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Thinking Like a Home Inspector:

Identifying Conditions for Structural Concerns: Part Four of a Four Part Series

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Part three of our four part series on “Identifying Conditions for Structural Concerns” focused on foundation settlement, when a home’s footings and foundation walls settle due to unstable or changing soil conditions. This foundation settlement commonly results in cracking and other interior and exterior structural or cosmetic damages. However, when these damages are primarily within the interior of the home with little to no distress apparent from the exterior, a proper diagnosis must consider whether the symptoms may be the result of deteriorating support conditions within the crawl space. Sagging timber girders and floor joists are common in older homes constructed over dirt crawl spaces. Sloping floors are typical for such conditions, which in turn can lead to damage and distress evident in walls, cabinetry, door framing and other finish work.

WHAT CAUSES SAGGING GIRDERS AND FLOOR JOISTS IN A CRAWL SPACE?

Typical residential construction with a crawl space includes timber floor joists that span between exterior foundation walls. For longer spans, timber or steel girders are installed perpendicular to the floor joists to limit the span of the joists and minimize deflection or bounce of the floor system. These beams or girders are supported by interior block or steel columns that may or may not be set on a poured concrete footing.



Sloping Floors caused by sagging girders and floor joists.



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A common cause of sloping floors is simply settlement of these interior block or steel columns. Weak or unstable foundation soils compress under the imposed column loads. Settlement can also occur over long periods of time or quickly after a specific event that causes changes in moisture content and/or density of the foundation soils. The columns may settle away from the girders and floor joists or the girders and joists may remain in contact with the column as they deform or deflect to follow the

column movement. In cases of column settlement, the girders and floor joists may not “sag”, but

rather uniformly slope from the exterior foundation wall to the settled column.

Actual sagging of timber girders and floor joists is often due to excess moisture and wood rot. Crawl spaces, particularly vented crawl spaces with dirt floors, are susceptible to seasonal temperature and humidity fluctuations. High humidity conditions over sustained periods of time create an environment for mold growth and wood rot. Wood rot weakens the structural members causing them to sag where they were once capable of spanning between the vertical supports.



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Another cause of sagging girders and floor joists is the improper spacing of those vertical supports. If these support points are too far apart for a given loading condition, the girders may sag between the columns or the joists may sag between the exterior wall and the girder. As the girder and floor joists sag, so do the floors above.

[Want to see more indications of structural concerns? Check out our Foundation Galley by clicking here!](#)

HOW WILL I KNOW IF A CRAWL SPACE IS EXPERIENCING SAGGING GIRDERS AND FLOOR JOISTS?

Mortar joints that are out of level, interior and exterior cracking, doors and windows difficult to open and close, and chimneys pulling away from exterior walls and roof overhangs are all symptoms of foundation settlement. Out of level mortar joints are a tell-tale sign of structural settlement. Block foundation walls and exterior brick veneer is generally laid near-horizontal during construction. Therefore, the mortar joints can then be used to identify settlement. A tool such as a laser level can help determine the extent of movement from one corner of the home to the other. Measuring from a mortar joint to the projected line or dot of the laser at several locations along the foundation wall can assist with identifying both settlement trend and magnitude.



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Symptoms of sagging girders and floor joists in a crawl space are typically easy to identify. The most common symptom is sloped and sagging floors in those rooms directly above the crawl space.

These floors will often seem soft, bouncy and generally uneven. You may even notice gaps between the floor and the bottoms of framed walls. If the sloped or sagging floor condition is more severe or advanced, the symptoms may appear similar to those common with foundation settlement. When the floor sags, there is often movement of interior partition walls supported on the floor. Movement of the framed walls often results in cracks above door framing, unlevel or racked door framing, doors that do not open and close without sticking, and walls pulling away from the ceiling or other abutting walls.

Other signs and symptoms of sagging girders and floor joists can be readily identified with a visual inspection of the crawl space. Separation between the tops of the interior columns and the girders typically indicate column settlement. The homeowner may have also previously identified the problem and come up with their own solution, such



as adding shims between the column and girder or constructing additional vertical supports to address sagging between existing columns.

Finally, high humidity levels in the crawl space can be an indicator of an existing or potential problem. A hygrometer or moisture meter is a useful tool to measure these humidity levels. Wood subjected to high humidity levels over sustained periods of time are susceptible to mold growth and rot, which deteriorates and weakens the girders and joists and reduces their load-carrying and spanning capabilities. Mold growth in these environments is often visually apparent.



Sincerely,



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