CHANYA

STRUCTURING THE CHANYA **GME** FOR THE LOW-CARBON ADDITIVE **3D CONCRETE PRINTING DEMONSTRATOR**

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INTRODUCTION TO THE ABBREVIATION GLOSSARY

To ensure clear and consistent understanding from the outset, this glossary brings together all the technical and institutional abbreviations used throughout the present document.

Positioned at the beginning, it aims to facilitate reading and avoid ambiguity in the interpretation of terms used during the analysis.

Each acronym is defined concisely to allow all future CHANYA GME partners — whether technical, institutional, or financial — to share a common frame of reference.

*In this document, the terms **JVT** (international terminology) and **GME** (French legal structure) both refer to the same collaborative consortium model.*

(Atex, Atec, BEP, BET, BIM, BMS, CAPEX, CE, CERIB, CFA, CHANYA, CSTB, CVC, DI, DICT, DOE, DP, DPE, DCE, DO, EPC, EPI, ESQ, PRO, EXE, GED, GME, GO, GTB, HSE, IFC, IA, LOD, MEP, MOD, OPEX, OPC, PC, PGC SPS, PID, PI, PMR, PPSS, PV, RC Pro, RE2020, SPS, STD, TRC)

Atex – *Experimental Technical Assessment*

A procedure issued by CSTB allowing the use of an innovative material or process prior to obtaining a Technical Approval (Atec).
It can be a **“site-specific” Atex** (single-use) or a **“type” Atex** (reusable).

Atec – ***Technical Approval***
Official recognition by CSTB of the long-term technical compliance of a product or process (equivalent to a certification).

BEP – ***Bilan d'Émission de Projet*** **(Project Emission Balance)**
Assessment of projected greenhouse gas emissions linked to a building's design, construction, and operation phases.

BET – ***Bureau d'Études Techniques*** **(Technical Design Office)**
Engineering consultancy responsible for technical studies (structure, thermal, fluid, etc.) in construction projects.

BIM – ***Building Information Modeling***
Digital modeling process integrating all data related to a construction project into a 3D model shared among stakeholders.

BMS – ***Building Management System***
Centralized software/hardware system that controls and monitors a building's technical systems (HVAC, lighting, security...).

CAPEX – ***Capital Expenditures***
Funds used by an organization to acquire, upgrade, or maintain physical assets such as property, buildings, or equipment.

CE – ***Conformité Européenne*** **(European Conformity)**
Marking indicating conformity with EU safety, health, and environmental protection standards.

CERIB – ***Centre d'Études et de Recherches de l'Industrie du Béton***
French technical center for innovation and expertise in concrete industry and materials.

CFA – ***Courants Faibles & Automatismes*** **(Low-Voltage Systems)**
Engineering specialty covering weak-current installations (alarm, telecoms, access control...).

CHANYA – ***Name of the project and design entity*** — dedicated to the development of sustainable, innovative architecture and housing.

CSTB – ***Scientific and Technical Center for Building***
French public institution supporting innovation in construction through research, certification, and technical standards (e.g., Atex, Atec).

CVC – ***Chauffage, Ventilation, Climatisation*** **(HVAC)**
Heating, Ventilation and Air Conditioning systems in buildings.

DI – ***Déclaration d'Intention de Commencement de Travaux*** **(Works Start Declaration)**
Mandatory declaration submitted before initiating certain construction or excavation projects.

DICT – ***Déclaration d'Intention de Commencement de Travaux Affectant les Réseaux***
Required notice sent to network operators to identify existing underground infrastructure before starting works.

DOE – ***Dossier des Ouvrages Exécutés*** **(As-Built Documentation)**
Technical documentation compiled at the end of a project showing how works were actually carried out (as opposed to initially planned).

DP – ***Déclaration Préalable*** **(Prior Declaration)**
Planning permission required for certain minor construction works or land use changes.

DPE – *Diagnostic de Performance Énergétique* (Energy Performance Diagnosis)
Assessment of a building's energy consumption and environmental impact, required during sale or rental.

DCE – *Dossier de Consultation des Entreprises* (Tender Document Package)
Comprehensive file issued to contractors during a call for tenders; includes plans, specs, contracts, etc.

DO – *Dommage Ouvrage* (Construction Damage Insurance)
Insurance covering the owner against potential defects or malfunctions affecting the structure after delivery.

EPC – *Engineering, Procurement & Construction*
Integrated contractual model combining engineering design, material procurement, and construction services under one contractor.

EPI – *Équipements de Protection Individuelle* (Personal Protective Equipment)
Mandatory protective gear for workers on construction sites (helmets, gloves, safety shoes, etc.).

