Homer Secondary School
Condition Overview

ECI/Hyer, Inc.
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Acknowledgements

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Executive Summary

On February 26, 2007 a team of architects and engineers visited the old Homer Secondary School. The purpose of the visit was to assess the general condition of the building and determine what upgrades would be required to convert the building to house City government functions.

The building currently provides classroom and office space to the Kachemak Campus of the University of Alaska and to the Homer Boys and Girls Club. As-built drawings for the building, provided by the City of Homer, were reviewed to determine the type of systems present in the building. These were confirmed, in part, by a field visit to the facility. Conclusions and recommendations included in this report are contingent upon limited investigation.

In general, it was determined that renovations and upgrades needed to make the old School an appropriate location for Civic Offices and an Assembly Hall would be approximately the same as construction of a new building on a site with reasonably good soils. Total project cost for upgrades is estimated at $478 per square foot in 2007 dollars (corresponding to a construction cost of $359 per square foot). Please refer to the cost analysis included at the end of this report.

It should be noted that the existing facility provides an excellent home for the Boys and Girls Club, and the classrooms on the upper level function very well as classrooms. The costs of relocating these functions should be taken into consideration when determining the future of the building.

Introduction

Originally constructed in 1956 as the Homer High School, the two-story structure is located at the corner of Pioneer Avenue and Stirling Highway. Neighboring land is occupied by the middle school, a veterinary clinic, a hotel and other small businesses.

Since approximately 1998 the upper level has been occupied by an extension of the Kachemak Bay Campus of the Kenai Peninsula College. The lower level is occupied by the Homer Clubhouse, a program administered by the Boys and Girls Club of the Kenai Peninsula.

Exterior Enclosure

The exterior wall and window assemblies appear to be original.

Windows are wood-framed with ½" insulating units consisting of 2 layers of 1/8" glass separated by a ¼" airspace. Operable lower and upper windows are provided at classrooms, most of which appear to be functioning.

The typical exterior wall assembly is comprised of the following layers:

- heavy-gage galvanized/painted metal siding (composite siding with battens surrounding major areas of glazing)
- kraft paper
- 5/8" plywood sheathing
- 2x6 wood studs at 16" o.c. (2x8 wood studs at gymnasium)
- 2" batt insulation
- vapor retarder
- ½" finish plywood or marlite sheathing

The typical low-slope roof assembly is comprised of the following layers:

- built-up roof membrane
- 2" rigid insulation
- vapor retarder (assumed to be present but not confirmed)
- tongue-and-groove decking
- structural members (glulams at classroom areas and long-span steel joists at gym)

In general the exterior enclosure is in very good condition considering its age. The roof membrane appears to be due for refurbishment, but we were not made aware of any roof leaks and none were immediately evident. The primary concern with the roof is a lack of overflow drains. Under current code requirements overflow drains are required to prevent overloading the roof structure in case of drain blockage. Considerable amounts of water could potentially build up on the roof if the roof drain system were to fail. This would add significant stress to the roof structure.

The metal siding has been dented in multiple locations, particularly at the south side of the building, but appears to be performing well in terms of weather protection for the building. Paint is beginning to chip and peel off the siding in multiple locations, particularly at the base of walls and where damage has occurred. This situation is most prevalent along the eastern wall base where soil and lawn is up against the material. In general the paint is tired and faded. The composite siding also appears to be in good condition, but is in need of a coat of paint.

Concrete retaining walls are present along several portions of the building. In discussions with City staff, we learned that these walls have been the source of moisture migration into the first level of the building, particularly along the east wall where the water service enters the building and along the north wall of the lower level classroom. The adjacent grade slopes towards both of these locations causing ponding during break-up.

While the exterior enclosure is in surprisingly good condition, it performs very poorly in terms of energy efficiency. Existing insulation in exterior stud walls can be expected to provide an overall R-value of no more than R-5. Insulation at the roof can be expected to provide an overall R-value of no more than R-7, assuming the insulation has retained some of its original thermal properties. The national energy code recommends a minimum value of R-13 at walls and R-15 at roofs for wood framed commercial structures in our region. The existing windows can be expected to allow more than twice the heat loss and three times the solar gain of modern glazed units. Making matters worse, cantilevered roof decking along the entire building perimeter creates a continuous thermal bridge at the eave level. Considerable heat loss is likely at this location.

