Entryways: Creating Attractive, Low-Cost Zero-Step Entrances

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Funded by

The Georgia Department of Community Affairs

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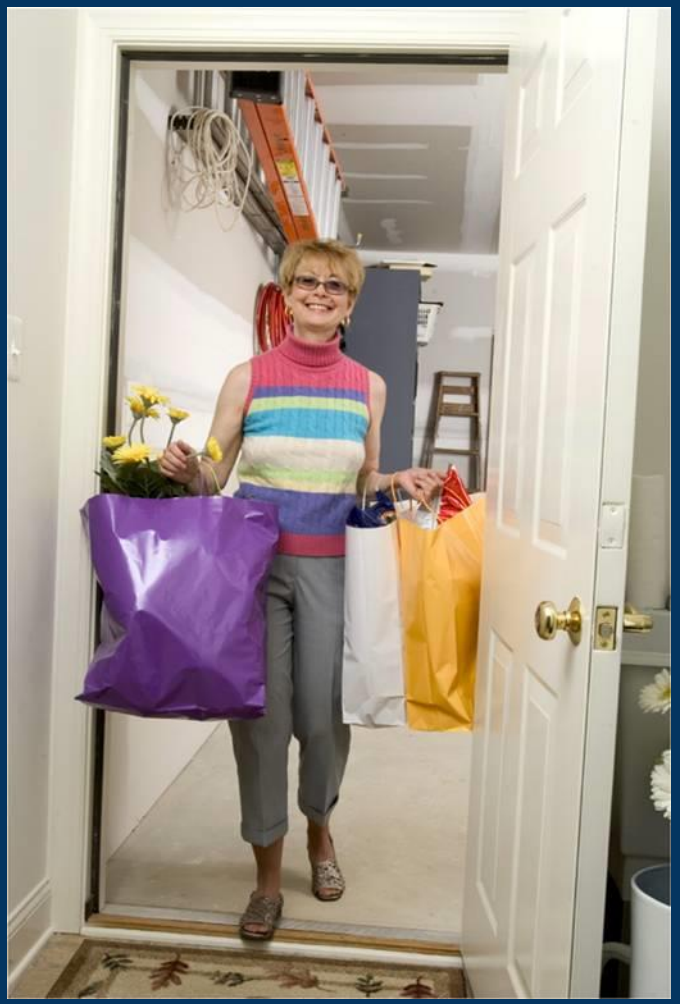
A zero-step entrance consists of :

- A stepless path no steeper than 1:12, preferably less steep, which leads to the entry door;
- A 3’0”entry door; and,
- A threshold preferably no higher than ½ inch.

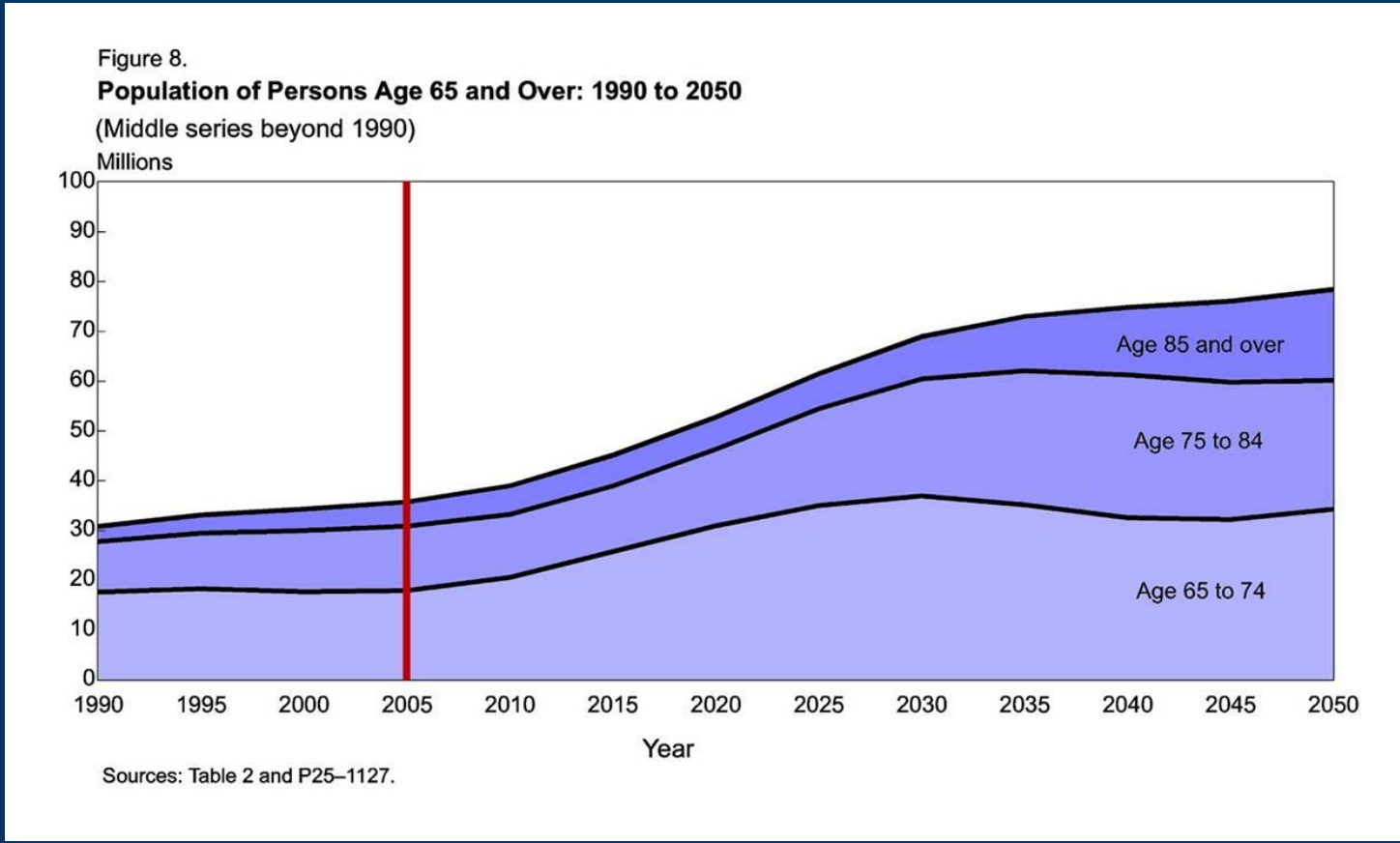


A zero-step entrance is **convenient** for all….

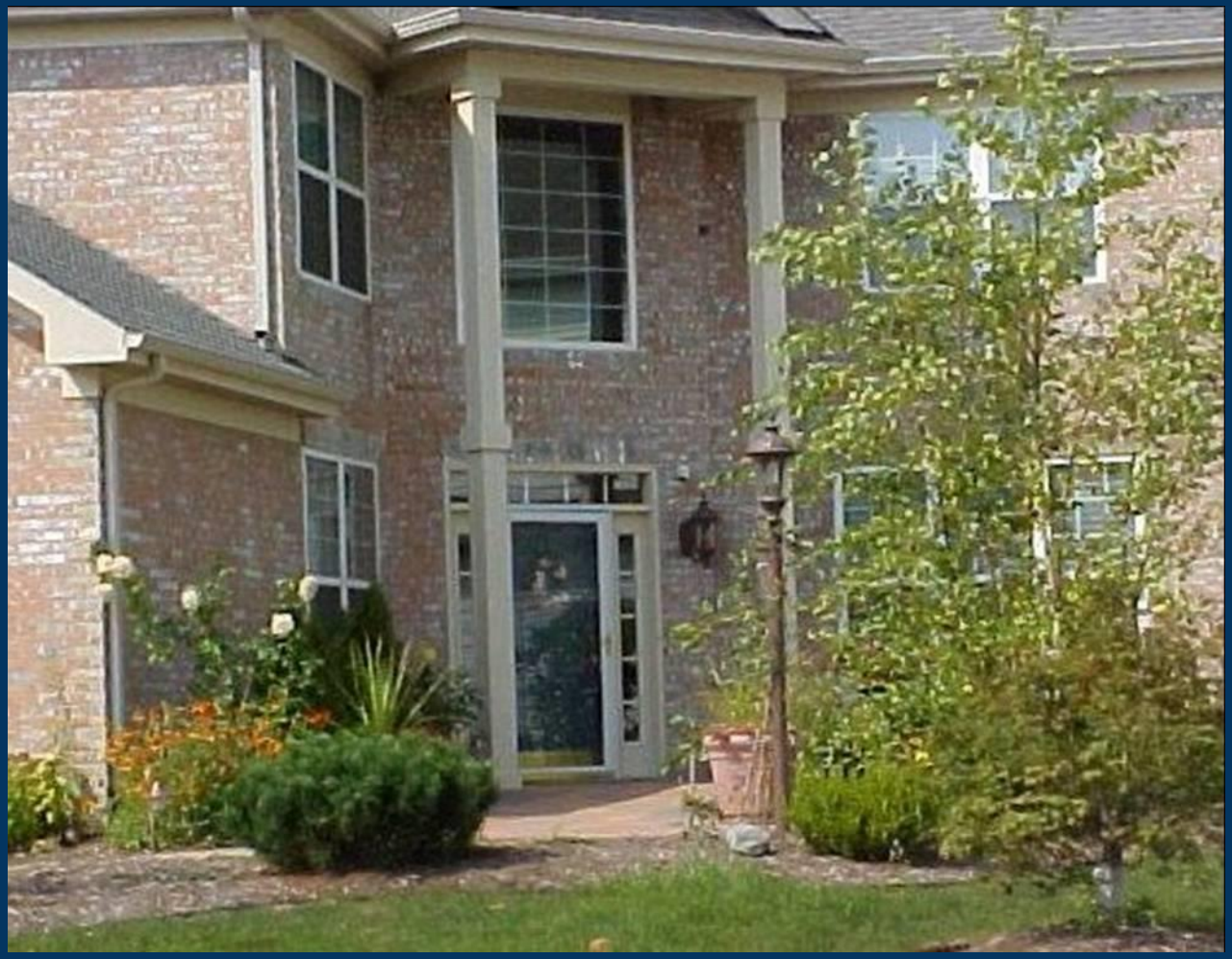
Essential for many…

…and **welcoming** to guests.

A well designed zero-step entrance is an amenity.



The number of older people in the USA and worldwide is rising dramatically. Two-thirds of all older Americans are likely to become disabled for some period, but their homes are ill-prepared to help them maintain their independence.



Many people are starting to realize the human and financial wisdom of building virtually ALL new homes with basic universal design.

Visit-ability?
Universal Design?
Inclusive Home Design?
EasyLiving Homes?

No matter what the term….

… a zero-step entrance is fundamental.

“How do I create the zero step entrance?”

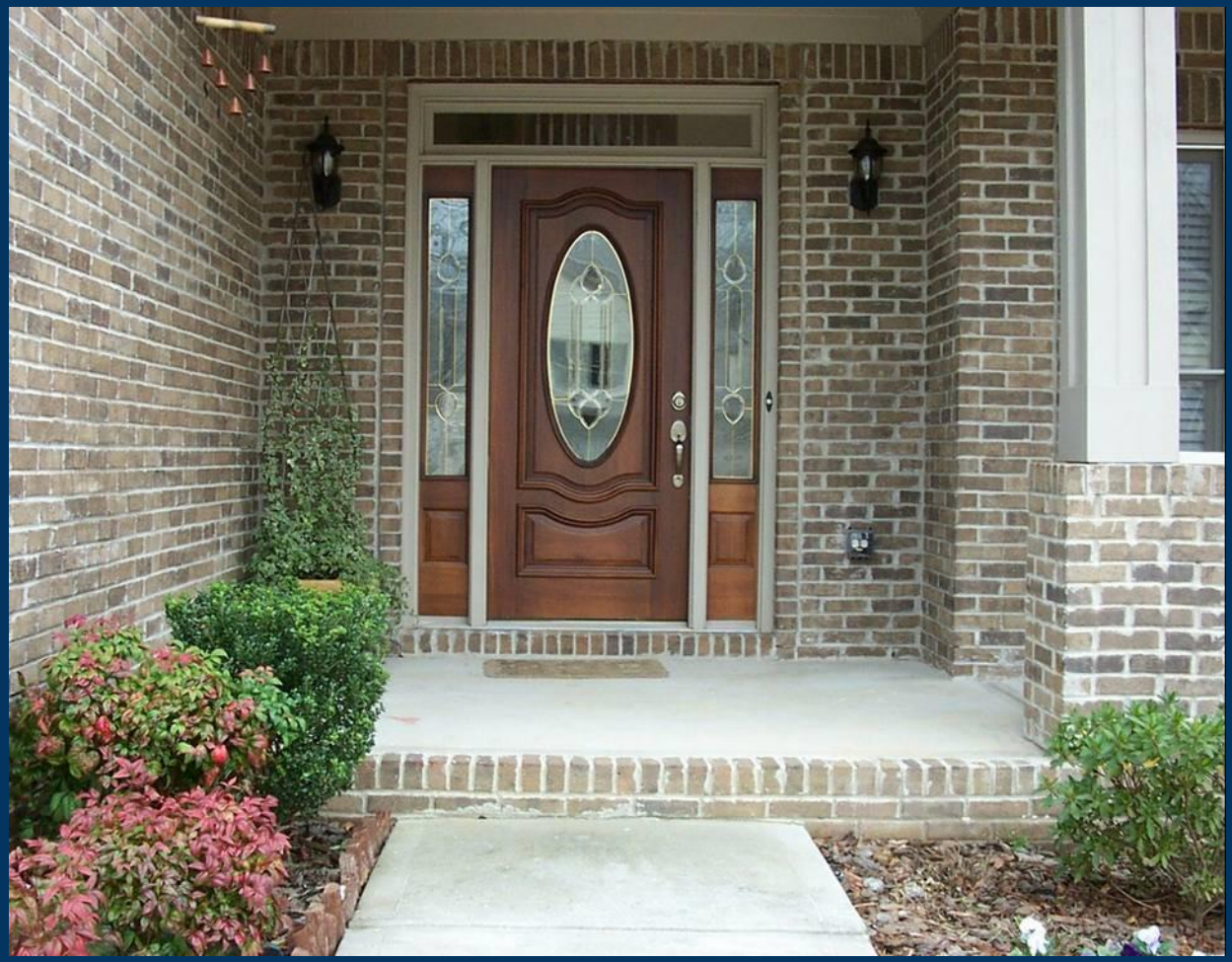
This presentation will cover:

- Myths
- Basic Principles of Siting and Grading
- Methods
- Costs
- Other Issues

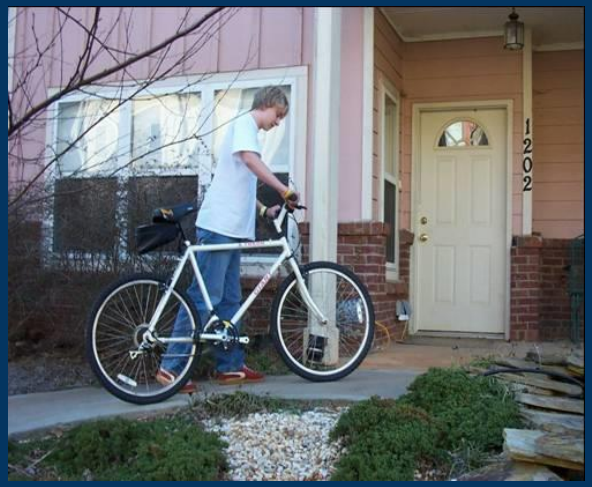
Throughout, the subject is *new* homes, not retrofits.

