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GEOTECHNICAL INVESTIGATION REPORT

CONSTRUCTION OF SAINT MARY'S UNIVERSITY

3700 Bayombong, Nueva Vizcaya

OWNER: SAINT MARY'S UNIVERSITY

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1.0 INTRODUCTION

This report pertains to the **CONSTRUCTION OF SAINT MARY'S UNIVERSITY** located at 3700 Bayombong, Nueva Vizcaya presents the evaluation of the results of the geotechnical investigation of the said area.

CGB Geotechnical Testing Services conducted the geotechnical investigation drilled **two (2) boreholes**, in order to assess the sub-soil condition and evaluate its characteristics, and for each site the soil samples recovered were then brought to **NDB Engineering Consultancy** the soil laboratory center for analysis and testing. Laboratory tests on selected soil samples include:

- Soil Classification of Soils for Engineering Purposes
  Unified Soil Classification System (ASTM D2487-93)
- Grain Size Analysis of Soils (ASTM D422-63)
- Liquid Limits of Soils (ASTM D4318-95)
- Plastic Limits of Soils (ASTM D4318-95)
- Determination of Moisture Content of Soils (ASTM D2216-92)
- Unconfined Compressive Strength of Cohesive Soil (ASTM D2166-91)

This report presents the field (Standard Penetration Test – SPT) by **CGB Geotechnical Testing Services** and laboratory procedures adopted in the investigation as well as the evaluation of the test results for the subsequent foundation analysis were made by **NDB Engineering Consultancy**.

Subsurface conditions are presented in the form of idealized soil profiles (See: Appendices) and borehole logs that include the results of the field and laboratory tests on soil samples were both coordinated by **CGB Geotechnical Testing Services** and **NDB Engineering Consultancy**.

2.0 FIELD INVESTIGATION

The field investigation within the site consisted of drilling of **two (2) boreholes**. The Borehole Location Plan is appended to this report (See Appendices). Table 1 presents the summary of the investigation conducted.

Table 1: Summary of Field Investigation

Borehole Designation	Final Depth of Borehole	Water Level	Date of Drilling
BH-1	**15.00 m**	**2.35 m**	**06-19-24 to 06-19-24**
BH-1	**15.00 m**	**2.15 m**	**06-19-24 to 06-19-24**

Washboring procedures were employed in order to advance the borehole and the Standard Penetration Test was done in order to get the penetration resistance profile of the underlying soils.

The Standard Penetration Test (SPT) was done in Accordance with ASTM specifications. For each test, a 2-inch (50.8mm) outside diameter Spoon Sampler is driven into soil a distance of 18 inches (460mm) by means of a 140lb. (63.5 kg.) driving mass falling free from a height of 30 inches (760mm). The number of blows needed to drive the sampler 18 inches (460mm) is recorded and the number of blows needed to drive the last 12 inches (305mm) is taken as the N-value.

Undisturbed Sample was done accordance with ASTMD-1587 procedure using thin-walled tube sampler to obtain intact specimens of fine-grained soils for laboratory tests to determine engineering properties of soils (strength, compressibility, permeability, and density).

Soil samples were recovered using the spoon sampler and were then taken to the laboratory for analysis and testing.

Complementing the field activities is the laboratory testing of the samples obtained. The results of the field works and laboratory investigation were then used to establish the parameters for determining the type of foundation, level of foundation and bearing capacities.

3.0 LABORATORY TESTING

Representative Soil Samples obtained during drilling / samplings were subjected to the following laboratory tests:

Soil Classification Tests per ASTM D2487
This standard describes a system for classifying mineral and organo-mineral soils for engineering purposes based on laboratory determination of particle size characteristics, liquid limit and plasticity index.

Grain Size Analysis per ASTM D422
This Method covers the quantities determination of the distribution of particle sizes of soils.

Soil was passed through a series of sieve, the weight of soil retained in each sieve determined and recorded. For each sample analyzed, a gradation curve was drawn based on the percent finer weight.

Determination Moisture Content per ASTM D2216
This method covers the laboratory determination of the water / moisture content of soil by weight.

The moisture content of a material is defined as the ratio, express as a percentage, of the mass of pore water in a given mass of material to the mass of the solid material particles.

Atterberg Limit Test per ASTM D4318
This test method covers the determination of the liquid limit, plastic limit and the plasticity index of soils.

Liquid Limit of Soil
The liquid limit of a soil is the water content, express as a percentage of the mass of the oven-dried soil after attaining the condition between the liquid and plastic states.

Plastic Limit and Plasticity Index of Soils
The plastic limit of the soil is the water content, express as a percentage of the mass of the oven oven-dried soil after attaining the condition between the plastic and semi-solid states.
Plasticity Index is defined as the difference of the liquid and plastic limits of the soil.

Unconfined Compressive Strength of Cohesive Soil ASTM D2166-91

This test method covers the determination of the unconfined compressive strength of cohesive soil in the intact, remolded, or reconstituted condition, using strain-controlled application of the axial load.

4.0 RESULTS OF FIELD AND LABORATORY TESTING

The result of field and laboratory testing are presented in table 2.

Table 2: Idealized subsurface profile at BH-1

Depth, m	USCS Classification / Description	SPT N-value	Consistency / Relative Condition
0.55 – 1.00	ML – Sandy SILT – brownish gray	13	Stiff
1.55 – 2.00	ML – Sandy SILT – brownish gray	15	Stiff
2.55 – 3.00	ML – Sandy SILT – brownish gray	32	Hard
3.55 – 4.00	SM – Silty SAND – gray	28	Medium Dense
4.55 – 5.00	SM – Silty Gravelly SAND – gray	53	Very Dense
5.55 – 6.00	SM – Silty Gravelly SAND – gray	50	Dense
7.05 – 7.50	GM – Silty Sandy GRAVEL – gray	55	Very Dense
8.55 – 9.00	GM – Silty Sandy GRAVEL – gray	58	Very Dense
10.05 – 10.50	GM – Silty Sandy GRAVEL – gray	42	Dense
11.55 – 12.00	GM – Silty Sandy GRAVEL – gray	55	Very Dense
13.05 – 13.50	GM – Silty Sandy GRAVEL – gray	58	Very Dense
14.55 – 15.00	GM – Silty Sandy GRAVEL – gray	58	Very Dense

Table 3: Idealized subsurface profile at BH-2

Depth, m	USCS Classification / Description	SPT N-value	Consistency / Relative Condition
0.55 – 1.00	GM – Silty Sandy GRAVEL – gray	13	Medium Dense
1.55 – 2.00	GM – Silty Sandy GRAVEL – gray	15	Medium Dense
2.55 – 3.00	SM – Silty Gravelly SAND – gray	46	Dense
3.55 – 4.00	SM – Silty Gravelly SAND – gray	41	Dense
4.55 – 5.00	SM – Silty Gravelly SAND – gray	38	Dense
5.55 – 6.00	GM – Silty Sandy GRAVEL – gray	52	Very Dense
7.05 – 7.50	GM – Silty Sandy GRAVEL – gray	58	Very Dense
8.55 – 9.00	SM – Silty Gravelly SAND – gray	62	Very Dense
10.05 – 10.50	SM – Silty Gravelly SAND – gray	49	Very Dense
11.55 – 12.00	SM – Silty Gravelly SAND – gray	62	Very Dense
13.05 – 13.50	SM – Silty Gravelly SAND – gray	70	Very Dense
14.55 – 15.00	SM – Silty Gravelly SAND – gray	64	Very Dense

5.0 REGIONAL GEOLOGY AND SEISMICITY

Surrounded by North Luzon's three large mountain ranges, Nueva Vizcaya is generally mountainous, varying from steep mountains to rolling hills, with some valleys and plains. It is bordered on the west by the Cordillera mountains, on the east by the Sierra Madre mountains, and on the south by the Caraballo Mountains. The province (and the entire Cagayan Valley) are separated from the Central Luzon plains by the Caraballo Mountains.

The province has a total land area of 3,975.67 square kilometres (1,535.01 sq mi). The southernmost province in the Cagayan Valley region, Nueva Vizcaya lies approximately 268 kilometres (167 mi) north of Metro Manila and can be reached by land via the Cagayan Valley Road (Maharlika Highway).

6.0 GEOTECHNICAL DESIGN / ENGINEERING CONSIDERATION

6.1 Seismic Design Criteria

The Philippine archipelago is a part of the Pacific Ring of Fire and considered as part of seismically active region globally, and locally classified under Seismic Zone IV where Z=0.4. The most probable seismic source that may affect the project site is the Approximately 2.3 km northwest of the Maddiangat Fault.

The following seismic design parameters are:

PARAMETER	VALUE
Peak Ground Acceleration	**0.60g**
Soil Profile Type	**S_C & S_D**
Seismic Zone	**4**
Seismic Source Type	**A**
Spectral Acceleration	**Ss = 1.61-3.00(0.2 seconds)** **S_1 = 0.71-1.60(1.0 seconds)**
Near-Source Factor	**N_a = 1.50** **N_v = 2.00**
Seismic Coefficient	**C_a = 0.40 N_a & 0.44 N_a** **C_v = 0.56 N_v & 0.64 N_v**

See Figure 1 and 2 of Acceleration Map of Region II and Figure 3 of Peak Ground Acceleration Map
**Table 6.1 – Seismic Design Parameters Other seismic parameters shall be determined by the Design Engineer using NSCP 2015 7th Edition.*

For concentrically loaded footings the required area is determined from

$$A_{req} = \frac{D+L}{q_a}$$

The allowable bearing pressure can be increased by 33% when aside from the service loads, wind and other lateral loads (transient loads) are considered.

$$A_{req} = \frac{(D+L+W)}{1.33q_a} \quad \text{or} \quad \frac{D+L+E}{1.33q_a}$$

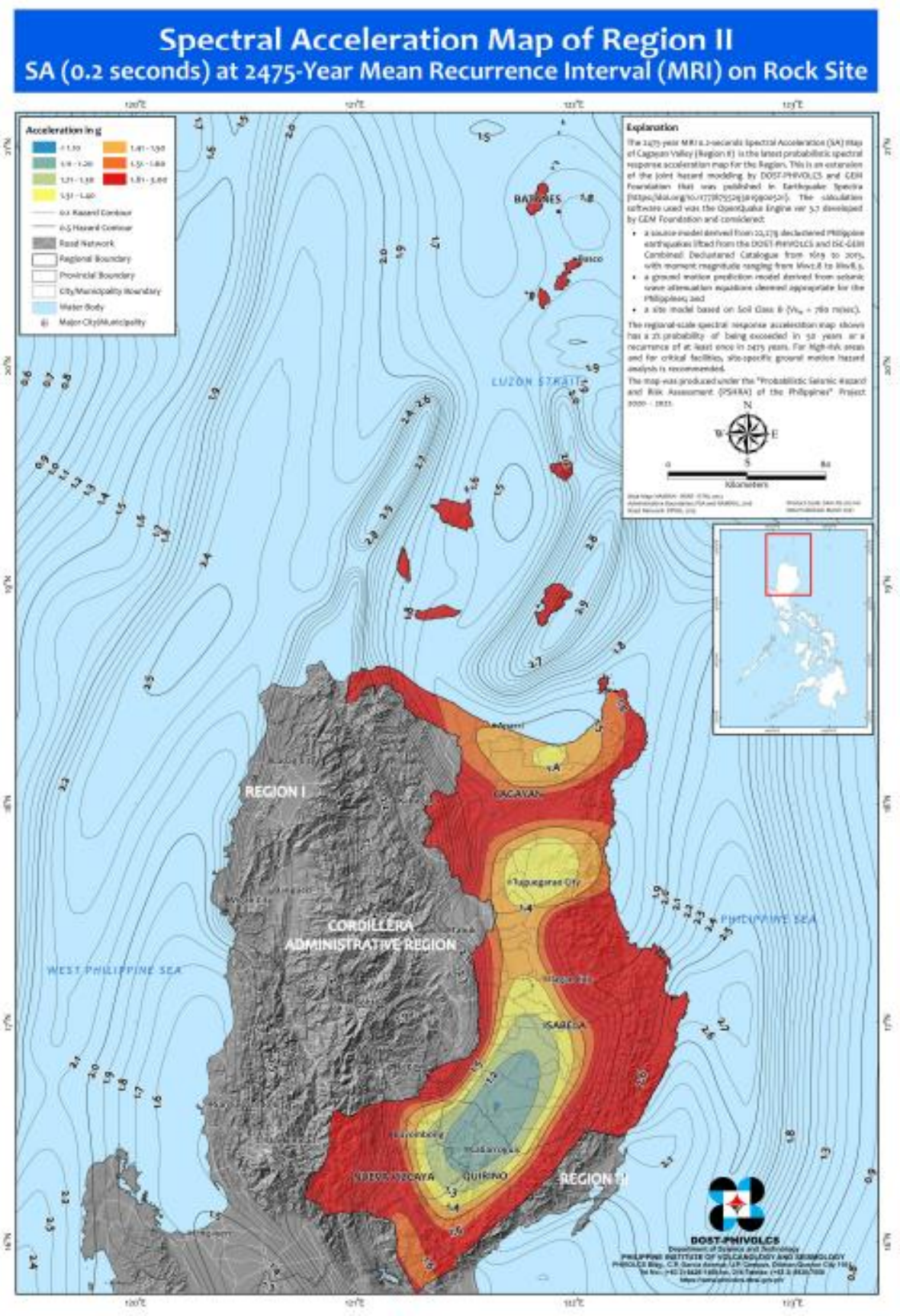

Spectral Acceleration Map of Region II
SA (0.2 seconds) at 2475-Year Mean Recurrence Interval (MRI) on Rock Site
Acceleration in g
Explanation
BATANES
LUZON STRAIT
REGION I
CORDILLERA ADMINISTRATIVE REGION
WEST PHILIPPINE SEA
PHILIPPINE SEA
CAGAYAN
ISABELA
QUIRINO
REGION III
DOST-PHIVOLCS

Figure 1.

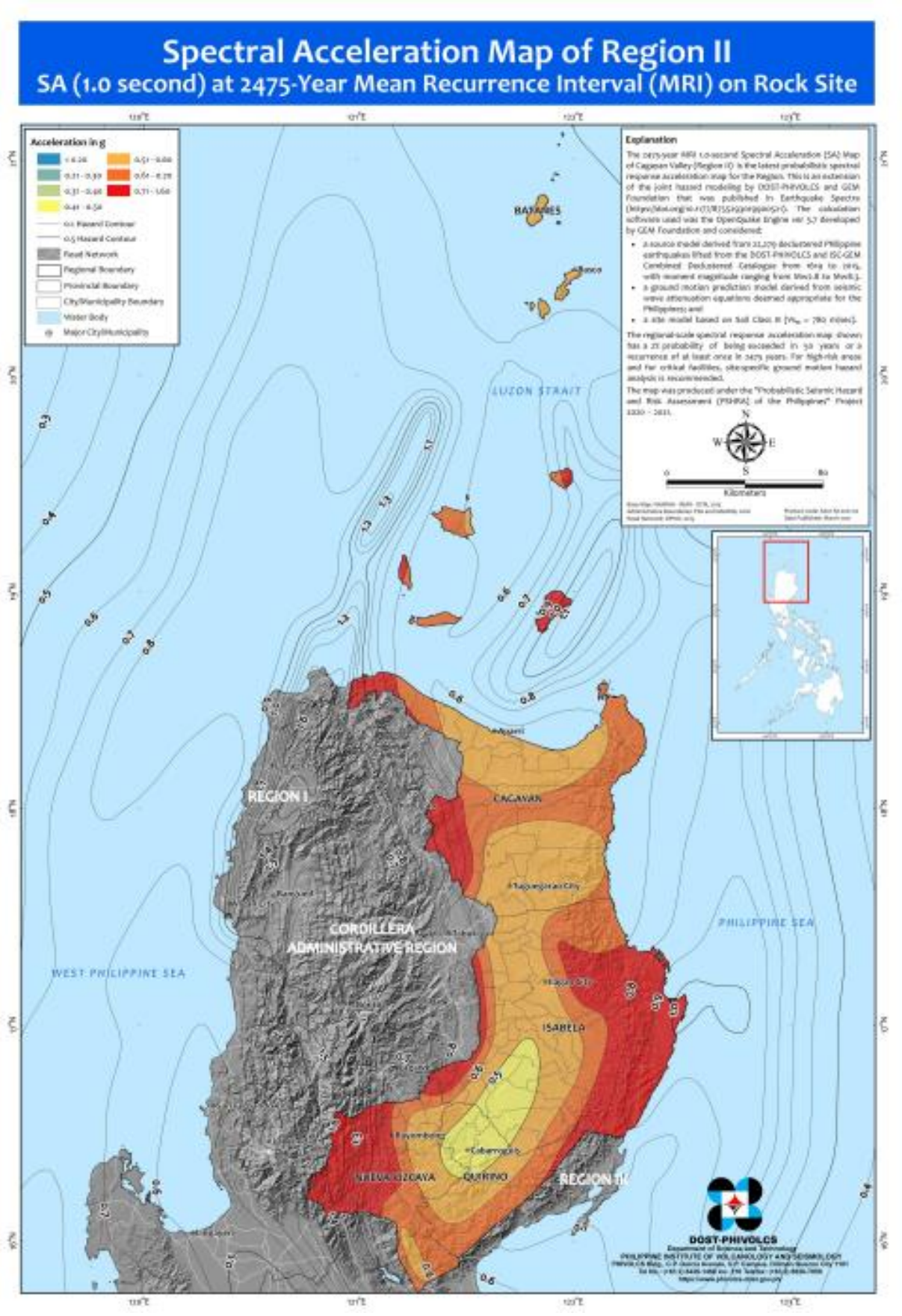

Spectral Acceleration Map of Region II
SA (1.0 second) at 2475-Year Mean Recurrence Interval (MRI) on Rock Site
Acceleration in g
Explanation
LUZON STRAIT
PHILIPPINE SEA
WEST PHILIPPINE SEA
REGION I
CAGAYAN
CORDILLERA ADMINISTRATIVE REGION
ISABELA
NUEVA VIZCAYA
QUIRINO
REGION III
DOST-PHIVOLCS

Figure 2

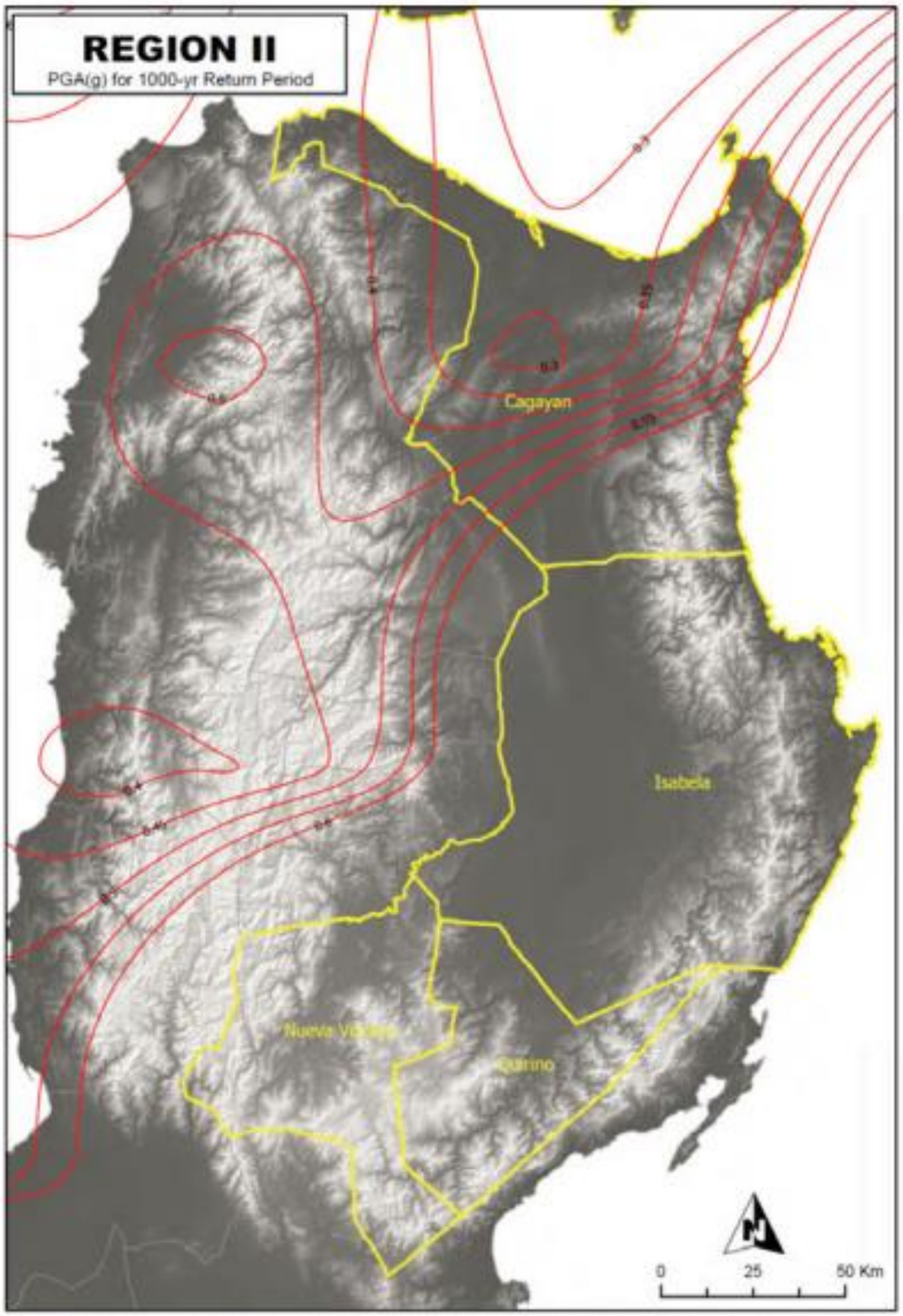


Figure 3B-3 Horizontal Peak Ground Acceleration Coefficient (*PGA*) for Level 1 Earthquake Ground Motion (Region II)

Figure 3.

6.2 Geotechnical Design Criteria

Soil conditions and local geological features affecting the site response for Borehole 1 are thick bedded of dense to very dense Silty Sandy GRAVEL OVERLAIN BY 3.00-meter thick (from natural grade line) of stiff to hard Sandy SILT, 1.00-meter lenses of medium dense of Silty SAND, 2.00-meter thick of dense to very dense Silty Gravelly SAND. And finally, 9.00-meter thick of very dense to dense to very dense Silty Sandy GRAVEL

The corresponding geotechnical design parameters are:

For Borehole 1:

PARAMETER	VALUE
Assumed founding depth for Shallow Footing	2.00 meters down from natural grade line
Adhesion between foundation base to soil materials (for lateral pressure)	C= 96 kpa
Poisson's Ratio, μ	0.30 to 0.35

Soil conditions and local geological features affecting the site response for Borehole 2 are thick bedded of very dense Silty Gravelly SAND OVERLAIN BY 2.00-meter thick (from natural grade line) of medium dense, 3.00-meter thick of dense Silty Gravelly SAND, 2.50-meter thick of dense to very dense Silty Sandy GRAVEL. And finally 7.50-meter thick of very dense Silty Gravelly SAND.

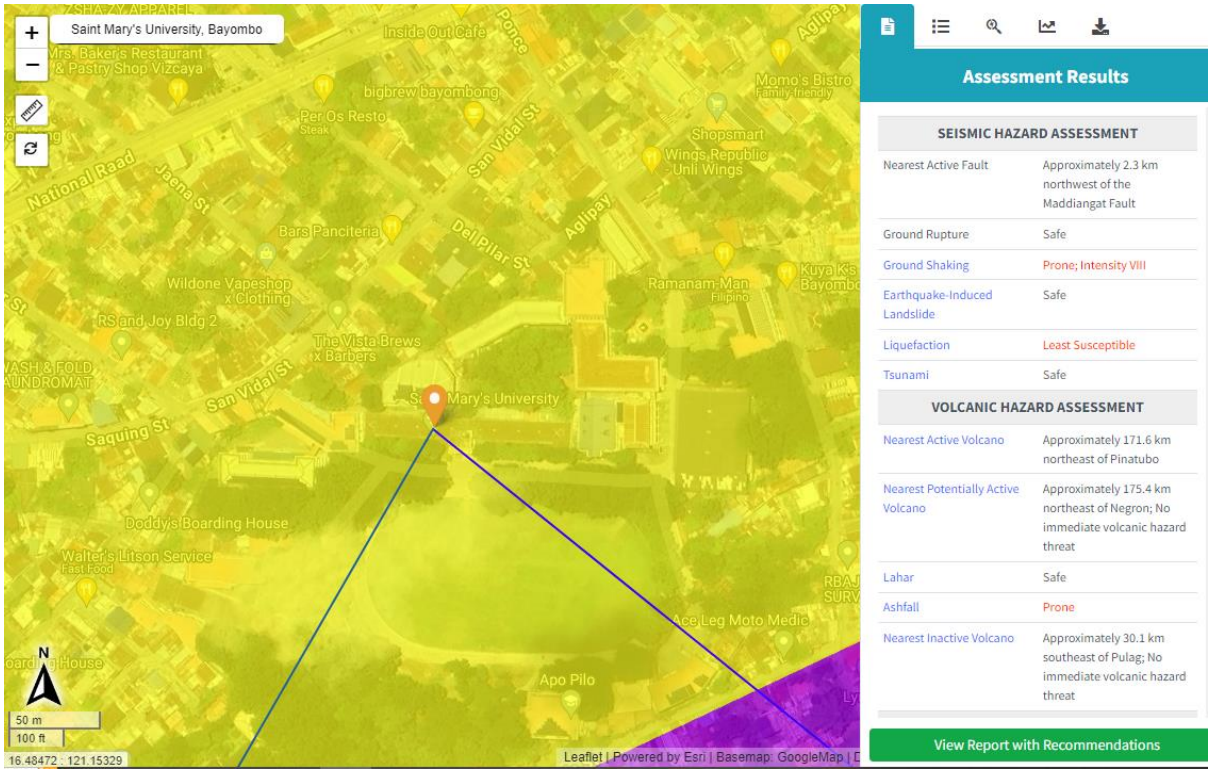
The corresponding geotechnical design parameters are:

For Borehole 2:

PARAMETER	VALUE
Assumed founding depth for Shallow Footing	2.00 meters down from natural grade line
Adhesion between foundation base to soil materials (for lateral pressure)	Ø = 36.25°
Poisson's Ratio, μ	-0.10 to 1.25

6.3 Potential Site Liquefaction

Based from the PHIVOLCS accredited site, HazardHunterPH, the site is LEAST SUSCEPTIBLE to site liquefaction.



