



# STRUCTURAL ASSESSMENT

FOR

UCSB BUILDING #406

January 6, 2017



GREGORY K. VAN SANDE, PE  
JENS AMLIE  
TOM PILLING  
SAGE M. SHINGLE, PE, SE

January 6, 2017

Ed Schmittgen,  
UCSB Facilities Management, Bldg. #439  
Santa Barbara, CA 93106-1030

Re: Building #406 Structural Damage Assessment

Dear Ed:

On September 15, 2016, I met with you and facilities staff to assess what appeared to be fairly extensive insect and dryrot damage to a 30 to 40 year old single story wood frame premanufactured building as shown in photo #1.

*Note: Existing as-built structural plans were not available for this study. The following assessment is based on visual observations and standards of practice for 1970's era Type V construction.*

Conventional wood floor joists are supported over a shallow crawl space by steel floor beams which are supported by steel tripods resting on what appears to be small concrete or wood load distribution plate set on top of the soil sub-grade. The floor joists cantilever over the steel beams to pick up exterior wood stud walls which carry roof loads, as shown in photos #2 thru #6 and detail sketch SK-2. The roof is assumed to be conventional wood roof joist construction supporting plywood sheathing.

Testing and inspection was not performed on the entire structure since finishes were not removed from all of the walls and floors, but our under-floor investigation revealed that the damage observed is consistent throughout the building. This damage is shown in the following photo exhibits taken during subsequent site visits.

Photo #1 shows that the under-floor ventilation is inadequate, and the area drain is set several inches higher than the lowest grade adjacent to the building.

Photos #7 thru #11 exhibit damage to wood floor joists and plywood sheathing caused by insect infestation and dryrot.

Photos #12 thru #15 show extensive insect and dryrot damage to wood framing and exterior plywood siding where in contact with soil and areas where moisture is in contact with these unprotected materials.

The rusted metal tripods (photos #16 thru #19) supporting the main steel floor beams are not connected to the beams and are also not connected to a reliable pad foundation.

The current California Building Code makes the following references to the minimum structural provisions required for an acceptable level of life safety in a building of this type:

#### **SOILS AND FOUNDATIONS** California Building Code

##### **18.05.1.2 Under-floor Space**

*"The finished ground level of an under-floor space such as a crawl space shall not be located below the bottom of the footings."*

Not only are the metal tripods that support the building resting on a wood block on top of the soil, but the under-floor soil grade is not higher than the exterior soil grade which allows water intrusion into the crawl space (Reference detail sketch SK-3). The resulting saturated condition (mud) greatly reduces the capacity of the soil to support the weight of the building in addition to creating a moist environment which promotes mold, dryrot and insect infestation. The crawl space is not drained or adequately ventilated causing serious structural damage and increased risk of collapse, in addition to health risks to inhabitants where mold growth is encouraged.

We did not observe any obvious signs of distress indicative of significant foundation settlement.

#### 1203.3 Under-floor Ventilation

*"The space between the bottom of the floor joists and the earth under any building except spaces occupied by basements or cellars shall be provided with ventilation openings through foundation walls or exterior walls. Such openings shall be placed so as to provide cross ventilation of the under-floor space."*

It appears that adequate ventilation was not provided for the existing crawl space which promoted the dryrot and insect problem. The only ventilation provided is what is shown in photo #21.

Currently, no structural foundation system exists to prevent the building's collapse in the event of a significant seismic event (Reference detail sketch SK-2). The building would simply shift laterally, either tipping over all the rusted metal tripod supports, or simply sliding of the top of these supports due to the lack of a proper connection. Such a motion and impact of the frail wood building on the ground below could be enough to distort and collapse the walls and roof above with potentially tragic consequences.

#### STEEL AISC Manual of Steel Construction, Specifications and Codes

##### 5-86, L5 Corrosion

*"When appropriate, structural components shall be designed to tolerate corrosion or shall be protected against corrosion that impairs the strength or serviceability of the structure".*

The main steel floor beams and the supporting tripods have significant rust scale, reducing their load-carrying capacity. In addition, as mentioned earlier, there appears to be no connection between these important structural elements. Photo #18 shows no connection between the tripod and the steel beam while photo #20 indicates no attachment of the floor joists to the main steel floor beams.

#### WOOD California Building Code

##### 2304.11.2.1.1 Joists, Girders and Subfloor

*"There shall be a clearance of at least 18 inches between the underside of wood floor joists and the finished surface of the ground."*

There are areas where the unprotected floor framing is in contact with the ground surface.

