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LOW-COST FIRE RESISTANCE TESTING METHOD OF WOOD COMPOSITE PANELS

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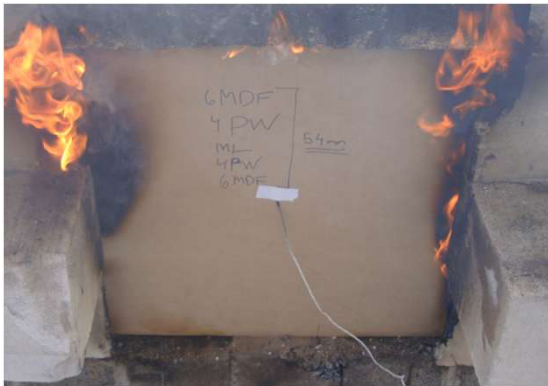
Standards

- BS 476-22 → publishes minutes of resistance separately. (older)
- EN 13501-2 → collapses that into a single EI/W rating, based on the weakest result.

Example:

- Integrity failure: 72 minutes → **E60**
- Insulation failure: 46 minutes → **I30**
- Classification under EN: **EI30**

Failure mode



Integrity failure:
Current surface temperature in
center is 122C



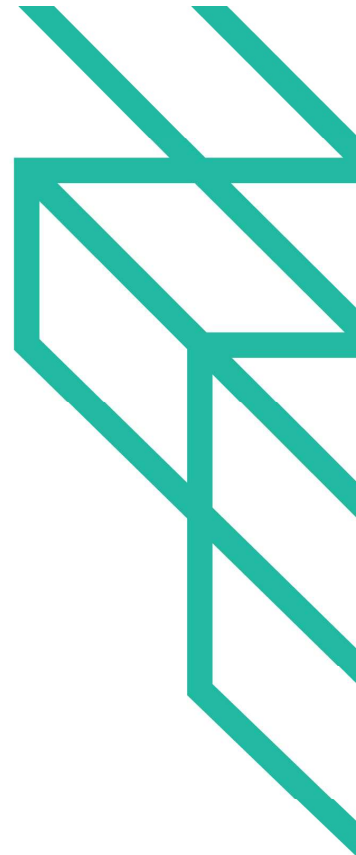
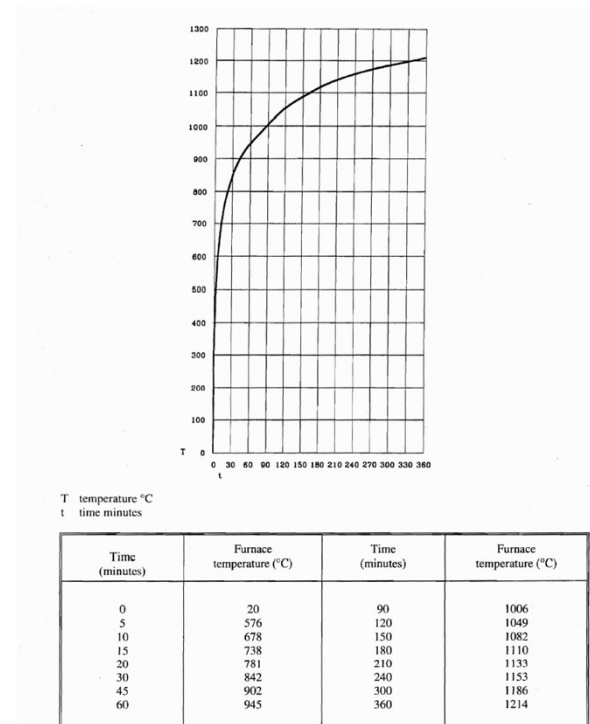
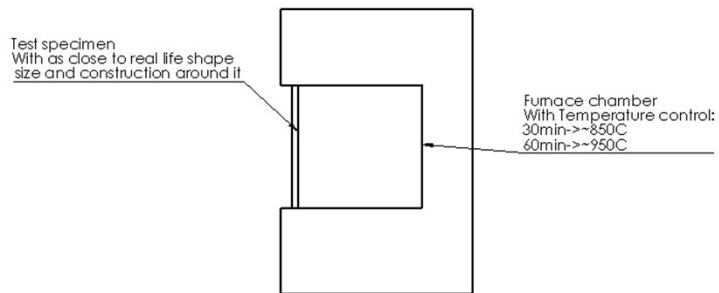
Insulation failure:
Average surface
temperature >140C



