

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

Bench Design Parameters MCP

Design safe, stable open-pit bench geometries with precision.

Bench Design Parameters MCP gives your AI client the specialized math needed for open-pit mine engineering. It handles the heavy lifting for calculating vertical limits, equipment clearance, and pit wall slopes based on specific rock types and machinery dimensions.

A+ Quality Score 100/100

open-pit

bench-design

mining-engineering

geology

safety



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.

Bench Design Parameters MCP

4 tools available

Cloud-hosted on Vinkius

You can now bring specialized mining geometry calculations directly into your AI workflow. This MCP provides the specific formulas and safety checks required for designing open-pit benches. Instead of manually calculating clearances or slope angles, you ask your agent to run the numbers based on the rock characteristics and equipment you are using on-site.

Whether you are working with hard rock or weathered material, the tools here ensure your designs stay within operational limits. You can determine how high a bench can safely go, how wide it needs to be to accommodate your haul trucks, and what the overall pit wall slope looks like across multiple benches. It also acts as a safety check, verifying that your proposed dimensions meet the necessary standards for the specific geology and machinery in your pit.

Core Capabilities

01 — Vertical Limit Calculation

Your agent uses this to find the safest bench height for specific rock types.

02 — Equipment Clearance Checks

The AI calculates the necessary bench width to accommodate your specific machinery.

03 — Slope Angle Estimation

Your agent determines the overall inter-ramp angle for the pit wall.

04 — Safety Compliance Verification

The AI checks if your design parameters meet operational safety requirements.

One Click on Vinkius — From Prompt to Execution

Available at vinkius.com/en/ai-agent-connect/bench-design-parameters — connect your AI agent in three steps.

- 01
- Subscribe to the MCP on Vinkius.
- 02
- Connect your client like Claude or Cursor using the provided link.
- 03
- Provide your rock type and equipment dimensions to your agent.
- 04
- The agent uses the MCP tools to run the specific calculations.
- 05
- Receive precise design parameters or compliance results immediately.

Get your mining geometry tools running in your AI client in minutes.

Built For

This MCP is built for professionals managing open-pit mining operations and geological stability.

Mining Engineers

They use the AI to quickly iterate on bench geometry and slope designs.

Geotechnical Engineers

They hand off rock stability data to the AI to validate bench heights.

Mine Planners

They use the tools to ensure equipment can move safely through the pit.

What Changes When You Connect

- 01
- Reduces manual calculation errors in pit wall design.
- 02
- Connects geological data directly to geometric constraints.
- 03
- Provides instant safety validation for proposed designs.

04 Speeds up the iteration of bench and slope parameters.

Real-World Applications

Bench Height Optimization

Determine the safest vertical limits when moving from hard rock to weathered zones.

Pit Wall Slope Design

Estimate the inter-ramp angle to plan the overall pit geometry.

Equipment Safety Planning

Calculate the exact bench width needed for specific haul truck dimensions.

Design Compliance Auditing

Run a final check on design parameters to ensure they meet safety standards.

4 Tools Available

#	TOOL	DESCRIPTION
01	calculate_bench_width	This tool calculates the horizontal width needed for a bench to keep equipment safe and provide proper rock catchment.
02	estimate_inter_ramp_angle	Use this to find the total slope angle of a pit wall across several benches.
03	get_bench_height	This tool determines the maximum vertical height for a bench based on the stability of the rock type.
04	validate_design_compliance	This tool checks your proposed design against safety and operational standards for your specific rock and equipment.

See It in Action

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

U What is the recommended bench height for Hard-Rock with large-scale equipment?



The recommended bench height for Hard-Rock with large-scale equipment is 15 meters, with a maximum allowable height of 18 meters.

U Calculate the required bench width for a 6-meter wide machine in Sedimentary rock.



The total required bench width is 12.5 meters, which includes a 9.0 meter working width and a 3.5 meter safety berm.

U Is a design with 12m height and 10m width compliant for Weathered rock and a 5m wide machine?



No, the design is non-compliant because the height exceeds the stability limits for Weathered rock.

Frequently Asked Questions

01 What can this MCP calculate for mine design?

It calculates bench height, bench width, inter-ramp angles, and validates design compliance based on rock and equipment.

02 Which AI clients can I use with this MCP?

You can use any MCP-compatible client, including Claude, Cursor, Windsurf, and VS Code.

03 Does the tool account for different rock types?

Yes, the tools use rock characteristics to determine height limits and compliance.

04 How does it handle equipment dimensions?

You provide the machine width, and the tool calculates the required bench width including safety berms.

05 Do I need to host the MCP myself?

No, Vinkius hosts and manages the MCP for you, so it is ready to use once you connect.

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>"bench-design-parameters": { "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

Bench Design Parameters 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	01a07f0d-9926-73d5-9426-e5cb581c09ec
Platform	Vinkius Cloud for AI Agents
Endpoint	<code>https://edge.vinkius.com/{token}/mcp</code>

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