

STATE OF ARIZONA

DEPARTMENT OF FIRE, BUILDING AND LIFE SAFETY

THE OFFICE OF MANUFACTURED HOUSING

MINIMUM STANDARDS FOR MANUFACTURED HOUSING FOUNDATIONS IN FLOODPLAINS

GENERAL COMMENTS

1. THESE STANDARDS ARE CONSIDERED MINIMUM AND THE OWNER/ CONTRACTOR SHALL CHECK WITH THE LOCAL GOVERNMENTAL AGENCY TO SEE IF THEIR STANDARDS ARE MORE RESTRICTIVE AND THE OWNER / CONTRACTOR SHALL USE THE MOST RESTRICTIVE STANDARDS.
2. THESE STANDARDS INCORPORATE FEMA-85, HUD PART II 24 CFR PARTS 3280 AND 3285, PART III 24 CFR PART 3286, 2006 IRC AND STATE OF ARIZONA OMH STANDARDS.
3. THESE STANDARDS MAY NOT MEET FHA,VA AND FmHA REQUIREMENTS FOR LOANS. THE OWNER / CONTRACTOR SHALL CHECK WITH THESE GOVERNMENTAL AGENCIES TO DETERMINE THEIR STANDARDS.
4. THE OWNER / CONTRACTOR SHALL REALIZE THAT IN MANY AREAS OF THE STATE THE DEPTH OF FROST MAY CONTROL THE DEPTH OF FOOTINGS FOR FOUNDATIONS.
5. THE STATE OMH STAFF/ IGA STAFF WILL INSPECT HOMES SET UNDER THESE STANDARDS.
6. THE OWNER / CONTRACTOR SHALL CHECK WITH THE LOCAL GOVERNMENTAL AGENCY TO GET THE NEEDED FLOODPLAIN INFORMATION.
7. FACTORY BUILT HOMES (OFF FRAME) CAN USE SHEET 6 OF 9, 8 OF 9, TABLE A,C AND G FOR THE PERIMETER WALL AND MARRIAGE LINE PIERS.
8. THESE MINIMUM INSTALLATION STANDARDS APPLY FOR INSTALLATIONS WITHIN FLOODPLAINS AT A LOCATION WHICH IS BEYOND THE ANTICIPATED MIGRATORY DISTANCE OF ADJACENT WASHES. IN OTHER WORDS, THESE INSTALLATION STANDARDS DO NOT ADDRESS POSSIBLE LATERAL MIGRATION OF AN ADJACENT WASH TOWARDS AND INTO THE MH FOUNDATION FILL PAD.



**THIS DOCUMENT
APPROVED
STATE OF ARIZONA**

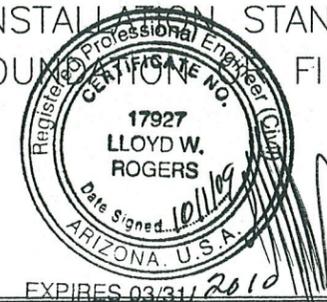
Approval does not imply compliance with the requirements of the State Fire Marshal or local codes and ordinances governing zoning, fire zones, fire separation, site development requirements.

Date 10-14-09 By BR

Approval No. F-LD 00 SUP

Sheet 1 of 10

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CONSTRUCTION NOTES

1. WHEN THE HOME IS SET ON A FILL PAD WHICH HAS BEEN CONSTRUCTED AT OR ABOVE THE BASE FLOOD ELEVATION, VINYL (i.e, BREAK-AWAY) OR OTHER APPROVED SKIRTING MAY BE USED AROUND THE HOME.
2. FILL PAD SHALL BE CONSTRUCTED TO FEMA-85, HUD, 2006IRC AND OMH STANDARDS.
3. WHEN A FILL PAD IS CONSTRUCTED AT OR ABOVE THE BASE FLOOD ELEVATION THE STANDARD PRECAST CONCRETE 16"X16"X3.5" FOOTINGS CAN BE SET ON THE FILL PAD.
4. HOME EQUIPMENT NORMALLY SET OUTSIDE OF THE HOME AT GROUND LEVEL MUST BE ELEVATED ABOVE RFE ON A STAND MADE OF TREATED LUMBER, STEEL OR BLOCK.
5. WHEN HOMES ARE ON PIERS BUILT IN ACORDANCE WITH THESE STANDARDS, THE HOME MUST BE TIED DOWN WITH GROUND ANCHORS OR OTHER APPROVED ANCHORING SYSTEMS FOR GROUND ANCHORING. THERE MUST BE 6 TIE DOWNS ALONG THE LONG SIDES(HOMES UNDER 50'), 7 TIE DOWNS ALONG THE LONG SIDES(HOMES 52' TO 65') AND 8 TIE DOWNS ALONG THE LONG SIDES(HOMES OVER 66'). LONGITUDINAL BRACING PER THE HOME MANUFACTURER OR Xi2, LLB SYSTEMS PER THE MANUFACTURERS RECOMMENDATIONS ON BOTH ENDS FOR LONGITUDINAL BRACING.
6. RIBBON FOOTINGS MAY BE USED INSTEAD OF THE STANDARD 16"X16"X3.5" PRECAST CONCRETE FOOTINGS.
7. FLOOD VENTS SHALL PROVIDE 1 SQ. IN. OF VENT OPENING FOR EVERY 1 SQ. FT. OF FLOOR AREA. BOTTOM OF VENTS SHALL BE WITHIN 12" OF GROUND LEVEL WITH 1/4"x1/4" GALV. WIRE MESH, AND SHALL BE INSTALLED ON AT LEAST TWO WALLS.(REFER TO FEMA TECHNICAL BULLETN 1-08 FOR MORE GUIDANCE)
8. WHEN HOMES ARE ON STEM WALL FOUNDATIONS, IF THE OWNER/CONTRACTOR USES TIE DOWNS OTHER THAN THE SIMPSON PA STRAPS SHOWN ON THE PLANS THEY SHALL SHOW THE INSPECTOR THAT WHAT THEY ARE USING MEETS OR EXCEEDS THE SIMPSON PA STRAPS.
9. NATURAL GRADE MEANS THE GROUND SURFACE PRIOR TO DISTURBANCE(i.e., GRADING ACTIVITY, PLACEMENT OF FILL PAD) BY MAN.
10. HIGHEST ADJACENT NATURAL GRADE MEANS THE HIGHEST NATURAL GRADE MEASURED BELOW THE FOOTPRINT OF THE HOME.
11. FINISHED GRADE MEANS THE GROUND SURFACE WHICH RESULTS AFTER GRADING ACTIVIES(PLACEMENT AND COMPACTION OF FILL, EXCAVATING OF DRAINAGE SWALES).

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REFER TO SHEET #1**

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ABBREVIATIONS

1. BFE— BASE FLOOD ELEVATION; AKA 100 YEAR FLOOD ELEVATION, ASK YOUR LOCAL JURISDICTION HAVING FLOODPLAIN AUTHORITY.
2. RFE— REGULATORY FLOOD ELEVATION; ASK YOUR LOCAL JURISDICTION HAVING FLOODPLAIN AUTHORITY..
3. TYP— TYPICAL
4. L— LENGTH
5. W— WIDTH
6. MIN.— MINIMUM
7. MAX.— MAXIMUM
8. D50— THE DIAMETER OF RIP-RAP STONES FOR WHICH 50% OF IS SMALLER.
9. LLB— A PROPRIETARY PRODUCT TO BE USED FOR LONGITUDINAL BRACING UNDER A MANUFACTURED HOME.
10. Xi2— A PROPRIETARY PRODUCT TO BE USED FOR LONGITUDINAL BRACING UNDER A MANUFACTURED HOME.
11. IGA— INTER GOVERNMENTAL AGREEMENT.
12. FHA— FEDERAL HOUSING AUTHORITY.
13. VA— VETERANS AFFAIRS.
14. FmHA.— FARMERS HOME ADMINISTRATION.
15. U/S.— UPSTREAM.
16. D/S— DOWNSTREAM.
17. MH.— MANUFACTURED HOME.
18. W/I— WITHIN.

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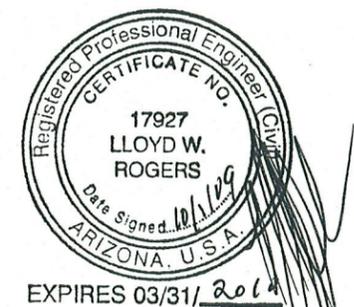


TABLE "A" STEM WALL FOOTING DEPTH FOR INSTALLATION IN FLOODPLAIN UP TO BFE OF 0.5 FT.

GROUND SLOPE ft./ft.	LESS THAN-0.014	0.014-0.04	0.04-0.06	0.06-0.07	OVER 0.07
FOOTING DEPTH-WITHIN 10 FT. EACH DIRECTION OF EACH U/S CORNER.	24"	30"	36"	36"	ENGINEER DESIGN
FOOTING DEPTH-REMAINDER OF STEM WALL	18"	18"	18"	24"	ENGINEER DESIGN

TABLE "B" I-BEAM PIER FOOTING THICKNESS FOR INSTALLATION IN FLOODPLAIN UP TO BFE OF 0.5 FT.

GROUND SLOPE ft./ft.	LESS THAN-0.011	0.011-0.022	0.022-0.047	0.047-0.07	OVER 0.07
FOOTING THICKNESS-	6"	8"	10"	12"	ENGINEER DESIGN

TABLE "C" STEM WALL FOOTING DEPTH FOR INSTALLATION IN FLOODPLAIN BFE 0.5 FT TO 1.0 FT.

