

Pipe System Testing

Specification

HYDROTEST IN PROGRESS	
SYSTEM	PW-102
TEST MEDIUM	WATER
TEST PRESSURE	25.0 BAR G
TEST DURATION	60 MINUTES
START TIME	10:15
STATUS	IN PROGRESS
SAFETY FIRST	

FIDIC RED BOOK



CONDITIONS OF CONTRACT
FOR BUILDING AND
ENGINEERING WORKS
DESIGNED BY THE EMPLOYER

SPECIFICATION SECTION

1. PIPE SYSTEM TESTING

1.1 General

This section covers the requirements for testing of pipe systems as specified herein.

1.2 Scope

The testing requirements comprise but are not limited to:

- Hydrostatic testing
- Pneumatic testing
- Leak testing
- Flushing
- Drying
- Cleaning and preservation

1.3 Standards

All testing shall be carried out in accordance with the applicable Codes, Standards and Specifications as specified herein.

1.4 Acceptance

The pipe system shall be accepted based on the results of the tests in accordance with the requirements specified herein.

HYDROTEST CHECKLIST

- | | |
|---|-------------------------------------|
| ☒ Pre-Test Inspection | ☒ |
| ☒ System Isolation | ☒ |
| ☒ Vent & Drain | ☒ |
| ☒ Test Pressure | ☒ |
| ☒ Hold Time | ☒ |
| ☒ Leak Inspection | ☒ |
| ☐ Pressure Record | ☒ |
| ☐ Acceptance | ☒ |

SCOPE OF WORK

Testing Pipe Systems

Pre-Commissioning & System Testing

Contract Form	FIDIC Conditions of Contract for Construction, 2nd Edition 2017 (Red Book)
Document Title	Scope of Work – Testing
Document No.	[SOW-TEST-001]
Project	[Insert Project Name]
Employer	[Insert Employer Name]
Revision	Rev. 0 – For Tender
Date	[DD Month YYYY]
Prepared by	[Name / Organization]
Approved by	[Engineer / Employer Rep]

1. PURPOSE AND SCOPE

This Scope of Work (SOW) defines the technical requirements, responsibilities, and acceptance criteria for all Testing activities to be performed by the Contractor under the Contract. It forms part of the Employer's Requirements and is to be read in conjunction with the General Conditions (FIDIC Red Book 2017) and the Particular Conditions.

This document covers the following testing activities, which shall be performed in the sequence set out in Section 7 of this SOW:

- Hydrostatic Testing (Hydrotest)
- Pneumatic Testing
- Water Flushing
- Chemical Cleaning
- Air Blowing
- Steam Blowing
- Drying and Preservation

The objective of the Testing programme is to verify that the piping systems and associated equipment are mechanically sound, clean, dry, and protected for safe introduction of process fluids, and meet all requirements for handover to commissioning in accordance with Sub-Clause 9.1 [Contractor's Obligations] of the General Conditions.

2. CONTRACT REFERENCES AND APPLICABLE CLAUSES

The following clauses of the FIDIC Conditions of Contract for Construction, 2nd Edition 2017 (Red Book) are directly applicable to this Scope of Work:

Clause / Sub-Clause	Title	Relevance to Testing
Sub-Clause 4.1	Contractor's General Obligations	Obligation to execute and complete Works; submit as-built records and O&M manuals prior to Tests on Completion
Sub-Clause 4.9	Quality Management and Compliance Verification Systems	Contractor to maintain QMS covering testing activities; Engineer may audit
Sub-Clause 7.4	Testing	Applies to all testing other than Tests after Completion; Contractor provides everything necessary; advance notice to Engineer; Engineer entitled to attend
Sub-Clause 7.5	Rejection	Engineer may reject Plant, Materials or workmanship that fails tests; Contractor to remedy at own cost
Sub-Clause 7.6	Remedial Work	Engineer may instruct repair, removal or re-execution following test failures
Sub-Clause 9.1	Contractor's Obligations (Tests on Completion)	Contractor to carry out Tests on Completion after providing requisite documents; test programme requires Engineer no-objection
Sub-Clause 9.2	Delayed Tests	Procedures where Engineer delays Tests on Completion beyond agreed date
Sub-Clause 9.3	Retesting	Failure to pass requires retesting; Performance Damages may apply on repeated failure
Sub-Clause 9.4	Failure to Pass Tests on Completion	Employer's entitlements including rejection, Performance Damages or Taking-Over with reduced Contract Price

