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Antequera Church facade. Photograph by Engr. Cedric Jon Manzano.

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ANTEQUERA CHURCH RESTORATION:

HISTORICAL PRESERVATION THROUGH ENGINEERING

Christianity is among the most enduring legacies of the Spanish (1565 to 1898) and American (1898 to 1946) colonization of the Philippines. Many beautiful, old churches, some of which are still in service to this day, attest to this religious heritage.

In Bohol, near the main city of Tagbilaran, before the earthquake of October 2013, a visitor could have easily visited the beautiful churches of 26 parishes. We will visit three of these churches: Baclayon, Maribojoc, and Antequera to illustrate differences in construction and repair methodology.

The 2013 Bohol Earthquake

On October 15, 2013, a magnitude 7.2 earthquake struck the western section of Bohol Province. The causative fault being the North Bohol Fault approximately 7.3 km from the town of Antequera, Bohol.

The Maribojoc Church, about 10 kms from Antequera, was totally destroyed. The facade of Baclayon Church detached and collapsed with the bell tower severely damaged, as shown in the photo on the right. These two churches were constructed during the Spanish colonial period when the materials of construction consisted mostly of coral limestone and sand with probably some kind of lime as cementing material, although legend has it they used egg white as binder. Finely dressed and fitted coral limestone blocks were used as exterior and interior cladding for the thick walls. Typically these walls were infilled between the coral limestone cladding with sand and rubble.

Construction of the Antequera Church was started in 1908 and completed in 1914, during the American colonial period. Construction material consisted of locally-sourced gravel, sand, and cement referred to as “Cement from Rome”. No steel rebars were used as reinforcement, however.

The Restoration of Antequera Church

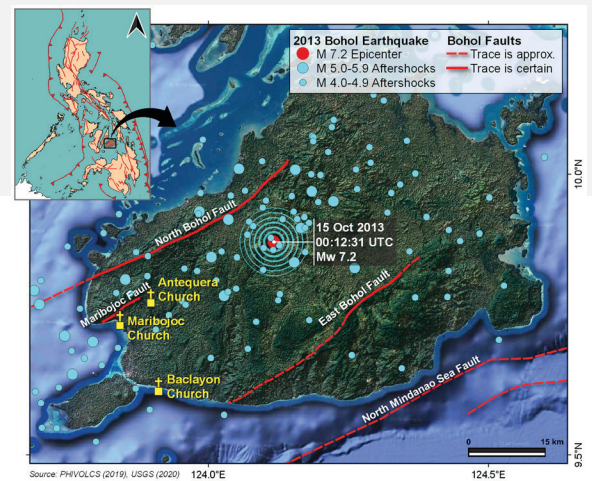
The Antequera Church was excluded from the intervention of the National Commission on Culture and the Arts (NCCA), National Museum (NM) and National Historical Commission of the Philippines (NHCP) as these institutions ordered the restoration only of older Spanish Colonial Era churches. The churches excluded are referred to as the “Orphan Churches of Bohol”.

Thus, the Diocese of Tagbilaran became responsible for the restoration of the Antequera Church. It requested several organizations, foremost of which was Bakas Pilipinas to assist them in making the repair and retrofit plans.

Bakas Pilipinas is a New York, USA based Non-Governmental Organization (NGO), dedicated to the preservation of heritage sites in the Philippines. Arch. Roz Zacarias Li, president of Bakas Pilipinas, is a founding partner of Li and Saltzman, Architects, P.C. of New York. The company specializes in architecture and the preservation of historic properties, making plans respectful of natural and cultural conditions. When Arch. Li retired, she decided to give back to the land of her birth by establishing Bakas Pilipinas.

Bakas Pilipinas performed a Preliminary Existing Condition Survey for the “Orphan Churches of Bohol” and among them, Antequera Church was chosen as the church in which they shall adopt and perform full restoration works. In turn, Bakas Pilipinas commissioned USA volunteer consultants: Atkinson - Noland and Associates, Swenson Say Fagét (SSF), structural engineers specializing in restoration of heritage structures; and Philippine consultants Digiscript Philippines and AMH Philippines to assist in drafting and completion of the dimension survey and retrofit plans, respectively.

Throughout the process of data gathering, surveying and in situ material testing, aforementioned volunteer organizations have been in close coordination with the Parish Pastoral Council led by Engr. Homer Balais. One of the unique features of the Antequera Church is that it could not be fully classified as a reinforced concrete structure nor as an unreinforced masonry structure. After a petrographic test, volunteer architect and consultant, Zach Watson Rice, revealed that the material used for the construction of the present-day church structure is gravel with Portland cement as binding material.



North Bohol Fault proximity to Antequera Church. Map generated from PHIVOLCS's Distribution of Active Faults and Trenches in the Philippines and USGS DEM using GIS Software. Prepared by Engr. Francis Jenner Bernales.



For the Baclayon Church, although the wall dimensions are massive, it appears that there is only some fitted stone masonry cladding that shores up the interior rubble material mostly calcareous rock and sand of weak or no cementation at all. Photographs by Mr. Stephen Kelley (left) and Mr. Anthony Manding (right).



Antequera Church facade before the October 2013 earthquake. Photograph by Mr. Mark Maranga.



Antequera Church narthex (left) and altar (right) as viewed from the nave.
Photographs by Engr. Francis Jenner Bernales (left) and Engr. Mary Grace Casuncad (right).



Antequera Church post-earthquake condition, during September 2019 ocular inspection. Photograph by Engr. Francis Jenner Bernales.

In the same report it is stated that the petrographic test detected the presence of limestone, chert, volcanic rock and ironstone, materials locally found in Antequera. As part of the Non Destructive Tests (NDTs) performed by Atkinson - Noland and Associates, a pachometer test was conducted to detect the presence of reinforcing bars in the nave walls. The results of the pachometer test demonstrate reinforcing bars being present on those walls; however, the spacing and size of reinforcing bars are insufficient.

The church walls are under-reinforced based on modern design code standards for new buildings. Upon coordination of AMH Philippines, Inc. with Bakas Pilipinas, Inc.'s structural consultant based in Seattle, USA - Swenson Say Fagét, Antequera Church is unofficially classified as an unreinforced concrete structure.

Furthermore, SSF Structural Engineer, Evan Neal Speer utilized the American Society for Civil Engineers (ASCE) 41 - 17 evaluation checklists for both building types C2A (Concrete shear walls with flexible diaphragms) and URM (Unreinforced masonry bearing walls with flexible diaphragms) in the Seismic Evaluation Report submitted to Bakas Pilipinas. The same document further notes that there is an overlap between the two building types in the structure's predicted behavior.

