



**Federal Aviation
Administration**

International Aircraft Materials Fire Test Working Group Meeting

Development of New Flammability Tests for Magnesium-Alloy Cabin Components

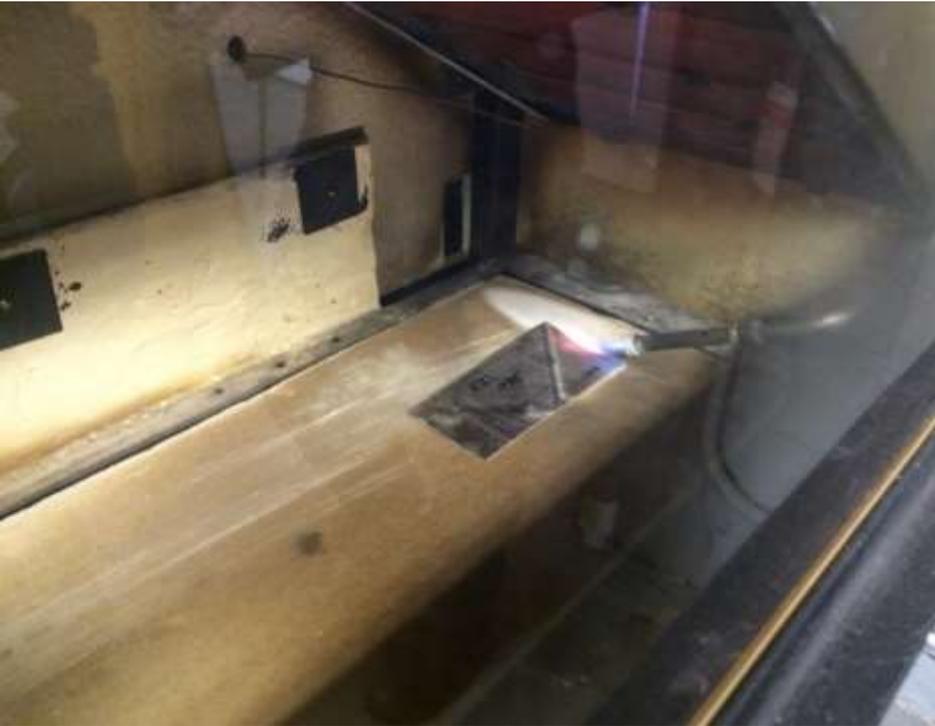
Presented to: International Aircraft Materials Fire Test
Working Group, Atlantic City, NJ

By: Tim Marker, FAA Technical Center

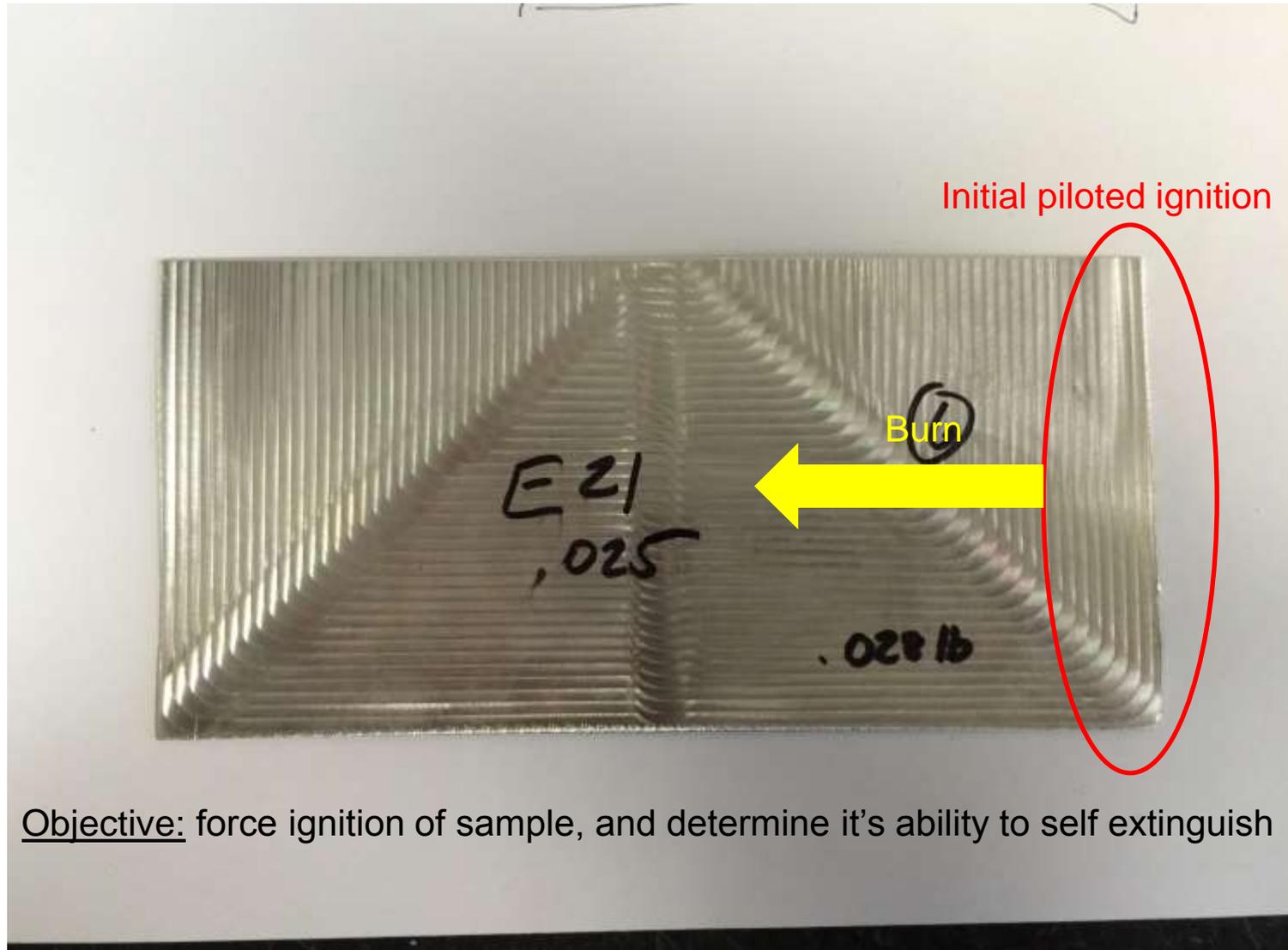
Date: October 30-31, 2017



Development of Flammability Test for Magnesium Components Located in Inaccessible Areas (Update)



3- by 6-inch Thin Magnesium Sample



Development of Flammability Test for Magnesium Components Located in Inaccessible Areas (Update)

- *270 tests completed using radiant panel apparatus (109 since last meeting)*
- *3- by 6-inch sample size*
- *2-minute piloted ignition, 4-minute total exposure*
- *0.025-inch and 0.050-inch thickness samples tested*
- *Various shapes and sizes of sample holders tested*

Milling Process...



