Geotechnical AI Agent – File Preparation and Token Usage

Every request sent to the SETAF Geotechnical AI Agent consists of the prompt you write, the attached files, and the relevant chat history.

The agent has a **1 million token context limit**. If the total token amount of a request exceeds this limit, the system will not forward the request to the agent.

In particular, DXF files can consume a large number of tokens depending on the number and complexity of drawing elements they contain. For this reason, it is recommended to simplify DXF files such as foundation plans, site layout plans, and building cross-sections as much as much as possible before sending them to the agent.

Following the rules below helps prevent exceeding the token limit and **reduces AI usage costs.**

1. Site Layout Plan (DXF)

It is usually sufficient to include the following information in the site layout plan:

- Contour lines showing plot (land) boundaries
- Contour lines showing building footprint
- Elevation levels of plot corner points
- Elevation levels of building corner points

Unnecessary drawings, hatchings, annotations, and other details outside of these should be removed.

Applying the PURGE command after simplification is beneficial for clearing unused drawing elements and definitions.

2. Foundation Plan (DXF)

In the foundation plan, it is generally sufficient to include contour lines showing the foundation boundaries.

If foundation elevation levels are available, these can also be kept in the drawing.

The file should be simplified by removing unnecessary detail drawings, hatchings, dimensions, and annotations.

3. Building Cross-Section (DXF)

The building cross-section may not be as necessary as the site plan and foundation plan.

Particularly if crucial information such as the foundation bottom level has been conveyed to the agent through other means, it may not be necessary to upload the building cross-section separately.

If a building cross-section is to be sent:

- Basic lines defining the geometry of the structure should be preserved.
- Relevant elevation level information should be kept.
- Hatchings, unnecessary details, and explanatory texts should be removed.

4. Sending DXF Files in Separate Requests

Sending multiple DXF files within the same request can significantly increase the total token amount.

For this reason, it may be preferable to send large DXF files **not in a single request, but sequentially in separate requests within the same chat**.

This way, the amount of data processed in each request can be reduced and the risk of hitting the token limit can be lowered.

However, it should be kept in mind that the chat history is also included in the context limit.

5. Soil Investigation Report (PDF)

Soil investigation reports can consume a high amount of tokens, especially when they contain numerous pages, tables, and visuals.

If the PDF file causes the token limit to be exceeded, simplifying the report is recommended.

During this process, information required for geotechnical analysis must be preserved; unnecessary repetitions, irrelevant appendices, and content that holds no importance for analysis should be removed.

In particular, soil profiles, borehole data, field and laboratory test results, groundwater levels, and geotechnical evaluations should be preserved.

6. File and Usage Limits

SETAF AI AGENT – STRICT LIMITS
When these limits are exceeded, the request will result in an error.

TOTAL ATTACHMENT SIZE (SINGLE MESSAGE)
- Limit: Total attachments in a single message is approximately 75 MB.
- Reason: Files are encrypted before being sent, which increases their size by 4/3. The server accepts a maximum request of 100 MB.
- If Exceeded: "Agent function returned an error (500)." or connection error.
- Note: Attachments are only sent in the message where they are attached. They are not re-sent in subsequent messages.

PDF PAGE COUNT (SINGLE MESSAGE)
- Limit: 600 pages.
- Pages of all PDFs in the same message are summed up.
- Encrypted or password-protected PDFs are not accepted.
- If Exceeded: "Agent function returned an error (...)."

CONTEXT (TOKEN) LIMIT

- Limit: 1 million tokens.
- Each PDF page consumes approximately 1,500–3,000 tokens. Dense PDFs can fill this limit before reaching the page count limit.
- If Exceeded: "Agent function returned an error (...)."

IMAGE LIMITS

- Maximum 10 MB per image (encrypted). This corresponds to approximately 7.5 MB as a raw file.
- Maximum dimensions: 8000 x 8000 pixels.
- If there are more than 20 images in a single message, each image edge can be at most approximately 3000 pixels.
- Number of images: Maximum 100 for 200K context models, maximum 600 for other models.
- If Exceeded: "Agent function returned an error (...)."

RESPONSE TIME

- Limit: Approximately 230 seconds (Server gateway limit).
- Server model waiting time is 240 seconds; program server waiting time is 5 minutes. In practice, 230 seconds is decisive.
- If Exceeded: "The agent did not respond in time..." or a server error.

CREDIT

- Limit: If credit balance is zero, request will not be processed.
- If Exceeded: HTTP 402 (Insufficient credit) message.

AUTOMATIC CHAIN STEPS

- Limit: Agent executes a maximum of 100 automatic command steps in a single instruction.
- If Exceeded: Chain stops and control returns to the user.

SUPPORTED ATTACHMENT TYPES

- PDF: Read directly.
- Image (PNG, JPG, etc.): Viewed directly.
- DXF: Read as text.
- DOCX: Only text is read; images and table visuals inside are not read.
- Other types: Only file name is conveyed, content is not read.

