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ENGINEERS

May 1, 2014

Ms. Sara Bourne, Vice President Architectural Review
Oak Hills Board of Directors
15435 NW Perimeter Drive
Beaverton, Oregon 97006
Via Email: saraebourne@gmail.com

Subject: Condition Assessment Report
2400 NW 153rd Avenue, Beaverton, Oregon
MCE Project Number: 140271

Dear Ms. Bourne:

As you have requested, Ronald G. Vandehey of Miller Consulting Engineers, Inc. (MCE) met with you at the above-noted address to perform a structural site observation on April 4 and April 21, 2014. The purpose of these site observations was to identify structural deficiencies present. The scope of this report includes visual observations of cracking in the foundation of the administration building. An additional scope was added at the site to perform a visual observation from the ground of the surrounding facilities.

This is a condition assessment report and is limited to visual observations only; no other means of testing or evaluation was performed to reach the conclusions in this letter. The professional opinions expressed in this report are based solely on the observed conditions at the time of the site observation and information supplied by the owner. Evaluation of waterproofing, flashing, and related moisture protection is beyond the scope of this report.

BACKGROUND

The drawings supplied showed the Oak Hills Recreation Center was designed in 1965. MCE was contacted after the remodel of a shower room revealed damage to the existing administration building. The administration building consists of a concrete basement with interior wood walls that contains the shower room. The upper floor at grade is wood construction that contains a meeting room and office area. A photo of the exterior of the administration building is shown in photo 3540. A photo of the exterior of the recreation pavilion is shown in photo 3551. A photo of the exterior of the pump building and pool area is shown in photo 3553 (a site plan is enclosed showing selected photo locations; also enclosed is an elevation page showing the elevation of the slabs around the administration building).

After reviewing the recreation building we were asked to take a look at the other facilities at the site to note other structural issues. Specifically, we were asked to review the elevated slab to the locker room.

Mark, who was reported to have been providing maintenance of the facility for many years, informed me that the slab settlement has been a long-term issue. Another company tried to slab jack the slab unsuccessfully, so they cut out and re-poured a portion of the slab.

OBSERVATIONS

Administration Building

The staining on the wood shown in Photo 2685 shows typical damage observed above the shower stall in the building.

Photo 2692 shows a water puddle on the floor resulting from water leaking through the locker room concrete wall near the northwest entry door.

Under the elevated slab water is leaking through the slab and into the embedded electrical fixtures. (See Photos 2697 and 2698.)

Photos 2701 - 2704 shows water leaking into the south locker room wall.

Photos 2713 and 2716 shows water staining of the decking near the support beams, as well as apparent dry rot of the wood screening members outside the windows. The wood members attaching the screening appear to have been notched to match the size of the beam and are likely locations for wood decay if not adequately protected from the moisture.

Photo 2717 shows settlement of the exterior slab prior to the drain. Photo 3545 shows this settlement is approximately 1 inch.

Photo 2718 shows a crack in the slab on grade adjacent to the elevated slab.

The slab on grade around the perimeter of the building is indicated on the drawings to slope away from the building to the drains near the concrete wall. Photo 3555 shows the dip in the center of the slab. Our survey indicates that the slab is over 3" lower than the adjacent drain at this location.

Photo 3511 shows un-caulked joints in the concrete slab on grade allowing water to undermine the slabs.

Photo 3556 shows the amount the slab has dropped since it has been poured again.

The drains for the sidewalks are plugged; see photo 3476.

Concrete walls are cracked and have exposed reinforcing in several locations; see photos 3477 and 3478.

Photo 3533 shows the building roof drain is plugged and overflowing. This is near the location of the leaks in the shower room below.

Recreation Pavilion

The roof diaphragm on the pavilion consists of skipped sheathing with steel X-braces in each lower bay as shown in photos 2720 and 2721.

The basketball hoop on the west side of the building appears to have been recently replaced and has not been fully re-attached to the supports (see photos 2722). The back support of the beam was not visible.



Pool Deck

The existing pool deck was reported to have been coated in the last couple of years. The existing coating appears to have covered the cracks in the concrete that were acting as expansion and contraction joints. This has caused the coating to buckle.

Photo 3486 shows chipped pool deck covering. Photo 3489 shows incomplete joint caulking.

Photos 3505 – 3511 and 3522 - 3526 show the pool deck patches that have buckled and in addition show patching that covers the expansion joints in the pool.

Mechanical Building/Lifeguard Station

The mechanical room has electrical, water and gas elements all in the same building. Leaking connections for the water has made the environment wet and metal electrical boxes are rusted. Photo 3405 shows the condition on the day of our second site visit. Photo 3408 shows leaking faucet. Photos 3410 and 3428 show the rusted electrical panels.

Mark posted a sign warning of some of the hazards in the room (Photo 3413). It is outside my area of expertise but I would also be concerned about electrocution with water so near the electrical and rusting panels.

The roof and walls appear to have wood deterioration. Photo 3415 shows the staining of the roof and upper walls of the building. Photo 3424 shows deterioration of the studs near the door. Photos 3425 and 3430 show decay of the door and the surrounding door framing. The doors can no longer be secured due to the decay in the door and frames. The wood above the concrete walls are decayed in several locations. (See photos 3422 - 3435.) The lifeguard room door and floor are also decayed; see photos 3437 and 3440.

Photos 3497 and 3498 show deterioration of the exterior wood. Photo 3499 shows staining where the flashing has a reverse slope causing water to pond under the siding and leak through the nail holes in the flashing.

Pump Building

The upper framing of the pump building appears to have been replaced. The roof has newer sheathing and the floors do not match the original construction.

The original drawings indicate 6 x 12 beams which we assume were supported in steel brackets, visibly anchored into the concrete wall. The new beams are built-up 2 x 6 joists supported in some cases with just a single stud and without a positive attachment to the concrete footing below (see photo 3451).

Photo 3456 shows a PVC pipe bracket that has come loose that is also supported by an electrical panel shown in photo 3461.

The built-up floor members do not extend to the support as shown in photo 3468.



The mechanical piping is poorly supported and some of the supports have rusted away and do not bear on the concrete; see photos 3458 and 3459. Other supports do not have a positive connection to the concrete or the pump; see photo 3457.

Photo 3462 shows serious alterations to the framing that reduce the capacity of the connections.

Photos 3490 and 3491 show cracking and chipping in the stucco coating.

Exterior Steel Fence

Several of the fence posts had missing or broken connections; see photos 3469, 3471 and 3473.

The fence bases are not supported on the concrete; see photo 3483.

Photo 3494 shows broken fence bases that have been attempted to be repaired with light angles; with very little force the fence deflects.

Photo 3496 shows a gap at the base of the fence post.

Photo 3500 shows more exposed steel in the concrete wall near the pool. The exterior of the wall appears to have the original finish. The side of the wall facing the pool has been painted.

CONCLUSIONS/RECOMMENDATIONS

Administration Building

Our office was only provided page 3 of the drawing set that has detail 6 of 3 showing a detail cut at the edge of the slab. This shows #4 bars tying the structural slab to the concrete walls and beams, but the bars extend less than 2' into the slab. There is another cut 4 on page 10 that we do not have. Based on the steel in the slab (indicated on page 3 of the drawings) the current slab is inadequate to support the code loads. Based on the reinforcing in the remainder of the building, it seems unlikely that the slab does not have additional reinforcing in it. We recommend that either the other drawing page is located or partial demolition of the underside of the slab be done to verify reinforcing. If the slab is not found to have any additional reinforcing, the area should be temporarily shored until a long-term repair can be made. The waterproofing of the existing slab appears to have failed allowing for water to drain through the slab and enter into the light fixtures in this area. We recommend that new waterproofing is installed.

The crack in the slab between the slab on grade and the elevated slab is most likely due to a combination of shrinkage of the concrete and settlement of the slab on grade. The slabs on grade around the building have settled in the past and it is expected that this settlement will continue, especially with the slab elevation being lower than many of the drain elevations.

Based on Mark's report of the unsuccessful attempt of slab jacking the exterior slab in the past along with the continued settlement of the exterior slab, we recommend that the existing slab on grade be replaced along with any incompetent fill. This will also be an opportunity to replace the waterproofing of the elevated slabs.

Slab jacking uses concrete slurry under pressure that is also known to plug drains so it is likely that the drains around the basement have failed resulting in leaks through the concrete walls. The drawings do not indicate waterproofing on the back side of the basement walls. We recommend that the walls are waterproofed when the slab and drains are removed and replaced.



The water intrusion has caused decay to the wood framing of the building. The high moisture conditions from leaking walls and steam from the shower can condense on the floor framing causing decay. Since this is already occurring, it is important that a mechanical engineer review this building and add fans to keep the wood framing dry to reduce the spread of decay. Unless the moisture level of the wood can be kept extremely low, the decay will likely continue and the floors will need to be replaced.

