Overview of the EMC for Functional Safety process for a 'Complex' EFS

To maintain the EM/safety performance of the EFS over its anticipated lifecycle, its EM/physical design and mitigation measures must take account of the lifecycle physical phenomena (mechanical, climatic, biological, chemical, etc.)

EFS Design

0 Overall EM safety planning

Determine who is in overall charge, aims of the project, boundaries of the EFS, budgets, timescales, and the personnel and their responsibilities and authorities. Set up activities that manage all the following steps.

1 Determine intersystem EM/physical phenomena

Determine the worst-case EM/physical external environment(s) that the EFS could reasonably foreseeably be exposed to (including emissions from other equipment or systems), over its anticipated lifecycle. Also determine effects of emissions on other EFS.

2 Determine intrasystem EM/physical phenomena

Determine the worst-case EM/physical environment(s) that parts of the EFS could reasonably foreseeably be exposed to, due to other parts of the same EFS over its anticipated lifecycle

3 Specify EM/physical phenomena *vs* functional performance

Perform hazard identification and risk assessment that takes EMI into account; create a specification for the EFS, for each worst-case inter/intrasystem EM phenomenon, that also specifies relevant physical environment phenomena, over the anticipated lifecycle of the EFS.

4 Study/design the EFS

Including EM/safety design techniques and EM/physical mitigation for the EFS as a whole, and/or to commercial products incorporated within it, plus EFS user instructions, to meet the Step 3 EM/physical/performance specification over the anticipated lifecycle of the EFS

5 Create EM and physical verification/validation plans

Create verification and validation plans for the EFS – and for any EM/physical mitigation measures not incorporated within it – to verify design elements as design and realisation progress, and to validate the EFS at its highest practical level of assembly against the Step 3 specification.

6a Specify EM/physical phenomena *vs* functional performance for each custom-engineered item of hardware and/or software

Create a specification for each custom item, for each worst-case inter/intrasystem EM phenomenon, that also specifies relevant physical environment phenomena, over the anticipated lifecycle of the EFS.

Custom Engineering

Includes items made 'in-house'

6b Study and design each custom item of hardware and/or software

Including EM/safety design techniques and EM/physical mitigation for each item, and/or for any commercial products incorporated within it, plus user instructions, to meet the item's EM/physical/performance specification from Step 6a over the anticipated lifecycle of the EFS.

6c Create EM/physical verification/validation plans for each custom item of hardware and/or software

Create verification and validation plans for each item – and for any EM/physical mitigation measures not incorporated within a custom item – for any EM/physical mitigation measures not incorporated within a custom item that verify individual design elements as their design and realisation progress, and validate them at their final assembly against their specifications from Step 6a.

Volume-manufactured standard products' EM and physical specifications

EM/physical/functional performance specifications offered by suppliers of standard volume-manufactured products, for equipment, modules, sub-assemblies, components, software, etc.

Includes standard products made 'in-house'

6d Select any volume-manufactured standard products for each custom item

So that their manufacturers' EM/physical/performance specifications plus the EM/safety designs of stage Step 6b meet the EM/physical/performance specifications from Step 6a, for each item. The required EM/physical spec's should be in their purchasing contracts. CE marking should not be taken as evidence of EM performance.

Design iteration may be required, if it is desired to use certain products

6e Assemble/install/commission and verify each custom item of hardware and/or software

Employ QC to ensure that no problems are caused by poor quality: materials; goods; services; workmanship, or errors. Verify the EM and physical performance by applying the verification plans from Step 6c, for each item.

6f Validate each custom item of hardware and/or software

Following the validation plans from Step 6c, validate that the EM/physical performance of each item – and any EM/physical mitigation measures not incorporated within a custom item – meet their Step 6a specifications.

EFS Creation

7 Assemble/install/commission and verify the EFS

Employ QC to ensure that no problems are caused by errors, or by poor quality: materials; goods; services; workmanship, etc. Follow the Step 5 verification plans to verify the EM and physical performance of the EFS – and any measures not incorporated within it.

8 Validate the EFS

Following the Step 5 validation plans, validate that the EM and physical performance of the EFS – and any EM and physical mitigation measures not incorporated within it – meet their Step 3 specifications.

EFS operation, decommissioning, disposal

9 Maintain the EFS's specified EM/physical/performance specifications over the lifecycle

Including operation, maintenance, repair, refurbishment, upgrade, modification, decommissioning, disposal, etc.

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