ESQ – *Esquisse* (Sketch Design)
Preliminary design phase that outlines general architecture, technical and aesthetic intentions.

PRO – *Projet* (Detailed Design)
Comprehensive design documentation used for execution and consultation with contractors.

EXE – *Exécution* (Execution Drawings)
Precise and scaled technical drawings used directly by construction teams on site.

GED – *Gestion Électronique des Documents* (Electronic Document Management)
Digital system used to store, track, and manage project documents and versions.

GME – *Groupement Momentané d'Entreprises* (Temporary Consortium of Companies)
Consortium of partners temporarily joined to deliver a specific project with shared responsibilities and governance.

GO – *Gros Œuvre* (Structural Work)
Main structural components of a building: foundations, walls, floors, roofs, etc.

GTB – *Gestion Technique du Bâtiment* (Building Management System)
Digital control system to monitor and optimize energy, lighting, HVAC, and security systems.

HSE – *Health, Safety & Environment*
Procedures and regulations ensuring health, safety, and environmental protection on construction sites and throughout the project lifecycle.

IFC – *Industry Foundation Classes*
Open standard file format used in BIM to ensure interoperability between different software tools.

IA – *Intelligence Artificielle* (Artificial Intelligence)
Computational systems capable of learning and decision-making, used here for simulation, optimization, or data analysis in construction.

LOD – *Level of Detail / Development*
In BIM, defines the precision and amount of information in a digital model (from conceptual to detailed).

MEP – *Mechanical, Electrical and Plumbing*

The combined systems in a building responsible for heating/cooling, electrical power, lighting, water, and waste management.

MOD – *Maîtrise d'Ouvrage Déléguée* (Delegated Project Ownership)

Entity or person appointed to act on behalf of the project owner to manage and oversee the project's execution.

OPEX – *Operational Expenditures*

Expenses related to the day-to-day operation, maintenance, and servicing of a building or infrastructure.

OPC – *Ordonnancement, Pilotage et Coordination* (Scheduling, Management, Coordination)

Role focused on organizing the construction site timeline, coordinating teams, and managing progress.

PC – *Permis de Construire* (Building Permit)

Official authorization required to start construction works in compliance with planning laws.

PGC SPS – *Plan Général de Coordination en matière de Sécurité et de Protection de la Santé*

Mandatory safety coordination plan required on construction sites involving multiple contractors.

PID – *Process & Instrumentation Diagram*

Diagram representing the flow of systems (fluids, energy, air) and associated control instruments.

PI – *Propriété Intellectuelle* (Intellectual Property)

Legal rights protecting innovations, processes, designs, or content developed during the project.

PMR – *Personnes à Mobilité Réduite* (Persons with Reduced Mobility)
Category of users considered in the design to ensure universal accessibility and inclusivity.

PPSS – *Plan Particulier de Sécurité et de Santé* (Specific Health and Safety Plan)
Document detailing site-specific safety measures and risk prevention strategies.

PV – *Procès-Verbal* (Minutes / Site Report)
Official record of a meeting or site inspection, outlining decisions, observations, and action items.

RC Pro – *Responsabilité Civile Professionnelle* (Professional Liability Insurance)
Insurance covering a professional against damages caused during the execution of their services.

RE2020 – *Réglementation Environnementale 2020* (Environmental Regulation 2020)
French regulation setting energy performance and carbon footprint standards for new buildings.

SPS – *Sécurité et Protection de la Santé* (Health and Safety Coordination)
Mandatory framework ensuring compliance with safety standards on construction sites.

STD – *Simulation Thermique Dynamique* (Dynamic Thermal Simulation)
Modeling method used to simulate and evaluate a building's thermal performance in real conditions.

TRC – *Travaux Réservés au Constructeur* (Contractor-Reserved Works)
Portions of the construction reserved specifically for execution by the designated builder or contractor.

WHY CREATE A JVT AROUND THE CHANYA DEMONSTRATOR

The creation of a **Joint Venture Team (JVT)** responds to the need to **gather, under one dynamic structure, the complementary skills** essential to the design and execution of the CHANYA demonstrator.

This demonstrator, focused on **low-carbon, additive concrete 3D printing using bio-based materials**, represents a breakthrough technology in the construction sector: it requires an integrated approach where engineering, architecture, robotics, materials, and insurance advance hand in hand.

The JVT offers a **flexible legal and operational framework**, allowing multiple partners — companies, design firms, laboratories, institutions, and manufacturers — to **collaborate on a shared project without creating a permanent structure**.