Retrofits of existing homes are often difficult and ungainly, and usually costly, like the long, add-on ramps in these photos. That's another reason to build a zero-step entrance from the beginning.

It is important to impact entrances on **speculative housing** – not just individually designed homes.



Currently, nearly all new homes, like the one above, lack zero-step entrances. Access laws cover only a tiny fraction of single-family houses



Common sense, changing demographics and human connection don’t wait for a law.

MYTHS

Myth 1:

A zero-step entrance looks unattractive.

In fact, well-planned access is integrated into the home and landscape design, and is an attractive asset.

MYTH 2: A zero-step entrance works only on a flat lot.

Front of 6340 Belmont

Back of 6340 Belmont

Fact: A steep lot is often even easier than a flat lot.

Myth 3:

Zero-step entrances must always be located at the front of the home.

Fact: The best location depends on the lay of the land.

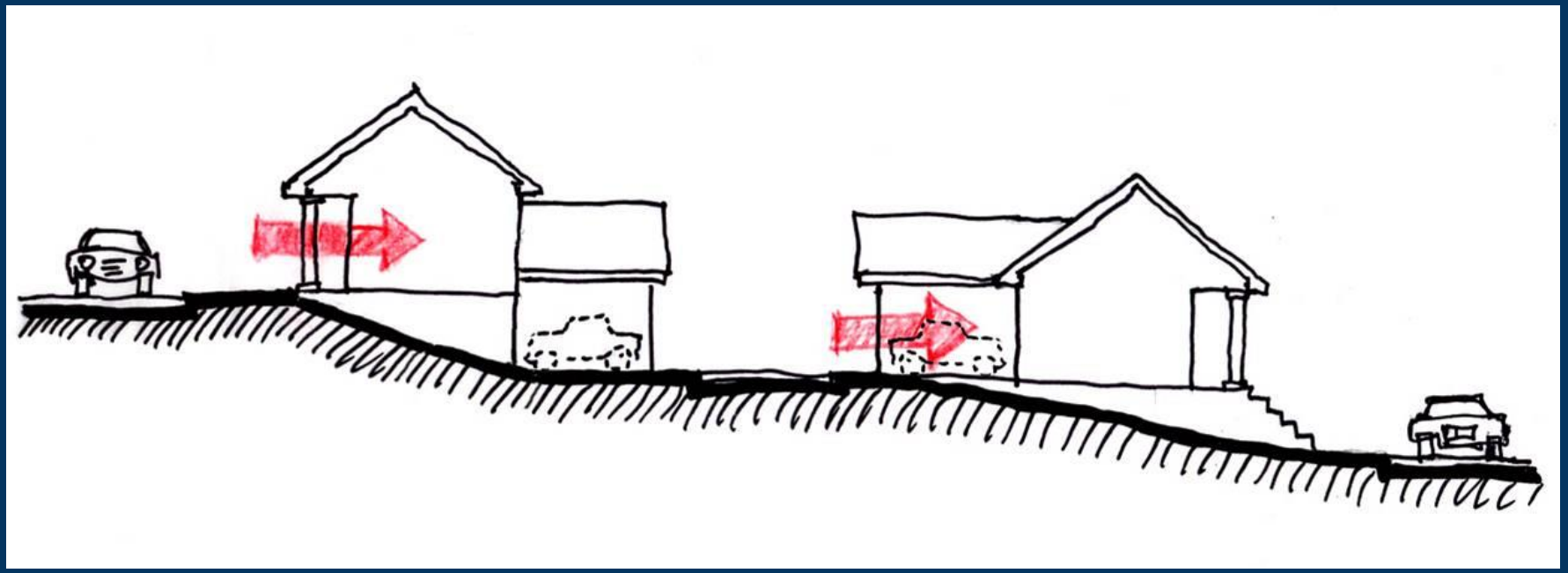
Steps at front

Short ramp at side

At the side…

Or from the driveway…

Or at the back.



Each home on this steep property has a zero-step entrance. The six homes along the high side of the property share a garage-entry alley with the six homes along the lower side.

Front of House 1

Back of House 1

Back of House 2

Front of House 2

These photos show two homes from that development.

Myth 4:

A zero-step entrance is feasible only when building on a concrete slab.

Fact: Building with a basement or crawl space does *not* deter a cost-effective zero-step entrance.

Nor does a cold, snowy climate.

This is one of several thousand Visitable homes in Bolingbrook, IL near Chicago – all with basements.

Myth 5:

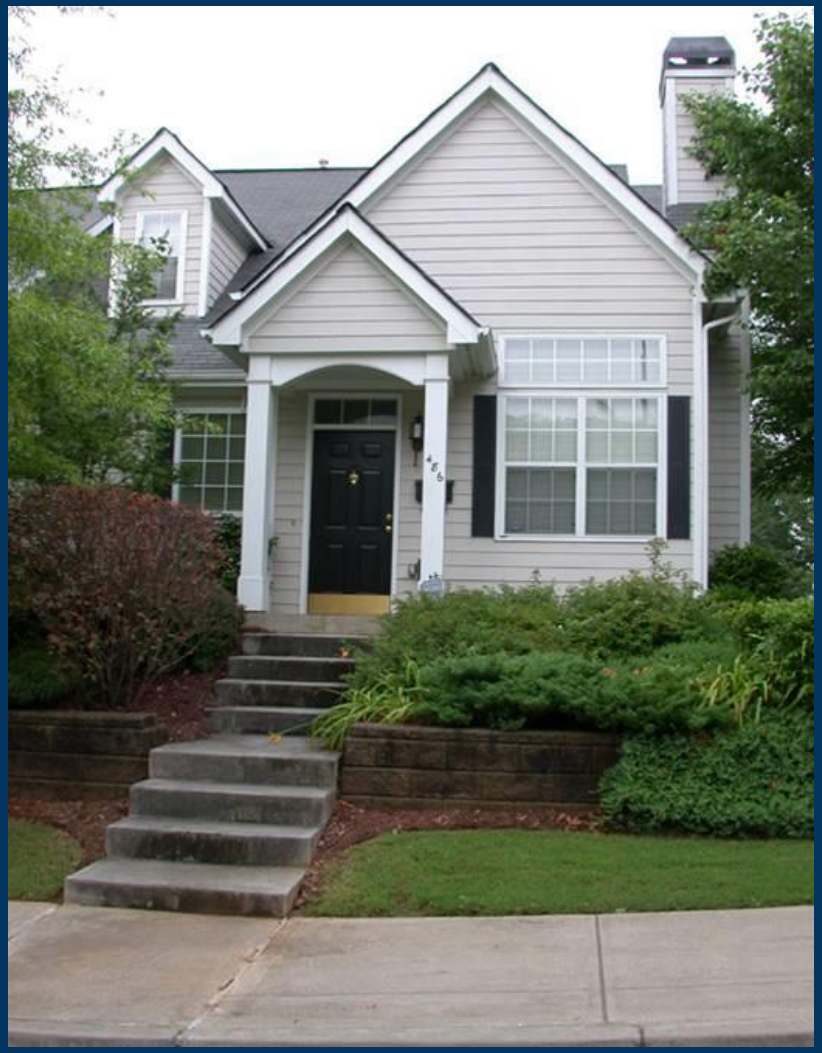
Zero-step entrances are expensive.

Fact: Planned-in-advance zero-step entrances cost little.

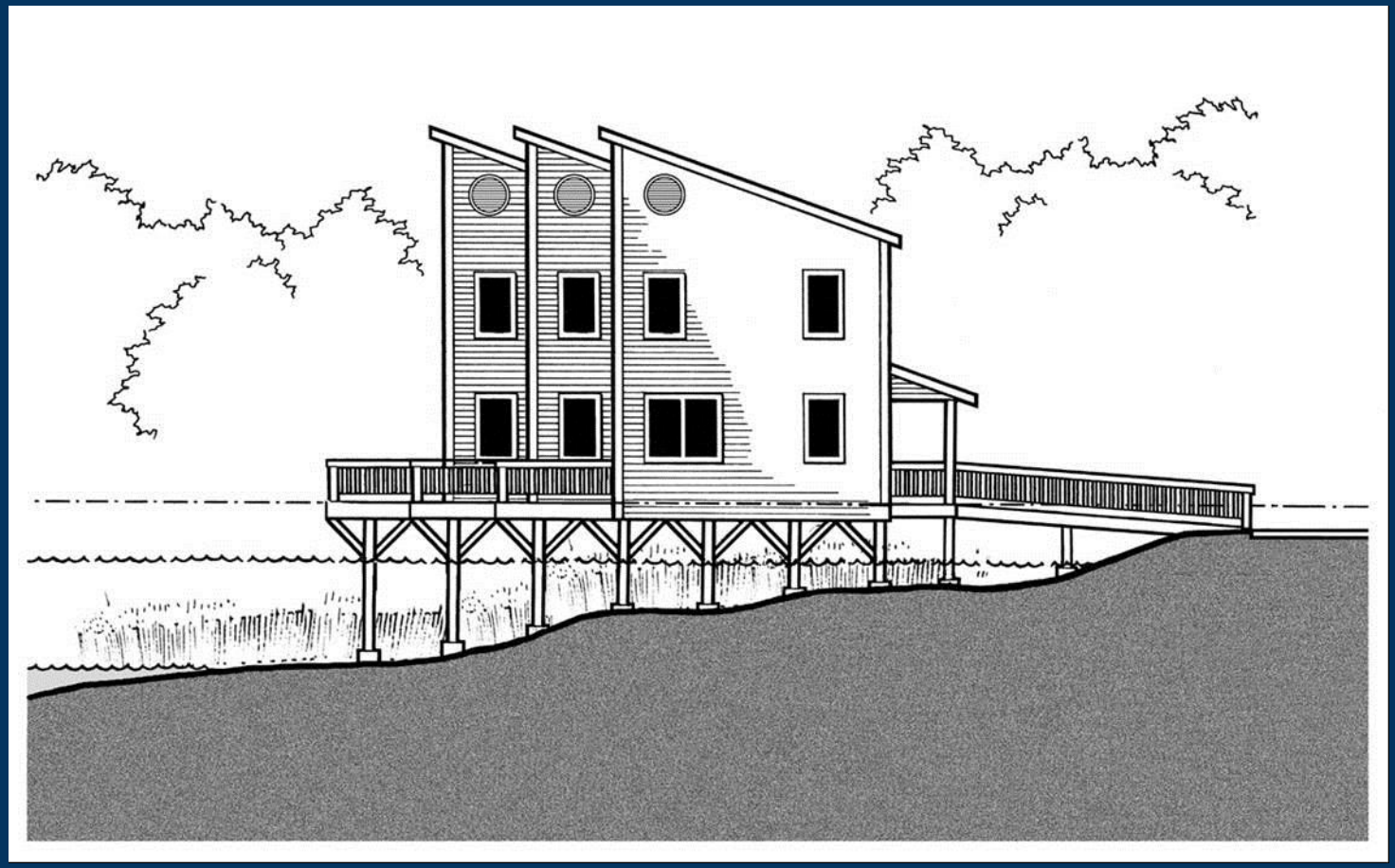
Is a zero-step entrance ALWAYS practical?

Not always.

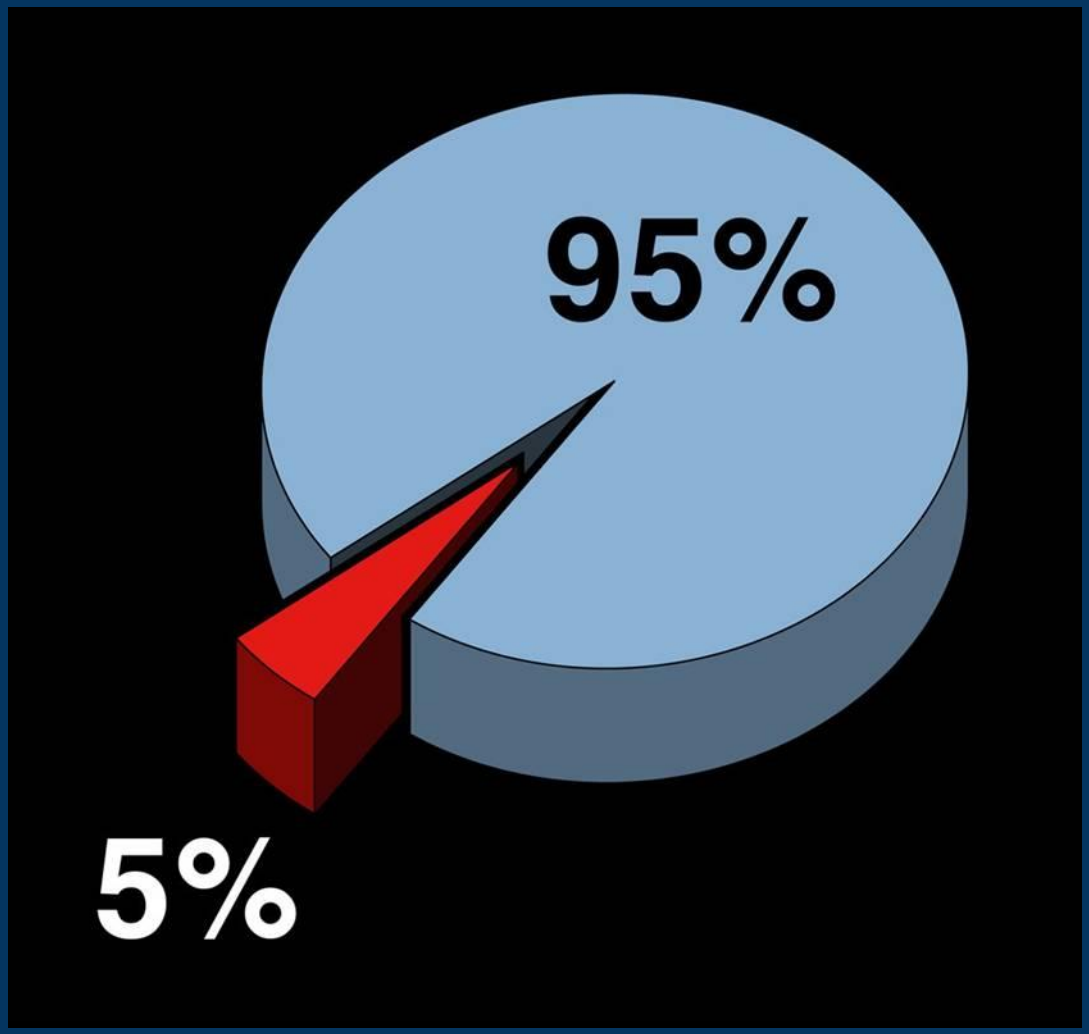
Not if the site is steep AND has no driveway AND has no back approach.