GROUND SLOPE ft./ft.	LESS THAN-0.004	0.004-0.008	0.008-0.022	0.022-0.026	OVER 0.026
FOOTING DEPTH-WITHIN 10 FT. EACH DIRECTION OF EACH U/S CORNER.	42"	48"	54"	54"	ENGINEER DESIGN
FOOTING DEPTH-REMAINDER OF STEM WALL	18"	18"	18"	24"	ENGINEER DESIGN

TABLE "D" I-BEAM PIER FOOTING THICKNESS FOR INSTALLATION IN FLOODPLAIN BFE 0.5 FT TO 1.0 FT.

GROUND SLOPE ft./ft.	LESS THAN-0.01	0.011-0.02	0.021-0.026	OVER 0.026
FOOTING THICKNESS-	6"	8"	10"	ENGINEER DESIGN

TABLE "E" PIER FOOTING DEPTH FOR INSTALLATION IN FLOODPLAIN UP TO BFE 0.5 FT.

GROUND SLOPE ft./ft.	LESS THAN-0.008	0.008-0.038	0.038-0.07	OVER 0.07
FOOTING DEPTH-	18"	24"	30"	ENGINEER DESIGN

TABLE "F" PIER FOOTING DEPTH FOR INSTALLATION IN FLOODPLAIN BFE 0.5 FT TO 1.0 FT.

GROUND SLOPE ft./ft.	LESS THAN-0.01	0.01-0.025	0.025-0.047	0.047-0.07	OVER 0.07
FOOTING DEPTH-	30"	36"	42"	48"	ENGINEER DESIGN

NOTE:
FOOTING AND CUTOFF WALL DEPTHS ARE MEASURED FROM NATURAL (UNDISTURBED) GRADE DOWN TO THE BOTTOM OF THE FOOTER OR CUTOFF WALL.

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MH FOUNDATIONS, OR FILL PAD EROSION PROTECTION, FOR INSTALLATIONS WITHIN FLOODPLAINS WITH A BASE FLOOD ELEVATION DEPTH GREATER THAN 1.0 FOOT SHALL BE DESIGNED BY AN ARIZONA-REGISTERED CIVIL ENGINEER, AND APPROVED BY ALL APPROPRIATE LOCAL GOVERNMENTAL AGENCIES AND BY THE OMH.

revised 9/22/09

TABLE "G" MARRIAGE LINE FOOTING DIMENSIONS FOR INSTALLATION IN FLOODPLAIN UP TO BFE 1.0 FT.

MARRIAGE LINE LOADING LBS.	SOIL LOADING PSI			
	1000	2000	3000	4000
2000	1.5'X1.5'X4"	1.33'X1.33'X4"	1.33'X1.33'X4"	1.33'X1.33'X4"
3000	1.75'X1.75'X6"	1.33'X1.33'X4"	1.33'X1.33'X4"	1.33'X1.33'X4"
4000	2'X2'X6"	1.5'X1.5'X4"	1.33'X1.33'X4"	1.33'X1.33'X4"
5000	2.25'X2.25'X8"	1.75'X1.75'X6"	1.33'X1.33'X4"	1.33'X1.33'X4"
6000	2.5'X2.5'X8"	1.75'X1.75'X6"	1.5'X1.5'X4"	1.33'X1.33'X4"
7000	2.75'X2.75'X8"	2'X2'X6"	1.75'X1.75'X6"	1.33'X1.33'X4"
8000	3'X3'X10"	2'X2'X6"	1.75'X1.75'X6"	1.5'X1.5'X4"
9000	3'X3'X10"	2.25'X2.25'X8"	1.75'X1.75'X6"	1.5'X1.5'X4"

FOOTNOTE 1- IF THE THICKNESS IN THIS TABLE IS SMALLER THAN IN TABLE B OR D THEN USE THE LARGER.
FOOTNOTE 2- FOOTINGS SHALL HAVE 3-#4 REBAR BOTH DIRECTIONS

TABLES "H"&"I" ARE FOR PADS WHERE THE LONG DIMENSION OF THE HOME IS PARALLEL TO FLOOD FLOW AND UP TO A 32 FOOT DOUBLE WIDE HOME.

TABLE "H" FILL PAD THICKNESS AND EROSION PROTECTION IN FLOODPLAIN UP TO BFE 0.5 FT

	GROUND SLOPE ft./ft.	LESS THAN-0.012	0.012-0.026	OVER 0.026
U/S END & 10 FOOT FROM U/S CORNERS	PAD THICKNESS TOE DOWN DEPTH RIP-RAP SIZING	12" 2.0' D50=6"	12" 2.0' D50=6"	ENGINEER DESIGN
REMAINDER OF PAD	PAD THICKNESS TOE DOWN DEPTH RIP-RAP SIZING	NONE REQUIRED NONE REQUIRED	12" 2.0' D50=6"	ENGINEER DESIGN

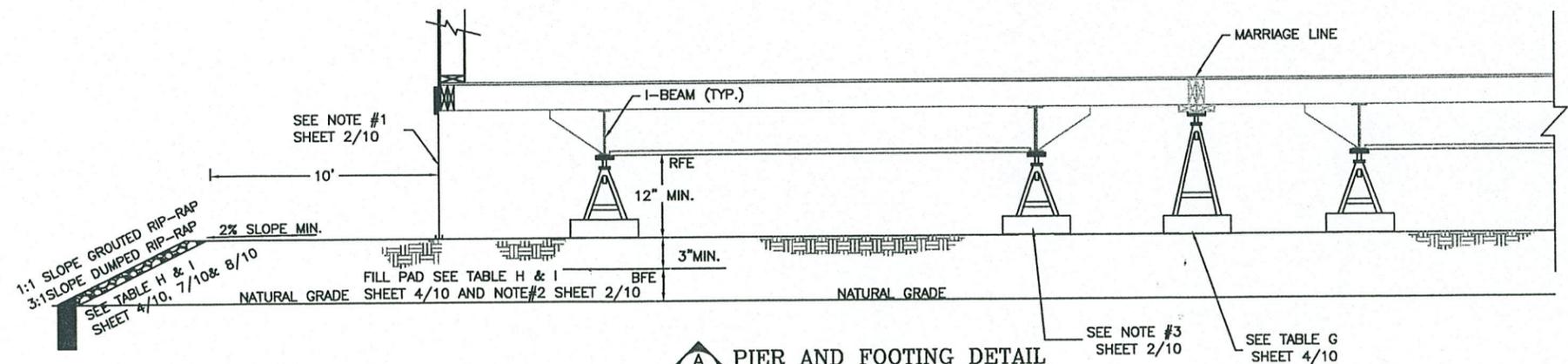
TABLE "I" FILL PAD THICKNESS AND EROSION PROTECTION IN FLOODPLAIN BFE 0.5 FT. TO 1.0 FT.

	GROUND SLOPE ft./ft.	LESS THAN-0.004	0.004-0.012	0.012-0.016	0.016-0.022	OVER 0.022
U/S EDGE & CORNERS	PAD THICKNESS TOE DOWN DEPTH RIP-RAP SIZING	18" 2.0' D50=6"	18" 2.0' D50=6"	18" 3.0' D50=6"	18" 3.0' D50=9"	ENGINEER DESIGN
SIDES, D/S EDGE & CORNERS.	PAD THICKNESS TOE DOWN DEPTH RIP-RAP SIZING	NONE REQUIRED NONE REQUIRED	18" 2.0' D50=6"	18" 2.0' D50=9"	ENGINEER DESIGN	



FOOTINGS AND CUTOFF WALL DEPTHS AND DIMENSIONS IN FLOODPLAIN

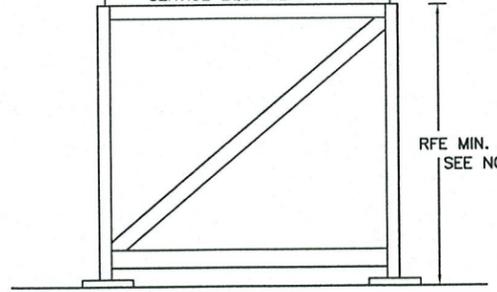
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SHEET 4 OF 10



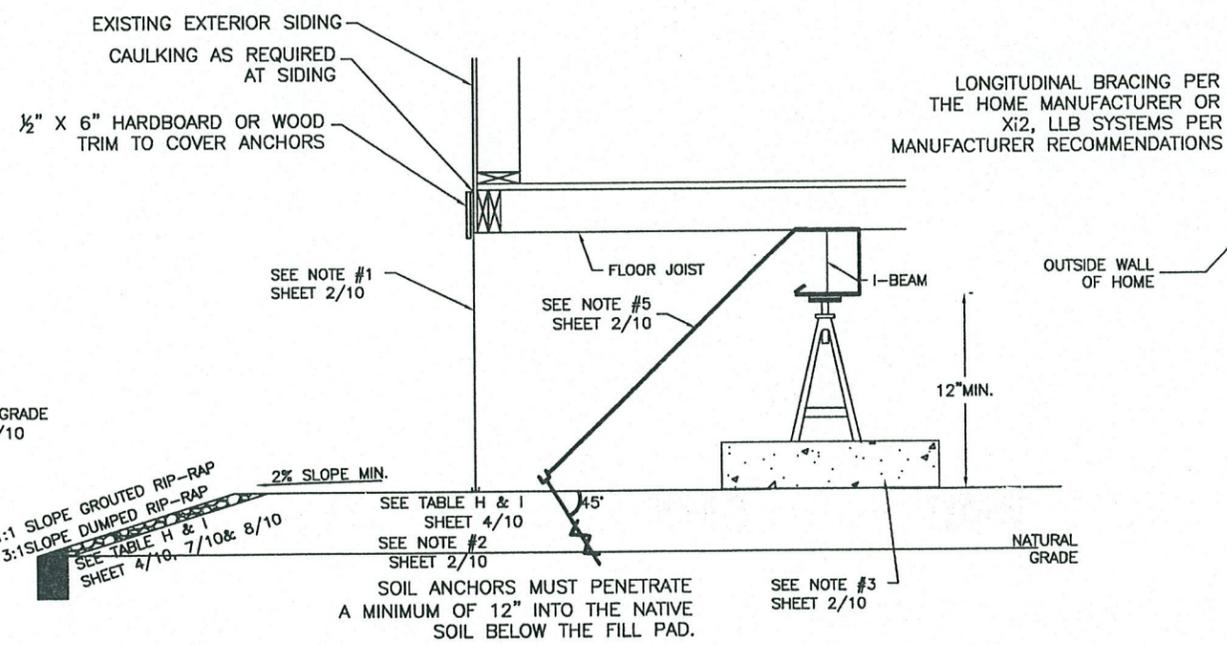
A PIER AND FOOTING DETAIL
NTS

NOTE: FILL PAD EROSION PROTECTION MUST BE INSTALLED ALONG THE ENTIRE PERIMETER OF THE FILL PAD.

