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From: Feiglin, Marc
Sent: Friday, August 18, 2000 4:52 PM
To: 'sbs-stds@listserv.olemiss.edu'
Subject: Minutes of the Aug. 15th SBS Plate Standards Meeting in Boston

Minutes of the August 15 Meeting of the SBS Microplate Standards Discussion Group

Attendees:
Neal Holtzman, Abgene, neal@abgene.com
John Coddaire, BD Biosciences, John_Coddaire@bd.com
Andy Muser, BD Biosciences, Andy_Muser@bd.com
Mike Septak, BD Biosciences, michael_septak@bd.com
Bryan Wildman, Beckman Coulter, Inc., bryan.wildman@jagian.com
Carol Homon, Boehringer Ingelheim, chomon@rdg.boehringer-ingelheim.com
Michael Labelle, Corning, labellem@corning.com
Jeri McMahon, Corning, mcmahonj@corning.com
Marty Popoloski, Corning, popoloskmj@corning.com
Vladimir Pismenny, Dynex Technologies, pismennyv@dynextechnologies.com
Paul Henkel, Electric Imaging, paul@eiminc.com
Guenther Knebel, Greiner, gknebel@greiner-lab.de
Amer El-Hage, LJLBiosystem, aelhage@ljlbio.com
Kevin Oldenburg, MartriCal, kevin.oldenburg@att.net
Marc Feiglin, Merck & Co, marc_feiglin@merck.com
David Titus, MJ Research, davidt@mjr.com
Bruce Turner, MJ Research, bturner@mjy.com
Barbara Sullivan, Nalge Nunc International, bsullivan@nalgenunc.com
Keith Whittlinger, Nunc, kwhittling@nalgenunc.com
Tim Towle, Orbital Biosciences, orbio@shore.net
John Lipsky, Whatman, jlipsky@whatman.com
Helen Liu, Whatman, hliu@whatman.com
Niran Shah, Whatman, nshah@whatman.com
Carl Boyer, Zymark Corp, carl.boyer@zymark.com
Bruce Peabody, SBS legal counsel, BruceRPeabody@worldnet.att.net

Agenda:
·ANSI Registration
·Procedures
  oDeciding to work on new standards
  oAdopting standards
·Review Standards
·Open Proposals
·What Next?

ANSI Registration:
There was a discussion on submitting the proposed standards for registration as official ANSI standards. After a discussion on the advantages this would provide the society and the standards, it was generally accepted that this was the appropriate path to take with the standards. Before the standards could be submitted to ANSI, the SBS must first apply as a member of ANSI. This request will be taken back to the SBS Council and office.

Procedures:
In order to become an accredited ANSI standards developer, the procedures and policies used in setting standards by this group need to be formalized and documented.
An actual committee needs to be identified, and how votes will be performed also needs to be decided. There was some discussion on this matter with input from Bruce Peabody, the SBS legal counsel. The discussion implied that the “official committee” would have to be balanced to meet the needs of all involved taking into account the desired of large and small

corporations, as well as users and manufacturers. Bruce Peabody suggested that there be an application process required with the SBS council selecting members. A number of comments were made that this may not be appropriate, especially since the committee should not be limited to SBS members only. Another suggestion was that any interested party could join, but it would be limited to one voting member per company. It was emphasized that the discussions and meetings should be kept open to all interested parties, but that the voting committee needed to be limited. There was a comment that it would be important to define what dictates a company vs a division, etc.

Review Standards and Open Proposals:

Minor changes were made to the proposed standards. The changes discussed were as follows:

- Standard 1a:
  - Change width dimensions from 85.47 mm to 85.48 mm
  - Add a statement in the text stating, "Any included chamfers must not in clued flange."
  - Rigidity was discussed. Bryan Wildman of Beckman presented the apparatus designed and built in collaboration with Marty Popoloski of Corning and Amer El-Hage of LJL to measure deflection of plates under applied force. It was agreed that the microplate vendors present were asked to forward plates to Bryan to A proposal was made that possibly this should be a separate standard
- Standards 3a, 3b, 3c:
  - Add a statement in the text stating, "Any included chamfers must not in clued flange."
- Standards 3d and 3e
  - After a request from Nunc seconded by Greiner, standards 3d and 3e were accepted by the group for inclusion. The feeling was that since these plates have been accepted by users since before the standards were begun, a standard should be developed to grandfather them.

The August 2000 revision of the proposed standards follow:

Standard 1a: External Microplate Dimensions

Footprint

The outside dimension of the base footprint, measured within 12.700 mm (0.500 inches) of the outside corners, shall be as follows:

- Length 127.76 mm ± 0.25 (5.030 inches ± 0.010)
- Width 85.48 mm ± 0.25 (3.365 inches ± 0.010)

The outside dimension of the base footprint, measured at any point along the side, shall be as follows:

- Length 127.76 mm ± 0.50 (5.030 inches ± 0.020)
- Width 85.48 mm ± 0.50 (3.365 inches ± 0.020)

Rigidity

Using the apparatus described in Appendix XXX, the plate shall not deflect more than YYY mm when 3 pounds of force is applied. (Draft language)

Corner Radius

The four outside corners of the plate's bottom flange shall have a corner radius to the outside of 3.18 mm ± 1.60 (0.125 inch ± 0.063)

External Clearance to the Plate Bottom

The minimum clearance from Datum A (the resting plane) to the plane of the bottom external surface of the wells shall be 1.00 mm (0.039 inch). This clearance is limited to the area of the wells, and is shown as WH on the figures.

Chamfers (Corner Notches)

The quantity and location of chamfer(s) is optional. If used, the chamfer must not include the flange.

Standard 2a: Standard Height Microplates

Plate Height

The plate height, measured from Datum A (the resting plane) to the maximum protrusion of the perimeter wells, shall be 14.35 mm ± 0.25 (0.565 inch ± 0.010)

The overall plate height, measured from Datum A (the resting plane) to the maximum protrusion of the plate, shall be 14.35 mm ± 0.76 (0.565 inch ± 0.030)

Top Surface

The maximum allowable projection above the top stacking surface is 0.75 mm (0.030 inch). The top stacking surface is defined as that surface on which another plate would rest when stacked one on another.

When resting on a flat surface, the top surface of the plate must be parallel to the resting surface within 0.75 mm (0.030 inch)

Standard 3a: Short Bottom-Outside Flange

Flange Height

The bottom outside flange, defined as dimension FH in the figures, shall be 2.41 mm ± 0.38 mm (0.095 inch ± 0.015). This is measured from the bottom-resting plane to the top of the flange.

All four sides must have the same flange height, and the height must be consistent around the entire perimeter.

Flange Width

The bottom flange width measured at the top of the flange, defined as dimension FW on the figures, shall be a minimum of 1.27 mm (0.050 inch).

