

1st CMH-17 Joint Coordination Meeting

April 22-25, 2024 Scottsdale, AZ 8:00 am – 5:30 pm MST

Spring 2024 – Hybrid Open Coordination (9:00 am - 2:15 pm MST)



CMH-17 WG Reorganization

Outline



- Reorganization Goals
- Working Group and Task Group Definitions
 - Current Arrangement and Discussion Points for Future Consolidation
- Content Development Process
- Future Publications
- Other Topics
- This Week Activities
- Next Actions

Reorganization Goals

- We plan to investigate and implement several changes to the CMH-17 organization and publication
 - 1. Combine all four coordination groups into one CMH-17 group
 - 2. Hold meetings semi-annually, in person in the spring and virtually in the fall
 - 3. Incrementally combine and reduce the number of "standing" working groups
 - 4. Increase the use of task groups to write specific content (beyond current Vol 3, 5, and 7 releases)
 - 5. Change publication methods to: (a) better support quicker electronic release cycles; and (b) improve content arrangement and availability
 - 6. Revamp yellow page process to simplify and automate balloting procedures and publication
 - 7. Consider different membership structure
 - 8. Investigate becoming an ANSI-certified SDO, or joining an SDO

Accomplished for this meeting, but need to evaluate if it's effective and desirable for the future



Future WG and TG Roles and Responsibilities CMH17

Working Group

- "Own" handbook content
- Permanent, standing group
- May be a joint (multiple material systems) or material system-specific group
- Maintain institutional knowledge of the handbook content
- Identify new or revised content needs
- Write updates for any topics that are wholly within that WG purview
 - Editorial corrections
 - Relevant technical content that doesn't require specialist input from outside the WG (eg, engine group probably doesn't need a TG, Guidelines wouldn't need a TG to update definitions or abbreviations)
- Remove or caveat obsolete content
- Hold sessions at the semi-annual CMH-17 meeting; may or may not require WG meetings between CMH-17 meetings

Task Group

• Temporary multi-discipline group formed to efficiently write specific content

COMPOSITE MATERIALS HANDBOOK

- Expected to draw members from across the organization (or new members) with the required skill and knowledge to develop the content, regardless of their existing WG membership
- Formed during coordination meetings where TG leaders are selected, members solicited, and a timeline proposed
- Report out at the semi-annual CMH-17 meeting; may or may not have a session at the CMH-17 semi-annual meeting; expected to hold TG meetings between CMH-17 meetings