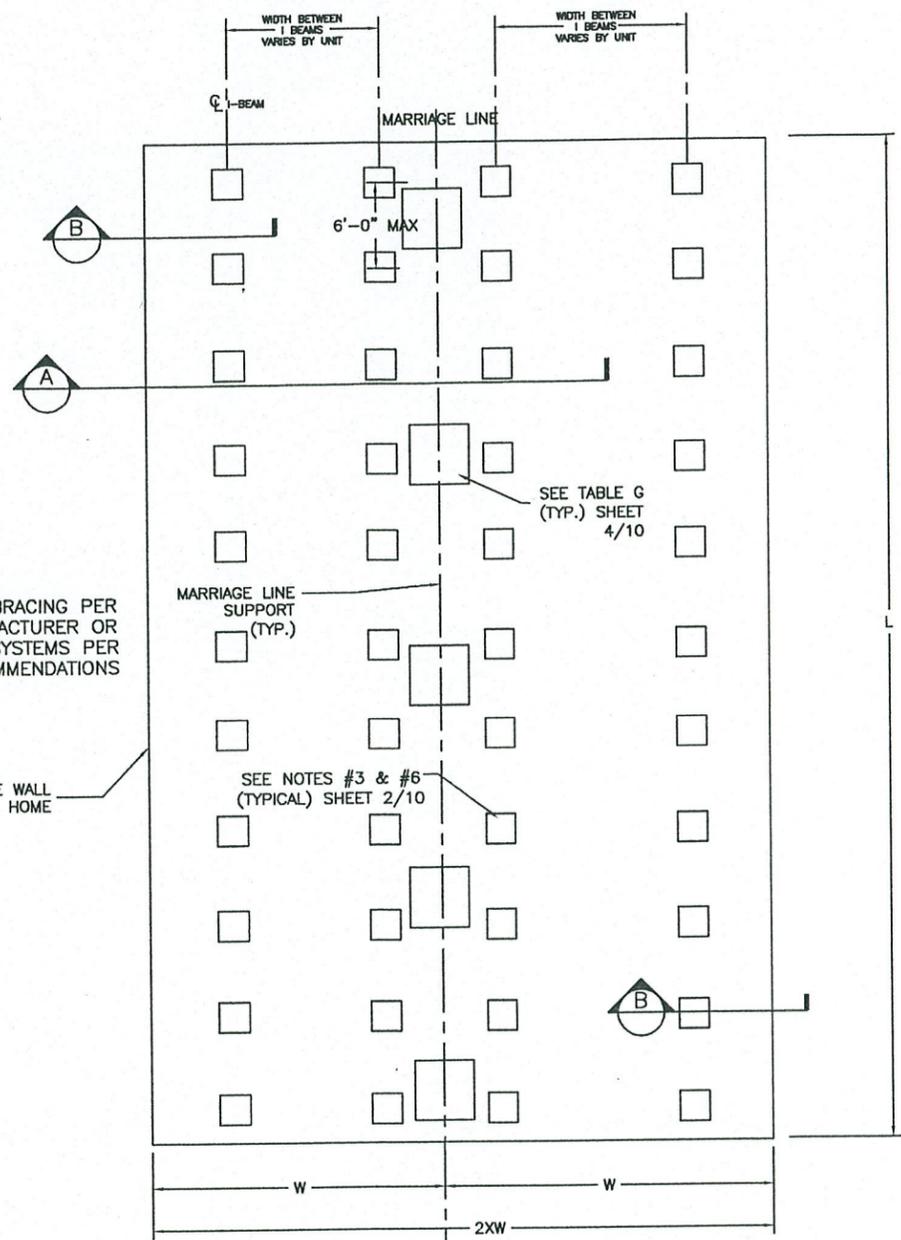
NOTE: STAND TO BE STEEL ANGLE IRON WITH ALL JOINTS WELDED OR TREATED WOOD BOXED AND REINFORCED OR BLOCK. EXACT LOCATION AND CONSTRUCTION OF STAND TO BE BY AC CONTRACTOR.



EXTERIOR HOME EQUIPMENT STAND DETAIL



B PIER AND FOOTING DETAIL
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SEE SHEET 7/10 AND 8/10 FOR DETAILS OF FILL PAD AROUND THE HOME.

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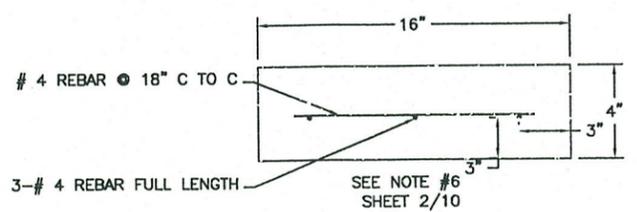
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FLOOD FLOW DIRECTION

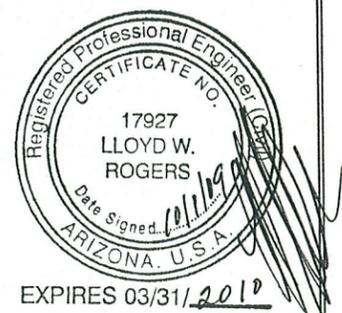
GENERAL FOOTING PLAN

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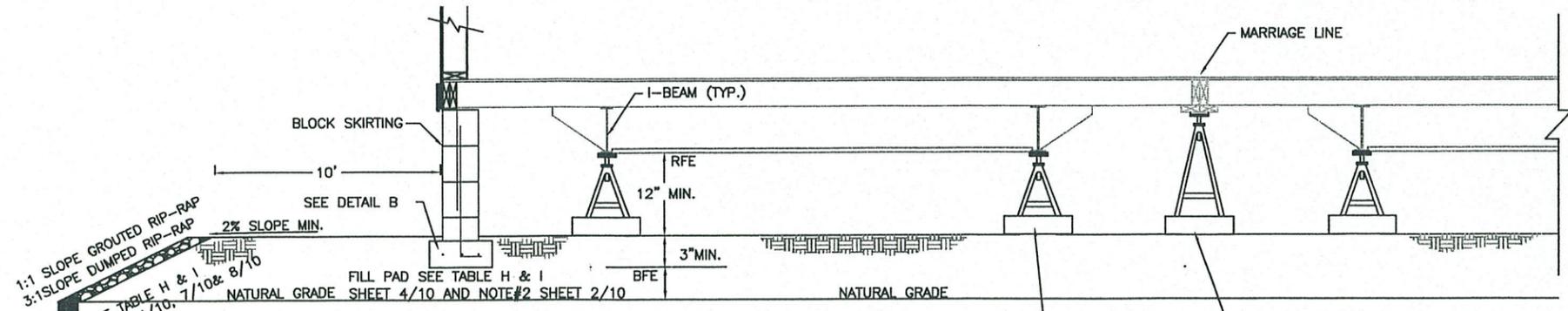


ALTERNATIVE I BEAM RIBBON FOOTING DETAIL
NTS

- A. ALL WORK SHALL CONFORM TO ALL LOCAL, STATE, AND THE 2006 IRC CODE. THE PERMANENT FOUNDATION GUIDE FOR MANUFACTURED HOUSING, HUD- 7584, SEPTEMBER 1996; AND THE STATE OF ARIZONA RULES TITLE 4, CHAPTER 34, ARTICLE 2.
- B. CONCRETE SHALL BE PER ASTM C-94 AND HAVE A 28 DAY STRENGTH OF 3,000 psi. THERE SHALL BE A MINIMUM OF 5 SACKS OF CEMENT PER CUBIC YARD AND CONFORM TO ASTM C-150 TYPE II. THE AGGREGATE PER ASTM C-33. THE SLUMP SHALL NOT BE MORE THAN 4".
- C. REINFORCING STEEL SHALL CONFORM TO ASTM A615, GRADE 60 AND LAP 30 BAR DIAM. REINFORCING SHALL BE CONTINUOUS AROUND ALL CORNERS.
- D. CONTRACTOR SHALL VERIFY ALL SITE CONDITIONS AND DIMENSIONS BEFORE STARTING WORK.
- E. MASONRY BLOCK SHALL CONFORM TO ASTM C-90, TYPE I, GRADE N-1. MORTAR SHALL BE TYPE "S" CONFORMING TO ASTM C-270. GROUT SHALL CONFORM TO ASTM C-476, WITH A 28-DAY STRENGTH OF 2,000psi.
- F. WOOD WITHIN 6" OF GROUND AND SILLS TO CONCRETE OR BLOCK TO BE PRESSURE TREATED TO FOUNDATION GRADE STANDARD FOR USE IN GROUND CONTACT PER REQUIREMENTS OF AMERICAN WOOD PRESERVES BUREAU STANDARD A.W.P.B.- FDN FOR USE IN GROUND CONTACT.
- G. THE FILL PAD ALIGNMENT SHALL BE SUCH THAT THE LONG DIMENSION IS PARALLEL WITH THE FLOW OF THE FLOOD WATER.



