

ENVITEST LABORATORIES PRIVATE LIMITED

Building Reliable Products: It's More Than Just Good Design.

When a Product Fails, Is It Fair to Blame the Design Engineer or the Test Lab?

When a product fails, the first reaction is often to identify someone to blame. More often than not, the finger is pointed at the design engineer who created the product or the laboratory that tested and certified it. While this may seem like a logical conclusion, it rarely reflects the complete picture. Product reliability is influenced by a combination of engineering decisions, manufacturing quality, operating conditions, user practices, and environmental stresses. Looking at only one part of the chain often leads to incorrect conclusions.

A design engineer develops a product based on defined requirements, available standards, expected operating conditions, cost targets, and project timelines. Every engineering decision involves trade-offs. A product designed for indoor operation cannot reasonably be expected to survive exposure to outdoor conditions. Similarly, no engineer can design against unknown or unspecified environmental stresses. A successful design is one that meets the intended application—not every

conceivable condition that might occur.

Likewise, a testing lab validates products against agreed standards, specifications, and customer-defined test plans. Laboratories do not determine how a product should be designed; they verify whether it satisfies the applicable qualification requirements. If a product successfully passes all specified tests but later encounters operating conditions that were never part of the qualification program, it does not necessarily indicate that the laboratory failed. It simply means the product was exposed to scenarios beyond the defined scope of testing.

The successful product development is always a collaborative effort. Design engineers, manufacturing teams, quality engineers, test laboratories, suppliers, logistics partners, installation teams, and end users all contribute to the final reliability of a product. When each stakeholder understands their role and communicates effectively, the likelihood of unexpected failures reduces considerably. .

Engineering Better Products Through Testing Feedback

Testing is often viewed as the final checkpoint in product development—a simple "pass" or "fail" exercise before a product reaches the market. In reality, the greatest value of testing lies in the engineering feedback it provides. Every test, whether successful or unsuccessful, generates valuable information that helps engineers better understand product behavior and make informed design improvements.

A product's reliability depends on far more than its design alone. Manufacturing quality, component selection, environmental conditions, power supply fluctuations, EMI/EMC, vibration, shock, transportation, installation practices, and actual field operating conditions all influence long-term performance. Even a well-designed product can encounter unexpected challenges when exposed to conditions beyond its original design requirements. Therefore, when a product experiences issues, the focus should not be on identifying and understanding the complete set of factors that contributed to the failure. A structured root cause analysis trans-

forms every failure into an opportunity for learning and continuous improvement.

Successful product development is never the responsibility of a single engineer or a single department. It is a collaborative journey. Each stage of the product lifecycle contributes to the overall reliability. When all stakeholders work together and share knowledge, products become more robust, safer, and better suited for real-world applications.

At Envitest Lab, we believe testing is about enabling better engineering decisions. Every activity and evaluation generates actionable engineering data that helps identify design weaknesses, validate improvements, and reduce future risks. Testing is not the end of product development—it is an essential part of the design improvement cycle. Every test as an opportunity to learn, innovate, and refine, engineer products that deliver higher reliability, greater customer confidence, and long-term performance in the environments where they truly matter...



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SPECIAL POINTS

Envitest Laboratories has successfully renewed its **NABL accreditation** without any gap, ensuring uninterrupted accredited testing services.

We have added a high-precision **Weiss Thermal chamber** to our lab, further enhancing our environmental testing capabilities to better support our customers..

Engineering New Possibilities: Envitest Engineers Built a Dedicated Test System

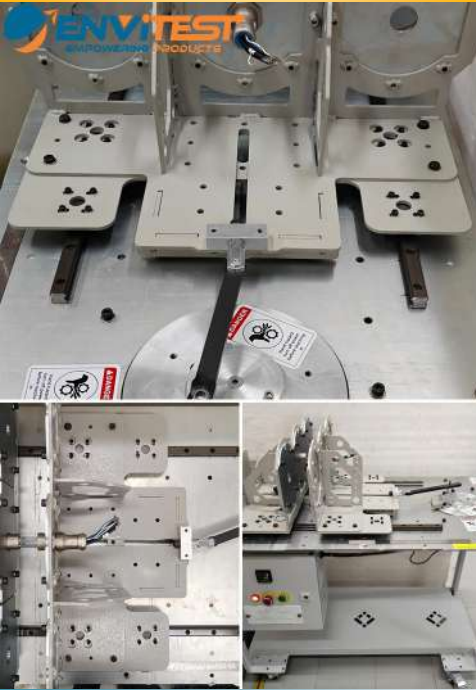
IEC 60512-9-1 (Test 9a):

