

NORTH SLOPE

Striving For Excellence —



# UTQIAGVIK IPALOOK ELEMENTARY SCHOOL

# MECHANICAL AND ELECTRICAL BUILDING ASSESSMENT AND INVENTORY SURVEY REPORT

August 19, 2024

Prepared by:



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## **SECTION 1. INTRODUCTION**

### A. OVERVIEW

This report provides an area wide condition survey of the mechanical and electrical systems in of the buildings owned by the North Slope Borough School District in Utqiagvik. The purpose of the survey was to develop a plan to prioritize and address the issues with the mechanical and electrical systems as money is available. The assessment was performed by a survey team composed of representatives from RSA Engineering Inc. and the NSBSD. The survey included a walk-through of each building to evaluate condition of the existing system. The survey was non-destructive, issues noted in this report were visible during the building walk-through or reported by NSBSD staff. During the walk-through the survey team met with NSBSD staff to discuss issues at the buildings and proceeded to assess the project area to develop recommended upgrades for the facility.

| Team Member           | Title  |
|-----------------------|--|
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|                       |  |

### **B. BUILDING SUMMARY**

The below table includes a list of buildings inspected in this survey:

#### Table 1: Buildings Surveyed

| Village   | Building Name             |
|-----------|---------------------------|
| Utqiagvik | Ipalook Elementary School |
|           |                           |

## C. REFERENCED CODES AND STANDARDS

The buildings were inspected for conformance of the following adopted codes and standards:

International Existing Building Code 2021 International Mechanical Code 2021 International Fire Code 2021 International Fuel Code 2021 Uniform Plumbing Code 2021 National Electrical Code 2020 ASHRAE 62.1-2019 – Ventilation & Acceptable Indoor Air Quality. National Fire Alarm Code (NFPA 72), 2019 ADA Standards for Accessible Design 2010 ANSI A117.1 2017: Accessible and Usable Buildings and Facilities Illuminating Engineering Society (IES) Lighting Standards, latest published version

## **SECTION 2. SURVEY RESULTS**

#### **Ipalook Elementary School**

Note that 2017 reports are included in regular text and updates from 2024 site visits are found in bold italic after each section.

#### Mechanical Systems

#### Overview

The school was visited on April 20<sup>th</sup>, 2024, to review the current conditions of the building with the conditions of the building identified in the report from 2017. The mechanical systems have not seen any new work since the previous inspection, and many components and systems require attention and repair. The building was constructed in 1993. Overall, the mechanical and plumbing equipment was in fair to poor condition.

#### Plumbing

Domestic water and sanitary sewer service is provided to the building by the city utility.

The condition of the sanitary sewer is good. The condition of the domestic water piping is fair. The plumbing fixtures vary in condition from fair to poor and need to be replaced. The piping under the lavatories is not insulated and does not have anti-scald valves. In the multiple stall restrooms, most of the toilets and urinals in the high use areas have automatic flush valves. The lavatories in the multiple stall restrooms have manual metering faucets. It is recommended that any remaining higher use toilets and urinals be converted to automatic flush valves. The lavatories are in especially poor condition and should be replaced.

Domestic hot water is provided by two gas fired 250-gallon hot water heaters. One of the heaters is recently installed. The other is original and due for replacement.

The lift station controls do not rotate pumps and need to be repaired or replaced.

The natural gas piping is original from the construction of the building and is in good condition.

#### 2024 Update

The plumbing fixtures are in fair to poor condition and need to be replaced.

Drinking fountains are old style and should be replaced with bottler fill type.

The new hot water heater installed around 2017 is out of service and needs to be repaired. Currently, the school is currently running on the older gas fired water heater. A replacement water heater is on hand and is scheduled to replace the older water heater. The newer hot water heater will still need to be repaired.

There are two lift stations, one has been rebuilt and is in good condition. The other is in fair condition and needs to be rebuilt including control panel, pumps, and piping from lift station to forced main.

The natural gas piping appeared to be in good conditions, recommend a detail gas piping inspection be performed during the summer. The kitchen gas automatic shutoff valve could not be located and needs to verified and tested.



