

October 15, 2021

City of Ann Arbor
Guy C. Larcom City Hall
301 E. Huron St.
Ann Arbor, Michigan 48107

Attn: Mr. Adam Fercho, Park Planner & Landscape Architect

Re: West Park Band Shell
Phase II: Foundation Exploratory Excavation – Conclusions and Recommendations

HRC Job No. 20210331.02

Dear Mr. Fercho:

General:

At the request and with the assistance of the City of Ann Arbor, and G2 Consulting Group, Hubbell, Roth & Clark, Inc. (HRC), performed a foundation exploratory excavation investigation on August 9, 2021. Three (3) excavation areas were performed with much of the investigation focused on the building's southeast corner quadrant and along the east wall. Test Pit #1 was located at the buildings' southeast corner, Test Pit #2 was located along the east wall at the original basement door and Test Pit #3 was in the northeast corner of the building. Historical drawings and documentation were provided to HRC to aid in the investigation. Historical Construction Photos & Plans and Observations of Significance, Photographs of Significance and Conclusions and Recommendations are as follows:

Historical Construction:

1938: The West Park Historic Bandshell located in Ann Arbor's West Park between Seventh Street and Chapin Street and north of Huron Street and was originally constructed in 1938. The Bandshell Structure consisted of a large conical bandshell and stage with an adjoining masonry and timber building. This adjoining building housed the women's and men's dressing rooms and stage corridors on its first floor and housed the women's and men's' public restroom facilities and storage area in the basement. The basement floor storage area consisted of compacted soils, not concrete. Access to the basement areas consisted of two access doors and stairs along the west wall and single door and stairs along the east wall. The utilities consisted of electrical, water and plumbing services. Heating / HVAC was not included. The concrete first floor was supported by premanufactured steel joists, steel diagonal bridging, steel lath stay-in--place forms and which is supported by the perimeter masonry basement block walls. The building block walls were supported on a continuous concrete footing. Foundation underdrains were not installed.

1993: The bandshell structure remained in service until 1993 when significant renovations and rehabilitation occurred. Structural repairs to the conical bandshell were completed, the basement stairs and retaining walls were removed, block inlay of the three doors and backfill within the stair area had occurred. An exterior stucco finish was applied and supported by steel mesh. South wall windows were replaced with block infill and the east & west wall windows were replaced with louvers with insect screens. The basement area and restroom facilities were abandoned in place and not backfilled. The timber arch truss at the face of the bandshell was replaced with a similar steel arch truss. Bathroom plumbing to the facility was severed and new electrical services were installed.

2003: The band shell remained in service until 2003 when the basement area was filled in with about 18" of crushed limestone and flowable fill up to the bottom of the existing building slab. Two-inch diameter holes at 4' on center, each way

Delhi Township 2101 Aurelius Rd. Suite 2A Holt, MI 48842 517-694-7760	Detroit 535 Griswold St. Buhl Building, Ste 1650 Detroit, MI 48226 313-965-3330	Grand Rapids 81925 Breton Road SE Suite 100 Grand Rapids, MI 49506 616-454-4286	Howell 105 W. Grand River Howell, MI 48843 517-552-9199	Jackson 401 S. Mechanic St. Suite B Jackson, MI 49201 517-292-1295	Kalamazoo 834 King Highway Suite 107 Kalamazoo, MI 49001 269-665-2005	Lansing 215 S. Washington SQ Suite D Lansing, MI 48933 517-292-1488
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was drilled thru the abandoned bathroom concrete floor slab prior to backfilling. The east and west wall windows were replaced with block infill and most of the stucco finish was repaired. The top of stage area was partially scarified, and a new concrete topping system was installed.

2009: Site drainage changes occurred during 2009. Three large wetland areas and two large basins we constructed in close proximity to the band shell, site drainage was improved to accommodate storm flows from west to east and two storm treatment units were installed upstream to provide filtration improving flow characteristics. The band shell structure is located within the 100-year flood plain. No known structural changes occurred to the bandshell and adjacent building.

2015: Due to extensive cracks within the stucco finish applied on the above ground masonry block, the City requested Stantec Consulting Engineers to perform a field inspection to assess if an overall structural safety issue exists or if maintenance work is required. Stantec Consulting Engineers concluded that there was no immediate threat to the structure or public safety, but maintenance work was required.

2021: HRC site scoping meeting and preliminary investigation.

Observations and Photos of Significance:

Test Pit #1 (located in the buildings' southeast corner):

- Nominal excavation area: 5'-3" height by 5'-3" length by 3' width.
- ½" parge coating on exterior surfaces - cement & sand as waterproofing coating.
- Wall section dimensions and details match the "Typical Wall Section" as shown on the original 1938 drawing 5 (see above).
- Full height wall crack in parging noted about 16" west from east corner. Nominal crack thickness was about 0.016 mils. Moisture weeping thru crack in a small steady stream.
- Ground water flowing around the wall corner starting from about 2' below grade to bottom of the excavation.
- Abandoned sanitary line noted below bottom of footing and about 3'-4" from wall corner.
- Abandoned collapsed clay foundation drain project out at about 75 degrees from face of wall.
- No delaminations within the parge coating were noted.
- Several smaller cracks noted throughout excavated wall face.
- Ground water is flowing from underneath the concrete footing.
- Excavated material – wet silt sand with some organics and trace of gravel.
- Clay tile foundation underdrain parallel to the wall face does not exist.
- Concrete perimeter curb at grade – full depth crack noted and matches location of corner crack in wall section above.
- Ground water elevation is above the foundation frost line.

Test Pit #1



Photo 1: Southeast Corner



Photo 3: Weeping Corner Wall Cracks



Photo 2: High Ground Water Table at 27" Below Grade



Photo 4: Saturated Top & Local Erosion Below Footing

Test Pit #2 (located along the east wall at the original door opening):

- Nominal excavation area: 2' height by 3' length by 2' wide.
- Door opening was closed off with a masonry block infill and waterproofed.
- Excavated material – very wet fluid sand backfill material. 100% saturated.
- Several hairline cracks noted in waterproofing cementitious coating.
- Ground water level about 10" higher than that at Test Pit #1.
- Original stairs return wall, off the building corner, was removed (consistent with 1993 construction).
- No delaminations noted in the cementitious waterproofing coating.
- An existing hole that measured about a 1" in diameter was noted at the interface between the original and infill masonry block. Deterioration of the infill block was also noted.
- Ground water elevation is above the foundation frost line.

