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RESEARCH ARTICLE OPEN ACCESS

Fire Safety Infrastructure: A Proposal for The Replacement of An Outdated Building with A Modern Fire Station Facility in Barangay Bulaon Resettlement City of San Fernando, Pampanga

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Abstract:

The fire station in a barangay provides many benefits to the community. The main advantage is the assurance that emergencies such as fires, natural disasters, and other dangerous events will be dealt with promptly and effectively. Fire department personnel, equipment, and supplies can help reduce property damage, injuries, and loss of life. Additionally, the fire station can serve as a center for disaster preparedness and community education programs, which helps build awareness and resilience in the barangay Furthermore, the presence of a fire station can have a positive effect on property prices and has attracted new businesses and residents to the area. In summary, a barangay fire station provides valuable community benefits, enhancing safety, rehabilitation, and economic development.

Keywords —— **Fire station, Emergency Response Planning, Mitigation, Quick Response Time.**

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I. INTRODUCTION

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II. METHODOLOGY

3.2 Setting the Parameters and Preparation of the Test Sample

Preparation of Material

Concrete - the study utilized design codes to ensure the efficiency and reliability of the structure. To guarantee a habitable building, the National Structural Code of the Philippines was followed. The most recent ACI 318 was utilized for the structural design, which had been reorganized as a member-based document. This meant that specific member types, such as beams, columns, or slabs, had separate sub-sections containing all the necessary design requirements for that member type. This streamlined the process by removing the necessity to search through multiple sections to fulfill the design criteria for a particular structural element, which used to be a requirement under the previous organizational format.

Steel - in the design process, the yield strength Fy = 414 MPa of A615M, Grade 60 was employed. The researchers opted to use ASTM A615 steel due to its desirable properties, as well as its ease of welding using any method.

Design Parameters

Soil Properties - the soil data will be provided by the nearest available soil investigation report in Bulaon Resettlement, City of San Fernando, Pampanga

Seismic - the near source factor can be determined by using the Fault Finder application. The nearest causative fault is located at the West Valley fault, which is 56.1 km away from the proposed fire station, which is in Bulaon Resettlement, City of San Fernando, Pampanga. The ACSE/SEI 7-10 approach, which uses spectral acceleration to determine the earthquake loads is accepted as an alternative procedure.

Location

The researchers selected the location of the fire station by considering various factors, such as accessibility and availability. To determine the most suitable spot, the researchers used Google Maps to identify the nearest location to the center of the barangay and the exit routes to neighboring barangays. They also ensured that the location was accessible for both small and large vehicles. After calculating the total available land area, the researchers developed a proposed layout for the fire station.

3.2 **Design Procedure**

Design method - The researchers used AutoCAD to build a floor plan for the fire station layout design. The total factored loads were calculated using the NSCP 2015 supported formulas.

STAAD Pro is used for structural design and determining the properties and dimensions that are used in the project's construction.

Capacity - Based on the data gathered in the given location, according to the 2020 Census, the Barangay comprises 27,506 individuals, equivalent to 7.76% of the entire population. It shares borders with neighboring barangays, namely Malpitic (2.12%), Maimpis (3.62%), Calulut (11.99%), Del Carmen (1.93%), and Sindalan (4.23%), making a combined total of 84,730 residents, representing 23.92% of San Fernando's total population. Meanwhile, Barangay Panipuan and Barangay Rafael have 4,016 (2.32%) and 4,805 (2.77%) residents, respectively, totaling 8,821 individuals, or 5.09% of Mexico's total population.

Structure - the primary objective of structural analysis and design is to engineer a structure capable of enduring all external forces throughout its intended lifespan. Flaws in the planning of structural elements can lead to critical consequences, including substantial financial burdens or, in the most tragic instances, the loss of human lives—a cost that cannot be equated with any monetary value. The initial phase, known as Conceptual Design, involves the creation of preliminary designs for elements like slabs, beams, columns, and footings, adhering to code recommendations.

Design Parameter

f'c	21 MPa
fy	276 MPa
Thickness	100 mm ϕ
Bars ϕ	12 mm ϕ
Concrete Cover	20 mm

Table 2.1 Design Parameters for Slabs

f'c	21 MPa
fy	414 MPa
Main bar	20 mm ϕ
Stirrups	10 mm ϕ
Concrete Cover	40 mm

Table 2.2 Design Parameters for Beams

f'c	21 MPa
fy	414 MPa
Main bar	16 mm ϕ
Lateral Ties	10 mm ϕ
Concrete Cover	40 mm

Table 2.3 Design Parameters for Columns

f'c	21 MPa
fy	414 MPa
Reinforcing Steel Bars	16 mm ϕ
Thickness	300 mm
Concrete Cover	75 mm

Table 2.4 Design Parameter for Footing

III. RESULTS AND DISCUSSION

3.1 **Location/Vicinity**

The recommended fire station location for the study region is Block 88 in Bulaon Resettlement, San Fernando, Pampanga. This location was selected based on factors such as accessibility, response time, and coverage area.

Figure 3.1: Homeowners Association Bulaon Resettlement

The location of the building is 15°04'52.9" N 120°39'44.7" E.

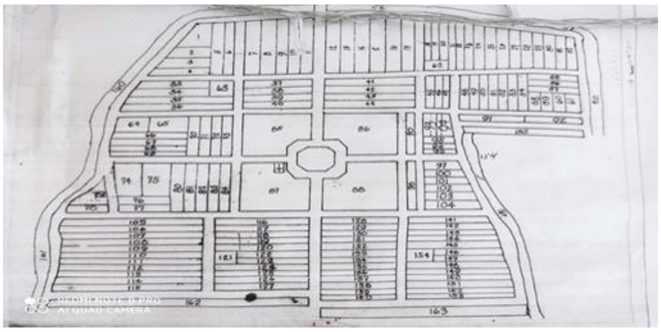


Figure 3.2: Blocks of Barangay Bulaon Resettlement

The proposed location for the fire station is Block 88 in Bulaon Resettlement, San Fernando, Pampanga. It is situated along major roads such as Jose Abad Santos Avenue (National Highway) and McArthur Highway, as well as minor roads such as Bulaon Rd, Northville Rd, Calulut Rd, J Rizal Ave, Northville Rd and Centro, Calulut, Gloria 1, and Mexico-Calulut Rd. These roads provide easy access to the barangay and nearby barangays, even for large vehicles that are required for firefighter response. The researchers also took into consideration the fact that the site is only in front of Ricardo P. Rodriguez Memorial Hospital and 900 meters away from the Bulaon Resettlement Health Center, which is advantageous in terms of providing health services.

