PRESERVATION MASTER PLAN

FOR

OLD MAIN

University of Arizona

Tucson

1891~2011

Designed by James M. Creighton, Architect, 1887
Constructed by M. J. Sullivan, Builder, 1887–1891

PRESERVATION MASTER PLAN

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Preservation Master Plan
for
OLD MAIN
University of Arizona

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(Cover Image: ca. 1930s hand-tinted postcard)

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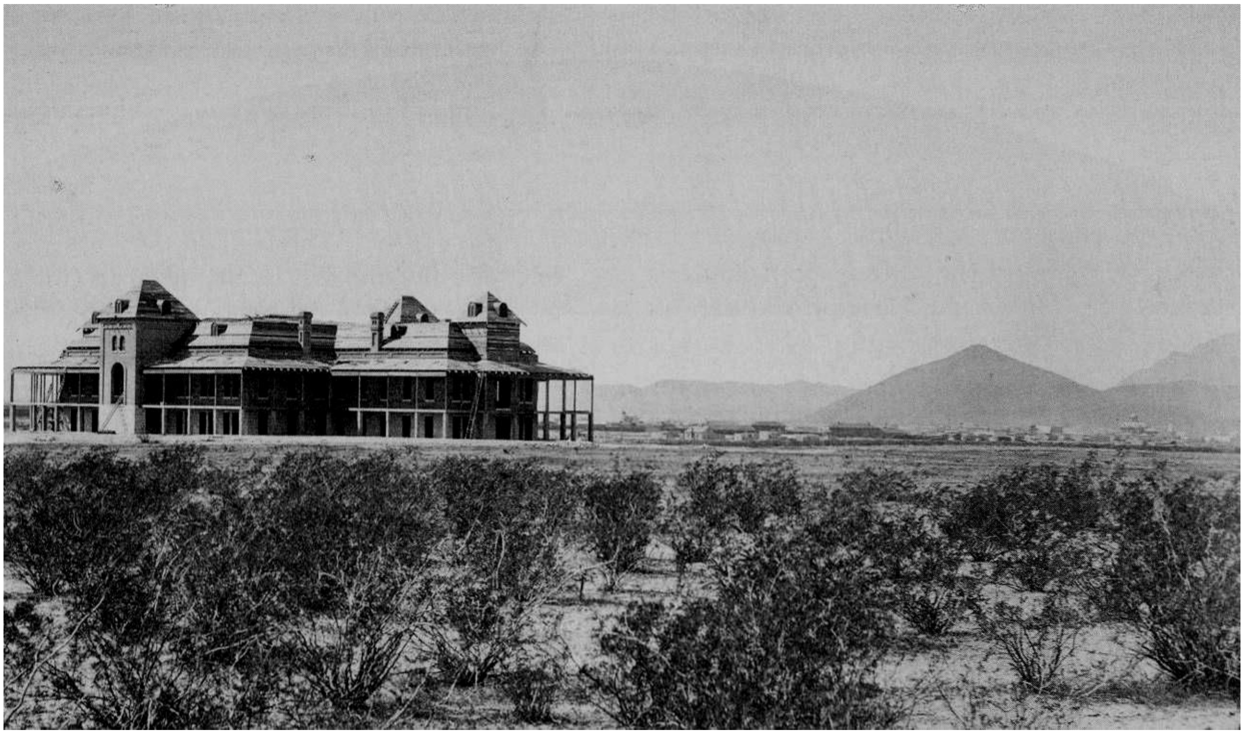


Figure A *- Old Main under construction, 1889; view looking southwest towards downtown Tucson and A-Mountain The roof is framed and sheathed, but metal roofing has yet to be installed. Ground was broken October 27, 1887, and construction completed October 1, 1891 (Ball, p. 5)*

Introduction

OLD MAIN is the first building of the University of Arizona. Over the century and more since it was built, it has become the most iconic structure on campus -- a symbol of the University itself. The building was designed by the architect James M. Creighton of Phoenix in 1887, and completed in 1891. Old Main is the second oldest public building in Arizona, after San Xavier Mission (which was built a century earlier, between 1783 and 1797). In 1970, at 79 years of age, Old Main was nominated for inclusion on the National Register of Historic Places by Professor Gordon Heck of the UA College of Architecture (an instructor of the present author). The building was individually listed in 1972, and 14 years later became part of University's Campus Historic District, created in 1986. It has been described as "a well preserved gem of the Territorial period of Arizona's History." *(1)*

The building has been well-maintained throughout the years, in terms of repairing and painting the wood rails and decking of the wrap-around porch, patching and painting the standing-seam metal Mansard roof, lateral structural stabilization of the masonry bearing walls, as well as strengthening of the wood floor structures and roof trusses. The interior has been significantly remodeled on several occasions. As can be expected at 120 years of age, Old Main shows signs of deterioration, and this significant historic structure is in need of rehabilitation. The Preservation Master Plan shall provide guidance for the long-term preservation and rehabilitation of Old Main. The goal of the report is to identify current problems and recommend appropriate treatment options and conceptual solutions. In-depth historical analysis and detailed specifications for treatment are de-emphasized in order to focus on preservation concerns. Detailed plans and solutions will be developed on a project-by-project basis once the Preservation Master Plan is completed.

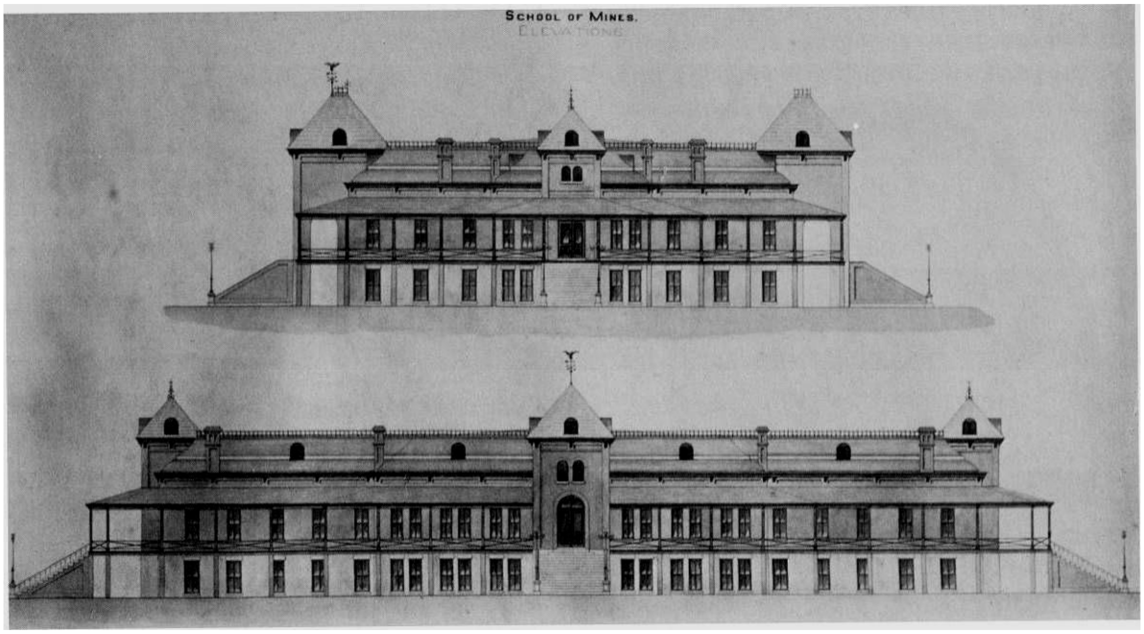


Figure B - *Original elevations for the 'School of Mines' by James M. Creighton displays the wrap-around porch and sunken lower story of the* French Colonial *style – climatically suited to Arizona's intense sun & heat – combined with the towers, spires, crests and dormers of the rare* Chateauesque *style, that briefly held sway in the late 1800s. Old Main shares features with the 18th C. plantation houses of Louisiana, blended with late 19th C. Victorian revival styles of the Territorial period of Arizona.*

Figure C - *The architect James Miller Creighton. According to the National Register nomination and the marble plaque at Old Main, the builder was M.J. Sullivan. Oddly the plaque makes no mention of Creighton; instead it credits* "Capt. A. E. Miltimore, U.S.A.*" as* "Designer & Superintendent of Building", *in what may be one of Arizona's earliest examples of intellectual property infringement.*

The PRESERVATION MASTER PLAN considers the building's overall current condition, encompassing three primary tasks:

1. OVERVIEW OF EXISTING CONDITIONS of the building's interior and exterior features, service systems, structural system, and site features;

    (a) EXTERIOR FEATURES: building wall finishes; roofing and drainage systems; doors; windows; stairways; light fixtures; second floor veranda; first floor porch and drainage issues;

    (b) INTERIOR FEATURES: floor finishes; interior wall finishes and trim; doors; ceilings; casework, stairways; light fixtures; restrooms;

    (c) SITE FEATURES: grading and drainage; landscaping; walkways; site features;

    (d) SERVICE SYSTEMS: heating, ventilating and air conditioning system; water and wastewater system; gas system; electrical system; fire protection system; elevator;

    (e) STRUCTURAL SYSTEM: foundation and foundation walls; porch retaining walls; floor and roof systems; bearing walls & columns. Portions of the second floor framing system have been identified as being deficient in loading capacity for recently proposed uses (file rooms) and are in need of an engineering solution to remedy the situation in these areas.

2. RECOMMENDATIONS FOR REHABILITATION MEASURES for each major system and feature of the building, consistent with the S*ecretary of the Interior's Standards for the Treatment of Historic Properties*.

3. ASSIGNMENT OF PRIORITIES AND PROBABLE COSTS FOR THE PRESERVATION OF EACH FEATURE AND SYSTEM OF OLD MAIN.

Research and Fieldwork

Vint & Associates has reviewed previous studies and files related to the structure, and has carried out archival research to document and understand current conditions. The UA PDC has provided copies of previous studies, the National Register of Historic Places nomination written by Professor Gordon Heck in 1970, drawings of various construction and alteration projects, and photos. Phyllis Ball's *A Photographic History of the University of Arizona 1885-1985* has been a great resource for both historical photos and details.

While the focus of this report is on the current condition of the building, it's important to understand the history of Old Main, as a guide to preserving it. The goal is to preserve both the physical and historic integrity of the building. ***Integrity*** is defined by the US Secretary of the Interior's Standards for the Treatment of Historic Properties as *"the ability of a property to convey its significance*". **S*ignificance*** is that which makes a building historic; that special combination of character-defining elements that make a structure worthy of preservation. Hence, we will refer to the historic record periodically in the Master Plan, so that the physical record of the past may inform future preservation efforts. In this way we will base preservation decisions on the best authority, which is the history of the building itself.

Figure D - *Upon completion in 1891, view looking east. Old Main is Arizona's first passively cooled solar building. The passive cooling system is the 12 ft. deep wrap-around porch providing continuous shade, combined with large double-hung windows on at least two sides of each classroom for cross-ventilation. The windows also provided day-lighting. Heating was provided by fireplaces in each classroom, hence the prominent chimneys on all sides of the building. (Ball, "A Photographic History" title page)*

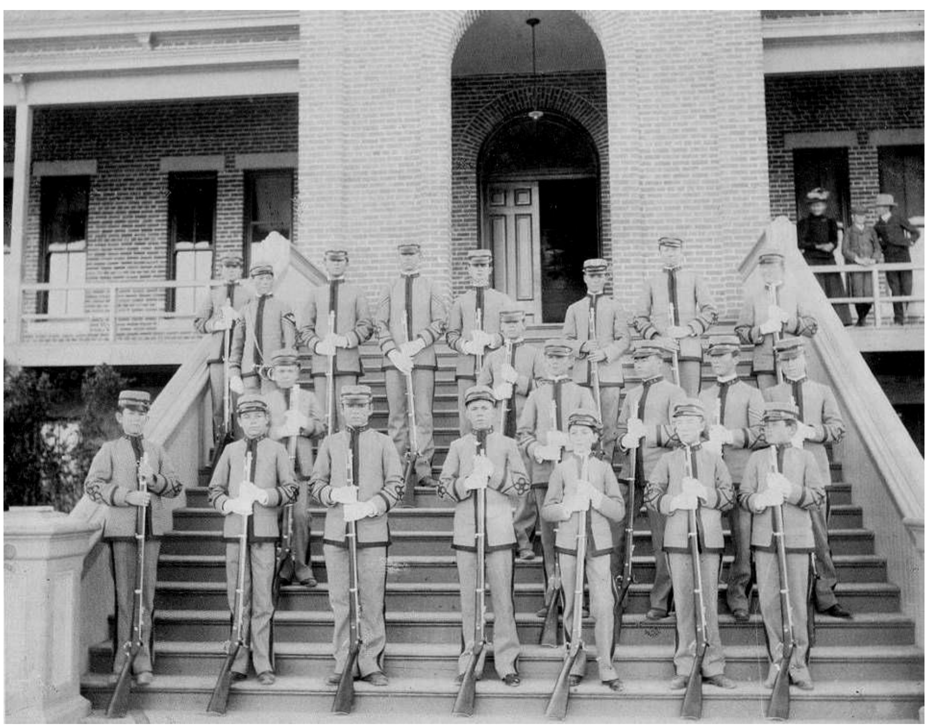


Figure E *-Cadets on west steps, 1898; note solid railings in lieu of pickets at stair sides. (Ball, p.30)*

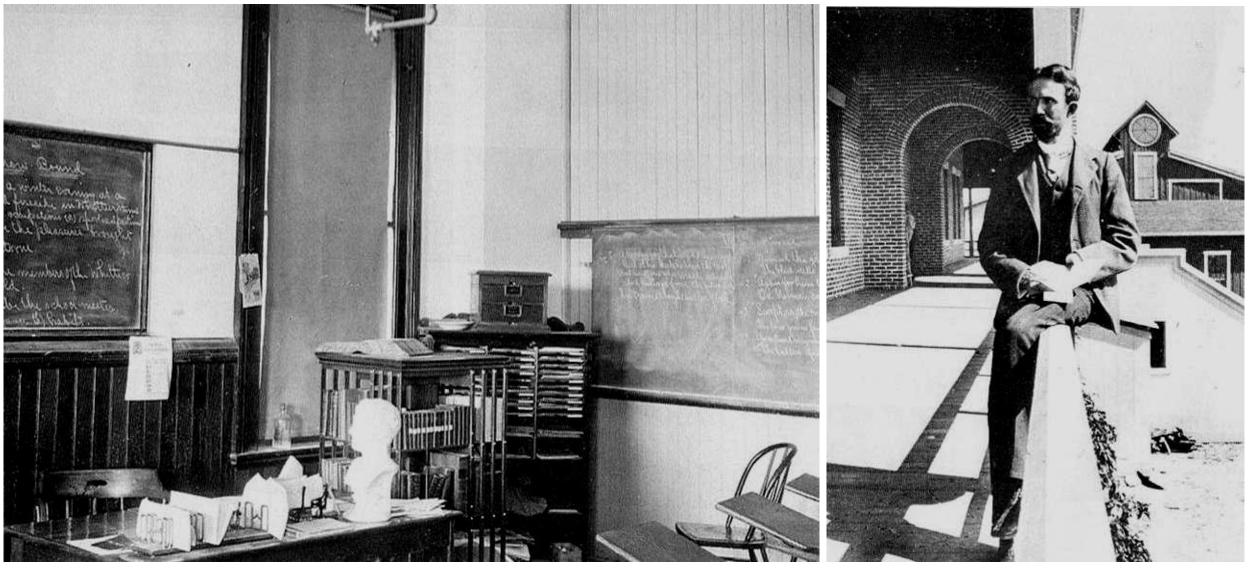


Figure F- *April 1896: Classroom of English Professor Howard Judson Hall, one of the first six faculty members, seen at right on east steps in 1898; note solid stair rail and Mining Annex beyond Prof. Hall. Interior wainscot of vertical 1x4 siding; note pull-down window shade & slate chalk board. (Ball, p. 28)*

Figure G *- Drawing class on second floor; note black-out shades on windows and wood wainscoting. The instructor at right is David H. Holmes of Holmes & Holmes Architects, the designers of Herring Hall among other buildings on campus. (Ball, p. 39)*

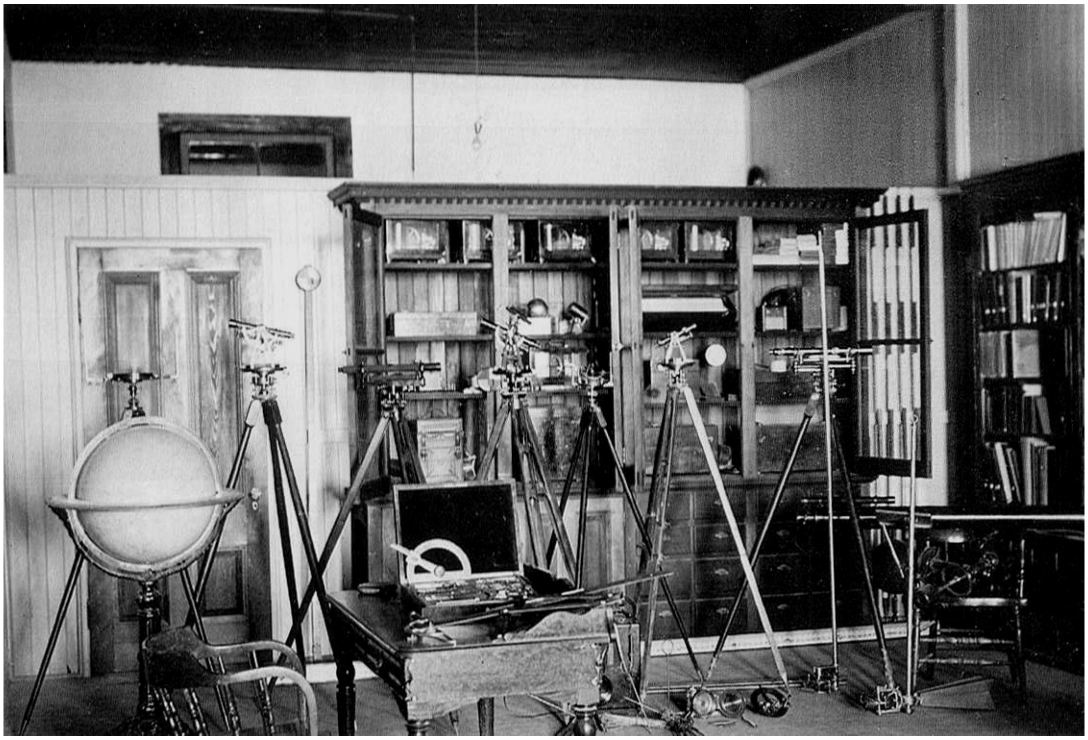


Figure H - *Interior of upper floor, showing wood paneled partition separating space from exterior wall, creating an office space near the window. As the UA's first building, Old Main served as classrooms, offices, library & laboratories. Civil engineering eqpt. on display. (Ball p.39)*

Figure I - *The original University library on the second floor of Old Main; book stacks located next to bearing walls at side of room to reduce bending stresses on 2 X 12 wood floor joists @ 18"O.C. (per Holben, Martin & Meza, structural reinforcing of second floor, 1978; Ball, p. 41)*

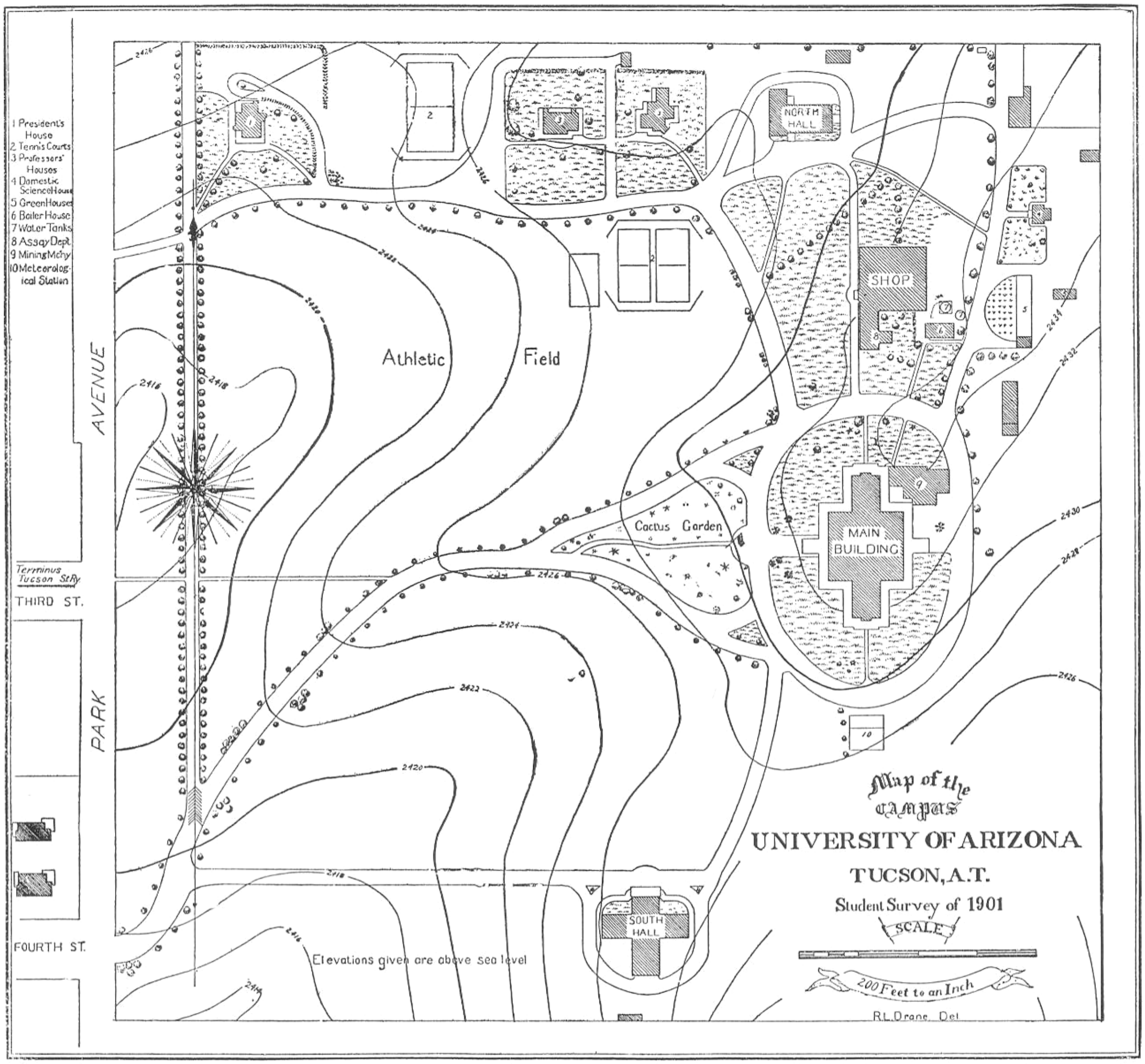


Figure J- *"The earliest published campus maps were the product of undergraduate surveying classes, and appeared in the UA* Registers *between 1900 and 1908." (Ball, p. 45)*

The prominent location of Old Main – originally known as the University of Arizona's "MAIN BUILDING" (before it grew old) – is indicated on this early campus plan from 1901. This survey was done by UA surveying students. In this current study of Old Main, history is repeating itself, in that a new detailed topographic survey of grade elevations of the sunken walkway and retaining wall around the building was prepared, at no cost to the University, by students of CE 251 under the direction of UA Prof. Jack Buchanan (a Registered Land Surveyor who in addition to teaching at the UA is on the staff of The WLB Group, the civil engineering and landscape consultant on our project team). The new survey is included with the architectural record drawings at APPENDIX B to the Preservation Master Plan.

Old Main – Engineering Record:

1978 – HOLBEN & MARTIN CONSULTING ENGINEERS

2nd Floor structural strengthening @ interior and wrap-around porch; steel bracing @ corners of stone retaining walls around 1st Floor and @ porch floor hip rafters. (Randon Holben, P.E., and Jerry A. Cannon, P.E.)

1987 - SMITH / PEDERSON ASSOCIATES:

Electrical (1st & 2nd Floors) - A.E. Magee, P.E.

Mechanical/Plumbing/Fire protection (1st & 2nd Floors) - Stewart R. Palmer, P.E.

Structural - Turner Schaller Engineering Co. (Cyril D. Schaller, P.E.)

2007 - M3 ENGINEERING & TECHNOLOGY (full architectural Construction Documents)

Electrical (Lighting/Conduit Plans/Lighting Schedule – 1st Floor, Panel Schedule & 1-Line Diagram - entire building) - Enrico B. Laos, P.E.

Mechanical (1st Floor only) - Lee Alan Becker, P.E.

Structural (Partial Foundation & 1st Floor) - Harry Lewsley, P.E.

Fieldwork:

Vint & Associates has visited the site on ten separate occasions over the period of January 25 – October 31, 2011, with the Owner's Representatives and engineering consultants, to inspect and record existing conditions for the purpose of assessing and recording physical condition of the structure. Examination of the building's features and systems addressed the following factors: areas and causes of deterioration, building code compliance, NFPA standards, areas of non-compliance with ADA/UFAS, site concerns and integrity of associated features, site and building drainage issues, as well as known or suspect hazardous materials. Vint & Associates has made photographs and prepared architectural drawings to illustrate these issues.

The drawings illustrate existing conditions and relevant historic development of the building. Photographs used in the report are keyed to the appropriate drawings. Original construction document were not available for Old Main. Existing conditions were determined by field observation, and recorded by measurements and photographs. Drawings indicate areas of notable deterioration, distress, and work required per assessment factors mentioned above. The drawings outline preservation needs, safety hazards, and areas of non-compliance with ADA/UFAS, NFPA, and other existing building code requirements. The condition assessment drawings illustrate site conditions impacting the structure, including rain runoff and erosion hazards, as well as areas of notable deterioration, distress and rehabilitation work required.

Second Floor Structural Analysis:

An investigation of the second floor framing system performed in March of 2010 by Turner Structural Engineering of Tucson uncovered limitations to the floor load capacity of certain areas of the second floor that have been proposed to be used as file storage areas. The Preservation Master Plan includes further analysis of the floor framing system and recommended solutions and probable costs to address the load bearing problems across the 2nd (upper) floor.

Figure 1- *West façade of Old Main with Memorial Fountain frozen solid, 2/3/11 (B. Vint)*

PART 1. EXISTING CONDITIONS

1.A EXTERIOR FEATURES:

The building is considered from the top down, following the path of both stresses and rainwater that flow over and through the structure. This leads from the roof, to the bearing walls, posts & beams, then to the stone foundation walls at the 1st Floor and stone retaining walls surrounding the lower level of the porch. The roof has both waterproofing and structural considerations. The foundations are affected by chronic “rising damp”, producing efflorescence and salt erosion as explained in detail below. The organization of the Master Plan transitions from exterior to interior and from top to bottom. The two greatest preservation threats to Old Main come from these two extremes and they both are driven by water: roof leaks affecting the structural integrity of wood roof framing, and foundation deterioration that threatens the stability of the structure at the point of accumulated bearing at the base of the walls.

Figure 2 *- East side of roof looking north.(B. Vint, 1/25/11)*

1.A.1 ROOF

1.A.1 (a) ROOFING

The original 120 year-old terne-metal roofing is still in place at the continuous wrap-around porch, the pyramidal tower roofs, and the scalloped Mansard roof of Old Main. This must surely rank as the oldest roofing installation in the State of Arizona, if not all of the Southwest, and likely is among the oldest roofing systems anywhere. Even the San Xavier Mission, the oldest intact building of European origin within State boundaries, has had its roof replaced twice in the 20th Century - first in the 1950s, and again 1990s.

Figure 3 *- Chimney requires re-pointing w/ compatible lime mortar and lateral reinforcing.*

Figure 4 *- Areas of rust and painted repairs at pyramidal roof of west tower.*

Figure 5 *- Rusted sheet metal roofing at ventilation dormer.*

Figure 6 *- Central area recently re-roofed with membrane roofing. This originally was roofed with standing-seam metal in a shallow hipped configuration, as seen in the historic photo on following page.*

1.A.1 (A) (1) CENTRAL AREA ABOVE ORIGINAL CLASSROOMS & CENTRAL HALL

The central portion of Old Main above the central crossing and all six of the 2nd floor classrooms has a modern membrane roof installed in 2008. This roof is in excellent condition, and requires no work at the present time.

Figure 7 *- North skylight at center of hallway.*

Figure 8 *- South skylight with roof hoods beyond, membrane roofing in place.*

***Figure K** - Aerial view from 1920s shows central area roofed with standing seam metal. Memorial Fountain built in 1919 to commemorate UA students killed in WW1.*

***Figure L** - Standing seam metal from central roof removed in September 1942 by Sundt Construction Co. in renovations carried out for the Navy at the start of WW2.*

Figure 9 *- Doubly curved Mansard (at center of photo) and pyramidal hipped roof at east tower (top right).The porch roof below has simple span with a single pitch and is considered separately.*

1.A.1 (A) (2) MANSARD & TOWER ROOFS @ PERIMETER

The area surrounding the membrane-roofed central portion is comprised of a doubly curved Mansard roof and four pyramidal towers, one at the center of each elevation. The Mansard roof is made up of custom-made sheet metal shingles that are crimped together at the edges. Through more than a century of weathering and repeated cycles of wetting & drying, freezing & thawing, the shingles have lost much of the protective coating they once had. UA Facilities staff reports that for approximately the past 30 years, the metal roofing at Old Main has been periodically painted a deep reddish-brown color, both to protect and waterproof it, and to improve its appearance.