The decking of the roof has dark staining around the perimeter and near every beam location which is an indicator of decay from water intrusion. This could be from leaks in the roof or condensation from below. The roof will eventually need to be replaced. Further investigation should be done to determine the amount of decay. This will help determine the amount of decay in the roof and when replacement will need to occur.

Exterior wood members shall be pressure treated and or protected from the weather. Remove all decayed members of the screens. The connection supporting the screens needs to be investigated for decay.

Recreation Pavilion

Our scope for this building was a brief walk-through of the facility to look for visual structural deficiencies. Based on our visual observation, we were asked if we observed issues with the seismic capacity of this structure. We responded that the building is very tall and made of lightweight wood framing and typically this structural design would be controlled by wind loading rather than seismic loading. The visual weakness of the building was the roof diaphragm that consisted of skipped sheathing and steel strap X-braces. The walls of the building that will resist the most wind load only has one (1) X-brace, while the sides that see a smaller amount of load has three X-braces. Since the roof was reported to be rather new, a typical strengthening scheme is to add plywood to the interior of the skip sheathing on the single X-braced sides (east and west ends). We would recommend the building be structurally analyzed to determine the level of strengthening required.

The connections in the bracing of the west basketball hoop are missing and the rear connection was covered. It is recommended that the fasteners be installed and a connection at the rear be verified.

Pool Deck

The pool deck coating is cracked and buckled. This appears to be a result of applying coatings over cracks in the concrete deck that continue to move. At these locations, the coating should be removed and the cracks be ground out and the joint should be filled with sealant like the other joints in the concrete deck. The deck coating should be re-applied up to the edge of the joint.

All joints in the concrete decks should have sealant to avoid water penetrating between the joints.

Mechanical Building/Lifeguard Station

First, it is recommended that a state-certified electrician review the water situation to ensure that there is not an electrocution issue and that the rusted electrical panels are serviceable and repair is made to the plumbing so it does not leak. Next, the building needs to have all of the deteriorated wood removed and replaced. Areas that are likely to get wet in the future should be replaced with treated wood. The flashing on the building needs to be redone so as not to the direct water back into the building or have water leak through nail holes securing the flashing. The building needs to have a full building envelope so water does not have direct contact with unprotected framing



members. The doors and door frames need to be replaced and the new doors need to be protected from the weather. The doors to the electrical/mechanical room need to be able to be secured.

Pump Building

The floor framing does not match the original drawings and by visual observation does not appear to provide adequate lateral bracing or vertical support. The current floor system needs to be fully analyzed and a repair scope needs to be put together and completed for the building to be used. Damage to the columns supporting the roof also needs to be reviewed to see if it can take the code loading. The piping in the building needs to be secured to prevent damage to the system.

Exterior Steel Fence & Walls

The exterior steel fence bases that have broken connections at the base and broken bases should be replaced. New bases should be welded to the post to match the code-required loads. There are several reasons for connectors and bases to fail, but the two most likely are thermal expansion, contraction and corrosion. Therefore we recommend that the new bases for the fence have slotted holes to allow for expansion and contraction of the fence and along the length. Corner posts that have damage may need oversized holes to allow for movement in two directions. The connectors need to be corrosion resistant and cannot be placed in or near the expansion joints of the concrete. Typical corrosion resistant connectors are stainless steel. The new connectors should have washers to span over slots and oversized holes.

The existing concrete walls have steel reinforcing. The concrete is spalling due to rusting of the reinforcing steel. We recommend that spalling concrete be removed to the point where the rebar only has minimal (light) corrosion. The rebar should be cleaned to bright metal and coated with a rich zinc primer and patched back with a repair mortar as prescribed by the manufacturer. Due to the shallow cover of the steel we recommend that the walls be sealed with a coating so as not to allow water into the concrete. The top of the walls should be sloped so as not to let water pond.

The above recommendations are not construction documents and should not be consider as such.

LIMITATIONS

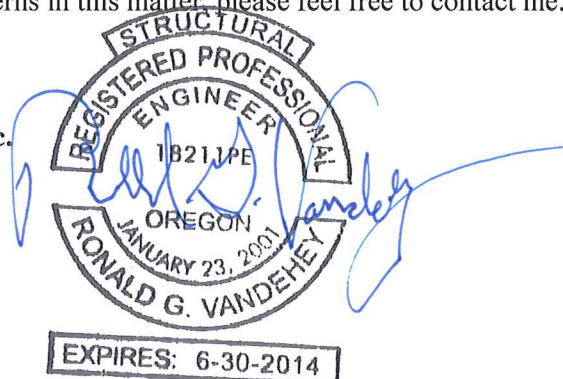
The information contained in this report is for the exclusive use of Oak Hills HOA. Miller Consulting Engineers, Inc. assumes no responsibility or liability for any use of this report by other parties. This report relates solely to the stated purpose of this investigation; and no representations concerning other aspects (if any) of the circumstance, structure or site are included. The conclusions (if any) are based on the above state visual observations, and no destructive testing or monitoring was performed. Specific construction details exceed the scope of this report. No guarantee or warranty, expressed or implied, is provided.

If you have any questions or concerns in this matter, please feel free to contact me.

Respectfully,

Miller Consulting Engineers, Inc.