Truncated Perimeter Sample Holder



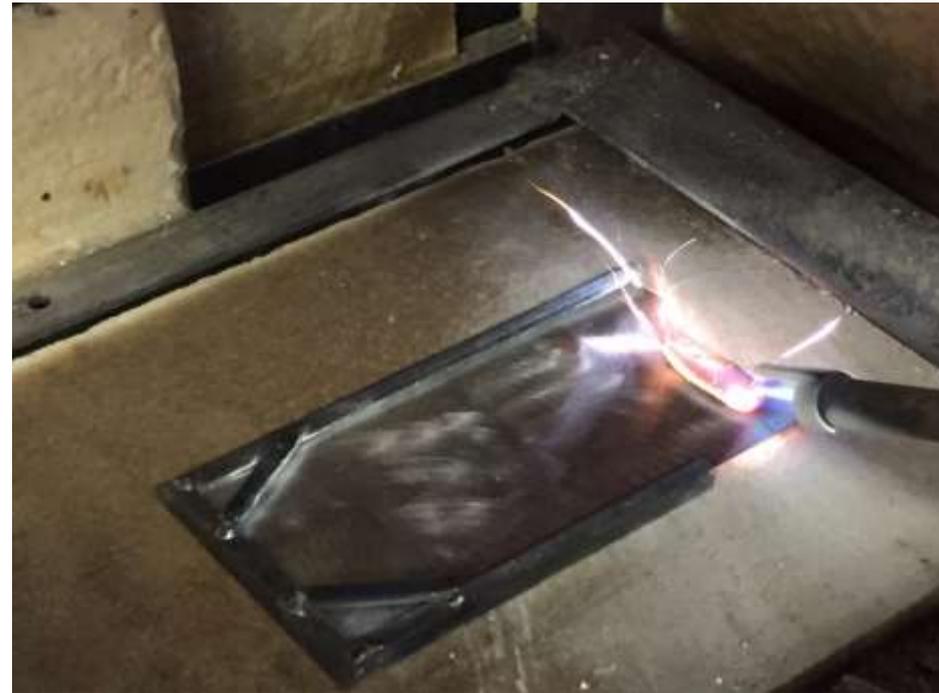
Truncated Perimeter Sample Holder



Truncated Perimeter Sample Holder



Truncated Perimeter Sample Holder



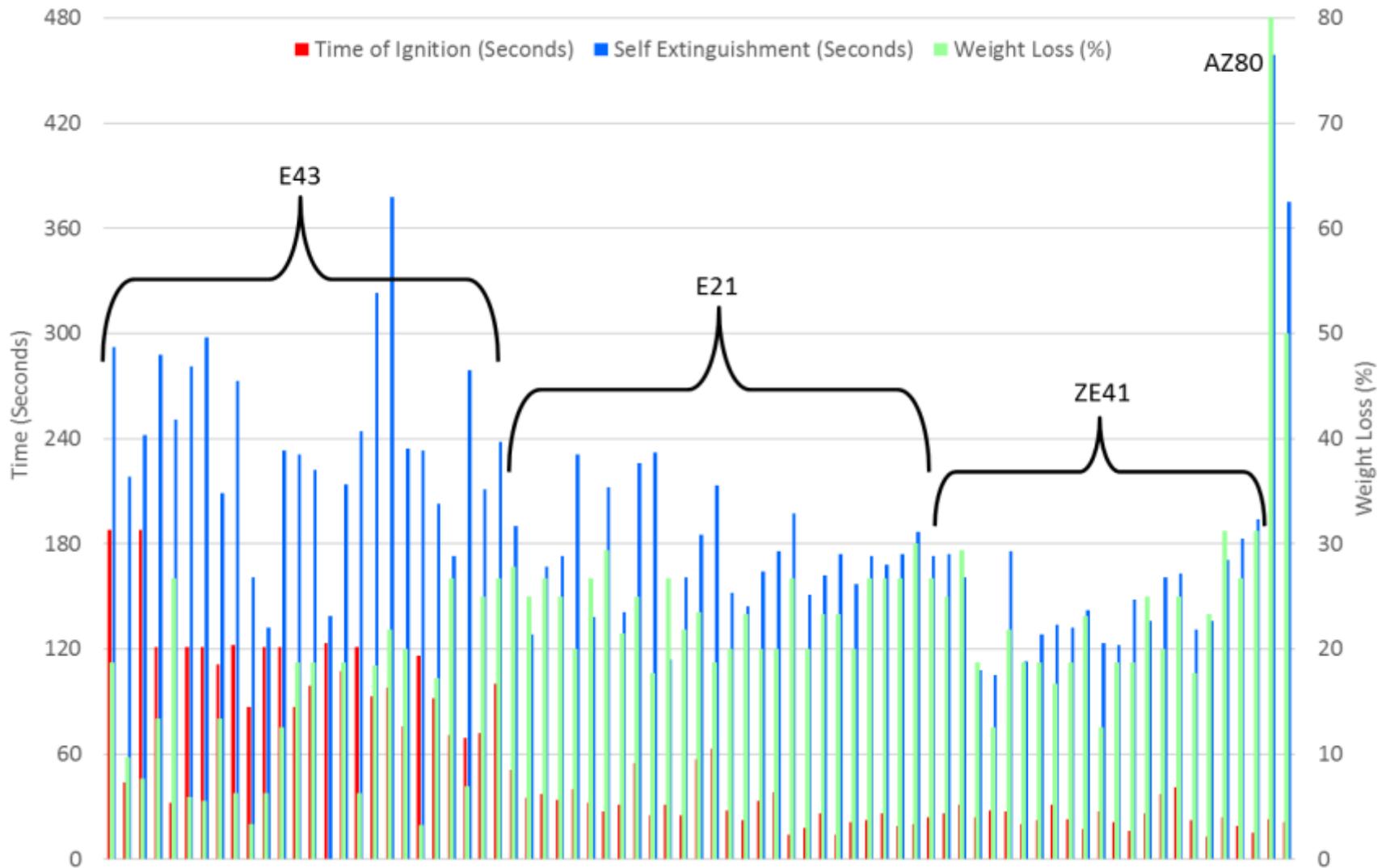
