EWCAP
ELECTRICAL WIRING COMPONENT APPLICATION PARTNERSHIP

Date: March 14, 2024

Subject: Change to USCAR-12, Rev 6 (Revision Letter #9)

Changes have been made to the Sealing section of the USCAR-12 specification. Comments and questions can be sent to EWCAP@uscar.org.

Situation:

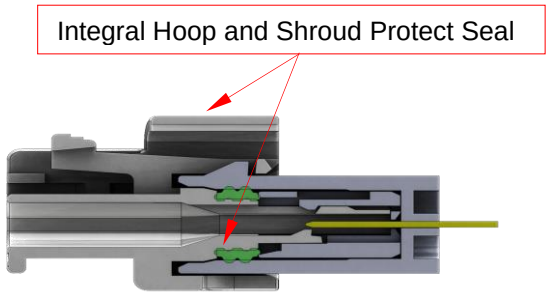
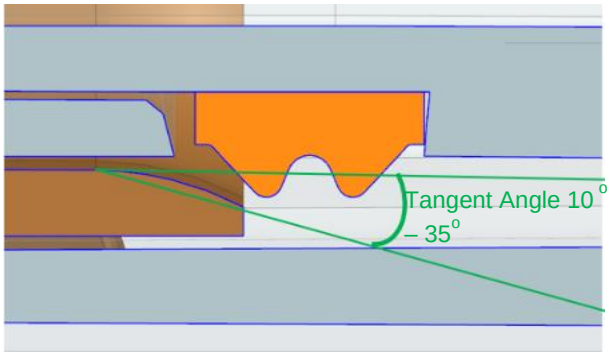
USCAR-12 did not include connector design rules to prevent perimeter seal rolling in sealed connectors. Rolling seals are a known failure mode that allows water entry into sealed connectors. Adding applicable rules will avoid designs with known risk to "seal roll" in the future.

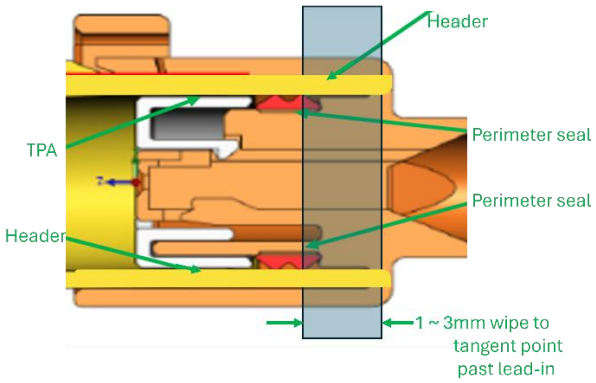
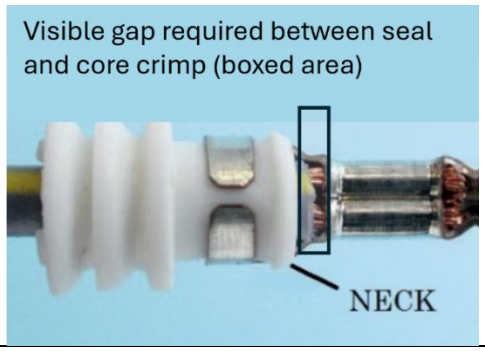
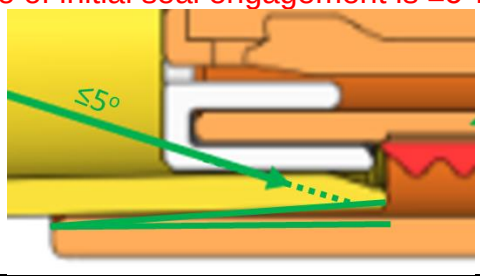
Resolution:

