PANHANDLE RESIDENTIAL FOUNDATION MANUAL

Optional foundation systems for use in one and two family dwellings
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*Inside back cover*
It is the intent of this publication to provide several methods to comply with the adopted standards of this municipality as well as provide some additional opportunities to conserve energy and ensure sustainability. “The Guidelines are not intended to be Standards, but are guidelines only, reflecting the engineering opinions and practices of the committee members. They in no way replace the basic need for good engineering judgment based on appropriate education, experience, wisdom, and ethics in any particular engineering application.”

The City of Amarillo, and participating Panhandle Municipalities, here-in provides an approved structural foundation system that complies or exceeds compliance with the Section 403.1 of the 2006 International Residential Code for One and Two Family Dwellings.

The presented systems are provided for optional use in design of residential structures that are considered to comply with City of Amarillo Municipal Code and the 2006 International Residential Code. These approved systems are applicable only for structures that fall within the criteria stipulated by the conditions of the approved foundation systems within the city limits of the City of Amarillo, Texas.

“The function of a residential foundation is to support the structure. The majority of foundations constructed in Texas consist of shallow, stiffened and reinforced slab-on-ground foundations. Many are placed on expansive clays and/or fills. Foundations placed on expansive clays and/or fills have an increased potential for movement and resulting distress.

National building codes have general guidelines, which may not be sufficient for the soil conditions and construction methods in the State of Texas. The purpose of this document is to present recommended practice for the design of residential foundations to augment current building codes to help reduce foundation related problems. Where the recommendations in this document vary from published methods or codes, the differences represent the experience and judgment of the majority of the committee members.

On sites having expansive clay, fill, and/or other adverse conditions, residential foundations shall be designed by licensed engineers utilizing the provisions of this document:(Recommended Practice for the Design of Residential Foundations). Expansive clay is defined as soil having a weighted plasticity index greater than 15 as defined by Building Research Advisory Board (BRAB) or a maximum potential volume change greater than 1 percent. This provision should also apply where local geology or experience indicates that active clay soils may be present. We propose that local and state governing bodies adopt this recommended practice.” Excerpt from: Recommended Practice for the Design of Residential Foundations, Version 1, By the Texas Section American Society of Civil Engineers © 2002
The following Table R401.3(a) depicts the specific approved residential structural foundation systems configurations for specific residential criteria:

<table>
<thead>
<tr>
<th>Area of Residence (square footage)</th>
<th>Number of Stories</th>
<th>Minimum Width of Perimeter Grade Beam</th>
<th>Size &amp; # of Continuous Reinforcement (Top &amp; Bottom)</th>
<th>Width/Depth of Interior Grade Beam</th>
<th>Interior Beam Size &amp; # of Continuous Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 2400SF</td>
<td>1</td>
<td>10</td>
<td>2-#4</td>
<td>8/8</td>
<td>2-#4</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>12</td>
<td>2-#5 or 3-#4</td>
<td>8/8</td>
<td>2-#5 or 3-#4</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>12</td>
<td>2-#5 or 3-#4</td>
<td>12/12</td>
<td>2-#5 or 3-#4</td>
</tr>
<tr>
<td>2400-4800SF</td>
<td>1</td>
<td>10</td>
<td>2-#5 or 3-#4</td>
<td>8/8</td>
<td>2-#5</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>12</td>
<td>2-#5 or 3-#4</td>
<td>12/12</td>
<td>2-#5 or 3-#4</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>12</td>
<td>2-#5</td>
<td>12/14</td>
<td>3-#5</td>
</tr>
<tr>
<td>Over 4800SF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Residential Design Professional Required</td>
</tr>
</tbody>
</table>

a. Reinforcement required top and bottom of footing in accordance with ACI-318
b. At intersections and corners, the #5 reinforcing bars can be tied using two bundled #4 "L" bars with minimum leg length of 5'.
c. Consisting of Over 4800 square feet. --- Designed by a Residential Design Professional approved by the City of Amarillo Building Official
d. Design Professionals are required to be licensed as an Architect or Engineer in the State of Texas in accordance with applicable laws. Residential Structures

The Table R403.1(a) is based on the following assumptions and are considered mandatory criteria if application of these approved design standards are utilized:

1. The generic configurations shown in this table are based on procedures recognized by the Reference (4) Wire Reinforcement Institute’s (WRI) Design of Slab-on-Ground Foundations WRI/CRSI-81.

