Five Principles to Specify Controls By

Clearly stating requirements is easier said than done

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In the ever-changing world of direct digital controls (DDC), the focus of design engineers has been on new technologies, such as open protocols, Web-based control, interoperability, and the like. While these are important considerations, we should not lose sight of the more basic—and more important—aspects of DDC systems. Following are five principles—in general order of priority—offered as guidelines for developing coherent specifications that clearly state the requirements of a DDC system.

1. THE CONTROL SYSTEM MUST PROVIDE EFFECTIVE AND RELIABLE CONTROL COMMENSURATE WITH THE SYSTEMS IT IS CONTROLLING.

Obviously, not all control products are created equal. In fact, they can vary greatly with respect to architecture, controller power/quality, network, etc. It is the design engineer's responsibility, then, to research the various options available to specify the most appropriate, cost-effective solution. This is not a trivial task, but rather an essential one.

An effective way of specifying controllers is applying the concept of generic "application categories," in which performance requirements of controllers (relative to stand-alone capability, memory, analog-to-digital conversion, communication facilities, etc.) are placed. This dictates, for instance, whether the network is the controller, as is assumed with pure node-based LonWorks systems, or critical/complex systems/equipment reside on high-powered, high-quality stand-alone controllers.

2. THE MANUFACTURER AND INSTALLER MUST BE HIGHLY QUALIFIED WITH EXTENSIVE EXPERIENCE AND COMMITTED/BOUND TO A THOROUGH COMMISSIONING OF THE SYSTEM.

Just as important—if not more so—as the power/quality of the control system is the expertise and commitment of the installing contractor, the installing contractor's collaboration with the design engineer, and the overall commissioning effort.

A specification should ensure that a quality contractor with a proven track record thoroughly commissions the control system, whether or not a formal commissioning process is employed. Given the critical nature of this, the designer must consider only those installers who can deliver effectively within both the construction and service/support arenas.

A specification should dictate qualifications of both the installer and manufacturer of the system. This may call for some research into the capabilities of local control contractors on the part of the designer.

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3. THE CONTROL INSTALLATION MUST BE FULLY DOCUMENTED AS CONSISTENTLY AS IS PRACTICAL WITH NOTHING THAT IS REQUIRED TO OPERATE AND MAINTAIN THE SYSTEM WITHHELD FROM THE OWNER.

Whether it is proprietary or interoperable, a control system always must be put in the context of the inheriting organization and, wherever possible, implemented and documented using standard approaches. Point-naming conventions, programming logic, network configuration, security information, etc. must be adhered to strictly and documented fully. Nothing that is essential to the continued operation and maintenance of the system should be withheld.

It is unacceptable that operators today do not have software that allows them to see how their systems are programmed. In some cases, they do not even "own" the programming to their own sequences of operations. Design documents need to address these issues. Of course, this is only part of the battle, as the documents need to be enforced as well.

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4. THE SYSTEM MUST BE INTEROPERABLE TO THE APPROPRIATE LEVEL.

Seamless interoperability is an important, yet elusive, goal. As you navigate the sea of claims of interoperability, you most definitely will find that the devil is in the details because of the multi-dimensional nature of modern-day building automation systems.

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There are many levels of interoperability that can be specified. A discussion of these are beyond the scope of this column. The designer must determine an appropriate level of interoperability, investigate and validate the necessary requirements, and specify those requirements clearly. Blanket statements requiring conformance to an open protocol are meaningless and unenforceable.

Interoperability can be classified into five categories:

- Enterprise historical data.
- Enterprise real-time data.
- Control internetwork communication.
- Control intranetwork communication.
- Point-level interoperability.

5. THE SEQUENCE OF OPERATION FOR EACH SYSTEM MUST BE COMMUNICATED CLEARLY AND COMPLETELY.

The sequence of operation for each system designed must be complete and detailed. Performance specifications that are general in nature "punt" design responsibility to the contractor. The engineer must figure out how each system is to work in all modes of operation and clearly communicate this in the sequence.

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Consideration should be given to developing logic diagrams during the design phase. A generic sequence makes programming and commissioning difficult, as there may be many possible interpretations. Which is most appropriate for the project? That should be the design engineer's decision. Period. Far too often, the commissioning engineer must find common ground between the design engineer's intent, the control vendor's interpretation, and the owner's desires.

CONCLUSION

Adhering to these five principles will result in better specifications and sequences of operation. This, however, is easier said than done, as research is necessary to meet the requirements. Design engineers must invest their time to shorten the learning curve if their intent is to specify better DDC systems.

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