

File No.: 04-1000-20-2019-696

December 19, 2019

s.22(1) s.22(1)

Dear 5.22(1)

Re: Request for Access to Records under the Freedom of Information and Protection of Privacy Act (the "Act")

I am responding to your request of November 6, 2019 for:

All past alternative solutions and code consultant letters related to 2001 Nanton Avenue (4226 Arbutus Street is the old address for the same property).

All responsive records are attached.

Under section 52 of the Act, and within 30 business days of receipt of this letter, you may ask the Information & Privacy Commissioner to review any matter related to the City's response to your FOI request by writing to: Office of the Information & Privacy Commissioner, info@oipc.bc.ca or by phoning 250-387-5629.

If you request a review, please provide the Commissioner's office with: 1) the request number (#04-1000-20-2019-696); 2) a copy of this letter; 3) a copy of your original request; and 4) detailed reasons why you are seeking the review.

Yours truly,

Barbara J. Van Fraassen, BA

Director, Access to Information & Privacy

Barbara.vanfraassen@vancouver.ca 453 W. 12th Avenue Vancouver BC V5Y 1V4

\*If you have any questions, please email us at <u>foi@vancouver.ca</u> and we will respond to you as soon as possible. Or you can call the FOI Case Manager at 604.871.6584.

Encl.

:ma





URGENT

October 14, 1992

Mr. Isa McHaile
Plumbing Inspector
City Of Vancouver
East Wlag - 453 W. 12th Ave.
Vancouver, B.C.
VSY 194

Dear Mr. Moltstie:

Be: Application for Permit - 4225 Arbutus St.

Further to our telephone conversation this morning, I would like to clarify several points.

- 1. Under our scape of work we are replacing existing copper pipe with new % type copper pipe which will supply 2 floatemeter water classes. 2 basine, 4 shower heads and 2 detailing fountains. The cold water supply is 2-lack with a developed length of approximately 350 feet. The hot water pipe size is 1 1/2-inch with a developed length of 100 feet from the storage task.
- 2. It is my opinion that the pipes we have lastelled are adequately sized for this land.
- Caness Systems is installing, under a separate permit, water piping to new plumbing fixtures they have installed for which I have so knowledge or responsibility. I must assume prior to your issuing a permit to them, they submitted piping drawings indicating the existing pipes which we have replaced.
- 4. The Arbutus Club has been in contact with MCW Consultants Ltd., the mechanical consultants on the job, to ascertain whether the 2-lack and 1 1/2-lack pipe we have installed is adequate and they have indicated that MCW will be in contact with you.
- S. We request you leave a permit to us for the work we have done in order that we may have it inspected and insulated no the project may proceed without octoy.
- S. If it comes to puss that the 2-lack pipe is not adequate for Canem Systems to the finit lines into, they will have to make attannets arrangements.

Yours truly.

Peter Gastaria.

GASKARTH MECHANICAL SERVICES LTD.

City of Vancouver - FOI 2019-696 - Page 1 of 11





October 19, 1992

CITY OF VANCOUVER 2675 Yukon Street Vancouver, BC

ATTENTION:

BRIAN WIENS

ELECTRICAL INSPECTOR

Dear Sir:

2001 Nanton

RE: 'ARBUTUS CLUB 4226 ARBUTUS STREET

PERMIT NO. EP 259696

Further to our conversation re; the primary conductors feeding the 150 KVA transformer (480/120-208), I have checked with the Electrical Engineer. He referred me to rule 26-258 Sub-rule 3. He based his calculations on the demand load.

130KVA - 156 AMPS x 1.25 = 195.78 AMPS
Could you please check this for me and advise.

The designer has requested that the fire gongs be placed above the T-bar ceiling. I have talked to Gus Wendrel of your office, who also checked with the Building Department, and could not come up with a rule against this. I also checked with the Fire Wardens office and they too did not know of a ruling prohibiting this installation. Could you please check and advise.

Yours truly,

Faxed

10-15-92 02:22FM FROM MCW CONSULTANTS LTD

TO 8730042

2001/001



MCW CONSULTANTS LTD. #1660 - 1800 West Georgia Street Vancouver, BC V6G 2Z8

Site tructuation No. 1 - Electrical



MCW FILE:

PROJECT:

ARCHITECT:

GENERAL CONTRACTOR

ELECTRICAL CONTRACTOR

DATE ISSUED:

V-967

Arbutus Club

Hopping Kovech Grinnell

Anak Interiors

Del Industrice

October 13, 1992

#### Organing R-2

- Revise switching and circuiting as follows:
  - Type I fixure to be an N/ L circuit.
  - All Type C fixtures in the front lobby (6) to be on switch 'a'.
  - Unnamed switch at door to office to switch office lights. ۵
  - Provide 2P switch for all whirtpool area lights.

  - Ladies shower area to be ewitched at area C.5, 4.5.

    Type A pet lights in back ladies lounge to be on switch f.

    Men's gang shower area to be on switch g located at switch a to h location. .7
  - Move switch a and it to opposite and near gride C.S and 4.5.

#### Drawing E-9

- Resocate AHU from roof to second floor. 1.
- Delete original feed (was 170 amp c/w 200A-3P and 4 #2/ O and 200 A disconnect) to roof and replace with following feeders:
  - 3 #12 in WC of w 1-20A-3P, breaker circuits P-01, 63, 65 and local 3P combination starter. See mechanical drawing M2 for location near grid 6A. .1

  - 3 #3 in 1-1/4°C c/w 1-125 A-3P, breaker circuits P-52, 64, 65 and local disconnect switch. See mechanical exatch PM-1 (enclosed) for location.
    3 #10 in 3/4°C c/w 1-90A-3P, breaker circuits P-55, 57, 59 and local disconnect switch. See mechanical sketch PM-1 (enclosed) for location.

ONBULTANTS LTD.

NUD! dis

#### CITY OF VANCOUVER



DIRECTOR:
R.V. Hebert, PEng 873-7520
ASSISTANT DIRECTORS:
Permits & Inspection Division
R.L. Maki, PEng 873-7522
License & Property Use Division
J.A. Perri 873-7545

PERMITS & LICENSES DEPARTMENT City Hall, East Wing 453 West 12th Avenue Vancouver, British Columbia Canada V5Y 1V4 Phone (604) 873-7611 FAX (604) 873-7100

October 19, 1992

The Dominion Company Inc. #300 - Two Bentall Centre 555 Burrard Street Vancouver, B. C. V7X 1S9

Attention: Tim Loo, PEng, CP

Dear Sirs

Re: 2001 Nanion Street

The Arbutus Club, BP215126

In your letter of September 15, 1992, you provide an updated architectural sketch, EXHIBIT C, which is noted to be in agreement with the original structural drawing EXHIBIT B of the wall detail separating the existing curling rink and the club hallway. You question the need to add 2 courses of concrete block as a stated requirement of the building permit which was based on an inaccurate architectural drawing (EXHIBIT A).

This is to provide our agreement not to require the additional two courses of concrete block subject to confirmation that the existing block wall and precast spandrel assembly are adequately constructed for structural and seismic loads, and subject to sealed architectural and structural drawings being submitted requesting a change notice to the building permit requirements.

Yours truly,

D. H. Jackson, PEng ACTING ASSISTANT DIRECTOR - INSPECTIONS

DHJ:lc

cc: Gabe Chan

Peter Sweeney

DBI (+ copy of EXHIBITS A, B, C & D)

bcc: R. L. Maki D. H. Jackson



November 3, 1992

**The Dominion Company** 

Developers, Designers, Builders

City of Vancouver Department of Permits & Licenses City Hall 453 West 12th. Avenue Vancouver, B.C. V5Y 1V4

Attention:

Mr. Bob Maki, P.Eng.

te: The Arbutus Club BP#215126

Fire Separation at Existing Concrete Block Wall, Curing

NOV 1 0 1992
ORIGINAL TO: LCC

Dear Bob:

Having not heard from me in some time, I should first explain that I am now with the Dominion Construction and Development team. My latest project as "contractor" has been the addition to the Arbutus Club.

While wrapping up the project, it was noted that during the Permit process, three (3) courses of block had been required to be added to the top of the existing west wall of the Curling Rink structure. We noted to the Engineer that the Vancouver Plan Checker had correctly required these courses because the drawings were in error - showing a point to point juxtaposition of the concrete block to the concrete fascia. In fact the block is extended up behind the fascia. The Engineer made application to your department for an adjustment to the Permit to reflect this reality. We are now advised that the existing condition would be acceptable (i.e.: the Club would not be required to add the courses of additional block) provided all other building code conditions are met, including seismic.

The difficulty with the ruling as it stands is that these existing walls were not required to be upgraded during the equivalency/permit process. Secondly, any upgrading of the Curting Rink was further waived when the Club received permission to replace their ice-making system and to add a new concrete floor base.

The long and the short of it is that although I could certainly revert to adding the courses of blockwork as required by the Permit, they would add high level mass to a non-seismic wall which was not / is not required to be upgraded - in effect compounding the problem.

May I as Contractor suggest that by adding a continuous bead of fire caulking along the top of the existing concrete block against the concrete fascia, the risk of fire penetration might be eliminated? This solution would not add mass to the wall while plugging the joint/crack through which fire might be drawn. Frankly, having seen the circumstances first hand, I do not envision a great risk from the installation as it stands. And by the way, it is an extra to my contract so I do not have a vested interest. It just seems the best way to resolve the question.

If I can provide any more information, please do not hesitate to call (631-0171), it would be good to hear from you.

8 - 17

Murray Mar Kinnon Project Manager

bm1103mm.let

### CITY OF VANCOUVER

PERMITS & LICENSES DEPARTMENT City Hall, East Wing 453 Wast 12th Avenue Vancouver, British Columbia Canada VSY 1V4 Phone (604) 873-7611 FAX (604) 873-7100



DIFECTOR
R.V. Hebert, PEng 873-7520
ASSISTANT DIRECTORS:
Permits & Inspection Division
R.L. Maki, PEng 873-7522
License & Property Use Division
J.A. Perri 873-7545

PLEASE REFER TO: Mr. P.R. Sweeney Supervisor, Bldg. Inspections Branch at 873-7560 I.R. No. 236134

1992 November 16

Arbutus Club Maintenance Engineer 2001 Nanton Avenue Vancouver, BC V6J 2X9

Dear Sirs:

Re: 2001 Nanton Avenue

Building Permit No. BP214872

This is directed to you for your information and appropriate action.

In June of 1991, Building Permit No. BP214872 was issued permitting the installation of a removable air-supported structure over the existing tennis courts at the above location.

A condition of this permit was that an annual inspection be carried out.

The purpose of this inspection is to ensure that the structure is installed in accordance with the original design and that the minimum life safety requirements of the Vancouver Building Bylaw are met.

However, as we are not requiring an annual permit for each installation, the onus is on you as the owners of the property to carry out the work annually, using good engineering practice and in accordance with the manufacturers installation procedures.

Yours truly,

P.R. Sweeney for R.L. Maki, PEng.

CITY BUILDING INSPECTOR

PRS\CR\hrd

of



December 2, 1992

The City of Vancouver
Department of Permits and Licenses
City Hall
453 West 12th. Avenue,
Vancouver, B.C.
V5Y 1V4

Attention:

Mr. James Lau

Re:

The Arbutus Club

BP#215126

Fire Separation at Existing Concrete Block Wall, Curling Rink

Dear Sir:

Further to the previous correspondence and your telephone call 921201, I understand that Bob Maki has made a ruling subsequent to a Building Inspector's field review. It was the opinion of the Inspector that the degree of concrete block overlap to the inside of the concrete fascia varied sufficiently to cause doubt about the ability of the overlap to meet the two-hour fire separation rating. I understand that the Club has two (2) options:

GOOI NANTON

To cast-in-place a continuous 6-inch high concrete cap along the walls at the existing locations, or

To have one (1) course of solid masonry block placed along the walls at the existing locations, being certain to fully grout the vertical gap behind, to the fascia (west) side.

I have discussed this situation with the Club. They will be proceeding with Option #2, the Concrete Block Course. They will, however, be proceeding under their own forces rather than through Dominion Construction And Development Inc. As this is a messy trade to be involved in the Curling Rink while the ice surface is in place, they will also be undertaking the Work at the end of the season if that is acceptable to Mr. Maki. They understand that a fee of \$375.00 will be required for the Amendment to their Permit.

Regards///

Murray MacKinnon Project Manager

cc: Mr. John Furlong, General Manager

Mr. Peter Sweeney, Building Inspections, City of Vancouver.

The Dominion Company Inc.
The Dominion Development Company Inc.
Dominion Construction & Development Inc.

Sux e 300, Two Bental Centre 555 Shurard Street Vancouver, B.C.

wledged:

General Manager

Fax. 604 631-1100 Tel: 604 631-1000

Canada V7X 1S9

jit 202mm let

The Dominion Company

PERMITS & LICENSES DEPARTMENT

DEC 16 1992

Developers, Designers, Builders



Province of British Columbia Ministry of Municipal Affairs, Recreation and Culture Office of the Fire Commissioner Vancouver Fraser Region 102, 10334 — 152 A Street Surrey British Columbia V3R 7P8. Telephonic (604) 650-9025

The Arbutus Club 2001 Nanton Avenue Vancouver, B.C. V6J 2X9 DEC 1 4 1992 ORIGINAL TO: PRS

File #: CVA-2 Plan #: 2645-A November 27, 1993

Attention: Mark Gotthes TO

Dear Sir:

2001 HATTON

Re: Shaughnessy Lounge, Arbutus Club, Vancouver, B.C.

Your drawings for the above noted project have been reviewed for compliance with the Public Hall and Theatre Safaty Regulations and are hereby approved subject to the construction being done in full compliance with the Fire Services Act and Regulations.

For the purpose of establishing the maximum number of persons admitted under the Public Hall and Theatre Safety Regulations, the net floor area of the portion of the building described as Shaughnessy Lounge has been calculated as 1808 square feet and provides for a maximum occupant load of 150 persons based on 12 square feet per person.

In addition to the requirements for exit signs, door swing and panic hardware in the Public Hall and Theatre Safety Regulations, emergency lighting is to be provided. The illumination level and the duration of the emergency lighting is set out in the Building Regulations of British Columbia.

Your attention is also directed to the requirement for a fire alarm system to be installed on the premises in accordance with the requirements of the Building Regulation of British Columbia.

Section 4 of the Public Hall and Theatre Safety Regulations requires an inspection approval by the Local Assistant to the Fire Commissioner prior to occupancy. For this project, requests for inspections should be addressed to L.A.F.C. Lionel Pare of Vancouver Fire Department, B.C., telephone number 873-7035.

This approval does not preclude any permit, inspection and approval requirements of other provincial and local authorities.

92-12-16: HOTED-FILE PLICHATHEMEDER:

Yours truly, FIRE COMMISSIONER

V. Friesen

Regional Fire Commissioner

C.C. L.A.F.C.
Building Inspector
L.C.L.B.

P. LIGHTHEART, thursing trap. - Dist: No. 16

DIRECTOR

R.V. Habert P.Eng. 873-7520 ASSISTANT DIRECTORSE License & Property Use Children - J. Fard 873-7345 Parents & Inspection Children -- R.L. Mari, P.Eng. 873-7522 City of Vancouver



PERMITS & UCDISES DEPARTMENT City Hall, 453 West 12th Avenue, Vancouver, British Columbia Canada V5Y IV4

Please roler to:

Brian Wiens 873-7857

Del Industries 24 East 4 Avenue Vancouver, BC V5T 1G8

January 11, 1993

MON SOO! TON

Dear Sire

RE: OBJECTION NOTICE NO. 40136

Our inspector reports that the objection filed against your work 4226 Arbutus ... has not been attended to. Your attention is directed to By-law No. 5563, Clause 6.8, which requires that this work be corrected within forty-eight (48) hours.

Please be advised that you are required to complete this work within seven (7) days of receipt of this letter. Failure to comply with this requirement will result in further action being taken to enforce Electrical By-law No. 5563.

Please take immediate action in this connection and inform this department when the work has been completed.

Yours truly,

M. A. Best

D.H. Jackson, P. Eng. City electrician

DHJ/1k

cc: Electrical Safety Branch RICHARD ROGERS

cc: Quality Control Coordinator



In reply, please refer to: Gordon Westover at 873-7755

1994 05 20

M.A. 01

Bruce Carscadden Hughes Baldwin Architects #300 - 1508 West 2nd Avenue Vancouver, B.C. V6J 1H2

Dear Mr. Carscadden: NOW 2001 NAVION

RE: 4226 Arbutus Street

Minor Amendment to Development Permit Number 212126

Thank you for your letter dated March 25, 1994, whereby you requested consideration of a minor amendment to provide interior and minor exterior alterations to the existing fitness centre.

In accordance with Section 4.4 of the Zoning and Development By-law, your request is granted, thereby permitting the relocation of the existing uses as outlined in your letter and to alter the parking layout, as shown on drawings Al to A9, submitted by your office, stamped "Received" by this department on March 25, 1994, and now APPROVED as a minor amendment to Development Permit Number 212126.

Any other changes or deviations from the approved development permit drawings that may have been shown on the drawings are not approved under this minor amendment.

You are further advised that this application has not been processed with regard to the requirements of the Building By-law. You must comply with any Building By-law requirements and obtain all the necessary relevant permits.

yours truly.

Gordon Westover

Plan Checking Technician

Development Applications Group Land Use and Development Division

GW/jw

cc: Central Property File

Supervisor Building Inspection Branch Supervisor Property Use Inspection Branch

P&L Plan Registry

WES\002-1840.COV

TH Finance Discret Cry Widness ... Flaming Discretion 455 State 12th Avenue Vision of their Courtina Consider VSY 194 No. (604) 873-7344 Fax (604) 873-7060

City of Vancouver - FOI 2019-696 - Page 11 of 119

READ JONES CHRISTOFFERSEN LTD.

210 • West Broadway, Vancouver B.C., V5Y 3W2 Phone (604) 872-0391 • Fax (604) 874-7733

FERUITS & LICENSE DEPARTMENT

APR 2 5 1994 ORIGINAL IU. JNR

Reg. No .:

COPY TO:

April 25, 1994

City of Vancouver Dept. of Permits & Licenses 453 West 12th Avenue Vancouver, B.C. V5Y 1V4

Attention: Mr. John N. Robertson, P. Eng., Manager, Plan Checking Branch

Dear Sir:

Re: Arbutus Club Renovations 2001 Nanton Avenue, Vancouver, B.C. RJC Ref. No. 35678-01

Thank you for meeting with me and the architect on April 13, 1994, to discuss the structural seismic upgrading implications of the proposed renovations for the existing Arbutus Club. The purpose of this letter is to confirm some items we discussed, and to request your department's response to our proposal for dealing with seismic upgrading implications of a new steel roof structure to be added over an existing roof area to create a new multi-purpose fitness studio (please refer to architectural drawings).

The Arbutus Club is a large complex, built in stages, with most of the existing construction built in the early 1960's and a newly completed administration wing addition. As is typical for structures built in the early 1960's, prior to modern seismic design Codes, most of the building structures of the existing complex have seismic resistances significantly below current Code requirements.

The extent of the proposed renovation work is shown on the architectural drawings and is described by the architect in his letter. The renovations are restricted to the areas described below. No renovation construction is planned for any of the remainder of the Arbutus Club which lies outside the areas described below..

The essentials of the proposed work are as follows:

 A two storey change room and gymnastics room is proposed for the north end of the existing ice rink.



- 2. A new one storey addition with an area of approximately 800 sq. ft. is to be added at the south end of the existing swimming pool. Also, a new 150 sq. ft. enclosure for a new hot tub is to be added to the west side of the existing swimming pool.
- 3. The existing swimming pool is to be completely refurbished with a new on grade children's pool inside the existing pool building. Some existing unreinforced concrete block infill masonry walls, infilled between columns and beams of the existing reinforced concrete structure for the pool, are to be removed.
- 4. The two storey structure between the pool and the ice rink is to be renovated, and a light steel roof structure added to create a third storey of new structure over two existing storeys.

During our meeting, the architectural drawings were briefly reviewed, and the foregoing highlights of the proposed renovations were discussed in the light of seismic upgrading implications. The following conclusions were reached:

- The architect has stated that the proposed project cost as a percentage of the assessed value is in the range of 25% to 50%, and that no change in occupancy is proposed. Table A of Appendix A of the Vancouver Building Bylaw indicates that no seismic upgrading of the existing building structure is required provided no additions are made.
- 2. The proposed two storey addition change rooms and gymnastics room at the north end of the ice rink may be constructed as a separate building with firewalls separating the new building from the existing building. If this is done, no seismic upgrading of the existing building structure will be required.
- 3. The new approximately 800 sq. ft. one storey restaurant addition to the south of the existing pool, and the new small 150 sq. ft. hot tub enclosure to be added to the west side of the existing pool may both be considered as "minor additions", and as such these minor additions will not trigger any requirement for seismic upgrading of the existing building structure.



4. The renovations to the pool area involve removal of some infill unreinforced concrete block masonry, which on one hand is a seismic hazard, but on the other hand, provides some lateral rigidity to the structure. The writer proposed that where unreinforced concrete block masonry is removed, new reinforced concrete shearwalls will be added elsewhere to compensate for the reduced rigidity of the structure. The new reinforced concrete shearwalls will be designed so that the seismic resistance of the existing structure is not reduced and is somewhat improved by the introduction of new reinforced concrete shearwalls to replace unreinforced concrete block infill walls. Such work will not trigger requirements for seismic upgrading of the existing building structure.

The proposed renovations for the area between the pool and the ice rink, and the addition of a new light steel roof structure in this area has seismic upgrading implications for which we request your department's response to the following proposal:

The existing concrete roof slab between the pool and the ice rink is presently an existing "occupied space" according to the architect (see architect's letter). As such, the new light steel roof structure may be considered an enclosure to this existing occupied space.

In order to meet the structural requirements of the Vancouver Building Bylaw, the new light steel roof structure must be supported by a structure which conforms to the requirements of the current Vancouver Building Bylaw. The writer proposes that the existing reinforced concrete structure directly below the new light steel roof structure addition be seismically upgraded with new reinforced concrete shearwalls designed to resist all seismic loads imposed, not only by the area of the existing building in question, but also all seismic loads imposed on these shearwalls by other parts of the existing building structure. The writer proposes seismic upgrading in the area directly below the new light steel roof structure only, and no seismic upgrading for any other parts of the existing building structure.

Note, however, that the new concrete shearwalls will provide some measure of seismic upgrading to other parts of the existing building structure. We request your department's response with regard to the acceptability of this proposal.



We thank you in advance for your consideration and your response to our proposal.

Yours truly,

READ JONES CHRISTOFFERSEN LTD.

John Bryson, M.Sc., P. Erg. Principal

JB/hj

c.c. Hughes Baldwin Architects Attn: Mr. Roger Hughes

\approver\jb\arbutus





RECEIVED

PERMITS & LIVENSES DEPT.

HUGHES BALDWIN ARCHITECTS

April 18, 1994

City of Vancouver Department of Permits & Licenses 453 West 12th Ave. Vancouver, B.C. V5Y 1V4

Attention: John N. Robertson, P.Eng., Manager, Plan Checking Branch

Dear Sir:

Re: (D.P. #212126 - 4226 Arbutus St.) - Arbutus Club Renovations, 2001 Nanton Ave., Vancouver

In addition to John Bryson's letter (Read Jones Christoffersen, April 14/94) we wish to provide the following nformation and comments regarding the above noted project.

The proposed additions and alterations as described by Read Jones Christoffersen are shown on the attached reductions of drawings A1 to A9 (dated April 18/94). Drawings A1 locates each of the areas described by the structural engineer. The two storey gym and change room addition is "Addition C", "Addition B" and "D" are the 1 storey hot tub enclosure and the cafe extension. "Addition F" is the 3rd storey addition over an existing 2 storey reinforced concrete structure (refer also to drawing A5) and is the subject of this letter.

