



THE FORENSIC ENGINEERING REPORT

I-ENG-A® [IN-J UH]

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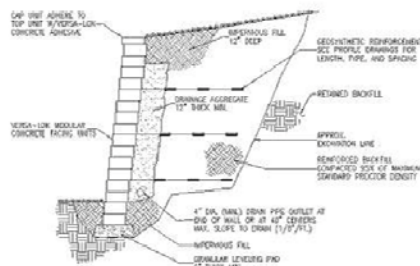
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RETAINING WALL FAILURES

A common type of retaining wall construction is the Segmental Retaining Wall. This type of wall consists of individual precast concrete blocks. These blocks are restrained by layers of geosynthetic fabric extending into the soil mass behind the wall. This mechanically stabilized earth (MSE) tied into the blocks can be built to heights exceeding 30 feet.

Failures of these type of retaining walls can result from various factors, including: poor drainage, foundation soil settlement, installation errors, or design errors. Many of our past failure investigations have revealed that the walls were not designed by a Professional Engineer. This has resulted in incorrect installation of the geotextile fabric, global soil failure, or use of improper backfill soils.

Many block manufacturers will provide a contractor with a Design Guide for estimating purposes only. Unfortunately the contractor will use this to build the wall without the review of a Professional Engineer. In this effort to save money on the front end, the contractor ends up paying much more in the event of a failure. An investigation into a segmental wall failure typically includes:



(Continued on page 2)

I ROOF, THEREFORE I MUST VENT?

Every roof needs to be ventilated...right? Not if it is properly designed it doesn't, regardless of climate. However, if I do vent an attic space, how should I go about doing that? That depends. It is not uncommon for roofing suppliers to state categorically that every wood framed house always needs adequate ventilation. And to a large degree that is true. But, what does adequate ventilation

this means is one needs to provide 1 unit of ventilation per 300 units of attic space (FHA guidelines). But, proper ventilation requires the air to enter, and the air to leave. So, what's the split? Generally, 50% through the soffits, and 50% through the ridge vent. The Home Ventilating Institute recommends a 60/40 split, with 60% intake. Regardless, the reason for roof ventilation is to control the

entail? While building codes can vary, the most typical ration used for determining the amount of roof ventilation required for an attic space is the 1:300 ratio. What



formation of ice dams, avoid moisture accumulation, and heat build-up in the attic space, and generally not to keep grazing animals off your roof!

(Continued on page 2)



RETAINING WALL FAILURES CONTINUED

(Continued from page 1)

1. Obtain any available preconstruction geotechnical testing reports. If the report is available, use the soil conditions in the report in the re-analysis.
2. Determine what products were actually used in the wall construction. There is a possibility that a product substitution was made without approval or the wrong materials were delivered to the job unknown to the installer.
3. Thoroughly investigate the construction methods used. The block manufacturer will provide specific instructions regarding construction. Carefully review each step as directed by the manufacturer.
4. Thoroughly evaluate the ground conditions and slopes above and below the wall. Steep slopes above and/or below the wall can have dramatic effects on the wall. The "typical" designs in the product manuals do not consider "special conditions" Reverse engineer the wall using the actual conditions at the time of the failure. Compare the results to an analysis of the wall using the correct materials, correct installation methods, and controlled site conditions.



I-ENG-A of Northern West Virginia, David Simpson, P.E.

I ROOF, THEREFORE I MUST VENT?...CONTINUED

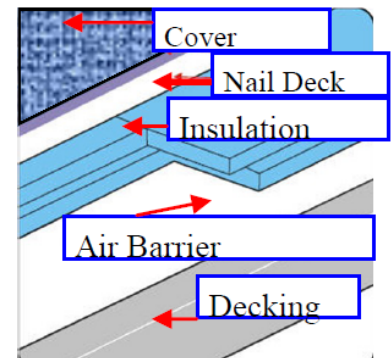
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Unless the roof ventilation is properly designed, providing adequate intake air area that is properly located, coupled with sufficient outlet area for air to escape, problems will remain. Can we use an unvented design in a cold climate like Ohio? If so, how does that work? The Building Science Consortium has broken these unvented designs into two groups: those that control the condensing surface temperature of the roof and those that do not.



Defined further as those regions of the US where average monthly temperatures do not fall below 45°F and those that do. While unvented designs have found more widespread acceptance in warmer climates, these designs have been successfully installed in cold climates as well. Since the roof deck is the principle condensing surface, the key in an unvented (also referred to as inverted) design is to keep the roof deck sufficiently warm regardless of the season. In these unvented designs, the insulation is placed over the

roof decking, with an air barrier between the decking nailed to the roof joists and the insulation. This design approach is required in colder climates to avoid moisture build-up within the roof assembly. Several unvented polymer-based designs are also available. In a re-roofing situation, you need not necessarily vent.



In performing roof or attic damage investigations, assessing the type and degree of ventilation available is typically an important factor.

