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## Claustrophobia

### Is affordable housing a fire storm in the making?

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**AZARANG (OZZIE) MIRKHAH**

Firehouse.Com Contributor

Recently, increases in the interest rates have revealed their adverse impact on the housing market, and nationwide construction of new homes has slowed down significantly. This current valley follows the many peaks of strong growth periods for the housing industry that lasted several years; a result of which was a significant surge on the price of land and a tremendous increase in the cost of new homes.

In the name of affordable housing and not to deprive any segments of our society from the American dream of owning their own home, higher density construction emerged as a means for reducing the price sticker for the new houses. The developers' logic was to build the houses compact and closer together, with the narrow street frontage (35 to 40 feet), facing much narrower streets (20 to 25 feet wide), which are even dead-ends in some cases.

This way the developers could build more units per acre; which would then theoretically decrease the cost of land per unit, thus lowering the cost per house and making them more affordable to the consumers. Or, at least that is their story, and by all means, they are sticking with it.

That was their public stance for these clustered design subdivisions. But as we all know, supply and demand is the name of the game in our market driven economy. Needless to say, the altruistic facade of affordability faded away as fast as the rapid pace of the construction boom. And in reality, throughout the country, the prices for the new houses continued to soar at record rates instead.

Still all across our nation, maybe even more noticeable to those of us in the Sun Belt States where land is more abundant and houses are built much further apart, there were a rash of these cluster subdivisions being constructed. These proposed cluster subdivision designs not only challenge the fire protection concepts contained in the body of the construction codes for residential dwellings; but even push the envelope for the good old fashion common sense of general community safety. After all, it is easy to figure out that on a bad fire day, lots of dry lumber piled up very close together could potentially result in much bigger fires; jeopardizing the safety of not only the occupants, but also for the responding firefighters.

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In our country, the International Code Council (ICC) publishes the International Residential Code (IRC) that governs construction of one- and two-family dwellings not exceeding three stories in height. Based on the provisions in the 2003 edition of the IRC, the exterior walls of the house were not required to have fire resistive rating, if they were not closer than three feet to the property line.

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Fortunately IRC eventually recognized the significant fire exposure problems, and their 2006 edition of the IRC, modified the three-foot requirement to a minimum of five feet away from the property line. So, the current edition of the code allows the exterior wall of these dwellings not to have any fire resistive rating if they are five feet or more from the property line. And if the houses are designed closer to the property line, then the exterior wall must have a one-hour fire resistive rating.

Out here in the West, these non-rated exterior walls are mostly constructed of 2-by-4 framing, with a layer of 1/2-inch gypsum board on the inside, expanded foam in the middle for insulation, chicken wire, and then finally a layer of stucco on the outside of the wall. In general, the major difference between the non-rated wall and the one-hour rated fire resistive wall is that the 1/2-inch gypsum board is little thicker and is a 5/8-inch gypsum board on the inside of the wall instead.

Remember that the one-hour fire resistive rating doesn't necessarily mean that the wall will last for one hour during actual fire. The fire resistive rating was established decades ago during the laboratory testing. An even more important fact to remember is that when the exterior wall is between three and five feet from the property line, the IRC allows for 25 percent of the one-hour fire resistive exterior wall to be unprotected openings such as windows, vents, etc.

Having all these areas of unprotected openings in the exterior walls should make us all think twice about the fire exposure problems and remind us of the old saying that "the chain is only as strong as its weakest link." After all, in all these cookie-cutter tract home cluster designs, the windows and vents are in close proximity even if not directly facing each other. Needless to say then, the closer they build these cluster dwellings together, the higher the chances of fire jumping from one house to the next.

In a fire scenario, especially with wind conditions, the heat from the fire in one house could definitely create fire exposure hazards for the neighboring house. The heat could begin melting the expanded foam insulation inside the exterior wall of the second house and get that one involved also. That is of course, if the fire has not already jumped right across those unprotected bedroom windows and vents to the neighboring dwelling.

I believe that in these types of situations installation of the residential fire sprinkler systems could be a great solution. Clearly, by extinguishing the fire in the incipient stage, fire sprinklers save the occupants lives. But then for most fire scenarios (other than the attic fires, since codes do not require installation of fire sprinklers in the attics of one and two family dwellings except as needed to protect fuel-fired equipment), fire sprinklers could also significantly reduce the probability of conflagration. That would then decrease the fire exposure intensity for the neighboring structure, thus reducing the probability of fire jumping from one building to the other.