Addition F encloses an existing roof well presently occupied by the club for storage (includes a storage shed) and is accessible from the existing servery on the same level and from the weights area by a small ships ladder and door.

We support the Structural Engineer's proposal for seismic upgrading in this area and in addition, we are proposing a complete upgrade of the life safety systems of the entire complex with a monitored sprinkler system and fire alarm.

Given the nature and age of the club, the magnitude for complete seismic upgrade of the entire complex is expected to cost 1 to 3 million dollars which is beyond the means of the club at this time.

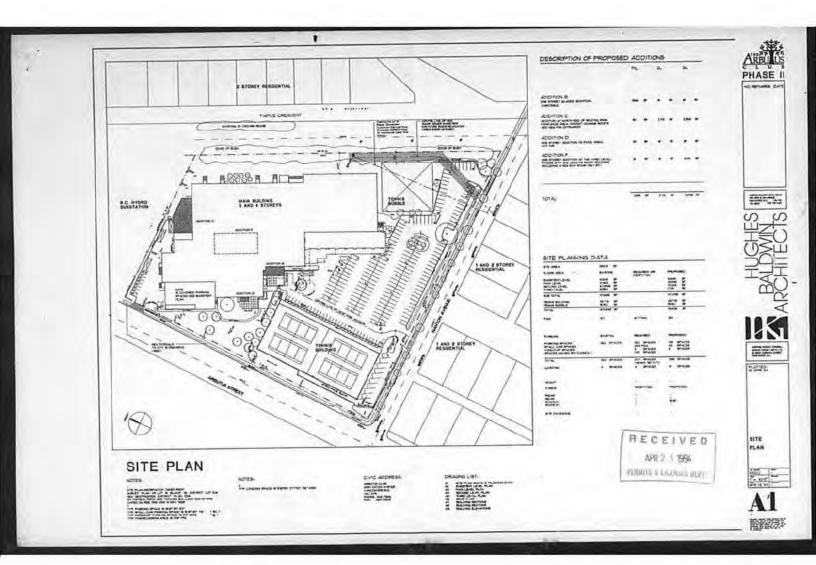
Your attention to our proposal as described by these joint letters is greatly appreciated. Should you require any further information please contact us.

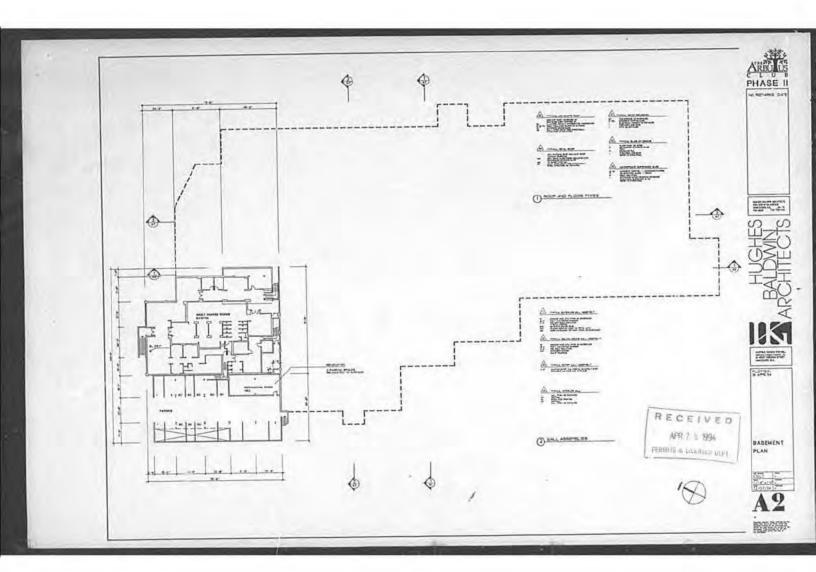
Yours truly,

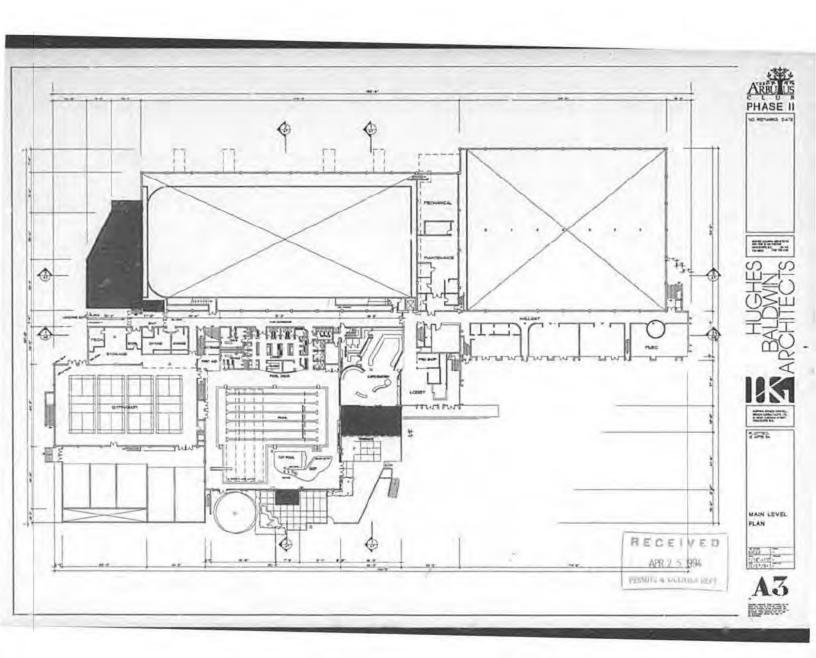
HUGHES BALDWIN ARCHITECTS

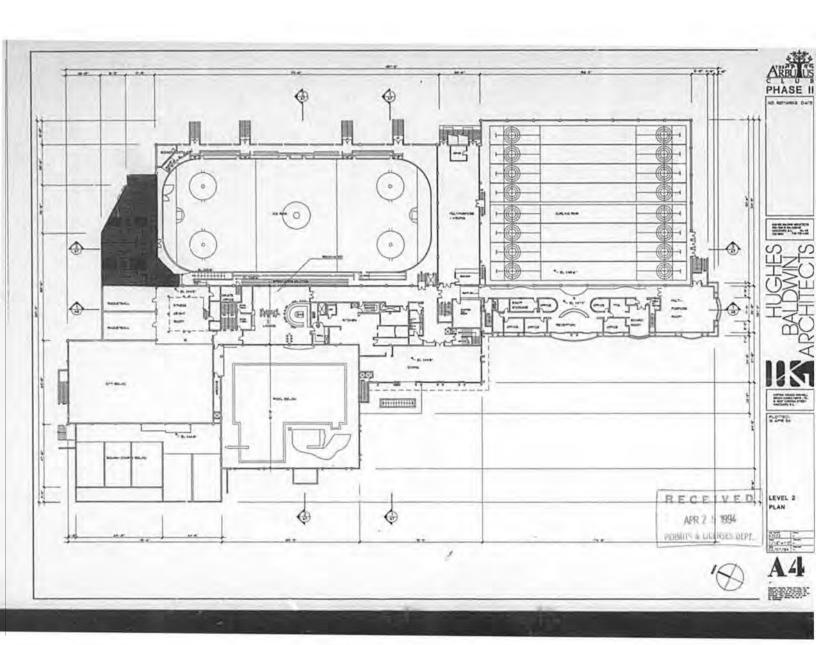
Per: Bruce Carscadden, MAIBC

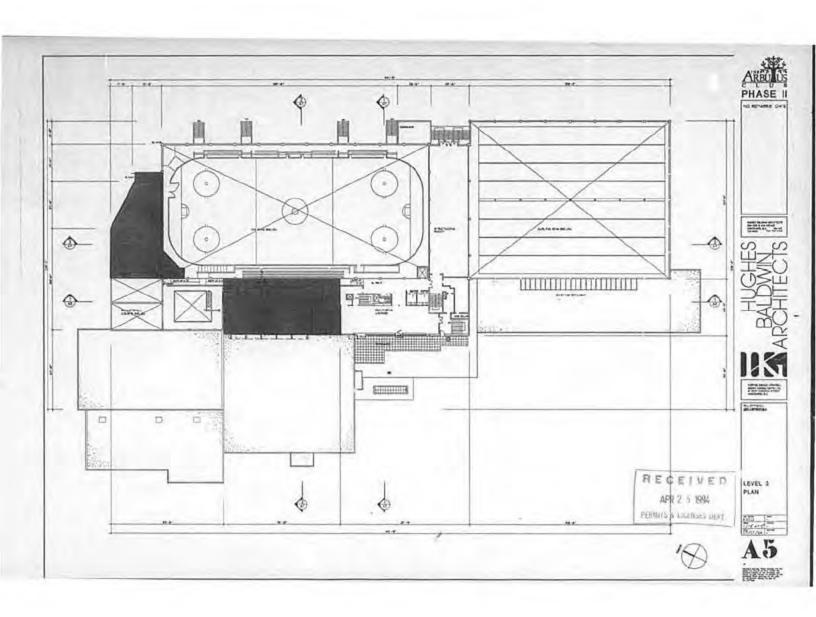
BC/ljp ec. John Bryson, Read Jones Christoffersen

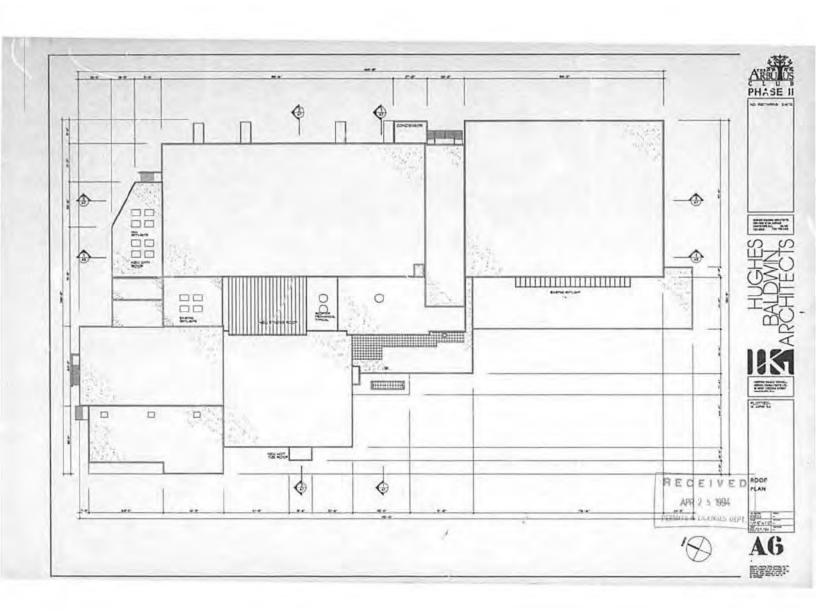


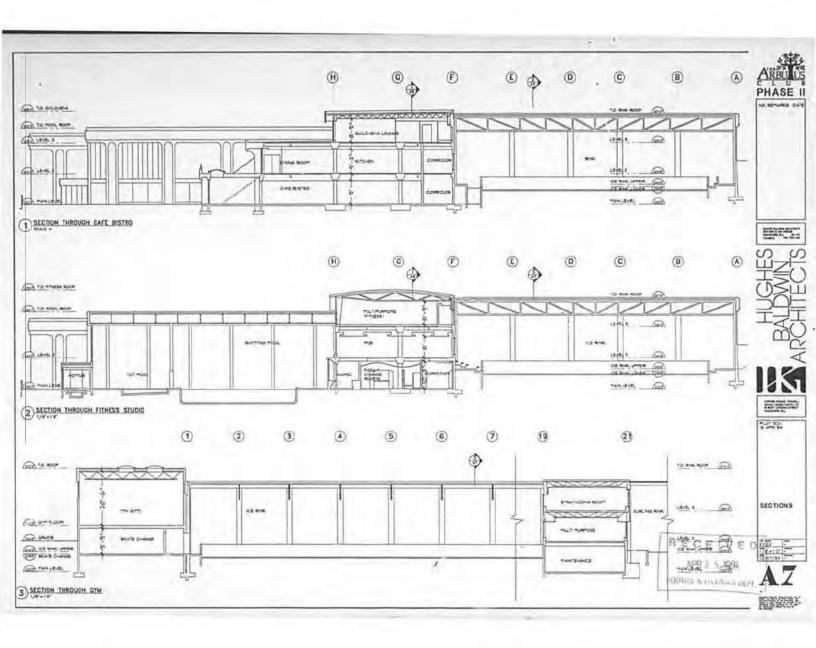


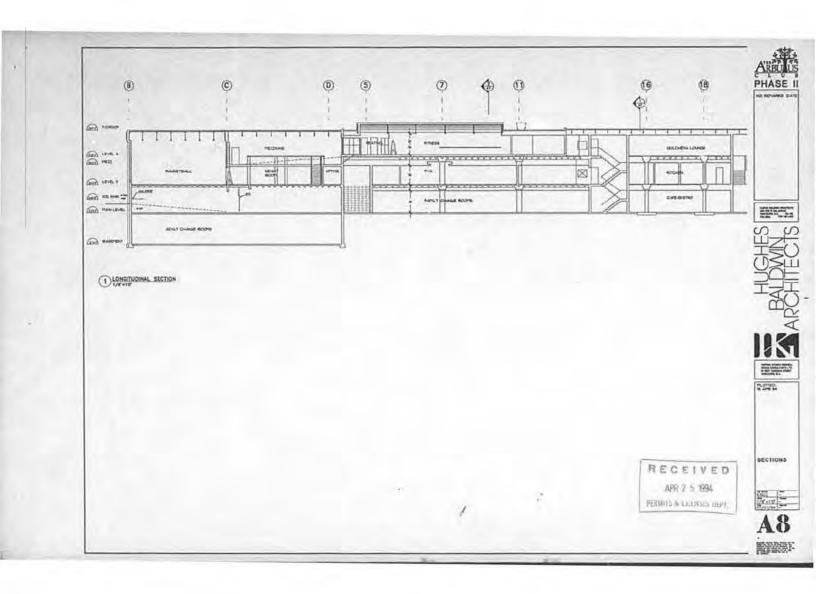


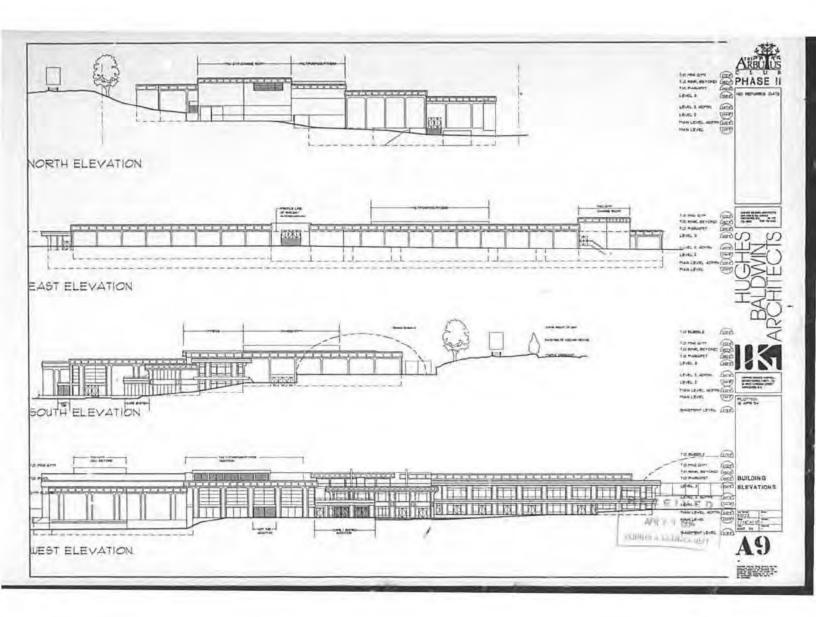












# CITY OF VANCOUVER

PERMITS & LICENSES DEPARTMENT City Hall, East Wing 453 West 12th Avenue Vancouver, British Columbia Canada V5Y 1V4 Phone (604) 873-7611 FAX (604) 873-7100



J.A. Perri

DEPUTY DIRECTOR: R.L. Maki, PEng Permits & Inspection Division

June 1, 1994

Read Jones Christoffersen Ltd. 210 West Broadway Vancouver, BC V5Y 3W2

Attention: Mr. John Bryson, PEng

Dear Sir.

RE: 2001 Nanton Avenue Seismic Renovation & Upgrading

This is confirm that the proposed seismic upgrading of the existing Arbutus Club outlined in your letter of April 25, 1994 will be acceptable for the proposed renovation subject to the following:

- that the proposed renovations do not in any way diminish the seismic resistance of the existing building.
- that the two storey change room and the new one storey addition are seismically separated from the existing buildings.

We trust the above meets your requirements, if you have any questions or require further information please call the undersigned at 873-7465.

Yours truly,

J. N. Robertson SUPERVISOR PLAN CHECKING BRANCH

JNR or readjone.let



## GAGE-BABCOCK & ASSOCIATES LTD.

SUITE 207-1099 WEST 8th AVENUE, VANCOUVER, B.C., CANADA V6H 1C3 • TEL. (604) 732-3751 FAX (604) 732-1277

July 3, 1992

The Chief Building Inspector City of Vancouver Permits & Licences Department 453 West 12th Avenue Vancouver, B.C. V5Y 1V4

Dear Sir:

Re: Arbutus Club Addition 2001 Nanton Street Vancouver, B.C. File: 91.085

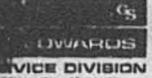
The undersigned has conducted a field review and confirm that the installation generally complies with the requirements stated in our equivalency report dated October 17, 1991.

Yours very truly,
GAGE-BABCOCK & ASSOCIATES

Celestine Chow P. Eng

CC/d1

cc. Domco Engineering





JULY 6, 1992

TEL: (604) 420-4478 (SCAVICE) INTUAN ELLE CAR (BUR) ATT - BAUR-CHA (BUIL) XA TAND FAIFBHAME STHEET, BURNARY HI VALIVI

INLET ELECTRIC 2526 DAVIES PORT COQUITLAM, BC V30 417

SUP 'EC/: THE ARBUTUS CLUB 2001 NANTON STREET, VANCOUVER, BC

Dear Sir.

In the with your request regarding specifications of the above project, our technicians have proceeded with a verification of the tire alarm system.

Attached, please tinu all the macessary documents pertaining to this verification.

- Reports of the technicians who verified the work
- · Fertification of Verification

'm'ess otherwise noted on the technicians report, all devices listed have been tested for operation and supervision. Also, all control equipment has been tested.

We trust that these documents meet with your specification requirements and approval.

four + truly.

EDWARDS SERVICE DIVISION

Craig Lapierro Service Manager

Ci /mr Fin I DSULES



# **Domco Engineering**

July 7th, 1992

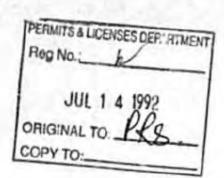
The City Building Inspector City of Vancouver 453 West 12th Avenue Vancouver, B.C. V5Y 1V4

Dear Sir:

RE: Fully Automatic Fire Protection for

> Arbutus Club Addition 'A' New Wing 2001 Nanton Street, Vancouver, B.C.

Our Job No. 7273



The undersigned hereby gives assurance that "field reviews" were carried out during the progression of the project to ascertain that the fully automatic fire protection system was installed as per drawings and N.F.P.A. requirements.

Piping above suspended 'T' bar and gyproc ceilings conform to "as-built" drawings provided by Fire Protection Contractor.

Yours truly,

DOMCO ENGINEERING

Len Farrant, P. Eng.

Mgr. Mechanical Eng. Dept.



Domco Engineering Co. Suite 300, Two Bentall Centre Tel: 604 631-1000

Fax 604 631-1100

555 Burrard Street

Vancouver, B.C. City of Vancouver - FOI 2019-696 - Page 29 of 119



September 15, 1992

The Dominion Company

Developers, Designers, Builders PERMITS & LICENSES DEPARTMENT

City of Vancouver Department of Permits & Licenses City Hall 453 West 12th Avenue

Vancouver, B.C. V5Y 1V4

Attention: Mr. Robert Maki B-Eng.

The Arbutus Club Re: BP#215126

REQUEST for CLARIFICATION

Dear Sir:

During the design of the Arbutus Club, a discrepancy occurred between the existing conditions, the Structural drawings as submitted, and the Architectural drawings as submitted. I attach four (4) portions of the respective drawings for your understanding.

Exhibit A: Architectural Drawing as originally submitted.

The drawing indicated in error a point-to-point relationship between the existing pre-cast parapet and the existing concrete block wall.

Exhibit B: Structural Drawing as originally submitted.

The structural drawing shows the actual overlap of the concrete block behind the pre-cast concrete parapet.

Exhibit C: Architectural Drawing showing actual.

Had the architectural drawing been drawn correctly, it would have shown the same concrete block overlap behind the pre-cast.

Exhibit D: Architectural Drawing showing added block for Building Permit.

The Plan Checker, having erroneous information from the Architectural Drawings (see: Exhibit A) correctly required additional courses of concrete block to maintain the Fire Separation.

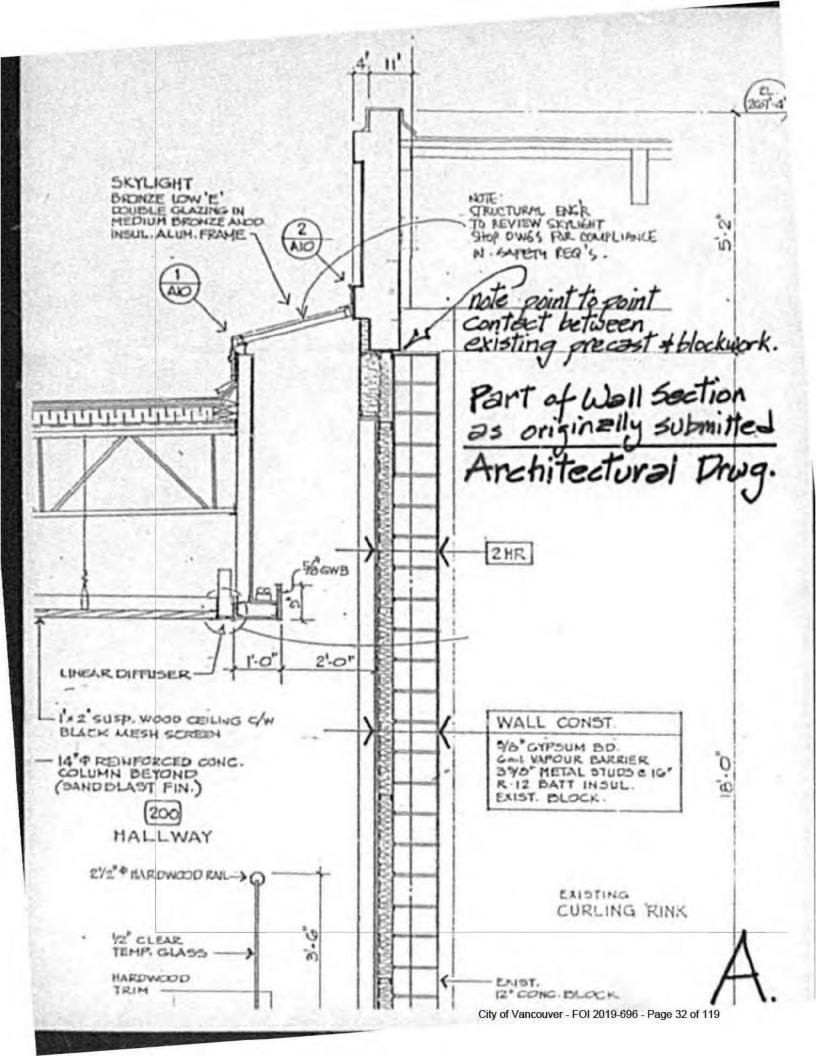
Given that the existing concrete block provides adequate overlap for a normal 2-hr Fire Separation, and that the added layers of steel stud, insulation, and gypsum wallboard (non-rated) can only improve the resistance, do you feel that it is still necessary to install the two (2) courses of concrete block required by the Building Permit?