Ronald G. Vandehey, P.E., S.E.
Principal





Photograph 3540: Exterior of administration building



Photograph 3551: Exterior of recreation pavilion



Photograph 3553: Exterior of pump room and pool area



Photograph 2685



Photograph 2698



Photograph 2692



Photograph 2697



Water dripping
down wall

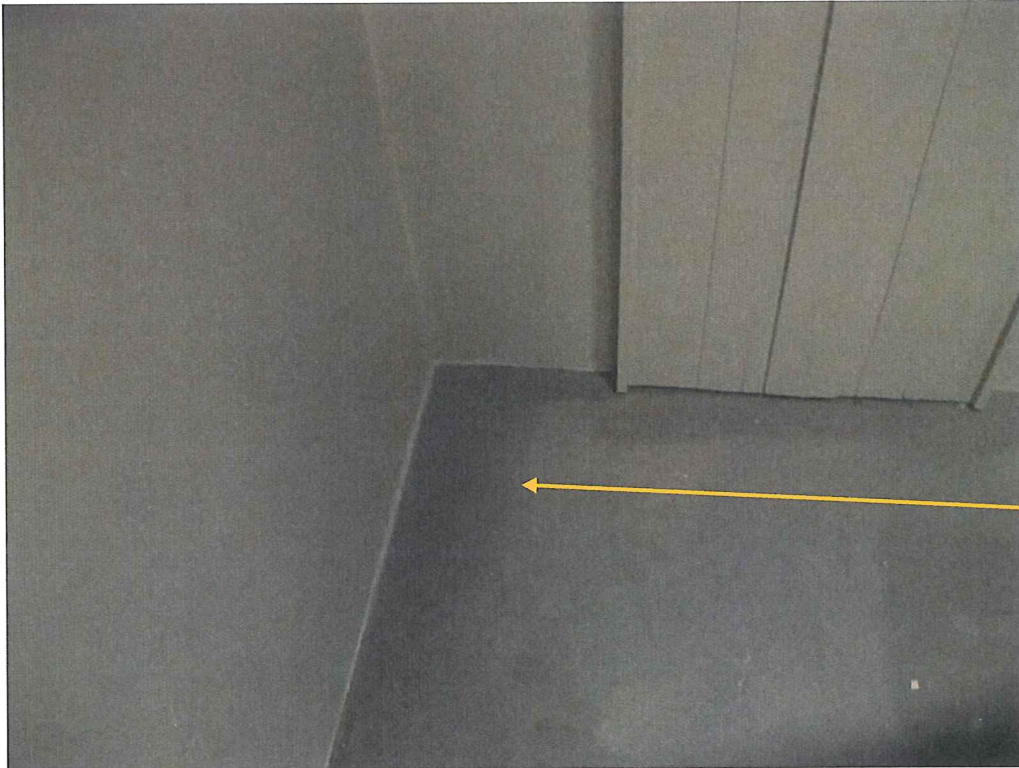
Photograph 2701



Photograph 2702



Photograph 2703



Photograph 2704



Photograph 2713



Photograph 2716



Photograph 2717



Photograph 2718

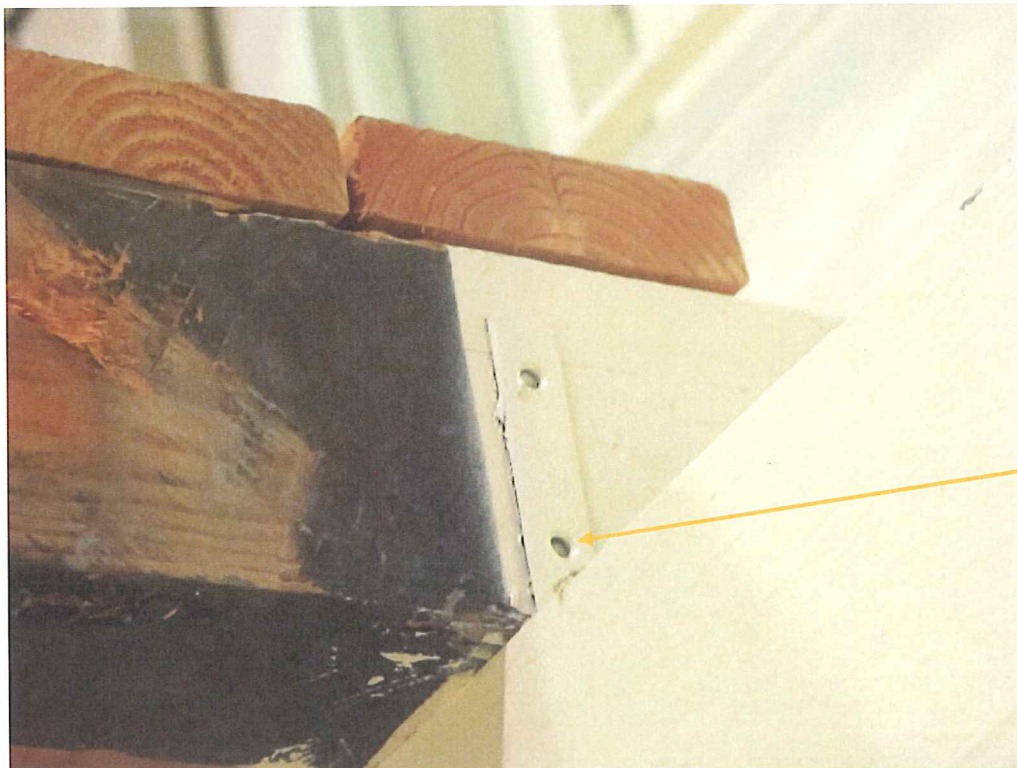


**Steel X-bracing
(seen behind
wood members)**

Photograph 2720



Photograph 2721

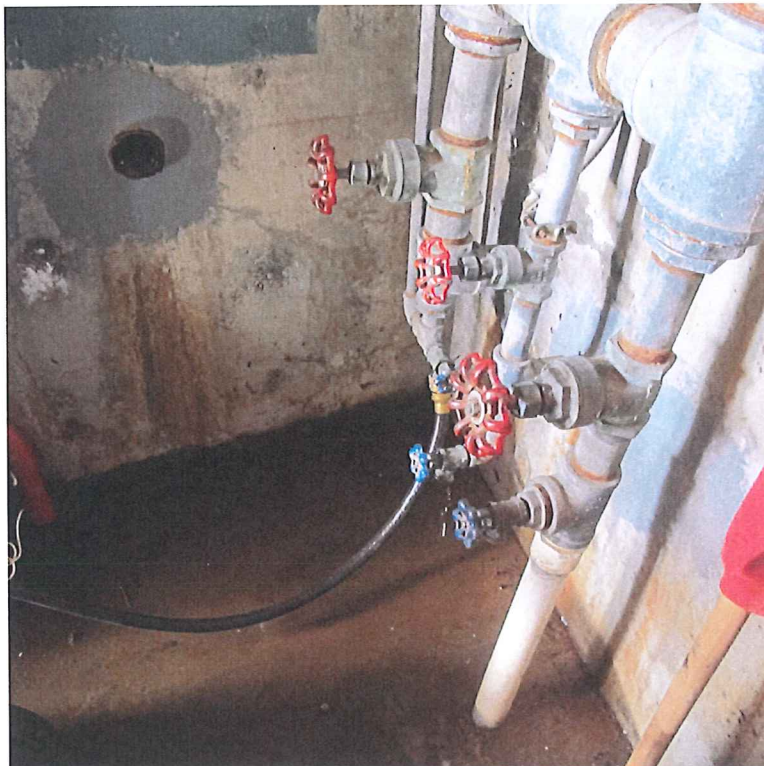


Missing
connections

Photograph 2722



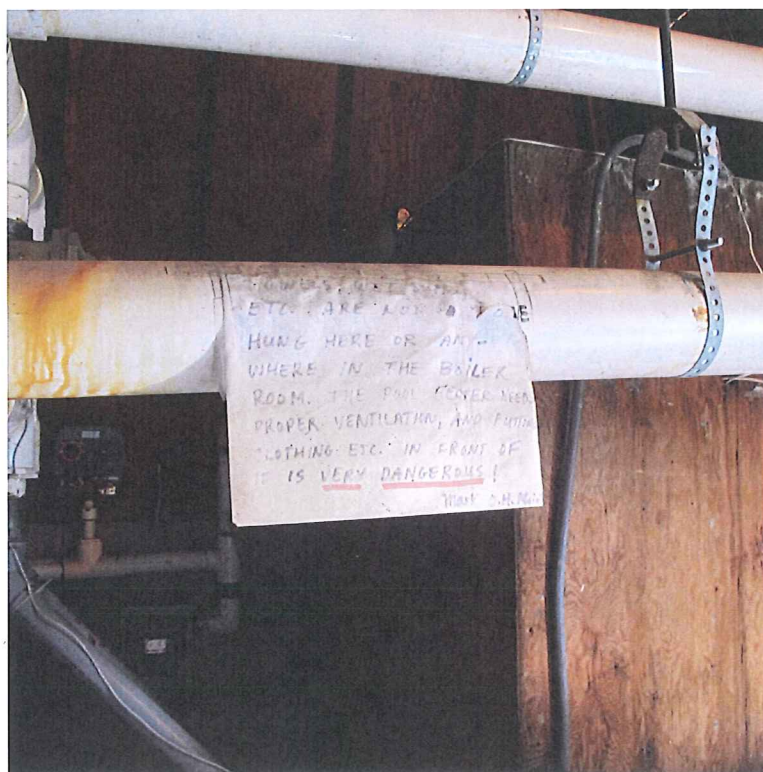
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Photograph 3408



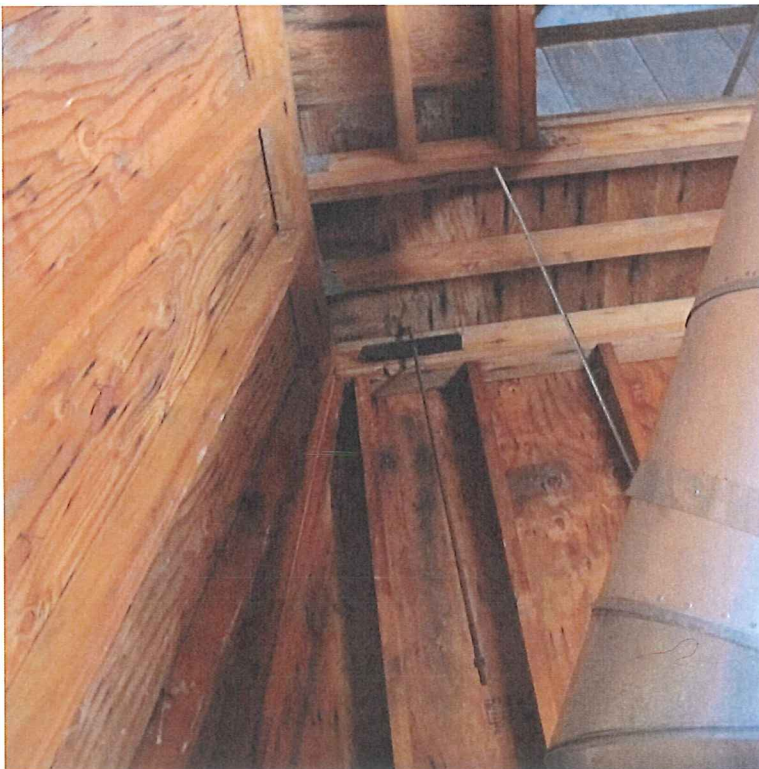
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Photograph 3413



