



May 16, 2011

Report

Public Safety Building

Evaluation

City of Ishpeming
100 East Division St
Ishpeming, MI 49849



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Public Safety Building Evaluation
City of Ishpeming

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1. Executive Summary



Executive Summary

Public Safety Building Evaluation
City of Ishpeming

As requested by the City of Ishpeming, OHM evaluated the existing Public Safety Building to provide recommendations for maintenance and improvement items to allow this historic building to continue to function in its current capacity for the Police and Fire Departments. Our evaluation identified a large number of deficiencies in the existing facility. It is recommended that these deficiencies be carefully analyzed before the City invests any funds in the repair or improvement of the Public Safety Building.

The most critical of these issues is the water penetration into the basement of the facility. The perpetual water penetration and associated dampness may be related to the apparent building movement issues which affect the function of the doors on the first floor. Soil borings were performed to determine the composition of the soil material adjacent to the foundations. Core drillings were also performed to investigate soil conditions below the basement floor slab. The borings and drillings indicated that the building was placed on suitable soil materials. The water table was indicated to be at approximately the same level as the basement slab. The addition of drain tile at the perimeter of the foundation should significantly improve the water penetration at the basement. The existing soil types will not present significant challenges to either building additions or structural modifications within the existing building.

The next most critical issue is the strength of the Fire Hall floor. It is estimated that the current floor system is not adequate to support the weight of the larger trucks. If the Fire Department continues to park the fire vehicles in this location, caution should be exercised and the structure should be regularly inspected for potential damage.

In addition to these critical issues, there are many other issues within the facility that may pose health and safety risks if not addressed. The roof system is failing, allowing water to penetrate the building and cause further deterioration to the structure and finishes. The electrical system is outdated and does not comply with current codes or safety standards. The mechanical system is not energy efficient and does not function to provide consistent comfort in the spaces it serves.

The estimated cost for repairs and improvements to the existing facility is between \$950,000 and \$1.39 Million. These repairs and improvements will extend the life of the existing building to allow its continued use for the Police and Fire Department functions. Some operating efficiency may be gained from the improvements both in energy savings and functionality. However, the facility will not operate as efficiently as a new facility in terms of energy consumption or functionality.

For the sake of comparison, the cost of a new facility was also estimated. A new facility is estimated to require an area of approximately 10,000 – 12,000 s.f. A new facility on City owned property with minimal site development has an estimated cost of \$1.75 Million to \$2.3 Million.



2. Existing Conditions

OHM performed a visual inspection of the existing Public Safety Building, located at 100 South Lake Street in Ishpeming, on February 25th, 2011. Present at the inspection were Jennifer Towles - Architect, Charles Johnson - Professional Engineer, and Brian Destache - Mechanical/Electrical Technician for OHM. Representing the City of Ishpeming were Jered Ottenwess, Jon Kangas, Ed Anderson, and Jim Bjome.

General

The building was constructed in 1912. It originally housed the Fire Department. The Police Department and Department of Public Works have come to occupy portions of the building in later years.

The building is wood framed with a brick facade. The fire hall has three overhead doors for access for their fire equipment. There is a hose drying tower adjacent to the fire hall. This tower was repaired and restored in the 1990's. The building was initially constructed with seven stalls that housed horses. Fire fighting vehicles were not present at the time of the building construction. The horse stalls were eliminated and the building modified to meet the current needs of the fire and police departments.



Roof

The existing single ply membrane EPDM roofing was reported to be more than twenty years old. The EPDM membrane is installed over a previous built-up roofing system. The built-up system does contain asbestos. Test results are available. A roof moisture study was completed for the City of Ishpeming in 2010 by ECI. The existing roof system has deteriorated and is allowing water to penetrate the building.

Our investigation found that that roof leakage caused water stained ceiling tile in several areas of the building. On the second floor, a leak occurred that has stained the ceiling tile in the hallway



below the siren cupola. On the first floor water leaks occur above the Police Chief's office at the location of a former roof penetration. Water staining of the wood ceiling joists was observed at this location. Water staining due to roof drain leakage was also observed on the north side of the tower where the block walls were water stained.

