



2-4-2022

Boulder Valley School District (BVSD)  
6500 Arapahoe Rd, Boulder, CO 80303  
(303) 447-1010  
www.bvsd.org

**RE: CSC Preliminary Indoor Environmental Quality (IEQ) Opinions  
For Boulder Valley School District (BVSD)**

**Related to the Marshal Fire Response at Eight District Schools**

- Coal Creek Elementary, 801 W Tamarisk St., Louisville, CO 80027
- Eldorado K-8, 3351 S Indiana St., Superior, CO 80027
- Fireside Elementary, 845 W. Dahlia, Louisville, CO 80027
- Louisville Elementary, 400 Hutchinson St, Louisville, CO 80027
- Louisville Middle School, 1341 Main St., Louisville, CO 80027
- Monarch High School, 329 Campus Dr., Louisville, CO 80027
- Monarch K-8, 263 Campus Dr., Louisville, CO 80027
- Superior Elementary, 1800 S Indiana St., Superior, CO 80027

**CSC Project 5005678**

**Executive Summary:**

1. CSC has been providing professional environmental consulting services for the District related to the Marshal Fire that started December 30, 2021.
2. CSC has reviewed the BVSD's indoor environmental quality actions:
  - a. Pre-fire,
  - b. During the fire and mandated evacuations, and
  - c. Post-fire and lifting of evacuation mandates.
3. In brief, the actions taken by BVSD are in line with CSC's recommendations and in line with the Boulder Office of Emergency Management guidance on their website for this event.

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**CSC's Abridged Qualifications:**

The scientists, engineers, industrial hygienists and environmental health and safety professionals at Clark Seif Clark, Inc. (CSC) are no strangers to indoor environmental quality detractors associated with fires. Since our inception in the 1980s, CSC has provided professional environmental consulting, industrial hygiene (IH) and testing services on residential, commercial and industrial site fires. Our fire response experience is vast having provided environmental health and safety (EH&S) services on burning or burned tires piles, titanium cuttings, meth labs, landfills, grease fires, pacemaker manufacturing sites, UPS battery banks and run-of-the-mill single family residences.

In 2001, CSC's was tapped by long-time clients to assist with a growing concern related to wildland/urban interface fires and the environmental impacts on the built environment in unburned structures. This paradigm shift unveiled an expertise and resource gap. Unburned buildings in the area of wildland/urban interface fires were not well studied academically, had little laboratory support, and had no experts. CSC stepped in to fill the gap.

Fast forward to today. CSC's wildland/urban interface fire preparation, assessment and response strategies are industry leading. CSC has conducted tens of thousands of investigations, has collected many more thousands of samples, has worked closely with laboratories to develop state of the art analytical tools, has supported litigation including testimony in trial, has published research, and has conducted dozens of prevention, impact reduction and response action training sessions. CSC has represented and advised insurance carriers, homeowners, school districts, hospitals, skilled nursing facilities office buildings and more on this topic.

**Marshal Fire Background:**

Accounts regarding the Marshal Fire of December 30, 2021 to January 4, 2022 indicate this wildland/urban interface event burned over 6,000 acres in less than 24-hours, and destroyed or damaged over 1,000 homes and businesses, making it the most destructive wildfire on record for the state of Colorado.

- Mandated evacuations were issued for much of the region.
- Many structures and undeveloped acreage within the 6,219-acre perimeter were destroyed as the fire was pushed by winds gusting, depending on the location, at 60 to 100 mph, while the relative humidity remained near 20%.
- The fire was 100% contained (fire was out) as of 1-4-2022.

Many unburned buildings, were impacted to varying degrees by the infiltration of combustion byproducts.

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**Impacted Schools:**

Eight BVSD schools are in the communities impacted by the Marshal Fire:

1. Coal Creek Elementary, 801 W. Tamarisk St., Louisville, CO 80027
2. Eldorado K-8, 3351 S Indiana St., Superior, CO 80027
3. Fireside Elementary, 845 W. Dahlia, Louisville, CO 80027
4. Louisville Elementary, 400 Hutchinson St., Louisville, CO 80027
5. Louisville Middle School, 1341 Main St., Louisville, CO 80027
6. Monarch High School, 329 Campus Dr., Louisville, CO 80027
7. Monarch K-8, 263 Campus Dr., Louisville, CO 80027
8. Superior Elementary, 1800 S Indiana St., Superior, CO 80027

**BVSD Response Action Recap:**

Measures were performed by BVSD to minimize the impact during the evacuations and active fire. Cleaning measures were conducted by BVSD with the presumption that some fire residue may have entered all parts of the school. Out of an abundance of caution there was no delay for testing, the District simply made a presumption that the eight schools were likely impacted by combustion byproducts and acted swiftly and effectively to clean the schools.

What were the BVSD preventative measures?