Test Pit #2



Photo 5: Along East Wall



Photo 6: Damaged and Saturated Door Infill Area

Test Pit #3 (located along the east wall at the north corner):

- Nominal excavation area: 1' height by 2' length by 2' wide.
- Extensive flowing ground water noted at the face of wall and flowing thru the wall cracks.
- Excavated material: very wet fluid sand backfills.
- Ground water surface measured about 1.5' below the perimeter of the concrete curb.
- Steady stream of moisture thru the block wall was noted.
- Ground water elevation is above the foundation frost line.

Test Pit #3



Photo 7: Plan View of Northeast Wall Corner: Saturated Soils and Local Erosion



Photo 8: Saturated Excavated Spoil

Soils Investigation:

In efforts to better understand the characteristics and properties of the soils supporting the building foundations and the changes that have occurred over time, two soil borings were drilled by the G2 Consulting Group. One boring was drilled near the east wall of the building and the other was drilled out of the flood plain about two hundred (200) feet north to the building.

The soils supporting the structure consist of peat / organics, very soft organic silt, loose gray sandy silt that is underlain by medium silty sand – generally classified as poor soils that are susceptible to building movement and settlement. Ground water was noted to be about two (2) foot below grade and confirmed by Test Pit excavations. The soils located about two (200) feet to the north consist of medium compact to compact sand and gravel with traces of silt – generally classified as good soils not susceptible to movement and settlement. Ground water was noted to be about seven (7) feet below grade.

Conclusions and Recommendations:

The bandshell and adjoining building have been in service for over eighty (80) years. Several significant building renovations and site development modifications have occurred throughout the years causing foundation damage to the structure and re-distribution / deterioration to the supporting soils. Based on our preliminary investigation, site investigation, and review of all City provided drawings and documentations we have concluded the following:

1. At the time of investigation, the ground water table inside and outside the building foundation was approximately 2' below grade. Perimeter foundation underdrains were not originally installed. Cracks within the parging waterproofing protective coating have permitted groundwater submergence of the block walls since about 2003. This prolonged submergence has likely caused the Portland Cement material component of the block to become compromised resulting in a loss of the block wall's structural integrity.
2. Flowable fill was placed within the basement up to the bottom of the original floor slab in 2003. Due to the high interior moisture content at and above the frost line and the lack of a building heating system, repeated freeze thaw cycles have changed the flowable fill material into a sand backfill type composition. This sandy type backfill has resulted in lateral pressure being applied on the interior block wall surface along the upper exposed block wall portion and observed by the insitu bowing / horizontal outward deflection of the exposed block. The portion of the block cells filled with grout have also been susceptible to freeze thaw cycles and deterioration of the block and grout has resulted. The upper exposed portions of the block wall can be classified as serious, while the lower non-exposed portions can be classified as poor.
3. The exposed stucco finish contains large areas of delaminations, cracks and deterioration. This type of deterioration is primarily attributed to a.) the high interior moisture content migrating through to the exterior surface of the block seeking a balanced humidity condition and b.) the lateral bowing or deflections of the block causing cracks within the stucco, exposing the internal steel mesh, which then retains moisture and becomes damaged by freeze thaw cycles and expansive corrosion.
4. The prefabricated steel joists, metal lath deck forms and channel strut bridging were mostly encapsulated within the flowable fill installed in 2003. Over time, changing of the flowable fill to more of a sand characteristic (Item #2 above) has permitted moisture reactivity to the steel joists, steel bridging and steel lath forms to occur, resulting in rust, loss of section, and deterioration. Even though these joists were not visible, we expect a loss of joist structural integrity especially along the top flanges.
5. The bandshell and adjoining building are located within the 100-year flood plan and adjacent to wetlands and storage basins. Storm drainage generally travels within West Park from the west to the east. This drainage flows around, below, and within the interior basement area. During the investigation of all Test Pits, the storm drainage water flow had a slow but steady velocity and was not stagnant. Test Pit #1 had observed ground water flow below

the bottom of footing causing local erosion. Knowing the amount of observed flowing ground water and soil saturation around the footings we would expect other local areas of erosion directly below the bottom of the concrete footings. The potential loss of soil bearing pressure from the footing underside is a structural concern.

6. The poor soils supporting the structures' foundation have permitted building movement and settlement. The high moisture content / high water table of the supporting soils are directly related to the amount of freeze thaw damage and deterioration the foundations have sustained.

Based on the above stated conclusions and understanding that preservation of the historical character of the bandshell and adjoining building are the City's primary objective, we recommend that the existing foundations be replaced. Two different foundation replacement approaches for consideration are as follows:

Alternate A:

The bandshell and adjoining building would be temporarily jacked and shored, transported to a location close to the existing but outside of the 100-year floodplain, (see attached Site Location A.1 & A.2), and positioned on new cast in place concrete foundations. The structure would likely be temporarily separated into four main sections for transportation, two for the conical bandshell arch (arch bandshell & sloped roof) and two for the adjoining building (east & west half). Soils information recently acquired indicate that conventional retaining wall style foundations would be appropriate and deep foundations would not be warranted in the new location. The new above ground foundation appearance could match the existing or be slightly different pending the City's needs for maintaining the historical character of the structure. Implementing this alternative would require a specialty building moving contractor and providing a temporary transporting road to the structures' new location. Audience seating could be similar or different and a separate restroom facility could be constructed pending the City's needs. Relocating the structure to a new location close to the existing but outside of the floodplain, we would anticipate the life expectancy of the new foundations to range from about 50 to 75 years. One advantage of Alternate A is that the structure and seating area will be above the 100-year floodplain and the surrounding soils will not remain saturated. One disadvantage is that during relocation efforts the historical structure may be susceptible to damage. As with any rehabilitation project, contingencies should be included for unanticipated / unintended costs. However, this approach would minimize that risk. Anticipated conceptual cost estimates for this alternate are as follows:

• Bandshell and Adjoining Building Relocation and Reassembly	\$250,000
• New Building Foundations	\$650,000
• New Audience Seating and Patio	\$400,000
• New Site: Restoration	\$100,000
• Existing Site: Partial Foundations Demolition and Site Restoration	\$100,000
• Contingencies, Design, and Miscellaneous (35%)	\$525,000
Total Conceptual Cost Estimate:	\$2,025,000

Alternate B:

The bandshell and adjoining building would be temporarily jacked and shored, similarly as described in Alternate A, and temporarily relocated about fifty (50') to the south of the existing foundations to allow construction for new cast in place concrete grade beams supported by a steel helical pier foundation system. Once the foundations are complete the structure would be returned to its original location and placed on the new foundations. This approach would limit the building relocation efforts; however, the surrounding dewatering efforts and existing building foundation demolition efforts would likely be substantial. This foundation system is akin to supporting a waterfront home on stilts. The foundation design and construction would then become more complicated and will need to be waterproofed. Since the structure would remain in the 100-year floodplain, we would anticipate the life expectancy of the new foundations to range from about 30 to 50 years. Because this type of foundation system is more complicated than Alternate A, higher unanticipated / unintended costs should be expected for Alternate B. One advantage of Alternate B is that damage to the historical structure during relocation efforts and changes to the site and audience seating would be minimized. One disadvantage is that the structure remains

in the 100-year floodplain and the surrounding soils will likely remain saturated. Anticipated conceptual cost estimates for this alternate are as follows:

• Site Dewatering	\$125,000
• Bandshell and Adjoining Building Temporary Relocation and Reassembly.....	\$250,000
• Existing Foundation Demolition	\$150,000
• New Building Foundations	\$825,000
• Site Restoration	\$50,000
• Contingencies, Design, and Miscellaneous (35%).....	\$490,000
Total Conceptual Cost Estimate:.....	\$1,890,000

Please note these total conceptual cost estimates include new electrical service only. All other utilities are excluded.

We understand that the City will have limited funds available for this rehabilitation project and as such have presented both Alternate A and B and their respective anticipated foundation service life and conceptual construction costs. Relocating the structure outside the 100-year floodplain (Alternative A) would provide a longer in service life and is our recommended alternative.

If you have any questions or require any additional information, please contact the undersigned.

Very truly yours,

HUBBELL, ROTH & CLARK, INC.