Ever since Envitest Lab expanded into Electrical and Optical Fibre Connector Testing, every week brings a new challenge. We regularly receive test requests that we have never encountered before—each requiring unique fixtures, specialized equipment, or entirely new test facilities. Rather than viewing these as obstacles, we see them as opportunities to innovate. At Envitest, we believe that every new standard is an opportunity to expand our capabilities, and our engineering team is always ready to develop solutions that meet evolving industry requirements.

One such challenge was IEC 60512-9-1 (Test 9a), an internationally recognized standard for evaluating the mechanical endurance of electronic connectors. At first glance, the test appears simple—it repeatedly mates (plugs) and

unmates (unplugs) connector pairs. However, the standard requires an asynchronous sequence of operations, which our existing endurance test system was not designed to support. To achieve accurate, repeatable, and standards-compliant results, we had two options: search for a commercially available machine or engineer a solution ourselves.

At Envitest Lab, our engineers are always excited for new challenges. The team unanimously chose the second option—design and build our own machine. Within just two weeks, our engineering team designed, fabricated, assembled, and validated a fully functional test system that met the requirements. The successful outcome once again demonstrated our ability to rapidly develop innovative testing solutions and expand our capabilities to meet evolving customer and industry requirements.



Sometimes, engineering victories aren't celebrated with loud applause. They're celebrated with a simple nod of satisfaction, because everyone in the room understands how much effort went into reaching that moment.

The Story Behind Our IEC 60512-9-1 Test System

The machine evolved based on three simple principles:

Get the Basics Right: Every movement, alignment, speed, and travel distance had to be precise. Even the smallest error could affect thousands of test cycles.

Keep Improving: Every trial taught us something new. We redesigned, adjusted, and tested again. Our mindset was simple: "Better... but not good enough."

Never Compromise: Nothing was left to chance. Every part, every motion, and every test cycle was checked until the machine delivered reliable, repeatable, and standards-compliant results.

From Standard to Solution: Two Weeks, One Challenge, Countless Ideas

The challenge looked deceptively simple. "Just plug and unplug the connector repeatedly." But standards tell the different story. Hidden behind those few lines was an engineering puzzle waiting to be solved.

The objective of the test is straightforward—to evaluate whether an electrical connector can withstand thousands of mating and unmating operations while maintaining its mechanical integrity and electrical performance. No electrical load is applied. The focus is entirely on mechanical endurance. Every cycle must be performed at a controlled speed, with perfect alignment, without introducing abnormal forces or stresses that could invalidate the results. That was the real challenge.

Our existing endurance systems were excellent at what they were designed to do, but they couldn't perform the sequence demanded by this standard. Buying a machine was certainly an option—but where was the fun in that?

The team gathered around sketched the first idea. Another engineer immediately pointed out a flaw. "What happens if the connector twists after 2,000 cycles?"

"What if insertion depth changes because of wear?"

"How do we maintain speed without introducing vibration?"

The questions kept coming. Every answer created two

new questions. The first prototype existed only as rough sketches and calculations. Then CAD models. Components were selected, rejected, redesigned. Nothing was accepted simply because it looked good. Every part had to justify its existence. The workshop slowly transformed into an engineering playground. Aluminium profiles, Linear guides, Motors, sensors, couplings, fixtures, and brackets found their places on the workbench. Every evening, the machine looked different from the previous day.

Then came the first movement. It worked. Well... almost. The connector didn't align perfectly. Back to the drawing board. A fixture was redesigned. The guide mechanism was repositioned. Travel limits were adjusted. The insertion angle improved. Try again. Better. Still not good enough.

