



## **Case Study - Older Home Renovation Challenges in Houston**

Completing a major renovation on an older home in Houston has many more challenges than a 20 - 30 year old home. Many of these challenges are concealed until you uncover them through demolition. This discovery process can result in many negative consequences like greatly increasing the budget and angering the owner. These types of consequences early in the affiliation of the general contractor and the owner can strain the trust and confidence of the relationship for the balance of the project.

The following discussions goal is to identify many of the high risk areas of the home renovation process that may have the greatest potential of negatively effecting the budget and working relationship. For the sake of definition we will identify older homes as houses build before 1970. Although the expected service life of homes varies significantly due to the original construction, the service repair and maintenance history. If properly maintained a quality built home can routinely last 80 - 100 years.

Houston metro area homes are demolished more often due to undesirable home designs and the economics of increasing land values outweighing the improvements. These properties structures are typically in such ruinous state and in need of so much structural repair that economical it does not make sense to renovate. In these cases the land has the true value and will be purchased to build a future new home at the location.

### **IBC Building Codes**

The City of Houston and surrounding areas employ the International Building Code (IBC) as the prevailing structural building code. Each of the required licensed professional trades are governed by their own codes; Electrical - National Electric Code (NEC), Plumbing - Uniform Plumbing Code (UPC). HVAC - Uniform Mechanical Code (UMC). These national code editions are updated every 3 years, but not necessarily adopted by the municipalities.

When a home experiences a major renovation, any component that is opened or modified must be brought up to the current code requirements adopted by the local enforcement municipality. This requirement can present some unexpected challenges and expenses when modifying older homes. In many cases it is more effective to abandon a section of a existing system and install a new system when it comes to mechanical, electrical and plumbing (MEP).



## **Foundations**

Modifying the foundation of the home generally involves a soil proctor and engineers examination. When you add to the structures foundation you can affect the entire load distribution of the structure. It is also necessary to give the mechanical connection of the 2 foundations careful consideration. This is a natural weak point that can cause cracking in the future. There are several different standard foundation types in Houston;

**Slab on Grade** - The most common of foundations in Houston is the slab on grade. This is a monolithic concrete foundation slab where the grade beams are incorporated into the design of the load distribution system. These foundations are reinforced with metal rebar and will often be supported by bell bottom piers placed under the grade beams.

Slab on grade foundations are a well accepted conventional home supporting system if placed on the proper compacted soil with suitable material properties. These types of foundations can be problematic if placed on highly plastic soils or earth faults subject to movement. They can be repaired and leveled by jacking the structure beams and adding additional piers and shimming the existing ones.

**Pier & Beam** - A pier and beam foundation is composed of piers placed under load bearing points of the structure. Typically the wood beams of the homes subfloor is placed over these piers to distribute a uniform load over the area of the structure.

This foundation is the easiest to modify and to mechanically attach too. There is usually a crawl space under the subfloor to get access to waste lines and some utility connections. In addition this foundation can be cost effectively leveled as it experiences settlement over time. Adding to these structures is fundamentally easier.

## **Plumbing**

The UPC has adopted some major changes over the last 60 years as the industry has accepted materials such as PVC waste lines and copper supply lines. Both of these materials have property values with greater life expectancy than their predecessors. Although the principles of plumbing have not dramatically changed, the popularity in the use of natural gas as an affordable energy source has increased the demand for heating, cooking and other required gas piping devices.



**Supply Lines** - The traditional vintage water supply lines were composed of galvanized steel pipe. The service life expectations for these pipes is generally expected to be 30 - 60 years. Copper became the preferred material of use in the late 1960's, and extended the service life of supply water lines. It was affordable and easy to use. Copper pipes have extended life expectancy over galvanized pipe. Their service life is indefinite if not required to supply hard water which causes blockage from mineral deposit buildup. This condition close to the water heater will shorten the service life.

In recent times many builders and plumbers have accepted the use of new approved supply lines known as PEX (polyethylene pipe) . This pipe has become very popular as a replacement product for retrofitting existing homes with dated water supply lines. This is due to the flexibility of the material during installation. The PEX pipe can be fished through small opening while being turned and twisted to fit. It is supple and flexible enough to maneuver through tight spots.

**Waste Lines** - It is common to find multiple waste line materials in homes over 50 years of age. Cast iron was commonly used for waste lines directly underneath the house. These cast iron lines would typically connect to a yard waste line made of concrete pipe or clay pipes. They were often flared for one section to fit into the next. The issue with these yard line pipes was the movement of soil and the interruption of tree roots over time. These types of waste lines provide a service life of 40 - 60 years before being required to be replaced with PVC.

## **Electrical Service Panels**

It was common in homes prior to 1950 that they were equipped with a 30 amp fuse panel and for the next 15 years might be increased to a 60 - amp fuse panel. Although most of these systems have since been replaced with a minimum of 100 - amp breaker panels. The electrical demands of homes have continued to increase over time. It is not uncommon to see multiple 200 - amp breaker panels to provide electricity needs to a larger home.

It is also common to find fabric sleeved 2 wire electrical wiring in homes built before 1970. These electrical wires did not have a ground wire. Although these electric lines are grandfathered, if you change switch or receptacles you are required to supply a acceptable grounding mechanism.



## **Energy Efficiency**

The value to homeowners of home energy efficiency has changed significantly since the 1970's when national energy challenges faced the nation. The energy ordinances have become increasingly more restrictive on home construction and home improvement products the last 40 years. In 1992 the Department of Energy created the Energy Star Program which is an independent council that evaluates and rates home products for their energy consumption.

Homes can also be rated to comply with the Energy Star Program by having a certified energy rater evaluate the home plans and supporting documents that meet the required standards. These standards are a point system for energy compliant products such as windows, doors, insulation, air conditioners and kitchen appliances. If the products meet the standards in their product category, they are awarded a Energy Star certification.

The construction energy requirements for homes is directly affected by product ratings of such products as windows, air conditioner condensers and the home's envelope insulation. Combined with the houses directional solar facing, HVAC duct insulation and structural shading factors, the homes energy efficiency is calculated to a score through a method called the manual J form. The manual J form combined with an insulation certificate provides the majority qualification standards for a Energy Star rating.

## **Structural Damage**

There is nothing unique about structural issues with vintage homes. These do not all occur through lack of maintenance. Many of these home's structural issues are unseen until uncovered or become apparent through the structure deflection. The longer these types of items go unattended the more expensive it becomes to repair them.

**Lumber Fatigue** - As lumber ages it loses its tensile strength in floor systems and becomes deformed when heavily loaded. As time passes in a heavily loaded condition, the timber begins to sag through deflection. This in turn causes belly's in the ceiling below. In older homes this needs to be corrected by placing steel beams or composite beams to transfer the loads off the joist or rafters to the walls.

**Dry Rot** - Dry rot is a condition where lumber members get saturated with water over time and then dry out. This cycle continues until the wood fibers decompose. The only way to properly repair dry rot is through replacement. This is a very common problem on older homes.



**Insect Damage** - If structural wood members survive dry rot they are still venerable to destruction by insects such as termites. Again this is a common problem for structural members that experience some form of dampness. Termites are often difficult to detect until the structure begins to show signs of distress. These problems can only be resolved by eliminating the cause of the dampness and then replacement of the damaged members.

## **Conclusion**

There many high probable areas of a vintage home that can blow up your budget or worse go unnoticed until they result in consequential damages. Through careful discovery and evaluation your professional general contractor can uncover and mitigate many of these issues.