Truncated Perimeter Sample Holder



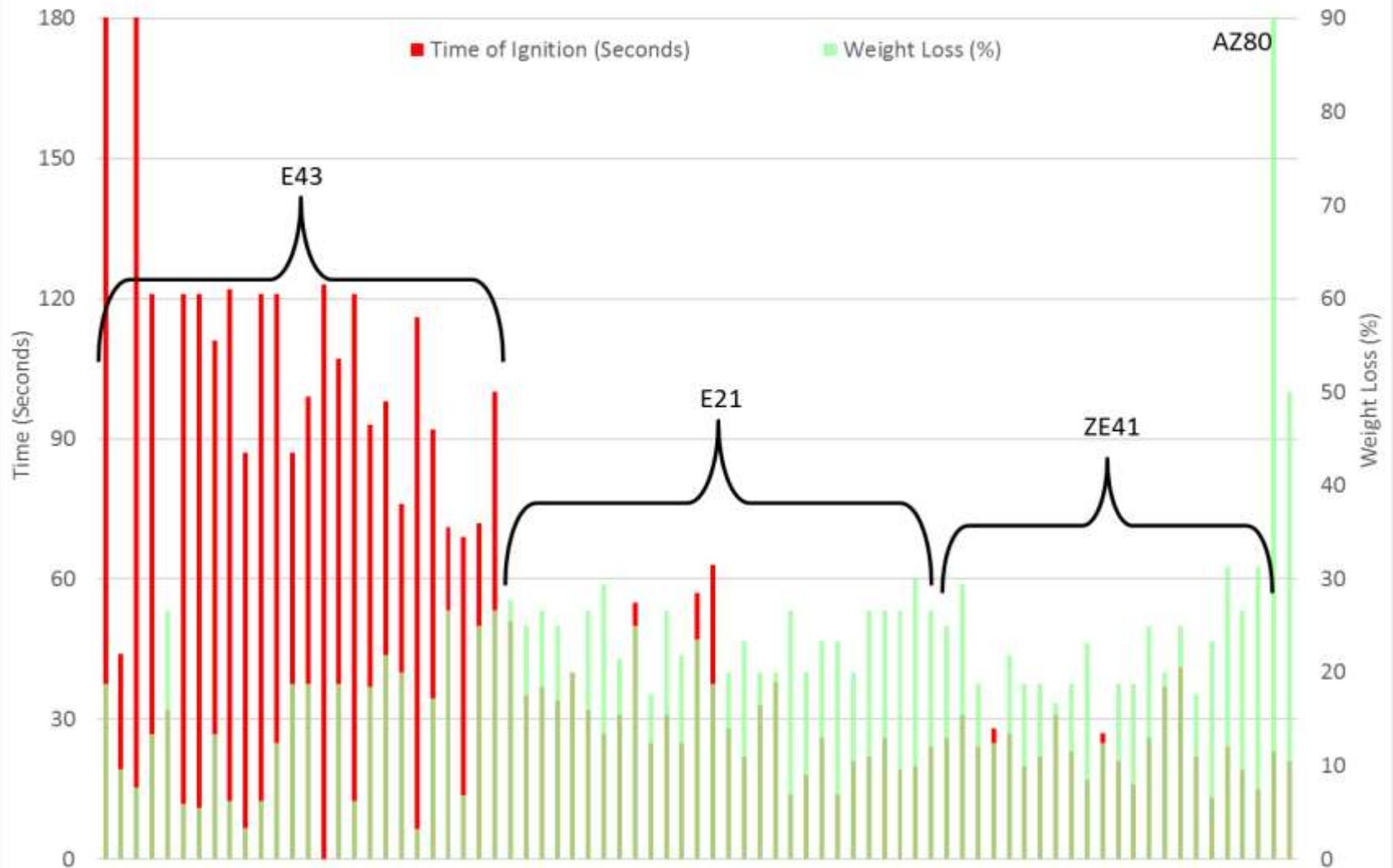
Truncated Perimeter Sample Holder



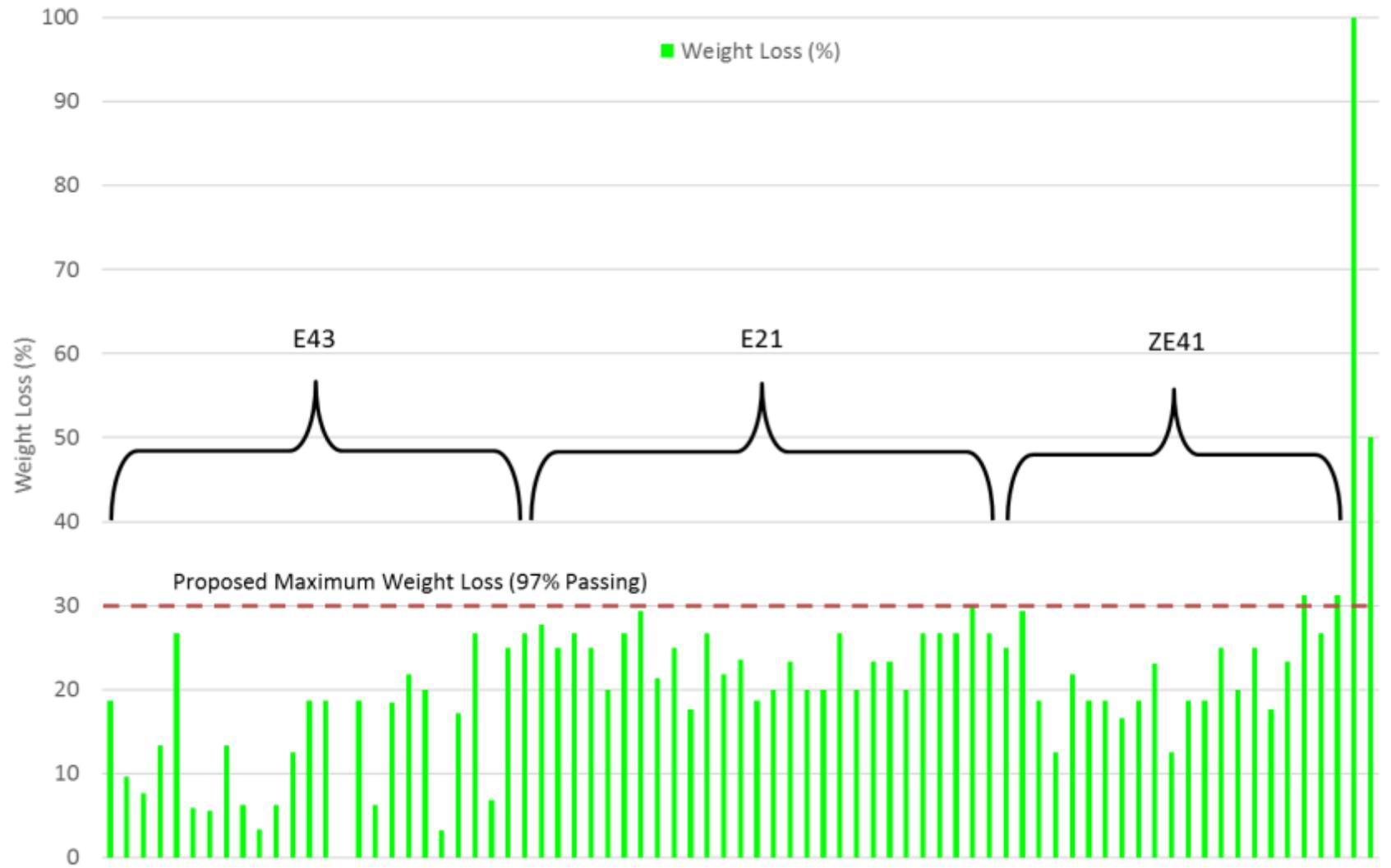
0.025-Inch Thickness Truncated Sample Holder Results (77 Tests)