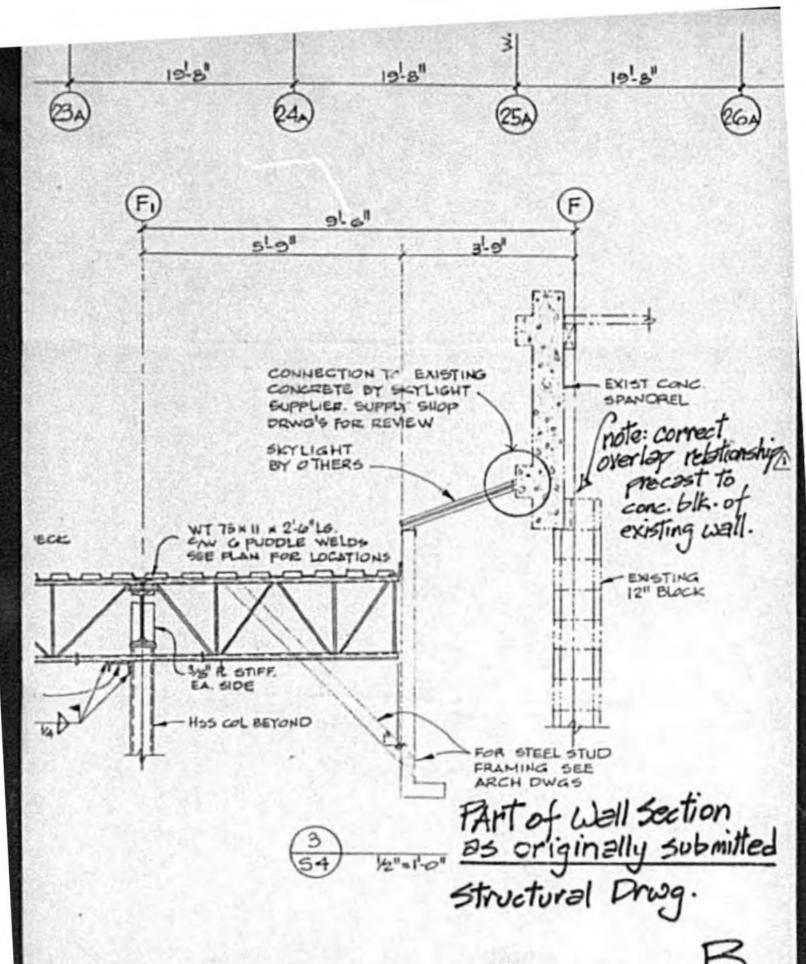
Sincerely,

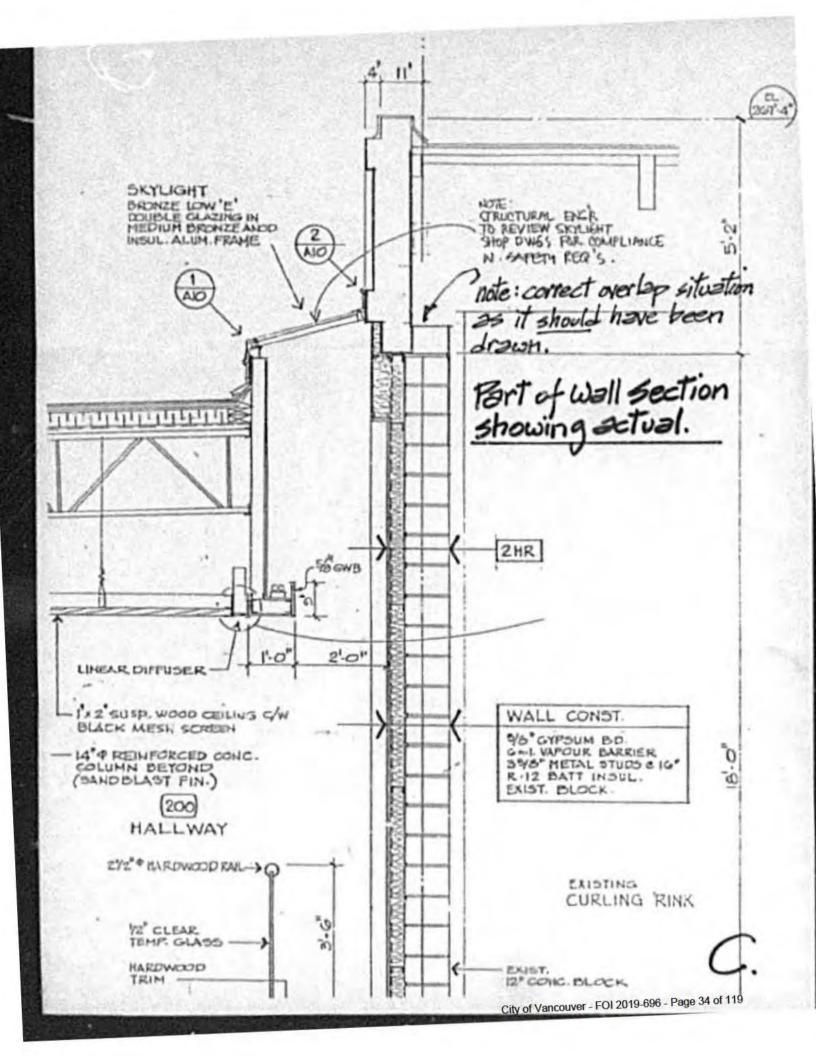
THE DOMINION COMPANY

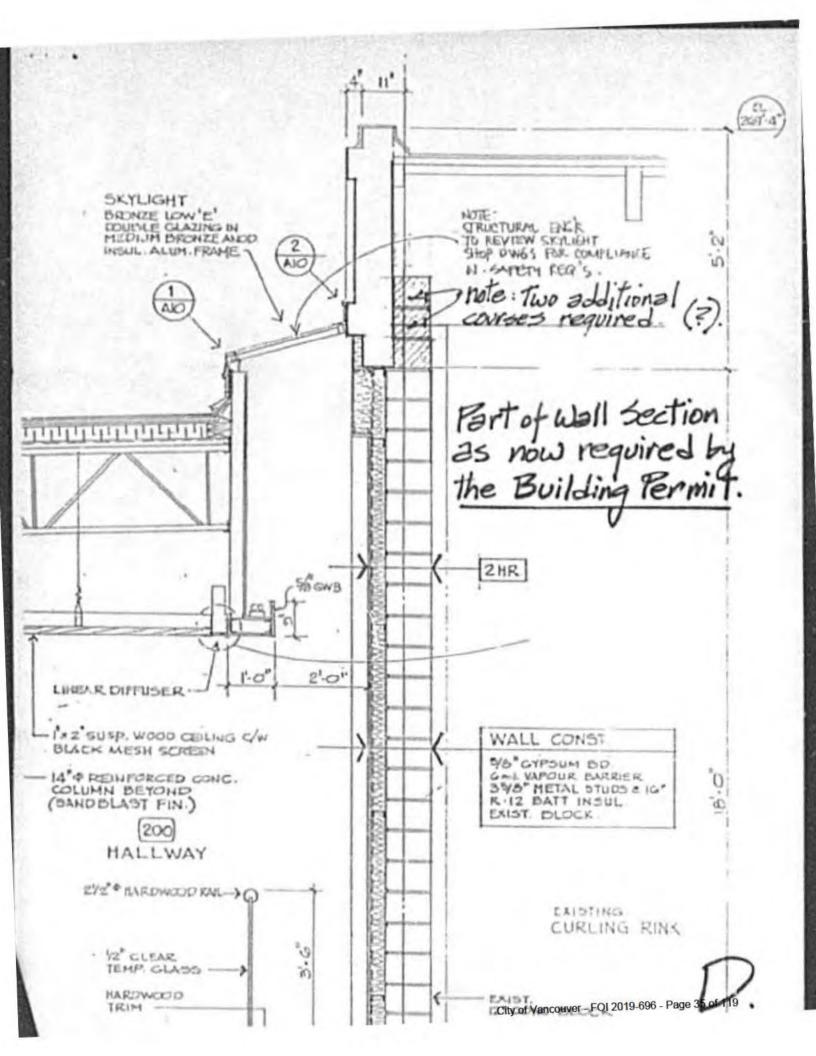
Tim Loo, P.Eng, Certified Professional

CC: Murray MacKinnon, Project Manager











October 10, 1991

The City Building Inspector City of Vancouver 453 West 12th Avenue Vancouver, B.C. V5Y 1V4

Attention: Mr. James Lau

Dear Mr. Lau

# RE: Building Permit Application 215126; Arbutus Club

This is to certify that the Arbutus Club conforms to the City of Vancouver Bylaws in the following design parameters:

- The existing elevator conforms to article 3.7.3.13 of the bylaw and is a suitable device for making the Club accessible to the handicapped.
- The total number of toilet fixtures and urinals in the Club conforms to the requirements of the occupant load and article 3.6.4.2 of the Bylaw. (The occupant load is based on a total Club area of 14,864 m<sup>2</sup> and 9.3 m<sup>2</sup> per person occupancy inclusive of the new wing and pursuant to table 3.6.4.B).

I trust this is the assurance you require. Please contact me if further discussion or clarification is required.

Yours truly,

DOMCO ENGINEERING

Larry Podhora, MAIBC

c.c. - Maguire & McCloy-John Furlong

Domco Engineering Co.

Fax 604 631-1100

PERMITE & LICENSES DEPARTMENT

OCT 2 2 1991

ORIGINAL TO Aface

Reg No.,

COPY TO:

Vancouver, B.C.

# 13 EQUIVALENT MEASURES

13.1 General

The purpose of this section of the report is to provide documentation for various equivalencies to specific By-law requirements. These equivalencies are proposed for:

- protection of glazed openings in a firewall, and
- egress through an interconnected floor space.
- 13.2 Glazed openings in a Firewall

It is proposed to provide 3 glazed openings in the firewall between the new building and the existing building. Normally, such openings are not permitted in a firewall. It is proposed to protect these openings with a sprinkler system which will provide protection equivalent to a 2 h fire separation.

The system will be designed on the information contained in the paper "Fire Tests on Window Assemblies Protected by Automatic Sprinklers" which was published in the journal Fire Technology. A copy of the paper is included in this as Appendix A. The paper describes a series of fire tests which were conducted at the National Research Council of Canada.

The tests showed that, with a properly designed sprinkler system, glazing assemblies can meet the criteria required to achieve classification as a wall assembly with a 2 h fire resistance rating. The test results also showed that the radiant flux from a fire was reduced below the levels required for unpiloted ignition of cellulosic materials.

The design criteria for the glazing assembly and sprinkler system are:

 The glazing will be a single pane of wired, tempered or laminated glass 6 mm thick with a maximum pane size 2600 mm high by 1680 mm wide.

- The glazing will be installed in hollow steel or aluminum frames 3 mm thick, 45 mm wide and 114 mm deep with frame stops sized so that the exposed glass area does not exceed 2590 mm by 1670 mm.
- 3. Grinnell type FR-1/Q-60 sprinkler heads will be installed near the top dead centre of each exposed pane and on both sides of the pane. The heads will be located so that the sprinkler deflector is 32 mm below the frame soffit and 16 mm from the face of the glass.
- 4. The supply piping will be securely attached to the firewall and protected so that in the event of structural collapse of the roof assembly on either side of the wall, the piping will not be damaged or pulled from the wall.
- Piping for the system will be sized so that the minimum flow from each sprinkler head will be at least 68 L/min/m of pane width .
- Distribution piping for the window sprinkler system will be independent of the distribution piping for the building sprinkler system.
- 7. The water demand for the window sprinkler system will be in addition to the water demand for the building sprinkler system over a design area immediately adjacent to the firewall. The water demand for the window sprinkler system will be based on all heads on one side of the wall operating.
- 13.3 Egress Through an Interconnected Floor space
- As noted previously, except for the multipurpose room, occupants on the second floor must approach the floor opening more closely than is permitted by Clause 3.2.8.1.(8)(c) of the By-law. It is proposed to offset this deficiency by providing additional fire protection features, namely:
- use of smoke detectors in the corridor in the first storey located near the opening through the floor assembly,
- use of smoke detectors at the ceiling of the second storey over the opening through the floor assembly,

- use of quick response sprinkler heads in the first storey sprinkler system, and
- provision of a 1 h fire separation between the corridor used by the public and the rest of the floor area on the first storey.

The concern addressed by Clause 3.2.8.1.(8)(c) is that smoke from a fire on the lower floor will pass through the floor opening in sufficient quantities to interfere with the safe egress of persons on the upper floor. In order to mitigate this interference, it is required that the egress system be designed to limit the passage of persons near the floor opening. The equivalency proposed in this section will achieve the same objective as follows:

- a. The lower hallway will not contain any occupancy and will be separated from occupied spaces by a fire separation with a fire resistance rating equal to that required for the floor assembly. Thus, the penetration of smoke into the interconnected floor space, and hence the upper level, should be no greater than if the floor opening did not exist.
- b. The use of quick response sprinkler heads will provide for early response by the sprinkler system to a fire thereby improving the probability that the fire will be controlled or extinguished at a small size. This will significantly reduce the volume of smoke produced by the fire and correspondingly reduce the risk to persons attempting to evacuate the upper floor.
- c. The smoke detectors will provide early notification of possible smoke penetration into the egress routes so that occupants of the second storey could be able to safely exit the floor area before access to exit is impaired.

It is our opinion that these equivalent measures provide a level of life safety at least equal to that intended by the requirement of Article 3.2.8.1.(8)(c) of the By-law.

# 14 SUMMARY

14.1 General

This report has presented an analysis of the proposed addition to the Arbutus Club with respect to the requirements of the Vancouver Building By-law No. 6134. The analysis has shown that in general, the proposed building complies with the requirements of the By-law. Explicit compliance with certain requirements was not possible and equivalent measures have been proposed for these requirements.

14.2 Equivalent Measures

Equivalent measures have been proposed in this report with respect to:

permitting glazed openings in a firewall, and

 allowing the path of egress travel to approach closer than 1/2 the maximum diagonal distance to an opening through a floor assembly in a 2 storey interconnected floor space.

The equivalencies proposed will, in our opinion provide a level of fire and life safety equivalent to that intended by the specific By-law requirements.

- Sill blands ley

W. M. Maudsley, P. Eng. (Alta)

Reviewed by:

T. K. Lenahan, R. Eng.



February 25, 1992

PERMITS & LICENSES DEPARTMENT
Reg No.: R
FEB 2 6 1992
ORIGINAL TO: PRS
COPY TO:

The City Building Inspector City of Vancouver 453 West 12th Avenue Vancouver, B.C. V5Y 1V4

Dear Sir.

2001 NANTON

RE: The Arbutus Club - 4226 Arbutus Street B.P. # 215126

This is to advise that my role as the coordinating design professional on the above project has been rescinded by the Owner. I hereby wish to withdraw my letters of assurance regarding 'coordination of design', 'coordination of field services' and 'architectural design and field review' all dated 91/06/17. Enclosed, please find the replacement assurance letters issued by the firm of Maguire McCloy architects who will carry on with the work. I wish to record that no contractual conflict exists either between myself (Domco) and the client or myself and Maguire McCloy Architects and I leave my field services mandate entirely in the care of Maguire and McCloy Architects effective immediately.

Yours truly,

DOMCO ENGINEERING

L. Podhora, MAIBC

92-02-25: HOTTED - FILE P.LIGHTHRARY

c.c. - J. Furlong, G.M., Arbutus Club
 D. Maguire, M.M., Architects

P. LIGHTHEART Building Insp. - Dist. No. (6)

> Domco Engineering Co. Suite 300, Two Bentall Centre 555 Burrand Street

Fax: 604 631-1100 Tel: 604 631-1000

555 Burrard Street Vancouver, B.C.

City of Vancouver - FOI 2019-696 - Page 41 of 119

# MAGUIRE & McCLOY ARCHITECTS

PERMITS & LICENSES DEPARTMENT
Reg No.: COPY TO: COPY TO: COPY

02/24/92

The City Building Inspector Permits & Licences Department City Hall - East Wing 453 West 12th Avenue Vancouver, B.C. Canada V5Y 1V4

2001 NANTON

Re: The Arbutus Club New Wing Addition - 4226 Arbutus St., Vancouver B.C.

BP No. 212126 \*(or 215126)

Dear Sir,

Please find attached two replacement letters of Professional Assurance for the above project, that will replace two letters previously submitted by Domco Engineering for:

- 1. Assurance of Field Review and Design for persons with disabilities and,
- 2. Confirmation of Commitment by Owner.

Please call if you have any questions.

Yours Truly,

Philip McCloy, MAIBC

92-02-28: HOTED-FILE PLOSHIRAND.

P. LIGHTHEART Building Insp. - Dist. No. 16 Proposer Refuser by KY (How.

HOPPING KOVACH CRINES



Besign Consultains 1155 B West Condona Street Grasbium Vancouves Brish Columbia 1168 (CB FAX 800) 664 7328

Now 2001 Nanton

May 28, 1992

City of Vancouver Permits & Licenses Department 2675 Yukon Street Vancouver, B.C.

Attention: Mr. Gabe Chan

FILE : ASSE PRENTS. JC My 4/22.

Dear Sir,

### Re: Renovation of Change Rooms - Arbutus Club

On behalf of the Arbutus Club, we would like to submit a proposal to delete an Egress door to a public corridor.

The building is classified as a Group A, Division 2 occupancy, 2 storeys, non-combustible construction. As part of upgrading of the entire building, the lower floor area will be sprinklered at this time.

As shown on attached drawing: PRELIM A-1, a stair leads to one of two exits from this floor area (see gridlines 4 between C & D).

Presently, doors at the bottom of the stairs separate the lower floor from the access to exit (see drawing SK-1). As this is also the main entrance to the Change Rooms, it would greatly enhance the design if the doors could be deleted.

We propose the following in lieu of the existing doors:

- Install Quick Response Sprinklerheads in the entire floor area.
- Use the opening in the west wall (at grid 6/C) as the second exit. This 1 1/2
  unit of exit width 1 1/2 hour FRR door in the 12\* reinforced concrete block, 2
  hour firewall, leads to a 15 feet wide corridor, adjacent to squash courts (see
  drawing SK-2)
- A third exit route can be made available, if necessary, through the south wall (grid 5/D) through the swimming pool area (see SK-1 & SK-2).

The building area, as a fire compartment, is 872.76 square meters. This is substantially below the allowed maximum area of 1000 square meters, which is 1/2 the area permitted for a two storey, sprinklered building, facing two streets. Therefore, subsection 3.2.8.1.(8) would apply, provided proposal items 1, 2 and/or 3 are acceptable.



City of Vancouver May 28, 1992 Page 2

As additional information we would like to note that the Fire Wardens Office makes regular inspections of the premises and is more than satisfied with the safety and exit measures in place at this time.

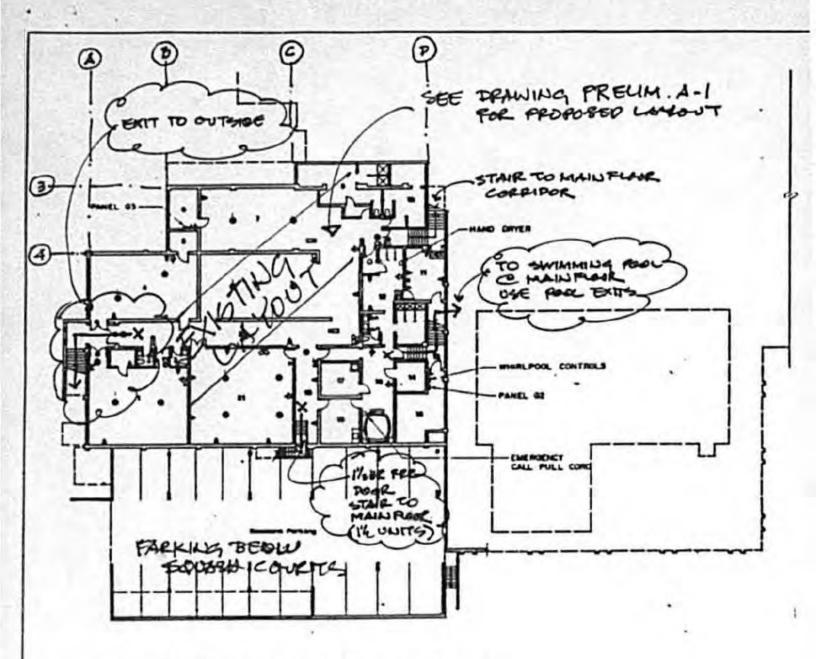
We would appreciate it if you could indicate your positive recommendation at your earliest convenience.

Yours truly,

HOPPING KOVACH GRINNELL

Robert H. Roodenburg

RHR/ss

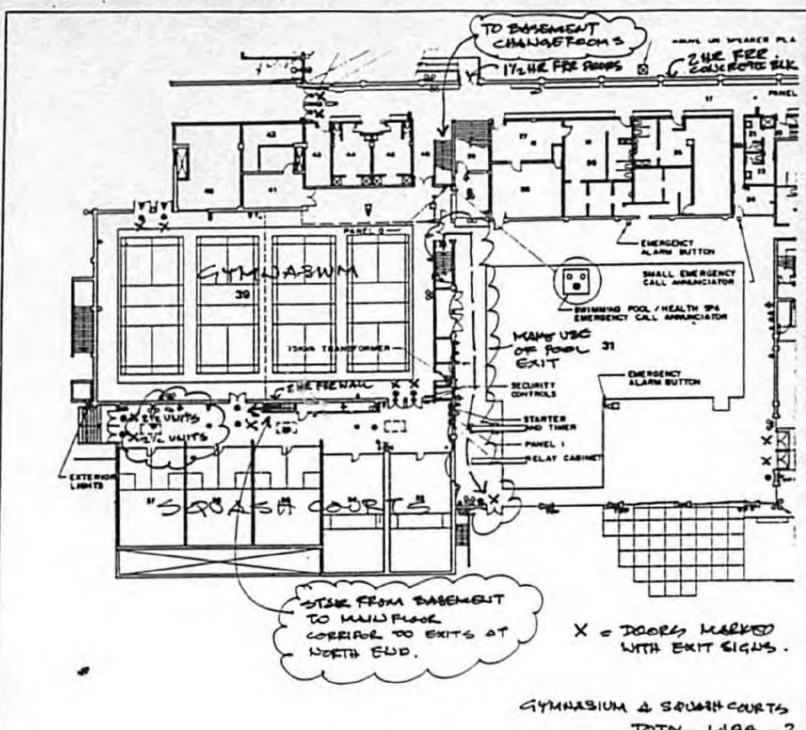


X = DOORS MARKED WITH EXIT SIGNS .

CHANGE ROOMS TOTAL goz m2.







TOTAL 1488 m2.

RECEIVED

MAY 29 1992



MOIN FLOOR LEVER PERMITS & LICENSES DEPT.

-

CHANGEROOMS RENOVATIONS ARBUTUS CLUB



HOPPING LOVACH GRINNELL Design Consultants ttd 96 - Page 46 of 119



### Province of **British Columbia**

Ministry of Municipal Affairs, Recreation and Culture Office of the Fire Commissioner Vancouver/Fraser Region 102, 10334 - 152 A Street Surrey British Columbia **V3R 7P8** Telephone: (604) 660-9026

Dominion Company #300 - 555 Burrard Vancouver, B.C. V7X 1S9

Attention: Larry Podhora

File #: CVA-2 Plan #: 2645-A 91 07 30

Dear Sir:

Re: Occupant Load - Wing Addition, Arbutus Club, 4226 . butus Street, Vancouver, B.C.

Your drawings for the above noted project have been reviewed for compliance with the Public Hall and Theatre Safety Regulations and are hereby approved subject to the construction being done in full compliance with the Fire Services Act and Regulations.

