Save Money Building Your Own Home

March 2025
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The advice given wherein, although worthy, is not to be used exclusively in building a home. You should consult with professional engineers and county/city officials in designing and building your home. By continuing to read this article, you understand that any advice you follow from this document is based solely on your own decisions.

There are advantages and disadvantages in building your own home. Assuming you don't already have land, one advantage is you can select a larger piece of land in a desirable area if you can find it. You can usually save 30 to 40% of the cost of buying a home if you do much of the work yourself, versus hiring a general contractor. However, if you select bad subcontractors, that savings can quickly evaporate. It can be difficult finding good contractors for those tasks you cannot do yourself, as most subcontractors place priority on supporting general contractors to get repeat business, the best kind of business in any discipline. I will discuss some of these issues and hopefully give some good advice.

Everyone should learn some basic building skills like framing, insulation, drywall, and simple plumbing and electrical work. The savings will be considerable when building a home and maintaining it later. A good starting point at learning a trade is to attend do-it-yourself (DIY) workshops, finish a basement, build a garage, or help a friend who is experienced at construction. I learned a great deal from Dave Suazo, a building contractor and former neighbor next to my first home. My experience is primarily in the Rocky Mountain areas.

Location

Obviously, if you're working, you should select a property that is within a 30 to 45 minute drive to work, and within similar distances from a large city if you want to get "good" contractors and prices. Many of us would like to get out in the country or in the foothills. In the west, you must be aware of the availability of water, wildfires, soil conditions, air quality, weather and so forth.

Water availability is critical, as is good water quality. City or community water service is ideal, but may not be available in the future in dry areas. Water should be taste tested to see if you like it, and well water should be tested for bacteria and other contaminants as a contingency on buying any existing home. Ideally, you would like to get over 10 gpm from wells with no bacteria. If you are buying vacant land with no well, you should ask neighbors regarding their wells and taste. The state websites usually have records on well capacity (gpm) in the area. South facing slopes are nice for solar exposure but may be dry - if it looks dry with cacti or little vegetation, then well rates may be poor. In the mountains, ponderosa trees usually do well in drier areas, and aspen trees thrive in wet areas. You need to contact the city, county or state if you can drill a well, usually requiring a well permit. In the late 90s, Jefferson County (JeffCo) Colorado, had (and probably still has) a 5 acre minimum for well and septic systems, with distance requirements between new wells and any septic system whether yours or a neighbor.

In 1980, I bought a new home on one acre of mountain land before the septic acreage requirements were changed. Living below a road has dust and snowplow issues.

T1-11 Painted Siding on an Evergreen Home
This is an inexpensive siding option and fairly easy to paint (except for the grooves). The large windows, using sliding door glass, increase heat loss. Horizontal deck rails (if allowed) are easier to stain than balusters.

Crazy as it may sound, people could sell a part of their land in JeffCo without subdividing it – but the county may not allow you to build on it because it is considered an illegal parcel. So, make sure it is a legal parcel after talking with the city or county, or you will have just bought some expensive picnic land. Don't sell off part of your property without going through a legal process that usually requires subdividing, or you may not be able to build any additions.

Air quality is increasingly important for good health. If you select property in a valley, even a big valley like in western Montana, smoke can collect to hazardous levels for many weeks or months of the year in summer and early fall due to wildfires. Wildfires have really increased since 2010. Some of these areas have strong temperature inversions during winter, so burning of fireplaces and woodstoves may be prohibited even during winter, such as in Missoula and the Denver/Boulder area. Low areas like valleys can have strong inversions. Poor air quality is the main reason I moved out of my 1st retirement home in Montana.

Is electrical power available, and can you obtain utility easements if a power pole is on a neighbor's land? Solar or wind power will add to the cost of homebuilding, although you may be able to recover costs if a utility company will buy back excess power.

In addition to utilities like water and power, what about phones, internet and TV? Can you get landlines including high speed internet (>25 Mbps)? Is there cell phone service? Or do you have to obtain satellite service? Can you get over-the-air (OTA) TV that today puts out high quality signals free of the buffering problems with internet service? Cable or satellite TV with local

channels can cost close to $100 per month in addition to hook-up fees and internet charges. The following website allows you to check if you can obtain free OTA TV signals:

http://www.receptionmaps.com/Advanced-TV-Maps.html

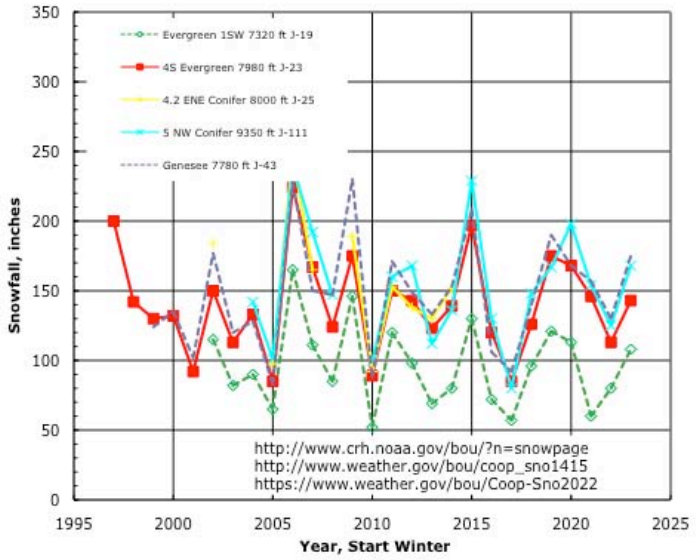
Research the weather conditions. Are the temperatures too hot or too cold for you? Is there adequate precipitation (rain and snow), too little or too much? Is it frequently windy? Are there bad hailstorms or tornadoes? Granted, there are hail and tornadoes in every state, but hilly areas tend to make them benign – which is even true in metro Kansas City! The following website is one of several that give details on weather statistics versus month by clicking on a state:

https://wrcc.dri.edu/summary/

Scroll to the bottom of this website to view air quality history, if it doesn't get cancelled:

https://www3.epa.gov/aircompare//

Colorado is considered a semi-arid climate, but most of it gets adequate precipitation. Metro Denver has a very nice all around climate but is very crowded. It used to be that you were safe from large hail west of I-25; however, climate change has resulted in large hailstorms even in Lakewood and Golden. The higher foothills (above about 7000 ft elevation) are safe from large hail and rattlesnakes, but will see annual snowfall averaging 150 inches with individual storms of 1 to 2 feet common, 3 ft every few years, and rarely over 6 ft. Snow melts fairly quickly due to down slope Chinook winds in the Denver metro, but not as quickly in the foothills, and definitely not in the high country where ski areas are located.



Snow Data in the Denver Foothills

A Large Snow In March 2003 Trapped Us for a Week in the Denver Foothills.
The county road grader was also stuck for a week on a county road. The hump on the far left was a buried car. A pickup was previously moved to the bottom of the 300 ft driveway.

Wyoming is also a beautiful state but is colder and very windy. In fact, the plains do not have many trees so are windy much of the time. Wyoming has many highway gates that shut down the highways during winter blizzards. There are limited amounts of land and homes where there are trees in Wyoming, as the national forest owns most of the treed areas. An exception is in the Jackson Hole area that is outrageously expensive – and since it is in a valley, smoke can collect in winter during temperature inversions and summer during forest fires. Excepting the Jackson Hole area, Wyoming is a very affordable state with no state income taxes, low population density, and reasonable sales and property taxes.

Montana is a beautiful state, but the eastern half of the state is extremely cold and windy in winter. The western half, being west of the continental divide, is much warmer in the valleys where most live, but will collect smoke in the winter and summer/fall. The western valleys get good moisture in the winter, mostly as drizzle or freezing rain with relatively little snow. Summers in western Montana are very dry with few hailstorms. In fact, the state is overall very dry except in the high mountains, which are in the national forest. Rivers usually run full due to mountain snow runoff. It has the worst state income tax forms I've ever seen. However, there is no sales tax except in a few resort towns (West Yellowstone, Whitefish, and Gardner).

Forest Fire Smoke in the Bitterroot Valley in Western Montana.
Forest fires have become far more common in this century.

County/City Requirements

It is important to contact the county, or city if you live within city limits, to understand building requirements, restrictions, permits, inspections, parcel legality, water availability, septic or sewer availability, and road access. In the past (and perhaps still today), you could buy land in Colorado and find out it is not a legal parcel - in which case you cannot build on it and can only use it for expensive picnic land. You may find that land is not big enough to permit drilling a well because of nearby septic tanks. You may not be able to access your land because there are no easements that allow you to get there – these are things you should discuss with the county and/or lawyers before making an offer on property. You should read the covenants and HOA requirements (if in an HOA) from a real estate agent before making an offer. And it is best to avoid any road easements on your property unless they are properly surveyed and clearly described; in either case, it is often the cause of many property disputes. Make sure you understand county/city property taxes, HOA fees, etc.

County requirements vary greatly depending on the county. Boulder County, Colorado, has extreme requirements and inspections, as friends of mine have discovered. Other counties are extremely lax, in rural areas like Ravalli in Montana or Custer in South Dakota. JeffCo charged high mill levies on vacant land versus occupied land.