Chamfers (Corner Notches)

The quantity and location of chamfer(s) is optional. If used, the chamfer must not include the flange.

Standard 3b: Medium Bottom-Outside Flange

Flange Height

The bottom outside flange, defined as dimension FH in the figures, shall be 6.10 mm ± 0.38 mm (0.240 inch ± 0.015). This is measured from the bottom-resting plane to the top of the flange.

All four sides must have the same flange height, and the height must be consistent around the entire perimeter.

Flange Width

The bottom flange width measured at the top of the flange, defined as dimension FW on the figures, shall be a minimum of 1.27 mm (0.050 inch).

Chamfers (Corner Notches)

The quantity and location of chamfer(s) is optional. If used, the chamfer must not include the flange.

Standard 3c: Tall Bottom-Outside Flange

Flange Height

The bottom outside flange, defined as dimension FH in the figures, shall be 7.62 mm ± 0.38 mm (0.300 inch ± 0.015). This is measured from the bottom-resting plane to the top of the flange.

All four sides must have the same flange height, and the height must be consistent around the entire perimeter.

Flange Width

The bottom flange width measured at the top of the flange, defined as dimension FW on the figures, shall be a minimum of 1.27 mm (0.050 inch).

Chamfers (Corner Notches)

The quantity and location of chamfer(s) is optional. If used, the chamfer must not include the flange.

Standard 3d: Short Bottom-Outside Flange with Interruptions

Flange Height

The bottom outside flange, defined as dimension FH in the figures, shall be 2.41 mm ± 0.38 mm (0.095 inch ± 0.015). This is measured from the bottom-resting plane to the top of the flange.

All four sides must have the same flange height, and the height must be consistent around the entire perimeter except for an interruption centered along datum B.

Interruptions

Each of the long sides of the plate, parallel to datum B, shall have a single centered interruption.
The length of the interruption shall not exceed 25.4 mm (1.000 inch)
The height, FH, at the interruption, shall exceed 6.85 mm (0.270 inch)

Flange Width
The bottom flange width measured at the top of the flange, defined as dimension FW on the figures, shall be a minimum of 1.27 mm (0.050 inch).

Chamfers (Corner Notches)
The quantity and location of chamfer(s) is optional. If used, the chamfer must not include the flange.

Standard 3e: Dual Flange Heights
Flange Height
The bottom outside flange, defined as dimension FH in the figures, shall be 2.41 mm ± 0.38 mm (0.095 inch ± 0.015) along the short sides of the plate, defined as datum B. This is measured from the bottom-resting plane to the top of the flange.
The bottom outside flange, defined as dimension FH in the figures, shall be 2.41 mm ± 0.38 mm (0.095 inch ± 0.015) along the long sides of the plate, defined as datum B. This is measured from the bottom-resting plane to the top of the flange.

Flange Width
The bottom flange width measured at the top of the flange, defined as dimension FW on the figures, shall be a minimum of 1.27 mm (0.050 inch).

Chamfers (Corner Notches)
The quantity and location of chamfer(s) is optional. If used, the chamfer must not include the flange.

Standard 4a: Well Positions for 96 Well Microplate
Well Layout
The wells in a 96 well microplate should be arranged as eight rows by twelve columns.

Well Column Position
The distance between the left outside edge of the plate and the center of the first column of wells shall be 14.38 mm (0.566 inches)
Each following column shall be an additional 9.00 mm (0.354 inches) in distance from the left outside edge of the plate.

Well Row Position
The distance between the top outside edge of the plate and the center of the first row of wells shall be 11.24 mm (0.443 inches)
Each following row shall be an additional 9.00 mm (0.354 inches) in distance from the top outside edge of the plate.

Positional Tolerance
The positional tolerance on the well centers is ± 0.25 mm (± 0.010 inches). The tolerances are non-cumulative. This is defined as follows. Each well will be within ± 0.25 mm (± 0.010 inches) of its theoretical centerline position when measured on a straight line between the first and last wells in that row or column.

Well Markings
The top left well of the plate shall be marked in a distinguishing manner.
The top left well of the plate can be marked with the letter A or numeral 1 located on the left-hand side of the well.
The top left well of the plate can be marked with a numeral 1 located on the upper side of the well.
Additional markings may be provided.

Standard 4b: Well Positions for 384 Well Microplate
Well Layout
The wells in a 384 well microplate should be arranged as sixteen rows by twenty-four columns.

Well Column Position
The distance between the left outside edge of the plate and the center of the first column of wells shall be 12.13 mm (0.478 inches)
Each following column shall be an additional 4.50 mm (0.177 inches) in distance from the left outside edge of the plate.

Well Row Position
The distance between the top outside edge of the plate and the center of the first row of wells shall be 8.99 mm (0.354 inches)
Each following row shall be an additional 4.50 mm (0.177 inches) in distance from the top outside edge of

Positional Tolerance
The positional tolerance on the well centers is ± 0.25 mm (± 0.010 inches). The tolerances are non-cumulative. This is defined as follows. Each well will be within ± 0.25 mm (± 0.010 inches) of its theoretical centerline position when measured on a straight line between the first and last wells in that row or column.

Well Markings
The top left well of the plate shall be marked in a distinguishing manner.
The top left well of the plate can be marked with the letter A or numeral 1 located on the left-hand side of the well.
The top left well of the plate can be marked with a numeral 1 located on the upper side of the well.
Additional markings may be provided.

Standard 4c: Well Positions for 1536 Well Microplate
Well Layout
The wells in a 1536 well microplate should be arranged as thirty-two rows by forty-eight columns.

Well Column Position
The distance between the left outside edge of the plate and the center of the first column of wells shall be 9.88 mm (0.389 inches)
Each following column shall be an additional 2.25 mm (0.088 inches) in distance from the left outside edge of the plate.

Well Row Position
The distance between the top outside edge of the plate and the center of the first row of wells shall be 6.74 mm (0.265 inches)
Each following row shall be an additional 2.25 mm (0.088 inches) in distance from the top outside edge of

Positional Tolerance
The positional tolerance on the well centers is ± 0.25 mm (± 0.010 inches). The tolerances are non-cumulative. This is defined as follows. Each well will be within ± 0.25 mm (± 0.010 inches) of its theoretical centerline position when measured on a straight line between the first and last wells in that row or column.

Well Markings
The top left well of the plate shall be marked in a distinguishing manner.
The top left well of the plate can be marked with the letter A or numeral 1 located on the left-hand side of the well.
The top left well of the plate can be marked with a numeral 1 located on the upper side of the well.
Additional markings may be provided.

