TRIP REPORT
VILLAGE SAFE WATER

REPORT DATE: December 20, 2004 **REPORTER (S):** Debra Addie, P.E., VSW
Kent Knapp, RMW Lead
TRIP DATE: October 14, 2004 Greg Magee, P.E., VSW

LOCATION: Emmonak, Alaska **PROJECT NO:** N/A

PURPOSE: Inspect New Washeteria

CONTACTS: Martin B Moore, Sr, City Manager
David Tucker, City Employee
George Hootch, City Employee

Accompanied by: Billy Westlock, RMW, YKHC
Allan Paukan, RMW, YKHC
Brian Shumaker, P.E., Duane Miller & Associates

On September 30, 2004, Village Safe Water (VSW) was requested by the Denali Commission to inspect and document the current conditions at the new Emmonak washeteria. Duane Miller & Associates (DMA) assisted VSW with inspecting and documenting the building's foundation system. Also, two Remote Maintenance Workers (Allan Paukan and Billy Westlock) from Yukon-Kuskokwim Health Corporation (YKHC) inspected the building with VSW representatives (Debra Addie, Kent Knapp, and Greg Magee) and a DMA representative (Brian Shumaker). Inspection visit took place on October 14, 2004.

FINDINGS and RECOMMENDATIONS:

General
No detailed foundation, mechanical, electrical, water and sewer service connection drawings were available during the inspection and it appears the washeteria was constructed without them.

Fuel Tank
The fuel tank is hard-piped into the building. Due to seasonal ground movement, the fuel line is under stress and could rupture, spilling fuel on the ground and in the crawl space under the building. It is recommended that the City install flexible connections ASAP.

Building Site
The gravel pad has altered the drainage in the area. It is important to ensure the culvert under the road remain open. The driveways cross the city water and sewer mains. Adequate cover should be maintained, and the city should be aware of possible pipeline settlement and related damage in the future.

Pile Foundation
The washeteria's pile foundation was inspected by Brian Shumaker of DMA. His report is attached. In summary, the findings and recommended corrective actions are:

Findings:

- The pile foundation appears to have adequate capacity to support downward building loads. However, relative vertical movement, although 1/2 –inch or less, has occurred due to upward movement of piles from frost heave forces except for the southeast corner of the building. The southeast corner of the building is approximately 2-inches higher than the rest of the buildings areas.

  In this area, movement is more significant due to additional uplift loads being transmitted to the washeteria from the water and sewer pipes and the enclosure walls of the vacuum sewage sump. Timber cribbing for supporting the pipes and the walls resting on the ground surface are both subject to the ground movement from frost action.

Recommendations:

- Timber cribbing for the pipes should be located further from the utility enclosure and piping connections should be flexible.
- Ground should be dug-out below the vacuum sewage sump to provide clearance for vertical movement of the ground from seasonal frost action.
- Gravel fill surrounding the building should be removed. Rocks and boulders in contact with the foundation piles should be removed.

Water and Service Connection
There were four CMP preinsulated pipes, two water pipes and two sewer pipes, connected to the washeteria and the utilidor service box. There are four 90 degree turns on one of the sewer pipes from the vacuum sewage sump to the utilidor box, making it susceptible to blockage. Typically, only two pipes are needed for hook up, one water service line and one sewer service line. The water service line would have the supply and return lines in the carrier pipe and the sewer service line would be connected the two vacuum valves at the sump, not a single line to each valve.

Mechanical Systems
A washeteria in the Arctic needs a well designed hydronics system, consisting of boilers, piping, pumps, valves, and control systems, provide heat for building heat, as well as dryer heat, make-up air pre-heat, hot water makers, and utilidor heat. During the inspection the dryer heat, hot water makers, and dry-preheat were inoperable due to an airlock.

The air vents were not adequate and were not located correctly to relieve the problem without a considerable amount of work. In addition, a number of UBC code violations in the piping, fuel systems, and boilers were observed. Also, the building and the utilidor heat loops were not working properly.

A more thorough inspection and assessment by a mechanical engineer is recommended to document all the mechanical deficiencies. However, it appears that moderate amount of modifications may be required before opening the facility.

