

M C P S E R V E R

N O C O D E

C L O U D H O S T E D

Cemented Backfill Mix Designer MCP

Design stable, pumpable tailings backfill for underground mines.

Cemented Backfill Mix Designer MCP gives your AI client the engineering logic needed to design tailings backfill. It handles the math for binder requirements, predicts if your mix will actually flow through pipes, and checks if the final cured fill meets your strength targets.

backfill

tailings

cement

mining-engineering

rheology



The connectivity layer between AI and the world's software.



Vinkius sits between AI and every application. All communication passes through Vinkius Cloud via the Model Context Protocol (MCP) — with governance, observability, and security at every layer.

Your AI Connections Run Through Vinkius Cloud

The world's largest
managed MCP catalog

Vinkius is the connectivity layer where AI connects to the software your business already runs. We handle the hosting, the security, the credentials, the uptime — you get agents that actually do things.

We operate the world's largest managed MCP catalog. Major SaaS platforms, CRMs, databases, and cloud providers — running, monitored, production-ready. This MCP server is hosted and maintained by the Vinkius Cloud for AI Agents.

The agent doesn't manage credentials, doesn't manage uptime, doesn't manage security. Vinkius does.

— Architecture principle

Four Pillars of the Vinkius Runtime

01 — Security by design

Credentials stay encrypted at rest via AES-256. The AI agent never touches raw keys — they're injected into a sandboxed V8 isolate at runtime. Actions are logged, and connections have an emergency kill switch.

03 — Deterministic observability

Eight immutable metrics per endpoint: request volume, p95 latency, error rate, active connections, cost attribution. A live payload feed logs every tool call with mutation detection.

02 — Built on MCP Fusion

This MCP server was built with **MCP Fusion**, the open-source framework (Apache 2.0) that powers the entire Vinkius catalog. Schema-as-firewall strips undeclared fields, compiled PII redaction runs at zero overhead, and cryptographic lockfiles produce git-diffable audit trails.

04 — Autonomous operations

Servers are deployed, monitored, and patched autonomously. New capabilities and security patches ship weekly. Zero-downtime deployments ensure continuous availability across all managed MCP servers.

AES-256

Encryption at rest

Ed25519

PKI vault signatures

24h TTL

Ephemeral session keys

V8 Isolate

Sandboxed execution

One Token. Instant Access.

Every MCP server on Vinkius is accessed through a **Connection Token**. Tokens are generated in the cloud dashboard and produce a unique MCP endpoint URL. Paste this URL into any MCP-compatible client — no SDK required.

A single token can serve **multiple AI clients simultaneously**, or you can issue separate tokens per client for granular access control. Each token tracks its own request count, last activity timestamp, and can be individually enabled or revoked.

MCP ENDPOINT`https://edge.vinkius.com/{token}/mcp`

Claude



Cursor



VS Code



Windsurf



Grok



Gemini

Security Is the Architecture

Security in Vinkius is not a feature — it's the foundation of the runtime. The gateway enforces multiple independent protection layers between AI agents and third-party APIs.

01 — Ed25519 PKI Vault

Every workspace has an Ed25519 Master Key. Session keys are generated ephemerally (24h TTL) and signed by the Master Key. Credentials never leave the vault boundary.

02 — V8 Isolate Sandboxing

Tool code runs inside isolated-vm V8 isolates with 64 MB memory caps and per-request timeouts. No filesystem access, no network access except through the SSRF-guarded fetch bridge.

03 — SSRF Guard

All outbound HTTP requests are DNS-resolved and validated before execution. Private IP ranges (10.x, 172.16-31.x, 192.168.x, AWS metadata 169.254.x) are blocked at the network layer.

05 — Cryptographic Audit Trail

Every request is signed into a SHA-256 hash chain with Ed25519 signatures. Events form a tamper-proof, SIEM-exportable forensic record.

04 — DLP & PII Redaction

A ResponseGuard pipeline intercepts every tool response. Configurable redaction patterns strip sensitive fields (emails, SSNs, card numbers) before data reaches the AI agent.

06 — Honeypot Trap System

Phantom credentials are injected into isolated environments. If a honeypot is used outside Vinkius infrastructure, the server is quarantined instantly.

Emergency Kill Switch

EU AI Act Art. 14(1)
Compliant

The kill switch is an **emergency halt** mechanism — not a simple toggle. When triggered, it executes three actions atomically:

01 — Server deactivated

The MCP server is immediately taken offline across the entire cluster.

02 — All tokens revoked

Every connection token is invalidated. Total lockout — reconnection blocked until new tokens are issued.

03 — WebSocket connections killed

Active connections terminated via Redis pubsub broadcast. Propagates to every runtime node in the cluster.

Full Visibility. Zero Guesswork.

The Vinkius cloud dashboard includes a full MCP Governance suite — real-time analytics and security controls for production AI operations.

Control Plane

KPI dashboard with request volume, latency, success rate, token consumption, and AI-generated operational briefings.

FinOps

Cost tracking per tool, payload compression savings, budget optimization signals, and consumption trends.

Firewall & DLP

PII redaction activity, sensitive data protection counters, and security event timeline.

Agent Activity

Which AI clients are connecting, how often, and what they're doing — real-time session tracking.

Tool Health

Slowest and most error-prone tools, with actionable root-cause insights and performance baselines.

Incident Log

Error trends, failure rates, status-code breakdowns, and forensic audit trail access.

Get started at cloud.vinkius.com — connect your AI agent in under 60 seconds.

