ASME CONAGT Subcommittee on Common Equipment

An Historical and Technical Perspective

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The following are the code sections that have been developed and are maintained by the ASME CONAGT Subcommittee on Common Equipment as part of the ASME AG-1 Code on Nuclear Air and Gas Treatment. The five sections are:

Ductwork: This code section (SA) covers the requirements for the performance, design, construction, inspection, shop and field fabrication acceptance testing, and quality assurance for ductwork, including ductwork supports, and duct mounted accessories used in nuclear safety-related air treatment systems in nuclear facilities.

Housings: This code section (HA) covers the requirements for the design, construction, performance, fabrication, inspection, acceptance testing and quality assurance for housings and housing supports for nuclear safety related air treatment systems.

Dampers: Code section (DA) covers the requirements for the design, fabrication, materials, performance, acceptance testing, and quality assurance for dampers and louvers used as components in nuclear safety related air and gas treatment systems in nuclear facilities. Also included are the requirements for actuators and other control equipment accessories used in conjunction with nuclear safety related dampers and louvers.

Fans: Code section (BA) covers the requirements for the performance, design, construction, acceptance testing, and quality assurance for fans, fan drivers, drives, and related fan accessories, used as components in nuclear safety related air or gas treatment systems in nuclear facilities.

Instrumentation and Controls: Code section (IA) covers the requirements for the design, manufacture, installation, testing, and documentation for instrumentation, control components, and control panels used in conjunction with nuclear safety-related air and gas treatment systems.

HISTORY

The Subcommittee on Common Equipment was formed as part of the original CONAGT Committee in the late 1970s. This subcommittee initially was tasked with preparing four code sections for equipment that was considered to have substantial common threads with the other code sections under development. These code sections were fans, dampers, ductwork and instrumentation and controls. The following is some historical perspective and technical background involved with the preparation of each of the code sections.

Section BA - Fans

The very first section that was prepared was fans and this section is undergoing a maintenance revision. This code section uses existing industry and national standards (AMCA, ASHRAE, etc.) where appropriate along with supplemental requirements to ensure the safety function. These additional requirements mostly involve seismic qualification, material requirements and equipment qualification. The section gives requirements for determining load combinations and environmental conditions that must be considered for qualifying fans for safety related applications. The code section also specifies the required testing and the integrity of the fan housing since it forms part of the system pressure boundary. A non-mandatory appendix in the fan section entitled "Fan System Consideration" gives guidance in the selection and arrangement of fan in systems. Another non-mandatory section gives guidelines for fan selection based on configuration system resistance for the required range operation. The fan section outlines additional testing and inspection that is required for safety class fans and blowers.

Section DA - Dampers

The damper section was prepared at the same time as the code section on fans. It specifies the qualifications necessary to ensure the operability of the dampers during and following an accident. This section relies heavily on commercial standards plus the testing requirements originally found in ANSI N509 and ANSI N510. It encompasses all the dampers used in the power plant, including bubble tight dampers, smoke dampers and control dampers. Performance criteria for leakage rates, seismic and environmental requirements are specified for both the damper and its actuator to ensure that they can perform their safety functions. The list of allowable materials is listed as well as the allowable stresses that the frame, blades and shafts can be subjected to. It is these damper components that are most vulnerable to warping resulting in binding of the blades during operation. During the development of the code, closure of fire dampers under air flow, became an issue, so the testing of fire dampers under air flow was originally specified in the fire damper requirements and later included in the testing requirements by U.L. Construction of safety related dampers are similar to commercial/industrial grade and the main difference lie in material traceability, welding controls and qualification analysis.

Section SA - Ductwork

The third section that was issued was the ductwork section. The section went through several draft revisions to make it consistent with previously published code sections. The most difficult part was establishing the appropriate level of additional requirements beyond commercial ductwork requirements to ensure integrity of the ductwork under required accident conditions. The biggest issue the subgroup faced was to establish appropriate leakage criteria. The subgroup considered leakage the single most important criteria driving the construction, installation and testing of ductwork. Industry feedback over a number of years indicated that existing leakage criteria had been overly conservative resulting in duct construction that was over designed. The leakage requirements that were established in the original editions of ASME N509 called for duct construction to be based on the worst case requirement based on a comparative evaluation of duct quality, air cleaning effectiveness and health physics. The most stringent criteria from these three considerations was then selected to be the design criteria for duct construction. This approach typically resulted in excessively heavy gauge welded ductwork for meeting stringent leakage requirements. After

considerable discussion the subgroup concluded maximum allowable leakage should be based on the resultant health physics consequences (radiological effects). The industry as a result of this change was able to build more economical duct systems with sufficient duct integrity to adequately counteract radiological effects from potential leaks. A non-mandatory appendix provides guidance on optimizing system configuration to reduce the impact from leakage.

Section IA – Instrumentation and Controls

The next section that was developed was Instrumentation and Controls. A major thrust of the subgroup was to focus the section towards air cleaning, ventilation and air conditioning components associated with air treatment systems. The code section refers to existing industry standards that are suitable for air treatment system application. The code section establishes separation, redundancy, and single failure requirements to ensure safety functions. The code section gives guidance for the appropriate level of monitoring, alarming and controlling instrumentation for the major components of air treatment systems. The main purpose of the section is to ensure the normal operating and safety related functions of the instrumentation and controls systems through a proper set of design requirements and qualification (environmental and seismic) requirements. This code section covers I&C components, piping, tubing, and wiring.

Section HA – Housings (In Preparation)

The effort to create a separate code section for housings was undertaken at the direction of the CONAGT Main Committee. When SA was first prepared, it consisted of ductwork and housings rolled into one code section. The decision was made in recognition of the uniqueness of housings as a separate manufactured item apart from ductwork. As a result of the directive from the Main Committee all the housing material was extracted from the ductwork code. This extracted material formed the basis for the first draft of the housing code section (HA). The main differences between housings and ductwork are that the housings contain unique features to hold the filtering elements and contain special provisions for loading and testing the filters. Creating separate code sections for ductwork and housings made sense

because they have different construction and testing requirements, and are generally produced by different manufacturers.

During the course of preparation, the subgroup has added housing features previously not included. The major addition is the coverage for side loaded filter housings where previously only walk in housings was addressed. Side loaded housings are dominant in DOE nuclear facilities and represent a significant percentage of manufactured filter housings for the nuclear industry.

The housing section also covers the requirements for housings for air conditioning and ventilation application.

CONCLUSION

The time and effort spent preparing the code sections has given us all an appreciation for the value of the consensus process established by ANSI for developing national standards. The sections have benefited from the input and review from the broad base of industry participants who are expert in their respective fields. Although the preparation and review process have at times seemed slow and arduous, one cannot argue with the results. The issued code sections are of a high caliber and have and will continue to benefit the users and the industry they were designed to serve.