



Housing Choice

HAVE WE A CHOICE ?

Lets look at the options

Yes we have a lot of different types of housing but do we really have choice.?

We seem to only recognised construction method-

- ▶ **Double Brick-** a brick structural house with brick as external skin

Other Options

- ▶ **Brick veneer** - A structural framed house with brick as a skin

- ▶ **Reverse Brick veneer-** a brick structural house with a light weight skin

- ▶ **SIPS** –Structurally insulated panels

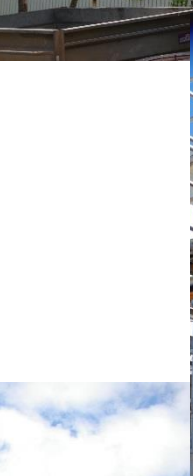
- ▶ **Light weight or integrated construction** – structural framed house and clad as an external skin

The Perth pre-occupation with double brick – Why?

- ▶ Convention - Its what we do.
- ▶ Fear – Of the unknown
- ▶ Politics – We are economically engaged.
- ▶ Cost – It costs more to be different.
- ▶ Resale – I'll never get value back if I sell.

Lets look at one option Integrated Construction

- ▶ Multifaceted appearances
- ▶ Speed of construction
- ▶ Size –more living space for the same total M2 area
- ▶ Footings and civil works
- ▶ Trades
- ▶ Sustainability
- ▶ Economics





One week



6 Weeks on the left 3 weeks on the right



How quick

- ▶ On our first home in Baldivis we are looking at 14 weeks complete including fit out –true turnkey.
- ▶ Two story in WA 200m² about 20weeks
- ▶ Queensland is 12 weeks for 200 m² home
- ▶ Two story In Fitzgibbon chase 16 weeks

\$\$ Savings in rent and holding costs

Space what does it really mean

- ▶ Equates to about 5% additional living space against the template of a double brick home.
- ▶ We measure houses on the external perimeter not on floor space so effectively we have to add 5% to the area of framed and clad home to compare to a double brick house
- ▶ 200m² house gives another bedroom in the space it saves
- ▶ This has major benefits in narrow and compact housing providing real exponential benefits

Space Maximisation

- Generate greater floor area within the house by taking advantage of a slimmer wall footprint compared to traditional construction methods. Composite material fixes direct to frame so no wasted space unlike alternative construction methods.

		Wall Thickness	Lost space on 250m ² slab
Double Brick		230mm	11.84m ²
Brick Veneer		230mm	10.46m ²
Aerated Concrete Panel		235mm	8.73m ²
Scyon™ Axon™ cladding		90 mm	none

What do your customers really value?



OR



ASK ABOUT OUR NEW
**FLOOR SPACE
MAXIMISER APP**



Civil Works and Footings

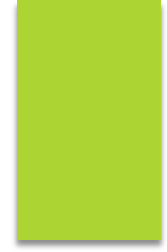
- ▶ We are used to building on A class soils –Sand
- ▶ So what happens when we move to other soil conditions S class or M ?
- ▶ What we are doing is trying to minimize the cost of a home by importing fill by changing the characteristics to an S class site. This reduces the footing detail for double brick. Approx. \$12000 dollars for a basic footing upgrade
- ▶ With a non brick house this is about \$2000 for a footing upgrade to an S

SITE CLASSIFICATION

- ▶ Site classification is given in accordance with AS2870 Residential slabs and footings 2011
- ▶ Is based on the condition of the site at the time of our assessment
- ▶ Take into account factors beyond the boundary of the subject site
- ▶ Fieldwork and associated Laboratory Testing with our NATA accredited lab
- ▶ Geo-technical information

CLASS	FOUNDATION	SURFACE MOVEMENT
A	Most sand and rock sites with little or no ground movement from moisture changes	
S	Slightly reactive clay sites, which may experience only slight ground movement from moisture changes	$0\text{mm} < y_s \leq 20\text{mm}$
M	Moderately reactive clay or silt sites, which may experience moderate ground movement from moisture changes	$20\text{mm} < y_s \leq 40\text{mm}$
H1	Highly reactive clay sites, which may experience high ground movement from moisture changes	$40\text{mm} < y_s \leq 60\text{mm}$
H2	Highly reactive clay sites, which may experience very high ground movement from moisture changes	$60\text{mm} < y_s \leq 75\text{mm}$
E	Extremely reactive sites, which may experience extreme ground movement from moisture changes	$y_s > 75\text{mm}$
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise	

