AS2870 - 1996

The Foundation and Footing Society of Victoria (Inc)

Forum on the new Residential Slabs and Footings Code.

30 July 1996

STANDARD DESIGNS AND NEW DETAILING REQUIREMENTS

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1. INTRODUCTION

The 'design' of slabs and footings for most residential housing in Melbourne and for many sites elsewhere in Victoria often only involves the 'selection' of a Standard Design from AS2870.

Standard Designs (or deemed to comply designs) were included in the Victorian Building Regulations as long ago as the 1970's. The V.B.R. 'deemed to comply' designs formed the basis of the design details given in the original version of AS2870 - 1986 and later AS2870.1 1988. Review of the performance of footing systems has led to some changes and subsequently to the 'Standard Designs' now given in AS2870 - 1996.

This paper will describe the major changes incorporated in the new code and will show some examples of design detailing requirements. Standard Designs discussed will generally focus on Victorian applications.

The major changes from the 1988 code to the new AS2870 - 1996 include the following :

- The incorporation of all Standard Designs into one section of the Code
- New rules for detailing beam layouts for raft slabs.
- New grid spacings for some stiffened raft slabs
- Standard Designs for strip footings on H sites for articulated full masonry construction (not in the previous code)
- The inclusion of Standard Designs for M-D and H-D site classifications

2. SELECTION OF FOOTING SYSTEMS

2.1 Basic Concepts

Standards Australia has stated that the "excessive engineering input is neither appropriate nor economical in house footing design"[1]. However, the purchase of a new house is a major investment for most individuals. The importance of input by an experienced engineer and adequate design detailing should not be taken lightly.

The footing 'design' process is generally considered to be a simple procedure, but practical and efficient design which ensures an acceptable level of long term performance is not always achieved. The footing design should be appropriate for the site classification, the site conditions, and must include adequate detailing.

The primary cause of footing failure in domestic construction is associated with the movement of reactive clay soils. The protection of the clay from extreme moisture changes is important, however it is universally accepted that all movement cannot be eliminated. The footing system and the supporting structure are designed to cope with the expected ground movements. Slabs and strip footings rely on there overall strength and stiffness to control the ground movements. The strength and stiffness required for the footing system depends on the expected ground movement (site classification) and the building superstructure.

AS2870 considers five basic types of construction :

- clad frame
- articulated masonry veneer
- masonry veneer
- articulated full masonry
- full masonry

Clad frame construction is relatively flexible and can tolerate differential movements in the order of 40mm. At the other end of the spectrum full masonry is brittle and unforgiving and generally would only tolerate a differential movement of about 10mm. Obviously stiffer and stronger footing systems are required for the more brittle forms of superstructure construction. The required footing stiffness also increases significantly for sites with higher ground movement potential.

The choice in footing system is most commonly between a concrete slab and strips footings (timber floor). This first part of the selection process is often made to suit the site but in most cases is decided by the preferences of the builder and owner. The next stage involves the selection of footing strength and stiffness appropriate for the site classification and building superstructure. The third phase relates to adequate design detailing.

2.2 Limitations

The 'Standard Designs' do not apply to some sites and do not apply to all types of construction. AS2870 lists these limitations in Clause 3.1.1. and are basically un-changed from the 1988 code. A new limitation is that earth or stone masonry walls shall not be more than 3m high.

The Standard Designs do not apply to E and P sites and do not apply to sites with abnormal environmental factors.

For sites and buildings outside the scope of Clause 3.1.1. the footing design must be carried out in accordance with engineering principles.

2.3 The Site Investigation Report

A site investigation is required before the footing 'design' process can begin. The site investigation, often referred to as a 'soil test' is often carried out by persons other than the designer. The term 'soil test' report is often misleading. In the past a 'soil test' basically only provided a site classification and maybe a few general recommendations. Today a 'soil test' is not good enough - we must insist on a thorough 'site investigation'. A good site investigation report will provide details on the existing surface grades and any abnormal environment factors. A site sketch, drawn to scale, detailing all existing features including tree locations, approximate tree sizes, existing construction and existing drainage should be provided. For some sites, levels and detailed contour plans may also be required.

The designer must fully understand the site investigation report. Reading only the 'site classification' is not satisfactory. Proposed site works including deep excavation, filling or unusual structural features not known to the site classifier may change the classification. The borehole logs should be reviewed and environment factors including site drainage must be considered.

The designer should have full confidence in the site investigation report and should be provided with all the information required for the footing design, drainage design and design detailing.

The Foundation & Footing Society of Victoria (Inc) is preparing an update to their publication 'Special Provision for Site Investigations and the Design of Residential Slabs and Footings for Victorian Conditions'. Section 1 of this document gives a very good guide on site investigation requirements, including details on what should be in the report. This publication is intended for use by the field practitioners but can also be used by designers as a guide for what to expect from a good site investigation report.

2.4 Stiffened Raft Slabs

For raft slabs the beams provide the double function of load support and stiffness to resist ground movements. In general the stiffness requirement is of most importance and for single storey construction the location of internal walls can generally be ignored.

The Standard Designs for stiffened raft slabs are given in Figure 3.1 of AS2870 - 1996.

The major change that will effect builders in Melbourne is the reduction in beam grid spacing from 5m to 4m for articulated masonry veneer construction on class H sites. Increased beam stiffness is now required for masonry veneer and articulated full masonry construction. The changes for H sites are summarised in the table below.

TABLE 1 NEW REQUIREMENTS FOR STIFFENED RAFT SLABS ON CLASS H SITES

a) Details Given in AS2870 - 1988

Type of Construction	Beam Depths (mm)	Reinforcement	Beam Spacing	Slab Fabric
Articulated Masonry Veneer	500	3-12TM	5.0	F82
Masonry Veneer	500	3-12TM	5.0	F82
Articulated Full Masonry	800	3-12TM	4.0	F92

b) The New AS2870 - 1996 Requirements

Type of Construction	Beam Depths (mm)	Reinforcement	Beam Spacing	Slab Fabric
Articulated Masonry Veneer	500	3-12TM	4.0	F82
Masonry Veneer	700	3-Y16	4.0	F92
Articulated Full Masonry	1000	4-Y16	4.0	F102

A new code requirement (given in AS2870-1996 Figure 3.1 Note 4) is "Beam layouts shall satisfy the requirements of Clause 5.3.9". This has a significant effect for most construction on Class M sites and will be discussed in more detail later in this paper.

Alternate reinforcement options are given in lieu of the slab fabric specified in the main table. This allows the use of a lighter slab fabric by using additional top reinforcement in the slab beams. This is demonstrated for masonry veneer construction on H sites in Figure 1 below.

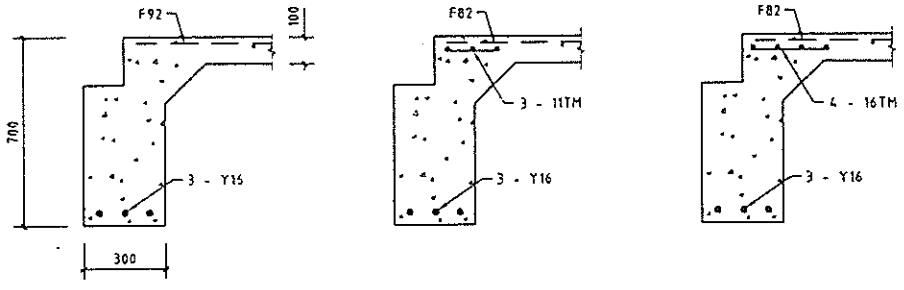


FIGURE 1 REINFORCEMENT OPTIONS FOR MASONRY VENEER CONSTRUCTION ON 'H' SITES

2.5 Waffle Slabs

The Standard Designs for waffle slabs are similar to the 1988 code. One major change is that the bar size has been reduced from Y16 to Y12 for articulated masonry veneer construction on H sites. However, a standard design is now not given for masonry veneer construction on H sites.

