Procedural Review Voting Sheet
2012 Cycle 4

REGION: NA
COMMITTEE: PV Materials
EVENT: Intersolar North America
DATE OF MEETING: July 11, 2012
PLACE OF MEETING: Moscone Center, San Francisco, CA
COMMITTEE CO-CHAIRS: John Valley (MEMC)
SEMI STAFF: Kevin Nguyen

A&R Voter: Name/Company
Date: 200X/MM/DD

I. Document Number & Title

5158A	New Standard: Specification for Anti-Reflective-Coated Glass, Used in Crystalline Silicon Photovoltaic Modules

II. Tally (Staff to fill in)

Voting Tally: As-cast tally after close of voting period

A minimum of 60% of the voting interests that have voting members within the technical committee must return votes. (Regulations ¶ 9.6.1)

	Return		Distribution		Return Rate	
Yellow	45	÷	74	=	60.8%	>=60%
Lilac & Others	35					
Total Vote	80					
Reject	6					
Accept	21					

A&R	☐ Not approved
	Reason:

III. Rejects

Jay Lin (PV Guider)

Negative 1 of Reject 1

Negative	Referenced Section	*TF/Committee to fill in if necessary		
	Reason	AR glass is associated with PID effect, PID test is suggested to be included in the standard.		
Withdrawal		x	No withdrawal made	GO TO "Related" section
			Withdrawal document received by staff on XXXX	GO TO "Final" → (A)
Related	Motion and Reason		"Related" is mutually agreed upon.	
			*This motion can be appended to the motion for Persuasive (See Persuasive Section)	
			Negative is related (needs over 1/3 votes to pass)	
			Negative is not related (needs 2/3 or more votes to pass)	
			Reason: XXXX	
	Motion by/2nd by	Name (Company)/Name (Company)		
	Discussion			
	Result of Vote (check ONE)	XX-XX		
			[Negative is related] > 1/3	GO TO "Persuasive"
			[Negative is not related] < 2/3	
			2/3=< [Negative is not related]	GO TO "Final" → (B)
Persuasive	Motion and Reason	x	Negative is related and persuasive (needs over 1/3 votes to pass)	
			Negative is related and not persuasive (needs 2/3 or more votes to pass)	
			Reason: XXXX	
	Motion by/2nd by	Peter Wagner (Self)/George Kelly (Safe Solar)		
	Discussion	In effort of convincing PV Materials committee members in overturning PV Guider reject and others, Jerry Liu (Suntech) presented slides for justification. See slides attached below. The committee's general consensus appears that more works need to be done. For improvement, the ballot in its current form needs additional content or reduce its scope. This specification has incomplete test method as called out in this negative. To get around this, it was suggested having Test Method to be determined by user and supplier. Also, some SEMI specification does not required test methods. The Working Group was suggested using SEMI PV22-1011 Specification for Silicon Wafers for Use in Photovoltaic Solar Cells as the format for writing specification.  20120711 Doc.5158.pptx		

	Result of Vote (check ONE)	10/1		
		x	[Negative is related and persuasive] > 1/3	**GO TO "Final" → (E)**
			[Negative is related and not persuasive] < 2/3	
			2/3=<[Negative is related and not persuasive] <90%	**GO TO "Final" → (C)**
			90% =< [Negative is related and not persuasive]	**GO TO "Not Significant Finding Option"**
Not Significant Finding Option	**This option can only be used "if the committee finds a negative not persuasive by a vote equal to or greater than 90% of the persons voting on the action". (Regulations ¶ 9.5.3.3.2)**			
	[redacted]		It is mutually agreed upon to term the negative "not significant"	**GO TO → (D)**
			It is mutually agreed upon to term the negative "significant"	**GO TO → (C)**
	Motion		The negative is "not significant".	
	Motion by/2nd by	Name (Company)/Name (Company)		
	Vote		XX-XX Motion passed with simple majority	**GO TO → (D)**
			XX-XX Motion failed with simple majority	**GO TO → (C)**
	Final	Negative is:		
			(A) withdrawn (counted under **h** in disposition)	
			(B) not related (counted under **i** in disposition)	
			(C) related and not persuasive (significant)	
			(D) not significant (counted under **j** in disposition)	
		x	**(E)** related and persuasive	**DOCUMENT FAILS**
			Comment generated. See comment #x	
A&R		**Not approved**		
		Reason:		

