

Draft
Minutes

ASC OP1 ASC OP/SC 1, Performance Based Optical Imperfections Task Force Draft Standard Meeting
Saturday, January 20, 2007, 8:30 a.m. — 12 Noon
Fairmont Hotel, Cupertino Room
170 South Market Street, San Jose, CA 95113

Present	Attendees (10 of 17)	Representing
<input checked="" type="checkbox"/>	Committee Members	
<input checked="" type="checkbox"/>	David Aikens	Zygo Corporation
<input checked="" type="checkbox"/>	Gordon Boulton	JDSU Corporation
<input checked="" type="checkbox"/>	Andrei Brunfeld	Xyrtex
<input type="checkbox"/>	Benjamin Catching (Alternate)	JDSU Corporation
<input checked="" type="checkbox"/>	Walter Czajkowski	APOMA (Edmund Optics)
<input checked="" type="checkbox"/>	Frank Dombrowski (by phone)	Gage-Line Technology, Inc. (by phone)
<input checked="" type="checkbox"/>	Marla Dowell	IEEE/LEOS (NIST)
<input checked="" type="checkbox"/>	Lincoln Endelman	SPIE, (Endelman Enterprises) (by phone)
<input type="checkbox"/>	Charles Gaugh	Davidson Optronics, Inc.
<input type="checkbox"/>	John Hamilton	Northrop Grumman
<input type="checkbox"/>	Hal Johnson	Harold Johnson Optical Lab
<input checked="" type="checkbox"/>	Rudolf Hartman	Retired
<input type="checkbox"/>	Michael Morrill	Lockheed Martin Space Systems Company
<input checked="" type="checkbox"/>	William Royall (by phone)	Eastman Kodak Company, Retired
<input type="checkbox"/>	Trey Turner	Research Electro-Optics, Inc.
<input type="checkbox"/>	Steve VanKerkhove	Corning Tropel
<input checked="" type="checkbox"/>	Ray Williamson	
	Observers (3)	
<input checked="" type="checkbox"/>	James Harvey	University of Central Florida
<input checked="" type="checkbox"/>	Gene Kohlenberg	OEOSC
<input checked="" type="checkbox"/>	Alan Krisiloff	Triptar Lens Co., Inc.

Auditor's Summary of Meeting

The task force continued editing a new draft of BSR/OEOSC OP1.002-XXXX. Much of the time was taken deciding how to merge a measurement method into the existing visual appearance document. They agreed to use the alphabetic notation that had been first used in military specifications to refer to measured imperfections. They then reworked sections of the standard so that the contents would be applicable to either method. They agreed to create a comparison measurement method for the standard, which will be edited at the next meeting.

1 Welcome and Introductions

G. Boulton opened the meeting at 8:40 a.m. He introduced each person for the benefit of those on the phone.

2 Adoption of Agenda

G. Boulton asked if there were changes or additions to the published agenda. If J. Hamilton and C. Gaugh do not call in, G. Boulton said that items four and five would not be covered. The secretary said that J. Hamilton had called him saying that he would try to join the phone conference. G. Boulton suggested that the agenda be approved as is, and make adjustments later if necessary. R. Williamson moved that the agenda be accepted; M. Dowell seconded the motion. The motion carried.

3 Approval of the Sunday, October 8, 2006 ASC OP/SC 1, BSR/OEOSC-OP1.002, Optics and Electro-Optical unaniously. Instruments – Optical Elements and Assemblies — Appearance Imperfections Draft Review Minutes

The minutes had been posted on the web site. The Task Force Leader asked if there were any additions or corrections to the minutes. He asked if the scratch and dig course document has been placed on the web site? D. Aikens said that he would transmit it to the secretary as soon as his computer arrives in San Jose. W. Czajkowski moved that the minutes be approved and D. Aikens seconded the motion. The motion carried unanimously.

