

CONCRETE SPALLING REPAIR GUIDE

FROM NATIONAL BUILDING EXPERT &
INTERNATIONAL BEST-SELLING AUTHOR

CONCRETE DOES NOT LAST FOREVER



LANCE LUKE, CCC, CCI, CCPM

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INTRODUCTION

This will be interesting information to help building owners and boards deal with the concrete spalling situation, which is pretty rampant around Hawaii. And also in other areas of the United States that are near the ocean.

We're going to give you information, insight, and helpful tips, information on spalling repair that people don't know and maybe help contractors also.

If you're a homeowner, condo owner, a condo board member, a property manager, you might not know this kind of stuff. So it's going to be a very good educational session. I hope you take good notes.

Before I get started, I want to let you know some facts about the word spalling and the correct pronunciation of the word spalling. Spalling is spelled like the word falling. It is not Spalding.

Spalding is actually a brand of a basketball in sports, so be sure to pronounce it correctly. And also please be aware of the term cement. if you say, Oh, look, that's a cement building. That's not really true. It's, sort of true. And here's why.

The fact of the matter is cement is actually a component of concrete. So to make concrete, it takes the cement, which is like a powdery substance made with calcified limestone. And then you add water, sand and gravel. So that's the recipe to make concrete.

So when people say cement, it's only one element or one ingredient of concrete. Now cement mixed with water makes a mortar and it doesn't have anything else in it.

So mortar is used for making stonewalls and block tile walls and different things like that, as opposed to concrete. So cement mixed with water, sand and gravel makes concrete.

Also when you add reinforcing steel and whatever else is needed that becomes a constructed reinforced concrete building. So that's to just clarify the nomenclature and the terminology of the words. So let's get right into the main causes of spalling.

CHAPTER I

MAIN CAUSES OF SPALLING

RAIN, SUN, WIND

What is spalling anyway?

Well, spalling is actually cracks in concrete, caused by either the concrete cracking on its own, or if there's reinforcing steel rebar, moisture and water gets into the concrete.

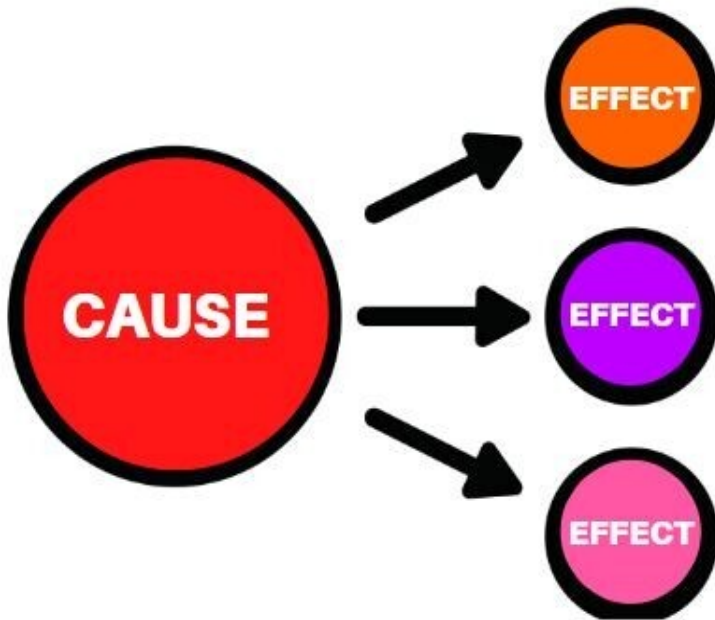
Then the water gets into the rebar, or it touches the rebar and the rebar is made of steel. Water and steel, aren't very good friends.

What happens is the steel starts corroding, and studies have shown that when the steel corrodes, it expands to about seven times the original size. So when the steel expands, guess what; it causes the concrete to crack because the steel is harder than concrete. So that's what spalling is.

How was it caused?

Let's take a high-rise building that's made of concrete and you have exposure to the elements such as rain, sun, wind, and components of nature. You have constant rain, wind, sun, humidity, and different things that are factors affecting the building or causes the wear and tear of the building.



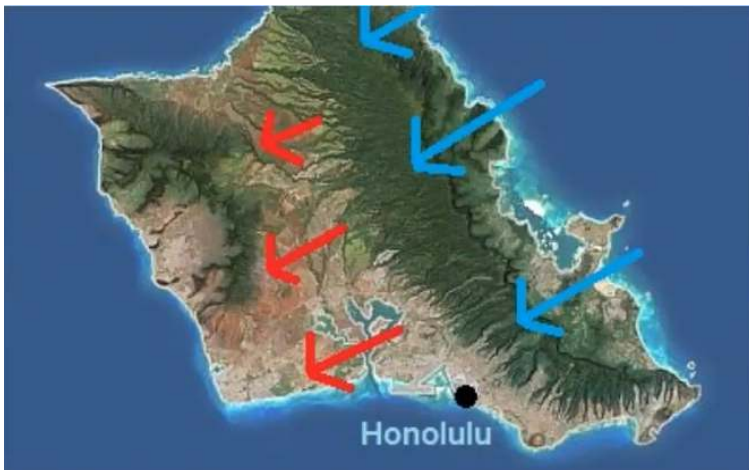


It doesn't cause spalling at first.