Written documents from the time of construction refer to “terne-metal” being used in the roofing of Old Main. From the Encyclopædia Britannica we have: Terneplate: *steel sheet with a coating of terne metal, an alloy of lead and tin applied by dipping the steel in molten metal. The alloy has a dull appearance resulting from the high lead content. The composition of terne metal ranges from 50–50 mixtures of lead and tin, to as low as 12 percent tin and 88 percent lead. The tin serves to wet the steel, making possible the union of lead and iron, which would otherwise not alloy. Terneplate is made by a process similar to galvanizing or tinplating.*

From Merriam Webster, we have: "***terne·plate* noun \turn-*plāt*\ :** sheet iron or steel coated with an alloy of lead and tin. *Origin: probably from French **terne** dull (Middle French, **ternir,** to tarnish) + English, **plate**".*

According to the US National Park Service (NPS), "Terneplate was first produced in the United States in New York in 1825. Joseph Truman of Philadelphia patented the lead coating of tinplate in 1831. Later production combined the lead and tin into a single coating. Called variously 'leaded plate,' 'roofing tin,' and 'roofing plate,' terne was cheaper than a pure tin coating, but its properties were very similar. Domestic production of terne was twice that of tin when it was chosen to roof the buildings of the 1893 World's Columbian Exposition. In the next few decades terne replaced tin completely in American production as steel replaced iron as the base metal."

From Asbestos to Zinc, Roofing for Historic Buildings, Metals-part II, Coated Ferrous Metals: Iron, Lead, Zinc, Tin, Terne, Galvanized, Enameled Roofs , Technical Preservation Services, NPS, US Department of the Interior http://www.nps.gov/history/hps/tps/roofingexhibit/roofingtoday.htm

"When terne was first used during the Colonial era it contained roughly 80 percent lead and 20 percent tin. Historic terne coatings using lead present an environmental contamination concern from lead leachate found in roof runoff. In the latter half of the 20th century, as lead was found to have potentially detrimental health effects, the lead/tin alloy was replaced. Years of metallurgic research and development produced a new and superior zinc/tin alloy in the mid-1990s. This new alloy, proven through ASTM corrosion resistance testing, provides improved performance and aesthetics over the original, minus potential risk to health.

"Today's terne metals are coated stainless steel. The "terne" coating (achieving the tarnished look if traditional terne coating) is a zinc-tin alloy metal coating process that gives extra corrosion resistance. Terne metals are produced by coating carbon steel, stainless and other select metals with a specially formulated alloy consisting of zinc, tin and trace amounts of other elements in order to dramatically increase a metal's corrosion resistance as much as ten times.

"Besides stainless and carbon steel, the zinc/tin alloy may also be applied to other metals such as copper, bronze, tin and titanium. Available in a variety of gauges and widths, today terne metals are used on industrial, commercial, institutional, and residential structures for roofing, gutters and downspouts, siding, soffits, fascias and numerous other architectural applications.

"A terne roof using a carbon steel substrate can easily last more than 100 years with very little maintenance required. "

Although heavily weathered, the appearance of those parts of the roof that still have patches of an original finish consistent with the appearance of terne-metal. The presence of lead can be confirmed quickly and inexpensively using XRF (x-ray fluorescence). It is recommended that the UA carry out lead testing at the metal roof, interior paint, and soil surrounding Old Main.

Figure 10 *- Pressed terne-metal fish scale shingles used at 4 tower roofs and as wall siding at north & south towers. Severe deterioration is evident. Paint disguised deterioration and prolonged life.*

"Roofing for Historic Buildings", Sarah M. Sweetser, Preservation Brief 4, Technical Preservation Services, National Park Service, U.S. Department of the Interior http://www.nps.gov/history/hps/tps/briefs/brief04.htm

"The Use of Substitute Materials on Historic Building Exteriors", Sharon C. Park, AIA, Preservation Brief 16, Technical Preservation Services, National Park Service, U.S. Department of the Interior

Figure M - *Hand-tinted post card view reflects original dull appearance of lead-coated terne-metal roofing.*

Figure N - *View from SW, 1891, before stairs or railings had been completed. Decorative finials installed at peaks of tower roofs, as shown in original drawings.*

Figure O - *West elevation 1938 with Memorial Fountain in foreground overgrown with vegetation. Note weathered and dilapidated appearance of building with pieces missing from wood louvers at ventilation dormers. According to the National Register nomination this was the year that the City of Tucson condemned Old Main as unsafe and University administrators considered demolition. Finials & weathervanes missing from peak of west tower.*

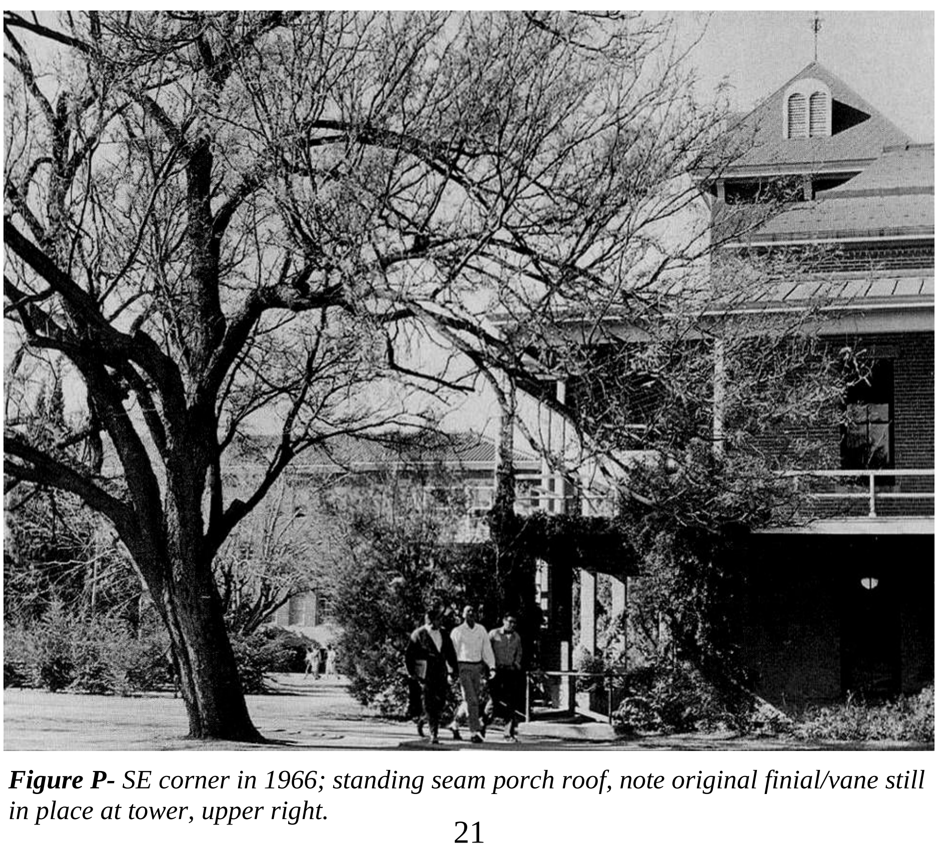
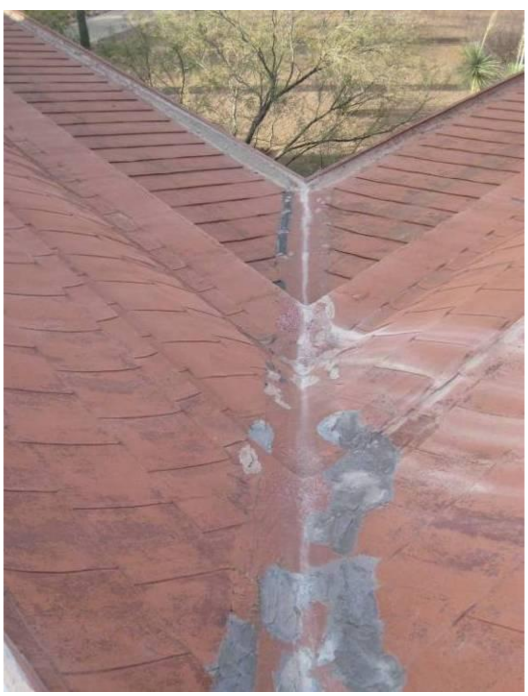


Figure P- *SE corner in 1966; standing seam porch roof, note original finial/vane still in place at tower, upper right.*

Figure 11 *- Hip seam at SW corner of curved Mansard roof, with standing seam at porch roof below & beyond. Gutters at porch eaves routinely become clogged with accumulated dust & debris turned to solid adobe.*



◄*SW*

◄*NW*

Figure 12 *- Valleys at perimeter Mansard roof have been repeatedly patched for decades and still chronically leak.*

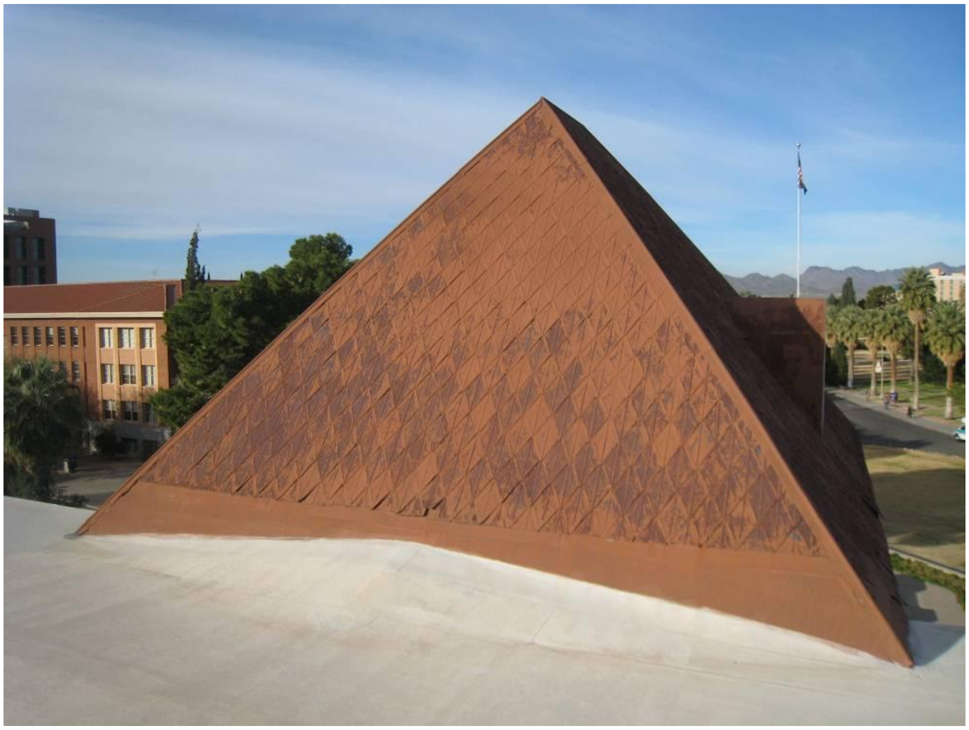


***Figure 13** - Pyramidal roof of West tower; original finial and weathervane is missing.*

***Figure 14** - Detail of terne-metal 'fish scale' roof tiles at West tower.*

Figure 15 - *Traces of lead & tin terne coating remain on a few tiles. Diamond shaped tiles measure 7½"w x 13"h.*

Figure 16 - *Details of pressed/stamped terne-metal shingles original to building (1891); Arizona's oldest roofing. Provisional repairs made w/galvanized sheet metal at north face of south tower (hence in shade).*

1.A.1 (A) (3) WRAP-AROUND PORCH ROOF

Old Main's continuous deep porch is a primary character-defining element of Territorial period architecture. As with the perimeter Mansard and towers, the porch roofing is rusted and deteriorated, having lost most of its terne coating. The valleys and gutters have been repeatedly repaired and the roof itself has been painted. Sections have been provisionally repaired with non-compatible materials.

Figure 17- *SE wing of porch with deteriorated standing seam metal, a portion of which has been replaced with patch of asphalt roll-roofing with brown mineral cap. Note shallowness of perimeter gutter, which is ineffective.*

CONCLUSION:

After 120 years, the roof of Old Main has lived its service life. The terne-metal roofing is significantly deteriorated in all areas: the crimped rectangular tiles at the perimeter Mansard, the diamond-shaped fish-scale tiles at the hipped tower roofs, and the standing seam porch roofs. The metal is rusted and flaking, and has been provisionally patched and painted throughout its history. For the past 30 years, it has had the characteristic reddish-brown paint applied to protect the roof and disguise the deterioration that has taken place over the decades. Chronic leaks in numerous areas have damaged the wood roof structure, as illustrated in **Section 1.A.1 (B)** of the Preservation Master Plan. The decision regarding final material selection for reroofing Old Main must be made in consultation with the State Historic Preservation Office (SHPO), as this is a National Register property, and among Arizona's oldest and most significant buildings.

ROOFING RECOMMENDATION:

To prevent continuing structural deterioration, the leaking sheet metal roofing must be either fully refurbished or replaced. The option of painting or coating the metal in an attempt to preserve it has been exhausted. In order for paint to adhere well to metal, all rust and scale must be removed. This would be a next to impossible task in this case, as the metal is covered with a continuous coat of rust. The amount of labor required to individually treat each element would be prohibitive, and the outcome uncertain in any event, as many of the metal elements are rusted through.

The Mansard, tower and porch roofing should be replaced with compatible metal shingles, tiles or standing seam panels to match exactly the size, shape, configuration and installation pattern of historic original, in every detail, consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties (*Std. #6, see APPENDIX D*.).

OPTIONS REGARDING MATERIAL USED FOR THE REPLACEMENT ROOFING:

(A) TRADITIONAL LEAD/TIN TERNE-METAL
(Not Recommended)

Although this would be the most authentic approach, given the environmental and public health issues associated with the use of lead in construction, it is not recommended. While not strictly banned as such, using traditional terne plate may be impractical, since manufacturers have moved away from traditional terne-metal. Lead-based paint has been banned since 1978, and lead contamination of soil is a health hazard. *The UA should test the soil around Old Main for lead, since over the past century-plus most of the original terne coating has broken down and washed off the roof into the surrounding soil. If significant amounts of lead are present environmental remediation will be required.*

(B) CONTEMPORARY TERNE-METAL: ZINC/TIN COATED STAINLESS STEEL
(Recommended)

This would be an appropriate long-lasting solution, compatible with the historic building. Each element of the original sheet metal shapes would be replicated. The patina of the coated steel would approximate the original dull pewter-like quality of true terne-metal.

(C) CONTEMPORARY PRE-FINISHED STANDING SEAM "GALVALUME" OR POWDER-COATED SHEET METAL SIMULATING TERNE-METAL COLOR
(Not Recommended)

Although this would be a functional, practical and relatively economical solution, it is not recommended, because the modern appearance, profile and sheen of the material would be historically incompatible and in violation of the Secretary's Standards.

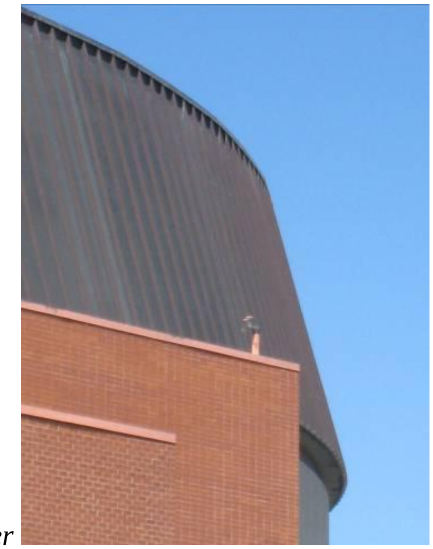
(D) COPPER SHEET ROOFING MATCHING ORIGINAL PROFILE & DETAIL
(Recommended)

The case can be made that the color of partially oxidized copper sheeting (as occurs in Tucson's dry climate, in which the copper turns a deep, warm brown) is compatible with the historic character of Old Main, in that it replicates the deep oxidized color of the original terne-metal, as it first rusted and then was painted, over the past many decades.

PRECEDENTS FOR USE OF COPPER ON UNIVERSITY OF ARIZONA CAMPUS:

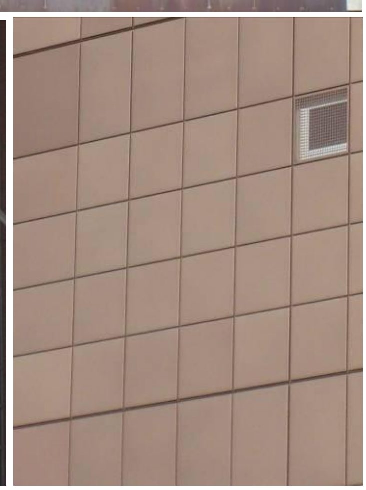
There are 3 examples of copper roofing and siding on the UA campus: first at McKale Center, where the roof structure is sheathed with a continuous copper fascia that has turned a dark bronze over the past 35 + years; secondly at the recent Optical Sciences Building, where copper siding has reached a warm patina over the past 5 years; and most recently at the new dormitories, whose fresh copper siding has already dulled and tarnished (recalling the definition of ***terne***).

McKale Center

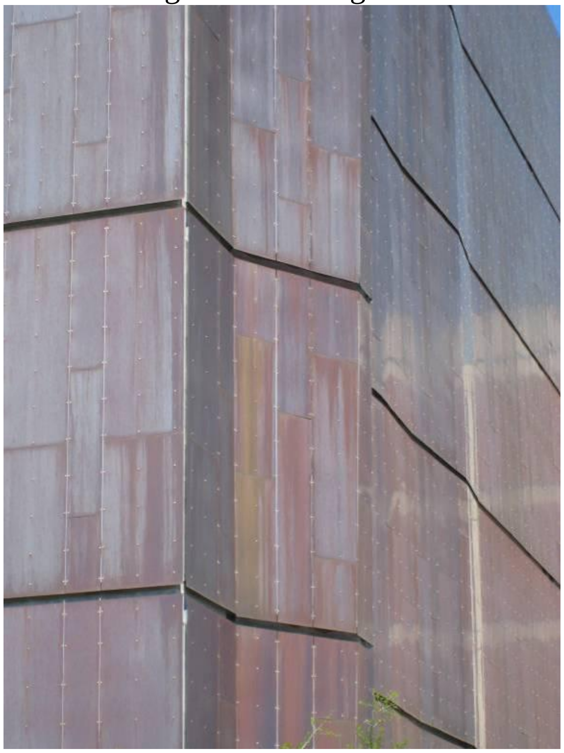


Meinel Optical Sciences

Sixth Street Residence Halls



An historical factor to consider is that copper is a product of the Arizona mining industry, and Old Main was initially conceived as the School of Mines. Using a material native to the state would have significance. It's also possible that a material donation or cost reduction to support the re-roofing could be sought from one of the state's copper mining companies, as a PR gesture.



Optical Sciences

McKale Center

Old Main

1.A.1 (B) ROOF STRUCTURE

(1) CENTRAL ROOF (ATTIC SPACE):

This section of the roof is framed with regularly spaced site-built X-braced wood trusses, made up 2-x and 1-x milled framing lumber, with 2-x-6 joists @ 16" OC spanning between the trusses at the ceiling level, and 2-x-6 joists @ 32" at the roof plane (ref. Roof and Ceiling Framing Plans at Appendix B, Architectural Drawings). The spans are modest, as the trusses are closely spaced at from 10 to 12 ft., hence the 2-x-6 framing is adequate. The roof pitch for the center section of the roof was accomplished by means of propping a secondary roof structure above. When Old Main was built it had neither electrical nor mechanical systems. Heat was via fireplaces in each classroom, and cooling was achieved by the shade of the deep porch, and natural ventilation through ample double-hung windows. Through the decades, as the UA modernized, electrical power and lighting were introduced, along with a four-pipe HVAC system with suspended fan coil units, fire sprinkler piping, a plywood walking surface at the attic and a suspended grid ceiling beneath the original ceiling level. This additional equipment, piping, conduit and material induced significant loads on the historic structure. As a result, the original roof structure has been periodically upgraded to maintain stability. Wood trusses were reinforced with steel gusset plates in 1987 under the direction of Cyril D. Schaller, P.E., of Turner-Schaller Engineering. Additional wood framing members have been added in numerous locations where deflection of the original structure occurred. There are no signs of distress or excessive settlement or deflection. Water-damaged decking has been replaced where necessary, and the membrane roof above is now effectively keeping water out. At the present time, the central roof structure of Old Main appears stable under gravity loads and is in good condition.

Figure 18 - *Original X-braced wood trusses reinforced with steel gusset plates and through-bolts ca.1987. The attic space is well-maintained and organized.*

Figure 19 - *Fire sprinkler and HVAC piping @ attic of central roof section; note diagonal propped hip rafter for roof pitch, with additional wood stiffener scabbed on beneath.*

Figure 20 - *View of typical truss at center section; note secondary roof joists propped from top chord for slope, and numerous repairs made to trusses over time. Despite apparently haphazard nature of repairs, structure is well tied together and presently stable. Duct at left of photo runs to east tower ceiling for air intake.*

(2) MANSARD @ PERIMETER EAVE:

The Mansard eave is ingeniously framed, with sloped 2-x-6 wood framing @ 32" OC transformed into a doubly curved Mansard by the addition of concave blocking cut from standard 2-x stock added to the upper half of the span, and a convex 2-x added to the lower half, creating an elaborate shape from standard dimensional framing lumber. The remainder from the cut of the upper concave scallop was used to form the convex (outward-bulging) curve of the lower half. Skilled and resourceful carpenters built the roof of Old Main.

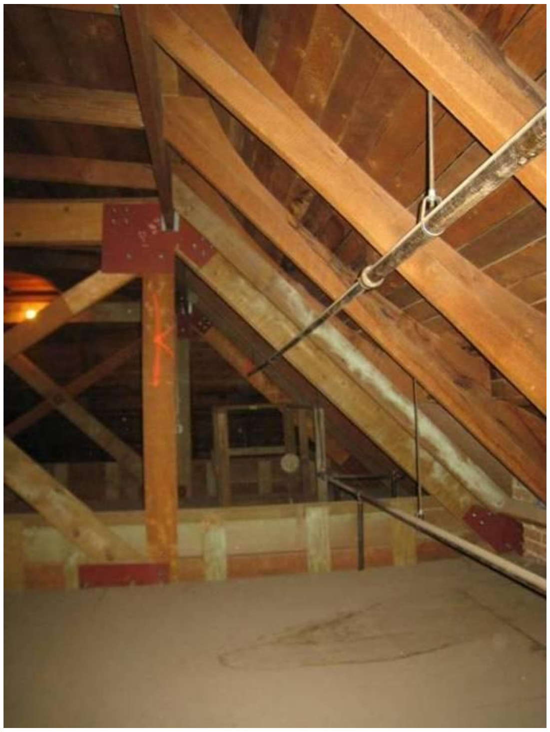


Figure 21 *- Slope of eave follows that of built-up wood truss beyond; concave blocking creates the Mansard shape.*

Figure 22 *- Convex lower curve at Mansard framing; note fire sprinkler piping and plywood floor at attic.*

Figure 23 *- Roof leaks at valleys and hips have damaged wood framing over time.*

Figure 24 *- Hip rafter adjacent replaced w/pressure treated 2x6 (note green tint)*

(3) TOWER ROOF STRUCTURE:

The east and west towers above the main entrances are similar in construction and current condition. Both have brick bearing walls and timber-framed hipped roof structures. The roofs are not true pyramids, as they are elongated east to west and have a central ridge. Framing is full dimension 2-x-4s @ 32” OC sheathed with 1-x-6 wood plank decking and roofed with diamond shaped terne-metal shingles. The decking is not tongue & groove, rather it’s butt-joined. Wood framing is original to the structure and shows signs of extensive roof leaks, water staining and rot. At the time that the roof is replaced, all damaged wood decking and joists must be replaced. Existing wood connections are made by nailing, without metal framing connectors tie the roof together. Yet the structure has survived for 120 years without serious signs of structural distress, such as excessive deflection or shearing of framing members. Although by today’s standards the 2-x-4 joists are undersized for the 16 ft. span, lumber used to build Old Main was brought by railroad from Oregon (according to Phyllis Ball’s history of the UA) and is likely old-growth timber of higher quality and strength than is available today.

A.

Figure 25 A & B- *East tower roof framing (west is similar). Note staining & damage from extensive roof leaks. Block & tackle built into tower was likely used in construction.*

B.

As repairs are made, improvements in structural design to resist wind and earthquake forces will require that the roof structure be tied together as well as connected to supporting walls to prevent the roof from separating from the walls during an earthquake. Improvements of this type were made to the first floor framing in 1978 under the direction of Randon Holben, P.E. A comprehensive structural plan will include a continuous steel angle bond beam (more easily concealed than concrete) bolted through the brick wall at intervals, with framing anchors tying the wood roof to the wall. Diagonal bracing at corners will increase lateral resistance of towers.

The north and south tower roofs are true pyramids in shape, with 4 equal slopes meeting at a single point. They are framed with full 2x4s @ 32" OC, supported on wood frame bearing walls composed of 2x4s @ 32" OC, sheathed with 1x4 plank type decking.

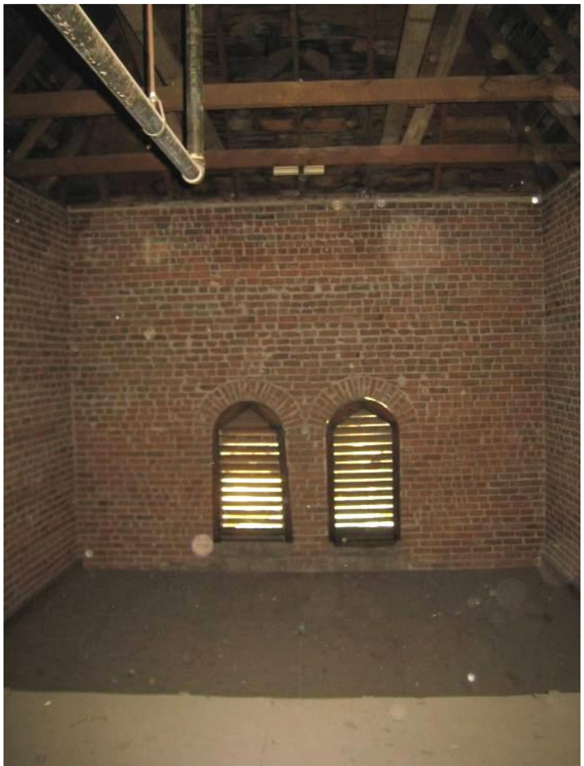


***Figure 26** - Interior of west tower (east similar) showing brick bearing walls and arched openings for wood ventilating louvers. Brick walls are unreinforced and transition from triple brick (13" thick) at the 2nd floor to double brick (9-½" thick) at the upper level of the towers. These elements would benefit from bracing at roof and floor level, to resist lateral forces (wind or earthquakes). The louvers are currently not screened against insects or birds.*

***Figure 27** - Interior of south tower pyramid; extensive leaking is evident. Roofing must be replaced as well as 1x6 wood deck affected by moisture. At the towers, approximately 50% of decking appears moisture-damaged. At time of re-roofing, plywood or OSB sheathing should be installed above 1x6 decking, to create a diaphragm for improved lateral stiffness.*

***Figure 28 -** Interior of south tower (north is similar). Wall framed with full 2x4 studs with diagonal 1x6 bracing and horizontal 1x6 sheathing. Exterior finish is diamond-shaped terne-metal shingles, installed directly to sheathing without a vapor barrier (it's possible that a vapor barrier, if it was asphalt building paper, may have disintegrated over the 120 year life of Old Main). Wood frame north and south towers are not weather-tight; wind, dust and rain penetrate space. Louvers lack bird & insect screens.*

***Figure 29 -** West wall of south tower (north tower similar). Wall framed w/2x4s @ 32" OC and 1x6 board siding. Exterior finish is diamond-shaped shingles of terne-metal with no vapor barrier apparent. Daylight shows between planks penetrating voids between shingles. The attic of Old Main is un-insulated including the central roof, the perimeter Mansard and tower roof and walls.*

(3) PORCH ROOF STRUCTURE:

The porch roof is framed with 2-x-6 wood joists @ 24” OC, spanning 12 ft. from a brick bearing wall to a built-up wood perimeter beam. This beam in turn is supported on built-up wood posts (considered below at Section. The roof joists appear stable, as does the 1-x-6’s deck above. The joists are pocketed into the brick wall and will require additional anchorage to resist lateral forces. The perimeter beam is generally stable, although in several sections there are signs of weathering & deterioration. Maintenance painting and/or repair/replacement of approximately 10% of the perimeter beam is recommended.

At the time that the porch is re-roofed with either copper or terne-metal, a plywood or OSB diaphragm should be installed above the 1-x-6 decking to provide a diaphragm to resist lateral loads. Additionally, at that time, each individual 2-x-6 joist should be anchored through the brick bearing wall to a steel angle bond beam that runs continuously around the top of the brick bearing wall at the interior, concealed in the attic space.

Figure 30 - *Old Main porch roof perspective.*

Figure 31 - *Perimeter beam at post #9 (second from left) shows deterioration & settlement; this may be due to foundation settlement rather than failure of the beam itself.*

1.A.2 PORCH COLUMNS & FLOOR DECK:

The porch floor was reinforced in 1978 by Holben & Martin Consulting Engineers to resist contemporary design loads. The work consisted of strengthening primary beams that span from each brick pier to the bearing stone wall of the 1st floor level. The built-up beams were tied with steel bolts & straps through the stone to interior floor joists. Bent steel plates were installed to brace the corners. The floor joists are chronically rotted at their upper surface due to moisture penetration at deck fasteners. The floor decking is also generally deteriorated: it has been patched sporadically, and must be replaced in the near-term.

Figure 32- *Porch floor structure; decking has deteriorated and joists are rotted.*

Of great concern is the deterioration of the supporting brick columns at the lower level (1st floor) of the porch. These are of un-reinforced brick masonry measuring 13½"x 13½" in plan. Each brick column supports a built-up timber post centered above it at the 2nd floor. There are 56 columns in total. These are all severely affected by rising dampness and salt erosion. The mechanism of decay is the cycle of wetting and drying, in which moisture present in the surrounding soil, whether from rain fall or irrigation, dissolves soluble salts (chlorides, sulfates and nitrates) endemic in the alkali soils of Arizona.