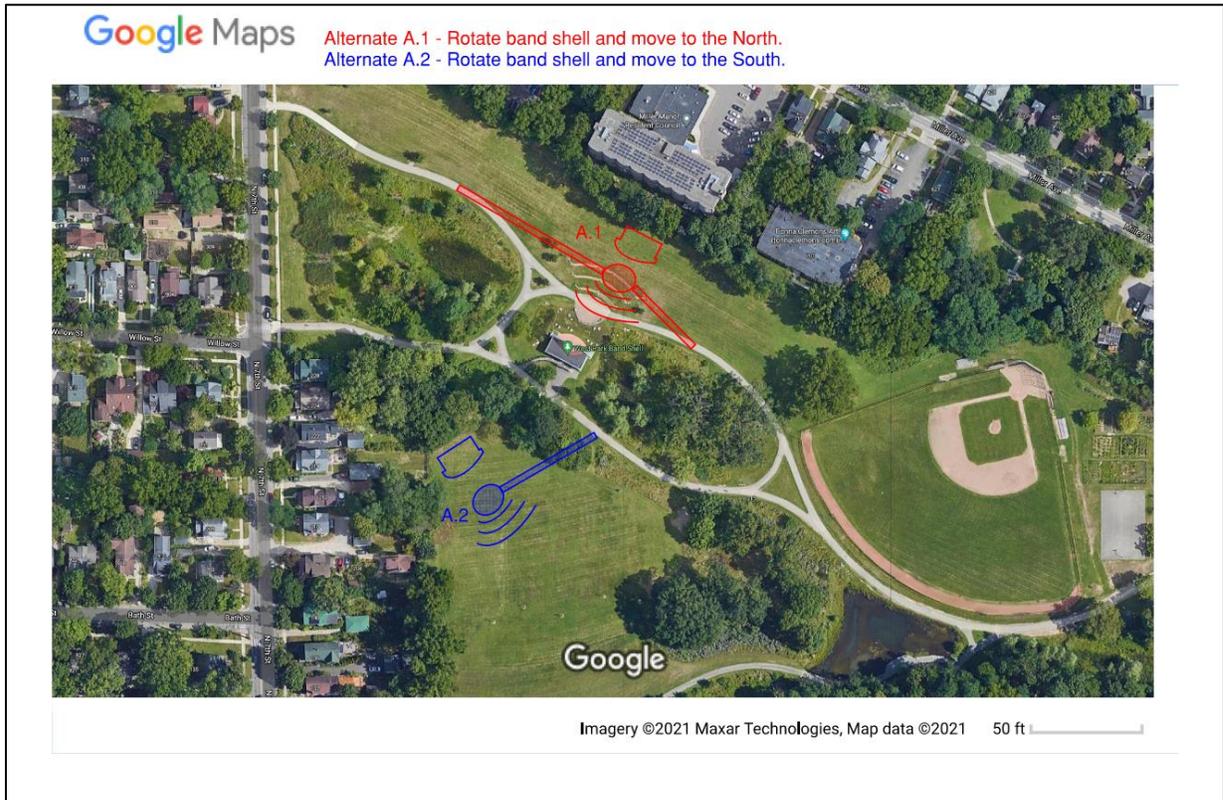


Richard B. Nacey, P.E.
Structural Department Head

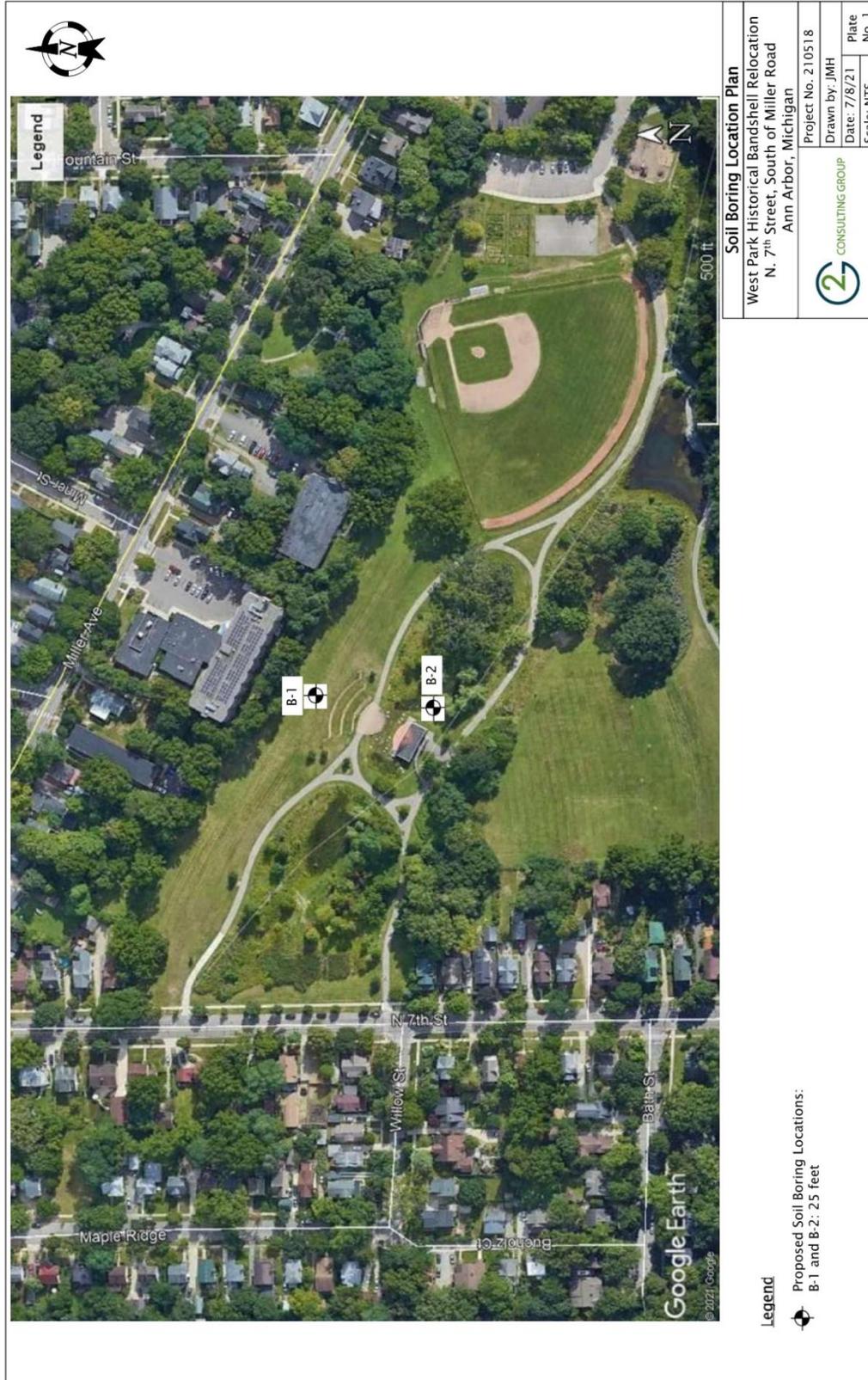
Attachments: Alternate Site Location Maps, Historical Photos, Soil Boring Logs and Plans.

pc: City of Ann Arbor:
HRC; J. Burton, A. Melchior, File

Alternate A - Potential Relocations:



Soil Borings:



Project Name: Proposed West Park Historical Bandshell Evaluation and Relocation										
Project Location: N. 7th Street, South of Miller Road Ann Arbor, Michigan										
G2 Project No. 210518 Latitude: N/A Longitude: N/A										
SUBSURFACE PROFILE				SOIL SAMPLE DATA						
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A		DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
5		(Profile Drilled - No Samples Taken)		5						
				8.5						
10		Medium Compact Brown Sand and Gravel with trace silt		10	S-4	7 7 10	17			
				15.0	15	S-5	6 10 20	30		
15		Compact Brown Gravelly Sand with little silt								
				19.0	20	S-6	9 17 21	38		
20		Compact to Very Compact Gray Gravel and Sand with trace silt								
				25.0	25	S-7	14 22 31	53		
25		End of Boring @ 25 ft								
30				30						
Total Depth: 25 ft Drilling Date: August 6, 2021 Inspector: --- Contractor: Strata Drilling, Inc. Driller: B. Sienkiewicz				Water Level Observation: 8 feet during; 6-1/2 feet upon completion						
Drilling Method: 2-1/4 inch inside-diameter hollow-stem auger										

SOIL / PAVEMENT BORING - 210518.GPJ, 20150116.G2 CONSULTING DATA TEMPLATE.GDT - 8/11/21

