

**CITY OF COOS BAY CITY COUNCIL**  
**Agenda Staff Report**

MEETING DATE April 1, 2014	AGENDA ITEM NUMBER
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**TO:** Mayor Shoji and City Councilors

**FROM:** Jim Hossley, Public Works Director  
Randy Dixon, Operations Administrator

**THROUGH:** Rodger Craddock, City Manager *per*

**ISSUE:** Discussion of Structural and Geotechnical Investigation of the Coos Bay Library

**BACKGROUND:**

The Coos Bay Library building has experienced some superficial and structural damage due to settling. The City contracted with the consulting firms SHN and ZCS to perform geotechnical and structural investigations of the Coos Bay Library. Representatives from the consulting firms will provide the City Council and citizens with presentation on their findings.

**ADVANTAGES:**

This discussion will help City Councilors and citizens understand the settlement that is occurring to the library building and learn about potential solutions along with estimated cost for those solutions.

**DISADVANTAGES:**

None

**BUDGET IMPLICATIONS:**

None at this time

**RELATED CITY GOAL:**

Infrastructure and Services: To maintain and improve the City's physical infrastructure and provide quality services for current and future citizens.

And

Citizen Education & Involvement: Educate, cultivate, and encourage public participation in City government, urban renewal and disaster preparedness.

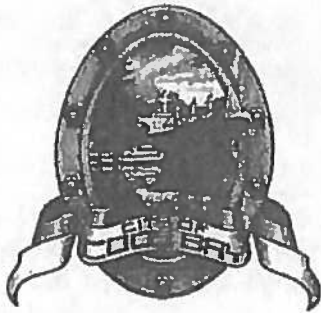
**ACTION REQUESTED:**

Staff is requesting the City Council direct staff as how you would like to proceed based on the information presented.

# Coos Bay Public Library Structural Assessment

525 Anderson Avenue, Coos Bay, OR

February 21, 2014



Prepared for:  
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EXPIRES: 12/31/15

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**Agenda Item #7**

February 21, 2014

Randy Dixon, Operations Manager  
City of Coos Bay  
500 Central Avenue  
Coos Bay, OR 97420

Reference: Coos Bay Public Library

Subject: Structural Improvement Evaluation

Mr. Dixon,

Please accept this report outlining our findings and recommendations for the structural improvement plan for the Coos Bay Public Library located at 525 Anderson Avenue in Coos Bay, Oregon. The purpose of our investigation was to verify the existing structural systems and perform an assessment based on current building code requirements to determine deficiencies, and to provide repair recommendations. We have outlined the findings of our evaluation in the enclosed report.

If you have any questions or concerns, please do not hesitate to contact our office at (541) 479-3865, or email me at SyA@ZCSengineering.com.

Sincerely,



EXPIRES: 12/31/16

Syllas E. Allen, PE  
Branch Manager

Enc: Structural evaluation report with repair recommendations and Tier 1 seismic evaluation.

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### Appendices

Appendix A: Figures

Appendix B: Tier 1 Evaluation

### Report Organization

**Introduction:** This section provides a brief overview and summary of the Structural Assessment and is intended to provide the reader with the important facts and findings contained in the overall report.

**Project Overview:** This section provides information on the background of the situation so the reader understands why this report was necessary.

**Observations & Findings:** This section includes a detailed summary of the building inspections along with the deficiencies that were observed.

**Conclusions & Recommendations:** This section outlines the conclusions that can be drawn from the information gathered and the actions deemed necessary to correct the noted deficiencies.

**Opinion of Probable Construction Cost:** This section provides a rough cost estimate to assist with the determination of the feasibility of moving forward with the structural repair work.

**Recommendations Moving Forward:** This section gives the reader an idea of the next steps to be taken if the City decides to move forward with the repair of this building.

**Limitations & Exclusions:** This section outlines the limits of the work performed, and the extent to which ZCS can be held responsible for the information provided in this report.

