Drew Hubbell: [Music] My presentation today is on sustainability, so a little bit of history, some alternative green building materials that we found are very fire-resistive, and then some things that everybody can do for fire-resistive construction. Starting, this is the property up in Julian. That's where I grew up. My parents bought it about 70 years ago and bought ten acres back then, and they started to build experimental buildings. That's Volcan Mountain in the background. A couple of pictures of me. I'm the one on the roof beside my dad plastering. If you know Antoni Gaudi's work in Barcelona, Spain, a lot of people refer to my father's work as similar. It's very free form, a lot of integration of art and mosaic, and I'm also the one up on the left mixing cement. We grew up from about Age 4, learning how to mix and lay Adobe block. This is one of the buildings. There's actually 14 different experimental structures around the property. It's now 30 acres of land, and this one was built with Adobe and reclaimed cedar. This is the main house, kitchen and master bedrooms. Then Jim mentioned the fires, but in 2003, we had the cedar fire, and it destroyed half of the buildings up there at our property, which was a big hit for my parents. You can see the structure, the same courtyard, but everything that was wood burned to the ground. Even the glass, which has a melting point in 1,800 degrees was like wax on top of the Adobe. But you also see that the Adobe and the stone walls and the masonry all survived. An interesting story. We went to the county to request a permit soon after the fires, and luckily, I was an architect dad knew how to build. But they said, well, you can't build with Adobe anymore. The code doesn't allow it. My dad was really upset. He had spent his whole life creating these structures. We went away for the weekend, and we thought, well, if you looked at the previous slide, the walls were still there. We went back and said, well, we just want a re-roofing permit, and somehow they let us do that. But these are a couple of images of that living house after it was rebuilt after the fire. This is facing west. We actually have views all the way to the ocean on a clear day. Then inside, we use reclaimed cedar. A lot of the cedar trees in Julian burns, but the wood is still good if you harvest it soon. Some people set up a mills to mill the cedar. In that picture on your left, the whole kitchen, the roof, and all the floor was reclaimed cedar. Very sustainable using a product that would just go to waste, but using it to rebuild. Then some of the more organic freeform structures. This was one of the early buildings. It's a studio. My dad was a well-known artist who passed away two years ago. There was a couple of KPBS films about him. You can look them up. But this one, the neighbors thought it was pretty strange in the 60s when he built it, and they used to call it the bat cave because it sits up on top of the hill. Then I have four brothers. This is the most extreme building that's up there. It's called the boys house because we lived in there as just the boys live. It was like our treehouse-type structure. But it's integrated, and mosaic and clay structures, and it has a stained glass ceiling on the bathroom. Really unique buildings, but all with the background of sustainability and building with local materials. Then a little quote from my dad, who was also a poet. He wrote, "I sometimes wonder that the lonely snails in their shells have such magnificent homes, why we with our souls so often relegate ourselves to slums and boxes. Surely, our homes should attempt to rival the best our souls have to offer. It does not seem inconsistent to expect men to live in cathedrals." A little more history. We started our firm in 1995, Hubbell and Hubbell Architects. We permitted the first straw bale structure. I'll show you a few examples of that. Then some of the half the buildings burned in the cedar fires. I've been practicing architecture for over 30 years. Strawbale Construction, have anybody been in a Strawbale building or seen one? Do we have a couple? It's using standard bales of straw as the building system. This is a house, about a 5,000 square foot house in Bonita area, and we've permitted and built over 45 of these different structures around Southern California and Northern California. Some of the benefits of it are its sustainability. It's a waste byproduct of wheat or rice or barley production super insulating, acoustically amazing, and it gives you a two-foot-thick wall. They stack the bales, put it in the middle of a wood frame, and then you can plaster right to the bales. Makes a lot of sense in a very hot climate. I went to school at the University of Arizona, really hot, super insulating, so a little bit of cool, like a thermos bottle stores that coolness inside. Then we also try to integrate earth and plasters. You can see the image on the left, they're chopping up the straw to mix with the earth the Adobe plaster. Next image is the Adobe plaster on the wall, and then the next is when it's all set, and then they do a lime plaster on top. You can see a

