## Introduction

CAESIM includes advanced physics simulation capabilities for analyzing fires within structures, and the resulting product of combustion dispersion. CAESIM provides two types of fire modeling capabilities:

- pool fires
- chemical combustion

The pool fire source boundary condition allows for the specification of heat and mass sources. The finite-rate chemistry capability allows for specifying chemical reactions related to the combustion process.
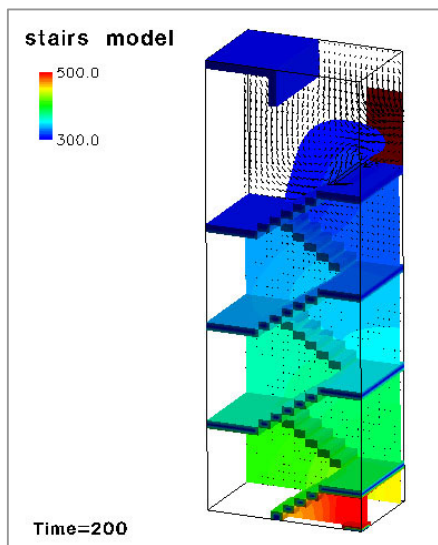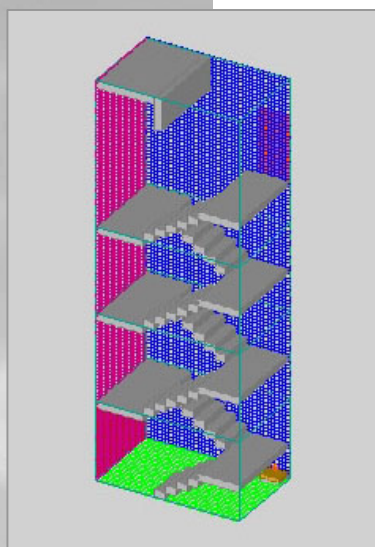
Parking Garage Fire – CFD Model
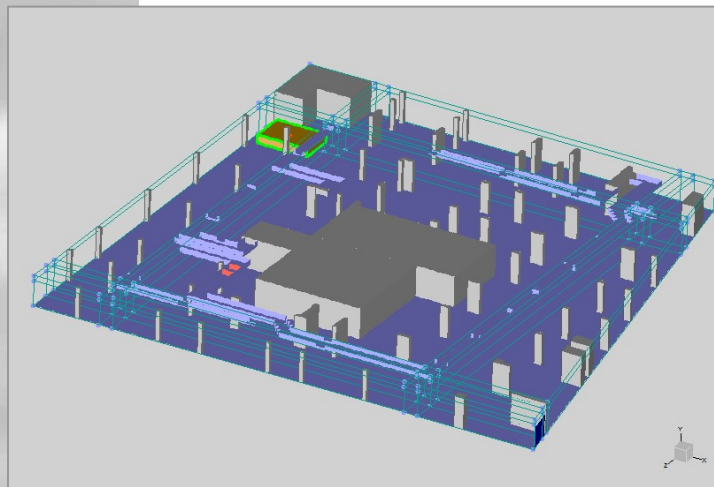
Simulation – Temperature Distribution

Temperature distribution on cross section (15 cm from ceiling) – 1200s
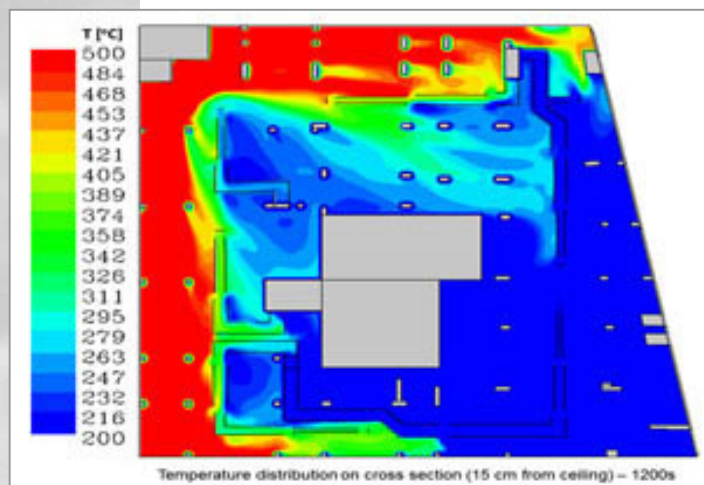
Example Fire Simulations

The following figures present example CFD simulations of fire modeling and smoke dispersion related applications.

