# Development of a Fireplace Baseline Particulate Emission Factor Database


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# Better Quantifying FP Emissions

- ASTM Task Group creating New Test method for Wood Burning FP
- 650,000~FP sold/year (6 Xs # of WS/year)
- PM 2.5 NAA need solid data for SIPS
- Existing Data base highly varialbe in method & quality --  2 Different test methods in use

# LITERATURE REVIEW

- OMNI identified 34 sources of Data
- Some used only portions of fires
- Some used Novel sample methods
- Some did not report Burn Rates

  (4.8kg/h used - ave for Data Base)
- 4 Methods used– All converted to 5G

# Fireplace Test Methods

- EPA **Method 5** samples directly (proportionally to flow) wt Heated Filter -
- **5G** – Dilution Tunnel- catches Condensate
- **ESS/AWES** – Designed for In-Situ – uses heated front filter & cooled XAD resin
- **5H** – Direct sampling but wt Cooled filter & 2nd "Back half" filter for condensables

(Standard format for Regs & Emission calcs)

- Other methods use conversion factors to report in "5H Equivalents"

# No Standard test method for FP

- Most researchers use Dimensional lumber for reproducibility
- Most researchers modifyed something in method to make it work for fireplaces
- AWES tests done “In-Situ” on cordwood
- ALL reports scrutinized for outliers and then converted to both 5G & 5H numbers
- Note-Original conversion from WS Data

## Table 1A - Summary of PM Factors for Masonry and Factory-Built FP

| Parameter | 5G g/kg | | 5H g/kg | | Count |
|---|---|---|---|---|---|
| | Mean | Median | Mean | Median | n |
| All masonry and factory-built (zero clearance) | 8.4 | 6.4 | 9.5 | 7.5 | 360 |
| All cordwood | 11.7 | 11.3 | **13.0** | 12.6 | 167 |
| All dimensional lumber | 5.6 | 4.3 | **6.5** | 5.2 | 193 |

**ave moisture all runs- 20%, ave burn rate for all runs - 4.8 kg/hr**

**Table 1B - Summary of PM Factors for Masonry and Factory-Built FP**

| Parameter | 5G g/kg | | 5H g/kg | | Count |
|---|---|---|---|---|---|
| | Mean | Median | Mean | Median | n |
| All with closed doors | 4.8 | 3.5 | 5.6 | 4.4 | 104 |
| All with open doors | 9.9 | 8.4 | 11.1 | 9.8 | 256 |
| All masonry fireplaces | 9.6 | 7.2 | 10.6 | 8.7 | 90 |
| All factory-built fireplaces | 8.0 | 6.1 | 9.2 | 7.2 | 270 |