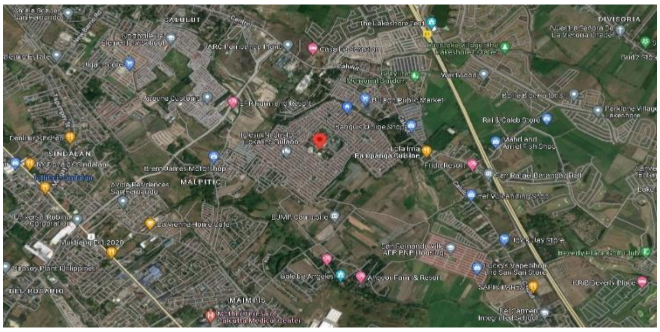


Figure 3.3: Bulaon Resettlement and the nearby barangays

The proposed location for the new fire station is the old building of the Homeowners Association, which is in close proximity to the Ricardo P. Rodriguez Memorial Hospital, San Vicente Pilot School for Philippine Craftsmen, Bulaon Multipurpose Pavilion, the elementary school in Bulaon, and the San Antonio Covered Court.

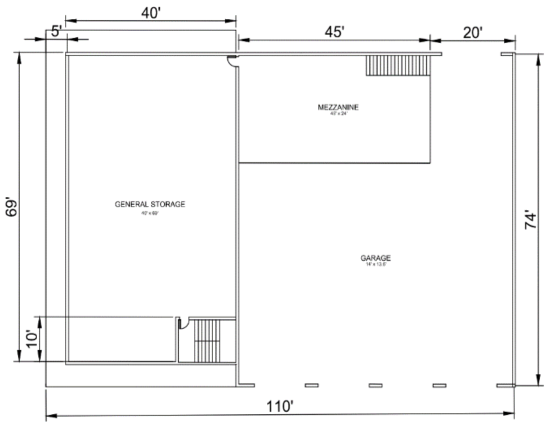


Figure 3.4: Site Plan (First Floor)

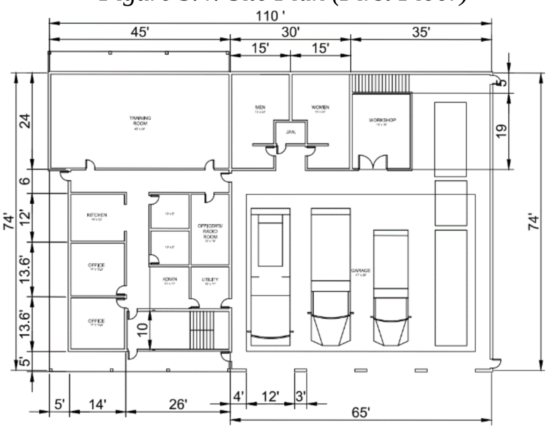


Figure 3.5: Site Plan (Second Floor)

3.2 Design Parameters

Availability

There are several stores within proximity to the location of the proposed fire station. Freeway Hardware & General Merchandise is one of the well-known stores that sell quality building products used for construction. Clarris Trading is also one of the nearest retailers that sell construction products.

Code and Specifications:

1. National Structural Code of the Philippines 2015, NSCP2015, Volume 1 – Generally for the entire Analysis and Design Requirements
2. Uniform Building Code 1997 Edition, UBC97 – For Building Seismic Analysis

Material Strengths:

The following material strengths shall follow the specifications used for the building, i.e.:

Material Properties:*As per the original design criteria*

Minimum Concrete Compressive Strength, f'c:

Columns: **fc' = 21MPa** *(3000 psi)*
Beams: **fc' = 21MPa** *(3000 psi)*
Slabs: **fc' = 21MPa** *(3000 psi)*
Footing: **fc' = 21MPa** *(3000 psi)*

Reinforcement steel bars shall be deformed and shall conform to ASTM 615

Main Bars, (16mm or larger)**fy = 414MPa** *(Grade 60)*

Secondary Bars, (<12mm) **fy = 228MPa** *(Grade 33)*
fy = 276MPa *(Grade40)*

Loads:

Design loads and forces encompass those originating from the building's self-weight, which includes all permanent loads referred to as "Dead Loads," non-permanent loads associated with occupancy known as "Live Loads," and seismic forces referred to as "Seismic Loads." These forces operate in the most crucial combinations, employing the relevant load factors as prescribed by the governing national structural code of the Philippines.

Dead Loads:

Dead loads encompass all the materials and fixed equipment integrated into a building or any other structure. These materials include but are not limited to, items such as walls, floors, roofs, ceilings, stairways, built-in partitions, finishes, cladding, and other architectural and structural components that are similarly incorporated. Additionally, fixed equipment is part of dead loads. These loads represent the self-weight of the structural frame of the building. Below, you'll find the design dead loads utilized in the analysis and design of the building.

Materials	Unit Dead Loads
ROOF DECK	(In kPa)
Slab (100mm @24kN/m^3)	2.40
Floor Finish (topping included)	1.10
Ceiling	0.10
Mechanical, Electrical, Plumbing (MEP)	0.10
Waterproofing	0.10
Interior Partitions	1.0
Total	**4.7**
SECOND FLOOR	(In kPa)
Slab (100mm @24kN/m^3)	2.40
Floor Finish (topping included)	1.10
Ceiling	0.10
Mechanical, Electrical, Plumbing (MEP)	0.10
Interior Partitions	1.0
Total	**4.7**
WALL	(In kN/m)
Wall Load	1.0

Table 3.1 Dead Load

Live Loads:

These are moveable loads and non-permanent loads that put stress on the floor, including interchangeable loads caused by occupancies during the life of the structure, with the exclusion of wind and earthquake loads. Live loads must consistently surpass the loads stipulated in Section 205 of the NSCP 2015 and should correspond to the highest loads expected based on the intended use or occupancy. Below, you will find the design live loads that have been employed in this design.

