Raised Wood Floor Foundations

DESIGN & CONSTRUCTION GUIDE

SOUTHERN FOREST PRODUCTS ASSOCIATION®

RaisedFloorLiving.com

Building to a Higher Standard

Satisfying the higher expectations of today's homebuyer presents new challenges. Meeting these challenges begins with a raised wood floor foundation that enhances curb appeal and provides many other benefits.

With raised wood floor foundations, building professionals stay…

Noticed.

Builders of raised wood floor homes distinguish themselves from the competition by establishing a reputation for being green and progressive.

Competitive.

The aesthetics and amenities of raised floor homes make a positive impression on homebuyers, which may result in faster, more profitable sales. A raised wood floor foundation can also be the cost-competitive solution, especially in locations with elevation requirements, problematic soils, sloping terrain or where extensive site preparation is needed.

On Schedule.

Lengthy concrete slab delays – due to poor weather, time-consuming forming and curing, trade scheduling problems, extra inspections, or hauling and compacting of fill dirt – can be avoided with raised wood floor foundations.

On The Upgrade.

Homebuyers appreciate features of a raised foundation – a front porch, screened back porch or sunroom, or a backyard deck.

Building professionals who elevate with raised floors framed with strong, renewable wood products create value for themselves and their clients. With the know-how to properly design and construct a raised wood floor, building professionals can build homes faster and more cost effectively.

Informed.

This publication provides basic design guidance and construction details for raised wood floor foundations. The pictorial to the right illustrates the four main sections – Getting Started, Foundations, Floor Framing and Other Considerations – and the features included within each section. Cost-Saving Strategies are also provided. For more information, visit *RaisedFloorLiving.com.*

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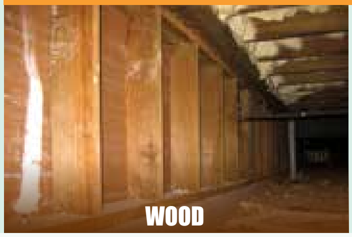

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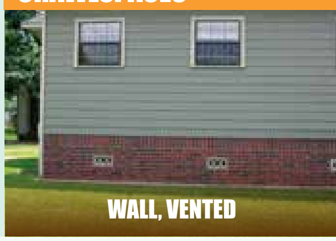
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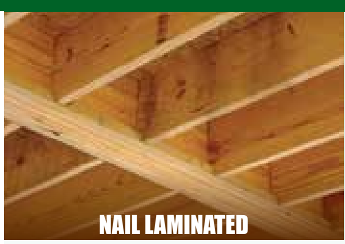
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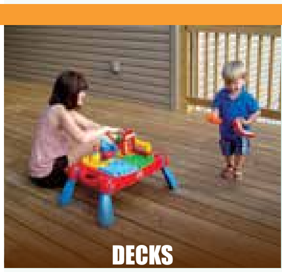
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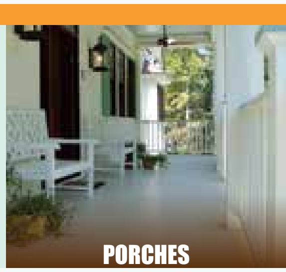
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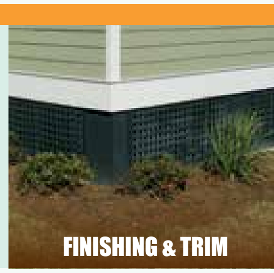

FINISHING & TRIM


UNIVERSAL DESIGN


PEST MANAGEMENT

Getting Started

For long-term durability and trouble-free performance, a raised wood floor foundation must be capable of accommodating all design loads and transferring those loads to the soil without excessive settlement. Before construction begins, an understanding of site and soil characteristics, specific design considerations and suitable connections is important.

Site Conditions

Site assessment and preparation steps are no different for a raised wood floor than for any other type of foundation system. Architects, engineers and local municipal agencies within a jurisdiction can provide information specific to flood zones, design wind velocity, seismic design category, slope stability and other factors for construction when selecting the optimum type of raised floor foundation.

Site clearing and excavation methods follow standard practices. Compacted backfill should be free of organic materials, including tree stumps or other vegetation, voids, chunks of clay and should be no more permeable than the surrounding soil.

Soil Properties

Raised wood floor assemblies may be constructed in any soil type. In fact, they perform very well even in problematic soils, such as expansive clays. The type of soil and the general grading conditions at the building site are important factors in determining foundation construction details, such as footing design and placement, backfill, and drainage.

The selected engineering properties of soils can be determined in several ways, including: published soil maps from government agencies, site borings, a review of borings from nearby sites, or other geophysical tests. It may be necessary to consult a geotechnical engineer when any unusual or unknown soil conditions are encountered.

Design Considerations

All elements of a raised wood floor system must be properly sized and assembled to support the design loads. A continuous load path must be provided to transfer lateral and vertical loads from the roof, walls, and floor system to the foundation.

A load path can be thought of as a "chain" running through the building. Because all applied loads must be transferred to the ground, the load path chain must connect to the foundation. To be effective, each link in the chain must be strong enough to transfer load without breaking. Suitable uplift, lateral, and shear connections are also required to complete the load path. A strong continuous load path is especially important in areas subject to high winds and/or seismic forces.

Connections

Proper design, specification and installation of fasterners and connections are crucial to the long-term structural integrity and performance under load. Nails used alone or in combination with metal framing anchors and construction adhesives are the most common method of fastening framing lumber and sheathing panels. Metal fasteners in contact with pressure-treated lumber must be corrosion-resistant.

Nail joints provide optimum performance when loads are applied at right angles to the shank. Nailed joints with the load applied parallel to the shank (in withdrawal) should be avoided.

