ASSESSMENT AND EVALUATION OF OPTIONS FOR MERCER ISLAND FIRE STATION 92

October 21, 2009
Report Outline

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1. Introduction

The purpose of this study is to provide an assessment of the existing condition of Mercer Island Fire Station 92 and to evaluate options for improvement or replacement of the Station. The assessment of the facility is concerned with the construction of the facility, structural observation, systems, and the programmatic function of the station – i.e. the facility’s operational usefulness as a modern fire station. The evaluation of the existing Station 92 considers options for addressing the deficiencies identified in the assessment. Sketches are employed at the conclusion of this report to demonstrate existing conditions, constraints and test-to-fit scenarios for approaches to redevelopment of the site.

2. Executive Summary and Recommendation

Mercer Island Fire Station 92 was built in 1962 with sleeping quarters added in 1984. As previously identified in the 1991 Study by Lawhead Architects and based on the assessment provided in this report, a replacement of the existing Fire Station 92 is recommended. The existing station’s limited size, programmatic deficiencies and structural concerns are the primary considerations that support the recommendation for replacement. Structural concerns are significant; the structural engineers conclude their assessment with the following: “Fire Station #92 is in dire need of a seismic upgrade or replacement.” Space constraints at the existing facility are well documented in the 1991 study and the limited size continues to underserve the Fire Department’s operational needs. New construction will also allow for implementation of current mechanical and electrical technologies, as well as, sustainable design approaches which will yield a more energy efficient facility. A rough order of magnitude estimate suggests a total project cost of $4.6 million based on a new 8500 square foot station with associated site development.
3. Programmatic Deficiencies

The November 1991 study prepared by Lawhead Architects (titled *Program and Site Study of Mercer Island Fire Station No. 1 and No. 2*) identified a number of programmatic deficiencies at Mercer Island Fire Station 92. The deficiencies represent needs and associated areas that were either not served or found to be inadequate in size and/or function. Since that time, codes, regulations, and Fire Department needs have added to the list of programmatic deficiencies. Based on a review of the Lawhead study, the existing facility, current requirements for fire stations and program needs as described by the Fire Department, the following provides a description of current programmatic deficiencies.

**Areas that are inadequate (in size/function/relationship)**

- General storage (limited space, lack of dedicated space for equipment and critical supply storage)
- Workspace (lack of firefighter work space for office and apparatus work)
- Kitchen (undersized to support crews)
- Dayroom (undersized to support crews)
- Physical fitness room (inadequate and does not meet the intent of NFPA 1583)
- Apparatus bay widths are narrow; lack of drive thru bays (WAC 296-305)
- Lack of 1-hour fire resistive construction between the bays and sleeping rooms (not compliant with WAC 296-305-06507)
- Lack of security between public and non-public areas (Dept. of Homeland Security guideline)
- HIPPA Security for records is lacking
- Sleeping Rooms (underserved by RR/Showers, lack of privacy, poor location)

**Areas that are needed**

- Public waiting room (separate area for walk-in public visits)
- Accessible restrooms (IBC, ANSI/ICC A117.1)
- Gender specific restroom/showers
- Aid room
- Office space
- Bunker gear storage (NFPA 1851)
- Decontamination/Clean room (NFPA 1581)
- Hand wash stations (WAC 296-305)
- SCBA storage
4. Mechanical and Electrical Assessment

The November 1991 Lawhead Report provides a review of the Fire Station 92 mechanical and electrical systems. Improvements and routine system maintenance have occurred since the time of the report. During this time, energy and mechanical code requirements and regulations have become stricter which only serves to increase the magnitude of the deficiencies. The following is a general summary of each area based on a review of the Lawhead Report and a description of maintenance and improvements provided by the City.

Electrical Systems

With the exception of the back-up generator, the electrical system was found to be in a poor state in 1991. Code violations were cited and recommendations were provided for new service to the building, as well as, new lighting and receptacles throughout. A larger fuel tank was recommended for the generator and the size and state of the generator should be reassessed for current condition and requirements. Since the time of the report, on-going electrical failures have been addressed; however, the system remains antiquated and in need of updating. Additionally, the low voltage system is surface mounted and out of date, and the station lacks a central fire alarm system.