In my mind, logic dictates that in one- and two-family dwellings, regardless of the fire resistive rating of the exterior walls, active fire protection provided by the residential fire sprinkler systems could provide a much higher degree of life safety for the occupants of the house involved, than the passive fire resistive rating of their exterior walls could. In reality the fire rating of the exterior wall is merely important for the fire exposures from the outside.

But then with the fires on the outside, the inside of the house would still be tenable, at least to a degree to afford the occupants of the house the chance to safely evacuate on their own will. Let's face it, if the fire in your neighbor's house is controlled by the residential fire sprinkler and contained, the fire rating of your exterior wall maybe of importance for the property protection purposes; but of less value for your life safety.

Simply stated, safety of the occupants in the residential dwellings is much higher, and they are better protected by the residential fire sprinkler systems than the fire rating of their exterior walls.

Just as important though is the safety of our own firefighters. By stopping the fire progression, fire sprinklers provide a much higher degree of safety for the firefighters. In confronting a fully involved structure, firefighters could face a higher probability of structural collapse, especially with the newer built houses that have lightweight wood trusses. And as you know, the fire service has long been concerned about the structural stability of these lightweight wood trusses under the adverse fire conditions.

As a result of these concerns, Department of Homeland Security (DHS) recently awarded Underwriters Laboratory (UL) a grant to study the structural stability and performance of the engineered lumber and lightweight wood trusses under adverse fire conditions. I believe that the results of this study will be quite valuable and could even further highlight the importance of residential fire sprinklers in protecting our own firefighters. After all, by discharging water at the earliest stages and containing the fire, structural members would not be exposed to the flames; therefore, risk of structural failure is eliminated.

Fire chiefs must also view the challenges associated with these narrow street cluster developments from yet another angle, the actual fire ground operations and tactics.

Apparatus placement is of significant importance in our fire ground operations. And the narrow streets and the long dead-ends do indeed present major challenges to our response, and further delays our fire rescue and suppression efforts.

In fighting fires, our actual battle is against the element of time. Considering that fire grows exponentially with time, the longer it takes for us to get dispatched, arrive at the scene, get set up and hooked up, and finally to get water on the fire, the much bigger fire that we have to face.

Before putting the wet stuff on the red stuff though, we need to vent the building. Laddering could be a major concern for the firefighters responding to these cluster dwellings. Considering narrow street frontage, laddering the front of these cluster homes in itself is definitely challenging even on flat grade. Raising a 28-foot ground ladder to the second story window on the side of these cluster dwellings might not even be possible. And the 35-foot ground ladder would not be adequate to safely get to the roof of the three-story dwellings.

Of course, that is even more challenging when the exterior wall is only three feet to the property line. Even trying to raise the 35-foot ladder from the neighbor's house (which is also only three feet away on the other side of the property line) to reach the roof would result in a very steep and unsafe climbing angle of around 80 degrees.

Don't get me wrong, one way or another we will eventually get it done, as we always do. But then all that takes time. And time is not what we have too much of when responding to fires. Think about it, considering the lightweight truss construction of these clustered dwellings, and their collapse potential in fire scenarios, do we really have much time to spare? With these cluster design lightweight construction dwellings, fact of the matter is that the more time we spend on setting up, the less time our firefighters would have for interior search and rescue, and roof ventilation.

Simply, these three story cluster dwellings are out of reach for the safe operation of our ground ladders. Logically, utilization of the aerial units is much safer for our rescue and ventilation operations. But then try to get a ladder truck in these narrow streets is itself a challenge at times. And even then, if the engines get there first and are staged in front of these narrow street frontage dwellings and stretch all their supply lines in these narrow streets, placement of the aerial in a usable position would be even more challenging.

Fire station locations and area coverage, apparatus allocations and staffing, future planning and the new fire station design, are the other important angles that the fire chief should consider in reviewing the challenges associated with these cluster developments.

It probably is a little different back East with all the old high-rises spread throughout the cities; but here out West, historically most of the aerials were stationed around the downtown areas where the majority of the commercial mid-rises or high-rises were constructed. With the urban sprawl of the past decades, the fire stations built to provide coverage for the suburbs, were generally designed for a couple of fire engines and a rescue unit. After all, most of those tract developments were far apart and only two stories high.

But now, with these new three-story cluster housing developments, the aerials are much more essential and their prompt arrival at the fire ground is of even of more importance. Therefore the extensive travel time to get to the suburbs from the downtown stations would be more detrimental to our operations.