Piece by piece, the machine evolved—not because someone had the perfect design on Day One, but because every engineer refused to stop improving it.

The room fell silent for a few seconds.

Then someone smiled.

Another engineer quietly said, "It works."

It was another reminder that innovation doesn't always begin with a purchase order. Sometimes, it begins with curiosity, a whiteboard full of ideas, countless iterations, and a team that refuses to give up until the solution is right.



India Needs More Than Manufacturing—It Needs World-Class Testing Infrastructure

The Government of India's approval of the ₹1.27 lakh crore Semicon 2.0 programme and the ₹62,500 crore Electronics Component Manufacturing (ECM) scheme is a landmark step towards making India a global electronics manufacturing hub. The focus on semiconductor packaging, PCBs, and component localization is exactly what the industry has been waiting for.

But there is one question we should all ask: Can India truly build world-class products without equally investing in testing and validation?

Every electronic component manufactured in India must eventually prove itself under real-world operating conditions. Whether it is an automotive ECU, aerospace connector, defence communication system, consumer electronic device, or telecom equipment, every product must survive vibration, thermal cycling, humidity, shock, EMI/EMC exposure, electrical stress, and years of continuous operation.

As India moves towards component localization, the country's testing ecosystem must grow at the same pace. Every new component, connector, PCB, cable assembly, requires qualification before it reaches customers. Without reliable testing infrastructure, manufacturers face increasing cost, development time, and certification delays.

At Envitest Lab, we see this transition as an opportunity and a responsibility. Since our incep-

tion, we have continuously invested in expanding testing capabilities whenever the industry demanded them. Every new customer requirement, every evolving international standard, and every emerging technology has motivated us to build new facilities, develop specialized fixtures, and engineer custom test solutions.

Supporting India's semiconductor and electronics ecosystem requires more than purchasing sophisticated equipment. It demands investment in skilled engineers, calibration systems, automation, QMS, and continuous capability development. These investments are long-term commitments, but they are essential for building global confidence in Indian products.

As the nation accelerates towards Make in India, Envitest Lab remains committed to strengthening India's testing infrastructure at every step. We are ready to invest in new technologies, develop new qualification methods, and collaborate with manufacturers, startups, research institutions, and government agencies to ensure that products designed and manufactured in India are also tested, validated, and trusted in India.

Because the journey from "Made in India" to "Trusted Worldwide" doesn't end at the factory—it passes through the testing laboratory. Our philosophy has always been same—if the industry needs it, we should be ready to build it.

Why Testing Infrastructure Is the Backbone of Research and Development for local Manufacturing

Every localized component reduces import dependence:

When components are made in India, manufacturers rely less on imports. This improves supply chain stability, reduces costs, and protects businesses from global disruptions.

Every domestically designed PCB builds engineering strength:

Designing PCBs in India develops local engineering talent and technical expertise. It helps Indian companies move beyond assembly and create products from the ground up.

Every validated product builds customer trust:

Testing and validation prove that a product is reliable and safe. Products that meet international standards earn greater confidence from customers in India and around the world.

Every successful Indian product strengthens the ecosystem:

A successful product creates jobs, supports suppliers, encourages startups, and drives further innovation. One product often creates opportunities for many other businesses.

Every Great Product Begins with Great Engineering—and Ends with Great Testing:

When India can design, manufacture, and test its own products, it becomes less dependent on other countries. This strengthens our economy, improves technological capability, and supports the vision of a truly self-reliant India....

From Road to Laboratory: Simulating Real Driving Environments

The ISO 16750-4 Splash Water Test is designed to recreate one of the harshest conditions experienced by automotive electronics—rapid thermal shock caused by cold water splashing onto hot components. Instead of relying on theoretical analysis, the test reproduces these conditions in a controlled laboratory environment, allowing engineers to evaluate the durability and reliability of automotive electrical and electronic systems.

Test Procedure

Pre-heating: The DUT is heated to its maximum operating temperature (Tmax) inside a temperature-controlled chamber until thermal stability is achieved.