VOLUME 1	VOLUME 3	VOLUME 5	VOLUME 6	VOLUME 7	
1 GENERAL INFORMATION	1 GENERAL INFORMATION	1 CMH-17 GUIDELINES AND PROCEDURES	1 GENERAL INFORMATION	1 CMH-17 AM	
2 GUIDELINES FOR	2 INTRODUCTION TO COMPOSITE STRUCTURE	2 INTRODUCTION, HISTORY AND OVERVIEW	2 GUIDELINES FOR PROPERTY	GUIDELINES	
PROPERTY TESTING OF COMPOSITES		3 PROCESSING, CHARACTERIZATION, AND	TESTING	2 CHARACTERIZATION	
3 EVALUATION OF	COMPLIANCE	MANUFACTURING	3 MATERIAL DATA		
REINFORCEMENT FIBERS	4 BUILDING BLOCK APPROACH FOR COMPOSITE	4 QUALITY CONTROL OF PRODUCTION MATERIALS AND PROCESSES	4 FABRICATION OF SANDWICH	FEEDSTOCK	
4 MATRIX	STRUCTURES	5 APPLICATIONS, CASE HISTORIES AND	STRUCTURES	4 PROCESSING AND	
CHARACTERIZATION	5 MATERIALS AND PROCESSES - THE EFFECT OF VARIABILITY ON COMPOSITE PROPERTIES	LESSONS LEARNED	5 QUALITY CONTROL		
5 PREPREG MATERIALS	6 QUALITY CONTROL OF PRODUCTION MATERIALS AND	6 DESIGN AND ANALYSIS	6 DESIGN AND	OF PRODUCTION	
6 LAMINA LAMINATE AND	PROCESSES	7 MAINTAINABILITY AND SUPPORTABILITY	SUBSTANTIATION FOR SANDWICH STRUCTURES	MATERIALS AND PROCESSES	
SPECIAL FORM	7 DESIGN OF COMPOSITES	8 THERMO-MECHANICAL-PHYSICAL TEST		6 MATERIAL TESTING & CHARACTERIZATION	
CHARACTERIZATION	8 ANALYSIS OF LAMINATES	METHODS - OVERVIEW	STRESSES		
7 STRUCTURAL ELEMENT	9 STRUCTURAL STABILITY ANALYSES	9 MATERIAL TESTING & CHARACTERIZATION FOR SUBMISSION OF	8 ANALYSIS AND STRUCTURAL	DATA TO CMH-17	
VOLUME 4	10 DESIGN AND ANALYSIS OF BONDED JOINTS	DATA TO CMH-17	DESIGN	7 PROPERTY TESTING OF ADDITIVELY MANUFACTURED	
1 GUIDELINES	11 DESIGN AND ANALYSIS OF BOLTED JOINTS	10 EVALUATION OF REINFORCEMENTS	9 DAMAGE ASSESSMENT OF SANDWICH STRUCTURES		
2 DESIGN GUIDELINES FOR	12 DAMAGE RESISTANCE, DURABILITY, AND DAMAGE	11 EVALUATION OF MATRIX MATERIALS	10 SUPPORTABILITY		
METAL MATRIX MATERIALS		12 EVALUATION OF INTERFACE MATERIAL	11 SANDWICH DESIGN CASE	METHODS	
3 MATERIALS PROPERTIES	13 DEFECTS, DAMAGE, AND INSPECTION	13 EVALUATION OF COMPOSITES	STUDIES	9 EVALUATION OF AM	
DATA		14 SUBCOMPONENT TESTING – OVERVIEW	12 SUPPORTING DATA AND	PARTS	
APPENDIX A TYPICAL		OF PROBLEM	DISCUSSIONS	10 ELEMENT LEVEL TESTING	
		15 MACHINING & GRINDING	VOLUME 2	11 DESIGN AND	
TABLES FOR MATRIX		16 DATA SUBMISSION, FORMAT AND	1 GENERAL INFORMATION	ANALYSIS	
MATERIALS	18 ENVIRONMENTAL MANAGEMENT	REQUIREMENTS	2 CARBON FIBER COMPOSITES	12 MAINTAINABILITY	
APPENDIX C RAW DATA	19 SPACE APPLICATIONS	17 STATISTICAL METHODS	3 BORON FIBER COMPOSITES		
COMPOSITE MATERIALS	20 ENGINE APPLICATIONS	18 CMC PROPERTY DATA		13 APPLICATIONS,	
		19 ENGINE APPLICATIONS		CASE HISTORIES, AND LESSONS LEARNED	
			5 QUARTZ FIBER COMPOSITES		

14 AM PROPERTY DATA

APPENDIX A1 CMH-17A DATA

Current Working Outlines

Topic: Introduction



Volume	Chapter	Current WG	Future WG
1	1 General Information	PMC Guidelines (+M&P, Specialized Data)	Joint Guidelines
2	1 General Information (1.1-1.4, 1.7, 1.8, 1.9)	PMC Guidelines (+Data Review)	Joint Guidelines
3	1 General Information	PMC Guidelines	Joint Guidelines
4	1 Guidelines (1.1, 1.2)	N/A	Joint Guidelines
5	1 Guidelines and Procedures 2 Introduction, History and Overview	CMC Guidelines CMC M&P	Joint Guidelines ???
6	1 General Information	Sandwich	Joint Guidelines
7	1 Guidelines and Procedures	AM Guidelines	Joint Guidelines

- Proposal: Joint Guidelines WG for all material systems / volumes
 - They own Chapter 1 in all volumes (handbook introduction, overview, purpose, scope, definitions, abbreviations, etc.)
 - They filter work proposals and identify the proper WG(s) who owns the content and if a new WG or TG is needed (will discuss later when we get to Content Development Process)
- Vol 5 has a unique chapter on "Introduction, History and Overview"
 - Should other materials have something similar?
 - Who should own the content?

