

Vancouver Aquatic Centre Rehabilitation – Memorandum

Attention: Emma Artis, City of Vancouver
CC: Tina Mathur, City of Vancouver
From: John Sherstobitoff, Ausenco
Reza Mortazavi, Ausenco
Oon-Soo Ooi, Ausenco
Subject: Options for Rehabilitation and Retrofit
Date: February 17, 2023
Document Ref: 107293-01-MEM-001, Rev.0

Permit to Practice #1001905



This memo describes the outcome from the structural/seismic engineering support services Ausenco provided to the City of Vancouver (the City) for the Vancouver Aquatic Centre – Study of Options for Rehabilitation and Retrofit.

1 Supporting Documents

The following supporting documents were reviewed in whole or in part as part of this study:

- Information from the City:
 - 1970s VAC Structural Drawings
 - 1983 Bldg Skin Reid Crowther Carlberg Jackson Report
 - 1990 Sayers Eng Seismic - Crystal Aquatic Centre
 - 1997 12 22 VAC - Precast Wall Panel Investigation Report
 - 1997 Glotman Simpson Precast Wall Panel Investigation Report
 - 2003 Glotman Simpson 203161 Inspection Report Rev May 13 03
 - 2013 RJC DOC 2013 157842 Seismic - Aquatic Centre RVS
 - 2014 GS Insulation Panel and Conc Debris – VAC
 - 2018 Acuren Report
 - 2018 C.Y. Loh Report
 - 2018 Glotman Simpson Structural Review
 - 2020 RJC Dive Tower Evaluation – VAC

- 2022 GS_20220511_ Building Condition Assessment - Vancouver Aquatic Centre (Final)
- 2022 VAC-RPT-20220513-GVA-Pool Condition Assessment_Rev.1 – RJC
- 2022 Acuren “Vancouver Aquatic Centre Structural Steel Corrosion Assessment”
- Reference Documents:
 - NBCC 2020 National Building Code of Canada

2 Scope of Services Provided

The scope of work that Ausenco carried out is summarized below, along with some outcomes of the work.

- John Sherstobitoff attended a site visit on September 28, 2022.
- Ausenco reviewed information provided by the City (see Section 1 above).
- Regarding two precast panel bolt/pad connections in attic space; SW and SE corners (as observed during site visit September 28). The bolt/pad appeared to be very near the edge of the support, rather than centred on the support.
 - The noted condition will be assessed by Glotman Simpson and reported on in their Q1 2023 report.

Figure 1: South West Corner Precast Panel Bolt/Pad Connection



Figure 2: South West Corner Precast Panel Bolt/Pad Connection-Close-up

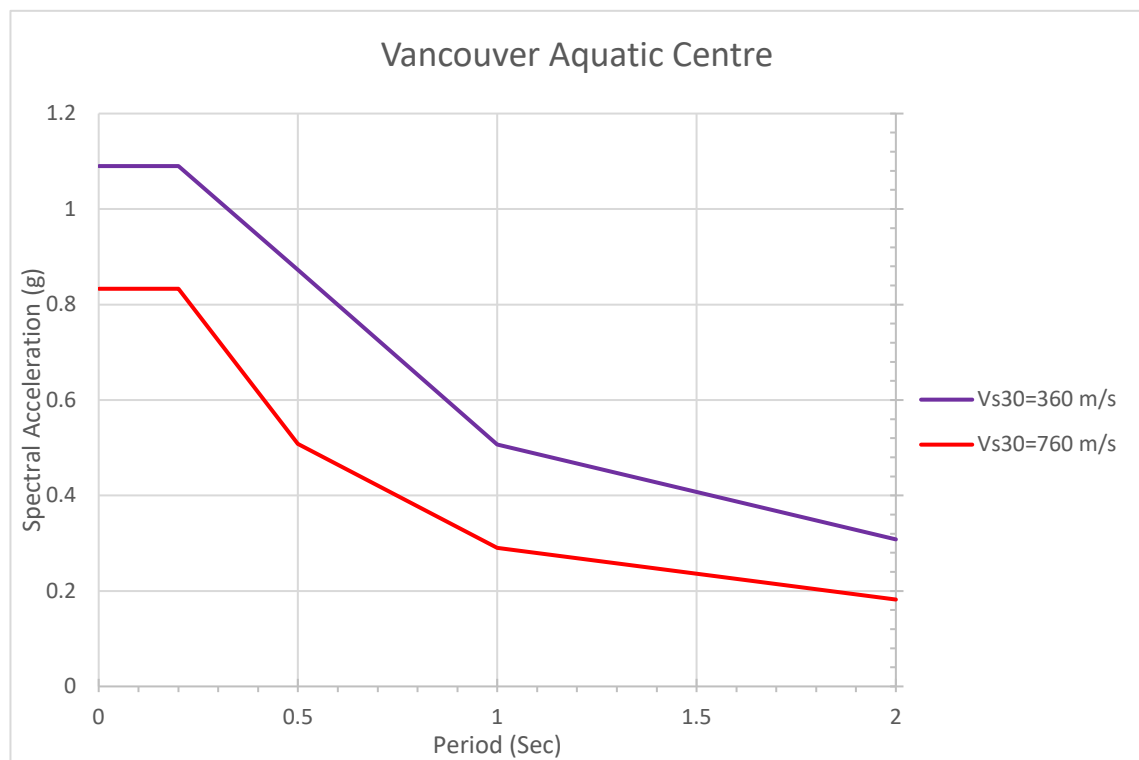


- Further material inspection and/or testing.
 - A Concrete Assessment Strategy was prepared by Ausenco (refer to Appendix 1).
 - Based on two site visits and review of existing reports, Ausenco's expectation is that retaining and remediating key existing concrete elements is feasible and practical.
 - A detailed inspection and material testing is proposed. The estimated cost of such a program as outlined in Appendix 1 is estimated to cost \$50,000 as summarized below. This program would have the City retain a specialized testing firm, with overview by a structural consultant.
 - 40" square columns, diving towers, precast girders, perimeter walls: \$30,000.
 - Bleachers and washrooms: \$5,000.
 - Consultant coordination and review: \$5,000.
 - Allowance for additional items: \$10,000.
 - City to provide complete access and make good all test locations.
 - Testing contingencies due to unforeseen in-situ conditions.
 - Updated Steel Assessment Report received November 7, 2022 from Acuren (refer to Appendix 2).
 - There are local areas of the steel truss with some loss of steel thickness.
 - Paint tested and noted to have some lead content.
 - The extent of remediation for the steel trusses (and these local areas) can be determined after the new design is developed and new loads on trusses are analyzed. The intent would be to focus on the areas that have the most thickness loss to determine if reinforcement is required for

the new demands. A goal would be to provide a lighter roof system to reduce the demand on the steel trusses.

