

# Calorimetry Services

Southwest Research Institute® (SwRI®) has the expertise and facilities to perform heat release rate calorimetry in small-, intermediate- and industrial-scale applications. Rate of heat release quantifies the energy generated by a fire and is measured using the principles of oxygen consumption calorimetry.

## Small-Scale Applications

### Cone Calorimeter

Cone calorimeter tests (ASTM E1354, ISO 5660, NFPA 271) measure heat release rate, mass loss rate and smoke production rate. Tests on 100-mm<sup>2</sup> samples include:

- Controlled levels of radiant heat (0–100 kW/m<sup>2</sup>) with or without external igniter
- Heat flux from 0 to 100 kW/m<sup>2</sup>
- Horizontal or vertical orientation

### Bomb Calorimeter

Bomb calorimeter tests (ISO 1716, NFPA 259) measure heat of combustion in BTU/lb. Testing on 1 g pellets is conducted in standardized burn conditions at constant volume in an oxygen atmosphere. Tests include:

- ISO 1716 – Combustion heat calculated on temperature rise, heat loss and latent heat of water vaporization
- NFPA 259 – Similar test procedure combined with muffle furnace procedure to account for residue heat of combustion

### Microcalorimeter Test

In the FAA microflow calorimeter test (ASTM D7309) a 5 mg specimen is decomposed under standardized conditions. Testing is conducted at a constant heating rate between 0.2 and 2 K/s in an oxygen-free environment. Calculations include:

- Method A – Controlled thermal decomposition, pyrolysis residue, specific heat of combustion, and heat release capacity
- Method B – Controlled thermal oxidative decomposition, combustion residue, and net calorific value

## Industrial-Scale Applications

SwRI's industrial-scale calorimeter is contained within a 5,000-ft<sup>2</sup> test facility designed specifically for industrial-scale fire performance investigations. This calorimeter is used for testing of:

- Vehicles
- Commodities
- Pool fires
- Custom fire performance

Heat release rates up to 10 MW can be measured and exhaust flows up to 14 m<sup>3</sup>/s can be developed during testing.



Close-up of cone calorimeter test



Cone calorimeter test in progress



Placement of microcalorimeter test sample



*Exceeding clients' expectations  
by providing world-class,  
innovative fire research, testing  
and product certification services*



Non-compliant mattress/foundation set; peak heat release rate ~1 MW

## Intermediate-Scale Applications

### Room Corner Tests

Room corner tests (NFPA 286, NFPA 265, ISO 9705, UBC 8-2, UBC 26-3, UL 1715) evaluate the flammability of surface finishes on exposed interior walls and ceilings. Common measurements include:

- Heat release rate
- Smoke release rate
- Heat flux
- Gas temperature

A 768-ft<sup>3</sup> test room is situated next to a 10-ft<sup>2</sup> exhaust hood equipped to measure heat release rates up to 3 MW and deliver exhaust flow up to 4 m<sup>3</sup>/s.

### Furniture

CPSC 16 CFR, Part 1633, developed by the Consumer Product Safety Commission, addresses measurement of the flammability of mattresses, futons and mattress/box spring sets. SwRI can also run the following types of furniture tests:

- California Technical Bulletin
- Cigarette ignition
- Open flame ignition

### Single Burning Item

The single burning item test (SBI – EN 13823) is used by the European Union to classify construction products, excluding floorings. Heat release rate and smoke growth rate are calculated to determine classifications.

SwRI works with European labs to perform testing in accordance with SBI and other European standards for clients wishing to obtain a European classification and CE mark.

### Custom Fire Performance

SwRI works with clients to develop test protocols that are not covered in test standards.



Southwest Research Institute is an independent, nonprofit, applied engineering and physical sciences research and development organization using multidisciplinary approaches to problem solving. The Institute occupies 1,200 acres in San Antonio, Texas, and provides more than 2 million square feet of laboratories, test facilities, workshops and offices for more than 3,200 employees who perform contract work for industry and government clients.



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## We welcome your inquiries. For additional information, please contact:

### Small-Scale Applications

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