All other rejects from other voters

Name: * Jay Lin
Company: * PV Guider

Reject

The first issue PV module manufactures concern is the conveyor marks on the surface of the glass, but it is not included in the standard. Is it possible to include the inspection method and criteria in the standard?

2. Another issue is the color uniformity of the module surface. Some glasses with local non-uniformity within one module, some with color difference from module to module (see picture attached). It is important to inspect the uniformity and color difference.

3. AR glass is associated with PID effect, PID test is suggested to be included in the standard.

4. The Note 3 in 7.4 indicates 'The test method and instrument of transmittance are determined by the user and supplier', then there is no need to have this standard. You should at least propose a method as a standard, otherwise the result can be very different, and the criteria is meaningless. By the way, where is the 93.5% from? Any theoretical or experimental data?

5. The standard is for 'silicon module', the transmittance should consider silicon technology more. For example, the spectrum response of silicon cells is high from 600 to 1000nm, the criteria uses T380-1100 is a little too wide in wavelength. What if you have a glass with high transmittance from 380 to 600nm but low in other range, the T380-1100 will be good but actually not so good for silicon cells.

Shall you need any further discussion, here is my contact,
Jay Lin
Chief Consultant/ PV Guider

Comments about
5158A from PV Guide

Name: * John Valley
Company: * MEMC

Reject

1) Limitations should be addressed, for example "AR transmission performance specification is based on a test method that may permit the existence of small areas that do not meet the transmission specification, such as those caused by micro-defects." There are likely some other limitations that are well known to experts in this practice.
2) Note 4 specifies glass thickness less than 5 mm while Table 2 specifies glass thickness range of 2 - 6 microns. A consistent thickness specification should be used.

Name: * Martin Holzbecher
Company: * **Interfloat Corp.**

Reject

4.1 BS Standard
Not appropriate for PV modules. BS 6206 is not valid anymore and has been replaced by EN 12600.

4.4 ISO Standards
Why are ISO-Standards for "Paints and Varnishes" used for AR-glass judgment?

In general
- all requirements which are independent of the AR-coating should be deleted. The standard is meant to be a "coating" standard for PV and not a glass standard. In Detail that is: 7.1, 7.3, 7.14, 7.15, 7.16, 7.17 .
- most of the durability test come from other materials and were made for other purposes. How is assured that the results (and limits set) of the different tests do simulate the behavior in the fields over years and represent the safety for the duration of the exposure time.

7.3 Surface flatness
Not appropriate to over specify the product. Parameter is not relevant for quality but reduces through-put and hence increases cost for glass manufacturing disproportional.

7.4 Optical properties
Type of glass (float/patterned) must be named clearly. Accuracy of measurement is not assured enough. Chosen transmittance measurement is not suitable for PV purposes. SPF Institute (Switzer-land) has just released a new measurement and certifying method for PV glass. We suggest binding on that.

7.5 Hardness
Pencil hardness test is seen as a very subjective test (even in the standard), with questionable rele-vance towards solar application. It has been abandoned in automotive industry already.

7.6 Scrub resistance
Suggested scrubbing is 10 times more than the standard. Why? What shall be tested/stated with it? Relevance on structured glass is questionable. Statically transmittance measurement is necessary over the whole scrubbed area.