Clause / Sub-Clause	Title	Relevance to Testing
Sub-Clause 10.1	Taking Over of the Works and Sections	Taking-Over Certificate not issued until Tests on Completion passed or deemed passed
Sub-Clause 11.6	Further Tests after Remedying Defects	Engineer may require re-testing after defect remediation during DNP

NOTE: Where this Scope of Work refers to the “Engineer”, this means the Engineer appointed under Sub-Clause 3.1 of the General Conditions acting within the authority delegated under the Contract.

3. DEFINITIONS

For the purposes of this Scope of Work, the following definitions apply in addition to those in Clause 1 of the General Conditions:

Term	Definition
Test Package	A set of documents compiled by the Contractor covering system boundaries, P&IDs, test procedures, material certificates, and records for a defined test system
Mechanical Completion	The stage at which construction of a system is complete in all respects, including installation of all permanent components, prior to testing
Pre-Commissioning	All activities from Mechanical Completion up to and including handover for Commissioning, encompassing the full testing sequence defined herein
Test Pressure	The pressure to which a system is subjected during pressure testing, as defined in the applicable design code and project specification
Acceptance Criteria	The measurable standards a system must achieve for a test to be deemed passed, as defined in this SOW and applicable codes
Hold Point	A stage in the work at which the Contractor must stop and obtain the Engineer's witness or review before proceeding
Witness Point	A stage at which the Engineer is notified and may attend; work may proceed if the Engineer does not attend within the agreed notification period
DNP	Defects Notification Period as defined in the Contract Data

4. GENERAL REQUIREMENTS

4.1 Contractor's Obligations

In accordance with Sub-Clause 7.4 of the General Conditions, the Contractor shall:

1. Provide all labour, supervision, equipment, instruments, materials, consumables, and utilities required to perform all testing activities described in this Scope of Work, unless otherwise stated in the Particular Conditions.
2. Prepare and submit, for the Engineer's no-objection, a Testing Programme and individual Test Procedures for each activity described in this SOW, at least [21] days prior to the commencement of the relevant test.
3. Give advance notice to the Engineer of the time and location of each test in accordance with Sub-Clause 7.4, to enable the Engineer to attend.
4. Ensure that no test is covered up, enclosed, or otherwise made inaccessible after completion, without the Engineer's prior no-objection.
5. Record all test results on approved Test Record Sheets and submit to the Engineer within [5] working days of test completion.
6. Maintain a Test Status Register showing the status (Not Started / In Progress / Complete / Failed / Accepted) of all test activities for each system.
7. Ensure all testing personnel hold relevant qualifications and competencies, and submit evidence thereof upon request by the Engineer.

4.2 Engineer's Hold Points and Witness Points

The following inspection and test hold/witness regime shall apply:

Testing Activity	Hold Point (H)	Witness Point (W)	Notification Period
Hydrostatic Test – final pressurisation	H		48 hours
Pneumatic Test – final pressurisation	H		48 hours
Water Flushing – final acceptance check		W	24 hours
Chemical Cleaning – passivation completion		W	24 hours
Air Blowing – final blow acceptance		W	24 hours
Steam Blowing – target plate inspection	H		48 hours
Drying – dew point verification		W	24 hours

NOTE: The Engineer's failure to attend a Witness Point after proper notification shall not prevent the Contractor from proceeding with the test.

4.3 Documentation and Records

The Contractor shall compile a Test Dossier for each system or test boundary, containing as a minimum:

- Test Package index and system boundary drawings
- Approved test procedure
- Calibration certificates for all test instruments
- Pressure gauge and thermometer calibration records
- Pre-test inspection checklist (signed by Contractor QC and Engineer)
- Test record sheets with time-stamped pressure / flow / temperature readings
- Non-conformance reports and close-out records
- Final test certificate signed by Contractor and countersigned by the Engineer

The complete Test Dossier shall be submitted to the Engineer as part of the documentation package required under Sub-Clause 4.1(d) prior to Tests on Completion.