little window that's called a truth window with the strawbale. It's a tradition that they started when they were building straw bales in the 90s, and they leave a little section, and you might put a door or glass over it, but it's to show people that it's actually straw inside because a lot of people don't believe that. North of Escondido is Titnad Han. He's a very well-known author. He passed away a few years ago in teaching Buddhism. They have a monastery near Escondido. The nuns were living in little wooden shacks which weren't very fire safe. They would freeze in the winter and sweat in the summer. They hired us to design them nuns housing. This is a watercolor rendering. It's a circular shape, but all built with straw bale. It has metal roofs. Here's some of the bales of straw after it was delivered. Then we have workshops putting the bales up. We actually had one yesterday in Ocean Beach. A client was building a small ADU in their backyard using straw. People come together, put up the straw together, and it's a little bit like an Amish barn raising. Then they have a little party afterward. But the nuns were really good about learning how to tie the bales and put them up, and then doing the plaster work. That's a shot of the courtyard. We used reclaimed timber from a wine mill that was up in Seattle area. They shipped the timber down and reused all that and all the walls, and it has a metal roof, which is very fire-resistant. Then it has a little bit of a dry stream bed where they collect the water when it does rain. A little more information on the earthen plaster and the natural. I'm sharing all these natural building systems that we've been working with for 30 years because they are very environmentally friendly. They use less energy, they're using local materials, and they're fire-resistive in the end. Some of the benefits you can read of the natural materials and one of the things we use a lot is lime, like they used to use in Rome for their cement, but the lime will let the building breathe. It's healthier than just the waterproofing membrane that wood-frame stick-frame houses have. Here's a picture of some of the lime plaster. We did a nice strawber house in Borrego Springs, and this is one of the artistic gateways that my father's studio made with some stained glass in that column. This is a house that's actually for sale right now. It would the two different owners have moved on. But one of the unique, it's called the boulder house. Can anybody see the boulder, I'd say? The original clients were both psychologists, and they came to me with a program of about 30 pages of what everything they wanted in their house. The main thing was this was it's in Hamul up on the top of a ridge and that boulder sat proud on the hill, and you could see where they had fires, and they had worked around. They wanted the whole house designed around that boulder. We have a little cooling tower above, you can see the light coming down where there's windows. In the summertime, they'll open the windows, and the hot air will naturally chimney effect out. The winter will close the windows, and you'll see there's a big fan, and that fan brings the warm air down. But the mass of that boulder, they told a story. They had forgotten to close the windows one night, and it was all foggy. In Hamul, the temperature can swing from 90 degrees to 30 at night in those in-between seasons. Left the windows, they thought, it's going to be freezing. They said they came in, and the boulder, because of that mass, was radiating the heat. They said it was about 72 degrees still inside with all the windows open. These are a couple of pictures of the boulder house. You can see that cooling tower and it's a bit of a Spanish design with the arcades on the west-facing, which also helps block that hot afternoon sun. There's a swimming pool on the south, so it gets lots of sun exposure. This one is also a strawbale. You can see the thickness of the walls. They're two feet thick. This is that western arcade facing to the views. They also can see down to the ocean, and a great place on a sunny afternoon where they can watch the sunset but sit within that arcade. Thinking about fire and fire-resistant directly. Direct flames are when flames come and directly hit the house or the building or whatever structure. Those are hard to prevent, and that's what happened at our property up in Julian. The winds were so strong, and the brush hadn't burned in 90-something years. They said there were 150-foot flame lanes. Right next door is where Steve Rucker, the fireman that passed in the Cedar Fire was overtaken by the flames and the gases. The next are embers and embers are what catch in the LA fires, the winds were so strong up to 90 miles per hour. The embers can fly miles and catch a palm tree or catch your house. One of the weak links we found are the vents of homes. In a fire, the embers will suck right up into the attic, catch the roof on fire. Even if you had a really protected building that gets inside, it's going to burn. One of the big tricks that the fire code

