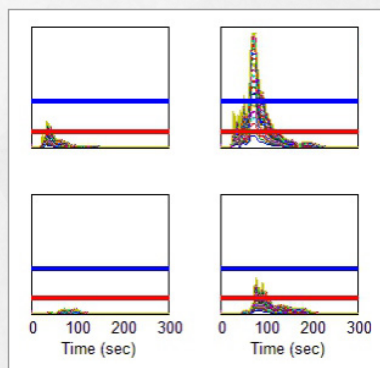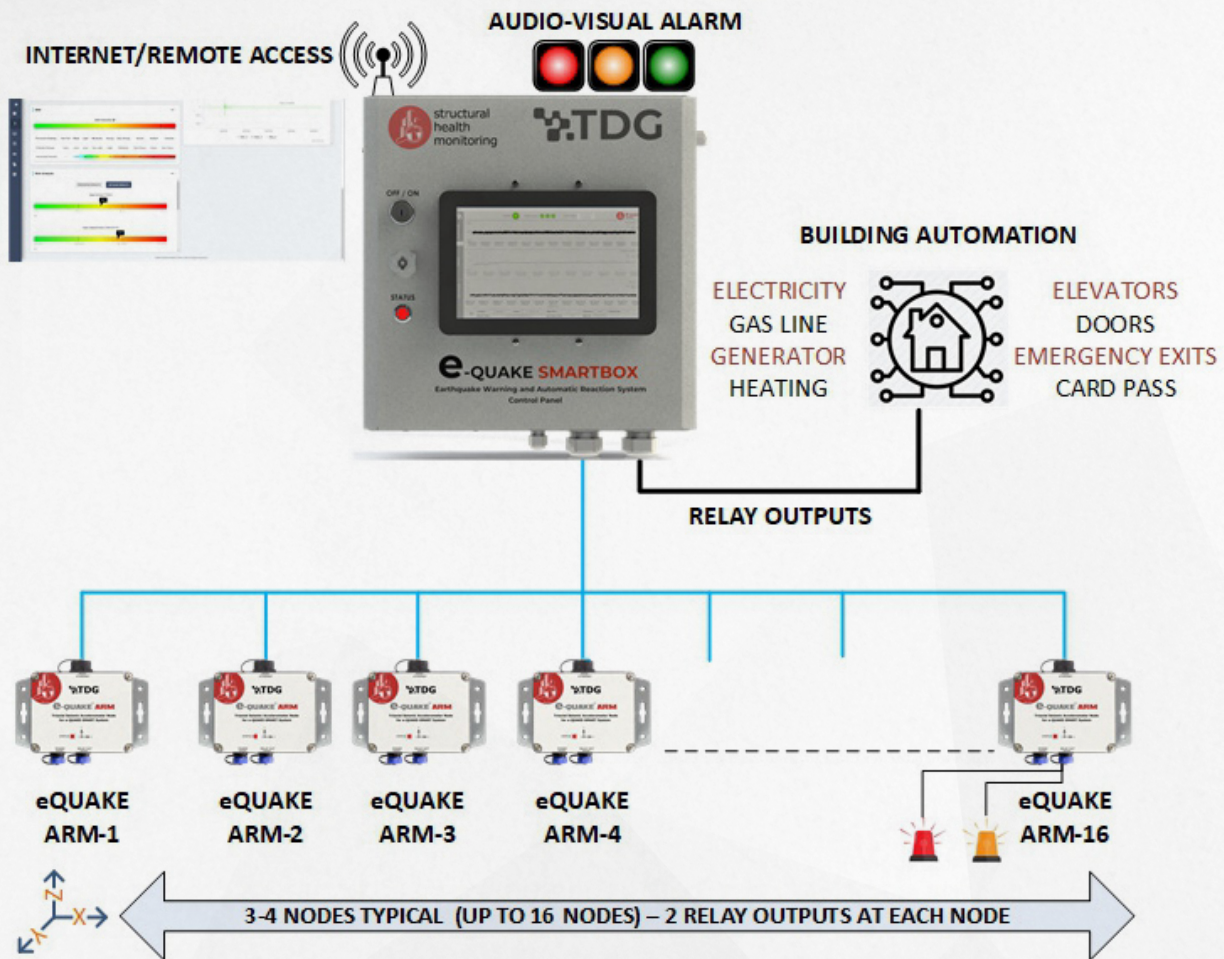
USER DEFINED ALARM SCENARIOS