Mechanical Systems

At the time of the Lawhead report, the gas fired unit heaters located in the apparatus bay were found to be reaching the end of their useful life and inefficient. These inefficiencies only increase when comparing the heating units to systems available today and it is worth noting that based on data from 2006-2008, the City of Mercer Island reports that Station 92 is the most expensive City facility in terms of Kbtu/SF use. Plumbing and ventilation code violations were cited in 1991. Plumbing fixtures were found to be inadequate. The lack of a source capture exhaust system in the apparatus bay was noted. Systems in the 1984 addition to the building were generally found to be adequate; however, a humidity problem with the HVAC was noticed during a recent site visit. Other plumbing and ventilation components were noted as in need of replacement. Additionally, consideration should be given to the existing facility’s lack of a fire suppression system — i.e. sprinklers (a WAC 296-305-06503 requirement for new or remodeled stations). Since the time of the Lawhead study, HVAC and plumbing maintenance issues have been dealt with, a bathroom remodel took place, failing plumbing components and conditions were addressed, and a source capture exhaust system was added to the apparatus bay. While the mechanical and plumbing systems are in need of replacement, newer components should be evaluated for reuse potential.
5. Structural Analysis

The following report prepared by Coughlin Porter Lundeen in June of 2009 is an update to the findings presented in the 1991 Lawhead Study.
June 23, 2009

TCA Architecture
6211 Roosevelt Way Northeast
Seattle, WA 98115

Attn: Mr. Brian Harris

RE: Seismic/Structural Review
    Mercer Island Fire Station #92

Dear Brian:

We are pleased to present the findings of our review of the Fire Station #92 structure located in Mercer Island, Washington. The purpose of this assessment is to review past studies and provide an updated general structural assessment for the current condition of the building based on more stringent codes which are now in effect. Moreover, we also provide comment on structural upgrades that could be installed to improve the performance of the buildings from an Immediate Occupancy standpoint as defined by ASCE 31-03. The original construction drawings were not available for our review. Therefore, our assessment is based on a limited amount of information gathered during a cursory walk-through of the site on June 9, 2009. We also reviewed pictures of the 1984 addition obtained by Fire Chief Chris Tubbs.

Scope

In this report, we will discuss the condition of the building’s vertical and lateral load resisting systems. Gravity and wind loads are considered in this structural assessment in addition to the primary risk associated with earthquake. Personal property and economic losses are not considered.

The scope of this review is limited to:

- Observations of the main structure via cursory walk-through of the building.
- Review of the original study, “Program and Site Study of Mercer Island Fire Station No. 1 and No. 2” by Lawhead Architects dated November 19, 1991.
- Update the original seismic evaluation of the structure based on current code and standard ASCE 31-03, Seismic Evaluation of Existing Buildings.
- Identification of any Immediate Occupancy seismic hazards or deficiencies.
- Recommendations for the repair of both vertical and lateral load resisting systems.
- Preparation of this letter stating our findings.

General Description
Mercer Island Fire Station #92 is a one-story wood-framed building with single-wythe concrete masonry (CMU) unit walls. Although no testing on the masonry walls has been completed to date, we anticipate these walls are unreinforced based on construction practices during that time. The building was constructed in 1962 and remodeled with an addition 1984. The center portion of the building consists of a tall apparatus bay with large doors on the north and south ends. The roof steps down over the kitchen and dayroom to the west of the apparatus bay, and over the living quarters and exercise room to the east of the apparatus bay. The three separate roofs are all configured with low slopes.

**Vertical Load Resisting System**

The apparatus bay and west roof are of the original 1962 construction and consist of plywood sheathing over 2x joists spanning north to south. These joists are supported by glulam beams spanning east to west that bear on top of the CMU walls. The east roof is part of the 1984 addition and consists of plywood sheathing over 2x joists. The east end of these joists bear on a wood-frame exterior wall while the west ends are supported off a ledger bolted to the apparatus bay CMU wall. We assume the building has conventional spread footings and a slab-on-grade.

**Lateral Force Resisting System**

The lateral force resisting system consists of plywood sheathing at the roofs that act as horizontal diaphragms. The diaphragms transfer lateral loads to the CMU shear walls that transfer the load through the foundation to the supporting soil. The exterior walls of the 1984 addition are plywood sheathed shear walls.

