



BUCKEYE HIGH EXPANSION FOAM

U.L. LISTED



Buckeye High Expansion Foam Systems consist of a proportioning system, high expansion foam concentrate and high expansion foam generators. The typical proportioning system is the Buckeye Bladder Tank and Ratio Controller. The combination of bladder tank, ratio controller, foam concentrate and high expansion foam generator is U. L. Listed.

Buckeye High Expansion Foam Concentrate is an Earth Friendly synthetic based foaming agent designed to be used with both medium or high expansion foam generating equipment and is normally proportioned at a 2.2% concentration (2.2 parts to 97.8 parts of water).

Extensive development work at the dedicated Buckeye Fire Test Facility has produced a fully integrated state-of-the-art high expansion foam system package using the latest technology available.

Several models of high expansion foam generators are available and the following specific units are U. L. Listed.

When applied to a fire, the following extinguishing mechanisms take place:

- The large volume of foam produced blankets the area being protected, smothering and preventing air from reaching the fire to continue the combustion process.
- As the foam is generated and comes in contact with the fire, the foam bubbles convert back to foam/water solution and a large amount of steam is generated which inerts the atmosphere, aiding in the fire extinguishing process.
- The water content in the foam produces a valuable cooling effect on the fire and the immediate surroundings.
- The foam solution has a low surface tension and as such will effectively penetrate Class “A” combustibles to control deep-seated fires.

FG12,500 – “S” Factor: 4.0

Bar	Psi	Lpm	Gpm	CuM	CFM	Expansion
6.10	90	510	135	367	12,964	716:1
4.76	70	454	120	324	11,448	711:1
3.74	55	405	107	244	8,629	601:1

FG23,000 – “S” Factor: 14.6

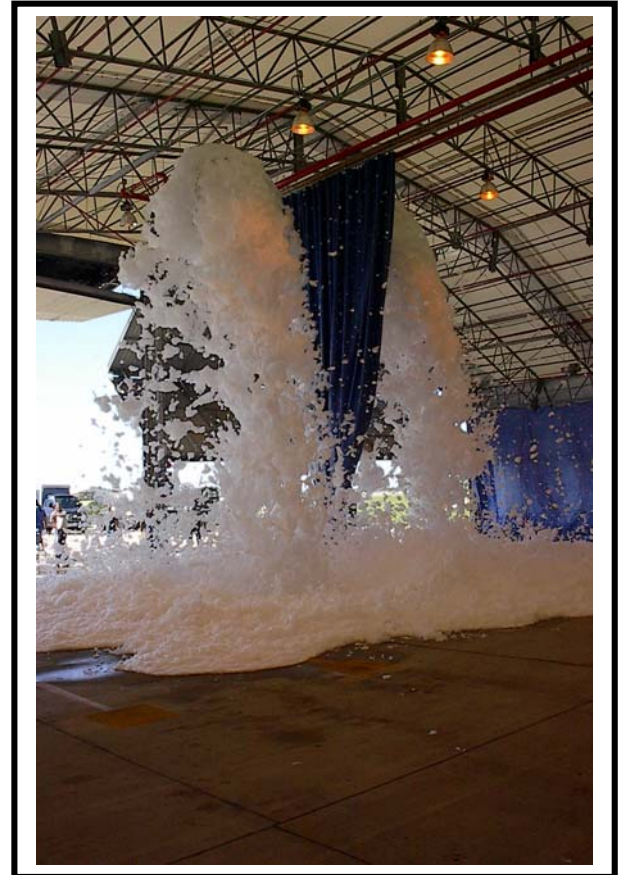
Bar	Psi	Lpm	Gpm	CuM	CFM	Expansion
6.10	90	1,029	272	656	23,172	638:1
5.10	75	943	249	584	20,635	620:1
4.08	60	833	220	497	17,534	596:1

FG20,000 – “S” Factor 7.8

Bar	Psi	Lpm	Gpm	CuM	CFM	Expansion
5.78	85	1,052	278	592	20,906	52:1
5.10	75	942	249	553	19,500	586:1
3.74	55	840	222	467	16,498	555:1

