DESIGN OF A SERVICE WORKSHOP FOR A FARMSTEAD OF FEDERAL POLYTECHINICS NASARAWA, NASARAWA STATE.

BY

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CERTIFICATION

This is to certify that LAWAL TALITT ALADE has carried out the project work present in this report during the 2000/200/ academic session.

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Signature of student

Signature of project supervisor

ENGR.DR.ADGIDZI

DEDICATION

This project is dedicated to my able and industrial us late parents:

Malama NIMATA ARINOLA LAWAL and my lovely father Alhaji LAMIDI AJADI LAWAL (May Allah be pleased with them in the grave and in the here after – amen). Likewise dedicated to my wife and children.

Mrs. F.A LAWAL (Wife)

1. RAMAT LAWAL
2. HALIYAT LAWAL
3. SAHEED LAWAL
4. RISIKAT LAWAL
5. ROKEETBAT LAWAL
6. HASIZAAT LAWAL.

ACKNOWLEDGEMENT

It is not possible to express my gratitudes to all those who have contributed positively to the successful completion of this project in this report, so I will mention but a few.

I hereby express my sincere gratitudes and appreciation to Engr. Dr. D. Adgidzi, my project supervisor, for this continued corrections, and advice in writing of this thesis. I also thank my head of department Engr. Dr. M. G.Yisa and others staff of the department for their enormous supports and encouragement.

My profound gratitude also goes to Mr. B. Balami of the department of basic and applied science and Mr. Nasiru of civil engineering department federal polytechnic nasarawa for their assistance in soil tests and soil analysis to determine bearing capacity of the soil.

I also which to expressed my thanks to Mr. Philip vandi kwaya of the department of agricultural engineering federal polytechnic Nasarawa and also my course mates at the federal university of technology, Minna for their help in the project.

Abstract

This proposed design service work shop for farm steal which is 19m x 19m ($304m^2$) is size will provide maintenance of farm machinery, automobiles, fabrication of simple tools and other materials used in the farm. The objective of the workshop is to have high productivity, reduction in drudgery and improvement in farm technique with the side investigation and soil tests carried out, the workshop was located at relatively high ground to avoid drainage problem while the soil was found to be will compacted and stable.i.e. good enough for the workshop.

This mensions were marked fro each unit according to the size of the workshop and range of operations to be carried out. (With reference to farm planning and control 2nd edition by C.S.Bernad and J.S.MIX)

The soil condition for constructing this workshop depends on the compaction characteristic and maximum density of the soil which were known through the soils properties by using the following equations.

1. Bulk density equation
2. Porosity
3. Moisture content
4. Void ratio

The workshop is rectangular in shape in size is 19mx16m with gable aluminium roof. Eave height is 3.6m while overall height is 5.8m. The wall is constructed with 9" block (450mmx225x225mm) the floor is 150mm thick cemented.

Service like lighting, ventilation and sewerage are adequately provide.

Code of practice CP110 is followed in structural design.

In conclusion and recommendation if the workshop is to carry out more functions not mention in this project, the physical redesign of it will be necessary so as to ensure its functionality and export will have to handle it.

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LIST OF SYMBOLS AND ABREVIATIONS

A - Cross-sectional Area

Ar - Roof Area

A.S.A.E - American Society of Agricultural Engineer

B - width, or least laterial dimension

d - Density, or thickness of members

D - Door

G - Acceleration due to gravity

H - Design height

L - Length

P - Load per joint

P_{Des} - Total design load, or design load

Pi - Allowance for insulation and fittings

P_l - Live load

Ps - Dead load of roofing sheet

Pt - Load due to self weight or truss

P_T - Total load

Pw - live load on roof by work men

R - Reaction on support

S.r - Slenderness ratio

T. D. L - Total dead load

T.L.L - Total live load

U - basic wind load

V - Total volume of truss load

W - window or watts

δ_u - Ultimate stress

CHAPTER ONE

0 INTROUDCTION

ne farmstead (F.S.D.) from the nucleus of the farmopration where a wide range of farming activities ke place.

normally include the following animals shelters storage, equipment shed workshop and other ructure like farmer house and other farm building.

he farm stead of the federal polytechnic nasarawa is about 2 kilometers (2km) from the major road /hich enter Nassarawa from keffi and in size the farm is about ten hectres (10ha) of land while the vorkshop for the farm faces the road that runs round the school. The size of the shop is 19mx16m 304m^2) and it contains the following

haping machine

Milling machine

athe machine

Grinding machine

Hand tools life file, bench tools and hand saws etc.

This project is therefore aimed at proposing for a design for work shop for the farm which will provide the following services.

a. Maintenance of farm machinery automobiles and other machines on the farm i.e.
routine servicing periodic check (repairs and hauling of machine and equipment

b. Fabrication of simple tools and materials used in the farm.

The design of the workshop involves the following process;

a. Locations
b. Determination of size of the work shop and space requirement of various units
c. Working out the layout
d. Choice of the materials for the constructions
e. Choice/determination of dimension of component of the building.

These processes require the knowledge of the soil on which the workshop is to be constructed, the properties of the materials for the construction, expected working load of the workshop, functions of the various units and structural machines.