WHICH SAND PAD FOR DOUBLE BRICK



CLASS A

- ▶ No sand Pad required

CLASS S

- ▶ 600mm minimum

CLASS M

- ▶ 800mm minimum

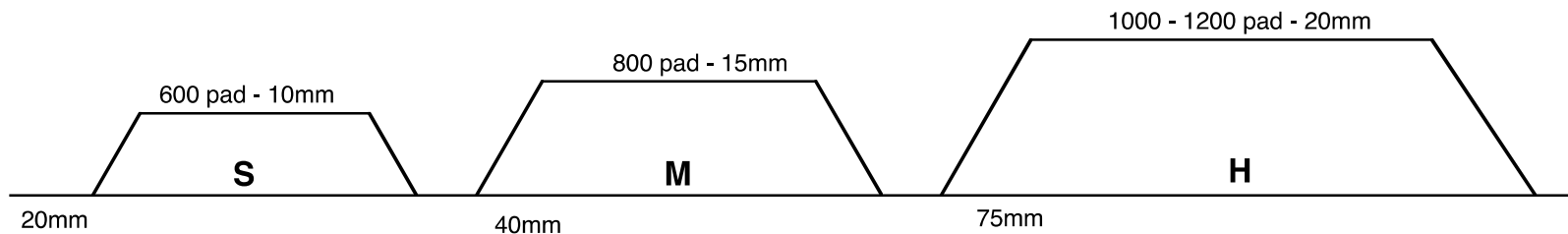
CLASS H1 & H2

- ▶ 1000mm to 1200mm minimum

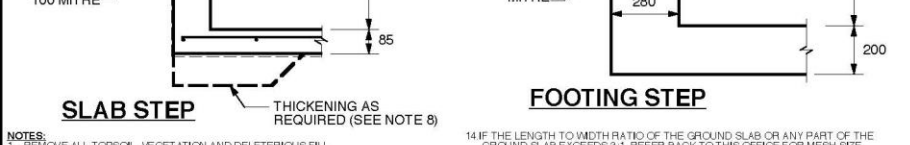
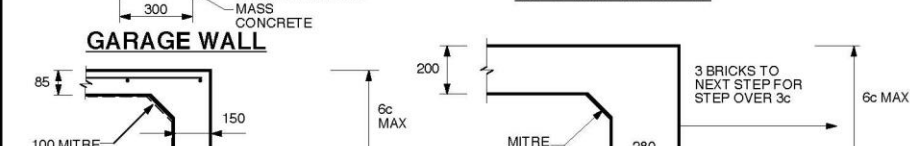
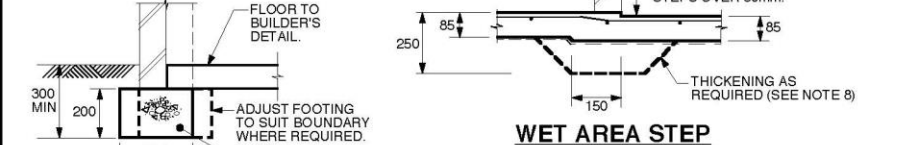
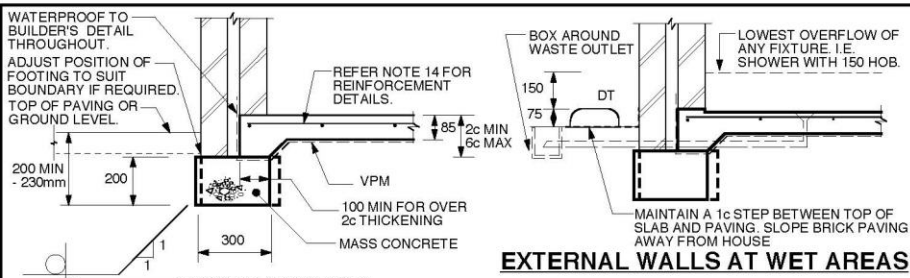
The depth of the sand pad is dependent on the specification for a footing.

