Evaluation of Old Renton City Hall
200 Mill Avenue South
Renton WA 98057

Submitted: 06.29.07

Evaluation Provided By:

Gensler

&

COFFMAN ENGINEERS

Introduction:

Gensler was retained by the City of Renton to perform a preliminary feasibility study of a remodel of the existing 7-story office building, previously used by the City for their City Hall. Gensler's scope included a review of the site access and the building itself for ADA compliance, and the major components of the life safety system for compliance with current building codes. Gensler retained Coffman Engineers Inc. to provide analysis of the electrical, mechanical and structural systems.

The building is located at 200 Mill Avenue South, in Renton, WA. The facility was constructed in 1968. Gensler and Coffman Engineers Inc. each performed a short walk through to review the facilities' systems and structure. A Tier 1 seismic evaluation using ASCE 31-03 as a guide was also requested. The field survey was conducted on May 11, 2007. The mechanical room and several office spaces on various floors were available for inspection. The majority of spaces were not accessible.

The purpose of this preliminary study was to identify any major deficiencies present in the building and it's systems that might make it immediately clear that the project would be cost-prohibitive. The findings of this study are to be used to determine the next steps in further defining additional due diligence needing to be performed in order that the City may decide how to manage this existing real estate asset. Existing tenant spaces were not reviewed as it is assumed that the interior improvements would likely be removed in order to perform the required upgrades and that new tenant improvements would be performed in compliance with the jurisdictional requirements at the time of their construction.

Architectural Evaluation

Accessibility (ADA) Review

Site Access

The site access from the public way is achieved by way of a mostly level sidewalk leading from Mill Avenue South to the building entry. The path appears to meet the requirements for building access with the exception of new striping and signage at the crosswalk where the path crosses the main vehicular driveway to the property. The parking lot is well striped and in good condition.

Accessible parking stalls are located near the building entry, and generally comply with the current standards for stall dimensions with the exception of stall signage. The number of accessible stalls, both passenger car and van stalls, does not appear to comply with the number required for the total number of parking stalls provided on-site. There is also no marked path connecting the accessible parking stalls to the building entry.

There are two curb ramps in the sidewalk in front of the building entry, however both should be replaced to comply with the specific requirements of the current accessibility codes. There are also two accessible parking stalls located near the main lower floor entry but these stalls do not meet the dimensional requirements of current codes, nor is there a marked access aisle to the door. These issues are easily fixed and are important in that they form the required connection between the site access and the building access, or building entry.

Building Access

The access from the sidewalk in front of the building to the building lobby is generally usable, however several improvements are necessary to comply with current codes. In all areas, handrails at stairs and ramps as well as the guardrails do not comply with current codes. In most cases, the guards at major building edges and grade changes are not of the appropriate height and do not have the appropriate distances between intermediate components to comply with the requirements preventing children from penetrating the guards. Handrails do not have the proper extensions beyond the top and bottom of ramps and stairs.

The stairs in front of the building entry are of the correct rise and run, but require new handrails as mentioned above. The ramp from the sidewalk elevation to the building entry is approximately 1:12 slope, which would be acceptable with improvements to the handrails as mentioned above. The building entry doors do not have an accessible operator assisted door, which would be required.

Building Components - Circulation
The building is equipped with two elevators serving the basement through 6th floors, which have recently been modernized and appear to meet code. The public corridors are of sufficient width.

Building Components – Doors
Door handsets need to be replaced on most doors as they are mostly of the ball type, which does not comply with the lever handle requirements of the code. Most interior doors are 36" wide or greater with the unfortunate exception of each of the access doors to the floor restrooms and janitor closets, which are 30" wide and would need replacement with doors of 36" wide with the proper pull and push side clearances. Doors providing access to the stair towers are of proper width, however the required clearances are not provided on the push and pull sides and as such would need to be relocated to provide the clearances. This reconfiguration could be accomplished in connection with the changes to the locations of the stair access doors described in the Life Safety part of this report.

Building Components – Restrooms
By our review, none of the restrooms in the building meet current accessibility codes. All would have to be removed and rebuilt, likely requiring more space on each floor. In addition, the number of women's toilets is below the number required for a building floor area such as this. This work can also incorporate the plumbing upgrades suggested in the Mechanical section of this report.

Building Components – Signage
The building does not have an accessibility code compliant signage system. One would need to be installed to meet the basic requirements of the code.

<u>Accessibility Recommendations:</u>

1. Provide new crosswalks across the main vehicular access from the path leading to the public way to the building and from the accessible parking stalls to the building entry.
2. Provide new signage at the accessible parking stalls and increase the total number of accessible stalls to meet code minimums.

3. Upgrade the existing curb ramps in the sidewalk in front of the building.
4. Restripe the accessible parking stalls at the lower level building entry to comply with code.
5. Replace all exterior guardrails and handrails with new to meet current code requirements.
6. Add an accessible door operator to one of the building entry doors.
7. Replace all door hardware not complying with current standards.
8. Remove and redesign the existing restrooms including access doors, stall counts, and accessible fixture types and clearances.
9. Relocate access to the exit stairs to comply with the required clearances on the pull and push side of the doors.
10. Install a compliant interior signage system.

Life Safety Review

Fire Stairs

The existing fire stairs are located in the SW and SE corners of the floor plate with access provided through either one or two doors with a corridor paralleling the South exterior building envelope. The access corridors are of proper width, however as noted above, the doors do not have proper clearances on the push and pull sides. In addition, the separation of the points of entry into the stair access corridor system do not meet the code minimum distance of ½ of the longest diagonal of the occupiable floor area. The access doors would need to be moved closer to their respective stairs to achieve compliance. This issue in combination with door clearances presents a design problem, which we believe could be solved, though it may require relocation of the restrooms. The stairs themselves are cast concrete and have risers of 7" and treads of 10 ¾", which does not strictly comply with the minimum tread depth of 11" in the IBC. The stairways varied between 44" and 45" in width and the landings varied between 42" and 44" deep, the lesser of which does not meet the requirement that landings be equal in length to the width of the stairway they serve. Some improvement to this condition may be able to be accomplished through minor changes to the location of the newel posts for the handrails and a small amount of filling of the gap between runs. All of the handrails for all stairways must be replaced to comply with current code for extension beyond top and bottom of stair runs as well for continuity and openness on the open side of the stair runs. There have also been installations of various pipes and conduits that run vertically through the towers and penetrate the landings, some of which exacerbate the issue of landing depth. If modifications to the existing concrete stairs do not yield a compliant situation, it may be possible to replace the runs with prefabricated stairs to utilize excess landing depth along the South exterior façade landings.

The west stair is continuous from the 6th floor to the basement with the main egress occurring at the main building lobby. The East stair is continuous from the Roof to the second floor where it discharges onto the occupiable terrace above the ground floor level. An open stair provides access from the terrace to the ground floor. The open stair does not meet currently exiting requirements due to the handrails and the existence of an outward swinging door at the bottom landing that impedes exiting. We recommend that

the East stair be reconfigured to provide a more direct access to the finished grade to the east of the building or the continuation occur within the building with direct discharge from the ground floor to adjacent grade. This solution would also improve security of the terrace on the 2nd floor. The lower level ground floor has several exits from the floor to at grade access points, providing sufficient exiting for any future uses.

Fire alarms, strobes, etc.
The building is generally equipped with fire alarms, strobes and horns. A complete review should be undertaken as part of the electrical system replacement.