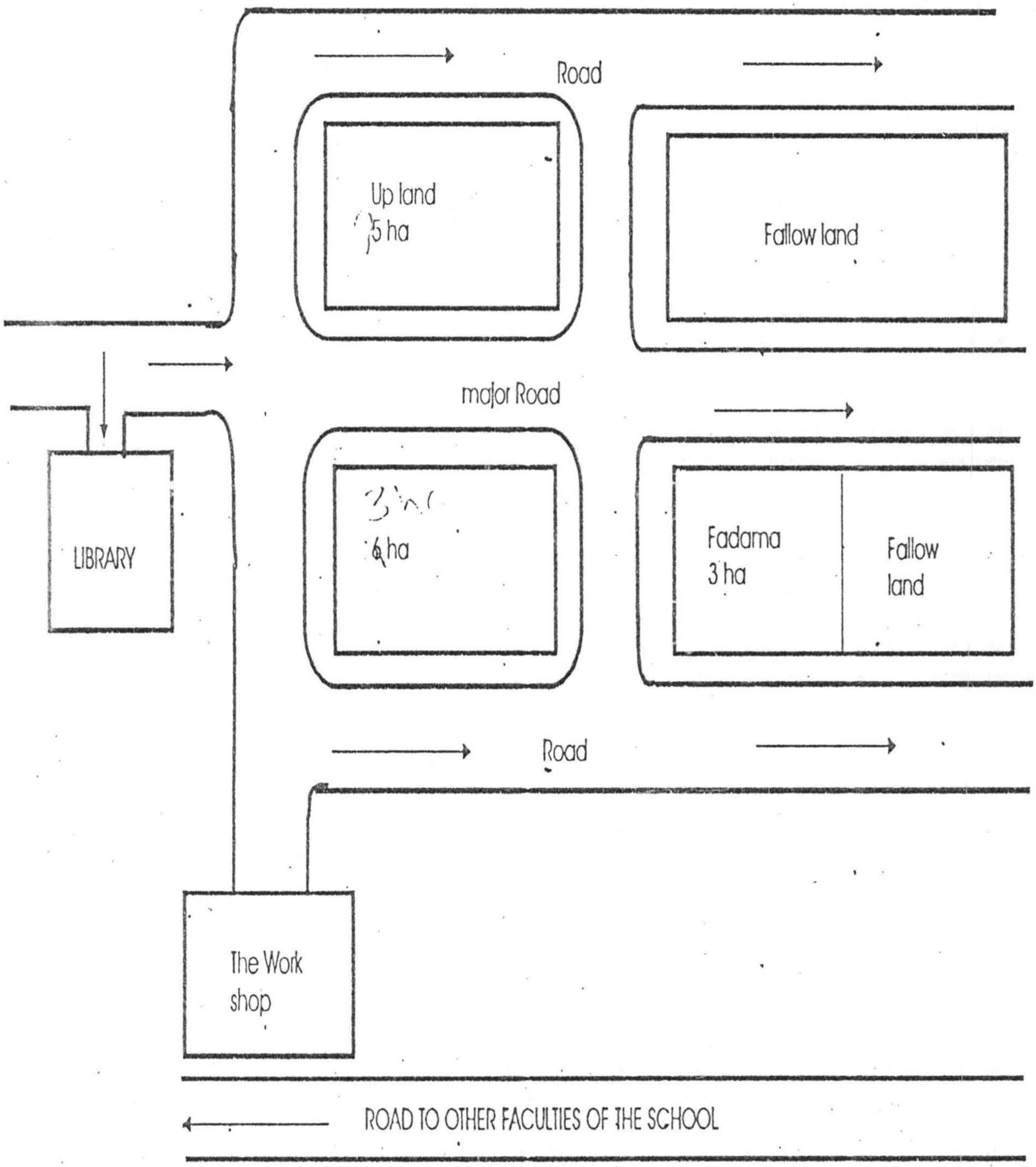
1.1 AIMS AND OBJECTIVE

The project is aimed at proposing a design for a workshop for the farm which will provide the following services;

a. Maintenance of term machinery, automobiles and other machines on the farm i.e. routine servicing, periodic checks (repairs and hauling of machine of equipment)

b. Fabrication of simple tools and materials used in the farms.

To achieve these objectives a well designed farm workshop is needed. From there will be benefit of high productivity, reduction in drudgery of farming operations and improvement of farming techniques will be attained while farm commodities will be produced at lowest cost, assuming farm workers are working efficiently.


Road
Up land
5 ha
Fallow land
LIBRARY
major Road
6 ha
Fadama
3 ha
Fallow
land
Road
The Work
shop
ROAD TO OTHER FACULTIES OF THE SCHOOL

1.3 JUSTIFICATION

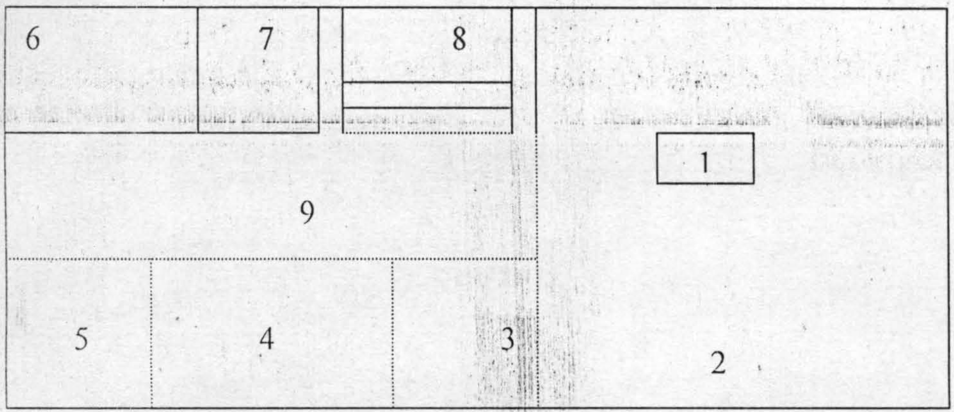
Farm workshop has a number of benefits in farmstead. These benefits include in increase in productivity of the farmstead, reducing drudgery of farming operations, improved farming techniques.