Each member retains their identity and individual responsibilities, while joining forces around a **clear collective goal**: to prove the **technical, economic, and regulatory feasibility** of an innovative construction method based on 3D printing.

BENEFITS FOR PARTNERS

- **Pooling of expertise and risk**: each partner contributes their specific know-how and benefits from the support of the other stakeholders.
- **Access to a unique experimental construction site**: a real-world showcase to test, validate, and promote technical solutions before full-scale industrial deployment.
- **Increased visibility**: the CHANYA demonstrator will serve as a media and professional reference in France and internationally.
- **Regulatory acceleration**: the JVT framework facilitates joint procedures with CSTB, insurers, and public funders.
- **Creation of a strategic network**: participation in the JVT paves the way for future collaborations in the field of sustainable and robotic construction.

WHY JOIN THE CHANYA JVT

Becoming part of it means **participating in the emergence of a pioneering construction model**, aligned with the climate, social and technological challenges of our time.
It also means **joining a collective venture**, where innovation is no longer confined to laboratories but takes shape through a tangible, visible, and reproducible demonstrator.

By combining their strengths within this flexible and collaborative framework, CHANYA JVT partners will help **shape the construction of tomorrow**, while reinforcing their own position in a rapidly evolving ecosystem.

1) “BuildTech” Core (3D Printing)

1. **BuildTech Core (3D Printing)**

   - ***e.g.***: Constructions-3D (assuming a complete ecosystem is provided).
   - **Role**: Supply of arm/gantry, nozzle, extrusion software, parameter settings, commissioning support.
   - **Deliverables**: BIM/CAD execution plan of the process, calibration protocol, operator training, HSE manual.
   - **Criteria**: Proven real construction site references, after-sales service in France, compatibility with low-carbon/bio-based mixes, redundancy of critical parts.
   - **Risks**: Machine unavailability, after-sales service bottlenecks → ***Mitigation***: Critical spare parts on-site + dedicated technician.

2. **Robotic integrator / Automation (if different from the manufacturer)**

   - **Role**: Safety PLC, sensors, interlocks, safety zones, interface with pumps/mixers.
   - **Deliverables**: Machine risk analysis, CE technical file, maintenance plan.

3. **Material & extrusion process supplier**

   - **Role**: Binders (low-carbon cement, geopolymers, stabilized earths), additives, fibers, particle size control, mixing.

- **Deliverables**: Printable mix-design, rheological windows (workability, thixotropy, strength gain), curing protocol.
- **Typical partners**: Low-carbon cement producers, hemp/flax/linen chain, additive producers, bio-based start-ups.
- **Risk**: Material variability → ***Mitigation***: Pilot batch + lab testing before on-site trials.

4. **Pumps, Mixers, Hoppers, Conveying**

- **Role**: Continuous feed, flow/pressure control, rapid cleaning.
- **Deliverables**: PID diagram, cleaning SOP, emergency kit.

2) Engineering & Compliance (Regulatory Framework)

5. Structural Engineering Office (anticipated technical lead)

- **Role**: Structural calculations (Eurocodes), justification for printed layers, reinforcement interfaces (bars, mesh, possible post-tensioning), foundations.
- **Deliverables**: EXE plans, printing phase planning, deflection/warping control.
- **Insurance**: Professional liability + 10-year structural warranty.

6. Materials Engineering / Testing Lab

- **Role**: Rheology testing, initial/28-day strength, interlayer adhesion, durability, fire resistance.
- **Deliverables**: Test reports, process curves, Go/No-Go criteria.
- **Typical Partners**: CERIB, university labs, CSTB (depending on scope).

7. Architect (Project Architect)

- **Role**: Building permit documents, urban integration, accessibility (e.g., persons with reduced mobility), fire safety, RE2020 compliance, envelope detailing (sealing, thermal bridges).
- **Deliverables**: Building permit file, PRO/DCE file, interface details for printed elements, joinery, roofing.

- **Insurance**: Professional liability + 10-year structural warranty.

8. MEP Engineering (HVAC – Plumbing – Electrical)

- **Role**: Integrated networks in the design, openings foreseen in G-code, ductwork routing, electrical panels.
- **Deliverables**: Schematics, reservations, thermal assessments, STD.

9. BIM / Digital Coordinator

- **Role**: Federated model (IFC), clash detection, model bridge → G-code/printing paths, digital As-Built.
- **Deliverables**: BEP, appropriate LOD model, as-built.

10. HSE / SPS (Health and Safety Coordination)

- **Role**: Safety plan, robot zones, lockout procedures, work permits.
- **Deliverables**: HSE plan, PPSS, PPE/EPC protocols.