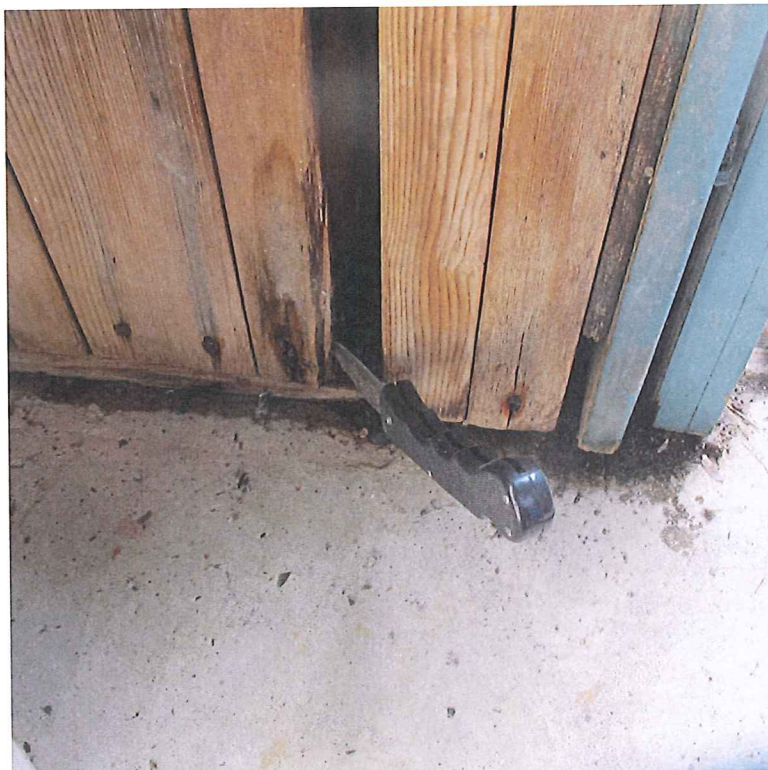
Photograph 3415



Photograph 3422



Photograph 3423



Photograph 3424



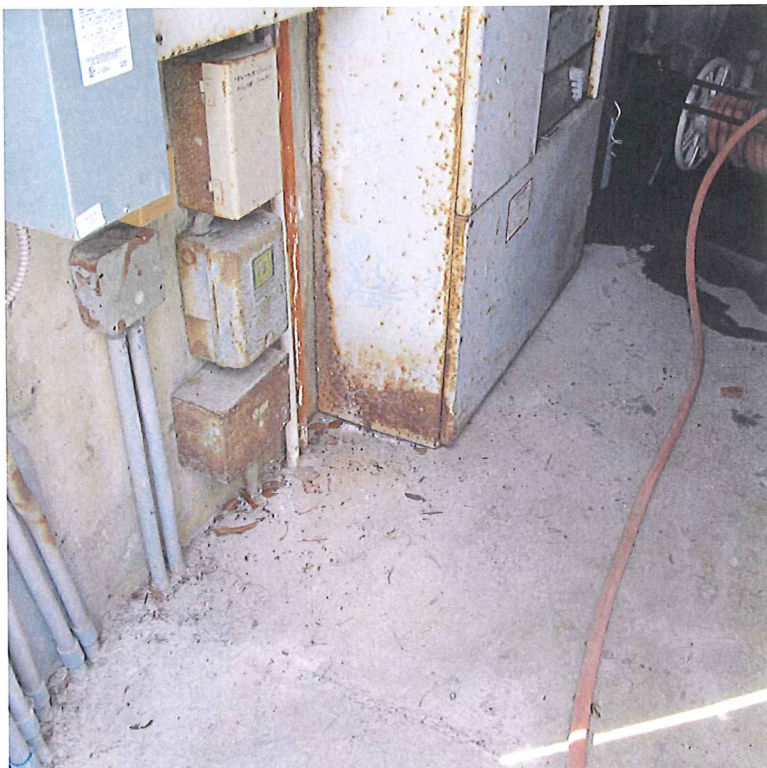
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Photograph 3426



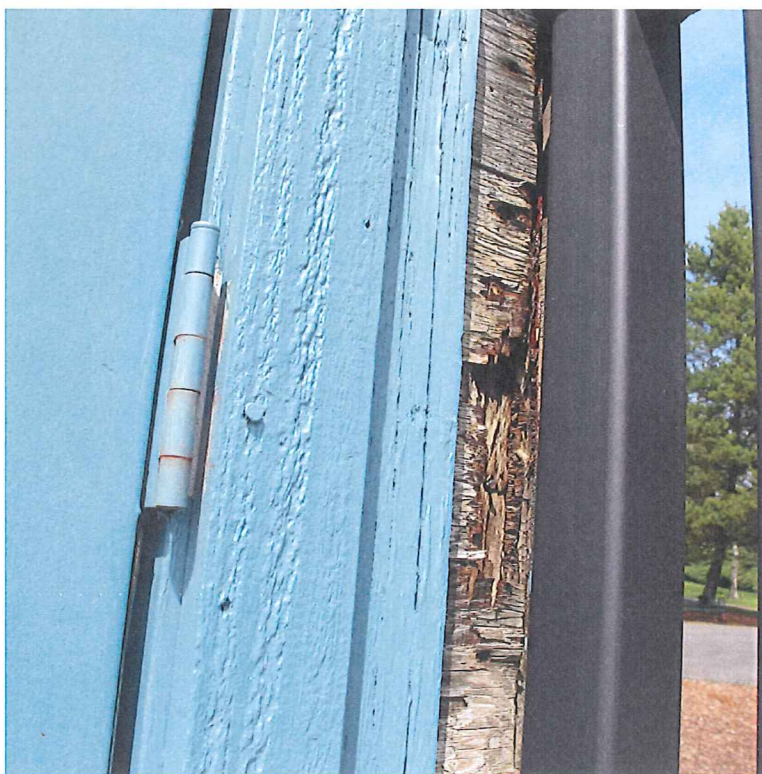
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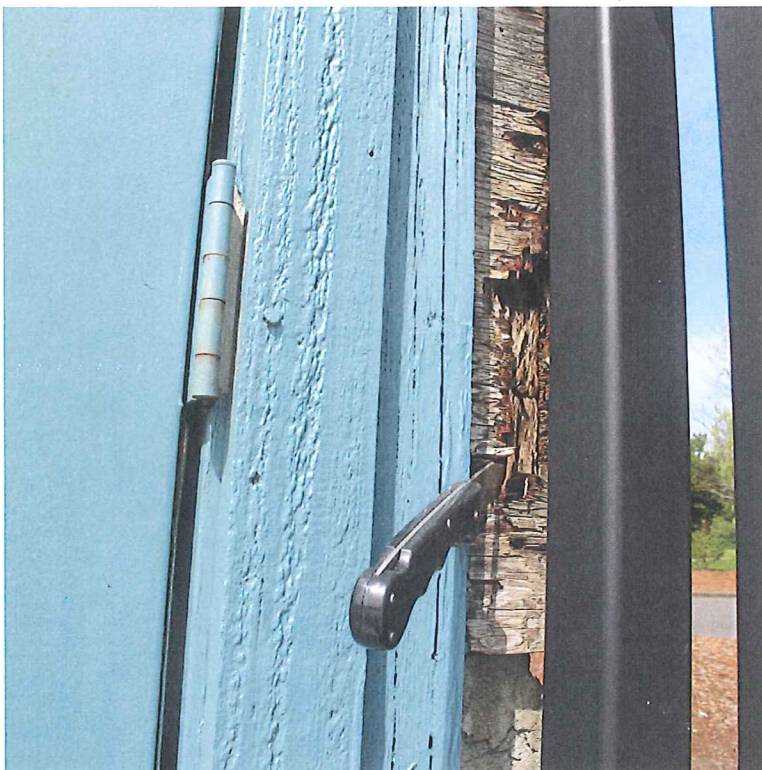
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Photograph 3429