Building Envelope - Masonry

The face brick appears to be in good condition in most areas of the building. It is estimated that approximately 1/3 of the mortar joints need tuckpointing. Several areas were observed with 1/8 inch cracking along mortar joints near the northwest corner of the building. Several of the windows on the south wall of the building were eliminated and the openings filled in with concrete block. There are vines growing on the south and east façades of the building. The condition of the masonry in these areas was not readily visible, however vines typically anchor into the mortar joints, damaging them, and allowing water to penetrate through the brick facade.



Building Envelope - Windows

The existing windows appear to be aluminum or steel. Most of the windows appear to have been installed in the 1970s. The windows appear to be double pane with insulated glass. The windows are not weather tight. Air leakage was detected around several of the windows. There are approximately 37 window openings.

Building Envelope - Doors

Several of the exterior doors do not seal properly. The Police Chief commented that the door near his office was adjusted and made weather tight. Within several months of the repair, a crack was observed by the Chief along the latch side of the door. At the time of the inspection, an 1/8 inch air gap existed below the latch along the edge of the door.

The interior hallway door near the Police Chief's office appears to have moved out of adjustment. The door has gotten hard to close and does not latch properly according to the acting Police Chief.

The door between the vestibule and the secured front entry on the east side of the building contacts the floor when the door is opened. It appears that the quarry tile floor has uplifted and causes the door to rub on the floor. The quarry tile appears to be solid with no cracks in the tile or the mortared tile joints. The severity of this issue varies with season according to building occupants.

The overhead doors in the fire hall are metal sectional doors with one section of glazing in each door. The doors units are in good to fair condition. The doors are operated by a trolley type overhead door operator. The operators function adequately at this time, but are beyond their expected life. The operators do not function in the event of power failure and there is not currently a manual means to open the overhead door (such as a chain operator).

Basement - Drainage

The basement is presently used as a boiler room, a place to store bicycles that have been abandoned within the City, and an exercise area. Much of the basement area is unused due to the damp condition. Water was observed penetrating the floor slab in several areas at columns and along the outside walls of the building. At the base of the stairs to the first floor, groundwater was

seen bubbling up along the edge of a concrete column to the concrete floor slab. A dark colored soil with a texture similar to peat moss was observed on the floor between the column and the floor drain near the northeast corner of the building. There was also a trace of light brown colored soil near the column. It appears that soil has been pumped up from under the floor slab. The fire department commented that this has been an on going problem. The soil is cleaned up before it blocks the floor drains. The floor drain piping has been checked out by the City. Blockage of the piping is not evident. Water was observed on the



floor along the north wall of the building. A sump pump was located in the basement but did not appear to operate when it was turned on.

The concrete columns supporting the first floor have experienced some spalling of the surface. The remainder of the exterior face of the columns appears to be solid. Hairline cracking was observed along the concrete beams along the edge of several columns.

In the rear of the basement under the entry for the public works employees, spalling of the bottom of the concrete floor slab was observed. The owner's representative commented that the ground outside of the entry door is salted in the winter. The workers track the salt into the building. The salt appears to penetrate the concrete and has caused the spalling.

Fire Hall - Floor System

The floor of the apparatus room is terrazzo in most areas. The terrazzo has been installed in approximately 3 foot squares. The terrazzo has uplifted at the joints. In several areas the terrazzo has been removed and the floor has been patched with a concrete patch. The fire department reported that they wash the fire trucks inside the building in the winter months. Water appears to have penetrated the terrazzo floor surface at the joints and has uplifted the terrazzo in several areas.

There are six floor drains without strainers and traps located in scattered locations in the vicinity of the fire trucks in the apparatus room. A single trench drain is also located at the man door to the office area. There is no existing method of oil separation for the water that enters the sanitary sewer through these drains.

Fire Hall – Structure

The floor system of the Fire Hall is supported by beams, columns, and a reinforced concrete slab system that is visible from the basement. The floor system appears to have been constructed per



the original design plans and consists of 12' square concrete columns supporting steel beams, which are encased in concrete, and a 6" steel reinforced concrete slab that spans between the beams. The span of the slab system is approximately 12' between beams.