Interior Finishes

In general, interior finishes are in very good condition. A large number of wall finishes are original including plywood wall cladding and wood doors in all classroom areas. Flooring and a number of common space wall finishes were upgraded when the Kachemak Bay Campus moved into the building approximately eight years ago. Wood windows are showing deterioration in some locations but are in surprisingly good condition considering their age.

Asbestos containing materials were not specifically identified, but should be anticipated throughout the building due to its age. Materials of concern may include flooring and other adhesives, resilient floor tiles that may be present under newer carpet and sheet vinyl, wall joint compounds, mechanical insulation, roofing materials, and other areas to be determined. A complete hazmat survey is recommended before any major renovations are undertaken.

Structural: Existing Conditions

The building consists of three distinct structural areas: The Classroom Wing; the Central Core and the Gymnasium.

<u>Classroom Wing Structural Systems</u>

The one story classroom wing measures approximately 99 feet x 63 feet. The structure is of wood construction with a concrete slab on grade floor and poured concrete foundation walls on continuous concrete footings. Gravity loads, including snow load and building dead load are supported by perimeter and interior post and beams and interior bearing walls. The roof is sheathed with structural tongue and groove planks applied diagonally to the roof beams. Beam spans and column grids vary from 24 feet to 36 feet along the longitudinal axis of the classroom wing. The beam span and column grid coincide with the original classroom partition walls, although subsequent remodeling of a portion of the classroom area has resulted in the construction of additional non-bearing partition walls. Beams are spaced at approximately 8 feet on center.

Two interior bearing walls, with 2x6 studs spaced at 16" form the corridor along the building's central axis. The notes on the structural drawings state that lateral loads are transferred to braced interior partitions, although no bracing details for the partitions were found on the drawings. Section details for the walls indicate that the walls are sheathed with 5/8" gypsum wallboard. Plywood sheathing is not indicated for the interior corridor walls.

Non-bearing end walls are framed with 2x wood studs with plywood sheathing.

A concrete utilidor around the perimeter of the classroom wing provides access to under floor mechanical systems.

<u>Central Core Structural Systems</u>

The central core measures approximately 25 feet x 111 feet. A two story section of the central cores, measuring 63 feet x 25 feet aligns with the classroom wing and gymnasium. A one story section of the central core extends to the north approximately 48 feet. The central core structure consists of poured. Reinforced concrete walls with continuous concrete footings. The ground floor is a concrete slab on grade and is located one story below the main floor of the classroom addition. The second floor structure consists of steel bar joists with a steel deck sheathing and concrete topping slab. The steel joists are supported by the concrete bearing walls and steel beam headers.

<u>Gymnasium Structural Systems</u>

The gymnasium measures approximately 97 feet x 63 feet. The roof structure consists of steel joists spanning across the 63 foot dimension with nominal two inch thick tongue and groove plank sheathing The steel joists are supported by 8x8 wood columns. The walls are formed by 2x8 wood studs spaced at 16" o/c and spanning full height from floor to roof deck. The perimeter columns and wall studs are supported on reinforce concrete foundation walls and continuous concrete footings.

The gymnasium structural floor consists of a concrete slab on grade. The finish floor is hardwood planks set on sleepers over the structural slab.

Structural: General Building Condition

Roof Structure

The underside of the roof structure was observed at one location from the existing science lab in the classroom wing.

Structural: Loading

Notes contained on the original drawings indicate the criteria used to design structural systems and are summarized as follows:

Floor Live Load (Classrooms/Offices):	50 psf
Floor Live Load: (Entrances/stairs)	100 psf
Design Snow Load:	30 psf
Wind Load:	30 psf
Seismic Coefficient:	C=0.133

Snow Loads

Ground snow loads have exceeded 30 psf during the life of the structure and will probably have and will continue to reach the current Homer design snow load of 50 psf. It is likely that the roof structure has not been subjected to loads in excess of the 30 psf design due to the unventilated 'hot roof' design of the thermal envelope. Poorly insulated hot roof systems typically lose enough heat to melt snow and to prevent accumulation of deep snow pack. Increasing the thermal resistance of the roof in order to reduce future energy costs would increase the effective snow load on the structure.

