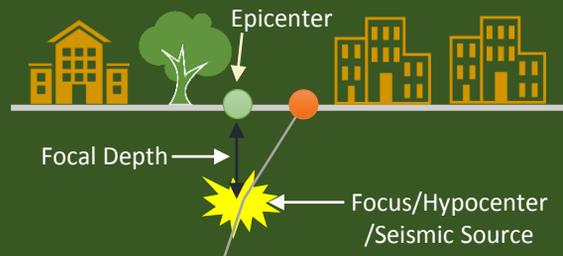
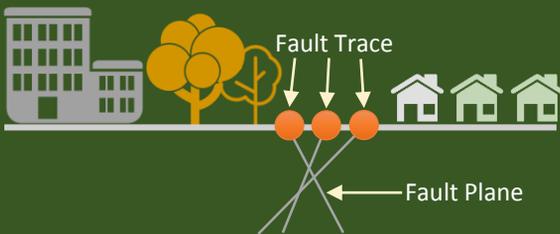


A. Earthquake 101



Terminologies

Active Fault	Likely to be source of an earthquake
Epicenter	Point on the earth's surface vertically above the hypocenter (or focus)
Fault	A fracture in rock resulting in significant displacement
Fault Plane	The planar (flat) surface along which there is slip during an earthquake
Fault Trace	Intersection of fault plane with ground surface
Focal Depth	Depth of an earthquake
Focus/ Hypocenter	Also known as seismic source; point within the earth where an earthquake rupture starts
Intensity	Description of severity of an earthquake; Multiple values for a single earthquake
Magnitude	Amount of energy released during an earthquake; one value per earthquake



MAGNITUDE

- Single value per earthquake
- Depends on:
 - Amount of energy released
- Decimal numbers
- Logarithmic scale
 - 1 point increase means energy increases by a factor of 31.6x
 - M=7 is 31.6x stronger than M=6
 - M=8 is 1000x stronger than M=6

INTENSITY

- Multiple values per earthquake
- Depends on:
 - Magnitude
 - Distance to epicenter
 - Depth of focus
 - Soil conditions
- Roman numerals



West Valley Fault

- Location: Angat, Bulacan to Canlubang, Laguna
~95-km long
- Estimated maximum magnitude: 6.5 to 7.2
- Historical movement: 4 times in past 1500 years
Most recent movement: 1638
- Recurrence interval: 400 to 600 years
(recent Phivolcs statement)

Myths and Facts

MYTH #1

 Buildings in the Philippines are not designed to resist earthquakes

Fact:

-  ✓ The NSCP requires structures to consider earthquake loads.
- ✓ The NSCP is based on the same international codes used in the US.
- ✓ Plans & structural computations are submitted to the building official for approval prior to construction in order to ensure compliance.

MYTH #3

 West Valley Fault (WVF) epicenter is always very close to the fault line (surface rupture)

Fact:

-  ✓ Experts say that the **WVF** is not vertical and it dips at an angle. Further studies say that the possible location where earthquakes are generated is approximately 10 to 50km deeper under ground (see illustration).



MYTH #2

 Buildings that do not have base-isolators, rollers, or dampers are not designed to resist earthquakes

Fact:

-  ✓ The building is considered safe from earthquakes as long as it was designed and constructed in compliance to existing building codes. The above-mentioned items can help in earthquake resistance but are not necessary.

MYTH #4

 The WVF can generate a magnitude 9 earthquake

Fact:

-  ✓ Magnitude 9 earthquakes are generated in really long faults.
- ✓ The WVF is relatively short and is estimated to generate a maximum of 7.2 magnitude earthquake.

MYTH #5

 It is safer to live in a one- or two-storey house than to live in a high-rise building

Fact:

-  ✓ Not necessarily. Engineered/well-designed buildings undergo various studies and stringent permit applications to ensure compliance to the **National Building Code**.
- ✓ The energy waves generated close to the fault are high frequency. Tall buildings respond well to high frequency waves.

