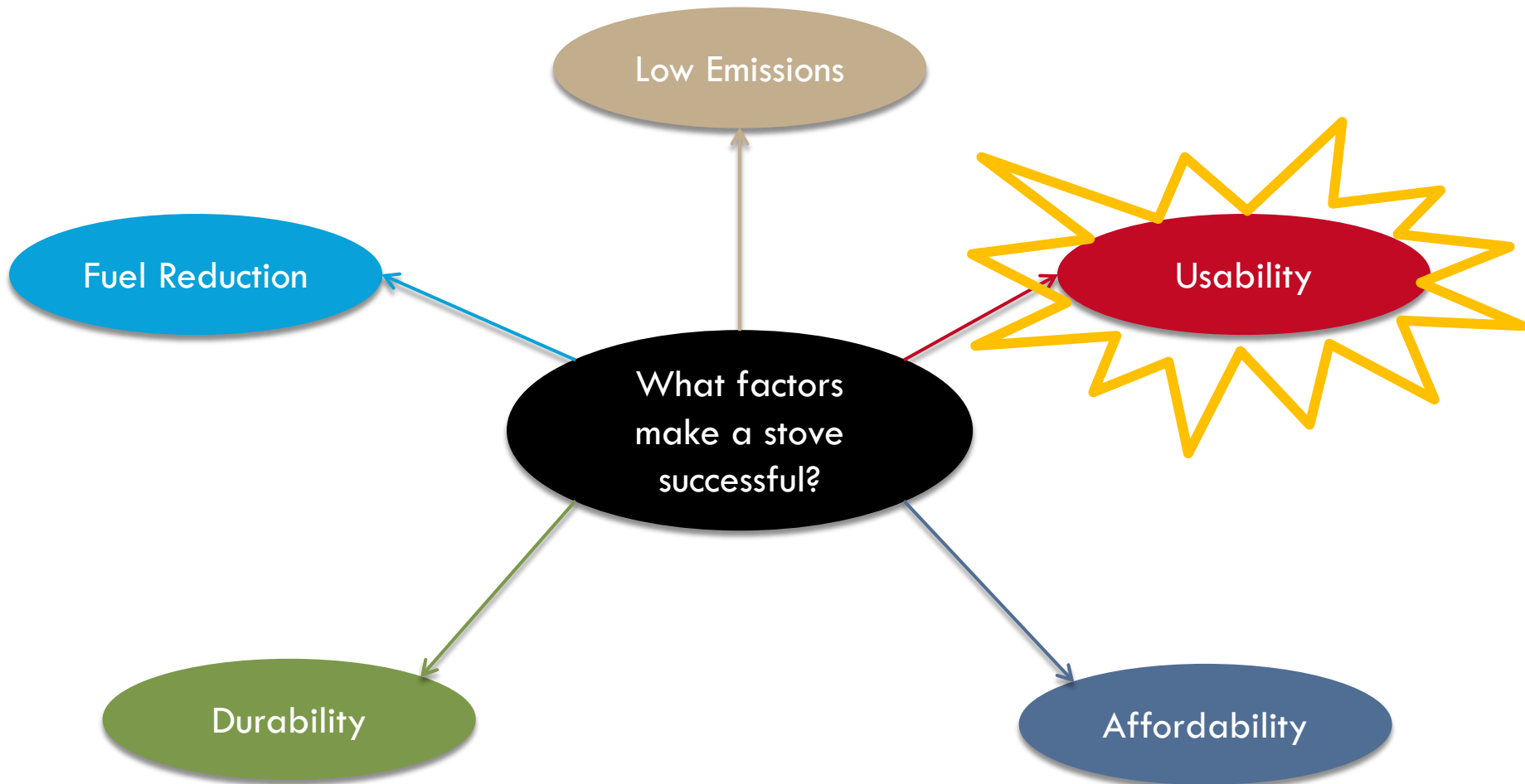


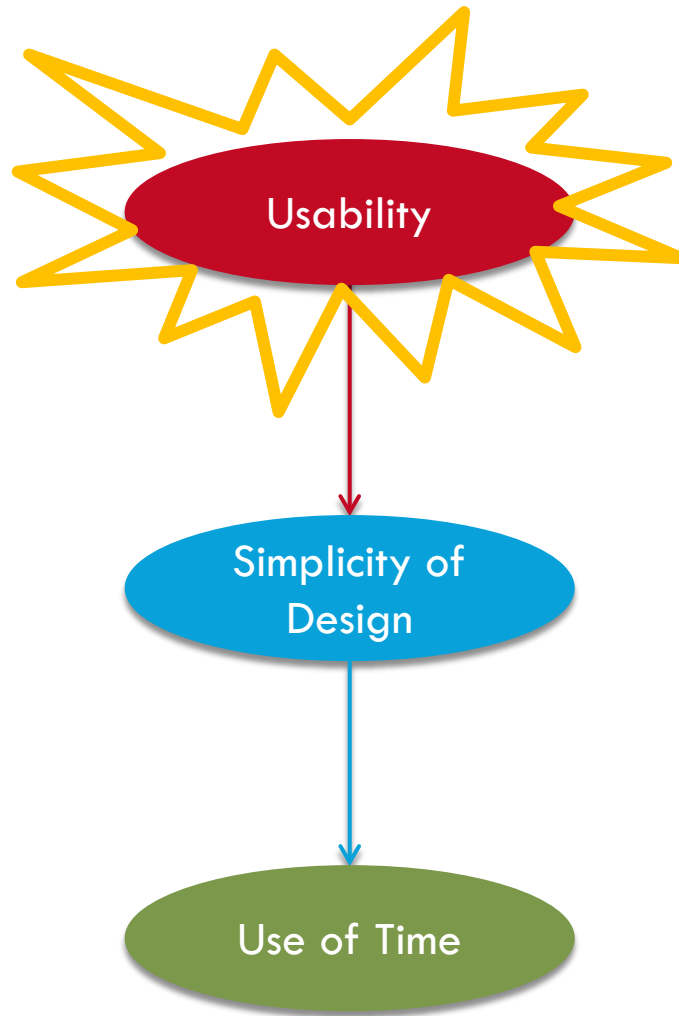


WALK AWAY TESTING

burn
DESIGN LAB

ETHOS 2019 | Molly Mazzucco





How to Evaluate Usability?

Field Simulation Protocol:

1. Baseline laboratory WBT
2. WBT at 1.5x design firepower
3. WBT with larger wood
4. WBT with wetter wood
5. WBT with reduced tending
6. **Walk Away Test**

Walk Away Test

- Motivation:

- ▣ Wood stoves require significantly more attention than other types of stoves, leaves insufficient time to complete other tasks

- Purpose:

- ▣ Quantify how long a user can walk away from their stove without the fire going out = **walk away time**
- ▣ Determine what factors increase walk away time