It is possible to minimise the sand but then that maximises the design of the footing, What is greater cost sand and retaining or concrete and steel

- ▶ No sand pad required structurally – where there is sufficient non-reactive cover to accommodate the footing detail
- ▶ Minimum 500mm above rock refusal – A class sites where there is rock/limestone refusal within 500mm of the surface
- ▶ Above cut base – used when site is sloping, or clay materials to the surface
- ▶ Above reactive material – flat site and more than 300mm of suitable non-reactive material (not gravels)
- ▶ Above existing ground levels – usually specified by client or local government



FOOTING DETAILS



- NOTES:**
- REMOVE ALL TOPSOIL, VEGETATION AND DELETERIOUS FILL MATERIAL FROM THE BUILDING AREA.
 - SAND FILL TO BE CLEAN WELL DRAINED, WITH MAX FINES (PARTICLES UP TO 0.075mm) CONTENT OF 5% SAND TO BE COMPACTED TO A MIN 6 BLOWNS/0.00mm FOR 750mm OR DEPTH OF PAD.
 - A MIN OF 150mm OF SAND REQUIRED UNDER FOOTINGS.
 - IF CLAY ON SITE AN ENGINEER TO BE CONSULTED.
 - ROOF AND SURFACE WATER TO BE TAKEN AWAY FROM FOUNDATION AREA.
 - EXCAVATIONS FOR PLUMBING NOT TO UNDERMINE FOOTINGS. IF UNDERMINING IS LIKELY TO OCCUR, CONTACT THE ENGINEER.
 - WHERE PLUMBING PIPES PASS THROUGH FOOTINGS OR SLAB, SPECIFIED DEPTH OF ALL CONCRETE IS ALWAYS TO BE MAINTAINED.
 - PLACE SLAB THICKENINGS (300 WIDE x 250 DEEP) UNDER INTERNAL WALLS (90 OR 110 HIGHER THAN 3.7m).
 - CONCRETE TO CONFORM WITH AS 3600.
 - BLENDED CEMENT TO CONFORM WITH AS 3972.
 - ALL CONCRETE TO BE N20/20/100.
 - REINFORCEMENT SHALL BE IN ACCORDANCE WITH THE FOLLOWING STANDARDS:
SL INDICATES DEFORMED SQUARE MESH D500L TO AS/NZS 4671.
TM SUFFIX INDICATES TRENCH MESH USING DEFORMED BARS D50L TO AS/NZS 4671.
ALL STEELWORK TO BE TREATED IN ACCORDANCE WITH CLAUSE 3.4.4 "CORROSION PROTECTION" OF THE BUILDING CODE OF AUSTRALIA.
 - LAP ALL MESH ONE TRANSVERSE WIRE PLUS 25mm OR TO MANUFACTURERS SPECIFICATIONS.
- 14 IF THE LENGTH TO WIDTH RATIO OF THE GROUND SLAB OR ANY PART OF THE GROUND SLAB EXCEEDS 3:1, REFER BACK TO THIS OFFICE FOR MESH SIZE. IF THE LENGTH TO WIDTH RATIO IS LESS THAN 3:1 USE THE FOLLOWING:**
USE SL 53 MESH FOR SLAB SPAN UP TO 22m.
USE SL 62/SL 63 MESH FOR SLAB SPAN UP TO 26m.
USE SL 72 MESH FOR SLAB SPAN UP TO 32m.
TOP COVER TO REINFORCEMENT:
15 CURE SLAB BY KEEPING MOIST (OR EQUIVALENT METHOD), TO IMPROVE CRACK CONTROL.
16 THIS FOOTING DETAIL HAS BEEN DESIGNED WITHIN THE PARAMETERS OF "AS 2601 1996 RESIDENTIAL SLABS AND FOOTINGS CONSTRUCTION".
17 MAXIMUM HEIGHT OF CAVITY WALL TO BE 2750mm ABOVE FLOOR LEVEL.
18 THIS IS A PERFORMANCE-BASED DESIGN.
19 A BRICK COURSE, AS REFERRED TO IN THIS DOCUMENT, IS STANDARD 86mm HIGH.
20 IF POLISHED (OR HONED) CONCRETE FINISHES ARE DESIRED, THIS DESIGN SHOULD BE REFERRED BACK TO THIS OFFICE FOR CONSIDERATION, AS IT IS NOT THE INTENTION OF THESE DESIGNS FOR SUCH FINISHES.
21 THIS DESIGN IS CONSIDERED SUITABLE AS A PHYSICAL BARRIER AGAINST INGRESS OF TERMITES.
22 PERFORATING THE VAPOUR BARRIER (VPM) USING LEVELLING PINS ON FREE DRAINING SAND PADS WILL STILL ENABLE THE BARRIER TO MEET THE PERFORMANCE PROVISIONS OF THE BUILDING CODE OF AUSTRALIA.
- QUALITY CONTROL PROGRAM REQUIREMENTS**
1. SLAB DEPTH IS TO BE CONFIRMED BY STRUCTURE ON SITE.

