Comments Accompanying Replies to Seven Questions
on OP1.002 Revision 3 Draft v16, Updated 1/31/2014, 2000 hrs PST

Q2A: Should we introduce supplementary scratch-and-dig notations to allow suspension of accumulation and concentration tests?

Commenter	Comments
Aikens	Yes, this is consistent with standard practice at many companies.
Bedard	Both sections 2.1.4.3.1 and 2.1.4.3.2 should be considered for they give more detailed information on the intent of the designer's requirements.
Turner	On the question of suspending the concentration rules, I think not. As a manufacturer, I think this would create a confusing situation, requiring us to define some arbitrary internal spec without any guidance from the customer, who most definitely has some upper limit to the number of smaller defects that he can tolerate. I just can't think of any situation where this would really be good practice.
Williamson	Absolutely!

Q2B: Should we introduce supplementary scratch-and-dig notations to allow scratch length to be defined along the optical surface rather than projected onto a planar clear aperture?

Commenter	Comments
Aikens	Yes, this is consistent with standard practice at many companies.
Bedard	Both sections 2.1.4.3.1 and 2.1.4.3.2 should be considered for they give more detailed information on the intent of the designer's requirements. Measurements of a scratch on a curved surface directly are more direct and leave less subjectivity than projection onto a planar clear aperture. Furthermore, the orientation of the scratch on a curved surface when projected can be exaggerated based on the strength of the curvature of the optical surface. [2nd sentence edited for clarity—ed.]
Turner	On the question of scratch length on curved surfaces, this seems fine to me. We should probably discuss the placement of this section within the spec, as there may be some argument that it should just be included as an option right in section 2.1.4.1.2.1 for simplicity.
Williamson	Absolutely!

Q3: Should we limit smallest dimensional specification to 1 micron for scratches and 10 microns for digs?

Commenter	Comments
Aikens	No. There is no need to impose a limit on the specification, since the requirement can be validated by any measurement means. For fiber tips or micro-optics, it may be useful to specify sub-

	micron scratches and sub-10 micron digs, and validate them using a scanning white light interferometer or AFM, for example.
Bedard	Limiting tables 2.1.3.1.1 and 2.1.3.1.2 to 1 micron for scratches and 10 microns for digs is acceptable for most general optical components, however I would caution this when dealing with micro-optics for telecommunications that need to be considered. These elements are in the physical size range of 1-2 mm and have optical CAs 25 to 100 microns. The callout in these sections would conflict with these size ranges, however data on performance of the optical components that have these attributes is limited at this point. Further information is needed to identify suitable numbers to support a change.
Boultbee	Yes. If people want to address smaller imperfections they should develop a new standard that addresses these size ranges.
Turner	No. REO already works to dig specs less than 10um. Who is to say where the industry will be in the future?
Williamson	Sounds reasonable to me (until we specify inspection using DUV).

Q4: Should we produce our own version of C7461866 rather than simply making reference to ARDEC's C7641866?

Commenter	Comments
Aikens	We should not publish our own version of the drawing, but we should also not reference the ARDEC drawing except as informative, since no one can manufacture to that drawing today. Annex E should be normative, and modified to remove the reference to the drawing, but should also require traceability to the limit masters at the Picatinny Arsenal.
Bedard	I would suggest continuing referencing ARDEC's C7641866. With further review, we could make a recommendation at a later date.
Boultbee	Not at this time. We should not hold up publication of the next revision any longer to deal with our new drawing. It will take much longer than most people realize.
Dowell	This is a big project that should not be undertaken without commitment of people who are willing to work on the project.
Palmari	No. Reason: Do we need yet another variation?
Tipps	I think it is fine to leave as-is with the reference to C7461866.
Turner	Yes. My goodness yes. We should include it right in this standard. Just imagine the simplicity!

Q5: Should we allow supplementary magnification of 4x to evaluate visibility specifications?

Commenter	Comments
Aikens	Yes. Magnification is allowed according to MIL-PRF-13830B, Annex C, when inspecting coated parts in reflection "if required," but no specific magnification is provided. Standard practice in many companies is to allow use of a loupe with low magnification. Designating a specific magnification removes ambiguity. Extending this magnification use to the transmitted methods, along with the restraint that is it only allowed under the specific circumstances mentioned, is a significant improvement.
Bedard	This is valid and should be supported.
Boultbee	With some reluctance, yes, for the reasons Allen has shared.
Dowell	No opinion. Yes, if there is a performance issue that requires supplementary magnification.
Palmari	Yes. Reason: My fear is for fractures. What might look like a dig could explode in the coating chamber. I don't worry so much after coating.
Tipps	No. I would stick with the MIL-PRF-13830B spec. of using an unaided eye for pass-fail determination and only use 4x for detection of artifacts on the surface, not determination of pass-fail.
Turner	Mixed feelings about this one, but probably yes.