Floor Live Loads

The slab on grade in the gymnasium, classroom wing and ground floor of the central core would be adequate for proposed office use. The second floor of the central core area may be adequate for 50 psf office floor live load, although further investigation would be warranted to determine if the floor is capable of supporting the design live load plus a Code prescribed allowance of 20 psf for interior partitions.

Wind Loads

The 30 psf wind load used for design of the original building appear to be adequate to meet wind horizontal wind load requirements of 2003 IBC. Further investigation would be required to determine if the structure could meet current wind uplift requirements.

Seismic Loads

Seismic Loads are determined as the product of the building's dead weight plus a percentage of design snow load, multiplied by the seismic coefficient. Increased building dead load that would result from the addition of roof insulation, along with the increased design snow load and increased seismic coefficient would result in the structure being subjected to seismic loads significantly larger than assumed for the original design.

Structural: Potential Upgrade Requirements

The increased snow load requirement and provision of an improved thermal envelope will result in the need to increase the structural capacity of the roof framing.

Class Room Wing

In the classroom area, this could be accomplished by either adding columns to shorten the span of existing beams, or by adding additional lines of beams and columns to reduce the tributary load area for existing beams or, by some combination of these two options. It may be necessary to provide additional lines of beams if the roof decking is incapable of supporting the increased snow load.

In either case, it would be necessary to cut the existing floor slab to provide additional footings under new columns or to increase the load carrying capacity of footings at existing columns.

New columns could most likely be located to coincide with new partitions required for the change of use from classroom space to office space. Existing suspended ceiling grids, lighting and wiring would need to be removed and replaced in order to add new beams.

The structural capacity of the roof diaphragm will need to be augmented by adding a layer of plywood sheathing over the existing tongue and groove sheathing. Existing roofing materials and roof insulation will need to be removed in order to apply the new plywood sheathing directly to the existing decking.

The shear capacity of the existing interior corridor bearing walls will need to be increased in order to handle the increased seismic loading. Gypsum wallboard will need to be removed in order to expose the wood framing and to apply plywood sheathing and seismic hold downs.

Central Core

The snow load capacity of the roof in the central core area will need to be increased. The most practical way to provide additional capacity may be to add a vaulted roof over the central core. The roof could be vaulted with wood trusses designed to span across the 25 foot dimension of the core. The trusses would be supported on existing concrete walls.

The lateral load shear capacity of the existing concrete walls is adequate, although the connection between the roof diaphragm and the walls may need to be strengthened to meet current codes.

Gymnasium

The load capacity of the gymnasium roof could be increased by adding a line of structural columns at midspan of the roof trusses. The truss bearing points would need to be reinforced and it would be necessary to either overlay the existing decking with another layer of diagonal decking to increase the snow load capacity. The new columns would be supported by new square concrete pad footings cut into the existing floor slab.

The lateral load capacity of the existing walls is probably adequate to meet current codes.

Structural: Site Conditions

The exterior grading around the school appears to be fine with the exception of the north wind of the central core area. This portion of the building is partially underground. Floor level at one side is at grade level and at the opposite side floor level is about 5 or 6 feet below grade. Reportedly, groundwater has leaked into the floor along the sub-grade wall in the past. The leak is probably the result of groundwater flowing down gradient and accumulating against the subgrade wall. The situation could be corrected by installing a sub surface drain along the wall and extending it to daylight in the drainage swale lying north of the building. The ground surface should also be regarded to direct surface water away from this area.

Structural: Summary

The old Homer High School could be converted to offices with the following upgrades:

1. Increased snow load will require structural upgrades to roof framing.

   Snow Load: 30psf-Original Design 50 psf Current City of Homer Code

2. Increased Seismic load requirements will require upgrades to interior shear walls in the classroom wing.

   Seismic Coefficient: C=0.133-Original Design C=0.154- 2003 IBC

3. Diagonal T&G Roof Diaphragm may not provide adequate capacity to resist lateral loads.
4. Drawings refer to 'braced' interior shear walls but bracing is not detailed on the drawings. Interior shear walls will likely need to be reinforced with plywood sheathing to meet seismic requirements.
5. Site should be re-graded in wing area of central core to direct surface flow away from structure.
6. Subdrain should be installed on uphill side of 'wing' to intercept groundwater flow and direct it towards drainage swale.