Water Splash: Immediately after heating, ice water maintained between 0°C and +4°C is poured onto the hot DUT, creating a sudden temperature change.

Repeated Cycles: The heating and rapid cooling process is repeated as specified in the standard to simulate real-world thermal shock conditions experienced by automotive components.

Performance Evaluation: After completing the required cycles, the DUT is inspected and tested to ensure it has maintained its mechanical integrity, sealing performance, and long-term reliability without degradation.

From Heat to Ice in Seconds: ISO 16750-4 Splash Water Test for Automotive Electronics

Modern vehicles are packed with sophisticated electronics, from engine control units (ECUs) to sensors, cameras, actuators, and power electronics. These components are expected to operate reliably for years, often in some of the harshest environments imaginable and perform without compromising reliability.

Consider a typical winter drive. After the engine has been running for some time, components under the hood can reach temperatures exceeding 100°C. Suddenly, the vehicle drives through an icy puddle or slush-covered road, and near-freezing water splashes directly onto these hot components. This rapid temperature change creates a severe thermal shock, causing different materials to expand and contract at different rates. Can the enclosure withstand the stress? Will the seals remain intact? Could

the PCB crack, solder joints weaken, or moisture enter the electronics? These are real-world challenges that automotive manufacturers must address, and the ISO 16750-4 Splash Water Test is specifically designed to simulate these conditions and verify that components remain reliable throughout their service life....



The Best Quality Tool Isn't on Your Desk—It's Your Gemba Walk!

One of the biggest mistakes a Quality Executive can make is spending the entire day behind a desk. Quality is not created through emails, spreadsheets, or checklists—it is built where the work actually happens.

That's why Gemba Walks are one of the most powerful tools in QMS. Step out, visit lab floor, observe how people perform their tasks, ask questions, listen to challenges, and understand

the real process. Many quality issues, improvement opportunities, and innovative ideas can only be discovered by being present.

Great Quality Executives don't just inspect processes—they build relationships, understand people, and continuously learn from the workplace. Remember, the best quality improvements rarely happen behind a desk—they begin where the work is actually done....

Fishbone Diagram (Ishikawa) – Engineering's Favorite Detective Tool!

At Envitest Lab, whenever something goes wrong, we don't ask, "Who made the mistake?" We ask, "Why did it happen?" That's where the Fishbone (Ishikawa) Diagram comes in—a simple but powerful tool used as part of our ISO/IEC 17025 quality system.

Imagine a temperature chamber gives unstable readings. Is the chamber faulty? Maybe—but it could also be a refrigeration/heater issue, a loose sensor, incorrect test setup, or even someone forgetting to close the door properly.

The Fishbone Diagram helps our engineers investigate every possible cause instead of

making assumptions. It's like solving an engineering puzzle together. The fun part is that investigation becomes a team exercise. Engineers gather around throw in ideas, debate possibilities, eliminate assumptions, and gradually solve the puzzle. Every branch represents a possible cause—People, Equipment, Methods, Environment, material or Measurement.

At Envitest Lab, root cause analysis isn't about finding fault—it's about finding facts. Every problem becomes an opportunity to learn, improve our processes, and deliver more reliable and accurate testing for our customers...

Eight Years of Building Envitest Laboratories

Eight years ago, when I started Envitest Laboratories, I made a promise to myself—to build a testing-first company. I believed testing should be more than just a compliance activity. It should help companies build products that people trust, enjoy using, and confidently recommend to others.

From the beginning, my vision was simple. Testing should be practical, customer-focused, and support innovation. Every test should provide meaningful outcome that helps engineers improve their products. Over the years, we have learned that building a successful laboratory is about much more than buying equipment. It requires skilled people, strong

processes, continuous learning, and a commitment to quality. Every project has taught us something new, and every challenge has helped us grow.

Today, we have come a long way, but our journey is far from over. There are still many capabilities to build, technologies to adopt, and challenges to solve. We may not yet be the world's best testing lab, but we are certainly much closer to that goal than we were eight years ago. Looking back, I feel incredibly proud of what our team has achieved. Their dedication, hard work, and passion have shaped Envitest into what it is today. The journey continues, and the best is yet to come...