- Seismic hazard data per recently released NBC 2020.
 - The facility was constructed circa 1972.
 - The structure was designed in accordance with the regulation of Vancouver Building Bylaw #4193.
 - All footings are noted to bear on till or shale, equivalent to Site Class C.
 - Based on Vancouver Building Bylaw #4193, Lateral EQ Force = 0.11 W.
 - The elastic response spectrum per NBC 2020 is provided below, for the range of Vs30 values for a Site Class C soil.

Figure 3: NBC 2020 Response Spectrum for Aquatic Centre Location, Upper and Lower Bound for Site Class C Soil



- Obtaining Vs30 may result in 24% to 43% reduction in seismic demand, compared to using a default Site Class C value (upper bound curve per NBC 2020 if Vs30 is not obtained), for structure with fundamental period less than 1 second.
- Based on NBC 2020 and assuming 1.3 for Importance Factor (Community Centre), fundamental period of structure less than 0.2 seconds, and $R_d = 1.5$, $R_o = 1.3$.
 - Lower Bound (Red Curve) Lateral EQ Force = 0.37 W
 - Upper Bound (Purple Curve) Lateral EQ Force = 0.58 W

Therefore, obtaining Vs30 could result in up to 36% reduction in lateral earthquake design forces for a structure with a period of less than 0.2 seconds. It is recommended to obtain Vs30 for the site.

- Options for rehabilitation and seismic retrofit of the facility.

- It is proposed that the following structural components be retained or removed as part of a rehabilitation and seismic retrofit of the facility at the existing location. Figure 4 highlights in green, those components proposed to be retained.
 - o Retain the steel truss superstructure.
 - o Retain 4-40" square columns and east and west diving towers.
 - o Retain the seven main precast concrete roof girders.
 - o Retain bleachers and washroom structures.
 - o Retain (and reinforce if necessary) the exterior concrete walls.
 - o Remove the pool walls and deck, replace entirely.
 - o Remove and replace the roof deck with a lighter and lower maintenance deck.
 - o Remove and replace the exterior siding with a lighter weight envelope; it is understood that more glazing is desirable.

Figure 4: Sectional View of the Building – Looking South

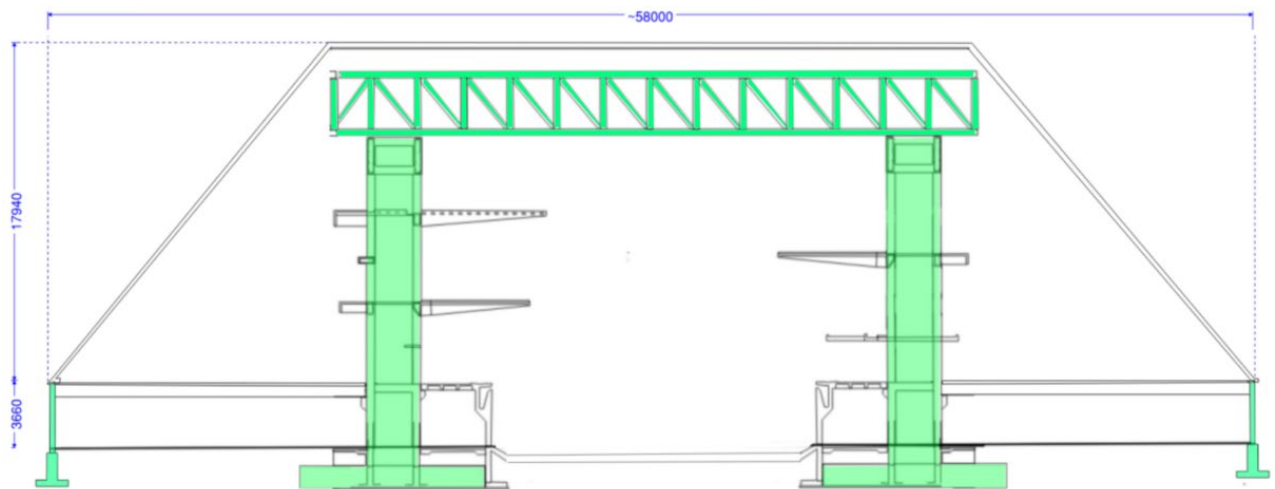
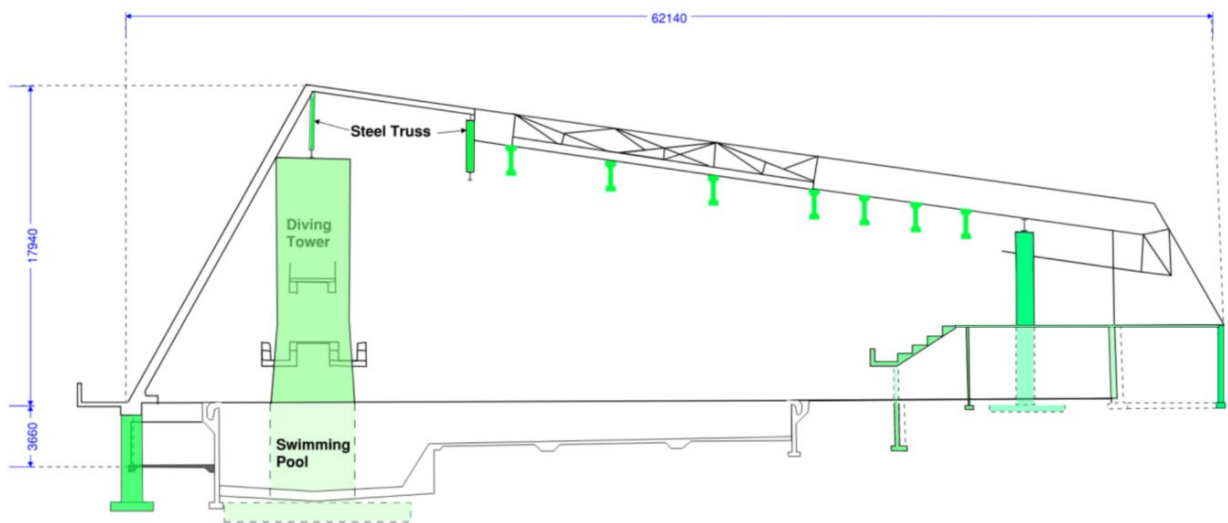


