# Bid Bulletin No. 3
# August 9, 2019

## PUBLIC BIDDING NO. 19-225-5

## PROPOSED INFRASTRUCTURE DEVELOPMENT OF BOQ MAIN BUILDING PHASE I

Issued pursuant to Sec. 22.5 of the IRR of R.A. 9184 to clarify and/or amend certain provisions in the Bidding Documents issued for this project, considering the issues raised and clarifications made by prospective bidders during the **Pre-Bid Conference** held on **31 July 2019**, likewise, respond to bidders' written queries received within the prescriptive period for filing.

### A. AMENDMENTS

| REFERENCE | BASES FOR AMENDMENT |
|---|---|
| **SECTION VI. SPECIFICATIONS** | |
| **Scope of Works and Technical Specifications:**<br>• Scope of Works of Soil Improvement by Jet Grouting<br>• Technical Specifications of Soil Improvement by Jet Grouting | To include in specifications for bidders reference. Attached as *Annex "A"* |
| **SECTION VI. SPECIFICATIONS** | |
| **Structural Analysis:**<br>• Mat Footing Structural Analysis | To include in specifications for bidders reference. Attached as *Annex "B"* |
| **SECTION VI. SPECIFICATIONS** | |
| **Geotechnical Investigation:**<br>• Soil Investigation Report | To include in specifications for bidders reference. Attached as *Annex "C"* |
| **SECTION VIII. BILL OF QUANTITIES** | |
| General Requirements:<br>• Mobilization and Demobilization (including demolition works of existing structures, Site Clearing & Disposal of Debris) | To clarify the scope of works for better understanding |

*For the purpose of this Bulletin and for better understanding of its contents, the following rules shall apply: (a) ~~Double Strike out~~ – denotes deletion; (b) Underline – denotes inclusion or new item/requirement; and "xxx" – denotes separation of phrase/s being amended from the rest of the main text.*

## B. CLARIFICATIONS

The Department of Budget and Management - Procurement Service, Bids and Awards Committee hereby clarifies prospective bidders' concerns and queries:

| ITEM | CONCERN | REFERENCE | CLARIFICATION/ RESOLUTION |
|---|---|---|---|
| **CONCERNS RAISED DURING PRE-BID** | | | |
| 1 | Based on the equipment required. A prospective bidder asked if there is embankment in this project. | **Section III. Bid Data Sheet**<br>BDS Clause 12.1(b)(ii.3)<br>*The minimum major equipment requirements are the following:*<br>*1. Backhoe (0.8 $m^3$ bucket – minimum) with concrete breaker*<br>*2. Vibratory Roller (10 MT minimum) SP56*<br>*3. Cement Mixer (1 bagger)* | Yes. Ground Floor Level elevation is at +0.750m above sidewalk level, as clarified by the End-User. |
| 2 | A prospective bidder asked if another Performance Security is needed aside from the Bond that must be posted to Procurement Service.<br><br>Further, the same bidder stated that the End-User must secure the building permit/permit to construct from the Philippine Ports Authority (PPA) prior the implementation of the project. | **Section II. Instructions to Bidders**<br>ITB Clause 32<br>*32. Performance Security* | Philippine Ports Authority (PPA) do not require a performance security. Upon Notice of Award, the winning bidder needs to secure Work Permit from PPA amounting to Seven Hundred Twenty Eight Pesos only (P728.00), as clarified by the End-User<br><br>End-User cleared that they will give assistance to the winning contractor in securing the Work Permit from the PPA |
| 3 | A prospective bidder inquired if the PPA be able to give a supplementary space where the winning contractor can store the necessary materials for constructing the project given that the site staging area is limited. | **Section VII. Drawings** | As clarified by the End-User, the winning contractor can make use of the available spaces in the project site.<br><br>Prospective bidders already conducted site inspection to check possible staging area. |

| | | | |
|---|---|---|---|
| 4 | One of the prospective bidders suggested to recheck the mat foundation design as per actual soil bearing capacity after soil improvement, as well as the bill of quantities. | **Section VII. Drawings**<br>Structural Plans | Please refer to the above amendments regarding to Mat footing structural analysis. |
| 5 | A prospective bidder asked information regarding soil improvement (jet grouting) | **Section VI. Specifications**<br>• Scope of Works of Soil Improvement by Jet Grouting<br>• Technical Specifications of Soil Improvement by Jet Grouting | Please refer to the above amendments regarding to Soil Improvement by Jet Grouting |
| 6 | A prospective bidder asked if a certificate/affidavit of site inspection is required. | **Section I. Invitation to Bid**<br>xxx<br>7. Site Inspection | Certificate/affidavit of site inspection is not required for this project |

| ITEM | CONCERN | REFERENCE | CLARIFICATION/ RESOLUTION |
|---|---|---|---|
| **RSP LIM CONSTRUCTION CO., INC.** | | | |
| 1 | Remove jet grouting of PG 11 as we cannot intelligently estimate this item of work and just negotiate the cost to the winning bidder. | **Section VIII. Bill of Quantities**<br>Civil/Structural Works:<br>• Soil Improvement by Jet Grouting | The soil improvement is already considered in the preparation of the ABC.<br><br>Please refer to the above amendments regarding to Soil Improvement by Jet Grouting |
| 2 | Demolition of existing canopy, fence, and existing pavement in which to our estimate may amount to Five Million Pesos (P 5,000,000.00) | **Section VIII. Bill of Quantities**<br>General Requirements:<br>xxx<br>Mobilization and Demobilization (including demolition works of existing structures, site clearing & disposal of debris) | Complete demolition of Existing Canopy and Pavement. While, the fence that will be demolished is only partial for access on the Construction Site only |

All other portions of the Bidding Documents affected by these amendments shall be made to conform to the same.

Amendments/inclusions/clarifications made herein shall be considered an integral part of the Bidding Documents.

(Sgd.)
**WEBSTER M. LAUREÑANA**
*Chairperson, DBM-PS BAC 5*

**ANNEX "A"**

**PROJECT : PROPOSED INFRASTRUCTURE DEVELOPMENT OF BOQ MAIN BUILDING ,PHASE 1**

**LOCATION : 25th and AC DELGADO ST. PORT AREA, MANILA**

**OWNER : BUREAU OF QUARANTINE**

**SUBJECT : SCOPE OF WORK**

## 23.0 SOIL IMPROVEMENT

Based on the Geotechnical Investigation conducted, the soil found on the project site is highly compressible and has potential liquefaction and settlement, the use of ground improvement may be considered as possible solution to improve the bearing capacity of the foundation material. The use of jet grouting can be done to address the soil condition. The corresponding design of the subsurface improvement techniques should come from the specialty contractor.

After ground improvement, confirmatory tests should be done to ascertain the bearing capacity of the improved ground. The resulting bearing capacity after ground improvement can be used to follow the original foundation design or redesign if necessary.

**Scope of Work**

- The work shall consist of **design, installation, monitoring** and **testing** of jet grouting to meet the acceptance criteria stated in the specification.
- The Specialist Contractor shall provide all labor, materials and equipment to accomplish the Work in connection with the Program of Work and Project timeline.
- The Specialist Contractor shall construct jet grout columns of nominal diameter and spacing as specified in the design & drawings to the requirements of the project.

# ARCHITECTURAL AND ENGINEERING SPECIFICATIONS

## FOR THE PROPOSED INFRASTRUCTURE DEVELOPMENT OF BOQ MAIN BUILDING, PHASE 1

## TABLE OF CLAUSES

## DIVISION 17 : SOIL IMPROVEMENT

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### 17.1GENERAL

The Specialist Contractor shall construct jet grout columns of nominal diameter and spacing as specified in the drawings & design by the Specialist Contractor.

The objective of the jet grouting is to improve the soil condition. Due to the specialized nature of the work, jet grouting shall be carried out by a reputed Specialized Contractor.

### 17.2SUBMITTALS

The following shall be submitted by the Contractor prior to commencement of the Work:

- Resumes of the management, supervisory and key personnel for approval of the Engineer
- A mix design for the project indicating sources and types of grout materials, with volumetric proportions.
- Work procedures, sequence and control criteria (including parameters for each stage.)
- A general Work Procedures Plan outlining the spacing, location, depth and quantity of grout to achieve the specified criteria of this specification. Grout hole locations shall be dimensionally referenced to the contract drawings.

The following shall be submitted by the Contractor during the Work:

- Accurate daily records of all jet grouting locations, depth of treatment, start and stop times, all jetting parameters, and grout injected for each location.
- Any change in the predetermined grouting program necessitated by a change in the subsurface conditions

### 17.2SITE INVESTIGATION AND TRIAL

#### Provision

All factual site investigation information and all interpretative reports relevant to the design of jet grouting works, including assessments of any soil contamination, shall be provided to the Contractor.

The Contractor shall ensure that the soil information is adequate to characterize the ground to be treated and all physical and geotechnical properties required for jet grouting works e.g. particle size distribution, density, organic content, strength characteristics and groundwater level.

#### Hazzard Assessment

All information relevant to the safe implementation of the proposed grouting works, including the location of all known buried and over-site services and the nature, proximity and condition od adjacent structures shall be obtained by the Contractor before work commencement. If underground utilities are anticipated, a thorough investigation may be necessary to ensure location, condition and protection requirements.

## 17.3 SPECIALIST CONTRACTORS

The execution of jet grouting shall be carried out by Specialist Contractors equal to the task. The specialist Contractor shall have the following experience and personnel:

- Executed previous jet grouting work locally for similar nature and scale using the method specified in this specification;
- Possess adequate equipment and instruments which are proven and recognized locally and internationally for the execution of jet grouting works and for quality assurance plan as required in this specification
- Personnel experienced in the design, supervision and execution of jet grouting works.

## 17.4TOLERANCE

**Setting Out**
Setting out shall be carried out from the reference lines and points shown in the drawings. Immediately before commencement of jet grouting works, the grout column positions shall be marked with suitable identifiable pins or markers.

**Position**
The maximum permissible deviation of the center of each grouting point from the correct center point as shown in the setting out drawing shall be 100mm in any direction.

**Verticality**
Jet grouting for vertical bore hole shall be carried out as near vertical as possible.

**Personnel**
The Specialist Contractor shall employ only personnel experienced in jet grouting for this part of the Works.

## 17.5 LENGTH, DIAMETER AND SPACING OF THE JET GROUT COLUMNS

The length, diameter and spacing of the jet grout columns shown on the drawings are indicative only and shall be adjusted to suit site conditions when deemed necessary.

## 17.6 COMPRESSIVE STRENGTH

The average unconfined compressive strength of the selected working columns shall comply with the approved design. This shall be confirmed through laboratory tests on samples collected from backflow on site.

## 17.7 GROUTING EQUIPMENT

The jet grouting equipment shall be specialized equipment and sufficiently powerful to ensure a property formed soil-cement column for treatment area.

- Drilling rig shall be capable of drilling down to the required depth.
- The cement grout batching plant shall include all storage cribs, weatherproof shelter, pumps, automatic mixers, agitator and regulating devices required to continuously measure and mix cement grout.
- High pressure pumps shall be able to produce high pressurized jet at variable pressures to cut and mix the in-situ soil.
- The jet grouting system shall be able to operate at different rotation and withdrawal rates within the required range in order to complete the work and produce the required jet grout columns.
- Real time measuring and recording devices shall be provided throughout the drilling and jet grouting operation e.g. column number, time, depth, pressures, flow rates, rotation speed etc.

Spare parts and equipment shall be available on site to maintain jet grouting equipment in satisfactory operation condition at all times during execution of the jet grouting works.

## 17.8 OBSTRUCTIONS

In the event of obstructions preventing the drilling, the Specialist Contractor shall inform the Project Engineer immediately. Remedial options will include:

- Reposition the grouting point a short distance from the original position
- Additional grouting point (s) around the obstructions
- Excavate, remove the obstruction, backfill and compact to the requirements of the Earthworks Specification and reinstall the jet grout column.

## 17.9 SPOIL RETURN

Spoil return is the most important quality control indicator on the site. During jet grouting, a visual observation of the flow and features of the spoil shall be maintained. An unexpected reduction in spoil return shall be investigated and dealt with immediately. If there is negligible spoil return, it should be ensured that there is no clogging of the borehole annulus and the jetting parameters may have to be revised. Samples shall be collected from spoil return during jetting at different levels of each column for subsequent laboratory tests.

During jet grouting, spoil return shall be channeled to silting pond, tank or other collection structures. The Contractor shall regularly dispose all waste materials in accordance with the regulations of the appropriate authority.

## 17.10 EXECUTION OF JET GROUTING

**Pre-treatment**
Working platforms shall be designed, prepared and maintained in a manner suitable for the safe movement and working of the grouting equipment. Material used to provide working platforms shall be suitable for the ground conditions on which it is placed and shall not prevent drilling operation.

Site working levels for the treatment shall be provided and maintained throughout the duration of the grouting works.

**Treatment**
Before starting the jet grouting works, a method statement should be submitted including grouting parameters, sequence of execution and quality control procedures.

If the jet grouting operation is interrupted for any reason, to ensure continuity of the column, re-drilling and re-grouting, may be required upon the confirmation from the Engineer on site.

The Contractor shall furnish sufficient equipment, material and labor necessary to carry out the jet grouting works in accordance to the Program.

The Contractor shall adjust the mix design and working parameters, if necessary, throughout the course of the work in order to achieve the requirement for the jet grout columns.

**Supervision**
Execution shall be supervised by trained and experienced personnel.

## 17.11 MATERIALS

The cement grout shall be of Portland cement, water and occasionally, bentonite or additives as approved by the Engineer. Trial mixes shall be tested prior to commencement of work.

The quality as well as the suitability of the fresh grout shall be constantly assured by measuringits density using a hydrometer.

## 17.12 DRILLING AND GROUTING RECORDS

Comprehensive records shall be kept. Copies of the completed records for each grout hole shall be submitted to the Engineer. The records shall include the following information:

- Contract
- Grout Hole reference number
- Water-cement ratio
- Pressures during jet grouting

- Flow rates
- Withdrawal rates
- Rotation speed
- Time for drilling, jet grouting and overcoming obstructions
- Details of constructions, delays and unusual ground
- Features of spoil return i.e. color, quantity and density
- Presence of ground deformation (plus estimate if detected) monitored using precise level
- Any other information as may be required

## 17.13 QUALITY CONTROL

The following quality control measures shall be implemented for each grout hole:

- Evaluation of the continuously drilling and grouting records from computer output
- Grout and spoil density tests (daily)
- Ground deformation monitoring

Any jet grout hole lost or damaged as the result of mechanical failure of equipment, inadequacy of grout, air, or water supplies, or improper drilling or injection procedures shall be backfilled with cement grout and replaced by another hole, drilled and injected by the Specialist Contractor at no additional cost.

Equipment for mixing, holding and pumping grout shall be in a secure location and shall be operated to minimize spillage of material. No material will be allowed to enter storm drains or other drainage courses.

**ANNEX "B"**

Republic of the Philippines
Department of Health
Health Facility Development Bureau

# STRUCTURAL ANALYSIS AND DESIGN

PROJECT: **Proposed Infrastructure Development of BOQ Main, Phase 1**

LOCATION: **25th AC Delgado St., Port Area, Manila**

**GILBERT V. PASIONA**
CIVIL ENGINEER
PRC No. 0128482
PTR No. 7012239
Issued on Jan. 5, 2018
Issued at City of Manila

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GILBERT V. PASIONA
CIVIL ENGINEER

## 1. DESIGN CRITERIA AND PARAMETERS

All components of the structural system were analyzed base on the loads presented below.

### 1.1 DEAD LOADS

Dead load includes all the weight of permanent construction materials and equipments that are permanently fastened thereto and or supported thereby:

| | |
|---|---|
| Unit weight of structural steel | 77.00 kN/m³ |
| Dry unit weight of concrete | 24.00 kN/m³ |
| Unit weight of soil | 15.00 kN/m³ |
| Ceiling and utilities | 0.24 kPa |
| Topping and finishes | 1.10 kPa |
| Topping and waterproofing | 0.96 kPa |
| Partitions | 1.00 kPa |
| 6" Plastered CHB | 3.11 kPa |
| 4" Plastered CHB | 2.98 kPa |
| Cladding | 0.24 kPa |

### 1.2 LIVE LOADS

Live load includes all the gravity loads except those mentioned above. These loads may vary in magnitude and its distribution during the life span of the structure. The minimum values are as follows:

| | |
|---|---|
| Exit Facilities | 4.80 kPa |
| Hallway | 4.80 kPa |
| Room / Office / Comfort Room | 2.40 kPa |
| Hall | 4.80 kPa |
| Partitions | 1.00 kPa |

### 1.3 EARTHQUAKE LOADS

Seismic Code: National Structural Code of the Philippines C101-15

Design Parameters

| | |
|---|---|
| Seismic Zone | Zone 4, Z = 0.4 |
| Soil Profile Type | $S_E$, defined in Table 208-2 |
| Seismic Source | Type A |
| Seismic Source Proximity | ≥ 15 km from Seismic Source |
| Seismic coefficients | $C_a = 0.44N_a$ |
| | $C_V = 0.96N_V$ |
| Near-Source Factor | $N_a = 1.0$ |
| | $N_V = 1.0$ |
| Importance factor | I = 1.5 |
| Numerical Coefficient | R = 8.50 |
| Period of Vibration | $T = C_t(h_n)^{3/4}$, using Method A |
| Base Shear | $V = C_VIW/RT$ |
| | $\leq 2.50C_aIW/R$ |
| | $\geq 0.11C_aIW$ |
| | $\geq 0.80ZN_VIW/R$ |

GILBERT V. PASIONA
CIVIL ENGINEER

## 1.4 WIND LOADS

Design Code: National Structural Code of the Philippines C101-15

Design Parameters

| | |
|---|---|
| Wind Exposure | Exposure C |
| Basic Wind Speed | V = 300 kph |
| Velocity Pressure | $q_z = 0.613 K_z K_{zt} K_d V^2$ (N/m$^2$); V in m/s |
| Velocity Pressure Exposure | $K_z = 2.01 (z/z_g)^{2/\alpha}$ |
| Topographic Factor | $K_{zt} = 1.0$ |
| Wind Directionality Factor | $K_d = 0.85$ |
| Wind Pressure | $p = q_h[(GC_{pf}) \pm (GC_{pi})]$, |

## 1.5 MATERIAL STRENGTH AND SPECIFICATIONS

The structural and non-structural components of the buildings were analyzed based on the following material strength.

### 1.5.1 Concrete

*Cement:* Cement shall conform to "Specification for Portland Cement" ASTM C150. Unless otherwise permitted or required, cement shall be Type I or Type II.

*Aggregates:* Fine aggregates shall consist of sand meeting the requirements of "Standard Specifications for Concrete Aggregates" ASTM C33. Coarse aggregate shall consist of gravel, crushed gravel, crushed stone or air-cooled blast furnace slag or a combination thereof, conforming to the requirements if ASTM C33.

*Water:* Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials or other substances deleterious to concrete or reinforcements.

*Strength:* Concrete shall be proportioned and mixed to obtain a 28-day compressive cylinder strength of 27.6 MPa for footings, columns, beams and girders, and suspended slabs. Slab on grade and other non-structural members shall be 17 MPa.

### 1.5.2 Reinforcing Bars and Structural Steel

*Grade of Bars:* All bars shall conform to the "Standard Specifications for Deformed and Plain Billet Steel Bars for Concrete Reinforcements" ASTM 615M with the following strengths:

| | |
|---|---|
| Yield strength of 10mm Φ (Unless noted otherwise) | $f_y$ = 275 MPa |
| Yield strength of 12mm Φ and larger | $f_y$ = 414 MPa |

*Details of Reinforcements:* Reinforcing steel shall be fabricated and placed in conformance with the requirements of Section 425 – Reinforcement Details of the National Structural Code of the Philippines (NSCP-C101-15).

### 1.5.3 Foundation

*Soil Bearing Capacity:* Assumed soil bearing capacity shall be 50kPa at a depth of 1.5m below the existing ground level. Soil bearing capacity shall be increased by 33% when in combination with seismic or wind load.

*Limitations:* The soil bearing capacity is only an assumption for this project. Soil test shall be conducted prior to start of construction. In case the actual soil bearing capacity is found less than the assumed value, the undersigned structural engineer should be informed immediately for proper revision of foundation.

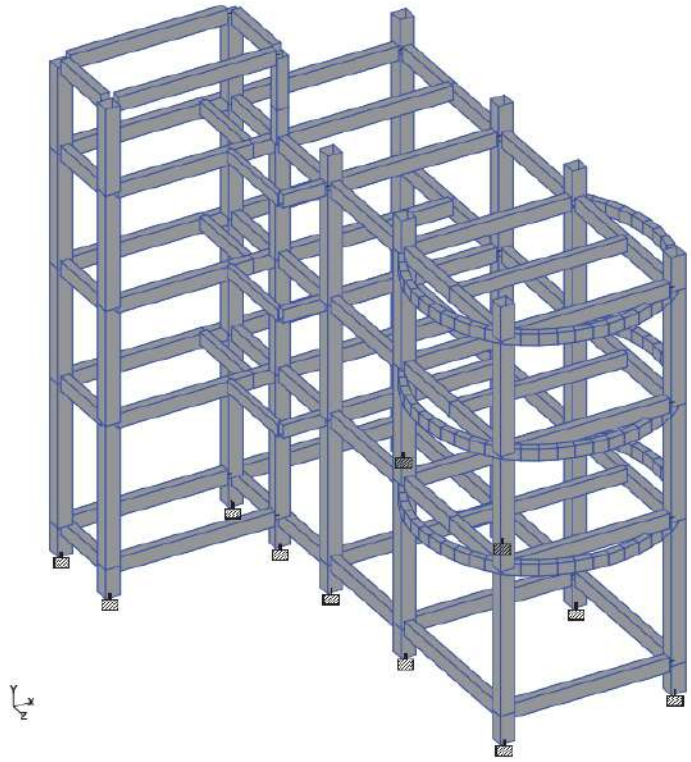
GILBERT V. PASIONA
CIVIL ENGINEER

## 2. STRUCTURAL ANALYSIS AND DESIGN

The structural analyses were carried out in conformance with the minimum requirements of the National Structural Code of the Philippines (NSCP C101-15).

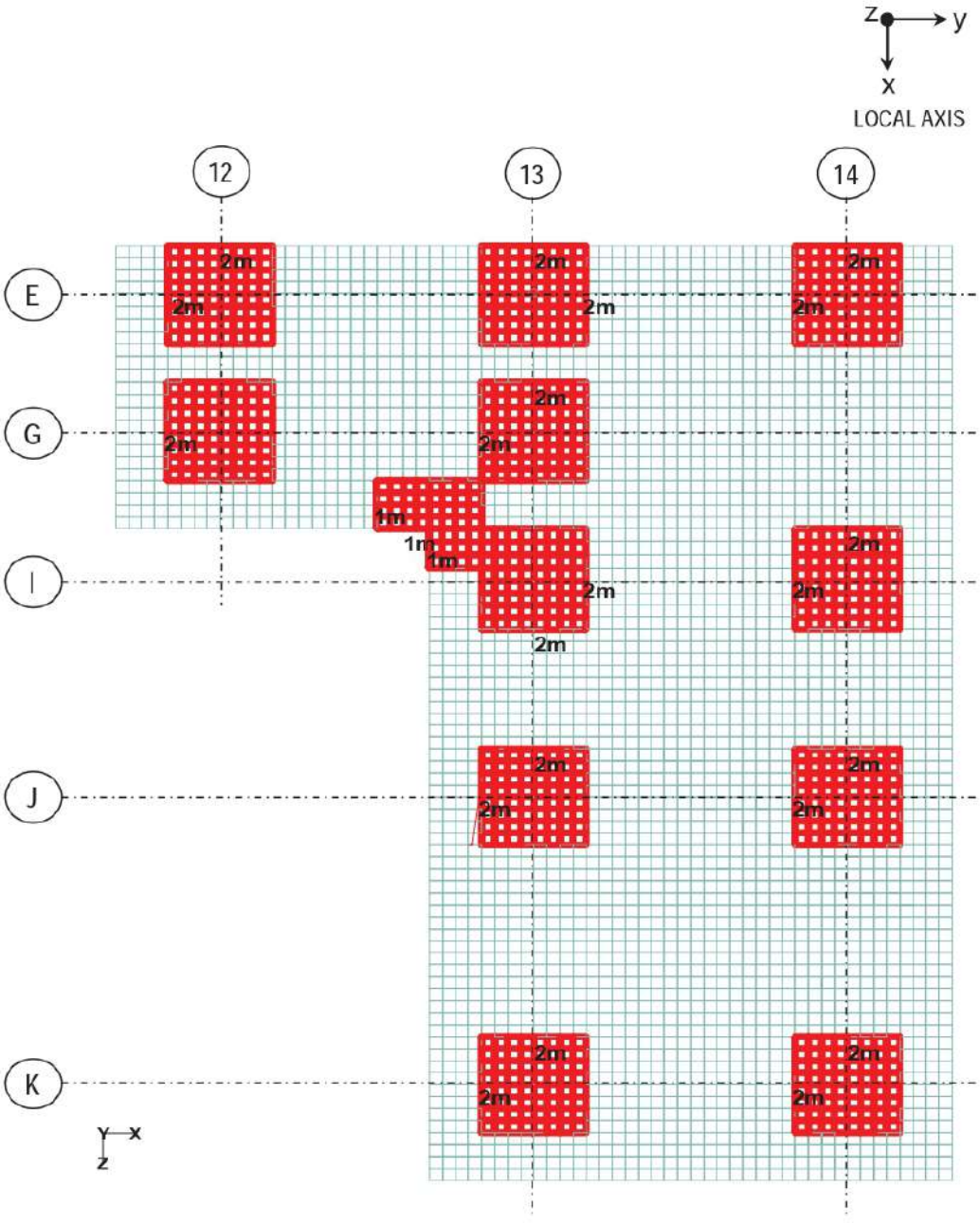
Three-dimensional model was used in the analysis incorporating the additional eccentricity of five percent (5%) of the building dimensions. This is in compliance with the code requirement pertaining to the accidental torsion due to earthquake.

### 2.1 STAAD GEOMETRY



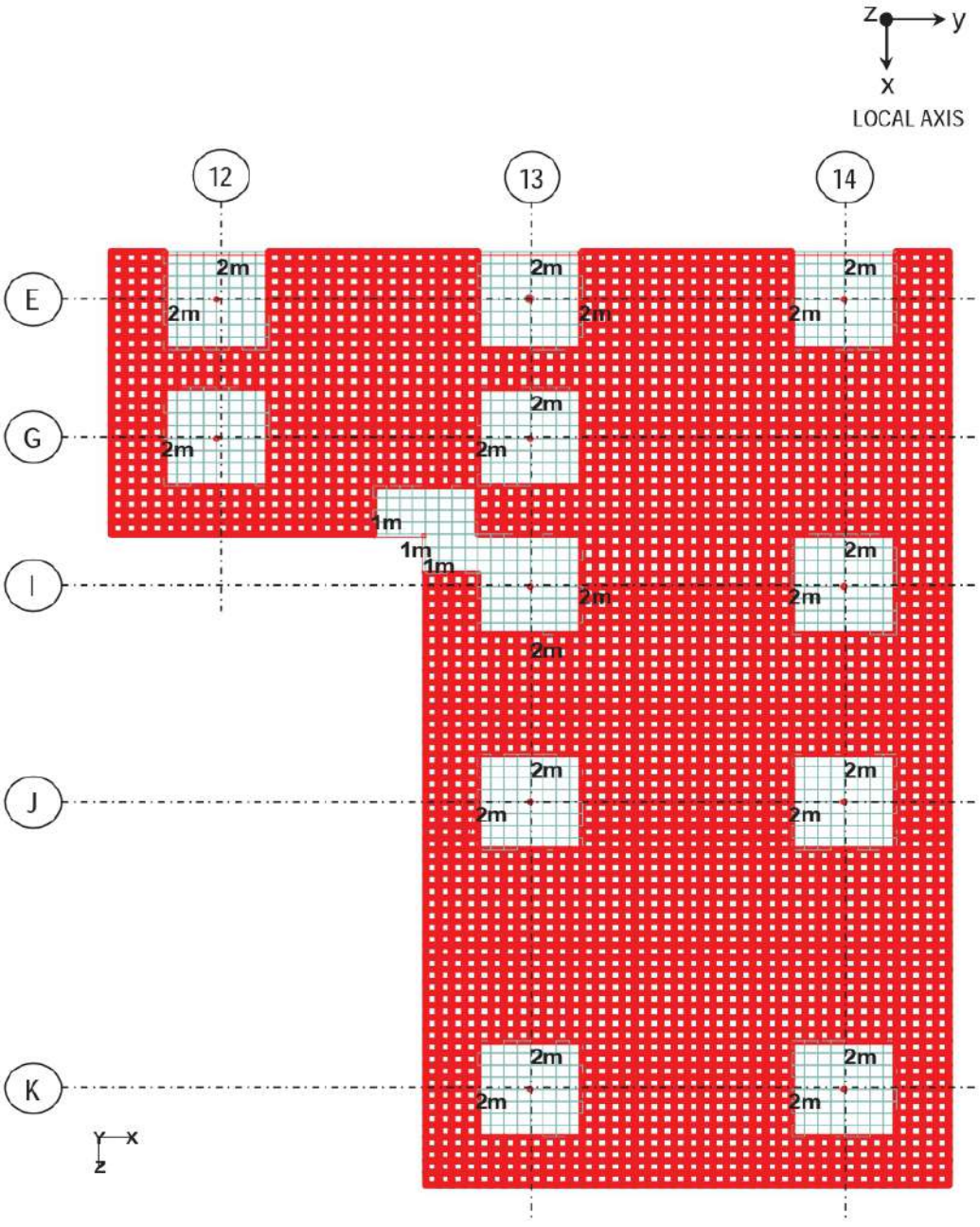
**THREE-DIMENSIONAL MODEL (BUILDING)**

## 2.8 DESIGN OF MAT FOOTING




**AREA A**

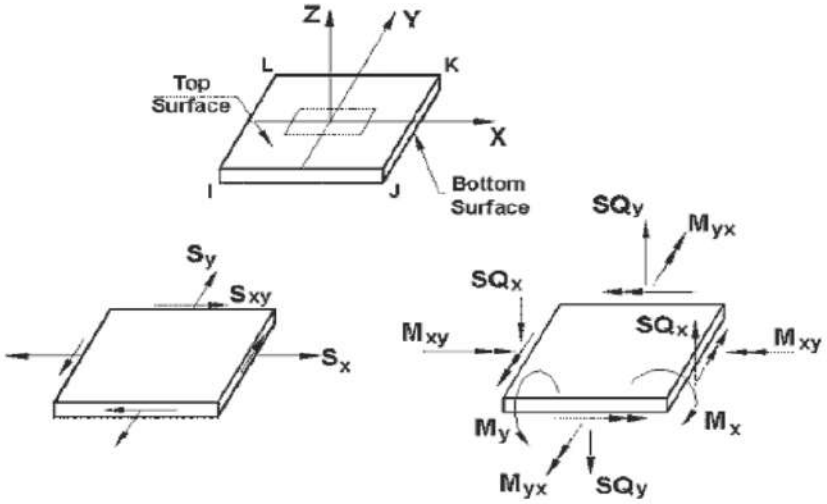
GILBERT V. PASIONA
CIVIL ENGINEER




**AREA B**

GILBERT V. PASIONA
CIVIL ENGINEER

# DESIGN OF FOOTING (AREA A)




Sign Convention of Element Forces

## A. REQUIRED FORCES

FACTORED LOAD COMBINATION (SHEAR) D = 600 mm (thickness)

| | Plate No. | L/C | Shear | | | Bending | | Shear | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Out of Plane | | In-Plane | | | | |
| | | | SQX N/mm$^2$ | SQY N/mm$^2$ | SXY N/mm$^2$ | Mx kNm/m | My kNm/m | Vux N/mm | Vuy N/mm |
| Max Qx | 968 | 240 | 2.35 | -2.09 | 0.00 | -536.26 | -315.65 | 1410.00 | *1254.00* |
| Min Qx | 3305 | 245 | -2.59 | 2.50 | 0.00 | -528.54 | -463.55 | *1554.00* | 1500.00 |
| Max Qy | 225 | 245 | -2.52 | 2.59 | 0.00 | -386.84 | -589.97 | 1512.00 | *1554.00* |
| Min Qy | 3280 | 239 | -2.32 | -2.58 | 0.00 | -307.98 | -577.22 | *1392.00* | 1548.00 |

where, Vux = ( D ) ( SQX ) + ( D ) ( SXY )
Vuy = ( D ) ( SQY ) + ( D ) ( SXY )

