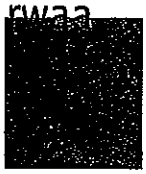

May 6, 2004

Kevin Crouthamel
Seattle Department of Parks and Recreation
Planning & Development Division
800 Maynard Avenue South, 3rd Floor
Seattle, Washington 98134-1336

RE: Lake Union Naval Reserve Building
Evaluation for Future Renovations

Dear Mr. Crouthamel:

We are pleased to provide you with our report regarding future improvements to the Lake Union Naval Reserve Building.

The existing Naval Reserve Building, located at South Lake Union in Seattle, is currently operated and maintained by the Seattle Parts and Recreation Department. The building, which is designated as a historic structure, was transferred to City ownership in 2000 from the Federal Government. It is currently used for offices and special events.

The objective of this report is to identify existing conditions, scope of work and corresponding CIP-level budget estimates related to future comprehensive planning for the building and the associated site. To accomplish this task, we conducted inspections of the existing building and reviewed all available documents pertaining to the construction and on-going maintenance of the building. We also obtained specific reports regarding the existing conditions and recommended improvements from structural, mechanical, and engineering consultants.

The basis for our review is the assumption that the ultimate use of the building will be compatible with that of a typical Parks Department community center building. This assumption allows for the greatest amount of flexibility for the eventual specific use of the building, which has not yet been determined. Further consideration was given to occupancy classification issues, City of Seattle code provisions regarding the Substantial Alteration of existing buildings, compliance with accessibility codes and ADA, and the overall condition of the existing building.

Ron Wright & Associates / Architects, PS
1932 First Avenue, Suite 616, Seattle, Washington 98101-1040 phone 206.728.4248 fax 206.728.4272

Overlaying the entire review process was the historic status of the building, and a covenant incorporated in the transfer of the property to the City of Seattle which requires all proposed renovations to be approved by the State of Washington Historic Preservation Officer.

Our report identifies three options for improvements, together with an estimate of the associated overall project costs for each:

Option One is for a complete renovation of the building. Once completed, the building would be of similar quality and character to what would be expected of a new community center. The total projected cost for a complete renovation of the building is $9,664,672.

Option Two provides for improvements necessary to simply bring the building in compliance with current building codes. These improvements represent the minimal amount of work necessary to achieve compliance with the structural design and accessibility provisions of the Seattle Building Code. The total projected cost for this work is $4,964,318.

Option Three is to maintain the building as it currently operates, with only minimal improvements necessary to for maintenance and essential maintenance and life/safety improvements. These improvements are consistent with maintaining the ongoing operation of the building as offices and a special events center. The estimated costs for these improvements, which are mostly maintenance related, is $1,717,697.

Thank you for the opportunity to assist you with identifying the future improvements and associated costs for the building. The Lake Union Naval Reserve Building clearly has the potential to be a valuable community resource.

Sincerely,

Ron Wright, AIA
Principal

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Lake Union Naval Reserve Building
Evaluation for Future Renovations

The intent of this report is to summarize the condition of the existing former Naval Reserve Building, currently owned by the City of Seattle and managed by the Department of Parks and Recreation, and to provide recommendations regarding options for future renovations.

As a foundation for determining the scope of work to be incorporated within each of the options, we conducted a thorough review of the building. Our report provides a summary of our findings, organized in the following manner:

- A brief history of the building, including a summary of the improvements that have occurred over time
- A summary of the issues pertaining to the use of the current and future building
- A review of the existing physical condition of the building
- The provisions relating to Substantial Alterations, as defined by the City of Seattle Building Code
- The building code issues pertaining to the building, including accessibility and energy code issues
- And lastly, the historical guidelines that must be followed as a component of any renovations to the building

For purposes of providing a range of options, we have identified three separate options of work, which vary with respect to the extent of work to be performed:

Option 1: Complete Project

This scope of work is for a complete renovation of the building with the assumption that the ultimate use of the building will be compatible with that of a typical Parks Department community center building. This assumption allows for the greatest amount of

flexibility for the eventual specific use of the building, which has not yet been determined.

Option 2: Substantial Alterations – Minimal Scope

This scope of work provides for improvements necessary to simply bring the building in compliance with current building codes. These improvements represent the minimal amount of work necessary to achieve compliance with the provisions of Chapters 11 and 34 of the Seattle Building Code, as elaborated upon in detail later in this report. The anticipated use guiding this effort would again be a use similar to that of a typical Parks Department community center.

Option 3: Minimal Code and Maintenance Improvements

This scope of work is comprised of only essential maintenance and life/safety improvements consistent with ongoing operation of the building as offices and a special events center. This scope of work does not attempt to provide any comprehensive ADA accessibility improvements.

The specific elements included within each of the above options are detailed further in this report. The projected costs for each of these options are based upon the following guiding parameters:

The improvements will be conducted as public works projects, subject to the typical wage and reporting requirements associated with public works projects.

The improvements will, to the greatest extent possible, incorporate LEED Incentive Program elements in conformance with the City of Seattle 2000 Sustainable Building Policy.

All work shall conform to the historic covenant incorporated as part of the transfer of the property from the federal government to the City of Seattle. This covenant mandates any improvements to the building be approved by the Washington State Historic Preservation Officer (SHPO).

The determination of the extent of improvements identified in each of the three options is based upon our evaluation of the building and our best judgment regarding the extent of improvements that may or may not be required by the City of Seattle permit process.

History

The Lake Union Naval Reserve Building was designed as a United States Naval Reserve Armory by the offices of Marcus Priteca and William Grant, and was constructed in 1940. It was used actively as a Naval Reserve center from the time it was built until it was transferred to the City of Seattle in the year 2000. The building has been continuously occupied since it was constructed.

The building is located at the south end of Lake Union in Seattle. The foundation system for the building is a concrete floor slab supported by timber piles capped with concrete pile caps. The construction of the building is reinforced concrete. The primary space in the building is a large multi-story high drill hall, surrounded by support and office spaces. Located above these spaces is a wood framed attic. This attic is used to conceal the distribution of mechanical and electrical utilities.

The drill hall is the centerpiece of the interior with its exposed steel trusses (currently partially concealed by suspended acoustical tile ceiling) and large interior undivided volume of space surrounded by a second floor balcony. The drill hall floor is unique, consisting of 2x4 wood studs cut into approximately 2 ½ inch length and installed end to end into a metal track resting on a mastic covered concrete slab. The interior walls of the building were constructed primarily using hollow clay tile with a plaster finish.

A review of available documents indicates the building has undergone periodic maintenance and improvement since it was constructed. However, the majority of these improvements were infrastructure related (heating, plumbing, and electrical systems, etc.), and the general character of the building remains largely intact.

In our review of the pertinent documents, we found the following documentation pertaining to repair and improvements:

1954 Showers added to women's restroom

1963 New roof, interior painting and miscellaneous improvements

1984 Extensive improvements, including the installation of new roofing, installation of suspended acoustical ceilings throughout the building (including the large drill hall space), limited

handicap accessibility improvements, exterior painting, complete replacement of all glazing, and selective replacement and upgrades to the mechanical and electrical systems in the building

1992 Exterior painting (entire building)

The improvements noted in the 1984 work were clearly the most significant of all the work reviewed.

The one notable component of the original building design that we observed to be missing relates to the roof. The original plans show two foot wide copper clad roof ribs placed to correspond with the location of the roof trusses below. The earliest available documentation is from roof repairs conducted in the early 1960's. While there is no indication that they were present at this time, it is possible that the ribs (if they were indeed installed as indicated) were removed prior to 1960.

A complete list of the documents used for the preparation of this report are incorporated as Attachment G.

Existing Conditions - Use

A primary issue pertaining to the building is the classified occupancy of the building. Because the building was constructed and operated as a federal government building until the recent transfer of ownership, the building has no established use or occupancy within the City of Seattle. Now that the building is owned by the City of Seattle, the use of the building has to be formally established.

As of the date of this report, the final determination of the established use of the building has not been made. Instead, the building is operating under a temporary use permit issued by the City of Seattle Department of Planning and Development (DPD). A key factor in the final decision by DPD regarding the use of the building is whether or not any improvements will be required as part of the establishment of the use.

The building, when it was constructed, was in compliance with the building codes in effect at that time. Buildings that are compliant with code in the year they are constructed are generally considered to be code compliant throughout their use even though the code changes from year to year, as long as the use of the building does not significantly change. For instance, if a building was constructed as a code compliant office building in 1940, and has continued to function as an office building since it was built, the building is considered to be code compliant. Any new improvements over the years are required to meet the codes current at the time of the improvements. Once the building use changes to more "hazardous" occupancy (from offices to assembly use, for instance), the building would be required to undergo renovations which bring the entire building into compliance with current code.

Therefore, as it currently operates, the existing Naval Reserve Building is compliant with code (based upon the constant uninterrupted use of the facility as offices and assembly spaces). However, there is gray area of interpretation that is brought on by the transfer of the building from federal to local control. Negotiations are currently underway between the Parks Department and DPD to reach an agreement regarding the establishment of the use of the building, and the extent of improvements required, if any, as a component of the establishment of the use.

Existing Conditions – Physical Conditions

Based upon our evaluation of the existing building and our review of the documents available regarding the existing construction, we have identified the following key areas of need for short and/or long term improvements.

Existing roof system: The roofing was installed as part of the 1984 work, and is in need of replacement within the next five years. At the upper roof, the existing roofing system was installed over existing roofing. The entire existing roofing system should be removed and replaced. It is likely this work may be incorporated into a separate project. However, because the scope of work of this separate project has not been determined, the roof replacement will be incorporated into the cost projections for all three scope of work options identified in this report.

(Installation of new roofing on the upper portion of the building should also incorporate the addition of a plywood diaphragm per the structural engineer's recommendations.)

The north portion of the roof of the building includes a roof-top mounted HVAC system, including associated ductwork. This system is no longer in use and should be removed.

The building's windows were installed in 1984. We noted a number of instances where the sealed double-pane glazing units have failed. These units are clouded with trapped moisture, but do not appear to be leaking. As part of the future repairs for the building, we recommend a replacement allowance for up to 20 percent of these glazing units, however replacement is not required to maintain the current use of the building.

The building was painted with an elastomeric-type coating in 1992. There are portions of this coating that need to be prepped and re-coated and this work should be performed as part of the near-term roof work so as to insure top-down water-tight integrity of the building envelope.

The interior finishes within the building are generally in good shape. Specific allowances for paint and some refurbishment of wood are included in the scope of work elements for each of the three options

identified. All of the interior painted surfaces are assumed to be coated with lead-based paint (from initial and subsequent coats of paint applied during the prevalence of lead-based paints). The current coating of paint covers or encapsulates the older lead-based paint.

The existing acoustical ceiling systems installed at the perimeter office and support spaces was installed as part of the 1984 improvements. The ceilings are installed approximately eighteen to twenty-four inches below the original ceiling which is largely still intact (but heavily damaged). The acoustical ceiling height is such that it is below the height of the exterior windows. The original ceiling is comprised of 12" x 12" acoustical ceiling panels glued to wood furring attached to the underside of the concrete structure above. There is a high likelihood of asbestos content in the glue used in the original ceiling system. Except for a few areas of the building, the existing ceiling system is concealed from view.

Although not verified, it is also assumed the existing light fixtures installed within the acoustical ceiling system are not in compliance with current energy codes, and likely include ballast systems that will require removal as a hazardous material if replacement of the fixtures is included as a scope of work item.

Existing floor finishes in the office and support spaces are at or beyond their useful life, and should be removed and replaced with new finishes (carpet and sheet vinyl) as part of any extensive renovations. It was also noted there is a significant amount of vinyl asbestos tile that will need to be removed.

The structural integrity of the building was reviewed by Coughlin Porter Lundeen. Their report, which evaluates the expected performance of the building during an earthquake event, is incorporated as Attachment D.

A summary of the mechanical and plumbing systems is as follows:

- The boiler is approximately 20 years old and is within 5 to 10 years of it's expected useful life.
- The pumps associated with the heating system are beginning to leak and need to be replaced.
- The hot water piping was replaced in 1985 and probably has about 15 years remaining of useful life and could remain.

- The fin tubes and convectors are mostly original devices and should be replaced.
- The piping insulation is missing in sections and require insulation patches and some replacement.
- The HVAC equipment on the roof is not operational and should be removed.
- The controls have been retrofitted from pneumatics controls and are in questionable state of operation. To control the systems independently and efficiently a new DDC system should be provided with zone controls and room thermostats.
- The plumbing fixtures appear to be in working order but only have approximately 5 years remaining for useful life.

A summary of the electrical conditions is as follows:

- The existing 480 volt, 3 phase Seattle City Light (SCL) overhead service is from a SCL power pole on Terry Avenue North. The actual service is to single-story concrete bunker at the West side of Terry Avenue North. The SCL point of service is at this bunker. The Armory Building is sub-fed underground from this bunker. This configuration whereby the building derives its power service from another building is not in compliance with the National Electric Code (NEC).
- There are two power services entering the building from the bunker: A 225 amp, 480 volt, three phase service and an 800 amp, 120/240 volt, single phase service. The service disconnects for both services are located in the Main Electrical room at the south end of the building. The main switchboard and a majority of the branch circuit panels were installed during the mid-1980's remodel and appear to be in good condition. However, the existing 120/240 volt, single-phase service to the building extends beyond 15 feet from where the conduit enters the building before encountering the main disconnect which violates the NEC.
- Existing water piping is routed above existing panel boards at some locations which violates the NEC.
- Wall receptacle mounting heights do not meet present ADA requirements.
- Fire alarm manual pull stations are required at all exits, and are presently missing at some exits. Manual pull station mounting

heights do not meet present ADA requirements. Fire alarm annunciation does not meet present ADA requirements.

- There are very few receptacles provided in the Gymnasium. Office receptacles have been retrofitted in surface mounted raceway in offices with an average of one receptacle per wall.
- The existing interior lighting system generally consists of high-bay quartz or HID fixtures in the Gymnasium and recessed 2'x4' fluorescent fixtures with prismatic acrylic diffusers in the offices. The Gymnasium fixtures appear to be in good condition and, according to the Building Manger, provide good lighting levels for gymnasium activities. The office and restroom fixtures are generally in poor condition. Interior lights are controlled by toggle switches, with the exception of the gymnasium lights which are controlled by panel circuit breakers.
- The existing emergency lights are battery pack "bug-eye" type located throughout the building. The "bug-eye" fixtures are nearing the end of their life expectancy. The existing exit signs are fed from a 1000 watt inverter located in the Main Electrical room. The inverter appears to be operating correctly, but is very old.
- The existing exterior lighting consists of parapet mounted flood lights, which appear to be in good condition, decorative lamp heads at the west entry, which appear to be in satisfactory condition, and fluorescent strip lights located at the west entry, which are in poor condition.
- The existing zone type fire alarm system is by Silent Knight and consists of manual pull stations at tops of stairs and at some exits, heat detectors in attic spaces and audible alarms in common areas. The existing system is obsolete. The main fire alarm control panel is located in the Chaplain's Office on the south end of the second floor. The fire alarm annunciator is located in the West Foyer. There is no fire protection system for the fire alarm system to monitor. It was not determined how or if the fire alarm system is remotely monitored.

Substantial Alterations

Chapter 34 of City of Seattle Building Code (SBC) stipulates the provisions for determining the extent of code upgrades required for renovation projects. Chapter 11 of the SBC also has criteria for classifying improvements to determine if buildings must be brought up to current code with respect to accessibility (ADA) requirements.

Per Chapter 34 of the SBC, the following are the criteria for determining if the project is to be classified as a Substantial Alteration:

- Extensive Structural Repair
- Remodeling which substantially extends the useful physical and/or economic life of the building
- A change of a significant portion of the building to an occupancy that is more hazardous (based upon the combined life safety and fire risk, as determined by DPD).
- Re-occupancy of a building that has been vacant for over 24 months.
- A significant increase in the occupant load of a building constructed primarily with unreinforced masonry.

Ultimately, the determination of whether or not alterations or renovations are to be classified as Substantial Alterations is made by DPD after an evaluation is made regarding the proposed improvements. There is no set objective criteria for this decision. Each project is evaluated for its own characteristics in relation to the specific criteria listed above. However, one major factor in the evaluation is the comparison of the amount of funds being spent for the improvements with the overall value of the structure itself. There is no set ratio that triggers the Substantial Alteration provision, but as the ratio increases to 60%, the determination that the improvements are Substantial Alterations becomes more certain. The 60% mark also is an automatic trigger for the Substantial Alteration provisions of Chapter 11 (Accessibility). It is rare (but not impossible) for improvements to be classified as Substantial Alterations under Chapter 11, and not under Chapter 34.

