Some notes about Mason Town Hall insulation.

Thermal camera inspection of a heated building is best done in cold weather when there are large and stable temperature differences between the heated space and the outside air.

Sunlight will warm exposed areas of outside walls, thereby appearing to change the effects of heat loss through the walls. A sunlit outside wall will be at a higher temperature - implying greater heat loss through the wall, thus poorer insulation than is present.

Thermal images taken inside also will be affected by the reduced temperature difference across walls whose outsides are being warmed by sunlight. From the inside the sunlit walls will appear warmer - implying less heat loss, thus better insulation, than is actually the case.

Consequently, the most useful thermal images of walls should be taken soon before sunrise when the building has had maximum time to come into equilibrium with the cold night air. Imaging during the evening after sunset is less reliable because the sun-heated walls will still be slowly cooling down from their sunlit peaks.

Thermal images of the Mason Town Hall were taken March 27, 2018. Nigh time temperatures had been in the low teens, under clear sky and low winds. Sunrise was due at at 6:38 AM. Thermostat inside showed 53°F

18 thermal images of the outside were taken between 6:02 and 6:08 AM

103 thermal images of the inside were taken between 6:22 and 6:48 AM (sunlight not yet hitting building)

The goals were to determine which walls were insulated, and which were not, and to try to locate significant leaks.

For orientation, here are some normal daytime photographs:

Front, facing Meeting House Hill Rd

Left side, main entrance

Rear

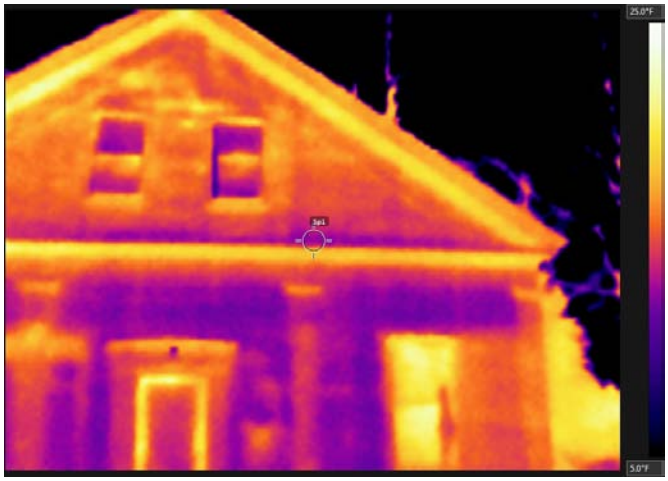
Right side

Looking at the left side view, the main entrance enters near the back side of the main room which extends leftward towards the rear to a raised stage and is the full width of the building. To the right of the main entrance are the bathrooms, an office, and the stairs to the upper floor.

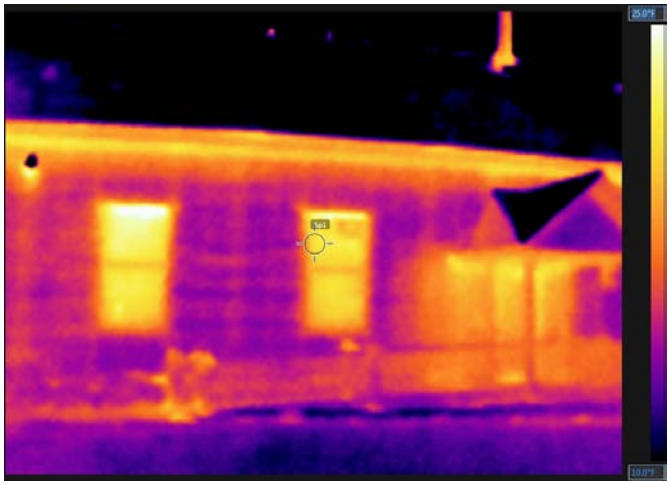
Looking at the Front view, that door opens into a corridor leading to the main room. Bathrooms are on the left side of the corridor and the office on the right. The stairs to the upper floor are at the far right, entered from the main room.

