

Your **IACL** Temperature Check Solutions for COVID -19

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See you Building Type Appendix for specific question for you to consider in development of Your Policy and Procedure using an Action Plan

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1. Introduction

The COVID-19 pandemic has changed our world if not forever, then for a very long time. The state, regional and local lock downs have devastated economic markets, shut down businesses and force the population of the US and rest of the world to reevaluate how we live, work and operate. The potential changes to the workplace are almost unimaginable, but if we are to continue building our businesses, then we will have to adapt and change.

Infrared – A Closer Look Inc. is a thermography company that provides Infrared scans of roofs, electrical systems, block wall construction, water intrusion and other issues to provide solutions to specific problems. Our inspectors are Level I and II certified and **Jim Hemsell, IACL President, is a Level III certified thermographer.** Our company is part of a national network of thermographers (*Thermal Imaging Partners*) and part of another national network of international thermographers (*United Infrared*) that has connections with Infrared camera manufacturers and the *Infraspection Institute* that provides specialized training for thermographers.

We use infrared technology daily and are extremely familiar with the science and scan criteria necessary to get reliable results. Jim is also a **Certified Energy Manager** (CEM with the AEE - Association of Energy Engineers) which deals with energy code inspections in the Dallas / Fort Worth area and Energy Efficiency recommendations for facilities around the nation. He has been an inspector for 37 years and has been in numerous types of facilities, so his familiarity with different facilities provides a background to helping understand the Reopen American Guidelines, FDA recommendations, Thermographic principles and criteria necessary to create a successful screening process to help keep your workplace safe and productive.

Please keep in mind that the medical industry's knowledge and experience with COVID-19 is very limited because of its recent outbreak. They have knowledge and experience with other influenzas viruses and coronaviruses, but as our knowledge and experience grows in relation with COVID-19, there will be further changes to the guidelines and recommendations from medical experts.

We know that the virus that causes COVID-19 can be easily spread to others by infected persons who have few or no symptoms. Even if an infected individual is only mildly ill, the person they spread it to may become seriously ill or even die, especially if

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that person is 65 or older with pre-existing health conditions that place them at higher risk.

There is a version number located on the bottom of each page. As knowledge regarding the virus changes, so will these recommendations. So long as the monthly commitment of your contract with **IACL** is maintained, you will automatically receive an updated document. The monthly financial commitment to continue our consulting program is very affordable to make this option possible. The bottom line is that **YOU need to work and plan** to keep your business operating and profitable.

2. Current COVID – 19 Measures and Testing

The social distancing and anti-viral protocols that have been adopted do not work well in the modern workplace, 6-9 foot distancing between people, limited physical contact, limits on group size at meetings, face mask and other measures are all going to have to be evaluated and then incorporated into how we meet, communicate and work will be challenging. The loss of key personnel, whether they are young or old, can have dramatic effects on your operations, future planning, payroll, health care and other factors that will change the dynamics of profitability that keep a business moving forward and growing.

I want to point out that by mid May 2020, over 100 meat processing plants closed because over 10,000 of their employees tested positive for COVID-19. The absenteeism had grown to the point where they were operating on reduced production level. Up to 40-50 of these employees have died after their outbreak. Some of these facilities were located in states that did not have a lock down in place or limited restrictions in place, but many of those businesses used IR Thermometer scans to protect their employees' health. It is unclear, at this time, if the infections were caused by their work environment or community activities outside the work environment, but the end result is for the plants have had to shut down for extended period of time (up to 5-6 weeks in some cases) while their work force went into hospitals or quarantine to help flatten the curve of the local outbreak.

Our knowledge regarding the COVID-19 virus is changing daily. The therapies, medications and recommendation are changing weekly. The methods that our society

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are using to combat the spread of the virus will also have to change as we learn more and discover new methods to fight this contagion.