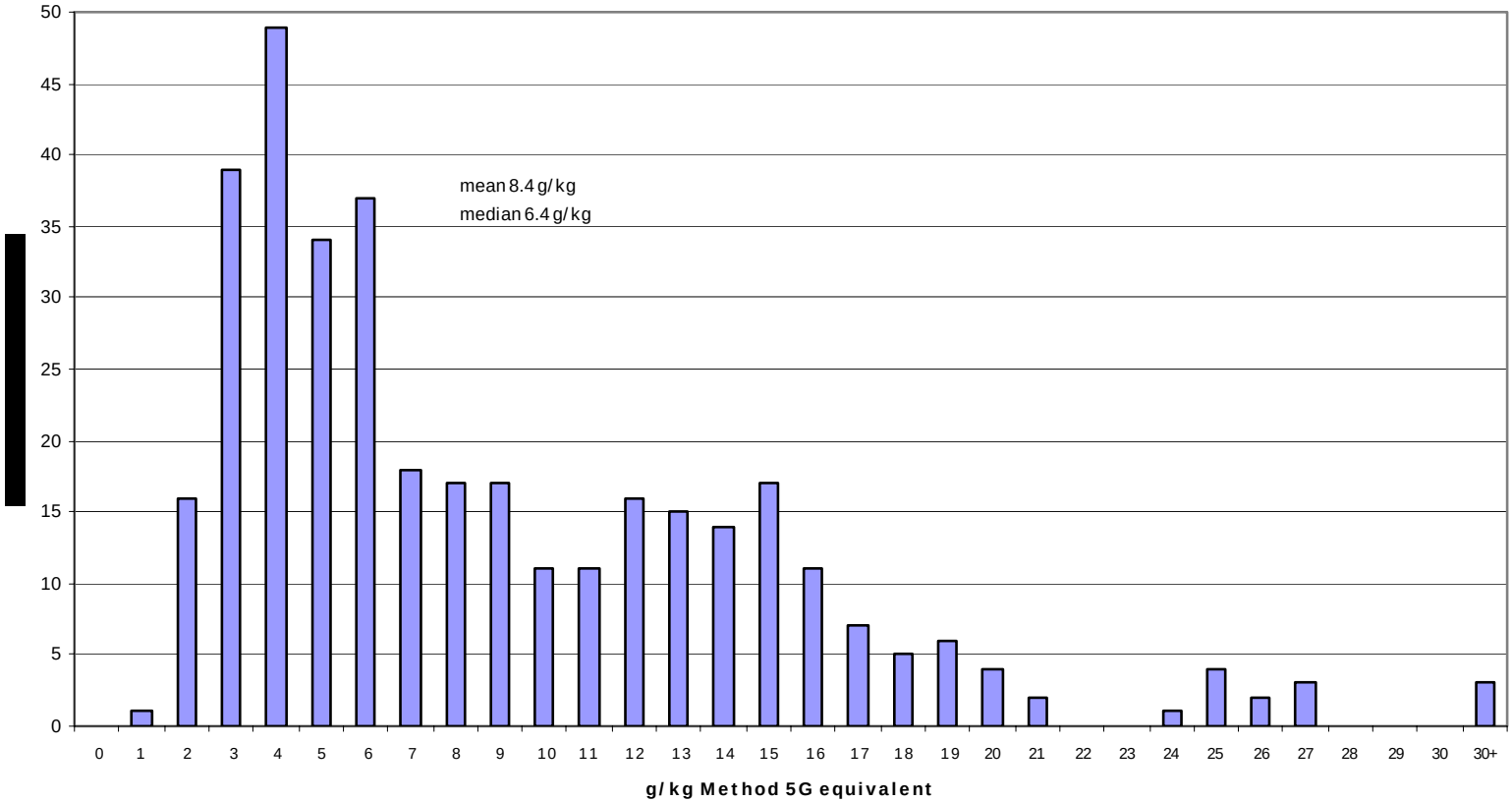
## Table 1C- Summary of PM Factors for Masonry and Factory-Built FP

| Parameter | 5G g/kg | | 5H g/kg | | Count |
|---|---|---|---|---|---|
| | Mean | Median | Mean | Median | n |
| Cordwood, factory-built, open doors | 12.4 | 11.9 | 13.9 | 13.5 | 92 |
| Dimensional lumber, factory-built, open doors | 7.1 | 5.6 | 8.2 | 6.5 | 92 |
| AP-42 calculated from references | 15.2 | 14.5 | **16.4** | 15.9 | 54 |
| AP-42 | 16.2 | - | **17.3** | - | - |