Electrical

Several electrical items appear to be incomplete. Possible NEC code violations were observed. A more thorough inspection and assessment by an electrical engineer is recommended to document all the electrical deficiencies. However, it appears that moderate amount of modifications may be required before opening the facility.

See attached report from Allan Paukan, Lead RMW from YKHC, regarding a list of mechanical and electrical deficiencies that he noted during the inspection.

Interior Finish

The cracks in the southeast corner of the building appeared to be caused by the additional vertical loads associated with the water and sewer pipes and the walls enclosing the sewage holding tank being uplifted by the ground from frost heave action. However, it appears that the cracks in the rest of the building are probably due to construction workmanship and possibly wood shrinkage and not likely caused by pile movement.

cc: Cindy Roberts, Denali Commission
Brian Shumaker, P.E., DMA
Allan Paukan, YKHC
Billy Westlock, YKHC

Duane Miller & Associates *Arctic & Geotechnical Engineering*
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December 17, 2004

State of Alaska
Department of Environmental Conservation
Division of Water/Village Safe Water
555 Cordova Street, 4th Floor
Anchorage, AK 99501-2617

Attention: Greg Magee, P.E., Program Director

Subject: Post-Construction Performance Evaluation
New Washeteria Building
Emmonak, Alaska
DM&A Job No. 4135.006

This letter summarizes the results of our performance evaluation of the foundation system at the new washeteria building in Emmonak, Alaska. The work was performed in accordance with our agreement dated October 8, 2004. This evaluation was conducted in support of efforts by Village Safe Water (VSW) to develop a scope of work to restore functionality to the facility. Mr. Greg Magee, P.E., Program Manager for VSW, made the initial arrangements for the trip and supplied construction drawings and other documentation. We understand the planned work may also include repair or replacement of portions of the interior finishes and mechanical systems. However, only corrective measures pertaining to the building's foundation system are discussed in this letter.

On October 14, 2004, Brian Shumaker, P.E., project engineer with DM&A traveled to Emmonak to observe and document the condition of the new washeteria (Figure 1). Ms. Debra Addie, P.E., and Mr. Kent Knapp, both with VSW, and Mr. Magee accompanied Mr. Shumaker during the visit.

Figure 1. View to the southwest of new washeteria building from Emmonak Road

The facility is located on the west side of Emmonak Road approximately 100 feet north of its intersection with Delta Street and Third Street. The building

consists of a wood frame structure 32 feet wide by 84 feet long supported on pipe piles that were driven to depths of 35 feet or more. The finished floor height is approximately 3 feet above the grade beneath the building. Under the building, the surface cover consists of a 3-inch thick leveling course of granular fill over an engineering fabric. This leveling course was reportedly placed by STG, Inc. to facilitate pile driving operations between December 2002 and January 2003.

Access from Emmonak Road and customer parking is provided by a granular fill pad north of the washeteria. The fill limits extend to the building eaves along the north side of the building and approximately half way along the east and west sides. The toe of the fill embankment in these areas extends underneath the building and around the pile supports as shown in Figure 2. In some areas, large cobbles and small boulders are in contact with the diagonal bracing. The total thickness of the fill ranges from 1.5 to 3 feet along the building eaves.

Figure 2. Parking area fill placed against the north pile supports and cross bracing (center) and east pile supports and cross bracing (right).

During our visit, one hand-dug test pit was advanced on the south side of the washeteria. The test pit encountered 3 inches of granular fill over an engineering fabric underlain by moist gray silt with organic stringers and occasional fibrous organics. We expect the organics are associated with the root system of a nearby stand of willow. The test pit was advanced to a depth of 1.8 feet. We probed the bottom of the test pit and found unfrozen conditions to at least 6.8 feet. No water seepage occurred within the exposed soils during the excavation. A soil sample was obtained by collecting loose cuttings. The sample was sealed to prevent loss of moisture and was delivered to our Anchorage laboratory for further evaluation.

We measured relative levels of the bottom of the glulam beams around the perimeter of the building using an auto-leveling laser and detector. Relative

interior finish floor heights were also measured for comparison. Both surveys indicate the southeast corner of the building is approximately 2 inches higher than the rest of the building areas. The survey results are shown on Plate 1.