Land

What about the quality of the land? Is it in a flood plain? Are there mining/oil claims filed on the property or nearby? You will generally not own mineral rights. What about water runoff so you don't have flooding concerns? What are the soil conditions? Are you building on solid rock or expansive soil?

You may need to hire a soil engineer to evaluate the type of foundation needed or if you can even put in a septic system (unless you can connect to city sewer). You don't want a cistern where you may have to get it pumped every month at great expense. At the base of the Denver foothills in JeffCo there are bentonite expansive soils that can crumble a foundation – many homes in the Ken Caryl neighborhood have caissons (piers) deep into the ground to support foundations – and many home foundations have been damaged with or without caissons.

What about solar exposure in the winter? Solar exposure is good as long as it is not too dry. North facing slopes may not get much sun and if in a cold climate driveways will ice up in the winter. I personally favor east-facing homes although you can't always be so picky.

How steep is the land? If really steep, the home may require a really tall foundation wall on the uphill side that adds to the building cost. Are there neighbors above you and do their roads have proper erosion control? Are culverts aimed at your preferred building site? A small slope can be really nice, as a 2nd floor may be able to easily walk out on a deck near ground level (which can make moving in a lot easier on the 2nd floor).

Legal costs to solve problems are excessive. In civil court, the party with the most money will likely win, as it is all about how much money the lawyers can put in their pockets. JeffCo allowed the plantiff to disallow expensive depositions, and that is an excellent option despite what the lawyers want to do. A better solution is to agree to mediation if you can present your case clearly. There is no doubt that the legal system is ridiculously expensive and lengthy, so it is best to avoid it unless it involves a small claim that can be handled in small claims court.

Avoid Road Easements on Your Property.

Neighbors can illegally widen private roads beyond their easement and leave a mess on your property. A 25 ft easement does not mean the surface width is 25 ft – it includes uphill and downhill slopes on the side of the road – it is the maximum width that they can disturb. This can be a problem in mountain and rural areas.

Improperly Installed Ditches and Culverts on Private Roads will cause Erosion Problems. Legal costs to remedy the situation can result in eventually selling your dream home you worked so hard to build. County officials are often of little help in civil matters.

Drive around the neighborhood and look on Google satellite maps – are there quarries nearby, gun ranges, national forest land, dumps, etc.

It took about a half year on weekends to find suitable land to build a home in the Denver foothills in 1997. This was after 20 years of living in the Denver area. My budget was tight after having to sell my Evergreen home in 1994. I looked as far north as the foothills west of the old Rocky Flats plant up Coal Creek Canyon, to areas near Central City which were too dry, and southwest on Highway 285 to Floyd Hill just above Bailey. Although I was only looking for about 5 acres, I ended up buying 36 acres at the end of a county maintained cul de sac at 9000 ft elevation, as the selling agent didn't know it could be accessed off the cul de sac instead of a private road on a jeep trail that was an easement on my property. I checked state well logs of adjacent properties, and talked with county planning & zoning, as well as a lawyer about all the road easements on the property before making an offer for the full price of $70K. It took one year to get a certificate of occupancy (CO), and I lived there until 2015.

After a year of retiring in smoky western Montana with hazardous air quality, it took several years to find Black Hills land, but I only visited the Black Hills a couple times per year while living 750 miles away in Montana's Bitterroot Valley. I ended up living in western Montana for 5 years before a home was built in the Black Hills. I knew I didn't want to live in the northern Black Hills because of cold and high snowfall, but I did look at it nonetheless – I was surprised that some of these areas had dry wells despite abundant precipitation. At one point, I was so frustrated at finding land, I looked in the foothills west of Colorado Springs - but the available properties were too steep. The areas in the Denver foothills were too expensive, having doubled in value after only leaving a few years earlier. I ended up further away from Rapid City than I wanted in the southern Black Hills, but that was the only area that had decent land, albeit much dryer than the central or northern hills.

Covenants

I prefer simple covenants so I don't have to get permission to put in a tree or paint a house. However, you don't want them so simple that a tiny home could be put next door, driving down property values. County zoning requirements should restrict the placement of such homes, but if not, then covenants should cover this. Always read the zoning regulations, easements and covenants (if any) before purchasing land or a home.

Permits

If not already in place, obtain permits for water access (e.g. a well permit), waste (a septic permit if sewer hookup is not available), a driveway permit, a fire mitigation inspection (if required as in the front range of Colorado), and of course building permits after the prior permits are in place. If you select an area that does not perform building inspections, then you will additionally need plumbing and electrical permits/inspections. Subcontractors you hire should get these permits and must call the state, county or city inspectors.

Financing

If buying vacant land, you can usually get a land loan that may end after only 5 years, but you are not likely to get a construction loan unless you have construction experience or hire a building contractor. I took full advantage of credit cards while building my "garage" home, and I kept getting offers for new cards with no balance transfer fees and low initial rates; so I took full advantage of these offers while building the garage home. You do not want to pay the ridiculous credit card rates of over 20%, which should be illegal. I got my Certificate of Occupancy (CO) within the one year requirement of the building permit, and moved in a year after buying the land. It took a few months to cut down trees, have contractors put in the driveway, well, and draw up the plans from my sketches, before I could get a building permit. After paying off the land loan, I was then able to get a 2nd mortgage (in the 1st position), but not a 1st mortgage as the main home was not yet completed (only the foundation was done). That mortgage was enough to pay off the credit cards and have money to start building the main two story home while holding down a full time job. It took a few years to build the main home (and a couple more building permits as they expired after a year with a half year grace period), but I was then finally able to obtain a fixed 30 year mortgage after the house was completed. Shop around for mortgages and insurance, as there are huge differences in rates.

Design

You can hire someone to design your house or draw it up yourself. Keeping the design simple will reduce costs. There are also simple kits available that include plans, but are usually not complete enough to account for land slopes and foundations. A professional CAD designer may cost a lot of money and take a lot of time, yet it should be easier to get a building permit with an engineer's stamp of approval. Some areas may not even do building inspections, which can lead to shoddy work if you're buying an existing home or hiring bad contractors (and many of them are not good).

If building in an area that does not require inspections, you may be able to get away with a hand sketch. Since the goal is to do framing yourself, try to keep the design simple if you haven't done much framing in the past. Cantilevers, although they look nice, are difficult to build by yourself and require many more floor joists in areas with high snow loads.

In order to get moved in within a year of buying land, I had a design for a Conifer, Colorado home drawn up in 1997 by a CAD planner for a foundation/footer permit for the entire house, plus a permit for a 2½ car garage that was finished as a living area so I could get moved in "quickly". The ½ space was for a small kitchen and a small bathroom that included a pressure tank from the well. Since I had a full-time job, this was the fastest way to get out of a cabin rental on Lookout Mountain and onsite where I could gradually build the main two-story house. Unfortunately, the designer took much longer than promised, and I ended up building the 2½ car "garage" in winter with lots of snow.

An Inexpensive Living Area with Plastic Gutters (later replaced), Plastic Siding (later replaced), T1-11 Siding on the South Side Interface to the Eventual Main Home, Metal Flashing on the Top Plate that will Support the 2nd Floor Joists, and a Foundation Wall for the Main Home with Black Tar Painted Below Ground Level. It is best to put in the entire foundation at one time.

This is the least expensive way to get into your own home and land without building a tiny home. It is all-electric with the ability to finish the rest of the home at your "leisure" – but be aware of renewal costs for building permits. There were no covenants on 36 acres, only JeffCo zoning requirements. Living on-site is a great advantage. In retrospect, heating only needed half as many electric baseboards as recommended, since it was well insulated. Firerock drywall was used in this portion of the home in case it became a garage in the future.

A Bit Crowded in the "Garage" Home, yet Everyone's Happy for Now

Very Crowded in a "Garage" Home.
There are times when you might want to rent storage space – no room for parties.

You don't need a crawl space - which I absolutely hate. With a two-story house, plumbing and central heating ducts can be hidden in the floor joists, except for a main run along the center of the house (which you can later box around). Some heating companies try a more efficient design for central heat that run straight into each room below the floor joists – that can result in an ugly 1st floor with low ceilings, and you would have to box around each heating duct instead of hiding them in the floor joists. Some "two-story" homes with a walk-out basement may actually be called a raised ranch home if some of the sides of the 1st floor (also called a basement) is partially underground.

Most homes are wide enough that they will require a center support for a two-story home. The "required" span distance for floor joists vary depending on load, width of the joists, and its construction. Joists with 2x3s vs 2x2s top and bottom cost a little more (such as a Boise Cascade BCI 6500 floor joist), but make it much easier when screwing/nailing down 2nd floor tongue & groove plywood and hanging ceiling drywall on the 1st floor.

Vaulted ceilings are very nice and spacious in an upstairs living room/kitchen. I prefer a 5/12 or a 4/12 roof pitch as it is easier to work on and hammers will not slide off the roof when laid down (a 5/12 and greater pitch is iffy for tools staying put). High pitch roofs may look neat, but require more lumber. Snow can slide off steep roofs and take out gutters and things below (including you).

