ENGINEERING
RESOURCE ASSOCIATES

Project:
Naperville Riverwalk
Moser Tower Structural Assessment

Prepared for:
Naperville Riverwalk

NAPERVILLE Riverwalk
FOR GENERATIONS TO COME

April 2017

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ENGINEERING RESOURCE ASSOCIATES, INC.
Consulting Engineers, Scientists & Surveyors

Naperville Riverwalk
Moser Tower Structural Assessment

April, 2017

TABLE OF CONTENTS

EXECUTIVE SUMMARY 2
PURPOSE 5
BACKGROUND 6
LEVEL DESCRIPTION & COMPONENTS 7
INTERIOR & EXTERIOR INSPECTION METHODS 9
OBSERVATIONS & ANALYSES 9
- STRUCTURAL STEEL CORROSION 10
- POST-TENSIONING ANCHORAGE EXPOSURE 16
- PRECAST CONCRETE CRACKING 17
- PRECAST CONCRETE SURFACE DELAMINATION 20
- PRECAST CONCRETE MORTAR JOINT DETERIORATION 21
- SEALANT AND SURFACE DETERIORATION 22
- PLAZA LEAKAGE 23
- OBSERVATION & ANALYSES SUMMARY 25

POTENTIAL REPAIRS & IMPROVEMENTS 26
- CONCRETE REPAIRS (PRIORITY #1) 26
- STEEL CORROSION ABATEMENT (PRIORITY #2) 26
- PLAZA REHABILITATION (PRIORITY #3) 27
- STRUCTURE MONITORING 27
- MAINTENANCE 28
- STRUCTURE ENCLOSURE 28

IMPLEMENTATION ALTERNATIVES 28

APPENDIX A – Moser Tower Interior Inspection performed by ERA

APPENDIX B – Moser Tower Exterior Inspection performed by Collins Engineering

APPENDIX C – Original Architect's Drawings by Charles Vincent George Design Group (9/2/99)

APPENDIX D – Improper Storage and Handling Damage (10/25/05)
Construction site observations and photos

APPENDIX E – Naperville Carillon Structural Cracks Consulting Report prepared by ESI (3/1/2006)

APPENDIX F – Repair Details
Structural Steel Corrosion Abatement and Post Tensioning Cable Anchorage Protection Drawings

APPENDIX G – Preliminary Opinions of Cost

Naperville Riverwalk
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EXECUTIVE SUMMARY

This report provides a comprehensive assessment of the current condition of the Moser Tower's structural elements. The assessment focuses on the interior and exterior portions of the tower which were analyzed by visual inspections performed by experienced staff. The interior inspection of the structure was performed by Engineering Resource Associates, Inc. (ERA) and the exterior inspection was performed by Collins Engineers, Inc. (Collins) as sub-consultants to ERA.

The original architectural design drawings prepared by the Charles Vincent George Design Group in 1999 were referenced to guide the interior and exterior inspections and to inform the inspections regarding structural connections encased in concrete or otherwise hidden from view. The City of Naperville Reserve Study prepared by Joseph C. Renn, PE was also instructive regarding the Moser Tower's history.

The Moser Tower's structure is composed of individual precast, prestressed concrete sections that have been post-tensioned together to form four major vertical pillars. The four pillars have been laterally braced together with seven structural steel rings intermittently spaced over the tower height. A review of the precast concrete shop drawings would help identify how these connections were made. The precast concrete shop drawings were not available for us to reference; therefore, any such changes are unknown at this time.

Appendices A and B each include a comprehensive summary of interior and exterior visual observations along with corresponding photos. Appendix C includes the original architect's drawings prepared by the Charles Vincent George Design Group.

Moser Tower was constructed in 1999 and 2000 by the Millennium Carillon Foundation. The Tower was originally intended to be an enclosed building to a height of 72'9" above ground level. Construction was terminated due to a lack of adequate funds. At that time, the main structure had been erected. Site grading, electrical service, lighting, fire alarm system, and carillon cabin access were incomplete. Over the next four years, several concrete pieces broke loose and fell from the structure. Several repair attempts were made with epoxies, sealants and other materials with little success. In 2005, the City retained a consultant to investigate the cause of the spalling concrete. The report identified that grout expansion within pockets of the precast concrete elements of the structure was the primary contributing factor leading to freeze-thaw damage and further spalling. The full report outlining the details of this investigation may be found in Appendix E. The last documented occurrence of concrete pieces falling from the structure was in 2005.

In 2005, the City of Naperville assumed responsibility for construction of the project bringing the structure to completion. In doing so, the portion of the Tower below the 72'9" level was converted to an exposed structure, associated mechanical systems were deleted, and site work was simplified. A significant consequence of that decision was that completed structural steel to precast concrete connections, which were originally intended to be protected from the weather, were now exposed. All of the steel connections now exposed to weather are, therefore, more susceptible to corrosion. This corrosion is particularly serious where moisture trapped between steel and concrete leads to plating of the steel,

associated volume expansion of the embedded steel, and cracking of the concrete where the connection is responsible for structural lateral stability. Another consequence of converting the lower portion of the Tower to an exposed structure was that the elevator was no longer protected by an enclosure which may shorten the length of its useful service life.

It is now evident that weather intrusion has caused premature corrosion and deterioration of the structure. Improper storage and handling of many of the precast concrete panels between the first and second phases of construction caused extensive cracking and chipping. These deficiencies were repaired with mortar and patches which are now showing signs of deterioration and failure. Further, the current degree of surface erosion in some of the precast concrete panels appears to be an indicator of poor quality concrete. Photographs of these observed deficiencies are included in Appendix D.

In our professional opinion, the primary structural risks are:

1. Deteriorated concrete patches and cracked concrete failures leading to falling concrete without notice.
2. Reduction in lateral structural stability due to structural steel connection corrosion between the precast pillars, fins, and the seven structural steel rings.
3. Structural damage due to steel stair, steel platform, steel railing, and reinforcing bar corrosion from weather intrusion and leakage.

Based upon our investigations and observations of the structure, in order to repair deficiencies and to prevent further deterioration which threatens the structural integrity of the Moser Tower, we recommend continued close monitoring and addressing of the following primary issues.

- Structural steel corrosion
- Post-tensioning anchorage exposure
- Precast concrete cracking
- Precast concrete surface delamination
- Precast concrete mortar joint deterioration
- Sealant deterioration
- Plaza leakage

It is anticipated that addressing these issues will require a combination of maintenance, rehabilitation and replacement of certain elements. Structural details showing the type and extent of potential improvements are included in Appendix F.

Several alternatives to repair and rehabilitate the structure were evaluated. The following is a summary of each alternative and their estimated costs. Preliminary engineer’s opinions of probable construction costs are provided in Appendix G. Costs outlined in these estimates are conceptual in nature, provided in present worth dollars and shall be refined during the design phase.

Alternative 1A – Repair Existing Structure (Single Phase) $ 2,785,000

Alternative 1B – Repair Existing Structure (Multiple Phases) $ 3,058,000

Alternative 1 includes repair of identified defects as described in the report to address structural steel and concrete issues as either a single phase or multiple phase project. The primary advantage of this alternative is that it addresses issues that have led to continued, accelerated deterioration of the structure. The primary disadvantage is that it is significantly more expensive than continued maintenance and parts of the structure that were intended to be enclosed will continue to be exposed to the elements.

Alternative 2A – Enclose and Repair Structure (Single Phase) $ 3,547,000

Alternative 2B – Enclose and Repair Structure (Multiple Phases) $ 3,750,000

Alternative 2 includes repairs described in Alternative 1 plus enclosure of the lower portion of the structure as it was originally designed as either a single phase or multiple phase project. The primary advantage of this alternative is that it addresses identified structural issues and protects the lower portion of the structure from continued exposure to the elements. The primary disadvantage is that it is the most expensive alternative.

Alternative 3 – Structure Maintenance & Decommission Structure $1,576,000

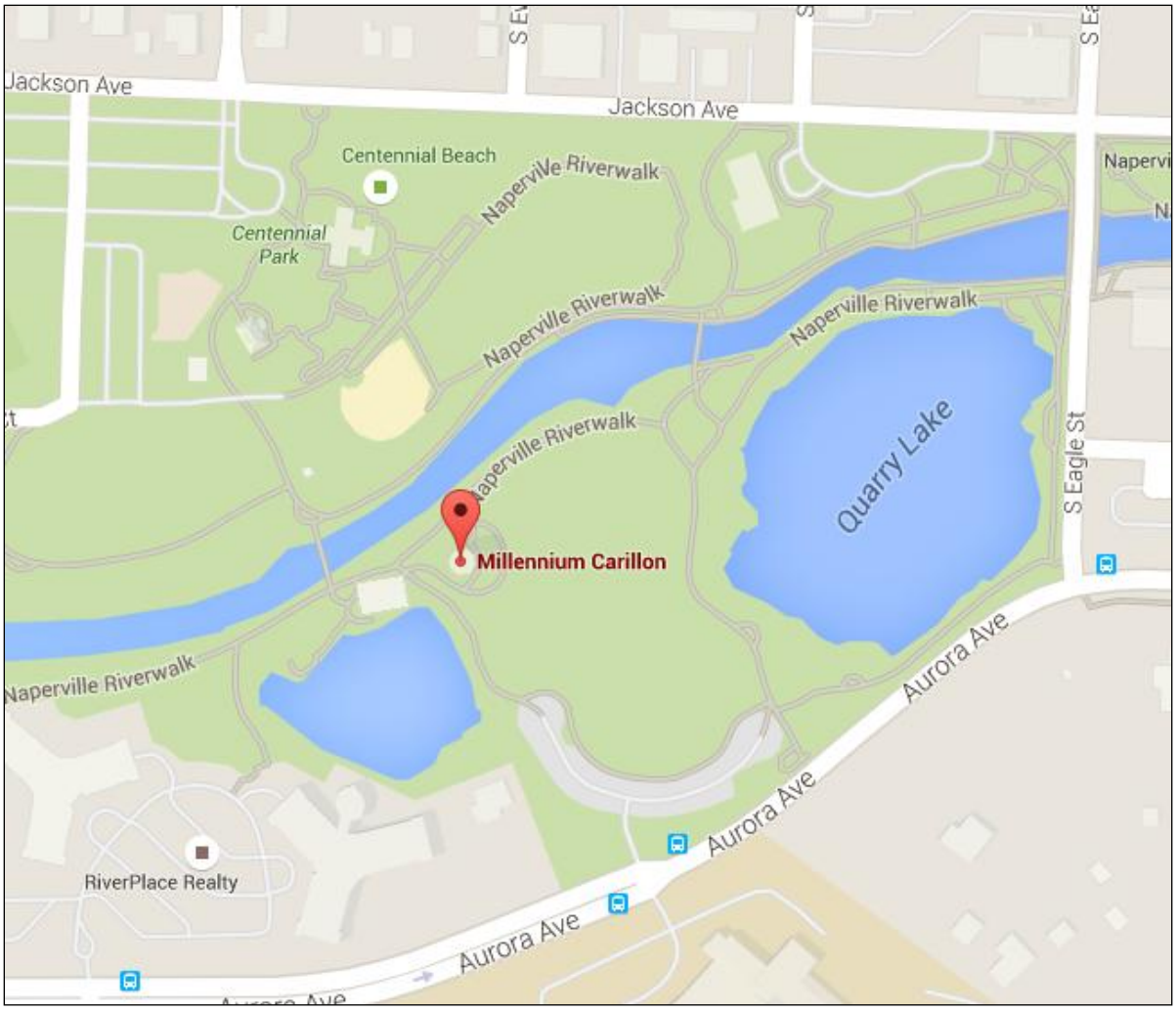
This alternative involves simple maintenance measures to keep the structure in operation including plaza membrane repairs; concrete panel surface and crack repairs; mortar joint repairs; structural steel cleaning, reinforcing and painting; anchorage flashing repairs and replacements; and sealant replacements. The primary advantage of structure maintenance only is that it delays much more significant expenditures to repair identified defects or to enclose the structure as originally designed. The primary disadvantage is that the structure will continue to deteriorate at defect and exposed locations and it does not address potentially imminent concrete spalling issues.

At some point, maintenance may become too expensive and the structure may need to be decommissioned; therefore, this alternative also includes the dismantling and removal of the entire structure and restoration of the site to a grassed condition. This would involve a one-time expenditure to decommission the structure and would end the use of the Moser Tower and the Millennium Carillon.

Naperville Riverwalk
Moser Tower Structural Assessment
April, 2017

PURPOSE

The purpose of this investigation and report is to substantially define the Moser Tower's current structural condition and to develop recommendations for potential repairs to deter further deterioration and extend the structure's useful lifetime.



Project Location
Image courtesy of Google Maps

BACKGROUND

In 1999, the Moser Tower and Millennium Carillon was conceived and adopted by the local community as a civic symbol to mark the entry into the 21st millennium. The initial concept was that the 160 feet tall tower would house a 72 bell carillon, a small exhibition center, and represent a public amenity to complement the adjacent Riverwalk and parks.

The tower comprises a reinforced concrete foundation which supports a composite architectural pre-cast concrete façade with an integral structural frame. The tower was planned to be enclosed with glass up to the 72'9" level, and the interior atrium so formed to be mechanically heated, air conditioned, and ventilated. The entire enclosed area would be protected with an automatic fire sprinkler system and fire alarm system.

Construction on the tower commenced in 1999 and was terminated in 2001 due to lack of funds. The structural work completed included concrete foundations, the steel tower structure, the precast concrete façade, structural steel for the elevator shaft and proposed roof at 72'9" above ground level. Major rough site grading was completed plus an access road but the majority of sidewalks, steps, retaining walls, lighting, a water feature, etc. were not completed. The carillon cabin was enclosed and temporary heating and air conditioning installed. Carillon bells, clavier and controls were installed and operational.

The final construction cost for Phase I construction was approximately $3,820,000. This included architectural, engineering and construction administration costs. In 2004, the City developed a completion plan for the tower that would result in substantially less cost to complete construction and result in less operational costs. The concept included:

1. Converting the building to an exposed structure by eliminating the glass panels between ground level and 72'9" above ground level.
2. Deletion of the mechanical, heating, air conditioning, ventilation, and fire protection sprinkler systems required for an enclosed structure.
3. Simplifying the site work and concrete retaining walls and eliminating the water feature at the base of the tower.

In 2005, prior to completing Phase II work as outlined above, the City retained a consultant to investigate the cause of the spalling concrete. The resulting report identified sulfate attack in grout pockets as the contributing factor. The sulfate attack caused the grout to expand and the expansive forces exerted on the precast concrete surrounding the grout pockets caused initial cracking in the concrete. Water was then allowed to enter the cracks which led to freeze-thaw damage and further spalling. Recommendations were made in the report to remove all the grout from these pockets at locations where spalling occurred, remove unsound spalled concrete and develop a repair plan to replace the spalled concrete and deteriorated grout. In general, all unsound grout and concrete were removed; however, grout was not removed at all locations. Grout work only occurred where concrete was spalling. Grout removal at all locations would have required substantial structural review and likely temporary support well beyond the scope or budget of the repair project and, therefore, was not completed.

Phase II work was completed in 2007 at a cost of approximately $3,300,000. This cost included all architectural, engineering and construction administration costs.

LEVEL DESCRIPTIONS & COMPONENTS

As shown in Figure 1, the Moser Tower consists of above and below grade levels. Each level consists of a combination of concrete and steel components. Structural observations detected and documented during the interior and exterior inspections are catalogued by level and are included in Appendices A and B.

The primary structure is composed of four precast, post-tensioned, concrete and steel columns. The post-tensioning was designed to place the components under high compression stresses in order to provide resistance to wind and seismic bending stresses. Post-tensioning cables are anchored at each end of the columns and fins. Cable anchorage is critical to structural stability. The four post-tensioned columns are laterally braced with seven polygon shaped, high-strength, steel tube compression rings. The seven compression rings are critical to structural stability. Based upon our inspections, water intrusion and onset corrosion is evident at many of the compression rings. The connections between the four post-tensioned columns and the seven polygonal compression rings are key stability components. The locations of these features are also shown in Figure 1 below. Figures 2 and 3 include cross-sectional plan views of Moser Tower at each level. Figure 4 shows how columns were inspected and documented from the interior of the structure.

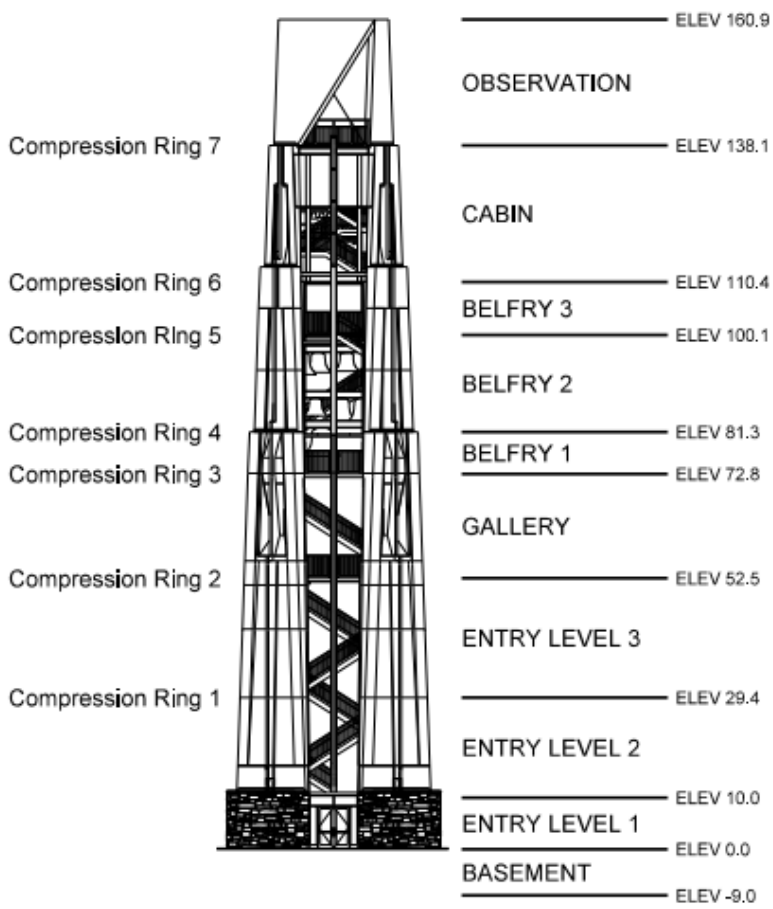


Figure 1: Elevation View Looking West

This drawing is taken from the Charles Vincent George Design Group drawings.

