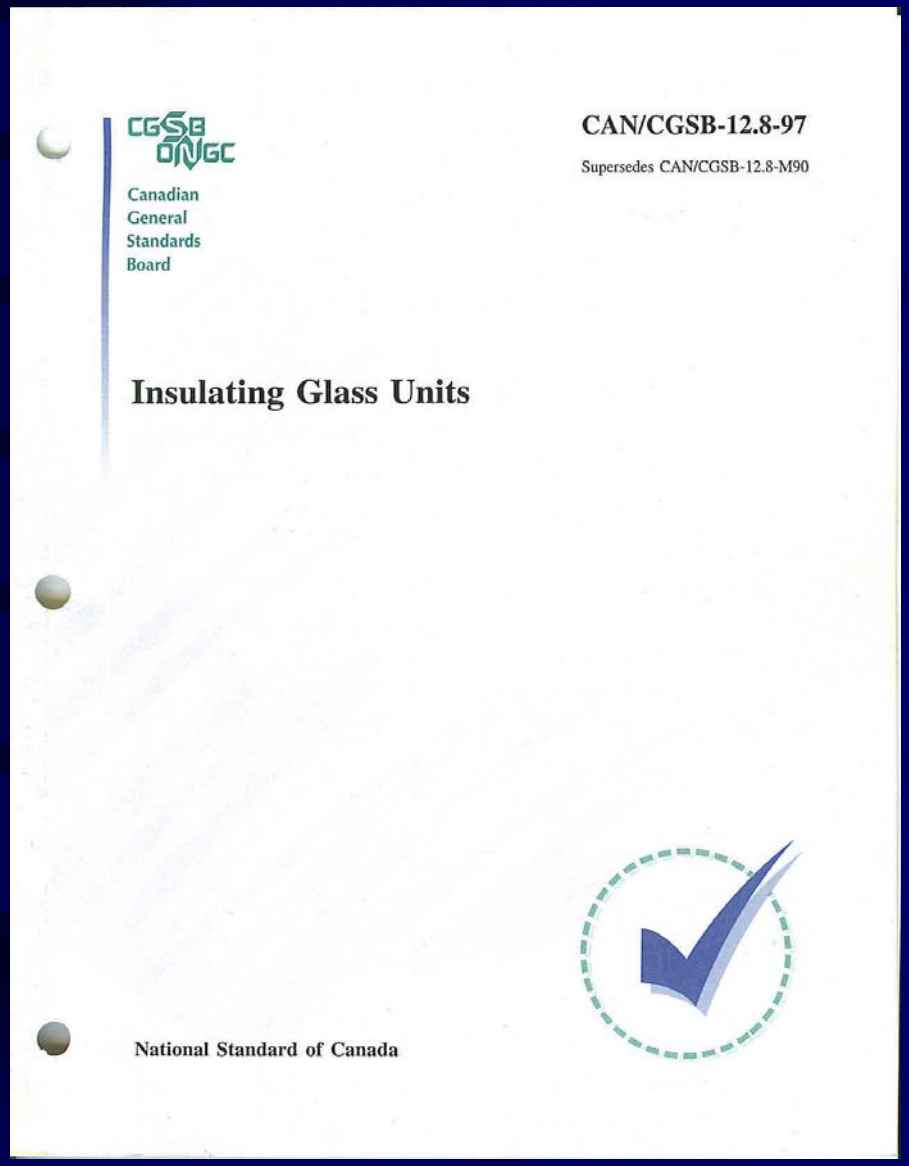
Performance Evaluation of **Insulating Glass Units**

By: Elie Alkhoury, M.Eng. (Building Science), P.Eng.

November 2005

Canadian Building Envelope Science and Technology
SCC & AAMA Accredited Laboratory
CAN-BEST
Established 1985



Canadian Building Envelope Science and Technology

SCC & AAMA Accredited Laboratory

CAN-BEST
Established 1985

Insulating Glass Units

CAN/CGSB-12.8-97

- **Set of 20 Specimens**
- **18 for testing, 2 spare**
- **350 x 500 mm**

Performance Requirements

- **Initial Seal**
- **Dew Point** (before and after cycling)
- **Argon Concentration** (before cycling)
- **Volatile Fogging**
- **Weather Cycling**
- **High Humidity Cycling**

Initial Seal

Performed at 5 kPa for 30 min. Glass deflection indicates good seal.

