Attachments Energy Rating Council
AERC

AERC Materials Manufacturer Informational Webinar

September 2017

Agenda

- Introductions
- Background and Progress
- Terminology
- Technical Background and Structure
- CGDB Background
- Submission Process
- Recertification
- Existing Listings
- Next Steps

Attachments Energy Rating Council
AERC

Background

What is AERC?

AERC is a DOE-funded, independent, **public interest** organization whose mission is to **rate, label and certify** the **energy performance** of **window attachments**.

AERC members include:

- Window attachment product and component manufacturers
- Public Interest Groups
- National Labs
- Commercial Labs
- Efficiency Organizations and Utilities

Project Partners

- U.S. Department of Energy
- Kellen Company
- D+R International
- Lawrence Berkeley National Laboratory
- Intertek

AERC Program Goals

- Deliver **energy performance-based rating and certification standards** and procedures for residential and commercial fenestration attachments.
- Provide a public website and database of **fenestration attachment product performance**.

Organizational Background

- Organization formed Fall 2014
- Focus on developing technical and certification standards for residential window attachments
- Developing residential product label and consumer-facing certified product database and website
- Board is majority public-interest

Attachments Energy Rating Council
AERC

Phased Prioritization of Ratings

Attachment	Product Category Major Sub-Types				Product Phase
	Interior	Exterior	Fixed	Operable	
Cellular Shades	X			X	1
Slat Shades	X			X	1
Roller Shades	X			X	1
Storm Windows	X	X	X	X	1
Solar Screens		X	X		1*
Pleated Shades	X			X	1*
Awnings		X	X	X	2
Roller Shutters		X		X	2
Window Quilts	X			X	2
Drapes	X			X	3
Louvered Shutters	X	X		X	3
Roman Shades	X			X	3
Surface Applied Films	X	X	X		If needed
Sheer Shades	X			X	If needed

Big Picture Goals – Year 3

- Launch EP Software Tool – Fall 2017
- Certify Products – Fall 2017
- Certified Products Database and Website launch – Fall 2017
- Label in stores— Winter 2017
- Public Education – On-going

Attachments Energy Rating Council
AERC

Terminology

Attachments Energy Rating Council
AERC

Product Terminology

Product Terminology

- Substrate Material
  - The primary material component in an attachment composing the majority of the effects on blocking light and thermal energy which is also a selectable input originating in the CGDB, IGDB, or NFRC 101, as appropriate for the material.
  - Examples: woven fabric  wood 

Product Terminology

- Attachment Product
  - An individual assembled fenestration covering product attached to fenestration, or attached to or near the perimeter of the inner or outer wall surrounding fenestration
  - Refers to an individual product configuration
    - See AERC 1, Section 5.2

Attachments Energy Rating Council
AERC

Manufacturer Terminology

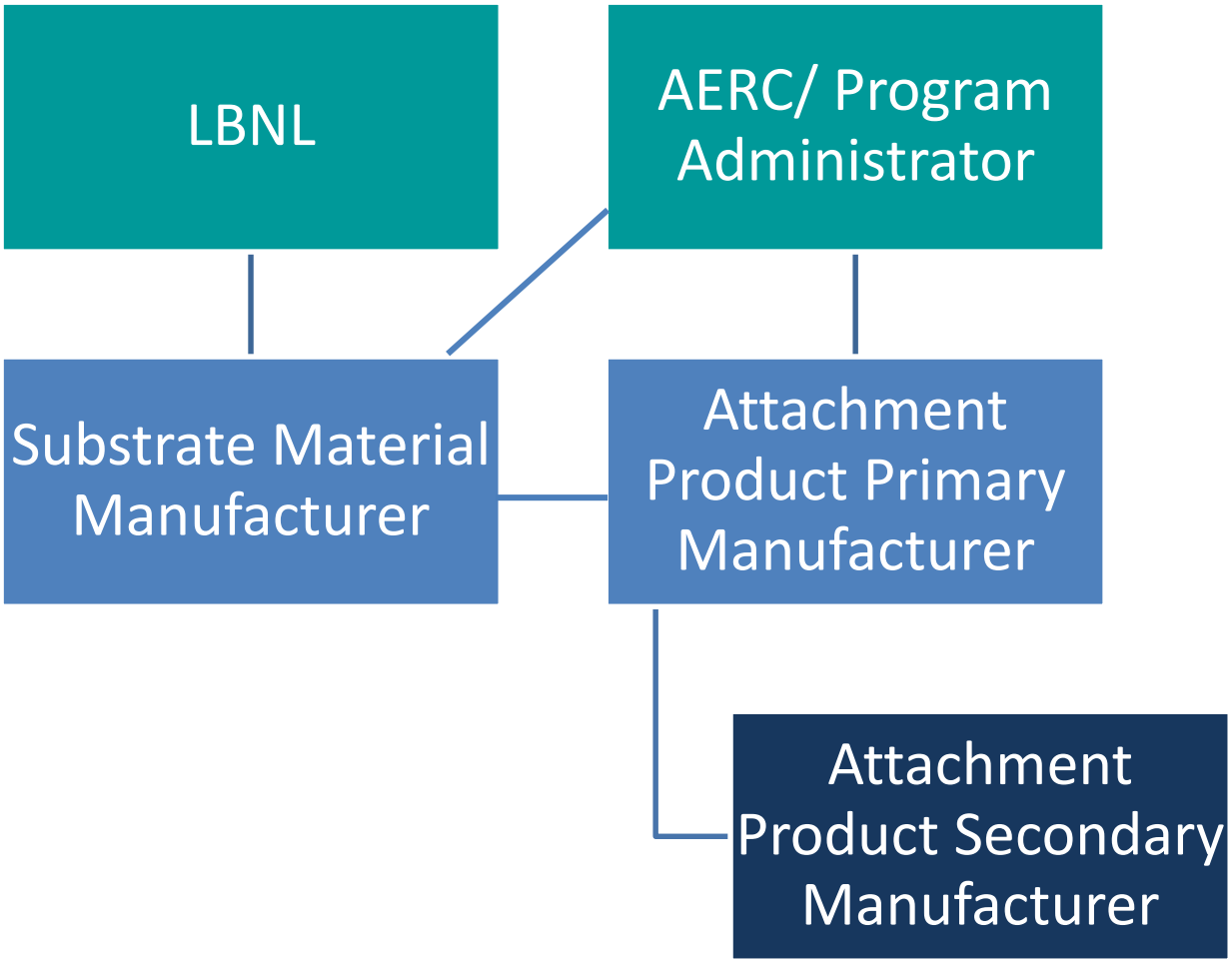
Manufacturer Distinctions

- Substrate Material Manufacturer
  - An entity that manufactures Substrate Materials
- Attachment Product Manufacturer
  - An entity that either directly manufactures/ assembles components and materials into a complete attachment product under license (Primary Manufacturer) or purchases the right to re-brand another manufacturer's products under their own name (as Secondary Manufacturer)

Attachment Manufacturers

- Primary Manufacturer:
  - An entity that qualifies products under their own name and designs or under license
- Secondary Manufacturer:
  - Acquires listings derived from the listings of a Primary Manufacturer. They are derived from the foundational Primary Listing and are subservient, limited versions thereof.
  - Status of their listings are dependent on the Primary Listing status