Photograph 3430



Photograph 3431



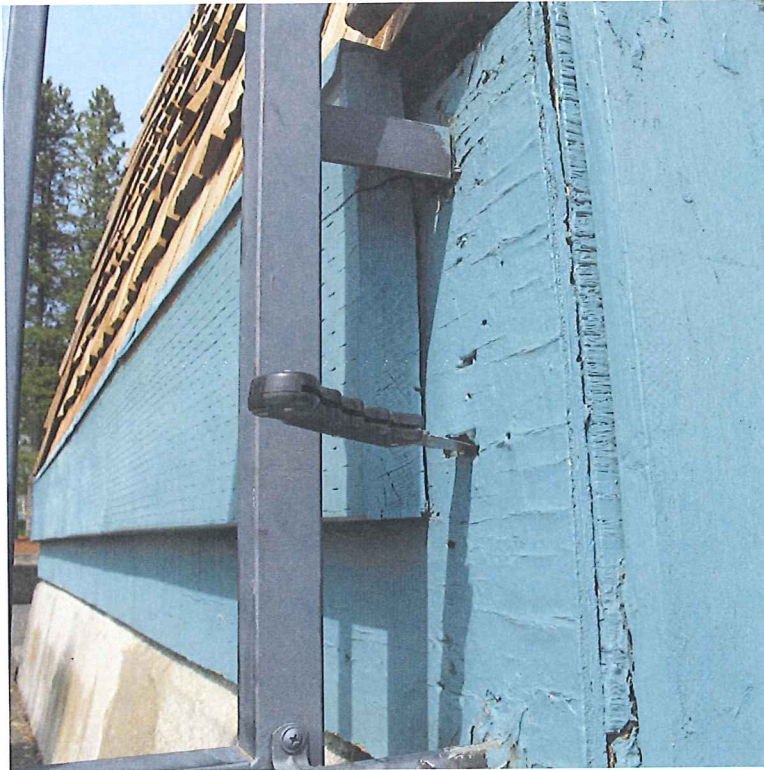
Photograph 3432



Photograph 3433



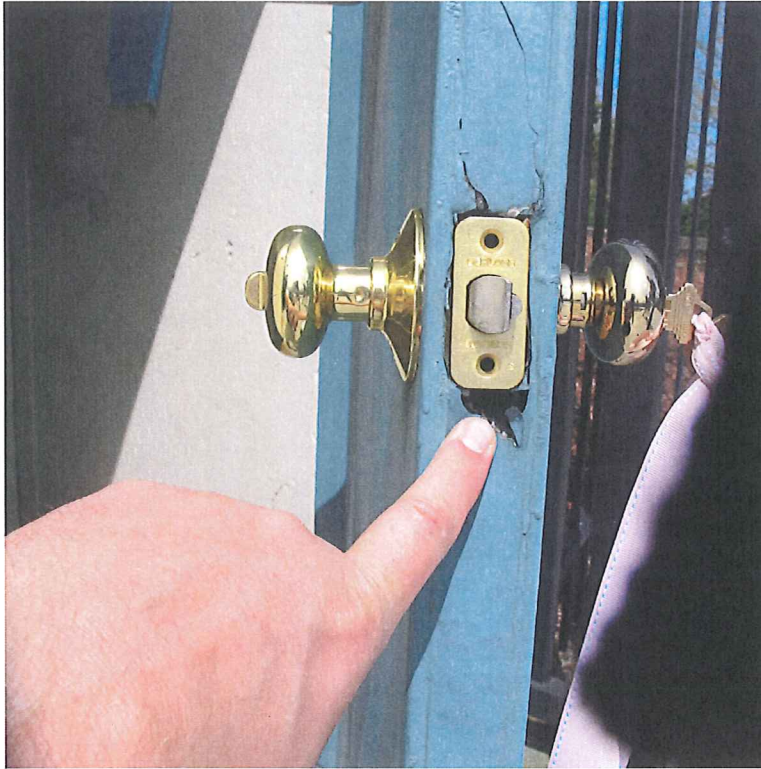
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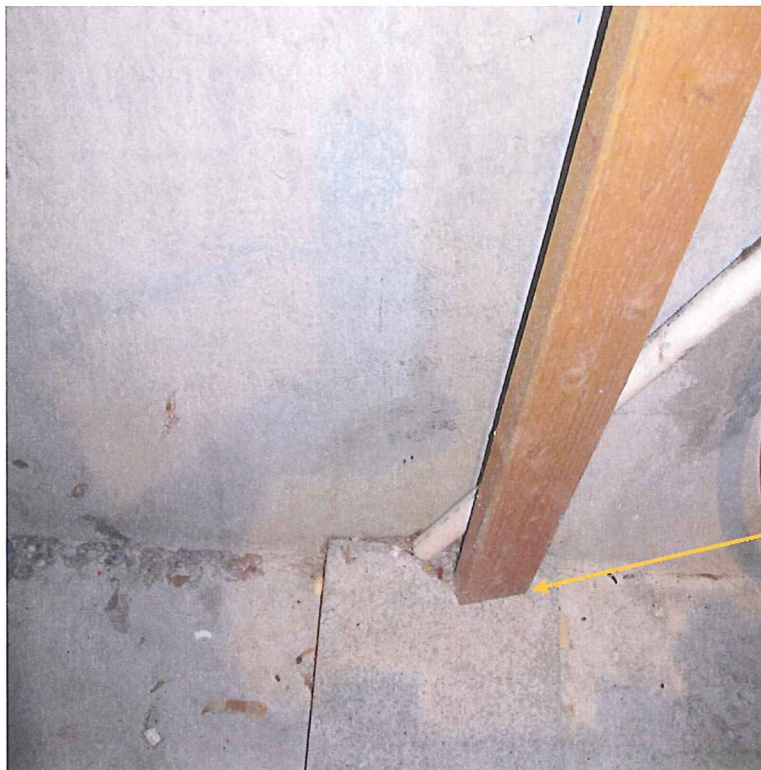
Photograph 3435



Photograph 3437



Photograph 3440

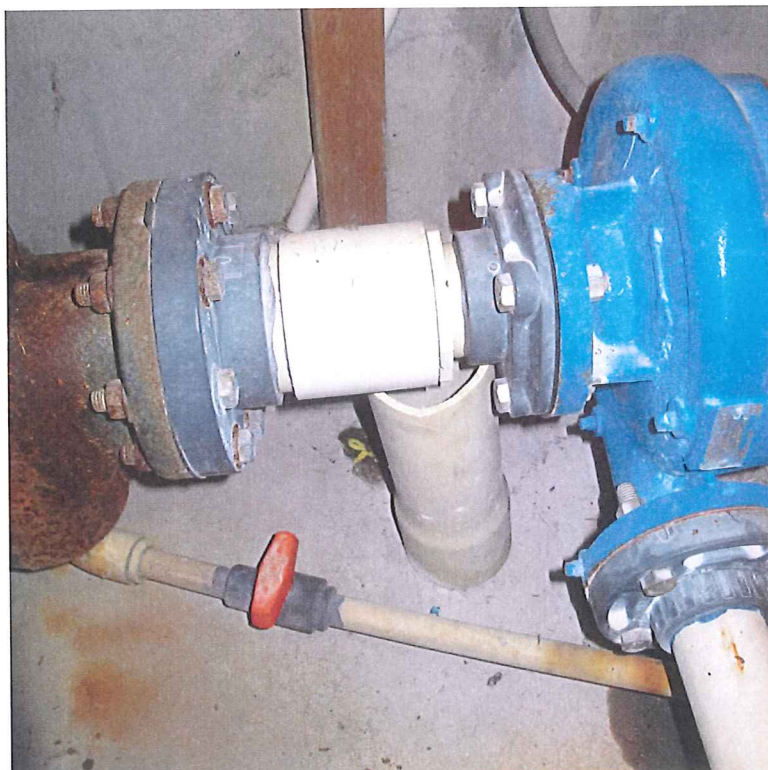


Single stud
column; no
support at base

Photograph 3451



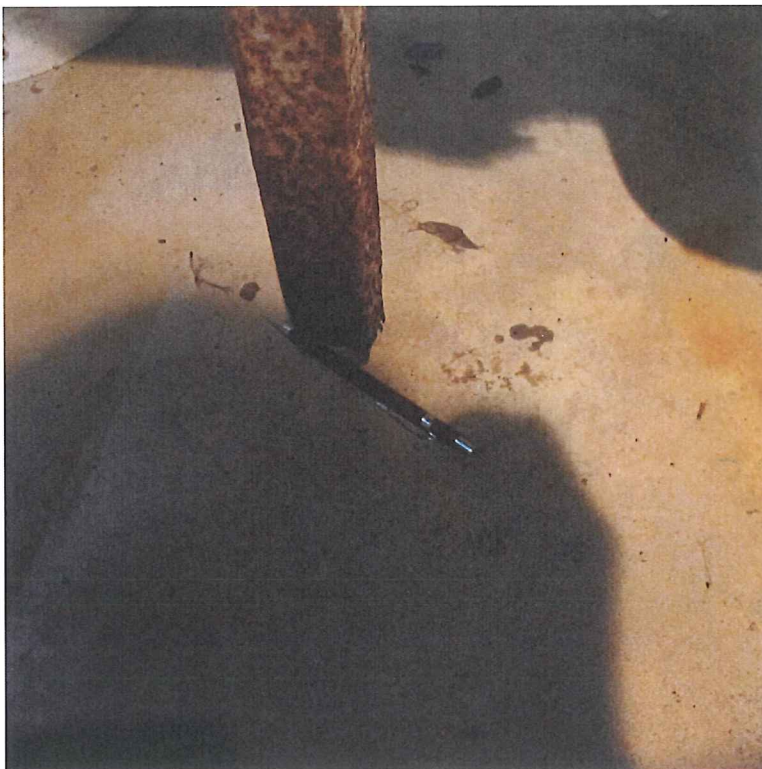
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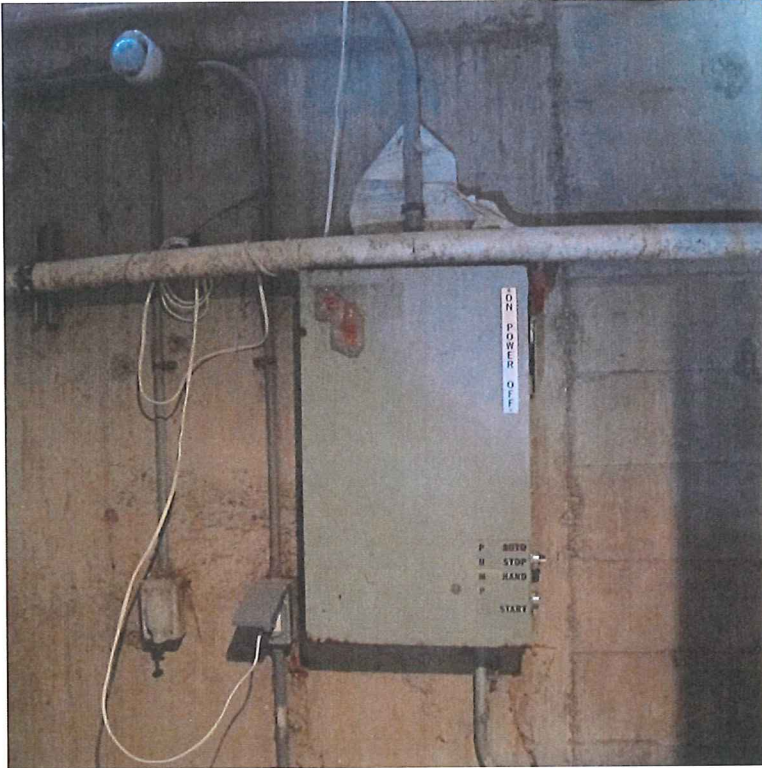
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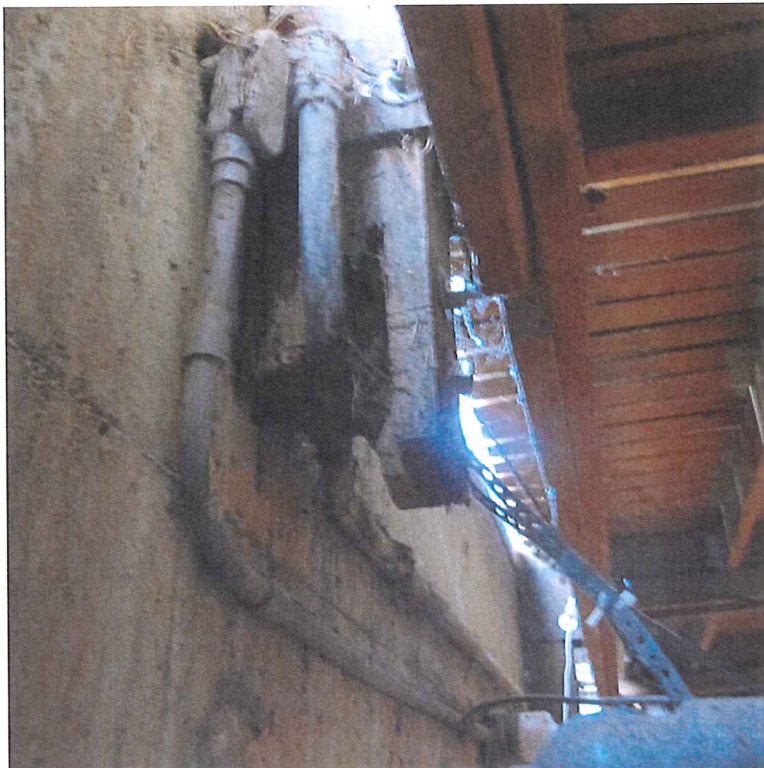
Photograph 3458