##### 2304.11.2.6 Wood Siding

*"Clearance between wood siding and earth on the exterior of a building shall not be less than 6 inches... from... horizontal surfaces exposed to the weather except where siding, sheathing and wall framing are of naturally durable or preservative-treated wood."*

There are several areas where untreated wood siding and trim is exposed to earth and are damaged (reference attached photos).

I could only speculate at this point what the structural integrity of the rest of this wood frame building might reveal if we were to remove interior finishes exposing the wall studs and the roof joists. Based upon what I have seen so far, there may be more deficiencies throughout the building.

## STRUCTURAL DESIGN California Building Code

### 16.04.9 Counteracting Structural Actions

*"Structural members, systems, components and cladding shall be designed to resist forces due to earthquakes and wind, with consideration of overturning, sliding and uplift. Continuous load paths shall be provided for transmitting these forces to the foundation."*

Beyond the dryrot and insect damaged structural elements, I have observed that earthquake forces producing overturning, sliding and uplift have not been accounted for in the design and construction of this building. This structure is clearly not capable of withstanding the seismic loads that we are anticipating the local faults are capable of delivering. In addition to what has been already mentioned, this building lacks acceptable elemental roof-to-wall, wall-to-floor, floor-to-foundation and foundation-to-soil connectivity.

## CONCLUSION

Based upon what I have viewed, this building does not meet minimum structural life safety standards as dictated by the latest edition of the California Building Code (CBC). That doesn't even take into account other issues such as fire protection, electrical, plumbing, roofing, windows, etc.

This building was intended to be a temporary installation. It seems to have outlived that purpose and the costs to repair and upgrade would be prohibitive. The current CBC would not permit this structure to be used even as a temporary facility without a viable foundation system and implementation of serious structural consideration for life safety in a high seismic risk location.

As for the UC Seismic Safety Policy, this structure is assigned an Earthquake Performance Rating Level of VI, since its performance during a major seismic disturbance is anticipated to result in significant structural and non-structural damage, potential structural collapse, and/or falling hazards that would represent appreciable exposure to injury (Reference Table A-2 of Appendix A).

Please contact me if you have any questions.

Sincerely,

VAN SANDE STRUCTURAL CONSULTANTS, INC.