3. Reopening America Again Guidelines

On April 13th 2020, the President of the United States issued the ***Reopening American Again Guidelines*** to help guide the State Governors and community leaders in a path to reopen businesses in this post COVID-19 environment. As each state, region or metropolitan area moved past their peak outbreaks and into a more manageable situation, the guidelines established three distinct phases where businesses and operations could return to a more normal state of operations. The guidelines presented responsibilities for the States, Individuals and Employers.

The States are responsible for testing, contact tracing, screening of the most vulnerable, health care capacity and planning to limit and mitigate further outbreaks. Individuals are responsible for personnel hygiene, using face mask and staying home if they are sick.

Employers are responsible for developing and implementing appropriate policies in accordance with Federal, State and local regulations and guidelines bases on industry best practices to protect their workforce. Those include:

- Workplace social distancing and protective equipment,
- **Temperature checks**,
- Testing, Isolating and contact tracing of employees.
- Sanitation
- Use of disinfection of common and high traffic areas
- Business travel
- Develop and implement policies and procedures for workforce contact tracing following COVID-19 + test.

The Guidelines want you to monitor your workforce for indicative symptoms and not allow symptomatic employees to physically return to work until cleared by a medical provider. **IACL's** focus is different from many companies because we want to help advise on a broad range of these recommendations instead of just temperature

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checks. We can definitely help with the Temperature Check, but there is much more in these recommendations than just temperature checks. Everything basically starts with your company's Policies and Procedures. The Reopening America Again Guidelines has these recommendations spread between the three phases of reopening.

Phase One for Employers encourages telework whenever possible and then allow for a return to work in phases. Close common areas where people gather, congregate and interact to enforce social distancing protocols. Strongly consider special accommodations for personnel who may be especially vulnerable to COVID-19. There are other restrictions related to specific types of business and employers.

Phase Two still encourages telework whenever possible and feasible with your business operations. They still want common areas closed where employees are likely to congregate to enforce moderate social distancing. It does allow non-essential travel to resume but still strongly considers special accommodations for especially vulnerable personnel. There are other relaxed restrictions related to specific types of business and employers.

Phase Three basically allows unrestricted staffing activities on worksites with some mild restrictions on some specific employers.

People think of the transition from Phase One to Phase Two to Phase Three as a linear progression in one direction. If there are further outbreaks of infection in a region, state or locality, our society could move from Phase One or Two directly to Phase Three and then back to Phase One. We will be dealing with COVID-19 for years to come and with the high mortality rate, it will affect your business's ability to be productive and profitable for a long time. That is why planning and preparation is so important.

a) **FDA Thermographic Guidelines**

In mid-April 2020, the Food and Drug Administration (FDA) issued enforcement policies for Thermographic systems when evaluating body temperatures for symptomatic people in the workplace. These policies are not binding or enforceable but designed to provide guidance for Employers during the COVID-19 public health emergency. The

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term Telethermography means using thermography to determine temperature gradients on the surface of the human body to determine underlying conditions.

What is Human Febrile Temperature Screening (or Fever Screening), and what does it have to do with thermal infrared (IR) imaging?

Normal core body temperature in the human body varies, but the average is 37°C or 98.6°F. Infections usually cause the body's temperature to rise. When a human's body temperature rises, this is called a fever. A fever is considered any core temperature above 38°C or 100.4°F. Fever Screening is accomplished by a qualified person and is the act of checking the internal temperature of a human being by placing an analog or digital thermometer in the mouth, armpit or rectum. Also, tympanic thermometers (infrared ear thermometers) have gained popularity because they are mostly accurate, more non-contact and faster than other types. At entry points into buildings, a check point can be set up and people can be screened using this method before entry is granted. However, at airports, factories and other buildings where there is a high flow of people per hour, this is an extremely slow process. This is where thermal IR Imaging comes into play.