PIER INSTALLATION ON EROSION-STABILIZED FILL PAD IN FLOODPLAIN



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REFER TO SHEET #1**

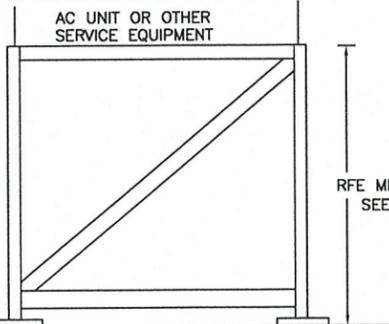
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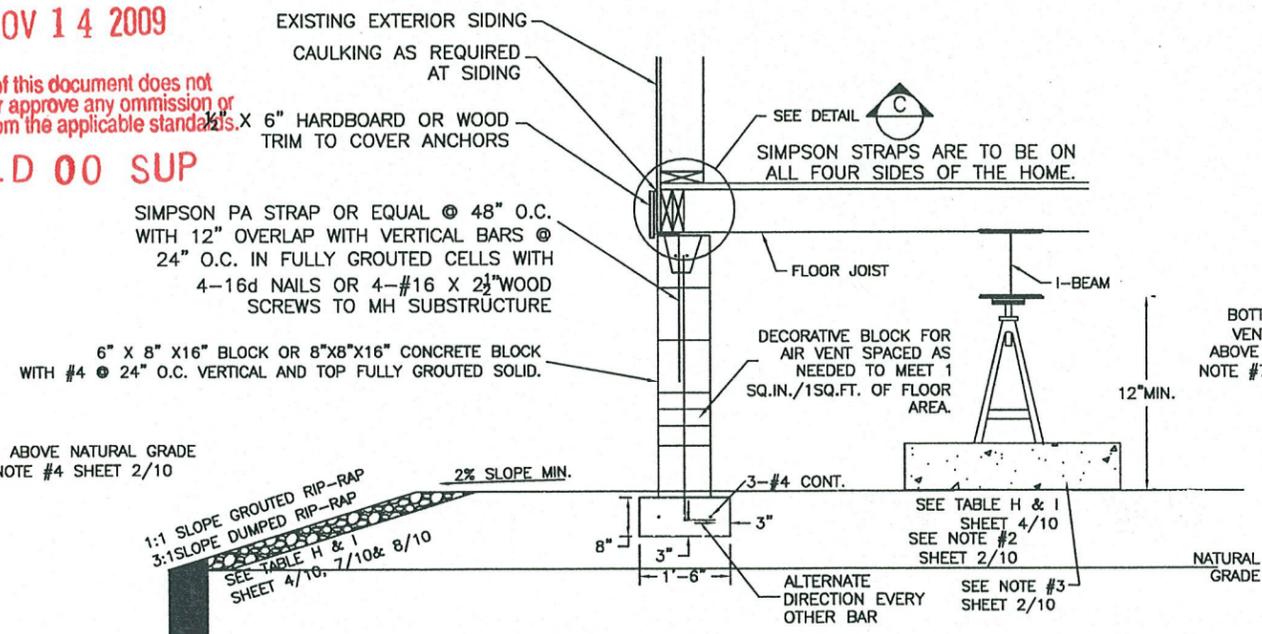
NOTE:
STAND TO BE STEEL ANGLE IRON
WITH ALL JOINTS WELDED OR
TREATED WOOD BOXED AND
REINFORCED OR BLOCK.

EXACT LOCATION AND CONSTRUCTION
OF STAND TO BE BY AC CONTRACTOR.