Figure 5: Sectional View of the Building – Looking West



- Other consultants required for this study.
 - No other consultants were retained by Ausenco during this study.
 - Ausenco recommended that Acuren update their report; Acuren was retained by the City and completed the update
- Review geotechnical scope of services for the next phase of the project, as prepared by the City.
 - Completed in November 2022; feedback via email.
- Additional site visits.
 - Ausenco's Reza Mortazavi and Oon-Soo Ooi visited the site on November 10, 2022.
 - Ausenco's Reza Mortazavi visited the site on January 31, 2023.
- Liaison with contractor.
 - Consulted with John Loop of Scott Construction Group on January 13, 2023; a summary is provided below:
 - Agreement with our general concept of restoration.
 - Complete removal of all paint on steel truss and repainting is not necessary unless so directed by the architect/Owner.
 - Remove paint locally as required for steel 'repairs', per Acuren report and further analyses.
 - Repaint any new reinforcing steel, with paint compatible with existing paint.
 - Most current primer paints have some lead content.
 - Retaining and remediating the noted concrete elements is feasible, given that the noted testing and investigations confirm that remediation is suitable to provide another 50-year life to those components, with subsequent regular inspection and maintenance.
 - Complete closure of facility is necessary during the restoration.
- Reusability of bleachers/seating and washroom structures.
 - There is delamination and spalling of concrete cover at a few locations.
 - There are many minor cracks along the perimeter walls and in the bleacher area.
 - Basement slab-on-grade has many cracks.

Overall, retaining and remediating the above existing concrete elements is feasible, given that some similar testing and investigation (as for the main structural elements discussed earlier) be performed on exposed rebars and also several randomly selected locations. The intent would be to confirm that remediation is suitable to provide another 50-year life to those components, with subsequent regular inspection and maintenance.

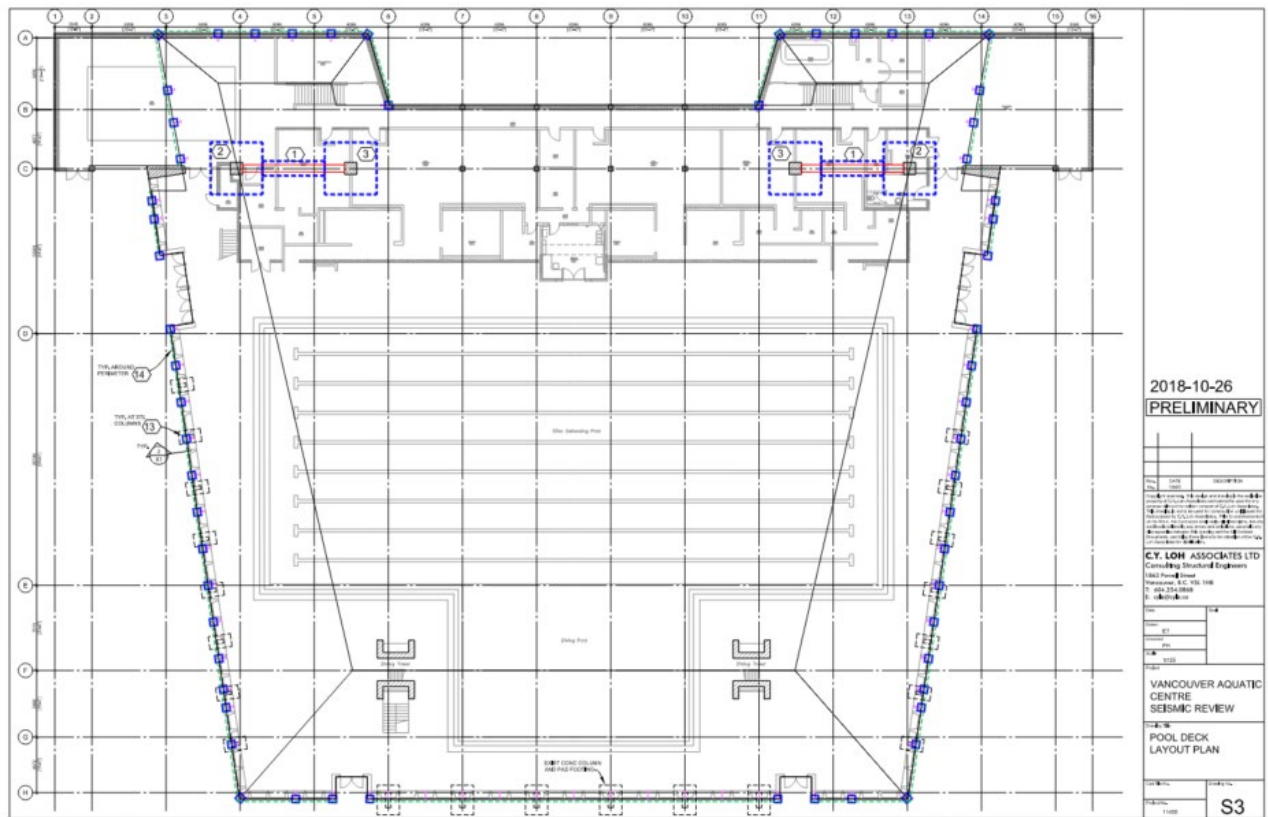
3 Seismic Upgrading Strategies

Below are two options for seismic upgrading, utilizing the structural component retained per Section 2.