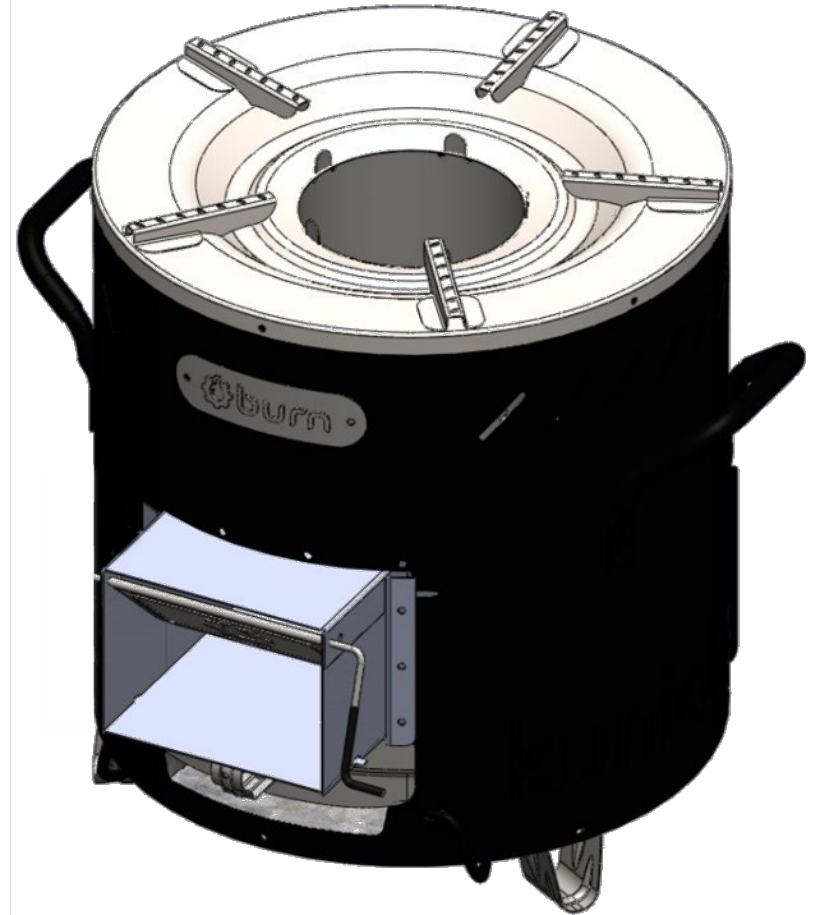
Walk Away Test Procedure



1. Light the stove to the design firepower with the pot off.
2. Once 15% of the mass of the wood and all kindling have burned off, tend the fire one final time.
3. Place the pot on the stove and initiate the walk away period.
4. The walk away period ends when the firepower drops below 1.0 kW (or fire travels outside of tunnel).

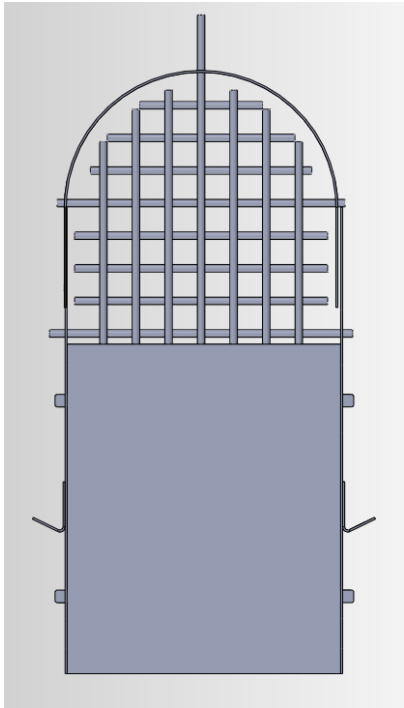
What Factors Affect WAT of Kuniokoa?

- **Extended Feed Tunnel**
 - ▣ Previous testing concluded that adding a 5cm tunnel extension to the stove produces the greatest walk away time
- **Extended Grate?**
 - ▣ Increases airflow under the fuel

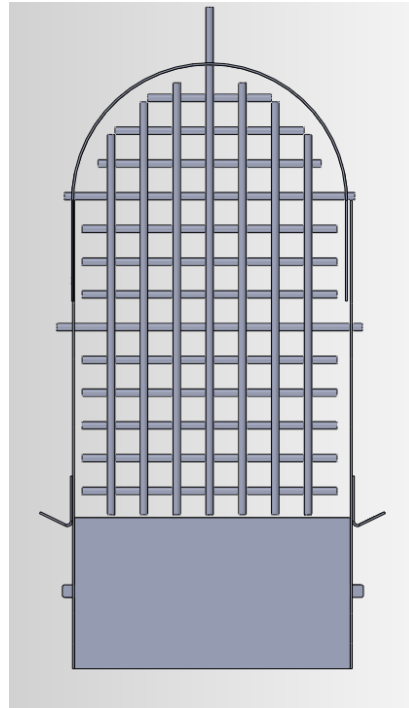


Previous testing on extended feed tunnel conducted by Lynée Turek-Hankins (Burn Design Lab)