Project Name: Proposed West Park Historical Bandshell Evaluation and Relocation		Soil Boring No. B-2							
Project Location: N. 7th Street, South of Miller Road Ann Arbor, Michigan									
G2 Project No. 210518									
Latitude: N/A Longitude: N/A									
SUBSURFACE PROFILE		SOIL SAMPLE DATA							
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Silty Clay with trace sand and gravel (18 inches)	1.5		3				
		Fill: Brown Silty Sand with trace gravel	2.0	S-1	1	3			
		Buried Peat: Soft Very Dark Brown Organic Silt with trace sand, light gray marl inclusions	3.0		2				
5		Loose Brown Silty Sand with trace gravel, occasional soft gray clay seams	5	S-2	4 4 6	10			
6.0		Loose Gray Sandy Silt, occasional clay seams	6.0	S-3	3 2 3	5			
8.0			8.0						
10		Medium to Stiff Gray Silty Clay with trace sand and gravel, occasional sand partings	10	S-4	3 2 3	5			1600**
15			15	S-5	3 3 4	7			3000*
18.0			18.0						
20		Medium Compact Gray Silty Sand with trace gravel	20	S-6	4 7 8	15			
20.5			20.5						
25		Very Compact Gray Silty Sand with trace gravel	25	S-7	12 14 40	54			
25.0		End of Boring @ 25 ft	25.0						
30			30						
Total Depth: 25 ft Drilling Date: August 6, 2021 Inspector: --- Contractor: Strata Drilling, Inc. Driller: B. Sienkiewicz		Water Level Observation: 3 feet during; 2-1/2 feet upon completion							
Drilling Method: 2-1/4 inch inside-diameter hollow-stem auger		Notes: * Calibrated Hand Penetrometer ** Torvane							