FACTORED LOAD COMBINATION (MOMENT)

| | Plate No. | L/C | Shear | | | Bending | | Shear | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Out of Plane | | In-Plane | | | | |
| | | | SQX N/mm$^2$ | SQY N/mm$^2$ | SXY N/mm$^2$ | Mx kNm/m | My kNm/m | Vux N/mm | Vuy N/mm |
| Max Mx | 1473 | 243 | -1.54 | -0.73 | 0.00 | *391.45* | -68.81 | 924.00 | 438.00 |
| Min Mx | 968 | 240 | 2.35 | -2.09 | 0.00 | *-536.26* | -315.65 | 1410.00 | *1254.00* |
| Max My | 3305 | 249 | 0.63 | -0.94 | 0.00 | 73.97 | *315.90* | 378.00 | 564.00 |
| Min My | 225 | 237 | -1.74 | 2.09 | 0.00 | -182.59 | *-626.30* | 1044.00 | *1254.00* |

DESIGN FORCES

| Location | Flexure (kNm/m) | Shear (N/mm) |
|---|---|---|
| | Factored Load | Factored Load |
| Inner (Top) | 391.45 | 1554.00 |
| Outer (Top) | 315.90 | |
| Inner (Bottom) | 536.26 | |
| Outer (Bottom) | 626.30 | |

## B. DESIGN PARAMETERS

| | | | | |
|---|---|---|---|---|
| b | = | 1000 | mm | width (1m strip) |
| D | = | 600 | mm | depth |
| $d_{to}$ | = | 513 | mm | eff. outer depth (top) |
| $d_{ti}$ | = | 488 | mm | eff. inner depth (top) |
| $d_o$ | = | 538 | mm | eff. outer depth (bot) |
| $d_i$ | = | 513 | mm | eff. inner depth (bot) |
| cc | = | 50 | mm | top concrete cover |
| cc | = | 75 | mm | bottom concrete cover |
| f'c | = | 27.6 | MPa | concrete compressive strength |
| fy | = | 414 | MPa | steel yeild strength |
| Es | = | 200000 | MPa | modulus of elasticity of steel |
| Ec | = | 24692 | MPa | modulus of elasticity of concrete, 4700√f'c |

**Rebar**

Top Bar

| | | | | |
|---|---|---|---|---|
| $Ø_i$ | = | 25 @ 150 mm | | Inner bar |
| $Ø_o$ | = | 25 @ 150 mm | | Outer bar |

Bottom Bar

| | | | | |
|---|---|---|---|---|
| $Ø_i$ | = | 25 @ 100 mm | | Inner bar |
| $Ø_o$ | = | 25 @ 100 mm | | Outer bar |

## C. FLEXURE DESIGN:

**Check for design reinforcement (As)**

Ru = $Mu / [(\varphi)(b)(d^2)]$

$$\rho = \frac{0.85f'c}{fy}\left[1 - \sqrt{1 - \frac{2Ru}{0.85f'c}}\right] \qquad \rho_{max} = \frac{0.75\beta_1(0.85f'c)600}{fy(600+fy)}$$

$\rho_{min}$ = min { max [ ( √f'c / 4 fy ) , (1.4 / fy ) ] , 4 ρ / 3 }

As = $(b / s) (\pi / 4) (Ø^2)$

| | Top Bar | | Bottom Bar | |
|---|---|---|---|---|
| | Inner (Mx) | Outer (My) | Inner (Mx) | Outer (My) |
| Mu | 391.45 kN-m | 315.90 kN-m | 536.26 kN-m | 626.30 kN-m |
| $d_n$ | 488.00 mm | 513.00 mm | 513.00 mm | 538.00 mm |
| Ru | 1.83 MPa | 1.33 MPa | 2.26 MPa | 2.40 MPa |
| ρ | 0.00461 | 0.00331 | 0.00575 | 0.00613 |
| $\rho_{max}$ | 0.02138 | 0.02138 | 0.02138 | 0.02138 |
| $\rho_{min}$ | 0.00338 | 0.00338 | 0.00338 | 0.00338 |
| $\rho_{req}$ | 0.00461 | 0.00338 | 0.00575 | 0.00613 |
| $\rho_{prov}$ | 0.00671 | 0.00638 | 0.00957 | 0.00912 |
| $As_{prov}$ | 3272.49 | 3272.49 | 4908.74 | 4908.74 |
| Remark | SAFE | SAFE! | SAFE | SAFE! |

## D. WIDE BEAM SHEAR DESIGN:

Vu = 1554.00 N/mm

ΦVc = $0.75 (f'c^{0.5}/6)(bw)(d)$ = 336885.19 N/mm

ΦVc > Vu , SAFE!

## E. TEMPERATURE REINFORCEMENT:

$A_{temp}$ = 0.0020 b D
= ( 0.0020 ) ( 1000 ) ( 600 )
$A_{temp}$ = 1200.00

$A_{temp}$ < $As_{prov}$ , SAFE!

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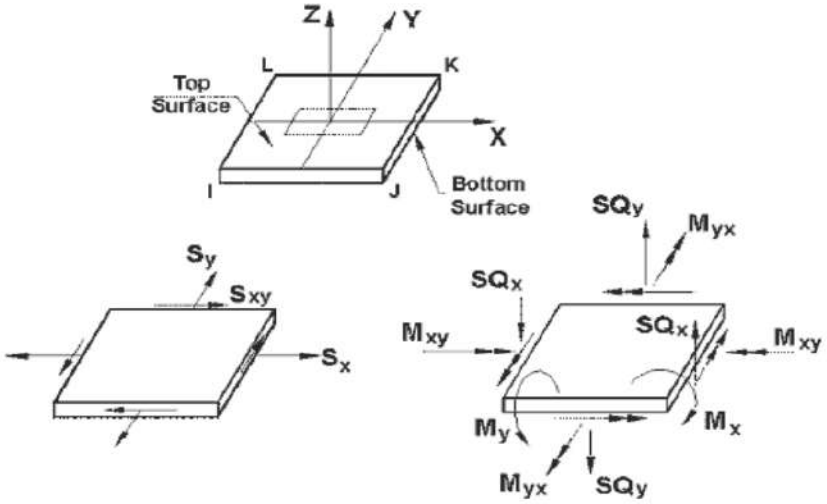
# DESIGN OF FOOTING (AREA B)




Sign Convention of Element Forces

## A. REQUIRED FORCES

FACTORED LOAD COMBINATION (SHEAR) D = 600 mm (thickness)

| | Plate No. | L/C | Shear | | | Bending | | Shear | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Out of Plane | | In-Plane | | | | |
| | | | SQX N/mm² | SQY N/mm² | SXY N/mm² | Mx kNm/m | My kNm/m | Vux N/mm | Vuy N/mm |
| Max Qx | 2520 | 241 | 0.32 | 0.00 | 0.00 | 21.84 | -76.17 | 192.00 | *0.00* |
| Min Qx | 1593 | 243 | -0.65 | -0.06 | 0.00 | 159.23 | -3.15 | *390.00* | 36.00 |
| Max Qy | 13 | 243 | -0.01 | 0.82 | 0.00 | -3.43 | -33.73 | *6.00* | 492.00 |
| Min Qy | 1428 | 243 | -0.06 | -1.07 | 0.00 | 5.62 | -1.51 | 36.00 | *642.00* |

where, Vux = ( D ) ( SQX ) + ( D ) ( SXY )
Vuy = ( D ) ( SQY ) + ( D ) ( SXY )

FACTORED LOAD COMBINATION (MOMENT)

| | Plate No. | L/C | Shear | | | Bending | | Shear | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Out of Plane | | In-Plane | | | | |
| | | | SQX N/mm² | SQY N/mm² | SXY N/mm² | Mx kNm/m | My kNm/m | Vux N/mm | Vuy N/mm |
| Max Mx | 1373 | 243 | 0.03 | -0.12 | 0.00 | *204.35* | -156.17 | 18.00 | 72.00 |
| Min Mx | 1596 | 240 | 0.01 | -0.14 | 0.00 | *-166.75* | -27.93 | *6.00* | 84.00 |
| Max My | 47 | 245 | 0.02 | -0.01 | 0.00 | 2.33 | *155.26* | 12.00 | 6.00 |
| Min My | 544 | 243 | 0.13 | -0.03 | 0.00 | 127.19 | *-219.71* | 78.00 | 18.00 |

DESIGN FORCES

| Location | Flexure (kNm/m) | Shear (N/mm) |
|---|---|---|
| | Factored Load | Factored Load |
| Inner (Top) | 204.35 | 642.00 |
| Outer (Top) | 155.26 | |
| Inner (Bottom) | 166.75 | |
| Outer (Bottom) | 219.71 | |

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## B. DESIGN PARAMETERS

| | | | | |
|---|---|---|---|---|
| b | = | 1000 | mm | width (1m strip) |
| D | = | 600 | mm | depth |
| $d_{to}$ | = | 513 | mm | eff. outer depth (top) |
| $d_{ti}$ | = | 488 | mm | eff. inner depth (top) |
| $d_o$ | = | 538 | mm | eff. outer depth (bot) |
| $d_i$ | = | 513 | mm | eff. inner depth (bot) |
| cc | = | 50 | mm | top concrete cover |
| cc | = | 75 | mm | bottom concrete cover |
| f'c | = | 27.6 | MPa | concrete compressive strength |
| fy | = | 414 | MPa | steel yeild strength |
| Es | = | 200000 | MPa | modulus of elasticity of steel |
| Ec | = | 24692 | MPa | modulus of elasticity of concrete, 4700√f'c |

**Rebar**

Top Bar

| | | | | |
|---|---|---|---|---|
| $Ø_i$ | = | 25 @ 300 mm | | Inner bar |
| $Ø_o$ | = | 25 @ 300 mm | | Outer bar |

Bottom Bar

| | | | | |
|---|---|---|---|---|
| $Ø_i$ | = | 25 @ 300 mm | | Inner bar |
| $Ø_o$ | = | 25 @ 300 mm | | Outer bar |

## C. FLEXURE DESIGN:

**Check for design reinforcement (As)**

$Ru = Mu / [(\varphi)(b)(d^2)]$

$$\rho = \frac{0.85f'c}{fy}\left[1 - \sqrt{1 - \frac{2Ru}{0.85f'c}}\right] \qquad \rho_{max} = \frac{0.75\beta_1(0.85f'c)600}{fy(600+fy)}$$

$\rho_{min} = \min\{\max[(\sqrt{f'c}/4fy), (1.4/fy)], 4\rho/3\}$

$As = (b/s)(\pi/4)(Ø^2)$

| | Top Bar | | Bottom Bar | |
|---|---|---|---|---|
| | Inner (Mx) | Outer (My) | Inner (Mx) | Outer (My) |
| Mu | 204.35 kN-m | 155.26 kN-m | 166.75 kN-m | 219.71 kN-m |
| $d_n$ | 488.00 mm | 513.00 mm | 513.00 mm | 538.00 mm |
| Ru | 0.95 MPa | 0.66 MPa | 0.70 MPa | 0.84 MPa |
| ρ | 0.00234 | 0.00162 | 0.00172 | 0.00207 |
| $\rho_{max}$ | 0.02138 | 0.02138 | 0.02138 | 0.02138 |
| $\rho_{min}$ | 0.00312 | 0.00216 | 0.00229 | 0.00276 |
| $\rho_{req}$ | 0.00312 | 0.00216 | 0.00229 | 0.00276 |
| $\rho_{prov}$ | 0.00335 | 0.00319 | 0.00319 | 0.00304 |
| $As_{prov}$ | 1636.25 | 1636.25 | 1636.25 | 1636.25 |
| Remark | SAFE | SAFE! | SAFE | SAFE! |

## D. WIDE BEAM SHEAR DESIGN:

Vu = 642.00 N/mm

$\Phi Vc = 0.75(f'c^{0.5}/6)(bw)(d)$ = 336885.19 N/mm

$\Phi Vc > Vu$ , SAFE!

## E. TEMPERATURE REINFORCEMENT:

$A_{temp} = 0.0020\ b\ D$

$= (0.0020)(1000)(600)$

$A_{temp} = 1200.00$

$A_{temp} < As_{prov}$ , SAFE!

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## PUNCHING SHEAR CHECK

### A. PARAMETERS

| | | | | |
|---|---|---|---|---|
| $q_{ALL}$ | – | 50 | kPa | allow. base pressure |
| $q_{ALL}$ | = | 67 | kPa | allow. base pressure (transient) |
| $\gamma_c$ | = | 24 | kN/m$^3$ | unit weight of concrete |
| $\gamma_s$ | = | 15 | kN/m$^3$ | unit weight of soil |
| f'c | – | 27.6 | MPa | concrete compressive strength |
| fy | = | 414 | MPa | yield strength of rebar |
| $\phi$ | = | 25 | mm$\phi$ | rebar diameter |
| $\phi_t$ | | 25 | mm$\phi$ | temperature bar diameter |
| $\phi$ | – | 0.9 | | strength reduction factor for flexure |
| | = | 0.75 | | strength reduction factor for shear |

### B. GEOMETRY

Column A
b = 500 mm
l = 500 mm
Column B
b – 500 mm
l = 500 mm
Column C
b = 400 mm
l – 500 mm

d = 487.5 mm

### C. PUNCHING SHEAR CHECK

COLUMN A

$Vu_{cap}$ = $\phi$ (f'c$^{0.5}$) ($b_o$) (d) / 3 — $Vu_{act}$ = 1371 kN — Node 4, LC 240

where: $b_o$ = 2 (b + d) + 2 (l + d)

= 3950.00 mm

= 2529.10 kN — Ratio = 0.54 Safe

COLUMN B

$Vu_{cap}$ = $\phi$ (f'c$^{0.5}$) ($b_o$) (d) / 3 — $Vu_{act}$ = 1478 kN — Node 2, LC 243

where: $b_o$ = 2 (b + d) + 2 (l + d)

= 3950.00 mm

= 2529.10 kN — Ratio = 0.58 Safe

COLUMN C

$Vu_{cap}$ = $\phi$ (f'c$^{0.5}$) ($b_o$) (d) / 3 — $Vu_{act}$ = 1249 kN — Node 5, LC 237

where: $b_o$ = 2 (b + d) + 2 (l + d)

= 3750.00 mm

– 2401.05 kN — Ratio – 0.52 Safe

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## 3. CODES AND REFERENCES

All structural components of the building were designed based on the following design codes and references.

### 3.1 NATIONAL STRUCTURAL CODE OF THE PHILIPPINES (NSCP C101-15) VOL.1, 7TH EDITION, 2015

### 3.2 BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE, ACI 318-14M

### 3.3 AMERICAN INSTITUTE FOR STEEL CONSTRUCTION (AISC-05)

## 4. SOFTWARES

The following structural analysis & design programs are being widely used by most structural and civil engineers around the world and also accepted in the Philippines.

### 4.1 STAAD.PRO V8i SELECT SERIES 6

### 4.2 SPCOLUMN V5.10

### 4.3 MS EXCEL

## 5. STAAD INPUT

**3D MODEL (BUILDING)**

```
STAAD SPACE
START JOB INFORMATION
ENGINEER DATE 29-May-18
ENGINEER NAME GVPasiona
END JOB INFORMATION
INPUT WIDTH 79
SET NL 1000
UNIT METER KN
JOINT COORDINATES
1 0 -1 0; 2 6 -1 0; 3 12 -1 0; 4 0 -1 2.9; 5 6 -1 2.9; 6
6 -1 6; 7 12 -1 6;
8 6 -1 10.5; 9 12 -1 10.5; 10 6 -1 16.5; 11 12 -1 16.5;
12 0 0 0; 13 0 5 0;
14 0 9 0; 15 0 13 0; 16 0 16 0; 17 6 0 0; 18 6 5 0; 19 6
9 0; 20 6 13 0;
21 6 16 0; 22 12 0 0; 23 12 5 0; 24 12 9 0; 25 12 13 0;
26 0 0 2.9; 27 0 5 2.9;
28 0 9 2.9; 29 0 13 2.9; 30 0 16 2.9; 31 6 0 2.9; 32 6 5
2.9; 33 6 9 2.9;
34 6 13 2.9; 35 6 16 2.9; 36 6 0 6; 37 6 5 6; 38 6 9 6;
39 6 13 6; 40 12 0 6;
41 12 5 6; 42 12 9 6; 43 12 13 6; 44 6 0 10.5; 45 6 5
10.5; 46 6 9 10.5;
47 6 13 10.5; 48 12 0 10.5; 49 12 5 10.5; 50 12 9 10.5;
51 12 13 10.5;
52 6 0 16.5; 53 6 5 16.5; 54 6 9 16.5; 55 6 13 16.5; 56
12 0 16.5;
57 12 5 16.5; 58 12 9 16.5; 59 12 13 16.5; 60 5.66969 5
10.9328;
61 5.39286 5 11.4016; 62 5.17342 5 11.8999; 63 5.01444 5
12.4206;
64 4.91815 5 12.9565; 65 4.88591 5 13.5; 66 4.91815 5
14.0435;
67 5.01444 5 14.5794; 68 5.17342 5 15.1001; 69 5.39286 5
15.5984;
70 5.66969 5 16.0672; 71 6.43281 5 16.8303; 72 6.90164 5
17.1071;
73 7.39991 5 17.3266; 74 7.92063 5 17.4856; 75 8.45651 5
17.5819;
76 9 5 17.6141; 77 9.5435 5 17.5819; 78 10.0794 5
17.4856;
79 10.6001 5 17.3266; 80 11.0984 5 17.1071; 81 11.5672 5
16.8303;
82 12.3303 5 10.9328; 83 12.6071 5 11.4016; 84 12.8266 5
11.8999;
85 12.9856 5 12.4206; 86 13.0819 5 12.9565; 87 13.1141 5
13.5;
88 13.0819 5 14.0435; 89 12.9856 5 14.5794; 90 12.8266 5
15.1001;
91 12.6071 5 15.5984; 92 12.3303 5 16.0672; 93 5.66969 9
10.9328;
94 5.39286 9 11.4016; 95 5.17342 9 11.8999; 96 5.01444 9
12.4206;
97 4.91815 9 12.9565; 98 4.88591 9 13.5; 99 4.91815 9
14.0435;
100 5.01444 9 14.5794; 101 5.17342 9 15.1001; 102 5.39286
9 15.5984;
103 5.66969 9 16.0672; 104 6.43281 9 16.8303; 105 6.90164
9 17.1071;
106 7.39991 9 17.3266; 107 7.92063 9 17.4856; 108 8.45651
9 17.5819;
109 9 9 17.6141; 110 9.5435 9 17.5819; 111 10.0794 9
17.4856;
112 10.6001 9 17.3266; 113 11.0984 9 17.1071; 114 11.5672
9 16.8303;
115 12.3303 9 10.9328; 116 12.6071 9 11.4016; 117 12.8266
9 11.8999;
118 12.9856 9 12.4206; 119 13.0819 9 12.9565; 120 13.1141
9 13.5;
121 13.0819 9 14.0435; 122 12.9856 9 14.5794; 123 12.8266
9 15.1001;
124 12.6071 9 15.5984; 125 12.3303 9 16.0672; 126 5.66969
13 10.9328;
127 5.39286 13 11.4016; 128 5.17342 13 11.8999; 129
5.01444 13 12.4206;
130 4.91815 13 12.9565; 131 4.88591 13 13.5; 132 4.91815
13 14.0435;
133 5.01444 13 14.5794; 134 5.17342 13 15.1001; 135
5.39286 13 15.5984;
136 5.66969 13 16.0672; 137 6.43281 13 16.8303; 138
6.90164 13 17.1071;
139 7.39991 13 17.3266; 140 7.92063 13 17.4856; 141
8.45651 13 17.5819;
142 9 13 17.6141; 143 9.5435 13 17.5819; 144 10.0794 13
17.4856;
145 10.6001 13 17.3266; 146 11.0984 13 17.1071; 147
11.5672 13 16.8303;
148 12.3303 13 10.9328; 149 12.6071 13 11.4016; 150
12.8266 13 11.8999;
151 12.9856 13 12.4206; 152 13.0819 13 12.9565; 153
13.1141 13 13.5;
154 13.0819 13 14.0435; 155 12.9856 13 14.5794; 156
12.8266 13 15.1001;
157 12.6071 13 15.5984; 158 12.3303 13 16.0672; 159 12 5
2.9; 160 6 5 13.5;
161 12 5 13.5; 162 5 5 0; 163 5 5 2.9; 164 5 9 0; 165 5 9
2.9; 166 12 9 2.9;
167 6 9 13.5; 168 12 9 13.5; 169 5 13 0; 170 5 13 2.9;
171 12 13 2.9;
172 6 13 13.5; 173 12 13 13.5; 174 4.25 5 2.9; 175 4.25 9
2.9; 176 4.25 13 2.9;
177 4.25 5 6; 178 4.25 9 6; 179 4.25 13 6; 180 6 14.2 0;
181 6 14.2 2.9;
182 12 14.2 0; 183 6 14.2 6; 184 12 14.2 6; 185 6 14.2
10.5; 186 12 14.2 10.5;
187 6 14.2 16.5; 188 12 14.2 16.5;
MEMBER INCIDENCES
1 1 12; 2 12 13; 3 13 14; 4 14 15; 5 15 16; 6 2 17; 7 17
18; 8 18 19; 9 19 20;
10 20 180; 11 3 22; 12 22 23; 13 23 24; 14 24 25; 15 4
26; 16 26 27; 17 27 28;
18 28 29; 19 29 30; 20 5 31; 21 31 32; 22 32 33; 23 33
34; 24 34 181; 25 6 36;
```

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26 36 37; 27 37 38; 28 38 39; 29 7 40; 30 40 41; 31 41
42; 32 42 43; 33 8 44;
34 44 45; 35 45 46; 36 46 47; 37 9 48; 38 48 49; 39 49
50; 40 50 51; 41 10 52;
42 52 53; 43 53 54; 44 54 55; 45 11 56; 46 56 57; 47 57
58; 48 58 59;
100 12 17; 101 17 22; 102 26 31; 103 36 40; 104 44 48;
105 52 56; 106 12 26;
107 17 31; 108 31 36; 109 36 44; 110 44 52; 111 22 40;
112 40 48; 113 48 56;
200 13 162; 201 162 18; 202 18 23; 203 27 174; 204 163
32; 205 32 159;
206 37 41; 207 45 49; 208 160 161; 209 53 57; 210 13 27;
211 162 163;
212 18 32; 213 32 37; 214 37 45; 215 45 160; 216 160 53;
217 23 159;
218 159 41; 219 41 49; 220 49 161; 221 161 57; 222 45 60;
223 60 61; 224 61 62;
225 62 63; 226 63 64; 227 64 65; 228 65 66; 229 66 67;
230 67 68; 231 68 69;
232 69 70; 233 70 53; 234 53 71; 235 71 72; 236 72 73;
237 73 74; 238 74 75;
239 75 76; 240 76 77; 241 77 78; 242 78 79; 243 79 80;
244 80 81; 245 81 57;
246 49 82; 247 82 83; 248 83 84; 249 84 85; 250 85 86;
251 86 87; 252 87 88;
253 88 89; 254 89 90; 255 90 91; 256 91 92; 257 92 57;
258 177 37; 259 174 177;
260 174 163; 300 14 164; 301 164 19; 302 19 24; 303 28
175; 304 165 33;
305 33 166; 306 38 42; 307 46 50; 308 167 168; 309 54 58;
310 14 28;
311 164 165; 312 19 33; 313 33 38; 314 38 46; 315 46 167;
316 167 54;
317 24 166; 318 166 42; 319 42 50; 320 50 168; 321 168
58; 322 46 93;
323 93 94; 324 94 95; 325 95 96; 326 96 97; 327 97 98;
328 98 99; 329 99 100;
330 100 101; 331 101 102; 332 102 103; 333 103 54; 334 54
104; 335 104 105;
336 105 106; 337 106 107; 338 107 108; 339 108 109; 340
109 110; 341 110 111;
342 111 112; 343 112 113; 344 113 114; 345 114 50; 346 50
115; 347 115 116;
348 116 117; 349 117 118; 350 118 119; 351 119 120; 352
120 121; 353 121 122;
354 122 123; 355 123 124; 356 124 125; 357 125 58; 358
178 38; 359 175 178;
360 175 165; 400 15 169; 401 169 20; 402 20 25; 403 29
176; 404 170 34;
405 34 171; 406 39 43; 407 47 51; 408 172 173; 409 55 59;
410 15 29;
411 169 170; 412 20 34; 413 34 39; 414 39 47; 415 47 172;
416 172 55;
417 25 171; 418 171 43; 419 43 51; 420 51 173; 421 173
59; 422 47 126;
423 126 127; 424 127 128; 425 128 129; 426 129 130; 427
130 131; 428 131 132;
429 132 133; 430 133 134; 431 134 135; 432 135 136; 433
136 55; 434 55 137;
435 137 138; 436 138 139; 437 139 140; 438 140 141; 439
141 142; 440 142 143;
441 143 144; 442 144 145; 443 145 146; 444 146 147; 445
147 59; 446 51 148;
447 148 149; 448 149 150; 449 150 151; 450 151 152; 451
152 153; 452 153 154;
453 154 155; 454 155 156; 455 156 157; 456 157 158; 457
158 59; 458 179 39;
459 176 179; 460 176 170; 500 16 21; 501 30 35; 502 16
30; 503 21 35;
504 180 21; 505 181 35; 506 25 182; 507 39 183; 508 43
184; 509 47 185;
510 51 186; 511 55 187; 512 59 188;
**********
START GROUP DEFINITION
MEMBER
_COLUMNS 1 TO 48 504 TO 512
_BEAMS 100 TO 113 200 TO 260 300 TO 360 400 TO 460 500 TO
503
_TIE_BEAMS 100 TO 113
_2NDFL_BEAMS 200 TO 260
_3RDFL_BEAMS 300 TO 360
_ROOF_DECK_BEAMS 400 TO 460
_STAIR_ROOF_BEAMS 500 TO 503
_EXTRACTING_BEAMS 100 TO 113 200 TO 221 258 TO 260 300 TO
321 358 TO 360 400 -
401 TO 421 458 TO 460 500 TO 503
***COLUMNS***
_C1 1 TO 19 25 TO 48 504 506 TO 512
_C2_1ST 20 TO 23
_C2_2ND 24 505
***TIE BEAMS***
_TB1 101 103 TO 105 107 TO 113
_TB2 100 102 106
***2ND & 3RD FLOOR BEAMS***
_B1 202 206 207 209 212 TO 214 219 302 306 307 309 312 TO
314 319
_B2 215 TO 218 220 221 315 TO 318 320 321
_B3 200 201 203 204 260 300 301 303 304 360
_B4 205 210 305 310
_B5 208 211 308 311
_B6 222 TO 257 322 TO 357
_B7 258 358
_B8 259 359
***ROOF BEAMS***
_RB1 402 406 407 409 412 TO 421 458 500 TO 503
_RB2 400 401 403 404 460
_RB3 405 410
_RB4 408 411 422 TO 457 459
JOINT
_PC_A 4 6 TO 11
_PC_B 1 TO 3
_PC_C 5
FLOOR
_2ND_FLR_3.4 201 202 204 TO 207 211 TO 214 217 TO 219 258
TO 260
_2ND_FLR_5.8 207 TO 209 215 216 220 TO 257
_3RD_FLR_3.4 301 302 304 TO 307 311 TO 314 317 TO 319 358
TO 360
_3RD_FLR_5.8 307 TO 309 315 316 320 TO 357
_ROOF_DECK_2.4 301 302 304 TO 309 311 TO 360
_STAIR_ROOF_2.4 500 TO 503
END GROUP DEFINITION
**********
DEFINE MATERIAL START
ISOTROPIC CONCRETE
E 2.46918e+007
POISSON 0.17
DENSITY 24
ALPHA 1e-005
DAMP 0.05
TYPE CONCRETE
STRENGTH FCU 27600
END DEFINE MATERIAL
**********
MEMBER PROPERTY AMERICAN
***COLUMNS***
***
_C1 PRIS YD 0.5 ZD 0.5
_C2_1ST PRIS YD 0.5 ZD 0.4
_C2_2ND PRIS YD 0.4 ZD 0.4
***TIE BEAMS***
_TB1 PRIS YD 0.5 ZD 0.3
_TB2 PRIS YD 0.5 ZD 0.3
***2ND & 3RD FLOOR BEAMS***
_B1 PRIS YD 0.5 ZD 0.3
_B2 PRIS YD 0.5 ZD 0.3
_B3 PRIS YD 0.5 ZD 0.3
_B4 PRIS YD 0.5 ZD 0.3
_B5 PRIS YD 0.45 ZD 0.25
_B6 PRIS YD 0.4 ZD 0.25
_B7 PRIS YD 0.45 ZD 0.25
_B8 PRIS YD 0.4 ZD 0.2
***ROOF BEAMS***
_RB1 PRIS YD 0.4 ZD 0.25
_RB2 PRIS YD 0.4 ZD 0.25
_RB3 PRIS YD 0.4 ZD 0.25
_RB4 PRIS YD 0.4 ZD 0.2
**********
CONSTANTS
MATERIAL CONCRETE ALL
**********
SUPPORTS
1 TO 11 FIXED
**********
MEMBER CRACKED
_COLUMNS REDUCTION RIY 0.700000 RIZ 0.700000
_BEAMS REDUCTION RIY 0.350000 RIZ 0.350000
**********
MEMBER RELEASE
211 259 311 359 411 459 START MY MZ
205 211 259 305 311 359 405 411 459 END MY MZ
**********
MEMBER OFFSET
100 TO 107 109 TO 113 START LOCAL 0.25 0 0
100 TO 106 108 TO 113 END LOCAL -0.25 0 0
108 START LOCAL 0.2 0 0
107 END LOCAL -0.2 0 0
*****
200 202 203 205 TO 207 209 210 212 214 215 217 219 220
START LOCAL 0.25 0 0
201 202 204 206 207 209 210 213 214 216 218 219 221 258
END LOCAL -0.25 0 0
213 START LOCAL 0.2 0 0
212 END LOCAL -0.2 0 0
*****
300 302 303 305 TO 307 309 310 312 314 315 317 319 320
START LOCAL 0.25 0 0
301 302 304 306 307 309 310 313 314 316 318 319 321 358
END LOCAL -0.25 0 0
313 START LOCAL 0.2 0 0
312 END LOCAL -0.2 0 0
*****
400 402 403 405 TO 407 409 410 412 414 415 417 419 420
START LOCAL 0.25 0 0
401 402 404 406 407 409 410 413 414 416 418 419 421 458
END LOCAL -0.25 0 0
413 START LOCAL 0.2 0 0
412 END LOCAL -0.2 0 0
*****
500 TO 503 START LOCAL 0.25 0 0
500 502 END LOCAL -0.25 0 0
501 503 END LOCAL -0.2 0 0
**********
```

**GILBERT V. PASIONA**
CIVIL ENGINEER