Topic: Guidelines for Property Testing

CMH17 COMPOSITE MATERIALS HANDBOOK

Volume	Chapter	Current WG	Future WG
1	2 Guidelines for Property Testing of Composites	PMC Guidelines (+Spacecraft)	
2	N/A		
3	N/A		
4	N/A		
5	8 Thermo-Mechanical-Physical Test Methods – Overview	CMC Testing	
6	N/A	Sandwich	
7	2 Characterization Considerations	AM Guidelines	

- Includes building block approach, test program planning, and recommended test matrices
 - Although Vol 6 Chapter 2 has this title, the content focuses on testing of individual sandwich components (e.g., "evaluation of core materials," "evaluation of face sheet properties," etc., not overall test planning the way Chapter 2 appears in Vol 1 and 7 and Chapter 8 appears in Vol 5
- Who should own this? A joint group? A different group for each material system?
 - If Guidelines becomes a joint group, is there also a need for individual material system-specific guidelines WG to own content such as this?

Topic: Testing

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Volume	Chapter	Current WG	Future WG	
1	 3 Evaluation of Reinforcement Fibers 4 Matrix Characterization 5 Prepreg Materials Characterization 6 Lamina, Laminate, and Special Form Characterization 7 Structural Element Characterization 	PMC Testing		HAI
2	N/A			
3	N/A			
4	1 Guidelines (1.3-1.10)	N/A		
5	 3 Processing, characterization and manufacturing (3.6) 10 Evaluation of Reinforcements 11 Evaluation of Matrix Materials 12 Evaluation of Interface Material 13 Evaluation of Composites 14 Subcomponent Testing – Overview of Problem 15 Machining & Grinding (assume this is for test specimens) 	CMC M&P CMC Testing CMC Testing CMC Testing CMC Testing CMC Testing CMC Testing	Chapters 11, 12, 14 and 15 have no content	
6	2 Guidelines for Property Testing	Sandwich*	*See next slide	
7	 3 Evaluation of Feedstock 6 Material Testing & Characterization for Submission of Data to CMH-17 7 Property Testing of Additively Manufactured Materials 9 Evaluation of AM Parts 10 Element Level Testing 	AM Testing		

- WG defines test methods at all levels of the building block, although coupon-level tests have the most information, due to their standard methods and requirements to develop handbook datasets
- Can this be managed by a joint group, or should each material system have a WG?

Special Case: Sandwich Structure



- Spoiler Alert: Sandwich WG currently owns all of Volume 6, yet that volume has a full range of topics including M&P, testing, design, analysis, repair, etc.
- Is it reasonable to have one WG for all of that, or should it be divided?
 - This is a matrix problem that we can slice and dice multiple ways
 - Option 1 is to create TG for Volume 6, but keep the sandwich WG as the content "owner" except for Chapter 1
 - Option 2 is to use existing topical WG to own all the content and disband the sandwich WG
- This will be discussed in the Sandwich WG sessions Wednesday afternoon

Option 1 (Keep Sandwich WG as overall owner, with multiple TG)	V6 Chapter	Option 2 (Disband Sandwich WG and have other WG own content)
Guidelines WG	1 General Information	Guidelines WG
Sandwich TG 1	2 Guidelines For Property Testing	Testing WG
	3 Material Data	Data Review WG
Sandwich TG 2	4 Fabrication Of Sandwich Structures	M&P WG
	5 Quality Control	M&P WG
Sandwich TG 4	6 Design And Substantiation For Sandwich Structures	D&A WG
Sandwich TG 3	7 Internal Loads And Stresses	D&A WG
	8 Analysis And Structural Design	D&A WG
Sandwich TG 4	9 Damage Assessment Of Sandwich Structures	Supportability WG
Sandwich TG 5	10 Supportability	Supportability WG
	11 Sandwich Design Case Studies	D&A WG
Sandwich TG 3	12 Supporting Data And Discussions	D&A WG
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The sandwich TG are a firm proposal The WG are just examples of how things <u>could</u> be divided into existing or future topic-based WG

Topic: Submitting Data

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Volume	Chapter	Current WG	Future WG
1	N/A		
2	1 General Information (1.5, 1.6, 1.10-1.12)	PMC Data Review (+M&P, Testing)	
3	N/A		
4	N/A		
5	8 Material Testing and Characterization for Submission of Data to CMH-17	CMC Testing	
0	To Data Submission, Format and Requirements		
6	2 Guidelines for Property Testing (2.2)	Sanawich	
7	6 Material Testing & Characterization for Submission of Data to CMH- 17	AM Testing (6.1-6.4) and AM Data Review (6.5)	

- A specific subset of information that defines requirements for material to be included in the handbook
 - May include requirements for M&P specs/controls, may define test requirements, or may only discuss data requirements and presentation
- Currently managed by a variety of WG Should this be standardized across the material systems? Should it be a joint group? Individual groups?

