PUBLIC SUBMISSION

As of: 6/15/15 3:53 PM
Received: June 15, 2015
Status: Pending_Post
Tracking No. 1jz-8jfp-46i0
Comments Due: June 15, 2015
Submission Type: API

Docket: NRC-2015-0059
Refining and Characterizing Heat Release Rates from Electrical Enclosures During Fire (RACHELLE-FIRE)

(2)

Comment On: NRC-2015-0059-0001
Refining and Characterizing Heat Release Rates from Electrical Enclosures During Fire (RACHELLE-FIRE); Draft NUREG for Comment

Document: NRC-2015-0059-DRAFT-0002
Comment on FR Doc # 2015-10130

4/30/2015
80 FR 24290

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General Comment

Please see the attached document for comments pertaining to the following topics:
1. Vents for application of Obstructed Plume;
2. Electrical enclosures with varying top plate obstruction configurations and sizes;
3. Dimensions of Group 4 cabinets with more than 1 vertical section

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Attachments

Comments on NUREG-2178 draft

SUNSI Review Complete
Template = ADM – 013
E-RIDS= ADM-03
Add= D. Stroup (DSW4)

Subject: Docket ID NRC-2015-0059
Comments on Draft NUREG-2178

Comments on Draft of NUREG-2178 (EPRI 3002005578), "Refining and Characterizing Heat Release Rates from Electrical Enclosures During Fire (RACHELLE-FIRE), Volume 1: Peak Heat Release Rates and Effect of Obstructed Plume."

Please see below for the following comments:

1. Vents for application of Obstructed Plume
2. Electrical enclosures with varying top plate obstruction configurations and sizes
3. Dimensions of Group 4 cabinets with more than 1 vertical section

1. **Vents for application of Obstructed Plume** – It appears that if the limits per Section 6.4 are observed, there is no explicit requirement that the electrical enclosure be vented in order to apply the obstructed plume methodology. Hence a closed electrical cabinet with no vents, cumulative top penetrations < 5% of the top surface area, and not well-sealed/robustly-secured may be modeled using the obstructed plume methodology. This is considering that the fire in this closed cabinet example would likely escape from the door or non-vented panel assembly and the treatment of that door or non-vented panel area would be the same as a vented panel. This is opposed to the previous "standard treatment" (non-obstructed plume) where the fire would simply be placed on top of the cabinet with a plume ZOI calculation that excludes the bias factor. Please confirm if this is true.
The following bullets are additional supporting information for clarification of the question:

    a. The photos of example cabinets provided in Figure 5-3 show obstruction configurations, where all three cabinets have some type of vent, or are an arch-type obstruction. There are no completely closed cabinets shown in these photos. This brought about the question regarding if vents are necessary, or if a closed-cabinet with no vents can be postulated to have the door open during the fire, resulting in an obstructed plume rather than simply assuming the fire is located on top of the cabinet.
    b. In the FDS simulations, clearly a fully closed cabinet was not modeled because there is no way to easily characterize the geometry. However, this contributed to the question regarding if vents are necessary for application of the obstructed plume methodology. But considering that a fire from a completely closed cabinet would need to escape the cabinet to have the fire effects modeled, the treatment of the opened door or non-vented panel area would be the same as a vented panel, allowing for obstructed plume methodology to be applied.
    c. Also Section 5.1.5 states that "Enclosure walls may have openings or vents. That is, for practical applications, electrical enclosures must have at least three metal walls and a solid top cover." This implies that the cabinet may have vents, or may not have vents for the obstructed plume methodology to be applied.
    d. If the obstructed plume methodology is not applied to the closed electrical cabinets, then the standard plume equation will need to be applied. This would result in a larger plume ZOI for the closed cabinet than the vented cabinet, which does not seem correct.

2. **<u>Electrical enclosures with varying top plate obstruction configurations and sizes</u>** – We were contemplating the applicability of the obstructed plume results to a cabinet where the top plate obstruction was smaller in size relative to the fire base, producing less of an effect on the plume, or where the fire could potentially be closer to the edge of the cabinet possibly avoiding a portion of the top plate obstruction. We didn't come across any limitation in NUREG-2178 that explicitly discusses this, but would like your input and clarification on it. The FDS models presented in Section 5 only included floor-mounted cabinets as their fuel source geometry where the associated obstructions were 8 cm (3 in) larger than the fire base on a side and centered over the fire source, as stated in Section 5.2.3.3.
   Below is an example to better explain our question:

   a. Our typical scenario here would be a wall-mounted cabinet with an example dimension of less than 10" deep, meaning the top plate obstruction would be less than 10" deep. I do acknowledge that the NUREG-2178 does not consider the effects of location factor as stated in Section 5.1.5, but we are debating whether the obstructed plume methodology would still be applicable to a cabinet with different/smaller top plate obstruction dimensions, or where the fire would be postulated at a location of at least 3" from the face of the cabinet. In these specified cases, the top plate obstruction might have would have less of an effect on the plume as opposed to the examples covered in the FDS runs.

3. **<u>Dimensions of Group 4 cabinets with more than 1 vertical section</u>** – Since the HRR for a Group 4 cabinet is based on the dimensions of the cabinet, any such cabinet that has more than one vertical section has the potential to be assigned different HRRs, depending on if the total dimensions, or if the dimensions of a single vertical section, are used. The HRR and propagation to adjacent vertical section(s) should be in agreement so that the cabinet is modeled appropriately. Section 3.2 of NUREG-2178 does not explicitly address for Group 4 cabinets with multiple vertical sections, which dimensions should be used for the calculation of the total volume of the enclosure, for classification in Table 4-2 (and Table 7-1). For such cabinets, it would be helpful to clarify if the dimensions for calculating enclosure volume, and ultimately the HRR per Table 4-2, should correspond to one vertical section or to the entire cabinet.
   Below is an example to illustrate the matter:

   a. Consider a cabinet that is 60 inches wide by 24 inches deep by 70 inches high, and was counted as having 2 vertical sections. If the total dimensions of the cabinet are used in calculating the HRR, this is Group 4a, resulting in a HRR of 400 kW modeled for each of the two vertical sections. Alternatively, if the dimensions of each vertical section are used for calculating the HRR (width of each section is 30 inches), this is Group 4b, resulting in a HRR of 200 kW modeled for each of the two vertical sections. The latter approach seems correct, but a clarification would be greatly appreciated.