2. The effective Plasticity Index (PI) of the sub-grade/fill is less than or equal to 20 when computed by the methods presented by the WRI. The determination of satisfaction this criteria shall be provided by the Building Official. The supporting foundation soils are assumed to have a minimum allowable soil bearing capacity of 1500 psf.

3. The top 8" of subgrade or finished fill soil are processed as specified minimum 90% compaction plus or minus 5% moisture content based on the Standard Proctor (ASTM D-698). Comment - The City of Amarillo does not require, but recommends a minimum of 95% compaction plus or minus 3% based on the Standard Proctor (ASTM D-698).

4. Uniform Loads are distributed across the interior floor slabs at 200 psf for single story, 275 psf for two story, and 350 psf for three story residential structures. Variations in above stated loadings should be taken into consideration in the final individual configuration. Structural demands imposed by concentrated application of loadings should receive enhanced foundation support.

5. All reinforcing steel is Grade 60 (60,000 psi), and all concrete is 3000 psi @ 28 day’s cure. All reinforcement must have at least 3” of cover where exposed directly to soil.

6. The approved foundation design standards are considered minimum standards for the City of Amarillo. Selected design dimensions and reinforcement sizes that exceed these provided standards can generally be considered acceptable.
2 POUR SLAB ON GRADE FOOTING

SCALE: 1' = 1'-0'
WEATHER-RESISTANT BARRIER, LAP OVER WATERPROOFING

1/2" x 4" BOLTS @ 6'-0' O.C. MAX.
(EMBEDDED 7" INTO FOUNDATION)

4' THK. 3,000 PSI CONC.
SLAB W/ 3# BARS @ 16'
O.C.E.W. (TYP.) OR
EQUIVALENT REINFORCING WIRE

REBAR
LOCATION AT TOP 1/2 OR
UPPER 1/3
OF SLAB

4' COMPACTED SAND FILL
(TYP.)

3# X 4'-0' LONG CORNER BARS @ 32' O.C.

WATERSTOP
CONT.

3,000 PSI CONC. GRADE
BEAM W/ STL. REINFORCING
CONTINUOUS @ TOP AND BTM.
AS PER TABLE W/ 3# VERT.
TIES AT 36' O.C.

METAL TIES: NO. 22 GA. X 7/8'
CORRUGATED HOT DIPPED GALV.

CONTINUOUS BASE FLASHING

3/16" WEEPS @ 33' O.C.
SHALL BE LOCATED ABOVE FIN. GRADE

1' x 8' ISO BOARD CONT. AT PERIMETER,
R-5 MIN. W/ SELF-ADHERING
WATERPROOFING EXTEND O/V ENTIRE SURFACE,
SLOPE GRADE @ 1/2'/FT.
FOR 5' MIN. AWAY FROM FOUNDATION

FINISH GRADE

PLASTIC CHAIRS (CLIP TO STL. REINF.) OR
EQUIVALENT

SEE TABLE R4013 (a)

2 POUR SLAB ON GRADE FOOTING

SCALE: 1" = 1'-0'

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WEATHER-RESISTANT BARRIER, LAP OVER WATERPROOFING

1/2" A-BOLTS @ 6'-0" O.C. MAX. (EMBEDDED 1' INTO FOUNDATION)

4' THK. 3,000 PSI CONC. SLAB W/ #3 BARS @ 16'
O.C.E.W. (TYP.) OR EQUIVALENT REINFORCING WIRE

REBAR LOCATION AT TOP 1/2 OR UPPER 1/3 OF SLAB

4' COMPACTED SAND FILL (TYP.)