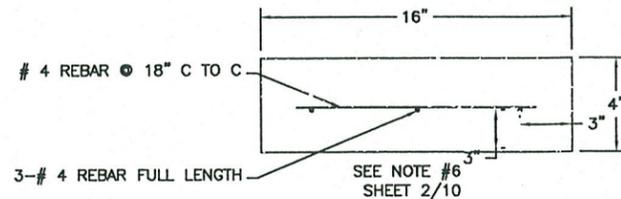


**EXTERIOR HOME
EQUIPMENT STAND DETAIL**

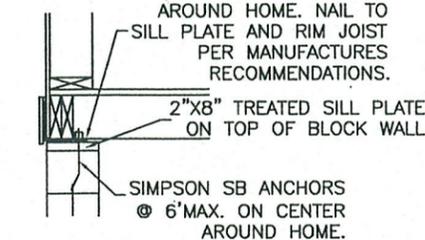
A PIER AND FOOTING DETAIL



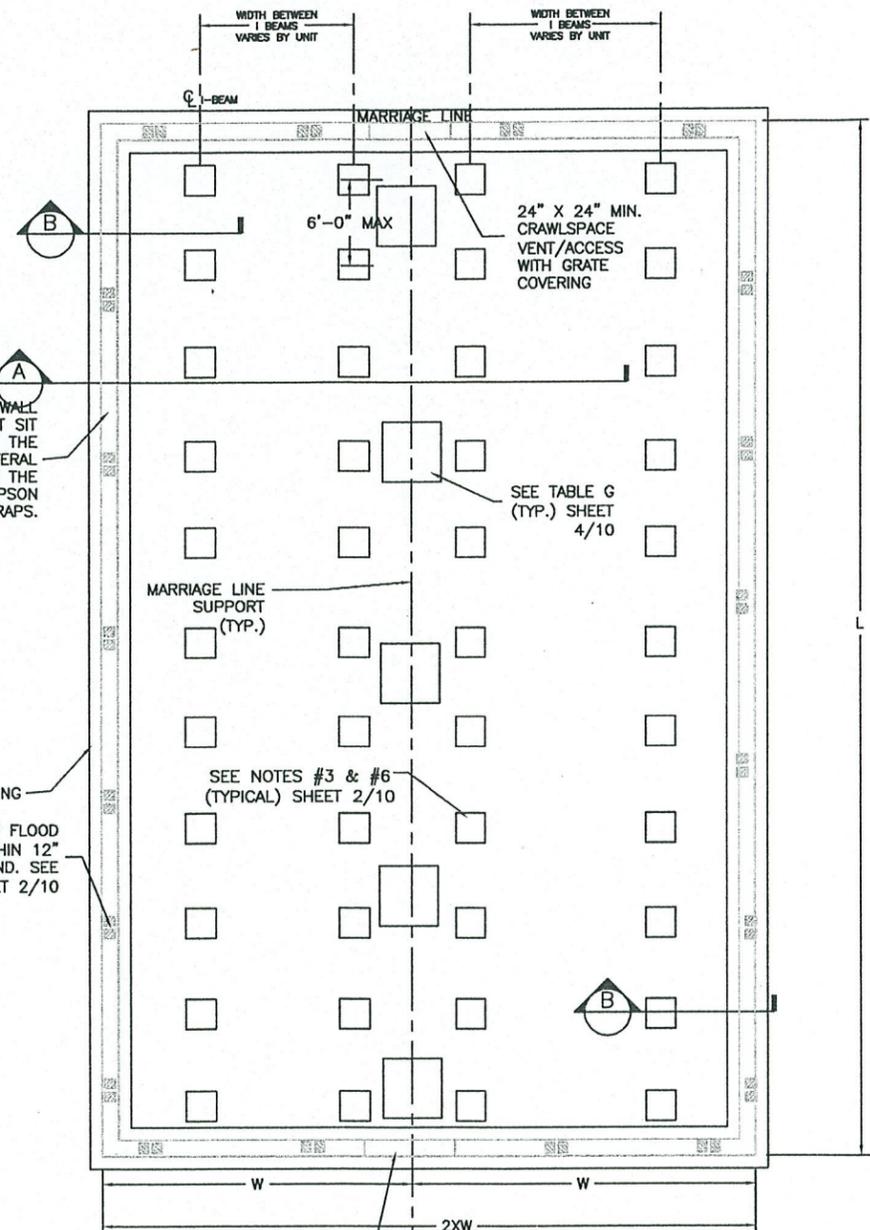
B STEM WALL FOOTING DETAIL



**ALTERNATIVE I BEAM
RIBBON FOOTING DETAIL**



**ALTERNATIVE
WALL AND HOME TIE DOWNS**



24" X 24" MIN.
CRAWLSPACE
VENT/ACCESS
WITH GRATE
COVERING

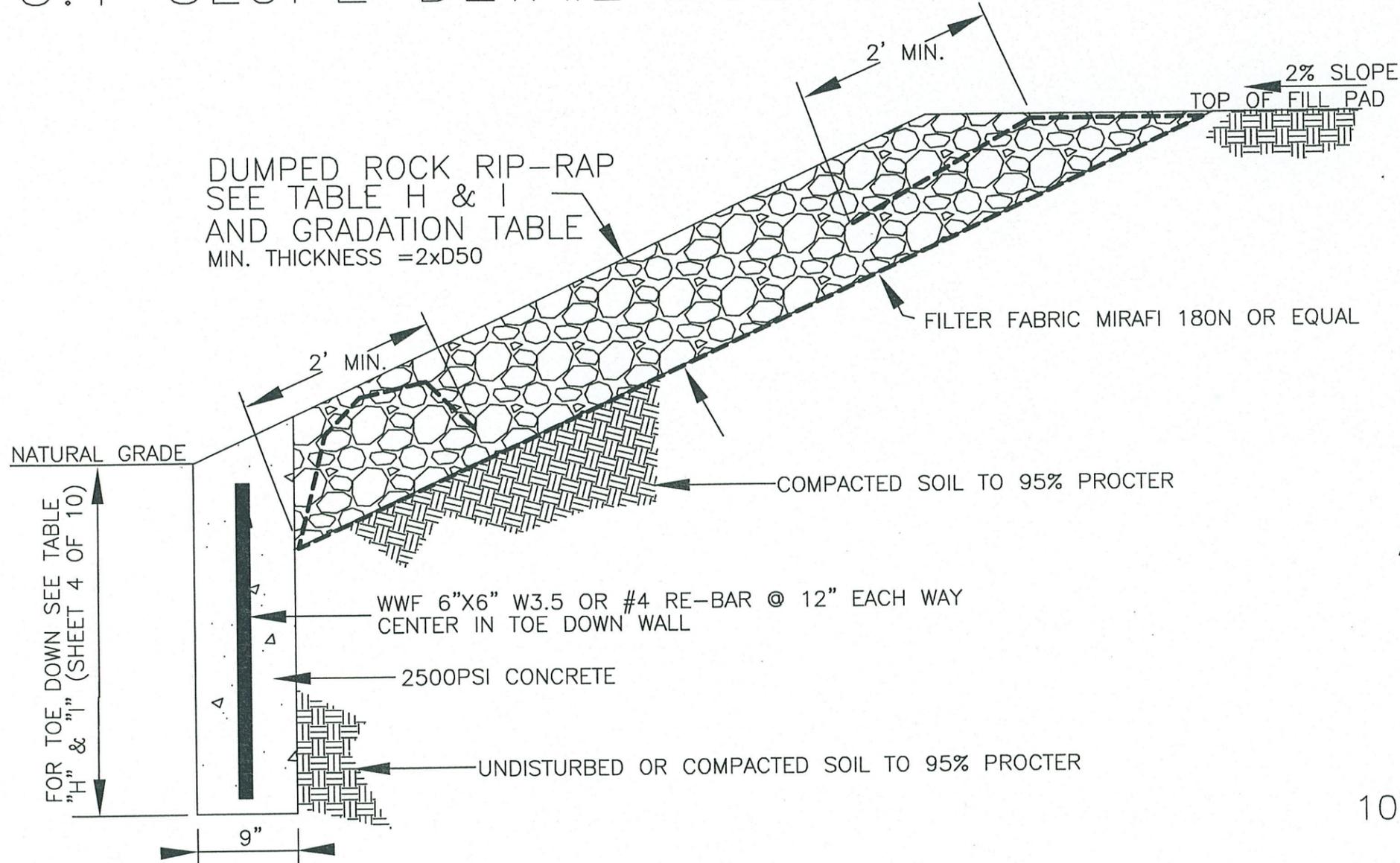
**FLOOD FLOW DIRECTION
GENERAL FOOTING PLAN**

- A. ALL WORK SHALL CONFORM TO ALL LOCAL, STATE, AND THE 2006 IRC CODE. THE PERMANENT FOUNDATION GUIDE FOR MANUFACTURED HOUSING, HUD- 7584, SEPTEMBER 1996; AND THE STATE OF ARIZONA RULES TITLE 4, CHAPTER 34, ARTICLE 2.
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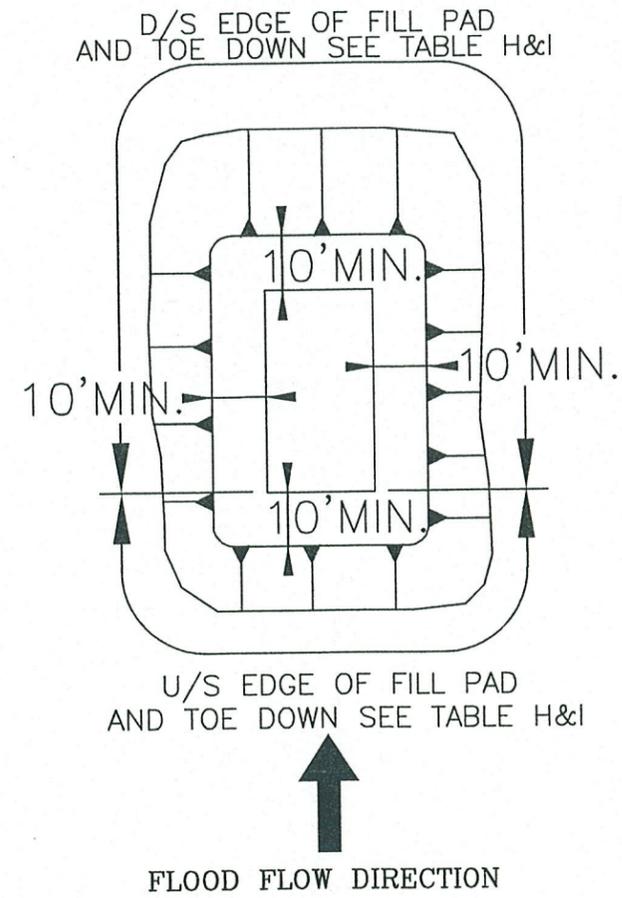
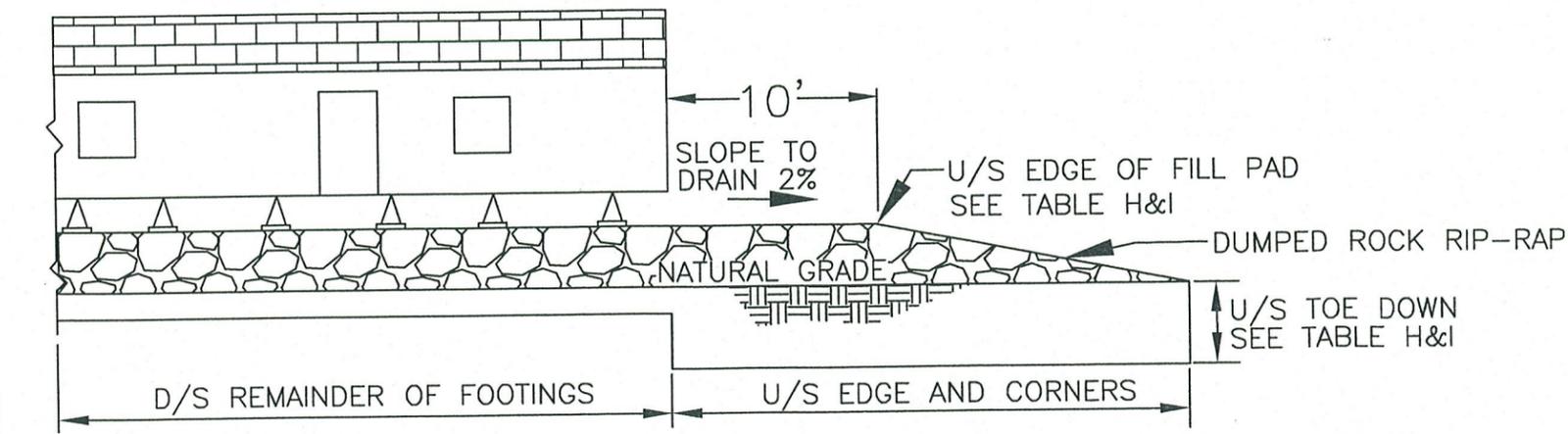
**STEM WALL INSTALLATION ON EROSION-STABILIZED
FILL PAD IN FLOODPLAIN**

3:1 SLOPE DETAIL DUMPED ROCK RIP-RAP



LOOSE ROCK RIP-RAP GRADATION	
% PASSING	SIZE
100-90	2.0 D50
85-70	1.5 D50
50-30	1.0 D50
15-5	0.67 D50
0-5	0.33 D50

HARD ANGULAR ROCK WITH GRADATION AS SHOWN AND SG OF 2.6 MIN.