THE APPROVED SIGNATURE ON THIS FOOTING AND SLAB DETAIL ENDORSES ITS USE FOR SINGLE STOREY BUILDINGS ON CLASS A STABLE SITES.

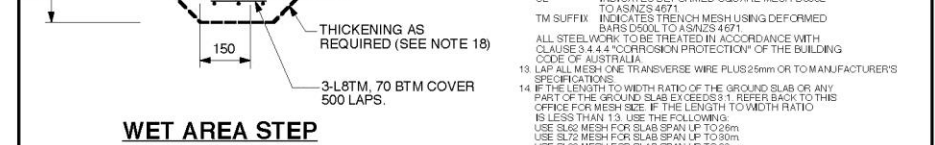
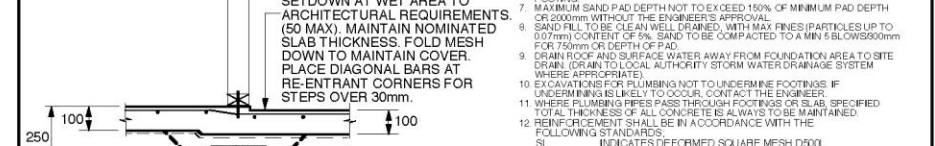
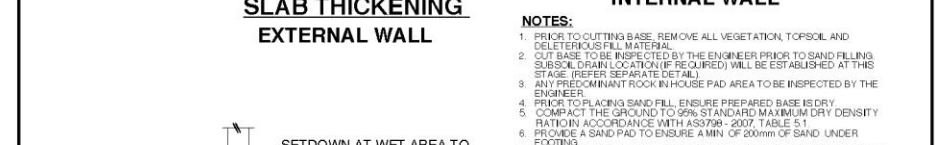
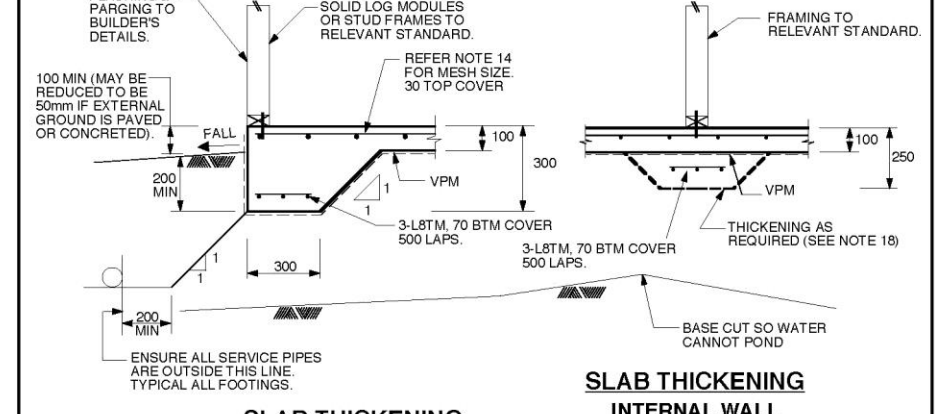
STRUCterre
consulting engineers

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PROJECT: XX
CLIENT: XX
SCALE: 1 : 20
DATE: APPROVED