Foundations

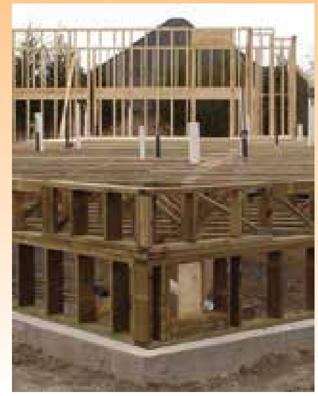
A home's finished appearance will always influence the selection of the foundation type for a raised wood floor home. But with many varieties of foundation types available, raised floor homes can be built anywhere, meeting virtually any criteria.

Footing design may be **continuous** – a continuous foundation wall around the structure's perimeter. Or, footings may be specified for the installation of isolated **piers or posts** supported by a grade beam. Or, they may be isolated (**spot footings**) for foundation piers or posts.

Pier-and-beam foundations offer a high level of versatility, specific not only to the dead, live, seismic and wind loads to be supported and/or restrained, but also to the girders or sill beams and floor joists and their respective span capabilities.

Fully enclosed foundations for raised wood floor construction are typically specified with continuous foundation walls, often called stemwalls. Stemwalls require continuous footings, but this design replaces the need for girders providing continuous support to single sill plates and the structure above.

As with pier construction, stemwalls may be built with a variety of materials including concrete masonry units (CMUs), formed concrete, as well as wood foundation walls, each providing versatility of design and many options for exterior finishing.



Pier and Beam

Exterior Wood Piling

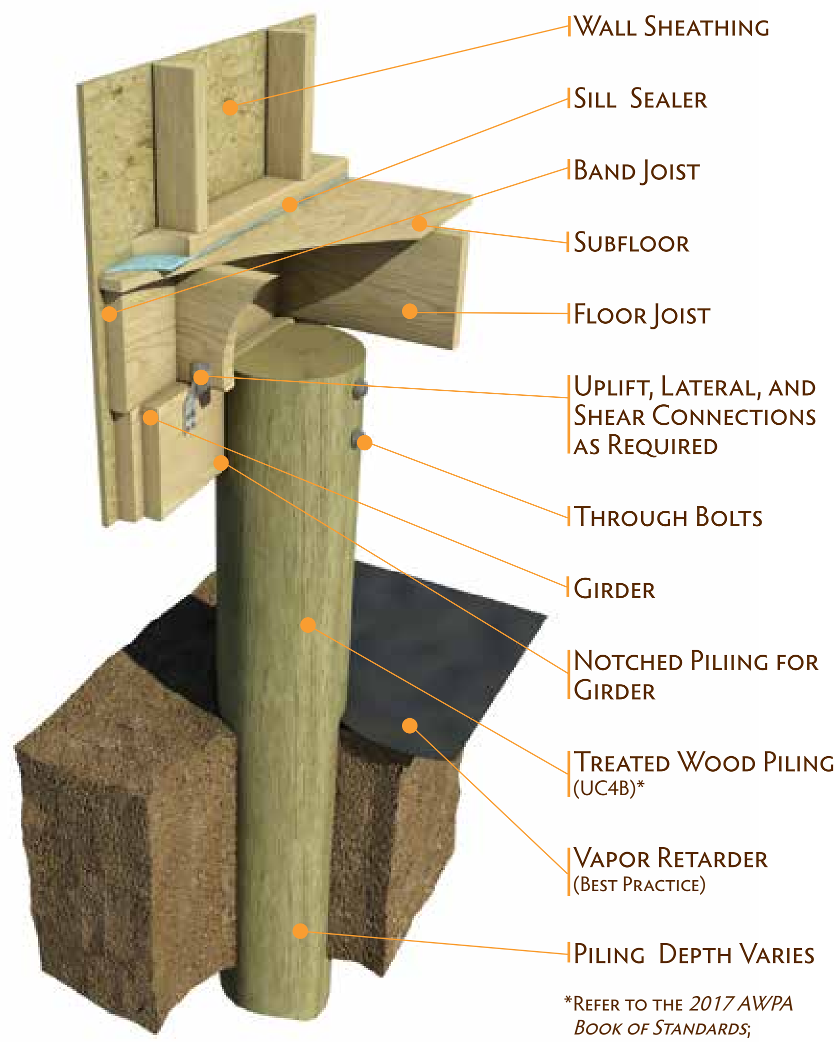
Pressure-treated wood piles are a common foundation for homes built in beachfront locations, as well as in other areas where soils have minimal bearing capacity. The cross-section area of a pile has little to do with its bearing capacity. The actual bearing support of the pile is the surface friction of the sand or soil encapsulating the pile below grade.

In beachfront construction, the length of the pile below finished grade is typically the same length as the pile above grade, or longer. In other pile applications, the length of the pile below grade may be several times the length of the exposed pile – subject to the soil properties providing friction support.

Anchoring girders to piles is a simple process with appropriately sized bolts connecting the assembly to resist loads. Cantilevered floor joist systems are sometimes preferred in conjunction with this type of foundation in order to allow tolerance for pile placement.

In coastal areas, fasteners should be a minimum of hot-dip galvanized G185 or stainless steel.

NOTE: Specification of the proper preservative retention level is important for pressure-treated wood components of a foundation – piling, posts, sill plates and framing (where required).