AMH's CSR Initiative and Role

AMH is providing assistance in the detailed design of the repair and retrofitting of Antequera Church as part of its Corporate Social Responsibility (CSR) initiative. AMH's scope of work primarily focuses on studying structural damages brought about by past earthquakes and performing a detailed structural analysis for the church, while collectively incorporating structural assessment recommendations (ASCE 41 Tier 1 – Quick Check), nondestructive test results (i.e. pachometer test, rebound hammer test, petrographic test) and dimension survey conducted by other volunteer organizations. AMH shall provide design approaches and retrofitting recommendations based on the results of the analysis.

AMH Ocular Inspection

AMH conducted an ocular inspection of the site from March 2 to 5, 2020, in order to assess the current condition of the Antequera Church. The ocular inspection included performing procedures such as non-destructive testing and verification survey.

AMH engineers observed that retrofitting works have begun, with major cracks on the walls already reinforced with stitch pins and Portland cement grout in accordance with retrofitting recommendations from the initial set of drawings provided by Arch. Rice. The non-destructive test method utilized was the Ultrasonic Pulse Velocity (UPV) Test.

Photogrammetric (drone) survey and truss dimension survey were also conducted by AMH engineers to support the dimension survey provided by Digiscript Philippines. Further testing recommendations include Unconfined Compression Tests (UCT) and Plate Load Tests, for an in-depth investigation and understanding of the current state of the structure and the soil on which it is built.

Guidelines for the Restoration of Heritage Structures

The guidelines for the restoration of heritage structures are not fully established in the Philippines during the present time. The National Structural Code of the Philippines (NSCP) presently caters mainly to the detailed design guidelines for new horizontal and vertical structures. This poses a challenge for local engineers to provide solutions beyond code provisions, ultimately basing analysis methods on a material level. AMH Philippines, Inc. in cooperation with the professors and structural engineering experts from the University of the Philippines Institute of Civil Engineering (UP ICE) and preservation engineering expert, Dr. Arun Menon of Indian Institute of Technology in Madras, India, aims to perform detailed structural modeling and analysis of the church using non-linear Finite Element Analysis approach.



AMH team performs Ultrasonic Pulse Velocity (UPV) test during March 2 to 5, 2020 ocular inspection. Photograph by Engr. Mary Grace Casuncad.

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OLD BALARA CHRISTIAN COMMUNITY SCHOOL INC. 5-STOREY SCHOOL BUILDING: SERVICE THROUGH ENGINEERING EXPERTISE

by Emmanuel Marasigan and Luigi Francisco

AMH has always been proud of its involvement in helping various communities through its engineering consultancy services. This involvement is manifested in AMH's Corporate Social Responsibility or CSR initiative, where AMH provides engineering consultancy for socially relevant projects such as institutional infrastructure. One of the institutions that AMH's CSR program involved itself with is the educational institution through an engagement by Old Balara Christian Community School, Inc. or OBCCS.

OBCCS is a non-profit organization formerly situated in Old Balara, Quezon City. It provides accessible enterprise education to low-income families. OBCCS recently moved to Rodriguez, Rizal where it aims to build a 5-story school building with the help and support of the United Nations. As part of Technical Due Diligence, the UN required a detailed geotechnical assessment of the project site. The assessment will help secure UN funding for the school building if proven safe to be constructed on the property. OBCCS called on AMH for its engineering expertise to conduct the geotechnical assessment based on a geotechnical investigation performed by the drilling contractor, Earthdrill Geosystem, Inc. The geotechnical assessment is pro bono as part of AMH's CSR initiative.

Upon analysis of the geotechnical investigation results, the site subsurface is characterized to be made up of basalt rocks. Core samples obtained from the drilling helped in the identification of the rock characteristics. Basalts make for a good foundation material in terms of bearing capacity, settlement, slope stability, and attenuation of seismic waves. Rock excavation becomes the main concern given the hardness of this subsurface.

A shallow foundation analysis was conducted and the calculated bearing capacity is 600 kilopascals at a minimum foundation depth of 1.5 meters below ground level. The analysis also resulted in higher bearing capacities that can be mobilized at greater depths and wider foundation elements. Although basalt is expected to stand up vertically without support, AMH performed slope stability analysis, or SSA, to further establish safety and rule out the possibility of slope failures. The SSA focused on the vertical wall of the basement excavation and yielded adequate factors of safety.



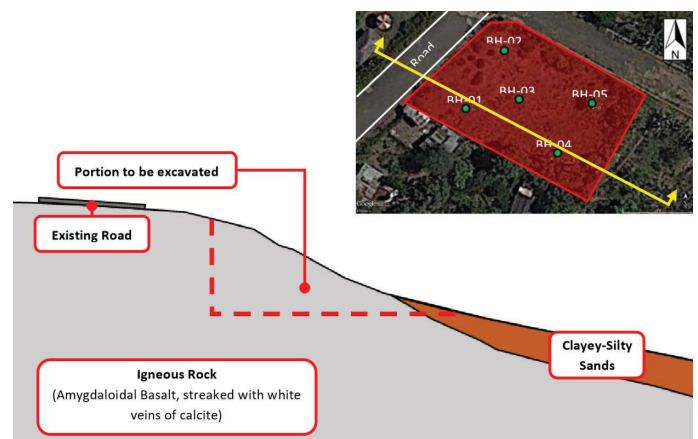
3D Rendered Exterior Perspective View of Proposed 5-Storey School Building

In addition to addressing the concerns of the UN regarding the property, AMH saw an opportunity to perform further analysis. Given the project site's proximity to the West Valley Fault, which is about 175 meters away, AMH performed an Engineering Geological and Geohazard Assessment (EGGA) and Seismic Hazard Analysis (SHA). The EGGA is a report that describes the baseline geology of the project site and conducts a comprehensive, multi-hazard assessment. The SHA, on the other hand, focuses and provides a detailed study on the seismic hazards to be considered, and supplement the planning and design of the school building. A Seismic Velocity Logging or SVL was also conducted to determine the properties of the rock formation, and the results of which are data used in the SHA.

All tests and assessments performed had consistent results about the project site subsurface. The massive basalt underlying the project site was found to be of the Cretaceous Kinabuan Formation. Aside from having good foundation material, the site can experience very high ground motion in case of a 7.2 magnitude earthquake along the West Valley Fault. With this finding, AMH highly recommended the building be designed to survive a major earthquake along said fault.



