

A 3D rendering of a meeting room. Twelve stylized human figures in various colors (purple, green, orange, brown, red, yellow, blue) are seated around a large, dark brown oval table. The table is covered with several large, colorful puzzle pieces in shades of blue, purple, and green. The background is a plain, light gray wall.

EFCOG SQA FALL 2022 MEETING SOFTWARE TYPES GROUP DISCUSSION OCTOBER 16, 2022

Lead by Carol Olijar
Argonne National Laboratory

What are Software Types?

Per DOE G 414.1-4 SQA Guide – basic definition:

Software typically is either custom developed or acquired software. Further characterizing these two basic types aids in the selection of the applicable practices and approaches for the SQA work activities. For the purposes of this Guide, five types of software have been identified as commonly used in DOE applications: (1) custom developed, (2) configurable, (3) acquired, (4) utility calculation, and (5) commercial design and analysis.

What are Software Types?

Per DOE G 414.1-4 SQA Guide – NQA-1:

Developed and acquired software types as discussed in American Society of Mechanical Engineers (ASME) NQA-1-2000, *Quality Assurance Requirements for Nuclear Facility Applications* are compatible with these five software types. Developed software as described in ASME NQA-1-2000 is directly associated with custom developed, configurable, and utility calculation software. Acquired software included in this Guide is easily mapped to that of acquired software in ASME NQA-1-2000. ASME NQA-1-2000 uses acquired and procured software terms interchangeably.⁵ This Guide includes an additional software type of commercial design and analysis software that is not directly related to either developed or acquired software. Safety software quality requirements can only be specified through work activities described in contractual agreements with the supplier of the facility design and analysis services.

What are Software Types?

Per DOE G 414.1-4 SQA Guide – First :

Custom developed software is built specifically for a DOE application or to support the same function for a related government organization. It may be developed by DOE or one of its management and operating (M&O) contractors or contracted with a qualified software company through the procurement process. Examples of custom developed software includes material inventory and tracking database applications, accident consequence applications, control system applications, and embedded custom developed software that controls a hardware device.

Built in-house.

Example: Waste Management Inventory Tracking System.

What are Software Types?

Per DOE G 414.1-4 SQA Guide – Second :

Configurable software is commercially available software or firmware that allows the user to modify the structure and functioning of the software in a limited way to suit user needs. An example is software associated with PLCs.

Acquired from vendor, but way it functions can be modified by user updating system administrative functions.

Example: Security Access Control System.

What are Software Types?

Per DOE G 414.1-4 SQA Guide – Third:

Acquired software is generally supplied through basic procurements, two-party agreements, or other contractual arrangements. Acquired software includes commercial off-the-shelf (COTS) software, such as operating systems, database management systems, compilers, software development tools, and commercial calculational software and spreadsheet tools (e.g., Mathsoft's MathCad and Microsoft's Excel). Downloadable software that is available at no cost to the user (referred to as freeware) is also considered acquired software. Firmware is acquired software. Firmware is usually provided by a hardware supplier through the procurement process and cannot be modified after receipt.

Acquired from vendor, cannot be modified, used as is.

Examples: MACCS2 toolbox code. Microshield.

What are Software Types?

Per DOE G 414.1-4 SQA Guide – Fourth:

Utility calculation software typically uses COTS spreadsheet applications as a foundation and user developed algorithms or data structures to create simple software products. The utility calculation software within the scope of this document is used frequently to perform calculations associated with the design of an SSC. Utility software that is used with high frequency may be labeled as custom software and may justify the same safety SQA work activities as custom developed software.⁶ With utility calculation software, it is important to recognize the difference between QA of the algorithms, macros, and logic that perform the calculations versus QA of the COTS software itself. Utility calculation software includes the associated data sets, configuration information, and test cases for validation and/or calibration.

Spreadsheets that may have macros or complex calculations.

Examples: Glovebox Inventory Spreadsheet, Can Drum Calculator.

What are Software Types?

Per DOE G 414.1-4 SQA Guide – Fifth:

Commercial design and analysis software is used in conjunction with design and analysis services provided to DOE from a commercial contractor. An example would be where DOE or an M&O contractor contracts for specified design services support. The design service provider uses its independently developed or acquired software without DOE involvement or support. DOE then receives a completed design. Procurement contracts can be enhanced to require that the software used in the design or analysis services meet the requirements in DOE O 414.1C.

Examples: I don't have any of these at Argonne, do you have examples of ones from your lab?

So Why Are Software Types Important to Safety Software Quality Assurance (SSQA)?

To determine the appropriate graded approach levels (Full, Grade, N/A) to apply to the safety software work activities, for Table 4 of the SQA Guide, you need to know the Software Type.

- (2) Implement QA criteria as defined in Attachment 2, as well as the requirements in Attachment 3 for all facilities, and for nuclear facilities, the requirements in Attachment 4.

Note: This requires that all software meet applicable QA requirements in Attachment 2, using a **graded** approach.

- (a) Describe how the criteria/requirements are met, using the documented **graded** approach.

Table 4. Mapping Safety Software Types and Grading Levels to Software Quality Assurance (SQA) Work Activities

SQA Work Activity	Level A					Level B					Level C				
	Custom Developed	Configurable	Acquired	Utility Calcs	Commercial D & A	Custom Developed	Configurable	Acquired	Utility Calcs	Commercial D & A	Custom Developed	Configurable	Acquired	Utility Calcs	Commercial D & A
Software (Sw) project management & quality planning	Full	Full	Grade	Grade	n/a	Full	Full	Grade	Grade	n/a	Grade	Grade	Grade	Grade	n/a
Sw risk management	Full	Full	Full	Full	n/a	Grade	Grade	Grade	Grade	n/a	Grade	Grade	Grade	Grade	n/a
Sw configuration management	Full	Grade	Grade	Grade	Grade	Full	Grade	Grade	Grade	Grade	Grade	Grade	Grade	Grade	Grade
Procurement & supplier management	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full
Sw requirements identification & management	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full
Sw design & implementation	Full	Grade	n/a	Grade	n/a	Full	Grade	n/a	Grade	n/a	Full	Grade	n/a	Grade	n/a
Sw safety	Full	Full	Full	n/a	n/a	Grade	Grade	Grade	n/a	n/a	Grade	Grade	Grade	n/a	n/a
Verification & Validation	Full	Full	Full	Grade	n/a	Grade	Grade	Grade	Grade	n/a	Grade	Grade	Grade	Grade	n/a
Problem reporting & corrective action	Full	Full	Full	Grade	Full	Full	Full	Full	Grade	Full	Full	Grade	Grade	Grade	Grade
Training of ... safety Sw	Full	Full	Full	Full	n/a	Grade	Grade	Grade	Grade	n/a	Grade	Grade	Grade	Grade	n/a



**NOW IT IS YOUR TURN, LETS
DISCUSS NOW ALL TOGETHER IN
OUR GROUP DISCUSSION**



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Questions