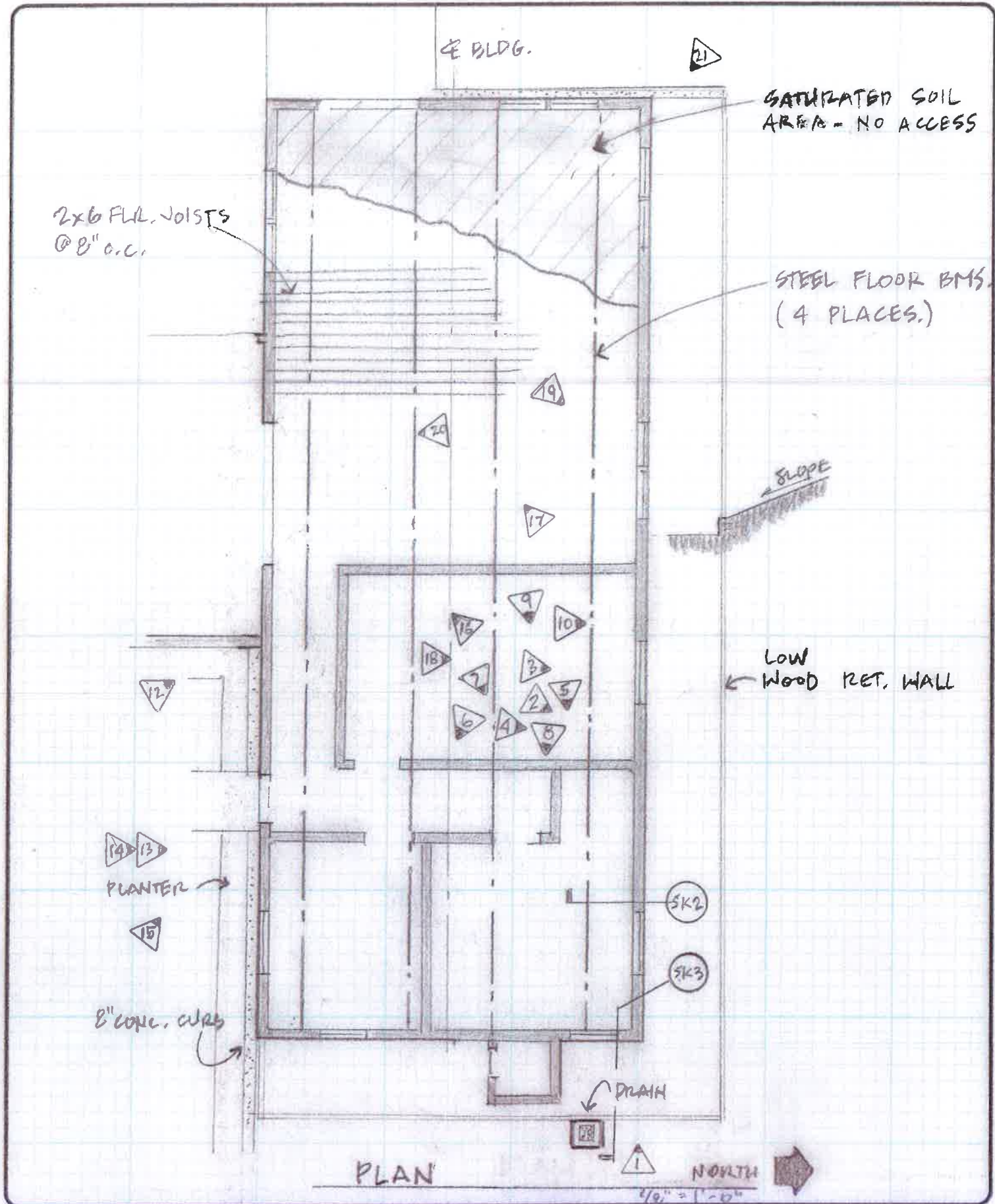
Gregory K. Van Sande



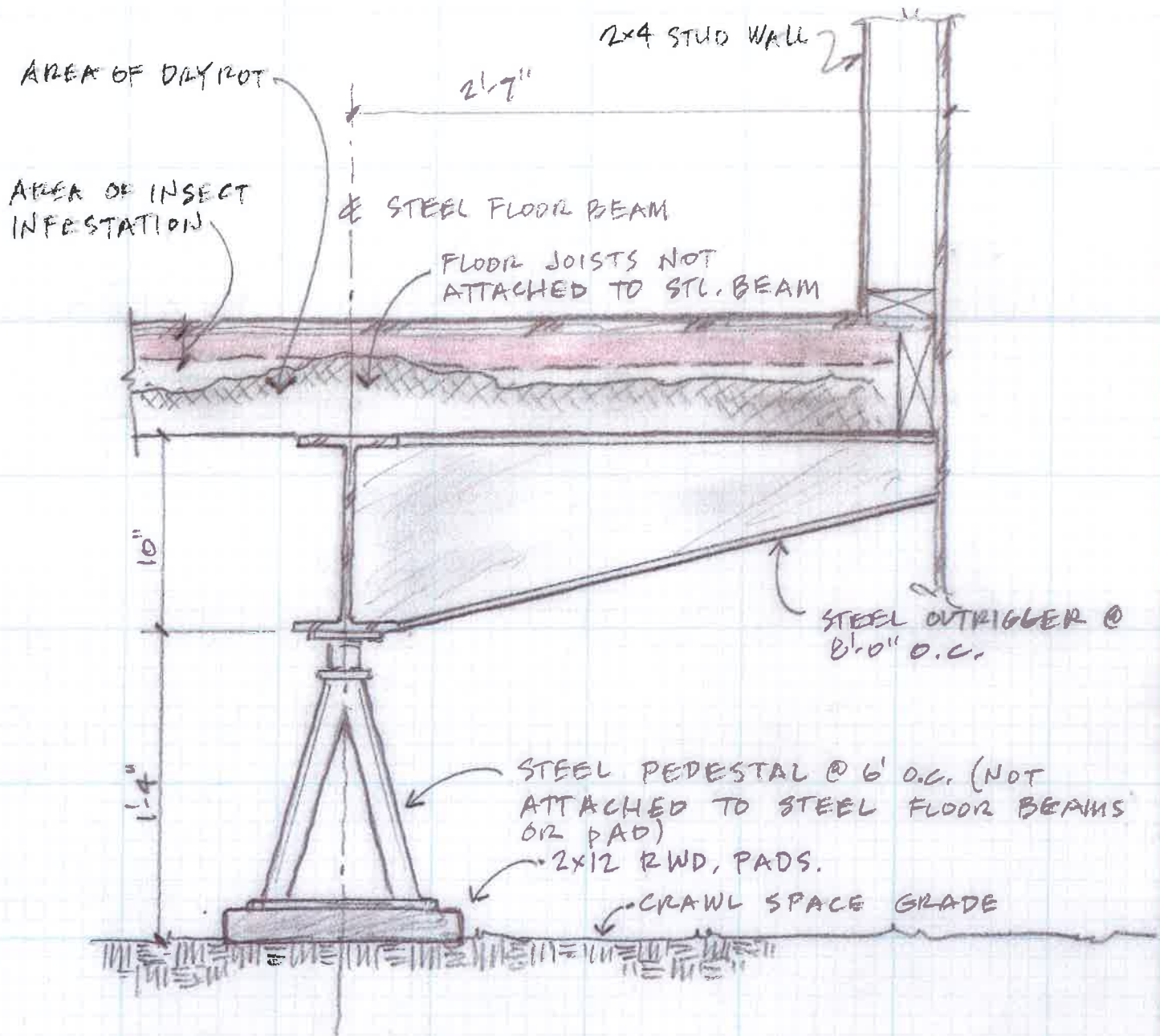
# SKETCHES

FOR

UCSB BUILDING #406

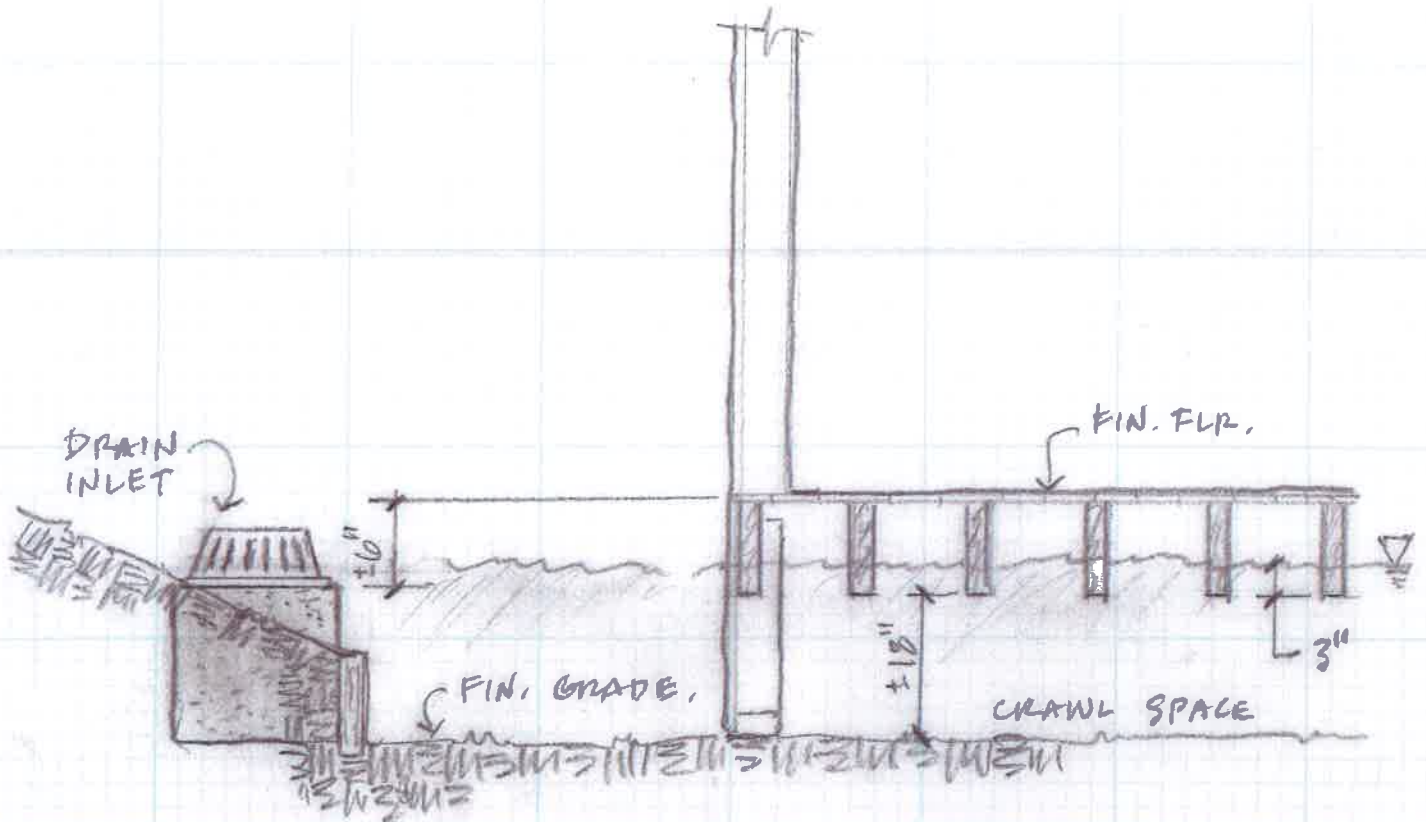






TYPICAL FLOOR SECTION AT PERIMETER

SCALE:  $1\frac{1}{2}" = 1'-0"$



CROSS-SECTION SHOWING RELATIONSHIP  
OF DRAIN INLET TO CRAWL SPACE & FIN. FLR.

NO SCALE.