**Structural Observations and Deficiencies**

Our structural analysis, as it pertains to the primary risk due to earthquakes, is based on ASCE 31-03, which is the current standard recognized by code for evaluating existing buildings. Our analysis consisted of a Tier 1 study for an Essential Facility with Immediate Occupancy criteria. A list of observed deficiencies is shown below. We have also listed the deficiencies stated in the 1991 report for comparison.

<table>
<thead>
<tr>
<th>Deficiencies Pertaining to the Roof Framing</th>
<th>Structural Deficiencies Per ASCE 31-03</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1991 Program and Site Study</strong></td>
<td><strong>Structural Deficiencies Per ASCE 31-03</strong></td>
</tr>
<tr>
<td>• The existing lateral elements do not conform to current code for lateral design nor detailing. (Ira L. Gross, Ratti Swenson Perbix Clark, 1991)</td>
<td>• The plywood sheathed roof diaphragms are likely unblocked and span greater than that recommended by ASCE 31-03 in the east-west direction. These diaphragms will likely become overstressed during a seismic event.</td>
</tr>
<tr>
<td>• Roof detailing at wall juncture is inadequate. (Paul Lukes, Building Envelope Consulting Services, 1991)</td>
<td>• The diaphragm does not have continuous cross ties in the north-south direction. Cross ties help resist out-of-plane seismic forces induced by the CMU walls. The roof diaphragms will likely become overstressed without cross ties.</td>
</tr>
<tr>
<td>• Glulam beams have a negative camber as they were installed inverted. Ira L. Gross, Ratti Swenson</td>
<td>• Wood ledgers supporting the low roof diaphragms at the mid-height of the tall apparatus bay walls are subject to a brittle failure known as cross-grain bending. The ledgers will likely be overstressed and fail during a seismic event causing partial</td>
</tr>
</tbody>
</table>
Deficiencies Pertaining to the Shear Walls

<table>
<thead>
<tr>
<th>1991 Program and Site Study</th>
<th>Structural Deficiencies Per ASCE 31-03</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The exterior masonry walls laid in stacked bond have several vertical cracks in both the block and in mortar joints. (Ira L. Gross, Ratti Swenson, Perbix Clark, 1991)</td>
<td>• There are clerestory windows on the east and west sides of the building between the roof diaphragm and the tops of the CMU walls. The windows separate the roof diaphragm from the CMU shear walls prohibiting proper in-plane shear transfer.</td>
</tr>
<tr>
<td></td>
<td>• The CMU walls do not appear to be positively anchored to the roof framing to resist forces perpendicular to the plane of the wall (out-of-plane forces). Positive anchorage is required to keep these walls from “tipping” in a seismic event.</td>
</tr>
<tr>
<td></td>
<td>• There are slender CMU piers adjacent to the apparatus bay doors on the north and south sides. These piers do not have adequate capacity or connections to the foundation to resist in-plane seismic shear forces and overturning forces. Therefore, the north and south sides of the apparatus bay do not have an adequate lateral load path to the foundation.</td>
</tr>
<tr>
<td></td>
<td>• The height-to-thickness ratio of the CMU walls is greater than that recommended by ASCE 31-03. Therefore, these walls are considered slender and likely do not have the capacity to span vertically between the supporting foundation and roof diaphragm during a seismic event.</td>
</tr>
</tbody>
</table>

**Recommendations**

The following recommendations address the specific issues identified above, however a cost effective seismic upgrade that includes masonry wall testing will require further analysis. We are making the following recommendations to reduce the potential seismic losses to the building based on the above findings.

**Work to the Roof Framing:**

1. The roof diaphragms require strengthening by installing 2x4 flat blocking at all unframed panel edges at the north and south ends. The blocked areas are roughly 1/3 the length of the diaphragm at each end. Proper installation of the blocking requires the
roofing to be removed, however an attachment to the sheathing from the underside only may be possible. This will require demolishing the ceiling to expose the underside of the roof sheathing in those areas.