3.1 Option 1

The C.Y. Loh Associates Ltd. report dated October 26, 2018 suggested the following concept:

Figure 7: Option 1 – Suggested Shear Wall and Perimeter Upgrades

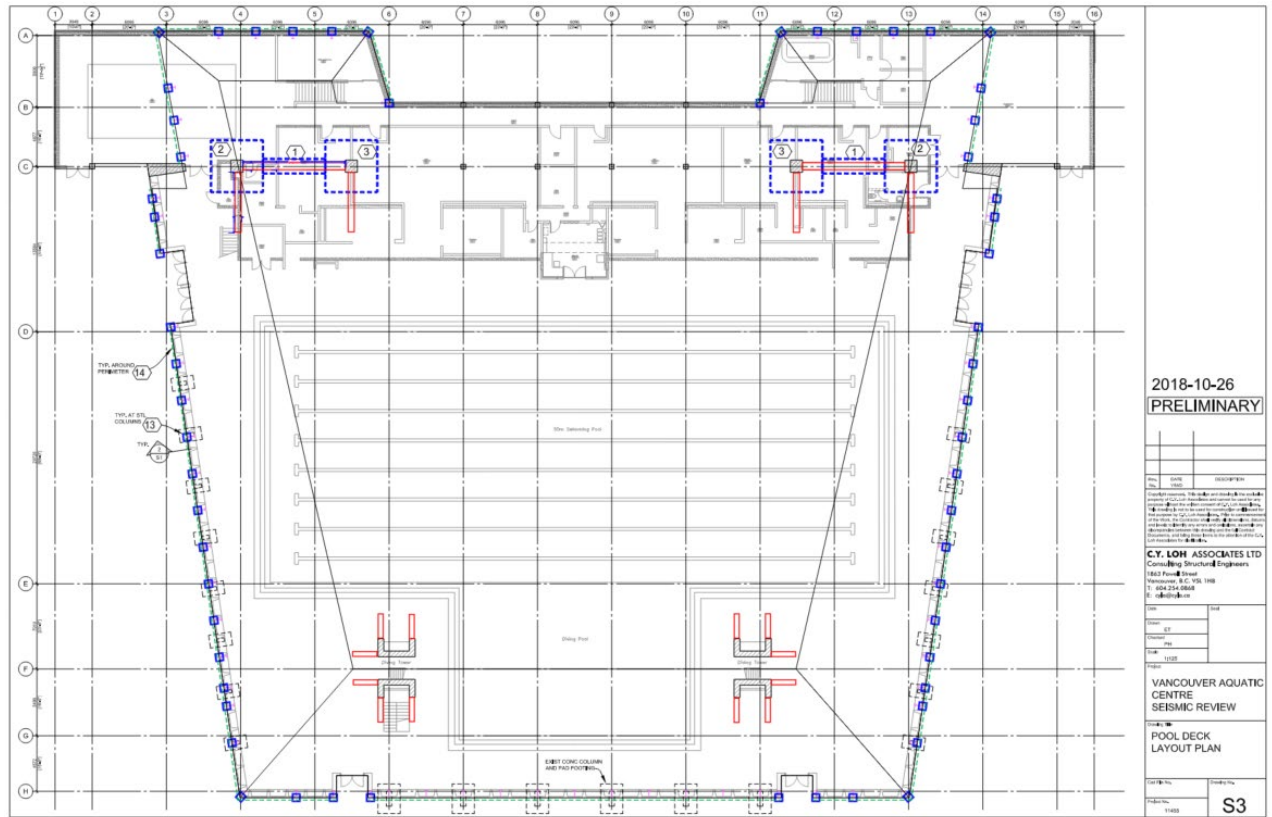


3.2 Option 2

To give more flexibility to the architectural design and building envelope design of a rehabilitated facility, we suggest a completely interior SFRS:

- Add shear walls in between and perpendicular to the 40" columns, for both NS and EW loading.
- Add concrete shear walls (fins) in two directions at the diving towers, away from diving pool, to augment both NS and EW lateral load capacity.
- Lateral bracing of roof truss to connect to above SFRS items.
- As per Option 1, removal of the heavy precast cladding and roof elements and replacement with a new structure that retains the form of the existing building; however, the new envelope could be non-SFRS to resist only wind pressure and snow loading.

Figure 8: Option 2 – Interior SFRS System, Shear Walls



Option 1 considers additional diagonal bracing for the entire perimeter wall plus some new interior shear walls as the SFRS. Option 2 avoids using the exterior wall as the SFRS and proposes the steel truss to be the lateral roof diaphragm to transfer roof and wall envelope loads to the SFRS. Therefore, the exterior building envelope would become primarily architectural which creates more latitude for architectural options for the roof system, wall system and extent of glazing.

4 List of Appendices

The following documents are provided as appendices to this memo.

- Appendix 1 – Concrete Assessment Strategies from Ausenco
- Appendix 2 – Updated Steel Assessment Report from Acuren

Appendix 1 – Concrete Assessment Strategies from Ausenco

107293-01 VANCOUVER AQUATIC CENTRE CONCRETE ASSESSMENT STRATEGIES

40" SQUARE COLUMNS

Scope of Work/Limitations

1. All 40" sq columns.

Objective

1. Investigate cracks, concrete delaminations and corrosion activity to evaluate concrete repair methods and service life extension. Tests are designed for the top end of column @ Grid 13C but can potentially be applied to other columns with some modifications.

Methodology

1. Perform detailed visual examination for cracks, corrosion stains, efflorescence, spalls and other visible deterioration.
2. Conduct hammer-sounding to detect delaminations. If delaminations are present, remove concrete delaminations to examine cause(s) of delamination.
3. Identify rebar layout at the vicinity of cracks by destructive means (chipping) and/or NDT (pachometer or GPR).
4. Extract concrete cores between rebar to intersect the end of cracks. NDT (GPR, impact-echo or pulse echo) may help but cores are required for conclusive data.
5. Conduct ASTM C876 corrosion potential test on all surfaces at 300 mm maximum grid spacing at the top 1 m of column.
6. Patch all chipped areas and core holes with non-shrink concrete repair product (e.g. Target Flowcrete, or eq.) in accordance with manufacturer's specifications.

EAST AND WEST DIVING TOWERS

Scope of Work/Limitations

1. Hands-on testing is limited to the wall areas below the lower dive platform of each tower due to their relatively higher moisture exposure and ease of accessibility. Testing can be extended to higher tower elevations and the diving platforms, if required.

Objectives

1. Limited condition assessment of the diving towers to evaluate service life extension options.
2. Investigate cracks in the repair patch in the southwest corner of east diving tower in the lower level.