6.4 Shallow Footing with NO SOIL REMEDIATION NEEDED AT THE SAID SITE, OPTION 1: USE ANY TYPE DEEP FOOTING is the most practical foundation options combined with robust grade beams.

Given the character of subsurface soil immediately underlain the proposed structure, the most economical and practical type of footing is a shallow footing with NO SOIL REMEDIATION NEEDED AT THE SAID, OPTION 1: USE ANY TYPE DEEP FOOTING combined with robust grade beams interconnecting the whole foundation system, but also depends on the following factors, re: structural configuration, gravitational & seismic loads, complexity of the soil profile, regional stratigraphy, structure and soil inter-action. See computation of allowable soil bearing pressure (asbp) and settlements at the Appendices.

6.5 For Eccentrically loaded Footing

If the supported column is not concentric with the footing area or if the column transmits at its juncture with the footing not only a vertical load but also a bending moment. In either case, the load effects at the footing base can be represented by the vertical load P and a bending moment M. The resulting bearing pressures are again assumed to be linearly distributed. As long as the eccentricity e = M/P does not exceed the kern distance k of the footing are, the usual flexure formula

$$Q_{max} = P/A +/- Mc/I$$
$$_{min}$$

permits the determination of the bearing pressures at the two extreme edges. The footing area is found by trial and error from the condition $q_{max} \leq q_a$.

6.6 For Eccentrically loaded Footing

If the supported column is not concentric with the footing area or if the column transmits at its juncture with the footing not only a vertical load but also a bending moment. In either case, the load effects at the footing base can be represented by the vertical load P and a bending moment M. The resulting bearing pressures are again assumed to be linearly distributed. As long as the eccentricity e = M/P does not exceed the kern distance k of the footing are, the usual flexure formula

6.7 Load Combinations using Strength Design or Load and Resistance Factor Design

6.7.1 Basic Load Combination

Structures and all portions thereof shall resist the most critical effects from the following combinations of factored loads:

1.4(D+F)
1.2(D+F+T)+1.6(L+H)+0.5($L_r$orR)
1.2D+1.6($L_r$orR)+(f_1Lor0.80W)
1.2D+1.6W+f_1L+0.5($L_r$orR)
1.2D+1.0E+f_1L
0.9D+1.6W+1.6H
0.9D+1.6E+1.6

6.7.2 Symbols and Notation

D=dead load
E=earthquake load
F=fluids load with well-defined pressures and maximum heights
H=lateral load from the combined soil & water pressures
L=live load
L_r=roof live load including any permitted live load reduction
P=ponding load
R=rain load on undefllected roof
T=self-straining force and effects arising from contraction and expansion resulting from temperature changes, shrinkage, moisture change, creep in component materials, movement due to differential settlement or combination thereof.
W=wind pressure load
F_1=1.0 for floors in places of pulic assembly, for live loads in excess of 4.8 kPa, and garage live load
=0.5 for other live loads

7.0 LIMITATION

The evaluation presented was generally based on the result of **the two boreholes** drilled at the site for the **CONSTRUCTION OF SAINT MARY'S UNIVERSITY** located at *3700 Bayombong, Nueva Vizcaya*.

The structural design of the sub-structure is beyond the scope of this report. The foregoing analyses, recommendations and conclusions have been based on the subsoil investigation data **AT or NEAR the two boreholes**, AND NOT TO BE INTERPRETED AS A WHOLE on the entire site lot, THUS, should any difference in the subsoil conditions be observed during construction, the undersigned shall be informed so that necessary corrections and changes in the recommendations can be made.

Extreme protection during excavation MUST BE EXERCISED to prevent soil softening due to high water level.

Correlated SPT Blow count for sand shear friction (ϕ) and clay cohesion value (c) were used in this computation.

ENGR. NOLI D. BANUA
PRC No.: 0045609
TIN No.: 154851714
PTR No.: 1547844
DATE: 01-12-24
PLACE: MANILA

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APPENDIX – 1.0

1.1 BOREHOLE LOCATION AND SITE LOCATION

1.2 SOIL STRATIFICATION

1.3 FINAL BORING LOG

1.4 LABORATORY TEST RESULTS

1.5 SOIL SAMPLE PICTURE & DRILL OPERATION

1.6 COMPUTATION OF ALLOWABLE SOIL BEARING CAPACITY AND TOTAL SETTLEMENTS

1.7 COMPUTATION OF ALLOWABLE PILE CAPACITY

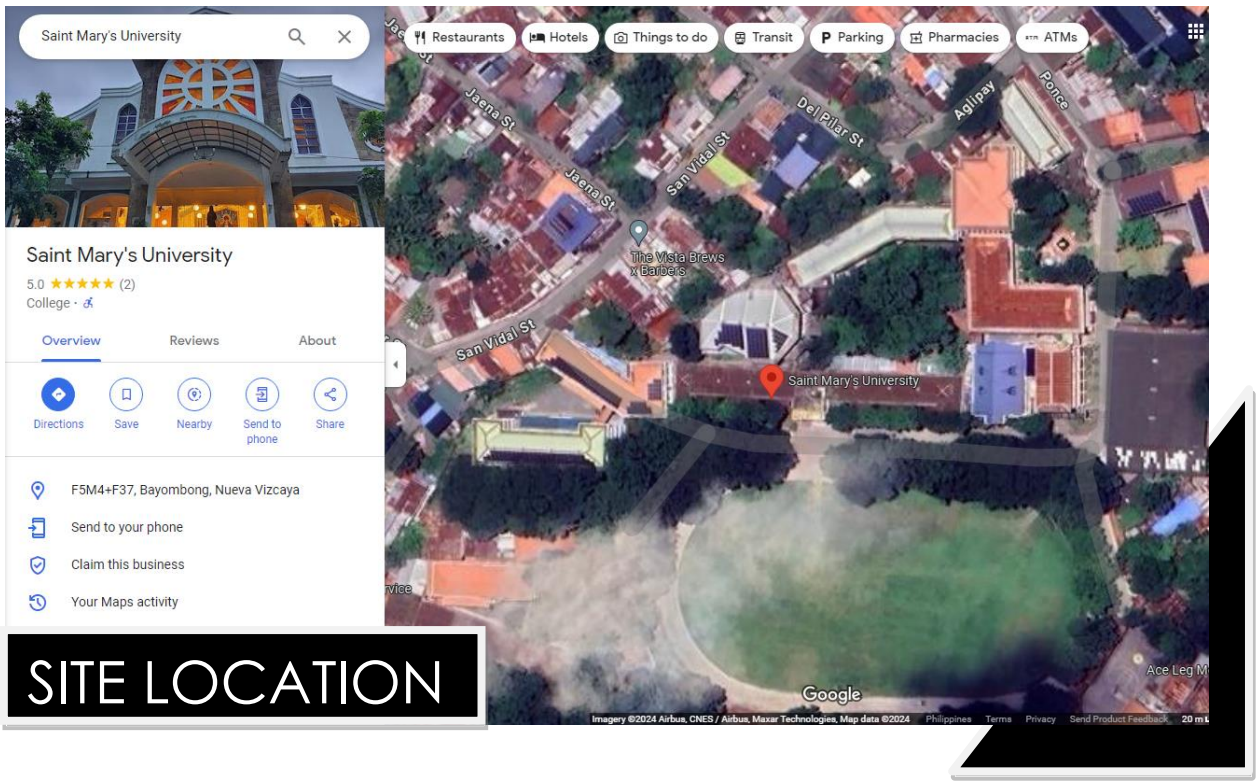
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APPENDIX – 1.1

BOREHOLE LOCATION AND SITE LOCATION



BOREHOLE LOCATION



SITE LOCATION

CGB Geotechnical Testing Services
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APPENDIX – 1.2
SOIL STRATIFICATION

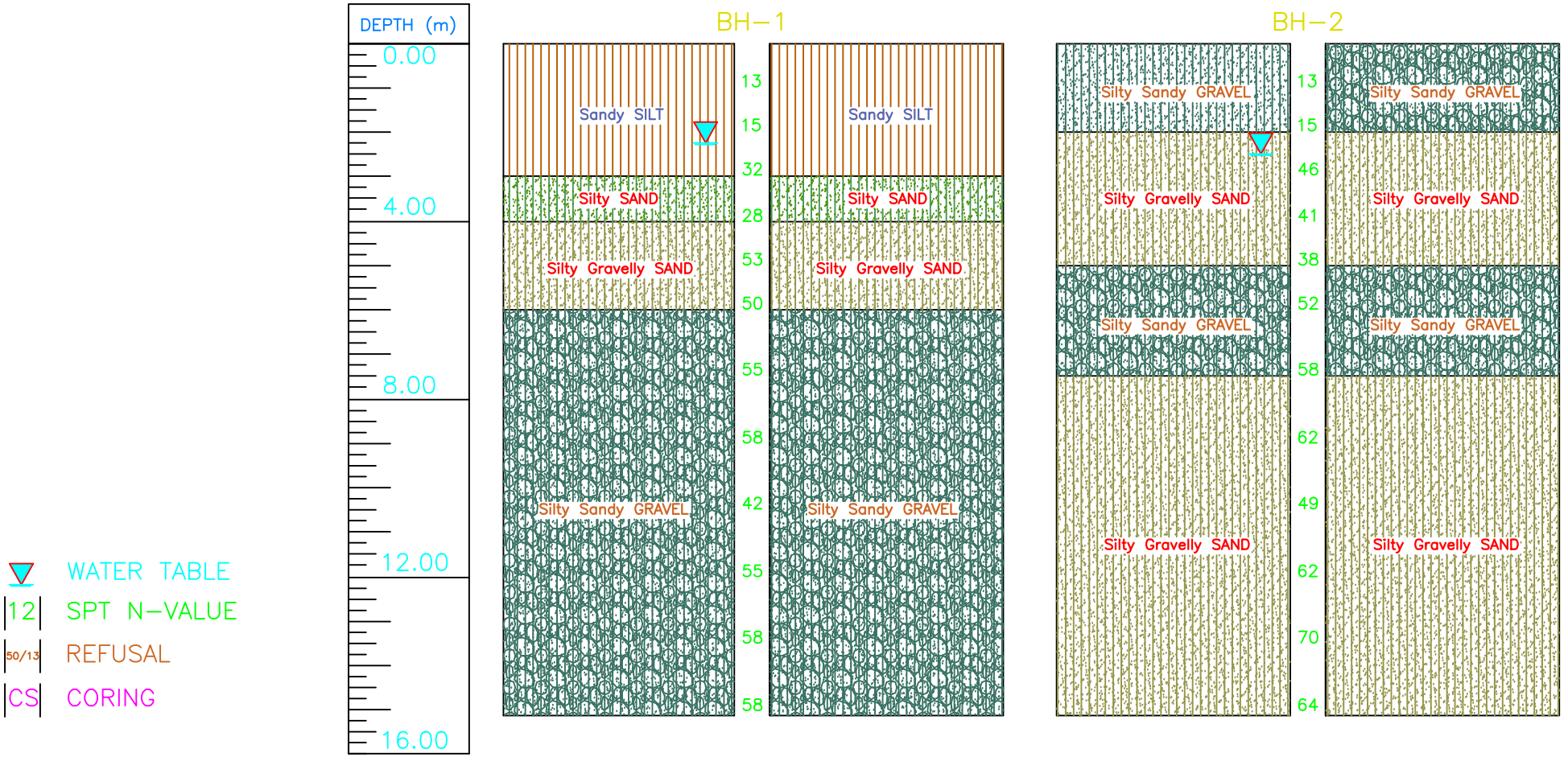


FIG. 02 SOIL STRATIFICATION

BAYOMBONG, NUEVA VISCAYA NTS

CGB Geotechnical Testing Services
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APPENDIX – 1.3
FINAL BORING LOG

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT NAME: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

PROJECT LOCATION: 3700 Bayombong, Nueva Vizcaya

DATE DRILLED: JUNE 19, 2024
DATE FINISHED: JUNE 19, 2024
DRILL RIG TYPE: MANUAL DRILLING RIG

BOREHOLE NO.: 1
BOREHOLE DEPTH: 15.00 m
WATER TABLE: 2.35 m

DEPTH, m	SAMPLE NO.	% RECOVERY	R.Q.D	LOG SYMBOL	CLASSIFICATION	DESCRIPTION	SPT BLOWS 15	15	15	SPT N-VALUE	MC	ATTERBERG LIMITS LL %	PI %	SIEVE ANALYSIS % PASSING SIEVE NO. 1	3/4	1/2	4	10	40	100	200
						GROUND SURFACE															
1	SS-1	100					5	6	7	**13**											
						GROUND WATER TABLE															
2	SS-2	95			ML	Sandy SILT, brownish gray; very fine to fine sand; traces of fine sub-angular to sub-rounded gravel; low plasticity; stiff to hard.	5	7	8	**15**	24.9	38	11	100	100	100	99	97	88	63	49
3	SS-3	82					14	15	17	**32**	21.8	42	13	100	100	95	90	84	79	62	51
4	SS-4	70			SM	Silty SAND, gray; medium to fine grained; traces of fine sub-angular to sub-rounded gravel; non-plastic fines; medium dense.	16	13	15	**28**	9.6		NP	100	100	100	90	85	57	19	12
5	SS-5	70				Silty Gravelly SAND, gray; fine to medium grained; medium to coarse sub-angular to sub-rounded gravel; non-plastic fines; dense to very dense.	13	29	24	**53**											
6	SS-6	100					15	27	23	**50**	8.0		NP	100	81	68	63	55	33	15	10
7																					
	SS-7	65			GM	Silty Sandy GRAVEL, gray; fine to medium sub-angular to sub-rounded gravel; medium to coarse sand; non-plastic fines; very dense.	13	28	27	**55**											
8																					
9	SS-8	89					21	29	29	**58**	4.9		NP	100	88	58	37	26	16	12	11

*** CONTINUATION OF BH-1 AT NEXT PAGE ***

LEGEND	TYPE OF SAMPLING	CBG GEOTECHNICAL TESTING SERVICES
LL-Liquid Limit PL-Plastic Limit RQD-Rock Quality Designation MC-Moisture Content WT-Water Table NP-No Plasticity * -Insufficient for Test	Split-Spoon Sample Core Sample Wash Sample Water Table	Encoded by: G. P. Panigo-os, Technical Manager Approved by: Engr. Noel D. Banua, Head of Engineering Department

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT NAME: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

PROJECT LOCATION: 3700 Bayombong, Nueva Vizcaya

DATE DRILLED: JUNE 19, 2024
DATE FINISHED: JUNE 19, 2024
DRILL RIG TYPE: MANUAL DRILLING RIG

BOREHOLE NO.: 1
BOREHOLE DEPTH: 15.00 m
WATER TABLE: 2.35 m

DEPTH, m	SAMPLE NO.	% RECOVERY	R.Q.D	LOG SYMBOL	CLASSIFICATION	DESCRIPTION	SPT BLOWS 15	15	15	SPT N-VALUE	SPT GRAPH 10	20	30	40	50	MC	ATTERBERG LIMITS LL %	PI %	SIEVE ANALYSIS % PASSING SIEVE NO. 1	3/4	1/2	4	10	40	100	200
						GROUND SURFACE																				
10	SS-9	85				Silty Sandy GRAVEL, gray; fine to coarse sub-angular to sub-rounded gravel; coarse to medium sand; non-plastic fines; dense to very dense.	16	18	24	**42**																
11																										
12	SS-10	67			GM		17	23	32	**55**						6.5		NP	100	71	67	50	39	21	13	10
13	SS-11	62				Silty Sandy GRAVEL, gray; medium to coarse sub-angular to sub-rounded gravel; fine to medium sand; non-plastic fines; dense to very dense.	16	27	31	**58**																
14																										
15	SS-12	71					25	25	33	**58**						9.8		NP	100	83	67	61	53	34	20	13
16																										
17																										
18																										

END OF BH-1 @ 15.00 m

LEGEND	TYPE OF SAMPLING	CBG GEOTECHNICAL TESTING SERVICES
LL-Liquid Limit PL-Plastic Limit RQD-Rock Quality Designation MC-Moisture Content WT-Water Table NP-No Plasticity * -Insufficient for Test	Split-Spoon Sample Core Sample Wash Sample Water Table	Encoded by: G. P. Panigo-os, Technical Manager Approved by: Engr. Mark D. Banua, Head of Engineering Department

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT NAME: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

PROJECT LOCATION: 3700 Bayombong, Nueva Vizcaya

DATE DRILLED: JUNE 19, 2024
DATE FINISHED: JUNE 19, 2024
DRILL RIG TYPE: MANUAL DRILLING RIG

BOREHOLE NO.: 2
BOREHOLE DEPTH: 15.00 m
WATER TABLE: 2.15 m

DEPTH, m	SAMPLE NO.	% RECOVERY	R.Q.D	LOG SYMBOL	CLASSIFICATION	DESCRIPTION	SPT BLOWS 15	15	15	SPT N-VALUE	SPT GRAPH 10 20 30 40 50	MC	ATTERBERG LIMITS LL %	PI %	SIEVE ANALYSIS % PASSING SIEVE NO. 1	3/4	1/2	4	10	40	100	200
						GROUND SURFACE																
1	SS-1	100			GM	Silty Sandy GRAVEL, gray; medium to coarse sub-angular to sub-rounded gravel; coarse to fine sand; non-plastic fines; medium dense.	5	6	7	**13**												
						GROUND WATER TABLE																
2	SS-2	100					5	7	8	**15**		5.4		NP	100	83	77	55	38	25	17	14
3	SS-3	92			SM	Silty Gravelly SAND, gray; fine to medium grained; medium to fine sub-angular to sub-rounded gravel; non-plastic fines; dense.	19	21	25	**46**		7.6		NP	100	100	89	58	32	20	13	10
4	SS-4	84					21	18	23	**41**		8.6		NP	100	100	88	68	39	23	14	11
5	SS-5	67					11	16	22	**38**												
6	SS-6	100			GM	Silty Sandy GRAVEL, gray; coarse to fine sub-angular to sub-rounded gravel; medium to coarse sand; non-plastic fines; dense to very dense.	22	25	27	**52**		6.6		NP	100	83	75	50	32	19	13	11
7	SS-7	100					19	27	31	**58**												
8					SM	Silty Gravelly SAND, gray; medium to coarse grained; medium to fine sub-angular to sub-rounded gravel; non-plastic fines; very dense.																
9	SS-8	80					28	30	32	**62**		10.0		NP	100	100	92	69	42	24	15	11

*** CONTINUATION OF BH-2 AT NEXT PAGE ***

LEGEND	TYPE OF SAMPLING	CBG GEOTECHNICAL TESTING SERVICES
LL-Liquid Limit PL-Plastic Limit RQD-Rock Quality Designation MC-Moisture Content WT-Water Table NP-No Plasticity * -Insufficient for Test	Split-Spoon Sample Core Sample Wash Sample Water Table	Encoded by: G. P. Panigo-os, Technical Manager Approved by: Engr. Noel D. Banua, Head of Engineering Department

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT NAME: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

PROJECT LOCATION: 3700 Bayombong, Nueva Vizcaya

DATE DRILLED: JUNE 19, 2024
DATE FINISHED: JUNE 19, 2024
DRILL RIG TYPE: MANUAL DRILLING RIG

BOREHOLE NO.: 2
BOREHOLE DEPTH: 15.00 m
WATER TABLE: 2.15 m

DEPTH, m	SAMPLE NO.	% RECOVERY	R.Q.D	LOG SYMBOL	CLASSIFICATION	DESCRIPTION	SPT BLOWS 15	15	15	SPT N-VALUE	SPT GRAPH 10	20	30	40	50	MC	ATTERBERG LIMITS LL	PI	SIEVE ANALYSIS % PASSING SIEVE NO. 1	3/4	1/2	4	10	40	100	200
						GROUND SURFACE											%	%								
10	SS-9	64			SM	Silty Gravelly SAND, gray; fine to medium grained; medium to fine sub-angular to sub-rounded gravel; non-plastic fines; dense to very dense.	36	26	23	**49**																
11																										
12	SS-10	71					19	27	35	**62**						15.3		NP	100	100	94	84	78	56	35	24
13	SS-11	55				Silty Gravelly SAND, gray; medium to coarse grained; medium to fine sub-angular to sub-rounded gravel; non-plastic fines; very dense.	28	33	37	**70**																
14																										
15	SS-12	60					32	26	38	**64**						8.0		NP	100	100	89	71	41	22	13	10
16																										
17																										
18																										

END OF BH-2 @ 15.00 m

LEGEND	TYPE OF SAMPLING	CBG GEOTECHNICAL TESTING SERVICES
LL-Liquid Limit PL-Plastic Limit RQD-Rock Quality Designation MC-Moisture Content WT-Water Table NP-No Plasticity * -Insufficient for Test	Split-Spoon Sample Core Sample Wash Sample Water Table	Encoded by: G. P. Panigo-os, Technical Manager Approved by: Engr. Mark D. Banua, Head of Engineering Department

CGB Geotechnical Testing Services
Lot 38-C-2 #61 Kambal Road., Guitnang Bayan 1, San Mateo Rizal
Mobile: 0936-0864365 Email: cgbgeotechnical2022@gmail.com

APPENDIX – 1.4
LABORATORY TEST RESULTS

NDB ENGINEERING CONSULTANCY

CIVIL - STRUCTURAL - GEOTECHNICAL - PLUMBING - SANITARY

242 Pahati Street,Balut, Tondo, Manila

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PROJECT: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

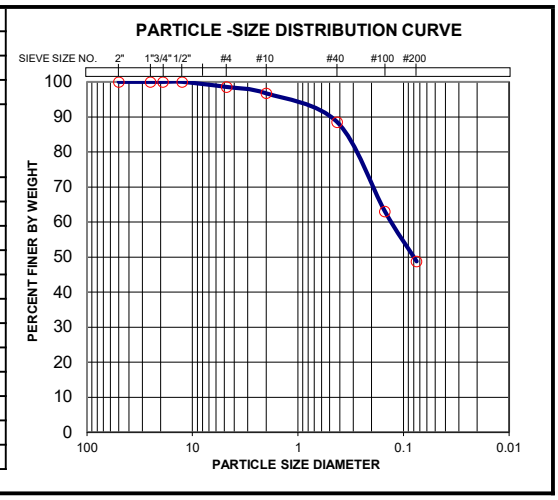
LOCATION: 3700 Bayombong, Nueva Viscaya

SAMPLE NO.: BH-1 SS-2 **DEPTH:** 1.55 - 2.00 m **DATE:** June 22, 2024

SIEVE ANALYSIS (ASTM D 422)

Wet Soil + Wt. Of Tare	155.32	Original Wt		138.70
Dry Soil + Wt. Of Tare	127.70	Oven-Dry Wt.		111.08
Wt. Of Tare	16.62	Dry Washed Weight		56.92
		Moisture Content		24.86

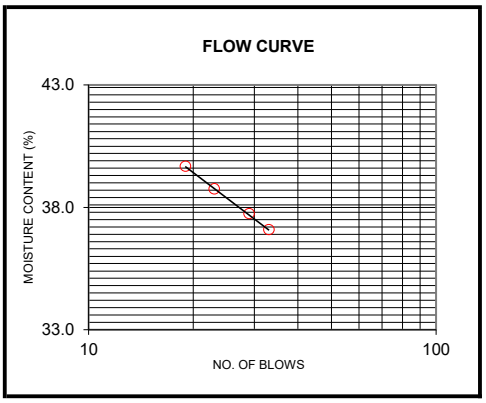
SIEVE SIZE		WT. RETAINED (gm)	PERCENT RETAINED	PERCENT PASSING 10TH	PERCENT PASSING (%)
INCH / NO.	DIAMETER (mm)				
2"	50.0	0.00	0.00	100.00	100
1"	25.0	0.00	0.00	100.00	100
3/4	19.0	0.00	0.00	100.00	100
1/2"	12.50	0.00	0.00	100.00	100
#4	4.75	1.60	1.44	98.56	99
#10	2.0	1.99	1.79	96.77	97
#40	0.425	9.21	8.29	88.48	88
#100	0.15	28.30	25.48	63.00	63
#200	0.075	15.82	14.24	48.76	49
PAN					
WASH LOSS		54.16	48.76		
TOTAL		111.08			



LIQUID LIMIT & PLASTIC LIMIT (ASTM D 4318-05)

LIQUID LIMIT					PLASTIC LIMIT	
TRIAL NO.	1	2	3	4	1	2
WT. OF WET SOIL + TARE	20.98	21.29	20.00	20.27	18.21	19.54
WT. OF DRY SOIL + TARE	17.03	17.24	16.40	16.35	15.75	16.74
WATER CONTENT	3.95	4.05	3.60	3.92	2.46	2.80
TARE NO.	J14	A1	W13	E7	O3	W8
TARE WT.	6.38	6.51	7.11	6.47	6.71	6.71
WT. OF DRY SOIL	10.65	10.73	9.29	9.88	9.04	10.03
MOISTURE CONTENT, %	37.1	37.7	38.8	39.7	27.2	27.9
NO. OF BLOWS	33	29	23	19	AVERAGE	27.6
LIQUID LIMIT	38.4					

LIQUID LIMIT:	38.4
PLASTIC LIMIT:	27.6
PLASTICITY INDEX:	10.8
SOIL DESCRIPTION:	Sandy SILT
GROUP SYMBOL	ML
COLOR	brownish gray
TESTED BY:	J. B. Quiboy Jr.
CERTIFIED BY:	G. P. Banigo-os