With regard to farmstead (F.S.D) which form the nucleus of the farm operation where a wide range of farming activities take place it normally includes the animals shelters, storage, equipment shed, workshop and other structures likes farmer's house and other form of buildings.

A farm of the size of Nasrawa polytechnics and with facilities and equipment available there clearly need a well designed workshop with necessary equipment

Presently this farm has a small workshop, which is not well designed. It cannot cope with the necessary working equipment, which the farm is having now.

The maintenance jobs are usually carried out I an open area. This does not provide the necessary working environment for maintaining a high efficiency level among the maintenance staff since they are constantly exposed to sun, dust, rains and other hazard .



LAYOUT OF PROPOSED WORKSHOP.

With regard to the size of work shop (304m^2) and range of operations to be carried out by each, the following dimensions were marked for each unit.

(farm planning and control 2nd edition by C.S.Bernad & J.S.Mix)

1. Maintenance section with equipments like compressor, inspection pit (one) implement wash down area and with bay = 36m^2
2. Metal work section with vice, lathe, drill e.t.c. = 26.4m^2
3. Welding section =11m^2
4. Carrentarge section = 17.6m^2
5. Store = 16.5m^2
6. Office = 9m^2
7. Toilet = 3m^2
8. Clock room =1.5m^2
9. Gang way = 15m^2

Total Area =136m^2

SITING

With the site investigation and soil test by trail hole carried out at the site it was fine found that the area available space for work shop is about one hectre (1ha) of land, which is enough for the workshop, and for future expansion when there is need.

2.0 CHAPTER TWO

2.1 LITERATURE REVIEW ON SOIL FOR DESIGNING WORK SHOP FOR A FARMSTEAD

Farm stead (F.S.D) being the nucleus of the farm operation involves a lot farming activities. Among these activities are the following: farming house, animal shelter, storage, equipment shed, shelter for fowls, visitors building, workshop and security's building.

In 1972 a survey of farm shops was carried out in North Dakota by the America society of Agricultural engineering. One hundred and twenty two (122) farmers in north Dakota were asked to evaluate the adequate of their farm shops on the basis of size, type of construction, type of floor and size of doors and windows. It was also asked for the workshop prepared for the farm stead.

The result of the survey is presented in the table below.

(S. A. E publication 8-81-1980)

	600-1500 Acres 46 farm shops 26 ade quate	20 ade- quate	1500-3000 Acres 52 farm shops 27- adeq uate	25 inadeq uate	3000 or more Acres 24 farm shops 26-adequ ate	9-inadequate
Farm shop Size Width (m) Length (m) Ceiling Height	9.14m 13.11m 3.66m	7.32m 10.36m 2.74m	9.75m 13.11m 3.66m	7.62m 11.50m 3.05m	10.97m 16.15m 44.27m	6.4m 10.67m 2.7m
Door size Width (m) Height (m)	5.18m 3.66m	3.66m 2.7m	4.5m 3.35m	3.96m 3.05m	5.18m 3.96m	3.66m 2.74m
Farm Workshop Construction Floor Walls Roof Soil hampa steal	A B F	A C F	A D F	A C F	A D F	A D F

With the out come this surveying it was discovered that a well compacted soil is necessary for a workshop for farm stead (FSD) (Kerth and Chris 1979)

2.2 GENERAL REVIEW ON SOIL FOR WORKSHOP

Definition: Soil compaction is the consolidation compression or aggregation of it's particle by the application of any the following:

i. Frequent machine traffic over the soil surface

ii. Annual movement on the soil surface (Kreth and Chris 1979)

The severity of such compaction of soil depends on the type, number of passes, the moisture content at time of compaction and the type of crops grown.

The question then arise to what degree of tilled and seed bed should be compacted to give a desired favourable soil compaction for constructing a work shop for farm stead this can only be answered if the compaction characteristic of the soil and maximum densities are known.

Therefore the availability of compaction characteristic of soil would be cultivated to give the desired favourable condition. This is very much needed in Nigeria, where tractors of various sizes often used in filling the soils for corps production (Ohu and Folourunso 1987)

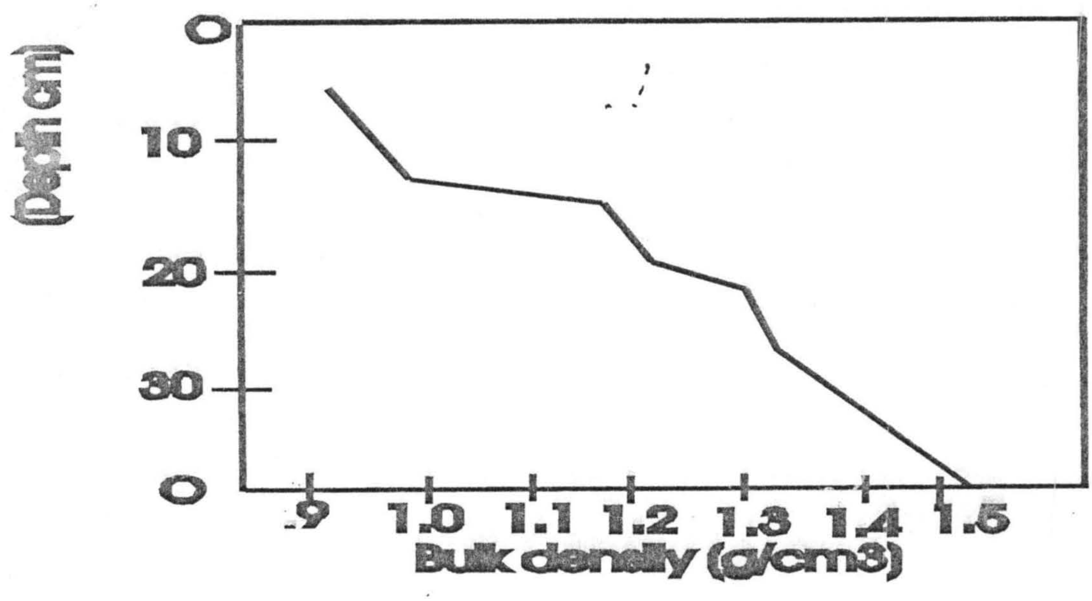
Surface soil horizons usually have a relatively small bulks density because of disturbance such as those due to plants, animals and village operations. However, pressure of about $100KN/M^2$ can be expected to cause hempaction and this may adversely affect water and air movements, seedling emergence and root penetration.