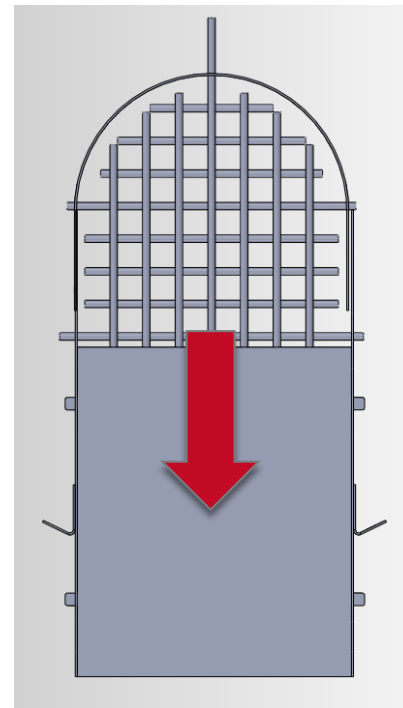
Grate Configurations



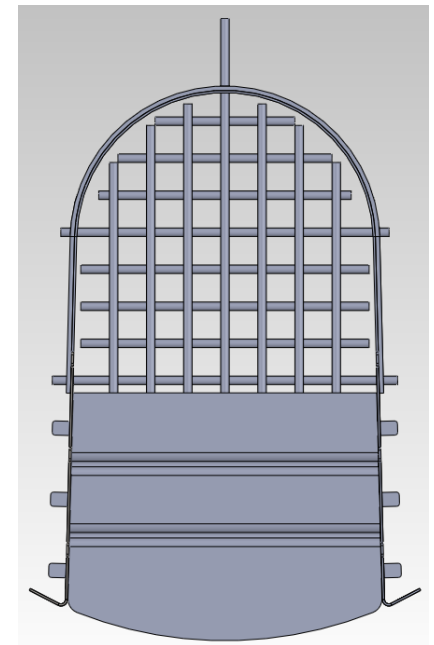
Production Grate
Extended Tunnel



Extended Grate
Extended Tunnel

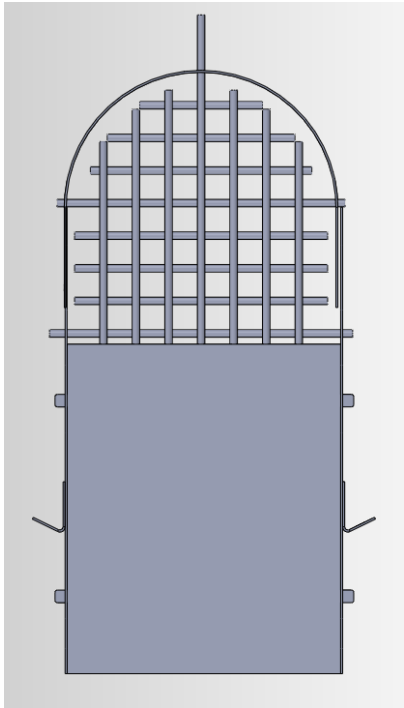


Transition Grate
Extended Tunnel

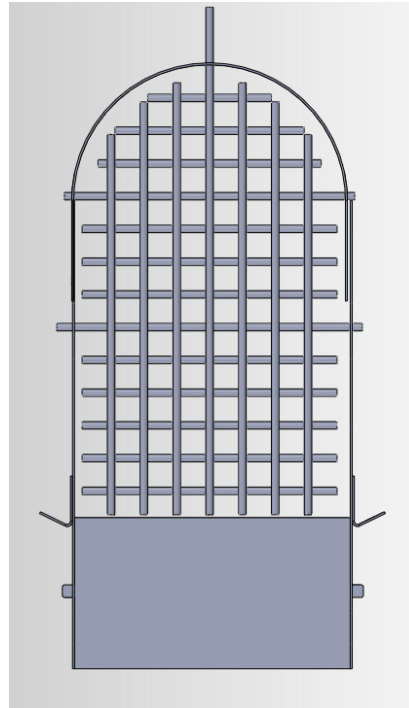