Manufacturer Relationships



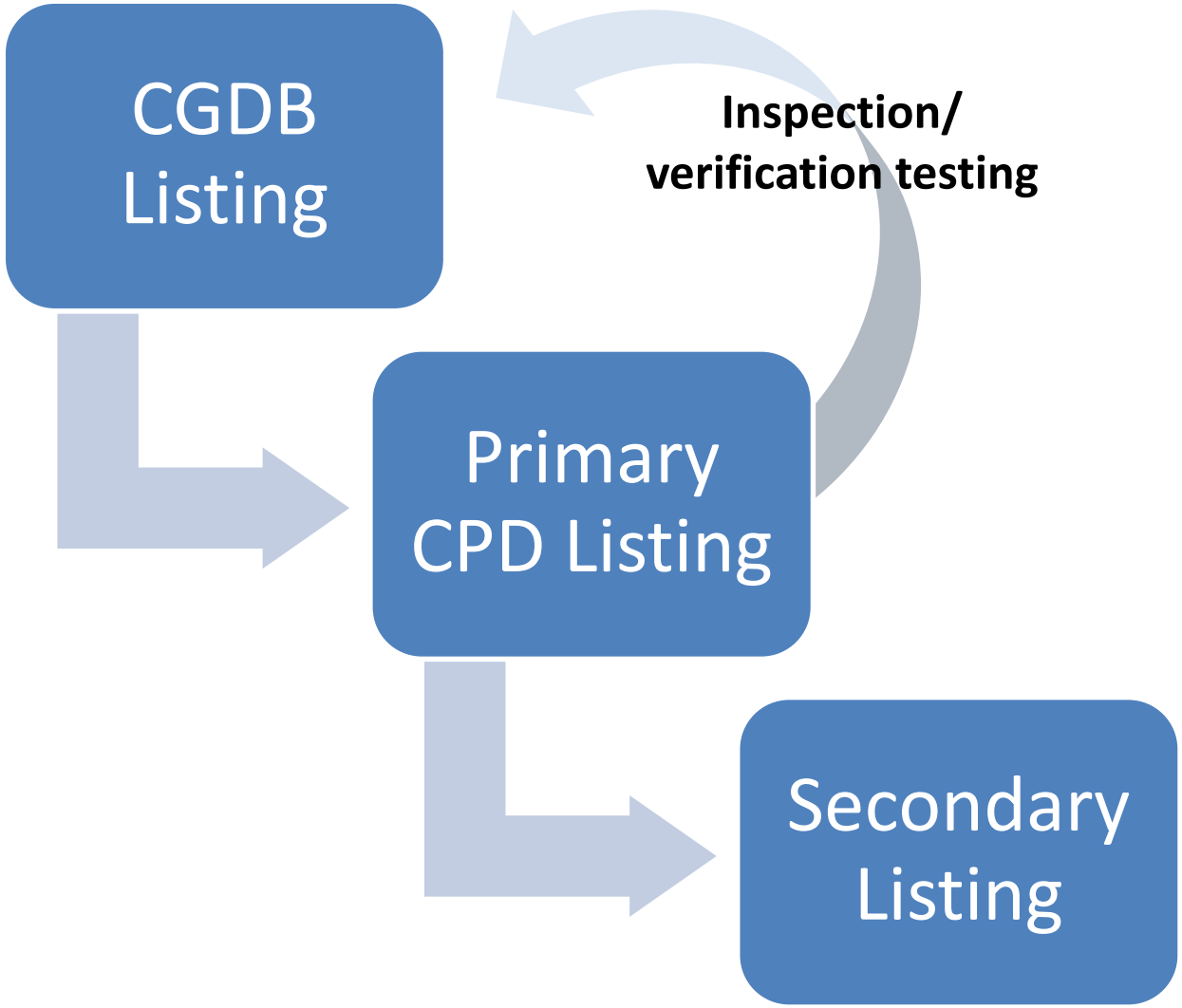
Attachments Energy Rating Council
AERC

Listing Terminology

CGDB v. CPD

- Complex Glazing Database (CGDB) Listing
  - A single, completely unique substrate tested in accordance with AERC 1.1 and submitted, reviewed, and accepted into the CGDB.
    - Example: Fabric X White 123
- Certified Products Database (CPD) Listing
  - A single, completely unique attachment product configuration submitted through an Accepted Calculation Entity and accepted into the CPD.
    - Example: 3/4 inch Light Filtering Single Cell Cellular Shades

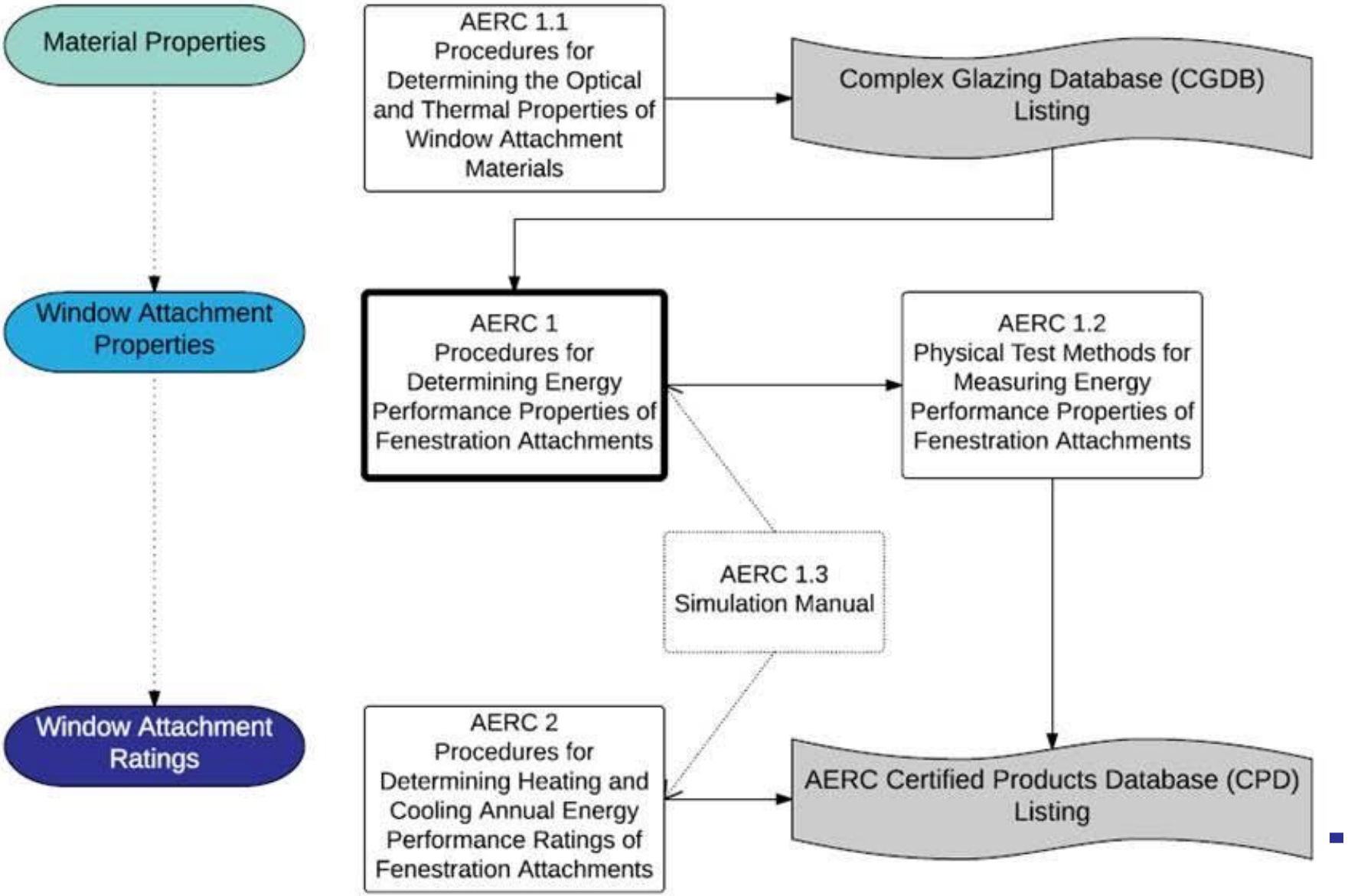
Listing Relationships



Attachments Energy Rating Council
AERC

Technical Background and Structure

Relevant Technical Standards



Technical Process Overview

Material Performance

- Tested according to AERC 1.1
- Entered in Complex Glazing Database (CGDB)