It is based upon this framework for determining whether or not proposed improvements are classified as Substantial Alterations, and the extent of work required once it is determined that the improvements are Substantial Alterations, that we identified the three specific scope of work options provided in this report.

The **Option 1: Complete Project** scope of work incorporates all the work necessary to comply with the provisions of the Substantial Alterations provisions of the code, while at the same time providing for complete renovations to provide for long term use of the building as a community facility.

The **Option 2: Substantial Alterations – Minimal Scope** work includes only the improvements necessary to satisfy the provisions required under the Substantial Alterations provision. This work provides for accessibility to the second floor (via a new elevator), additional accessibility improvements, and the structural improvements described in the structural engineer's report.

The **Option 3: Minimal Code and Maintenance Improvements** work is comprised of work elements that provide only essential occupancy compliance and maintenance items. It is our judgment that this work will not be classified as Substantial Alterations by DPD. This work makes little or no attempt to provide for programmatic accommodations or ADA access beyond the existing level.

Building Code Issues

The City of Seattle has adopted the International Building Code (IBC), effective July 1, 2004. City of Seattle amendments to the code have not been adopted as of the time of this report. We have reviewed the building under the current code (1997 edition of the Uniform Building Code, with City of Seattle Amendments), and have noted there are no significant code changes in the adoption of the IBC code that affect the scope of the renovations.

Under the UBC, the drill hall space is classified as an A2.1 Occupancy, with special requirements for assembly use. In the IBC, the drill hall space is classified as an A3 Occupancy, with similar (if not equal) requirements for assembly use. All but a few of the rooms which surround the hall will be classified as B Occupancy (or as non-occupied support spaces).

As noted previously, the building as it currently exists is compliant with the building code by virtue of the fact that the building was originally compliant with code, and the use of the building has not changed since it was built.

Because the building was constructed and operated as a U.S. Navy building, it was never officially classified under the Uniform Building Code. Based upon the current provisions of the code (and the IBC), the building would likely be classified as Type III-1hr (assuming an automatic fire sprinkler is ultimately installed). The reasoning behind this classification has to do with the presence of combustible wood framing supporting the lower roof (around the entire perimeter of the building) and the presence of existing 2 x 6 wood roof decking.

The key component to Type III-1hr classification (which is required for the assembly occupancy) is the addition of the automatic fire sprinkler system. Installation of the system would need to be per code, and should be installed to be as unobtrusive as possible within the historic spaces of the building.

A further key item regarding code compliance is the existing design for the railing at the second floor walkway in the drill hall space. This railing was installed as part of the 1984 improvements, and is designed in compliance with the building code in effect at that time. The spacing between the pickets in the railing is six inches. Current code requires a

minimum spacing of 4 inches between the pickets. Because of the intended public use of the facility, and the fact that this railing is not the original railing installed when the building was constructed, it is highly likely replacement would be required as part of the Substantial Alteration requirements.

Accessibility

The primary deficiency of the existing building is the lack of accessible access to the second floor. Access is also not present to the small third and fourth floors. If future public access to these areas is desired, a method for accessibility to these floors must also be considered. Accessibility for the second floor should be a primary component of any future long-term improvements, and will be required under the Substantial Alteration provisions. We have identified two options for providing elevator access to the second floor: installation of a new elevator within the existing building, or installation of a new addition to the side of the building which incorporates an elevator with access to the second floor. Depending upon the location chosen for a new elevator within the building, some changes to the building envelope may be required (to accommodate the required elevator penthouse structure), and would need to be designed in compliance with the historic guidelines identified later in this report. Any addition to the building would also need to be designed in conformance to these guidelines as well. The characteristics of the exterior of the building and the existing site lead us to propose the elevator be installed within the building. Installation at the north end of the building would be likely, as it would make use of the extra space available on the two small upper floors for the override space required by the elevator portion of the building code. It is also highly likely this would be the preferred method of the Washington State Historical Preservation Officer (SHPO) for installing an elevator. (The historical issues are outlined later in this report.)

A ramp for first floor accessibility was installed at the southwest corner of the building in 1984. The steel ramp, as installed, is not compliant with the current requirement for a 60 inch clear landing at the top of the ramp. While access to the southwest corner entrance complies with intent to provide access, it is recommended and preferred that an accessible means of entering the building be provided at or near the main entry to the building.

Other studies for the site have proposed a large raised area at the front entry that would eliminate the steps at the front entry. This raised area would have a code compliant access ramp at the southern end. It is our opinion this new raised area would be an acceptable solution to the SHPO. (There are at least two underground fuel tanks in this area which will need to removed as part of the work to add the new raised area).

Improvements in 1984 reduced the number of toilet fixtures by one in both the men's and women's restrooms in order to provide an accessible toilet stall within each. While the existing restrooms are identified as being accessible, the door and access to the women's room does not comply with ADA code.

Per current code, the occupancy of the large drill hall space would require 7 toilet fixtures for the women's room, and a combination of 4 toilets and 3 urinals for the men's room. There are currently only 2 toilets in the first floor women's room, 3 toilets and 4 urinals in the first floor men's room. Our recommendation is for new restrooms (and shower rooms) to be installed at a new location, in compliance with current code. While the existing restrooms have been identified as having some historical significance, our opinion is that the installation of new restrooms would be acceptable to SHPO.

In order to provide for supervision and control of the facility, we recommend the area currently occupied by the men's restrooms be converted to an administration and control area, directly adjacent and open to the main entry to the building.

There are other minor accessibility items that would be required to be remedied under the Substantial Alteration provisions, including the replacement of door hardware to provide lever handles.

Energy Code

In general, compliance with current energy codes is to be balanced with the historic issues. For instance, existing exterior walls would not be required to be fully insulated per current code because the installation of the insulation would alter the historic character of the building.

As part of the roofing replacement, the new roof is required to be fully insulated per current code. For the upper roof, a new installation of rigid insulation is recommended. For the lower perimeter roof, we recommend a new layer of rigid insulation be installed below the new

roof system. The attic space below this roof system includes building system piping that would need to be freeze-protected (and the attic space would need to be ventilated) if new insulation is installed at the top of the existing second floor ceiling slab. The attic space would also likely be used for installation of a new automatic fire sprinkler system.

The existing windows are sealed insulated units, and are compliant with current code. As previously noted, some of the units will need to be replaced with new units.

Additional means for energy savings include the possibility of installing insulation at the underside of the existing first floor slab (which is elevated above Lake Union), and the possible use of a concealed recirculation system at the drill hall space to minimize the extent of heating required for the large volume of space. Current code will require a ventilation system to be installed for this space, as well as the other large rooms used for assemblies.

The mechanical and electrical reports provide additional information regarding the code issues pertaining to the individual systems.

Historical Issues

The transfer of ownership of the building from the U.S. Navy to the City of Seattle occurred in 2000. The building was described as "Building 10" in the transfer documents. The transfer and sale of the building included a stipulation that all improvements comply with the recommended approaches in the Secretary of the Interior's "Standards for Rehabilitation and Guidelines for Rehabilitating Buildings" (Department of the Interior, National Park Service), and that all improvements be approved by the Washington State Historic Preservation Officer (SHPO).

The text of the transfer agreement is included as Attachment A to this report. This text includes a detailed description of the elements of the building that are considered to be historic.

Any improvements planned for the building are, as indicated, subject to compliance with the Secretary of the Interior's "Standards for Rehabilitation and Guidelines for Rehabilitating Buildings." Any considerations regarding the eventual future use of the building need to incorporate a consideration of these standards and guidelines. The full text of the standards is attached to this report as Attachment B.

Item No. 9 of the Standards is perhaps the most relevant regarding future plans for the building:

> 9. *New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its environment.*

The Guidelines also provide guidance regarding additions and alterations to the historic buildings in relation to new uses for the building. These guidelines are appended as Attachment C.

When combining these provisions with those required by the Substantial Alteration provisions, a certain balance is necessary to allow for both provisions to be applied. In general, it is acceptable for some necessary structural improvements to impact the historic character of the building, and as well, it is acceptable for some provisions of the building code to

be waived in order to preserve the historical integrity of the building. The eventual balance between these two provisions will ultimately be negotiated with the City of Seattle DPD. For example, it would not be necessary to install new insulation at the exterior walls of the building (to meet the provisions of the current Energy Code) because doing so would impact the historic character of the building. And similarly, replacing four bays of upper windows at the drill hall to meet the seismic code requirements would be considered a necessary balance between the need to reinforce the building structurally, and the desire to maintain as much of the historic integrity of the drill hall as possible.

In general, the historic guidelines preclude any major improvements or additions that alter the historic character of the building. It would not be possible, for instance, to divide the drill hall space into multiple separate rooms.

Overall Site Design

Our office also reviewed the current state of plans for the overall development of the South Lake Union area. It is clear from these plans that the former Naval Reserve Center is a primary component of these plans.

The costs identified in **Option 1: Complete Project** scope of work include provisions for the construction of a large raised area at the front (west side) of the building, and pathway lighting to the proposed parking on near Westlake Avenue.

The costs identified in **Option 2: Substantial Alterations – Minimal Scope** improvements provide for a new raised entry at the front door, but only to the extent necessary to provide for a ramp for barrier free accessibility.

The costs identified in **Option 3: Minimal Code and Maintenance Improvements** do not include site related improvements.

Cost Projections

Using the various criteria identified above, as well as the structural, mechanical, and electrical work identified in attached reports, we have prepared, with assistance from Turner Construction, estimates of the probable construction costs for each of the identified scope of work options.

A summary of each of the options follows, together with detailed cost projections for each.

Option 1: Complete Project

This scope of work is for a complete renovation of the building for use of the building compatible with that of a typical Parks Department community center building.

The scope of the improvements are described within the attached estimate of probable construction costs. The overall intent is to provide an updated facility that is essentially equal to a new building. All aspects of the existing building are updated to current code. Key elements of this work include:

Complete removal of all hazardous materials and lead based paint. The process for removal of the lead based paint is a soft bead-blast method. After removal, the walls will require a coating of veneer plaster to patch over the uneven surface left by the removal process. A complete and current hazardous materials survey was not available. Using previously prepared reports, we developed an estimate of the likely costs associated with removal.

New accessible restrooms and shower rooms in conformance with code and Parks Department Standards. These would be located somewhere within the perimeter office spaces of the building, on both the first and second floors.

Renovation of the existing men's room adjacent to the main entry to become the administrative offices and control station for building. It is envisioned a counter could be installed between the entry lobby and this space.

Installation of new elevator within the northern portion of the building, providing access to the second floor only. The small third and fourth floor spaces would remain as non-accessible, non-public spaces.

Construction of a new large entry plaza that incorporates a barrier-free access ramp. The costs also include allowances for soil remediation based upon the history of soil issues directly adjacent to the building, and an allowance for upgrades to the existing storm water system which now appears to directly drain into Lake Union.

For long term use of the facility, it is our recommendation the existing acoustical ceiling in the perimeter offices be completely removed and replaced with a hard lid ceiling with acoustical tile overlay to more closely match the original construction. Much of the

existing acoustical ceiling would need to be removed anyway in order to remove the old existing ceiling which is suspected to have asbestos content.

The estimate also includes the removal of the acoustical ceiling grid in the drill hall.

The entire roof system is shown as being replaced, which is a necessary component of all options. Also included is a new paint coating for the entire exterior.

The structural improvements are those identified in the attached structural engineer's report, including the addition of roof diaphragm material, connection of the roof diaphragm to the exterior walls, installation of lateral resistant panels (in place of four existing window bays), structural reinforcement of columns, and selective bracing of hollow-clay tile walls adjacent to assembly spaces.

Mechanical and electrical improvements are as described in the attached engineer's reports, and are intended to provide for future long term use of the facility. Specific improvements include a new fire sprinkler system, a new boiler and associated pumps, a new fire alarm system, code required upgrades to the existing electrical system, and new security and communication systems.

Included in the electrical improvements is the relocation of the existing electrical service to the building, which is currently provided via overhead power lines to the nearby bunker. Consistent with the overall plans for the site, it is desirable for the power lines to be underground.

Per the attached spreadsheet, we project the total project cost for the above described improvements to be **$9,664,672**.

OPTION 1: COMPLETE PROJECT

Lake Union Naval Reserve Renovation

Estimate of Probable Construction Costs
6-May-04

										NOTES (See Below)
SITE IMPROVEMENTS:										
1 Underground Existing Power Lines & Structures	1	ls	x	$	95,000.00	=	$	95,000		(9)
2 Install new 6" DC \ FDC (fire sprinkler)	1	ea	x	$	30,000.00	=	$	30,000		
3 Install new 6" Fire Lateral (fire sprinkler)	50	lf	x	$	50.00	=	$	2,500		
4 Landscape Repair Allowance	1	ls	x	$	5,000.00	=	$	5,000		
5 Pathway Lighting and Signage to Building	1	ls	x	$	12,000.00	=	$	12,000		
6 Demo Existing S.W. Ramp	1	ls	x	$	750.00	=	$	750		
7 Allowance for removal of underground fuel tanks	1	ls	x	$	10,000.00	=	$	10,000		
8 New raised entry plaza with ADA ramp	1	ls	x	$	85,000.00	=	$	85,000		
9 Architectural Site Lighting Allowance	1	ls	x	$	25,000.00	=	$	25,000		
10 Storm Drainage Allowance	1	ls	x	$	20,000.00	=	$	20,000		
11 Soils remediation SW Corner Allowance	1	ls	x	$	50,000.00	=	$	50,000	$ 335,250	(1)
BUILDING IMPROVEMENTS - EXTERIOR:										
1 Prep. \ Paint Building Exterior	28,575	sf	x	$	2.30	=	$	65,705		
2 Replace 20% of Perimeter Exterior Dual Pane Glass	1,692	sf	x	$	45.00	=	$	76,140		
3 Allowance for floor slab repair (from underside)	1	ls	x	$	20,000.00	=	$	20,000		
4 3" Foam R-9 Rigid Insulation Under Exp Struct. Slab	7,420	sf	x	$	6.45	=	$	47,882	$ 209,727	
BUILDING IMPROVEMENTS - INTERIOR:										
Perimeter Offices										
1 Refinish Existing Perimeter Offices	24,385	sf	x	$	33.00	=	$	804,705		
2 3 Coat Plaster - Smooth Sand Finish	6,083	sy	x	$	49.50	=	$	301,109		(2)
3 Paint Walls	54,750	sf	x	$	0.75	=	$	41,063		
4 Selective Demolition	24,385	sf	x	$	2.00		$	48,770	$ 1,195,646	(3)
Common Areas										
1 1st Floor Men's \ Women's Bathrooms	600	sf	x	$	155.00	=	$	93,000		(4)
2 2nd Floor Men's \ Women's Bathrooms	420	sf	x	$	155.00	=	$	65,100		(4)
3 Entry Reception Area	420	sf	x	$	45.00	=	$	18,900		(5)
4 New Second Floor Handrail	400	lf	x	$	60.00	=	$	24,000		
5 Paint Second Floor Handrail	400	lf	x	$	5.00	=	$	2,000		
6 Remove Existing ACT in Drill Hall	15,456	sf	x	$	0.75	=	$	11,592		
7 New surface mounted acoustical panels at Drill Hall	1	ls	x	$	9,500.00	=	$	9,500		
8 3 Coat Plaster, Smooth Sand Finish	3,326	sy	x	$	51.00	=	$	169,637		
9 Paint Walls	29,930	sf	x	$	1.25	=	$	37,413		
10 Wood Refinishing Allowance	49,187	sf	x	$	0.50	=	$	24,594		
11 Paint Drill Hall Joist & Girder System	15,456	sf	x	$	1.50	=	$	23,184		
12 Install 2' x 8' White Acoustical Tile - Tectum (Surface Mount to Underside of Roof/Ceiling Structure)	14,628	sf	x	$	5.07	=	$	74,175		
13 Drill Hall Floor Protection	10,000	sf	x	$	3.00	=	$	30,000	$ 583,094	
Roof Upgrades										
1 Remove Existing Roofing	29,605	sf	x	$	0.75	=	$	22,204		
2 Polyiso Insulation Board - R30	29,605	sf	x	$	1.35	=	$	39,967		
3 Two Ply Modified Bituminious Roofing @ Low Roof	16,000	sf	x	$	11.00	=	$	176,000		
4 Modified Three Tab Shingle Roofing @ High Roof	13,605	sf	x	$	8.00	=	$	108,840		
5 Vent Board @ High Roof	13,605	sf	x	$	3.00	=	$	40,815		
6 Reconnect \ Modify Roof Drains	16	ea	x	$	1,450.00	=	$	23,200		
7 Paint Back Side of Parapet - Elastomeric	4,080	sf	x	$	1.00	=	$	4,080		
8 Sheet Metal Reglet & Counterflashing	1,360	lf	x	$	11.00	=	$	14,960		
9 Top of Parapet Coping	1,360	lf	x	$	12.00	=	$	16,320	$ 446,386	
Structural Upgrades										
1 Infill 4 Existing High Windows W\P.I.P. Wall	512	sf	x	$	65.00	=	$	33,280		(6)
2 Provide Fiber-reinforced Composite Wrap @ Interior Col.	20	ea	x	$	1,800.00	=	$	36,000		
3 Allowance for structural upgrade to selected HC tile walls	1	ls	x	$	15,000.00	=	$	15,000		(7)
4 Roof Sheathing With 3\4" STRUCT. I Plywood Over T & G	13,605	sf	x	$	2.25	=	$	30,611		
5 Sill Angle Plate @ Roof Tie-in	260	lf	x	$	20.00	=	$	5,200		
6 Anchor Roof Sill Plates to Perimeter Walls 24" O.C.	130	ea	x	$	50.00	=	$	6,500	$ 126,591	