Production Grate
Production Tunnel

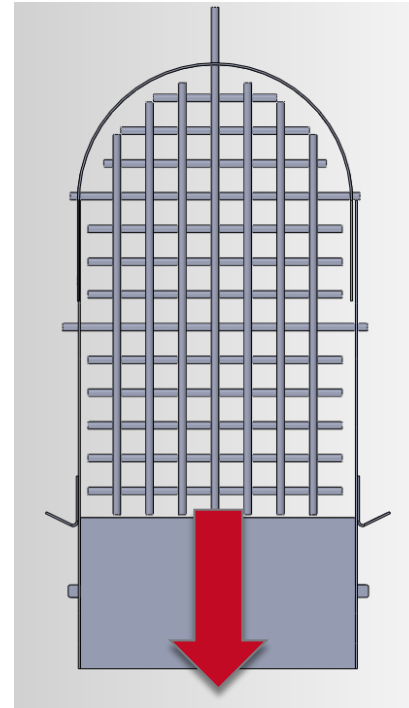
Grate Configurations



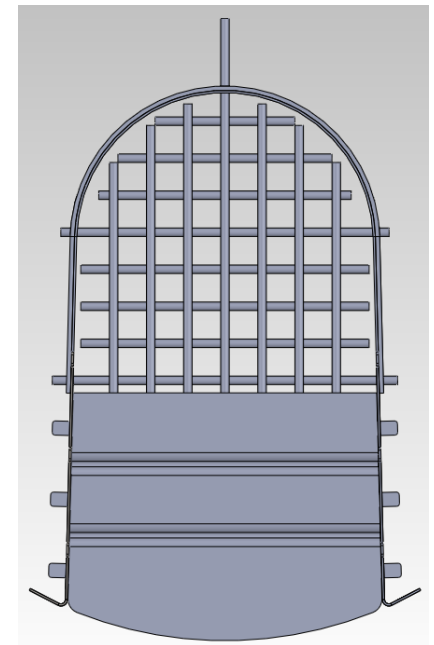
Production Grate
Extended Tunnel



Extended Grate
Extended Tunnel



Transition Grate
Extended Tunnel



Production Grate
Production Tunnel

