

Item 19-28. Bearing and Shear Properties – Disposition of Legacy Values and Publication of New Alloys

60-Day Approval

The proposed policy documented in the Agenda Item was discussed. The consensus is that the current indirect method is the acceptable default method for secondary tensile orientation and compressive test data. Therefore, the name of the item, and several references within the item, are changed from “Secondary” to “Bearing and Shear.” This change requires 60-day approval.

This policy for characterizing Bearing and Shear properties will be used until a new method can be developed, proposed, and approved. Chapter 9 of the Handbook will not be changed until the issues are resolved but the policy will be shared publically.

Discussion

During the summer of 2019, Battelle hosted separate telecons with the ASG, GSG, and MATSSG to solicit input on the draft of this Agenda Item. During the 34th meeting, the Committee discussed all inputs to arrive at a consensus. Several suggestions for possible investigative directions were offered.

- The Coordination Committee accepted the consensus opinion that the indirect method can remain the default method for compressive yield and secondary orientation tensile property calculations. Bearing and Shear properties are the primary concern. For future data analysis packages, Battelle will flag cases with an unlikely percentage of test results below the calculated A-/B-Basis values.
- The Coordination Committee does not recommend investigating the use of regression analysis of the Bearing Strength with e/D as the independent variable.
- Development of a conservative fudge factor function is a last resort. Battelle will not actively pursue this approach at this time.
- Battelle will continue to investigate options.

Approved for Public Release

Battelle does not recommend immediately modifying Chapter 9 until new guidelines have been developed and approved. That could lead to confusion if a data generating organization used the interim plan as documented in an edition of MMPDS. If approved, the procedures proposed here will be enforced until a new guideline is proposed by Battelle and reviewed and approved by the Guidelines Task Group and the General Coordinating Committee. Details of the interim plan will be posted on the public [MMPDS](#) website for all potential data suppliers to see. This proposal has three parts:

1. Treatment of bearing and shear properties data packages submitted after the start of the 34th MMPDS Coordination Meeting.
2. Treatment of bearing and shear properties data packages submitted before the start of the 34th meeting.
3. Treatment of bearing and shear properties already in the Handbook.

1. Treatment of bearing and shear properties data packages submitted after September 24, 2019: Data will be analyzed using currently approved direct analysis methods. The data requirements are summarized in Table 19-28.1.

S-Basis: At least 30 test points must be submitted from at least three heats and multiple lots. S-Basis values will be calculated using currently approved direct analysis methods, normal/censored-normal analysis. Published values will be designated as S-Basis according to current guidelines. This increases the data-generation requirement from 20 data points to 30 for bearing and shear properties by 50%.

A-Basis & B-Basis: At least 100 test points must be submitted from at least 10 heats and 10 lots, T₉₉ and T₉₀ values will be computed per current guidelines for direct analysis. For data covering a wide range of thicknesses, regression analysis requirements also apply. If a parametric representation of the data is not possible, additional data will be necessary to use a nonparametric approach for a T₉₉ computation. A-Basis and B-Basis values will be proposed consistent with current guidelines. This increases the data generation requirement for bearing and shear properties from 20 points to 100 and three heats to 10 heats.

Table 19-28.1 Interim Bearing and Shear Data Submission Requirements

	S-Basis	A-Basis & B-Basis	A-Basis & B-Basis
Specimens	30	100	299
Heats	3	10	10
Lots	3	10	10
Method	Direct	Direct	Direct
Normal	S-Basis		
Censored-Normal	S-Basis		
Weibull		A-/B-Basis	
Pearson		A-/B-Basis	
Non-Parametric			A-/B-Basis

Material suppliers are strongly encouraged to work with interested airframe customers to determine the need for A-Basis bearing and shear properties in their applications.

2. Treatment of data packages submitted to Battelle before September 24, 2019: Submitting organizations generated their data in good faith according to the currently published guidelines. Data packages will be analyzed according to the guidelines in MMPDS-13 using the indirect method as long as the data meet the minimum requirements in Table 9.2.4. If enough data are submitted, direct analysis results will be compared. Data will also be analyzed as described above for comparison. Battelle will recommend design values based on their best engineering judgment.

3. Treatment of properties already in the Handbook: All numbers published in the Handbook met the requirements and guidelines existing at the time of their review. Proposed values were judged acceptable by the MMPDS/MIL-HDBK-5 Coordinating Committee. When new or improved methods were added tables are not actively reviewed to measure the consequences of the change. For these properties, the industry has not identified significantly higher than expected failure rates. Therefore, bearing and shear properties in all tables published in MMPDS-13 will remain in future versions of MMPDS. No proactive review will be initiated to identify properties calculated using the traditional derived property method. Nearly 1000 design values are published for secondary properties. A proactive review would consume 1-2 hours per value, 0.5 to 1.0 FTE from Battelle's MMPDS support staff.

When discovered during the course of a legacy alloy review, Section 9.4.2.4 Derived Properties in the contemporary edition of MMPDS will be the approved guideline for evaluating current Handbook entries. Item 19-25 includes a proposal to update this section. If an organization has concerns about any value published in the Handbook, they are asked to bring those concerns to Battelle's attention to determine an appropriate corrective action.