Existing site condition showing thin soil cover with vegetation; basalt formation are observed at the surface in some areas. Photograph taken last Oct 2019.



The most critical section considered in the slop stability analysis showing the area for foundation excavation.

KEEPING EDUCATIONAL INFRASTRUCTURES SAFE THROUGH RAPID VISUAL ASSESSMENT

by Rafielle Pintor, Jayson Chua, and Rodora Perez

History has proven that the Philippines is quite the hotspot for various hazards. Counting typhoons alone, an average of 20 hit the country every year according to the Asian Disaster Reduction Center. Not to mention, the country is made up of areas that are tectonically, seismically, and volcanically active. Exposure to such hazards, alongside possible vulnerabilities of some structures to these hazards, increases the risk of disasters that disrupt regular operations. Disaster Risk Reduction and Management Service (DRRMS) works to manage this risk. DRRMS programs help identify and improve upon vulnerabilities of communities and structures to hazards. It may even help reduce a population's exposure. These in turn reduce risk. In order to decrease the likelihood of disasters, essential functions of society, and thus the infrastructure supporting these functions, ideally need to be free of risk.

One such example is that of public school buildings. These buildings are under Essential Facilities in the National Structural Code (NSCP). Incidentally, public schools, when necessary, also serve as evacuation centers, which are also under Essential Facilities in the NSCP. As such, it is not surprising that the DRRMS of the Department of Education had various buildings all over Metro Manila be assessed, and had guidelines be developed from this for use throughout the country.

AMH was contracted by the joint venture of two leading Italian Engineering firms, ALL Ingegneria (ALL) and Aires Ingegneria (AI) for a World Bank-funded project of conducting a Rapid Visual Assessment (RVA) of over 40 public school buildings around Metro Manila including two buildings within the Department of Education complex in Pasig City, and developing a decision-making algorithm for retrofitting.

Rapid Visual Assessment (RVA) is an approach to assess the health of a structure in terms of its age, built, configuration, location, and estimated performance during extreme events such as typhoons and earthquakes. It is a qualitative assessment with a numerical scoring system that indicates the structure's perceived performance. The process encourages efficiency, especially when multiple structures are to be assessed. The scores indicate which structure needs to be prioritized, in terms of attention and resources. A lower score is indicative of higher risk and a need for numerical modeling using structural analysis software to determine how the retrofitting will be done. RVA considers the year of construction to estimate which edition of local design codes were employed, what materials were used for walls and structural members, and plan irregularities, among others. A comprehensive checklist is used parallel to desk studies and site inspections to gauge the need for retrofitting. RVA is also typically lightweight in equipment and can be done with handheld measurement devices such as handheld rebar scanners, range meters, measuring tapes, camera, and essential writing materials. This allowed the team to conduct assessments even while classes were on-going, with minimal disturbance thereto.



Observed Damages in School Buildings included in the Site Inspections

The assessment also involved geologic and geotechnical hazard assessment, done for both the immediate vicinity of the buildings individually and a larger scale assessment for the entire Metro Manila. This included the assessment of seismic hazards, flooding, landslides, coastal hazards, volcanic hazards, sinkholes, and ground subsidence. This was done through a combination of literature research, interpretation of available maps, estimation of peak ground acceleration, and site visits. Results suggest that practically all of the assessed school buildings will experience very strong seismic loading in the case of a magnitude 7.2 design earthquake occurring along the West Valley Fault, with twenty-six (26) school buildings found on recent soil deposits being more vulnerable as it makes poor foundation material in terms of attenuation of seismic waves. Six (6) schools were found to be at risk from faulting in the case of a major earthquake along the Valley Fault System. Areas underlain by Recent Deposits were also assumed to be susceptible to liquefaction and settlement. In terms of susceptibility to flooding, ten (10) buildings were suspected to have high susceptibility ratings, and nine (9) buildings with moderate ratings. Considering the potential for tsunamis, storm surges, and seiches, five (5) schools were noted to be within one kilometer of a shoreline. Only schools within a certain municipality were situated in areas with moderate to high landslide vulnerability. And, only one (1) school among the assessed was founded on limestone, according to available geologic maps.

AMH also computed the cost estimates for the conceptual retrofitting schemes provided by ALL and AI. ALL, AI, and AMH conducted a 3-day risk assessment training for DepEd engineers and officers of the DRRMS that showed how to apply the use of the RVA and decision-making algorithm in other regions, bridging the gap between the engineering and management aspects of the division's objectives. In addition to this, AMH wrote the Environmental Code of Practice applicable to retrofitting public school buildings around Metro Manila and provided input in the development of a decision-making algorithm for risk reduction.



AMH Engineers Doing Inspections in Different Schools around Metro Manila

STAYING UPDATED WITH THE LATEST ENGINEERING SOFTWARE AND EQUIPMENT

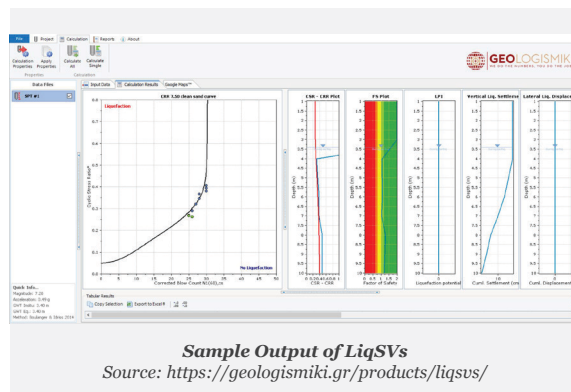
by Helli-mar Trilles, Patrick Selda, Neil Amery Fabi, Jeremy Rifareal, and Cristelle San Antonio

Technology has taken great leaps in optimizing engineering work and applying improved methods in solving engineering problems. The use of improved methodologies from updated software and equipment has always been one of the key advantages that AMH works on in the highly competitive consultancy business. As AMH stays committed to its mission to be an engineering consultancy firm that Filipinos can be proud of, it keeps itself up to date with the acquisition of the following software and equipment in the past year to continuously deliver quality service to its clients.

LiqSVs

LiqSVs is software that assesses soil liquefaction using field data from either Standard Penetration Tests (SPT) or shear wave velocity tests. It calculates the cyclic stress ratio (CSR) and cyclic resistance ratio (CRR) of a soil layer using the two most commonly used deterministic methods today – NCEER (1997) and Boulanger and Idriss (2014). Consequently, the factor of safety (FS) against liquefaction and liquefaction potential index (LPI) are also evaluated by the software. Aside from those, LiqSVs can also calculate liquefaction-induced vertical settlements and lateral displacements of the liquefiable sand layers.