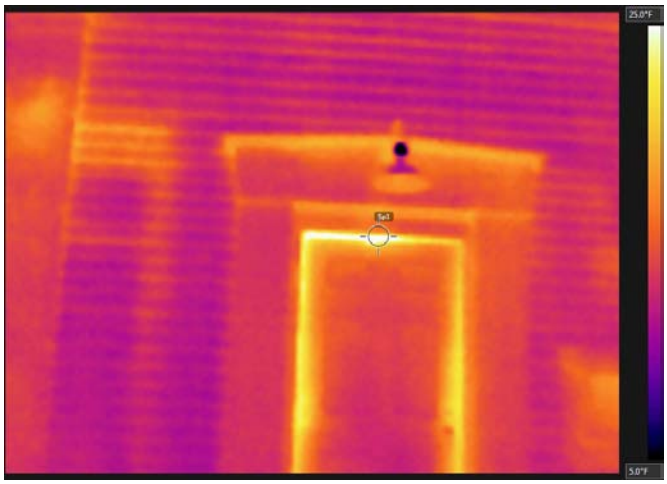
Outside surfaces:

Front

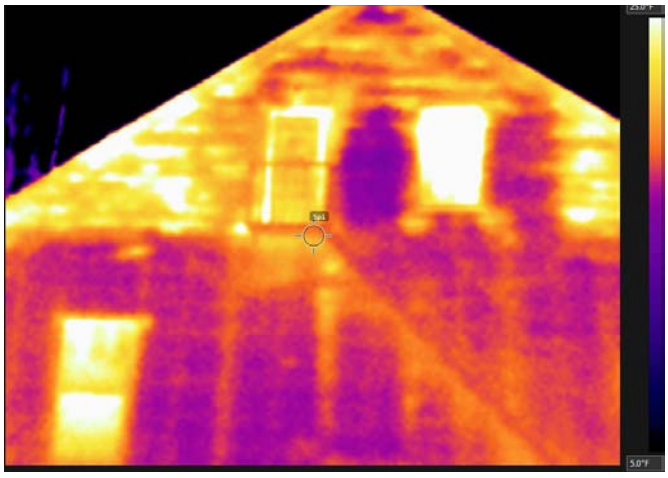


Left side, main entrance





Front door, detail



Rear

For almost all of the lower floor, the studs are warmer (leaking more heat) than the wall sections between - indicating that those walls are insulated. An exception is seen in the lower right side of the front view - which corresponds to the location of the stairs from the main room to the second floor. Lack of insulation here is further confirmed by thermograms taken inside.

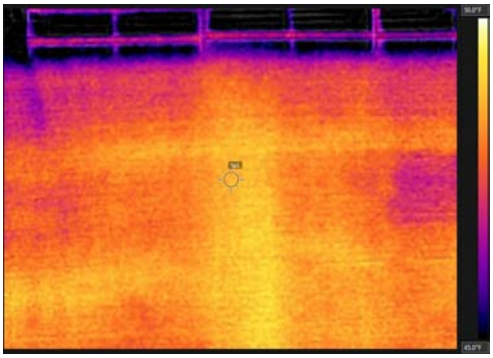
The gables are not insulated, except for two sections in the rear gable on either side of the right hand window. (the diagonal line is the metal fire escape)

Note in the side view the warmer strips just under the roof soffits; these are matched with a similar strip of warmth (poor insulation) at the same height in the front view. These likely represent the solid wood top plates which support the rafters.

Note that all windows are significantly warmer - these single-pane windows represent a major path of heat loss.

Note the very warm door perimeter shown in *Front door, detail* - which indicates poor weatherstripping. In fact there is a visible gap near the top which allows free escape of heated air.

