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Yukon Beringia Interpretive Centre Fire Alarm System Assessment

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Document Revisions:

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June 17 2024	Issued for Client Review	Rev A
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1.0 BACKGROUND

The Yukon Beringia Interpretive Centre (YG Building #1329) was constructed and commissioned as the Yukon Visitors Reception Centre in 1992. The fire alarm system provided was a single stage Notifier System 5000 conventional fire alarm system. No reports are available for its testing and certification at the time of construction.

In 1996/97 the Visitor Reception Centre was repurposed as the Beringia Interpretive Centre. The building was extended to provide gallery space for new interpretive displays. The building addition triggered renovation and extension of the original fire alarm system but the original panel, devices and wiring remained. The renovated fire alarm system was commissioned into service in May 1997. The verification/certification report for this time was made available.

The original fire alarm panel failed in 2017 and was upgraded to a Notifier 320 SYS Panel. The panel upgrade was completed without an assessment or upgrade of the system wiring and field devices. The Verification test report for the new panel install lists eleven deficiencies in the system and there is no record of the required ULC certificate for the test.

In 2023 a renovation of the washroom pavilion triggered the addition of new horns/strobe notification appliances (NAC's) required for the new layout. The installed devices did not match the existing legacy NAC devices. The verification report for the washroom area brought the historical problems back to the attention of the Authority Having Jurisdiction (AHJ) resulting in the AHJ placing a condition on occupancy approval that requires the owner to upgrade the base building fire alarm system to current codes and standards.

As a result of this action Dorward Engineering Services Ltd. (DES) was commissioned in April 10th 2024 to investigate the facility fire alarm system at the facility and make recommendations for repair/replacement.

A site meeting with stakeholders was held April 25th 2024 to examine site conditions and discuss the impact fire alarm upgrade work on the facility operations. It was noted that fire alarm work will be required in most of the public areas of the building. A decision was reached that the fire alarm system renovation work should

take place in the off season to avoid disruption of the busy tourist period. During the site visit paper copies of the original construction and 1998 addition were made available for viewing.

Additional system documentation on permits and available testing reports was made available to DES on May 15th 2024.

In conclusion the existing system devices have reached the end of their service life and are no longer compliant with present codes for a number of reasons. This report will outline the short comings of the existing system, present repair/replacement options, discuss the challenges to implementation of the repair/replacement options and will provide cost estimates.

2.0 REFERENCE STANDARDS

- National Building Code (NBC-2020)
- Standard for the Installation of Fire Alarm Systems (CAN/ULC-S524-2019)
- Standard for Verification of Fire Alarm Systems (CAN/ULC-S537-2019)
- Standard for Inspection and Testing of Fire Alarm Systems (CAN/ULC-S536-2019)
- National Fire Code (NFC-2020)
- Canadian Electrical Code (C22.1 2021-24).
- Standard for Installation and Services for Fire Signal Receiving Centres and Systems (CAN/ULC-S561-2020).
- Government of Yukon Design Requirements and Technical Standards 2022 (GYDRaTS)
- Relevant YG Safety Bulletins.

3.0 EXISTING SYSTEM DOCUMENTATION

The following fire alarm permits and reports dating back to the original construction were made available to the consultant. These reports along with site observations informed the recommendations that follow.

1. Beringia fire alarm verification May 1997 (original)
2. Fire Alarm system verification report dated March 7, 2017
3. Fire alarm system annual test and inspection report dated March 22, 2018.
4. ULC Fire alarm certificate issued on March 22, 2018
5. Inspection Report dated April 16, 2018, for the permit no 2017-1462-E.
6. Fire alarm system annual test and inspection report dated October 4, 2022
7. Annual Verification and Test report with ULC Certificate dated December 8,2023.
8. Pending permits 2016-2689 & 2017-2420.
9. As Built Drawings for Yukon Visitor Reception Centre FSCFSC GHM Project No. 90-8110 May 1991.
10. As Built Electrical Drawings for Yukon Beringia Interpretive Centre November 1997

Post construction plans of the fire alarm system were made available however, they only show device locations and do not show the details of fire alarm cable routing spices and connections.