2.6 Strip Footings

The Standard Designs for strip footing systems are given in AS2870 - 1996 Figure 3.6. The main changes are summarised below.

a) Standard Designs are now given for masonry veneer and articulated full masonry construction on H sites (no solutions are given for H-D sites)

b) For H sites, internal footings shall be provided at not more that 6m centres. Note that the figure on page 28 of the new code is not drawn to scale - Figure 2 shows the intended code requirements.

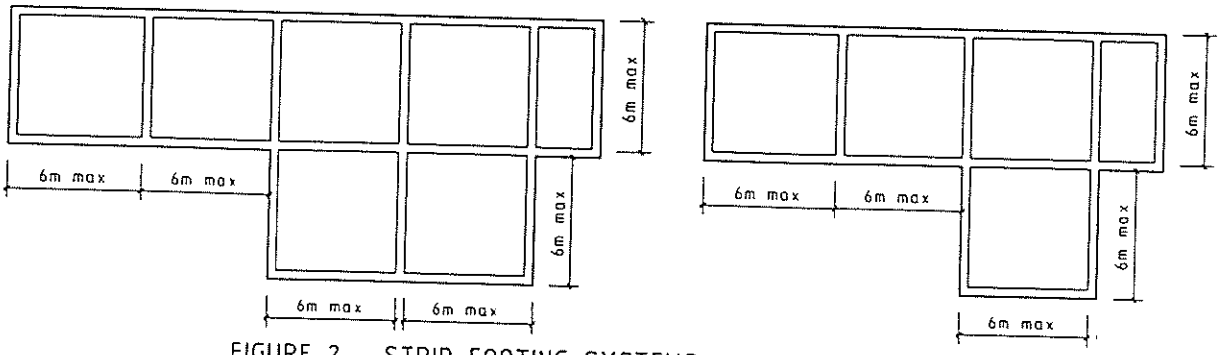
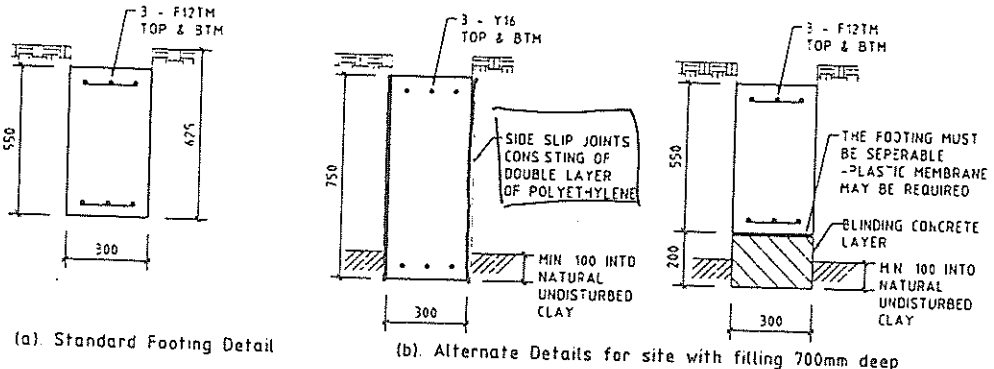


FIGURE 2 - STRIP FOOTING SYSTEMS
EXAMPLES OF FOOTING SYSTEMS FOR 'H' SITES

c) Side Slip Joints are only required on H sites for footings deeper that 700mm. That is, 'side slip joints' are not required for articulated masonry veneer construction on a *standard* H site. However, if deeper footings are required due to site conditions (eg. deep filling) then the side slip joints **and** increased reinforcement are required. An alternative to the use of 'side slip joints' and additional reinforcement, in some cases, can involve the use of a blinding concrete layer as shown in Figure 3.



(a). Standard Footing Detail

(b). Alternate Details for site with filling 700mm deep

FIGURE 3 STRIP FOOTING DETAILS FOR ARTICULATED MASONRY VENEER CONSTRUCTION ON CLASS 'H' SITES

d) For sloping H sites the additional corner reinforcement specified in the 1988 code is not required. This requirement was intended to provide increased strength and stiffness at corners where poor site drainage could lead to increased ground movements. This should not be a problem now with the site drainage requirements given in the new code.

e) For M-D and H sites AS2870 - 1996 requires that provision be made to allow for future re-levelling of the timber floor due to the effects of clay drying. The most simple method is to provide an adequate crawl space below the floor. The use of adjustable stumps (now readily available) would make any re-levelling easier.

f) Code Error - Correction to be made :

Note 7 on page 29 of AS2870 - 1996 is in error in that it states that infill floors can be used for 'M' sites. This is wrong and will be corrected in Amendment No. 1. Figure 3.6 (in part) on page 27 is correct.

3. DETAILING AND CONSTRUCTION REQUIREMENTS

Footing systems designed in accordance with Section 3 and Section 4 of AS2870 - 1996 must also comply with Section 5 'Detailing Requirements' and Section 6 'Construction Requirements'.

Many of the detailing and construction requirements given in the new code were previously given in Section 6 of the 1988 code. Some of the important changes are listed below.

3.1 Drainage

Effective drainage of a site is a prerequisite for the satisfactory performance of the footing system, particularly on reactive clay sites. The new code specifies:

> Drainage shall be designed and constructed to avoid water ponding against or near the footing. The ground in the immediate vicinity of the perimeter footing, including the ground uphill from the slab on cut-and-fill sites, shall be graded to fall 50mm minimum away from the footing over a distance of 1m.
>
> Alternative drainage systems will be required on zero lot line construction. Any paving shall also be suitably sloped.

Site grading around the perimeter of the footing should be achieved *by excavation*. Where this is achieved by filling, the nature and permeability of the filling should be considered in relation to the underlying soil. Figure 4 illustrates an unsatisfactory situation.

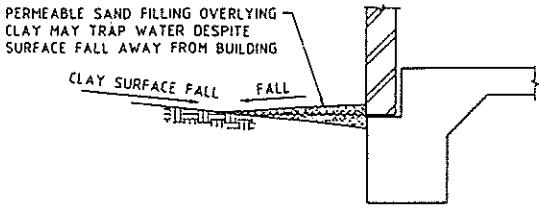


FIGURE 4 UNSATISFACTORY METHOD OF ACHIEVING USURFACE FALL AWAY FROM BUILDING

Drainage design must take account of existing drainage paths, site gradients and proposed earthworks. It is important to specify surface grading where necessary around the perimeter of the house to ensure that water cannot pond adjacent to the footings. Cut-off drains should be detailed to show required depths, gradients and connection into the legal point of discharge.

Care should also be taken when specifying concrete paving around the edges of the building. It is not good enough just to show the paving grading away from the house; the base preparation is also important as indicated on Figure 5 below.