B. AT Altura Site Conditions

1. Soil Investigation

- 12 boreholes were drilled within Nestle Property to determine soil type and structural design considerations for the project.
- Ground is underlain by the Guadalupe Tuff Formation (Adobe)
- Similar to BGC, Ortigas Center, Makati Characteristics of Adobe:
 - ✓ Classifies as rock
 - ✓ Not liquefiable
 - ✓ Very low compressibility
 - ✓ Advantage as a foundation material
 - No need for special foundation systems (piles, jet-grouting, ground improvement)
 - Does not amplify earthquake motions

2. Distance to the West Valley Fault

- The property is very safe from ground rupture hazard as it is approximately 25 meters east and approximately 69 meters west of the West Valley Fault as compared to the 5-meter buffer zone on both sides of the trace required by Phivolcs.

Reference: Phivolcs Map and Certification

Site Conditions cont'd



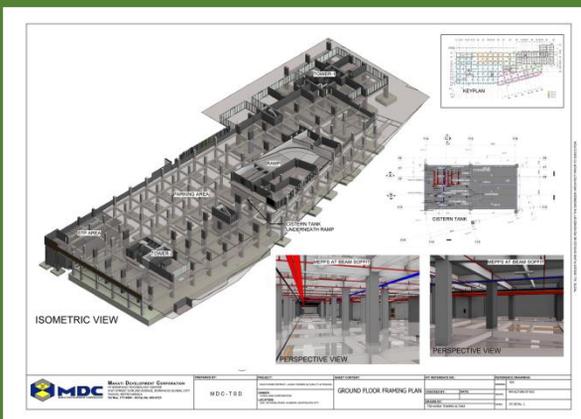
3. Structural Design Considerations

- AT Altura building design follows the latest edition of National Structural Code of the Philippines (NSCP).
- Base Shear is the estimate of the maximum expected lateral force that will occur due to seismic ground motion at the base of the structure.
- The NSCP provides for different considerations in the base shear computation depending on the distance of the property to the known seismic source. The Code provides for different considerations for properties within 5kms, 10kms, and more than 15kms from the known seismic source.
- AT Altura being within 5kms, has 32% higher base shear, versus a similar structure that is located more than 15kms from the known seismic source.

2. Structural design based on the structural code and structural peer review are done during planning stage. Structural peer review is conducted by a **third party** to validate that the structural design is compliant to the structural code.

3. **Building Information Modelling** is conducted to check the building design, to resolve for potential clashes within and across mechanical, electrical, plumbing and sanitary . It models how project will be constructed on-site to avoid possible conflicts.

Building Information Model



C. Quality Assurance in Project Development

1. Technical Due Diligence Studies particularly Geotechnical Investigation and Geohazard Investigation are conducted during **acquisition stage**.
 - a. Geotechnical Investigation
 - Includes sub-surface exploration of a site, which involves soil sampling and laboratory tests to determine the soil type for determining structural design criteria of the project
 - b. Geohazard Investigation
 - Engineering Geological and Geo-hazard Assessment Report (EGGAR) focuses on potential geologic hazards that may have direct or indirect impact to the project, and their appropriate mitigating measures.
 - Fault related/Seismic hazards
 - Mass Movement
 - Volcanic Hazards
4. Implementation is done by MDC with **three 2014 ISO certifications**.



- Prior to implementation, the detailed methodology and execution plan is determined . Regular training and orientation on quality are also being conducted.
- During implementation, inspection and testing are conducted by MDC.
- Upon completion, testing and validation are done by APMC and Avida, before turnover to unit owners.

D. Addressing Buyer's Concerns

SAFEGUARDS

Safeguards have been put in place to mitigate potential damages of earthquakes on properties.

- Technical due diligence studies are conducted during acquisition stage:
 - i. Geotechnical assessment or soil study
 - ii. Engineering Geological and Geo-hazard Assessments Report (EGGAR), which is a requirement by DENR for the ECC
- Quality assurance measures are implemented during design and construction stages:
 - i. Structural peer review
 - ii. Building information modelling
- Throughout all stages of project development, professional services of reputable consultants are engaged.

SAFETY PROGRAMS

Safety programs are implemented by APMC in all developments through its health, safety and security teams.

- Each development has an emergency brigade team (EBT) which conducts weekly timed drills under different emergency scenarios.
- Each year, a fire and earthquake drill is conducted with all stakeholders (including unit owners and residents) usually facilitated by Bureau of Fire Protection (BFP).

STANDARDS

Avida developments are up to standards to withstand earthquakes.