Since there is a locked relationship between the internal and external body temperatures of humans, it has been determined that; a) to reduce screening times, and b) to reduce the risk of cross-infection between the incoming person and the screener, that thermal infrared imaging does have an acceptable level of accuracy and repeatability to be used confidently as a primary screening method of **fever screening**. In the **primary fever screening process**, when people with a skin surface temperature higher than that of a given set point are found by using thermal IR imaging, this apparent elevated body temperature warrants that person should be directed to **secondary fever screening**, using thermometers to determine if they actually do have a fever.

International and US protocols recognize **thermal infrared imaging** as a valid method of detecting **Elevated Body Temperature** in humans by using **Skin Temperature Measurement** which will significantly speed the process of employees and visitors safely entering buildings using **Human Febrile Temperature Screening**.

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The FDA recommends that if you are using Infrared Thermal Imaging for febrile body temperatures, a secondary temperature evaluation process should be used if an elevated body temperature is discovered using an infrared device. For better accuracy, this is usually performed using a digital or contact thermometer. The close proximity of people taking this secondary test will require the use of PPE and procedures to clean or use disposable components to prevent the spread of the virus

The current standard indicates that Infrared equipment should include at least $\pm 0.9^{\circ}$ F (0.5° C) sensitivity for temperatures between 93.2° – 102.2° and temperature drift of less than 0.36° F and use a Black Body temperature reference source. The labeling or instruction for the device should include language about setup factors, locations for body measurements, conditions of screening sites, factors based on the design of facility and criteria for testing based on spatial resolution and camera performance. Much of this detail will be discussed in the next section.

b. Testing

Medical experts have always stated that testing is the key to stopping the spread of the virus. There are basically two types of testing and each has its place in the workplace.

- Viral testing is the test for active infestation of the COVID-19 virus. The first testing protocols used nasal swabs and the results were provided within a few days. Now testing can be performed using mouth swabs and results can, in some locations, be provided within minutes. There are new home test kits now available that take saliva samples to be mailed in and results are available in a few days. This type of test is a snapshot of the current infection condition. That condition could change tomorrow. This test is necessary to demonstrate if someone has or does not have COVID-19 if they have an elevated body temperature at a fever scan.
- Antibody testing is usually a blood test to determine if COVID-19 antibodies (dead or alive) are present This test is a good indicator that someone previously had COVID-19. It is unclear if previous infections will provide any protection (or some protection for a limited time) from future exposure. This is a good test to have performed at all company physicals to determine past exposure.

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Testing is best handled in a local area so results can be transmitted quickly. You should develop and maintain a list of locations that has these different tests in case someone has an elevated body temperature

c. Contact Tracing

Contact Tracing is a difficult part of the recommendations to address. Technology will probably be part of the solution. Korea used contact tracing apps on individuals' cell phones to track who they may have come in contact with during the transmission period. Currently the United States is using a more labor-intensive system of personnel using phone contacts to track who may have come in contact with a specific individual. Basically, the reason for this is concerns that individuals may have about technology tracking their locations and routes. Cell phone tower data is already doing some of this, but still there are real concerns about personal privacy issues here. The development of an easy to use and cost-effective method is still being developed, but as employers, you need to be aware of who may be carriers and transmitting the COVID-19 virus.

4. Start with your Policy and Planning

When business started closing down because of the COVID-19 virus in March 2020, everyone had an established system using their current business processes and personnel to get the job done. Coordination between leaders and employees created a team of workers that were able to overcome almost any obstacle in business. After the shutdown, that coordination and teamwork has been lost to work around solutions to get the job done, even if it was at a lower level of productivity. Working from home was one of the most popular solutions.

As leaders, we need to determine what structural changes are necessary in our businesses to operate in this different environment. Operational readiness should be examined and divided into different categories. These categories will contain different options depending on your business. Your operating policies need to reflect those priorities and empower you and your staff to enforce the decisions that are necessary to get you up and running or keep you up and running in this new world and environment with COVID-19 challenges.

