

## Memo on use of GmSAFIR with versions of SAFIR executable anterior to 2022

**Last release:** 11 February 2022

SAFIR is a nonlinear finite element software for modeling the behavior of structures in fire. It is provided as an executable file that runs a model described in an input “.IN” file in ASCII text format.

To facilitate the creation of the input “.IN” file, a graphic preprocessor can be used. Before 2022, the preferred preprocessor was GiD. Starting with SAFIR version 2022a0, the use of GmSAFIR is recommended as a preprocessor.

GmSAFIR is free and open source.

Video tutorials for the use of GmSAFIR are provided on the SAFIR Youtube channel:

<https://www.youtube.com/channel/UC0E-fNxuxk0pQORHy89Lw6g/videos>

The executable file of GmSAFIR, a user’s manual and an installation guide will be posted for download on the SAFIR website, see “SAFIR resources” on [https://www.uee.uliege.be/cms/c\\_6331644/fr/uee-safir](https://www.uee.uliege.be/cms/c_6331644/fr/uee-safir)

Input “.IN” files created by GmSAFIR are compatible with SAFIR2022a0 and subsequent versions of SAFIR. It is therefore recommended to update the executable of SAFIR to version 2022 to benefit fully from the new preprocessor.

Input “.IN” files created by GmSAFIR can also be run with former versions of SAFIR but this will require certain modifications to be made in the .IN files. Note that, as has always been the case, “.IN” files for SAFIR can be edited using a text editor (they can even be written entirely in a text editor or created by a user’s script without the use of any preprocessor, following instructions for the format of the file given in SAFIR manuals). Here below is a non-exhaustive list of modifications required to run GmSAFIR-created input files with versions of SAFIR anterior to 2022:

- Torsional analysis: mechanical properties required with SAFIR2022a0 are Young Modulus and Poisson ratio for all materials in torsional analyses. GmSAFIR will generate the torsional input file accordingly. This input file may thus require modification in material properties if run with former versions of SAFIR (e.g., for concrete, it used to be: Poisson ratio, fc, ft). Refer to the manuals.
- Torsional analysis: the “.IN” for the torsional analysis now ends with material properties. Former versions of SAFIR require additional lines to be added for IMPRESSION and TIMEPRINT.
- Structural 3D analyses with beams - torsion: SAFIR2022a0 and GmSAFIR do not incorporate the torsional analysis data in the “name.TEM” files, but instead read these data from the “name-t.TOR” file. Running the input files created by GmSAFIR with a former version of SAFIR therefore requires incorporating the torsional lines “w ... GJ” from the “name-t.TOR” into the “name.TEM” (before the “HOT” line).
- Structural analyses with shells – thickness, rebars: SAFIR2022a0 and GmSAFIR incorporate the information on the shell thickness and rebars in the structural input file .IN, while this information used to be in the thermal file .TSH. Running the input files generated by GmSAFIR with a former version of SAFIR therefore requires moving these lines back from the .IN to the .TSH. The chain of character “REBARMAT” must also be changed back to “MATERIAL” in the TSH file and the TRANSLATE commands should be written in the mechanical input file.

- Several materials have been withdrawn from the list of available materials for thermal analyses, because they were redundant in terms of thermal behavior (they still exist for the mechanical analyses). For example, SILCON\_ETC is no longer available for thermal analysis because it has the same thermal behavior as SILCONC\_EN. As a result, “.IN” thermal files created for SAFIR 2022 may require updating the materials before running with former versions of SAFIR. Refer to the manual for the list of materials.
- New capabilities have been added in SAFIR2022a0 and are thus offered in GmSAFIR. They include:
  - ✓ For thermal analyses the new “DIAG\_CAPA” command, the possibility to use the COMEBACK procedure and the possibility to mesh 3D SOLID with tetrahedral elements.
  - ✓ For mechanical analyses with shell finite element, the position of the 4 nodes can be located at any level Z0 across the thickness of the element.
  - ✓ Several new materials have been added, for thermal and for mechanical analyses (such as, for example, USER\_STL2D, USER\_CONC, GALVASTEEL and CONCEN2020)

These options should not be activated in the input file created by GmSAFIR if the file has to be used with former versions of SAFIR.

New functionalities that will be developed in SAFIR in the future will be incorporated in GmSAFIR whereas no effort will be made to update the problems types previously used for GID.

Redaction: T. Gernay.