Life Safety Recommendations:

1. Relocate the access doors to the vertical exit stairs to allow sufficient separation relative to the diagonal of the floor plate.
2. Replace all of the handrails, guardrails, and newel posts in the stairs with new to meet code, including minor modifications to the landings to take advantage of all possible depth. If these modifications do not result in a compliant stair, replace the concrete risers and treads with new prefabricated steel stairs to meet the current codes.
3. Evaluate the possibility of a departure from the code requirement of 11" minimum tread depths.
4. Reconfigure the continuation of the East stair to provide access to the first floor grade rather than the use of the non-compliant stair from the second floor to first floor grade.

Other Architectural Considerations

Building Envelope
The existing building envelope of the tower (Floors 3-7) is a composite system of structural tubing, insulated aluminum panels and single pane glass. The second floor is enclosed by structural masonry with some glazing. The podium (Ground Floors) is clad in stucco.

The current curtain wall on the tower provides very little thermal protection for its occupants. It is our understanding that the facades of the building exposed to direct sunlight often become very warm to hot to the touch by the occupants of the building. As is described in the Mechanical analysis, the mechanical systems must be oversized by today's standards to provide some comfort to its occupants during the peak heating and cooling seasons. It is also our understanding that the existing façade has had considerable leakage occurring over time.

The stucco and brick cladding on the lower levels have created a relatively dark interior to the bottom three floors.

Building Entry
Though the building entry nearly meets the current code requirements, some remodeling to the building entry and main lobby could provide a significantly improved user experience.

Other Architectural Recommendations:

1. We strongly recommend that the entire building envelope be replaced with a more modern, thermally efficient envelope that would provide significant energy savings, considerable added comfort to the occupants and lower maintenance. Integration of sun shading devices on the West, South and East sides of the building could further reduce the cooling loads in the summer. Replacing the brick and stucco facades with a curtain wall would greatly improve the natural day lighting of the occupied spaces as well as provide a connection for the occupants to the outdoor environment, which is a significant asset of this property. A new envelope would also extend the life of the building and increase its lease value in the market, whether the building is occupied by the City or by private tenants.
2. Remodel the building entry to create a more open and welcoming experience for the building occupants and their visitors.

Electrical Evaluation

The original building was constructed in 1968 and most of the electrical equipment is original installation equipment except for a new electrical service which was installed as part of the 1996 Phase I Remodel project. Modifications to the electrical distribution system have been made over time including additional panels, replaced transformers, and the installation of transient voltage surge suppressors. The original equipment has limited capacity to be modified due to its age and lack of connection spaces. The original main electrical room is completely full leaving no room for any additional electrical equipment within the main electrical room.

Building Service:

The building was originally served by a 1200-Ampere 480Y/277V main electrical service. The 1996 Phase I Remodel project upgraded the existing service to the building. The existing utility service was replaced with a new utility service, pad mounted transformer, and 2500-Ampere 480Y/277V main distribution switchboard. The original electrical distribution system including the original main switchboard was left in place and back fed from the new main switchboard. The new service size provides approximately 27 watts per square foot, which is more than a typical modern office design service size of 15-20 watts per square foot. The original main switchboard is manufactured by General Electric and uses a 1200-Ampere main disconnect and a distribution section. The distribution section does not have space to add additional circuit breakers. The 1996 main service switchboard included three spare switches to allow for future expansion. In addition to upgrading the electrical service, the 1996 Phase I

Remodel also added transient voltage surge suppression and ground fault protection at the main service, and upgraded the building's service ground.

The wiring method throughout the building is predominately insulated conductors installed in conduit. Some branch circuits that have been added over time have been installed using MC cable.

A combination of full-voltage, non-reversing motor starters and retrofitted ABB variable frequency drives support the mechanical systems.

The elevator system was recently upgraded and the elevator machine room has been upgraded to meet current codes. The elevator system is connected to the emergency generator providing ADA accessible egress to building occupants.

The building still has many of its original General Electric dry type distribution transformers. A few transformers have been replaced or added, however the majority of the transformers are original installation. New Energy Star rated transformers are more energy efficient than the older transformers. Due to the high computer loads in office spaces K-4 rated transformers are recommended.

Emergency Generator;

Emergency power is provided for the building by an old 110kw/137.5kva stand-by 480Y/277V natural gas generator located in the mechanical room on the 6th floor. The generator connects to the distribution system via a 150-Ampere automatic transfer switch. This generator is the source of life safety power for the building. In addition to life safety loads, optional stand-by loads have been connected to it. This installation does not meet today's code requirement to separate life safety and optional standby loads with separate transfer switches.

Lighting:

The building uses predominately linear fluorescent lighting, however the fluorescent lights use the older T-12 lamps instead of the newer, more energy efficient T-8 or T-5 lamps. Any original ballast that has not been replaced is potentially PCB containing because the original ballasts were magnetic-core type and due to their age could contain PCB's. The old incandescent lamps used in the mechanical and electrical rooms have been retrofitted with compact fluorescent bulbs. The fluorescent lights installed in the t-bar ceiling did not appear to be adequately secured for a seismic event. The fixtures were secured with only one support wire. Today's standards require four support wires per fixture.

The existing lights are locally switched and do not meet current Washington State Non-Residential Energy Code Requirements. Current lighting requirements for office spaces include daylighting controls and zones, and automatic shutoff capability via occupancy sensors or a central control system.

Electrical Recommendations:

1. We recommend that the original electrical system be removed back to the 1996 Phase I Service Upgrade and replaced in its entirety due to the age of the equipment and its limited flexibility. The new distribution system should include Energy Star and K-4 rated transformers. Branch panels serving computer or sensitive electronic loads should use TVSS's.
2. We recommend that a new generator be provided, preferably on the ground level, and that the emergency distribution use two transfer switches to allow the generator to serve both Life Safety and Optional Standby loads. The associated compressed natural gas fuel tanks and associated piping on the roof should be removed at that time.
3. The lighting should be upgraded to linear fluorescent T-8's or T-5's with electronic ballasts and a code compliant lighting control system with automatic shutoff capability should be installed.

Mechanical Evaluation

After going over the building we were able to interview the McDonald Miller service technician who has been looking after the building for approximately 8 years. His insights into what is working and what isn't were invaluable in developing an idea about the condition of specific systems and their history. During our visit access to the ground floor was restricted and no interior observations for this area were possible.

Heating, Ventilation and Air Conditioning (HVAC):

Environmental conditions in the building are maintained by a dual duct, VAV modified HVAC system using natural gas fired hot water boilers and electrically driven water chillers as sources for heating and cooling respectively. Although it is serviceable, this system is not very efficient and a modern variable air volume system (VAV) with digital controls should be installed. Newer fan and electric motor designs coupled with digital controls could provide significant energy savings relative to this building's current configuration. Coupling a new mechanical system design to a new building envelope that is more energy efficient can greatly reduce energy consumption and improve occupant comfort. The exact amount of savings is dependent on the envelope options chosen and the electrical equipment loading (i.e. computer density) installed in the renovated space. If a total renovation is undertaken this facility would probably be a good candidate for LEED accreditation.