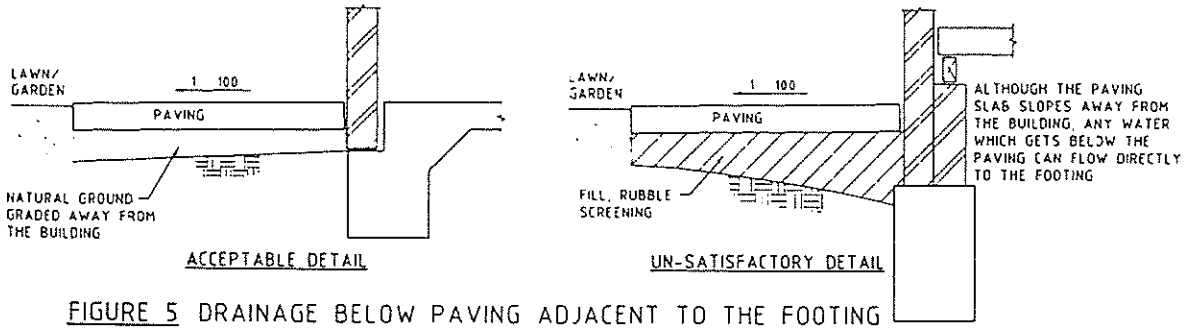


FIGURE 5 DRAINAGE BELOW PAVING ADJACENT TO THE FOOTING

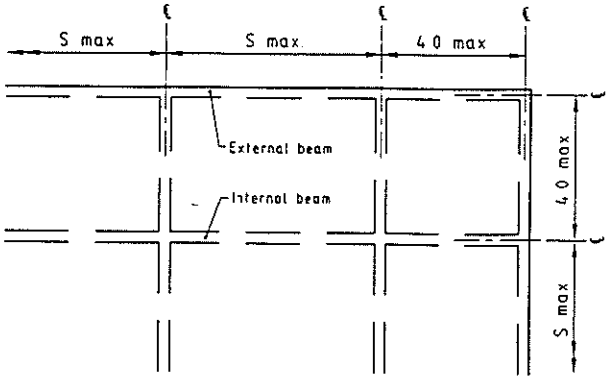
Drainage detailing should also consider service trenching. Trenches for service piping may introduce water into subsoil beneath a house. Backfills are usually highly permeable relative to the surrounding clay soils. Therefore the surface of the backfill within the vicinity of the house should be 'sealed' to reduce moisture ingress. Additionally, the base of the trench should be sloped away from the house to drain any water away.

Subsurface drains should be avoided near the footings, where practical, as they can introduce water to the foundation if the drains become blocked. However it is recognised that such drains may be essential behind steps in slabs or for the relief of subsurface water flow. The base of the subsurface trench should be capable of providing some drainage away from the footings in the advent of the main drain becoming blocked.

Site drainage requirements must be included as part of the footing design.

3.2 Beam Layout in Stiffened Raft Slabs

New beam layout restrictions are specified in AS2870 - 1996 for the corners of raft slabs. The beam spacing requirements are given in AS2870 - 1996 Figure 5.5 and is reproduced in Figure 6 below.



NOTE S = beam spacing from Figure 3 1 AS2870-1996

FIGURE 6 BEAM SPACING RESTRICTIONS FOR CLASS M & H SITES

Note that the wording in AS2870 - 1996 clause 5.3.9 is confusing and will be changed in the first code amendment. The figure accurately conveys the requirements.

The restrictions significantly effect 'M' slabs and only effect 'H' slabs with clad frame construction. The current chairman of the code committee has indicated that the 4m distance from the corner is an 'absolute' maximum and cannot be increased in any circumstances.

3.3 Construction Requirements for Class H and E Sites

AS2870 - 1996 lists additional requirements for H and E sites which now include the following :

i) Any method used to minimize the damage to masonry construction caused by foundation movement shall be detailed on the drawings.

ii) Water run-off shall be collected and channelled away from the house ***during construction.***

iii) Water shall not be allowed to pond in the trenches for a long period.

iv) Concrete in beams shall be ***vibrated*** and reinforcement shall be fixed in position by bar chairs and / or ligatures.

If the footing system relies on a certain level of articulation then the articulation joints should be detailed and the joint locations clearly specified. Don't assume the builder will always place articulation at the appropriate locations.

3.4 Miscellaneous Details

The 1996 code gives new details for stump pad sizes, braced stump uplift capacity and horizontal load capacity.

The new details are clearly presented in Appendix E of AS2870 - 1996.

4. GENERAL DETAILING REQUIREMENTS

The attached drawings show some examples of good and bad design detailing. The 'bad' drawings are composite examples from my own old job files and drawings by others seen over past years. The recommended details are a suggested minimum standard which will not necessarily be applicable in all circumstances. Every footing/slab design must be considered on an individual basis by an experienced building practitioner.

3.1 Strip Footings

An example of a typical poorly detailed footing is given on Drawing A1. Drawing A2 gives recommended details for the same house shown on Drawing A1.

The major items of interest include:

a) Founding Depths: Clearly specify the founding requirements making reference to the site investigation report.

b) Site Drainage: Although the first example (Drawing A1) shows an A.G. drain the detailing is not sufficient. Drainage is a very important aspect of footing design - many footing failures can be related to inadequate site drainage.

c) Garage Slabs: Specific details should be given. A bituminous canite strip around the edges is good practice.

d) Trench Mesh: It is important that the reinforcement is placed where required; especially for "M" and "H" sites. The use of R6 ligatures ensures that the top mesh finishes in the correct location. The method of dropping the top mesh into place during the pour may not necessarily ensure correct placement.

e) Porches and Landings: Raised porches and landings are often neglected at the design stage. Footings added later are often of a lower standard or inadequately founded resulting in differential movements of the steps and landings.

f) Floor Clearance: It is now generally accepted that stump settlement can occur. The provision of adequate clearance so that someone can get under the floor and adjust the bearers makes common sense.

ADDITIONAL REQUIREMENTS FOR CLASS "H" SITES

g) Grid Footing Systems: Drawing B shows a typical footing system for a "H" site. Internal tie beams are provided to prevent rotation of the main external strip footings. The new code specifies that for 'deemed to comply' design the internal footings be of the same proportions as the external strip footings, however, smaller tie beams can be used to provide the necessary restraint. The shallower depth of the internal tie beams also minimizes localised water infiltration to the underside of the house. This design does not comply with the Standard Designs of Section 3 of AS2870 - 1996 but has been designed in accordance with Section 4. Long span floor joists and long span bearers are specified to minimize damage caused by differential movements. Any internal pad settlements that occur can be easily repaired - for the design shown adjustments at only seven internal supports is necessary.

h) Vertical Sides to Footing Excavations:

The wide splaying at the top of strip footings as indicated on Figure 7 has been known to lead to footing failure. Some builders may consider the extra concrete to be a good thing, but very high uplift pressures can be developed in basaltic clays (a footing heave of about 50mm has been measured at one site). To ensure vertical sides to footings a detail similar to that shown near the bottom right hand corner of Drawing B is recommended.