Cemented Backfill Mix Designer MCP

4 tools available

Cloud-hosted on Vinkius

You can use this MCP to bridge the gap between raw tailings data and a functional backfill design. Instead of manual calculations, you tell your AI client your target strength and tailings properties, and it handles the binder mass and water-to-cement ratio math. It helps you avoid pipe blockages by predicting how a specific mix will behave during transport. If you need to tweak the recipe, the MCP can suggest chemical additives to adjust the rheology. Once the fill is placed, you can run validation checks to ensure the cured material matches your original design specs. It's built to help you balance the structural needs of the mine with the practical realities of pumping paste or hydraulic fill.

Core Capabilities

01 — Binder Calculation

The AI calculates necessary binder mass and water-to-cement ratios based on target strength.

02 — Transport Prediction

Your agent predicts if a mix will successfully pump through the chosen placement method.

03 — Additive Optimization

The AI suggests chemical additives like retarding agents to improve mix performance.

04 — Quality Verification

The agent compares cured fill properties against the original design to ensure compliance.

One Click on Vinkius — From Prompt to Execution

Available at vinkius.com/en/ai-agent-connect/cemented-backfill-mix-designer — connect your AI agent in three steps.

- 01

Connect your preferred MCP-compatible client to Vinkius.
- 02

Provide your tailings and target strength data to your AI agent.
- 03

Run the binder calculation and pumpability tools.
- 04

Adjust the mix with additives if the initial design fails tests.
- 05

Validate the final fill integrity against your design goals.

Connect your AI client to Vinkius to access these engineering tools instantly.

Built For

This MCP is built for mining engineers and technical specialists managing underground backfill operations.

Mining Engineer

Hands off tailings properties to the AI to generate initial mix designs.

Geotechnical Engineer

Uses the tool to validate that cured backfill meets structural safety requirements.

Process Engineer

Checks pumpability predictions to prevent pipeline issues during placement.

What Changes When You Connect

- 01

Reduces manual math for binder and water-to-cement ratios.
- 02

Lowers the risk of pipeline blockages through pumpability testing.

-
- 03** Speeds up the mix optimization process using chemical additives.
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- 04** Provides a digital audit trail for fill quality compliance.
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Real-World Applications

Initial Mix Design

Generate a baseline recipe using tailings specific gravity and moisture data.

Chemical Adjustment

Modify a mix to include retarding agents when transport times are long.

Pipeline Risk Mitigation

Test a new mix design for pumpability before sending it through the pipes.

Post-Placement Audit

Verify that the strength of the placed fill matches the design specifications.

4 Tools Available

#	TOOL	DESCRIPTION
01	calculate_binder_requirements	This tool determines the exact binder mass and water-to-cement ratio you need to hit a specific strength target.
02	evaluate_pumpability	Use this to predict if your designed mix will successfully travel through your chosen placement system without issues.
03	optimize_mix_with_additives	This tool adjusts your current mix design by suggesting the right amount of retarding agents or other chemical additives.
04	validate_fill_quality	This tool checks the final integrity of the backfill to see if it actually meets your design requirements.

See It in Action

Real prompts you can use once this MCP is connected to your AI agent through Vinkius Cloud.

- U** Calculate the binder requirements for a target strength of 5 MPa with a tailings specific gravity of 2.7 and 15% moisture.



The required binder content is 12.5% with a water-to-cement ratio of 0.45.

- U** Will a mix with 10% binder and 0.5 w/c ratio work for paste placement?



The flow status is predicted as stable with a low pressure risk score for paste placement.

- U** Validate a fill that achieved 4.8 MPa strength against a 5 MPa design with a void ratio of 0.05 using hydraulic placement.



The fill meets the design requirements with a high quality grade and compliant status.

Frequently Asked Questions

01 What AI clients can I use with this MCP?

You can use this MCP with any compatible client like Claude, Cursor, Windsurf, or VS Code.

02 Do I need to host the MCP myself?

No, Vinkius hosts and manages the MCP for you. You just connect and start using the tools.

03 Can this tool help with paste fill specifically?

Yes, the evaluate_pumpability tool can predict if a mix is suitable for paste placement.

04 How does the tool handle chemical additives?

The `optimize_mix_with_additives` tool allows your agent to adjust the mix by incorporating retarding agents or other chemicals.

05 Can I check if my fill meets strength requirements?

Yes, the `validate_fill_quality` tool assesses if the final fill complies with your original design.

Go Live in 60 Seconds

Get your connection token from cloud.vinkius.com, then paste the endpoint URL into any MCP-compatible client.

YOUR MCP ENDPOINT

https://edge.vinkius.com/[TOKEN]/mcp

CLIENT	WHERE TO CONFIGURE
 Claude AI	Profile → Customize → Connectors → "+" → Add custom connector → Paste endpoint
 Cursor	Settings → Features → MCP Servers → "+ Add New MCP Server" → Type: SSE → Paste endpoint
 VS Code	Ctrl/Cmd+Shift+P → "MCP: Add Server" → add <code>"cemented-backfill-mix-designer": { "url": "..." }</code>
 Windsurf	MCP Settings → <code>mcp_settings.json</code> → Add endpoint URL
 ChatGPT	Settings → Tools & plugins → Add MCP server → Paste endpoint
 Gemini	Extensions → Add MCP Server → Paste endpoint URL

ASK AN AI ABOUT THIS

Let your preferred AI explain this MCP server

Ask ChatGPT

Ask Claude

Ask Perplexity

Ask Gemini

Ask Grok

READY TO CONNECT

Cemented Backfill Mix Designer is live on Vinkius Cloud.

Get your connection token, paste it into your AI agent, and
start building. No SDK. No deployment. Just results.

Start at cloud.vinkius.com →

vinkius.com · support@vinkius.com

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DOCUMENT INFORMATION

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Server ID	01a0823d-2327-70e2-938c-3c8e683e7607
Platform	Vinkius Cloud for AI Agents
Endpoint	https://edge.vinkius.com/{token}/mcp

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