

RELAP5-3D Developer Guidelines

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Rules and guidelines for developing quality RELAP5-3D coding.

The ultimate goal of the new Developer Guidelines is to maintain RELAP5-3D as the best software tool available to analyze nuclear power plants. This begins with writing excellent programming and requires thorough testing. This document covers development of RELAP5-3D software, the behavior of the RELAP5-3D program that must be maintained, and code testing.

RELAP5-3D must perform in a manner consistent with previous code versions for the sake of the users. Thus file operations, code termination, input and output must remain consistent in form and content while adding appropriate new files, input and output as new features are listed and explained. Backward compatibility is very important for input processing for many users. Developers are responsible for not changing code behavior by the updates they submit and for producing the same consistent for new code features, error fixes, and maintenance.

As computer hardware, operating systems, and other software change, RELAP5-3D must adapt and maintain performance. The code must be thoroughly tested to ensure that it continues to perform robustly on the supported platform. Testing is explained. Developers are responsible for creating input that tests their coding updates, testing their code developments, and providing a test set to the code version maker to include in the RELAP5-3D test sets. As computer hardware, operating systems, and other software change, RELAP5-3D must adapt and maintain performance. The code must be thoroughly tested to ensure that it continues to perform robustly on the supported platforms.

RELAP5-3D coding must be written in a consistent manner that makes the program easy to read to reduce the time and cost of development, maintenance and error resolution. The Developer guidelines institutionalize a consistent way of writing programming for RELAP5-3D that will minimize errors and rework. A common format and organization of program units creates a unifying look and feel to the code. This in turn increases readability and reduces time required for maintenance, development and debugging. Once a new programmer becomes familiarized with it, it also aids the reading and understanding of the program.

When undertaking development of the RELAP5-3D computer program, the programmer must write computer code that follows these guidelines, maintain its behavior, and test the coding. This applies to new development, addition of capability to existing coding, and bug fixes.

The programming guidelines sets forth rules of format, selection, and usage of programming in several categories.

- It establishes documentation guidance on internal comments.
- It sets out formatting rules for lines of code, such as indentation, capitalization, spacing, etc.

- It establishes order and format for non-executable statements, such as derived type declarations coming before intrinsic type, arrays before scalars, and alphabetization.
- Similarly, it establishes format and selection rules for executable statements, such as placing a single space around keywords, and excluding non-ANSI and non-obsolcesced statements.
- It creates limits on program units, subprograms, functions, and modules, such as the number of lines of code, and avoidance of module dependencies on other modules.
- It creates a framework of good programming practices, such as initialization, structured programming, and parallel- and vector-friendly coding. It

These guidelines apply to both existing and new subprograms. They apply to main and internal subroutines. There are separate considerations and guidelines given for FORTRAN 77 and FORTRAN 95. The guidelines are not so restrictive as to inhibit a programmer's unique style, but do restrict the variations in acceptable coding to create sufficient commonality that new readers will find the coding in each new subroutine familiar.

It is recognized that this is a "living" document and must be updated as languages, compilers, and computer hardware and software evolve. An early new section will involve rules and guidance for FORTRAN 2003 programming.

The Guidelines are available from INL. The document number is INL/EXT-13-29228.