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a. Litigation Concerns

Litigation concerns are often driving issues for many businesses. This document is designed to help you develop a specific plan for your specific business. This is such a new issue that there is little guidance and standards that can apply to every situation. Whatever solutions you decided to decide, make sure it is documented, reviewed by your attorney to verify its defensible and implemented. Litigation regarding this crisis has not started at the writing of this document but could quickly evolve. There is discussion in Washington about exempting businesses from litigation, but Washington is full of attorneys and Congress is full of attorneys, so I don't hold any real hopes about a general exemption to litigation concerns for businesses. Your crisis plan should be considered a living document as knowledge and awareness of the COVID-19 changes as well as litigation and legal standards evolve.

b. Facility Assessment

Preparing your facility before you reopen is important to make sure there is minimal chance of existing levels of disease present in your workplace. You will need to be flexible, inventive, and intuitive to address issues that can become evident as we learn more about this disease, its' transmission, testing options and methods to minimize the spread. You will need to be involved and engaged with the local health care industry to develop partnerships to help you address these issues. Your goals are to:

- **Provide leadership to build confidence**
- **Maintain healthy business operations**
- **Maintain a healthy work environment**
- **Reduce transmission among employees**

c. Facility Entry and Acclimation

Using body surface temperatures as your screening procedure, means that you have to account and mitigate conditions that provide false indications of the internal body core temperature. The human body is a biometric machine that regulates temperature depending on external conditions.

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- If it is cold outside, the body shunts heat away from the skin to keep the core temperature steady. This results in lower skin temperature during cold weather.
- If it is hot outside, the body moves heat towards the skin to radiate elevated temperatures to keep the core temperature steady. It also uses evaporation from sweat to help cool the body down. As the sweat evaporates, heat energy is carried away from the body.
- The sun also creates a heat load on the body as you stand out in the bright sun. The sun will elevate the body temperature and if extreme enough, it can lead to sun stroke. This elevates the body core temperature.

All three of these conditions need to be mitigated to get a more accurate body temperature using telethermography. That process is called acclimatization. Before the thermal screening takes place, people need to be in a controlled environment and out of the bright sun. Screening can take place outdoors but is generally not recommended. If it does take place outdoors, then large shaded areas should be provided to mitigate the sun's affect.

Also rain or snow can affect the surface body temperature, so people need to have dry faces to mitigate the cooling effects of evaporation. Disposable paper towels, with sanitary disposal can be used shortly after they enter the building to dry their face.

As the people stand in line and maintain their social distancing, their body will slowly adapt to the interior temperature and provide a steadier temperature reading from the infrared equipment. Generally, the longer the acclimatization period the better, but no one wants to stand in line for 20 minutes, so a short period is better than nothing.

It should also be noted that other factors can affect core and surface body temperature. Drinking hot and cold beverages shortly before the scan can have some affects. Also, the use of aspirin or ibuprofen can decrease elevated core body temperatures, so the use of the product before entering the facility should be questioned before the scan takes place.

d. Screening Line logistics

The volume of people that are entering the facility needs to be carefully considered before establishing an IR Fever Scan program. If each person needs to maintain 6-foot

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distance from each other. Assuming a 2 square foot floor profile of your body and 3 feet in all directions, then that is 56 square feet per person. How big is the area that you are planning to set up your screening process? A 1000 square foot lobby, if used exclusively for a screen line and used the most efficient line orientation could only hold 17 people. Take away some area for the primary and secondary screening area (150 sf total for both) and consider that there is no optimal way (perhaps 80%) to use every square foot of the lobby efficiently then you are down to about 12 people. If you have a secretary in the lobby to assist people to check in or provide assistance locating offices, then you are down to about 9-10 people.

If you have large volumes of people entering the facility and they have to stand outside (in a shaded area), then the line can become very long. 100 people with 6 foot spacing between people is 600 feet of line. 1000 people is 6,000 feet of line or more than a mile long.