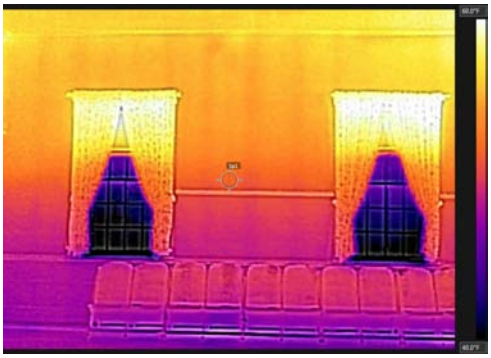
Internal surfaces - main room:



The room thermostat at the back (opposite end from the stage) of the room indicated 53°F; the FLIR thermal camera indicated 52°F at the same location.

Floor is uninsulated - above its support beams it is warmer than between the beams (see image to right). Average floor temperature is 48°F.

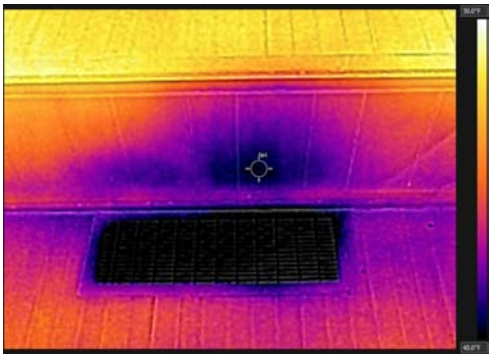
The walls are insulated as shown by the slightly colder surfaces above the studs than above the areas between studs. The small difference, 1 °F or so, indicates relatively unimpressive insulation - perhaps on the order of R6.



Note the very cold single-pane windows - lots of heat being lost there. Replacement with insulting double pane windows might be considered.

The blinds at the top are insulating to some degree - would it be practical to draw them down during periods of disuse?

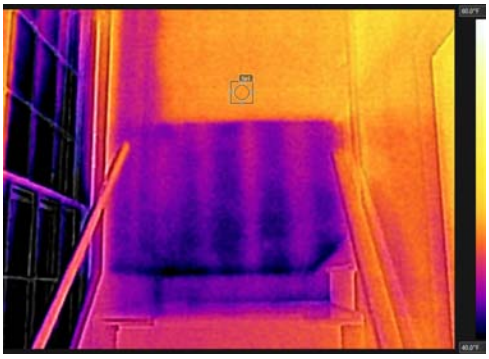
Wall temperature is quite stratified: 48°F near the floor, 49°F at the level of the window bottoms, 52°F at head height, 57-58° near the ceiling with spots of 60°F. Wood window frames are around °40F as is the glass, though the latter could be an E mismatch.

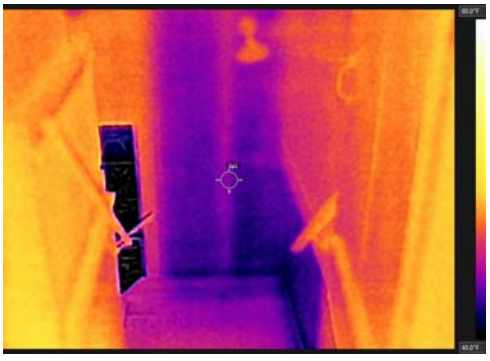


A floor grate in the floor just in front of the stage appears to be a source of cold air - as shown both by the coldness of the grate itself and also by the spot in the wood above being cooled by the air flow. Temperature of the grate itself is around 37°F; the cooled spot is around 40°F.

A similar floor grate at the back of the room shows similar but lesser cold air inflow (not shown). Perhaps the air ducts have come loose, or are not sufficiently insulated?

