

# Thoughts on Determining Credible Abnormal Conditions

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How do you determine what normal is?

You can't determine abnormal if you don't understand the normal conditions.

Are you dealing with

- a proposed change to a current operation,
- a new operation,
- or a discovered legacy condition?

What is available from operating history?

For a proposed change to a current operation, or a new operation:

- What do the knowledgeable operators have to say?
  - ✦ Do the operators see the criticality safety staff as part of the team?
- What is available from operating history in similar operations?
- What is available in the site records?
  - ✦ How relevant are the records?

# What can go wrong?

## How wrong can it go?

- Here is where site records can help, if you have them.
- How big is a credible overbatch?
- What was the magnitude and spread of previous overbatches?
- How much of the magnitude and spread was real versus assay error?
- Find reality!

Everybody's favorite bugaboo: The optimally moderated sphere, or near optimum cylinder, surrounded by a large reflector.

- How do you make one?
- Could you even make one on purpose?
- What would it take to make such a condition deliberately?
- Is it even possible accidentally?
- Apply real mixing and fluid flow, and develop the real accidental condition.

How credible is it to combine several containers to form a near sphere with optimum moderation and full reflection?

- They all have to be over fissile mass
- They all have to be overloaded with reflector
- The geometry of each has to be exactly right
- They each have to land in exactly the right place in the array.

But if I can model it with my code, and calculate critical, it must be credible, right?

**No. Concievable  $\neq$  Credible**

Calculating with code is easy, when compared to determining what to calculate.

Every operation will fail.

Your, and operations, job, is to make sure it fails to a subcritical condition.

You would prefer the recovery be relatively easy - but - for example

I don't like doing decontamination, but it beats dying from acute radiation.



Two types of valves:  
Those that leak;  
Those that will leak.

Two types of casting operations:  
Those where a mis-pour has occurred;  
Those where it will.

In these cases, it had better fail to safe geometry.

One type of piece handling operations -  
Sooner or later there will be too many  
pieces.

How many extra pieces are credible?

Is it credible to combine extra pieces  
with, say, full reflection?

# Natural Phenomena

- All is not what it seems
- It is very site specific
- Structure specific.
- And also material specific.

I once did an evaluation where we had given up and assumed that the material in a vault would crush, and probably go critical.

Subsequent data showed that even with substantial more weight than the weight of the building above the vault could not crush the material, and it would be subcritical under full collapse.