# **PHOTO EXHIBITS**

**FOR**

# **UCSB BUILDING #406**



PHOTO 1





PHOTO 2





PHOTO 3





PHOTO 4





PHOTO 5





PHOTO 6





PHOTO 7





PHOTO 8





PHOTO 9





PHOTO 10





PHOTO 11





PHOTO 12





PHOTO 13





PHOTO 14



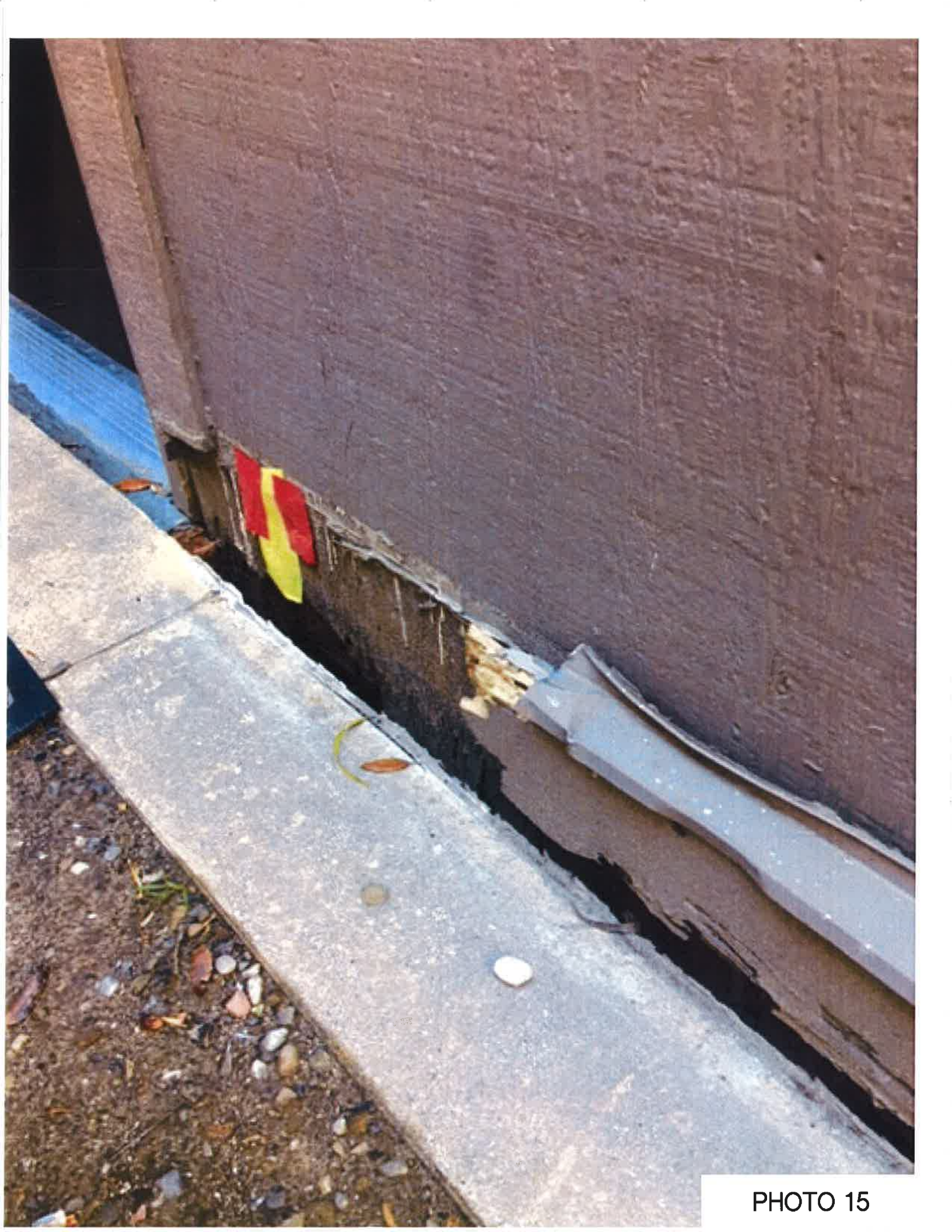


PHOTO 15





PHOTO 16



PHOTO 17



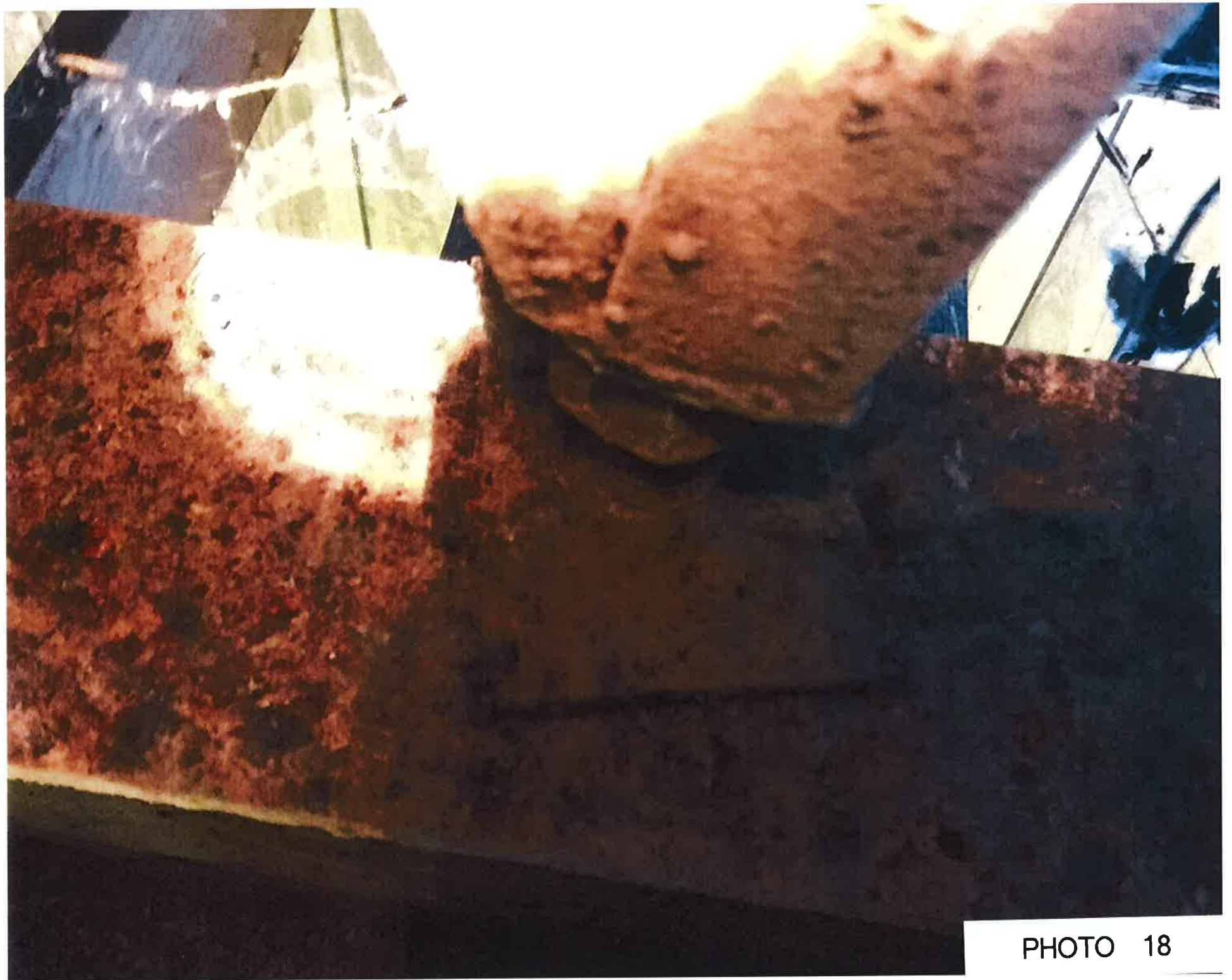


PHOTO 18



PHOTO 19





PHOTO 20





PHOTO 21