Make sure you have a structural engineer review the plans, or you may end up with a collapsed building. An engineer will have to stamp your plans if required and the county or city will sign your plans before issuing a building permit (if they do building inspections).

Apartments after a >6 ft Denver Foothills Snowstorm in March 2003

Excavation

Excavation will likely be your largest cost, and you should select recommended excavators with big bulldozers and excavators. Don't select them if they won't give you an estimate, and understand that blasting (if needed) is an additional cost by the hour (which can often be avoided with big equipment). Avoid contractors wanting payment up front – partial payments as partial work is completed is OK. Don't hesitate to hire someone else if work is unsatisfactory or going too slowly (assuming you didn't sign a contract).

In general, I don't like to sign contracts as they are usually written only in favor of the contractor with no completion date. However, you will likely have to sign a contract for some work like well drilling, HVAC, decks, roofing, etc. Try to add a line with a generous completion date.

I do not recommend doing excavation during winter months with snow on the ground or frozen ground. Snow gets mixed up during excavation, and when smoothed after foundation or septic line work, will collapse as the snow eventually melts (which can take months in summer). You should rent a porta-potty during construction if a restroom is not nearby.

You will need to cut down trees that are in the way of the driveway, house, and leech field, as well as those needed for fire mitigation. You may need to leave high stumps if using small bulldozers. For large bulldozers, stumps can be short. Some contractors may even remove the trees for you and haul them off. This is hard work, and I still have bruises on my legs over 20 years later. A few logs got buried during excavation as I didn't get them far enough away from the work site. Once I bought a tractor with a front loader after a >6 ft snowfall in 2003, I was able to dump the stumps into about four roll-off dumpsters to be hauled off. I learned to have the excavator take care of the stumps and slash while building the Black Hills home.

The next thing is to cut in the driveway and if a well is needed, the excavator will know how to make a pad for well drillers. Slope should be minimized and the county or city may have requirements on the maximum driveway slope, or you may have to get approval from a fire department if the slope exceeds driveway requirements.

Be Careful Around Well Drilling.
The "exhaust" is mostly rock/dirt prior to hitting water – it has now hit water below 300 ft. In a forest, it is more work to clear the area of trees than building the house, unless you hire someone to do it. I went through several McCullough chain saws.

Once you have completed a good well or have contracts to hook up to waterlines, and cleared out trees, the excavation for the house can start. It should be level for the concrete subcontractor, although some concrete guys can compensate for unlevel work. It will look ugly until the foundation is completed and backfilled.

The excavator will also dig a trench for the water line, and you should avoid running it under the

house except where it enters the house, as insurance companies may not cover water line breaks beneath the house. In some cold areas, it may need to be 10 ft deep. If running a copper line, run two in case one gets crushed by rock, as excavation costs can later be high to fix it. Today many are running a thick “rubber” pipe that is unlikely to be crushed by rocks from backfilling.

Excavators should also run a power/phone/internet line, if available, underground to the house, unless it is an aerial line. Aerial power lines are subject to wind damage or falling tree branches, and can start fires when down. Make sure you have legal access to the nearest power pole via utility easements, as some power poles may be on private land. Some lines are direct burial, but a better solution is to run it in conduit like was done in my Black Hills home. If you think it might be needed, excavators can also put in a radon pipe system inside the house at much lower cost than later, before concrete is poured. Subsequent buyers may want a radon mitigation system.

I would not advise putting in a French drain around the foundation if drainage is adequate. It just makes a nice tunnel for rodents, and gives them easier access to dig under the foundation, then into holes left for bathtub drains. Cats can earn their keep in rural/mountain areas.

The excavator contractor will backfill the foundation after concrete is poured and underground plumbing installed, and slope the dirt around the house away from the house to assure good drainage and make the land look nice. In Colorado, over 20 yrs ago, dirt was compacted inside the foundation; in South Dakota recently, it was filled with a structural fill of rock which is a lot better (although underground plumbers may think otherwise).

Black Hills Foundation Prior to Pouring Floor

The excavator will dig a septic or sewer line, and if a septic system, bury a tank and install a leech field. Unless you have a sewer hookup, you should not buy land where you cannot install a leech field, or you’ll be having your septic tank pumped about every month instead of every couple years. Installing a septic or sewer line can often be done after a concrete foundation is poured and building has started.

A Leech Field is Needed with a Septic Tank to Minimize Septic Pumping.

Blasting may be required and a special fill may also be required. Installing a Septic Tank and Leech Field is expensive in Colorado rocky areas. Pipes are later installed and the area backfilled and smoothed. Keep grasses mowed above these areas.

Foundation or Slab

My preference is for a foundation as you usually cannot get down to the frost line with a slab, and I like to have a strong foundation for a two-story house versus a thickened slab. Since concrete work is so expensive today, I prefer to build two stories to increase the square footage and therefore the value of the home; however, **a two-story home is much more difficult to build**. The construction order is a little different for a slab, and I will not discuss it further. I like to have a footer and foundation wall installed because it makes a good reference point for installing underground plumbing. A thick footer is also needed where you would put a load-bearing framing wall. Although the footer may be a bit crooked, the foundation wall needs to be straight and level or framing will be difficult.

If building on a hill, the foundation will step down on the ends prior to reaching the lower foundation wall. Although a single step down might cost less, use at least two step downs to avoid water getting in the house after backfilling. Any concrete walls below ground and above floor level will require sealing prior to backfill (such as brushing on black tar). Make sure an engineer reviews the foundation plans.

Footers for the Foundation Wall.
These do not need to be straight and level like the subsequent foundation wall.

Forms for Pouring the Colorado Foundation Wall on the Footers (Back Wall is 4 ft High).
Don’t forget to put rigid insulation on the outside of the wall that will be below ground level, and seal the wall with black tar on areas that will be below ground level and above floor level.

Additional Footings to Support a Center Load Bearing Wall for 2 Story Homes.
This will avoid the need for steel I-beams down the center to help support the 2nd floor.

You really need to select a good concrete team, as this work cannot be easily fixed if poured poorly. My first house in Colorado (which I bought with a finished upper level) had an unlevel foundation, which I found out years later after a neighbor said he felt like he was falling down when visiting, and insisted on pulling out a level. I did have to disclose the house was not built level when I sold it after 6 years, reducing listing price, and thereafter I always took a level with me to make sure floors were level and walls vertical. There are no specs on how level a home needs to be, unless you put it on your drawings; however, framers don't work to specs anyway – just guidelines. The house I bought in Evergreen was level and straight. The concrete guys I hired to build my foundation in Conifer corrected a not so great excavator job, yet did a great job making the foundation level and straight, which was then easy for me to frame up. The guy in the Black Hills did not do a good job as it was not straight and had waves in the wall, although the overall job was level. The framer I hired for this job, since I was living 750 miles away in Montana at the time, charged me an extra $3K to custom cut studs to make the upstairs level but he created other problematic issues. Again, it is very hard to find good contractors when you live a long ways away from a big city and don't know who is good or bad.

Other options for foundations are cinder block foundations and concrete piers to save on concrete costs. I only mention these as options as I have no experience building with these.

Electrical Temporary

An electrical temp is absolutely essential if you're hiring contractors to do framing, plumbing, electrical, and HVAC. For my garage temporary "home" in Conifer, I used a 5 hp generator and circular saw to cut framing before I had an electrical temp.

Underground Plumbing

Underground plumbing is done before the floor is poured. You should be present for the start of the underground plumbing work to make sure the drains are placed where you want them. I will not discuss installing floor heating (which I never installed) as it costs more, and would be

expensive to replace if problems develop. Hire a large plumbing contractor, because the mom and pop shops get so many emergency calls for plumbing, that your plumbing job could otherwise take a long time to finish.

Underground Plumbing Ready for Inspection for the Bathroom and Laundry Area.
Day Plumbing from Indian Hills did great plumbing work in the Denver foothills.

Framing

This is something you should be able to do yourself to save a lot of money, if you live reasonably close to the job site. Use 2x6 studs for exterior walls and 2x4 studs for interior walls. 2x6 studs are usually much straighter than 2x4 studs. Buy them in large bundles as they will be straighter, unless you're doing a small job and plan on spending extra time trying to find straight ones at the lumberyard. Don't forget about asking for discounts, including veteran discounts at Lowes and Home Depot. If doing this yourself, I will under-buy quantities so I don't have a lot of wood left over, then later buy small amounts to finish the job. Since you are probably working at your day job, and doing work on weekends, you will not likely be able to return wood within the return window. I've always framed with a large framing hammer using clear coat (adhesive) 16 penny nails, whereas most contractors use nail guns today. Hammers reduce stress! Obviously, metal studs, as are often used in office buildings for interior walls, will be fire resistant, but since I've never used them they will not be discussed further.

Treated wood will be required for the base plates. Base plates need to be drilled to match the J-bolts on the foundation, and if you lay the wood on the bolts and hit the base plate, it will leave a mark where you need to drill. Don't forget to use rolls of sill sealer before installing the 1st floor walls. If a bolt is in the opening of a door, a demolition saw is very handy to cut if off versus using a hack saw. My Makita reciprocating saw still works well 40 years later.