Control devices are mix of electric and pneumatic equipment. Pneumatic control components dominate the building. Unfortunately, many items have reached the end of their useful life. Chronic component failures and system set point drift cause the system to have great difficulty maintaining environmental control of the building. Space temperature control is regulated by pneumatic thermostats that adjust dampers in the Carnes mixing boxes. The mixing boxes in each zone blend hot and cold air to provide

comfort heating, cooling and ventilation. These boxes are original equipment and have a tendency to stick or freeze in one position limiting their ability to control the environment. Corrosion appears to be a major cause of the problem. The existing control system needs to be replaced. A modern direct digital control (DDC) system with external interface capability would benefit energy management goals as well as sophisticated user schedules and building maintenance/monitoring needs.

Maintenance is currently provided by McDonald Miller. Recent upgrades to equipment included a new roof top mounted York water chiller (2004) and two AO Smith Copper Coil hot water boilers and associated circulating pump (2005). The old Trane Centrivac chiller and the associated Evapco condenser were abandoned in place in the mechanical room on the 7th floor. The two old AO Smith boilers were also abandoned in place, as was their associated pump. Much of this old equipment should be removed if a remodel of the buildings envelope is undertaken. Although the new equipment listed above is relatively new and serviceable it does not represent the current state of the art in heating or cooling technology. Efficiency improvements are possible with new equipment.

All of the primary fans appeared to be original equipment and have been retrofitted with variable frequency drives from ABB at some point in the past. While this retrofit has helped reduce energy costs it is a stopgap measure and is not as efficient as a fully integrated VAV system would be. Exhaust fan 9 was found to be inoperable and had not been used for some time. A large through wall exhaust fan has been installed on the west side of the building but no drawings or historical information about it was available. The space it served was not accessible. In addition we were told that one of the trunk ducts may have suffered a partial collapse at some point in the past due to a quick closing damper. More detailed study and analysis is needed to verify this condition and its impact on the system. If a full replacement is planned this effort may not be needed and could potentially be a waste of funding.

We were informed that the heating and cooling water loops were filled with a propylene glycol mixture to prevent freezing and corrosion. The cooling and heating systems had not been tested for residual corrosion inhibitor since they were filled in 2005 and 2006 respectively. It is recommended that heat transfer fluids be sampled annually and tested for signs of corrosion and inhibitor breakdown.

From what little we could see, the use of fire and smoke dampers may not be in compliance with current building, fire and mechanical codes. Since the internal spaces in the building are likely to be reconfigured as part of any upgrade, this issue can be addressed as part of the overall rearrangement of occupied spaces and exit paths.

Overall, the current energy efficiency of this building is poor. The existing curtain wall and roof insulation systems are poor at best. The glazing is single pane glass. If the curtain wall was replaced with a more energy efficient design and the upper occupied floor and roof properly insulated the building could see a 50% reduction in heating bills and a 30% reduction in cooling. Cooling load reduction is also dependent on the number and type of computer systems brought into the facility. Couple a new external envelope

with an energy efficient HVAC system and the building could provide a comfortable work environment and lower operating costs.

A rough order of magnitude cost to replace the HVAC system is $850,000 (does not include LEED accreditation activities)

Plumbing:

None of the bathrooms observed fully comply with ADA (Americans with Disabilities Act) requirements. Many of the fixtures and appear to have been original equipment and are well worn and showing their age. A significant amount of new water piping was observed and much of it had been retrofitted into accessible spaces, which compromised the use of the space such as janitor's closets. We also noted that there was blue staining in many of the toilets, urinals and drinking fountains. Staining was less noticeable in sinks. Coupled with our pipe replacement observations we believe the facility continues to have an aggressive (corrosive) potable water problem. The blue staining is indicative of copper leaching from the system (see figure 1 below).

Figure 1: Urinal with blue water stains indicating corrosion of copper pipes.

We recommend that water samples be pulled from faucets and fountains and tested for lead and copper content to see if they exceed EPA action levels. The following was extracted from the City of Renton's water utility web site.

In 1993, the City of Renton tested for the presence of lead and copper in water drawn from 75 household taps. None of the tested taps exceeded the EPA's action level for lead of 15 parts per billion. However, 63 of 75 tested tap samples exceeded the EPA's action level for copper of 1.3 parts per million. To remedy this situation and comply with EPA regulations, the City of Renton constructed the Corrosion Control Treatment Facilities in 1998 and started the operation of the facilities in the spring of 1999. The treatment process entails adding sodium hydroxide to the water to raise the pH from below 7.0 to above 7.3. At this higher pH, the water is less corrosive to household plumbing, which in turn, reduces the leaching of lead or copper from home plumbing.

In the fall of 1999, the City retested for lead and copper at 72 of the previous 75 household taps. None of these tested taps exceeded the EPA's action levels for lead or copper. Our water now meets the EPA's regulations for lead and copper.

Based on data from the City of Renton 2005 drinking water quality report corrosion of piping is still a concern in that 10% of the samples tested in 2004 (the last year testing data is available) exceeded EPA criteria. The testing was done in homes with far smaller amounts of copper pipe and generally higher churn rates than office buildings. Copper concentration in office building water system is often higher than in homes served by the same water source.

Since the bathrooms will need to be replaced during a major retrofit, in order to meet current ADA requirements, much of the plumbing system will also be replaced. To protect this new investment in piping it is recommended that the owner consider an on site water treatment system to further reduce corrosion of the system or engineer a system that is easy to isolate and quick to replace.

Roof drains appeared to be in various stages of disrepair with some missing screens and clogged bowls. If LEED EB is pursued uses can be found for the run off water which could enhance the LEED point total.

Fire Protection:

A considerable amount of new fire sprinkler piping was also noted during our walk through. From the parts that were visible/accessible, the system appears to conform to NFPA 13. Seismic bracing was clearly evident and of recent construction. A clean agent, gaseous type, fire suppression system (Inergen by Ansul) has been installed in the 7th floor mechanical room to serve the adjacent elevator equipment room. The original smoke detection equipment has been replaced with newer model smoke detectors in the HVAC ducts near the fans in the 7th floor mechanical room. These should all be replaced when the HVAC system is upgraded. Since new space layouts would entail the movement of sprinkler heads and the replacement of life safety devices, it is recommended that a registered fire protection engineer evaluate the remodeled building and a completely integrated fire and protection and life safety system be installed.

Elevator Equipment:

After the Nisqually earthquake in 2001 the elevators were found to have sustained damage. Repairs were made and updated equipment was installed. A new drive system was installed in 2006. A new fire protection system consisting of an Ansul Inergen clean suppressant system was installed when the new drives were put in. An open existing roof vent in the elevator equipment room could compromise the effectiveness of the Ansul system.

Mechanical Recommendations:

1. A new building envelope can greatly reduce energy consumption and allow for newer, reduced size, more efficient mechanical equipment.
2. A new variable air volume HVAC system with direct digital controls is suggested based on the need to rework ducting in the spaces, the age of the HVAC and control system, and the need for new mixing boxes in each zone.
3. When reworking the fire sprinkler system, to accommodate the new floor plans, a completely integrated fire and smoke control system should also be implemented that meets current codes.
4. As plumbing is replaced to accommodate the need for ADA compliant restrooms consideration should be given to an on site water treatment system to reduce the corrosive effects of the potable water.
5. Removal of old, unused or abandoned mechanical equipment is recommended as this will clean up the mechanical spaces, reduce structural loading and allow more options for the arrangement of new systems.
6. LEED accreditation may be possible under the LEED – EB criteria. The additional cost for such accreditation does not always justify the reward. Most if not all of the LEED concepts can be applied to the building without the cost of implementing the accreditation effort.