What Next?
- Decide whether rigidity is a separate standard
- 1536 well position standard (4c)
- Prepare for submission to ANSI

Tim Towle volunteered to assist in rewriting standards to meet ANSI style guidelines (Available at http://web.ansi.org/public/library/guides/pdf/STYLEMAN.PDF)

- Present at SBS Annual Meeting

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From: Feiglin, Marc
Sent: Friday, August 18, 2000 5:14 PM
To: 'sbs-stds@listserv.olemiss.edu'
Subject: Open issues from the Aug. 15th Meeting

Hi,
You should have recently received a copy of the minutes from the last meeting. Regarding the current version of the proposed standards there are three things we'd like to point out:

1-There was an open question at the meeting as to whether the rigidity issues should remain part of standard 1 or become a separate standard (say standard 5). What is the feeling on this?

2-Initial wording for Standard 4c, Well Spacing for 1536 well plates, was added. We're not sure all the numbers are correct, so if some people could double check it, we'd appreciate it.

3-Regarding the new Standard 4d, I have had a number of emails from a company called Techno Plastic Products in Switzerland that would like to propose that the pinch bar be 30mm in length. I've asked them to submit their comments to the ListServ, but I haven't seen anything yet. What do others think?

Just a reminder, then next meeting will be during the SBS annual meeting in Vancouver, BC. It will be held on Thursday Sept 7 from 1:00pm - 4:00. The agenda for this meeting will include mainly be about issues regarding formalizing up an official committee and policies to meet ANSI guidelines. This will also be an opportunity to formally present the standards as a completed work to the SBS.

The plate standard discussion group will be open to those who are not attending the SBS conference, but you MUST then let the SBS office know that you plan on attending the plate standard discussion group so that you will be permitted into the building. You should RSVP to the SBS office by sending an email to mailto:Sbsemail@aol.com. YOU ONLY NEED TO DO THIS IF YOU ARE NOT REGISTERING FOR THE CONFERENCE ITSELF.

Marc & Carol

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From: chomon@rdg.boehringer-ingelheim.com
[mailto:chomon@rdg.boehringer-ingelheim.com]
Sent: Monday, August 21, 2000 11:56 AM
To: sbs-stds@listserv.olemiss.edu
Subject: RE: Open issues from the Aug. 15th Meeting

Marc
I believe that the rigidity issue is close to being resolved but will require quite specific information on the device and the test method. There is likely to be at least some discussion about what is required for the rigidity for plates which might not get resolved at our next meeting. For these two reasons, I think it would be best to break out this requirement as a separate standard. This will then not deter the SBS from moving forward with the other 4 standards as quickly as possible.
As regards point three, I had mentioned the need for the standard 3d to meet the needs of all companies with this variation. Therefore, I would recommend the wording be up to 30mm to handle this variation as well as Costar's and Greiner's.
I would also like to remind people to send in their ideas about the "formal" committee membership. We need to have a good idea of who will be the committee members and how the committee will proceed to move forward with ANSI. I think that I better leave the 1536 measurements up to those companies that know best.

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From: Keith Whittlinger [mailto:KWhittling@nalgenunc.com]
Sent: Monday, August 21, 2000 2:40 PM
To: 'sbs-stds@listserv.olemiss.edu'
Subject: RE: Open issues from the Aug. 15th Meeting

To all,

Regarding item 1 - If there is any possibility that the rigidity specification could be agreed to and included into the proposal for the SBS Board meeting in September, that would seem to be best rather than having a separate standard. However, as Carol has pointed out, further discussions about plate rigidity could delay submitting the existing proposals, and we think that most everyone involved would like to see some closure to these initial plate standard proposals in September.
Regarding item 2 - We recommend that the text for "Well Column Position" should be corrected to read "The distance between the left outside edge of the plate and the center of the first column of wells shall be 11.00 mm (0.433 inches)", and the text "Each following column shall be an additional 2.25 mm (0.088 inches) in distance from the left outside edge of the plate" is correct as is.
For "Well Row Position" the text should be corrected to read "The distance between the top outside edge of the plate and the center of the first row of wells shall be 7.86 mm (0.309 inches)", and the following text should read "Each following row shall be an additional 2.25 mm (0.088 inches) in distance from the top outside edge of the plate."
Regarding item 3 - For the purpose of being inclusive with this initial set of standards, we would support increasing the pinch bar length to a maximum of 30 mm. Text for standard 3d would then read ".... The length of the interruption shall not exceed 30 mm (1.181 inches)..."

Keith Whittlinger
Nalge Nunc International

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From: Feiglin, Marc
Sent: Wednesday, August 23, 2000 8:40 AM
To: 'sbs-stds@listserv.olemiss.edu'
Subject: RE: Open issues from the Aug. 15th Meeting

I am posting this for Mike Septak who has had trouble posting it....

ORIGINAL MESSAGE SUBMITTED TO SERVER:
To all:

Concerning the left-edge-to-1st-column (11.005mm = 0.4333") and top-edge-to-1st-row distances (7.865mm = 0.3096") for 1536 well plates, I get essentially the same values as Keith Whittlinger of Nunc when I calculate these from the footprint and well spacing (2.25mm) specifications. Therefore I join with him in recommending that these values be substituted for those which were in the proposed "standard 4c" draft specification.

Mike Septak
BD Biosciences

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From: Kevin R. Oldenburg [mailto:Kevin.Oldenburg@worldnet.att.net]
Sent: Wednesday, August 23, 2000 9:49 AM
To: sbs-stds@listserv.olemiss.edu
Subject: Re: Open issues from the Aug. 15th Meeting

Hi all,
I also get those numbers and concur.
Kevin Oldenburg
MatriCal

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From: Feiglin, Marc
Sent: Wednesday, August 23, 2000 3:30 PM
To: 'sbs-stds@listserv.olemiss.edu'
Subject: Rewrite of Proposed Standards 3d and 4c

I've rewritten proposed standards 3d and 4c using the corrected numbers that have been posted to the ListServ recently.

Standard 3d: Short Bottom-Outside Flange with Interruptions

Flange Height
-The bottom outside flange, defined as dimension FH in the figures, shall be 2.41 mm ± 0.38 mm (0.095 inch ± 0.015). This is measured from the bottom-resting plane to the top of the flange.
-All four sides must have the same flange height, and the height must be consistent around the entire perimeter except for an interruption centered along datum B.

Interruptions
-Each of the long sides of the plate, parallel to datum B, shall have a single centered interruption.
-The length of the interruption shall not exceed 30.0 mm (1.181 inch)
-The height, FH, at the interruption, shall exceed 6.85 mm (0.270 inch)

Flange Width
-The bottom flange width measured at the top of the flange, defined as dimension FW on the figures, shall be a minimum of 1.27 mm (0.050 inch).

Chamfers (Corner Notches)
-The quantity and location of chamfer(s) is optional. If used, the chamfer must not include the flange.