*3* X 4'-0" LONG CORNER BARS @ 32" O.C.

WATERSTOP CONT.

3,000 PSI CONC. GRADE BEAM W/ STIL. REINFORCING CONTINUOUS @ TOP AND BTM.
AS PER TABLE W/ #3 VERT. TIES AT 36" O.C.

METAL TIES:
NO. 22 GA. X 1/8" CORRUGATED HOT DIPPED GALV.

CONTINUOUS BASE FLASHING

3/16" WEEPS @ 33' O.C. SHALL BE LOCATED ABOVE FIN. GRADE

FILL CORES OF BRICK & COLLAR JOINT SOLID W/ MORTAR

SLOPE GRADE @ 1/2' FT. FOR 5' MIN. AWAY FROM FOUNDATION

FINISH GRADE

PLASTIC CHAIRS (CLIP TO STL. REINF.) OR EQUIVALENT

SEE TABLE R4013 (a)

2 POUR SLAB ON GRADE FOOTING FLOATING EDGE FORM

SCALE: 1" = 1'-0"
MONOLITHIC SLAB ON GRADE FOOTING

SCALE: 1" = 1'-0"
MONOLITHIC SLAB ON GRADE FOOTING

SCALE: 1' = 1'-0"
WEATHER-RESISTANT BARRIER, LAP OVER WATERPROOFING
1/2" x A-BOLTS @ 6'-0" O.C. MAX.
(EMBEDDED 1' INTO FOUNDATION)

4" THK. 3,000 PSI CONC. SLAB W/ 3# BARS @ 16'
O.C.E.W. (TYP.) OR EQUIVALENT REINFORCING WIRE

REBAR LOCATION AT TOP 1/2 OR UPPER 1/3 OF SLAB

4" COMPACTED SAND FILL (TYP.)

3# X 4'-0" LONG CORNER BARS @ 32" O.C.

3,000 PSI CONC. GRADE BEAM W/ STL. REINFORCING CONTINUOUS @ TOP AND BTM.
AS PER TABLE W/ 3# VERT. TIES AT 36" O.C.

METAL TIES: NO. 22 GA. X 1/8" CORRUGATED HOT DIPPED GALV.
CONTINUOUS BASE FLASHING

3/16" WEEPS @ 33" O.C.
SHALL BE LOCATED ABOVE FIN. GRADE
METAL OR STUCCO O/V INSULATION

SLOPE GRADE @ 1/2"/FT.
FOR 5' MIN. AWAY FROM FOUNDATION
FINISH GRADE

INSULATION W/ R-VALUE OF 4.5 R TABLE R403.3 (C)

PLASTIC CHAIRS (CLIP TO STL. REINF.) OR EQUIVALENT

ENERGY EFFICIENT FOUNDATION, MONOLITHIC
SCALE: 1' = 1'-0"
ENERGY EFFICIENT FOUNDATION, TWO POUR

SCALE: 1' = 1'-0"
INTERIOR FOUNDATION BEAM

SCALE: 1" = 1'-0"

4' THK. 3,000 PSI CONC. SLAB W/ #3+ BARS @ 16' O.C.E.W. (TYP.) OR EQUIVALENT REINFORCING WIRE

REBAR LOCATION AT TOP 1/2 OR UPPER 1/3 OF SLAB

R506.2.4

4' COMPACTED SAND FILL (TYP.)

STL. REINFORCING BARS PER TABLE

PER TABLE R401.3 (a)

MUST BE INSTALLED AT MAXIMUM INTERVALS OF 20' AND/OR UNDER LOAD-BEARING WALLS
4' THICK 3,000 PSI CONC. SLAB W/ "3+BARS @ 16' O.C.E.W.

4' COMPACTED SAND FILL (TYP.)

