

SHVA RESEARCH & DEVELOPMENT CENTER





Sustaining Quality, Building Excellence for Stronger



SHVA RESEARCH and DEVELOPMENT CENTER (R&D CENTER)

In order to ensure the quality in all construction sectors, the largest center in the private sector for research and development of construction materials was established at the international and local levels in Iraq, particularly in Sulaymaniyah city for testing construction materials, which is called (SHVA Center for Research and Development of Construction Materials).



Research and Development of Construction Materials

It is the largest specialized center in the private sector for testing construction materials in Iraq, as well as of being equipped with the latest devices and advanced technology, it provides testing services to customers, Moreover the customers can follow up the results of the tests periodically and around the globe through visiting our website www.shvalab.com



SECTION 1 – CONCRETE :

Concrete is a mixture of cement, water, and aggregates that hardens into a strong material, used to provide structural strength and stability in construction.

Physical testing of concrete checks strength, workability, and durability to ensure it can safely carry loads and perform as designed.

Chemical testing identifies harmful substances that may cause corrosion or long-term deterioration.



EN & ASTM Standard

Chemical Tests			Physical Tests		
Test	Purpose	Common Standard	Test	Purpose	Common Standard
Cement content	Determines cement proportion in hardened concrete	EN 196-2	Slump Test (Workability)	Measures consistency/workability	EN 12350-2
			Slump Flow Test	Determine Flowability	EN 12350-8
			Slump Flow Time	Determines the flowability and viscosity of highly flowable concrete	ASTM C1611
			J-Ring Test	Determine Passing Ability Of SCC	EN 12350-12
			V-Funnel Test	Determine The Flow Time and Viscosity of SCC	EN 12350-9
			L-Box Test	Determine Passing Ability of SCC	EN 12350-10
			U-Box Test	Determine the Filling and Passing Ability of SCC	EFNARC (2002)
Chloride Content	Detects chloride ions that cause steel corrosion.	EN 14629	Accelerated Curing Test	Determine the Future Strength of Concrete Quickly by Using Accelerated Curing Conditions	ASTM C684
			Air Content	Determines entrained air volume.	EN 12350-7
			Unit Weight/Density	Measures weight per unit volume.	EN 12350-6
Sulfate Content	Measures harmful sulfate levels and durability	EN 196-2	Temperature	Monitors fresh concrete temperature.	EN 12350-7 Annex
			Compressive Strength	Measures loadbearing capacity (MPa).	EN 12390-3
			Split Tensile Strength	Measures tensile capacity.	EN 12390-6
			Modulus of Elasticity	Measures Stiffness	ASTM C469
Alkali Content (Na ₂ O _{eq})	Indicates alkali-silica reaction risk.	EN 196-2	Shrinkage	Measures volume changes during drying	ASTM C157 and EN 12390-16
			Core test Concrete	Measures the compressive strength of in-place, hardened concrete	ASTM C42/C42M
			Hammer test Concrete	Evaluates surface hardness and estimates in-place compressive strength	ASTM C805
Carbonation Depth	Checks reduction of alkalinity due to CO ₂ ingress.	Phenolphthalein test	Ultrasonic test Concrete	is to non-destructively evaluate concrete quality, uniformity, and integrity	ASTM C597-22
			Self Compacting test Concrete	Measures the average diameter of concrete spread to determine flowability, using a concrete mold (slump cone) without rodding	ASTM C1611/C16 11M
pH Measurement	Confirms alkalinity level.	EN 1015-21	Creep	Measures long-term deformation under load.	ASTM C512
			Permeability / Water Absorption	Indicates water ingress resistance.	EN 12390-8
			Freeze-Thaw Resistance	Measures durability under cyclic freezing.	EN 12390-9

SECTION 2 – CEMENT :

Cement is a fine powdered binder that reacts with water to harden and bind materials together, and its purpose is to provide strength and cohesion in concrete and mortar.

Physical testing of cement checks properties such as fineness, setting time, soundness, and strength to ensure proper workability and performance in concrete.