Standard 4c: Well Positions for 1536 Well Microplate

Well Layout
-The wells in a 1536 well microplate should be arranged as thirty-two rows by forty-eight columns.

Well Column Position
-The distance between the left outside edge of the plate and the center of the first column of wells shall be 11.00 mm (0.433 inches)
-Each following column shall be an additional 2.25 mm (0.088 inches) in distance from the left outside edge of the plate.

Well Row Position
-The distance between the top outside edge of the plate and the center of the first row of wells shall be 7.86 mm (0.309 inches)
-Each following row shall be an additional 2.25 mm (0.088 inches) in distance from the top outside edge of the plate.

Positional Tolerance
-The positional tolerance on the well centers is ± 0.25 mm (± 0.010 inches).
-The tolerances are non-cumulative. This is defined as follows. Each well will be within ± 0.25 mm (± 0.010 inches) of its theoretical centerline position when measured on a straight line between the first and last wells in that row or column.

Well Markings
-The top left well of the plate shall be marked in a distinguishing manner.
-The top left well of the plate can be marked with the letter A or numeral 1 located on the left-hand side of the well.
-The top left well of the plate can be marked with a numeral 1 located on the upper side of the well.
-Additional markings may be provided.

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From: Amer El-Hage [mailto:aelhage@ljlbio.com]
Sent: Wednesday, August 23, 2000 8:41 PM
To: 'sbs-stds@listserv.olemiss.edu'
Subject: RE: Rewrite of Proposed Standards 3d and 4c

All looks good.

I have attempted to summarize and describe the proposed Microplate standards to the general interested public here. This includes the latest discussion and conclusions from the meeting on 8/15/2000.
Please review and forward any comments:
There are now 4 major standards with 7 variations or a total of 11 standards. A maximum of four standards from each of the major standards 1.,2.,3.,4. (Each one except for 1. could have a,b,c... variation) would ever apply and should define any one microplate in the common formats (96,384,1536):

Standard 1. Defines the footprint, edge radius, and minimum height of the bottom of the wells to the resting plane, all with tolerance. The size, location and number of registration notches are left optional. The intent is to include the rigidity measurement procedure in this standard. However the procedure is still in development and the committee will decide by SBS 2000 if it will be in this standard or we will have to create a separate one.

Standard 2. Defines plate height and flatness, with zone and tolerance. 2a. is for a height of 14.35 mm. This is a common height in 96 and 384. Matrical has a 1536 microplate with this height. Most current 864, 1536 and higher density microplates have a lower profile height (less than 10 mm). Large volume microplates on the other hand have a higher profile i.e. 30mm or more. We all agreed that other plate height standards i.e. 2b, 2c, etc. will be submitted later to cover these other microplates.

Standard 3. Defines the microplate flange or "ledge", and the tolerance. There were three variations 3a, 3b, 3c proposed. Nunc representative (with Greiner, Corning and other support) proposed adding two more standards to 3. to cover pinch bar and flange height variations. After some discussion, the committee agreed, and two additional 3d and 3e standards were submitted.

Standard 4. Defines the well pattern, well center spacing and the x and y location of the first well A1 center from the two edges or datum planes, and the tolerance.
4a. Defines the 96 microplate
4b. Defines the 384 microplate
4c. Defines the 1536 microplate

With the addition of 3d and 3e we now have 11 standards 1, 2a, 3a, 3b, 3c, 3d, 3e, 3f, 4a, 4b, and 4c to submit. These standards apply to all microplates regardless of material of composition or the method of manufacturing.

If we find out that the rigidity requires a separate standard, say 5. Then we will have 5 major standards or a total of 12 standards to initially submit to ANSI. We should try hard to include rigidity in standard 1. We also may have the option to amend standard 1. at a later date to include rigidity.

Later, with few more plate height standards we will have a set of four (or five) numbers to unequivocally describe the physical characteristics of any microplate to the user, instrument manufacturer, automated integrators and the microplate maker.

This will be a great achievement indeed. It will certainly justify the hard work that the committee has put into this almost impossible task. It also exemplifies the spirit of inclusiveness that this committee was able to achieve throughout this endeavor.

Regards
Amer El-Hage
Sr. Director, Engineering Programs
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1-408-541-8789 Voice
1-408-548-0571 Fax

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From: Vladimir Pismenny [mailto:pismennyv@dynextechnologies.com]
Sent: Thursday, August 24, 2000 11:47 AM
To: sbs-stds@listserv.olemiss.edu
Subject: RE: Open issues from the Aug. 15th Meeting

Hello all,
I also agree in principal with Mike, Keith and Kevin about 1536 plate edge-to-first-column and edge-to-first-row dimensions although I urge our group to bring these dimensions to more readible and manufacturable form (I mean dimension 11.005mm should be 11.0mm and dimension 7.865mm should be 7.8mm or, as a maximum, 7.86mm with corresponding dimensions in inches rounded to the third decimal after the dot and, of course, with all applicable tolerances). There are very few machine shops and Labs that can perform such precise measurements on plastics. Also measurements down to the microns are not necessary for this application.

Vladimir Pismenny, Project Engineer,
DYNEX Technologies, Inc.,
14340 Sullyfield Cr., Chantilly, VA 20151.
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pismennyv@dynextechnologies.com

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From: Amer El-Hage [mailto:aelhage@ljlbio.com]
Sent: Thursday, August 24, 2000 9:33 PM
To: 'sbs-stds@listserv.olemiss.edu'
Subject: RE: Open issues from the Aug. 15th Meeting

Hi all,

I concur with Vladimir rationale. You cannot measure or expect a molded plastic to hold a three-digit (mm) dimension repeat-ably. A half-joke to this subject is something like " If you want a piece of plastic to be measured to a micron, then tell me how much I can squeeze it, and at what time during the day?" Since the structural rigidity and the temperature effect usually have several micron impact on the dimension being measured. This is besides the material softness and other molded features such as flash or sink marks that can throw your measurement repeatability out regularly.

Although the proposed standard dimension is for all microplates regardless of the material or method of construction, Vladimir point that most common and/or standard measuring tools that read or measure in mm can do so to only two decimals. You will have to go to an inspection lab to get a micrometer reading. Even in a 1536 microplate, we have a target of about 1.60 mm (well diameter) and the positional tolerance is in a 0.25-0.5 mm range. So a 5 microns location resolution cannot be that critical.

But we still have to resolve the conflict between the two requirements that we want to preserve; 1) Dimensions in mm to two decimals, and 2) Well center locations to be symmetrical or centered from either edge. Because if we decide to use either 11.00 or 11.01 it will either give us a 127.75 or 127.77 overall length, which conflicts with 127.76 dimension outlined in Standard 1.