PLASTIC CHAIRS (CLIP TO STL. REINF.) OR EQUIVALENT

FIREPLACE FOOTING
PROVIDE 3,000 PSI CONC. FOOTING W/ "5+BARS AT 6' O.C.E.W. TYP. AT 3' ABOVE BOTTOM OF FOOTING TYP.

"3+BARS VERT. @ EA. CORNER OF MAT W/ "3+B TIE @ TOP

"3+BARS @ 6' O.C. LONG CORNER BARS

3' CLR.

WIDTH OF MASONRY
6' (ONE STORY)
12' (TWO STORY)

6'

"FIREPLACE FOOTING"

SCALE: 1" = 1'-0"

NOTE: INTERIOR FIREPLACE SHALL BE PERMITTED TO HAVE 12' DEPTH FOOTING

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EXTERIOR FOUNDATION
(CONC. PIER AND BEAM SYSTEM)

SCALE: 1' = 1'-0'

Metal Ties: No. 22 Ga. x 7/16" Corrugated Hot Dipped Galv.
Wood Decking O/V Wood Floor Framing Per 2006 IRC
1 1/4" Rim Board
Floor Framing
2x6 Treated Sole Plate W/ 1/2" A-BOLTS @ 6'-0" O.C. Max.
Termite Shield
1/2" A-BOLTS @ 6'-0" O.C. Max.
(Embedded 1" into Foundation)
Final Grade (Crawl Space)
Plastic Chairs (Clip To Stl. Rein.) or Equivalent

Three 000 psi Conc. Grade
Beam w/ Stl. Reinforcing
Continuous @ Top and Btm.
As Per Table w/ 9# Vert.
Ties at 36" O.C.

See Table
R4013 (a)

Weather-Resistant Barrier,
Lap Over Waterproofing
Continuous Base Flashing
3/16" Weeps @ 33" O.C.
Weeping Shall Be Located Above Fin. Grade

Slope Grade @ 1/2'/ft.
For 5' Min. Away From Foundation
PIER DETAIL (INTERIOR PIER)

SCALE: 1" = 1'-0"

<table>
<thead>
<tr>
<th>PIER DIA.</th>
<th>SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>12'</td>
<td>Piers shall be located @ 4'-0&quot; O.C. in each direction</td>
</tr>
<tr>
<td>15'</td>
<td>Piers shall be located @ 5'-0&quot; O.C. in each direction</td>
</tr>
</tbody>
</table>

SEE TABLE BELOW
<table>
<thead>
<tr>
<th>CLEAR SPAN OF ROOF SLAB</th>
<th>SLAB THICKNESS</th>
<th>REQUIRED REINFORCEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SHORT WAY</td>
</tr>
<tr>
<td>6'-0''</td>
<td>5''</td>
<td>1/2'' x 6'' O.C.</td>
</tr>
<tr>
<td>8'-0''</td>
<td>5''</td>
<td>1/2'' x 6'' O.C.</td>
</tr>
<tr>
<td>10'-0''</td>
<td>5''</td>
<td>1/2'' x 6'' O.C.</td>
</tr>
<tr>
<td>12'-0''</td>
<td>6''</td>
<td>1/2'' x 8'' O.C.</td>
</tr>
<tr>
<td>14'-0''</td>
<td>7''</td>
<td>1/2'' x 6'' O.C.</td>
</tr>
<tr>
<td>16'-0''</td>
<td>8''</td>
<td>1/2'' x 6'' O.C.</td>
</tr>
<tr>
<td>18'-0''</td>
<td>9''</td>
<td>1/2'' x 8'' O.C.</td>
</tr>
<tr>
<td>20'-0''</td>
<td>10''</td>
<td>1/2'' x 6'' O.C.</td>
</tr>
<tr>
<td>22'-0''</td>
<td>11''</td>
<td>1/2'' x 6'' O.C.</td>
</tr>
<tr>
<td>24'-0''</td>
<td>12''</td>
<td>1/2'' x 5'' O.C.</td>
</tr>
</tbody>
</table>

**GENERAL NOTES**

GRADE 60 REINFORCING STEEL. BOTTOM BARS TO RUN SHORT WAY WITH 3/4' CLEAR BELOW BARS IN ALL CASES.