Structural calculations, based on assumptions regarding reinforcing size, frequency, and placement and concrete strength, indicate that the existing slab is not adequate to support the weight of present day fire equipment. The maximum recommended loading of the slab,

should it meet the assumptions, is 100p.s.f. of working live load. See Appendix A for the structural analysis of the slab.

Water System

A 1-1/2 inch water service provides water to the building and extends to provide water to the apparatus room for filling the fire trucks. In the vicinity of the water meter, the water service is copper piping. The water system enters the building in the northeast corner of the building from Lake Street. Much of the piping that is buried in the walls is believed to be older galvanized iron.

Sewer System

The sanitary sewer piping is 4 inch PVC pipe in the basement. The piping buried in the walls is believed to be original cast iron. The sewer piping appears to be adequate to meet the needs of the limited number of sinks and toilet facilities. The sanitary sewer exits the building in the northeast corner of the building onto Lake Street. The Police Chief stated there have been issues with the sink trap being plugged a couple times a year in the kitchenette, which then breaks the seal for sewer gases to enter the building.

Storm Sewer

The storm sewer piping is primarily 4 inch cast iron piping with some 4" PVC. An 8 inch storm sewer pipe runs along the north wall near the basement floor. All of the roof drain piping connects to the 8 inch storm sewer. The storm sewer exits the building in the northeast corner of the building onto Lake Street. The Police Chief commented that during a heavy rain storm water leaks from around the roof drain near the northeast corner of the building. The roof drain lead can be seen from the stairs accessing the second floor.



Electrical

The electrical system is fed from the Department of Public Works (DPW) building and shares a 120/240V high leg delta, 3-phase, 800A service between both buildings. The Fire Hall and Police Station are fed from a main panel in the DPW building, to three panel boards and one fuse box. The fuse box is concealed under wood paneling in the Fire Hall lounge room, with knob and tube wiring to all circuits. Most of the wiring observed in concealed spaces was knob and tube. It was observed that some knob and tube wiring has been spliced into and extended with Romex, which is in violation of the current National Electrical Code. It is difficult to estimate the number of spliced knob and tube connections.

The Police Chief stated there was a lack of receptacles in the renovated Police Station area. It was observed the entire facility was lacking receptacles as many had multiple power strips plugged into them. The Fire Department has a small 5kW portable generator to open garage doors and one emergency light in the event that power is lost. Users have to manually switch/transfer the power over for these devices to operate in the event of an outage. Telecommunications is also lost for the facility in a power outage.

Mechanical Systems

The Fire Hall is heated by a two-pipe steam system. This steam system also feeds the office areas of the Department of Public Works (DPW) building. All steam piping insulation has previously been removed during an asbestos abatement project and was not replaced with new insulation. All of the radiators in the Fire Hall are not connected at the top, thus will be unusable for a hydronic (water) heating system. There were two field fabricated radiators made from galvanized pipe off of a galvanized header, which should be removed from service for safety purposes. Piping leaks in the steam infrastructure are annually repaired on an as needed basis.

The building occupants of both the Fire Hall and DPW stated comfort is compromised with the steam heating system. The steam boiler is controlled by a single thermostat located on the second floor of the fire hall. This single thermostat does not allow the different portions of the building to be zoned separately. All radiators have manual zone valves and steam traps which are not functioning correctly due to lack of annual maintenance. The existing system does not provide consistent heat to the various spaces it serves.

The police station area has a roof top heating and cooling unit for ventilation and space conditioning which was installed around 2001. The owner's representative stated that this unit meets their needs, with the exception of the vestibule where a small heating unit was installed to heat that space off the steam boiler. There is no existing ventilation system in the Fire Hall.

3. Recommendations



EXISTING FACILITY – MAINTENANCE ITEMS

Roof Replacement

The existing roof system has aged beyond its expected life. There is evidence of water damage on the First and Second Floors indicating that the roof has deteriorated. It is recommended that the roof system, including roof membrane, flashings, and drains, be replaced. The existing roof materials and existing insulation should be removed. The existing built-up roof system does contain asbestos and will require special removal procedures and disposal. The roof deck should be examined and repaired as required. Roof openings should be evaluated and any unnecessary openings should be removed and infilled. All roof drains should be replaced. Adequacy of the drainage systems including the addition of overflow drains should also be considered. A new EPDM or PVC membrane roof system is recommended. The roof area is approximately 6,400 s.f.