*Refer to the *2017 AWPA Book of Standards*; www.awpa.com

Foundations

Pier and Beam

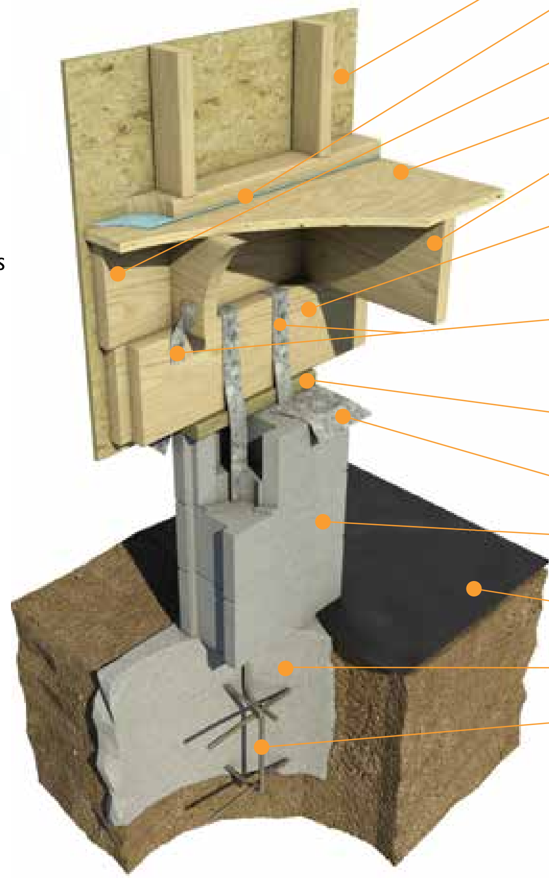
Perimeter Masonry Pier on Grade Beam

Where the stability and bearing capacity of the soils are sufficient to support loads, open crawlspace foundations are typically built with masonry piers on continuous grade beams or footings. The continuous footing "ties" the foundation together, resisting any lateral movement from the bearing soils, while providing support for individual piers distributed over a larger area compared with spot footings.

Where piers are required to resist lateral loads or uplift, such as those supporting exterior shear walls, the masonry piers must be designed accordingly, typically reinforced with vertical steel rods (rebar) and concrete fill. Anchors or straps to resist uplift are "wet-set" into the piers, secured by the concrete fill.

The specification of masonry piers provides for precise placement – eliminating the need for cantilevered floor joist systems – allowing exterior wall sheathing panels to be installed continuous over wall frames above to the floor girders.

Masonry piers on continuous concrete footings may also be used in conjunction with other materials to enclose the crawlspace, and should not be considered as an option for use only with open crawlspace construction.

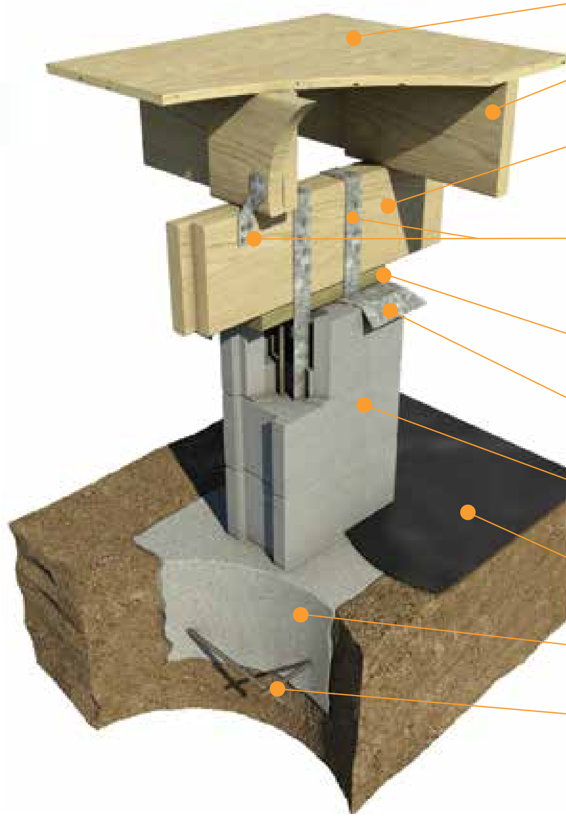


Interior Masonry Pier on Spot Footing

Where soil bearing of sufficient capacity and stability exists, spot footings are often more cost efficient than continuous footings.

Masonry piers placed on spot footings to support floor-frame systems at the interior of the structure are typically not subject to either lateral or uplift loads, and therefore may not require the same reinforcement as those at the exterior perimeter, subject to pier height.

Straps or anchors that provide stability throughout floor-frame construction will typically require only concrete fill in a single CMU column, facilitating the connection of anchors or straps within the pier. Where straps may be wet-set into the spot footing prior to the construction of the piers, no concrete fill would be required, again subject to the height of the pier.



Foundations

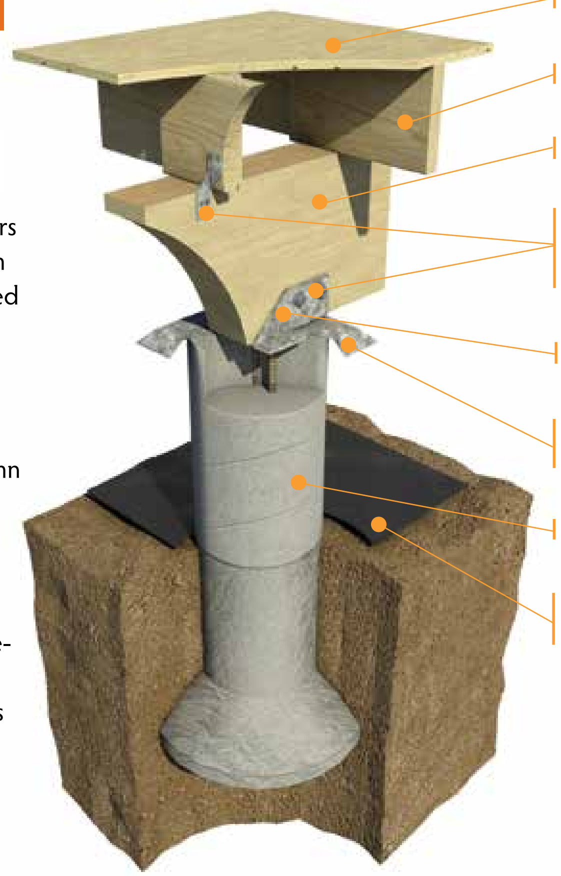
Pier and Beam

Interior Concrete Pier on Bell Footing

Poured-in-place concrete piers are the choice of some designers and builders. They may be formed and poured separately from concrete footings, but with careful planning they may be poured at the same time as footings, reducing the number of required inspections and overall construction time.

When poured with the required sized pier, it is typical for the footing to be of much greater cross-section area than the column itself – requiring the column to "flare" or "bell" at its base – normally below the finished grade.