Start of Framing for a “Garage” Home.

Garage openings shown above were later filled with “temporary” framing. Due to frozen ground, the garage home was framed, roofing installed, windows installed, and propane heaters used to warm the ground so underground plumbing and a concrete floor could be installed in winter. This is why it is preferred to complete all concrete work prior to winter. Ideally, the home should be sealed prior to winter so you can work indoors in winter.

Work directly with floor joist and roof truss distributors, not the local lumberyard. They draw up plans, usually for free, and will deliver joists and trusses to you. I trusted the design on my Colorado home that was handled thru a lumberyard, but it was a bad design with floor joists only going half way across the width of the home to the center load bearing wall. They even had a laminated beam going all the way across! I asked to speak to an engineer at TJI in Denver and they had none! So, I ended up giving away the short floor joists and ordered more to go all the way across the width of the home (still supported in the middle by a load bearing wall). I only wish my engineer that stamped the plans had caught this before I bought the floor joists. So, 20 years later, I worked directly with Black Hills Truss and went thru a few iterations of the plans before I bought them; we even designed a 4x4 ft elevator option to go thru the floor joists if climbing the stairs became difficult in old age; of course, some short laminated cross beams are needed for an elevator shaft and for stair openings.

Make sure you support your walls with temporary bracing. I prefer studs with 16 inch spacing, although some designs may work with 24 inch spacing. Recheck they are vertical after framing up adjacent walls, as they can shift during construction. They will firm up after OSB sheathing and roof trusses are installed, after which bracing can be removed.

Pre-built Roof Trusses.

Note the temporary board at the top maintaining spacing and vertical boards at the far end. Hurricane ties (not shown) hold the trusses to the top plate, and every hole of the ties must be filled with special nails. Once thick plywood sheathing is installed on the trusses, the braces can be removed. An end truss that overhangs (a flying truss and flying rafters) are not really needed as rain doesn't always fall vertically and it just makes a nice home for wasps.

Regarding door openings, many contractors like to make the rough openings 2 inches wider than the door, although I prefer a little tighter clearance than that. For standard door heights, an 83 inch high rough opening allows you to put a ½ inch temporary shim under the jams so the door will clear any carpet or tile, without having to cut the bottom of the door to clear carpet. You should double-check the openings required for pre-hung doors before framing, as well as the openings required for the windows you intend to buy. Measure the width of the windows and pre-hung doors you intend to buy at the lumberyard – paper specs may not be accurate. One co-worker of mine said that he trusted specs about as far as he could throw an elephant! The windows I bought for my Colorado home were exact per the description; for example, a 5 ft x 5 ft window was exactly that size, so the opening needed to be a bit larger. For my Black Hills home, a 4x4 Pella window was actually a bit smaller, so the opening needed to be right at 4x4 ft.

Today, sheathing is often done with Oriented Strand Board (OSB) instead of plywood. OSB works well on vertical sides. However, I would not use them for flooring or roofing, as they will warp when it rains (as I have seen in other homes during construction), and it will very likely rain before you can get the home weather-tight. I prefer thick plywood for floors (3/4 tongue and groove) and roofing (5/8). When installing OSB with a hammer, I prefer spiral galvanized nails instead of ring shank nails. For flooring, I prefer screws and glue, although most contractors will use nails that develop squeaks. You may want to ask for an early courtesy inspection, before the official framing inspection, to check your work before installing siding and roofing (e.g. shingles), if inspection is required.

Start of Roofing for a “Garage” Home

Bathroom Installation for the “Garage” Home

A small bathroom contains the well pressure tank, stool, and a small sink and bathtub (not shown). Note the use of green drywall on the walls. And since there is no window in this bathroom, there is an opening for an exhaust fan on the ceiling.

For two story homes, you will likely use TJI or BCI structural floor joists instead of 2x10s or 2x12s. It is difficult to nail into the ends of these floor joists, so be wary of this problem if you are building a cantilevered 2nd floor. A cantilevered floor (2 ft overhang), like I built in Colorado, requires extra support for the rim joists, extra blocking to prevent it from rotating (which you may want to wait to install until stuffing insulation in the overhang or use blown insulation), and many more floor joists if you are in a high snow load area.

The floor joists will likely need a center support with a steel I-beam or a load-bearing wall. The steel I-beam requires a crane to install and a lot of framing lumber to support it at the ends (which reduces insulation), although it is good for hanging a punching bag. A load-bearing wall is much easier to build and requires an extra thick footing beneath a concrete floor. However, you should never remove a load-bearing wall once installed.

A Steel I-beam (just above the punching bag that is difficult to see) at my 1st Home.

There are lots of studs (where insulation cannot be placed) to support the I-beam. However, the steel I-beam is handy for hanging a heavy punching bag – make sure you buy a canvas bag as the plastic ones will rip. Note also the gap (not quite large enough) at the bottom of the walls inside the foundation – this is a floating wall (not load bearing) that allows the floor to heave if you have expansive soils (like bentonite).

If you are building in an expansive soil area, you will need floating walls in the basement except of course for walls on the foundation. I did have to do those in my 1st home basement, and it is not wise to buy a home in an expansive soil area. If you don't do an interior floating wall, the concrete floor and walls may lift and fracture the floor above.

TJI Floor Trusses Installed
Laminated beams go part way down the center, allowing a larger walkway opening downstairs. The stairs will do a right angle to fit within the narrower 1st floor.

Start of 2nd Floor Walls
At this point, it is just about time to slide roof trusses on the floor, and then lift them with one other helper to stack on top of the this 2nd floor framing to save the cost of a crane.

Use prebuilt roof trusses. Scissors trusses are nice for vaulted ceilings but will require extra framing support; it really doesn't add that much cost compared to common trusses, as long as it is not too steep. If you stack trusses in order on top of the top plate of the exterior walls, you can install them by hand, although contractors will likely use a crane. I thank Bill Coats for showing me how to do this without a crane on my Conifer "garage", so I could put up the main house trusses by myself (except for help to stack them on the upper floor top plates). Hurricane ties fasten the trusses to the framing, and you have to be sure every hole is filled with nails.

Roof Trusses Stacked in Order and More Walls Ready to Be Lifted.
It is easy for two tall people to lift the trusses on the 2nd floor framing before installing all the framing. Otherwise you'll have to rent an expensive crane.

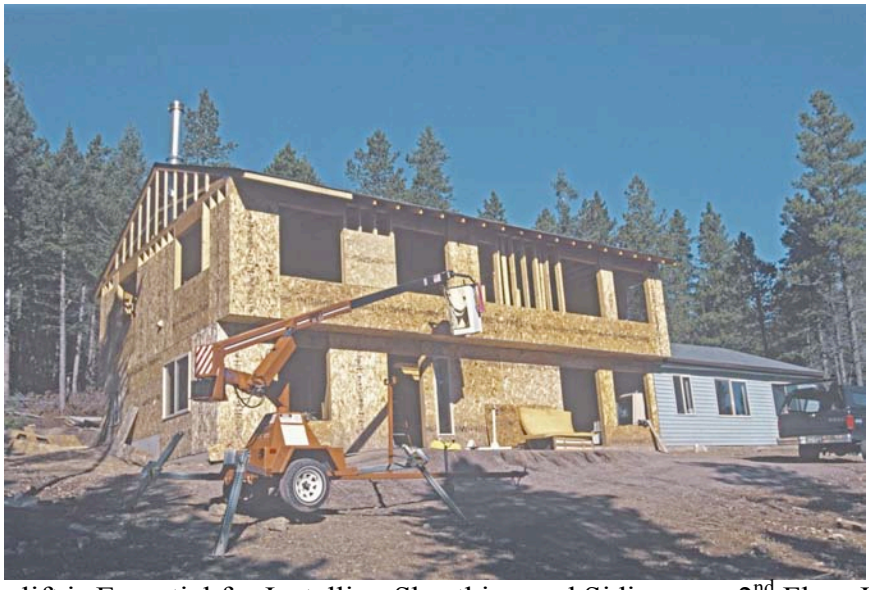
Installing the Gable Truss
Now it is easy for one person to slide the trusses to the other end and rotate them up. A special slanted platform ladder helps to rotate them up.

A 10 ft Step Ladder is Needed for Vaulted Ceilings to Reach Roof Trusses and Secure Them with a Temporary 2x4. Note that the thick plywood floor is wet with recent rainfall. If it was an OSB floor, it would be warped with the rain.

A Temporary Roof Opening for Roof Access Prior to Deck Installation

Take lots of pictures of the framing, as you will want to refer to those pictures when trying to find studs after drywall is finished and painted. Ultrasonic stud finders, which are an essential tool for homeowners, work much of the time, but not always.

Since you probably can only work at the job site on weekends, holidays, and vacation days, it may snow and turn to ice by the following weekend. Ice scrapers won't work on top plates, but if you gently hit the ice with a framing hammer, it shatters and comes right off.



A Manlift is Essential for Installing Sheathing and Siding on a 2nd Floor Home
This rental was a bit flimsy and bouncy, but it got the job done. Note levelers on this electric lift for uneven ground. Some contractors may use scaffolding. The cheap blue siding on the "garage" was later removed and replaced with cedar siding.