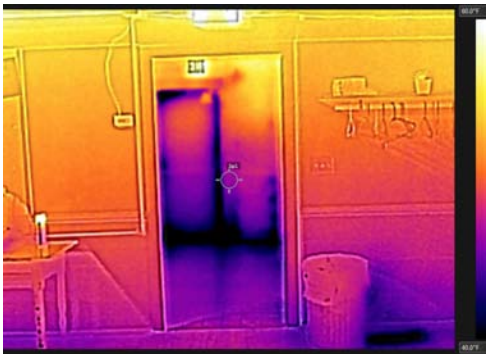
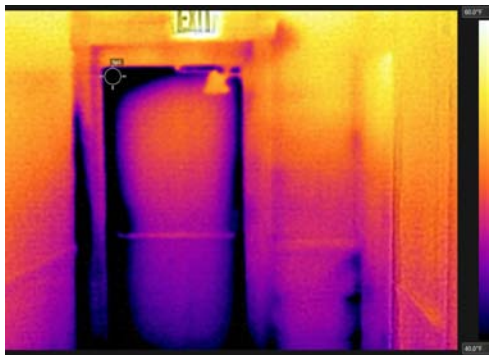
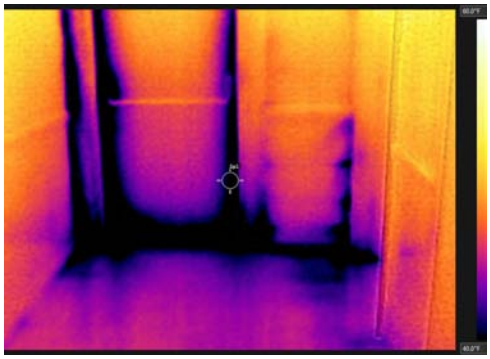
The stairs to the 2nd floor exit from the main room's rear left corner (as seen in inside images).





This area is noticeably cooler - in part due to the exit door and window the the left of the stairs, but also due to the lack of outer wall insulation in this corner location - see the detail images of landing from below and above. This stairwell should be a major path for warm air rising to the 2nd floor, so its coolness seems especially significant.

The corridor to the front door is another source of heat loss. The fit and weatherstripping of the outside door shows visible openings through which heated air escapes.

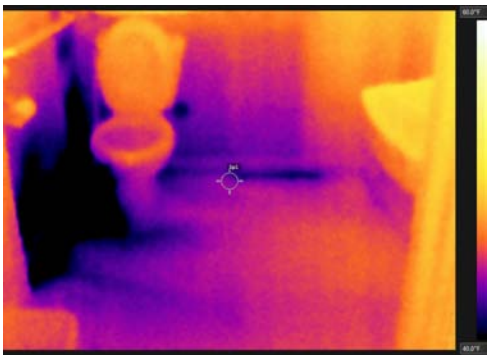
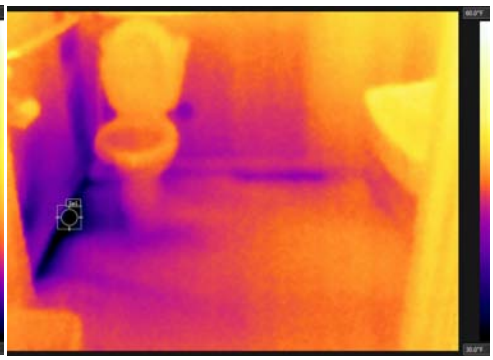




The upper left corner of the door (see center image) has a visible gap to the outside and a temperature of 27.5°F. The lower portion of the door and adjacent floor read low 30's down to 29°F.

To the right of this door is a bathroom.

The first (left-hand) image shows the 40-60°F scale used in most images.

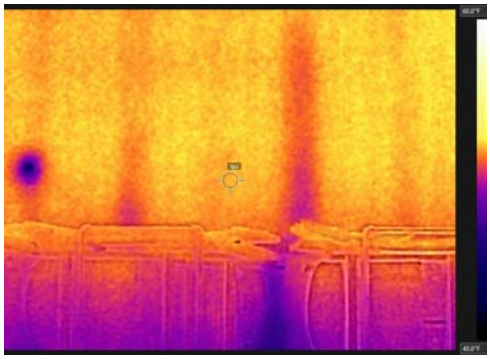
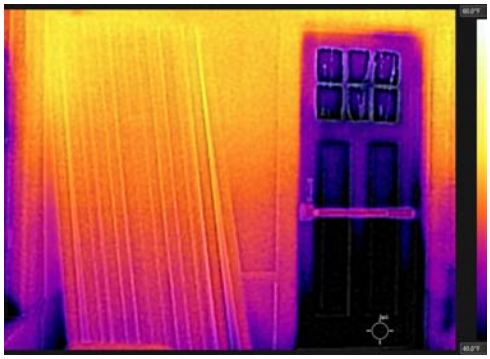
The right-hand image's scale's low temperature has been shifted down to 30°F to reveal more detail in the coldest areas. The lowest temperatures seen there are below 27°F.