11. Certification & Experimental Track

- **Role**: Evaluation strategy (on-site ATEx, ATEx by type, ATec in the long term), test protocol, CSTB relationship.
- **Deliverables**: Test plan, ATEx file, traceability.

12. Technical Inspection (Inspection Body)

- **Role**: Opinions on structural strength, fire safety, accessibility, RE2020 compliance.
- **Deliverables**: Expert reports for ESQ/PRO/EXE phases.

3) Execution (GME "Construction Site")

13. General Contractor / GME Representative (if applicable)

- **Role**: Overall coordination, scheduling, logistics, co-contractor coordination, GME invoicing.
- **Deliverables**: OPC (construction planning), milestones, reports.

14. Earthworks / Structural Foundations

- **Role**: Geotechnical study (G2), earthworks, foundations, slabs compatible with 3D printing.
- **Deliverables**: Site layout plan, strict geometric tolerances.

15. 3D Printing Operator (can be manufacturer + local team)

- **Role**: Printing execution, quality control during layering, G-code adjustments.
- **Deliverables**: Tracking sheets, logbook process, as-built layers.

16. Building Envelope & Secondary Works

- **Role**: Carpentry, roofing/waterproofing, additional insulation if needed, finishes compatible with printed substrate.
- **Deliverables**: Jointing details, air-tightness testing.

17. Technical Packages (HVAC, plumbing, electrical, BMS)

- **Role**: Installation of networks, equipment setup, testing, and commissioning.
- **Deliverables**: Test reports, As-Built Documentation (DOE), single-line diagrams.

18. Energy & Water

- **Role**: Photovoltaics (PV), inverters, storage, rainwater harvesting, treatment, dual-flow ventilation (if selected).
- **Deliverables**: Sizing calculations, Consuel compliance certificates, self-consumption documentation.

4) Insurance, Finance, Legal

19. Broker / Insurer

- **Role**: Professional liability (RC Pro – engineering office), ten-year insurance (architect/contractor), CAR (Construction All Risks), site civil liability, decennial warranty, builder's risk (if needed), machine liability.
- **Deliverables**: Named certificates, specific clauses for "non-traditional/experimental process."

20. Legal – Contracts / GME Agreements

- **Role**: GME agreement (lead party, joint liability, IP sharing), subcontracting agreements, IP & data management, GDPR compliance.
- **Deliverables**: Signed agreement, risk/responsibility matrix, IP plan (algorithms, G-code, parametric libraries).

21. Funders / Sponsors / Grants

- **Role**: Non-dilutive funding, industrial sponsorship, regional/local support, land or site contribution.
- **Deliverables**: Letters of intent, detailed CAPEX/OPEX budget, cash flow plan.

5) Site, Land, Institutional Stakeholders

22. Site Owner / Local Authority / Lessor

- **Role**: Provision of the land (demonstrator), permits, temporary utility connections.
- **Deliverables**: Occupancy agreement, building/planning permits (PC/DP), DICT (declaration of intended works), utility connection documents.

23. Control & Emergency Services Authorities

- **Role**: Coordination with SDIS (fire safety), accessibility, safety inspections.
- **Deliverables**: Formal opinions and approvals.

24. Waste Management / Circular Economy

- **Role**: Valorization of printed scraps, wash water treatment, short-loop recycling of aggregates.
- **Deliverables**: Waste management plan, traceability forms.

6) Data, AI & Scientific Validation

25. AI Partner / Digital Twin

- **Role**: Topo-structural optimization, print path planning, real-time monitoring (vision/sensors).
- **Deliverables**: Data pipeline, dashboards, optimization report.

26. Academic / Training Partner

- **Role**: Research protocol, publications, operator training (e.g. BTP CFA Grand Est, IUT, technical schools).
- **Deliverables**: Certification modules, demonstrator white paper.

7) Communication & Outreach

27. Press Relations / Video

- **Role**: Filming, storytelling, FR/EU media planning, managing professional visits.
- **Deliverables**: Media kit, image rights, PR calendar.

28. "Use-case" Partners *(tourism, social, private, public sectors)*

- **Role**: Usage scenarios aligned with CHANYA's target sectors.
- **Deliverables**: Functional requirements, field feedback.

Governance GME (proposition)

- **GME Mandate:** The Structural Engineering Consulting Firm (BET Structure) is designated as the Technical and Operational Representative of the GME.
- **Committees:**
    - *Tech & Quality (weekly):* Manufacturer, BETs (Engineering Offices), Labs, Operator.
    - *Risk & Assurance (bi-weekly):* Mandate holder, Courier/Broker, Technical control.
    - *Strategy & Partnerships (monthly):* Mandate holder, CHANYA (design), Local Authorities/Owner, Financial backers.
- **Tools:** BIM collaborative, Document management (GED), stage-gate matrices (ATEX, PC, GO, DOE).