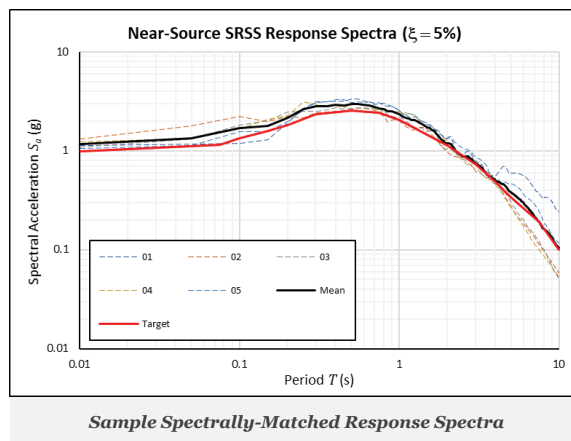
The software provides a comprehensive report of results including a table of computed CRR, CSR, FS, LPI, and estimated settlements. The plots of these calculated parameters against depth are also shown, making the identification of liquefiable layers much easier. Currently, liquefaction analysis using LiqSVs has already been applied for various geotechnical assessment projects in sites with suspected potentially liquefiable depths.



SeismoMatch

SeismoMatch is an analytical tool that performs spectral matching using the wavelet algorithm of Al Atik and Abrahamson (2010). This wavelet algorithm utilizes an improved tapered cosine adjustment function that prevents drift in the modified velocity and displacement time series without baseline correction. The matching algorithm proposed by Hancock et al. (2006) is also available for use in the SeismoMatch library.

Spectral matching is the process of modifying the amplitude and/or frequency content of a certain ground motion such that the hazard associated with it will match the site-specific seismic hazard. By doing so, the modified record can be surmised to be an event that may happen on-site given the nature of the potential earthquake generators within the vicinity of the project site.



Since then, AMH has used SeismoMatch in over 10 projects involving the performance-based design of high-rise buildings, bridges, coastal revetments, and massive embankments.

Autodesk InfraWorks

A great tool for planning and preliminary engineering design with 3D visualization is Autodesk InfraWorks®. It is a comprehensive planning and conceptual design software that enables users to create a highly accurate model of the proposed development derived from integrating multiple sources of data. Through the 3D visualization and design capability of InfraWorks, it is easier to present design alternatives such as different options for the road layout of a proposed development.

The main preliminary engineering design features of the software include roadway, drainage, and bridge design. Another known feature of InfraWorks is its workability with other design software. During the detailed engineering design phase, data are collaborated with other known civil design software by Autodesk such as Civil 3D, Revit, and Navisworks.



In the absence of a 3D model, only a few people can imagine how the development would appear on a 2D model which makes the discussion more difficult and decision-making longer. With this dilemma, it can be said that InfraWorks is truly a powerful tool to communicate designs to clients effectively by giving them a feel on how the finished project would look like. The accurate 3D model of development helps the client make faster and better decisions on the design approach.

Ground Penetrating Radar

Ground Penetrating Radar (GPR) is a non-destructive scanning equipment that uses high-frequency electromagnetic radiation to penetrate and capture an image of the subsurface. Some examples of the uses of GPR include locating underground utilities, detecting changes in material properties, and scanning steel reinforcement embedded in concrete.

AMH has three types of GPR antennas with different frequencies and maximum penetration depths: 750 MHz and 450 MHz for relatively shallow depths, and 80 MHz for depths down to 10 m. These equipment have been used in several projects, one of which is the underground utility scanning prior to subsurface exploration for the Metro Manila Subway Project (MMSP).



AMH Engineers Using GPR for Site Inspection

Software for Tailings Dam Breach Studies

Tailings from mining operations are commonly fine-grained materials that are left over from the physical and chemical processes involved in the extraction of a mineral. Since these processes are mostly water-based, the tailings are produced and discharged into a Tailings Storage Facility (TSF) in the form of a slurry. One of the mining projects that AMH recently assessed is the nickel mine in Surigao del Norte facilitated by the Taganito HPAL Nickel Corporation (THPAL). Since the primary purpose of a TSF is to safely contain the tailings and to eventually facilitate the removal of water without much environmental impacts, THPAL engaged AMH to conduct a dam breach study as part of their risk mitigation plan.

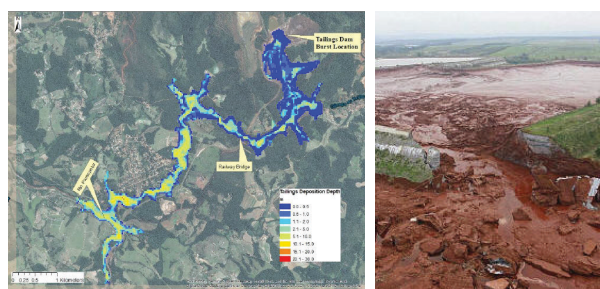


HEC-RAS Inundation Map for Case 2 (PMF w/ Dam Breach)

In the hydraulic study, the dam breach was assumed to be caused by overtopping failure during an extreme rainfall event (equivalent to a probable maximum flood or PMF). This type of failure, applicable to earthen dams, considers a headcut erosion process that starts on the downstream side of the dam embankment, which makes its way upstream towards the dam crest and widens over time. Three cases were considered for this study: Case 1 or PMF without Dam Breach, Case 2 or PMF with Dam Breach (or “Rainy Day” condition), and Case 3 or Dam Breach without Rainfall (or “Sunny Day” condition). Both Cases 2 and 3 consider overtopping failure with trigger at the elevation of the dam embankment.

The dam breach parameters, i.e. breach depth, width, and formation time, were computed using the Froehlich regression equation and were then inputted into the HEC-RAS (Hydraulic Engineering Center River Analysis System) software. HEC-RAS is a public domain program developed by the US Army Corps of Engineers that allows modelling of several hydraulic mechanisms. HEC-RAS is capable of performing two-dimensional unsteady-flow routing with the Saint Venant or Full Momentum equation which accounts for the effect of turbulence due to the highly dynamic flood waves that occur during a dam break. Based on the 24-hr simulations, Case 2 results in the maximum discharge and flood levels affecting the downstream areas. However, since the tailings slurry was assumed to act as water to simulate the initial flood wave, the resulting velocity and flow values are thus conservative.

As of present, although the HEC-RAS software is powerful as a flood routing tool, it is unable to simulate the tailings slurry as a non-Newtonian (thickened, viscous) fluid as well as detailed sediment transport. Since these analyses are important in the study of tailings flow, different software are currently being assessed by AMH in order to expand our services and be able to conduct more comprehensive dam break studies specific to Tailings Dams.