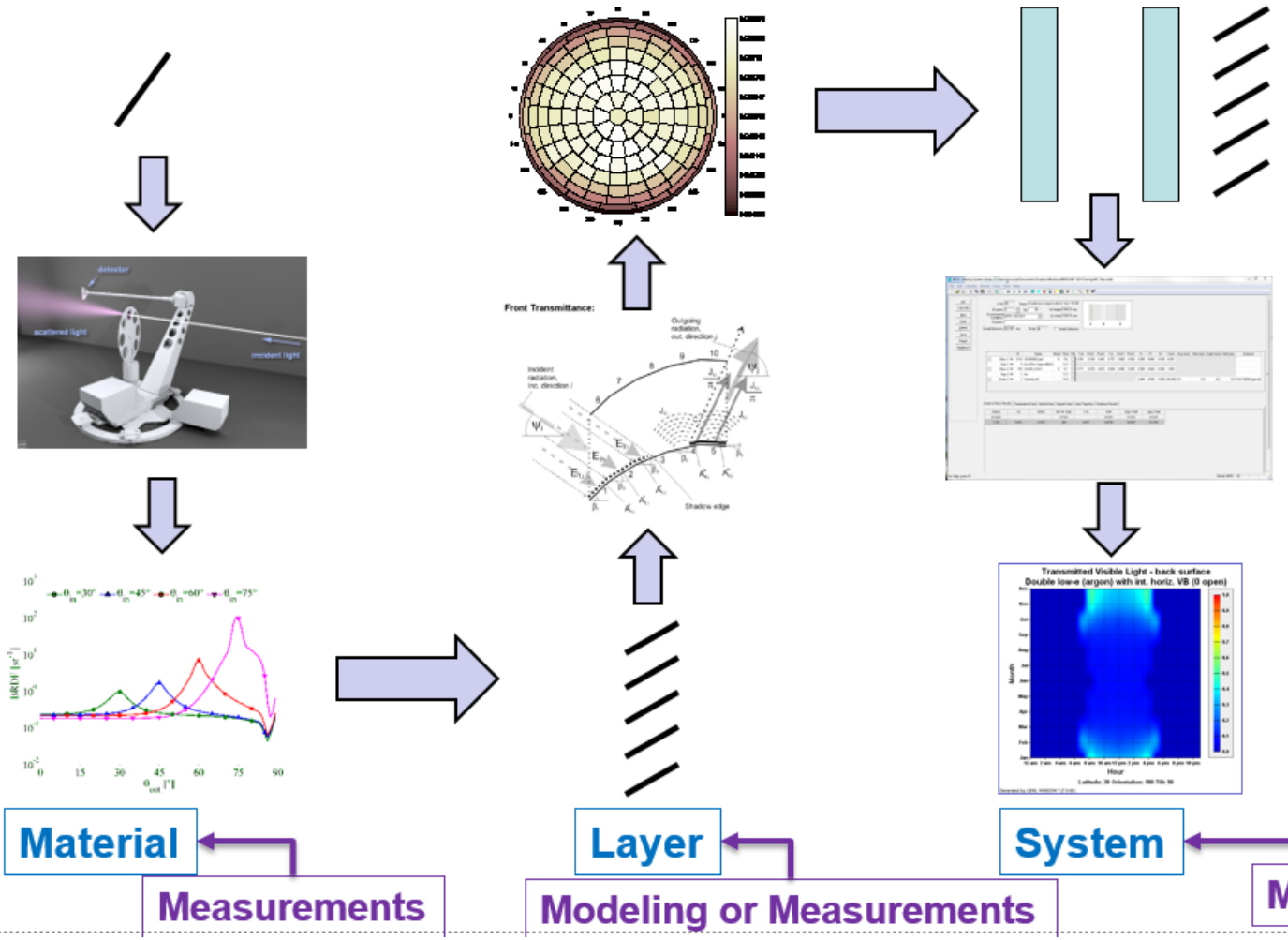
Product Performance

- Simulated according to AERC 1
- Determine U-Factor, SHGC, VT, and AL
- Software: WINDOW and THERM
- Entered in Certified Products Database (CPD)

Energy Performance

- Calculated according to AERC 2
- Determine Annual Energy Performance Rating for Heating and Cooling
- Software: AERCalc
- Entered in Certified Products Database

Technical Process Overview



AERC 1.1: Procedures for Determining the Optical and Thermal Properties of Window Attachment Materials

- Defines the technical procedures to determine the optical and thermal properties of materials used in fenestration attachments.

- Properties include:
  - Optical openness factor (OF)
  - Visible transmittance (Tvis)
  - Solar transmittance (Tsol)
  - Visible reflectance (Rvis)
  - Solar reflectance (Rsol)
  - Bi-directional scattering distribution function (BSDF)
  - Emissivity (Ɛ)
  - Infrared transmittance (Tir)
  - Permeability factor (PF)
  - Thermal conductivity (k)

AERC 1.1: Procedures for Determining the Optical and Thermal Properties of Window Attachment Materials

- The technical procedures of this standard apply to material types used in the following attachment product types:
  - *Exterior Shades* (e.g. exterior solar screens, exterior solar shades)
  - *Interior Blinds* (e.g. interior venetian blinds)
  - *Interior Shades: Insulating* (e.g. interior cellular shades)
  - *Interior Shades: Non-insulating* (e.g. interior roller shades, interior solar screens)

AERC 1: Procedures for Determining EP Properties of Fenestration Attachments

- Defines procedures for rating the energy performance properties of fenestration attachments
- Properties include:
  - U-factor
  - Solar heat gain coefficient (SHGC)
  - Visible transmittance (VT)
  - Air leakage (AL)

AERC 2: Procedures for Determining Heating and Cooling AEP Ratings of Fenestration Attachments

- Defines procedures for generating annual energy performance ratings (EP_H and EP_C) for fenestration attachments
- Rated for use in a model residential house through AERCalc software tool
- Defines EP values and meaning

Attachments Energy Rating Council
AERC

Complex Glazing Database (CGDB) Background

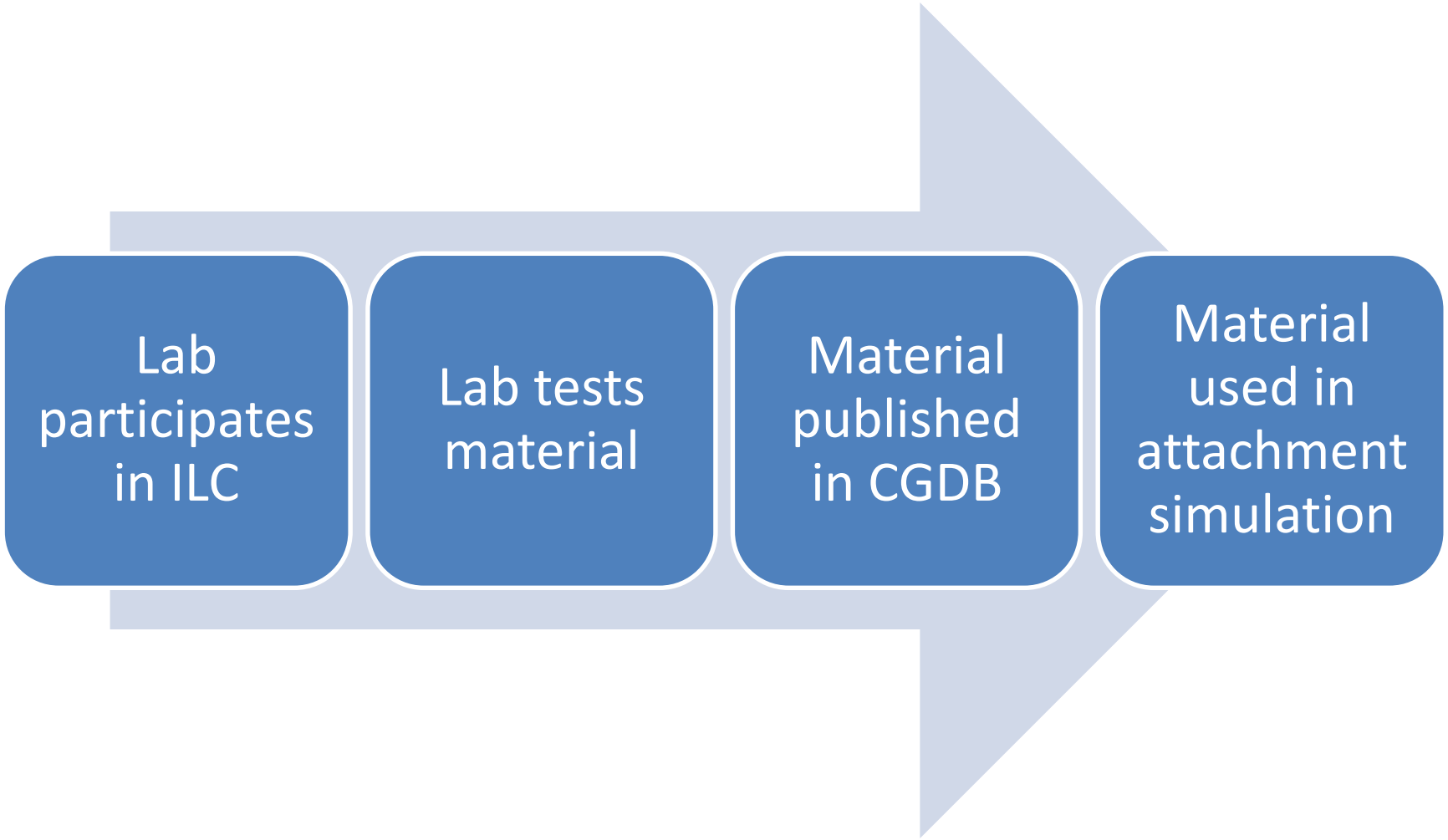
CGDB Background

- CGDB stores performance information for materials other than glazing
- International Glazing Database (IGDB) stores information on glazing
- LBNL administers both the CGDB (in coordination with AERC) and IGDB (in coordination with NFRC)
- CGDB currently has ~300 listings
- CGDB files accessed through WINDOW software

IGDB Provision

- Glazing systems can be added to the IGDB in accordance with all the provisions of NFRC 300
- Materials listed in the IGDB can also be used for simulation purposes for the AERC program
  - Assuming they fall within AERC 1 and definitional requirements

