EQUIPMENT FOUNDATION SYSTEMS

Grout Compatibility with Concrete & Steel

CHOCKFAST® Red & ESCOWELD 7505E/7530

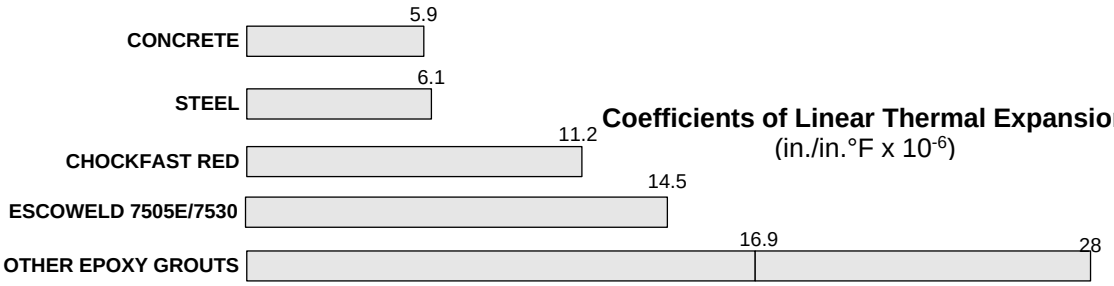
Technical Bulletin # 638D

Bulletin Description

All major epoxy grouts on the market today have sufficient Compressive Strength to bear the weight of the equipment they support. It is more important compare grouts based on how compatible they are with both the concrete and steel it is connected to. Therefore, the most important design criteria for an epoxy grout are those physical properties that directly affect the grout's compatibility with concrete and steel; Coefficient of Linear Thermal Expansion and Peak Exotherm.

Coefficient Of Expansion

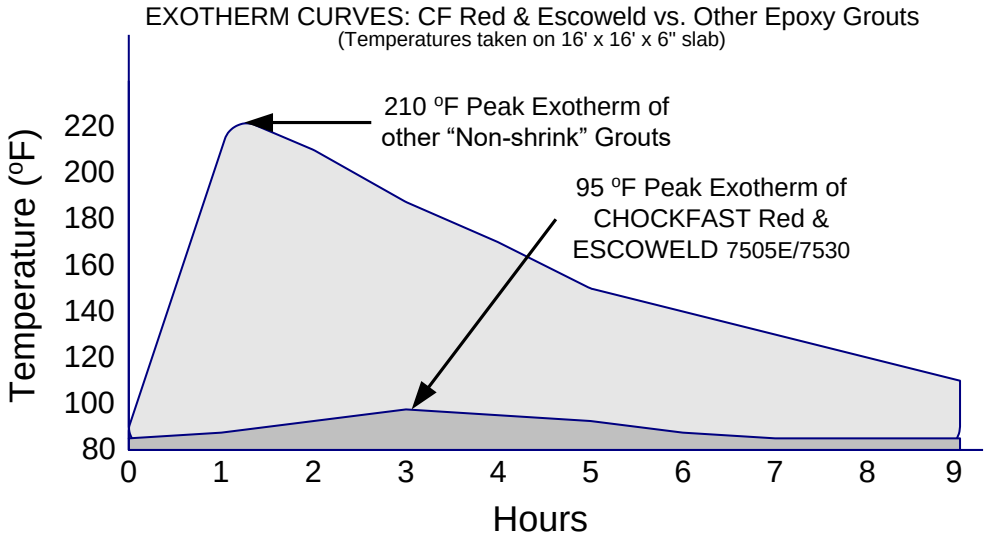
Coefficient of Linear Thermal Expansion (CTE) is the amount something will expand or contract when it is subjected to a 1°F increase or decrease in temperature. It is expressed in units of inch per inch, degree of temperature change of the material. The following is a listing of the CTE's for concrete, steel and various epoxy grouts as published by their respective manufacturers:



The closer the CTE of two materials are, the more compatible those materials are. They are compatible because they will tend to grow and shrink together as the outside temperature increases and decreases.

Peak Exotherm

Peak Exotherm (PE) is the maximum temperature that an epoxy reaches during its cure. This is also the point at which the epoxy changes from liquid to solid. The equipment operating temperature that produces no thermal stress is be equal to the peak exotherm temperature for that epoxy. For this reason, CHOCKFAST RED and ESCOWELD 7505E/7530 were formulated to have the lowest peak exotherm possible (95°F to 130°F depending on depth).



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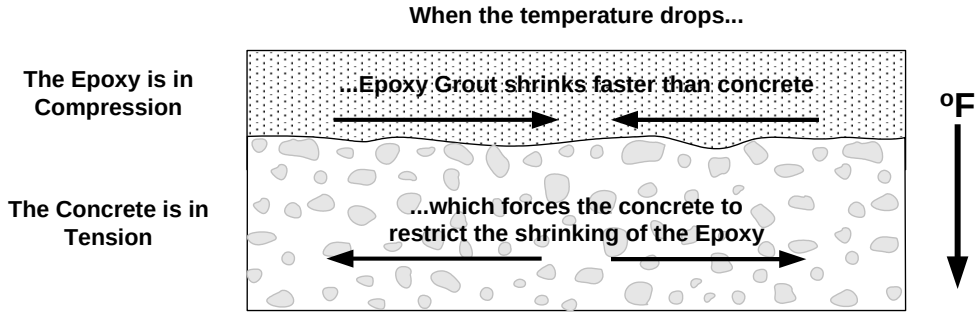
Application Instructions

Because CHOCKFAST Red and ESCOWELD 7505E/7530 are gently curing epoxy grouts, their peak exotherm temperatures are usually very close to the foundation temperature underneath operating equipment. This small difference between the peak exotherm temperature and the operating temperature results in minimum foundation stress.

When machinery is not operating, freezing conditions may occur. In this case, the epoxy grout will want to contract more than the concrete or steel because it has a higher CTE's. As a result of the epoxy bond to the concrete, the epoxy will be put into compression and the concrete into tension.



If the temperature drops far enough, the epoxy may build up sufficient tension to crack, or shear the bond line with the concrete. By using expansion joints installed in accordance with ITW Performance Polymers' procedures, stress cracking can be avoided and longer life can be expected from properly designed foundations. Please see Bulletins No. 662 and 645 for more information on expansion joints.

Example Calculating Linear Contraction of Epoxy

The following example calculates the Linear Contraction of epoxy grout starting at the grout's Peak Exotherm and returning to a foundation temperature of 70°F. The formula for Linear Contraction is:

Linear Contraction (in/in) = Coefficient of Thermal Expansion (CTE) X Change in Temperature (ΔT)

Grout	CTE		ΔT (PE - 70°)	Linear Contraction
CHOCKFAST RED	11.2×10^{-6} in/in/°F	x	(95 - 70)°F =	28.0×10^{-5} in/in
Other Epoxy Grout	27.0×10^{-6} in/in/°F	x	(210 - 70°)F =	378.0×10^{-5} in/in

This shows that the linear contraction of the competitive grout is 13 times as more than the linear contraction of the CHOCKFAST Red. Of course, if the foundation temperature were 95°F, there would be no linear contraction of CHOCKFAST Red.

Conclusion

A foundation that is healthy over the long-term is the result of a low peak exotherm coupled with a low Coefficient of Linear Thermal Expansion. CHOCKFAST Red and ESCOWELD 7505E/7530 were formulated to maintain these properties in single pours 18" deep if necessary. The compatibility of these grouts with concrete ensures a problem-free foundation for many years of operation.

Date June 2018