2. Diagonal bracing between the tops of the CMU walls and the roof framing is required to support the walls from tipping due to out-of-plane seismic forces. Alternatively, tube steel column “strong-backing” may be installed against the walls and span from the slab to the roof framing. Braces or strong-backs must connect to continuous cross-ties on the north and south ends of the building. The cross-ties consist of 4x material spanning between the existing framing with bolted hardware connecting each cross-tie together.

3. The low roof ledger connections must be tied to the roof diaphragms to prevent cross-grain bending using light gage steel straps. These L-shaped straps are bolted to the CMU walls and nailed to the roof framing normally at 4 feet on-center above the roof sheathing. This requires a portion of the roofing to be removed, however a connection from the underside of the roof framing may also be possible. This will require a portion of the ceiling to be removed.

4. The existing roof beams require a positive connection to the tops of the CMU walls. Such a connection consists of steel angles on each side of the beam with bolts to the beam and lag screws to the sill plate. The sill plate shall be connected to the top of the wall with epoxy grouted bolts.

5. Glulam beams installed upside down will continue to creep over time affecting the overall quality of the roof unless the load imposed on them is reduced. Intermediate glulam beams can be installed to reduce the load on these beams. New beams can be installed from the underside by removing the ceiling and inserting them below the existing joists. These beams receive a bolted connection to the existing CMU walls, or are supported by new steel columns.

6. Increasing the redundancy in the roof framing as described above would preclude installing independent secondary columns to separate the vertical load resisting system from the lateral force resisting system.

Work to the CMU Shear Walls:

1. The clerestories must be infilled at several locations to allow for a proper load path between the roof diaphragm and the CMU shear walls. These infills consist of sawn lumber framing and plywood sheathing bolted to the walls and diaphragms, or grouted and reinforced CMU.

2. As discussed in Item 2 of the section above, diagonal bracing or tube steel strong-backs shall be installed to connect the CMU walls properly to the roof diaphragms. These are required on all sides. The bracing is normally centered at 4 feet along the wall and consists of 4x material or steel angles. The strong-backs, normally 3-inch tube steel columns, are spaced roughly 6 feet on center and get anchored to the slab, CMU walls, and the roof framing.

3. The tall, slender CMU piers on either side of the apparatus bay doors require modifications for resisting in-plane overturning forces. Such modifications include enlarging the footings, connections to adjacent walls at the corners, and strong-backs at the free ends near the opening. The vertical cracks in CMU walls shall also be repaired with an epoxy.

4. The CMU wall slenderness deficiency can be mitigated by installing tube steel strong-backing as discussed in Item 2 of this section. The strong-backing can be designed to mitigate both the out-of-plane connection and wall slenderness deficiencies.
Conclusion

It is our opinion that Fire Station #92 is in dire need of a seismic upgrade or replacement. We found several major deficiencies in the lateral force resisting system merely by performing a cursory on-site review. The most severe of these pertains to the construction of the CMU shear walls; a construction type consisting of stack bond masonry units that is no longer allowed by current code (without special units with substantial grouting and reinforcement). Although no masonry testing has occurred, we would not expect to find much grout or internal reinforcement. Moreover, the shear walls are not connected to the roof diaphragms they are intended to support, and do not appear to have adequate strength to remain standing during a code-level seismic event. Renovating this structure in accordance with the immediate occupancy criteria would be significant and further diminish useable space and necessary clearances.

Furthermore, we understand the station must be expanded if renovated to extend the life of the building. As stated in the Lawhead study, the site is too small to support further expansions and any additions must be constructed vertically (additional stories). The existing structure cannot support vertical or lateral loads from an additional story. Therefore, a separate structural system designed to supplement the original structure is required to support any additional areas. This type of construction tends to be quite tedious, very labor intensive, and generally cost prohibitive. We recommend the City of Mercer Island and the Fire Department compare the cost of renovation/expansion versus complete replacement to choose the best course of action.

Sincerely,
Coughlin Porter Lundeen, Inc.

Jason Marvin
6. Property and Land Use Summary

Property Description

The existing Mercer Island Fire Station 92 is located at 8473 SE 68th Street. The majority of the site as presently developed is impervious (approximately 78%) consisting of paving and the existing 3 bay fire station. The property is approximately 100’ x 150’ with the shorter dimension fronting SE 68th Street. This yields 15,000 SF (0.34 acres) of property. The use east of the fire station site is Utility. Commercial uses exist to the south and west.