1. To improve the indoor air quality in all eight schools around December of 2020, BVSD equipped 377 rooms with room-sized free-standing air filtering devices equipped with HEPA filters and with activated charcoal.
  - a. The HEPA filters and activated charcoal filters were changed in December of 2021.
  - b. These units run 24 hours a day in some cases and in other cases they are operated by the staff members. Some ran throughout the vacancy of the schools. All are available for operation during and after school hours.
  - c. Room sized filtration devices are effective in addressing small spaces.
  - d. This is a fortuitous event courtesy of infection control measures for a global pandemic.
  - e. Although small, they are numerous, and these filtration devices provide a positive effect in addressing combustion byproducts.
2. BVSD facility teams worked to prevent/reduce the infiltration potential at all eight campuses.
  - a. All doors and windows were closed.
  - b. Mechanical outdoor air intakes on all HVAC systems were closed.
  - c. Both actions (closed passive penetrations and closed mechanical outside air systems) were conducted before CSC's involvement in this project, but both are effective recommended actions to reduce/prevent infiltration of undue outside air that may carry combustion byproducts.

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What were the BVSD post fire response actions?

1. Room Air Filtration Devices –
  - a. Room-sized free-standing air-filtering devices equipped with HEPA filters and with activated charcoal remain disseminated among 377rooms between all eight schools.
2. Specialty Surface Cleaning –
  - a. Professional restoration contractors cleaned horizontal and vertical surfaces (e.g. walls, floors, desks, chairs, etc.) at all eight schools using wiping and vacuuming techniques. Wiping included a combination of microfiber rags, surfactants, and chemical dry sponges. Vacuuming was conducted using HEPA-equipped commercial vacuums (also called HEPA-vacuums) equipped with various wands suitable for various surfaces.
3. Commercial Air Filtration Devices –
  - a. Particle cleaning of air and disturbance/ entrainment of settled particles was achieved by commercial HEPA-equipped air filtration devices (AFDs). Numerous large commercial HEPA-equipped AFDs were disseminated between all eight schools. These devices were operated after school hours. Between the eight schools these AFDs filter over 230-million cubic feet of air nightly. Between Monday, January 3, 2022 and the morning of Wednesday, January 12, 2022, well over 2-billion cubic feet of air was HEPA filtered in total at all eight schools.
4. Air Washing –
  - a. The AFDs were run in recirculation, or scrub, mode. This achieves two goals. First it exhausts clean air in the school and second it expels clean air with a high velocity, which acts to dislodge particles from surfaces and keep them suspended in the air where they can be filtered out. This is often called air washing.
5. Replacement of HVAC Filters –
  - a. HVAC filters were replaced upon return to the campuses. They will continue to be replaced regularly. HVAC filters are not as effective as HEPA filters, but they are important in protecting equipment and work to improve air quality in fire events.
6. Mechanical System Cleaning –
  - a. HVAC systems at all eight schools were professionally cleaned. Sometimes referred to as “duct cleaning”, professional HVAC cleaning includes cleaning of all components (e.g. ductwork, supply diffusers, return grilles, and air handlers).
  - b. All HVAC filters were replaced at all eight schools.
7. Water Quality Measures –
  - a. Water quality at all eight schools was addressed presuming the potential for degraded water quality was possible. BVSD conducted this work out of an abundance of caution. Activities to ensure water quality were numerous at all eight school and included: draining water heaters, flushing all hot and cold plumbing outlets, discarding ice in ice makers, replacing water filters, etc.
8. Outdoor Playground Considerations –
  - a. BVSD had professional restoration contractors pressure wash all playground equipment. These contractors removed the bedding (also called engineered wood fiber or EWF) under all the playground equipment and replaced it with new material.

**Conclusions:**

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1. CSC has been providing professional environmental consulting services for the District related to the Marshal Fire that started December 30, 2021.
2. CSC intends to continue to act as a subject matter expert (SME) for BVSD and their restoration teams.
3. CSC reviewed the BVSD's indoor environmental quality actions, and conducted a site visit. CSC finds the District's response to be on target:
  - a. Pre-fire,
  - b. During the fire and mandated evacuations, and
  - c. Post fire and lifting of evacuation mandates.
4. BVSD embarked on a herculean effort to safeguard the quality of the built environment for the benefit of students, staff and structure.
5. Based on CSC's site visit and review of the Marshal Fire response activities by BVSD, the District has completed and continues to complete tasks to provide students and staff with an environment free from hazards at concentrations of concern, comfortable, better than outdoors and compliant with local, state and federal laws.
6. The actions taken by BVSD before and during CSC's involvement on the project have been exemplary and were not stifled by cost or influenced by convenience.
7. The actions taken by BVSD are in line with the Boulder Office of Emergency Management guidance on their website for this event. Therein it states: "If your house is **still intact but was affected by smoke**, please refer to **How to Mitigate Post-Fire Smoke Impacts in Your Home** by the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado Boulder."

**CSC, Inc.**

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**Reservation of Rights:**

The opinions offered herein are not intended to be exhaustive of all the opinions CSC has in this matter. CSC reserves the right to offer additional opinions based on the existing information. CSC reserves the right to review any additional information and render opinions regarding those and relating them to the current document set as needed.

Thank you,  
Clark Seif Clark, Inc.

Written by,



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