CellBlock®

Fire Containment Systems

LIBIK®
Lithium-Ion Battery Incident Kit

CellBlockEX™
FIRE/HEAT/SMOKE SUPPRESSANT

CellBlock®

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LIBIK®

Lithium-Ion Battery Incident Kit

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FIRE/HEAT/SMOKE SUPPRESSANT

Safe. Simple. Effective.

CONTENTS

CellBlock® FCS

INTRODUCTION

Manufactured in Standish, Maine by Cornerstone Products LLC, CellBlock® Fire Containment Systems (FCS), CellBlockEX™ and LIBIK® provides solutions for the safe handling, collection, transportation and storage of lithium-ion batteries.

CELLBLOCK® FCS

CellBlock FCS utilizes expanded glass technology to manufacture fire containment panels - a specialized material that can be used to clad existing rooms or can be constructed as free standing structures, transportation units, collection boxes, or storage shelves. These structural pre-cast panels consist of varying glass aggregate grain sizes bound with lightweight cements, pozzolans, and other additives. The resulting product is a strong, lightweight fire containment panel that can withstand temperatures in excess of 1100°C (2012°F) for extended periods of time. The outside of the panel will remain cool to the touch when the inside is heated, as there is minimal heat transfer. Cloud-enabled controls can be used to monitor the thermal activity of the storage unit and will send alerts if the temperature inside the CellBlock packaging exceeds normal range.

CELLBLOCK® FIRE CONTAINMENT PACKAGING, ULD LINER TILES, AND CARGO BAY LINER PANELS

Aluminum structures, such as ULDs and cargo bays can be easily retrofitted with CellBlock tiles or panels to protect the outer shell from the extreme heat of lithium-ion battery fires. The rigid strength of the CellBlock panels make them an ideal substrate for the construction of high-temperature fire containment shipping and storage units. Thicknesses are based on customer requirements; a 2.54cm (1") tile or panel can withstand up to 6 hours of direct heat in excess of 1100°C (2012°F).

CELLBLOCK TRANSPORTION AND STORAGE CASES

Available in two standard sizes and designed to fit in an overhead luggage compartment, CellBlock Transportation Cases allow for safe air transport of lithium-ion batteries and devices containing them. These units utilize CellBlock panels coupled with CellBlockEX loose-fill media. If the batteries or devices within the unit experience a thermal event, the inner panels insulate the outside of the box from the extreme heat, while the CellBlockEX serves as both a fire suppressant and a filter, absorbing harmful fumes.

LIBIK®

LIBIK (Lithium-Ion Battery Incident Kit) utilizes CellBlock FCS units, and CellBlockEX loose-fill media to provide a solution for the immediate suppression and containment of lithium-ion battery fires. LIBIK was initially designed to fit in an overhead luggage compartment but can be manufactured to any size for any lithium-ion battery containment need. If a phone, device or laptop has been compromised, LIBIK provides the transportation and storage industry with a safe method to deal with the thermal runaway event in the field.

CELLBLOCKEX™ LOOSE-FILL FIRE SUPPRESSANT MEDIA

Containment boxes and other structures made with CellBlock technology can be filled with CellBlockEX loose-fill. CellBlockEX extinguishes the fire and absorbs the smoke, gases and flammable electrolyte associated with a lithium-ion battery incident. The CellBlockEX material itself is an inert mineral that poses no health risk, and has no measurable shelf life. The material is also lightweight at 6.8 kg (15 lbs) per cubic foot.

Lithium-ion batteries covered in CellBlockEX and enclosed within our CellBlock panels are safely contained during a thermal run-away incident. Whether the batteries are uncompromised, or have been compromised, the CellBlock/CellBlockEX unit provides the optimal turn-key solution for safe handling, transporting and storing of lithium-ion batteries and products, all while exceeding stringent DOT requirements.

CELLBLOCKEX™ FIRE EXTINGUISHER MEDIA

This technology is new. CellBlockEX has just released their fine particle offering for use in pressure vessels, such as metal fire extinguishers (see technical data sheet on page 17) and fire suppression systems. CellBlockEX has fire suppression characteristics that are extremely efficient for addressing lithium-ion battery fires and provides an alternative to using halon which is an ozone depleting chemical. In 2017 a small extinguisher containing CellBlockEX 0.3 will be integrated as part of the LIBIK system to extinguish flames prior to insertion into the containment box.

PLEASE CONTACT US FOR MORE INFORMATION

CellBlock FCS, LIBIK, and CellBlockEX fire suppressant media represent current best practices management for the handling of lithium-ion batteries and devices. We would welcome the opportunity to demonstrate the effectiveness of these products. Please advise us of a convenient time to visit your corporate headquarters and give a formal presentation.