now has is a very tight metal mesh. All of your vents, either your attic or your basement or crawlspace? Then radiant heat in LA, because all those homes were built so closely together and they were all built in the 30s or the 40s, they were all stick frame. When one house caught on fire and it's only eight or ten feet to the next, the radiant heat catches the next one. Up in Altadena, we're doing a number of fire rebuilds up there right now with some of these greener materials, fire-resistant materials, and wholes miles of Altadena, there's not one house that's left, which is pretty amazing. The only thing that's left on most of them are the masonry chimneys. This is an example of a fire of a house that was cited correctly and survived. This was in Northern California, I think the Paradise Fire. You can see they had cleared the brush around and even in the forest, they had built it correctly to the new codes and that house survived, but you can see the forest, everything around it did not. I mentioned sight and access steep slopes. One of the things that the code now requires is you can't build right on the edge of a steep slope because the fire comes up, catches, creates its own wind, and then it'll just catch the house on fire. That happened to the house that I showed up at Elon Leal that was right on the slope. They're making us setback from the edge of the ridge or edge of the slope so the fire can come up and go over and not hit your house directly. One of our largest projects is called the Friends Center. We designed this. It's down off of the 15 near Home Avenue east of downtown, and it's a Quaker church. They wanted to build a sustainable model church. It was about 15 years ago, so they were a little bit ahead of the time. This is a watercolor bird's eye rendering as though you were flying over it. The design concept is the courtyard with two wings and the peace Resource Center, which does peace work with the border. Then the Quakers have a tradition of meeting in a circle. You can see the tower in the center is a circular meeting hall where the Quakers meet. The concept was using a silo because they came from the Midwest and so the roof is a silo structure, but very sustainable. And here's a shot of during the bale raising, which I mentioned earlier, you can see some of the straw bales in place, and they didn't want to use any lumber on this building, which is great for fire resistant, but it's all metal studs and this metal was 90% recycled content. A great sustainable model. They collect the rainwater. It needs very little heating or cooling. We have solar, so it's all 100% off grid. There's a picture of the finished friend center. You'll notice a little crane sculpture. They also have a peace program that they do in Japan where they teach students to fold origami. That's an origami crane that my dad studio designed, and then there's a little inlay mosaic river you'll see in the courtyard and metal roof. Very sustainable, comfortable building for them. It's about 7,000 square feet, it's a bigger structure. Another building material that we like to use a lot, this is called sandwich panels. Those are Styrofoam and I have a couple of sample building materials if anybody's really interested over under the clock. This is a material that's made in Mexicali. It's virgin foam and they come from 1 " to 5 " thick. And then they have a metal mesh on top and bottom with a truss. So you can put those panels up and apply a plaster. If it's a simple structure like a warehouse, I've seen them in the videos, put it up in a day, plaster it the next day, and it's a little bit like tilt up concrete, but very fire resistive, earthquake resistive. They've done a lot of these in hurricane areas. First, I'll touch on green roofs. The structure on the upper right is an Elfin forest. It's a little interpretive center, so that's the construction. But I'm showing that one because that little dome structure is the foam sandwich panels that I showed. This one has a living roof all natives. They're adjacent to the Escondido Creek. Having the living roof filters the water before it goes into the creek. It's a great way to keep the water clean and they're also very high fire resistant or fire risk area being nestled in all the oaks. It's a pretty indestructible building. You'll see one of the tips that we learned that window right there has a roll down shutter. That's great for vandalism and people trying to break in. But it also in a fire, one of the weak links of houses we found are the windows. The fire will crack the window, get inside. Even if it's like our home was Adobe, it got inside and could burn everything. Those have a fusible link. If it gets up to, I think, 450 degrees, the link releases the shutter. If nobody was there and the shutters were up, it's a great system for especially when you're building in the urban interface right against a lot of brush. Then another house north of Escondido, a living roof. This one was a game room, but the living roof is great. In our climate, you do have to irrigate it a little bit. But in Australia and other spots where it rains some, it's a great system. That's a little rendering of