High Level Process



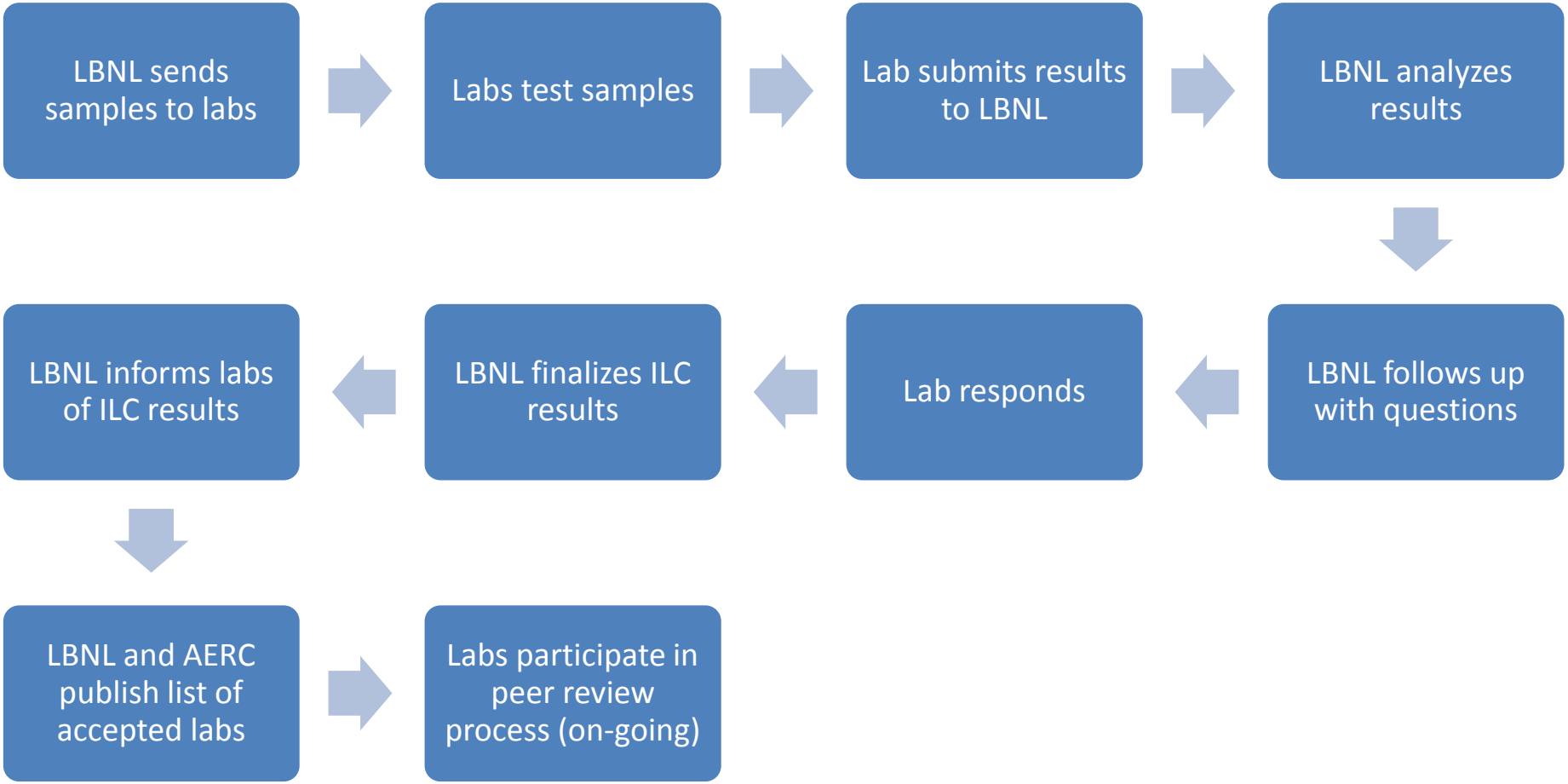
Attachments Energy Rating Council
AERC

Test Laboratories

Test Laboratories

- Must be approved as part of LBNL-run Inter-Lab Comparison (ILC) process to submit materials to CGDB
- ILC currently running and expected to be complete in November
- Manufacturer in-house labs can participate
- If interested in participating reach out to Jacob Jonsson (jcjonsson@lbnl.gov) as soon as possible

ILC Process


LBNL sends samples to labs
Labs test samples
Lab submits results to LBNL
LBNL analyzes results
LBNL follows up with questions
Lab responds
LBNL finalizes ILC results
LBNL informs labs of ILC results
LBNL and AERC publish list of accepted labs
Labs participate in peer review process (on-going)

Attachments Energy Rating Council
AERC

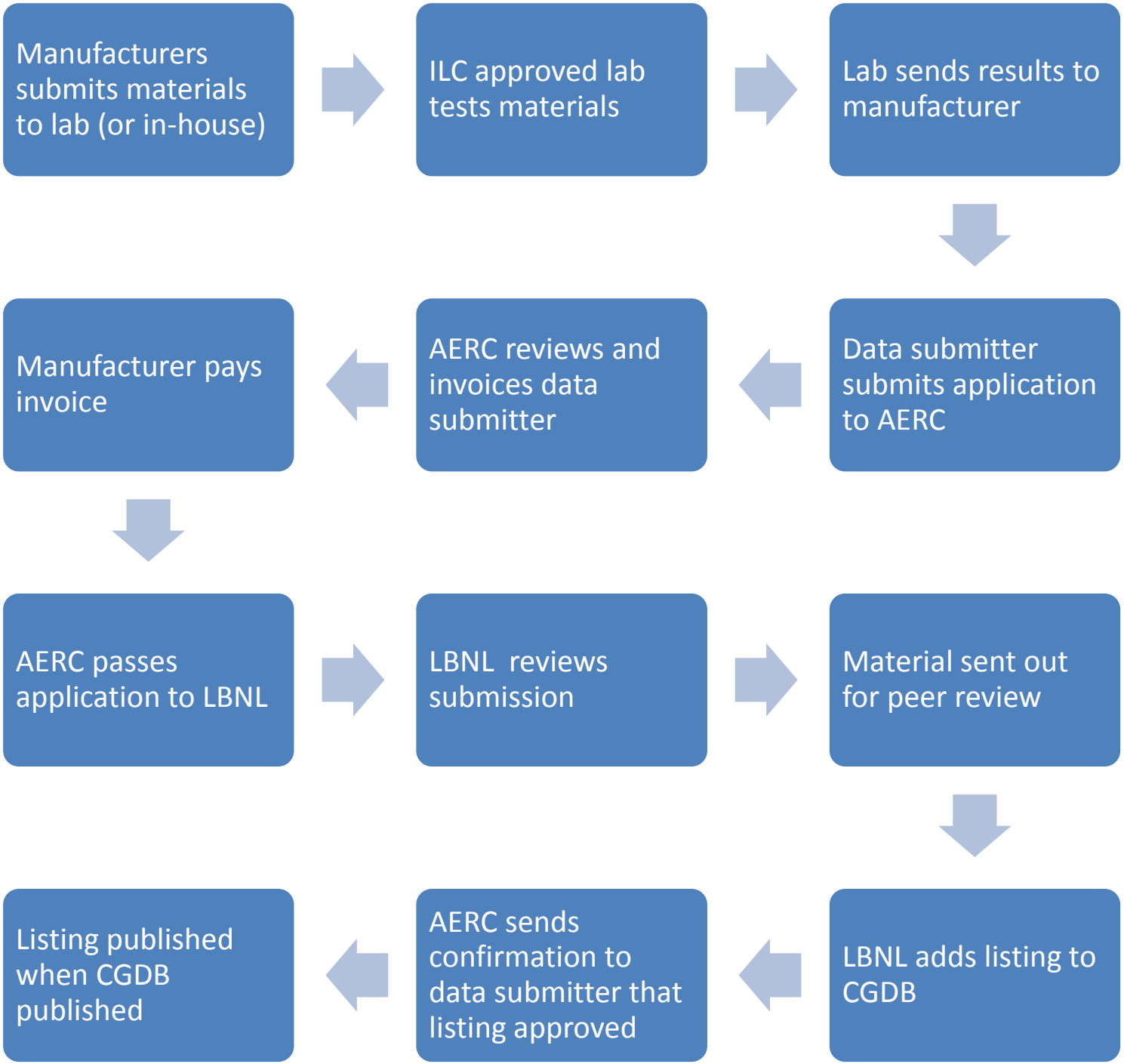
Material Submission Process

Material Submission Process

- Material **must** be listed in the CGDB before it can be used for full attachment simulation in WINDOW in accordance with AERC 1