DATE LAST MODIFIED: 31/01/13

D10



- NOTES:**
- PRIOR TO CUTTING BASE, REMOVE ALL VEGETATION, TOPSOIL AND DELETERIOUS FILL MATERIAL.
 - CUT BASE TO BE INSPECTED BY THE ENGINEER PRIOR TO SAND FILLING. SUBSOIL DRAIN LOCATION (IF REQUIRED) WILL BE ESTABLISHED AT THIS STAGE. (REFER SEPARATE DETAIL).
 - ANY PREDOMINANT ROCK IN HOUSE PAD AREA TO BE INSPECTED BY THE ENGINEER.
 - PRIOR TO PLACING SAND FILL, ENSURE PREPARED BASE IS DRY.
 - COMPACT THE GROUND TO 95% STANDARD MAXIMUM DRY DENSITY RATIO IN ACCORDANCE WITH AS 3798 - 2007 TABLE.
 - PROVIDE A SAND PAD TO ENSURE A MIN. OF 200mm OF SAND UNDER FOOTING.
 - MAXIMUM SAND PAD DEPTH NOT TO EXCEED 150% OF MINIMUM PAD DEPTH OR 200mm WITHOUT THE ENGINEER'S APPROVAL.
 - SAND FILL TO BE CLEAN WELL DRAINED, WITH MAX FINES (PARTICLES UP TO 0.075mm) CONTENT OF 5% SAND TO BE COMPACTED TO A MIN 6 BLOWNS/0.00mm FOR 750mm OR DEPTH OF PAD.
 - DRAIN ROOF AND SURFACE WATER AWAY FROM FOUNDATION AREA TO SITE DRAIN. DRAIN TO LOCAL AUTHORITY STORM WATER DRAINAGE SYSTEM WHERE APPROPRIATE.
 - EXCAVATIONS FOR PLUMBING NOT TO UNDERMINE FOOTINGS. IF UNDERMINING IS LIKELY TO OCCUR, CONTACT THE ENGINEER.
 - WHERE PLUMBING PIPES PASS THROUGH FOOTINGS OR SLAB, SPECIFIED TOTAL THICKNESS OF ALL CONCRETE IS ALWAYS TO BE MAINTAINED.
 - REINFORCEMENT SHALL BE IN ACCORDANCE WITH THE FOLLOWING STANDARDS:
SL INDICATES DEFORMED SQUARE MESH D500L TO AS/NZS 4671.
TM SUFFIX INDICATES TRENCH MESH USING DEFORMED BARS D50L TO AS/NZS 4671.
ALL STEELWORK TO BE TREATED IN ACCORDANCE WITH CLAUSE 3.4.4 "CORROSION PROTECTION" OF THE BUILDING CODE OF AUSTRALIA.
 - LAP ALL MESH ONE TRANSVERSE WIRE PLUS 25mm OR TO MANUFACTURERS SPECIFICATIONS.
 - IF THE LENGTH TO WIDTH RATIO OF THE GROUND SLAB OR ANY PART OF THE GROUND SLAB EXCEEDS 3:1, REFER BACK TO THIS OFFICE FOR MESH SIZE. IF THE LENGTH TO WIDTH RATIO IS LESS THAN 3:1, USE THE FOLLOWING:
USE SL 53 MESH FOR SLAB SPAN UP TO 22m.
USE SL 62 MESH FOR SLAB SPAN UP TO 26m.
USE SL 72 MESH FOR SLAB SPAN UP TO 32m.
CONCRETE TO CONFORM WITH AS 3600.
BLENDED CEMENT TO CONFORM WITH AS 3972.
 - ALL CONCRETE TO BE N20/20/100.
 - CURE SLAB BY KEEPING MOIST (OR EQUIVALENT METHOD), FOR 3 DAYS TO IMPROVE CRACK CONTROL.
 - PLACE SLAB THICKENINGS (300 WIDE x 250 DEEP) IN A CONTINUOUS GRID PATTERN (60mm MAX SPACING EACH WAY) ON CLASS M SITES WITH LESS THAN 80mm OF SAND FILL ON THEM.
 - BUILDER TO ENSURE THAT QUANTIES BE INFORMED, OF NECESSITY TO MAINTAIN DRAINS IN GOOD WORKING ORDER AT ALL TIMES.
 - THIS DESIGN SHOULD BE REFERRED BACK TO THIS OFFICE FOR CONSIDERATION, AS IT IS NOT THE INTENTION OF THESE DESIGNS FOR SUCH FINISHES.
 - PERFORATING THE VAPOUR BARRIER (VPM) USING LEVELLING PINS ON FREE DRAINING SAND PADS WILL STILL ENABLE THE BARRIER TO MEET THE PERFORMANCE PROVISIONS OF THE BUILDING CODE OF AUSTRALIA.
 - REFER BACK TO THE ENGINEER IF AGGRESSIVE SOILS ARE ENCOUNTERED (IN ACCORDANCE WITH AS 2870).