```
DEFINE REFERENCE LOADS
**************************
LOAD R1 LOADTYPE Mass  TITLE REF LOAD CASE - DEAD LOAD
**************************
***A.  STAAD MODEL SELFWEIGHT
***The actual member sizes and structure geometry was
modeled as space frame by STAAD Pro software.
***The software recognizes the respective structure
weight by generating the "SELFWEIGHT" command feature.
***The weight of the structure is based on concrete
density of 24.00 kN / m3. The STAAD syntax below
signifies
***consideration of such selfweight.
SELFWEIGHT Y 1
***B. STAIRS
***a.  LANDING (Exit)  =  3.12 kN/m2
***b.  EXIT STAIR  =  7.13 kN/m2
***c.  TOPPINGS AND FINISHES  =  1.10 kN/m2
MEMBER LOAD
***LANDING
106 210 310 UNI GY 7.76
***STAIR
106 210 310 UNI GY 15.33
211 311 411 UNI GY 15.33
***C. FLOOR WALLS
***a.  6" CHB WALL  =  3.11 kN/m2
***b.  6" CHB WALL W/ OPENING =  2.98 kN/m2
***c.  4" CHB WALL =  2.98 kN/m2
MEMBER LOAD
***SECOND FLOOR
200 TO 204 210 212 214 217 TO 219 222 TO 260 UNI GY 11.04
***THIRD FLOOR
300 TO 304 310 312 314 317 TO 319 322 TO 360 UNI GY 11.04
***ROOF
402 414 417 TO 419 422 TO 459 UNI GY 3.73
400 401 403 404 410 412 460 UNI GY 8.09
***D. FLOOR SLABS
***a.  CEILING AND UTILITIES  =  0.24 kN/m2
***b.  TOPPINGS AND FINISHES  =  1.10 kN/m2
***c.  TOPPINGS AND WATERPROOFING  =  0.96 kN/m2
***d.  SLAB (125mm)  =  3.00 kN/m2
***e.  INTERIOR PARTITIONS =  1.0 kN/m2
***f.  CANTILEVER SLAB  =  2.40 kN/m2
MEMBER LOAD
359 459 503 UNI GY 1.2
303 403 UNI GY 1.2 0 1.35
FLOOR LOAD
***SECOND FLOOR
_2ND_FLR_3.4 FLOAD 5.34 GY
_2ND_FLR_5.8 FLOAD 5.34 GY
***THIRD FLOOR
_3RD_FLR_3.4 FLOAD 5.34 GY
_3RD_FLR_5.8 FLOAD 5.34 GY
***ROOF DECK
_ROOF_DECK_2.4 FLOAD 5.2 GY
***STAIR ROOF
_STAIR_ROOF_2.4 FLOAD 5.2 GY
**************************
LOAD R2 LOADTYPE Mass  TITLE REF LOAD CASE - DEAD LOAD
(RSA)
**************************
******
******
*****************              X-              DIRECTION
************************************
SELFWEIGHT X 1
***B. STAIRS
***a.  LANDING (Exit)  =  3.12 kN/m2
***b.  EXIT STAIR  =  7.13 kN/m2
***c.  TOPPINGS AND FINISHES  =  1.10 kN/m2
MEMBER LOAD
***LANDING
106 210 310 UNI GX 7.76
***STAIR
106 210 310 UNI GX 15.33
211 311 411 UNI GX 15.33
***C. FLOOR WALLS
***a.  6" CHB WALL  =  3.11 kN/m2
***b.  6" CHB WALL W/ OPENING =  2.98 kN/m2
***c.  4" CHB WALL =  2.98 kN/m2
MEMBER LOAD
***SECOND FLOOR
200 TO 204 210 212 214 217 TO 219 222 TO 260 UNI GX 11.04
***THIRD FLOOR
300 TO 304 310 312 314 317 TO 319 322 TO 360 UNI GX 11.04
***ROOF
402 414 417 TO 419 422 TO 459 UNI GX 3.73
400 401 403 404 410 412 460 UNI GX 8.09
***D. FLOOR SLABS
***a.  CEILING AND UTILITIES  =  0.24 kN/m2
***b.  TOPPINGS AND FINISHES  =  1.10 kN/m2
***c.  TOPPINGS AND WATERPROOFING  =  0.96 kN/m2
***d.  SLAB (125mm)  =  3.00 kN/m2
***e.  INTERIOR PARTITIONS =  1.0 kN/m2
***f.  CANTILEVER SLAB  =  2.40 kN/m2
MEMBER LOAD
359 459 503 UNI GX 1.2
303 403 UNI GX 1.2 0 1.35
FLOOR LOAD
***SECOND FLOOR
_2ND_FLR_3.4 FLOAD 5.34 GX
_2ND_FLR_5.8 FLOAD 5.34 GX
***THIRD FLOOR
_3RD_FLR_3.4 FLOAD 5.34 GX
_3RD_FLR_5.8 FLOAD 5.34 GX
***ROOF DECK
_ROOF_DECK_2.4 FLOAD 5.2 GX
***STAIR ROOF
_STAIR_ROOF_2.4 FLOAD 5.2 GX
******
******
*****************              Z-              DIRECTION
************************************
SELFWEIGHT Z 1
***B. STAIRS
***a.  LANDING (Exit)  =  3.12 kN/m2
***b.  EXIT STAIR  =  7.13 kN/m2
***c.  TOPPINGS AND FINISHES  =  1.10 kN/m2
MEMBER LOAD
***LANDING
106 210 310 UNI GZ 7.76
***STAIR
106 210 310 UNI GZ 15.33
211 311 411 UNI GZ 15.33
***C. FLOOR WALLS
***a.  6" CHB WALL  =  3.11 kN/m2
***b.  6" CHB WALL W/ OPENING =  2.98 kN/m2
***c.  4" CHB WALL =  2.98 kN/m2
MEMBER LOAD
***SECOND FLOOR
200 TO 204 210 212 214 217 TO 219 222 TO 260 UNI GZ 11.04
***THIRD FLOOR
300 TO 304 310 312 314 317 TO 319 322 TO 360 UNI GZ 11.04
***ROOF
402 414 417 TO 419 422 TO 459 UNI GZ 3.73
400 401 403 404 410 412 460 UNI GZ 8.09
***D. FLOOR SLABS
***a.  CEILING AND UTILITIES  =  0.24 kN/m2
***b.  TOPPINGS AND FINISHES  =  1.10 kN/m2
***c.  TOPPINGS AND WATERPROOFING  =  0.96 kN/m2
***d.  SLAB (125mm)  =  3.00 kN/m2
***e.  INTERIOR PARTITIONS =  1.0 kN/m2
***f.  CANTILEVER SLAB  =  2.40 kN/m2
MEMBER LOAD
359 459 503 UNI GZ 1.2
303 403 UNI GZ 1.2 0 1.35
FLOOR LOAD
***SECOND FLOOR
_2ND_FLR_3.4 FLOAD 5.34 GZ
_2ND_FLR_5.8 FLOAD 5.34 GZ
***THIRD FLOOR
_3RD_FLR_3.4 FLOAD 5.34 GZ
_3RD_FLR_5.8 FLOAD 5.34 GZ
***ROOF DECK
_ROOF_DECK_2.4 FLOAD 5.2 GZ
***STAIR ROOF
_STAIR_ROOF_2.4 FLOAD 5.2 GZ
END DEFINE REFERENCE LOADS
**************************
FLOOR DIAPHRAGM
DIA 1 TYPE RIG HEI 0 JOINT 12 17 22 26 31 36 40 44 48 52
56
DIA 2 TYPE RIG HEI 5 JOINT 13 18 23 27 32 37 41 45 49 53
57 60 TO 92 -
159 TO 163 174 177
DIA 3 TYPE RIG HEI 9 JOINT 14 19 24 28 33 38 42 46 50 54
58 93 TO 125 164 -
165 TO 168 175 178
DIA 4 TYPE RIG HEI 13 JOINT 15 20 25 29 34 39 43 47 51 55
59 126 TO 158 169 -
170 TO 173 176 179
DIA 5 TYPE RIG HEI 16 JOINT 16 21 30 35
**************************
DEFINE UBC LOAD
**V(GEN) = 964.73
**V(COMP) = 1179.11
**I(MODIFIED) = I X V(COMP) / V(GEN) = 1.5 X 1179.11 /
964.73 = 1.833
ZONE 0.4 I 1.833 RWX 8.5 RWZ 8.5 STYP 5 NA 1 NV 1
REFERENCE LOAD Y
R1 1.0
**************************
CUT OFF MODE SHAPE 12
**************************
**LOAD CALCULATIONS********
**************************
*******************************
LOAD 4 : SEISMIC LOAD AT +X+E DIRECTION, E(+X+E)
*******************************
UBC LOAD X 1 DEC 1 ACC 0.05
PERFORM ANALYSIS
CHANGE
*******************************
LOAD 5 : SEISMIC LOAD AT +X-E DIRECTION, E(+X-E)
*******************************
UBC LOAD X 1 DEC 1 ACC -0.05
PERFORM ANALYSIS
CHANGE
*******************************
LOAD 6 : SEISMIC LOAD AT -X+E DIRECTION, E(-X+E)
*******************************
UBC LOAD X -1 DEC 1 ACC 0.05
PERFORM ANALYSIS
CHANGE
```

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*********************************
LOAD 7 : SEISMIC LOAD AT -X-E DIRECTION, E(-X-E)
*********************************
UBC LOAD X -1 DEC 1 ACC -0.05
PERFORM ANALYSIS
CHANGE
*********************************
LOAD 8 : SEISMIC LOAD AT +Z+E DIRECTION, E(+Z+E)
*********************************
UBC LOAD Z 1 DEC 1 ACC 0.05
PERFORM ANALYSIS
CHANGE
*********************************
LOAD 9 : SEISMIC LOAD AT +Z-E DIRECTION, E(+Z-E)
*********************************
UBC LOAD Z 1 DEC 1 ACC -0.05
PERFORM ANALYSIS
CHANGE
*********************************
LOAD 10 : SEISMIC LOAD AT -Z+E DIRECTION, E(-Z+E)
*********************************
UBC LOAD Z -1 DEC 1 ACC 0.05
PERFORM ANALYSIS
CHANGE
*********************************
LOAD 11 : SEISMIC LOAD AT -Z-E DIRECTION, E(-Z-E)
*********************************
UBC LOAD Z -1 DEC 1 ACC -0.05
PERFORM ANALYSIS
CHANGE
*********************************
LOAD 12 RESPONSE SPECTRUM AT X, RS(X)
*********************************
REFERENCE LOAD
R2 1.0
***I = 1.5***
SPECTRUM SRSS X 1 ACC SCALE 2.432 DAMP 0.05 LIN
0 0.44; 0.192 1; 0.96 1; 1.2 0.8; 1.4 0.6857; 1.6 0.6;
1.8 0.533; 2 0.48;
2.5 0.384; 3 0.32; 3.5 0.2743; 4 0.24; 4.5 0.2133; 5
0.192; 5.5 0.1745;
6 0.16; 6.5 0.1477; 7 0.1371; 7.5 0.128; 8 0.12; 8.5
0.1129; 9 0.1067;
9.5 0.1011; 10 0.096;
PERFORM ANALYSIS
CHANGE
*********************************
LOAD 13 RESPONSE SPECTRUM AT Z, RS(Z)
*********************************
***I = 1.5***
SPECTRUM SRSS Z 1 ACC SCALE 2.745 DAMP 0.05 LIN
0 0.44; 0.192 1; 0.96 1; 1.2 0.8; 1.4 0.6857; 1.6 0.6;
1.8 0.533; 2 0.48;
2.5 0.384; 3 0.32; 3.5 0.2743; 4 0.24; 4.5 0.2133; 5
0.192; 5.5 0.1745;
6 0.16; 6.5 0.1477; 7 0.1371; 7.5 0.128; 8 0.12; 8.5
0.1129; 9 0.1067;
9.5 0.1011; 10 0.096;
PERFORM ANALYSIS
CHANGE
*****************************************
LOAD 14 : WIND LOAD AT +X DIRECTION, W(+X)
*****************************************
MEMBER LOAD
***A. WINDWARD
***WEST
2 TO 5 16 TO 19 UNI GX 4.03
21 TO 24 26 TO 28 507 UNI GX 4.31
26 TO 28 34 TO 36 507 509 UNI GX 6.26
34 TO 36 42 TO 44 509 511 UNI GX 8.34
***B. LEEWARD
***EAST
12 TO 14 30 TO 32 506 508 UNI GX 5.22
30 TO 32 38 TO 40 508 510 UNI GX 3.92
38 TO 40 46 TO 48 510 512 UNI GX 5.22
***C. SIDEWALLS
***NORTH
2 TO 5 7 TO 10 504 UNI GZ -7.29
7 TO 10 12 TO 14 506 UNI GZ -7.29
***SOUTH
16 TO 19 21 TO 24 505 UNI GZ 7.29
42 TO 44 46 TO 48 511 512 UNI GZ 7.29
***D. ROOF
***UPPER ROOF
500 501 UNI Y 2.52
***LOWER ROOF
FLOOR LOAD
YRANGE 12.5 13.5 FLOAD 1.74 XRANGE 3 14  ZRANGE -0.1 19
GY
PERFORM ANALYSIS
CHANGE
*****************************************
LOAD 15 : WIND LOAD AT -X DIRECTION, W(-X)
*****************************************
MEMBER LOAD
***A. WINDWARD
***EAST
12 TO 14 30 TO 32 506 508 UNI GX -8.34
30 TO 32 38 TO 40 508 510 UNI GX -6.26
38 TO 40 46 TO 48 510 512 UNI GX -8.34
***B. LEEWARD
***WEST
2 TO 5 16 TO 19 UNI GX -2.52
21 TO 24 26 TO 28 507 UNI GX -2.7
26 TO 28 34 TO 36 507 509 UNI GX -3.92
34 TO 36 42 TO 44 509 511 UNI GX -5.22
***C. SIDEWALLS
***NORTH
2 TO 5 7 TO 10 504 UNI GZ -7.29
7 TO 10 12 TO 14 506 UNI GZ -7.29
***SOUTH
16 TO 19 21 TO 24 505 UNI GZ 7.29
42 TO 44 46 TO 48 511 512 UNI GZ 7.29
***D. ROOF
***UPPER ROOF
500 501 UNI Y 2.52
***LOWER ROOF
FLOOR LOAD
YRANGE 12.5 13.5 FLOAD 1.74 XRANGE 3 14  ZRANGE -0.1 19
GY
PERFORM ANALYSIS
CHANGE
*****************************************
LOAD 16 : WIND LOAD AT +Z DIRECTION, W(+Z)
*****************************************
MEMBER LOAD
***A. WINDWARD
***NORTH
2 TO 5 7 TO 10 504 UNI GZ 8.34
7 TO 10 12 TO 14 506 UNI GZ 8.34
***B. LEEWARD
***SOUTH
16 TO 19 21 TO 24 505 UNI GZ 5.22
42 TO 44 46 TO 48 511 512 UNI GZ 5.22
***C. SIDEWALLS
***WEST
2 TO 5 16 TO 19 UNI GX -3.52
21 TO 24 26 TO 28 507 UNI GX -3.77
26 TO 28 34 TO 36 507 509 UNI GX -5.47
34 TO 36 42 TO 44 509 511 UNI GX -7.29
***EAST
12 TO 14 30 TO 32 506 508 UNI GX 7.29
30 TO 32 38 TO 40 508 510 UNI GX 5.47
38 TO 40 46 TO 48 510 512 UNI GX 7.29
***D. ROOF
***UPPER ROOF
500 501 UNI Y 2.52
***LOWER ROOF
FLOOR LOAD
YRANGE 12.5 13.5 FLOAD 1.74 XRANGE 3 14  ZRANGE -0.1 19
GY
PERFORM ANALYSIS
CHANGE
*****************************************
LOAD 17 : WIND LOAD AT -Z DIRECTION, W(-Z)
*****************************************
MEMBER LOAD
***A. WINDWARD
***SOUTH
16 TO 19 21 TO 24 505 UNI GZ -8.34
42 TO 44 46 TO 48 511 512 UNI GZ -8.34
***B. LEEWARD
***NORTH
2 TO 5 7 TO 10 504 UNI GZ -5.22
7 TO 10 12 TO 14 506 UNI GZ -5.22
***C. SIDEWALLS
***WEST
2 TO 5 16 TO 19 UNI GX -3.52
21 TO 24 26 TO 28 507 UNI GX -3.77
26 TO 28 34 TO 36 507 509 UNI GX -5.47
34 TO 36 42 TO 44 509 511 UNI GX -7.29
***EAST
12 TO 14 30 TO 32 506 508 UNI GX 7.29
30 TO 32 38 TO 40 508 510 UNI GX 5.47
38 TO 40 46 TO 48 510 512 UNI GX 7.29
***D. ROOF
***UPPER ROOF
500 501 UNI Y 2.52
***LOWER ROOF
FLOOR LOAD
YRANGE 12.5 13.5 FLOAD 1.74 XRANGE 3 14  ZRANGE -0.1 19
GY
PERFORM ANALYSIS
CHANGE
*****************************************
LOAD 18 : WIND LOAD SUCTION, WS
*****************************************
MEMBER LOAD
***A. SUCTION
***SOUTH
16 TO 19 21 TO 24 505 UNI GZ -2.19
42 TO 44 46 TO 48 511 512 UNI GZ -2.19
***NORTH
2 TO 5 7 TO 10 504 UNI GZ 2.19
7 TO 10 12 TO 14 506 UNI GZ 2.19
***WEST
2 TO 5 16 TO 19 UNI GX 1.06
21 TO 24 26 TO 28 507 UNI GX 1.13
26 TO 28 34 TO 36 507 509 UNI GX 1.64
34 TO 36 42 TO 44 509 511 UNI GX 2.19
***EAST
12 TO 14 30 TO 32 506 508 UNI GX -2.19
30 TO 32 38 TO 40 508 510 UNI GX -1.64
38 TO 40 46 TO 48 510 512 UNI GX -2.19
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```
***UPPER ROOF
500 501 UNI Y -1.06
***LOWER ROOF
FLOOR LOAD
YRANGE 12.5 13.5 FLOAD -0.73 XRANGE 3 14  ZRANGE -0.1 19
GY
PERFORM ANALYSIS
CHANGE
*****************************************
LOAD 19 : WIND LOAD PRESSURE, WP
*****************************************
MEMBER LOAD
***A. PRESSURE
***SOUTH
16 TO 19 21 TO 24 505 UNI GZ 2.19
42 TO 44 46 TO 48 511 512 UNI GZ 2.19
***NORTH
2 TO 5 7 TO 10 504 UNI GZ -2.19
7 TO 10 12 TO 14 506 UNI GZ -2.19
***WEST
2 TO 5 16 TO 19 UNI GX -1.06
21 TO 24 26 TO 28 507 UNI GX -1.13
26 TO 28 34 TO 36 507 509 UNI GX -1.64
34 TO 36 42 TO 44 509 511 UNI GX -2.19
***EAST
12 TO 14 30 TO 32 506 508 UNI GX 2.19
30 TO 32 38 TO 40 508 510 UNI GX 1.64
38 TO 40 46 TO 48 510 512 UNI GX 2.19
***UPPER ROOF
500 501 UNI Y 1.06
***LOWER ROOF
FLOOR LOAD
YRANGE 12.5 13.5 FLOAD 0.73 XRANGE 3 14  ZRANGE -0.1 19
GY
PERFORM ANALYSIS
CHANGE
*********************************
LOAD 1 : DEAD LOAD , DL
*********************************
REFERENCE LOAD
R1 -1.0
PERFORM ANALYSIS
CHANGE
*********************************
LOAD 2 : LIVE LOAD , LL
*********************************
***A. STAIR
MEMBER LOAD
***LANDING
106 210 310 UNI GY -8.83
***STAIR
106 210 310 UNI GY -10.32
211 311 411 UNI GY -10.32
***B. SECOND FLOOR SLAB
***a.  Room / Office / Comfort Room  =  2.4 kN/m2
***b.  Hall  =  3.80 kN/m2
***c.  Conference Room  =  4.80 kN/m2
***d.  Movable Partition  =  1.00 kN/m2
***e.  Cantilever Slab  =  1.00 kN/m2
MEMBER LOAD
359 459 503 UNI GY -0.5
303 403 UNI GY -0.5 0 1.35
FLOOR LOAD
***SECOND FLOOR
_2ND_FLR_3.4 FLOAD -3.4 GY
_2ND_FLR_5.8 FLOAD -5.8 GY
***THIRD FLOOR
_3RD_FLR_3.4 FLOAD -3.4 GY
_3RD_FLR_5.8 FLOAD -5.8 GY
PERFORM ANALYSIS
CHANGE
*********************************
LOAD 3 : ROOF LIVE LOAD , LR
*********************************
***a.  ROOF LIVE LOAD  =  2.40 kN/m2
FLOOR LOAD
***ROOF DECK
_ROOF_DECK_2.4 FLOAD -2.4 GY
***STAIR ROOF
_STAIR_ROOF_2.4 FLOAD -2.4 GY
PERFORM ANALYSIS
CHANGE
************
*********************************
*******LOAD COMBINATIONS*******
*********************************
*********************************************
******* ASD LOAD COMB COMBINATIONS *******
*********************************************
LOAD COMB 101 : DL
1 1.0
LOAD COMB 102 : DL + LL
1 1.0 2 1.0
LOAD COMB 103 : DL + LR
1 1.0 3 1.0
LOAD COMB 104 : DL + 0.75LL + 0.75LR
1 1.0 2 0.75 3 0.75
LOAD COMB 105 : DL + 0.6W(+X) + 0.18W(+Z) + 0.6WS
1 1.0 14 0.6 16 0.18 18 0.6
LOAD COMB 106 : DL + 0.6W(+X) + 0.18W(+Z) + 0.6WP
1 1.0 14 0.6 16 0.18 19 0.6
LOAD COMB 107 : DL + 0.6W(+X) + 0.18W(-Z) + 0.6WS
1 1.0 14 0.6 17 0.18 18 0.6
LOAD COMB 108 : DL + 0.6W(+X) + 0.18W(-Z) + 0.6WP
1 1.0 14 0.6 17 0.18 19 0.6
LOAD COMB 109 : DL + 0.6W(-X) + 0.18W(+Z) + 0.6WS
1 1.0 15 0.6 16 0.18 18 0.6
LOAD COMB 110 : DL + 0.6W(-X) + 0.18W(+Z) + 0.6WP
1 1.0 15 0.6 16 0.18 19 0.6
LOAD COMB 111 : DL + 0.6W(-X) + 0.18W(-Z) + 0.6WS
1 1.0 15 0.6 17 0.18 18 0.6
LOAD COMB 112 : DL + 0.6W(-X) + 0.18W(-Z) + 0.6WP
1 1.0 15 0.6 17 0.18 19 0.6
LOAD COMB 113 : DL + 0.18W(+X) + 0.6W(+Z) + 0.6WS
1 1.0 14 0.18 16 0.6 18 0.6
LOAD COMB 114 : DL + 0.18W(+X) + 0.6W(+Z) + 0.6WP
1 1.0 14 0.18 16 0.6 19 0.6
LOAD COMB 115 : DL + 0.18W(-X) + 0.6W(+Z) + 0.6WS
1 1.0 15 0.18 16 0.6 18 0.6
LOAD COMB 116 : DL + 0.18W(-X) + 0.6W(+Z) + 0.6WP
1 1.0 15 0.18 16 0.6 19 0.6
LOAD COMB 117 : DL + 0.18W(+X) + 0.6W(-Z) + 0.6WS
1 1.0 14 0.18 17 0.6 18 0.6
LOAD COMB 118 : DL + 0.18W(+X) + 0.6W(-Z) + 0.6WP
1 1.0 14 0.18 17 0.6 19 0.6
LOAD COMB 119 : DL + 0.18W(-X) + 0.6W(-Z) + 0.6WS
1 1.0 15 0.18 17 0.6 18 0.6
LOAD COMB 120 : DL + 0.18W(-X) + 0.6W(-Z) + 0.6WP
1 1.0 15 0.18 17 0.6 19 0.6
LOAD COMB 121 : DL + 0.7143E(+X+E)
1 1.0 4 0.7143
LOAD COMB 122 : DL + 0.7143E(+X-E)
1 1.0 5 0.7143
LOAD COMB 123 : DL + 0.7143E(-X+E)
1 1.0 6 0.7143
LOAD COMB 124 : DL + 0.7143E(-X-E)
1 1.0 7 0.7143
LOAD COMB 125 : DL + 0.7143E(+Z+E)
1 1.0 8 0.7143
LOAD COMB 126 : DL + 0.7143E(+Z-E)
1 1.0 9 0.7143
LOAD COMB 127 : DL + 0.7143E(-Z+E)
1 1.0 10 0.7143
LOAD COMB 128 : DL + 0.7143E(-Z-E)
1 1.0 11 0.7143
LOAD COMB 129 : DL + 0.7143RS(X)
1 1.0 12 0.7143
LOAD COMB 130 : DL + 0.7143RS(Z)
1 1.0 13 0.7143
*****************************************
****** LRFD LOAD COMB COMBINATIONS ******
*****************************************
LOAD COMB 201 : 1.4DL
1 1.4
LOAD COMB 202 : 1.2DL + 1.6LL + 0.5LR
1 1.2 2 1.6 3 0.5
LOAD COMB 203 : 1.2DL + 0.5LL + 1.6LR
1 1.2 2 0.5 3 1.6
LOAD COMB 204 : 1.2DL + 1.6LR + 0.5W(+X) + 0.15W(+Z) +
0.5WS
1 1.2 3 1.6 14 0.5 16 0.15 18 0.5
LOAD COMB 205 : 1.2DL + 1.6LR + 0.5W(+X) + 0.15W(+Z) +
0.5WP
1 1.2 3 1.6 14 0.5 16 0.15 19 0.5
LOAD COMB 206 : 1.2DL + 1.6LR + 0.5W(+X) + 0.15W(-Z) +
0.5WS
1 1.2 3 1.6 14 0.5 17 0.15 18 0.5
LOAD COMB 207 : 1.2DL + 1.6LR + 0.5W(+X) + 0.15W(-Z) +
0.5WP
1 1.2 3 1.6 14 0.5 17 0.15 19 0.5
LOAD COMB 208 : 1.2DL + 1.6LR + 0.5W(-X) + 0.15W(+Z) +
0.5WS
1 1.2 3 1.6 15 0.5 16 0.15 18 0.5
LOAD COMB 209 : 1.2DL + 1.6LR + 0.5W(-X) + 0.15W(+Z) +
0.5WP
1 1.2 3 1.6 15 0.5 16 0.15 19 0.5
LOAD COMB 210 : 1.2DL + 1.6LR + 0.5W(-X) + 0.15W(-Z) +
0.5WS
1 1.2 3 1.6 15 0.5 17 0.15 18 0.5
LOAD COMB 211 : 1.2DL + 1.6LR + 0.5W(-X) + 0.15W(-Z) +
0.5WP
1 1.2 3 1.6 15 0.5 17 0.15 19 0.5
LOAD COMB 212 : 1.2DL + 1.6LR + 0.15W(+X) + 0.5W(+Z) +
0.5WS
1 1.2 3 1.6 14 0.15 16 0.5 18 0.5
LOAD COMB 213 : 1.2DL + 1.6LR + 0.15W(+X) + 0.5W(+Z) +
0.5WP
1 1.2 3 1.6 14 0.15 16 0.5 19 0.5
LOAD COMB 214 : 1.2DL + 1.6LR + 0.15W(-X) + 0.5W(+Z) +
0.5WS
1 1.2 3 1.6 15 0.15 16 0.5 18 0.5
LOAD COMB 215 : 1.2DL + 1.6LR + 0.15W(-X) + 0.5W(+Z) +
0.5WP
1 1.2 3 1.6 15 0.15 16 0.5 19 0.5
LOAD COMB 216 : 1.2DL + 1.6LR + 0.15W(+X) + 0.5W(-Z) +
0.5WS
1 1.2 3 1.6 14 0.15 17 0.5 18 0.5
LOAD COMB 217 : 1.2DL + 1.6LR + 0.15W(+X) + 0.5W(-Z) +
0.5WP
1 1.2 3 1.6 14 0.15 17 0.5 19 0.5
LOAD COMB 218 : 1.2DL + 1.6LR + 0.15W(-X) + 0.5W(-Z) +
0.5WS
1 1.2 3 1.6 15 0.15 17 0.5 18 0.5
```