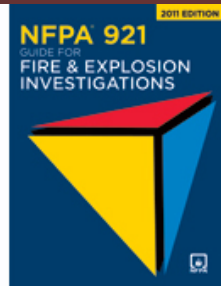
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NFPA 921—THE SCIENTIFIC APPROACH

The 2011 edition of the NFPA 921 Guide for Fire & Explosions is out. Chapter 4 includes an all-new section on report review procedure. Chapter 12 has new insights on personal protective equipment PPE, and other important safety information. It is never a good idea to enter into an unsafe environment. Care and prevention are absolutely essential when investigating a building or other large structure that has been severely compromised. Chapter 18 was re-written to focus on the use of the scientific method when determining cause and origin of a fire. For too long old wives tales and *negative corpus* have been used to determine the cause and origin (C&O). The day will soon arrive when we can no longer argue that fire investigation is "*less scientific*" as was done in the Kumho Tire case. Chapter 21 also has improvements to the science and technology of explosions. Chapter 23 was re-written to highlight when the C&O investigator should seek toxicology reports with regards to injuries and death. There is now a more robust Chapter 25, highlighting motor vehicle fires, with a complete rendering on all types of vehicles. Coupled with NFPA 1033, Standard for Professional Qualifications for the Fire Investigator, these two documents form the basis of the latest scientific approach to C&O investigations.



By: Steve Feeney, PE, I-ENG-A of Columbus

I-ENG-A CONVENTION 2011

The Investigative Engineers Association Convention 2011 is being held November 6-9, 2011, in Las Vegas, Nevada at Bally's. The Convention Chairmen, Lewis Ernest, PE, I-ENG-A Advisor and Edgar K. Riddick III, PE had their jobs cut out for them selecting from the over 50 topics requested by the association last year at Convention 2010. The agenda includes important coverage of forensic engineering trends in need today including: Basic Vehicle Crash Reconstruction, Blasting Damage Investigations, Ethics, Earthquake Issues; The State of California and Beyond, Environmental Issues and Investigations, Fire Investigation: The New 2011 NFPA 921 Scientific Method for Fire and Explosion Investigations, Geotechnical Investigations & Foundation/Slab Investigations, Product Faults and Failures Investigations, Pipe Loss Investigations, Sinkholes vs. Settlement, Structural Investigations and Repairs.

Special attention is being given to topics that have been at issue over the past months, including environmental issues and earthquake damage evaluations and requirements. This information assists the association in preparing for Catastrophes that may be in our countries future, and helps to serve as a part of the foundation needed for our organization to perform as a team.

The I-ENG-A Convention 2011 is offering more than 15 professional development hours for the members of the association, plus the required annual ethics time for engineers specifically addressing forensic or investigative engineering for the insurance industry. We are pleased to again welcome Mr. Barry Zalma, Esq., to our Convention presenting during our ethics time. And, we are also proud to provide the time for members of the association to learn, grow and network with one another, building on the associations depth and diversity for years to come.

COMEDY RELIEF CORNER: THE CONE OF SILENCE

According to a number of reports available online, a complaint was received by the Pontiac Division of GM: "This is the second time I have written you, and I don't blame you for not answering me, because I kind of sounded crazy, but it is a fact that we have a tradition in our family of ice cream for dessert after dinner each night. But the kind of ice cream varies so, every night, after we've eaten, the whole family votes on which kind of ice cream we should have and I drive down to the store to get it. It's also a fact that I recently purchased a new Pontiac and since then my trips to the store have created a problem. You see, every time I buy vanilla ice cream, when I start back from the store my car won't start. If I get any other kind of ice cream, the car starts just fine. I want you to know I'm serious about this question, no matter how silly it sounds: 'What is there about a Pontiac that makes it not start when I get vanilla ice cream, and easy to start whenever I get any other kind?'"



The engineer returned for three more nights. The first night, the man got chocolate. The car started. The second night, he got strawberry. The car started. The third night he ordered vanilla. The car failed to start.

Now the engineer, being a logical man, refused to believe that this man's car was allergic to vanilla ice cream. He arranged, therefore, to continue his visits for as long as it took to solve the problem. And toward this end he began to take notes: he jotted down all sorts of data, time of day, type of gas used, time to drive back and forth, etc.

In a short time, he had a clue: the man took less time to buy vanilla than any other flavor. Why? The answer was in the layout of the store. Vanilla, being the most popular flavor, was in a separate case at the front of the store for quick pickup. All the other flavors were kept in the back of the store at a different counter where it took considerably longer to find the flavor and get checked out.

Now the question for the engineer was why the car wouldn't start when it took less time. Once time became the problem -- not the vanilla ice cream -- the engineer quickly came up with the answer: vapor lock. It was happening every night, but the extra time taken to get the other flavors allowed the engine to cool down sufficiently to start. When the man got vanilla, the engine was still too hot for the vapor lock to dissipate.

Moral of the story: Even insane looking problems are sometimes real.

The President was understandably skeptical about the letter, but sent an engineer to check it out anyway. The latter was surprised to be greeted by a successful, obviously well educated man in a fine neighborhood. He had arranged to meet the man just after dinner time, so the two hopped into the car and drove to the ice cream store. It was vanilla ice cream that night and, sure enough, after they came back to the car, it wouldn't start.



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The commentary contained in The Forensic Engineering Report is not intended, nor should it be relied upon, to replace specific professional advice. We recommend that readers consult their professional advisors regarding issues raised in this publication.

I-ENG-A CATASTROPHE RESPONSE

The Investigative Engineers Association has over 75 member firm locations with hundreds of engineers. The I-ENG-A Catastrophe Response Team stands ready to assist with claims services. The benefits of calling upon an I-ENG-A team includes:

- Capable of supplying multiple engineering teams at one time fully supported by licensed and insured professionals.
- Multi-disciplined engineers available from within the network can be brought in as needed, determined by team leader.
- Teams can handle large numbers of assignments concurrently in an organized fashion thus saving time and money.
- Local representation assures a timely response of teams to disasters and long term local involvement with projects.
- Rapid field investigations and report development.
- Local operational firm to serve as command center.
- Efficient and cost effective investigations.

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