Topic: Statistics



Volume	Chapter	Current WG	Future WG
1	8 Statistical Methods	PMC Statistics	Joint Statistics
2	N/A		
3	N/A		
4	1 General (1.11)	N/A	
5	17 Statistical Methods	CMC Data Review	Joint Statistics
6	N/A		
7	8 Statistical Methods	AM Statistics	Joint Statistics

• Propose that this be managed by a single joint WG, as the statistical principles are common across the material systems, even when sources of variability differ, and some details may be different

Topic: Material Data



Volume	Chapter	Current WG	Future WG
1	N/A		
2	2 Carbon Fiber Composites 3 Boron Fiber Composites 4 Glass Fiber Composites 5 Quartz Fiber Composites Appendix A1 CMH-17A Data	PMC Data Review	
3	N/A		
4	3 Materials Property Data Appendix A Typical Pushout Test Data Appendix B Raw Data Tables for Matrix Materials Appendix C Raw Data Tables for Metal Matrix Composite Materials	N/A	
5	18 CMC Property data	CMC Data Review	
6	3 Material Data	Sandwich	
7	14 AM Property Data	AM Data Review	

- This WG has a different process for approving content than other yellow pages to ensure proper data pedigree
- Should this be a joint group, or a different group for each material system?

Topic: Processing and Manufacturing



Volume	Chapter	Current WG	Future WG
1	N/A		
2	N/A		
3	5 Materials and Processes – the effect of variability on composite properties 6 Quality Control of Production Materials and Processes	PMC M&P PMC M&P	
4	N/A		
5	3 Processing, Characterization and Manufacturing (3.1-3.5) 4 Quality Control of Production Materials and Processes	CMC M&P CMC M&P	
6	4 Fabrication of Sandwich Structures 5 Quality Control	Sandwich Sandwich	
7	4 Processing and Manufacturing 5 Quality Control of Production Materials and Processes	AM M&P AM M&P	

- Currently each material system has their own M&P WG
 - Should they be combined?
 - Should Sandwich have a separate Sandwich M&P WG or TG?

Topic: Design



Volume	Chapter	Current WG	Future WG
1	N/A		
2	N/A		
3	 2 Introduction to Composite Structure Development 7 Design of Composites 10 Design and Analysis of Bonded Joints (10.1-10.3) 11 Design and Analysis of Bolted Joints (11.1-11.3) 	PMC Guidelines	
4	2 Design Guidelines for Metal Matrix Materials (partial 2.1-2.3)	N/A	
5	6 Design and analysis (6.1-6.3)	CMC D&A	
6	6 Design and Substantiation for Sandwich Structures (6.1, 6.2) 8 Analysis and Structural Design (8.3-8.5)	Sandwich	
7	11 Design and Analysis (partial)	AM D&A	

- Design content is scattered throughout Volume 3, but more concise in the other volumes
- Some design content is often combined with analysis
- V3C7 could be applicable to other material systems, parts and applications
- V3C2 is written for PMC, but could be generalized for other material systems
- Should Sandwich have a separate specific WG or TG for this topic?
- How do we want to manage this moving forward? Will not be part of Joint Guidelines