Cylindrical cardboard tubes are often used as forms for round columns; square columns may use temporary forms or purpose-specific reusable forms. In either case, when poured-in-place concrete columns are specified and poured at the same time as the required spot footing, the resulting bell shape of the flared column base below undisturbed finished grade can provide enhanced uplift resistance for the structure.



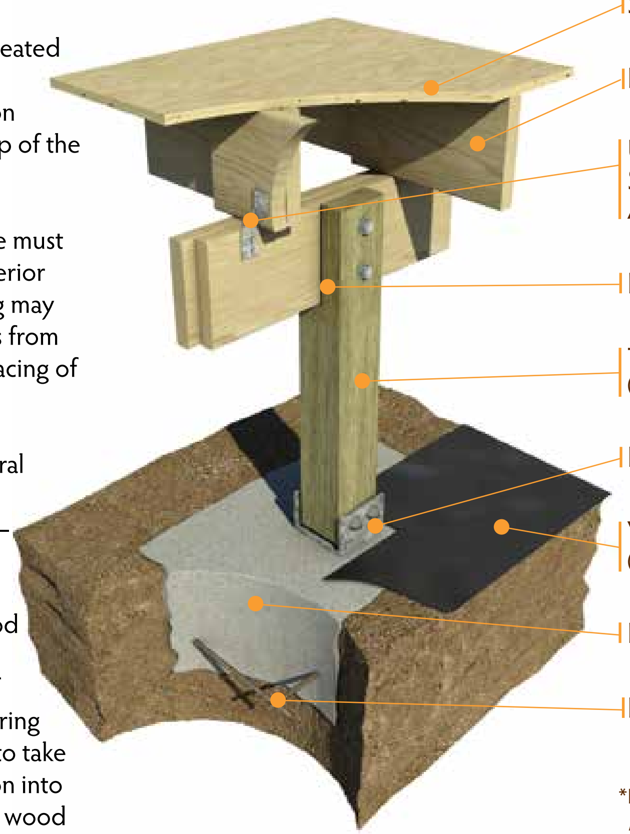
Interior Wood Post on Spot Footing

Another option for piers on either continuous or spot footings is the specification of wood posts. Pressure-treated wood posts, including solid lumber such as 6x6s, or multiple plies of dimension lumber, may be installed on appropriate post anchor bases and attached to the top of the footing or wet-set into the footing.

At the connection to the footing, the post anchor base must resist lateral, shear and uplift loads, as required. At interior wood post piers, connections at the top of the footing may also be required to resist lateral, shear and uplift loads from the structure above. For piers along the perimeter, bracing of the posts to resist such loads will be required.

Where wood post piers are not required to resist lateral or shear loads from the supported structure above – as may be the case with interior piers of the structure – additional bracing of posts should not be required.

Some builders prefer to wet-set pressure-treated wood posts into appropriately sized concrete spot footings. Uplift resistance can be provided through insertion of reinforcement bars or bolts into the post prior to pouring concrete. In such cases, the recommendation is made to take appropriate steps to prevent surface water penetration into any cavity between the concrete spot footing and the wood post that may be created by shrinkage of the post over time.



*Refer to the *2017 AWPA Book of Standards*; www.awpa.com

Foundations

Continuous Stemwall

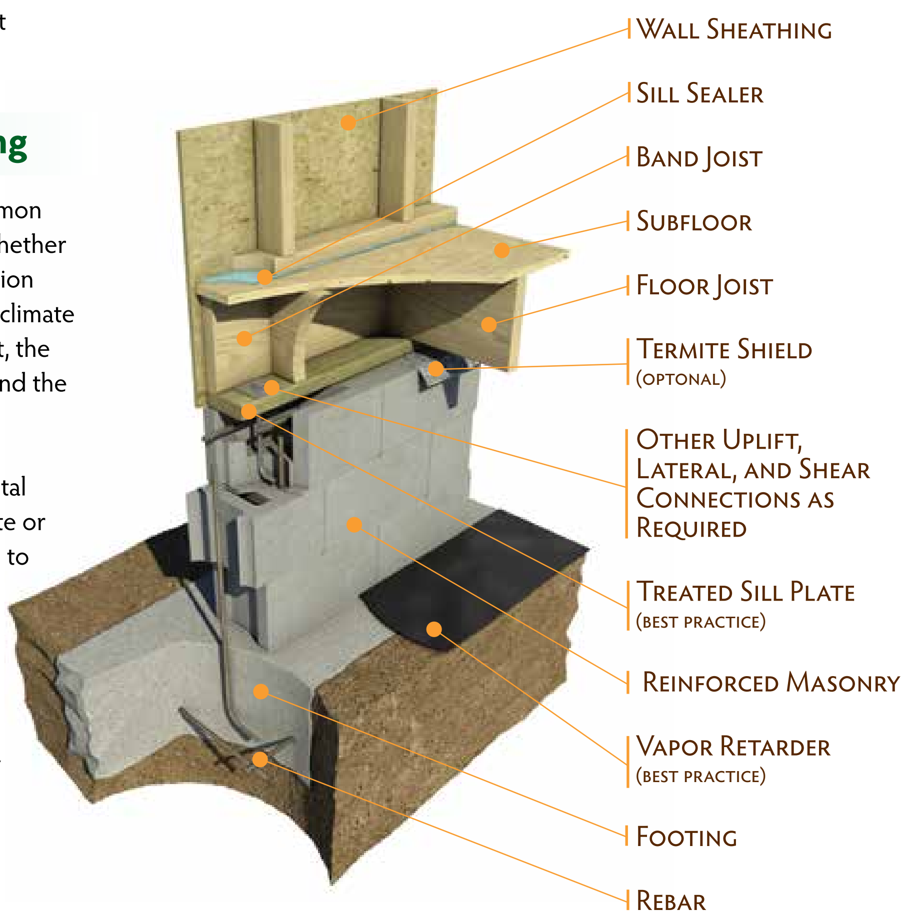
Wood Stemwall on Spread Footing

Stemwall foundations – enclosing the entire perimeter of a crawlspace – can be built most efficiently using pressure-treated wood. This foundation option may save time and money by eliminating the need for masonry work. Also referred to as "pony walls," wood foundation walls should be built on continuous footings finished above grade and backfilled to below the face of the foundation wall.