Chemical testing verifies composition and limits harmful compounds to ensure durability and compatibility with standards.



EN & ASTM Standard

Chemical Tests			Physical Tests		
Test	Purpose	Common Standard	Test	Purpose	Common Standard
Loss on Ignition (LOI)	Measures un-combined water & CO ₂ (hydration/carbonation)	EN 196-2	Fineness (Blaine / Sieve)	Affects hydration rate & strength	EN 196-6
Insoluble Residue (IR)	Non-reactive materials like sand, clay	EN 196-2			
Sulfur Trioxide(SO ₃)	Control set time & soundness	ASTM C114	Setting Time (Initial & Final)	Workability control	EN 196-3
Magnesium Oxide (MgO)	High MgO can cause expansion	ASTM C150	Soundness (Le Chatelier / Autoclave)	Checks volume stability against expansion	EN 196-3
Chloride Content	Prevents corrosion of reinforcement	EN 196-2			
Free Lime (CaO)	Excess causes unsoundness	EN 196-2	Compressive Strength (3, 7, 28 days)	Structural performance Load bearing capacity	EN 196-1 & ASTM
Alkalis (Na ₂ O + 0.658 K ₂ O)	Control alkali-silica reaction	EN 196-2	Consistency	Water content for standard consistency	EN 196-3
Sulphate Content	Durability Chec	EN 196-2	Sound Test of Cement - Autoclave Expansion	Determine the Soundness of Cement by Measuring the Expansion	ASTM C151/C151M
Main Osides(SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , CaO)	Determine Cement type & quality	ASTM C114			
C ₃ A Content	Affects Sulfate resistance & heat generation	ASTM C150	Flexural Strength Test	Determine the Flexural Strength of a Hardened Cement Mortar Beam	ASTM C348

SECTION 3 - MORTAR :

Mortar is a mixture of cement (or lime), sand, and water used to bond masonry units, fill joints, and provide load transfer and weather resistance in masonry construction.

Physical testing of mortar checks workability, strength, adhesion, and durability to ensure proper application and performance.

Chemical testing verifies composition and identifies harmful substances that could affect durability or bonding.



EN Standards

Chemical Tests

These identify composition, reactivity, and potential durability problems.
 Typical standards: EN standards.

Physical Tests / Performance Tests

These measure mechanical and performance properties of the mortar. Typical standards: EN standards