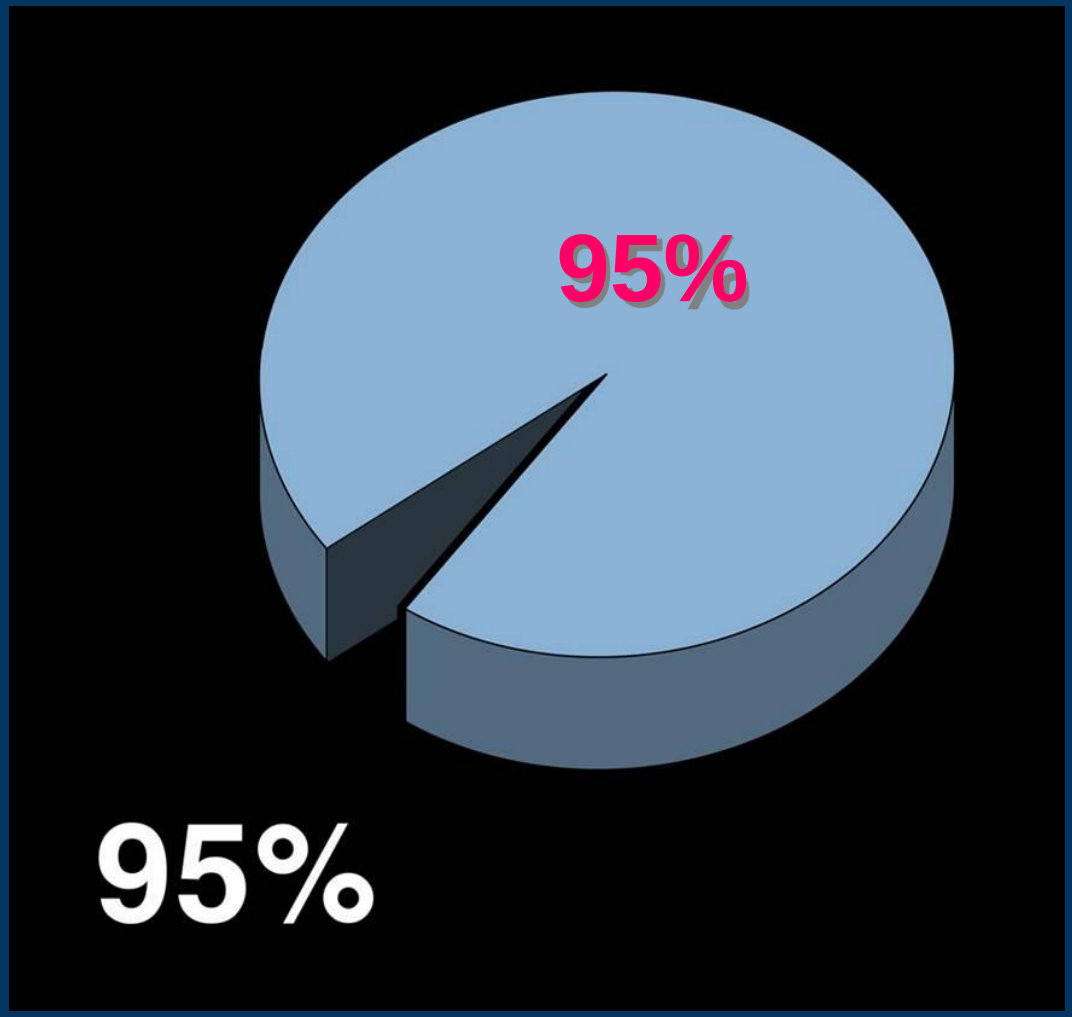
A zero step entrance is often impractical on a house set on pilings. . .



. . . Although sometimes pilings and zero-step entrances can co-exist.



Exceptions make up less than 5% of new homes.



Why not focus on the 95% plus that ARE practical?

Are zero-step entrances feasible on townhouses with short setbacks?

Yes.

And added privacy can be achieved by walls, gates, plants and other creative design.

Long view

Ramp to porch

Porch provides zero-step entrances to multiple units

A single ramp may serve multiple townhouses. Although not ideal because of the long path of travel, this solution is much preferred over steps alone.

The very common, over-garage townhouse style may result in unintended negative consequences in the near future.

It is used to address affordability and land-use issues. But….

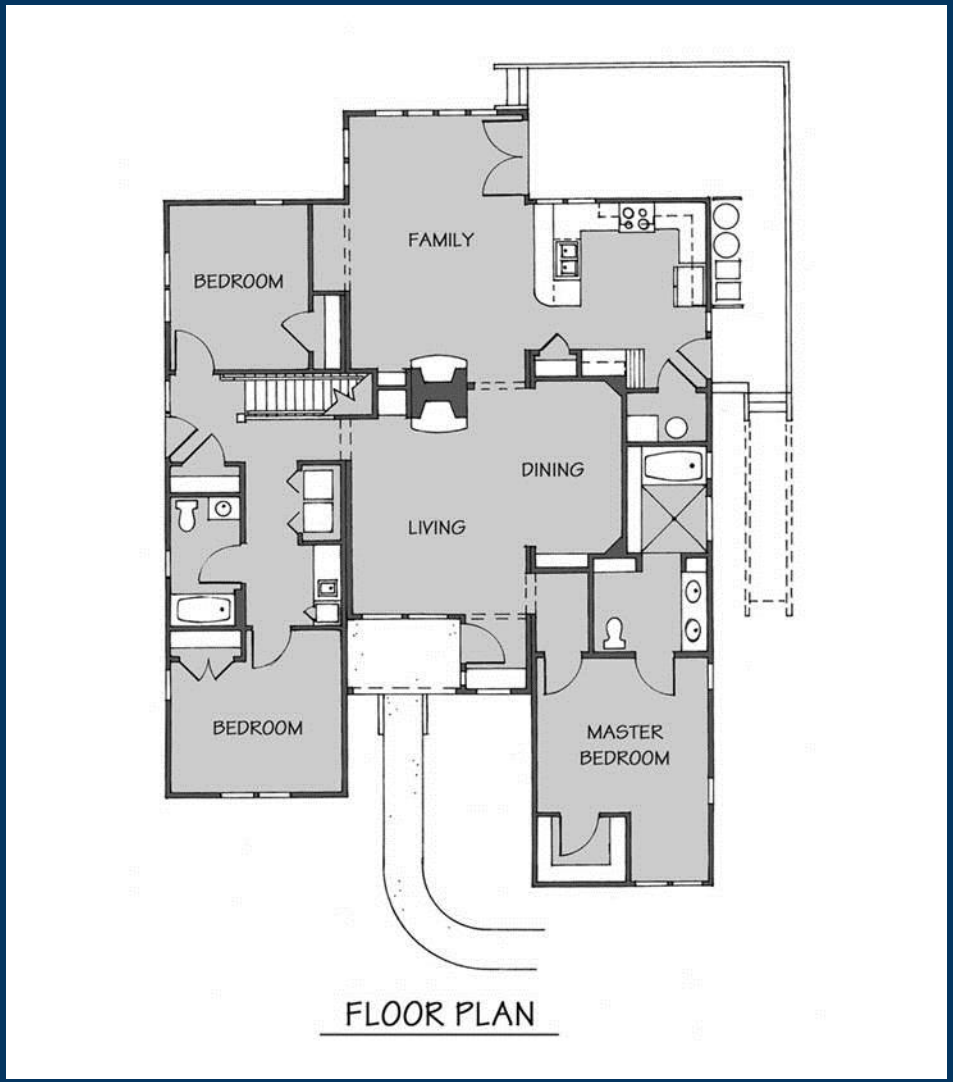
- **Is this style being over-built considering today's demographics?**
- **Could other design and parking options meet the same goals without the intense steps?**

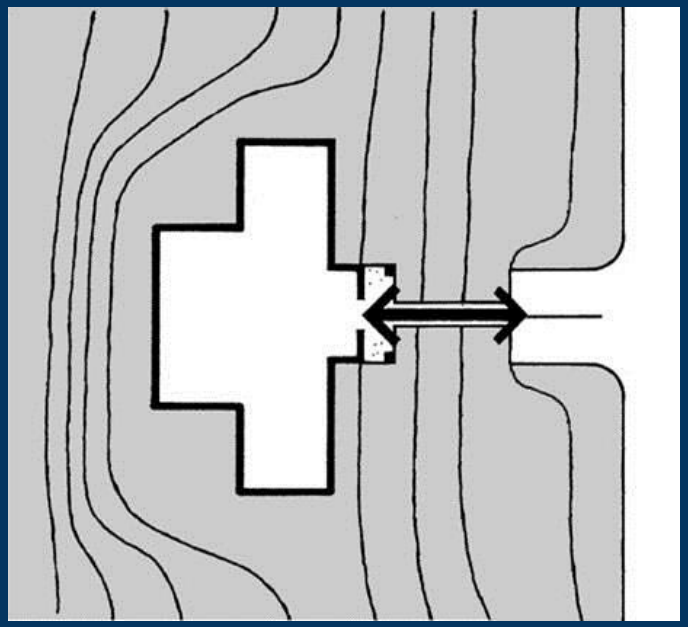
GENERAL PRINCIPLES

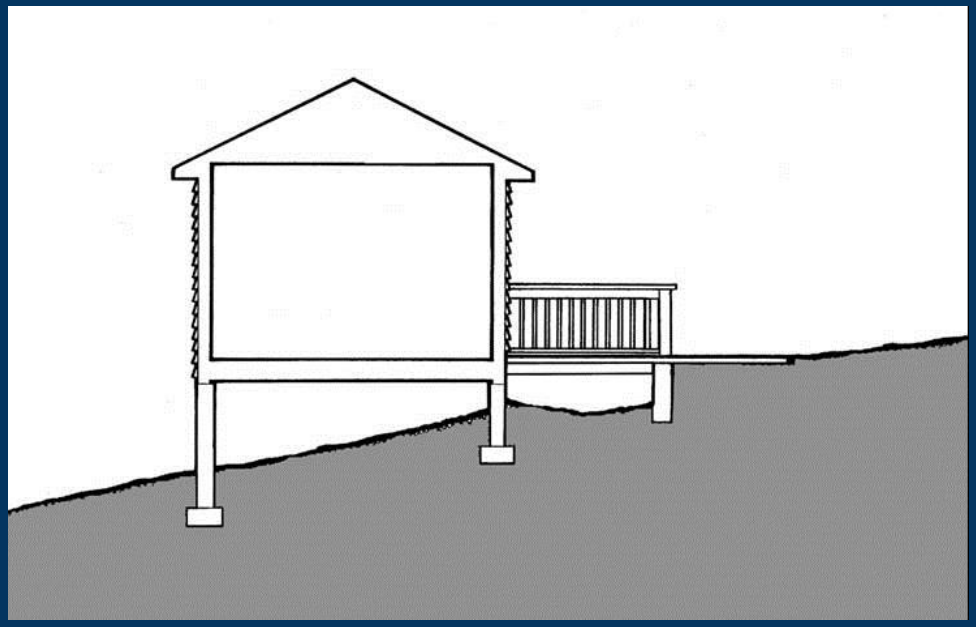
For Siting and Grading

Principle 1:

Begin at the **plan** stage…





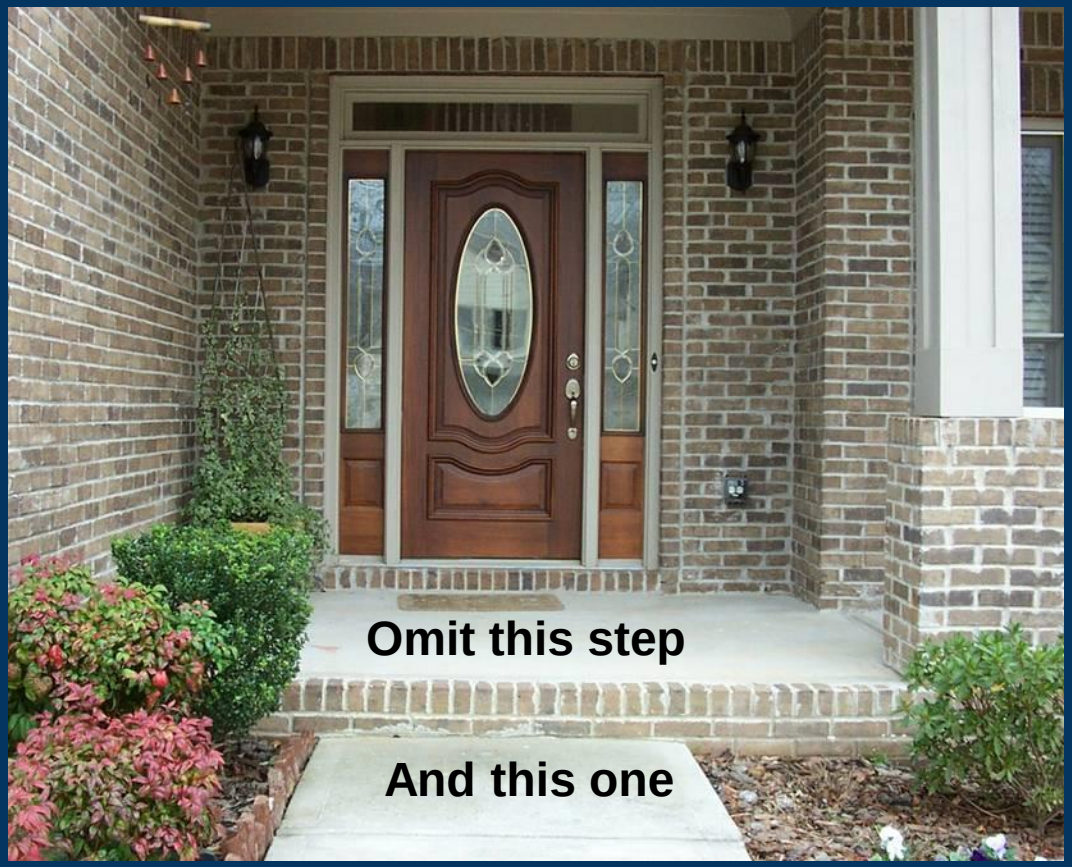


…**Site** the home with the zero-step in mind…

…and **grade** for the zero-step.

Is “one small step” a problem?