SOIL / PAVEMENT BORING - 210518.GPJ - 20150116 G2 CONSULTING DATA TEMPLATE.GDT 8/11/21

Historical Photos:

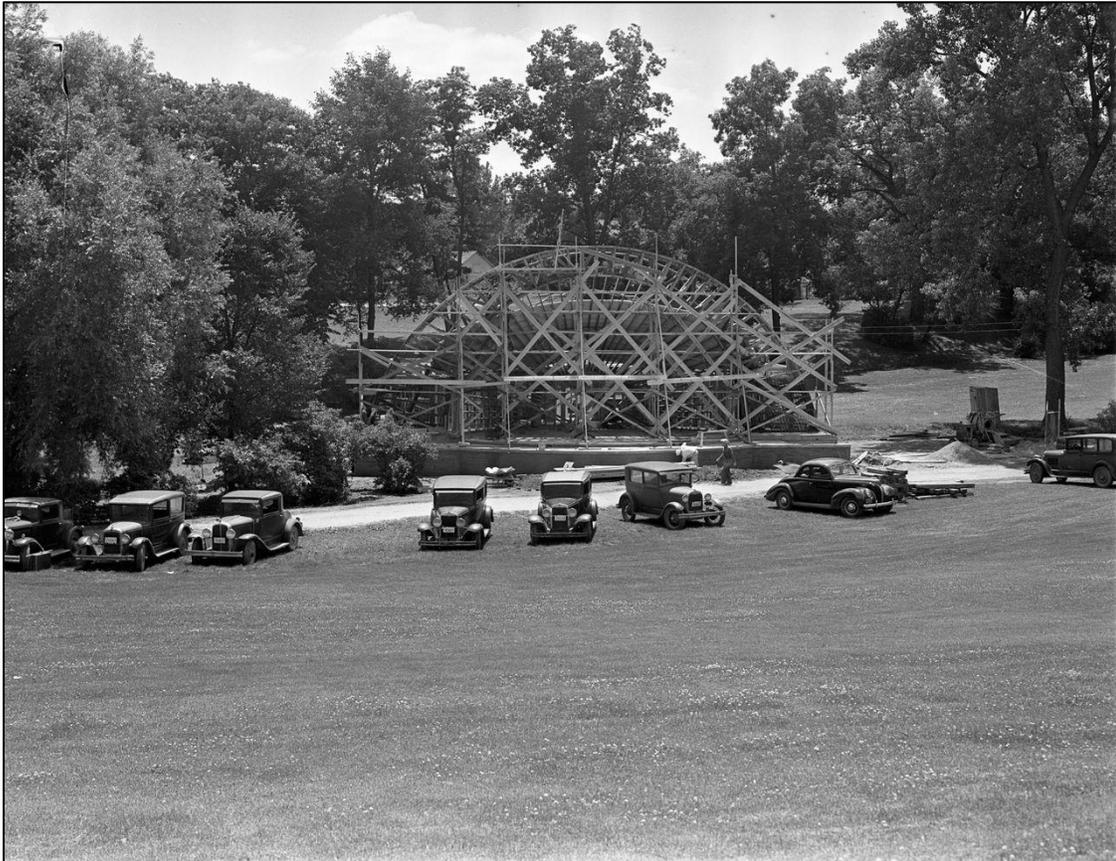


Figure 1: Historical Construction

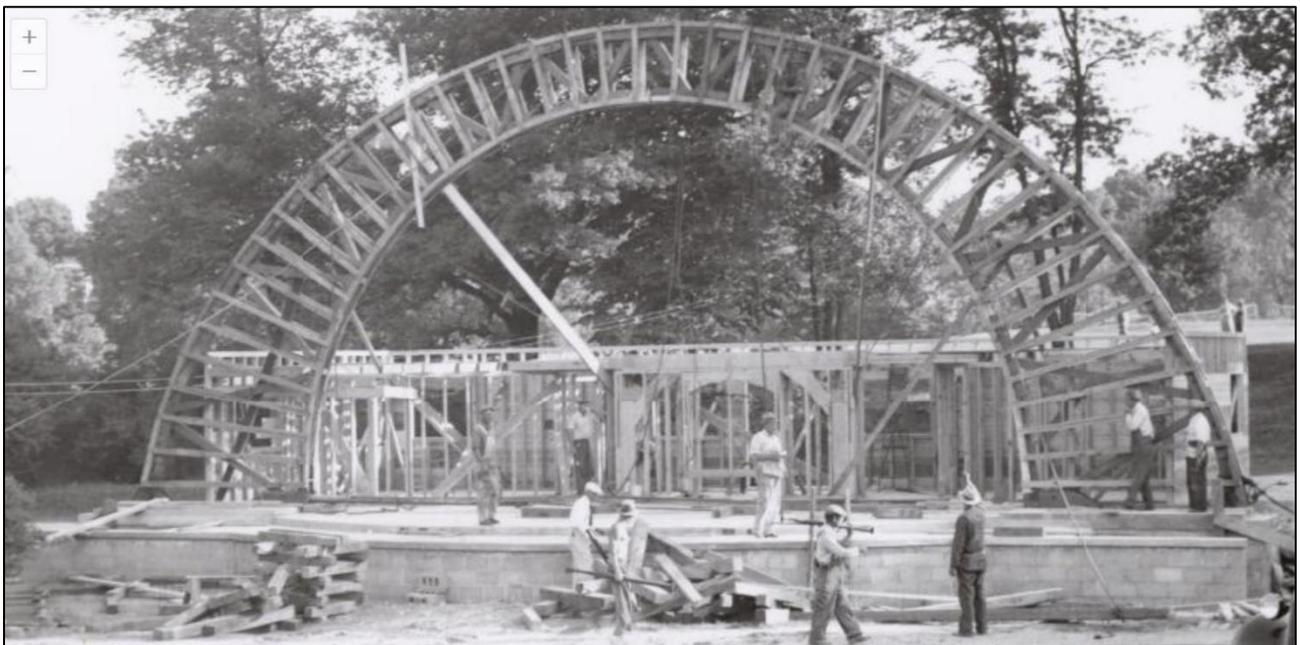