Roofing, Windows, and Siding

At this point you will want to protect your wood with roofing, windows, and siding, although the wood will often be fine a half year or more later after exposure to the weather. However, put a plastic cover over stacked piles of wood. For shingles, make sure you put a couple rows of ice shield down over the eaves, or whatever codes require to prevent ice dams from leaking thru the roof. Don't use cheap 3 tab shingles. Buy architectural shingles, and if you live in an area where hail damage is a concern in summer, buy hail resistant shingles that will likely reduce your insurance costs by about $1K per year. A metal roof costs a lot more money and can still get damaged by hail. If you hire someone to install shingles and gutters, make sure they are certified by the shingle manufacturer. Put downspouts far away from bedrooms for peaceful sleep.

Putting vents on the ends of the attic are no longer recommended, compared to soffit vents and roof ridge vents. A roofing contractor will cut the top of roof sheathing before installing the ridge vents, which are then covered with shingles. Make sure they do not set the saw blades to cut into the roof trusses or do it yourself during framing – just deep enough to take out the sheathing. You also need to be sure that blown-in insulation does not cover the soffit vents; soffit baffles or

a thin piece of plywood can be attached on the bottom of the roof trusses near the walls to block blown-in insulation.

Leave an Opening or Slit the Ridge if Using Roof Ridge Vents.
Better to not let a roofing contractor do this step.

You may want to install home wrap over the outside sheathing before installing windows and siding; building codes today may require it. It allows moisture vapor to pass through, and supposedly stops water from getting past the siding into the framing. Water shouldn't get past the siding anyway if installed correctly. Wrap does not cost much relative to the cost of wood.

I prefer vinyl low E windows with nailing tabs, although I have had wood windows (which are expensive) on my Evergreen home (which I bought finished except for a family room downstairs). There were metal windows (which are not a good insulator) on my 1st home (which I bought with an unfinished "basement"). I used screws to install vinyl windows in Colorado so they can be easily removed if necessary. The Pella vinyl windows used on my Black Hills home have terrible locking mechanisms – they will secure your windows but are sloppy. The Jen Weld vinyl windows I had in Montana had excellent locking mechanisms and were still working well after 20 yrs. The Champagne windows I used in Colorado also were excellent and identical to the Jen Weld windows; I was able to install all the windows myself on my Conifer home, except for the big picture window on the 2nd floor.

I now prefer prefinished two-tone siding on LP board, which I had installed on my Black Hills home. Oil-stained cedar siding was popular in the Colorado foothills, but are high maintenance requiring new oil-based stain every 4 or 5 years, and today it is difficult to find oil-based deck & siding stain. Plus, oil-based stain is highly flammable.

T1-11 siding is an inexpensive option and painted. Horizontal plastic siding is also inexpensive. Brick exteriors look nice and are obviously fire resistant but will add to the cost of the home, so brick will not be discussed further.

Exterior Doors

Exterior doors should be installed before installing siding to keep animals and other riff-raff out of the home. Select at least 3 ft doors so it will be easier to move in appliances and furniture. Wooden doors take a beating from the weather unless they have a storm door or are recessed (like under a covered porch). I would have to apply another coat of exterior polyurethane every couple years on my Conifer home. Consequently, I went with pre-colored fiberglass exterior doors on my Black Hills home and am pleased with them so far. It is also possible to buy steel doors, which will be required with fire ratings to go into an attached garage. Choose your colors carefully, as you will need to select a "complementary" color for the siding, trim, and moulding. Dark colors are more difficult to match if you do the staining.

A storm door can help to protect your exterior doors. They will have vertically sliding windows and screens. When desiring fresh air, put the screen in the upper half of the door so pets won't tear it up.

Sliding glass doors are not a favorite of mine. They lose a lot of heat and the rollers at the bottom wear out over time. The rollers are difficult to replace as the doors are heavy. There are times when you may try to walk right through the door. The sliding screen doors that usually come with them can fall out of the tracks and pets will destroy the screen doors.

Decks and Carports

I have always hired deck contractors and used redwood that can be difficult to obtain today. They have similar maintenance issues as cedar siding. Treated wood is an inexpensive option, is very dense (hence heavy) and still requires staining. There are prefinished products available like Trex, although they are extremely expensive and supposedly do not require maintenance. Trex boards I've seen in Yellowstone definitely discolor in time. Make sure decks are fastened to the house properly, preferably using big nuts and bolts, although most contractors will use large structural screws. Inspectors should ensure this is done correctly. Put the deck up while framing the 2nd floor, which will make access much easier while carrying materials upstairs.

A western style deck allows you to slide or brush snow off the edges, which is much easier than lifting snow over the rails. Some building codes may require balusters with no more than 4 inch openings so little kids cannot fall thru the openings. It seemed dumb that they did not require gates, but I added one later mainly to discourage (not prevent) wildlife from getting on the deck. Balusters are a pain to stain (unless you use a sprayer), so if building codes are not required, you may want to just put in a couple horizontal 2x4s in lieu of balusters - it was allowed in the 1980s (my prior Evergreen home).

Carports have similar construction plans as decks, except the roof must be slanted to drain rain water with at least a 2/12 pitch. As I found out later, they will not protect your car from wind-blown hail in hail prone areas; I did subsequently buy some hail netting to drape over the sides.

A Western Deck that Allows Snow to be Slid off the Deck
Note also that the flooring is slanted at an angle to avoid butted floor boards.
Use special deck screws and recess them.

Plumbing/Mechanical

I had to start framing before the floor was poured in Colorado, because it was too cold for plumbers to dig the frozen backfilled dirt that was covered with snow, and it was not fun doing so on uneven ground. So, the underground plumbing was done after it warmed up and after framing, which would usually be done before any framing starts.

Do NOT let any of the contractors cut into the floor joists or put holes in laminated beams, or you'll flunk your framing inspection – make sure that everyone understands this. They can knock out the holes in the TJI or BCI floor joists, but don't let them cut holes in laminated beams nor cut the joists. Move any walls upstairs a few inches to a half foot from the design if it looks like a floor joist is in the way of the toilet or tub drains. Talk to your plumber before framing the 2nd floor. I don't know why toilet tanks are installed close to the wall, which makes repainting hard.

The rough-in mechanical should be done before plumbing or electrical as it requires the most space (if installing a central HVAC system). The rough-in plumbing should be done afterwards. I had great plumbing and HVAC contractors for the main two-story house in Colorado. Some HVAC contractors will try to make straight runs to your rooms beneath the floor joists, which would require extra framing, boxing, and can look terrible. Every new home I've owned had a main run down the center of the house, again beneath the floor joists, but then the takeoffs and ductwork are hidden in the floor joists (which works adequately and looks nice). Occasionally the 1st floor is made 10 ft high because of the main ductwork, but that adds costs to the home. I would suggest having floor registers at least a half foot away from the wall, instead of a few inches, as they will just blow into curtains. Use sheet metal for HVAC ductwork, not aluminized cardboard for returns, as it can be damaged during duct cleaning.

An HVAC system does not draw in outside air. This is important if poor air quality is a concern. If the outside air is high quality, you can always open a window to bring in fresh air. Window mounted air conditioners suck in outside air, as do air exchange systems designed to bring "fresh" air into the house. Swamp coolers used in desert areas have noisy big fans and bring in outside air. Heat pump systems often do not work when temperatures drop about 10 degrees below freezing. Mini splits are not as quiet as central air conditioners and will only cool (or heat with a reversing valve) one big room. Electrical wall fan heaters are very noisy and only suitable for small bathrooms, and the fan will wear out after a half dozen years.

Thermostats should not be placed on exterior walls or on the other side of refrigerators, as the thermostat will not reflect the actual indoor air temperature. Wiring for thermostats will be installed during the rough-in. Most people will want touch screen controls that can also be accessed with smart phones, despite internet scams.

Plumbers have not installed rough-in plumbing in exterior walls for many decades due to freezing issues. You may have to install an additional wall just inside the exterior wall to run plumbing. Plumbing should also be installed thru the knockouts on the floor joists if not in walls, or it will be difficult to complete drywall. You may want to install false ceiling tile in these areas.

Electrical

I would advise using a larger company to do electrical. The neighbor that asked to do the electrical in Colorado did a terrible job – baseboard heaters were falling off the wall, and I had to later secure them with screws into studs. Plus, he didn't label wiring for the main home, and simply stuffed the rough-in wiring into the attic of the garage; I had to use a 9V battery on one end of the main house wiring and a voltmeter at the other end to properly label the wiring. The electrical did finally pass inspections, but I would not hire a mom and pop contractor again for electrical, even if he/she is certified.

You should have a temporary installed after the foundation is in place, so you have power while framing and hiring contractors.