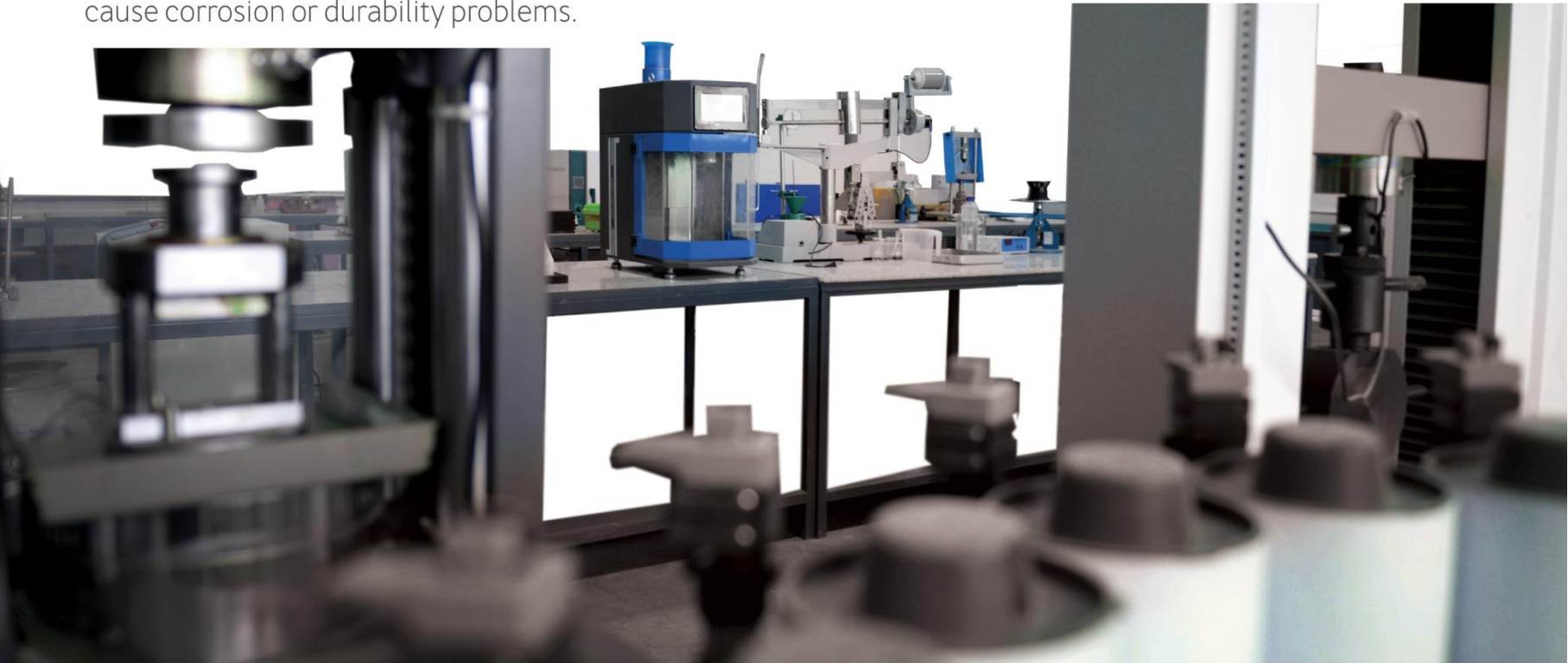
Test	Purpose	Common Standard	Test	Purpose	Common Standard
Cement Content	Determines binder percentage.	EN 196-2	Flow (Workability)	Determines mortar's plasticity and ease of application.	EN 1015-3
Chloride Content	Detects salts that can corrode steel.	EN 1015-17	Setting Time	Measures time to initial and final set.	EN 196-3
Sulphate Content	Checks for harmful sulphate levels.	EN 196-2	Compressive Strength	Measures load-bearing capacity (MPa).	EN 1015-11
Alkali Content (Na ₂ O _{eq})	Indicates risk of alkali-silica reaction.	EN 196-2	Flexural Strength	Checks bending resistance.	EN 1015-11
pH Measurement	Confirms alkalinity.	EN 1015-21	Bond Strength	Measures adhesion to masonry units.	EN 1052-5
Carbonation Depth	Measures loss of alkalinity due to CO ₂ ingress.	Phenolphthalein test	Density	Determines unit weight (dry/wet).	EN 1015-10
			Water Retention	Indicates how well mortar retains water before setting.	EN 1015-8
Loss on Ignition (LOI)	Measures water + CO ₂ release; indicates organic or carbonate content	EN 196-2	Shrinkage	Measures dimensional changes during drying.	EN 12617-4
			Absorption / Permeability	Indicates resistance to water ingress.	EN 1015-18
Thermogravimetric Analysis (TGA)	Measures hydration and decomposition.		Freeze-Thaw Resistance	Measures durability in cold climates.	EN 12371

SECTION 4 - AGGREGATE :

Fine aggregate (sand) and coarse aggregate (gravel or crushed stone) are granular materials that form the main bulk of concrete. Their purpose is to provide strength, reduce shrinkage, and improve the economy and stability of concrete and mortar.

Physical testing of fine and coarse aggregates checks grading, strength, shape, cleanliness, and durability to ensure proper workability, strength, and long-term performance in concrete and mortar.

Chemical testing identifies harmful substances such as chlorides, sulfates, and organic impurities that may cause corrosion or durability problems.