Material Submission Roles

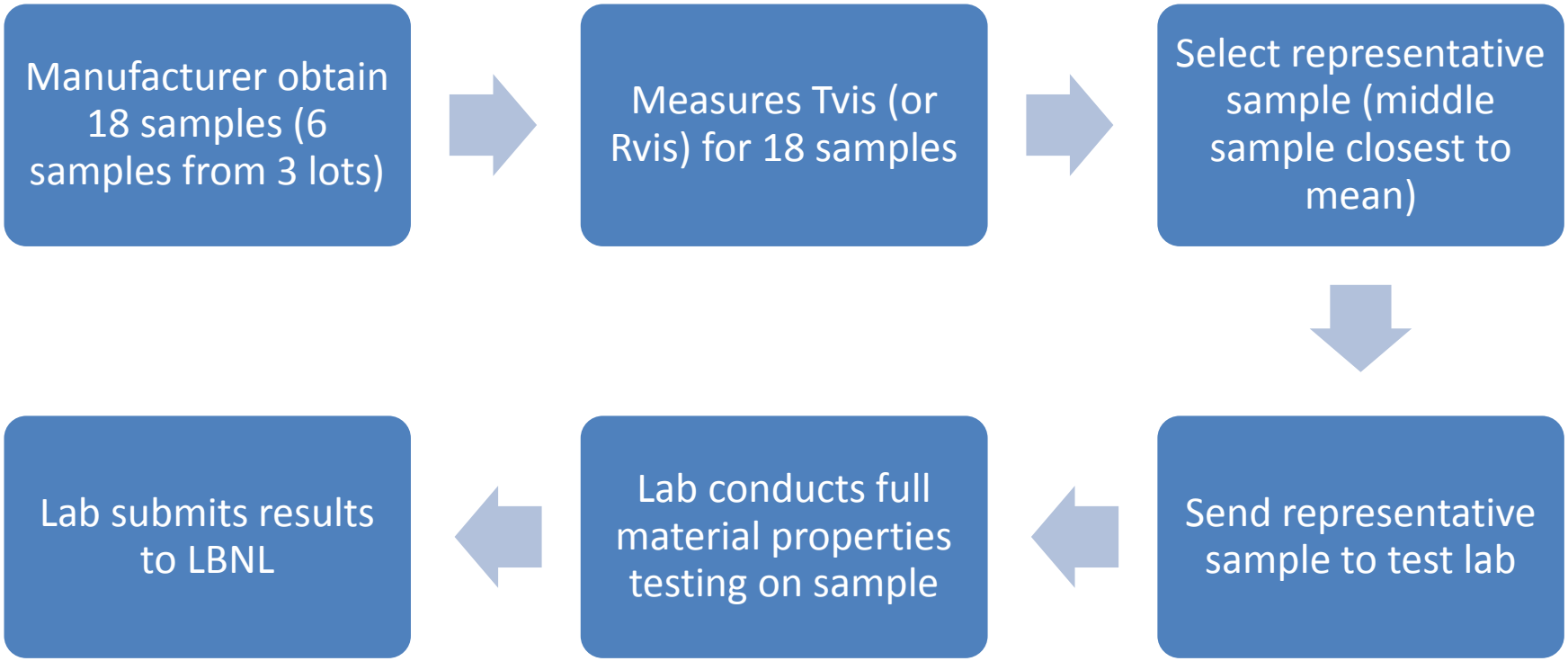
- Three entities relevant entities:
  - Manufacturer
  - Measurement Lab
  - Data Submitter
- All three can be a single organization
  - Manufacturer can also outsource measurement and data submission
  - Whoever is data submitter will be main point of contact for AERC/LBNL for CGDB interactions


Manufacturers submits materials to lab (or in-house)
ILC approved lab tests materials
Lab sends results to manufacturer
Data submitter submits application to AERC
AERC reviews and invoices data submitter
Manufacturer pays invoice
AERC passes application to LBNL
LBNL reviews submission
Material sent out for peer review
LBNL adds listing to CGDB
AERC sends confirmation to data submitter that listing approved
Listing published when CGDB published

Submission to Labs

- Manufacturers access list of ILC-approved labs on LBNL or AERC websites (or use ILC-approved in-house lab)
- Contact lab about testing materials and come to agreement
- After AERC 1.1 is approved and until ILC complete, LBNL will conduct any testing for CGDB submission
  - Likely November and December

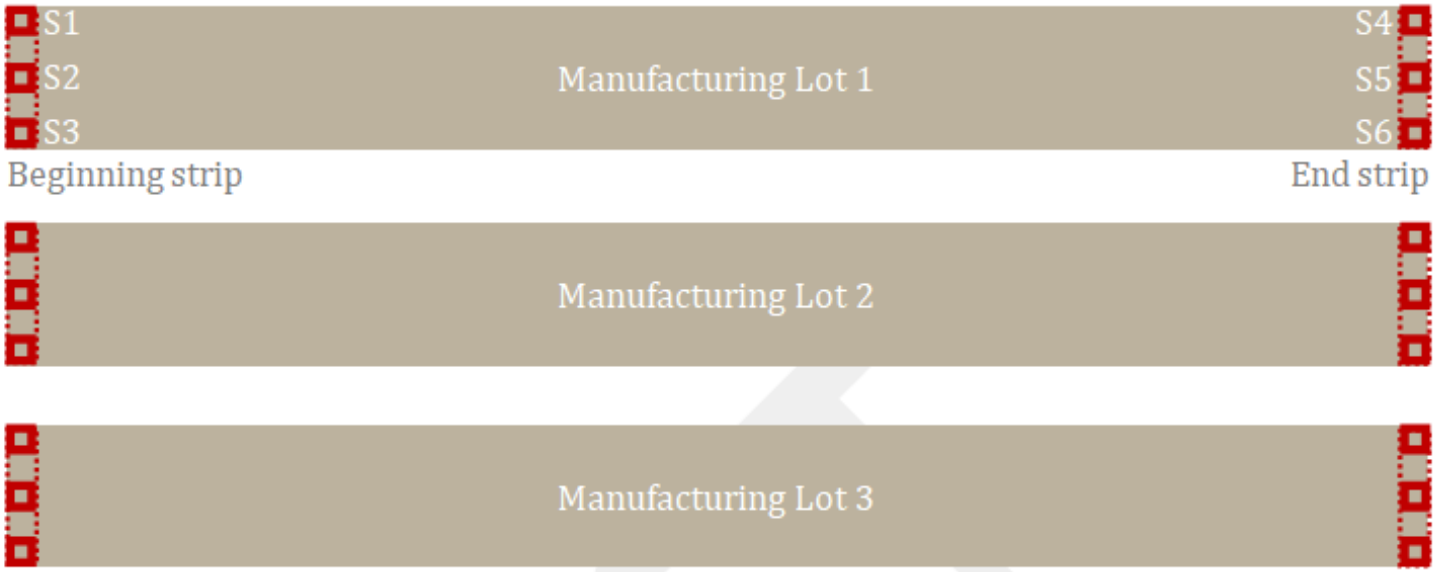
Testing Process



Submission to Labs

- For each material, submit or test in-house
  - 6 samples from 3 lots of material (18 total)

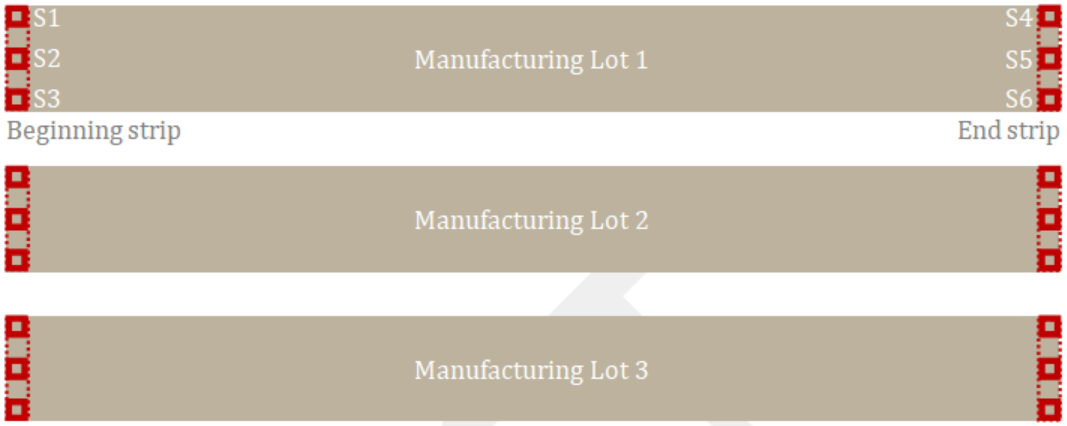
Figure 5.1.1.1a: Locations of test strips and material samples.



