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M&P Qualification and Control
Material Selection & Process Definition

- *Select adhesives & substrate materials that are chemically compatible for adhesive bonding and meet application requirements*
  - *Environmental use limits (e.g., guideline for T_{gwet})*
- *Establish detailed bonding procedures and process limits suitable for selected manufacturing approach*
  - *Surface preparation*
  - *Mix ratios*
  - *Cure cycle*
  - *Other factors affecting substrate surface wetting and chemical adhesion*

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M&P Qualification and Control
Qualification Testing

- *Qualification tests to demonstrate the suitability and repeatability of selected materials & bonding processes*
  - *Repetitive testing of key properties – set requirements*
    - *Distinct batches of material*
    - *Distinct bonding process runs controlled by the specs*
  - *Testing details characteristic of the application*
    - *Chemical and physical tests*
    - *Mechanical tests (load types, environment)*
    - *Bond durability tests*
    - *Bond test specimen details (bondline thickness, overlap length)*
  - *Analysis & documentation of qualification data*
    - *Statistical data treatment*
    - *Apply qualification data to subsequent material & process control*

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M&P Qualification and Control
Material Control

- *Specifications and instructions to control materials*
  - *Documented material requirements (acceptance limits)*
  - *Acceptance testing for adhesives*
    - *Chemical, physical and mechanical test types*
    - *Test details (adherend types, environmental effects)*
  - *Control of ancillary materials (e.g., peel ply)*
  - *Adhesive & substrate protection, storage and handling*
    - *Shipping instructions, storage environment and out time*
    - *Protection from contamination*
    - *Pre-bond moisture of substrates and adhesives*
- *Adhesive material changes that require re-assessment*

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M&P Qualification and Control
Process Control

- *Specifications & instructions to control bond processes*
  - *Bonding process details to be controlled and monitored*
    - *Substrate surface preparation for bonding*
    - *Adhesive mixing variables (if applicable)*
    - *Adhesive application (methods and timing)*
    - *Bondline thickness*
    - *Cure pressure and temperature*
  - *In-process bond testing (witness panels)*
  - *Inspection of bonded structure*
    - *Geometric tolerance assessments*
    - *Use of NDI*
- *Substrate material changes that require re-assessment*
- *Changes in bond processes that require re-assessment*

Likely overlap with Manufacturing Breakout