One suggestion is to pick say, the 11.01 dimension as the first A1 well center. Then we define a dimension between the first well center to the last (48 direction) well center as a range of 105.74-105.76. This will be in effect the maximum accumulated positional error of 0.2mm, if we do not make this a basic dimension. I am not sure ANSI Y14.5 standard will allow it with a positional tolerance at the first well location and 47 next locations, but I will appreciate the feedback.

Regards
Amer El-Hage
Sr. Director, Engineering Programs
LJL BioSystems
1-408-541-8789 Voice
1-408-548-0571 Fax

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From: Feiglin, Marc
Sent: Friday, August 25, 2000 8:33 AM
To: 'sbs-stds@listserv.olemiss.edu'
Subject: RE: Open issues from the Aug. 15th Meeting

Hi everyone,

Back at the January meeting (I think), we had agreed upon 2 decimal places for the metric and three for the non-metric. For the proposed standard 4c, I had used Keith's suggested values rather than Mike's because they were to 2 decimal places. That put the first well position at 11.00 mm from the left edge, and 7.86 mm from the top.

Amer is correct, these numbers would make the plate non-symmetrical. One other possibility is to go back and give the well positions off the theoretical plate centerline? (I know that many people didn't like this idea, but it is another solution to this issue)

Marc

From: Kevin R. Oldenburg [mailto:Kevin.Oldenburg@worldnet.att.net]
Sent: Friday, August 25, 2000 7:46 AM
To: sbs-stds@listserv.olemiss.edu
Subject: Re: Open issues from the Aug. 15th Meeting

Guys,

I think that we are getting much to carried away. There is no problem "listing" the exact position that the center of the well should have since we always give a tolerance. Let's worry about how much tolerance we need and forget about the number of digits on the center point. Would a tolerance of +/- 0.05 mm be OK? (That would be about a 5% error on a 1mm diameter well) How much do we actually need?

Regards,
Kevin

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From: Michael_Septak@bd.com [mailto:Michael_Septak@bd.com]
Sent: Friday, August 25, 2000 9:31 AM
To: sbs-stds@listserv.olemiss.edu
Subject: 1536 array location

On the A1 location issue, I agree with Kevin Oldenburg. It makes sense to establish the correct theoretical location for well A1 and all others without messing with the footprint, well-to-well spacing, or well pattern symmetry of the plate. While any plates made from the usual materials by typical molding processes will no doubt deviate from the ideal, in my view that does not mean that only measurements carried out to three decimal places could be used to qualify such plates as compliant with the standard. It is the tolerance range that is important in defining the resolution needed, more so than the theoretical well center position. I believe that we all recognize that the flexing of plastic parts during measurement is an important issue, as evidenced by our apparently universal belief that a rigidity standard specification is necessary to ensure that plates function in the application. Perhaps that fact suggests that the most relevant rigidity standard would also ensure that suitably accurate metrology data can be obtained on all plates, but that would be a tall order significantly beyond what has been proposed to date since it would probably mean having two rigidity standards (one for the "bare minimum necessary for robotic handling" as previously envisioned [applicable to all plates], and one for the functional requirement for accurate metrology [for 1536 well plates specifically]). It isn't obvious that we are ready to go there yet.

However, tackling this issue would almost certainly help make ANSI certification (of 1536 designs, anyway) a manageable process rather than a nightmare for all. This issue appears worthy of significant discussion to seek a consensus. How about putting this discussion topic on the agenda for the meeting in Vancouver?

Mike Septak
BD Biosciences

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From: Amer El-Hage [mailto:aelhage@ljlbio.com]
Sent: Friday, August 25, 2000 10:06 PM
To: 'sbs-stds@listserv.olemiss.edu'
Subject: RE: Open issues from the Aug. 15th Meeting

Ladies and Gentlemen,

I understand everybody's desire to get this process expedited, but what we are discussing are not just individual opinions, but a real mechanical dimensioning issue. First, a dimension should not be subject to interpretation or disputes by professionals who are trained in the field. Secondly, I hope our goals with this standard are still like mine:

1) Consistent, clear and complete.
2) Cannot violate or contradict established industry standards.
3) Be attainable (measurable) and be independently verifiable.

We do not want to position ourselves for frustration, failure or future arguments. If we list a dimension to three significant figures as in 11.005mm, then the tolerance need to be in three significant figures. A proposed positional tolerance of 0.05 mm would become 0.050 mm.
Usually the mean of few measurements (using a NIST traceable calibrated equipment) will be compared to the range established by the listed nominal dimension plus or minus tolerance, for compliance. As long as the Standard deviation of the measurements are also within an industry accepted level. I think the tolerance number proposed here is too small for this kind of molded plastics.
I am no expert on this subject, but I am confident from my experience that none of the 1536 microplates today are in compliance with what's been proposed so far. Even with substantiated data, I can find a certified metrologist who can measure the microplates and disagree with the data.
You can see where I am leading. I do not want us early to set ourselves a point for future dispute. I would like Marty, Keith and Gunther (representatives from Corning, NUNC, and Greiner the major manufacturer of 1536 plates today) who will mostly be impacted by this standard to explain their views and/or propose solutions before SBS 2000.

Anyone has any ideas about a MIL-spec or other standards for dealing with such an issue? If we are unable, maybe the ANSI review committee can help us on it.

Regards
Amer El-Hage
Sr. Director, Engineering Programs
LJL BioSystems
1-408-541-8789 Voice
1-408-548-0571 Fax
e-mail: aelhage@ljlbio.com

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From: Guenther Knebel (GREINER) [mailto:gknebel@greiner-lab.de]
Sent: Sunday, August 27, 2000 1:28 PM
To: sbs-stds@listserv.olemiss.edu
Subject: Antwort: RE: Open issues from the Aug. 15th Meeting

Hi everybody,

To overcome all current listserv-activities on the 1536 well A1 position, I would propose to review 1536-well manufacturers current pros and cons in general. I assume that the A1 position is minor compared to footprint tolerances and overall flatness as these issues will directly address the reliability of this plate in its intended application with a major focus in liquid handling.

Why not 3 digits for the A1 location. This is only a theoretical measurement taken from a CAD-system and does not incorporate any tolerances.

Guenther Knebel, Ph.D.
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From: Feiglin, Marc
Sent: Tuesday, August 29, 2000 3:42 PM
To: 'sbs-stds@listserv.olemiss.edu'
Subject: September 7 Meeting

Just a reminder, then next meeting will be during the SBS annual meeting in Vancouver, BC. It will be held on Thursday Sept 7 from 1:00pm - 4:00.