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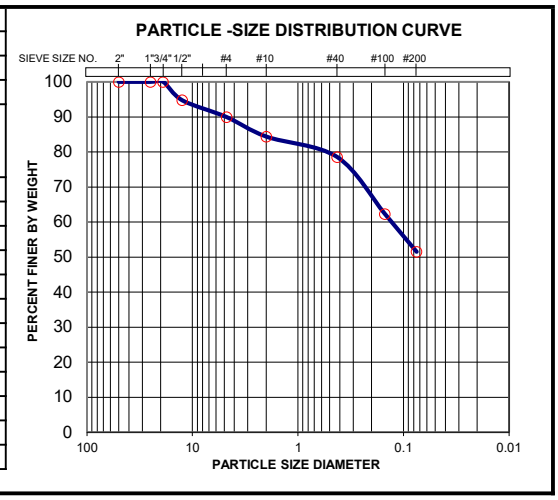
PROJECT: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

LOCATION: 3700 Bayombong, Nueva Viscaya

SAMPLE NO.: BH-1 SS-3 **DEPTH:** 2.55 - 3.00 m **DATE:** June 22, 2024

SIEVE ANALYSIS (ASTM D 422)

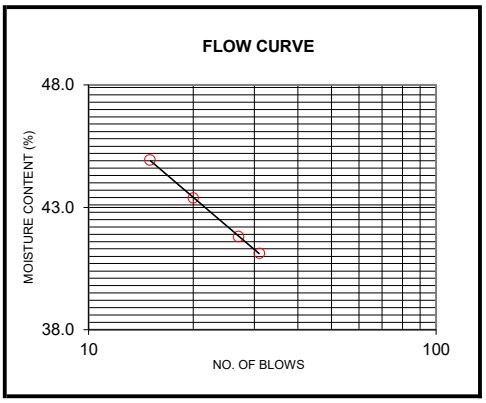
Wet Soil + Wt. Of Tare		124.36	Original Wt		107.39
Dry Soil + Wt. Of Tare		105.13	Oven-Dry Wt.		88.16
Wt. Of Tare		16.97	Dry Washed Weight		42.76
			Moisture Content		21.81
SIEVE SIZE		WT. RETAINED (gm)	PERCENT RETAINED	PERCENT PASSING 10TH	PERCENT PASSING (%)
INCH / NO.	DIAMETER (mm)				
2"	50.0	0.00	0.00	100.00	100
1"	25.0	0.00	0.00	100.00	100
3/4	19.0	0.00	0.00	100.00	100
1/2"	12.50	4.61	5.23	94.77	95
#4	4.75	4.25	4.82	89.95	90
#10	2.0	4.89	5.55	84.40	84
#40	0.425	5.17	5.86	78.54	79
#100	0.15	14.30	16.22	62.32	62
#200	0.075	9.54	10.82	51.50	51
PAN					
WASH LOSS		45.40	51.50		
TOTAL		88.16			



LIQUID LIMIT & PLASTIC LIMIT (ASTM D 4318-05)

LIQUID LIMIT					PLASTIC LIMIT	
TRIAL NO.	1	2	3	4	1	2
WT. OF WET SOIL + TARE	19.93	20.86	19.78	19.92	17.72	18.39
WT. OF DRY SOIL + TARE	16.04	16.70	15.75	15.84	15.13	15.91
WATER CONTENT	3.89	4.16	4.03	4.08	2.59	2.48
TARE NO.	C11	L4	U1	T10	F3	O12
TARE WT.	6.58	6.75	6.46	6.76	6.37	7.30
WT. OF DRY SOIL	9.46	9.95	9.29	9.08	8.76	8.61
MOISTURE CONTENT, %	41.1	41.8	43.4	44.9	29.6	28.8
NO. OF BLOWS	31	27	20	15	AVERAGE	29.2
LIQUID LIMIT	42.2					

LIQUID LIMIT:	42.2
PLASTIC LIMIT:	29.2
PLASTICITY INDEX:	13.0
SOIL DESCRIPTION:	Sandy SILT
GROUP SYMBOL	ML
COLOR	brownish gray
TESTED BY:	J. B. Quiboy Jr.
CERTIFIED BY:	G. P. Banigo-os



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PROJECT: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

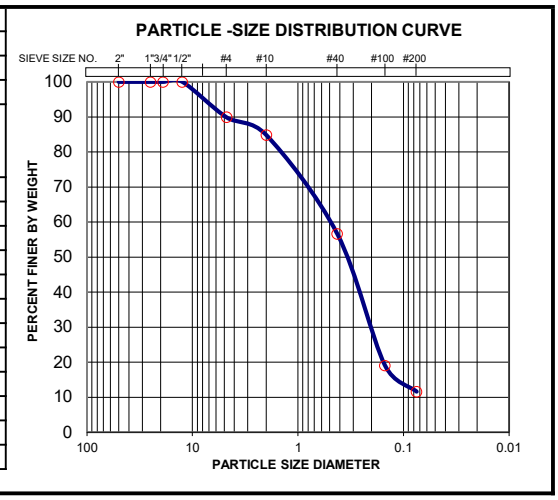
LOCATION: 3700 Bayombong, Nueva Viscaya

SAMPLE NO.: BH-1 SS-4 **DEPTH:** 3.55 - 4.00 m **DATE:** June 22, 2024

SIEVE ANALYSIS (ASTM D 422)

Wet Soil + Wt. Of Tare	112.76	Original Wt		96.24
Dry Soil + Wt. Of Tare	104.32	Oven-Dry Wt.		87.80
Wt. Of Tare	16.52	Dry Washed Weight		77.63
		Moisture Content		9.61

SIEVE SIZE		WT. RETAINED (gm)	PERCENT RETAINED	PERCENT PASSING 10TH	PERCENT PASSING (%)
INCH / NO.	DIAMETER (mm)				
2"	50.0	0.00	0.00	100.00	100
1"	25.0	0.00	0.00	100.00	100
3/4	19.0	0.00	0.00	100.00	100
1/2"	12.50	0.00	0.00	100.00	100
#4	4.75	8.86	10.09	89.91	90
#10	2.0	4.43	5.05	84.86	85
#40	0.425	24.76	28.20	56.66	57
#100	0.15	33.00	37.59	19.08	19
#200	0.075	6.58	7.49	11.58	12
PAN					
WASH LOSS		10.17	11.58		
TOTAL		87.80			



LIQUID LIMIT & PLASTIC LIMIT (ASTM D 4318-05)

LIQUID LIMIT					PLASTIC LIMIT	
TRIAL NO.	1	2	3	4	1	2
WT. OF WET SOIL + TARE						
WT. OF DRY SOIL + TARE						
WATER CONTENT						
TARE NO.						
TARE WT.						
WT. OF DRY SOIL						
MOISTURE CONTENT, %						
NO. OF BLOWS					AVERAGE	
LIQUID LIMIT						

LIQUID LIMIT:

PLASTIC LIMIT: NP

PLASTICITY INDEX:

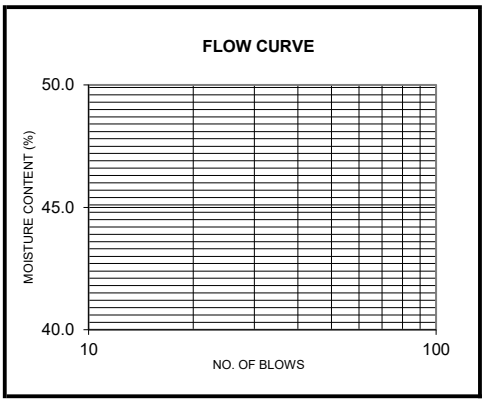
SOIL DESCRIPTION: Silty SAND

GROUP SYMBOL SM

COLOR gray

TESTED BY: J. B. Quiboy Jr.

CERTIFIED BY: G. P. Banigo-os



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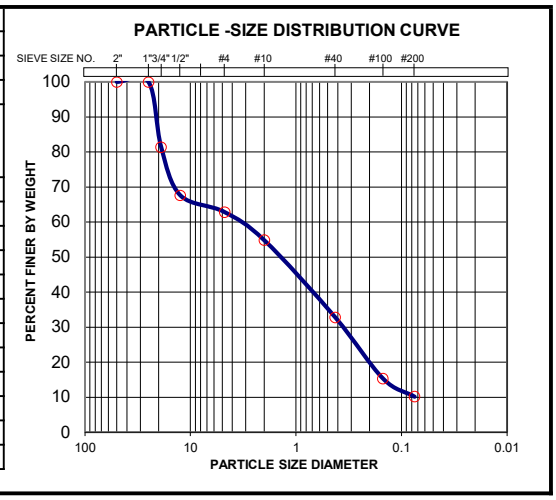
PROJECT: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

LOCATION: 3700 Bayombong, Nueva Viscaya

SAMPLE NO.: BH-1 SS-6 **DEPTH:** 5.55 - 6.00 m **DATE:** June 22, 2024

SIEVE ANALYSIS (ASTM D 422)

Wet Soil + Wt. Of Tare		138.95	Original Wt		121.78
Dry Soil + Wt. Of Tare		129.95	Oven-Dry Wt.		112.78
Wt. Of Tare		17.17	Dry Washed Weight		101.30
			Moisture Content		7.98
SIEVE SIZE		WT. RETAINED (gm)	PERCENT RETAINED	PERCENT PASSING 10TH	PERCENT PASSING (%)
INCH / NO.	DIAMETER (mm)				
2"	50.0	0.00	0.00	100.00	100
1"	25.0	0.00	0.00	100.00	100
3/4	19.0	20.96	18.58	81.42	81
1/2"	12.50	15.53	13.77	67.64	68
#4	4.75	5.37	4.76	62.88	63
#10	2.0	9.05	8.02	54.86	55
#40	0.425	24.92	22.10	32.76	33
#100	0.15	19.67	17.44	15.32	15
#200	0.075	5.80	5.14	10.18	10
PAN					
WASH LOSS		11.48	10.18		
TOTAL		112.78			



LIQUID LIMIT & PLASTIC LIMIT (ASTM D 4318-05)

LIQUID LIMIT					PLASTIC LIMIT	
TRIAL NO.	1	2	3	4	1	2
WT. OF WET SOIL + TARE						
WT. OF DRY SOIL + TARE						
WATER CONTENT						
TARE NO.						
TARE WT.						
WT. OF DRY SOIL						
MOISTURE CONTENT, %						
NO. OF BLOWS					AVERAGE	
LIQUID LIMIT						

LIQUID LIMIT:

PLASTIC LIMIT: NP

PLASTICITY INDEX:

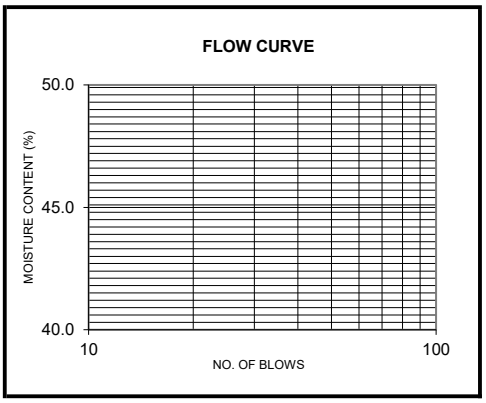
SOIL DESCRIPTION: Silty Gravelly SAND

GROUP SYMBOL SM

COLOR gray

TESTED BY: J. B. Quiboy Jr.

CERTIFIED BY: G. P. Banigo-os



NDB ENGINEERING CONSULTANCY

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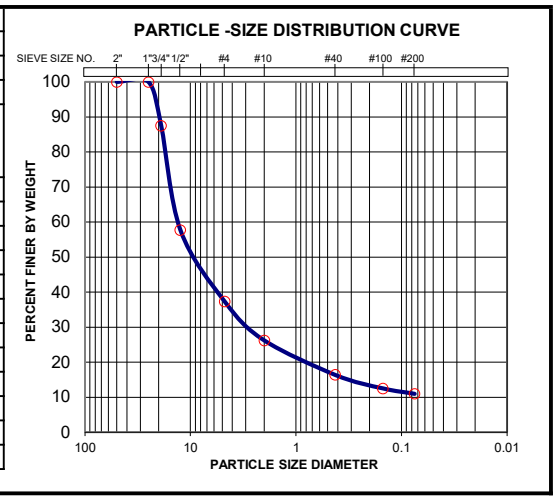
PROJECT: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

LOCATION: 3700 Bayombong, Nueva Viscaya

SAMPLE NO.: BH-1 SS-8 **DEPTH:** 8.55 - 9.00 m **DATE:** June 22, 2024

SIEVE ANALYSIS (ASTM D 422)

Wet Soil + Wt. Of Tare		199.51	Original Wt		182.86
Dry Soil + Wt. Of Tare		191.03	Oven-Dry Wt.		174.38
Wt. Of Tare		16.65	Dry Washed Weight		155.18
			Moisture Content		4.86
SIEVE SIZE		WT. RETAINED (gm)	PERCENT RETAINED	PERCENT PASSING 10TH	PERCENT PASSING (%)
INCH / NO.	DIAMETER (mm)				
2"	50.0	0.00	0.00	100.00	100
1"	25.0	0.00	0.00	100.00	100
3/4	19.0	21.75	12.47	87.53	88
1/2"	12.50	52.02	29.83	57.70	58
#4	4.75	35.52	20.37	37.33	37
#10	2.0	19.32	11.08	26.25	26
#40	0.425	17.17	9.85	16.40	16
#100	0.15	6.83	3.92	12.48	12
#200	0.075	2.57	1.47	11.01	11
PAN					
WASH LOSS		19.20	11.01		
TOTAL		174.38			



LIQUID LIMIT & PLASTIC LIMIT (ASTM D 4318-05)

LIQUID LIMIT					PLASTIC LIMIT	
TRIAL NO.	1	2	3	4	1	2
WT. OF WET SOIL + TARE						
WT. OF DRY SOIL + TARE						
WATER CONTENT						
TARE NO.						
TARE WT.						
WT. OF DRY SOIL						
MOISTURE CONTENT, %						
NO. OF BLOWS					AVERAGE	
LIQUID LIMIT						

LIQUID LIMIT:

PLASTIC LIMIT: NP

PLASTICITY INDEX:

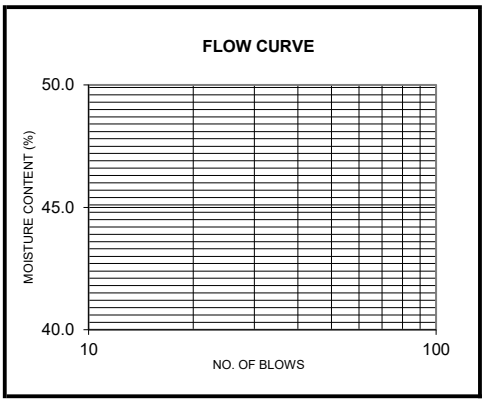
SOIL DESCRIPTION: Silty Sandy GRAVEL

GROUP SYMBOL GM

COLOR gray

TESTED BY: J. B. Quiboy Jr.

CERTIFIED BY: G. P. Banigo-os



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PROJECT: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

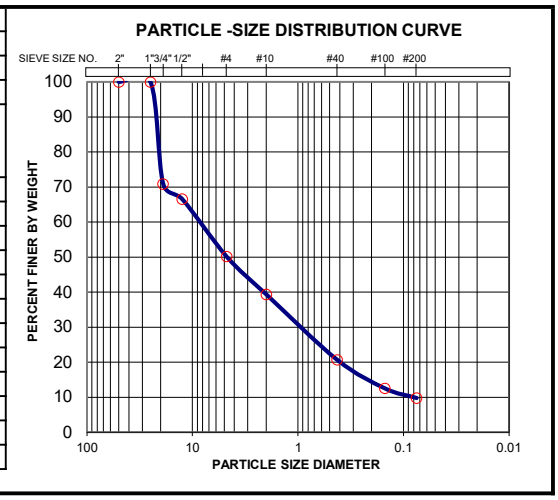
LOCATION: 3700 Bayombong, Nueva Viscaya

SAMPLE NO.: BH-1 SS-10 **DEPTH:** 11.55 - 12.00 m **DATE:** June 22, 2024

SIEVE ANALYSIS (ASTM D 422)

Wet Soil + Wt. Of Tare	165.21	Original Wt		148.79
Dry Soil + Wt. Of Tare	156.10	Oven-Dry Wt.		139.68
Wt. Of Tare	16.42	Dry Washed Weight		126.04
		Moisture Content		6.52

SIEVE SIZE		WT. RETAINED (gm)	PERCENT RETAINED	PERCENT PASSING 10TH	PERCENT PASSING (%)
INCH / NO.	DIAMETER (mm)				
2"	50.0	0.00	0.00	100.00	100
1"	25.0	0.00	0.00	100.00	100
3/4	19.0	40.65	29.10	70.90	71
1/2"	12.50	6.07	4.35	66.55	67
#4	4.75	22.86	16.37	50.19	50
#10	2.0	15.15	10.85	39.34	39
#40	0.425	26.07	18.66	20.68	21
#100	0.15	11.35	8.13	12.55	13
#200	0.075	3.89	2.78	9.77	10
PAN					
WASH LOSS		13.64	9.77		
TOTAL		139.68			



LIQUID LIMIT & PLASTIC LIMIT (ASTM D 4318-05)

LIQUID LIMIT					PLASTIC LIMIT	
TRIAL NO.	1	2	3	4	1	2
WT. OF WET SOIL + TARE						
WT. OF DRY SOIL + TARE						
WATER CONTENT						
TARE NO.						
TARE WT.						
WT. OF DRY SOIL						
MOISTURE CONTENT, %						
NO. OF BLOWS					AVERAGE	
LIQUID LIMIT						

LIQUID LIMIT:

PLASTIC LIMIT: NP

PLASTICITY INDEX:

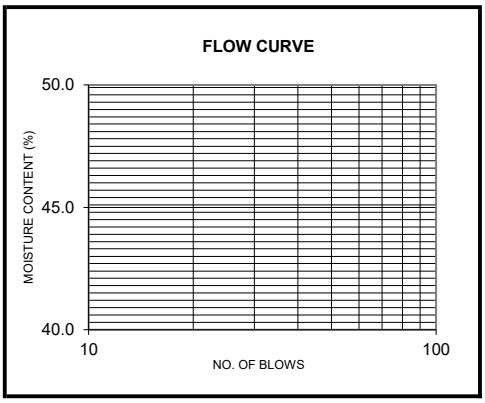
SOIL DESCRIPTION: Silty Sandy GRAVEL

GROUP SYMBOL GM

COLOR gray

TESTED BY: J. B. Quiboy Jr.

CERTIFIED BY: G. P. Banigo-os



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PROJECT: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

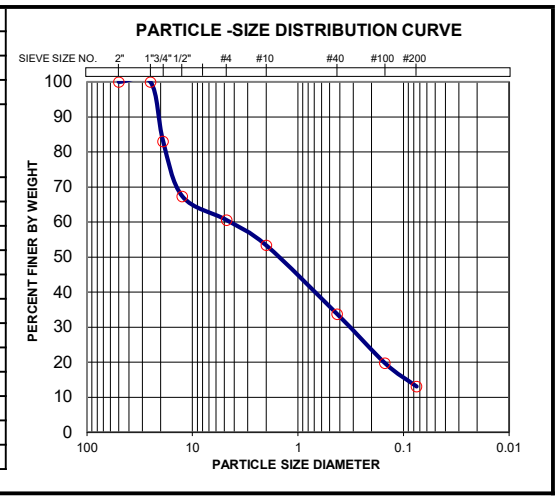
LOCATION: 3700 Bayombong, Nueva Viscaya

SAMPLE NO.: BH-1 SS-12 **DEPTH:** 14.55 - 15.00 m **DATE:** June 22, 2024

SIEVE ANALYSIS (ASTM D 422)

Wet Soil + Wt. Of Tare	156.54	Original Wt		139.43
Dry Soil + Wt. Of Tare	144.12	Oven-Dry Wt.		127.01
Wt. Of Tare	17.11	Dry Washed Weight		110.41
		Moisture Content		9.78

SIEVE SIZE		WT. RETAINED (gm)	PERCENT RETAINED	PERCENT PASSING 10TH	PERCENT PASSING (%)
INCH / NO.	DIAMETER (mm)				
2"	50.0	0.00	0.00	100.00	100
1"	25.0	0.00	0.00	100.00	100
3/4	19.0	21.56	16.98	83.02	83
1/2"	12.50	19.88	15.65	67.37	67
#4	4.75	8.65	6.81	60.56	61
#10	2.0	9.10	7.16	53.40	53
#40	0.425	24.99	19.68	33.72	34
#100	0.15	17.77	13.99	19.73	20
#200	0.075	8.46	6.66	13.07	13
PAN					
WASH LOSS		16.60	13.07		
TOTAL		127.01			



LIQUID LIMIT & PLASTIC LIMIT (ASTM D 4318-05)

LIQUID LIMIT					PLASTIC LIMIT	
TRIAL NO.	1	2	3	4	1	2
WT. OF WET SOIL + TARE						
WT. OF DRY SOIL + TARE						
WATER CONTENT						
TARE NO.						
TARE WT.						
WT. OF DRY SOIL						
MOISTURE CONTENT, %						
NO. OF BLOWS					AVERAGE	
LIQUID LIMIT						

LIQUID LIMIT:

PLASTIC LIMIT: NP

PLASTICITY INDEX:

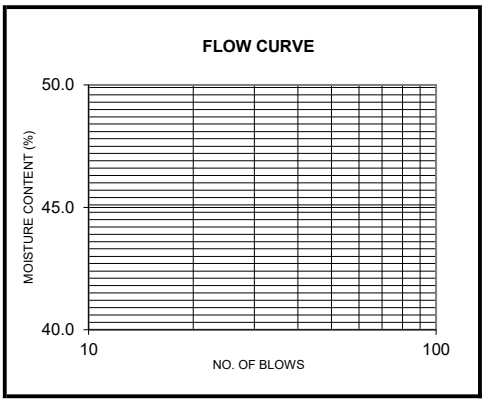
SOIL DESCRIPTION: Silty Gravelly SAND

GROUP SYMBOL SM

COLOR gray

TESTED BY: J. B. Quiboy Jr.

CERTIFIED BY: G. P. Banigo-os



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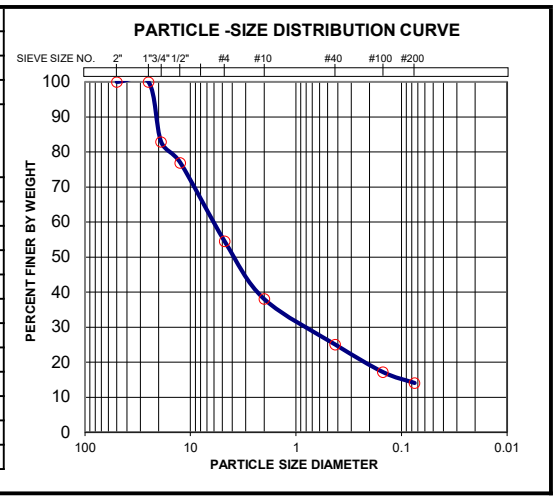
PROJECT: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

LOCATION: 3700 Bayombong, Nueva Viscaya

SAMPLE NO.: BH-2 SS-2 **DEPTH:** 1.55 - 2.00 m **DATE:** June 22, 2024

SIEVE ANALYSIS (ASTM D 422)

Wet Soil + Wt. Of Tare		178.12	Original Wt		161.05
Dry Soil + Wt. Of Tare		169.88	Oven-Dry Wt.		152.81
Wt. Of Tare		17.07	Dry Washed Weight		131.31
			Moisture Content		5.39
SIEVE SIZE		WT. RETAINED (gm)	PERCENT RETAINED	PERCENT PASSING 10TH	PERCENT PASSING (%)
INCH / NO.	DIAMETER (mm)				
2"	50.0	0.00	0.00	100.00	100
1"	25.0	0.00	0.00	100.00	100
3/4	19.0	26.16	17.12	82.88	83
1/2"	12.50	9.17	6.00	76.88	77
#4	4.75	34.13	22.33	54.54	55
#10	2.0	25.20	16.49	38.05	38
#40	0.425	19.93	13.04	25.01	25
#100	0.15	11.90	7.79	17.22	17
#200	0.075	4.82	3.15	14.07	14
PAN					
WASH LOSS		21.50	14.07		
TOTAL		152.81			



LIQUID LIMIT & PLASTIC LIMIT (ASTM D 4318-05)

LIQUID LIMIT					PLASTIC LIMIT	
TRIAL NO.	1	2	3	4	1	2
WT. OF WET SOIL + TARE						
WT. OF DRY SOIL + TARE						
WATER CONTENT						
TARE NO.						
TARE WT.						
WT. OF DRY SOIL						
MOISTURE CONTENT, %						
NO. OF BLOWS					AVERAGE	
LIQUID LIMIT						

LIQUID LIMIT:

PLASTIC LIMIT: NP

PLASTICITY INDEX:

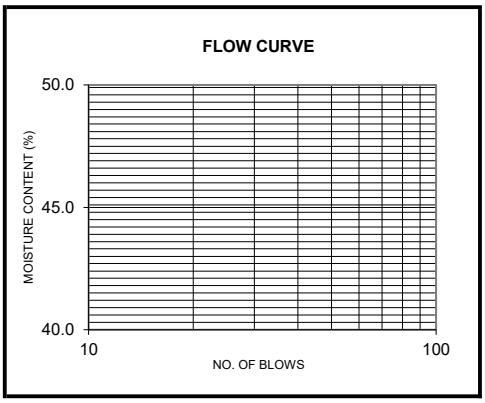
SOIL DESCRIPTION: Silty Sandy GRAVEL

GROUP SYMBOL GM

COLOR gray

TESTED BY: J. B. Quiboy Jr.