- **Deflection of all units at least 80% of greatest**
- **Max. one unit of Zero deflection**
- **Max. one unit breakage**

Canadian Building Envelope Science and Technology

SCC & AAMA Accredited Laboratory

CAN-BEST
Established 1985

Cavity Dew Point

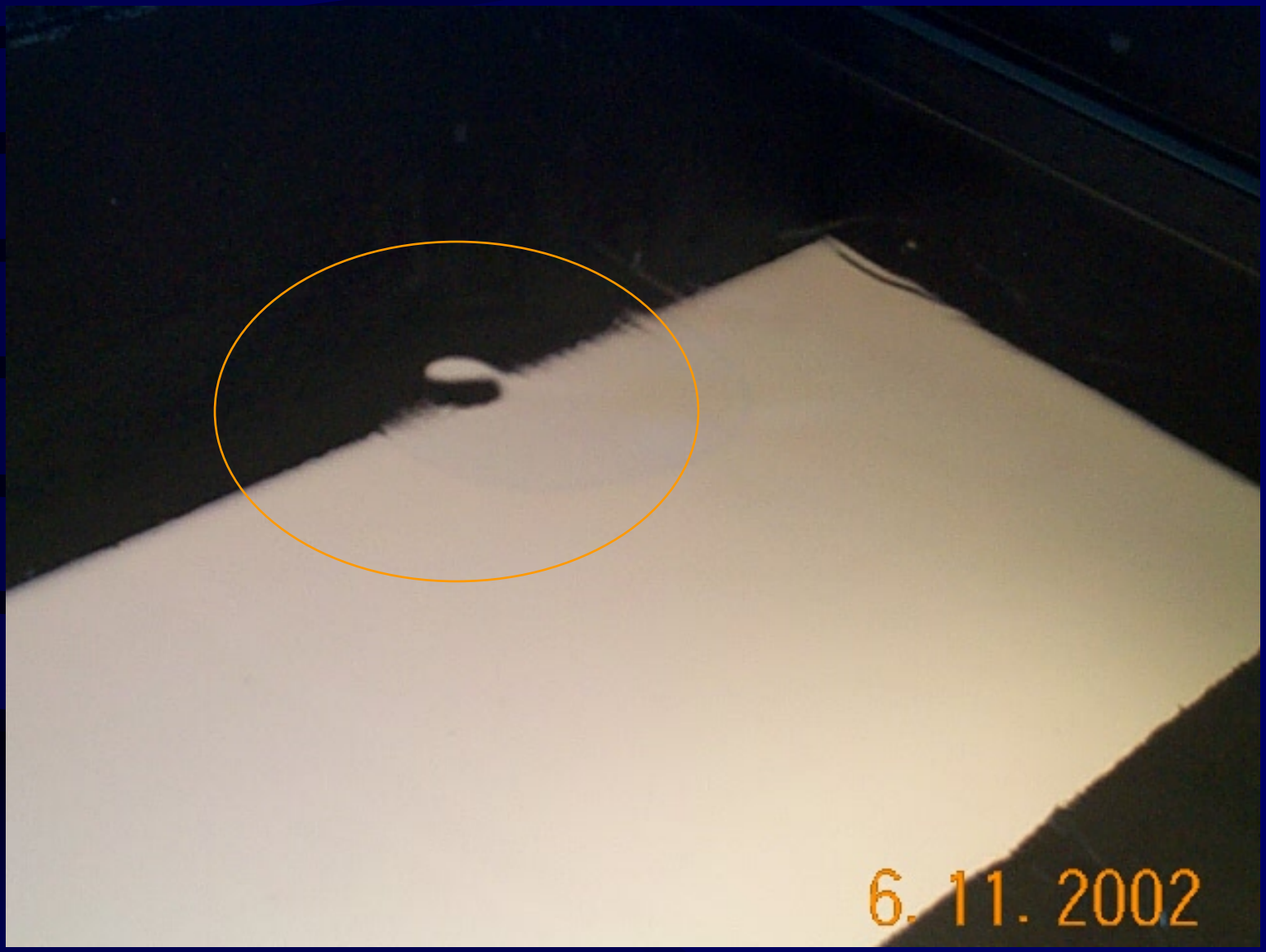
50 mm diameter surface cooled with Ethanol and dry ice