that Elfin Forest Interpretive Center. I was actually there yesterday, spoke at a Green Building Council. If you've never been it's open on the weekends, it's full of artwork. It's just east of Lacosta and west of Escondido. But a great little visit. They have hiking trails. One of my favorite things is the Escondido Creek runs year round, and it's really flowing right now, but it's one of the few places in San Diego where there's live water and there are some fish. They're trying to bring back the trout there. A couple of shots of that sandwich panel, the 3D foam panel, which we use for the arches, and then I'm going to show you the wall system next. That's a recycled foam block and there's a picture of the finished building. Another thing we try to do is think about the environment the building is located in and passive solar is another great design strategy. This is facing southwest, the pergola on the front. We have a deciduous vine, a grapevine. In the winter, the leaves all drop and the sun can go inside and passively heat the building. In the summertime, the grapes grow over, the sun can't get in, and it keeps it cooler. Thinking about the environment, where you're building, and where the breezes come from, that's all important for reducing your footprint and energy. I showed you a brief picture of that, but these are the insulated concrete blocks. They come in four foot blocks and they're recycled Styrofoam from shipping. They're mixed with cement, so they're fire resistive.You can blow a torch on that block and it won'tdo anything to it. They're a regular wood frame house with two by six construction and stucco is 1 hour fire rated. The fire could burn against it for an hour and then it would start to inflame inside. This is four hour rating. A fire would have to stay there and just keep burning and they don't do that in our climate, so great material. At Escondido Creek, we also liked it because they're in a 100 year floodplain. If there was a flood, we haven't had any while, but the building would survive the foam and the cement, the moisture wouldn't hurt it. It would just go through. We could put back anything that was inside. Pretty indestructible building material and this is what we've been using a lot in Los Angeles. People are starting to catch on. Two years ago, we designed a house in the Ramona area near their airport and this one we call the Ramona Villa. It's a more traditional build, but courtyard, and this is an aerial photo looking northfrom the house, just got finished recently. There's a shot of the entryway with arcade going in. But this is also the ICCF block and the manufacturer calls it perfect block if you wanted to look it up, and they're made in Phoenix, Arizona area. A couple of pictures. The walls are 10 " thick, so you get a little more depth, better for shading, better for interest of the windows. But it looks like a traditional building with maybe you use double studs. If you're isn't going to cost anymore if you're building a wall that thick with wood, but it does cost more than a standard two by four wall construction. There's an evening shot of the Ramona villa at night. So this is looking southwest towards Mount Woodson. Then I mentioned our Elon Le Center where I grew up, and then my parents moved off the property about five years ago, and now it's a nonprofit. We support the arts and we have classes and we have tours. But this is the new Elon Le Center, which we built about ten years ago. We're using both of the materials that I showed you, the sandwich panel for these vaults on the roof. This is a watercolor rendering. My dad, who is also a painter painted this and then we're also using the block for the wall system. There's a courtyard in the center where we have classes and presentation we'll have the local school, the Spencer Valley Elementary School or the Julian School, they'll come and do plays so the children can sit on the stairs and they'll have a little play in the courtyard. Here's some fun images of the construction withthat sandwich 3D panel. These are some of the domes you'll see under construction. That's the interior. They lay it up with some rebar, and then you can plaster. It's a little bit like a swimming pool, but up in the air. Also indestructible, fire will never burn it with the plaster and it's a great system we found for making these curved or creative roofs. Then that's a picture of the center. This is where the nonprofit is housed. The building on the left, and you'll see a lot of art integrated, which I mentioned like Gaudi. There's mosaic coming off the roof, the blue mosaic with the illusion of water. We don't get a lot of rain, but sometimes there's a stained glass door on the left. That's our archive where all the artwork is stored and they do some work. Have a conference center for up to 60 people in the center, and then an office, and we also do my favorite spot is the rooftop deck up on where you follow up the stairs. Sometimes we'll do wine tastings with the Ramona, some of the Ramona wineries, and that's my favorite place on the whole property at dusk. Then a couple of recent projects we've done. This