CERTIFIED BY: G. P. Banigo-os



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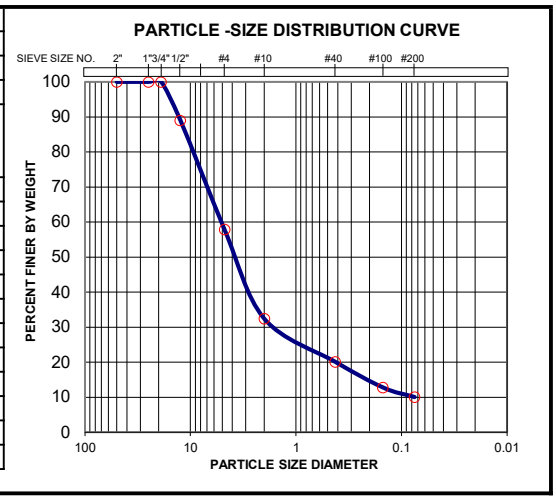
PROJECT: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

LOCATION: 3700 Bayombong, Nueva Viscaya

SAMPLE NO.: BH-2 SS-3 **DEPTH:** 2.55 - 3.00 m **DATE:** June 22, 2024

SIEVE ANALYSIS (ASTM D 422)

Wet Soil + Wt. Of Tare		166.49	Original Wt		149.29
Dry Soil + Wt. Of Tare		155.91	Oven-Dry Wt.		138.71
Wt. Of Tare		17.20	Dry Washed Weight		124.78
			Moisture Content		7.63
SIEVE SIZE		WT. RETAINED (gm)	PERCENT RETAINED	PERCENT PASSING 10TH	PERCENT PASSING (%)
INCH / NO.	DIAMETER (mm)				
2"	50.0	0.00	0.00	100.00	100
1"	25.0	0.00	0.00	100.00	100
3/4	19.0	0.00	0.00	100.00	100
1/2"	12.50	15.22	10.97	89.03	89
#4	4.75	43.25	31.18	57.85	58
#10	2.0	35.26	25.42	32.43	32
#40	0.425	17.11	12.34	20.09	20
#100	0.15	10.15	7.32	12.77	13
#200	0.075	3.79	2.73	10.04	10
PAN					
WASH LOSS		13.93	10.04		
TOTAL		138.71			



LIQUID LIMIT & PLASTIC LIMIT (ASTM D 4318-05)

LIQUID LIMIT					PLASTIC LIMIT	
TRIAL NO.	1	2	3	4	1	2
WT. OF WET SOIL + TARE						
WT. OF DRY SOIL + TARE						
WATER CONTENT						
TARE NO.						
TARE WT.						
WT. OF DRY SOIL						
MOISTURE CONTENT, %						
NO. OF BLOWS					AVERAGE	
LIQUID LIMIT						

LIQUID LIMIT:

PLASTIC LIMIT: NP

PLASTICITY INDEX:

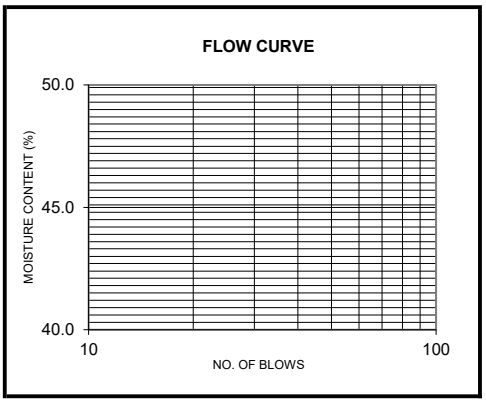
SOIL DESCRIPTION: Silty Gravelly SAND

GROUP SYMBOL SM

COLOR gray

TESTED BY: J. B. Quiboy Jr.

CERTIFIED BY: G. P. Banigo-os



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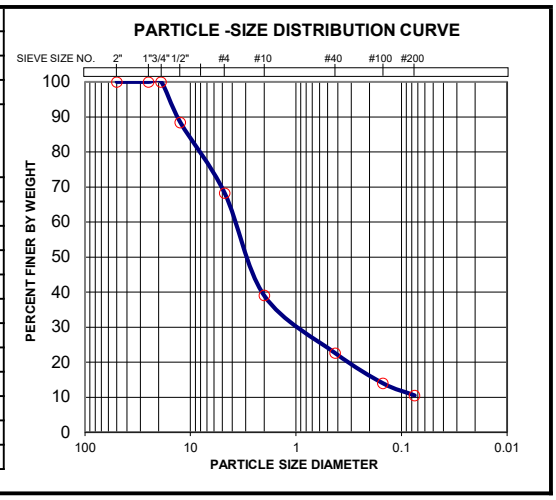
PROJECT: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

LOCATION: 3700 Bayombong, Nueva Viscaya

SAMPLE NO.: BH-2 SS-4 **DEPTH:** 3.55 - 4.00 m **DATE:** June 22, 2024

SIEVE ANALYSIS (ASTM D 422)

Wet Soil + Wt. Of Tare		160.22	Original Wt		143.18
Dry Soil + Wt. Of Tare		148.86	Oven-Dry Wt.		131.82
Wt. Of Tare		17.04	Dry Washed Weight		117.95
			Moisture Content		8.62
SIEVE SIZE		WT. RETAINED (gm)	PERCENT RETAINED	PERCENT PASSING 10TH	PERCENT PASSING (%)
INCH / NO.	DIAMETER (mm)				
2"	50.0	0.00	0.00	100.00	100
1"	25.0	0.00	0.00	100.00	100
3/4	19.0	0.00	0.00	100.00	100
1/2"	12.50	15.22	11.55	88.45	88
#4	4.75	26.58	20.16	68.29	68
#10	2.0	38.57	29.26	39.03	39
#40	0.425	21.65	16.42	22.61	23
#100	0.15	11.37	8.63	13.98	14
#200	0.075	4.56	3.46	10.52	11
PAN					
WASH LOSS		13.87	10.52		
TOTAL		131.82			



LIQUID LIMIT & PLASTIC LIMIT (ASTM D 4318-05)

LIQUID LIMIT					PLASTIC LIMIT	
TRIAL NO.	1	2	3	4	1	2
WT. OF WET SOIL + TARE						
WT. OF DRY SOIL + TARE						
WATER CONTENT						
TARE NO.						
TARE WT.						
WT. OF DRY SOIL						
MOISTURE CONTENT, %						
NO. OF BLOWS					AVERAGE	
LIQUID LIMIT						

LIQUID LIMIT:

PLASTIC LIMIT: NP

PLASTICITY INDEX:

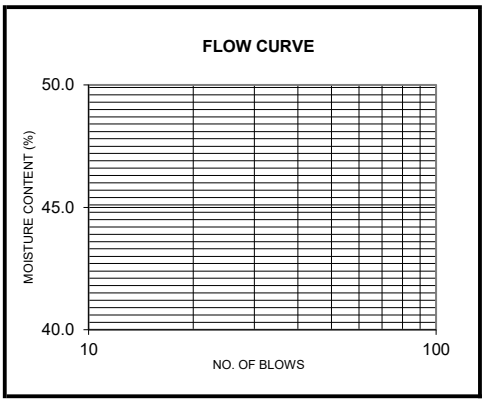
SOIL DESCRIPTION: Silty Gravelly SAND

GROUP SYMBOL SM

COLOR gray

TESTED BY: J. B. Quiboy Jr.

CERTIFIED BY: G. P. Banigo-os



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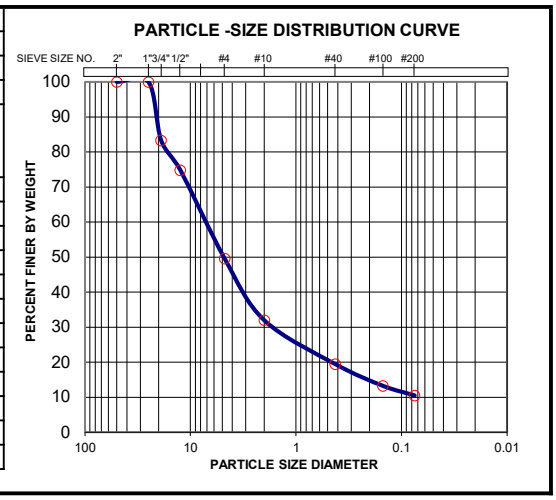
PROJECT: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

LOCATION: 3700 Bayombong, Nueva Viscaya

SAMPLE NO.: BH-2 SS-6 **DEPTH:** 5.55 - 6.00 m **DATE:** June 22, 2024

SIEVE ANALYSIS (ASTM D 422)

Wet Soil + Wt. Of Tare		177.61	Original Wt		160.77
Dry Soil + Wt. Of Tare		167.62	Oven-Dry Wt.		150.78
Wt. Of Tare		16.84	Dry Washed Weight		134.92
			Moisture Content		6.63
SIEVE SIZE		WT. RETAINED (gm)	PERCENT RETAINED	PERCENT PASSING 10TH	PERCENT PASSING (%)
INCH / NO.	DIAMETER (mm)				
2"	50.0	0.00	0.00	100.00	100
1"	25.0	0.00	0.00	100.00	100
3/4	19.0	25.19	16.71	83.29	83
1/2"	12.50	12.81	8.50	74.80	75
#4	4.75	37.97	25.18	49.62	50
#10	2.0	26.55	17.61	32.01	32
#40	0.425	18.90	12.53	19.47	19
#100	0.15	9.35	6.20	13.27	13
#200	0.075	4.15	2.75	10.52	11
PAN					
WASH LOSS		15.86	10.52		
TOTAL		150.78			



LIQUID LIMIT & PLASTIC LIMIT (ASTM D 4318-05)

LIQUID LIMIT					PLASTIC LIMIT	
TRIAL NO.	1	2	3	4	1	2
WT. OF WET SOIL + TARE						
WT. OF DRY SOIL + TARE						
WATER CONTENT						
TARE NO.						
TARE WT.						
WT. OF DRY SOIL						
MOISTURE CONTENT, %						
NO. OF BLOWS					AVERAGE	
LIQUID LIMIT						

LIQUID LIMIT:

PLASTIC LIMIT: NP

PLASTICITY INDEX:

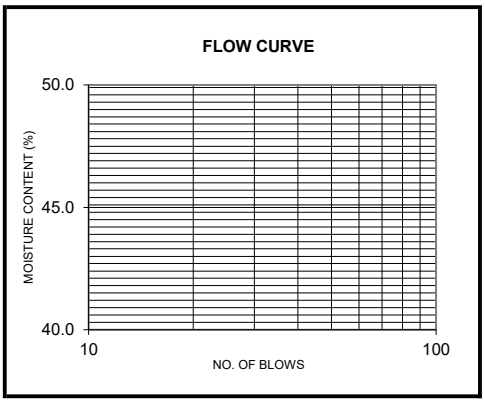
SOIL DESCRIPTION: Silty Sandy GRAVEL

GROUP SYMBOL GM

COLOR gray

TESTED BY: J. B. Quiboy Jr.

CERTIFIED BY: G. P. Banigo-os



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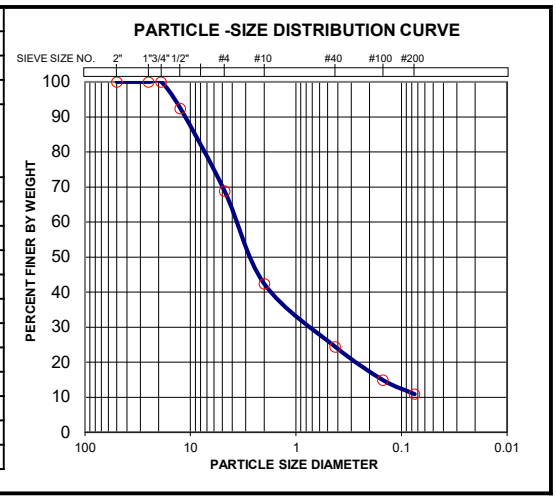
PROJECT: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

LOCATION: 3700 Bayombong, Nueva Viscaya

SAMPLE NO.: BH-2 SS-8 **DEPTH:** 8.55 - 9.00 m **DATE:** June 22, 2024

SIEVE ANALYSIS (ASTM D 422)

Wet Soil + Wt. Of Tare		162.29	Original Wt		145.59
Dry Soil + Wt. Of Tare		149.04	Oven-Dry Wt.		132.34
Wt. Of Tare		16.70	Dry Washed Weight		117.88
			Moisture Content		10.01
SIEVE SIZE		WT. RETAINED (gm)	PERCENT RETAINED	PERCENT PASSING 10TH	PERCENT PASSING (%)
INCH / NO.	DIAMETER (mm)				
2"	50.0	0.00	0.00	100.00	100
1"	25.0	0.00	0.00	100.00	100
3/4	19.0	0.00	0.00	100.00	100
1/2"	12.50	10.03	7.58	92.42	92
#4	4.75	31.21	23.58	68.84	69
#10	2.0	34.98	26.43	42.41	42
#40	0.425	23.80	17.98	24.42	24
#100	0.15	12.56	9.49	14.93	15
#200	0.075	5.30	4.00	10.93	11
PAN					
WASH LOSS		14.46	10.93		
TOTAL		132.34			



LIQUID LIMIT & PLASTIC LIMIT (ASTM D 4318-05)

LIQUID LIMIT					PLASTIC LIMIT	
TRIAL NO.	1	2	3	4	1	2
WT. OF WET SOIL + TARE						
WT. OF DRY SOIL + TARE						
WATER CONTENT						
TARE NO.						
TARE WT.						
WT. OF DRY SOIL						
MOISTURE CONTENT, %						
NO. OF BLOWS					AVERAGE	
LIQUID LIMIT						

LIQUID LIMIT:

PLASTIC LIMIT: NP

PLASTICITY INDEX:

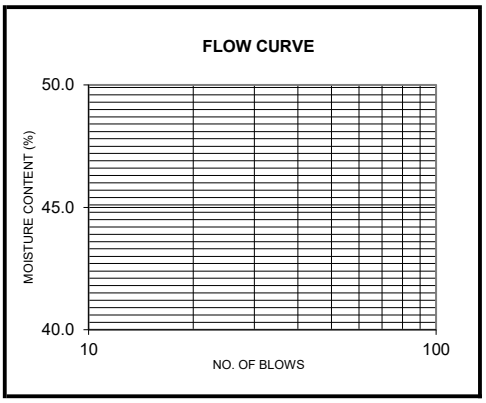
SOIL DESCRIPTION: Silty Gravelly SAND

GROUP SYMBOL SM

COLOR gray

TESTED BY: J. B. Quiboy Jr.

CERTIFIED BY: G. P. Banigo-os



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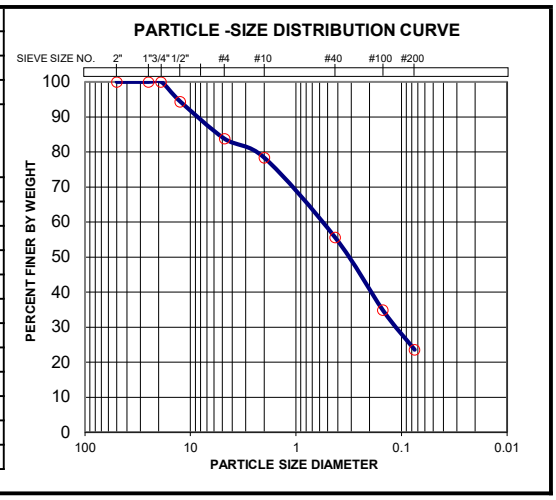
PROJECT: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

LOCATION: 3700 Bayombong, Nueva Viscaya

SAMPLE NO.: BH-2 SS-10 **DEPTH:** 11.55 - 12.00 m **DATE:** June 22, 2024

SIEVE ANALYSIS (ASTM D 422)

Wet Soil + Wt. Of Tare		156.42	Original Wt		139.99
Dry Soil + Wt. Of Tare		137.88	Oven-Dry Wt.		121.45
Wt. Of Tare		16.43	Dry Washed Weight		92.84
			Moisture Content		15.27
SIEVE SIZE		WT. RETAINED (gm)	PERCENT RETAINED	PERCENT PASSING 10TH	PERCENT PASSING (%)
INCH / NO.	DIAMETER (mm)				
2"	50.0	0.00	0.00	100.00	100
1"	25.0	0.00	0.00	100.00	100
3/4	19.0	0.00	0.00	100.00	100
1/2"	12.50	6.83	5.62	94.38	94
#4	4.75	12.84	10.57	83.80	84
#10	2.0	6.54	5.38	78.42	78
#40	0.425	27.74	22.84	55.58	56
#100	0.15	25.19	20.74	34.84	35
#200	0.075	13.70	11.28	23.56	24
PAN					
WASH LOSS		28.61	23.56		
TOTAL		121.45			



LIQUID LIMIT & PLASTIC LIMIT (ASTM D 4318-05)

LIQUID LIMIT					PLASTIC LIMIT	
TRIAL NO.	1	2	3	4	1	2
WT. OF WET SOIL + TARE						
WT. OF DRY SOIL + TARE						
WATER CONTENT						
TARE NO.						
TARE WT.						
WT. OF DRY SOIL						
MOISTURE CONTENT, %						
NO. OF BLOWS					AVERAGE	
LIQUID LIMIT						

LIQUID LIMIT:

PLASTIC LIMIT: NP

PLASTICITY INDEX:

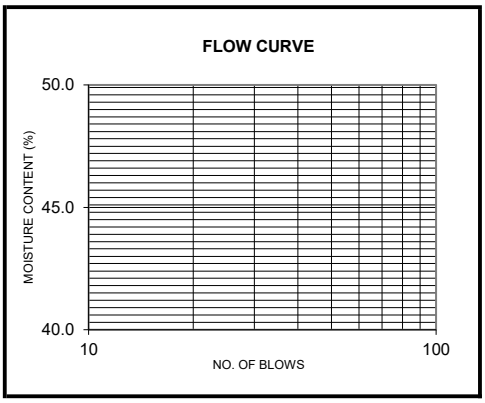
SOIL DESCRIPTION: Silty Gravelly SAND

GROUP SYMBOL SM

COLOR gray

TESTED BY: J. B. Quiboy Jr.

CERTIFIED BY: G. P. Banigo-os



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PROJECT: CONSTRUCTION OF SAINT MARY'S UNIVERSITY

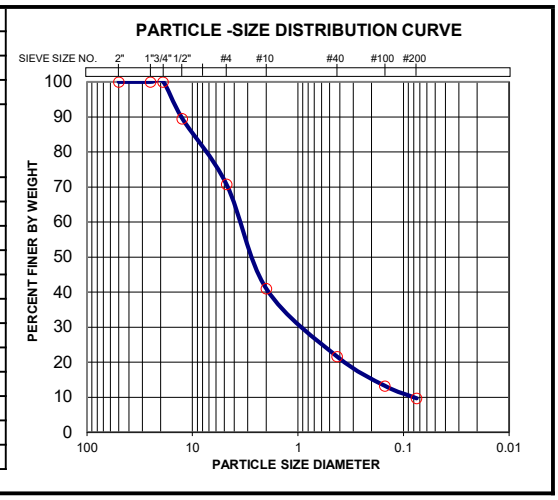
LOCATION: 3700 Bayombong, Nueva Viscaya

SAMPLE NO.: BH-2 SS-12 **DEPTH:** 14.55 - 15.00 m **DATE:** June 22, 2024

SIEVE ANALYSIS (ASTM D 422)

Wet Soil + Wt. Of Tare	155.54	Original Wt		138.73
Dry Soil + Wt. Of Tare	145.22	Oven-Dry Wt.		128.41
Wt. Of Tare	16.81	Dry Washed Weight		115.93
		Moisture Content		8.04

SIEVE SIZE		WT. RETAINED (gm)	PERCENT RETAINED	PERCENT PASSING 10TH	PERCENT PASSING (%)
INCH / NO.	DIAMETER (mm)				
2"	50.0	0.00	0.00	100.00	100
1"	25.0	0.00	0.00	100.00	100
3/4	19.0	0.00	0.00	100.00	100
1/2"	12.50	13.49	10.51	89.49	89
#4	4.75	24.07	18.74	70.75	71
#10	2.0	38.20	29.75	41.00	41
#40	0.425	24.93	19.41	21.59	22
#100	0.15	10.72	8.35	13.24	13
#200	0.075	4.52	3.52	9.72	10
PAN					
WASH LOSS		12.48	9.72		
TOTAL		128.41			



LIQUID LIMIT & PLASTIC LIMIT (ASTM D 4318-05)

LIQUID LIMIT					PLASTIC LIMIT	
TRIAL NO.	1	2	3	4	1	2
WT. OF WET SOIL + TARE						
WT. OF DRY SOIL + TARE						
WATER CONTENT						
TARE NO.						
TARE WT.						
WT. OF DRY SOIL						
MOISTURE CONTENT, %						
NO. OF BLOWS					AVERAGE	
LIQUID LIMIT						

LIQUID LIMIT:

PLASTIC LIMIT: NP

PLASTICITY INDEX:

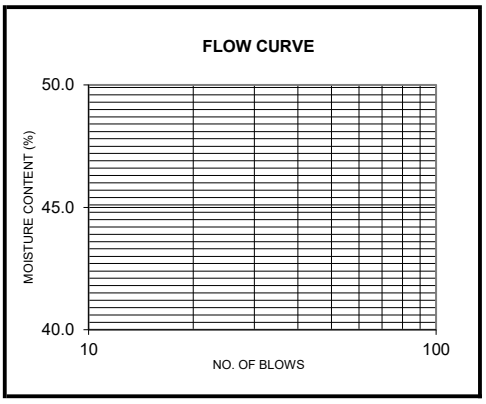
SOIL DESCRIPTION: Silty Gravelly SAND

GROUP SYMBOL SM

COLOR gray

TESTED BY: J. B. Quiboy Jr.

CERTIFIED BY: G. P. Banigo-os



CGB Geotechnical Testing Services
Lot 38-C-2 #61 Kambal Road., Guitnang Bayan 1, San Mateo Rizal
Mobile: 0936-0864365 Email: cgbgeotechnical2022@gmail.com

APPENDIX – 1.5

SOIL SAMPLE PICTURE & DRILL OPERATION



Drilling at BH-1



Drilling at BH-1



Drilling at BH-2



Drilling at BH-2

CGB Geotechnical Testing Services
Lot 38-C-2 #61 Kambal Road., Guitnang Bayan 1, San Mateo Rizal
Mobile: 0936-0864365 Email: cgbgeotechnical2022@gmail.com

APPENDIX – 1.6

COMPUTATION OF ALLOWABLE SOIL BEARING CAPACITY

DESIGN OF SHALLOW FOOTING (For CONSTRUCTION OF SAIN MARY'S UNIVESITY)...square & combined footings (with breadth,B)

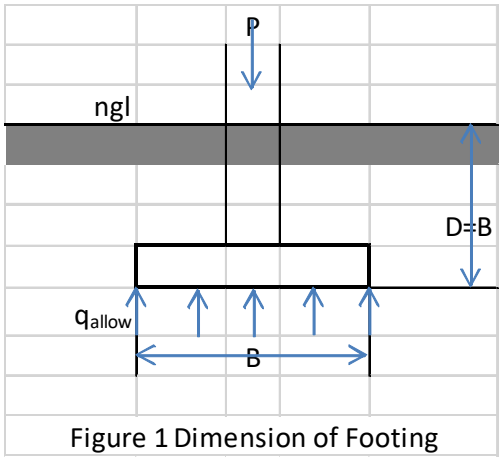


Figure 1 Dimension of Footing

DESIGN PARAMETERS AT DEPTH OF 2.00 meters

Cohesion value, (C):

Strength of Clay		
Penetration Resistance N (Blows/305 mm)	**Unconfined Compressive Strength (kN/m^2)**	**Consistency**
0-2	<12	Very soft
2-4	12 - 24	Soft
4-8	24 - 48	Medium
8-15	48 - 96	Stiff
15-30	96 - 190	Very stiff
>30	>190	Hard

Table 1: Approximate relation between SPT N-value (n) and Cohesion value c)

Angle of Friction, (Ø):

Value of N	Relative Condition of Soil	Approximate Value of Angle of Friction, φ
0 to 4	Very poor	< 28
4 to 10	Poor	28 - 30
10 to 30	Fair	30 - 36
30 to 50	Good	36 - 41
above 50	Very good	> 41

Table 2: Approximate relation between SPT N-value (n) and Cohesionless value Ø)

Void Ratio, (e) :

$$S \cdot e := w \cdot G_s$$ **Eq. 1**

where:
- e = Void ratio
- w = Water/Moisture content
- G_s = Specic Gravity of Soil
- γ_w = Unit Weight of Water

Unit Weight of Soil, (γ):

$$\gamma := \frac{(G_s + e) \cdot \gamma_w}{1 + e}$$ **Eq. 2**

Effective Unit Weight of Soil, (γ_{sat}):

$$\gamma_{eff} := \gamma - \gamma_w$$ **Eq. 3**

ULTIMATE BEARING CAPACITY:

$$q_u := 1.3c'\cdot N_c + q\cdot N_q + 0.4\cdot\gamma\cdot B\cdot N_\gamma$$ =Square Foundation

*Terzaghi, (1943)

where:

q_u	=ultimate bearing pressure, kN per s.m.
c'	= Cohesion of Soil (Since the soil profile is cohesionless, c = 0)
γ	= Unit weight of Soil
q	= γ^*D_f (Equivalent surcharge)
D_f	= Foundation Depth
N_c,N_q,N_γ	= Bearing capacity factors that are nondimensional and are only functions of the soil friction angle, ϕ
B	= Base of the foundation

Bearing Capacity Factors:

Table 1.b Terzaghi's Bearing Capacity Factors - Nc, Nq and Ny

ϕ (deg)	Nc	Nq	Ny	ϕ (deg)	Nc	Nq	Ny
0	5.70	1.00	0.00	26	27.09	14.21	9.84
1	6.00	1.10	0.01	27	29.24	15.90	11.60
2	6.30	1.22	0.04	28	31.61	17.81	13.70
3	6.62	1.35	0.06	29	34.24	19.98	16.18
4	6.97	1.49	0.10	30	37.16	22.46	19.13
5	7.34	1.64	0.14	31	40.41	25.28	22.65
6	7.73	1.81	0.20	32	44.04	28.52	26.87
7	8.15	2.00	0.27	33	48.09	32.23	31.94
8	8.60	2.21	0.35	34	52.64	36.50	38.04
9	9.09	2.44	0.44	35	57.75	41.44	45.41
10	9.61	2.69	0.56	36	63.53	47.16	54.36
11	10.16	2.98	0.69	37	70.01	53.80	65.27
12	10.76	3.29	0.85	38	77.50	61.55	78.61
13	11.41	3.63	1.04	39	85.97	70.61	95.03
14	12.11	4.02	1.26	40	95.66	81.27	115.31
15	12.86	4.45	1.52	41	106.81	93.85	140.51
16	13.68	4.92	1.82	42	119.67	108.75	171.99
17	14.60	5.45	2.18	43	134.58	126.50	211.56
18	15.12	6.04	2.59	44	151.95	147.74	261.60
19	16.56	6.70	3.07	45	172.28	173.28	325.34
20	17.69	7.44	3.64	46	196.22	204.19	407.11
21	18.92	8.26	4.31	47	224.55	241.80	512.84
22	20.27	9.19	5.09	48	258.28	287.85	650.67
23	21.75	10.23	6.00	49	298.71	344.63	831.99
24	23.36	11.40	7.08	50	347.50	415.40	1072.80
25	25.13	12.72	8.34				

If the soil is cohesionless

*Kumbojkar, (1993)

Therefore, $N_c = 0$

Ultimate Bearing Capacity:

if the soil profile is cohesionless, c = 0.