Photograph 3459



Photograph 3461



Photograph 3462



Photograph 3468



Photograph 3469



Photograph 3471



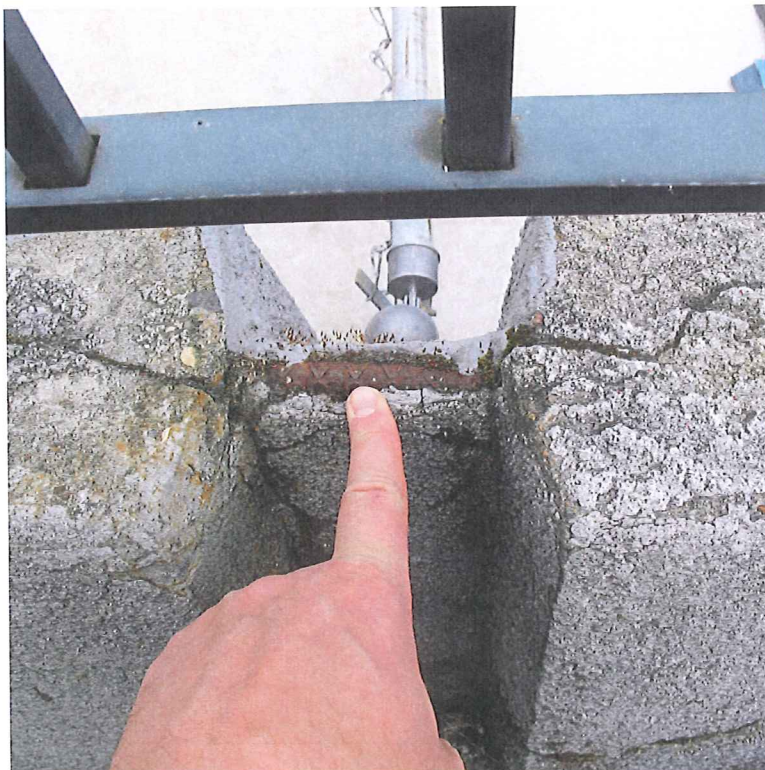
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Photograph 3476