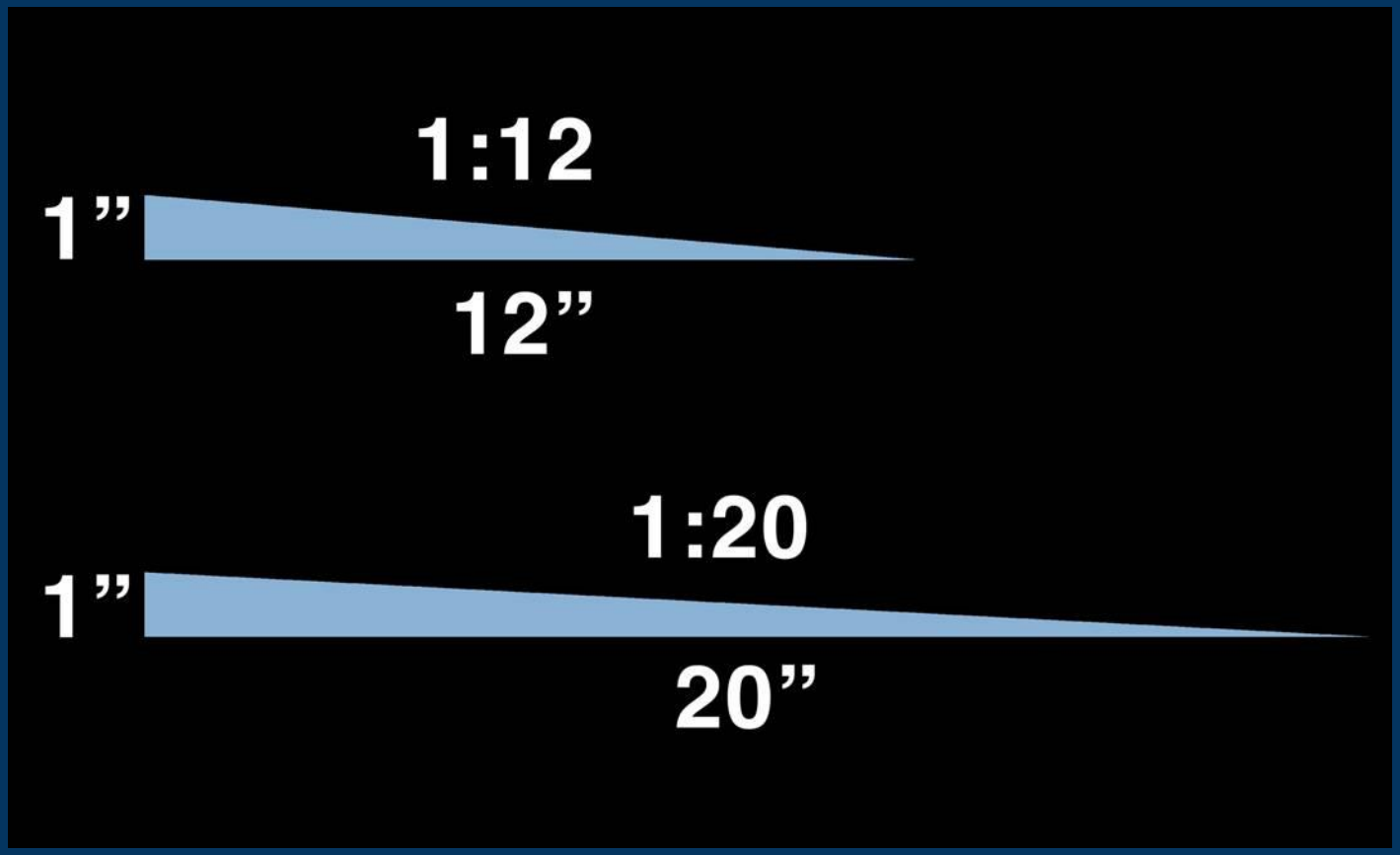
Yes!



Omit steps from walk to porch and from the porch into the house.

Principle 2: Usually a ramp is not necessary. A sidewalk can do the job, even with a basement.

Principle 3: The entry must be approachable by a firm surface at least three feet wide.



Principle 4: The slope of the incline must not exceed one inch in height for every foot in length. *It is best to go less steep when possible. 1:20 is ideal when space allows.*

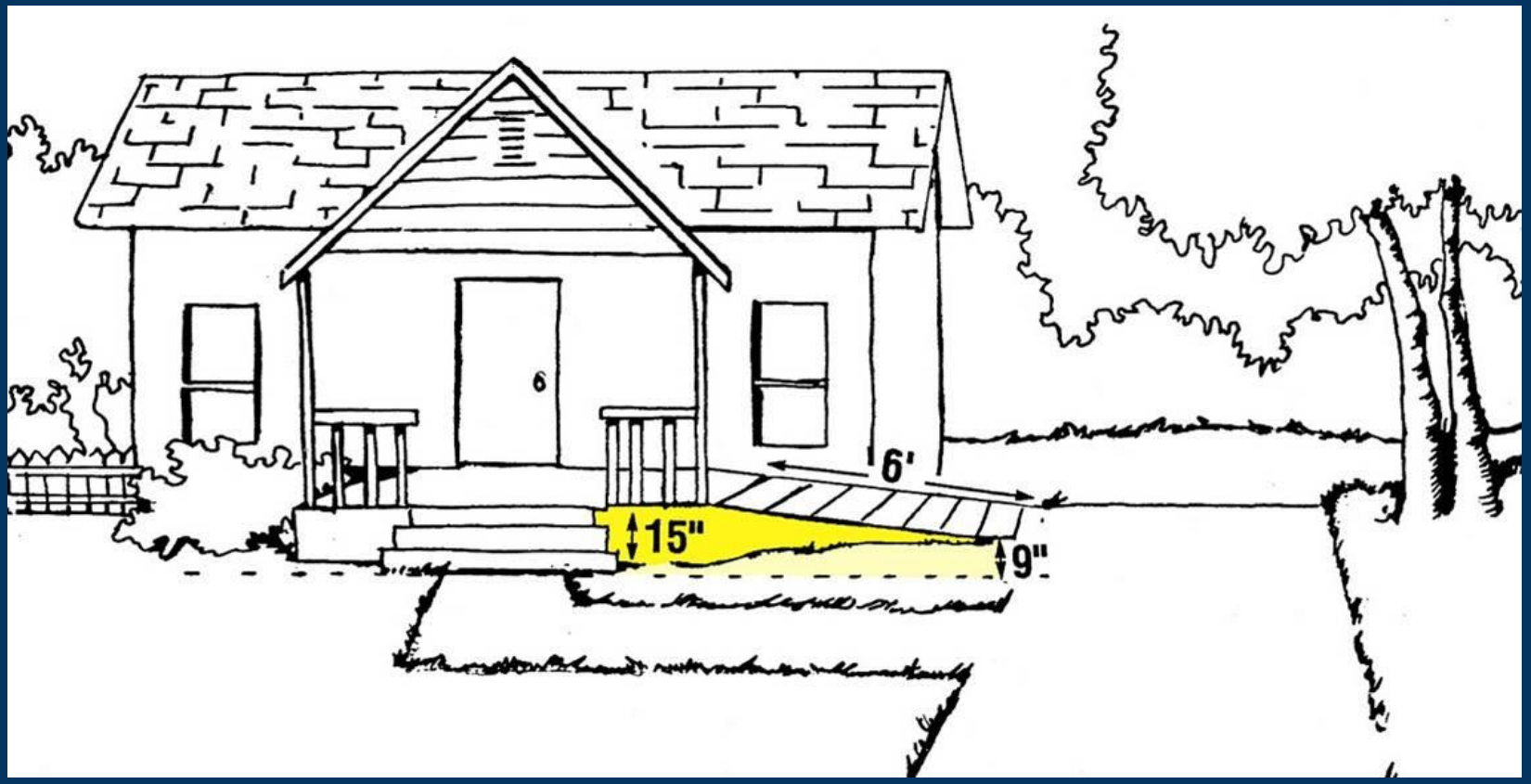
1:8 Ratios:

1 inch rise	8 inch length
2 inch rise	16 inch length
3 inch rise	2 foot length
4 inch rise	2 foot 8 inch length
5 inch rise	3 foot 4 inch length
6 inch rise	4 foot length

An exception to the 1:12 rule is that for heights six inches or less, a steeper slope can be used where space is limited. In spaces such as a small garage, 1:8 is acceptable, but otherwise should be avoided. *And, beyond a six inch rise, a 1:8 slope becomes dangerously steep for a variety of technical reasons*.

How do you minimize the steepness or the needed length of a slope?

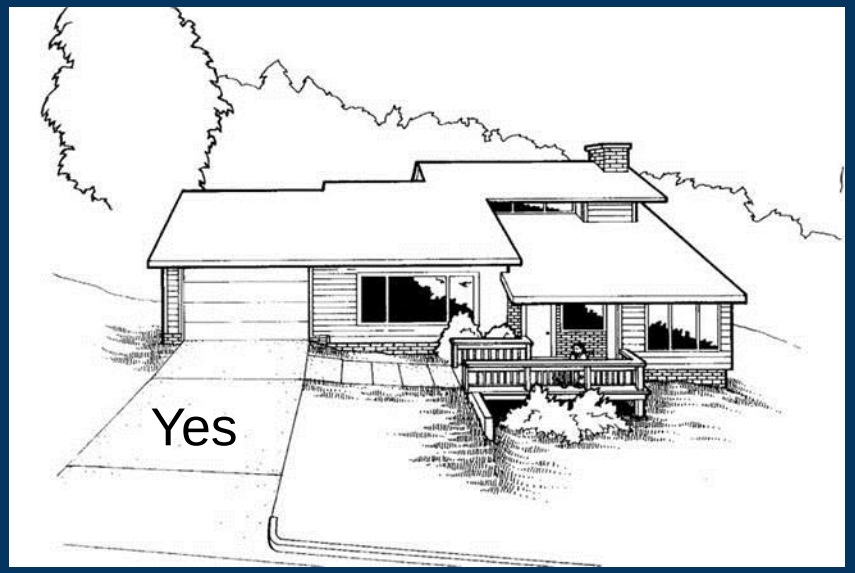
By making the elevation at the slope's starting point as near as possible to the elevation of the porch!



For example, in the informal drawing above, the 15 inch above-grade rise at the porch floor could require a 15 foot slope to achieve a 1:12 ratio. But by building up the parking pad 9 inches higher than the grade at the steps, the needed ratio is achieved with a slope just 6 feet long.

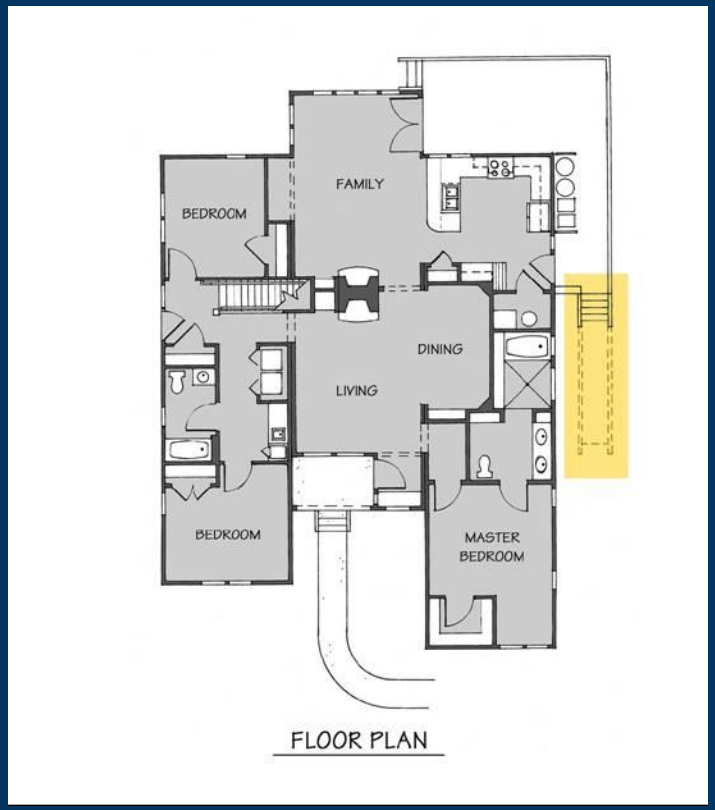
Principle 5: On a lot higher on one side than the other, put the driveway on the high side.

Here, the driveway on the low side forces a high climb to the porch.

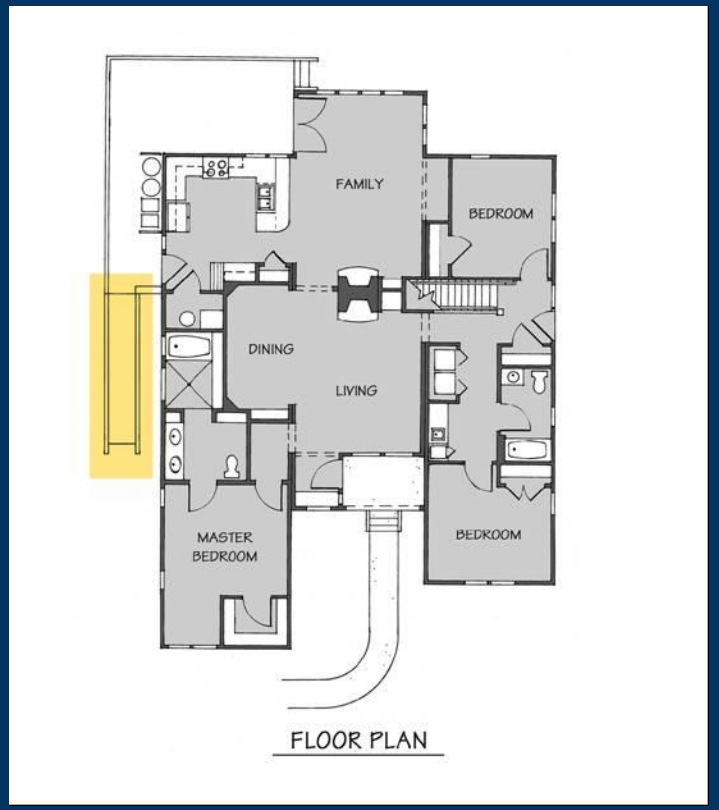


Here, the driveway on the high side permits a slope nearly level with the porch.

High Side



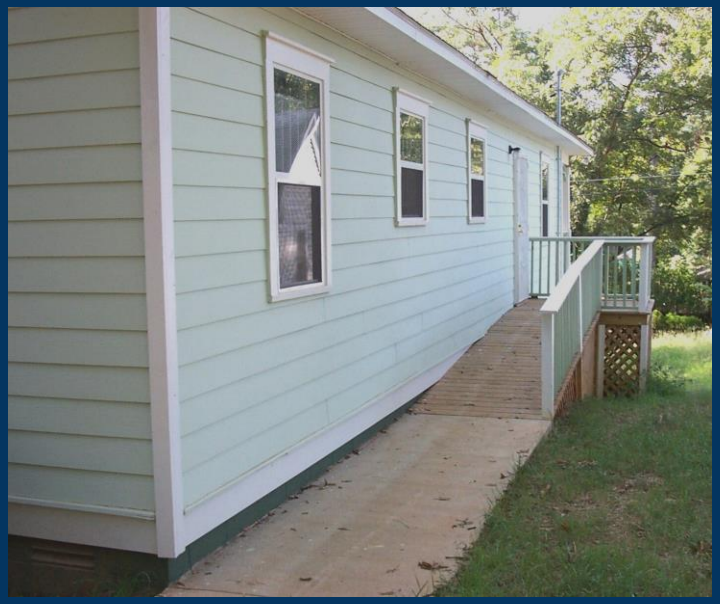
High Side



To achieve the driveway on the high side, sometimes the house plan can be reversed, or “flipped.”