We appreciate your interest in CellBlock and CellBlockEX. For any further questions, please contact me directly at 603-276-5785. I'd be more than happy to assist.

Thank you,
Matthew Vandemark
cellblockfcs.com

SAFE BATTERY TRANSPORTATION AND STORAGE IS AT THE FOREFRONT OF EVERYTHING WE DO

Lithium-ion battery incidents are on the rise. We're working hard to deliver solutions.

Since March 20, 1991 more than 160 air/airport incidents involving lithium batteries carried as cargo or baggage have been recorded.

http://www.faa.gov/about/office_org/headquarters_offices/ash/ash_programs/hazmat/aircarrier_info/media/battery_incident_chart.pdf.

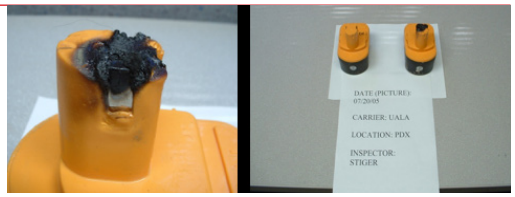
Laptop with lithium-ion battery in carry-on baggage: Started burning in the overhead bin in the passenger cabin. Fire extinguished on the ramp.

Prototype lithium battery shipped by a PHMSA Approval Holder. Fire discovered as ULD was being loaded for trans-Atlantic cargo flight in Memphis.

Two 12-volt non-spillable batteries packed together in same box. Package caught fire in air cargo sort facility.

Portable drill in checked baggage: Battery-powered drill accidentally activated in checked baggage. Drill/battery overheated and caused more than 20 suitcases to catch fire on the ramp right before loading on passenger flight.

A passenger checked a toolbox as checked baggage. TSA screeners noticed smoke coming from the toolbox. The Port of Portland Fire Dept. (POPFD) was alerted and responded to the incident and closed the screening location. The violator paid a $10,000 Civil Penalty.



Lithium-ion Batteries for remote control model cars: Shipment being returned to manufacturer in Korea caught fire in air cargo warehouse.

Jet Blue Flight 721

During takeoff from JFK, smoke began pouring from an overhead bin in the passenger cabin. Passengers alerted flight attendants. As the plane returned to JFK for an emergency landing, flight attendants were able to put out the fire, discharging both Halon fire extinguishers. Additionally, water was applied to cloth embers that continued to burn after the Halon was used.

One passenger complained of chest pains and needed assistance in exiting the aircraft.

Both lithium metal and ion batteries were loosely packed with the equipment.

CellBlock® FCS

CELLBLOCK® FCS

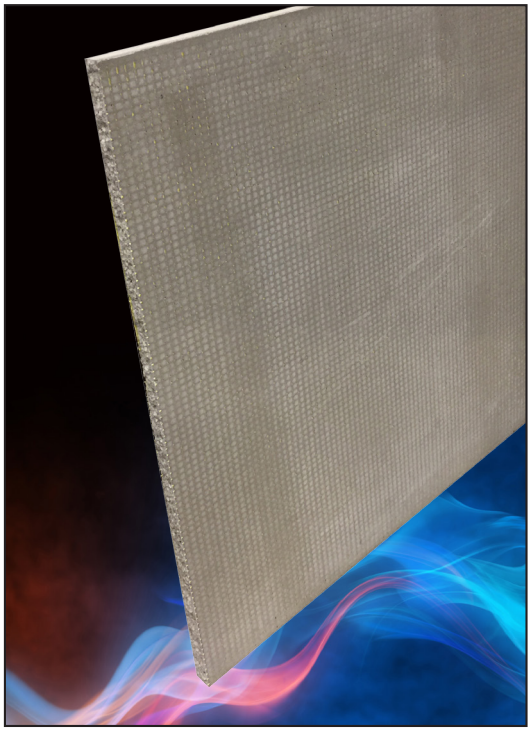
CellBlock FCS (Fire Containment Systems) were developed for the safe storage, collection, containment and transportation of lithium-ion batteries and products.

CellBlock FCS panels and tiles are made from expanded glass aggregate bound with multiple pozzolans and finished with a cementitious powder coating that features expanded glass and basalt fibers. The resulting product is a durable, lightweight fire containment panel that can withstand temperatures in excess of 1100°C (2012°F) for extended periods of time with negligible heat transfer.

Panels can be used to clad existing rooms or can be constructed as free standing structures. They may also be assembled in crate form for transportation, storage, or recycling of lithium-ion batteries.