Once the saline solution is drawn up in the masonry, the water seeks to evaporate, driven by the energy of wind and sun. As the water evaporates the salts recrystalize, both on and beneath the surface of the brick (the former is efflorescence, the latter subflorescence). As salt crystals form in the pores of the clay they expand, crushing the brick. When repairs are made to the brick using Portland cement mortar and plaster, moisture is forced higher in the pillar seeking to escape. The same type of moisture and salt driven deterioration takes place. All the supporting brick piers are affected, creating a serious threat to the stability of the structure.

Figure 33- *Pier #50 at SE corner of porch. The brick has been seriously eroded by the action of water and salts.*

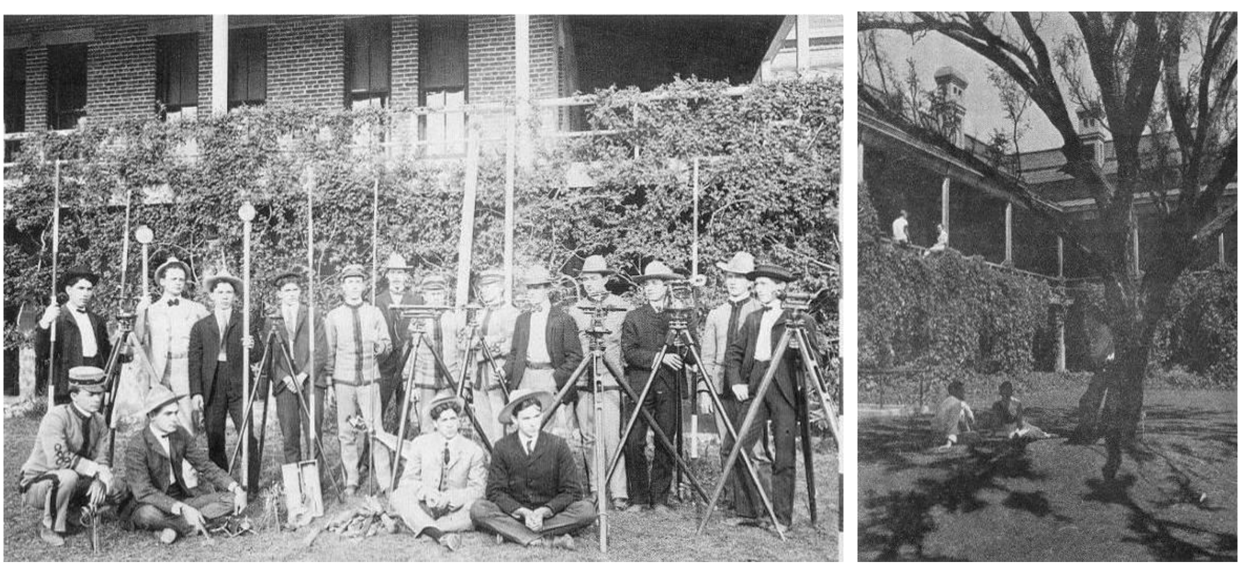
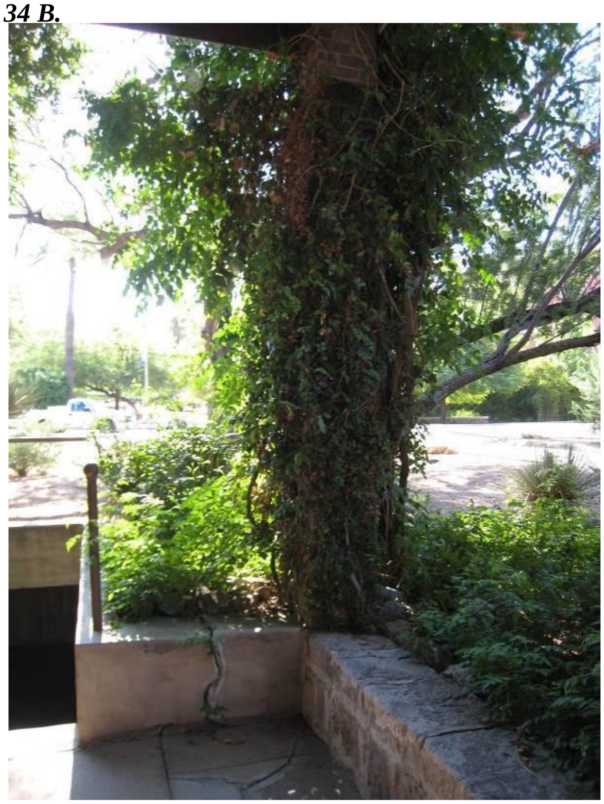


Figure Q- *Survey class in 1903 (left) and students seated on lawn at SE corner in 1936; vines had been planted around the sunken 1st floor within the first decade of Old Main's existence, likely to achieve evaporative cooling via the vegetative screen. 120 years of wetting & drying have eaten up the base of brick pillars.*

Figure 34 A. – *Vines and ground cover are picturesque and cool, but very bad for the building. Irrigated or non-native plants within 5 ft. of structure should be removed. Only native desert plants should be used near foundations.*

34 B.



34 C.

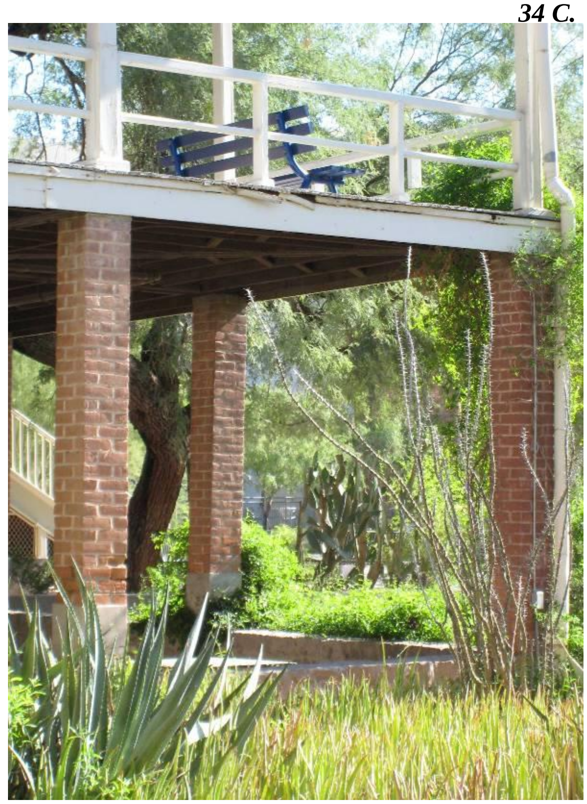


Figure 35 – *Pier #48 jack-knifing outward, out of plumb.*

Figure 36 - *Deteriorated deck & base at post # 11.*

Figure 37 - *Deteriorated wood & sheet metal bracket at post #7.*

PORCH POST PIERS & FOUNDATIONS

The brick piers at the first floor support the load of the second floor deck, as well as the wooden porch posts of the second floor, which in turn carry the porch roof above. The piers are a significant concern in that they are unreinforced and deteriorated at their bases. The brick has been greatly softened by the corrosive action of rising dampness and salt erosion. The piers could fail in compression if the deck were overloaded with a large group of students participating in a special event, for example. An earthquake could cause the unreinforced piers to shatter and collapse. Repair of the porch piers and supporting floor beams and decking is the highest priority for the rehabilitation of Old Main. Similarly, the roof framing, decking and deteriorated sheet metal roofing of the wrap-around porch must also be addressed.

Figure 38 - *North east porch from pier #8 to pier #11 note differential settlements at pier #9, as indicated by deflection in eave line.*

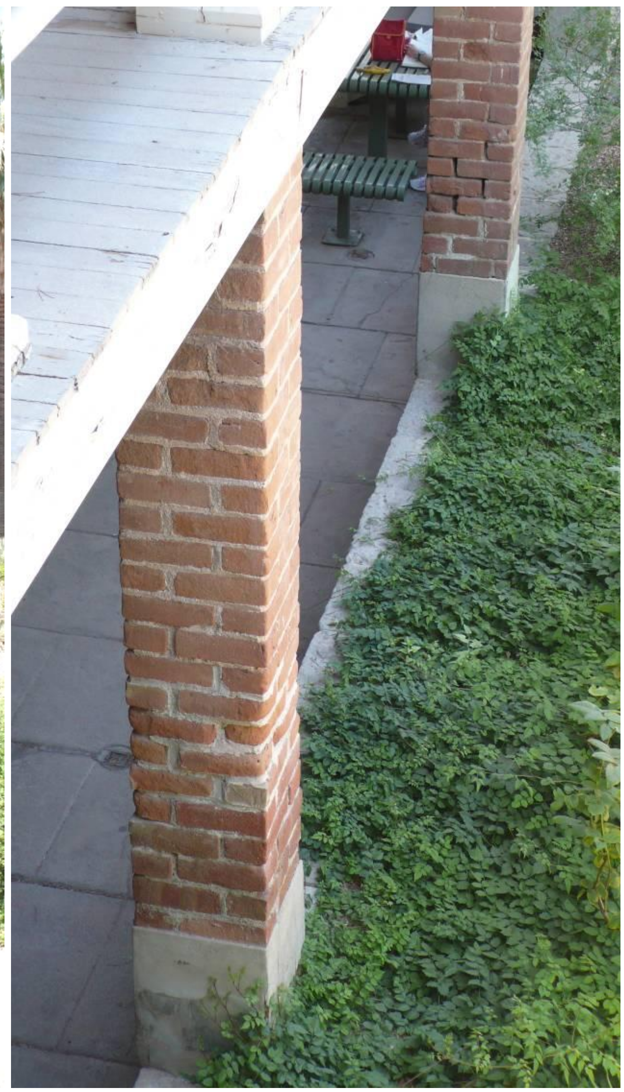


Figure 39 - *Piers # 8 & 9 have rising dampness to a height of 6 ft. above floor level. Water-loving plants near building attract & hold moisture. It is advisable to remove all such plants for the long-term health & stability of the historic structure.*

Figure 40 *- Porch piers & posts significantly out of plumb; piers #5 & #6 at NE corner of east wing.*

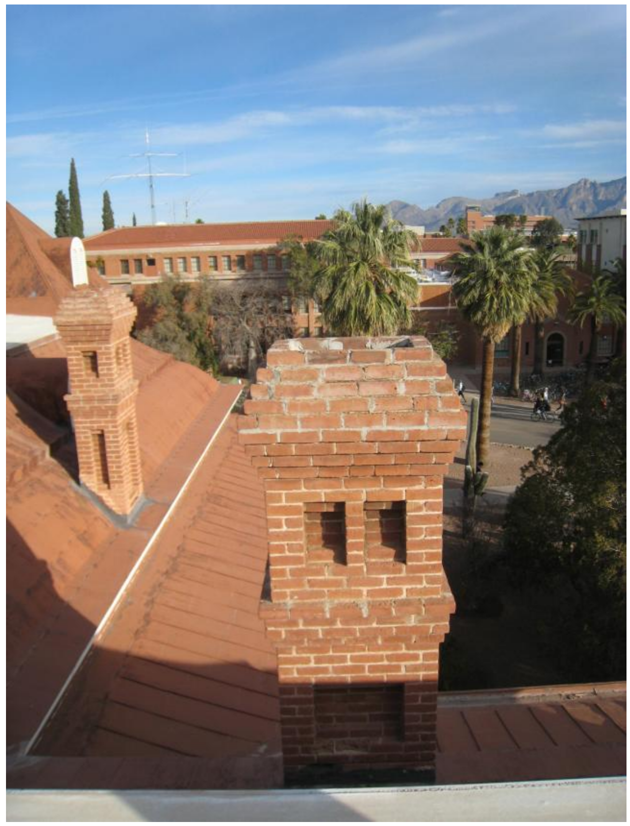


Figure 41 *– Old Main has eight un-reinforced brick chimneys, vulnerable to earthquake forces. Such exposed features are also vulnerable to lightning.*

Above the porch roof is another threat to the structure: eight tall, slender un-reinforced brick chimneys that rise 11 ft. above the top of their supporting brick walls. These tall heavy objects would likely topple in an earthquake, and should be reinforced. Since the chimneys are no longer in use, it is possible that they may be reinforced from within by inserting steel angles and through-bolting, or by installing steel re-bar and grout. If the grout option is pursued, caution must be taken not to cause the old brick to blew-out from the weight and force of liquid grout.

While the porch structure and chimneys are being re-structured against lateral forces, it is recommended that Old Main be fitted with a comprehensive structural lightning protection system to minimize the risk of structural damage or fire to the building from lightning strikes. Such a system would include a continuous ½" braided copper rope with periodic air terminals at the perimeter of each level of the building (porch eave, Mansard, tower eaves and peaks, and all chimneys). This continuous loop should be taken to ground at every other post (24 ft. O.C.).

1.A.3 WALLS:

Exterior and interior bearing walls are masonry. Exterior walls at the 1st floor (lower level) are quarried stone, identified as volcanic tuff by Dr. Mark Candee, curator of the UA Mineral Museum at Flandrau Planetarium. They measure approximately 18” thick, although this varies because the stone is rusticated (rough-faced quarry stone), and more importantly it has deteriorated at its surface in the lower 3 ft. to 4 ft. above paving level as a result of rising dampness (foundation moisture) and the action of soluble salts (salt erosion). This process is explained above at the section on brick piers. A 14” thick stone retaining wall runs continuously around the sunken first floor level. Above the 1st floor, exterior and interior bearing walls of the 2nd floor are 13½” thick triple-brick construction.

The lower level (1st floor) of stone displays a greater level of deterioration as illustrated below in the section on foundations. The upper brick portion is largely stable, although it displays numerous hairline cracks that have resulted from settlement and thermal movement over more than a century. These cracks occur typically at the corners of sills and lintels, and do not appear to indicate a serious stability or settlement problem, as they do not grow larger moving up or down the wall.

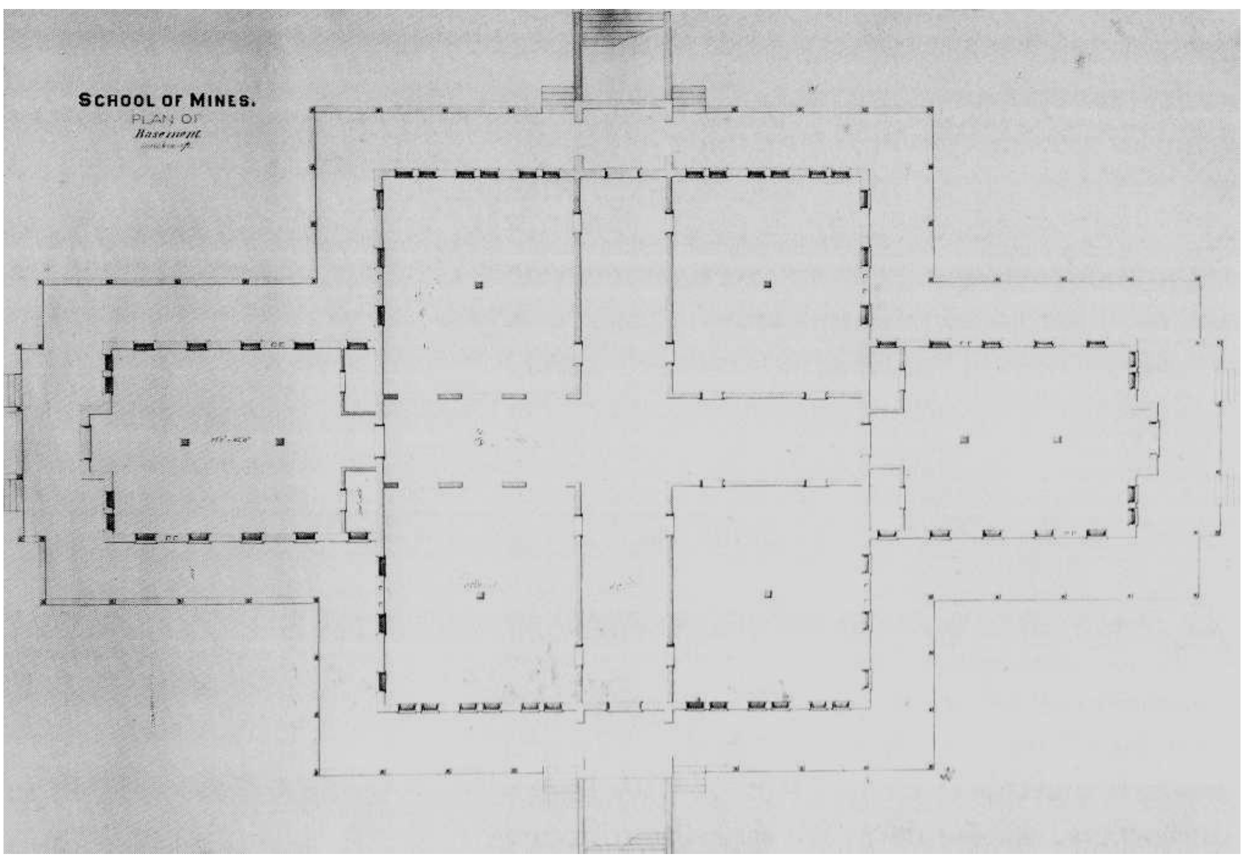


Figure R - *Original plan of Old Main displays Classical symmetry & simplicity. Regularity of bearing walls is evident. Symmetrical plan is an advantage with regard to lateral forces, as symmetrical buildings perform better under wind or earthquake loads than do asymmetrical ones.*

Exterior brick walls are generally stable. While hairline cracks are visible in many locations – often from the corners of lintels -- the brick walls do not display signs of structural distress such as severe cracking, differential settlement or out-of-plane movement. Overall the brick and lime mortar is in good condition for its age. There are some areas of concern, however, as illustrated herein. The twin arches of the east and west towers, above the main entrances, have lost mortar from joints near the 'key-stone' bricks. There are additionally hairline settlement cracks on each side of the sills of the upper arched openings at the east tower; these should be monitored with crack gauges to detect any continued movement.

Figure 42 - *East wall of east tower: cracks at key-stones of arches at entry towers, east & west. These will require re-pointing*

Figure 43 - *Shear cracks through brick at left side of sill of left-hand arch at east tower should be monitored.*

Where an original historic brick has deteriorated beyond repair, it must be substituted with a compatible replacement brick, laid in a bed of lime and sand mortar matching the original. Fortunately, UA has a stockpile of matching historic brick that may be used for repairs.

Figure 44 - *Worn brick and threshold stone at west tower.*

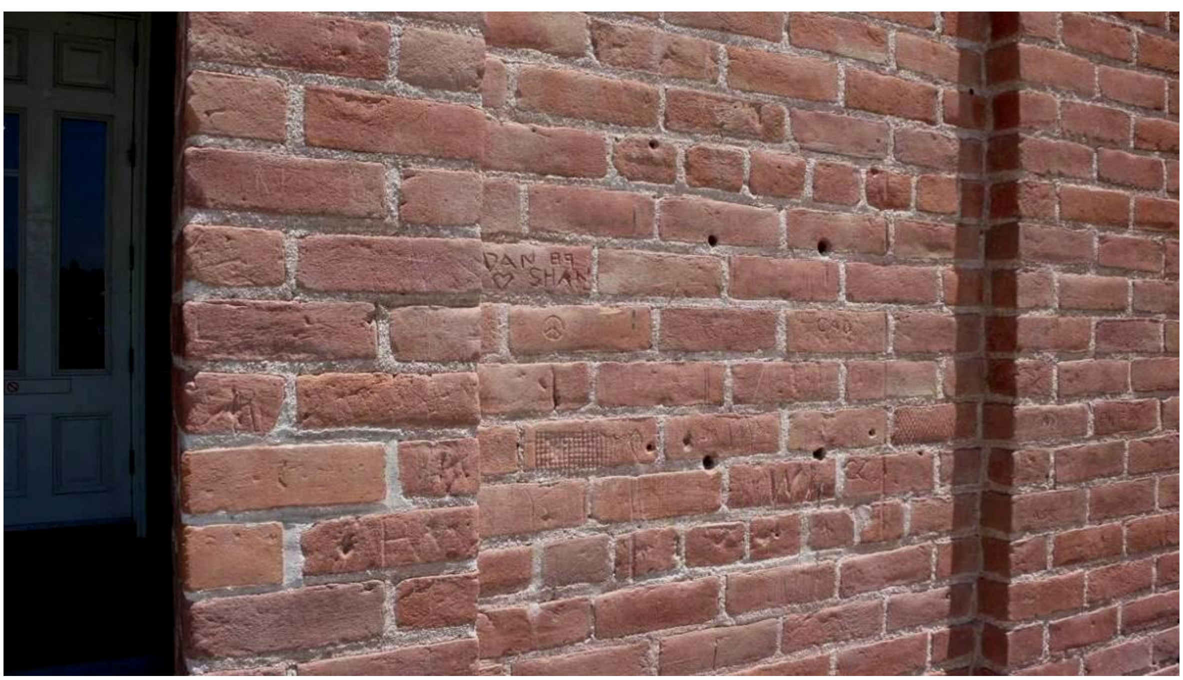


Figure 45 - *Brick worn smooth where people come in contact with it, brushing by or carving graffiti in the surface.*

1.A.4 FOUNDATIONS:

Foundations at both the building and the surrounding porch are built of quarried stone identified as volcanic tuff by Dr. Mark Candee, curator of the UA Mineral Museum at Flandrau Planetarium. Recent renovations suggest there are no spread footings beneath the stone stem walls. The stone appears to bear at the width of the wall directly on native soil, approximately eight inches below grade. Bearing depth is likely to vary around the building. The fact that the building is of unreinforced masonry, and after 120 years does not exhibit serious settlement cracking, suggests that it is relatively well-founded on soil with a sufficient bearing capacity. However, the supporting soil must be kept dry to reduce the potential for future settlement.

The greatest threat to the foundations and to the stability of Old Main as a whole is the continuous deterioration of the base of the stone walls by efflorescence and sub-florescence, or salt erosion as explained above. The driving force behind this decay is foundation moisture and salts present in the soil, now concentrated in the stone and brick of the building. Over the more than a century the building has stood, continuous leaching of salts and evaporation of water has resulted in the lower section of the walls and piers being infused with high concentrations of salts, which have the expansive potential of splitting the stone through sub-florescence, causing spalling of large sections of material as the salt crystals form within the stone. This process is endemic at Old Main. The Romans had a term (in Latin, of course) for stones that had reached this level of salt contamination: *pietra infirma*, or "sick stone." This is so infused with salts that it cannot be preserved, and must be removed and replaced or substituted with fresh stone of a matching variety.

Figure 46 - *The level to which moisture rises is evident in the discoloration of stone in the lower section of the wall, up to and above the sill level. Two-thirds of the sills at the 1st floor (40 out of 60) are deteriorated through salt erosion and must be replaced .*

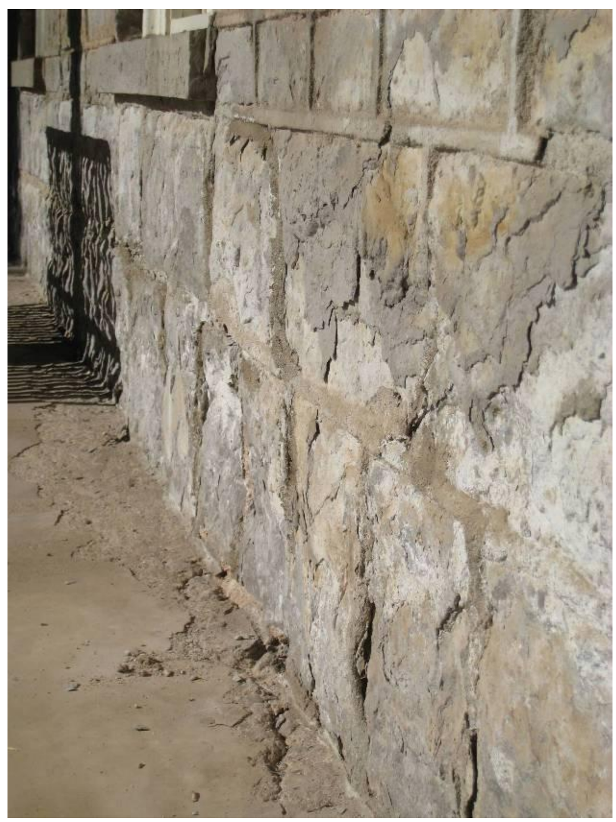


Figure 47 - *"Pietra infirma" (sick stone) must be removed and substituted with new stone of compatible strength & geologic composition, to the depth of the deterioration. Cement repairs must also be removed.*

1.A.5 DOORS & WINDOWS:

In keeping with the Secretary's Standards for the Treatment of Historic Properties (APPENDIX E.) original doors and windows are important character defining elements and should be preserved in place. They should be repaired rather than replaced. This has largely been followed in the case of windows, although less so for doors.

DOORS:

Original exterior entrance doors have been replaced in the original jambs with reasonably compatible wood panel and glass doors. Many original interior wood-panel doors remain intact in their frames. All surviving original doors should be preserved in their original frames and locations, maintaining original oil-rubbed bronze hardware wherever practical and functioning, or provide accurate period replicas where necrssary. Future renovations should include the refurbishment of all original doors, and the replacement of non-historic doors with compatible replicas based on the surviving originals.

Figure 48 - *Original wood panel doors survive at 2nd floor (left); at 1st Floor, historic doors have been fixed in place and painted; a new tempered glass door has been cut through the historic brick wall beside it to give access to new offices in a former classroom.*

WINDOWS:

Fortunately, 120 of the original 128 wood-sash double-hung windows survive. Most retain historic float glass with characteristic ripples. Inevitably some panes have been replaced, but 90% of the windows retain historic character. Eight original windows were removed and the openings cut down to floor level for doors or mechanical louvers. Window openings are spanned by stone lintels, two of which have cracked. The window frames must support the stone to some degree. Fortunately the condition is limited and appears stable for the present: the two cracked lintels should be monitored to detect any changes with time.

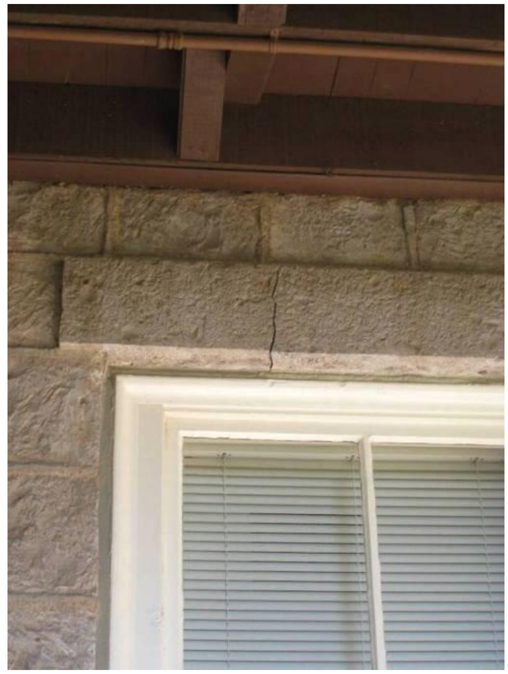



Fig. 49 - *DH wood sash window with float glass.* ***Fig. 50 -*** *Cracked stone lintel at SE corner.*

Figure 51 - *East wall of first floor displays discoloration to height of rising damp in stone.*

Window frames have been sealed and painted and no longer operate. With modern air conditioning, passive ventilation afforded by windows is no longer required as Old Main is now served by the UA's central plant. The loss of operable windows is understandable from a conventional energy management point of view, but is unfortunate from the historic and energy sustainability perspective: the tall narrow double-hung windows provided passive ventilation and cooling for much of the year. In a future restoration, all windows should be rendered operable. Repair is favored over replacement, and exact replicas using compatible materials are required if the window frames are deteriorated beyond repair, as determined by the Preservation Architect.

1.B INTERIOR FEATURES:

Over the 120 years that have passed since its construction, Old Main has served many functions. The original intended use as the first dozen classrooms for the University of Arizona was quickly outgrown, as the building became adapted for faculty offices and the original UA Library within its first decade of existence. Adaptation and re-use of the interior has continued ever since.

Old Main has been home to the UA Bookstore, the Student Co-op (which included a 1950s style diner), and housed the campus ROTC program for the decades spanning WW2 and the Korean and Vietnam conflicts. Currently the building is home to the Dean of Students office as well as the Center for Exploratory Students and new student orientation. The first floor (lower level or basement) was completely remodeled in 2008 and has the character of a contemporary corporate office interior, with tempered glass doors and chrome hardware.

As a result, the interior has been heavily remodeled on several occasions over the years. Historic integrity has largely been lost at the interior. The original large classroom spaces have been subdivided into multiple small offices, conference and storage rooms. The original 3 ft. high grooved wood wainscoting has been removed in most spaces, and replaced with contemporary smooth wood paneling to 8 ft. height. The ceilings have been lowered by installation of suspended acoustical tile, concealing modern ductwork above. All of these contemporary installations make it impossible for Old Main to convey its significance as an historic building at the interior.

Although the interior character has been drastically altered, it could still be recovered in the future. Many original doors and frames remain, although some have been fixed in the closed position, with new doors opened through historic masonry beside them to access remodeled office space on the first floor. In any future remodeling or adaptive re-use, priority should be given to recovering the original spatial configuration of Old Main, by re-opening the original twelve classrooms, which could be given new uses such as exhibit of conference space.