The rough-in electrical is the last rough-in job. The main breaker panel should be installed indoors, so you do not have to go outside in the rain or snow to see if a breaker has tripped or to turn off a breaker while you're replacing a light fixture. Unfortunately, the newer breakers are twice as wide as the breakers from the 1990s, so you can't get as many breakers in a 200 amp box, and the newer breakers aren't as reliable (but supposedly safer and the current codes require them). I never had an issue with the good old skinny GE breakers, which in turn replaced the really old fuse boxes. Electric baseboard and cove heaters (hang'em high) are good "quiet" heating options. Cadet baseboard heaters are inexpensive and reliable, whereas the cove heaters are very expensive and don't put out as much heat per unit length – use 240V wiring. Cove heaters also have sharp edges and make thumping noises as the ceramic expands and contracts, especially the longer ones. The main advantage of cove heaters is that they are out of the way, so you can put dressers and sofas against the wall, which you should never do with baseboard heat.

Don't forget to run wiring for a doorbell, or you will be buying batteries for a wireless doorbell.

As mentioned earlier, solar or wind power will add to the cost of the home. And, if you don't have power company hookups, you will need battery backup when the sun doesn't shine or wind doesn't blow, which will greatly add to costs. Use deep cycle lead-acid batteries versus Li-ion, as Li-ion explodes if damaged and is very expensive to recycle.

Final electrical is done much later after drywall is in place, textured and painted. I prefer metal outlet and switch covers that do not discolor, although plastic covers are less expensive.

Insulation

Before you install insulation, re-tighten the nuts on the J-bolts that hold the base plate framing to the foundation – they will likely be loose after framing. Insulation is the easiest job to do, but wear gloves, protective clothing and facemasks, as fiberglass fibers itch and can damage your lungs if inhaled. Asbestos insulation is forbidden in home construction, but don't think other insulation is healthy to install without proper personnel protective equipment (PPE).

Use R-19 insulation in exterior walls. I had one idiot contractor try to put R-30 insulation in my Black Hills walls that was originally intended to be put above the ceiling. That was corrected. The batts tend to come out a bit short on standard height walls, so cut a small piece to fill in gaps. Split the insulation down the middle to get insulation on both sides of wiring so it is not compacted. And follow the manufacturer's instructions, like using staples to secure the paper backing. Alternatively, I've seen contractors use unfaced insulation and staple up plastic sheets as a moisture barrier.

Use unfaced fiberglass insulation around fireplaces – you may need to use metal cross-pieces to hold it in place.

I don't like blown-in insulation above the ceiling as it goes all over the place, and if using R-30 or R-38 batts, it is much easier to install batts if you do a row of ceiling drywall, then stuff the batts above the drywall, then do another row of ceiling drywall. Make sure the moisture barrier (paper or plastic) is facing down above ceilings – these do not need to be stapled. I suppose you could use a layer of aluminum foil at the moisture barrier interface if you need to hide a Sherman tank in the garage from satellite radar – OK, just kidding – as it would also shield against RF links like radio/TV broadcasts.

Stairs and Rails

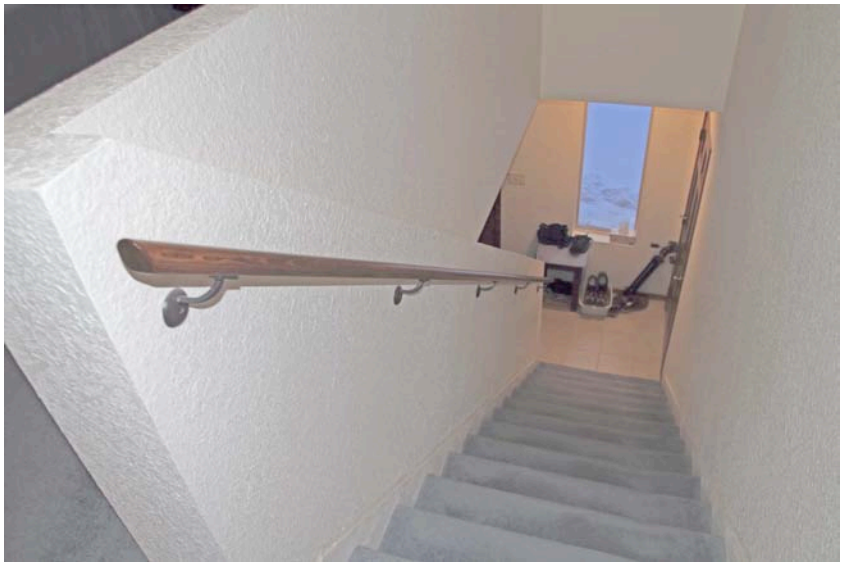
You can frame the stairs yourself, hire someone, or buy pre-built stairs. Unfortunately, I bought custom pre-built stairs in Colorado, which looked nice, but were glued and stapled together, and fell apart when I was installing them. I had to screw everything back together again. And I do recommend using screws on anything you walk on.

Handrails are probably something you want an expert to install if using balusters, which look

nice. I had oak rails installed in Colorado, which I then had to stain and “varnish”. However, wait until the drywall is installed and painted before installing handrails. You can touch up the walls later with paint since stain tends to splatter. Install carpet later.

Oak Stair Rails and Balusters Look Great but are Expensive

Alternatively, it is much easier to install rails on walls that do not look as nice as above, but cost a lot less. For a single wooden handrail, use brackets that have one hole for a screw, so you can hopefully hit the center of a 2x4, versus those with 3 holes. Check code requirements on height. Iron balusters and rails, which also cost less, obviously do not need staining. Use 2x10s or 2x12s on the side of the stairs instead of drywall, or you’ll damage the drywall when vacuuming. It is easier to install carpet on these steps versus those with balusters.



A Low Cost Handrail

Interior Doors

You should be able to use 2x4 framing for all interior doors, which will reduce the cost of interior doors. “Flush” prehung doors are the least expensive doors to install. They are not fancy, but if you are reading this you are probably trying to save money. Shims will be needed, although I prefer cutting small pieces of plywood to use as shims, and use a screw to hold the shims in place. Screws work better than nails when installing prehung doors, as it is easier to realign the door if necessary. I have had good luck with oak or birch veneer flush doors, which are lighter in weight. Heavy doors are more expensive and tend to sag off the hinges, and then you eventually have to move the striking plate down.

I have purchased panel doors and tried pre-stained doors. Many companies use water-based stains that do not penetrate like oil-based stains, and bare wood gets exposed as the panels dry out and contract. Water-based stains can also rub off when pets brush the doors. Menards told me in 2023 that their pre-stained doors used oil-based stain but without a polyurethane coating that is needed to protect the stain – so I didn’t buy it, and the packaging is poor.

A light-colored stain is easier to apply and match with other light colors than a dark stain. If using pine wood, it will require prestaining prior to applying a dark stain; it is not necessary to prestain hardwoods like oak.

For closet doors, you have a choice between bypass and bifold doors for large openings. You can only open bypass doors to access half the opening and they require a guide on the floor in the middle of the opening. Bypass doors are very forgiving on the width of rough framing. Bifold doors give you a wide access to the closet but require close attention to the rough framing width. You do not necessarily need to screw anything to the floor for bifold closet doors, which is advantageous for concrete floors.

When doors start squeaking, take the pins out one at a time, and spray them with WD40 outdoors – when they dry, wipe them off if necessary and reinstall. Do not use some of the carbon products that leave carbon dust on the floor. (By the way, for car door hinges that are hidden, a white grease spray works well to stop squeaking that is available at most hardware stores.)

Drywall and Painting

I hate installing drywall, but you can save a lot of money by hanging drywall yourself with a drywall screw gun. Buy most of your drywall directly from a drywall distributor, not your lumberyard. They have trucks, and special lifts and dollies, that will place your drywall on each floor right where you can use it. That worked great in the Black Hills. Unfortunately, a lumber yard just left the drywall outside during build of my Colorado home 20 years earlier, so I had two high school football players carry the drywall inside the house and up the stairs – too much work for me.

Drywall hammers make too large of an impression and you will waste time trying to fill it with mud (joint compound). Make sure you use drywall screws – I use 1-1/4 inch screws on walls and

1-1/2 inch on ceilings. Use ½ inch thick drywall unless codes require you to use thicker fire resistant drywall under stairs and on walls with attached garages.

Since I like 8 ft high walls, I hang 4x8 drywall vertically that results in fewer butt joints, after ceiling drywall is installed. Many drywall contractors buy 4x12 drywall, which is too clumsy and heavy for me, and hang them horizontally. Hang the ceiling drywall first using a drywall lift – they were cheap enough to rent around Y2K, but not 20 years later. However, Menards had a cheap lift for sale that was OK for the downstairs job in the Black Hills.

Drywall contractors have special tools for cutting holes for light fixtures and outlets. You may have to use a tape measure, pencil, drywall or keyhole saw and utility knife to do it yourself.

For the walls, I use a flat pry bar tool and a small board to lift the drywall against the ceiling drywall, and put temporary shims under the drywall while screwing in a few screws to hold up the drywall. Then I can install the rest of the screws. Metal tends to flake off the screws and create splinters, so you may have to use tweezers to get metal splinters out of your fingers, especially when you try to get the screws out of your tool belt. It's safer to just pull the screws out of their box. Make sure they have coarse, not fine thread.