Occupancy / Use	**Floor Live Loads (kPa)**
Basic Floor Area (Residential)	1.9
Roof Live Load	0.6

Table 3.2 Live Load

Seismic Loads:
Given the Philippines' high seismic risk location, it's crucial to factor in seismic effects during building design. NSCP 2010 Section 208, which draws from the Uniform Building Code, offers a comprehensive approach to addressing seismic loads. This involves considerations such as seismic zoning, site characteristics, occupancy, and structural layout, all of which inform design choices and restrictions.
The seismic analysis parameters for computing the lateral seismic forces on the building structure are presented below:
Occupancy Category: Essential Facilities
Table 3.5 of Section 103
Occupancy Importance Factor, I: 1.5
Table 208
Seismic Zone Factor, Z: 0.40

Designated Fire Station

Occupancy Category	Seismic Importance Factor, I_p	Seismic Importance Factor,
Essential Facilities	1.50	1.50
Hazardous Facilities	1.25	1.50
Special Occupancy Structures	1.00	1.00
Standard Occupancy Structures	1.00	1.00
Miscellaneous Structures	1.00	1.00

Table 3.3: Seismic Importance Factors

Seismic Zone:
The Philippines archipelago is divided into only two seismic zones. Zone 2 includes the provinces of Palawan, Sulu, and Tawi-Tawi, while the remainder of the country falls under Zone 4.

Zone	2	4
Z	0.20	0.40

Table 3.4: Seismic Zone Factor Z

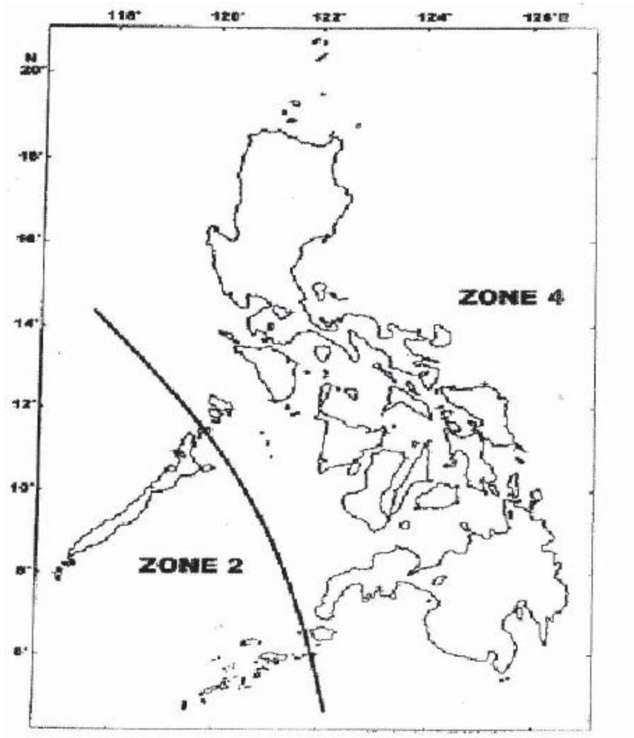


Figure 3.6: Referenced Seismic Map of the Philippines

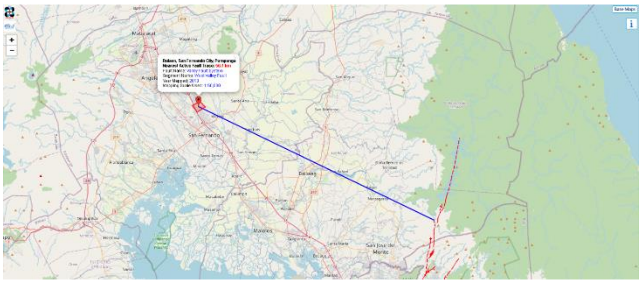


Figure 3.7: Nearest to West Valley Fault

Nearest Source Factor: 56.1km Nearest to West Valley Fault

1.0 Near-Source factor, Na
1.0 Near-Source factor, Nv

Seismic Source Type	Closest Distance to Known Seismic Source		
	≤ 2 km	5 km	≥ 10 km
A	1.5	1.2	1.0
B	1.3	1.0	1.0
C	1.0	1.0	1.0

Table 3.5: Near-Source Factor, $N_a{}^I$

Seismic Source Type	Closest Distance to Known Seismic Source			
	≤ 2 km	5 km	10 km	≥ 15 km
A	2.0	1.6	1.2	1.0
B	1.6	1.2	1.0	1.0
C	1.0	1.0	1.0	1.0

Table 3.6: Near-Source Factor, $N_v{}^I$

Seismic Source Type: **A**

Faults with Max. Moment Magnitude greater than 7

Moment-Resisting Frame Structure:

Concrete Special Moment Resisting Frame

Seismic Resistance factor: **8.5**

Loading Combination:

Considering that earthquake load, E, is as specified under section 208.6.1 which is equal to: $E = pE_h + E_v$

