INTER PLANT STANDARD - STEEL INDUSTRY

IPSS	ACCEPTANCE TESTING OF BUSINESS COMPUTERS AND PROCESS CONTROL COMPUTERS	IPSS:2-07-089-95
	NO CORRESPONDING IS	

0. FOREWORD

0.1 This Inter Plant Standard was prepared by the Standards Committee on Computerization & Automation, IPSS 2:7 with the active participation of the representatives of steel plants and reputed consultants in this field and was adopted on 27 September 1995.

0.2 Inter Plant Standards on design parameters primarily aim at achieving rationalization and unification of parts and assemblies of process and auxiliary equipment used in steel plants and these are intended to provide guidance to the steel plant engineers, consultants and manufacturers in their design activities.

1. SCOPE

1.1 The guidelines are prepared for acceptance testing of the computer system hardware and system software. They are expected to remove the ambiguity and limitations, if any, in testing during final acceptance.

2. EXCLUSIONS

2.1 These guidelines exclude the following from its purview:

i) Application Software Packages

ii) Field Instruments, Transmitters, Signal generators etc.

iii) Field Cabling to Instruments and Transmitters

iv) Testing of Peripherals other than Terminals, Printers etc.

3. TERMINOLOGY

3.1 **Contract** - Contract is base document. It consists of the detailed requirements of the buyer and the offer of the vendor to meet the above requirements. It also consists of the detailed technical features and specifications of the system which is to be supplied by the vendor. The detailed test procedure for evaluating these technical features will also form part of the contract.

3.2 **Down-Time** - Down time is the cumulative time for which the system as a whole or a part of it is unfit for operation.

3.3 **Evaluation Criteria** - The most critical technical features of the system offered which have met the requirement of the buyer and form part of the reasons for technical acceptance of the bid.

3.4 **Manufacturer's Works** - The shop in which the equipment has been actually manufactured.

3.5 **Performance Test** - Performance test is the final testing of the equipment where both hardware and system software are put through a stress test by loading the system with software packages/application software for a prolonged period.

3.6 **Software Packages** - Software packages are ready made software for solving the user problems using the computer, e.g. Project Management Packages, Statistical Packages, etc.

3.7 **System Software** - System software is that portion of the software without which the system cannot be put to productive use. All applications are developed using the system software.

3.8 **Uptime** - Uptime is the time for which the system has operated without any trouble.

3.9 **Vendor** - The party who has actually submitted the bid to the buyer. The bid may include many bought out items which might not have been manufactured by the vendor. He can be the manufacturer or other party.

4. ACCEPTANCE CRITERIA

The acceptance criteria like response time, uptime, etc, for the system should be settled between the vendor and the buyer at the time of contract stage itself. Each and every clause should be explicitly written and the performance acceptance criteria must be defined in quantitative terms. The following items give a brief description of all the items involved.

4.1 **Bill of Materials** - The contract should contain the Bill of Materials clearly indicating all the items that are within the scope of the supply of the vendor. These items should include not only the computer cabinets but also the inter-connecting cables, connectors, terminators for both power and signal cables. The quantities, unit of measurement should be clearly mentioned. The country of origin should also be mentioned if that was part of the evaluation criteria.

4.2 **Installation Procedures** - The installation procedures for the system should form part of the contract. These guidelines can include the IPSS guidelines and the guidelines as specified by the vendor/original manufacturer.

4.3 **Technical Features** - The technical features of the systems and the peripherals should be clearly defined in the contract. All the points considered for evaluation should be included.

4.4 **System Performance** - The system performance which was part of the evaluation criteria should be clearly defined in quantitative terms, e.g. Access time of memories, printer speeds etc.

4.5 **Acceptance Test Procedure** - Acceptance test to be performed jointly by the authorized representatives of the buyer and supplier. The acceptance test procedures should form part of the contract. It should be clearly mentioned that any instruments, equipment, software package required for testing and evaluating technical features for system performance should be provided by the vendor. The testing can be divided into two phases,

viz, testing at Manufacturer's Works and testing at site after installation and commissioning. The scope of PAT/FAT would be mutually decided within the frame work of this specification.

5. TEST PROCEDURES

The test procedures include the following:

i) Visual inspection

ii) Testing of individual hardware items

ii(a) Checking Earthing requirement fulfillment

iii) Integrated test at Manufacturer's site

iv) Visual inspection after installation and commissioning

v) Unit testing and integrated testing

vi) System software testing

vii) Software packages testing

viii) Performance testing

5.1 **Visual Inspection** - This will be done at Manufacturer's site. All the equipment will be visually inspected for manufacturing defects. The defects can be classified into two categories, viz, the defects which can be rectified subsequent to the tests at Manufacturer's site and the defects which have to be rectified before the tests at Manufacturer's site can continue. Subsequent testing will be conducted depending on the nature of defects found during the inspection.

5.2 **Testing of Individual Hardware Items** - The individual hardware items will be powered up and they will be tested for the technical features specified in the contract. All deviations will be recorded and a decision will be taken regarding the acceptance of each of the items.