Methodology

1. Perform detailed visual examination for cracks, corrosion stains, efflorescence, spalls and other visible deterioration.
2. Conduct hammer-sounding of concrete surfaces to detect delaminations. If present, remove concrete delaminations to examine cause(s) of delamination.
3. Conduct pachometer survey at representative areas to measure as-built rebar cover.
4. Obtain concrete samples from the tower walls above and below the pool deck for water-soluble chloride content (CSA A23.2-4B) and pH analysis. Test locations shall represent one area of deteriorated or marginal concrete in each tower and two sound areas in each tower with highest vulnerability to rebar corrosion. Each test location shall have a minimum of three concrete sampling depths to establish their concentration profiles. Possible depth profiles are the outer 20 mm of concrete, a 20 mm depth at the first mat of rebar, and a 20 mm depth at the second mat of rebar.
5. Conduct ASTM C876 corrosion potential tests on all vertical surfaces of the towers from slab on grade to the lower dive platforms. Provide separate electrical grounding lead for above and below the pool deck testing. Conduct the half cell tests at maximum 500 mm grid spacing, with additional testing along cracks. Remove wall coating by grinding to expose concrete surface for testing (City to repaint test locations). Patch the contact points without damaging the electrical grounding leads and cap the protruding electrical leads with banana plug for re-use in future corrosion potential tests. Provide graphical layout of test locations for future reference.
6. The ASTM C876 corrosion potential tests can be supplemented with "rate of corrosion" testing, if testing equipment and resources are available.
7. Conduct two tensile bond tests (CSA A23.2-6B) of the repair patch at the SW corner of east diving platform to measure the bond strength. Identify the rebar layout and cover using pachometer. Further diagnostic tests shall be determined after conducting the above-noted tests.

PRECAST GIRDERS

Scope of Work/Limitations

1. Hands-on testing is limited to girders readily accessible from catwalk, and is conducted with minimal invasive work. Testing can be extended to other girders if access is provided.

Objectives

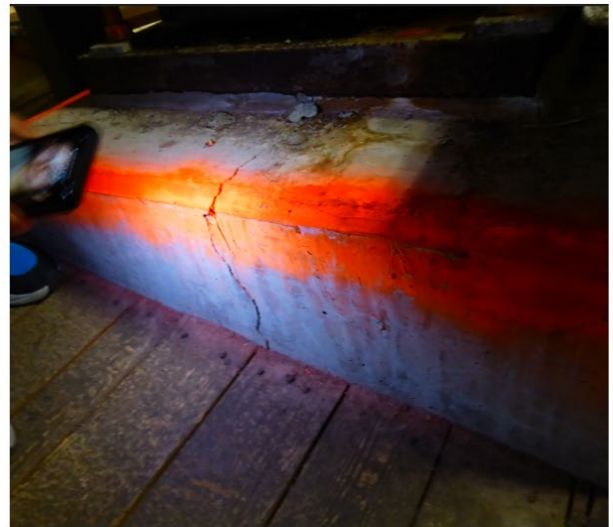
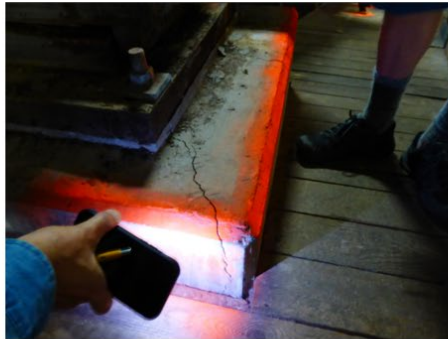
1. Limited condition assessment to evaluate service life extension options.

Methodology

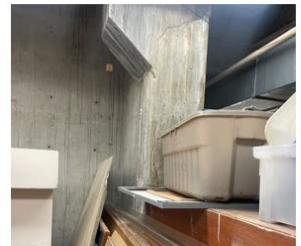
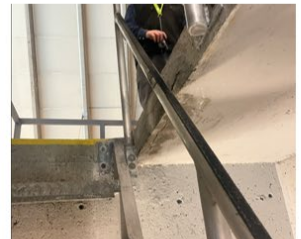
1. Perform detailed visual examination of all girders for cracks, corrosion stains, efflorescence, spalls and other visible anomalies.

2. Perform hammer-sounding to locate concrete delaminations of girders accessible from the catwalk. If present, remove concrete delaminations to examine cause(s) of delamination if removal can be done safely. (City to do delamination repair.)
3. Conduct pachometer survey to measure as-built cover of prestressing strands and rebar at representative areas of the girders.
4. Conduct ASTM C876 corrosion potential tests for the full length of minimum two precast girders at maximum 1 m interval. Test locations shall include top and bottom flanges and minimum two locations on the web per test interval. Patch all contact points without damaging the electrical grounding leads and cap the grounding leads with banana plug for re-use in future corrosion potential tests. Provide graphical layout of test locations for future reference.
5. The ASTM C876 corrosion potential tests can be supplemented with “rate of corrosion” testing, if testing equipment and resources are available.
6. If there are durability concerns arising from the above tests, further testing shall be conducted.

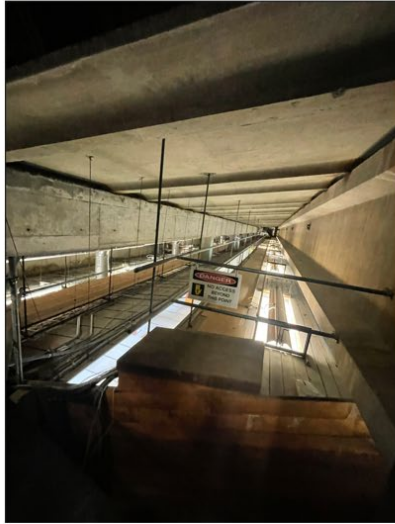
East-End 40" Column



Diving Towers



Precast Girders



Steel Trusses



Appendix 2 – Updated Steel Assessment Report from Acuren

**Acuren Group Inc.**

12271 Horseshoe Way
Richmond, BC, Canada V7A 4V4
www.acuren.com

Phone: 604.275.3800
Fax: 604.274.7235

A Higher Level of Reliability



November 7, 2022

File Number: 605J035110
EGBC Permit Number: 1001973

City of Vancouver Parks Board
955 Evans Avenue
Vancouver, BC
V6A 4C8

Attention: Billy Shen

Re: Vancouver Aquatic Centre Structural Steel Corrosion Assessment

1.0 INTRODUCTION

Acuren attended the VAC on November 2, 2022 to inspect and measure the thickness of select roof framing steel trusses in the attic. This was a follow up to similar work conducted in August 2018 and included measurements of the same locations tested previously. Thickness measurements were performed with ultrasonic testing (UT) equipment calibrated on certified blocks at the time of use. Test locations were lightly scraped and wire brushed by hand as necessary. Magnetic particle (MT) testing was performed on two of the most-corroded welded joints in the NW corner under past roof leaks.