Large facilities with large volumes of people entering the building will need multiple entrances for scanning, multiple scanning devices and then other exits for people to leave the building. The line leaving the building would also require 6 foot spacing between people inside the building. Where will all the people gather to leave your building?

e. Scanning Equipment and Procedures

Depending on the Infrared Equipment selected for your scanning process, you will need space and equipment to perform the scan. People will then walk to a place at a set distance in front of the IR Camera, stop shortly to be scanned and then proceed on into the building or over to a secondary screening area if they have an elevated body temperature. The IR screening process takes about 5-10 seconds on average depending on the line speed and the IR camera processing speed. A 9 Hz camera will take longer to reset the IR image than a 50-60 Hz speed camera. Again, using a 100 people example, you are talking about 17 minutes to process to gain entry for all these people in a single line.

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f. Secondary Screening

If someone scans positive with a surface skin temperature above 100.4° F, then they move to a secondary screening area where their core temperature is taken with a digital oral thermometer. The thermometer takes about 1 minute to register, so figuring a 3-5 minutes per person to set up, provide instructions, take a temperature and then pass or prevent them from proceeding into the building. If there are several people in line, then an addition screening line and social distancing space should be provided. There should also be a short distance to the exit from the building for those people that are not allowed into the building because of an elevated body temperature. You will need a supply of thermometers and disposable covers to meet the needs of this station and a sanitary disposal station.

g. Signage

Signage should be considered to help communicate with people the importance of safety protocols. Floor signs can show social distancing spacing when in line or in an elevator. This can help flow control and minimize congregating in large groups. Plexiglas separators can protect individuals at cash registers, check in stations or other places where people typically stand face to face in close proximity. Signage in bathrooms and at sanitizing station can be reminders to practice safe personal hygiene.

h. Meetings

Some planning is needed to cover office meeting and group functions. These events are necessary to build coordination and teamwork. Social distancing, personal hygiene and possible face mask use are considerations here

i. Lessons learned during the previous shut down

The experience of the last few months had challenges churches to become inventive and change the ways they operate. Change can be good because it requires us to look at different ways of doing things. What lessons have you learned during the previous shut down and which of those changes should continue to help meet your mission?

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j. Financial Considerations

There is no easy way to work through the financial ramifications of all the changes necessary to protect your business and workforce. Ongoing business makes payroll and keeps the doors open. It is easy to skimp on these protocols, but what are the ramifications of you losing $\frac{1}{2}$ of your workforce because of new outbreak? The old fashion tactics of maintaining cost controls and finding that balance of cost and pricing will provide the profitability necessary to business. Government funds and assistance will help in the short run, but only good planning and hard work will ultimately work in the long run.

5. Personnel

Personnel are considered staff, employees, cleaning crews and volunteers for this discussion. Some staff and employees will not return or feel comfortable returning because of health concerns. This may open doors for new leadership or personnel and considerations should be provided as to the wants and needs of your business. What are good ideas and your capabilities using technology to grow the business.

You need to actively encourage any sick individuals to stay home. They should not return to work until they have been tested, satisfied any quarantine requirements and are well so they do not spread COVID-19 or other diseases. Any Individual that has sick (COVID-19) members in their household should not come to work until they are well and finish their 14-day isolation period. If they have passed a COVID-19 swab test, then they could return in as little as 3 days. The documentation and results of that test will need to be provided to the Facility Administrator or other designated individual. They should not be taking any fever reducing medication (such as Aspirin or Ibuprofen) for at least 3 days.

There is a need to implement a flexible sick leave policy to handle challenges such as COVID-19 illness, other types of illness, illness in the family that may restrict an employee from being involved in the business for a limited time. Remember that it takes a team to be successful and you have invested time, training and resources in your current personnel to keep your operations running smoothly. Your sick leave policies should be non-punitive in nature, because you will only have to train new people to replace those that leave or can not afford to stay under your current policies.