Drywall Installation

A gap at the bottom allows boards to be placed over the stair opening. An 8 ft step ladder is handy for attic access. Batt insulation is installed on the ceiling as drywall is installed. Don't forget about the wall area between the flat ceiling and vaulted ceiling, although it is a small heat loss into the attic compared to the windows heat loss.

Try to find a good contractor for taping and texturing – I have yet to find a good one, although I did find a good repair drywall contractor from a State Farm list. I really hate this job myself, but I have done it in the 80s, 90s, 00s, and later. It takes me a lot of steps to mud and sand to create a smooth surface for texturing, but a really good contractor should be able to minimize sanding. Make sure you put down a floor covering prior to texturing, or you will have a mess to clean up

later. The texturing and painting should be done prior to laying floor tile or carpet. I prefer a light "knock-down" texture as it is easy to paint later with rollers. Contractors will likely spray paint the walls, as windows will already be covered during spray-on texturing. I have sprayed a popcorn ceiling on the basement of my first home, which looked nice, but that limits you to spray painting later if it becomes faded; and you will have to use a drywall knife to scrape it off the walls. **Use primer on drywall!** Don't believe the paint ads that say both primer and paint are included, because it won't work on drywall that hasn't been painted yet.

Flooring

This is a job you may want to contract, as it is laborious yet expensive if hiring someone to do it. I have, however, used semi-rigid floor tile with self-adhesive already applied (a peel-and-stick product), and it came out nice. It was easy versus laying down linoleum or ceramic tile.

A Peel-and-Stick Floor Tile is Low Cost and Easy to Install
No messes like with linoleum or ceramic tile. It can bend a little bit but is mostly rigid. Moulding has not been installed at this point. Again, the large windows look nice but will have significant heat loss.

Linoleum is often used to reduce costs in block homes. It is a soft material. If you do it yourself, you can spend a lot of money on glue (which doesn't smell good and offsets the cost savings).

For ceramic tile, buy tile all from the same lot, and extra tile for repairs, as different lots can have slightly different sizes and colors. I'd stick with no larger than 12x12 inch floor tile, versus larger tile, in case a concrete floor is not level. For kitchen tile on a wood floor, I'd stick with an underlayment of Hardie board instead of the much more expensive Detra that can create popping sounds when walked upon, which then produces cracked grout lines due to poor installation. You do not need underlayment for a concrete floor. Make sure you use the correct color of grout, and keep a record of the color, as changing grout colors later is a very messy, tedious job, which I now hate more than drywall work.

Other than floor tile, I like thick nylon carpet that is more expensive but lasts longer than polyester. Make sure you test any cleaners in a closet or extra piece of carpet, or you may damage the color. Hardwood floors are very expensive and better left to an expert. I've tried engineered hardwood that snaps together, but I ended up reselling it at a loss as it snapped apart because a concrete floor was not level enough.

Carpet in the Process of Installation after Painting and Floor Tile is Completed

This rock fireplace wall looks a bit too large for this living room, so don't let your spouse talk you out of a simple moss rock or stone veneer for fireplaces (e.g. Gold Creek Ledge & Moon Mist from Dakota Stone). Also, you don't need as large of a hearth in front of an EPA rated fireplace, as the window door (which needs frequent cleaning on the inside because it seals) does not allow sparks to jump onto the floor. An EPA rated fireplace may be required in areas with poor air quality; although the Denver foothills had excellent air quality, smoke can blow down into the Denver area. This fireplace put out a lot of heat, had takeoffs to send heat to other rooms, and dampers/carbon canisters, but required a crane to lift to the 2nd floor while framing. Baseboard heat was added as a backup in case the HVAC system failed or if propane was not delivered on time (natural gas became available later).

I was actually disappointed with a smaller RSF EPA fireplace (not shown), as there was no damper and cold air comes out of the bottom intake when the fireplace is not used, even with vents closed.

Cabinets

Cabinets and vanities are installed after the flooring is down and walls painted. In Colorado, I bought these during sales when various lumberyards were going out of business such as Homebase. Home Depot and Lowes survived, but my favorite yards did not survive – Hugh M Woods with many smaller stores - where you could drive right to the lumber, load up, take tickets inside to pay up, and drive out through a checkpoint – different than the Menards today

where you have to buy first before you can drive to the lumber, which may be on a 2nd outdoor floor.

I was able to install cabinets by myself on the home in Conifer and use 5 gallon buckets and a board to support the overhead cabinets while screwing them to studs. Cabinet quality has greatly decreased today, so you really need to inspect them in person instead of buying online.

Kitchen Cabinets can be Installed after the Floor Tile is in Place and Walls Painted.

Note that leftover 5 gal buckets from painting or drywall mud, and leftover wood is handy for installing upper cabinets. Note the opening on the right below the vaulted ceiling that allows kitchen heat to escape into the living area. An opening in the wall (my Bronco "window") is also handy for watching TV while cooking although it takes some space away from cabinets.

I had a lumberyard design and install kitchen cabinets and bathroom vanities in the Black Hills. This was a mistake as they designed the cabinets too wide, and the doors can hit you in the head when you open them. Do not buy overhead cabinets any wider than 30 inches if you don't want the cabinet doors to hit you in the head. It is better to buy a 30 inch and 15 inch cabinet instead of a 45 inch overhead cabinet. For base cabinets, you will want at least a 36 inch wide cabinet for sinks. Wide cabinets are OK for the base.

The face of cabinet drawers should be held on with screws from the inner drawer. If stapled together, they will likely fall off, usually during installation. It will take a lot of time to buy handles and screw those on from the inside to fix a staple job – careful pre-drilling is required.

I prefer laminated countertops with a "no drip" shelf. Granite countertops look nice but are expensive. Ceramic tile countertops like I had in Evergreen are difficult to clean because of the grout lines and also more expensive than laminated countertops.

Final Plumbing and HVAC

I like cast iron sinks but they are too heavy to install by yourself. Thick stainless steel sinks can be installed by one person but show water spots if you don't dry them after each use. I've never seen a stainless steel sink with a porcelain coating that should be easy to install and not show water spots. Drop-in sinks are easy to clean. Under-counter sinks, like you see any many hotels, are difficult to clean under the lip and can harbor germs.

Cast iron bathtubs are heavy but rigid, and usually come with no-slip strips that are uncomfortable today, unlike the old days. Plastic tubs are not rigid enough. I have bought a steel tub with a porcelain coating that was rigid and much lighter than cast iron – it came with no-slip strips that were difficult to remove. I did have a plastic, drop-in jetted tub installed in Colorado, and the plumber secured it in concrete to make it rigid – good luck trying to remove it! Unfortunately, the extra framing required for a drop-in tub made the bathroom too small.

Delta faucets are the most reliable, and you can get classic designs for under $100 by shopping around. Some single-handle tub faucets have very expensive cartridges when it is time to replace them, so be wary of this issue. There are adjustable disks inside single-handled tub faucets to mix in a little cold water when turning it all the way to hot – plumbers may mix in too much cold water to pass inspections for showers, but it can be adjusted later to give more hot water.

HVAC Ductwork is Hidden in the False Ceiling and Boxing Overhead

This is looking toward the "Garage" Home. The furnace and hot water heater is in the closet to the left. The round ducts take off from the main and are hidden in the floor joists, so the rooms will have 8 ft high ceilings. It is a good idea to add extra electrical heat on the lower floor, as the thermostat controlling the furnace is usually upstairs. On the right is the center load-bearing wall.

Unlike the good old-fashioned analog thermostats with mechanical levers, the newer digital thermostats, which can also be controlled via the internet, are ESD sensitive. If you used metal

corners for the drywall, you may need to discharge yourself on a wall corner prior to touching the thermostat screen, as it can go haywire from an ESD event and take several minutes to reset.

Also, the high efficiency gas furnaces are expensive to repair and do not offer that much more efficiency compared to standard furnaces. The old standard furnaces do require ductwork to go thru the roof, and fresh air vents, whereas the newer furnaces have intake and exhaust tubes thru the walls (which are noisier outside). An all-electrical heating system avoids these problems.

I cannot find good towel rack bars today. Ideally, you'd like them to have 16 inch (or 24 inch) wide spacing between fastener holes so you can screw them into studs.

Final Electrical

This is not difficult to do but it is probably best to hire an electrical contractor. Make sure the breakers are labeled and turned off when working on a circuit – and verify the wires are not hot with a voltmeter. You will want to select the light fixtures. Menards may have the cheapest lights, and there are also some good buys at Lowes and Home Depot. Indoor fluorescent and LED lights will not save you much money over incandescent lights in a cold climate. Incandescents are nearly 100% efficient at generating **heat** plus visible light. Whenever you need to run heaters or furnaces to heat your home, you just need to make up the loss of heat from not using incandescents with your primary heating sources. In a warm climate like L.A. or Florida, LEDs and fluorescents will save you money. However, the latter contains mercury and is a recycling hazard. A temporary horizontal 2x4 is useful for installing electric baseboard.

