

From: David Campbell [dmc@geigerengineers.com]

Sent: Monday, October 19, 2009 10:19 AM

To: structuralsafety@nist.gov

Subject: Comments on Draft NIST Report on Cowboys Practice Facility Collapse

Report Committee:

I read your draft report with great interest. I have the following comments regarding the tensile membrane:

1. Irrespective of the reliability of the tensile membrane, the end frames' top chords are not braced by the intact roof membrane and are subject to lateral loads from the membrane. This does not appear to be considered in the draft report.

2. In general, as noted in the draft report, it is inappropriate to rely on tensile membrane to brace the chord members of frames in structures such as this . This is a consequence of the relatively (in relation to tensile strength) low tear strength of most composite textiles employed as tensile membranes as well as their vulnerability to tears initiated by wind-borne debris.

3. In the event of a tear in the tensile membrane, it is also necessary to consider the changed nature of the demand on the structure local to the tear. In the subject structure it would be likely for a tear to propagate sufficiently to result in frame outside (top) chord to be subject to lateral loads from the tensile membrane of the panel opposite the tear. (Note in the subject structure, under significant surface loading the membrane will act primarily one way, spanning between the frames. In the case of outward surface pressures the local curvature of the tensile membrane will reverse.) It is good design practice to consider the demand from load conditions where a membrane tear has occurred. Such consideration for wind conditions would necessarily address the implications of the likely extent of a tear on the enclosure's internal pressure. This is not industry practice nor is it expressly addressed in the current ASCE draft standard.

4. The subject structure likely used a pvc-coated polyester or nylon fabric membrane, possibly laminated. (If the membrane type and properties were discussed the draft report, I did not find it.)

Dependent upon the type of material, the top finish, and formulation of the coating, the anticipated service life of the membrane should be expected to be in a nominal range of 5 to 15 years. Generally, for these materials strength properties degrade over the service life, primarily due to UV exposure. For the types of fabric membranes utilized in such structures, tear strength degrades more quickly than tensile strength. This brings to light the importance of the points 2 and 3 above, as even if the tensile membrane would be seemingly have enough initial tear resistance to reliably brace steel members, it most likely will not as it approaches the end of its service life. As the intended service life of the steel structure is likely intended to be much greater than that of the tensile membrane, it is clearly poor practice to rely on the tensile membrane as an essential component of the primary structure.

Please do not hesitate to contact me should you have any questions.

Best Regards,

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