Photo M1 – Restroom Lavatories

Photo M2 – Old Style Drinking Fountain



Photo M3 – Water Heaters

Photo M4 – Classroom Sink

#### **Heating**

The heating system consists of two natural gas fired cast iron sectional boilers. The boilers are rated at 4,640,000 BTU/hr gross output each. The boilers were installed in 1993 as part of the original construction. The boilers are piped in a primary system only with three secondary system pumps piped in parallel. The building heating pumps are constant volume. The piping as configured does not ensure even flow to each boiler and it does not provide minimum return water protection or minimum flow to the boilers. The piping configuration can lead to condensation of flue gases due low temperature, overheating of glycol solution and uneven system heating as each boiler receives part of the flow regardless of boiler operation. The piping system should be replaced with a primary/secondary pumping system with variable flow secondary pumps. The primary/secondary pumping system would ensure adequate flow to each boiler, allow control system to flow water only through operating boiler and would provide energy savings with the variable speed secondary pumps. The variable speed secondary pumps would operate to match actual system demand, saving energy and improving overall system performance. Glycol was a clean and had 60% propylene mixture. The piping in the boiler room consists of steel and copper piping.

The rooms throughout the building are heated by finned tube which, is generally in fair condition.

#### 2024 Update

The heating boilers were rebuilt in 2020 and are in good condition. The rebuild including new section gaskets and new burners.

The utilidor space needs additional heat to keep the underfloor piping from freezing during very cold days. Additionally, the utilidor heat mains have signs of leaks where flanges are used to transition to copper piping or branch piping. The utilidor piping is difficult to repair due to lack of isolation valves on the heating mains; recommend additional isolation valves be added to help facilitate the replacement of the leaking flange gaskets.



<u>Photo M5– Boilers</u>

Photo M6 – New and old hot water generator



Photo M7- Utilidor Leaking Gaskets

Photo M8 - Utilidor

#### **Ventilation**

Ventilation for the building is provided by multiple air handlers located in several mechanical rooms in the mezzanine area. The air handlers are in fair condition. The air handlers have hydronic heating coils and mixing dampers for economizer cooling and ventilation. The air handlers need to be evaluated to determine if they are providing current ASHRAE ventilation requirements. Several of the return air fans have bad bearings and are out of service and some of the heating coil valves have failed. The server room has a dedicated cooling unit, but it does not function and needs to be replaced. There are large smoke dampers in the ceiling of the multi-purpose room which were not closed completely. The dampers and their actuators need to be inspected and tested to verify proper operation and repaired as needed. There is a combustion air fan in the boiler room which provides cooling and required combustion air for the equipment. The fan does not have filters on the intake and blows dust over all the equipment in the boiler room. The intake of the fan needs to be modified to install filters.

#### 2024 Update

The server room had a spilt system cooling system recently installed and is in good condition. The condensate for the unit is currently draining into a bucket; a condensate pump needs to be installed and piped to any appropriate drain. Additionally, the old AC unit is still in the ceiling and needs to be remove.

The large smoke dampers in the ceiling of the multi-purpose room which were repaired and tested to verify proper operation.



<u>Photo M9– Boiler room combustion air handler</u> <u>intakes – not filtered or screened</u>



Photo 11 – Server Room AC Unit



<u>Photo M10 – Air handler return fan with bad</u> <u>bearing that cannot be accessed for repair</u>



Photo 12 – Server Room Condensate

#### **HVAC Controls**

The control system utilized throughout the building is primarily the originally installed pneumatic system with a mix of antiquated Johnson Controls electronic controllers in some mechanical rooms. The Johnson Controls are obsolete and not supported anymore. Some of the heating valves have failed and need to be replaced. The pneumatic control system and Johnson Controls system needs to be replaced with a modern BACnet based DDC system for proper temperature control, ventilation, and energy management. The pneumatic control valves and actuators need to be replaced with devices that will integrate into the new DDC system.

The emergency generator module dampers and control do not work properly and need to be replaced and integrated into the DDC system when it is installed.

#### 2024 Update

The HVAC control system is mostly non-functional causing many of the heating control valves to fail open. This leads to the overheating of many spaces which must be controlled manually by shut off heating isolation valves and pumps or by opening windows. Consequently, more energy is being used by the heating system than is necessary.

Due to the age and condition of the pneumatic control system the air compressor runs almost continuously and will fail at some point.



Photo M13- Out Dated DDC System





Photo 13– Out Dated Pneumatic Controls

<u>Photo M12– Outdated Pneumatic Damper</u> <u>Actuators</u>

#### <u>Kitchen</u>

The school has a commercial grade kitchen with associated stove, exhaust hood and fire suppression system. The kitchen equipment is in good condition. The condensers for the kitchen freezers are located in the boiler room. The compressors utilize R404A an ozone depleting refrigerant and should be replaced

with a non-ozone depleting refrigerant systems. The kitchen hood exhaust fan is located high in the ceiling space above the kitchen and inaccessible for maintenance. The fan should be re-located so that proper cleaning of the fan and associated ductwork can be performed.