For the purpose of establishing the maximum number of persons admitted under the Public Hall and Theatre Safety Regulations, the net floor area of the portion of the building described as Multi Purpose Room has been calculated as 1326 square feet and provides for a maximum occupant load of 110 persons based on 12 square feet per person.

In addition to the requirements for exit signs, door swing and panic hardware in the Public Hall and Theatre Safety Regulations, emergency lighting is to be provided. The illumination level and the duration of the emergency lighting is set out in the Building Regulations of British Columbia.

Your attention is also directed to the requirement for a fire alarm system to be installed on the premises in accordance with the requirements of the Building Regulation of British Columbia.

Section 4 of the Public Hall and Theatre Safety Regulations requires an inspection approval by the Local Assistant to the Fire Commissioner prior to occupancy. For this project, requests for inspections should be addressed to L.A.F.C. K. Fox of Vancouver Fire Dept., B.C. Telephone number 873-7562.

This approval does not preclude any permit, inspection and approval requirements of other provincial and local authorities.

PERMITS & LICENSES DEPARTMENT ORIGINAL IU

VF/ss C.C.

Building Inspector

Yours truly, FIRE COMMISSIONER

per:

V. Friesen Regional Fire Commissioner

RECEIVED
PLANNING DEPARTMENT
AUG - 2 1991

NUMBER
REFERRED TO
COPY TO
ANSWER REQUE

July 30, 1991

City of Vancouver Planning Department Building Permit Division 453 West 12th Avenue Vancouver, B.C. V5Y 1V4

1226 ARBUYUS

Dear Sirs;



This is further to the Building Fermit application for the New Wing of the Arbutus Club, as submitted by Domco Ltd. Please be advised that the Arbutus Club will provide immediate alternate washroom arrangements for the handicapped, that meet the necessary legal requirements, to replace the washrooms scheduled to be demolished, as a result of New wing construction. I trust this is the information you require.

John A.F. Furlong General Manager The Arbutus Club

ours truly

c.c. Mr. Larry Podhora Domco Engineering

4226 Arbutus Street

Vancouver, B.C.

Canada Vel 4A1

Telephone (604) 266-7166

City of Vancouver - FOI 2019-696 - Page 48 of 119

Facsimile (604) 266-3762



### Province of British Columbia

Ministry of Municipal Affairs, Recreation and Culture Office of the Fire Commissioner Vancouver/Fraser Region 102, 10334 — 152 A Street Surrey British Columbia V3R 7P8 Telephone: (604) 660-9026

Dominion Company #300 - 555 Burrard Vancouver, B.C. V7X 1S9 Attention: Larry Podhora

File #: CVA-2 Plan #: 2645-A 91 07 30

Dear Sir:

Re: Occupant Load - Wing Addition, Arbutus Club, 4226 Arbutus Street, Vancouver, B.C.

Your drawings for the above noted project have been reviewed for compliance with the Public Hall and Theatre Safety Regulations and are hereby approved subject to the construction being done in full compliance with the Fire Services Act and Regulations.

For the purpose of establishing the maximum number of persons admitted under the Public Hall and Theatre Safety Regulations, the net floor area of the portion of the building described as Multi Purpose Room has been calculated as 1326 square feet and provides for a maximum occupant load of 110 persons based on 12 square feet per person.

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This approval does not preclude any permit, inspection and approval requirements of other provincial and local authorities.

Yours truly, FIRE COMMISSIONER

per:

V. Friesen

Regional Fire Commissioner

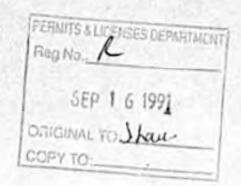
VF/ss

C.C. L.A.F.C.

Building Inspector



September 16, 1991



City of Vancouver Department of Permits and Licences City Hall - East Wing 453 West 12th Avenue Vancouver, B.C. V5Y 1V4

Attention:

Mr. R. Maki, Assistant Director

Permits and Inspections

Re:

Building Permit Application BA 215126 4226 Arbutus Street, The Arbutus Club

I had been informed by Lieut. Miller of the Fire Department that I must seek your agreement to a phased upgrading and integration of the fire alarm system at the Arbutus Club to coincide with the Club's ongoing programme of renovations. I have subsequently received consent to this strategy from your office and wish to hereby make the declaration that the fire alarms in each part of the building will be fully functional during any future construction project at the club. I also enclose a letter of Owner's intent. I trust that this is the information you require to support our strategy of phased alarm upgrading and ask that you acknowledge your acceptance of the above by a written reply.

Thank you very much.

Sincerely;

DOMCO ENGINEERING

Larry Podhora, MAIBC

copy:

J. Lau, Plan Checker

J. Miller, Plans Review Officer

Domco Engineering Co. Suite 300, Two Bentall Centre Fax: 604 631-1100

ourse (6)

Tel: 604 631-1000

555 Burrard Street

City of Vancouver - FOI 2019-696 - Page 50 of 119

Canada V7X tS9

City of Vancouver
Department of Permits and Licences
City Hall - East Wing
453 West 12th Avenue
Vancouver, B.C.
V5Y 1V4

Attention:

Mr. R. Maki, Assistant Director

Permits & Inspection

Dear Mr. Maki:

Re: Building Permit Application BA215126 4226 Arbutus Street, The Arbutus Club

I declare, on behalf of The Arbutus Club, that the planned Addition 'A' now under review by your department is the first of several phases planned according to the development permit on the property. At the end of this phased program, the fire alarm system of the entire club will be integrated and brought into compliance with fire department's requirements.



Sincerely,

Mr. Ed J. Duda

Manager, Finance & Administration

The Arbutus Club

FOR: John A.F. Furlong

General Manager The Arbutus Club

4226 Arbutus Street

Vancouver, B.C.

Canada V6I 4A1

rlephone (604) 266-7166



October 03, 1991

City of Vancouver Permits & Inspection Division 453 West 12th Avenue Vancouver, B.C. V5Y 1V4

Attention:

Mr. R.L. Maki

Assistant Director

Dear Mr. Maki,

RE: Proposed New Wing Of The Arbutus Club 4226 Arbutus Street, Vancouver

Thank you for meeting with the project design team representatives on 17/5/91. The following is an abbreviated summary of the decisions reached.

- a) The partition walls demising the public corridor at the ground floor level shall be designed to have 1 hr. rating.
- Smoke detectors will be provided in the ceiling of the lower level of the interconnected space.
- c) The existing exterior wall of the curling rink shall be deemed a 2 hr. rated firewall and the rink a separate building.
- d) Glazing in this wall shall be protected so that it qualifies as a rated closure suitable for the 2 hr. wall rating.
- Our structural engineer is to verify that the design of the new wing is structurally independent of the existing buildings. (See enclosed certification letter.)
- f) One exit for the curling rink will be relocated to the north wall.

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Reg No	_ ^
OCT 0	3 1991
ORIGINAL TO	RLM
COPY TO:	

Domco Engineering Co. Suite 300, Two Bentall Centre

Fax: 604 631-1100 Tet: 604 631-1000

City of Vancouver - FOI 2019-696 - Page 52 of 119

Canada V7X 159

g) Provided of the above are complied with, the existing curling rink may remain as is with no seismic upgrading required.

I trust this is an accurate summary of the pertinent points of our discussion. Should you wish to amend this list in way way please contact me within seven days of the date of receipt.

Yours truly

Larry Podhora, M.A.I.B.C.

C.C.-

J. Furlong / Arbutus Club D. Maguire / Maguire McCloy Architects M. Maudsley / Gage Babcock & Associates



### Province of **British Columbia**

· Ministry of Municipal Affairs, Recreation and Culture Office of the Fire Commissioner Vancouver/Fraser Région 102, 10334 -- 152 A Street Surrey British Columbia V3R 7P8 Telephone: (604) 660-9026

PERMITS A LICENSES DEPARTMENT

HOD NO.

AUG U 2 1991

File #: CVA-2 Plan #: 2645-A

91 07 30

Now 2001 Nanton

#300 - 555 Burrard Vancouver, B.C. V7X 1S9 Attention: Larry Podhoraginal To.

COPY TO:

Dear Sir:

Dominion Company

Re: Occupant Load - Wing Addition, Arbutus Club, 4226 Arbutus Street, Vancouver, B.C.

Your drawings for the above noted project have been reviewed for compliance with the Public Hall and Theatre Safety Regulations and are hereby approved subject to the construction being done in full compliance with the Fire Services Act and Regulations.

For the purpose of establishing the maximum number of persons admitted under the Public Hall and Theatre Safety Regulations, the net floor area of the portion of the building described as Multi Purpose Room has been calculated as 1326 square feet and provides for a maximum occupant load of 110 persons based on 12 square feet per person.

In addition to the requirements for exit signs, door swing and panic hardware in the Public Hall and Theatre Safety Regulations, emergency lighting is to be provided. The illumination level and the duration of the emergency lighting is set out in the Building Regulations of British Columbia.

Your attention is also directed to the requirement for a fire alarm system to be installed on the premises in accordance with \_the requirements of the Building Regulation of British Columbia.

Section 4 of the Public Hall and Theatre Safety Regulations requires an inspection approval by the Local Assistant to the Fire Commissioner prior to occupancy. For this project, requests for inspections should be addressed to L.A.F.C. K. Fox of Vancouver Fire Dept., B.C. Telephone number 873-7562.

This approval does not preclude any permit, inspection and approval requirements of other provincial and local authorities.

> Yours truly, FIRE COMMISSIONER

per:

V. Friesen

Regional Fire Commissioner

VF/ss

L.A.F.C. C.C.

Building Inspector



May 17, 1991

PERMITS & LICENSES DEPARTMENT
Reg No.: R

OCT 3 0 1991

ORIGINAL TO: KLM

COPY TO:

City of Vancouver Permits & Inspection Division 453 West 12th Avenue Vancouver, B.C. V5Y 1V4

Attention:

Mr. R.L. Maki Assistant Director

Dear Mr. Maki,

4226 ARBUTUS

RE: Proposed New Wing Of The Arbutus Club

BA 215126

This is to certify that the structural design for the above mentioned project provides for the new building being independent of the existing structures. A seismic movement gap is incorporated into the design to separate the new wing from the existing structures during an earthquake.

Yours truly,

Bill Cosman, P. Eng.

Bill Goman

c.c.- J. Furlong / Arbutus Club
D. Maguire / Maguire McCloy Architects
F. Wong / Gage Babcock & Associates

noted - Alaki.



Domco Engineering Co. Suite 300, Two Bentall Centre Fax: 604 631-1100 Tel: 604 631-1000

City of Vancouver - FOI 2019-696 - Page 55 of 119



October 30, 1991

City of Vancouver Permits & Inspection Division 453 West 12th Avenue Vancouver, B.C. V5Y 1V4

Attention:

Mr. Lau

Dear Mr. Lau.

Structural Integrity Of The North Firewall Arbutus Club Addition B.A.: 215126 RE:

As you have requested a Certification Letter to ensure that the north firewall complies with section 3.1.8 of the V.B.B.L., I wish to record the following:

- a) The structural frame is not independent of the 'Firewall'.
- b) The firewall is supported on the concrete frame.
- According to our available sources of information, the existing structure is C) non-combustible, rib concrete slab construction with a minimum concrete steel cover of 25mm.
- d) Such a cover will yield at least 2 hr. fire rating according to N.B.C. supplement 2.2.B.
- e) The wall therefore maintains its 2 hr., fire rating integrity and qualifies as a firewall according to 3.1.8.10 of the V.B.B.L.

I trust this is the information you require and hope for an imminent issue of the building permit.

Yours truly.

DOMCO ENGINEERING

Larry Podhora, M.A.I.B.C.

Fax: 604 631-1100 Tel: 604 631-1000

Domou Engineering Co. Williams Suite 300, Two Bentall City of Vancouver - FOI 2019-696 - Page 56 of 119 Canada V7X 159

PERMITS & LICENSES DEPARTMENT

OCT 5 0 1991

ORIGINAL TO: J.Lau

Reg No.:

COPY TO:-

4226 arlutus OFFI. PERMITS & LICENSES. Maguire Fred. No. 10/711 Pearson & Salikan SEP 27-188 Architects == Note, pass on as shown September 21, 1988 Note and file Info - do not return Mr. RALL Maks Take appropriate action Assistant Director Permits and Inspection Division Imperignes and report City of Vancouver Draft for my signature 2675 Yukon St. Vancouver, B.C.

RE: Minutes of our meeting of September 13, 1988 regarding the code compliance of The Arbutus Club.

Dear Sir:

V5Y 3P9

The following is a summary of your responses and comments to our enquiries, as we understand them. Please return us a signed copy to confirm:

- Additions to a building will require a seismic upgrade of that building, and therefore a seismic report will be required on it.
- If the value of renovations is greater than the assessed value of the total building, then it will require a seismic report on it and a subsequent upgrade, if necessary.
- 3. If an overall building is divided by firevalls, then the seissic upgrade can be limited to that "sub-building" (or compartment); that is, seissic upgrade can be limited to separate "buildings" as per the N.B.Code. Similarily, if a renovation is separated out by a firevall (and perhaps has a separate heating plant), then this area can be treated as a separate building with respect to seismic upgrade.
- Bonus credits are now given in the new building code for buildings that are close to square in plan, recognizing that this reduces potential coriolis forces.
- Buildings constructed between 1962 to 1965 were already anticipating the seismic requirements of the 1965 N.B.Code, hence the curling rink probably already has some seismic design.

(continued)

Since 404 (873 Bousty E). Conneces RE, Conado YES 2566 Brighous, 86841 988-0103

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# Page No. 2.

- 6. If the owners are voluntarily improving the occupant safety of their building, for example by sprinklering, then this can be approved as a staged process (as long as an overall plan is in place). The City will not require in this case that the entire complex be upgraded all at once.
- Sprinklering of the building will allow one downgrade of the fire-resistance ratings required for its components and assemblies.
- Similar to (3) above, as for seismic upgrade, fire-safety upgrade can be limited to a "building" separated out by firewalls.
- 9. Host of section 3.8 of the Vancouver Building Bylav, dealing with equivalencies, particularly in older non-conforming buildings, is applied through Building Board of Appeal decision? which are now codified for general use.
- 10. The Tag wood decking on the roofs is not really a problem even though the building is required to be of non-combustible construction. (See 3.8 of Bylaw.)
- Travel distances to exits will have to comply to latest code requirements if renevations proceed.
- 12. Existing doors, and their hardware, in required fire separations likely do not attain current standards; for example, the older hollow metal doors do not limit temperature rise across them as now required.
- 13. If unprotected openings in a required firewall are limited to 10% of its area, then the cumbersome requirements for alarm activated closures, special hardware, etc. are avoided.
- There are no specific City regulations regarding asbestos removal requirements (this is a WCB jurisdiction).

Sincerely,

(Robert A. Salikan, MAIBC, MRAIC)

September 30, 1988

I concur with the principles discussed

herein,

R. L. Maki, P. Eng.

DEPUTY CITY BUILDING INSPECTOR

cc: dopert A. Saliken, MAIBC

E. w. Rush

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PERMITS & LICENSES DEPARTMENT
Reg No.:

MAY 2 1 1991

ORIGINAL TO: PLM
COPY TO:

May 17, 1991

City of Vancouver Permits & Inspection Division 453 West 12th Avenue Vancouver, B.C. V5Y 1V4

Attention:

Mr. R.L. Maki Assistant Director

Dear Mr. Maki,

AZZE ARBUJUS

# RE: Proposed New Wing Of The Arbutus Club

Thank you for meeting with the project design team representatives on 17/5/91. The following is an abbreviated summary of the decisions reached.

- The partition walls demising the public corridor at the ground floor level shall be designed to have 1 hr. rating.
- b) The ground floor sprinklers shall have the quick response heads. Smoke detectors will be provided at both levels of the interconnected space.
- c) The existing exterior wall of the curling rink shall be deemed a 2 hr. rated firewall and the rink a separate building.
- d) Glazing in this wall shall be protected so that it qualifies as a rated closure suitable for the 2 hr. wall rating.
- Our structural engineer is to verify that the design of the new wing is structurally independent of the existing buildings. (See enclosed certification letter.)
- f) One exit for the curling rink will be relocated to the north wall.

Domco Engineering Co. Suite 300, Two Bentall Centre 555 Burrard Street Fax 604 631-1100 Tel: 604 631-1000

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Provided of the above are complied with, the existing curling rink may remain as is g) with no seismic upgrading required.

I trust this is an accurate summary of the pertinent points of our discussion. Should you wish to amend this list in any way please contact me within seven days of the date of receipt.

Yours truly

Larry Podhora, M.A.I.B.C.

c.c.- J. Furlong / Arbutus Club
D. Maguire / Maguire McCloy Architects
F. Wong / Gage Babcock & Associates



May 24, 1991

City of Vancouver Permits & Inspection Department 453 West 12th Avenue Vancouver, B.C. V5Y 1V4

Attention:

Mr. R.L. Maki

Assistant Director

Dear Mr. Maki,

Re: Proposed New Wing Of The Arbutus Club

4226 ARBUTUS

Further to my letter of May 17, 1991, I had been asked by Mr. Maguire to clarify the wording on item d, and item g, so that it is clear we intend to put new glazing into the existing fabric of the curling rink. I enclose the amended version of the same letter. Would you please initial a copy and return it to me.

Thank You.

Your	s trul	у,			
ром	co	ENGINE	RIN	G	
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Larry	Pod	hora, M.	A.I.B.C		_
June	3,	1991			

ACCEPTABLE subject to any new glazing being fire-rated as proposed for firewall equivalency

L. Maki, PEng for R. V. Hebert, PEng DIRECTOR and CITY

BUILDING INSPECTOR

CC: Larry Podhora Domco Engineering Co. M.A.I.B.C.

K. Y. Chan FILE

555 Burrard Street Vancouver, B.C.

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MAY 2 7 1991

Fax: 604 631-1100

Tel: 604 631-1000

ORIGINAL TU RLP

COPY TO:

Reg No

PERMITS & LICENS





PLANNING AND DEVELOPMENT SERVICES
Office of the Chief Building Official

2001 Nanton Avenue	Fire-Resistance	l <u>y</u> Oct 10, 2018	
Project Address	Title/Descriptor	Initial Submission Date	
DB-2018-04665 Related Building Permit	☑Alternative Solution Select One	n / □ Minor Relaxation*	Sept 4, 2019  Last Revision Date
APPLICANT INFORMATION			(Professional Seal)
Proposed By:	Cel Chow, M.Eng., P.Eng., C	CP, FEC	
Firm: Jen	a Ltd.		
Address: 1195 West	rer, BC V6H 3X5		
Phone: <u>(604) 732-3751</u> Fax:	(604) 732-1277 Email:	cchow@JensenHughes.com	
Certified Professional Stamp &			ance & Conditions of Acceptance
For Certified Professional Use (where a	applicable)	For CoV office use only	

#### BRIEF BUILDING DESCRIPTION AND SCOPE OF PROJECT:

The Arbutus Club is an existing 3-storey building providing modern recreational facilities. The building is permitted to be interconnected between the first and second storey, but there is an existing interconnection in the fitness area which forms the second and third storey. The second storey of the fitness area also looks into the gymnasium, which spans 2 levels (first and second storey). The construction Article of the building is 3.2.2.24, which requires a 1 hour fire separation for the floors.

The club is proposing a renovation in the fitness area, which includes a minor vertical addition. To address the existing nonconformity of the fitness area, it is proposed to separate the gymnasium from the fitness area so that the gymnasium does not interconnect 3 floors. The existing arrangement contains glazing along the wall between the fitness area and the gymnasium, and it is proposed to protect the glazing to the required 1 hour fire separation with water curtain sprinkler protection.

In addition, there is an existing floor opening between the 2<sup>nd</sup> storey and the 3<sup>rd</sup> storey in the fitness area. Although there is no alteration on the existing floor opening except a structural improvement around the opening, it is proposed to provide closely spaced sprinklers around the opening.

#### BY-LAW EDITION, REFERENCE(S) & SUMMARY OF DEVIATION(S):

The governing Code of this building is the 2014 Vancouver Building By-law (VBBL). Unless noted otherwise, all building code references in the body of the report refer to Division B of the VBBL. Italicized items in this report are given the same meaning as ascribed to them in the VBBL.

Sentence 3.1.7.1.(1) of the VBBL states that the rating of a material, assembly of materials or a structural member that is required to have a fire-resistance rating, shall be determined on the basis of the results of tests conducted in conformance with CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials". The proposed glazing at the gymnasium area is not a CAN/ULC-S101 tested system and therefore does not satisfy the determination of ratings per 3.1.7.1.(1).

Sentence 3.1.8.4.(1) of the VBBL states that the fire-protection rating of a closure shall be determined based on the results of tests conducted in conformance with the appropriate provisions in CAN4-S104-M, CAN4-S106-M, or CAN/ULC-S112-M for fire tests of door assemblies, window and glass block assemblies, and fire-damper assemblies.

The existing glazing spans along the length of the walls and is unprotected.

## LIST OBJECTIVE(S) AND FUNCTIONAL STATEMENT(S)\* INCLUDING DESCRIPTION OF INTENT:

\*(as Attributed in Tables of Division B)

The following objective and functional statements are attributed to the acceptable solutions of Sentence 3.1.8.4.(1) in Section 3.9 of the VBBL:

#### Determination of Ratings

3.1.7.1.(1): [F03-OS1.2][F04-OS1.3]

[F03-OP1.2][F04-OP1.3]

3.1.8.4.(1): [F03-OS1.2]

[F03-OP1.2]

### Mezzanines and Openings through Floor Assemblies

3.2.8.4.(1): [F02-OS1.2][F02-OP1.2]

3.2.5.12.(1): [F02, F81, F82-OS1.2]

[F02, F81, F82-OP1.2]

#### Objectives

### OS1 Safety

An objective of the Code is to limit the probability that, as a result of the design or construction of the building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to fire. The risks of injury due to fire addressed in the Code are those caused by -

OS1.2 - fire or explosion impacting areas beyond its point of origin

OS1.3 - collapse of physical elements due to a fire or explosion

OP1 Fire Protection of the Building

An objective of the Code is to limit the probability that, as a result of the design or construction of the building, the building will be exposed to an unacceptable risk of damage due to fire. The risks of damage due to fire addressed in the Code are those caused by -

OP1.2 - fire or explosion impacting areas beyond its point of origin

OP1.3 - collapse of physical elements due to a fire or explosion

#### **Functional Statements**

The objectives of the Code are achieved by measures, such as those described in the acceptable solutions in Division B, that are intended to allow the building or its elements to perform the following functions:

F03 To retard the effects of fire on areas beyond its point of origin.

FO4 To retard failure or collapse due to the effects of fire.

F81 To minimize the risk of malfunction, interference, damage, tampering, lack of use or misuse.

#### F81 To minimize the risk of inadequate performance due to improper maintenance or lack of maintenance.

Functional statements are not in and of themselves quantitative measures of performance, but are considered to be satisfied by the literal solutions of Division B of the VBBL. Therefore, if it can be demonstrated that the proposed alternative solution can fulfill the above functional statements in a manner consistent with that of the acceptable solutions of Division B, the objectives of Sentence 3.1.7.1.(1) and 3.1.8.4.(1) will have been achieved.

#### SUMMARY OF SOLUTIONS/LIST OF MITIGATING FEATURES\*\*:

\*\*(additional design features in excess of literal requirements)

#### 1 h Fire-Resistance Rating on the Wall

To achieve the required 1 h fire-resistance rating on the wall, the unrated glazing will be provided with water curtain sprinkler protection (see Attachment 1).

The water curtain sprinkler protected system will provide an equivalent level of protection required of Division B by abating thermal radiation heat transfer and discouraging the passage of smoke and flame in the event of a fire. Per 3.1.7.3.(2), interior vertical fire separations shall be rated for exposure to fire on each side, therefore the water curtain sprinkler protection will be installed on both sides of the glazing wall assembly.

Closely spaced sprinklers are to be provided:

• On both sides of the walls between the gymnasium and fitness area.