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LOAD COMB 219 : 1.2DL + 1.6LR + 0.15W(-X) + 0.5W(-Z) +
0.5WP
1 1.2 3 1.6 15 0.15 17 0.5 19 0.5
LOAD COMB 220 : 1.2DL + 0.5LL + 0.5LR + W(+X) + 0.3W(+Z)
+ WS
1 1.2 2 0.5 3 0.5 14 1.0 16 0.3 18 1.0
LOAD COMB 221 : 1.2DL + 0.5LL + 0.5LR + W(+X) + 0.3W(+Z)
+ WP
1 1.2 2 0.5 3 0.5 14 1.0 16 0.3 19 1.0
LOAD COMB 222 : 1.2DL + 0.5LL + 0.5LR + W(+X) + 0.3W(-Z)
+ WS
1 1.2 2 0.5 3 0.5 14 1.0 17 0.3 18 1.0
LOAD COMB 223 : 1.2DL + 0.5LL + 0.5LR + W(+X) + 0.3W(-Z)
+ WP
1 1.2 2 0.5 3 0.5 14 1.0 17 0.3 19 1.0
LOAD COMB 224 : 1.2DL + 0.5LL + 0.5LR + W(-X) + 0.3W(+Z)
+ WS
1 1.2 2 0.5 3 0.5 15 1.0 16 0.3 18 1.0
LOAD COMB 225 : 1.2DL + 0.5LL + 0.5LR + W(-X) + 0.3W(+Z)
+ WP
1 1.2 2 0.5 3 0.5 15 1.0 16 0.3 19 1.0
LOAD COMB 226 : 1.2DL + 0.5LL + 0.5LR + W(-X) + 0.3W(-Z)
+ WS
1 1.2 2 0.5 3 0.5 15 1.0 17 0.3 18 1.0
LOAD COMB 227 : 1.2DL + 0.5LL + 0.5LR + W(-X) + 0.3W(-Z)
+ WP
1 1.2 2 0.5 3 0.5 15 1.0 17 0.3 19 1.0
LOAD COMB 228 : 1.2DL + 0.5LL + 0.5LR + 0.3W(+X) + W(+Z)
+ WS
1 1.2 2 0.5 3 0.5 14 0.3 16 1.0 18 1.0
LOAD COMB 229 : 1.2DL + 0.5LL + 0.5LR + 0.3W(+X) + W(+Z)
+ WP
1 1.2 2 0.5 3 0.5 14 0.3 16 1.0 19 1.0
LOAD COMB 230 : 1.2DL + 0.5LL + 0.5LR + 0.3W(-X) + W(+Z)
+ WS
1 1.2 2 0.5 3 0.5 15 0.3 16 1.0 18 1.0
LOAD COMB 231 : 1.2DL + 0.5LL + 0.5LR + 0.3W(-X) + W(+Z)
+ WP
1 1.2 2 0.5 3 0.5 15 0.3 16 1.0 19 1.0
LOAD COMB 232 : 1.2DL + 0.5LL + 0.5LR + 0.3W(+X) + W(-Z)
+ WS
1 1.2 2 0.5 3 0.5 14 0.3 17 1.0 18 1.0
LOAD COMB 233 : 1.2DL + 0.5LL + 0.5LR + 0.3W(+X) + W(-Z)
+ WP
1 1.2 2 0.5 3 0.5 14 0.3 17 1.0 19 1.0
LOAD COMB 234 : 1.2DL + 0.5LL + 0.5LR + 0.3W(-X) + W(-Z)
+ WS
1 1.2 2 0.5 3 0.5 15 0.3 17 1.0 18 1.0
LOAD COMB 235 : 1.2DL + 0.5LL + 0.5LR + 0.3W(-X) + W(-Z)
+ WP
1 1.2 2 0.5 3 0.5 15 0.3 17 1.0 19 1.0
LOAD COMB 236 : 1.53DL + 0.5LL + E(+X+E)
1 1.53 2 0.5 4 1.0
LOAD COMB 237 : 1.53DL + 0.5LL + E(+X-E)
1 1.53 2 0.5 5 1.0
LOAD COMB 238 : 1.53DL + 0.5LL + E(-X+E)
1 1.53 2 0.5 6 1.0
LOAD COMB 239 : 1.53DL + 0.5LL + E(-X-E)
1 1.53 2 0.5 7 1.0
LOAD COMB 240 : 1.53DL + 0.5LL + E(+Z+E)
1 1.53 2 0.5 8 1.0
LOAD COMB 241 : 1.53DL + 0.5LL + E(+Z-E)
1 1.53 2 0.5 9 1.0
LOAD COMB 242 : 1.53DL + 0.5LL + E(-Z+E)
1 1.53 2 0.5 10 1.0
LOAD COMB 243 : 1.53DL + 0.5LL + E(-Z-E)
1 1.53 2 0.5 11 1.0
LOAD COMB 244 : 1.53DL + 0.5LL + RS(X)
1 1.53 2 0.5 12 1.0
LOAD COMB 245 : 1.53DL + 0.5LL + RS(Z)
1 1.53 2 0.5 13 1.0
LOAD COMB 246 : 0.57DL + E(+X+E)
1 0.57 4 1.0
LOAD COMB 247 : 0.57DL + E(+X-E)
1 0.57 5 1.0
LOAD COMB 248 : 0.57DL + E(-X+E)
1 0.57 6 1.0
LOAD COMB 249 : 0.57DL + E(-X-E)
1 0.57 7 1.0
LOAD COMB 250 : 0.57DL + E(+Z+E)
1 0.57 8 1.0
LOAD COMB 251 : 0.57DL + E(+Z-E)
1 0.57 9 1.0
LOAD COMB 252 : 0.57DL + E(-Z+E)
1 0.57 10 1.0
LOAD COMB 253 : 0.57DL + E(-Z-E)
1 0.57 11 1.0
LOAD COMB 254 : 0.57DL + RS(X)
1 0.57 12 1.0
LOAD COMB 255 : 0.57DL + RS(Z)
1 0.57 13 1.0
PDELTA ANALYSIS SMALLDELTA
**************************************
DEFINE ENVELOPE
101 TO 130 ENVELOPE 1 TYPE SERVICEABILITY
201 TO 255 ENVELOPE 2 TYPE STRENGTH
101 TO 104 ENVELOPE 3 TYPE SERVICEABILITY
105 TO 130 ENVELOPE 4 TYPE SERVICEABILITY
END DEFINE ENVELOPE
**************************************
FINISH
```

## MAT FOOTING