Mechanical systems

1. **Fire protection system**
   a. Sprinkler system: There was no fire suppression system observed at the school. It is possible that the Fire Marshal could construe a requirement for fire suppression at the building because an A-3 occupancy over 12,000 SF requires fire suppression. The gym downstairs is an A-3 occupancy, and if a court room is put in the building, it too would be an A-3. The International Building Code defines civic administration as well as education occupancies beyond 12th grade as a B occupancy, so while the upstairs occupancy may not change occupancy classifications, the remodel may create a need for compliance with current code
2. **Fuel system**
   a. Fuel tank: There is an above grade steel fuel tank in the rear of the building. The age and size of the tank are unknown, but the tank visually appears to be in good condition.
3. **Roof drains**
   a. The roof is relatively flat, with a designed slope of 4" from the edge of the roof to the center. There is also a 3" cant strip edge around the perimeter, which could create a 7" deep pond (worse case in the center) if the main roof drains were to clog. The original design shows four main roof drains, with no overflow drains, all piped to a main 6" rain leader leaving the building with no relief drain. The IBC requires that overflow roof drains be installed with an inlet weir 2" above the main drain, but no overflow drains are installed. Either overflow drains with independent piping out of the building need to be installed, or structural calcs need to be prepared to show that the roof can support the total possible amount of water that can collect on the roof in the event of a blockage of the main roof drains.
4. **Heat generation**
   a. The building is heated using a 1958 vintage cast iron boiler that was originally steam, but now is converted to a hydronic boiler. The interior of the boiler has some loose fire brick, but the unit appears in relatively good condition for its age. The useful life of the boiler has been exceeded, and so it is recommended that the boiler be replaced with a new, more energy efficient unit if the building is to remain in service for any length of time. The boiler most likely has asbestos insulation around the outside and asbestos rope between the castings.
   b. The condition of the boiler flue is unknown. It is recommended that a chimney expert be employed to examine the chimney to avoid a potential fire or blockage. As viewed from the outside, the masonry chimney has rust stains, indicating possible corrosion of the rebar in the concrete. This could have caused internal sloughing of concrete into the chimney, potentially blocking the flue.
   c. The burner for the boiler is in good condition, as it was apparently replaced at some point during the last 10 years. The burner is rated at 12 gallons per hour, and it appears to be sized adequately

to heat the building. Unless a city hall occupancy requires significantly more outside air ventilation, the boiler sizing should be adequate for an occupancy change.