But what happens is when the coating of the building starts failing such as paint, then the water can enter the concrete because the concrete is porous.

It's not waterproof.

Other main causes are humidity, salt, air, and failed paint. In places that are near the ocean with a lot of wind, such as Hawaii and California, San Francisco, areas of Texas, Louisiana, Florida, they all have spalling conditions that are due to salt air. Believe it or not, there's a lot of salt in the air.



When the trade winds blow, it carries the salt from the ocean to the land. And what do you have on land? You have tons of concrete buildings.

So if you have a building that is fully protected with new paint on it, it's very hard for the salt and rain water to get into the concrete.

If you have failed paint such as in the photo, the paint is not doing its job. What happens is the paint starts failing and layers of paint start eroding away or disintegrating.



Now, you don't have full coverage of the concrete material. So it's very important that the concrete be protected.

Once again, concrete is not waterproof. I took chunks of concrete as a experiment and set it in little pans of water. And eventually the water soaked up into the concrete rocks that I had as a samples.

I will give you another analogy.

Let's take a car. You have a nice Mercedes with new paint. And if there's a scratch on the paint that is not touched up, guess what? Where the scratches are it starts rusting. And that's why full coverage of paint or waterproofing is the best thing for a concrete building.

CHAPTER II

CONDITION SURVEY

CONFIRMATION OF QUANTITIES

How do we determine whether there's spalling of the buildings or let's say we know there is spalling, but how do we determine how much damage there is and what the cost to repair is going to be?



So there's, what's called a condition survey and the survey is a method to determine the quantities of spalls at a particular building. And there's different ways to do the surveying.

It's kind of simple on one hand. On the other hand, it may not be so simple, but the objective is to get a good snapshot of the condition of the building with respect to the various spalling conditions.

Once all these spalled areas are identified, those are all quantities, and we've put all the quantities together, add them up, and we can determine basically what the cost is by the number of quantities for the different types of spalling.

CHAPTER III

INSPECTION METHODOLOGY

The inspection methodology to determine the survey condition.

VISUAL (NON-DESTRUCTIVE)

The photo is a high-rise building with a lot of lanais. One method is to just look around from the ground and look at each unit and each section of the building.



We look for cracks or peeling paint and that's called a visual inspection, which is non-destructive. Meaning we're not breaking anything or hitting anything.

Also in addition to the visual, we can do an inspection via drone, and we can also set up appointments with each unit owner and actually go through the unit.

We would go on their lanais and look for cracks or spalling, check the railing and see if there's any loose railing and look for conditions like that.

The other method is more intrusive and it's called sounding and it's destructive.

SOUNDING (DESTRUCTIVE)

The reason why it's considered destructive is because we're actually using instruments such as a hammer to pound the concrete, to look for spalling areas.

The correct protocol is via tapping, using a hammer and tapping every square inch of the building. There's also a chain that's used and we chained walkways and unit lanais and driveways. And that's called a chain drag method where we're dragging a chain and listening for the difference in sound.

So what happens is when we take a hammer and start pounding the concrete, we're actually listening for a difference in sound. If the concrete is solid, you're going to hear a solid type of sound. If the concrete's hollow, it is indicative of spalling.

You are going to hear a more hollow type sound because there's air or space between the solid concrete and the spalled area. Also, if there's an obvious crack and you hit it with a hammer and pieces of concrete fall off, well, it's pretty obvious that it's spalling.

So the sounding method could be very costly because in order to sound every square inch of the building, you're going to have to set up rigs, which is these sky climbers.

Then on every drop or every stack of the building we would have to go up on the rig and start hammering away and doing our sounding.

So for instance if you have a smaller building, it could range from \$35,000, for rigging and time spent. The bigger buildings, where if you're going to rig the building and do sounding, it costs \$100,000 to \$200,000.

And a lot of times, owners or condo boards do not want to spend that kind of money because they don't need to.

My advice to them was if you don't have enough money in reserve to pay for your spalling, then save that \$100,000 or \$50,000 that you want to use for a sounding and investigation and use it for actual spalling repair.

So it just all depends on the nature of the ownership of the buildings and what they want to do, and how much money they have. So those are basically the two different methods to determine a spalling.

CHAPTER IV

INFORMATION GATHERING

COMPILATION OF RESULTS

Once we do our sounding, we have a spreadsheet and it's listed by units or unit numbers, and listed by drops.

A drop is a vertical stack of the building.



So let's say you have one drop. So every unit is the 01 unit from the first floor, all the way up to the 40th floor. So that would be a stack or drop one.

Then we list down how much spalling and what type of spalling that they have. And we'll talk about the types of spalling as we go further.

We gather all this information and compile the results and total everything, and come up with an approximate number. Now I'm not the contractor that does the work, but when I manage construction projects, I do my own estimates.

When I do get the proposals from the contractors, I kind of gauge whether they're far off or whether they're kind of within the ballpark based on what my own number is. So it's like a cross-check.

If I don't do that, I'm not going to have a clue whether these numbers from the contractors are correct or whether they're way, way off. So we're going to compile the results and we're going to come up with some numbers.

Right now let's take a tour of a building to see how we gather the data on spalling concrete.

CHAPTER V

TYPES OF SPALLING BY LOCATION

Believe it or not, there's different locations and types of spalling.