#### 2024 Update

#### There are no changes to the kitchen report.

#### Fire Protection

The fire protection system is a wet sprinkler system and is supplied from the city water utility. The sprinkler system is pressurized from a diesel operated fire pump and a dedicated fuel tank. The system is in fair condition.

#### 2024 Update



#### There are no changes to the fire protection report.

Photo M5 – Diesel powered fire pump.

#### **Electrical Systems**

#### <u>Overview</u>

The school was visited on April 20<sup>th</sup>, 2024, to review the current conditions of the building with the conditions of the building identified in the report from 2017. The current fire alarm system has been updated to a new addressable system with the ability to upgrade to a voice evacuation system in the future. All other systems have not had any, or minor, updates since the 2017 inspection. Most of the changes needed are either general maintenance, minor updates to comply with current codes, or possible energy saving enhancements such as LED lighting upgrades.

#### Power

The existing service is fed from a platform-mounted transformer (Photo E1) under the building into the service entrance gear. The service entrance equipment and distribution equipment are older style equipment, but spare parts are still available from the manufacturers.

The existing service entrance equipment consists of a 1600A piece of switchgear with an Automatic Transfer Switch (ATS) which feeds from the standby system (Photo E2). The switchgear is no longer manufactured, and replacement parts are difficult to obtain. As the existing equipment appears to be functioning no replacement is required but as mechanical equipment is replaced or upgraded, we recommend providing individual motor starters for each equipment.

The school standby system is a 515KW, 480V, 3-phase, 4-wire natural gas generator. The generator and associated equipment are kept in a walk-in artic enclosure across adjacent to the building. The generator mounted breaker only has 30" of working clearance which does not meet NEC requirements. This standby system connected to an ATS in the service entrance equipment (Photo E2). The enclosure has its own standalone clean agent fire suppression system. The standby system is similar to the system installed at Hopson Middle School.

Mechanical equipment is fed with individual combination motor starters/disconnects which are in good working order. Replacement would only be required if mechanical equipment is to be replaced with different sized equipment.

Headbolt heater connections are in good condition, but connections are made on the front of the bull rail and are subject to damage from vehicles.

#### 2024 Update

The 277/480V branch circuit panels are Square D type NEHB panels (see Photo-E2a which are no longer manufactured or supported. Replacement breakers are no longer available and if new are required a panel upgrade would be required. The existing may remain until such time as that happens.





Photo E1–Service Transformer

Photo E2- Service Entrance Equipment



Photo E2a-277/480V panel

#### <u>Lighting</u>

The facility lighting system consists mostly of linear T8 fluorescent fixtures (Photo E3). The gym lighting is high-bay Metal Halide fixtures with LED replacements. Some incandescent bare bulb porcelain bases are in the crawl space but have burned out and need to be replaced. Fluorescent or LED replacement bulbs are recommended to reduce time between replacement and lower energy use. Some occupancy sensor switches have been installed in storage closets. Some of these storage closets have electrical equipment in them and occupancy sensors will need to be replaced as automatic controls do not comply with NEC.

The exterior lighting consists of newer LED pole-mounted area lights for the parking lot with HPS lights for building mounted lights. The existing poles have extensive corrosion along the pole bases which has corroded the base plate and destroyed some of the base covers.

The exit signs are tritium type fixtures which have expired and need to be replaced (Photo E4). Our recommendation is for new LED type with battery back-up. Additional wiring would be required and where there is no accessible ceilings surface raceway would be used to run circuits.

The existing emergency lighting system is provided with emergency lighting units. The emergency lighting units are adjustable, dual head fixtures with battery back-up, and halogen lamps. The emergency lighting units that were tested were operational.

#### 2024 Update

Area LED lights are rusting out and the underground branch circuits are starting to fail, see photo E4a.



Photo E3–Typical Classroom Lighting



Photo E4- Nuke Type Exit Sign



Photo E4a–Area Lighting

#### Telecommunication System

The building has a dedicated room for the telecommunication system. The system consists of a fiber optic rack which provides connectivity between racks in the building and other NSB sites in Utqiagvik (Photo E5). The room also has a telecom rack which is used for Voice Over Internet Protocol (VOIP) phone system and data (Photo E5). This system consists of CAT 5e cabling to data outlets for the Wireless system, administrative offices, and classrooms. Based on conversations with IT personnel additional data drops would help in the classrooms considering the data needs of the students. They also explained that the VOIP system in place is not functional at this time. Although the current infrastructure appears to be close to capacity the existing racks have adequate capacity for expansion to allow for additional equipment. Some additional organization and labelling of the existing cabling would help with installation of any new systems.

Wireless Access Points (WAP) in classrooms have cabling taped to the ceiling (Photo E6). We recommend a surface raceway system as a more permanent wiring method and to help protect wiring.