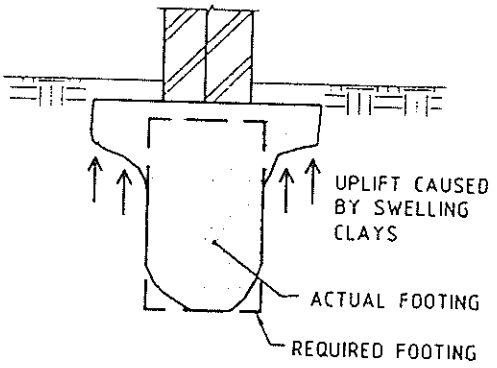


FIGURE 7

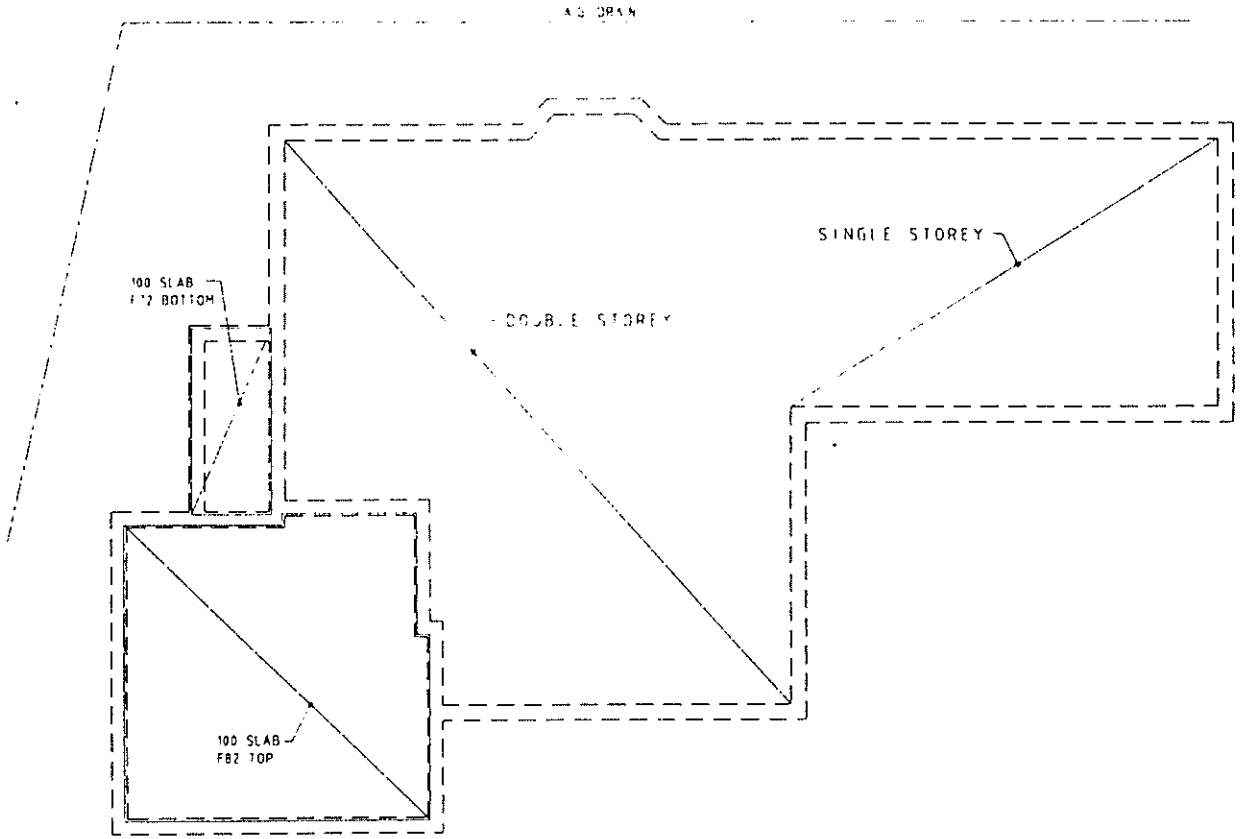
3.2 Slabs

Drawing C1 shows a poorly designed slab and unsatisfactory detailing. The slab design does not provide continuity of the beams or adequate overall slab stiffness. Using one interpretation of AS2870 would lead to the slab beam layout shown on Drawing C2. This alternate layout is not considered to be economically practical. Drawing C3 shows the slab design and detailing submitted for approval.

REFERENCES

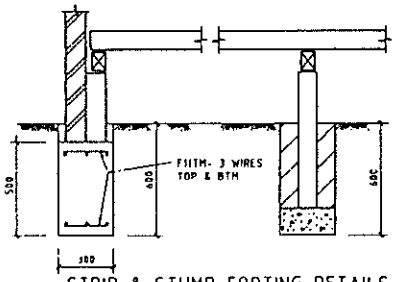
1 TAS The Australian Standard July 1996 - Article by Gordana Miletic, Project Manager, Housing and Fire Protection Group, Standards Australia

2 Special Provision for Site Investigation and the Design of Residential Slabs and Footings for Victorian Conditions - Foundation and Footing Society of Victoria - 1992



NOTES

CONCRETE SHALL BE 20 MPa GRADE
FOOTINGS TO BE FOUNDED 100mm
INTO CLAY



STRIP & STUMP FOOTING DETAILS

SITE CLASSIFICATION CLASS M

PREPARED BY JOHN McFARLANE FOR

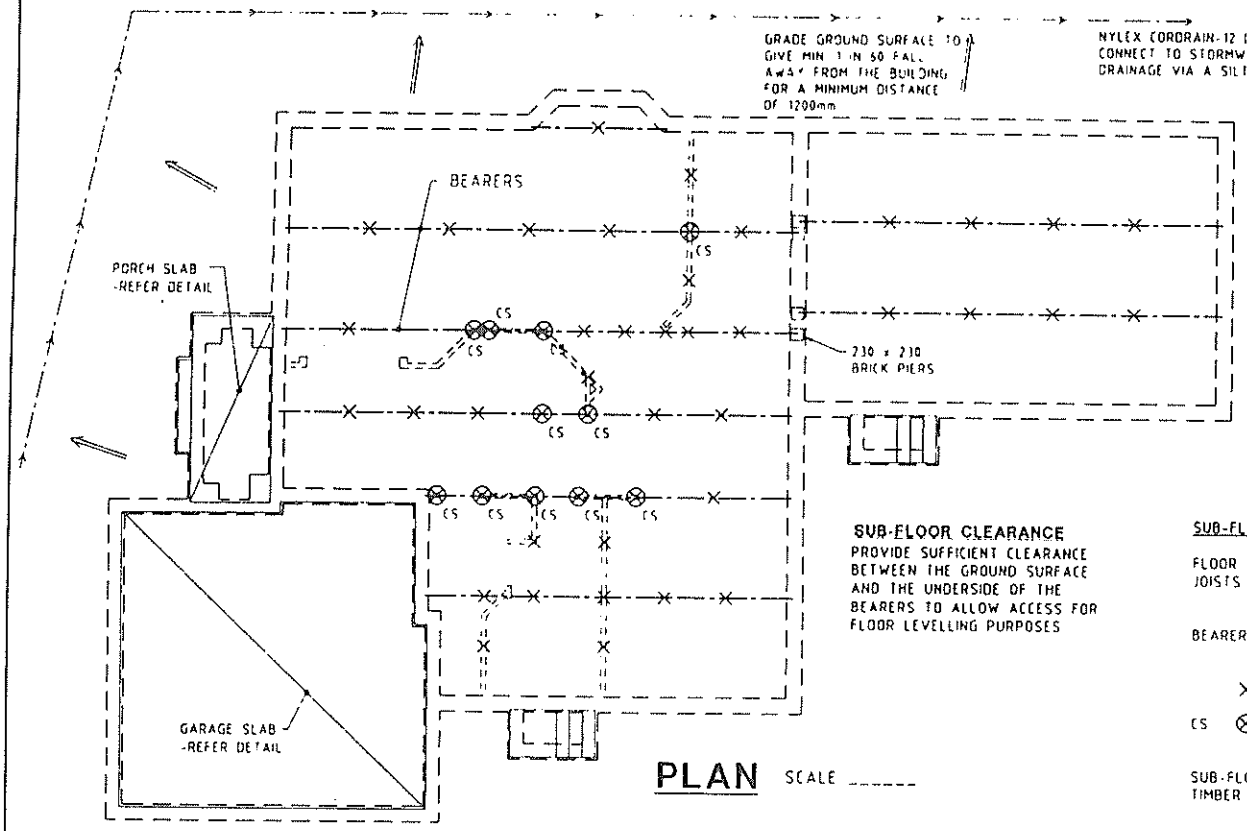
THE FOUNDATION AND FOOTINGS SOCIETY (Vic) Inc.

AS 2870 CODE FORUM

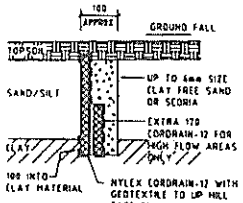
TUESDAY 30 JULY 1996

SAMPLE DRAWING FOR CLASS 'M' FOOTING
-UNSATISFACTORY DETAILING

DRAWING A1



PLAN SCALE _____



TYPICAL CUT OFF DRAIN
(DEPTH 200 - 1200)

SUB-FLOOR CLEARANCE
PROVIDE SUFFICIENT CLEARANCE BETWEEN THE GROUND SURFACE AND THE UNDERSIDE OF THE BEARERS TO ALLOW ACCESS FOR FLOOR LEVELLING PURPOSES

SUB-FLOOR FRAMING

FLOOR JOISTS 100 x 50 F8 H/W AT 450 CTRS. (CONTINUOUS OVER MIN 2 SPANS) DOUBLE JOISTS BELOW PARALLEL WALLS

BEARERS 100 x 75 F8 H/W (CONTINUOUS OVER MIN 2 SPANS)