Structural Evaluation

The purpose of this structural evaluation is to assist in the preparation of a facility assessment for the building by conducting a preliminary seismic evaluation. The building structure plays an integral role in the analysis of possibilities for future use and is also important for considering potential rehabilitation costs.

A site visits was made on May 11, 2007 in order to conduct a limited visual review of the building. The review included gathering field information regarding the typical construction, arrangement, materials, elements, and physical conditions. The scope was limited to elements that were readily visible from floor level on the interior and from roof level at the exterior. No destructive methods were used nor were any material samples taken for testing.

Existing as-built drawings provide good documentation of the original construction and were reviewed and compared with observed conditions. Some modifications have been made to the building over its history, but significant structural changes were not apparent.

Methodology:

Our evaluation of the Old Renton City Hall follows the standard ASCE/SEI 31-03 (American Society of Civil Engineers / Structural Engineering Institute) entitled "Seismic Evaluation of Existing Buildings." The evaluation is a three tiered process (as required):

Tier 1 – Screening Phase;
Tier 2 – Evaluation Phase; and
Tier 3 – Detailed Evaluation Phase.

This report outlines the results of our Tier 1 evaluation, highlighting potential deficiencies in the building and directing us to further evaluation requirements. The analysis is directed by the desired performance level, the level of seismicity specific to the building location, and the building type. The Old Renton City Hall falls into the following categories respectively: life safety performance, high level of seismicity, and a building type consisting of concrete shearwalls with rigid diaphragms. Based on those characteristics, the standard directs us to look at five checklists to complete a Tier 1 evaluation. The applicable compliant / noncompliant checklists serve to rapidly evaluate the major building components which may possess deficiencies requiring further analysis. The checklists include (see attached for completed checklists):

Basic Structural Checklist for Bldg Type C2
Supplemental Structural Checklist for Bldg Type C2
Geologic Site Hazards and Foundation Checklist
Basic Nonstructural Component Checklist
Intermediate Nonstructural Component Checklist

Some definition may be helpful regarding the characteristics noted above. First, the "life safety" performance level was selected because it is generally consistent with the types of occupancy that may be considered for future use and that currently exist. The alternative performance level is "immediate occupancy" which is a very high level of seismic performance chosen for essential facilities such as hospitals and emergency response centers. "Life safety" does not imply that the building is somehow "earthquake proof," but attempts to achieve a level of performance that protects against major collapse and allows the majority of the occupants to safely exit the building. Secondly, the "high level of seismicity" is simply a function of where the building is located. In the Puget Sound region there are not many, if any, exceptions to this classification.

The methodology of ASCE 31 directs the user to the Tier 1 screening via the checklists noted above. A selective Tier 2 may be appropriate when the Tier 1 quick checks identify deficiencies. The standard also requires a more exhaustive, complete Tier 2 evaluation for buildings that fall outside of certain limits. Technically speaking, Old Renton City Hall requires this complete Tier 2 analysis, which is beyond the scope of this report. The trigger is that for a concrete shear wall building, with a selected performance level of "life-safety" in a "high seismic" location, the maximum number of stories for a Tier 1 evaluation is six.

However, a Tier 1 evaluation is still useful in screening for typical seismic performance characteristics and highlighting the general areas of deficiency. A Tier 2 analysis will further confirm and quantify these deficiencies and direct the need for selective action. It is not anticipated that a Tier 3 analysis will be recommended, which is an even more exhaustive analysis that is warranted for complex structures or where the Tier 2 results are felt to be overly conservative. Our preliminary recommendation is that a Tier 2 analysis be utilized to direct structural solutions per ASCE Standard 41-06, "*Seismic Rehabilitation of Existing Buildings.*"

Description of the Structure:

The building structure is generally a simple cast-in-place concrete structure with concrete columns supporting concrete floor slabs. The elevated slabs are actually created using forms that create a floor system that is called a "waffle slab" due to the appearance from underneath. The floors are supported in some locations by concrete bearing walls. These walls are also used to support the building against lateral forces such as wind and seismic and as such are referred to as "shear walls."

The basic occupied building footprint at the basement and first floor levels is approximately 96 feet square. At these levels, tube steel columns around the perimeter, spaced at approximately six feet on center, support the edges of the floor slabs. Above the second floor level the building footprint steps back to 76 feet square for the full height of the structure.

The building uses shallow, spread footings to support interior columns and shear walls. Existing drawings indicate very high-capacity soils for bearing support and indicate the building is likely founded on glacial till common to the region.

It should be noted that at the first and second floor levels there are plan area changes where elevated concrete floor structures create roofs over lower levels. At these locations there is a vertical step in the floor structure to allow for weather membrane and wear surfaces to be applied to the exterior while matching the finished floor level on the interior.

Site Visit:

The intent of the site visits was to review for conformance to existing documentation, unusual features, evidence of structural modification, deterioration of structural components, evidence of settlement or other forms of distress, etc. Only those areas that were readily available were viewed, however, much of the structural systems are quite consistent from floor to floor.

Observations:

Generally speaking the primary building structure appears to be in very good condition. No obvious signs of distress were found that would indicate foundation settlement. The shear wall elements, exterior finishes, and exposed structure did not show evidence of significant cracking or failure due to lateral loads such as seismic forces. Also, the visible structure (limited) at the lower levels did not show evidence of significant corrosion, water damage, or other environmental issues.

The building has endured at least one moderate seismic event in the Nisqually earthquake of 2001. While detailed information was not provided regarding specific analysis or review of the building conducted after that event, it is our understanding that a seismic review to some level was performed. We also understand that the event caused some damage to tenant contents, elevators, and very significant building movement was experienced by occupants.

One of the key locations to look for seismic damage is on the brittle finish materials typically encountered around the exterior. The brick exterior finish at the lower levels was generally in very good condition, with very few, minor cracks observed. These cracks were more noticeable on the interior side of the wall than the exterior, and only extended a few bricks in length. Larger diagonal cracks were not observed in these walls nor were they noted at lower level window openings where brittle stucco-type finish is used.

It should be noted that several occupied areas were not readily accessible. Seismic effects can be amplified at specific floor levels depending on the ground motion of the seismic event and the response of the building. However, concrete shear walls at the stairs did not reveal noticeable cracking at any level.

Preliminary Tier 1 Analysis:

The Tier 1 evaluation checklists lead the reviewer to specific areas of concern. The format requires the selection of a response to each criterion as compliant, non-compliant, or not applicable. For the purposes of this review, the focus of the evaluation was on basic structural components. Interior elements such as ceilings and light fixtures, for example, are sometimes not evaluated due to their secondary nature and presumption that future building uses would almost certainly require extensive rework to these components. The checklist results are summarized below and are attached for further review.

Checklist 3.7.9 for the basic structural components highlights the one significant flaw identified in this preliminary evaluation. The building utilizes shear walls to support against earthquake forces. Above the second floor level these walls are all concentrated near the south edge of the building floor. The center of gravity for the floors is near the center of the square floor plan, but what is referred to as the “center of rigidity” is nearer

the south edge. This creates a torsional effect as the building responds to an earthquake and requires a much more detailed Tier 2 analysis in order to investigate further.

This first checklist also indicates that the stress in the shear walls is higher than allowed by the initial Tier 1 screening. Further analysis of these walls may or may not reveal any problems, but they do not pass the initial rough-order test. The likely outcome may be that resolution of the torsional deficiency noted above will also correct this issue.