Submission to Labs

- If limited supply:
  - 6 samples from 1 lot of material initially
  - 12 samples from 2 other lots submitted within 18 months

Figure 5.1.1.1a: Locations of test strips and material samples.



Testing: Tvis

- Manufacturer or Lab tests 18 samples for Tvis (or Rvis) in-house using spectrometer
- Report results in Appendix B format

Manufacturer	<Indicate manufacture name as reported in CGDB>
Product Name	<Indicate product name as reported in CGDB>
Location of Sample Testing	<Indicate if initial sample testing was done by manufacturer or the test lab>
Spectrometer Type	<Provide manufacturer and model #>
Name of Test Lab	<Indicate the name of the AERC test lab that is submitting data for CGDB>

Section 1: Material Sampling Data

Sample #	Lot #	Position (l)	Position (w)	Tvis	Rvis	T/Rvis	Rank
1	**1**	**start**	**left**	**22.1%**	**40.1%**	**22.1%**	**10**
2	1	start	center	24.5%	39.5%	24.5%	1.5
3	1	start	right	24.5%	41.5%	24.5%	1.5
4	1	end	left	24.1%	42.1%	24.1%	4
5	1	end	center	24.3%	38.3%	24.3%	3
6	**1**	**end**	**right**	**22.4%**	**40.4%**	**22.4%**	**9**
7	2	start	left	20.4%	42.4%	20.4%	16.5
8	2	start	center	21.9%	39.9%	21.9%	12
9	2	start	right	19.7%	40.7%	19.7%	18
10	2	end	left	22.5%	41.5%	22.5%	8
11	2	end	center	23.0%	41.0%	23.0%	7
12	2	end	right	21.4%	39.4%	21.4%	13
13	3	start	left	21.0%	42.0%	21.0%	14
14	3	start	center	20.4%	38.4%	20.4%	16.5
15	3	start	right	23.7%	39.7%	23.7%	6
16	3	end	left	24.0%	40.0%	24.0%	5
17	3	end	center	22.0%	40.0%	22.0%	11
18	3	end	right	20.9%	41.9%	20.9%	15
				T/Rvis'=	**22.4%**	**22.4%**	
				Tolerance=	**19.0%**	**0.0%**	

Representative Sample

- If Tvis of all samples is less than 0.01, then Rvis shall be used to determine the representative sample (T/Rvis)
- From 18 samples, calculate 95% confidence interval of Tvis or Rvis
- The representative sample is selected by:
  - Rank the material samples by Tvis (or Rvis)
  - Choose the two samples at the center of the data set
  - Of the two samples, select the sample that is closest to the mean value of the data set. This sample will also be used as the “typical” sample for determining variability

Tvis Testing: Representative Sample

Manufacturer	<Indicate manufacture name as reported in CGDB>
Product Name	<Indicate product name as reported in CGDB>
Location of Sample Testing	<Indicate if initial sample testing was done by manufacturer or the test lab>
Spectrometer Type	<Provide manufacturer and model #>
Name of Test Lab	<Indicate the name of the AERC test lab that is submitting data for CGDB>

Section 1: Material Sampling Data

Sample #	Lot #	Position (l)	Position (w)	Tvis	Rvis	T/Rvis	Rank
1	**1**	**start**	**left**	**22.1%**	**40.1%**	**22.1%**	**10**
2	1	start	center	24.5%	39.5%	24.5%	1.5
3	1	start	right	24.5%	41.5%	24.5%	1.5
4	1	end	left	24.1%	42.1%	24.1%	4
5	1	end	center	24.3%	38.3%	24.3%	3
6	**1**	**end**	**right**	**22.4%**	**40.4%**	**22.4%**	**9**
7	2	start	left	20.4%	42.4%	20.4%	16.5
8	2	start	center	21.9%	39.9%	21.9%	12
9	2	start	right	19.7%	40.7%	19.7%	18
10	2	end	left	22.5%	41.5%	22.5%	8
11	2	end	center	23.0%	41.0%	23.0%	7
12	2	end	right	21.4%	39.4%	21.4%	13
13	3	start	left	21.0%	42.0%	21.0%	14
14	3	start	center	20.4%	38.4%	20.4%	16.5
15	3	start	right	23.7%	39.7%	23.7%	6
16	3	end	left	24.0%	40.0%	24.0%	5
17	3	end	center	22.0%	40.0%	22.0%	11
18	3	end	right	20.9%	41.9%	20.9%	15
				T/Rvis'=	**22.4%**	**22.4%**	
				Tolerance=	**19.0%**	**0.0%**	

Calculating Tolerance

Variance

$$\sigma_t = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(Tvis, i - Tvis')^2}$$

Confidence Interval

$$CI_t = 2.8 \times \sigma_t$$

Variability

$$TvT_t = \frac{CI_t}{Tvis'} \times 100\%$$

Reminder: Tvis is replace with Rvis for materials with low transmittance (<0.01)

- Calculate the confidence interval for samples
- This variability (TvT) will be reported in CGDB and used to determine:
  - Can reduced sampling be done of other materials in a product family
  - Can re-certification be completed without repeating testing

Full Sample Testing

- Representative sample submitted to test lab and tested for optical and thermal properties
- Samples shall be tested for solar and visible optical properties of:
  - OF, Tvis, Tsol, Rvis, Rsol
  - BSDF (optional)
  - Test methods detailed in Appendix C
  - Testing conducting using Scanning Spectrophotometer (e.g. Perkin-Elmer Lambda 900/950/1050)
  - Full spectral data must be submitted

Full Sample Testing

- Representative sample submitted to test lab and tested for optical and thermal properties
- Samples shall be tested for:
  - Ɛ and Tir
  - Testing conducted using Emissometer (e.g. Devices and Services AE-1)
- Test methods for determining these properties are outlined in Appendix E

Full Sample Testing

- **Thermal Conductivity (k)**
  - The thermal conductivity of the material product determined according to NFRC 101.
  - A proprietary value accepted if tested according to Section 3 in Appendix E .
- **Permeability Factor (PF)**
  - Permeability factor of a material is equal to the openness factor.
  - If any transparent coating or film is applied to base material that may reduce permeability with little to no change in openness factor
    - Permeability factor is zero if the material is coated or covered by an impermeable coating or a film.
    - Material product permeability determined based on ASTM D737 Standard Test Method for Air Permeability of Textile Fabrics and calculation procedure in Appendix F.