× STUMP LOCATIONS

CS ⊗ CRITICAL STUMP - LOCATION TO BE DIRECTLY BELOW BEAM SUPPORT

SUB-FLOOR FRAMING TO COMPLY WITH THE NATIONAL TIMBER FRAMING CODE

NOTES

GENERAL

G1 CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE BUILDING CODE OF AUSTRALIA, THE RESIDENTIAL SLABS AND FOOTING CODE AS2870 - SECTION 6 AND THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITY

G2 ALL DIMENSIONS AND LEVELS SHALL BE VERIFIED BEFORE COMMENCING ANY WORK

G3 THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE ARCHITECTURAL PLANS AND SPECIFICATIONS

G4 NO RESPONSIBILITY FOR THE FOUNDATIONS CAN BE TAKEN BY B.H.M.P. SOIL ENGINEERING UNLESS WORK IS INSPECTED AND APPROVED DURING CONSTRUCTION. ALL INSPECTIONS REQUIRED SHALL BE CONFIRMED 24 HOURS IN ADVANCE OF TIME REQUIRED

CONCRETE

C1 CONCRETE SHALL NOT BE LESS THAN 20 MPa GRADE, WITH 20mm NOMINAL MAXIMUM AGGREGATE SIZE AND 100mm SLUMP. ALL CONCRETE SHALL BE COMPACTED USING VIBRATION

REINFORCEMENT

R1 SYMBOLS ON THE DRAWING FOR REINFORCEMENT ARE AS FOLLOWS
F - HARD DRAWN WIRE REINFORCING FABRIC TO AS1304
TM - TRENCH MESH TO AS1304

R2 STRIP FOOTING REINFORCEMENT SHALL HAVE A NOMINAL COVER OF 50mm. TRENCH MESH SHALL BE LAID CONTINUOUSLY AND SHALL BE SPLICED WHERE NECESSARY, BY A LAP OF 500mm. THE TRENCH MESH SHALL BE OVERLAPPED BY THE WIDTH OF FABRIC AT T- AND L-JUNCTIONS

R3 ALL REINFORCEMENT SHALL BE SUPPORTED BY APPROVED CHAIRS, SPACERS OR TIES AS REQUIRED TO PROVIDE ADEQUATE SUPPORT

LANDSCAPING, CONSTRUCTION AND SITE MAINTENANCE

L1 SURFACE GRADING OR DRAINAGE SHALL BE PROVIDED AROUND THE PERIMETER OF THE BUILDING SO THAT NO WATER CAN POND OR COLLECT ADJACENT TO THE FOOTINGS

L2 THE DRAINAGE MEASURES SHALL BE CARRIED OUT PRIOR TO OR IMMEDIATELY AFTER CONSTRUCTION OF THE FOOTINGS

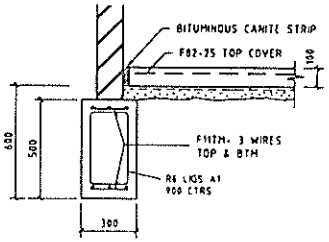
L3 EXCAVATIONS FOR SERVICE TRENCHES UNDER OR ADJACENT TO THE BUILDING SHALL BE BACKFILLED WITH CLAY OR CONCRETE TO PREVENT THE INGRESS OF WATER BENEATH THE FOOTINGS

L4 SERVICE TRENCHES PARALLEL TO THE EDGE OF THE BUILDING SHOULD BE OFFSET A DISTANCE EQUAL TO THE DEPTH OF THE TRENCH EXCAVATION

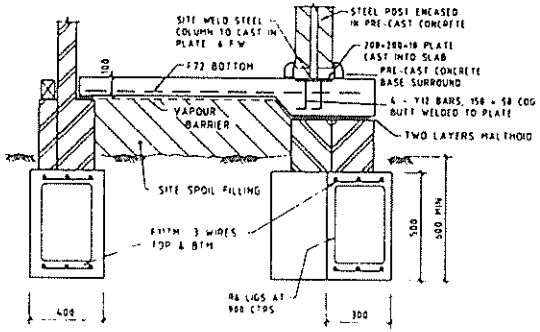
L5 ROOF GUTTERS, DOWNPIPES, STORMWATER AND SEWERAGE DRAINAGE SHALL BE MAINTAINED TO PREVENT OVERFLOWS AND TO ENSURE THAT ANY LEAKS ARE PROMPTLY REPAIRED

L6 MASONRY SHALL BE ARTICULATED WITH FULL HEIGHT WINDOW AND DOOR OPENINGS AND/OR APPROVED FULL HEIGHT BRICKWORK JOINTS AT INTERVALS OF NOT GREATER THAN 7m.

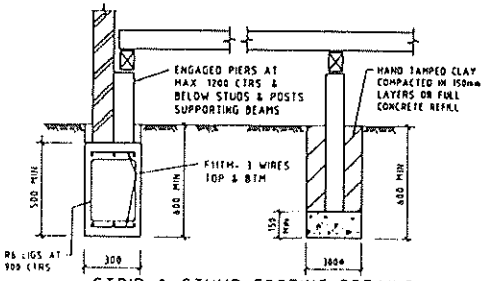
L7 THE PLANTING OF TREES AND LARGE SHRUBS AND GENERAL SITE MAINTENANCE SHALL COMPLY WITH THE REQUIREMENTS OF CSIRO PUBLICATION SHEET 10-91 "GUIDE TO HOME OWNERS ON FOUNDATION MAINTENANCE AND FOOTING PERFORMANCE"



DETAIL AT GARAGE



TYPICAL DETAIL AT CONCRETE PORCH & COLUMN FIXING DETAIL



STRIP & STUMP FOOTING DETAILS

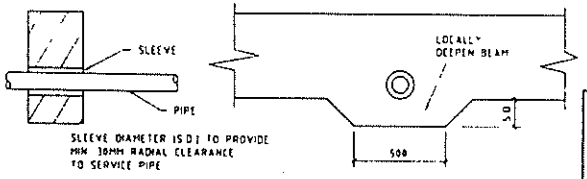
FOUNDING DEPTHS

ALL FOOTINGS SHALL BE FOUNDED AT LEAST 100mm INTO NATURAL UNDISTURBED SILTY CLAY MATERIAL WITH MINIMUM 100 kPa ALLOWABLE BEARING PRESSURE

REFER ALSO TO THE SITE INVESTIGATION REPORT BY _____ REF No _____ DATED _____

DESIGN IN ACCORDANCE WITH SECTION 4 OF AS2870-1996

SITE CLASSIFICATION CLASS M



DETAIL ① FLEXIBLE CONNECTION FOR SERVICE PIPES PASSING THROUGH BEAMS

PREPARED BY JOHN McFARLANE FOR

THE FOUNDATION AND FOOTINGS SOCIETY (Vic) Inc.

AS 2870 CODE FORUM

TUESDAY 30 JULY 1996

SAMPLE DRAWING FOR CLASS 'M' FOOTING -RECOMMENDED DETAILING

DRAWING A2

ALL DUAL MEMBERS TO BE LAMINATED IN ACCORDANCE WITH CLAUSE 6.7 OF AS1684 - 1992 (NATIONAL TIMBER FRAMING CODE)

FLOOR JOISTS
240 x 45 F7 KD PINE
AT 450 CTRS
SOLID BLOCKING AT MAX
1800 CTRS

GARAGE SLAB
REFER DETAIL

SB1 SB1 P1

SB1 SB1 SB1 SB1 SB1
P1 P1 P1 P1 P1

HYLEX CORDRAIN-12 (REFER DETAIL) CONNECT TO STORMWATER DRAINAGE VIA A SILT TRAP

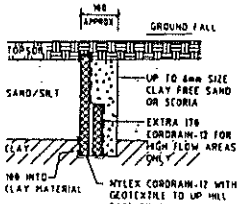
HY-LEX CORDRAIN-12 (REFER DETAIL) CONNECT TO STORMWATER DRAINAGE VIA A SILT TRAP

