

March 23, 2002



## **TO ALL USERS OF TEMPERATURE MONITORING SYSTEMS IN LIVE FIRE TRAINING STRUCTURES**

We wish to advise you of an issue relating to temperature monitoring systems installed in live fire training structures.

Many temperature monitoring systems have been installed over the years in an attempt to provide the fire service with accurate information as to the temperatures being generated in burn rooms. This information is important to the training officer to understand the following:

- a) The highest temperature in the room as measured by the thermocouple that is mounted on the ceiling.
- b) The temperature at a level of approximately 24-30 inches off the floor to measure the temperature encountered by firefighters crawling into the room.
- c) The temperature between the protective linings and the concrete structure to monitor the performance of the lining system over a long period of time.

We have learned over the years that thermocouples mounted to the wall and ceiling surfaces read a temperature that is tempered by the mass of the wall or ceiling. In other words, the wall and ceiling surface temperatures are going to be lower than the air temperature that is trying to heat up the mass of the wall or ceiling. Imagine putting lasagna in an oven set at 350 degrees. The lasagna may take an hour to heat up to the air temperature of the oven. This is the same phenomenon experienced in burn rooms. The walls and ceilings are mass that is absorbing heat similar to the lasagna. We have measured wall and air temperatures that vary by as much as 70-100%. E.g... air temperature of 368 degrees and wall temperature of 230 degrees.

Therefore, during the first several evolutions of a training day the thermocouple will report temperatures that are considerably lower than the temperature of the air. Then, for a while, the thermocouple will report temperatures that are closer to the actual air temperature. However, as the day wears on, the thermocouple will actually begin to report temperatures that are higher than the air temperature. This is the result of cooling the air temperatures with bursts of water while the mass of the wall is storing the extraordinary heat generated in the room during the day of training.

We have consulted with various experts in the field of temperature monitoring and have concluded, at least for the moment, that there is nothing we can do to improve this situation. We are dealing with the laws of nature. The only way to provide more accurate readings would be to dangle thermocouples in the air throughout the room. This is impractical in a training environment.

We still believe the temperature monitoring system is a tool that provides a relative measure of what is occurring in a burn room. However, it is important to understand, particularly with the thermocouple that is mounted near the floor, that the temperatures

**TEMPERATURE MONITORING SYSTEMS**  
**MARCH 23, 2002**  
**PAGE 2 OF 2**

reported by the temperature monitoring system are inaccurate relative to air temperature and should not be used to measure "safe" air temperatures. Should you still elect to install a thermocouple at this elevation, we very strongly recommend that training officers be repeatedly and firmly advised that such monitoring offers only a "relative" measure of the heat in the room and that such information may be very inaccurate. Install placards on the exterior of all training structures with temperature monitoring systems stating something like this: "Temperature readings displayed and recorded by the temperature monitoring system recorder may be considerably lower than actual air (gas) temperatures. Do not use the temperature monitoring system to determine safe fire loadings. Use only standard operating procedures. The same placard should be installed on the temperature recorder panel housing."

We encourage all training divisions to rely on PASS devices mounted to the firefighter to ensure the firefighter is not exposed to extreme temperatures. We understand these are available with rate of rise measuring capabilities, but do not know of one that measures a set temperature as adjusted by the user. If you know of one, please let us know.

Finally, the thermocouple that is installed between the protective lining system and the concrete structure is measuring the amount of heat that slowly soaks into the structure. This is accurate. This thermocouple is not affected by thermal imbalance that occurs in the confines of the burn room. This concealed thermocouple is an important component of your system.

Please make sure all personnel using your facility are made aware of this condition.

We realize this is an undesirable situation and are still looking for a better way to provide accurate data to the training officer. Your comments, questions and suggestions would be appreciated.

Sincerely,

**HIGH TEMPERATURE LININGS**

William E. Glover

[will@firetrain.com](mailto:will@firetrain.com)