Above grade cross-bracing was added during construction to some perimeter and interior pile supports to increase the lateral stiffness of the foundation against wind and seismic loads and to control vibratory loads from the laundry equipment. Perimeter cross-bracing consisted of 3-inch angle steel. Interior bracing consisted of 4-inch pipe. Large cobbles and small boulders were observed around many of the perimeter piles as shown in Figure 3. In addition to the cobbles and boulders, several piles were partially buried by the edge of the parking area fill pad. Based on the observed surface wear at the interior piles, the near surface soils experience approximately 6 inches of seasonal frost heave annually.

Figure 3. Perimeter cross bracing and loose debris around the pile supports at the southwest building corner.

Figure 4. Typical appearance of damaged cross bracing (southwest corner).

The bottom edges of the cross bracing appeared damaged at several locations along the perimeter. At the time of our visit, loose rocks were observed beneath the cross bracing at each of these locations. We expect the rocks engaged the bracing in these areas in the past as the surficial soils heaved due to seasonal frost action. Figure 4 shows an example of the cross bracing damage typically observed. The locations where damaged bracing was observed are at areas where up to 1-inch of uplift was measured.

Water and sewer service is provided by above ground insulated pipes which enter the washeteria through a plywood utility enclosure under the southeast corner of the building. We observed evidence of approximately 2 to 3 inches of previous displacement where the pipes pass into the enclosure (Figure 5). The enclosure is accessed from the interior of the building and contains the water supply and wastewater manifolds. We assume the enclosure is insulated. We do not know if the pipes have a flexible connection where they enter the building. Most of the walls of the enclosure were in contact with the ground beneath the building at the time of our visit. This type of enclosure is typically suspended from the floor beams or joists and designed to provide enough clearance between the bottom of the enclosure and the ground surface to avoid interference caused by seasonal ground motion associated with frost heave.

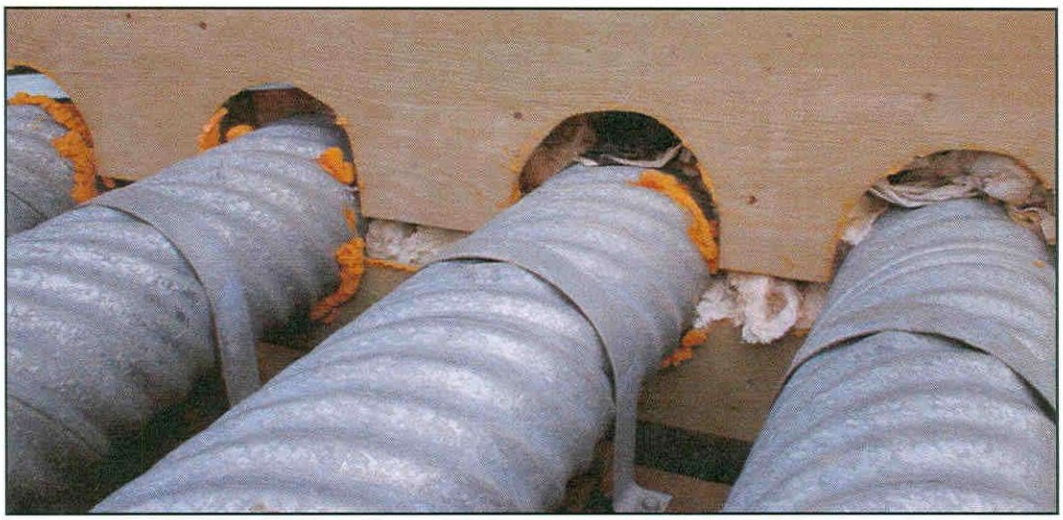


Figure 5. Separated plywood at arctic pipe penetrations into utility enclosure (SE corner).

We also noted the water and sewer pipes were supported by treated timber cribbing immediately adjacent to the building. The timber cribbing rests on the ground surface and is subject to seasonal ground motion. If the pipes do not have a flexible connection where they enter the building, any uplift of the timber cribbing could result in uplift of the building.

Conclusions and Recommendations

Our previous experience in Emmonak has shown driven pile foundations offer positive support in unfrozen ground for above-grade structures similar to the washeteria. The site specific data and observations recorded during our visit and the reported driven depths suggest the existing piles have adequate capacity to support the downward building loads.