GRADE GROUND SURFACE TO GIVE MIN 1 IN 60 FALL AWAY FROM THE BUILDING FOR AN MINIMUM DISTANCE OF 1200mm

MEMBER SCHEDULE
SB1 2 No 190 x 35
F17 KDHW

SUB-FLOOR CLEARANCE

PROVIDE SUFFICIENT CLEARANCE BETWEEN THE GROUND SURFACE AND THE UNDERSIDE OF THE BEARERS TO ALLOW ACCESS FOR FLOOR LEVELLING PURPOSES



TYPICAL CUT OFF DRAIN
(DEPTH 200 - 1200)

NOTES

GENERAL

G1 CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE BUILDING CODE OF AUSTRALIA, THE RESIDENTIAL SLABS AND FOOTING CODE AS2870 - SECTION 6 AND THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITY

G2 ALL DIMENSIONS AND LEVELS SHALL BE VERIFIED BEFORE COMMENCING ANY WORK

G3 THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE ARCHITECTURAL PLANS AND SPECIFICATIONS

G4 NO RESPONSIBILITY FOR THE FOUNDATIONS CAN BE TAKEN BY B.H.M.P. SOIL ENGINEERING UNLESS WORK IS INSPECTED AND APPROVED DURING CONSTRUCTION. ALL INSPECTIONS REQUIRED SHALL BE CONFIRMED 24 HOURS IN ADVANCE OF TIME REQUIRED

G5 PROVIDE MIN 110mm END BEARING FOR STEEL BEAMS ON BRICKWORK

CONCRETE

C1 CONCRETE SHALL NOT BE LESS THAN 25 MPa GRADE, WITH 20mm NOMINAL MAXIMUM AGGREGATE SIZE AND 80mm SLUMP. ALL CONCRETE SHALL BE COMPACTED USING VIBRATION

REINFORCEMENT

R1 SYMBOLS ON THE DRAWING FOR REINFORCEMENT ARE AS FOLLOWS .

F - HARD DRAWN WIRE REINFORCING FABRIC TO AS1304
TM- TRENCH MESH TO AS1304.

R2 STRIP FOOTING REINFORCEMENT SHALL HAVE A NOMINAL COVER OF 50mm TRENCH MESH SHALL BE LAID CONTINUOUSLY AND SHALL BE SPLICED WHERE NECESSARY, BY A LAP OF 500mm. THE TRENCH MESH SHALL BE OVERLAPPED BY THE WIDTH OF FABRIC AT T- AND L- JUNCTIONS

R3 ALL REINFORCEMENT SHALL BE SUPPORTED BY APPROVED CHAIRS, SPACERS OR TIES AS REQUIRED TO PROVIDE ADEQUATE SUPPORT

LANDSCAPING, CONSTRUCTION AND SITE MAINTENANCE

L1 SURFACE GRADING OR DRAINAGE SHALL BE PROVIDED AROUND THE PERIMETER OF THE BUILDING SO THAT NO WATER CAN POND OR COLLECT ADJACENT TO THE FOOTINGS

L2 THE DRAINAGE MEASURES SHALL BE CARRIED OUT PRIOR TO OR IMMEDIATELY AFTER CONSTRUCTION OF THE FOOTINGS

L3 EXCAVATIONS FOR SERVICE TRENCHES UNDER OR ADJACENT TO THE BUILDING SHALL BE BACKFILLED WITH CLAY OR CONCRETE TO PREVENT THE INGRESS OF WATER BENEATH THE FOOTINGS

L4 SERVICE TRENCHES PARALLEL TO THE EDGE OF THE BUILDING SHOULD BE OFFSET A DISTANCE EQUAL TO THE DEPTH OF THE TRENCH EXCAVATION.

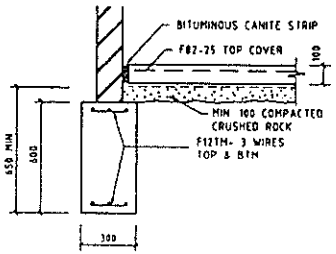
L5 ROOF GUTTERS, DOWNPIPES, STORMWATER AND SEWERAGE DRAINAGE SHALL BE MAINTAINED TO PREVENT OVERFLOWS AND TO ENSURE THAT ANY LEAKS ARE PROMPTLY REPAIRED.

L6 MASONRY SHALL BE ARTICULATED WITH FULL HEIGHT WINDOW AND DOOR OPENINGS AND/OR APPROVED FULL HEIGHT BRICKWORK JOINTS AT INTERVALS OF NOT GREATER THAN 7m.

L7 THE PLANTING OF TREES AND LARGE SHRUBS AND GENERAL SITE MAINTENANCE SHALL COMPLY WITH THE REQUIREMENTS OF CSIRO PUBLICATION SHEET 10-91 "GUIDE TO HOME OWNERS ON FOUNDATION MAINTENANCE AND FOOTING PERFORMANCE"

PLAN

SCALE _____

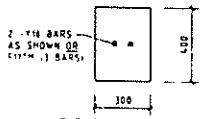


DETAIL AT GARAGE

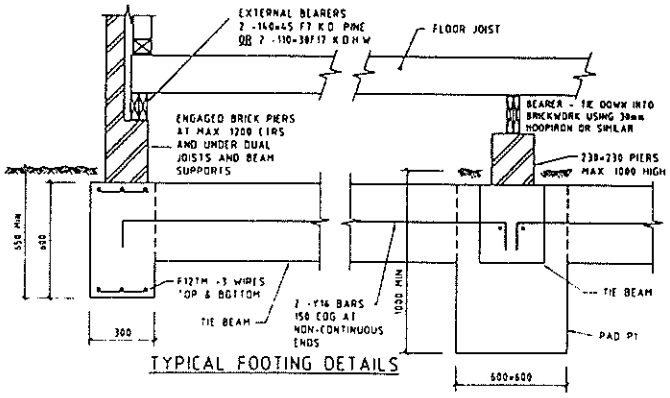
FOUNDING DEPTHS

ALL FOOTINGS SHALL BE FOUNDED AT LEAST 100mm INTO NATURAL UNDISTURBED CLAY MATERIAL WITH MINIMUM 100 kPa ALLOWABLE BEARING PRESSURE

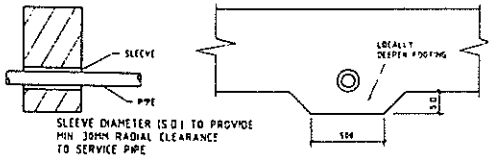
REFER ALSO TO THE SITE INVESTIGATION REPORT BY _____ REF No _____ DATED _____



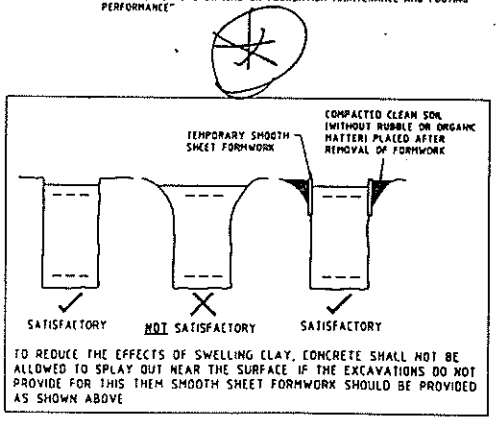
TIE BEAM DETAIL
TIE BEAMS SHOWN HATCHED ON PLAN



TYPICAL FOOTING DETAILS



FLEXIBLE CONNECTION FOR SERVICE PIPES PASSING THROUGH FOOTINGS



TO REDUCE THE EFFECTS OF SWELLING CLAY, CONCRETE SHALL NOT BE ALLOWED TO SPLAY OUT NEAR THE SURFACE IF THE EXCAVATIONS DO NOT PROVIDE FOR THIS THEM SMOOTH SHEET FORMWORK SHOULD BE PROVIDED AS SHOWN ABOVE