An example of compaction by machinery is shown in fig. (2.2) (marshall and Holmes 1988)

Most farm machines and equipment are used indiscriminately either at too wet or too dry conditions which are henducire to increased cempaction in order to prevent or minimise soil hempaction and laso to prepare seed bed favourable for crop growth.

Knowing the moisture buylk density and type will facilitate the forecast of how close a tilled agriculture land is to hempaction and this information added to the knowledge of required soil bulk density, can help in wrming the farmers before more inputs and other input will be required to make an agricultural soil capable of supporting farming practices for given crop (Reghavan and Ohu, 1985).

Note that understand the state of hempaction of a soil and the maximum hempactin that can be obtained, laboratory methods of soil hempaction are employed to give estimates of these values that will occur in the fields. The results obtained from these laboratory tests are used as guides to know when cultivation practice should be performed and to test the



susceptability of agriculturcal soils to various applied heals (Ragharam and Ohu 1985). (Proctor, 1933) used his method to show that when a soil is subjected to a give effort of hempaction, the bulk density reached depends on the particles size distribution and it's water contents and came up with plotted values of bulk dendity (g/m^2) against moisture content (g/g) as shown in (figure 2.2)

2.3 EQUATION USED IN THE STUDY OF SOIL PROPERTIES

2.3.1 BULK DENSITY EQUATION

The bulk density of the soil (Bd) refers to the ratio of the mass of soil to its volume. The bulk density of soil can either be wet or dry and the blacks (1965) methods of determination of this parameter graphically was used

Let Wb = Wet bulk density
Db = Dry bulk density
V = Volume of soil

Then $$Bd = Wb/v \ (g/cm^3) \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.1$$

Similarly. $$Wb = \frac{\text{Weight of wet soil}}{\text{Volume of soil}} \ (g/cm^3) \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.2$$

$$Db = \frac{\text{Weight of dry soil}}{\text{Volume of soil}} \ g/cm^3 \quad \ldots \quad 3.3$$

In both cases the volume of soil equals the volume of sample core used in collection of soil samples.

2.3.2 POROSITY

Black (1965) from his gravimetric test results adopted the equation shown below for determination of porosity which is the ratio of the volume of voids to the total volume of soil.

i.e $\text{Porosity} = \frac{Vv}{Vtotal}$

Where Vv = Volume of voids

Vtotal = Volume of soil sample

But Black expressed porosity in term of both wet and dry bulk densities as shown below

$$P = (1 - Db/Wb) \times 100\% \quad \ldots \quad 3.4$$

2.3.3. MOISTURE CONTENT

The moisture content of the soil is the ratio of the total amount by weight of water in the soil to the weight of total solid particles in that given volume of soil. the moisture content is very important to crops because in dissolve the mineral substances necessary for god and healthy growth of the crops.

The black's method of determination of bulk density cover the moisture content determination as well. And the equation for computing this parameter is as shown below

$$M.C., = Ww/Wds \times 100\% \ (g/g)\% \quad \ldots \quad 3.5$$

Where M.C. = Moisture content

Ww = Weight of water

Wds = Weight of dry soil.

CHAPTER THREE

METHODOLOGY

3.1 MATERIALS AND DESCRIPTION OF THE WORKSHOP

3.1.1 General Description.

The prepared workshop is rectangular in shape with full external walls and measure 19m x 16m^2. The eave height is ³.6m and the overall height is 5.8m. It has no ceiling in order to reduce cost. The flour (150mm thick) should be cemented for easy cleaning.

3.1.2 **Roof:**

For simple farm building the shed flat roof is most economical. But for the proposed workshop, gable roof is recommended because it effectively reduces the effects of driving rain and wind. Choice of roofing sheet is based in consideration of cost, and strength i.e. susceptibility to breakage). Asbestos roofing sheet has lowest heat condition compared to aluminum and zinc, but it is more expensive than other two and can easily break. Zinc and aluminum have greater heat conductivity than asbestos, but in case of cost and strength, they are than asbestos and easily available in the local areas.

Aluminum has higher conductivity than zinc, but has greater availability and is cheaper. In the light of this, aluminum roofing sheet has the greatest advantages of the three and is recommended. Truss could be made up of steel or wood. Wooden trusses are recommended because they are cheaper and strong for the purpose.

3.1.3 **WALLS**

Walls are commonly made of cement block, or bricks.

Brick-size 2.5. X100 x 65mm

Cement block is 450 x 22 5x 225mm

Cement block are also available than bricks around the area of the proposed workshop.

