

# Home Builders' Perception of Virtual Inspections: A Case Study

**Kyle Morse**

California Polytechnic State University  
San Luis Obispo, CA

The COVID-19 pandemic created a new set of restrictions and safety protocols for the residential construction industry. Many jurisdictions began placing social distancing practices on inspectors, limiting their ability to visit the jobsite. The adjustment required many residential builders and inspectors to adapt to virtual inspections using videos, photographs, and recordings. As this new technology gains traction in the residential industry, questions arise regarding its benefits, drawbacks, and industry acceptance. This case study analyzes the perceptions and experiences of five separate homebuilders in Yolo County, California. Semi-structured interviews were conducted with five residential general contractors, transcribed, and thematically analyzed to discover reoccurring patterns and ideas. Throughout the five interviews, seven significant themes emerged that all participants acknowledged, including familiarity with the technology, time savings, cost savings, applicability, accuracy, homebuilder's preference, and future considerations. Based on the interviews, homebuilders in Yolo County believe the new technology has potential time and cost savings. There are some concerns with the technology's accuracy since virtual inspections inhibit the inspector's visibility. However, all general contractors interviewed agreed they would like to see a hybrid system in the future that allows for some virtual inspections and some in-person inspections.

**Key Words:** Virtual Inspections, Homebuilders, Industry Perception, Construction Industry, Technology

## Introduction

Virtual inspection in the residential construction sector is a new technology that is beginning to gain traction. The process allows an inspector to see the jobsite virtually through photos, videos, or live video-call interfaces. In March 2020, the world faced the COVID-19 pandemic (coronavirus), which led to a shift in how construction practices operated. Until the beginning of the pandemic, contractors rarely used virtual inspections – only in specific circumstances where an inspector could not visit the jobsite due to holidays and sick leave. During the pandemic many counties began to place strategic social distancing practices on inspectors, limiting their ability to visit the jobsite. Due to the newly enforced guidelines, the residential sector began to see a significant increase in virtual inspections (NAHB, 2020).

The three main types of virtual inspections are live-video chats, recorded videos, and photographs. In a live-video chat format, the general contractor shows the inspector the jobsite through a live video. In the recorded format, the general contractor takes a video of the item and uploads it to an online portal for the inspector to verify. The photographing method is the same process as the video method but with still pictures. This case study will dive into the experiences of several different residential general contractors located in Yolo County, California. The Yolo County Building Inspections Service website noted that the region allowed a combination of video calls and pictures to move away from the in-person visits (Building Inspection Services, 2020). However, during the peak of the pandemic, inspectors were still considered essential to the construction practice and therefore were allowed to be on site. Homebuilders and inspectors had the option to either use a form of virtual inspection or continue their in-person inspections.

## Literature Review

The COVID-19 pandemic dramatically affected homebuilders throughout the United States. Homebuilders had to follow immense policy changes and struggled to operate normally. One example that had taken on a lot of issues is the use of inspections. In a survey conducted by the National Association of Home Builders (2013), the median number of separate inspections required during the construction of a typical single-family home is 8, with nearly 20% of builders using more than 15. In a later study, the COVID-19 pandemic was shown to have a noticeable adverse effect on most homebuilders (see Figure 1), with 82% of respondents noting that the building department took longer to respond to requests for inspections (NAHB, 2020).

To help alleviate this problem, jurisdictional authorities began to allow the use of third-party private inspections and virtual inspections. The NAHB Economics and Housing Policy Group conducted a survey in April 2020 to see if the homebuilder received these options to mitigate the inspection delays (see Figure 2). In this survey, only 4% of homebuilders said that virtual inspections were allowed before the Pandemic. However, 20% of homebuilders noted that their local building department allowed virtual inspections as a response to the coronavirus pandemic (NAHB, 2020).

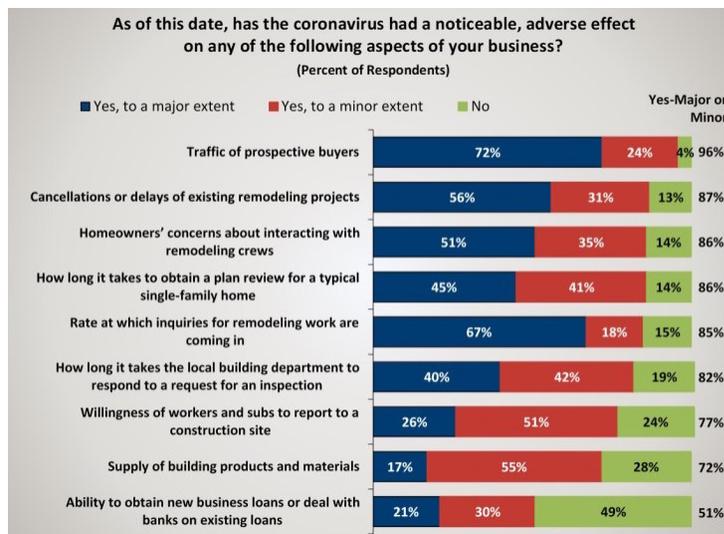


Figure 1. Adverse Effects of COVID-19 (Emrath, 2020)