Photograph 3477



Photograph 3478



Photograph 3483



Photograph 3486



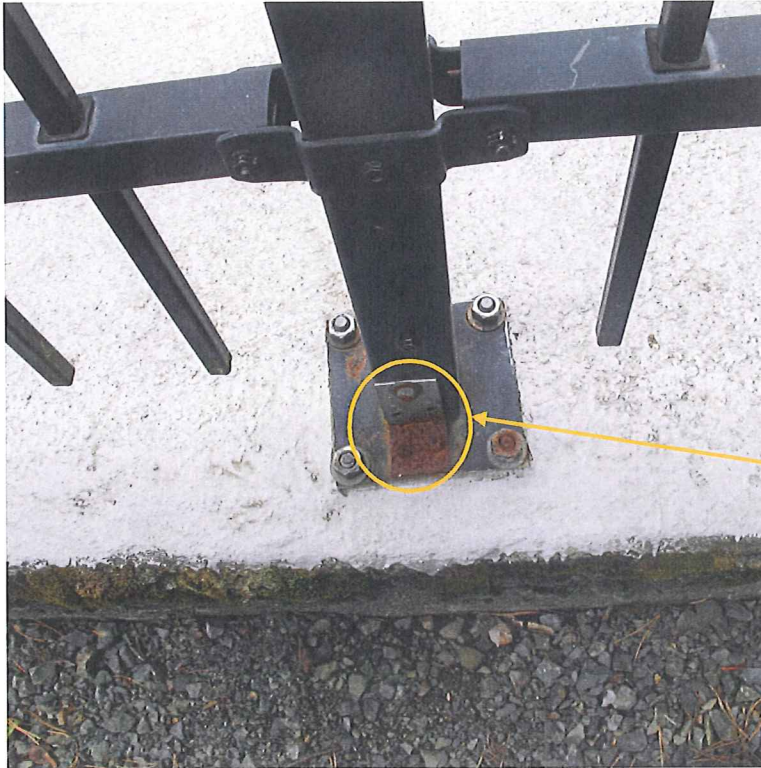
Photograph 3489



Photograph 3490



Photograph 3491



Inadequate
angle

Photograph 3494



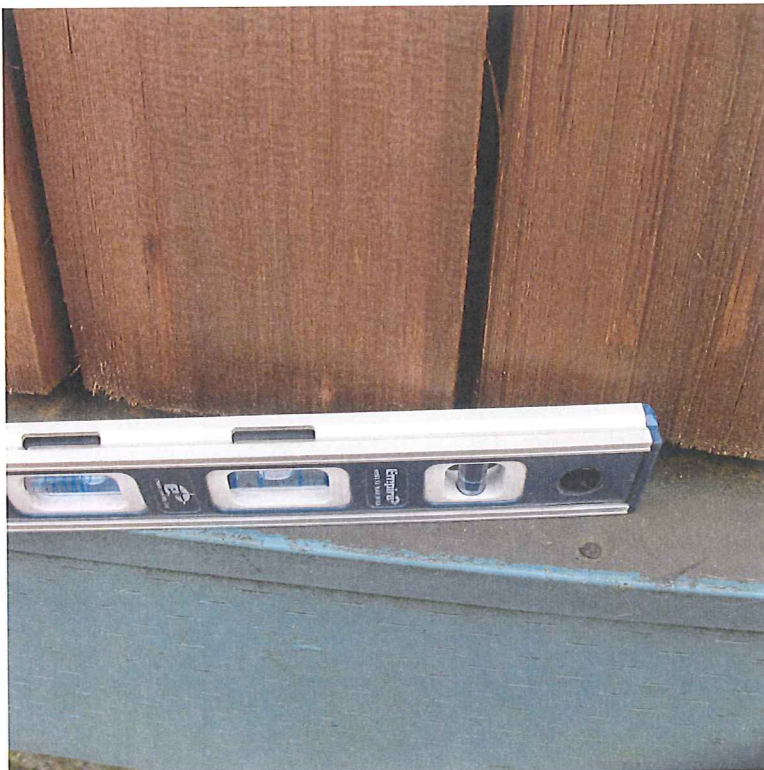
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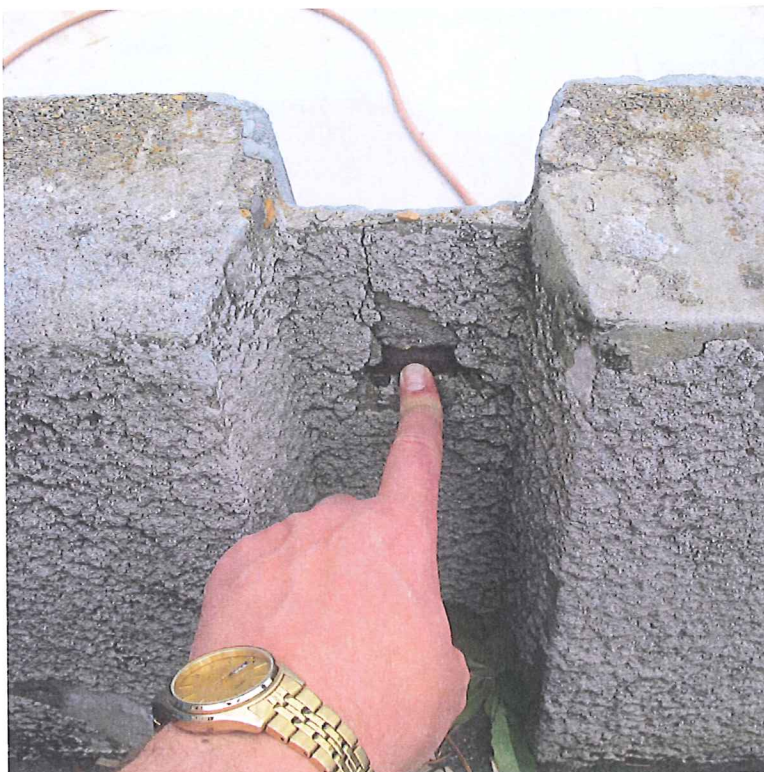
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Photograph 3498



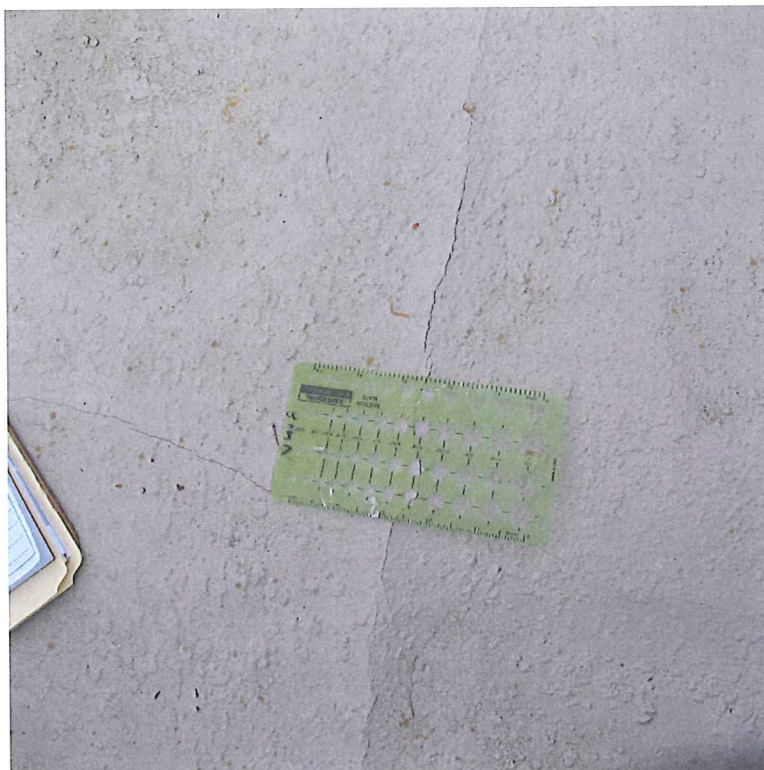
Photograph 3499



Photograph 3500



Photograph 3505



Photograph 3506



Photograph 3507



Photograph 3508



Photograph 3509



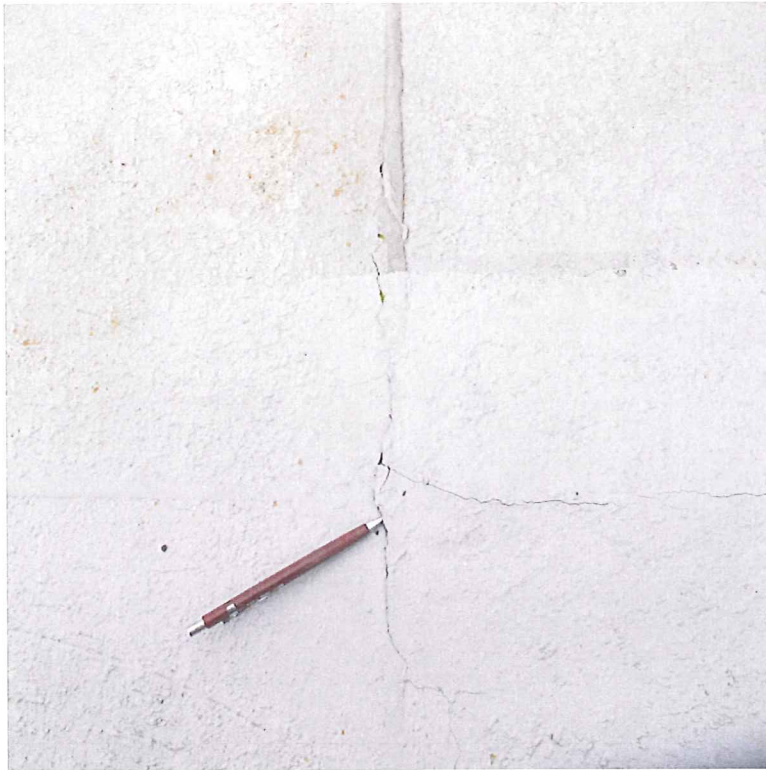
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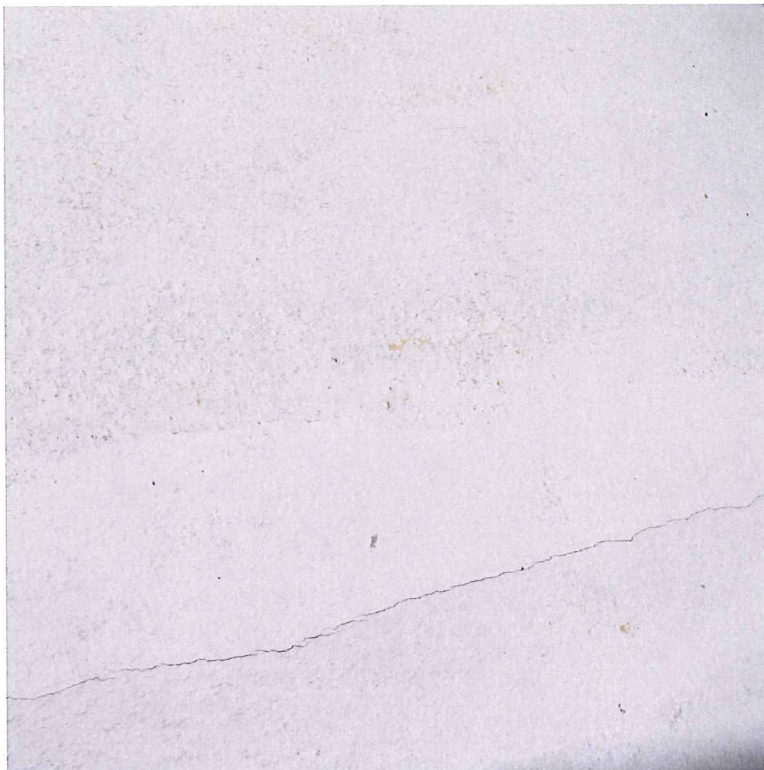
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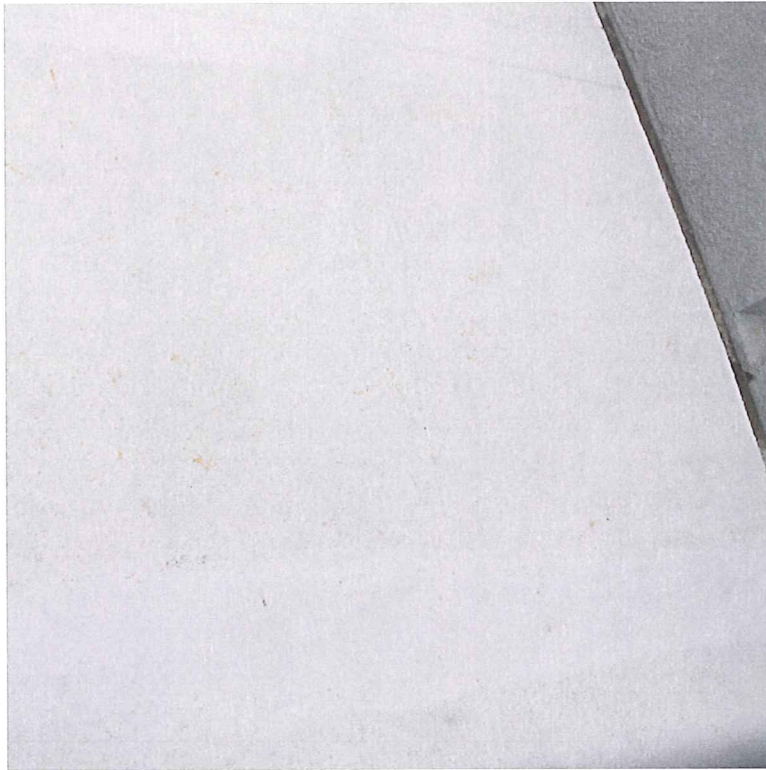
Photograph 3522