4.4 Applicable Codes and Standards

All testing shall be performed in accordance with the following codes and standards (latest edition unless stated). Where conflicts exist, the more stringent requirement shall apply:

- ASME B31.3 – Process Piping
- ASME B31.1 – Power Piping (steam systems)
- EN 13480 – Metallic Industrial Piping
- ISO 15614 – Specification and qualification of welding procedures
- Project-specific piping and instrumentation specifications (as listed in Annex A)
- Applicable statutory and regulatory requirements of the country of the project

5. TESTING ACTIVITIES

5.1 Hydrostatic Testing (Hydrotest)

5.1.1 Purpose

Hydrostatic testing is performed to verify the strength and leak-tightness of piping systems before they are placed into service. In accordance with Sub-Clause 7.4, the Contractor shall demonstrate that all systems comply with the specified test pressure requirements.

5.1.2 Scope

Hydrostatic testing shall be applied to all process, utility, and service piping systems within the Works, unless specifically excluded in the Particular Conditions or the applicable design code permits an alternative test method.

5.1.3 Procedure

The Contractor shall perform hydrostatic testing in accordance with the approved procedure. The following minimum steps shall be observed:

8. Verify Mechanical Completion of the test system including all permanent supports and isolation devices.
9. Install test blinds, temporary spades, and pressure relief devices as shown on the approved test boundary drawing.
10. Fill the system with clean, potable-quality water. Inhibitors may be added subject to Engineer approval.
11. Vent all trapped air from all high points prior to pressurisation.
12. Raise pressure gradually in stages of not more than [10%] of the test pressure, pausing at each stage to check for leaks and deformations.
13. Hold at the specified test pressure for a minimum duration of [30 minutes] (or as specified in the applicable code, whichever is greater), during which a visual inspection of all welds, joints, flanges, and fittings shall be carried out.
14. Record pressure and temperature continuously throughout the hold period.
15. Depressurise safely to atmospheric pressure before breaking any joint.
16. Drain the system completely and ensure all test water is disposed of in accordance with the environmental requirements of the Contract.

5.1.4 Test Pressure

Unless otherwise specified, the hydrostatic test pressure shall be 1.5 times the design pressure ($P_2 = 1.5 \times P_1$), corrected for temperature where required by the applicable code.

5.1.5 Acceptance Criteria

Criterion	Requirement
Visible leakage	None permitted
Pressure loss	Not to exceed [0.1 bar] over the hold period after temperature stabilisation
Permanent deformation	None permitted; system to be visually inspected throughout
Structural damage	None permitted

5.1.6 Typical Risks and Mitigations

- Leaking flange joints: Ensure correct bolt torque to specification before test; re-torque permitted during hold at atmospheric pressure only.
- Defective welds: Pre-test NDE to be completed and signed off per the Inspection and Test Plan.
- Air pockets: Adequate venting at all high points verified by Contractor QC prior to pressurisation.
- Corrosion from retained test water: Systems shall be drained and dried within [48] hours of test completion. Inhibitors shall be used where prolonged water contact is unavoidable.

5.2 Pneumatic Testing

5.2.1 Purpose

Pneumatic testing verifies the integrity and leak-tightness of systems where hydrostatic testing is not feasible or where water contamination must be avoided, including instrument air systems, gas pipelines, cryogenic systems, and dry gas services.

5.2.2 Scope

Pneumatic testing shall be applied only to systems specifically identified in the Particular Conditions or approved by the Engineer in writing. Given the significantly greater stored energy in compressed gas compared with water, pneumatic testing shall be treated as a safety-critical activity and shall require a specific Risk Assessment and Method Statement (RAMS) approved by the Engineer prior to commencement.

5.2.3 Procedure

17. Complete all pre-test documentation, RAMS, and obtain Engineer Hold Point sign-off.
18. Establish and clearly demarcate an exclusion zone around the test system.
19. Pressurise the system using dry compressed air or nitrogen in stages: to [10%] test pressure, hold for [10 minutes]; then to [50%] test pressure, hold for [15 minutes]; then raise to full test pressure.
20. Apply a soap solution or approved leak detection fluid to all joints, welds, and connections to detect leakage.
21. Hold at test pressure for the specified duration.
22. Depressurise safely and in a controlled manner.

5.2.4 Test Pressure

The pneumatic test pressure shall be 1.1 times the design pressure ($P_2 = 1.1 \times P_1$) unless a higher value is required by the applicable code.

