

Best's Insurance Law Podcast

 [Digging for Answers During Geotechnical Investigations - Episode #241](#)

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Hosted by: John Czuba, Managing Editor

Guest Expert: Matthew Berninghaus from [S-E-A](#)

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John Czuba: Welcome to “Best’s Insurance Law Podcast,” the broadcast about timely and important legal issues affecting the insurance industry. I’m John Czuba, manager of *Best’s Insurance Professional Resources*.

We’re very pleased to have with us today Matthew Berninghaus from Qualified Member Expert Service Provider, [S-E-A](#). Mr. Berninghaus received his Bachelor of Science degree in civil engineering with a specialization in geotechnical engineering from California Polytechnic State University in San Luis Obispo.

As a civil geotechnical engineer at S-E-A, Mr. Berninghaus performs forensic investigations and evaluations of soils, foundations, retaining walls, water intrusion, and construction materials to determine the presence, extent, and/or cause of distress and damage.

Prior to joining S-E-A, Mr. Berninghaus worked for over six years in the geotechnical engineering industry, primarily in the design and construction of large-scale federal infrastructure and dam projects for both the US Army Corps of Engineers and US Bureau of Reclamation.

His responsibilities included developing and conducting subsurface exploration programs, earthen dam component analysis, seepage and slope stability analysis, and oversight of both the placement and testing of soils and concrete during construction.

Mr. Berninghaus is also experienced in geotechnical and concrete laboratory testing, earthwork, erosion and sediment control, and construction oversight. Mr. Berninghaus is a registered professional engineer in Colorado, Idaho, Illinois, Missouri, Texas, Utah, Washington, and Wyoming.

Matt Berninghaus, we’re very pleased to have you with us on our show today.

Matt Berninghaus: Thank you for having me today, John.

John: Today's discussion is digging for answers during geotechnical investigations. Matt, for our first question today, can you tell our audience what is geotechnical engineering?

Matt: Geotechnical engineering is actually a branch of civil engineering that focuses on the behavior of soil, bedrock, and earthen materials such as backfill, sand, and gravel. It is essentially the science and engineering of the ground beneath and around a structure, roadway, or concrete.

Here at S-E-A, we have both civil structural and civil geotechnical engineers. While a structural engineer generally focuses on load paths and how a building or bridge transmits a load to the foundation, geotechnical engineers are focused on ensuring the foundation supporting a structure can handle those loads and also how the ground around and below a structure may behave over time.

John: Matt, what type of matters does a geotechnical engineer typically work on?

Matt: We work on a surprisingly broad range of matters because virtually every structure interacts with the ground. We've had matters or claims ranging from cracks in a front porch to an entire multi-acre housing development where dozens of homes have reported foundation movement. Geotechnical engineers also work on construction defect matters, primarily evaluating foundations, grading, and earthwork.

I'll give you a list of examples here. We get hired to investigate retaining walls, water intrusion claims, foundations, cracks or movement of driveways, distress in roadways, culverts, dams, retention ponds, basically, anything that touches the ground is within the knowledge base of a geotechnical engineer.

John: Now, Matt, you came from the design and construction side of engineering. How do investigations differ on the design side versus the forensic side, and what makes an investigation forensic?

Matt: That's a great question. For design, we're looking forward, at what we need to know, whereas for a forensic investigation, we're looking back and trying to understand what occurred.

A typical geotechnical investigation for design purposes seeks to understand the conditions at a site so that we can design the proper foundation, let's say, to ensure a structure performs as intended. This is commonly done through a subsurface investigation and the collection of soil or rock samples.

A drill rig would be brought out to drill down maybe 50 or 100 feet below the ground surface in order to develop a profile of the different soil or rock layers. The focus of a typical geotechnical engineering investigation for constructing a building is to understand what the building will be built on.

The depth to groundwater and bedrock, along with the characteristics such as the strength and classification of the soil, allows us engineers to determine the bearing capacity, any anticipated settlement or other geotechnical hazards, and site characteristics. This, along with the type and size of the structure, influences the design of that foundation.

On the other hand, a forensic geotechnical investigation is looking at what happened, why it happened, and whether the damage is consistent with the reported event. From a geotechnical perspective, we would focus on the soil conditions, grading, drainage, signs of movement or distress, and the history of the property.

If there are original design documents, we would look at those as well. We may still collect soil samples for testing, if necessary, to determine the characteristics of the soil and whether that was a factor that contributed to the loss or failure.

John: Matt, can you walk our listeners through an example of a forensic geotechnical investigation?

Matt: Certainly, let's consider a 15-foot-tall retaining wall. We've all seen retaining walls. They're typically in areas where there is a change in elevation, so think roadways, slopes, or, a lot of times, backyards have terraced or stepped retaining walls in them. Their purpose is to retain soil and provide a workable area without performing a large amount of grading or earthwork.