The exterior of wood foundation walls may be finished with all commonly used materials as appropriate for contact with or proximity to surrounding finished grades.

Wood stemwalls perform well in vented crawlspace construction, but may also be specified for closed conditioned/semi-conditioned crawlspace construction. For either application, close attention to the specification and details is required along with optional vapor retarders. In cases where wood foundation walls are required to finish below grade, design specifications will need to meet all relevant requirements of a Permanent Wood Foundation (PWF).[1]

Masonry Stemwall on Spread Footing



Masonry foundation walls are probably the most common method used for enclosed crawlspace construction, whether the crawlspace is to be vented or unvented. Construction techniques for masonry foundation walls vary little by climate or region in terms of the required rebar reinforcement, the concrete or mortar fill to the finished height of walls, and the loads they are designed to support and resist.

Masonry foundation walls require vertical and horizontal reinforcement, subject to their finished height, concrete or appropriate mortar fill in the voids, and (again specific to height of the walls) strap or anchor placement for properly fastening the structure above to complete the load path.

When compared with other foundation wall options, construction of masonry foundation walls will typically require the use of more construction labor at the site, in addition to possibly necessitating more visits by the building inspector at the foundation stage.

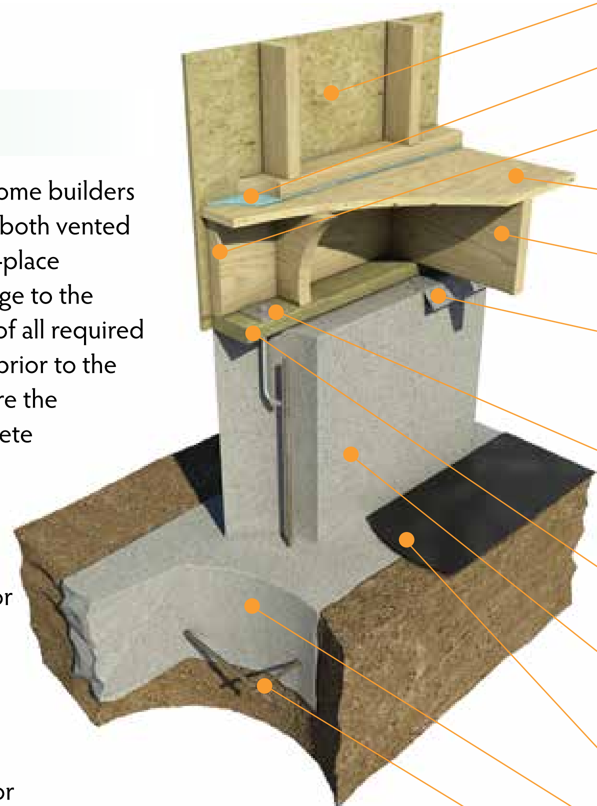
(1) ANSI/AWC PWF 2007; www.awc.org

Foundations

Continuous Stemwall

Concrete Stemwalll on Spread Footing

Poured concrete foundation walls are an option used by some builders for enclosed crawlspace construction, and are suitable for both vented and unvented crawlspaces. The construction of poured-in-place concrete foundation walls is typically done as a second stage to the concrete footings in order to allow for correct placement of all required wall reinforcement. Additional inspections and approvals prior to the concrete pour may be required. Straps or anchors to secure the structure above are normally wet-set into the top of concrete foundation walls.



Although complex, requiring construction of forms and temporary bracing, concrete foundation walls offer high integral strength that may be necessary in high-wind and/or flood-prone areas. Poured concrete foundation walls are preferred by some builders where unbalanced backfill heights of finished grades can be an issue.

Care must be taken to prevent inconsistent or incomplete placement of concrete within the forms; otherwise, voids or "honeycombs" in the finished foundation walls may result.

Adequate time for the concrete walls to sufficiently cure prior to the commencement of construction above the foundation is necessary for both structural integrity and worker safety.

Closed Crawlspaces

Insulated unvented/semi-conditioned crawlspace construction provides the opportunity for heating and air-conditioning ductwork to be installed below the floor framing, yet still within the conditioned thermal envelope of the home. This practice meets the current mandatory requirement of the EnergyStar® certification program for HVAC ductwork to be installed within the conditioned space. Mechanical or other equipment may be installed within the crawlspace, subject to access, combustion-air and exhaust gas ventilation requirements.

Construction cost savings and increased energy efficiency may be achieved with the specification of an unvented/semi-conditioned crawlspace where the insulated wall area of the enclosed foundation is less than the floor area that would otherwise require insulation.

Attention is required to properly install a Class I vapor retarder – fully taped and sealed with seams overlapping at least six inches – to all exposed earth within the enclosed crawlspace, as well as to the inside face of all perimeter foundation walls.

Where masonry foundation walls are specified, the vapor retarder secured to the inside face of the walls is to terminate below the sill plate, providing future inspection access that may be required in locations susceptible to termites or other wood-destroying insects.

www.energyvanguard.com

Floor Framing

A typical framing system for a raised wood floor includes three main structural elements: girders, joists and the subfloor. Tables 12-19 are intended to provide guidance on wood products commonly used in raised floor systems. Allowable loads or maximum spans are given for typical grades and sizes of the various structural wood products. These loads or spans were determined in accordance with appropriate standards assuming dry service and normal load duration. They are based on uniformly distributed gravity loads only. Refer to referenced sources for more complete information and detailed requirements for each wood product.

KEY

FOR EACH CLEAR OPENING[1], THERE ARE THREE ROWS OF NUMBERS:

Row 1: Maximum Total Load (plf) with deflection limited to ℓ/240
Row 2: Maximum Live Load (plf) with deflection limited to ℓ/360
Row 3: Required Bearing Length[2] in inches

1 Clear Opening is defined as the distance from inside face to inside face of supports.
2 Required Bearing Lengths are provided in 1.5" increments. They are based on the compression perpendicular-to-grain design value for the girder. Longer lengths may be required because of the material the girder is bearing on.