Basement – Drainage

Two soil borings were taken along the north side of the building in the area where groundwater enters the building at the basement level using a solid stem auger. One boring was drilled to a depth of 15 feet. A boulder or bedrock was encountered at the northeast corner of the building. A 16 inch seam of peat was found at a depth of 20 inches. A second seam of peat was found at a depth of 4 feet, which was approximately 12 inches thick. The groundwater table was found at a depth of 8.5 feet below the ground surface. The soil and water table condition were found to be similar for the second boring. Peat was found at similar elevations with the water table at a depth of 8 feet. Silty fine sand was found below the peat at the building footing level and extending the remaining depth of the borings.

Two core holes were drilled below the apparatus room in the basement area. The locations can be seen on the attached sketch. The core holes were drilled and the soil was sampled to a depth of 3.5 feet below the basement floor. A dynamic cone penetrometer was used to determine the strength of the granular subgrade soil at each core sample location. The soil was found to be fine sand in a fairly dense condition. Shelby tube samples were taken for field observation of the soils.

A $\frac{3}{4}$ inch void was found near the stairs near the northeast corner of the building. This was the only void that was observed while core sampling. It does not appear that substantial amount of voids will be encountered. Pressure grouting by an experienced contractor is recommended if voids are found while installing drain tile along the perimeter of the interior of the building.

Drain tile may be required in order to control the groundwater along the perimeter of the building. The drain tile would need to be placed above the bottom of the footings to prevent undermining of the footings. It is recommended that drain tile be placed along the north wall of the building. If groundwater continues to be a problem after installing drain tile along the north side of the building, the entire perimeter of the building will need drain tile.

Environmental testing is recommended to determine any environmental and/or air quality hazards that may exist due to the extreme dampness in the basement.

Fire Hall – Floor Replacement System

The existing terrazzo should be removed to the structural concrete slab. A new polymer modified

mortar system should be installed over the existing structural slab. New floor drains should be installed and the new floor topping should slope to drain locations. The new floor surface should be sealed or coated to reduce water and salt penetration to the existing structural slab. The Fire Hall floor contains approximately 3,000 s.f. It is assumed that six floor drains would be needed in the new floor system. These floor drains should all be connected to an oil separator prior to entering the sewer system.

Fire Hall – Structure

The existing floor system is not adequate to support the present day fire equipment. The addition of new larger equipment will only increase the loading on the floor system. If the floor system continues to be used to store large vehicles, it needs to be reinforced to bring the floor within acceptable loading limits.

It is recommended that steel beams and columns be installed in the basement area to reduce the concrete slab spans. New beams and columns should be installed at the midpoints of the existing spans to reduce the effective spans to approximately 6'. It should be noted that the modifications of the span lengths will affect the existing structural system and may result in some cracking of the slab above the existing beams.

Based upon the results of the core drilling, the subgrade below the basement concrete floor appears to be adequate to support footings that would be installed to reduce the concrete slab spans below the apparatus room.

The floor slab should also be repaired where it has deteriorated below the DPW entry on the west side of the building. The slab should be pressure washed on the upper and lower sides of the slab. The slab should be repaired using an epoxy product and coated to prevent further damage.

Water System

The existing galvanized piping throughout the facility should be replaced with copper piping. All domestic water piping should be insulated. The existing galvanized piping is primarily located within the walls. The installation of new copper piping will affect some existing finishes as portions of the existing walls may need to be removed to access the piping. The subsequent repair of the finishes will be required.

HVAC System

The primary existing building heating is done by a steam boiler. The building occupants are not satisfied with its operation as many spaces are too hot and others too cold.

