Operation Of Thermal Imaging Cameras

1. Introduction

This device allows the user to *see* through dense smoke and darkness by detecting and displaying the relative temperatures of objects.

2. Operating Features

- The camera displays relative temperature differences between individual objects and their surroundings irrespective of overall ambient temperature.
- Images are displayed as black, gray, white, yellow, orange, and red. black for cooler, white for hotter, and red for hottest.
- Visibility is not impaired by smoke, water vapor, water spray or darkness but is obstructed by stone, glass, snow, ice, and most plastics. An image builds when surfaces have a temperature difference of greater than 0. 1 * C.
- Extremely hot fires will cause the camera iris to close down fully to prevent overload of the image sensor. This is normal and the camera will not sustain damage. By moving the camera such that the fire is "out of the picture" or occupying as little of the picture as possible, the iris will re-open to enable the image to be restarted.
- The cameras will automatically switch from high sensitivity mode to low sensitivity mode, this happens when the view reaches a certain temperature.

❖ *This thermal imaging system is not rated as intrinsically safe. Do not use the camera in atmospheres where static or spark may cause an explosion*.

3. Limitations and Misconceptions

- Dirt or soot build up on the lens will obscure or reduce the clarity of the thermal image. Wipe the lens with a glove as needed.
- Condensation on the lens of the thermal imaging camera will also block the thermal image and make entire display appear blank. Wipe the lens regularly to remove accumulated condensation.
- Thermal imaging does not see through clear glass or plastic. These act as a mirror to IR.
- Shinny Surfaces will reflect IR creating a mirror effect. The actual source of the image may be opposite the reflected surface. Example: Glass, waxed floors, tiled walls, some painted or polished surfaces or water on the floor.
- Thermal imaging will not see through water.
- Depth perception in TIC’s are rarely represented in a 1:1 ratio and may vary from camera to camera.
- Beware of misconceptions about thermal imaging cameras. Thermal imaging cameras only show temperature differences between objects and not an optical image of the objects. The greater the temperature difference, the more distinct the thermal image.

These are some other circumstances which could result in misinterpretation:

- The thermal imaging camera cannot see through walls. A source of heat behind a wall will not be evident if it does not heat the wall itself.
- Some chemical substances in a concentrated cloud or vapor
- Heated smoke or a layer of heated gases
- If a concrete floor and a hole in that floor have the same temperature, there will be no apparent difference in the thermal image display to indicate the presence of the hole.
- When viewing a source of high temperature through a clear window with a thermal imaging camera, the camera display will only show a reflection of the user holding the camera and not the source of high temperature behind the window.
- When viewing a hole filled with water, the thermal imaging camera display will show a reflection of any heat sources above and away from the water surface.
- Molten or boiling substances will appear hot in the thermal image display, but it may be difficult to identify their physical nature and the hazards they present based on the thermal image alone.

4. Use at Fires and Emergencies

The Thermal Imaging camera is designed to ***augment*** the departments existing procedures for search and rescue. Possible applications; but are not limited to; include:

- Whenever a search rope is used.
- Large non-compartmented areas.
- Commercial structures (e.g., Schools, Churches, Stores)
- Duct fires to determine the location of the fire.
- 0verheated motors or fluorescent light ballasts.
- When dealing with a container, such as a propane tank, the thermal imaging camera can show the amount of liquid in the container by detecting the frost line.
- When responding at night to a person in the water. (Although it will not penetrate the water), it will detect any part of the body above the water.
- At large roof areas, the camera can show hot spots.
- **Do not rely on the camera as a sole means of searching**. Use all basic techniques when conducting a search because if the unit fails, the user might become disoriented or lost.
- Due to the insulating characteristic of bunker gear, the image of a firefighter will ap- pear darker as opposed to the image of a civilian. In addition, a Scott cylinder will show a darker image because of the compressed air.
- At advanced fires, a layer of hot gases may build up in the upper region of a closed space. The image of this area will become featureless. The camera should be aimed below this area in order to increase the accuracy of the unit.
- Use a slow-moving side to side and up and down motion during operation.
- If the lens needs cleaning during an operation, wipe it with a glove or cloth.
- The members of the team who will be operating with the camera will each carry a spare battery.

- Sudden white out of a scene may signal rapid increase in room temperature with flashover imminent or occurred.
- The image sensor will detect reflections from glass, mirrors, and polished or painted surfaces. The actual source of the image may be directly opposite that point.

5. Routine Maintenance

- When not in regular use, the camera should be switched on for a period of five minutes every Sunday duty to check for correct operation.
- The battery should be switched every Sunday duty.
- After use and prior to storage, the camera should be cleaned using a cloth soaked with warm water. Solvents should not be used.
  - Keep the lens clean.
    - Dirt or soot build up on the lens will obscure or reduce the clarity of the thermal image. Wipe the lens with a cloth as needed. Clean lens thoroughly after use.

6. Repair

If the camera is placed out of service, an officer must be notified, and the member shall prepare the appropriate form on the website.