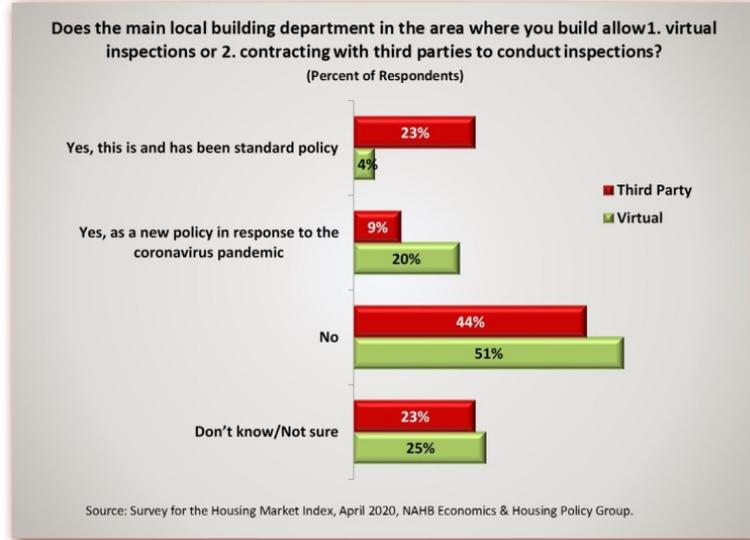


Figure 2. Virtual Inspections as a Result of COVID-19 (Emrath, 2020a)

## Methodology

A qualitative data approach was utilized to better understand the detailed perceptions of the participants. Five separate residential homebuilders participated in a semi-structured interview to review their perceptions of virtual inspections in the workplace. Each participant held an ownership position at their company. The companies were individually selected to confine to the criteria requirements defined below.

1. Must be a residential general contractor
2. Must have less than 100 employees
3. Must be located in Yolo County, California
4. Must have some knowledge of virtual inspections

### *Interview Structure*

The interviews occurred over the phone and were recorded with their permission. Each interview lasted approximately 20 minutes and was conducted using a semi-structured approach. The interviewers did not follow a strict formalized list of yes or no questions, rather several open-ended questions that led to follow-up questions. This semi-structured approach allowed the participants to highlight their perceptions and go into details of their own experiences. The open-ended questions that acted as the framework for each interview are shown below.

- What are some of the benefits of virtual inspections in the residential sector?
- What are some of the disadvantages of virtual inspections in the residential sector?
- When are virtual inspections appropriate to conduct over the traditional method?
- Do you have any concerns with the accuracy of virtual inspections?

- If COVID-19 was not a factor, would you prefer to use in-person inspections or virtual inspections?
- Do you think this technology will take off in the next decade or do you think we are going to see less after the pandemic?

### *Coding and Data Analysis*

The interviews were transcribed digitally to allow for coding and data analysis. Using Charmaz's (2006) initial coding approach as a framework, the data collection was performed inductively as the homebuilder's ideas were analyzed to find industry themes. The transcriptions were divided into segments and labeled with codes using the software ATLAS.ti. Once all transcriptions were coded, reoccurring patterns were grouped to determine which perceptions were shared throughout all participants. These patterns were then sorted into benefits, disadvantages, and future considerations.

## **Results and Discussion**

All five interviews were digitally transcribed and coded to find reoccurring themes and ideas. Throughout the five interviews, there were seven significant themes that all participants mentioned. These seven themes included (1) familiarity with virtual inspections; (2) time savings/time loss; (3) cost savings/money loss; (4) applicability; (5) accuracy; (6) homebuilders preference; and (7) future considerations. While several homebuilders had differing opinions over the implementation and use of virtual inspections, most participants agreed on these seven topics. Each theme is expanded upon in the sections that follow.

### *Familiarity with Virtual Inspections*

All five residential general contractors had used some form of virtual inspection during their careers, but only two had encountered virtual inspections prior to the pandemic. Two of the participants had used only photos, where they were in charge of photographing items and sending them to the inspector off-site. The other three participants had used a combination of video-call inspections and photograph inspections. COVID-19 contributed the major shift to these virtual inspections, where each participant noted they saw a dramatic increase in virtuality. One participant noted, "we have gotten permission in the past to take photographs of the work when it's a jurisdictional holiday, and the inspector could not make it." Even though some companies used virtual inspections prior to the pandemic, they were only used in special circumstances and were not the industry norm.