The main Telephone Terminal Board is also in this dedicated room for the main telephone in the system. It also has some existing CAT 3 telephone systems which connect into the existing paging systems (Photo E10).

#### 2024 Update

There are no changes to the report.



Photo E5– Telecomm Racks

Photo E6- WAP Cabling

#### Fire Alarm System

The existing fire alarm system is a conventional class B system, Johnson Controls Fire Alarm Control Panel (Photo E7). The facilities occupant notification is deficient throughout the facility including classrooms. This system is past end of life and is no longer supported by the manufacturer. Any modifications of the system would require an entire building upgrade. At that time, we recommend upgrading to an addressable system which would improve system reliability and reduce maintenance requirements. With the building fully sprinklered, most of the smoke detectors may be removed when the system is upgraded to an addressable system. Existing wiring and pathways may be reused where available for the new system.

#### 2024 Update

AFC has upgraded the Johnson Controls FACP to a new Notifier control panel (Photo E7a) which is compatible with the existing smoke detectors while the annunciating system have all been replaced and upgraded. Additional devices and wiring will be required to update to a voice evacuation system, but the new FACP can support this upgrade.





Photo E7- Fire Alarm Control Panel

Photo E7a- Fire Alarm Control Panel

#### Intercom, Master Clock and Bell System

The intercom system head-end equipment is located behind the main desk. The equipment still functions as a PA system connected to the CAT 3 telephone systems and speaker systems for use as for paging and announcements. The music play system does not function anymore but as that system is no longer used, they may use this equipment as long as it still functions.

The clock system was recently upgraded to a wireless clock system by Primex. There are battery-operated 12" round clocks throughout the facility (Photo E8). The clock system is tied into the intercom system for use with the bell system.

#### 2024 Update

#### There are no changes to the report.



Photo E8– PA Speaker and Time Clock

#### CCTV System

The CCTV system is an analog system using coax cable (Photo E9). As it functions now there is no issues with the existing system. Upgrading to a newer IP system would mean increased resolution cameras and more flexibility for remote connectivity.

### 2024 Update

There are no changes to the report.



Photo E9- CCTV System

End of Ipalook Elementary School Survey results

## SECTION 3. DEFICIENCY CODES & FINDINGS

This section explains the codification system for categorizing facility deficiencies based upon field survey findings.

### A. DEFICIENCY CODES

<u>1 – Health/Life Safety</u>: These deficiencies identify areas where the facility is not constructed or maintained in compliance with provisions of the state mandated life safety aspects of building codes including the codes adopted from the International Code Council (such as the International Building Code) or other standards organizations (such as the National Fire Prevention Association). Deficiencies could include inadequacies in fire barriers, smoke barriers, capacity and means of egress, door ratings, and fire protection equipment not covered in other deficiency codes.

2 - Operating Cost: These deficiencies address the efficiency of lighting, heating systems/fuel types and the thermal enclosures of buildings, processes, and are required for energy conservation and good energy management.

<u>3 – Technical Upgrade</u>: These are items that would upgrade obsolete equipment or systems to the current technology.

<u>4 – Code Upgrade</u>: These are deficiencies related to building code violations where there is no imminent threat to life safety.

<u>5 – Protection of Structure</u>: These are deficiencies that endanger the physical structure of the facility.

<u>6 – Functional Upgrade</u>: These are deficiencies in the plumbing, heating, ventilating, air conditioning, power, lighting, special systems, etc. requiring maintenance due to normal wear and tear that would result in system failure.

<u>7 - Education Program Upgrade</u>: These are items that would improve the ability of the educators to instruct the students.

The deficiencies are further categorized by design disciplines and priority as follows:

| Code | Discipline |  |  |  |  |
|------|------------|--|--|--|--|
| М    | Mechanical |  |  |  |  |
| E    | Electrical |  |  |  |  |

| Priority | Description                                       |
|----------|---|
| 1        | Highest priority – Life safety or imminent danger |
| 2        | Building Code Compliance Issues                   |
| 3        | Energy Efficiency Upgrades                        |

See attached Deficiency Matrix for detailed information.