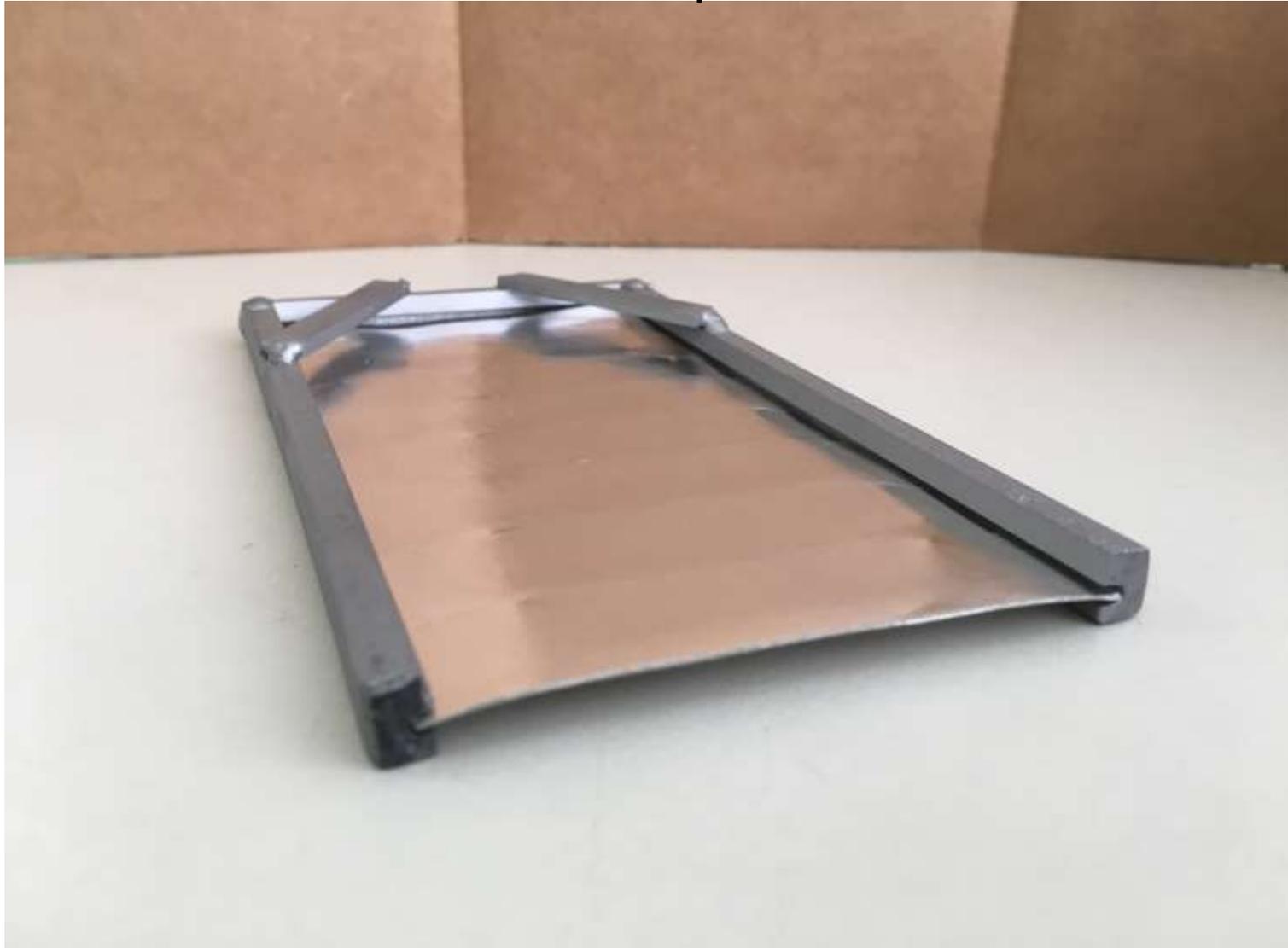
0.025-Inch Thickness Truncated Sample Holder Results (77 Tests)



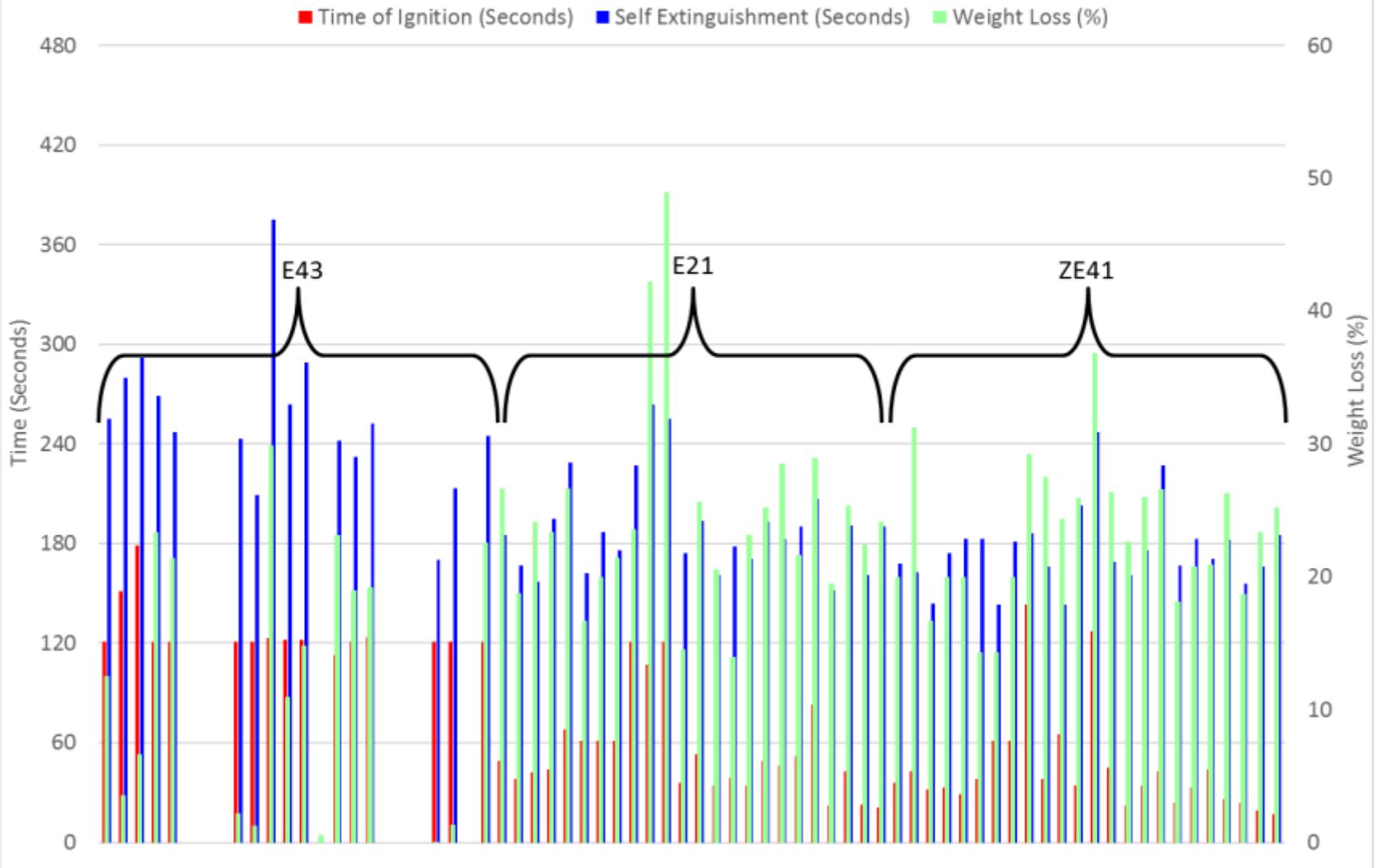
0.025-Inch Thickness Truncated Sample Holder Results (77 Tests)



