

**From:** Ron Parkhill  
**To:** Mahendra Shah  
**Date:** 1/15/03 7:43AM  
**Subject:** Re: Cask Layout Issues

For the tip over issue regarding an angled approach, the frictional force is increasing by 0.3 times the vertical vector of the impact force. Thus there is more resistance (friction) and the question becomes: does that added frictional force become greater than the weight of the cask- thus producing tipover?

>>> Mahendra Shah 01/14/03 06:18PM >>>  
Ron:

The spacing of 16 ft is center-to-center for the proposed PFS ISFSI.

The vertical component of the impact force should help in preventing the tip-over, and thus would be bounded by the case of the ( ) for the tip-over potential. Ex2

Thanks. i for

Mahendra

>>> Ron Parkhill 01/14/03 02:33PM >>>  
Mahendra,

Is the 16 foot spacing you are referring to center-to-center?

Also, wouldn't any ( ) Ex2

>>> Mahendra Shah 01/14/03 01:55PM >>>  
Jeff:

I believe we should use the maximum spacing of the HI-STORM cask as 16'-0", which is the maximum spacing for the proposed PFS facility, with 4000 casks in a 2 x N rectangular pattern. For the HI-STORM TSAR cask minimum spacing criteria of 18'-8" for a square pattern cask layout, the number of casks would generally be 4 to 9, and the probability of a large commercial jetliner impacting a cask is less than ( ) compared to the PFS layout which has 4000 casks. Ex2

Therefore, the reasonable approach is to consider the maximum cask spacing of 16'-0".

As for the angle of attack, I think we should consider the maximum angle of ( ) If we still have a problem, we could narrow it down to a lower value, based on probability studies by the RES.

Thanks.

Mahendra

>>> "Smith, Jeffrey" <jasmith@sandia.gov> 01/14/03 01:09PM >>>  
Mahendra and Bernie:

In regard to my question yesterday about the cask layout/spacing. The figure below (let me know if it does not come through) is how I understand the site in Utah is going to be.

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Act, exemptions 2  
FOIA- 2003-0184

H/20

The HI-STORM TSAR (Section 1.4) discusses the stored layout. They list minimum pitch distances of 13.5 ft and 38 ft between the two isles of casks (for the 2 by N array). The minimum pitch distances for a square layout is listed as 18'-8".

These are minimum distances. As you can see the site in Utah is not using the minimum. In my discussion this morning with Mahendra he suggested that we examine the case where the 18'-8" distance is the "maximum" minimum distance. As I understand that, we will examine the case of the 18'-8" spacing (leaving an approximate minimum clear distance between the casks of 7.67ft) as the most likely reasonable scenario. From Greg Bessettes analysis this would require that we handle cask-on-cask impacts at velocities up to

Ex 2

Also, Mahendra and I did discuss briefly the cask tipping issue again. I still believe that the Bob Kalan has been working on a hand calculation that I believe will demonstrate this clearly. I am hoping to fax that to you today. With the 4ft clear space being the most likely impact, I don't believe the tipping was a real issue. However, if we change that clear space to 7.67ft (and the cask velocity at that distance being as much as the tipping MIGHT be an issue. The is based on the jetliner impacting the cask. If we have tipping and horizontal velocity, we need to re-evaluate what velocity we are using for the 7.67ft separation distance.

Ex 2

I am exploring this and will follow this with more information soon.  
Jeff

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Bottom's Ex 2