MCP SERVER | NO CODE | CLOUD HOSTED

Column Sizing Estimator MCP for AI Agents

Pre-dimensioning Vertical Supports and Calculating Axial Loads for Building Blueprints

The Column Sizing Estimator lets engineers quickly pre-dimension vertical supports for new builds. It calculates total axial loads and suggests optimal initial cross-sections for both steel profiles and reinforced concrete columns, saving hours during early structural design.

A+ Quality Score 100/100

structural-engineering | column-sizing | concrete-design | steel-profiles | axial-load

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vinkius.com/mcp/column-sizing-estimator

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.

Column Sizing Estimator MCP

4 tools available
Cloud-hosted on Vinkius

When starting a major building project, the first hurdle is figuring out how much weight those core pillars need to bear. This MCP helps architects and civil engineers bypass tedious manual calculations. It performs rapid pre-dimensioning of vertical supports by calculating cumulative axial loads based on floor counts and tributary areas. You can quickly determine the required initial cross-sections for both steel and reinforced concrete columns, making early design faster and more accurate.

Whether you need to check if a project is commercial or residential, or if you're selecting between standard HEB profiles versus custom concrete dimensions, this utility handles it all. If your team uses Vinkius, the AI client can access all these structural calculations from one place, keeping your design process flowing without switching tools.

Core Capabilities

01 — Determine cumulative column load

Calculates the total vertical force acting on a foundation based on specified floor count and area.

02 — Suggest concrete dimensions

Provides minimum side measurements for a square reinforced concrete support pillar.

03 — Classify project load type

Categorizes the total calculated axial load into standard engineering tiers (residential, commercial, industrial).

04 — Recommend steel profiles

Suggests appropriate standard steel profile types for handling vertical compression.

One Click on Vinkius — From Prompt to Execution

Available at **vinkius.com/mcp/column-sizing-estimator** — connect your AI agent in three steps.

01 First, input the project parameters into your AI client: provide the building's floor count, its total influence area, and the expected load per square meter.

02 The MCP runs these inputs through the necessary calculations to determine the full accumulated axial force on the base of the column.

03 Finally, it generates specific recommendations—suggesting appropriate concrete dimensions or standard steel profiles based on that calculated load.

The bottom line is you get reliable, pre-dimensioned structural estimates without having to run multiple calculations manually.

Built For

This MCP is essential for structural engineers and architects who spend their days designing buildings. If you're tired of cross-referencing building codes or running complex, multi-step spreadsheets just to size a column, this tool saves your time.

Structural Engineer

Uses this MCP daily to validate preliminary sizing and check load requirements before drafting full structural blueprints.

Architect

Relies on the estimates to inform early design decisions, ensuring that proposed column sizes fit within aesthetic and functional constraints.

Civil Engineer

Employs it during feasibility studies to quickly determine if a site can support the intended vertical loads for different building types.

What Changes When You Connect

01 Eliminate guesswork by accurately calculating the total cumulative axial load using the `calculate_total_axial_load` tool, providing a reliable foundation metric.

02 Speed up early design phases significantly. Instead of manual calculations, you get immediate suggestions for concrete dimensions via `estimate_concrete_section`.

03 Instantly understand project requirements by running the load through `check_load_severity`, which correctly classifies if the structure is commercial, residential, or industrial.

04 Stop guessing steel profiles. Use `estimate_steel_section` to get recommendations for standard HEB profiles that guarantee structural integrity under compression.

05 Consolidate your workflow. You can run multiple checks—from load calculation to material sizing—without leaving your AI chat interface.

Real-World Applications

Determining capacity for a multi-story commercial building

A project manager needs to know if the site can support a 7-story office complex. They ask their agent to first run `calculate_total_axial_load` for the given area, then use `check_load_severity` to confirm it falls into the 'commercial' tier before moving on.

Quickly sizing a concrete pillar in residential design

An architect needs preliminary sizes for several pillars. They input the load and then ask the agent to use `estimate_concrete_section` to get immediate, square dimensions they can pass straight to the drafting team.

Selecting appropriate steel members for industrial structures

A civil engineer is designing a warehouse. After calculating the load, they ask the agent to use `estimate_steel_section` to get specific HEB profiles that meet the required compression strength.

Comparing structural feasibility across different building types

A developer needs to compare residential versus industrial site loads. They run the load through `check_load_severity` first, and then use the resulting category data to guide their subsequent material sizing requests.

Patterns to Avoid

Only calculating a single type of load

✗ AVOID

A user only runs the tool to calculate axial load but fails to determine if that load qualifies as commercial or residential, leading to incorrect structural assumptions.

✓ INSTEAD

Always pair the load calculation with `check_load_severity`. This ensures your design parameters match the correct engineering classification (e.g., industrial vs. residential).

Ignoring material limitations

✗ AVOID

An engineer calculates a high total axial load but then only uses concrete sizing, forgetting to check if standard steel profiles are needed for better performance.