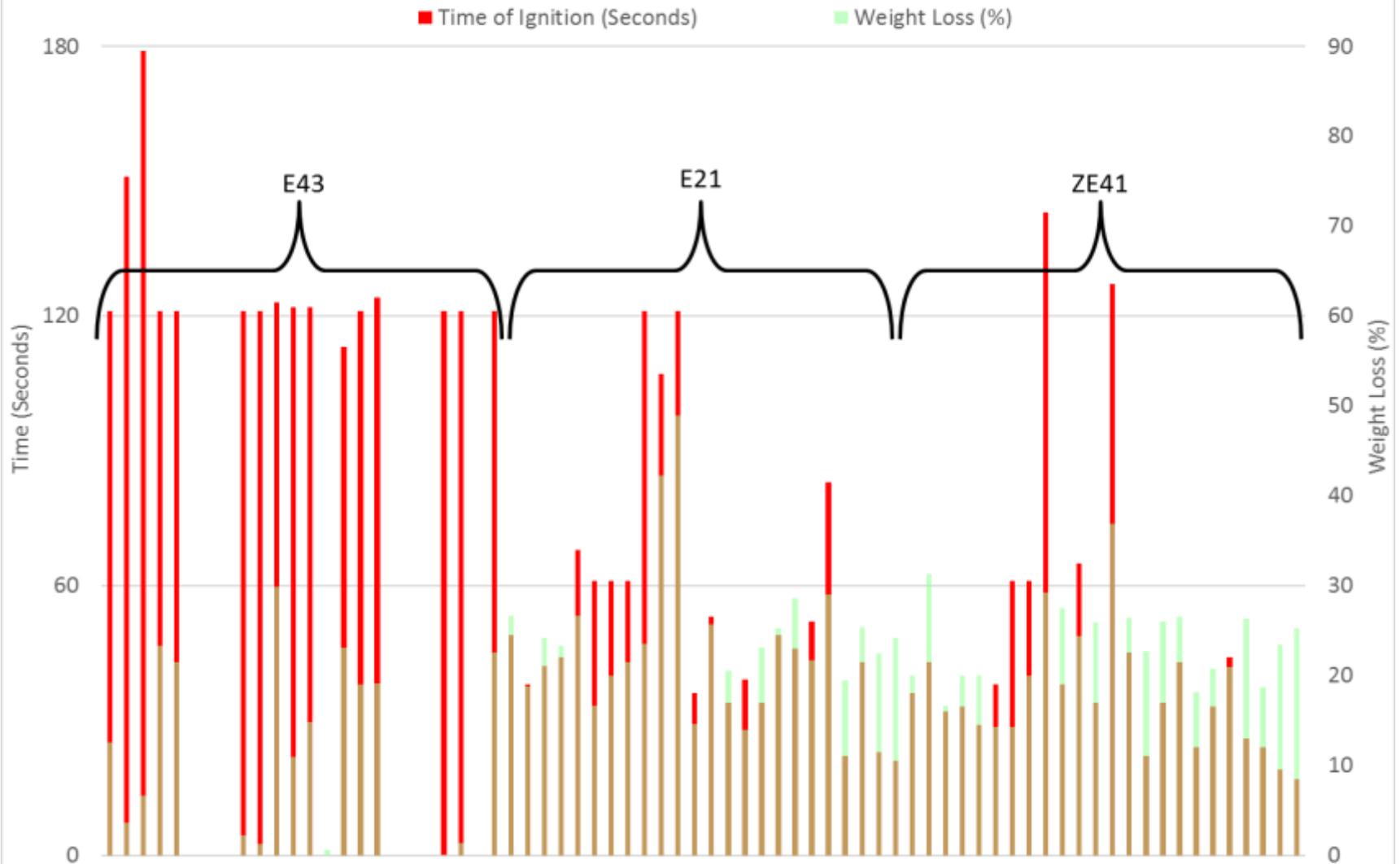
Perimeter Sample Holder



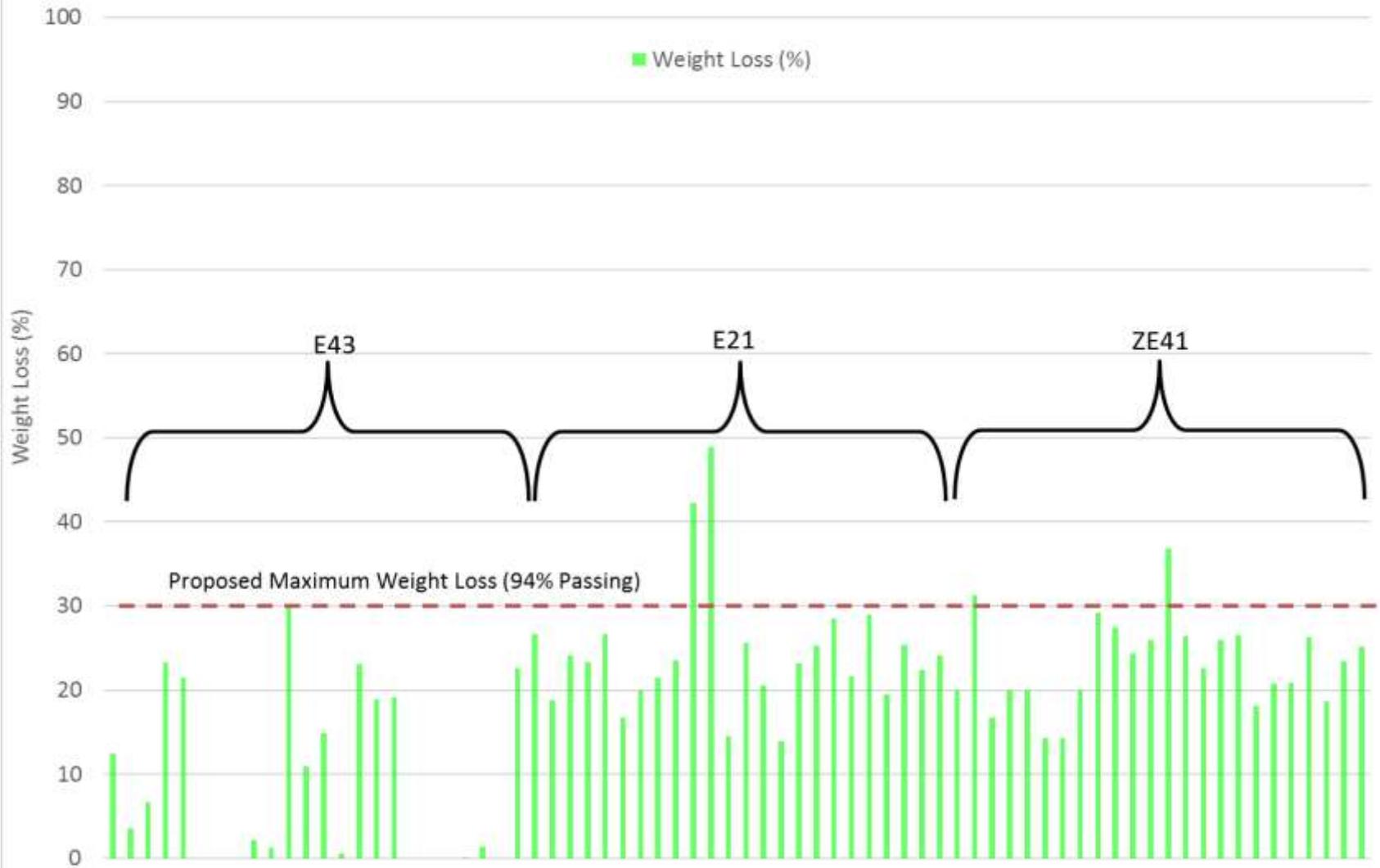
0.025-Inch Thickness Perimeter