It is our recommendation to upgrade the entire system to a multiple boiler hydronic (water) system. With this upgrade to hydronic heating and a zoned control system, more predictable zoning and comfort will be achieved. With a multiple boiler hydronic system, energy savings will also result. The roof top heating and cooling unit for the police station should be accessed regularly by a qualified technician to make sure that the heat exchanger and cooling coils are performing to the best possible standards since the unit has been in operation for approximately ten years. Currently, there is no ventilation system in the Fire Hall. Current mechanical codes require ventilation. If the facility is experiencing problems with humidity or exhaust fumes within the Fire



Hall space or migrating to adjacent spaces then the addition of a ventilation system is recommended to provide code required air changes per room use type.

Electrical System

Replacement of the entire knob and tube wiring as well as the fuse panels is recommended as many splices were identified in the existing knob and tube wiring system. With this upgrade, additional receptacles should be installed to serve the facility loads. During this time many wall and ceiling finishes will have to be disturbed to bring the building wiring up to current code. An electrical load calculation should be completed to determine the need for additional distribution panels. A generator with automatic transfer switch should be added to serve critical loads for both Police and Fire Departments to insure that critical services to the community's residents are not delayed or interrupted.

Building Envelope - Masonry

Removal of all of the vines growing on the building exterior is recommended. The vine growth will damage the brick and mortar surfaces resulting in further facade deterioration.

Tuckpointing of the exterior masonry is recommended. It is estimated that approximately 1/3 of masonry exterior will need tuckpointing. The entire façade includes approximately 7,570 s.f.

Building Envelope - Windows

Window replacement is recommended. New windows will reduce the air infiltration into the building and will make the building more weather tight. The cost for window replacement will vary based on the type of window selected and the extent of work required at each opening. Additional design decisions, such as the replacement of windows to meet the original opening size rather than an infill with alternate material will affect the cost as well.

Building Envelope - Doors

The existing doors in the police area appear to move out of adjustment. The existing doors should be adjusted as needed once footing drains are installed along the north wall of the building in the basement area. Once the basement has dried out, the doors may be replaced as needed. There is no substantial evidence of movement of the entire building. It is expected that the addition of the drain tile will reduce the fluctuations in humidity and reduce the problems with the doors. Three doors (one exterior and two interior) may need to be replaced.

The existing overhead doors in the fire hall are functional and would not provide a significant increase in efficiency to replace. The door operators are dated and do not function in the event of power outage. It is recommended to install new electric operators that include manual chain operators in the event of electrical or operator failure. Replacement of the overhead doors would result in aesthetic improvements to the building façade.



Building Envelope - Insulation

Insulation may be increased at the roof during a roof replacement. However, the addition of insulation at the entire envelope of the building will not be cost effective in providing a useful payback in energy savings.

EXISTING FACILITY – IMPROVEMENT ITEMS

Expand Fire Hall

The City is considering expanding the existing Fire Hall to accommodate a 50' long pumper truck. It is assumed that the Fire Hall would be expanded into the existing Department of Public Works breakroom area. This would necessitate the development of additional space elsewhere for the Public Works staff. This would require approximately 850 s.f. of added space to the fire hall area. The additional area could be used to provide storage for the fire equipment and could be used to provide a toilet/shower room at fire hall level. The structural system of the existing wall and floor system would require further evaluation and structural modifications would be needed to provide functional space.

Police Garage

Add Garage Space to provide indoor vehicle storage and evidence storage for the Police Department. It was indicated by the Police Department that approximately 5 bays of garage space are required to meet the needs. Allowing for approximately 360 s.f. per bay, an addition of 1,800 s.f. is required. This minimum addition size would require that each bay be accessed from a separate overhead garage door. An addition size of approximately 2,500 s.f. would be required if access was included within the garage system resulting in a need for only two overhead doors. The garage construction addition is assumed to be masonry with a concrete floor slab on grade and a membrane roof system.

Entrance /Emergency Exit for Fire Hall

A separate entry to the fire hall that would also serve as an emergency exit is recommended. This would involve creating an entrance on the south side of the Fire Hall for access in and out of the facility. It is recommended to add a new hollow metal or aluminum door and frame below one of the original window openings. The addition of the entry/exit will also include relocating the fence/gate at this area and may need a roof to protect the entry from snow fall off the adjacent Public Works garage roof.

