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Todays Quality is Tomorrows' Safety

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Today's Quality is Tomorrow's Safety

- Safety outcomes are "designed in" long before operations: quality decisions in concept, design, sourcing, manufacturing, and service become tomorrow's risk profile.
- Quality decisions made today become tomorrow's safety conditions (design, sourcing, production, installation, service).
- Quality enables safe business: fewer incidents, less downtime, fewer claims/warranty events, stronger reliability and availability.
- Business enablement: fewer incidents + less downtime + faster execution + lower warranty/claims + stronger bankability.

Quality and safety investigations often overlap

One Industry Approach: Shared Safety Expectations Across the Value Chain

- Safety requires a shared “definition of done” across the value chain.

Developer ⇔ OEM ⇔ suppliers ⇔ site execution ⇔ O&M

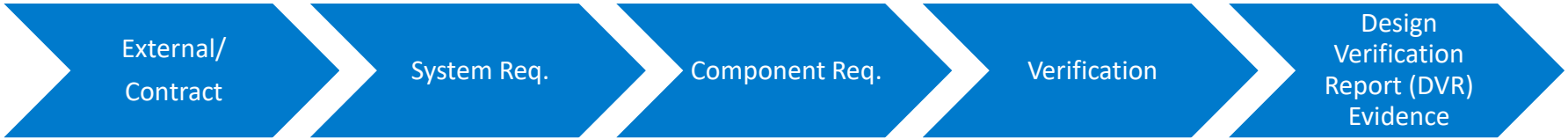
- APQP4Wind provides common language and deliverables to prevent gaps at interfaces (requirements, design changes, manufacturing escapes).
- Commercial success depends on safety-by-design and must reinforce safety outcomes (not trade them off): clear scope, controlled changes, and objective evidence reduce surprises and dispute cost.

We can still improve

Requirement Management: The Backbone of Safety Through the Product Life Cycle

- No safety without traceability: **Regulations/standards → requirements → design goals → verification → evidence**.
- Requirements must be clear, testable, owned, version-controlled, and flowed down to sub-suppliers.
- Management of Change processes is a safety barrier: any change triggers impact assessment on Design and Manufacturing Processes, with the following verification documentation.

Requirement traceability chain

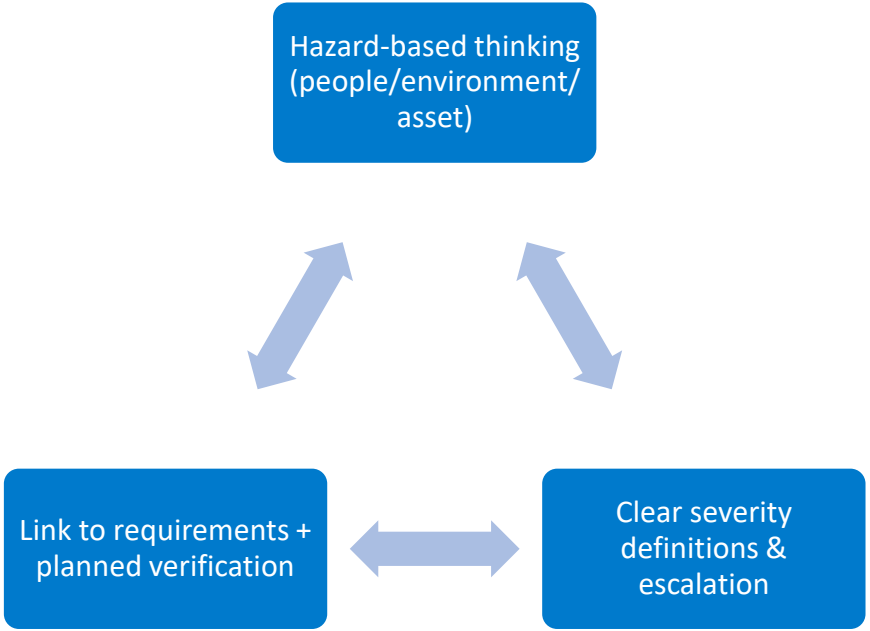


G+ considerations to share safety requirements for suppliers

Crisp Safety in Design Goals + DFMEA with the Right Competence in the Room

- Make safety explicit in design goals: hazards, limits, misuse, installation/service scenarios, abnormal conditions.
- Design Risk Assessment as DFMEA must include cross-functional competence: design + safety/quality + manufacturing + service/O&M + suppliers + test/verification (+ software/cyber where relevant).
- High-severity/safety-related failure modes demand robust action: eliminate, reduce, or control with objective evidence.

Design Risk Assessment (DFMEA) "must include"



PFMEA + Safety Special Characteristics: Mitigate to ALARP and Prove Control

- Process Risk Assessment (PFMEA) validates the process can consistently deliver safety-critical characteristics—at volume, across sites, and over time.

- Identify **Safety Special Characteristics** and reduce risk to **ALARP** using:
  - Prevention (robust process/design)
  - Detection (inspection/test/monitoring)
  - Reaction plans (stop, contain, correct, verify)

- Mandatory flow-down into execution system:
  - Design Verification Plans and Reports (verification plan + objective evidence)
  - Control Plans / ITPs (control method, frequency, acceptance, reaction)
  - Work Instructions (steps, hold points, tools, traceability)
  - RAMS (safety/reliability targets reflected in design and operational concept)

Competence: Training Quality is a Safety Barrier (and a Business Enabler)

- Competence is part of process capability: weak training = weak controls = increased safety risk.

- Role-based competence requirements per function (design, SQE, manufacturing, installation, service):
  - Risk assessment facilitation competence (DFMEA/PFMEA)
  - Inspection/test competence for safety characteristics
  - Authorization for safety-critical tasks (e.g., electrical, torqueing, lifting interfaces)

- Sustainment: refresh after design/process changes; verify through observed assessments, audits, and escape/near-miss trends.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