OPTION 1: COMPLETE PROJECT

Hazardous Material Abatement - Owner Allowance								
1 Hazmat Report(s)	1 ls	x	$ 15,000.00	=	$ 15,000			
2 Soft Bead Blast Interior Walls - Lead Paint	84,680 sf	x	$ 4.00	=	$338,720			(8)
3 Remove Flooring @ Perimeter Office Areas	24,385 sf	x	$ 1.50	=	$ 36,578			
4 Remove Glued Ceiling Tiles @ Perimeter Office Areas	24,385 sf	x	$ 1.50	=	$ 36,578			
5 Remove Existing Light Ballasts	270 ea	x	$ 20.00	=	$ 5,400			
6 Allowance for asbestos pipe wrap and lining	1 ls	x	$ 25,000.00	=	$ 25,000			
7 Miscellaneous removal (i.e. unknown conditions)	1 ls	x	$ 10,000.00	=	$ 10,000	$	467,275	
Fire Protection								
1 Install PIV \ Backflow \ Riser	1 ea	x	$ 5,000.00	=	$ 5,000			
2 Install Fire Protection Overhead	49,187 sf	x	$ 3.50	=	$172,155	$	177,155	
Mechanical								
1 General Mechanical Upgrade	49,187 sf	x	$ 3.52	=	$173,000			
2 Remove Existing Roof-top HVAC Units @ North Portion of The Building and Associated Ductwork	1 ls	x	$ 15,000.00	=	$ 15,000			
3 Add Code Required Ventilation	1 ls	x	$ 50,000.00		$ 50,000			
4 Install New Space Heaters & Piping @ the Drill Hall	4 ls	x	$ 7,500.00	=	$ 30,000	$	268,000	
Electrical								
1 Install 2000 AMP UGPS	1 ls	x	$ 3,000.00	=	$ 3,000			
2 Install Main Switch Gear 1,200 AMP	1 ls	x	$ 15,000.00	=	$ 15,000			
3 Electrical Upgrades	1 ls	x	$ 74,000.00	=	$ 74,000			(9)
4 Install 400W HID Lighting in Drill Hall	40 ea	x	$ 850.00	=	$ 34,000			
5 Specialty Lighting	1 ls	x	$ 15,000.00	=	$ 15,000			
6 Security \ Fire Alarm & Life Safety - Office	27,337 sf	x	$ 2.20	=	$ 60,141			(10)
7 Security \ Fire Alarm & Life Safety - Common	20,830 sf	x	$ 1.75	=	$ 36,453			(10)
8 Office and Reception Area Data Cabling	24,805 sf	x	$ 3.00	=	$ 74,415	$	312,009	
Elevator Addition:								
1 Elevator Housing (includes structural allowance)	1 ls	x	$ 90,000.00	=	$ 90,000			
2 Elevator Equipment and Installation - 3000 lb Holeless	1 ls	x	$ 36,000.00	=	$ 36,000			(11)
3 Elevator Cab Finish Allowance	1 ls	x	$ 7,500.00	=	$ 7,500	$	133,500	
MISC.:								
1 General Cleaning	49,187 sf	x	$ 0.50	=	$ 24,594			
2 Door Hardware	17 ea	x	$ 500.00	=	$ 8,500			
3 Kitchen Area - Allowance	1 ls	x	$150,000.00	=	$150,000	$	183,094	(12)
General Conditions	9 mo	x	$ 30,000.00	=	$270,000	$	270,000	(13)
Design Contingency					15%	$	706,159	
				SUBTOTAL			**$ 5,413,885**	
				General Contractor's O & P & Bond	8.5%	$	460,180	
				General Contractor's Taxes and Insurance	1.25%	$	73,426	
				SUBTOTAL			**$ 5,947,491**	
				Associated Direct Project Costs (permits, fees, taxes, etc.)	62.5%	$	3,717,182	
				TOTAL ESTIMATED PROJECT COSTS			**$ 9,664,672**	

Notes

1 Allowance is included to provide roof drainage system that complies with current standard environmental practices.

2 Veneer plaster system applied after paint removal process (which will likely damage existing plaster walls).

3 Includes necessary demolition to relocate restrooms, install new kitchen, etc.

4 New code compliant restrooms at new location within existing spaces currently used as offices.

5 New administration/control room located at existing first floor men's room location, adjacent and open to main entry for the building.

Notes (continued)

6 Per the structural evaluation, two of the upper window bays on both sides of the drill hall will need to filled in with concrete to provide seismic lateral strength for the existing structure. This is a common solution which, in our opinion will be approved by SHPO. In general, the National Park Services Guidelines recognize the balance necessary between the structural viability of the building and the historic aspect of the building. During the formal design for the improvements, other less invasive methods (such as a steel truss) could be researched. However, the cost associated with providing the additional strength, using concrete or steel, will not vary significantly from that shown.

7 This is an allowance which is based upon the likely requirements for bracing existing hollow clay tile walls. It is not possible to specifically identify the scope of work for bracing until a formal meeting is conducted with the City of Seattle Department of Planning and Design (DPD) to review and obtain approval for the overall approach to structural design for the project. Our past experience with similar conditions suggests this amount is reasonable, but the ultimate cost will be dependent upon the DPD review.

8 Soft bead blast to remove all lead based paint. The amount shown reflects a dry method of removal. If it is determined that a chemical or acid wash type of removal system is required, the cost would escalate to approximately $10.00 per square foot.

9 City Light charges not included in this amount. Includes new service installation and removal of existing concrete bunker.

10 Includes CCTV security system for building.

11 Assumes two-stop elevator. No access planned for third and fourth floors.

12 This amount is based upon the installation of a commercial kitchen, approximately 600 square feet, including a commercial hood.

13 General Conditions includes Division 0 items and in general, direct costs associated with operating the project, including but not limited to, project management, project supervision, temporary offices, temporary utilities, periodic cleaning, transporation, hauling, and disposal expenses not normally covered by sub-contractors, dust control, temporary fencing, etc.

Option 2: Substantial Alterations – Minimal Scope

This scope of work provides for improvements necessary to bring the building in compliance with current building codes. The scope of work is centered around providing for the structural upgrades described in the structural engineer's report, and the required accessibility improvements to provide for full access to the building and to the second floor of the building.

Specific scope of work items include:

Selected removal of hazardous materials. Only those materials necessary to be removed to incorporate the scope of work would be removed, including any hazardous pipe insulation in public areas, and removal of all vinyl asbestos floor tile. Lead-based paint is to remain encapsulated under existing and new paint.

New accessible restrooms and shower rooms in conformance with code and Parks Department Standards. These would be located somewhere within the perimeter office spaces of the building, on both the first and second floors.

Renovation of the existing men's room adjacent to the main entry to become the administrative offices and control station for building. It is envisioned a counter could be installed between the entry lobby and this space.

Installation of new elevator within the northern portion of the building, providing access to the second floor only. The small third and fourth floor spaces would remain as non-accessible, non-public spaces.

Construction of a new raised entry area that incorporates a barrier-free access ramp. The size of this "plaza" is significantly reduced from the size anticipated for the Complete Project. Only minimal allowances are provided for soil remediation and no allowance is included for storm water system upgrades.

The existing acoustical ceiling in the perimeter offices and at the drill hall is to remain. An allowance is provided for minimal maintenance related upgrades.

The entire roof system is shown as being replaced, together with a new paint coating for the entire exterior.

The structural improvements identified in the scope of work for the complete project are also incorporated in this option.

Mechanical and electrical improvements are incorporated only to the extent required to be in compliance with current building codes. Specific improvements include a new fire sprinkler system, a new fire alarm system, as well as code required upgrades to the existing electrical and mechanical systems. Included as well is the installation of a DDC control system for the heating system. The existing boiler would remain.

The relocation of the existing power service to the building from overhead to an underground installation is not required by code, and is therefore not included in this scope of work. However, the service would be required to be upgraded and changed to comply with code (i.e., removal of the sub-service installation from the existing bunker). Additional power is also required due to the installation of the elevator.

Per the attached spreadsheet, we project the total project cost for the above described improvements to be **$4,964,318**.

OPTION 2: SUBSTANTIAL ALTERATIONS - MINIMAL SCOPE

Lake Union Naval Reserve Renovation

Estimate of Probable Construction Costs
6-May-04

										NOTES (See Below)
	SITE IMPROVEMENTS:									
2	Install new 6" DC \ FDC (fire sprinkler)	1	ea	x	$	30,000.00	=	$ 30,000		
3	Install new 6" Fire Lateral (fire sprinkler)	50	lf	x	$	50.00	=	$ 2,500		
4	Landscape Repair Allowance	1	ls	x	$	5,000.00	=	$ 5,000		
6	Demo Existing S.W. Ramp	1	ls	x	$	750.00	=	$ 750		
7	Allowance for removal of underground fuel tanks	1	ls	x	$	10,000.00	=	$ 10,000		
8	New raised entry plaza with ADA ramp	1	ls	x	$	30,000.00	=	$ 30,000		
9	Architectural Site Lighting Allowance	1	ls	x	$	5,000.00	=	$ 5,000	$ 83,250	
	BUILDING IMPROVEMENTS - EXTERIOR:									
1	Prep. \ Paint Building Exterior	28,575	sf	x	$	2.30	=	$ 65,705		
2	Replace 20% of Perimeter Exterior Dual Pane Glass	1,692	sf	x	$	45.00	=	$ 76,140		
3	Allowance for floor slab repair (from underside)	1	ls	x	$	20,000.00	=	$ 20,000		
4	3" Foam R-9 Rigid Insulation Under Exp Struct. Slab	7,420	sf	x	$	6.45	=	$ 47,882	$ 209,727	
	BUILDING IMPROVEMENTS - INTERIOR:									
	Perimeter Offices									
1	Refinish Existing Perimeter Offices - Allowance	1	ls	x	$	150,000.00	=	$150,000		
3	Paint Walls	1	ls	x	$	15,000.00	=	$ 15,000		
4	Selective Demolition	1	ls	x	$	20,000.00		$ 20,000	$ 185,000	(1)
	Common Areas									
1	1st Floor Men's \ Women's Bathrooms	600	sf	x	$	155.00	=	$ 93,000		(2)
2	2nd Floor Men's \ Women's Bathrooms	420	sf	x	$	155.00	=	$ 65,100		(2)
3	Entry Reception Area	420	sf	x	$	45.00	=	$ 18,900		(3)
4	New Second Floor Handrail	400	lf	x	$	60.00	=	$ 24,000		
5	Paint Second Floor Handrail	400	lf	x	$	5.00	=	$ 2,000		
6	New ACT Panels in Drill Hall plus misc. upgrade to system	15,456	sf	x	$	0.25	=	$ 3,864		
9	Paint Walls - Allowance	1	ls	x	$	20,000.00	=	$ 20,000		
10	Wood Refinishing Allowance	1	ls	x	$	6,000.00	=	$ 6,000		
13	Drill Hall Floor Protection	10,000	sf	x	$	2.00	=	$ 20,000	$ 252,864	
	Roof Upgrades									
1	Remove Existing Roofing	29,605	sf	x	$	0.75	=	$ 22,204		
2	Polyiso Insulation Board - R30	29,605	sf	x	$	1.35	=	$ 39,967		
3	Two Ply Modified Bituminious Roofing @ Low Roof	16,000	sf	x	$	11.00	=	$176,000		
4	Modified Three Tab Shingle Roofing @ High Roof	13,605	sf	x	$	8.00	=	$108,840		
5	Vent Board @ High Roof	13,605	sf	x	$	3.00	=	$ 40,815		
6	Reconnect \ Modify Roof Drains	16	ea	x	$	1,450.00	=	$ 23,200		
7	Paint Back Side of Parapet - Elastomeric	4,080	sf	x	$	1.00	=	$ 4,080		
8	Sheet Metal Reglet & Counterflashing	1,360	lf	x	$	11.00	=	$ 14,960		
9	Top of Parapet Coping	1,360	lf	x	$	12.00	=	$ 16,320	$ 446,386	
	Structural Upgrades									
1	Infill 4 Existing High Windows W\P.I.P. Wall	512	sf	x	$	65.00	=	$ 33,280		(4)
2	Provide Fiber-reinforced Composite Wrap @ Interior Col.	20	ea	x	$	1,800.00	=	$ 36,000		
3	Allowance for structural upgrade to selected HC tile walls	1	ls	x	$	15,000.00	=	$ 15,000		(5)
4	Roof Sheathing With 3\4" STRUCT. I Plywood Over T & G	13,605	sf	x	$	2.25	=	$ 30,611		
5	Sill Angle Plate @ Roof Tie-in	260	lf	x	$	20.00	=	$ 5,200		
6	Anchor Roof Sill Plates to Perimeter Walls 24" O.C.	130	ea	x	$	50.00	=	$ 6,500	$ 126,591	
	Hazardous Material Abatement - Owner Allowance									
1	Hazmat Report(s)	1	ls	x	$	15,000.00	=	$ 15,000		
3	Remove Flooring @ Perimeter Office Areas	24,385	sf	x	$	1.50	=	$ 36,578		
6	Allowance for asbestos pipe wrap and lining	1	ls	x	$	25,000.00	=	$ 25,000		
7	Miscellaneous removal (i.e. unknown conditions)	1	ls	x	$	10,000.00	=	$ 10,000	$ 86,578	
	Fire Protection									
1	Install PIV \ Backflow \ Riser	1	ea	x	$	5,000.00	=	$ 5,000		
2	Install Fire Protection Overhead	49,187	sf	x	$	3.50	=	$172,155	$ 177,155	

OPTION 2: SUBSTANTIAL ALTERATIONS - MINIMAL SCOPE

Mechanical						
2 Remove Existing Roof-top HVAC Units @ North Portion of The Building and Associated Ductwork	1 ls x $ 15,000.00 =	$ 15,000				
3 Add Code Required Ventilation	1 ls x $ 35,000.00	$ 35,000				
4 Miscellaneous Mechanical Improvements	1 ls x $ 25,000.00 =	$ 25,000	$ 75,000	(9)		
Electrical						
1 Install 2000 AMP UGPS	1 ls x $ 3,000.00 =	$ 3,000				
2 Install Main Switch Gear 1,200 AMP	1 ls x $ 15,000.00 =	$ 15,000				
3 Electrical Upgrades	1 ls x $ 45,000.00 =	$ 45,000				
4 Install 400W HID Lighting in Drill Hall	0 ea x $ 850.00 =	$ -				
5 Specialty Lighting	1 ls x $ 15,000.00 =	$ 15,000				
6 Security \ Fire Alarm & Life Safety - Office	27,337 sf x $ 2.20 =	$ 60,141				(6)
7 Security \ Fire Alarm & Life Safety - Common	20,830 sf x $ 1.75 =	$ 36,453				(6)
8 Office and Reception Area Data Cabling	24,805 sf x $ 3.00 =	$ 74,415	$ 249,009			
Elevator Addition:						
1 Elevator Housing (includes structural allowance)	1 ls x $ 90,000.00 =	$ 90,000				
2 Elevator Equipment and Installation - 3000 lb Holeless	1 ls x $ 36,000.00 =	$ 36,000				(7)
3 Elevator Cab Finish Allowance	1 ls x $ 7,500.00 =	$ 7,500	$ 133,500			
MISC.:						
1 General Cleaning	49,187 sf x $ 0.50 =	$ 24,594				
2 Door Hardware	17 ea x $ 500.00 =	$ 8,500				
3 Kitchen Area - Allowance	1 ls x $150,000.00 =	$150,000	$ 183,094	(8)		
General Conditions	7 mo x $ 30,000.00 =	$210,000	$ 210,000	(10)		
Design Contingency		15%	$ 362,723			
	SUBTOTAL		**$ 2,780,875**			
	General Contractor's O & P & Bond	8.5%	$ 236,374			
	General Contractor's Taxes and Insurance	1.25%	$ 37,716			
	SUBTOTAL		**$ 3,054,965**			
	Associated Direct Project Costs (permits, fees, taxes, etc.)	62.5%	$ 1,909,353			
	TOTAL ESTIMATED PROJECT COSTS		**$ 4,964,318**			

Notes

1 Includes necessary demolition to relocate restrooms, install new kitchen, etc.

2 New code compliant restrooms at new location within existing spaces currently used as offices.

3 New administration/control room located at existing first floor men's room location, adjacent and open to main entry for the building.