The survey results show differential vertical movement has occurred. We expect the relative displacements are attributable to upward movement of piles subjected to localized frost heave forces. The alternate scenario of downward movement associated with pile settlement in the areas of the building where lower floor elevations were measured is unlikely.

Both the water and sewer pipes entering the building and the utility enclosure itself have been subjected to vertical uplift loads associated with seasonal frost action and these loads have been transmitted to the washeteria floor in the southeast corner of the building. In addition, where the pile supports and cross bracing are either partially buried by granular fill or surrounded by loose cobbles and boulders, seasonal ground motion has resulted in damage to some of the cross bracing and uplift loads on the piles. If the fill and loose rocks are left in place, these piles may experience additional displacements in the future. We recommend relieving the potential for vertical loading in the future at each of these areas of concern. Specific recommendations include:

- Lower the existing grade below the utility enclosure by manually excavating material so that at least 6 inches of clearance is provided below the enclosure at all points. Care should be taken to maintain positive drainage so that surface water runoff does not collect underneath the enclosure or around nearby piles.

- Provide an allowance for seasonal movement of the water and sewer pipes. This may be accomplished either by locating the supporting timber cribbing further from the enclosure or designing flexibility into the pipe penetrations and connections inside the enclosure.

- Manually remove the loose cobbles and boulders from around all piles and cross bracing along the south side of the building so that future ground motion will not cause interference with the above grade support structure. Provide at least 6 inches of clearance under the cross bracing.

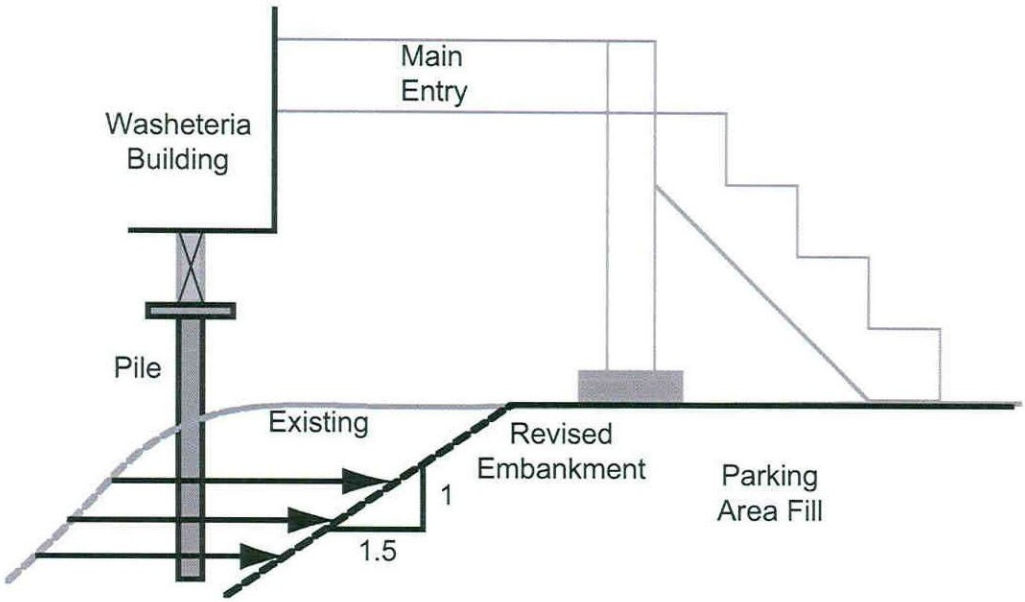


Figure 6. Revised cross section for parking area fill pad embankment.

