



RESPONSE SPECTRUM

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Recent seismic alerts and warnings from researchers and agencies in Nigeria as regards earthquakes in the South-Western part of Nigeria have led to earthquake forecasts. A team of researchers forecasted an earthquake of magnitude 7.2 for the South-Western region of Nigeria in the year 2028 while another team of researchers forecasted an earthquake of ≥ 5.0 magnitude for 2028 in the same region.

In a bid to prepare towards these forecasted events, it is necessary to design subsequent upcoming buildings and equipment around the lines of fault in the South West to prevent these predicted

events.

A response spectrum is a function of frequency or period, showing the peak response of a simple harmonic oscillator that is subjected to a transient event.

Response Spectrum Analysis (RSA) is a linear-dynamic statistical analysis method which measures the contribution from each natural mode of vibration to indicate the likely maximum seismic response of an essentially elastic structure.

Response spectrum analysis provides insight into dynamic behaviour by measuring pseudo-spectral acceleration, velocity or displacement as a function of structur-

al period for a given time history and level of damping.

6 biggest earthquakes in recorded history

Kamchatka, Russia, 4 November 1952

1 (9.0) This earthquake generated a tsunami that caused widespread damage in the Hawaiian Islands. Property damage was estimated at around US \$1,000,000. Some reports describe waves of over 9 m high at Kaena Point, Oahu. A farmer on Oahu reported the loss of six cows to the tsunami, but no people were reportedly killed.

2 Bio-Bio, Chile, 27 February 2010 (8.8): This earthquake and subsequent tsunami killed at least 521 people, with 56 missing and 12,000 injured. More than 800,000 people were displaced with a total of 1.8 m people affected across Chile, where damage was estimated at US \$30 billion. The epicentre was 335 km south-west of Santiago, at a depth of 35 km.

3 Sumatra, Indonesia, 26 December 2004 (9.1): In terms of damage and loss of life, the scale of the disaster caused by the resulting Boxing Day Tsunami was enormous. In total, 227,900 people were killed or presumed dead, with around 1.7 million displaced over 14 countries in South Asia and East Africa.

4 Sendai, Japan, 11 March 2011 (9.0): So far, the official death toll stands at several thousand from the combined effect of the powerful earthquake, aftershocks and the tsunami. However, the total is expected to rise, with some estimates of a final toll of over 10,000. Economic impacts are expected to be huge, with the shutting down of nuclear reactors which many industries rely on for power.

5 Valdivia, Chile, 22 May 1960 (9.5): This earthquake killed 1655 people, injured 3000 and displaced two million. It caused US \$550 million damage in Chile, while the tsunami that it spawned caused deaths and damage as far away as Hawaii, Japan and the Philippines.

6 Prince William Sound, Alaska, 28 March 1964 (9.2): Compared to the Chilean earthquake, this earthquake was less damaging: the resulting tsunami took 128 lives and caused overall US \$311 million in damage. The earthquake was felt mainly over Alaska, as well as some places in Canada, while the tsunami created by it caused damage as far away as Hawaii.

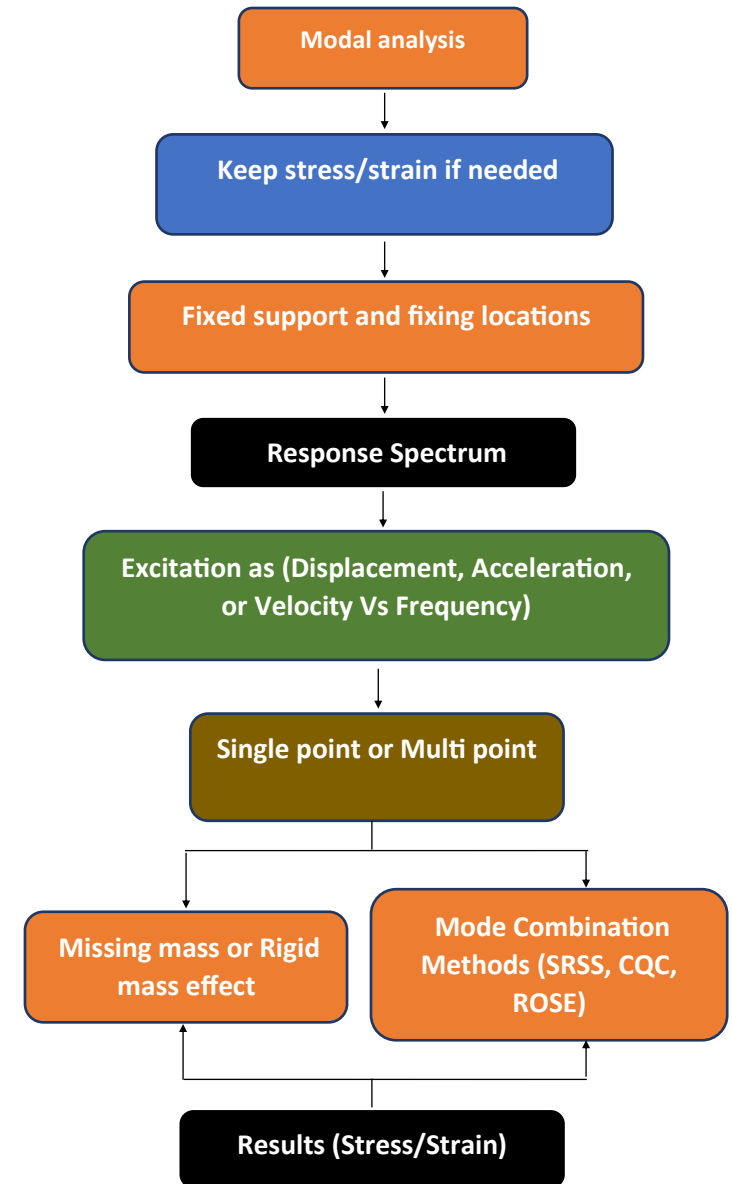


Figure: Response Spectrum Analysis Process Flow