✓ INSTEAD

After determining the load, run both `estimate_concrete_section` and `estimate_steel_section`. Compare the suggested dimensions to find the most efficient material solution.

Manual cross-checking of multiple tools

✗ AVOID

Copying the load value from a separate spreadsheet calculation and pasting it into the sizing tool, creating manual data entry errors.

✓ INSTEAD

Let your AI client manage the workflow. Have it first use `calculate_total_axial_load` and then pass that exact result directly to both material estimation tools.

The Right Fit

Use this MCP when you need pre-dimensioning estimates for vertical supports in structural engineering. Specifically, if you have determined the load (or estimate it) and need initial suggestions for concrete or steel cross-sections, this is your tool. Don't use this if you are designing foundations (that requires geotechnical data) or if you are calculating lateral forces like shear or moment (those require specialized finite element analysis). If all you need is to calculate the total weight of an object, a simple calculator will do; but if that weight needs to be interpreted as a structural load and sized for materials, this MCP handles it.

Using Column Sizing Estimator for Structural Load Calculations

Today, determining the preliminary size of a column is an old-school pain. Engineers spend hours cross-referencing building codes and manually calculating cumulative loads across multiple floors just to get initial dimensions. It's tedious; you're constantly switching between load sheets, sizing manuals, and spreadsheets.

With this MCP, that entire process shrinks down to a prompt. You tell the agent the basic project parameters, and it handles the complex math. The punchline? You walk away with immediate, data-backed suggestions for everything from concrete dimensions to HEB steel profiles.

Streamlining Structural Design Workflows with Column Sizing Estimator

The biggest time sink is the back-and-forth between disciplines. You calculate a load, then send it to another team for review, who might ask you to re-check the classification—all requiring manual data transfer and version control.

Now, your agent manages the sequence. It calculates the total axial force, automatically checks the project's severity (commercial or residential), and spits out all necessary material dimensions in one go. You move straight from concept to preliminary design.

Column Sizing Estimator: 4 Tools for Axial Load Calculation

Use these tools to calculate total axial loads, estimate required dimensions for concrete supports, classify load severity, or suggest standard steel profiles.

#	TOOL	DESCRIPTION
01	`calculate_total_axial_load`	Calculates the total cumulative vertical force acting on the base of the column using project metrics.
02	`estimate_concrete_section`	Suggests the minimum side dimensions needed for a square reinforced concrete column.
03	`check_load_severity`	Categorizes the total axial load into an engineering tier: residential, commercial, or industrial.
04	`estimate_steel_section`	Suggests a standard steel profile type suitable for high axial compression forces.

See It in Action

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

U Calculate the load for a 6-story mixed-use building on this site.

Axial Load Calculation Report

- **Input Area:** 80m²
- **Floor Count:** 6
- **Load Density:** 12 kN/m²
- **Total Accumulated Axial Load: 5,760 kN**

This high load places the project in the **Industrial Tier**. Below are initial material suggestions based on this figure.

U What concrete size should I use for a 1,800 kN residential pillar?

Concrete Column Sizing Recommendation

The suggested dimension for your reinforced concrete column is **50 cm x 50 cm**.

- **Required Strength:** >1,800 kN
- **Minimum Code Dimension:** 45 cm x 45 cm
- **Recommendation Margin:** The larger size provides a necessary safety margin for typical residential environments.

U Give me the best steel profile estimate for an 800 kN column.

Steel Profile Recommendation (Axial Compression)

Based on the required strength of 800 kN, we recommend the following standard HEB profile:

- **Recommended Profile: HEB 160**
- **Yield Strength Check:** Meets requirements with a safety factor of 1.2
- **Note:** This profile is optimized for maximum axial compression efficiency.

Frequently Asked Questions

01 **How does the Column Sizing Estimator work if I'm designing a mixed-use building?**

The MCP handles this complexity by first running `check_load_severity`. It assesses the total load against multiple criteria, giving you an accurate engineering tier classification that guides your subsequent material choices.

02 **Can I use Column Sizing Estimator to check if a pillar needs steel or concrete?**

Yes. After calculating the axial load, the MCP provides separate recommendations for both reinforced concrete dimensions and standard steel profiles using two different tools, allowing you to compare material efficiencies side-by-side.

03 **What kind of loads does the Column Sizing Estimator use?**

It uses cumulative axial load. This means it calculates the total weight pressing down on a pillar's base based on the combined influence area and the number of stories above it.

04 **Is this MCP good for early-stage architectural sketches?**

Absolutely. It is designed specifically for rapid pre-dimensioning during the initial design phase, helping architects quickly confirm if their structural concepts are viable before detailed drafting begins.

05 **Does Column Sizing Estimator consider different building types like warehouses vs offices?**

Yes. The `check_load_severity` tool classifies the load into residential, commercial, or industrial tiers, which is critical because each category has different governing structural code requirements.

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 `"column-sizing-estimator": { "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

Column Sizing Estimator 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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