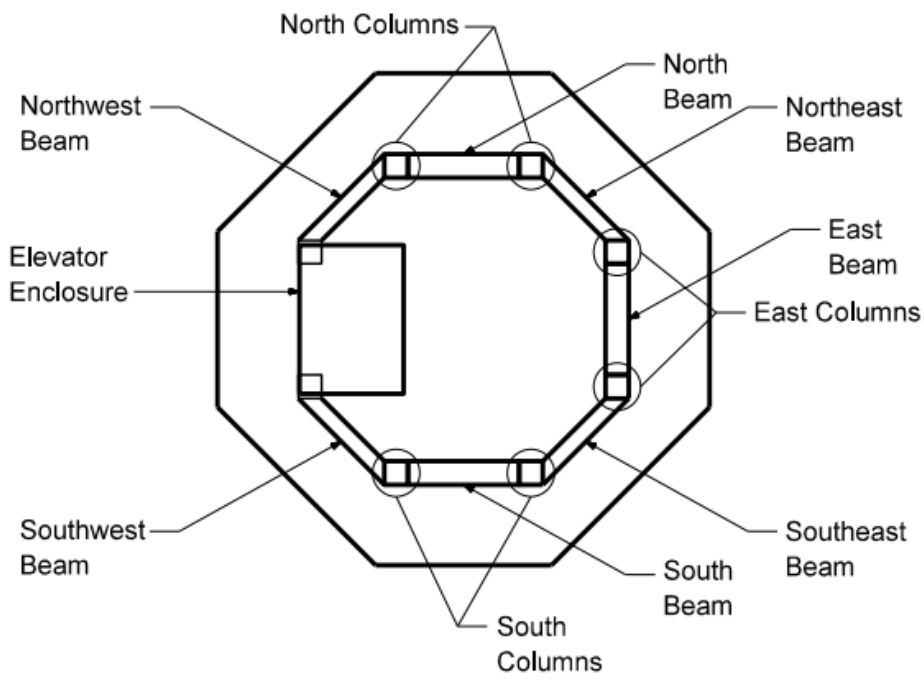


Figure 2: Typical Plan View for Basement Level

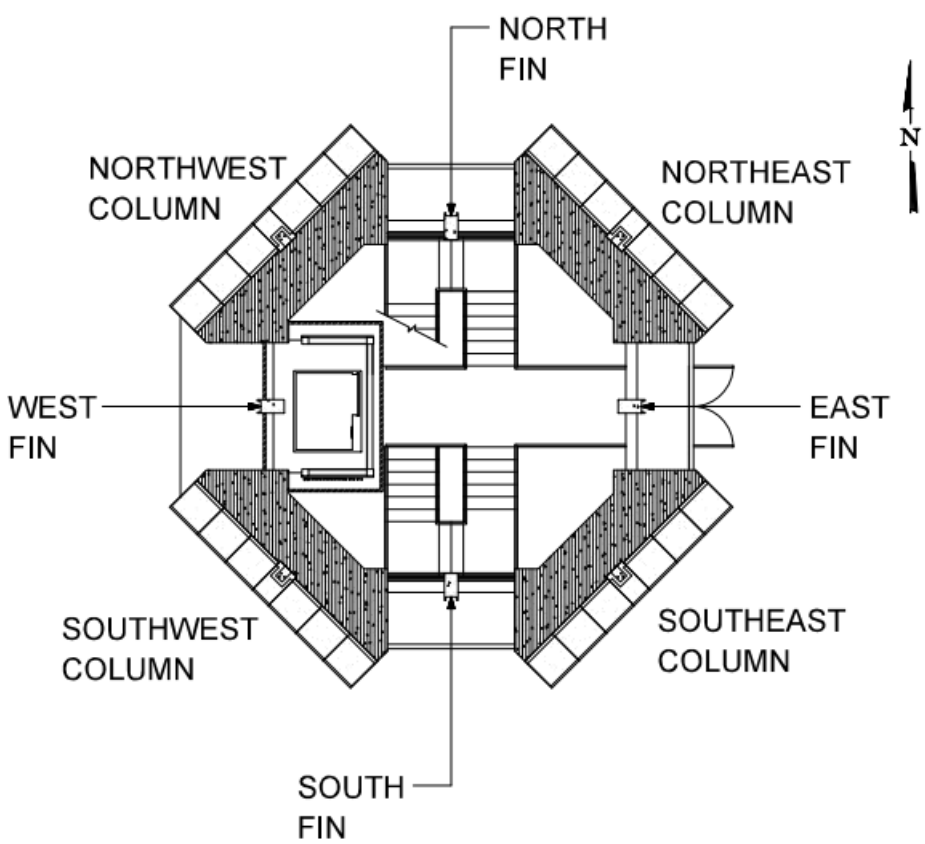


Figure 3: Typical Plan View for Entry Level 1 to Cabin Level

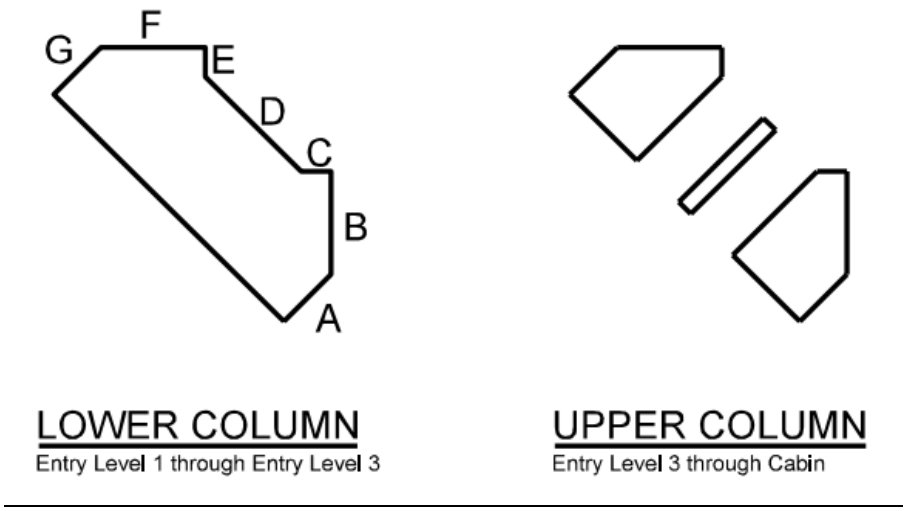


Figure 4: Typical Plan View of Concrete Columns

INTERIOR & EXTERIOR INSPECTION METHODS

Structural engineering inspections were visually performed from the ground, interior stair and platform structures, and by rappelling down the exterior of the structure. Structural elements evaluated include precast concrete columns and fins, steel support structures, and steel and concrete surfaces of the stairs and observation decks.

The interior inspections of Moser Tower were completed by ERA between July and September, 2015. Interior facing elements, stairs and platforms were inspected individually within each level of the structure as shown in Figure 1. Visual observations were documented and inventoried including photographs of accessible elements. This information is provided in Appendix A.

The exterior inspection was completed by Collings by rappelling down the tower on August 25, 2015. This work was overseen by ERA to coordinate inspection and documentation procedures. Exterior facing concrete and steel elements were also inspected at each level as shown in Figure 1. Concrete was sounded with an inspection hammer to determine areas of delamination and to identify areas of apparent deterioration and/or distress. This information is provided in Appendix B.

OBSERVATIONS & ANALYSES

Observations were visually performed from the ground, the interior stairs, platform structures, and by rappelling down ropes along the exterior. Identified defects and damages generally include structural steel corrosion, post-tensioning anchorage exposure, precast concrete cracking, precast concrete surface delamination, precast concrete mortar joint deterioration, sealant deterioration and plaza leakage. Information collected and included in Appendices A and B are summarized below.

STRUCTURAL STEEL CORROSION

The structure exhibits two types of embedded steel corrosion.

Photograph #1: Embedded Steel Corrosion, Gallery Level

The first type of embedded steel corrosion is evident where steel plates are cast into precast concrete components as shown in Photograph #1. Weather intrusion through concrete cracks and pores caused by spalled aggregates can cause corrosion on the backside of the connection plates as evidenced by rust stains flowing down the face of the concrete. These plates are anchored to the concrete with steel studs which are also subjected to premature corrosion and continued deterioration. Weather intrusion must be prevented in order to prevent further loss of structural integrity.

Photograph #2: Structural Steel Corrosion, Entry Level

The second type of embedded steel corrosion is shown in Photograph #2. Steel angles were field welded to polygonal compression rings and platform framing to act as retainers to laterally support the concrete columns and fins. Weather intrusion has caused premature steel corrosion where water has been trapped between the concrete and the steel elements.

Photograph #3: Structural Steel Corrosion, Observation Level

As shown in Photograph 3, the polygonal compression ring connects at a notch in the precast concrete component. This notched area can be soaked from wind driven rain which causes steel corrosion and freeze-thaw deterioration of the concrete.

Photograph #4: Base plate corrosion and staining in Basement

Photograph #5: Corrosion, Cracking, and Aggregate Popping at Polygonal Compression Ring #6 Connection

Photograph #6: Corrosion and Warpage between Steel Angle and Polygonal Compression Ring #2

Photograph #7: Corroded Connection between Polygonal Compression Ring #4 and Precast Concrete Column

Corrosion of steel is problematic to precast concrete structures where the welded steel connections are exposed to weather. Exterior surface corrosion is relatively easy to clean and prevent. Embedded steel corrosion is more difficult to rehabilitate.

Photograph #8: Concrete Surface Deterioration, Poor Overhead Weld, and Embedded Steel Corrosion at Entry Level

Photograph #9: Concrete Deck Angle Corrosion at Steel Beam Top Flange at Gallery Level

Where wind driven rain becomes trapped between steel beams and angles, corrosion will result. Additionally, de-icing salts carried into the tower by foot traffic can also cause steel corrosion in platform and walking areas

POST-TENSIONING ANCHORAGE EXPOSURE

Photograph #10: Exposed Post-tensioning Cable Anchorage

Post-tensioning cable anchorages are visible at the top of the precast concrete fins. Plastic anchorage cups were placed over the holes grouted. Poor seals and leaks make them susceptible to rain intrusion and freeze-thaw damage. Preventing corrosion of these anchorages is critical to the structural integrity of the Moser Tower.

PRECAST CONCRETE CRACKING

Photograph #11: Crack Repair Deterioration and Cracking, Cabin Level

It is evident that extensive repairs of chips and cracks were made to the precast concrete components during both phases of construction of the Moser Tower. As shown in Photograph 4, many of the repairs and patches are showing signs of deterioration and separation from the main structure. Some of these repairs have reached the end of their useful life.

Photograph #12: Aggregate Popping Freeze-Thaw Damage, Belfry Level

Many surface holes in the Moser Tower concrete elements appear to be the result of poor aggregate choices, improper consolidation, and poor concrete consolidation around the aggregates within the concrete. Cement paste must fully encapsulate the aggregate or the result is exposed aggregate. Exposed aggregates are susceptible to popping out due to ice formation behind the aggregate from weather intrusion. Driving rains have the ability to penetrate behind the aggregate during warmer days. The trapped water can then freeze during colder nights, and pop out pieces of aggregate.

Photograph #13: Cracking and Aggregate Popping

Photograph #14: Cracking, Efflorescence, and Aggregate Popping; Top of the Northeast Column

Photograph #15: Cracking and Aggregate Popping, Northwest Column

PRECAST CONCRETE SURFACE DELAMINATION

Photograph #16: Delamination and Cracking, Southwest Column

PRECAST CONCRETE MORTAR JOINT DETERIORATION

Photograph #17: Mortar Loss at West Fin

We were not able to visually determine conclusively if compression stresses from post-tensioning of concrete elements are being transferred across mortar joints. Post-tensioning shop drawings were not available at the time of our investigations. The details typically included in precast prestressed concrete panel shop drawings would provide answers to these questions.

There are two likely possibilities. First, the compression stresses from the weight of the panels and the post-tensioning cables could be transferred through steel inserts designed to carry the entire load. Second, the precast concrete sections may have been shimmed for erection with the joints mortared prior to tensioning the cables. In the second case, the mortar joints are critical to stability.

Hence, compression stresses from dead load and post-tensioning stresses may require competent mortar joints. Observed mortar loss at some locations may be caused by these stresses in combination with cyclic freeze-thaw damage.

SEALANT AND SURFACE DETERIORATION

Photograph #18: Waterproofing Deterioration; 3rd Step of the Northeast Column

Waterproofing at the tops of precast concrete components appears to be at the end of its useful life.

Photograph #19: Surface deterioration at stair treads.

PLAZA LEAKAGE

Water leaking through the plaza waterproofing membrane drains through the concrete structural slab and slab cracks, carrying lime liberated by the concrete hydration process. As the lime-laden water evaporates, white lime staining remains on the concrete surfaces. As shown in Photograph #23, water draining through the structure contacts embedded steel and reinforcing bars causing premature corrosion and rust staining.

Photograph #20: Free Lime Staining in Basement due to Plaza Leakage

Photograph #21: Free Lime Staining in Basement due to Plaza Leakage

Photograph #22: Electrical Room Leakage in basement at underside of Plaza.

Photograph #23: Embedded steel corrosion and staining in Basement

OBSERVATIONS & ANALYSES SUMMARY

In summary, the conversion of the Moser Tower from a partially enclosed structure to an open structure has subjected many of the structural components to moisture intrusion from wind driven rain. Exposed structural steel, embedded steel in proximity to cracking and aggregate popping and non-structural metals are being subjected to premature corrosion and continued deterioration. In addition to increased, ongoing maintenance costs, if unaddressed, these issues will eventually seriously threaten the structural integrity of the Moser Tower.

The four precast concrete post-tensioned columns depend upon the seven polygonal compression rings for structural stability. Hence the ring to concrete connections must be maintained in good condition.

Exposed structural steel is generally accessible for cleaning and painting. However, repairs can be complicated by the height above horizontal floors or platforms. Embedded steel is more difficult to repair and maintain, and requires temporary shoring and bracing, concrete removal, cleaning, painting, and concrete rehabilitation. Rust staining caused by moisture trapped between steel surfaces or between steel and concrete surfaces will lead to corroded metal expansion, cracking of contact concrete, and eventual loss of structural connection. These conditions are primary concerns and will require repairs or periodic, continued inspection and substantial future repairs.

POTENTIAL REPAIRS & IMPROVEMENTS

Below are summaries of potential repairs and other improvements that may be performed to address deficiencies and to prevent further deterioration which threatens the structural integrity of the Moser Tower.

CONCRETE REPAIRS (PRIORITY #1)

Concrete repairs are recommended as the top priority due to the risk of falling concrete, the need to preserve the concrete pillars, and abatement of original construction latent defects. These resolutions include:

1. **Removal of Loose and Cracked Concrete:** Loose and cracked concrete are the result of previous repairs reaching the ends of their useful lives, cracks that have propagated as a result of previous cracking, newly formed cracks as a result of steel connection corrosion, and cyclic freeze-thaw damage.
2. **New Repairs with Higher Quality Materials:** Modern latex modified mortar repair materials have a high degree of adhesion, denser material matrices, and higher strengths. The use of these types of materials will lengthen the concrete lifecycle.
3. **Surface Rehabilitation:** Surfaces that have suffered from weather erosion now exhibit exposed aggregates. These aggregates are now susceptible to freeze-thaw damage, particularly during rainy winter days followed by below-freezing winter nights. Surface applied modified mortars will preserve the aggregates and extend the panel lifecycle.
4. **Cracked and Missing Mortar Replacement:** The mortars either simply fill the horizontal joints, transfer compression stresses, or both. Replacement will return this structural component to its original condition.

STEEL CORROSION ABATEMENT (PRIORITY #2)

Steel corrosion must be abated to maintain structural stability. The Tower depends upon the seven horizontal compression rings for stability of the four precast prestressed concrete pillars. The corrosion abatement resolutions include:

1. **Remove and replace embedded steel:** At the locations where corrosion is evident, concrete embedding the connection is cracked, or corrosion product is draining from the embedment, the corrosion must be abated. Abatement requires erecting a replacement connection for stability, concrete removal, corrosion elimination, future corrosion protection, and high-quality concrete replacement. Horizontal compression ring to concrete connections must be maintained in good condition.
2. **Reinforce, clean, and paint steel:** Any exposed steel including stairs, platforms and railings exhibiting corrosion will be cleaned, reinforced if section loss has occurred, and painted for future corrosion protection.
3. **Weatherproof anchorages:** Post-tensioning anchorages must be protected to preserve structural stability. Clean corrosion and coat exposed steel. Protect anchorages with latex modified concrete and flashings.

4. **Replace sealants:** Sealants have reached the end of their useful lives. Sealants will be replaced with multi-component materials having the advantage of on-site chemical reactions to produce superior sealant resilience and adhesion.

See Appendix F for the structural details pertaining to Steel Corrosion Abatement and Post-Tensioning Cable Anchorage.

PLAZA REHABILITATION (PRIORITY #3)

Plaza leakage promotes basement corrosion, structural column base embedded steel corrosion, and electrical damage. The plaza waterproofing membrane has failed. Plaza leakage resolutions include:

1. **Remove the plaza concrete and membrane:** The plaza membrane waterproofing system has been modified in attempts to prevent leakage. These modifications have failed. It is now necessary to strip the plaza walking surface and failed membrane down to bare concrete structure and replace the system in its entirety.
2. **Replace the waterproofing membrane:** The bare concrete structure must be prepared to receive the new membrane. The membrane must have positive drainage off of the structure and must be installed with puncture protections. Leakage testing is required to determine the waterproof integrity of the membrane.
3. **Install a removable walking surface:** The membrane will require repairs over time. A removable paver system is critical to accessing the membrane for future repairs.

There are staging opportunities for the priority items listed above. One potential staging scheme may include aligning each priority item with a stage. The purpose of concrete repairs in Stage One would be to remove loose and cracked concrete and perform repairs with modern materials to protect the structure and abate falling concrete risk. Structural steel rehabilitation in Stage Two would allow for removal of corroded structural steel connections and replacement with connections that can be more effectively maintained in the future. This stage will restore the Structural Lateral Stability of the Tower. The purpose of rehabilitating the plaza area in Stage Three would be to eliminate the water leakage into the basement of the structure that affects the existing electrical wiring and equipment. The benefit of staging is to spread costs incrementally over time. The burden of staging for this project is the repeated erection and removal of scaffolding and work platforms and multiple mobilizations and de-mobilizations.

In addition to the priority repair and rehabilitation methods outlined above, the following are additional items to consider.

STRUCTURE MONITORING

In our professional opinion, the Tower requires inspections every three years to identify substantial changes in the precast, prestressed panel conditions and the horizontal compression ring connections to the four pillars. Substantial changes could trigger an emergency stabilization project at the impacted locations.

MAINTENANCE

In our professional opinion, the Tower will require ongoing maintenance. Maintenance tasks recommended on a 5-year cycle include plaza membrane repairs; concrete panel surface and crack repairs; and mortar joint repairs. Maintenance tasks recommended on a 10-year cycle include structural steel cleaning, reinforcing, and painting; anchorage flashing repairs and replacements; and sealant replacements.