Hence cement blocks are recommended for the walls, since they are strong enough to carry the expected load from the roof. Both external and internal walls are of the same materials and dimensions.

3.1.4 DESIGN LAYOUT AND ANALYSIS

.4 ~~4.1~~ SERVICES

Lighting: Artificial lighting is provided in form of electric lamps to supplement natural lighting through the openings. In the operational sections lighting is provided at the recommended rate of 10 w/m^2 as follows: -

(a) Maintenance section – six 4 – feet fluorescent lamps (60 watts each)

(b) Welding section – two 4 – feet fluorescent lamps (60 watts each)

(c) Metal work section – Three 4 – feet fluorescent lamps (60 watts each) and one – 4 feet fluorescent lamps (80 watts)

(d) Carpentry section – Three 4 – feet fluorescent lamps (60 watts each).

Additional lighting is provided in the inspection pit in form of one 80 watts 4 – feet fluorescent lamp. Provision of lighting in other section is as follows:

(a) Office – one 2 – feet fluorescent lamps (60 watts)

(b) Store – Three 4 –feet fluorescent lamps (60 watts)

(c) Toilet – one incandescent lamp (40 watts)

VENTILATION

Artificial ventilation is provided in form of ceiling fans to supplement the natural ventilation through the openings. (i.e. doors and windows)

Fans should be provided as follows: -

(a) Office – one ceiling fan (1400 watts)

(b) Store – Two ceiling fans (1400 watts)

(c) Maintenance section – three ceiling fans (1400 watts each)

(d) Metal work section – Two ceiling fans (1400 watts each)

(e) Welding section – Two ceiling fans (1400 watts each)

SEWERAGE

Sewerage is by means of a septic tank measuring: 2.25 m x 0.75 m x 1.5 m located at a distance of 15 m from left hand side wall of the work shop.

3.1.5 COLUMNS.

Columns can be made of timber, steel sections, reinforced concrete or steel pipe. Considering strength, cost and availability, wood is weaker and can easily decay.

Steel section and reinforced concrete are strong but very expensive. Steel pipes are strong, cheaper and more available than the others. In high of their comparism hollow steel pipe has the highest advantages and is recommended. Five diameter 75mm pipes of 4m length are provided to support the trusses.

Chapter Four

4.0 3.2 STRUCTURAL DESIGN

4.1 3.2.1 ROOF

(1) Total roof area Ar = 2 x Area of each side of roof.

Width of each side of roof = 7.2 f (2 x 0.4) = 8 m.

Length of roof = 10 f (2 x 0.4) = 10.8 m

(2) Dead load of roofing sheet (Ps)

Ps = mass/m^2 x g x Ar

Where g = acceleration due to gravity

:. Ps = 9.5 x 9.81 x 172.8 = 16104 N.

(3) Load due to self weight of trusses.

Pt = V x d x g

Where V = total volume of trusses members

d = density of wood

Assuming 150 mm square (0.15m^2) African mahogany [d= 590 kg/m^3]

V = 0.15 x 0.15 x total length of members

I .e V = 0.15 x0.15 x 246.7 = 5.551m^3

Pt = 5.551 x 590 x 9.81 = 32128.633 N

32128.633 N

(4) Allowance for insulation and fittings taking 50 N/m^2

:. P_I = 50 x 13.6 x 10 = 6800 N

Where 10 x 13.6m = size of building

(5) Total dead load : T . D . L = Ps + Pt + P_I = 16104 + 32128.633 + 6800

= 55032.633 N

(6) Live Load on roof (by workmen) is taking as 750 N/m^2 x Area of roof.

Pw = 750 x 172.8 = 129600 N

(7) Live Load due to wind is computed according to the formular (ASAER 288.3)

$$P_I = Ar \times 0.004466 \frac{(H)^{2/7} \times V^2 \times 9.81}{9.144}$$

where H = Design Height = 5.8 m

V = Basic wind Speed = 30 m/s

$$P_I = 172.8 \times 0.004466 \frac{(5.8)^{2/7} \times (30)^2 \times 9.81}{9.14} = 5982.5 \text{ N}$$

(8) Total live load (T . L. L)

T. L.L = 129600 +5982.5 N =135582.5 N

(9) TOTAL DESIGN LOAD P_{DES}

P_{DES} = 1.2 x total dead load + 1.4 x total live load

Where 1.2 = safety factor for dead load

1.4 = safety factor for Live load

$\therefore P_{DES} = 1.2 \times 55032.633 + 1.4 \times 135582.5 = 255854.66$ N.

(10) Total load per truss = $\frac{\text{Total design load}}{\text{Number of trusses}}$

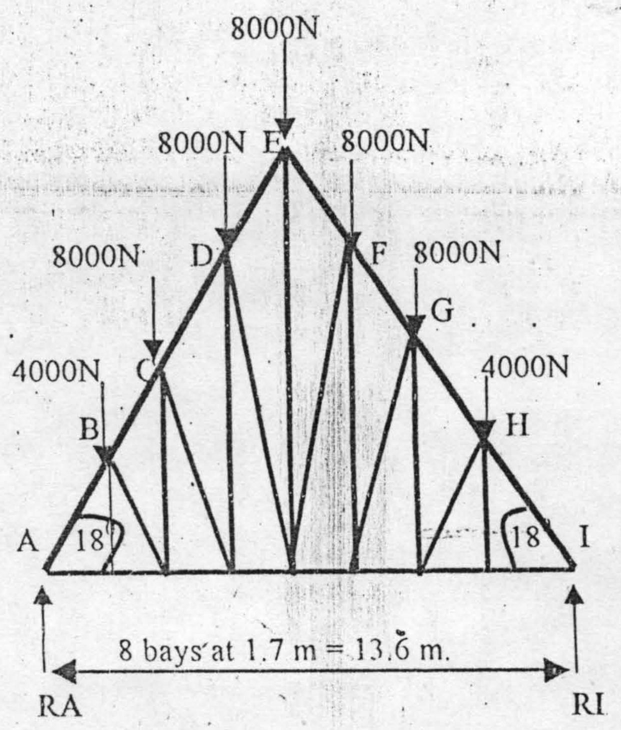
The two end trusses each carried half of the load carried by each center truss. Therefore for the purpose of calculation the load/truss, the number of truss are given by number of center trusses + number of end truss + 2 = 3 + 2/2 = 4.

