

## **Factual Analysis of FirstEnergy's Recent Statements About Damaged Shield Building at Davis-Besse Nuclear Power Plant**

### **FirstEnergy Statements:**

FirstEnergy originally announced that, while cutting an opening in the shield building of its aging Davis-Besse nuclear reactor, to replace a deteriorating reactor head for the second time, workers discovered cracks in the concrete shield building wall. FirstEnergy called this a “barely visible indication” of a crack, which ran for approximately 30 feet along the line of the steel reinforcing rods in the wall.

[http://www.cleveland.com/business/index.ssf/2011/10/nrc\\_firstenergy\\_concerned\\_about.html](http://www.cleveland.com/business/index.ssf/2011/10/nrc_firstenergy_concerned_about.html)

### **Fact:**

A photo of the wall posted on the website of the Nuclear Regulatory Commission appears to show cracks that are not “hairline” and that are clearly visible.

<http://www.sanduskyregister.com/carroll-twp/news/2011/nov/23/kucinich-urges-public-hearing-proposed-davis-besse-restart>

### **FirstEnergy Statements:**

We were told by FirstEnergy that the cracks were not a problem because they were in “architectural elements” of the concrete wall

[http://www.cleveland.com/business/index.ssf/2011/10/firstenergy\\_reveals\\_it\\_has\\_found.html](http://www.cleveland.com/business/index.ssf/2011/10/firstenergy_reveals_it_has_found.html) or “architectural design components” of the wall,

<http://www.sanduskyregister.com/carroll-twp/news/2011/nov/01/more-cracks-found-davis-besse-nuclear-power-station>

that were, somehow, different from the “structural” elements of the wall.

The NRC initially accepted this characterization and issued a statement that the cracking was in “non-structural architectural” concrete.

[http://blog.cleveland.com/metro/2011/10/crack\\_at\\_davis-besse\\_nuclear\\_p.html](http://blog.cleveland.com/metro/2011/10/crack_at_davis-besse_nuclear_p.html)

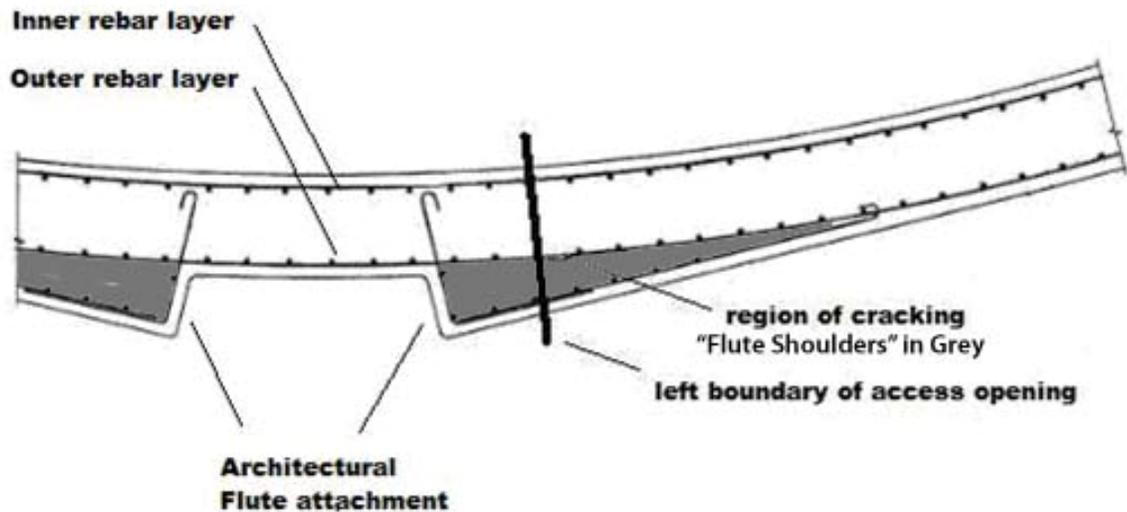
On October 31, in a letter to its “Investors,” FirstEnergy wrote that there are cracks in “**most**” of the “exterior architectural elements” of the shield building that merely “serve as architectural features and do not have any structural significance.”

