DESIGN DAY
MECHANICALS INC

8/18/06

Bob Green
c/o Mike Green
Brookline, NH

Re: Green Woodlands House/ Barn Project

Bob and Mike,

I have completed my review of the plans, and found that I did not need to meet directly with Lloyd Nichols of Tarm USA. I can still be available to visit the site if and when you think it is required. Based on my review, I have noted the following items.

1. As I mentioned in a previous e-mail, the Tarm Boilers are not listed to meet the required Standards in the prevailing IMC 2000.

   "The Excel boilers have been safety tested by Omni-Test Laboratories to UL 391-1995, CAN/CSA B366.1-M91, UL 726, ANSI Z21.13-2000, and CSA 4.9-M2000 test standards for sale in the U.S.A. and Canada."

   The IMC 2000 (International Mechanical Code, adopted by the State of NH) states the following:

   1004.1 Standards.

   …Boilers shall be designed and constructed in accordance with the requirements of ASME CSD-1 and as applicable, the ASME Boiler and Pressure Vessel Code, Sections I, II, V, and IX; NFPA 8501; NFPA 8502 or NFPA 8504.

   You will note that the Excel testing does not match the testing required by the IMC 2000. have ignored that issue in my own house installation. But, I do not want to presume that you would make the same decision. In another Tarm installation we got around the lack of ASME certification by making the boiler non-pressurized and exchanging the boiler water to the heating system through a heat exchanger. This heat exchanger could be another copper coil in the storage tank.

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2. In the specifications it mentions “PEX tubing, ASTM F 876 and F 877” as acceptable piping materials. The schedule for the Radiant Manifolds mentions that the selections are “Based on Viega Pextron”. The Tarm boiler is a steel boiler and must have ONLY PEX tubing with an oxygen barrier to keep it from rusting out prematurely. The ASTM standards referenced do not pertain to the oxygen barrier as the standards are also met with Viega’s non-oxygen barrier tubing product. The Pextron tubing does have an oxygen barrier, but I think it is worth specifically noting in the specifications that tubing with an oxygen barrier is required.
3. In the Control Sequences, a minimum tank temperature of 110 degrees F is shown. It is worth checking with the manufacture of the domestic hot water coil in the storage tank to see that 110 degree water in the tank will provide you with sufficient water temperature at peak demand with your plumbing fixtures.
4. Also in the Control Sequence, the maximum water temperature is shown as 200 degrees F. When I purchased EPDM roofing for use in my storage tank, I asked about the listed temperature rating for the product, and the supplier told me that upper limit was listed as 180 degrees F. Perhaps the manufacturer of this tank should be consulted about the upper limit that they recommend.
5. The Control Sequence notes the following regarding the operation of the boiler pump P-1 “If the wood boiler B-1 is operating, energize pump (P-1)…”, and “When the boiler is stopped, the associated pump shall continue to operate until the temperature of the water from the boiler is less than 5 degrees F above the tank temperature.” The Termovar thermostatic mixing valve is set to maintain a minimum 160 degree F return water temperature to the boiler to prevent creosote build up in the heat exchanger. In a scenario where the wood load in the boiler has been used up, and the storage tank is water is 120 degrees F (before the LP side of the boiler would be activated at 110 degree F), the Termovar will cause the circulator pump flow to be continuously recirculating through the boiler without going to the tank from the time when the boiler temperature is 159.9 degrees F until it reaches 114.9 degrees F (“…less than 5 degrees above the tank temperature.”). Also the boiler circulator does not need to circulate until the heat in the boiler reaches at least 160 degrees F, when it can then come out of the recirculation mode and start sending heat to the tank. I believe that the wood boiler high and low limit controls should allow circulator pump P-1 to operate, wired in series with the high and low limit setting of the thermostat or thermostatic sensor in the tank.
6. The exception to the operation of P-1 is when the boiler reaches its safety high limit. If, as sometimes can happen with a cord wood boiler, the combustion fan damper sticks open, or for some other reason the combustion does not stop when the operating high limit is reached, the boiler can continue to generate heat, eventually reaching a point where the safety relief valve blows off. I believe that Tarm still recommends two levels of safety control before the safety relief valve blows off.

7. The first level of emergency high limit safety control is to open a emergency dump zone or zones and activate P-1 and the terminal heating pump P-2, to reject excess heat to the building. Yes, it will overheat the space, but this is preferable to blowing off the safety relief valve with the resulting steam, condensed steam on cold surfaces like windows, etc., etc.
8. The second level of safety has to do with the loss of electricity, whether from loss of power, or from the failure of an electrical component. If power is lost, a gravity connection to a dump zone or zones should be opened to allow for thermal siphoning of extra heat to high terminal heating units located above the level of the boiler. In this case it could be a powered close, spring fail open valve connected from the boiler supply and return piping directly to the radiant panels on the second floor. Since this water could be in excess of 200 degrees F, the use of PEX tubing may not be appropriate for the portion of the piping that would interact with these dump zones.
9. The use of a storage tank is the recommended way of operating this boiler in the wood heating mode. In particular it is best to batch load the wood, which means that you fire a full load of wood and let it basically burn out. This may not be what is written in the literature that you receive, where it talks about being able to through wood on the remaining coals when a batch is finished, but it is what has been verbally communicated to me by Tarm USA. The issue is creosote, its slightly acid quality, and the square wood box. Creosote WILL build up in the fire box. This normal, and it is as far as the creosote build up should travel. As a part of that build up, the bottom corners of the wood box can start to trap slightly liquid creosote behind an outer layer of creosote, and it can start to attack the steel of the wood box, leading to premature failure. By batch firing the wood, and allowing the wood box to dry out before the next firing, it allows that moisture to dry and allows for easier periodic cleaning of those lower edges of the wood box.
10. The final mundane observation is that the diffusers and grilles on the plan have not been coordinated with lettering from the schedule.

That is the extent of my review at this time. I'm sure you may have additional questions after reading it, so please e-mail or call, and, as I wrote earlier, I can travel to the site if and when you need me. I am sending a copy of this report to Lloyd Nichols for his review and input also.

Sincerely,

DESIGN DAY MECHANICALS, INC.

Douglas C. Waitt