THE APPROVED SIGNATURE ON THIS FOOTING AND SLAB DETAIL ENDORSES ITS USE FOR SINGLE STOREY BUILDINGS ON CLASS M OR S SITES.

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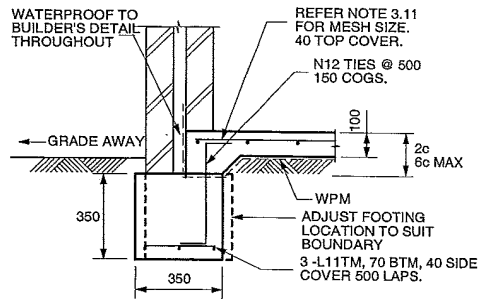
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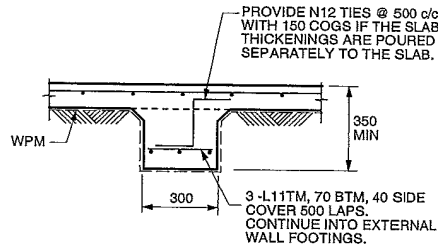
DATE LAST MODIFIED: 17/02/12

F2

- Site Classification
- Single or double story construction
- Construction type
- Surface movement
- Sand pad requirements
- Underlying ground conditions

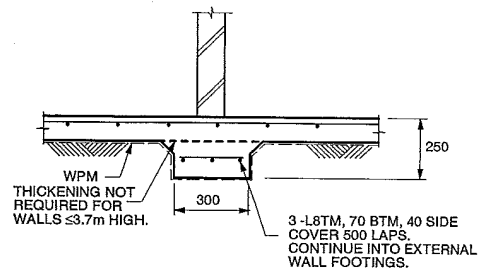


EXTERNAL WALLS

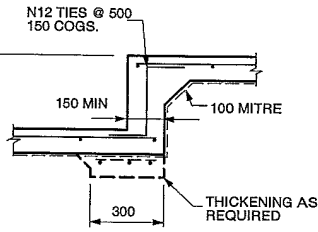


INTERNAL THICKENINGS

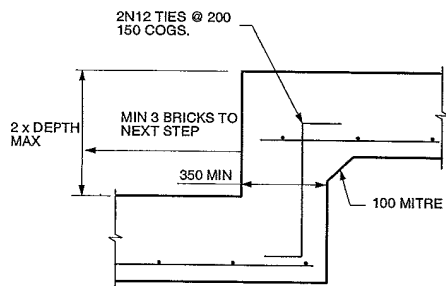
PLACE THICKENINGS IN A CONTINUOUS GRID PATTERN (4.5m MAX CRS EACH WAY EXCEPT FIRST THICKENING IN FROM AN EXTERNAL WALL TO BE 4.0m).



SLAB THICKENINGS



SLAB STEP



CLASS M SITES

THE APPROVED SIGNATURE ON THIS DETAIL ENDORSES ITS USE FOR SINGLE STOREY BUILDINGS ON CLASS M SITES.

FOOTING STEP

M1

NOTE: THESE FOOTING DETAILS ARE TO BE READ IN CONJUNCTION WITH THE CLASS M SITE NOTES.