Land Use Requirements Summary

The table below summarizes land use code criteria that establish the limits for the development of a new fire station on the Fire Station 92 site.

<table>
<thead>
<tr>
<th>Planning Authority</th>
<th>City of Mercer Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning Code</td>
<td>Mercer Island City Code (MICC), Title 19 Unified Land Development Code</td>
</tr>
<tr>
<td>Zoning</td>
<td>R9.6</td>
</tr>
<tr>
<td>Land Use Permits</td>
<td>A Conditional Use Permit (CUP) is required for development of a Fire Station in a Residential Zone (MICC 19.02.010(C)(1)).</td>
</tr>
<tr>
<td>Setbacks:</td>
<td>20'-0&quot; from abutting property (19.02.010(C)(1)(a))</td>
</tr>
<tr>
<td>Building Height Limit</td>
<td>30'-0&quot; above average elevation (19.02.010(D))</td>
</tr>
<tr>
<td>Gross Floor Area</td>
<td>Max. of 45% of lot area for a single family structure (19.02.010(E)(1))</td>
</tr>
<tr>
<td>Allowable Impervious</td>
<td>40% max. for a lot slope &lt;15% (19.02.020(D)(1))</td>
</tr>
<tr>
<td></td>
<td>45% with code official granted deviation (19.02.020(D)(3))</td>
</tr>
<tr>
<td></td>
<td>60% with granted variance – a fire station would need to be considered a “public facility” (19.02.020(D)(4))</td>
</tr>
<tr>
<td></td>
<td>78% (approximately) if present site impervious is found “legally existing” as determined by the code official and a fire station is considered a “public facility” (19.02.020(D)(1*))</td>
</tr>
<tr>
<td>Parking</td>
<td>1 space required for every 200 square feet of gross floor area (19.02.010(C)(1)(b))</td>
</tr>
<tr>
<td>Landscape Area</td>
<td>35% min. for nonresidential use in a single family zone (19.12.040(B)(4)(a)(i))</td>
</tr>
<tr>
<td>Perimeter Screen</td>
<td>Per table (19.12.040(B)(7)(a))</td>
</tr>
<tr>
<td></td>
<td>20'-0&quot; of partial screening for Public Facility adjacent to Public Way (north prop. line)</td>
</tr>
<tr>
<td></td>
<td>10'-0&quot; of partial screening between Public Facility and Commercial or Utility (east, south and west prop. lines)</td>
</tr>
</tbody>
</table>
7. Discussion of Land Use Code Constraints and Considerations

The requirements of the land use code are considerable when looking at the option of building a new Fire Station on the existing Fire Station 92 property which would be a non-residential and conditionally permitted use in a residential zone. The existing station could not be built today without multiple variances from the code.

Construction of a new approximately 8500 SF facility on this site would require variances from the following land use code requirements: parking, gross floor area, setbacks, landscape area, perimeter screening and allowable impervious surface. At the sacrifice of program and requirements based on operational needs, there are options for developing the site with fewer variances, but there is no feasible option for construction a new fire station on the property, as zoned, without variances.

Consideration should be given to pursuing a rezone of the property from R9.6 to the adjacent Planned Business Zone (PBZ). Adjacency and the nature of the present development of the site would seem to support a rezone of the property. With the property zoned PBZ, a new station could be built on this site with little or no need for variances from the land use code. The process for rezoning property in the City of Mercer Island requires further research.
8. New Station Target Size

8,500 square feet is identified as the preliminary pre-design target size for a new station. This is the approximate gross square footage that would be required to allow for correction of programmatic deficiencies and to support operational needs. It is worth noting that in 1991 Lawhead Architects provided 8,000 square feet as a preliminary design size based on assessed needs and conceptual planning for a new Station 92. The slight disparity with the present day target size can be explained by the standards and regulations impacting program needs (e.g., dedicated bunker gear storage, separation of decon. from cleaning) that have come into effect in the 18 year interim between the studies.