3000 PSI MIN. CONCRETE STRENGTH REQUIRED.

DESIGN LOADS ASSUMED: 100 PSF LIVE LOAD AND 20 PSF PARTITION LOAD.

DESIGN PER ACI 318-03

NO BEARING WALLS SHALL OCCUR ON BASEMENT ROOF SLAB.

BASEMENT MAY NOT BE USED AS SLEEPING AREAS UNLESS EMERGENCY ESCAPE OPENINGS ARE PROVIDED ACCORDING TO IRC SECTION 312.

MAXIMUM LENGTH OF STAIR OPENING IN ROOF SLAB SHALL BE 13'-0''. OPENINGS SHALL HAVE STEEL SUPPORT BEAM (W12x26, W10x30, OR W8x40) ON ALL SIDES WHERE NO BEARING WALL OCCURS. OPENINGS SHALL HAVE A 3' STANDARD PIPE COLUMN WITH CONCRETE FOOTINGS AT ALL STEEL BEAM INTERSECTIONS.

WHEN ONE LONG SIDE OF THE STAIR OPENING IS ADJACENT TO A BASEMENT WALL, THE TOP OF THE WALL FOR THE LENGTH OF THE OPENING MUST BE HORIZONTALLY RESTRAINED BY EITHER A SLAB OR ONE OF THE FOLLOWING METHODS:

**STANDARD RESIDENTIAL CONCRETE ROOF SLAB DETAIL**

*(OVER BASEMENT OR STORM CELLAR WITHOUT EARTH COVER)*
TRENCHED BASEMENT WALL DETAIL

MIN. TO EXTERIOR OF FOUNDATION

4" COMPACTED SAND

4" COMPACTED SAND (TOP)

FILL (TOP)

6" MAX. OF DOWEL

10", O.C.

4" VERTICAL REIN.

#16, O.C. W/6" @ 2.0' LONG DOWEL

EMBEDDED INTO WALL

SLAB

BASEMENT FLOOR

WATERSTOP

1.0" TO 10.0' WALL HEIGHT

DAMP PROOFING 1" GED1

FOUNDATION

WATERSTOP

WATERSTOP

WATERSTOP

FILL (TOP)

20'-0" SPAN

CONCRETE SLAB

CONCRETE SLAB

(ALTERTATE DIRECTIONS)

CORNER BAR

2.0' x 36" x 36"
ACCESSORY BUILDING, MONOLITHIC SLAB ON GRADE FOOTING

SCALE: 1' = 1'-0"

NOTE
THIS FOUNDATION DETAIL IS APPROVED FOR USE WITH DETACHED ONE-STORY GROUP U WOOD FRAME BUILDINGS LESS THAN SIX HUNDRED (600) SQUARE FEET IN GROSS FLOOR AREA, AND LOCATED ON THE SAME SITE WITH A GROUP R-3 OCCUPANCY.
DESIGN OF STRUCTURAL ELEMENT OR SYSTEMS SHALL COMPLY W/ SECTION R301.1 IRC

BUILDING MUST BE ANCHORED

ANCHOR BOLTS EMBEDDED 1" INTO FOUNDATION

EXTEND SKIRTING TO GRADE AROUND PERIMETER. APPROVED MATERIAL TO BE IN CONTACT W/ EARTH

FINISH SOIL GRADE 4' SLOPE IN FIRST 5'-0" FROM THE FOUNDATION, 1% THEREAFTER

3,000 PSI CONC. PIER

12" MIN. DIAMETER PIER SPACED 8'-0" O.C. MAX.