Observations

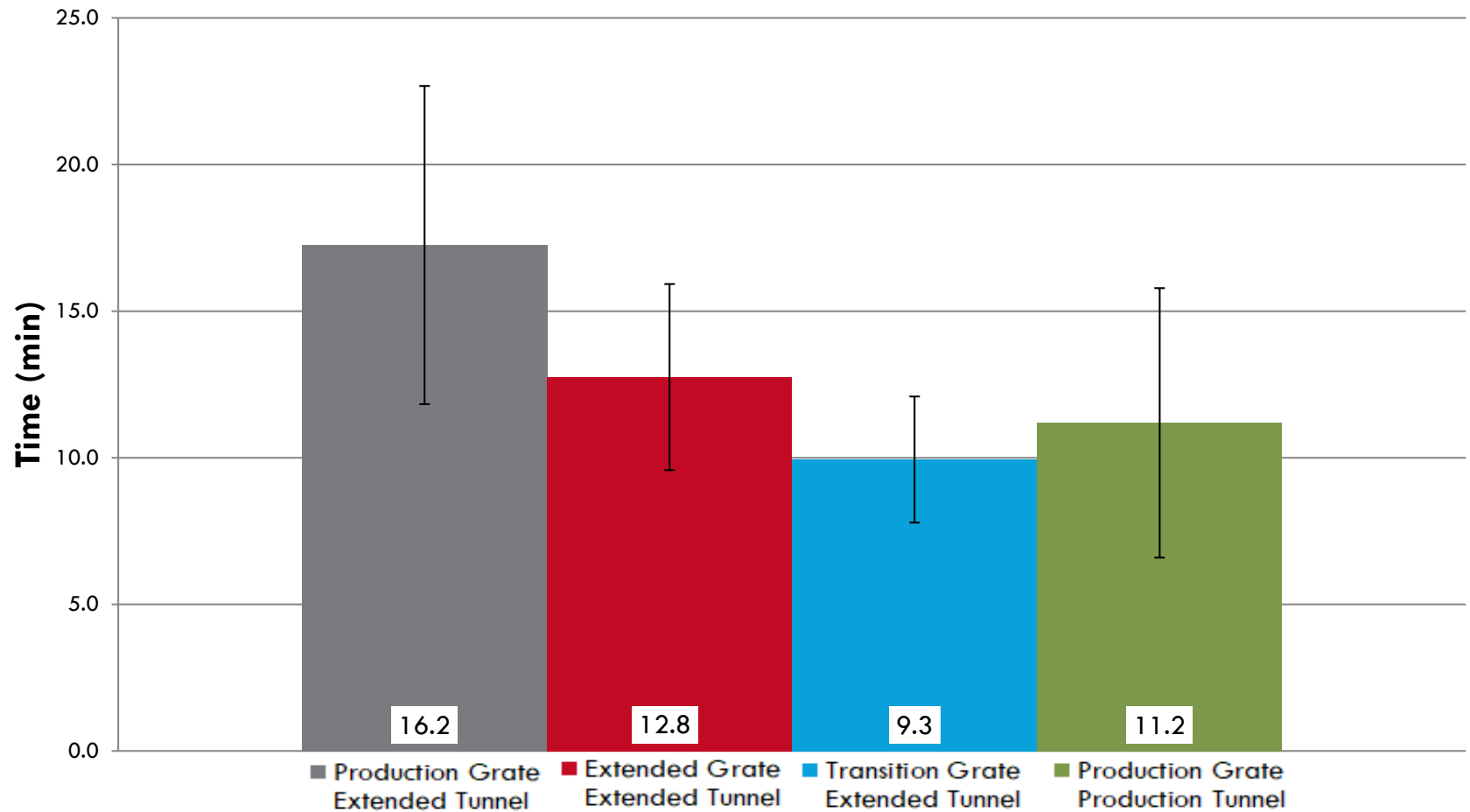
- During walk away period, fire travelled outside CC
 - ▣ Safety hazard
 - ▣ Loss of thermal efficiency
- **Safe walk away period** ends once flame visibly exits tunnel
- **Total walk away period** ends once firepower drops below 1.0 kW