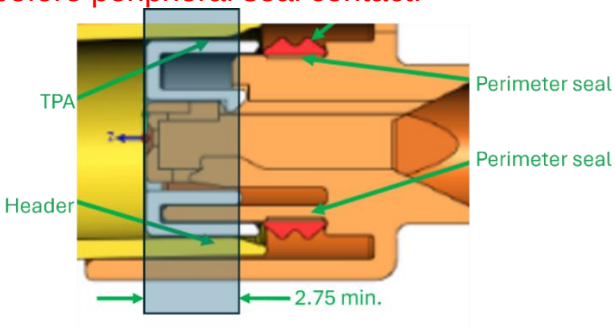
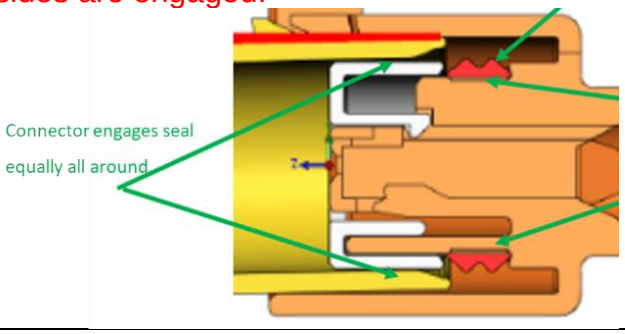
The section for seal design rules has three new requirements, identified as "SE11" "SE12" and "SE13." Also, SE7 and SE8 have been changed to make the criteria measurable instead of directional. The entire sealing section (designated as SE) is shown below for completeness (including a pending SE10 change, per Revision letter 12-6-2), with updated sections in red.

CONNECTOR SEALS

#	Requirement	Confirmation Method	X
SE1	Make seal presence visually detectable by using a contrasting color.	Confirm contrasting color to the connector housing.	
SE2	Make a continuous and smooth surface in seal areas (includes peripheral seal, applied cable seal, and mat-style wire seals).	1) Confirm parting lines and part decorations are not on sealing surfaces. 2) Specify R_a (tool steel roughness) of 0.4µm, max.	
SE3	Include cable seal retention features so USCAR-21 (crimp) criteria will be met.	Ensure retaining features are present on cable seals when required by design analysis.	
SE4	Design protective covers, when required, for unused (option delete) connectors with positive retention to the covered connector.	Maintain sealing capability as required and meet BSR performance.	

#	Requirement	Confirmation Method	X
SE5	Design connectors so that wire seal is not affected by wire bending and handling by: 1) Providing positive retention for seal plugs. if used. 2) Including a back cap with a wire strain relief feature for mat-seal designs 3) Flash-over cavities in the connector or mat seal to avoid a needless potential leak path.	Complete a Design Review of the connectors to ensure the design includes proper wire seal support.	
SE6	Design peripheral seals as part of the female connector. The connector must have a shroud to completely protect the peripheral seal. Design must include a peripheral-style seal (not compression-style) had have positive retention. (Refer to Figure 20)  Figure 20	Complete a Design Review of the connectors to ensure the design includes a peripheral seal, retaining feature and shroud to protect the peripheral seal from damage.	
SE7	Design the surface contacting the peripheral seal with smooth transitions and a tangent angle (relative to the seal) of 10° to 35°. (Refer to Fig. 21)  Figure 21	Confirm with CAD studies at nominal conditions.	

#	Requirement	Confirmation Method	X
SE8	Design for 1mm min. and 3mm max. wipe of the “last to engage” peripheral seal gland at full engagement. See Figure 22.  Figure 22	Assess wipe distance using CAD study of last seal gland to make full engagement. Confirm 1mm minimum using worst-case tolerances. Evaluate 3mm maximum travel past last seal gland at nominal dimensions.	
SE9	Design sealing systems for two terminal insertions and one terminal extraction from the connector cavity without compromising the sealing properties.	Ensure seal and terminal designs are compatible with safe terminal insert and removal process.	
SE10	For cable seal designs, design the connector cavity and insulation crimp so that the retention feature on the neck of the seal (the “mushroom cap”) does not come in contact with the leading edge of the terminal cavity during terminal insertion. 	Confirm the clearance by CAD studies using terminal insertion at worst possible angle. (If parts are available, evaluate and do not allow any condition where a retention feature comes in contact with the leading edge of the terminal cavity.)	
SE11	Design mating parts so the angle of tilt between male and female connectors at the time of initial seal engagement is ≤5º. 	Assess tilt angle in CAD study at nominal conditions. (Forces connector to be aligned before seal engages with mating surface.)	

#	Requirement	Confirmation Method	X
SE12	Design ≥2.75mm engagement of connector to header (measured inside of shroud) before peripheral seal contact. 	Assess using a CAD study at nominal conditions. (Ensures connector and header are aligned before seal engagement.)	
SE13	Seal compression cannot start until all four sides are engaged. 	Confirm in a CAD study that seal compression does not start until all four sides are engaged. (Minimizes seal bunching.)	