EXECUTIVE SUMMARY

Introduction

This structural condition assessment, performed by Skilling Ward Magnusson Barkshire, describes the general structural condition of the existing building at 565 Broadway in Tacoma and provides a background and conceptual recommendations to address a prioritized list of structural deficiencies. It includes a brief description of the primary structural systems, an assessment of their current condition, a limited review of the gravity load-carrying capacity of the framing systems, and an assessment of the seismic load-resisting ability of the lateral system.

Scope of Assessment

The assessment is based on visual observation made during a walkthrough of the building on February 13, 2002, and a cursory review of the available construction drawings. The building layout and dimensions from an as-built drawing are not included. No testing or investigative work is included.

A limited gravity load verification of allowable floor loading was based on a spot check of column loads included in the original design drawings as compared to the tributary area of the column.

The initial seismic assessment is based on the ASCE draft standard *Seismic Evaluation of Existing Buildings* (ASCE 31). The assessment is based on a Life Safety performance level, which is consistent with common practice for buildings of this construction type and expected occupancy. We believe the renovation, re-occupancy, and resulting extended life of the building may constitute a substantial alteration to the existing building as defined by most building jurisdictions and in accordance with the Tacoma Building Code. Therefore, the focus of the seismic portion of this assessment is to present a list in a priority of descending order of the seismic deficiencies based on an ASCE 31 Tier 1 evaluation. The criteria and methodology for the seismic assessment and rehabilitation are discussed in greater detail in a subsequent section.

Documents Reviewed

The documentation for the original building includes structural and architectural drawings by Purdy & Hendersen Consulting Engineers and Frere Champney Architects, dated November 13, 1914. The structural drawings include a numbered set of 10 sheets and appear to be complete for the main building. A partial set of architectural elevation drawings were also provided. No drawings were available for the 1937 and 1948 additions.

In addition, we were provided a copy of a newspaper article dated February 20, 1916 (The Tacoma News Tribune). This article provided some description of the exterior finish that substituted the terra-cotta as shown in the design drawing. The article also describes a unique floor system that substituted the original beam and slab system shown in the design drawings.

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Building Description

The main building was originally constructed in 1915. It is approximately six stories in height and is situated on a sloping site with the first level (first floor) at the street level of Commerce Street and the fourth level (third floor) at the Broadway Street level. The original building measures approximately 112 feet (east-west direction) by 75 feet (north-south direction) with an approximately 26-foot-wide addition (circa 1937) on the north side of the building. This addition, however, rises up only to the fourth floor line of the main building. An accounting of the levels and related floor nomenclature of the building are ordered as follows:

Level	Floor	Description (Based on Original Elks Usage)
1	First	Pool/Gym – approximates the street level of Commerce Street
2	Second	Banquet Hall/Stage
3	Second Mezzanine	Mezzanine open to Hall below
4	Third	Dining/Card Room – approximates the street level of Broadway
5	Fourth	Lodge Room (note: high story) – approximates the roof of the north addition
6	Fourth Mezzanine	Balcony
7	Roof	Roof

Most of the present structure dates from the original 1915 main building and the1937 north addition. A smaller ancillary single-story addition further to the north was added in 1948. We did not access the 1948 addition during our site visit. There have been a few subsequent alterations that affected the structural systems in localized areas. A comparison of the original construction drawings to observations made in the field confirmed that much of the building structure appears to match the original drawings with some exceptions.

Both the main building and north addition are of similar construction. The structural framework consists of a grid of reinforced concrete columns supporting floors of reinforced concrete beams and slabs. The original main building, however, appears to have changed its floor framing in construction to a pan-joist type system.

Foundations are shown in the drawings to be conical tapered and stacked concrete spread footings typical of this vintage construction. A perimeter concrete basement wall is shown in the drawings to be supported on a continuous wall footing.