- We comply with the National Building Code and the National Structural Code which take earthquake loads into consideration
- All projects begin after securing all clearances from applicable government agencies:
 - Department of Environment and Natural Resources (DENR) – Requires EGGAR for ECC application
 - Philippine Institute of Volcanology and Seismology (Phivolcs) – Certifies that property is not within the 5m no-build buffer zone
 - Building Official – Certifies compliance to the Building Code through the Building Permit
 - Housing and Land Use Regulatory Board (HLURB)– Requires above-mentioned permits to ensure compliance to existing laws and ordinances

Before we start selling and construction, we go through numerous checkpoints to ensure safety and soundness of the building.

In summary:

To ensure safety, ALI has put in place safeguards to mitigate potential damages of earthquakes in all stages of the project development process.

- Technical due diligence studies prior to acquisition
- Planning and Design in accordance with the building code
- Quality assurance during the design and construction
- Safety programs implemented in all developments during operations

Throughout all stages of project development, professional services of reputable consultants are engaged.

We also secure all the clearances and permits from the different agencies such as DENR, PHIVOLCS, City Planning Office, Office of the Building Official and HLURB prior to development.

In ALI, customer safety is a priority.

FREQUENTLY ASKED QUESTIONS

a. Is your building earthquake proof?

Our buildings are designed to resist earthquake. There are no earthquake proof buildings; what we have are earthquake resistant buildings.

b. Can your project withstand a magnitude 7 earthquake? What magnitude is your building designed for?

Yes. Avida Towers Altura conforms to the National Structural Code of the Philippines which is designed to resist major earthquakes that we have experienced in the past.

c. What is the difference between magnitude and intensity?

Magnitude is the amount of energy released during an earthquake while intensity describes the degree of shaking at a particular location. There is only one value for magnitude. Intensity has multiple values in a single earthquake.

d. What is the estimated magnitude that WVF can generate?

6.5-7.2 Magnitude

e. Are base isolators, rollers and dampers necessary for buildings to resist earthquakes?

These are just options to help resist earthquakes but are not necessary.

f. Can WVF generate a magnitude 9 earthquake?

No. Magnitude 9 earthquakes are generated in really long faults. The WVF is relatively short and therefore cannot generate a magnitude 9 earthquake. In the 2011 Japan earthquake which generated a magnitude 9 earthquake, the fault that ruptured was 1,000km long. The WVF is only approximately 100km long.

g. What is the soil type in Altura?

Adobe (Guadalupe Tuff Formation), similar to BGC, Ortigas Center, and Makati.

Adobe is not liquefiable and has very low compressibility. An advantage of Adobe as a foundation material is it does not amplify earthquake motions.

h. How far is the fault line from the property?

The distance of the project is approximately 25m east and approximately 69m west of the West Valley Fault. The project is not within the buffer zone against ground rupture hazard, which is 5m from both sides of the mapped fault trace.

i. Is it safe to buy in Altura?

Yes! We designed it against any earthquake force we believe it will be subjected to.

j. Where does your company base the design of the projects from?

We engage reputable Structural Designers to design our building in accordance with the latest National Structural Code of the Philippines (NSCP), which takes earthquake loads into consideration.

k. How does your company ensure that the designs of projects are at par with standards?

We engage third-party consultants to perform peer review on Structural Design for validation.

We ensure that our construction partners implement the project in accordance with the structural plans and specifications following strict quality control process.

Before we begin any project, we ensure that we have acquired all necessary permits and clearances from the relevant government agencies.

FREQUENTLY ASKED QUESTIONS

I. Should the towers be damaged during an earthquake, who is liable for repairs and restoration?

The owner of the building will be responsible for repairs and restoration in case of damages due to earthquakes.

During construction stage, the Developer secures a Contractors All Risks Insurance (CARI), which provides coverage over the insured properties against loss or damage, the proximate cause arising from fortuitous events including earthquakes.

After construction and before turnover of the Common Areas to the Condominium Corporation, the Developer secures Commercial/Property All Risks Insurance, which protects against loss or damage caused by fire, lightning, earthquakes, etc.

After turnover of the Common Areas, the Condominium Corporation, as owner of the Common Areas, becomes responsible for securing property insurance to protect properties against loss or damage arising from chosen contingencies.

The buyer, as owner of his/her residential unit, becomes responsible for securing property insurance to protect his unit and its contents against loss or damages arising from chosen contingencies.