When the contractor bids on a job, you know exactly what he's bidding on and what he's talking about, and it's not Greek.

Let's talk about spalling by location. One type is overhead and horizontal spall.

OVERHEAD & HORIZONTAL SPALL

If you look at the photo on the next page, it is a photo of high-rise buildings, but the same locations apply regardless of whether it's a high rise building, a low-rise building, a single-family house, a three-story apartment building, a shopping center, or basically anytime type of a commercial or residential building.



If you look at the left area at the top, almost by the right, at the blue sky, you're going to see areas where it's not painted and it's flat. And that's what we call overhead because it's a ceiling.

If the flat area was not overhead and it's horizontal, like a lanai slab, that's considered horizontal.

So overhead and horizontal basically mean the same thing. It's flat, except one is on the ground or a walking area. And one is above and overhead.

The other type of spalling by location is a vertical spall. And instead of having it flat, whether it's a walking surface or a ceiling, it's actually a vertical surface.

VERTICAL SPALL

It's the vertical plane of the building. If you look at the photo, you can see those little vertical rectangles on either side of the unit opening. Those are vertical spall repairs. So that's the terminology of overhead, horizontal, and vertical.



Now, what do you call it if it's a horizontal, but it's at the edge where you walk but where your railing is?

LEADING EDGE

That's called a leading edge spall.

If you look at the photo, you can see the edge and this is a concrete balcony where the railing was removed. You could see the edge of the slab is severely spalled. So that's what we call the leading edge. It's the edge of a walkway, edge of a lanai, or it could be a window ledge.



There are two different types of horizontal spalls. One is called a partial depth and the other is called a full depth.

PARTIAL DEPTH SPALL

Now it's pretty obvious, but you take a four inch or six inch thick walkway concrete slab and if the spalling damage doesn't go all the way through.

In other words, it's maybe the first inch or first two inches of the surface, horizontal surface, that's called a partial depth repair. Why? Because it's only partial. It's not total and full.



FULL DEPTH SPALL

If you start jackhammering away, and all of a sudden you go all the way through the floor slab, that's called a full depth repair.

If you look at the photo, it is a Waikiki Hotel where they had severe spalling on their walkways, it was a full depth repair.



As you could see, the concrete got demolished all the way through and only the rebar is there. This is a very unsafe condition. If it gets to the point of holes in the walkway slab where people could fall through, that is very dangerous.

So naturally a partial depth repair is cheaper to fix than a full depth repair. For a partial depth repair, you only need to work on the top, or maybe it's a partial depth from the bottom, from the ceiling. And it doesn't go all the way through to the top.

If it's a full depth repair, you have to form the bottom with a ply board and wood framing in order to build a floor.

So when you pour concrete, the concrete doesn't fall through the holes and end up on the next floor.

CHAPTER VI

ADDITIONAL RELATED COST ITEMS

In addition to spalling and concrete repair, there's actually other related costs that are inherent in a spalling repair project.

CRACK FILL

For example, we have a crack fill. So you have a concrete wall. Like the photo, there is a crack, but there's no spall.



It could be a settlement crack where maybe water didn't get in, but through settlement of the ground or building just cracked.

And the fix on that is we would have to fill it in with some filler such as caulking and sealant. There's also a rebar replacement.

REBAR REPLACEMENT

If you look at the photo, the rebar on this column is severely corroded and it would require replacement. So the replacement on this rebar would entail having to cut it out and put a new piece of brand new rebar in its place.



CMU BLOCK

You have block tiles, you have a tile wall and there's cracks and depth and it's a spall. So we would need to repair that as well.

By the way, some older apartment buildings, office buildings they're made of CMU block and not solid concrete and the spalling repair is basically treated the same way. With respect to figuring out what the cost is, the method to do the spall repairs is a little bit different for each.



CAULKING & SEALANT

If you look at the photo, you see that kind of gray substance between the brick and the aluminum sliding door. That's caulking.

A lot of times in older buildings that caulking gets worn away and disintegrates, and it just shrinks. And guess what, when it rains, now you have spaces there where water could get in.

So we have to pay attention to that.



RAILING REPAIR

If you have solid steel railing, those don't last that long. And it's so corroded where we would have to cut pieces of railing and weld a new piece in.

As you can see, this is a leading edge corner of a walkway stairway. And in addition to the railing problem, there is spalling too. So that whole section or corner of that slab landing has to be taken out. And at the same time, that's when new pieces of railing would be welded in.



DRILL & FILL

If you have an aluminum railing, which is not solid it's hollow. A lot of times the railing bases get loose and water gets inside the post base. Now you have spalls around the base of the railing.

So we have what's called a drill and fill where we drill holes in the base of the railing and inject a filler material. Water can build up in the railing post base.



Because what happens is even if rain doesn't get in, over time humidity causes water to build up due to different temperatures and condensation forms. So there is water actually sitting in the base of that railing.

Hollow railing embedded in concrete, and therein lies the problem where the water starts damaging the concrete and there is spalling right at the railing post base.

It's pretty common to have spalls where the railing bases are. And that's where your leading edges are of your lanai.

CHAPTER VII

BASE BID VS. UNITS COSTS

Beware of the lowest bidder. Low quantities result in low bids.