2.0 OBSERVATIONS

Table 1 shows the results. Refer to the figures in Appendix A and instrument details in Appendix B. There was no significant material loss or visible change at any of the test locations (less than 15% thickness loss compared to estimated nominal). The NW and NE corners showed general corrosion and disbonded coatings but no pitting of the steel. Other areas had only scattered areas of flaking paint and surface corrosion. No relevant indications were found with MT. Paint testing using XRF (x-ray fluorescence) found 20-30 wt. % lead present. No repairs were visible since 2018.

Table 1: Thickness Values for Steel Trusses

LOCATION	BEAM TYPE	TEST LOCATION	THICKNESS 2018 (INCH)	THICKNESS 2022 (INCH)	BASELINE THICKNESS (INCH)	% LOSS*
NW Top Connection	Main Vertical	S Flange	0.295	0.285	0.30	5%
Figures 2 to 3		Web	0.232	0.231	0.24	4%
		N Flange	0.296	0.291	0.30	3%
	Main Horiz. Top West	Top Flange	0.360	0.342	0.39	12%
		Web	0.268	0.254	0.27	6%
		Bottom Flange	0.380	0.362	0.39	7%
		Diagonal plate	0.794	0.740	0.80	8%



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Vancouver Aquatic Centre Structural Steel Corrosion Assessment

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Table 1: Thickness Values for Steel Trusses

LOCATION	BEAM TYPE	TEST LOCATION	THICKNESS 2018 (INCH)	THICKNESS 2022 (INCH)	BASELINE THICKNESS (INCH)	% LOSS*
	Main Horiz. Top North**	Top Flange	N/A	N/A	N/A	N/A
		Web	0.269	N/A	0.27	0%
		Bottom Flange	0.400	N/A	0.39	-3%
	Diagonal Stiffener Angle**	Gusset	0.395	N/A	0.40	1%
		Vertical	0.252	N/A	0.25	-1%
		Horizontal	0.252	N/A	0.25	-1%
	Roof Diagonal Angle**	Gusset	0.400	N/A	0.40	0%
		Vertical	0.249	N/A	0.25	0%
		Horizontal	0.230	N/A	0.25	8%
Bottom Connection	Main Horiz. Bottom North	Top Flange	0.385	0.361	0.39	7%
Figures 4 to 8		Web	0.246	0.239	0.27	12%
		Bottom Flange	0.380	0.361	0.39	7%
	Main Vertical	W Flange	0.360	0.357	0.36	1%
		Web	0.235	0.230	0.24	4%
		E Flange	0.360	0.356	0.36	1%
	Diagonal Angle	Gusset	0.398	0.382	0.40	5%
		Vertical	0.245	0.248	0.25	1%
		Horizontal	0.246	0.239	0.25	5%
	Centre Horiz. Stiffener	Top Flange	0.298	0.293	0.30	2%
		Web	0.228	0.219	0.25	13%
		Bottom Flange	0.300	0.294	0.30	2%
	Small Diagonal Angle W	Gusset	0.408	0.383	0.40	4%
		Vertical	0.244	0.239	0.25	5%
		Horizontal	0.239	0.237	0.25	5%
	Small Diagonal Angle E	Gusset	0.375	0.352	0.40	12%
		Vertical	0.247	0.239	0.25	4%
		Horizontal	0.250	0.229	0.25	9%
Area No. 1	Main Horiz. Bottom	Top Flange	2.294	2.122	2.30	8%
West Side		Web	1.443	1.316	1.50	12%
Figures 9 to 14		Bottom Flange	2.332	2.147	2.30	7%



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Table 1: Thickness Values for Steel Trusses

LOCATION	BEAM TYPE	TEST LOCATION	THICKNESS 2018 (INCH)	THICKNESS 2022 (INCH)	BASELINE THICKNESS (INCH)	% LOSS*
Area No. 2	Main Horiz. Bottom	Top Flange	1.980	2.156	2.00	-8%
East Side		Web	1.225	1.214	1.20	-1%
Figures 15 to 21		Bottom Flange	1.995	1.916	2.00	4%
	Diagonal Beam 1	Top Flange	0.488	0.495	0.50	1%
		Web	0.372	0.375	0.40	6%
		Bottom Flange	0.495	0.490	0.50	2%
	Diagonal Beam 2	Top Flange	0.394	N/A	0.40	N/A
NE Area No. 3	Main Horiz. Bottom North	Top Flange	0.393	0.360	0.39	8%
Figures 22 to 27		Web	0.260	0.244	0.27	10%
		Bottom Flange	0.400	0.367	0.39	6%
	Main Horiz. Bottom East	Top Flange	0.583	0.540	0.60	10%
		Web	0.360	0.321	0.35	8%
		Bottom Flange	0.593	0.534	0.60	11%
	Vertical	S Flange	0.315	0.281	0.30	6%
		Web	0.267	0.244	0.24	-2%
		N Flange	0.313	0.287	0.30	4%
	Diagonal Beam	Top Flange	0.335	0.307	0.34	10%
		Web	0.263	0.239	0.27	11%
		Bottom Flange	0.320	0.302	0.34	11%
	Diagonal Angle	Gusset	0.420	0.356	0.40	11%
		Vertical	0.283	0.236	0.25	6%
		Horizontal	0.270	0.244	0.25	2%

* Negative % loss indicates a thickness increase compared to baseline location.

** These areas were not accessible for measurement in 2022.



3.0 RECOMMENDATIONS

It is recommended to remove all discoloured, flaking and damaged paint and corrosion products to bare metal in areas of active corrosion. Surface preparation should be performed according to the Society for Protective Coatings (SSPC) "SP-11 Power tool cleaning to bare metal" procedure or similar standard.