Topic: Structural Substantiation and Analysis

Volume	Chapter	Current WG	Future WG
1	N/A		
2	N/A		
3 *This chapter could go in multiple categories	 3 Aircraft Structure Certification and Compliance 4 Building Block Approach for Composite Structures 8 Analysis of Laminates 9 Structural Stability Analysis 10 Design and Analysis of Bonded Joints (10.4-10.6) 11 Design and Analysis of Bolted Joints (11.4-11.6) 12* Damage Resistance, Durability, and Damage Tolerance 14* Supportability, Maintenance, and Repair 15 Thick-Section Composites 	PMC Guidelines PMC Guidelines PMC Guidelines PMC Guidelines PMC Guidelines PMC Guidelines PMC DT (some DD)** PMC Supportability PMC Specialized Data	** These are both task groups. In the future we should either identify an existing WG or change one or both of the TG into WG
4	2 Design Guidelines for Metal Matrix Materials (partial 2.1-2.3)	N/A	
5	3 Processing, Characterization and Manufacturing (3.8) 6 Design and analysis (6.3-6.5) Appendix A Derivation of the Residual Strength Reduction Expressions for LCF and Rupture Loadings	CMC M&P CMC D&A CMC D&A	
6	6 Design and Substantiation for Sandwich Structures (6.3, 6.4) 7 Internal Loads and Stresses 8 Analysis and Structural Design (8.1, 8.2, 8.6) 9 Damage Assessment of Sandwich Structures	Sandwich	
7	11 Design and Analysis (partial)	AM D&A	
Analysis and so 3, but more cor • Is it possib Design content V3C3 could be	 ubstantiation content is scattered throughout Volume v3C4 system le our content is out of balance in this subject? Should applicable to other material systems 	Building Block Approach is writte ms have similar content Can/Sho Id Sandwich have a separate spe do we want to manage this movir elines	en for PMC, but all other materia ould it be combined? ecific WG or TG for this topic? ng forward? Will not be part of Jc

Topic: Inspection and Maintenance

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	Volume	Chapter	Current WG	Future WG
	1	N/A		
	2	N/A		
* This chapter could go in multiple categories	3	 12* Damage Resistance, Durability, and Damage Tolerance 13 Defects, Damage and Inspection 14 Supportability, Maintenance, and Repair 	PMC DT PMC DT PMC Supportability	
	4	N/A		
	5	3 Processing, characterization and manufacturing (3.7) 7 Maintainability and Supportability	CMC M&P CMC D&A	
	6	10 Supportability	Sandwich	
	7	12 Maintainability and Supportability	AM D&A	

- Inspection and Maintenance is related to damage tolerance for numerous damage threats (environmental defects, corrosion, manufacturing escapements, all categories of accidental factory/field damage, fatigue)
- Currently owned by a variety of WG
 - Should they be combined into one or more WG dedicated to this topic?
 - Should Sandwich have a separate specific WG or TG for this subject?

Topic: Applications

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Volume	Chapter	Current WG	Future WG
1	N/A		
2	N/A		
3	19 Space Applications 20 Engine Applications	Space Engine	
4	2 Design Guidelines for Metal Matrix Materials (2.4)	N/A	
5	5 Applications, Case Histories and Lessons Learned 19 Engine Applications	CMC M&P Engine	
6	11 Sandwich Design Case Studies	Sandwich	
7	13 Applications, Case Histories, and Lessons Learned	AM D&A	

- Recommend keeping separate WG that own content for applications such as Space, Engine, and Interiors
 - Applications are likely to cover multiple material systems
- CMC, Sandwich and AM have "case histories and lessons learned" that are not segregated that way in PMC
 - SoBR, Design, and other V3 chapters have examples/case histories
 - How do we want to organize this in the future and how will we manage the content?

Sp	ecial	Topics	C M H±17		
	Volume	Chapter	Current WG	Future WG	
[*] This chapter could go in multiple categories	1	N/A			
	2	N/A			
	3	 12* Damage Resistance, Durability, and Damage Tolerance 16 Crashworthiness and Energy Management 17 Structural Safety Management 18 Environmental Management 	PMC DT (some DD)** PMC Crashworthiness PMC Safety Management PMC M&P	** These are both task groups. In the future we should either identify an existing WG or	
	4	N/A			
	5	N/A		of the TG into WG	
	6	12 Supporting Data and Discussions	Sandwich		
	7	N/A			

- Volume 3 has chapters with content that is not segregated in the other volumes
 - In some cases, information on these topics is integrated with other chapters, but for the others there is no similar information

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- Is the content applicable to other materials, or can it be generalized?
- Should these be joint WG?
- Sandwich Ch 12 may align with another topic
- Will other volumes have "special topics" in the future outside of applications?