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A healthy environment at work and home starts with good personal hygiene. Educate your personnel about the importance of good hygiene such as washing hands with soap for 20 seconds (or use hand sanitizer when soap and water are not available), completely drying their hands, covering their mouth when they cough or sneeze into a tissue or their elbow, wearing face mask (over the nose and mouth) when in public, avoid touching their face, eyes and mouth with unwashed hands. Practice social distancing (six feet separation) whenever possible. Your sick leave policies will have to become more adaptive and non-punitive to keep employees. Individuals should wash their hands again upon entering the facility.

Signage on floors, walls, doors and other areas to remind everyone of the best hygiene practices, social distancing and other guideline necessary to protect the public. Discourage hand shaking because of the potential of spreading the virus. Any provide meals should be individually pack for each employee or visitor.

Employees who travel should perform self-evaluations before leaving to assure they are not sick. What are the travel requirements for the mode of travel they have planned? Airlines, trains and buses are important modes of travel, but people are exposed to crowds for long periods of time and infection rates can go up. What are the health conditions of communities along the way and at the final destination? Will that employee who traveled by air to an outbreak zone be able to return to the office upon their return?

a) Personal Protection Equipment (PPE)

Safety equipment such as PPE (Personal Protection Equipment) for your employees should be considered. Face mask will become a requirement in many states for shopping and workplaces in the short run and may become common place in the long run as people with varying degrees of susceptibility try to protect their health. Face shield, smock and gloves will not probably become common place except in environments of high exposure to the virus or close proximity for secondary screening. Consideration should be given to your company supplying PPE to keep your work force safe and productive. Bulk quantities of these material are usually much cheaper and sometimes more readily available that consumer products bought in small quantities.

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b. Disinfecting

Disinfecting surfaces is very important in slowing the spread of COVID-19. The virus survives up to several days on different types of surfaces depending on the surface material. Cleaning these surfaces are important to keeping your operation going, as well as employees and visitor's safety. Frequently touched surfaces include workstations, keyboards, mice, chair handles, desk drawers, telephones, handrails, doorknobs, tools, faucets, toilet components, water coolers, coffee pots and urns, ice stations and scoops as well as other kitchen equipment. You want to discourage workers from using other employees' phones, desk, offices.

The use of cleaning and disinfection products can create other problems in your workplace environment. Disinfect using common EPA registered household disinfectants. Follow the manufacturer's instructions. Bleach (diluted to a 50/50 or 30/70 solution) is a commonly used disinfectant, but it should not be mixed with other cleaning products because the combination can create toxic gases that can send people to the hospital or even cause death. When mixing bleach with water for a disinfectant spray, please keep in mind that the efficacy of the solution will diminish quickly as the chlorine starts to escape into the air or becomes chemically bound to minerals or PH of the water. Mix your solution in small batches and use it that day. Always label the bottle with the type of solution that you are using in that bottle. Chlorine will slowly deteriorate some components in sprayers so these should be considered as having a limited life span.

6. IR Temperature Scanning Process

Infrared Imaging is an approved and recognized method for determining Elevated Body Temperatures. It was used and studied during the SARS virus outbreak in 2003 and then again in the Swine Flu epidemic of 2009. There is established research and guidelines that cover the use of Infrared Imaging for identifying human febrile body temperatures. ISO/TR 13154:2017 covers deployment, implementation and operational guidelines for using medical equipment for a screening thermograph. IEC 80601-2-59:2017 covers the basic safety and essential performance of screening thermographs under controlled environmental conditions. Little of that research is current with the recent advances in IR camera technology, standards and guidelines that provide instructions on its' use for this triage in business settings. These infrared

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devices may have a greater sensitivity and ability to detect elevated temperature readings and can be more easily equipped to integrate with software for a more automated process with digital images and telemetry functions.