Measurable corrosion loss was very limited and connections appeared substantially free of corrosion product wedging. Spot repair and/or zone painting of the truss elements is suggested to mitigate undercutting of the existing coating system and also the active surface corrosion. Key elements of the coating repair method shall observe the following:

1. The generic chemistry and typical adhesion of the existing coating shall be assessed for compatibility with repair products.
2. Spot repair areas shall be feathered into adjacent sound coatings by grinding/abrading.
3. Surfaces to receive remedial coatings must be free of loose paint, rust, oil, grease, wax, moisture, chlorides and residual contaminants that may affect adhesion or performance.
4. Surface preparation shall conform with the coating manufacturer's requirements and shall include solvent cleaning (SSPC-SP1), low pressure waterjet cleaning (SSPC-SP12), power tool cleaning (SSPC-SP3) and/or power tool cleaning to bare metal (SSPC-SP11). This standard covers the requirements for power tool cleaning to produce a bare metal surface and to retain or produce a minimum 25 micrometer (1.0 mil) surface profile. This standard is suitable where a roughened, clean, bare metal surface is required, but where abrasive blasting is not feasible or permissible.
5. Application of a compatible penetrating sealer and surface tolerant topcoat per the manufacturer's specifications. Devoe Pre-primer 167 and Devoe Bar-rust 235 or equivalent for repair coating in an ISO 12944-5 C4 exposure is required. Penetrating sealer may be eliminated in lieu of an additional coat of film building product for boldly exposed (non-lapped) surfaces.

The coating can be replaced by any compatible corrosion resistant coating system according to the manufacturer's specifications. A surface-tolerant epoxy with minimum two (2) coats is recommended.



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Vancouver Aquatic Centre Structural Steel Corrosion Assessment

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Please contact the undersigned with any questions.

Yours truly,

ACUREN GROUP INC.



Jessica Mager, P.Eng.
Materials Engineer

JMM/ds
Appendixes

Client acknowledges receipt and accepts custody of the report, work or other deliverable (the "Deliverable"). Client agrees that it is responsible for assuring that any standards or criteria identified in the Deliverable and Statement of Work ("SOW") are clear and understood. Client acknowledges that Acuren is providing the Deliverable according to the SOW and not other standards. Client acknowledges that it is responsible for the failure of any items inspected to meet standards, and for remediation. Client has 15 business days following the date Acuren provides the Deliverable to inspect, identify deficiencies in writing, and provide written rejection, or else the Deliverable is deemed accepted. The Deliverable and services are governed by the Master Services Agreement ("MSA") and SOW (including Job Sheet). If the parties have not entered into an MSA, then the Deliverable and services are governed by the Statement of Work and the "Acuren Standard Service Terms" (www.acuren.com/service/terms) in effect when the services were ordered.



APPENDIX A

FIGURES 1 - 27

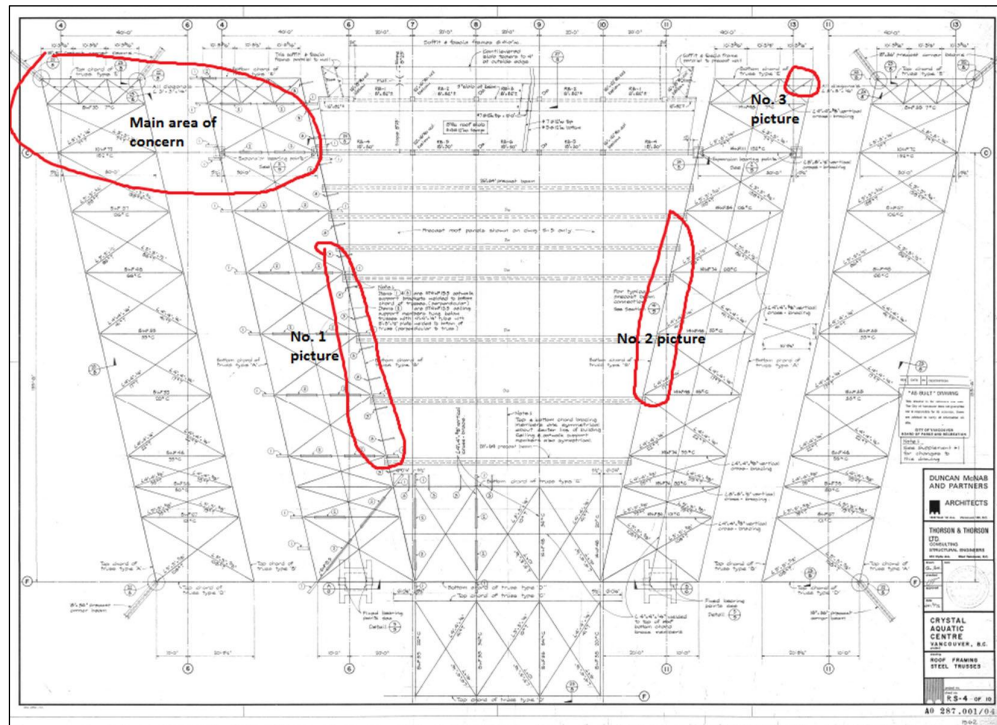


Figure 1 Schematic of four test areas in VAC attic – roof framing steel trusses. North is approximately at the top (Beach Avenue).



Figure 2 NW corner top connection under roof.



Figure 3 NW corner top connection under roof.



Figure 4 NW corner bottom connection.



Figure 5 NW corner bottom connection.



Figure 6 NW corner bottom connection.



Figure 7 NW corner bottom connection. MT results.



Figure 8 NW corner bottom connection. MT results.



Figure 9 Centre of West side structure, "No 1 Picture".



Figure 10 Centre of West side structure, "No 1 Picture".



Figure 11 Centre of West side structure, "No 1 Picture".



Figure 12 Centre of West side structure, "No 1 Picture".



Figure 13 Centre of West side structure, "No 1 Picture".



Figure 14 Centre of West side structure, "No 1 Picture".



Figure 15 Centre of East side structure, "No 2 Picture".



Figure 16 Centre of East side structure, "No 2 Picture".



Figure 17 Centre of East side structure, "No 2 Picture".



Figure 18 Centre of East side structure, "No 2 Picture".



Figure 19 Centre of East side structure, "No 2 Picture".



Figure 20 Centre of East side structure, "No 2 Picture".



Figure 21 Centre of East side structure, "No 2 Picture".



Figure 22 NE corner bottom connection.



Figure 23 NE corner bottom connection.