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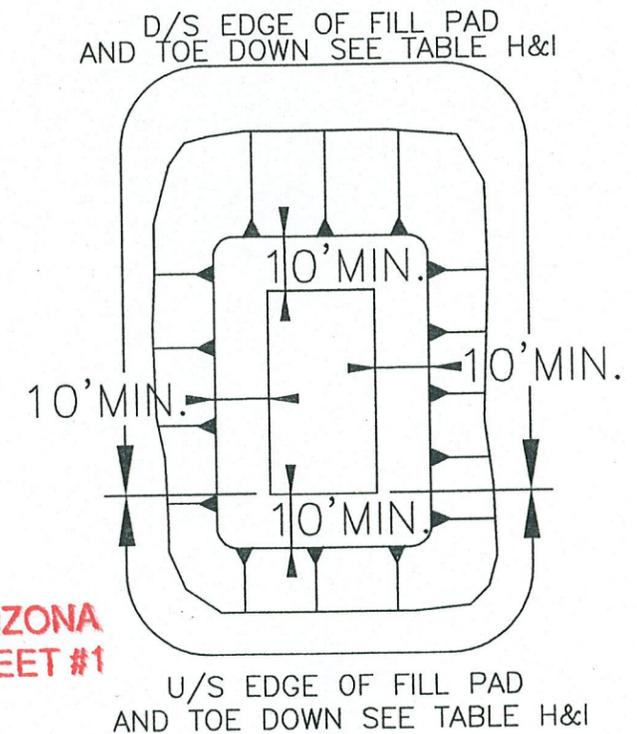
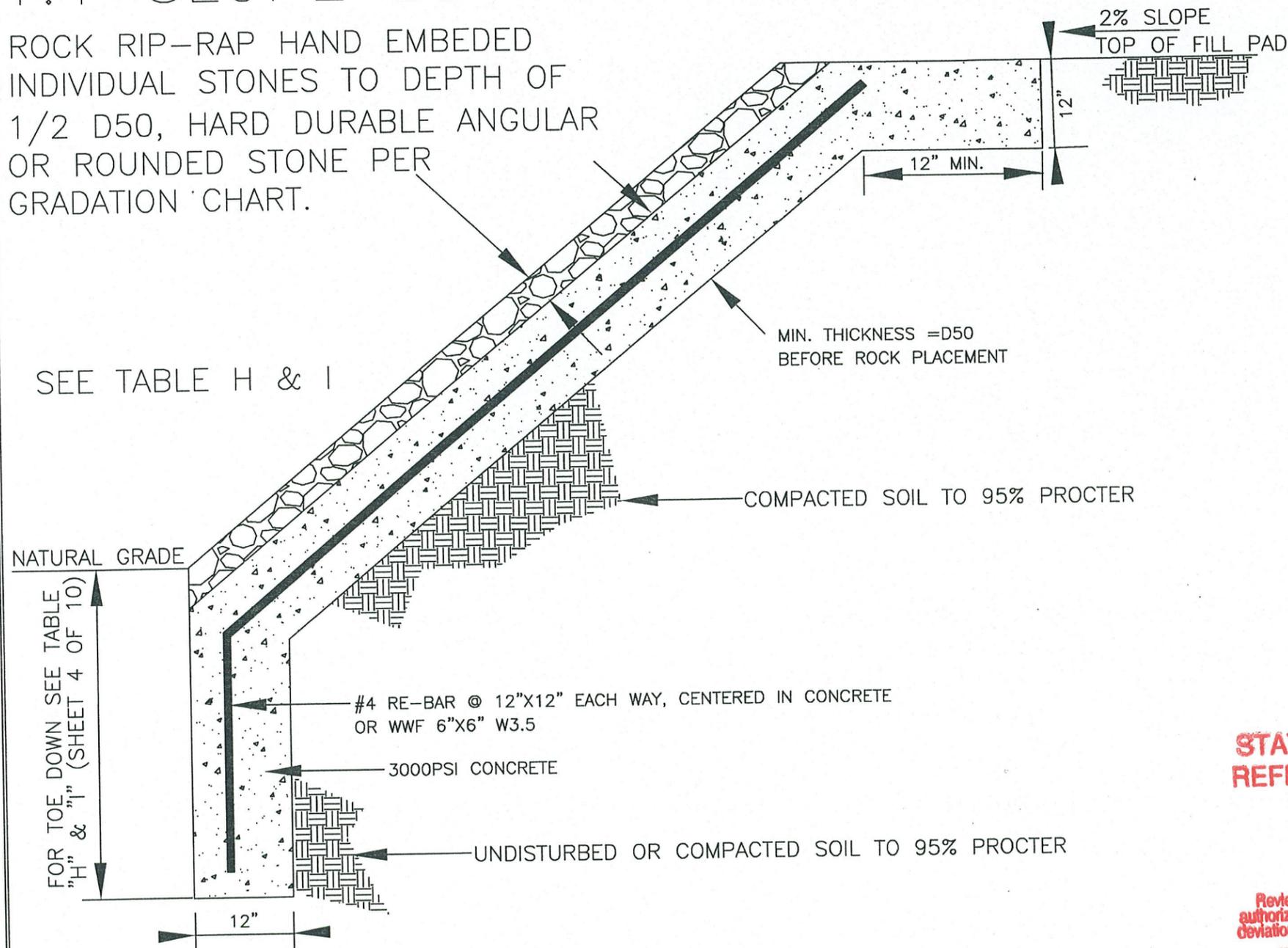
EXPIRES 03/31/2010

DUMPED RIP-RAP EROSION STABILIZATION OF FILL PAD IN FLOODPLAIN

1:1 SLOPE DETAIL GROUTED ROCK RIP-RAP

ROCK RIP-RAP HAND EMBEDDED INDIVIDUAL STONES TO DEPTH OF 1/2 D50, HARD DURABLE ANGULAR OR ROUNDED STONE PER GRADATION CHART.

GROUTED ROCK RIP-RAP GRADATION	
% PASSING	SIZE
100	1.5 D50
0	0.67 D50

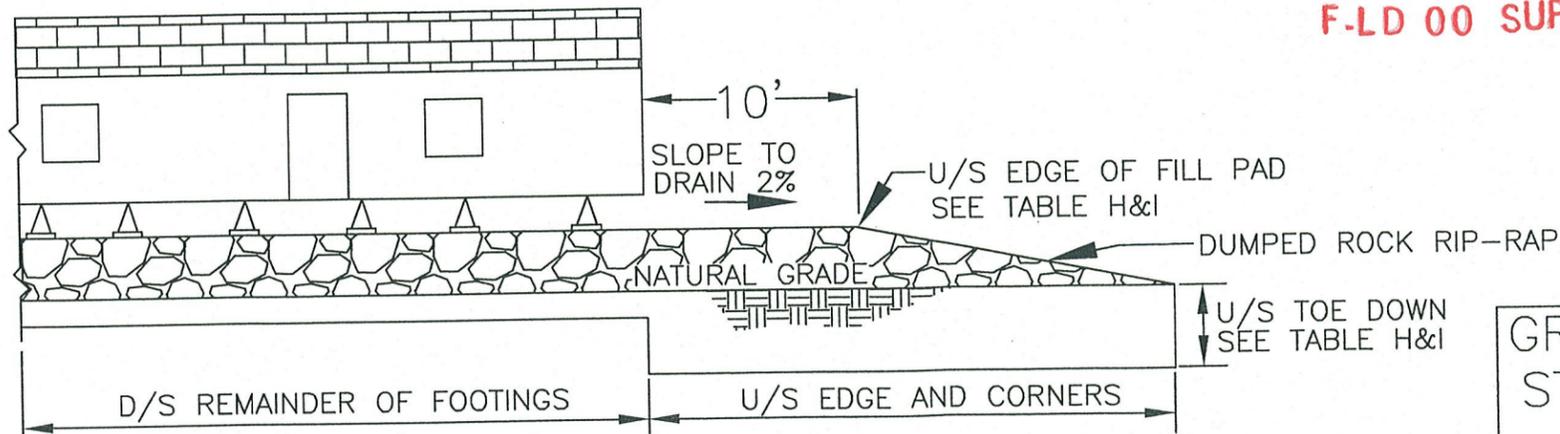


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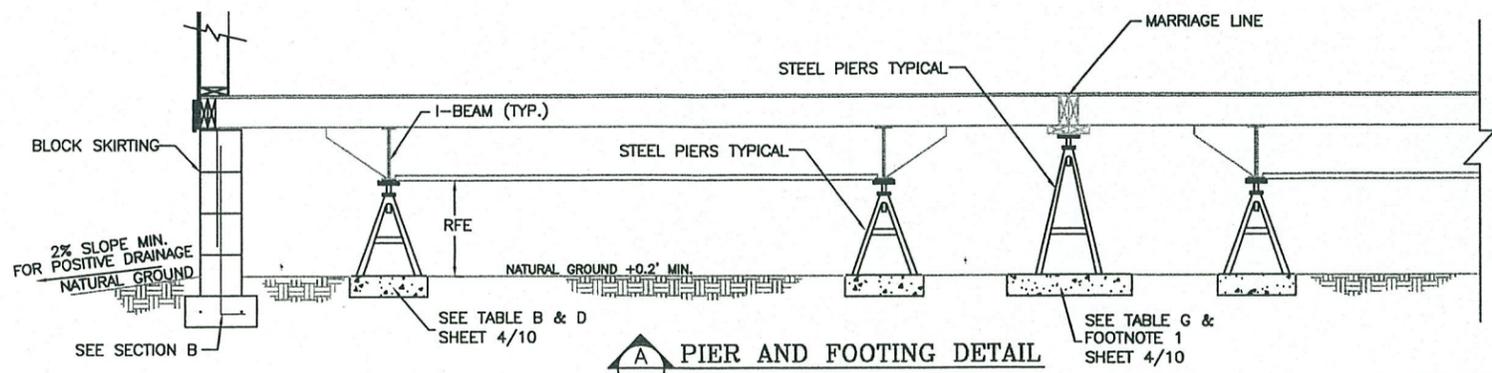
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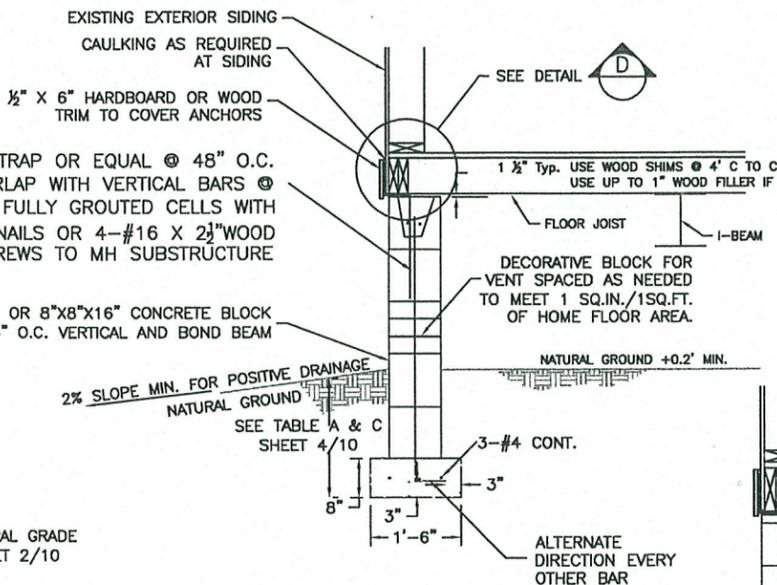
GROUTED RIP-RAP EROSION STABILIZATION OF FILL PAD IN FLOODPLAIN