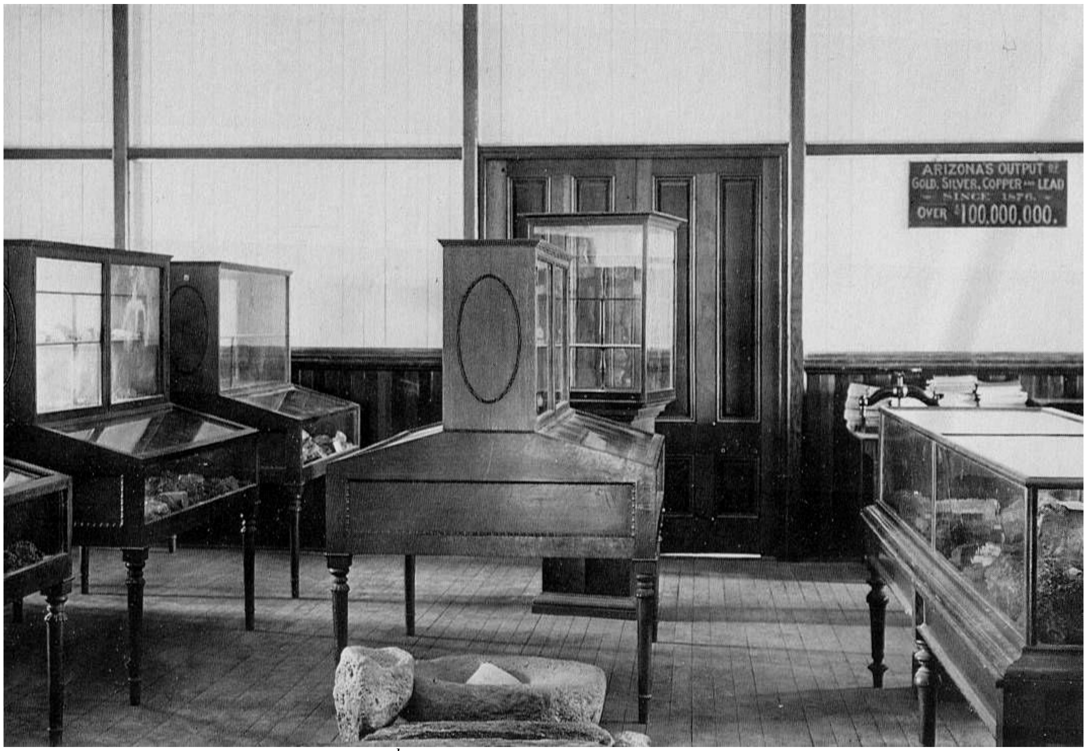


Figure S- *Territorial Museum at 2nd floor of Old Main, 1899. Note wood floor (1 x 4, likely fir), wood wainscot and partition, also vertical proportions of wood panel door. Sign at right reads:* ARIZONA'S OUTPUT IN GOLD, SILVER, COPPER AND LEAD ~ SINCE 1876 ~ OVER $100,000,000.

Figure T- *Territorial Museum, 1899; note gas jet light fixtures from the Arizona Pavilion at the 1893 World's Columbian Exposition in Chicago. The historic use of Old Main suggests a future possibility: Old Main as a Museum of the History of the University. The original classroom spaces could be re-opened, the original wainscoting restored, the building returned to its historic sense of space and appearance.*

Figure U- *1897 Office/Classroom; partitions are wood panel made up of individual 1x4s.*

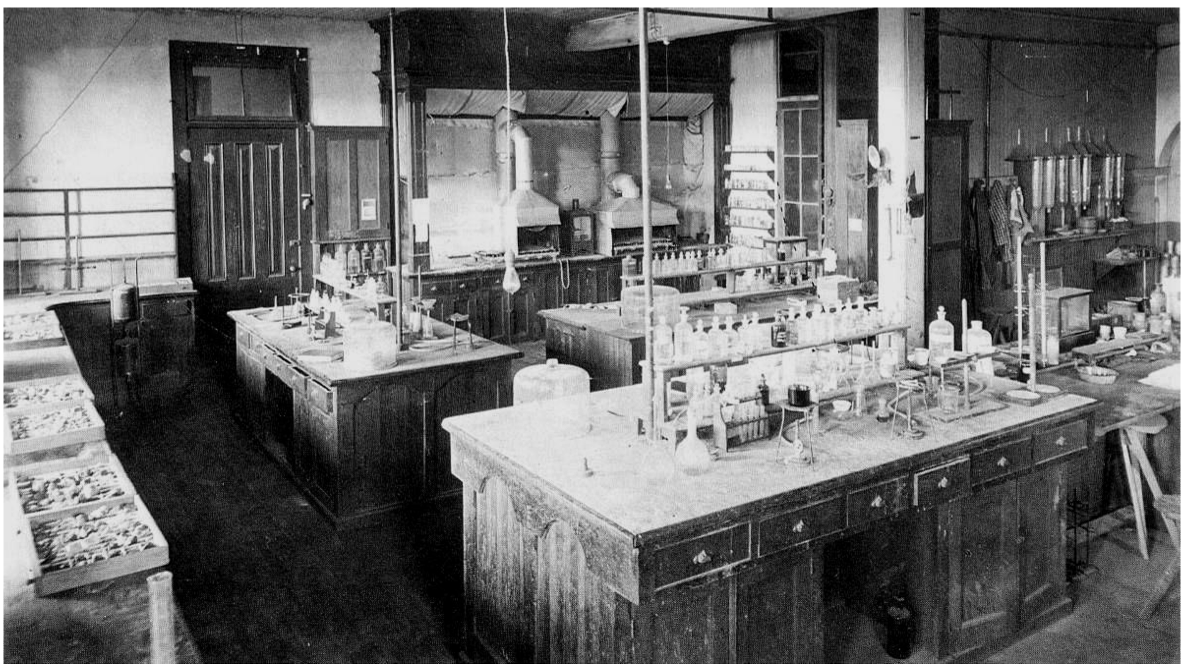
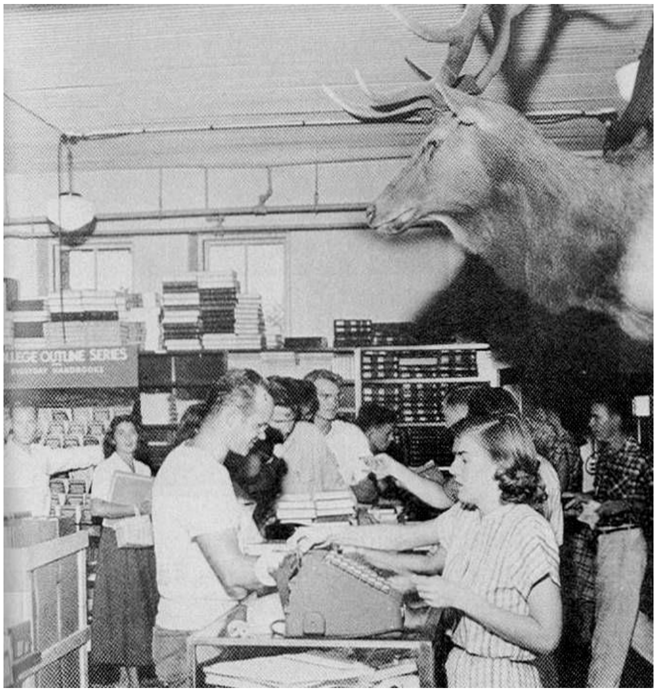


Figure V- *1902 - Chemistry & mineralogy laboratory - 1st floor, NE corner. Note wood floor on sleepers that wasn't removed until 2008, with the remodeling for the undergraduate admissions office.*



HISTORIC USES:

Old Main has been home to the UA bookstore and a student-run diner ("The Coop") on the 1st floor, prior to construction of the first Student Union in 1954.

It's important to know the history of uses that an historic building has housed in the past, both to be aware of conditions that may emerge in relation to a former use, as well as to give an indication of what may be an appropriate or meaningful new use to give the building relevance.

***Figure W** - UA Bookstore was on the 1st floor in the 1950s; note corrugated metal ceiling, trophy head on wall, and school-house light fixture extended from the ceiling. Similar fixtures may be considered in future rehabilitation, as there is a precedent.*

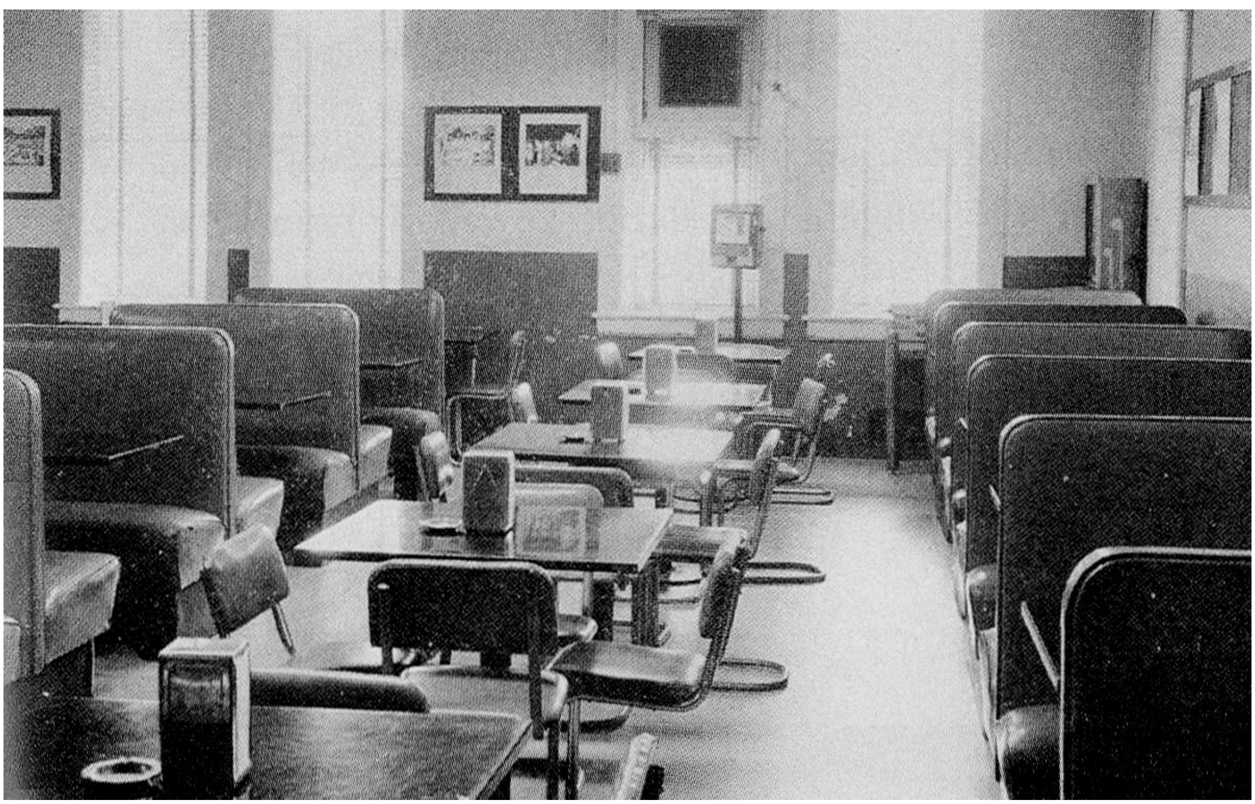


***Figure X** - Student Fountain ('The Coop') in 1950, located on the 1st floor, SW corner. Note vinyl booths of the era. There was presumably a kitchen to serve diner. Old Main has been heavily used over the years.*

Figure Y *- 2nd floor in 1966 looking north in central hall; note stair to 1st floor @ left and 1-x-4 wood floor. The building retains original wood wainscot, doors and trim, high ceilings and panelized walls. Light fixtures are glass globes on stems ("school house lights").*

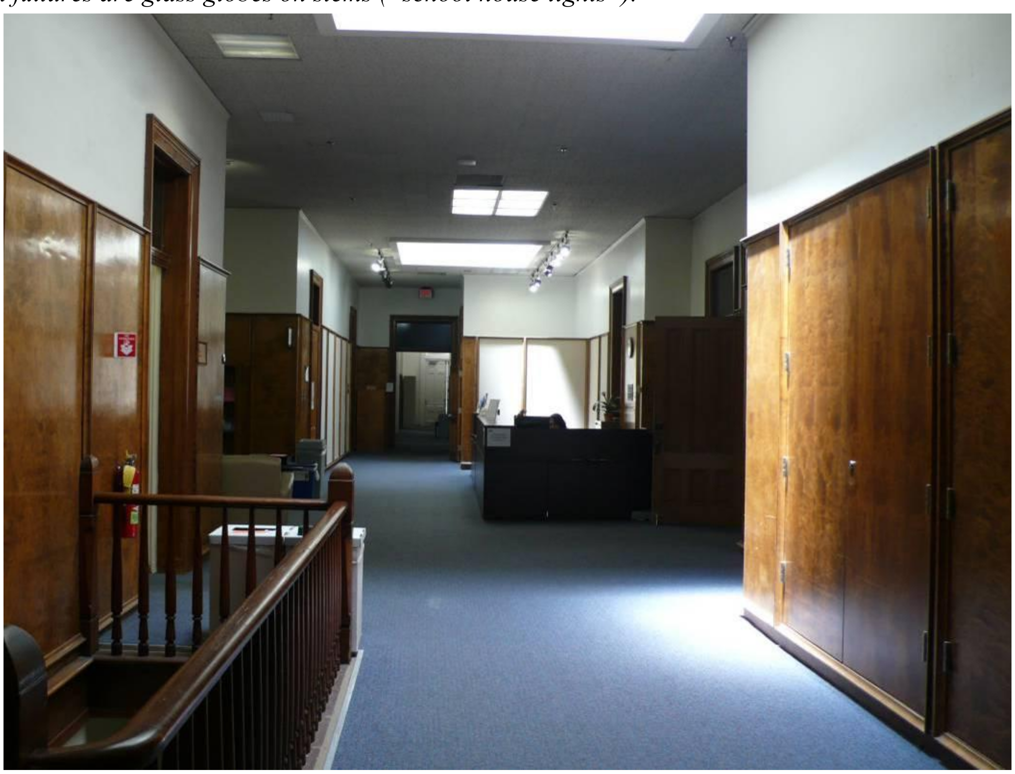


Figure 52 *- 2nd floor at central hall looking north, 2011; floor has been carpeted and ceiling dropped with acoustical tile on suspended grid. Original wainscot replaced with 8 ft. tall mahogany paneling.*

Figure Z *- 1st floor in 1966 when Old Main was used by ROTC. Note corrugated iron ceiling and 1950s-era fluorescent light fixtures. The US military saved the building from demolition in 1941, when the Department of the Navy refurbished it as a training and recruitment center (Old Main had been condemned by the City of Tucson in 1938 at the height of the Great Depression, when the building was only 46 years old; at that time, it was dilapidated and the UA could not afford repairs).* ***Figure 53-*** *Below, the same view in 2011.*

Figure AA *- Interior of second floor under renovation in 1975. Central hall, looking south; stair at right and original wainscoting removed exposing brick beneath. Skylight provides natural day-lighting.* ***Figure 54 -*** *Below, the same view in 2011.*

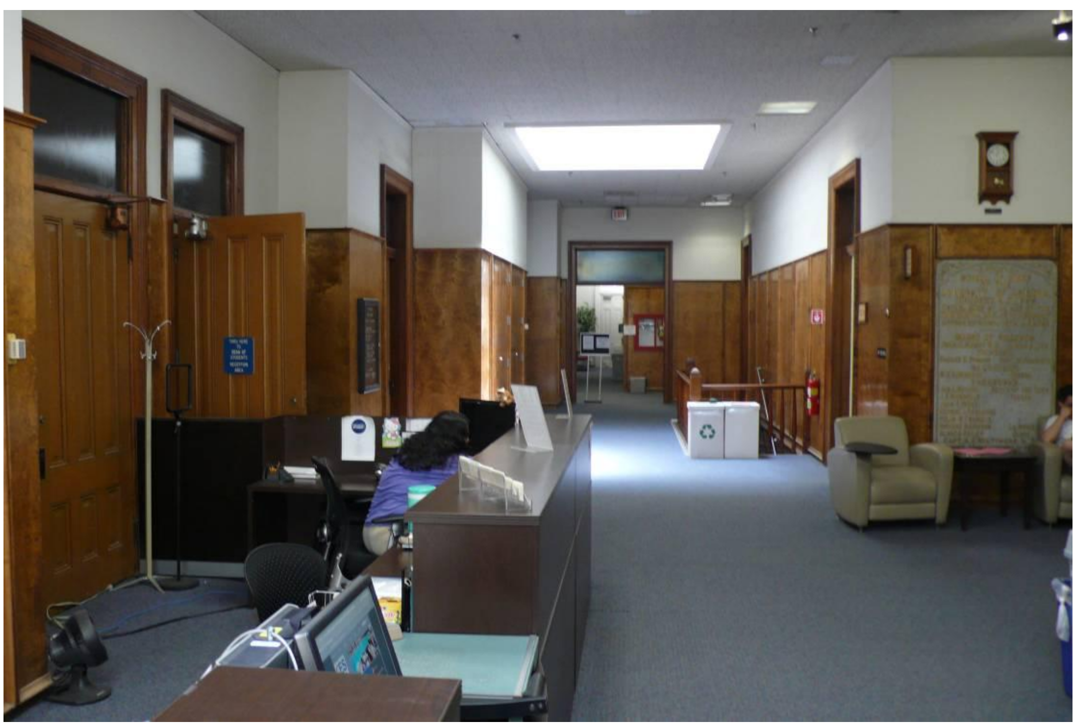


Figure BB *- 1976 – First floor hallway, looking west. The First floor had been spared renovation thus far. ROTC still used the building for displays on the military history of the UA and USA.*

Figure 55 *- 2011 – First floor hallway, looking west. The lower level was heavily remodeled in 2008 for the Office of Undergraduate Admissions. The goal was to involve incoming students with the UA's most significant historic building. The result has the character of a contemporary office building any where in the US. Historic doors were closed and new openings cut through historic bearing walls (what's done is done)*

Figure CC *- 1976 - 2nd floor, Dean of Students lobby. The interior of the upper floor was renovated with an updated corporate appearance. This was not an historically sympathetic renovation, but rather an attempt to modernize the old building, as was commonly done in the 1970s.*
Figure 56 - *Below, the same view in 2011.*

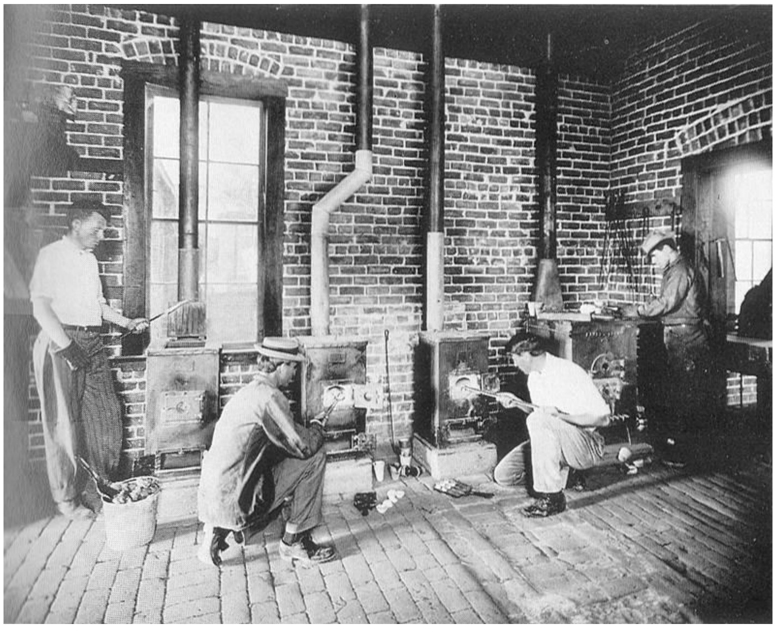
INTERIOR SPACE:

Typical access-way at interior of attic space to fan coil unit suspended beneath original ceiling structure, above grid ceiling of 2nd floor; walking surface is 1/2" plywood sheathing installed over original 2-x-6 ceiling joists @ 16" O.C. spanning between trusses at 10 ft. O.C.

56 A

56 B

Figure 56 A & B- *Interstitial space above 1975 suspended acoustical grid ceiling (seen beyond ductwork) and below underside of the original ceiling structure of 2-x-6's @ 16"O.C.; Original plaster ceilings have been removed and the 2x-6 joist space insulated with fiberglass batting, then sheathed on the underside with a Homosote® or Masonite®-like fiberboard, that has subsequently been punctured with numerous metal strap hangers to suspend ductwork and ceiling channels. In the future, if UA desires to return ceilings to their original height, the ductwork and fan-coil units must be relocated above the ceiling in the attic.*



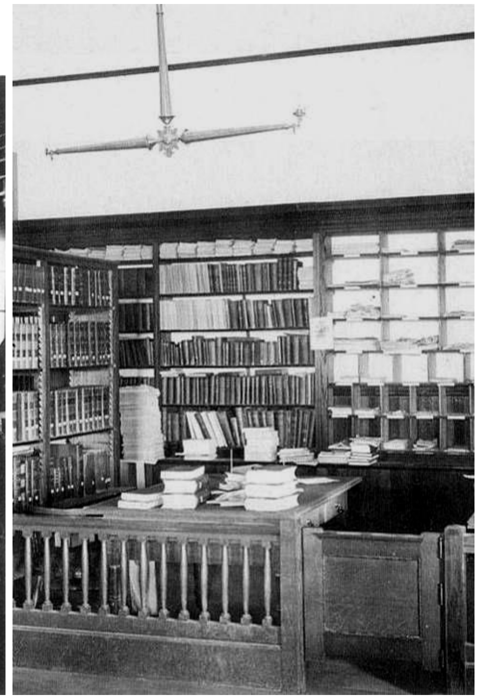


Figure DD *- Brick floor of furnace room at shop building annex to north of Old Main (precedent for use of brick paving @ lower level of porch).*

Figure EE *- Library on 2nd floor; note gas-jet light from Arizona Pavilion at the 1893 Columbian Exposition in Chicago*

STRUCTURAL CONCERNS: LATERAL FORCES (WIND OR EARTHQUAKE)

As an unreinforced brick & stone masonry building, Old Main is vulnerable to lateral forces. Recognition as a National Register historic building affords some leeway in interpreting the requirements of the building safety code, as long as there are no conditions that would make the building dangerous. It is not strictly required to be brought up to today's seismic or wind design standards. Nonetheless it must be made as safe as possible, without interfering with its historic character. Areas of the building which pose the greatest danger have been identified as the porch posts and the unreinforced chimneys. The entire structure would benefit from being tied together by continuous bond beams, possibly of steel angles through-bolted at intervals to be determined, with plate washers to distribute load evenly. Connecting the roof structure to the walls and developing a roof diaphragm with plywood sheathing above the old tongue & groove decking will go along way towards protecting the building from earthquakes. Roof diaphragms brace walls effectively. The symmetrical shape of the plan is a benefit in lateral force resistance.

Any interventions in the structure must meet the Secretary's Standards for Historic Preservation, favoring repair of original materials over replacement. Any replacement must be done selectively.

A lateral force resisting system must be designed and implemented that significantly improves the existing unstable condition. A structural engineering analysis will determine the most serious conditions and recommend interventions to significantly lessen the risk of damage from lateral forces. It is likely that, as a masonry building, earthquake forces will prevail over wind – although the 12 ft. deep porch presents a significant open structure to capture wind load.

1.B.2 HANDICAPPED ACCESSIBILITY (ADA); EXITING AND FIRE PROTECTION SYSTEMS (NFPA); LIGHTNING PROTECTION

Handicapped accessibility is largely adequate, with a few exceptions in the upper-floor restrooms, as noted below. The deficiencies pertain to the height required for toilets and urinals, grab bar locations in toilet stalls, and the heights of toilet paper holders.

Access is provided to the upper floor by an elevator. A ramp complying with ADA requirements provides access at the south end of the sunken porch. The 16 ft. long ramp slopes 14" (i.e. less than 1:12 maximum slope). The ramp has adequate handrails on each side.

The fire sprinkler system appears complete at both levels of the interior, surrounding porch and in the attic. As mentioned in the discussion of the porch, a lightning protection system is recommended.

1.B.3 RESTROOMS

Old Main has a total of four restrooms with rooms for men's and women's at each floor level. Field visits and measurements highlighted minimal differences between the First Floor and Second Floor restrooms.

The 1st floor restroom presents newer installations, product of 2008 remodeling for the Office of Undergraduate Admissions. Women's restroom spatial array includes four individual stalls sharing a communal washbasin counter at the far end of the restroom area. Each stall houses new E/O wall mounted toilets with automatic flushing sensors. In addition, separated and at the front end, a fifth water closet accommodates ADA regulations having its individual lavatory area. The Men's restroom had several modifications during 2008 remodel including the use of E/O pluming and lighting installations. The interior space accommodates a urinal section, two water closets and one ADA accessible water closet, similar to the Women's restroom, separated by a partition wall and counter with an individual vanity.

Figure 58 *– 1st. Floor Men's restroom recently remodeled.*

Figure 59 *– 1st. Floor Men's restroom interior layout.*

***Figure 60** – 1st. Floor Women's restroom, showing four individual water closets at far end, and one ADA accessible water closet separated by partition wall.*

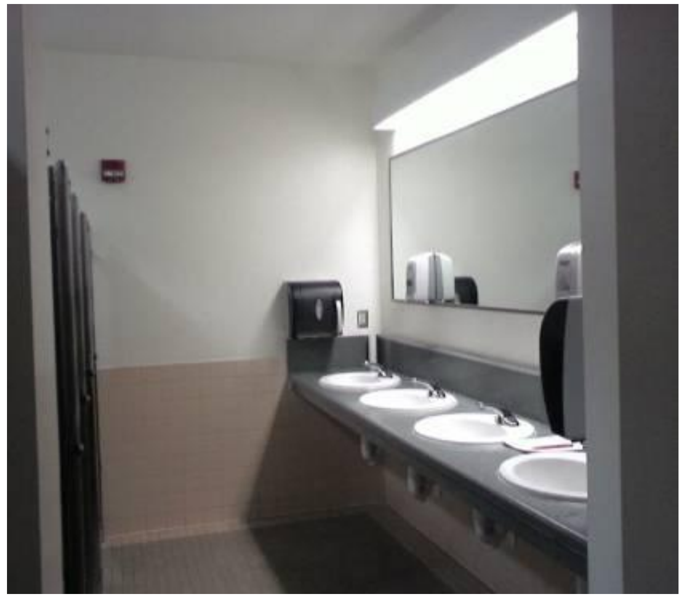


***Figure 61** – 1st. Floor Women's restroom, showing washbasin counter, with motion sensor faucets and newer materials.*

At the second floor, the Men's room is located adjacent to the Women's restroom, which means both rooms share similar installations and spatial arrangement. Moreover, the material palette includes glossy white tile as wall and vanity counter covering and 1"x1" square royal blue tile flooring distinguishing the atmosphere of the space.

Alternatively, the Women's 2nd floor restroom presents a more outmoded style and installations. Equipment and fixtures encompass dated floor mounted tank toilets, popcorn style ceiling tile with fluorescent lights. Initially seems as three individual stalls and ADA accessible one; however, spatial modifications have left two regular water closets, where a third got cancelled to accommodate a handicapped water closet.

***Figure 62** – 2nd. Floor Women's restroom has four stalls but only 3 toilet fixtures, the fourth stall being modified to provide a wider detail for handicapped access.*

***Figure 63** – Dated pluming fixtures is the case at Women's Second floor restroom.*

Figure 64 *– Ceiling tile representative of 1990's interior finishing, including fluorescent lighting.*

Figure 65 *– Second floor restroom first approach presents an aged tiled counter supported with steel brackets.*

Figure 66 *– Second Floor Restroom material palette.*

Figure 67*– Men's restroom counter contrast between royal blue flooring and bright orange stalls.*

Three important aspects to look in an ADA accessible water closet arrangement are wheelchair accessibility, door clearance and location of grab bars. According to the American with Disabilities Act Facilities Compliance Guide (ICC/ANSI A117.1-2003), a wheelchair accessible compartment shall be no less than 60 inches wide and 56 inches long, if wall hung. Furthermore, ADA accessible water closet shall be at the rear end of a wall or partition with a min. of 18" O.C. of separation between the partition wall and toilet. This allows for an accessible turning radio of 5'-0" with a clearance of 42" between partition wall and swing of door. Finally, the placement of fixed grab bars shall provide one at the rear wall, a 42" horizontal side bar and an 18" vertical side bar.

A visual assessment and dimensioning of the wheelchair accessible water closet, at both men's and women's first floor restrooms, prove new modifications comply with the requirements outlined at the ADA standards, respecting allowable spacing, location, installation of grab bars and inclusion of an ADA accessible vanity.

In order to accommodate for ADA standards, the second floor restroom modifications removed one individual water closet to extend the wheelchair accessible dimensions. This gives the water closet a dimension of 5'-5" in width by 56" in length, bringing it to comply with the minimum dimensions and guidelines. This strategy was followed at both men's and women's restroom. However, the space does not allow the necessary turning radius space of 5'-0"; situation that is seen in both restrooms.

Figure 68 *– ADA Wheelchair accessible water closet at 1st. Floor women's restroom.*

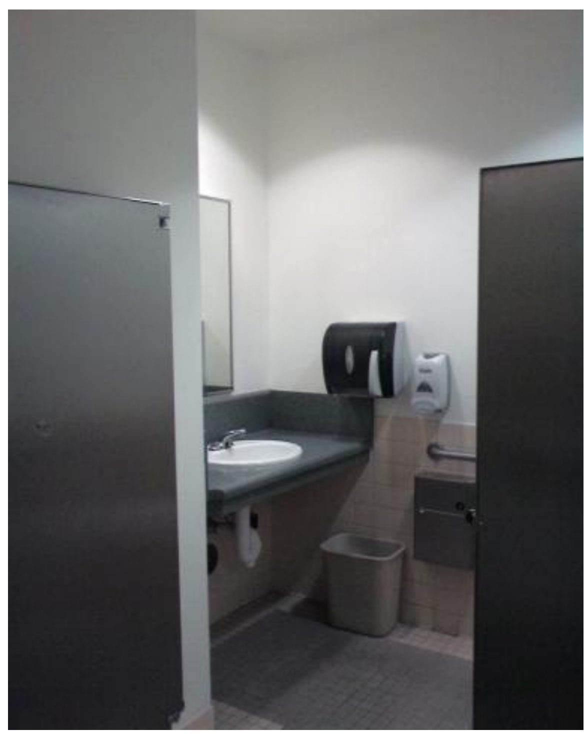


Figure 69 *–Wheelchair accessible water closet included a separate vanity counter under ADA dimensions and accessibility.*

***Figure 70** – 1st. Floor Men's restroom, showing E/O wall mounted toilet and ADA compliance installations.*

***Figure 71** – 1st. Floor Men's restroom ADA water closet.*

***Figure 72** – 2nd. Floor Men's restroom ADA water closet; re-patching in the tile, after the removal of next toilet to accommodate ADA guidelines.*

2.1

CIVIL & LANDSCAPE ***(The WLB Group)***

The WLB Group Inc.