The agenda for this meeting will include

1- Issues regarding formalizing up an official committee and policies to meet ANSI guidelines.
2- Formally present the completed standards to the SBS.
1) 3-Discussion of issues regarding 1536 well positions

The plate standard discussion group will be open to those who are not attending the SBS conference, but you MUST then let the SBS office know that you plan on attending the plate standard discussion group so that you will be permitted into the building. You should RSVP to the SBS office by sending an email to mailto:Sbsemail@aol.com. YOU ONLY NEED TO DO THIS IF YOU ARE NOT REGISTERING FOR THE CONFERENCE ITSELF.

Marc & Carol

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From: Feiglin, Marc
Sent: Tuesday, August 29, 2000 4:46 PM
To: 'sbs-stds@listserv.olemiss.edu'
Subject: FW: Microplate Optical Standards

Is this something we should consider developing a standard for? Does any one know of any exisiting standards for optical quality that we could refer to?

Marc

> From: David Aziz [mailto:DavidA@axon.com]
> Sent: Tuesday, August 29, 2000 4:33 PM
> To: marc_feiglin@merck.com
> Subject: Microplate
>
> Hi Marc,
>
> I'm trying to determine if there are any optical standards for microplates.
> I'm concerned with material properties and dimensions, both of which will
> impact the performance of imaging systems viewing samples through the bottom
> of the plate. Do you know if anybody has addressed this topic?
>
> Thanks and best regards,
>
> David Aziz
> Axon Instruments
> 1101 Chess Dr.
> Foster City, CA 94404
> (650)571-9400
> (650)571-9500 Fax
> davida@axon.com

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From: Kerry Armour [mailto:Kerry.Armour@zymark.com]
Sent: Tuesday, August 29, 2000 5:01 PM
To: 'sbs-stds@listserv.olemiss.edu'
Subject: RE: Microplate Optical Standards

From my experience, the optical properties of microplates have always been an issue. In my days at PE working with microplate fluorometers and luminometers, we kept long lists of what plates worked best with which fluorophores/lumiphores. Plate coatings, type of plastic, the plastic colorants, mold releasing agent and all kinds of things had effects on assay results.
While it would be wonderful to have an optical standard, it likely would be more complex to arrive at than the physical standards have been. But, it might be well worth the effort to assemble a database from what people have seen emperically.

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From: chomon@rdg.boehringer-ingelheim.com
[mailto:chomon@rdg.boehringer-ingelheim.com]
Sent: Tuesday, August 29, 2000 5:37 PM
To: sbs-stds@listserv.olemiss.edu
Subject: RE: Microplate Optical Standards

To the best of my knowledge, no one has set optical properties specs for the plates. These would of course be very dependent on the plastic. I have talked to a couple of companies about plates and imaging and have gotten very different responses. The issue should come into play for any reader reading from the bottom but seems to be of particular importance for the Imagers. Sounds like an interesting new area. Let's see who the experts are out there.

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From: Amer El-Hage [mailto:aelhage@ljlbio.com]
Sent: Tuesday, August 29, 2000 10:18 PM
To: 'sbs-stds@listserv.olemiss.edu'
Subject: RE: Microplate Optical Standards

A good point, but "optical quality" is a very tricky proposition to an instrument development engineer like me. If we mean "optical properties" of microplates then we need to first define the optical properties that are unique and essential to standardize on for general automation and users issues. That is not impossible, but very difficult.

So will a microplate optical standard be designed to fit all photo-transmission and photoluminescence applications? It is also common to hear one user microplate poor "optical quality" that is a great performer in another user assay or optical set-up.

When quality is tied to assay performance, we will have to develop a standard(s) that lists all possible optical assays in a standard. The design or conformance of the microplate to the detection instrumentation, material and other manufacturing issues come into the assay performance issues. All these are either proprietary or are what makes each microplate unique. I think the optical and assay properties are best left to the microplate manufacturer specification and their quality or validation standards. Interested user can select from a plethora of available microplates and methods for the various assays they want the microplate to be part of the final performance. If not, they can define their needs and go shopping around or even make their own.

If after all this, we still feel the need as a committee to pursue this further, one could check the diagnostics cuvette based systems and see if there is any developed there. In microplate where the spectroscopic measurements are Epi in nature there are other "optical quality" factors that determine the performance such as the liquid-air interface, geometry or walls, internal surface condition and finish.

If one needs to define or measure optical properties as in measuring transmission, voids, haze, etc... then there are also several established methods one can use or refer to characterize a microplate optical quality. NIST and ASTM are just some of the sources that come to mind. Some examples are: ASTM D542-90 for: Standard Test Method for Index of Refraction of Transparent Plastics. Or ASTM D4039-92 for: Standard Test Method for Reflection Haze of High-Gloss Surfaces

Check the optical society of America (OSA) web page at www.osa.org for one source of details.

Regards, and see some of you in Vancouver next week.

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From: Keith Whittlinger [mailto:KWhittling@nalgenunc.com]
Sent: Wednesday, August 30, 2000 8:28 AM
To: 'sbs-stds@listserv.olemiss.edu'
Subject: RE: Microplate Optical Standards

To all.
As time permits at our meetings and on the listserve, it would be of interest to discuss optical quality for the various transparent & translucent plastics that are commonly used for microplates, and what sort of light transmission values (for example) are minimally necessary for various assays with various microplate readers. However, as optical quality is a function of many factors, such as the exact formulation of PS or PP or PC used, the thickness of the well bottom, the level of final polishing performed on the molding surfaces, the material itself used for the molding surfaces, etc., all items which are considered extremely proprietary, it may be very difficult (and very time consuming) to reach a consensus for a standard for this subject.

There are, of course, several excellent reference books that one could use as a guide to exactly what type of optical qualities can be expected from various plastics. Books such as the 'Plastics Engineering Handbook of the Society of the Plastics Industry' published by Van Nostrand Reinhold (New York)and several books published by Hanser Publishers (Munich)provide indexes, charts and other information regarding light transmission, haze and luminous transmittance, luminous reflectance, etc. Also, a comparison of the various 'Tech sheets' available from most every resin distributor offers one a realistic perspective of what optical qualities can be consistently expected for a given material with a given wall thickness, etc.

Regarding the recent postings for the distance between the microplate edge to well A1 position for 1536-well plates, I would again recommend that we continue to use a two-place decimal (which we have all agreed to several months ago), while fully recognizing the fact that a three-place decimal is more correct and allows us to have a perfectly symmetrical "ideal" set of dimensions to describe the well matrix perfectly centered on the microplate centerlines.

All the of the recent postings regarding this subject are excellent, thoughtful and well-reasoned. In theory, I agree completely with Kevin Oldenburg, Michael Septak, and Guenther Knebel to use a three-place decimal so the "exact" position for the well center is defined. But, Amer has correctly pointed out that according to industry standards, "if we list a dimension to three significant figures as in 11.005 mm, then the tolerance needs to be in three significant figures."