## 1.0 Introduction

This report outlines our findings regarding the structural assessment of the Coos Bay Public Library located at 525 Anderson Ave. in Coos Bay, Oregon. The purpose of this assessment was to determine the cause of building settlement, investigate existing structural systems for deficiencies, and prescribe repairs for the items found with associated costs to guide the City in their decision making regarding this building. Our scope did not include evaluation of space planning; fire and life safety and ADA code related items; energy efficiency, security measures, finish upgrades, facility modernization, or mechanical, electrical and plumbing systems. The list below briefly outlines the findings of our evaluation, and recommended repairs.

### Summary of Findings and Recommended Repairs

- Global settlement throughout the building, with localized areas of substantial settlement over short distances. In addition, condition of the existing pile and attachment to the pile caps is unknown. Refer to geotechnical report prepared by SHN Consulting Engineers & Geologists, Inc. dated January 22, 2014.
  - Complete foundation rehabilitation in the form of cased micropiles extending approximately 120' (into the underlying bearing stratum).
  - Localized floor slab repair incidental to structural work and levelling of drastic changes in elevation.
  - Repair and replacement of finishes, fixtures, casework, etc.
- Deficient gravity framing elements at the second floor storage portion of the original building (beams 'L' and 'F', and truss 'T-1' in Figure 5).
  - Repair measures should be further investigated, but could consist of additional columns or direct repairs to deficient members.
  - If deficiency is deemed a major concern, abandonment of second floor storage may be necessary.
- Concrete columns acting as lateral force resisting system in original structure are not compliant, refer to Appendix B: Tier 1 Evaluation.
  - Provide CMU shear walls to resist lateral loads, concrete columns remain for gravity element support.
- The roof diaphragm of the original building consists of 2x horizontal sheathing, rendering it inadequate for seismic loading, refer to Appendix B: Tier 1 Evaluation.
  - Provide plywood sheathing over existing 2x horizontal sheathing in conjunction with the re-roof of the building.
- The roof diaphragm of the wood-framed addition consists of unblocked plywood sheathing, refer to Appendix B: Tier 1 Evaluation.
  - Provide blocking at all panel edges and edge nail sheathing.
  - Improve connections at beam lines and walls to roof, provide strapping for connectivity across the building.

We have prepared an "Opinion of Probable Construction Cost" for the repair and rehabilitation of this building in Table 1. Based on expected costs to perform the work described above, we arrived at approximately \$6.3 million. The use of this budget should be limited to planning level decision making only, to determine the feasibility of undertaking the structural repairs outlined herein. The findings in this report, that the budget is based on, will need to be further evaluated to determine the exact nature of the necessary repairs should the City decide this route to be in their best interest. In addition, the following is recommended: hazardous material investigation, space planning if so desired, utility coordination, detailed code review, and preparation of construction documents for structural, architectural, and MEP disciplines.

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Agenda Item #7



## 2.0 Project Overview

The original Coos Bay Public Library was constructed around 1965 on the corner of Anderson and 5<sup>th</sup> Streets in Coos Bay, Oregon. Based on the original construction drawings made available for our review, this single-story, 16,640 sf building was founded on timber pile capped with concrete, a structural floor slab and building superstructure. The perimeter concrete columns appear to function as the building's lateral- and gravity-force resisting system, with non-structural masonry infill walls and window packages between. The roof construction is comprised of heavy timber trusses and beam systems, with 2x roof decking and asphalt shingle roofing. The library underwent an approximately 9000 sf addition around 1998, expanding to the west of the original building and modifying the main entrance. Based on construction documents made available for our review, the addition was founded on steel pipe pile, and also supports a structural slab system, but the lateral- and gravity-force resisting system is comprised of wood shearwalls, and the roof is light timber-framed trusses with plywood sheathing and asphalt shingle roofing. At some point between the original construction and the addition, the north wall of the original building underwent undocumented modifications, bumping the exterior wall out under the existing overhang. This minor addition involved new concrete grade beams between the columns, and a wood-framed floor system and exterior walls between the existing concrete columns.