As per Section 203.3 of the NSCP2015 7th Edition

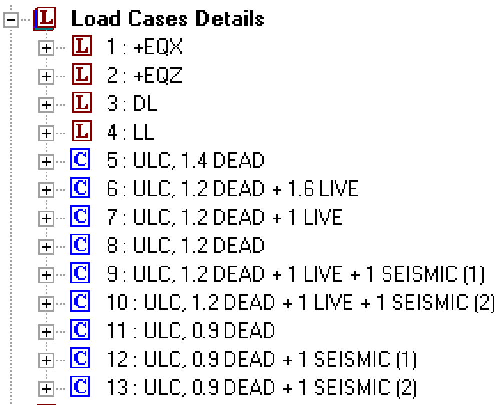
1.4 Dead Load

1.2 Dead Load + 1.6 Live Load + 0.5 Roof Live Load

1.2 Dead Load + 1.0 Live Load + 1.6 Roof Live Load

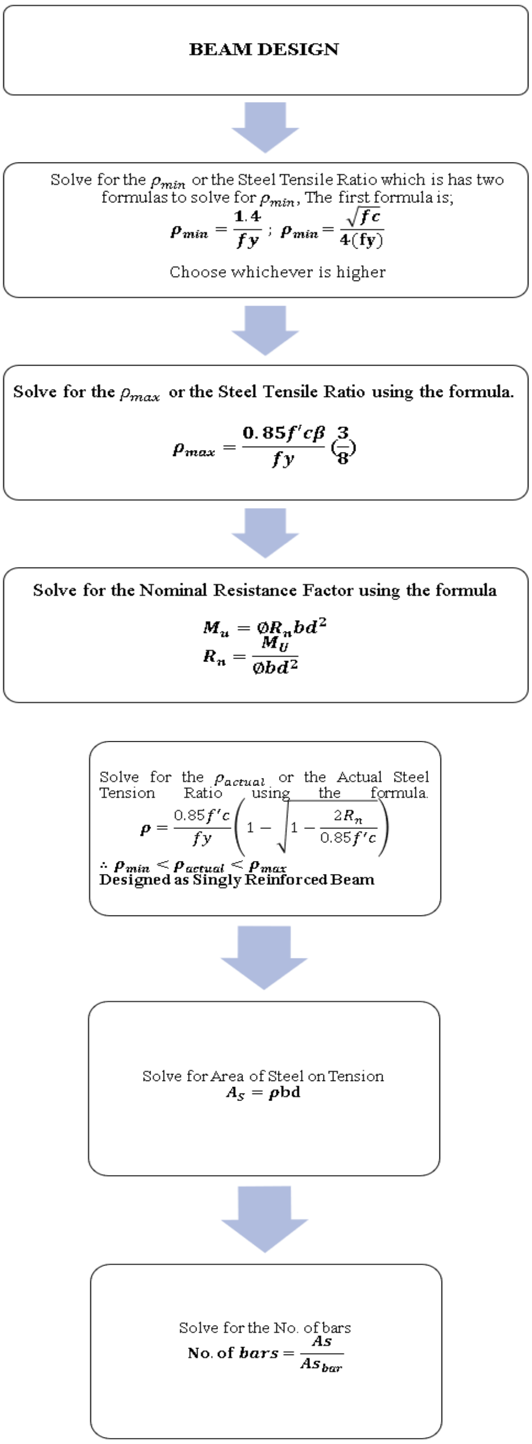
1.53 Dead Load + 1.0 Earthquake + (f_1) Live Load

LRFD Load Combination with

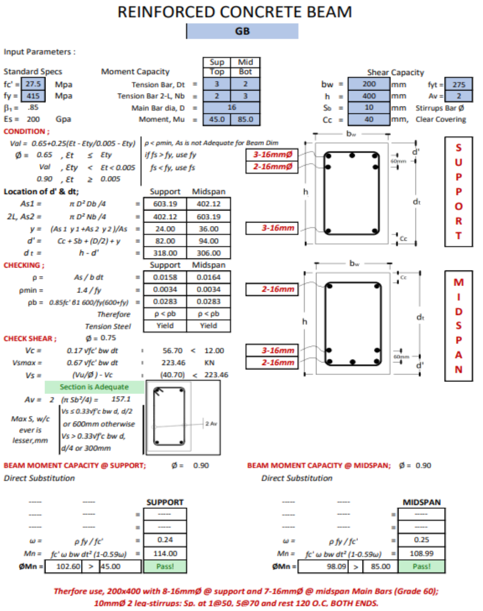


3.3 **Structural Details**

Structural detailing must comply with NSCP 2015's Section 418 (Earthquake-Resistant Structures) and Section 425 (Reinforcement Detailing).



Beam Design – 0.2 x 0.3 tie beam



INPUT ON BLUE COLORS ONLY

SAVING AND PRINTING INSTRUCTION

1. After satisfying the design, Click the title and drag down a bit.
2. Copy the highlighted area.
3. Open a Microsoft word Program and paste as "Picture".
4. Return to the Excel Program, design another Beam, change the Beam ID.
5. Repeat the procedure

Main Bar Spacing Calculator

Sup Main Bar, S = 36 > 25mm
Mid Main Bar, S = 88 > 25mm

Dimensional Limits, 418.6.2.1

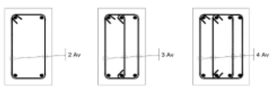
bw ≥ max[.3h, 200mm] Ok!

Main Reinforcements Ratio Limits, 418.6.3.1

Asmin < As > Asmax, Ok! Support
Asmin < As > Asmax, Ok! Midspan

Main Reinforcements, 418.6.3.2

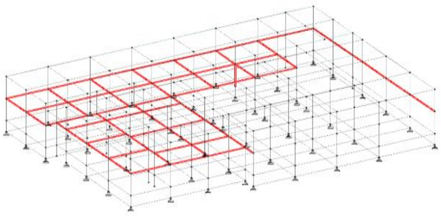
Mumin ≥ 0.25 Mumax Ok



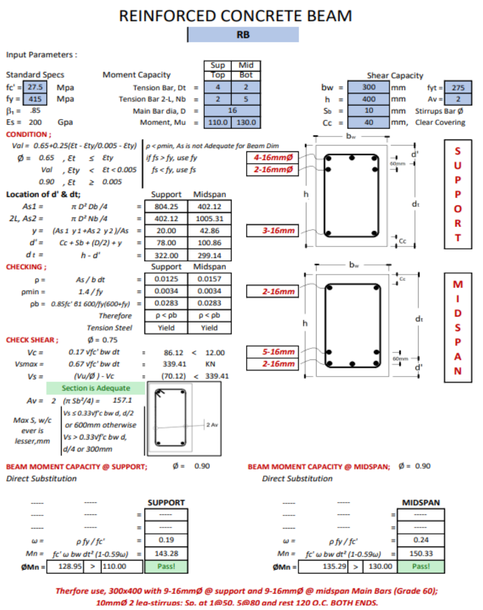
Add extra Stirrups to increase area of Shear resisting steel, Av

NSCP 2015 418.6.4

Beam mark on critical	Beam Length, m	Vu	Vs	Smax	Req per Seismic	Stirrups Spacing Qty	Stirrups Spacing mm (unit)	
	0 - 0.05m	12.00	(40.70)	382.1	50.00	1.00	50.00	Pass!
2h	0.05 - 0.8m	6.00	(48.70)	319.3	79.50	5.00	70.00	Pass!
Mid	> 0.8m	-	(56.70)	274.3	153.00	Rest	120.00	Pass!