STRUCTURE ENCLOSURE

Most of the problems identified in this investigation relating to steel corrosion are the product of the decision to leave a portion of the Tower open to weather. Enclosing the Tower as originally conceived would abate future corrosion propagation. Tower enclosure would include:

1. Design and erection of a wall panel and window wall system to enclose the structure.
2. Design and installation of heating, ventilating, air conditioning, and fire alarm systems.
3. Implementation of the structural and weatherproofing rehabilitations recommended.

Enclosure completion would preserve the cleaned, reinforced, and painted structural steel which would then not be subjected to weather. Concrete panel surfaces not enclosed would continue to weather and would require ongoing maintenance.

IMPLEMENTATION ALTERNATIVES

Several alternatives to repair and rehabilitate the structure were evaluated. The following is a summary of each alternative and their estimated costs. Preliminary engineer's opinions of probable construction costs are provided in Appendix G. Costs outlined in these estimates are conceptual in nature, provided in present worth dollars and shall be refined during the design phase.

Alternative 1A – Repair Existing Structure (Single Phase) $ 2,785,000

Alternative 1B – Repair Existing Structure (Multiple Phases) $ 3,058,000

Alternative 1 includes repair of identified defects as described in the report to address structural steel and concrete issues as either a single phase or multiple phase project.

Advantages:

- Addresses issues that have led to continued, accelerated deterioration of the structure
- Multi-phase implementation allows costs to be spread out incrementally over time
- Lower future maintenance costs

Disadvantages:

- Significantly more expensive than continued maintenance
- Parts of the structure that were intended to be enclosed will continue to be exposed to the elements
- Multi-phase implementation would require repeated erection and removal of scaffolding and work platforms and multiple mobilizations and de-mobilizations
- Public access restricted during construction

Alternative 2A – Enclose and Repair Structure (Single Phase) $ 3,547,000

Alternative 2B – Enclose and Repair Structure (Multiple Phases) $ 3,750,000

Alternative 2 includes repairs described in Alternative 1 plus enclosure of the lower portion of the structure as it was originally designed as either a single phase or multiple phase project.

Advantages:

- Addresses all identified structural issues
- Protects parts of the structure from continued exposure to the elements
- Multi-phase implementation allows costs to be spread out incrementally over time
- Lower future maintenance costs

Disadvantages:

- Most expensive alternative
- Multi-phase implementation would require repeated erection and removal of scaffolding and work platforms and multiple mobilizations and de-mobilizations
- Public access restricted during construction

Alternative 3 – Structure Maintenance & Decommission Structure $ 1,576,000

This alternative involves simple maintenance measures to keep the structure in operation including plaza membrane repairs; concrete panel surface and crack repairs; mortar joint repairs; structural steel cleaning, reinforcing and painting; anchorage flashing repairs and replacements; and sealant replacements.

Advantages:

- Delays much more significant expenditures to repair identified defects or to enclose the structure as originally designed
- Daily operations minimally impacted by routine maintenance

Disadvantages:

- Structure will continue to deteriorate at defect and exposed locations
- Does not address potentially imminent concrete spalling issues
- Highest maintenance costs

At some point, maintenance may become too expensive and the structure may need to be decommissioned; therefore, this alternative also includes the dismantling and removal of the entire structure and restoration of the site to a grassed condition. This would involve a one-time expenditure to decommission the structure and would end the use of the Moser Tower and the Millennium Carillon.

APPENDIX A

MOSER TOWER INTERIOR INSPECTION
PERFORMED BY ERA

INSPECTION OVERVIEW

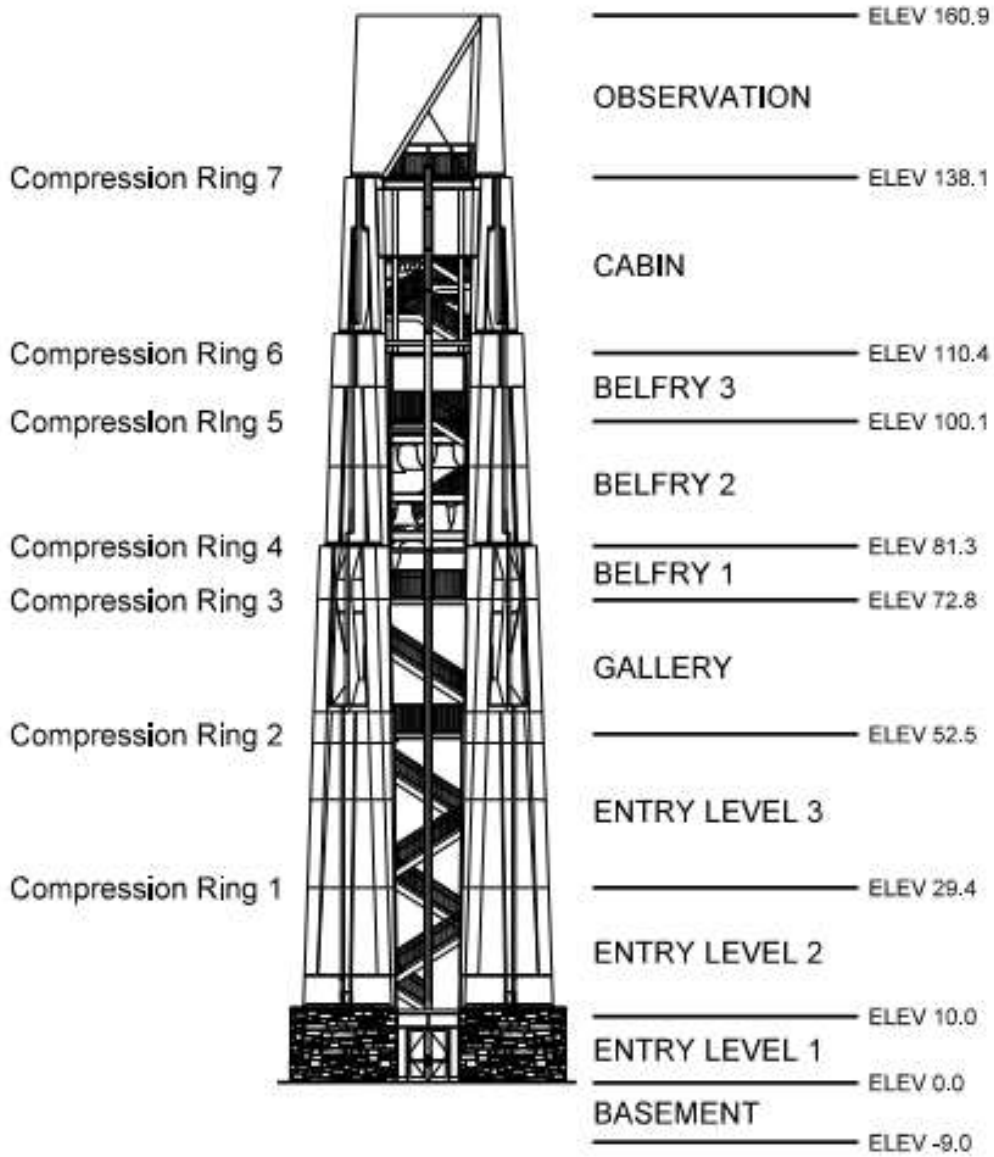
The inspection was separated into several groups to make the results easier to organize and quantify. Engineering Resource Associates conducted the interior inspection of Moser Tower, while Collins Engineering conducted the exterior inspection by rappelling from the top of the tower.
The interior inspection included the precast concrete blocks in the corners of the structure, the precast concrete fins between the columns, the steel support structure for the belfry, the steel support structure for the stairs and the steel and concrete surfaces of the stairs and observation decks. The elements were separated into horizontal sections of the building as access dictated. The exterior inspection primarily included the precast concrete blocks and fins, though information for the other elements of the structure was gathered where access was possible.

INTERIOR INSPECTION

The interior inspection was completed by Engineering Resource Associates over several days. The following sections address the field notes attained during the inspections. Within each section of the structure, each element was inspected individually. There were four precast concrete columns, at the Northeast, Northwest, Southeast and Southwest corners of the structure. The precast concrete fins that hung vertically between the columns were at the north, east and south for the entire height of the tower and on the west side from the Belfry Section on up. The basement level consisted of eight precast concrete columns and beams, supporting the entry level walkways and support structure above.
The steel superstructure within the tower was used to support the instrumentation and cabin for the belfry. Four steel tube columns ran vertically up the interior of the tower between the walkways and the instrument at the Northeast, Northwest, Southeast and Southwest. The steel structure has been separated into major sections of the columns. The sections correspond to the splicing of the columns, beam locations, stair and walkway connections, and additional steel supports for the bells.
The table below shows the segmentation used for the interior inspection:

Level	Lower Elevation	Upper Elevation	Precast Fins	Steel Interior
Basement	-9.0’	0.0’	no	yes
Entry Level 1	0.0’	10.0’	no	no
Entry Level 2	10.0’’	29.4’	yes	no
Entry Level 3	29.4’	52.5’	yes	no
Gallery	52.5’	72.8’	yes	yes
Belfry 1	72.8’	81.3’	yes	yes
Belfry 2	81.3’	100.1’	yes	yes
Belfry 3	100.1’	110.4’	no	yes
Cabin	110.4’	138.1’	no	yes
Observation + Roof	138.1’	160.9’	no	yes

Moser Tower Level Description Summary

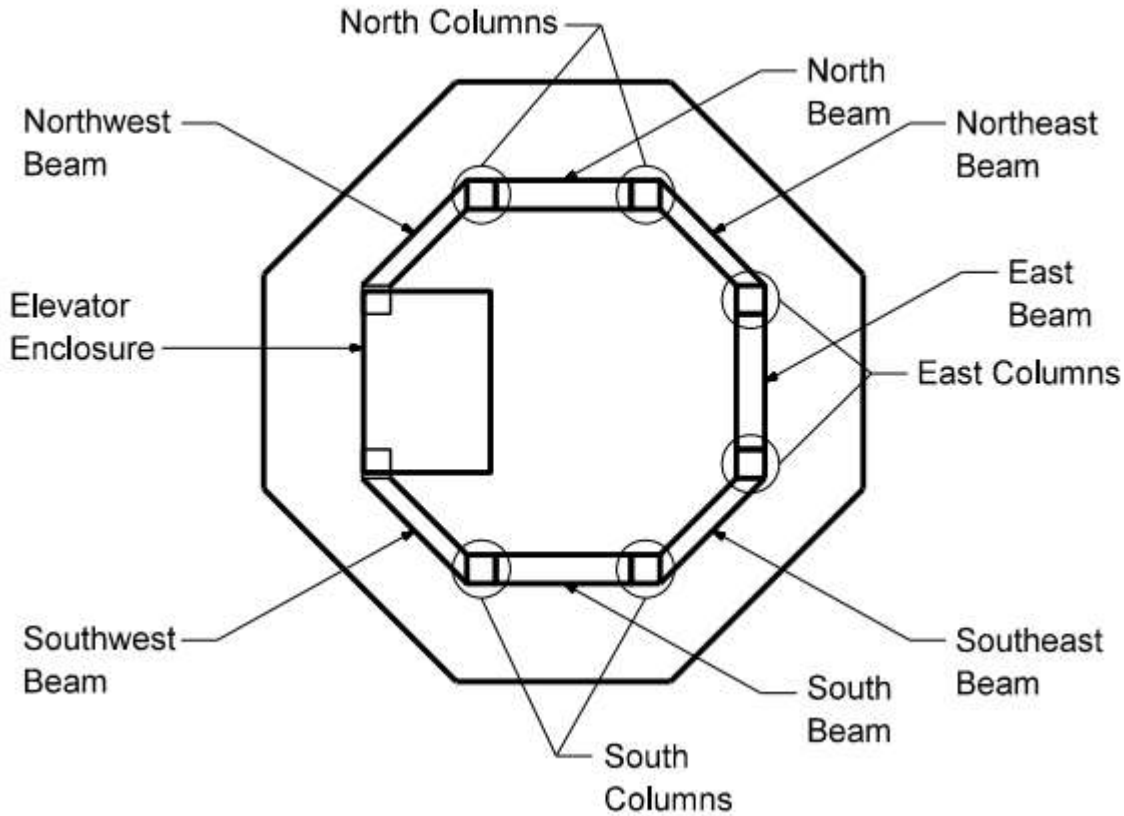


Elevation View of Moser Tower Looking West

APPENDIX A-1
BASEMENT LEVEL

BASEMENT LEVEL

The basement level begins below the main entrance to the Moser Tower. It consists of eight precast concrete columns(2 of which are hidden within the elevator on the west side) and seven precast concrete beams between columns. The 8-sided outer concrete wall of the basement surrounds the free standing columns. The beams and columns will be referred to based on their location with respect to cardinal directions.



BASEMENT OBSERVATIONS

General		
Construction: Concrete	***Lower Elevation:*** -9.0’	***UpperElevation:*** 0.0’
Observations:		

North Columns
Observations: Minor cracking and scaling. Small spall and rust stain at the top of the east face of the west column. See Photos A1-1 and A1-2.

East Columns
Observations: Heavy rust stains in the corners of the columns, 4-5’ in length. South column has staining that runs the length of the column. See Photos A1-3 and A1-4.

South Columns
Observations: Mild rust staining on east column near stair attachment. One patch on southwest corner of east column. Severe rust stains on all corners of west column. Patched spall or delamination at connection to slab above, on the north face. Scaling on west column beneath rust stains. See Photos A1-5 through A1-8.

Basement Walls
Observations: Vertical crack on south wall, floor to ceiling. Crack continues into slab above; ceiling crack is salt stained. 2 repaired vertical cracks in south wall with efflorescence. Salt staining and leakage in east wall, beneath the entrance. See Photos A1-9, 10.

Northwest Beam
Observations: Minor scaling and hairline cracks.

North Beam
Observations: Rust stains at the stair connection. Minor popouts and shrinkage cracks. Staining and scaling near conduit. See Photo A1-11.

Northeast Beam
Observations: Minor scaling. See Photo A1-12.

East Beam
Observations: Rust and staining at beam connection, on the sides and underside of the beam. Efflorescence and staining is present at the deck joint. See Photos A1-13, 14.
Southeast Beam
Observations: Minor scaling. Rust and salt stains on the bottom of the beam. See Photo A1-15.
South Beam
Observations: Rust stains near stair railing. Spalls and repairs on lower north corner. Salt and rust stains on underside of beam. See Photo A1-16.
Southwest Beam
Observations: Minor scaling on outside face. Staining on underside of beam.

Photo A1-1: Scaling and staining on northwest column.

Photo A1-2: Rust staining on northeast column.

Photo A1-3: Rust staining on northeast column.

Photo A1-4: Rust staining on southeast column.

Photo A1-5: Rust staining near stair attachment.

Photo A1-6: Rust staining on southwest column.

Photo A1-7: Patch and staining on southwest column.

Photo A1-8: Patch on southwest column.

Photo A1-9: Efflorescence on east basement wall.

Photo A1-10: Crack in south basement wall.

Photo A1-11: Rust staining on north beam near connections.

Photo A1-12: Scaling on northwest beam.

Photo A1-13: East Basement beam to steel beam connections.

Photo A1-15: Stains and efflorescence on southeast basement beam.

Photo A1-14: Staining and rust stains near steel beam connection on east basement beam.

Photo A1-16: Rust stains near railing on south basement beam.

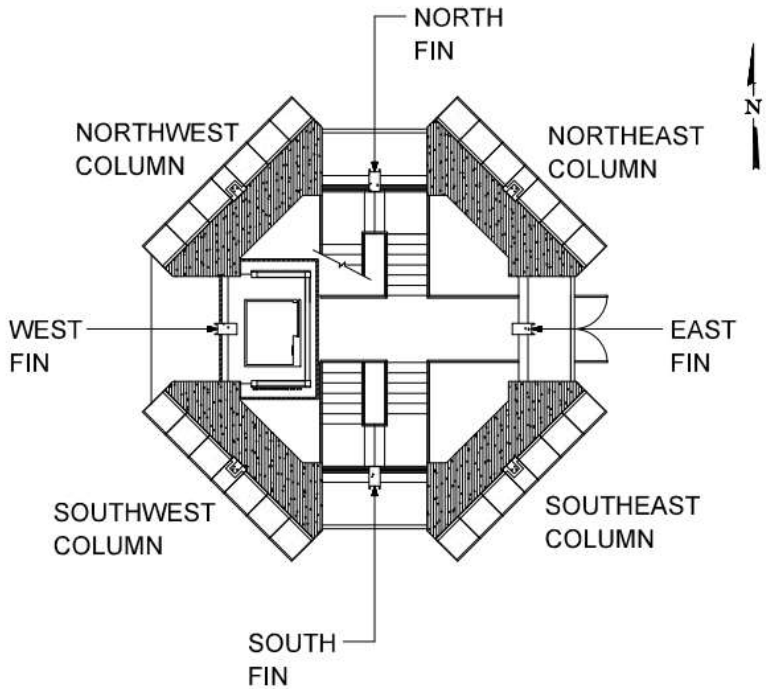
APPENDIX A-2
ENTRY LEVEL 1

ENTRY LEVEL 1

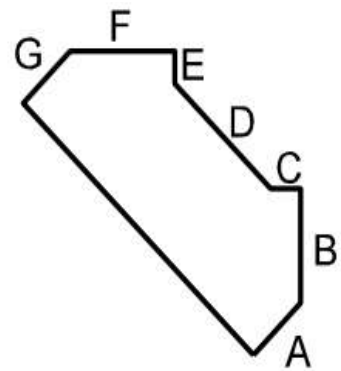
The main structure of the tower begins in Entry Level 1. The tower transitions from the basement layout to the layout that continues for the remainder of the tower. The remaining appendices will address the four precast concrete column blocks in the corners of the tower, the precast concrete fins and other miscellaneous beams and walls at various locations throughout the tower.

The precast concrete column blocks had 7 sides visible during the interior inspection, labeled sides A-G from left to right. Sides A and G were 6' wide. Sides B and F were 21" wide. Sides C and E were 3' wide. Side D was 5' wide. The widths slightly narrowed going upwards in the tower, before separating into 3 separate elements in the Belfry. The column block heights varied, and are noted individually in the inspection notes below.

Precast concrete fins were 6' wide at the bottom, narrowing going upwards in the tower, before jutting inwards in the Belfry 2 section of the fins. The fins were approximately 9" thick, with 1" "flanges" on the interior and exterior edges.