Figure 1 Building Exterior

It is our understanding the City of Coos Bay (City) retained the services of SHN Consulting Engineers & Geologists, Inc. (SHN) to investigate the apparent settlement of the north wall of the library where the undocumented modifications occurred (refer to Geotechnical Evaluation dated May 8, 2012). Based on the findings in that report, the City retained the services of ZCS Engineering, Inc. (ZCS) to design a foundation solution to address the localized settlement. During the course of this design, ZCS began to question the effectiveness of a localized solution, when the problem appeared to be of a global nature. The City again enlisted the services of SHN to provide further geotechnical investigation on a global scale (refer to "Supplemental Geotechnical Investigation" dated January 22, 2014), in conjunction with the structural investigation performed by ZCS. The following report summarizes the findings, recommendations and conclusions of the geotechnical and structural evaluations.

## 3.0 Observations & Findings

### 3.1 Geotechnical

Refer to SHN report "Supplemental Geotechnical Investigation Relative to Structural Distress" dated January 22, 2014 for additional information. The following summarizes the report:

- SHN performed geotechnical investigations to determine soil characteristics essential to determining the adequacy of the existing foundation and appropriate foundation repair methods.
- SHN performed a floor level survey to ascertain the nature of the building settlement in an attempt to relate the findings to the actual building grid loads as provided by ZCS.
- The soils were deemed highly compressible, even under light loading, with a long time-rate of settlement and possibility of induced downdrag forces on pile.
- The allowable pile capacity is approximately 16.67 kips for single pile, 11.77 kips per pile for pile groups (FS = 3.0, group efficiency factor = 0.7)

### 3.2 Structural

Agents of ZCS visited the site on a number of occasions at the request of the City to observe what appeared to be recent cracking of the finishes, to verify the information provided in the original construction drawings, and to observe the general layout of the furniture and shelving units to approximate the floor loading accurately. We prepared a summary of the loading on a grid basis for use by SHN in correlating their findings with the actual loading conditions (this loading summary can be found in the supplemental geotechnical report referenced above).

In conjunction with the loading summary, we also performed calculations to analyze the existing beams and trusses for deficient members. It was determined that some of the members supporting the second floor storage space are deficient under the prescribed code loading (see Figure 2). We also performed a Tier 1 Evaluation, per the ASCE 31-03 – Seismic Evaluation of Existing Buildings, to get a general sense of the adequacy of the lateral-force resisting system as it pertains to seismic loading (see Appendix B: Tier 1 Evaluation). Overall, the building did not raise many red flags; most notable were the inadequacy of the diaphragms (2x roof decking on the original structure, unblocked plywood sheathing on the addition), lack of cross-ties between diaphragm chords, improper spacing of the column ties at the connection to the pile cap where the forces would concentrate, and insufficient anchorage of the existing pile to the pile caps.

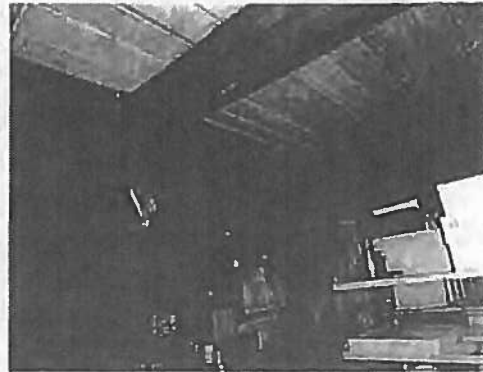


Figure 2 Storage Space Construction

## 4.0 Conclusions & Recommendations

### 4.1 Geotechnical

Refer to SHN report "Supplemental Geotechnical Investigation Relative to Structural Distress" dated January 22, 2014 for additional information. To summarize:

- The existing pile are inadequate for support of the structure, although a majority of the total expected settlement has occurred.
- Groundwater fluctuation could be deteriorating the top of the timber pile, contributing to the settlement observed.
- The best option for remediation of the settlement and adequate support of the building is cased micropile installed to a depth of approximately 120' (into the underlying dense siltstone bedrock).