4 Report of Gage Study

J. Hamilton had said that he join the meeting conference call. This item is being postponed until he calls.

5 A Multiple Company Round-robin Comparison of Imperfection Samples

Without C. Gaugh this item had to be postponed.

6 Review of Revised OP1.002

G. Boulton explained that the version with edit marks included, and a version with all of the edits accepted were placed on the web site.

D. Aikens asked the Secretary if the task force should be formally approving the current draft to help minimize ANSI auditing problems. The Secretary said that the confusion during the audit had occurred because the auditor did not realize that the task force was immediately beginning to modify the standard for a future revision right after ANSI had approved the current version. The Auditor had thought that the task force was trying to publish a version with new material after ANSI had issued its approval. The secretary then said that the Auditor did make a good recommendation concerning task force balloting of drafts: If the task force makes edits after an unsuccessful ballot, then it can re-ballot just the sections that were edited. That way sections where there were no objections would not be subject to re-inspection. The balloting process should proceed more quickly.

G. Boulton recommended that the task force begin at clause 3.6.3. The word “element” was changed to “surface” as requested by W. Royall.

D. Aikens suggested that the task force review briefly the work thus far for J. Harvey's benefit. He said that the task force has released a cleaned up version of MIL-O-13830 as ANSI/OEOSC OP1.002-2006, and is now preparing an update to OP1.002 that includes dimensional measurement of scratches and digs that is similar to MIL-F-48416 and MIL-C-48497. The last two meetings covered a restructuring so that the entire standard would remain the same except that it would include two notations and interpretations, one for visual and one for measurement, but the metrology and edge specifications would remain the same as in the current approved version. The task force is now going through the document to make sure that accumulation techniques, etc., are still consistent with both types of notation. G. Boulton thanked D. Aikens for the summary of the task force's activities.

F. Dombrowski had a question concerning Tables 1 and 2 in clause 3.5.3. He noted that there are alphabetic (letter) references in both of them. He thought that it can be confusing to use letters for both scratches and digs. It may be less confusing if numbers were used for digs and letters for scratches. G. Boulton said that OP is using the historical notations used by the former military standards for consistency. He said that it would have been preferable if the military had used different notations for scratches and digs when they created the military specifications fifty years ago. In MIL-F-48416 and MIL-C-48497 the military had to use alphabetic notation because they had already used numbers for specifying the appearance of scratches and digs in MIL-O-13830.

D. Aikens reminded the group that clause 3.6 was being edited so that it is valid for both appearance and measurement designations. The user of the standard will have the option to use either a number or a letter designation depending upon whether the user wants a visual or dimensional interpretation of the standard. The manufacturer will understand which portion of the standard the engineer wants to use from the choice of notation. In clause 3.6.4 the wording had to be changed to add a letter designation. R. Williamson said that there is no designation for an indication of 12 or 15; therefore, the paragraph is really saying that clause 3.6.4 does not apply to anything other than 20 and 10 or C and B. D. Aikens said that he thought R. Williamson was misinterpreting the clause, therefore it is not clearly written. The first sentence describes the notation which results in the concentration being invoked. It means that if the surface has a specified number of 20 or C or smaller, then concentration applies. When doing concentration analysis, one only considers scratches of maximum size. R. Williamson agreed that the reference to this is not clear.

L. Endelman asked if the words “circular” and “diameter” were both needed. A discussion followed about non-circular apertures, and how they would be handled under this specification. G. Boulton reminded the group that this phrasing appeared in the original military specification, and D. Aikens agreed that the task force should not deviate too greatly from the original wording to keep this standard backward compatible with the original military specifications. The optical engineer can write a specific note to cover a non-standard aperture shape to ensure that the part is evaluated properly.

