# 2014-09-02

# Calculator Development Timeline

## Work Item 1: Setting the goals for the project

1.  Prove that the open-source calculator does calculate standard Austrian design of a channeled heater.

2. Make sure we can cover all types of heaters we build: contraflow and bell heaters.

3. Test heaters made with other refractory materials (firebricks, refractory concrete, soapstone) that have been calculated with Damiens calculator.  Co-ordinate with Tulikivi regarding the testing of soapstone properties.

4.  Test a heater with a large glass door by reducing glass area to see what the effect on emissions and performance is.

5. Allow the use of a prefabricated or partly prefabricated core (covered by standard 15250 in Europe)

6. Make the burn rate variable. This will allow the simulation of firing with large firewood pieces (EN15544 sets firing duration to 77 minutes, whatever the fuel load,meaning that the larger the load, the smaller the pieces have to be, which is not how masonry heaters are typically operated in North America)

7. Base the dimensioning of the firebox on burn rate instead of on fuel load (EN15544)  
 - make the air factor variable (set to 2.95 in EN15544)   
- make the air speed and gas speed variable (set at 4mN3/kg and 4.8 mN3/kg, respectively in EN15544)

- make the temperature at the top of the firebox and at the entrance of the heat exchanger variable (set to 700°C and 550°C, respectively in EN15544)

- allow the coefficient of heat transfer to vary with the cross section area of each channel

- allow the coefficient of heat transfer to vary with the orientation of the gas flow (horizontal, upward, downward) in each channel

 - allow the coefficient of heat transfer to vary with the gas flow velocity in each channel

These last three changes are instrumental in making the standard accurately calculate thermal transfer in units where most transfer happens when the gas flow is descending (Contraflow and Bell heaters) and in units where the gas flow is very slow (Bell heaters).

Testing Proposal (from Alex):

For the best outcome of our testing for the calculator, we should build a specific heater, which would allow easy changes for all versions we need to test, rather than collect bits of info from different labs, different people and heaters.

Benefits:

-          Having the same firebox would eliminate unnecessary variability and would simplify the task.

-          getting a small change to arrive at the needed variation would be easy in comparison to trying to build entire specific heater or trying to make changes in someone’s existing test heater.

-          It would be much cheaper for the association to invest in a single set of proper quality equipment, than trying to finance part or entire cost of several sets or trying to solicit donations.

-          Convenience of having everything set-up and ready for tests any time.