```
STAAD SPACE
START JOB INFORMATION
ENGINEER DATE 28-May-18
ENGINEER NAME GVPasiona
END JOB INFORMATION
INPUT WIDTH 79
SET NL 1000
UNIT METER KN
JOINT COORDINATES
1 0 -1 0; 2 6 -1 0; 3 12 -1 0; 4 0 -1 2.9; 5 6 -1 2.9; 6
6 -1 6; 7 12 -1 6;
8 6 -1 10.5; 9 12 -1 10.5; 10 6 -1 16.5; 11 12 -1 16.5;
12 0 -1 -0.5;
13 6 -1 -0.5; 14 12 -1 -0.5; 15 -2 -1 0; 16 -2 -1 2.9; 17
-2 -1 -0.5;
18 0 -1 4.9; 19 6 -1 4.9; 20 -2 -1 4.9; 21 4 -1 6; 22 4 -
1 10.5; 23 4 -1 16.5;
24 4 -1 4.9; 25 14 -1 0; 26 14 -1 6; 27 14 -1 10.5; 28 14
-1 16.5;
29 14 -1 -0.5; 30 6 -1 18.5; 31 12 -1 18.5; 32 4 -1 18.5;
33 14 -1 18.5;
34 4 -1 0; 35 4 -1 2.9; 36 4 -1 -0.5; 37 12 -1 2.9; 38 14
-1 2.9; 39 12 -1 4.9;
40 14 -1 4.9; 41 -2 -1 -0.25; 42 -1.75 -1 -0.25; 43 -1.75
-1 -0.5;
44 -1.75 -1 0; 45 -1.5 -1 -0.25; 46 -1.5 -1 -0.5; 47 -1.5
-1 0;
48 -1.25 -1 -0.25; 49 -1.25 -1 -0.5; 50 -1.25 -1 0; 51 -1
-1 -0.25;
52 -1 -1 -0.5; 53 -1 -1 0; 54 -0.75 -1 -0.25; 55 -0.75 -1
-0.5; 56 -0.75 -1 0;
57 -0.5 -1 -0.25; 58 -0.5 -1 -0.5; 59 -0.5 -1 0; 60 -0.25
-1 -0.25;
61 -0.25 -1 -0.5; 62 -0.25 -1 0; 63 0 -1 -0.25; 64 4 -1 -
0.25;
65 4.25 -1 -0.25; 66 4.25 -1 -0.5; 67 4.25 -1 0; 68 4.5 -
1 -0.25;
69 4.5 -1 -0.5; 70 4.5 -1 0; 71 4.75 -1 -0.25; 72 4.75 -1
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74 5 -1 -0.25; 75 5 -1 -0.5; 76 5 -1 0; 77 5.25 -1 -0.25;
78 5.25 -1 -0.5;
79 5.25 -1 0; 80 5.5 -1 -0.25; 81 5.5 -1 -0.5; 82 5.5 -1
0; 83 5.75 -1 -0.25;
84 5.75 -1 -0.5; 85 5.75 -1 0; 86 6 -1 -0.25; 87 12 -1 -
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12.5 -1 -0.25;
92 12.5 -1 -0.5; 93 12.5 -1 0; 94 12.75 -1 -0.25; 95
12.75 -1 -0.5;
96 12.75 -1 0; 97 13 -1 -0.25; 98 13 -1 -0.5; 99 13 -1 0;
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101 13.25 -1 -0.5; 102 13.25 -1 0; 103 13.5 -1 -0.25; 104
13.5 -1 -0.5;
105 13.5 -1 0; 106 13.75 -1 -0.25; 107 13.75 -1 -0.5; 108
13.75 -1 0;
109 14 -1 -0.25; 110 -2 -1 0.263636; 111 -1.75 -1
0.263636; 112 -2 -1 0.527273;
113 -1.75 -1 0.527273; 114 -2 -1 0.790909; 115 -1.75 -1
0.790909;
116 -2 -1 1.05455; 117 -1.75 -1 1.05455; 118 -2 -1
1.31818;
119 -1.75 -1 1.31818; 120 -2 -1 1.58182; 121 -1.75 -1
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122 -2 -1 1.84545; 123 -1.75 -1 1.84545; 124 -2 -1
2.10909;
125 -1.75 -1 2.10909; 126 -2 -1 2.37273; 127 -1.75 -1
2.37273;
128 -2 -1 2.63636; 129 -1.75 -1 2.63636; 130 -1.75 -1
2.9;
131 -1.5 -1 0.263636; 132 -1.5 -1 0.527273; 133 -1.5 -1
0.790909;
134 -1.5 -1 1.05455; 135 -1.5 -1 1.31818; 136 -1.5 -1
1.58182;
137 -1.5 -1 1.84545; 138 -1.5 -1 2.10909; 139 -1.5 -1
2.37273;
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0.263636;
143 -1.25 -1 0.527273; 144 -1.25 -1 0.790909; 145 -1.25 -
1 1.05455;
146 -1.25 -1 1.31818; 147 -1.25 -1 1.58182; 148 -1.25 -1
1.84545;
149 -1.25 -1 2.10909; 150 -1.25 -1 2.37273; 151 -1.25 -1
2.63636;
152 -1.25 -1 2.9; 153 -1 -1 0.263636; 154 -1 -1 0.527273;
155 -1 -1 0.790909;
156 -1 -1 1.05455; 157 -1 -1 1.31818; 158 -1 -1 1.58182;
159 -1 -1 1.84545;
160 -1 -1 2.10909; 161 -1 -1 2.37273; 162 -1 -1 2.63636;
163 -1 -1 2.9;
164 -0.75 -1 0.263636; 165 -0.75 -1 0.527273; 166 -0.75 -
1 0.790909;
167 -0.75 -1 1.05455; 168 -0.75 -1 1.31818; 169 -0.75 -1
1.58182;
170 -0.75 -1 1.84545; 171 -0.75 -1 2.10909; 172 -0.75 -1
2.37273;
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0.263636;
176 -0.5 -1 0.527273; 177 -0.5 -1 0.790909; 178 -0.5 -1
1.05455;
```

GILBERT V. PASIONA
CIVIL ENGINEER

179 -0.5 -1 1.31818; 180 -0.5 -1 1.58182; 181 -0.5 -1 1.84545;
182 -0.5 -1 2.10909; 183 -0.5 -1 2.37273; 184 -0.5 -1 2.63636; 185 -0.5 -1 2.9;
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203 0 -1 1.84545; 204 0 -1 2.10909; 205 0 -1 2.37273; 206 0 -1 2.63636;
207 4 -1 0.263636; 208 4.25 -1 0.263636; 209 4 -1 0.527273;
210 4.25 -1 0.527273; 211 4 -1 0.790909; 212 4.25 -1 0.790909;
213 4 -1 1.05455; 214 4.25 -1 1.05455; 215 4 -1 1.31818; 216 4.25 -1 1.31818;
217 4 -1 1.58182; 218 4.25 -1 1.58182; 219 4 -1 1.84545; 220 4.25 -1 1.84545;
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258 5 -1 2.37273; 259 5 -1 2.63636; 260 5 -1 2.9; 261 5.25 -1 0.263636;
262 5.25 -1 0.527273; 263 5.25 -1 0.790909; 264 5.25 -1 1.05455;
265 5.25 -1 1.31818; 266 5.25 -1 1.58182; 267 5.25 -1 1.84545;
268 5.25 -1 2.10909; 269 5.25 -1 2.37273; 270 5.25 -1 2.63636; 271 5.25 -1 2.9;
272 5.5 -1 0.263636; 273 5.5 -1 0.527273; 274 5.5 -1 0.790909;
275 5.5 -1 1.05455; 276 5.5 -1 1.31818; 277 5.5 -1 1.58182; 278 5.5 -1 1.84545;
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310 12 -1 1.05455; 311 12.25 -1 1.05455; 312 12 -1 1.31818;
313 12.25 -1 1.31818; 314 12 -1 1.58182; 315 12.25 -1 1.58182;
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322 12 -1 2.63636; 323 12.25 -1 2.63636; 324 12.25 -1 2.9;
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367 13.25 -1 2.63636; 368 13.25 -1 2.9; 369 13.5 -1 0.263636;
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373 13.5 -1 1.31818; 374 13.5 -1 1.58182; 375 13.5 -1 1.84545;
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534 6 -1 3.15; 535 6 -1 3.4; 536 6 -1 3.65; 537 6 -1 3.9; 538 6 -1 4.15;
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547 4.25 -1 17.25; 548 4 -1 17.5; 549 4.25 -1 17.5; 550 4 -1 17.75;
551 4.25 -1 17.75; 552 4 -1 18; 553 4.25 -1 18; 554 4 -1 18.25;

**GILBERT V. PASIONA**
CIVIL ENGINEER

555 4.25 -1 18.25; 556 4.25 -1 18.5; 557 4.5 -1 16.75; 558 4.5 -1 16.5;
559 4.5 -1 17; 560 4.5 -1 17.25; 561 4.5 -1 17.5; 562 4.5 -1 17.75;
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575 5 -1 16.75; 576 5 -1 16.5; 577 5 -1 17; 578 5 -1 17.25; 579 5 -1 17.5;
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589 5.25 -1 17.75; 590 5.25 -1 18; 591 5.25 -1 18.25; 592 5.25 -1 18.5;
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605 5.75 -1 17.25; 606 5.75 -1 17.5; 607 5.75 -1 17.75; 608 5.75 -1 18;
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626 12 -1 4.15; 627 12.25 -1 4.15; 628 12 -1 4.4; 629 12.25 -1 4.4;
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634 12.5 -1 3.4; 635 12.5 -1 3.65; 636 12.5 -1 3.9; 637 12.5 -1 4.15;
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646 12.75 -1 4.4; 647 12.75 -1 4.65; 648 12.75 -1 4.9; 649 13 -1 3.15;
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692 12.25 -1 17; 693 12 -1 17.25; 694 12.25 -1 17.25; 695 12 -1 17.5;
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733 13.25 -1 17; 734 13.25 -1 17.25; 735 13.25 -1 17.5; 736 13.25 -1 17.75;
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741 13.5 -1 16.5; 742 13.5 -1 17; 743 13.5 -1 17.25; 744 13.5 -1 17.5;
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769 0.5 -1 -0.5; 770 0.5 -1 0; 771 0.75 -1 -0.25; 772 0.75 -1 -0.5;
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778 1.25 -1 -0.5; 779 1.25 -1 0; 780 1.5 -1 -0.25; 781 1.5 -1 -0.5;
782 1.5 -1 0; 783 1.75 -1 -0.25; 784 1.75 -1 -0.5; 785 1.75 -1 0;
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812 6.25 -1 0; 813 6.5 -1 -0.25; 814 6.5 -1 -0.5; 815 6.5 -1 0;
816 6.75 -1 -0.25; 817 6.75 -1 -0.5; 818 6.75 -1 0; 819 7 -1 -0.25;
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829 7.75 -1 -0.5; 830 7.75 -1 0; 831 8 -1 -0.25; 832 8 -1 -0.5; 833 8 -1 0;
834 8.25 -1 -0.25; 835 8.25 -1 -0.5; 836 8.25 -1 0; 837 8.5 -1 -0.25;
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842 8.75 -1 0; 843 9 -1 -0.25; 844 9 -1 -0.5; 845 9 -1 0; 846 9.25 -1 -0.25;
847 9.25 -1 -0.5; 848 9.25 -1 0; 849 9.5 -1 -0.25; 850 9.5 -1 -0.5;
851 9.5 -1 0; 852 9.75 -1 -0.25; 853 9.75 -1 -0.5; 854 9.75 -1 0;
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859 10.25 -1 -0.5; 860 10.25 -1 0; 861 10.5 -1 -0.25; 862 10.5 -1 -0.5;
863 10.5 -1 0; 864 10.75 -1 -0.25; 865 10.75 -1 -0.5; 866 10.75 -1 0;
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875 11.5 -1 0; 876 11.75 -1 -0.25; 877 11.75 -1 -0.5; 878 11.75 -1 0;
879 0.25 -1 0.263636; 880 0.25 -1 0.527273; 881 0.25 -1 0.790909;
882 0.25 -1 1.05455; 883 0.25 -1 1.31818; 884 0.25 -1 1.58182;
885 0.25 -1 1.84545; 886 0.25 -1 2.10909; 887 0.25 -1 2.37273;
888 0.25 -1 2.63636; 889 0.25 -1 2.9; 890 0.5 -1 0.263636; 891 0.5 -1 0.527273;
892 0.5 -1 0.790909; 893 0.5 -1 1.05455; 894 0.5 -1 1.31818;
895 0.5 -1 1.58182; 896 0.5 -1 1.84545; 897 0.5 -1 2.10909; 898 0.5 -1 2.37273;
899 0.5 -1 2.63636; 900 0.5 -1 2.9; 901 0.75 -1 0.263636; 902 0.75 -1 0.527273;
903 0.75 -1 0.790909; 904 0.75 -1 1.05455; 905 0.75 -1 1.31818;
906 0.75 -1 1.58182; 907 0.75 -1 1.84545; 908 0.75 -1 2.10909;
909 0.75 -1 2.37273; 910 0.75 -1 2.63636; 911 0.75 -1 2.9; 912 1 -1 0.263636;
913 1 -1 0.527273; 914 1 -1 0.790909; 915 1 -1 1.05455; 916 1 -1 1.31818;
917 1 -1 1.58182; 918 1 -1 1.84545; 919 1 -1 2.10909; 920 1 -1 2.37273;
921 1 -1 2.63636; 922 1 -1 2.9; 923 1.25 -1 0.263636; 924 1.25 -1 0.527273;
925 1.25 -1 0.790909; 926 1.25 -1 1.05455; 927 1.25 -1 1.31818;
928 1.25 -1 1.58182; 929 1.25 -1 1.84545; 930 1.25 -1 2.10909;
931 1.25 -1 2.37273; 932 1.25 -1 2.63636; 933 1.25 -1 2.9; 934 1.5 -1 0.263636;
935 1.5 -1 0.527273; 936 1.5 -1 0.790909; 937 1.5 -1 1.05455;
938 1.5 -1 1.31818; 939 1.5 -1 1.58182; 940 1.5 -1 1.84545; 941 1.5 -1 2.10909;
942 1.5 -1 2.37273; 943 1.5 -1 2.63636; 944 1.5 -1 2.9; 945 1.75 -1 0.263636;
946 1.75 -1 0.527273; 947 1.75 -1 0.790909; 948 1.75 -1 1.05455;
949 1.75 -1 1.31818; 950 1.75 -1 1.58182; 951 1.75 -1 1.84545;
952 1.75 -1 2.10909; 953 1.75 -1 2.37273; 954 1.75 -1 2.63636; 955 1.75 -1 2.9;
956 2 -1 0.263636; 957 2 -1 0.527273; 958 2 -1 0.790909; 959 2 -1 1.05455;
960 2 -1 1.31818; 961 2 -1 1.58182; 962 2 -1 1.84545; 963 2 -1 2.10909;

**GILBERT V. PASIONA**
CIVIL ENGINEER

964 2 -1 2.37273; 965 2 -1 2.63636; 966 2 -1 2.9; 967 2.25 -1 0.263636;
968 2.25 -1 0.527273; 969 2.25 -1 0.790909; 970 2.25 -1 1.05455;
971 2.25 -1 1.31818; 972 2.25 -1 1.58182; 973 2.25 -1 1.84545;
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985 2.5 -1 2.10909; 986 2.5 -1 2.37273; 987 2.5 -1 2.63636; 988 2.5 -1 2.9;
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992 2.75 -1 1.05455; 993 2.75 -1 1.31818; 994 2.75 -1 1.58182;
995 2.75 -1 1.84545; 996 2.75 -1 2.10909; 997 2.75 -1 2.37273;
998 2.75 -1 2.63636; 999 2.75 -1 2.9; 1000 3 -1 0.263636;
1001 3 -1 0.527273;
1002 3 -1 0.790909; 1003 3 -1 1.05455; 1004 3 -1 1.31818;
1005 3 -1 1.58182;
1006 3 -1 1.84545; 1007 3 -1 2.10909; 1008 3 -1 2.37273;
1009 3 -1 2.63636;
1010 3 -1 2.9; 1011 3.25 -1 0.263636; 1012 3.25 -1 0.527273;
1013 3.25 -1 0.790909; 1014 3.25 -1 1.05455; 1015 3.25 -1 1.31818;
1016 3.25 -1 1.58182; 1017 3.25 -1 1.84545; 1018 3.25 -1 2.10909;
1019 3.25 -1 2.37273; 1020 3.25 -1 2.63636; 1021 3.25 -1 2.9;
1022 3.5 -1 0.263636; 1023 3.5 -1 0.527273; 1024 3.5 -1 0.790909;
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1076 6.75 -1 2.9; 1077 7 -1 0.263636; 1078 7 -1 0.527273;
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1080 7 -1 1.05455; 1081 7 -1 1.31818; 1082 7 -1 1.58182;
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1227 10.25 -1 2.10909; 1228 10.25 -1 2.37273; 1229 10.25 -1 2.63636;
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1261 11 -1 2.37273; 1262 11 -1 2.63636; 1263 11 -1 2.9;
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1265 11.25 -1 0.527273; 1266 11.25 -1 0.790909; 1267 11.25 -1 1.05455;
1268 11.25 -1 1.31818; 1269 11.25 -1 1.58182; 1270 11.25 -1 1.84545;
1271 11.25 -1 2.10909; 1272 11.25 -1 2.37273; 1273 11.25 -1 2.63636;
1274 11.25 -1 2.9; 1275 11.5 -1 0.263636; 1276 11.5 -1 0.527273;
1277 11.5 -1 0.790909; 1278 11.5 -1 1.05455; 1279 11.5 -1 1.31818;
1280 11.5 -1 1.58182; 1281 11.5 -1 1.84545; 1282 11.5 -1 2.10909;
1283 11.5 -1 2.37273; 1284 11.5 -1 2.63636; 1285 11.5 -1 2.9;
1286 11.75 -1 0.263636; 1287 11.75 -1 0.527273; 1288 11.75 -1 0.790909;
1289 11.75 -1 1.05455; 1290 11.75 -1 1.31818; 1291 11.75 -1 1.58182;

**GILBERT V. PASIONA**
CIVIL ENGINEER

1292 11.75 -1 1.84545; 1293 11.75 -1 2.10909; 1294 11.75 -1 2.37273;
1295 11.75 -1 2.63636; 1296 11.75 -1 2.9; 1297 0.25 -1 3.15; 1298 0.25 -1 3.4;
1299 0.25 -1 3.65; 1300 0.25 -1 3.9; 1301 0.25 -1 4.15; 1302 0.25 -1 4.4;
1303 0.25 -1 4.65; 1304 0.25 -1 4.9; 1305 0.5 -1 3.15; 1306 0.5 -1 3.4;
1307 0.5 -1 3.65; 1308 0.5 -1 3.9; 1309 0.5 -1 4.15; 1310 0.5 -1 4.4;
1311 0.5 -1 4.65; 1312 0.5 -1 4.9; 1313 0.75 -1 3.15; 1314 0.75 -1 3.4;
1315 0.75 -1 3.65; 1316 0.75 -1 3.9; 1317 0.75 -1 4.15; 1318 0.75 -1 4.4;
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1323 1 -1 3.65; 1324 1 -1 3.9; 1325 1 -1 4.15; 1326 1 -1 4.4; 1327 1 -1 4.65;
1328 1 -1 4.9; 1329 1.25 -1 3.15; 1330 1.25 -1 3.4; 1331 1.25 -1 3.65;
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1447 7 -1 4.65; 1448 7 -1 4.9; 1449 7.25 -1 3.15; 1450 7.25 -1 3.4;
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1475 8 -1 3.65; 1476 8 -1 3.9; 1477 8 -1 4.15; 1478 8 -1 4.4; 1479 8 -1 4.65;
1480 8 -1 4.9; 1481 8.25 -1 3.15; 1482 8.25 -1 3.4; 1483 8.25 -1 3.65;
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1601 4 -1 5.175; 1602 4.25 -1 5.175; 1603 4 -1 5.45; 1604 4.25 -1 5.45;
1605 4 -1 5.725; 1606 4.25 -1 5.725; 1607 4.25 -1 6; 1608 4.5 -1 5.175;
1609 4.5 -1 5.45; 1610 4.5 -1 5.725; 1611 4.5 -1 6; 1612 4.75 -1 5.175;
1613 4.75 -1 5.45; 1614 4.75 -1 5.725; 1615 4.75 -1 6; 1616 5 -1 5.175;
1617 5 -1 5.45; 1618 5 -1 5.725; 1619 5 -1 6; 1620 5.25 -1 5.175;
1621 5.25 -1 5.45; 1622 5.25 -1 5.725; 1623 5.25 -1 6; 1624 5.5 -1 5.175;
1625 5.5 -1 5.45; 1626 5.5 -1 5.725; 1627 5.5 -1 6; 1628 5.75 -1 5.175;
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1641 12.25 -1 6; 1642 12.5 -1 5.175; 1643 12.5 -1 5.45; 1644 12.5 -1 5.725;
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1669 6.25 -1 5.175; 1670 6.25 -1 5.45; 1671 6.25 -1 5.725; 1672 6.25 -1 6;
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1677 6.75 -1 5.175; 1678 6.75 -1 5.45; 1679 6.75 -1 5.725; 1680 6.75 -1 6;
1681 7 -1 5.175; 1682 7 -1 5.45; 1683 7 -1 5.725; 1684 7 -1 6;
1685 7.25 -1 5.175; 1686 7.25 -1 5.45; 1687 7.25 -1 5.725; 1688 7.25 -1 6;
1689 7.5 -1 5.175; 1690 7.5 -1 5.45; 1691 7.5 -1 5.725; 1692 7.5 -1 6;
1693 7.75 -1 5.175; 1694 7.75 -1 5.45; 1695 7.75 -1 5.725; 1696 7.75 -1 6;
1697 8 -1 5.175; 1698 8 -1 5.45; 1699 8 -1 5.725; 1700 8 -1 6;
1701 8.25 -1 5.175; 1702 8.25 -1 5.45; 1703 8.25 -1 5.725; 1704 8.25 -1 6;

**GILBERT V. PASIONA**
CIVIL ENGINEER

1705 8.5 -1 5.175; 1706 8.5 -1 5.45; 1707 8.5 -1 5.725; 1708 8.5 -1 6;
1709 8.75 -1 5.175; 1710 8.75 -1 5.45; 1711 8.75 -1 5.725; 1712 8.75 -1 6;
1713 9 -1 5.175; 1714 9 -1 5.45; 1715 9 -1 5.725; 1716 9 -1 6;
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1725 9.75 -1 5.175; 1726 9.75 -1 5.45; 1727 9.75 -1 5.725; 1728 9.75 -1 6;
1729 10 -1 5.175; 1730 10 -1 5.45; 1731 10 -1 5.725; 1732 10 -1 6;
1733 10.25 -1 5.175; 1734 10.25 -1 5.45; 1735 10.25 -1 5.725; 1736 10.25 -1 6;
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1741 10.75 -1 5.175; 1742 10.75 -1 5.45; 1743 10.75 -1 5.725; 1744 10.75 -1 6;
1745 11 -1 5.175; 1746 11 -1 5.45; 1747 11 -1 5.725; 1748 11 -1 6;
1749 11.25 -1 5.175; 1750 11.25 -1 5.45; 1751 11.25 -1 5.725; 1752 11.25 -1 6;
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1774 4.25 -1 7.75; 1775 4 -1 8; 1776 4.25 -1 8; 1777 4 -1 8.25;
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1782 4.25 -1 8.75; 1783 4 -1 9; 1784 4.25 -1 9; 1785 4 -1 9.25;
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1790 4.25 -1 9.75; 1791 4 -1 10; 1792 4.25 -1 10; 1793 4 -1 10.25;
1794 4.25 -1 10.25; 1795 4.25 -1 10.5; 1796 4.5 -1 6.25; 1797 4.5 -1 6.5;
1798 4.5 -1 6.75; 1799 4.5 -1 7; 1800 4.5 -1 7.25; 1801 4.5 -1 7.5;
1802 4.5 -1 7.75; 1803 4.5 -1 8; 1804 4.5 -1 8.25; 1805 4.5 -1 8.5;
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1844 5 -1 9.25; 1845 5 -1 9.5; 1846 5 -1 9.75; 1847 5 -1 10; 1848 5 -1 10.25;
1849 5 -1 10.5; 1850 5.25 -1 6.25; 1851 5.25 -1 6.5; 1852 5.25 -1 6.75;
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1857 5.25 -1 8; 1858 5.25 -1 8.25; 1859 5.25 -1 8.5; 1860 5.25 -1 8.75;
1861 5.25 -1 9; 1862 5.25 -1 9.25; 1863 5.25 -1 9.5; 1864 5.25 -1 9.75;
1865 5.25 -1 10; 1866 5.25 -1 10.25; 1867 5.25 -1 10.5; 1868 5.5 -1 6.25;
1869 5.5 -1 6.5; 1870 5.5 -1 6.75; 1871 5.5 -1 7; 1872 5.5 -1 7.25;
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1901 5.75 -1 10; 1902 5.75 -1 10.25; 1903 5.75 -1 10.5; 1904 6 -1 6.25;
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1910 6 -1 7.75; 1911 6 -1 8; 1912 6 -1 8.25; 1913 6 -1 8.5; 1914 6 -1 8.75;
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1920 6 -1 10.25; 1921 12 -1 6.25; 1922 12.25 -1 6.25; 1923 12 -1 6.5;
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1956 12.5 -1 6.25; 1957 12.5 -1 6.5; 1958 12.5 -1 6.75; 1959 12.5 -1 7;
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1964 12.5 -1 8.25; 1965 12.5 -1 8.5; 1966 12.5 -1 8.75; 1967 12.5 -1 9;
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1988 12.75 -1 9.75; 1989 12.75 -1 10; 1990 12.75 -1 10.25; 1991 12.75 -1 10.5;
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2012 13.25 -1 6.75; 2013 13.25 -1 7; 2014 13.25 -1 7.25; 2015 13.25 -1 7.5;
2016 13.25 -1 7.75; 2017 13.25 -1 8; 2018 13.25 -1 8.25; 2019 13.25 -1 8.5;
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2068 14 -1 7.25; 2069 14 -1 7.5; 2070 14 -1 7.75; 2071 14 -1 8;
2072 14 -1 8.25; 2073 14 -1 8.5; 2074 14 -1 8.75; 2075 14 -1 9;
2076 14 -1 9.25; 2077 14 -1 9.5; 2078 14 -1 9.75; 2079 14 -1 10;
2080 14 -1 10.25; 2081 6.25 -1 6.25; 2082 6.25 -1 6.5; 2083 6.25 -1 6.75;
2084 6.25 -1 7; 2085 6.25 -1 7.25; 2086 6.25 -1 7.5; 2087 6.25 -1 7.75;
2088 6.25 -1 8; 2089 6.25 -1 8.25; 2090 6.25 -1 8.5; 2091 6.25 -1 8.75;
2092 6.25 -1 9; 2093 6.25 -1 9.25; 2094 6.25 -1 9.5; 2095 6.25 -1 9.75;
2096 6.25 -1 10; 2097 6.25 -1 10.25; 2098 6.25 -1 10.5; 2099 6.5 -1 6.25;
2100 6.5 -1 6.5; 2101 6.5 -1 6.75; 2102 6.5 -1 7; 2103 6.5 -1 7.25;
2104 6.5 -1 7.5; 2105 6.5 -1 7.75; 2106 6.5 -1 8; 2107 6.5 -1 8.25;
2108 6.5 -1 8.5; 2109 6.5 -1 8.75; 2110 6.5 -1 9; 2111 6.5 -1 9.25;
2112 6.5 -1 9.5; 2113 6.5 -1 9.75; 2114 6.5 -1 10; 2115 6.5 -1 10.25;
2116 6.5 -1 10.5; 2117 6.75 -1 6.25; 2118 6.75 -1 6.5; 2119 6.75 -1 6.75;

**GILBERT V. PASIONA**
CIVIL ENGINEER

2120 6.75 -1 7; 2121 6.75 -1 7.25; 2122 6.75 -1 7.5; 2123 6.75 -1 7.75;
2124 6.75 -1 8; 2125 6.75 -1 8.25; 2126 6.75 -1 8.5; 2127 6.75 -1 8.75;