Figure 24 NE corner bottom connection.



Figure 25 NE corner bottom connection.



Figure 26 NE corner bottom connection.



Figure 27 NE corner bottom connection.



APPENDIX B

NONDESTRUCTIVE EXAMINATION REPORT



ACUREN

NONDESTRUCTIVE EXAMINATION

Acuren Group Inc.

12271 Horseshoe Way
Richmond, BC, Canada V7A 4V4
www.acuren.com

Phone: 604.275.3800
Fax: 604.274.7235



A Higher Level of Reliability

CLIENT: CITY OF VANCOUVER PARKS BOARD
955 EVANS AVENUE
VANCOUVER, BC
V6A 4C8

PAGE: 1 of 2

DATE: November 2, 2022

ACUREN JOB #: 605-J035110

REPORT #: 605J035110-221102-KGW-01

CONTRACT/PO: Pending

WO: -

WORK LOCATION: 1055 Beach Ave. Vancouver

ATTENTION: **B. SHEN**

PROJECT: Vancouver Aquatic Center Structural Beams as directed

ITEM(S) EXAMINED: Follow up NDE of Structural Beams previously evaluated in 2018

PART #: N/A MATERIAL: Carbon steel THICKNESS: Varies
SCOPE: As directed perform an ultrasonic thickness evaluation (UTT) of structural beams at same or equivalent areas as performed on previous 2018 inspection. Plus carry out dry visible magnetic particle evaluation of a sampling of worst welds effected by corrosion (for crack indications).
TYPES OF INSPECTION: Magnetic Particle; Ultrasonic

RESULTS:

Ultrasonic thickness was carried out on structural beams at locations identified from previous 2018 report. Thickness locations were as directed by client in 2018, where surface corrosion was heaviest.

Please see thickness data sheet where location and thickness for 2022 were recorded.

A dry visible magnetic particle evaluation with contrast paint of corroded two sample weld locations did not find any cracking indications.

Client acknowledges receipt and custody of the report or other work ("Deliverable"). Client agrees that it is responsible for assuring that acceptance standards, specifications and criteria in the Deliverable and Statement of Work ("SOW") are correct. Client acknowledges that Acuren is providing the Deliverable according to the SOW, and not any other standards. Client acknowledges that it is responsible for the failure of any items inspected to meet standards, and for remediation. Client has 15 business days following the date Acuren provides the Deliverable to inspect it, identify deficiencies in writing, and provide written rejection, or else the Deliverable will be deemed accepted. The Deliverable and other services provided by Acuren are governed by a Master Services Agreement ("MSA"). If the parties have not entered into an MSA, then the Deliverable and services are governed by the SOW and the "Acuren Standard Service Terms" (www.acuren.com/service/terms) in effect when the services were ordered.

CLIENT: _____
CLIENT PRINTED NAME: _____
CLIENT SIGNATURE: _____
ACCEPTED & ACKNOWLEDGED BY: _____
ACUREN TECHNICIAN: Kevin White
1st Technician: _____
CGSB Level 2 MT, PT, UT, SNT Level II MT, PT
CGSB Reg. #2495
2nd Technician: _____
REVIEWER: Jason Light, P.Eng.

TOTAL HOURS: _____
ST: _____
OT: _____
SHIFT: _____
1ST TECHNICIAN: _____ Day ☒
2ND TECHNICIAN: _____ PM ☐
KILOMETRES: _____ OTHER CHARGES: YES ☐ NO ☐
(IF YES, SEE DAILY OR PROJECT TIME REPORT)

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NDT 605J035110 Vancouver Aquatic Center Beams UTM 221102-KGW-01.docx



ACUREN JOB # 605-J035110
REPORT # 605J035110-221102-KGW-01

CITY OF VANCOUVER PARKS BOARD
Vancouver Aquatic Center Structural Beams as directed

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TEST DETAILS: MAGNETIC PARTICLE

ACCEPTANCE STANDARD: Client's Information		REVISION: N/A	
PROCEDURE/TECHNIQUE: CAN-MT-14P001		REVISION: 17	
TYPE: Dry Visible		METHOD: Yoke	
PARTICLE BRAND: Magnaflux	PRODUCT No.: 3A	CURRENT: AC	MT INSTRUMENT: Parker B-300
PARTICLE COLOUR: Red		MT INSTRUMENT S/N: 30634	CAL DUE: 17MARCH23
SUSPENSION: N/A		LIFT CHECK BEFORE USE: Yes	LIFT WEIGHT S/N: P16-019
CONTRAST PAINT: Ardrex	PRODUCT No.: 8901W	LIGHTING EQUIPMENT: Flashlight	
MAG TIME (SECONDS): 5	DEMAG REQUIRED?: No	BLACKLIGHT MAKE: N/A	S/N: N/A
TECHNIQUE DEMONSTRATED OVER A PAINTED SURFACE?: N/A		LIGHT METER S/N: 1896561	CAL DUE: 17FEB23
		LIGHT INTENSITY: > 100 fc (1076 lx)	
TEST SURFACE CONDITION: As WIRE BRUSHED / SCRAPER		TEST SURFACE TEMPERATURE: 33°C	

TEST DETAILS: ULTRASONIC

ACCEPTANCE STANDARD: Client's Information		REVISION: N/A	
PROCEDURE/TECHNIQUE: CAN-UT-14T001		REVISION: 10	
TYPE: Thickness		METHOD: Contact	
INSTRUMENT: Olympus	MODEL: Epoch 650	S/N: 160271110	CAL DUE: March 06 2023
CAL. BLOCK: Step Block	S/N: 24316	CABLE-TYPE: Coaxial	LENGTH: 1.2
CAL. BLOCK: IIW	S/N: 21-1055	COUPLANT: Sonotech - UT-X FE	

Probe & Technique Details:

	TEST ANGLE (°)	PROBE TYPE	CRYSTAL SIZE	FREQ. (MHZ)	SERIAL NUMBER	DAMPING Ω	TEST FROM	REFERENCE REFLECTOR	TRANSFER VALUE	REFERENCE		SCAN dB	RANGE
										dB	% FSH		
1	0°	Dual	12.75mm	5	N/A	400	A	BEW	NA	38	80	+12	100

TEST SURFACE CONDITION: Clean Bare Metal

TEST SURFACE TEMPERATURE: 33°C