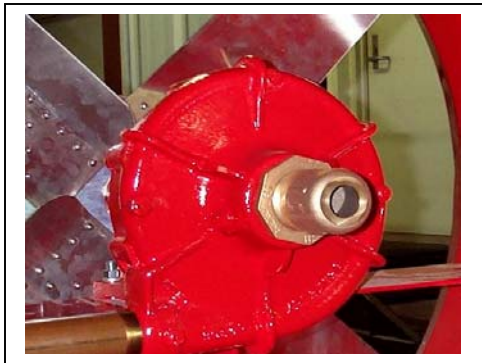
FG28,000 – “S” Factor 8.5

Bar	Psi	Lpm	Gpm	CuM	CFM	Expansion
5.30	78	1,226	324	804	28,367	655:1
4.08	60	1,094	289	675	23,848	618:1
3.06	45	927	245	525	18,532	566:1



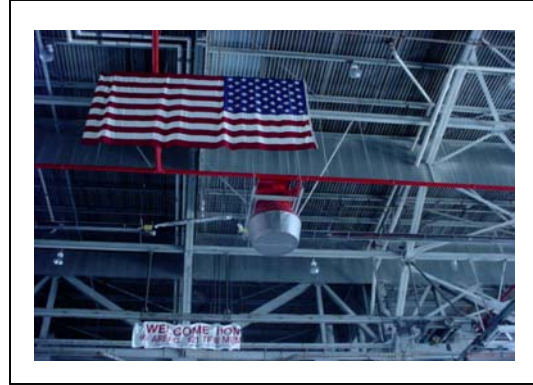
High expansion foam systems are designed for the most part to be Total Flooding Systems and require a confining structure to ensure that the highly expanded foam remains inside the protected area. As a result, high expansion foam systems find applications in the following highly protected risk areas:

- Cable Tunnels
- Aircraft Hangars
- Mine Shafts
- Underground Parking
- Tire Warehouse
- Hazardous Material Storage
- Flammable Liquid Storage
- Engine test Cells
- LNG Spills
- Basements
- Paper Storage Warehouses
- Ship Holds



The key to the performance of high expansion foam systems is the synergy between the High Expansion Foam Generator and the High Expansion Foam Concentrate. The Buckeye High Expansion Foam Generators have been designed with functionality, reliability and serviceability in mind. For example, the foam solution discharge is projected across the stainless steel aeration screen using one large nozzle. This nozzle optimally atomizes the foam solution and yet has a large enough orifice that silt; rust and other normal pipe debris will not block the nozzle.

A high efficiency water turbine drives the fan blade, providing a very reliable mechanism that survives the U. L. test of direct fire exposure and impingement and keeps running with no loss of efficiency.



We purposely designed the Buckeye High Expansion Foam Generators to operate with no external power requirements, other than flowing water. However, to provide a unit with total flexibility under the most adverse of conditions, the internal design and motor support structure does allow the substitution of an electric motor to turn the fan blade, in the event the water supply pressure is below the optimum requirements for the water turbine unit. This inherent capability makes the Buckeye High Expansion Foam Generator unique in its class.



After a very extensive test protocol, the Buckeye High Expansion Foam Generators are U. L. Listed and offered with the capability to produce an expanded foam output in excess of 30,000 cfm. The U. L. Listing includes the Buckeye High Expansion Foam Concentrate, Buckeye Bladder Tanks, Ratio controllers and of course the Buckeye High Expansion Foam Generator. The foam expansion ratio from the generator varies according to a number of factors, which include water pressure at the foam generator, water temperature and environmental effects, but typical values

range from 400:1 up to 900:1, although optimum expansion ratios are in the range of 500:1 – 700:1.

Buckeye High Expansion Foam Systems offer some features not found in other foam fire suppression systems. They typically exhibit lower firewater consumption when compared to a deluge system; which can mean less water damage or run-off and reduced containment. Enhancing this effect is the Buckeye High Expansion Foam Concentrate, which is considered “Earth-Friendly” and contains no reportable substances.