PROJECT: LOT XX

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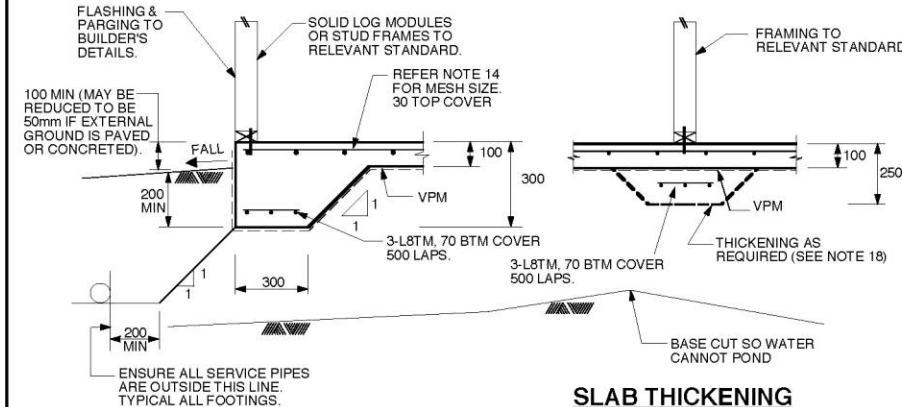
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FOOTING DETAILS

M Class sites

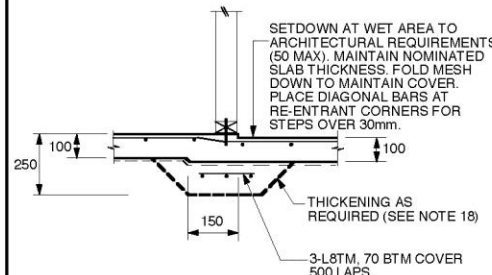
M1 is for masonry on 800mm of sand
F2 on is for 400mm of sand



SLAB THICKENING EXTERNAL WALL

SLAB THICKENING INTERNAL WALL

- NOTES:**
- PRIOR TO CUTTING BASE, REMOVE ALL VEGETATION, TOPSOIL AND BELIEVED UNSUITABLE MATERIAL.
 - CUT BASE TO BE INSPECTED BY THE ENGINEER PRIOR TO SAND FILLING. (SLOPE DRAIN LOCATION IF REQUIRED) WILL BE ESTABLISHED AT THIS STAGE (REFER SEPARATE DETAIL).
 - ANY PREDOMINANT ROCK IN HOUSE PAD AREA TO BE INSPECTED BY THE ENGINEER.
 - PRIOR TO PLACING SAND FILL, ENSURE PREPARED BASE IS DRY.
 - COMPACT THE GROUND TO 99% STANDARD MAXIMUM DRY DENSITY RATIO IN ACCORDANCE WITH AS3799 - 2007, TABLE 5.1
 - PROVIDE A SAND PAD TO ENSURE A MIN OF 200mm OF SAND UNDER FOOTINGS.
 - MAXIMUM SAND PAD DEPTH NOT TO EXCEED 150% OF MINIMUM PAD DEPTH (2000mm) WITHOUT THE ENGINEER'S APPROVAL.
 - SAND FILL TO BE CLEAN WELL DRAINED, WITH MAX FINES (PARTICLES UP TO 0.075mm) CONTENT OF 5%. SAND TO BE COMPACTED TO A MIN 5 BLOWS/900mm FOR 750mm OR DEPTH OF PAD.
 - DRAIN ROOF AND SURFACE WATER AWAY FROM FOUNDATION AREA TO SITE DRAIN (OR MIN TO LOCAL AUTHORITY) STORM WATER DRAINAGE SYSTEM WHERE APPROPRIATE).
 - EXCAVATIONS FOR PLUMBING NOT TO UNDERMINE FOOTINGS. IF UNDERMINING LIKELY TO OCCUR, CONTACT THE ENGINEER.
 - WHERE PLUMBING PIPES PASS THROUGH FOOTINGS OR SLAB, SPECIFIED TOTAL THICKNESS OF ALL CONCRETE IS ALWAYS TO BE MAINTAINED.
 - REINFORCEMENT SHALL BE IN ACCORDANCE WITH THE FOLLOWING STANDARDS:
SL - INDICATES DEFORMED SQUARE MESH D50L TO AS/NZS 4671
SL - INDICATES TRENCH MESH USING DEFORMED BARS D50L TO AS/NZS 4671
 - ALL STEELWORK TO BE TREATED IN ACCORDANCE WITH CLAUSE 9.4.4 "CORROSION PROTECTION" OF THE BUILDING CODE OF AUSTRALIA.
 - LAP ALL MESH ONE TRANSVERSE WIRE PLUS 25mm OR TO MANUFACTURER'S SPECIFICATIONS.
 - IF THE LENGTH TO WIDTH RATIO OF THE GROUND SLAB OR ANY PART OF THE GROUND SLAB EXCEEDS 1:1 REFER BACK TO THIS OFFICE FOR MESH SIZE. IF THE LENGTH TO WIDTH RATIO IS LESS THAN 1:3 USE THE FOLLOWING:
USE SL2 MESH FOR SLAB SPAN UP TO 2.0m
USE SL2 MESH FOR SLAB SPAN UP TO 3.0m
USE SL2 MESH FOR SLAB SPAN UP TO 4.0m
USE SL2 MESH FOR SLAB SPAN UP TO 5.0m
 - CONCRETE TO CONFORM WITH AS 3600.
 - BLENDED CEMENT TO CONFORM WITH AS 3972.
 - ALL CONCRETE TO BE NEGOTIATED.
 - CURE SLAB BY KEEPING MOIST (OR EQUIVALENT METHOD), FOR 3 DAYS TO IMPROVE CRACK CONTROL.
 - PLACE SLAB THICKENINGS 300 WIDE x 250 DEEP IN A CONTINUOUS GRID PATTERN (600 MAX SPACING EACH WAY) ON CLASS 'M' SITES WITH LESS THAN 800mm OF SAND FILL ON THEM.
 - BUILDER TO ENSURE THAT CLIENT BE INFORMED OF NECESSITY TO MAINTAIN GRASS IN GOOD WORKING ORDER AT ALL TIMES.
 - BUILDER TO ADVISE CLIENT TO CONSULT AN ENGINEER BEFORE PLANTING TREES OR SHRUBS WITHIN 2.5m, OR A DISTANCE EQUAL TO THE ANTICIPATED MAXIMUM HEIGHT OF THE TREE, OF THE BUILDING (WHICHEVER IS LEAST).
 - THIS IS A PERFORMANCE-BASED DESIGN.
 - A BRICK COURSE, AS REFERRED TO IN THIS DOCUMENT IS STANDARD 90mm HIGH.
 - REFER TO CERTIFICATE OF INSPECTION FOR SAND PAD REQUIREMENTS.
 - IF POLISHED (OR HOLLOW) CONCRETE FINISHES ARE DESIRED, THIS DESIGN SHOULD BE REFERRED BACK TO THIS OFFICE FOR CONSIDERATION, AS IT IS NOT THE INTENTION OF THESE DESIGNS FOR SUCH FINISHES.
 - PIERCING THE VAPOUR BARRIER (VPM) USING LEVELLING RINGS OR FREE DRAINING SAND PADS WILL STILL ENABLE THE BARRIER TO MEET THE PERFORMANCE PROVISIONS OF THE BUILDING CODE OF AUSTRALIA.
 - REFER BACK TO THE ENGINEER IF AGGRESSIVE SOILS ARE ENCOUNTERED IN ACCORDANCE WITH AS29870.