Steel roof trusses and a concrete roof slab are shown in the original design drawings; however, from site observation these appear to have been substituted. We believe that during the original construction, the steel truss and concrete slab system was changed to wood trusses and a wood framed roof deck. A central skylight, shown in the original design drawings, appears to have also been omitted from the original construction. The fourth floor balcony (Level 6) appears to be suspended from the wood trusses, similar to as shown in the original design drawings.

Non-bearing clay-tile interior block walls, typically covered in lath and plaster, were observed throughout as dividing walls within the building.

Exterior non-bearing walls consist of hollow clay tile between the exterior columns and are supported on exterior perimeter concrete beams. These appear to be constructed of hollow clay-tile block with some cast-stone lintels. It appears that what is indicated as terra-cotta exterior finishes in the architectural design may have been substituted during the original construction to a cement-based cast-stone finished surface made to emulate the architecturally designed terra-cotta finished profile.

Reinforced concrete walls form areaways to the north and south of the original building. These walls vary in height with the slope but generally extend up to the second floor level. Concrete strut beams cross the areaways perpendicular to the walls and appear to be out-of-plane supports where these walls retain earth. The walls no longer retain earth on the north side where the addition was placed.

The small ancillary northernmost single-story addition, with access off Broadway Street, appears to be a concrete masonry block (CMU) perimeter bearing wall system with possibly a metal roof structure. A braced steel framework was observed supporting the block wall addition, taking it to foundations placed on the sloping ground.

The lateral-load-resisting system consists primarily of the exterior reinforced concrete column and beam framework acting as a type of moment frame. The non-bearing in-fill exterior clay-tile wall is not considered a lateral resisting element; however, it will act to stiffen the building under very minor seismic demands (see the seismic considerations). Concrete floor slabs act as a diaphragm to deliver the lateral forces to the perimeter frame. The framework then transfers forces to the basement shear walls supported on the basement wall foundations.

STRUCTURAL CONDITION ASSESSMENT AND RECOMMENDATIONS

The existing building condition is based on observations made during our site visit on February 13, 2002. The purpose of the walkthrough was to look for signs of distress that may indicate structural concerns as well as to compare the as-built conditions to the available drawings. In most cases, the structure is covered with architectural finishes and is therefore inaccessible to direct observation. Some dropped ceiling areas, primarily on the third floor, were exposed to view as a result of what we were told was a broken water line occurrence.

Based on this limited observation, we have determined that the main building is in fair structural condition with no indications of distress beyond what would be expected in a building of this age. Where the structure could be observed in mechanical rooms, attics, and other unfinished areas, the framing and materials were in general conformance with the available drawings and consistent with this vintage of construction, with the exception of the roof as noted above. The following is a summary of the observations at the main building:

Concrete Floor Slabs

- Assessment. As observed on the third floor of the main building where we were able to look at the bottom of the slab of the floor above, it is a steel pan joist construction that forms the beam/joist and slab floor system. This is consistent with the vintage of concrete construction practices at the time of the original construction and as noted in the historical record. The bottoms of the metal pans show signs of corrosion.
- Recommendation. The extent of the corrosion was not determined, however, we recommend further investigative study of this pan-joist system to evaluate the condition and capacity of the system. Limited calculations based on column loads in the original design drawings, however, indicate that the floor framing (assuming the size and spacing matches the original drawings) is adequate for an office-type or similar usage.

Attic Framing

- Assessment. The attic framing departs from the information in the original drawings. The attic space and roof is framed in wood, not the steel truss and concrete slab as shown in the drawings. The wood trusses and floor/roof framing appear to be in generally sound condition, with no evidence of excessive rotting, deterioration, or other damage.

- Recommendation. Access within this space was limited, and some isolated areas appear to have been exposed to past water intrusion. Therefore, further investigative measures are needed to confirm the extent of possible isolated rot locations.

Roof Framing

- Assessment. The wood decking is overlayed by an insulating foam layer. Access was limited; however, some minor water leaks were indicated.