$$P_T/\text{truss} = \frac{P_{DES}}{\text{No. of trusses}} = \frac{255854.66}{4} = 63963.665\text{N} = 64000 \text{ N}$$

(11) Load per joint = $\frac{\text{Total load/truss}}{\text{No. of purlin joints}}$

$$\frac{P}{\text{Joint}} = \frac{63963.665}{8} = 7995.46 \text{ N} \cong 8000 \text{ N}$$

Roofing truss



RA + RI = 63963.67 N

Fig. 4 Roof truss diagram.

(12) Taking moment about A :

7995.46 x 1.7 + 7995.46 x 3.4 + 7995.46 x 5.1+ 7995.46 x 6.8 + 7995.46 x 8.5 +7995.46 x 10.2 + 7995.46 x 11.9 + 3997.73 x 13.6 = RI x 13.6

= 13592.28 + 27184.56 + 40776.85 + 54369.13 + 67961.41 + 81553.69 + 95145.974 + 54369.13

RI 13.6 = 434453.02

$RI = \frac{434453.02}{13.6} = 31981.84$ N $\cong 32000$ N

RA = 63963.67 – 31981.84 = 32000 N

(13) Determination of member forces done by graphical method s(stress diagram)

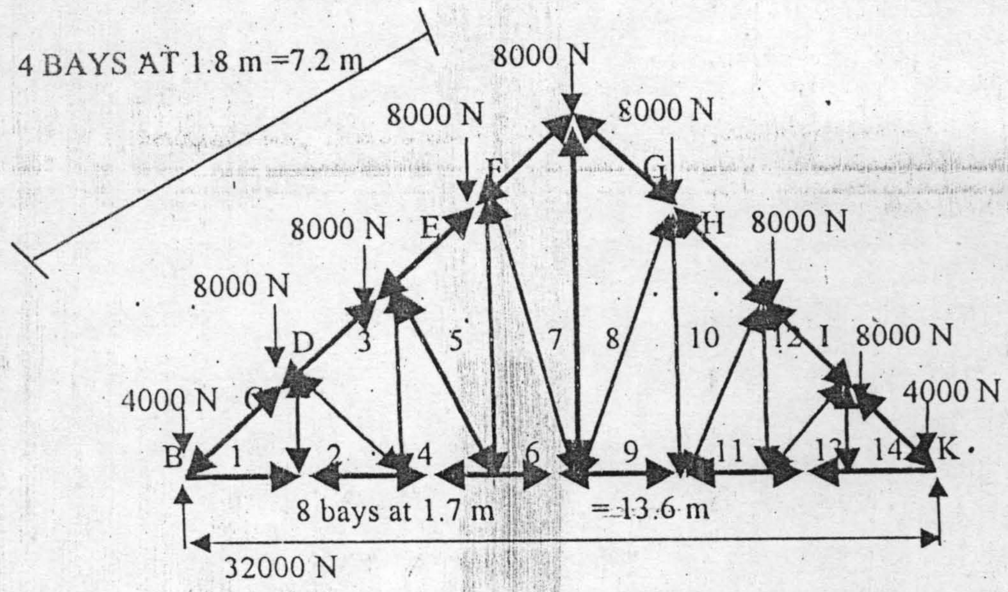


Fig. 5 Free body diagram by graphical method.

MEMBER		FORCES (- Compression N / + Tension N)
1	C – 1	91400 (-)
2	J – 14	91400 (-)
3	D – 3	77409 (-)
4	I – 12	77400 (-)
5	E – 5	64400 (-)
6	H – 10	64400 (-)
7	F – 7	51200 (-)
8	G – 8	51200 (-)
9	1 – 2	0 (+)
10	13 – 14	0 (+)
11	2 – 3	14200 (-)
12	12 – 13	14200 (-)
13	3 – 4	4400 (+)
14	11 – 12	4400 (+)
15	4 – 5	15000 (-)
16	10 – 11	15000 (-)
17	5 – 6	8400 (+)

18	9 – 10	8400 (+)
19	6 – 7	17600 (-)
20	8 – 9	17600 (-)
21	7 – 8	248000 (+)
22	A – 1	87000 (+)
23	A – 14	87000 (+)
24	A – 2	87000 (+)
25	A – 13	87000 (+)
26	A – 4	73600 (+)
27	A – 11	73600 (+)
28	A –.11	61200 (+)
29	A – 9	61200 (+)

Design load for each group is determined as the maximum load in the group as below.