5.2.5 Acceptance Criteria

Criterion	Requirement
Visible leakage	None permitted (including from soap solution bubble test)
Pressure loss	No measurable pressure loss over hold period after temperature stabilisation
Component damage	None permitted

5.2.6 Safety

The Contractor's attention is drawn to the stored energy hazard associated with pneumatic testing. As a minimum, the following safety measures shall be observed:

- All personnel not directly involved in the test shall be excluded from the exclusion zone.
- Pressure relief valves set at not more than 110% of test pressure shall be installed.
- No impact, welding, or cutting activities shall be permitted on the pressurised system.
- Testing shall not be carried out in adverse weather conditions (high winds or lightning risk).

5.3 Water Flushing

5.3.1 Purpose

Water flushing removes loose particulate contamination (sand, dust, rust particles, welding slag, and construction debris) from the internal surfaces of piping systems prior to commissioning.

5.3.2 Procedure

23. Install temporary strainers at all equipment nozzles and designated flush exit points.
24. Flush clean water through the system via designated flush circuits, maintaining a minimum flushing velocity of [1.5 m/s] or as specified by the applicable project standard.
25. Direct flush water to approved discharge points in accordance with the environmental requirements of the Contract.

26. Monitor effluent clarity visually and, where specified, by turbidity measurement.
27. Continue flushing until acceptance criteria are met. Change flush direction where practical to dislodge debris from dead legs.
28. Remove and inspect temporary strainers; replace or clean as required.

5.3.3 Acceptance Criteria

- Effluent water visually clear with no visible solid particles.
- Turbidity not to exceed [10 NTU] or the value specified in the project specification.
- Strainer mesh free of significant solid debris on two consecutive inspections at intervals of [15 minutes].

5.4 Chemical Cleaning

5.4.1 Purpose

Chemical cleaning removes contaminants that cannot be removed by water flushing alone, including mill scale, oxide layers, grease, oil, and corrosion products.

5.4.2 Cleaning Stages

The following cleaning stages shall be performed in the sequence stated, unless otherwise agreed in writing with the Engineer:

Stage	Activity	Purpose
1	Degreasing	Removes oil, grease, and hydrocarbon contamination from internal surfaces using alkaline detergent or solvent solution
2	Pickling	Removes mill scale, oxides, and rust using acid solution (typically citric acid or dilute hydrochloric acid); concentration and temperature per procedure
3	Neutralisation	Raises pH to neutral range to halt acid reaction; monitored by pH measurement
4	Rinse	Thorough water rinsing to remove all chemical residue
5	Passivation	Creates a stable protective oxide film on metal surfaces using sodium nitrite or other approved passivating agent
6	Drying	System dried to required dew point; see Section 5.7

5.4.3 Acceptance Criteria

- Required surface cleanliness grade achieved (as defined in project specification, e.g. Sa 2½ to ISO 8501-1).
- All chemical residues removed; rinse water pH within acceptable range [6.5–7.5].
- Surface condition inspected and accepted by Engineer prior to passivation.
- No pitting or chemical attack beyond allowable limits.

5.4.4 Environmental and Safety Requirements

All chemical cleaning agents, waste solutions, and rinse water shall be managed in accordance with the relevant legislation and the Environmental Management Plan. The Contractor shall prepare a Chemical Waste Management Plan for Engineer approval prior to commencing chemical cleaning activities.

5.5 Air Blowing

5.5.1 Purpose

Air blowing removes loose debris from piping systems where the use of water is undesirable, particularly instrument air systems, utility air systems, and dry gas services.

5.5.2 Procedure

29. Install temporary blow-out connections and ensure downstream equipment is isolated and protected.
30. Pressurize the system to [2–4 bar g] (or as specified) using oil-free dry compressed air.
31. Open the blow-out connection rapidly to create a high-velocity air discharge.
32. Collect and inspect debris at blow-out exit points.
33. Repeat until acceptance criteria are achieved.
34. Cap or seal all temporary connections upon completion.

5.5.3 Acceptance Criteria

- No visible debris discharged on final blow.
- Inspection target (white cloth or similar) placed at exit shows no solid particles on [3] consecutive blows.

5.6 Steam Blowing

5.6.1 Purpose

Steam blowing removes construction debris from high-pressure steam systems before turbine startup or plant operation. The high-velocity steam generates forces significantly greater than normal operating conditions, dislodging debris that cannot be removed by other means.