- 8 Configurable threshold levels
- Selectable different alarm & earthquake intensity scales, RI, DI, MMI, MMI-Local
- P&S wave alarms
- False triggering cancelation
- Building automation system outputs
- Audio / Visual Warning / Siren Outputs
- Synchronized multiple sensor locations verification to avoid false triggers.
- Pre-defined scenarios
- User-defined flexible scenarios—Parameter / algorithm integration

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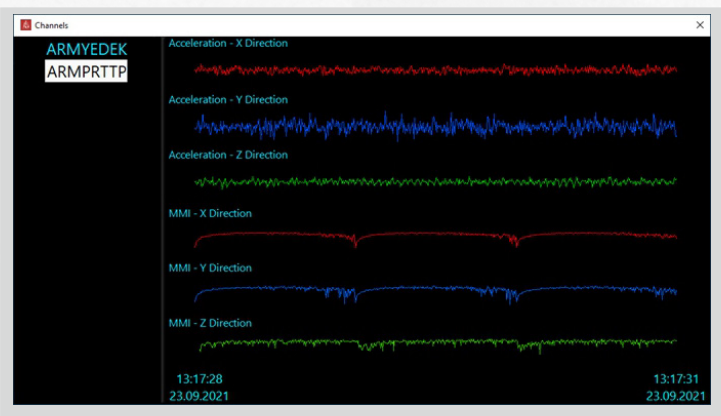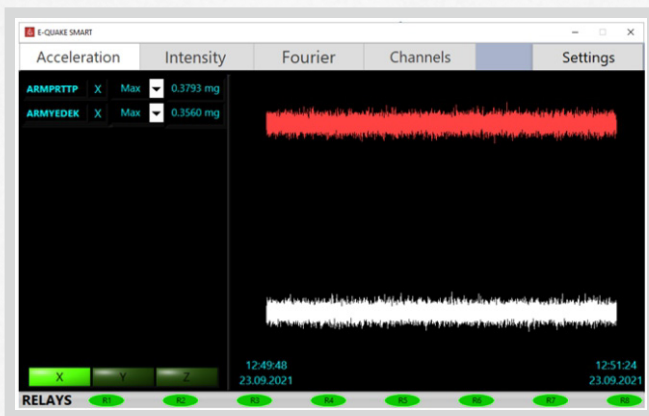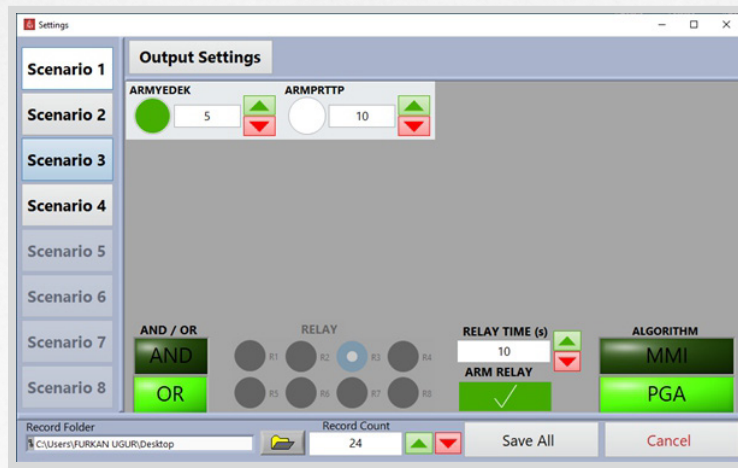
APPLICATIONS/TYPICAL SENSOR LAYOUTS