Beam Design – 0.2 x 0.4 RB



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Main Bar Spacing Calculator

Sup Main Bar, S = 52 > 25mm
Mid Main Bar, S = 188 > 25mm

Dimensional Limits, 418.6.2.1

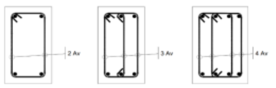
bw ≥ max[.3h, 200mm] Ok!

Main Reinforcements Ratio Limits, 418.6.3.1

Asmin < As > Asmax, Ok! Support
Asmin < As > Asmax, Ok! Midspan

Main Reinforcements, 418.6.3.2

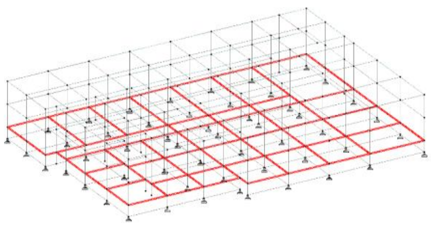
Mumin ≥ 0.25 Mumax Ok



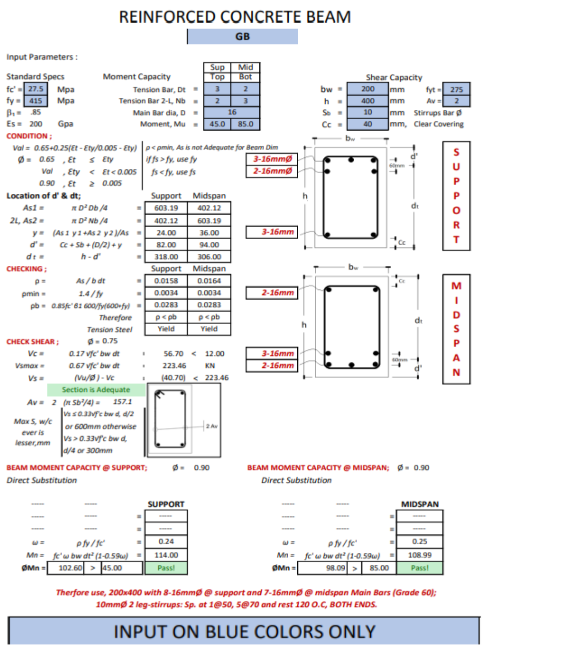
Add extra Stirrups to increase area of Shear resisting steel, Av

NSCP 2015 418.6.4

Beam mark on critical	Beam Length, m	Vu	Vs	Smax	Req per Seismic	Stirrups Spacing Qty	Stirrups Spacing mm (unit)	
	0 - 0.05m	12.00	(70.12)	221.8	50.00	1.00	50.00	Pass!
2h	0.05 - 0.8m	6.00	(78.12)	199.1	80.50	5.00	80.00	Pass!
Mid	> 0.8m	-	(86.12)	180.6	149.57	Rest	120.00	Pass!



Beam Design – 0.2 x 0.4 B-1



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Main Reinforcements Ratio Limits, 418.6.3.1

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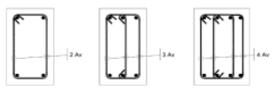
Asmin < As > Asmax, Ok! Midspan

Main Reinforcements, 418.6.3.2

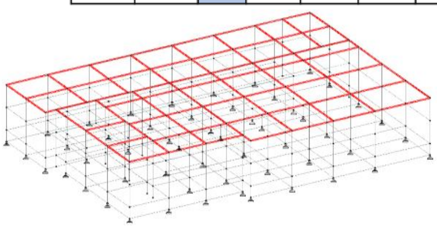
Mumin ≥ 0.25 Mumax Ok



Add extra Stirrups to increase area of Shear resisting steel, Av

NSCP 2015 418.6.4

Beam mark on critical	Beam Length, m	Vu	Vs	Smax	Req per Seismic	Stirrups Spacing		
						Qty	mm (unit)	
	0 - 0.05m	12.00	(40.70)	382.1	50.00	1.00	50.00	Pass!
2h	0.05 - 0.8m	6.00	(48.70)	319.3	79.50	5.00	70.00	Pass!
Mid	> 0.8m	-	(56.70)	274.3	153.00	Rest	120.00	Pass!



Columns

COLUMN DESIGN

↓

Solve for the Area of Tension Bars using the formula.
$\rho_g x A_g$

↓

Solve for the Ultimate Axial Load using the formula.
$P_U = 1.2DL + 1.6LL$

↓

Solve for the Gross Concrete Area using the formula.
Length x width

↓

MAIN REINFORCEMENT BAR

↓

Solve for the Area of Bar using the formula.
$\pi(\frac{\emptyset}{2})^2$

↓

Solve for the No. of bars using the formula.
$\frac{As}{Ab}$

↓

Solve for the Ultimate Actual Axial Load using the formula.
$P_{Uact} = \frac{0.80\emptyset(0.85 * f'c)(Ag - As) + (fy * As)}{1000}$

↓

Solve for the Actual Area of Tension Bar using the formula.
No. of $bar * \pi(\frac{D}{2})^2$

↓

According to NSCP 2015 Use $\emptyset = 0.65$

↓

$Pu_{act} > Pu$
Therefore it is Safe!