2128 6.75 -1 9; 2129 6.75 -1 9.25; 2130 6.75 -1 9.5; 2131 6.75 -1 9.75;
2132 6.75 -1 10; 2133 6.75 -1 10.25; 2134 6.75 -1 10.5; 2135 7 -1 6.25;
2136 7 -1 6.5; 2137 7 -1 6.75; 2138 7 -1 7; 2139 7 -1 7.25; 2140 7 -1 7.5;
2141 7 -1 7.75; 2142 7 -1 8; 2143 7 -1 8.25; 2144 7 -1 8.5; 2145 7 -1 8.75;
2146 7 -1 9; 2147 7 -1 9.25; 2148 7 -1 9.5; 2149 7 -1 9.75; 2150 7 -1 10;
2151 7 -1 10.25; 2152 7 -1 10.5; 2153 7.25 -1 6.25; 2154 7.25 -1 6.5;
2155 7.25 -1 6.75; 2156 7.25 -1 7; 2157 7.25 -1 7.25; 2158 7.25 -1 7.5;
2159 7.25 -1 7.75; 2160 7.25 -1 8; 2161 7.25 -1 8.25; 2162 7.25 -1 8.5;
2163 7.25 -1 8.75; 2164 7.25 -1 9; 2165 7.25 -1 9.25; 2166 7.25 -1 9.5;
2167 7.25 -1 9.75; 2168 7.25 -1 10; 2169 7.25 -1 10.25; 2170 7.25 -1 10.5;
2171 7.5 -1 6.25; 2172 7.5 -1 6.5; 2173 7.5 -1 6.75; 2174 7.5 -1 7;
2175 7.5 -1 7.25; 2176 7.5 -1 7.5; 2177 7.5 -1 7.75; 2178 7.5 -1 8;
2179 7.5 -1 8.25; 2180 7.5 -1 8.5; 2181 7.5 -1 8.75; 2182 7.5 -1 9;
2183 7.5 -1 9.25; 2184 7.5 -1 9.5; 2185 7.5 -1 9.75; 2186 7.5 -1 10;
2187 7.5 -1 10.25; 2188 7.5 -1 10.5; 2189 7.75 -1 6.25; 2190 7.75 -1 6.5;
2191 7.75 -1 6.75; 2192 7.75 -1 7; 2193 7.75 -1 7.25; 2194 7.75 -1 7.5;
2195 7.75 -1 7.75; 2196 7.75 -1 8; 2197 7.75 -1 8.25; 2198 7.75 -1 8.5;
2199 7.75 -1 8.75; 2200 7.75 -1 9; 2201 7.75 -1 9.25; 2202 7.75 -1 9.5;
2203 7.75 -1 9.75; 2204 7.75 -1 10; 2205 7.75 -1 10.25; 2206 7.75 -1 10.5;
2207 8 -1 6.25; 2208 8 -1 6.5; 2209 8 -1 6.75; 2210 8 -1 7; 2211 8 -1 7.25;
2212 8 -1 7.5; 2213 8 -1 7.75; 2214 8 -1 8; 2215 8 -1 8.25; 2216 8 -1 8.5;
2217 8 -1 8.75; 2218 8 -1 9; 2219 8 -1 9.25; 2220 8 -1 9.5; 2221 8 -1 9.75;
2222 8 -1 10; 2223 8 -1 10.25; 2224 8 -1 10.5; 2225 8.25 -1 6.25;
2226 8.25 -1 6.5; 2227 8.25 -1 6.75; 2228 8.25 -1 7; 2229 8.25 -1 7.25;
2230 8.25 -1 7.5; 2231 8.25 -1 7.75; 2232 8.25 -1 8; 2233 8.25 -1 8.25;
2234 8.25 -1 8.5; 2235 8.25 -1 8.75; 2236 8.25 -1 9; 2237 8.25 -1 9.25;
2238 8.25 -1 9.5; 2239 8.25 -1 9.75; 2240 8.25 -1 10; 2241 8.25 -1 10.25;
2242 8.25 -1 10.5; 2243 8.5 -1 6.25; 2244 8.5 -1 6.5; 2245 8.5 -1 6.75;
2246 8.5 -1 7; 2247 8.5 -1 7.25; 2248 8.5 -1 7.5; 2249 8.5 -1 7.75;
2250 8.5 -1 8; 2251 8.5 -1 8.25; 2252 8.5 -1 8.5; 2253 8.5 -1 8.75;
2254 8.5 -1 9; 2255 8.5 -1 9.25; 2256 8.5 -1 9.5; 2257 8.5 -1 9.75;
2258 8.5 -1 10; 2259 8.5 -1 10.25; 2260 8.5 -1 10.5; 2261 8.75 -1 6.25;
2262 8.75 -1 6.5; 2263 8.75 -1 6.75; 2264 8.75 -1 7; 2265 8.75 -1 7.25;
2266 8.75 -1 7.5; 2267 8.75 -1 7.75; 2268 8.75 -1 8; 2269 8.75 -1 8.25;
2270 8.75 -1 8.5; 2271 8.75 -1 8.75; 2272 8.75 -1 9; 2273 8.75 -1 9.25;
2274 8.75 -1 9.5; 2275 8.75 -1 9.75; 2276 8.75 -1 10; 2277 8.75 -1 10.25;
2278 8.75 -1 10.5; 2279 9 -1 6.25; 2280 9 -1 6.5; 2281 9 -1 6.75; 2282 9 -1 7;
2283 9 -1 7.25; 2284 9 -1 7.5; 2285 9 -1 7.75; 2286 9 -1 8; 2287 9 -1 8.25;
2288 9 -1 8.5; 2289 9 -1 8.75; 2290 9 -1 9; 2291 9 -1 9.25; 2292 9 -1 9.5;
2293 9 -1 9.75; 2294 9 -1 10; 2295 9 -1 10.25; 2296 9 -1 10.5;
2297 9.25 -1 6.25; 2298 9.25 -1 6.5; 2299 9.25 -1 6.75; 2300 9.25 -1 7;
2301 9.25 -1 7.25; 2302 9.25 -1 7.5; 2303 9.25 -1 7.75; 2304 9.25 -1 8;
2305 9.25 -1 8.25; 2306 9.25 -1 8.5; 2307 9.25 -1 8.75; 2308 9.25 -1 9;
2309 9.25 -1 9.25; 2310 9.25 -1 9.5; 2311 9.25 -1 9.75; 2312 9.25 -1 10;
2313 9.25 -1 10.25; 2314 9.25 -1 10.5; 2315 9.5 -1 6.25; 2316 9.5 -1 6.5;
2317 9.5 -1 6.75; 2318 9.5 -1 7; 2319 9.5 -1 7.25; 2320 9.5 -1 7.5;
2321 9.5 -1 7.75; 2322 9.5 -1 8; 2323 9.5 -1 8.25; 2324 9.5 -1 8.5;
2325 9.5 -1 8.75; 2326 9.5 -1 9; 2327 9.5 -1 9.25; 2328 9.5 -1 9.5;
2329 9.5 -1 9.75; 2330 9.5 -1 10; 2331 9.5 -1 10.25; 2332 9.5 -1 10.5;
2333 9.75 -1 6.25; 2334 9.75 -1 6.5; 2335 9.75 -1 6.75; 2336 9.75 -1 7;
2337 9.75 -1 7.25; 2338 9.75 -1 7.5; 2339 9.75 -1 7.75; 2340 9.75 -1 8;
2341 9.75 -1 8.25; 2342 9.75 -1 8.5; 2343 9.75 -1 8.75; 2344 9.75 -1 9;
2345 9.75 -1 9.25; 2346 9.75 -1 9.5; 2347 9.75 -1 9.75; 2348 9.75 -1 10;
2349 9.75 -1 10.25; 2350 9.75 -1 10.5; 2351 10 -1 6.25; 2352 10 -1 6.5;
2353 10 -1 6.75; 2354 10 -1 7; 2355 10 -1 7.25; 2356 10 -1 7.5;
2357 10 -1 7.75; 2358 10 -1 8; 2359 10 -1 8.25; 2360 10 -1 8.5;
2361 10 -1 8.75; 2362 10 -1 9; 2363 10 -1 9.25; 2364 10 -1 9.5;
2365 10 -1 9.75; 2366 10 -1 10; 2367 10 -1 10.25; 2368 10 -1 10.5;
2369 10.25 -1 6.25; 2370 10.25 -1 6.5; 2371 10.25 -1 6.75; 2372 10.25 -1 7;
2373 10.25 -1 7.25; 2374 10.25 -1 7.5; 2375 10.25 -1 7.75; 2376 10.25 -1 8;
2377 10.25 -1 8.25; 2378 10.25 -1 8.5; 2379 10.25 -1 8.75; 2380 10.25 -1 9;
2381 10.25 -1 9.25; 2382 10.25 -1 9.5; 2383 10.25 -1 9.75; 2384 10.25 -1 10;
2385 10.25 -1 10.25; 2386 10.25 -1 10.5; 2387 10.5 -1 6.25; 2388 10.5 -1 6.5;
2389 10.5 -1 6.75; 2390 10.5 -1 7; 2391 10.5 -1 7.25; 2392 10.5 -1 7.5;
2393 10.5 -1 7.75; 2394 10.5 -1 8; 2395 10.5 -1 8.25; 2396 10.5 -1 8.5;
2397 10.5 -1 8.75; 2398 10.5 -1 9; 2399 10.5 -1 9.25; 2400 10.5 -1 9.5;
2401 10.5 -1 9.75; 2402 10.5 -1 10; 2403 10.5 -1 10.25; 2404 10.5 -1 10.5;
2405 10.75 -1 6.25; 2406 10.75 -1 6.5; 2407 10.75 -1 6.75; 2408 10.75 -1 7;
2409 10.75 -1 7.25; 2410 10.75 -1 7.5; 2411 10.75 -1 7.75; 2412 10.75 -1 8;
2413 10.75 -1 8.25; 2414 10.75 -1 8.5; 2415 10.75 -1 8.75; 2416 10.75 -1 9;
2417 10.75 -1 9.25; 2418 10.75 -1 9.5; 2419 10.75 -1 9.75; 2420 10.75 -1 10;
2421 10.75 -1 10.25; 2422 10.75 -1 10.5; 2423 11 -1 6.25; 2424 11 -1 6.5;
2425 11 -1 6.75; 2426 11 -1 7; 2427 11 -1 7.25; 2428 11 -1 7.5;
2429 11 -1 7.75; 2430 11 -1 8; 2431 11 -1 8.25; 2432 11 -1 8.5;
2433 11 -1 8.75; 2434 11 -1 9; 2435 11 -1 9.25; 2436 11 -1 9.5;
2437 11 -1 9.75; 2438 11 -1 10; 2439 11 -1 10.25; 2440 11 -1 10.5;
2441 11.25 -1 6.25; 2442 11.25 -1 6.5; 2443 11.25 -1 6.75; 2444 11.25 -1 7;
2445 11.25 -1 7.25; 2446 11.25 -1 7.5; 2447 11.25 -1 7.75; 2448 11.25 -1 8;
2449 11.25 -1 8.25; 2450 11.25 -1 8.5; 2451 11.25 -1 8.75; 2452 11.25 -1 9;
2453 11.25 -1 9.25; 2454 11.25 -1 9.5; 2455 11.25 -1 9.75; 2456 11.25 -1 10;
2457 11.25 -1 10.25; 2458 11.25 -1 10.5; 2459 11.5 -1 6.25; 2460 11.5 -1 6.5;
2461 11.5 -1 6.75; 2462 11.5 -1 7; 2463 11.5 -1 7.25; 2464 11.5 -1 7.5;
2465 11.5 -1 7.75; 2466 11.5 -1 8; 2467 11.5 -1 8.25; 2468 11.5 -1 8.5;
2469 11.5 -1 8.75; 2470 11.5 -1 9; 2471 11.5 -1 9.25; 2472 11.5 -1 9.5;
2473 11.5 -1 9.75; 2474 11.5 -1 10; 2475 11.5 -1 10.25; 2476 11.5 -1 10.5;
2477 11.75 -1 6.25; 2478 11.75 -1 6.5; 2479 11.75 -1 6.75; 2480 11.75 -1 7;
2481 11.75 -1 7.25; 2482 11.75 -1 7.5; 2483 11.75 -1 7.75; 2484 11.75 -1 8;
2485 11.75 -1 8.25; 2486 11.75 -1 8.5; 2487 11.75 -1 8.75; 2488 11.75 -1 9;
2489 11.75 -1 9.25; 2490 11.75 -1 9.5; 2491 11.75 -1 9.75; 2492 11.75 -1 10;
2493 11.75 -1 10.25; 2494 11.75 -1 10.5; 2495 4 -1 10.75; 2496 4.25 -1 10.75;
2497 4 -1 11; 2498 4.25 -1 11; 2499 4 -1 11.25; 2500 4.25 -1 11.25;
2501 4 -1 11.5; 2502 4.25 -1 11.5; 2503 4 -1 11.75; 2504 4.25 -1 11.75;
2505 4 -1 12; 2506 4.25 -1 12; 2507 4 -1 12.25; 2508 4.25 -1 12.25;
2509 4 -1 12.5; 2510 4.25 -1 12.5; 2511 4 -1 12.75; 2512 4.25 -1 12.75;
2513 4 -1 13; 2514 4.25 -1 13; 2515 4 -1 13.25; 2516 4.25 -1 13.25;
2517 4 -1 13.5; 2518 4.25 -1 13.5; 2519 4 -1 13.75; 2520 4.25 -1 13.75;
2521 4 -1 14; 2522 4.25 -1 14; 2523 4 -1 14.25; 2524 4.25 -1 14.25;
2525 4 -1 14.5; 2526 4.25 -1 14.5; 2527 4 -1 14.75; 2528 4.25 -1 14.75;
2529 4 -1 15; 2530 4.25 -1 15; 2531 4 -1 15.25; 2532 4.25 -1 15.25;
2533 4 -1 15.5; 2534 4.25 -1 15.5; 2535 4 -1 15.75; 2536 4.25 -1 15.75;

**GILBERT V. PASIONA**
CIVIL ENGINEER

2537 4 -1 16; 2538 4.25 -1 16; 2539 4 -1 16.25; 2540 4.25 -1 16.25;
2541 4.5 -1 10.75; 2542 4.5 -1 11; 2543 4.5 -1 11.25; 2544 4.5 -1 11.5;
2545 4.5 -1 11.75; 2546 4.5 -1 12; 2547 4.5 -1 12.25; 2548 4.5 -1 12.5;
2549 4.5 -1 12.75; 2550 4.5 -1 13; 2551 4.5 -1 13.25; 2552 4.5 -1 13.5;
2553 4.5 -1 13.75; 2554 4.5 -1 14; 2555 4.5 -1 14.25; 2556 4.5 -1 14.5;
2557 4.5 -1 14.75; 2558 4.5 -1 15; 2559 4.5 -1 15.25; 2560 4.5 -1 15.5;
2561 4.5 -1 15.75; 2562 4.5 -1 16; 2563 4.5 -1 16.25; 2564 4.75 -1 10.75;
2565 4.75 -1 11; 2566 4.75 -1 11.25; 2567 4.75 -1 11.5; 2568 4.75 -1 11.75;
2569 4.75 -1 12; 2570 4.75 -1 12.25; 2571 4.75 -1 12.5; 2572 4.75 -1 12.75;
2573 4.75 -1 13; 2574 4.75 -1 13.25; 2575 4.75 -1 13.5; 2576 4.75 -1 13.75;
2577 4.75 -1 14; 2578 4.75 -1 14.25; 2579 4.75 -1 14.5; 2580 4.75 -1 14.75;
2581 4.75 -1 15; 2582 4.75 -1 15.25; 2583 4.75 -1 15.5; 2584 4.75 -1 15.75;
2585 4.75 -1 16; 2586 4.75 -1 16.25; 2587 5 -1 10.75; 2588 5 -1 11;
2589 5 -1 11.25; 2590 5 -1 11.5; 2591 5 -1 11.75; 2592 5 -1 12;
2593 5 -1 12.25; 2594 5 -1 12.5; 2595 5 -1 12.75; 2596 5 -1 13;
2597 5 -1 13.25; 2598 5 -1 13.5; 2599 5 -1 13.75; 2600 5 -1 14;
2601 5 -1 14.25; 2602 5 -1 14.5; 2603 5 -1 14.75; 2604 5 -1 15;
2605 5 -1 15.25; 2606 5 -1 15.5; 2607 5 -1 15.75; 2608 5 -1 16;
2609 5 -1 16.25; 2610 5.25 -1 10.75; 2611 5.25 -1 11; 2612 5.25 -1 11.25;
2613 5.25 -1 11.5; 2614 5.25 -1 11.75; 2615 5.25 -1 12; 2616 5.25 -1 12.25;
2617 5.25 -1 12.5; 2618 5.25 -1 12.75; 2619 5.25 -1 13; 2620 5.25 -1 13.25;
2621 5.25 -1 13.5; 2622 5.25 -1 13.75; 2623 5.25 -1 14; 2624 5.25 -1 14.25;
2625 5.25 -1 14.5; 2626 5.25 -1 14.75; 2627 5.25 -1 15; 2628 5.25 -1 15.25;
2629 5.25 -1 15.5; 2630 5.25 -1 15.75; 2631 5.25 -1 16; 2632 5.25 -1 16.25;
2633 5.5 -1 10.75; 2634 5.5 -1 11; 2635 5.5 -1 11.25; 2636 5.5 -1 11.5;
2637 5.5 -1 11.75; 2638 5.5 -1 12; 2639 5.5 -1 12.25; 2640 5.5 -1 12.5;
2641 5.5 -1 12.75; 2642 5.5 -1 13; 2643 5.5 -1 13.25; 2644 5.5 -1 13.5;
2645 5.5 -1 13.75; 2646 5.5 -1 14; 2647 5.5 -1 14.25; 2648 5.5 -1 14.5;
2649 5.5 -1 14.75; 2650 5.5 -1 15; 2651 5.5 -1 15.25; 2652 5.5 -1 15.5;
2653 5.5 -1 15.75; 2654 5.5 -1 16; 2655 5.5 -1 16.25; 2656 5.75 -1 10.75;
2657 5.75 -1 11; 2658 5.75 -1 11.25; 2659 5.75 -1 11.5; 2660 5.75 -1 11.75;
2661 5.75 -1 12; 2662 5.75 -1 12.25; 2663 5.75 -1 12.5; 2664 5.75 -1 12.75;
2665 5.75 -1 13; 2666 5.75 -1 13.25; 2667 5.75 -1 13.5; 2668 5.75 -1 13.75;
2669 5.75 -1 14; 2670 5.75 -1 14.25; 2671 5.75 -1 14.5; 2672 5.75 -1 14.75;
2673 5.75 -1 15; 2674 5.75 -1 15.25; 2675 5.75 -1 15.5; 2676 5.75 -1 15.75;
2677 5.75 -1 16; 2678 5.75 -1 16.25; 2679 6 -1 10.75; 2680 6 -1 11;
2681 6 -1 11.25; 2682 6 -1 11.5; 2683 6 -1 11.75; 2684 6 -1 12;
2685 6 -1 12.25; 2686 6 -1 12.5; 2687 6 -1 12.75; 2688 6 -1 13;
2689 6 -1 13.25; 2690 6 -1 13.5; 2691 6 -1 13.75; 2692 6 -1 14;
2693 6 -1 14.25; 2694 6 -1 14.5; 2695 6 -1 14.75; 2696 6 -1 15;
2697 6 -1 15.25; 2698 6 -1 15.5; 2699 6 -1 15.75; 2700 6 -1 16;
2701 6 -1 16.25; 2702 12 -1 10.75; 2703 12.25 -1 10.75; 2704 12 -1 11;
2705 12.25 -1 11; 2706 12 -1 11.25; 2707 12.25 -1 11.25; 2708 12 -1 11.5;
2709 12.25 -1 11.5; 2710 12 -1 11.75; 2711 12.25 -1 11.75; 2712 12 -1 12;
2713 12.25 -1 12; 2714 12 -1 12.25; 2715 12.25 -1 12.25; 2716 12 -1 12.5;
2717 12.25 -1 12.5; 2718 12 -1 12.75; 2719 12.25 -1 12.75; 2720 12 -1 13;
2721 12.25 -1 13; 2722 12 -1 13.25; 2723 12.25 -1 13.25; 2724 12 -1 13.5;
2725 12.25 -1 13.5; 2726 12 -1 13.75; 2727 12.25 -1 13.75; 2728 12 -1 14;
2729 12.25 -1 14; 2730 12 -1 14.25; 2731 12.25 -1 14.25; 2732 12 -1 14.5;
2733 12.25 -1 14.5; 2734 12 -1 14.75; 2735 12.25 -1 14.75; 2736 12 -1 15;
2737 12.25 -1 15; 2738 12 -1 15.25; 2739 12.25 -1 15.25; 2740 12 -1 15.5;
2741 12.25 -1 15.5; 2742 12 -1 15.75; 2743 12.25 -1 15.75; 2744 12 -1 16;
2745 12.25 -1 16; 2746 12 -1 16.25; 2747 12.25 -1 16.25; 2748 12.5 -1 10.75;
2749 12.5 -1 11; 2750 12.5 -1 11.25; 2751 12.5 -1 11.5; 2752 12.5 -1 11.75;
2753 12.5 -1 12; 2754 12.5 -1 12.25; 2755 12.5 -1 12.5; 2756 12.5 -1 12.75;
2757 12.5 -1 13; 2758 12.5 -1 13.25; 2759 12.5 -1 13.5; 2760 12.5 -1 13.75;
2761 12.5 -1 14; 2762 12.5 -1 14.25; 2763 12.5 -1 14.5; 2764 12.5 -1 14.75;
2765 12.5 -1 15; 2766 12.5 -1 15.25; 2767 12.5 -1 15.5; 2768 12.5 -1 15.75;
2769 12.5 -1 16; 2770 12.5 -1 16.25; 2771 12.75 -1 10.75; 2772 12.75 -1 11;
2773 12.75 -1 11.25; 2774 12.75 -1 11.5; 2775 12.75 -1 11.75; 2776 12.75 -1 12;
2777 12.75 -1 12.25; 2778 12.75 -1 12.5; 2779 12.75 -1 12.75; 2780 12.75 -1 13;
2781 12.75 -1 13.25; 2782 12.75 -1 13.5; 2783 12.75 -1 13.75; 2784 12.75 -1 14;
2785 12.75 -1 14.25; 2786 12.75 -1 14.5; 2787 12.75 -1 14.75; 2788 12.75 -1 15;
2789 12.75 -1 15.25; 2790 12.75 -1 15.5; 2791 12.75 -1 15.75; 2792 12.75 -1 16;
2793 12.75 -1 16.25; 2794 13 -1 10.75; 2795 13 -1 11; 2796 13 -1 11.25;
2797 13 -1 11.5; 2798 13 -1 11.75; 2799 13 -1 12; 2800 13 -1 12.25;
2801 13 -1 12.5; 2802 13 -1 12.75; 2803 13 -1 13; 2804 13 -1 13.25;
2805 13 -1 13.5; 2806 13 -1 13.75; 2807 13 -1 14; 2808 13 -1 14.25;
2809 13 -1 14.5; 2810 13 -1 14.75; 2811 13 -1 15; 2812 13 -1 15.25;
2813 13 -1 15.5; 2814 13 -1 15.75; 2815 13 -1 16; 2816 13 -1 16.25;
2817 13.25 -1 10.75; 2818 13.25 -1 11; 2819 13.25 -1 11.25; 2820 13.25 -1 11.5;
2821 13.25 -1 11.75; 2822 13.25 -1 12; 2823 13.25 -1 12.25; 2824 13.25 -1 12.5;
2825 13.25 -1 12.75; 2826 13.25 -1 13; 2827 13.25 -1 13.25; 2828 13.25 -1 13.5;
2829 13.25 -1 13.75; 2830 13.25 -1 14; 2831 13.25 -1 14.25; 2832 13.25 -1 14.5;
2833 13.25 -1 14.75; 2834 13.25 -1 15; 2835 13.25 -1 15.25; 2836 13.25 -1 15.5;
2837 13.25 -1 15.75; 2838 13.25 -1 16; 2839 13.25 -1 16.25; 2840 13.5 -1 10.75;
2841 13.5 -1 11; 2842 13.5 -1 11.25; 2843 13.5 -1 11.5; 2844 13.5 -1 11.75;
2845 13.5 -1 12; 2846 13.5 -1 12.25; 2847 13.5 -1 12.5; 2848 13.5 -1 12.75;
2849 13.5 -1 13; 2850 13.5 -1 13.25; 2851 13.5 -1 13.5; 2852 13.5 -1 13.75;
2853 13.5 -1 14; 2854 13.5 -1 14.25; 2855 13.5 -1 14.5; 2856 13.5 -1 14.75;
2857 13.5 -1 15; 2858 13.5 -1 15.25; 2859 13.5 -1 15.5; 2860 13.5 -1 15.75;
2861 13.5 -1 16; 2862 13.5 -1 16.25; 2863 13.75 -1 10.75; 2864 13.75 -1 11;
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2881 13.75 -1 15.25; 2882 13.75 -1 15.5; 2883 13.75 -1 15.75; 2884 13.75 -1 16;
2885 13.75 -1 16.25; 2886 14 -1 10.75; 2887 14 -1 11; 2888 14 -1 11.25;
2889 14 -1 11.5; 2890 14 -1 11.75; 2891 14 -1 12; 2892 14 -1 12.25;
2893 14 -1 12.5; 2894 14 -1 12.75; 2895 14 -1 13; 2896 14 -1 13.25;
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2901 14 -1 14.5; 2902 14 -1 14.75; 2903 14 -1 15; 2904 14 -1 15.25;
2905 14 -1 15.5; 2906 14 -1 15.75; 2907 14 -1 16; 2908 14 -1 16.25;
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2917 6.25 -1 12.75; 2918 6.25 -1 13; 2919 6.25 -1 13.25; 2920 6.25 -1 13.5;
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2929 6.25 -1 15.75; 2930 6.25 -1 16; 2931 6.25 -1 16.25; 2932 6.25 -1 16.5;
2933 6.5 -1 10.75; 2934 6.5 -1 11; 2935 6.5 -1 11.25; 2936 6.5 -1 11.5;
2937 6.5 -1 11.75; 2938 6.5 -1 12; 2939 6.5 -1 12.25; 2940 6.5 -1 12.5;
2941 6.5 -1 12.75; 2942 6.5 -1 13; 2943 6.5 -1 13.25; 2944 6.5 -1 13.5;

**GILBERT V. PASIONA**
CIVIL ENGINEER

2945 6.5 -1 13.75; 2946 6.5 -1 14; 2947 6.5 -1 14.25; 2948 6.5 -1 14.5;
2949 6.5 -1 14.75; 2950 6.5 -1 15; 2951 6.5 -1 15.25; 2952 6.5 -1 15.5;
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2997 7 -1 14.75; 2998 7 -1 15; 2999 7 -1 15.25; 3000 7 -1 15.5;
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3005 7.25 -1 10.75; 3006 7.25 -1 11; 3007 7.25 -1 11.25; 3008 7.25 -1 11.5;
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3221 9.5 -1 10.75; 3222 9.5 -1 11; 3223 9.5 -1 11.25; 3224 9.5 -1 11.5;
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3233 9.5 -1 13.75; 3234 9.5 -1 14; 3235 9.5 -1 14.25; 3236 9.5 -1 14.5;
3237 9.5 -1 14.75; 3238 9.5 -1 15; 3239 9.5 -1 15.25; 3240 9.5 -1 15.5;
3241 9.5 -1 15.75; 3242 9.5 -1 16; 3243 9.5 -1 16.25; 3244 9.5 -1 16.5;
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3341 10.75 -1 10.75; 3342 10.75 -1 11; 3343 10.75 -1 11.25; 3344 10.75 -1 11.5;
3345 10.75 -1 11.75; 3346 10.75 -1 12; 3347 10.75 -1 12.25; 3348 10.75 -1 12.5;
3349 10.75 -1 12.75; 3350 10.75 -1 13; 3351 10.75 -1 13.25; 3352 10.75 -1 13.5;

**GILBERT V. PASIONA**
CIVIL ENGINEER

3353 10.75 -1 13.75; 3354 10.75 -1 14; 3355 10.75 -1 14.25; 3356 10.75 -1 14.5;
3357 10.75 -1 14.75; 3358 10.75 -1 15; 3359 10.75 -1 15.25; 3360 10.75 -1 15.5;
3361 10.75 -1 15.75; 3362 10.75 -1 16; 3363 10.75 -1 16.25; 3364 10.75 -1 16.5;
3365 11 -1 10.75; 3366 11 -1 11; 3367 11 -1 11.25; 3368 11 -1 11.5;
3369 11 -1 11.75; 3370 11 -1 12; 3371 11 -1 12.25; 3372 11 -1 12.5;
3373 11 -1 12.75; 3374 11 -1 13; 3375 11 -1 13.25; 3376 11 -1 13.5;
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3405 11.25 -1 14.75; 3406 11.25 -1 15; 3407 11.25 -1 15.25; 3408 11.25 -1 15.5;
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738 737;
3590 737 738 747 746; 3591 746 747 756 755; 3592 755 756
764 763;
3593 554 32 556 555; 3594 555 556 565 564; 3595 564 565
574 573;
3596 573 574 583 582; 3597 582 583 592 591; 3598 591 592
601 600;
3599 600 601 610 609; 3600 609 610 30 617; 3601 617 30
3468 3467;
3602 3467 3468 3476 3475; 3603 3475 3476 3484 3483; 3604
3483 3484 3492 3491;
3605 3491 3492 3500 3499; 3606 3499 3500 3508 3507; 3607
3507 3508 3516 3515;
3608 3515 3516 3524 3523; 3609 3523 3524 3532 3531; 3610
3531 3532 3540 3539;
3611 3539 3540 3548 3547; 3612 3547 3548 3556 3555; 3613
3555 3556 3564 3563;
3614 3563 3564 3572 3571; 3615 3571 3572 3580 3579; 3616
3579 3580 3588 3587;
3617 3587 3588 3596 3595; 3618 3595 3596 3604 3603; 3619
3603 3604 3612 3611;
3620 3611 3612 3620 3619; 3621 3619 3620 3628 3627; 3622
3627 3628 3636 3635;
3623 3635 3636 3644 3643; 3624 3643 3644 31 701; 3625 701
31 703 702;
3626 702 703 712 711; 3627 711 712 721 720; 3628 720 721
730 729;
3629 729 730 739 738; 3630 738 739 748 747; 3631 747 748
757 756;
3632 756 757 33 764;
**************************
START GROUP DEFINITION
JOINT
 COLUMNS 1 TO 11
ELEMENT
 AREA A 5 TO 12 29 TO 36 53 TO 60 69 TO 76 93 TO 100 117
TO 124 133 TO 140 -
157 TO 164 181 TO 188 197 TO 204 221 TO 228 245 TO 252
261 TO 268 -
285 TO 292 309 TO 316 325 TO 332 349 TO 356 373 TO 380
389 TO 396 -
413 TO 420 437 TO 444 453 TO 460 477 TO 484 501 TO 508
709 TO 716 -
733 TO 740 773 TO 780 797 TO 804 837 TO 844 861 TO 868
901 TO 908 -
925 TO 932 965 TO 972 989 TO 996 1029 TO 1036 1053 TO
1060 1093 TO 1100 1117 -
1118 TO 1124 1157 TO 1164 1181 TO 1188 1237 TO 1244 1301
TO 1308 1365 TO 1372 -
1429 TO 1436 1473 TO 1484 1501 TO 1508 1513 TO 1524 1541
TO 1548 -
1553 TO 1564 1581 TO 1588 1597 TO 1604 1621 TO 1628 1637
TO 1644 -
1661 TO 1668 1677 TO 1684 1701 TO 1708 1717 TO 1724 1741
TO 1748 -
1757 TO 1764 1781 TO 1788 2197 TO 2204 2221 TO 2228 2237
TO 2244 -
2261 TO 2268 2277 TO 2284 2301 TO 2308 2317 TO 2324 2341
TO 2348 -
2357 TO 2364 2381 TO 2388 2397 TO 2404 2421 TO 2428 2437
TO 2444 -
2461 TO 2468 2477 TO 2484 2501 TO 2508 3157 TO 3164 3181
TO 3188 -
3197 TO 3204 3221 TO 3228 3237 TO 3244 3261 TO 3268 3277
TO 3284 -
```