GIRDERS – ALLOWABLE LOADS

Tables 12, 13, 14 and 15 provide allowable loads in pounds per lineal foot (plf) for glued-laminated, solid-sawn, nail-laminated and laminated veneer lumber girders, respectively. See the KEY for an explanation of the table values.

Table 12 24F-1.8E Southern Pine Glued-Laminated Timber, 3½" Width

Clear Opening ft.	Size (nominal inches)						
	8¼	9⅝	11	12⅜	13¾	15⅛	16½
8	955	1262	1650	2027	2504	2942	-
	814	1235	1650	2027	2504	2942	-
	1.5	3.0	3.0	4.5	4.5	6.0	-
10	612	815	1065	1350	1627	1970	2290
	421	644	961	1350	1627	1970	2290
	1.5	3.0	3.0	3.0	4.5	4.5	6.0
12	360	557	743	942	1164	1381	1645
	245	377	563	802	1100	1381	1645
	1.5	3.0	3.0	3.0	3.0	4.5	4.5

Source: *APA - The Engineered Wood Association* (www.apawood.org). Maximum floor spans are from inside of bearings in simple-span applications. 36 pcf.

Table 13 Solid-Sawn No. 2 Southern Pine

Span ft.		Size (nominal inches)		
		4x6	6x6	6x8
8	TL	173	272	404
	LL	173	272	404
	Brg	1.5	1.5	1.5
10	TL	110	173	256
	LL	96	152	256
	Brg	1.5	1.5	1.5
12	TL	75	118	176
	LL	56	88	174
	Brg	1.5	1.5	1.5

Source: Structural Building Components Association (www.sbcindustry.com)

Table 14 Nail-Laminated No. 2 Southern Pine Lumber

Span ft.		2-ply			3-ply			4-ply		
		2x8	2x10	2x12	2x8	2x10	2x12	2x8	2x10	2x12
8	TL	240	339	471	415	586	814	554	781	1086
	LL	240	339	471	415	586	814	554	781	1086
	Brg	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
10	TL	152	215	300	264	374	520	353	498	693
	LL	152	215	300	264	374	520	353	498	693
	Brg	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
12	TL	105	148	207	182	257	359	243	343	478
	LL	105	148	207	166	257	359	221	343	478
	Brg	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5

Source: Structural Building Components Association (www.sbcindustry.com)

Table 15 2.0E Laminated Veneer Lumber, 3½" Width (2-ply 1¾")

Clear Opening ft.	Depth (inches)						
	7¼	9¼	9½	11¼	11⅞	14	16
10	466	911	983	1358	1504	2000	2510
	316	614	662	1063	1234	1867	2510
	1.5	3.0	3.0	3.0	3.0	4.5	6.0
12	273	560	605	947	1049	1402	1802
	187	379	410	645	751	1156	1664
	1.5	1.5	1.5	3.0	3.0	4.5	4.5
14	172	356	385	617	721	1053	1331
	119	244	263	419	489	780	1105
	1.5	1.5	1.5	3.0	3.0	3.0	4.5

Source: APA - The Engineered Wood Association (www.apawood.org). Maximum floor spans are from inside of bearings in simple-span applications.
Design properties: 2900 F_b, 2.0 E (Apparent), 285 Fv, 750 $F_{c\perp}$, Depth factor = $(12/d)^{(1/8)}$, 42 pcf.

JOISTS – MAXIMUM SPANS

Tables 16, 17 and 18 provide maximum spans in feet-inches for lumber floor joists, floor trusses and I-joists, respectively, all designed for a floor live load of 40 pounds per square foot (psf). See each individual table for other design assumptions.

Table 16 — Southern Pine Lumber

40 psf live load, 10 psf dead load, ℓ/360 live-load deflection

Size (inches)	Spacing (on-center, inches)	Grade No. 1 (ft. - in.)	No. 2 (ft. - in.)	No. 3 (ft. - in.)
2 x 8	12	14 - 2	13 - 6	10 - 3
	16	12 - 10	11 - 10	8 - 11
	24	11 - 3	9 - 8	7 - 3
2 x 10	12	18 - 0	16 - 2	12 - 6
	16	16 - 1	14 - 0	10 - 10
	24	13 - 1	11 - 5	8 - 10
2 x 12	12	21 - 11	19 - 1	14 - 9
	16	19 - 1	16 - 6	12 - 10
	24	15 - 7	13 - 6	10 - 5

Source: Structural Building Components Association (www.sbcindustry.com). Maximum spans are from inside to inside of bearings.

Table 17 — Floor Trusses with Southern Pine Lumber

40 psf live load
10 psf dead load top chord, 5 psf dead load bottom chord

Depth (inches)	Spacing (on-center, inches)	Grade Sel Str/No. 1 Dns (ft. - in.)	No. 1 (ft. - in.)	No. 2 (ft. - in.)
12	24	18 - 2	17 - 6	14 - 6
14	24	21 - 3	20 - 5	15 - 6
16	24	22 - 6	21 - 6	16 - 3

Source: Structural Building Components Association (www.sbcindustry.com). Assumes bottom-chord bearing.
Sel Str = Select Structural, Dns = Dense

Table 18 — Prefabricated Wood I-Joists

40 psf live load, 10 psf dead load, ℓ/480 live-load deflection

Depth (inches)	Spacing (on-center, inches)	I-Joist Series PRI-40 (ft. - in.)	PRI-80 (ft. - in.)	PRI-90 (ft. - in.)
11⅞	16	19 - 4	22 - 4	22 - 11
	19.2	18 - 3	21 - 0	21 - 8
	24	16 - 7	19 - 7	20 - 2
14	16	21 - 11	25 - 4	26 - 0
	19.2	20 - 5	23 - 10	24 - 6
	24	18 - 3	22 - 2	22 - 10
16	16	24 - 2	28 - 0	28 - 9
	19.2	22 - 0	26 - 5	27 - 1
	24	19 - 8	23 - 11	25 - 3

Source: *PRI-400 Performance Standard for APA EWS I-Joists*, APA – The Engineered Wood Association (www.apawood.org). Maximum floor spans are from inside of bearings in simple- or multiple-span applications with glued-nailed floor.