Sample Tailings Deposition Output of a Two-Phase Tailings Dam Breach Model. Source: FLO-2D Webinar (O'Brien)

FLO-2D is one of the longstanding flood and tailings modelling software in the market. It was based on a model developed by Jim O'Brien for the Federal Emergency Management Agency or FEMA in 1989, called MUDFLOW. It is both a hydrologic and hydraulic tool that is able to simulate flood, mudflows, and debris flows over floodplains. It also allows sediment continuity and modelling remobilization based on changes in the landscape and the fluid, such as in the case of a dam breach.

RiverFlow2D is also a two-dimensional flood routing software, developed by Hydronia in 2009, which is complemented by specialized modules such as Mud & Debris Flow, Sediment Transport, Urban Drainage, Pollutant Transport, and Plastic Transport. TUFLOW (first developed in 1989 by WBM Pty Ltd), FLOW-3D (produced by Flow Science in 1980), as well as

MIKE21 (developed by DHI, and is currently being used by AMH Coastal Engineers) are also alternatives, with their recently released developments including flow simulations of non-Newtonian fluids. As with most modelling software, the accuracy of the said models is dependent on the grid resolution and the data available as well as, and more importantly, on the experience of the software user.

Dam breach studies for water-retaining structures are complicated enough on their own, thus the additional consideration of the behavior of tailings makes the analysis more complex. The development and improvement of models are therefore appreciated as engineers worldwide strive to advance the performance of robust and comprehensive hydraulic simulations, not just for tailings dam breach, but for a wide variety of applications.



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MESSAGE FROM THE PRESIDENT

Dear Clients and Colleagues in the Academe and Industry,

Guided by its vision “to be an engineering company that Filipinos can be proud of”, AMH continues to give back to the country and community through its involvement in noteworthy projects and various Corporate Social Responsibility (CSR) endeavors. This latest newsletter issue contains relevant articles which also touch on the importance of the following themes:

Preserving the Past

Together with a New York-based NGO, AMH provided engineering services leading to the restoration of a centuries-old church, the Nuestra Senora Del Rosario (Antequera Church), which was damaged by the 2013 Bohol earthquake. As one of the “Orphan Churches of Bohol”, due to its exclusion from

the restoration efforts of the government, private sector assistance was much needed to facilitate the repair of this structurally unique church.

Taking Care of the Present

With its expertise in undertaking Technical Due Diligence (TDD) studies, AMH provided engineering consultancy services to Old Balara Christian Community School or OBCCS, pro bono. OBCCS is a non-profit organization which provides accessible enterprise education to low-income families.

Laying the Foundations for the Future

The future success of a nation is very much tied to the quality of its educational system. Through the funding of the World Bank and together with two leading Italian Engineering firms, AMH continues to contribute to nation-building by providing Rapid Visual Assessment (RVA) of over 40 public school buildings in Metro Manila including two buildings within the DepEd complex in Pasig City. Information gathered through this method was used to develop a decision-making algorithm for structural retrofitting.

The Story of AMH

The above underlined themes do not just describe the projects and initiatives AMH has undertaken but also depict how the company started, was nurtured and continues to grow. The name AMH (=AM+MH) was derived

after a great Filipino engineer, Alejandro Melchor (1900-1947) and a great institution, Melchor Hall, UP Diliman’s College of Engineering, established in 1908.

With its co-equal priorities of “people” and “prosperity”, the company continues to promote the development of its people by providing financial support to its employees pursuing graduate studies. It actively participates in both local and international engineering conferences, presenting technical papers showcasing the expertise and capabilities of Filipino engineers and contributing as well to the profession’s body of knowledge.

Lastly, AMH lays the foundation for the future by ensuring the sustainability of its greatest asset, its people, through its homegrown internship program as well as providing qualified senior employees the opportunity to become owners themselves. It is the goal of the Principal Founders to ensure that AMH continues to exist and pursue its vision even beyond their lifetimes.

Preserving the Past. Taking Care of the Present. Laying the Foundations for the Future. These words evidently tell the story of AMH.

Eric Santos
President



MESSAGE FROM THE CHAIRMAN

Coping with the COVID-19 Pandemic

AMH was born in 1999 during difficult times, the Asian Financial Crisis, some two decades ago. As it enters its third decade of existence, it finds itself again in the middle of a crisis.

The COVID-19 Pandemic was a health and economic risk that was not foreseen by most. Starting March 2020, it was terrible reading news about thousands of infections and hundreds of deaths in China, in countries in Europe, and the United States.

The Philippines was not spared the infection. To contain the infection, the Philippine Government imposed lockdowns and home quarantines starting March 15, 2020 in many places, especially Metro Manila. These measures caused great disruption to economic activities and difficulties to families dependent on daily wage earners.

How did AMH cope with the pandemic? By focusing attention and actions towards employee health, safety, and financial well-being.

Then AMH President Jon Kasilag immediately formed a task force and issued protocols to safeguard the health and safety of employees. To comply with quarantine rules, the setting up of Work-From-Home facilities for employees from Metro Manila was the priority. The house we rented for use as an office in U.P. Village began to also house some employees who were just bed-spacers at nearby U.P. communities. The skeletal HR, IT, and accounting force that had to report to our Bahay ng Alumni office were fetched and brought home by office vehicles.

Current AMH President Eric Santos took office on April 1. He let Jon continue his work as health and safety task force head, so he (Eric) could concentrate on the financial well-being of employees. President Eric’s priority objective was to continue paying in full the salaries of all employees. This was much appreciated, especially by the office cleaning employees and drivers who received their salaries in full, even though they did not report to the office at all until quarantine restrictions eased.

It has been six (6) months since the Government started to impose lockdowns and quarantine protocols, and we are happy that we have not laid off any employee, implemented pay cuts, or missed a payroll. The company was even able to release previously scheduled bonuses and continues to proceed with its planned employee promotions and salary increases. I attribute this achievement to the following:

- AMH was able to transition to Work-From-Home arrangements quickly because AMH had set up and maintained an ICT network almost from the beginning; from the time we had less than 30 employees to now that we are 140 employees strong. The network was continuously upgraded, such that we had a centralized, externally accessible ICT network even before COVID-19 struck.
- We have no debts to pay. We bought expensive software like MIKE 21, pile testing equipment and survey equipment like the ground penetrating radar (GPR), depth echo sounder, downhole seismic velocity logger, only when we had the cash for it. We nearly went into debt to buy land for an office building, but luckily it did not push through.
- Our repeat clients continue to award us new projects even during this period of the pandemic.