EN & ASTM Standards

Chemical Tests (Coarse Aggregate)			Physical Tests (Coarse Aggregate)		
Test	Purpose	Common Standard	Test	Purpose	Common Standard
Water- soluble Chloride Content	Risk of reinforcement corrosion	EN 1744-1	Bulk specific gravity	determine the ratio of the weight of aggregate particles to the weight of an equal volume of water, including the permeable internal pores	ASTM C127(Coarse) & ASTM C128 (Fine)
			Particle Size Distribution	Grading of aggregates.	EN 933-1
			Fines Modules	determining the fineness modulus	ASTM C136
Water- soluble Sulphate Content (SO ₃)	Prevents expansion/damage durability	EN 1744-1	Elongation	This test method determines the percentages of flat, elongated, or flat-and-elongated particles in coarse aggregates based on dimensional ratios (typically 1:3 or 1:5).	ASTM D4791
			Flakiness Index	Measures the percentage of particles that are thin relative to their width (flaky)	ASTM D4791
			Light weight particles	Determine the percentage of lightweight particles, which may affect the durability and strength of concrete	ASTM D4791
Organic Impurities	Affects cement hydration Presence of harmful organics	EN 1744-1	Aggregate Impact Value(AIV) Test	Resistance of Coarse Aggregate Sample to Sudden Impact of Shock Loading	BS812-112
			Clay Lumps and Friable Particles Test of Aggregate	The percentage of clay lumps and friable particles in natural or manufactured aggregates	ASTM C142/C142M
Acid Soluble Sulfate Content	Durability Check	EN 1744-1	Aggregate Crushing Value(ACV) Test	Resistance of Coarse Aggregate to Crushing Under a Gradually Applied Compressive Load	BS 812-110
			Fines Content	Percentage passing 0.063 mm	EN933-1, EN933-8
			Moisture Content Test	Determine Moisture Content	ASTM C566
Total Sulfur Content	Impurity detection	EN 1744-1	Particle Density and water absorption	Specific gravity and absorption	EN 1097-6 & ASTM
			Resistance to fragmentation (LAA Test)	Mechanical Strength	EN 1097-2 & ASTM C131
			Resistance to Freezing and thawing	durability in cold climates	EN 1367-1

EN & ASTM Standards

Chemical Tests (Fine Aggregate)			Physical Tests (Fine Aggregate)		
Test	Purpose	Common Standard	Test	Purpose	Common Standard
Organic Impurities	Detect harmful organic matter	EN 1744-1	Sieve Analysis	Grading and compliance	EN 933-1 and ASTM C136/C136M
		ASTM C40	(Specific Gravity) & Water Absorption		
Chloride Content (Cl ⁻)	Prevent steel reinforcement corrosion	EN 1744-1	Sand equivalent	Cleanliness of sand	EN 933-8
		ASTM C1152			
Prevent steel reinforcement corrosion	Durability and sulfate attack prevention	EN 1744-1	Bulk Density & Voids	Yield and batching control	EN 1097-3 and ASTM C29/C29M
		ASTM C1580			
Alkali Content (Na ₂ O _{eq})	Control Alkali-Silica Reaction (ASR)	EN 1744-1	Prevent bonding and strength problems	Resistance to weathering	EN 933-1 (fines < 0.063 mm)
		ASTM C114			EN 933-8 (Sand Equivalent)
Alkali-Silica Reactivity (ASR)	Long-term expansion control	EN 12620	Soundness (Physical Durability)	Resistance to weathering	ASTM C117 (fines < 75 μm)
		EN 1744-1			ASTM D2419 (Sand Equivalent)
		ASTM C1260 (accelerated)			EN 1367-2
		ASTM C1293 (long-term)			ASTM C88
Harmful Substances	Ensure aggregate suitability	EN 1744-1	Material pass sieve NO.200%	accurately determine the percentage of material passing the 75-μm (No. 200)	ASTM C117
		ASTM C33			



SECTION 5 - SOIL:

Soil is a natural material composed of mineral particles, water, and air. Its purpose in construction is to support foundations, transfer loads, and provide a stable base for structures and pavements.