project is called Serenity Under the Oaks. The client was the former president of Palomar Colleges, so big educator, very good at marketing, and she wanted to create a house that was very sustainable, fire resistive, but on a property in in the Hidden Meadows area, which is above Lawrence Walks. Anybody been there know where that is? But a lot of boulders, a lot of giant granite boulders. Her the lot you bought was fairly big, but with all the fire codes and all the boulders, there was no place to build it unless you integrated the boulders. This building is also using those two systems, the block and the sandwich panel and that's a rendering that we did with a 3D model. There's a picture early on in construction, you can see the block for the walls. That's foam block. The center wall is concrete block structural and that's inside, and then some of the boulders and you'll see the boulder inside. It was too big to move. We did demo one of them that was where the dining room had to go, but we kept that one in similar to the earlier boulder house I mentioned. This one has the beautiful thermal mass. This one we have stairs going up, and there's a balcony sort of mezzanine on top of that boulder, and that's a picture of it. Another handmade door that some of the artists at our studio and Julian made. My father wasn't around for this one, so one of the artists that worked with him, but that has stained glass, and she happened to order the light from Canada from an artist. The two, if you see the swirl of the two, they came together just beautifully. This has steel beams as the structure with the foam above that. This is more of a detailed picture of that stained glass and custom wood door. The entryway coming up to the house, it's set back and there's a large oak trees on both sides. The garage is tucked into the right, and that's a aluminum door that is made to look like wood. It has a wood print on it. You can barely tell it's not wood when you're there. Some of the natural landscaping. Some clients want to tear down all of the landscaping. They're worried about their home burning. But I gave a lecture about six months ago in Balboa Park with the Horticulture Society, and one of the other speakers was a specialist in native plants. He said, one of the worst things you can do because we talked about embers and the blowing embers in a firestorm is to remove all the planting on your property. Because that allows those embers to go directly to the house. He was teaching, even with native plants, if they have a little moisture, they're going to catch the embers and keep it serve like a wall away from your house so you have better chance of surviving a fire with some landscape. I toured around Los Angeles after the fires, there was a few homes that had big pine trees, 40 or 50 feet tall that were flanking a house. Everything else around was burned. The pine trees had survived. They had burned a little, but they protected the house, which I thought was just amazing. Traditional logic, the pine tree would burn, catch the house on fire with the radiant heat, and it would all be gone. But just an interesting lesson of those winds and the embers and what helps you survive. This is a picture from the mezzanine that I mentioned and on top of that boulder, looking at serenity under the oaks, she has a view to the ocean through those big sliding glass windows. Those all open up, and there's a patio on the west side. Thinking about the passive solar in the sun, a lot of homes that we worked on near the coast and the beach, everybody wants to see the ocean, but in the late afternoon, that Sun's really hot and it heats up your house. We have automatic shades in that little wood piece above the doors, and those can come down and block 8-9% of that solar gain. This is a shot-ended at the dusk time with a full moon of serenity, looking at those West facing and some of the manzanita bushes on the left and an oak. It's a beautiful spot, we would like to have retreats and corporate getaways because it's close to the city center, especially the Escondido. Then building design. Another example, we didn't design this house, but some of the things that they did that helped it survive, you can see everything. This was in Northern California as well, Paradise Fire, metal roof, embers cannot catch onto the metal. Even clay tile roofs, sometimes there's openings and the embers could get up inside and they'll just burn and get down into the wood. This one was a straw bale house as well, the earthen plaster, and then they had cleared the brush pretty well. The columns, some of them did singe, but they are a heavier timber, so the wood would or the fire would have to burn against them for a while to catch those on fire. Then a few specific areas. This was the old way a lot of you probably remember shake roofs. Rancho Santa Fe, I think he used to have a rule. In some parts, you had to have a wood shake roof. The worst thing you can do now because the embers will catch on fire. They are making some shake that is fire resistant, but I would say that's not a great way to go.