SUBFLOOR – ALLOWABLE LIVE LOADS

Table 19 provides allowable live loads in pounds per square foot (psf) for Sturd-I-Floor and rated sheathing with the strength axis perpendicular to supports.

Table 19 — Plywood and OSB[1]

10 psf dead load, ℓ/360 live-load deflection

Sturd-I-Floor Span Rating	Sheathing Span Rating	Minimal Panel Performance Category	Maximum Span (inches)	Allowable Live Loads (psf), Joist Spacing (on-center, inches): 12	16	19.2	24	32	40	48[2]
16 oc	24/16, 32/16	7/16[3]	16	185	100					
20 oc	40/20	19/32	19.2	270	150	100				
24 oc	48/24	23/32	24	430	240	160	100			
32 oc	60/32[4]	7/8	32		405	295	185	100		
48 oc		1-3/32	48			425	290	160	100	55

Source: *Engineered Wood Construction Guide*, APA - The Engineered Wood Association (www.apawood.org). (1) Panels 24 inches or wider applied over two or more spans in dry use. (2) 4x nominal or double 2x framing. (3) 19/32 is minimum of Rated Sturd-I-Floor. (4) Check with supplier for availability. oc = on-center spacing.

Other Considerations

Moisture Management

Moisture-related issues are among the most common problems faced in new home construction. Moisture management in raised wood floor construction should be addressed with shared attention to drainage, ventilation, insulation and vapor retarders.

Drainage paths under and away from the home are critical, whether to basement construction or grade-level crawlspaces. Flood vents are required to be installed within enclosed crawlspaces of homes built in flood zones, providing pressure equilibrium to the foundation walls in the event of flooding.

Ventilation, whether natural or mechanical, is vital to the occupants' health and the sustainability of the structure. Installation of a Class I vapor retarder over exposed earth under a raised wood floor will reduce code-required ventilation, though optimum foundation performance is provided by incorporating plentiful, rather than minimal, ventilation.

Conditioned/semi-conditioned crawlspace construction requires the vapor retarder to be continuous up the inside face of enclosing foundation walls, sealed to the walls within inches of the sill plate.

Insulation

A thorough understanding of insulation options is critical to the health, energy performance, sustainability and overall livability of a raised wood floor home. Carefully consider the choice of insulation. This decision should not be based solely on the minimum R-value required, but with consideration to construction cost, home occupant energy use and related cost, and off-gassing of volatile organic compounds. Also consider the insulation's compatibility with all other construction methods and materials used, as well as with both the site-specific and the surrounding environment.

Common thermal barrier-type insulations include a variety of options such as fiberglass or cellulose batt, open-cell sprayed cellulose, and closed-cell sprayed foam.

Thermal break insulation, including rigid foam board, is typically installed at the exterior face of the thermal envelope. Often placed behind exterior finish materials, or between footings/foundation walls and bearing soils in frost-protected or thermally enhanced foundations, this type provides continuous insulation, excluding thermal bridging materials.

Radiant barrier-type products, such as foil-faced structural panels, have been proven to enhance home energy performance where sufficient, continuous "air space" is provided immediately adjacent to the foil surface, but are redundant if insulation eliminates the required void.

The selection of insulation can significantly impact moisture management. Particular attention is recommended in coastal and other moisture-rich environments, especially hot, humid climate zones.

Whether required or optional, important consideration of the type of vapor barrier is necessary for best performance of the insulation, as well as the sustainability of the structure. Wood, and wood fiber-based products, must be allowed to "breathe"; otherwise, their service life can be reduced. The improper use of vapor retarders, including insulation products such as closed-cell spray foam which forms a vapor barrier by its composition, may cause considerable damage to structural elements where wood products are unintentionally encapsulated.

Decks & Porches

Wood decks and porches are natural extensions of a raised floor's elevated platform. Each year, more than a million decks are built or upgraded in America. Homeowners are also rediscovering the charm and energy-saving practicality of porches. Beauty, added value and comfort are just a few reasons why decks and porches are so popular. These "outdoor rooms" extend the living space of the home for open-air entertainment and relaxation.

SouthernPineDecks.com offers the building professional a host of construction details and installation tips to create safe, code-compliant outdoor living spaces that maximize homeowner satisfaction. Because of its wide use in outdoor applications, special guidance is provided for pressure-treated Southern Pine structural lumber and decking boards.

Finishing & Trim

Visually, a raised foundation functions as a pedestal, enhancing curb appeal regardless of architectural style. Landscaping also enhances the look of a raised floor home by accenting, rather than hiding the home's façade.

Finishing touches to the foundation's appearance are an important final step to complete the job. Many options are available. For a continuous stemwall foundation, for example, textured concrete blocks or stucco can provide an upgraded look. For pier-and-beam foundations, pressure-treated wood lattice is a popular choice to install between perimeter piers.

Universal Design

Today, more builders are incorporating basic elements of universal design – such as wider doorways and lower light switches – and successfully marketing these as value-added features to homebuyers. The subtle "cushion" of a wood floor system provides a more comfortable walking surface, putting less stress on people's joints, legs and backs as they age. And, if the need arises to bypass stairs, a ramp or electric lift can create safe, easy entry to the home.

Considerations for aesthetics are paramount. Creative designs blend the ramp into the overall design of a home. Consider using a side, garage or rear entrance to the home, helping conceal its appearance from the street. A sloping lot may allow the existing landscape to reduce the required length of a ramp. Plants, shrubs and decorative fencing screens can be used to soften the visual appearance of a ramp.