Physical testing of soil determines properties such as strength, density, compressibility, and permeability to ensure it can safely support structures.

Chemical testing identifies harmful substances that may cause corrosion, sulfate attack, or durability issues.



ASTM & ASHTO Standards

Chemical Tests			Physical Tests		
Test	Purpose	Common Standard	Test	Purpose	Common Standard
pH Value	Assess soil acidity/alkalinity & Corrosion risk to concrete and steel	ASTM D4972 & AASHTO T 289	Moisture Content	Determine natural water content & Control compaction and strength	ASTM D2216 & AASHTO T265
			Particle Size Distribution (Grain Size Analysis)	Soil classification & Evaluate drainage and compaction behavior	ASTM D6913 & AASHTO T88
Sulfate Content (SO ₄ ²⁻)	Sulfate attack risk on concrete & Selection of sulfate-resistant cement	ASTM D516 / ASTM C1580 & AASHTO T290	Atterberg Limits (LL, PL, PI)	Identify plasticity of fine soils & Swelling and shrinkage assessment	ASTM D4318 & AASHTO T89 & T90
			Specific Gravity of Soil Solids	Density and void ratio calculations	ASTM D854 & AASHTO T100
Chloride Content (Cl ⁻)	Corrosion risk for steel reinforcement	ASTM D512 & AASHTO T291	Compaction Test (Proctor)	Determine Maximum Dry Density (MDD) & Optimum Moisture Content (OMC)	ASTM D698 / ASTM D1557 & AASHTO T 99/T180
			California Bearing Ratio (CBR)	Evaluate subgrade strength for pavements	ASTM D1883 & AASHTO T193
Organic Matter Content	Detect unsuitable soils for construction & Effect on cement stabilization	ASTM D2974 & AASHTO T267	Shear Strength Tests (Direct Shear & Triaxial Compression)	Determine shear parameters (c, φ)	ASTM D3080/D4767 & AASHTO T236/T296
			Consolidation (Oedometer)	Settlement and compressibility evaluation	ASTM D2435 & AASHTO T216
Carbonate Content (CaCO ₃)	Identify calcareous soils & Cement reaction evaluation	ASTM D4373 &	Permeability (Hydraulic Conductivity)	Drainage and seepage analysis	ASTM D2435/D5084 & AASHTO T215
			Total Dissolved Solids (TDS) / Salinity	Durability and corrosion assessment.	ASTM D5907
Electrical Resistivity	Soil corrosivity classification	ASTM G57			

SECTION 6 - ASPHALT :

Asphalt is a mixture of bitumen and aggregates used in road construction. Its purpose is to provide a strong, durable, and flexible surface that can carry traffic loads and resist weathering.

Physical testing of asphalt evaluates properties such as consistency, viscosity, softening point, and strength to ensure proper workability, load-bearing capacity, and durability.

Chemical testing identifies harmful substances, ageing effects, and binder purity to ensure long-term performance and resistance to deterioration.