4 Per the structural evaluation, two of the upper window bays on both sides of the drill hall will need to filled in with concrete to provide seismic lateral strength for the existing structure. This is a common solution which, in our opinion will be approved by SHPO. In general, the National Park Services Guidelines recognize the balance necessary between the structural viability of the building and the historic aspect of the building. During the formal design for the improvements, other less invasive methods (such as a steel truss) could be researched. However, the cost associated with providing the additional strength, using concrete or steel, will not vary significantly from that shown.

5 This is an allowance which is based upon the likely requirements for bracing existing hollow clay tile walls. It is not possible to specifically identify the scope of work for bracing until a formal meeting is conducted with the City of Seattle Department of Planning and Design (DPD) to review and obtain approval for the overall approach to structural design for the project. Our past experience with similar conditions suggests this amount is reasonable, but the ultimate cost will be dependent upon the DPD review.

6 Includes CCTV security system for building.

7 Assumes two-stop elevator. No access planned for third and fourth floors.

Notes (continued)

8 This amount is based upon the installation of a commercial kitchen, approximately 600 square feet, including a commercial hood.

9 Includes the installation of a DDC control system for the mechanical system, and replacement of heating system pumps. Replacement of the existing boiler is not included.

10 General Conditions includes Division 0 items and in general, direct costs associated with operating the project, including but not limited to, project management, project supervision, temporary offices, temporary utilities, periodic cleaning, transporation, hauling, and disposal expenses not normally covered by sub-contractors, dust control, temporary fencing, etc.

Option 3: Minimal Code and Maintenance Improvements

This scope of work is comprised of only essential maintenance and life/safety improvements consistent with ongoing operation of the building as offices and a special events center.

Specific work areas include:

Complete replacement of the existing roof system and re-painting of the building exterior. Included in this scope is the installation of the plywood diaphragm described in the structural engineer's report. This diaphragm work is included simply because once the roof deck is exposed this work should be completed (rather than requiring the new roof to be removed in the future to facilitate the eventual installation of this material).

New small restrooms at the first floor to comply with current assembly space requirements regarding the number of fixtures required. The existing restrooms would remain intact.

Upgrades to bring the electrical service into compliance with code, and minimal mechanical system improvements.

All existing aspects of the building pertaining to the use and accessibility of the building would remain as is.

Per the attached spreadsheet, we project the total project cost for the above described improvements to be **$1,717,697**. It is our professional opinion that these improvements would not trigger the Substantial Alteration clause of the Seattle Building Code. However, as previously noted, the ultimate determination will need to be made by DPD staff.

OPTION 3: MINIMAL CODE AND MAINTENANCE IMPROVEMENTS

Lake Union Naval Reserve Renovation

Estimate of Probable Construction Costs
6-May-04

								NOTES (See Next Page)
SITE IMPROVEMENTS:								
1 Allowance for minimal repairs	1	ea	x	$ 15,000.00	=	$ 15,000	$ 15,000	
BUILDING IMPROVEMENTS - EXTERIOR:								
1 Prep. \ Paint Building Exterior	28,575	sf	x	$ 2.30	=	$ 65,705	$ 65,705	
BUILDING IMPROVEMENTS - INTERIOR:								
1 Perimeter Offices - minimal improvements	1	ls	x	$ 10,000.00	=	$ 10,000		
1 1st Floor Men's \ Women's Bathrooms	240	sf	x	$ 155.00	=	$ 37,200		(1)
2 2nd Floor Men's \ Women's Bathrooms	120	sf	x	$ 155.00	=	$ 18,600		(1)
3 Selective Drill Hall Floor Protection	10,000	sf	x	$ 0.75	=	$ 7,500	$ 73,300	
Roof Upgrades								
1 Remove Existing Roofing	29,605	sf	x	$ 0.75	=	$ 22,204		
2 Polyiso Insulation Board - R30	29,605	sf	x	$ 1.35	=	$ 39,967		(5)
3 Two Ply Modified Bituminious Roofing @ Low Roof	16,000	sf	x	$ 11.00	=	$176,000		
4 Modified Three Tab Shingle Roofing @ High Roof	13,605	sf	x	$ 8.00	=	$108,840		
5 Vent Board @ High Roof	13,605	sf	x	$ 3.00	=	$ 40,815		
6 Reconnect \ Modify Roof Drains	16	ea	x	$ 1,450.00	=	$ 23,200		
7 Paint Back Side of Parapet - Elastomeric	4,080	sf	x	$ 1.00	=	$ 4,080		
8 Sheet Metal Reglet & Counterflashing	1,360	lf	x	$ 11.00	=	$ 14,960		
9 Top of Parapet Coping	1,360	lf	x	$ 12.00	=	$ 16,320	$ 446,386	
Voluntary Structural Upgrades								
1 Roof Sheathing With 3\4" STRUCT. I Plywood Over T & G	13,605	sf	x	$ 2.25	=	$ 30,611		(2)
2 Sill Angle Plate @ Roof Tie-in	260	lf	x	$ 20.00	=	$ 5,200	$ 35,811	
Hazardous Material Abatement - Minimal Owner Allowance								
1 Hazmat Report(s)	1	ls	x	$ 7,500.00	=	$ 7,500		
2 Allowance for asbestos pipe wrap and lining	1	ls	x	$ 15,000.00	=	$ 15,000		
3 Miscellaneous removal (i.e. unknown conditions)	1	ls	x	$ 10,000.00	=	$ 10,000	$ 32,500	
Mechanical								
1 Minimal Mechanical Upgrades - Maintenance Related	1	ls	x	$ 10,000.00	=	$ 10,000		
2 Remove Existing Roof-top HVAC Units @ North Portion of The Building and Associated Ductwork	1	ls	x	$ 15,000.00	=	$ 15,000	$ 25,000	
Electrical								
1 Install 2000 AMP UGPS	1	ls	x	$ 3,000.00	=	$ 3,000		(4)
2 Install Main Switch Gear 1,200 AMP	1	ls	x	$ 15,000.00	=	$ 15,000		(4)
3 Misc. Electrical Upgrades	1	ls	x	$ 10,000.00	=	$ 10,000		(4)
4 Fire Alarm & Life Safety	1	ls	x	$ 35,000.00	=	$ 35,000	$ 63,000	(3)
MISC.:								
1 General Cleaning	1	ls	x	$ 5,000.00	=	$ 5,000		
General Conditions	4	mo	x	$ 20,000.00	=	$ 80,000	$ 80,000	(6)
Design Contingency						15%	$ 125,505	
						SUBTOTAL	**$ 962,207**	
General Contractor's O & P & Bond						8.5%	$ 81,788	
General Contractor's Taxes and Insurance						1.25%	$ 13,050	
						SUBTOTAL	**$ 1,057,045**	
Associated Direct Project Costs (permits, fees, taxes, etc.)						62.5%	$ 660,653	
TOTAL ESTIMATED PROJECT COSTS							**$ 1,717,697**	

CC/T = 15/56
TOTAL = $24

numerous interior columns and the first floor slab provide an inherent amount of resistance.

IV. Seismicity

Seattle, Washington, is located in the seismically active Puget Sound Basin. Historic earthquakes, capable of regional damage, have been reported in the area since the 1800's. Studies of earthquake activity, combined with evidence preserved in the regional geology, have defined three source zones responsible for Pacific Northwest earthquakes. These three zones are related to the slow movement of tectonic plates. The pushes and pulls of these moving plates are responsible for the forces that cause most of the earthquakes in the region. Ground shaking in Seattle is likely to occur from one of these source zones:

Zone 1. Shallow earthquakes located in the North American Plate within 20 miles of the earth's surface.

Zone 2. Deep earthquakes located in the downward moving Juan de Fuca plate with ruptures more than 25 miles below the surface.

Zone 3. Shallow earthquakes occurring where the North American Plate and the Juan de Fuca Plate overlap.

Zone 1 earthquakes historically have been less than magnitude 6 in the Puget Sound Basin and up to magnitude 7.4 in the North Cascade Mountains. Recurrence intervals of large, shallow earthquakes have not yet been defined and the geological structures responsible are poorly understood. The shallow Seattle Fault has been identified to run along the I-90 corridor. There is currently significant disagreement among the scientific community in regards to the potential magnitude and return period for earthquakes along this fault.

Zone 2 earthquakes, generated by the tensional forces caused as the Juan de Fuca Plate descends beneath the overlying North American Plate, have historically caused the most damage in the state. Since the mid-1800's, at least five deep, Zone 2 earthquakes have caused damage of intensity VI or more in the Seattle area, based on the Modified Mercalli Index of Intensity (MMI), a common checklist for seismic reconnaissance. In 1949, a magnitude 7.1 earthquake generated intensity VIII damage. This is the same region in which the February 28, 2001 Nisqually (M=6.8) earthquake was located. Historically, Zone 2 earthquakes have been concentrated to the north (in the Georgia Strait) and in the southern Puget Sound Basin between Seattle and Olympia. Magnitude 7, Zone 2 earthquakes occur about every 150-to-200 years in the Puget Sound area. A magnitude 7.5, Zone 2 earthquake directly beneath the site could generate MMI's of VIII to IX.

Zone 3 earthquakes are produced when the North American Plate and the Juan de Fuca Plate suddenly jerk by each other. No earthquakes of this type have been recorded by instruments in this area. Geologic evidence suggests the last Zone 3 earthquake occurred approximately 300 years ago, however, there is no specific record of the event. Zone 3 events are expected to be magnitude 8+ and occur about every 500 years. Ground shaking in the Puget Sound Basin from this type of earthquake would be equal to or less than a deep Zone 2 event because of the greater epicentral distance (100+ miles). The extent of damage to buildings from a Zone 3 event is more difficult to estimate because the duration

of ground shaking is expected to be considerably longer than the more frequently occurring types of earthquakes.

V. Seismic Evaluation

The supporting documentation for the evaluation is located in the Appendices. Appendix A contains photographs of the building. Appendix B contains Figures. Appendix C contains the FEMA-178 checklists, which are a collection of evaluation statements to highlight potential deficiencies that must be investigated further.

A. General

During an earthquake, the horizontal acceleration of the ground induces inertia forces in the building. These inertia forces are proportional to the building's weight; they are primarily horizontal (lateral) and must be resisted by the building's lateral-force-resisting system. If the structure cannot resist the lateral forces induced by the seismic ground motion, it will suffer damage to both structural and non-structural elements and potentially collapse.

All buildings have some minor level of inherent lateral force resistance, simply due to the nature of how various building materials are connected and constructed. The seismic evaluation of a building simply determines the level to which the individual elements can resist the recommended earthquake forces.

As noted previously, the lateral-force-resisting system in the Naval Reserve Armory consists of rigid concrete and wood diaphragms, reinforced concrete moment frames, and concrete shear walls. Inertial forces generated in the building must be transferred to the foundation through a continuous load path. Forces in this system are transferred to the frames via diaphragm (horizontal beam) action of the roof and floors. The diaphragms behave as rigid elements, distributing forces to the frames and walls in proportion to their stiffness.

B. Analysis

Both Tier 1 and Tier 2 analyses were performed.

1. Tier 1

The analysis for Tier 1 consists of checklists composed primarily of qualitative evaluation statements. The checklists for Building Type 8 (Concrete Moment Frames) were used to correspond with the primary lateral-force-resisting system. The checklist is presented in Appendix C.

2. Tier 2

In order to account for the complex dynamic structural behavior of the building, a three-dimensional mathematical computer model of the building was constructed. This model was developed using the ETABS software package. The model consists of a system of horizontal diaphragms at the floor levels connected to the lateral-force-resisting elements (beams, columns, and walls).

The model included all of the concrete beams that connect to either interior or exterior concrete columns. The lateral system below the first floor was modeled using slab strip beams connecting all interior columns. The deep exterior beams were also modeled. The story height was taken as 9 feet, as field measured from the top of the pile.

Cracked section properties were used in the dynamic analysis using factors given in FEMA-273. The concrete walls' stiffness was reduced to 70%, the concrete columns' stiffness was reduced to 60%, and concrete beams' stiffness was reduced to 50%. In addition, the first floor slab strip beam's stiffness was reduced to 35%, to account for a higher level of cracking that may occur. The shear walls at the 2nd floor are relatively stiff compared to the flexible moment frames elsewhere in the building. Because of this, these walls attract high force levels and are quickly overloaded. This overload would not effect the gravity load carrying capacity of the structure. The shear walls at the 2nd floor were considered to be secondary elements, due to their expected degradation, and in turn modeled with zero stiffness.

The base shear was calculated using the FEMA-178 Pseudo Lateral Force Procedure with Site Class S3 soil. The effective peak acceleration coefficient is 0.30g, and the peak velocity-related acceleration coefficient is 0.30g. An R factor of 2 was used consistent with the building's classification as an ordinary concrete moment frame.

C. Results

Per the FEMA-178 checklist, the existing structure contains most of the key elements required to form a complete load path for resisting earthquake forces. The requirements for ordinary concrete moment frames are limited. This building classification relies on higher strength rather than more stringent ductility requirements.

The drift ratios at each floor, shown in the table below, are within the acceptable FEMA-178 drift range. The maximum permissible drift ratio, per FEMA-178, is 0.033.

Level	Drift Ratio North-South	Drift Ratio East-West
High Roof	0.020	0.001
Low Roof	0.020	0.017
2nd Floor	0.029	0.027
1st Floor	0.016	0.018

The column shearing stress check is the primary strength check of an ordinary concrete moment frame's ability to resist seismic forces. The adequacy of the columns is measured by their demand-capacity-ratio (DCR). DCR's less than 1.0 are acceptable. Below the 1st floor, the DCRs ranged from 0.7 to 1.0 at exterior columns and range from 0.1 to 0.2 at the interior columns. Between the 1st and 2nd floors the column shear DCR's ranged from 0.3 to 0.9 at the exterior columns and

ranged from 0.2 to 0.5 at the interior columns. The column shear DCR's range from 0.3 to 0.5 at the exterior columns between the 2nd floor and the low roof. Between the low roof and the high roof, the column shear DCR's range from 0.1 to 1.0 at the interior columns.

Several deficiencies were identified in the existing lateral-load-resisting system. The deficiencies noted are as follows:

1. The existing straight sheathed timber high roof is deficient in both strength and stiffness.
2. The high roof diaphragm is not adequately anchored to the existing concrete walls or beams for in-plane and out-of-plane forces.
3. The lateral-load-resisting system for the high roof in the east-west direction is deficient. Column shear strength is deficient and the concrete beam between columns at the high roof is not adequately anchored to the columns.
4. The concrete columns at the interior of the building between the 2nd floor and low roof have inadequate shear capacity. DCRs range from 1.1 to 2.1.
5. There are unbraced hollow-clay-tile (HCT) partitions walls adjacent to most of the offices as well as at the gable ends of the building above the low roof.