Device and panel technical literature is available in the O&M manual and on line so the technical aspects of the field devices are well understood.

4.0 SYSTEM MANUFACTER

The existing fire alarm system is manufactured by Notifier, a unit of Honeywell. Notifier is a common standard in YG facilities. Notifier operates on a system of third-party suppliers who carry technical staff certified to maintain and repair Notifier systems.

Notifier has good local support with technicians available to conduct field repairs, programming and modifications as required on short notice.

It is recommended that the system remain as a Notifier system and all upgrades are completed using Notifier products.

5.0 SYSTEM DESCRIPTION

The existing system is a conventional fire alarm system installed to the standards applicable at the time of construction.

The original system included one alarm zone fitted with 4 Notification Appliances (NA) or Notification Appliance Circuit Devices (NAC's). These were the bell type of alarm device.

The 2017 addition saw the installation of additional bells as well as strobe devices. The total was 10 Bells and 8 strobes.

The 2023 washroom pavilion renovation added 9 new strobes and 2 new horn strobes.

There are 16 conventional zones on the system. They are:

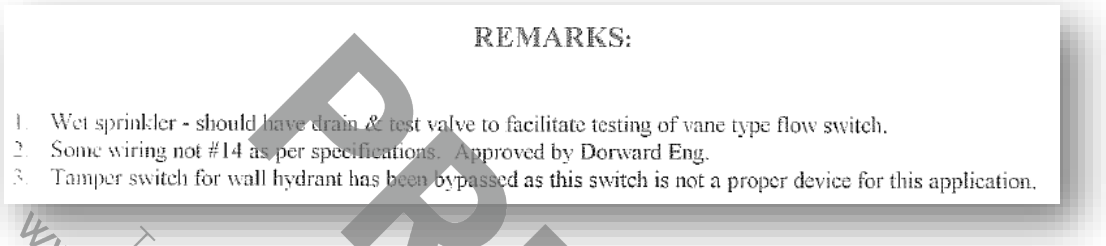
Zone 1: Theatre
Zone 2: Exhibit Hall
Zone 3: Wash Pavilion
Zone 4: Office
Zone 5: Stairwell
Zone 6: Basement
Zone 7: Main Gallery
Zone 8: Exhibit Hall – Theatre
Zone 9: Dumb Waiter
Zone 10: Main Gallery
Zone 11: Mezzanine
Zone 12: Basement Stairwell
Zone 13: Wet Sprinkler Trouble
Zone 14: Dry Sprinkler Trouble
Zone 15: Wet Sprinkler Alarm
Zone 16: Dry Sprinkler Alarm

6.0 FIRE ALARM SYSTEM DEFICIENCIES

Deficiencies have been identified during testing that was required over the years. These deficiencies are noted as follows:

6.1 First Report Reviewed: Beringia Fire Alarm Verification May 1997 (original)

Reported Deficiencies:



REMARKS:

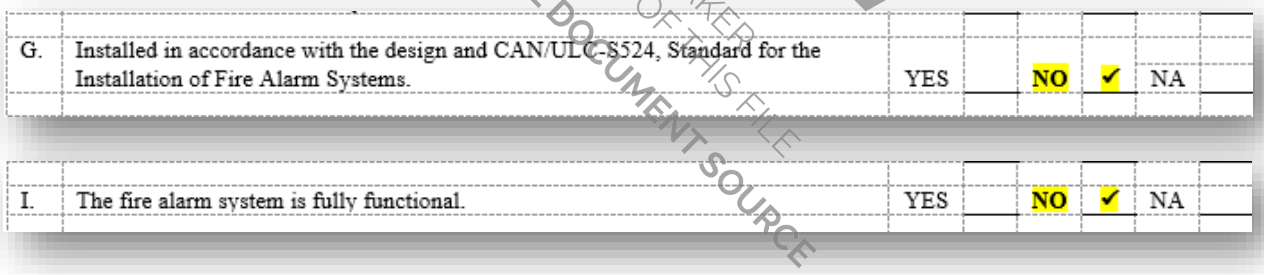
1. Wet sprinkler - should have drain & test valve to facilitate testing of vane type flow switch.
2. Some wiring not #14 as per specifications. Approved by Dorward Eng.
3. Tamper switch for wall hydrant has been bypassed as this switch is not a proper device for this application.