Figure 2: Historical Construction



Figure 3: Historical Construction

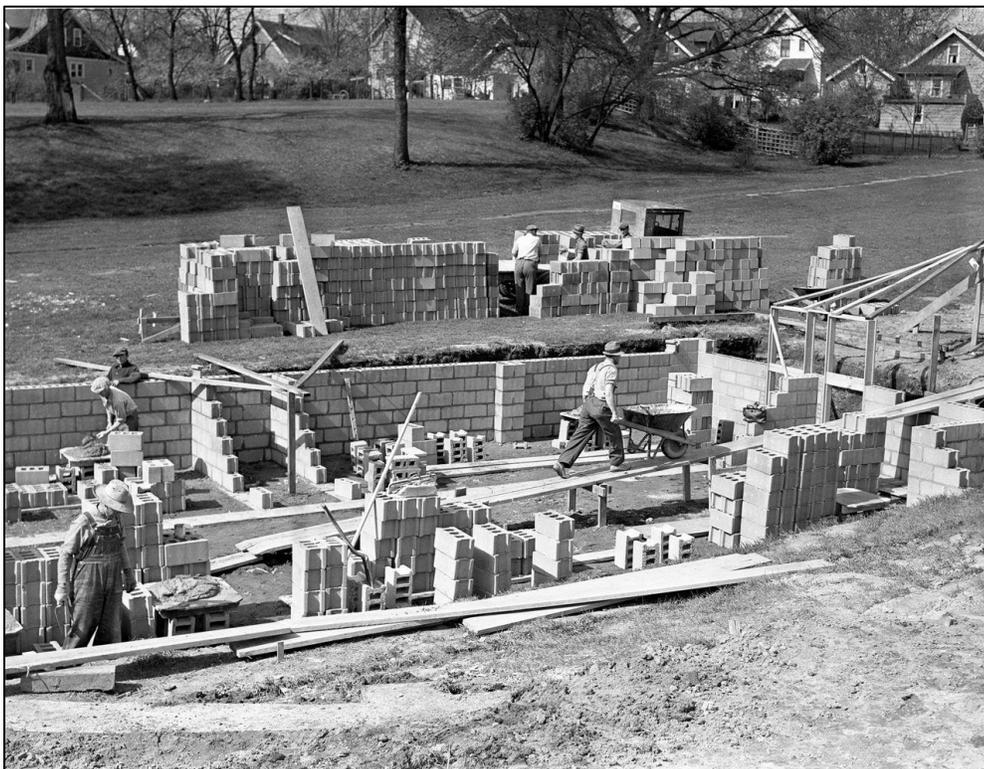
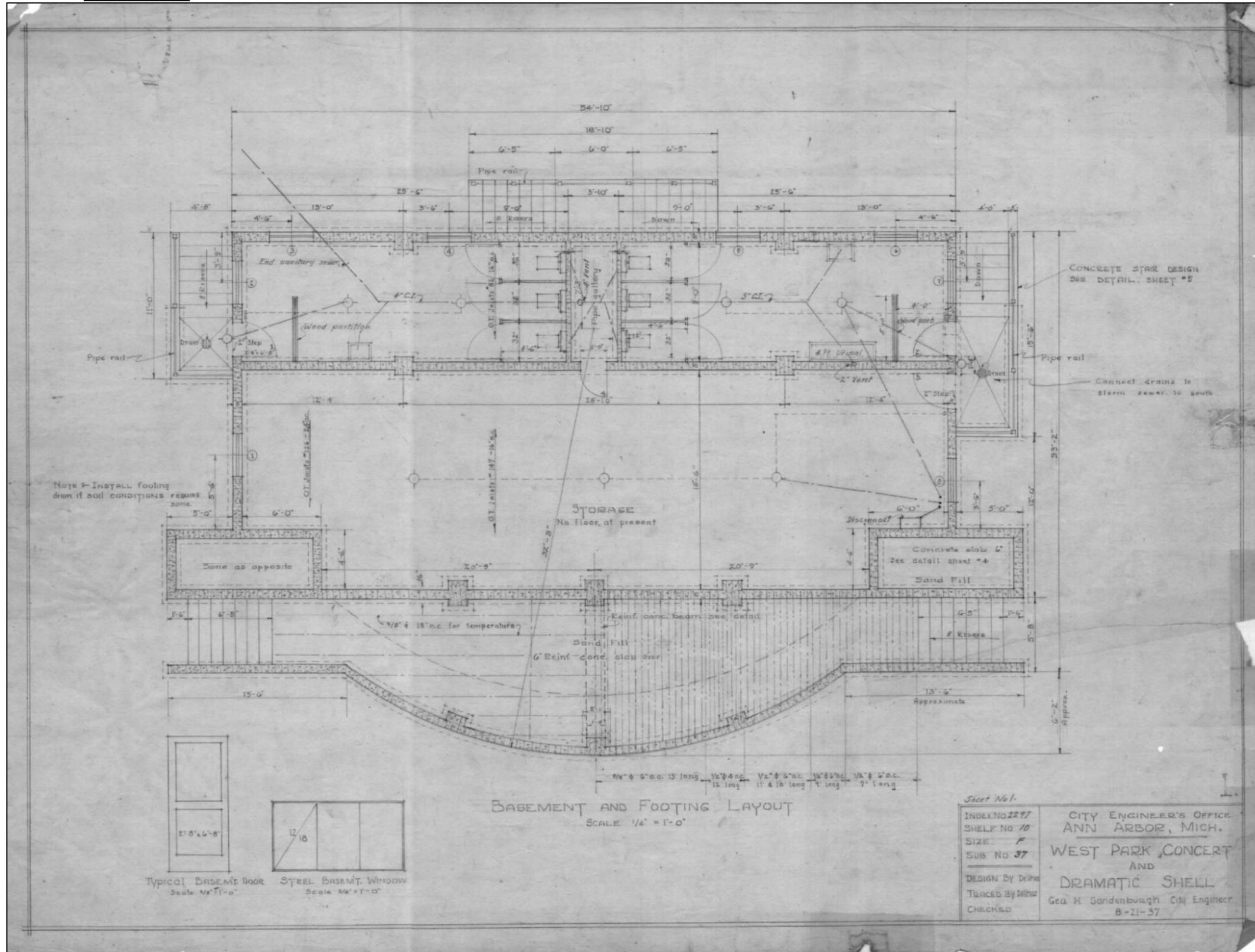
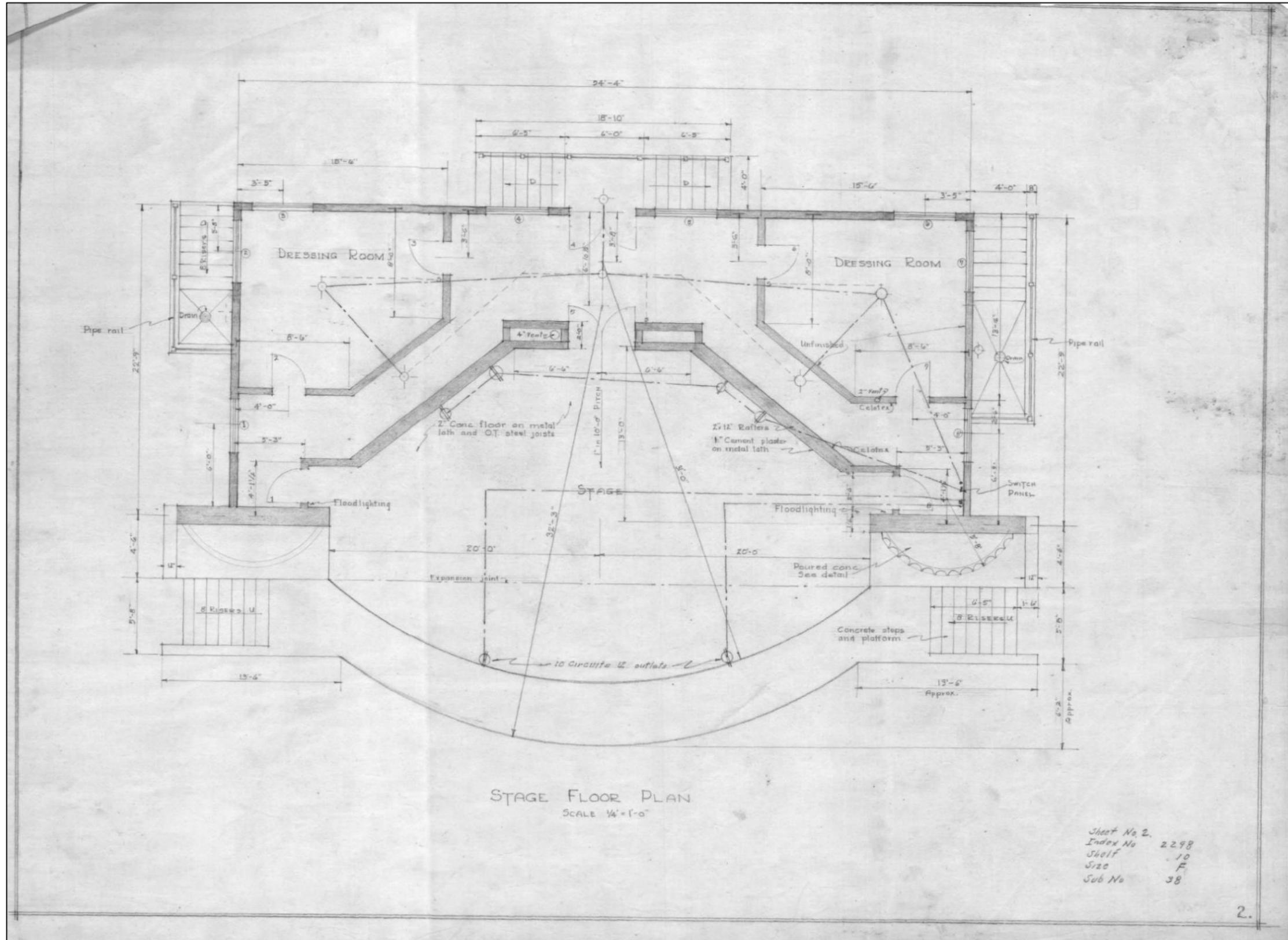