Let's say we invite contractors to our building and say, take a look at our spalls. We want to get your proposals. So you call three contractors, they come in, they look around and then you get a proposal from them.



Be aware of the lowest bidder, because it may not be as it seems. And the lowest bidder price could be low. And that bidder could be the lowest bidder because he bid on a lower quantity than the other bidders.

So common sense dictates that the low quantities will result in a low bid. And I'm not saying do not take or accept the lowest bidder as a contractor.

I'm saying is to be aware of the bids, and be sure the bids are not apples and oranges.

And watch out for an apple and a lemon when you're comparing the bids. This is very valuable information that contractors may not tell you.

So let's say we have two contractor proposals and I ask you which one is the lowest proposal.

TWO CONTRACTOR PROPOSALS

1. \$150,000
2. \$250,000
3. \$300,000

Okay, good. Someone said, "Oh, wait a minute. Can't you do the math? You said two contractor proposals, but you have three." Okay, good catch.

The reason why I say two is because contractor number three was too lazy and he didn't want the job. And he just arbitrarily bid high. Because he's too busy and got enough jobs already. And he figures that if he gets it, he gets it and he can make plenty of profit.

So basically I threw that one out. So there's only two valid proposals.

And by the way, the contractor number three even admitted, he says, you know, "I don't really want the job, but instead of not turning in a bid, I just made my bid high. I know I'm not going to get it, but if I do get it, then I'll make plenty of money." Well, I said, "Thank you."

So, Contractor 1 bid \$150,000 and Contractor 2 bid \$250,000. So if you were the owner of the building or you were the condo board, you're a board member of a condo, which one of these proposals would you take? Number one or number two; which is the lowest proposal?

Well, naturally the lowest proposal is number 1. Okay. So the board gets together and says, "We're going to accept proposal number 1, because it's the lowest bidder", and they don't have any construction consultant.

Then their smart and experienced property manager says, "Well, wait a minute. Do you guys actually know what a whole spalling project is like and what the components are, what needs to be done? And are you aware, of how the contractor is going to fix the building, and how do you know that the lowest contractor is the best contractor?"

And then they're going, "Whoa, you have a point there", and then somebody on the board says, "Are any of you board members contractors or engineers? Or do any of you know how to estimate a spalling project, or how to inspect a spalling project, or even how to manage a spalling project?"

And all of them said, "No, but it's easy. Right?" And the manager says, "I think we should get bids from construction consulting or construction management companies."

So they contacted me and didn't hire me at first.

They just said, "We want you to come in and let us know what you can do for us." And by the way, we have these three bids that we want you to look at and tell us why we shouldn't take the lowest bid. I said, okay, that's simple enough. So I met with them and here's what I told the

FURTHER ANALYSIS

BASE BID 1000 SF X \$150 = \$150,000
2000 SF X \$125 = \$250,000

UNIT COST 200 SF X \$150 = \$30,000
200 SF X \$125 = \$25,000

So I met with them and here's what I told them, "Further analysis after my review of the two bids, here's my analysis. Then board members, you tell me what contractor you should choose before I tell you."

So base bid, the contractor one bid \$150,000 after further discussion and questioning. It was based on a thousand square feet at \$150 a square foot. And by the way the square foot is a measurement, a 12 inch by 12 inch square of concrete on a building.

The contractor number two bid \$250,000. But it was based on 2000 square feet times, \$125 a square foot. So if you look at it and think about it, contractor, number two, his price was higher, but his unit cost was lower.

Contractor number two is basically doing twice the amount of repair work compared to contractor one at lower unit costs. This is how you analyze a spalling proposal.

Let's go down to unit costs, 20 square feet times one \$50 per square foot equals \$30,000. The same square footage of 200 times \$125 equal \$25,000.

As you can see, it's better to choose the contractor that charges a lower unit cost than a lower base bid. And by the way, the unit costs of these various locations where I described above should be all listed. So you can compare and you have apples to apples bidding.

In this case, the contractor that bid the lowest is not the best contractor as you can see. You have to quantify what the unit costs are, because what happens is there have been cases of a condo board selecting the lowest contractor, but their unit costs were a lot higher.

In the end, they paid more overall than the highest contractor that bid on the job. So this is key here. This is how to really determine apples and apples, and which is the best value contractor.

CHAPTER VIII

CONCRETE REPAIR SPECIFICATIONS

Let's talk about concrete specifications, and this is another important factor. So you don't just have the contractor go there, chip out concrete, and then, patch it with the new concrete they bought at the neighborhood hardware store.

That's why it's critical to have specific concrete repair specifications, there's industry standards, which is a general acceptable industry standards.

There's various associations that are specific to concrete repair and concrete construction.

- American Society of Concrete Construction.
- American Concrete Institute(ACI)
- International Concrete Repair Institute (ICRI)

If you look at the photos, I attended the World of Concrete show in Las Vegas a couple of years ago, and man, it was a eye-opener.



I thought I knew everything, but I did learn a bunch of things. I've been in the concrete industry for over 40 years now, and I still want to learn more.

That's why I spent the money to go up there and sit in on the classes and see what's new out there and network with other engineers in the industry.

It's key that the contractor follow the specs and don't just hire any contractor. Make sure you have specs written as far as what they're required to follow.