W. Royall asked if one has a scratch of 10, does that mean that there is no concentration requirement? D. Aikens replied that the concentration rule applies to designations of 20 or C or smaller. G. Boulton pointed out that only those scratches classified as 10 would be counted in concentration because anything less than 10 is disregarded. M. Dowell said that since this specification was written 50 years ago, technology for measuring scratches and digs has improved. She asked if this section should be rewritten to account for concentrations? D. Aikens replied that the visual inspection technology has not improved. There have been improvements to physical measurement of these imperfections, which

would relate to the alpha designations. He proposed that after the military has adopted this standard, then this section should be the number one priority for improvement.

A. Krisiloff stated that as an instrument designer he always worries about concentration of scratches. D. Aikens said that this section always causes students of the course confusion. A. Krisiloff said that the word “designation” also confused him. He suggested that it should be referring to a “classification.” The group agreed with that change in wording so that the clause now reads:

“The concentration rule applies only to scratch designations of either 20 or C or smaller. Areas of surfaces with specified scratch designation of either 20 or C or smaller shall have no more than four separate scratches in any 6.35 mm diameter circular area. Scratches that have been classified as less than either 10 or B shall be disregarded for the concentration requirement.”

F. Dombrowski asked about Table 1 Column 3 “Disregard Scratch Widths Less Than.” D. Aikens said that that column was for accumulation, not concentration.

At this point the task force took a five minute break.

G. Boulton reconvened the meeting by saying that the task force has completed one clause in one and one-half hours.

A. Brunfeld suggested that for coatings, clauses 3.6.1 through 3.6.4 should be referenced for concentration. There is no reason that coatings should have different evaluations than other surfaces. The task force concurred.

F. Dombrowski said that he thought 3.6.5 had three sentences that were redundant.

- These scratches shall not penetrate the glass surface.
- These scratches shall be considered separate from the substrate.
- Coatings are treated as a separate surface.

He said that these all say that the coating is a separate surface. D. Aikens asked if the second sentence is adding any value. After some discussion that included looking at the original military wording, the task force agreed to drop the second sentence.

A. Brunfeld asked how he could tell if the scratch penetrated the coating, and what difference does it make? W. Czajkowski said that there may be different reflections if the scratch enters the substrate. A. Krisiloff said that inspection occurs after coating, and you would not remove the coating to see if the scratch had penetrated the substrate. R. Williamson said that if one is inspecting a coated surface, scratches may accumulate to the point that the coated part is rejected. However, if some of the scratches are on the coating, and pass the accumulation rule for the coating, while the remainder are on the substrate and pass the accumulation rule for the substrate, then the argument settles upon whether any scratches penetrate the substrate through the coating. D. Aikens asked inspectors at Zygo how they interpret the coating rule. Zygo only applies the coating rule if there are pre-coating records for the part that can be used as reference. Anything that shows up in the surface inspection is excluded from the coating evaluation. No consideration is given to whether the new coating scratch penetrates the substrate.

D. Aikens said that a user of the part would want to get rid of this specification, but a manufacturer wants the specification because the substrate may have been produced by a different financial entity than that which coated the part. The manufacturer wants to be able to assign responsibility properly to the two producing organizations. A. Brunfeld asked how, as a manufacturer, he is to be able to tell where the scratches reside. D. Aikens said that the metrologist in him says that one cannot tell, while the user in him says, “of course you can.” A user looks at the scratch and says, “Wow, that scratch goes through the coating into the substrate!” The user doesn't care where the scratch is located; he wants it counted. It is the manufacturer's problem to decide to which surface he assigns the scratch. A. Krisiloff said that the manufacturer must inspect the parts before coating to make sure that appropriate imperfections are assigned to that process. After the part is coated, then any rejections must be assigned to coating. W. Czajkowski said that there will always be handling risks along the manufacturing process that can cause additional scratches. A. Krisiloff asked if the specification should contain the “wobble room” for such imperfections, or should their internal processes be managing this problem? R. Williamson said that he did not think that the specification was written to handle the assignment of blame for accounting purposes. D. Aikens said that he thinks that the specification is there to settle disputes between manufacturers and coaters. These specifications were created for military contracts. Until recently, coating was generally done by subcontractors. So the military has a means for distinguishing between the two types of scratches. G. Boulton said that the coating houses will not accept the specification if there is not some wobble room.