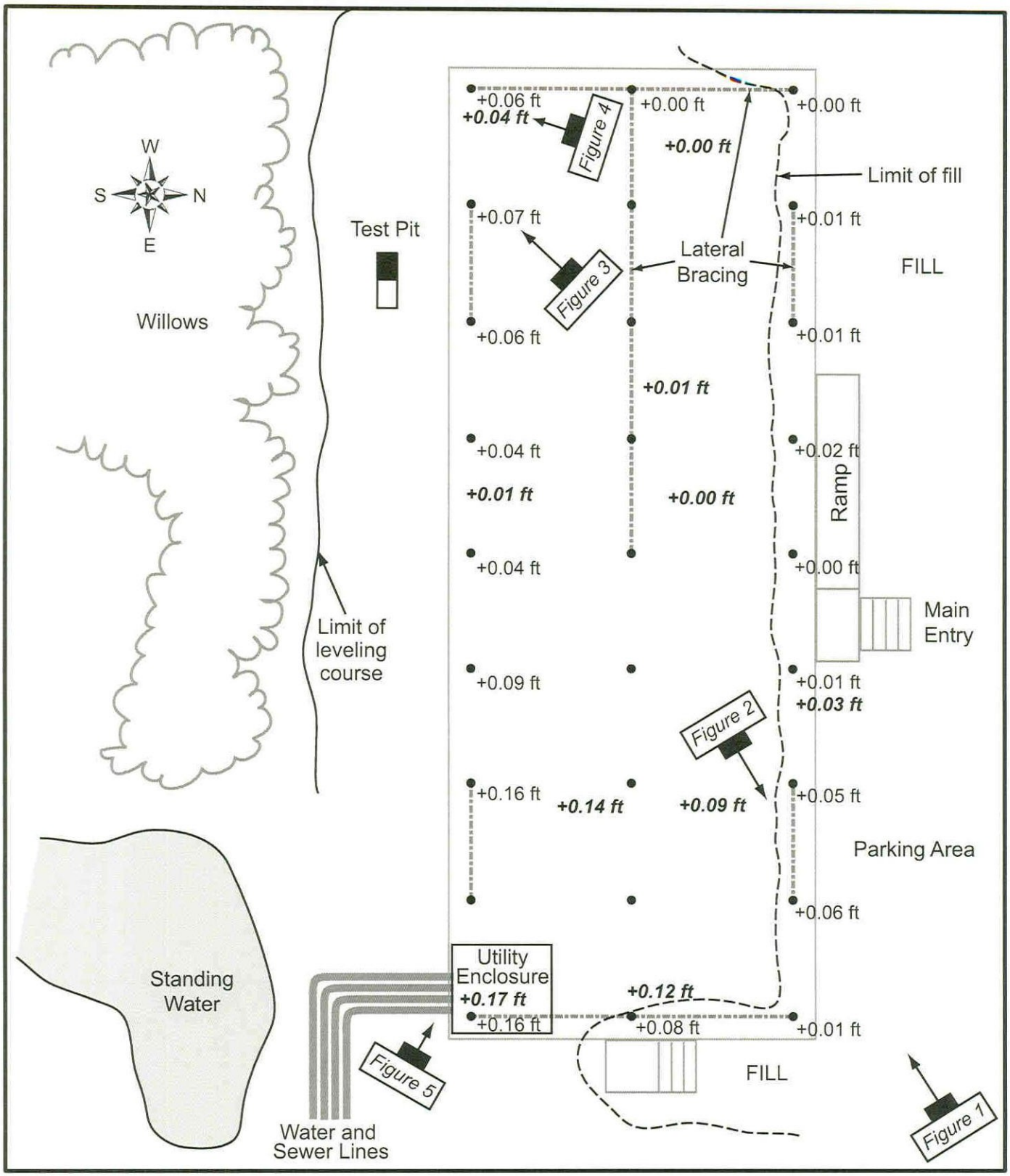
- Remove the parking area fill and loose rocks from around the pile supports and cross bracing along the north, east, and west sides of the building. Reestablish the fill pad such that the toe of the embankment does not extend to the piles under the building. The embankment shoulders should be sloped at 1.5 horizontal to 1 vertical (1.5:1) or flatter.

Very truly yours,

Brian R. Shumaker, P.E.

BRS/DLM

Attachment: Plate 1 Site Layout and Photo Key



NOTE: Interior and exterior survey elevations are relative to the northwest building corner.