Engineering • Planning
Surveying • Urban Design
Landscape Architecture

OLD MAIN

The University of Arizona
Preservation Master Plan
Civil and Landscape

November 2011

Engineering • Planning • Surveying • Urban Design • Landscape Architecture
Offices located in Tucson, Phoenix, Flagstaff, Las Vegas • E-mail: tucson@wlbgroup.com
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1. INTRODUCTION

Vint & Associates, Architects, has been awarded a contract with the University of Arizona to develop a Building Condition Assessment for the Old Main Building on UA's main campus. Completed in 1891, Old Main was the University's first building and is the iconic structure for the University. The building was individually listed on the National Register of Historic Places in 1972 and is part of the University's Campus Historic District, which was listed in 1986.

The building has been generally well-maintained over time but displays signs of deterioration and is in need of significant rehabilitation. The building condition assessment shall provide guidance in developing a rehabilitation plan for Old Main. The primary goal of the report shall be to identify current problems and recommend appropriate treatment options and conceptual solutions. Providing in-depth historical analysis and detailed specifications for treatment is not included. Detailed plans and solutions will be developed on a project-by-project basis after this general overview is completed.

This report is a generalized analysis of the condition of the exterior site features.

2. OVERVIEW OF EXISTING CONDITIONS

Old Main is surrounded by a concrete walkway at the first floor level, which is below the surrounding grade ranging from 1.5' to 4.0'. A stone retaining wall forms the outer edge of the walkway, approximately eleven feet from the face of the stone building.

The stone walls are exhibiting evidence of efflorescence and deterioration of the face of the stone. Efflorescence occurs when water moves through a wall and minerals are deposited by evaporation.

Visual inspection revealed no drain pipes or catch basins to remove water that collects around the exterior of the building. There are eight building downspouts that transport a portion of the roof runoff to the ground just outside of the retaining wall.

The first floor walkway is penetrated at several points by stairs and ramps for access. The two new ramps on the east side have slotted drains that capture the water running down the ramp then it is subsequently pumped out. Some of the stairs are situated so that storm water transverses the steps and into the lower walkway. The ramp on the south side of the building allows water into the lower walkway area.

The first floor concrete walkway's thickness is less than a typical 4" sidewalk. Visual inspection revealed ½" to 1" thickness in some areas.

During storm events it has been reported that storm water enters the building on the first floor. Visual inspection reveals sand bags being stored in the vicinity of the doors in case of a storm event.

Sources of Water Entering the First Floor Area

Water is penetrating the first floor area from several different sources.

- There is potential for water seeping through the walkway retaining wall. The existing grade of the retained earth behind the walkway wall does not slope away from the wall, and runoff is ponding at the back of the wall.

- Water is entering the first floor area via steps and the south end ramp. Additionally, during a storm event with wind, rain water is blown into the first floor area.

- Existing vegetation, and attendant irrigation, is located in close proximity to the retaining wall.

- Existing roof drains discharge too close to the retaining wall, and existing grades are not sufficiently sloped to convey this water away from the wall.

3. PROPOSED SOLUTIONS

Preventing water from infiltrating the first floor area will reduce and or eliminate the efflorescence and deterioration of the existing stone walls. The following are options/solutions in achieving this.

- The existing grade next to the outside of portions of the retaining wall is lower than the adjacent surrounding grade. The grade adjacent to the retaining wall should be raised to achieve positive flow away from the wall or the grades away from the wall should be adjusted to create positive drainage away from the building. Most of the area will positively drain away from the building. The area at the southeast corner will have to drain to a micro basin. A small dry well should be installed to prevent ponding.(See *Exhibit 2 –Proposed Drainage Improvements*)

- The building downspouts are discharging water next to the retaining wall and the adjacent grade is not sufficiently sloped to provide positive drainage away from the building. The outlet of the downspouts should be extended. A concrete splash pad and rock rip rap should be installed to dissipate the energy of the water and to prevent erosion. The area should be graded to provide positive drainage away from the building.

- The existing first floor walkway is composed of thin and failing concrete. The existing concrete and subgrade should be removed and replaced with a paving material that will allow moisture to evaporate and provide a more durable surface. The paving material could be hand placed brick pavers on sand. The rate of moisture transport in a brick paver is faster than other paver types. The ability to release moisture to the atmosphere instead of trapping moisture beneath the paver is advantageous. Additionally, a drainage collection system, either trench/slot drains, or small area drains with grates should be installed. This will prevent water from ponding and entering the building. The drainage collection system can either gravity flow in an underground pipe to an area north of the Douglass building or be pumped out to the grass area west of the fountain near the flagpole. (See *Exhibit 2, Proposed Drainage Improvements)*

- In some areas along the back of the retaining wall vegetation that requires supplemental irrigation is planted. It appears some of this vegetation is on a drip irrigation system and some is being hand watered with a hose. This added moisture is promoting the problem. The vegetation that requires supplemental irrigation should be removed along with its irrigation emission devices to within five feet of the back of the retaining wall. The area within the five feet could be landscaped with non-irrigated cacti and decorative boulders.

4. PRELIMINARY OPINION OF PROBABLE COSTS

Grading outside of retaining wall	LS	1	$15,000	$ 15,000
Micro basin/dry well	LS	1	$ 5,000	$ 5,000
Downspout extension, splash pad, rock	EA	8	$ 2,500	$ 20,000
Remove concrete & replace w/ brick paving	SF	7000	$ 15	$105,000
Trench drain and outlet piping (no pump)	LS	1	$30,000	$ 30,000
Remove plants and replace landscape	LS	1	$ 5,000	$ 5,000
				$180,000

EA = each
LS = lump sum
SF = square foot

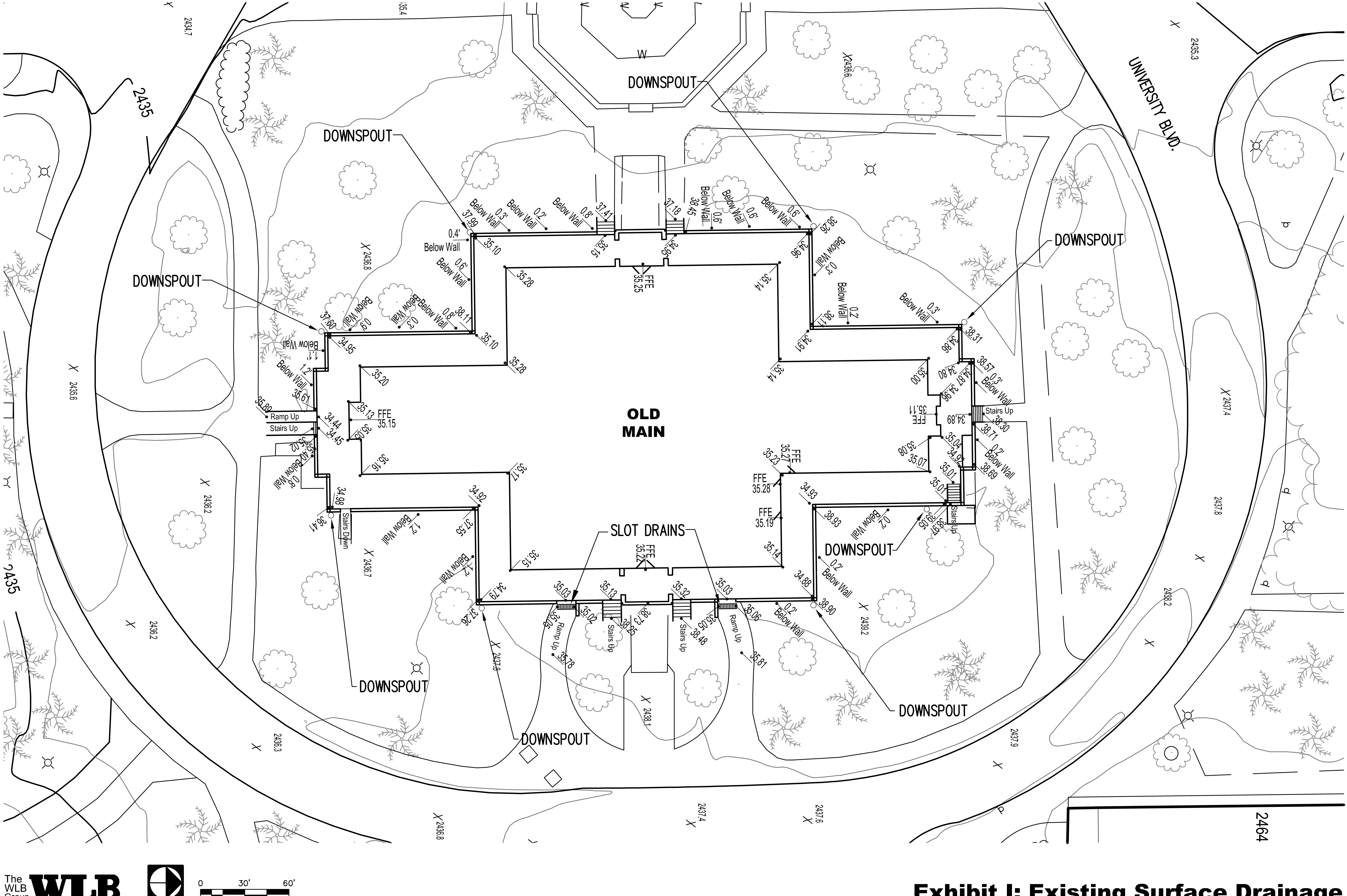

Exhibit I: Existing Surface Drainage

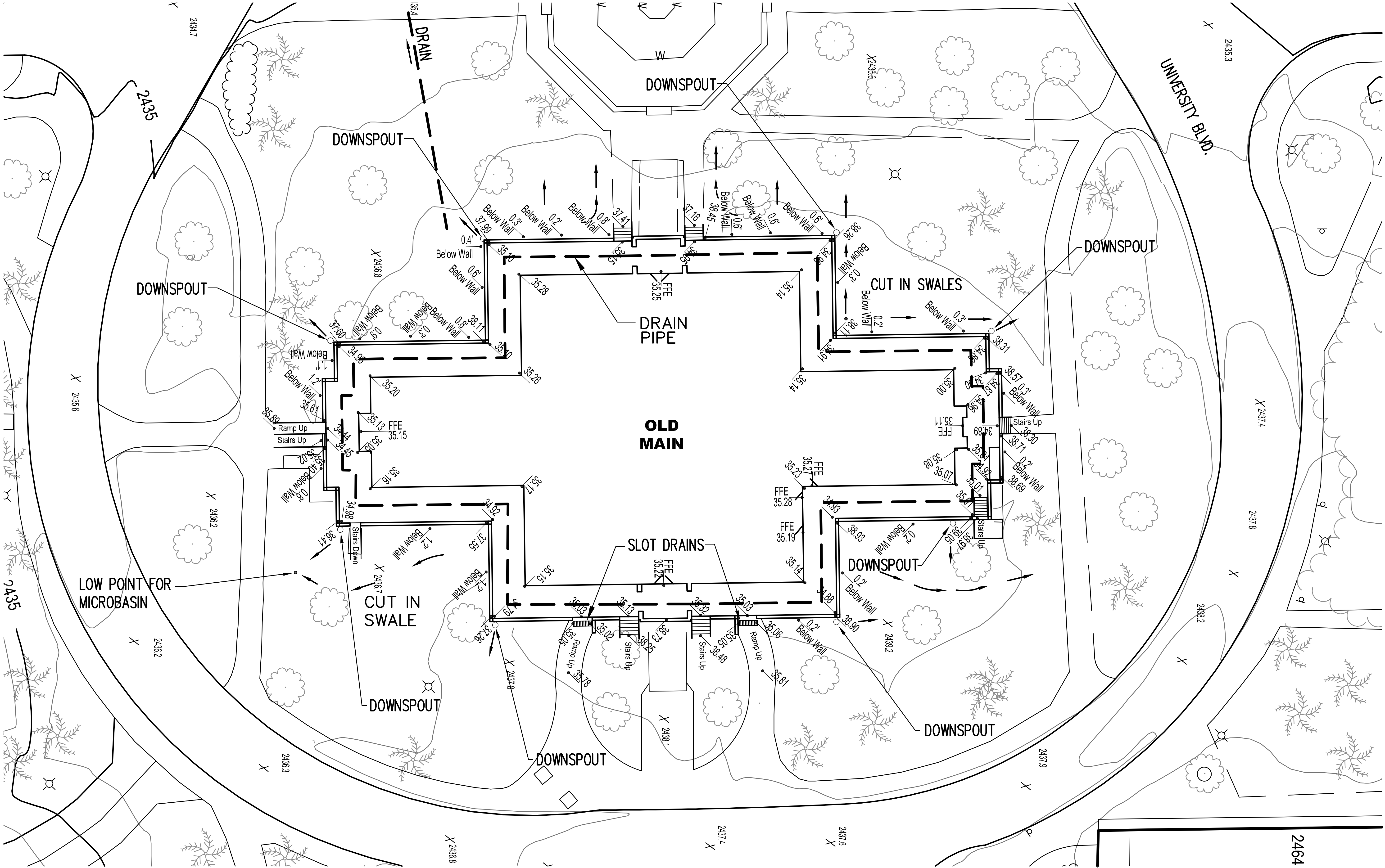

Exhibit 2: Proposed Drainage Improvements

2.2

ELECTRICAL/LIGHTING *(McGetrick & Assoc.)*

JEROME E. MCGETRICK AND ASSOCIATES, INC.
CONSULTING ELECTRICAL ENGINEERS

Jerome E. McGetrick, P.E.
Dennis W. Coon, P.E.
Mike Barbes, P.E.

August 29, 2011

REGISTERED PROFESSIONAL ENGINEER (ELECTRICAL) CERTIFICATE NO. 26387 DENNIS W. COON 8/29/11 Date Signed ARIZONA U.S.A. EXPIRES 9/30/13

Vint & Associates Architects
312 East Sixth Street
Tucson, AZ 85705

Reference: University of Arizona Old Main, Electrical Systems Analysis
1200 E. University Boulevard
Tucson, Arizona 85721
JEM project # 10-1828

This report is on the electrical systems presently installed at the University of Arizona Old Main Building. The scope of this report covers electrical power, lighting, fire alarm and telecommunications systems installed in the building. Analysis of the Campus distribution system supplying the building is not a part of this report. Included in this report is a list of all found deficiencies along with recommended corrective action and estimates of probable construction costs.

An on-site visual observation of installed electrical systems was done on January 27, 2011. During this site visit, it was not possible to look into every room or space in the building, however, we were able to observe the main electric service equipment, mechanical room on the first floor, electrical room on the second floor, attic and all common spaces throughout both the first and second floors. Some private offices on the first and second floors were also observed, but not all were un-locked or un-occupied to allow a thorough observation of every room. The building main telecommunications room was also locked and not made accessible to us on the site visit.

Copies of existing electrical plans dated 1971 (Lawrence L. Anderson, Architect and A. E. Magee Electrical Engineer), 1975 (Lawrence L. Anderson, Architect and A. E. Magee Electrical Engineer), 1987 (Smith/Pedersen Associates Architects and A. E. Magee Electrical Engineer) and 2007 (M3 Engineering & Technology Co. Architects and Electrical Engineer) were supplied by the Owner and were used in preparation of this report.

Code references are to the 2008 NFPA-70 National Electrical Code (NEC).

ELECTRICAL POWER AND LIGHTING SYSTEMS

Existing Systems Description

Although Old Main Building was originally constructed in 1887-1891 and likely was retrofitted with electrical wiring in the early 20th century, there is little evidence of antique electrical systems. The active electrical systems appear to be no older than 1971 vintage.

The first floor electrical power and lighting system mostly appears to be as depicted on the 2007 electrical plans. The 2007 construction substantially reworked the first floor electrical power and

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lighting systems replacing the pre-existing electrical system with new equipment and wiring. Second floor systems were mostly unaffected by the 2007 construction. At that time, a new supply transformer, new main distribution switchboard, branch circuit panelboards for the first floor and feeders to the first floor were installed. Branch circuits for the first floor, power outlets and lighting outlets and controls were installed new. New light fixtures were provided throughout. New exterior lighting was also installed on the first and second floors.

Electric Supply to the building is via a 300KVA transformer which is supplied medium voltage power from the Campus medium voltage distribution system. Secondary voltage is 208Y/120V, 3-phase, 4-wire. Building main distribution switchboard is an 800A NEMA 3R switchboard with circuit breaker type overcurrent devices. According to the 2007 electrical plans, the calculated loading on this equipment is 224 KVA (622 amps). The service transformer and main switchboard are located east of the building below the east stair. The physical layout of the switchboard and equipment differs slightly from that shown on the 2007 electrical plans in that the switchboard has been relocated to the south side of the equipment space. It is noted that the existing transformer is a fluid-filled type transformer and the Owner advises that it was determined during the 2007 transformer installation that the fluid-filled transformer installation was Code compliant with respect to its location under the egress stair.

The building main electrical distribution equipment is currently adequate for the present loading but should be reevaluated when the Second Floor is remodeled.

Branch circuit panelboards for the first floor are located in Mechanical Room 103, Kitchen 112 and outside in the space below the west stair. According to the 2007 plans the panels have spares or spaces to accommodate future circuit additions. There are a total of 6 branch circuit panelboards serving the first floor. There are two additional panelboards, one below the east stair supplying exterior building and grounds lighting and the other below the west stair supplying power for the exterior fountain located west of the building.

Branch circuit panelboards for the second floor and Attic are located in Electric Closet 224. There are two panels, identified MFL and MFP. These panels date to the 1975 second floor remodeling. There is a single 200A, 3-phase feeder supplying these panels that was extended to the new main distribution switchboard in the 2007 building upgrade. Based on study of the 1975, 1987 and 2007 electrical plans there is no spare capacity in the second floor panels or the 200A feeder.

First floor branch circuits, convenience outlets, equipment connections, etc. were all redone in the 2007 building upgrade and are suitable for the purpose and in good condition.

Second floor branch circuits, convenience outlets, equipment connections, etc. mostly date to 1971 and 1975 building upgrades. Some minor remodeling of these areas was done in the 1987 building alterations project. There are some additional outlets and circuits which have been added subsequent to the 1971, 1975 or 1987 work and is not documented. Branch circuit wiring appears to be installed with EMT raceways and copper wiring.

One thing that was noteworthy was the absence of extension cords or daisy chained surge strips that are frequently found in old buildings. This demonstrates that there are at least minimally adequate quantity and locations of convenience outlets in most areas for the present usage of the building.

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First floor lighting, lighting controls and branch circuits were all redone in the 2007 building upgrade and are suitable for the purpose and good condition. Light fixtures utilize compact, T5 and T8 fluorescent lamp types and are energy efficient. Light fixtures are attractive and match the interior design scheme.

Second floor lighting, lighting controls and branch circuits date to the 1971 and 1975 building upgrades. Most lighting is fluorescent using linear 4' T8 lamps which are probably a retrofit to original T12 fixtures. Second floor lighting equipment has a dated appearance and is not at all attractive or coordinated with the building interior design. In some areas light levels may be substandard.

Attic spaces appear to have been re-wired in the 1971 and 1975 building upgrades. There are a few abandoned pieces of old knob and tube wiring systems which pose no harm and should probably be left alone for historical reference. The active wiring is in EMT raceways and appears to be in relatively good condition. Lighting in the attic is incandescent and is minimal.

Exterior lighting was upgraded in the 2007 work and utilizes metal halide fixtures around the perimeter of the building. It appears that the initial installation was over-lit as every other fixture around the perimeter of both the first and second floors appears to have been removed. The resulting lighting is still ample for this application, although not very uniform and not particularly energy efficient. As the system is fairly new, it would not be economical to modify it to improve the appearance and function of the lighting as the economic life of the present installation would not be utilized.

Deficiencies - Power and Lighting Systems

Mechanical Room 103 has insufficient working clearance provided for the motor starters for the heating water pumps. 27" provided, 36" required per NEC 110.26.

Mechanical Room 103 ambient temperature exceeds 40°C (104°F). Branch circuit panelboards and electrical wiring in the room is designed for normal building ambient temperature of 30°C (86°F) so equipment and wiring is being continuously overheated which will affect the equipment service life. Please refer to the fire alarm section which also addresses this issue and has recommendation for mitigation of the excessive heat.

Second floor branch circuit panelboards do not have any spares or spaces and have some tandem circuit breakers added so the total number of overcurrent devices in each panel exceeds 42, in violation of 1975 NEC section 384-15 and the UL listing of the equipment.

At least one exit sign was noted to be not lighted (either lamps burned out or fixture malfunction).

Lighting in room 201 is inadequate and is being supplemented by the building occupants by the use of portable lighting.

Emergency egress lighting at exterior egress discharge does not exist.

There is inadequate emergency egress lighting in the second floor egress paths both inside on the exterior egress porches and stairs.

One conduit on Attic floor was observed to be pulled apart at an EMT coupling.

Recommendations and Estimates of Probable Construction Cost - Power and Lighting Systems

In Mechanical Room 103 there is insufficient space to provide required working clearance for the motor starters for the heating water pumps. Provide signage for this equipment indicating to turn of power at the branch circuit breaker prior to working on the equipment. Estimate of probable construction cost - $200.00

Provide mitigation of excessive heat in Mechanical Room 103. Refer to Fire Alarm section of this report for recommendation and estimate of probable construction cost.

Provide an additional branch circuit panelboard for the second floor to make more circuit space available and eliminate tandem circuit breakers in the existing panels. Estimated probable construction cost - $7,000.00 if no new feeder added. Add $8,000.00 if another feeder is run to the second floor to provide increased load capacity.

Repair broken exit sign. Estimated probable construction cost - none, this should be done by UA maintenance staff.

Provide ceiling lighting in room 201. Estimated probable construction cost - $3,000.00

Provide emergency egress lighting at the exit discharge and along the second floor exterior exit paths. Estimated probable construction cost - $40,000.00

Provide emergency egress lighting in second floor building interior corridors. Estimated probable construction cost - $8,000.00

Repair pulled apart conduit on the attic floor. Estimated probable construction cost - none, this should be done by UA maintenance staff.

It is recognized that the most cost effective way to mitigate the deficiencies in the second floor electrical system is to make those improvements as part of a partial or total remodel of the second floor area. Costs associated with the second floor could be significantly reduced if the work was done as part of a complete remodel project.

FIRE ALARM SYSTEM

Existing System Description

The building has a manual and automatic fire alarm system. There are considerable differences comparing the first floor fire alarm installation to the second floor.

The main fire alarm panel is a SimplexGrinnell type 4100 Miniplex panel. There also exists a SimplexGrinnell type 4009 Notification Appliance power supply panel. These panels are located in first floor Mechanical Room 103.

The building has a fire sprinkler system and it was noted that there are flow and tamper switches on the sprinkler riser which are connected to the fire alarm system.

The first floor has manual stations, spot type smoke detection, and notification appliances installed in accordance with present day standards. Notification appliances appear to be installed in accordance with ADA requirements.

The second floor fire alarm devices and wiring appear to date to the 1975 remodel work. Installed fire alarm devices are minimal, just manual stations at the exterior doors and a few horns, horn-strobes or strobe lights. While no additional initiation devices are required, the notification side of the system does not comply with present day standards. There are insufficient notification appliances to provide audible alarm signals 15dB over ambient sound level throughout the second floor and there are insufficient visible notification appliances for ADA compliance.

Deficiencies - Fire Alarm System

Location of Fire Alarm Control Panel in Mechanical Room 103 subjects the equipment to excessive temperature. The steam-water heat exchanger equipment within room 103 has significant heat rejection. Ambient temperature of the fire alarm equipment should not exceed 30°C (86°F), actual room temperature is in excess of 40°C (104°F).

Notification appliances on second floor do not meet present day standards for adequacy or ADA compliance.

Recommendations and Estimates of Probable Construction Cost - Fire Alarm System

Provide mechanical refrigeration of Mechanical Room 103 to maintain room temperature to not exceed 30°C (86°F). Probable construction cost - $15,000.00

Provide complete new fire alarm wiring and notification appliances on second floor to bring second floor up to present day standards and ADA compliance. Probable construction cost - $40,000.00 if done as a stand alone project, or $27,000.00 if done as part of a major remodel project of the second floor.

TELECOMMUNICATIONS SYSTEM

Existing System Description

Due to unavailability of a key to access the main telecommunications equipment room during the site visit it was not possible to do much of an assessment of this system. What can be reported is that active station wiring appears to be modern 4-pair EIA-TIA 568 compliant copper cable distribution. On both first and second floors there appeared to be adequate stations jacks for the present building uses. It is likely that all of the station wiring and jacks in the first floor were installed during the 2007 building upgrade work. The second floor telecommunications installation likely dates to Campus telecommunications upgrades that were done in the 1990's.

Deficiencies - Telecommunications

None noted.

Recommendations and Estimates of Probable Construction Cost - Telecommunications System

Include $50,000.00 for remodeling of the telecommunications room and related upgrades.

END

Report prepared by: Dennis W. Coon, PE

2.3

PLUMBING/MECHANICAL/HVAC *(KC MECHANICAL)*

KC MECHANICAL ENGINEERING, L.L.C.

November 17, 2011

Bob Vint & Associates Architects
312 East Sixth Street
Tucson, AZ 85705

Re: University of Arizona Old Main, HVAC and Plumbing System Analysis
1200 East University Boulevard
Tucson, Arizona 85721
KC Mechanical Project #: 11-136

The following is the analysis of existing mechanical, plumbing and fire protection systems currently installed at the University of Arizona Old Main building and proposed new mechanical system improvements for this building. Included in this report is a prioritized list of all found deficiencies, recommended corrective action and a cost estimate for completing the recommended action. This report is based on a review and evaluation of existing mechanical and electrical drawings as well as a site visit performed on January 25, 2011.

MECHANICAL REPORT

The University of Arizona Old Main building, the original building on the campus, has been listed in the National Register of Historic Places since April 13, 1972. The building was originally constructed starting in 1887, completed in 1891, with recent mechanical and plumbing renovations in 1987 (Smith/Pedersen Architects, Palmer Engineering) & 2007 (M3 Architecture & Engineering) among previous others. Total building floor area is approximately 12,750 square feet on both the first and second floors or 25,500 square feet total.

The building, still true to original form, is two stories with an attic space accessed through the second floor. The first floor of the building is sunk into grade approximately six feet, designed to minimize cooling on the first floor when originally constructed. The exterior of the building is red brick, 3 rows deep in most if not all portions of the building. Though wall insulation type & quantity on either floor could not be determined, R-19 batt roof insulation is currently installed below the attic floor joists. Both the roof and attic floor are wood construction. Based on observations from the exterior of the building, all windows also appear to be operable although access to the perimeter offices on the first and second floor was not possible. The attic is naturally ventilated by exterior louvers and gable vents, the quantity of which seems consistent with code requirements.

EXISTING CONDITIONS, MECHANICAL:

The building is currently conditioned on both floors with 4-pipe chilled and heating water fan coils, ranging in size from about 500-2,000 cfm or approximately 1-5 tons in capacity. Based on existing drawings, chilled water and steam enters the building at the first floor mechanical room, however, access to this room was not possible during site visit and equipment condition could not be verified. Chilled water appears to be piped directly to the building fan coils whereas steam is converted to heating water with a heat exchanger in this same mechanical room and pumped throughout the building with primary/secondary heating water pumps. According to the 2007 mechanical drawings, the primary/secondary heating water pumps were replaced at this time along with the hot water expansion

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tank but the heat exchanger was not. All hydronic piping appears to be copper & steel as per University specifications. First floor building controls are manufactured by Johnson. Design appears to be consistent with other existing buildings on campus connected to the main chilled water and steam central plants.

First Floor:
The last major renovation in 2007 replaced all the first floor fan coils with approximately twenty (20) new chilled/heating fan coils, installed above and accessible from the first floor acoustical drop ceiling. These units are provided with code required outside air (based on 2003 IMC amounts) tempered and ducted thru dedicated outside air fan coils with outside air drawn from exterior louvers mounted above first floor windows. All units are provided with two-way DDC control valves for both heating and chilled water, with outside air fan coils receiving three-way valves to maintain loop temperature and recirculation. Unfortunately due to space limitations (approximately 36" ceiling space), access is limited, most units are provided with condensate pumps and overall system and acoustics are a little less than desirable.

Exhaust air for the two first floor restrooms is provided by two (2) exhaust fans located in the attic space, ducted to roof caps. No other exhaust was noted on the first floor, however, a relief air louver is provided in the multi-purpose room to relieve excess outside air delivered to the space.