D. Aikens suggested that this problem be examined in two parts. He asked what happens if the scratch penetrates the coating into the surface. G. Boulton said that for JDSU, they would look at the part under a microscope. If the scratch does penetrate the substrate, then they accept the responsibility if the part is rejected because the substrate now fails to pass its specification. W. Czajkowski added that the fact that a coating can increase the visibility of scratches on the substrate can confuse the issue. L. Endelman asked if coating ever improves the appearance of scratches on a substrate because the scratch is filled in. The general consensus was that the appearance never improves after coating.

At this point G. Boulton suggested that this discussion be tabled so that the group can proceed to look at other parts of the draft.

M. Dowell discovered that the reference in the clause “Scratches” is missing. It should point to the “Accumulation” section.

While the reference was being inserted, W. Royall had a question concerning clause 3.5.3. In his factory they control the scratch width measurement. When they bin the scratches, they use the actual scratch width. D. Aikens said that he saw the binning being done both ways. If one simply says to round up to the next letter, then all of the other clauses in the standard apply straightforwardly. If the standard were to allow interpolation between letters, then additional instructions would have to be added to explain how to do that. He thought that the task force is avoiding complication by sticking to the binning concept. W. Royall replied that he thought that the standard should document current industry practice, and he was not sure what that practice is. D. Aikens reiterated that he has not seen a consistent practice for this specification. Binning allows for the variability of measurement of scratch width.

L. Endelman suggested that the phrase “...for the purposes of...” in clause 3.5.3 be changed to “...as defined in...” The task force decided to leave the phrase unchanged.

G. Boulton returned to W. Royall's original question by saying that it is possible to conduct a “quick and dirty” scratch measurement evaluation by using a comparison standard that has scratches with known widths, whether they are black lines on clear plastic or chrome on glass.

R. Williamson said the first sentence of clause 3.5.3 should read “The scratch designation is defined by the width...” rather than “The scratch letter defines the width...”

D. Aikens stated that clause 3.6.1 should not be in section 3.6. It needs to be moved to section 3.4. The current clause 3.6.1 is not an accumulation rule; it is a definition, and therefore, needs to be under section 3.4. M. Dowell suggested that it is equivalent to clause 3.5.3. D. Aikens said that there is a difference; clause 3.6.1 refers to comparison standards and clause 3.5.3 refers to letter designations. This clause 3.6.1 will become a new clause 3.4.2.

M. Dowell suggested that section 3.6.6 “Digs (Round Imperfections)” be dropped because there is no similar section label for scratches. The task force agreed to that change.

In 3.6.8 A. Brunfeld noted that, “Digs with diameters less than 2.5 micrometers shall be ignored.” The rule for dig designation states that any dig less than 10 micrometers shall be ignored. G. Boulton replied that the 2.5 micrometers number came from MIL-O-13830 while the 10 micrometers number came from MIL-C-48497 and MIL-F-48616, which are more liberal. The task force will have to reconcile these numbers. D. Aikens said that the 2.5 micrometers statement needs to be moved to the visual section. Then the ignore criteria is defined in clauses 3.4 and 3.5.

The task force took another five-minute break while D. Aikens edited clause 3.6.8. The edited version is as follows:

Allowable Dig Total. The sum of all the dig diameters on a single surface shall not exceed twice the product of the maximum size dig specified and the number of maximum sized digs allowed per paragraph 3.6.7.

$$\sum_i d_i \leq 2 \times N \times D$$

where N is the number of maximum-size digs allowed,
 D is the dig diameter of the maximum dig allowed,
 d_i is the diameter of dig i .

