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Technical Bulletin **No. 0895-1**

EVALUATING THE VENTING VOLUMETRIC RELEASE RATE

During beyond design basis accidents, the accumulation of steam and non-condensable gases in containment may lead to a severe challenge to the containment structural integrity due to over-pressurization. Under such conditions, plant operators must identify available means for depressurizing the containment, and, with knowledge of both the positive and negative impact on consequences, select the appropriate course of action.

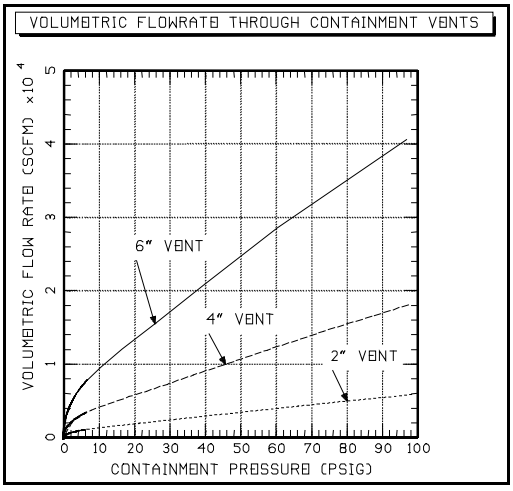
Various nuclear reactor vendor owner's groups have developed Severe Accident Management Guidelines (SAMGs) to assist in the decision making process, which includes identifying containment depressurization limitations. For instance, containment venting, which provides one possible means for pressure control, may be limited by off-site dose considerations.

An evaluation of the available containment venting paths should be performed in conjunction with the implementation of the SAMGs. The evaluation of the venting paths should consider: accessibility to energizing/ de-energizing the vent, venting discharge location, if the vent is connected or passes through a filter (and the resulting decontamination factor), the possibility to plug the vent due to aerosol build up and the equivalent venting area (considering all line losses). The selection of the appropriate vent should be made based upon these considerations and those presented in the next paragraph.

For containment venting, SAMG guidance provides a means for de4termining off-site radiation levels by combining estimates of containment venting rates for known vent sizes with estimates of containment airborne fission product concentrations. These estimates, along with current and projected meteorological predictions would influence the vent size selection, the venting duration and the venting frequency.

The Westinghouse Owners Group Severe Accident Management Guidance (WOG-SAMG) program has developed a specific Computational Aid (CA) to estimate the maximum volumetric flowrate of gases that could be released due to venting the containment. The WOG-SAMG CA (CA-4, "Volumetric Release Rate from Vent") uses a series of hand calculations and boundary conditions to develop sets of curves which provide the estimated volumetric flowrate through the vent as a function of the containment pressure.

Another method for developing volumetric flow rate curves for various vent sizes is through the use of the Modular Accident Analysis Program version 4 (MAAP4). The key to using MAAP4 is to select a sequence which leads to elevated containment pressures, and then model the venting with the appropriate line size. The end result will be a curve of volumetric flow rate through the vent as a function of containment pressure. The figure below was developed using MAAP4 with an input deck which could



be easily modified to evaluate each vent size. The MAAP4 results have been conditioned, via the input deck, to yield volumetric flow in standard cubic feet per minute (scfm) and pressure in psig. A single MAAP4 case was necessary for each vent size shown in the figure. Advantages to using MAAP4 analyses over other methodologies (such as hand calculations) are that once

the proper input deck is developed, calculations can be rapidly performed which use well established plant parameters and thoroughly tested calculations. Detailed venting analyses can also be performed using MAAP4 to study the timing of vent operations and also to assess the impact of aerosol plugging.

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