As for life-safety, submergence in high expansion foam for a short period of time should not be harmful. The foam concentrate is not considered toxic but the foam solution does have a low surface tension and as a result can in some remote cases liberate natural oils from the skin surface. In the event this was to occur, application of a lanoline based skin treatment lotion is recommended. In the event personnel are caught in a discharge of high expansion foam, some senses (hearing & visibility) will be impaired and there will be a loss of orientation, extreme care should be taken when moving around a room filled with high expansion foam. Thus evacuation from the area should be carried out as soon as possible and if entry to a room after or during a high expansion foam discharge is desired, (rescue purposes) self-contained breathing apparatus should be used and a lifeline attached to the point of egress.



Due to the high expansion ratio, the finished foam tends to be “light” and as such does

not have a true application outdoors, since light winds will blow the foam blanket away from the hazard area. Therefore, care should be taken when considering high expansion foam as an extinguishing agent to ensure that proper containment can be achieved.

The number of generators used for a given risk should be optimized to allow an even build up of foam over the entire hazard area. A single large generator may not give an even build-up and consideration should be given to several smaller units, giving the same combined output, equi-spaced over the hazard area to produce the desired effect. In this case, another advantage would be that if one generator were to fail, foam would still be falling from other units, thus providing some fire fighting capability.



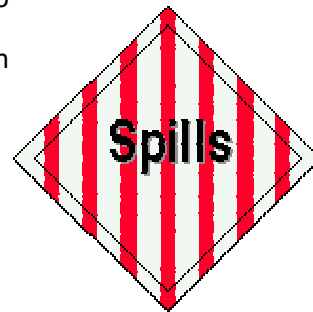
High expansion foam systems are designed for specific risks and a proper evaluation should be carried out to ensure that the appropriate guidelines are followed. Consideration should be given to generator locations, rate of foam spread, which will vary based on the substrate and the configuration of the hazard. For example, the foam blanket will spread at a much slower rate on dry concrete, than it will on a fuel spill or other wet surface. Protected areas with large obstructions (such as gensets) will impede the foam travel and speed due to increased friction between the expanded foam and the object. Thus the quantity and location of high expansion foam generators becomes quite critical, to ensure that the appropriate flooding time is achieved.



High expansion foam can be used for the control of LNG (liquefied natural gas) spills or fires in the event of an accidental release or failure of piping, pumps or flanges. When the temperature of natural gas is reduced to -161 degrees Celsius (-260° F) and at atmospheric pressure, the gas changes from a vapor to a liquid. This shrinks the gas to less than 600 times its original volume. LNG is less than half as dense as water. It is colorless, odorless and non-toxic. It is stored as a liquid and later regasified as needed. As a clean-burning fossil fuel, countries such as Japan have used revaporised LNG to help its air pollution problems. In the event of a release, LNG on contact with air will form a gas cloud and may ignite if an appropriate ignition source is found. The resulting explosion can produce significant damage in the area. Thus LNG storage tanks are typically found in large, deep-diked containment areas, so if the leak persists, the LNG will pool in the dike once the ground is frozen. In this case high expansion foam can be used to fill the diked area and while extinguishment is not required, or desired, the foam blanket will control the vaporization or in the event of a fire; the burn-off rate, it will also reduce vapor release and limit heat exposure to surrounding plant and machinery. By controlling the vapor release, it is less likely for a flammable gas cloud to build up and find an ignition source. High expansion foam can mitigate the situation and allow a controlled release of the vapor until the area is made safe.

Due to
water
of high

the low
content



expansion foam and in some cases, medium expansion foam, these agents can be used quite effectively on various hazardous materials. In some cases where plain water would react violently with for example a fuming acid or other equally hazardous material, the low water content of high expansion foam is less reactive and can cover the spill to reduce harmful vapor release. Maintaining the foam blanket gives First-Responders an opportunity to assess the risk and determine a suitable course of action. In addition, the low water content of high expansion foam means that the mitigating agent does not significantly add to the problem. The foam/water solution is reduced and there is less run-off to contend with.

Buckeye has up to the minute experience with high expansion foam systems and their application. We have significant data on the behavior of this material and can provide in-depth experience and advice as to the proper application of high expansion foam and the related proportioning and delivery systems. Contact the Fire Protection Professionals at Buckeye Fire Equipment Company for your fire protection needs.