SITE CLASSIFICATION- CLASS H

PREPARED BY JOHN McFARLANE FOR

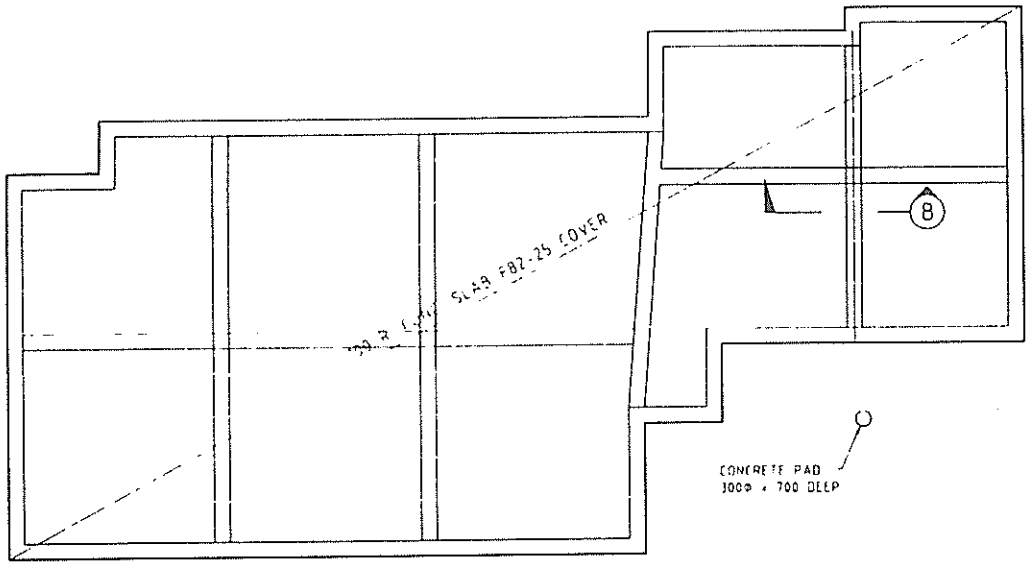
THE FOUNDATION AND FOOTINGS SOCIETY (Vic) Inc.

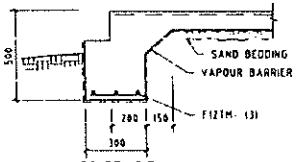
AS 2870 CODE FORUM

TUESDAY 30 JULY 1996

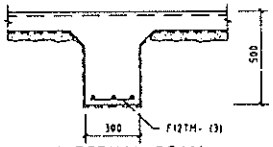
SAMPLE DRAWING -RECOMMENDED DETAILS FOR TIMBER FLOOR 'H' SITE CLASSIFICATI

DRAWING B

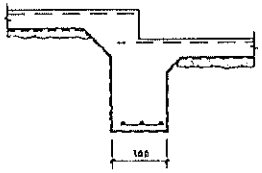




EDGE BEAM



INTERNAL BEAM



SECTION B

NOTE

SITE CLASSIFICATION CLASS 'H' AS 2870 - 1988
ALL SLAB BEAMS TO BE FOUNDED A MINIMUM OF 150mm
INTO THE NATURAL GROUND

PREPARED BY JOHN McFARLANE FOR

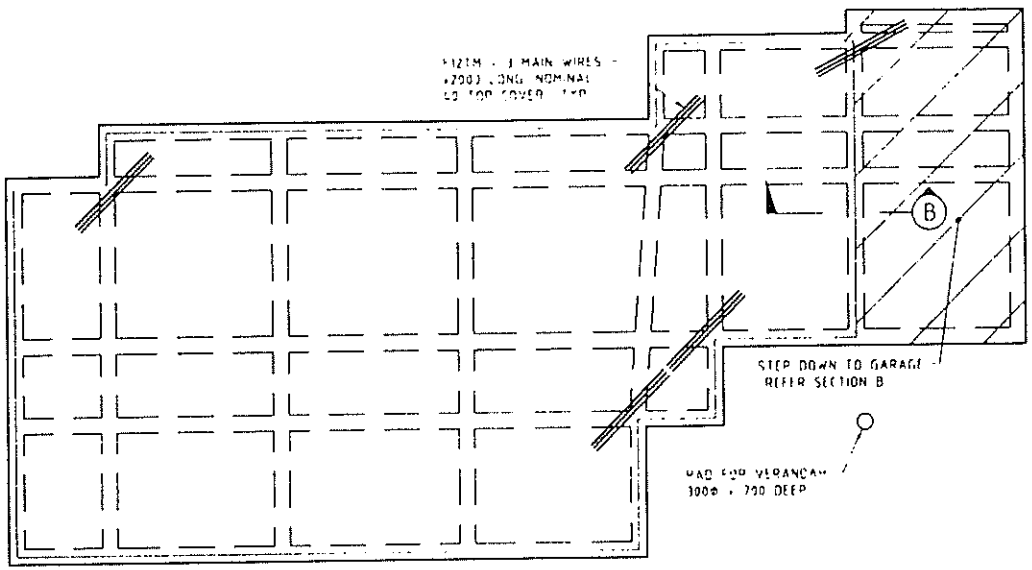
THE FOUNDATION AND FOOTINGS SOCIETY (Vic) Inc.

AS 2870 CODE FORUM

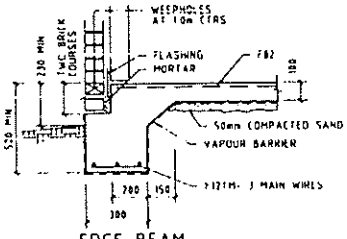
TUESDAY 30 JULY 1996

SAMPLE DRAWING FOR CLASS 'H' SLAB
-UNSATISFACTORY DESIGN & DETAILING

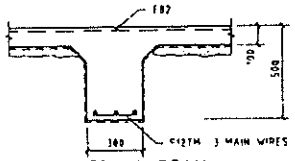
DRAWING C1



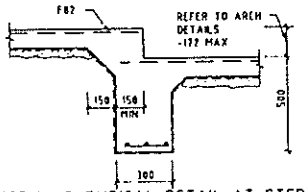
PLAN
SCALE ------



EDGE BEAM



INTERNAL BEAM



SECTION B-TYPICAL DETAIL AT STEP

NOTES

GENERAL

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G4 THE SLAB SITE SHALL BE STRIPPED OF TOPSOIL CONTAINING SIGNIFICANT ORGANIC MATTER PRIOR TO BEAM EXCAVATION.

G5 A VAPOUR BARRIER OF 0.2mm MINIMUM THICKNESS SHALL BE PLACED UNDER THE SLAB AS SHOWN. THE VAPOUR BARRIER SHALL BE LAPPED A MINIMUM OF 200mm AT JOINES AND SHALL BE TAPED AROUND PIPES WHICH PENETRATE THE SLAB

G6 FILLING UP TO 600mm MAY BE PLACED UNDER THE SLAB. FILLING SHALL BE COMPACTED IN 150mm THICK LAYERS. CLEAN GRANULAR MATERIAL SHALL BE USED

G7 AN EXTRA LAYER OF SLAB FABRIC SHALL BE PLACED IN AREAS TO BE COVERED BY BRITTLE FLOOR TILES. ALTERNATIVELY THE PLACEMENT OF TILES SHALL BE DELAYED OR PROVISION MADE FOR MOVEMENT

CONCRETE

C1 CONCRETE SHALL NOT BE LESS THAN 20 MPa GRADE, WITH 20mm NOMINAL MAXIMUM AGGREGATE SIZE AND 80mm SLUMP. ALL CONCRETE SHALL BE COMPACTED USING VIBRATION

REINFORCEMENT

R1 SYMBOLS ON THE DRAWING FOR REINFORCEMENT ARE AS FOLLOWS

F - HARD DRAWN WIRE REINFORCING FABRIC TO AS1304.
TM - TRENCH MESH TO AS1304

R2 BEAM AND STRIP FOOTING REINFORCEMENT SHALL HAVE A NOMINAL COVER OF 50mm. TRENCH MESH SHALL BE LAID CONTINUOUSLY AND SHALL BE SPLICED WHERE NECESSARY BY A LAP OF 500mm. THE TRENCH MESH SHALL BE OVERLAPPED BY THE WIDTH OF FABRIC AT T- AND L- JUNCTIONS

R3 SLAB REINFORCING FABRIC SHALL BE PLACED NEAR THE TOP OF THE SLAB AND SHALL HAVE A NOMINAL COVER OF 20mm, UNLESS SHOWN OTHERWISE. REINFORCING FABRIC SHALL BE LAPPED A MINIMUM OF TWO WIRES PLUS 25mm AND SHALL BE SET OUT SUCH THAT NO MORE THAN THREE THICKNESSES OF FABRIC OCCUR AT ANY LOCATION

R4 ALL REINFORCEMENT SHALL BE SUPPORTED BY APPROVED CHAIRS, SPACERS OR TIES AS REQUIRED TO PROVIDE ADEQUATE SUPPORT.