Gutters are another place. If there's leaves inside, the embers can catch the gutter on fire. Eaves and a lot of the fire codes from the Cedar fires and we've had so many fires in the last 25 years in California. The codes have gone from maybe two pages to about 10 of everything to protect homes. Shiplap siding, the wood siding wasn't great. There's a new code that just came out this year because of the LA fires and the lessons they learned. This is all San Diego County, and I think LA, within five feet of your home, nothing that's burnable. They're wanting people to remove their landscaping if it's flammable, but for sure not putting your woodpile or even wood chips in your landscape, those can catch if the fire is hard enough. That's a new code, they're not enforcing it for existing, but it is a good rule of thumb. For example, we have 100 year home in Kensington. There's some old wood fences that run right to the house. I'm going to stop those somewhere and convert to a different material because in LA, they saw the fire catch onto the fences, and it was like a wick taking it right to the house, and just a tragic thing that people didn't think about. Then windows, previously in the early days they use single-pane windows. But now everything has to be dual-pane, and at least one has to be tempered glass because the tempered has a lot higher crack rate. The cedar fire for our house, some of the buildings were concrete domes, which you'd think, those have survived. The fire was so hot, it blew the window inside and then anything that was wood or fabric inside burned. We were able to rebuild it the way it was, but it's a lot of work and a lot of cost. Going over the newer conditions, Class A roof, which just means it's non-combustible. Metal is one of the best or concrete or clay tile, and they make asphalt shingles, not as good, but they make them fire resistive as well. Then gutters, they require screens, so there's no leaves that can build up or wood. Now the eaves all have to be enclosed or they have to be very heavy timbers. A lot of times we're wrapping the eaves with a cement board if you want that look, or you can plaster stucco right on the eaves because that was one of the other big wick links. If the fire came up and was right against the house, it would blow up the wall, catch the eaves, and then the whole house goes down. Plasters or cement board on the siding and no vents in the crawlspace. If there are existing vents, then you're putting that 8" metal mesh over it, so no embers can get inside and catch it on fire. A couple of examples of fire rebuilds. This was an Adobe Ranchero it's at the West side of Cuyamaca Mountain out in Descanso. This lady had bought a ranchero 800 acres and the cedar fire came soon after. Some of the Adobe buildings survived. This one, you can see the wall and the masonry stone chimney did not. We were able to go back and strengthen the Adobe wall for earthquakes and then rebuilt it, and that's the interior, again, using the reclaimed cedar for the roof. But I'll give an example of what burns and what doesn't. The fire got inside of this one, but the walls survive, so you're building maybe 60% versus starting from scratch. Then these are a couple of pictures of the exterior of Rancho Alegria. It's a beautiful rancho, middle of nowhere, but we had to design it for being off the grid. There was no power coming to the property. We had a backup generator, solar, and batteries, which much easier now with all the home batteries that they're making. Back when we did this, it took a big building just to house all those traditional batteries. Then I'm going to finish a little bit early. We were working with the Tongva tribe, which was the Native American tribe in the LA Basin. They were given two years ago a piece of property donated to them. It's the first land given back to their tribe in the LA Basin. They're similar to the Kumeyaay in San Diego County. They happen to clear all the eucalyptus trees. They're big fans of oak trees. You can see the oak trees, this was soon after the Eden fire, and they had a old stone building on the property. Again, the stone survived, but anything that was wood burn. There's another structure on the property, a Spanish clay tile. If they hadn't removed those eucalyptus, which are very dry and filled of oil, everything on the property would just be flat and it would have burned the oak trees as well so badly. The oaks, this was, I think, two months after the fire. They were already sprouting new. They had burned and were black after the fire. They're sprouting new leaves and I was amazed at how quickly nature came back in that location. They're located right on the ravine where the fire started across, and the mountain in the back are the San Gabriel Mountains. Those were completely black two months ago and you can see the growth starting to come. They have a beautiful river. But they're creating a sacred spot on this property. We're going to build some sustainable building materials, and they also have a gathering center where they can teach the young about their

property. One of the fun things they're doing is they're starting a nursery for native plants that have medicinal value for their tribe. They'll be able to disperse those to their community and have educational classes about them. This is a little rendering of that Spanish house that survived. It's not finished but we're going to rebuild it, put in fire-resistive construction. One of the fun little features is you can see the little dome entry pavilion. They were known for making their woven baskets. We took that imagery. Some of their early structures were woven baskets or made with reeds. Then the images of the column, this is metal in our version, but the columns are the reeds of those early structures. We're excited to be working with them. We also have six different homes which we're teaching people. LA has been behind Northern California and San Diego in their green building. Building department is very restrictive as they make it hard to do everything, but we've gotten some of these materials introduced, and we think once some of these block buildings and foam start to go up so quickly and people compare a wood frame, is mostly what's going back up is wood frame, which people are used to. When you look at that before it's plastered and you look at the foam, people are going to click and we're hoping and start to build in more smart ways. I'm going to end on this is a website or the website for Hubbell and Hubbell Architects. If you're interested, all of these materials and a lot of information about green building. Then our foundation, I mentioned we have tours and art workshops. It's near Julian, it's about an hour and 10 minutes away. But it's a magical place. If you want to just get away for a day or take a tour, invites you to come up there. Thank you very much.