- Meets ASTM E136 requirements for non-combustibility.
- Exceeds DOT requirements for the safe transport of lithium-ion batteries.
- Panels can be manufactured in 1 cm to 10 cm (3/8″ to 4″) thicknesses depending on the heat energy they are intended to contain and the structural loading and deflection requirements.

US Patent Pending



Fire containment panels

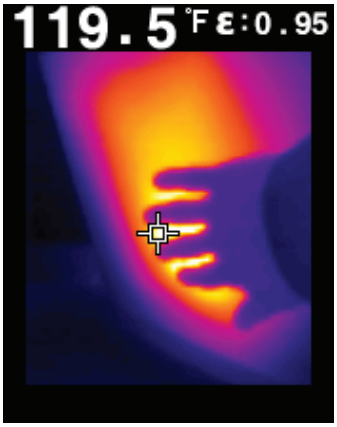
LOW THERMAL CONDUCTIVITY

A direct flame with temperatures of +1100°C (2012°F) was applied to the front of a CellBlock FCS 2.5 cm (1″) tile.

After an hour, the back of the tile remained relatively cool, as indicated by the top two photos at right.

In the bottom two photos, a 3.175mm (.125”) high-grade aluminum panel was added behind the tile.

The infrared camera images demonstrate the extremely low thermal conductivity of the CellBlock FCS tiles.



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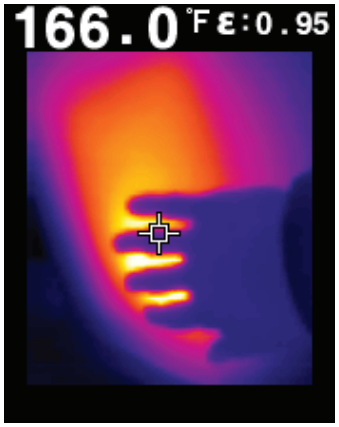

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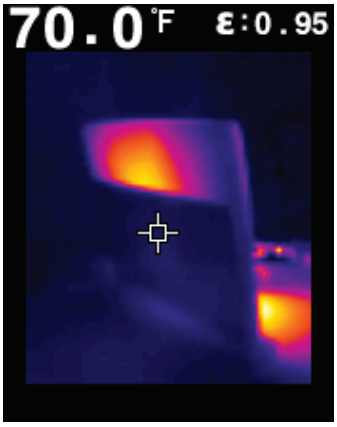

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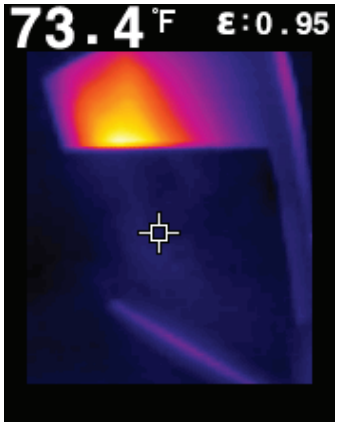

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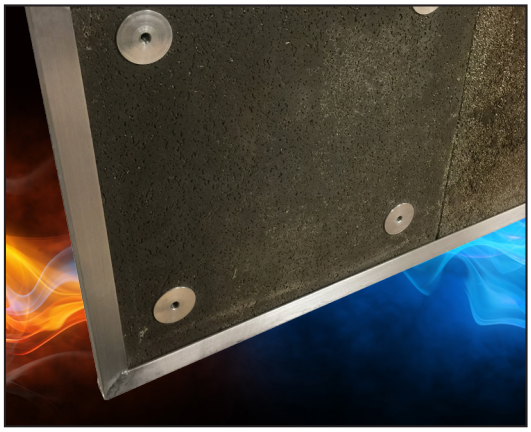
Infrared camera data