Sample Holder Results (72 Tests)



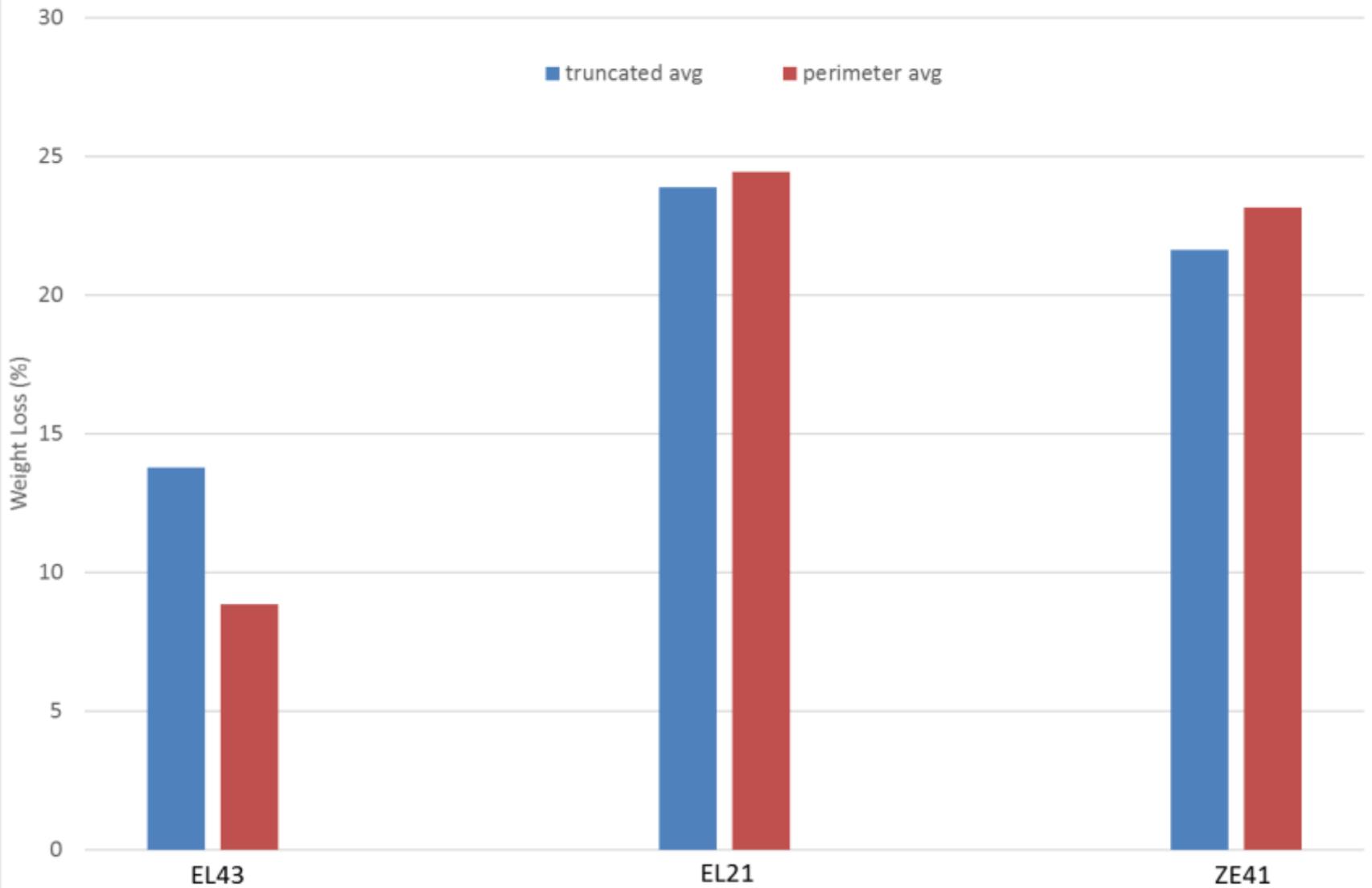
0.025-Inch Thickness Perimeter Sample Holder Results (72 Tests)