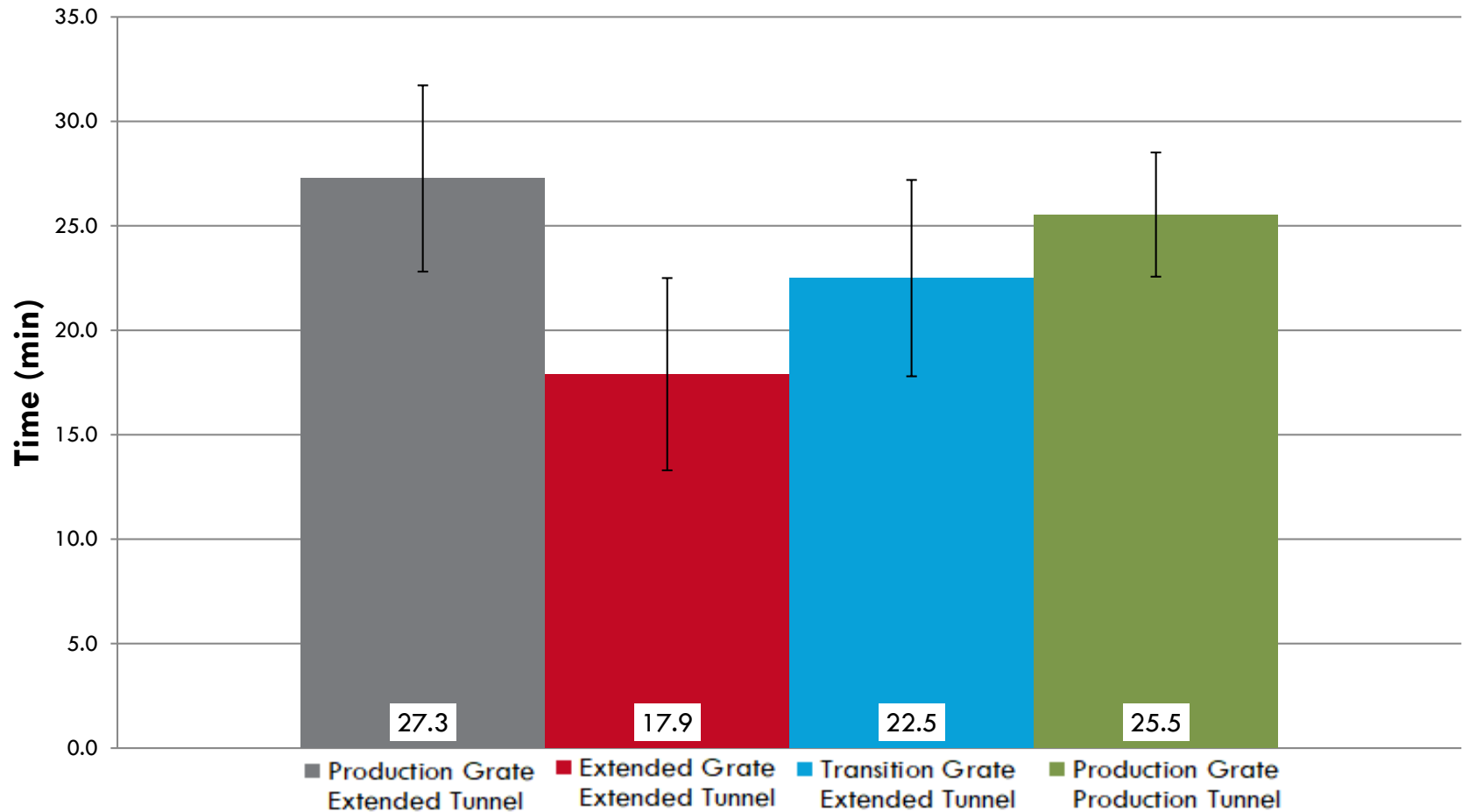
Unsafe Walk Away Periods

	Production Gate Extended Tunnel	Extended Gate Extended Tunnel	Transitional Gate Extended Tunnel	Production Gate Production Tunnel
Total Number of Tests	11	11	11	7
Tests with Unsafe Walk Away Period	7	9	3	6
Percent of Tests with Unsafe Walk Away Period	64%	82%	27%	86%