We feel fortunate, we feel blessed.

Egbert Abiad
Chairman

DR. SALVADOR F. REYES ACCEPTS INVITATION TO BECOME AMH SHAREHOLDER

AMH partners consider the late U.P. Architecture Dean Geronimo Manahan, the late Philippine construction leader David Consunji, and the still hale and hearty Dr. Salvador F. Reyes, as their “inspirational advisers”. The three had given advice in a strategic meeting of AMH, and were always available for professional advice.

This is especially true of Dr. Reyes (more fondly called SFR), who is an expert in geotechnical engineering- a professional service that AMH continues to develop. Another reason is because Dr. Reyes lives in U.P. Village, just outside the U.P. Diliman campus where AMH is a tenant at the Bahay ng Alumni.

Many AMH stockholders, including all ten (10) founders, had been students of Dr. Reyes. Recently the Board of Directors passed a resolution to invite Dr. Reyes to become a shareholder, and Roy Luna discreetly mentioned the invitation to Dr. Reyes. Everyone was pleasantly surprised and felt very honored when Dr. Reyes accepted the Board’s invitation to become an AMH stockholder.

Dr. Salvador F. Reyes turned 90 years old on September 11, 2020. To mark the occasion, the PSSMGE (Philippine Society of Soil Mechanics and Geotechnical Engineering) organized an online honor lecture last September 10, 2020. The UP Institute of Civil Engineering (UP ICE), the Philippine Institute of Civil Engineers (PICE), the Association of Structural Engineers of the Philippines, Inc. (ASEP) and the Council of Engineering Consultants of the Philippines (CECOPHIL) co-presented the event. The entire webinar can be viewed at <https://www.facebook.com/ice.upd.edu.ph/videos/633684347578045>.



Six former students of Dr. Salvador F. Reyes who are all practicing geotechnical engineers. From left to right: Roy Luna (MSCE), Mark Zarco (Ph.D.), Rolando Orense (Ph.D.), Dr. Salvador F. Reyes, Alexis Acacio (Ph.D.), Egbert Abiad (Project Management), and Eric Santos (MSCE).

The following three former students of SFR presented technical papers:

- Dr. Marolo C. Alfaro, Professor, University of Manitoba (Canada), on “*Delayed Instability of Earth Fill Dams in Hydroelectric Generating Stations*”;
- Dr. Rolando P. Orense, Professor, University of Auckland (New Zealand), on “*Evaluation of Liquefaction Resistance of Crushable Volcanic Sands*”; and
- Dr. Mark Albert H. Zarco, Professor, University of the Philippines, on “*A J-sub2 Plasticity Model based on the Modified Ramberg-Osgood Power*”.

Near the end of the webinar, Engr. Brian Tan paid a moving tribute to Dr. Reyes. Engr. Tan said that Dr. Reyes is a simple, humble, and practical man who is known to stay calm despite testy discussions. He said that Dr. Reyes was a dedicated Professor of the UP Diliman Institute of Civil Engineering, who influenced numerous students to pursue further studies and research in civil engineering.

Engr. Brian Tan shared the following five personal lessons imparted through example to him by Dr. Reyes:

1. **Respect your fellow professionals.** This is reflected in how Dr. Reyes is considered a friend of everyone.
2. **Always keep the client in mind when developing a solution.** This can be seen in Dr. Reyes’ focus on practicality and economy in exploring solutions for clients.
3. **Be concise.** Dr. Reyes believes that nobody will read your report if it is too long.
4. **Keep things simple.** Calculations and solutions need not be too complicated.
5. **Be generous, especially with your knowledge.** Dr. Reyes believes that engineering is for everyone with no secrets to be kept.

- Contributed by various sources

ANNUAL SHAREHOLDERS’ MEETING

by Philip Lu

AMH’s 20th Annual Stockholders’ Meeting was held last March 30, 2020 through a video conference call due to the COVID-19 quarantine measures implemented at the time. The meeting was highlighted by the presentation of the 2019 Annual Report and the election of new AMH Directors and Officers.

The 2019 Annual Report highlighted the strong year that AMH had in its pursuit of becoming a Filipino engineering consultancy company that Filipinos can be proud of. The report included a discussion on the various projects and figures showing AMH’s growth over the past year.

The newly elected Directors and Officers who will hold office from April 1, 2020 to March 31, 2021 are:

Board of Directors

Chairman

Egbert B. Abiad

Vice-Chairman

Alexis A. Acacio

President

Jose Carlo Eric L. Santos

Treasurer

Edgardo G. Atanacio

Corporate Secretary /

Legal Counsel:

Atty. Gregorio T. Viterbo, Jr.*

Directors

Eric C. Cruz

Ma. Antonia N. Tanchuling

Independent Directors

Jose Regin F. Regidor

Rafael V. Mantaring

Consultant Shareholders

Jerome L. Catbagan

Ma. Elena L. del Rosario

Nathaniel B. Diola

Michael Paolo V. Follusco

Fernando J. Germar

Ulpiano P. Ignacio, Jr.

Ma. Jocelyn B. Jocson

Edgardo P. Kasilag II

Roy Anthony C. Luna

Adeline A. Pacia

Victor A. Pulmano

Ramon D. Quebral

Salvador F. Reyes

Rodolfo C. Salazar

Employee Shareholders

Mary Grace L. Casuncad

Edsel M. Edra

John Michael B. Gargullo

Ismael Aragorn D. Inocencio

Jenna Carmela C. Pallarca

Arlene B. Paulino

Rodora C. Perez

Gian Paulo D. Reyes

Geogy B. Vizcarra

*not a shareholder

NEW EMPLOYEE SHAREHOLDERS

by Jayson Chua and Philip Lu

AMH always strives to deliver engineering services that inspire a sense of pride within the nation's people. As such, the company greatly encourages and aids in the growth of its employees. A noteworthy part of the company's initiative in developing its employees is the Employee Education Assistance Program (EEAP). The EEAP supports employees pursuing post-graduate studies or additional undergraduate degrees while still working for AMH. Currently, sixteen (16) employees are supported by the EEAP. In addition to this, recent graduates include Engr. Brianne Inocencio, Engr. Mary Grace Casuncad, Engr. Victor Serra, Engr. Kaye Leobrera, and Arch. Jerameel Sumabong. AMH also offers eligible employees who have displayed exemplary performance and professionalism while embodying AMH values, the opportunity to become shareholders. This year, AMH invited two deserving employees: Engr. Ismael Inocencio and Engr. Mary Grace Casuncad.