Important Reminder

Simplifying files not only reduces token consumption and cost, but also makes it easier for the agent to focus on essential engineering data.

Therefore, it is recommended to keep only the information necessary for the analysis and design to be performed in the files sent to the agent.

Sample Scenarios

In this section, sample scenarios and their corresponding prompts (written instructions) demonstrating how the SETAF Geotechnical AI Agent can be used in different engineering tasks are presented.

The scenarios cover the evaluation of soil investigation reports, geotechnical modeling, foundation analysis, soil improvement, and design operations.

For each scenario, the instructions to be given to the agent and the required files are explained. You can adapt and use the sample prompts for your own projects.

Soil Improvement with Concrete Piles

Scenario: In this project, we have a soil investigation report with 3 boreholes. The foundation plan, site plan, and building cross-section are drawn in a single DXF file. Attaching two files at the same time in the prompt may exceed the 1 million token limit. Therefore, in the first prompt, we will attach the soil investigation report (.pdf). In the second prompt, we will attach the DXF file.

Prompt *(1st request: In this request, we attach the PDF file.)*

Complete this task end-to-end without asking for confirmation at any stage: materials, soil profiles, foundation model, foundation analyses, and design. I am providing 2 files attached:

1. Soil investigation report (PDF)
2. Foundation plan, site plan, and building cross-section (in a single DXF file)

Raft foundation base pressure values:
Foundation name: RD01
Foundation thickness: 70 cm
G+Q load combination:
- Minimum: 9.76 t/m²
- Average: 10.72 t/m²
- Maximum: 11.76 t/m²
1.4G+1.6Q load combination:
- Minimum: 13.85 t/m²
- Average: 15.21 t/m²
- Maximum: 16.68 t/m²
G+Q+E / 0.9G+E load combination:
- Minimum: -9.15 t/m²
- Average: 19.34 t/m²
- Maximum: 30.88 t/m²
I will provide the files one by one. Summarize each one as you receive it. Then you can continue completing end-to-end. Because all files together exceed the token limit.
1. File summaries: Provide a detailed summary of each file before starting the modeling. The summary must remain in the chat history and be used as a resource in subsequent steps.

- From the soil report: Borehole locations and elevations, strata, SPT and pressuremeter values, laboratory test results (UU, CU, consolidation, etc.), groundwater level, seismic/local soil class information.
- In the DXFs:
    - Foundation corner coordinates in the foundation plan (with units).
    - Plot and ground elevations in the site layout plan.
    - Story and foundation elevations in the building cross-section.
    - Foundation bottom elevation and which data it was derived from.

2. Materials and soil profiles

- Do not idealize boreholes. Define all available boreholes.
- Do not idealize SPT and pressuremeter values; enter the values exactly as in the report.
- Determine the groundwater level from the soil report.
- Be sure to enter consolidation parameters for fine-grained soils.

- If there are data in the report contradicting geotechnical engineering principles, estimate the correct values and state the reasoning. For example, internal friction angle given as 2-3° in a UU test.
- Pay attention to the concept of model depth.

3. Foundation model

- Consistently determine foundation geometry from the foundation plan in the DXF and the foundation bottom elevation from all files.
- Enter necessary settlement points (corners, mid-edges, center, etc.).
- Define a cast-in-place concrete pile type rigid column group under the foundation. Let the column diameter be 45 cm; determine length and spacing during design.

4. Foundation analyses and design

- First, bearing capacity: Since it is a foundation with rigid columns, deep foundation bearing capacity analysis. Perform bearing capacity analyses according to the load combination giving the highest average base pressure.
- Then settlement: Settlement and differential settlement analysis. Perform settlement analyses according to the average base pressure in the G+Q load combination.
- Liquefaction: Liquefaction analysis if soil and groundwater conditions require it.
- Adequacy: First rely on the program's adequacy checks. If a relevant check is not in the program, decide according to geotechnical engineering principles.
- Revision: If inadequate, revise rigid column length and/or spacing. Make sure column tips do not extend below the bottom elevation of the soil profile. Recheck previous analyses after each revision. Continue until all criteria are met.

5. Geotechnical report

- After analysis and design are completed, generate a geotechnical report in the program based on final (revised) results. Report content must reflect only the final design; specify intermediate revisions in the final summary, not in the report.
- Report type shall be "parcel". Write the required text requested in the report type. Report name must be distinctive: use information from the soil report such as province/district, block/parcel, and project name (e.g., "<District> <Block>/<Parcel> Soil and Foundation Investigation Report"). If a report with the same name exists, do not create a new one, update it.