### *Time Savings/Time Loss*

One contractor elaborated on time savings when he said, "we don't have to wait around for the inspector to show up. When an inspector comes, we usually need a body on site, and that employee is sitting around doing nothing while he waits." Another participant agreed by saying, "I usually take pictures before I leave the jobsite, and it takes me five minutes tops. Inspectors talk your ear off, and the inspection can sometimes take close to an hour." In addition to time savings for the general contractor, all five interviewees mentioned that virtual inspections provide tremendous time savings for the city. Participant five discussed how inspectors don't have to drive around the county and instead can inspect a building from the comfort of their office.

Participant 3 contradicted the other homebuilders by saying more minor virtual inspections can waste time. He said, "on smaller inspections, we do not have to be onsite, and the inspector can perform his task alone. When we do a virtual video-call inspection, we have to be onsite and point the camera around for him to see, which costs us time."

### *Cost Savings/Money loss*

Most homebuilders mentioned that virtual inspections save the general contractor and inspector money. One participant said, "There will definitely be cost savings. In the past, employees have waited for inspectors for hours, and that employee is on the clock. So, you're going to save money from that perspective." Furthermore, another homebuilder mentioned that the time savings made by the virtual inspections directly correlate to costs savings for both the general contractor and inspector.

Participant 3 contradicted the rest of the homebuilders by mentioning that cost savings apply only to the city, and the general contractor may experience a financial loss. He stressed the importance of having in-person inspections as he stated, "there has been a couple of times where a building inspector has called something that we genuinely missed, and I am so thankful because that correction has saved me a lot of money and headache." While these mistakes don't happen frequently, they are more likely to be caught in person and can save the general contractor a financial loss.

### *Applicability*

All five homebuilders agreed that virtual inspections work better in some scenarios but worse in others. Three participants mentioned how virtual inspections should be used for smaller items and in-person inspections should be used for larger items. One participant said, "virtual inspections work best for smaller items such as drywall nail inspection or insulation inspection. When it comes to larger-scale items like roof, foundation, and MEP [mechanical, electrical, plumbing], I think it's more likely that things could get missed." Another homebuilder mentioned that virtual inspections should only be used for items that are exposed. He went on to say, "Framing, mechanical and electrical are all extremely important inspections because once when they get buried, it becomes really difficult to get to and fix. Whereas if you miss something and it's exposed, at least we've caught it." The third participant noted that virtual inspections work best in scenarios where you can prove the accuracy of the dimensions. He went on to mention, "I think virtual inspections work in scenarios where you have to confine to a certain set of dimensions. You can use a tape measure in those types of applications to show that you are meeting that requirement. It might get a little bit more difficult when you have to actually test things like electrical, safety and plumbing items." Based on these responses, the general contractors believe that virtual inspections work best only in specific applications.

### *Accuracy*

Four of the five homebuilders believed that virtual inspections are less accurate than in-person inspections. One participant noted, "If you're not getting a set of eyes physically on something, there are going to be more mistakes." He went on to say, "One example that has been hard to do virtually is when they are inspecting shear nailing for instance, they want to see if that nail has penetrated layers in a plywood and it's hard for the project manager to take an accurate picture of that instance." Several participants also noted how virtual inspections contribute to an increase in ethical abuse. One participant mentioned, "I get the general impression that the inspector would rather be on the job, and it's a trust issue. They don't trust us. Anybody can manipulate the camera, and I've heard some inspectors say that general contractors have been manipulating pictures and videos to speed up the

process." Another homebuilder agreed with this abuse by saying, "A lot of GCs [general contractors] try to schedule a rough inspection on a Friday afternoon because they know the inspector is going to be looking forward to the weekend and not pay as much attention. And so there's always been strategies like that to make things easier, but this one, I suppose, would be open to more abuse." One homebuilder also mentioned his concern for legal repercussions by stating, "I am concerned with some of the liability issues that might come up down the road if something was missed because it wasn't thoroughly inspected. As an owner of the company, I want to take every precaution possible to minimize legal repercussions."

In contrast, one participant made the argument that virtuality does not affect the accuracy of the inspection. He went on to say, "I don't think it affects the accuracy. I think [virtual inspections] could be just as effective if the inspector knows what to look for and is shown the proper footage. It's an odd thing anyway for them to come out here for 15 minutes and think they can find everything in a 6,000 square foot house."