Ismael Aragorn D. Inocencio
BS Civil Engineering 2009

Aragorn joined AMH in 2010, under the position that was then called Assistant Engineer 1 (AE1). As his first job, he has been with the company since passing his board licensure exam. Since then, he has been involved in the civil engineering sub-disciplines of Civil Works, Flood, and Coastal Engineering in his projects. He also has experience working as the coordinator of a big project from 2012-2013, the BVI Thermasouth project, which was primarily a structural engineering project which also involved electrical, and mechanical engineering. These days, the majority of his engagements are technical studies, design, and analysis projects under the Coastal Engineering Practice-Based Group, of which he is the head. He is also currently pursuing his master's degree in the UP Institute of Civil Engineering.



Mary Grace L. Casuncad
BS Civil Engineering 2013
MS Structural Engineering 2020

Mary Grace joined AMH under the company's Internship Program in 2014. She has had prior experience assisting in the analysis and design of tall buildings and sports stadiums as an on-the-job-trainee in a structural firm. In AMH, her exposure to the different subfields of civil engineering under the internship program started with the Water Practice-Based Group (PBG). She is now a key member of the company's Structural Engineering PBG and has had experience working on projects from design-build projects as both structural designer and project lead. Her engagements include bridges, dams, manufacturing facilities, water and sewage treatment plants, metro rail transits, telecommunication towers, and power generating plants. Currently, she is part of the project team working on the Restoration of Antequera Church, pioneering the company's initiative to venture into the field of Preservation Engineering.

COMPANY EVENTS

by Jeremy Rifareal



2019 Anniversary: Obra

Celebrating another fortuitous year, AMH held its anniversary on August 30, 2019 at Seameo Innotech, Quezon City. The event commemorated AMH's 20 years of continued and growing success with the theme, "*Obra: A Toast to 20 Years of Excellence*", with employees clad in their Filipiniana attires to match the theme. The founders delivered inspirational messages to the company to express gratitude as they looked back on AMH's humble beginnings. Following tradition, new hires brought life to the festivities by showcasing their talents in performance and dance, while loyal employees were given recognition for their steadfast service to the company. The special edition 20th anniversary logo, video presentation, and newsletter were also showcased that night.

AMH White Christmas

AMH ended the year with a White Christmas Party. The employees' Cantata performances in accordance to the theme were highlights of the event. Four teams competed against each other, demonstrating their talents in teamwork and harmony. The night got more exciting as some prizes were raffled to spread the holiday cheer.



AMH Outreach

AMH's annual events also include outreach activities. Earlier this year, January 31, the company went to Asilo de San Vicente de Paul, an orphanage in UN Avenue, Manila, ran by the Company of the Daughters of Charity of Saint Vincent de Paul. The outreach activities included giving out 200 sets of disaster preparedness kits. AMH technical staff also inspected the site as input to their structural assessment.





AMH Fit Activities

In lieu of the usual Sportsfest activities, the employees were given the chance to form groups of ten or more for their choice of physical activity. This initiative by the AMH Fit committee aimed to promote physical wellness as well as camaraderie among colleagues. Some of the organized activities include basketball, volleyball, dance, laser tag, and yoga, among others.

2020 Anniversary: Thankful at Twenty-One

Despite the ongoing health crisis, AMH was able to push through with its 21st Anniversary by celebrating it together as a company virtually last September 01, 2020. Through the efforts of the organizers, the company's first online anniversary was without question more than just an ordinary online meeting. A special gift was sent out to the staff beforehand to unbox simultaneously during the celebration. In place of live performances, the newly-hired staff and the employee dance group, the 5S Movers, showcased their talents through video performances. The seven employees who have reached a service milestone this 2020 were also honored and awarded.



LOCAL AND INTERNATIONAL CONFERENCES

by Philip Lu



16th ASIAN REGIONAL CONFERENCE ON SOIL MECHANICS AND GEOTECHNICAL ENGINEERING October 2019 | Taipei, Taiwan

Attendees: Patrick Selda, Mike Gargullo, Gian Reyes, Rodgie Cabungcal, Karen Leobrera, Roy Anthony Luna, Joanne Parafina, Jenna Pallarca, Rodora Perez, Jose Carlo Eric Santos, and Alexis Acacio

The 16th Asian Regional Conference on Soil Mechanics was held last October 14 to 18, 2019 at the Taipei International Convention Center (TICC) in Taipei, Taiwan. AMH presented five (5) technical papers, including geotechnical engineering studies on the North-South Philippine Railway, Metro Manila Subway, and Philippine infrastructure, as well as on Seismic Hazard Analysis and Design. The main theme of the conference was Geotechnique for Sustainable Development and Emerging Market Regions covering subjects on modern geotechnical technologies and activities.



BENTLEY YEAR IN INFRASTRUCTURE 2019 October 2019 | Singapore

Attendees: Emmanuel Marasigan, Arian Fruto, and Mark Jay Armario

The Bentley Year in Infrastructure 2019 was held at the Marina Bay Sands Hotel in Singapore last October 21 to 24, 2019. The conference was organized by Bentley Systems Inc., a global leader in engineering software, as a platform where industry leaders from all over the world can collaborate and share best practices and technologies in advancing Building Information Modelling, or BIM, through digital twins.



INTERNATIONAL CONFERENCE ON SUSTAINABLE INFRASTRUCTURE

November 2019 | Los Angeles, USA

Attendees: Ma. Jocelyn Jocson and Edgardo Kasilag II

The ASCE International Conference on Sustainable Infrastructure was held in the Millenium Biltmore Hotel, Los Angeles, California, U.S.A. last November 6 to 9, 2019. The conference was attended by industry leaders from all over the world, as a collaborative space to learn from the latest sustainable infrastructure studies, trends, and policies. The conference is highlighted by technical tours around Los Angeles' sustainable infrastructures, technical sessions, and dedicated networking sessions.