Therefore, IF we can deviate from that industry standard in the text of our standard, so as to allow ourselves a two-place tolerance on a three-place exact position dimension as Kevin Oldenburg recommended August 25, then NNI can certainly support listing the well positions using 3-digits as Kevin, Michael and Guenther have recommended.

However, IF the consensus 'ends up' being that we cannot use a three-place dimension without a requisite three-place tolerance, then please consider just staying with two-place dimensions and let's accept the non-symmetrical issue and move on to other important concerns.

While the A1 well position is important, especially considering the size of the well for concerns such as liquid dispensing, Guenther correctly points out that the plate footprint tolerances and overall flatness "directly address the reliability of this plate..." Flatness is extraordinarily important for 1536-well plate applications.

Keith Whittlinger
Nalge Nunc International

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From: Guenther Knebel (GREINER) [mailto:gknebel@greiner-lab.de]
Sent: Thursday, August 31, 2000 9:41 AM
To: sbs-stds@listserv.olemiss.edu
Subject: optical data [Virus checked]

Further to all ongoing communication, I have attached a spreadsheet and the corresponding graph to show how hard it will be to define optical properties of plates, as these are highly depending on the material in use and the thickness. Our patented technology to laminate thin films (50 - 500 microns) directly to the parent plate offers better transmittance than any other plate with a 1 mm solid styrene bottom.

I would appreciate if we can direct our efforts to standardization of the mechanical properties first, before wasting our time for new subjects.

With kinds regards

Guenther Knebel, Ph.D.
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From: Feiglin, Marc
Sent: Friday, September 01, 2000 5:41 PM
To: 'sbs-stds@listserv.olemiss.edu'
Subject: Updated Standards

The text version of the stanadards have been recently cleaned up to closer match the drawings. Most changes were minor (additional decimal places to match ANSI standards). But some were more significant:

1- 1-External Clearance to the Plate Bottom was moved from proposed standard 1 to proposed standard 2. It was felt that this had morew to do with height than footprint, and had been drawn on the height drawing anyways.
2- The allowable flange interuption in Standard 3d was changed to refer off the edge rather than the center. It was increased to allow the 3 mm interuption requested by one company.
3- Side wall rigidity was moved to its own proposed standard (#5). We discussed this possibility, but made no decision. I took the initiative to do it so that we can complete proposed standard 1. If there are strong objections to this, I will put it back in 1.
4- A dimension of 11.005 mm was chosen for standard 4c. According to ANSI guideliners there does not seem to be any reason why this standard cannot list a more precise dimension. It is certainly within tolerance of equipment that many of us have access too, and this number keeps the plate symmetrical. Again, if there are strong objections, we can do something else. I doubt we are done with 4c yet anyways.

Enclosed is the word document. If you cannot open it, the text is below. Please look over it closely and place any comments on the ListServ or bring them to the meeting next week.

See you next week!
Marc

****
SBS Proposed Microplate Specifications
Revised September 2000
****

Standard 1a: Microplate Footprint

Footprint

The outside dimension of the base footprint, measured within 12.7 mm (0.5000 inches) of the outside corners, shall be as follows:

- Length 127.76 mm ± 0.25 (5.0299 inches ± .0098)
- Width 85.48 mm ± 0.25 (3.3654 inches ± .0098)

The outside dimension of the base footprint, measured at any point along the side, shall be as follows:

- Length 127.76 mm ± 0.5 (5.0299 inches ± .0197)
- Width 85.48 mm ± 0.5 (3.3654 inches ± .0197)

Corner Radius

The four outside corners of the plate's bottom flange shall have a corner radius to the outside of 3.18 mm ± 1.6 (.1252 inch ± .0630)

Standard 2a: Microplate Height- Standard Height

Plate Height

The plate height, measured from Datum A (the resting plane) to the maximum protrusion of the perimeter wells, shall be 14.35 mm ± 0.25 (.565 inch ± .010)

The overall plate height, measured from Datum A (the resting plane) to the maximum protrusion of the plate, shall be 14.35 mm ± 0.76 (.565 inch ± .030)

Top Surface

The maximum allowable projection above the top stacking surface is 0.76 mm (.0299 inch). The top stacking surface is defined as that surface on which another plate would rest when stacked one on another.

When resting on a flat surface, the top surface of the plate must be parallel to the resting surface within 0.76 mm (.0299 inch)

External Clearance to the Plate Bottom

The minimum clearance from Datum A (the resting plane) to the plane of the bottom external surface of the wells shall be 1. mm (.0394 inch). This clearance is limited to the area of the wells.

Standard 3a: Bottom-Outside Flange Height- Short Flange

Flange Height

The height of the bottom outside flange shall be 2.41 mm ± 0.38 mm (.0948 inch ± .0150). This is measured from Datum A (the bottom-resting plane) to the top of the flange.

All four sides must have the same flange height.

Flange Width

The width of the bottom outside flange measured at the top of the flange shall be a minimum of 1.27 mm (.0500 inch).

Chamfers (Corner Notches)

The quantity and location of chamfer(s) is optional. If used, the chamfer must not include the flange.

Standard 3b: Bottom-Outside Flange Height- Medium Flange

Flange Height

The height of the bottom outside flange shall be 6.1 mm ± 0.38 mm (.2402 inch ± .0150). This is measured from Datum A (the bottom-resting plane) to the top of the flange.

All four sides must have the same flange height.

Flange Width

The width of the bottom outside flange measured at the top of the flange shall be a minimum of 1.27 mm (.0500 inch).

Chamfers (Corner Notches)
The quantity and location of chamfer(s) is optional. If used, the chamfer must not include the flange.

Standard 3c: Bottom-Outside Flange Height- Tall Flange
Flange Height
The height of the bottom outside flange shall be 7.62 mm ± 0.38 mm (.3000 inch ± .0150). This is measured from Datum A (the bottom-resting plane) to the top of the flange.
All four sides must have the same flange height.

Flange Width
The width of the bottom outside flange measured at the top of the flange shall be a minimum of 1.27 mm (.0500 inch).

Chamfers (Corner Notches)
The quantity and location of chamfer(s) is optional. If used, the chamfer must not include the flange.

Standard 3d: Bottom-Outside Flange Height- Short Flange with Interruptions
Flange Height
The height of the bottom outside flange shall be 2.41 mm ± 0.38 mm (.0948 inch ± .0150). This is measured from Datum A (the bottom-resting plane) to the top of the flange.
All four sides must have the same flange height except for an allowable interruption centered along the long side.

Interruptions
Each of the long sides of the plate shall be allowed to have a single interruption or projection on center.
Each edge of the interruption shall be a minimum of 48.5 mm (1.9094 inches) from the nearest edge of the part.
The height of the flange at the interruption shall not exceed 6.85 mm (.2697 inch)

Flange Width
The width of the bottom outside flange measured at the top of the flange shall be a minimum of 1.27 mm (.0500 inch).