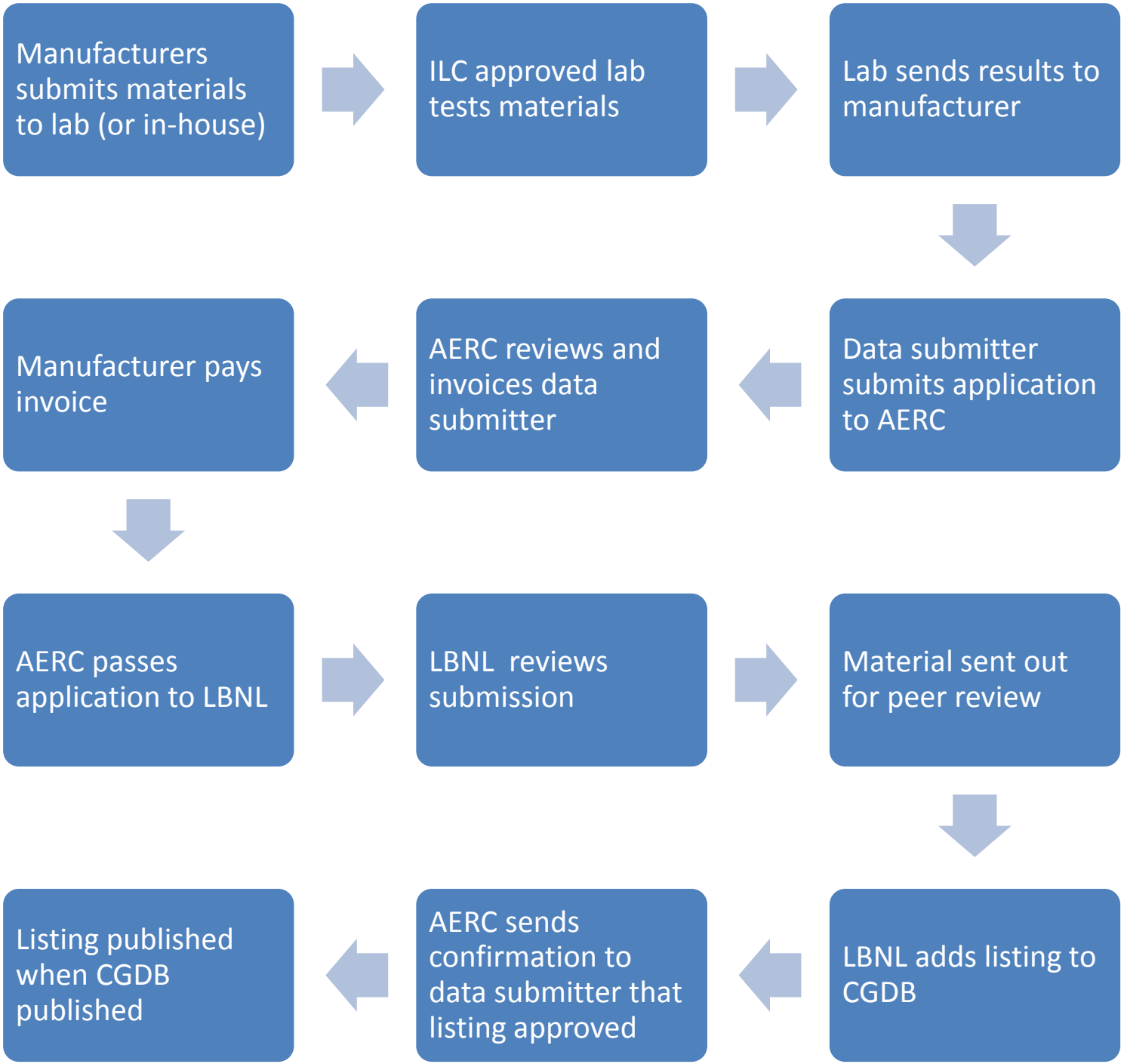
Simplified Sampling for a Family

1. Select two representative material products within the material product family
   - At least one light color and one dark color.
   - At least one product be chosen at both the lowest and highest OF listing.
2. Each material product shall be sampled (18 samples), tested (Tvis or Rvis only), and variability computed
3. If the variability of both products is less than defined limits, the remaining products in the family can skip the 18 sample variability test and choose any random sample as the representative sample
   - If Tvis (or Rvis) is greater or equal to 0.05: TvT limit = 20%
   - If Tvis (or Rvis) is less than 0.05: CI limit = 0.01
4. Only the properties of the representative sample is added to CGDB
   - TvT for these materials are entered as the max from

Reporting Checklist

APPENDIX G: REPORTING CHECKLIST

Single Product (Section 5.1.1)	Product in a Product Family (Section 5.1.2)
Using either 18 samples (full test) or 6 samples (temporary listing), provide: ☐ Tolerance report (Appendix D)	Using 18 samples each for 2 products within the family, provide: ☐ Tolerance report (Appendix D)
For representative sample (single sample) provide: ☐ Spectral transmittance data ☐ Spectral reflectance data ☐ BSDF data (optional) ☐ Emissivity ☐ Infrared transmittance data ☐ Thermal conductivity ☐ Permeability factor	For all products (single sample each) provide: ☐ Spectral transmittance data ☐ Spectral reflectance data ☐ BSDF data (optional) ☐ Emissivity ☐ Infrared transmittance data ☐ Thermal conductivity ☐ Permeability factor


Manufacturers submits materials to lab (or in-house)
ILC approved lab tests materials
Lab sends results to manufacturer
Data submitter submits application to AERC
AERC reviews and invoices data submitter
Manufacturer pays invoice
AERC passes application to LBNL
LBNL reviews submission
Material sent out for peer review
LBNL adds listing to CGDB
AERC sends confirmation to data submitter that listing approved
Listing published when CGDB published

AERC CGDB Application

- Manufacturer/Data Submitter:
  - Enrollment form (one-time only)
  - Submission sheet
    - Basic information: submitter, number of listings, test lab, etc.
    - Exact format forthcoming
  - Submit testing info in XML/JSON format
    - Format will be published by LBNL in coming months
- Find more information here: http://windowoptics.lbl.gov/data/cgdb

AERC Review

- AERC reviews submission for completeness and sends invoice to manufacturer based on number of listings
- CGDB participation includes three fee elements:
  - Participation fee
  - New submission fees
  - Annual listing fees

Attachments Energy Rating Council
AERC

CGDB Fees

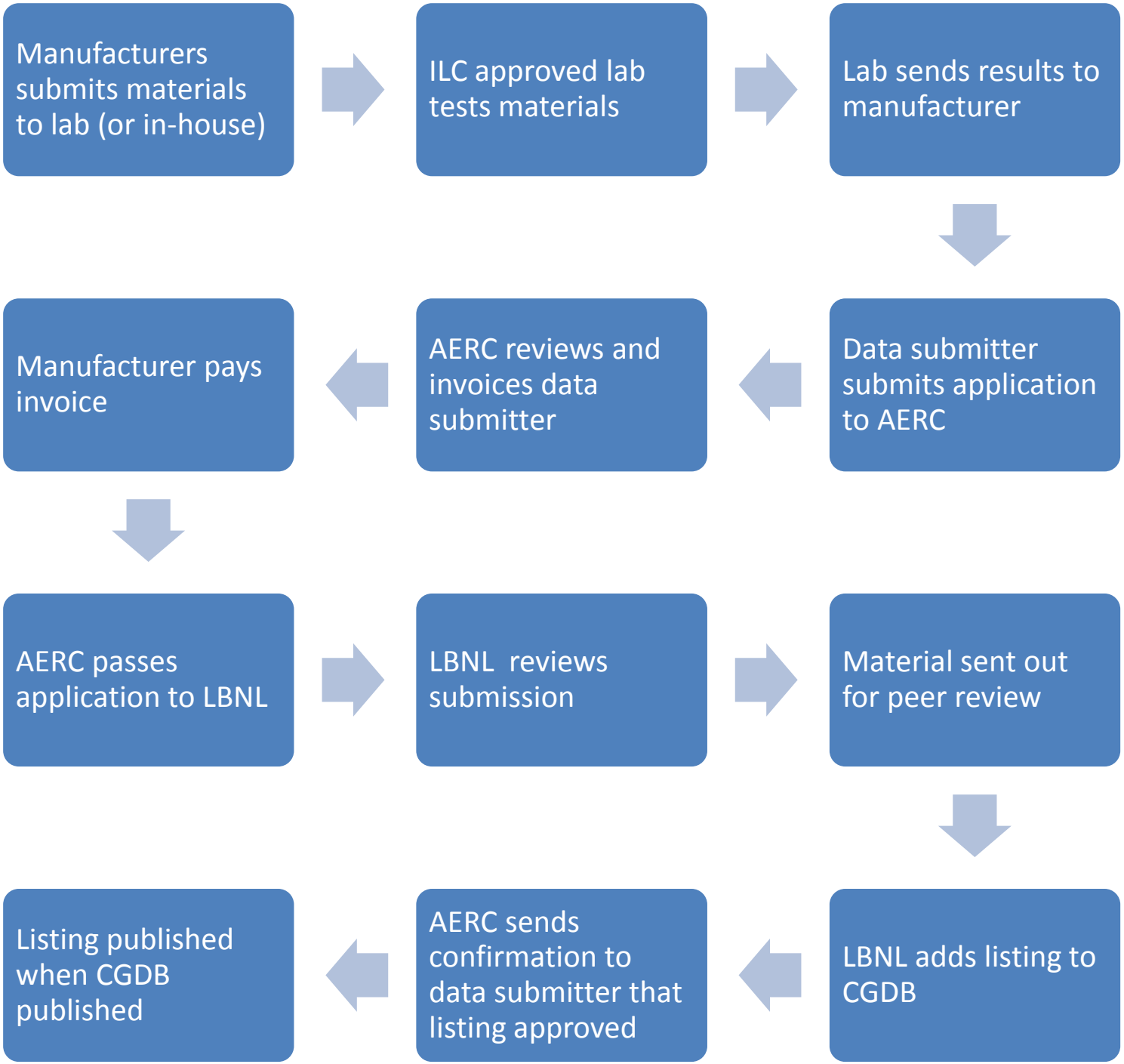
Fee Type	Sub-type	Member	Non-Member
Annual Manufacturer Participation Fee		$1,000	$4,000
New Submission Per Product Listing Fee*	1-50 Listings	$210	$300
	51-150 Listings	$170	$300
	151+ Listings	$90	$300
Annual Per Product Listing Fee**	1-50 Listings	$70	$200
	51-150 Listings	$55	$200
	151+ Listings	$30	$200
Editorial change fee		$50	$135

*Listing fee excludes cost of material testing. Covers first year listing costs.

**Covers annual per product listing fee after the first year and until a listing has to be updated with new performance information at which point a new submission fee would need to be paid.