Photograph 3523



Photograph 3524



Photograph 3525



Photograph 3526



Photograph 3533



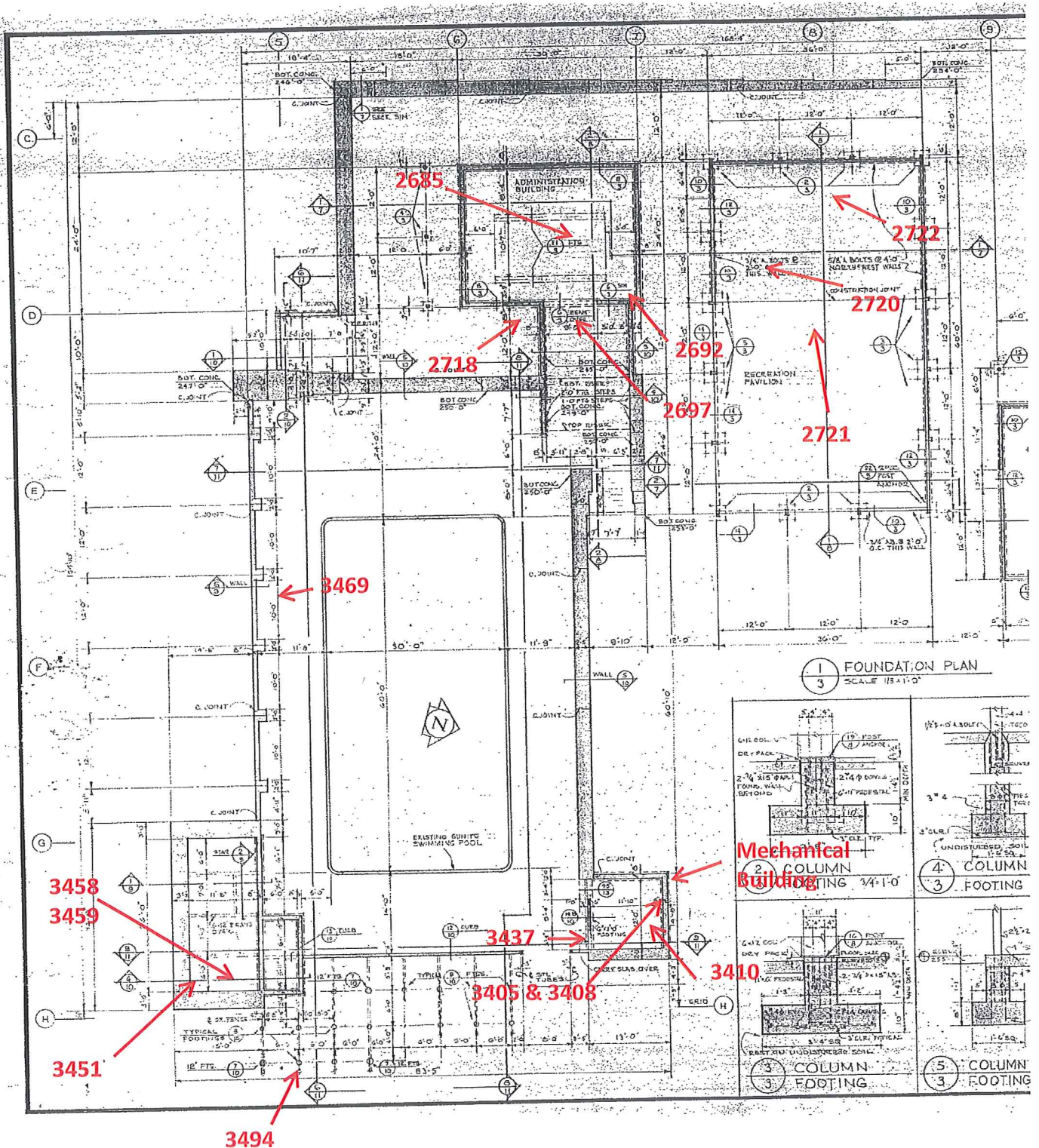
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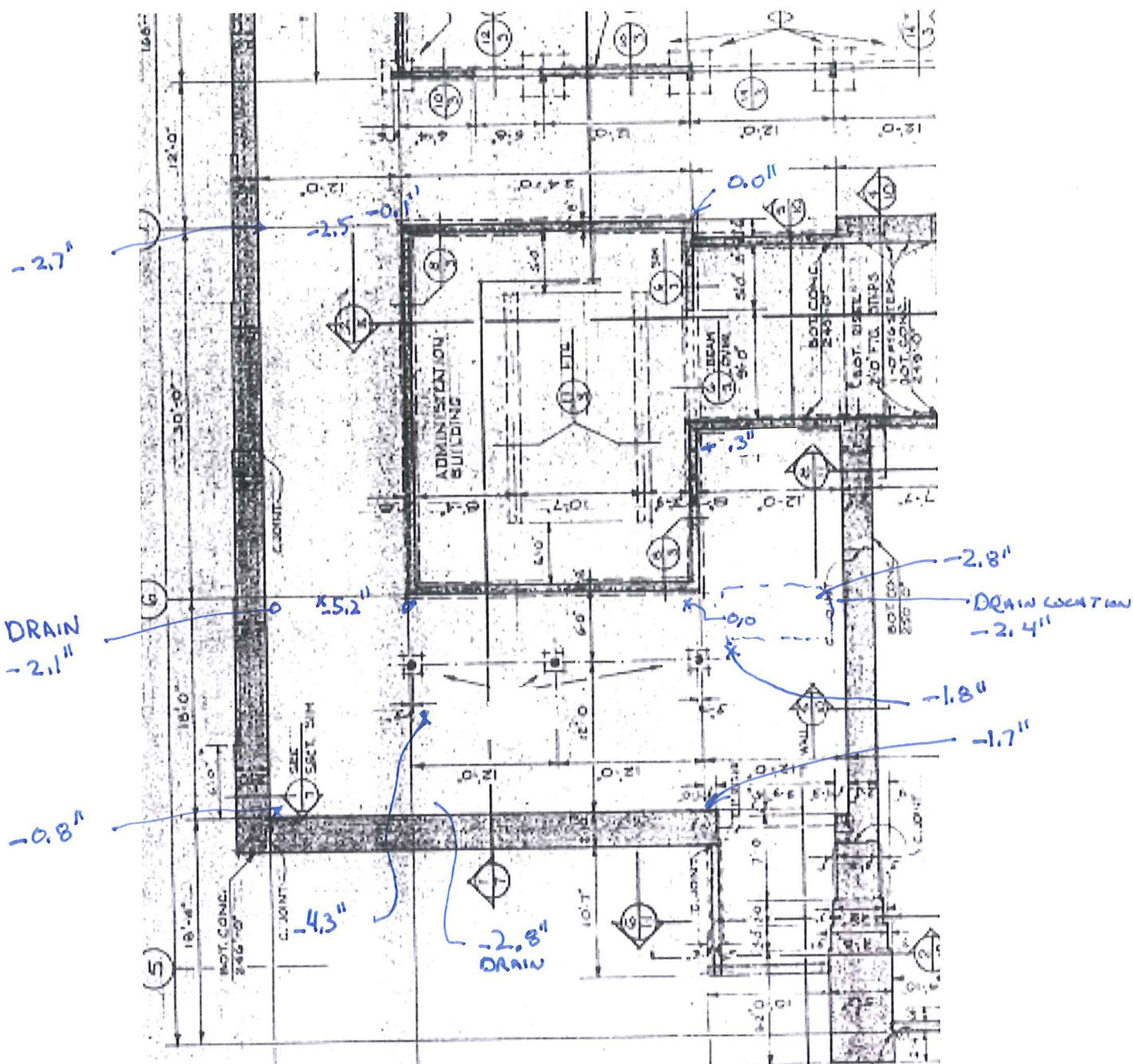
Photograph 3555



Photograph 3556



SITE PLAN



N.T.S