Moulding

I used pine moulding on my Conifer home that is cheaper than oak, and oak moulding on my Black Hills home. I could not get a good match to the darker doors on my Black Hills home using pine, so I switched to oak, had to mix two stains, and applied it twice before adding a polyurethane coat outside. Also, oak doesn't dent as easily as pine when you miss hit a nail. If I had bought light colored doors, the staining would be a lot easier. A 10 inch miter saw is absolutely essential in making clean cuts, and I custom cut every baseboard and casing prior to staining, labeling the back of each board as to where it goes.

I moved in prior to installing moulding which makes it a lot more difficult to do when desks, beds and cabinets have to be moved again and again. But it saves money as you're probably paying for living quarters while the home gets "finished". Professionals may install baseboard before flooring, leaving a suitable gap for tile and carpet.

Final Inspections and Moving In

If building inspections were required, you will need a Certificate of Occupancy (CO) before moving in. It is often easier to use the deck stairs to move furniture into the 2nd floor with less damage to finished interior walls. Rent dollies from outfits like Uhaul. Plastic moving "men" also work great for scooting things on carpet.

Appliances and Furniture

These are strongly personal preference, so I will only offer a few comments. Best Buy often has the best prices on appliances; if they don't have what you want in the store, look online and they can often get it. Depending on the time of the year, Lowes and Home Depot can also have good prices. Shop around. These stores often allow you to cancel an order or return the item according to their return policy. You are usually stuck with an item once you sign a contract with a furniture store.

Refrigerators used to last well over a decade. I bought one in 2020 that failed just after a year, after the warranty expired. Pay attention to where the refrigerator light switch is once the door hinge is on the side you want it to open. I've scratched/cut my arm on a door light switch while reaching for food. They used to be placed in the middle near the top of the door.

I do not like gas stoves as they are often vented in the house, and I would get headaches from the fumes when I visited my parents home. If buying an electric stove, a glass smooth top is much easier to clean despite costing a little more.

The larger furniture stores will obviously have better prices on furniture. Sectional sofas are much easier to move. I prefer kitchen tables with four legs, instead of center supports that get in the way of feet.

Never push furniture up against electric baseboard heaters or wall heaters. Read the instructions for proper distances.

Choose round corners on tables, as sharp corners can stab your legs.

Window Curtains and Blinds

Wait to buy window curtains and blinds until they go on sale, although you'll probably want to buy them as soon as possible for the bedrooms.

Full length (to the floor) curtains look nice, but cost more and may cover up heating/cooling registers and electrical outlets. Never allow any curtains to get close to electric baseboard heaters. There are shorter length curtains that cost less. Traverse rods are my favorite with strong cords and pulleys to keep the cords from tangling, but you usually have to look online to find them today. Strangling was a concern for kids, but I never had an issue with them and the cords last many decades. Those that pass through metal rings on curtains are durable, but scratch metal surfaces and are a pain to open one side at a time, often hanging up on the rods.

Fasten the rods to the wall with screws, preferably hitting the wall studs for a secure fit. Tension rods are just asking for trouble – they will eventually fall off.

Mini-blinds look nice and will not block your heating/cooling ducts or outlets. The cords are too skinny and will break, and cats will likely get their arms stuck in them as they play with the

cords. Cats and dogs can destroy the cloth mini-blinds as they try to get flies or other bugs & spiders crawling on them. Bugs also like to get inside cloth blinds with open ends. Metal mini-blinds are much more durable, easy to clean, but still have the thin cords.

Driveways and Sidewalks

If not completed earlier, you can have a concrete sidewalk and driveway put in, but only after the backfill has settled or the concrete will develop cracks and collapse. An asphalt driveway is another option, but may become slick during ice storms. Gravel driveways are cheaper, usually not too slippery when it snows, but difficult to snow plow without scraping the gravel to the side.

Landscaping

Put down a thick layer of plastic and decorative rock or bark for a few feet surrounding your home. You can also install edging if desired to separate the rock from grass.

In my first home, a sprinkler system was installed with the help of neighbors. Four neighbors also got together to buy sod and help each other lay down sod.

If using grass seed, like my last home, make sure you put down a couple inches of black dirt first and put it down in the spring when there is more rain and when it has time to grow over the summer. You will have a muddy yard when it rains before grass is established. Putting down seed in the fall doesn't work very well in the drier western states. You will get a thick lawn where you put down black dirt, and a spotty lawn where you didn't.

If you don't already have trees and bushes, you can install them but they are expensive. Aspen trees need lots of water and should be installed well away from the house, or their root system will grow rapidly and wrap around your foundation.

Landscaping of My Littleton Home

I bought railroad ties for the hillside which can be maintained by brushing on used car engine oil – but don't sit on them for awhile. I put brick around the concrete posts for the deck, which stuck too far out of the ground, and flagstone for the back patio (not shown). Tulips, flowers and bushes are on the hillside. The upper grass row is a utility easement.

Fencing

Fencing is optional, and can be useful to avoid neighbors from encroaching on your land or keeping pets off (or on) your property. You may need a fence permit. Unintentional encroachment is common in mountainous areas. I've even had neighbors move a property pin in forested areas, and corrected the pin's location with the assistance of surveyors. Wooden fences are expensive but easy to install yourself. If it is not rocky, digging a hole for the posts is easy, and you can mix up a bag of concrete in a wheelbarrow to dump in the hole to support the post – just make sure the finished concrete is slightly above grade to drain water away from the wood. A nail, string, and plumb bob (or bolt) can be used to align the post vertically.

A welded wire fence, if allowed, is a lot less money. Most cats will stay inside a 6 ft high wire fence with metal T-posts, and it will also usually keep out deer. A stepladder and hand sledge is useful if knocking T-posts into rocky soil; there is a T-post driver to do this that is OK in dirt but not rock. If you use wooden posts, cats can climb right out. A wooden gate, if used, can be put under the deck and extended to the deck joists if the deck is low (this will also prevent cats from climbing out). Put flagstone under the gate to keep pets from digging out.

Maintenance

You can now enjoy your home, except for maintenance items like mowing lawns, repainting when needed (hopefully not sooner than 20 years), replacing filters and gaskets, cleaning, etc – and you thought you could now relax!

Personally, I would not buy extra insurance from plumbing and other contractor companies if fixtures go bad. When my mother needed a new faucet in the Kansas City area, AB May's gold plan would not pay for it because they said it was an upgrade – what do you expect from a home that was 60 years old at the time? Nor would they pay for furnace repair or a water-damaged breaker box. It is best to stick with the regular home insurance companies that may offer options for underground utilities insurance, flooding, etc.

Summary of Building Costs

In 1997-2003, when I hired subcontractors for well drilling, excavating, concrete, plumbing/HVAC/FP, electrical, decking and roofing, it cost me about $54/sq ft on a 3006 sq ft house less land costs. Since general contractor costs were running about $100/sq ft at that time, the savings were over 40% by doing most of the work myself. Excavation was about 15% of my total cost, 4% for permits/engineering/CAD, 5% for a well, 8% concrete, 4.4% framing (I did the framing), 12% deck, 6% shingles, 5% doors & windows (that I installed), 11% plumbing/HVAC, 4% electrical, 1.4% insulation, 2% drywall since I did most of the work, 4% siding (which I installed), 15% finishing, 2% power pole/phone, with the balance on appliances, etc. It cost about 40% of the total cost just to get into the "garage" home, as I still had to put in a well, septic system, and complete most of the excavating. I never ended up building a garage for this mountain property.

In 2018-2019, when I hired subcontractors to do excavating, concrete, framing, plumbing/ HVAC/FP, electrical, siding, decking, and roofing, I saved over 30% of the cost to hire a general contractor which was running about $180/sq ft excluding land. It is not unusual to see costs double over 20 years for "low" inflation rates, with ripples due to recessions. Excavation was about 13% of the total cost, 10% for concrete, 15% framing, 3% shingles, 4% doors & windows, 13% plumbing/HVAC/FP, 5% electrical, 1.5% insulation, 5% drywall, 13% siding/deck, 16% finishing, and the balance on permits, appliances, etc. Since this home was built in a hail prone area (which was never a problem in prior homes), a 2½ car garage plus a carport was built.

You can use the above percentages as rough guidelines. Find out what general contractors are charging per square foot to build an average home (excluding land) in your area, and figure you can save at least 30 to 40% by being your own general contractor and doing framing, insulation, drywall, and siding yourself. You really shouldn't get quotes for various jobs until you're serious about doing them. You can get a good idea of costs by talking to contractors at home shows.

Another source for housing cost trends are Housing Price Indexes (HPI) for different areas at the Federal Resource Economic Data (FRED) website. You can use the search window for FRED, e.g., "HPI for Denver", "HPI for Wyoming". Denver data is normalized to 1995 versus year:

https://fred.stlouisfed.org/series/ATNHPIUS19740Q

Colorado and Wyoming data is normalized to 1980:

https://fred.stlouisfed.org/series/COSTHPI
https://fred.stlouisfed.org/series/WYSTHPI

You can see that the housing prices after the great recession of 2008, due to greedy banking practices, did not recover for half a decade, and then went crazy – currently over 8 times home prices since 1980 for Colorado and Montana, 10 times for California, yet about 4 to 5 times for Wyoming and Kansas. The fed rate was kept way too low for way too long after 2008. You can also look up CPI data on FRED.