Article 3: Plastic wrapped glasshouse walls vs non-wrapped glasshouse walls

Two sites visited for the study had plastic wrapping attached to the glasshouse walls on the inside to prevent excessive heat loss:

1. Used bubble wrap across the glass in combination with aluminium
2. Had plastic wrap in front of the glass with an air gap between the plastic and the glass.

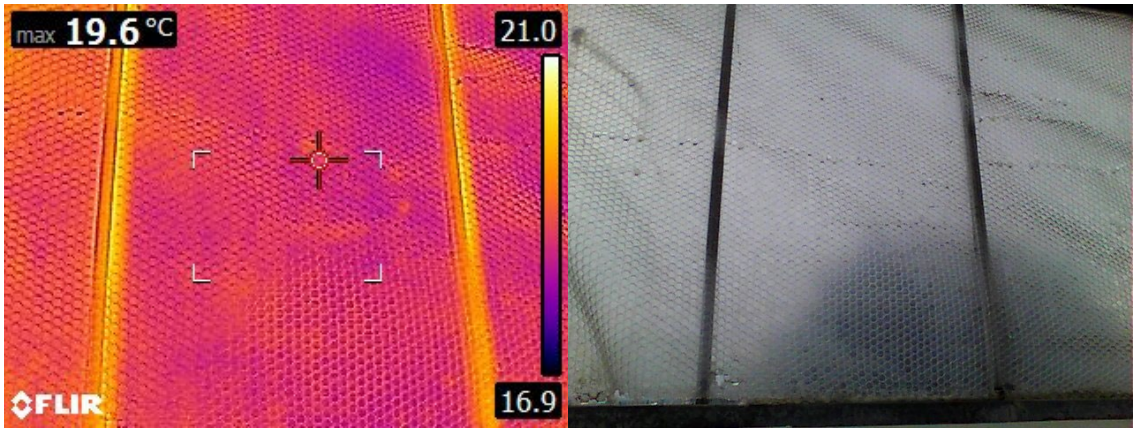

Figure 1: Inside of the glasshouse that had bubble wrap on the surface of the glass