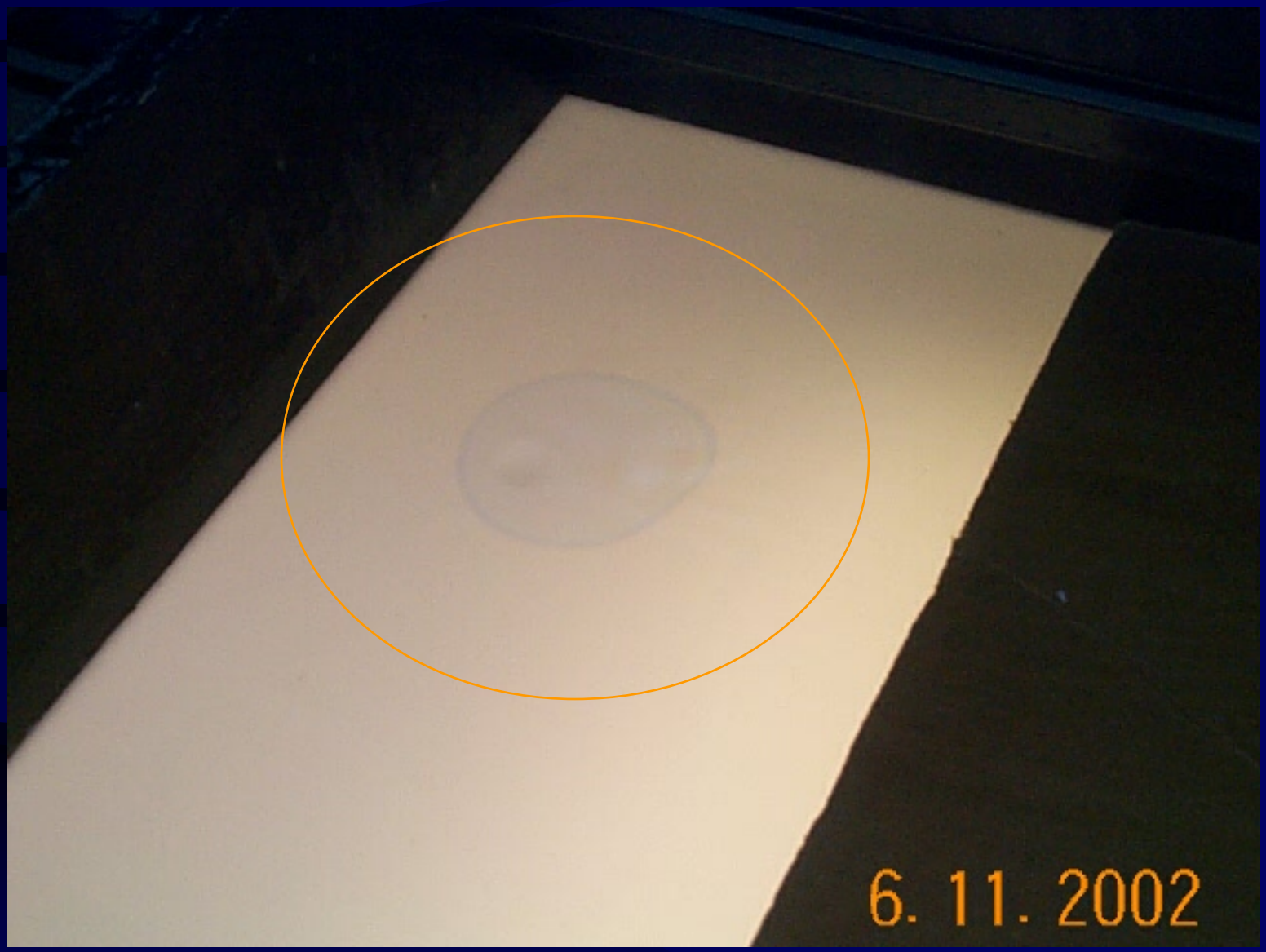
- **Initial - Performed before cycling**
- **Final - Performed after cycling**
- **Maximum final dew point temperature of -40°C allowed**