### 4.2 Structural

Based on the calculated loads and condition of the underlying soils, all of the existing pile have insufficient capacity to support the calculated loads, contributing to the settlements observed. SHN has determined that the best repair option is to install an array of micropile that take the existing foundation out of service completely, even if the loads can be reduced below the provided allowable capacity of the existing pile. These micropile are very expensive, due to the depth they have to be installed to achieve capacity. The number of pile could fluctuate depending on the repair methods chosen, but our preliminary estimate puts the total just over 200 pile. This would involve installing a single pile through the middle of the existing pile caps where there are no columns to interfering, and installing two pile where columns are interfering; one either side of the existing pile cap to negate any eccentricity (see Figure 4).

The installation of the pile will require intensive demolition with regards to the existing slab system. Portions of the slab would have to be removed to allow access to the existing pile caps, and replaced after the pile installation is complete. Structure would have to be appended to the existing pile caps to anchor the new micropile system to the building. Among other options, removal of the entire slab and replacement with a lighter wood-framed floor system was entertained, but the gain does not outweigh the cost since the existing pile were deemed useless regardless of the loading applied. In essence, it would require the same number of new micropile, and even more work to the substructure in order to frame the new floor into the building. The only major gain with this approach is a more level floor and unlimited access to the existing substructure during construction.

In order to install the micropile, the entire building would need to be cleared of all contents, and gutted of all interior walls and items conflicting with the pile locations, perhaps leaving the ceiling finishes and the existing HVAC system intact. This includes, but is not limited to, walls, casework, plumbing, fixtures, electrical, and floor finishes, which would all have to be replaced after the work is complete. This would also involve storing all the contents and closing down the library for the duration of construction, which could be a year to a year-and-a-half. This would provide the City with an opportune time to perform the desired roof replacement, and recommended structural roof upgrades.

The structural work described above is considered "repairs", and is completely voluntary on the part of the City as the structure has not been deemed "dangerous". Repairs are work that is deemed necessary to fix a structural deficiency, with the exception of the voluntary seismic strengthening that would fall into the "upgrades" category. Upgrades are items that may or may not improve the usability of the space, but improve the overall performance of the structure. While the seismic strengthening is voluntary per sections 3408.4 and 3404.5 of the OSSC, we would recommend performing this work to protect the investment that is made in the building. This would entail providing new CMU shearwalls to take the place of the existing concrete columns as part of the lateral force resisting system, as well as providing plywood sheathing and cross-ties at the roof level to create diaphragms and load path components.

It is our opinion that the repair of the library as described above would not be money well spent on the part of the City. The expected gain is minimal: reduction in maintenance associated with settlement, and assurance of public perception of safety. What is not gained is what determined our recommendation: the floor is still uneven; you gain no efficiencies that a modern building would grant you in MEP systems, maintenance costs, energy consumption, up-to-date electronics, security measures, and usability. An evaluation could be performed to determine if the library still fits the needs of the community, or if it is outdated. The contents of the library would have to be moved out, and the library closed for at least a year during construction, whereas if a new building was constructed, the City could move the contents directly into the new building with little down-time.

The City maintains the option to take no action, and continue to use the library as they are currently. The building is safe for occupancy, as the settlements observed do not constitute a collapse potential or immediate danger. The City will have to keep up with maintenance items such as repairs to finishes and thresholds as they become an issue due to continued settlement. We would recommend a monthly monitoring program be established to track the continued settlement of the building, as we can provide no warranty as to the condition of the building as it continues to settle, or its performance during a code wind or seismic event. The City will also have to tolerate the public perception of the settlement, with the knowledge that at some point the perception of the safety of the library may be compromised due to the undulations of the floor and the finish damage.

## 5.0 Opinion of Probable Construction Cost

The intent of this section is to help establish a reasonable estimate of the construction cost to help the City determine the feasibility of undertaking the foundation repair. To develop the probable construction cost for the repairs, we consulted a specialty contractor regarding the micropile foundation system, and a local contractor regarding the incidental demo and replacement work. The construction cost excludes the voluntary seismic strengthening work outlined previously, roof replacement, optional HVAC replacement, any hazardous material investigation/mitigation, any moving and storage of building contents, any costs associated with down-time during the construction process (approx. 1 to 1.5 year), and any alterations to the building outside the scope of the repairs. Based on basic finishes such as carpet and vinyl flooring, standard fixtures and casework, painted wood doors and trim, and wood framed walls with gypsum finishes, the following opinion utilizes a cost of \$85.00 per square foot for direct replacement of the existing interior elements.