5. **Heat distribution**
   - **a.** There was a conversion from steam to hydronic around 1996 based on the age of the water heater. The conversion appears to be in good condition, with relatively new pumps, expansion tanks, and specialties. The age and condition of the piping within the building is unknown, however. According to the original plans, there is a perimeter utilidor under the floor that carries the heating piping around the edge of the building that can then be routed up to each classroom ventilator. We could not get access to the utilidor during the visit, so the condition of this area is unknown.
6. **System controls**
   - **a.** The building heating and ventilation systems are controlled using the original pneumatic controls, with a upgraded compressor and air dryer. The upstairs classrooms are controlled using original or replacement pneumatic thermostats that are apparently still in operational condition. In order to achieve energy savings, a new direct digital control system should be considered.
7. **Combustion air**
   - a. Combustion air for the boiler is ducted down directly from above the room into the mechanical room. The system appears to be adequate based on 50 years of performance, and no observed sooting in the boiler room.
8. **Cooling and Ventilation**
   - a. Air handling: There are no air handlers in the building. Each of the classrooms is heated and ventilated using a Nesbitt classroom ventilator located under the windows. The device is designed to take outside air from below the unit at the outside wall, and duct air up into the bottom of the ventilator, where it can also be mixed with return air from the classroom itself using mixing dampers. When one enters the building, a musty smell is evident. This suggests that the classroom ventilators are not taking in any outside air, so the same room air is recirculating. While there are operable windows in the classrooms, it is not likely that they are opened or effective during cold, windy winter months. If the owner wishes to convert the classrooms to more of an office environment as expected in a city hall, than it is probable that the rooms will overheat due to the additional heat load generated by the electronic equipment typical of any office. The original construction, which appears to be still in place, has a design for fixed exhaust air coming out of each classroom totaling 4,525 CFM for all classrooms. The multipurpose room has an exhaust fan sized at 4,300 CFM. The toilet rooms exhaust 1,410 CFM, and the kitchen exhausted 1,900 CFM by design. The amount of actual exhaust air is unknown, although one of the exhaust fans was visited and it was operational. The system has been maintained amazingly well for its age, but it is not at all efficient.
   - b. VAV option: If a more responsive centralized air handling system is desired, such that it can satisfy different and varying cooling loads to different spaces, than a medium pressure variable air volume (VAV) system should be considered. This type of system would require a more sophisticated control system, a new air handler and duct system, with VAV boxes for each space served that will vary the amount of cooling air depending on each space need. If this type of system is desired, than a split system air conditioner is also recommended, with the direct expansion compressor or chiller located outside. A reheat coil could be placed in each zone served, and the main supply air would be kept to 55 degrees (with a cold deck reset) with the amount of cooling air varied according to demand. Alternatively, separate unit ventilators could be installed at each space with cooling capability that would eliminate the need for a new ducted system centralized.
9. **Plumbing fixtures**
   - a. Lavs: The restrooms are all equipped with china lay-in lavs that appear to be ADA compliant and in good condition. No changes are recommended for the lavs, except for replacement of the faucets with automatic closure, motion detector activated faucets that will save water. Metered

faucets are code required for occupancies serving a transient public, such as an airport, but they are not a code requirement for this or a city hall occupancy per UPC 402.4, so this is just a water saving suggestion.

b. The urinals in the men's room appear to be in good condition, and would work well for present or future occupancies.
c. Water closets: The toilets appear to be in good condition, and would work well for present or future occupancies. There is also an ADA unisex toilet room on the second floor that appears to be in good condition, and would work well for a city hall environment serving the public.
d. Sinks; There is a three compartment sink in the old kitchen downstairs.

10. Kitchen Facility

a. Ranges: Ductwork in the old kitchen adjacent to the MPR has been capped off, and any ranges have been removed.
b. Convection ovens: There remains only two convection ovens that are ducted to the existing ductwork. It appears that the facility once had a full commercial kitchen that has been removed now, and that no food preparation is presently being done with the possible exception of some heating of food in the convection ovens.

Electrical systems

1. Electrical service

a. Size: The original design requirement for the electrical service was 120/208 volts, three phase, and 800 amps capacity. This size of service should be adequate for both the existing occupancy as well as any planned conversion to a city hall.
b. Age/condition: The main distribution panel is original equipment, as well as panels in the upstairs hallway. The main service should be replaced due to obsolesce and unreliability of the old service equipment.

2. Power distribution

a. Type: All power is distributed throughout the building through a main distribution panel.
b. Condition: Power distribution that was visible is in conduit, and appears to be done professionally.
c. Panels: Panels located in the boiler room are of a newer vintage than the remaining panels observed in the upstairs corridors. It is likely that parts are no longer available for the original electrical equipment, so all original panels should be replaced. It is not possible to determine the condition of the existing wiring, because the relative age of the wiring is not known. Original wiring is most likely at the end of its useful life and should be replaced, especially if the occupancy changes to a more energy intensive city hall environment.

3. Electrical devices

a. Interior outlets: The interior outlets appeared to be in good condition, although continuity and polarity testing was not done on the outlets to confirm proper wiring. The upstairs classrooms have had additional outlets installed, piped with surface conduit. With the additional receptacles, there are now four receptacles per classroom. This will not be adequate for a city hall office environment, so significant electrical upgrades will be necessary.

