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Design Requirements Manual **News to Use**

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The formulae $\frac{\partial \rho U_i}{\partial t}+\frac{\partial}{\partial x_j}(\rho U_i U_j)=-\frac{\partial P}{\partial x_i}+\frac{\partial}{\partial x_j}\left(\mu\frac{\partial U_i}{\partial x_j}\right)+g_i(\rho-\rho_0)$ *for building* $\frac{\partial}{\partial x_j}(\rho \bar{U}_i \bar{U}_j)=-\frac{\partial P}{\partial x_i}+\frac{\partial}{\partial x_j}\left(\mu\frac{\partial \bar{U}_i}{\partial x_j}-\rho\overline{u_i' u_j'}\right)+g_i(\rho-\rho_0)$ *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 2: Joint Design

Last month's News to Use covered Part 1 of sealant joint design for 100% silicone (ASTM C920), referred to as JS-2 in the DRM, and was focused on sealant properties. This month's article delves deeper into joint design considerations. Joint design and installation must be in strict conformance with the manufacturer's written instructions and technical guidance; the best materials of construction (MOC) and perfect application technique cannot overcome poor joint design. The design directly impacts the flexibility, durability, and adhesion of the completed joint. Joint conditions include:

Flat Joint: A joint where substrates are coplanar and either abutting or gapped (see Image 1). Coplanar abutting joints should be avoided in design and detailing as there is inadequate accommodation for a sealant joint; other joining types may be appropriate in this condition. Coplanar gapped joints should have a closed-cell backer rod / bond breaker installed to ensure that the sealant only adheres to two sides of this three-sided joint. The ratio of the width of the joint to the setback of the backer rod should be 2:1, but the maximum setback should not exceed 3/8" (10 mm). The width of the joint shall not exceed the manufacturer's recommended limit for the sealant material. The sealant joint should be installed smooth and continuous to room-side edges of the adjoining surfaces and tooled flush to slightly concave.

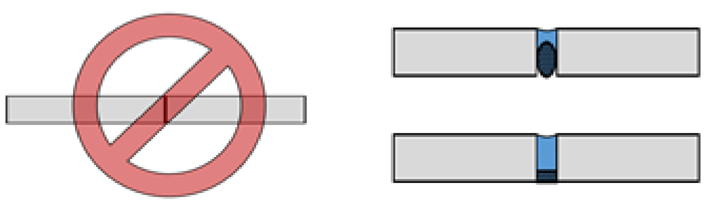

Image 1: Flat joints – abutting (left) and gapped (right)

Inside Corner Joint: Where substrates are abutting and no-to-minimal joint movement is anticipated, provide bond breaker tape in the corner extending no less than 1/4" (6 mm) out from the corner in BOTH directions (see Image 2). The sealant joint shall fully embed the bond breaker tape, extending 1/4" (6 mm) to 3/8" (10 mm) beyond the end of the tape in both directions. The sealant joint should be tooled concave, leaving a smooth, continuous joint.

Where minor to moderate joint movement is anticipated, gap the substrates 1/4" (6 mm) to 3/8" (10 mm) and provide a closed-cell backer rod to fill the gap, leaving half of the rod proud of the surface (see Image 2). The sealant joint should be tooled concave, leaving a smooth, continuous joint that provides between 1/4" (6 mm) to 3/8" (10 mm) of cover above the backer rod. The sides of the joint should be equal and not less than 1/4" (6 mm) from the inside of the corner.

Where moderate joint movement is anticipated, gap the substrates as required to ensure adequate structural movement and provide a closed-cell backer rod to fill the gap, leaving the rod between 1/4" (6 mm) to 3/8" (10 mm) below the surface of the joint. The sealant joint should be tooled concave, leaving a smooth, continuous joint that provides between 1/4" (6 mm) to 3/8" (10 mm) cover above the top of the backer rod to the inside of the concave surface. The joint should NOT be symmetrical in this case, tapering to flush on one side and extending between 1/4" (6 mm) to 3/8" (10 mm) up the other side.

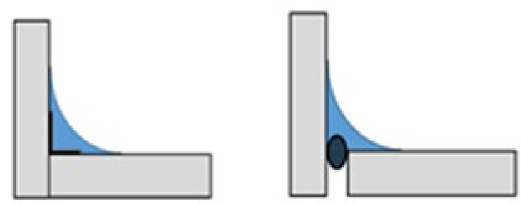

Image 2: Tight inside corner joints

Where joint width is greater than 3/4" (19.5 mm), provide a flashing to reduce the exposed width of the joint (stainless steel is preferred; see Image 3). The flashing must be designed accommodate the anticipated movement in the joint, and often must also be designed to be removable to facilitate any necessary maintenance.

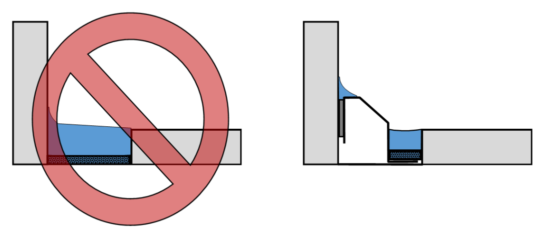

Image 3: Wide inside corner joints

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*

Next Month this series will continue with the article Sealant Joints - Part 3: Execution Quality Assurance.

'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