There may be a risk of freezing in the adjacent toilet or in its plumbing below.

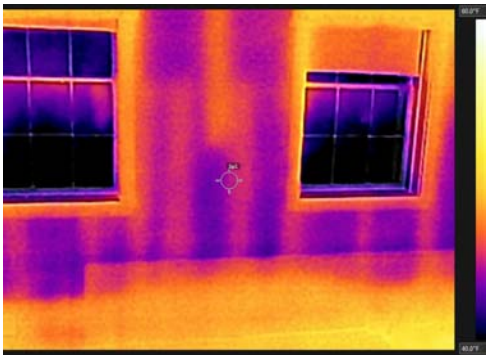
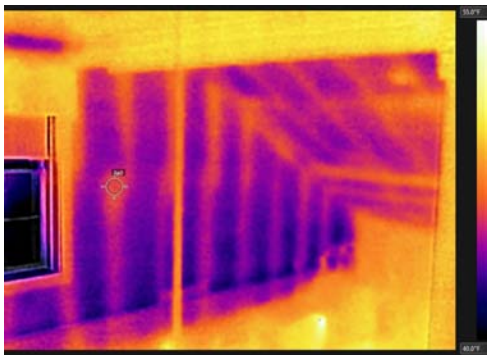
Moving to the front of the room - the stage - we again see evidence of insulated walls (colder over the studs than between them) and a cold door.

In the left-hand picture at the far left there is a curious circular heat leak - perhaps a large bolt anchoring something onto the outside of the wall?

Second floor

Going up the steps we enter the 2nd floor via the kitchen area. Neither the gable end walls nor the overhead ceiling sloping with the roof are insulated.

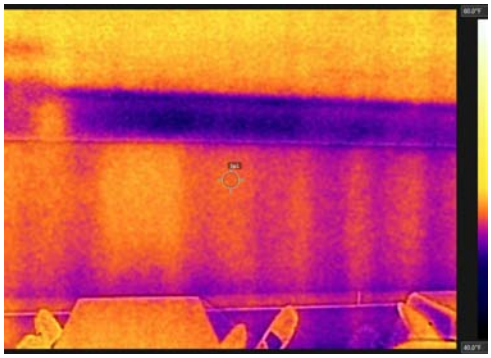




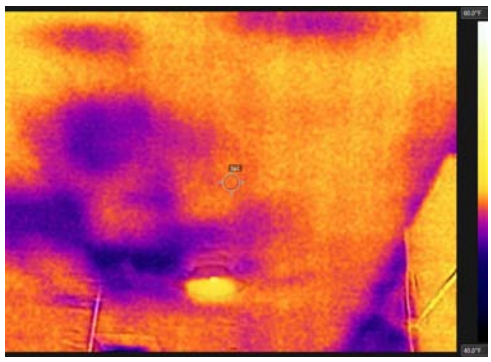
The dining area is raised up (to allow the high ceiling in the main meeting room) and reached by a short flight of stairs.

The area is enclosed by short vertical walls, a small hip section following the roof line and an overhead ceiling.

The side walls appear to be uninsulated (warmer over studs than between).

The hipped section between the vertical walls and the ceiling appears to be attached directly to the rafters without any insulation, and is noticeably colder.





The ceiling shows some odd thermal blotches. These might be due to displaced insulation (if there is any), condensation droplets, or ??.

Settling of the building has warped many of the door frames to the extent that the doors can no longer close. This allows copious air flow from the boxed-in dining area into the sub-roof area which is uninsulated and well ventilated by visible gaps in the soffits.