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| IALA Guideline |

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Acceptance of VTS SYSTEM

Edition 1.0

Document date

Revisions to this IALA Document are to be noted in the table prior to the issue of a revised document.

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# INTRODUCTION

This guideline provides general information for acceptance of VTS System.

## Objective of the Document

The objective is to provide a framework for acceptance of Systems and an overall VTS System. The framework describes suggests steps.

It provides procedures and activities that should demonstrate a VTS System is working according to the agreed specifications (e.g. verification) and is suitable for the intended services (e.g. validation).

As a result, there will be a common understanding between the Customer and the Supplier about the set requirements and the procedures that demonstrate compliance.

The suggested steps in this document can be tailored depending on the size and/or complexity of a system.

## Definitions

For the purposes of this document, the following definitions apply:

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| **System** | – | A system is an arrangement of parts or elements that together exhibit behaviour or meaning that the individual constituents do not [7]. This can be a group of items or devices working together. |
| **Test Procedure** | – | A detailed sequence of steps to be executed to demonstrate compliance to a requirement. |
| **VTS System** | – | within this document, the VTS System is considered to be the VTS software, hardware, communications and sensors. This excludes personnel and procedures [3]. |

## References

| [1] | IALA Recommendation V-119 | The Implementation of Vessel Traffic Services |
| --- | --- | --- |
| [2] | IALA Recommendation V-128 | Preparation of Operational and Technical Performance Requirements for VTS Systems |
| [3] | IALA Guideline 1111 | Preparation of Operational and Technical Performance Requirements for VTS Systems |
| [4] | IEEE 1012-2016 | IEEE Standard for System, Software, and Hardware Verification and Validation |
| [5] | ISO 9000-2005 | Quality Management Systems |
| [6] | ISO 15288-2008 | Systems and Software Engineering – System life cycle processes |
| [7] | INCOSE-TP-2003-002-03.2.2 | INCOSE Systems Engineering Handbook. A Guide for System Life Cycle Processes and Activities, Ver. 3.2.2 October 2011 |

# Acceptance Process

The acceptance process is intended to demonstrate the compliance of the VTS system, prior to operation, to the requirements.

Guideline 1111 [3] already provides an introduction to the verification and validation process, the planning and the acceptance testing. This section further elaborates the different phases and methods to serve as a reference for the subsequent sections of the document.

## Process Management

### Strategic Planning

The VTS system acceptance strategic plan shall describe how acceptance is organised. This could include:

* Acceptance criteria
* Key milestones;
* Test procedure and sequence;
* Dependencies between process steps;
* System integration and interfacing;
* Logistics arrangements;

The level of effort and detail should be in agreement with the system complexity and criticality. Compliance to a given requirement should be demonstrated as early as possible to reduce risk.

### Acceptance criteria

The basis for any acceptance process is to demonstrate that the agreed requirements are fulfilled. The handling of any discrepancies should be considered.

The requirements should describe the operational scenarios, use cases, technical functions and performance of the system. These should:

* Be uniquely identifiable
* Have an acceptance criterion
* Be SMART (Specific, Measurable, Achievable, Relevant, Time bound).

## Acceptance Steps

Typically, acceptance of a system involves various steps to demonstrate agreed requirements are fulfilled. These are shown in Figure 1.



Figure 1: Acceptance steps within a VTS Project

Typical Acceptance could include the following steps:

* Acceptance at Design Review(s);
* Factory Acceptance;
* Site Acceptance;
* Overall Acceptance

Depending on the VTS system complexity, these steps could be repeated for multiple systems and system levels. A complex VTS system could include multi-sensor system and / or a multi – site system as shown in Figure 2.



Figure 2: VTS System breakdown structure

## Acceptance Documentation

Acceptance Documentation within this section covers mainly Factory and Site Acceptance. This documentation [4] comprises the following:

1. Test Plan
2. Test Procedure
3. Test Report

### Test Plan

A test plan describes how the Supplier intends to demonstrate compliance to the requirements at a specific step (e.g. FAT, SAT etc.) The test plan should be approved by the customer prior to testing.

It should include the:

* Scope
* Approach
* Resources and Schedule
* Documentation
* Logistics
* Responsibilities

### Test Procedure

Test procedures should contain an overview of the items and requirements to be tested. It includes the test inputs, conditions, methods and expected outcomes.

The basic acceptance methods applicable to a system are the following:

1. Inspection
2. Similarity
3. Analysis
4. Demonstration
5. Test

Apart from the test methodology, the acceptance criteria should be specified and there should be an indication of how discrepancies are handled. The criteria would differ depending on the criticality of the requirement to the entire system.