Canadian Building Envelope Science and Technology

SCC & AAMA Accredited Laboratory

CAN-BEST
Established 1985





Argon Concentration

Gas Chromatography Method

- **Performed before all cycling**
- **Minimum gas concentration 90%**

Canadian Building Envelope Science and Technology

SCC & AAMA Accredited Laboratory

CAN-BEST
Established 1985

Volatile Fogging (One Week)

No evidence of fogging or residue

- **2 units tested**
- **UV and +58°C**
- **Exposure for 7 days**

Weather Cycling (80 Days)

- **4 units tested**
- **320 6-hr cycles**
- **Temperature -32 to +50°C**
- **Water spray, 5 min**

High Humidity Cycling (28 Days)

- **8 units tested**
- **224 three-hr cycles**
- **Temperature +22 to +55°C**
- **Humidity 100%**

Canadian Building Envelope Science and Technology

SCC & AAMA Accredited Laboratory

CAN-BEST
Established 1985

More Info

Regular Contributing Writer to the Industry

ELIE'S INSIGHT...

By James R. Scott, B.Sc. (Mechanical Engineering), P.Eng
Research EngineerCanadian Building Envelope Science and Technology (CAN-BEST)

Elie Alkhoury,

How to IMPROVE Forced Entry Resistance of Windows & Sliding Doors

In Canada, windows and sliding doors are required to meet the specified level of forced entry resistance, as mandated in national and provincial building codes. Testing requirements are outlined in their respective standards. In this article, I would like to provide some insight to the evaluation process. Most importantly, I will provide some general design guidelines to meeting these levels in a practical manner. The CSA A440-98 window standard specifies one level of performance, which requires passing all the tests outlined in ASTM F 588 Grade 10 with some minor variation. The CAN/CGSB-82.1-M89 sliding door standard also specifies two levels of performance: F1 and F2, which both require testing to ASTM F 842, Grades 10 and 20 respectively. In all cases, the ASTM test methods involve the following steps in sequence:

- Remove from any exposed screws, glazing beads, and any other members or mechanical fasteners that can be removed from the exterior within a time limit of 5 minutes, using some prescribed common hand tools.
- Perform hand manipulation from the exterior for a period of 5 or 10 minutes for Grade 10 and 20 respectively.
- Carry out tool manipulation for the same period of time as hand manipulation.
- Perform sash and hardware load tests in a specified sequence involving various load directions and magnitude, in an attempt to disengage the locking mechanism.
- Repeat the hand and tool manipulation tests as above. It should be noted that all of the above tests are to be performed without damaging the window/door intentionally by cutting through components, or breaking glass. The methods are intended to establish a measure of resistance to assemblies subjected to attacks by "unskilled or opportunistic burglars." For applications requiring higher levels of security, security glazing is usually employed which offer higher resistance to force generated by skilled burglary attacks. For these applications other evaluation methods, which could be the subject of a future article, should be employed.

In Canada, building codes mandate a specified level of FER

Preventing Access Of Lock From The Exterior: Your First Step To Securing A Pass Rating.

We have seen, in many instances, that by simply reducing clearances, controlling tolerances between window components and/or relocating a lock, a typical residential window would pass the evaluation process with flying colors. If such control cannot be achieved on the shop floor, then you may need to resort to some active means of shielding the hardware, in order to prevent exterior access. First of all, improving FER does not necessarily imply increased product cost. There are simple and effective ➤

ELIE'S INSIGHT...

By Elie Alkhoury
M.Eng. (Building Science), P.Eng.

Do You Know Your Temperature Index?

Elie Alkhoury

Elie Alkhoury is founder & CEO of CAN-BEST, operating an independent, state-of-the-art testing and research laboratory, accredited by SCC and AAMA. He welcomes any comments or questions pertaining to window performance evaluation and testing. You can reach Elie at: (905) 840-2014, by fax (905) 840-2847, or by e-mail at elie@can-best.com.

Well, that's not exactly what I meant! Since my usual column has something to do with windows, I'll try to restrict my talk to just that. By now, I presume some of you window suppliers have had your fair share of customers complaining about window condensation and frosting during this winter. While many of these complaints would be easily and readily dealt with, some unfortunately could escalate unnecessarily to the detriment of the window manufacturer.