ASTM & ASHTO Standards

Chemical Tests			Physical Tests		
			Test	Purpose	Common Standard
Test	Purpose	Common Standard	Penetration Test	Measure hardness/consistency of bitumen & Control temperature susceptibility	ASTM D5 & AASHTO T49
Loss on Heating / Aging (RTFOT)	measure the amount of volatile components lost from the asphalt binder and to assess the hardening (aging) of the binder due to heat and air exposure.	ASTM D2872 & AASHTO T240	Softening Point (Ring & Ball)	Determine temperature at which bitumen softens & Evaluate high temperature performance	ASTM D5 & AASHTO T49
			Ductility Test	Measure ability of bitumen to stretch & Indication of cracking resistance	ASTM D113 & AASHTO T51
			Viscosity Test	Mixing and compaction temperature control	ASTM D4402/D2171 & AASHTO T201/T316
			Flash & Fire Point	Determine safe heating temperature	ASTM D92 & AASHTO T48
Solubility in Trichloroethylene	Measure purity of bitumen & Detect contamination	ASTM D2042 & AASHTO T44	Specific Gravity (Density)	determine the ratio of the material's weight to an equal volume of water	ASTM D70 & AASHTO T228
			Marshall Stability & Flow	Load resistance and deformation control & Mix design acceptance	ASTM D6927 & AASHTO T245
			Bulk Density of Asphalt Mix	Air voids calculation & Compaction control	ASTM D2726 & AASHTO T166
Ash Content	Detect mineral impurities	ASTM D482 & AASHTO T111	maximum Theoretical Density (Rice Test)	Air void determination	ASTM D2041 & AASHTO T209
			Air Voids, VMA, VFB	Durability and rutting resistance	ASTM D3203 & AASHTO T269
			Gradation of Extra-cted Aggregates	Check aggregate grading after extraction	ASTM D5444 & AASHTO T30
Bitumen Content (Extraction)	Verify binder percentage & Quality control	ASTM D2172/ D6307 & AASHTO T164/T308	Indirect Tensile Strength (ITS)	Cracking resistance & Moisture damage evaluation	ASTM D6931 & AASHTO T322
			Moisture Susceptibility (ITSR / TSR)	Resistance to stripping	ASTM D4867 & AASHTO T293

SECTION 7 - PAINT :

Paint is a liquid coating made of pigments, binders, solvents, and additives. Its purpose is to protect surfaces, enhance appearance, and provide resistance to weather, corrosion, and wear.

Physical testing of paint checks properties like viscosity, drying time, adhesion, color, and coverage to ensure proper application, performance, and durability.

Chemical testing verifies composition, presence of harmful substances, and stability to ensure safety, long-term durability, and resistance to corrosion or environmental damage.