5.3 **Integrated Test at Vendor/Manufacturer's Site** - The system will be installed at the Manufacturer's site. All the equipment, viz, CPU, Peripherals, etc, will be inter-connected and will be tested for integrated operation.

5.4 **Visual Inspection After Installation and Commissioning** - After the above inspection, the system will be packed for proper transportation. On receipt at the buyer's site, it will be unpacked at the buyer's site under the supervision of the vendor and all the equipment will be inspected for completeness of supplies, as per supply documents/packing list and physical condition of the supplied items.

5.5 **Unit Testing and Integrated Testing** - Unit testing will be done for the CPU and the peripherals individually. After installation an integrated test will be conducted for the entire system. The healthiness of the hardware system will be proved by running diagnostics for the CPU and the peripherals. Required test/diagnostic software must accompany the supply.

In order to qualify for acceptance, computer system with mutually agreed minimum configuration shall operate upto 24 hours a day for 15 consecutive days at an average uptime of 97%. Acceptance for hardware shall be deemed to be successful only if the computer system of agreed minimum configuration along with networking functionality, if any, is demonstrated during the agreed uptime. All the peripherals shall be demonstrated to have at least 90% uptime during this period.

Uptime is defined as productive, error-free use of equipment on the minimum configuration. Any unutilized time during the test shall also qualify as uptime provided there is no hardware and software malfunction of the minimum configuration. Supplier shall run mutually agreed software in the presence of authorized representative of the buyer during the testing period to ensure that the system conform to the specified performance.

5.6 **System Software Testing** - System software viz, Operating system, Utilities, etc, will be tested for completeness and error free running. Test programmes required, if any, will be provided by the vendor.

5.7 **Software Packages Testing** - Application Software modules/packages will be loaded and tested for errors. Each software package will be provided with a sample programme/problem with pre-defined inputs and outputs. The successful running of the sample programme with the pre-defined inputs resulting in pre-defined outputs to the satisfaction of the buyer will be pre-requisite for acceptance of the software package. These tests will be run in the actual multi-user environment, if desired so, for all the individual as well as combined software packages purchased.

5.8 **Performance Testing** - After all the above tests are completed the performance test for the system will be conducted. The entire system will be powered up. The standard performance test will be for a period of 30 consecutive days. The system will be operated for 24 hours a day for 30 consecutive days and the system should give an uptime of 99% or more for Business Computers and 99.9% or more for Process Control computers. The uptime percentage will be calculated as following:

$$\text{The Uptime Percentage} = \frac{\text{Total Performance Test Time - Down Time}}{\text{Total Performance Test Time}} \times 100$$

Performance Test Time = Power on time - Previous maintenance time

The down time for each incident shall be measured by those periods of time taken by the vendor for rectifying a defect from receiving the information till the system is handed over to the user in working condition. However, this time will include the time to get the spare parts if they are not readily available at site. During this acceptance testing, the system will be loaded by actual production programmes or a simulated programme by the buyer.

6. PERFORMANCE TESTING FOR PROCESS CONTROL COMPUTERS

6.1 Response time and system integration are most important features of Process Control Computers. The testing of the Process Control Computers should take this into consideration. The test procedures adopted for these two items will essentially depend on who is the system integrator/system engineer. If the buyer himself has designed the

system, then the tests mentioned above are adequate since the onus of system performance in actual Process Control lies with the system engineer. If the vendor is a system integrator, then the performance testing for the system should be done in three phases:

1) The tests mentioned above at para 5. except for the performance test.

2) Performance test of the Computer system without connecting to the Process. It is recommended that this test can be conducted for a week (seven days).

   All the modules shall be tested for error free performance as per contract and approved documents, using simulator programmes, wherever required. All the specified functions are to be demonstrated at the buyer's site.

3) Performance test for at least two weeks when the system is fully integrated with the process.

   For a newly installed processing plant, it shall start after the establishment of stabilised functioning of the plant itself. Bugs identified shall be removed to the satisfaction of the buyer. In case of detection of bugs/errors, the test will be restarted from zero date (beginning) after fixing the bugs.

   The test shall demonstrate error-free performance of the system meeting the specified process/production control/response time requirements fully.

The communication with field instruments response times to control the process should be thoroughly tested. The entire system should meet the performance specifications mentioned in the contract.

7. SUCCESSFUL COMPLETION OF ACCEPTANCE TEST

7.1 The acceptance test will be considered successfully completed after 30 days of continuous successful running and the uptime percentage calculated as per para 5.8 meets the specified requirements. However, if the system is down for more than 24 hours during the first 30 days, the acceptance test will be prolonged for that many days for which the system was down.

8. RECTIFICATION OF DEFECTS

8.1 If the system does not meet the uptime requirements, the manufacturer will take over the system and attend to defects if any to remove the constraints. After these rectification, the acceptance testing as mentioned at para 5.8 will be repeated from the beginning till the system is in a condition for acceptance.

9. ACCEPTANCE OF THE SYSTEM

9.1 After the successful completion of the tests, the system will be finally accepted by buyer as per protocol agreed.