There are two other areas of interest noted by the evaluation. First, the geologic site hazards are not specifically addressed by this review. A geotechnical engineer must be consulted in order to identify the possibility of loss of soil strength referred to as "liquefaction," slope failure potential, or surface fault rupture. Also, several checklist items include non-structural components that would almost certainly be dealt with by any significant remodel effort. Examples include bracing of ceiling, piping connections, and improving equipment base attachments.

Conclusions and Recommendations:

As noted above, this Tier 1 evaluation is presented only to give a general idea of potential issues concerning major structural systems and components. The ASCE 31 criteria requires that a more detailed Tier 2 analysis is completed for this building, and the Tier 1 screening reinforces that need with respect to the concrete shear walls.

The preliminary evaluation identifies the unbalanced arrangement of shear walls and the total lengths of those shear walls as the primary concern. The most likely resolution would be the construction of vertical bracing or new shear wall(s) in the east-west direction near the north side of the building. These vertical elements would extend from the seventh floor all the way to the basement where supplemental foundation work would be required. Concrete shear wall construction would be the most consistent with the existing framing; however steel bracing may also be a consideration for constructability reasons and minimizing disruption to occupied spaces. The full Tier 2 analysis would determine the required length of wall, size of bracing, best location(s), and other factors for making the most suitable choice.

The Tier 2 effort would also require a geotechnical evaluation and consideration of interior, non-structural components. While the non-structural detailing is generally minor impact to the overall restoration, it will be important to evaluate the site for the possibility of local geologic faults that could impact the site.

A copy of the Tier 1 calculations and checklist can be found in the Appendix

Renton Seismic Eval

Requirements per ASCE/SEI 31-03

* Table 2-1 Seismic Definitions

  zip 98055, Assumed site class 'C'.

  $S_{DS} = .856$ & $S_{D1} = .404$

  - High seismic zone

* Table 2-2 Bldg Types

  Conc. shearwalls w/ rigid diaphragm ~> C2

* Table 3-2 Req'd checklists under T1

  w/ Life Safety & high seismic zone

  - basic struct (3.7)
  - Supp struct (3.7)
  - Geologic / Fdn (3.8)
  - Basic non-struct (3.9.1)
  - Intermediate non-struct (3.9.2)

* Table 3-3 Further Eval Req'ments

  w/ Life Safety, High seismic, C2 ~> 6 story limit

  Bldg is 7 story, ∴ T2 Req'd

COFFMAN ENGINEERS	project Renton Eval	by TB	sheet no.
	location	date 5/16/07	job no.
	client	checked	07230
		date	

Renton Seismic Eval

Seismic Shear forces

(3-1) $V = C S_a W$

'C' per table 3-4 $= \underline{\underline{1}}$

S_a per (3-4) $= \frac{S_{D1}}{T}$ w/

$S_{D1} = .404$

T per (3-8) $= C_t h_n^B$

$C_t = .02$

$h_n = 86'$

$B = .75$

$T = .565$

$S_a = .404/.565 \rightarrow \underline{\underline{.715}}$

W = Dead + 1/4 storage + 10psf partition + mech + 1/5 S (if S>30psf)

no storage, neglect snow (<30)

weight workup on following sheets

$W = 6998^K$

$\therefore V = 1 \times .715 \times 6998 = \underline{5004^K}$

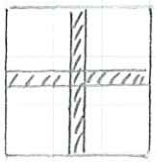
COFFMAN ENGINEERS	project Renton Eval	by TB	sheet no.
	location	date 5/17/07	job no. 07230
	client	checked	
		date	

Renton Seismic Eval

Weight workup

Flor DL (Typ)

take 9' sq section of waffle slab



3' SQ

joists

[6" × 14" × 6'] 150 = 525 lbs

slab

[3" (9ft²] 150 = 338 lbs

$\frac{863^{lb}}{9ft^2} \rightarrow \approx 100 psf$

w/ beams, columns, misc → use 110 psf Flor DL

Partitions

per ASCE/SE → add 10 psf

Typ shearwall weight

@ stairs 2 [34' long × 10" thk × 13' tall (150)] → 110.6 K

@ elevator N/S 3 (9' × 8" × 13' tall)(150) → 34 K

E/W 2 (20' × 12" × 13' tall) (150) → 78 K

2 (5' long × 12" × 13' tall)(150) → 20 K

242 K/flor

* half @ roof

COFFMAN ENGINEERS	project Renton Eval	by TB	sheet no.
	location	date 5/17/07	
	client	checked	job no. 07230
		date	

Renton Seismic Eval

Weight workup cont.

Roof

$H = 86'$

$W = 76^2(110+10) + \frac{1}{2}(242{,}000) = 814^K$

7th

$H = 74'$

$W = 76^2(110+10+\underbrace{15}_{\text{mech}}) + 242{,}000 + \underbrace{74000}_{\text{brick}} = 1096^K$

6th

$H = 62'$

$W = 76^2(110+10) + 242000 = 935^K$

5th

$H = 50'$

$W = 935^K$

4th

$H = 38'$

$W = 935^K$

3rd

$H = 26'$

$W = 935^K$

2nd

$H = 13'$

$W = 96^2(110+10) + 242000 = 1{,}348^K$

COFFMAN ENGINEERS	project Renton Eval	by TB	sheet no.
	location	date 5/17/07	
	client	checked	job no. 07230
		date	

Renton Seismic Eval

Story Shear Forces

(3-3a & 3-3b)

$$F_x = \frac{w_x h_x^k}{\Sigma w_i h_i^k} V \qquad w/\ k = 1.0325,\ \Sigma w_i h_i^k = 379630,\ \& V = 5004^k$$

$$V_j = \sum_{x=j}^{n} F_x$$

R	← 1066.5^k
7	← 1229.6
6	← 873.8
5	← 699.8
4	← 527.1
3	← 356.2
2	← 257.1

story by story shear

R	← 1066.5^k
7	← 2296
6	← 3169.8
5	← 3869.8
4	← 4396.7
3	← 4752.9
2	← 5004

accumulated shear

COFFMAN ENGINEERS	project Renton Eval	by TB	sheet no.
	location	date 5/18/07	
	client	checked	job no. 07230
		date	

Renton Seismic Eval

Shear stress in shear walls (per 3-12)

$$V_{j\,avg} = \frac{1}{m}\left(\frac{V_j}{A_w}\right) < 100psi \text{ or } 2\sqrt{f'_c}$$

lesser = 100psi

where

$m = 4$ (table 3-7)

$V_{j\,max} = 5004^k$

A_w NS $= 12\left(\frac{10}{12}\right)(2) + 13\left(\frac{8}{12}\right) + 9\left(\frac{12}{12}\right)(2) = 46.7ft^2$

EW $= 20\left(\frac{8}{12}\right)(2) + 9\left(\frac{10}{12}\right)(2) + 14\left(\frac{10}{12}\right)(2) = 65ft^2$

worst case

$$V_{j\,avg} = \frac{1}{4}\left(\frac{5,004,000}{47.7(144)}\right) = 182psi \rightarrow N.C.$$

COFFMAN ENGINEERS	project Renton Eval	by TB	sheet no.
	location	date 5/18/07	job no. 07231
	client	checked	
		date	

3.7.9 Basic Structural Checklist for Building Type C2: Concrete Shear Walls with Stiff Diaphragms

This Basic Structural Checklist shall be completed where required by Table 3-2.