D. Aikens then said that the group needs to decide if it wants to bin the digs before performing accumulation. W. Royall said that his company's practice when measuring digs is to use the actual measurement for accumulation rather than binning the digs before accumulation. He could see no advantage for binning the digs because it tightens the specification. D. Aikens reiterated how he understood W. Royall's common practice by saying that under the visual method, the digs would be binned, but when actual measurements of the digs are performed, then the actual dig diameter is used. However, one would then have to decide how accurately the measurement of the dig diameter must be.

There are three options for how binning could be handled:

1. Require binning before accumulation for clauses 3.4 and 3.5;
2. require binning before accumulation for clause 3.4, digs and scratches; with clause 3.5 one would measure and accumulate without binning the digs;
3. no binning applied for either clauses 3.4 or 3.5; digs would always be measured and compared based on their measured value.

F. Dombrowski asked why was there binning in option 1. D. Aikens said that is because in option one clause 3.4 is a visual inspection.

G. Boulton proposed to poll the task force to see which each participant prefers. D. Aikens moved that the task force be polled to determine which of the three options be chosen for the draft standard. The results of the poll are

- G. Boulton: 3
- M. Dowell: abstain
- D. Aikens: 2

- A. Krisiloff: 2
- A. Brunfeld: 1
- R. Williamson: 2
- W. Czajkowski: 3
- L. Endelman: 2
- J. Harvey: abstain
- W. Royall: 3
- F. Dombrowski: abstain, must study further before choosing

The poll resulted in

1. 1 person
2. 4 persons
3. 3 persons

A. Brunfeld said that option number 2 is confusing as a standard procedure. He did not think that the standard should offer one method for scratches and another for digs. The standard should offer option 1 or option 3, but not option 2. D. Aikens reinforced A. Brunfeld's opinion by looking at the definition of dig notation in 3.4.1.2. The dig tolerance number is the actual dig diameter of the imperfection allowed. So the task force has established precedence that the visual comparison method is talking about actual diameters for digs. The next brightest bin number only applies to scratches. At this point, those who voted for options 1 and 2 agreed that option 3 is the method to use in the draft standard. The wording of clause 3.6.8 then becomes –

Allowable Dig Total. The sum of all the dig diameters on a single surface shall not exceed twice the product of the maximum size dig specified and the number of maximum sized digs allowed per paragraph 3.6.7

$$\sum_i d_i \leq 2 \times N \times D,$$

where N is the number of maximum-size digs allowed,
 D is the dig diameter of the maximum dig allowed,
 d_i is the diameter of dig i .

D. Aikens then said that the sentence, “Digs with diameters less than 2.5 micrometers shall be ignored.” should be moved up to clause 3.4.1.2.

The sentence, “On surfaces having dig specifications less than or equal to either 10 or B, the digs shall be separated edge to edge by at least 1 mm.” was added to clause 3.6.9 Concentration of Digs. The definition of d_i was changed to, “ d_i is the diameter of dig i .” It was formerly, “ d_i is the dig number of dig i .”

D. Aikens noted that clause 3.5.3.1 should be 3.5.4.

In the time left D. Aikens suggested that the task force decide how to attack clause 3.7. G. Boulbee suggested that he write a proposal base on ISO 14997 for this section to be edited by the task force at the next meeting: “an inspection method using comparison standards based on artifacts with measured dimensions rather than on visibility indications.” OP could come up with an artifact similar to what ISO formerly had. D. Aikens suggested that F. Dombrowski would be a good candidate to write the description of a comparison standard to be used with the measurement method. F. Dombrowski agreed to prepare a paragraph and possibly an illustration of such an artifact standard. G. Boulbee and F. Dombrowski will work together on this section.

7 Time and Place of next OP 1 Meeting

The Task Force agreed to meet next in Rochester, NY during Optifab on May 14, 2007, 8:30 a.m. – noon. They decided to defer decision on the following meeting until the next time.

8 Adjourn

A. Brunfeld moved that the meeting be adjourned; M. Dowell seconded the motion, which carried unanimously. The meeting adjourned at 12:05 p.m.