

Luncheon Address to the Passé Club

National Association of Insurance Commissioners

Hilton at Union Square, San Francisco

16 November 2018

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Hello and welcome to San Francisco everyone although I must apologize for the current weather forecast: **Hazy with patches of smoke.**

Now, I was asked if I could to make this talk, humorous, and also brief. The Honorable Glenn Pomeroy and the Honorable George Dale both emphasized this – brief, and humorous. So, in conclusion, let me say it has been a pleasure speaking to you... (*cue the laughter*) – so, now I can check those two off.

However, the current atmosphere is anything but humorous – I refer literally to the atmosphere and the smoke we're all breathing in. So, given who you are, and your influence, I'd like to discuss the state of fire in the US, especially cat fires, and perhaps what we can do about it.

My wife tells me I always begin with Adam and Eve, but in this case, I'll only go back to the Great London fire of 1666 apropos in that it launched the modern property insurance industry. The fire destroyed about 13,000 buildings, about the same as has been lost in California in the last 10 days. While the structures lost in the last ten days are comparable, I doubt they'll have the same impact as those in 1666 – besides launching the modern property insurance industry, the London fire resulted in the first non-combustible construction regulations (1667 Rebuilding Act, all buildings only brick and stone) and gave Christopher Wren the opportunity to design 52 new churches including St. Paul's.

Despite numerous other historic conflagrations, such as the Burning of Moscow and the Great New York fire, the London fire was not exceeded in size until the Chicago Fire in 1871 which I won't go into because that fire was soon exceeded by the 1906 San Francisco fire following the magnitude 7.9 earthquake.

The 1906 earthquake is the stuff of lore – every year on April 18th San Franciscans gather at 5:12 am at Lotta's Fountain to remember those who died. Until a few years ago, we still had survivors attending. Lotta's Fountain was donated to the City by Lotta Crabtree, a world-famous entertainer who grew up close to the fire now burning in Butte County. The special place the fountain holds for San Franciscans is that following the 1906 fire, everyone left messages at the fountain seeking to find their loved ones. If you're curious to see the fountain, it is close to here, at the corner of Market and Kearny Sts.

One of the more ironic aspects of the 1906 fire was that it was clearly foreseen – six months before, in 1905, the National Bureau of Fire Underwriters' survey of the city had concluded[1] "*In fact, San Francisco has violated all underwriting traditions and precedent by not burning up. That it has not done so is largely due to the vigilance of the fire department, which cannot be relied upon indefinitely to stave off the inevitable*". Because it was so obvious, in 1905 Dennis Sullivan, the fire chief, had recommended the construction of a high pressure saltwater Auxiliary Water Supply System or AWSS, which however was rejected by the Board of Supervisors as "too expensive". Six months later the earthquake occurred, and Sullivan was killed.

Although most of the town burned, there were several firefights that succeeded – employees defended and saved the US Mint, and San Franciscans turned out in droves to protect the most important building in the City – Hotaling's distillery. As the ditty went:

*If, as they say, God spanked the town
For being over frisky
Why did he burn the churches down
And save Hotaling's Whiskey?*

Some people became legends in the aftermath of the fire. A.P. Giannini had founded the Bank of Italy in San Francisco in 1904 for the “little man”. Immediately following the earthquake, he moved the Bank’s cash from the vaults to his home outside the fire zone in a garbage wagon hidden beneath garbage. The fires had heated the vaults of the other big banks, and the sudden temperature change from opening the vaults risked destroying the contents, so that many vaults were kept closed for weeks. During this period Giannini made loans on a handshake from a plank across two barrels on the waterfront. It is reported every one of those loans was repaid.

Similarly, Cuthbert Heath, credited as being the “Father of Non-marine insurance ” at Lloyd’s, following the earthquake immediately sent a telegram instructing “pay all claims” irrespective of policy wordings and proximate cause [2], thereby making Lloyds’ reputation in the US. While highly commendable, neither Heath nor anyone realized that the flow of gold from London to San Francisco for insurance payments would lead to a loss of liquidity in New York, contributing to the Panic of 1907 [3].

Perhaps in a bit of a parallel, financial impact we’re seeing today is the loss of 60% in stock price of Pacific Gas and Electric (largest US electric utility by some measures) due to potential liabilities from the Butte County fire.

Coming back to the AWSS – in 1906 it was hardly unique, Boston, Philadelphia, Baltimore and many other cities had built high pressure systems, due to the urban conflagrations that were happening, caused in part by inadequate water supply. The largest of these systems had been built in New York about 1900, and after the earthquake San Francisco built its system modeled after NY’s, only larger. Today, San Francisco’s is the only surviving high pressure system, and consists of 130 miles of high pressure buried pipe specially designed for earthquake and supplied by a 10-million-gallon reservoir on Twin Peaks, two 10,000 gpm pump stations and three fireboats. The city takes the system very seriously – I’ve consulted on it since the 1980s, and in that time the city has spent or is spending about \$200 million to maintain and improve the system. Interestingly, while high pressure systems have been abandoned in all other US cities, Vancouver B.C. whose situation is very similar to San Francisco’s, built a Dedicated Fire Protection System in the 1990s modeled after San Francisco’s.