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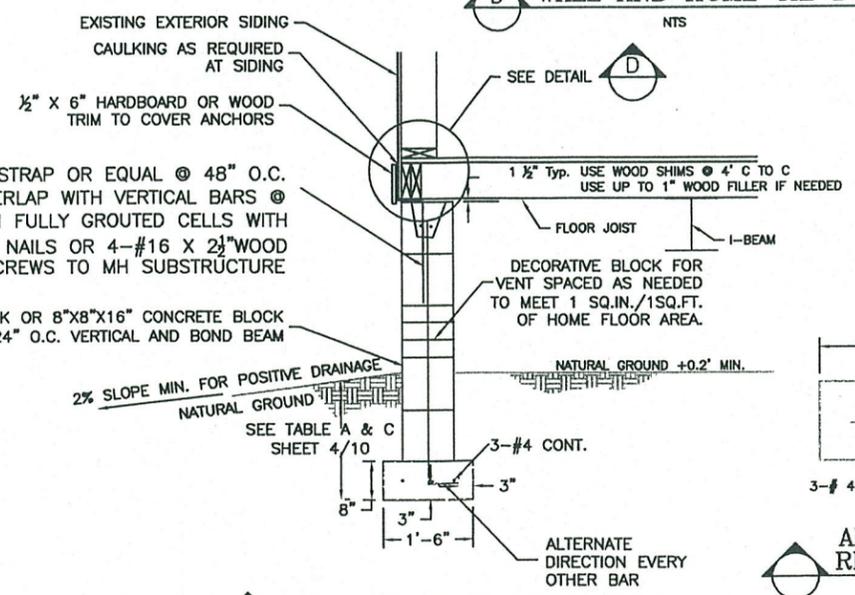


PIER AND FOOTING DETAIL
NTS



WALL AND FOOTING SECTION
NTS

ALTERNATIVE WALL AND HOME TIE DOWNS
NTS



WALL AND FOOTING SECTION
10' EACH WAY AT UPSTREAM CORNERS
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NON-LOAD BEARING WALL THE HOME DOES NOT SIT ON THE WALL BUT THE WALL DOES RESIST LATERAL AND UPLIFT LOADS ON THE HOME BY THE SIMPSON STRAPS.

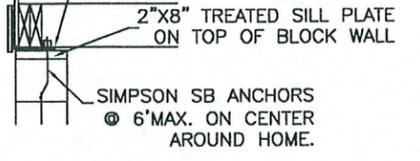
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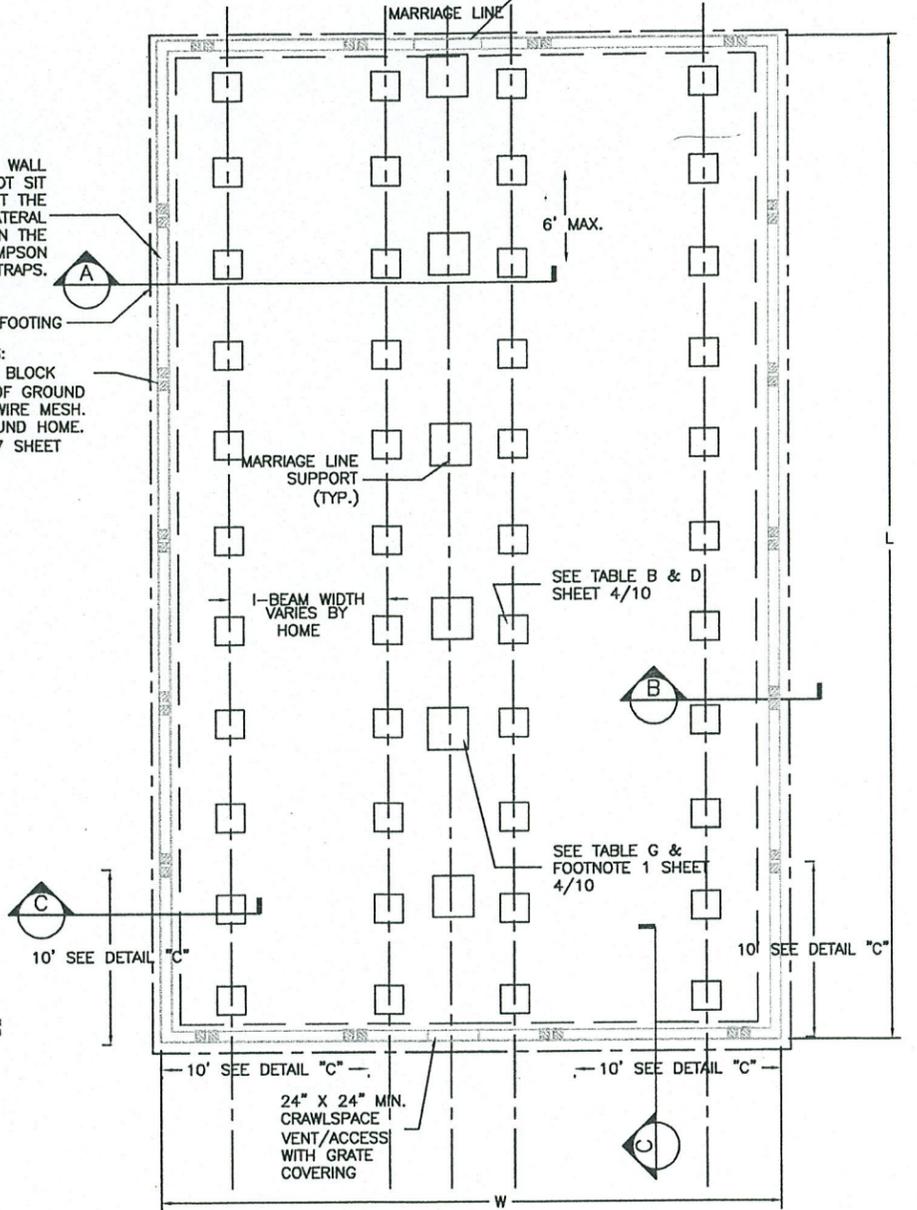
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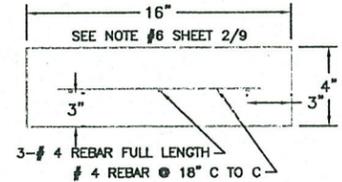
SIMPSON FWANZ ANCHORS @ 4' MAX. ON CENTER AROUND HOME. NAIL TO SILL PLATE AND RIM JOIST PER MANUFACTURERS RECOMMENDATIONS.



FLOOD VENTS: 8\"/>



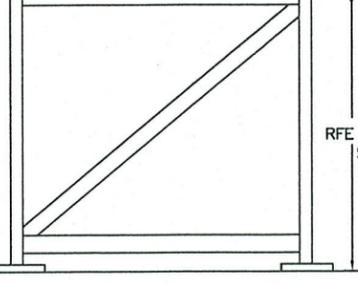
DIRECTION OF FLOOD FLOW GENERAL FOOTING PLAN
NTS



ALTERNATIVE I BEAM RIBBON FOOTING DETAIL
NTS

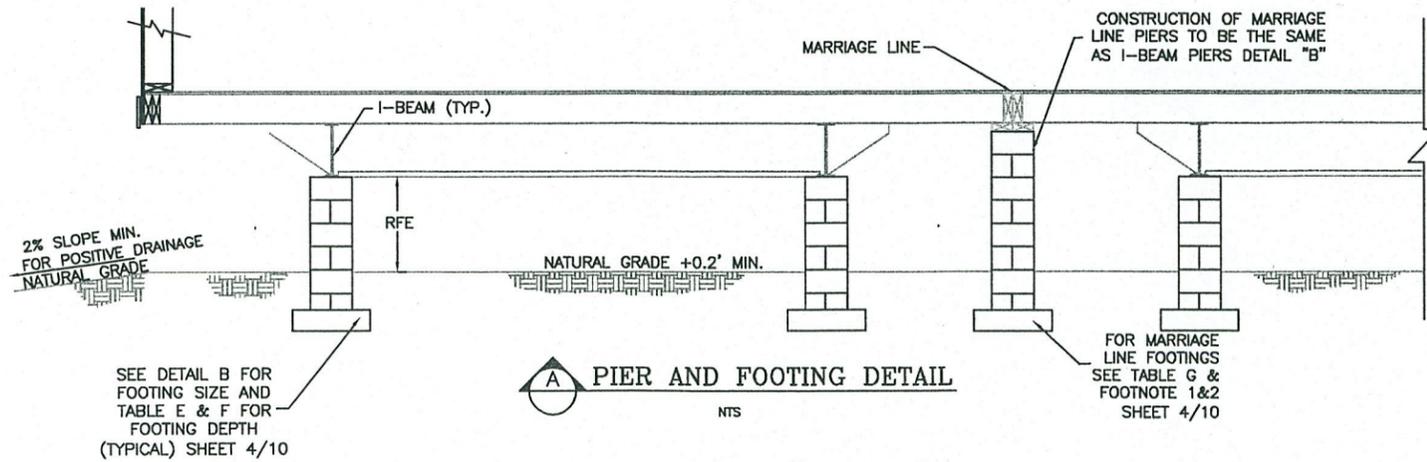
STEM WALL INSTALLATION AT GRADE IN FLOODPLAINS

NOTE: STAND TO BE STEEL ANGLE IRON WITH ALL JOINTS WELDED OR TREATED WOOD BOXED AND REINFORCED OR BLOCK. EXACT LOCATION AND CONSTRUCTION OF STAND TO BE BY AC CONTRACTOR, AC UNIT OR OTHER SERVICE EQUIPMENT