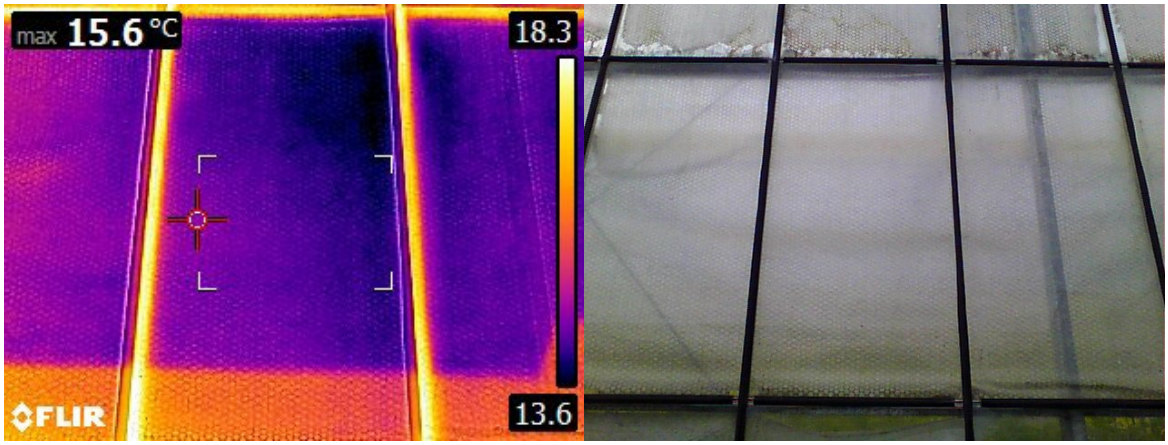

Figure 2: Outside of the glasshouse that has bubble wrap on the inside

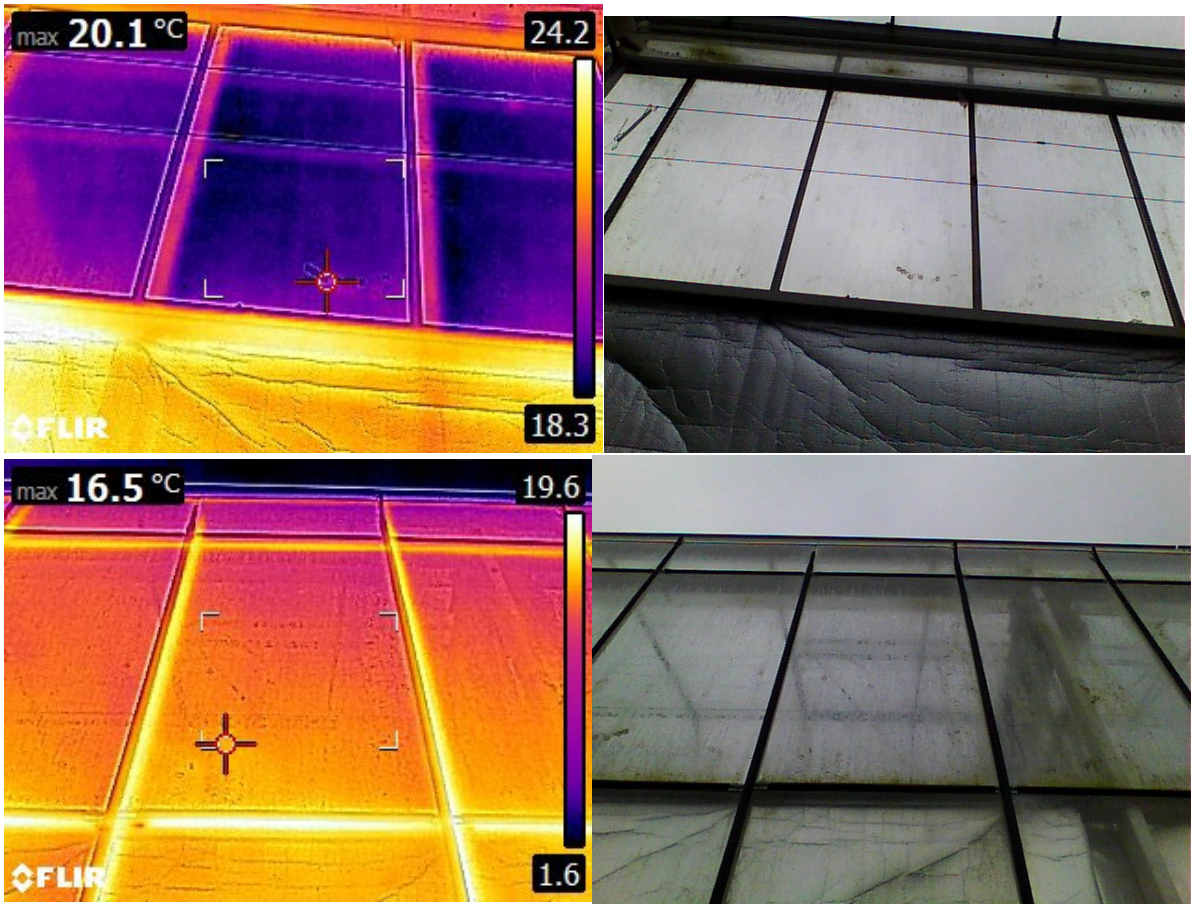

Figure 3: Inside (above) and outside (below) of the photos of glass with no bubble wrap

Figure 8 above shows the inside and Figure 9 shows the outside of the bubble wrapped glasshouse. From the images, there is a temperature difference of 4°C between the glass and the bubble wrapped inside of the greenhouse. This indicates that there is a good amount of insulation occurring between the bubble wrap and the glass. This can be compared to Figure 10, which shows the glass that is not wrapped by plastic.

The temperature of the glass without the bubble wrap is about 0.5°C higher than the surface of the bubble wrap, while the outside of the glass with no wrap is almost 1°C higher than the bubble wrapped surface. This indicates that more heat is being lost through the unwrapped glass than the bubble wrap. Although an additional 1°C of heat seems small, for a 10,000m^2 glasshouse, an additional 1°C of heating costs an estimated extra 20 tonnes of coal per year, which could cost around $9,000. Using natural gas at $24/GJ could cost the site an additional $11,069.00 per year.

Although the bubble wrap reduced conduction related heat losses, the bubble wrapped walls did a poor job at reducing infiltration between the gaps of the glass. This is because there was no air gap left between the bubble wrap and the glass window. This scenario can be compared to another grower's, who wraps one of their walls in plastic, except with a large air gap between the glass and plastic to create a double-glazing effect. These pictures are found below in Figures 11 and 12.