A method of scaling the fire station components of the Headquarters Fire Station 91 was employed to determine Fire Station 92 space needs and resulting target size. This method allocates new Station 92 square footage based on area per firefighter and per apparatus found at Station 91. The table below provides the data that was used:

<table>
<thead>
<tr>
<th>Scaling method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Station Area</td>
</tr>
<tr>
<td>Crew Living Work</td>
</tr>
<tr>
<td>Apparatus Bay</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

As a check of the target sizing, TCA looked at recent or planned projects both nationally and regionally. This data supports the target size that the scaling method suggests. The comparable projects data is represented below:

<table>
<thead>
<tr>
<th>Comparison method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station Type</td>
</tr>
<tr>
<td>Fire Sta. No. 3</td>
</tr>
<tr>
<td>Fire Sta. No. 2</td>
</tr>
<tr>
<td>Fire Sta. No. 185</td>
</tr>
<tr>
<td>Fire Sta. No. 2</td>
</tr>
<tr>
<td>Neighborhood Station 20</td>
</tr>
<tr>
<td>Neighborhood Station 21</td>
</tr>
<tr>
<td>Neighborhood Station 22</td>
</tr>
<tr>
<td>Neighborhood Station 30</td>
</tr>
<tr>
<td>average</td>
</tr>
<tr>
<td>Fire Sta. 66</td>
</tr>
<tr>
<td>Snohomish FD 1 Station 18</td>
</tr>
<tr>
<td>Snohomish FD 1 156th St Sta.</td>
</tr>
<tr>
<td>average</td>
</tr>
<tr>
<td>adjusted*</td>
</tr>
</tbody>
</table>

average bay/total station 0.38%

* adjustment is per ratio to establish an average 2 bay 4 FF station
9. The Remodel Option

A remodel alone of the existing approximately 4600 square foot station would fail to address the programmatic deficiencies, and a significant addition would be required to address operational needs. A structural retrofit of the existing facility would require the insertion of new structural components adjacent to existing structure; this construction would further reduce existing building space limiting the available square footage for remodeling. Given the configuration of spaces and the existing station’s location on the site, an addition would take the form of a second floor. Second floor construction introduces new structural concerns and, as identified in CPL’s structural analysis, new first floor structure and foundations would be required to support a vertical addition. There is little value that the existing construction offers to a remodel/addition solution. It is anticipated that a remodel/addition would cost as much or more than new construction and would limit the opportunities for improvement of the facility.

Other considerations for a remodel/addition approach are:

- Zoning Code requirements that are triggered based on the value of the improvements
- ADA and Building Code issues that will need to be brought into compliance
- WAC fire resistive construction requirements
- Removal of existing mechanical and electrical systems for installation of new systems
- A remodel addition will require working a new scheme around an existing plan and compromises will need to be made in establishing space adjacencies and circulation.
- The location of the existing building limits options for use of the site.
10. Sustainable Design Considerations for the development of a fire station facility.

According to the US Green Building Council, sustainable design encompasses a “design intent on balancing environmental responsiveness, resource efficiency, and cultural and community sensitivity”. In the design of Fire Facilities there are many operational goals that have parallel strategies to sustainable building design.

<table>
<thead>
<tr>
<th>Sustainable Design</th>
<th>Fire Station Priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meet programmatic requirements efficiently</td>
<td>Support operational criteria</td>
</tr>
<tr>
<td>Decrease pollutants, reduce health risks</td>
<td>Firefighter safety within facility</td>
</tr>
<tr>
<td>Minimize total cost of ownership</td>
<td>Durable and low maintenance</td>
</tr>
<tr>
<td>Utilize “free” services</td>
<td>Ability of facility to accommodate change</td>
</tr>
<tr>
<td>Create a sense of community</td>
<td>Responds to contextual circumstances</td>
</tr>
</tbody>
</table>

Taking an operations first approach, using experience and vision in conjunction with an integrated design process will allow the development of holistic strategies which can be incorporated with little premium to capital costs. Building orientation and siting, envelop performance, ventilation approaches, thermal massing concepts, renewable energy, cost benefit analysis and energy budgeting are core concepts that could be explored during the schematic design phase. Using like facilities as a baseline there are strategies that other Departments have incorporated into similar projects around the country that have been tested and can be verified as the conceptual project moves into the design phase. From green house keeping, alternative fueling sources, optimized energy performance, water reclamation, waste management to light pollution reduction, LEED can be used as a performance metric to establish and verify the desired level of green design. In general, LEED certification (Silver level) can add another 2-3% to construction costs.