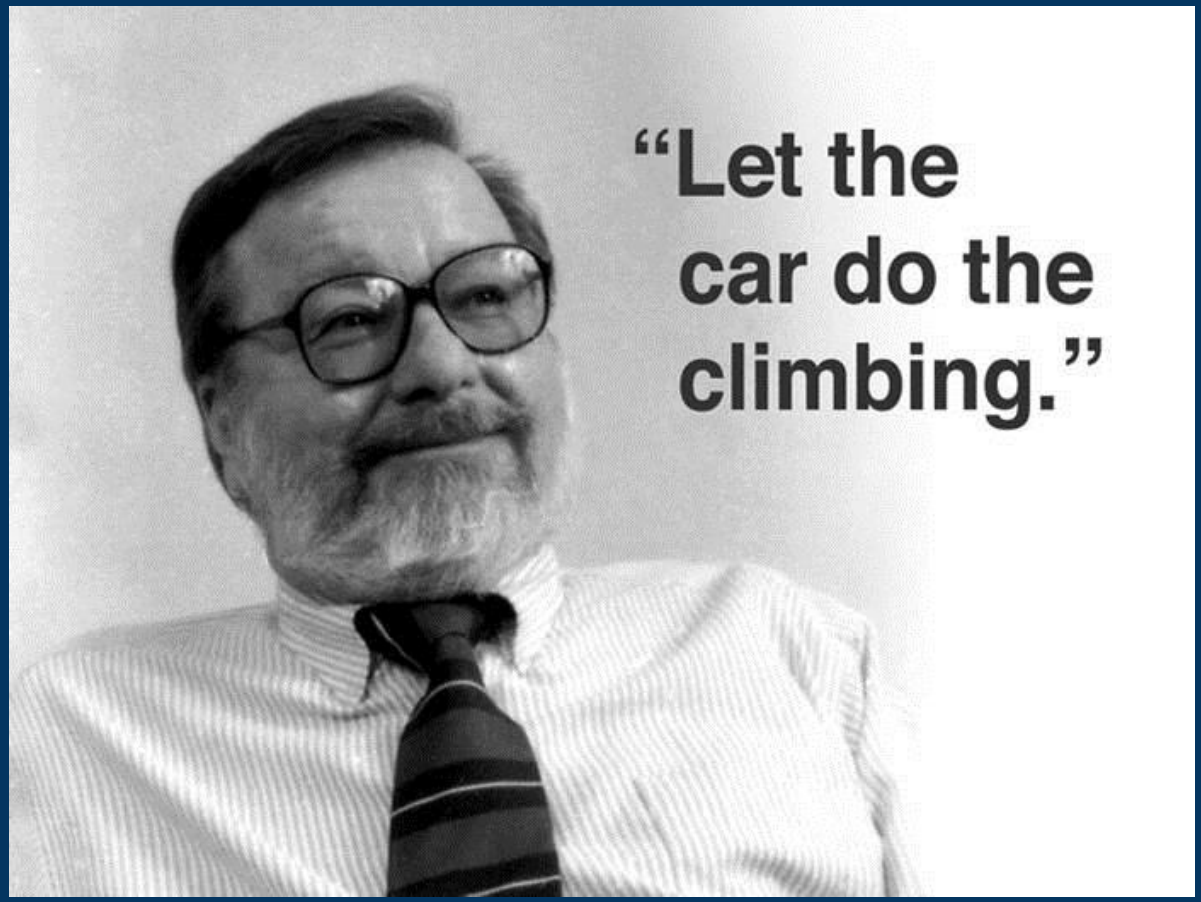
Principle 6: A driveway steeper than 1:12 does not prevent a zero-step entrance.

Front of 121 Glenwood



Back of 121Glenwood

Although not ideal, the very steep driveway above leads to a fairly flat parking pad, and a sidewalk and ramp to the back door.



As Universal Design architect Ron Mace said, “Let the car do the climbing.”

Inform your sub-contractors, be clear about expectations and regularly check their progress.

METHODS

for Zero-Step Entrances

1. Slab on Grade

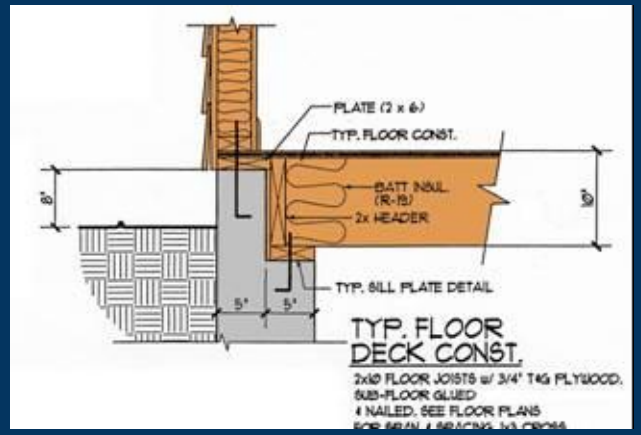
2. Earth Berms

3. Retaining walls

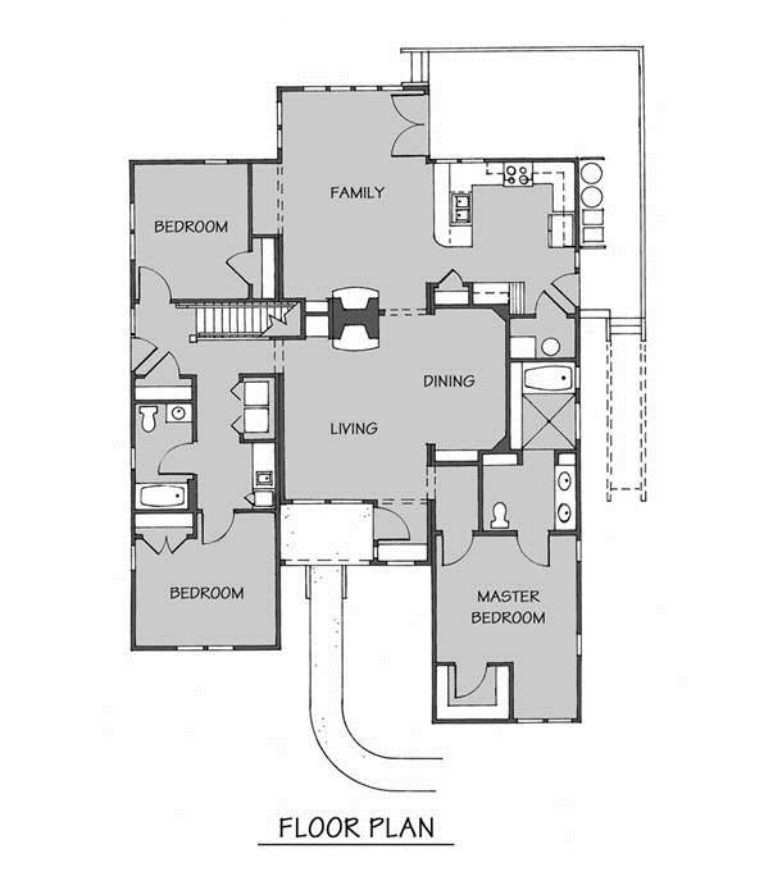
4. Through the Garage

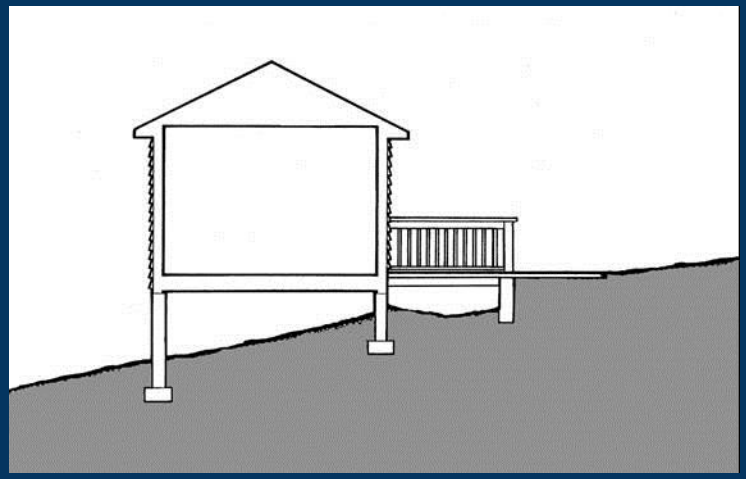
5. Ramps

6. Bridges



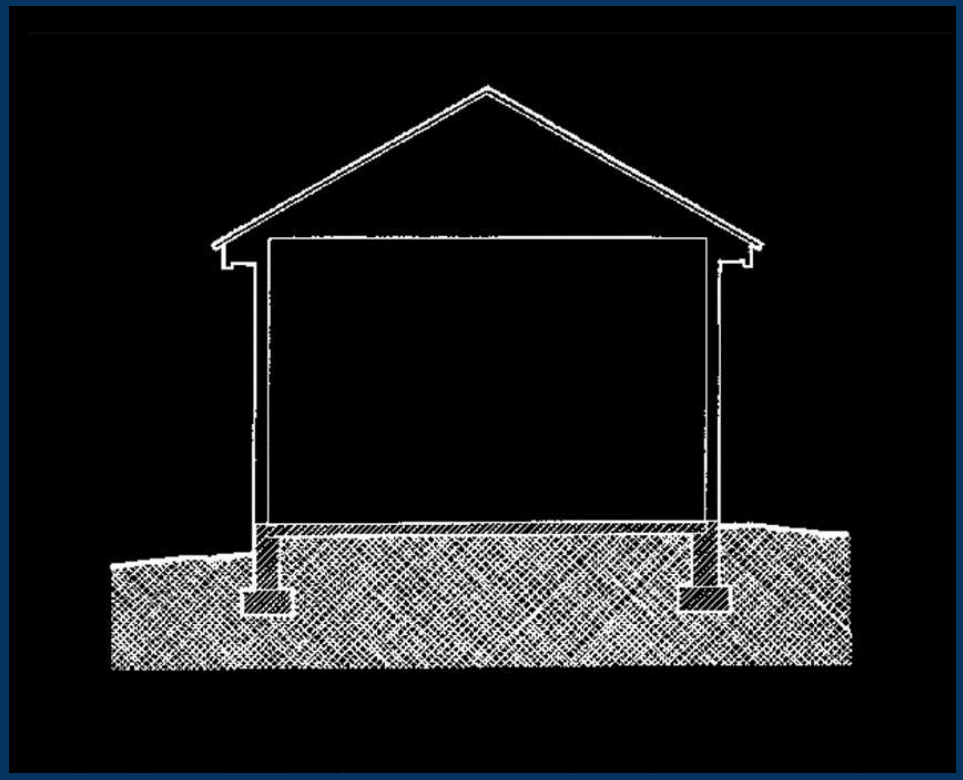
7. Lowered Floor System





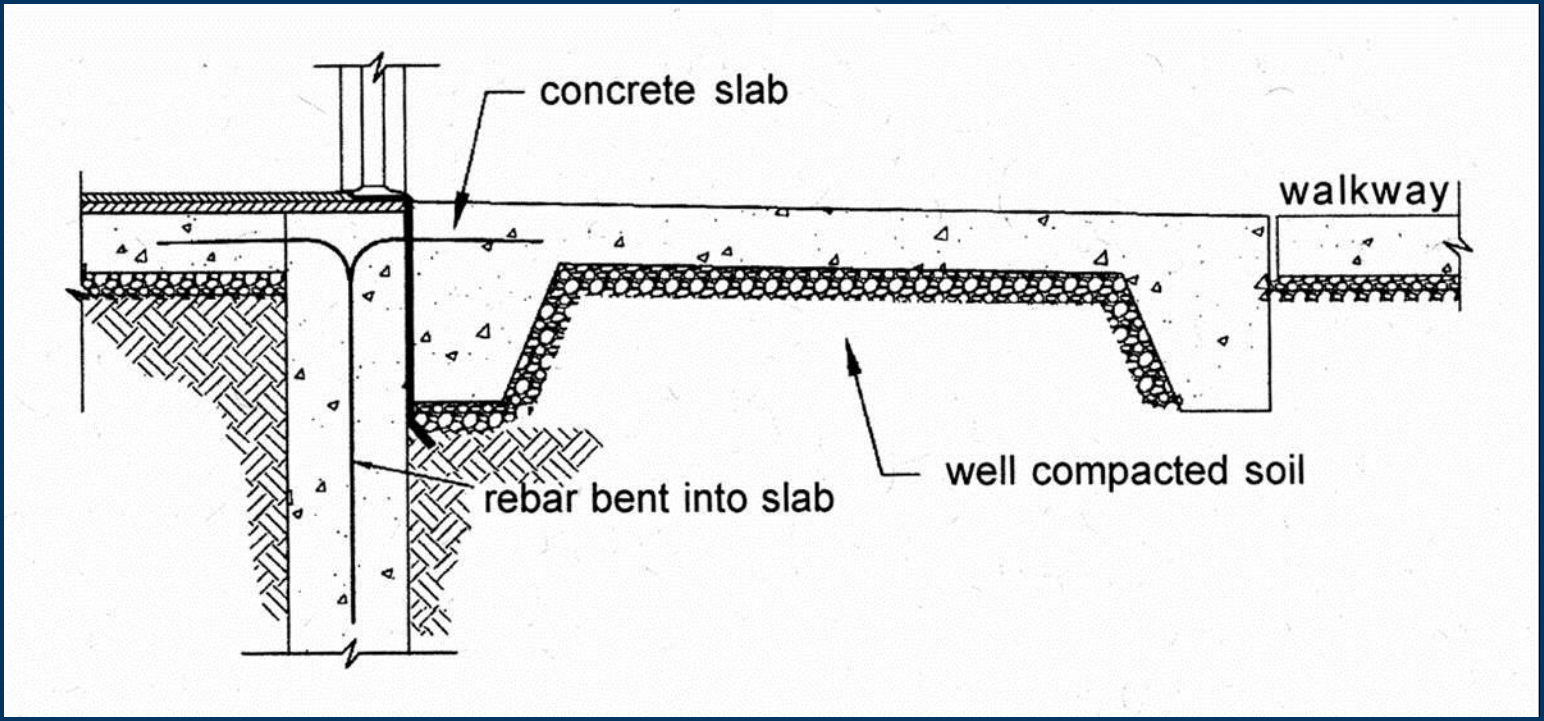
For all methods, pre-**planning**, good **siting** and appropriate **grading** -- and good communication with contractors -- are **essential**.

Method 1: Slab on Grade



More than 40% of single-family, detached houses in the United States are built on a concrete slab. In nearly all cases, the zero-step entrance is very simple.

For zero-step entrances on slabs, grade the earth higher than usual under the porch and berm slightly where the sidewalk meets the porch. It is very important to compact the fill under the porch to prevent uneven settling.



If uneven settling is a concern, tie-in between the walk and the porch – or the porch and the foundation – can be as simple as rebar dowels drilled into the foundation and extending a foot or two into the walk/porch, or a turn down footing on the walk/porch that bears directly onto the house foundation.

The slab process for zero-step entrances to homes is virtually identical to the process for a new bank or restaurant where a non-paved surface touches a wall.