<http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MTEzZmJlEwfENoaWxkSUQ9LTF8VHlwZT0z&t=1>

On November 1, we learned that “**most**” meant 15 out of 16 of what FirstEnergy still claimed were merely “architectural elements.” <http://www.sanduskyregister.com/carroll-twp/news/2011/nov/01/more-cracks-found-davis-besse-nuclear-power-station>

**Fact:**

The areas where most of the cracks have been discovered do have structural significance. They are not merely “architectural elements.” The drawing that FirstEnergy provided, of the cross-section of the wall where the first cracks were discovered, shows that the “flutes” contain steel reinforcing rods within the concrete and that those rods are anchored to the rest of the wall in two ways— first, an anchor to one of two of the bands of steel rods that run around the full circumference of the shield building wall, and second, a perpendicular anchor through most of the thickness of the wall itself.



Furthermore, what FirstEnergy calls “architectural flute attachments” in this drawing are not “attachments” at all. They are an integral part of the concrete shield building wall and the concrete they contain was poured at the same time as the rest of the concrete in the shield building wall. In both briefings that the NRC has provided us, their employees volunteered that this was one continuous concrete wall that was poured at the same time. There is no “architectural” element that is distinct from the structure of the wall.

**FirstEnergy Statements:**

FirstEnergy has tried to minimize the significance of the cracks by describing the shield building as something that merely “provides protection from natural phenomena including wind and tornados.” <http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MTEzZmJlEwfENoaWxkSUQ9LTF8VHlwZT0z&t=1>

**Fact:**

However, First Energy described the purpose of the shield building quite differently in its recent “License Renewal Application.” That document states

that the primary purpose of the shield building is to provide protection from radiation leakage in accident situations:

“The Shield Building is a concrete structure surrounding the Containment Vessel. It is designed to provide biological shielding during normal operation and from hypothetical accident conditions. The building provides a means for collection and filtration of fission product leakage from the Containment Vessel following a hypothetical accident through the Emergency Ventilation System, an engineered safety feature designed for that purpose. In addition, the building provides environmental protection for the Containment Vessel from adverse atmospheric conditions and external missiles.”<sup>1</sup>

“Environmental protection” is only an “additional” purpose of the shield building. And, FirstEnergy has totally omitted the fact that one “additional” purpose of the shield building concrete is to protect against “external missiles.”

### **FirstEnergy Statements:**

In its letter to investors, FirstEnergy stated that it had discovered cracks in two other locations that were not “flute shoulders.” <http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MTEzMjEwfENoaWxkSUQ9LTF8VHlwZT0z&t=1> FirstEnergy subsequently described those two areas as places where the steam lines entered and exited the shield building. [cite]

### **Fact:**

On December 6, 2011, the NRC informed us that “impact response mapping” had revealed similar cracks in “various areas of the top 20 feet of the building” that were not flute shoulders. This cracking seems to be “more extensive on the south side of the building.” They also described the cracking as “laminar cracking” that is “circumferential to the entire outer rebar map.” While only a small percentage of the wall has actually been tested, they are assuming for purposes of evaluation that the flute shoulders have laminar cracking “all the way up and down” the concrete wall.

### **Glossary of Terms:**

“**Containment**”—The structure enclosing a nuclear reactor and designed to contain the results of an anticipated nuclear accident and to prevent release of radiation into the environment. At Davis-Besse, the containment system includes the containment vessel and the shield building.

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<sup>1</sup> “License Renewal Application,” p. 2.4-3

**“Containment vessel”**—At Davis-Besse, the containment vessel is a 1.5-inch-thick steel structure that encloses the reactor vessel and the heat exchanger.

**“Shield building”**—At Davis-Besse, the shield building is a reinforced concrete building that encloses the containment vessel, separated by 4.5 feet of interior space.

**“Flutes”**—there are 8 vertical flutes evenly spaced around the circumference of the shield building. They appear to be vertical grooves in the wall, where the thickness of the wall is less than the edges on either side of the flute. [See diagram above]

**“Flute shoulder”**—there are 16 shoulders—two on each side of each flute. The flute shoulders become thicker as they approach the flute. [See diagram above]

**“Laminar cracking”** or **“Delamination”**—A mode of failure of composite materials, including concrete, in which the “layers” or “lamina” of the material separate. In reinforced concrete structures, laminar cracking or delamination usually occurs as a result of corrosion of the steel reinforcing rods, which expand as they corrode and cause cracking along the line of the steel reinforcement.

**“Impact response mapping”**—term used by NRC representative for testing to locate laminar cracking inside a concrete wall. The wall is struck with a hammer and an instrument records and evaluates the response.

**“Rebar map”**—term used by NRC representative to describe the system of steel reinforcing bars inside the concrete wall.