Select features that could be incorporated into the facility include:

- Water reclamation/gray water systems for apparatus washing, irrigation, etc.
- Daylighting to offset power costs
- Lighting system controls
- Plug load switching to reduce energy demand
- Highly insulated walls and roof systems
- Appropriate plantings to reduce or eliminate irrigation requirements
- Energy modeling to optimize energy performance
- Indirect feedback monitoring device to encourage energy use awareness
- Energy star appliances
- Direct Digital Control system for precise and weather reactive HVAC
- Use low emitting materials for a healthier indoor environment
- Recycled content material to reduce impact to environment
- Bike racks to support alternative transportation and reduction of carbon footprint
- Use of concrete at parking areas to reduce heat island effect
- Minimize foot candles at exterior to reduce light pollution
- Dual flush toilets to reduce water demand
- Commissioning of building energy systems to enhance building performance
- Storage and collection or recyclables to reduce waste
- Incorporate construction waste management plan
- Use of regional materials where appropriate
- Prohibit smoking within and around facility to improve indoor air quality
- Implement a green cleaning program to improve indoor air quality
- Provide educational/informational signage to educate public and occupant on sustainable design.
11. Rough Order of Magnitude Estimate

The following rough order of magnitude estimate provides a relative total project cost based on similar fire stations currently being designed and built. The estimated costs reflect a mid-level quality, wood-frame, slab on grade, neighborhood type facility.
## Cost Basis

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost/sf</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BUILDING ESTIMATE TOTAL</strong></td>
<td>$265</td>
<td>$2,252,500</td>
</tr>
<tr>
<td><strong>SITEWORK ESTIMATE TOTAL</strong></td>
<td>$35</td>
<td>$525,000</td>
</tr>
<tr>
<td><strong>OFF-SITE IMPROVEMENTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic Signal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S.S. Extension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-site Wetland/Stream Mitigation</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ESTIMATED CONSTRUCTION COST</strong></td>
<td>$2,777,500</td>
<td></td>
</tr>
</tbody>
</table>

## Projected Soft Costs:

<table>
<thead>
<tr>
<th>Description</th>
<th>%</th>
<th>Base building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington State Sales Tax</td>
<td>9.50%</td>
<td>$263,863</td>
</tr>
<tr>
<td>A/E/Speciality Sub/Fees/Printing/Bidding/Reimb</td>
<td>14.00%</td>
<td>$388,850</td>
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<tr>
<td>Geotechnical/Surveys</td>
<td>0.50%</td>
<td>$13,888</td>
</tr>
<tr>
<td>Testing &amp; Inspection</td>
<td>1.50%</td>
<td>$41,663</td>
</tr>
<tr>
<td>Permits</td>
<td>3.00%</td>
<td>$83,325</td>
</tr>
<tr>
<td>City Administration Cost/Construction Management</td>
<td>4.00%</td>
<td>$111,100</td>
</tr>
<tr>
<td>Enhanced Construction Consultant Services</td>
<td>1.00%</td>
<td>$27,775</td>
</tr>
<tr>
<td>Builders Risk Insurance</td>
<td>0.75%</td>
<td>$20,831</td>
</tr>
<tr>
<td>Commissioning</td>
<td>0.50%</td>
<td>$11,263</td>
</tr>
<tr>
<td>Poor Soil Contingency</td>
<td>2.00%</td>
<td>$55,550</td>
</tr>
<tr>
<td>Construction Contingency</td>
<td>8.00%</td>
<td>$222,200</td>
</tr>
<tr>
<td>Design Contingency</td>
<td>5.00%</td>
<td>$138,875</td>
</tr>
<tr>
<td>Arts (based on 1% of construction cost w/o tax)</td>
<td>1.00%</td>
<td>$27,775</td>
</tr>
<tr>
<td>FF&amp;E Allowance</td>
<td>3.00%</td>
<td>$67,575</td>
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<tr>
<td></td>
<td></td>
<td>$1,474,531</td>
</tr>
</tbody>
</table>

**Anticipated Project Costs (w/o Land)** $4,252,031

**Escalation** $302,851

**LEED certification (2.5% for Silver)** $74,383

**TOTAL ANTICIPATED PROJECT COSTS** $4,629,265

### Exclusions:
- Toxic Soil Removal
- Bond Costs
- Special Foundations

### Notes:
- Escalated @ 3.5%/Year Until Oct 2011
- Budget based on Rough Order of Magnitude of Fire Station Costs
12. Sketches

The following sketches represent site analysis, constraints and test-to-fit scenarios applicable to the development of a new Mercer Island Fire Station 92 on the existing site.