Second floor:
With the exception of one (1) unit provided during the 2007 renovation for a second floor electrical room with two-way valves and DDC controls, all the second floor fan coils units are much older (pre-1987 at a minimum) and most appear well beyond their useful life. All of these units (approximately 42 total) are provided with pneumatic controls, and pneumatic two-way chilled water and three-way heating water control valves. Though a few units are installed in the accessible attic space, a majority of the fan coils are installed above the second floor accoustical drop ceiling and are accessible through openings from the attic along with wood access ladders suspended from the attic floor with threaded rods. Existing ceiling space from the attic floor to the accoustical drop ceiling is approximately 4-5 feet throughout the second floor. Due to the access of these units being from above without proper support platforms, many of the units have duct or casing sections crushed, likely from maintenance not having proper support and footing when servicing equipment. The installation of these in the ceiling space is also especially dangerous considering a fall from one of these platforms would go through the suspended second floor accoustical ceiling, a height of approximately 17-20 feet above the second floor finished floor level.

While all windows appear to be operable for ventilation, there are currently only a few rooms on the north end of the second floor which are provided with ducted outside air. The length of outside air duct is so long compared to the return air duct, however, it is likely only making up the air being exhausted from the second floor, if any.

Exhaust from the second floor restrooms was difficult to determine based on existing drawings and access but appears to be by way of an in-line fan located above the second floor restroom in the second floor ceiling space and discharging thru a second floor wall louver. It does not appear that any other exhaust air is provided for the second floor.

<u>EXISTING CONDITIONS, PLUMBING:</u>
Plumbing in the building is fairly limited, consisting only of men's and womens restrooms on each floor, several water coolers and a single janitors and breakroom sink. Water is routed to the building from the west side of the building with 2-1/2" cold water line and 2" reduced pressure backflow preventor, runs beneath the first floor slab and comes up in the first floor mechanical room. Sanitary sewer direction could not be verified on site but according to existing plans exits out the east side of the building towards

the mall. There is no natural gas service to the building. Soil & vent piping is a combination of galvanized & cast iron, water piping is galvanized & copper.

With the exception of the first floor janitor's mop sink, no restroom fixtures in the building have hot water as per the University of Arizona typical design guidelines for energy conservation, however the break room sink is also not provided with hot water. There are also abandoned cold water lines that run throughout the first floor patio, likely serving evaporative coolers which were previously removed. It could not be determined whether these are still connected to the main cold water service to the building or are abandoned in place but should be removed if no longer in use to prevent freezing and long stagnant dead-end runs.

First Floor:
Plumbing on the first floor consists of men's and women's restrooms located in the south portion of the building, each with 5 counter mounted lavatories and flush valve water closets (3 water closets and 2 flush valve urinals in men's room), a janitor's closet with mop sink adjacent to the men's restroom and a 2-faucet electric water cooler located under the main stairwell. There is also a breakroom with a single compartment kitchen sink located in the northwest portion of the first floor. All fixtures were replaced as part of the 2007 renovation project and appear to be in good working order. All water closets are 1.6 gpf (gallon per flush), urinals are 1.0 gpf and lavatory faucets are 15 second cycle self closing type with 0.5 gpm aerators.
Second Floor:
Plumbing on the second floor consists of men's and women's restrooms in the southwest portion of the building each with 4 counter lavatories and tank type water closets (2 water closets and 2 flush valve urinals in men's room) and a water cooler located near the center of the building. The lavatories and faucets appear to have replaced during or around the 2007 renovation project and appear to be in good working order. The urinals and water closets are older, however, but still appear to be in good working order. All lavatory faucets are 15 second cycle self closing type with 0.5 gpm aerators, and while exact flow rates for water closets and urinals could not be obtained, water closets appear to be about 3.5 gpf and urinals around 2.0 gpf.

EXISTING CONDITIONS, FIRE PROTECTION:
Fire service is routed to the building on the north side where it comes up from underground and runs below the first floor patio. The main then runs to the fire riser located directly inside the north door in the first floor multi-purpose room with the fire department connection (FDC) routed back outside, blow the patio and to grade on the North side of the building adjacent to the fire service main. The sprinkler system (wet pipe) appears to service the building as a single zone (6" main) as the riser only has one visible zone valve, flow switch and tamper switch. The 6" sprinkler line appears to route up from the fire riser to the attic with branch lines on the first and second floors. Both floors and the entire attic space are completely sprinklered.

First Floor:
All the sprinklers on the first floor were replaced with new during the most recent 2007 renovation project and appear to be in good working order. The first floor sprinkler heads all appear to be pendant type, quick response heads and both fully recessed types with white covers and partially recessed types with white escutcheons were noted. The first floor patio is covered by upright, standard response sprinkler heads. The piping installed outside the building envelope is not insulated.

Second Floor:
All the sprinklers on the second floor appear to have been installed pre-1987. All second floor sprinkler heads were noted pendant type, standard response heads with either standard or extended standard

chrome escutcheons with skirts. The second floor patio is covered by upright, standard response sprinkler heads. The piping installed outside the building envelope is not insulated.

Attic:
All the sprinklers on the second floor appear to have been installed pre-1987. All attic sprinklers are upright, standard response type. The piping in the attic is currently not insulated and not inside the building envelope as the roof insulation is installed below the attic floor. Much of this piping is smaller than 2" in diameter and could be subject to freezing.

DEFICIENCIES, MECHANICAL:

1. CODE VIOLATION- As currently installed with access openings in the attic floor to service the 2nd floor fan coil units, since the R-19 batt insulation is installed below the attic floor and there are no access panels, the building thermal envelope and any vapor barrier is severely compromised. Rather than being a naturally ventilated attic, the attic is effectively open to the second floor, causing the second floor equipment to use more energy to try to overcome the thermal heat loss or heat gain of the attic. It should be noted that during the site visit while approximately 35 degrees F outside, the attic temperature was quite comfortable, around approximately 60-65 degrees F.

2. CODE VIOLATION- While the perimeter rooms do have operable windows for natural ventilation, a vast majority of the second floor fan coils units are not provided with code required outside air, tempered or otherwise. All fan coil units should be provided with outside air to ensure current ASHRAE 62.1 outside air ventilation rates are maintained. In addition, outside air is important for making up air which is being exhaust to maintain a neutral or slightly positively pressurized building.

3. Many units in the 2nd floor ceiling space are well beyond their useful life and many have duct or casing sections crushed, likely from maintenance not having proper support and footing when servicing equipment. The fan coils supported in the 2nd floor ceiling space are also hard and fairly dangerous to access and maintain. Due to the smaller mechanical zoning on the 2nd floor and subsequently smaller unit sizes but increased quantity of units, maintenance on these units is likely extremely time consuming. These units should be removed and replaced with a smaller quantity in a more accessible location, such as above the attic floor or mechanical rooms on the 2nd floor.

DEFICIENCIES, PLUMBING:

1. Though popular in the past, due to its material composition and local hard water, galvanized piping is easily clogged with deposits when used in plumbing installations. Due to the age of the galvanized piping still installed on the 2nd floor plumbing (pre-1987), this piping is likely heavily clog and needs to be replaced with copper water piping and cast iron soil & vent piping.

2. The 2nd floor restrooms do not appear to currently meet ADA accessibility requirements. The water closets are also tank type fixtures as opposed to the previously replaced 1st floor fixtures. Due to their age and flow rates, these fixtures should be replaced.

DEFICIENCIES, FIRE PROTECTION:

1. Per U of A standards, all piping installed outside the building envelope and subject to freezing should be minimum 2" in diameter. This includes both the patios and attic space and any other areas outside the building thermal envelope.

RECOMMENDATIONS/COST, MECHANICAL:

1. Likely as part of a larger 2nd floor remodel, remove all existing air devices, fan coils and ductwork currently installed in the 2nd floor ceiling space, all existing chilled and heating water piping back to the mains in attic space, and all existing service platforms & guardrails at the openings in the attic floor.

   Provide approximately (20) new 4-pipe, double wall construction with minimum 2", R-8 internal liner, belt drive, nominal 2-5 ton fan coils installed in the attic space, zoned, sized and located according to the existing or new 2nd floor floorplan. Several of these units will be outside air units ducted to other fan coil units and will require reusing roof/wall openings or providing new as required. Duct supply & return from the fan coils serving 2nd floor spaces through the existing openings in the attic floor and duct as required to the zone served with new air devices. Provide new chilled and heating water piping as required from the existing mains to the new fan coil units. As part of this work, repair existing openings in the attic floor as required for new smaller ductwork and fully seal any unused openings to match existing. Provide new insulation below attic floor and patch openings to restore complete building roof envelope. Note: In that the attic is currently natural ventilated, this would require R-8 or 3" external duct insulation where installed above the attic floor.
   ESTIMATED COST OF WORK DESCRIBED: $300,000.
   As an alternate to keeping the attic as naturally ventilated and sealing/insulating attic floor, new batt insulation could be provided and installed at existing roof joints and walls, as well as existing natural ventilation openings closed off to make the attic space part of the building envelope. In doing so, only minimum 1" liner would be required inside double wall mechanical units and 1.5" external insulation on ductwork in lieu of 2" and 3" respectfully as specified above, however, this may prove to be more costly than increasing insulation on ductwork and could take away from the character and look of the existing attic structure.

RECOMMENDATIONS/COST, PLUMBING:

1. Likely as part of a bathroom remodel to meet ADA accessibility requirements, remove all existing tank type water closets and urinals and replace with new flush valve units in same or new positions as required for accessibility. As part of this work, remove and replace existing galvanized water, soil & vent lines. In order to support flush valve fixtures, a larger water line up from the 1st floor to the 2nd floor will be required. ESTIMATED COST OF WORK DESCRIBED: $25,000-40,000 depending on location of fixtures to existing.

RECOMMENDATIONS/COST, FIRE PROTECTION:

1. In that some fire sprinkler piping is installed in unconditioned spaces, replace any piping smaller than 2" in diameter with minimum 2" to prevent freezing per U of A standards.
   ESTIMATED COST OF WORK DESCRIBED: $15,000.

If you have any questions, please don't hesitate to call.

Sincerely,

Robert C. Kunkel, P.E.

PART 3. RECOMMENDED REHABILITATION MEASURES

Recommendations for the preservation of Old Main, including the means to accomplish the treatments in compliance with historic preservation laws, the adequacy of each solution in terms of impact on historic materials, effect on historic character, human safety, fire protection, mechanical, electrical, and plumbing systems, hazardous materials, handicapped accessibility, and UA's management of the structure within its larger context.

3.A EXTERIOR FEATURES:

1. ROOF

a. REPLACE SHEET METAL ROOFING of Porch, Towers and Mansard eave.

b. MATCH EXISTING DETAILS, shapes, sizes and methods of joining metal.

c. USE 16 OZ. STANDING SEAM COPPER or stainless steel terne-metal (no painting required – 100 year roofing types).

d. INSTALL ROOFING over continuous vapor barrier over ½" sheathing as diaphragm to improve resistance to lateral forces.

e. INSTALL CONTINUOUS GUTTERS and new downspouts; Direct away from base of building; extend rain leaders to min. 5 ft. distance from foundation, or harvest rainfall in cistern(s) for irrigation use *(recommended – water harvesting @ Old Main would be an excellent pilot-demonstration project).*

f. IMPROVE CONNECTIONS @ ROOF & WALLS for greater stability vs. wind & earthquake loads; install concealed perimeter bond beam of steel angles @ 2nd floor roof level; through-bolt @ brick walls w/anchor plates as engineered.

2. WALLS

a. STONE WALLS @ 1ST FLOOR: Repair & re-point wall bases @ perimeter of building and porch perimeter using compatible lime/sand mortar and volcanic tuff stone matching historic original. Remove & replace *pietra infirma* - "sick stone" - that is infused and contaminated with accumulated salts, with replacement stones minimum 2"- 4" thick, bedded in lime mortar.

b. SILLS AT 1st FLOOR: Replace sills where deteriorated by salt erosion (40 of 60); use compatible stone set in lime/sand mortar to match original

c. BRICK WALLS @ 2ND FLOOR: Re-point mortar @t joints that have cracked or fallen out, esp. @ arches of east and west entrances; Continue to monitor hairline cracks that have appeared at corners of lintels many sills.

3. PORCH COLUMNS & DECK

a. REBUILD BRICK PIERS @ 1ST FLOOR; Shore porch structure; Remove existing brick columns, individually or in sets, taking care to preserve original brick without damage; Install 4" diam. steel pipe columns anchored to stone foundation below and wood beam above; wrap steel for thermal break; re-lay brick around w/lime-rich mortar; use matching historic brick for nec. replacement.

b. REMOVE EXISTING CONCRETE PAVING around building at sunken porch; Install brick-on-sand permeable paving for breathability of surface, with drainage as detailed @ Sht. A11 of documentation drawings, APPENDIX B..

c. REPLACE WOOD DECKING @ 2nd FLOOR PORCH; Remove & replace with a durable species such as teak or mesquite *(higher first cost, but longer lasting).*

4. FOUNDATIONS

a. REPAIR & RE-POINT STONE MASONRY of foundations at building perimeter and at porch perimeter, using compatible lime mortar and volcanic tuff matching historic original.

b. INSTALL DAMP-PROOFING & DRAIN BOARD with geo-textile filter fabric at all stem walls, continuous around building perimeter and porch perimeter.

c. INSTALL CONTINUOUS FOUNDATION DRAINAGE SYSTEM around perimeter of porch and building perimeter at 1st floor inside porch; conduct perforated drain tile to sump. Re-grade site to slope away from building typ.

d. INSTALL CONTINUOUS TRENCH DRAIN at lower level walkway, with walkable grating & drainage to sump or cistern for water harvesting/irrigation.

APPENDIX A.

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4. US National Park Service: Secretary of the Interior's Standards for Historic Preservation; NPS, Washington D.C, September, 2008

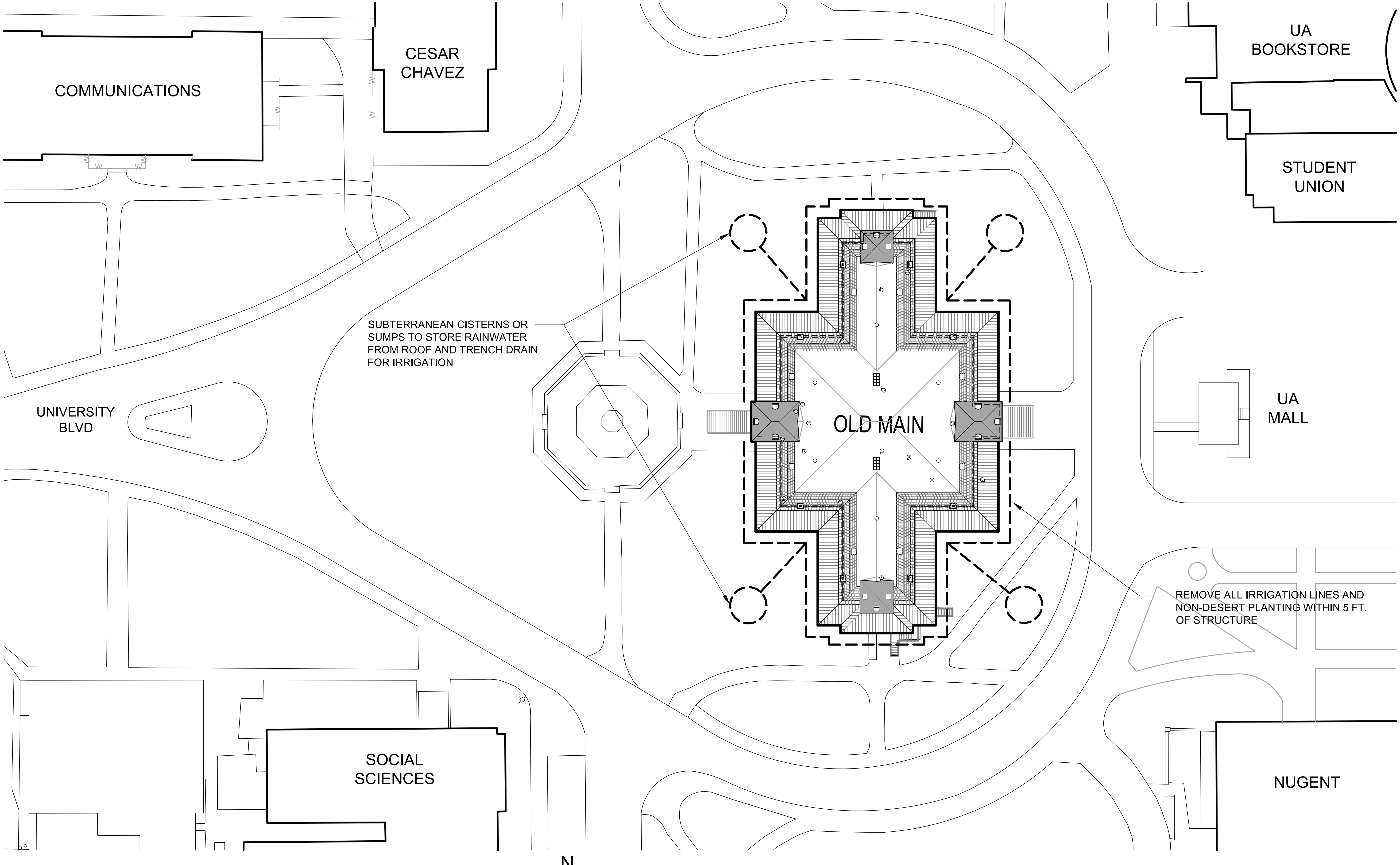
APPENDIX B.

ARCHITECTURAL DRAWINGS – EXISTING CONDITIONS
VINT & ASSOCIATES ARCHITECTS, INC. 2011 (*ATTACHED)*

A.1 SITE PLAN
A.2 LOWER LEVEL (1ST FLOOR) PLAN
A.3 UPPER LEVEL (2ND FLOOR) PLAN
A.4 ROOF PLAN
A.5 EAST & WEST ELEVATIONS
A.6 NORTH & SOUTH ELEVATIONS
A.7 LONGITUDINAL & CROSS SECTIONS
A.8 2ND FLOOR FRAMING PLAN
A.9 2ND FLOOR CEILING PLAN
A.10 ROOF FRAMING PLAN
A.11 SECTION – FOUNDATION DRAINAGE DETAIL
A.11.A ALT .SECTION – INTERIM FOUNDATION DRAINAGE DETAIL
A.12 DETAIL PLANS – FIRST FLOOR RESTROOMS
A.13 DETAIL PLANS – SECOND FLOOR RESTROOMS
C.1 PERIMETER SURVEY

O.1 ORIGINAL FLOOR PLAN (1ST FLOOR ONLY)
O.2 ORIGINAL ELEVATIONS
O.3 ORIGINAL CROSS SECTIONS

(FOLLOWING THIS PAGE)



Planning, Design & Construction

SITE PLAN
NTS

10.30 OLD MAIN - THE UNIVERSITY OF ARIZONA

Date: 11.17.11
Drawn by: OMR & AC

VINT & ASSOCIATES ARCHITECTS
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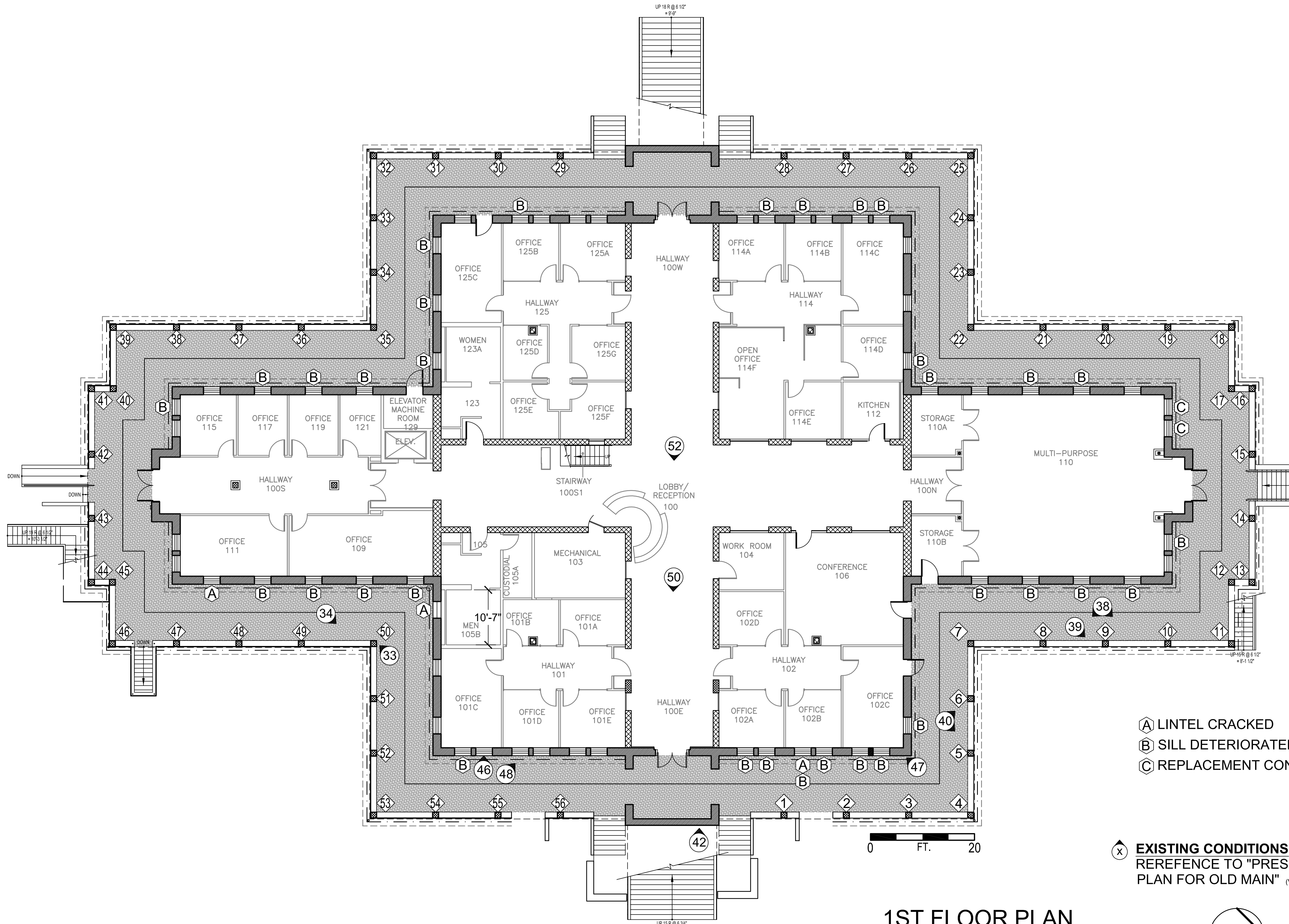
A.1
SITE
PLAN



Ⓐ LINTEL CRACKED
Ⓑ SILL DETERIORATED / CRACKED
Ⓒ REPLACEMENT CONCRETE SILLS

EXISTING CONDITIONS
REREFENCE TO "PRESERVATION MASTER PLAN FOR OLD MAIN" (Vint & Associates Inc.)

1ST FLOOR PLAN

SCALE: 1" = 20'-0"

N

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A.2

Planning, Design & Construction

Date: 11.17.11
Drawn by: OMR

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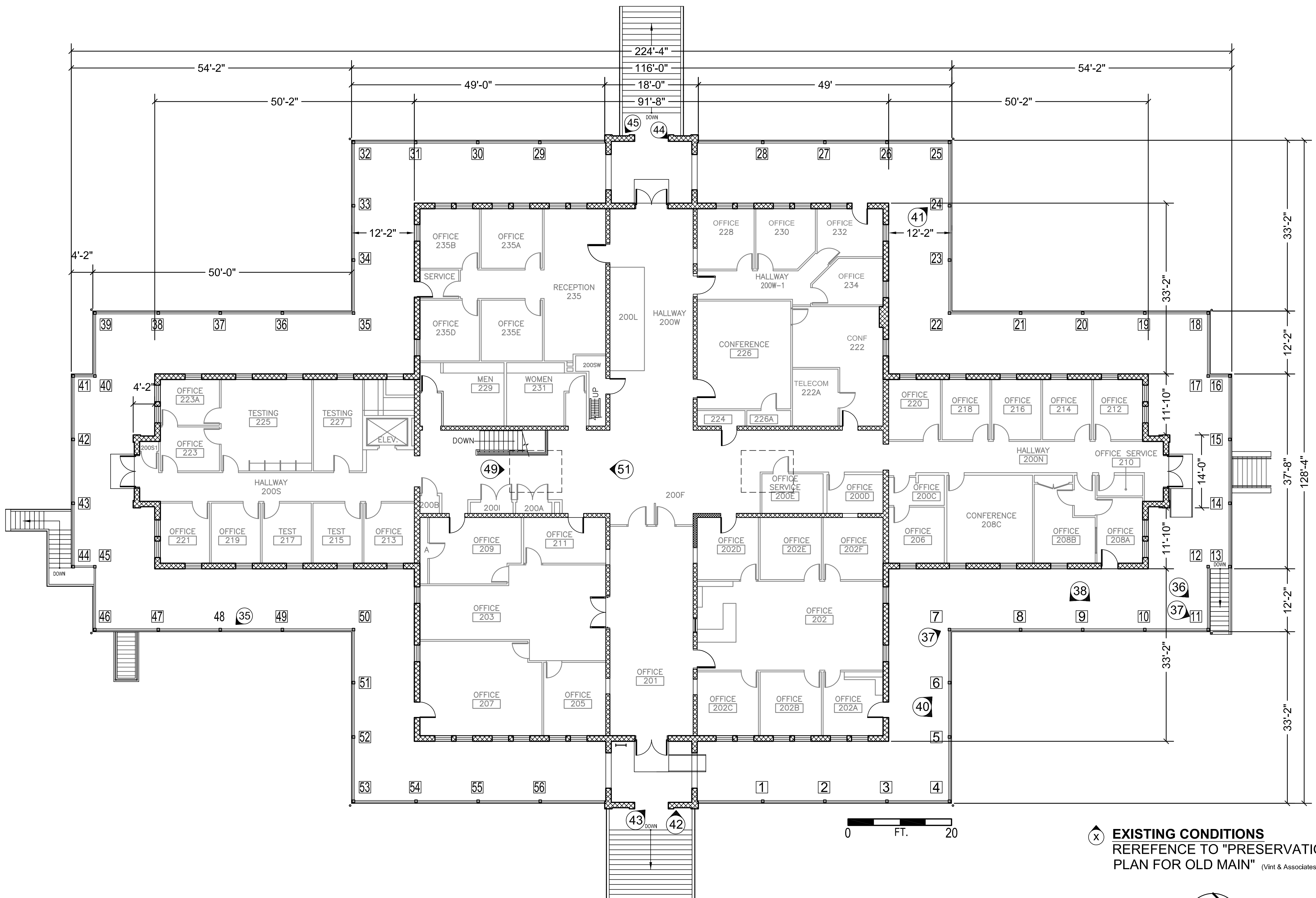
1ST FLOOR PLAN



EXISTING CONDITIONS
REREFENCE TO "PRESERVATION MASTER PLAN FOR OLD MAIN" (Vint & Associates Inc.)

2ND FLOOR PLAN

SCALE: 1" = 20'-0"

N

10.30 OLD MAIN - THE UNIVERSITY OF ARIZONA

A.3

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Drawn by: OMR

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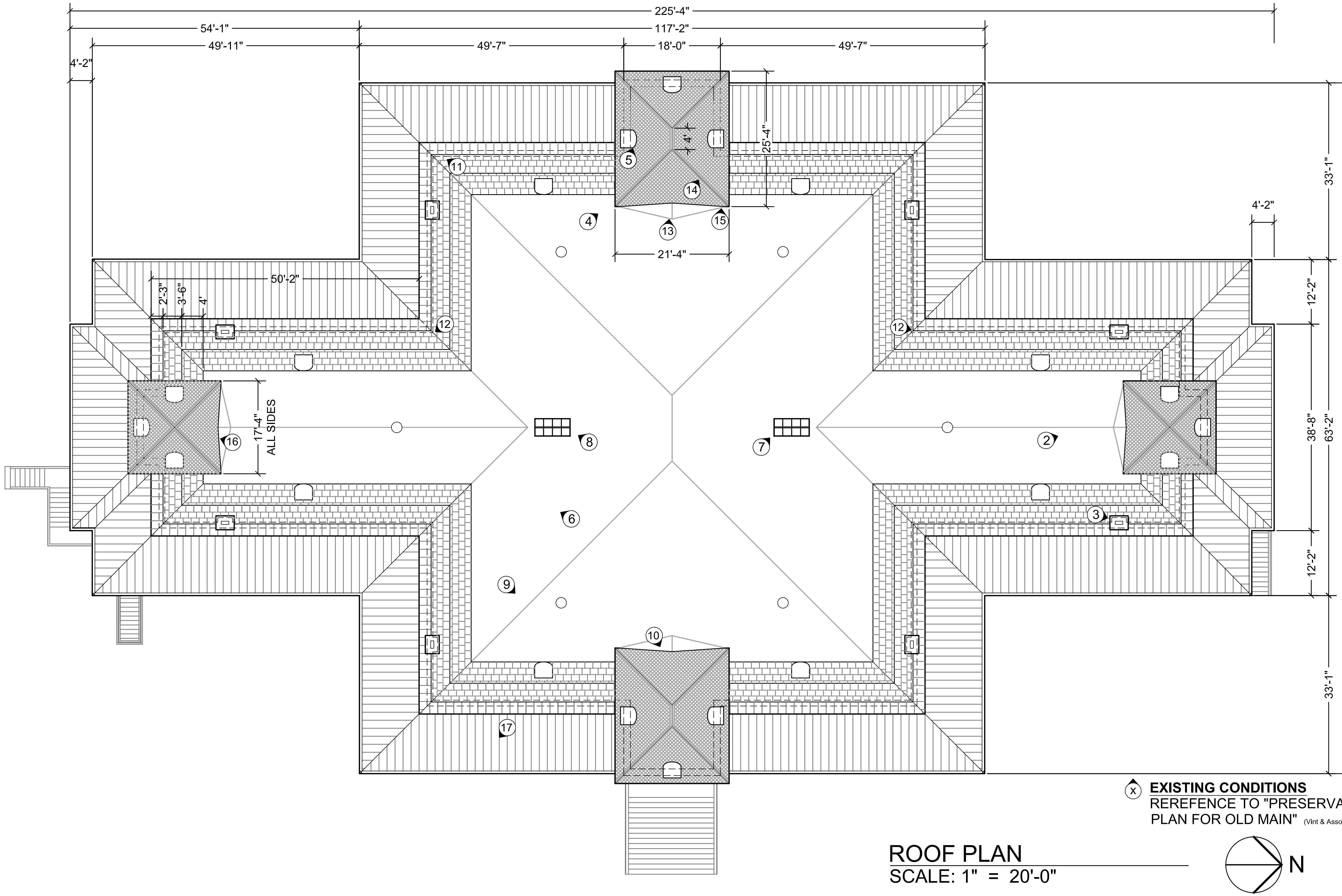
2ND FLOOR PLAN



(x) **EXISTING CONDITIONS**
REREFENCE TO "PRESERVATION MASTER PLAN FOR OLD MAIN" (Vint & Associates Inc.)