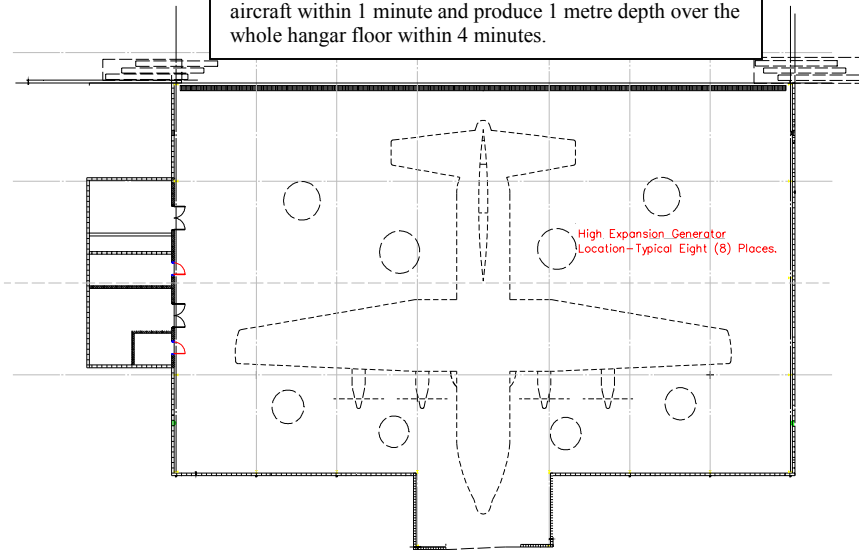
Buckeye Fire Equipment Company is ISO 9001 certified and within our 165,000 sq. ft. (15,335 sq.m.) facility we have a fully integrated manufacturing facility that includes an ASME (American Society of Mechanical Engineers) pressure vessel shop that allows us to build our own pressure vessels for bladder tanks and other related products.

Buckeye High Expansion Foam Systems are designed to comply with the stringent requirements of standards such as NFPA 11(A), NFPA 409, the USAF ETL 2-15 and

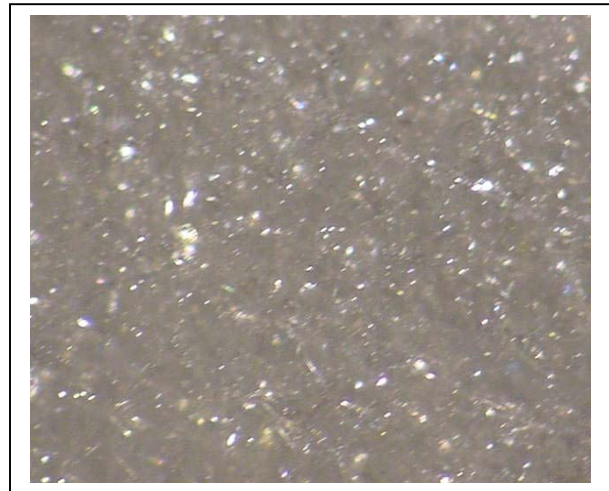
the Air National Guard Standard for High Expansion Foam Systems.

TYPICAL LAYOUT FOR A HIGH EXPANSION FOAM SYSTEM IN A C-130 AIRCRAFT HANGAR

The layout of the high expansion foam generators in this example are designed to cover the shadow area of the aircraft within 1 minute and produce 1 metre depth over the whole hangar floor within 4 minutes.



Buckeye Fire Equipment Company offers a full range of foam agents and hardware to satisfy your fire protection requirements. In addition, our product offering includes, Hand Portable and Wheeled Fire Extinguishers, Clean Gas – HFC-227ea Fire Suppression Systems and Co2 Systems for fixed installations. We have been in business for over 40 years, supplying the fire protection community with high quality products and continue to strive for excellence. Our products are supported by a highly qualified group of people who have knowledge and expertise to provide the answers you need to your fire protection problems. Our philosophy is to do it right, do it on budget, do it to specification and do it on time.



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