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3301 TO 3308 3317 TO 3324 3341 TO 3348 3357 TO 3364 3381
TO 3388 -
3397 TO 3404 3421 TO 3428 3437 TO 3444 3461 TO 3468
 AREA B 1 TO 4 13 TO 28 37 TO 52 61 TO 68 77 TO 92 101 TO
116 125 TO 132 141 -
142 TO 156 165 TO 180 189 TO 196 205 TO 220 229 TO 244
253 TO 260 269 TO 284 -
293 TO 308 317 TO 324 333 TO 348 357 TO 372 381 TO 388
397 TO 412 -
421 TO 436 445 TO 452 461 TO 476 485 TO 500 509 TO 708
717 TO 732 -
741 TO 772 781 TO 796 805 TO 836 845 TO 860 869 TO 900
909 TO 924 -
933 TO 964 973 TO 988 997 TO 1028 1037 TO 1052 1061 TO
1092 1101 TO 1116 -
1125 TO 1156 1165 TO 1180 1189 TO 1236 1245 TO 1300 1309
TO 1364 -
1373 TO 1428 1437 TO 1472 1485 TO 1500 1509 TO 1512 1525
TO 1540 -
1549 TO 1552 1565 TO 1580 1589 TO 1596 1605 TO 1620 1629
TO 1636 -
1645 TO 1660 1669 TO 1676 1685 TO 1700 1709 TO 1716 1725
TO 1740 -
1749 TO 1756 1765 TO 1780 1789 TO 2196 2205 TO 2220 2229
TO 2236 -
2245 TO 2260 2269 TO 2276 2285 TO 2300 2309 TO 2316 2325
TO 2340 -
2349 TO 2356 2365 TO 2380 2389 TO 2396 2405 TO 2420 2429
TO 2436 -
2445 TO 2460 2469 TO 2476 2485 TO 2500 2509 TO 3156 3165
TO 3180 -
3189 TO 3196 3205 TO 3220 3229 TO 3236 3245 TO 3260 3269
TO 3276 -
3285 TO 3300 3309 TO 3316 3325 TO 3340 3349 TO 3356 3365
TO 3380 -
3389 TO 3396 3405 TO 3420 3429 TO 3436 3445 TO 3460 3469
TO 3632
END GROUP DEFINITION
*****************************
DEFINE MATERIAL START
ISOTROPIC CONCRETE
E 2.46918e+007
POISSON 0.17
DENSITY 24
ALPHA 1e-005
DAMP 0.05
TYPE CONCRETE
STRENGTH FCU 27600
END DEFINE MATERIAL
*************************
CONSTANTS
MATERIAL CONCRETE ALL
*************************
ELEMENT PROPERTY
1 TO 3632 THICKNESS 0.6
*************************
SUPPORTS
1 TO 3632 PLATE MAT DIRECT Y SUBGRADE 6000 PRINT
*************************
**LOAD CALCULATIONS********
*************************
*******************************
LOAD 4 : SEISMIC LOAD AT +X+E DIRECTION, E(+X+E)
*******************************
JOINT LOAD
1 FX 86.373 FY 272.762 FZ -34.689 MX 48.758 MY 3.05 MZ -
287.5
2 FX 139.93 FY -18.838 FZ -2.601 MX 5.16 MY 3.05 MZ -
301.052
3 FX 86.894 FY -213.573 FZ 15.212 MX -34.826 MY 3.05 MZ -
287.632
4 FX 98.238 FY 141.987 FZ -34.703 MX 48.762 MY 3.05 MZ -
307.65
5 FX 75.692 FY -160.102 FZ -3.963 MX 3.422 MY 1.897 MZ -
245.387
6 FX 100.911 FY 188.07 FZ -5.86 MX 5.985 MY 3.05 MZ -
326.657
7 FX 105.793 FY -230.001 FZ 29.515 MX -38.445 MY 3.05 MZ
-327.893
8 FX 113.044 FY 239.534 FZ -1.401 MX 4.856 MY 3.05 MZ -
356.336
9 FX 113.507 FY -232.141 FZ 23.973 MX -37.043 MY 3.05 MZ
-356.453
10 FX 119.959 FY 300.092 FZ -2.756 MX 5.199 MY 3.05 MZ -
393.564
11 FX 119.813 FY -287.791 FZ 17.275 MX -35.348 MY 3.05 MZ
-393.527
PERFORM ANALYSIS
CHANGE
*******************************
LOAD 5 : SEISMIC LOAD AT +X-E DIRECTION, E(+X-E)
*******************************
JOINT LOAD
1 FX 102.52 FY 170.794 FZ -0.629 MX -9.291 MY -0.727 MZ -
338.889
2 FX 166.029 FY -33.651 FZ -0.39 MX -0.897 MY -0.727 MZ -
354.96
3 FX 102.941 FY -219.599 FZ -0.676 MX 7.63 MY -0.727 MZ -
338.996
4 FX 104.051 FY 288.607 FZ -0.603 MX -9.297 MY -0.727 MZ
-335.191
5 FX 81.58 FY -169.492 FZ -0.061 MX -0.492 MY -0.452 MZ -
267.732
6 FX 100.415 FY 195.213 FZ -0.808 MX -0.791 MY -0.727 MZ
-329.902
7 FX 105.654 FY -219.036 FZ 2.043 MX 6.942 MY -0.727 MZ -
331.228
8 FX 102.236 FY 219.675 FZ 1.681 MX -1.421 MY -0.727 MZ -
324.022
9 FX 102.485 FY -222.299 FZ -2.28 MX 8.036 MY -0.727 MZ -
324.085
10 FX 96.074 FY 249.476 FZ -1.589 MX -0.593 MY -0.727 MZ
-314.008
11 FX 96.168 FY -259.688 FZ 3.314 MX 6.621 MY -0.727 MZ -
314.032
PERFORM ANALYSIS
CHANGE
*******************************
LOAD 6 : SEISMIC LOAD AT -X+E DIRECTION, E(-X+E)
*******************************
JOINT LOAD
1 FX -102.52 FY -170.794 FZ 0.629 MX 9.291 MY 0.727 MZ
338.889
2 FX -166.029 FY 33.651 FZ 0.39 MX 0.897 MY 0.727 MZ
354.96
3 FX -102.941 FY 219.599 FZ 0.676 MX -7.63 MY 0.727 MZ
338.996
4 FX -104.051 FY -288.607 FZ 0.603 MX 9.297 MY 0.727 MZ
335.191
5 FX -81.58 FY 169.492 FZ 0.061 MX 0.492 MY 0.452 MZ
267.732
6 FX -100.415 FY -195.213 FZ 0.808 MX 0.791 MY 0.727 MZ
329.902
7 FX -105.654 FY 219.036 FZ -2.043 MX -6.942 MY 0.727 MZ
331.228
8 FX -102.236 FY -219.675 FZ -1.681 MX 1.421 MY 0.727 MZ
324.022
9 FX -102.485 FY 222.299 FZ 2.28 MX -8.036 MY 0.727 MZ
324.085
10 FX -96.074 FY -249.476 FZ 1.589 MX 0.593 MY 0.727 MZ
314.008
11 FX -96.168 FY 259.688 FZ -3.314 MX -6.621 MY 0.727 MZ
314.032
PERFORM ANALYSIS
CHANGE
*******************************
LOAD 7 : SEISMIC LOAD AT -X-E DIRECTION, E(-X-E)
*******************************
JOINT LOAD
1 FX -86.373 FY -272.762 FZ 34.689 MX -48.758 MY -3.05 MZ
287.5
2 FX -139.93 FY 18.838 FZ 2.601 MX -5.16 MY -3.05 MZ
301.052
3 FX -86.894 FY 213.573 FZ -15.212 MX 34.826 MY -3.05 MZ
287.632
4 FX -98.238 FY -141.987 FZ 34.703 MX -48.762 MY -3.05 MZ
307.65
5 FX -75.692 FY 160.102 FZ 3.963 MX -3.422 MY -1.897 MZ
245.387
6 FX -100.911 FY -188.07 FZ 5.86 MX -5.985 MY -3.05 MZ
326.657
7 FX -105.793 FY 230.001 FZ -29.515 MX 38.445 MY -3.05 MZ
327.893
8 FX -113.044 FY -239.534 FZ 1.401 MX -4.856 MY -3.05 MZ
356.336
9 FX -113.507 FY 232.141 FZ -23.973 MX 37.043 MY -3.05 MZ
356.453
10 FX -119.959 FY -300.092 FZ 2.756 MX -5.199 MY -3.05 MZ
393.564
11 FX -119.813 FY 287.791 FZ -17.275 MX 35.348 MY -3.05
MZ 393.527
PERFORM ANALYSIS
CHANGE
*******************************
LOAD 8 : SEISMIC LOAD AT +Z+E DIRECTION, E(+Z+E)
*******************************
JOINT LOAD
1 FX 4.808 FY 656.116 FZ -118.458 MX 254.315 MY 0.384 MZ
3.605
2 FX 3.452 FY 499.211 FZ -107.427 MX 247.052 MY 0.384 MZ
3.948
3 FX 4.765 FY 145.53 FZ -44.217 MX 226.585 MY 0.384 MZ
3.616
4 FX 3.258 FY -664.432 FZ -119.38 MX 254.548 MY 0.384 MZ
1.636
5 FX 2.967 FY -108.267 FZ -209.057 MX 171.515 MY 0.239 MZ
1.378
6 FX 0.871 FY -169.175 FZ -165.959 MX 261.863 MY 0.384 MZ
0.13
7 FX 0.59 FY 81.348 FZ -113.664 MX 244.158 MY 0.384 MZ
0.201
8 FX -1.121 FY -58.822 FZ -103.895 MX 246.158 MY 0.384 MZ
-2.72
9 FX -4.424 FY -71.51 FZ -107.99 MX 242.722 MY 0.384 MZ -
1.884
10 FX -9.302 FY -146.483 FZ -32.806 MX 228.17 MY 0.384 MZ
-5.122
11 FX -5.864 FY -163.517 FZ -37.3 MX 224.835 MY 0.384 MZ
-5.992
PERFORM ANALYSIS
CHANGE
*******************************
LOAD 9 : SEISMIC LOAD AT +Z-E DIRECTION, E(+Z-E)
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*********************************
JOINT LOAD
1 FX 17.018 FY 577.261 FZ -92.707 MX 210.404 MY -2.473 MZ
-35.27
2 FX 23.185 FY 488.825 FZ -105.777 MX 242.475 MY -2.473
MZ -36.831
3 FX 16.889 FY 140.926 FZ -56.228 MX 258.701 MY -2.473 MZ
-35.237
4 FX 7.632 FY -551.45 FZ -93.597 MX 210.629 MY -2.473 MZ
-18.992
5 FX 7.41 FY -116.218 FZ -206.102 MX 168.553 MY -1.538 MZ
-15.524
6 FX 0.494 FY -163.903 FZ -162.139 MX 256.737 MY -2.473
MZ -2.325
7 FX 0.484 FY 89.707 FZ -134.429 MX 278.489 MY -2.473 MZ
-2.322
8 FX -9.289 FY -73.994 FZ -101.567 MX 241.41 MY -2.473 MZ
21.724
9 FX -12.754 FY -63.966 FZ -127.832 MX 276.82 MY -2.473
MZ 22.601
10 FX -27.345 FY -185.161 FZ -31.926 MX 223.788 MY -2.473
MZ 55.057
11 FX -23.725 FY -142.027 FZ -47.848 MX 256.581 MY -2.473
MZ 54.141
PERFORM ANALYSIS
CHANGE
*********************************
LOAD 10 : SEISMIC LOAD AT -Z+E DIRECTION, E(-Z+E)
*********************************
JOINT LOAD
1 FX -17.018 FY -577.261 FZ 92.707 MX -210.404 MY 2.473
MZ 35.27
2 FX -23.185 FY -488.825 FZ 105.777 MX -242.475 MY 2.473
MZ 36.831
3 FX -16.889 FY -140.926 FZ 56.228 MX -258.701 MY 2.473
MZ 35.237
4 FX -7.632 FY 551.45 FZ 93.597 MX -210.629 MY 2.473 MZ
18.992
5 FX -7.41 FY 116.218 FZ 206.102 MX -168.553 MY 1.538 MZ
15.524
6 FX -0.494 FY 163.903 FZ 162.139 MX -256.737 MY 2.473 MZ
2.325
7 FX -0.484 FY -89.707 FZ 134.429 MX -278.489 MY 2.473 MZ
2.322
8 FX 9.289 FY 73.994 FZ 101.567 MX -241.41 MY 2.473 MZ -
21.724
9 FX 12.754 FY 63.966 FZ 127.832 MX -276.82 MY 2.473 MZ -
22.601
10 FX 27.345 FY 185.161 FZ 31.926 MX -223.788 MY 2.473 MZ
-55.057
11 FX 23.725 FY 142.027 FZ 47.848 MX -256.581 MY 2.473 MZ
-54.141
PERFORM ANALYSIS
CHANGE
*********************************
LOAD 11 : SEISMIC LOAD AT -Z-E DIRECTION, E(-Z-E)
*********************************
JOINT LOAD
1 FX -4.808 FY -656.116 FZ 118.458 MX -254.315 MY -0.384
MZ -3.605
2 FX -3.452 FY -499.211 FZ 107.427 MX -247.052 MY -0.384
MZ -3.948
3 FX -4.765 FY -145.53 FZ 44.217 MX -226.585 MY -0.384 MZ
-3.616
4 FX -3.258 FY 664.432 FZ 119.38 MX -254.548 MY -0.384 MZ
-1.836
5 FX -2.967 FY 108.267 FZ 209.057 MX -171.515 MY -0.239
MZ -1.378
6 FX -0.871 FY 169.175 FZ 165.959 MX -261.863 MY -0.384
MZ -0.13
7 FX -0.59 FY -81.348 FZ 113.664 MX -244.158 MY -0.384 MZ
-0.201
8 FX 1.121 FY 58.822 FZ 103.895 MX -246.159 MY -0.384 MZ
2.72
9 FX 4.424 FY 71.51 FZ 107.99 MX -242.722 MY -0.384 MZ
1.884
10 FX 9.302 FY 146.483 FZ 32.806 MX -228.17 MY -0.384 MZ
5.122
11 FX 5.864 FY 163.517 FZ 37.3 MX -224.835 MY -0.384 MZ
5.992
PERFORM ANALYSIS
CHANGE
*********************************
LOAD 12 RESPONSE SPECTRUM AT X, RS(X)
*********************************
JOINT LOAD
1 FX -82.782 FY -239.591 FZ 28.861 MX -39.278 MY -2.712
MZ -276.686
2 FX -134.514 FY -34.116 FZ 5.178 MX -11.755 MY -2.712 MZ
-289.771
3 FX -83.343 FY -202.865 FZ 14.783 MX -38.08 MY -2.712 MZ
-276.828
4 FX -93.034 FY -155.767 FZ 28.86 MX -39.279 MY -2.712 MZ
-293.519
5 FX -71.86 FY -148.823 FZ 10.189 MX -8.219 MY -1.687 MZ
-234.165
6 FX -95.1 FY -179.577 FZ 8.158 MX -12.446 MY -2.712 MZ -
309.374
7 FX -99.759 FY -216.178 FZ 29.678 MX -41.833 MY -2.712
MZ -310.554
8 FX -105.748 FY -224.206 FZ 5.082 MX -11.72 MY -2.712 MZ
-334.504
9 FX -106.233 FY -215.63 FZ 24.64 MX -40.598 MY -2.712 MZ
-334.627
10 FX -111.429 FY -280.58 FZ 2.425 MX -10.828 MY -2.712
MZ -366.113
11 FX -111.241 FY -265.06 FZ 16.499 MX -38.459 MY -2.712
MZ -366.066
PERFORM ANALYSIS
CHANGE
*********************************
LOAD 13 RESPONSE SPECTRUM AT Z, RS(Z)
*********************************
JOINT LOAD
1 FX -65.408 FY -551.778 FZ 123.343 MX -237.592 MY -
13.493 MZ -202.821
2 FX -104.007 FY -428.544 FZ 96.818 MX -221.958 MY -
13.493 MZ -212.613
3 FX -64.808 FY -119.111 FZ 83.434 MX -311.179 MY -13.493
MZ -202.669
4 FX -28.033 FY -633.223 FZ 123.836 MX -237.744 MY -
13.493 MZ -117.649
5 FX -26.662 FY -125.631 FZ 189.768 MX -154.592 MY -8.391
MZ -95.194
6 FX -5.067 FY -139.22 FZ 147.818 MX -234.861 MY -13.493
MZ -31.63
7 FX -6.206 FY -83.421 FZ 173.536 MX -334.276 MY -13.493
MZ -31.987
8 FX -34.038 FY -89.365 FZ 92.439 MX -220.849 MY -13.493
MZ -97.558
9 FX -36.214 FY -62.16 FZ 165.58 MX -332.261 MY -13.493
MZ -98.046
10 FX -84.645 FY -248.95 FZ 28.648 MX -204.708 MY -13.493
MZ -266.889
11 FX -82.206 FY -137.761 FZ 71.88 MX -308.271 MY -13.493
MZ -266.339
PERFORM ANALYSIS
CHANGE
*************************************
LOAD 14 : WIND LOAD AT +X DIRECTION, W(+X)
*************************************
JOINT LOAD
1 FX 79.547 FY 225.339 FZ -56.117 MX 56.134 MY 3.205 MZ -
227.543
2 FX 132.028 FY 12.932 FZ -34.681 MX 13.433 MY 3.205 MZ -
240.823
3 FX 77.518 FY -137.822 FZ 2.64 MX -33.287 MY 3.205 MZ -
227.03
4 FX 93.726 FY 65.614 FZ -22.583 MX 47.649 MY 3.205 MZ -
249.149
5 FX 71.697 FY -80.363 FZ 9.708 MX -0.352 MY 1.993 MZ -
198.488
6 FX 85.251 FY 156.187 FZ -7.916 MX 6.661 MY 3.205 MZ -
266.264
7 FX 92.844 FY -144.476 FZ 33.284 MX -41.041 MY 3.205 MZ
-268.185
8 FX 91.251 FY 206.492 FZ -2.716 MX 5.345 MY 3.205 MZ -
295.74
9 FX 105.361 FY -140.174 FZ 28.245 MX -39.766 MY 3.205 MZ
-299.31
10 FX 118.229 FY 250.003 FZ 13.38 MX 1.272 MY 3.205 MZ -
339.843
11 FX 126.377 FY -189.88 FZ 36.757 MX -41.92 MY 3.205 MZ
-341.905
PERFORM ANALYSIS
CHANGE
*************************************
LOAD 15 : WIND LOAD AT -X DIRECTION, W(-X)
*************************************
JOINT LOAD
1 FX -82.123 FY -213.34 FZ 23.786 MX -49.057 MY -3.263 MZ
226.035
2 FX -131.516 FY 22.748 FZ -27.846 MX 1.954 MY -3.263 MZ
238.534
3 FX -69.096 FY 161.379 FZ -35.604 MX 41.862 MY -3.263 MZ
222.739
4 FX -96.253 FY -46.679 FZ 57.368 MX -67.554 MY -3.263 MZ
247.951
5 FX -75.154 FY 139.741 FZ 18.568 MX -7.843 MY -2.029 MZ
197.893
6 FX -95.068 FY -108.005 FZ 5.133 MX -6.391 MY -3.263 MZ
267.256
7 FX -78.681 FY 188.431 FZ -31.946 MX 40.937 MY -3.263 MZ
263.11
8 FX -104.872 FY -145.007 FZ 2.98 MX -5.847 MY -3.263 MZ
298.196
9 FX -91.113 FY 195.322 FZ -28.655 MX 40.104 MY -3.263 MZ
294.715
10 FX -126.485 FY -203.755 FZ 19.9 MX -10.128 MY -3.263
MZ 341.611
11 FX -118.028 FY 233.016 FZ -3.685 MX 33.786 MY -3.263
MZ 339.471
PERFORM ANALYSIS
CHANGE
*************************************
LOAD 16 : WIND LOAD AT +Z DIRECTION, W(+Z)
*************************************
JOINT LOAD
1 FX 2.74 FY 412.457 FZ -90.134 MX 182.652 MY 1.514 MZ
21.939
2 FX -9.699 FY 314.4 FZ -53.69 MX 155.817 MY 1.514 MZ
25.086
3 FX -21.952 FY 102.506 FZ -19.042 MX 129.436 MY 1.514 MZ
28.187
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4 FX 5.628 FY -428.225 FZ -98.31 MX 184.721 MY 1.514 MZ
12.695
5 FX 6.062 FY -26.878 FZ -137.495 MX 111.589 MY 0.942 MZ
9.761
6 FX 21.202 FY -80.429 FZ -125.477 MX 173.982 MY 1.514 MZ
-0.347
7 FX -30.328 FY 70.43 FZ -80.575 MX 145.006 MY 1.514 MZ
12.692
8 FX 32.298 FY -2.004 FZ -85.93 MX 163.975 MY 1.514 MZ -
16.365
9 FX -28.667 FY -12.124 FZ -76.935 MX 144.085 MY 1.514 MZ
-0.938
10 FX 21.32 FY -50.605 FZ -27.66 MX 149.23 MY 1.514 MZ -
31.201
11 FX -11.277 FY -75.675 FZ -23.775 MX 130.633 MY 1.514
MZ -22.952
PERFORM ANALYSIS
CHANGE
*************************************
LOAD 17 : WIND LOAD AT -Z DIRECTION, W(-2)
*************************************
JOINT LOAD
1 FX 10.093 FY -398.416 FZ 95.181 MX -180.468 MY -1.253
MZ -14.599
2 FX 5.534 FY -273.322 FZ 67.005 MX -158.77 MY -1.253 MZ
-13.446
3 FX -14.588 FY -68.263 FZ 27.676 MX -134.249 MY -1.253
MZ -8.354
4 FX 7.116 FY 415.704 FZ 88.987 MX -178.901 MY -1.253 MZ
-6.804
5 FX 7.789 FY 94.596 FZ 131.229 MX -109.609 MY -0.779 MZ
-5.974
6 FX 20.213 FY 120.617 FZ 125.799 MX -173.647 MY -1.253
MZ -2.591
7 FX -30.805 FY -18.16 FZ 81.466 MX -147.86 MY -1.253 MZ
10.319
8 FX 25.242 FY 56.205 FZ 86.265 MX -163.643 MY -1.253 MZ
7.063
9 FX -32.147 FY 76.129 FZ 79.269 MX -147.305 MY -1.253 MZ
21.585
10 FX 12.596 FY 91.525 FZ 19.644 MX -146.786 MY -1.253 MZ
24.832
11 FX -23.715 FY 127.237 FZ 16.503 MX -131.422 MY -1.253
MZ 34.02
PERFORM ANALYSIS
CHANGE
*************************************
LOAD 18 : WIND LOAD SUCTION, WS
*************************************
JOINT LOAD
1 FX -1.945 FY -2.917 FZ 5.228 MX -1.783 MY -0.039 MZ -
1.107
2 FX 0.642 FY -8.362 FZ 9.412 MX -2.384 MY -0.039 MZ -
1.762
3 FX 5.456 FY -6.658 FZ 4.742 MX -0.744 MY -0.039 MZ -
2.98
4 FX -1.931 FY 1.151 FZ -4.853 MX 0.768 MY -0.039 MZ -
0.889
5 FX -2.056 FY -13.972 FZ -4.205 MX 1.184 MY -0.024 MZ -
0.582
6 FX -6.16 FY -8.659 FZ 0.469 MX -0.121 MY -0.039 MZ
0.417
7 FX 9.122 FY -10.577 FZ -0.485 MX 0.579 MY -0.039 MZ -
3.45
8 FX -8.565 FY -11.704 FZ -0.027 MX 0.005 MY -0.039 MZ
1.369
9 FX 9.068 FY -12.969 FZ -0.274 MX 0.525 MY -0.039 MZ -
3.092
10 FX -5.04 FY -8.862 FZ -4.95 MX 1.251 MY -0.039 MZ
0.936
11 FX 5.224 FY -10.416 FZ -5.058 MX 1.736 MY -0.039 MZ -
1.662
PERFORM ANALYSIS
CHANGE
*************************************
LOAD 19 : WIND LOAD PRESSURE, WP
*************************************
JOINT LOAD
1 FX 1.945 FY 2.917 FZ -5.228 MX 1.783 MY 0.039 MZ 1.107
2 FX -0.642 FY 8.362 FZ -9.412 MX 2.384 MY 0.039 MZ 1.762
3 FX -5.456 FY 6.658 FZ -4.742 MX 0.744 MY 0.039 MZ 2.98
4 FX 1.931 FY -1.151 FZ 4.853 MX -0.768 MY 0.039 MZ 0.889
5 FX 2.056 FY 13.972 FZ 4.205 MX -1.184 MY 0.024 MZ 0.582
6 FX 6.16 FY 8.659 FZ -0.469 MX 0.121 MY 0.039 MZ -0.417
7 FX -9.122 FY 10.577 FZ 0.485 MX -0.579 MY 0.039 MZ 3.45
8 FX 8.565 FY 11.704 FZ 0.027 MX -0.005 MY 0.039 MZ -
1.369
9 FX -9.068 FY 12.969 FZ 0.274 MX -0.525 MY 0.039 MZ
3.092
10 FX 5.04 FY 8.862 FZ 4.95 MX -1.251 MY 0.039 MZ -0.936
11 FX -5.224 FY 10.416 FZ 5.058 MX -1.736 MY 0.039 MZ
1.662
PERFORM ANALYSIS
CHANGE
*******************************
LOAD 1 : DEAD LOAD , DL
*******************************
JOINT LOAD
1 FX -2.884 FY -385.594 FZ 16.907 MX -3.976 MY -0.032 MZ
0.214
2 FX -0.801 FY -584.315 FZ 1.249 MX 0.359 MY -0.032 MZ -
0.313
3 FX 2.248 FY -421.16 FZ 0.353 MX 0.959 MY -0.032 MZ -
1.085
4 FX -1.848 FY -412.157 FZ -15.451 MX 4.212 MY -0.032 MZ
0.132
5 FX 7.694 FY -651.915 FZ 0.685 MX 0.152 MY -0.02 MZ -
2.215
6 FX -12.776 FY -553.184 FZ 0.531 MX 0.541 MY -0.032 MZ
3.09
7 FX 5.572 FY -520.923 FZ 2.363 MX 0.45 MY -0.032 MZ -
1.552
8 FX -7.152 FY -645.006 FZ -2.838 MX 1.393 MY -0.032 MZ
1.947
9 FX 8.271 FY -615.775 FZ -3.247 MX 1.87 MY -0.032 MZ -
1.956
10 FX -2.135 FY -600.739 FZ -0.407 MX 0.778 MY -0.032 MZ
1.051
11 FX 3.011 FY -586.865 FZ -0.144 MX 1.085 MY -0.032 MZ -
0.454
PERFORM ANALYSIS
CHANGE
*******************************
LOAD 2 : LIVE LOAD , LL
*******************************
JOINT LOAD
1 FX 0.042 FY -70.103 FZ 12.485 MX -3.019 MY -0.002 MZ -
0.427
2 FX 0.346 FY -85.024 FZ -0.487 MX 0.283 MY -0.002 MZ -
0.504
3 FX -2.443 FY -47.772 FZ -3.571 MX 1.083 MY -0.002 MZ
0.202
4 FX -0.16 FY -75.056 FZ -12.806 MX 3.381 MY -0.002 MZ -
0.366
5 FX 3.366 FY -134.293 FZ -0.381 MX 0.189 MY -0.001 MZ -
1.177
6 FX 4.783 FY -94.359 FZ 0.079 MX 0.14 MY -0.002 MZ -
1.607
7 FX -5.714 FY -86.016 FZ 2.215 MX -0.381 MY -0.002 MZ
1.049
8 FX 9.346 FY -174.239 FZ -7.329 MX 2.014 MY -0.002 MZ -
2.748
9 FX -9.284 FY -162.284 FZ -7.608 MX 2.104 MY -0.002 MZ
1.967
10 FX 8.329 FY -152.25 FZ 8.71 MX -2.044 MY -0.002 MZ -
2.471
11 FX -8.611 FY -145.534 FZ 8.693 MX -2.02 MY -0.002 MZ
1.816
PERFORM ANALYSIS
CHANGE
*******************************
LOAD 3 : ROOF LIVE LOAD , LR
*******************************
JOINT LOAD
1 FX 0.125 FY -9.753 FZ 0.054 MX -0.02 MY -0.002 MZ -
0.198
2 FX -0.412 FY -24.107 FZ 0.19 MX -0.029 MY -0.002 MZ -
0.062
3 FX 0.708 FY -17.682 FZ 0.812 MX -0.161 MY -0.002 MZ -
0.346
4 FX 0.186 FY -9.033 FZ 0.034 MX -0.014 MY -0.002 MZ -
0.202
5 FX -0.886 FY -40.514 FZ 0.025 MX 0.003 MY -0.001 MZ
0.101
6 FX -1.161 FY -32.655 FZ -0.068 MX 0.036 MY -0.002 MZ
0.152
7 FX 1.378 FY -31.313 FZ -0.472 MX 0.163 MY -0.002 MZ -
0.49
8 FX -1.575 FY -41.677 FZ 0.813 MX -0.186 MY -0.002 MZ
0.276
9 FX 1.61 FY -39.313 FZ 0.889 MX -0.181 MY -0.002 MZ -
0.53
10 FX -1.194 FY -31.172 FZ -1.129 MX 0.305 MY -0.002 MZ
0.204
11 FX 1.22 FY -30.734 FZ -1.147 MX 0.334 MY -0.002 MZ -
0.406
PERFORM ANALYSIS
CHANGE
************
FINISH
```

**GILBERT V. PASIONA**
CIVIL ENGINEER

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DPWH-BRS Accredited
Laboratory

# FINAL REPORT - R1

# ON

# GEOTECHNICAL INVESTIGATION

## " PROPOSED CONSTRUCTION OF THE NEW BOQ BUILDING "

25TH & A.C. DELGADO STS. PORT AREA MANILA

## BUREAU OF QUARANTINE

# FINAL REPORT
# GEOTECHNICAL INVESTIGATION
# " PROPOSED CONSTRUCTION OF THE NEW BOQ BUILDING "

25th & A.C. Delgado Sts. Port Area Manila

## TABLE OF CONTENTS



## ATTACHMENTS

Appendices

## 1.0 INTRODUCTION

### 1.1 Project Description

It is understood that the Construction of the **Proposed Quarantine Station** is a low rise (2-4 storey) bulding structure. Foundation of the structure can be shallow foundation or deep foundation, depending on the soil and loading conditions. Details of the loading conditions for the proposed structures were not available at the time that this report is being written. A Vicinity Map of the project site containing the borehole location is presented in the Appendix and it is located within Port Area Manila.

### 1.2 Purpose and Scope

The purpose of this geotechnical evaluation report is to establish the subsurface stratification at the project site and to review and analyze soil boring data to develop appropriate geotechnical engineering recommendations for the foundation of the structure. Data was based on the result of the Geotechnical Investigation conducted by **TERMS Concrete and Materials Testing Laboratory Inc.** and it included the following scope:

- Drilling three (3) boreholes up to a depth of 30.0 to 34.5 meters below existing grade;
- Performing field and laboratory tests on selected soil samples to evaluate the geotechnical engineering properties of the subsurface soils;
- Measuring ground water table below existing grade.

## 2.0 FIELD INVESTIGATION & LABORATORY TESTING

### 2.1 Standard Penetration Test (ASTM 1586)

The Standard Penetration Test (SPT) is a field test used in determining the shear strength of soils from an established literature correlation. The SPTs, conducted at every 1.5 meter interval, consisted of driving a standard split spoon sampler of 5.08 cm (2 inches O.D.) diameter in three successive segments of 15 cm (6 inches) using a freely falling drop hammer of 63.6 kg (140 lbs) weight from a height of 76.2 cm (30 inches).

The number of blows required to penetrate the three 15-cm layers are recorded. The blow counts of the last two layers are added to give the N-value of a particular 45cm stretch, a measure of density or consistency of the soil.

SPT procedures are conducted in accordance to ASTM D-1586. Soil samples were retrieved using the spoon sampler. When very hard material, including gravel and rock formations, is encountered, coring procedure is employed.

### 2.2 Laboratory Testing

Soil samples that were retrieved from drilling were brought to the Laboratory to undergo testing as follows:

- Soil Classification Tests ( ASTM D2487)
- Moisture Content Determination (ASTM D2216)
- Atterberg Limit (ASTM D4318) – to determine Liquid Limit (LL), Plastic Limit (PL) and Plasticity Index (PI) of soils
- Grain Size Analysis (ASTM D422)

## 3.0 GROUND AND GROUNDWATER CONDITIONS

The resulting general ground stratigraphy revealed by the site specific exploratory holes are presented in Table 3.1 and 3.2 below.

| Stratum | Depth,m | Description |
|---|---|---|
| 1 | 0.0-7.5 | Very Soft to Soft Silty Clay |
| 2 | 7.5-16.5 | Very Loose to Loose Silty Sand |
| 3 | 16.5-19.5 | Very Dense Silty Sand |

Table 3.1 – Summary of Stratigraphy for BH-1

| Stratum | Depth,m | Description |
|---|---|---|
| 1 | 0.0-4.5 | Very Soft to Soft Silty Clay |
| 2 | 4.5-31.5 | Very Loose to Loose Silty Sand |
| 3 | 31.5-34.5 | Very Dense Silty Sand |

Table 3.2 – Summary of Stratigraphy for BH-2 and BH-3

Ground water table (GWT) was encountered at a depth of 6m to 7m from the natural grade line during the drilling process. This should be confirmed during construction and reported to the structural engineer and geotechnical engineer.

## 4.0 MATERIAL PROPERTIES & GEOTECHNICAL PARAMETERS

In the absence of direct laboratory measurement of shear strength, the angle of shearing resistance has been determined from its correlation with SPT "$N_{60}$" values

(Bowles, 1997). The stiffness parameters (Es) and unit weights (γ) were also taken from correlation with SPT "$N_{60}$" values and is summarized in the table below.

| Stratum | Φ' | Es, MPa | C, KPa | Y, Kn/m$^3$ |
|---|---|---|---|---|
| 1 | - | 2 | 6 | 12 |
| 2 | 28 | 10 | - | 15 |
| 3 | 36 | 40 | - | 19 |

Table 4.1 – Summary of Geotechnical Parameters for BH-1 to BH-3

In lieu of any project-specific data, Poisson's Ratio can be considered conservatively as μ=0.30 as suitable for design purposes.

## 5.0 GEOTECHNICAL DESIGN AND ENGINEERING CONSIDERATIONS

### 5.1 Seismic Design Criteria

The Philippine archipelago is located in a seismically active region. Thus, most of the country, except for Palawan, can be classified as under Seismic Zone IV (Z=0.4). Based on National Structural Code of the Philippines (NSCP 2015) 7$^{th}$ edition, the soil underneath the project site can be classified as Type $S_F$. The most proximate seismic source that may directly affect the project site is the West Valley Fault. It can be classified as a Type A source and its distance from the project site may be considered as less than 10 kilometers.

| Parameter | Value |
|---|---|
| Soil Profile Type | $S_F$ |
| Seismic Zone | IV |
| Seismic Source Type | A |

Table 5.1 – Seismic Design Parameters

Other seismic parameters shall be determined by the Design Engineer using NSCP 2015 7$^{th}$ Edition.

### 5.2 Site Liquefaction and Compressibility Potential

The liquefaction potential of a site is primarily determined by factors including the seismic region of the site, subsurface conditions, and loading conditions (especially cyclic). The potential for liquefaction to occur is generally identified when the pore water pressure within a saturated granular stratum approaches or reaches the effective stress of the stratum, which causes deformation within the stratum.

As presented in Table 3.1 and 3.2, the loose saturated sand layers are prone to liquefaction during a Magnitude 7.0 earthquake.

Further the soft clay and loose sand layers are prone to excessive immediate settlement when subjected to the building loads. It is therefore recommended to use deep foundations or ground improvement to arrest the liquefaction and settlement potential of the site.

### 5.3 Deep Foundation

Driven Pile foundation can also be used as the foundation system for the low rise building structure. Piles are assumed to rest at the very dense sand layer in the calculation. Pile capacities are calculated assuming individual piles with spacing of at least 3 shaft diameters/widths, on-centers.

| Pile Size | Length | Pall (kN) |
|---|---|---|
| 300x300mm | 18m | **250** |
| 400x400mm | | **385** |
| 500x500mm | | **465** |

Table 5.2 – Allowable driven pile capacity for all BH-1

| Pile Size | Length | Pall (kN) |
|---|---|---|
| 300x300mm | 32m | **340** |
| 400x400mm | | **505** |
| 500x500mm | | **600** |

Table 5.3 – Allowable driven pile capacity for all BH-2 and BH-3

The above tables shows allowable pile capacities using a Factor of Safety of 3.0. *It should be noted that piles should be driven to refusal. It is recommended to perform driving of test pile to confirm actual pile lengths. Piles driven short of 1 meter to the theoretical length can be assumed to have reached the design capacity.* PDA can be performed to check the bearing capacity of driven piles.

For checking for any deformations, voids or anomalies throughout the depth of the pile a Pile Integrity Test (PIT) is recommended.

Internal strength of the piles is not considered in the analysis and should be checked by the structural engineer.

## 5.4 Subsurface Improvement Techniques

As the soil found on the project site is highly compressible, the use of ground improvement may be considered as a possible solution to improve the bearing capacity of the foundation material.

The use of stone columns, jet grouting, low pressure grouting, and other soil cement mixing methods up to a 20-30m depth may be feasible for the project. The corresponding design of the subsurface improvement techniques mentioned should come from the specialty contractor.

After ground improvement, confirmatory tests should be done to ascertain the bearing capacity of the improved ground. The resulting bearing capacity after ground improvement can be used to redesign shallow foundations.

## 5.5 Site Preparation and Earthwork

The specifications described in DPWH Manual of Standard Specification (Vol. II Highways, Bridges and Airports, 2015) can be taken as a reference for site preparation and earthworks.

All engineered fills should be compacted to 95% of its MDD. Backfilling should be carefully monitored and should be compacted in lifts not greater than 0.2m.

| Description | Reference Page |
|---|---|
| Clearing and grubbing | Item 100 |
| Embankment | Item 104 |
| Subgrade Preparation | Item 105 |
| Compaction and Density Control | Item 106 |

Table 5.4– Site Preparation and Earthworks Reference

## 5.6 Slab on Grade Design

For purpose of preliminary design a modulus of subgrade reaction of 3,000 kN/m$^3$ is recommended subject to field verification (field plate load test). Design of slab-on-grade should be revised depending on the field plate load test results. Soil supporting slab on grade should be compacted to 95% MDD prior to rebar placement.

## 5.7 Excavations

For general open excavations a maximum slope of 1H:1V is recommended. For excavations near the road/adjacent structures, sheet piling must be considered to prevent soil erosion and loss of foundation material. Rankine's Lateral earth pressure could be calculated using Table 4.1.

## 6.0 REPORT APPLICABILITY

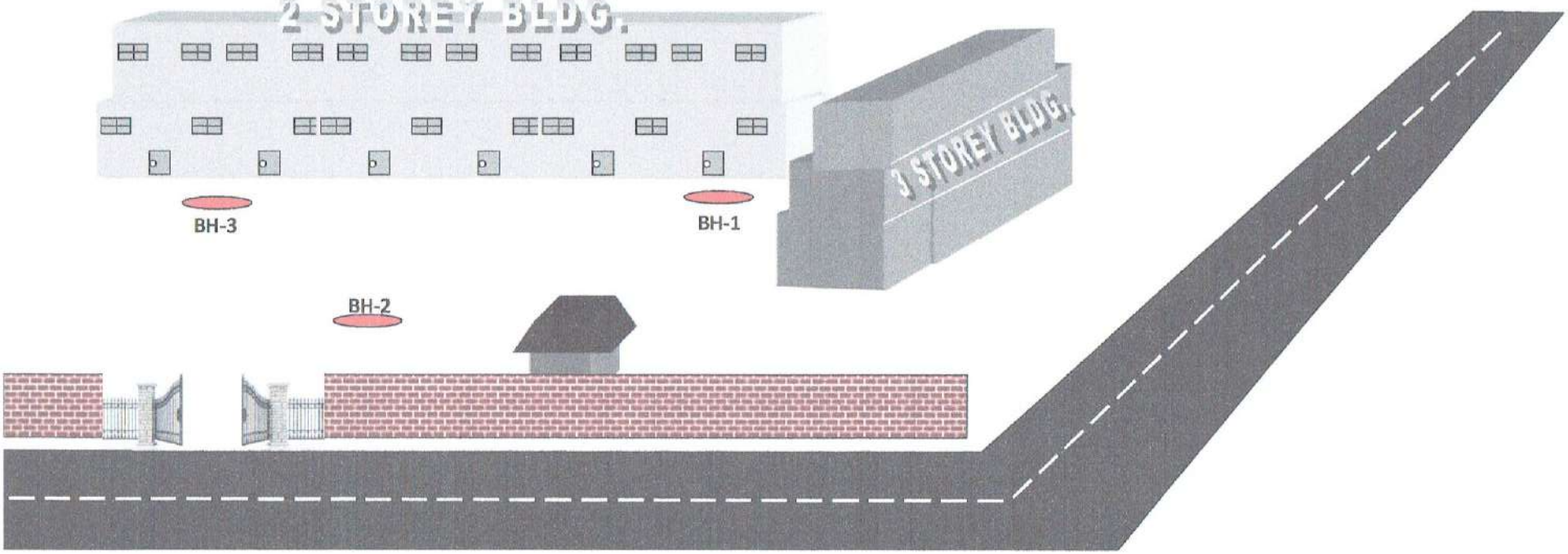
The conclusions and recommendations presented in this report were based on our understanding of the project and it may not apply to locations not explored by borings or areas outside the project boundaries. Should there be significant differences in the soil stratifications encountered during the construction phase, or any differences in the understanding of the requirements of the project, the undersigned could be reached at ***geotechnicalgroup2014@gmail.com*** so that additional recommendations / corrections can be made.