	Member group	Maximum load (N)	Design Load (N)
Group 1	C – 1, J – 14 D – 3,.1 – 12	(-) 91400	(-) 91400
Group 2	E – 5, H – 10 F – 7, G – 8	(-) 64400	(-) 64400
Group 3	2 – 3, 12 – 13, 4 – 5, 10 – 11 6 – 7, 8 – 9	(-) 17600	(-) 17600
Group 4	A – 1, A – 14 A – 2, A – 13	(+) 87000	(+) 87000
Group 5	A – 4, A – 11 A – 6, A – 9	(+)736000	(+)736000
Group 6	7 – 8	(+) 24800	(+) 24800
Group 7	5 – 6, 9 – 10 3 – 4, 11 – 12	(+) 8400	(+) 8400
Group 8	1 – 2, 13 – 14	(+) 0	(+) 0

Determination of cross- sectional Dimensions of members.

$$A = \frac{P_{DES}}{6\Lambda}$$

Where A = cross sectional area

P_{DES} = Design load

6Λ = ultimate stress

A = bd. Where b = width of member

d = thickness of member

$$bd = F/\Lambda = \frac{P_{DES}}{6\Lambda}$$

By fixing ine of the dimension (usually b), d can be calculated from the equation.

$$d = \frac{P_{Des}}{6\Lambda\, b}$$

Group 1. $d = \dfrac{91400}{13.1 \times 50} = 140$mm

Take 150 mm x 50 mm

Group 2. $d = \dfrac{64400}{13.1 \times 50 \text{ mm}} = 98$ mm

Take 100mm x 50 mm

Group 3. $d = \dfrac{17600}{13.1 \times 50} = 27$ mm

Take 100mm x 50 mm

Group 4. $d = \dfrac{87000}{15.2 \times 50} = 115$ mm

Take 150mm x 50 mm

Group 5. $d = \dfrac{73600}{15.2 \times 50} = 97$ mm

Take 100mm x 50 mm

Group 6. $d = \dfrac{24800}{15.2 \times 50} = 33$ mm

Take 100 mm x 50 mm

Group 7. $d = \frac{8400}{15.2 \times 50}$ = 11 mm

Take 100 mm x 50 mm

Group 8 . d = 0

Take 50 mm x 50 mm

(16) Consideration of bending effect

Slenderness ratio of each member is the ratio of the length to the least laterial dimension.

$$Sr = L/b$$

The slenderness ratio of the member were checked and all were found to be bellow the maximum allowable value of 50 (for wood).

4.2 COLUMNS

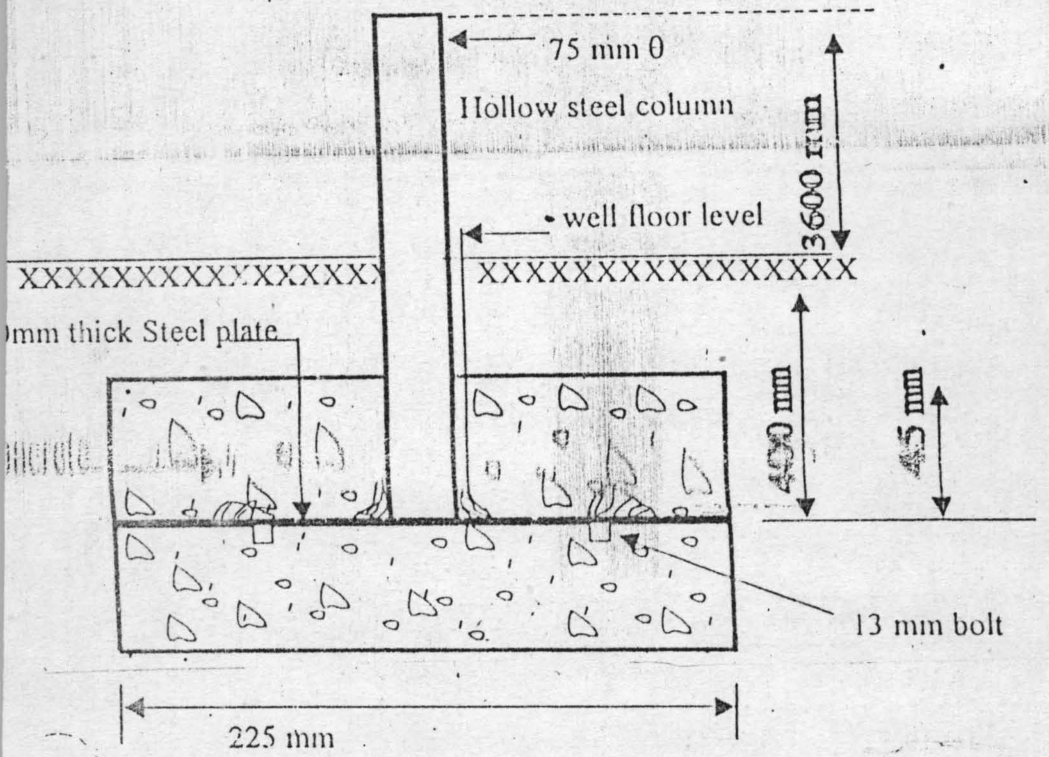
From the roof design, the load is supported at the two ends of each truss by walls. Thus the load carried by the column is zero. The purpose of columns are to support the roof truss spans to reduce the bending effect.

For the above reason hot rolled hollow section steel columns of the minimum size (dimension 75 mm) and of height 4 mm are recommended.

4.2.3 COLUMNS FOOTING

Since column carries no load, the only load acting on the footing is the weight of the column. This lead (540.57 N) is very small in relation to the bearing capacity if the soil ($140 kN/m^2$). Hence detail design of the footing is not necessary. Plain (unreinceforce) concrete footing (1:2:4 mixed by volume) measuring 225 mm square and 75 mm thick is recommended.

) below shows the connection of the column to the footing.



:ross section column footing.