5.6.2 Typical Applications

Steam blowing shall be applied to all high-pressure steam headers, turbine inlet piping, and associated systems as identified on the approved Steam Blow Scope Drawing.

5.6.3 Procedure

35. Install temporary steam blow piping and silencer (or discharge to a safe location) in accordance with the approved temporary piping design.
36. Install a stainless steel target plate (polished, 150 mm × 150 mm minimum) at the designated discharge location downstream of the last permanent valve.
37. Raise steam pressure to the specified blow pressure, heat soak the system and then rapidly open the blow valve.
38. After each blow, allow the system to cool and recover to pressure before the next blow.
39. Remove and inspect the target plate after each set of blows; record all impact marks.
40. Continue until acceptance criteria are met.

5.6.4 Acceptance Criteria

The target plate shall show, on two consecutive blow sets:

- No particle impact mark greater than [0.8 mm] in any dimension.
- No more than [2] impact marks per [100 cm²] of target area.
- No metallic debris visible on the plate surface.
- Acceptance in accordance with the project-specific Cleanliness Factor (CF) calculation where required.

5.7 Drying and Preservation

5.7.1 Purpose

Drying removes residual moisture after testing and cleaning to prevent corrosion, microbial growth, instrument damage, and product contamination. Preservation protects the system from deterioration until commissioning.

5.7.2 Drying Methods

The applicable drying method shall be selected based on the system service and specified in the test procedure. The following methods are recognised:

Method	Description	Typical Application
Air Drying	Circulation of dry compressed air at ambient temperature	General utility systems with moderate dryness requirement
Hot Air Drying	Circulation of heated dry air to accelerate evaporation	Larger systems or where faster drying is required
Nitrogen Drying	Purging with dry nitrogen to achieve very low dew points	Instrument systems, gas service, and cryogenic systems
Vacuum Drying	Reduction of system pressure to remove moisture	Sealed systems requiring very low residual moisture levels

5.7.3 Dryness Verification

Dryness shall be verified by continuous monitoring with a calibrated hygrometer or dew point meter at the system outlet. Readings shall be logged at intervals of not more than [15 minutes].

5.7.4 Acceptance Criteria for Drying

- Dew point at system outlet to reach and maintain the specified level for a continuous period of [30 minutes]: typical target $-[40]^{\circ}\text{C}$ dew point or as specified per system service.
- No standing water visible in any low point or drain.
- Moisture content within project specification limits.

5.7.5 Preservation Methods

Following acceptance of drying, the system shall be preserved using one of the following methods, as specified for the system service:

- Nitrogen Blanketing: Maintain positive nitrogen pressure of [0.1–0.3 bar g] with continuous monitoring and make-up supply.
- Desiccant Preservation: Install desiccant breathers or sealed desiccant packs at all vents and drains; replace on schedule or when colour-change indicator shows saturation.
- Chemical Preservation: Apply approved corrosion inhibitor in accordance with the Chemical Preservation Procedure submitted by the Contractor.

The Contractor shall maintain the preservation until written authorisation to commence commissioning activities is received from the Engineer.

6. HEALTH, SAFETY AND ENVIRONMENT

All testing activities shall be performed in accordance with the Contractor's Health, Safety and Environmental (HSE) Management Plan and the project HSE requirements. As a minimum:

- A site-specific Risk Assessment and Method Statement (RAMS) shall be prepared and submitted to the Engineer at least [14] days before each testing activity commences.
- Permit to Work (PTW) systems shall be observed for all pressure testing and chemical cleaning activities.
- All high-pressure testing areas shall be barricaded with appropriate signage and exclusion zones established.
- Emergency depressurisation procedures shall be established and communicated to all test personnel.
- Medical and first aid facilities shall be available at the test site.
- All chemical handling shall comply with applicable Safety Data Sheet (SDS) requirements.
- Waste water and chemical effluent disposal shall be in accordance with the Environmental Management Plan and applicable regulations.
- Steam blow activities shall include noise assessment and appropriate hearing protection for all personnel within [50 m] of the blow discharge.