The sprinkler protection must meet the following criteria:

### Sprinkler Design Criteria

Type: Quick-response pendent or upright sprinklers with a K-factor of 5.6 and a maximum activation

temperature of  $74\,^{\circ}\text{C}$  (165 $^{\circ}\text{F}$ ). It is proposed that the sprinklers in the gymnasium and workout room

are to be concealed recessed sprinklers in the bulkhead.

System: The sprinklers shall be served by a wet system.

Coverage: Alternative solution sprinklers may be considered to provide floor area coverage.

Location: See sketches in Attachment 1 for protected opening locations. Sprinklers shall be located at 6' on

centre, with a maximum of 3' (900 mm) from a sprinkler to the edge of an opening.

Position: Sprinkler deflectors are to be positioned a maximum of 1'-6" (450 mm) vertically above the top of the

opening, and between 6" and 1' (150 and 300 mm) horizontally from the face of the opening. Sprinklers

shall be positioned on both sides of the openings and the deflectors are at the same level as the top of

the openings.

Zoning: The sprinklers for the alternative solution shall be zoned separately from the building floor area

sprinklers.

Min. Flow: A minimum flow of 4.5 USgpm/linear foot, with no sprinkler discharging less than 27 USgpm.

Design Area: The water curtain must be hydraulically designed to include both the water curtain sprinklers within

the adjacent NFPA 13 design area, and the adjacent floor area sprinklers and hose demand, as required

by NFPA 13.

Baffles: Noncombustible baffles in conformance with NFPA 13 will be provided where alternative solution

sprinklers are located within 1,830 mm (6'-0") of any other sprinklers or subjected to cold solder effect

by sprinklers at higher ceiling level.

### Unrated Glazing

Glazing needs to be not less than 6 mm thick, tempered glass in aluminum frames.

#### Kalwall Composite Panels

Minimum 2-3/4" thick Kalwall panels with aluminum I-beam grid framed perimeter.

#### Ponywall

Zoning:

A 3 ft ponywall will be provided where the Kalwall Composite Panels are.

## Opening through Floor Assembly

To provide protection around the floor opening, closely spaced sprinklers will be provided at the 2<sup>nd</sup> Floor ceiling around the opening. (See Attachment 1).

The proposed closely spaced sprinkler protection system will provide an equivalent level of protection for the floor separation as required of the VBBL.

The sprinkler protection must meet the following criteria:

# Sprinkler Design Criteria

Type:	Quick-response	pendent	or	upright	sprinklers	with	а	K-factor	of	5.6	and	а	maximum	activation	1
			~ - \												

temperature of 74°C (165°F).

System: The sprinklers shall be served by a wet system.

Coverage: Alternative solution sprinklers may be considered to provide floor area coverage.

Location: See sketches in Attachment 1 for protected opening locations. Sprinklers shall be located at 6' on

centre, with a maximum of 3' (900 mm) from a sprinkler to the edge of an opening. Since the limited headroom clearance is available around the opening, the design opening can be located physically 2'

to 3' from the edge of the opening to the floor area.

Position: Sprinkler deflectors are to be positioned as high as possible to maintain the maximum headroom clearance. Concealed sprinklers are preferred to be installed to avoid physical damage.

The closely spaced sprinklers shall be part of the 2<sup>nd</sup> floor ceiling sprinkler system.

Min. Flow: A minimum flow of 3 USgpm/linear foot as required by NFPA 13, with no sprinkler discharging less than

18 USgpm.

Design Area: The selection of the most hydraulically remote design will be based on the hydraulic calculation

procedures in Section 23.4 of the NFPA 13 - 2013.

Draft Stops: Due to the limited headroom clearance, draft stops will not be provided.

Baffles: Noncombustible baffles in conformance with NFPA 13 will be provided where the closely spaced

sprinklers are located within 1,830 mm (6'-0") of any other sprinklers or subjected to cold solder effect

by sprinklers.

#### PROVIDE ANALYSIS AND EVALUATION TO VALIDATE ACCEPTANCE:

#### Kalwall Panels

The Kalwall panels are made of composite material with aluminum bracing. The Kalwall panels have been tested to ASTM E-119, which is tested with a furnace temperature following the time-temperature curve, but with an exception of capping the temperature at 1200 F (650 C) which occurs at approximately 8  $\frac{1}{2}$  minutes into the test. The test is kept at 1200 F (650 C) until 65 minutes into the test. The test report noted that there were no flames that passed through to the unexposed side during the 65 minutes of testing. As the building is sprinklered, the temperature is not expected to reach 650 C as sprinkler activation will have occurred, so therefore the Kalwall panels are anticipated to remain standing.

#### Ceiling-Mounted Sprinklers for Fire Separations

The design of a sprinkler protected tempered glass system in a fire separation is based on fire tests conducted by Kim and Lougheed in "Fire Protection of Windows Using Sprinklers". The study demonstrated that ceiling-mounted sprinklers located up to 600 mm (2'-0) from a glazed assembly will provide at least a 1 h fire-resistance rating for an 1,800 mm (6'-0") wide tempered glazing system with a maximum 150 mm (0'-6") sill depth. The fire tests conducted for the ceiling-mounted sprinklers were based on fire exposures corresponding to the CAN/ULC-S101 standard time-temperature curve, where temperatures reached are expected for an unsprinklered building.

As the building will be fully sprinklered on both sides of the required fire separations, the proposed alternative solution sprinklers will be mounted directly under a continuous noncombustible bulkhead which is above the window openings. The unrated glazing and Kalwall panels will be exposed to much lower temperatures, providing an additional level of safety.

### Saturation of Hot Gases

Research by Leonard Cooper in his paper "Design of Effective Water Spray Cooling in Stairwell Sprinkler System" demonstrates the effectiveness of closely spaced sprinkler water curtains in reducing the temperature of gases and protecting an open stair. The experimental setup included a 3-storey stair tower with a contiguous basement burn room. The water curtain sprinklers were located 6' (1,830 mm) on centre between the burn room and the base of the stairway. Instrumentation was used to measure the temperature of fire gases in the stairwell at the first floor both with and without water curtain protection.

Cooper indicates that fire gases would never exceed 212°F (100°C) if they were brought to their fully saturated state. At this temperature, the ignition of ordinary combustibles will not occur. Cooper also studied the efficiency of water usage. Where ½" orifice sprinklers (K=5.6) are utilized, the criteria provided by Cooper indicates that a water discharge of at least 4.5 USgpm/ft will be sufficient to fully saturate fire gases that pass through the water curtain.

#### Ambient Air Cooling

Additional research demonstrating the ability of a standard sprinkler to saturate atmosphere and pre-wet surrounding surfaces is summarized in the NRCC article "Fire Exposure of Glazing". Tests were carried out to determine whether a 51 mm thick oak double-door assembly with wired glass inserts would exhibit sufficient fire-resistance, either with or

without automatic sprinkler protection. The tests were performed in a burn room with a floor area of 3.6 x 3.6 m and a ceiling height of 3.3 m, under test conditions specified in CAN4 S104-M. A single quick-response sidewall sprinkler was provided in the burn room, installed 150 mm below the ceiling approximately 300 mm away from the wall opposite to the tested door assembly.

During the test, the sprinkler activated fast enough to prevent cracking of the wired glass located within the door 3.6 m away from the sprinkler. Due to the sprinkler discharge, the average temperature of the test room never exceeded 75°C. The maximum temperature recorded on the inside surface of the glazing was approximately 75°C, and the outside surface temperature was approximately 60°C. No damage to the door assembly was observed during the test and the radiation through the glazing was negligible.

With regards to the Kalwall panel, based on the temperatures encountered during the test and that the glass did not crack, the temperature at the glass was likely not greater than 300 C, whereas the Kalwall panel was tested to a furnace temperature of 650 C.

Given that in the reviewed test the single sprinkler was discharging 27 USgpm of water in a 3.6 m wide room (2.25 USgpm/ft), it can be concluded that sprinklers spaced at 1.8 m (4.5 USgpm/ft) per sprinkler will be sufficient to saturate air sufficiently to prevent flame-spread and temperature rise on adjacent surfaces.

It can be concluded that the water curtain will meet the performance objective of a code compliant closure, which is to prevent undue radiation and flame from moving through the opening.

### Fire Separation Performance

Section 7 of CAN/ULC-S101 governs the test criteria for acceptance of non-loadbearing walls and partitions subjected to the standard fire endurance test and hose stream test described in Sections 4 and 5 of the Standard. Paragraph 7.3.3 states that the fire endurance test of a wall assembly may be regarded as successful if the average temperature rise on the unexposed side of the test specimen does not exceed 140°C, no individually recorded temperature rise exceeds 180°C for the duration of the test, and no through-openings develop for the duration of the test.

**Per Cooper's study, quick**-response, ceiling-mounted sprinklers discharging a minimum of 3 USgpm per linear foot will be sufficient to fully saturate fire gases on the exposed side of an unprotected opening to not more than 100°C. It is reasonable to assume that the unexposed side of the unprotected opening will therefore not exceed 100°C at any point while the sprinklers are discharging. This is within the boundary set out per CAN/ULC S101 for acceptance of the fire endurance test, and as such, the proposed water curtain will meet the performance objective of a code compliant fire separation as long as a continuous water supply is provided.

The paper "Glass Breakage in Fires" by V. Babrauskas summarizes studies conducted on the fire-resistance of unprotected glazing. The paper concluded that tempered glass is able to withstand radiant heat flux of up to 43 KW/m2 and temperatures of around 300°C before breakage occurs. For reference, 6 KW/m2 is considered the threshold of human exposure to fire. Piloted ignition of wood volatiles occurs at 12.5 KW/m2 [3].

Per Babrauskas' study, the glazing provides an additional redundancy to smoke and flame spread. The glazing is expected to remain in place as long as the water curtain is active and temperatures in the vicinity of the glazing are controlled. The proposed water curtain is capable of fully saturating fire gases passing through the curtain, and such gases will not be of a sufficiently high temperature to cause glazing/door failure.

Furthermore, the test conditions of CAN/ULC S101 simulate a post-flashover fire, and the flames in these tests impinge directly onto the tested wall surface. As both floor areas on either side of the required fire separation will be fully sprinklered, the exposure conditions will be significantly less severe than in CAN/ULC S101.

#### Sprinkler Activation

Sprinklers are designed to activate once it reaches a certain temperature based on the convective and radiative heat transfer from a fire. The closest sprinkler to the fire is expected to activate based on its proximity. With regards to the water curtain in relation to the varying ceiling height between the gymnasium and the fitness area windows, if a fire were far away from the water curtain, it is expected that the floor area sprinkler would activate and temperatures

at the openings would not be at a level that would require protection. If there is a fire near or adjacent to the wall containing the opening, then the water curtain is expected to activate based on the higher temperatures near the fire plume and the higher radiative heat flux that will be transferred to the sprinkler. This is based on the concept that fires adjacent to walls are subject to less air entrainment which presents less cooling effect and less temperature decrease emitted from the fire plume then if it had no physical barriers nearby, which will help with sprinkler activation. In addition, the water curtain sprinklers have a shield built above the heads, which will aid in heat collection to help with early sprinkler activation.

If the fire is of a moderate size, heat may be accumulated at the ceiling. The sprinklers at the ceiling level may operate before the sprinkler at the glazing opening. The temperature at the glazing opening is likely below the failure temperature of the glazing subject to thermal shock. It is expected that the glazing remains intact during the fire.

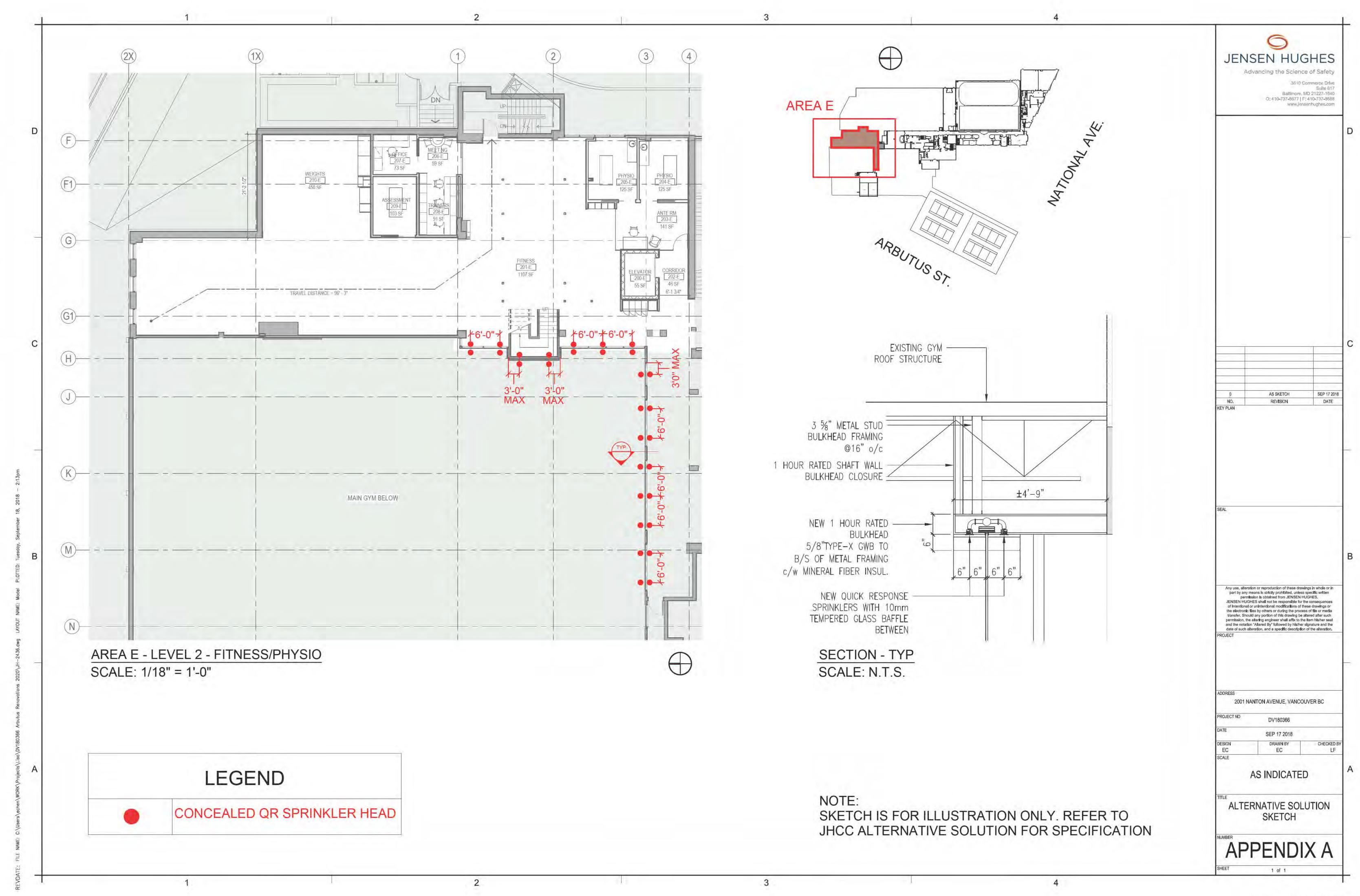
Subsection 7.8 Outside Sprinklers for Protection Against Exposures Fires of the NFPA 13 Automatic Sprinkler Systems Handbook specifically mentioned that one of the performance objectives of the window sprinklers is to limit the radiation or connective heat generated by an exposure fire near the window. The approximate location of the alternative solution sprinklers to the window openings will provide a prompt response of the sprinkler activation. The discharge of the sprinklers will prevent the ignition of the combustible material near the window openings and also prevent the glazing surface becoming overheated and glass breakage as the result of the thermal shock.

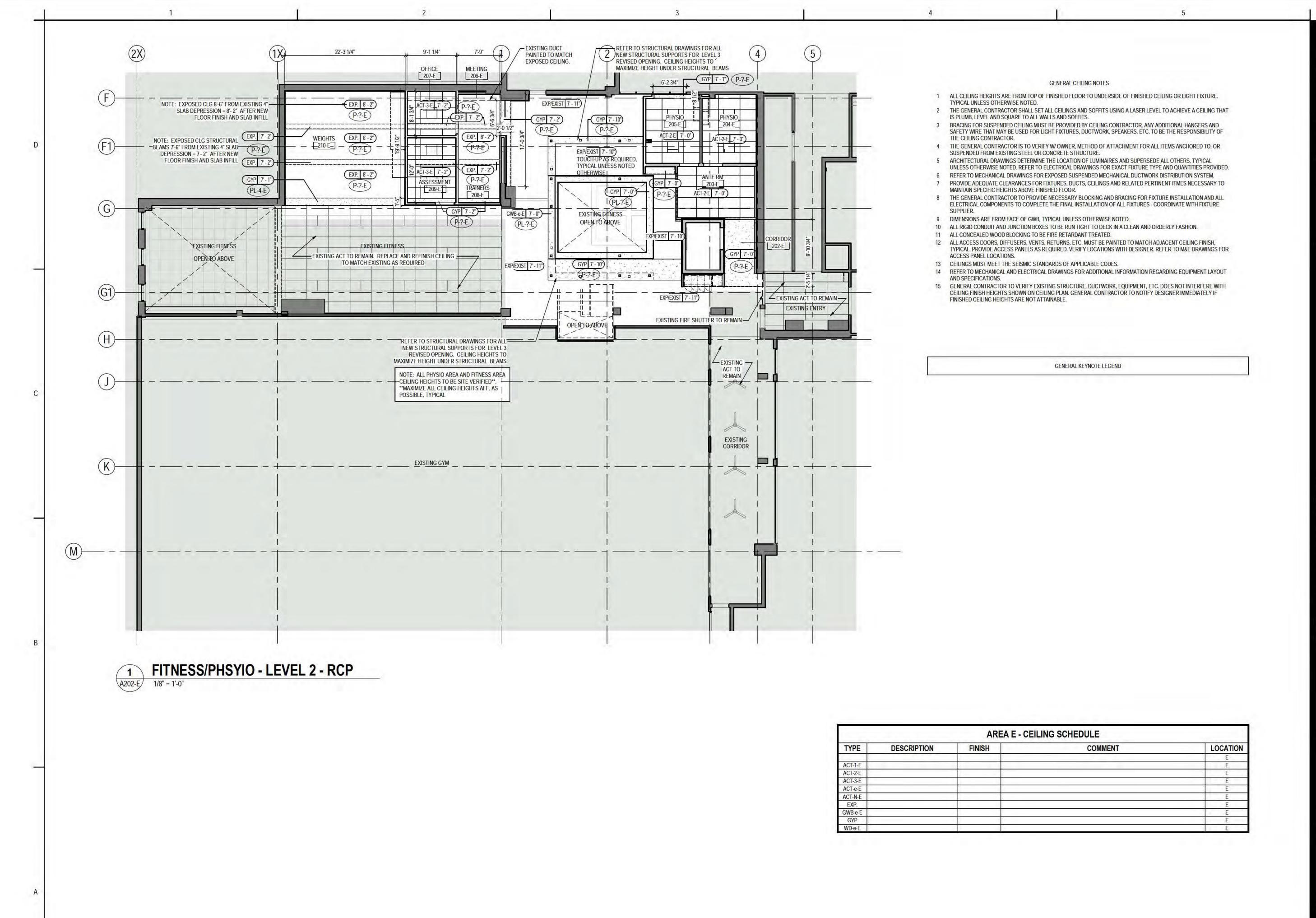
If combustibles are placed near the base of the window openings, there may be a concern about a small fire at the base of the window openings. The local hot spot may shatter the glazing as the result of the thermal shock created by the sprinkler discharge. A 3' high gypsum pony wall will be constructed in the fitness room side on Level 2 to prevent local hot spots in the bottom of the window.

#### Reliability of the Sprinkler System

Since the proposed solution is based on an active fire protection system in lieu of a passive fire protection system, the reliability of a sprinkler protection system is required to be reviewed and addressed in order to demonstrate that the proposed system will provide the same level of safety as a passive fire protection. J.R. Hall discusses the reliability of sprinkler operations in structural fires and the main factors contributing to failure of sprinkler operations. The statistics indicate that sprinkler systems have 93% operational reliability. The main factors contributing to the 7% of sprinkler failures noted include the system being shut off before the fire (65% of failed operations), sprinklers being shut off prematurely (16% of failed operations) and lack of maintenance (11% of failed operations). In the proposed building, all shutoff valves will be electrically supervised by the building fire alarm system and monitored off-site by a ULC listed monitoring station. The sprinkler system is required to be properly maintained in accordance with NFPA 25. Therefore, a fire scenario involving sprinkler system failure due to the system being shut off or shut off prematurely is unlikely, and with proper maintenance, this further decreases the risk of sprinkler failure. As this building is managed by the fire department, the personnel in the building will have educational and field knowledge of sprinkler systems and understand the importance of fire system maintenance.

AL-1 Attachment 1







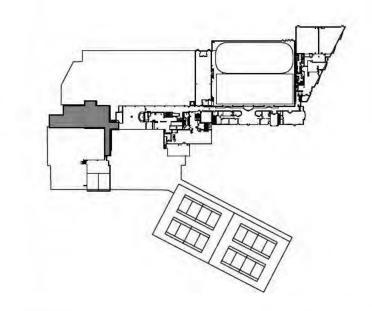
STANTEC ARCHITECTURE LTD. 1100-111 Dunsmuir Street Vancouver, BC V6B 6A3 Tel: (604) 696-8000 • www.stantec.com

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Consultant

Notes



ISSUED FOR PRELIMINARY PRICING - AREA E MB DAS 2018 08 0

Issued / Revision By Appd YYYY MM

File Name N/A

Permit/Seal

Client/Project Logo



Client/Project
THE ARBUTUS CLUB

INTERIOR RENOVATION TO:

THE ARBUTUS CLUB
2001 NANTON AVENUE VANCOUVER, BC

AREA E - LEVEL 2 - FITNESS/PHSYIO -REFLECTED CEILING PLAN

Project No. 144317145

Revision

Scale 1/8" = 1'-0"

Drawing No. **A202-E** 

AL-1 Attachment 2

KALWALL PRODUCT AND TEST REPORT

+ RESOURCES (https://www.kalwall.com/resources/) BROCHURES (https://www.kalwall.com/product-brochures/) NEWS (https://www.kalwall.com/news/)

BLOG (https://www.kalwall.com/category/blog/)

SEARCH...