CGDB Fees

- Manufacturers can submit letter and commit to submitting set number of listings per year to receive lower listing fee level
  - If do not submit minimum number by end of the year will be invoiced balance
- Subsidiaries considered part of parent entity
  - One participation fee for entire organization
    - Unless have separate memberships
  - Listing fee commitments counted as one block
- For administrative purposes will be responsible for designating and maintaining appropriate contacts


Manufacturers submits materials to lab (or in-house)
ILC approved lab tests materials
Lab sends results to manufacturer
Data submitter submits application to AERC
AERC reviews and invoices data submitter
Manufacturer pays invoice
AERC passes application to LBNL
LBNL reviews submission
Material sent out for peer review
LBNL adds listing to CGDB
AERC sends confirmation to data submitter that listing approved
Listing published when CGDB published

LBNL Submission Review

- Data submitted to LBNL is subjected to technical review to verify that
  - Data submitted in the correct format
  - All required properties are reported
  - Physical properties are within possible range

Peer Review Process

- A committee of peer reviewers will have access to the submitted results prior to release
- The committee will consist of:
  - Manufacturers
  - Scientists
  - Consultants
  - ILC Labs
- Questions about submitted samples will be resolved by LBNL
- If interested in joining peer review process let Jacob know

CGDB Publishing

- AERC and LBNL will release publishing schedule for CGBD
  - Plan to release new version approximately every two months
- Schedule will include cut-off dates for submission to be included in a particular CGDB release

Attachments Energy Rating Council
AERC

Recertification

Recertification Process

- Material properties must be **revalidated every three years**.
- WRITTEN AFFIRMATION ONLY:

  Fabrics that have not changed in terms of manufacturing methods, materials, and properties from their CGDB listing may submit a written affirmation to AERC proclaiming the product is unchanged from the original submission provided the following variance limits were met with the existing listing:

  - If Tvis (or Rvis) is greater or equal to 0.05: TvT limit = 20%
  - If Tvis (or Rvis) is less than 0.05: CI limit = 0.01

Recertification Process

- Material properties must be **revalidated every three years**.
- VISIBLE RE-TEST ONLY:

  If the tolerance limits were not met, then the material product must be re-tested for Tvis (or Rvis)

  – If Tvis (or Rvis) falls within the variance of the existing listing, then no updates are required

- FULL RE-TEST:

  If the affirmation cannot be met OR the visible retest does not fall within the variance of the existing listing

Attachments Energy Rating Council
AERC

Existing CGDB Listings

Existing CGDB Listings

- Materials that are currently listed in the CGDB (through v10) are permitted to remain in the CGDB for 1 year from the date of final Board approval of AERC 1.1
- After one year, any listings which have not gone through full AERC 1.1 testing (not simplified recertification process) and been resubmitted to LBNL for review and upload to the CGDB will be removed.
- LBNL and AERC will notify CGDB listing owners one month prior to removal.

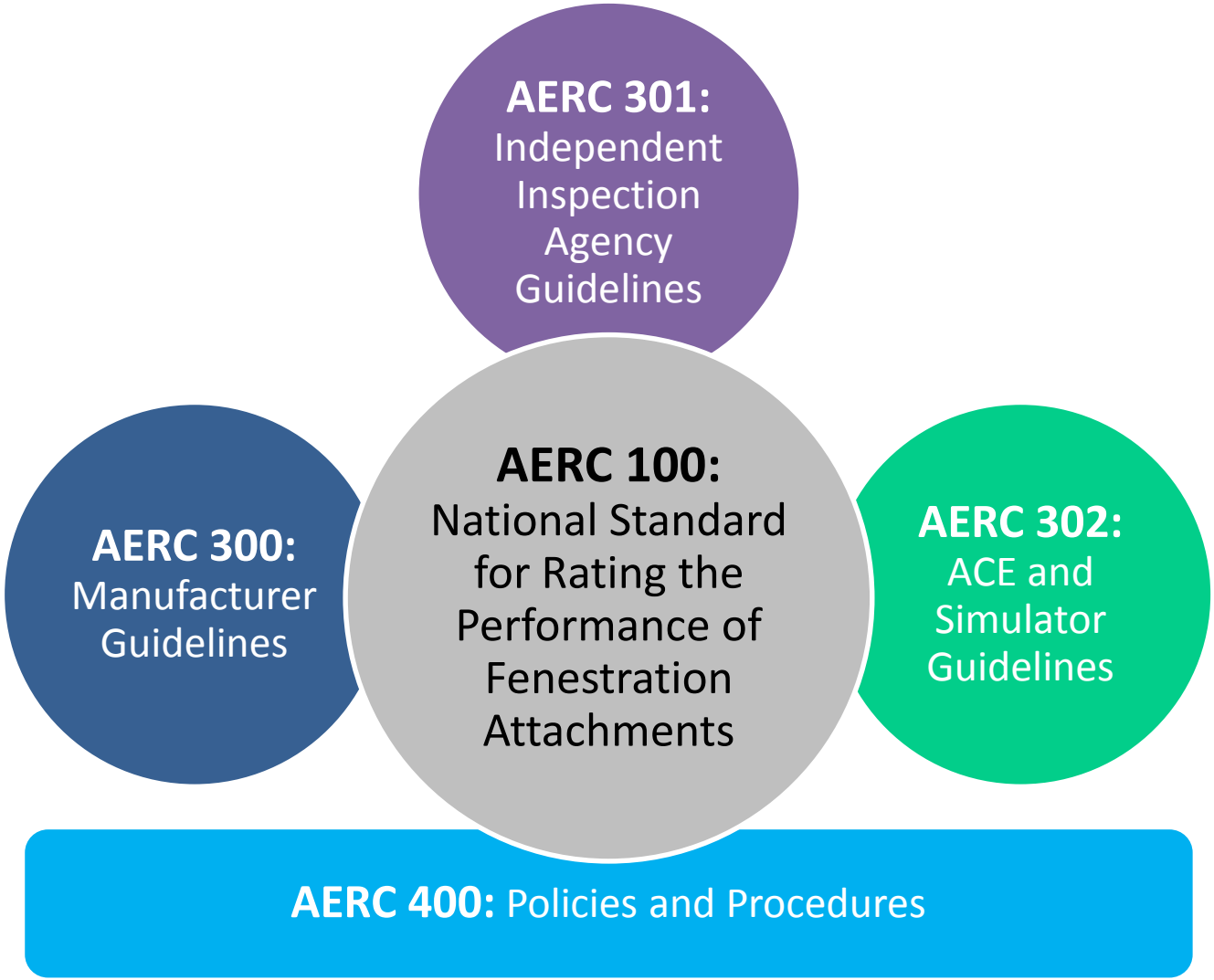
Existing CGDB Listings

- Full attachment products certified using a CGDB listing that has not been tested using AERC 1.1 procedures will need to be re-simulated and submitted within one year of final Board approval of AERC 1.1
  - Unless the manufacturer can demonstrate to the Program Administrator that the changes will produce a ≤ +/- 2.5 change for both the EP_C and EP_H rating.
- If the Administrator can confirm that the change is ≤ +/- 2.5 for both EP_C and EP_H then the original four year authorization for that product listing will remain.

Attachments Energy Rating Council
AERC

Relevant Certification Standards

Certification Standards to Reference



Challenges and Verification Testing

- Performance values for materials can be challenged according to AERC 400 Appendix D
  - Must have objective evidence
  - Board appointed for consideration
- Certified product undergo verification testing (AERC 400 Appendix H)
  - 5 fabric samples obtained and one undergoes physical testing
  - The material sample's visible light spectrum testing results must fall within +/- the value of the TvT of the reported Tvis of the *Material Group Representative*
  - Slightly different requirements for other material types

Attachments Energy Rating Council
AERC

Next Steps

Next Steps

- Short term: next 1-2 months
  - AERC staff will distribute PowerPoint
  - Enroll in ILC if interested in participating
  - AERC will announce once AERC 1.1 has passed
  - Contact LBNL about testing materials in interim
- Mid-term: next 2-3 months
  - AERC will announce ILC-validated labs
  - Contact test labs about conducting testing (or test in-house)

AERC Staff Contacts

Emily Phan Gruber – Program Manager
epgruber@drintl.com

Zach Koser – Program Coordinator
zkoser@kellencompany.com

Erika Burns – Technical and Certification Program Associate
eburns@drintl.com

Administrator Contacts (Intertek)

Karen Yetter – Program Manager
Karen.Yetter@intertek.com
(717) 764-7700

Randy Covington
Edward.Covington@intertek.com
(717) 764-7700

Karen Amspacher
Karen.Amspacher@intertek.com
(717) 764-7700

Attachments Energy Rating Council
AERC

LBNL Contacts

D. Charlie Curcija
dccurcija@lbl.gov

Jacob Jonsson
jcjonsson@lbl.gov

Robin Mitchell
rdmitchell@lbl.gov

Attachments Energy Rating Council
AERC

Thank you!

AERCnet.org