EN ISO & ASTM Standards

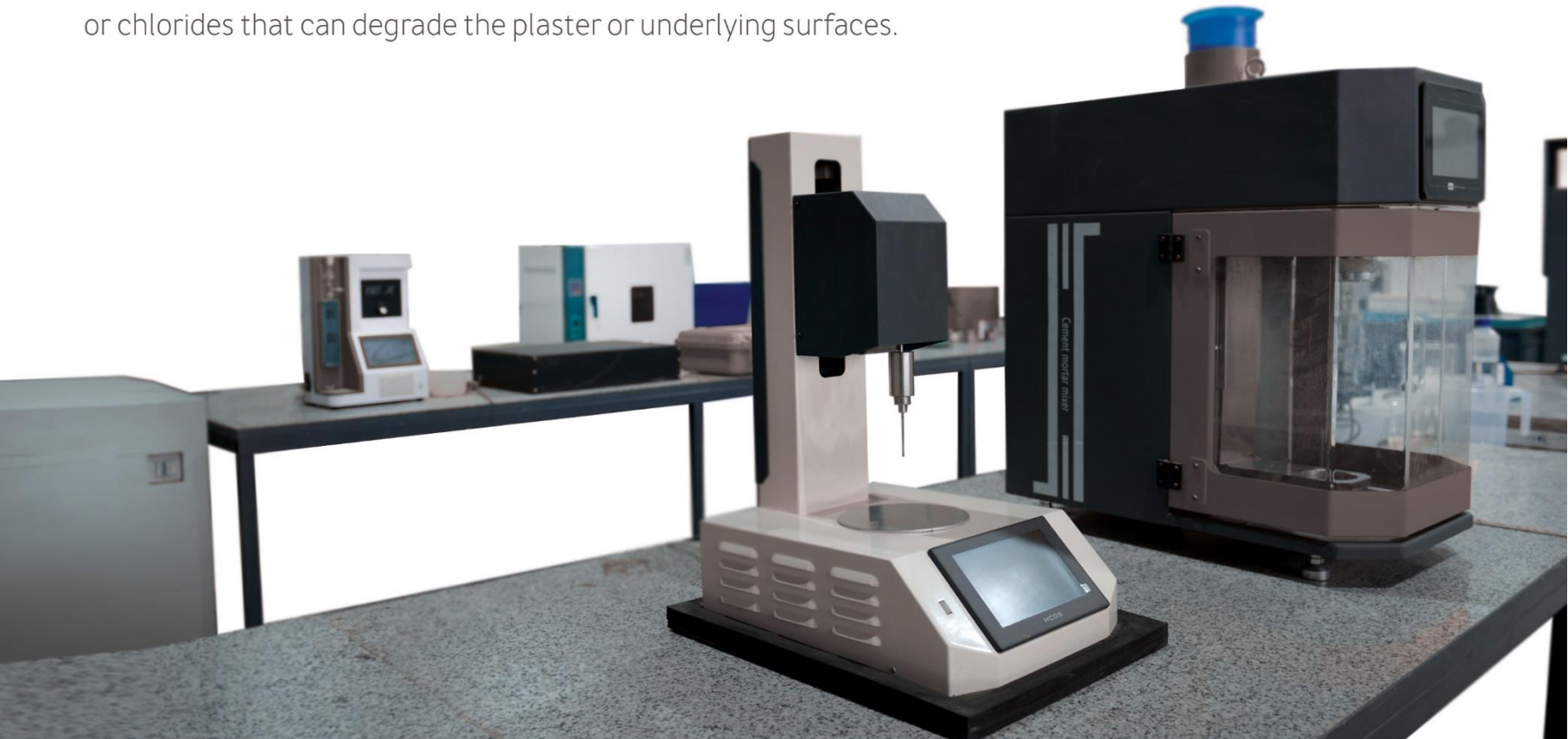
Chemical Tests			Physical Tests / Performance Tests		
Test	Purpose	Common Standard	Test	Purpose	Common Standard
None- Volatile Matter	Solid content	E EN ISO 3251	Density	Mass per unit volume	EN ISO 2811
Volatile Organic Compounds (VOC)	Environmental & health compliance	EN ISO 11890	Viscosity	Flow characteristic	EN ISO 3219, EN ISO 2431
pH of aqueous Paints	Acidity/alkalinity	EN ISO 11423	Drying Time (Surface/Hard)	Time to surface dry	EN ISO 9117-1
Resistance to water	Water resistance	EN ISO 2812-2	Gloss Level	Appearance control, Surface Reflectivity	EN ISO 2813
Resistance to Chemical	Chemical Durability	EN ISO 2812-2	Hardness (Pencil / König)	Scratch resistance, Surface Hardness	EN ISO 1522, EN ISO 15184
Pigment Volume Concentration(PVC)	Controls gloss/durability	ASTM D523 , ISO 2813	Adhesion (Cross-cut / Pull-off)	Bond strength to substrate	EN ISO 2409
Ash content	Filler/pigment loading	ASTM D3723	Impact Resistance	Mechanical durabilityToughness under impact	EN ISO 6272
Salt spray Resistance	Corrosion resistance	EN ISO 9227	Film Thickness	Coating thickness	EN ISO 2808

SECTION 8 - INSULATION & PLASTER :

Thermal insulation plaster is a lightweight plaster applied to walls or ceilings to reduce heat transfer, improve energy efficiency, and provide fire and moisture resistance while also protecting the building structure.

Physical testing of thermal insulation plaster checks properties like density, adhesion, thermal conductivity, compressive and flexural strength to ensure it performs well as a protective and insulating layer.

Chemical testing identifies harmful compounds or reactions that may affect durability, such as sulfates or chlorides that can degrade the plaster or underlying surfaces.