- DEMOLITION/CHIPPING PROTOCOL
- SAW CUT GEOMETRIC SHAPES
- DEMO 3 INCHES BEYOND THE CORROSION

The contractor should follow a demolition and chipping protocol and what is the protocol while they don't just go and start jackhammering away.

So if you look at the photo , it's a photo of a leading edge with a lanai and the railing is loose. But what I want you to learn is that if you look at the photo closely, they're ready to pour back new concrete. Is the spalled area cut to geometric shapes? Now. If you look closely on the left of that middle section, it's all not even.



And so there's no way to pour new concrete back and have it really bond if you don't have an even cut.

Look at the area on the right, that rope hanging down and that bad cut. So what I normally specify is the contractor mark areas that they're going to cut out and saw cut it. They don't just haphazardly start jackhammering away at everything.

Also, I specify demolition three inches beyond the corrosion area. If they see corroded rebar, don't stop there. You measure three inches from that corrosion and demo out, even if the concrete is solid, because we want a good bond.

This is a photo of me at the World of Concrete show. I entered a contest.



I actually mixed concrete and filled in the form that already contained rebar and smoothed the concrete out.

The winner got a \$1000 cash prize. And guess what? I took second place and didn't win anything.

But the guy that won, turned to me and said, "Hey, you're a good competitor", I said "Thank you." He said, "Are you a concrete finisher?"

And I said, "No, I'm an engineer. I don't even work with concrete, but I wanted to know how it's done and I know how it's done, but of course, because I don't do it every day, I was kind of slow"

The guy was laughing and he ended up taking me to lunch by the way. Cause he was thankful. I said, "Yeah, take me to lunch. You won a thousand bucks cash in Las Vegas and you didn't have to gamble." Good thing.

So if you look at the photo, it is what mine looked like a when I was partly done.



In order for me to inspect concrete, I got to be able to know how it's done. So that's the reason why I entered the contest. I also wanted to win a thousand bucks.

- Rebar Replacement Protocol
- Corrosion Removal & Treatment
- Concrete Product, Concrete Coverage & Curing Time
- Metal Railing, Paint Scrapping, Prime and Paint

Some more concrete repair specs, there's rebar replacement protocol.

What is the protocol? When do we know when to replace the rebar?

Well, if you look at the photo, the rebar is severely corroded. Right at the end and you hold it, and you're looking at the end of it, that's called a cross section.



If you're looking right on. And if the cross section is corroded away, 15% or more, that's a determination that you have to replace the entire rebar. You can't save it. Don't grind it and try to save it because you're cheap. That's not going to do it. You have to remove all the corrosion on the rebar.

If you just grind it, use a metal grinder and grind all the rebar that you see and it's shiny, is that good enough?

Now, you have to chip behind the rebar so that you could go behind the rebar with a brush and apply corrosion treatment.

If you do not chip behind the rebar and you just patch the top, in two years, the corroded rebar in the back will continue to corrode and start spalling the concrete again, and then you're back to square one.

So the corrosion removal and the treatment is important. Don't just remove the corrosion and then fill it back with concrete. You've got to apply a corrosion inhibitor to treat every inch of that rebar so that it doesn't get corroded again, or it takes a while for it to get corroded.

Also be sure you use the right concrete product. Just don't go to buy a bag at the nearest hardware store. That's not structural concrete for high rise spalling repair.

Also the concrete coverage. If you have rebar, that's sticking up too close to the surface of the concrete that's not good enough because it's easier for water to get in. So I usually want to see a one and a half to two inch concrete coverage.

Sometimes you can't help it because of rebars. They're really too close to the top of the concrete. And that's how they built the building. But we try our best.

Also curing time. If the concrete specs say it takes seven days to cure after you patched a spalling area, you don't go paint right after the second day. You have to wait until the concrete is fully cured before you apply paint. There's a metal railing, how to deal with that.

If your building has a lot of paint that's peeling off, you have to scrape the paint off to either bare concrete or solid paint before you prime and paint.

And although we're talking about concrete, spalling, priming and painting has a lot to do with the success of a spalling project.

If you don't use the right primer, you don't use the right paint and you don't put enough paint on, you're going to have the same problem. It's not going to last too long. So be sure you have full coverage of the paint.

If you look at the photo, they're doing a prime and paint. By the way. I'm not happy with the green color. It's like an army worm green. I don't like it. I don't know about you guys.



CHAPTER IX

PROPER CONTRACT DOCUMENTATION

Proper contract documentation. You don't just hire the contractor. He goes and fixes it and then he goes, here's the bill.

Here's what you should require at every spalling project. You should require additional to documentation of the areas that need to be repaired.

I want to see a photo of beforehand, a photo of during the spalling repair and a photo after.

If you look at the photo on the next page, it's obvious that there's a horizontal crack. There is a leading edge spall, right at the base of the railing. And this is a photo as is before any work is done.



Then they started chipping up the area and this is a closeup of the same area showing the rebar where they cleaned it up. So it looks pretty good.

Although there's still some concrete cracks around there, they got to dig it out some more and then they formed it and they poured concrete.



The photo on the right is after they took out the form of the concrete. So we could see the repair.

What is critical is the before and during, because the during is going to have the photo showing the condition of the actual spall area. And they have to take measurements in order for me to cross check how much they are billing for.