### *Homebuilders' Preferences*

Each participant was asked if they wanted to keep a form of virtual inspection post-pandemic. All five homebuilders agreed they would like to keep the technology in some circumstances. For example, one participant noted, "I would like to see a hybrid model in the future; the kind where you need to have an inspector on site when it's really critical for them to be there. But virtual inspections on some of the smaller things, that you can document easily and send to inspector would be beneficial." Another homebuilder agreed by saying, "virtual inspections are not as good as in-person inspections, but I suppose I would want to keep the option open for smaller projects."

Two participants noted they would only want to keep one form of the technology. One homebuilder mentioned, "If I had the option, I would want to keep virtual inspection using the picture method just because of the convenience factor, and then I don't have to chat with them for 15 minutes." Another participant mentioned how he would only want to keep the FaceTime method of virtual inspections; "FaceTime did work well in Yolo County. I'm on the jobsite, and I'm able to flash my iPad around, and he would say point me up over there. So FaceTiming is the best and if COVID wasn't a factor, I would want to keep that method."

### *Future Considerations*

All five homebuilders agreed that the use of virtual inspections will grow in the residential sector. One participant said, "I think it's going to be more in use, and I think the technology is going to be better. I just think the zoom calls are going to evolve, and that's not going away. We are going to refine this and make it more effective." Another participant agreed by saying, "I see this hybrid model working to our advantage and taking off in the future." He went on to say, "With the change in technology and the way that the digital era is going, it's going to be beneficial, and I think it's going to go in that direction. I truly believe there will be a hybrid model that would have the inspector come to certain critical inspections or larger structural inspections. But for the residential sector, I think it makes a lot of sense, especially if it's something simple."

Another participant saw the potential of the technology but was hesitant about implementation. He said, "I think jurisdictions would be smart to adopt some kind of hybrid model. And that being said, if it makes sense, and would save money, then the government probably won't do it." One homebuilder also mentioned the technology can grow but never replace humans; "I think in-person inspections has

a level of fluidity that is impossible to accomplish with technology." Even though these two participants were hesitant about future growth, they both agreed that a hybrid model would be more favorable. The uncertainties centered on implementation and complete virtuality.

## **Conclusion**

A majority of the contractors interviewed perceived that virtual inspections save time for both the general contractor and inspector. However, one homebuilder mentioned that there are reduced time-saving's for the general contractor during minor inspections when the general contractor must be onsite to FaceTime the inspector. In cost savings, most participants believed that virtual inspections save both the general contractor and the inspector money. However, one opposing theme was that virtual inspections may lead to inaccuracies which will cost the general contractor more in the future. All five participants agree that virtual inspections should only be used in certain situations. These situations include smaller trades along with inspections that don't require testing. There was also a majority consensus that virtual inspections are less accurate than in-person inspections. The accuracy concerns include its susceptibility to abuse, the inspector's lack of vision, and the inability to take accurate photographs. Despite the accuracy concerns, all five general contractors agreed that they want to keep a form of virtual inspection and believed the technology will continue to grow in the future. This study was an in-depth analysis of five specific companies in the Yolo County area but does not accurately reflect the entire industry perception. Future research should explore homebuilders' perception of virtual inspections in the residential construction industry as a whole.

## References

Building Inspection Services. (2020). "Yolo County." *Building Inspection Services | Yolo County*, [www.yolocounty.org/government/general-government-departments/community-services/building-inspection-services](http://www.yolocounty.org/government/general-government-departments/community-services/building-inspection-services).

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. Sage.

Emrath, P. (2020). Virus now Impacting traffic for nearly ALL Builders: Eye on housing. Retrieved June 08, 2021, from <https://eyeonhousing.org/2020/04/virus-now-impacting-traffic-for-nearly-all-builders/>

Emrath, P. (2020a). Some Cities Keep Construction Going via Virtual Inspections: Eye On Housing. Retrieved June 10, 2021, from <https://eyeonhousing.org/2020/04/some-cities-keep-construction-going-via-virtual-inspections/>

NAHB. (2013). "NAHB/Wells Fargo Housing Market Index (HMI)." *Housing Market Index*, Sept. 2013, [www.nahb.org/news-and-economics/housing-economics/indices/housing-market-index](http://www.nahb.org/news-and-economics/housing-economics/indices/housing-market-index).

NAHB. (2020). "NAHB/Wells Fargo Housing Market Index (HMI)." *Housing Market Index*, Apr. 2020, [www.nahb.org/news-and-economics/housing-economics/indices/housing-market-index](http://www.nahb.org/news-and-economics/housing-economics/indices/housing-market-index).