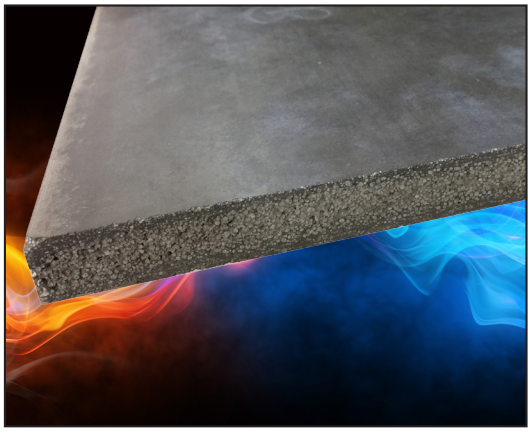
CellBlock® FCS

CELLBLOCK® PACKAGING, STORAGE CONTAINER, ULD LINER TILES AND CARGO BAY LINER PANELS

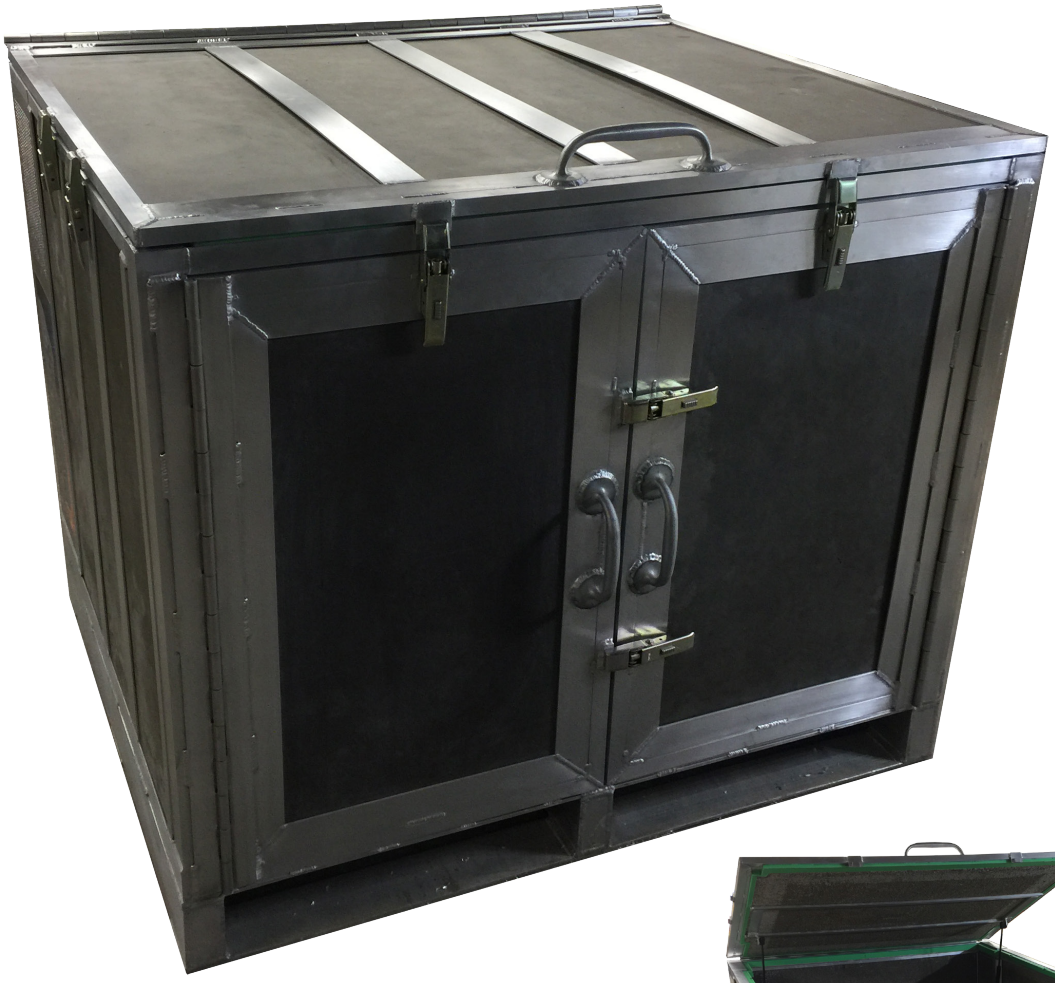
Aluminum structures, such as ULD's and cargo bays, can be easily retrofitted with CellBlock tiles or panels to protect the outer shell from the extreme high heat of lithium-ion battery fires.

- Densities as low as 640kg/m^3 (45lbs/ft^3).
- Although our product is strong, it is 60-70% air by volume, and has low heat retention and high insulating properties.
- Thicknesses based on customer requirements from 1 cm to 10 cm (3/8″ to 4″); a 2.5 cm (1″) panel can withstand +1100°C (2012°F) of direct heat in excess of 6 hours.
- Extremely low thermal conductivity: in 3-hour direct flame tests, the temperature on backside of tile did not exceed 175°C (350°F).
- Unaffected by heat or moisture.





CELLBLOCK HIGH-TEMPERATURE FIRE CONTAINMENT ULD



Dimensions: 122cm x 102cm x 91cm (48” x 40” x 36”)
Weight: 140.6 kg (310 lbs.)

Can be equipped with digital cloud-based monitoring technology.

CellBlock® FCS

CELLBLOCK DEVICE AND LITHIUM-ION BATTERY TRANSPORTION AND STORAGE CASES WITH CELLBLOCKEX TECHNOLOGY

Designed to safely transport or store your organization's devices and lithium-ion batteries.