CHAPTER X

MEASUREMENTS TAKEN OF EACH REPAIR

In addition to taking a photo, they also need to take dimensions- length, width, depth. As you can see there are cracks in the bricks and it's measured.



So when they do the repair and it's a unit cost repair, they have to submit the photos of the measurement showing exactly how much concrete they use, how long, how deep, how wide.

And I crosscheck the measurements with the photos and make sure that they're charging accordingly.

This is considered full documentation of a spall repair. This is the right way to do it.

If a contractor doesn't submit all this documentation, how do you know if they're not overcharging you. If you can't prove for each spall area, how much concrete they took out and how much they patch, you will not be able to verify the actual repairs.

CHAPTER XI

DESCRIPTION OF LOCATION, SPALL TYPE, DROP NO., CONDO UNIT NO.

When they're doing their repair, they need to list what the unit number was, and the type of spall. So unit 201 leading edge spall was three linear feet times X amount per linear foot. And I double-check all of that.



This photo is actually of a parking stall. And what kind of spall is this?

This is a horizontal spall and not too much concrete was chipped out. Which is good, because we don't want to start digging to China.

So basically, in a nutshell, that's what a whole spalling repair is like.

CHAPTER XII

QUESTION & ANSWER



"What is the typical painting cycle? And what that means is how often should we paint the building?"

A typical cycle is about 8 to 10 years. Basically that means that you have to paint every 8 to 10 years.

Some buildings may last longer, some may not, but if your building hasn't been painted for 15 to 20 years, you're way past the cycle. You're overdue like two cycles already.

As I mentioned earlier, why do you need to paint?

Well, you got to protect your building and that prevents spalls.

So what happens is on the cycle.

Let's say you paint every 10 years, the next time you paint that's when you got to do a whole spall check repair, and repair all those spalls and paint.

If you don't repair the spalls, you're going to have a major cost factor in the future because the spalls that may cost \$80,000 today, two years from now, it may end up costing \$250,000 because it's a pyramid type of effect because spalling.

It doesn't heal itself. It just gets worse and worse over time.

"On your past spalling projects, what has been the percentage of cost overruns?"

Let's say, I have a building where we did a visual check for spalling, and we figured out that it was a million dollars. After we started the spalling, we used up a million and we're only halfway through the building. And so it results in a change order.

So at the end, the spalling repair costs ended up costing two million. Initially we thought it was \$1 million. So that's the danger of a spalling repair project. You never know what you're going to get into.

Now, there have been cases where the spalling costs was three times more than the initial estimate. And why? Because once you start chipping away, what looked like a six inch crack turns out to be a two-foot major spalling repair structural in nature. So that's just a caveat.

"Do you recommend other types of rebar?"

This is more of an engineering building material type question.

The photos I showed you was the original rebar, which is solid reinforcing steel. And the rebar is just a short term for reinforcing bar or steel. But in addition to solid steel, there's the same type of solid steel where it's epoxy coated and that's called the epoxy coated rebar.

Lately they came up with this fiber reinforced rebar that doesn't have any steel at all. And the plus on that one is that it doesn't rust, it doesn't corrode, the diameter is smaller, it's lighter and it's easier to work with. So there's pros and cons for each type.

Lately I've seen a lot of fiber reinforcing rebar being used, but all over the mainland, even in Hawaii, they're still using the original rebar. If, if I take a tour of Kakaako and look at all those new buildings going up, it's all original solid rebar.

"How often should a building be inspected for spalling?"

Remember the painting question. The cycle is every eight to 10 years. The inspection cycle of spalling is you should inspect every year.

So regardless of whether you hire a consultant or you just do it yourself, every owner of a building should have an inspection every year. Why? Because you need to know what's going on.

If you don't see anything that may be good. If you start seeing a lot of cracks and all that, that's the time to call in experts. And even if you have small spalling cracks that look minor to you, it's better to pay the price now to have it fixed because the price is going to go up because guess what?

If you let it go and say oh it's only minor, it doesn't look major. Why don't we wait you know, three years, five years from now, when we paint the building and fix it. Then the problem you're going to have is higher repair costs.

Right now to fix it, it may cost \$10,000 and when you wait, it's going to be a lot more.

So the time would be now to get it done. You fix the localized spot areas and you have the contractor do touch up paint to match the building. And you're good to go. Don't ignore it. And let the thing go on and on.

"What do you think about railing replacement?"

As I mentioned before, there's different types of railing and the idea is you want to pay attention to it now and not wait because if the railing is loose and someone falls over, that's a definite liability and safety concern.

The other thing is, if you let it go too long, like the old apartment buildings in McCully, Makiki, Waikiki, they have those walk up apartment buildings and they have the sixties and seventies solid metal railing and the railing is corroded.

You want to fix it now because if it gets so bad and you have to replace it, you're talking big money, hundreds of thousands of dollars, because then you have to conform with today's code, the building safety code.

If you repair it, it's grandfathered in, and it's a lot cheaper to repair. The last railing replacement I did ended up costing \$750,000. So not cheap.

"I'm a condo board member and my building has peeling paint. How do I deal with that? And what is the cost?"

You'd have to scrape it off to the bare concrete or to solid paint. So if the paint is old and when you scrape it with a metal scraper, it doesn't come off, then you can paint over it.