Typical cost for the zero step entrance on Slab Construction as compared to a stepped entrance:

$0.00

Step to porch and door

Step to door, but not to porch

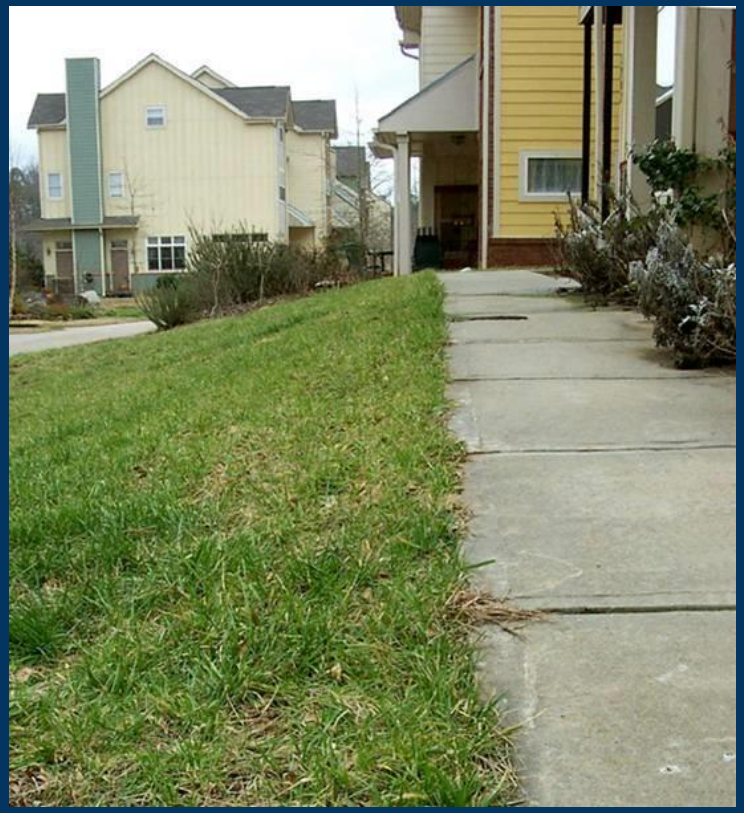
Step to porch, but not to door

In this new subdivision, steps were omitted randomly at some doors or onto some porches. This trend is also appearing in other developments, which suggests that zero steps on slab houses may be less expensive than steps.

All steps could have been omitted without sacrificing height above street level.

Method 2: Earth Berms

In general, earth berms on new residential construction will be very slight rises where a sidewalk meets a porch.



No

Yes

Avoid drop-offs at the edges of sidewalks.

For erosion control: compacted berms and topsoil with vegetation.

Method 3: Retaining Walls

A retaining wall parallel to the house can be used to keep earth away from the foundation.

For attached town homes on sloped terrain, a retaining wall can facilitate nearly level lots, making entry steps unnecessary.

Method 4: Through the Garage

The ideal solution for a garage entry is a garage floor flush with the entrance to an adjacent room.

Older codes may not permit this design.

If local codes require a height difference, build the least height permissible, and a short concrete ramp can provide the entry.

If a concrete ramp is used, it should be level side to side, flat top to bottom, and end in a drop of ½ inch or less. For edge protection, if the ramp is higher than 4 inches, it should have code-compliant rails or extend at least six inches wider than the door on both sides.

Why do some codes forbid a flush entrance and others permit it? Older codes project that fumes pooling on the garage floor can create a fire risk. But most codes reflect the fact that current construction and appliances make that risk negligible. The 2003 International Building Code removed the requirement for a step between the garage and house.

Cost of a zero-step entrance through the garage:
$0 to $500

If the house is on a concrete slab and code permits a flush entrance from an attached garage to an adjacent room: **Typical Cost : $ 0**

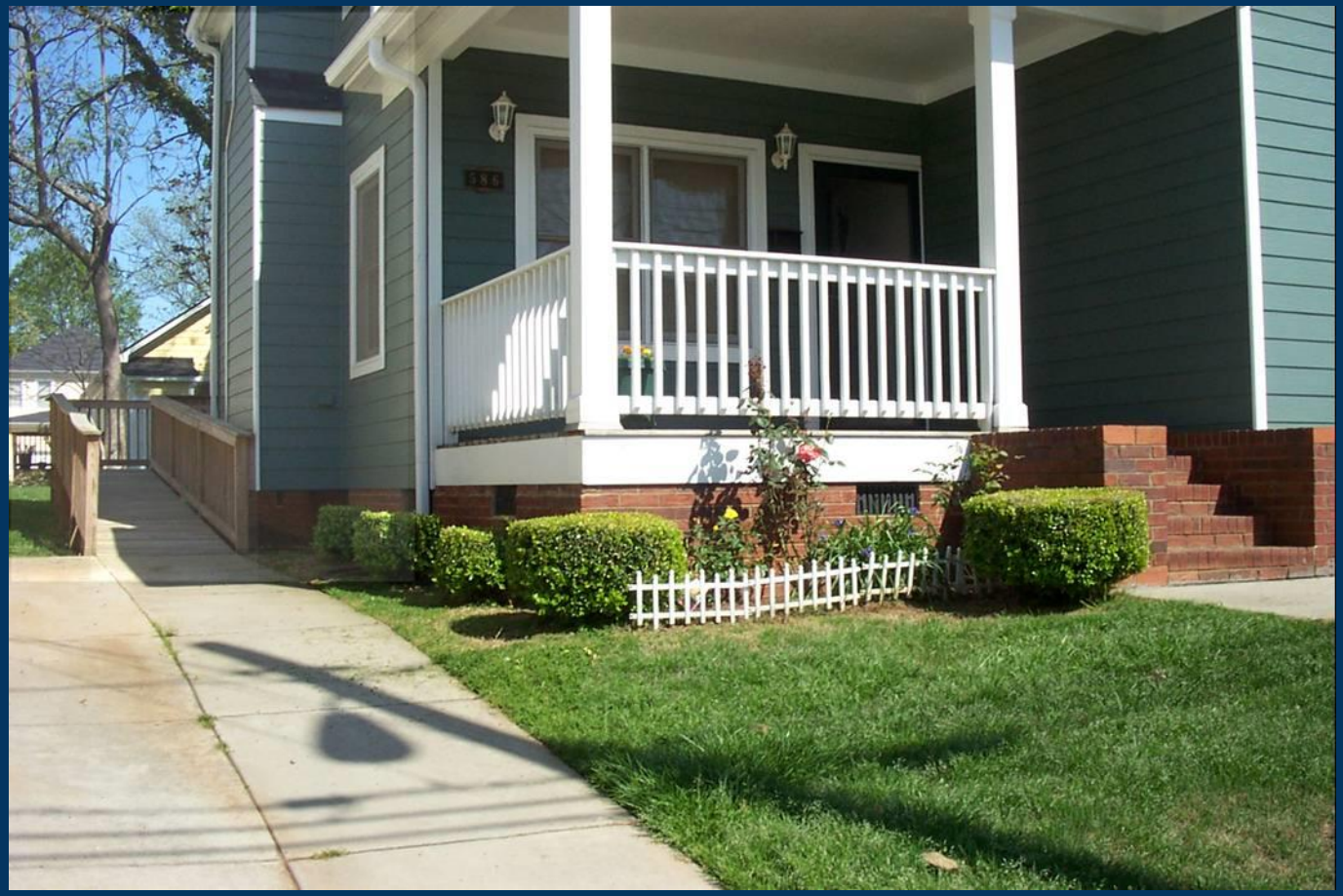
If the house is on a concrete slab and a four-inch height difference is required, involving a short concrete ramp: **Typical Cost: less than $100**

If a four-inch height difference is required AND a lowered-floor system is used:

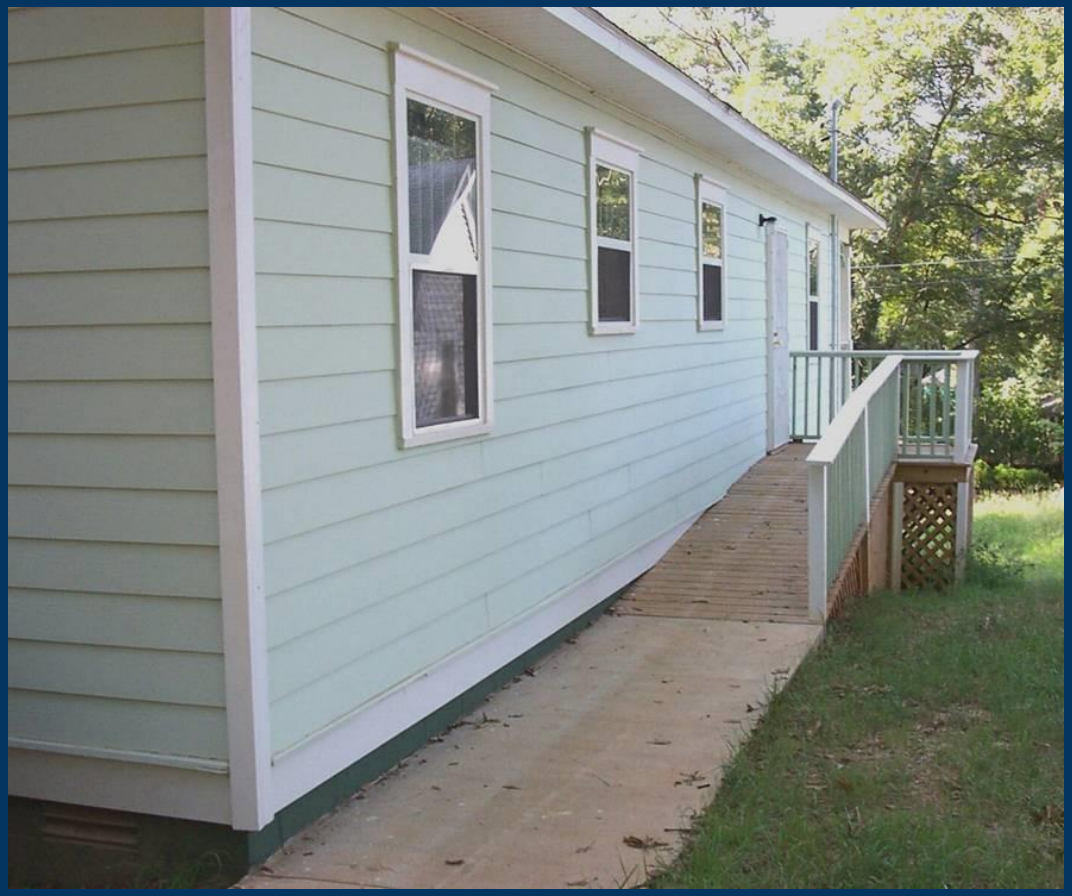
Typical Cost of Lowered Floor Plus Garage Ramp: $300-$500

Method 5: Ramps

On new construction, attractive short ramps can be easily integrated into overall design.



Ramps are a good option in some neighborhoods where historic preservation guidelines may result in higher foundations.



Building code must be followed to construct safe and legal residential ramps.

2” by 6” pressure treated board can make an attractive ramp. Composite wood striated for a non-slip surface has also proved to be a good option.

Mindful siting and grading permit a ramp to be reasonably short, and therefore cost-effective.

COST INFORMATION FOR RAMPS

When deducting the cost of the steps that the ramp replaces, and siting with care, the cost of a typical ramp using pressure treated 2 x 6 board is **$200 to $600**, including materials and labor.

Method 6: Bridges

On homes with a basement or crawl space, the porch itself can act as a bridge to the interior, without additional construction.

If the porch is wood, the sidewalk should be poured thicker where the sidewalk reaches the porch to keep earth away from wood. Fiberboard expansion joint material is placed between wood and concrete. If soil and climate conditions require a footing, the thicker sidewalk can be notched to hold the joists away from the soil.

The bridge approach has the advantage of naturally keeping earth away from the house.

Concrete slab porches on masonry walls, like wood porches, can also be used for homes with crawl spaces or basements. They can effectively act as both a "bridge" and a "retaining wall" between the site grade and conventional wood framed construction.

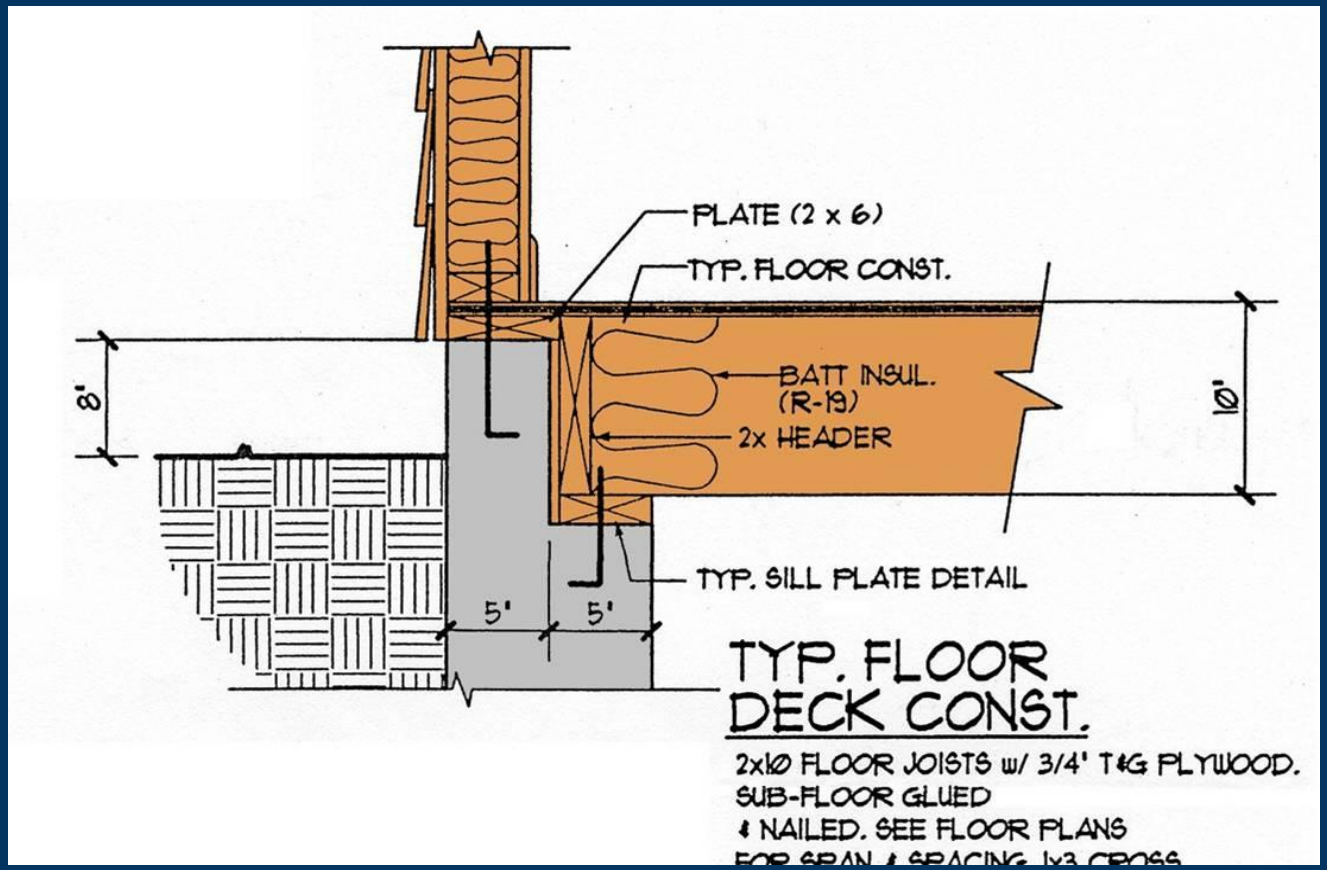
Effective siting and attractive landscaping can produce an elegant look.