↓

SECONDARY REINFORCEMENTS (Lateral Ties)

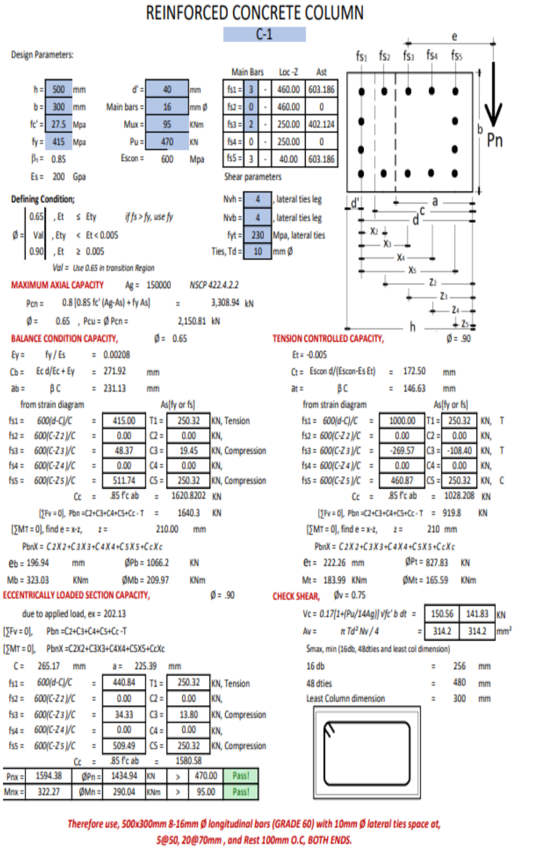
↓

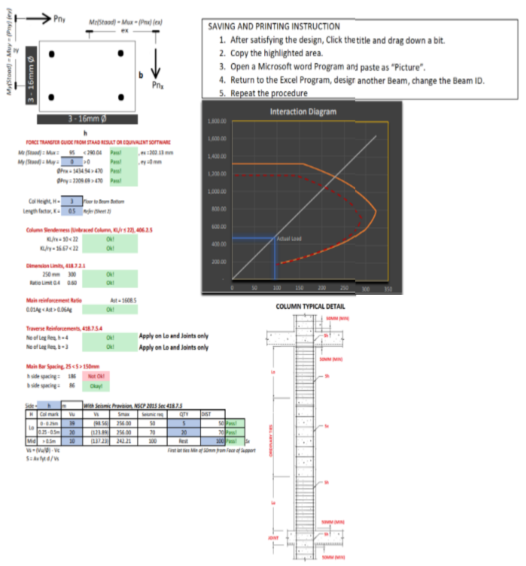
For the vertical spacing use **whichever is smallest**

↓

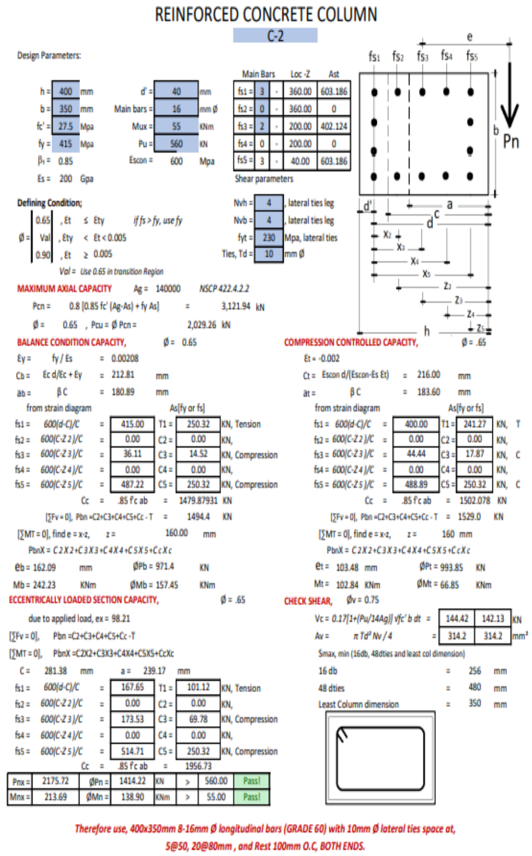
Special Moment Resisting Frame Detailing, use **whichever is Smallest**

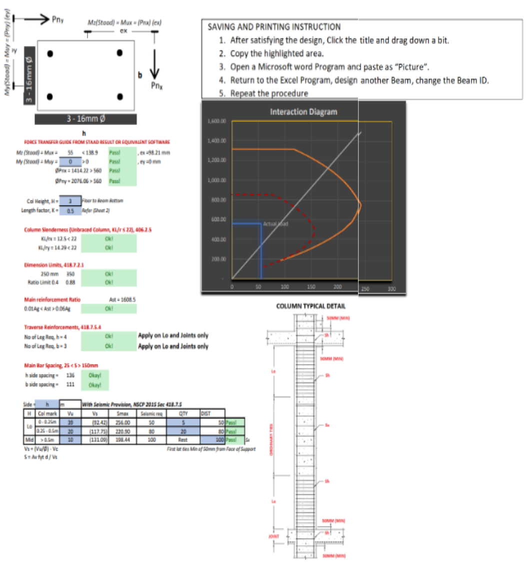
Column Design – C1





Column Design – C2





Slab

SLAB DESIGN

Solve for the ρ_{min} or the Steel Tensile Ratio which is has two formulas to solve for ρ_{min}, The first formula is;

$$\rho_{min} = \frac{1.4}{fy} \; ; \; \rho_{min} = \frac{\sqrt{fc}}{4(fy)}$$

Solve for the Solve for the ρ_{max} or the Steel Tensile Ratio using the formula.

$$\rho_{max} = \frac{0.85 f'c\beta}{fy}\left(\frac{3}{8}\right)$$

Solve for the Nominal Resistance Factor using the formula

$$M_u = \emptyset R_n bd^2$$
$$R_n = \frac{M_U}{\emptyset bd^2})$$

Solve for the ρ_{actual} or the Actual Steel Tension Ratio using the formula.

$$\rho = \frac{0.85 f'c}{fy}\left(1 - \sqrt{1 - \frac{2R_n}{0.85 f'c}}\right)$$
$$\therefore \rho_{min} < \rho_{actual} < \rho_{max}$$