Content Development Process



- 1. Any WG or individual identifies the need for new or revised content or, obsolete content that should be removed or given a caveat
- 2. Submit proposal to the Secretariat
- 3. The Secretariat records the proposal and sends to the (Joint) Guidelines WG
- 4. The Guidelines WG identifies the appropriate WG(s) who owns the content and identifies if a multi-discipline TG or new WG is needed
- 5. Guidelines brings the proposal to the Exec Committee who decides whether to approve the proposal
 - a. If not approved, the Secretary records the decision and notifies the Submitter
 - b. If approved, the Exec Committee assigns a relative priority to the task and the Secretariat provides a tasking identifier
- 6. The Leader Committee decides which proposals will be started at the next semi-annual meeting
 - a. The Secretariat will work with the Leader Committee, the Exec Committee, and the Submitter to identify new WG/TG leaders prior to the next semi-annual meeting, as necessary
- 7. At the semi-annual meeting opening coordination session, the secretariat provides a list of all taskings
 - a. Status updates of active taskings
 - b. Identify tasks that will begin later (i.e., other approved proposals)
 - c. Describe new taskings that will begin now and request participants
- 8. If the tasking is assigned to a current WG, they will begin work and manage per their usual methods
- 9. If the tasking is assigned to a new TG or WG, the tasking will be discussed in detail at the Guidelines WG session
 - a. The tasking will be formalized at the closing coordination meeting with TG/WG leaders, membership roster, identified sections, and proposed timeline

Future Publication



- Nothing Changes until Volume 3 Rev H, Volume 5 Rev B and Volume 7 Initial Release are published in their current volume formats (not waiting for V6 Rev A)
 - Beginning to track metadata to identify author (for internal records only) and date a section was written (to be added to future publications)
- Vision for future publications:
 - Updates annually or biannually
 - Greater emphasis on digital version and ease of use (that is, right now the "handbook" isn't necessarily "handy")
 - Improve CMC and AM access to PMC content that has general applicability
- Some options that have been discussed:
 - 1. Publishing chapters instead of volumes
 - One option would be to combine content from all material systems together. Each topic (e.g, building block, data submittal requirements, quality control) would have a chapter with a beginning section of information that is common to all material systems, followed by sections that provide material-specific information Could create "volumes" (compendiums) by pulling all information that is generally applicable and appropriate material sections
 - 2. Keep volumes as-is, except re-organize and divide Volume 3 into Volume 3a and 3b
 - Volume 3a could be for content that is generally applicable information and Volume 3b could be for PMC-specific information
 - Or reorganize to emphasize providing information in the order it would be used in a development program
 - Note: Vol 3 will have to be split for Rev H because it's too long. Currently planning to split into approximately equal number of pages between two existing chapters





- Revamp yellow page process to simplify and automate balloting procedures and publication
 - Secretariat provided an update
- Consider different membership structure
 - No action in this area right now, until we determine if the merged organization works and what kind of publication we will offer in the future
 - Goals are to reward active members, allow organizational/corporate membership, and increase voting participation
- Investigate becoming an ANSI-certified SDO, or joining an SDO
 - Currently no action in this area

For This Meeting



- Joint Guidelines kick-off (1 hour this afternoon)
 - Further describe future activities
- Separate PMC and AM Guidelines sessions Wednesday
 - PMC Guidelines focusing on post-Rev H activities, identifying taskings (beginning new task identification process)
 - AM Guidelines addressing yellow pages and other committee business
- AM and CMC WGs are meeting to continue content development
- PMC WG and TGs are meeting to disposition yellow pages, finalize Rev H content and some future planning
- Sandwich WG is meeting and will identify WG/TG for specific Vol 6 content needs
- Would like to emphasize cross-pollination of knowledge across material systems and identify content that is applicable to more than one material system
 - For example, if you are a member of one M&P WG or have skills in that area, consider attending M&P sessions for the other material systems

Next Actions

- Short Term
 - Finalize V3 Rev H, V5 Rev B, V7 Initial Release
 - PMC to identify post-Rev H taskings in a formal manner and establish any new WG or TG (including for Vol 6 Sandwich)
 - Update website and voting
 - Evaluate effectiveness of merged organization
- Longer Term
 - Propose and decide on new WG/TG structure
 - Propose and decide on new membership structure
 - Propose and decide on new publication methods
 - Investigate becoming or joining an SDO

Volume 6 Rev A publication is also a priority, but not certain where it will fall on this timeline

POSITE MATERIALS HANDBOOK

Email us!



- Please share your thoughts on comments with us.
- You can send them to : info@cmh17.org