There is what's called an adhesion test where the contractor would use a knife, make X's on the paint, put special tape and try and rip the tape off.

When he rips the tape, if the paint comes with it, then that's not solid and it needs to be addressed. If he pulls the tape off and there's no paint on it, then the paint is pretty solid.

So that's the official testing protocol.

Peeling paint, you have to scrape it off. And unfortunately, to peel the paint and scrape it off to bare concrete costs three times the costs of just painting the building, because it's labor intensive.

Can you imagine on a scaffold swing stage 40 stories above the ground, having to scrape paint off on a wall of a building.

That's tedious work. So that's why the cost is there.

"What is the difference between a time and material bid versus a base bid?"

Spalling projects, you want to get a base bid and unit costs. And I rarely see a time and material bid and why? It's because you need to track the materials, the cost of the materials, and you need to track the time on a T and M bid.

There's normally all this extra costs such as a rigging, installing the scaffolding, installing safety barriers, blocking cars, and all this other stuff that's added into a time and material bid.

And also if the workers are working slow, you're paying for their time to work slow. If you get a unit costs, hey, they can work as slow as they want.

You're still paying the same price, except that if they tell you it's going to take six months to repair the building, you don't want them to take a year because people lose their parking stalls or they have to subject themselves to the dust, noise, jackhammering and such.

And it's just not a conducive environment to be at home, listening to loud construction noise.

So sometimes a T and M can work out, but for the most part, spalling projects are not time and material. So you really got to track it.

"My building has spalling repair completed three years ago, but some areas are cracking again. What do you think?"

So normally I would say, well, it may be a poor job. Maybe, they didn't use good concrete. Maybe they chipped away and the rebar was still corroded and they just put concrete over that.

Maybe they should have replaced a rebar. I mean, there's any number of things to determine any number of factors. You know what I said, maybe that's a spall that just came up and it wasn't an area where the contractor fixed.

Some people tell me I never thought about that. So what happens is you normally want to blame the contractor for bad work. And so this is an example of just that. And I basically told him, "No, it may not be due to bad work."

It may be that these areas just got spalled recently. They weren't spalled at the time of repair, but in a couple of years, these are new spalls. So I said, "If there are new spalls, you got to address it."

If there's spalls where it was a previous repair by the same contractor, then you have a claim. But sometimes it could be a spall showing that was repaired 20 years ago.

So it wasn't repaired by this recent contractor. It was repaired by a previous contractor. And it's beyond that 10 year cycle. So it just all depends.

It needs further investigation. I said, well, "We need to figure out what really is going on. You can't automatically blame the contractor. He may not be at fault."

-END-

ABOUT THE AUTHOR



CURRICULUM VITAE

of

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SUMMARY/OVERVIEW

Lance Luke has been in the construction and real estate industry for over 42 years. He is a former general contractor and worked as a construction and project manager for real estate development companies. Currently he owns an independent construction consulting company, Construction Management Inspection, LLC. He has experience in design, engineering, construction inspections, construction management, reserve studies, real estate development, property management and condo association management.

His specialty is in inspection and construction management for condo association buildings and commercial properties. Various types of projects worked on include concrete spalling repair, painting, roofing, waterproofing, asphalt resurfacing, plumbing re-piping, electrical retrofit and structural wood repair. He provides construction oversight and progress inspections for residential and commercial projects.

He has 42 years managing capital improvement projects for condominium associations.

Lance Luke serves as an expert witness on construction and real estate litigation cases. He was formally an Advisory Board Member for the State of Hawaii Regulated Industries Complaints Office, as an expert consultant (for over 15 years). His expertise was in helping to resolve complaints filed with the Contractors' License Board. He was also selected in 2017 by Honolulu Assistant Fire Chief to serve on the RFSAC (Residential Fire Safety Advisory Committee) Building Code Sub-Committee to prepare the Fire Life Safety Evaluation criteria.

He has written numerous articles on construction and inspection, which have published in both local and national media. He conducts up to 30 presentations a year to the construction, real estate and property management industry including educational webinars and construction seminars.

Two-time Best-Selling Author on subjects of construction management and building safety. Numerous articles published in national construction, design, and building management publications.

Featured guest on national media shows such as Times Square Today and Hollywood Live which were broadcast on national media outlets such as ABC, CNBC, CNN, NBC, Fox Affiliates, A&E, and Bravo.

Mr. Luke is a qualified insurance inspector and an approved Federal HUD Construction Inspector. HUD projects included “from the ground up” assisted living facilities such as Plaza at Moanalua (2012), Plaza at Pearl City (2014) and Ilima at Leihano (2016) He is also listed as one of America’s Premier Experts and Marquis Who’s Who in America 70th Anniversary Edition. And is an instructor for National Seminar Providers such as Lorman Education Services, Compliance Prime, and Half Moon Education Seminars.