4. Lighting systems

a. Exterior Lighting: There are exterior lights on the front and sides of the building.
b. Interior lighting: The classroom lighting, and hall lighting uses 4' T-12 fluorescent lamps, with magnetic ballasts. These fixtures can all be replaced with newer technology T-8 lamps with matching electronic ballasts. A lighting retrofit could save up to 50% of lighting energy is the proper ballast/lamp combination is selected. There is a definite opportunity for energy savings with a lighting upgrade, regardless of the intended occupancy.
c. Light switching: Lights are switched off and on manually. Dual technology occupancy sensors can automatically shut off lighting in classrooms, restrooms, janitor closets, offices, and other places,

resulting in huge potential energy savings. Many of the classrooms were vacant during our visit, but most of the lights were on.

d. Emergency egress lighting: The emergency egress lighting system needs to be checked when it is dark outside to determine if adequate light is available along the egress path. Also, current codes require that emergency egress lighting in places that require two exits (this is the case here) require that the lighting continues to the outside. This means that remote emergency heads need to be installed outside each exit as well as along the egress path.

5. Signage

a. Exit signs: There are a few exit signs, however there needs to be a survey of all signage, and an upgrade of the exit signs throughout the facility to bring it up to code. A person should be able to see two exit signs from any place he is standing.

Homer Secondary School -- Conversion to Civic Offices and Assembly Hall					
Feasibility Study					
Order of Magnitude Cost Estimate					
Building Areas					
Gym Area			5700	sf	
Lower Level Area			2800	sf	
Upper Level Area			8300	sf	
Total Building Area			16800	sf	
Architectural					
Replace Siding, Windows, Insulation	11880	sf	$55	psf	$653,400
Damproof Foundation Walls, Upgrade Fdn Drain, Regrade	660	lf	$85	plf	$56,100
Renovations: Gym	5700	sf	$110	psf	$627,000
Renovations: Lower Level	2800	sf	$80	psf	$224,000
Renovations: Upper Level	8300	sf	$80	psf	$664,000
Replace Roofing Assembly, Complete	15200	sf	$25	psf	$380,000
Architectural Subtotal					$2,604,500
Structural					
Upgrade Roof Structure	15200	sf	$15	psf	$228,000
Upgrade Shear Walls: Upper Level	480	lf	$140	plf	$67,200
Upgrade Shear Walls: Lower Level	230	lf	$240	plf	$55,200
Structural Subtotal					$350,400
Mechanical					
New Sprinkler System	16800	sf	$8	psf	$134,400
New Boilers & Heating Distribution System	16800	sf	$17	psf	$285,600
New Air Handlers & VAV Air Distribution System	16800	sf	$23	psf	$386,400
New Bathrooms: Lower Level	2	@	$75,000	per	$150,000
Add Roof Overflow Drain System With Heat Trace	16800	@	$3	psf	$50,400
Mechanical Subtotal					$1,006,800
Electrical					
Replace Power Distribution System	16800	sf	$8	psf	$134,400
Replace All Lighting	16800	sf	$14	psf	$235,200
New Fire Alarm System	16800	sf	$4	psf	$67,200
New Telecom Distribution System	16800	sf	$8	psf	$134,400
Electrical Subtotal					$571,200

General Contractor Costs		
Construction Subtotal		$4,532,900
General Conditions	10%	$453,290
Hazmat Abatement (allowance)		$500,000
Contractor Overhead & Profit	10%	$548,619
Total Estimated Construction Cost (2007 Dollars)		**$6,034,809**
Total Construction Cost Per Square Foot (2007 Dollars)		$359
Permits and Fees	2%	$120,696
Design	10%	$603,481
Construction Admin & Management	5%	$301,740
Furniture, Fixtures, Equipment	5%	$301,740
1% For Art	1%	$60,348
Project Contingency	10%	$603,481
Total Estimated Project Cost (2007 Dollars)		**$8,026,296**
Total Project Cost Per Square Foot (2007 Dollars)		$478
Comparison of Construction Cost Per Square Foot in 2007 Dollars		
Convert Homer Secondary School to Civic Office & Assembly Use		$359
New Construction Estimate: Steel-framed Class A Office in Homer		$336
Homer Library Construction Cost Escalated to 2007 Dollars		$385
Girdwood Library Construction Cost (Bid in February 2007)		$392