**Sketch A**  Provides the data on the current development of the Station 92 property

**Sketch B**  Applies land use code constraints applicable to the development of the property

**Sketch C**  Shows that the required parking alone is not feasible on the property

**Sketch D**  Shows development of a new station on the site with the minimum number of variances. The size is inadequate when considering programmatic needs and the established target station size

**Sketch E**  Assumes multi-variances or a rezone of the site and represents development of an 8500SF station arranged as a three story volume next to the apparatus bay structure

**Sketch F**  Provides another configuration: three stories with the third story built over the apparatus bay

**Sketch G**  Represents site requirements for an 8500 SF new station with drive through bays
SKETCH A: EXISTING STATION/SITE

AREA OF SITE: 15,000 SF (34 ACRES)
APPROX. EXISTING BUILDING FOOTPRINT: 4,680 SF
APPROX. TOTAL EXISTING IMPERVIOUS: 78% (11,680/15,000)
EXISTING PARKING: 3 SPACES

1" = 30'-0"

MERCER ISLAND FIRE STATION 92  OCTOBER 09

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SKETCH B: CONSTRAINTS

AREA OF SITE
ZONE: R9.6
15,000 SF (.34 ACRES)

ALLOWABLE IMPERVIOUS:
45%* (6750 SF), 60%** (9000 SF), 70%** (11,686 SF)

ALLOWABLE GROSS FLOOR AREA:
45% (6750 SF)

REQUIRED LOT AREA AS LANDSCAPING:
35% (5250 SF)

MIN. DISTANCE TO ABUTTING PROP.
20'

MAX. HEIGHT
30'

MIN. PARKING REQUIRED
1:200 GROSS (34 SPACES FOR AN 6750 SF BLDG)

*INCLUDES 5% DEVIATION, **IF STATION USE IS DEFINED AS PUBLIC FACILITY
ZONE: R9.6
MIN. PARKING REQUIRED: 1:200 GROSS (34 SPACES
FOR AN 6750 SF BLDG)
AREA OF PARKING: 61% OF SITE (9109 SF)
NOTE: DIAGRAM EXCLUDES REQUIRED MICC
REQ'D LANDSCAPING FOR PARKING
SKETCH D: NEW STATION W/ MIN. VARIANCES

1" = 30'-0"

MERcer ISLAND FIRE STATION 92  OCTOBER 09

architecture · planning
ph: 206-522-3830  fax: 206-522-2456
SKETCH E: 8500 SF STATION

1" = 30'-0"

MERCER ISLAND FIRE STATION 92 OCTOBER 09

ARCHITECTURE · PLANNING
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SKETCH F: 8500 SF STATION

1" = 30'-0"

MERCER ISLAND FIRE STATION 92 OCTOBER 09

IMPERVIOUS 84% (12,564 SF)
PARKING 10 SPACES (W/ VAN ACCESSIBLE)

REQUIRES MULTIPLE VARIANCES OR REZONE TO PBZ

COMMENTS: REQUIRES THIRD FLOOR OVER BAYS SMALLER FOOTPRINT

BAYS

SECTION ORGANIZATION

T CA

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SE 68TH ST
100'-0"

NEW STATION
3 STORY
8500SF

HC

E
A
M

IMPERVIOUS
85% (12,688 SF)
PARKING
10 SPACES (W/ VAN ACCESSIBLE)

REQUIRES MULTIPLE VARIANCES OR REZONE TO PBZ

COMMENTS: AVOIDS BUILDING OVER THE BAYS
DRIVER-THRU BAYS

BAYS

SECTION ORGANIZATION

SKETCH G: 8500 SF STATION

MERCER ISLAND FIRE STATION 92
OCTOBER 09

1" = 30'-0"

TCA
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