The route to the “porch as bridge” may be from the front sidewalk to the front of the home.

…or from the driveway to the side of the front porch…

…or to a back porch or deck.

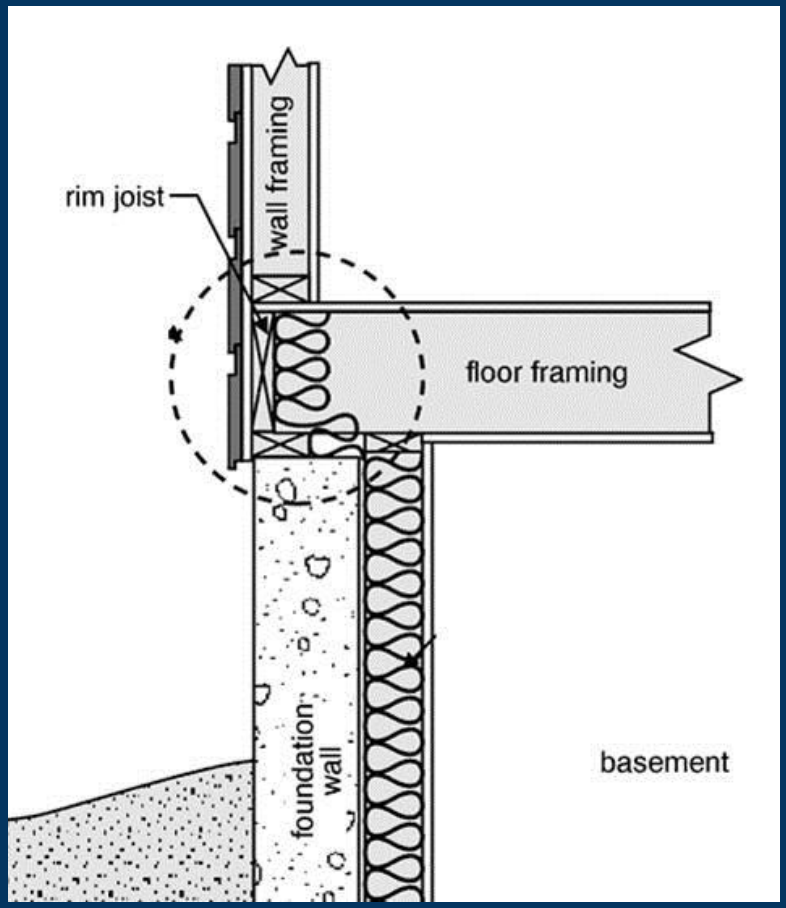
The more a person develops an eye for access, the more options appear.



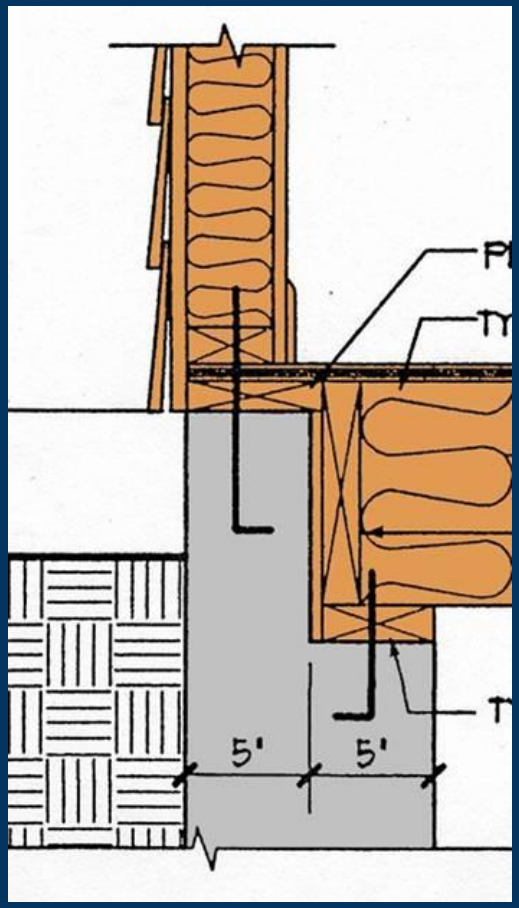
Method 7: Lowered Floor/Notched Foundation System for Homes with Basements or Crawl Spaces

In typical homes with basements or crawl spaces, the finish floor level is 18-24 inches above grade – or more – on all sides of the house, making it more difficult to grade for a slope that is maximum 1:12 (preferably less).

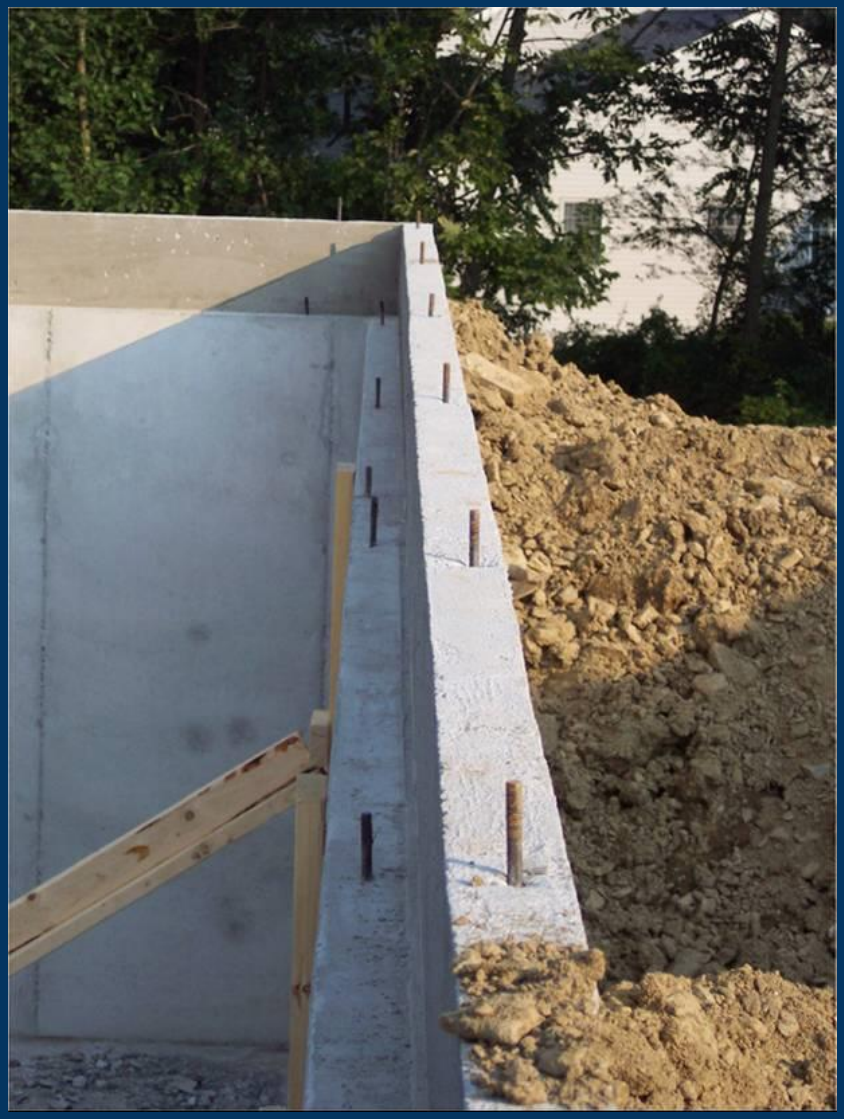
There are practical solutions to this problem. For a house on a basement or crawl space, how do we achieve a zero-step entrance that works similar to a slab-on-grade entrance? One approach is to modify the foundation wall to make it closer to the finished floor.



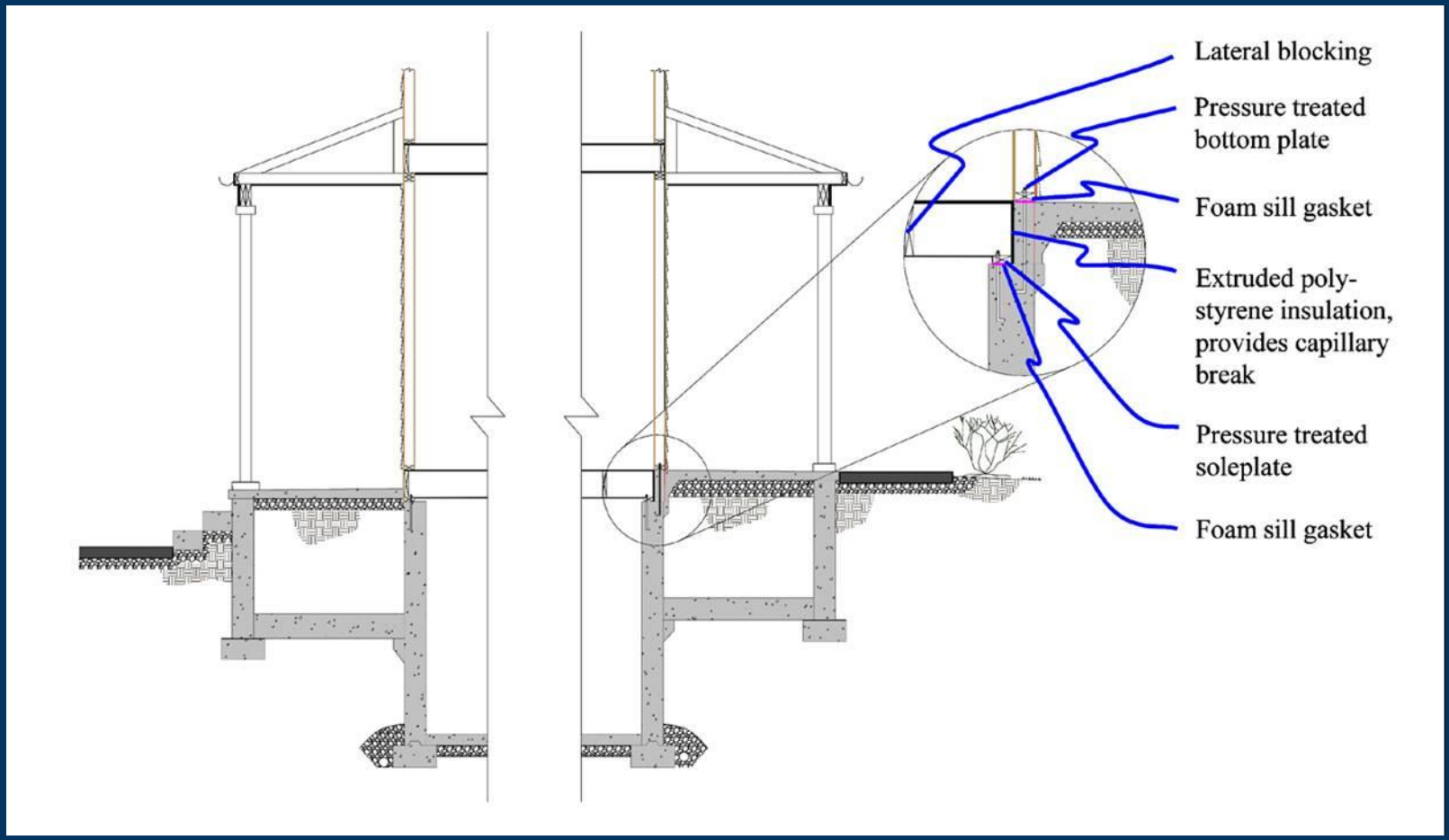
Conventional method: All of the framing on top of the foundation.



Alternative method: Lower the framing onto a notch at the top of the foundation.



Notched Foundation/ Lowered Floor method in mid-process.



By lowering the floor system, the “notch method” facilitates the sidewalk tying directly to the porch in a home with a basement or crawl space. This, in turn, makes it easier to obtain the needed gentle approach to the porch. (See Appendix A for enlarged detail.)

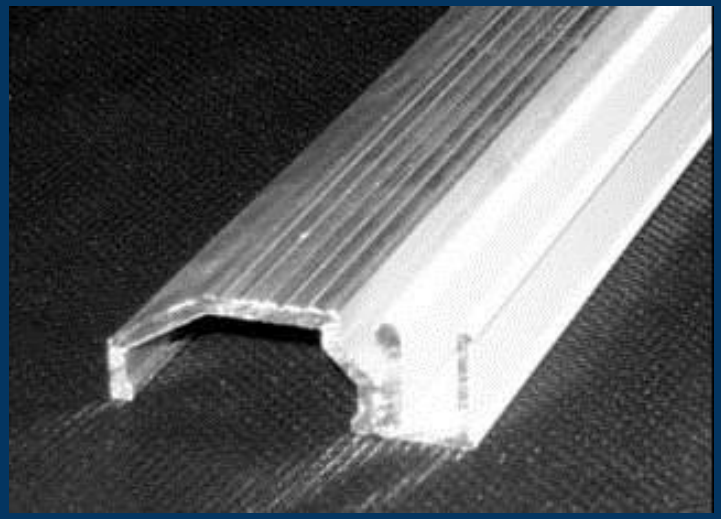
This house and the those in the next two slides ***appear to be built on slabs, but in fact have basements***. In each, the builders used the notched foundation wall method.