Therefore,

$$qu_s := q \cdot N_q + 0.4 \cdot \gamma \cdot B \cdot N_\gamma$$ =Square Foundation

*Terzaghi, (1943)

Allowable Bearing Capacity

Factor of safety:

$$q_{all} := \frac{qu}{FS}$$

where:

q_{all} = Net stress increase in soil

qu = Ultimate bearig capacity

FS = Factor of safety

BH-1

SUMMARY FOR BASE 2.00 meters

Table 1.1 Design Parameters of Soil

Base x Length B x L (m)	SPT N-value, Nave	Water content, w	Void ratio, e	Cohesion, c', (kN/m^2)	Unit Weight, γ (kN/m^3)
1.50 x 1.50	28.200	24.90%	0.660	178.720	9.752
2.00 x 2.00	31.833			201.487	
2.50 x 2.50	31.833			201.487	
3.00 x 3.00	35.143			222.230	
3.50 x 3.50	38.000			240.133	
4.00 x 4.00	38.000			240.133	

Table 1.2 Bearing Capacity Factor & Ultimate Bearing Cap

Base, (m)	Bearing Capacity Factc			Unit Weight, γ (kN/m^3)	Equivalent Surcharge, q (kPa)	Ultimate Bearing Capacity, qus (kPa)	Allowable Bearing Capacity, qall (kPa)
	Nc	Nq	Nγ				
1.50	5.7	1.000	0.000	9.752	19.504	1324.315	441.438
2.00	5.7	1.000	0.000			1493.017	497.672
2.50	5.7	1.000	0.000			1493.017	497.672
3.00	5.7	1.000	0.000			1646.721	548.907
3.50	5.7	1.000	0.000			1779.388	593.129
4.00	5.7	1.000	0.000			1779.388	593.129

Table 1.3 Allowable Bearing Capacity from N-value using 25.4mm settlement			
Base, (m)	SPT N-value, N_{ave}	Tolerable Settlement, s (mm)	**Allowable Bearing Capacity, q_a (kPa)**
1.50	28.20	25.400	**375.391**
2.00	31.83	25.400	**386.411**
2.50	31.83	25.400	**364.830**
3.00	35.14	25.400	**387.256**
3.50	38.00	25.400	**406.968**
4.00	38.00	25.400	**398.249**

BH-2

SUMMARY FOR DEPTH 2.00meters

Table 1.1 Design Parameters of Soil					
Base x Length B x L (m)	SPT N-value, N_{ave}	Water content, w	Void ratio, e	Angle of Friction, ϕ	Unit Weight, γ_{eff} (kN/m^3)
1.50 x 1.50	30.600	5.40%	0.146	38.210	14.555
2.00 x 2.00	34.167	5.40%	0.146	39.458	14.555
2.50 x 2.50	34.167	5.40%	0.146	39.458	14.555
3.00 x 3.00	37.571	5.40%	0.146	40.649	14.555
3.50 x 3.50	40.625	5.40%	0.146	41.718	14.555
4.00 x 4.00	40.625	5.40%	0.146	41.718	14.555

Table 1.2 Bearing Capacity Factor & Ultimate Bearing Capacity							
Base, (m)	Bearing Capacity Factor			Unit Weight, γeff (kN/m^3)	Equivalent Surcharge, q (kPa)	Ultimate Bearing Capacity, q_{us} (kPa)	Allowable Bearing Capacity, q_{all} (kPa)
	Nc	Nq	Nγ				
1.50	77.50	61.55	78.61	14.555	29.110	2478.204	**826.068**
2.00	85.97	70.61	95.03	14.555	29.110	3161.964	**1053.988**
2.50	85.97	70.61	95.03	14.555	29.110	3438.594	**1146.198**
3.00	106.81	93.85	140.51	14.555	29.110	5186.084	**1728.695**
3.50	119.67	108.75	171.99	14.555	29.110	6670.305	**2223.435**
4.00	119.67	108.75	171.99	14.555	29.110	7170.964	**2390.321**

Table 1.3 Allowable Bearing Capacity from N-value using 25.4mm settlement			
Base, (m)	SPT N-value, N_{ave}	Tolerable Settlement, s (mm)	**Allowable Bearing Capacity, q_a (kPa)**
1.50	30.60	25.400	**203.670**
2.00	34.17	25.400	**207.367**
2.50	34.17	25.400	**195.786**
3.00	37.57	25.400	**207.009**
3.50	40.63	25.400	**217.541**
4.00	40.63	25.400	**212.880**

CONCLUSION : Based from the above matrix, **ALL the computed ALLOWABLE SOIL BEARING PRESSURE (ASBP) ARE EXCEEDED the specified allowable soil bearing pressure (ASBP) of 96 kPa (based from the DPWH and Dep-Ed shallow footing for 3-to 4-sty school bldg.) for the *CONSTRUCTION OF SAIN MARY'S UNIVERSITY.***

RECOMMENDATION:

NO SOIL REMEDIATION IS NEEDED AT THE SAID SITE,

OPTION 1: USE ANY TYPE DEEP FOOTING.

REFERENCES :

a : A Short Course in Foundation Engineering by N.E. Simons and B.K. Menzies, c. Butterworth & Co. Ltd., 1977

** : Principles of Geotechnical Engineering. 4th Ed. by Braja M. Das*

***: Foundation Design Principles and Practices, 2nd Ed. by Donald P. Coduto*

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APPENDIX – 1.7

COMPUTATION OF ALLOWABLE PILE CAPACITY

OPTION 1. DEEP PILE FOOTING: Based from the critical data near o at BH-01

I. BOREPILE FOOTING:

FOR PILE DIAMETER OF D1= 0.60 METER & DEPTH OF 15.00 METERS

A. Side Friction in Sand (Qs) & Clay (Qc):

Beta factor (β): empirical factor that incorporates of both friction angle and lateral stress:

	Depth (D)	Depth (d)	z	L	ysat/yeff	c	σ	qs	qc	D1	S	n-value	qb	Shaft Resistance (kN)	Bearing Resitance (kN)
1	**3.000**	**1.500**	2.250	1.500	**0.000**	**149.267**	0.000	0.000	82.097	**0.600**	2.827	**0.000**	0.000	**232.123**	**0.000**
2	**4.500**	**3.000**	3.750	1.500	**13.479**	**0.000**	50.546	12.637	0.000	**0.600**	2.827	**28.000**	1.680	**35.729**	**0.000**
3	**6.000**	**4.500**	5.250	1.500	**13.715**	**0.000**	72.004	18.001	0.000	**0.600**	2.827	**51.000**	3.060	**50.896**	**0.000**
4	**7.500**	**6.000**	6.750	1.500	**14.728**	**0.000**	99.414	24.854	0.000	**0.600**	2.827	**55.000**	3.300	**70.272**	**933.053**
5	**9.000**	**7.500**	8.250	1.500	**14.728**	**0.000**	121.506	30.377	0.000	**0.600**	2.827	**58.000**	3.480	**85.888**	**983.947**
6	**10.500**	**9.000**	9.750	1.500	**14.187**	**0.000**	138.323	34.581	0.000	**0.600**	2.827	**42.000**	2.520	**97.775**	**712.513**
7	**12.000**	**10.500**	11.250	1.500	**14.187**	**0.000**	159.604	39.901	0.000	**0.600**	2.827	**55.000**	3.300	**112.817**	**933.053**
8	**13.500**	**12.000**	12.750	1.500	**13.188**	**0.000**	168.147	42.037	0.000	**0.600**	2.827	**58.000**	3.480	**118.856**	**983.947**
9	**15.000**	**13.500**	14.250	1.500	**13.188**	**0.000**	187.929	46.982	0.000	**0.600**	2.827	**58.000**	3.480	**132.839**	**983.947**

OPTION 1. DEEP PILE FOOTING: Based from the critical data near o at BH-01

I. BOREPILE FOOTING:

FOR PILE DIAMETER OF D2= 0.70 METER & DEPTH OF 15.00 METERS

A. Side Friction in Sand (Qs) & Clay (Qc):

Beta factor (β): empirical factor that incorporates of both friction angle and lateral stress:

	Depth (D)	Depth (d)	z	L	ysat/yeff	c	σ	qs	qc	D2	S	n-value	qb	Shaft Resistance (kN)	Bearing Resitance (kN)
1	**3.000**	**1.500**	2.250	1.500	**0.000**	**149.267**	0.000	0.000	82.097	**0.700**	3.299	**0.000**	0.000	**270.810**	**0.000**
2	**4.500**	**3.000**	3.750	1.500	**13.479**	**0.000**	50.546	12.637	0.000	**0.700**	3.299	**28.000**	1.680	**41.684**	**0.000**
3	**6.000**	**4.500**	5.250	1.500	**13.715**	**0.000**	72.004	18.001	0.000	**0.700**	3.299	**51.000**	3.060	**59.379**	**0.000**
4	**7.500**	**6.000**	6.750	1.500	**14.728**	**0.000**	99.414	24.854	0.000	**0.700**	3.299	**55.000**	3.300	**81.984**	**1269.989**
5	**9.000**	**7.500**	8.250	1.500	**14.728**	**0.000**	121.506	30.377	0.000	**0.700**	3.299	**58.000**	3.480	**100.202**	**1339.261**
6	**10.500**	**9.000**	9.750	1.500	**14.187**	**0.000**	138.323	34.581	0.000	**0.700**	3.299	**42.000**	2.520	**114.071**	**969.810**
7	**12.000**	**10.500**	11.250	1.500	**14.187**	**0.000**	159.604	39.901	0.000	**0.700**	3.299	**55.000**	3.300	**131.620**	**1269.989**
8	**13.500**	**12.000**	12.750	1.500	**13.188**	**0.000**	168.147	42.037	0.000	**0.700**	3.299	**58.000**	3.480	**138.665**	**1339.261**
9	**15.000**	**13.500**	14.250	1.500	**13.188**	**0.000**	187.929	46.982	0.000	**0.700**	3.299	**58.000**	3.480	**154.979**	**1339.261**

OPTION 1. DEEP PILE FOOTING: Based from the critical data near o at BH-01

I. BOREPILE FOOTING:

FOR PILE DIAMETER OF D3= 0.80 METER & DEPTH OF 15.00 METERS

A. Side Friction in Sand (Qs) & Clay (Qc):

Beta factor (β): empirical factor that incorporates of both friction angle and lateral stress:

	Depth (D)	Depth (d)	z	L	ysat/yeff	c	σ	qs	qc	D3	S	n-value	qb	Shaft Resistance (kN)	Bearing Resitance (kN)
1	**3.000**	**1.500**	2.250	1.500	**0.000**	**149.267**	0.000	0.000	82.097	**0.800**	3.770	**0.000**	0.000	**309.497**	**0.000**
2	**4.500**	**3.000**	3.750	1.500	**13.479**	**0.000**	50.546	12.637	0.000	**0.800**	3.770	**28.000**	1.680	**47.639**	**0.000**
3	**6.000**	**4.500**	5.250	1.500	**13.715**	**0.000**	72.004	18.001	0.000	**0.800**	3.770	**51.000**	3.060	**67.862**	**0.000**
4	**7.500**	**6.000**	6.750	1.500	**14.728**	**0.000**	99.414	24.854	0.000	**0.800**	3.770	**55.000**	3.300	**93.695**	**1658.761**
5	**9.000**	**7.500**	8.250	1.500	**14.728**	**0.000**	121.506	30.377	0.000	**0.800**	3.770	**58.000**	3.480	**114.517**	**1749.239**
6	**10.500**	**9.000**	9.750	1.500	**14.187**	**0.000**	138.323	34.581	0.000	**0.800**	3.770	**42.000**	2.520	**130.367**	**1266.690**
7	**12.000**	**10.500**	11.250	1.500	**14.187**	**0.000**	159.604	39.901	0.000	**0.800**	3.770	**55.000**	3.300	**150.423**	**1658.761**
8	**13.500**	**12.000**	12.750	1.500	**13.188**	**0.000**	168.147	42.037	0.000	**0.800**	3.770	**58.000**	3.480	**158.475**	**1749.239**
9	**15.000**	**13.500**	14.250	1.500	**13.188**	**0.000**	187.929	46.982	0.000	**0.800**	3.770	**58.000**	3.480	**177.119**	**1749.239**

OPTION 1. DEEP PILE FOOTING: Based from the critical data near o at BH-02

I. BOREPILE FOOTING:

FOR PILE DIAMETER OF D1= 0.60 METER & DEPTH OF 15.00 METERS

A. Side Friction in Sand (Qs):

Beta factor (β): empirical factor that incorporates of both friction angle and lateral stress:

	Depth (D)	Depth (d)	z	L	ysat/yeff	c	σ	qs	qc	D1	S	n-value	qb	Shaft Resistance (kN)	Bearing Resitance (kN)
1	**3.000**	**1.500**	2.250	1.500	**14.196**	**0.000**	31.941	7.985	0.000	**0.600**	2.827	**46.000**	2.760	**22.578**	**0.000**
2	**4.500**	**3.000**	3.750	1.500	**13.534**	**0.000**	50.753	12.688	0.000	**0.600**	2.827	**41.000**	2.460	**35.875**	**0.000**
3	**6.000**	**4.500**	5.250	1.500	**14.155**	**0.000**	74.314	18.578	0.000	**0.600**	2.827	**52.000**	3.120	**52.529**	**0.000**
4	**7.500**	**6.000**	6.750	1.500	**13.131**	**0.000**	88.634	22.159	0.000	**0.600**	2.827	**58.000**	3.480	**62.652**	**983.947**
5	**9.000**	**7.500**	8.250	1.500	**13.131**	**0.000**	108.331	27.083	0.000	**0.600**	2.827	**62.000**	3.720	**76.574**	**1051.805**
6	**10.500**	**9.000**	9.750	1.500	**11.803**	**0.000**	115.079	28.770	0.000	**0.600**	2.827	**49.000**	2.940	**81.345**	**831.265**
7	**12.000**	**10.500**	11.250	1.500	**11.803**	**0.000**	132.784	33.196	0.000	**0.600**	2.827	**62.000**	3.720	**93.859**	**1051.805**
8	**13.500**	**12.000**	12.750	1.500	**13.715**	**0.000**	174.866	43.717	0.000	**0.600**	2.827	**70.000**	4.200	**123.606**	**1187.522**
9	**15.000**	**13.500**	14.250	1.500	**13.715**	**0.000**	195.439	48.860	0.000	**0.600**	2.827	**64.000**	3.840	**138.148**	**1085.734**

OPTION 1. DEEP PILE FOOTING: Based from the critical data near o at BH-02

I. BOREPILE FOOTING:

FOR PILE DIAMETER OF D2= 0.70 METER & DEPTH OF 15.00 METERS

A. Side Friction in Sand (Qs):

Beta factor (β): empirical factor that incorporates of both friction angle and lateral stress:

	Depth (D)	Depth (d)	z	L	ysat/yeff	c	σ	qs	qc	D2	S	n-value	qb	Shaft Resistance (kN)	Bearing Resitance (kN)
1	**3.000**	**1.500**	2.250	1.500	**14.196**	**0.000**	31.941	7.985	0.000	**0.700**	3.299	**46.000**	2.760	**26.341**	**0.000**
2	**4.500**	**3.000**	3.750	1.500	**13.534**	**0.000**	50.753	12.688	0.000	**0.700**	3.299	**41.000**	2.460	**41.854**	**0.000**
3	**6.000**	**4.500**	5.250	1.500	**14.155**	**0.000**	74.314	18.578	0.000	**0.700**	3.299	**52.000**	3.120	**61.284**	**0.000**
4	**7.500**	**6.000**	6.750	1.500	**13.131**	**0.000**	88.634	22.159	0.000	**0.700**	3.299	**58.000**	3.480	**73.094**	**1339.261**
5	**9.000**	**7.500**	8.250	1.500	**13.131**	**0.000**	108.331	27.083	0.000	**0.700**	3.299	**62.000**	3.720	**89.337**	**1431.624**
6	**10.500**	**9.000**	9.750	1.500	**11.803**	**0.000**	115.079	28.770	0.000	**0.700**	3.299	**49.000**	2.940	**94.902**	**1131.445**
7	**12.000**	**10.500**	11.250	1.500	**11.803**	**0.000**	132.784	33.196	0.000	**0.700**	3.299	**62.000**	3.720	**109.503**	**1431.624**
8	**13.500**	**12.000**	12.750	1.500	**13.715**	**0.000**	174.866	43.717	0.000	**0.700**	3.299	**70.000**	4.200	**144.207**	**1616.349**
9	**15.000**	**13.500**	14.250	1.500	**13.715**	**0.000**	195.439	48.860	0.000	**0.700**	3.299	**64.000**	3.840	**161.172**	**1477.805**

OPTION 1. DEEP PILE FOOTING: Based from the critical data near o at BH-02

I. BOREPILE FOOTING:

FOR PILE DIAMETER OF D3= 0.80 METER & DEPTH OF 15.00 METERS

A. Side Friction in Sand (Qs):

Beta factor (β): empirical factor that incorporates of both friction angle and lateral stress:

	Depth (D)	Depth (d)	z	L	ysat/yeff	c	σ	qs	qc	D3	S	n-value	qb	Shaft Resistance (kN)	Bearing Resitance (kN)
1	**3.000**	**1.500**	2.250	1.500	**14.196**	**0.000**	31.941	7.985	0.000	**0.800**	3.770	**46.000**	2.760	**30.104**	**0.000**
2	**4.500**	**3.000**	3.750	1.500	**13.534**	**0.000**	50.753	12.688	0.000	**0.800**	3.770	**41.000**	2.460	**47.833**	**0.000**
3	**6.000**	**4.500**	5.250	1.500	**14.155**	**0.000**	74.314	18.578	0.000	**0.800**	3.770	**52.000**	3.120	**70.039**	**0.000**
4	**7.500**	**6.000**	6.750	1.500	**13.131**	**0.000**	88.634	22.159	0.000	**0.800**	3.770	**58.000**	3.480	**83.536**	**1749.239**
5	**9.000**	**7.500**	8.250	1.500	**13.131**	**0.000**	108.331	27.083	0.000	**0.800**	3.770	**62.000**	3.720	**102.099**	**1869.876**
6	**10.500**	**9.000**	9.750	1.500	**11.803**	**0.000**	115.079	28.770	0.000	**0.800**	3.770	**49.000**	2.940	**108.460**	**1477.805**
7	**12.000**	**10.500**	11.250	1.500	**11.803**	**0.000**	132.784	33.196	0.000	**0.800**	3.770	**62.000**	3.720	**125.146**	**1869.876**
8	**13.500**	**12.000**	12.750	1.500	**13.715**	**0.000**	174.866	43.717	0.000	**0.800**	3.770	**70.000**	4.200	**164.808**	**2111.150**
9	**15.000**	**13.500**	14.250	1.500	**13.715**	**0.000**	195.439	48.860	0.000	**0.800**	3.770	**64.000**	3.840	**184.197**	**1930.195**

SUMMARY FOR BOREHOLE 1

Diameter 0.60 meter						
	Soil Type	Depth, m	Skin Friction, fs (kN)	Total Skin Friction, Fs	Bearing Reaction, fb (kN)	Support Reaction, Rx (kN)
1	CLAY	from 1.50 down to 3.00	232.123	232.123	0.000	77.374
2	SAND	4.500	35.729	267.852	0.000	89.284
3	SAND	6.000	50.896	318.748	0.000	106.249
4	SAND	7.500	70.272	389.020	933.053	440.691
5	SAND	9.000	85.888	474.908	983.947	486.285
6	SAND	10.500	97.775	572.682	712.513	428.399
7	SAND	12.000	112.817	685.500	933.053	539.518
8	SAND	13.500	118.856	804.356	983.947	596.101
9	SAND	15.000	132.839	937.195	983.947	640.381

Diameter 0.70 meter						
	Soil Type	Depth, m	Skin Friction, fs (kN)	Total Skin Friction, Fs	Bearing Reaction, fb (kN)	Support Reaction, Rx (kN)
1	CLAY	from 1.50 down to 3.00	270.810	270.810	0.000	90.270
2	SAND	4.500	41.684	312.494	0.000	104.165
3	SAND	6.000	59.379	371.873	0.000	123.958
4	SAND	7.500	81.984	453.857	1269.989	574.615
5	SAND	9.000	100.202	554.059	1339.261	631.107
6	SAND	10.500	114.071	668.130	969.810	545.980
7	SAND	12.000	131.620	799.750	1269.989	689.913
8	SAND	13.500	138.665	938.415	1339.261	759.225
9	SAND	15.000	154.979	1093.394	1339.261	810.885

Diameter 0.80 meter						
	Soil Type	Depth, m	Skin Friction, fs (kN)	Total Skin Friction, Fs	Bearing Reaction, fb (kN)	Support Reaction, Rx (kN)
1	CLAY	from 1.50 down to 3.00	309.497	309.497	0.000	103.166
2	SAND	4.500	47.639	357.136	0.000	119.045
3	SAND	6.000	67.862	424.998	0.000	141.666
4	SAND	7.500	93.695	518.693	1658.761	725.818
5	SAND	9.000	114.517	633.210	1749.239	794.150
6	SAND	10.500	130.367	763.577	1266.690	676.756
7	SAND	12.000	150.423	914.000	1658.761	857.587
8	SAND	13.500	158.475	1072.474	1749.239	940.571
9	SAND	15.000	177.119	1249.593	1749.239	999.611

SUMMARY FOR BOREHOLE 2

Diameter 0.60 meter						
	Soil Type	Depth, m	Skin Friction, fs (kN)	Total Skin Friction, Fs	Bearing Reaction, fb (kN)	Support Reaction, Rx (kN)
1	SAND	from 1.50 down to 3.00	22.578	22.578	0.000	7.526
2	SAND	4.500	35.875	58.453	0.000	19.484
3	SAND	6.000	52.529	110.982	0.000	36.994
4	SAND	7.500	62.652	173.634	983.947	385.860
5	SAND	9.000	76.574	250.208	1051.805	434.004
6	SAND	10.500	81.345	331.553	831.265	387.606
7	SAND	12.000	93.859	425.412	1051.805	492.406
8	SAND	13.500	123.606	549.018	1187.522	578.847
9	SAND	15.000	138.148	687.165	1085.734	590.967

Diameter 0.70 meter						
	Soil Type	Depth, m	Skin Friction, fs (kN)	Total Skin Friction, Fs	Bearing Reaction, fb (kN)	Support Reaction, Rx (kN)
1	SAND	from 1.50 down to 3.00	26.341	26.341	0.000	8.780
2	SAND	4.500	41.854	68.195	0.000	22.732
3	SAND	6.000	61.284	129.479	0.000	43.160
4	SAND	7.500	73.094	202.573	1339.261	513.945
5	SAND	9.000	89.337	291.910	1431.624	574.511
6	SAND	10.500	94.902	386.812	1131.445	506.085
7	SAND	12.000	109.503	496.314	1431.624	642.646
8	SAND	13.500	144.207	640.521	1616.349	752.290
9	SAND	15.000	161.172	801.693	1477.805	759.833

Diameter 0.80 meter						
	Soil Type	Depth, m	Skin Friction, fs (kN)	Total Skin Friction, Fs	Bearing Reaction, fb (kN)	Support Reaction, Rx (kN)
1	SAND	from 1.50 down to 3.00	30.104	30.104	0.000	10.035
2	SAND	4.500	47.833	77.937	0.000	25.979
3	SAND	6.000	70.039	147.976	0.000	49.325
4	SAND	7.500	83.536	231.512	1749.239	660.250
5	SAND	9.000	102.099	333.611	1869.876	734.496
6	SAND	10.500	108.460	442.071	1477.805	639.959
7	SAND	12.000	125.146	567.216	1869.876	812.364
8	SAND	13.500	164.808	732.024	2111.150	947.725
9	SAND	15.000	184.197	916.221	1930.195	948.805

CONCLUSION : Based from the above matrix, the **computed allowable pile capacity can be used at or near the two boreholes** for the ***CONSTRUCTION OF SAINT MARY'S UNIVERSITY.***

RECOMMENDATION:

IF THE COMPUTED ALLOWABLE PILE CAPACITY IS LESS THAN THE REACTION LOADS FROM THE SUPERSTRUCTURE OF THE STRUCTURAL ANALYSIS MADE BY THE STRUCTURAL ENGINEER, THE FOLLOWING OPTIONS CAN BE MADE: (1) INCREASE THE DEPTH OF THE PILE WITH CORRESPONDING DIAMETER, (2) OR, USED GROUPED PILE.

REFERENCES :

a : A Short Course in Foundation Engineering by N.E. Simons and B.K. Menzies, c. Butterworth & Co. Ltd., 1977

** : Principles of Geotechnical Engineering. 4th Ed. by Braja M. Das*

***: Foundation Design Principles and Practices, 2nd Ed. by Donald P. Coduto*

MR. HANSEN T. VILLANUEVA
INSPECTION COMMITTEE MEMBER

MRS. IRIS E. REGINALDE
INSPECTION COMMITTEE MEMBER

MRS. ARIANE P. DARAN
INSPECTION COMMITTEE MEMBER

ENGR. JOHN PHILIP M. GARCES
INSPECTION COMMITTEE MEMBER

ENGR. JOJO C. MARIANO
INSPECTION COMMITTEE MEMBER

ENGR. LEONIDO A. COSTALES JR.
INSPECTION COMMITTEE MEMBER

MR. SHERWIN A. MARCIANO
CO-CHAIRMAN

DR. JOHN G. TAYABAN
CHAIRMAN

SAINT MARY'S UNIVERSITY
BAYOMBONG, NUEVA VIZCAYA, PHILIPPINES
PHYSICAL PLANT, PROPERTIES DEVELOPMENT AND MAINTENANCE OFFICE

December 3, 2024

DR. JOHN OCTAVIOUS S. PALINA
University President
This Institution

Dear Sir,

Marian Greetings!