Available in two standard sizes and designed to fit in an overhead luggage compartment, CellBlock cases allow for safe air transport of lithium-ion batteries and devices containing them. These units utilize CellBlock panels coupled with CellBlockEX loose-fill media. If the batteries or devices within the unit experience a thermal event, the inner panels insulate the outside of the box from the extreme heat, while the CellBlockEX serves as both a fire suppressant and a filter, absorbing harmful fumes.

When flames are present, CellBlockEX fire supressant media is released from inside the lid, immediately working to extinguish the flame. After such an event, the transport unit may be factory-inspected and recharged with CellBlockEX media for continued use.

CellBlock transportation units are approved to be placed in the passenger compartment or cargo hold of airplanes, and may therefore be manufactured in various sizes to suit specific needs.

The cases are available in polished aluminum, or can be powder coated with a corporate color and customized with a logo.

These transportation cases are critical for companies and organizations that are committed to safety and rely on lithium-ion powered devices in their daily operations.

SPECIFICATIONS

LARGE CASE (SHOWN OPPOSITE PAGE)

Dimensions	76.2cm x 43.2cm x 25.4cm (30" x 17" x 10")
Tare Weight:	26.3 kg (58 lbs.)

SMALL CASE (SHOWN BELOW)

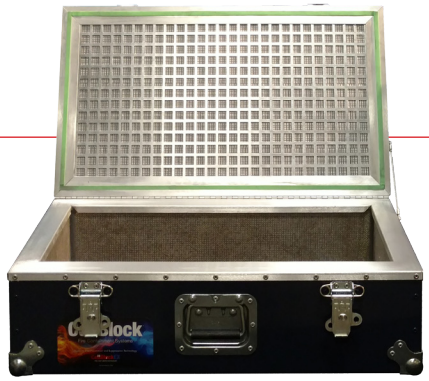
Dimensions	50.8cm x 43.2cm x 25.4cm (20" x 17" x 10")
Tare Weight:	19 kg (42 lbs.)

CELLBOCK TRANPORTATION AND STORAGE UNITS ALLOW FOR THE SAFE AIR TRANSPORT OF LITHIUM-ION BATTERIES AND DEVICES

Miami Air, one of the very few US Part 121 airlines to have a fully FAA-accepted Safety Management System (SMS), encourages its clients to use CellBlock cases to transport lithium battery-powered devices.

NFL Teams are using CellBlock cases to safely transport electronics and the lithium-ion batteries that power them.

Dimensions of units shown at right:
76.2cm x 43.2cm x 25.4cm (30” x 17” x 10”)
Tare Weight: 26.3 kg (58 lbs.)



The lid of the case contains CellBlockEX fire supressant media. When flames are present, the media is released from inside the lid, immediately working to extinguish the flame and absorb smoke and fumes.

Fire-retardant equipment dividers are reconfigurable with velcro. Made from fire resistant fabric with a CellBlockEx felt core, the dividers provide padding plus an extra layer of insulation around a compromised device. CellBlockEx dividers effectively limit the spread of heat and flames to neighboring devices and to help prevent further damage while the CellBlockEx loose-fill works to extinguish the fire.

CellBlockEX™

FIRE/HEAT/SMOKE SUPPRESSANT

CELLBLOCKEX™ - EXTINGUISHING WITH GLASS

CellBlockEX is the environmentally friendly, mineral-based fire extinguishing agent used for fire containment and prevention.

Suffocation Effect

Covering the fire load with CellBlockEX granulate displaces oxygen and separates it from the fuel, suffocating the fire.

Cooling Effect

Due to its specific thermal capacity, CellBlockEX absorbs heat energy, thereby cooling the fire, disrupting the thermal reaction.

Isolation Effect

Like glass, CellBlockEX melts at a high temperature. The granulates absorb heat in the form of melting energy, cooling the fire while forming an impervious layer over the fire load, preventing a reaction with oxygen. Even difficult to control metal fires (i.e., sodium or magnesium) can be extinguished with CellBlockEX.

Gas Tightness

Thanks to the CellBlockEX grain shape, very dense sphere packing is achieved. The supply of oxygen is impeded by the packed bed, and the formation of combustible gases is prevented.

Sorbency of Liquids

The special granulate mixture combined with the porous, and therefore especially large grain surface, effectively binds liquids.

Fire Gas Filtering

Just like liquids, gases and vapors accumulate on the extremely large surface of the CellBlockEX granulate and are bound for disposal.

ADVANTAGES

- **Environmentally-friendly; made from post-consumer recycled glass**
- Non-combustible
- Multi-functional (sorbency capable, filtration capable, combinable with other extinguishing agents)
- No water damage
- Reusable and recyclable
- Harmless to health
- Maintenance-free
- Easy handling as bulk material
- Very free-flowing
- Buoyant

CellBlockEx beads

FIRE EXTINGUISHING AGENT FOR PROBLEMATIC FIRE LOADS

Metal fires, lithium-ion battery fires and combustible liquids.