Although an in-house test setup appears to save time and money, still had to depend on partner laboratories for many specialized tests, as it is not practical to establish every capability in-house. As a result, the expected cost savings never fully materializes.

A Conversation That Made Us Reflect: Building a Laboratory Is Easier; Sustaining??!!

Recently, I had an interesting conversation with one of our premier customers who had established his own in-house testing facility. Like many organizations, his objective was straightforward—create in-house testing capabilities that would reduce costs, shorten project timelines, provide customers with faster and more reliable services, and gain better control over product validation.

As we spoke, he admitted that reality had been far more challenging than expected. While they had set up a few testing capabilities, many specialized qualification tests still had to be outsourced. The anticipated cost savings were therefore much lower than originally anticipated. In addition, it substantially impacted both our capital (CAPEX) and operational (OPEX) budgets for the year. He was struggling to justify to his management.

I told him, Let me share something from our own experience. When we built Envitest, we soon realised that we need to cover every qualification requirement, specialized tests to

be full scale laboratories.

I explained that the investment doesn't end with purchasing equipment. Running a laboratory involves continuous expenses such as calibration, maintenance, accreditation, skilled manpower, utilities, quality systems, infrastructure, and periodic upgrades. These costs continue regardless of how much the equipment is utilized.

I then asked, "Instead of design company investing heavily to recreate the same infrastructure, why not use laboratories that already have these capabilities? Your strength is designing and manufacturing products. Our strength is testing and validation."

The takeaway wasn't to discourage investment, but to highlight an important lesson. Building and sustaining a testing laboratory is a long-term commitment that only becomes commercially viable with consistent utilization. Sometimes, the smartest investment is not building everything yourself, but leveraging infrastructure that already exists.



Our Services

- ◇ Climatic Simulations
- ◇ Dynamics & Vibration
- ◇ Contamination and Ingress
- ◇ Materials / Metallurgical Testing
- ◇ Aircraft Electrical Testing
- ◇ Electrical Safety Testing
- ◇ Optical Fibre Cable Testing
- ◇ Optical Fibre Connector Testing
- ◇ Telecom Interface Testing
- ◇ Electrical Cables Testing
- ◇ Electrical Connectors Testing
- ◇ International Approvals
- ◇ Customized Tests
- ◇ Engineering Services

Envitest Laboratories continues its journey with renewed energy, sharper focus, and an even stronger commitment to empowering products through reliable and precise testing.

What began in 2017 at Bangalore Electronic City as a focused testing facility has today evolved into a multi-location organization, serving industries with agility, scale, and deep technical expertise.

Operating across three strategic locations, Envitest is now better positioned than ever to support customers with faster turnaround times, enhanced capacity, and a wider spectrum of testing capabilities. This expansion reflects not just growth in infrastructure, but our intent to stay closer to our customers and their evolving needs.

In a world where products are becoming smarter, more connected, and more demanding, testing can no longer be generic. At Envitest, we align our capabilities with real-world application needs—whether it is electronics, telecom systems, or complex environmental validation. From optical fiber and connectors to advanced telecom systems and rugged industrial products, we ensure performance, reliability, and compliance across diverse domains.

Our environmental testing capabilities continue to push boundaries—simulating real-life conditions through vibration, thermal cycling, humidity, ingress protection, corrosion, and more. Every test we conduct is driven by one goal: to ensure that products don't just pass standards, but perform in reality.

What sets Envitest apart is not just infrastructure, but mindset. A customer-first approach, attention to detail, and commitment to quality define everything we do. As we move forward, we remain focused on enabling industries to launch safer, more reliable, and high-performing products.

This year, we don't just aim to grow—we aim to raise the standard.

Empowering Products. Elevating Standards. Enabling Confidence.

ENVITEST LAB Bengaluru Test Centre	ENVITEST LAB Coimbatore Test Centre	ENVITEST LAB Chennai Test Centre
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- ⇒ TEC Recognised Lab – Certificate # TEC/MRA/CAB/IND-D/91