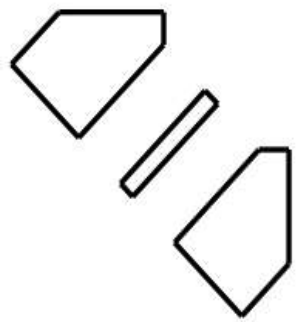


Plan View of Moser Tower at Entry Level



LOWER COLUMN

Entry Level 1 through Entry Level 3



UPPER COLUMN

Entry Level 3 through Cabin

ENTRY LEVEL 1 OBSERVATIONS

General		
Construction: Concrete	***Lower Elevation:*** 0.0’	***Upper Elevation:*** 10.0’
Observations:		

North Columns
Observations: There were two columns located on the north side of the entry level of the tower. There were several locations where honeycombing and other indicators of poor concrete consolidation were noted. The west column had slight rust staining from adjacent steel connections. See Photos A2-1, 2.

East Columns
Observations: There were two columns located on the east side of the entry level of the tower. There were several locations where honeycombing and other indicators of poor concrete consolidation were noted. See Photo A2-3.

South Columns
Observations: There were two columns located on the north side of the entry level of the tower. There were several locations where honeycombing and other indicators of poor concrete consolidation were noted. Honeycombing on west column base was noted. There was visible rebar where there was not enough concrete cover during construction. See Photos A2-4, 5.

Entry Level 1 Beams
Observations: There were 7 beams spanning between the columns on the outer edge of the entry level. Most beams had hairline cracks in various locations and rust staining on the underside from steel above. North and south beams had rust staining from the precast fin connections above. See Photos A2-6 through A2-9.

Exterior Walls
Observations: Hairline cracks in ceiling in all 8 corners, about 10’ above the ground. Northeast wall had a horizontal construction joint or repaired crack. Minor honeycombing was noticed at all the construction joints, resulting from poor concrete consolidation during construction. See Photos A2-10, 11.

Photo A2-1: Rust staining on northwest column.

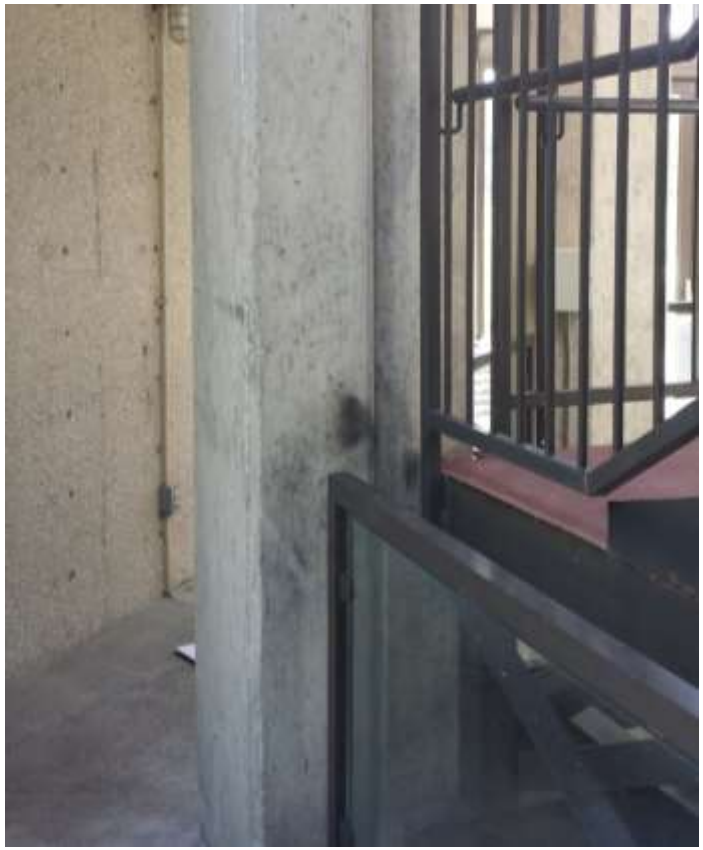


Photo A2-2: Staining on northeast column.

Photo A2-3: Staining and scaling south column.

Photo A2-4: Honeycombing and exposed rebar on south columns.

Photo A2-5: Honeycombing at base of south columns.

Photo A2-6: Staining on underside of north beam. Rust at precast fin connection.

Photo A2-8: Staining on underside of south beam.

Photo A2-7: Rust and staining near precast fin connection above north beam.

Photo A2-9: Cracking and popouts on east southeast beam.

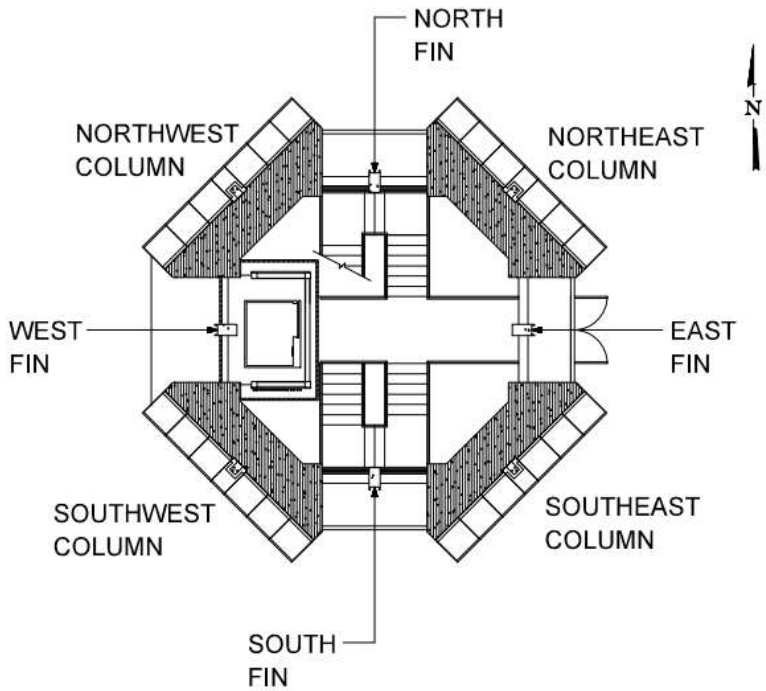
Photo A2-10: Hairline cracks in ceiling near exterior wall corners.

Photo A2-11: Honeycombing in upper corners of exterior walls.

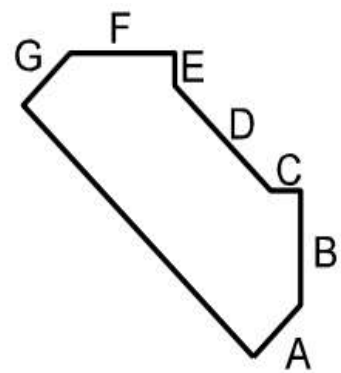
APPENDIX A-3
ENTRY LEVEL 2

ENTRY LEVEL 2

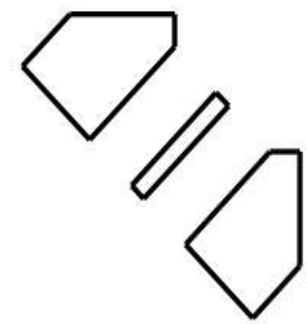
Entry Level 2 begins 10’ above the entry level floor. This level is designated by the top of the first level of precast concrete column blocks. This level also begins the Precast Concrete Fins at the North, East and South. The fins are attached to the top of the precast concrete beams in Entry Level 1. Entry Level 2 extends upwards from an elevation of 10’ to an elevation of 29.4’. There is a joint between the precast fins and the columns at this elevation that can be identified as the end of this level.



Plan View of Moser Tower at Entry Level



LOWER COLUMN
Entry Level 1 through Entry Level 3



UPPER COLUMN
Entry Level 3 through Cabin

ENTRY LEVEL 2 OBSERVATIONS

General		
Construction: Concrete	***Lower Elevation:*** 10.0’	***Upper Elevation:*** 29.4’
Observations:		

General Fins

Observations: The fins are 18’ tall in the Entry Level 2 section. They are separated by steel connections on the interior web of the fins. There is no west fin in this section due to the presence of the elevator. The groups of patches on a single face of the fins are from the lifting loops used to raise and position the fins.

North Fin

Observations: Horizontal cracking at 1’ intervals, length of the fin. Rust stains at top and bottom of fin at steel connection points. Staining runs down both sides and the interior web of the fin. There were four concrete patches on the east side of the fin, located in the corners, about 1’ from the edges. There was cracking at the lower northeast corner on the top of the arched portion of the fin. Cracks with repairs were noted on the west side of the arch near the bottom. See Photos A3-1, 2, 3.

East Fin

Observations: Rust stains at top and bottom of fin at steel connection points. Staining runs down both sides and the interior web of the fin. There were four concrete patches on the north side of the fin, located in the corners, about 1’ from the edges. A 2’ crack on the outer flange of the southeast corner at the top of the arch was noted. There were minor chips and rust stains on the interior portion of the web. Minor cracking was evident on the east edge of the fin near the top. See Photos A3-4, 5.

South Fin

Observations: Minor rust stains at top and bottom connections. Minor cracking on outer flange of fins. There were four concrete patches on the east side of the fin, located in the corners, about 1’ from the edges.

General Columns

Observations: There are four columns in the Entry Level 2 sections. The western columns are connected to the west exterior wall behind the elevator. As such, the columns were only inspected for the visible portions of the columns from the interior. Entry Level 2 has 6 stacked blocks, each standing 39” tall.

Northeast Column

Observations: Rust stains on blocks 1 and 2 on side D. Minor honeycombing on sides A and G. There is a 1’ diagonal shear crack on block 5 on side G. Cracking is evident around the electrical tubing on the corners side F and G. Corrosion has built up around the connections to the HSS tubes on top of block 6. See Photos A3-6, 7.

Southeast Column
Observations: Staining on side D of block 1. Blocks 4 and 5 are misaligned 1”. Patching on side A of most blocks. Discoloration and scaling at connection to steel stair supports on block 2, side F. See Photos A3-8, 9.
Southwest Column
Observations: Staining on blocks 1 and 2. Discoloration on block 6, side A. Patchwork for previous spalls or cracks was noted on blocks 4 and 6, on sides A and B. Slight block misalignment was noted. Debris has collected behind and around the HSS tube connection at the top of block 6.
Northwest Column
Observations: Block misalignments were noted between blocks 2 and 3. Block 2 was ½” east and ½” south. Block 3 was 1” south and ½” east. Discoloration and staining was evident on blocks 1 and 2, on side D. See Photos A3-10, 11.

Photo A3-1: Rust staining at top of north fin. West face.

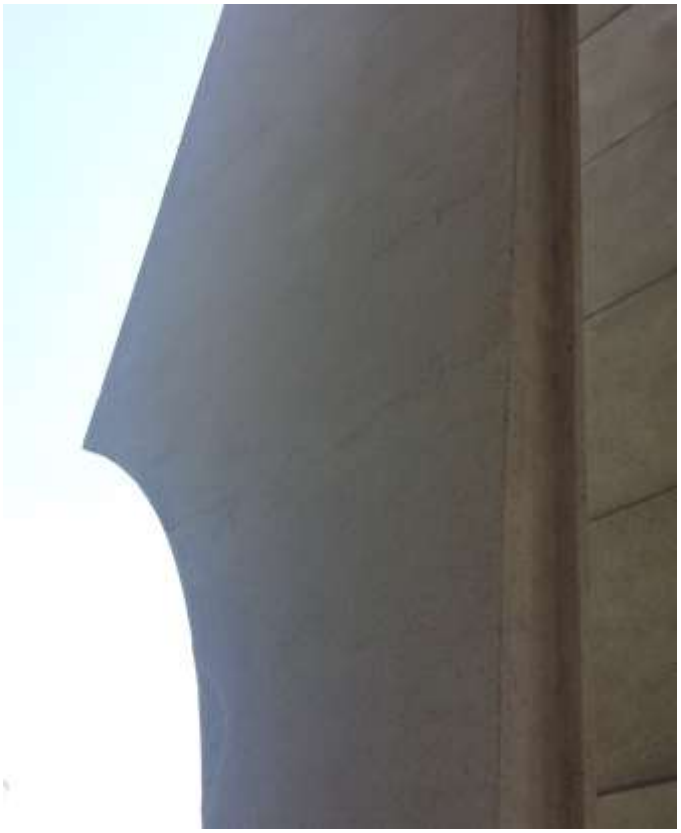


Photo A3-2: Horizontal Cracking on west face of north fin.

Photo A3-3: Horizontal crack on west face of north fin.

Photo A3-4: Staining at top of east fin near connection.

Photo A3-5: Crack on outer web of East Fin.

Photo A3-6: Staining on northeast column.

Photo A3-7: Rust build-up around HSS tube at top of northeast column.

Photo A3-8: Patch on Southeast Column.

Photo A3-9: Staining, scaling and misalignment on southeast column.

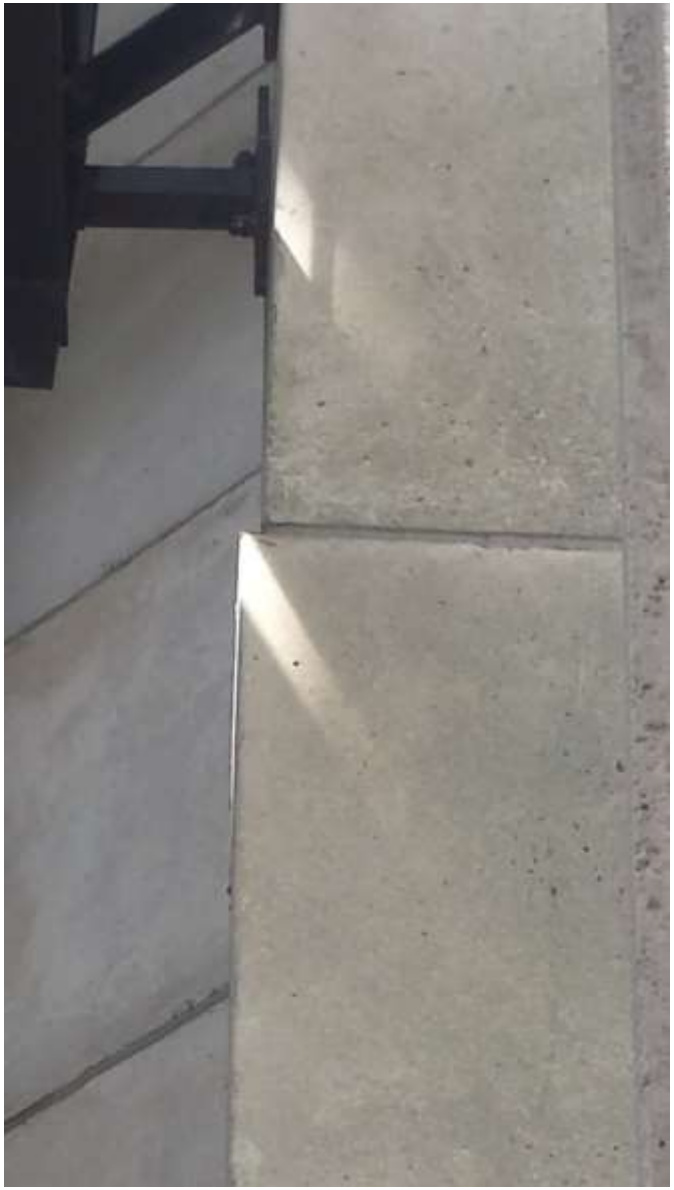


Photo A3-10: Northwest column block misalignment

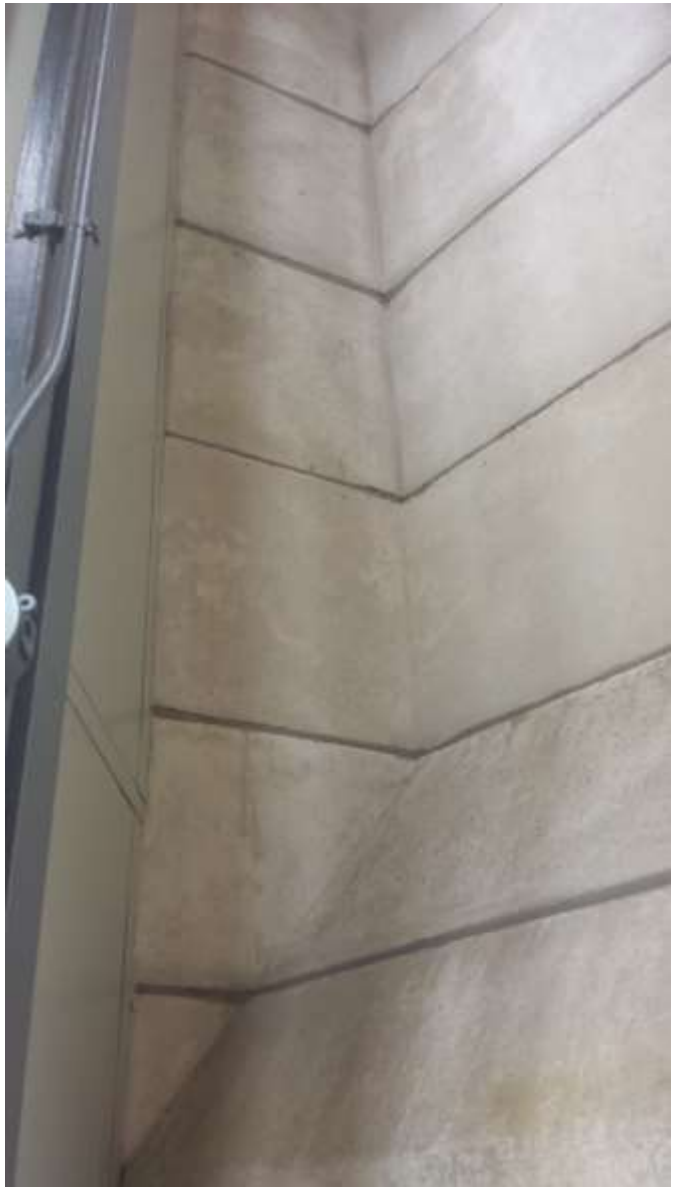
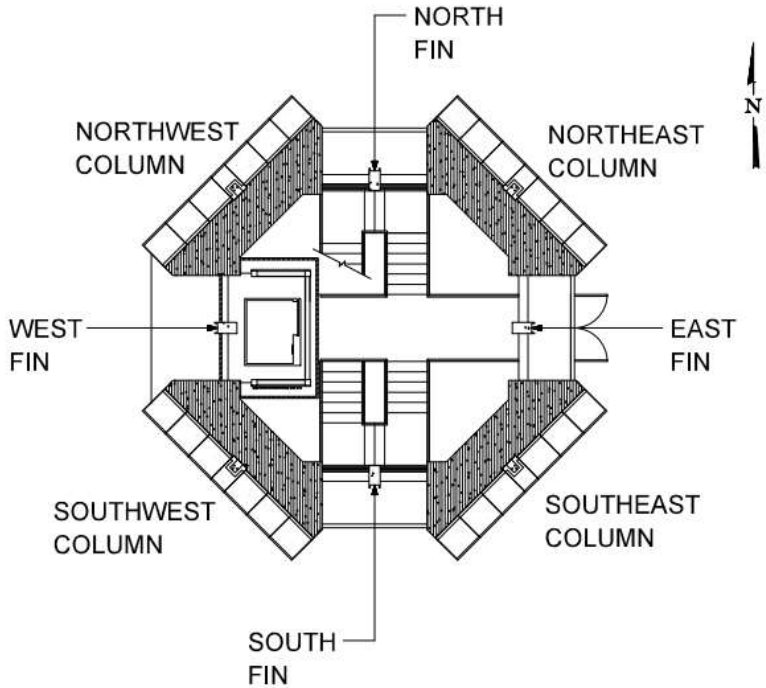


Photo A3-11: Northwest column block scaling and discoloration

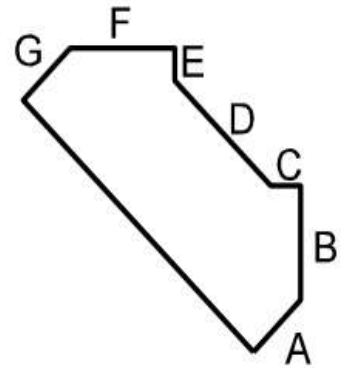
APPENDIX A-4
ENTRY LEVEL 3

ENTRY LEVEL 3

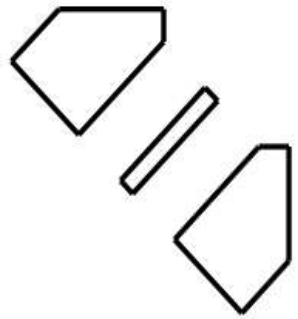
Entry Level 3 begins 29.4' above the entry level floor. This level begins at the first joint in the precast fins, where they are attached to a piece of concentrical tube steel. The fins are attached to the Gallery deck at the top of Entry Level 3. Entry Level 3 extends upwards from an elevation of 29.4' to an elevation of 52.5'.