eQUAKE-SMART solution can be installed on different types of structures. The solution consists of eQUAKE-SMARTBOX (Control Panel) and complementary components such as Ethernet, ADSL, 4G, & optional PC, screen. Only the typical locations of the eQUAKE-ARM units, which are the sensors of the system, are shown below.
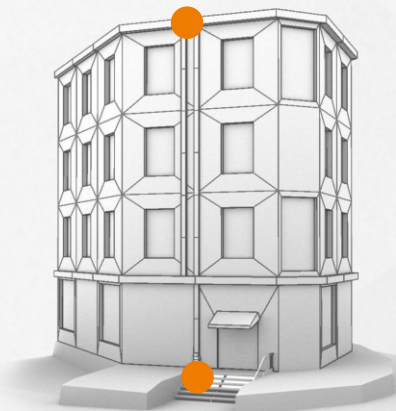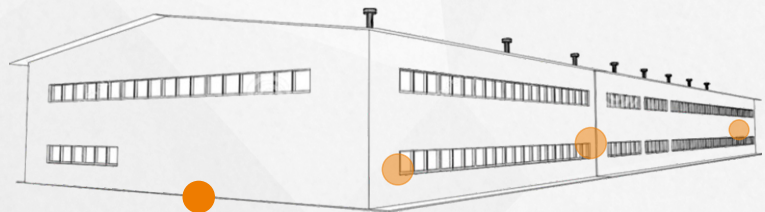
● eQUAKE-ARM (Sensors)

HIGH - RISE BUILDING / RESIDENCES / PLAZAS
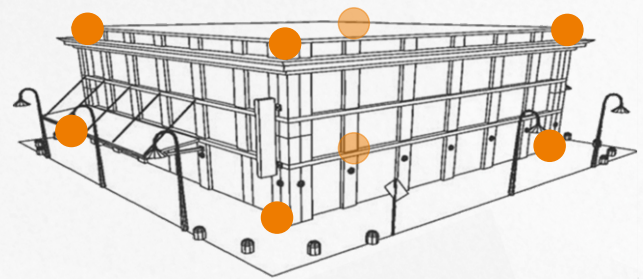
SHOPPING MALLS / BUSINESS CENTERS / AIRPORTS

FLATS / HOUSES

INDUSTRIAL PLANTS

Information: Above sensor layouts are for recommendation purposes. Specific layout plan will be appropriate according to the characteristics of each building.

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TECHNICAL SPECIFICATIONS

eQUAKE-ARM   (Acceleration Sensing & Reaction Node)

Measurement Performance

Sensor	3-Component Low Noise Seismic Accelerometer (North-South, East-West, Vertical)
Sampling Rate	62.5, 125, 250, 500, 1000 Sps Adjustable (Nominal 250)
Acceleration Measurement Range	±2g (±4g, ±8g Adjustable)
Frequency Range	DC-1000 Hz
Acceleration Resolution	4 µG
Time Synchronization	NTP Synchronization Between Arm Nodes ($<\pm2$ ms @250 Sps)

System Specifications

Communication	Digital / Ethernet (Cat 6) - RJ45
Digital / Relay Outputs	2 Normally Open Dry Contact (0-60VDC 0-400mA) /Siren Switching
Connectors	Power, Ethernet, Relay—IP67
Indicators	Status, Ambiance Warning LEDs
Siren / Flashing Lights	Not Included—Siren Output in each ARM Node
Power Requirement	8-20 VDC / 1.5 W Nom.—125 mA@12V
Power Protection	Over Voltage & Current, Low Voltage, Reverse Polarity Protections
Operating Temperature	$-30\ ^0$C - $+70^0$C
Size / Enclosure Type	157.5 x 90 x 58.5 mm, Plastic, IP67 Housing

eQUAKE-SMARTBOX   (Control Panel)

Number of Acceleration Sensor Nodes	Nu Typical 4 (maximum:16, minimum:1) eQUAKE-ARM
Number of Alarm Scenarios	8
Digital / Relay Outputs	4 Dry Contact Relay Outputs(220VAC/2A) Optional 8 Outputs
Optional Extra Digital Outputs	250V/8A, 250V/10A ve 250V/16A Relay Outputs
Siren / Flashing Lights	Siren / Flashing Light (Not Included)
Self-Recording Capability	Internal Memory / Optional USB Flash
Remote Connection	Internet Server (ADSL/4G/other) Multiple User Connection
Local Connection	Ethernet (Cat 6) - RJ45

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