If you step outside this hotel, at any corners you will see two different kinds of fire hydrants – one a relatively normal sized hydrant with a flat top, and the other much large diameter with a nut on the top. This larger hydrant is supplied by the AWSS and can reach pressures of 350 psi in the downtown area – in other words, it was designed so that a firefighter could connect directly to the hydrant without a fire engine’s pressure boost. The idea was that firefighters could have a major hose stream at every corner and create a water curtain stretching a mile or more in any direction. This is crucial because, despite the City now having twice the population and many times more highrises than in 1906, the San Francisco Fire Department in fact has fewer on-duty staff now than in 1906 and, without the AWSS, less pumping capacity than in 1906. However, while the 1906 department edges out the 2018 department in pumping capacity, it fails miserably in its ability to move water. After all, San Francisco lost 28,000 buildings in the 1906 fire due to lack of water, even though it is surrounded on three sides by the largest body of water on earth.

The situation today other fire departments is not much better. In a UC Berkeley study funded by the California Seismic Safety Commission I found that most water agencies know their hydrants will go dry in

a major earthquake but don't tell the fire departments [4]. Most fire departments assume they'll go dry in an earthquake but haven't asked. And, most fire departments cannot move water more than a mile.

A key factor in all those historic conflagrations, and now in at least some WUI fires such as the 1991 East Bay Hills fire across the Bay, is poor water supply. The US has been, is now and will be suffering from very large Wildland Urban Interface (WUI) fires. [How many people here live in WUI zones – raise your hands.] In the recent “Mitigation Saves” study for FEMA and National Institute of Building Sciences [5], we found that about 120 million people or 36% of the US population now live in WUI zones, and this is rapidly increasing. Structures lost in WUI fires have been increasing at an annual rate of 20% since 2000, which is probably faster than insurance profits. We also found that complying with the International WUI code, which requires fire-resistive construction and, most importantly, a defensible space, yielded a benefit-cost ratio of about 4:1 over the life of the structure, which is more cost-effective than say solar roof panels.

Which brings us to the present, and the future. The greatest structural fire loss in US history was the 1906 fire. Analyses published by the US Geological Survey has shown that in a great earthquake in southern California we can expect to lose 130,000 dwellings by fire, or a loss of about \$100 billion, virtually all insured [6, 7]. Here in the Bay Area, in April, we released results showing that for a magnitude 7 earthquake on the Hayward fault (which runs through the Cal football stadium in Berkeley) we can expect a loss of about 79,000 dwellings or \$30 billion [8, 9]. Even without earthquakes, we're now losing perhaps 10,000 buildings a year to WUI fire alone, if this and last year are any guide.

How can we reduce these losses? These are two different situations – WUI fires, and post-earthquake fires – neither affect all states, some measures would help mitigate one or the other, some measure relate to infrastructure and some to insurance and finance, which is where you might help the most.

To begin with, you can't fight fire without water. As I've described, San Francisco learned this the hard way and hasn't forgotten it. And, in fact, for some time major cities in high seismic zones in Western North America have been assessing and upgrading their water distribution systems for earthquake. However, this has mostly been to assure drinking water rather than for immediate firefighting. And, as noted earlier, fire departments can't move water more than a mile. The insurance industry seems oblivious to this vulnerability: nowhere in the Insurance Services Office (ISO) *Fire Suppression Rating Schedule* or its *Guide for Determination of Needed Fire Flow*, does the word “earthquake” appear [4]. What is needed is incorporation of post-earthquake fire in rating schedules and encouragement of a standardized portable water supply system. Such a system would be of benefit not only for firefighting, but also for example for major main breaks and floods.

Another low-hanging seismic mitigation measure are mandated gas shut-off valves in seismic areas. Following the 1995 Kobe earthquake, Japan mandated replacing all gas meters in the country (120 million population) with meters with automatic seismic shut off triggers. Recently PG&E replaced all meters in its service area with “smart meters” in order to eliminate meter readers, but did not incorporate a seismic trigger.

On the WUI front, the portable water supply system would obviously help. Probably more effective however would be stronger rate incentives for compliance with the WUI code, or at least creation and maintenance of defensible spaces around structures. Compliance for this can be easily determined nowadays via remote sensing.

Lastly, due in part to the Mitigation Saves study I previously mentioned, interest is growing in incentivization for disaster resilience [10]. The insurance industry of course has been a pioneer in encouraging good construction since at least the days of the New England mills, birth of the Factory Mutual system and fire sprinklers. More recently, the FORTIFIED program for wind resistance, the Impact

Resistant Roof for hail, the FIREWISE program for WUI and the California Earthquake Authority's Brace and Bolt program for earthquake are all steps in the right direction for which the industry deserves praise. However, penetration of these programs has been less than it could be. Time doesn't permit me to go into any detail, but the concept of a "resilient mortgage" is now emerging, which would be something of a marriage of residential financing and disaster mitigation, akin to similar products for energy conservation such as Fannie Mae's Green Refinance Plan. I believe the industry, and particularly insurance regulators, can provide crucial leadership here for the benefit of all, and I encourage you to do so.

Thank you – it has been an honor and a pleasure.

Endnotes

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