EN & ASTM Standards

Chemical Tests			Physical Tests / Performance Tests		
Test	Purpose	Common Standard	Test	Purpose	Common Standard
Sulphate Content	Sulphate attack risk	EN 196-2 and ASTM C114	Bulk Density (Fresh)	Control mix quality & yield	EN 1015-6 and ASTM C138
			Consistency / Flow	Workability & ease of application	EN 1015-3 and ASTM C1437
Chloride Content	Corrosion risk (ETICS systems)	EN 1015-17 and ASTM C1152	Pot Life / Open Time	Usable time after mixing	EN 1015-9
			Setting Time	Control application & finishing	EN 1015-9 and ASTM C807
pH Value	Compatibility with substrates	EN 196-2 and ASTM E70	Water Retention	Prevent water loss & cracking	EN 1015-8 and ASTM C1506
			Dry Bulk Density	Weight & insulation efficiency	EN 1015-10 and ASTM C567
Soluble Salts	Efflorescence prevention	EN 772-5	Compressive Strength	Mechanical resistance	EN 1015-11 and ASTM C109
			Flexural Strength	Crack resistance	EN 1015-11 and ASTM C348
Alkali Content	Material stability	EN 196-2 and ASTM C114	Adhesion / Bond Strength	Bond to substrate	EN 1015-12 and ASTM C1583
			Capillary Water Absorption	Moisture resistance	EN 1015-18 and ASTM C1585
Resistance to Chemicals	Chemical durability	ASTM C267	Water Vapor Permeability (μ)	Breathability of plaster	EN 1015-19 and ASTM E96
			Thermal Conductivity (λ)	Insulation performance	EN 1745/EN 12667 and ASTM C177/C518
Reaction to Fire	Fire classification (A1-F)	EN 13501-1	Shrinkage	Crack risk control	EN 12617-4 abd ASTM C596
Fire Resistance	Fire exposure behavior	EN 1363-1	Freeze-Thaw Resistance	Durability in cold climates	EN 13687-1 and ASTM C666

SECTION 9 - PLASTIC :

Plastic pipes are tubes made from materials like PVC, HDPE, or PP, used to transport water, gas, or chemicals safely and efficiently while being lightweight, durable, and corrosion-resistant.

Physical testing of plastic pipes checks properties such as strength, flexibility, impact resistance, pressure rating, and dimensional accuracy to ensure safe and reliable performance.

Chemical testing verifies material composition, resistance to chemicals, UV stability, and absence of harmful substances that could degrade the pipe or contaminate transported fluids.



EN ISO & ASTM Standards

Chemical Tests			Physical Tests / Performance Tests		
Test	Purpose	Common Standard	Test	Purpose	Common Standard
Chemical Resistance Test (Acids, Alkalis, Solvents)	Resistance to chemicals.	ASTM D543 / ISO 175	Tensile Strength & Elongation	Measures strength and ductility of plastic	ASTM D638 / ISO 527
			Flexural Strength & Modulus	Resistance to bending.	ASTM D790 / ISO 178
Ash Content	Inorganic filler content.	ASTM D5630 / ISO 3451	Impact Resistance (Izod / Charpy)	Resistance to sudden shock or impact.	ASTM D256 / ISO 180
			Hardness (Shore A / Shore D)	Surface hardness of plastic.	ASTM D2240 / ISO 868
FTIR Analysis (Material Identification)	Polymer type identification.	ASTM E1252 / ISO 10640	Density / Specific Gravity	Mass per unit volume.	ASTM D792 / ISO 1183
			Melt Flow Index (MFI / MFR)	Flow behavior of molten plastic (processability).	ASTM D1238 / ISO 1133
Heavy Metals (Pb, Cd, Hg, Cr ⁶⁺)	Safety & environmental compliance.	ISO 11885 / EPA methods	Heat Deflection Temperature(HDT)	Resistance to deformation under heat.	ASTM D648 / ISO 75
			Vicat Softening Temperature	Softening temperature of plastic.	ASTM D1525 / ISO 306
Plasticizer Content (e.g. PVC)	Amount of plasticizers	ASTM D2124	Water Absorption	Moisture uptake.	ASTM D570 / ISO 62
			Flammability (UL 94)	Burning behavior.	ASTM D635 / UL 94
			Weathering / UV Resistance	Resistance to sunlight and aging.	ASTM G154 / ISO 4892



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At the SHVA R&D CENTER, We perform comprehensive physical and chemical analyses on all materials used in the construction industry, ensuring the highest standards of quality and reliability.







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