Each of the evaluation statements on this checklist shall be marked Compliant (C), Non-compliant (NC), or Not Applicable (N/A) for a Tier 1 Evaluation. Compliant statements identify issues that are acceptable according to the criteria of this standard, while non-compliant statements identify issues that require further investigation. Certain statements may not apply to the buildings being evaluated. For non-compliant evaluation statements, the design professional may choose to conduct further investigation using the corresponding Tier 2 Evaluation procedure; corresponding section numbers are in parentheses following each evaluation statement.

C3.7.9 Basic Structural Checklist for Building Type C2

These buildings have floor and roof framing that consists of cast-in-place concrete slabs, concrete beams, one-way joists, two-way waffle joists, or flat slabs. Floors are supported on concrete columns or bearing walls. Lateral forces are resisted by cast-in-place concrete shear walls. In older construction, shear walls are lightly reinforced but often extend throughout the building. In more recent construction, shear walls occur in isolated locations and are more heavily reinforced with boundary elements and closely spaced ties to provide ductile performance. The diaphragms consist of concrete slabs and are stiff relative to the walls. Foundations consist of concrete spread footings, mat foundations, or deep foundations.

Building System

C	NC	N/A	LOAD PATH: The structure shall contain a minimum of one complete load path for Life Safety and Immediate Occupancy for seismic force effects from any horizontal direction that serves to transfer the inertial forces from the mass to the foundation. (Tier 2: Sec. 4.3.1.1)
C	NC	N/A	MEZZANINES: Interior mezzanine levels shall be braced independently from the main structure, or shall be anchored to the lateral-force-resisting elements of the main structure. (Tier 2: Sec. 4.3.1.3)
C	NC	N/A	WEAK STORY: The strength of the lateral-force-resisting system in any story shall not be less than 80 percent of the strength in an adjacent story, above or below, for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.1)
C	NC	N/A	SOFT STORY: The stiffness of the lateral-force-resisting system in any story shall not be less than 70 percent of the lateral-force-resisting system stiffness in an adjacent story above or below, or less than 80 percent of the average lateral-force-resisting system stiffness of the three stories above or below for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.2)
C	NC	N/A	GEOMETRY: There shall be no changes in horizontal dimension of the lateral-force-resisting system of more than 30 percent in a story relative to adjacent stories for Life Safety and Immediate Occupancy, excluding one-story penthouses and mezzanines. (Tier 2: Sec. 4.3.2.3)
C	NC	N/A	VERTICAL DISCONTINUITIES: All vertical elements in the lateral-force-resisting system shall be continuous to the foundation. (Tier 2: Sec. 4.3.2.4)
C	NC	N/A	MASS: There shall be no change in effective mass more than 50 percent from one story to the next for Life Safety and Immediate Occupancy. Light roofs, penthouses, and mezzanines need not be considered. (Tier 2: Sec. 4.3.2.5)

C NC N/A TORSION: The estimated distance between the story center of mass and the story center of rigidity shall be less than 20 percent of the building width in either plan dimension for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.6)

C NC N/A DETERIORATION OF CONCRETE: There shall be no visible deterioration of concrete or reinforcing steel in any of the vertical- or lateral-force-resisting elements. (Tier 2: Sec. 4.3.3.4)

C NC N/A POST-TENSIONING ANCHORS: There shall be no evidence of corrosion or spalling in the vicinity of post-tensioning or end fittings. Coil anchors shall not have been used. (Tier 2: Sec. 4.3.3.5)

C NC N/A CONCRETE WALL CRACKS: All existing diagonal cracks in wall elements shall be less than 1/8 inch for Life Safety and 1/16 inch for Immediate Occupancy, shall not be concentrated in one location, and shall not form an X pattern. (Tier 2: Sec. 4.3.3.9)

Lateral-Force-Resisting System

C NC N/A COMPLETE FRAMES: Steel or concrete frames classified as secondary components shall form a complete vertical-load-carrying system. (Tier 2: Sec. 4.4.1.6.1)

C NC N/A REDUNDANCY: The number of lines of shear walls in each principal direction shall be greater than or equal to 2 for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.1.1)

C NC N/A SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than the greater of 100 psi or $2\sqrt{f'c}$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.2.1)

C NC N/A REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area shall be not less than 0.0015 in the vertical direction and 0.0025 in the horizontal direction for Life Safety and Immediate Occupancy. The spacing of reinforcing steel shall be equal to or less than 18 inches for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.2.2)

Connections

C NC N/A TRANSFER TO SHEAR WALLS: Diaphragms shall be connected for transfer of loads to the shear walls for Life Safety and the connections shall be able to develop the lesser of the shear strength of the walls or diaphragms for Immediate Occupancy. (Tier 2: Sec. 4.6.2.1)

C NC N/A FOUNDATION DOWELS: Wall reinforcement shall be doweled into the foundation for Life Safety, and the dowels shall be able to develop the lesser of the strength of the walls or the uplift capacity of the foundation for Immediate Occupancy. (Tier 2: Sec. 4.6.3.5)

3.7.9S Supplemental Structural Checklist for Building Type C2: Concrete Shear Walls with Stiff Diaphragms

This Supplemental Structural Checklist shall be completed where required by Table 3-2. The Basic Structural Checklist shall be completed prior to completing this Supplemental Structural Checklist.

Lateral-Force-Resisting System

C NC N/A DEFLECTION COMPATIBILITY: Secondary components shall have the shear capacity to develop the flexural strength of the components for Life Safety and shall meet the requirements of Sections 4.4.1.4.9, 4.4.1.4.10, 4.4.1.4.11, 4.4.1.4.12 and 4.4.1.4.15 for Immediate Occupancy. (Tier 2: Sec. 4.4.1.6.2)

C NC N/A FLAT SLABS: Flat slabs/plates not part of lateral-force-resisting system shall have continuous bottom steel through the column joints for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.6.3)

C NC N/A COUPLING BEAMS: The stirrups in coupling beams over means of egress shall be spaced at or less than $d/2$ and shall be anchored into the confined core of the beam with hooks of 135° or more for Life Safety. All coupling beams shall comply with the requirements above and shall have the capacity in shear to develop the uplift capacity of the adjacent wall for Immediate Occupancy. (Tier 2: Sec. 4.4.2.2.3)

C NC N/A OVERTURNING: All shear walls shall have aspect ratios less than 4-to-1. Wall piers need not be considered. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.4)

C NC N/A CONFINEMENT REINFORCING: For shear walls with aspect ratios greater than 2-to-1, the boundary elements shall be confined with spirals or ties with spacing less than $8d_b$. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.5)

C NC N/A REINFORCING AT OPENINGS: There shall be added trim reinforcement around all wall openings with a dimension greater than three times the thickness of the wall. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.6)

C NC N/A WALL THICKNESS: Thickness of bearing walls shall not be less than 1/25 the unsupported height or length, whichever is shorter, nor less than 4 inches. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.7)

Diaphragms

C NC N/A DIAPHRAGM CONTINUITY: The diaphragms shall not be composed of split-level floors and shall not have expansion joints. (Tier 2: Sec. 4.5.1.1)

C NC N/A OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls shall be less than 25 percent of the wall length for Life Safety and 15 percent of the wall length for Immediate Occupancy. (Tier 2: Sec. 4.5.1.4)

C NC N/A PLAN IRREGULARITIES: There shall be tensile capacity to develop the strength of the diaphragm at re-entrant corners or other locations of plan irregularities. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.7)

C NC N/A DIAPHRAGM REINFORCEMENT AT OPENINGS: There shall be reinforcing around all diaphragm openings larger than 50 percent of the building width in either major plan dimension. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.8)

Connections

C NC N/A

UPLIFT AT PILE CAPS: Pile caps shall have top reinforcement and piles shall be anchored to the pile caps for Life Safety, and the pile cap reinforcement and pile anchorage shall be able to develop the tensile capacity of the piles for Immediate Occupancy. (Tier 2: Sec. 4.6.3.10)

3.8 Geologic Site Hazards and Foundations Checklist

This Geologic Site Hazards and Foundations Checklist shall be completed where required by Table 3-2.