6.2 Second Report Reviewed: Fire Alarm System VI Report March 7, 2017

- This was the verification of the new Panel replacing original panel.
- Partial Verification Only – Included Panel and Certification of Devices.
- Verified to ULC S537 – 2013

Reported Deficiencies:

6.2.1 Deficiencies Noted in Section C1. "FIRE ALARM SYSTEM VERIFICATION REPORT"



G.	Installed in accordance with the design and CAN/ULC-S524, Standard for the Installation of Fire Alarm Systems.	YES		NO	✓	NA	
I.	The fire alarm system is fully functional.	YES		NO	✓	NA	

6.2.2 Deficiencies Noted in Section C5.13 "INTERCONNECTION TO THE FIRE SIGNAL RECEIVING CENTRE":

C.	Where an interconnection between the fire alarm control unit and a separate fire signal receiving centre transmitter is provided, a demarcation terminal box with a minimum of 12 terminals is installed.	YES		NO	✓	NA	
D.	The demarcation terminal box is located in the same room as the fire alarm control unit it is connected to.	YES		NO	✓	NA	
E.	The demarcation terminal box is labeled "Fire Alarm Demarcation" and/or "Limitation D'Alarme Incendie".	YES		NO	✓	NA	

6.2.3 Deficiencies Noted in Section C2.13 "DEFICIENCIES"

1. Strobes not synchronized – ULC S524 – 9.3.2
2. Bells must be temporal – NBC – 3.2.4.19(2)
3. DCL interconnecting control units or transponders shall be style "C" – ULC S524 – 5.7.2.1.

S-524

1. Monitoring does not comply with ULC – s561
2. Supervisory contacts not connected to monitoring.
3. 4.7.4 – documentation required by ULC – S524, not provided
   b. Instructions for silencing trouble and actions to be taken.
   e. Sequence of operations
   f. Description of ancillary devices
   g. Annunciator operating manual
   j. Contact information for installer and service company
4. 4.7.7 – documentation must be kept on site.

S537

1. 4.2.3 – Sequence of operation required.
2. Supervisory indication must be yellow not red at annunciators.
3. 5.4.2 – f – Ancillary devices must be recorded.
4. 5.2.5.1 – p – Installation instructions required.

6.2.4 Deficiencies Noted in Section C2.15 "RECOMMENDATONS"

1. No information on annunciators on site.

6.3 Third Report Reviewed: Fire Alarm System Annual Test and Inspection Report dated March 22, 2018.

- Annual test as per ULC S536-13

Reported Deficiencies:

6.3.1 Deficiencies Noted in Section C2.1 "CONTROL UNIT OR TRANSPONDER TEST RECORD"

Q. Audible and visual alert signals and alarm signals programmed and operate as per design and specification or documentation as detailed in appendix E, Description of Fire Alarm System for Inspection and Test Procedures. YES ___ NO ✓ NA ___

6.3.2 Deficiencies Noted in Section C2.14 "RECOMMENDATIONS"

1. Strobes not synchronized – ULC S524 – 9.3.2
2. Bells must be temporal – NBC – 3.2.4.19(2)
3. DCL interconnecting control units or transponders shall be style "C" – ULC S524 – 5.7.2.1.