Project Sequence (key milestones)

Note: The unit **‘S’** corresponds to **Weeks** for the Execution phases, and **‘M’** to **Months** for the Preparation and Engineering phases.

1. **Framing (M0-M4):** Potential site, program, sketches, pre-ATEX/job site, structured insurances.
2. **Engineering & Trials (M4-M10):** Validated mix-design, prototype elements, stable G-code, lab controls.
3. **Permits & Consultations (M8-M14):** PC/DP (Building Permit/Declaration of Prior Works), co-contractor consultation, TRC/DO (Technical Control/Owner's Representative), technical control.
4. **Pre-prod & Training (S12-S16):** Implementation, foundations, rehearsals/mock-ups, HSE (Health, Safety,
5. Environment).
6. **Printing & Second Works (S16-S22):** Layer production, envelope, MEP (Mechanical, Electrical, Plumbing).
7. **Commissioning & ATEX/DOE (S22-S24):** PV (Protocol of Reception), DOE (Owner's Manual), metrics, final inspection.

Proof File (KPIs & Final Deliverables)

- **Tech:** Cycle time metrics (m/h), precision (+/- tolerances), rejection rate < X%, setup time.
- **Material:** 24h/28 day strengths, inter-layer adhesion, permeability, fire/acoustic/thermal performance.
- **Energy & Water:** kWh/m^2 in projected area, % self-consumption, m^2 recovered.
- **Cost & Delays:** Demonstrator cost €/m^2, delta vs. traditional, milestones achieved.
- **Compliance:** Technical control reports, favorable ATEX certification, RE2020 attestations/Accessibility.
- **Operation:** Digital DOE (Owner's Manual), maintenance plan, user guide.

Partners:

- **Insurance certificates** (Professional Civil Liability, Ten-Year Warranty if applicable).
- **Comparable project references** (3D printing / unconventional / bio-based processes).
- **Capabilities:** Dedicated team, mobilization lead times, after-sales service on-call duty.
- **Quality & HSE:** Certifications, procedures, incidents over the last 24 months.
- **Data openness:** Anonymized sharing for ATEX / publications.
- **Commitment:** Letter of interest + calendar availability.

Categories

- Printing system manufacturer / Robotic integrator
- Suppliers of low-carbon / bio-sourced materials & admixtures
- Pumps / mixers / conveyance
- Structural Engineering Office / Materials Testing Lab / Architect / MEP Engineering Office / BIM
- HSE / Health & Safety Coordinator (SPS) / Technical Control / Insurance / Brokerage / Public Procurement Law
- General contractor / Earthworks / Foundations / Printing operator / Envelope / Plumbing-HVAC-Electricity Works Packages

- Energies (PV, inverters, storage) / Water (recovery/treatment)
- Site owners / Local authorities / Lessors (demonstrator plot)
- Academics / CFA (Apprenticeship Training Center) / PR (Public Relations) / Video / Financial Backers / Sponsors

CHANYA Notes

CHANYA does not build: it designs and orchestrates via a GME.

Clearly positions the demonstrator objective: convince insurers/investors, validate the ATEX (Technical Experimentation Approval), and disseminate the technology.

Highlights the target sectors (tourism, social, private, public) and the alliance of AI + additive 3D printing, low-carbon or bio-sourced materials.

Legal Clarity

This document constitutes a working basis for the formation of the CHANYA GME and should not be interpreted as a contractual commitment. Responsibilities and obligations will be defined in the agreement formally signed between the partners.

Intellectual Property (IP) and Data

The GME agreement will formalize the IP framework according to the principle of **“Background IP / Foreground IP”**:

- **Background IP**:
  Each partner retains full ownership of its existing know-how, technologies, software, and patents contributed to the project prior to or independently of the GME.
- **Foreground IP**:
  Specific innovations developed strictly within the scope of the demonstrator (including optimization algorithms, G-codes, rheological curves, and related technical outputs) shall be the property of **CHANYA**.
  CHANYA will grant GME partners a **non-exclusive, worldwide, irrevocable license** (free of charge or subject to agreed conditions) for their respective commercial exploitation, subject to the final agreement.
- **Data**:
  Protocols for sharing **anonymized data** (notably for publications and ATEx / experimental authorizations) will be defined in the agreement to ensure scientific traceability while preserving industrial confidentiality.