- Recommendation. We recommend further investigation to determine if, and to what extent, any rot is present.

Interior Non-Bearing Clay-Tile Walls

- Assessment. Many of the walls observed were damaged with large to small openings apparently broken through by vandal or transient acts.

- Recommendation. We recommend for consideration of renovation that these walls be removed or repaired and strong-backed. See also the seismic considerations.

Exterior Non-Bearing Hollow Clay-Tile Walls and Cast-Stone Lintels

- Assessment. Many of the walls observed were intact but suffer from varying degrees of weathering damage. Some minor cracks and water intrusion was observed. The exterior of higher stories was not accessible during our site observation review.

- Recommendation. While repairs are indicated for renovation, the exterior is of historical importance to this building and must be considered. See also the seismic considerations.

Exterior Ornamentation

- Assessment. Ornamental features throughout the exterior façade and primarily at entries to the building were observed to be reinforced cast-stone works in lieu of the terra-cotta shown in the original architectural drawings. Most of these elements are cracked and spalled and are in poor condition.

- Recommendation. We recommend that these elements be repaired or removed. Again, restoration will likely be desired for historical elements. See also the seismic considerations.

Foundations

- Assessment. There were no indications of excessive foundation settlement or distress. Some minor settlement cracks were observed in concrete retaining walls and sidewalks and stairs located at the exterior southside promenade stair walk.

- Recommendation. Patch repair cracks in localized areas.

Floor Capacity for Consideration of Renovation

As indicated previously, the floors generally have a vertical load carrying capacity compatible with an office or other similar use occupancy. Based on a two-location spot check of the self-weight dead load compared to the original column load design schedule, we calculate an available load in the range of 75 to 110 psf. Assuming that superimposed dead loads (i.e., finishes, mechanical/electrical) will account for approximately 5 to10 psf and code-required partition loads (for office occupancy) are at 20 psf, this leaves available a live load range of about 50 to 80 psf. Office occupancy requires a live load equal to 50 psf. While a much more detailed analysis is required to determine the allowable loads for re-occupancy of this building, this quick check indicates that the existing vertical load carrying capacity of the building will adequately support an office or other similar or lesser occupancy usage.

Localized areas of special loading—libraries, mechanical, storage, etc.—will require additional evaluation of the floor framing; however, with calculated areas of an available capacity of over 100 psf, the spot check indicates that certain areas will be adequate with little to no modification.

INTRODUCTION TO THE SEISMIC ASSESSMENT

The design of new buildings in Tacoma is typically governed by the *Uniform Building Code* (UBC) as amended by the City of Tacoma. However, this code is neither appropriate nor intended for the evaluation of existing buildings. Codes for new buildings, including the UBC, contain three basic types of requirements: strength, stiffness, and detailing. The strength and stiffness requirements are easily transferred to the evaluation of existing buildings, but the detailing provisions are not. The detailing requirements (e.g., the proportioning of structural members and connections) in the UBC are in place to ensure that the systems providing the building's strength and stiffness perform as intended. These requirements have been significantly revised throughout the code update cycles as the knowledge base of building performance has increased, either through observations from earthquakes or various research programs. Since the strength and stiffness of an existing building cannot be adequately addressed without assurances of proper detailing, guidelines have been developed specifically for the seismic assessment of these buildings.

Evaluation Guidelines

The basis of the seismic assessment is the Public Ballot version of American Society of Civil Engineers (ASCE) Draft Standard 31, *Seismic Evaluation of Existing Buildings,* commonly referred to as ASCE 31. This document, which will be formally adopted as an ASCE standard within the next year, is a recently updated version of the previously accepted national guideline, *Handbook for the Seismic Evaluation of Buildings – A Prestandard* (FEMA 310), and represents the most current practice for seismic evaluations. The purpose of ASCE 31 is to provide guidance in the review of an existing building's response to a predetermined level of earthquake based on a selected performance level. The ASCE 31 methodology consists of three phases, or tiers. The first phase is used to identify any potential deficiencies in the lateral load-resisting system. Potential deficiencies are then examined during the second phase and, if necessary, a more detailed full-building evaluation can be performed as a third phase.