6.4 Fourth Report Reviewed: Fire Alarm System Partial Verification for Sprinkler Work. Report dated March 22, 2018.

- **No deficiencies noted on fire alarm verification report**
- **Building permit #2017-2420 was not closed.**
- **Electrical permit #2017-1462-E was closed**

6.5 Fifth Report Reviewed: Fire Alarm System Annual Test and Inspection Report dated October 4 2022.

- Annual test as per ULC S536-2013

Reported Deficiencies:

6.5.1 Deficiencies Noted in Section C1. "FIRE ALARM SYSTEM VERIFICATION REPORT"

E.	The fire alarm system is fully functional.	YES		NO	✓

6.5.2 Deficiencies Noted in Section C2.13 "DEFICIENCIES"

1. Z 17 Need Access to attic to test Heat Detectors. These have not been tested for a few years. (2021)
2. Z7 Duct smokes not testing. Need room access (2022)
3. Z9 Smoke in dumb waiter not tested. No access (2022)
4. Z9 EOL – requires repair. No Bond (2022)

6.5.3 Deficiencies Noted in Section C2.15 "RECOMMENDATONS"

The following deficiencies passed original verification. Recommend repairing to meet current codes.

1. Strobes not synchronized – ULC S524 – 9.3.2
2. Bells must be temporal – NBC – 3.2.4.19(2)
3. DCL interconnecting control units or transponders shall be style "C" – ULC S524 – 5.7.2.1.

6.6 Sixth Report Reviewed: Fire Alarm System Annual Test and Inspection Report dated December 8th 2023.

- Annual test as per ULC S536- 2019
- ULC Certificate No: 174683.231208
- No reported deficiencies

Deficiencies and recommendations for system improvement were also made during the engineers site visit. They are:

- Pull stations are not mounted at code approved heights throughout.
- Documentation located on site is not adequate. A thorough review is required during design including the size of the document box.
- Smoke detector placement requires redesign to address concerns with adequate coverage.
- The door holder smoke detector installation must be corrected to meet current codes.
- Devices have reached, or are close to reaching the end of their service life and are recommended for replacement.
- The annunciator is reported to be not compatible with the panel and may require replacement and or re-cabling.
- The water bug that is installed does not report to fire alarm panel.
- Fire alarm connections to the sprinkler tree do not meet current code requirements.
- A sprinkler room low temperature alarm has not been provided.
- It is recommended that all ION smoke detectors be replaced with photoelectric detectors as the ION technology is no longer supported.
- Detailed as built drawings are required but are not available.
- Access between main floor areas and between the basement and the main floor is difficult as there are no chase ways available.
- Wiring routing is unknown.
- The record show that testing over the years is questionable leading to doubt of testing integrity.

7.0 CONCLUSION

There are a number of known deficiencies that have plagued the installation over many years. These require immediate attention. There are outstanding building permits that may have to be closed. There are also a number of serious issues not reflected in the test reports that must be corrected. There may be unknown conditions that may arise during construction.

The building is an active public display facility with no concealed spaces available for routing conduits.

The base system wiring can be considered for re-use but will need upgrade for new system. The upgrade will be expensive as work is in detail and may require accessory trades, painting carpentry etc, all by others to complete the installation.

An engineered design and professional oversight during construction will be required as well as City of Whitehorse Professional Letters of Design Assurance.

The facility is busy during the summer tourist season but quiet during the winter months. Project design and construction phases should match the facility schedule for the most cost-effective solution.

8.0 LIMITATIONS OF THE REPORT

This report presents an overview of the issues perceived of the Yukon Beringia Interpretive Centre fire alarm system, reflecting Dorward Engineering Services Ltd.'s best judgment using information available at the time of the review and information that was obtained during investigations. Dorward Engineering Services Ltd. has prepared this report using information understood to be factual and correct and shall not be responsible for conditions arising from information or facts that were concealed or not fully disclosed at the time of the investigation. This report has been prepared by Dorward Engineering Services Ltd. For the exclusive use by the client, in accordance with the terms and conditions of the professional services agreement and contract terms. Any use, or reliance upon this document by a third, is at risk and responsibility of that party.

9.0 CLOSURE

Should further information or clarification be required, please do not hesitate to contact the undersigned.

SIGNATURES

Prepared by,

Ross Dorward; *M.E., B.Sc, FEC, P.Eng* July 9, 2024

Name, Designation **Date**

Approved by,

Ross Dorward; *M.E., B.Sc, FEC, P. Eng* July 9, 2024

Name, Designation **Date**

END OF REPORT