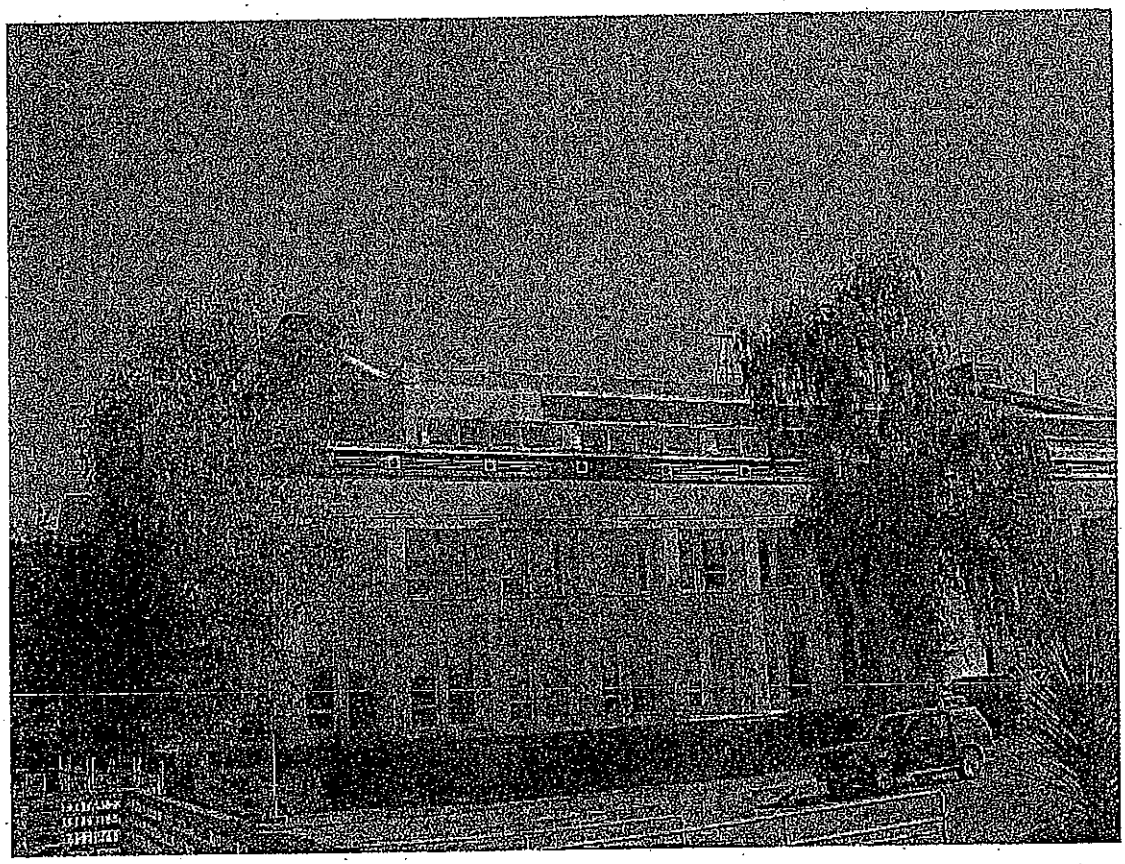
D. Recommendations

The following recommendations were developed to address the problems described previously in the Results:

1. Add plywood sheathing over the existing tongue and groove sheathing.
2. Provide tension ties and steel angles epoxy bolted to the concrete and anchored to the high roof diaphragm.
3. As an alternate to 1 and 2, provide diagonal steel diaphragm trusses just below the high roof.
4. Provide a new lateral-load-resisting system between the high roof and low roof in the east-west direction. This system may consist of infilling two window openings each direction between concrete columns with CMU or concrete or steel bracing.
5. Provide fiber-reinforced composite wrap around approximately 20 interior concrete columns between the 2nd floor and the low roof.
6. Anchor the HCT walls at the gables to the concrete walls in back. This anchorage may consist of threaded rods with plate washers epoxy bolted to the concrete wall through the HCT wall. HCT partitions walls adjacent to assembly areas should be strongbacked. The strongbacking may consist of 6" metal stud walls attached to the floor and the slab above and anchored to the HCT wall with epoxy anchors.

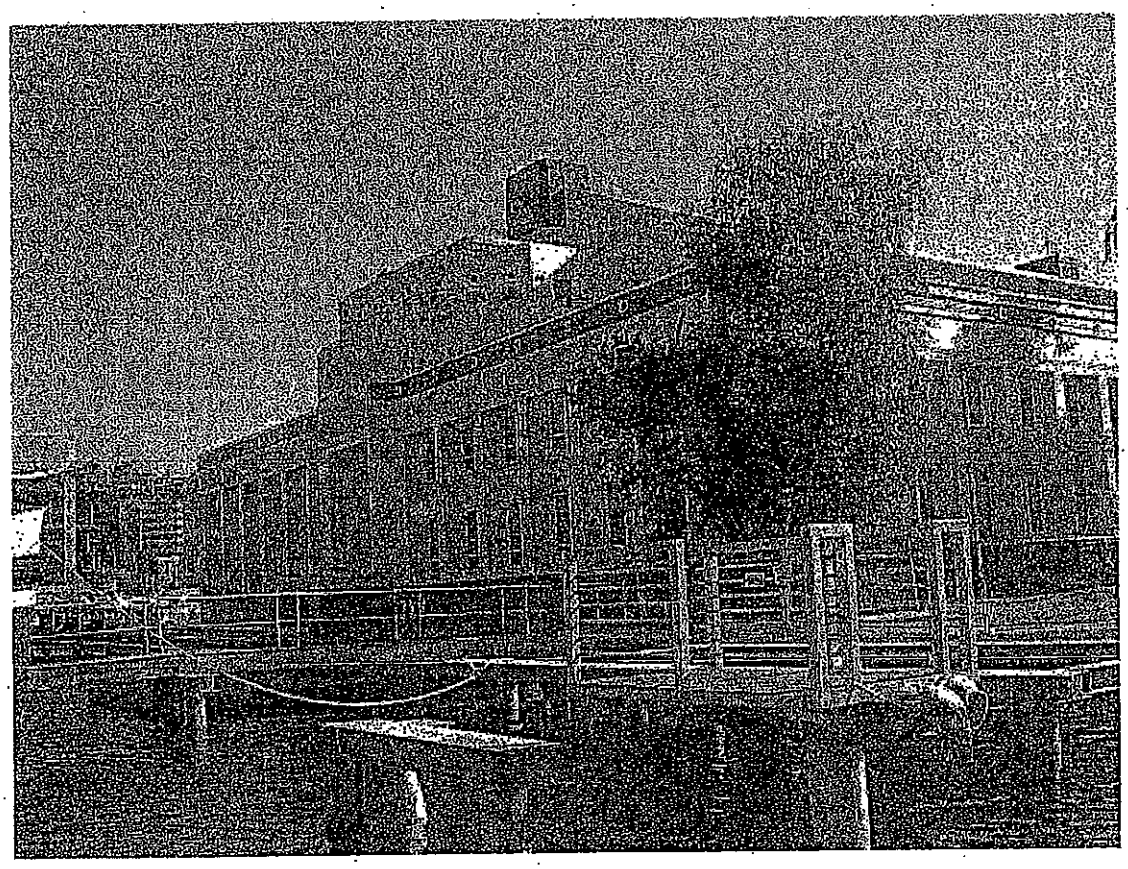
VI. Conclusions

Based on the FEMA-178 methodology, the Naval Reserve Armory was evaluated. The building contains most of the elements to resist seismic forces. However, several deficiencies in the system were noted, and recommendations have been provided to mitigate these deficiencies.