CellBlockEX is a new and environmentally friendly extinguishing agent using expanded glass granulates. It can be used for fire extinguishing or prevention. The small, lightweight spheres consist of foamed recycled glass with tiny pores on the inside, forming a closed cell structure. Since the granulate is 100% mineral based, it is not combustible.

CellBlockEX is reusable and was tested by the Material Testing Institute (MPA) Dresden, Germany.* CellBlockEX is suitable for class A, B, D and K fire loads.

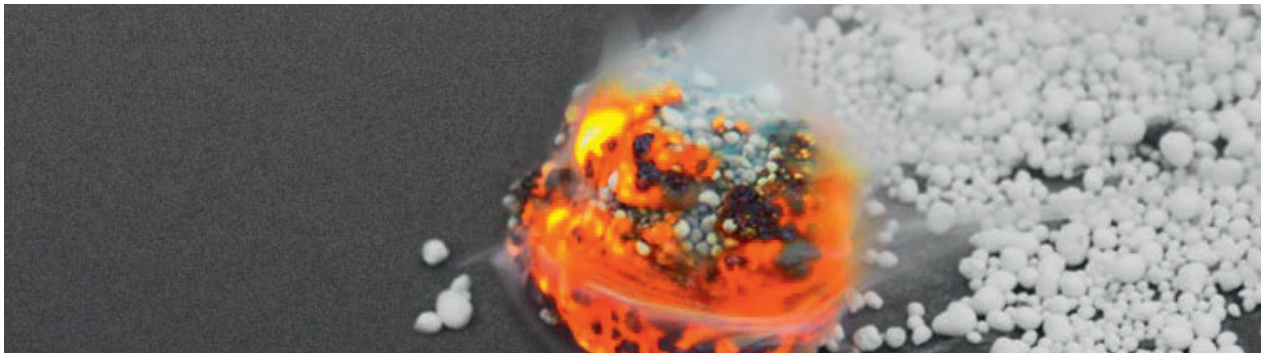
CellBlockEX beads are manufactured using a proprietary process. The recycled glass is finely ground, mixed and formed into granules. The raw grain is then sintered and foamed (expanded) in a rotary kiln to create lightweight and stable spheres with a fine closed cellular pore structure.

* See Appendix I (page 19)

TECHNICAL DATA

Fire extinguishing agent class D		MPA No. 20140494-1
Fire rating class (DIN 4102-4)		non combustible (A1)
Grain size	[mm]	1 - 4
Particle size	[mesh #]	18 - 5
Dry loose bulk density	[kg/m³]	240 ± 30
	[lb/ft³]	15 ± 1.9
Particle density [1]	[kg/m³]	360 ± 60
	[lb/ft³]	22 ± 3.7
Crushing resistance according to DIN EN 13055-1 [2]	[N/mm²]	1.5
	[PSI]	217
Oversize	[M.-%]	≤ 10
Undersize	[M.-%]	≤ 15
pH value		8 - 11
Moisture content	[M.-%]	< 0.5
Color		creamy white
Thermal conductivity	[W/(m·K)]	0.07
	[BTU-in/hr-ft²-°F]	0.486
Main Component		silicon dioxide
CE according DIN EN 13055-1		✓
Thermal capacity	[kJ/(kg·K)]	0.7
	[BTU/lb-°F]	0.167
Porosity approx.	[%]	85

[1] Apparent (relative) density according to EN 1097-6
[2] Values according to DIN V 18004 on request



CellBlockEX™

FIRE/HEAT/SMOKE SUPPRESSANT

CELLBLOCKEX® ALL-ROUND EXTINGUISHING AGENT

The granulate is very well suited for use in industrial facilities, production operations, data processing centers, archives, warehousing and transportation. Since it is an electrical insulator, CellBlockEX is also ideal for use in the energy storage and supply sector (i.e., transformer station protection). CellBlockEX has a low dust content, tolerates frost and is easily removable

LITHIUM-ION BATTERY FIRE PROTECTION

The increasing demand for battery cells also results in higher fire protection requirements during production, transportation, storage and the disposal or recycling of lithium-ion batteries. CellBlockEX is ideal as a dry extinguishing agent and especially well-suited for processes where the use of extinguishing water or foam is not possible (i.e., the aging of lithium-ion batteries).