The solution though, might not be as easy as merely relocating the aerials to the fire stations in the suburbs. More than likely, the aerials are too long and will not fit in the bays of the existing fire stations. Unless, of course parking the aerials outside is an option that you are willing to entertain. Again we might be able to mitigate this situation if these cluster dwellings were protected with fire sprinklers. There is always more than one solution.

Here is the problem. Many fire departments are not fully cognizant of these new challenges with the cluster home developments. And what they don't know would also prolong the problem well into the future. After all, most fire departments use their cookie-cutter fire station designs for their future stations as they have historically done in the past. Therefore, one can expect that fitting the aerials into the fire stations would still be an afterthought, well into the future.

I believe that we in the fire service need to get actively involved in our planning commission meetings and public hearings, especially when such cluster developments are being proposed. Fire station location, apparatus placement, equipment, and staffing requirements are very important and costly factors that the fire chief and the jurisdictions' political and administrative leadership must consider upfront. After all, these are major decisions and extensive capitol expenditures that deserve in-depth review.

A lot of times in many jurisdictions, for the larger master plan communities, the developers must pay impact fees or are required to provide land or even build a new fire station for their development. Cognizant of the major challenges mentioned above, the fire chief must have a strategic plan and they should evaluate such proposals in great detail. Inadequate fire station design will not be the answer, and insufficient staffing and not having the necessary equipment and apparatus either, would only compound the problem.

I believe that the jurisdiction's elected officials and the top administrators must be fully aware of all these long term risks and the expenditures. I believe that detailed cost/benefit analysis would prove to them that not only residential fire sprinkler systems are invaluable in saving the lives of the occupants and our firefighters, but even from the economic perspective, residential fire sprinklers are also the most efficient and cost effective way to protect our communities.

Economic development and tax base increases are indeed the absolute necessities for the thriving communities. But then the key is having long-term strategic view for the community's development, and nourishment of sustained smart growth.

I believe that we will not be able to change the market values, and the economics of the construction world. Thus we must accept that these cluster developments, the three story houses fronting narrow roads, lightweight wood trusses, etc. are going to be with us for a very long time. Rest assured that we will have serious challenges fighting the fires in these cluster developments.

However we can and must be proactive, and provide for the highest level of fire protection and life safety both for the occupants and also our own firefighters. This is complimentary of the smart growth concept. Have your cake, and eat it too. Allow for economic growth and high density design, and yet provide the most efficient and highest level of life safety and fire protection. Residential fire sprinkler systems are an essential part of the community's smart growth.

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*Azarang (Ozzie) Mirkhah, Firehouse.com Contributing Editor, is the Fire Protection Engineer (FPE) for the City of Las Vegas Department of Fire & Rescue. His responsibilities include reviewing all building fire and life safety system designs and submittals to insure compliance with the federal, state and local fire and life safety codes and standards. Mr. Mirkhah is also involved in the development of fire & life safety codes and standards for the city.*

Mr. Mirkhah is a registered professional engineer with more than 25 years of work experience in the field of fire protection engineering. Mr. Mirkhah joined the Las Vegas Fire & Rescue (LVF&R) more than 12 years ago. Prior to that Mr. Mirkhah worked as a consultant designing fire protection systems for some of the most internationally recognized fire protection consulting firms.

Mr. Mirkhah holds a Bachelor of Science degree in Mechanical Engineering (BSME), and a Masters degree in Public Administration (MPA). Mr. Mirkhah is a 1999 graduate of the National Fire Academy's Executive Fire Officer Program. Mr. Mirkhah is a Certified Building Official, Certified Fire Inspector, Certified Mechanical Inspector, and Certified Plans Examiner through the International Code Council (ICC).

Mr. Mirkhah is a member of the National Fire Protection Association (NFPA) and serves on the national NFPA 13 Technical Committee for Sprinkler System Discharge Design Criteria. Mr. Mirkhah is a member of the Society of Fire Protection Engineers (SFPE) a member of the Institution of Fire Engineers (IFE) - USA Branch. Mr. Mirkhah is also a member of the International Association of Fire Chiefs (IAFC). You can contact Mr. Mirkhah at: [amirkhah@lasvegasnevada.gov](mailto:amirkhah@lasvegasnevada.gov). To view all of Ozzie's articles on Firehouse.com, please click [here](#).

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