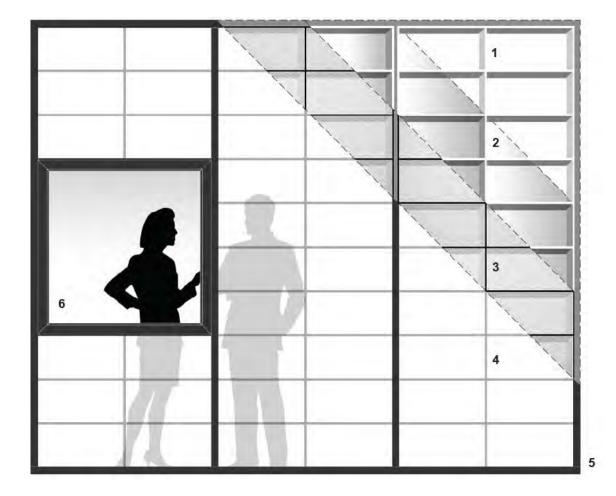
company (https://www.kalwall.com/company/) technology (https://www.kalwall.com/technology/)
products (https://www.kalwall.com/kalwall-products/) portfolio (https://www.kalwall.com/portfolio/)
markets (https://www.kalwall.com/markets/) contact (https://www.kalwall.com/contact/)

# panel technology

Home (https://www.kalwall.com) » Technology (https://www.kalwall.com/technology/) » Panel Technology

# **Kalwall Cutaway Diagram**

- 1) Aluminum or thermally-broken Grid Core (https://www.kalwall.com/technology/panel-anatomy/structural-grid-cores/) composed of a series of interlocking I-beams
- 2) Interior shatterproof Fiber-Reinforced Polymer (FRP) face sheet (https://www.kalwall.com/technology/panel-anatomy/fiberglass-reinforced-polymerfrpskins/) formulated to meet finish, flame and smoke requirements of the toughest international City of Vancouver FOI 2019-696 Page 73 of 119 codes



- 3) Translucent Insulation (TI) (https://www.kalwall.com/technology/panel-anatomy/translucent-insulation/) options, including Cabot's Lumira <sup>™</sup> aerogel offer exceptional thermal up to 0.05 U
- 4) Color stable, exterior Fiber-Reinforced Polymer FRP face sheet

(https://www.kalwall.com/technology/panelanatomy/fiberglass-reinforcedpolymerfrpskins/) with a permanent glass veil erosion barrier to eliminate fiberbloom

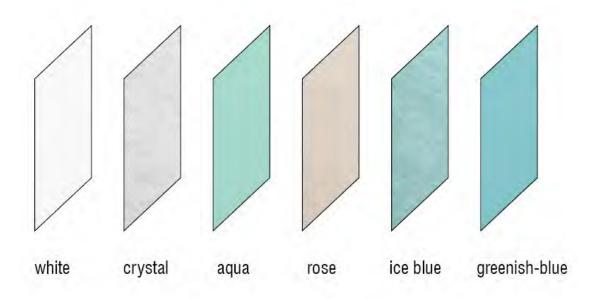
- 5) Clamp-tite™ aluminum fastening system, (https://www.kalwall.com/technology/clamp-tite-system/) specifically engineered and available as either standard or thermally-broken with many finish options
- 6) HC (https://www.kalwall.com/wp-content/uploads/2015/03/Kalwall\_HC-Series.pdf) and E-Series (https://www.kalwall.com/wp-content/uploads/2015/03/Kalwall\_E-Series.pdf) fixed and operable windows, fixed louvers, even opaque panels can all be factory-unitized to add areas of ventilation and vision glazing

As the inventor of the translucent structural sandwich panel, Kalwall provides museum-quality daylighting™ with superior thermal packages. Lightweight and low-maintenance, whether its being designed for a wall, roof or specialty application, consider our high performance translucent building systems for your next project. Both structural and diffuse light-transmitting, Kalwall performs as an excellent thermal envelope, especially when compared to polycarbonate systems and most insulated glass units (IGU). We hope that you enjoy learning about the basics of our unique fenestration technology.

Translucent Fiberglass Reinforced Polymer (FRP) Faces

#### Notes:

We produce a selection of translucent FRP to meet a wideOitangte/onfromoject EOPDIC 1816 in Religious personal light of the control of translucent FRP to meet a wideOitangte/onfromoject EOPDIC 1816 in Religious personal light of the control of translucent FRP to meet a wideOitangte/onfromoject EOPDIC 1816 in Religious personal light of the control of translucent FRP to meet a wideOitangte/onfromoject EOPDIC 1816 in Religious personal light of translucent FRP to meet a wideOitangte/onfromoject EOPDIC 1816 in Religious personal light of translucent FRP to meet a wideOitangte/onfromoject EOPDIC 1816 in Religious personal light of translucent FRP to meet a wideOitangte/onfromoject EOPDIC 1816 in Religious personal light of translucent FRP to meet a wideOitangte/onfromoject EOPDIC 1816 in Religious personal light of translucent FRP to meet a wideOitangte/onfromoject EOPDIC 1816 in Religious personal light of translucent FRP to meet a wideOitangte/onfromoject EOPDIC 1816 in Religious personal light of translucent FRP to meet a wideOitangte/onfromoject EOPDIC 1816 in Religious personal light of translucent FRP to meet a wide of translucent FRP to meet

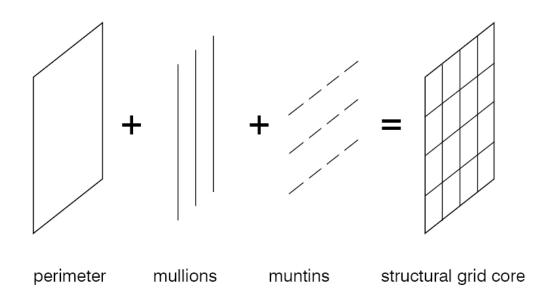


formulated, exterior rated FRP as well as high impact, vandal resistant, UL and FM options. White and Crystal are standard. Kal-tints are optional.

learn more
(https://www.kalwall.com/technology/par
anatomy/fiberglass-reinforcedpolymerfrpskins/)

(https://www.kalwall.com/wp-content/uploads/2015/01/KW WWW mockups FRP.png)

# Structural Grid Core

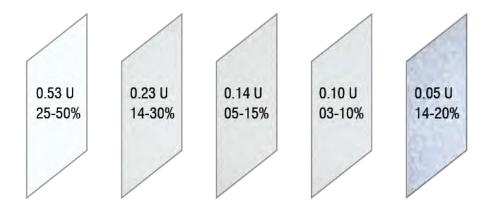


#### Notes:

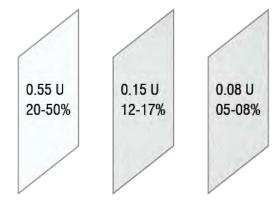
The Kalwall panel's structural grid core provides strength while being extremely lightweight. That said, each core configuration performs differently. In general, more vertical mullions and tighter grids allow for longer spans and more panel stiffness. Both standard aluminum I-beams and thermally-broken interlocking I-beams are available.

learn more (https://www.kalwall.com/technology/par anatomy/structural-grid-cores/)

# Translucent Insulation (TI) Thermal Packages



U-factors (only thermally broken panel values shown above) + VLT% ranges for 2-3/4" thick Kalwall panels



U-factors (only thermally broken panel values shown above) + VLT% ranges for 4" thick Kalwall panels

#### Notes:

Numerous translucent insulation options are available between 0.29-0.08 U-factor. For the most demanding applications, Kalwall offers a 0.05 U-factor (R-20) Lumira® aerogel option (available in 2-3/4" thick panels only | limited grid-cores options available). TI specifications affect not only thermal performance but visible light transmission (VLT%) as well so please consult our sales team to optimize your design including our complementary daylight modeling services.

learn more (https://www.kalwall.com/technology/par anatomy/translucent-insulation/)

As you can see, there are many considerations when designing and specifying with Kalwall. Please contact us for further information from one of our Sales Representatives based on your project specific requirements.

# SOUTHWEST RESEARCH INSTITUTE®

6226 CULEBRA RD. 78238-5166 P.O. DRAWER 28510 78228-051C SAN ANTONIO, TEXAS, USA (210) 684-5111 WWW.SWRI.ORG
OHEMISTRY AND CHEMICAL ENGINEERING DIVISION
PIRE TECHNOLOGY DEPARTMENT
WWW.FIRE.SVM.LORG
FAX (210) 622-3377



# CUSTOM FIRE PERFORMANCE EVALUATION OF STANDARD 2-3/4-IN. KALWALL PANELS

FINAL REPORT Consisting of 38 Pages

SwRI® Project No. 01.16046.01.403 Test Date: November 23, 2010 Report Date: December 15, 2010

Prepared for:

Kalwall Corporation 1111 Candia Rd Manchester, NH 03109

Prepared by:

Barry L. Badders, M.E., P.E.

Manager

Fire Resistance Section

Burn Busser

Approved by:

Matthew S. Blais, Ph.D.

Directo

Fire Technology Department

This report is for the information of the client. It may be used in its entirety for the purpose of securing product ecceptance from duty constituted approval authorities. This report shall not be reproduced except in full, without the written approval of SWR). Nather this report not the name of the Institute shall be used in publicity ix advertising.



HOUSTON, TEXAS (713) 977-1377 . WASHINGTON, DG (501) 881-0228

#### **OBJECTIVE**

The objective of the test described in this report was to evaluate the ability of two Kalwall Corporation composite panels to provide a fire barrier.

#### TEST METHOD

This test was intended to evaluate the duration for which a composite panel will contain a fire. The furnace followed the ASTM E 119 time-temperature curve to 1200 °F, and the 1200 °F was maintained for the duration of the test. The panels were not tested under load and a hose-stream test was not conducted.

This test was conducted to measure and describe the response of materials, products, or assemblies to heat and flame under controlled laboratory conditions, but does not by itself incorporate all factors required for fire hazard or fire risk assessment of the materials, products, or assemblies under actual fire conditions.

This report describes the test results obtained for composite wall panels. The performance of the assembly is expressed in terms of the transmission of heat and hot gases during the standard fire exposure and penetration of water to the unexposed side of the assembly during the hose stream test. The results presented in this report apply specifically to the materials tested, in the manner tested, and not to the entire production of these or similar materials, nor to the performance when used in combination with other materials.

#### TEST ASSEMBLIES

Materials:

Provided By:

Received On:

• Composite panels with aluminum bracing, with and without thermal breaks.

Kalwall Corporation November 9, 2010

#### Sample Description:

The samples tested were identified as Panel A and Panel B. The panels were described as standard 2-3/4-in. thick Kalwall panels. The exterior faces were 0.070-in., Type SW composite, and the interior faces (fire exposed) were 0.045-in. S-171 composite. Panel A had a solid aluminum I-beam grid core and white fiberglass batt insulation resulting in a U-factor of 0.29. Panel B had a thermally broken FRP, aluminum I-beam (TBI) grid core, and white fiberglass batt insulation, resulting in a U-factor of 0.23. The aluminum I-beam grid framed the perimeter of the sample and had vertical pieces, extending the full height, spaced 12 in. on center. A horizontal piece, extending the full width at the horizontal center, formed a 12 × 24-in. grid pattern.

The samples were provided to SwRI in a ready to test condition.

#### TEST RESULTS

Test Date:

November 23, 2010

Test Witnesses:

Mr. Ken Schmidtchen - Kalwall Corporation

Ambient Temperature:

75 °F

Relative Humidity:

79%

Instrumentation:

The unexposed side of each sample was instrumented with three thermocouples (TCs) designed in accordance with ASTM E 119. One approximately at the center, one at approximately the diagonal quarter of the top, and one at approximately the diagonal quarter of the bottom of each panel. See Figure B-3 for a photograph illustrating the TC locations.

Kalwall Corporation

2

SwRI Project No.: 01.16046.01.403

#### Observations:

Time (min:s)	Observations	
00:00	Start of test.	
01:50	Combustion visible through the unexposed skin (no flame through).	
03:00	Unexposed face is discoloring.	
05:15	TC 4 fell from Panel B.	
07:00	Minor delamination visible on unexposed face.	
10:00	TCs are falling off Panel A.	
10:25	TC 6 fell from Panel B; darker color behind TC pads.	
14:00	Panel A is darker than Panel B; more smoke emitting from perimeter of Panel A.	
18:00	TC 5 fell from Panel B.	
20:00	Panel A bracing grid is darker in color than overall panel.  Panel B bracing grid is lighter in color than overall panel.	
65:00	End of test.	

Rating Obtained:

None – this was a custom test with no prescribed criteria.

Results:

The acquired data is located in Appendix A in graphical and tabular form.

#### CONCLUSION

The wall was tested with a furnace temperature following the ASTM E 119 time-temperature curve to 1200 °F, and held at 1200 °F for a total duration of 65 min. At no point during the furnace exposure period did flames pass through to the unexposed side.



# CITY OF VANCOUVER **DEPARTMENT OF PERMITS & LICENSES**

1997 (YY DD) (Date) MM

(See over) City of Vancouver - FOI 2019-696 - Page 80 of 119

	FOR:	DE402244 \$ B	THE STATE OF THE S	2001 Nanton Avenue, Vancouver, B.C (Print Address)	
		Enclosed Payment \$310.0	0 Cheque No. 11470	Invoice No	
PROP	osed b	Y Protection Engineering In	nc., Murray Currie-Johnson, M.	.Sc., P.Eng., CP/Geoff Triggs, A.Sc.T.	
ADDF	RESS 140	00-510 W. Hastings Street, V	ancouver, B.C., V6B 1L8	Phone No. 682-0388	
(1)		RIPTION CODE R	REFERENCE(S) OF DEVIATION (SERVICE)	ON: Subsection 3.2.8.1.8(c)	
		refer to the attached Build s on the proposed equivaler		t dated March 20, 1997 for a complete description	n and
	3.2.8.1 (6m it	1.8(c) of the VBBL requires	that occupants can travel to e	to protect occupants of new second floor area. C egress doorways/exits without passing close to ope an equivalent level of performance with fixed ve	ning
CT/dgt:JSA	-Eal MI7		PERMITS & LICENSES DEPART	700 (27) (2.7)	Oyer
	•		APR 0 7 1997		
(2)	PROP	OSED EQUIVALENCY IS	ORIGINAL TO: 2000 COPY TO: Ch#11470	(Professional Seal)	
		REFUSED (For the following	g reason)	1 10 10 10 10 10 10 10 10 10 10 10 10 10	
	$\boxtimes$	ACCEPTABLE [Subject to, - the clean fix glan	the following conditions(s)]:	tompered Harry	
		ACCEPTABLE (As propose	ed)	- American	
0	4 Joe	for	City Building Inspector Assistant Director, Inspection Manager, Building Code Revie Engineer/Plan Checker Hw		ch –

Codes Engineer

#### (1) SUMMARY OF MINOR RELAXATION/EQUIVALENCY (Cont'd.)

#### SUMMARY

The above report outlines an equivalent level of performance to that required by the Vancouver Building By-law for protection of the new proposed second floor areas to be constructed around the perimeter of the existing north gymnasium area of the Arbutus Club, 2001 Nanton Avenue, Vancouver, B.C. The features to be incorporated in the project are summarized as follows:

- The west portion of the proposed addition will be constructed as a mezzanine in accordance with the VBBL requirements including visual openness to the floor area below and less than 10% enclosed area on the mezzanine.
- The south and east portions of the proposed addition will have similar attributes to a mezzanine including visual
  openness to the floor areas below. In addition, the new second floor areas are technically permitted to be part of
  an interconnected floor space in accordance with the VBBL.
- Floor assemblies supporting the new second floor areas will be constructed as a fire separation having a 1 hour FRR
  as required. The vertical wall assemblies separating the new floor areas from the adjoining floor areas will consist
  of 1 hour FRR construction (ULC W415) except where glazing is installed.
- Clear, fixed glazing will be installed in the surrounding walls of the second floor areas in order to provide visual
  openness to the floor areas below and to maintain an unrated fire separation for protection of occupants from smoke
  and allow safe evacuation of the floor areas.
- The adjacent floor areas of the building consist of low hazard type occupancies with typically low fuel loading and high ceilings, which will not present a significant fire exposure hazard to the new second floor areas of the building. In addition, all floor areas are provided with automatic sprinkler protection including the adjoining low hazard gymnasium, ice rink and swimming pool areas, which enhances the level of protection to the new second floor areas further.
- Sprinklers within the new second floor areas of the project will be listed fast response type heads in order to provide an additional level of fire and life safety for occupants of this area of the building.

This report is based on review of the proposed arrangements for the new fitness/weight room facilities for the Arbutus Club, Vancouver, B.C. and application of the applicable Vancouver Building By-law requirements to the existing building including the proposed mezzanine/second floor additions.

With the above specified features to be provided for the proposed second floor areas in the building, an equivalent level of fire and life safety will be provided. The measures outlined above are based on sound principles of fire protection engineering and will provide an equivalent level of performance to that required by the Vancouver Building By-law.

- 000 000 000 000 000 000 000 000 000 0	
Comments By:	Agreed By:
Branch	Supervisor
Branch	 Supervisor Branch
	Date

EQUIVREY FRM/c (Revised November/94)

# 2001 Nonton.

December 02, 1996

City of Vancouver 435 West 12th Avenue Vancouver, BC V5Y 1V4 PERMITS & LICENSES SERAMULAN
Reg. No.

DEC 0 & 1996
OHIGHYOL AZT.

Attn:

Mr. Ark Tsisserev, P.Eng. Chief Electrical Inspector

Ref: Arbutus Club Phase II Our Job #484

Dear Sir:

Further to our meeting on site on November 28th 1996, we request the following protection as equivalency, for the 12KV feeder.

The vacuum circuit breaker is set to protect the piece of high voltage cable located in the building prior to its termination in the main overcurrent protective device.

The length of the high voltage cable installed in metal raceway (maintenance area) will be further enclosed in a 2 hour rated box consisting of gyproc.

These two features will meet the required fire and shock protection intent of the Canadian Electrical Code.

The room is sprinklered and equipped with heath detectors, that will in event of a fire condition provide early warning.

Yours truly:

S. Mahanti, P. Eng.

MAHANTI/CHU ENGINEERING LTD.



# CITY OF VANCOUVER

DEPARTMENT OF PERMITS & LICENSES (Date) DDI MM REQUEST FOR MINOR RELAXATION EQUIVALENCY nanton FOR: 4226 Arbutus Street Print (Permit Application Number) Address) 057267 Enclosed Payment \$ 258.00 Cheque No. 2533 PROPOSED BY David Graham - Graham Harmsworth Lai & Associates Ltd. ADDRESS\_ 701-744 West Hastings Street, Vancouver, BC V6C 1A5 Phone No. 689-4449 (1) DESCRIPTION CODE REFERENCE(S) OF DEVIATION: Article 3.4.4.1 [Include all relevant details and list all compensatory features.] It is proposed to protect a door from the pool change room to an adjacent exit corridor using a fire rated glazing system with identical design criteria to a previously approved fire rated glazing system for this project. The only change in the design criteria is that wood frames in the door will house the wired glass panels. The doors will be mounted in steel frames. Wood frames will be designed to comply with the minimum requirements of the Vancouver Building Bylaw specified in Appendix A-3.3.1.3.(3)(b), which specifies density for wood **PERMITS & LICENSES DEPARTMENT** frames. Reg. No.: (Continue Over) JUN 2 6 1995 IL:\PRJ\3\396\EQUIV1.DOC (2) PROPOSED EQUIVALENCY IS (Professional Seal) REFUSED (For the following reason) \_ DATE: \_ INITIALS: ACCEPTABLE [Subject to the following conditions(s)]: ELLMENTS TO BE AN ACCUPINACE INTUNESCER ACCEPTABLE (As proposed)

CITY BUILDING INSPECTOR

Sender/Certified Professional City Building Inspector Assistant Director, Inspection

Codes Engineer

Manager, Building Code Review Branch Inspector, DE / NP/ Engineer/Plan Checker

FILE

Supervisor, Building Inspection Branch Supervisor, Plumbing & Gas Inspection Branch Supervisor, Electrical Inspection Eranch Branch Others Department

(See over)

•			,	
	•			
(3)	STAFF COMMENTS AND RECOMMENDATION	ONS:		
	Community Division in the Community of t			
	Comments By:  Branch	Agreed By:	Supervisor	
	Date		Branch	
			Date	
EQUIVREV (Revused No	/ FRM/Ic ovember/94)			

SUMMARY OF MINOR RELAXATION/EQUIVALENCY (Cont'd.)

(1)



# CITY OF VANCOUVER OFFICE OF THE CHIEF BUILDING OFFICIAL

Community Services, 453 West 12th Avenue, Vancouver, BC, V5Y 1V4

#### ALTERNATIVE SOLUTION PROPOSAL

(In Accordance with Section 2.3 OF Division C of the Vancouver Building By-law)

Building Permit No. 2001 Nanton Avenue, Vancouver, BC, Project Address	V6J 4A1July 02, 2008
Payment \$ 20%, Invoice Number: 516709	EQ Number: EQ 402502
APPLICANT INFORMATION  Proposed By:Kevin Lau, P. Eng., C.P  Firm:Gage-Babcock & Associates Ltd  Address:228-1195 West Broadway, Vancouver, V6H 3X5  Phone: _604-732-3751 Fax:604-732-1277 Email:k_lau	(Professional Seal)
CODE REFERENCE(S) & SUMMARY OF DEVIATION(S) FROM VANCO Sentence 3.1.6.2.(1) of Division B states that "an air-supported st storey on any building." Clause 3.1.6.3.(2)(a) states that "Tents erected closer than 3 m to other structures on the same property (4)." As a part of the new enhancements within the Arbutus Club, built on the second storey of the new structure, which will be erect on the same properties.	OUVER BUILDING BY-LAW: tructure shall not be located above the first and air-supported structures shall not be except as permitted by Sentences (3) and an air-supported structure is proposed to be
BRIEF PROJECT DESCRIPTION: The proposed renovations within the Arbutus Club include the alternain and second floor levels. It is also proposed to incorporate a floor level. A 2 h firewall will separate the newly added structur main building (Group A, Division 2). A glazed walkway will conne on the second floor level.	minor interstitial floor addition on the third re (Group A, Division 2) from the existing
For office use only  PROPOSED ALTERNATIVE SOLUTION IS:  ACCEPTABLE ACCEPTABLE (Subject to condition(s) noted below)	REFUSED (For the reason(s) noted below)
es Jeffery Mitchell	COMMUNITY SERVICES

cc: Sender/Certified Professional Chief Building Official Deputy Chief Building Official City Electrical Inspector Code Development Engineer

CHIEF BUILDING OFFICIAL

Manager, Processing Centre (Buildings)
Manager, Building Inspection Branch
Manager, Plumbing & Gas Inspection Branch
Other Department

Erv Hildebrandt

Engineer/Project Coordinator District Building Inspector District Electrical Inspector Sprinkler Plan Reviewer FILE

Kandian City of Vancouver - FOI 2019-696 - Page 85 of 119

DATE

#### SUMMARY OF ALTERNATIVE SOLUTION CONTINUED:

#### OBJECTIVE(S) OF THE VANCOUVER BUILDING BY-LAW REQUIREMENT(S):

OS1.2: "An Objective of this By-law is to limit the probability that, as a result of the design or construction of the building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to fire. The risk of injury due to fire addressed in this By-law is that caused by fire or explosion impacting areas beyond its point of origin."

OS2.2: "An Objective of this By-law is to limit the probability that, as a result of the design or construction of the building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to structural failure. The risk of injury due to structural failure addressed in this By-law is that caused by loads bearing on the building that exceed the loadbearing properties of the supporting medium."

OP3.1: "An Objective of this By-law is to limit the probability that, as a result of the design or construction of the building, adjacent buildings will be exposed to an unacceptable risk of damage due to fire. The risk of damage to adjacent buildings due to fire addressed in this By-law is that caused by fire or explosion impacting areas beyond the building of origin."

OS3.7: "An Objective of this By-law is to limit the probability that, as a result of the design or construction of the building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to hazards. The risk of injury due to hazards addressed in this By-law is that caused by persons being delayed in or impeded from moving to a safe place during an emergency."

#### SUMMARY OF MITIGATING FEATURES:

The proposed air-supported structure is not expected to create a hazard to the public due to following mitigating features:

- Non-combustible construction of the existing and new buildings;
- Both the existing and new buildings are fully sprinklered;
- Air-supported structure has low fire load, low occupancy load along with sufficient exit capacity, portable fire extinguishers as per By-law, fire access as per By-law;
- d) Emergency air supply;
- e) Low structural load;
- f) Full perimeter fencing;
- g) Warning device;
- h) Water curtain sprinkler system; and
- i) Fire shutters.

#### ANALYSIS AND EVALUATION TO VALIDATE ACCEPTANCE:

Low Combustible Loads: Since the proposed air-supported structure will solely be used as tennis courts, and will not be provided with any kind of seating arrangements, it is therefore expected that this facility will contain a very negligible amount of combustible loads.

Ignition Source: One of the potential sources of ignition in this structure would be the lighting. The lighting fixtures will not be supported or suspended from the fabric structure. They will be of floor mounted portable standard type. Since the lighting will not come across the direct contact with the fabrics, it is very unlikely that the ignition will occur within a reasonable period of time.

Low Occupant Load: Occupancy of the air-supported structure shall be limited to only tennis functions. The normal average occupant load of this structure will not be more than 20 persons with a total foreseeable maximum number of occupant load of 40 persons on a rare occasion during the summer months, especially when a demonstration or match play could occur. But in the summer, the air-supported structure will not be in place.