ROOF PLAN

SCALE: 1" = 20'-0"

10.30 OLD MAIN - THE UNIVERSITY OF ARIZONA

A.4

Planning, Design & Construction

Date: 11.17.11
Drawn by: OMR

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ROOF PLAN

WEST ELEVATION
SCALE: 1/16" = 1'-0"

EAST ELEVATION
SCALE: 1/16" = 1'-0"

0 FT. 16

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A.5

Date: 11.17.11
Drawn by: OMR

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EAST & WEST ELEVATIONS

SOUTH ELEVATION
SCALE: 1/16" = 1'-0"

NORTH ELEVATION
SCALE: 1/16" = 1'-0"

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10.30 OLD MAIN - THE UNIVERSITY OF ARIZONA

A.6

Date: 11.17.11
Drawn by: OMR

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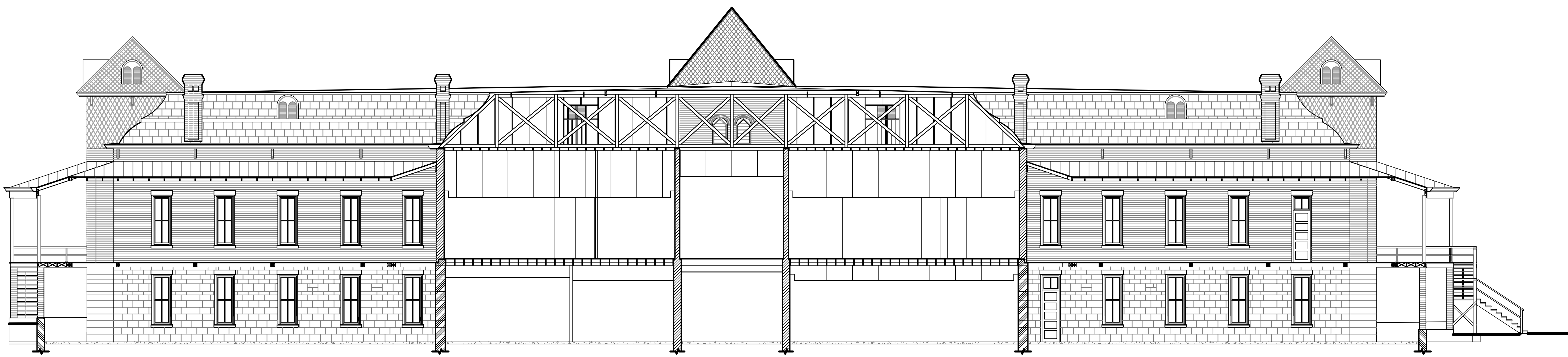
NORTH & SOUTH ELEVATIONS

CROSS SECTION
SCALE: 1/16" = 1'-0"



LONGITUDINAL SECTION
SCALE: 1/16" = 1'-0"

0 FT. 16

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A.7

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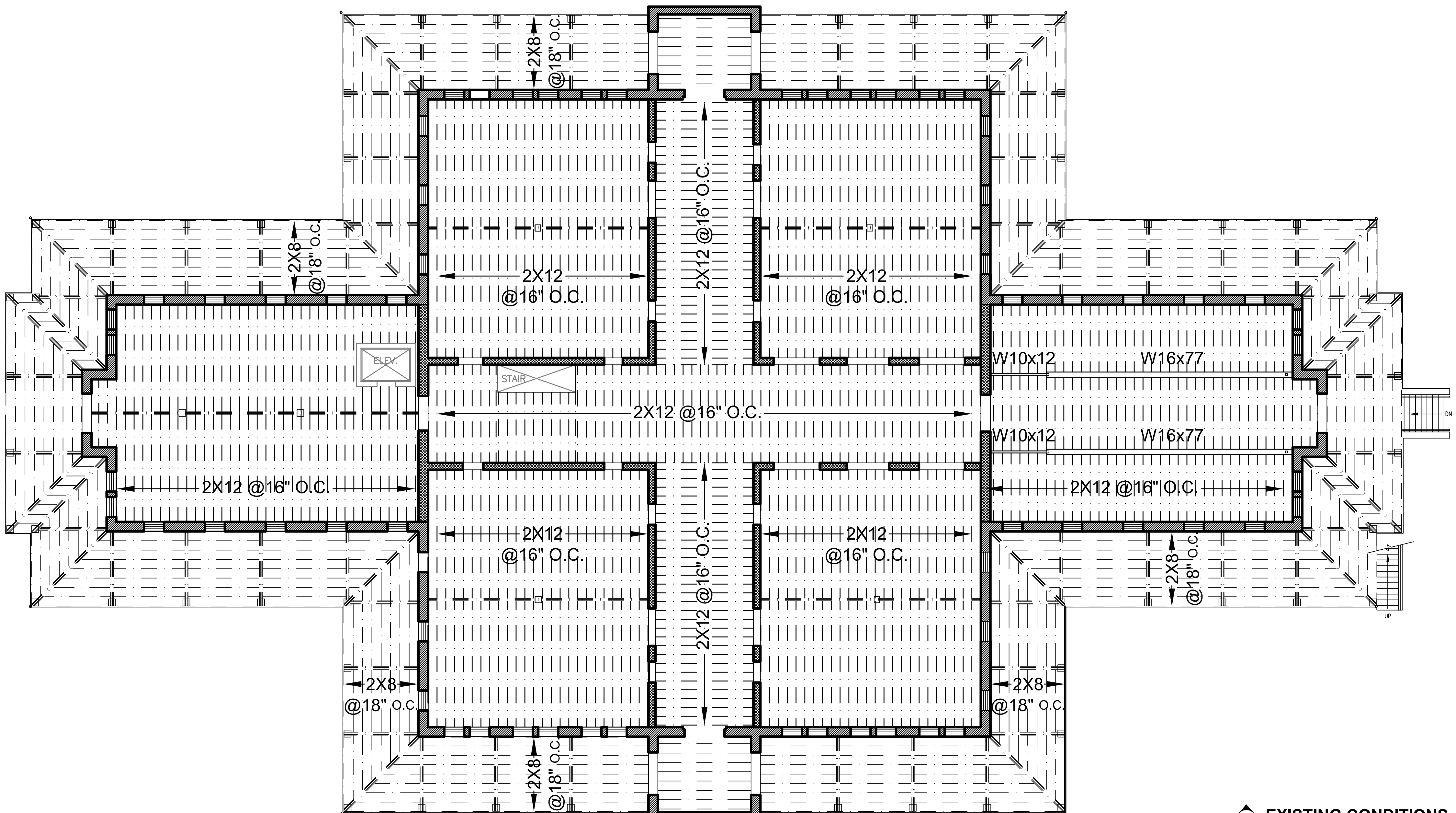
SECTIONS



(X) **EXISTING CONDITIONS**
REREFENCE TO "PRESERVATION MASTER PLAN FOR OLD MAIN" (Vint & Associates Inc.)

2ND FLOOR FRAMING PLAN
SCALE: 1" = 20'-0"

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A.8

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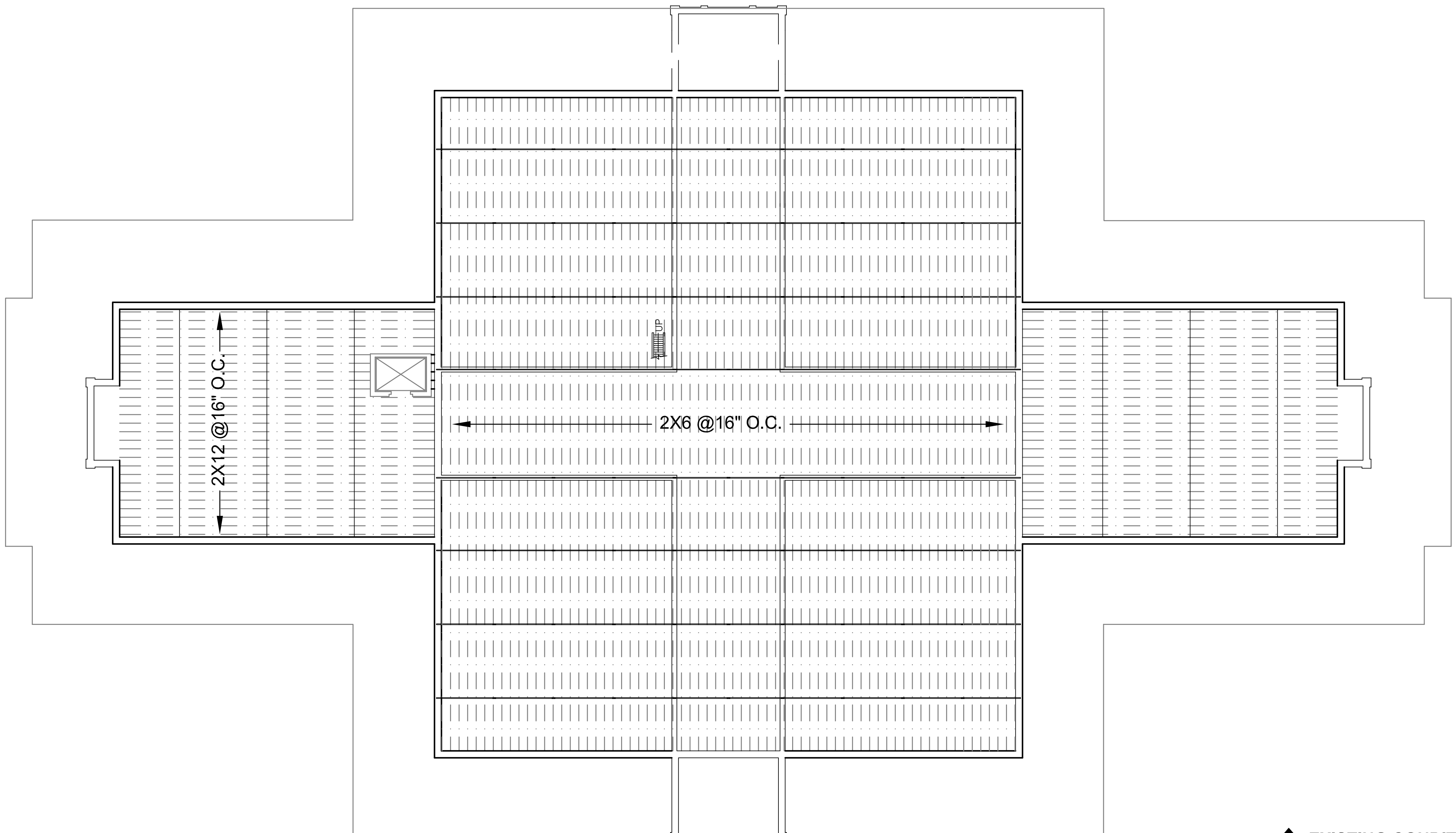
2nd FLOOR FRAMING PLAN



EXISTING CONDITIONS
REREFENCE TO "PRESERVATION MASTER PLAN FOR OLD MAIN" (Vint & Associates Inc.)

2ND FLOOR CEILING PLAN
SCALE: 1" = 20'-0"

N

A.9

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Drawn by: OMR

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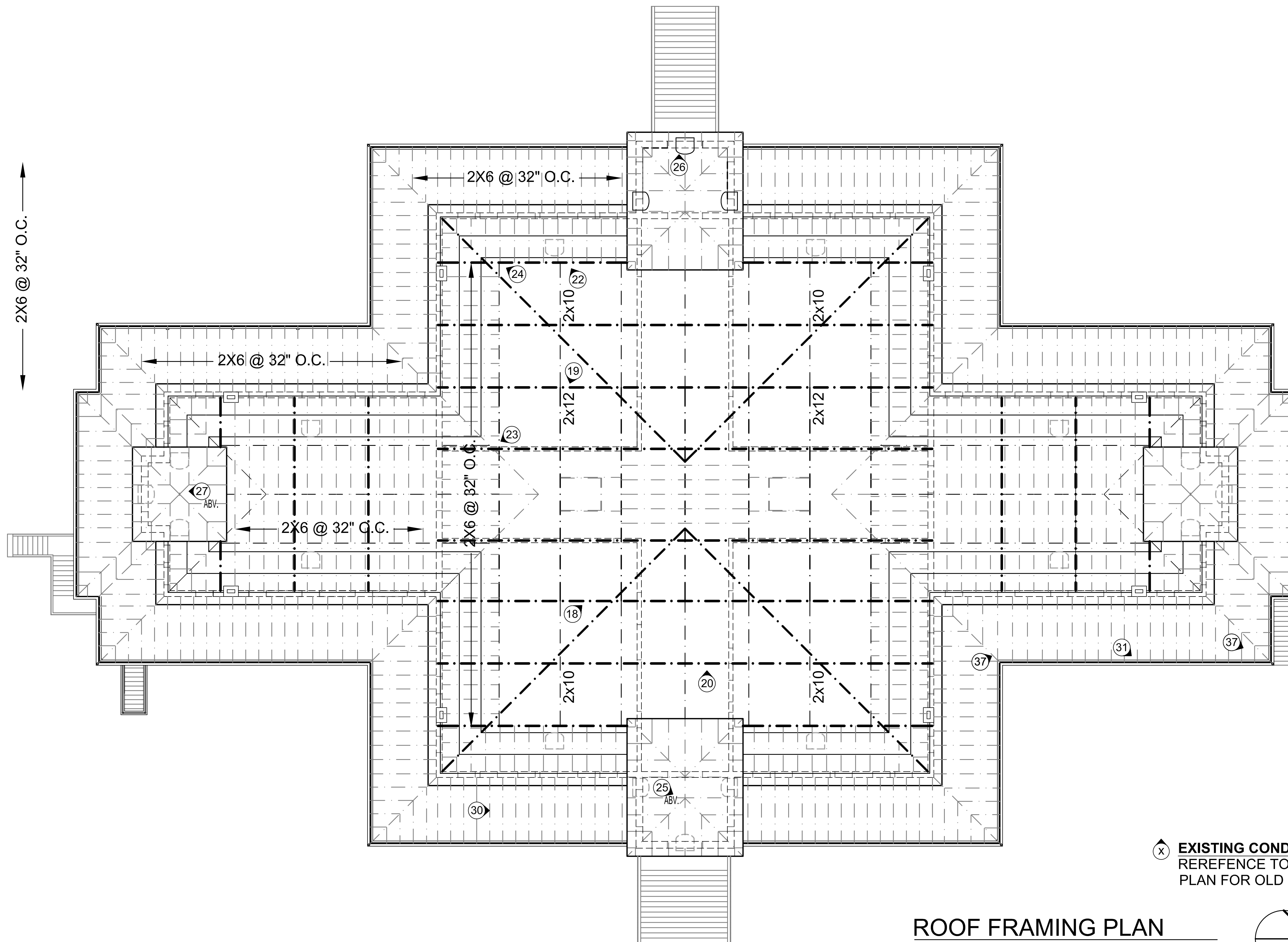
2ND FLOOR CEILING PLAN



x **EXISTING CONDITIONS**
REREFENCE TO "PRESERVATION MASTER PLAN FOR OLD MAIN" (Vint & Associates Inc.)

ROOF FRAMING PLAN
SCALE: 1" = 20'-0"

N

10.30 OLD MAIN - THE UNIVERSITY OF ARIZONA

A.10

Planning, Design & Construction

Date: 11.17.11
Drawn by: OMR

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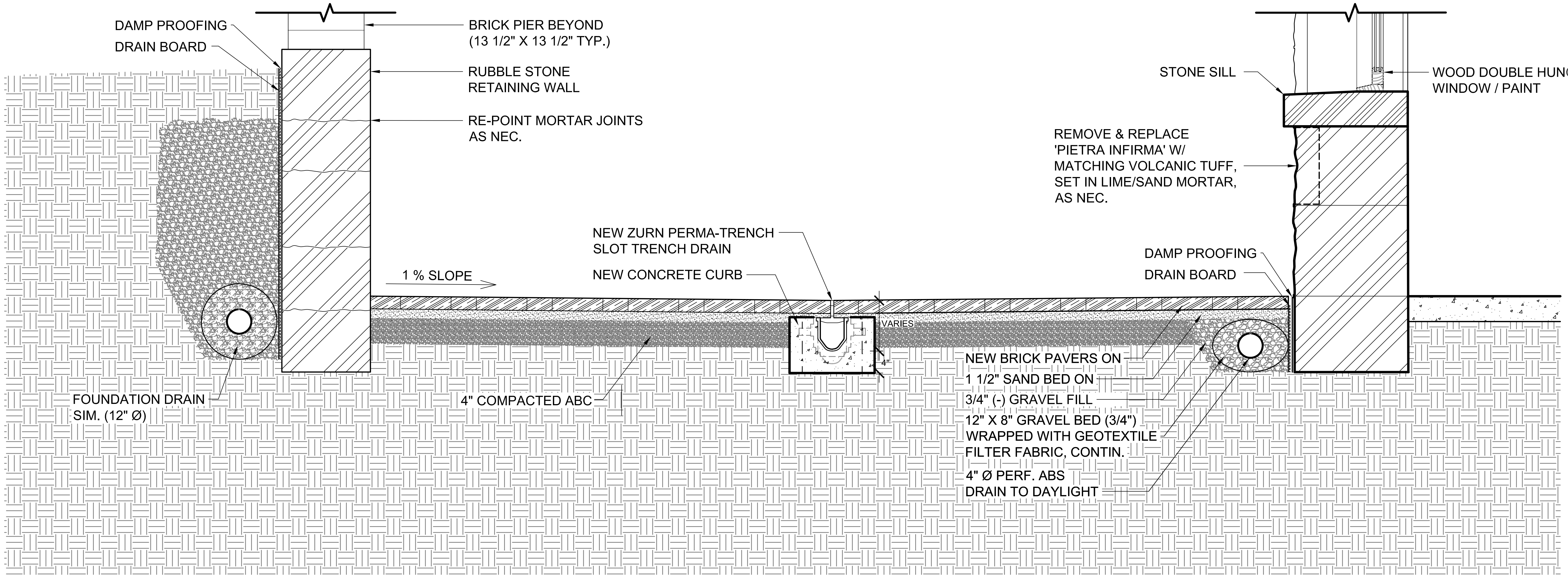
ROOF FRAMING PLAN



FOUNDATION DRAINAGE @ 1ST FLOOR

SCALE: 3/4" = 1'-0"

Planning, Design & Construction

10.30 OLD MAIN - THE UNIVERSITY OF ARIZONA

Date: 11.17.11
Drawn by: OMR

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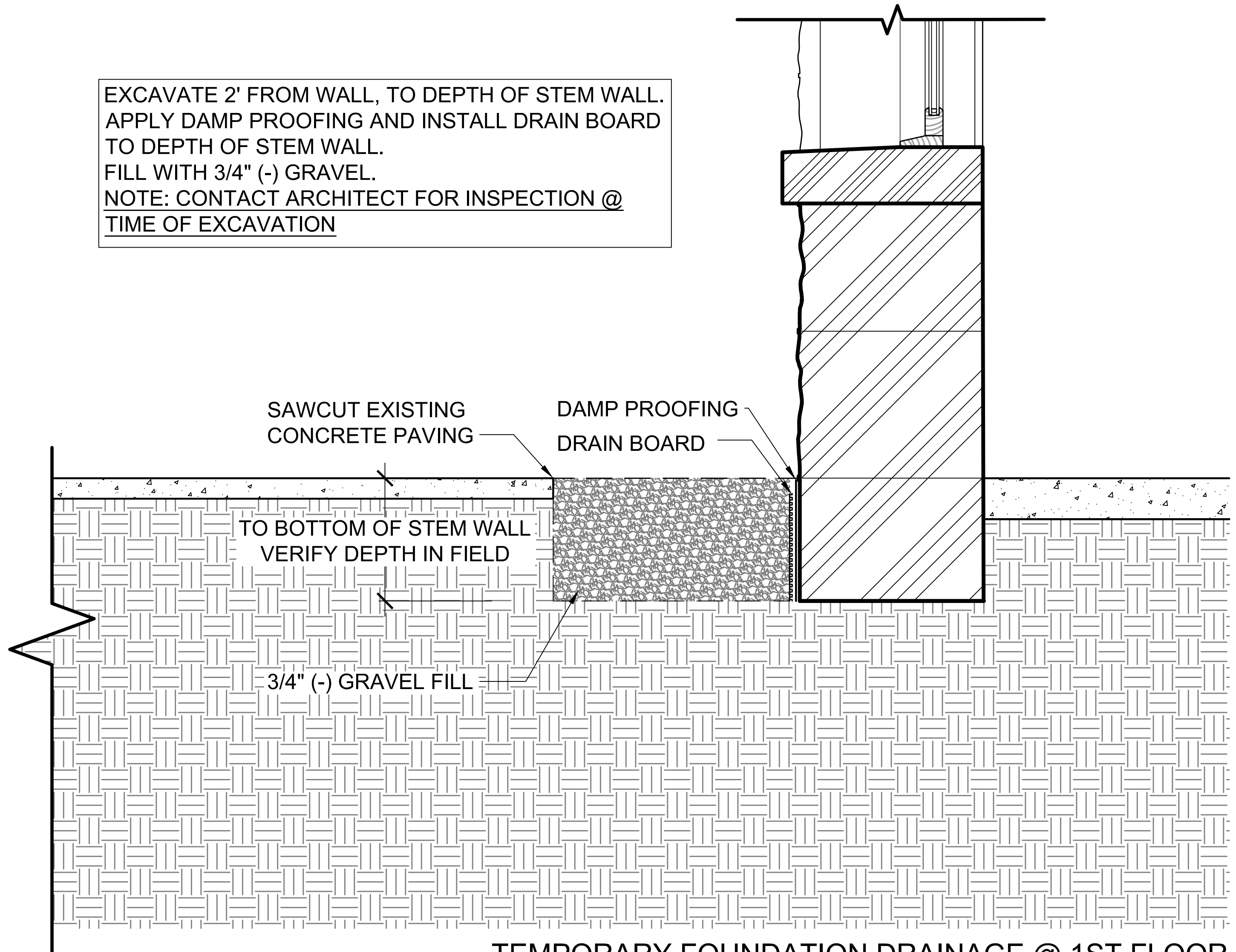
A.11

DETAILS



TEMPORARY FOUNDATION DRAINAGE @ 1ST FLOOR

SCALE: 3/4" = 1'-0"

(ALT)
A.11

10.30 OLD MAIN - THE UNIVERSITY OF ARIZONA

Date: 11.17.11
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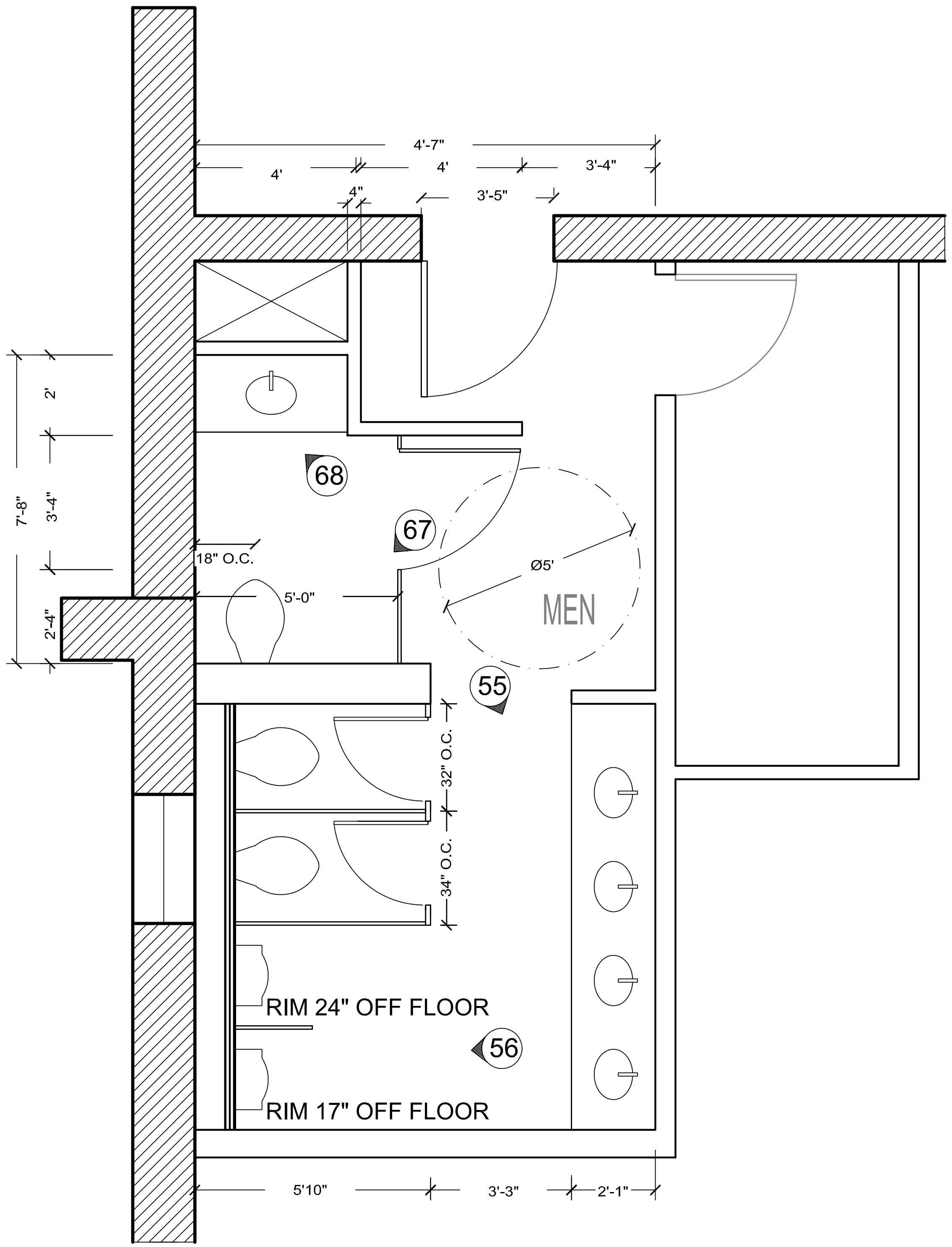
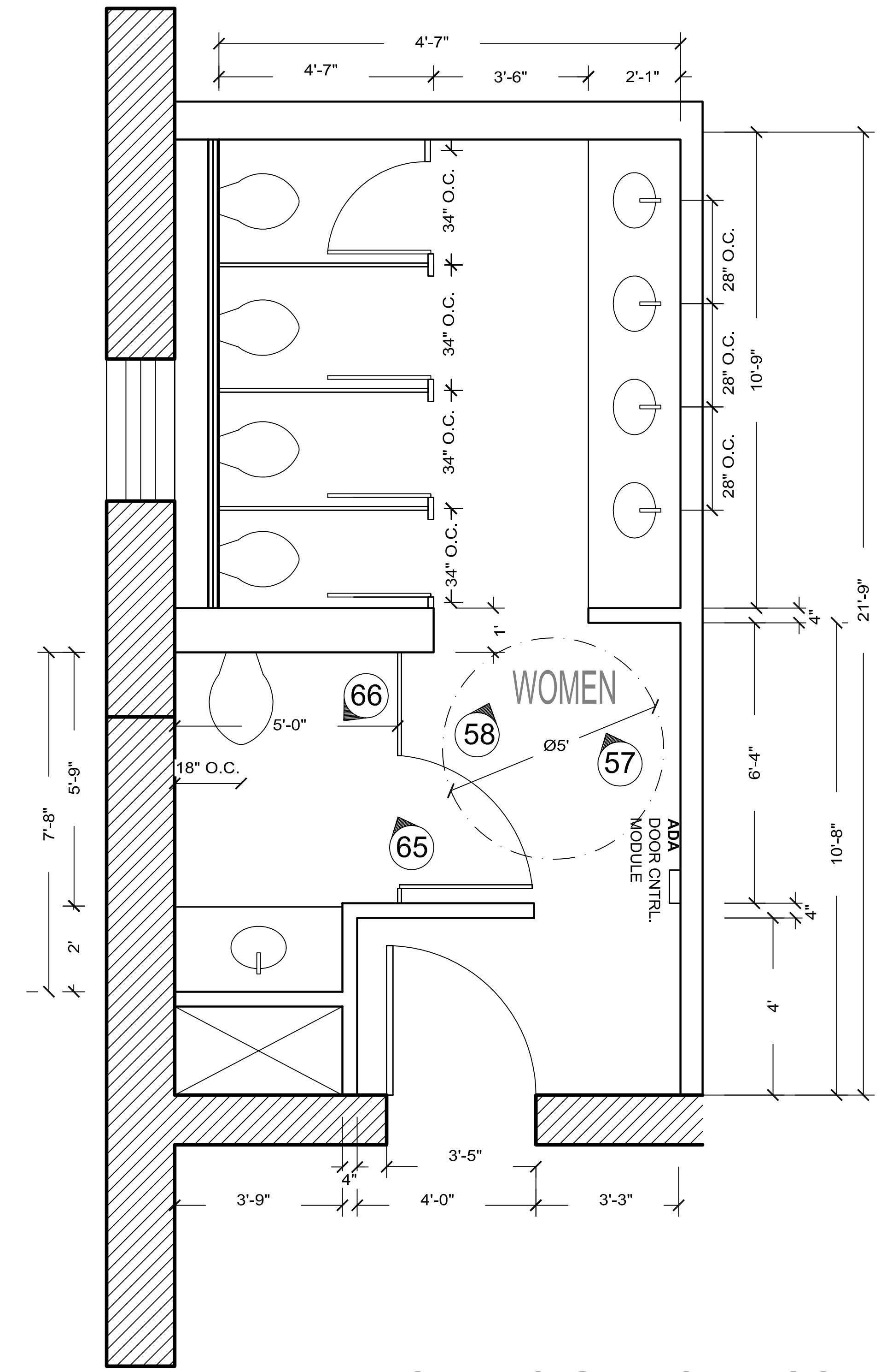
DETAILS