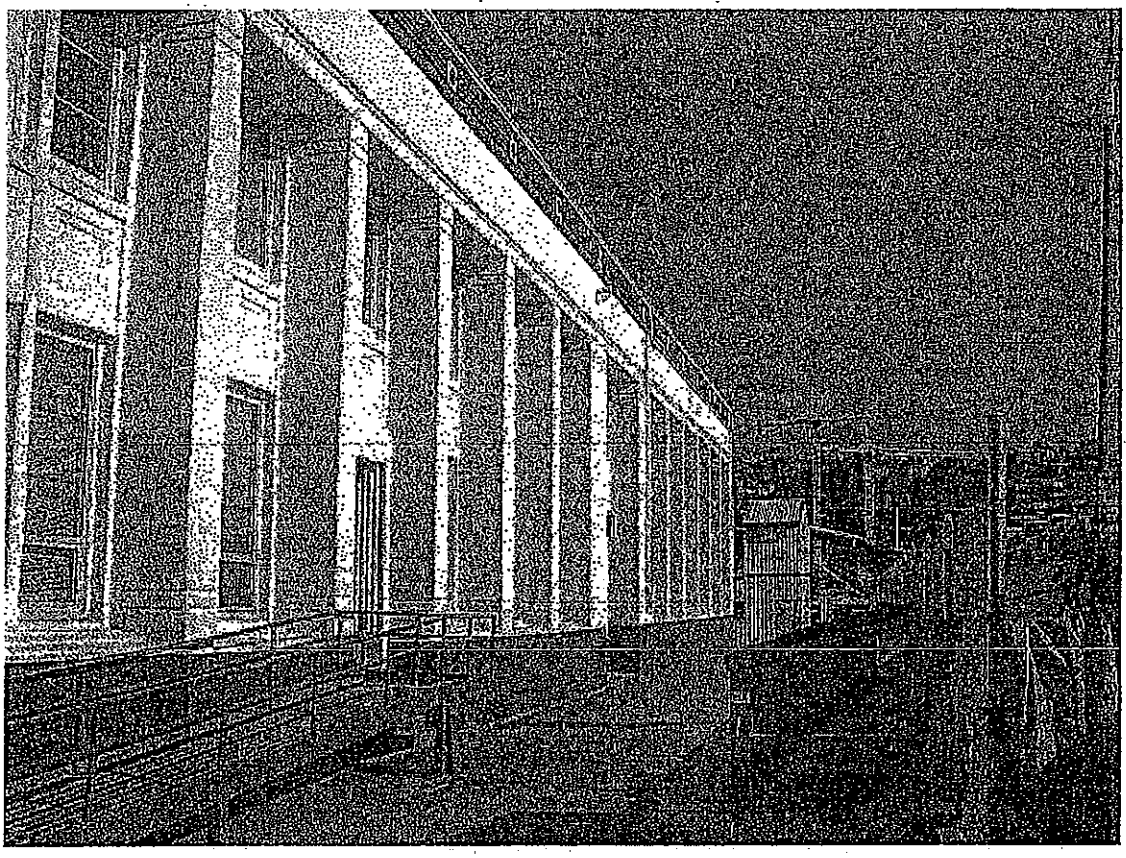


West Elevation

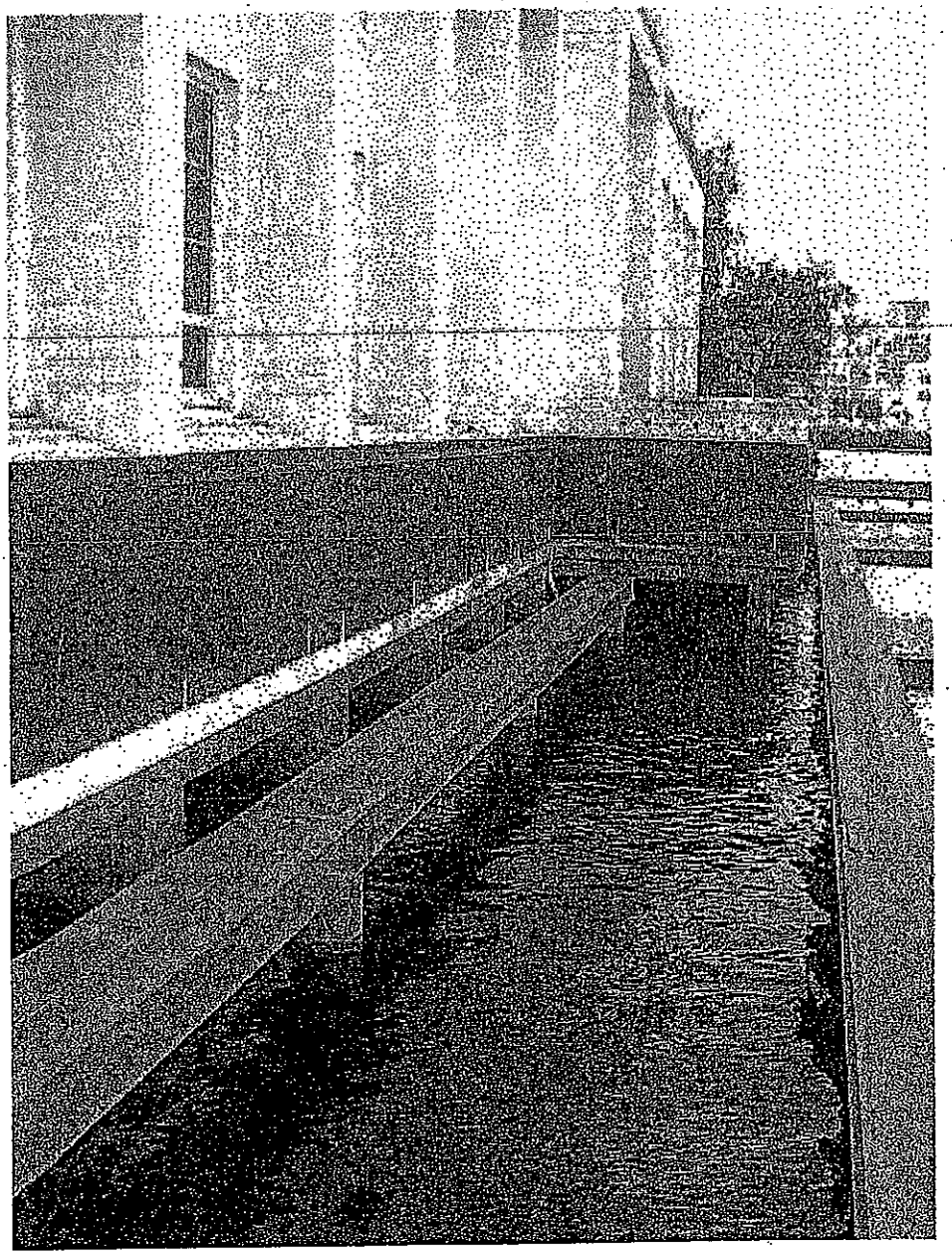
East Elevation



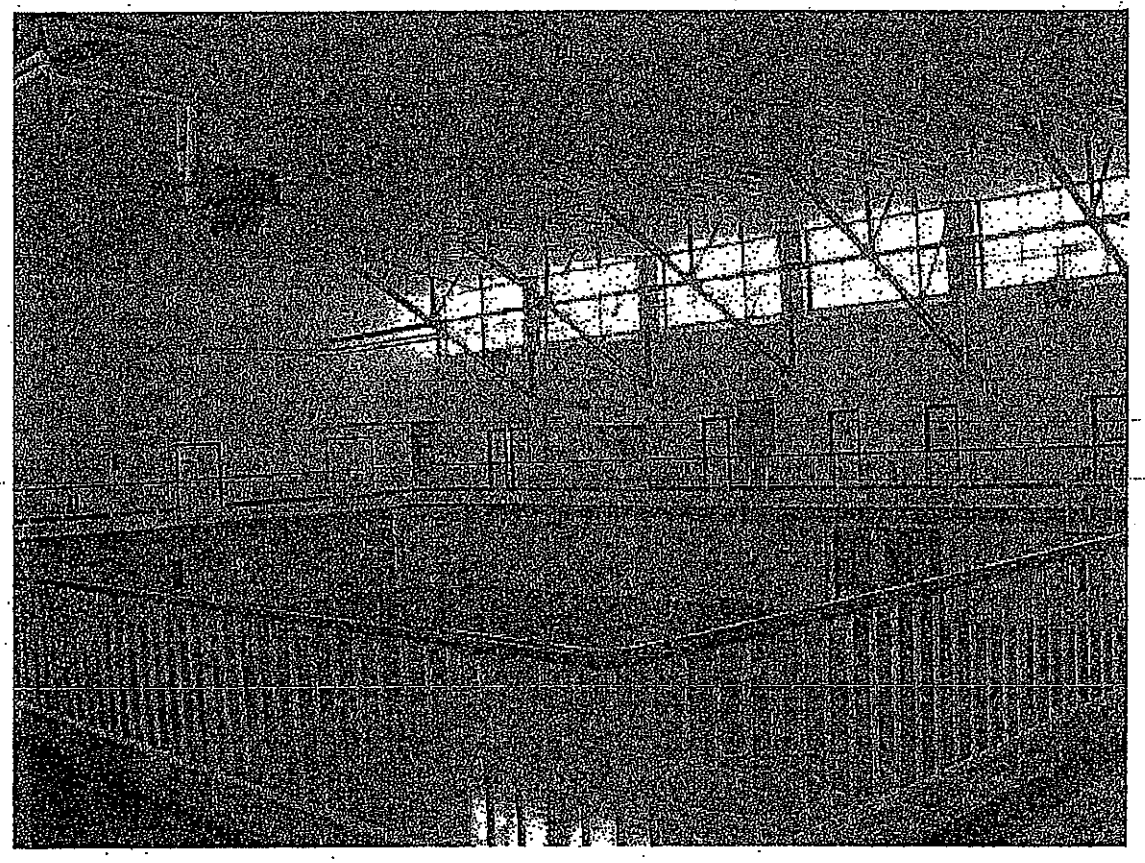
North Elevation



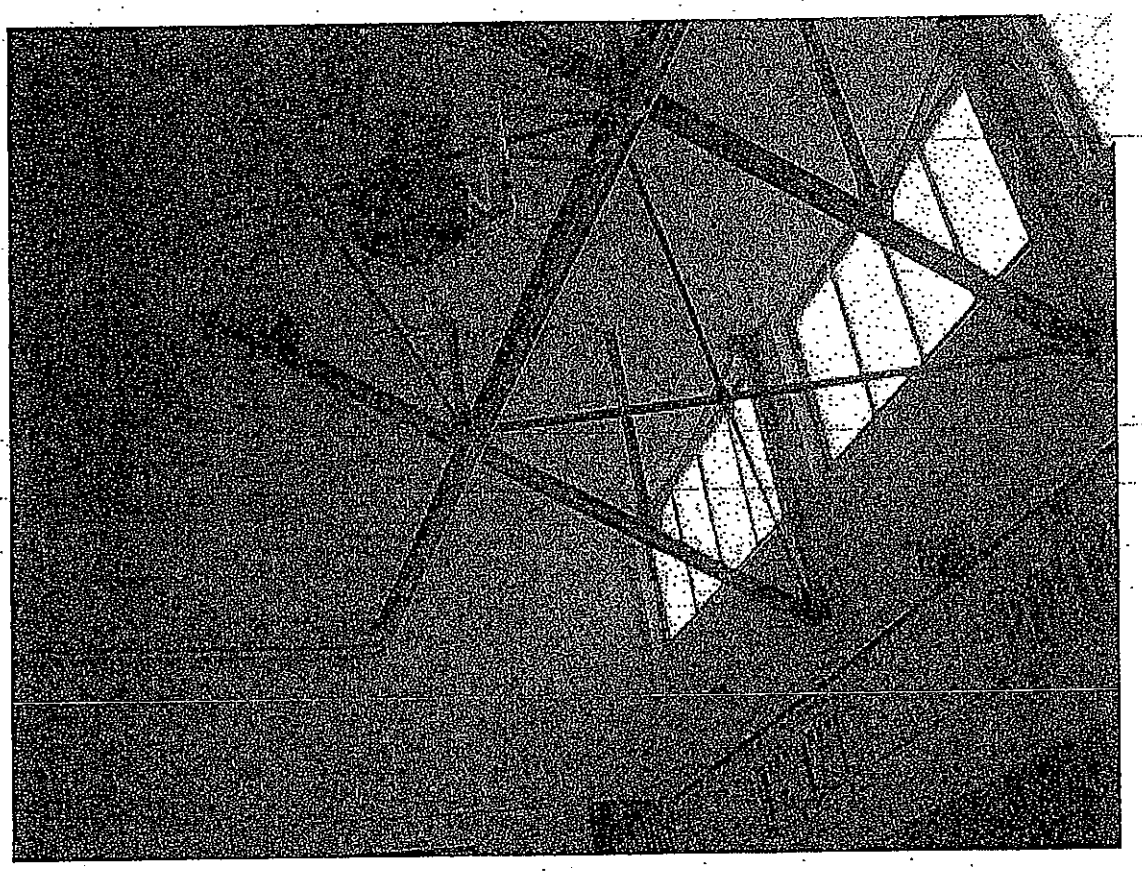
South Elevation



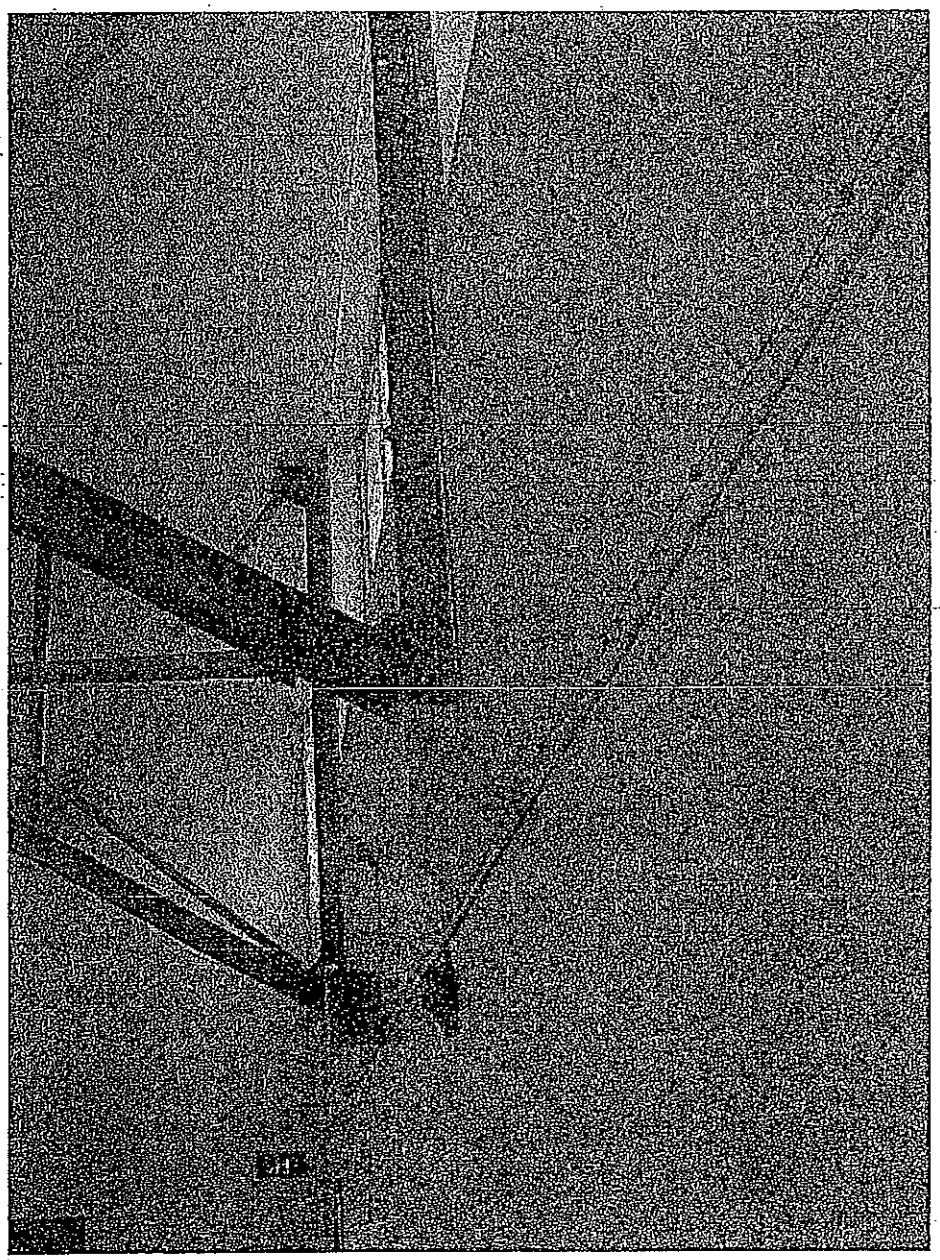
North Elevation at Sea Level



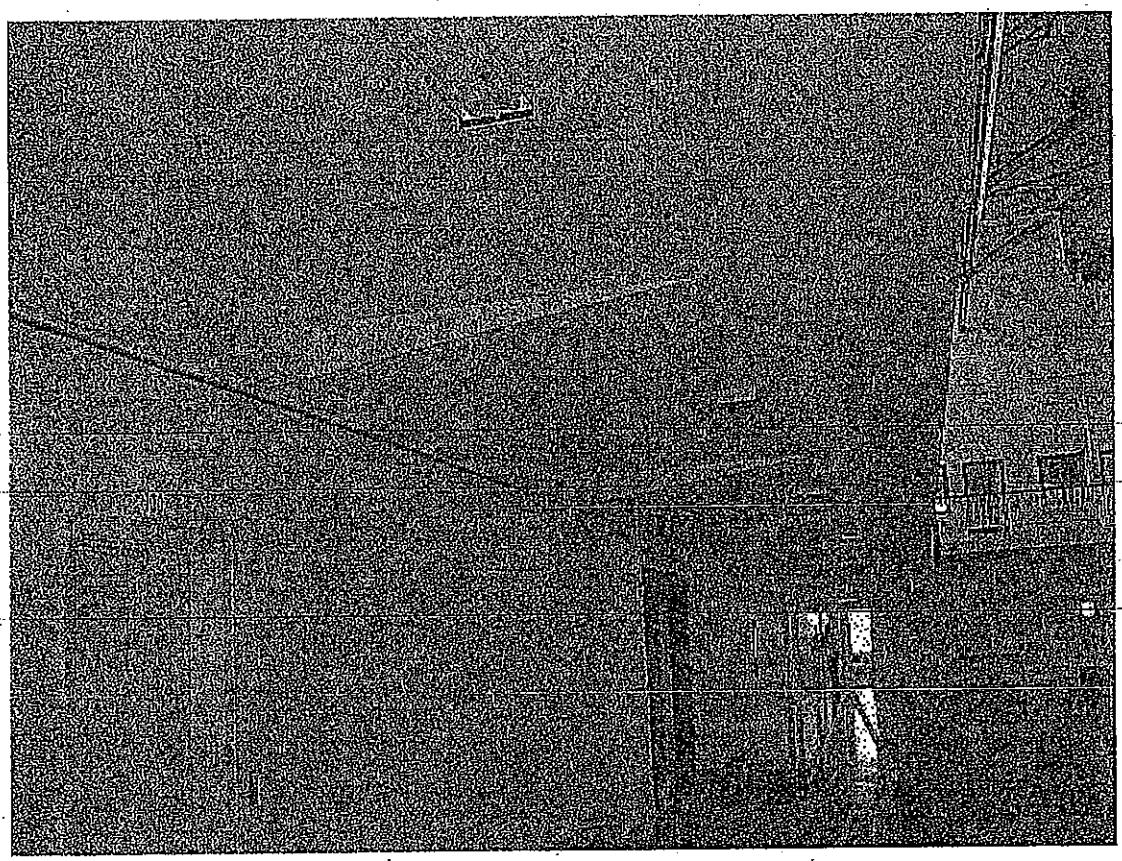
Interior Open Space



Roof Trusses



Connection of Roof Trusses at Exterior Wall



Second Floor Overhang Support

Columns Supporting the 1st Floor

NAVAL RESERVE ARMORY

EVALUATION STATEMENTS FOR BUILDING TYPE 8: CONCRETE MOMENT FRAME

These buildings are similar to Type 3 buildings except that the frames are of concrete. There is a large variety of frame systems. Buildings in zones of low seismicity or older buildings in zones of high seismicity can have frame beams that have broad shallow cross sections or are simply the column strips of flat-slabs. Modern frames in zones of high seismicity are detailed for ductile behavior and the beams and columns have definitely regulated proportions.

Address the following evaluation statements, marking each either true (T) or false (F). Statements that are found to be true identify issues that are acceptable according to the criteria of this handbook; statements that are found to be false identify issues that need investigation. For guidance in the investigation, refer to the handbook section indicated in parentheses at the end of the statement.

Be advised that the numerical indices preceded by an asterisk (*) in these statements are based on high seismicity ($A_V = 0.4$). Adjustments are reasonable for lower seismicity. The appropriate adjustment is not necessarily a direct ratio of seismicity.

BUILDING SYSTEMS

(T) F LOAD PATH: The structure contains a complete load path for seismic force effects from any horizontal direction that serves to transfer the inertial forces from the mass to the foundation (NOTE: Write a brief description of this linkage for each principal direction.) (Sec. 3.1)

(T) F REDUNDANCY: The structure will remain laterally stable after the failure of any single element. (Sec. 3.2)

(T) F WEAK STORY: Visual observation or a Quick Check indicates that there are no significant strength discontinuities in any of the vertical elements in the lateral-force-resisting system; the story strength at any story is not less than 80 percent of the strength of the story above. (Sec. 3.3.1)

(T) F SOFT STORY: Visual observation or a Quick Check indicates that there are no significant stiffness discontinuities in any of the vertical elements in the lateral-force-resisting system; the lateral stiffness of a story is not less than 70 percent of that in the story above or less than 80 percent of the average stiffness of the three stories above. (Sec. 3.3.2)

(T) F GEOMETRY: There are no significant geometrical irregularities; there are no setbacks (i.e., no changes in horizontal dimension of the lateral-force-resisting system of more than 30 percent in a story relative to the adjacent stories). (Sec. 3.3.3)

(T) F MASS: There are no significant mass irregularities; there is no change of effective mass of more than 50 percent from one story to the next, excluding light roofs. (Sec. 3.3.4)

T (F) VERTICAL IRREGULARITIES: All frames are continuous to the foundation. (Sec. 3.3.5)

(T) F TORSION: The lateral force resisting elements form a well balanced system that is not subject to significant torsion. Significant torsion will be taken as any condition where the distance between the story center of rigidity and the story center of mass is greater than 20 percent of the width of the structure in either major plan dimension. (Sec. 3.3.6)

(T) F ADJACENT BUILDINGS: There is no immediately adjacent structure that is less than half as tall or has floors/levels that do not match those of the building being evaluated. A neighboring structure is considered to be "immediately adjacent" if it is within 2 inches times the number of stories away from the building being evaluated. (Sec. 3.4)

(T) F DETERIORATION OF CONCRETE: There is no visible deterioration of concrete or reinforcing steel in any of the frame elements. (Sec. 3.5.4)

T F POST-TENSIONING ANCHORS: There is no evidence of corrosion or spalling in the vicinity of post-tensioning or end fittings. Coil anchors have not been used. (Sec. 3.5.5)
N/A

MOMENT FRAMES[1]

(T) F INTERFERING WALLS: All concrete and masonry infill walls placed in the moment frames are isolated from the structural elements. (Sec. 4.1.1)

T (F) SHEARING STRESS CHECK: The building satisfies the Quick Check of the stress in the frame columns. (Sec. 4.3.1) SEE COLUMN DCR'S

(T) F DRIFT CHECK: The building satisfies the Quick Check of story drift. (Sec. 4.3.2)

* T (F) NO SHEAR FAILURES: The shear capacity of the frame columns is greater than the moment capacity. (Sec. 4.3.5)

* (T) F STRONG COLUMN/WEAK BEAM: The moment capacity of the columns appears to be greater than that of the beams. (Sec. 4.3.6)

(T) F PRESTRESSED FRAME ELEMENTS: The lateral-load-resisting frames do not include any prestressed or post-tensioned elements. (Sec. 4.3.3)

T (F) JOINT ECCENTRICITY: There are no eccentricities larger than 20 percent of the smallest column plan dimension between girder and column centerlines. (Sec. 4.3.4)

* T (F) COLUMN-TIE SPACING: Frame columns have ties spaced at $d/4$ or less throughout their length and at $8\,d_b$ or less at all potential plastic hinge regions. (Sec. 4.3.8)

* T (F) STIRRUP AND TIE HOOKS: The beam stirrups and column ties are anchored into the member cores with hooks of 135 degrees or more. (Sec. 4.3.7)

* T (F) COLUMN-BAR SPLICES: All column bar lap splice lengths are greater than $35\,d_b$ long and are enclosed by ties spaced at $8\,d_b$ or less. (Sec. 4.3.9)

(T) NO BEAM SHEAR FAILURES

[1]Refer to the discussion in Chapter 5 for guidance in use of the evaluation statements for selection of the appropriate value of *R*.

* T F BEAM BARS: At least two longitudinal top and two longitudinal bottom bars extend continuously throughout the length of each frame beam. At least 25 percent of the steel provided at the joints for either positive or negative moment is continuous throughout the member. (Sec. 4.3.10)

* T F BEAM-BAR SPLICES: The lap splices for the longitudinal beam reinforcing are located within the center half of the member lengths or in the vicinity of potential plastic hinges. (Sec. 4.3.11)

* T F STIRRUP SPACING: All beams have stirrups spaced at $d/2$ or less throughout their length and at $8d_b$ or less at potential hinge locations. (Sec. 4.3.12)

* T F BEAM TRUSS BARS: Bent-up longitudinal steel is not used for shear reinforcement. (Sec. 4.3.13)

* T F JOINT REINFORCING: Column ties extend with their typical spacing through all beam-column joints at exterior columns. (Sec. 4.3.14)

(T) F FLAT SLAB FRAMES: The system is not a frame consisting of columns and a flat slab/plate without beams. (Sec. 4.3.15)

DIAPHRAGMS

(T) F PLAN IRREGULARITIES: There is significant tensile capacity at re-entrant corners or other locations of plan irregularities. (Sec. 7.1.1)

(T) F REINFORCING AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50 percent of the building width in either major plan dimension. (Sec. 7.1.3)

CONNECTIONS

(T) F CONCRETE COLUMNS: All longitudinal column steel is doweled into the foundation. (8.4.2)

* NOT REQUIRED FOR ORDINARY MOMENT FRAME PER TABLE IN SECTION 4.3

EVALUATION STATEMENTS FOR DIAPHRAGMS

Address the following evaluation statements, marking each either true (T) or false (F). Statements that are found to be true identify issues that are acceptable according to the criteria of this handbook; statements that are found to be false identify issues that need investigation. For guidance in the investigation, refer to the handbook section indicated in parentheses at the end of the statement.