Chamfers (Corner Notches)
The quantity and location of chamfer(s) is optional. If used, the chamfer must not include the flange.

Standard 3e: Bottom-Outside Flange Height- Dual Flange Heights
Flange Height
The height of the bottom outside flange shall be 2.41 mm ± 0.38 mm (.0948 inch ± .0150) along the short sides of the plate. This is measured from Datum A (the bottom-resting plane) to the top of the flange.
The height of the bottom outside flange shall be 7.62 mm ± 0.38 mm (.3000 inch ± .0150) along the long sides of the plate. This is measured from Datum A (the bottom-resting plane) to the top of the flange.

Flange Width
The width of the bottom outside flange measured at the top of the flange shall be a minimum of 1.27 mm (.0500 inch).

Chamfers (Corner Notches)
The quantity and location of chamfer(s) is optional. If used, the chamfer must not include the flange.

Standard 4a: Well Positions- 96 Well Microplate
Well Layout
The wells in a 96 well microplate should be arranged as eight rows by twelve columns.

Well Column Position

The distance between the left outside edge of the plate and the center of the first column of wells shall be 14.38 mm (.566 inches)
The left edge of the part will be defined as the two 12.7 mm areas (as measured from the corners) as specified in SBS-1
Each following column shall be an additional 9. mm (.3543 inches) in distance from the left outside edge of the plate.

Well Row Position
The distance between the top outside edge of the plate and the center of the first row of wells shall be 11.24 mm (.4425 inches)
The top edge of the part will be defined as the two 12.7 mm areas (as measured from the corners) as specified in SBS-1
Each following row shall be an additional 9. mm (.3543 inches) in distance from the top outside edge of the plate.

Positional Tolerance
The positional tolerance of the well centers will be specified using so called "True Position". The center of each well will be within a 0.71 mm (.0280 inch) diameter of the specified location. This tolerance will apply at "RFS" (regardless of feature size).

Well Markings
The top left well of the plate shall be marked in a distinguishing manner.

- The top left well of the plate can be marked with the letter A or numeral 1 located on the left-hand side of the well.
- The top left well of the plate can be marked with a numeral 1 located on the upper side of the well.

Additional markings may be provided.

Standard 4b: Well Positions- 384 Well Microplate
Well Layout
The wells in a 384 well microplate should be arranged as sixteen rows by twenty-four columns.

Well Column Position
The distance between the left outside edge of the plate and the center of the first column of wells shall be 12.13 mm (.478 inches)
The left edge of the part will be defined as the two 12.7 mm areas (as measured from the corners) as specified in SBS-1
Each following column shall be an additional 4.5 mm (.1772 inches) in distance from the left outside edge of the plate.

Well Row Position
The distance between the top outside edge of the plate and the center of the first row of wells shall be 8.99 mm (.3539 inches)
The top edge of the part will be defined as the two 12.7 mm areas (as measured from the corners) as specified in SBS-1
Each following row shall be an additional 4.5 mm (.1772 inches) in distance from the top outside edge of

Positional Tolerance
The positional tolerance of the well centers will be specified using so called "True Position". The center of each well will be within a 0.71 mm (.0280 inch) diameter of the specified location. This tolerance will apply at "RFS" (regardless of feature size).

Well Markings
The top left well of the plate shall be marked in a distinguishing manner.

- The top left well of the plate can be marked with the letter A or numeral 1 located on the left-hand side of the well.
- The top left well of the plate can be marked with a numeral 1 located on the upper side of the well.

Additional markings may be provided.

Standard 4c: Well Positions- 1536 Well Microplate
Well Layout
The wells in a 1536 well microplate should be arranged as thirty-two rows by forty-eight columns.

Well Column Position

The distance between the left outside edge of the plate and the center of the first column of wells shall be 11.005 mm (.4332 inches)
The left edge of the part will be defined as the two 12.7 mm areas (as measured from the corners) as specified in SBS-1
Each following column shall be an additional 2.25 mm (.0886 inches) in distance from the left outside edge of the plate.

Well Row Position
The distance between the top outside edge of the plate and the center of the first row of wells shall be 7.86 mm (.3094 inches)
The top edge of the part will be defined as the two 12.7 mm areas (as measured from the corners) as specified in SBS-1
Each following row shall be an additional 2.25 mm (.0886 inches) in distance from the top outside edge of

Positional Tolerance
The positional tolerance of the well centers will be specified using so called "True Position". The center of each well will be within a 0.71 mm (.0280 inch) diameter of the specified location. This tolerance will apply at "RFS" (regardless of feature size).

Well Markings
The top left well of the plate shall be marked in a distinguishing manner.
· The top left well of the plate can be marked with the letter A or numeral 1 located on the left-hand side of the well.
· The top left well of the plate can be marked with a numeral 1 located on the upper side of the well.
Additional markings may be provided.

Standard 5: Side Wall Rigidity

Rigidity
Using the apparatus described in Appendix XXX, the plate shall not deflect more than YYY mm when 3 pounds of force is applied.

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From: Popoloski, Marty J [mailto:PopoloskMJ@corning.com]
Sent: Wednesday, September 06, 2000 1:54 PM
To: 'SBS (Standards ListServer)'
Subject: SBS; Standards, 1536 well location

Hello all;

This message is to comment on the issue of the A1 well location on the 1536 well plates. My apologies for sending this out so late. I do hope some of you get this before the meeting.

We have already changes the footprint slightly to have the 96 well plate dimensions come out even, and we recommend that we continue with only the one footprint.

There are always ways to deal with gauge resolution and tolerances etc. Plastic parts are typically more difficult to measure (than metal) but that issue is the same no matter what the nominal dimension happens to be. This one reason we were so careful to specify the split Datums (i.e.: B-C and D-E) to locate the plates.

Common tools used to measure the well location on microplates (optical comparators, co-ordinate measuring machines, etc.) typically have a read out with a one or two micron resolution. Our first article inspections are typically done on equipment with either a 0.5 or a 0.25 micron resolution. As far as having the appropriate R&R (repeatability and reproducibility) on the gauging equipment, that is a factor that always needs to be considered when measuring any part. A one, a two, or a three place decimal dimension is irrelevant. It's the tolerance of the feature to be measured which needs to be considered.

Although it may be a rule that a three place decimal dimension requires a three place tolerance, there is nothing that prevents that tolerance from being any value the designer chooses to specify (e.g.: X.XXXmm +/-0.010mm has the same limits as X.XXX mm +/-0.01mm).

My experience has been that you always seem to run into trouble later on when you compromise the original design specifications. If we want the wells to be symmetrically located on the plate, then that is exactly what the design should say, even if it brings the nominal dimension to the nearest micron.

Best regards, Marty