MEN'S @ FIRST FLOOR RESTROOM

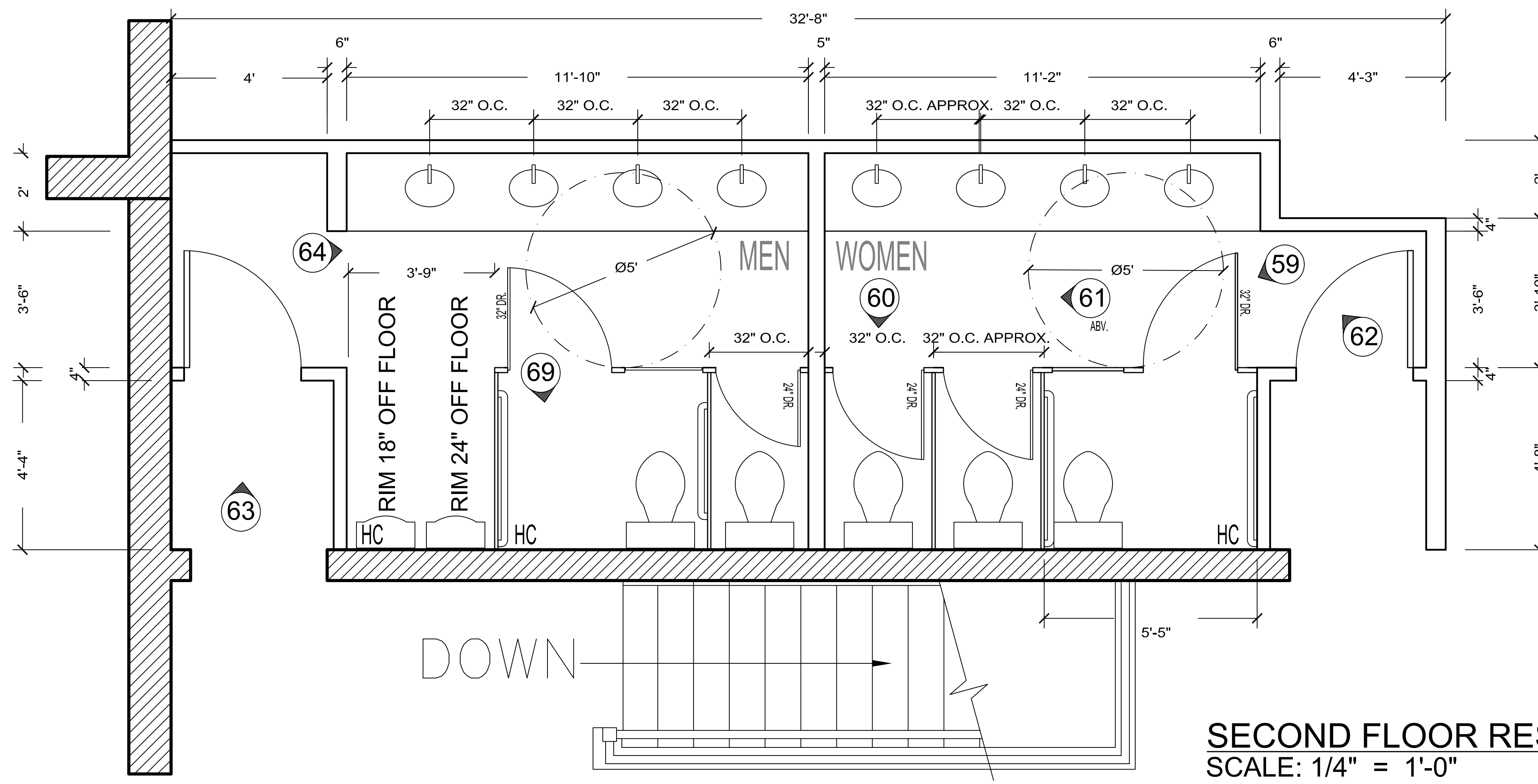
SCALE: 1/4" = 1'-0"



WOMEN'S @ FIRST FLOOR RESTROOM

SCALE: 1/4" = 1'-0"

(x) **EXISTING CONDITIONS**
REREFENCE TO "PRESERVATION MASTER PLAN FOR OLD MAIN" (Vint & Associates Inc.)



SECOND FLOOR RESTROOMS

SCALE: 1/4" = 1'-0"

EXISTING CONDITIONS
REREFENCE TO "PRESERVATION MASTER PLAN FOR OLD MAIN" (Vint & Associates Inc.)

Planning, Design & Construction

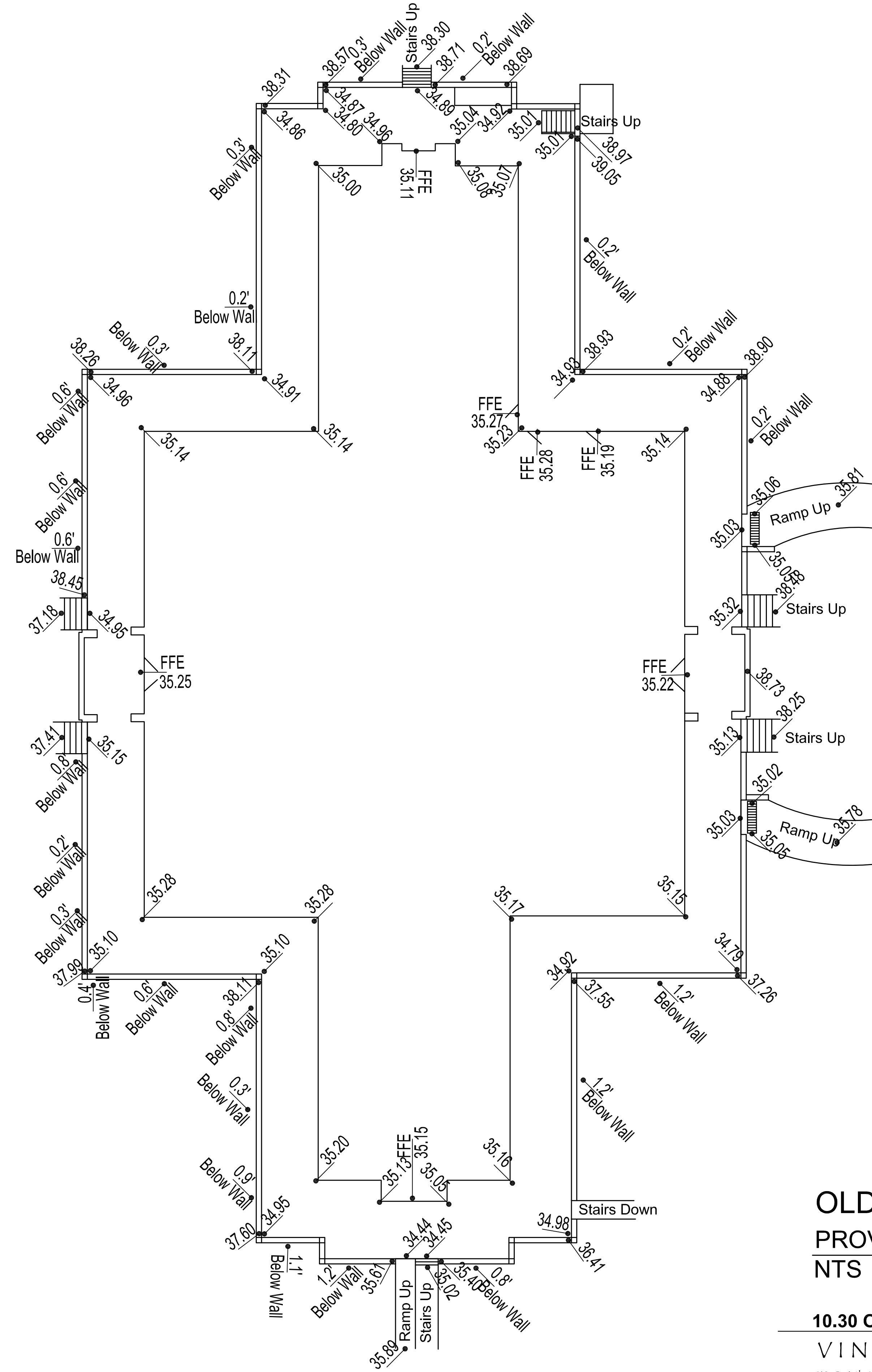
10.30 OLD MAIN - THE UNIVERSITY OF ARIZONA

A.13

Date: 11.17.11
Drawn by: AFN

VINT & ASSOCIATES ARCHITECTS
312 E. 6th St. Tucson AZ 85705 P.O. Box 648 Tucson, AZ 85702 P. (520) 882-5252 F. (520) 882-5449

RESTROOMS
SECOND FLOOR



OLD MAIN SURVEY DATA

PROVIDED BY THE WLB GROUP

NTS

N

C.1

10.30 OLD MAIN - THE UNIVERSITY OF ARIZONA

VINT & ASSOCIATES ARCHITECTS

312 E. 6th St. Tucson AZ 85705 P.O. Box 648 Tucson, AZ 85702 P. (520) 882-5252 F. (520)882-5449

PERIMETER SURVEY

Planning, Design & Construction

APPENDIX C.

LIST OF ILLUSTRATIONS

Historic Illustrations and Photographs (alphabetical designations):

A. Old Main under construction. – Ball, Phyllis. “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ: Old Main in 1889. From U of A Special Collections.
B. Original Design for the School of Mines. – Ball, Phyllis. “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ: Original drawings of Old Main. From U of A Special Collections.
C. James Miller Creighton, architect. - Ball, Phyllis. “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ. From U of A Special Collections.
D. Old Main upon completion in 1889. - Ball, Phyllis. “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ: Old Main upon completion in 1889. From U of A Special Collections.
E. Cadets in West Steps. - Ball, Phyllis. “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ: Old Main in 1889. From U of A Special Collections.
F. Classroom of English Professor Howard Judson Hall. – “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ: April 1896. From U of A Special Collections.
G. Drawing Classroom on Second Floor. – “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ. From U of A Special Collections.
H. Interior of Upper Floor. – “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ. From U of A Special Collections.
I. Original University Library at Old Main Second Floor. – “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ. From U of A Special Collections.
J. Earliest Campus Map. – “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ: Survey by undergrad classes circa 1900-1908. From U of A Special Collections.
K. Aerial view of University’s of Arizona Campus. – Photograph. Tucson AZ: Circa 1920. From Arizona Historic Society Archives.
L. Removal of Old Main’s Central original standing seam metal roof. – Photograph. Tucson AZ: September 1942. From Arizona Historic Society Archives.
M. Hand –tinted postcard view of Old Main. –
N. View from southwest of Old Main before stairs or railings had been completed. - “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ: in 1891.From U of A Special Collections.
O. West elevation with historic fountain on foreground. – “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ: 1938. From U of A Special Collections.
P. Southeast corner. – “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ: 1966. From U of A Special Collections.
Q. Historic pictures portraying vines around the porch promenade. “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ: 1903-1936. From U of A Special Collections.
R. Original plan of Old Main. “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ. From U of A Special Collections.
S. Territorial Museum at Second Floor of Old Main. “A photographic History of the University of Arizona 1885-1985”. Photograph. Tucson AZ: 1899. From U of A Special Collections.

T. Territorial Museum; note gas jet light fixtures from the Arizona Pavilion at the 1893 World's Columbian Exposition in Chicago. "A photographic History of the University of Arizona 1885-1985". Photograph. Tucson AZ: 1899. From U of A Special Collections.
U. - Office/Classroom; wood panel partitions. "A photographic History of the University of Arizona 1885-1985". Photograph. Tucson AZ: 1897. From U of A Special Collections.
V. Chemistry and mineralogy laboratory. "A photographic History of the University of Arizona 1885-1985". Photograph. Tucson AZ: 1902. From U of A Special Collections.
W. UofA Bookstore located at first floor during the 1950's. "A photographic History of the University of Arizona 1885-1985". Photograph. Tucson AZ: 1950. From U of A Special Collections.
X. Student fountain "The Coop". "A photographic History of the University of Arizona 1885-1985". Photograph. Tucson AZ: 1950. From U of A Special Collections.
Y. Second floor in 1966 looking north in central hall. ----
Z. Old Main used by the ROTC during 1966.---
AA. Interior of 2nd floor under renovation in 1975. Central.---
BB. First floor hallway, looking west. in 1976. ---
CC. Second floor as Dean of Students lobby in 1976.
DD. Brick floor of furnace room at shop building annex to north of Old Main. "A photographic History of the University of Arizona 1885-1985". Photograph. Tucson AZ. From U of A Special Collections.
EE. Library on 2nd floor; note gas-jet light from AZ pavilion, 1893 Columbian Expo. "A photographic History of the University of Arizona 1885-1985". Photograph. Tucson AZ. From U of A Special Collections.

Current conditions as of October, 2011 (numerical designations).:
Refer to Architectural Drawings for further information about location.
Photographs by author. B. Vint, January-October, 2011.

1. West façade of Old Main with Memorial Fountain. –
2. East side of roof looking north. –
3. Chimney requires re-pointing. –
4. Pyramidal roof at west tower. –
5. Ventilation dormer at west tower. –
6. Existing roof conditions at central area. –
7. North skylight at center of hallway. –
8. South skylight w/ roof hoods beyond. –
9. Doubly curved Mansard and pyramidal hipped roof at East tower. –
10. Sample of pressed terne-metal fish scale shingle. –
11. Hip seam at southwest corner of curved Mansard roof. –
12. Valleys at perimeter Mansard roof. –
13. Pyramidal roof of west tower. –
14. Detail of terne-metal 'fish scale' roof tiles at west tower. –
15. Diamond shaped-tiles. –
16. Detail of pressed terne-metal shingles. –
17. SE wing of porch and deteriorated standing seam metal. –
18. Original X-braced wood trusses at central roof section. –
19. Building installations and HVAC system at attic of central roof section. –
20. Typical truss at center section. –
21. Slope of eave and built-up wood truss. –
22. Convex lower curve at Mansard wood blocking. –
23. Roof leaks at valleys & hips damage wood. –

24. Hip rafter adjacent replaced w/PT 2-x-6. –
25. East tower roof framing. –
26. Interior of west tower brick bearing walls. –
27. Interior of south tower pyramid. –
28. Interior of south tower. –
29. West wall of south tower. –
30. Old Main porch roof. –
31. Perimeter beam at post #9. –
32. Deterioration of Second Floor decking. –
33. Damage at pier #50. –
34. Vines repercussions to Old Main structure. –
35. Second pier from right bending outward. –
36. Deteriorated deck and post at post #11. –
37. Deteriorated wood/sheet metal bracket at post #7.# 11. –
38. Differential settlement at piers #8-10#. –
39. Pier #8-9 evidence of rising dampness up to 6 feet of ground. –
40. Porch piers and post at #5 and #6 significantly out of plumb. –
41. Unreinforced brick chimneys above porch. –
42. East tower, east wall. –
43. Shear cracks through brick. –
44. Worn brick and threshold stone at west side. –
45. Brick worn smooth, where people brushed and carved in the surface. –
46. Deterioration and discoloration of stone to level of rising damp. –
47. *Pietra infirma*: Sick stone. –
48. Historic doors at interior of 1st and 2nd floors. –
49. Double-hung wood-frame window. –
50. Cracked stone lintel above window at south east corner of porch. –
51. East wall of first floor displays discoloration to height of rising damp in stone. –
52. Second floor at central hall looking north. –
53. Current conditions of interior space at first floor looking toward west entrance. –
54. Second floor central hall looking south. –
55. First floor hallway looking west. –
56. Second floor, Dean of the Students office. –
57. Interstitial space above 1975 suspended acoustical grid ceiling. –
58. 1st Floor Men's restroom newest remodel.-
59. 1st Floor Men's restroom interior layout. –
60. 1st Floor Women's restroom interior layout. –
61. 1st Floor Women's restroom showing wash-basin counter with motion sensor faucets. –
62. 2nd Floor Women's restroom interior layout, with handicapped access later intervention. –
63. 2nd Floor Women's dated plumbing fixtures. –
64. Ceiling tile representative of 1990's interior finishing, including fluorescent lighting. -
65. Aged tiled counter supported with steel brackets. –
66. Second Floor material palette. –
67. Men's restrooms counter contrast between flooring and toilet stalls.-
68. ADA wheelchair accessible water closet at First Floor women's restroom.-
69. Wheelchair accessible water closet.-
70. 1st Floor Men's restroom, showing E/O wall mounted toilet and ADA compliance installations.-
71. 1st Floor Men's restroom ADA water closet.-
72. 2nd Floor Men's restroom ADA water closet; accommodate ADA guidelines.

APPENDIX D.

National Register of Historic Places Nomination, 1970

(FOLLOWING THIS PAGE)

Form 10-300
(July 1969)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
INVENTORY – NOMINATION FORM

(Type all entries – complete applicable sections)

STATE:	Arizona
COUNTY:	Pima
FOR NPS USE ONLY	
ENTRY NUMBER	DATE

1. NAME

COMMON: "Old Main"

AND/OR HISTORIC: University of Arizona, School of Agriculture (1891)

2. LOCATION

STREET AND NUMBER: University of Arizona

CITY OR TOWN: Tucson Zip 85720

STATE	CODE	COUNTY:	CODE
Arizona	04	Pima	019

3. CLASSIFICATION

CATEGORY (Check One)	OWNERSHIP		STATUS	ACCESSIBLE TO THE PUBLIC
☐ District ☒ Building ☐ Site ☐ Structure ☐ Object	☒ Public ☐ Private ☐ Both	Public Acquisition: ☐ In Process ☐ Being Considered	☒ Occupied ☐ Unoccupied ☐ Preservation work in progress	Yes: ☐ Restricted ☒ Unrestricted ☐ No

PRESENT USE *(Check One or More as Appropriate)*

☐ Agricultural	☐ Government	☐ Park	☐ Transportation	☐ Comments
☐ Commercial	☐ Industrial	☐ Private Residence	☐ Other *(Specify)*	
☒ Educational	☐ Military	☐ Religious		
☐ Entertainment	☐ Museum	☐ Scientific		

SEE INSTRUCTIONS

4. OWNER OF PROPERTY

OWNER'S NAME: University of Arizona (State of Arizona)

STREET AND NUMBER:

CITY OR TOWN:	STATE:	CODE
Tucson	Arizona	04

STATE: Arizona

5. LOCATION OF LEGAL DESCRIPTION

COURTHOUSE, REGISTRY OF DEEDS, ETC: State Land Department

STREET AND NUMBER: 1688 West Adams

CITY OR TOWN:	STATE	CODE
Phoenix	Arizona	04

COUNTY: Pima

6. REPRESENTATION IN EXISTING SURVEYS

TITLE OF SURVEY: Historic American Buildings Survey

DATE OF SURVEY: 1938 ☒ Federal ☐ State ☐ County ☐ Local

DEPOSITORY FOR SURVEY RECORDS: Library of Congress

STREET AND NUMBER:

CITY OR TOWN:	STATE:	CODE
Washington	District of Columbia	08

FOR NPS USE ONLY

ENTRY NUMBER

DATE

7. DESCRIPTION

CONDITION	(Check One)					
	☐ Excellent	☒ Good	☐ Fair	☐ Deteriorated	☐ Ruins	☐ Unexposed
	(Check One) ☒ Altered Interior ☐ Unaltered			(Check One) ☐ Moved ☒ Original Site		

DESCRIBE THE PRESENT AND ORIGINAL *(if known)* PHYSICAL APPEARANCE

Oct 6, 1975 JG

"OLD MAIN", University of Arizona, Pima County, Tucson, Arizona.
Dates of Construction - October 27, 1887-October 1, 1891.
Architect - ~~C. H.~~ James M. Creighton; Builder - M. ~~H.~~ (J) Sullivan.

Old Main is a two story structure, consisting in plan of a center section about 100' on the north-south sides and 95' on the east-west sides. From the north-south sides of this center section and centered upon thise sides, two wings project which are about 50' long and 35' wide. The result in plan is a bi-symmetrical elongated cross about 195' on the long (north-south) axis, and 120' on the short (east-west) axis. All portions of Old Main were constructed and finished at the same time. The interior has witnessed major alterations in response to changing functional demands, while the exterior has changed very little since 1891.

There are four towers, capped with pyramidal roofs and about 50' in height, centered upon the four sides of the cross type plan. These towers mark the entries, with primary entries on the east and west sides and the secondary on the north-south sides. These entries are notable, for they utilize a semi-circular arch to further express the points of entry.

The floor of the first story is about 3' below existing grade, which results in a "raised basement" tucked under a 12' wide roofed porch which surrounds the entire second story. Each floor--first and second-- is reached by stairs centered upon each side. The ceiling heights are 12' for the first story and 17' for the second story. The roof of Old Main can best be described as a variety of the "Mansard" which was a popular architectural mode c. 1890, while the porch roof, which is lower, is a simple sloping shed roof surrounding the entire structure. In general, the exterior character of Old Main is one of horizontality due to the surrounding porch and a resulting deep horizontal shadow which emphasizes this horizontality by accentuating the fascia of the proch roof. The four towers punctuate this horizontality and provide vertical accents as well as expressing entry points.

The basis structural concept is wall-beam. The first story wall is of ashlar stone masonry, while the second story wall to its intersection with the roof is of red brick. Beams in all cases are of dimensioned lumber, with wooden trusses used

SEE INSTRUCTIONS

7. Description (continued)

in the roof structure. The porch floor and roof also utilize demensioned lumber, while the porch posts on the first story are of red brick. The second story porch posts are of wood with a wooden porch handrail between. Some wooden brackets occur on both the porch eaves at the column points and on the cornice of the main structure.

Openings, both doors and windows, are spanned by flat lintels of stone on both stories. The only exceptions to this are the tower entries which are spanned by semi-circular arches of brick. The windows were the double-hung wooden single light type. Exterior doors were the typical paneled raised moulding doors of the 1890's. Roof surfaces have been replaced, and as far as can be ascertained, the present roof is not original.

The interior of Old Main has seen the greatest number ofphysical alterations, due to continuously changing uses since 1891. At present, the plan has a "through-hall" from east to west on axis of the main entries, while the remainder of the plan responds not to axial symmetry but instead to functional demands. While there have been considerable internal changes since 1891, sufficient detail, i.e., doors, mouldings and other trim, remains which, when correlated with early photographs, gives a clear picture of the original interior if a restoration were contemplated. All interior floors are of wood, and the porch at the second story is also of wood, while the first story exterior floor below the porch is of concrete.

In 1938, due to neglect by the University, Old Main was condemned and ruled as unsafe by city authorities. Nothing was done to rectify this until 1942 when the U. S. Navy took over the structure and provided considerable funds for the necessary repairs. At this time, the Sundt Construction Company of Tucson repointed the exterior walls where needed, and the first story exterior concrete walk below the porch was repaired. The second story porch floor and roof were also renovated, as was the porch handrail and all wooden stairs. All interior wooden floors were put into good condition, and interior walls were patched where necessary. Several bad trusses in the roof were replaced, and roof leaks were repaired. Since this major renovation of 1942, the building has been relatively well maintained, and it continues to function as part of the University. It now

Form 10-300a
(Dec. 1968)

UNITED ST[illegible]S [illegible]PARTMENT OF THE INTERIOR
[illegible]AL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
INVENTORY - NOMINATION FORM

(Continuation Sheet)

STATE: Arizona
COUNTY: Pima

FOR NPS USE ONLY

ENTRY NUMBER	DATE

(Number all entries)

7. Description (continued)

provides space for the ROTC program and other minor campus offices.

8. SIGNIFICANCE

PERIOD *(Check One or More as Appropriate)*

- [ ] Pre-Columbian
- [ ] 15th Century
- [ ] 16th Century
- [ ] 17th Century
- [ ] 18th Century
- [x] 19th Century
- [ ] 20th Century

SPECIFIC DATE(S) *(If Applicable and Known)* October 27, 1887 - October 1, 1891

AREAS OF SIGNIFICANCE *(Check One or More as Appropriate)*

- Aboriginal
  - [ ] Prehistoric
  - [ ] Historic
- [ ] Agriculture
- [x] Architecture
- [ ] Art
- [ ] Commerce
- [ ] Communications
- [ ] Conservation
- [x] Education
- [ ] Engineering
- [ ] Industry
- [ ] Invention
- [ ] Landscape Architecture
- [ ] Literature
- [ ] Military
- [ ] Music
- [ ] Political
- [ ] Religion/Philosophy
- [ ] Science
- [ ] Sculpture
- [ ] Social/Humanitarian
- [ ] Theater
- [ ] Transportation
- [ ] Urban Planning
- [ ] Other *(Specify)*

STATEMENT OF SIGNIFICANCE

Old Main is the original University of Arizona. The University was authorized in 1885 by an act of the 13th Arizona Territorial Assembly, which appropriated $25,000 for the purpose. Two years later, the Regents approved a contract of $37,969 for construction of "Old Main", which was originally intended to house the School of Mines. Ground was broken on October 27, 1887 in a picturesque ceremony at which school children, soldiers from Fort Lowell, a traveling stock company and citizens of Tucson all participated. Construction went along until funds ran out. When the Regents learned that federal funds were available for schools of agriculture, the School of Mines was moved out, and Old Main became the home of Agriculture. With the resulting federal money, Old Main was completed and opened its doors on October 1, 1891.

Today, Old Main stands in a central position within a great university. Its site is astride an east-west mall, upon which it occupies a most significant position as the termination of vistas from the east and west arrival gates of the University. Thus, it has immense significance as a vital piece of the present campus plan. While fulfilling this focal function, it further acts as a significant symbolic landmark, reminding all who view it of the historical educational aspirations of a western territory which viewed education as a civilizing force on the frontier. It is one of the oldest surviving western educational structures.

Architecturally, Old Main is a well preserved gem of the "Territorial" period of Arizona's history. It presents today the architectural idiom in use for educational and civic structures in the Southwest of c. 1890. Its exterior, especially, possesses an architectural integrity found all too seldom in the Southwest of today, for structures of this vintage have all too often been badly altered or even destroyed.

SEE INSTRUCTIONS

8. Significance (continued)

There is no surfeit of such structures in the Southwest, and because of its significance as a vital piece of the campus plan and its historical and architectural merit, Old Main deserves to be listed on the National Register of Historic Places.

9. MAJOR BIBLIOGRAPHICAL REFERENCES

A. File on "Old Main" (books, clippings and other documents), Special Collections Division, University of Arizona Library, Tucson, Arizona

B. Photographs and other documents, Collection, Arizona Pioneers' Society Historical Society Tucson, Arizona

10. GEOGRAPHICAL DATA

LATITUDE AND LONGITUDE COORDINATES DEFINING A RECTANGLE LOCATING THE PROPERTY

CORNER	LATITUDE Degrees Minutes Seconds	LONGITUDE Degrees Minutes Seconds
NW	° ' "	° ' "
NE	° ' "	° ' "
SE	° ' "	° ' "
SW	° ' "	° ' "

OR

LATITUDE AND LONGITUDE COORDINATES DEFINING THE CENTER POINT OF A PROPERTY OF LESS THAN TEN ACRES

LATITUDE			LONGITUDE		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
32 °	13 '	55 "	110 °	57 '	10 "

APPROXIMATE ACREAGE OF NOMINATED PROPERTY: 3/4 acre

LIST ALL STATES AND COUNTIES FOR PROPERTIES OVERLAPPING STATE OR COUNTY BOUNDARIES

STATE:	CODE	COUNTY	CODE
STATE:	CODE	COUNTY:	CODE
STATE:	CODE	COUNTY:	CODE
STATE:	CODE	COUNTY:	CODE

SEE INSTRUCTIONS

11. FORM PREPARED BY

NAME AND TITLE: Prof. Gordon Heck, AIA & Mrs. June Caldwell Martin, Ed., Ariz. Alumni Mag.

ORGANIZATION: College of Architecture

DATE: 15 Jan. 1970

STREET AND NUMBER: University of Arizona

CITY OR TOWN: Tucson

STATE: Arizona

CODE: 04

12. STATE LIAISON OFFICER CERTIFICATION

As the designated State Liaison Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service. The recommended level of significance of this nomination is:

National ☐ State ☒ Local ☐

Name Dennis McCarthy

Title Director, ASPB

Date 8/12/71

NATIONAL REGISTER VERIFICATION

I hereby certify that this property is included in the National Register.

Chief, Office of Archeology and Historic Preservation

Date

ATTEST:

Keeper of The National Register

Date

APPENDIX E.

THE SECRETARY OF THE INTERIOR'S STANDARDS FOR REHABILITATION

The Standards (Department of Interior regulations, 36 CFR 67) pertain to historic buildings of all materials, construction types, sizes, and occupancy and encompass the exterior and the interior, related landscape features and the building's site and environment as well as attached, adjacent, or related new construction. The Standards are to be applied to specific rehabilitation projects in a reasonable manner, taking into consideration economic and technical feasibility.

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.
2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.
3. Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.
4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.
5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.
6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.
7. Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.
8. Significant archeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.
9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.