If you're building a house on the side of a hill, for example, it may not be practical or cost-effective to flatten that entire slope, but you could create a flat building pad and then use a retaining wall to keep the soil upslope in place. Retaining walls not only bear or sit on soil, but they also typically retain a large amount of soil behind them.

Let's assume for this example of the 15-foot-tall retaining wall that it had existed for 20 years, and then one day it collapses. For a forensic geotechnical investigation, we likely would start by trying to understand the type of retaining wall and the type of failure. There could be cracking, bulging, overturning, settlement, and the collapse of the wall may be partial or total.

We would try to obtain any available original plans, construction records, photographs, repair records, any and all information that would help us in understanding the history of the retaining wall.

At some point, we would likely conduct a site examination, which would allow us to understand what type of retaining wall we are dealing with, whether that's concrete, segmental block, timber. We would document the wall and the surrounding property, and we'd be better able to define the failure type, the drainage features, evidence of repairs, and the overall condition of the wall.

Next, we would work to understand what happened. What type of failure was it? What do we know about the original construction and the performance of the retaining wall over the last 20 years? What were the drainage and grading conditions?

We would also look at changes, such as was there a large storm event that introduced a lot of water, or was there new construction nearby or upslope of the retaining walls that may have introduced new loads or vibrations? Finally, we would synthesize the observations, history, and analyses into a conclusion of what occurred.

John: Matt, how do you determine whether damage is recent or has developed over time?

Matt: This is a very important thing to distinguish in forensic engineering. I'll give you another example here. Cracks in a concrete driveway. After recent flooding, a homeowner submits a claim, and part of it includes damage to the driveway.

An adjuster may be trying to understand if the recent flooding contributed to or caused the cracks in the driveway. A homeowner may not know or may not remember what the condition of the driveway was prior to the flooding.

Forensic engineers will evaluate the history of the property in addition to the physical evidence to determine whether damage was preexisting or caused by recent events.

The history of a property can include photographs, aerial images, records of previous repairs, drainage conditions, and I might, for example, look at the street view of a residence to see the age of the driveway and to look and see if I can see cracks in the driveway prior to that flooding event.

In evaluating the crack itself, indicators of the age of the crack may be the edges of it, the width, the pattern, staining, any biological growth, deterioration, and evidence of previous repairs, such as if there was a sealant applied to any of the joints or cracks in the driveway.

We'll oftentimes put together a timeline to ultimately answer the question, does the physical evidence support the reported cause and timing of the loss?

John: Now Matt, throughout our discussion you mentioned groundwater and drainage a couple of times. How important is the presence of water to claims that a geotechnical engineer might investigate?

Matt: The presence of water is very important. Based on the type of soil present at the site, changes in the moisture content of that soil can cause it to expand, collapse, soften, lose strength, or erode. This can lead to foundation movement as well as other issues.

Water can come from rainfall, irrigation, plumbing leaks, groundwater, and sometimes what might originally look like a structural issue is actually a water management problem. Engineers can evaluate the grade of the ground surface around a property, which would help tell us where the water and runoff are likely to flow.

We will often look at gutters and downspouts because they can introduce a significant amount of water directly adjacent to foundations whenever there is rain or snow. The presence and condition of perimeter drains or sump pumps is another thing an engineer might look for that would help them understand the way water moves around a property.

John: Matt, one final question today. What's a final takeaway or something you think insurance professionals would benefit from knowing about claims that may require a geotechnical engineer?

Matt: I would say that they could benefit from knowing that the ground is part of the building, even though you can't necessarily see it. Visible damage is not always the cause of the problem. What I mean by that is that a crack in a driveway, settlement of a foundation, or a door inside a house that's difficult to open are symptoms, but those things don't tell us what actually happened.

What might look like a problem with a building may have actually originated in the ground. I've also had matters where the loss is attributable to something other than a geotechnical-related issue, and I've needed to utilize other engineering disciplines to investigate that loss.

There may be multiple contributing factors, which is why bringing in the right experts can help identify the cause, preserve evidence, and save time.

Luckily, at S-E-A, we have just about every discipline necessary to cover those investigative needs, and if any of your listeners have questions for me or are in need of an expert, they can find relevant information on S-E-A's website.

John: Matt, thank you so much for joining us today.

Matt: Thanks for having me on the podcast. I appreciate the opportunity to share some information with your listeners.

John: You just listened to Matthew Berninghaus from qualified member expert service provider, [S-E-A](#), and special thanks to today's producer, Frank Vowinkle. And thank you all for joining us for "Best's Insurance Law Podcast." To subscribe to this audio program, go to our webpage, www.ambest.com/professionalresources. If you have any suggestions for a future topic regarding an insurance law case or issue, please email us at lawpodcast@ambest.com.

I'm John Czuba, and now this message.

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