### Test Report

At each stage of acceptance, the test report should include at least:

* Tested requirement(s);
* Configuration details (e.g. customer, software revisions, hardware revisions, parts and serial numbers);
* Test date;
* Person(s) who performed/witnessed the test and Signatories;
* Test outcome (e.g. Pass/fail)
* Functional and Performance Test results and comments (e.g. measurements, findings, etc.)
* References to project name;
* List of instruments and their calibration status;

In case of discrepancies, corrective actions should be agreed upon.

## Design Review

Depending on the VTS system complexity, design review(s) can be included in the acceptance process. Early involvement of relevant stakeholders in the process of the system architecture development adds value, reduces risk and ensures awareness of design, performance and legal issues.

## Factory Acceptance

### Introduction

The main reasons for factory acceptance are:

* Availability of specific and specialised equipment
* Tests are in a controlled environment and are therefore:
  + Methodical
  + Efficient
  + Precise
  + Repeatable

Personnel conducting the test should be familiar with setup and operation of the system in test. The Customer or representative should be appropriately qualified to review test report and accept the system.

### Test Execution

Factory Acceptance could include the following activities:

* Inspection of Documentation (including Production Test Reports);
* Review of Quality, Health, Safety and Environmental processes;
* System(s) inspection;
* Factory Acceptance Test (FAT).

The FAT is the Supplier’s responsibility and the Customer may elect to attend or to be represented at the FAT. The FAT will normally include Functional and Performance testing to agreed test procedures.

The FAT report should include the items listed in Section 2.3.3.

## Site Acceptance

* + 1. **Introduction**

Site Acceptance should demonstrate against the agreed design and / or requirements of the system after installation.

Site Acceptance should address those requirements that can only be tested in the operational environment. It should reference the Factory Acceptance outcome. Site acceptance may include inspections, functional checks and performance measurements.

Reasons for testing on site:

* Interaction with other systems
* Interaction with present infrastructure
* representative environment (e.g. geography)

Ideally, the SAT should not repeat the tests done at FAT.

* + 1. **Pre-conditions for site acceptance**

Prior to Site Acceptance the following should be considered:

* + Completion of installation
  + Completion of system setup
  + Status of possible corrective actions from Factory Acceptance
  + Site access and physical security
  + Construction works
  + Facilities such as power supplies (grid / non-grid / backup) and environmental conditioning
  + Safety measures, such as proper grounding, fire and lightning protection.
  + Ergonomics
  + Communication connections, on-site and, if required, off-site
    1. **Test Execution**

System Testing could comprise:

* + Physical Configuration Audits
  + Inspection of installation and workmanship including regulatory compliance
  + Test of system integration, including communications
  + Inspection of setup, parameter adaptations, and tuning
  + Site Acceptance Tests (SAT), including Functions and Performance

The SAT report should include the items listed in Section 2.3.3.

## Overall Acceptance

* + 1. **Introduction**

The VTS System should go through an Overall Acceptance. The final step of the Acceptance Process is the Overall Acceptance which should demonstrate that the system is fit for operational use and compliant with the requirements.

Reasons for an overall acceptance:

* Opportunity to test the complete VTS system
* Ensures the interfaces are performing correctly
* Ensure the VTS system is performing as intended
* Ensure the VTS system is reliable
* Observe the VTS system across different Meteorological and Hydrographical conditions

Overall acceptance is a separate process and may follow different acceptance documentation to those listed in Section 2.3. The process and acceptance criteria should be pre-agreed and the time period defined with the customer in advance.

* + 1. **Pre-conditions for overall acceptance**

The VTS System may have been through its own:

* Design Review acceptance
* Factory Acceptance
* Site Acceptance.

The VTS System is in the intended operational mode.

* + 1. **Execution**

Overall Acceptance could be performed over a period of time and could monitor the performance of the Overall VTS System including:

* + Communications (e.g. Networking);
  + Interfaces and Integration;
  + Reliability and Availability;
  + Coverage.

# ANNEX

Example of different test procedures / reports for single system and complex system.

**Design Review Acceptance Report**

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| I**ntroduction**  **blah** | |  |
| **Item** | **Description** | **Pass / Fail** |
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**FAT Report**

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| I**ntroduction**  **blah** | |  |
| **Item** | **Description** | **Pass / Fail** |
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**SAT Report**

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| I**ntroduction**  **blah** | |  |
| **Item** | **Description** | **Pass / Fail** |
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