Pest Management

By design, a raised floor helps isolate the living space from pests by elevating it above the ground. Practical and effective methods and materials are available to also prevent entry of pests into the crawlspace.

In continuous stemwall foundations, pest entry is restricted with properly specified ventilation coverings. A variety of materials can be used, provided the openings in the coverings do not exceed 1⁄4˝.

With a pier-and-beam foundation, either a perimeter or an under-floor barrier can be used to inhibit pest entry. At the foundation's perimeter, pressure-treated decorative latticework backed with corrosion and pest-resistant screening can be framed between piers. For protection under the floor, a breathable pest barrier is typically attached to the bottom edge of the joists.

Cost-Saving Strategies

Consider these proven strategies to save time and money in the construction process.

1 Eliminate/minimize fill dirt requirement

Bringing in fill to raise a site is expensive and time consuming. Fortunately, using a raised wood floor foundation by default eliminates practically all fill dirt needs. So, the first strategy is a no-brainer: build on a raised wood floor foundation.

Saves dirt, transportation, one subcontractor trade and time

2 Properly size all concrete footings, grade beams and piers

Don't be afraid to challenge the project engineer. In many cases, footings are oversized because they were not designed for the specific project and site, and because cost-saving strategies were not considered.

Saves concrete

3 Consider spot footings for interior piers

When the design allows for spot footings under a pier or column, considerable concrete and labor is saved when compared to continuous footings.

Saves concrete and time

4 Use trenched earth to form concrete

Whenever possible, avoid formwork by using the free formwork of dirt. Most footings will be below finish grade and not exposed to view.

Saves labor and form material

5 Consider wood pony walls and/or wood posts

Eliminate a separate subcontractor trade. When there is no concrete masonry on the project, an entire sub-trade can be eliminated. Instead, framers can easily install wood pony walls and wood posts on top of footings.

Saves one subcontractor trade, CMUs and time

6 Explore systems that require only a single pour of concrete

Most projects require a concrete truck (and possibly a pumping truck) twice – once for the footings, and then a second time to either fill CMU cells or to pour a concrete wall. Consider mono-pour systems with the wall and footing poured at the same time, or wood systems situated on a concrete footing.

Saves jobsite trips, time and inspections

7 Use roof trusses to eliminate/minimize interior loads

The floor system can often be simplified by pushing all or most of the gravity loads to the exterior walls of the structure.

Saves concrete and wood

8 Optimize/eliminate interior supports

Reducing the number of required interior supports can result in significant cost savings. Consider narrow structures and design a floor system with girders and joists that span further.

Saves concrete, wood and time

9 Optimize spans and spacing of joists and girders

Wood floors systems can often be optimized with advanced framing concepts that remove redundant materials, resulting in dramatic savings. Consider the direction and spacing of joist spans, depth of joists, deflection criteria, cantilever locations, girder direction, location and spacing.

Saves wood and time

10 Employ best practices for detailing a wood floor system

Simple concepts can save a bundle: avoid hangers, ledger boards, and notching by placing joists in bearing. Framing over the top of girders minimizes the cutting of joists; end-nail rather than toe-nail whenever possible.

Saves time and connectors

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to find SFPA member producers.

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Additional Resources

The Southern Forest Products Association offers a wide variety of helpful publications for design-build professionals. The titles listed below are available online in PDF; visit SouthernPine.com to download.

Southern Pine Use Guide
grade descriptions, design values, applications, specification guidelines

Southern Pine Maximum Spans for Joists & Rafters
span tables, design criteria

Southern Pine Headers & Beams
size selection and allowable load tables for Southern Pine lumber and glulam timber

Southern Pine Flooring
product description, installation, finishing, maintenance

Pressure-Treated Southern Pine
preservative types, standards, specifications, applications

Southern Pine Decks and Porches
product selection, construction guidelines, maintenance

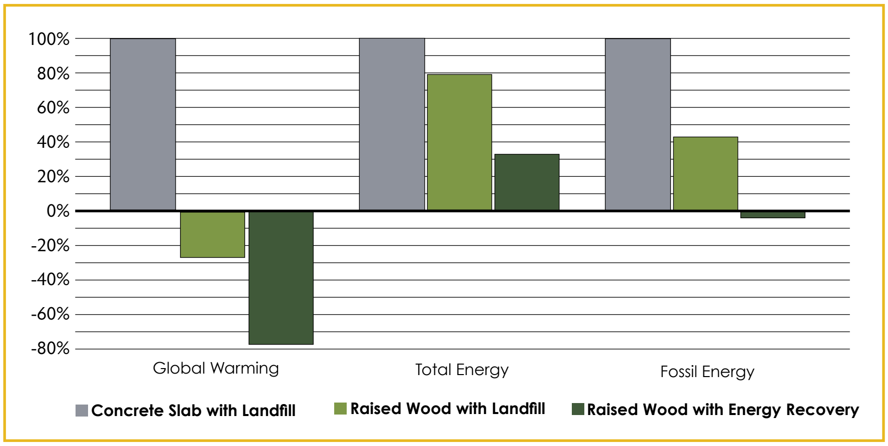
The Closed Crawl Space: Making the Transition
benefits, code considerations, best practices

The Earth-Friendly Foundation

Raised wood floor foundations are the best choice for the environment. Wood products are produced from trees, a naturally renewable and sustainable resource. A life cycle assessment of a raised wood floor compared to a concrete slab-on-grade confirmed that wood is considerably less fossil fuel dependent and contributes far less to global warming than concrete.

Raised wood floor foundations are also the best choice for sustainable community development. By not displacing rising water, raised wood floor foundations support the floodplain management principle of "No Adverse Impact" on the rights of neighboring property owners and communities. Conversely, slab-on-fill developments alter the natural floodplain, causing higher water levels and more potential flooding.

Cradle-to-Grave Comparison: Global Warming, Total Energy, Fossil Energy[3]



Source: *Reducing the Carbon Footprint of Floor Systems: The impacts on fossil fuel use and global warming of raised wood versus slab-on-grade floors*, APA – The Engineered Wood Association, 2010.

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