Each of the evaluation statements on this checklist shall be marked Compliant (C), Non-compliant (NC), or Not Applicable (N/A) for a Tier 1 Evaluation. Compliant statements identify issues that are acceptable according to the criteria of this standard, while non-compliant statements identify issues that require further investigation. Certain statements may not apply to the buildings being evaluated. For non-compliant evaluation statements, the design professional may choose to conduct further investigation using the corresponding Tier 2 Evaluation procedure; corresponding section numbers are in parentheses following each evaluation statement.

Geologic Site Hazards

The following statements shall be completed for buildings in levels of high or moderate seismicity.

Geotech Req'd

C NC N/A LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance shall not exist in the foundation soils at depths within 50 feet under the building for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.7.1.1)

C NC N/A SLOPE FAILURE: The building site shall be sufficiently remote from potential earthquake-induced slope failures or rockfalls to be unaffected by such failures or shall be capable of accommodating any predicted movements without failure. (Tier 2: Sec. 4.7.1.2)

C NC N/A SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site is not anticipated. (Tier 2: Sec. 4.7.1.3)

Condition of Foundations

The following statement shall be completed for all Tier 1 building evaluations.

C NC N/A FOUNDATION PERFORMANCE: There shall be no evidence of excessive foundation movement such as settlement or heave that would affect the integrity or strength of the structure. (Tier 2: Sec. 4.7.2.1)

The following statement shall be completed for buildings in levels of high or moderate seismicity being evaluated to the Immediate Occupancy Performance Level.

C NC N/A DETERIORATION: There shall not be evidence that foundation elements have deteriorated due to corrosion, sulfate attack, material breakdown, or other reasons in a manner that would affect the integrity or strength of the structure. (Tier 2: Sec. 4.7.2.2)

Capacity of Foundations

The following statement shall be completed for all Tier 1 building evaluations.

C NC N/A POLE FOUNDATIONS: Pole foundations shall have a minimum embedment depth of 4 feet for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.7.3.1)

The following statements shall be completed for buildings in levels of moderate seismicity being evaluated to the Immediate Occupancy Performance Level and for buildings in levels of high seismicity.

C NC N/A OVERTURNING: The ratio of the horizontal dimension of the lateral-force-resisting system at the foundation level to the building height (base/height) shall be greater than $0.6S_a$. (Tier 2: Sec. 4.7.3.2)

C	NC	N/A	TIES BETWEEN FOUNDATION ELEMENTS: The foundation shall have ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Class A, B, or C. (Section 3.5.2.3.1, Tier 2: Sec. 4.7.3.3)
C	NC	N/A	DEEP FOUNDATIONS: Piles and piers shall be capable of transferring the lateral forces between the structure and the soil. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.7.3.4)
C	NC	N/A	SLOPING SITES: The difference in foundation embedment depth from one side of the building to another shall not exceed one story in height. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.7.3.5)

3.9.1 Basic Nonstructural Component Checklist

This Basic Nonstructural Component Checklist shall be completed where required by Table 3-2.

Each of the evaluation statements on this checklist shall be marked Compliant (C), Non-compliant (NC), or Not Applicable (N/A) for a Tier 1 Evaluation. Compliant statements identify issues that are acceptable according to the criteria of this standard, while non-compliant statements identify issues that require further investigation. Certain statements may not apply to the buildings being evaluated. For non-compliant evaluation statements, the design professional may choose to conduct further investigation using the corresponding Tier 2 Evaluation procedure; corresponding section numbers are in parentheses following each evaluation statement.

Partitions

C NC N/A — UNREINFORCED MASONRY: Unreinforced masonry or hollow clay tile partitions shall be braced at a spacing equal to or less than 10 feet in levels of low or moderate seismicity and 6 feet in levels of high seismicity. (Tier 2: Sec. 4.8.1.1)

Ceiling Systems

C NC N/A — SUPPORT: The integrated suspended ceiling system shall not be used to laterally support the tops of gypsum board, masonry, or hollow clay tile partitions. Gypsum board partitions need not be evaluated where only the Basic Nonstructural Component Checklist is required by Table 3-2. (Tier 2: Sec. 4.8.2.1)

Light Fixtures

C NC N/A — EMERGENCY LIGHTING: Emergency lighting shall be anchored or braced to prevent falling during an earthquake. (Tier 2: Sec. 4.8.3.1)

Cladding and Glazing

C NC N/A — CLADDING ANCHORS: Cladding components weighing more than 10 psf shall be mechanically anchored to the exterior wall framing at a spacing equal to or less than 4 feet. A spacing of up to 6 feet is permitted where only the Basic Nonstructural Component Checklist is required by Table 3-2. (Tier 2: Sec. 4.8.4.1)

C NC N/A — DETERIORATION: There shall be no evidence of deterioration, damage or corrosion in any of the connection elements. (Tier 2: Sec. 4.8.4.2)

C NC N/A — CLADDING ISOLATION: For moment frame buildings of steel or concrete, panel connections shall be detailed to accommodate a story drift ratio of 0.02. Panel connection detailing for a story drift ratio of 0.01 is permitted where only the Basic Nonstructural Component Checklist is required by Table 3-2. (Tier 2: Sec. 4.8.4.3)

C NC N/A — MULTI-STORY PANELS: For multi-story panels attached at each floor level, panel connections shall be detailed to accommodate a story drift ratio of 0.02. Panel connection detailing for a story drift ratio of 0.01 is permitted where only the Basic Nonstructural Component Checklist is required by Table 3-2. (Tier 2: Sec. 4.8.4.4)

C NC N/A — BEARING CONNECTIONS: Where bearing connections are required, there shall be a minimum of two bearing connections for each wall panel. (Tier 2: Sec. 4.8.4.5)

C NC N/A INSERTS: Where inserts are used in concrete connections, the inserts shall be anchored to reinforcing steel or other positive anchorage. (Tier 2: Sec. 4.8.4.6)

C NC N/A PANEL CONNECTIONS: Exterior cladding panels shall be anchored out-of-plane with a minimum of 4 connections for each wall panel. Two connections per wall panel are permitted where only the Basic Nonstructural Component Checklist is required by Table 3-2. (Tier 2: Sec. 4.8.4.7)

Masonry Veneer

C NC N/A SHELF ANGLES: Masonry veneer shall be supported by shelf angles or other elements at each floor 30 feet or more above ground for Life Safety and at each floor above the first floor for Immediate Occupancy. (Tier 2: Sec. 4.8.5.1)

