Acceptance of VTS System

NB we already have a similar section in draft V128 (taken from the input file to VTS 39), as copied below:

# Verification and Validation

## *Introduction*

*The performance of VTS equipment should be verified prior to operation. This may include the following verification activities:*

* *Type approval of individual equipment, as required by law in individual countries;*
* *Other equipment specific verification tests as required by the individual VTS Authority;*
* *Verification of equipment prior to delivery in the form of Factory Acceptance Tests;*

*Verification of individual equipment or systems upon installation and Setting-to-Work, but prior to operational use in the form of Site Acceptance Tests.The overall specifications should be agreed in contractual documents. It is recommended that FAT, SAT, and other procedures are agreed before conducting tests.*

*Procedures may be generic to the individual equipment and/or specific to the individual contract.*

## *Planning and Management of Activities*

*Implementing, extending or upgrading an existing VTS should be planned and managed in detail. This could include planning of cutover activities to minimise disruption of the VTS operation.*

*The establishment and agreement of acceptance plan(s) and verification matrices may be necessary to assist all stakeholders. This may, for example, call upon:*

* *Proper attention on HMI acceptance and ergonomics;*
* *Verification of interfaces;*
* *Verification of fall back modes, graceful degradation, and redundancy within the VTS system;*
* *Latency checks of data presentation;*
* *Verification of performance parameters, including coverage;*
* *Verification of radio communication parameters, such as bit-error rates, signal-to-noise ratios, etc.;*
* *Verification of overlapping sensor coverage, including different sensor types and associated correlation;*
* *Coordination and definition of Factory Acceptance Test, Setting to Work and Site/System Acceptance Tests.*

*Early prototyping to validate critical parts (e.g. user interfaces) can minimise risk at a later stage in the programme;*

### *Renewal, Update or Extension of Existing VTS*

*The supplier(s) and the VTS Authority should propose and agree on a Cutover Plan that may take into account parallel service delivery, the use of temporary interfaces between the old system and the new system components and, in some cases, recognising that the new equipment may have to form part of the interim and/or final system configuration prior to final acceptance.*

*In many circumstances, it may not be possible to maintain the desired continuity of service throughout the planned installation activities and this need to be carefully considered by all stakeholders. Alternative procedures offering minimal safety provisions, possibly including reduced service levels, should be considered by the VTS Authority. Penalties associated with unforeseen system downtime should be agreed during contract negotiation.*

## *Acceptance Testing*

### *The Acceptance Test Plan (ATP)*

*The Acceptance Test Plan (ATP) is a collection of stages, tests, analysis, and acceptance criteria that allows the suppliers to demonstrate to the customer that their requirements have been met. For example, Factory Acceptance Test (FAT) and Site Acceptance Test (SAT) may be two key tests within an ATP.*

*The Contractor, in cooperation with the Customer, may be responsible for the creation of the ATP. The agreed Acceptance Test Plan should be available prior to the commencement of the acceptance testing. The ATP scope shall cover the complete system that forms the overall deliverable.*

*For each stage of acceptance testing, a test procedure should be issued by the Contractor based on the agreed acceptance methods and procedures captured in the ATP.*

*Test procedures should demonstrate compliance to the Customer’s functional and performance requirements. They should include an agreed test script which includes a list of requirements and corresponding verification tests, with their measurements, to demonstrate compliance.*

*At each stage of acceptance testing, test records should be issued and retained. Test records may include, as a minimum:*

* *Configuration details;*
* *Date of the test;*
* *Who performed the test;*
* *The outcome of the test such as pass/fail, measurements, or findings.*

*Upon successful completion of the acceptance activities, described in the ATP, the system is considered ready for operational use.*

### *Factory Acceptance Test (FAT)*

*If applicable, the Factory Acceptance Test demonstrates, prior to shipping and as far as agreed, that the equipment and/or system conform to contractual specifications. The VTS Authority may elect to attend or to be represented at the FAT.*

*The FAT will normally include Functional and Performance testing to agreed procedures. Tests will normally be performed for individual units and, in some cases, for pre-assembled systems.*

*The FAT may also include Functional Configuration Audit (FCA) and Physical Configuration Audit (PCA) type reviews.*

*Personnel conducting the test should be familiar with set-up and operation of the equipment in test. The Customer’s representative(s), if in attendance, should be appropriately qualified to accept the equipment and understand issues that may arise during the testing. Safety Instructions should be noted.*

*The outcome of a FAT should be recorded in a test report or certificate. These typically include:*

* *References to project name, customer, software revisions, hardware revisions, parts and serial numbers etc.;*
* *List of instruments and their calibration status;*
* *Functional test results including verification of safety measures;*
* *Performance test results;*
* *Signatures.*

*After the FAT, the Supplier should ensure that any issues that arise are addressed.*

### *Installation and Site Acceptance Test (SAT)*

*Prior to the installation of equipment, the Supplier and Customer should agree that preparatory work, such as civil works and structures, is satisfactorily completed.*

*After installation and setting-to-work, the SAT should take place. The purpose of the SAT is to confirm full functional compliance and system integration of the installed equipment.*

*The SAT may also include final Functional Configuration Audit (FCA) and final Physical Configuration Audit (PCA) type reviews.*

*The Supplier should confirm to the Customer that:*

* *All supporting documentation is available;*
* *Equipment is as tested during FAT, i.e. the software and hardware revisions do not invalidate the FAT results.*

*If these conditions are not met, additional activities should be jointly agreed and resolved.*

*The outcome of a SAT should be recorded in a test report or certificate. These typically include:*

* *References to project name, customer, software revisions, hardware revisions, parts and serial numbers etc.;*
* *List of instruments and their calibration status;*
* *Functional test results including verification of safety measures;*
* *Performance test results;*
* *Signatures.*

*After the SAT, the Supplier should ensure that any issues that arise are discussed and appropriate actions are agreed and managed to a satisfactory conclusion.*

Other random thoughts that I captured are listed below (there may be some overlap with the above copied text):

Verification and Validation

Establish the importance of the link between operational and technical requirements and acceptance – the V diagram?

Cutover planning, if important should be foreseen in the contract

Customer involvement in design reviews, the use of FCA / PCA to gather evidence for acceptance and requirement sell-off

Acceptance test plan, V&V plan, test plan, use of plans to indicate method of sell off (IADT) and phase within the project where each requirement will be sold off

Acceptance process can be linked to the different phases of the project, uses of Acceptance test plan, and separately acceptance test procedures, installation and setting to work – should not be part of acceptance, allow supplier time to rehearse and prepare for successful acceptance testing, formal presentation of system for acceptance, deviation process, documentation of “acceptance”, long term proving and monitoring (reliability, variable environments etc..)

What: equipment, system, COTS vs bespoke items, HW, SW, different environments etc..

Why: to ensure that expectations / contract / requirements are met by the delivered solution

Who: supplier, integrator, installer, customer, users, other stakeholders (competent authorities etc.)

Whan: plan, programme, phased acceptance, what is the end point? Link to warranty? Interpretation of warranty of design vs equipment LRU failures

How: test, simulate, stimulate, analysis, IADT, test scenarios, modelling etc