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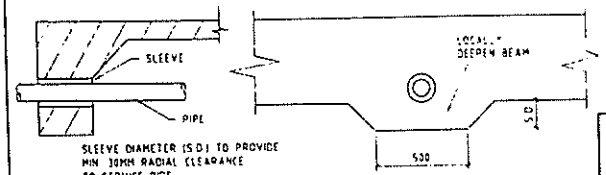
L7 THE PLANTING OF TREES AND LARGE SHRUBS AND GENERAL SITE MAINTENANCE SHALL COMPLY WITH THE REQUIREMENTS OF CSIRO PUBLICATION SHEET 10-91 "GUIDE TO HOME OWNERS ON FOUNDATION MAINTENANCE AND FOOTING PERFORMANCE"



DETAIL (1) FLEXIBLE CONNECTION FOR SERVICE PIPES PASSING THROUGH BEAMS

SITE CLASSIFICATION CLASS H

PREPARED BY JOHN McFARLANE FOR

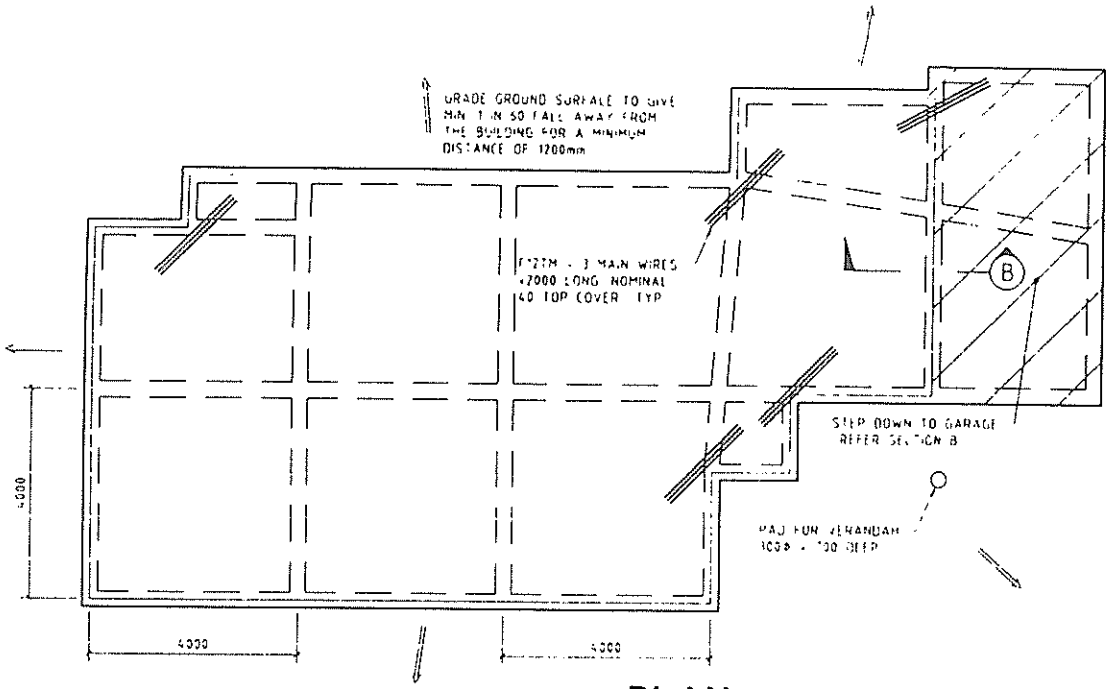
THE FOUNDATION AND FOOTINGS SOCIETY (Vic) Inc.

AS 2870 CODE FORUM

TUESDAY 30 JULY 1996

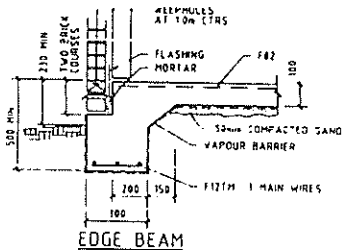
SAMPLE DRAWING FOR CLASS 'H' FOOTING -ALTERNATE SLAB BEAM LAYOUT

DRAWING C2

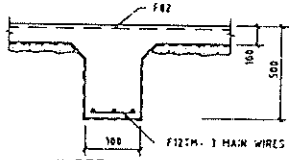


PLAN

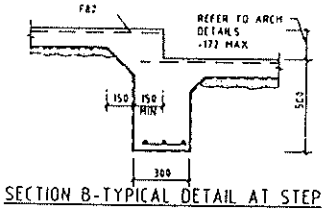
SCALE _____



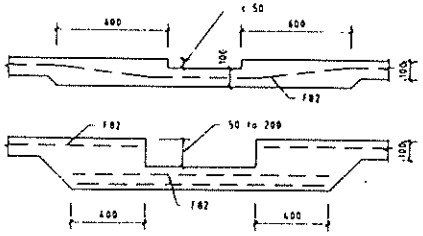
EDGE BEAM



INTERNAL BEAM



SECTION B-TYPICAL DETAIL AT STEP

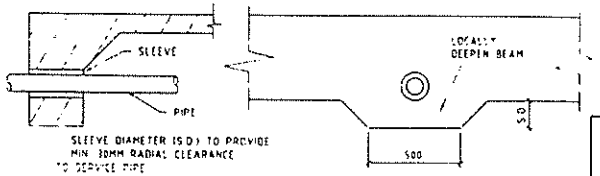


SLAB DETAIL AT SHOWER RECESS

FOUNDING DEPTHS

ALL SLAB BEAMS SHALL BE FOUNDED AT A MINIMUM DEPTH OF 200mm BELOW THE GROUND SURFACE AND AT LEAST 50mm INTO THE NATURAL CLAY MATERIAL

REFER ALSO TO THE SITE INVESTIGATION REPORT BY _____ REF No _____ DATED



DETAIL (1) FLEXIBLE CONNECTION FOR SERVICE PIPES PASSING THROUGH BEAMS

NOTES

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R3 SLAB REINFORCING FABRIC SHALL BE PLACED NEAR THE TOP OF THE SLAB AND SHALL HAVE A NOMINAL COVER OF 20mm, UNLESS SHOWN OTHERWISE. REINFORCING FABRIC SHALL BE LAPPED A MINIMUM OF TWO WIRES PLUS 25mm AND SHALL BE SET OUT SUCH THAT NO MORE THAN THREE THICKNESSES OF FABRIC OCCUR AT ANY LOCATION

R4 ALL REINFORCEMENT SHALL BE SUPPORTED BY APPROVED CHAIRS, SPACERS OR TIES AS REQUIRED TO PROVIDE ADEQUATE SUPPORT.

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SITE CLASSIFICATION CLASS H

PREPARED BY JOHN McFARLANE FOR

THE FOUNDATION AND FOOTINGS SOCIETY (Vic) Inc.

AS 2870 CODE FORUM

TUESDAY 30 JULY 1996

SAMPLE DRAWING FOR CLASS 'H' FOOTING -RECOMMENDED DETAILING

DRAWING C3