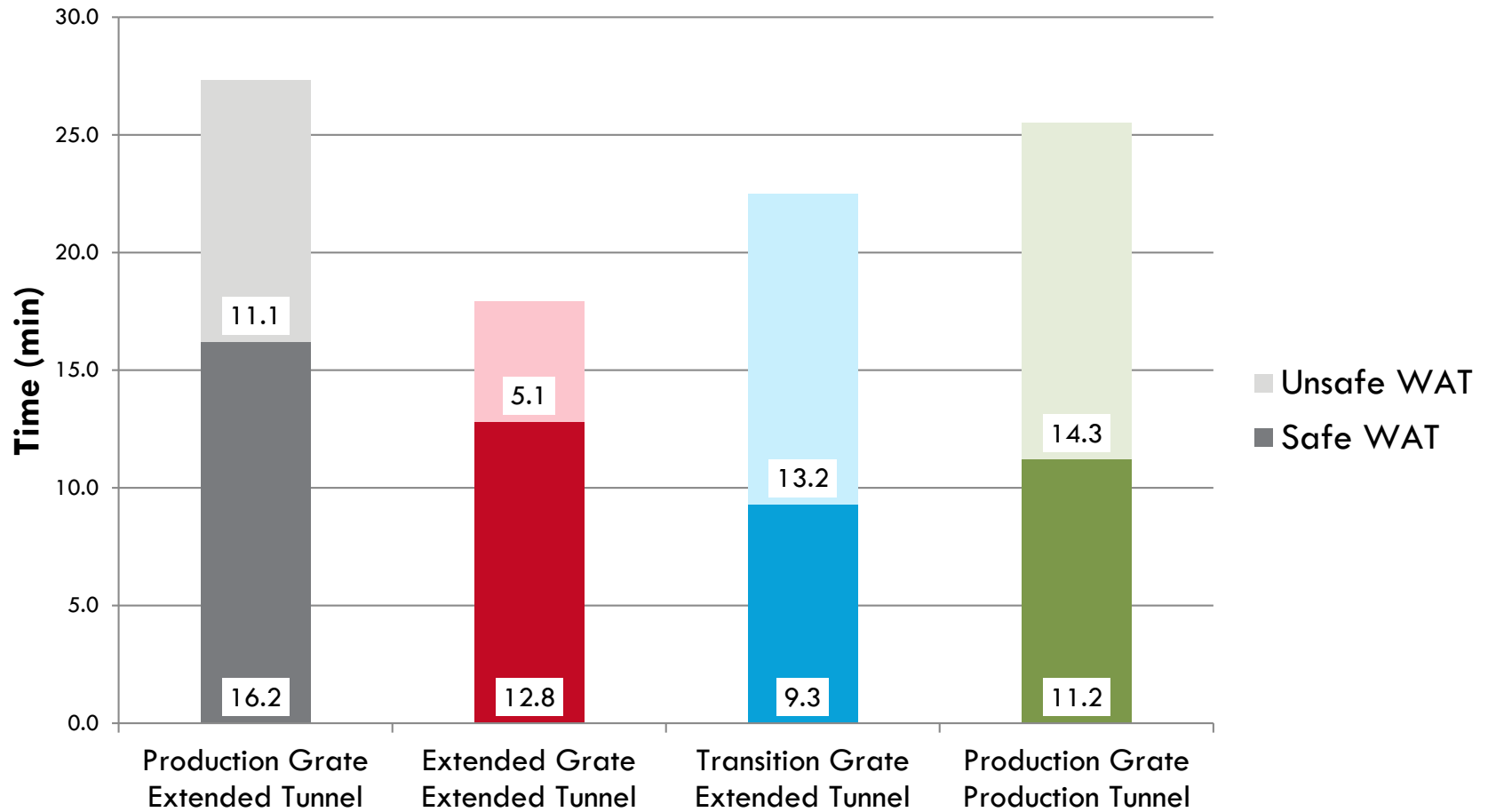
Safe Walk Away Times



Total Walk Away Times



Walk Away Time Comparison



Conclusions

- An extended grate does not appear to increase the walk away time
- May be an ideal grate length between the production and fully extended grates
- The flame in the extended grate configuration was least likely to escape the tunnel
- An untended fire is extremely unpredictable leading to increased variability between tests

Future Studies

- Evaluate other stove design factors that affect walk away time
- Develop safety features to decrease risk of fire escaping the tunnel during the walk away period
- Determine walk away times for other cookstove models on the market
- Conduct remaining field simulation tests to evaluate how other factors affect usability of Kuniokoa

THANK YOU