DANGEROUS GOODS PACKAGING

Whether transporting freight via road, air or sea – the dangerous goods industry has to observe numerous regulations. Shipping damaged or defective lithium-ion batteries is problematic and special measures are required. CellBlockEX meets the fundamental requirements for fire protection filler. Accordingly, it may be used for conforming special transport containers and it exceeds DOT requirements for lithium-ion battery transport.

FIRE PREVENTION WITH CELLBLOCKEX®

Preventive fire protection encompasses steps taken in advance to counteract the outbreak and spread of fires, limiting their impact. In technical fire protection, CellBlockEX can be used as a fire suppressing material by permanently filling cavities, suspended ceilings, cable shafts, lines and pipes.

CELLBLOCKEX AS A PACKAGING FILLER

CellBlockEX fillers protect packaged goods against damage, vibration and impact. It is lightweight, binds liquids, and is environmentally friendly. It may be used in blankets and bags, as well as solid containers. For shipping hazardous liquids (i.e., laboratory chemicals, bases, acids, paint thinner, or similar) transportation in a dangerous goods unit with CellBlockEX as a filler/binding agent is prescribed. CellBlockEX offers secure fire and leak protection when used as a packing filler for transporting dangerous substances.

APPLICATIONS

- Server rooms
- Telecommunication centers
- Engineering rooms
- Aviation and shipping
- Transportation of dangerous goods
- Museums
- Archives
- Energy facilities
- Production facilities
- Tank farms

CELLBLOCKEX™ USED IN CONJUNCTION WITH CELLBLOCK® FOR THE TRANSPORT OF HAZARDOUS GOODS

CellBlockEX used in shipping and storage containers offers fire and leak protection for the safe transport of hazardous materials. It is an ideal loose-fill fireproof outer packing.

- Very good fluid retention
- Acid and alkali resistant
- 100% inorganic, pure glass
- Inert, minimally reactive
- Minimal weight (low dumping costs of contaminated materials)
- Minimal thermal conduction
- Sound-absorbent
- Non-perishable
- Bacteria and germ-free

The use of expanded glass pellets as an inert filler is in accordance with the specifications of the Federal Institute for Materials Research and Testing for the transport of damaged lithium-ion batteries.*

CellBlockEX can be incorporated into bags, blankets, and liners

CellBlockEX loose-fill can be placed within packaging to increase fire suppression and smoke absorption

* The Federal Institute for Materials Research and Testing (Bundesanstalt für Materialforschung und -prüfung, or BAM) is a German material research institute. [See BAM definition D/BAM/GGVSEB (ADR)/2.2-275/13, 2013]

CELLBLOCKEX™ TRANSPORT DRUMS FOR HAZARDOUS MATERIALS

CellBlock FCS steel drums represent a best-practice method for transporting used, spent, damaged and prototype batteries. Under our pending special permit we anticipate being able to ship various battery types in the same packaging and with hazard communication exceptions.

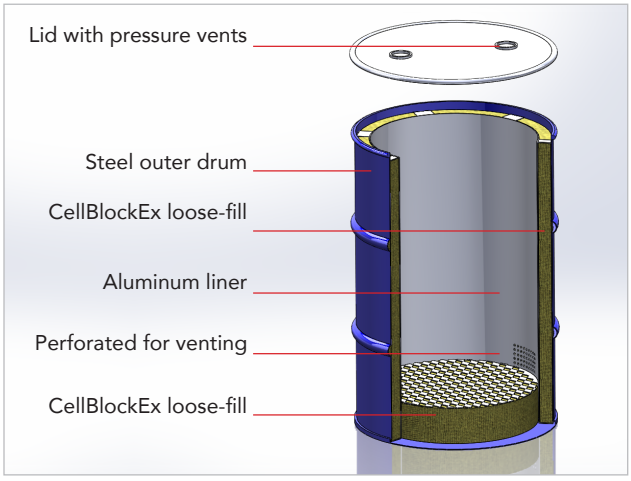
Lined with 1.5" of CellBlockEx loose-fill in the perimeter and 4" in the base, these provide a higher level of safety than standard drums in Hazard Materials Regulations (HMR).

The unique characteristics of the CellBlockEX will reduce the probability of ignition of flammable vapors and the release of toxic fumes. With CellBlockEx surrounding the batteries, the likelihood of fire, heat, or smoke being released from the packaging is greatly reduced.

These drums are available in various sizes and can be customized based on customer needs.

In addition to transport, these reusable containers may also be used for storage, effectively solving two problems in one package.

CellBlockEx loose-fill media is packaged with the drums.



CellBlockEX™

FIRE/HEAT/SMOKE SUPPRESSANT

CELLBLOCKEX® 0.3

CellBlockEX 0.3 is a mineral fire-extinguishing agent for lithium-ion battery and Class D (metal) fires. **Environmentally friendly:** made from post-consumer recycled glass.