Together, these documents cover the safe and effective manner for application and equipment requirements for using Thermal Imaging to measure Elevated Body Temperatures. Devices, such as Infrared Cameras and Thermometers, that are approved for medical use are regulated under 21CFR 884.2980 (a) and have a product label of LHQ. Many of the Non-Contact Infrared thermometers meet this standard but are used for temperatures taken at the forehead and have a temperature sensitivity of 0.9° F. There are also some high-end Infrared cameras that meet this standard and are labeled for this use. The April 2020 FDA Guidelines basically suspend all the prior standards to help meet the needs of this pandemic. Those guidelines required a 320 x 240-pixel resolution camera, with a Black body incorporated to help provide an accurate temperature reading, requiring that the face fill over 50% of the screen to meet focal level and spot size criteria. With the suspension of those guidelines, many of the Infrared products coming on the market do not meet those guidelines so business will have to make choices to go with product that can meet their immediate needs and may not be compliant if and when those original guidelines are reestablished.

a) The Science behind Thermography

Thermography has been used for many years in military, industrial and medical applications. Infrared Thermography uses sensors that detect Infrared Radiation which part of the electromagnetic spectrum. That spectrum includes visible light that humans can see with their eyes. The infrared spectrum runs from .8 to 100 microns, Most IR devices used for telethermometry operate in the 8-14 micron (μ) range. Most of the Infrared Cameras and IR Thermometers today use uncooled microbolometers. They all have common feature and considerations for accuracy.

1. All Infrared detectors is the use of quantum detectors in a focal plan array to detect heat signatures. The larger the array, the better the resolution. The focal plan array is sized to provide micrometer detectors that give resolutions measured in pixels. An Infrared camera with a 320 x 240 resolution has 76,800-

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pixel detectors. A 640 x 480 camera has 307,200 pixels. An IR Thermometer may have an array of 10 x10 with about 100 pixels.

- **Why this is important** – The more pixels, the more temperature sensing points in the IR image. The more sensing points, the greater the accuracy.
2. All Infrared detectors measure infrared radiation based on thermal emittance of the surface being scanned. A perfect thermal emitter is measured as 1.0. Human skin is measured as 0.98. IR thermometer are preset at 0.98. IR cameras typically can have the thermal emittance adjustable to measure infrared radiation on different surface. The lower the thermal emittance, the greater the chance of an inaccurate reading.
 - **Why this is important** – Different IR equipment have different abilities to adjust the emittance of the target. IR thermometers cannot be adjusted. A industrial spot radiometer, such as those at one of the big box stores, may have a different preset emissive value that a medical device and this can affect accuracy.
 3. Forehead screening is common for IR Thermometers. The FDA guidelines recommend oral targets (digital thermometer only) or tympanic membrane (ear drum) and does not specifically mention forehead scanning locations. Most IR Thermometers use the forehead, and some can use the ear canal for readings. IR Cameras that have the increased resolution to use the nasolacrimal duct (eye tear ducts) as a measurement point. This was the recommendation that came out with the SARS research 17 years ago.
 - **Why this is important** - Each IR device has strengths and weaknesses for reliability, speed and recordability for long term data retention. If an IR camera is used, then a secondary screening with a digital thermometer is recommended.
 4. The focal distance is important to get accurate temperatures. Lenses are used on all IR devices to give a Field of View (FOV) and Instantaneous Field of View (IFOV). IR Cameras use their larger arrays to give a larger Field of View to measure temperatures. They come with different lenses and adjustable lenses so they can better utilize distance to measure temperatures.
 - **Why this is important** - IR thermometers have a very short focal distance so they must be placed .5 to 2.5 inches away from the object being measured to be fairly accurate. That distance can vary with IR

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Thermometers. As distances increase, the spot size of the target decreases, but the pixels size increases. Increased pixel size means that the temperature reading of a particular spot (or target) will be averaged with temperatures from areas that surround the spot. The higher the pixel resolution, the potential for better temperature readings so long as the spot size is considered. The average size of the tear duct in the corner of the eyes is about 2-3 mm. That is a small spot size. It takes good resolution camera to be able to get an accurate reading from 3 feet away.