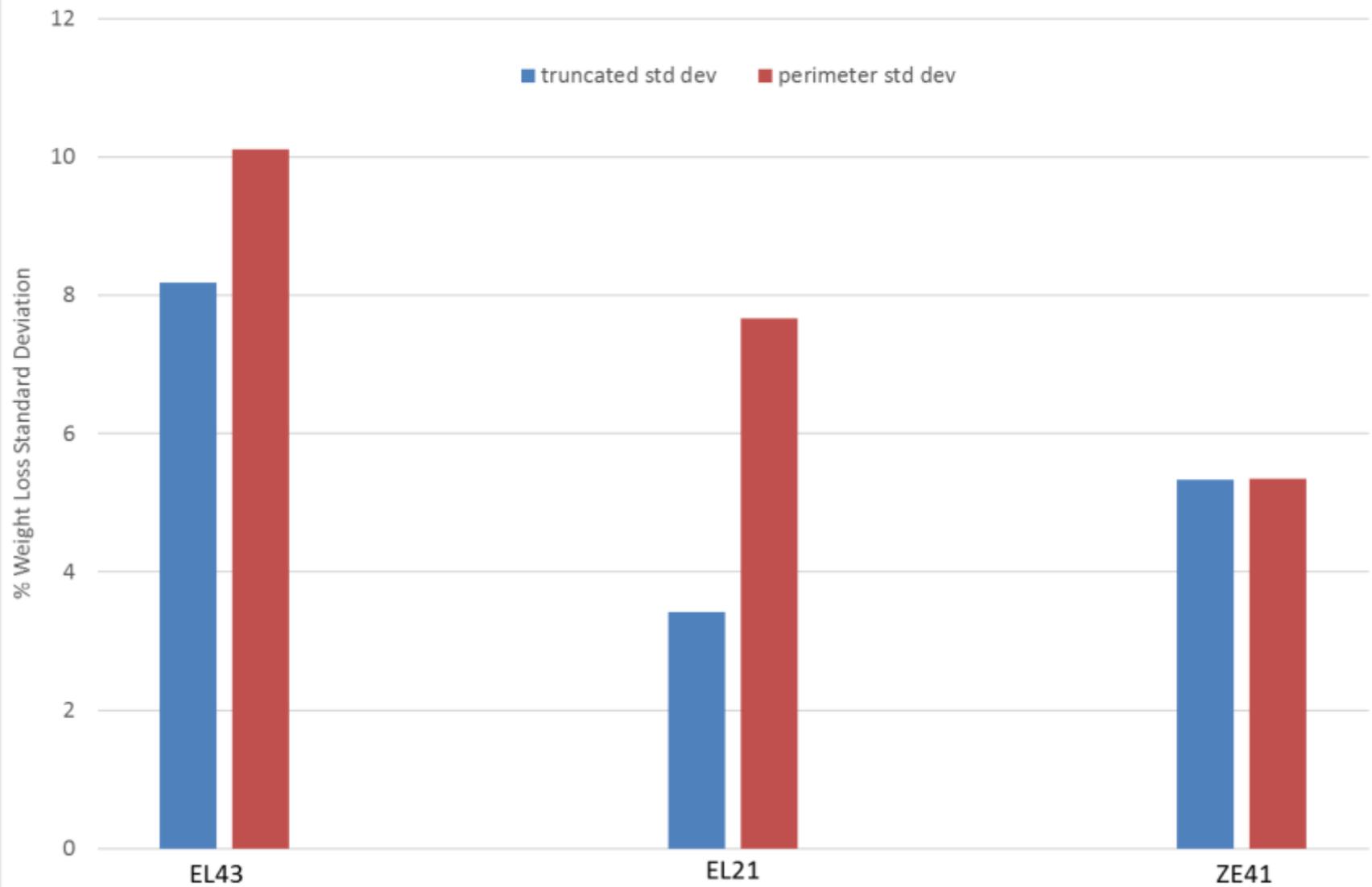
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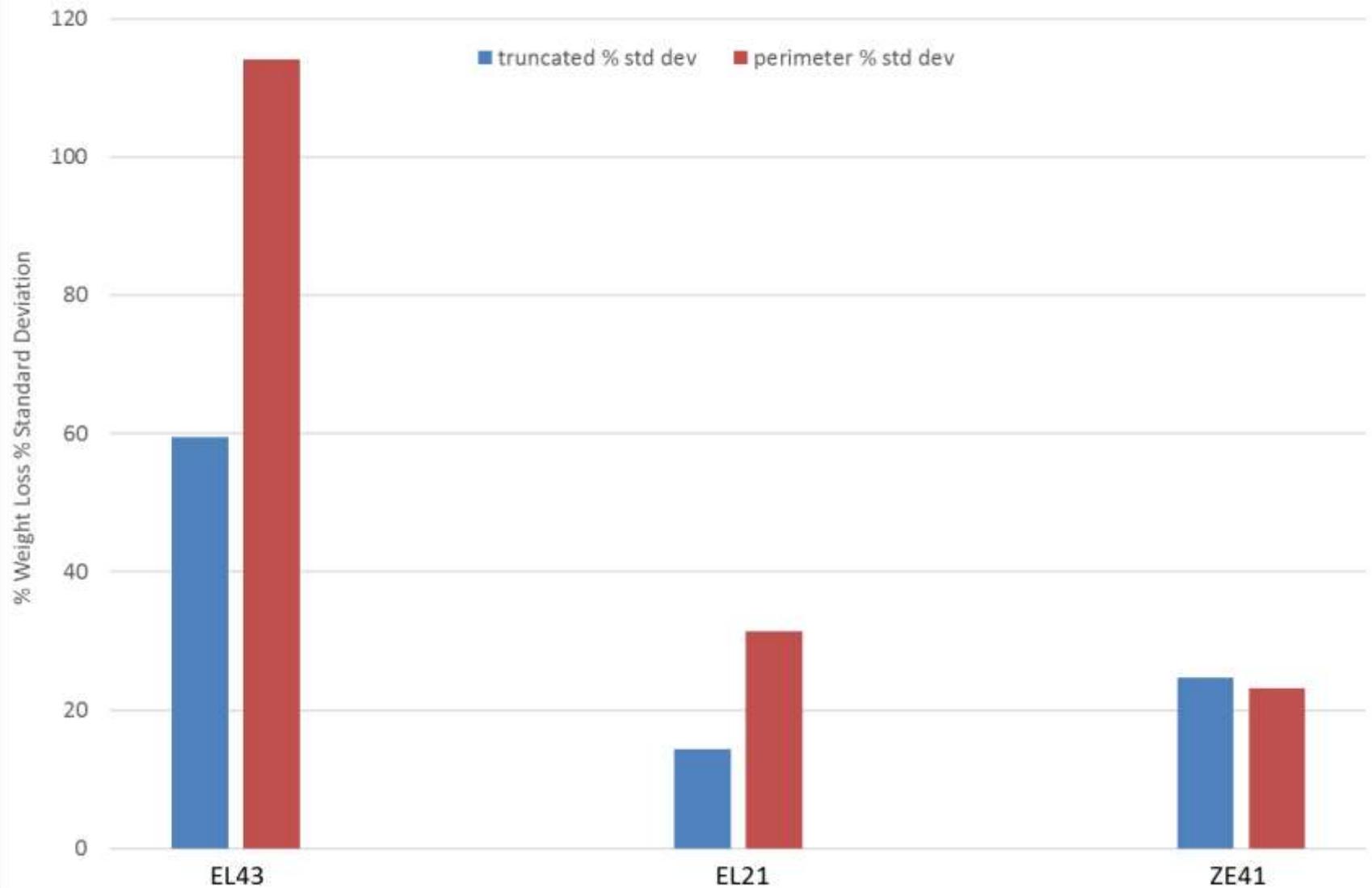
% Weight Loss Comparison, Truncated Vs Perimeter