Further, this report has been prepared for use as a guide for the geotechnical part of the design and construction of the foundations for the proposed project. This report should be made available to all parties involved for information only and not as a warranty of subsurface conditions.

**ANDRE C. CRUZ, MSCE**
*Geotechnical Engineer*
PRC CE Reg. 103391
January 17, 2019

REFERENCES

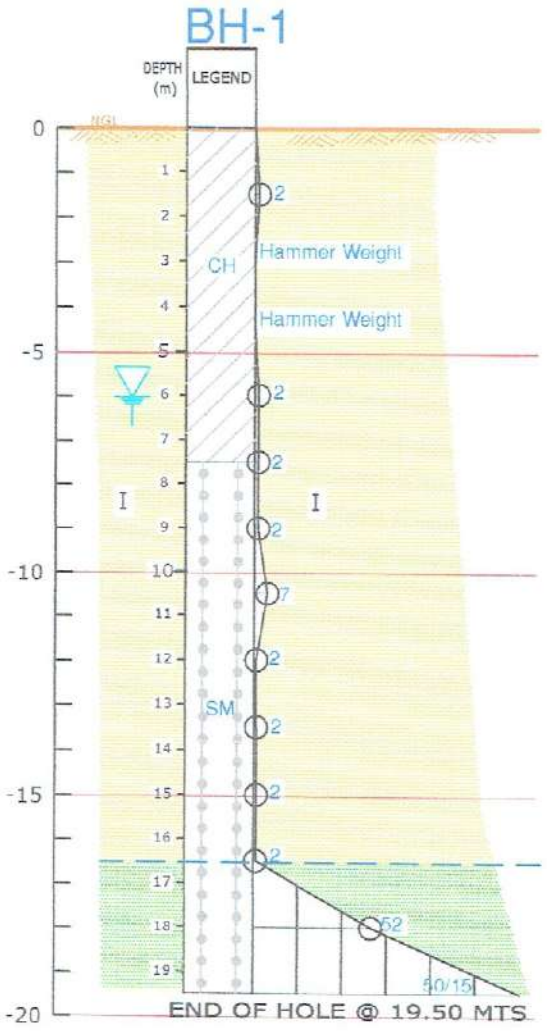

1. Bowles, J.E. (1997). Foundation Analysis and Design, 5th ed., The McGraw-Hill Companies Inc.
2. Look, B.G. (2007). Handbook of Geotechnical Investigation and Design Tables. London, UK: Taylor & Francis Group.



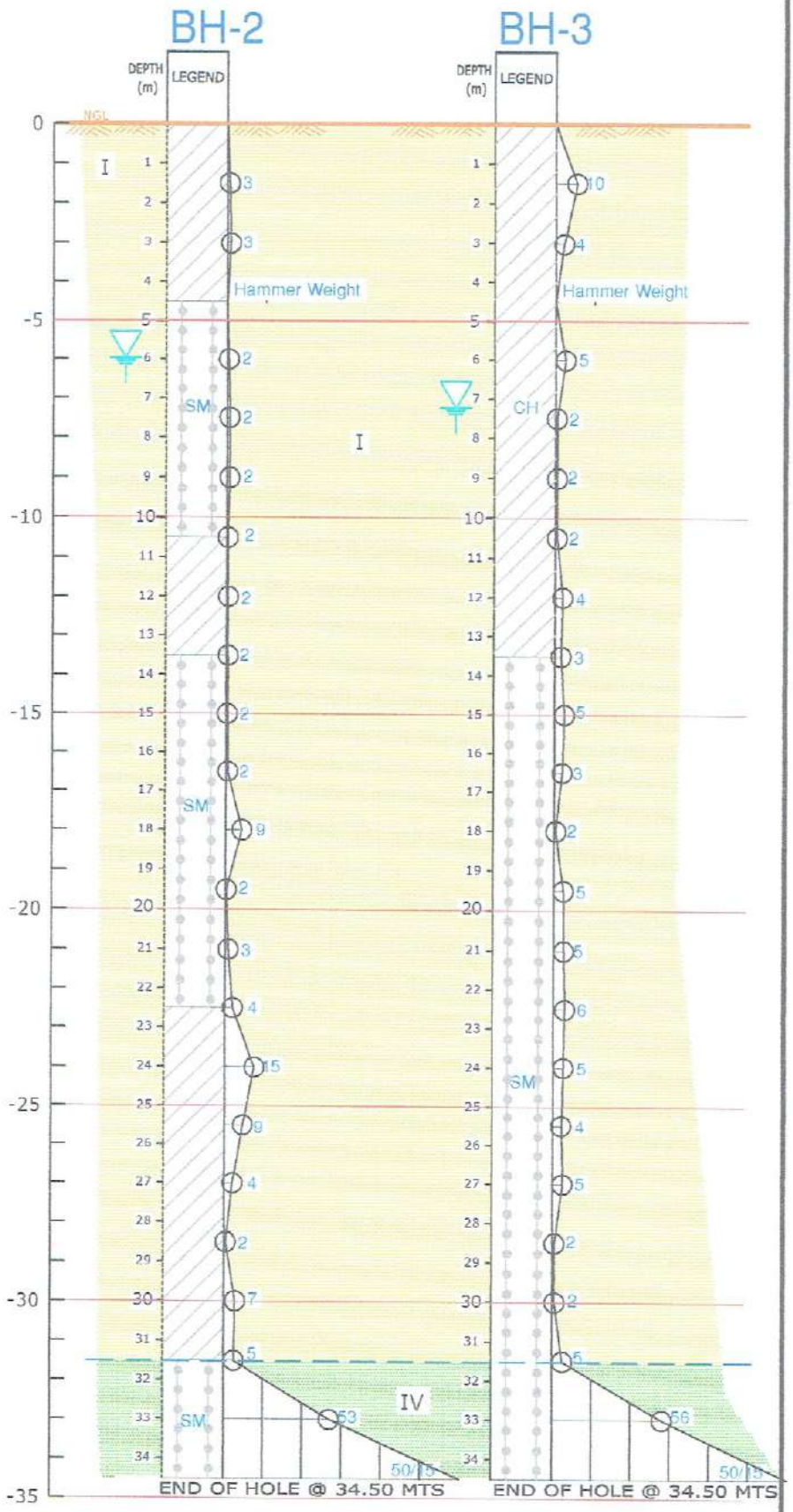

LEGEND: DRILLED BOREHOLE

FIGURE 1.0

## BOREHOLE LOCATION PLAN




**Soil Profile along BH-1**




**Soil Profile along BH-2 & 3**

N - VALUE
0 20 40 60 80 100

L E G E N D :

- Silty C L A Y
- Sandy C L A Y
- Clayey S I L T
- Sandy S I L T
- Clayey S A N D
- Silty S A N D
- Poorly graded SAND with silt
- Clayey silty S A N D
- Poorly graded SAND
- BASALT
- Silty TUFF / Tuffaceous SILTSTONE
- GRAVEL

- I - N-Value > 10
- II - N-Value 10 to 30
- III - N-Value 30 to 50
- IV - N-Value >50 (Refusal)
- V - CORING (Hard Formation)

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DPWH-BRS Accredited Laboratory

# FINAL BORING LOG

| | | | |
|---|---|---|---|
| CLIENT | BUREAU OF QUARANTINE | CONTROL NUMBER | |
| PROJECT NAME | PROPOSED CONSTRUCTION OF THE NEW BOQ BUILDING | DRILLED BY | Noel Homeres |
| PROJECT LOCATION | 25th & A.C. Delgado Sts. Port Area Manila | DATE STARTED | 27-Sep-18 |
| BOREHOLE NO. | BH-1 | DATE FINISHED | 29-Sep-18 |
| GROUND WATER LEVEL | 6.00m | WEATHER | SUNNY DAY |
| FINAL DEPTH | 19.50m | ENCODED BY | J. Llona |

| z | SAMPLING DEPTH | TYPE OF SAMPLING | REC. (m) | SAMPLE NO. | RQD (%) | SPT BLOWS PER 15 CM | N. VALUE | SOIL DESCRIPTION | GRADING % PASSING | | ATTERBERG | | CLASSIFICATION UNIFIED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | | | | | | | | | | | | |
| | 1.05 | WASH BORING | | | | | | Very soft, brownish gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 63.10 | CH |
| 1.50 | 1.50 | SPT | 0.45 | SS-1 | - | 1 1 1 | 2 | | #10 | 100.00 | PL= | 30.29 | |
| | | | | | | | | | #40 | 93.86 | PI= | 32.81 | |
| | | | | | | | | | #200 | 83.71 | | | |
| | 2.55 | WASH BORING | | | | | | Very soft, brownish gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 65.60 | CH |
| 3.00 | 3.00 | SPT | 0.45 | SS-2 | - | HAMMER WEIGHT | | | #10 | 100.00 | PL= | 30.77 | |
| | | | | | | | | | #40 | 95.96 | PI= | 34.83 | |
| | | | | | | | | | #200 | 84.79 | | | |
| | 4.05 | WASH BORING | | | | | | Very soft, brownish gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 65.30 | CH |
| 4.50 | 4.50 | SPT | 0.45 | SS-3 | - | HAMMER WEIGHT | | | #10 | 100.00 | PL= | 30.70 | |
| | | | | | | | | | #40 | 96.08 | PI= | 34.60 | |
| | | | | | | | | | #200 | 84.45 | | | |
| | 5.55 | WASH BORING | | | | | | Very soft, brownish gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 64.20 | CH |
| 6.00 | 6.00 | SPT | 0.45 | SS-4 | - | 1 1 1 | 2 | | #10 | 100.00 | PL= | 30.47 | |
| | | | | | | | | | #40 | 95.67 | PI= | 33.73 | |
| | | | | | | | | | #200 | 84.49 | | | |
| | 7.05 | WASH BORING | | | | | | Very soft, brownish gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 62.80 | CH |
| 7.50 | 7.50 | SPT | 0.45 | SS-5 | - | 1 1 1 | 2 | | #10 | 100.00 | PL= | 30.39 | |
| | | | | | | | | | #40 | 97.33 | PI= | 32.41 | |
| | | | | | | | | | #200 | 85.64 | | | |
| | 8.55 | WASH BORING | | | | | | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 9.00 | 9.00 | SPT | 0.45 | SS-6 | - | 1 1 1 | 2 | | #10 | 96.98 | PL= | NP | |
| | | | | | | | | | #40 | 81.79 | PI= | - | |
| | | | | | | | | | #200 | 30.37 | | | |
| | 10.05 | WASH BORING | | | | | | Loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 10.50 | 10.50 | SPT | 0.45 | SS-7 | - | 2 3 4 | 7 | | #10 | 97.15 | PL= | NP | |
| | | | | | | | | | #40 | 81.72 | PI= | - | |
| | | | | | | | | | #200 | 29.64 | | | |
| | 11.55 | WASH BORING | | | | | | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 12.00 | 12.00 | SPT | 0.45 | SS-8 | - | 2 1 1 | 2 | | #10 | 97.63 | PL= | NP | |
| | | | | | | | | | #40 | 78.20 | PI= | - | |
| | | | | | | | | | #200 | 22.86 | | | |
| | 13.05 | WASH BORING | | | | | | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 13.50 | 13.50 | SPT | 0.45 | SS-9 | - | 1 1 1 | 2 | | #10 | 96.88 | PL= | NP | |
| | | | | | | | | | #40 | 76.31 | PI= | - | |
| | | | | | | | | | #200 | 25.05 | | | |
| | 14.55 | WASH BORING | | | | | | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 15.00 | 15.00 | SPT | 0.45 | SS-10 | - | 1 1 1 | 2 | | #10 | 95.93 | PL= | NP | |
| | | | | | | | | | #40 | 77.55 | PI= | - | |
| | | | | | | | | | #200 | 31.00 | | | |
| | 16.05 | WASH BORING | | | | | | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 16.50 | 16.50 | SPT | 0.45 | SS-11 | - | 5 1 1 | 2 | | #10 | 96.59 | PL= | NP | |
| | | | | | | | | | #40 | 80.81 | PI= | - | |
| | | | | | | | | | #200 | 25.32 | | | |
| | 17.55 | WASH BORING | | | | | | Very dense, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 18.00 | 18.00 | SPT | 0.45 | SS-12 | - | 11 25 27 | 52 | | #10 | 95.58 | PL= | NP | |
| | | | | | | | | | #40 | 79.27 | PI= | - | |
| | | | | | | | | | #200 | 28.60 | | | |
| | 19.05 | WASH BORING | | | | | | Very dense, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 19.50 | 19.50 | SPT | 0.10 | SS-13 | - | 50/15 | | | #10 | 96.82 | PL= | NP | |
| | | | | | | | | | #40 | 82.31 | PI= | - | |
| | | | | | | | | | #200 | 31.70 | | | |
| | | | | | | | | End of Borehole | | | | | |
| 0.00 | | | | | | | | | | | | | |

N - VALUE (GRAPHICAL): 20 40 60 80 100

**LEGENDS, SYMBOLS, AND RANGE OF VALUES**

STANDARD PENETRATION TEST | UNDISTURBED SAMPLING | CORING

Encoded By: J. Llona, Laboratory Technician/Encoder

Certified By: M. CUNAHAP

CH-Silty CLAY; MH-Clayey SILT; ML-Sandy SILT; SW-Well Graded SAND; SM-Silty SAND; SP-Poorly Graded SAND; SP-SM-Poorly Graded SAND with silt; SW-SM-Well Graded SAND with silt

| COHESIVE SOILS | |
|---|---|
| N - VALUES | CONSISTENCY |
| 0 - 2 | VERY SOFT |
| 3 - 4 | SOFT |
| 5 - 8 | FIRM |
| 9 - 15 | STIFF |
| 16 - 30 | VERY STIFF |
| > 30 | HARD |

| COHENSIONLESS SOILS | |
|---|---|
| N - VALUES | CONSISTENCY |
| 0 - 4 | VERY LOOSE |
| 5 - 10 | LOOSE |
| 11 - 30 | MEDIUM DENSE |
| 31 -50 | DENSE |
| >50 | VERY DENSE |

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DPWH-BRS Accredited Laboratory

# FINAL BORING LOG

CLIENT: BUREAU OF QUARANTINE
PROJECT NAME: PROPOSED CONSTRUCTION OF THE NEW BOQ BUILDING
PROJECT LOCATION: 25th & A.C. Delgado Sts. Port Area Manila
BOREHOLE NO.: BH-2
GROUND WATER LEVEL: 6.00m
FINAL DEPTH: 34.50m
CONTROL NUMBER:
DRILLED BY: Noel Homeres
DATE STARTED: 30-Sep-18
DATE FINISHED: 11-Oct-18
WEATHER: SUNNY DAY
ENCODED BY: J. Llona

| DEPTH | SAMPLING DEPTH | TYPE OF SAMPLING | REC. (m) | SAMPLE NO. | RQD (%) | SPT BLOWS PER 15 CM | N. VALUE | SOIL DESCRIPTION | GRADING % PASSING | | ATTERBERG | | CLASSIFICATION UNIFIED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | | | | | | | | | | | | |
| | 1.05 | WASH BORING | | | | | | Soft, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 64.70 | CH |
| 1.50 | 1.50 | SPT | 0.45 | SS-1 | - | 2 2 1 | 3 | | #10 | 100.00 | PL= | 31.15 | |
| | | | | | | | | | #40 | 95.89 | PI= | 33.55 | |
| | | | | | | | | | #200 | 86.73 | | | |
| | 2.55 | WASH BORING | | | | | | Soft, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 67.50 | CH |
| 3.00 | 3.00 | SPT | 0.45 | SS-2 | - | 1 2 1 | 3 | | #10 | 100.00 | PL= | 31.99 | |
| | | | | | | | | | #40 | 94.94 | PI= | 35.51 | |
| | | | | | | | | | #200 | 83.64 | | | |
| | 4.05 | WASH BORING | | | | | | Very soft, gray silty CLAY with traces of shell fragments of high plasticity | #4 | 98.10 | LL= | 62.40 | CH |
| 4.50 | 4.50 | SPT | 0.45 | SS-3 | - | HAMMER WEIGHT | | | #10 | 97.05 | PL= | 31.44 | |
| | | | | | | | | | #40 | 94.31 | PI= | 30.96 | |
| | | | | | | | | | #200 | 83.50 | | | |
| | 5.55 | WASH BORING | | | | | | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 6.00 | 6.00 | SPT | 0.45 | SS-4 | - | 1 1 1 | 2 | | #10 | 96.97 | PL= | NP | |
| | | | | | | | | | #40 | 81.71 | PI= | - | |
| | | | | | | | | | #200 | 30.33 | | | |
| | 7.05 | WASH BORING | | | | | | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 7.50 | 7.50 | SPT | 0.45 | SS-5 | - | 1 1 1 | 2 | | #10 | 96.79 | PL= | NP | |
| | | | | | | | | | #40 | 77.63 | PI= | - | |
| | | | | | | | | | #200 | 24.99 | | | |
| | 8.55 | WASH BORING | | | | | | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 9.00 | 9.00 | SPT | 0.45 | SS-6 | - | 2 1 1 | 2 | | #10 | 97.14 | PL= | NP | |
| | | | | | | | | | #40 | 83.45 | PI= | - | |
| | | | | | | | | | #200 | 31.13 | | | |
| | 10.05 | WASH BORING | | | | | | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 10.50 | 10.50 | SPT | 0.45 | SS-7 | - | 1 1 1 | 2 | | #10 | 96.50 | PL= | NP | |
| | | | | | | | | | #40 | 81.96 | PI= | - | |
| | | | | | | | | | #200 | 33.86 | | | |
| | 11.55 | WASH BORING | | | | | | Very soft, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 63.40 | CH |
| 12.00 | 12.00 | SPT | 0.45 | SS-8 | - | 2 1 1 | 2 | | #10 | 100.00 | PL= | 31.30 | |
| | | | | | | | | | #40 | 95.27 | PI= | 32.10 | |
| | | | | | | | | | #200 | 84.50 | | | |
| | 13.05 | WASH BORING | | | | | | Very soft, gray silty CLAY with traces of shell fragments of high plasticity | #4 | 96.46 | LL= | 64.20 | CH |
| 13.50 | 13.50 | SPT | 0.45 | SS-9 | - | 1 1 1 | 2 | | #10 | 95.33 | PL= | 30.60 | |
| | | | | | | | | | #40 | 91.79 | PI= | 33.60 | |
| | | | | | | | | | #200 | 82.52 | | | |
| | 14.55 | WASH BORING | | | | | | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 15.00 | 15.00 | SPT | 0.45 | SS-10 | - | 1 1 1 | 2 | | #10 | 97.10 | PL= | NP | |
| | | | | | | | | | #40 | 82.49 | PI= | - | |
| | | | | | | | | | #200 | 29.93 | | | |
| | 16.05 | WASH BORING | | | | | | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 16.50 | 16.50 | SPT | 0.45 | SS-11 | - | 1 1 1 | 2 | | #10 | 97.52 | PL= | NP | |
| | | | | | | | | | #40 | 82.91 | PI= | - | |
| | | | | | | | | | #200 | 29.05 | | | |
| | 17.55 | WASH BORING | | | | | | Loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 18.00 | 18.00 | SPT | 0.45 | SS-12 | - | 2 5 4 | 9 | | #10 | 97.00 | PL= | NP | |
| | | | | | | | | | #40 | 82.64 | PI= | - | |
| | | | | | | | | | #200 | 32.20 | | | |
| | 19.05 | WASH BORING | | | | | | Very loose, gray silty SAND with traces of shell fragments fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 19.50 | 19.50 | SPT | 0.10 | SS-13 | - | 3 1 1 | 2 | | #10 | 96.85 | PL= | NP | |
| | | | | | | | | | #40 | 78.83 | PI= | - | |
| | | | | | | | | | #200 | 29.68 | | | |
| | 20.55 | WASH BORING | | | | | | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 21.00 | 21.00 | SPT | 0.45 | SS-14 | - | 2 2 1 | 3 | | #10 | 98.19 | PL= | NP | |
| | | | | | | | | | #40 | 83.25 | PI= | - | |
| | | | | | | | | | #200 | 30.65 | | | |

**LEGENDS, SYMBOLS, AND RANGE OF VALUES**

STANDARD PENETRATION TEST | UNDISTURBED SAMPLING | CORING

CH-Silty CLAY
ML-Sandy SILT
SM-Silty SAND
SP-Poorly Graded SAND
SP-SM-Poorly Graded SAND with silt
SW-SM-Well Graded SAND with silt
MH-Clayey SILT
SW-Well Graded SAND

| COHESIVE SOILS | | COHENSIONLESS SOILS | |
|---|---|---|---|
| N - VALUES | CONSISTENCY | N - VALUES | CONSISTENCY |
| 0 - 2 | VERY SOFT | 0 - 4 | VERY LOOSE |
| 3 - 4 | SOFT | 5 - 10 | LOOSE |
| 5 - 8 | FIRM | 11 - 30 | MEDIUM DENSE |
| 9 - 15 | STIFF | 31 -50 | DENSE |
| 16 - 30 | VERY STIFF | >50 | VERY DENSE |
| > 30 | HARD | | |

Encoded By: J. Llona, Laboratory Technician/Encoder
Certified By: M.CUNAHAP, Laboratory Head

TERMS Concrete & Materials Testing Laboratory Inc.
#19L Intalan St., Bagong Ilog, Pasig City.
DPWH-BRS Accredited Laboratory

# FINAL BORING LOG

CLIENT: BUREAU OF QUARANTINE
CONTROL NUMBER:
PROJECT NAME: PROPOSED CONSTRUCTION OF THE NEW BOQ BUILDING
PROJECT LOCATION: 25th & A.C. Delgado Sts. Port Area Manila
BOREHOLE NO.: BH-2
GROUND WATER LEVEL: 6.00m
FINAL DEPTH: 34.50m
DRILLED BY: Noel Homeres
DATE STARTED: 30-Sep-18
DATE FINISHED: 11-Oct-18
WEATHER: SUNNY DAY
ENCODED BY: J. Llona

| DEPTH | SAMPLING DEPTH | TYPE OF SAMPLING | REC. (m) | SAMPLE NO. | RQD (%) | SPT BLOWS PER 15 CM | | | N. VALUE | SOIL DESCRIPTION | GRADING % PASSING | | ATTERBERG | | CLASSIFICATION UNIFIED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 22.05 | WASH BORING | | | | | | | | Loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| | | | | | | | | | | | #10 | 96.69 | PL= | NP | |
| 22.50 | 22.50 | SPT | 0.45 | SS-15 | - | 2 | 1 | 3 | 4 | | #40 | 80.11 | PI= | - | |
| | | | | | | | | | | | #200 | 26.80 | | | |
| | 23.55 | WASH BORING | | | | | | | | Medium dense, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| | | | | | | | | | | | #10 | 97.49 | PL= | NP | |
| 24.00 | 24.00 | SPT | 0.45 | SS-16 | - | 4 | 6 | 9 | 15 | | #40 | 82.01 | PI= | - | |
| | | | | | | | | | | | #200 | 26.17 | | | |
| | 25.05 | WASH BORING | | | | | | | | Loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| | | | | | | | | | | | #10 | 96.68 | PL= | NP | |
| 25.50 | 25.50 | SPT | 0.45 | SS-17 | - | 5 | 4 | 5 | 9 | | #40 | 79.85 | PI= | - | |
| | | | | | | | | | | | #200 | 26.37 | | | |
| | 26.55 | WASH BORING | | | | | | | | Soft, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 64.50 | CH |
| | | | | | | | | | | | #10 | 100.00 | PL= | 31.13 | |
| 27.00 | 27.00 | SPT | 0.45 | SS-18 | - | 3 | 2 | 2 | 4 | | #40 | 94.62 | PI= | 33.37 | |
| | | | | | | | | | | | #200 | 84.08 | | | |
| | 28.05 | WASH BORING | | | | | | | | Very soft, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 64.20 | CH |
| | | | | | | | | | | | #10 | 100.00 | PL= | 31.52 | |
| 28.50 | 28.50 | SPT | 0.45 | SS-19 | - | 2 | 1 | 1 | 2 | | #40 | 93.26 | PI= | 32.68 | |
| | | | | | | | | | | | #200 | 83.41 | | | |
| | 29.55 | WASH BORING | | | | | | | | Firm, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 62.40 | CH |
| | | | | | | | | | | | #10 | 100.00 | PL= | 30.72 | |
| | 30.00 | SPT | 0.45 | SS-20 | - | 2 | 3 | 4 | 7 | | #40 | 96.17 | PI= | 31.68 | |
| | | | | | | | | | | | #200 | 88.58 | | | |
| | 31.05 | WASH BORING | | | | | | | | Firm, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 66.80 | CH |
| | | | | | | | | | | | #10 | 100.00 | PL= | 31.01 | |
| 31.50 | 31.50 | SPT | 0.45 | SS-21 | - | 2 | 2 | 3 | 5 | | #40 | 96.22 | PI= | 35.79 | |
| | | | | | | | | | | | #200 | 86.15 | | | |
| | 32.55 | WASH BORING | | | | | | | | Very dense, gray silty SAND fine grained, non plasticity | #4 | 100.00 | LL= | - | SM |
| | | | | | | | | | | | #10 | 96.11 | PL= | NP | |
| 33.00 | 33.00 | SPT | 0.45 | SS-22 | - | 12 | 24 | 29 | 53 | | #40 | 80.15 | PI= | - | |
| | | | | | | | | | | | #200 | 27.11 | | | |
| | 34.05 | WASH BORING | | | | | | | | Very dense, gray silty SAND fine grained, non plasticity | #4 | 100.00 | LL= | - | SM |
| | | | | | | | | | | | #10 | 96.42 | PL= | NP | |
| 34.50 | 34.50 | SPT | 0.45 | SS-23 | - | 50/15 | | | | | #40 | 81.32 | PI= | - | |
| | | | | | | | | | | | #200 | 25.62 | | | |

N - VALUE (GRAPHICAL): 20 40 60 80 100

**LEGENDS, SYMBOLS, AND RANGE OF VALUES**

STANDARD PENETRATION TEST
UNDISTURBED SAMPLING
CORING

CH-Silty CLAY
ML-Sandy SILT
SM-Silty SAND
SP-Poorly Graded SAND
SP-SM-Poorly Graded SAND with silt
SW-SM-Well Graded SAND with silt
MH-Clayey SILT
SW-Well Graded SAND

| COHESIVE SOILS | |
|---|---|
| N - VALUES | CONSISTENCY |
| 0 - 2 | VERY SOFT |
| 3 - 4 | SOFT |
| 5 - 8 | FIRM |
| 9 - 15 | STIFF |
| 16 - 30 | VERY STIFF |
| > 30 | HARD |

| COHENSIONLESS SOILS | |
|---|---|
| N - VALUES | CONSISTENCY |
| 0 - 4 | VERY LOOSE |
| 5 - 10 | LOOSE |
| 11 - 30 | MEDIUM DENSE |
| 31 -50 | DENSE |
| >50 | VERY DENSE |

Encoded By:
J. Llona
Laboratory Technician/Encoder

Certified By:
M.CUNAHAP
Laboratory Head

TERMS Concrete & Materials Testing Laboratory Inc.
#19L Intalan St., Bagong Ilog, Pasig City.

DPWH-BRS Accredited Laboratory

# FINAL BORING LOG

| | | | |
|---|---|---|---|
| CLIENT | BUREAU OF QUARANTINE | CONTROL NUMBER | |
| PROJECT NAME | PROPOSED CONSTRUCTION OF THE NEW BOQ BUILDING | DRILLED BY | Noel Homeres |
| PROJECT LOCATION | 25th & A.C. Delgado Sts. Port Area Manila | DATE STARTED | 13-Oct-18 |
| BOREHOLE NO. | BH-3 | DATE FINISHED | 16-Oct-18 |
| GROUND WATER LEVEL | 7.05m | WEATHER | SUNNY DAY |
| FINAL DEPTH | 34.50m | ENCODED BY | J. Llona |

| z | SAMPLING DEPTH | TYPE OF SAMPLING | REC. (m) | SAMPLE NO. | RQD (%) | SPT BLOWS PER 15 CM | | | N. VALUE | SOIL DESCRIPTION | GRADING % PASSING | | ATTERBERG | | CLASSIFICATION UNIFIED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | | | | | | | | | | | | | | |
| | 1.05 | WASH BORING | | | | | | | | Stiff, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 66.50 | CH |
| 1.50 | 1.50 | SPT | 0.45 | SS-1 | - | 4 | 4 | 6 | 10 | | #10 | 100.00 | PL= | 30.55 | |
| | | | | | | | | | | | #40 | 95.37 | PI= | 34.95 | |
| | 2.55 | WASH BORING | | | | | | | | | #200 | 83.43 | | | |
| 3.00 | 3.00 | SPT | 0.45 | SS-2 | - | 2 | 2 | 2 | 4 | Soft, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 63.64 | CH |
| | | | | | | | | | | | #10 | 100.00 | PL= | 30.37 | |
| | 4.05 | WASH BORING | | | | | | | | | #40 | 95.20 | PI= | 33.27 | |
| 4.50 | 4.50 | SPT | 0.45 | SS-3 | - | HAMMER WEIGHT | | | | | #200 | 86.70 | | | |
| | | | | | | | | | | Very soft, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 66.80 | CH |
| | 5.55 | WASH BORING | | | | | | | | | #10 | 100.00 | PL= | 31.09 | |
| 6.00 | 6.00 | SPT | 0.45 | SS-4 | - | 1 | 2 | 3 | 5 | | #40 | 94.22 | PI= | 35.71 | |
| | | | | | | | | | | | #200 | 84.87 | | | |
| | 7.05 | WASH BORING | | | | | | | | Firm, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 62.50 | CH |
| 7.50 | 7.50 | SPT | 0.45 | SS-5 | - | 1 | 1 | 1 | 2 | | #10 | 100.00 | PL= | 30.98 | |
| | | | | | | | | | | | #40 | 94.96 | PI= | 31.52 | |
| | 8.55 | WASH BORING | | | | | | | | | #200 | 86.24 | | | |
| 9.00 | 9.00 | SPT | 0.45 | SS-6 | - | 1 | 1 | 1 | 2 | Very soft, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 68.60 | CH |
| | | | | | | | | | | | #10 | 100.00 | PL= | 31.92 | |
| | 10.05 | WASH BORING | | | | | | | | | #40 | 96.50 | PI= | 36.68 | |
| 10.50 | 10.50 | SPT | 0.45 | SS-7 | - | 1 | 1 | 1 | 2 | | #200 | 85.92 | | | |
| | | | | | | | | | | Very soft, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 68.70 | CH |
| | 11.55 | WASH BORING | | | | | | | | | #10 | 100.00 | PL= | 32.09 | |
| 12.00 | 12.00 | SPT | 0.45 | SS-8 | - | 1 | 2 | 2 | 4 | | #40 | 95.71 | PI= | 36.61 | |
| | | | | | | | | | | | #200 | 83.38 | | | |
| | 13.05 | WASH BORING | | | | | | | | Very soft, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 65.50 | CH |
| 13.50 | 13.50 | SPT | 0.45 | SS-9 | - | 2 | 1 | 2 | 3 | | #10 | 100.00 | PL= | 31.77 | |
| | | | | | | | | | | | #40 | 95.80 | PI= | 33.73 | |
| | 14.55 | WASH BORING | | | | | | | | | #200 | 85.90 | | | |
| 15.00 | 15.00 | SPT | 0.45 | SS-10 | - | 1 | 2 | 3 | 5 | Soft, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 64.40 | CH |
| | | | | | | | | | | | #10 | 100.00 | PL= | 31.26 | |
| | 16.05 | WASH BORING | | | | | | | | | #40 | 96.99 | PI= | 33.14 | |
| 16.50 | 16.50 | SPT | 0.45 | SS-11 | - | 1 | 2 | 1 | 3 | | #200 | 89.59 | | | |
| | | | | | | | | | | Soft, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 62.50 | CH |
| | 17.55 | WASH BORING | | | | | | | | | #10 | 100.00 | PL= | 30.30 | |
| 18.00 | 18.00 | SPT | 0.45 | SS-12 | - | 1 | 1 | 1 | 2 | | #40 | 97.38 | PI= | 32.20 | |
| | | | | | | | | | | | #200 | 88.74 | | | |
| | 19.05 | WASH BORING | | | | | | | | Firm, gray silty CLAY of high plasticity | #4 | 100.00 | LL= | 66.50 | CH |
| 19.50 | 19.50 | SPT | 0.10 | SS-13 | - | 2 | 3 | 2 | 5 | | #10 | 100.00 | PL= | 32.40 | |
| | | | | | | | | | | | #40 | 94.93 | PI= | 34.10 | |
| | 20.55 | WASH BORING | | | | | | | | | #200 | 84.13 | | | |
| 21.00 | 21.00 | SPT | 0.45 | SS-14 | - | 4 | 3 | 2 | 5 | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| | | | | | | | | | | | #10 | 96.80 | PL= | NP | |
| | | | | | | | | | | | #40 | 82.07 | PI= | - | |
| | | | | | | | | | | | #200 | 29.04 | | | |
| | | | | | | | | | | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| | | | | | | | | | | | #10 | 97.49 | PL= | NP | |
| | | | | | | | | | | | #40 | 83.43 | PI= | - | |
| | | | | | | | | | | | #200 | 28.89 | | | |
| | | | | | | | | | | Loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| | | | | | | | | | | | #10 | 97.06 | PL= | NP | |
| | | | | | | | | | | | #40 | 79.86 | PI= | - | |
| | | | | | | | | | | | #200 | 33.03 | | | |
| | | | | | | | | | | Loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| | | | | | | | | | | | #10 | 97.20 | PL= | NP | |
| | | | | | | | | | | | #40 | 83.35 | PI= | - | |
| | | | | | | | | | | | #200 | 34.66 | | | |

**LEGENDS, SYMBOLS, AND RANGE OF VALUES**

STANDARD PENETRATION TEST ☒ | UNDISTURBED SAMPLING ■ | CORING ▯

CH-Silty CLAY
ML-Sandy SILT
SM-Silty SAND
SP-Poorly Graded SAND
SP-SM-Poorly Graded SAND with silt
SW-SM-Well Graded SAND with silt
MH-Clayey SILT
SW-Well Graded SAND

| COHESIVE SOILS | | COHENSIONLESS SOILS | |
|---|---|---|---|
| N - VALUES | CONSISTENCY | N - VALUES | CONSISTENCY |
| 0 - 2 | VERY SOFT | 0 - 4 | VERY LOOSE |
| 3 - 4 | SOFT | 5 - 10 | LOOSE |
| 5 - 8 | FIRM | 11 - 30 | MEDIUM DENSE |
| 9 - 15 | STIFF | 31 -50 | DENSE |
| 16 - 30 | VERY STIFF | >50 | VERY DENSE |
| > 30 | HARD | | |

Encoded By:
J. Llona
Laboratory Technician/Encoder

Certified By:
M. CUNAHAP
Laboratory Head

TERMS Concrete & Materials Testing Laboratory Inc.
#19L Intalan St., Bagong Ilog, Pasig City.

DPWH-BRS Accredited Laboratory

# FINAL BORING LOG

CLIENT: BUREAU OF QUARANTINE
CONTROL NUMBER:

PROJECT NAME: PROPOSED CONSTRUCTION OF THE NEW BOQ BUILDING
PROJECT LOCATION: 25th & A.C. Delgado Sts. Port Area Manila
BOREHOLE NO.: BH-3
GROUND WATER LEVEL: 7.05m
FINAL DEPTH: 34.50m

DRILLED BY: Noel Homeres
DATE STARTED: 13-Oct-18
DATE FINISHED: 16-Oct-18
WEATHER: SUNNY DAY
ENCODED BY: J. Llona

| DEPTH | SAMPLING DEPTH | TYPE OF SAMPLING | REC. (m) | SAMPLE NO. | RQD (%) | SPT BLOWS PER 15 CM | | | N. VALUE | SOIL DESCRIPTION | GRADING % PASSING | | ATTERBERG | | CLASSIFICATION UNIFIED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 22.05 | WASH BORING | | | | | | | | Loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 22.50 | 22.50 | SPT | 0.45 | SS-15 | - | 3 | 3 | 3 | 6 | | #10 | 96.25 | PL= | NP | |
| | | | | | | | | | | | #40 | 75.51 | PI= | - | |
| | | | | | | | | | | | #200 | 23.24 | | | |
| | 23.55 | WASH BORING | | | | | | | | Loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 24.00 | 24.00 | SPT | 0.45 | SS-16 | - | 2 | 2 | 3 | 5 | | #10 | 96.75 | PL= | NP | |
| | | | | | | | | | | | #40 | 80.99 | PI= | - | |
| | | | | | | | | | | | #200 | 35.04 | | | |
| | 25.05 | WASH BORING | | | | | | | | Loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 25.50 | 25.50 | SPT | 0.45 | SS-17 | - | 2 | 2 | 2 | 4 | | #10 | 96.70 | PL= | NP | |
| | | | | | | | | | | | #40 | 84.04 | PI= | - | |
| | | | | | | | | | | | #200 | 33.33 | | | |
| | 26.55 | WASH BORING | | | | | | | | Loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 27.00 | 27.00 | SPT | 0.45 | SS-18 | - | 2 | 3 | 2 | 5 | | #10 | 97.06 | PL= | NP | |
| | | | | | | | | | | | #40 | 83.04 | PI= | - | |
| | | | | | | | | | | | #200 | 30.89 | | | |
| | 28.05 | WASH BORING | | | | | | | | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 28.50 | 28.50 | SPT | 0.45 | SS-19 | - | 1 | 1 | 1 | 2 | | #10 | 95.66 | PL= | NP | |
| | | | | | | | | | | | #40 | 78.90 | PI= | - | |
| | | | | | | | | | | | #200 | 23.40 | | | |
| | 29.55 | WASH BORING | | | | | | | | Very loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 30.00 | 30.00 | SPT | 0.45 | SS-20 | - | 1 | 1 | 1 | 2 | | #10 | 94.86 | PL= | NP | |
| | | | | | | | | | | | #40 | 74.53 | PI= | - | |
| | | | | | | | | | | | #200 | 29.63 | | | |
| | 31.05 | WASH BORING | | | | | | | | Loose, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 31.50 | 31.50 | SPT | 0.45 | SS-21 | - | 3 | 3 | 2 | 5 | | #10 | 96.74 | PL= | NP | |
| | | | | | | | | | | | #40 | 82.59 | PI= | - | |
| | | | | | | | | | | | #200 | 35.01 | | | |
| | 32.55 | WASH BORING | | | | | | | | Very dense, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 33.00 | 33.00 | SPT | 0.45 | SS-22 | - | 13 | 28 | 28 | 56 | | #10 | 96.52 | PL= | NP | |
| | | | | | | | | | | | #40 | 80.64 | PI= | - | |
| | | | | | | | | | | | #200 | 23.46 | | | |
| | 34.05 | WASH BORING | | | | | | | | Very dense, gray silty SAND fine grained, non plastic | #4 | 100.00 | LL= | - | SM |
| 34.50 | 34.50 | SPT | 0.45 | SS-23 | - | 50/15 | | | | | #10 | 96.29 | PL= | NP | |
| | | | | | | | | | | | #40 | 79.93 | PI= | - | |
| | | | | | | | | | | | #200 | 24.07 | | | |

N - VALUE (GRAPHICAL): 20 40 60 80 100

**LEGENDS, SYMBOLS, AND RANGE OF VALUES**

STANDARD PENETRATION TEST
UNDISTURBED SAMPLING
CORING

CH-Silty CLAY
ML-Sandy SILT
SM-Silty SAND
SP-Poorly Graded SAND
SP-SM-Poorly Graded SAND with silt
SW-SM-Well Graded SAND with silt
MH-Clayey SILT
SW-Well Graded SAND

**COHESIVE SOILS**

| N - VALUES | CONSISTENCY |
|---|---|
| 0 - 2 | VERY SOFT |
| 3 - 4 | SOFT |
| 5 - 8 | FIRM |
| 9 - 15 | STIFF |
| 16 - 30 | VERY STIFF |
| > 30 | HARD |

**COHENSIONLESS SOILS**

| N - VALUES | CONSISTENCY |
|---|---|
| 0 - 4 | VERY LOOSE |
| 5 - 10 | LOOSE |
| 11 - 30 | MEDIUM DENSE |
| 31 -50 | DENSE |
| >50 | VERY DENSE |

Encoded By:
J. Llona
Laboratory Technician/Encoder

Certified By:
M.CUNAHAP
Laboratory Head

# BILL OF QUANTITIES

**PROPOSED INFRASTRUCTURE DEVELOPMENT OF BOQ MAIN BUILDING, PHASE 1**

Port Area, Manila

| Item No. | | DESCRIPTION | QTY | UNIT | UNIT COST | TOTAL COST |
|---|---|---|---|---|---|---|
| (1) | | (2) | (3) | (4) | (5) | (6) |
| | | | | | | |
| **I** | **GENERAL REQUIREMENTS** | | | | | |
| | | | | | | |
| **A** | MOBILIZATION AND DEMOBILIZATION (Including Demolition Works of | | 1 | lot | | - |
| | Existing Structures, Site Clearing & Disposal of Debris) | | | | | |
| **B** | TEMPORARY FACILITIES | | 1 | lot | | - |
| **C** | SAFETY, SECURITY AND HEALTH | | 1 | lot | | - |
| **D** | PERMITS | | 1 | lot | | - |
| | **D.1** | Building Permit | | | | |
| | **D.2** | Electrical Analysis with Sign and Seal of Plans (If aplicable) | | | | |
| | **D.3** | Structural Analysis with Sign and Seal of Plans (If aplicable) | | | | |
| | **D.4** | Mechanical Analysis with Sign and Seal of Plans (If aplicable) | | | | |
| | **D.5** | Plumbing Analysis with Sign and Seal of Plans (If aplicable) | | | | |
| | | | | | | |
| | **SUBTOTAL FOR GENERAL REQUIREMENTS** | | | | | - |
| | | | | | | |
| **II** | **ARCHITECTURAL WORKS** | | | | | |
| **A** | **MASONRY** | | | | | |
| | | | | | | |
| **1** | **Masonry Works** | | | | | |
| | Supply and installation of masonry, including all necessary accessories to | | | | | |
| | complete the work | | | | | |
| | | | | | | |
| | | 150 mm Thk CHB | 13,547.00 | pcs | | - |
| | | Cement | 1,104.00 | bag | | - |
| | 1.1 | Sand | 92.00 | cu.m | | - |
| | | 12mm dia. Deformed bars | 380.00 | pcs | | - |
| | | 10 mm dia. Deformed bars | 380.00 | pcs | | - |
| | | Tie wires | 45.00 | kg | | - |
| | | | | | | |
| | | PLASTERING WORKS | | | | |
| | 1.2 | Cement | 622.00 | bag | | - |
| | | Sand | 35.00 | cu.m | | - |
| | | | | | | |
| **B** | **THERMAL MOISTURE AND CONTROL** | | | | | |
| | Supply and Installation of water proofing and other works including tools and | | | | | |
| | equipmnet and all necessary to complete the work . | | | | | |
| | | | | | | |
| | 1.1 | Flexible Cementitious Water Proofing | 18.00 | gal | | - |
| | 1.2 | Cement | 4.00 | bag | | - |
| | | | | | | |
| **C** | **DOORS AND WINDOWS** | | | | | |
| **1** | **Doors** | | | | | |
| | Supply & installation of doors & frames incuding painting, hardware and fixing | | | | | |
| | accessories, and usage of equipment and tools to complete the Works as per | | | | | |
| | Architect's Specifications | | | | | |
| | | | | | | |
| | **D1** | Single Leaf Acrylic Spray Painted Hollow metal | 8.00 | set | | - |
| | | swing door w/ vision panel, | | | | |
| | | 300x900mm Vision Panel in 6mm thk tempered | | | | |
| | | Glass on clear anodized Glaizing Bead; | | | | |
| | | Guage 18 Steel Door & Jamb, Primed and Painted | | | | |
| | | | | | | |
| | **D2** | Single Leaf Acrylic Spray Painted Hollow metal | 8.00 | set | | - |
| | | swing door w/ louver | | | | |
| | | Guage 18 Steel Door & Jamb, Primed and Painted | | | | |
| | | | | | | |
| | | | | | | |