Part of the blame I think rests on the window supplier's first reaction to their customer's complaint. The first response is usually "the window is fine, but the house is too humid"... too many plants... lots of cooking and showers... too cold of a spell, etc. All that may be perfectly true, but how do you expect to get paid if all the consumer wanted was to have a "better" window, a window that's not drafty and that doesn't condense itself to a puddle of water every morning. Here, the old adage " a better educated customer is a better consumer" comes to the rescue. Better customer education is needed, and most significantly at the time of sale and not at the time of complaint.

Having a higher Temperature Index for a window is perhaps the most significant of three main variables that, if maximized, it would contribute greatly towards reducing the potential for surface condensation. The second variable would be to control window installation, while the third is to moderate the interior environmental conditions. Therefore, whenever you're faced with a complaint, just remember that two out of these three variables are actually under your own control, not your customer's. So, before we rush to blame the customer for jacking up that humidifier, let's have a deeper look at the real question, the one that you're expected to have answers for: What's the window's Temperature Index? i.e. under what conditions do you expect your window to operate satisfactorily and near-condensation-free?

The Temperature Index – Referred to as "I Value", the Temperature Index is the condensation resistance rating of the CSA A440 Window Standard. The purpose of this rating is to provide a comparative means of evaluating windows under the same set of environmental and installation conditions. It does not relate to actual field installations or to its environmental conditions.

The Temperature index (I) is derived by laboratory testing of an actual window under controlled exterior and interior environmental conditions. It is directly proportional to the window's interior surface temperature relative to the temperature difference between the interior and exterior. In other words, the higher I value is, the higher the window's potential resistance to condensation would be. It's a dimensionless number that could theoretically range from 0 to 100. While the minimum Temperature Index allowable by the A440 Standard is 140, it is quite possible to achieve up to 180 or more in a specially designed window for that demanding application where moisture condensation would not be tolerated,

Standards Council of Canada

Conseil canadien des normes

Certificate of accreditation

Certificat d'accréditation

Canadian Building Envelope Science and Technology
CAN-BEST TESTING LABORATORY
38 Regan Road, Unit 4, Brampton, Ontario

having been assessed under the authority of the *Standards Council of Canada Act* and found to conform with the requirements of ISO/IEC 17025 and the conditions established by the SCC is hereby recognized as an

ACCREDITED TESTING LABORATORY

for specific tests or types of tests listed in the scope of accreditation approved by the Standards Council of Canada.

ayant été soumis à une évaluation selon la *Loi sur le Conseil canadien des normes* et ayant été trouvé conforme aux prescriptions d'ISO/CEI 17025 et aux conditions établies par le CCN est de fait reconnu comme étant un

LABORATOIRE D'ESSAIS ACCRÉDITÉ

pour les essais ou types d'essais déterminés inscrits dans la portée d'accréditation approuvée par le Conseil canadien des normes.

Accredited Laboratory No.:
Numéro de laboratoire accrédité : 222

Accreditation date:
Date d'accréditation : 1995-11-27

Issued on:
Délivré le : 2002-10-11

Expiry date:
Date d'expiration : 2005-11-27

Chair (SCC) / Président (CCN)

Assessment performed according to CAN-P-4 (ISO/IEC 17025) and the conditions of the *PALCAN Handbook* D82.6. Laboratories that conform with the requirements of ISO/IEC 17025 operate a Quality Management System for testing and calibration activities that meets the requirements of ISO 9001: 1994 when designing/developing new methods, and/or developing test programs that combine standard and non-standard test and calibration methods; or meets ISO 9002 when only standard methods are used. The scope of accreditation is available from the accredited laboratory or SCC. To verify the validity of the certificate, please see the listing of Accredited Laboratories on www.scc.ca.

Évaluation effectuée conformément du CAN-P-4 (ISO/CEI 17025) et aux conditions du *Guide PALCAN D82.6*. Pour concevoir et développer des méthodes nouvelles et établir des programmes d'essais fondés sur des méthodes d'essai et d'étalonnage normalisées et non normalisées, les laboratoires respectant la norme ISO/CEI 17025 ont, dans leurs essais et leur étalonnage, recours à un système de management de la qualité conforme aux exigences d'ISO 9001: 1994, et à celles d'ISO 9002 dans le seul cas des méthodes normalisées. Pour connaître la portée d'accréditation, s'adresser soit au laboratoire accrédité, soit au CCN. Pour vérifier la validité du présent certificat, consultez la liste des Laboratoires accrédités à l'adresse www.ccn.ca.

Canada

Thank You