% Weight Loss Standard Deviation Comparison, Truncated vs. Perimeter



% Weight Loss % Standard Deviation, Truncated vs. Perimeter



Wrapping Up...

Data suggests a slight decrease in weight loss repeatability when using the perimeter sample holder versus using the truncated sample holder:

| % Standard Dev 77 Tests <u>Truncated Sample Holder</u> | → | % Standard Dev 72 Tests <u>Perimeter Sample Holder</u> | |
|--|---|--|--|
| EL43: 59.5 | → | EL43: 114 |  |
| EL21: 14.3 | → | EL21: 31.4 |  |
| ZE41: 24.7 | → | ZE41: 23.1 |  |

Summary, Future Work

Finalize test parameters and pass/fail criteria for magnesium alloy components located in inaccessible areas:

- *Radiant Panel Apparatus, 3- by 6-inch sample size, 0.025-inch thickness*
- *No ignition before ~~60~~ 30 seconds (**remove from criteria**)*
- *Maximum weight loss of 30% (proposed)*
- *Continue experimentation with sample holder needed to prevent curling or lifting*

Questions?



Development of Advisory Circular



Potential Advisory Circular Topics

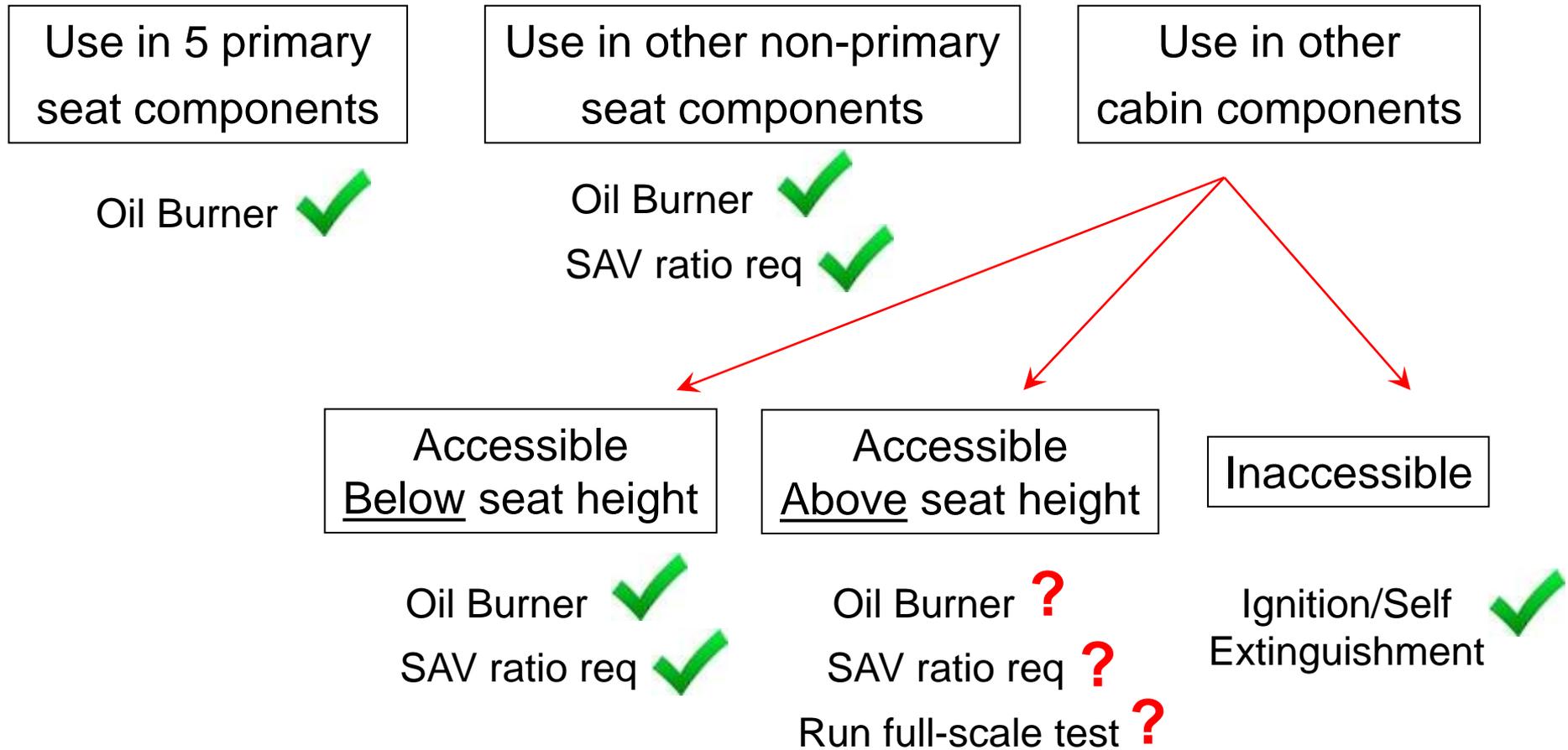
An AC on magnesium use may include some of the following:

- *Purpose*
- *Applicability*
- *Definitions*
- *Related documents*
- *Background*
- *Requirements of 25.853*
- *Compliance with 25.853*
- *Magnesium alloy flammability tests*
- *Measuring the weight of molten/re-solidified parts*
- *Determining self-extinguishment*
- *Test data collection*
- *Pass/fail criteria*
- *Engineering evaluation*



The Use of Magnesium Alloy in Cabin Areas

What is the appropriate method of test?



Discussion Items for Task Group

Discuss test method for magnesium alloy components located in inaccessible areas

- Recent testing conducted on thin samples using perimeter sample holder
- Should time of ignition be considered as part of criteria?
- Select test and begin to finalize pass/fail criteria. (insert into Handbook?)

Discuss the key elements that need to be included in an Advisory Circular

- What is the appropriate method of test for each application?

Discuss any other items related to the use of magnesium alloy in either seats or other cabin components