Toilet/Shower facilities for Fire Hall

Additional space at the rear of the Fire Hall could accommodate the new accessible bathroom/shower areas. Toilet/Shower facilities should be provided for both male and female firefighters. It is recommended that two single fixture toilet rooms be constructed each with access to a single shower unit. Each toilet/shower room would contain approximately 80-100 s.f. It is assumed that the walls would be constructed out of masonry block. The floors would be a resinous floor system and the shower area would be tiled.



NEW FACILITY

For cost comparisons, the City of Ishpeming has requested an opinion of cost for a new facility to house the Police Department and Fire Department. The area of the existing building is approximately 15,500 s.f. including the basement, first and second floors. The required area of the new facility is estimated to be approximately 10,000 – 12,000 s.f. The following spaces are required:

Fire Department

- Fire Hall to accommodate 4 bays for fire equipment, storage, air compressor
- Bunker gear for a minimum of 33 fire fighters
- Toilet/shower rooms (can be shared with Police Department)
- Work areas
- Office
- Hose Tower
- Multipurpose / Training Room w/kitchen facilities (can be shared with Police Department and/or City)

Police Department

- Lobby
- Dispatch/Front Desk/Administration
- Evidence Storage
- Offices (3)
- Interview Room
- Record Storage
- Squad Room
- Locker Room
- Toilet/shower rooms (can be shared with Fire Department)

A new facility will need to have three overhead doors for fire trucks with 14 foot high openings. The building will need to accommodate 50 foot long fire trucks.

Water will need to be provided in a new facility to fill the fire trucks and to wash the trucks and police vehicles. A 1-1/2 inch water service to the apparatus room is required. All of the water to the facility shall be metered.

The cost estimate for a new Public Safety Building assumes that the facility will be located on a clear, level site with existing utilities and no requirements for storm water detention.

The City has recommended that the parking lot for a new facility be capable of providing parking for five spaces for the police department and twenty-five spaces for the fire department.

4. Opinion of Probable Construction Cost



Opinion of Probable Construction Cost

Public Safety Building Evaluation
City of Ishpeming

OPINION OF PROBABLE CONSTRUCTION COST		
	RANGE OF COST	
	Estimated Minimum	Estimated Maximum
EXISTING FACILITY – MAINTENANCE ITEMS		
Roof Replacement	\$61,320	\$80,400
Basement – Drainage		
Drain Tile - North Side	\$30,000	\$37,000
Drain Tile - South/East/West Side	\$80,000	\$93,000
Environmental Testing	\$1,000	\$3,000
Fire Hall – Replacement Floor System	\$48,000	\$75,000
Fire Hall – Structure	\$40,000	\$60,000
Water System	\$12,000	\$18,000
HVAC System	\$180,000	\$220,000
Fire Hall Ventilation	\$20,000	\$40,000
Electrical System	\$100,000	\$200,000
Building Envelope – Masonry	\$16,000	\$25,000
Building Envelope – Window Replacement	\$35,000	\$50,000
Building Envelope – Overhead Garage Doors – Hardware	\$3,000	\$4,000
Building Envelope – Overhead Garage Doors – Doors and Hardware	\$10,000	\$20,000
Door Replacement	\$4,500	\$6,000
Subtotal	\$640,820	\$931,400
EXISTING FACILITY – IMPROVEMENT ITEMS		
Fire Hall – Expansion	\$80,000	\$100,000
Fire Hall – Exit/Entrance	\$10,000	\$30,000
Fire Hall – Toilet/Shower Facilities	\$20,000	\$30,000
Police Garage	\$200,000	\$300,000
Subtotal	\$310,000	\$460,000
Total – EXISTING FACILITY	\$950,820	\$1,391,400
NEW FACILITY		
Public Safety Building to House Fire Department and Police Department	\$1,750,000	\$2,300,000

The costs indicated are intended as magnitude of order costs to be used for planning purposes. Complete investigation, analysis and design should be completed in order to calculate more accurate budget numbers. The total intended project cost will also affect the costs as smaller projects will require additional general condition and mobilization costs (by percentage) than larger projects.

5. Appendix

- a. Building Drawings
- b. Photos
- c. Structural Analysis Notes
- d. Soil Boring Logs
- e. Core Drilling Logs