Plan View of Moser Tower at Entry Level



LOWER COLUMN
Entry Level 1 through Entry Level 3



UPPER COLUMN
Entry Level 3 through Cabin

ENTRY LEVEL 3 OBSERVATIONS

General					
Construction:	Concrete	***Lower Elevation:***	29.4’	***Upper Elevation:***	52.5’
Observations:					

General Fins

Observations: The precast fins were 6’ in width at the base of Entry Level 3, standing 21’ tall. The thickness was still 9”. The lower extent of Entry Level 3 coincides with the HSS tube that runs horizontally around the extents of the tower interior. The section goes upwards to the bottom of the Gallery deck above, where the fins have another steel connection joint. The groups of patches on a single face of the fins are from the lifting loops used to raise and position the fins.

North Fin

Observations: Rust stains at top and bottom of fin at steel connection points. Staining runs down both sides and the interior web of the fin. There were four concrete patches on the north side of the fin, located in the corners, about 1’ from the edges. There is horizontal cracking on the west face of the fin. Cracks are at 6” to 1’ intervals. Some cracks have visible rust staining. See Photos A4-1, 2.

East Fin

Observations: Rust staining was visible at the top fin connection to the Gallery deck above. Staining runs down the majority of both faces of the fin and the interior web. There are minor vertical cracks and popouts on the interior web. There were four concrete patches on the north face of the fin, located in the corners, about 1’ from the edges. A horizontal crack at the midpoint of the south face was evident on the east end of the fin. A 2’ crack, slightly above the horizontal crack at the midpoint looks close to spalling. There is another 2’ crack about 5’ above the previous crack in slightly better condition. See Photos A4-3, 4.

South Fin

Observations: There is rust staining at the top connection to the Gallery deck at the top of the fin. There is a horizontal crack in the interior web and east face of the fin 5’ from the bottom. 2’ crack on west face, north end of fin, about 8’ from the bottom. 3’ horizontal crack on east face, south end of fin, 6’ from the bottom. 1’ crack on west face, south side, 5’ from top of fin. There were four concrete patches on the east side of the fin, located in the corners, about 1’ from the edges. 1 Patch was noted on the south side of the west face near the flanges, 3’ from the top. See Photo A4-5.

General Columns

Observations: The column blocks are comprised of 4 blocks, each standing 64” tall. The blocks are the same 7 sided concave blocks from the Entry Level 1. The blocks run between the HSS tube that horizontally separated Entry Levels 1 and 2 and the Gallery deck above.

Northeast Column

Observations: Rust staining on on top of Block 4 at the Gallery deck connections above. Honeycombing is evident on sides A and G where concrete consolidation was poor during construction. There is staining and discoloration on side G of blocks 1 and 2. Side G of block 1 has a chip in the upper left hand corner. There are patches for previous cracks and spalls at the tops of blocks 1 and 2 on side D. Horizontal cracking in block 1, sides A, B, F, G. Mild misalignments in blocks at various locations. See Photos A4-6, 7.

Southeast Column
Observations: Horizontal cracks at midpoints of blocks 1, 2 and 3 on sides A, B, F, G. Mild misalignments in blocks at various locations. Rust staining on side A of all blocks, and beneath Gallery deck connections above. Patching for previous cracks and spalls was noted on block 3, in the upper right hand corner of side A. The top left corner of block 4, side A has minor cracking and spalling. Block 4, side B has a crack stemming from the plate connection above. See Photos A4-8.
Southwest Column
Observations: Rust staining at Gallery deck connection above. Cracking at connection to horizontal HSS tube at top of block 4. Discoloration and staining on Side A of all four blocks. Horizontal cracks, sides A and B at mid-height of all four blocks. Blocks 3 and 4 have 1" to 1½" separation on side D. Delamination near the top middle of block 3, side D. No rebar was visible near the delamination. There was a patched section in the top right corner of block 3, on side A. See Photo A4-9.
Northwest Column
Observations: Rust staining at Gallery deck connections above. Cracking has occurred in block 4, side C, near the elevator shaft and adjacent steel connections. Horizontal cracking has occurred on sides E, F and G of block 3 near mid-height of the blocks. There is slight block misalignment. Horizontal cracking has also occurred on sides F and G of block 4 at the plate connections. Patching is evident on block 2, side G in the lower left corner where previous cracks or spalls have been repaired. Sides F and G have horizontal cracks in block 1 as well. See Photo A4-10.

Photo A4-1: Horizontal cracking on the west face of the north fin.

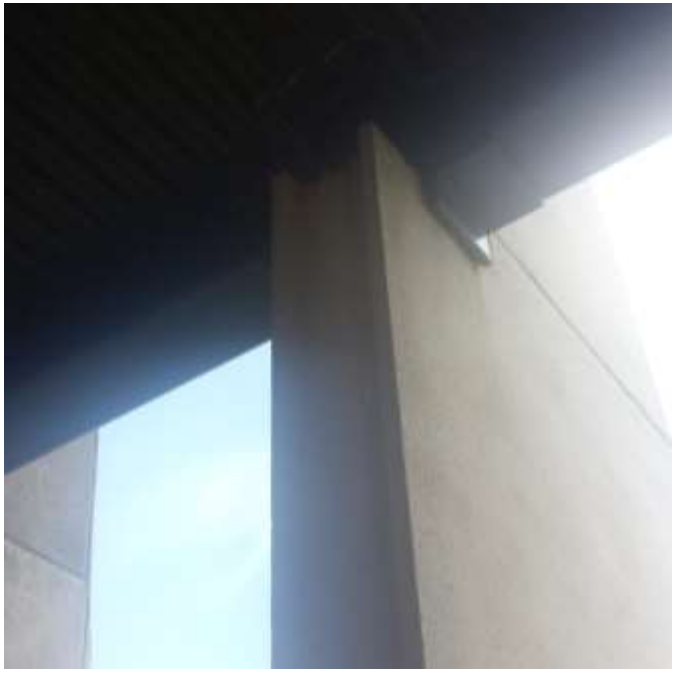


Photo A4-2: Staining at the upper connection of the north fin.

Photo A4-3: Rust staining at upper connection of east fin. South face.

Photo A4-4: Repaired spall on outer web of east fin.

Photo A4-5: Rust staining at upper connection of south fin. West face.

Photo A4-6: Stair attachment on northeast column.

Photo A4-7: Horizontal crack in block 1 of northeast column.

Photo A4-8: Spalling, repairs and staining in southeast column.

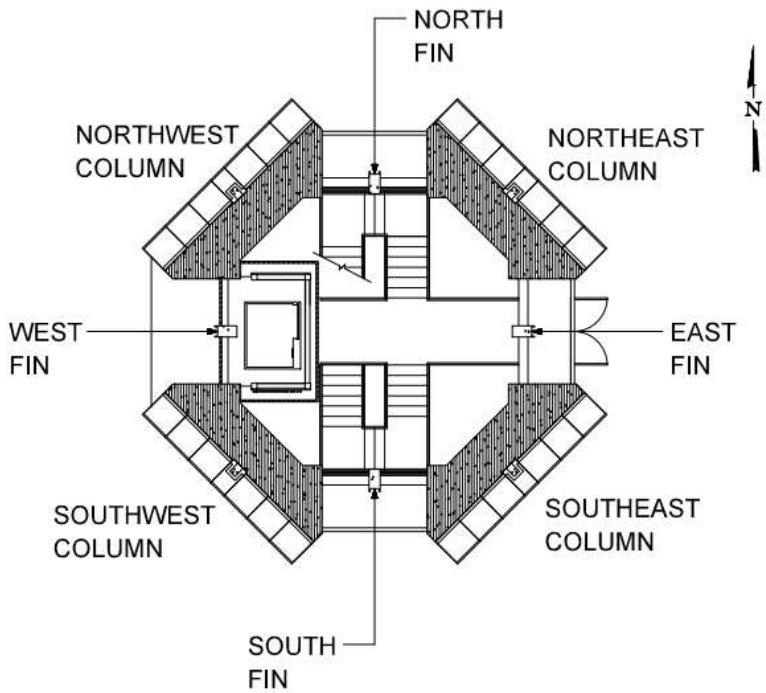
Photo A4-9: Stair and HSS connection at top of southwest column.

Photo A4-10: Connection to Gallery Beams at top of northwest column.

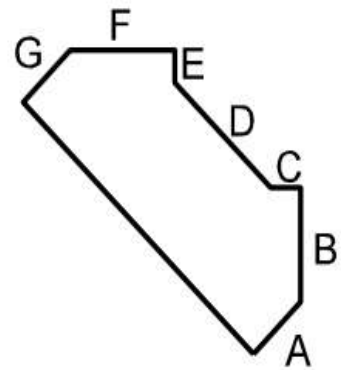
APPENDIX A-5
GALLERY LEVEL

GALLERY LEVEL

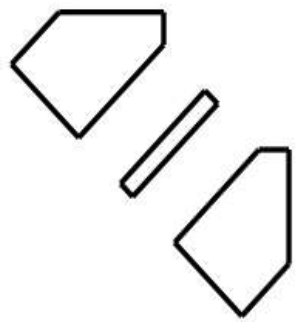
The Gallery Level begins 52.5’ above the entry level floor and extends about twenty feet upwards to an elevation of 72.8’. The Gallery Level begins with the Gallery observation deck, and goes up to the Belfry deck. The Gallery Level includes the concrete columns and fins, as well as the steel superstructure which begins in this level. The steel superstructure consists of 2 I-beams spanning north-south from the precast columns with 4 steel columns extending upwards from these beams. Lateral bracing is resent between the columns at various intervals. Some beams span between columns and bracing to support the instrumentation for the bell tower.



Plan View of Moser Tower at Entry Level



LOWER COLUMN
Entry Level 1 through Entry Level 3



UPPER COLUMN
Entry Level 3 through Cabin

GALLERY LEVEL OBSERVATIONS

General					
Construction:	Concrete, Steel	***Lower Elevation:***	52.5’	***Upper Elevation:***	72.8’
Observations:					

General Fins

Observations: The precast fins were 6’ in width at the base of the Gallery Level, standing 20’ tall. The thickness was still 9”. The lower extent of the Gallery Level coincides with the HSS tube that runs horizontally around the gallery deck interior. The section goes upwards to the bottom of the Belfry deck above, where the fins have another steel connection joint. The groups of patches on a single face of the fins are from the lifting loops used to raise and position the fins.

North Fin

Observations: Rust staining on west face at top connection. Patched spall with cracking 3’ from bottom on inside web on the west side. There is a patch on the outside web, about 10’ from the bottom on the west side. 3-4 horizontal cracks on the west face, 15’ from the bottom. East face has 5 patches. See Photos A5-1, 2.

East Fin

Observations: Horizontal crack on south face at mid-height. Cracks/delamination above previously mentioned horizontal crack. Rust stains at top connections, both faces. There are 6 patches on the north face. Cracks and repaired spalls on north face, near outer web. See Photos A5-3, 4.

South Fin

Observations: Horizontal cracking on the west face, one third of the way up from the bottom of the fin. East face 4 patches. Various patches on the west face, near the top. Rust staining is visible on both sides of the fin near the top connection. Repaired spall and discoloration on the west face, 5’ from top. See Photos A5-5.

General Columns

Observations: The columns in the Gallery Level are the same shape as below for the first 8’ of the column. From 8’ to the top of the top of the tower, the column is separated into 3 distinct concrete sections. The center portion of the column block narrows into two columns on the right and left. A precast fin begins 8’ up and goes to the top of the Gallery Level.

Northeast Column

Observations: Minor cracking and discoloration on column base (lower 8’) and both upper column sections. Cracking on inside of precast fin near mid-height. Minor cracks on underside and inside of column block top piece. Repaired pop-out at lower fin connection. See Photos A5-6, 7.

Southeast Column

Observations: Column block top piece is misaligned 1”. Corrosion and spalling at HSS tube connection. Vertical crack in column block top piece. Honeycombing on all column pieces and southwest face of precast fin. Rust staining on lower column block. Popouts and delamination at lower fin connection. Minor discoloration on fin, no cracking. See Photos A5-8, 9.

Southwest Column
Observations: Rust staining on lower column block. Popouts and delamination at precast fin connection. Corroded angle connection at top of precast fin. Honeycombing and discoloration in various locations. Minor cracking in column base.
Northwest Column
Observations: Minor cracking and discoloration in column base. Popout and delamination near lower precast fin connection. Minor Popouts in fin. Slight honeycombing in left column. Honeycombing and discoloration in right column. Sever corrosion at upper precast fin connection. See Photos A5-10, 11, 12.
General Main Beams - Steel
Observations: 2 I-Beams span between the precast concrete columns, running north-south, which support the Gallery deck and the columns that run upward through the tower. The beams are 33” deep, with an 11” wide x 1” thick flange. There are stingers between them and cantilevered to the east to support the Gallery deck.
East Main Beam - Steel
Observations: The beam spans between the northeast and southeast columns. Bottom flange has paint chipping and slight rusting. Top flange has slight rust at the south end of the beam, near the connection to the Gallery deck. North connection only has 5 bolts, while the other connections have 10. Top flange is rusting beneath metal deck above, 5’ from north end. North connection is rusting and staining on the northeast column. See Photos A5-13, 14, 15, 16.
West Main Beam - Steel
Observations: The beam spans between the northwest and southwest columns behind the elevator covering. South connection has slight rust near bolts. North connection plate is rusting, with rust stains visible on nearby concrete. Both connections have 10 bolts. See Photo A5-17.
Main Stringer - Steel
Observations: There are 6 stringers spanning between the Main Beams at uneven spacing. They are bolted to angles at the top web of the main beams, and support the deck above. Rust on the flange of the south-most stringer near the east side. The rust occurs beneath a section of corroded metal deck above. See Photos A5-14, 18.
East Stringer - Steel
Observations: 2 stringers are on the east side of the East Main Beam, spanning to the concrete columns on the east side. Connections to the concrete consist of embedded plates, which are corroded and causing rust staining on the concrete columns. Both the north and south sides of the flanges are rusted on the north stringer. The south side of the south stringer has rusted flanges. There are 3 stringers in between the 2 stringers spanning to the columns. These 3 stringers span to the HSS tube that runs along the inside of the Gallery level. There is slight rusting on the south sides of the flanges of all 3 stringers. Center stringer has paint and chipping beneath the corroded section of metal deck above. See Photos A5-19, 20.
HSS Horizontal Tube - Steel
Observations: The HSS tube surrounding the Gallery Level has slight rust and paint chipping near weld locations. There is rust in the northeast corner beneath the corroded deck above. East portion of the HSS tube has rust staining beneath the corroded deck. See Photos A5-21, 22.

General Columns - Steel
Observations: The steel columns begin at the Gallery level, sitting on top of 2 main steel beams that span between the precast concrete columns. They are I-shaped columns with 12” depth and 12” flange widths. The flange thicknesses are ¾”. They have 3 sets of diaphragms. The lowest diaphragm is near mid-height of the columns, with 2 sets of diaphragms coming near the top. The upper diaphragms support some of the bells and instrumentation.
Northeast Column - Steel
Observations: Minor rust near connections. No paint failure or chipping visible. See Photo A5-23.
Southeast Column - Steel
Observations: Slight rust stains near first set of steel diaphragms. No paint failure or chipping. See Photos A5-24, 25.
Southwest Column - Steel
Observations: The column is mostly covered by the metal enclosure of the elevator. There is some slight rust visible near the diaphragm connections.
Northwest Column - Steel
Observations: The column is mostly covered by the metal enclosure of the elevator. There is some slight rust visible near the diaphragm connections.
Intermediate Diaphragms - Steel
Observations: There are 4 diaphragms that run between the four columns at the mid height of the columns. They are 12” deep W-shape beams. There is rust on the bottom flange of the north beam, near the south side. Rust staining has occurred on the columns due to corrosion of the bolts and plates at the connections. See Photo A5-26.
Upper Diaphragms - Steel
Observations: There are 4 diaphragms at the top of this section of columns. They are 12” deep W-shape beams. The south beam is rusted on the top flange near the connections to the deck above. The top flange of the north beam is rusted and has chipped paint. There are 10” interior beams supporting the belfry deck above, which are all significantly rusted. The east and west main diaphragms are in good shape, but the 10” deep diaphragms have rust on the underside of the flanges. Se Photos A5-27, 28, 29.

Photo A5-1: Patch on inside web of north fin. West face.

Photo A5-2: Rust staining at upper connection of north fin. West face.

Photo A5-3: Patch on outer web of east fin.

Photo A5-4: Rust staining at upper connection of east fin. South face.

Photo A5-5: Staining and scaling on west face of south fin.