Stairwell Fire – CFD Model / Simulation

Mire Fire Smoke Spread

CAESIM was utilized to model buoyancy induced Product-Of-Combustion (POC) spread from experimental fires in the National Institute for Occupational Safety and Health (NIOSH), Pittsburg Research Laboratory (PRL), safety research coal mine.
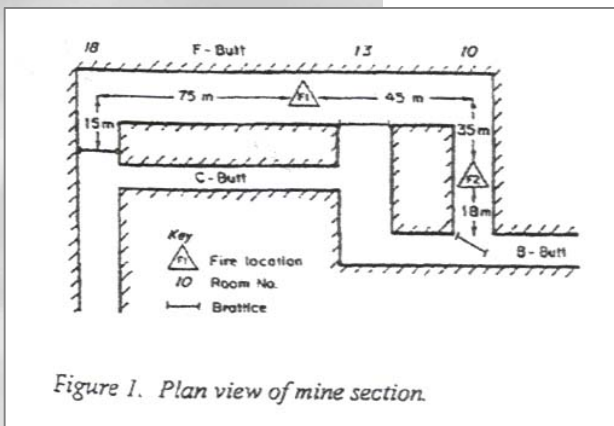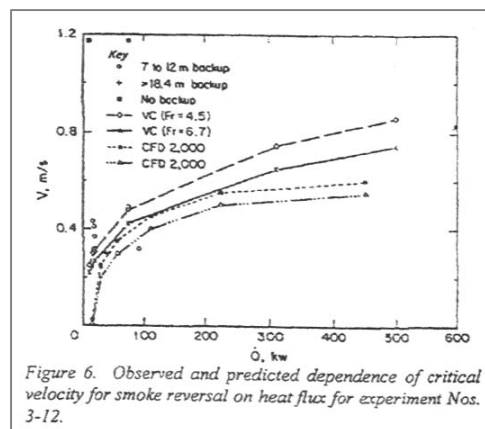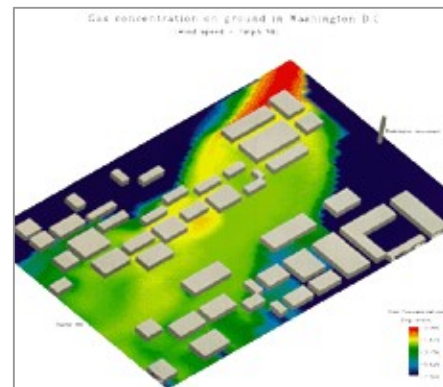

Figure 1. Plan view of mine section.

Figure 6. Observed and predicted dependence of critical velocity for smoke reversal on heat flux for experiment Nos. 3-12.
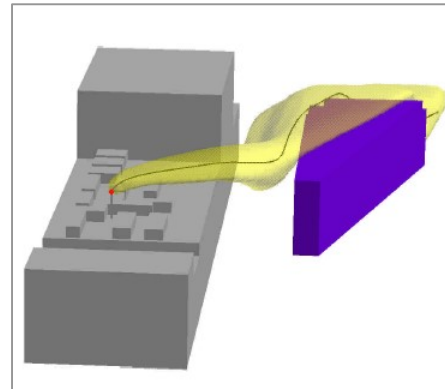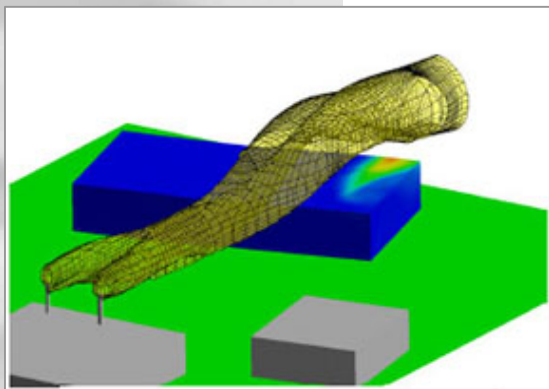
Example Dispersion Simulations

The following figures present example CFD simulations of additional dispersion related applications.

Chemical Dispersion in an Urban Environment

Odor Dispersion in an Urban Environment

Product of Combustion (POC) Dispersion in an Industrial Environment