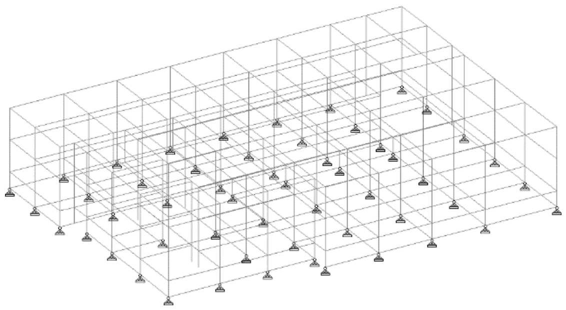
Solve for Area of Steel on Tension

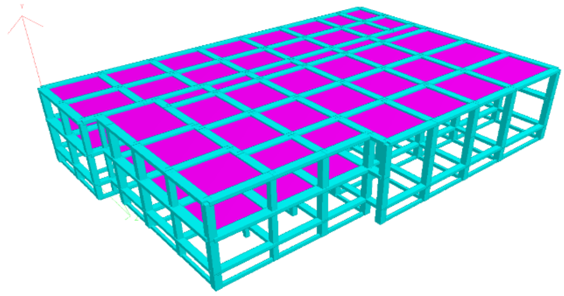
$$A_S = \rho bd$$

Solve for the Spacing

$$Spacing = \frac{1000(Ab)}{As}$$

Slab Schedule





Foundation

FOOTING DESIGN

Solve for the Effective Bearing Pressure capacity qeff:

SBC-(ϒsoil*D)

Solve for the factored and unfactored:

$$L^2 = \frac{DL + LL}{qef}$$

Solve for the unfactored the formula is:

$$qult = \frac{Governing\ Load\ Case}{Area}$$

Solve for the One Way beam shear using the formula,

$$AreaVo = \left[\frac{(L-Col)}{2}\right]L$$

$$Vu = qult * AreaVo$$

To solve Shear Stress use the formula,

$$v = \frac{Vu}{\emptyset bd}$$

Solve for the Two Way/Punching Shear using the formula

$$AreaVt = Col + d)^2$$

$$Vu = Puf - (qult * AreaVt)$$

Solve Shear Stress use the formula,

$$v = \frac{Vu}{\emptyset bd}$$

Solve Moment for Strength Design

$$l = L - \left(\frac{ColWidth}{1000}\right)/2$$

$$Mu = qu \cdot l \cdot L \cdot \frac{1}{2}$$

Solve for the Design the Footing Reinforcement using the beam data: Solve for the ρ_{min} or the Steel Tensile Ratio which is has two formulas to solve for ρ_{min}, The first formula is;

$$\rho_{min} = \frac{1.4}{fy}\ ;\ \rho_{min} = \frac{\sqrt{fc}}{4(fy)}$$

Choose whichever is higher

Solve for the Solve for the ρ_{max} or the Steel Tensile Ratio using the formula.

$$\rho_{max} = \frac{0.85f'c\beta}{fy}\left(\frac{3}{8}\right)$$

Solve for the Nominal Resistance Factor using the formula

$$M_u = \emptyset R_n bd^2$$

$$R_n = \frac{M_U}{\emptyset bd^2}$$

Solve for the ρ_{actual} or the Actual Steel Tension Ratio using the formula.

$$\rho = \frac{0.85f'c}{fy}\left(1 - \sqrt{1 - \frac{2R_n}{0.85f'c}}\right)$$

$$\therefore \rho_{min} < \rho_{actual} < \rho_{max}$$

Designed as Singly Reinforced Beam

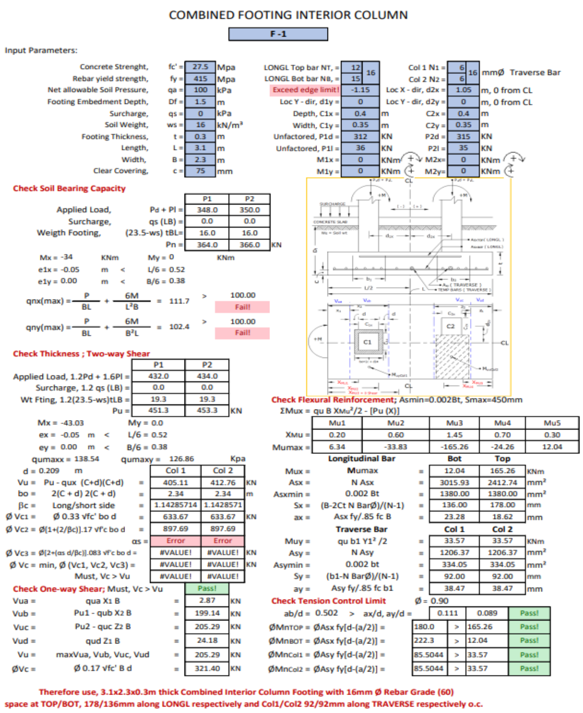
Solve for Area of Steel on Tension

$$A_{Sreq} = \rho bd$$

Solve for the No. of bars

$$\text{No. of } bars = \frac{Asreq}{As_{bar}}$$

Footing Design – Design Footing F-1



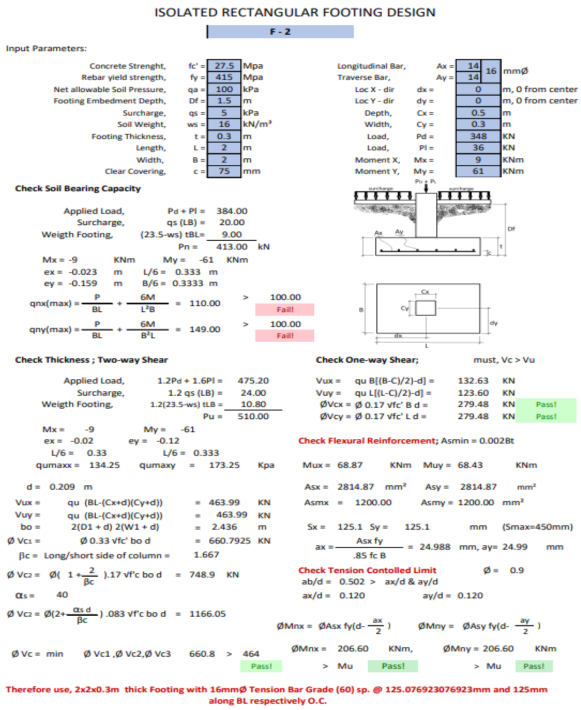
DESIGN INSTRUCTION

1. Sign convention
   a. COLUMN LOCATION
      - Horizontal location of Column, CL (Center Line) is Zero (0) – going Left is negative, Right is positive
      - Vertical location of Column, CL (Center Line) is Zero (0) – going Down is negative, Up is positive
   b. MOMENT – Clockwise positive

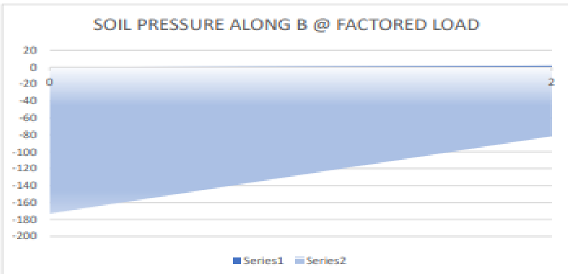
PRINTING INSTRUCTION

1. After satisfying the Design, click the title and drag down.
2. Copy the highlighted area.
3. Open a Microsoft word, paste as "PICTURE".
4. Proceed with the other design and repeat the procedure.
5. Save the word program as PDF.