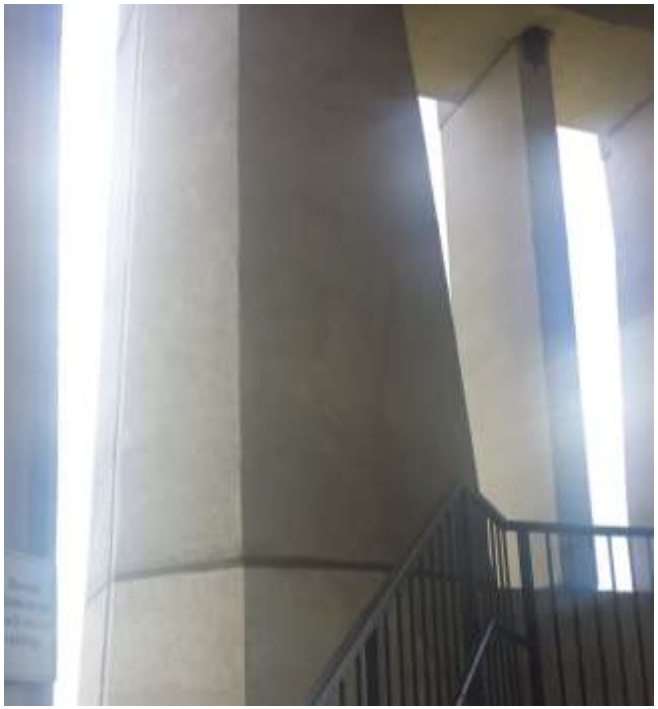


Photo A5-6: Staining on northeast column block.

Photo A5-7: Upper fin connection on northeast column.

Photo A5-8: Pop-out on lower fin connection of southeast column.

Photo A5-9: Block misalignment on southeast column.

Photo A5-11: Corroded upper fin connection on northwest column.

Photo A5-10: Pop-out at fin connection and rust staining on northwest column.

Photo A5-12: Honeycombing on northwest column.

Photo A5-13: East Main beam and stringers.

Photo A5-14: Corrosion in deck and stringers below Gallery observation deck.

Photo A5-15: Corrosion on East Main Beam.

Photo A5-16: North connection on east main beam.

Photo A5-17: North connection of west main beam.

Photo A5-18: Main stringers below Gallery deck.

Photo A5-19: East stringer connection corrosion to column.

Photo A5-20: East stringer connection to HSS tube near fin.

Photo A5-22: HSS tube paint chipping in southwest corner.

Photo A5-21: HSS tube surrounding Gallery deck.

Photo A5-23: Northeast column connection to Belfry deck above.

Photo A5-24: Staining on southeast column. South flange.

Photo A5-25: Rusted bolts at lower connection of southeast column.

Photo A5-26: Paint chipping and rust on north intermediate diaphragm.

Photo A5-27: Rust on 10” intermediate diaphragm.

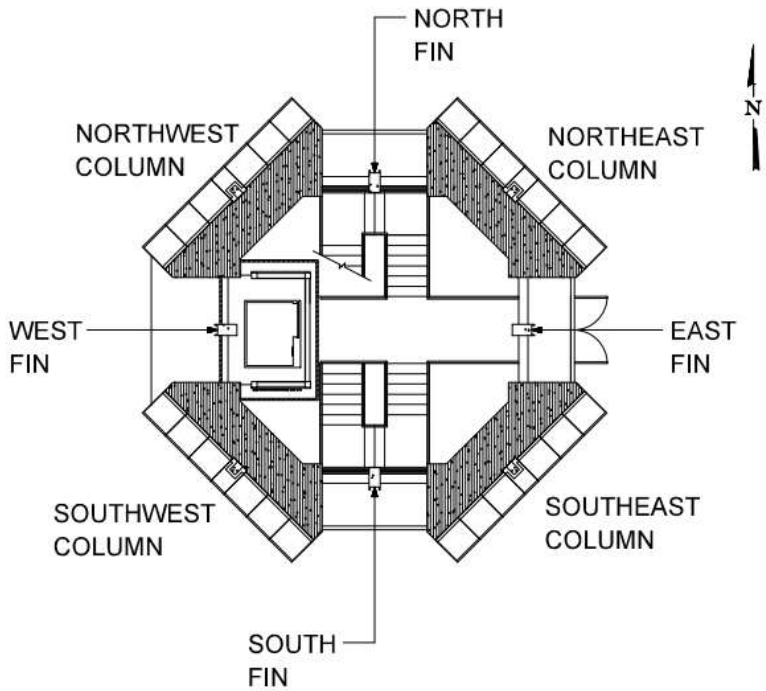
Photo A5-28: Rust on 10” intermediate diaphragm and belfry deck above.

Photo A5-29: Rust and corrosion on underside of belfry deck and intermediate diaphragms.

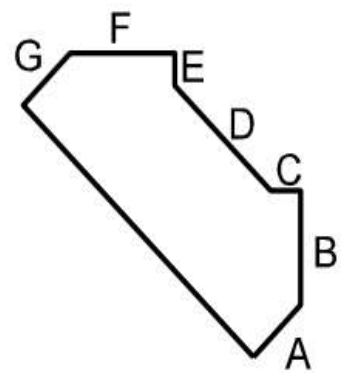
APPENDIX A-6
BELFRY LEVEL 1

BELFRY LEVEL 1

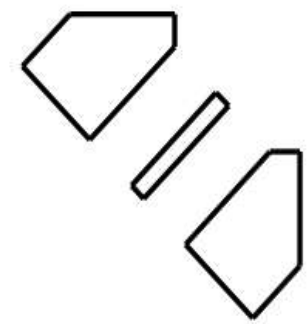
Belfry Level 1 spans from elevation 72.8’ to elevation 81.3’. Belfry Level 1 is the section of the tower above the belfry deck. This section has precast concrete columns and fins, and the steel superstructure. The steel superstructure consists of four columns in the shape of steel I-beams surrounding and supporting the bell tower instrumentation. Lateral bracing is resent between the columns at various intervals.



Plan View of Moser Tower at Entry Level



LOWER COLUMN
Entry Level 1 through Entry Level 3



UPPER COLUMN
Entry Level 3 through Cabin

BELFRY LEVEL 1 OBSERVATIONS

General					
Construction:	Concrete, Steel	***Lower Elevation:***	72.8’	***Upper Elevation:***	81.3’
Observations:					

General Fins

Observations: Precast concrete fins are 9” thick and 5’-6” wide in the Belfry 1 level. This small section is the lower section of concrete elements, beginning at the belfry deck. This the next deck above the Gallery, where the bells and instrumentation begin. The groups of patches on a single face of the fins are from the lifting loops used to raise and position the fins.

North Fin

Observations: 4 Patches on the east face from the lifting loops. Rust staining on the both faces of the precast fin at the connection to the HSS tube. Rust staining on the inside web of the fin. Delamination on the west face, near the inside web at the top of the fin. See Photos A6-1, 2.

East Fin

Observations: Rust staining at HSS connection, both faces of the precast fin. South side has 4 patches from the lifting loops. South side, east web has delamination and cracking at mid-height. See Photos A6-3, 4.

South Fin

Observations: Minor cracking and honeycombing throughout. Rust staining on inside web at HSS connections. Patch on lower outside web near adjacent fin. 4 patches on south face of precast fin.

West Fin

Observations: Rust staining at HSS connection, both sides of precast fin on the inside web. Discoloration and horizontal crack at mid-height. 4 patches on south face of fin. A6-5.

General Columns

Observations: Column blocks are solid precast concrete blocks, without precast fins in the center like in the section below and above. These blocks are 8’ tall, beginning at the lower Belfry deck. The 5 interior faces of the column block were inspected during the interior inspection.

Northeast Column

Observations: Minor cracking and discoloration throughout block. Honeycombing on west side on column block. Debris build up behind HSS connections. See Photos A6-6.

Southeast Column

Observations: Minor honeycombing and popouts throughout column block. Small patches on west facing side. Slight block misalignment.

Southwest Column
Observations: Block Misalignment-lower block is 1” inward of upper block. Minor rust stains near HSS and fin connections. Minor cracking and discoloration throughout. Salt staining on exposed faces. See Photo A7-7.
Northwest Column
Observations: Minor honeycombing and discoloration, slight block misalignment. Rust staining is prevalent near HSS tube connections and steel connections to precast concrete fins above and below. See Photo A6-8.
General Columns - Steel
Observations: The columns are spliced a few feet above the belfry deck, using splice plates and bolts. The column sections above the belfry deck are not painted. They are the same size and shape as the columns in the lower section.
Northeast Column - Steel
Observations: Splice connection looks good. Slight rusting near first diaphragm connection. Staining and slight rust near second diaphragm connection. Rust at blocking near third diaphragm cantilever connection. See Photo A6-9.
Southeast Column - Steel
Observations: Splice connection has slight discolorations on east side. Rust at blocking near diaphragms. Slight rust and staining on inside webs below diaphragms. See Photo A6-10.
Southwest Column - Steel
Observations: Splice connection looks good. Slight rusting around first diaphragm connection. Chipping paint at rust stain between second and third diaphragm, southwest corner of flange. Rusting on west face of web, below third diaphragm. See Photo A6-11.
Northwest Column - Steel
Observations: Discoloration on both plates of splice connection. Rusting around diaphragm connections. See Photo A6-12.
General Diaphragms - Steel
Observations: There are three levels of diaphragms between columns in the belfry section. The first set of diaphragms is between 6’ and 10’, and falls in Belfry Level 1. There are 12” deep W-shape beams on all four sides, and HSS 15V x 8H tubes on the east and west sides.
North Diaphragm - Steel
Observations: Connections have slight rust around the bolts. Both flanges have no corrosion.
East Diaphragm - Steel
Observations: No issues noted on W-shape beam. Slight discoloration on HSS angle seats.

South Diaphragm - Steel
Observations: Slight rust on bolts at connections.
West Diaphragm - Steel
Observations: No issues on either beam noted.

Photo A6-1: Rust staining near connection at top of north fin.

Photo A6-2: Patch on inner web of north fin.

Photo A6-3: Rust staining at top connection of east fin.

Photo A6-4: Patch on outer web of east fin.

Photo A6-5: Rust staining near connection of south face of west fin.

Photo A6-6: Honeycombing on northeast column.

Photo A6-7: Patch on southwest column.

Photo A6-8: Staining on northwest column.

Photo A6-9: Rusted connection on northeast steel column.

Photo A6-10: Rust along upper portion of southeast steel column.

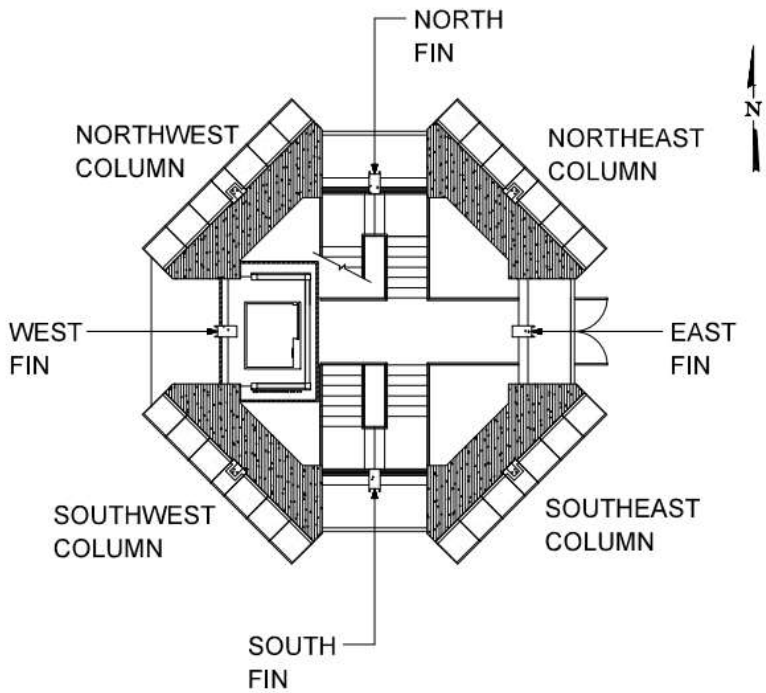
Photo A6-11: Rust near top of southwest steel column and connections.

Photo A6-12: Rust at upper connection of northwest steel column.

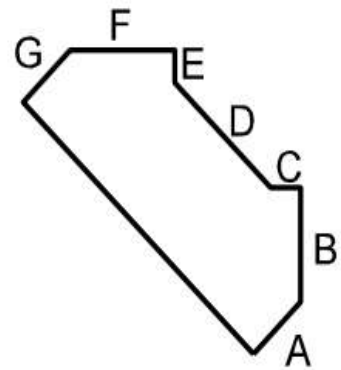
APPENDIX A-7
BELFRY LEVEL 2

BELFRY LEVEL 2

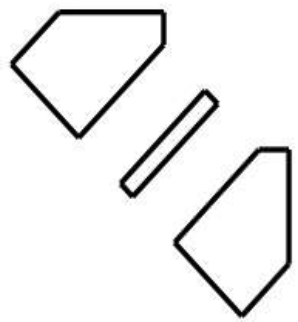
Belfry Level 2 spans from elevation 81.3’ to elevation 100.1’. Belfry Level 2 is the main section of the belfry. This section has precast concrete columns and fins, and the steel superstructure. The concrete columns are treated as one element from elevation 81.3’ to 110’, which includes Belfry Levels 2 and 3. The steel columns are treated as one element for all three Belfry levels and are included in Belfry Level 1. The steel superstructure consists of four columns in the shape of steel I-beams surrounding and supporting the bell tower instrumentation. Lateral bracing is resent between the columns at various intervals.



Plan View of Moser Tower at Entry Level



LOWER COLUMN
Entry Level 1 through Entry Level 3



UPPER COLUMN
Entry Level 3 through Cabin

BELFRY LEVEL 2 OBSERVATIONS

General					
Construction:	Concrete, Steel	***Lower Elevation:***	81.3’	***Upper Elevation:***	100.1’
Observations:					

General Fins

Observations: The fins are still 9” thick, and stand approximately 18’ tall in this section. The fins reduce width to 3’-9” after the first 3’. The second belfry section begins 8’ above the Belfry deck. The groups of patches on a single face of the fins are from the lifting loops used to raise and position the fins.

North Fin

Observations: Diagonal cracking at lower connection. Diagonal cracking on lower corner of fin at the outside web, both faces. Both diagonal cracks are patched. 4 patches on west face of fins from lifting loops. Minor cracks, spalls, and delaminations on inside web, both faces. Rust staining at upper connection, both sides of fin. See Photos A7-1, 2.

East Fin

Observations: Cracking and repairs at lower connection of fin. 3’ vertical crack near bottom of south face. 4 patches on the south fin face over lifting loops. Diagonal cracking and rust staining at upper connection, on both sides of the fin. 2 large cracks with minor spalling on north face at quarter height and three-quarter’s height of the fin. Spall in the inside web near the upper connection. Horizontal cracking and delamination 3’ from top of fin. See Photos A7-3, 4.

South Fin

Observations: 4 patches on east face of fin over lifting loops. Rust stains on inside web. Rust staining on outer web at top of fin on both faces. Rust staining on west face at the upper connection. Spall delamination on inner web at mid-height. Cracking on west face at lower right corner, where the fin changes in width. Discoloration near lower connection of the west face. See Photos A7-5, 6.

West Fin

Observations: Rust stains at upper connection, both faces. Cracks with spalls, with repairs and re-cracking about 8’ from top. Horizontal cracks on south face at mid-height. Rust staining on inside web at upper connection. 4 patches on north face of fin over lifting loops. Discoloration at top of north face, top right corner of fin. See Photo A7-7.

General Columns

Observations: The columns for Belfry 2 begin 8’ above the belfry deck and run up 30’ to the cabin deck. The columns are comprised of 3 elements including 2 precast concrete blocks and a central fin, like the columns in the Gallery Section. The precast fins in between the precast column blocks have patches over the lifting loops.

Northeast Column

Observations: Scaling and vertical cracking on right column. Scaling on top half of left column. Poor rebar cover in left column, ends of all rebar visible. 3 patches on inside face of fin. Horizontal cracks on inside face of fin, whole length. Scaling and delamination on the left face of fin, whole

length. Rust staining on inside web of fin at both lower connections. Scaling on top of column block. See Photos A7-8, 9.
Southeast Column
Observations: Scaling on top of column of column block. Discoloration and patching at top of right column on the west face. Minor block misalignment in both columns. Scaling and vertical cracking with salt staining on west face of right column. Scaling on all faces of columns and fin. 3 patches on inside face of fin covering lifting loops. Inadequate rebar cover on both columns, on the north and west faces. Rusting on lower connections. See Photo A7-10.
Southwest Column
Observations: Scaling and discoloration on both columns, all faces. Inadequate rebar cover on north and east faces of columns. 3 patches on inside face of fin over lifting loops. Corrosion and staining at upper fin connection. Column block misalignment of approximately 1” on left column. Rust staining and discoloration near HSS connection at two-thirds height. Mild rusting at top of column block. See Photo A7-11.
Northwest Column
Observations: Slight scaling on columns. Cracking and rust at upper fin connection. Scaling and inadequate rebar cover on columns. Rebar is visible on columns. 3 patches on side of fin face. Rust staining inside of fin face. Block misalignment in both columns (1½” on left, ½” on right). See Photo A7-12, 13.
General Diaphragms - Steel
Observations: There are three levels of diaphragms between columns in the belfry section. The second set of diaphragms is between 15’ and 18’.
North Diaphragm - Steel
Observations: The north diaphragms are channels that support some of the bells and instrumentation. The seat angles for the beam has slight rust.
East Diaphragm - Steel
Observations: The east diaphragms are channels that support some of the bells and instrumentation. Seats angles are slightly discolored with some rust.
South Diaphragm - Steel
Observations: The south diaphragm is a 12” W-shape beam. There is slight rusting around the end plates and interior blocking.
West Diaphragm - Steel
Observations: There is a 12” W-shape beam and an HSS 15”V x 8”H beam on the west side. The W-shape has slight rusting near various connections and welded plates. The HSS tube has rust staining on north end near connection. North angle seat has slight rust. See Photo A6-9.

Photo A7-1: Crack in outer web of north fin where width is reduced.

Photo A7-2: Diagonal cracking and rust staining at north upper fin connection.

Photo A7-3: Upper connection of east fin. South face.

Photo A7-4: Lower connection of east fin. South face.

Photo A7-5: Upper connection of south fin. West face.

Photo A7-6: Cracking on outer web of south fin at width reduction.

Photo A7-7: Cracking and staining at lower west fin connection.

Photo A7-8: Rust behind HSS tube in northeast concrete column.

Photo A7-9: Scaling on south face of northeast concrete column.

Photo A7-10: Scaling on west face of southeast concrete column.

Photo A7-11: Staining on north face of southwest concrete column.

Photo A7-12: Upper fin connection of northwest column.