TECHNICAL DATA SHEET CELLBLOCKEX™ 0.3

Fire rating class (DIN 4102-4)		non combustible (A1)
Grain size	[mm]	0.1 - 0.3
Particle size	[mesh #]	140 - 50
Dry loose bulk density	[kg/m³]	400 ± 60
	[lb/ft³]	25 ± 3.8
Particle density [1]	[kg/m³]	950 ± 150
	[lb/ft³]	59 ± 9.3
Crushing resistance according to DIN EN 13055-1 [2]	[N/mm²]	2.8
	[PSI]	406
Oversize	[M.-%]	≤ 10
Undersize	[M.-%]	≤ 15
pH value		8 - 11
Moisture content	[M.-%]	< 0.5
Color		creamy white
Main Component		silicon dioxide
CE according DIN EN 13055-1		✓
Porosity approx.	[%]	60

The strength grades may vary within the tolerance range of bulk densities.
[1] Apparent (relative) density according to EN 1097-6
[2] Values according to DIN V 18004 on request

Health and environmentally friendly material: inert mineral, VOC-free and odorless.

Suitable for use in fire extinguishers

ADVANTAGES

- Purley mineral
- Low density
- Dry bulk material
- Best free flowing properties due to spherical grain shape
- Odorless
- Health and environmentally friendly and can be easily disposed
- Suitable for the use in fire extinguishers and may be used as a replacement for Halon

LIBIK®

Lithium-Ion Battery Incident Kit

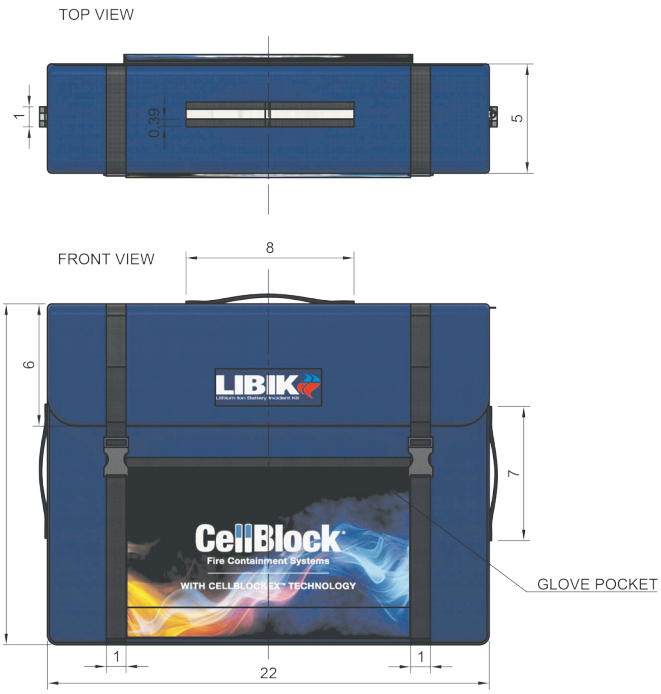
LIBIK®

The LIBIK System (Lithium-Ion Battery Incident Kit) is a fire containment and suppression unit specifically developed for the airline industry.

The all new LIBIK is fabricated with layered fire-retardent materials that can handle temperatures up to 1648° C (3000°F), plus multiple layers of CellBlockEx loose-fill fire-suppressant media. The standard LIBIK's geometry is such that it will fit anywhere that you could stow a carry-on. Our new prototype unit will accommodate the largest laptops on the market as well as all tablets and cell phones. A pair of fire retardent gloves and a fire blanket are included with the kit.

The LIBIK bag is lined with CellBlockEX loose-fill. It is the CellBlockEX which extinguishes the fire and absorbs the smoke, gases and flammable electrolyte associated with a lithium-ion battery fire. The CellBlockEX material itself is a very lightweight inert mineral that poses no health risk, and does not have a measurable shelf life or environmental impact.

If a passenger's device gets overly hot, it can be placed in the LIBIK unit. The CellBlockEX will immediately start absorbing the heat. No water is needed once the device is inside the LIBIK. If a thermal event happens while the device is in the LIBIK, the entire event will be suppressed and contained safely without the release of flammable and toxic vapors. This would preclude potentially diverting an aircraft in flight since the hazards would be fully contained. If there is no thermal event, the device can be returned to the passenger or retained for forensic analysis upon arrival.



CellBlock®

Fire Containment Systems

LIBIK®
Lithium-Ion Battery Incident Kit

CellBlockEX™
FIRE/HEAT/SMOKE SUPPRESSANT

cellblockfcs.com

CORNERSTONE
ARCHITECTURAL PRODUCTS

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