Lance Luke is a former member of the Structural Engineers Association of Hawaii and the American Bar Association serving on the Real Property/Probate Law Division and the Forum for the Construction Industry and a former member of the following Professional Associations:

PROFESSIONAL ASSOCIATIONS

- ❑ Construction Management Association of America (CMAA)
- ❑ Certified Home Inspector 1990 (American Inspectors Association)
- ❑ The Construction Specifications Institute (CSI)
- ❑ Hawaii Building Association (HBA)
- ❑ International Code Council (ICC)
- ❑ International Concrete Repair Institute (ICRI)
- ❑ National Institute of Building Sciences (NIBS)
- ❑ Roofing Consultant Institute (RCI)
- ❑ Structural Engineers Association of Hawaii (SEAH)
- ❑ Association of Construction Inspectors (ACI)
- ❑ American Association of Cost Engineers (AACE)
- ❑ InterNACHI (National Association of Certified Home Inspectors)

LICENSING/CERTIFICATIONS

- Real Estate License 1980 (currently licensed)
- Certified Real Estate Appraiser 1987 (National Association of Real Estate Appraisers)
- Registered Home Inspector 1996 (Housing Inspection Institute)
- Senior Certified Valuer 1996 (International Real Estate Institute)
- Registered Property Manager 1996 (International Real Estate Institute)
- Mortgage Solicitor/Designated Mortgage Broker 1996-2010
- General Residential Contractor (Oregon 1998-2000)
- Certified Construction Project Manager 2007 (Association of Construction Inspectors)
- Certified Construction Consultant 2007 (Association of Construction Inspectors)
- Certified Construction Inspector 2007 (Association of Construction Inspectors)
- Certified Environmental Inspector (2009)
- Certified Environmental Manager (2009)
- Certified Environmental Specialist (2009)
- Certified Environmental Consultant (2009)
- Certified Mold Inspector (2009)
- Certified Mold Specialist (2009)
- Certified Testing Specialist (2009)
- Certified Remediation Specialist (2009)
- Certified Air Quality Specialist (2009)
- Certified Environmental Records Specialist (2009)

- OSHA Certifications:
 - NFPA 70-E
 - Scaffolding Competent Person
 - Fall Protection Competent Person
 - Revised Hazard Communication
 - Standard (HCS) Globally Harmonized System
 - Aerial Lifts
 - Powered Industrial Truck Certification (Class VII Rough Terrain Telehandler Forklift)
 - Respirable Crystalline Silica
 - NFPA 70E Arc Flash Safety
 - Trenching & Excavation Safety

EXPERIENCE: REAL ESTATE DEVELOPMENT, CONSTRUCTION MANAGEMENT, CONSTRUCTION ENGINEERING

- Central Pacific Development Corporation (Hawaii Headquarters) 1979-1990
- Capital Pacific Development Corporation (Mainland Branch) 1980-1990
- Building Inspection Consultants 1989-2000
- Lance Luke, Construction Consultant 2000-2007
- Construction Management Inspection LLC. 2008-current
- Served as construction manager on hundreds of capital improvement projects for condo and commercial buildings from 1990 to the current date.

EXPERIENCE: REAL ESTATE CONDO ASSOCIATION MANAGEMENT, CONDO BOARDS

- Certified Properties Inc. 1978-1984
- First American Realty & Management Corp. 1981-1986
- First American Real Estate Services Inc. 1986-1989
- Certified Management Inc./Associa Hawaii 2007-2011
- Certified Association Services Inc 2007-2012
- Certified Real Estate Services Inc. 2007-2012
- Certified Reserve Studies 2007-2012
- Certified Maintenance 2007-2012
- Served on various condo boards from 1979 to 1984, and 2017 to current. Currently on three condo association boards serving as Vice President, Secretary and Treasurer respectively.
- In addition to serving as corporate and consulting manager, Mr. Luke also trained many condo association property, resident and site managers from 1990 to the current date.

REAL ESTATE DEVELOPMENT PROJECTS (Served as Construction Manager for the following projects)

1. Makiki Plaza: 131 units, 25 stories, 1980
2. Tradewinds Plaza: 80 units, 11 stories, 1979
3. Punahou Surf: 7 units, 2 stories, 1980
4. Emerson Plaza: 12 units, 4 stories, 1979
5. Atkinson Plaza: 127 units, 18 stories, 1979
6. Plaza at Century Court: 94 units, 20 stories 1987

7. Century Park Plaza: 600 units, 40 story twin towers.1984
8. Makiki Colony: 56 units, 9 stories, 1980
9. Kuulei Hale: 16 units, 4 stories. 1984
10. Castle Hills: 130 single family subdivision, 1982
11. Nuuanu Palms: 7 unit single family cluster, 1988
12. Executive Plaza/Starts International: 7 story office building, 1990
13. Iolani Palms: 31 units, 6 stories, 1989
14. Fountains at Makiki: 72 units, 5 stories, 1991
15. Lani Hale: 15 units, 2 stories, 4 buildings, 2011
16. Leialoha Parkside, 10 units, 3 stories, 2011
17. Parkway Plaza: Residential Highrise Building, San Antonio, Texas 1984
18. Centre Plaza: Residential Highrise Building, Orlando Florida, 1984
19. Capital Pacific Business Plaza: Commercial Highrise Office Building, San Diego California, 1984

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Hurricane Ties - Don't Be Blown Away	05/08
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The National Building Expert Lance Luke shares his tips on Building Safety for Buildings large and small. He shares his 42 years of experience in the construction industry.

His webinars on building and construction topics draws audiences not only from the Unites States but from all over the world.

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