I am submitting the Inspection Report from the Project Monitoring and Inspection Committee for the installation of 3 x 100 KVA power transformers and primary metering at the Junior High School, Grade School, and Senior High School, as well as the electrical works for 38 air conditioning units at the Grade School and the construction of a power house at the Senior High School, executed by ACGG Engineering, Construction, and Supply.

Thank you very much.

Sincerely yours,

SHERWIN A. MARCIANO
Head

RECEIVED
Date: DEC 0 3 2024
Signature:
Office of the President
SMU – Bayombong, NV

INSPECTION REPORT

Project Name: Installation of 3x100KVA Power Transformer & Primary Metering at the Junior High School, Grade School, Senior High School and Installation and Electrical Works of 38 Air Conditioning Units of the Grade Schools & Construction of Power House at the SHS

Contractor: ACGG Engineering, Construction and Supply

Status: **100% Completion and Turnover – 5% Retention Money**

We, the undersigned members of the Project Monitoring and Inspection Committee consisting of Representative from the End-User Department with the assistance of Subject Matter Experts (SMEs), Quality Assurance (QA) Inspectors, Administrative Support Staff and Technical Personnels of the Implementing Office and other Staff designated by the Owner, conducted an official inspection of the above-stated project. The inspection covers and reiterates the materials, items and specifications as detailed in the signed (Owner-Contractor Agreement) Contract. The inspection is also conducted in response to the action/in-action of the Contractor to the initial findings in the given report.

The Committee conducted the inspection on 21th day of November and found the following findings by ocular inspection of the project site in relation to the presented product to wit:

✓1. Surrender of all the available copies of all existing locks installed.

✓2. Issuance and Provision of Certificate of Occupancy (Use-and-occupancy certificate)

✓3. For the General Safety of SMU Personnel, Staff and Students, installation of additional protection at the Perimeter Fence of the Transformers at SHS Powerhouse (preferably Barbed Wire or Razor Wire)

The Committee recommends the contractor to present the guaranteed time table or schedule to address the issues and queries of the project before granting the Certificate of Acceptance and release of retention money. The Committee also recommends haste and swift actions to avoid any issues and further damages that can be caused upon the usage and utilization of the swimming pool.

APPROVED

JOHN OCTAVIOUS S. PALINA, Ph.D., DBA
University President

05 DEC 2024

DATE: JULY 30, 2024 – TESTING & COMMISSIONING
SMU INSPECTION TEAM – Engr. JOJO M., SHERWIN M., Engr. PHILLIP G. – POWERHOUSE 2

















SMU SR. HIGH – POWERHOUSE #2





DATE : JULY 26, 2024 TRANSMISSION LINES & PRIMARY METERING







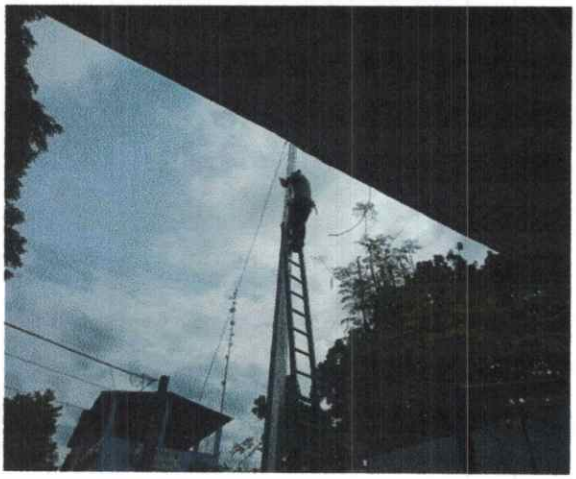


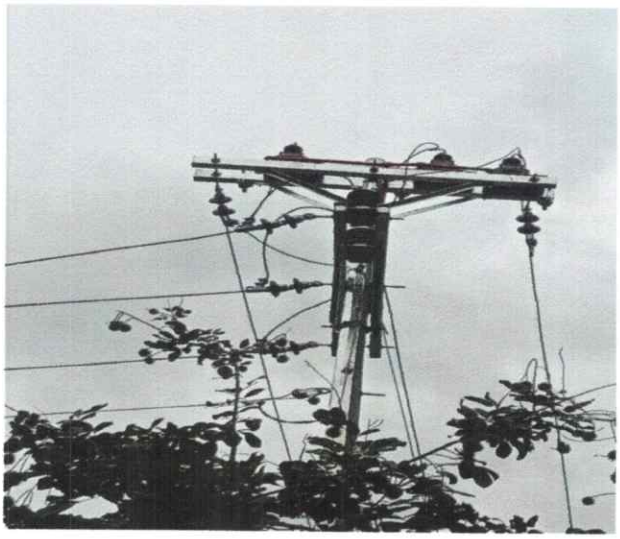




DATE: JULY 27, 2024 – NUVELCO PRIMARY METERING & TRANSMISSION LINES













DATE: JULY 28, 2024 - SMU SENIOR HIGH SCHOOL POWER TRANSFORMER 3 X 100KVA
ON GOING INSTALLATION – NUVELCO PERSONNEL













Republic of the Philippines
Department of the Interior and Local Government
BUREAU OF FIRE PROTECTION
Region II (CAGAYAN VALLEY)

BAYOMBONG FIRE STATION - NUEVA VIZCAYA
Sgt. L.B. Perez St., Don Mariano Marcos
Bayombong , Nueva Vizcaya
Hotline: 0915-172-1574 / 0919-678-5482
Email Address: bayombongfs@yahoo.com.ph

FSIC NO. R 2-RW156490

February 7, 2024
Date

FIRE SAFETY INSPECTION CERTIFICATE

☑ **FOR CERTIFICATE OF OCCUPANCY**
☐ **FOR BUSINESS PERMIT (NEW/RENEWAL)**
☐ **OTHERS** _____

TO WHOM IT MAY CONCERN:

By virtue of the provisions of RA 9514 otherwise known as the Fire Code of the Philippines of 2008, the application for **FIRE SAFETY INSPECTION CERTIFICATE** of ***SAINT MARY'S UNIVERSITY COLLEGE(OLD LIBRARY, JURGENE HALL UB BUILDING, AND PUBLISHING HOUSE ONLY)***
(Name of Establishment)
owned and managed by ***SAINT MARY'S UNIVERSIRY*** with postal address at
(Name of Owner/Representative)
DON MARIANO MARCOS, BAYOMBONG, NUEVA VIZCAYA
(Address)
is hereby **GRANTED** after said building structure or facility has been duly inspected with the finding that it has fully complied with the fire safety and protection requirements of the Fire Code of the Philippines of 2008 and its Revised Implementing Rules and Regulations.

This certification is valid for **BUSINESS PERMIT (NEW/RENEWAL)**
(Description)
valid until February 7, 2025.

Violation of Fire Code provisions shall cause this certificate *null and void* after appropriate proceeding and shall hold the owner liable to the penalties provided for by the said Fire Code.

Fire Code Fees:
Amount Paid: ₱5,527.00
O.R. Number: 02-24056597
Date: January 25, 2024

RECOMMEND APPROVAL:

SFO2 Nestor A Teneza
CHIEF, Fire Safety Enforcement Section

APPROVED:

INSP ARNOLD G GUNTALILIB, BFP
CITY/MUNICIPAL FIRE MARSHAL

NOTE: "This Certificate does not take the place of any license required by law and is not transferable. Any change in the use of occupancy of the premises shall require a new certificate."

THIS CERTIFICATE SHALL BE POSTED CONSPICUOUSLY

PAALALA: "MAHIGPIT NA IPINAGBABAWAL NG PAMUNUAN NG BUREAU OF FIRE PROTECTION SA MGA KAWANI NITO ANG MAGBENTA O MAGREKOMENDA NG ANUMANG BRAND NG FIRE EXTINGUISHER"

"FIRE SAFETY IS OUR MAIN CONCERN"

Applicant/Owner's COPY

Republic of the Philippines
Department of the Interior and Local Government
BUREAU OF FIRE PROTECTION
Region II (CAGAYAN VALLEY)

BAYOMBONG FIRE STATION - NUEVA VIZCAYA
Sgt. L.B. Perez St., Don Mariano Marcos
Bayombong , Nueva Vizcaya
Hotline: 0915-172-1574 / 0919-678-5482
Email Address: bayombongfs@yahoo.com.ph

FSIC NO. R 2-RW156490

February 7, 2024
Date

FIRE SAFETY INSPECTION CERTIFICATE

- ☑ **FOR CERTIFICATE OF OCCUPANCY**
- ☐ **FOR BUSINESS PERMIT (NEW/RENEWAL)**
- ☐ **OTHERS** _____

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By virtue of the provisions of RA 9514 otherwise known as the Fire Code of the Philippines of 2008, the application for **FIRE SAFETY INSPECTION CERTIFICATE** of *SAINT MARY'S UNIVERSITY COLLEGE(OLD LIBRARY, JURGENE HALL UB BUILDING, AND PUBLISHING HOUSE ONLY)*
(Name of Establishment)
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(Name of Owner/Representative)
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(Address)
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O.R. Number: 02-24056597
Date: January 25, 2024

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CHIEF, Fire Safety Enforcement Section

APPROVED:

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CITY/MUNICIPAL FIRE MARSHAL

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PAALALA: "MAHIGPIT NA IPINAGBABAWAL NG PAMUNUAN NG BUREAU OF FIRE PROTECTION SA MGA KAWANI NITO ANG MAGBENTA O MAGREKOMENDA NG ANUMANG BRAND NG FIRE EXTINGUISHER"

"FIRE SAFETY IS OUR MAIN CONCERN"

OBO/BPLO's COPY

Republic of the Philippines
Department of the Interior and Local Government
Bureau of Fire Protection

Regional Office Nr 2
BAYOMBONG FIRE STATION – NUEVA VIZCAYA
Sgt. L.B. Perez St., Don Mariano Marcos
Bayombong, Nueva Vizcaya
Hotline: **0915-172-1574**
Email: **bayombongfs@yahoo.com.ph**

INSPECTION ORDER
NUMBER: R2-RW-156490
(Pre-numbered)

01/09/2024
DATE

TO	:	FOI Dolorfino RB / FOI Viernes RLB
PROCEED	:	SMU COLLEGE DON MARIANO MARCOS, BAY. N.V.
PURPOSE	:	To conduct fire safety inspection to determine compliance with the Revised Implementing Rules and Regulations of RA 9514 otherwise known as the Fire Code of the Philippines of 2008.
DURATION	:	
REMARKS OR ADDITIONAL INSTRUCTION/S	:	Be in proper GOA uniform; coordinate with administrator/representative and accomplish prescribed After Inspection Report indicating therein the specific violation/deficiencies which shall be corrected by the owner/s prior renewal of Business Permit.

RECOMMEND APPROVAL:

SFO2 Nestor A Teneza, BFP
Chief, Fire Prevention Section

APPROVED:

INSP ARNOLD G GUNTALILIB, BFP
ACTING MUNICIPAL FIRE MARSHAL

ACKNOWLEDGEMENT

This is to acknowledge that permission was granted to the above-named Fire Safety Inspector/s accompanied by authorized representative to conduct Fire Safety Inspection within the premises in accordance with law.

RAYMOND VILLANUEVA
Signature over Printed Name/Authorized Representative

JAN. 7, 2024
Date/Time

PAALALA: "MAHIGPIT NA IPINAGBABAWAL NG PAMUNUAN NG BUREAU OF FIRE PROTECTION SA MGA KAWANI NITO ANG MAGBENTA O MAGREKOMENDA NG ANUMANG BRAND NG FIRE EXTINGUISHER"

"FIRE SAFETY IS OUR MAIN CONCERN"

DISTRIBUTION:
Original (Applicant/Owner's Copy)
Duplicate (BFP Copy)

Tier 1 Seismic Evaluation Report

Based on ASCE/SEI 41-17 – Seismic Evaluation and Retrofit of Existing Buildings

Evaluation Objective: Life Safety (LS) and Collapse Prevention (CP)

1. Building Identification

- Location: 16.481850, 121.148967
- Occupancy: Educational Building
- Risk Category: III
- Number of Stories: 4
- Structural System: Reinforced Concrete Special Moment Frame (SMF)
- Approximate Plan Dimensions: 36m (longitudinal) x 10.5m (transverse)
- Year Built: 1998
- Original Design Code: likely designed using 1992 NSCP
- Available Drawings: Architectural & Structural

2. Site Seismicity and Ground Motion Parameters (SAMPH & ASCE 7-05)

- Mapped Spectral Accelerations (2475-year), SAMPH:
  - Ss = 1.7 (short-period)
  - S1 = 0.65 (1.0-second period)
- Site Class: Assumed D (based on general Philippine soil profiles unless geotechnical data suggests otherwise)

Site Coefficients (ASCE 7-05, Table 11.4-1 & 11.4-2):
- Fa = 1.0 (for Ss = 1.7, Site Class D)
- Fv = 1.5 (for S1 = 0.65, Site Class D)

Design Spectral Response Acceleration Parameters:
- SDS = 1.13
- SD1 = 0.65

3. Description of Existing Conditions

- Structural System: Reinforced Concrete Special Moment Frame
- Gridlines: Longitudinal (1 to 10): 4m spacing; Transverse (A to D): A–B = 2.5m; B–D = 8m

- Column Sizes:
  - Gridline A: 40 cm x 40 cm (Captive Columns)
  - Gridlines B & D: 40 cm x 50 cm
- Stairwell: Located between gridlines 5 and 6, all floors
- Infill Walls:
  - Along gridlines B & D with large windows
  - Dividing infill walls at Gridlines 1, 3, 5, 6, 8, 10

Observed Conditions:
- Cracking at junctions with adjacent building, primarily around openings
- Captive columns on Gridline A on all floors (flagged)
- Primary components show no signs of structural distress
- Structural plans show proper hoop spacing and joint confinement

4. Seismic Evaluation Objective

This Tier 1 seismic evaluation was conducted to assess Life Safety (LS) performance under the Design Basis Earthquake (DBE) and Collapse Prevention (CP) under the Maximum Considered Earthquake (MCE), in accordance with ASCE 41-17 guidelines for Risk Category III buildings.

5. Tier 1 Checklist Summary – ASCE 41-17

A. Building Configuration Checklist

- Vertical Irregularity: Pass
- Plan Irregularity: Pass
- Weak Story: Pass
- Soft Story: Pass
- Torsion: Unknown (Stair located near the back side may cause torsional response)
- Diaphragm Discontinuity: Pass
- Out-of-Plane Offsets: Pass
- Non-Orthogonal Systems: Pass

B. Structural Component Checklist – Reinforced Concrete

- C1: Beam-Column Joint Details: Pass
- C2: Column Shear Strength: Pass
- C3: Column Axial Strength: Pass
- C4: Column Confinement: Pass
- C5: Beam Reinforcement Continuity: Pass
- C6: Shear Strength of Beams: Pass

- C7: Captive Columns: Does Not Comply – Fail
- C8: Wall Anchorage: Pass

C. Geologic Site and Foundation Checklist

- Liquefaction Potential: Pass (HazardHunterPH)
- Landslide Potential: Pass
- Surface Fault Rupture: Unknown (No known active fault trace within immediate site)
- Settlement and Soil Capacity: Pass

6. Summary of Findings

The building complies with most of the Tier 1 checklist requirements. However, the presence of captive columns introduces a short column effect that needs to be addressed. Another issue is the Other observed conditions are minor and do not impact structural performance.

7. Recommendations

1. Flagged Deficiency: Captive Columns – Retrofit or alter wall elements to prevent short column effects.
2. Optional Tier 2 Analysis to assess nonlinear behavior, especially for Collapse Prevention.
3. Monitor non-structural cracking for further deterioration.

Appendices

A. Photos of Captive Columns
B. Photos of Infill Wall Cracks

Prepared By:

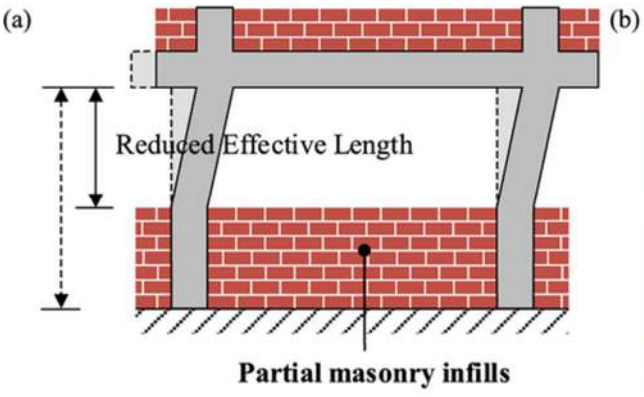
ENGR. SHERWIN M. SARMIENTO, M.PICE, M.ASEP
PRC# 0128257
CP# 09173008809

Appendix A

Photos of Captive Columns (Short column effect)

The "short column effect" refers to a phenomenon where columns in a building, particularly those in reinforced concrete (RC) structures, experience increased stiffness and attraction of lateral forces due to being shorter than other columns in the same story. This shorter length, often caused by obstructions like infill walls, mezzanine floors, or sloping ground, leads to a concentrated load on the shorter column, potentially causing shear failure and brittle damage, especially during seismic events.



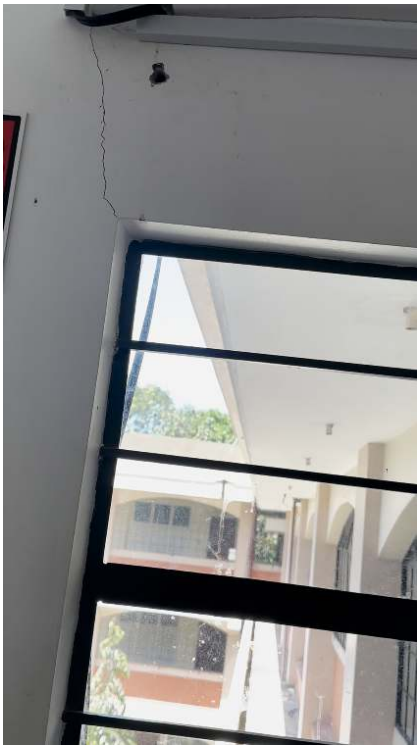




Appendix B

Photos of Infill Wall Cracks







Tier 1 Seismic Evaluation Report

Based on ASCE/SEI 41-17 – Seismic Evaluation and Retrofit of Existing Buildings

Evaluation Objective: Life Safety (LS) and Collapse Prevention (CP)

1. Building Identification

- Location: 16.481657, 121.149194
- Occupancy: Educational Building (School Canteen, Library, Computer Room, Basketball Gym)
- Risk Category: III
- Number of Stories: 3
- Structural System: Reinforced Concrete Special Moment Frame (SMF)
- Approximate Plan Dimensions: 34m (longitudinal) x 23 (transverse)
- Year Built: 2015
- Original Design Code: likely designed using 2010 NSCP
- Available Drawings: Architectural, Structural, Plumbing & Electrical

2. Site Seismicity and Ground Motion Parameters (SAMPH & ASCE 7-05)

- Mapped Spectral Accelerations (2475-year), SAMPH:
  - Ss = 1.7 (short-period)
  - S1 = 0.65 (1.0-second period)
- Site Class: Assumed D (based on general Philippine soil profiles unless geotechnical data suggests otherwise)

Site Coefficients (ASCE 7-05, Table 11.4-1 & 11.4-2):
- Fa = 1.0 (for Ss = 1.7, Site Class D)
- Fv = 1.5 (for S1 = 0.65, Site Class D)

Design Spectral Response Acceleration Parameters:
- SDS = 1.13
- SD1 = 0.65

3. Description of Existing Conditions

The subject structure is a 3-story reinforced concrete moment frame building with perimeter and interior columns. It houses a school canteen with food stalls at the ground level, library and computer rooms at the second floor, and a basketball gym with bleachers at the third floor. The building was likely designed under the 2010 edition of the National Structural Code of the Philippines (NSCP), which generally aligns with seismic detailing requirements of ASCE 7-05 and ACI 318-08.

Plan Dimensions:

- Approx. 28m (gridlines B–I at 3.914m spacing) x approx. 22m (gridlines 2–7 at 4.45m spacing)
- Grid irregularity introduced by stair core (Grid I–J/2–3) and front ramp (Grid A–D)

Structural System:

- Reinforced Concrete Special Moment Frame (per plans)
- Foundation: Isolated footings of various sizes and reinforcement layouts

Column Details:

- Perimeter: 40cm x 60cm (1st floor to roof)
- interior columns: 40cm x 60cm (1st floor to 3rd Flr)
- Interior column layout present at gridlines 4 & 5, parallel to gridlines C–H

Beam/Girder Details (per plans):

- Typical beam size: beam sizes vary from 300mm x 650mm to 250mm x 500mm
- Typical Stirrup spacing:
    - 1 @ 50mm
    - 6 @ 100mm
    - 6 @ 150mm
    - Remaining @ 175mm toward midspan

This stirrup detailing appears consistent with ***ACI 318-08 Section 21.5.3***, which mandates close stirrup spacing within a distance of 2h from column face. The provided detailing meets minimum code requirements for seismic confinement zones assuming beam shear demand is not excessive.

Observed Conditions and Concerns

- **Soft Story Potential:** Ground floor has minimal infill walls (primarily located on gridline 7 and segments of gridlines I and B), while upper floors have perimeter infill. This indicates increased stiffness at upper levels, contributing to a soft/weak story at the ground level.

- **Cracking Observed:** Cracks were evident at the stair and ramp areas (gridlines I–J/2–3 and D–A), suggesting torsional demand or in-plane bracing action from non-structural elements. Additional cracks noted near connections with the adjacent *Jurgens Building*, where no seismic separation joint appears to exist.
- **Differential Movement:** Cracks along infill wall plaster at the interface with the Jurgens Building suggest thermal or differential seismic movement. Possible pounding effect should be investigated.
- **Seismic Detailing:** Based on structural drawings, though no detail of joint reinforcements was evident on plan, stirrup spacing and hoop configurations appear compliant with minimum code requirements for seismic design per ACI 318-08.

4. Seismic Evaluation Objective

This Tier 1 seismic evaluation was conducted to assess Life Safety (LS) performance under the Design Basis Earthquake (DBE) and Collapse Prevention (CP) under the Maximum Considered Earthquake (MCE), in accordance with ASCE 41-17 guidelines for Risk Category III buildings.

5. Tier 1 Checklist Summary – ASCE 41-17

5.1 Basic Structural Checklist

Item	Description	Status
S1	Vertical Irregularities	**No significant setback; however, vertical stiffness irregularity suspected (soft story)**
S2	Plan Irregularities	**Yes** – Not rectangular due to stairs (I–J/2–3) and ramp (D–A); may induce torsion
S3	Weak Story	**Potential Concern** – Minimal wall presence at ground floor
S4	Pounding	**Possible** – Adjacent to Jurgens Building with no seismic gap
S5	Diaphragm Discontinuity	**None observed**
S6	Irregularities	**Horizontal & vertical irregularities suspected** due to stair core and ramp asymmetry

5.2 Basic Configuration Checklist

Item	Description	Status
C1	Torsion Irregularity	**Likely** due to stair/ramp asymmetry

Item	Description	Status
C2	Re-entrant Corners	**Yes** – Along the transverse location due to the stairs
C3	Diaphragm Openings	**None observed**
C4	Out-of-Plane Offsets	**None observed**

5.3 Geologic Site and Foundation Checklist

Item	Description	Status
G1	Slope Instability	**None** – Site is flat
G2	Liquefaction Potential	**Pass** – Based on hazardhunter.georisk.gov.ph
G3	Surface Fault Rupture	**Not within fault zone** – No trace within vicinity

6. Conclusions and Recommendations

- The building appears to be generally compliant with seismic detailing provisions of the 2010 NSCP (ACI 318-08), based on provided plans.
- Ground-level infill wall configuration combined with upper-level perimeter wall presence raises concern for ***soft story behavior***.
- Stair and ramp layout introduces potential for torsion; further modeling recommended to verify.
- Cracks at interfaces and lack of seismic separation from the adjacent Jurgens Building should be further evaluated.
- A **Tier 2 or nonlinear analysis** is recommended to quantify stiffness irregularities and validate collapse prevention and life safety objectives.

