MCP SERVER | NO CODE | CLOUD HOSTED

Backfill Design Calculator MCP

Get precise mix compositions and curing timelines for mine backfill.

Backfill Design Calculator MCP gives your AI client the engineering logic needed to design underground mine backfill. It handles the math for mix compositions, predicts how long materials take to reach design strength, and checks if your tailings are actually suitable for the specific fill type you're planning.

A+ Quality Score 100/100

mining | backfill | cement | engineering | tailings

MAINTAINED BY VINKIUS CLOUD FOR AI AGENTS · SEPTEMBER 2026
vinkius.com/en/ai-agent-connect/backfill-design-calculator

SCAN TO VIEW

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.

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.

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.

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	Ed25519	24h TTL	V8 Isolate
Encryption at rest	PKI vault signatures	Ephemeral session keys	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.

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.

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.

06 — Honeytoken Trap System

Phantom credentials are injected into isolated environments. If a honeytoken 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.

Agent Activity

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

FinOps

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

Tool Health

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

Firewall & DLP

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

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.

Backfill Design Calculator MCP

4 tools available
Cloud-hosted on Vinkius

You can use this MCP to handle the heavy lifting of underground backfill engineering. Instead of manually running calculations for every new batch, you can ask your AI client to determine the exact composition of a mix or check if your current tailings properties will support a specific hydraulic or paste fill. It covers the full design cycle, from initial material suitability to final economic comparisons. You can predict hydration timelines to plan your production schedule or run cost analyses to find the cheapest binder solution that still meets your strength requirements. It's built for hydraulic, paste, and rock fill applications where getting the cement ratio and curing time right is critical for mine stability.

Core Capabilities

01 — Mix Composition

Your agent calculates the exact cement and water ratios needed for a specific strength.

02 — Curing Predictions

Your agent estimates the time required for a mix to hit its design strength.

03 — Material Validation

Your agent checks if tailings properties match the requirements for hydraulic or paste fill.

04 — Economic Modeling

Your agent compares different binder solutions to find the lowest cost per mix.

One Click on Vinkius — From Prompt to Execution

Available at **vinkius.com/en/ai-agent-connect/backfill-design-calculator** — connect your AI agent in three steps.

01 Connect your AI client to the Vinkius hosted MCP.

02 Provide tailings properties or target strength requirements to your agent.

03 The agent uses the specialized tools to run the engineering math.

04 Receive specific mix designs, curing times, or suitability reports.

You connect the MCP to your AI client and start asking engineering questions immediately.

Built For

This MCP is built for mining professionals who need to move from raw tailings data to a finalized backfill design quickly.

Mining Engineers

They hand off tailings data and target strengths to the AI to get rapid mix designs.

Geotechnical Engineers

They use the tool to validate if tailings properties are compatible with planned fill types.

Mine Operations Managers

They use curing estimates to schedule production and equipment movement.

What Changes When You Connect

01 Reduces manual calculation errors in cement and water ratios.

02 Speeds up the design process for hydraulic, paste, and rock fill.

03 Provides cost comparisons between different binder combinations.

04 Links tailings properties directly to backfill suitability.

Real-World Applications

Paste Fill Design

Calculate the exact cement percentage needed for a specific tailings density and target strength.

Operational Scheduling

Determine how many days to wait before a fill reaches the required MPa for safe reentry.

Cost Optimization

Compare different mix designs to find the most economical binder for a specific strength requirement.

Tailings Assessment

Verify if a new batch of tailings is suitable for the existing hydraulic fill setup.

4 Tools Available

#	TOOL	DESCRIPTION
01	`calculate_mix_design`	This tool determines the fundamental composition of a backfill mix. It calculates the necessary ratios for your specific design requirements.
02	`compare_mix_economies`	This tool evaluates the cost-effectiveness of different mix designs. It helps you find the most affordable binder options that still meet your strength targets.
03	`estimate_curing_duration`	This tool predicts how long a specific mix takes to reach its design strength. You use it to plan operational timelines and curing windows.
04	`validate_tailings_suitability`	This tool checks if your tailings properties can support a chosen backfill type. It verifies if the material is a good match for hydraulic or paste fill.

See It in Action

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

U Calculate a mix design for paste fill with a tailings density of 2.6, a void ratio of 0.4, and a target strength of 2.0 MPa.

The required cement content is 12.5% with a water-to-cement ratio of 0.65.

U How many days will it take for a paste fill with 15% cement and a 0.6 water-to-cement ratio to reach 3.0 MPa?

The estimated curing duration is 28 days to reach the target strength.

U Is a particle size distribution of [0.01, 0.05, 0.1, 0.5] suitable for hydraulic fill?

The tailings are suitable for hydraulic fill with a low risk level.

Frequently Asked Questions

01 **What types of backfill can this MCP design?**

The tool supports designs for hydraulic, paste, and rock fill applications.

02 **Can I use this with Claude or Cursor?**

Yes, you can connect this MCP to any compatible client like Claude, Cursor, or Windsurf.

03 **Does it help with cost management?**

Yes, it includes a tool to compare the economics of different mix designs based on strength requirements.

04 **How does it handle tailings data?**

It uses a validation tool to check if specific tailings properties support your desired backfill type.

05 **Do I need to host the MCP myself?**

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

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 `"backfill-design-calculator": { "url": "…" }`
Windsurf	MCP Settings → `mcp_settings.json` → 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

Backfill Design Calculator 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

INDEPENDENT PLATFORM DISCLAIMER

Vinkius is an independent platform and is not affiliated with, endorsed by, sponsored by, verified by, or otherwise authorized by Backfill Design Calculator. All third-party trademarks, logos, and brand names are the property of their respective owners. Their use in this document is strictly for informational purposes to identify service compatibility and interoperability.

DOCUMENT INFORMATION

Generated	September 2026
MCP Server	Backfill Design Calculator MCP
Server ID	`01a07f4e-a08f-7059-8855-3ed4419d4892`
Platform	Vinkius Cloud for AI Agents
Endpoint	`https://edge.vinkius.com/{token}/mcp`

LICENSE & USAGE

This document is generated automatically by the Vinkius PDF Engine. Content reflects the MCP server configuration at the time of generation and may change as updates are deployed. For the most current information, visit vinkius.com/en/ai-agent-connect/backfill-design-calculator.