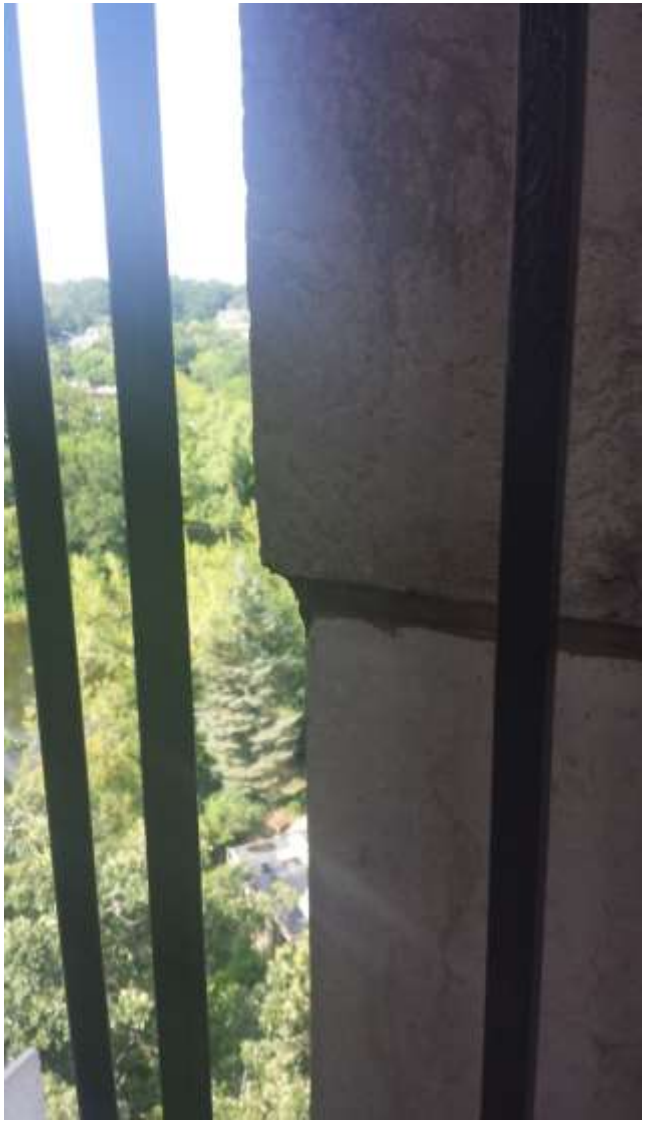
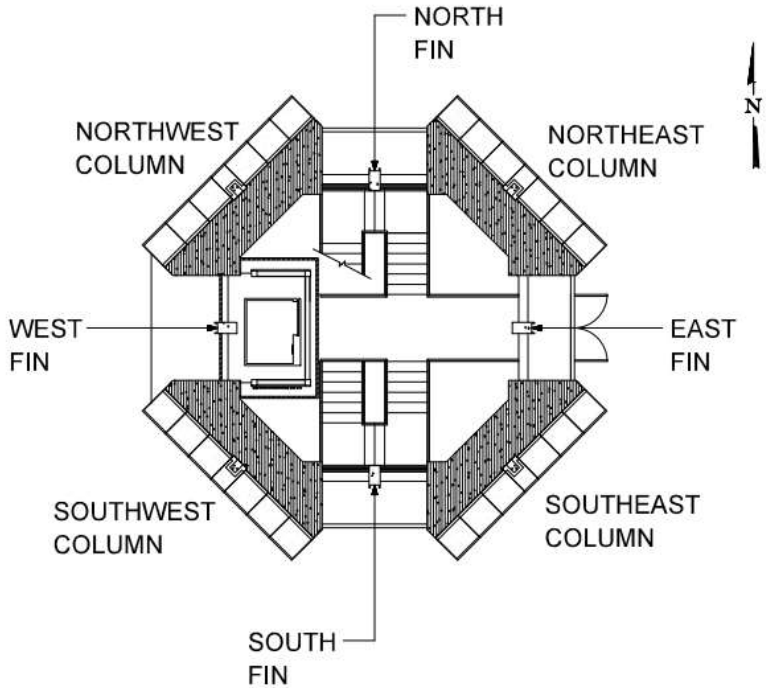


Photo A7-13: Misalignment of northwest column.

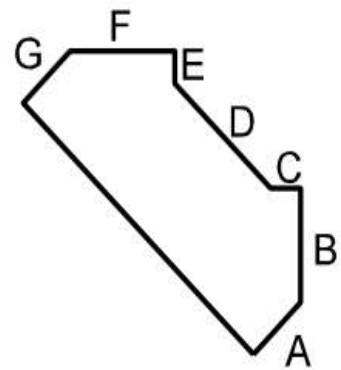
APPENDIX A-8
BELFRY LEVEL 3

BELFRY LEVEL 3

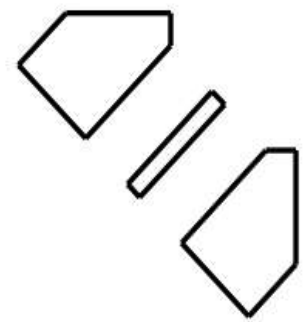
Belfry Level 3 spans from elevation 100.1’ to elevation 110.4’. Belfry Level 3 is the upper portion of the belfry. This section only includes the last 10’ of the precast concrete fins of the tower. The columns in the corners of the tower are covered in Belfry Level 2, since they are one element. The fins are segmented in between these levels, around elevation 100.1’.



Plan View of Moser Tower at Entry Level



LOWER COLUMN
Entry Level 1 through Entry Level 3



UPPER COLUMN
Entry Level 3 through Cabin

BELFRY LEVEL 3 OBSERVATIONS

General		
Construction: Concrete	***Lower Elevation:*** 100.1'	***Upper Elevation:*** 110.4'
Observations:		

General Fins
Observations: The fins are 9" thick, 12' tall, and 3'-9" wide. This is the last section of precast concrete fins. Above these sections of fins are telecommunication equipment. The groups of patches on a single face of the fins are from the lifting loops used to raise and position the fins.

North Fin
Observations: Diagonal cracking at upper connection of both faces of the fin. 4 patches on east face over lifting loops. Repaired crack and spall, top 5-6' of outer web and east face. Horizontal staining at bottom of east fin face. Repaired cracks at lower connection, both fin faces. Diagonal crack in the lower left corner of the west fin face. Scaling is prevalent on the west face. Vertical rust stains running the length of the fin from the top connection downwards. Corrosion and rust staining at top fin connection on the inside web. See Photos A8-1, 2, 3.

East Fin
Observations: Cracks and delaminations in 3 locations for a total of 5' in length on the north side of the outer web. Rust staining along with vertical and diagonal cracking on the inner web of the upper connection. Diagonal cracks and spalls on lower web connection, both sides. Rust stains on the interior web and inner 1' of the south face, length of the fin. 4 patches for lifting loops on the south face of the fin. Spall with repair on south face, near outer web. Rust staining at lower plate connection. See Photos A8-4, 5, 6.

South Fin
Observations: Vertical cracking and delamination on east face of the outer web, ~6" x 12'. 4 patches on the east face for lifting loops. Minor rust stains on both connections on east face. Rust staining on upper connection on the west face and interior web. Diagonal cracking on inner web of upper connection. See Photos A8-7, 8.

West Fin
Observations: 4 patches on south face over lifting loops. 2 significant cracks on outer web at top of fin, south face, 4' total length. Minor rust stains on both faces of the upper connection. Rust stains on the inner web at both connections. Diagonal crack on inner web at upper connection. Cracking on north face near outer web, ~5' top crack and ~3' bottom crack. 3 minor cracks on interior web: 6" at mid-height, 6" and 12" near bottom. Discoloration at the bottom of the fin on the north face. See Photos A8-9, 10.

Photo A8-1: Cracking on inner web at top of north fin. East face.

Photo A8-2: Cracking on outer web at bottom of north fin. West face.

Photo A8-3: Repair to top of North fin. East face.

Photo A8-4: Crack near outer web of east fin. North face.

Photo A8-5: Spalling at inner web at lower east fin connection.

Photo A8-6: Rust staining at upper connection of east fin. South face.

Photo A8-7: Repair on outer web of south fin. East face.

Photo A8-9: Cracking on outer web of west fin.

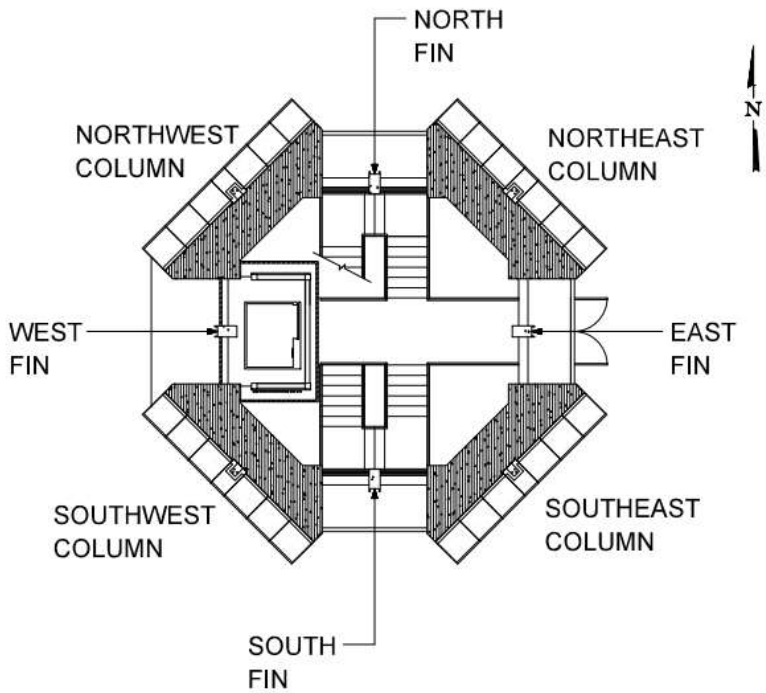
Photo A8-8: Staining at upper connection of south fin.

Photo A8-10: Top of west fin. Post-tensioning anchorage locations.

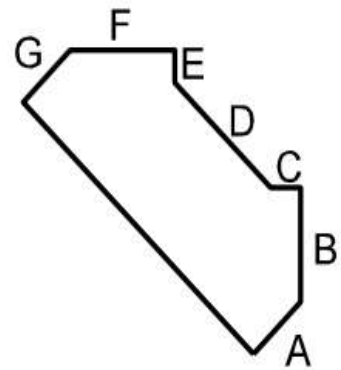
APPENDIX A-9
CABIN LEVEL

CABIN LEVEL

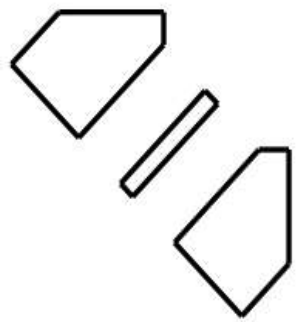
The Cabin Level spans from elevation 110.4’ to elevation 138.1’. The Cabin Level includes the enclosed room used for the bell tower and is the last level before the observation deck at the top of the tower. This section has precast concrete columns and the steel superstructure. The precast fins end at the top of Belfry Level 3. The steel superstructure consists of four columns in the shape of steel I-beams surrounding and supporting the bell tower instrumentation. Lateral bracing is resent between the columns at various intervals.



Plan View of Moser Tower at Entry Level



LOWER COLUMN
Entry Level 1 through Entry Level 3



UPPER COLUMN
Entry Level 3 through Cabin

CABIN LEVEL OBSERVATIONS

General					
Construction:	Concrete, Steel	***Lower Elevation:***	110.4'	***Upper Elevation:***	138.1'
Observations:					

General Columns

Observations: This is the last set of columns before the roof structure that covers the top observation deck. The columns begin as 3 elements: 2 outside column blocks and a precast fin between them. At the top of the column section, there is a singular precast block that sits atop the 3 elements and supports the observation deck and rood above.

Northeast Column

Observations: Minor cracks and delaminations on sides of columns and block. Rust staining near lower fin connection. Cracking and repairs at lower fin connection on inner web. Scaling on west face of left column. 2 patches on inside faces of each column and fin over lifting loops. 5 patches on the top column block inside face for lifting loops. Minor rust and rust stains at top fin connection. See Photos A9-1, 2.

Southeast Column

Observations: Patch on west corner of top column block runs the length of the block into the right column. Minor rust staining near top fin connection. 4 patches on inner face of top column block over lifting loops. Discoloration on top of left column. Crack runs the length of the column; the bottom 3' are patched. Spall and repair on lower right corner of right column. Scaling on north facing sides of both columns. Corrosion and rust staining near lower fin connection. 2 patches on each column and inner fin face over lifting loops. Rust staining on top of lower column block. Map cracking on top right of lower column block. Scaling and salt staining on lower column block. See Photos A9-3, 4.

Southwest Column

Observations: Rust stains on inner face of lower column block. Cracking near repair on upper left corner of the lower column block. Scaling on outer faces of both column columns. Spall repair at lower right corner of lower column block and lower right column. 2 patches on each column and precast fin over lifting loops. 4 patches on upper and lower column blocks over lifting loops. Cracking and repair at lower fin connection. Rust staining at both precast fin connections. Rust stains on upper column block near fin connection. See Photos A9-5, 6.

Northwest Column

Observations: 5 patches on upper column block, 2 on each column block and 2 on the precast fin covering the lifting loops. Scaling on the column faces. Diagonal crack on top right and left corners of top column block. Rust stains near lower precast fin connection. Repair at lower fin connection for spalls and cracking. See Photos A9-7, 8.

Cabin Columns 2(Lower) - Steel

Observations: Columns that enclose the cabin. They sit directly above the columns below. They are braced by Cabin Diaphragms 1 at the bottom and Cabin Diaphragms 2 at the top. This is the final section of columns in this vertical line. The next set of columns are inward in both directions.

Northeast Column - Steel
Observations: Rust around empty bolt holes on east side at the bottom of this section. Discoloration along the north interior flange. See Photos A9-9, 12.
Southeast Column - Steel
Observations: Rust stains run down south side of flange. Empty bolt holes have been painted or marked. There is evidence of rust beneath the paint in the empty bolt holes. See Photo A9-10.
Southwest Column - Steel
Observations: This column was difficult to access from the stairs. There were no defects noted however.
Northwest Column - Steel
Observations: Rusting near cantilevered diaphragm to the north, at the top of the column. See Photo A9-11.
Cabin Columns 2(Upper) - Steel
Observations: The main line of columns that begin at the gallery end at the top of the Cabin. Columns begin further inward from the lower columns in all four corners of the structure. The columns are still 12” x 12” steel I-beams. The connection and bearing configuration of these columns is hidden.
Northeast Column - Steel
Observations: Rust and discoloration has been painted over near diaphragm connections. Rust is visible through the paint. See Photos A9-14, 15.
Southeast Column - Steel
Observations: Rust and discoloration has been painted over near diaphragm connections. Rust is visible through the paint. Paint is chipping and has failed on the interior of the north flange near the top. See Photo A9-16.
Southwest Column - Steel
Observations: Rust and discoloration has been painted over near diaphragm connections. Rust is visible through the paint. Rust is prevalent on the flanges near adjacent conduit and piping. See Photos A9-17, 18.
Northwest Column - Steel
Observations: Rust and discoloration has been painted over near diaphragm connections. Rust is visible through the paint. Rust is prevalent near conduits and piping. Rust staining on north side of north flange. See Photo A9-19.
Cabin Diaphragms 1(Lower) - Steel
Observations: There are 12” W-shape beams at the lower corners of the enclosed cabin room.

North Diaphragm - Steel
Observations: Welds are damaged and burnt though in several locations. Concrete is on the back side of the beams, where the steel was field welded and the damage has occurred. The angle in the northeast corner is cut around bolts, and has slight corrosion. See Photo A9-12.
East Diaphragm - Steel
Observations: Slightly rusted near connection plates and bolts. Welds have the same issue as the north diaphragms. Rust is present on the bottom flange beneath the cabin room entrance.
South Diaphragm - Steel
Observations: The welds have similar damage to the other beams. The connection on both ends of the beam are rusting.
West Diaphragm - Steel
Observations: There is rust near holes in deck above at the north and south ends of the beam. See Photo A9-13.
Cabin Diaphragms 2 - Steel
Observations: There are 12” W-shape beams at the upper corners of the enclosed cabin room.
North Diaphragm - Steel
Observations: Slight rusting around the bolts and connections, both sides of beam. See Photo A9-14.
East Diaphragm - Steel
Observations: Appears to be odd red-orange discoloration near top connections. See Photo A9-16, 20.
South Diaphragm - Steel
Observations: No defects were noted on the south diaphragm. See Photo A9-16, 21.
West Diaphragm - Steel
Observations: The western beam was hidden behind the cabin enclosure.
Cabin Diaphragms 3 - Steel
Observations: The first set of bracing between Cabin Columns 2. The beams are 12” W-shapes. There is slight rust on the main connections. The rusting locations have been painted over, as can also be seen on the columns. The rust is still bleeding through the paint.
Cabin Diaphragms 4(Upper) - Steel
Observations: The south, west, and north sides have an additional set of diaphragms between Cabin Columns 2. The west and north diaphragms are 6’ above the previous set of diaphragms, while the south diaphragm is only 3’ above Cabin Diaphragms 3. The beams are 12” W-shapes. There is some rust and paint chipping in a few locations. No other defects were noted.

Photo A9-1: Cracks and scaling on northeast concrete column.

Photo A9-2: Lower fin connection on northeast column.

Photo A9-3: Cracking and repairs in southeast column.

Photo A9-4: Previous repairs on southeast column.

Photo A9-5: Previous repairs on southwest column.

Photo A9-6: Upper fin connection on southwest column.

Photo A9-7: Crack at top of northwest column.

Photo A9-8: Spall at top of northwest column, adjacent to observation deck.

Photo A9-10: Rust staining at top of northeast column.

Photo A9-9: Rust in empty bolt holes of northeast cabin column 1.

Photo A9-11: Rust and discoloration at upper connection of northwest column.

Photo A9-12: Rust buildup at connection of north diaphragm and northeast column.

Photo A9-13: West cabin diaphragm 1.

Photo A9-14: Northeast cabin column 2 and north diaphragm 2 connections.

Photo A9-15: Staining at top of northeast cabin column 2.

Photo A9-16: Southeast cabin column 2 and diaphragms 2 connection.

Photo A9-17: Rust staining on southwest cabin column 2.

Photo A9-18: Rust and staining around connections to cabin column 2.

Photo A9-19: Rusted connection on northwest cabin column 2.

