

Implementation of an HVAC Network Model in FDS

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Abstract

An HVAC network model was coupled to FDS v5.5. The HVAC model allows a user to specify the topology of an HVAC system along with dampers, fans, and forward/reverse flow loss through ducts and fittings. The model was indirectly coupled with the FDS flow solver. The HVAC model uses prior time step values as its boundary conditions and provides to FDS wall boundary conditions of temperature, velocity, and species for prediction of the next FDS time step. The current implementation does not account for transport times with the HVAC network.

This presentation describes the governing equations for the HVAC network model which is based upon the MELCOR, a nodal network model used for nuclear power plant containment buildings, solver. The specific numerical implementation of the equations within FDS is described.

A series of verification exercises demonstrate that the network model correctly models HVAC flows and that its coupling with FDS maintains mass conservation. A simple and a complex validation exercise show that the combined solvers can accurately predict HVAC flows for a duct network in a complex geometry with fire effects.