0 6 9 12
SCALE IN FEET

LEGEND

Figure 1	Photograph Location and Direction
•	Pile Support
+0.01 ft	Interior Survey Relative Elevation
+0.04 ft	Exterior Survey Relative Elevation

Duane Miller & Associates
Job No.: 4135.006
Date: November 2004

SITE LAYOUT and PHOTO KEY

New Washeteria Building
Emmonak, Alaska

Plate
1

TO: Karl Powers, OEHE Director

FROM: Allan Paukan, Lead Remote Maintenance Worker (LRMW)
Billy Westlock, Remote Maintenance Worker (RMW)

DATE: October 21, 2004

SUBJECT: Trip Report, Emmonak, October 14, 2004

Depart:	Arrive:	Depart:	Arrive:	Cost:	Per Diem:	Carrier:
Bethel 10/14 @ 1030	Emmonak 10/14 @ 1330	Emmonak 10/14 @ 1730	St. Mary's 10/14 @ 1830	$ 496.00	$ 45.00/ Day	Grant & Hageland Aviation

OBJECTIVES:
To conduct an inspection of the new washeteria with Lower Yukon RMW and VSW Representatives.

CONTACTS:
Kent Knapp, RMW Program Manager
Greg Magee, VSW Program Manager
Debra Addie, VSW Engineer
David Tucker, Emmonak Washeteria Maintenance
George Hootch, Emmonak Washeteria Maintenance

ACTIVITIES:
We were invited by VSW to assist with inspection of the new washeteria. After corresponding with Kent Knapp I made arrangements to travel from Bethel to Emmonak. These are our findings:

Mainline Water and Vacuum Collection System Hook-up

- The hook-ups for both the water and the vacuum lines could have been done in one carrier pipe for water and one carrier pipe for vacuum sewer instead of using four carriers to connect to the building.
- The water connection should have had a by-pass line for the water meter in case the Washeteria maintenance person needs to repair the line.
- The circulation pump for the water main needs a proper electrical connection with a disconnect switch. It currently has a power cord connection.

Shower Electrical

- Southeast shower stalls (5 each) need access holes for transformers and relays in case of maintenance.

P.O. Box 528 — Bethel, Alaska 99559 — 907-543-6000 — 1-800-478-3321

- The waste line vent is undersized for the amount of showers attached to the vent system, currently five are on the two inch PVC vent line.

Electrical

- In the mechanical room for the main electrical panel the correct clamps are needed for the conduits, currently plumbers tape (strap) is used.
- The Ground Fault Circuit Interuptor (GFCI) outlets that are installed do not have the correct circuit breaker(s).
- A question; Should the 3 phase- 488 volts have a power conditioner before appliance to prevent the circuit boards from burning out when the main power lines have a fault in them?

Boiler/ Mechanical Room

- A possible cross connection is made with the make-up water line. The backflow prevention device is not an approved RPZ device.
- The boiler make-up line should have a glycol tank and the boiler pressure relief valve lines should be plumbed to the glycol add tank. The hydronic system will leak all over the floor and will continue to do so with the deficiencies in the hydronic system.
- The expansion tank is placed in the wrong location; it should be placed on the supply line to the hydronic system after the boiler. The expansion tank may be undersized.
- For the three zones in the hydronic system they do not have flow control valves. All the systems have the circulation pump on the return line side.
- The main hydronic line does not have an air scoop with an air relief valve on it. This would be the correct place to install the makeup water line and expansion tank.
- All zones do not have air relief valves. The hydronic system is currently airlocked and probably will stay that way until the hydronic system is correctly installed.
- The dryer hydronic lines do not have zone valves. All the dryers will heat up when only one dryer is in use.
- A primary / secondary system would be ideal for the hydronic system.
- The fuel lines do not have fire safe fusible link valves.
- The boiler make-up air vent will condensate and plug up due to the size of the vents.
- Another question; Should the building have carbon monoxide testers installed?

Critical Observations:

With no stamped construction plans for the mechanical and electrical available it was difficult to see if the building was made to the UBC and NEC codes and do the shower rooms meet ADA requirements.

Recommendations:
Deficiencies should be taken care of before the building is open for operation. Additional inspection and a detailed assessment will be needed to assess all the deficiencies.

cc: Hugh Short, VP Support Services YKHC
Kerry Lindley, A.D.E.C., Juneau
Kent Knapp, RMW Program Manager
Matt Dixon, Western District Manager, ANTHC
Gregg Magee, Village Safe Water Program Manager
Joe Mike, YKHC Board Member
Aaron Kameroff, YKHC Board Member
Martin Moore, City
Marita Hanson, Bethel RUBA
Billy Westlock, RMW