WET AREA STEP

THE APPROVED SIGNATURE ON THIS FOOTING AND SLAB DETAIL ENDORSES ITS USE FOR SINGLE STOREY BUILDINGS ON CLASS M OR S SITES.

DATE LAST MODIFIED: 17/02/12



PROJECT: XX

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F2

Fill and retaining above natural ground

Major arterial



Canyon Road



Views are great



Trades

- ▶ As our trade resource depletes for masonry construction it leaves us in a real quandary longer term.
- ▶ There is a supposed issue for trades for this methodology but it is more our ability to guide the trade resource down this path
- ▶ Thompsons in the short term have bought carpenters in from Queensland but in the longer term they will be training carpenters here.

Sustainability

- ▶ Less fill if any
- ▶ Reduced or eliminated retaining
- ▶ Less concrete
- ▶ Less construction waste clean sites
- ▶ Recyclable materials with less embodied energy.
- ▶ Factory built components
- ▶ Better star rating. Operates like an esky not a heat sink

Economics

- ▶ We are looking at this solution in a constrained view . Not looking at the bigger picture.
- ▶ The savings could be enormous and bring Perth residents a much more affordable housing solution.

Speed of construction savings for the builder + speed saving buyers on holding, rent and mortgage costs + engineering savings + civil work savings + house running cost savings+ additional floor area bonus + how much?

BONUS: Thompsons evidence is that it is less expensive construct.