Insulation failure:
Maximum surface
temperature >180C

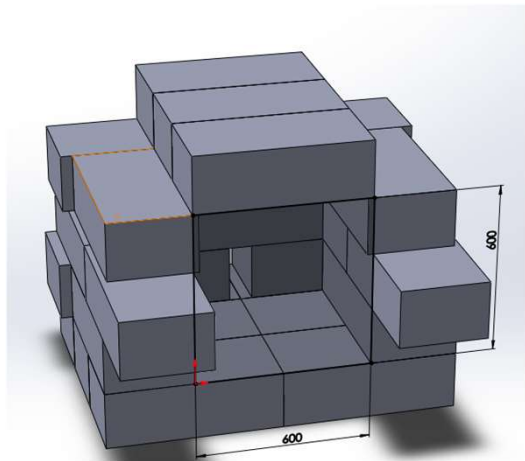


How The test works



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How the oven was built



Measurement tools	#:	Rated Maximum	Error
B&D infrared thermometer	BD TLD 100	150	0.1
Digital Thermometer	6802 II	1300	0.1
K-Type Thermocouple Sensor 1300°C	-	1300	-

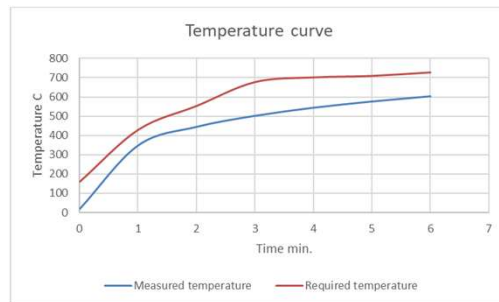
Burner	Sievert PRO 88
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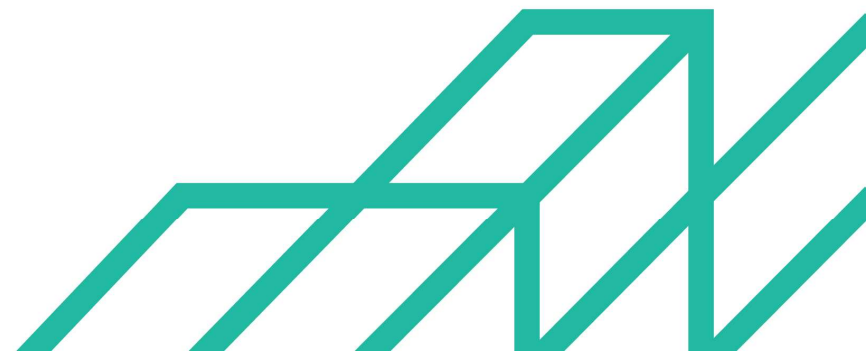
Where the corners were cut.

- Size.
- Pressure in oven chamber is not measured.
- Surface radiation not measured.
- Infrared thermometer.
- Temperature controls.