Be advised that the numerical indices preceded by an asterisk (*) in these statements are based on high seismicity ($A_v = 0.4$). Adjustments are reasonable for lower seismicity. The appropriate adjustment is not necessarily a direct ratio of seismicity.

T F PLAN IRREGULARITIES: There is significant tensile capacity at re-entrant corners or other locations of plan irregularities. (Sec. 7.1.1)

T F CROSS TIES: There are continuous cross ties between diaphragm chords. (Sec. 7.1.2)

T F REINFORCING AT OPENINGS: There is reinforcing around all diaphragm openings larger than *50 percent of the building width in either major plan dimension. (Sec. 7.1.3)

T F OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls constitute less than *25 percent of the wall length, and the available length appears sufficient. (Sec. 7.1.4)

T F OPENINGS AT BRACED FRAMES: Diaphragm openings immediately adjacent to the braced frames extend less than *25 percent of the length of the bracing. (Sec. 7.1.5)

T F OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry walls are no more than 8 feet long. (Sec. 7.1.6)

WOOD DIAPHRAGMS

T (F) SHEATHING: None of the diaphragms consist of straight sheathing or have span/depth ratios greater than *2 to 1. (Sec. 7.2.1)

T (F) SPANS: All diaphragms with spans greater than *24 feet have plywood or diagonal sheathing. Wood commercial and industrial buildings may have rod-braced systems. (Sec. 7.2.2)

T (F) UNBLOCKED DIAPHRAGMS: Unblocked wood panel diaphragms consist of horizontal spans less than 40 feet and have span/depth ratios less than or equal to 3 to 1. (Sec. 7.2.3)

T (F) SPAN/DEPTH RATIO: If the span/depth ratios of wood diaphragms are greater than 3 to 1, there are nonstructural walls connected to all diaphragm levels at less than 40-foot spacing. (Sec. 7.2.4)

T F DIAPHRAGM CONTINUITY: None of the diaphragms are composed of split-level floors or, in wood commercial or industrial buildings, have expansion joints. (Sec. 7.2.5)

T F CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation. (Sec. 7.2.6)

METAL DECK DIAPHRAGMS

T F UNTOPPED DIAPHRAGMS: Untopped metal deck diaphragms consist of horizontal spans of less than 40 feet in areas of high seismicity (A_v greater than or equal to 0.2) and have span/depth ratios less than or equal to 3 to 1. (Sec. 7.3.1)

PRECAST CONCRETE DIAPHRAGMS

T F TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a reinforced concrete topping slab. (Sec. 7.5.1)

T F CONTINUITY OF TOPPING SLAB: The topping slab continues uninterrupted through the interior walls and into the exterior walls or is provided with dowels with a total area equal to the topping slab reinforcing. (Sec. 7.5.2)

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5 May 2004

Ron Wright
Ron Wright and Associates
1932 First Avenue, Suite 616
Seattle, WA 98101

SUBJECT: South Lake Union Naval Reserve Center
Mechanical System Analysis

Dear Ron:

The purpose of this letter is to report on the state of repair of the HVAC, fire protection and plumbing systems in this facility. This report is based on a site visit and visual inspection on February 3, 2004. Our recommendations are based upon a requirement that the mechanical systems shall have a minimum of 20 years of useful life at completion of the renovation.

ISSUES WITH APPLICABLE CODES

If the future renovations are classified as Substantial Alterations by the City of Seattle Department of Planning and Development (DPD), the building will be required to be upgraded to be in compliance with the current Washington State Energy Code for envelope and equipment efficiency. However, there are some exceptions that are allowed due to the historic designation of the structure. The ultimate scope of work would need to be negotiated with DPD. Based upon the current and planned assembly use of the building, the building is not compliant with current codes regarding fire protection. Again, under a Substantial Alteration scenario, the building would be required to have a fire sprinkler system compliant with current codes.

EXPLANATION OF THE BASIC SYSTEM

HVAC SYSTEM

The HVAC system consists of a gas fired hot water boiler (Burnham 3W-80-50-lb) with a dual fuel burner (Power Flame Model #L3-C0-20).The burner is only connected to the natural gas service, the oil has been disconnect, Further investigation would be required to determine if the oil tank has been removed. The hot water is distributed throughout the building with 5 zone hot water pumps serving hot water fin tube and convector heaters in the perimeter offices and 4 hot water unit heaters in the building central open space. The piping was replaced in 1985 and appears to have been insulated with asbestos free insulation (per the insulation labels).The pumps are Armstrong pumps with 1 horsepower motors of which only 3 operated when the disconnect was switched on.

There is a separate HVAC Unit sewing the "Bridge Area" (3rd&4th Floors), this unit is a Trane (Model #SA CB B506-C) with DX cooling and electric heat located on the north east roof. The system was not operating.

CONTROL SYSTEM

The boiler has self-contained controls and the building appears to be controlled by Honeywell electronic thermostats and timers. The Bridge Area system has self-contained controls with Honeywell electronic thermostats.

FIRE SYSTEM

The fire protection system consists of fire extinguishers and a fire alarm system in the building. The building is currently not served by a fire sprinkler system.

PLUMBING SYSTEM

The plumbing system consists of multiple restroom facilities, a few have showers. The facilities have been modified over the years by adding, replacing and removing fixtures. The fixtures currently installed are of varying quality and age. The fixtures are served by electric hot water tanks and instant water heaters. Some of the water heaters have been modified or disconnected. The original water piping, probably galvanized, was replaced with copper piping in 1985.

RECOMMENDED FACILITY SYSTEM UPGRADES

If the building is to be renovated in conformance with Parks Department Standards for Community Centers (under a DPD Substantial Alteration classification), the following upgrades are recommended:

- The boiler is approximately 20 years old and is within 5 to 10 years of it's expected useful life. The outward appearance of the boiler is acceptable, but I question the condition of the inner tubes and the useful life of the burner. While the existing boiler is still operational and acceptable for current use, we recommend complete replacement of the boiler under a complete (Substantial Alteration) renovation scenario.
- The pumps are beginning to leak and need to be replaced.
- The hot water piping was replaced in 1985 and probably has about 15 years remaining of useful life and could remain.
- The fin tubes and convectors are mostly original devices and should be replaced.
- The piping insulation is missing in sections and require insulation patches and some replacement.
- The DX HVAC equipment on the roof was not operating at the time of the site visit, the life expectancy of that equipment is about 15 years and is at the end of it's useful life.
- The controls have been retrofitted from pneumatics controls and are in questionable state of operation. To control the systems independently and efficiently a new DDC system should be provided with zone controls and room thermostats.
- The use of fire extinguishers is not current design standards for fire protection of unprotected steel structure and therefore a complete sprinkler system is recommend for fire protection.
- The plumbing fixtures appear to be in working order but only have approximately 5 years remaining for useful life. We recommend that all fixtures be replaced. The water heaters that are damaged will need replacement and a new connection to the existing system domestic hot water system shall be provided.

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REQUIRED ADDITIONAL EFFORTS

- The existing systems will need to be maintained and operated during this transition time to prevent any future deterioration of the systems by keeping the building warm. Particular attention should be made to maintain the building temperature and preventing freezing in the water systems and to prevent moisture building up within the building.

During the course of the review of the buildings and components, certain assumptions must be made regarding existing conditions which are not visible. Because some assumptions may not be verifiable with out selective demolition of otherwise adequate and serviceable portions of the structure, or testing, this report should not be construed as a warranty of the conditions, details or future performance of the building.

If you have any questions, please call.

Sincerely,

ABACUS ENGINEERED SYSTEMS

Mark W. Stavig

Mark W. Stavig, P.E.
Director of Mechanical Engineering

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cond Avenue South
01
WA 98104
-583 - 0200 TEL
-583 - 5626 FAX
secure-engr.com

6 May 2004

Ron Wright
Ron Wright and Associates
1932 First Avenue, Suite 616
Seattle, WA 98101

SUBJECT: South Lake Union Naval Reserve Center
Electrical System Analysis

Dear Ron:

The purpose of this letter is to report on the state of repair of the electrical, communication and signal systems in this facility. This report is based on a site visit and visual inspection February 3, 2004. Our recommendations are based upon a requirement that the electrical systems shall have a minimum of 20 years of useful life at completion of the renovation.

ISSUES WITH APPLICABLE CODES

The building does not appear to violate the present Washington State Energy Code for lighting to any large degree. A detailed analysis would need to be performed in order to determine if the allowed lighting wattage exceeds the Code allowed amount and what lighting control discrepancies there are. It is likely that all Code discrepancies will be required to be brought up to current Code in the event the future alterations are classified as Substantial Alterations by the City of Seattle.

The Armory derives its power service from another building (single-story bunker building) which violates the National Electric Code (NEC). It is also assumed that the bunker will be demolished.

The 120/240 volt, single-phase service extends beyond 15 feet from where the conduit enters the building before encountering the main disconnect which violates the NEC.

Existing water piping is routed above existing panelboards at some locations which violates the NEC.

Wall receptacle mounting heights do not meet present ADA requirements. There are no maintenance receptacles located near roof top HVAC equipment which violates the NEC and Uniform Mechanical Code (UMC).

Fire alarm manual pull stations are required at all exits, and are presently missing at some exits. Manual pull station mounting heights do not meet present ADA requirements. Fire alarm annunciation does not meet present ADA requirements.

EXPLANATION OF ELECTRICAL SYSTEMS

POWER DISTRIBUTION SYSTEM

There is an existing 480 volt, 3 phase Seattle City Light (SCL) overhead service from an SCL power pole along Terry Avenue North to a single-story concrete bunker at the West side of Terry Avenue North. The SCL point of service is at this bunker. The Armory Building is sub-fed underground from this bunker.

There are two power services entering the Armory Building from the bunker: A 225 amp, 480 volt, three phase service and an 800 amp, 120/240 volt, single phase service. The service disconnects for both services are located in the Main Electrical room at the south end of the building. The main switchboard and a majority of the branch circuit panels were installed during the mid-1980's remodel and appear to be in good condition.

There are very few receptacles provided in the Gymnasium. Office receptacles have been retrofitted in surface mounted raceway in offices with an average of one receptacle per wall.

The shed located near the southeast corner of the Armory building is sub-fed from the Armory power distribution system.

LIGHTING SYSTEM

The existing interior lighting system generally consists of high-bay quartz or HID fixtures in the Gymnasium and recessed 2'x4' fluorescent fixtures with prismatic acrylic diffusers in the offices. The Gymnasium fixtures appear to be in good condition and, according to the Building Manger, provide good lighting levels for gymnasium activities. The office and restroom fixtures are generally in poor condition. Interior lights are controlled by toggle switches, with the exception of the gymnasium lights which are controlled by panel circuit breakers.

The existing emergency lights are battery pack "bug-eye" type located throughout the building. The "bug-eye" fixtures are probably nearing the end of their life expectancy and are not very aesthetically pleasing. The existing exit signs are fed from a 1000 watt inverter located in the Main Electrical room. The inverter appears to be operating correctly, but is very old.

The existing exterior lighting consists of parapet mounted flood lights, which appear to be in good condition, decorative lamp heads at the west entry, which appear to be in satisfactory condition, and fluorescent strip lights located at the west entry, which are in poor condition. We did not witness the operation of the exterior lights. The existing exterior lights are controlled by a photoelectric cell located on the roof.

FIRE ALARM SYSTEM

The existing zone type fire alarm system is by Silent Knight and consists of manual pull stations at tops of stairs and at some exits, heat detectors in attic spaces and audible alarms in common areas. The existing system is obsolete. The main fire alarm control panel is located in the Chaplain's Office on the south end of the second floor. The fire alarm annunciator is located in the West Foyer. There is no fire protection system for the fire alarm system to monitor. It was not determined how or if the fire alarm system is remotely monitored.

COMMUNICATION SYSTEM

The existing main telephone service backboard appears to be in the main electrical room. The old station voice cabling is generally run exposed and loose through walls and above ceilings. Voice outlets are typically surface mounted.

The Parks and Recreation voice and data communication room is located near the northeast side of the first floor. A northern Telcom PBX is located in the communications room and connected to the Loop 28 fiber optic cable from Seattle Center. In addition, there is a 6-strand single-mode fiber optic cable from 100 Dexter building and a 6-strand single-mode fiber optic cable from Parks Facilities. Voice and data cabling is routed from this room to Parks and Recreation outlets scattered throughout the building. Data station cabling is Cat 5e type and terminated on patch panels in the communications room. Voice station cabling is Cat 5e type and terminated on connector blocks in the communications room.

PUBLIC ADDRESS SYSTEM

There is an existing public address speaker in the Gymnasium. The speaker is connected to microphone outlets.

SECURITY SYSTEM

The existing security intrusion detection system is by Radionics and consists of motion sensors near building entrances and in some offices. The system appears to be in satisfactory condition. The control panel includes integral battery back-up and is located in the communications room. The system is remotely monitored at a central monitoring station via telephone lines.

CABLE TELEVISION SYSTEM

None found.

<u>RECOMMENDED FACILITY SYSTEM UPGRADES</u>

If converted to a Community Center, the following upgrades are recommended:

- Delete service connection via single-story building. Provide service directly from SCL with meter at Armory building. Add 120/240 volt service disconnect closer to exterior of building. (Code Required)
- Increase capacity of existing service(s) if cooling or elevators are added.
- Relocate panelboards or water piping to avoid being routed above panelboards. (Code Required)
- Add panelboards as required to accommodate additional loads.
- Add receptacles throughout and at roof top HVAC equipment.
- Replace existing office/restroom lights with new energy efficient fixtures.
- Upgrade gymnasium lighting controls to allow appropriate lighting levels for use other than gymnasium use.

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- Replace existing emergency lighting with new.
- Replace or refurbish existing exterior lighting to match Parks and recreation standards including, vandal resistant fixtures with high pressure sodium lamps and controlled by a programmable time clock.
- Replace fire alarm system with new system. Voice annunciation may be required. (Code Required)
- Replace old voice outlets, infrastructure and cabling with new.
- Add data outlets, infrastructure and cabling where required.
- Replace existing public address system.
- Expand existing security system as required.
- Add cable television system.

REQUIRED ADDITIONAL EFFORTS

- Field measurement of existing lighting levels.
- Field testing of existing circuit breakers and feeders.

During the course of review of the existing buildings and components, certain assumptions must be made regarding existing conditions that are not visible. Because some assumptions may not be verifiable with out selective demolition of otherwise adequate and serviceable portions of the structure, or testing, this report should not be construed as a warranty of the conditions, details or future performance of the building.

If you have any questions, please call.

Sincerely,

ABACUS ENGINEERED SYSTEMS

Greg L. Livengood, P.E.
Director of Electrical Engineering

Scope Comparisons of Future Upgrade Alternatives

South Lake Union Naval Reserve Building

Elements	OPTION 1 Complete Project	OPTION 2 Substantial Alterations	OPTION 3 Minimal Code & Maintenance
Hazardous Material Abatement	Most material abated	Partial	None
New Accessible Restrooms	√	√	Partial
Admin Entry Room	√	√	None
New Elevator	√	√	None
New Entry Plaza	√	Partial	None
Removal of Acoustical Ceiling in Offices	√	None	None
New Roof	√	√	√
New Exterior Paint	√	√	√
Removal of Acoustical Ceiling in Drill Hall	√	Partial	None
Structural Elements	√	√	Partial
Fire Sprinkler System	√	√	None
Fire Alarm	√	√	Partial
Electrical Upgrades	New site service, switch gear, lighting, fire alarm, security sys, cabling, specialty lighting.	Switch gear, lighting, fire alarm, security sys, cabling, specialty lighting.	New switchgear, fire alarm, minor upgrades
Mechanical	New ventilation equip,new boilers, piping, controls, plumbing fixtures, Remove old HVAC*	New ventilation equip, remove old HVAC*, small misc maintenance items	Remove old HVAC*, misc mech maintenance
TOTAL PROJECT COST ESTIMATE	**$9,665,000**	**$4,964,000**	**$1,718,000**

* - Existing bridge HVAC system not working,

References

- Original and modified record drawings for Building 10, via Consultant examination and selection of Park files of original (1940) and renovation/repairs from 1942 through 1993.

  Our office reviewed both the original construction documents and the scope of work for all relevant major improvement projects.

- *South Lake Union Park Master Plan Update Background Information*, Kato & Warren, 6/2000

- *South Lake Union Park Schematic Design,* Seattle Parks, September 2003

  This document provides a guideline for the planned site improvements adjacent to the existing Naval Reserve Building. The site improvements referenced in our report are based upon the plans provided in this report.