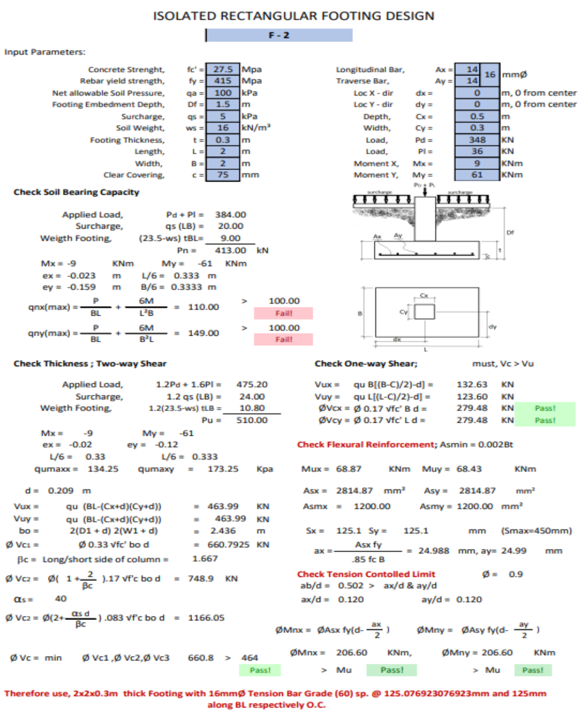
Footing Design – Isolated Footing F-2



Instruction
1. Fill up on Blue Color Only
2. If design is satisfied, Click the Title and drag down a little.
3. Copy and Paste as Picture to Word Document
4. Save as PDF file.



Footing Design – Isolated Footing F-2



Instruction
1. Fill up on Blue Color Only
2. If design is satisfied, Click the Title and drag down a little.
3. Copy and Paste as Picture to Word Document
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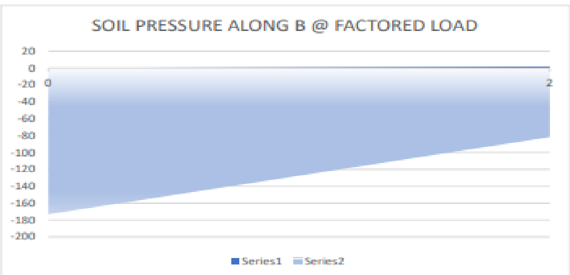

Budget Estimate

Item No.	Description	Quantity	Unit	Unit Cost	Total Amount
A.	STRUCTURAL STEEL				
A.1	STEEL REBARS				
1	10mmø x 6.0m	3512	pcs.	140.00	491,680.00
2	12mmø x 6.0m	3,765.00	pcs.	190.00	715,350.00
3	16mmø x 6.0m	386.00	pcs.	340.00	131,240.00
4	16mmø x 6.0m	291.00	pcs.	400.00	116,400.00
5	Tie Wire No.16	10.00	roll	1,800.00	18,000.00
	Subtotal				1,472,670.00
	Subtotal (Structural Steel)				1,472,670.00
B.	Concrete Works				
1	READY MIX CONCRETE (4000)psi	510.15	cu.m.	4,910.00	2,504,836.50
	Subtotal (Concrete Works)				2,504,836.50
	GRANDTOTAL				3,977,506.50

IV. SUMMARY AND RECOMMENDATIONS

4.1 Summary

The objective of this study is to establish an appropriate fire station to serve the residents of Bulaon Resettlement, San Fernando, Pampanga as well as residents of the barangay who live near Bulaon Resettlement. The fire station will be sustainable in terms of the components like fire accidents, quick response, and serving the community.

The following is the summary of the findings:

• The location in Block 88 Bulaon Resettlement, City of San Fernando, Pampanga is suitable for the building's location.

• The structure was designed with the logical connection of Ultimate Strength Design, Steel Design, Earthquake Engineering, and Foundation Engineering In accordance with the specifications and recommended guidelines of the National Structural Code of the Philippines (NSCP 2015).

4.2 **Summary**

Considering the study's results, the following recommendations are proposed to improve the future development of the suggested Fire Station.

1. Due to assumptions on the allowable soil-bearing capacity within the design, a soil test shall be conducted to configure the appropriate design of the foundation of the building.
2. Ensure that the fire station prioritizes accessibility and inclusivity for all community members, including individuals with disabilities. This may involve incorporating wheelchair ramps, accessible restrooms, and braille signage, among other features.
3. Health Organizations and Barangay personnel will use the building to carry out plans and programs in the absence of fire accidents.
4. In addition to providing emergency response services, the fire station could also serve as a community health center, offering health care programs and services to residents. This could include services such as first aid training, and blood pressure screenings, and serves as a second health center of the barangay.
5. Develop a comprehensive training program for firefighters and other staff who will be working at the fire station. This should cover a range of topics, including fire safety protocols, emergency response procedures, and equipment operation and maintenance.
6. A certification or any proof that the location is suitable and possible to have a fire station.

V. CONCLUSIONS

Based on the researchers, consultations, and design computation that were made, the following conclusions were drawn:

• The building's confirmed location is Block 88, Bulaon, San Fernando, Pampanga, situated along the main road. The project occupies a total land area of 1934 square meters, ensuring accessibility for large vehicles like fire trucks, emergency vehicles, and ambulances.

• Within the architectural design that has been made, for the structural design based on the calculations using the supported formulas and standard requirements in the NSCP 2015; the structure is safe.

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