Figure 4: Historical Construction

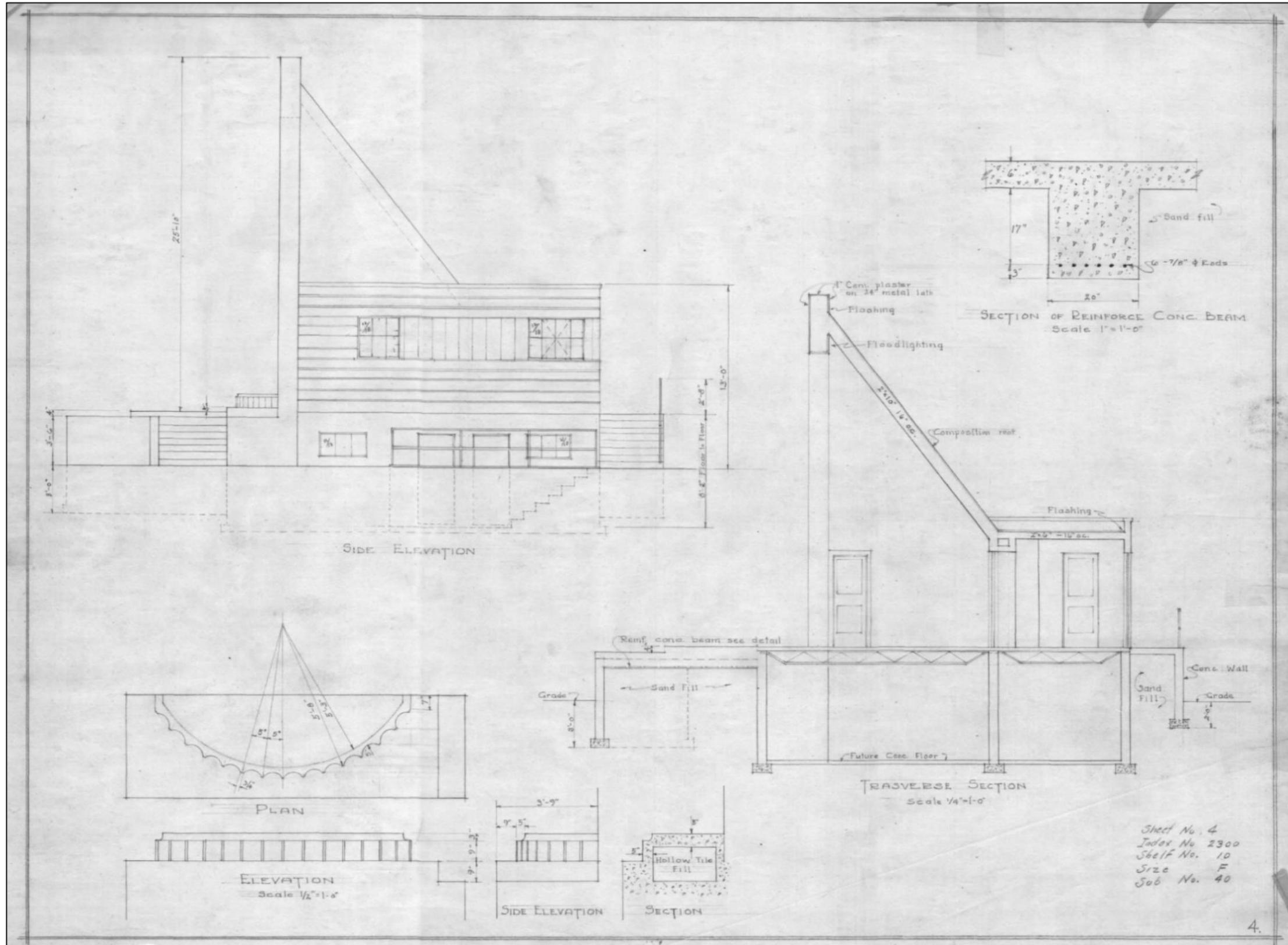
Historical Plans:



Sketch SK-1: Basement and Footing Layout

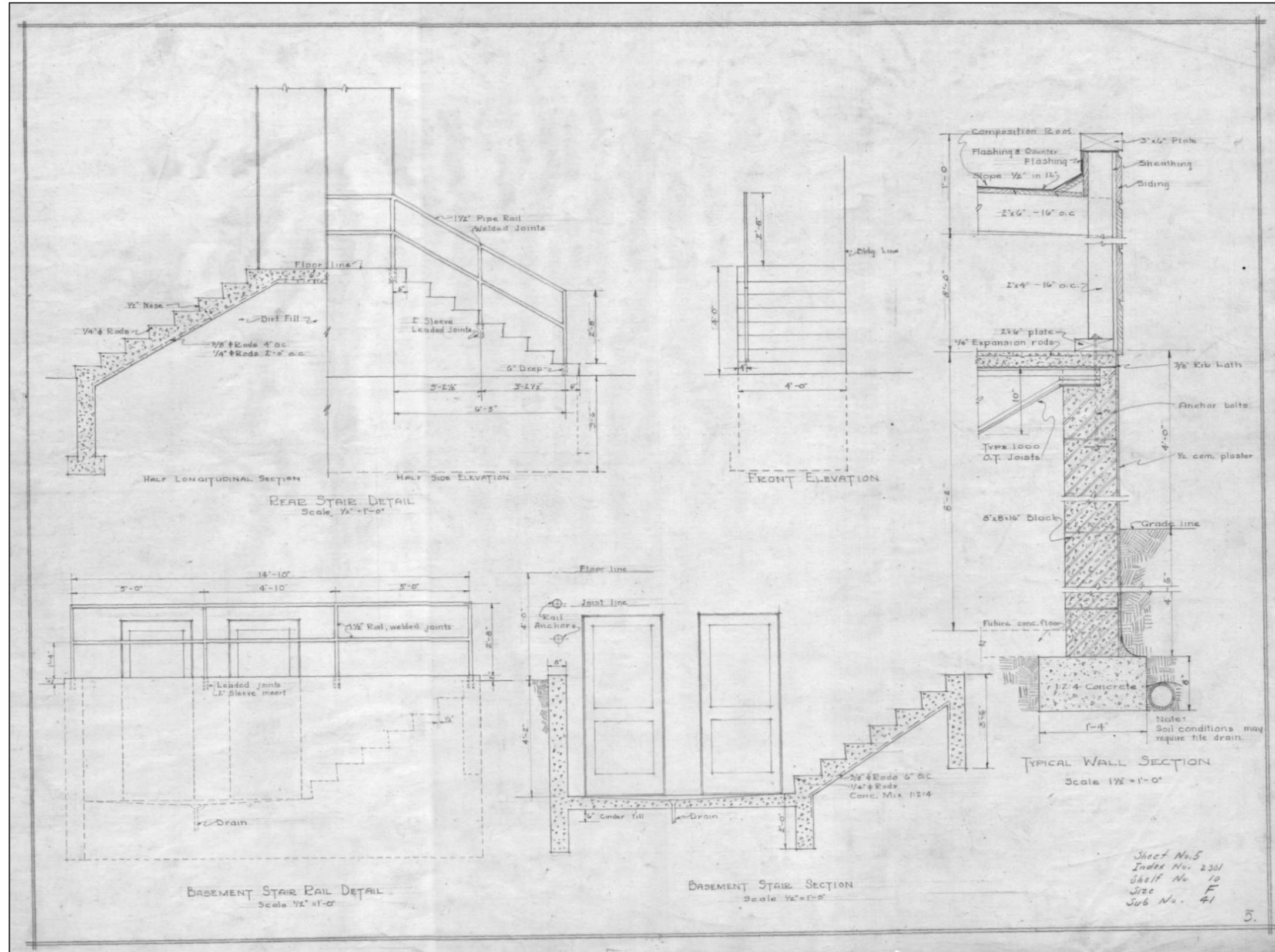


Sketch SK-2: Stage Floor Plan



Sheet No. 4
 Index No. 2300
 Shelf No. 10
 Size F
 Sub No. 40

Sketch SK-3: Sections



Sketch SK- 4: Sections Drawing 5