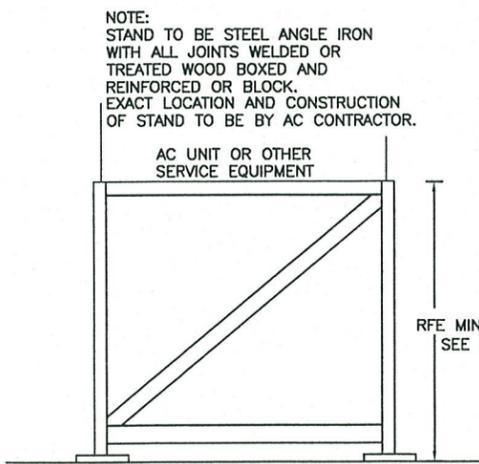


- A. ALL WORK SHALL CONFORM TO ALL LOCAL, STATE, AND THE 2006 IRC CODE. THE PERMANENT FOUNDATION GUIDE FOR MANUFACTURED HOUSING, HUD-7584, SEPTEMBER 1996; AND THE STATE OF ARIZONA RULES TITLE 4, CHAPTER 34, ARTICLE 2.
- B. CONCRETE SHALL BE PER ASTM C-94 AND HAVE A 28 DAY STRENGTH OF 3,000 psi. THERE SHALL BE A MINIMUM OF 5 SACKS OF CEMENT PER CUBIC YARD AND CONFORM TO ASTM C-150 TYPE II. THE AGGREGATE PER ASTM C-33. THE SLUMP SHALL NOT BE MORE THAN 4".
- C. REINFORCING STEEL SHALL CONFORM TO ASTM A615, GRADE 60 AND LAP 30 BAR DIAM. REINFORCING SHALL BE CONTINUOUS AROUND ALL CORNERS.
- D. CONTRACTOR SHALL VERIFY ALL SITE CONDITIONS AND DIMENSIONS BEFORE STARTING WORK.
- E. MASONRY BLOCK SHALL CONFORM TO ASTM C-90, TYPE I, GRADE N-1. MORTAR SHALL BE TYPE "S" CONFORMING TO ASTM C-270. GROUT SHALL CONFORM TO ASTM C-476, WITH A 28-DAY STRENGTH OF 2,000psi.
- F. WOOD WITHIN 6" OF GROUND AND SILLS TO CONCRETE OR BLOCK TO BE PRESSURE TREATED TO FOUNDATION GRADE STANDARD FOR USE IN GROUND CONTACT PER REQUIREMENTS OF AMERICAN WOOD PRESERVES BUREAU STANDARD A.W.P.B.- FDN FOR USE IN GROUND CONTACT.
- G. HOME INSTALLED WITH LONG DIMENSION PARALLEL TO FLOOD FLOW.

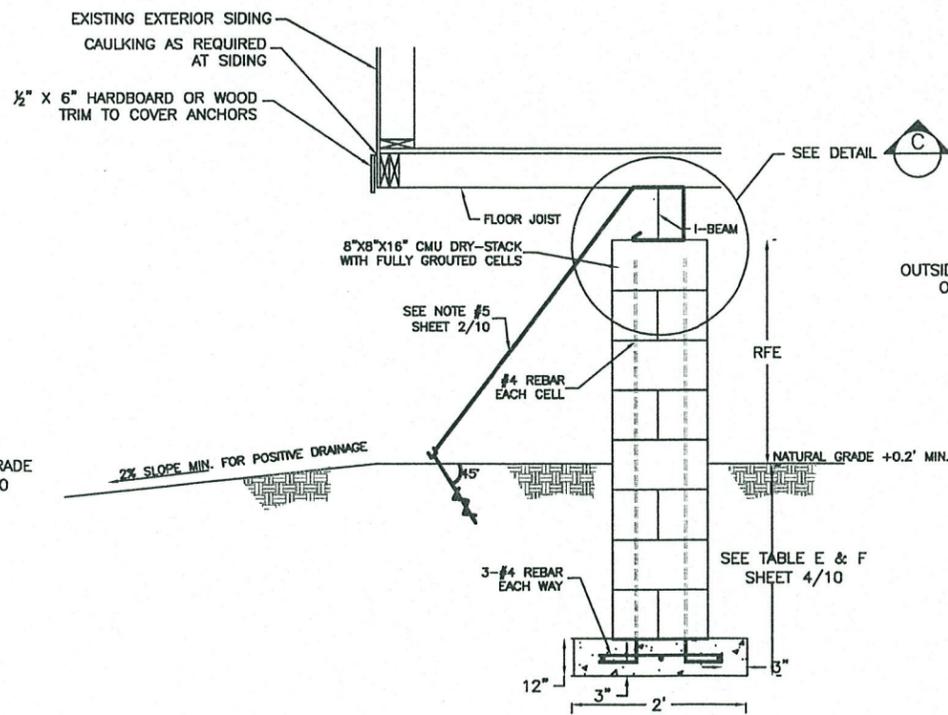




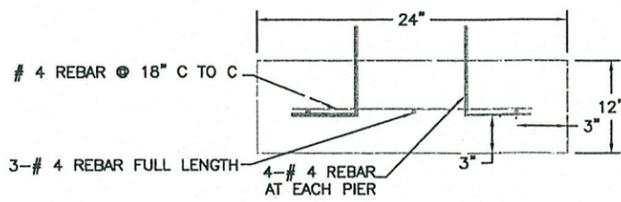
A PIER AND FOOTING DETAIL
NTS



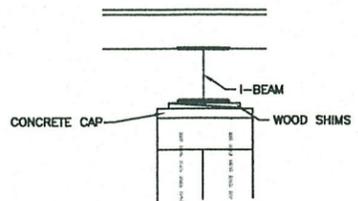
EXTERIOR HOME EQUIPMENT STAND DETAIL



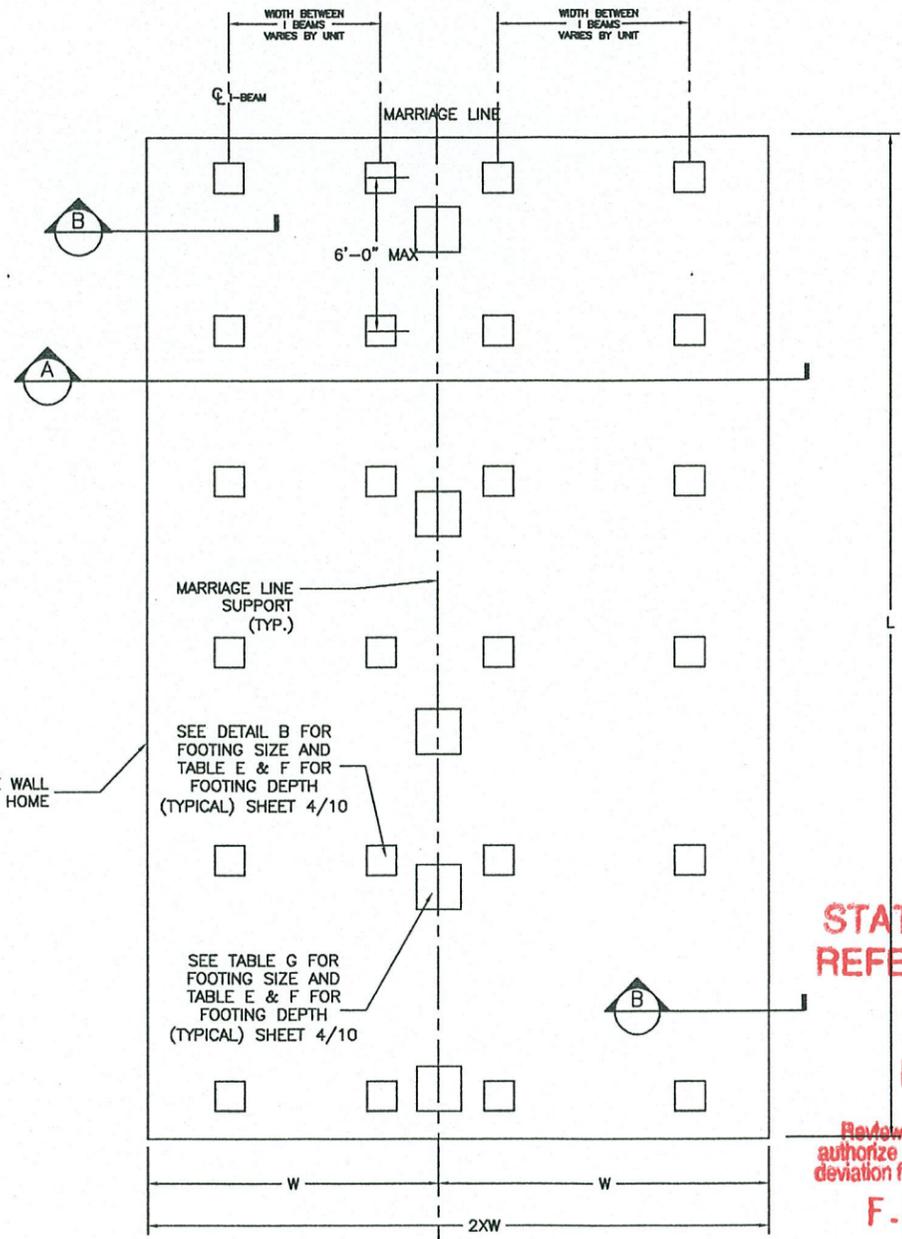
B PIER AND FOOTING DETAIL
NTS



ALTERNATIVE I BEAM RIBBON FOOTING DETAIL
NTS



C PIER CAP DETAIL
NTS



GENERAL FOOTING PLAN
NTS



DIRECTION OF FLOOD FLOW

PIER INSTALLATION AT GRADE IN FLOODPLAINS

STATE OF ARIZONA REFER TO SHEET #1

NOV 14 2009

Review of this document does not authorize or approve any omission or deviation from the applicable standards.

F-LD 00 SUP



EXPIRES 03/31/2011

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revised 9/22/09