- Review sections coming from the template; add, delete, or reorder sections if necessary. The report must contain at least the following sections:
    - Introduction and project information (location, structure, number of stories, foundation type)
    - Field and laboratory work (boreholes, SPT, pressuremeter, tests)
    - Soil profile and design parameters (idealized profiles, groundwater level, local soil class)
    - Corrected report data and accepted assumptions (with reasoning)
    - Foundation system and rigid column design (foundation geometry and bottom elevation, column diameter/length/spacing/count)
    - Bearing capacity analysis
    - Settlement and differential settlement analysis
    - Liquefaction evaluation (if not required, state reason)
    - Conclusion and recommendations
- Texts must be written in engineering report language, in Turkish with units; numerical values must be identical to the final analysis results in the program.
- List the element pool. Place analysis images and tables from the pool into relevant sections; give each an explanatory caption. Do not modify table contents. Adjust image sizes to fit the page (width maximum ~6.5 inches, height auto). If there is no consolidation settlement at a settlement point, you do not need to place the consolidation table and image for that settlement point into the report. If present, do so. Also ensure the same image does not appear twice in the report.
- If relevant image or table is not in the pool, write the results as text and state this in the final summary.
- Make section titles and important conclusion sentences bold where necessary.
- After completing the report, check by listing the elements of each section; read and verify long texts completely, fix the order.
- If you wish to show the report form to the user, do this at the very end of all operations.

6. Final summary

- Accepted assumptions (including uncertain units or missing parameters) and corrected report data, with reasoning.
- Idealized soil profiles.
- Foundation geometry and foundation bottom elevation.

- Final rigid column design: diameter, length, spacing, count.
- Bearing capacity, settlement, and if required, liquefaction results (with units).
- If any criterion could not be met, the reason for it.
- Name, number, section list of the created geotechnical report, and figures/tables used in the report; results written as text because they could not be found in the pool.

If you encounter ambiguous data, do not ask questions; make the most reasonable engineering assumption, proceed with work, and state the assumption in the final summary.

Additional Prompt *(2nd Request: In this request, we attach the DXF file)*

Now I am providing the DXF file.

Regular Grid Rigid Column Placement Under Polygonal Foundation

Scenario: There is a previously created polygonal foundation in the model. In this scenario, a pile-type rigid column group with a diameter of 80 cm and grid spacing of approximately 3 m in both axes will be placed under the existing foundation.

The agent will place the columns close to the foundation boundaries parallel to the respective foundation edges while aligning the interior columns on the same axes as the edge columns. Thus, a regular and continuous grid system that adapts to the foundation geometry as much as possible will be created.

All placement operations will be performed automatically by the agent while maintaining the foundation boundaries.

Prompt

Manually place 80 cm diameter pile-type rigid columns under the existing polygonal foundation model. Let the target grid spacing of columns be 3 m in both directions.

Place columns close to foundation boundaries such that they form rows parallel to the respective edges of the polygonal foundation.

Do not position interior columns independently of edge columns. Continue the axis directions formed by the edge columns inward into the foundation and align interior columns along these axes.

Edge and interior columns together should form as continuous and regular a grid system as possible. Centers of columns in the same row must lie on a common straight line; there should be no unnecessary axis shifts or staggered layouts between interior columns and edge columns.

In regions where different edge directions meet due to polygonal foundation geometry, prioritize column alignment and regular distribution. You may make minor adjustments to axis spacing where necessary.

All rigid columns must remain within the foundation boundaries.

End-to-End Geotechnical Analysis, Design, and Reporting from Soil Investigation Report

Prompt *(Request 1: In this request, we attach the PDF report)*

Complete this project end-to-end without asking for confirmation at any stage: soil materials and profiles, foundation model, bearing capacity and settlement analyses, design, and an English geotechnical report.

First, I will provide the soil investigation report (PDF), followed by the site layout and foundation plan (DXF). As you receive each file, extract a detailed summary and use it in subsequent operations.

Determine boreholes, test results, soil parameters, and groundwater levels from the soil investigation report. Obtain foundation geometry and elevations from DXF files. Do not modify DXF dimensions.

Determine structural loads and average foundation base pressure primarily from the provided PDF and DXF files. If this information is not available, calculate approximate foundation base pressure through reasonable engineering assumptions considering

the building's intended use, number of stories, structural system, and foundation area. Clearly state all load assumptions and calculation methods. Define analyses performed with hypothetical loads as preliminary evaluations.

Estimate missing geotechnical parameters based on engineering principles and state your assumptions. Define soil materials and profiles to establish the foundation model. Perform required bearing capacity and settlement analyses, evaluate results, and check adequacy criteria.

If soil improvement is required, select the most suitable method for soil conditions, design it, and repeat the analyses. If inadequate, revise design and re-perform analyses.

Generate an English geotechnical report with the final results. Place program analysis figures, calculation tables, and results into relevant sections of the report.

At the end of the work, summarize engineering assumptions made, final design, and analysis results. Make reasonable engineering assumptions for missing information to continue work and complete the entire process without seeking intermediate approval from the user.

Additional Prompt *(2nd Request: In this request, we attach the DXF file)*

I have attached the DXF file. Continue and complete the project from start to finish.