| B. | MASTER | <b>DEFICIENCY INDEX</b> | K |
|----|--------|-------------------------|---|
|----|--------|-------------------------|---|

| Discipline/    | <b>Deficiency</b> | <u>Priority</u> | Building   | <b>Deficiency</b> |                    |
|----------------|-------------------|-----------------|------------|-------------------|--------------------|
| <u>Record#</u> | <u>Code</u>       |                 |            | <u>Title</u>      | <u>2024 Update</u> |
|                |                   |                 | Ipalook    |                   |                    |
|                |                   |                 | Elementary | Fan bearings      |                    |
| M1             | 6                 | 2               | School     | have failed.      | No change noted.   |
|                |                   |                 |            | Lacking           |                    |
|                |                   |                 | Ipalook    | automatic         |                    |
|                |                   |                 | Elementary | flush valves      |                    |
| M2             | 4                 | 3               | School     | and faucets       | No change noted.   |
|                |                   |                 |            | One of the        |                    |
|                |                   |                 |            | hot water         |                    |
|                |                   |                 |            | heaters is        |                    |
|                |                   |                 |            | past              |                    |
|                |                   |                 |            | expected          |                    |
|                |                   |                 | Ipalook    | life and due      |                    |
|                |                   |                 | Elementary | for               |                    |
| M3             | 6                 | 3               | School     | replacement       | No change noted.   |
|                |                   |                 |            | Old boilers       |                    |
|                |                   |                 |            | and non-          |                    |
|                |                   |                 | Ipalook    | recommend         |                    |
|                |                   |                 | Elementary | ed piping         |                    |
| M4             | 6                 | 3               | School     | layout.           | No change noted.   |
|                |                   |                 |            | Boiler            |                    |
|                |                   |                 |            | combustion        |                    |
|                |                   |                 | Ipalook    | air system        |                    |
|                |                   |                 | Elementary | does not          |                    |
| M5             | 6                 | 3               | School     | have filters      | No change noted.   |
|                |                   |                 |            | Outdated          |                    |
|                |                   |                 |            | pneumatic         |                    |
|                |                   |                 |            | controls,         |                    |
|                |                   |                 |            | many leaks        |                    |
|                |                   |                 |            | causing           |                    |
|                |                   |                 |            | compressor        |                    |
|                |                   |                 | Ipalook    | to run            |                    |
|                |                   |                 | Elementary | continuousl       |                    |
| M6             | 2                 | 3               | School     | У                 | No change noted.   |
|                |                   |                 |            | Freezers          |                    |
|                |                   |                 |            | utilize           |                    |
|                |                   |                 | Ipalook    | Ozone             |                    |
|                |                   |                 | Elementary | depleting         |                    |
| M7             | 3                 | 3               | School     | refrigerant.      | No change noted.   |
|                |                   |                 |            | Kitchen           |                    |
|                |                   |                 | Ipalook    | hood              |                    |
|                |                   |                 | Elementary | exhaust fan       |                    |
| M8             | 3                 | 3               | School     | inaccessible      | No change noted.   |
|                |                   |                 |            | Replace           |                    |
|                |                   |                 |            | plumbing          |                    |
|                |                   |                 |            | fixtures          |                    |
|                |                   |                 | Ipalook    | including         |                    |
|                |                   |                 | Elementary | drinking          |                    |
| М9             | 3                 | 3               | School     | fountains.        | New item.          |

|     | c | - | Ipalook<br>Elementary           | Replace lift   | Nowitam   |
|-----|---|---|---------------------------------|--|---|
| M10 | 6 | 3 | Ipalook<br>Elementary<br>School | Add<br>isolation<br>valves in<br>utilidor to<br>facilitate<br>repairing<br>leaking<br>flanges. | New item.   |
| M12 | 6 | 2 | lpalook<br>Elementary<br>School | Pipe AC unit<br>condensate<br>to<br>appropriate<br>drain<br>location                           | New item.   |
| E1  | 4 | 2 | Ipalook<br>Elementary<br>School | Fire alarm<br>system is<br>conventiona<br>l  | FACP upgraded to<br>addressable and minimum<br>upgrades for a voice evac<br>system. |
| E2  | 1 | 1 | lpalook<br>Elementary<br>School | EM lighting<br>is<br>insufficient  | No change noted.  |
| E3  | 6 | 2 | lpalook<br>Elementary<br>School | CAT 5 and<br>5e Cabling  | No change noted.  |
| E4  | 6 | 3 | Ipalook<br>Elementary<br>School | Lighting<br>Controls   | No change noted.  |
| E5  | 6 | 3 | Ipalook<br>Elementary<br>School | Intercom<br>Headend  | No change noted.  |
| E6  | 2 | 3 | Ipalook<br>Elementary<br>School | Fixtures<br>source<br>update.  | No change noted.  |
| E7  | 3 | 2 | Ipalook<br>Elementary<br>School | Panels are<br>passed<br>useful life.   | New item.   |
| E8  | 6 | 3 | Ipalook<br>Elementary<br>School | Exterior<br>light<br>fixtures and<br>circuits  | New item.   |