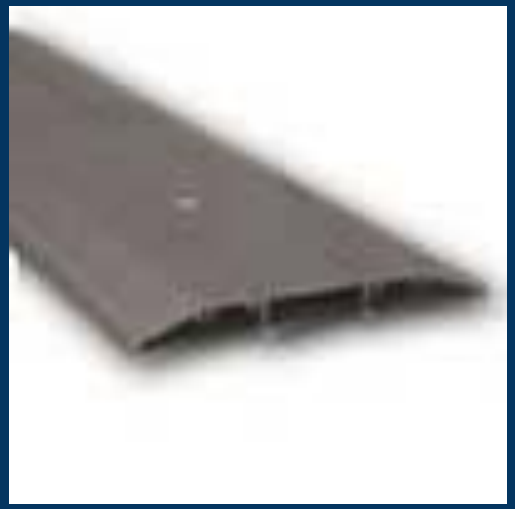

Augusta Village
Birmingham

Typical Cost of Lowered Floor/Notched Foundation Method above the cost of regular flooring system:

$250

Thresholds, Moisture Protection, and Other Considerations



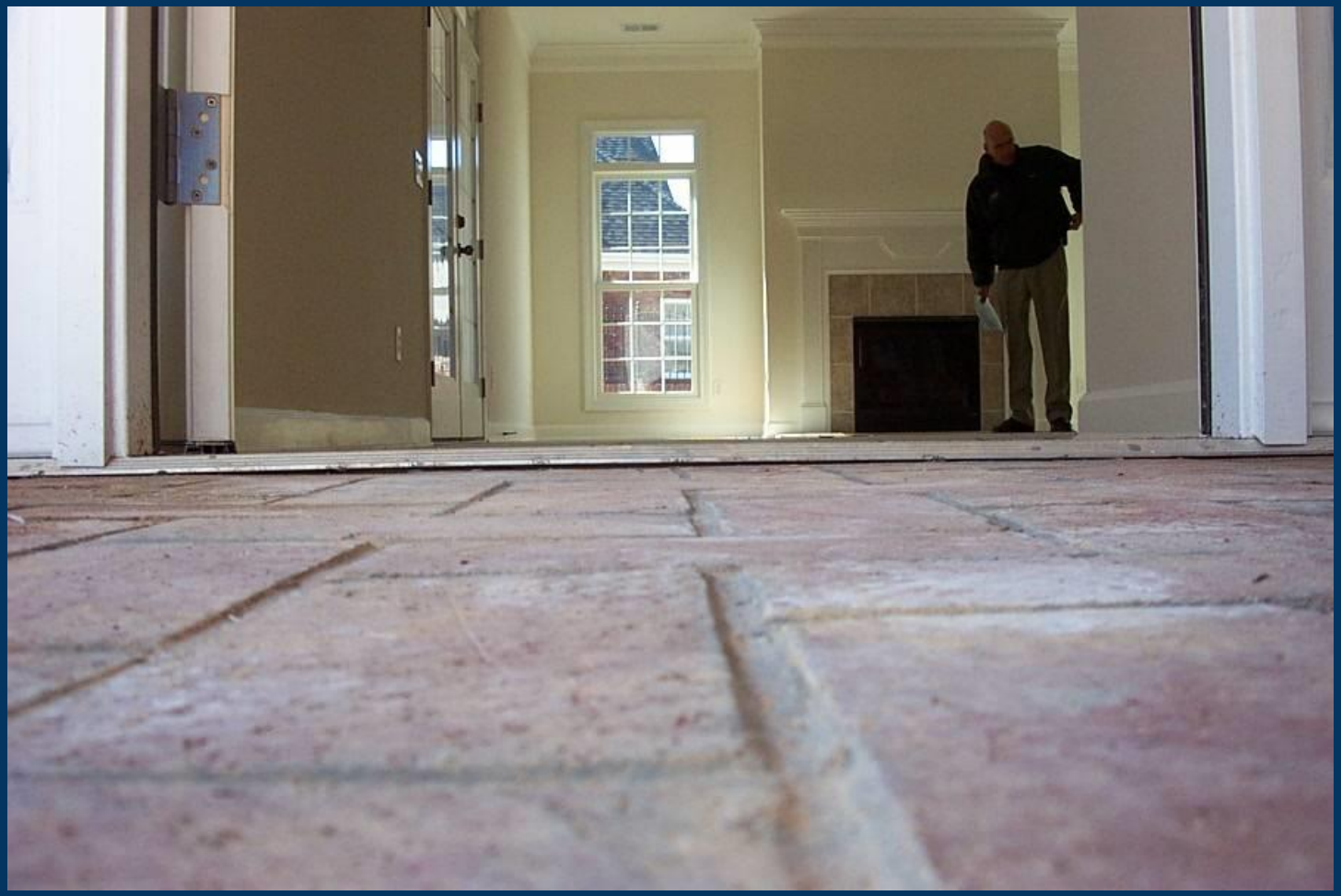


It is best to install a ½ inch threshold at the zero-step entry door. Shown above are a regular threshold and a ½ inch threshold.

Attractive pre-hung entry doors with ½ inch thresholds can be obtained from door wholesalers.

Typical Added Cost:

Under $20



This half-inch threshold awaits final caulking.

It is often easy to install the flooring at a level consistent with the threshold.

Other times, a major lip exists at the interior, making exit difficult.

A transition piece may serve adequately to bevel an interior lip for a good, usable threshold. These can be obtained pre-packaged, finished or unfinished.

Typical cost of a 6-foot finished transition piece, serving two doors: **$25**

With a high-pile carpet, the threshold will need to be set to permit the inward-swinging door to clear the carpet. Or, a small area of tile or wood flooring just inside the entry is a good option.

Question: Is the zero-step entrance useless if a builder installs a regular threshold instead of a half-inch threshold?

No, not useless. A regular threshold – IF there is no step at all, not even a 2-inch step or a row of brick – is usable by some mobility-impaired people. A half-inch threshold is significantly better. But if a builder chooses to go with regular thresholds, by constructing zero-step entrances they make a big contribution to the needed change in speculative homes.

Moisture protection for zero-step entrances can be accomplished by carefully applying normal waterproofing procedures.

All zero-step entrances should have an overhang of at least three feet.

As in all porch construction, the floor will be sloped slightly to divert water away from the door.

The combination of a good-quality **door seal**, a **sloping porch floor** and an **overhang above the door** has proven to provide long-term, reliable moisture protection at the zero-step entrance.

Overall Summary of Costs:

Zero-Step Entrances over Stepped Entrances:

$15 to $600

Why are the costs so reasonable?

- Figures refer to NEW construction, where the builder has the opportunity to plan, site and grade for cost-effectiveness.
- Zero-step entrances should be omitted on sites that present unusual difficulties, so “worst case scenario” cost estimates are not relevant to typical costs.
- The entrance may be located at the front, side, back or from an attached garage – whatever location is most advantageous.
- Cost-effective methods have evolved in the field through direct construction experience.

Confirming Cost Data for Zero-Step Entrances:

Ed Phillips Executive Director Home Builders Association of Georgia	425 homes constructed throughout Georgia on a wide variety of terrains, through EasyLiving Homes©, a voluntary certification program of for-profit homes with several access features.
Dan Buonamici Building Commissioner Bolingbrook IL	2,500 homes constructed under a local ordinance requiring several access features in all new homes .
Ray Maynard Construction Director Affordable housing agency	600 homes constructed through a voluntary initiative begun in 1990 in Atlanta, Georgia.

A zero-step entrance as a routine part of home construction is a needed innovation, growing nationally – house by house and builder by builder. We hope you will join in.

Again, please do not permit this presentation to be copied. It can be obtained from:

Concrete Change
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or

The Georgia Department of Community Affairs
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Remember, see Appendix A for more detail on the Notched Foundation/Lowered Floor method and Other Considerations.

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Appendix A:

- Settling, Termites and Other Considerations
- Notched Foundation Detail

The following paragraphs and drawing by architect Scott Ball give guidance on avoiding uneven settling, soil/lumber separation, termite control, and a smooth construction process.

One easy way to achieve all of these goals in a poured foundation is to simply block out the top 8” of the foundation wall in the area directly under the entry threshold with Styrofoam or wood blocking.

In a CMU foundation, the top course of blocks can simply be left out in the area under the door threshold. The framing, backfilling and other construction processes can then proceed as normal, using the pressure treated foundation sill plate to span the 8” deep gap in the foundation wall under the threshold area.

Late in construction, perhaps even after finished flooring is in place, a form board can be placed at the back of the 8” deep gap (on the crawlspace side) in the foundation wall and the walk/porch can be poured with a “turn down footing” at the end that keys right into this gap.

The result is a walk/porch that bears directly on the foundation wall, and thus

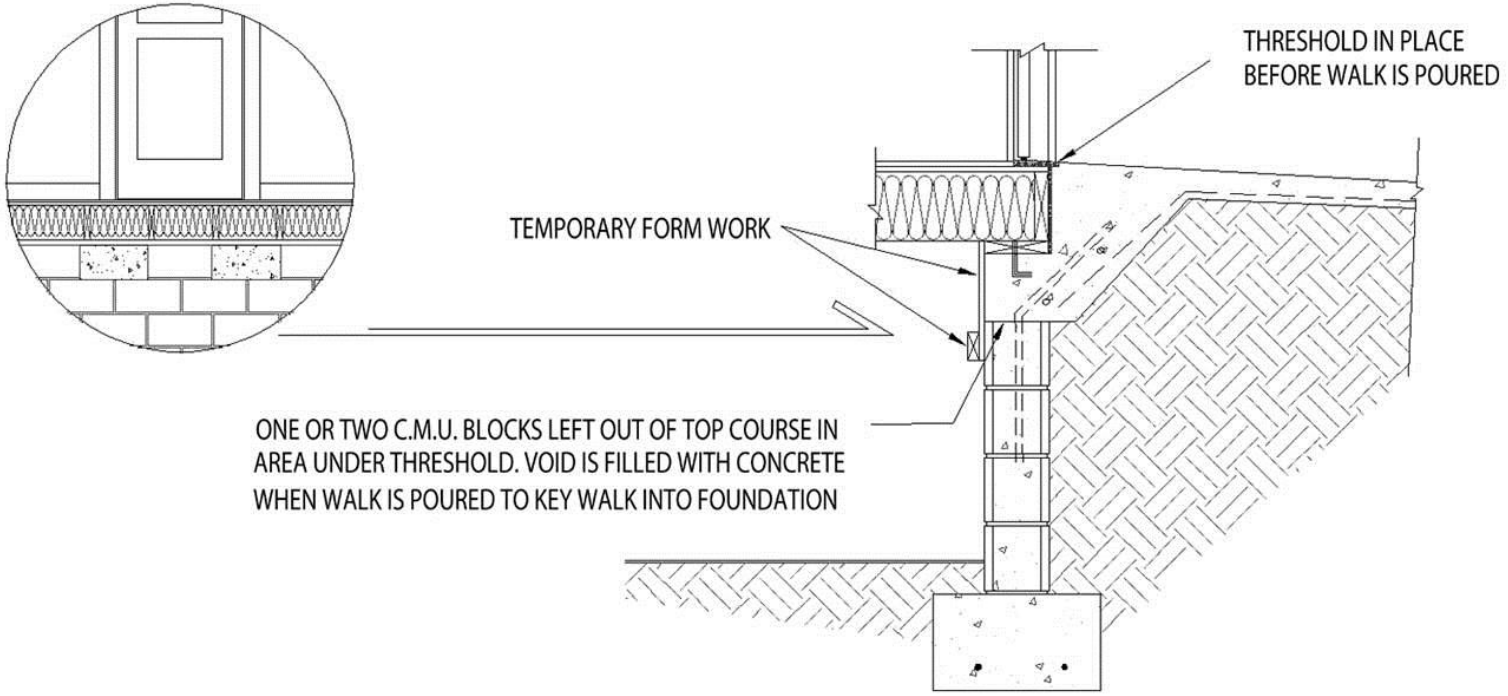
- avoids uneven settling,
- prevents contact between soil and non-treated lumber,
- does not create additional avenues for termite penetration,
- and does not interfere with construction phasing.

After the walk is poured, the temporary form board can be pulled out and hydraulic cement used to plug any gaps or air pockets left between the foundation wall and the porch/walk turn down footing.

The following construction detail provides an illustration.

NOTE:

PRINCIPLE IS THE SAME FOR POURED FOUNDATIONS, USING BLOCKING TO FORM UNDER THRESHOLD.



SECTION @ ZERO-STEP THRESHOLD WITH CRAWL SPACE/BASEMENT

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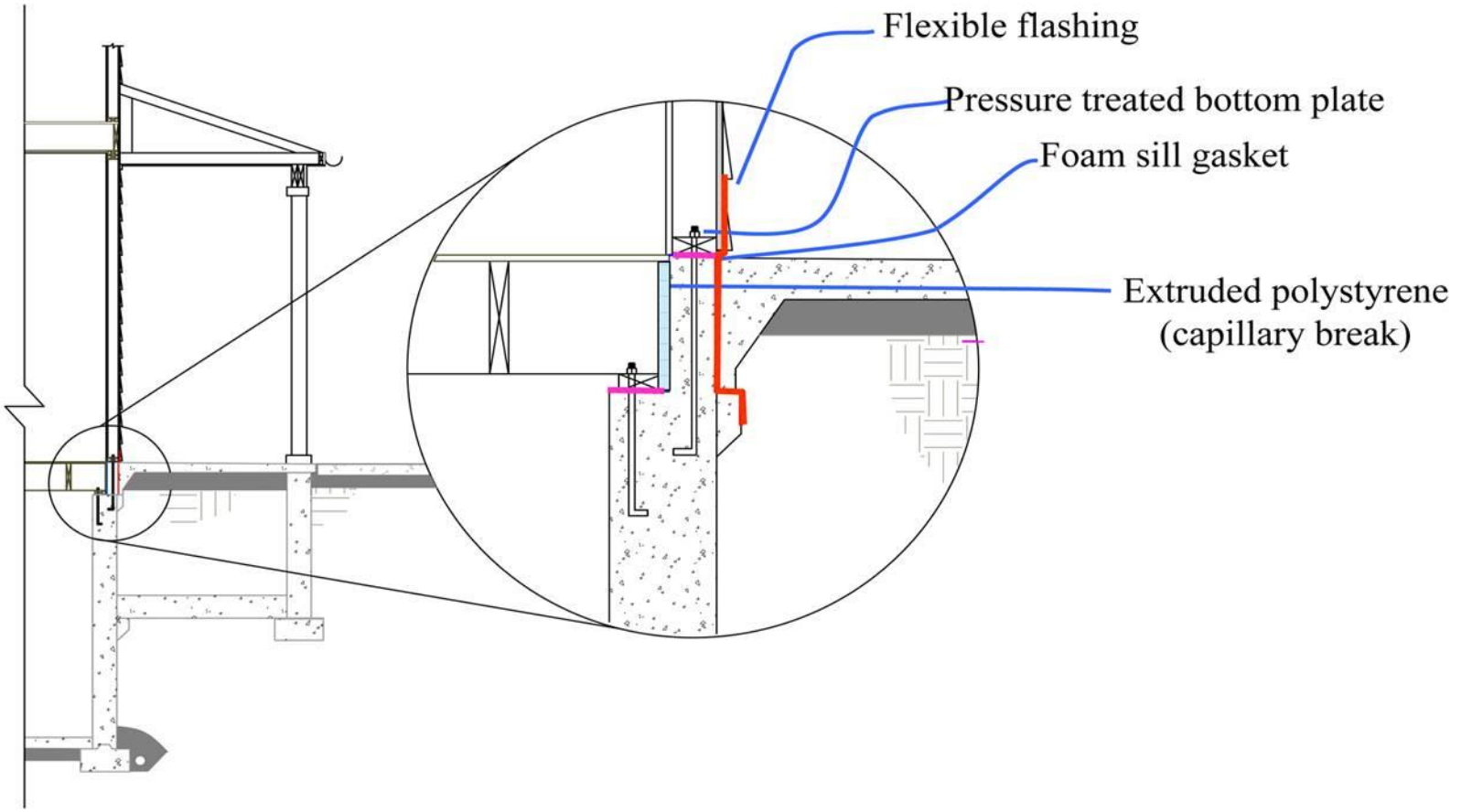
The following drawing produced under the auspices of the Pennsylvania Housing Research Center shows additional detail for the lowered floor/notched foundation method.


Flexible flashing
Pressure treated bottom plate
Foam sill gasket
Extruded polystyrene
(capillary break)

End of Presentation.

Thank you for your participation.