Appendices

A. Photos of Cracks within Stairwell & Ramp
B. Photos of Infill Wall Cracks, Due to Nonexistent Seismic Gap

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Appendix A

Photos of Cracks within Stairwell & Ramp

SECOND FLOOR, Showing a Long horizontal crack, evident of stress concentration within the stair well





Photos of mid 1st level height and 2nd floor (Ramp)





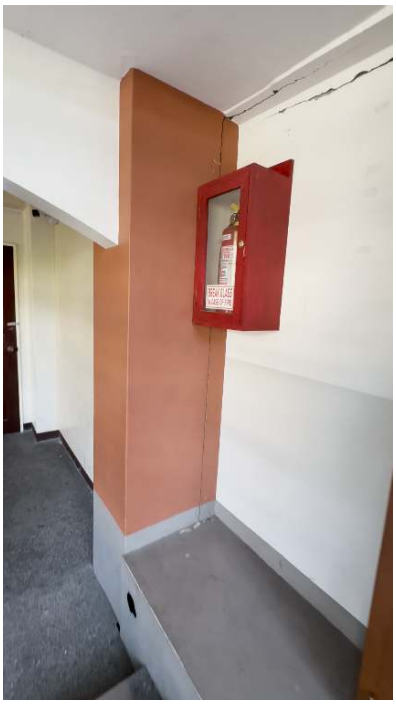
Photos of mid 2nd level height and 3rd floor (Ramp)





Appendix B

Photos of Infill Wall Cracks, Due to Nonexistent Seismic Gap









Tier 1 Seismic Assessment Report

Based on ASCE/SEI 41-17 – Seismic Evaluation and Retrofit of Existing Buildings

Evaluation Objective: Life Safety (LS) and Collapse Prevention (CP)

1. General Building Data

Location: 16.484502, 121.150859
Structural System: Concrete Moment Frame
Year of Construction: 2016
Code of Record: NSCP 2015
Risk Category: III
Occupancy Type: Educational – multi-use (canteen, classrooms, gym)
Seismic Design Category (SDC): D
Seismic Hazard Data:
- MCEr: Ss = 1.7, S1 = 0.65 (from SAMPH)
- Site Class: D (assumed due to unknown soil data)
- Design Spectral Acceleration: SDS = 1.13, SD1 = 0.65

2. Structural Configuration and Geometry

Number of Stories: 4
Plan Dimensions: 14m × 29m
Grid Layout:
- Horizontal (A–H): Spacing ranges from 3.89m to 5.05m
- Vertical (1–7): Spacing ranges from 2.4m to 5.752m

Column & Beam Sizes: Concrete; sizes vary and plans are unavailable
Floor Heights:
- 1st–2nd: 5.0m
- 2nd–3rd: 3.2m
- 3rd–4th: 3.2m
- 4th–Roof: 5.4m

Roof Type: Arc-type

Irregularities:

- Soft Story: Likely at ground floor (open, taller story)
- Torsional Irregularity: Possible, due to ramp between gridlines 1–4 & E–G
- Vertical Irregularity: Yes, per ASCE 7-05 Table 12.3-2, a story height >130% of adjacent story qualifies – here, 1st story (5.0m) vs 2nd (3.2m) exceeds this threshold

3. Foundation Configuration

Foundation System: Unknown

Soil Type: Assumed Class D

Reinforcement/Detailing: Unknown

4. Structural Elements

Moment-Resisting Frames

- Column/Beam Detailing: Unknown
- Connection Strength:
  - Critical connections transfer full moment demands;
  - Non-critical transfer limited loads.
  - In absence of plans, assume non-critical unless field evidence suggests otherwise
- Beam-Column Joints: No visible joint damage; larger columns than beams suggest column-strong hierarchy
- Infill Walls:
  - Present on 2nd & 3rd floors, partial on 1st and 4th
  - Likely stiffening effect and potential for soft story mechanism

Other Observations:

- Downspouts observed embedded in three columns along gridline G between gridlines 1–3, which may affect the effective cross-sectional area and performance of these structural members.

5. Lateral Load Resisting System

System Type: Moment Resisting Frame

Load Path: Load distribution present

Torsional Effects: Possible due to ramp

Performance: Needs further study due to irregularities and lack of details

6. Seismic Detailing and Reinforcement

Detailing: Unknown

Ductility: Cannot be confirmed

Splice and Anchorage: Unknown

7. Deficiencies and Vulnerabilities

Potential Failure Modes: Unverified due to lack of data

Soft Story: Possible at 1st floor

Torsional Effects: Ramp and irregular plan

Foundation: Unknown

Inadequate Reinforcement: Cannot confirm

Other:

- Vertical irregularity, unknown confinement
- Embedded downspouts in critical columns (Gridline G, 1–3) may pose a local weakness

8. Seismic Risk Assessment

Site-Specific Hazard: SDS = 1.13, SD1 = 0.65 (ASCE 7-05; Site Class D)

Risk Assessment:

- Potential collapse mechanisms due to soft and torsional irregularities
- Ground floor more vulnerable during seismic excitation
- No observed structural cracks, only infill wall damage during recent earthquakes suggests resilient structural frame

Occupancy Risk:

- High due to educational use and occupancy
- Life Safety: Potential risk due to irregularities
- Collapse Prevention: Requires further assessment

9. Recommended Actions

Conduct Tier 2 or Tier 3 evaluation for detailed seismic analysis

Perform material testing or structural probing to confirm reinforcement and concrete strength

Consider retrofitting for soft story or torsion issues

Install non-structural mitigation measures

10. Conclusion

Seismic Safety: Marginally acceptable for Life Safety, but not confirmed for Collapse Prevention due to unknowns

Code Compliance: Not verifiable due to lack of plans

Recommendation: Proceed with Tier 2 Investigation

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Tier 1 Seismic Assessment Report

Based on ASCE/SEI 41-17 – Seismic Evaluation and Retrofit of Existing Buildings

Evaluation Objective: Life Safety (LS) and Collapse Prevention (CP)

1. General Building Data

Location: 16.484335, 121.151174
Structural System: Concrete Moment Frame
Year of Construction: 2005–2007
Code of Record: NSCP 2001
Risk Category: III
Occupancy Type: Educational building
Seismic Design Category (SDC): D (based on Seismic Zone 4 under NSCP 2001)
Seismic Hazard Data:
- MCEr: Ss = 1.7, S1 = 0.65 (from SAMPH)
- Site Class: D (assumed due to unknown soil data)
- Design Spectral Acceleration: SDS = 1.13, SD1 = 0.65

2. Structural Configuration and Geometry

Number of Stories: 3 Story with Covered and Usable Roof Deck
Plan Dimensions: 42m (L) × 11m (W)
Grid Layout:
- Horizontal A–K (A-B = 5m; B–J = 4m each; J–K = 5m)
- Vertical 1–3 (1–2 = 3m; 2–3 = 8m)

Column Sizes and Layout:

- 400mm × 500mm concrete columns at grid intersections

Beam Sizes and Layout:

- Typical: 300mm × 500mm

- Long spans (8m): 300mm × 600mm

Floor-to-Floor Heights:

- Ground to 2F: 3.2m

- 2F to 3F: 3.1m

- 3F to Roof Deck: 3.1m

- Roof Deck to Roof Beam: 3.1m

Roof Type: Hipped Roof

Irregularities Identified:

- Plan Irregularity: None

- Vertical Irregularity: None

- Torsional Irregularity: None

- Soft Story: None

3. Foundation Configuration

System: Isolated Footings

Details:

- 14 @ 3.6m x 3.6m x 0.4m thick, 20 pcs of 2 bundled 16mm rebars each way

- 8 @ 3.6m x 3.6m x 0.4m thick, 17 pcs of 2 bundled 16mm rebars each way

- 7 @ 3.3m x 2.75m x 0.4m thick, 14 pcs avg. of 2 bundled 16mm rebars

- 6 @ 2.75m x 2.75m x 0.4m thick, 13 pcs of 2 bundled 16mm rebars

- 2 @ 2m x 2m x 0.4m thick, 10 pcs of 2 bundled 16mm rebars

Concrete Quality: Unknown

Reinforcement Detailing: Typical bundled bar reinforcement in both directions.

Soil Conditions: Unknown — assumed Site Class D

4. Structural Elements

Moment-Resisting Frames

- Column Detailing: Hoop spacing, the provided hoop spacing—2 sets of 12mm diameter ties at 2@50mm, 5@75mm, 5@100mm, and the remainder at 175mm centers towards mid-height—suggests adequate confinement in the plastic hinge regions, aligning with seismic detailing requirements. meets confinement requirements if near joints

- Beam Detailing: Regular, no torsion expected, strength connections non-critical

- Reinforcement Ratios: Columns and beams appear to meet code minimums

Beam-Column Joints

- Confinement ties are present; generally acceptable

Infill Walls

Present Along Gridlines:

- 2, 3, A, B, D, F, H, J, K

- Captive columns identified along gridline 1

Type: Reinforced Masonry

5. Lateral Load Resisting System

Lateral Load Path: Complete and direct via moment-resisting frames
Redundancy: Sufficient in both directions
Diaphragm: Rigid, continuous concrete slab
No soft stories or torsional irregularities

6. Seismic Detailing and Reinforcement

Columns and Beams: Consistent with NSCP 2001 and ACI 318-99

Ductility: Adequate

Splice Locations: Mid-height of columns, beam data unavailable

Anchorage: Satisfactory per plans

7. Deficiencies and Vulnerabilities

Column/Beam Failure Modes:

- Captive column risk along gridline 1

8. Seismic Risk Assessment

Site-Specific Hazard: SDS = 1.13, SD1 = 0.65 (ASCE 7-05; Site Class D)

Seismic Risk: Acceptable overall, captive columns a concern

Occupancy Risk: Risk Category III – Life Safety expected

9. Recommended Actions

Mitigation of Captive Column Effect: Cut infill walls adjacent to columns and provide separation using backer rods or foam

No structural cracks or damage noted during my ocular inspection even after the Abra earthquake (Magnitude 7.0, July 27, 2022, approx. 140km away)

10. Conclusion

Overall Seismic Safety Assessment:

- Meets Life Safety and Collapse Prevention under ASCE 41-17

Compliance: Generally compliant with NSCP 2001, ACI 318-99, ASCE 41-17

Tier 2 Investigation Recommendation:

- Tier 2 Evaluation not necessary unless usage or layout is changed

- No visible damage post-July 27, 2022 M7.0 Abra Earthquake

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Tier 1 Seismic Evaluation Report

Based on ASCE/SEI 41-17 – Seismic Evaluation and Retrofit of Existing Buildings

Evaluation Objective: Life Safety (LS) and Collapse Prevention (CP)

1. Building Identification

- Location: 16.483879, 121.151063
- Occupancy: Educational Building
- Risk Category: III
- Number of Stories: 3
- Structural System: Reinforced Concrete Special Moment Frame (SMF)
- Approximate Plan Dimensions: 28m (longitudinal) x 10m (transverse)
- Year Built: 1986
- Original Design Code: Presumably NSCP 1981
- Available Drawings: None

2. Site Seismicity and Ground Motion Parameters (SAMPH & ASCE 7-05)

- Mapped Spectral Accelerations (2475-year), SAMPH:
  - Ss = 1.7 (short-period)
  - S1 = 0.65 (1.0-second period)
- Site Class: Assumed D (based on general Philippine soil profiles unless geotechnical data suggests otherwise)

Site Coefficients (ASCE 7-05, Table 11.4-1 & 11.4-2):
- Fa = 1.0 (for Ss = 1.7, Site Class D)
- Fv = 1.5 (for S1 = 0.65, Site Class D)

Design Spectral Response Acceleration Parameters:
- SDS = 1.13
- SD1 = 0.65

3. Description of Existing Conditions

- Concrete Frame: Lateral system appears to be special moment frame, typical for

educational buildings.
- Observed Deterioration: Slab reinforcement near roof slab is rusted and spalling, possibly due to internal gutter detailing.
- Column Sizes: 35cm x 35cm at base.
- Architectural Irregularities: Presence of stairwell offset may introduce torsional effects.
- Construction Deficiencies: Given construction year (1986) and NSCP 1981, building likely lacks adequate seismic confinement detailing required by modern codes.

Observation: Embedded Downspout Pipes in Concrete Columns

During the site walkthrough, it was observed that vertical downspout drainage pipes are embedded within several reinforced concrete columns throughout the building. These embedded elements reduce the effective gross concrete area (Ag) of the columns and may interfere with proper reinforcement placement and confinement, particularly in smaller column cross sections (e.g., 350 mm x 350 mm at the ground level).

The presence of such pipes introduces potential structural concerns due to the reduction in axial and flexural capacity. In addition, long-term durability is a concern, as any cracking or failure of the pipe may lead to water seepage into the concrete, increasing the risk of reinforcement corrosion and concrete degradation.

This condition was probably not explicitly accounted for in the original design and is not compliant with current good practice. While detailed calculations were not performed as part of this Tier 1 evaluation, the embedded downspouts may contribute to reduced vertical and lateral load-carrying capacity. The affected columns are therefore flagged as **potentially deficient**, warranting further evaluation under a Tier 2 analysis or detailed structural investigation.

4. Seismic Evaluation Objective

Life Safety (LS) and Collapse Prevention (CP) performance levels are targeted for Tier 1 screening in accordance with ASCE 41-17 for Risk Category III buildings.

5. Tier 1 Checklists

5.1 Basic Structural Checklist

Item	Description	Pass / Fail	Comments
S1	Load Path	Pass	Vertical and horizontal load

			paths appear continuous
S2	Redundancy	Unknown	No as-built plans available
S3	Capacity/Det.	Fail	Building was designed pre-modern ductility requirements (likely poor confinement)
S4	Weak Story	Unknown	Needs further investigation
S5	Soft Story	Unknown	Potential depending on partition wall stiffness
S6	Diaphragm Continuity	Pass	Diaphragms assumed rigid and continuous
S7	Collector Elements	Unknown	Unable to verify due to lack of drawings
S8	Irregularities	Fail	Presence of stair core may induce torsional irregularities

5.2 Basic Configuration Checklist

Item	Description	Pass / Fail	Comments
C1	Torsion	Fail	Stair located near the back and side may cause torsional response
C2	Columns	Fail	Column contains embedded downspout pipe reducing effective Ag and potentially interfering with

			reinforcement layout.
C3	Re-entrant Corners	Pass	No apparent re-entrant corners observed
C4	Diaphragm Discontinuity	Unknown	Not observable, assumed continuous unless proven otherwise
C5	Out-of-Plane Offsets	Pass	None observed
C6	Non-orthogonal System	Pass	Structural elements assumed orthogonal

5.3 Geologic Site and Foundation Checklist

Item	Description	Pass / Fail	Comments
G1	Slope Instability	Pass	Flat site assumed
G2	Liquefaction	Pass	Per HazardHunterPH, liquefaction potential is low
G3	Surface Fault Rupture	Unknown	No known active fault trace within immediate site

6. Summary of Findings

Structural Deficiencies:

- Lack of structural plans limits definitive assessments.
- Downspout pipes seem to be imbedded in columns (Reduced Effective concrete Ag & potential for water seepage if pipe cracks)
- Likely inadequate confinement in columns based on pre-1992 design codes (NSCP 1981).
- pre-modern detailing (lack of confinement, anchorage, and ductility)
- Potential torsional irregularities due to stair core location
- Signs of durability degradation (corrosion, spalling) in topmost slab near internal gutter
- Existing deterioration at roof slab could reduce structural integrity.

Non-Compliance Items:
- S3 (Detailing), S8 (Irregularities), C1 (Torsion), C2 (Column)

7. Recommendations

- Conduct a Tier 2 evaluation focusing on:
  - Column detailing and confinement checks
  - 3D modeling to evaluate torsional response
  - Verification of slab and diaphragm integrity
- Perform limited destructive testing (e.g., concrete core testing, rebar exposure) to validate material properties and reinforcement detailing
- Conduct non-destructive scanning of slab and beams, especially near corroded areas
- Retrofit options may include column jacketing, addition of shear walls or steel braces to counter torsion, and roof slab repair.

Appendices

A. Photos of spalled slabs and corroded rebar
B. Photos of Downspout within columns

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Appendix A

Photos of spalled slabs and corroded rebar



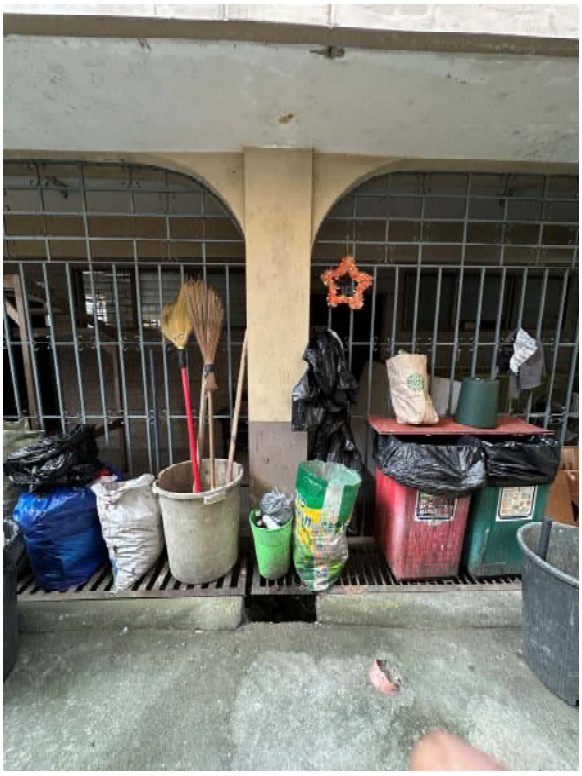






Appendix B

Photos of Downspout within columns







Possible crack due to corroded rebars, due to pipe embedment/waterproofing



Hole for downspout seen penetrating

Tier 1 Seismic Evaluation Report

ASCE 41-17 Life Safety Performance Level

Project: Seismic Evaluation of a 4-Story Educational Building

Location: 16.4823233342161, 121.15577533024661

Inspection Date: March 4, 2025, 12:10 PM

1. General Building Information

- Occupancy Type: Educational
- Structural System: Concrete Special Moment Resisting Frame (SMRF)
- Risk Category: III
- Seismic Design Category (SDC): D
- Year of Construction: 2007–2008
- Code of Record: NSCP 2001
- Available Plans: Mechanical plans only; no structural or architectural plans provided

2. Site Conditions and Seismic Hazard

- Site Soil Conditions: Unknown; client stated structure was constructed on landfill, suggesting potentially soft or compressible soils. No geotechnical report available.
- Distance to Active Fault: Approximately 2.3 km from the Maddiangat Fault
- Seismic Hazard Parameters (2475-year return period):
  - Ss = 1.7
  - S1 = 0.65

Based on ASCE 7-05 site coefficient values (assuming Site Class D):
- Fa = 1.0, Fv = 1.5
- SDS = (2/3) x Fa x Ss = (2/3) x 1.0 x 1.7 = 1.13
- SD1 = (2/3) x Fv x S1 = (2/3) x 1.5 x 0.65 = 0.65

3. Structural Configuration and Geometry

- Number of Stories: 4

- Plan Dimensions: 23.5m (L) × 20m (W)
- Grid Layout:
  - Longitudinal: 1–2 (5m), 2–3 (2.5m), 3–7 (4m spacing)
  - Transverse: A–B (4m), B–C (3.5m), C–D (5m), D–E (3.5m), E–F (4m)
- Typical Floor Height: Approx. 3.1m at Ground, 3.0m for upper floors
- Column Sizes: ~500mm x 500mm (estimated)
- Beam Sizes: ~300mm x 500mm (estimated)
- Roof Type: Inaccessible; unknown configuration
- Observed Irregularities: None (no plan, soft story, or torsional irregularities observed)

4. Lateral Load Resisting System

- System Type: Concrete Moment Resisting Frame
- Lateral Load Path: Appears continuous from roof to foundation
- Torsional Effects: No excessive torsional behavior observed or expected
- MRF Performance: The moment frame likely provides sufficient lateral strength and stiffness given the building's performance during past seismic events; however, detailed evaluation is limited due to lack of structural drawings.

5. Observed Conditions and Damage (Based on Ocular Inspection)

- Date of Inspection: March 4, 2025
- Recent Earthquake Exposure:
  - Event: July 27, 2022, Mw 7.0 Abra Earthquake
  - Epicenter Distance: Approx. 100–120 km from site
  - Observed Damage:
    - Cracks in perimeter walkway possibly due to settlement
    - Vertical cracks between infill walls and columns on the 1st floor
    - Minor cracking on infill walls near window and door corners
    - One beam on gridline J between A–C had a horizontal crack at the bottom—potential structural concern; recommended for further investigation
    - Spalling of concrete plaster observed on one column at grid intersection 7-A
    - Roof canopy slabs show signs of concrete spalling and corrosion

6. Structural Elements Summary

- Column/Beam Detailing: Not visible; assumed adequate given construction period and similarity to nearby Florentina building (in terms of designer)
- Infill Walls: Reinforced masonry; full perimeter and room dividers; contributing significantly to lateral stiffness
- Beam-Column Joints: Visual evidence suggests larger columns relative to beams, indicating possible intent for seismic-resilient detailing
- Canopy Slabs: Localized corrosion and spalling observed—recommend repair

7. Deficiencies and Vulnerabilities

- Infill-Coupled Cracks: Typical behavior due to drift demand; not structural
- Beam Crack: Possible structural concern—warrants closer review or non-destructive testing
- Column Spalling: Minor; likely superficial but should be patched and monitored
- Settlement Cracks: Perimeter walkway cracks suggest potential settlement; soil conditions must be investigated further
- Canopy Deterioration: Spalling and corrosion at roof-level canopy require repair to avoid falling debris hazards

8. Seismic Risk Assessment

- Site-Specific Hazard Level:
  - High seismicity zone (SDS = 1.13, SD1 = 0.65)
  - Built on landfill—possible amplification effects

- Structural Seismic Performance (Life Safety):
  - Performance during the 2022 Abra earthquake was acceptable; damage limited to non-structural elements (infill)
  - No major damage observed to primary structural elements except one beam—warrants further investigation
  - Columns appear oversized, suggesting intentional design for ductility and confinement

- Occupancy Risk:
  - Educational use (Risk Category III) requires Life Safety minimum performance
  - Building appears to meet Life Safety requirements under current Tier 1 evaluation
  - No signs of collapse potential observed

9. Conclusion and Recommendations

- Seismic Safety Rating: Building is likely to meet Life Safety and Collapse Prevention performance levels
- Code Compliance: Built under NSCP 2001; assessed using ASCE 41-17
- Recommendation for Tier 2 Evaluation:
  - Not required at this time, except:
    - Further investigation recommended for beam crack (Grid J, A–C)
    - Optional geotechnical review for foundation settlement risk (due to landfill)
    - Monitor and repair roof canopy and spalled concrete

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Note: This report is based on a limited visual inspection and available data as of March 4, 2025. No structural or geotechnical documents were provided by the client at the time of assessment.

Tier 1 Seismic Evaluation Report

Based on ASCE/SEI 41-17 – Seismic Evaluation and Retrofit of Existing Buildings

Evaluation Objective: Life Safety (LS) and Collapse Prevention (CP)

1. General Building Information

Building Name/Location: Educational Building, 16.483688°N, 121.154616°E
Structural System: Reinforced Concrete Moment Frame
Year of Construction: 2018
Code of Record: NSCP 2015
Occupancy Type: Educational Facility
Risk Category: III
Seismic Design Category (SDC): D

Seismic Hazard Parameters (2475-year return period):
- Ss = 1.7
- S1 = 0.65

Site Coefficients (ASCE 7-05, assumed Site Class D):
- Fa = 1.0
- Fv = 1.5

Design Spectral Response Acceleration Parameters (ASCE 7-05):
- Sds = 1.13
- Sd1 = 0.65

2. Structural Configuration and Geometry

Number of Stories: 4
Plan Dimensions: ~40.00 m x 21.00 m (from Google maps)
Floor-to-Floor Heights: GF–2F: ~3.5 m; 2F–Roof: ~3.0 m (assumed)
Roof Configuration: Trussed hip roof with perimeter concrete canopy/gutter

Irregularities:
- Torsional Irregularity: Severe
- Re-entrant Corners: Present
- Soft Story/Vertical Irregularities: None observed

3. Foundation System

Type and Details: Unknown
Soil Conditions: No geotechnical report; assumed average (Site Class D)
Proximity to Fault Line: ~2.3 km from the Maddiangat Fault

4. Structural Elements

Moment-Resisting Frame:
- Columns and Beams: Sizes and reinforcement unknown (no plans provided)
- Observed Behavior: Columns appear larger than beams, suggesting strong column–weak beam concept
- Joint Detailing/Confined Concrete: Unknown

Infill Walls:
- Type: Reinforced Masonry
- Seismic Effect: Contributing to stiffness; evidence of damage and torsional behavior
- Observed Damage: Horizontal cracks near stairwells and ramp; bracing effect seen at ramp

5. Lateral Load Resisting System

Primary System: Concrete Moment Frame
Load Transfer: Appears continuous from roof to foundation
Torsional Effects: Significant due to irregular geometry; cracks concentrated at stress points
Observed Behavior: Stairwell and ramp areas show signs of high stress; possible rigid diaphragm behavior

6. Seismic Detailing and Reinforcement

Column/Beam Seismic Detailing: Unknown, no structural plans
Ductility/Energy Dissipation: Possibly adequate, but not confirmed
Anchorage/Splice Details: Unknown

7. Deficiencies and Vulnerabilities

Visible Distress:
- Cracks at stairwells and ramp areas
- Concrete spalling and rebar corrosion at perimeter canopy/gutter

Plan Irregularities:
- High stress concentrations due to re-entrant corners and asymmetrical appendages
- Severe Torsional Irregularity

Foundation: Unknown condition

8. Seismic Risk Assessment

Seismic Hazard Evaluation:
- High seismic hazard zone (Ss = 1.7, S1 = 0.65)
- Building located 2.3 km from the Maddiangat Fault

Seismic Risk Assessment:
- Likely Failure Modes: Infill wall detachment, torsional failure at re-entrant corners, concentrated stress at irregular interfaces
- Occupancy Risk Classification: Risk Category III (essential facility)
- Performance Expectation:
  - Life Safety: May be compromised due to irregularity and observed damage
  - Collapse Prevention: Achievable but contingent on detailed analysis and retrofitting

9. Conclusion and Recommendations

Seismic Safety Rating:
- ASCE 41-17 Performance Level: Life Safety to Collapse Prevention
- Current Code Compliance: Built to NSCP 2015, but observed damage and severe irregularities indicate potential performance issues

Recommended Actions:
- Proceed with Tier 2 Evaluation (focusing on torsion, diaphragm behavior, infill interaction)
- Conduct Nonlinear Static (Pushover) Analysis
- Retrofit/waterproof canopy/gutter and cracked infill areas
- Assess ramp & stairwell interface for seismic movement accommodation

Recent Seismic Event:
- Abra Earthquake (Magnitude 7.0)
- Date: July 27, 2022
- Epicenter Distance: ~100–120 km from site
- May have contributed to observed cracking in ramp and stairwell areas

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PRC# 0128257
CP# 09173008809

Note: This report is based on a limited visual inspection and available data as of March 4, 2025. No structural or geotechnical documents were provided by the client at the time of assessment.