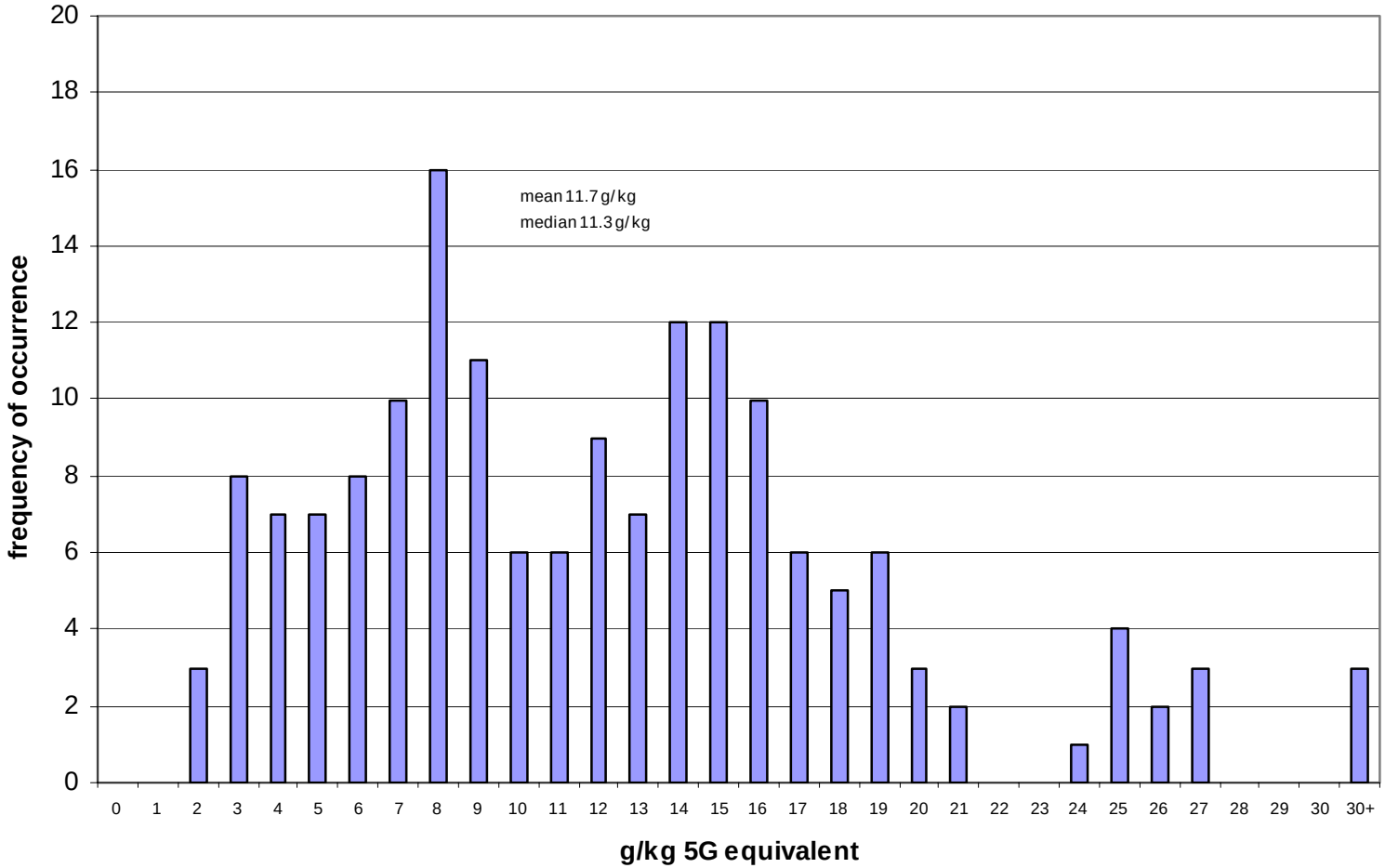
**OMNI was unable to duplicate the exact AP-42 values from the tests cited**