#### ANALYSIS AND EVALUATION TO VALIDATE ACCEPTANCE: (Continued)

Emergency Air Supply: Article 3.1.6.6. does not require any emergency air supply system to be installed within an air-supported structure, if the occupant load served by that structure is not more than 200 persons. An emergency air supply system will still be provided in the proposed bubble structure in order to ensure a high level of life safety in case of an emergency.

Low Structural Load: The proposed air-supported structure is not expected to contain a significant amount of structural load and will not be in place during the summer months. The deck over the P-I floor level has been designed to receive and support the loads imposed by the proposed air-supported structure.

Full Perimeter Fencing: Fencing will provide a full surround to the air-supported structure on the deck of the second floor. The height of the fencing will typically be 11 ft (3.35 m) above the tennis court surface. Should a collapse occur, the fencing will block the structure from draping down the outside of the building, which will ensure that egress routes remain unblocked at the time of emergency.

Warning Device: An audible warning device will be installed to warn occupants of an impending collapse of the air-supported structure.

Water Curtain Sprinklers: The intent of the By-law is to protect the structures from unacceptable levels of radiation or flame spread through the unprotected openings in the event of a fire originating within either the air-supported structure or the adjacent buildings. The proposed alternative solution addresses the intent by providing a water curtain that has been documented by Heselden & Hinkley to be capable of absorbing 60% to 70% of the incident radiation emitted from a fire source. The activation of the water curtain will also prevent flame spread from the building into the exterior.

Fire Shutters: In addition to the water curtain sprinkler system, the glazed openings along the exposed side of the existing building will be protected with fire shutters. These redundant safety measures will minimize the chances of spreading fire between the air-supported structure and the adjacent buildings.

On the basis of the foregoing, it is the opinion of the proponent that the proposed alternative solution described in this report will provide at least the same level of protection as required by the corresponding Bylaw requirements. Where installed in conformance with the requirements of this report, the alternative solution will satisfy the functional requirements (F03, F10, F12, F20, and F36) of Sentence 3.1.6.2.(1) and Clause 3.1.6.3.(2)(a), Division B, of the VBBL. Please refer to the GBA Alternative Solution Report, dated June 17, 2008, for detailed discussion on the proposed Alternative Solution features. The proposed alternative solution is project specific and shall not be interpreted as establishing a precedent for future installations.

STAFF COMMENTS AND RECOMMENDATIONS:  Attached Noted in Prism		
Comments By:	Position:	Date:
REVIEW PANEL COMMENTS:		
Comments By:	Position:	Date:

Gage-Babcock & Associates Limited

008436

RE: 2001 Nanton Avenue - Arbutus Club Renov. Air-supported Structure Alternative Solution Revision Review Fee (GBA File: 070901)

# TRANSMITTAL



Project: Arbutus Club Renovation and Addition

Subject: Alternative Solution Report

GBA File 070901

Date:

July 02, 2008

CONSULTING ENGINEERS

LIFE SAFETY • FIRE PROTECTION • SECURITY

228 - 1195 WEST BROADWAY VANCOUVER, BRITISH COLUMBIA CANADA, V6H 3X5 TEL 604 . 732-3751 FAX 604 . 732-1277 www.GBACAN.com

From: Montu Das for Kevin Lau, P.Eng

Tel: 604 . 732-3751 Ext 244 E-Mail: m das@gbacan.com

To:	The Chief Building Official 453 West 12th Avenue Vancouver, BC V5Y 1V4	Attn: The CBO  1 Original + 1 Copy of Alternative Solution Report
	☐ Hand ■ Courier ☐ Mail ☐ Fax#	1 Alternative Solution Form (Pink Sheet) + A Cheque of \$208.00
Сору:	Omicron AEC Ltd. 595 Burrard Street Vancouver, BC V7X 1L4  ☐ Hand ☐ Courier ☐ Mail ☐ Fax#	Attn: Peter Joyce  1 Copy of Alternative Solution Report  1 Copy of Alternative Solution Form
	☐ Hand ☐ Courier ☐ Mail ☐ Fax#	
	☐ Hand ☐ Courier ☐ Mail ☐ Fax#	
Comm	ents:	



#### GAGE-BABCOCK & ASSOCIATES LTD.

SUITE 228 - 1195 WEST BROADWAY, VANCOUVER, B.C., CANADA V6H 3X5 • TEL. 604-732-3751 FAX 604-732-1277 • www.gbacan.com

R.KOVACS, P.ENG., CP
W.M. MAUDSLEY, P.ENG., CP
C.M.K.CHOW, P.ENG., CP
G.C. RICHARDS, MAIBC, CP
HOLDER OF AN AIBC
CERTIFICATE OF PRACTICE

Alternative Solution Report

# ARBUTUS CLUB RENOVATIONS AND ADDITION

Vancouver, B.C.

# FINAL REPORT

GBA File No. 070901 July 02, 2008

Prepared for:
Omicron AEC Ltd.
595 Burrard Street
Vancouver, BC, V7X 1L4

JUL 0 3 2008

COMMUNITY SERVIL

Prepared by

Reviewed by

Montu L. Das Consultant Kevin Lau, P. Eng., C.P. Project Engineer

JUL 0 2 2008

#### 1.0 INTRODUCTION

Gage-Babcock & Associates Ltd. (GBA) has been retained by Omicron AEC Ltd., to provide Building By-law consulting services, and to develop an alternative solution for the construction of the proposed air-supported structure that will be located on the second storey of the new addition and will be erected closer than approximately 3 m to the adjacent structures. The analysis will be based on the 2007 Vancouver Building By-law (VBBL). Building construction design details for the renovations and addition of the Arbutus Club have already been discussed in the GBA By-law Compliance Report submitted on April 23, 2008.

## 2.0 BUILDING INFORMATION

# 2.1 Size and Construction - Existing

Major Occupancy: Group A, Division 2

Building Height: 3 Storeys and Basement

Building area: 8057 m<sup>2</sup> (2<sup>nd</sup> Level Area)

Construction: Noncombustible

Fire Protection: Sprinklered

#### 2.2 Size and Construction - New Construction

Major Occupancy: Group A, Division 2

Building Height: 2 storeys + Parkade

Building area: 3420 m<sup>2</sup>

Construction: Noncombustible

Fire Protection: Sprinklered

# 3.0 CONSTRUCTION REQUIREMENTS FOR AIR-SUPPORTED STRUCTURE

# 3.1 Means of Egress

The proposed air-supported structure will be provided with sufficient means of egress in conformance with Sections 3.3, and 3.4, of the VBBL.



#### 3.2 Restrictions

Section 3.1.6.2. of the VBBL requires that "an air-supported structure

- 1) shall not be located above the first storey on any building.
- shall not be used for Groups B, C, or Group F, Division 1 major occupancies or for classrooms.
- 3) shall be designed as open floor space without interior walls, mezzanines, intermediate floors or similar construction."

The proposed air-supported structure will be located on the second storey of the new building, will be used for Group A, Division 2 major occupancies, and will be designed as open space without interior walls, mezzanines, intermediate floors or similar construction. It will therefore satisfy all the requirements of Section 3.1.6.2., except the fact that it will be located on the second storey. An alternative solution is proposed (please refer to **Section 4.0** of this report) in order to justify that the proposed location, along with other mitigating features, will provide at least the same level of life safety and property protection required by Sentence 3.1.6.2.(1) of the VBBL.

## 3.3 Clearance to Other Structures

Sentence 3.1.6.3.(2) states that "Tents and air-supported structures

- a) shall not be erected closer than 3 m to other structures on the same property except as permitted by Sentences (3) and (4), and
- b) shall be sufficiently distant from one another to provide an area to be used as a means of emergency egress."

The proposed air supported structure will be erected approximately 3.0 m to the new building and approximately 1.2 m to the existing building at the northwest corner. An alternative solution is proposed (please refer to **Section 4.0** of this report) in order to ensure that the proposed location, along with mitigating features, will provide at least the same level of life safety and property protection required by Clause 3.1.6.3.(2)(a) of the VBBL.

#### 3.4 Clearance to Flammable Material

The ground enclosed by the proposed air-supported structure will be cleared of all flammable materials of vegetation that will spread fire, according to Clause 3.1.6.3.(2)(b) of the VBBL. The type of roof systems installed at the Arbutus Club



would be classified as 'Class A' roof coverings. These roof coverings are not expected to spread fire to the proposed air-supported structure.

#### 3.5 Flame Resistance

The materials used in connection with the proposed air-supported structure will conform to CAN/ULC-S109, "Flame Tests of Flame-Resistant Fabrics and Films."

# 3.6 Emergency Air Supply

According to Sentence 3.1.6,6.(1), the proposed structure is not required to be equipped with an emergency air supply system.

#### 4.0 ALTERNATIVE SOLUTION - LOCATION OF AIR-SUPPORTED STRUCTURE

#### 4.1 Introduction

An air-supported structure is proposed to be built on the second storey of the new structure as a part of the new enhancements within the Arbutus Club. As a consequence of the proposed location, the proposed structure will be erected closer than 3 m to the other structures on the same property and is located above the first storey.

# 4.2 By-law Requirements

Sentence 3.1.6.2.(1) of Division B states that "an air-supported structure shall not be located above the first storey on any building."

Clause 3.1.6.3.(2)(a) states that "Tents and air-supported structures shall not be erected closer than 3 m to other structures on the same property except as permitted by Sentences (3) and (4)."

# 4.3 Application

Sentence 3.1.6.2.(1) applies to the location of air-supported structures with respect to building storeys, when such structures are used as buildings described in Sentence 1.3.3.2.(1) of Division A. This also applies when air-supported structures are used as buildings to which Part 9 applies, as stated in Sentence 9.10.1.2.(1).

Clause 3.1.6.3.(2)(a) applies to the spatial separation, from other structures on the same property, of tents and air-supported structures used as buildings described in



Sentence 1.3.3.2.(1) of Division A, except as provided in Sentences 3.1.6.3.(3) and (4), which apply when there is no public occupancy and a limited ground area. This also applies when air-supported structures are used as buildings to which Part 9 applies, as stated in Sentence 9.10.1.2.(1).

# 4.4 Intent of the By-law Requirements

The intent statements of Sentence 3.1.6.2.(1) are as follows:

- a) To limit the probability that collapse of the structure will trap persons within the structure in an emergency, which could lead to excessive delays in evacuation, which could lead to harm to persons.
- b) To limit the probability that collapse of the structure will lead to the structure draping down the outside of the building, which could lead to the blocking of exits from the building in an emergency, which could lead to harm to persons.
- c) To limit the probability that collapse of the structure will lead to the structure draping down the outside of the building, which could lead to the blocking of exits from the building in an emergency, which could lead to emergency responders being unable to access the structure in a timely manner, which could lead to ineffective emergency response operations, which could lead to harm to persons.
- d) To limit the probability of inadequate anchorage of the structure to the ground or basement, which could lead to collapse of the structure, which could lead to harm to persons.

The intent statements of Clause 3.1.6.3.(2)(a) are as follows:

- a) To exempt such structures from the application of Subsection 3.2.3., if certain conditions are met to provide an acceptable level of protection. This is to limit the probability that a fire in a tent or air-supported structure will spread into another structure on the same property, which could lead to harm to persons in the building, and that a fire in a building will spread into a tent or air-supported structure, which could lead to harm to persons in the tent or air-supported structure.
- To exempt such structures from the application of Subsection 3.2.3., if certain conditions are met to provide an acceptable level of



protection. This is to limit the probability that a fire in a tent or airsupported structure will spread into another building on the same property, which could lead to damage to the adjacent building.

# 4.5 Objectives and Functional Statements

Division B, Article 3.9.1.1. lists two Objectives (OS2.2 and OS3.7) and four Functional Statements (F10, F12, F20, and F36) for Sentence 3.1.6.2.(1) of the VBBL. Division B, Article 3.9.1.1. lists two Objectives (OS1.2 and OP3.1) and one Functional Statement (F03) for Clause 3.1.6.3.(2)(a) of the By-law.

# 4.5.1 Fire Safety

An Objective of this By-law is to limit the probability that, as a result of the design or construction of the building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to fire. The risk of injury due to fire addressed in this By-law is that caused by:

OS1.2 "fire or explosion impacting areas beyond its point of origin."

# 4.5.2 Structural Safety

An Objective of this By-law is to limit the probability that, as a result of the design or construction of the building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to the structural failure. The risk of injury due to structural failure addressed in this By-law is that caused by:

OS2.2 "loads bearing on the building that exceed the loadbearing properties of the supporting medium."

# 4.5.3 Protection of Adjacent Buildings from Fire

An Objective of this By-law is to limit the probability that, as a result of the design or construction of the building, adjacent buildings will be exposed to an unacceptable risk of damage due to fire. The risk of damage to adjacent buildings due to fire addressed in this By-law is that caused by:

OP3.1 "fire or explosion impacting areas beyond the building of origin."



# 4.5.4 Safety in Use

An Objective of this By-law is to limit the probability that, as a result of the design or construction of the building, a person in, or adjacent to, the building will be exposed to an unacceptable risk of injury due to hazards. The risk of injury due to hazards addressed in this By-law is that caused by:

OS3.7 "persons being delayed in or impeded from moving to a safe place during an emergency."

#### 4.5.3 Functional Statements

The Functional Statements assigned to Sentence 3.1.6.2.(1) and Clause 3.1.6.3.(2)(a) are summarized as follows:

F03	"To retard the effects of fire on areas beyond its point of origin."
F10	"To facilitate the timely movement of persons to a safe place in an emergency."
F12	"To facilitate emergency response."
F20	"To support and withstand expected loads and forces."
F36	"To minimize the risk that persons will be trapped in confined spaces."

These Functional Statements are not in and of themselves quantitative measures of performance, but are considered to be satisfied by the acceptable solutions of Division B of the By-law. Therefore, if it can be demonstrated that the proposed alternative solution can fulfill the above Functional Statements in a manner consistent with those of the acceptable solution of Division B of the VBBL, then the Objectives of Sentence 3.1.6.2.(1) and Clause 3.1.6.3.(2)(a) will have been achieved.

# 4.6 Proposed Alternative Solution

The proposed air-supported structure is not expected to create a hazard to the public due to following mitigating features:

- Non-combustible construction of the existing and new buildings;
- b) Both the existing and new buildings are fully sprinklered;



- Air-supported structure has low fire load, low occupancy load along with sufficient exit capacity, portable fire extinguishers as per Bylaw, fire access as per By-law;
- d) Emergency air supply;
- e) Low structural load;
- f) Full perimeter fencing;
- g) Audible warning device; and
- h) Fire shutters.

It is also proposed to provide a water curtain sprinkler system in order to protect the air-supported structure from the fire originating in the adjacent structures, and similarly to protect the adjacent structures from a fire originating within the air-supported structures. Please refer to **Appendix A** of this report for the proposed location of the water curtain sprinkler system. The water curtain sprinklers will have the following features:

Sprinkler Requirements		
Sprinkler Type	Quick Response, ½ inch orifice.	
Spacing	Sprinklers will be spaced on 6 ft (1.8 m) centres with a maximum space of 3 ft (0.9 m) from the end of the row to the edge of the opening.	
Freezing Protection	Sprinklers will be protected against freezing according to the NFPA 13, 1999.	
Flow Rate	5 USgpm/ft with minimum of 30 USgpm per head.	
Baffles	Cross baffles will be provided between any sprinklers closer than 6 ft. (1.8 m).	
Design Standard	NFPA 13, 1999	
Zoning	The water curtain sprinklers will be zoned as a separate system from the floor area sprinklers.	
Hydraulic Calculations	Hydraulically designed to accommodate:  - the floor area system demand,  - water curtain sprinklers in this design area, and  - hose stream allowance.	



## 4.7 Discussion on Alternative Solution Features

# 4.7.1 Sprinklered Noncombustible Construction

Both the existing and the new buildings are of noncombustible construction. They are also fully sprinklered in accordance with the NFPA-13, 1999 requirements.

#### 4.7.2 Low Combustible Load

Since the proposed air-supported structure will solely be used as tennis courts, and will not be provided with any kind of seating arrangements, it is therefore expected that this facility will contain a very negligible amount of combustible loads.

# 4.7.3 Ignition Source

One of the potential sources of ignition in this structure would be the lighting. The lighting fixtures will not be supported or suspended from the fabric structure. They will be of floor mounted portable standard type. Since the lighting fixtures will not come in close contact with the fabrics, it is very unlikely that the ignition will occur within a reasonable period of time.

# 4.7.4 Low Occupant Load

Occupancy of the air-supported structure shall be limited to only tennis functions. The normal average occupant load of this structure will not be more than 20 persons with a total foreseeable maximum number of occupant load of 40 persons on a rare occasion during the summer months, especially when a demonstration or match play could occur. But in the summer, the air-supported structure will not be in place.

# 4.7.5 Emergency Air Supply

Article 3.1.6.6. does not require any emergency air supply system to be installed within an air-supported structure, if the occupant load served by that structure is not more than 200 persons. An emergency air supply system will still be provided in the proposed bubble structure in order to ensure a high level of life safety in case of an emergency.



#### 4.7.6 Low Structural Load

The proposed air-supported structure is not expected to contain a significant amount of structural load and will not be in place during the summer months. The deck over the P-1 floor level has been designed to receive and support the loads imposed by the proposed air-supported structure.

# 4.7.7 Full Perimeter Fencing

Fencing will provide a full surround to the air-supported structure on the deck of the second floor. The height of the fencing will typically be 11 ft (3.35 m) above the tennis court surface. Should a collapse occur, the fencing will block the structure from draping down the outside of the building, which will ensure that egress routes remain unblocked at the time of emergency.

# 4.7.8 Warning Device

An audible warning device will be installed to warn occupants of an impending collapse of the air-supported structure.

# 4.7.9 Sprinkler Protection

The intent of the By-law is to protect the structures from unacceptable levels of radiation or flame spread through the unprotected openings, in the event of a fire originating within either the air-supported structure or the adjacent buildings. The proposed alternative solution addresses the intent by providing a water curtain that has been documented by Heselden & Hinkley to be capable of absorbing 60% to 70% of the incident radiation emitted from a fire source (please refer to **Appendix B** of this report). The activation of the water curtain will also prevent flame spread from the building into the exterior.

#### 4.7.10 Fire Shutters

In addition to the water curtain sprinkler system, the glazed openings along the exposed side of the existing building will be protected with fire shutters. These redundant safety measures will minimize the chances of spreading fire between the air-supported structure and the adjacent buildings.



# 4.8 Maintenance Requirements

The proposed alternative solution measures consist of water curtain sprinkler protection, fire shutters, warning device, full perimeter fencing etc. that require periodic maintenance. The inspection and maintenance will be provided in order to maintain the effectiveness of the proposed alternative solution features.

# 4.9 Concluding Opinion

On the basis of the foregoing, it is the opinion of the proponent that the proposed alternative solution described in this report will provide at least the same level of protection as required by the corresponding the By-law requirements. Where installed in conformance with the requirements of this report, the alternative solution will satisfy the functional requirements (F03, F10, F12, F20, and F36) of Sentence 3.1.6.2.(1) and Clause 3.1.6.3.(2)(a), Division B of the VBBL. The qualifications of the proponent are included in **Appendix C** of this report. The proposed alternative solution is project specific and shall not be interpreted as establishing a precedent for future installations.

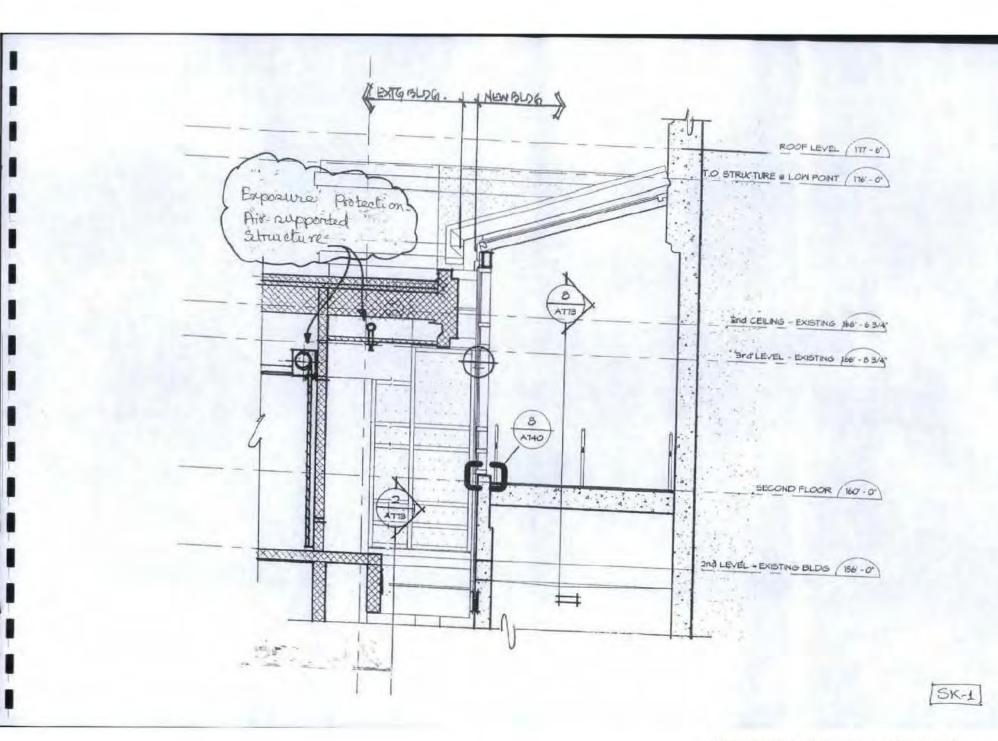
This report was prepared by Gage-Babcock & Associates Ltd. (GBA) for our client. The material herein reflects GBA's best judgment in light of the information available to it at the time of preparation. GBA accepts no responsibility for damages, if any, suffered by any third part as a result of use of the contents of this report without authorization from GBA. GBA shall not be held responsible for any alternative solutions stated in this report without written acceptance of same by the applicable Authority Having Jurisdiction. It is the responsibility of the registered professionals of record to incorporate building code measures described herein, including alternative solutions, into the design, building permit and construction documents.