RESIDENTIAL ACCESSORY BUILDING, TREATED FLOOR SYSTEM

SCALE: 1" = 1'-0"
EXTEND SKIRTING TO GRADE AROUND PERIMETER. APPROVED MATERIAL TO BE IN CONTACT W/ EARTH

1'-6" R403.1 (3)

FLOOR FRAMING NON-TREATED

BUILDING MUST BE ANCHORED

ANCHOR BOLTS EMBEDDED 1" INTO FOUNDATION

3,000 PSI CONC. PIER

12" MIN. DIAMETER PIER SPACED 8'-0" O.C. MAX.

RESIDENTIAL ACCESSORY BUILDING, NON-TREATED FLOOR SYSTEM

SCALE: 1" = 1'-0"
This manual is provided as an aid to homeowners, builders, and specialty contactors. It was created in an effort to provide a simple to understand manual intended to meet and exceed the minimum standards set forth in the International Residential Code. This manual does not take into account all possible situations and requires the permit holder to ensure site conditions permit the use of this manual.

The following individuals, companies, and references contributed to this publication:

Amarillo Testing & Engineering
Bernard Ray Tillery, P.E.
Utility Engineering
Timothy Pillsbury, P.E.
Gregg Bliss Architect
Dana Williams
Maricel Gonzales
American Concrete Institute (ACI 318-05)
Wire Reinforcement Institute (WRI)
City of Amarillo Construction Advisory and Appeals Board
Structural Standards sub-committee
City of Amarillo Department of Building Safety
This document is provided by and published by the City of Amarillo, Department of Building Safety only to be used as a guide. It is not intended to replace the basic need for good engineering judgment based on appropriate education, experience, wisdom and ethics in any particular engineering application.

This material was published in May 2008 for use with 2006 International Residential Code.

If you have comments, questions or suggestions, please feel free to contact us at (806) 378-3041.
References and Links

The State of Texas

- Texas Residential Construction Commission (TRCC) [www.trcc.state.tx.us](http://www.trcc.state.tx.us)
- Texas Board of Professional Engineers [www.tbpe.state.tx.us](http://www.tbpe.state.tx.us)
- Texas Board of Architectural Examiners [www.tbae.state.tx.us](http://www.tbae.state.tx.us)
- Texas State Board Plumbing Examiners (TSBPE) [www.tsbpe.state.tx.us](http://www.tsbpe.state.tx.us)
- Texas Department of Licensing and Regulation (TDLR) [www.license.state.tx.us](http://www.license.state.tx.us)
- Texas Commission on Environmental Quality (TCEQ) [www.tceq.state.tx.us](http://www.tceq.state.tx.us)

Panhandle Associations

- Texas Panhandle Inspectors Association (TPIA)
- Texas Panhandle Builders Association (TPBA) [www.tpba.org](http://www.tpba.org)
- American Institute of Architects (AIA) [www.aia.org](http://www.aia.org)
- American Society of Civil Engineers (ASCE) [www.asce.org](http://www.asce.org)
- Construction Specifications Institute (CSI) [www.csinet.org](http://www.csinet.org)
- Associated Plumbing Heating Cooling Contractors (PHCC) [www.phcc-tx.org](http://www.phcc-tx.org)
- Independent Electrical Contractors Association (IECA)
- Panhandle Roofing Contractors

National Standards

- International Code Council (ICC) [www.iccsafe.org](http://www.iccsafe.org)
- Energy Systems Laboratory Texas A & M University [http://esl.eslwin.tamu.edu](http://esl.eslwin.tamu.edu)
- American Concrete Institute (ACI) [www.concrete.org](http://www.concrete.org)
- Wire Reinforcement Institute (WRI) [www.wirereinforcementinstitute.org](http://www.wirereinforcementinstitute.org)
This publication provides interpretive drawings considered to comply or exceed the requirements of the 2006 International Residential Code and are approved for use in One & Two Family Dwellings in the following municipalities:

- City of Amarillo
- City of Canyon
- City of Tulia
- City of Dalhart
- City of Dimmitt
- City of Dumas