7.7 Water resistance
Samples conditioning is not specified.

7.8 Acid resistance
Acid concentration is higher that ISO-standard. What is the purpose?

7.9 Salt spray resistance
ISO 7253 not valid anymore and has been replaced by EN 1096-2.

7.14 Impact resistance
This SEMI Standard is for AR-glass, the mentioned test is useful for PV modules; for both the impact resistance is independent of AR-coatings. Furthermore steel balls are not appropriate test for impact (as already written in EN 12975-2). A more realistic test would be ice ball test. Also supporting fixture as well as dimension of glass is far away from realistic modules. The behavior of this combination will be completely different than a module.

7.16 Shot bag impact resistance
Same as 7.14; suitable for PV-modules, not for AR-coatings.

Name: * Kornelia Matloka
Company: * DSM

Reject

20120627 SEMI5158A_DSM.pdf

Name: * Jan Vedde
Company: * Elkem Solar

Reject

Despite a good progress I do not think this standard is ready for publication yet.
Several issues need to be clarified.
I must have overlooked the fact that the allowed transmission degradation in 7.11 and others can be up to 1.5% - for me this seems to be much too high and it must be clarified if this really can be accepted. It seems like we accept degradation where the ARC has been fully removed.

I still need a better clarification of the type of glass to which this standard apply. Both flat glass and structured and patterned.
I also think it's not clear if we can adopt the same standard for single and double side coated glass. In case the back side of the glass corrodes – with no impact on the coated front side – the glass fails. However as the glass will be protected on the inner side when used in a PV module this should not be important. I think we need to clarify this point.
Then I've also learned that the company DSM has raised some questions regarding Hardness and Scrub resistance that we need to address. And they also comment on the missing specification of water purity in the cleaning progress.
Finally I still find it relevant to introduce different classes of glass based on the overall transmission as an alternative to the actual Pass/Fail distinction.

Best regards
Jan Vedde
Vetro Solar

Name: * Christopher Barry

Company: * Pilkington NA Inc

Reject

5158A goes beyond its scope of Anti-Reflective coated glass.
The "Requirements" do not adequately take into account the beneficial diffuse plus the direct transmission requirements of some products for some CdTl coatings.
The "Requirements" are beyond the accuracy readily attainable for diffuse transmission properties.
We can elaborate at the 7/11 meeting.

Name: * Yu Yang

Company: * **1st Solar**

Abstain with comment

Thanks for the documents. Here are several comments/questions:
1) ISO 15184 (pencil hardness) is referred for hardness measurement. However, it is not practical to measure 3H pencil hardness because ARC is very thin (typically < 150nm) and transparent.
2) Neutral salt spray (fog) test standard ISO 7253 is superseded by ISO 9227:2012.
3) Is there any reference for impact resistance test (7.14)? If not, how/who developed the procedure, and whoelse has tested?

Name: * michael buchanan

Company: * PPG Industries

Abstain with comment
Section 7.4 - as I have mentioned in the past, T380-1100 of 93.5% doesn't seem like a reasonable number based on our measurements (it is too high). It could be an instrument issue, as I have heard that European and Asian companies typically measure higher in transmittance than we do. I would favor not including a T380-1100 cutoff in the SEMI standard. Just provide the calculation method and let the user and supplier specify what the value should be.

In section 7.5 - I don't have experience with this, but I would imagine that measuring the pencil hardness of a coating on patterned glass would be problematic. The use of pencil hardness would seem to be restricted to coated float glass only (flat surface).

IX. Action for this document

Motion		This document passed committee review as balloted and will be forwarded to the A&R for procedural review.
		This document passed committee review with editorial changes and will be forwarded to the A&R for procedural review.
	x	This document failed committee review and will be returned to the task force for rework.
		This document failed committee review and work will be discontinued.
Motion by/2nd by		Peter Wagner (Self)/George Kelly (Safe Solar)
Discussion		In order to build consensus, the Working Group encouraged voters to provide constructive feedback, direction and guidance in moving forward.
Vote		10-1
Final Action	x	Motion passed
		Motion failed
A&R		**Approved**
		Not approved
		Reason: