DCI+SDE STRUCTURAL EVALUATIONS

OFFICE BUILDING, TOOL SHED & WATER TANK, AND BLACKSMITH & MACHINE SHOP BUILDINGS

SAN FRANCISCO, CALIFORNIA
[14290]

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OFFICE BUILDING

EXISTING CONDITIONS

General

The intent of this report is to provide a limited preliminary structural assessment of the existing Office building, located on an adjoining parcel of the 900 Innes Avenue property and adjacent to the Tool Shed and Water Tank building, in order to assist Page and Turnbull and the Client in evaluating the most appropriate re-use options for the building, if appropriate. This limited preliminary structural assessment is intended to primarily provide a summary of any observed structural deficiencies in the building.

DCI+SDE Engineers visited the 900 Innes Avenue site on Wednesday, July 15, 2015. Our observations of the Office building were limited to visual observations from the exterior of the structure only. Access to view the interior was not possible, except through some window openings in the exterior walls. No destructive testing or removal of architectural finishes and no materials testing was completed as part of our review. No structural analysis or calculations were completed as part of this preliminary observation report.

The Office building is a one story woodframe building with what appears to be a wood floor over crawlspace at grade, on a slightly sloping site. No foundations were visible at the time of our visit.

There was only very limited access to view the existing structural framing at the time of our site visit. Based on our limited site observations of these accessible areas, the structural system for the Office building is assumed to consist of the following:

- 1x skip sheathing at the roof and asphalt shingles.
- The existing roof is slightly sloping or "flat". The roof sheathing appears to be supported by 2x sloping rafters spanning north-south for the full dimension of the building, with separate flat ceiling joists.
- The roof rafters extend to and cantilever beyond the north and south exterior walls to create an eave condition. Some evidence of fire damage to the existing roof rafters and ceiling joists as well as more limited damage to interior wall vertical siding was also noted. The extent of this damage and the required repairs are unknown without a more detailed survey.
- Exterior walls appear to be exterior horizontal clap board siding with interior 1x vertical sheathing with no studs except around window and door openings.
- No exterior foundations or foundation stem walls were visible at the time of our visit. The size of the existing exterior wall footings, if any, as well as the depth of embedment of the footings below existing site grades is unknown without additional exploratory foundation pits being excavated. Based on our limited site observations, the building may be supported by wood piers or posts in direct contact with or embedded in earth.
- Lateral (wind or seismic) loads are currently resisted primarily by the exterior horizontal wood clap board siding and interior vertical 1x sheathing on the exterior walls. The existing 1x roof skip sheathing acts as a diaphragm to transfer lateral loads to the exterior walls which are then transferred to the existing exterior foundations, if any.
- Based on our limited walkthrough observations, the main structure of the Office building appears to be in poor to fair condition, however, it appears to have performed adequately over its life, including in past seismic events.
- Additional deficiencies noted were the lack of proper site drainage around the building, the possible need for crawlspace venting, continuous wood-soil contact around the entire perimeter of the building due to the existing exterior wall framing and floor framing contacting and extending into site exterior grades, some

areas of water and dry rot damage as well as fire damage, some areas of deterioration and dry rot damage to exterior siding and roof eave members and some sagging of the roof framing indicating that the framing may be overloaded and require strengthening.

Foundations

No existing exterior or interior foundations were visible at the time of our visit as noted above. Any gravity loading deficiencies or seismic deficiencies noted in the existing foundations are addressed under the Code Considerations section below.

Wall Structure

The existing exterior wood walls appear to be in fair to good condition with the exception being some limited areas of the interior vertical sheathing on the exterior walls where there is evidence of possible fire damage. A more detailed survey would be required to confirm the extent of this damage. Finally, the construction of the exterior walls appear to lack stud framing as noted above. Any gravity load deficiencies as well as seismic deficiencies noted in the existing walls and their connections to the roof diaphragms are addressed under the Code Considerations section below.

Roof Structure

The existing roof framing, except at exposed rafter ends and at roof diaphragm edges exposed to weather, appeared to be in fair to good condition, assuming that the extent of fire damage does not significantly affect its strength. However, based on our preliminary observations to date and past experience with similar roof structures, the roof rafters and their connections are likely inadequate to support the roof dead and code required live loads without additional strengthening. This deficiency is addressed in more detail in the TREATMENT RECOMMENDATIONS section of this report. Seismic deficiencies noted in the existing roof diaphragm and its connections are addressed under the Code Considerations section below.

Floor Structure

Access to observe crawlspace floor sheathing and framing was not possible during our site visit. Any gravity load deficiencies as well as seismic deficiencies related to the existing crawlspace floor framing and its connections are addressed under the Code Considerations section below.

Code Considerations

A preliminary seismic analysis of the Office building was not possible within the scope of this limited preliminary structural assessment. The criteria for this analysis would be based on the lateral load regulations of Section 8-706 of the 2013 California Historic Building Code, including Tables 8-8-A and 8-8-B, allowable capacities for existing materials. The wind and seismic lateral force levels for evaluation of historic buildings required by this code section is equivalent to approximately 75% of the 2013 California Building Code wind and seismic force levels for new buildings.

As we understand it, wind or seismic strengthening of the Office building would be triggered or required primarily by a planned reuse or a new proposed change of use. However, our preliminary observations indicated that there are several structural deficiencies that would be prudent to address on a voluntary basis if the building, vacant now, is proposed to be reoccupied in the future.

The structural deficiencies noted are summarized below. The proposed strengthening to address these deficiencies is covered in the TREATMENT RECOMMENDATIONS section of this report.

Roof Diaphragm Capacity:

The existing 1x skip sheathing does not have adequate capacity to transfer the code required wind or seismic forces to the exterior walls or to brace the walls out-of-plane. In addition, the connections of the roof diaphragm to the exterior walls are likely deficient.

Existing Shear Wall Capacities:

A detailed survey of the existing exterior wall siding and vertical sheathing and their connections was not possible as part of this assessment. However, in general, the existing exterior wood siding and interior wood vertical sheathing do not likely have adequate capacity to resist the code required wind or seismic forces. In addition, the exterior walls are not adequately connected (bolted) to the existing foundations, if any, to transfer the code required wind or seismic forces.

Existing Foundations:

A detailed survey was not possible without some additional exploratory foundation pits. However, based on our past experience and engineering judgment, the existing foundations, if wood only, do not have adequate capacity to resist their tributary dead and code required live loads without additional strengthening. Also, localized strengthening or possible new foundation portions will likely be required in areas where new exterior shear walls are proposed.

Additional Noted Deficiencies:

In addition to the deficiencies noted above, the following deficiencies/maintenance issues were noted but not reviewed in detail:

- More crawlspace vents may be required.
- Portions of the existing roof rafter tails will need to be stabilized/strengthened or replaced.
- Portions of the existing crawlspace floor framing may need to be replaced and the existing roof framing will likely need to be strengthened.
- Improved drainage around the exterior of the building will be required in order to direct surface water away from the existing or new foundations.
- Exterior site grades will need to be lowered or existing or new exterior concrete foundation stem wall heights will need to be raised in order to address the existing wood-earth contact conditions around the entire perimeter of the building.
- Areas of deteriorated or water or dry rot damaged wood at exterior walls, at crawlspace floor framing and at exterior wall siding in contact with earth, and at roof rafter tails and other areas of damaged exterior siding, will need to be stabilized or replaced in-kind.

TREATMENT RECOMMENDATIONS

General

Protect Foundations and Crawlspace Framing:

- Provide proper grading to direct site water, including roof runoff, away from existing or new foundations or crawlspace framing.
- Provide overall site and foundation drainage to keep site water away from the existing or new foundations and to prevent moisture infiltration and accumulation in the crawlspace.
- Provide proper, code required, wood-earth separation between the existing or new exterior wall sill plates and crawlspace framing and adjacent soil grades.

Structure

Roof Framing Strengthening:

- Strengthen existing roof rafter framing throughout by sistering (doubling up) with similar size roof rafters at all roof members and by improving the connections of all existing ceiling joists to all existing and new roof rafters.

Roof Diaphragm Strengthening:

- Improve roof diaphragm capacity by the addition of new 19/32" plywood sheathing throughout over the existing 1x skip sheathing. Improve roof diaphragm connections to the existing exterior walls, including new, proposed shearwalls noted below, by the addition of new plywood edge nailing to existing or new blocking over walls and new Simpson framing clips to attach the existing or new blocking to the existing or new exterior wall top plates.

Improve Existing Shear Wall Strength:

- Provide new 15/32" plywood sheathing on the interior face of selected exterior walls and new foundation bolting, including new Simpson holdowns, to existing or new foundations to improve overall building wind and seismic resistance. As part of this strengthening, for all exterior walls, remove and replace interior 1x vertical sheathing and provide new 2x stud framing in walls behind existing interior horizontal siding as required to comply with code gravity loading and plywood shear wall requirements.

Improve Existing Foundations:

- Investigate in more detail and provide localized new reinforced concrete foundations, as required, in areas where new exterior plywood shear walls are proposed above as well as at areas where foundation walls retain earth, and at areas where foundations are overloaded for dead plus code required design live loads. The addition of new reinforced concrete stem walls and foundations should be assumed throughout under exterior walls as well as replacement of the existing crawlspace floor framing with a new reinforced concrete slab-on-grade.

TOOL SHED AND WATER TANK BUILDING

EXISTING CONDITIONS

General

The intent of this report is to provide a limited preliminary structural assessment of the existing Tool Shed and Water Tank building located on an adjoining parcel of the 900 Innes Avenue property, in order to assist Page and Turnbull and the Client in evaluating the most appropriate re-use options for the building, if appropriate. This limited preliminary structural assessment is intended to primarily provide a summary of any observed structural deficiencies in the building.

DCI+SDE Engineers visited the 900 Innes Avenue site on Wednesday, July 15, 2015. Our observations of the Tool Shed and Water Tank building were limited to visual observations only from the exterior and accessible areas of the interior of the structure. No destructive testing or removal of architectural finishes and no materials testing was completed as part of our review. No structural analysis or calculations were completed as part of this preliminary structural assessment.

The Tool Shed and Water Tank building is a one story plus partial mezzanine woodframe building with some concrete foundations and a concrete slab on grade, likely unreinforced, on a gently sloping site.

Most areas of the existing structural framing were visible at the time of our site visit. Based on our site observations of these areas, the structural system for the Tool Shed and Water Tank building is assumed to consist of the following:

- 1x6 skip sheathing at the roof with wood shingles. Wood shingles are missing and/or damaged in large portions of the roof.
- The roof sheathing is supported by 2x4 sloping roof rafters @ ~ 32"o.c. with no separate ceiling joists, which span from the east-to west exterior walls. The sloping roof rafters are supported by 2-2x6 built-up beams @ ~ 5'-4" o.c. which span the full north-south dimension of the building and are supported by wood posts at the north and south exterior walls and at the full height interior wall separating the Tool Shed and Water Tank rooms.
- The existing west mezzanine area framing consists of 2x12flat decking spanning the full north-south dimension of the building and being supported at the north and south exterior walls, the full height interior wall separating the Tool Shed and Water Tank rooms and the partial height 2x4 @ 16"o.c. stud wall that occurs under the mezzanine in the Tool Shed room.
- The floor of the building consists of a concrete slab-on-grade, in most areas, approximately 3" in thickness and likely unreinforced. The slab is damaged and/or missing in some areas.
- Exterior walls and the interior wall separating the Tool Shed and Water Tank rooms consist primarily of 1x or 2x horizontal members for nailing of the vertical siding and no vertical studs. These walls also have embedded vertical posts (@~5'-4"o.c.) for supporting the 2-2x6 built-up roof beams referenced above.
- The interior 2x4 @16"o.c. stud wall supporting the mezzanine appears to be of newer construction and appears to have been added at same time during the life of the building.
- The only exterior foundation wall, visible during site visit was along the north exterior wall and appeared to consist of ~6" thick concrete stem wall extending slightly above the exterior site grade, likely unreinforced. The size and presence of additional existing exterior wall footings as well as the size and depth of embedment of the footings below existing site grades is unknown without additional exploratory foundation pits being excavated.

- With the exception of the north exterior wall, all other exterior and interior wood stud bearing walls below appear to be supported directly on the concrete slab-on-grade with no supplemental footing support.
- Lateral (wind or seismic) loads are currently resisted primarily by the vertical wood siding on the interior and exterior walls. The existing 1x roof skip sheathing acts as a diaphragm to transfer lateral loads to the interior and exterior walls which are then transferred to the existing exterior concrete foundations and concrete slab-on-grade.
- Based on our limited walkthrough observations, the main structure of the Tool Shed and Water Tank building appear to be in poor to fair condition, however, it appears to have performed marginally well over its life, including in past seismic events.
- The additional deficiencies noted were the lack of proper site drainage around the building, continuous wood-soil contact around the entire perimeter of the building due to the existing concrete slab-on-grade elevation being lower than existing site exterior grades except at the north exterior wall foundation, some cracking and displacement of north exterior foundation concrete stem wall, some areas of deterioration and dry rot damage to exterior siding, roof sheathing and roof eave members and some sagging of the roof and mezzanine framing, indicating that the framing may be overloaded and require strengthening.

Foundations

The limited area of existing foundations (where noted along the north exterior wall) are of concrete construction, likely unreinforced. No independent field testing to verify the concrete compressive strength and the extent of reinforcing steel, if any, was possible within the scope of this report. These foundations, where observed, appear to have performed adequately over their life. Any gravity loading deficiencies or seismic deficiencies noted in the existing foundations are addressed under the Code Considerations section below.

Wall Structure

The existing interior and exterior wood walls appear to be in fair to good condition with the exception being some areas on the exterior walls where there is evidence of moisture infiltration and possible water and dry rot damage. A more detailed survey would be required to confirm the extent of this damage. Also, the construction of the full height interior and exterior walls lack stud framing. Any gravity load deficiencies as well as seismic deficiencies noted in the existing walls and their connections to the roof diaphragm and foundations are addressed under the Code Considerations section below.

Roof Structure

The existing roof framing, except at rafter ends and at roof sheathing and diaphragm edges exposed to weather, appeared to be in fair to good condition. However, based on our preliminary observations and past experience with similar roof structures, the roof rafters and roof built-up beams and their connections are likely inadequate to support the roof dead and code required live loads without additional strengthening. This deficiency is addressed in more detail in the TREATMENT RECOMMENDATIONS section of this report. Seismic deficiencies noted in the existing roof diaphragm and its connections are addressed under the Code Considerations section below.

Mezzanine Floor Structure

The existing mezzanine framing appeared to be in fair to good condition. However, based on our preliminary observations, the existing mezzanine decking and framing and their connections are likely inadequate to support the roof dead and code required live loads without additional strengthening. This deficiency is addressed in more detail in the TREATMENT RECOMMENDATIONS section of this report. Any gravity load deficiencies as well as seismic deficiencies noted in the existing mezzanine floor framing as well as the mezzanine floor diaphragm and its connections are addressed under the Code Considerations section below.

Code Considerations

A preliminary seismic analysis of the Tool Shed and Water Tank building was not possible within the scope of this limited preliminary structural assessment. The analysis criteria for this building would likely be based on the lateral load regulations of Section 8-706 of the 2013 California Historic Building Code, including Tables 8-8-A and 8-8-B, allowable capacities for existing materials. The wind and seismic lateral force levels for evaluation of historic buildings required by this code section is equivalent to approximately 75% of the 2013 California Building Code wind and seismic force levels for new buildings.

As we understand it, wind or seismic strengthening of the Tool Shed and Water Tank building would be triggered or required primarily by a proposed plan to reuse the building or a proposed change of use. However, our preliminary observations indicated that there are several structural deficiencies that would be prudent to address on a voluntary basis if the building, vacant now, is proposed to be reoccupied in the future.

The structural deficiencies noted are summarized below. The proposed strengthening to address these deficiencies is covered in the TREATMENT RECOMMENDATIONS section of this report.

Roof Diaphragm Capacity:

The existing 1x skip sheathing does not have adequate capacity to transfer the code required wind or seismic forces to the interior and exterior walls or to brace the walls out-of-plane. In addition, the connections of the roof diaphragm to the interior and exterior walls are likely deficient.

Mezzanine Floor Diaphragm Capacity:

The existing 2x decking does not likely have adequate capacity to transfer the code required wind or seismic forces to the existing interior and exterior walls. In addition, the connections of the floor diaphragm to these walls are likely deficient.

Existing Shear Wall Capacities:

A detailed survey of the existing exterior and interior wall wood vertical siding and its connections was not possible as part of this assessment. However, in general, the existing exterior and interior wood vertical siding does not likely have adequate capacity to resist the code required wind or seismic forces. In addition, the interior and exterior walls are not adequately connected (bolted) to the existing foundation or slab-on-grade to transfer the code required wind or seismic forces.

Existing Foundations:

A detailed analysis was not possible without some additional concrete strength testing and verification of the extent of reinforcing steel, if any, as well as exploratory foundation pits. However, based on our site observations and our experience and engineering judgment, the existing north exterior wall concrete foundations as well as the concrete slab-on-grade, do not have adequate capacity to resist their tributary dead and code required live loads without additional strengthening. Also, additional localized strengthening or new foundation portions will likely be required in areas where new interior or exterior shear walls are proposed below.

Additional Noted Deficiencies:

In addition to the deficiencies noted above, the following deficiencies/maintenance issues were noted but not reviewed in detail:

- Portions of the existing roof rafter tails will need to be stabilized/strengthened or replaced.
- Significant portions of the existing mezzanine floor and roof framing will likely need to be strengthened.
- Improved drainage around the exterior of the building foundations will likely be required in order to direct

surface water away from the existing or new foundations and exterior walls.

- Exterior site grades will need to be lowered or existing or new exterior concrete foundation stem wall heights will need to be raised in order to address the existing wood-earth contact conditions around the entire perimeter of the building.
- Cracked and displaced portions of the existing concrete north exterior wall foundation stem wall will require repair/strengthening. The entire existing concrete slab-on-grade will require replacement.
- Areas of deteriorated or water or dry rot damaged wood at exterior wall vertical siding, nailers and posts at sill plates and siding in contact with earth, and at roof rafter tails and roof sheathing and other areas of exterior siding, will need to be stabilized, repaired or replaced in-kind.

TREATMENT RECOMMENDATIONS

General

Protect Foundations and Exterior Wall Framing:

- Provide proper grading to direct site water, including roof runoff, away from existing or new foundations.
- Provide overall site and foundation drainage to keep site water away from the existing or new foundations and to prevent moisture infiltration and accumulation in the interior spaces.
- Provide proper, code required, wood-earth separation between the existing or new interior and exterior wall sill plates and adjacent soil grades.

Structure

Roof Framing Strengthening:

- Strengthen existing roof rafter and built-up beam framing throughout.

Roof Diaphragm Strengthening:

- Improve roof diaphragm capacity by removal of the existing wood shingles and the addition of new 19/32" plywood sheathing throughout over the existing 1x skip sheathing. Improve roof diaphragm connections to the existing interior and exterior walls, including new, proposed shear walls noted below, by the addition of new plywood edge nailing to new blocking or rim joists over walls and new Simpson framing clips to attach the blocking or rim joists to the existing or new interior and exterior wall top plates.

Improve Mezzanine Floor Diaphragm Connections:

- Improve mezzanine floor diaphragm capacity by the addition of new 15/32" plywood over existing 2x decking. Provide additional Simpson framing clips and anchor plates (or bolts) to improve the connection of the strengthened floor diaphragm to existing or new blocking at interior and exterior walls.

Improve Existing Shear Wall Strength:

- Provide new 15/32" plywood sheathing on the interior face of selected exterior and interior walls and new foundation bolting, including new Simpson holdowns, to existing or new foundations to improve overall building wind and seismic resistance. As part of this strengthening, for all interior and exterior walls, provide new full height 2x stud framing between the existing wood posts and the existing horizontal wall framing as required to comply with code gravity load and plywood shear wall requirements.

Improve Existing Foundations:

- Investigate in more detail and provide localized strengthening (new reinforced concrete) of existing concrete foundations, as required, in areas where new interior and exterior plywood shear walls are proposed above as well as at areas where foundation walls retain earth, at areas where foundations are overloaded for dead plus code required design live loads and where existing foundations are damaged. Addition of new reinforced concrete stem walls and foundations or replacement or strengthening of existing concrete stem walls and foundations at all interior and exterior walls should be assumed throughout as well as replacement of the existing concrete slab-on-grade with a new reinforced concrete slab-on-grade.

BLACKSMITH AND MACHINE SHOP BUILDING

EXISTING CONDITIONS

General

The intent of this report is to provide a limited preliminary structural assessment of the existing Blacksmith and Machine Shop building located on an adjoining parcel of the 900 Innes Avenue property in order to assist Page and Turnbull and the Client in evaluating the most appropriate re-use options for the building, if appropriate. This limited structural assessment is intended to primarily provide a summary of any observed structural deficiencies in the building.

DCI+SDE Engineers visited the 900 Innes Avenue site on Wednesday, July 15, 2015. Our observations of the Blacksmith and Machine Shop building were limited to visual observations from the exterior and accessible areas of the interior of the structure. No destructive testing or removal of architectural finishes and no materials testing was completed as part of our review. No structural analysis or calculations were completed as part of this preliminary structural assessment.

The Blacksmith and Machine Shop building is a one story woodframe building which is at least partially elevated over water on what appears to be a wood pier structure with wood piles. A portion near the southeast corner of the building has partially collapsed into the water below.

Most areas of the existing structural framing were visible at the time of our site visit except for the wood pier structure below the ground level. Based on our site observations of these areas, the structural system for the Blacksmith and Machine Shop building is assumed to consist of the following:

- Corrugated metal decking with some areas of metal decking having been replaced with fiberglass decking.
- The corrugated metal roof decking is supported by 2x4 flat purlins under the deck at ~4'0"o.c. that are supported by 3x6 sloping rafters at ~6'-0"o.c. that span parallel to the corrugated decking. The roof rafters appear to span the full width of the building to the exterior bearing walls in all sections of the building.
- In areas exposed during our visit, the ground level or pier floor framing consists of 3x12 flat wood decking supported by 3x8 wood floor joists @16"o.c. The 3x8 interior joists appear to span the full north-south width of the building and to be supported by wood 6x12 edge beams under the north and south exterior walls.
- Exterior walls are primarily clad in horizontal 1x board-and-batten siding with 3x4 studs @~6'-0"o.c. only for supporting the 3x6 sloping roof rafters. Additional studs are provided to frame for door and window openings. A portion of the east side of the building exterior walls are clad in vertical corrugated metal decking.
- Interior walls, in general, where they occur, are similar in construction to the exterior walls.
- The northeast portion of the building floor has a concrete slab poured over the floor/pier framing of unknown thickness and likely unreinforced.
- Exterior walls, in general, as noted above, are supported by 6x12 continuous wood edge beams. Access to the underside of the wharf/pier structure was not possible at the time of our site visit, however, these 6x12 edge beams appear to be supported by wood piles at areas exposed for observation. The spacing and condition of these wood piles are unknown. Given the age of the structure (1930s), our past experience with the performance of wood piles in marine environments, and the fact that a portion of the wood pier has collapsed, it is likely that the existing wood piles are in poor condition.

- Lateral (wind or seismic) loads are currently resisted primarily by the exterior horizontal wood board-and-batten siding on the exterior walls. The existing corrugated steel and fiberglass roof decking is intended to act as a diaphragm to transfer lateral loads to the exterior walls which are then transferred to the existing 6x12 beams and the supporting pier structure.
- Based on our limited walkthrough observations, the main structure of the Blacksmith and Machine Shop building appears to be in poor to very poor condition and appears to have performed poorly over its life, including in past seismic events.
- Additional items noted were the lack of proper site drainage around the building, continuous wood to concrete or water contact around the entire perimeter of the building, some areas of water and dry rot damage at the base of the exterior walls, some areas of deterioration and dry rot damage to exterior siding and roof eave members and some sagging of the roof framing, indicating that the framing may be overloaded and require strengthening.

Foundations

The existing wood pier foundation (where exposed) appears to be of heavy timber construction supported by wood piles. No independent field testing or exploratory work was possible within the scope of this report. The wood pier structure where observed, appears to have performed adequately over its life in the main portions of the pier, except for the partially collapsed area. Any gravity loading deficiencies or seismic deficiencies noted in the wood pier and wood pile foundation system are addressed under the Code Considerations section below.

Wall Structure

The existing exterior wood walls appear to be in fair to good condition with the exception being some limited areas of the exterior walls where there is evidence of moisture infiltration and possible water damage. A more detailed survey would be required to confirm the extent of this damage. In addition, it was noted that the 3x4 exterior wall studs were out-of-plumb in some limited locations. Finally, the construction of the exterior walls appear to lack adequate stud framing. Any gravity load deficiencies as well as seismic deficiencies noted in the existing walls and their connections to the floor and roof diaphragms are addressed under the Code Considerations section below.

Roof Structure

The existing roof framing, except at exposed rafter ends, appeared to be in fair condition. However, based on our preliminary observations and past experience with similar roof structures, the 2x flat roof purlins and the roof rafters and their connections are likely inadequate to support the roof dead and code required live loads without additional strengthening. This deficiency is addressed in more detail in the TREATMENT RECOMMENDATIONS section of this report. Seismic deficiencies noted in the existing roof diaphragm and its connections are addressed under the Code Considerations section below.

Floor Structure

Access to observe the ground level wood pier framing was limited during our site visit. Any gravity load deficiencies as well as seismic deficiencies noted in the existing floor framing as well as the floor diaphragm and its connections are addressed under the Code Considerations section below.

Code Considerations

A preliminary seismic analysis of the Blacksmith and Machine Shop building was not possible within the scope of this limited preliminary structural assessment. The analysis criteria for this building would likely be based on the lateral load regulations of Section 8-706 of the 2013 California Historic Building Code, including Tables 8-8-A and 8-8-B, allowable capacities for existing materials. The wind and seismic lateral force levels for evaluation of historic buildings required by this code section is equivalent to approximately 75% of the 2013 California Building Code wind and seismic force levels for new buildings.

As we understand it, wind or seismic strengthening of the Blacksmith and Machine Shop building would be triggered or required primarily by a proposed plan to reuse the building or a planned change of use. However, our preliminary observations indicated that there are several structural deficiencies that would be prudent to address on a voluntary basis if the building, vacant now, is proposed to be reoccupied in the future.

The structural deficiencies noted are summarized below. The proposed strengthening to address these deficiencies is covered in the TREATMENT RECOMMENDATIONS section of this report.

Roof Diaphragm Capacity:

The existing corrugated metal/fiberglass roof decking does not have adequate capacity to transfer the code required wind or seismic forces to the interior and exterior walls or to brace the walls out-of-plane. In addition, the connections of the roof decking to the interior and exterior walls are likely deficient.

Floor Diaphragm Capacity:

The existing 3x floor decking likely has adequate capacity at most locations to transfer the code required wind or seismic forces to the existing pier structure. However, the connections of the floor decking to pier structure are likely deficient. More detailed investigations would be required to confirm this.

Existing Shear Wall Capacities:

A detailed survey of the existing exterior wall board-and-batten siding and its connections was not possible during this phase. However, in general, the existing exterior wood siding does not have adequate capacity to resist the code required wind or seismic forces. This is also true in areas of the exterior walls clad in vertical corrugated metal decking as noted above. In addition, the exterior walls are not adequately connected (bolted) to the existing pier structure to transfer the code required wind or seismic forces

Existing Foundations/Pier Structure:

A detailed analysis of the existing pier structure was not possible without some additional field exploratory work including observations under the supporting pier structure and underwater inspections of the existing wood piles. However, based on our experience and engineering judgment, the existing wood pier structure and supporting wood piles likely do not have adequate capacity to resist their tributary dead and code required live loads without additional strengthening. Also, additional localized strengthening or possible new wood piles will likely be required in areas where new exterior shear walls are proposed or where the existing structure has collapsed. A more detailed site survey, including likely underwater inspections, would be required to confirm this.

Additional Noted Deficiencies:

In addition to the deficiencies noted above, the following deficiencies/maintenance issues were noted but not reviewed in detail:

- Portions of the existing roof rafter tails will need to be stabilized/strengthened or replaced.
- Portions of the existing pier floor and the roof framing will likely need to be strengthened.
- Improved drainage around the exterior of the building will likely be required in order to direct surface water away from the existing building.
- Areas of deteriorated or water or dry rot damaged wood in the lower level, at exterior wall studs, at sill plates and siding in contact with concrete or water, and at roof rafter tails and other areas of exterior siding, will need to be stabilized or replaced in-kind.
- The collapsed southeast portion of the existing building, if proposed to be reused, would need to be rebuilt, including a new supporting pier structure.

TREATMENT RECOMMENDATIONS

General

Protect Foundations and Lower Level Framing:

- Provide proper grading to direct site water, including roof runoff, away from existing or new exterior walls.
- Provide overall site drainage to keep site water away from the existing exterior walls and to prevent moisture infiltration and accumulation in the building.
- Provide proper, code required, wood-earth separation between the existing or new exterior wall sill plates and adjacent concrete or soil grades.

Structure

Roof Framing Strengthening:

- Strengthen existing roof rafter framing throughout. Improve the connections of all existing and new roof rafters to the exterior wall top plates.

Roof Diaphragm Strengthening:

- Improve roof diaphragm capacity by removing the corrugated metal/fiberglass roof decking and replacing it with new 19/32" plywood sheathing throughout over the existing roof rafters. Improve roof diaphragm connections to the existing exterior walls, including new, proposed shearwalls noted below, by the addition of new plywood edge nailing to existing or new blocking over walls and new Simpson framing clips to attach the existing or new blocking to the existing or new exterior wall top plates.

Improve Floor Diaphragm to Foundation Connections:

- Provide additional anchor plates and bolts to improve the connection of the existing 3x floor decking diaphragm to the existing 6x12 edge beams and the connection of the 6x12s to the existing or new pier structure and piles.

Improve Existing Shear Wall Strength:

- Provide new plywood sheathing on the interior face of selected exterior walls and new foundation bolting, including new Simpson holdowns, to the existing or new pier structure to improve overall building wind and seismic resistance. As part of this strengthening, for all exterior walls, remove any interior finishes and provide new 2x stud framing in walls as required to comply with code gravity load and plywood shear wall requirements.

Improve Existing Foundation/Pier Structure:

- Investigate in more detail and provide localized strengthening of the existing pier structure and wood pile foundations, as required, in areas where new exterior plywood shear walls are proposed above as well as at areas where the existing pier structure, including the wood piles, are overloaded for dead plus code required design live loads and where the existing the pier structure, including the wood piles, are missing or damaged.

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