- *Seismic Evaluation, Seattle Naval Reserve Center (Building 10),* Reid/Middleton, 2002

- *Adaptive RE-use of the Naval Reserve Center at South Lake Union, Seattle, Washington* Streeter/Dermanis and Associates, et al, 1990

- *Environmental Baseline Survey Report, Naval Reserve Readiness Center, Seattle, Washington* URS et al, 1995

- *Historic Preservation Covenant for Building 10 at the Naval Reserve Center, Seattle Washington,* 1999, State Historic Preservation Office (SHPO)

- *Attachment A: Historic Preservation Covenant for Building 10 at the Naval Reserve Center, Seattle Washington, [Exterior and Interior Contributing Features],* 1999, State Historic Preservation Office (SHPO)

- *Letter from William K. Mills, Land Use Analyst, City of Seattle Department of Construction and Land Use, addressed to Jeffery L. Murdoch, Staff Appraiser, U.S. Department of the Navy,* 10/20/98.

  This correspondence provides an analysis of the development potential for the Naval Reserve Center property with specific information regarding compliance with the City of Seattle Zoning Code.

OPTION 3: MINIMAL CODE AND MAINTENANCE IMPROVEMENTS

Notes

1 New additional code compliant restrooms at new location within existing spaces currently used as offices. These are intended to provide additional restroom capacity to comply with current code regarding the number of fixtures required for the building assembly spaces.

2 Voluntary structural improvements pertain to new diaphragm sheathing installed over existing roof decking (while decking is exposed during roof replacement).

3 Existing fire alarm system is obsolete. Cost assumes new code compliant system, with capacity for future building upgrades/improvements.

4 Costs for installing new service to comply with code.

5 New code compliant insulation is required to be installed as part of roof replacement work.

6 General Conditions includes Division 0 items and in general, direct costs associated with operating the project, including but not limited to, project management, project supervision, temporary offices, temporary utilities, periodic cleaning, transporation, hauling, and disposal expenses not normally covered by sub-contractors, dust control, temporary fencing, etc.

Attachments:

A Provisions of the Transfer Agreement between the City of Seattle and the Federal Government

B Secretary of the Interior's "Standards for Rehabilitation"

C Secretary of the Interior's Guidelines for Rehabilitating Buildings, Alterations/Additions for the New Use

D Structural Engineer's Report, prepared by Coughlin Porter Lundeen.

E Mechanical Engineer's Report, prepared by ABACUS Engineered Systems

F Electrical Engineer's Report, prepared by ABACUS Engineered Systems

G Scope Comparisons of Future Upgrade Alternatives

H Summary of documents used for preparation of this report

Provisions of the Transfer Agreement between the City of Seattle and the Federal Government

In consideration of the conveyance of the property described above, which contains Building 10 Grantee hereby covenants on behalf of itself, its heirs, successors and assigns at all times to the United States of America to maintain and preserve Building 10 in a manner that preserves those attributes that make this historic property eligible for inclusion in the National Register of Historic Places as follows. General building features of concern include exterior façade, roof, and fenestration, color, use of materials and mass. The specific significant exterior and interior features of this building are listed on Appendix A.

1. *Grantee shall preserve and maintain Building 10 in accordance with the recommended approaches in the Secretary of the Interior's "Standards for Rehabilitation and Guidelines for Rehabilitating Buildings" (Department of the Interior, National Park Service).*

2. *No construction, alteration, remodeling, demolition, or other action which would materially affect the integrity or appearance of the building shall be undertaken or permitted to be undertaken without the express prior written permission of the Washington State Historic Preservation Officer (SHPO) or duly authorized representative thereof. Actions considered to materially affect the building would affect the exterior surfaces, or change the height, ,or alter the exterior façade (including without limitation exterior walls, windows and roofs, design, color and materials) or adversely effect the structural soundness of the building or alter a significant interior feature. However, reconstruction, repair, repainting, or refinishing of presently existing parts or elements of the building which has resulted from deterioration or wear and tear shall be permitted without the prior approval of SHPO, provided the action is performed in a manner which will not alter the appearance or material composition of those elements of the building subject to the covenant.*

Historic Preservation Covenant for Building 10 Naval Reserve Center, Seattle Exterior and Interior Contributing Features

Appendix A of the Transfer Agreement

Significant Exterior Features

Building architectural style is Art Deco and Art Moderne conveyed in massive concrete exterior, geometric and grooved detailing and nautical references in decorative elements (anchor/eagle emblems at west door). A continuous entablature encircles the building, with a grooved and button patterned cornice articulated the parapet wall. Two story window bays are recessed and framed by entablature, squared concrete columns and poured concrete foundation course. Each window bay consists of paired three-light windows stacked above paired four light windows. A cast coffer-like panel separates the stacked windows. Current windows are aluminum replacements installed in 1989 (prior to historic evaluation). They are similar in detailing and operation to the original steel ones, with slightly wider sashes. A flat built up roof encloses the office space. Four-light clerestory windows on side walls and massive concrete end walls incorporating roof vents support the gabled drill hall roof. The west entryway is flanked by eight window bays on each side. The two story entry alcove projects out slightly from the main façade supported by two squared concrete columns, while the actual doorway is slightly recessed. There is a recessed window sized opening faced in wood on either side of the entry doors. There is a stairway projection trimmed with gold stars one ach side. The north doorway is a simplified version of the main entry. The entry alcove projection contains three small horizontally oriented windows. It has stairway projections identical to the west entry. The roofline steps back to the fourth floor which provides inclusive views of Lake Union from rooms on this level. The center entry on the south side contains a single glass and metal door flanked by 3-light transom. The entry at the south end of the east side serves a loading dock, has a metal rolling door and is not a contributing feature.

Significant Interior Features

North and west entries open onto into terrazzo floored foyers decorated by a central compass. Other contributing elements of the west entry are ceiling molding, scoring on the walls, entry doors, and the granite

and marble threshold doorplates. The stairwells in the west entry areas of the building are detailed with grooved archways, scored walls and curved elements including stair end walls and recessed display panels with cast curved frames.

The drill hall is the centerpiece of the facility with its exposed steel trusses (currently partially concealed by suspended acoustical tile ceiling) and large interior undivided space. The drill hall floor is unique, consisting of 2x4 wood studs cut into approximately 2 ½ inch length and installed end to end into a metal track resting on a mastic covered concrete slab.
There is a two-chamber damage control wet trainer located on the northeast wall. A second level balcony with a metal railing surrounds the drill hall area. The ward room located in the northeast corner of the second floor contains a roman brick fireplace built into a curved wood wall unit and a wood parquet floor, wood base boards and original doors. The former indoor rifle range area, located south of the wardroom down to room 215, retains its hinged steel window guards. The ship bridge simulation space on the fourth level at the north end is a contributing building feature. Additional contributing details include two service windows on either side of Room 223 and glazed wall tile and glass block inserts in three men's restrooms (rooms 143,219,237)

Secretary of the Interior's Standards for Rehabilitating Buildings

1. A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces, and spatial relationships.

2. The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.

3. Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.

4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.

6. Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.

7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

8. Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

9. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its environment.

10. New additions and adjacent or related new construction will be undertaken in a such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

Secretary of the Interior's Guidelines for Rehabilitating Buildings, Alterations/Additions for the New Use

Some exterior and interior alterations to a historic building are generally needed to assure its continued use, but it is most important that such alterations do not radically change, obscure, or destroy character-defining spaces, materials, features, or finishes. Alterations may include providing additional parking space on an existing historic building site; cutting new entrances or windows on secondary elevations; inserting an additional floor; installing an entirely new mechanical system; or creating an atrium or light well. Alteration may also include the selective removal of buildings or other features of the environment or building site that are intrusive and therefore detract from the overall historic character. The construction of an exterior addition to a historic building may seem to be essential for the new use, but it is emphasized in the **Rehabilitation** guidelines that such new additions should be avoided, if possible, and considered only after it is determined that those needs cannot be met by altering secondary, i.e., non character-defining interior spaces. If, after a thorough evaluation of interior solutions, an exterior addition is still judged to be the only viable alterative, it should be designed and constructed to be clearly differentiated from the historic building and so that the character-defining features are not radically changed, obscured, damaged, or destroyed. Additions and alterations to historic buildings are referenced within specific sections of the Rehabilitation guidelines such as Site, Roofs, Structural Systems, etc., but are addressed in detail in New Additions to Historic Buildings.

Naval Reserve Armory Building
Seismic Evaluation Report

I. Introduction

The purpose of this study is to evaluate the expected performance of the Naval Reserve Armory during an earthquake, and to provide general recommendations to strengthen the building, as required. The building structure was evaluated for general conformance to the requirements of FEMA-178, an approved national standard whose seismic performance objective is Life-Safety. It is assumed that structures that satisfy the Life-Safety criteria of FEMA-178 may be significantly damaged in a major earthquake, but the occupants will be able to safely exit the building.

The evaluation is based on a review of the 1940 original construction drawings and cursory visual observations.

A. Building Code Requirements

The Seattle Building Code (SBC) requires that a seismic upgrade be performed if the substantial alteration provisions are triggered. The SBC considers a renovation to be a substantial alteration if any of the following occurs:

1. Extensive structural repair.
2. Remodeling which substantially extends the useful physical and/or economic life of the building.
3. A change of a significant portion of a building to an occupancy that is more hazardous.
4. Reoccupancy of a building that has been vacant for over 12 months. A significant increase in the occupant load of a URM building.

If a renovation is deemed a substantial alteration, the seismic provisions of the current building code, or an approved standard, are enforced. Currently, DCLU accepts FEMA-178 *NEHRP Handbook for the Seismic Evaluation of Existing Buildings* as an approved standard. The seismic performance objective of FEMA-178 is life-safety.

B. Life-Safety Evaluation (FEMA-178)

The basis of our evaluation was the Federal Emergency Management Agency document 178 (FEMA-178) *NEHRP Handbook for the Seismic Evaluation of Existing Buildings*. FEMA-178 is a standard evaluation methodology developed by the Building Seismic Safety Council (BSSC) for the Federal Emergency Management Agency (FEMA). FEMA-178 is the current consensus standard for life-safety evaluation of existing structures and is accepted by most building departments for substantial alteration projects. The purpose of the methodology is to provide guidance in the review of a building's response to earthquakes based on a life-safety

philosophy. This document, published in June 1992, provides current consensus information. The federal government, as reference, specifies the use of FEMA-178 when seismic evaluations of federally owned buildings are required.

FEMA-178 recommends the use of seismic forces that are lower than the Uniform Building Code (UBC) and the code provisions proposed by the National Earthquake Hazards Reduction Program (NEHRP) for new buildings. The building can be analyzed for resistance to lower force levels in life-safety evaluations because non-life threatening damage to the building is accepted. *In other words, substantial damage may be sustained by the building while still providing life-safety protection for the occupants.* If the building must survive major earthquakes without sustaining severe damage in addition to providing life-safety protection, then it is analyzed using a higher force level. In general, only buildings of greater importance such as hospitals, fire stations and other essential facilities are upgraded to a higher force level.

A building does not meet the life-safety objectives of FEMA-178 if any of the following events occur during an earthquake:

- The entire building collapses.
- Any portion of the building collapses.
- The components of the building fail and fall.
- The exits and entry routes are blocked, preventing the evacuation and rescue of the occupants.

To summarize, life-safety is the primary concern; building damage and reoccupancy is the secondary concern.

The analysis methodology of FEMA-178 employs a quick check methodology (Tier 1 analysis) and a more intensive Tier 2 analysis methodology. The Tier 1 quick check employs a set of checklists for each building type. The checklist contains a set of (generally qualitative) evaluation statements which help identify areas of concern with regard to the structures' ability to adequately transmit earthquake forces to the foundation and supporting grade.

The Tier 2 analysis methodology involves numerical calculations to determine the stiffness and strength of various framing elements and connections within the structure, based on material and geometric properties. The values derived from the analysis are compared to code prescribed allowable values in order to determine the "weak links" in the structural system.

C. Summary of Evaluation

Evaluation force levels and their performance goals are based on the average performance of a particular building type. They do not relate in any rigorous fashion to a particular building. The general FEMA-178 methodology is appropriate to use as a basis for the analysis of this building.

II. Scope of Work

The scope of work for the seismic evaluation of the original building of the Naval Reserve Armory includes the following:

1. Perform cursory site visual investigation(s) of the building to determine existing conditions as required to perform the evaluation.
2. Provide an evaluation of the building using FEMA-178.
3. Develop mitigation (strengthening) schemes to address concerns identified.
4. Provide a written report summarizing the findings.

III. Building Description

A. General

The Naval Reserve Armory is located at 1000 Valley Street on the South side of Lake Union in Seattle, Washington. The building was constructed in 1942 of reinforced concrete with steel trusses at the roof. The exterior dimensions of the building are approximately 200 feet in the north/south direction and 150 feet in the east/west direction. The building consists of two levels, the first and second floors and two roof levels, the "bridge level" (the low roof) and the high roof. There is a large open space approximately 130' x 100' that runs from the first floor to the high roof and is centered in the building. The building lies partially over the low water line of Lake Union and is completely open to the water at the north end and partially open along the east side where a dock abuts the building. Exterior grade is several feet below the 1st floor on the south and west sides.

B. Document Review

The following original construction documents were available for review:

- "U.S. Naval Reserve Armory", sheets 60601-60621 and 60623-60628 dated April 26, 1940. "Naval Reserve Readiness Center", sheets 3 and 4, dated December 17, 1992. In addition, eight sheets of undated reinforcing steel details were available. The architect of record was B. Marcus Priteca & William R. Grant. Drawings were in generally fair condition.

C. Foundation System

The foundation system consists of piles with concrete pile caps. The top of pile is specified as 11 feet below the 1st floor on the original plans but field measurement of some piles indicated that the top of pile is approximately 9 feet below the 1st floor. The top of pile cap is typically below water level except at the south end and far west side where the grade is slightly higher. The 1st floor elevated structural slab is supported by single piles at approximately 10 feet on center each way. The exterior columns and multi-story interior columns typically have three to six piles depending on location.

The soil along the west and south sides of the building is retained by a deep beam at the exterior of the building.

D. Vertical-Load-Resisting System

The vertical-load-resisting system at the high roof consists of 2x6 tongue and groove wood decking spanning approximately 7 feet between 12 inch deep steel beams. The steel beams are supported by deep trusses at 20 feet on center that span 100 feet across the open interior space. Concrete columns support the trusses at each end.

The low roof is built of sloping overframed timber framing approximately 6 feet above a concrete one-way slab system. The overframing consists of 2x6 tongue and groove wood decking supported by 4x6 timber joists at 4 feet on center. The joists are supported by 4x4 timber posts that are supported on upturned concrete beams that occur at 10 feet on center. A 3½ inch slab spans between the concrete beams forming the ceiling. This slab likely supports only its own weight and serves as a fire break to the timber roof. A tall concrete spandrel beam wraps around the exterior as a parapet from the level of the low roof slab to above the timber roof.

At the exterior, these beams are supported by 20 inch by 38 inch concrete columns at approximately 10 feet on center. The beams are supported at the interior by 18 inch square columns at 20 feet on center. A concrete girder supports the beams that occur between columns.

The 2nd floor vertical-load-resisting system consists of a concrete pan joist system. A 2½ inch concrete slab is supported by 5x12½ inch joists at 2 feet on center. These joists span approximately 20 feet between concrete beams. The joists span parallel with the exterior of the building as it wraps around the open interior. The beams are supported similarly to the low roof, at the exterior and interior.

At the 1st floor, the vertical-load-resisting system consists of a 6 inch two-way flat slab supported by columns at 10 feet on center each way. The columns supporting the 1st floor only are typically 12 inch square. The columns bear on concrete pile caps at the foundation.

E. Lateral-Load-Resisting System

In general, the interior and exterior beams and columns (acting as a reinforced concrete moment frame), the concrete shear walls, and the concrete slabs act as the primary elements of the lateral-load-resisting system for the building. Earthquake induced inertia forces occur within the concrete floor diaphragms, which then transfer the seismic forces to the concrete moment frame and the concrete walls throughout the building. The frames and walls transfer the seismic forces directly to the piles. In turn, the forces on the piles are resisted by friction and bearing pressure against the surrounding soils.

At the high roof the lateral load resisting system in the east/west direction consists of concrete shear walls. At the south end of the building the shear wall extends the full story height, while at the north end there is an opening at the bridge level. In the north/south direction the lateral load resisting system consists of concrete spandrel beams attached to the top of concrete columns.

At the low roof and the 2nd floor the lateral load resisting system consists of concrete moment frames in both the east/west and north/south directions. In addition, there are some concrete shear walls at the 2nd floor.

At the first floor, a large five foot deep beam wraps around the perimeter of the building acting as the primary lateral load resisting element. In addition, the