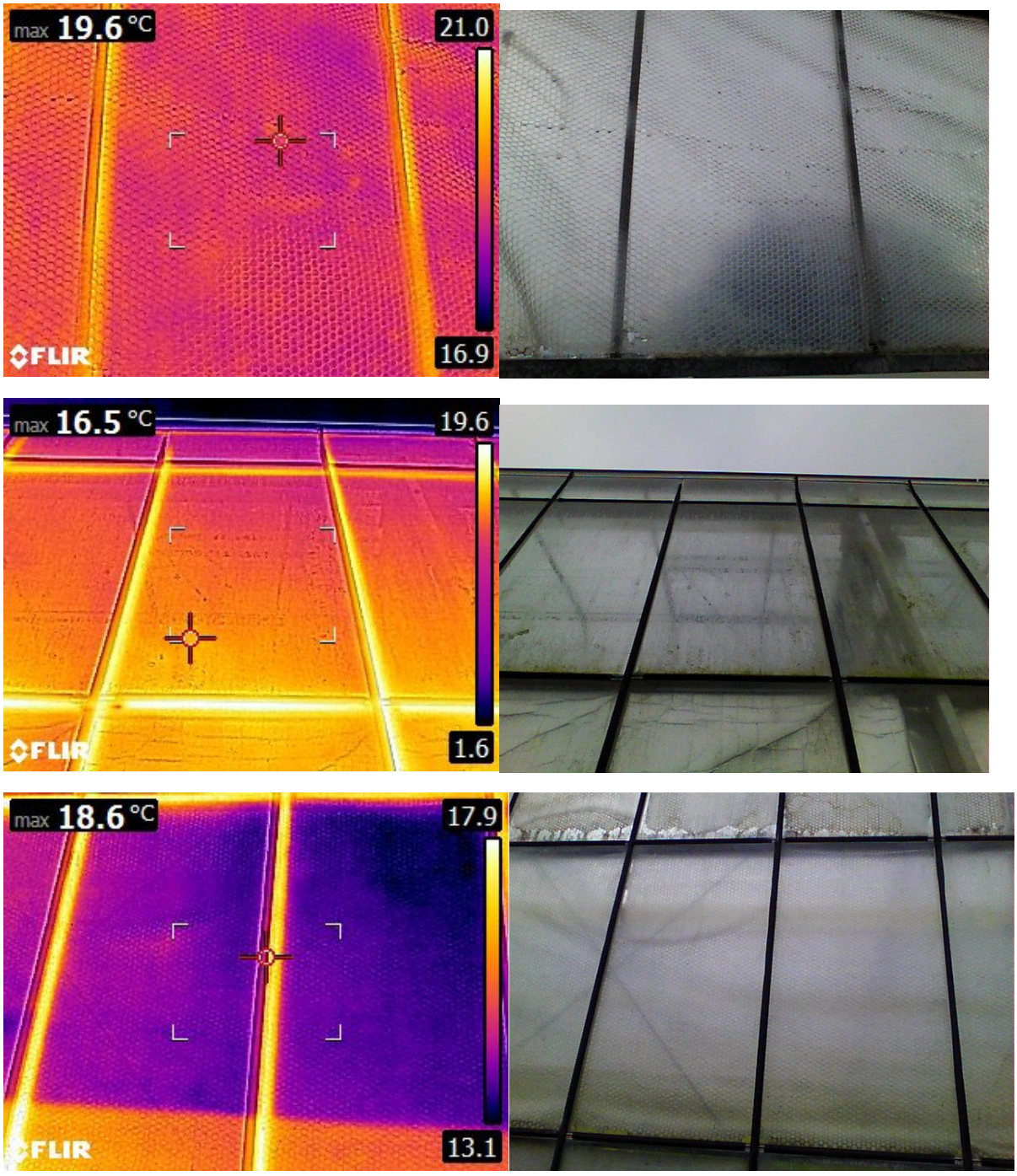

Figure 4: The inside temperature of the glass with bubble wrap (top photo) vs the outside temperature of the glass without bubble wrap (middle photo) vs the outside temperature of the gaps in the glass (bottom photo)