WALL FOUNDATION

The foundation provides a stable base for a building. It distributes the weight of building and its applied loads over an area of the foundation bed sufficient to prevent unequal of excessive settlement. Soil test of the area has been carried out and the result shows that the soil is clayey sand with bearing capacity of 140 KN/M^2.

For this, strip foundation is suitable for the load bearing walls. An unreinforced strip foundation using a mix of 1: 2: 6 (by volume) is recommended.

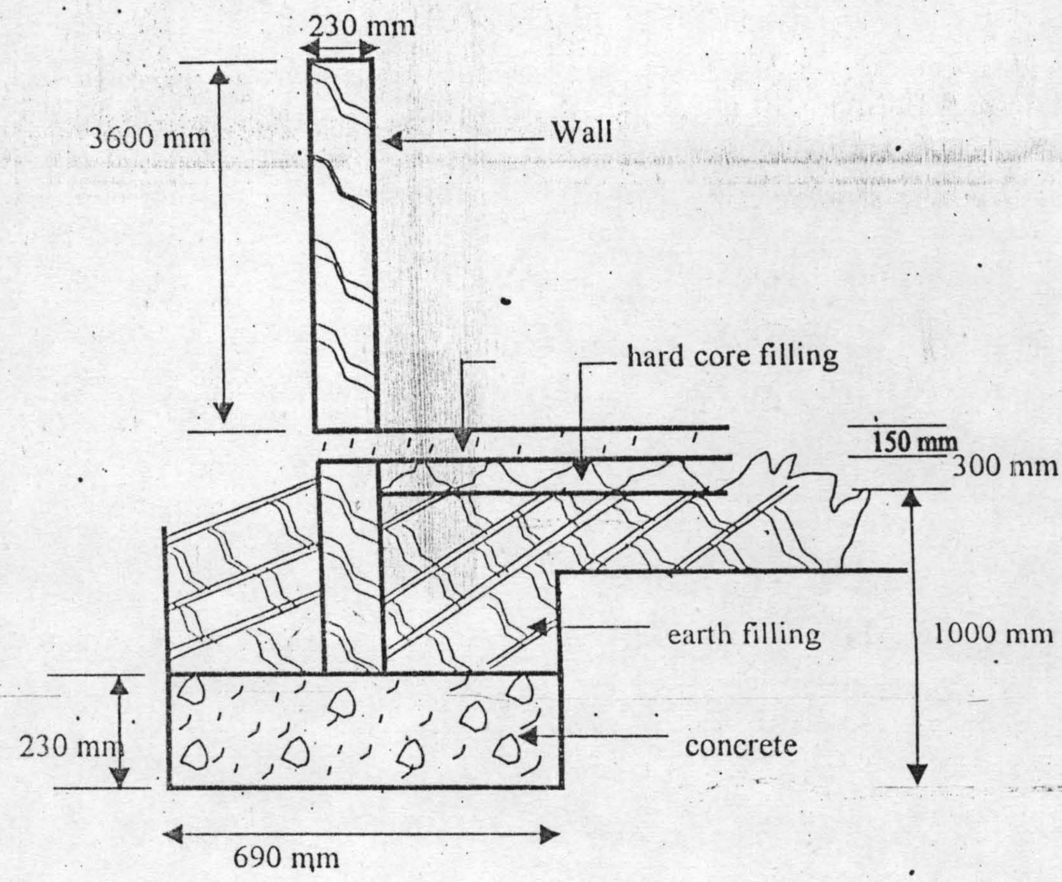


Fig. 7 cross section of unreinforced strip foundation.

COLUMNS FOOTINGS

(a) Material - concrete (1 : 2 : 4 mix)

(b) Dimension – 225 x 225 x 75 mm

(c) Number - 5

4.1.5 WALL FOUNDATION.

(a) Type: strip foundation 450 mm thick

(b) Materials and dimensions: concrete under laid with hard core (300 mm) on earth filling.

4.1.6 CONSTRUCTION

In the design of the workshop all the necessary factors affecting the location and physical and structural design have been taken into consideration.

The result of this pains taking work is a functional workshop which is expected to be constructed at the technically possible minimum cost. In spite this however, there is provision for change which may be desired by the management of the farm, since this project is not a consultancy job. Such changes that may be desired may affect location, materials, layout and size of the various section.

The workshop may also be required to perform functions additional to the ones mentioned in this project, and this may necessitate changes in the physical design. However, such changes, should effected with due consideration of the relevant factors to ensure the functional of the workshop.

4.1.7 EXPANSION

The site has adequate area for future expansion of the workshop when the need arises. However, a specialist should be consulted if such expansion is complex enough to effect the structural stability of the workshop.

MAINTENANCE

4.1.3 The septic tank should be emptied when it is about one-third full of sludge or in the alternative every two years.

BILL OF QUANTITIES

4.1.4

ITEM	WORK DONE	ESTIMATE
1.	Substructure	210,000.00
2.	Concrete work	150,000.00
3.	Block work	80,000.00
4.	Rooting	150,000.00
5.	Wood work	50,000.00
6.	Doors and Windows	90,000.00
7.	Service and Installation (i.e electrical and plumbing)	95,000.00
8.	Drainage	50,000.00
9.	Contingency	975,000.00
Total estimate cost		1,072,500.00

One million and seven hundred and twenty five thousand naira only.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

In general the constructions of this project engineering workshop for Federal Polytechnics of Nasarawa by estimate will cost one million, seven hundred and twenty five thousand Naira only.

This estimate cost include plaster painting ceiling and other decoration which are not necessary for farm work shop, but if desired then can be done if funds are available the cost is relatively suitable for the workshop farm of size of the school.

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