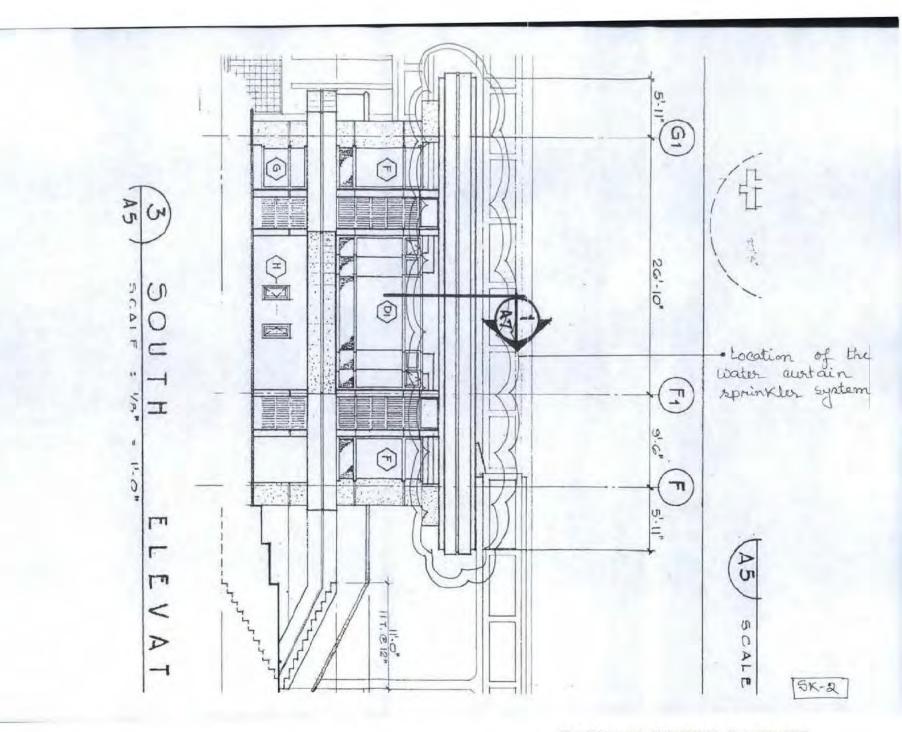
O:\07\070900 (wmm) Arbutus Club renovation and addition\Reports and equivalencies\Alternative Solution (2008-July-02) wpd



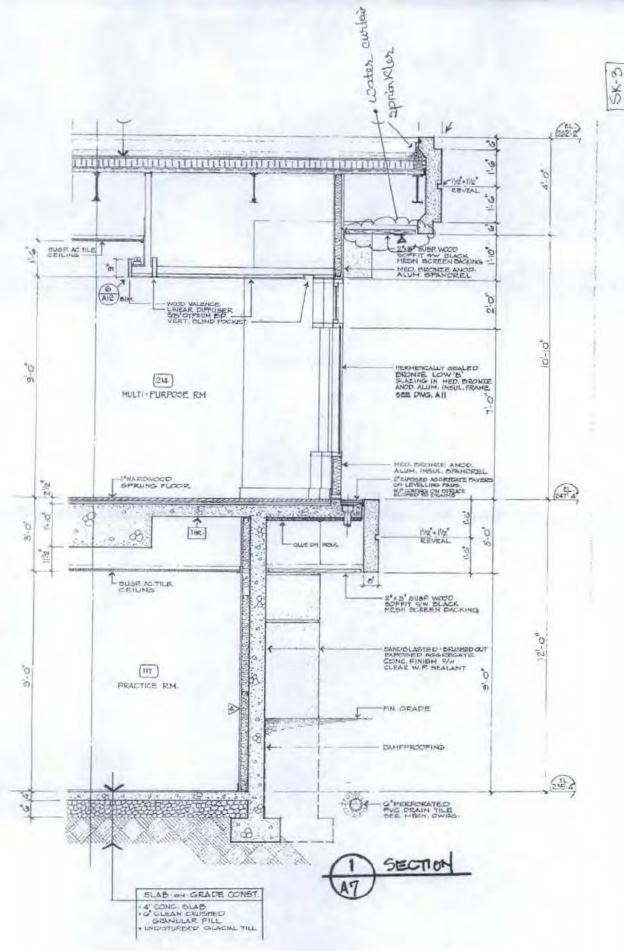
# Appendix A Sketches

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Appendix B
Heselden & Hinkley's Paper



# Measurements of the Transmission of Radiation Through Water Sprays

A. J. M. HESELDEN and P. L. HINKLEY British Joint Fire Research Organization

The effectiveness of water spray curtains in preventing fire spread depends on the amount of thermal radiation transmitted through the spray. The authors have measured the transmission of radiation through spray curtains from a sprinkler and a nozzle producing a flat spray at both high and low water pressures. They conclude that with proper nozzles, a water curtain of low transmission could be produced from water flows comparable with those of sprinkler installations.

In CONSIDERING water curtains as a means of preventing spread of fire within buildings, it is necessary to know the amount of thermal radiation which would be transmitted through such curtains. Measurements have accordingly been made of this transmission for the spray from a sprinkler, and from a small nozzle giving a fan-shaped spray. The results are compared with data published for other nozzles.

## TRANSMISSION THROUGH A FLAT SPRAY

The transmission through the spray from a nozzle consisting of a Bray 266/5 burner (intended for use at a bat's wing burner) was measured by means of a radiometer! receiving radiation from a Schwank gas radiant panel either directly, or after passage through the spray (see Figure 1). The radiometer was 19 cm below the nozzle which pointed vertically downward and produced a flat spray increasing in width from 5 cm to 8 cm at the radiometer height as water pressure was increased from 1.1 psi to 2.6 psi (0.07 to 0.18 atmospheres) and nozzle flow increased from 9.7 ml/sec to 16 ml/sec. The hot refractory surface of the panel measured about 12 cm wide and 17 cm high, and ran at 800°C to 850°C. This temperature was high enough to produce a wavelength-intensity distribution comparable with that from large fires. The results are given in Table 1.

Note: The following equivalents may be helpful in perusing this paper: 1 cm = .394 in.; 1 m = 3.28 ft; 1 atmosphere = 14.7 psi; temperature (°C) +17.78  $\times$  1.8 = temperature (°F); 1 milliliter per second = .0159 gpm; 1 cal/sec/cm² = 13,272 Btu/hr/ft².

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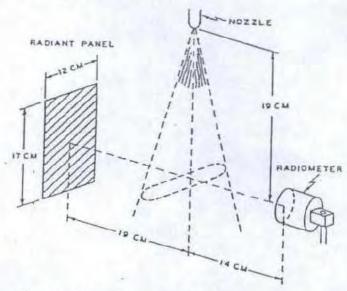


Figure 1. Layout of apparatus for flat spray measurements.

TABLE 1. Results with Flat Spray

Number	W	Water pressure		
nordes	cm Fig	- ×	psi	(per cent)
	6		1.1	95
	9.5		1.8	93
1	12		2.3	90
	13		2.5	88 .
	13.5		2.6	88
3	12		2.3	74

## TRANSMISSION THROUGH A SPRINKLER SPRAY

The sprinkler was a spray-type pendent version, mounted 2.75 m '9 ft) from the floor, and operated at pressures of 50 psi and 6.5 psi (3.4 atm and 0.4 atm respectively). A Schwank gas radiant panel was used as a radiation source. The panel was viewed by a Land total-radiation, narrow-angle pyrometer with an arsenic-trisulfide lens giving substantially constant and high transmission to 9 microns and some transmission to 11 microns. The radiant panel and pyrometer were set up 1.4 m above the floor on opposite sides of the sprinkler spray (see Figure 2).

The pyrometer was aligned to view the panel, and readings were taken of the pyrometer output before, during, and after operation of the sprinkler spray. Measurements were made with the line joining pyrometer

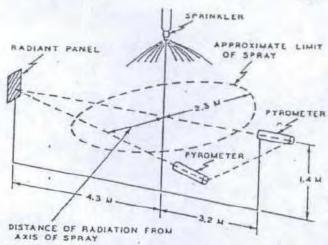


Figure 2. Layout of apparatus for sprinkler spray measurements.

and panel intersecting a vertical line passing through the sprinkler and also with the pyrometer moved to one side so that the transmission through outer parts of the spray could be determined (see Figure 2).

The sprinkler spray induced considerable air movement in the laboratory and the panel was cooled slightly. The radiation from the panel was therefore monitored by a radiometer and corrections were made for the cooling of the panel. Values obtained for transmission are given in Table 2.

## JOINT FIRE RESEARCH ORGANIZATION RESULTS

The transmission (T) of unit intensity of radiation incident on a layer

TABLE 2. Results with Sprinkler Spray

Water pressure at sprinkler (psi)	Distance of radiation path from vertical line from sprinder (meter[s])	Transmission of radiation (per cent)	Qd1 (g/cm/sec)
50	0	9, 10*	12.3
	0.52	8, 14*	8.8
	1.01	46	4.9
	1.59	78	2.9
	0	55	
6.5	0.52	72	6.4
	1.01	84	5.5
	1.59	15.7	3.3
	1.03	95	1.2

\* Repeat experiments.

+ Total rate of water flow for unit width of spray.

of totally absorbing particles can be expressed as the Lambert-Beer Law:

$$T = e^{-\phi Nd}$$
(1)

where q is the extinction cross-section of a single particle, N is the number of particles per unit volume, and d is the layer thickness.

For a pencil of radiation

$$q = \pi r^2$$

where r is the drop radius. Also, if all particles are the same size

$$N = \frac{Q}{v} \frac{3}{4xr^2}$$

where Q is the volume flow rate through unit horizontal area and  $\nu$  is the downward component of drop velocity.

Therefore

$$T = e^{-\frac{30d}{4vr}} \tag{2}$$

Neither the downward velocity component nor the size distribution of the drops is known for the sprinkler, so that the results cannot be correlated in terms of equation (2). However, if u and r were constant for all drops from both jets, then

$$T = e^{-AQd}$$
(3)

where A is approximately constant for a given spray operating at a given nozzle pressure. In most real sprays, A is not quite constant for all radiation paths since r and r are not the same in all parts of the spray; thus A should vary with water pressure at the nozzle since higher pressures will give smaller drops. The factor Qd has a considerable practical importance since it is the total rate of flow of water in the spray for unit width. Approximate values of Qd for the sprinkler spray were obtained by conversion of the water distribution measured in the standard Joint Fire Research Organization sprinkler tests to the distribution at the height of measurement (1.4 m).

The fraction of the total water output from the sprinkler, falling within a given radius at a pressure of 50 psi, was very similar to that at a pressure of 5 psi. The distribution for a pressure of 6.5 psi could, therefore, be found, since sprinkler discharge is nearly proportional to the square root of flowing pressure.

In Figure 3 log T has been plotted against the factor Qd. The sprinkler spray transmission for a pressure of 50 psi is lower than that for a pressure of 6.5 psi, presumably because the higher pressure produces smaller drops which, according to equation (2), give a spray of lower transmission. The best lines through the points do not pass through the origin, probably because the drop size distribution is not the same for the radiation paths through different parts of the spray.

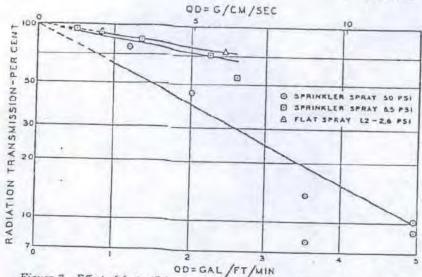


Figure 3. Effect of factor Qil on radiant transmission through water sprays.

The transmission values obtained with the flat jet were high presumably because the drops were large. At the low pressures used, the jet produced a small sheet of water breaking up into drops

#### SCATTERING OF RADIATION

Before pyrometer readings were taken to measure the transmission of heat through the sprinkler spray, it was necessary to know whether scattering of radiation by the spray was important. The scattering can be estimated if the droplet size is known.

The product (wr) can be obtained from the slope of the Beer Law relation (Equation 2, as plotted in Figure 3). Since the downward momentum of the water spray is largely destroyed by the deflector plate, the upper limit to the downward component of velocity is that due to free fall under gravity, which, neglecting air drag, is 525 cm/sec for a drop falling 1.4 m from rest. From the value of wr we can now obtain a lower limit for the average drop radius of 0.0075 cm for the spray at 50 psi. This radius is comparable with those of drops from various nozzles used by Rasbash and Rogowski. They obtained mass median drop radii between 0.015 cm and 0.15 cm.

The fraction absorbed of a narrow beam of radiation incident on a single drop of radius 0.0075 cm can be found from the relation given by Thomas. For a source at  $800^{\circ}$  C, a value for k (the absorption index) of 120 per centimeter was calculated, giving a fraction of incident radiation absorbed of 0.75 and this would be even higher for the actual drops which are, in fact, larger. The remaining 25 per cent is reflected and transmitted, but not in the direction of the incident beam. Thus, in the sprinkler spray

experiments some radiation which was received by the pyrometer before the spray was turned on is scattered outside the field of view of the pyrometer, but may still penetrate the spray. The effective transmission of radiation from an extended source to an extended receiver is, therefore, underestimated by the pyrometer. Table 3 gives the estimated transmission of radiation from an extended source for two source temperatures assuming:

- In these experiments, none of the scattered radiation was received by the pyrometer.
- In the case of the extended source all the scattered radiation is scattered in a forward direction, and penetrates the spray. No account has been taken of the increase in extinction area of the drop as the source becomes larger, from  $\pi r^2$  for a narrow beam of radiation to  $2\pi r^2$  for an infinite source. The transmission for an extended source is, therefore, likely to be smaller than the values given in Table 3 and the absorption larger.

TABLE 3. Estimated Equivalent Transmission from an Extended Source Water Pressure 50 psi

Absorption index (k) (per centimeter)		Absorption of narrow beam ircident on a single drop (per cent)		Transmission that would be measured by the pyrometer (per cent)	Estimated equivalentransmission from an extended source (per cent)	
800° C Source	1,000° C Source	800°, C Source	1,000° C Source	800° C Source	800° C Source	1,000° C Source
				5	29	38
				10	33	42
120	93	75	65	25	44	51
				50	63	67
				90	92	93

#### RESULTS OF OTHER WORKERS

Seekamp<sup>4</sup> and Schuler<sup>5</sup> measured the transmission of radiation from an extended source through water curtains formed from a number of spray heads mounted at short distances apart on pipes. Seekamp used only one water pressure (2.5 atm). Schuler varied water flow independently of pressure by increasing the number of pipes; thus Qd can be taken as the rate of volume flow of water per unit length of curtain. Schuler measured radiation transmission, drop size distribution and drop velocity of water curtains and has presented his transmission values as a function of the dimensionless variables of Equation 2. His results, simplified to the form of Equation 3, are plotted in Figure 4 which shows only the transmissions quoted by Schuler where the flow of water was varied independently of pressure. Smart<sup>4</sup> measured radiation transmitted by water sprays from various nozzles operating at various pressures using a pyrometer and a

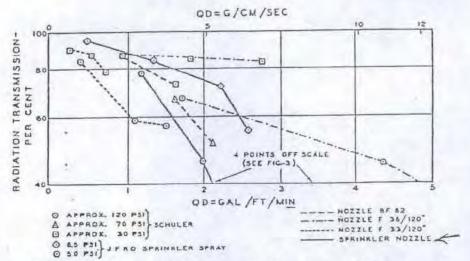


Figure 4. Effect of water pressure on the amount of radiant heat absorbed by water sprays.

3-ft-square radiant panel as radiation source. He found that the radiation transmission could be as low as 5 per cent for 100 psi, but it is difficult to compare his results with those quoted because of differences in geometry. The radiation path was horizontal, through horizontally directed sprays and in the direction of the sprays, and it is difficult to calculate values for Qd.

#### EVAPORATION OF DROPS

For low values of Qd and high intensities of radiation, evaporation of a substantial fraction of the spray can take place. The fractional absorption by the drops in the lower portions of the spray is then less than for lower radiation intensities since from Equation 1 as q becomes smaller, T becomes larger even if no drops are completely evaporated. Since the air in the spray is not heated one would expect condensation to form clouds of very small droplets, which would scatter radiation rather than absorb it. Water vapor would also absorb radiation. These aspects have not yet been studied.

If we consider a 10 ft  $\times$ 10 ft radiation source and an intensity of 4 cal/cm²/sec the total radiant heat emitted is  $10 \times 10 \times 144 \times 2.54^2 \times 4$  or 370,000 cal/sec. The maximum possible heat absorption by water at 20° C converted to steam at 100° C is 620 cal/g so that the minimum amount of water necessary for complete absorption of the radiation is  $\frac{370,000}{620} \times \frac{60}{454} \times \frac{1}{10}$  or 8 gpm. Thus, the substantial fractional absorption that is possible by sprays producing 10 to 30 gpm over a 10-ft length, such as sprinklers, would be expected to evaporate a correspondingly sub-

stantial part of the flow but still leave a significant quantity of water reaching the floor for extinguishing or suppressing fire.

#### GENERAL DISCUSSION

In Figures 3 and 4 it can be seen that for any given nozzle and water pressure, transmission of heat falls as the rate of flow of water in the radiation path increases, but the results are not sufficient to indicate the exact form of the relation. For any given nozzle, transmission falls as water pressure increases, even when the rate of flow does not change (Figure 4). This is to be expected from Equation 2 since higher pressures will tend to

produce smaller drops and the value of  $\frac{3}{4v}$  will therefore increase.

#### CONCLUSIONS

The results suggest that, provided a high pressure was used, a water curtain produced by a water flow of 3 gal/ft/min could absorb at least 50 to 55 per cent of incident radiation from sources at 800° C to 1,000° C, and a curtain produced by a flow of 4 to 5 gal/ft/min could absorb at least 60 to 70 per cent of incident radiation. Further experiments are desirable, and ettention should be given to nozzle design, since this appears to be critical.

Note: The work described herein forms part of the program of the British Joint Fire Research Organization of the Department of Scientific and Industrial Research and Fire Offices' Committee; the paper is published by permission of the Director of

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# Appendix C

Qualifications of the Proponent



#### HISTORY & QUALIFICATIONS

Gage-Babcock & Associates Ltd. (GBA) is a Canadian Fire Protection, Security and Code Consulting Engineering firm with majority British Columbia resident ownership. GBA is dedicated to the protection of life and property from the potentially severe consequences of fire and criminal activity. The original firm was incorporated in 1974 as Compyro Consultants Ltd., and in 1985, GBA commenced our affiliation with Gage-Babcock & Associates Inc., an American fire-protection engineering and security-consulting firm.

Members of GBA technical staff are a closely-knit group with complementary experience and expertise in theoretical and technical design, project administration, and asset protection principles and practices. GBA's projects generally involve multiple staff to ensure a high quality of engineering as well the continuing development of individual talents.

GBA staff includes six professional engineers and one registered architect. Five are eligible to use the designation 'Certified Professional'. Under this program, the Certified Professional (CP) is delegated the authority to ascertain that the design and construction of a building substantially conforms in all material respects with Part 3 of the British Columbia Building Code or applicable Municipal Bylaws. GBA played a significant role in modifying the CP program to the Independent Professional Program currently in use by the Vancouver International Airport Authority and Vancouver Port Authority for use with the 1995 edition of the National Building Code of Canada. GBA is also a holder of an Architectural Institute of British Columbia Certificate of Practice.

GBA keeps current on new developments in fire protection engineering, security and building issues through membership in such organizations as the Society of Fire Protection Engineers, the National Fire Protection Association, and Provincial (Manitoba, Alberta, Ontario and British Columbia) Professional Engineering Associations, and the American Society for Industrial Security. GBA staff work with building and fire codes and standards on a daily basis and also serve on technical committees responsible for their development.

GBA offers both fire protection and security expertise. This allows us to reconcile life safety and security conflicts that arise in both retrofit and new construction projects. Our experienced team of fire protection engineers, security consultants, and life safety specialists ensure that our design recommendations are in compliance with applicable building codes and standards and properly interface with other building systems. For over thirty years, GBA's Canadian clients and their building occupants have benefited from the significant level of threat and risk reduction enabled through the integration of the crime prevention, life safety, and fire protection disciplines working in concert to achieve the optimum level in code compliance and safe use of buildings.



GAGE-BABCOCK & ASSOCIATES LTD.

Fire Protection

Life Safety

Security

Tel: 604-732-3751

Fax: 604-732-1277

www.gbacan.com

#### PROFESSIONAL SERVICES

#### Overview

Gage-Babcock & Associates Ltd. (GBA) provides professional consulting & engineering services in fire safety, life safety, and security for the building design, construction, and management industry.

GBA's team of technical staff provides advice and design consulting to architects, designers, owners, and developers to ensure that a building design will achieve compliance with the intent of the appropriate building and fire codes, while preserving the functional and budgetary requirements of the space.

GBA staff provide expert consulting and design services in the following areas:

- ▲ Building Code Consulting
- ▲ Code Equivalency Development
- ▲ Certified Professional (CP) Services
- ▲ Fire Sprinkler System Design
- ▲ Fire Alarm System Design
- ▲ Independent Professional Design Reviews
- ▲ Objective Based Design Justification
- ▲ Fire Growth and Smoke Spread Modelling
- ▲ Litigation Support
- ▲ Expert Witness Service
- ▲ Life Safety & Security Reconciliation
- ▲ Security Consulting
- ▲ Security Systems Design
- ▲ Forced Entry Resistance Design

#### The Gage-Babcock Philosophy

GBA is committed to providing the highest level of service to the design community. Our goal is to assist designers and other stakeholders in the development of innovative designs which will achieve a level of fire protection, life safety, and security that meets, or exceeds, the requirements as mandated by the current building and fire codes and criminal threat levels.

The key to the success of Gage-Babcock and Associates Ltd. lies in the satisfaction of our clients. GBA strives to provide prompt, efficient, goal-oriented service to all of our clientele, with particular emphasis on the quality of work that we produce.



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### GRAHAM HARMSWORTH LAI & ASSOCIATES LTD

FIRE PROTECTION ENGINEERS • CERTIFIED PROFESSIONALS • BUILDING CODE CONSULTANTS SUITE 701 - 744 W HASTINGS ST · VANCOUVER BC · V6C 1A5 · TEL (604) 689-4449 · FAX (604) 689-4419

March 17, 1997

Mr. Robert L. Maki, P Eng
Deputy Director and City Building Inspector
Permits and Licenses Department
City of Vancouver
453 West 12<sup>th</sup> Avenue
Vancouver, BC
V5Y 1V4

PERMITS & LICENSES DEPARTMENT Reg. No.:
MAR 2 0 1997
ORIGINAL TO: RLM COPY TO:

FIELD REVIEW OF BUILDING BYLAW EQUIVALENCIES
ARBUTUS CLUB
2001 NANTON AVENUE
VANCOUVER, BC

OUR FILE: 94-396.1

Dear Mr. Maki:

This letter is intended to confirm that Graham Harmsworth Lai & Associates Ltd has reviewed plans and specifications for the above noted project and conducted field reviews relative to the Building Bylaw equivalencies described in our equivalency submissions dated as summarized below.

#### These equivalencies include:

- refuge areas designed to the reduced dimensional requirements of CAN/CSA-B651-M90 (submitted September 12, 1994)
- 2. fire rated glazing system in exit stair enclosure "C20" (between exit and adjacent rink and gymnasium) (submitted September 12, 1994)
- 3. fire rated glazing system in exit stair enclosure "C" (between exit stair and adjacent lobby, submitted September 12, 1994)
- 4. fire rated glazing system for protection of doors leading from pool change room to adjacent exit corridor (submitted June 26, 1995)

We have not reviewed working drawings or conducted site inspections for any other purpose.

With one exception, these equivalencies have now been completed and installed in a satisfactory manner. The exception to full completion, as of this date, is that doors to the pool change rooms (item 4 previous) are not equipped with positive latching mechanisms. We have identified this deficiency to the project architects.

Please contact us with any comments or questions.

Yours truly,

Graham Harmsworth Lai & Associates Ltd.

David W. Graham, P Eng, CP

PERM	AITS & LICENSES DEPARTMENT
Reg.	No.:
	MAR 2 0 1997
ORIG	GINAL TO:
COP	Y TO:

#### JDM/jmh/lg

cc: N. Lubiw, Roger Hughes Architects (Fax: 732-6695)

A. Adams, Hopping Kovach Grinnell Design Consultants (Fax 684-7328)

D. W. D. J. GRAHAM

F:\PRJ\3\396\_1\maki-9c.wpd



#### CITY OF VANCOUVER - DEPARTMENT OF PERMITS & LICENSES

DD)

City of Vancouver - FOI 2019-696 - Page 119 of 119

(Revised July 1994)

REQUEST FOR MINOR RELAXATION/EQUIVALENCY 4226 Arbutus or DP 212126 Print (Pennit Application Number) BUILDING DESCRIPTION: Herilding Area 4600 No. of Storeys 3 Occupancies ASSEMBLY, GROP 7

EXISTING: Year B		g Value	Cost of WorkTable	
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Comments By:	1/1	Agreed		
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(iii) ACCEPTAB	LE (As proposed)			
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XAA	n Mr	Certified Professional	Supervisor, Plumbing & Gas Inspection	Branch
A HH - b	60 Materia	City Building Inspector	Supervisor, Electrical Inspection Branch	N.
1 VV CCC	1 0124/94	Assistant Director, Inspection	Inspector,	Branch
City Building Inspector	(Date)	Supervisor, Plan Check Branch Engineer/Plan Checker	Others	Departm unt

Codes Engineer

pd. Inv # 028314