## Summary of PM Emission Factors - Masonry & Factory-Built FP

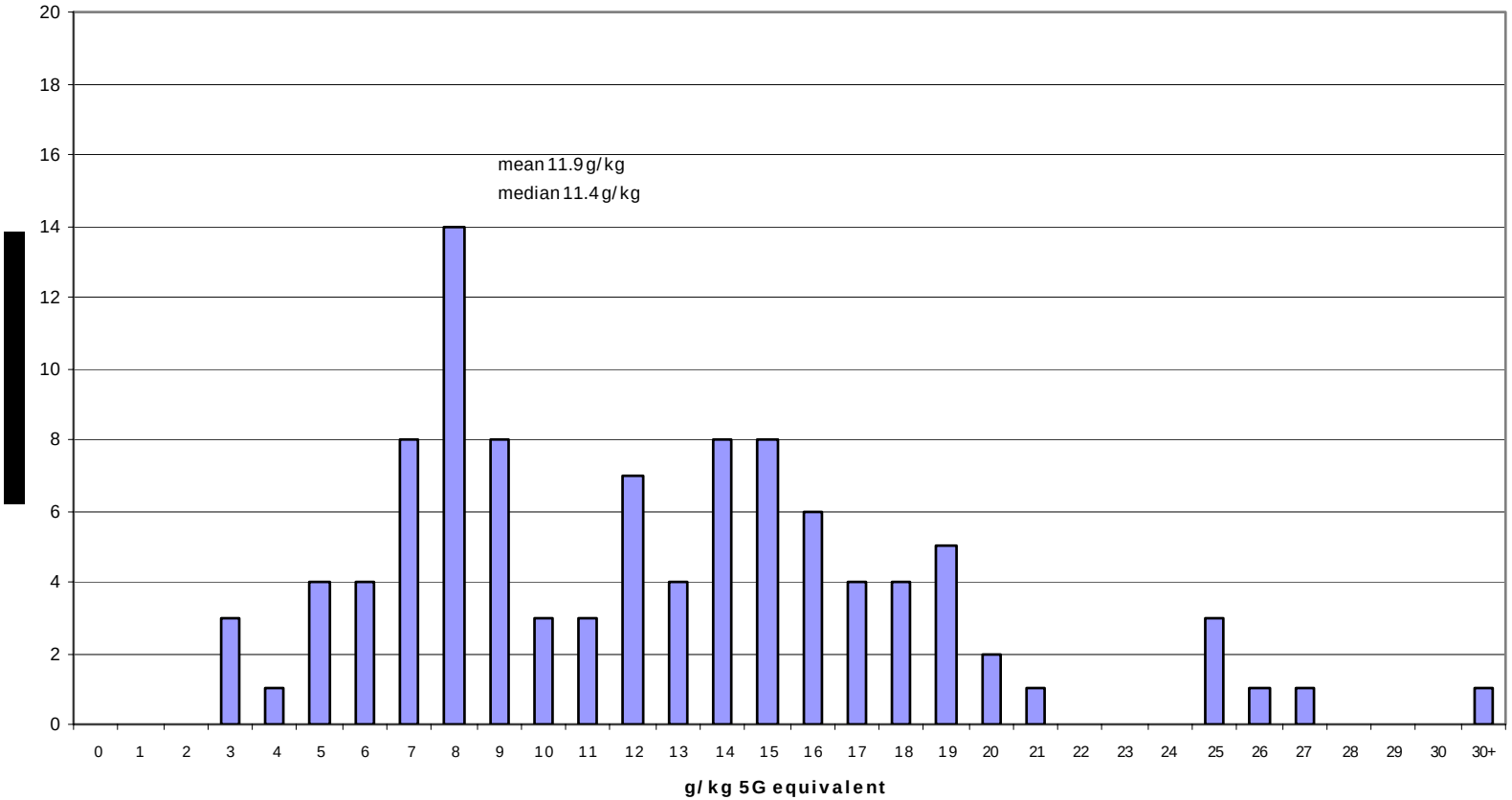
| Parameter | 5G g/kg | | 5H g/kg | | Count |
|---|---|---|---|---|---|
| | Mean | Median | Mean | Median | N |
| All masonry and factory-built | 8.4 | 6.4 | 9.5 | 7.5 | 360 |
| All cordwood | 11.7 | 11.3 | **13.0** | 12.6 | 167 |
| All dimensional lumber | 5.6 | 4.3 | **6.5** | 5.2 | 193 |
| All with closed doors | 4.8 | 3.5 | 5.6 | 4.4 | 104 |
| All with open doors | 9.9 | 8.4 | 11.1 | 9.8 | 256 |
| All factory-built fireplaces | 8.0 | 6.1 | 9.2 | 7.2 | 270 |
| **Cordwood, factory-built, open doors** | 12.4 | 11.9 | 13.9 | 13.5 | 92 |
| **AP-42 calculated** | 15.2 | 14.5 | **16.4** | 15.9 | 54 |
| **AP-42** | 16.2 | - | **17.3** | - | - |




# Distribution of Emissions – Data from All Tests, 5G equivalent




**Distribution of Emissions – Data from Only Cordwood Tests, 5G equivalent**




# Distribution of Emissions – Data from Factory-built, Cordwood Tests, 5G equivalent