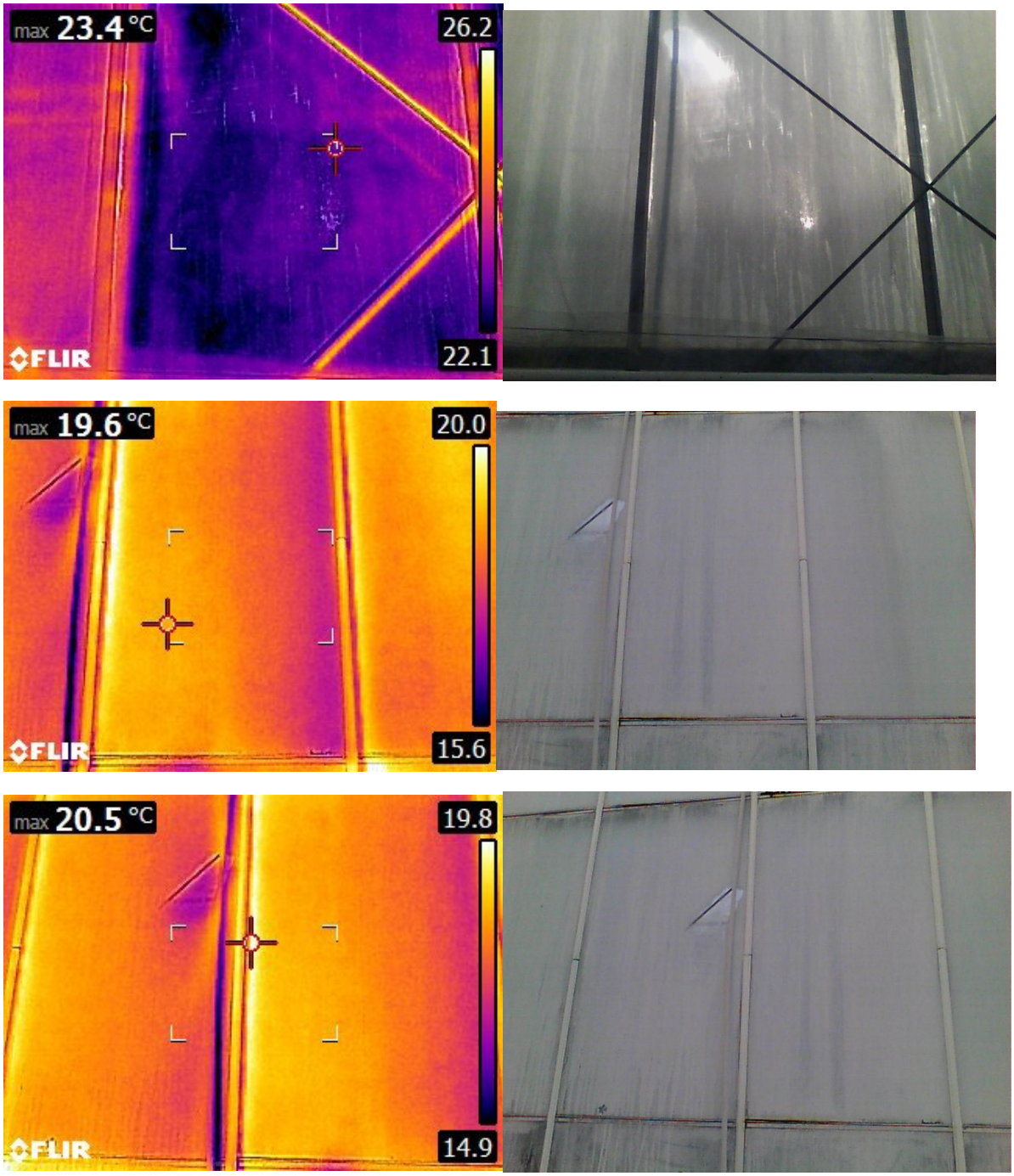

Figure 5: Temperature of the inside of the glasshouse with plastic wrap (top picture) vs the outside glass temperature (middle picture) vs the temperature of the glass gaps on the outside of the house (bottom picture)

The key point to notice between Figures 11 and 12 is that the infiltration losses in Figure 12 are within 1°C of the outside glass temperature, and around 3°C lower than the inside temperature. This is compared to Figure 12, which shows that the glass gaps are within 1°C of the inside temperature, and about 2°C higher than the outside glass temperature.

What this shows is that when the glass is wrapped with plastic with an air gap between, the infiltration losses through glass are greatly reduced. This is significant when considering that the largest form of heat loss in a glasshouse is due to infiltration. Reducing infiltration could reduce energy costs by between 10% and 20%, depending how much glass is wrapped in plastic.

During winter, the lower segments of the glasshouse walls, particularly near hot water carrier pipes, should be wrapped. By wrapping these low areas of glass, a reduction in heat loss through the glass was observed, while having a very small impact on light transmission into the glasshouse.

If glasshouses are going to be wrapped, it is recommended that they are done so with an air gap between the plastic and the glass. This will create an insulation layer and maximise the reduction in heat loss that will be achieved from the plastic wrap. If this is too difficult, bubble wrap is a good next choice.

When wrapping with bubble wrap, use long continuous rolls and try to cover the gaps between the glass segments, because this will minimise infiltration losses through these gaps. An example of the glasshouse bubble wrap that can be used is shown in Figure 16. This example is 100 metres of bubble wrap for $67.00 from Office Products Depot.

The type of plastic wrap to use for greenhouses is up to you, however, it could be worth purchasing a small quantity of greenhouse skin wrap as this will last longer and it could be taken down and put back up over winter and summer for a few years.

An example of this type of plastic wrap is pictured below in Figure 17, which shows 100ft of overwintering plastic film being sold for $27.00 on Amazon. A good option could be to speak to the person who provides greenhouse supplies for your facility.

Figure 6: Example of bubble wrap and plastic wrap that can be used to wrap glasshouses