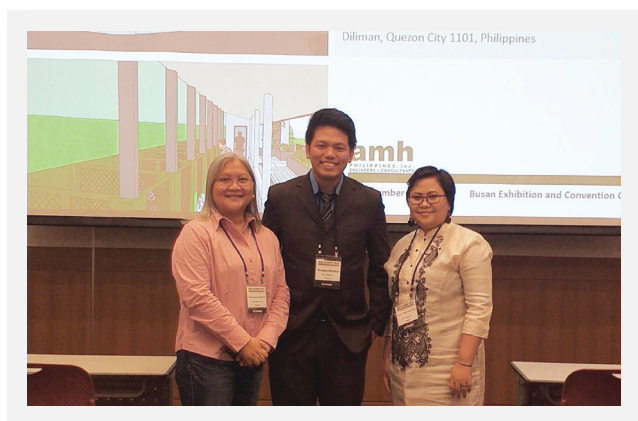


4th INTERNATIONAL CONFERENCE ON GEOTECHNICS FOR SUSTAINABLE INFRASTRUCTURE DEVELOPMENT

November 2019 | Hanoi, Vietnam

Attendees: Roy Anthony Luna, Josephine Razon, John Michael Tanap, Cedric Manzano, Monica Baniquett, Camille Tuppil, and Egbert Abiad

The 4th International Conference on Geotechnics for Sustainable Infrastructure Development was held at the National Convention Center in Hanoi, Vietnam last November 28 to 29, 2019. AMH engineers presented three (3) studies during the conference entitled "Utilization of Geoinformatics for Geohazard Assessment in Philippine Infrastructure", "Geotechnical and Seismic Considerations in the Design of Highway Embankments", and "Geotechnical and Seismic Design Considerations for Mine Tailings Dam".



INTEGRATED ENVIRONMENTAL ENGINEERING CONFERENCE AND 4TH INTERNATIONAL CONFERENCE ON BIOLOGICAL WASTE AS RESOURCE (IEEC & BWR 2019)

December 2019 | Busan, South Korea

Attendees: Maria Antonia Tanchuling, Benedict Requejo, and Brianne Inocencio

AMH presented a paper entitled "Design of Materials Recovery Facility (MRF) for a Residential Subdivision Development in the Philippines" in the Integrated Environmental Engineering Conference and 4th International Conference on Biological Waste as Resource held last December 10 to 13, 2019 at the Busan Exhibition and Convention Center in Busan, South Korea. The theme of the conference was "Integrated Management of Environment, Water, and Energy."



ISSMGE-PSSMGE GEOTECHNICAL SYMPOSIUM

February 2020 | Manila

The Philippine Society for Soil Mechanics and Geotechnical Engineering (PSSMGE) in collaboration with its international entity, ISSMGE, held a Geotechnical Symposium in Manila Hotel last February 4, 2020. The symposium served as a platform for various geotechnical engineering research from all over the world to be presented and shared. The event was organized and facilitated by AMH's very own engineers, from the logistics to the program. The conference included seven (7) technical presentations, an open forum, and an awarding ceremony.

2020 INTERNSHIP PROGRAM

by Aerial Beco

Ten years have passed since AMH started a program to mold young professionals, helping them find themselves in the engineering profession. For fledgling engineers fresh out of student life, at the point wherein choosing which career path to take seems to be the most critical, AMH provides an opportunity to learn and to have a taste of each flavor civil engineering has to offer. The AMH Internship Program serves as fertile ground for budding engineers to take root and grow by allowing them to holistically experience, across two years, different fields such as Geotechnical Engineering, Structural Engineering, Civil Works, Water Resources, Earthquake Engineering, and Coastal Engineering, through AMH's Practice-Based Groups (PBG).

On its anniversary, the AMH Internship Program accepted ten individuals to be part of the ever growing AMH family. Led by the Dean, Engr. Roy Anthony C. Luna, these are the engineers chosen to be part of the Internship Batch of 2020:

Interns from UP Diliman:

1. Jayson Chua, *cum laude*
2. Reina Dagui, *summa cum laude, Top 6 CE Board Exam (Nov 2019)*
3. Reyvin Legaspi, *magna cum laude*
4. Philip Lu
5. Stanley Sayson, *summa cum laude*
6. Bryanth Tolentino, *cum laude*
7. Helli-mar Trilles, *summa cum laude*
8. Renee Vizmanos, *magna cum laude*

Intern from PUP Lopez:

9. Jeremy Rifareal, *cum laude, Top 2 CE Board Exam (Nov 2019)*

Intern from SLSU Lucban:

10. Aerial Beco, *magna cum laude*



2020 Interns (left to right, top row): Reyvin Legaspi, Helli-mar Trilles, Alvin Carandang (Lateral Entrant), Philip Lu; (middle row): Bryanth Tolentino, Jayson Chua, Jeremy Rifareal, Stanley Sayson; (bottom row): Roy Luna (Dean), Renee Vizmanos, Aerial Beco, Reina Dagui

When asked why they chose AMH, the interns were of one mind: PBG Rotation and Mentorship. For instance, according to Philip, "I applied to AMH hoping to belong to a healthy work environment that values mentorship for fresh graduates."

Your first job is never easy. There are countless things to learn and adjustments to be made. Luckily, in AMH, the project leads, senior engineers, and even those who just happen to sit next to you in the office, are generous to share their knowledge not only about the technical aspects of the job but also about their lives as engineers in general.

The concept of PBG rotation is highly appealing to fresh graduates. "I was attracted to the internship program because newly-licensed civil engineers like me are given the opportunity to be involved in projects from various fields of civil engineering before choosing where to specialize," Helli-mar said. This rotation among PBGs not only widens one's horizons; it also helps in discovering one's passions and interests. "Currently, I am assigned to the Geotechnical Engineering PBG. So far, I am glad to have already used several software for geotechnical analyses of reclamation projects," Helli-mar added.

AMH is also more than just a company, it is a home. Officemates are not just co-workers, they are family. "The best

thing about the MGH office for me is the culture of sharing and fellowship during lunchtime. It feels like a break from work without really being outside the office," Renee said.

AMH values the family culture it has established. As of writing, the world is in the middle of a pandemic. Employees face challenges unique to this era. But, AMH ensures the welfare of its employees now more than ever, and takes every step necessary to address every concern. This consideration extends even to the newest members of the AMH family, its interns. Despite the difficulties of online mentoring, and problems brought about by the work-from-home experience, AMH still continues to strive to guide and nurture its interns. These efforts are not without fruit. For Stanley, "The Work from Home setup has its challenges, but it wasn't too difficult to adapt shortly after it started." As everyone looks forward to better days ahead, the learning never stops and growth continues.

Eleanor Roosevelt once said, "The purpose of life is to live it, to taste experience to the utmost, and to reach out eagerly and without fear for a newer and richer experience." AMH provides its interns the opportunity to do just so. And, as they accumulate experience in their practice, may they grow to be engineers of which Filipinos can be proud, as the company envisions.

Thank you, dear Clients (a few of whose logos appear here), for your continued support!



ROCKWELL LAND



MEGAWORLD





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