Q6: Should we allow all kinds of scratches and digs outside the clear aperture? Currently, we limit them. (See Section 2.1.2.5 and Section 2.1.3.3). However, we allow all kinds of areal imperfections in that outer region. There is no section that defines acceptable levels of areal imperfections outside the clear aperture; therefore, every kind of areal imperfection is allowed out there, unless limited by the designer in the form of a comment. (See Section 2.3). Note that all specifications are limited to the clear aperture unless explicitly stated otherwise. (See Section 1.2.1).

Commenter	Comments
Aikens	We should follow the MIL, which is also standard practice. Limit scratches and digs outside the CA, but loosely. Allow any areal imperfection. Do not allow fractures anywhere. This is what everyone does now.
Bedard	At the present time, I do not see a need to change this. It is the role of the optical and mechanical designers to convey the requirements of the optical and mechanical surfaces of the entire component. Whereas the optical designer's requirements are for the optical performance of the component, the mechanical designer's requirements are for the mechanical fit/interface of the optical component with the mechanical component.
Boultbee	Yes. If it is necessary to control scratches and digs outside the CA for any reason, this must be stated in a drawing note.

Dowell	Only if it affects the performance of the part.
Howland	Yes, let the designer comment on specific requirements outside the CA.
Palmari	No. Reason: We are used to Engineering adding notes to the drawing governing outside the clear aperture. I think without control outside the clear aperture, there would be bitter arguments with suppliers.
Tipps	I agree with the current terminology as specified in Sections 2.1.2.5 and Section 2.1.3.3.
Turner	No. We should leave this as is. Probably has little practical impact but it avoids pathological scenarios that will result in unhappy customers.
Williamson	An argument for limiting scratches has been for sealing and mounting purposes, but that does not apply to all components. I think it should be a note in the print by the cognizant engineer.

Q7: Should we correct the misunderstanding about the meaning of “true roof surface” and apply the scratch-and-dig specification to any roof surface? Should we explicitly address roof surfaces at all? (See Section 8.6). Note that the diagram in Section 8.6.4 depicts a “true” roof prism, an Amici Roof Prism, as probably intended by MIL-PRF-13830B, and note that it is different than the diagram in version 2009 in which a Porro Prism is depicted. (See Section 3.1.5 of OP1.002-2009).

Commenter	Comments
Aikens	The current wording and figures are acceptable.
Bedard	I would need to review the contents of this a little more and compare the two standards to give a more thorough answer, however in my opinion section 8.6.4 appears to be accurate and I do not have any objections, at this time.
Boultbee	I have no opinion on this.
Tipps	Yes. I have no issue leaving the roof surface reference as-is in Section 8.6.4.
Turner	I think we should deal with roof surfaces, but personally I think the treatment in the 2009 version is fine. The new language does not suggest that we are treating them any differently than roof surfaces as defined in 2009, so I don’t understand the point of treating them separately. I think the new version is confusing but maybe I’m missing a subtle point.
Williamson	The true roof has always been an odd paragraph in MIL-PRF-13830: It didn't define what a "true roof surface" is, it just told us how to "consider" it. If we assume a "true roof surface" is one in which a single clear aperture is bisected by the roof where each side is used in TIR, then a scratch on one side appears on both sides of the clear aperture. That would mean its effective length summation is twice the actual length of the scratch, which is contrary to setting the size of the surface as the sum of the two

	surfaces. Also, the paragraph in 13830 refers to surface areas for purposes of summation, not effective clear apertures as we use for our accumulation formulae. And one more issue: We say that scratches are projected onto a planar clear aperture. That reduces their length by sqrt(2). So, yes, we should address roof surfaces but we need to be more careful about them than MIL-PRF was.

Q8: Should we clarify the nature of a default “clear aperture” as “planar”? (See Section 2.1.4.3.3 and Section 8.4).

Commenter	Comments
Aikens	No. The current wording is acceptable.
Bedard	The clear aperture should not be defined as planar; this contradicts the requirement for section 2.1.4.3.3. This section is describing an "ARC length" and is needed for the optical designer to understand the impact of the scratch length's impact on the usable clear aperture, when projected.
Boultbee	I agree with the wording in draft 16.
Palmari	Abstain. Reason: I personally prefer referring to the clear aperture, regardless of flat or radial.
Turner	I’m inclined towards no on this one until we have a robust discussion about it. I think the potential for adding confusion exists here, and the benefit is fairly minor if I’m thinking about it right.
Williamson	It may be helpful. But beware: we've chosen the designator /P as profile. That could be easy to confuse with planar.