The National Institutes of Health | Division of Technical Resources | Office of Research Facilities

Design Requirements Manual **News to Use**

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The formulae $\frac{\partial \rho \bar{U}_i}{\partial t}+\frac{\partial}{\partial x_j}(\rho \bar{U}_i \bar{U}_j)=-\frac{\partial \bar{P}}{\partial x_i}+\frac{\partial}{\partial x_j}\left(\mu \frac{\partial \bar{U}_i}{\partial x_j}\right)+g_i(\rho-\rho_0)$ *for building* $\frac{\partial}{\partial x_j}(\rho \bar{U}_i \bar{U}_j)=-\frac{\partial \bar{P}}{\partial x_i}+\frac{\partial}{\partial x_j}\left(\mu \frac{\partial \bar{U}_i}{\partial x_j}-\rho \overline{u_i' u_j'}\right)+g_i(\rho-\rho_0)$ *state of the art* $\frac{\partial}{\partial x_i}(\rho \bar{U}_i \bar{H})=\frac{\partial}{\partial x_i}\left(\lambda \frac{\partial \bar{T}}{\partial x_i}-\rho \overline{u_i' h'}\right)$ *biomedical research facilities.*

Sealant Joints – Part 3: Quality Execution Performance

The last two months' News to Use articles covered sealant joint selection and detailing for 100% silicone (ASTM C920), referred to as JS-2 in the DRM. This month's article covers the best practices for ensuring quality joint design and execution. Sealant joints are critical because of the integral role they play in creating durable, joint-filling, and gap sealing conditions, but they are only as good as their installation. Quality execution is essential because the best materials and detailing cannot overcome deficiencies in preparation and execution of the joints.

Designers should develop a Sealant Execution Plan (SEP) that details the sealant joint design requirements, including:

- Sealant joint details
- Materials Of Construction (MOC), including material selection criteria
- Minimum qualifications for the installers, supervisors, and internal Quality Assurance personnel
- Inspection procedures and acceptance criteria for each sealant joint type

The SEP shall reflect the manufacturer's recommended and required procedures to ensure conformance with their warranty requirements. Other best practices include thoroughly documenting the preparation of multi-part sealants and ensuring substrates are adequately prepared (clean, dry, and free of mark at minimum, along with any requirements in the manufacturer's literature) before sealant application.

When executing a sealant joint, there are also several practices to avoid:

- Do not apply sealant in an area where significant particulates, or particulate generating processes, will be present for 48 hours after installation to allow for adequate skinning and curing of the sealant without adhered contaminants.
- Do not feather (or "smear") sealant to zero-thickness along the edges of the joint. Inadequate sealant thickness will result in peeling, pilling, and shedding of sealant material over time. In Aseptic Processing Facilities (APFs), this type of failure is a significant source of non-viable particles, which threaten the purity of the products being produced and the health and safety of patients.
- Do not use a finger or cloth wipe to shape the sealant joint. This approach, though common, results in uneven appearance, pinholes, inadequate joint compression, inadequate adhesion, and feathering – all of which contribute to accelerated joint failure.
- Do not use saliva or soapy water as tooling lubricants. Tooling lubricants should be avoided, but if required, must be the sealant manufacturer's recommended product for the application.
- Do not use application nozzles which are significantly smaller than the surface of the joint profile or cut at less than 90-degrees. Proper nozzle size and shape minimizes sealant waste and ensures adequate fill and compaction of sealant into the depth of the joint.
- Do not leave any bond breakers, backing rods, gaskets, or similar material exposed through the finished joint.
- Do not use a sealant that is incompatible with the substrates being joined. The sealant must be non-reactive and non-staining while developing adequate adhesion, and must possess the necessary elongation, flexibility, and resistance to degradation from cleaning materials and methods.
- Do not expose sealant joints in an APF environment more than 3/4" (19.5 mm) wide. Provide 316 stainless steel flashing or an escutcheon to minimize the exposed sealant area within the APF environment.

Conclusion

This series of News to Use articles has presented the importance of properly selecting, detailing, and assuring the quality installation of sealant joints in biomedical facilities; this guidance is especially applicable to APFs, but can also be applied to animal and high containment facilities. It is incumbent on the designer, construction contractor, and inspectors to be aware of and follow both ASTM and manufacturer's requirements to achieve quality installations.

Additional Information

ASTM C794 Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
ASTM C920 *Standard Specification for Elastomeric Joint Sealants*
ASTM C 1193 *Standard Guide for Use of Joint Sealants*

'Design Requirements Manual (DRM) News to Use' is a monthly ORF publication featuring salient technical information that should be applied to the design of NIH biomedical research laboratories and animal facilities. NIH Project Officers, A/E's and other consultants to the NIH, who develop intramural, extramural and American Recovery and Reinvestment Act (ARRA) projects will benefit from 'News to Use'. **Please address questions or comments to:** shawm@nih.gov

Further details on this month's topic are available on the DRM website DRM Appendix-L Sealant Table
https://www.orf.od.nih.gov/TechnicalResources/Pages/DesignRequirementsManual2016.aspx