7. PRE-COMMISSIONING TESTING SEQUENCE

The Contractor shall perform testing activities in the following sequence unless an alternative sequence is approved in writing by the Engineer:

Step	Activity	Completion Criteria	Section Ref.
1	Mechanical Completion	All construction complete; punch-list items categorised	N/A
2	Hydrostatic / Pneumatic Test	Test certificate issued; zero leaks	5.1 / 5.2
3	Draining	All test water drained; verified dry	5.1.3
4	Water Flushing	Effluent clean; turbidity within limits	5.3
5	Chemical Cleaning (if required)	Cleanliness grade achieved; chemical residues removed	5.4
6	Air Blowing / Steam Blowing	Target plate / cloth clean on consecutive blows	5.5 / 5.6
7	Drying	Dew point achieved and maintained	5.7
8	Preservation	System preserved; handover documentation complete	5.7.5
9	System Handover	Test Dossier submitted; Tests on Completion readiness confirmed	Section 8

NOTE: The Engineer's no-objection to the Tests on Completion programme (Sub-Clause 9.1) must be obtained before the Contractor can proceed to Step 9.

8. HANDOVER FOR TESTS ON COMPLETION

Upon completion of the Pre-Commissioning Testing sequence described in Section 7, the Contractor shall:

41. Submit the complete Test Dossier for each system to the Engineer.
42. Submit updated as-built drawings and the Operation and Maintenance (O&M) manuals in accordance with Sub-Clause 4.1(d).
43. Submit the proposed Tests on Completion programme and test procedures, and obtain the Engineer's no-objection in accordance with Sub-Clause 9.1.
44. Give notice to the Engineer of readiness to commence Tests on Completion, specifying the date, time, and location.

The Contractor shall carry out the Tests on Completion in the presence of the Engineer. Failure to pass any Test on Completion shall be addressed in accordance with Sub-Clause 9.3 [Retesting] and Sub-Clause 9.4 [Failure to Pass Tests on Completion].

The Taking-Over Certificate shall not be issued until the Tests on Completion have been passed in accordance with Sub-Clause 10.1 of the General Conditions.

9. SUBMITTALS SCHEDULE

The Contractor shall submit the following documents for the Engineer's review and no-objection. The minimum submission lead times stated below are measured from the planned start of the relevant activity:

Document	Review Basis	Lead Time	Applicable Clause
Master Testing Programme	No-objection	28 days	SC 7.4
Individual Test Procedures (each activity)	No-objection	21 days	SC 7.4
RAMS for Pressure Testing and Chemical Cleaning	No-objection	14 days	SC 4.8
Chemical Waste Management Plan	No-objection	21 days	SC 4.18
Tests on Completion Programme	No-objection	21 days	SC 9.1
Test Record Sheets (per test)	For record	5 working days after test	SC 7.4
Test Dossier (per system)	No-objection	Prior to Tests on Completion	SC 4.1(d)
Instrument Calibration Certificates	For record	Prior to test	SC 7.4

10. MEASUREMENT AND PAYMENT

Unless otherwise stated in the Bill of Quantities or Schedule of Prices, all testing activities described in this Scope of Work are deemed to be included within the Contract Price and are not subject to separate measurement or payment.

Where the Engineer instructs additional testing under Sub-Clause 7.4 (variation to the scope of the specified testing) or where repeated testing is necessitated by the Employer's actions (Sub-Clause 9.2), the Contractor shall be entitled to a Claim for additional Cost and any appropriate extension of time in accordance with Clause 20 of the General Conditions.

Where the Contractor fails to pass any Test on Completion and retesting is required under Sub-Clause 9.3, the cost of retesting shall be borne by the Contractor. Performance Damages applicable to failure of Tests on Completion are set out in the Schedule of Performance Guarantees (Annex B).

11. ANNEXES

The following annexes form part of this Scope of Work:

Annex	Title	Description
A	Applicable Project Specifications and Standards	List of project-specific technical standards and specifications governing testing activities
B	Schedule of Performance Guarantees	Performance Damages applicable to failure of Tests on Completion (Sub-Clause 9.4)
C	System List and Test Boundaries	List of all systems subject to this SOW, with test boundary reference drawings
D	Test Record Sheet Templates	Blank record sheets for each testing activity
E	Test Status Register Template	Master register for tracking test status per system

DOCUMENT APPROVAL

Role	Name	Signature	Date
Prepared by			
Checked by			
Engineer (Employer's Rep.)			
Employer Approval			

End of Scope of Work – Testing