How does it compare to real results:

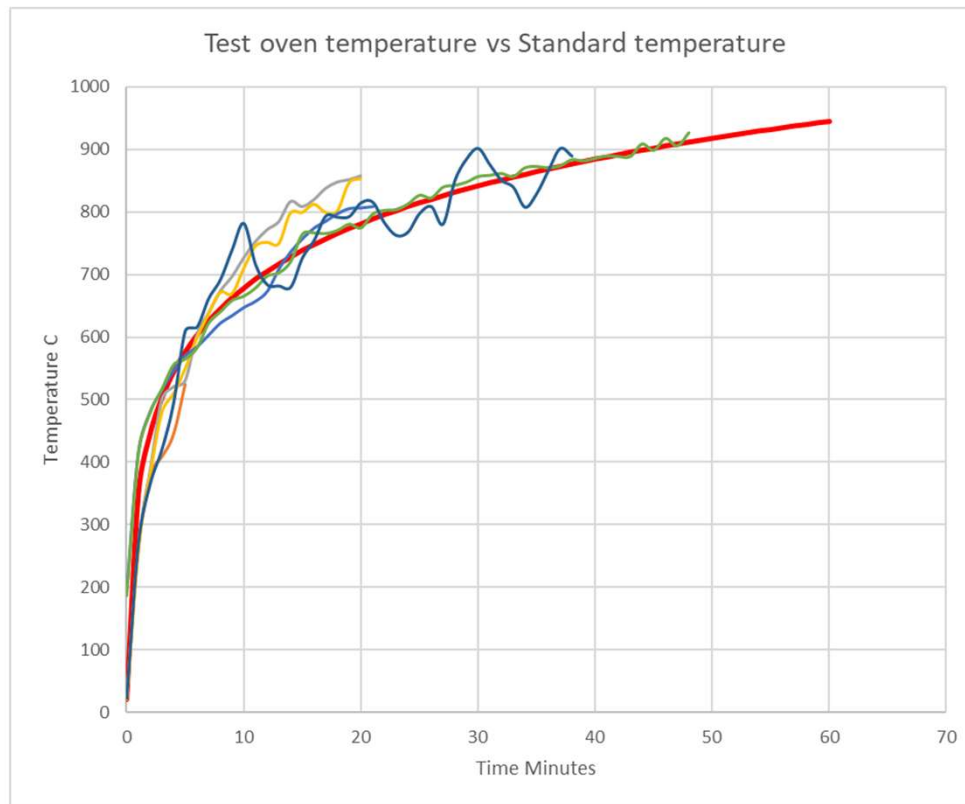
- Two products with known EI rating were tested and results compared.
- One with EI30 (FD30) and one FD30
- Tested results were close.(Differences in measured temperature curve to required curve.)
- Burn was uniform.



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Temperature curves



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What to improve

- Very simple microcontroller (Arduino) based gas valve control.
- Oven temperature sensor linked to this device.
- Panel surface temperature sensors that's linked to logger.
- If non uniform along surface panel is tested definitely thermal camera would be interesting.
- For precise results for measuring with IR devices emission coefficients need to be calibrated(also smoke..)



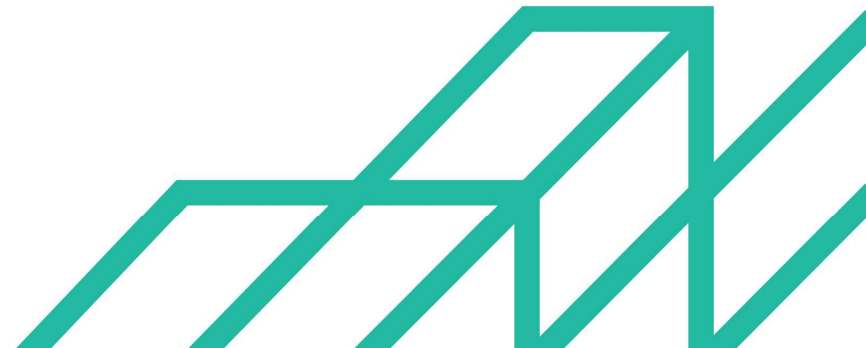
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Conclusions

- It is possible to make relatively cheap reasonably precise fire resistance testing apparatus from aerated concrete and gas burner.
- Wood in fire acts surprisingly predictable, changes color post 100C, and starts to burn very close or just after the 180C surface temperature.
- This kind of oven can be used to do even smaller scale comparative tests for example between glues.



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