5. The process speed of the IR device is the speed that allows the Infrared image to be reset for accurate measurement. Some equipment has a slow speed such as 9 Hz so it takes longer to perform the scan. Faster processor speeds, such as 50 or 60 Hz would allow for faster imaging.
 - **Why this is important** – The faster the processor speed, the faster the scanning speed and quicker you can perform EBT scanning.
6. Temperature sensitivity and drift (tendency to wander of the correct temperature calibrations) are other factors to be considered when selecting your infrared equipment. IR devices can have some drift in their temperature readings over time (so they have internal systems that check that drift to make adjustments and assure that the device is accurate. It is a good idea to periodically check those measurements with an external device called a Black Body that creates specific temperatures that can be used to test the device accuracy. That would be included in part of your monthly maintenance contract.
 - **Why this is important** - The FDA recommendations suggest a $\pm 0.9^\circ \text{ F}$ ($\pm 0.5^\circ \text{ C}$) sensitivity for your IR devices. IR Thermometers typically have a $0.5 - 0.9^\circ \text{ F}$ range of sensitivity. Infrared cameras can have up to a $1/10^\circ \text{ F}$ sensitivity for better accuracy and selection of better temperature targets for measurements
7. Price and process design are the last factor that you will want to consider. The current crisis has created a backlog of IR equipment availability that can delay a permanent solution, so a temporary solution may have to be considered until the equipment is available to install in your facility.

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An important consideration to improve accuracy with IR temperature detection is something called the cavity effect. When you have a concave surface (such as the inner canthus), the thermal emitted energy reflects off the other surfaces of the cavity and increase the temperature accuracy. The forehead is convex and while it makes a good radiator, the temperature reading can vary more for the body core temperature.

b. Your IR Policy & Procedures

Your company will need to adopt some policy for the use of any temperature screening method for your employees and visitors. That policy should cover who performs these tests, how and where they will be done, will data be retained and what happens if you detect someone with an elevated temperature. There should also be training involved in the process, use of the specialize screen equipment and your procedures.

c. Your Scanning Process

You need to have enough room to handle the people waiting in line and allow for them to acclimatize to indoor air temperatures. You do not want them to progress to far into the building before being checked in case they are infected. You also need a quick and direct path for them to leave if they have an elevated body temperature.

d. IR Equipment, Care, Maintenance and Calibration

Infrared Camera are specialized equipment using highly technological components. This type of equipment should not be dropped, get wet or mishandled. The surface of the lens has rare earth minerals that cannot be touched. Each manufacture has instruction on cleaning and caring for their equipment.

The national guidelines recommend an associated Black Body to check calibration of the equipment. A Black Body is like a vertical warming plate that is set at a specific temperature so you can check to see if the camera is reading its temperatures correctly. The rush to get equipment out quickly during this pandemic has resulted in manufacturers not being able to build sufficient supplies of the black body devices to provide that automatic temperature check. These components will come, but they are an extra expense (usually \$600 - \$700 per camera). Most of the scanning software is built to incorporate that feedback, but until then, a periodic check with a portable black body may be necessary to verify accurate temperature readings.

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e. Personnel as Thermographers and COVID-19 Training

Personnel that are going to use Thermal Imaging equipment should receive training, so they understand the basics of thermography, potential problems with its application and guideline for its use and application in the field. It would be dangerous to turn this equipment over to untrained individuals. We have partnered with *The Infraspction Institute* to provide that training online. The training provides one certification for each class.

Appendices

These Appendices are special sections for different types of business with specific questions, concerns to help guide you in developing **New Policy** and an **Action Plan** that you can implement at your facility. You will be provided with the appropriate Appendices for your specific business as part of your consulting contract.

A – High Rise Office Buildings

B – Office Buildings

C – Churches

D - Manufacturing Facilities

E – K-12 School Facilities

F – University School Facilities

G – Malls / Retail Facilities

H – Senior Living Facilities

I – Government Buildings