Separate line items, including an industry standard 5% for permitting fees, 15% for soft costs associated with architectural/engineering plan development, and a 15% contingency associated with potential unknowns that could develop with a repair of this magnitude, have been included. The total construction cost is based on 26,000 sf of building area. The following table outlines our Opinion of Probable Construction Cost:

**Table 1 Opinion of Probable Construction Cost**

Micropile Foundation Repairs	207 pile @ \$12,000 per pile	\$2,484,000
Demo and Replacement	\$85/sf	\$2,210,000
<b>Subtotal</b>		<b>\$4,694,000</b>
Permitting Fees	5%	\$235,000
Plan Development Fees	15%	\$704,000
Contingency	15%	\$704,000
<b>Total Building Improvements</b>		<b>\$6,337,000</b>

By comparison, if a new library of the same square footage were built today, the City could expect to pay around \$250/sf. At 26,000 sf, a new library would cost around \$6.5 million. With the current technology trends, and departure from paper media to more electronic media, a new library may not need to be as large as the existing library. An evaluation could be performed within the local community to determine if the currently library is sufficient, or if a new library could better serve the needs of the community.

It should be noted that the above probable construction costs do not include potential increases related to inflation over time and material price escalations. The above construction cost is based on current pricing data available. This budget should be used for planning level decision making only.

## **6.0 Recommendations Moving Forward**

As stated above, it is not our recommendation to repair the existing library. We believe the community of Coos Bay could benefit from a more modern public library facility, and the City may come out money-ahead by pursuing a newer, more efficient building. We believe a viable option may be to construct a new facility on a corner of the current library parking lot, while continuing to utilize the existing library. When this structure is complete, the moving process would be relatively easy by comparison to moving to a completely different site, decreasing the down-time, and maintaining the public association with this site as the public library.

Should the City decide to proceed with the repairs to the library foundation, based on the information provided in this report, further investigation/evaluation will need to be performed during a schematic design phase. Further consultation with the micropile specialty contractor will be necessary to confirm the assumptions that were made to provide the above cost estimate. A schematic foundation repair plan shall be developed, which will be utilized during discussions and subsequent testing or selective demolition to maximize the efficiency of the proposed repairs. Schematic mechanical, electrical and plumbing plans shall be developed, which will be utilized to evaluate the existing utilities and compare to the new requirements. This phase will also include hazardous materials testing to determine the occurrence of the materials and how they will have to be dealt with during demolition and construction. The construction cost should be reevaluated at the end of the schematic design phase, prior to progressing into the construction document phase, and during each phase thereafter.

## **7.0 Limitations & Exclusions**

This report is limited to the footprint of the building, and does not include public ways or parking requirements. This inspection took place within the readily accessible areas of the building and is limited to visual observations of evident conditions existing at the time of the inspection only. Limited structural analysis was performed at this stage to substantiate the structure's performance during prescribed code loading events. Concealed and latent defects and deficiencies are excluded from this report. Systems were not dismantled to provide inspection access. Destructive investigation and testing was not performed.

It is understood that ZCS Engineering, Inc. is not an insurer and that this inspection and report are not intended or to be construed as an express or implied guarantee or warranty of adequacy, performance, or condition of the structure at the inspected property address. No guarantee or warranty of the structure's performance outside the loading observed at the time of inspection can be made. The Client hereby releases and exempts ZCS Engineering, Inc. and its agents and employees of and from all claims of responsibility and liability for the cost of repairing or replacing any unreported deficiency or defect and for any consequential harm, property damage, personal injury of any nature, and/or legal fees. This report is for the sole, confidential and exclusive use of the Client.