C NC N/A TIES: Masonry veneer shall be connected to the back-up with corrosion-resistant ties. The ties shall have a spacing equal to or less than 24 inches with a minimum of one tie for every 2-2/3 square feet. A spacing of up to 36 inches is permitted where only the Basic Nonstructural Component Checklist is required by Table 3-2. (Tier 2: Sec. 4.8.5.2)

C NC N/A WEAKENED PLANES: Masonry veneer shall be anchored to the back-up adjacent to weakened planes, such as at the locations of flashing. (Tier 2: Sec. 4.8.5.3)

C NC N/A DETERIORATION: There shall be no evidence of deterioration, damage, or corrosion in any of the connection elements. (Tier 2: Sec. 4.8.5.4)

Parapets, Cornices, Ornamentation, and Appendages

C NC N/A URM PARAPETS: There shall be no laterally unsupported unreinforced masonry parapets or cornices with height-to-thickness ratios greater than 1.5. A height-to-thickness ratio of up to 2.5 is permitted where only the Basic Nonstructural Component Checklist is required by Table 3-2. (Tier 2: Sec. 4.8.8.1)

C NC N/A CANOPIES: Canopies located at building exits shall be anchored to the structural framing at a spacing of 6 feet or less. An anchorage spacing of up to 10 feet is permitted where only the Basic Nonstructural Component Checklist is required by Table 3-2. (Tier 2: Sec. 4.8.8.2)

Masonry Chimneys

C NC N/A URM CHIMNEYS: No unreinforced masonry chimney shall extend above the roof surface more than twice the least dimension of the chimney. A height above the roof surface of up to three times the least dimension of the chimney is permitted where only the Basic Nonstructural Component Checklist is required by Table 3-2. (Tier 2: Sec. 4.8.9.1)

Stairs

C NC N/A URM WALLS: Walls around stair enclosures shall not consist of unbraced hollow clay tile or unreinforced masonry with a height-to-thickness ratio greater than 12-to-1. A height-to-thickness ratio of up to 15-to-1 is permitted where only the Basic Nonstructural Component Checklist is required by Table 3-2. (Tier 2: Sec. 4.8.10.1)

C NC N/A STAIR DETAILS: In moment frame structures, the connection between the stairs and the structure shall not rely on shallow anchors in concrete. Alternatively, the stair details shall be capable of accommodating the drift calculated using the Quick Check procedure of Section 3.5.3.1 without including tension in the anchors. (Tier 2: Sec. 4.8.10.2)

Building Contents and Furnishing

C NC N/A TALL NARROW CONTENTS: Contents over 4 feet in height with a height-to-depth or height-to-width ratio greater than 3-to-1 shall be anchored to the floor slab or adjacent structural walls. A height-to-depth or height-to-width ratio of up to 4-to-1 is permitted where only the Basic Nonstructural Component Checklist is required by Table 3-2. (Tier 2: Sec. 4.8.11.1)

Mechanical and Electrical Equipment

C NC N/A EMERGENCY POWER: Equipment used as part of an emergency power system shall be mounted to maintain continued operation after an earthquake. (Tier 2: Sec. 4.8.12.1)

C NC N/A HAZARDOUS MATERIAL EQUIPMENT: HVAC or other equipment containing hazardous material shall not have damaged supply lines or unbraced isolation supports. (Tier 2: Sec. 4.8.12.2)

C NC N/A DETERIORATION: There shall be no evidence of deterioration, damage, or corrosion in any of the anchorage or supports of mechanical or electrical equipment. (Tier 2: Sec. 4.8.12.3)

C NC N/A ATTACHED EQUIPMENT: Equipment weighing over 20 lb that is attached to ceilings, walls, or other supports 4 feet above the floor level shall be braced. (Tier 2: Sec. 4.8.12.4)

Piping

C NC N/A FIRE SUPPRESSION PIPING: Fire suppression piping shall be anchored and braced in accordance with NFPA-13 (NFPA, 1996). (Tier 2: Sec. 4.8.13.1)

C NC N/A FLEXIBLE COUPLINGS: Fluid, gas, and fire suppression piping shall have flexible couplings. (Tier 2: Sec. 4.8.13.2)

Hazardous Materials Storage and Distribution

C NC N/A TOXIC SUBSTANCES: Toxic and hazardous substances stored in breakable containers shall be restrained from falling by latched doors, shelf lips, wires, or other methods. (Tier 2: Sec. 4.8.15.1)

3.9.2 Intermediate Nonstructural Component Checklist

This Intermediate Nonstructural Component Checklist shall be completed where required by Table 3-2. The Basic Nonstructural Component Checklist shall be completed prior to completing this Intermediate Nonstructural Component Checklist.

Ceiling Systems

C NC N/A — LAY-IN TILES: Lay-in tiles used in ceiling panels located at exits and corridors shall be secured with clips. (Tier 2: Sec. 4.8.2.2)

C NC N/A — INTEGRATED CEILINGS: Integrated suspended ceilings at exits and corridors or weighing more than 2 pounds per square foot shall be laterally restrained with a minimum of four diagonal wires or rigid members attached to the structure above at a spacing equal to or less than 12 feet. (Tier 2: Sec. 4.8.2.3)

C NC N/A — SUSPENDED LATH AND PLASTER: Ceilings consisting of suspended lath and plaster or gypsum board shall be attached to resist seismic forces for every 12 square feet of area. (Tier 2: Sec. 4.8.2.4)

Light Fixtures

C NC N/A — INDEPENDENT SUPPORT: Light fixtures in suspended grid ceilings shall be supported independently of the ceiling suspension system by a minimum of two wires at diagonally opposite corners of the fixtures. (Tier 2: Sec. 4.8.3.2)

Cladding and Glazing

C NC N/A — GLAZING: Glazing in curtain walls and individual panes over 16 square feet in area, located up to a height of 10 feet above an exterior walking surface, shall have safety glazing. Such glazing located over 10 feet above an exterior walking surface shall be laminated annealed or laminated heat-strengthened safety glass or other glazing system that will remain in the frame when glass is cracked. (Tier 2: Sec. 4.8.4.8)

Parapets, Cornices, Ornamentation, and Appendages

C NC N/A — CONCRETE PARAPETS: Concrete parapets with height-to-thickness ratios greater than 2.5 shall have vertical reinforcement. (Tier 2: Sec. 4.8.8.3)

C NC N/A — APPENDAGES: Cornices, parapets, signs, and other appendages that extend above the highest point of anchorage to the structure or cantilever from exterior wall faces and other exterior wall ornamentation shall be reinforced and anchored to the structural system at a spacing equal to or less than 10 feet for Life Safety and 6 feet for Immediate Occupancy. This requirement need not apply to parapets or cornices compliant with Section 4.8.8.1 or 4.8.8.3. (Tier 2: Sec. 4.8.8.4)

Masonry Chimneys

C NC N/A — ANCHORAGE: Masonry chimneys shall be anchored at each floor level and the roof. (Tier 2: Sec. 4.8.9.2)

Mechanical and Electrical Equipment

C NC N/A VIBRATION ISOLATORS: Equipment mounted on vibration isolators shall be equipped with restraints or snubbers. (Tier 2: Sec. 4.8.12.5)

Ducts

C NC N/A STAIR AND SMOKE DUCTS: Stair pressurization and smoke control ducts shall be braced and shall have flexible connections at seismic joints. (Tier 2: Sec. 4.8.14.1)