The first phase, Tier 1, is a screening phase utilizing a series of checklists designed to identify potential flaws and weaknesses common to specific building types. The checklist is a collection of evaluation statements describing building characteristics that are considered necessary to achieve the desired performance level. The Tier 1 screening was considered in this evaluation.

The second phase, Tier 2, is a further evaluation of the deficiencies identified during the Tier 1 evaluation. This analysis is typically performed on just those elements that were identified as non-compliant with the Tier 1 acceptance criteria. In some cases, further evaluation of the entire building is required, depending on the building type, number of stories, desired performance level, and site seismicity. A Tier 2 evaluation was not provided in this assessment; however, this evaluation can be skipped in favor of a more direct FEMA 356 rehabilitation approach.

The final phase, Tier 3, is not usually performed for typical seismic evaluations. It involves performing a very detailed seismic evaluation of the building, usually involving some seismic rehabilitation measures, using an approved methodology. ASCE does not contain any specific procedures or criteria for this level of evaluation, but Tier 3 is often performed using *Prestandard and Commentary for the Seismic Rehabilitation of Buildings* (FEMA 356), which, like its companion FEMA 310, is in the process of becoming an ASCE standard. FEMA 356 provides design requirements for new elements within an existing building, and includes provisions that are intended to ensure adequate performance of the existing elements that are relied upon to provide lateral resistance or to support gravity loads. FEMA 356 provides a rational method for combining the strength and stiffness of new and existing elements within the strengthened building and includes provisions for the interconnection of these elements to form a complete and adequate lateral load path.

Based on a preliminary, qualitative assessment of the main building (described in more detail in a subsequent section), this building will require seismic rehabilitation in order to achieve the minimum seismic performance objectives (see below) normally required by the City of Tacoma. Since any lateral upgrade for this building addressed by the UBC or UCBC (which refers to the UBC for design of new elements) is not appropriate for the rehabilitation design for reasons discussed previously, we therefore would recommend that the rehabilitation design be based on FEMA 356.

Seismic Performance Objectives

In traditional and current codes for new buildings, seismic performance is considered implicitly. Specified seismic force levels are used to provide adequate strength and stiffness based on implicit performance objectives, and prescriptive detailing requirements are used to provide a high degree of confidence that these performance objectives will be achieved. As indicated previously, this method is not applicable for existing buildings because the level of detailing cannot be controlled in most cases. For this reason the current seismic evaluation and rehabilitation guidelines are based on explicit performance objectives (also known as performance-based design). A specific seismic performance objective consists of two parts— a performance level and a seismic hazard (magnitude or frequency of earthquake).

Seismic Performance Levels

ASCE 31 provides criteria for two performance levels—Immediate Occupancy and Life Safety. FEMA 356, which has a much more comprehensive performance-based design approach, defines a series of three distinct performance levels and additional performance ranges. These levels, beginning with the most stringent, are defined as follows:

- Immediate Occupancy. Only minor structural damage is expected to occur in the design level earthquake. The risks to life safety are very low, and any minor structural repairs that may be required could be done following re-occupancy of the building.
- Life Safety. Significant structural damage could occur, but there is some margin against either partial or total structural collapse. It is expected that the risk of life-threatening injury is low and that building occupants can safely exit the building, albeit with some minor injuries. It would likely be prudent to implement structural repairs or install temporary bracing before re-occupancy of the building. It is important to stress that complete repair of the building is possible, but it may not be economically practical.
- Collapse Prevention. Substantial structural damage is expected, and the building may be on the verge of partial or total collapse. Significant risk of injury

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