Tier 1 Seismic Evaluation Report

Based on ASCE/SEI 41-17 – Seismic Evaluation and Retrofit of Existing Buildings

Evaluation Objective: Life Safety (LS) and Collapse Prevention (CP)

1. General Building Information

Building Name/Location: Chapel Building, 16.483712°N, 121.156035°E
Structural System: Reinforced Concrete Moment Frame
Year of Construction: 2012
Code of Record: NSCP 2010
Occupancy Type: Assembly
Risk Category: III
Seismic Design Category (SDC): D

Seismic Hazard Parameters (2475-year return period):
- Ss = 1.7
- S1 = 0.65

Site Coefficients (ASCE 7-05, assumed Site Class D):
- Fa = 1.0
- Fv = 1.5

Design Spectral Response Acceleration Parameters (ASCE 7-05):
- Sds = 1.13
- Sd1 = 0.65

2. Structural Configuration and Geometry

Number of Stories: 3
Plan Dimensions: 26m x 26m
Grid Layout: Varying, GL A–F: 4m, 5m, 8m, 5m, 4m; GL 1–8: 3.4m to 2.85m
Column Sizes: C-1 & C-2: 500x300mm; C-3 & C-4: 300x300mm; C-5: 400x400mm
Beam Sizes: 250x350mm, 250x600mm, 300x600mm, 200x400mm, 200x500mm
Floor-to-Floor Heights: Basement–Ground: 2.4m; Ground–Mezzanine: 3.0m; Mezzanine–Roof: 7.26m

Irregularities:
- Soft Story: None
- Torsional Irregularity: Possible due to stiffer front (denser column placement)
- Height Irregularity: No
- Vertical Irregularity: None

3. Foundation System

Foundation System: Isolated Footings
Footing Sizes: F-1: 2.5x2.5x0.31m; F-2: 2.0x2.0x0.30m; F-3: 1.75x1.75x0.3m; F-4: 2.25x2.25x0.3m

Soil Type: Unknown (no geotechnical report)
Proximity to Fault Line: ~2.3 km from the Maddiangat Fault

4. Structural Elements

Columns:
- Hoop spacing: 10mm hoops at 1@50mm, 6@100mm, 6@150mm, then 200mm spacing
- Confined concrete: Yes

Beams:
- Reinforcement for bending: Yes
- Beam-column connection: Appears adequate per plans
- Connection strength: Critical (SMRF)

Beam-Column Joints:
- Confined concrete: Possibly
- Strong column–weak beam mechanism may not be satisfied in some areas with deep beams

Infill Walls:
- Type: Reinforced Masonry
- Contribution to stiffness: Yes, potential torsional effects

5. Lateral Load Resisting System

Primary System: Concrete Moment Frames
Load Transfer: Appears continuous from top to bottom
Torsional Effects: *Possible* – front of structure has higher stiffness due to more columns
Moment Frame Behavior: Likely adequate, though torsion and column-beam strength (strong column-weak Beam) need further investigation

6. Seismic Detailing and Reinforcement

Seismic Reinforcement: Possibly present based on plan
Ductility and Energy Dissipation: Possibly provided
Splice Locations: Unknown (no detail)
Anchorage of Reinforcement: Possibly adequate

7. Deficiencies and Vulnerabilities

Observed Damage:
- Water penetration from roof deck over mezzanine
- Beam cracking along gridline B (GL1-2) where another beam intersects
- Shear cracking in infill wall (GL B, GL7-8)
- Suspected rebar corrosion due to water ingress

Failure Modes:
- Strong beam–weak column mechanism suspected in some locations; needs further detailed analysis (beyond Tier 1)

Foundation: No current issues observed

8. Seismic Risk Assessment

Seismic Hazard Level: High (Ss = 1.7, S1 = 0.65)
Failure Modes: Infill cracking, beam distress, potential column underperformance
Occupancy Risk: Life Safety concern due to irregularities and observed damage
Performance Expectation: Life Safety to Collapse Prevention based on observed damage and structural behavior

9. Recommended Actions

- Address roof deck waterproofing immediately to prevent structural deterioration
- Repair affected beams and cracked infill walls
- Monitor for corrosion-related spalling
- Conduct Tier 2 evaluation focusing on torsion, beam-column interaction, and detailing verification

10. Conclusion

Overall Seismic Safety Assessment: Life Safety to Collapse Prevention
Code Compliance: Built to NSCP 2010; further verification required for full ASCE 41-17 compliance
Tier 2 Evaluation: Recommended to confirm performance, investigate potential strong beam-weak column issues, and assess torsional behavior

Appendices

A. Photos of Cracks in beam
B. Photos of Infill Wall Cracks
C. Photos of water penetration

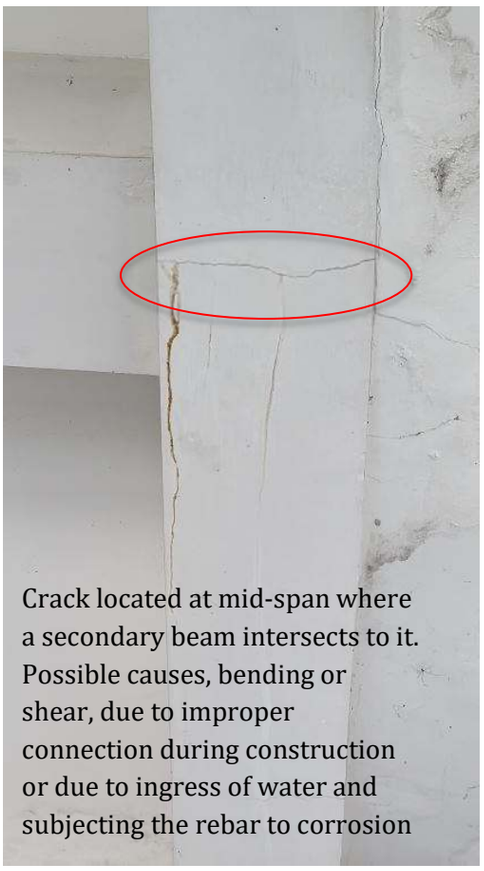
Prepared By:



Evaluator : ENGR. SHERWIN M. SARMIENTO, M.PICE, M.ASEP
PRC# 0128257
CP# 09173008809

Appendix A

Photos of Cracks in Beam



Crack located at mid-span where a secondary beam intersects to it. Possible causes, bending or shear, due to improper connection during construction or due to ingress of water and subjecting the rebar to corrosion





Signs, water has penetrated from top fiber to bottom fiber, slab rebars in the future will corrode and cause spalling



Appendix B

Photos of Infill wall cracks



Appendix C

Photos of Water penetration









Tier 1 Seismic Evaluation Report

Based on ASCE/SEI 41-17 – Seismic Evaluation and Retrofit of Existing Buildings

Evaluation Objective: Life Safety (LS) and Collapse Prevention (CP)

1. General Building Information

Building Name/Location: Chapel Building, 16.483712°N, 121.156035°E
Structural System: Reinforced Concrete Moment Frame
Year of Construction: 2012
Code of Record: NSCP 2010
Occupancy Type: Assembly
Risk Category: III
Seismic Design Category (SDC): D

Seismic Hazard Parameters (2475-year return period):
- Ss = 1.7
- S1 = 0.65

Site Coefficients (ASCE 7-05, assumed Site Class D):
- Fa = 1.0
- Fv = 1.5

Design Spectral Response Acceleration Parameters (ASCE 7-05):
- Sds = 1.13
- Sd1 = 0.65

2. Structural Configuration and Geometry

Number of Stories: 3
Plan Dimensions: 26m x 26m
Grid Layout: Varying, GL A–F: 4m, 5m, 8m, 5m, 4m; GL 1–8: 3.4m to 2.85m
Column Sizes: C-1 & C-2: 500x300mm; C-3 & C-4: 300x300mm; C-5: 400x400mm
Beam Sizes: 250x350mm, 250x600mm, 300x600mm, 200x400mm, 200x500mm
Floor-to-Floor Heights: Basement–Ground: 2.4m; Ground–Mezzanine: 3.0m; Mezzanine–Roof: 7.26m

Irregularities:
- Soft Story: None
- Torsional Irregularity: Possible due to stiffer front (denser column placement)
- Height Irregularity: No
- Vertical Irregularity: None

3. Foundation System

Foundation System: Isolated Footings
Footing Sizes: F-1: 2.5x2.5x0.31m; F-2: 2.0x2.0x0.30m; F-3: 1.75x1.75x0.3m; F-4: 2.25x2.25x0.3m

Soil Type: Unknown (no geotechnical report)
Proximity to Fault Line: ~2.3 km from the Maddiangat Fault

4. Structural Elements

Columns:
- Hoop spacing: 10mm hoops at 1@50mm, 6@100mm, 6@150mm, then 200mm spacing
- Confined concrete: Yes

Beams:
- Reinforcement for bending: Yes
- Beam-column connection: Appears adequate per plans
- Connection strength: Critical (SMRF)

Beam-Column Joints:
- Confined concrete: Possibly
- Strong column–weak beam mechanism may not be satisfied in some areas with deep beams

Infill Walls:
- Type: Reinforced Masonry
- Contribution to stiffness: Yes, potential torsional effects

5. Lateral Load Resisting System

Primary System: Concrete Moment Frames
Load Transfer: Appears continuous from top to bottom
Torsional Effects: *Possible* – front of structure has higher stiffness due to more columns
Moment Frame Behavior: Likely adequate, though torsion and column-beam strength (strong column-weak Beam) need further investigation

6. Seismic Detailing and Reinforcement

Seismic Reinforcement: Possibly present based on plan
Ductility and Energy Dissipation: Possibly provided
Splice Locations: Unknown (no detail)
Anchorage of Reinforcement: Possibly adequate

7. Deficiencies and Vulnerabilities

Observed Damage:
- Water penetration from roof deck over mezzanine
- Beam cracking along gridline B (GL1-2) where another beam intersects
- Shear cracking in infill wall (GL B, GL7-8)
- Suspected rebar corrosion due to water ingress

Failure Modes:
- Strong beam–weak column mechanism suspected in some locations; needs further detailed analysis (beyond Tier 1)

Foundation: No current issues observed

8. Seismic Risk Assessment

Seismic Hazard Level: High (Ss = 1.7, S1 = 0.65)
Failure Modes: Infill cracking, beam distress, potential column underperformance
Occupancy Risk: Life Safety concern due to irregularities and observed damage
Performance Expectation: Life Safety to Collapse Prevention based on observed damage and structural behavior

9. Recommended Actions

- Address roof deck waterproofing immediately to prevent structural deterioration
- Repair affected beams and cracked infill walls
- Monitor for corrosion-related spalling
- Conduct Tier 2 evaluation focusing on torsion, beam-column interaction, and detailing verification

10. Conclusion

Overall Seismic Safety Assessment: Life Safety to Collapse Prevention
Code Compliance: Built to NSCP 2010; further verification required for full ASCE 41-17 compliance
Tier 2 Evaluation: Recommended to confirm performance, investigate potential strong beam-weak column issues, and assess torsional behavior

Appendices

A. Photos of Cracks in beam
B. Photos of Infill Wall Cracks
C. Photos of water penetration

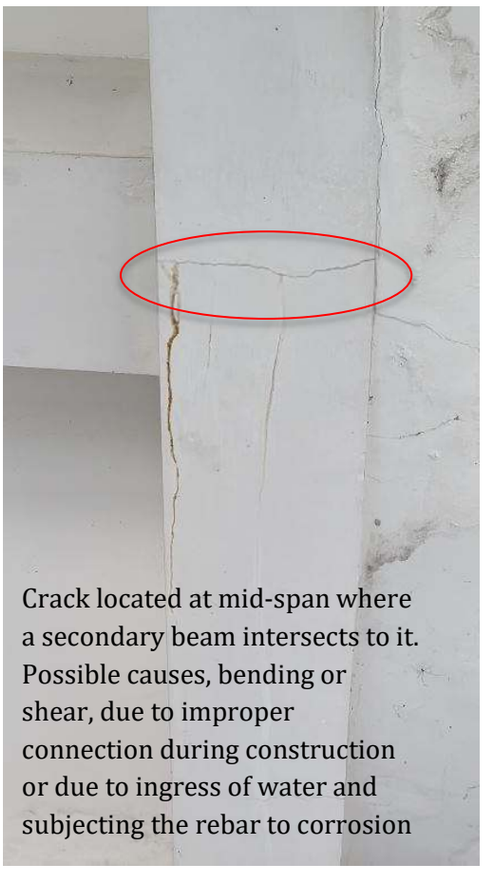
Prepared By:



Evaluator : ENGR. SHERWIN M. SARMIENTO, M.PICE, M.ASEP
PRC# 0128257
CP# 09173008809

Appendix A

Photos of Cracks in Beam



Crack located at mid-span where a secondary beam intersects to it. Possible causes, bending or shear, due to improper connection during construction or due to ingress of water and subjecting the rebar to corrosion





Signs, water has penetrated from top fiber to bottom fiber, slab rebars in the future will corrode and cause spalling



Appendix B

Photos of Infill wall cracks



Appendix C

Photos of Water penetration









Tier 1 Seismic Evaluation Report

Based on ASCE/SEI 41-17 – Seismic Evaluation and Retrofit of Existing Buildings

Evaluation Objective: Life Safety (LS) and Collapse Prevention (CP)

1. General Building Information

Building Name/Location: 16.484359, 121.155960
Structural System: Reinforced Concrete Moment Frame
Year of Construction: 2010
Code of Record: Presumed NSCP 2010
Occupancy Type: Educational Facility
Risk Category: III
Seismic Design Category (SDC): D

Seismic Hazard Parameters (2475-year return period):
- Ss = 1.7
- S1 = 0.65

Site Coefficients (ASCE 7-05, assumed Site Class D):
- Fa = 1.0
- Fv = 1.5

Design Spectral Response Acceleration Parameters (ASCE 7-05):
- Sds = 1.13
- Sd1 = 0.65

2. Structural Configuration and Geometry

Number of Stories: 4
Plan Dimensions: 29m (Width) × 20.1m (Length)
Column Sizes: C1–C4: 600mm × 400mm, C5–C8: 400mm × 500mm
Beam Sizes: Unknown (No structural plans available)
Floor-to-Floor Heights: Typical 3.2m
Irregularities:
- Soft Story: None
- Torsional Irregularity: Possible
- Height Irregularity: None
- Vertical Irregularity: None

3. Foundation System

Foundation System: Isolated Footings
Footing Sizes: F1: 3.0m × 3.0m × 0.65m, F2: 2.75m × 2.75m × 0.45m, F3: 1.75m × 1.75m × 0.35m
Soil Type: Unknown (no geotechnical report)
Proximity to Fault Line: ~2.3 km from the Maddiangat Fault

4. Structural Elements

Columns:
- Hoop spacing: 10mm diameter spaced 1@50, 6@100, 6@150, rest @175mm
- Confined concrete: Yes

Beams:
- Reinforcement for bending: Yes
- Connection strength: Critical (SMRF)

Beam-Column Joints:
- Joint Confinement: Likely provided
- Column-to-Beam Size Ratio: Larger column sizes suggest ductility and strength
- Connection Detailing: Not verifiable without structural drawings

Infill Walls:
- Type: Reinforced Masonry
- Contribution to stiffness: Yes, potential torsional effects
- Crack Observations:
    - Infill wall cracks at stairwell (2nd & 3rd floors)
    - Severe cracking at 4th floor infill walls on grid intersections 1-6, 2-6, 1-8, and 2-8
- Effect on Seismic Response: Significant; likely contributing to torsional stiffness and uneven load path

5. Lateral Load Resisting System

Primary System: Concrete Moment Frames
Load Transfer: Appears continuous and effective, top-to-bottom transfer is visually intact
Torsional Effects: Likely significant due to plan irregularities and eccentric stairwell placement
Moment Frame Behavior: Possibly adequate, though no signs of beam or column failure observed. However, irregular geometry and infill wall cracking raise concerns for stress concentrations in seismic events.

6. Seismic Detailing and Reinforcement

Seismic Reinforcement: Presumed present based on frame classification and column size
Ductility and Energy Dissipation: Likely adequate
Splice Locations: Unknown (no detail)
Anchorage of Reinforcement: Unknown – plans not available

7. Deficiencies and Vulnerabilities

Observed Issues:
- Torsional Irregularity: Cracks and damage at re-entrant stairwell corners suggest torsion
- Water Intrusion: Roof runoff appears to flow into the concrete canopy, acting like a gutter, leading to spalling and potential rebar corrosion
- Embedded PVC Downspouts in Columns: If confirmed, this would reduce effective concrete area and compromise axial or flexural strength. This configuration is non-compliant with ACI 318 provisions, which disallow any significant voids or embeds in critical load-bearing elements unless designed for it.

- Suspected rebar corrosion due to water ingress

Likely Failure Mode in Seismic Events:
- Localized shear failure at re-entrant corners and perimeter infill wall regions
- Possible vertical capacity degradation due to corrosion at canopy soffit

Foundation: No current issues observed

8. Seismic Risk Assessment

Seismic Hazard Level: High (Ss = 1.7, S1 = 0.65)
Performance Assessment:

- In the event of a design-level earthquake, torsional behavior, localized infill wall cracking, and weakened canopy elements could contribute to partial non-structural failure or localized shear failure.
- However, absence of visible damage to primary moment frame columns or beams suggests that the structure likely satisfies Life Safety and Collapse Prevention objectives.

9. Recommended Actions

- Short-Term Repair Measures:
  - Address waterproofing defects and inspect canopy rebar for corrosion. Patch and repair spalled concrete.
- Further Investigation Needed:
  - Confirm presence of embedded PVC in structural columns and its extent. Conduct capacity reduction analysis.
  - Torsional behavior should be investigated using a Tier 2 nonlinear static analysis or 3D modeling to verify that first mode behavior does not exceed ASCE 41-17 drift limits.

10. Conclusion

- Overall Seismic Performance Level:
  - Meets Life Safety and Collapse Prevention targets under ASCE 41-17, considering existing configuration and observed damage
- Code Compliance:
  - Building was likely designed under NSCP 2010, with detailing practices similar to ACI 318-08 and ASCE 7-05
- Recommendation:
  - Proceed to Tier 2 analysis to better quantify torsional effects and verify member capacities
  - Address roof water drainage and check canopy corrosion extent
  - Evaluate structural implications of embedded PVC in columns

Appendix A: Photo Documentation

- Figure A.1: Infill wall crack at 4th floor, Gridline 1–6
- Figure A.2: Infill wall crack at 4th floor, Gridline 2–6
- Figure A.3: Infill wall crack at 4th floor, Gridline 1–8

- Figure A.4: Infill wall crack at 4th floor, Gridline 2–8
- Figure A.5: Infill wall crack at stairwells
- Figure A.6: Spalling and rebar corrosion at roof canopy soffit

Prepared By:

Evaluator : ENGR. SHERWIN M. SARMIENTO, M.PICE, M.ASEP
PRC# 0128257
CP# 09173008809

Note: This report is based on a limited visual inspection and available data as of March 3, 2025. No structural or geotechnical documents were provided by the client at the time of assessment.

Appendix A

Figure A.1: Infill wall crack at 4th floor, Gridline 1–6



Figure A.2: Infill wall crack at 4th floor, Gridline 2–6



Figure A.3: Infill wall crack at 4th floor, Gridline 1–8



Figure A.4: Infill wall crack at 4th floor, Gridline 2–8



Figure A.5: Infill wall crack at stairwells



Figure A.6: Spalling and rebar corrosion at roof canopy soffit



Tier 1 Seismic Evaluation Report

Based on ASCE/SEI 41-17 – Seismic Evaluation and Retrofit of Existing Buildings

Evaluation Objective: Life Safety (LS) and Collapse Prevention (CP)

Ocular Inspection Dates: March 3–4, 2025

1. General Building Information

Building Name/Location: 16.483889974806793, 121.15512461431523
Structural System: Reinforced Concrete Moment Frame
Year of Construction: 2002 - 2003
Code of Record: Presumed NSCP 2001
Occupancy Type: Assembly Occupancy (Auditorium)
Risk Category: III
Seismic Design Category (SDC): D

Seismic Hazard Parameters (2475-year return period):
- Ss = 1.7
- S1 = 0.65

Site Coefficients (ASCE 7-05, assumed Site Class D):
- Fa = 1.0
- Fv = 1.5

Design Spectral Response Acceleration Parameters (ASCE 7-05):
- Sds = 1.13
- Sd1 = 0.65

2. Structural Configuration and Geometry

Number of Stories: 1 Story with Mezzanine and Balcony
Plan Dimensions: 27m (width) × 34.7m (length)
Column Sizes:
- C-1: 500 × 400 mm
- C-2: 400 × 400 mm
- C-3: 300 × 300 mm

Beam Sizes: Unknown 400 × 800 mm, 400 × 600 mm, 350 × 500 mm, 300 × 400 mm
Roof Configuration: Gable Type
Irregularities:
- Plan Irregularity: Yes – Heart-shaped layout, torsional response likely
- Vertical Irregularity: Yes – Mezzanine only covers ~50% of floor area

3. Foundation System

Foundation System: Isolated Footings
Footing Sizes:
- F-1: 2.5m × 2.5m × 0.45m
- F-2: 2.3m × 2.3m × 0.4m
- F-3: 1.8m × 1.8m × 0.35m

Soil Type: Unknown (no geotechnical report)

Proximity to Fault Line: ~2.3 km from the Maddiangat Fault

4. Structural Elements

Columns:
- Hoop spacing: as per plan 10mm diameter hoops, spaced 1@50mm, 3@75mm,5@100mm and rest @250mm on center towards mid-height of column
- Confined concrete: Yes

Beams:
- Reinforcement for bending: Designed for bending only; torsion resistance not detailed
- Connection strength: Critical (SMRF)

Beam-Column Joints:
- Joint Confinement: Likely confined; joints appear adequately detailed for SMRF
- Column-to-Beam Size Ratio: Columns appear adequately reinforced; beams possibly Stiffer than columns (strong column–weak beam issue)

Infill Walls:
- Presence: Yes – Reinforced masonry, perimeter only
- Behavior: Contribute to lateral stiffness; may induce torsional effects
- Observed Damage: 1 major crack along Gridline H (~4m–5m high)

5. Lateral Load Resisting System

- Load Path: Gravity and lateral loads appear to be well-distributed
- Torsional Effects: Likely due to irregular shape and stiff mezzanine
- SMRF Behavior: Appears to behave adequately, but strength hierarchy and torsion effects require further analysis

6. Seismic Detailing and Reinforcement

- Seismic Detailing: Likely present; hoop spacing is adequate
- Ductility: Possibly adequate but questionable due to beam depth
- Strong Column–Weak Beam: Possibly not met
    - NSCP 2001: Does not explicitly require strong-column–weak-beam design (first required in NSCP 2010/ACI 318-02 Section 21.3.1)
- Splice Details: Not visible in plans
- Anchorage: Presumed adequate, no damage observed

7. Deficiencies and Vulnerabilities

- Columns/Beams: No signs of distress or cracking, but large beam dimensions may indicate potential for shear failure if column strength is insufficient
- Moisture Penetration: Evident efflorescence and lime leaching; water intrusion risk due to poor or absent waterproofing membranes on balconies/canopies
- Infill Wall Cracking: One major crack observed at perimeter suggests lateral movement or differential stiffness

8. Seismic Risk Assessment

- Site Hazard: Located ~2.3 km from Maddiangat Fault; Sa(0.2s) = 1.7 and Sa(1.0s) = 0.65 indicate high seismic hazard
- Seismic Performance:
    - Expected to meet Life Safety at minimum due to SMRF configuration and column confinement
    - Potential Collapse Prevention met for main frame; mezzanine configuration and possible beam-column imbalance require verification
- Failure Modes:
    - Potential torsional effects from irregular layout
    - Unverified strong column–weak beam ratio
    - Water intrusion may accelerate long-term deterioration, increasing future seismic risk

9. Recommended Actions

- Repair/Maintenance:
    - Install effective waterproofing membranes for balconies/canopies
    - Address moisture damage to prevent rebar corrosion and concrete spalling
- Further Assessment:
    - Perform Tier 2 analysis or 3D modeling to confirm absence of torsion
    - Verify strength hierarchy in beam-column system
    - Consider material testing to confirm rebar condition and existing strength capacity
    - Evaluate infill wall stiffness contribution to global behavior

10. Conclusion

- Overall Seismic Safety Rating:
    - Life Safety: Achieved based on detailing and moment frame system
    - Collapse Prevention: Likely, but further analysis needed due to possible torsion and strong-column–weak-beam risks
- Code Compliance: Appears to comply with NSCP 2001, ASCE 7-05, and ACI 318-99 for its era
- Recommendation:
    - Conduct Tier 2 Evaluation to validate torsional effects and confirm ductility
    - Prioritize moisture damage mitigation as a structural longevity and safety concern

Prepared By:



Evaluator : ENGR. SHERWIN M. SARMIENTO, M.PICE, M.ASEP
PRC# 0128257
CP# 09173008809

INSPECTION REPORT

Project Name: Installation of 3x100KVA Power Transformer & Primary Metering at the Junior High School, Grade School, Senior High School and Installation and Electrical Works of 38 Air Conditioning Units of the Grade Schools & Construction of Power House at the SHS

Contractor: ACGG Engineering, Construction and Supply

Status: **100% Completion and Turnover – 5% Retention Money**

We, the undersigned members of the Project Monitoring and Inspection Committee consisting of Representative from the End-User Department with the assistance of Subject Matter Experts (SMEs), Quality Assurance (QA) Inspectors, Administrative Support Staff and Technical Personnels of the Implementing Office and other Staff designated by the Owner, conducted an official inspection of the above-stated project. The inspection covers and reiterates the materials, items and specifications as detailed in the signed (Owner-Contractor Agreement) Contract. The inspection is also conducted in response to the action/in-action of the Contractor to the initial findings in the given report.

The Committee conducted the inspection on 21th day of November and found the following findings by ocular inspection of the project site in relation to the presented product to wit:

✓1. Surrender of all the available copies of all existing locks installed.

✓2. Issuance and Provision of Certificate of Occupancy (Use-and-occupancy certificate)

✓3. For the General Safety of SMU Personnel, Staff and Students, installation of additional protection at the Perimeter Fence of the Transformers at SHS Powerhouse (preferably Barbed Wire or Razor Wire)

The Committee recommends the contractor to present the guaranteed time table or schedule to address the issues and queries of the project before granting the Certificate of Acceptance and release of retention money. The Committee also recommends haste and swift actions to avoid any issues and further damages that can be caused upon the usage and utilization of the swimming pool.

APPROVED

JOHN OCTAVIOUS S. PALINA, Ph.D., DBA
University President

05 DEC 2024