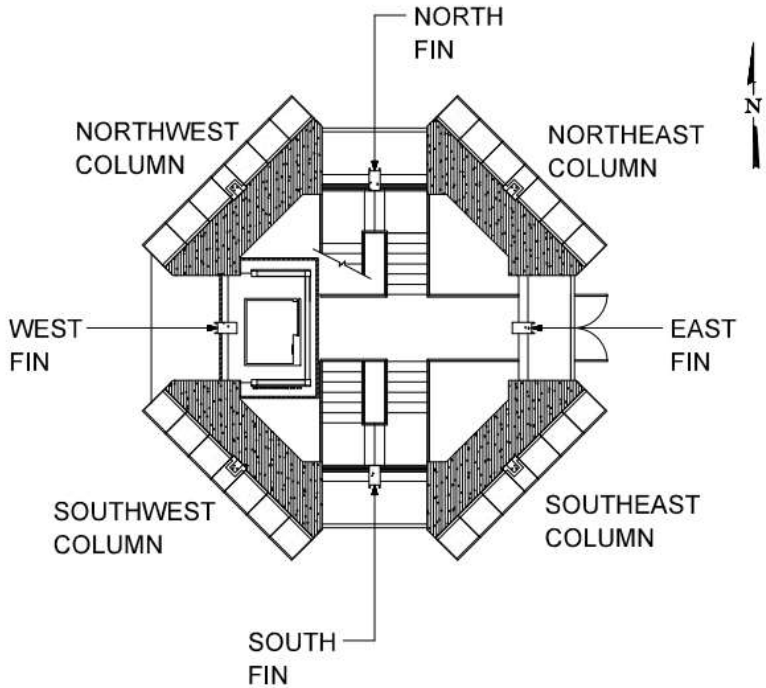
Photo A9-20: Rust and chipped pain in east cabin diaphragm 2.

Photo A9-21: Rust and repainting on south diaphragm 2.

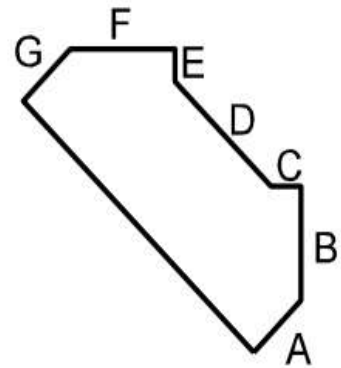
APPENDIX A-10
OBSERVATION LEVEL

OBSERVATION LEVEL

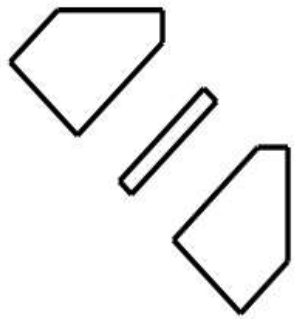
The Observation Level spans from elevation 138.1' to the top of the tower. The observation level includes the observation deck and the end caps for the columns, as well as the roof structure. The concrete column caps are precast concrete, as is the roof. The roof structure is in the southeast and northwest corners of the tower, meeting diagonally above the observation deck. The northeast and southwest columns continue upward to meet the roof in the corners.



Plan View of Moser Tower at Entry Level



LOWER COLUMN
Entry Level 1 through Entry Level 3



UPPER COLUMN
Entry Level 3 through Cabin

OBSERVATION LEVEL OBSERVATIONS

General		
Construction: Concrete	***Lower Elevation:*** 138.1’	***Upper Elevation:*** 160.9’
Observations:		

General Roof
Observations: The roof is comprised of 2 precast concrete columns, located in the northeast and the southwest corners. The southeast and northwest corners have precast concrete roof pieces that widen as they go upwards, meeting at their peak. The roof pieces also widen at the top and meet the two columns in the corners. The roof pieces have slotted openings in the roof.

Northeast Column
Observations: 7 patches on inside face over lifting loops. Scaling on both outside faces of column. Staining around joint at mid-height of column. Cracking and staining in the top left corner of column. See Photo A10-1.

Southeast Roof
Observations: 20 patches over lifting loops throughout roof. Rusting at the top of the HSS tube connection at the lower portion of the precast roof. 3 Spalls and repairs along the centerline joint. 2 repairs on the concrete ‘beams’ in the slotted portion of the roof. Left ‘beam’ has horizontal cracking. Scaling and rust staining throughout. See Photos A10-2, 3.

Southwest Column
Observations: 6 patches on inside face over lifting loops. 2 horizontal spots of rust staining. The area is about 1’ tall and 6’ in width. Cracking and repaired spalls at midway joint.

Northwest Roof
Observations: 20 patches over lifting loops throughout roof. Rust stains on lower column block behind HSS tube connection. Horizontal staining lines on entire face. Rust stains on beam slots, top and bottom. Faulty joint repairs on centerline of precast roof. See Photos A10-4, 5.

Observation Deck Stringers
Observations: The observation deck sits on top of the new set of interior columns, which begin atop the Cabin enclosure. There are two girders running east/west between their respective set of columns. The 7 north/south stringers span between them and cantilever to the north and south on either end. The edge stringers are larger in size than the interior stringers. The spacing varies throughout the deck. There is minor rust near connections and on exposed potions of bolts, but no major defects. See Photo A10-6.

Observation Deck
Observations: The observation deck is comprised of corrugated metal deck and concrete. The are no major cracks in the top surface of the concrete. The metal deck has several locations where it has rusted though. The southeast corner of the deck exhibits the most significant damage, where rust and corrosion is occurring on the stringers below. See Photos A10-6, 7.

Photo A10-1: Northeast column/roof above observation deck.

Photo A10-2: Staining on southeast precast roof section.

Photo A10-3: Cracks and stains in southeast roof section.

Photo A10-4: Staining on base on northwest roof section.

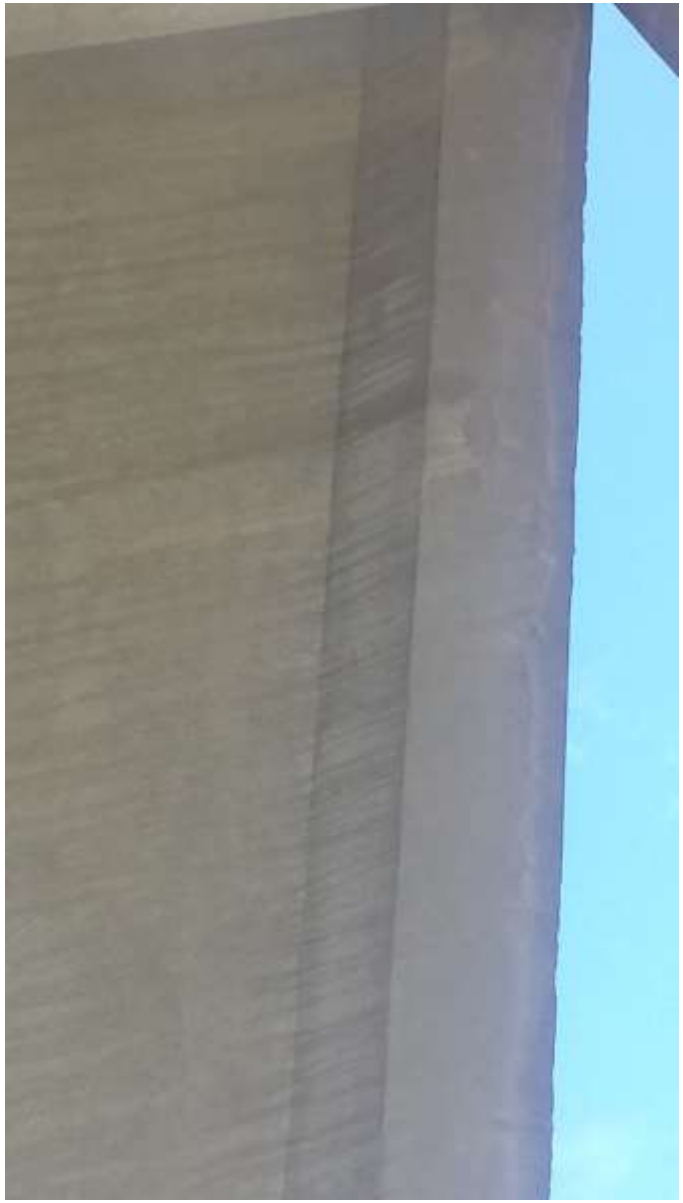


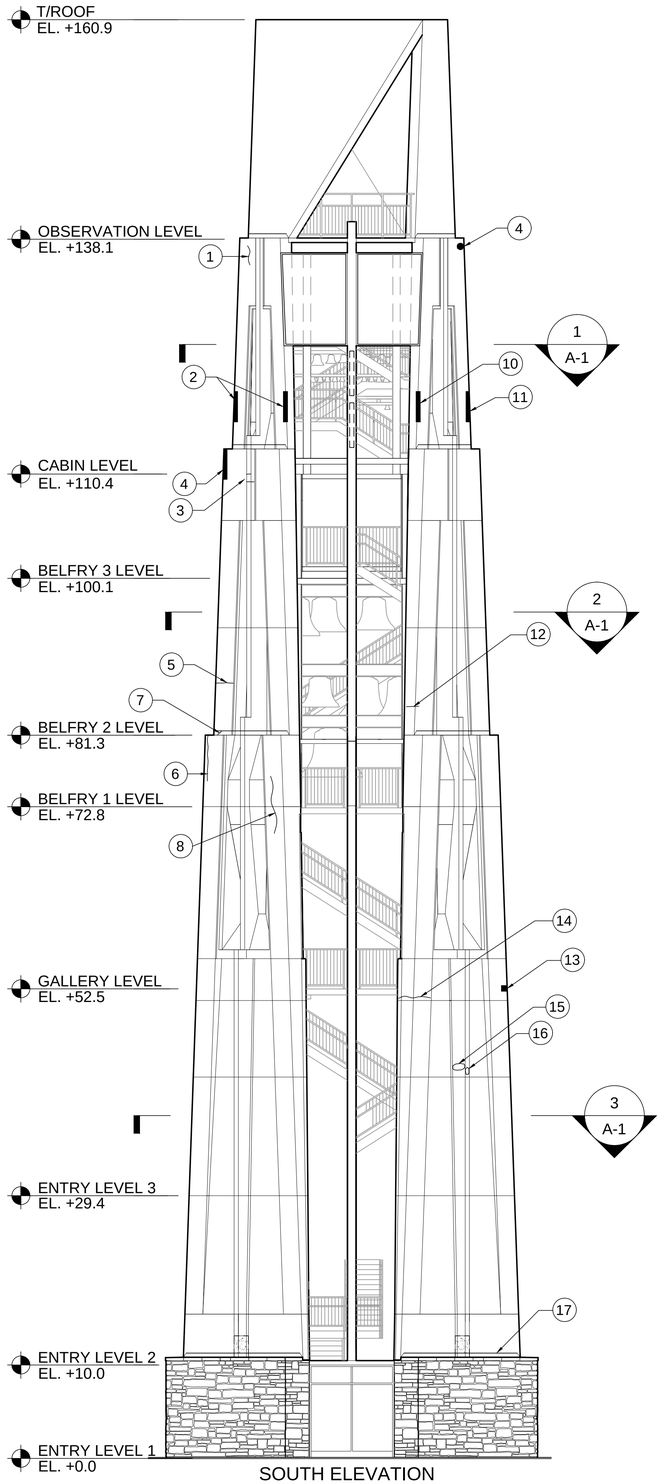
Photo A10-5: Staining on edge of northwest roof section.

Photo A10-6: Stringer and observation deck.

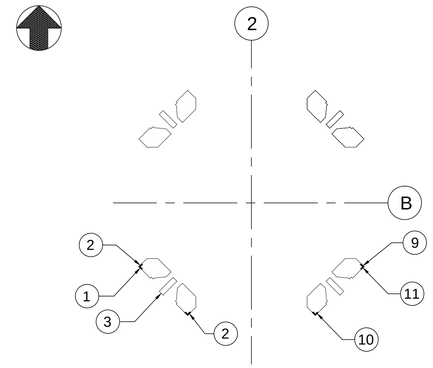
Photo A10-7: Rust and corrosion on underside of observation level metal deck.

APPENDIX B

MOSER TOWER EXTERIOR INSPECTION
PERFORMED BY COLLINS ENGINEERING



SOUTH ELEVATION



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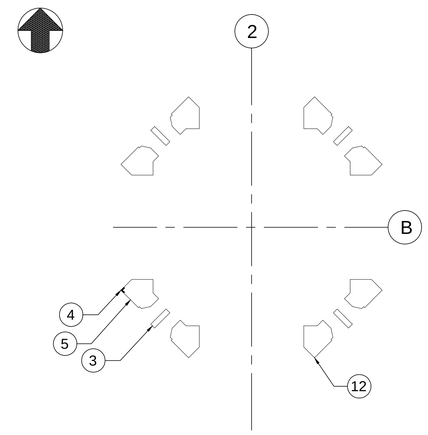

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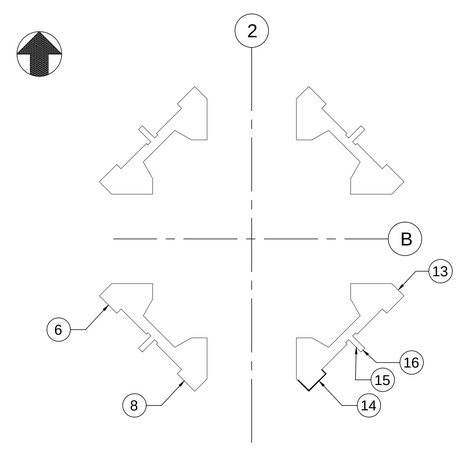

3 SECTION

SOUTHWEST PANEL INSPECTION NOTES

1. VERTICAL HAIRLINE CRACK, MEASURING 12 INCHES LONG, LOCATED ON THE WEST SIDE OF THE SOUTHWEST COLUMN. ELEVATION +/- 135'.
2. TWO AREAS OF CONCRETE DELAMINATION WITH ASSOCIATED CRACKING, LOCATED IN THE PREVIOUS REPAIRS ON THE SOUTH AND WEST CORNERS OF THE SOUTHWEST COLUMN. EACH AREA MEASURED APPROXIMATELY 4 FEET HIGH BY 30 INCHES WIDE. ELEVATION +/- 117'. SEE PHOTOGRAPHS 1, 2, AND 3.
3. TWO HORIZONTAL HAIRLINE CRACKS, MEASURING 12 INCHES LONG, LOCATED ON THE CENTER FIN OF THE SOUTHWEST COLUMN. ELEVATION +/- 107'. SEE PHOTOGRAPH 4.
4. AREA OF CONCRETE DELAMINATION WITH MAP CRACKING IN THE PREVIOUS REPAIR ON THE WEST CORNER OF THE SOUTHWEST COLUMN. THE AREA MEASURED APPROXIMATELY 5 FEET HIGH BY 3 FEET WIDE. ELEVATION +/- 110'. SEE PHOTOGRAPHS 5 AND 6.
5. HORIZONTAL HAIRLINE CRACK, MEASURING 3 FEET LONG, LOCATED ON THE WEST SECTION OF THE SOUTHWEST COLUMN. ELEVATION +/- 87'. SEE PHOTOGRAPH 7.
6. VERTICAL HAIRLINE CRACK WITH EFFLORESCENCE, MEASURING 5 FEET LONG, LOCATED ON THE WEST SIDE OF THE SOUTHWEST COLUMN. ELEVATION +/- 78'. SEE PHOTOGRAPH 8.
7. THE TOP OF CONCRETE STEP-OUT OF THE SOUTHWEST COLUMN EXHIBITED APPROXIMATELY 25 PERCENT COATING LOSS. THIS CONDITION IS TYPICAL FOR MAJORITY OF COLUMN STEP-OUTS. SEE PHOTOGRAPH 9.
8. VERTICAL HAIRLINE CRACK WITH EFFLORESCENCE, MEASURING 6 FEET LONG, LOCATED ON THE SOUTH SIDE OF THE SOUTHWEST COLUMN. ELEVATION +/- 73'. SEE PHOTOGRAPH 10.

SOUTHEAST PANEL INSPECTION NOTES

9. AREA OF UNSOUND CONCRETE IN THE PREVIOUS REPAIR, MEASURING 12 INCHES IN DIAMETER, LOCATED ON THE EAST CORNER OF THE SOUTHEAST COLUMN. ELEVATION +/- 132'. SEE PHOTOGRAPH 11.
10. AREA OF CONCRETE DELAMINATION WITH MAP CRACKING IN THE PREVIOUS REPAIR ON THE SOUTH CORNER OF THE SOUTHEAST COLUMN. THE AREA MEASURED APPROXIMATELY 7 FEET HIGH BY 3 FEET WIDE. ELEVATION +/- 117'. SEE PHOTOGRAPH 12.
11. AREA OF CONCRETE DELAMINATION WITH MAP CRACKING IN THE PREVIOUS REPAIR ON THE EAST CORNER OF THE EAST SECTION OF THE SOUTHEAST COLUMN. THE AREA MEASURED APPROXIMATELY 5 FEET HIGH BY 3 FEET WIDE. ELEVATION +/- 116'. SEE PHOTOGRAPHS 13 AND 14.
12. HORIZONTAL HAIRLINE CRACK, MEASURING 12 INCHES LONG, LOCATED ON THE SOUTH CORNER OF THE SOUTH SECTION OF THE SOUTHEAST COLUMN. ELEVATION +/- 86'.
13. AREA OF DELAMINATED CONCRETE ON THE NORTHEAST SIDE OF THE SOUTHEAST COLUMN. THE AREA MEASURED APPROXIMATELY 12 INCHES HIGH BY 4 INCHES WIDE. ELEVATION +/- 53'.
14. HORIZONTAL HAIRLINE CRACK, MEASURING APPROXIMATELY 6 FEET LONG, LOCATED ON THE SOUTHEAST SIDE OF THE SOUTHEAST COLUMN. ELEVATION +/- 48'. SEE PHOTOGRAPH 15,
15. SPALL WITH EXPOSED REINFORCING STEEL LOCATED ON THE SOUTH FACE OF THE CENTER FIN OF THE SOUTHEAST COLUMN. THE AREA MEASURED APPROXIMATELY 2 INCHES HIGH BY 6 INCHES WIDE. ELEVATION +/- 41'. SEE PHOTOGRAPH 16.
16. AREA OF DELAMINATED CONCRETE LOCATED ON THE CENTER FIN OF THE SOUTHEAST COLUMN. THE AREA MEASURED APPROXIMATELY 12 INCHES HIGH BY 4 INCHES WIDE. ELEVATION +/- 41'. SEE PHOTOGRAPH 17.
17. THE SEALANT BETWEEN THE HORIZONTAL PANELS ABOVE THE LIMESTONE CLADDING EXHIBITED WEATHERING AND MINOR DETERIORATION, TYPICAL AT ALL FOUR COLUMNS OF THE STRUCTURE. SEE PHOTOGRAPH 18.

DRAWING LEGEND

(12) INSPECTION NOTE NUMBER

COLLINS ENGINEERS
123 N. Wacker Drive
Chicago, Illinois 60606
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Fax: 312-704-9320

OWNER
CITY OF NAPERVILLE
400 EAGLE STREET
NAPERVILLE, IL 60540

NAPERVILLE MILLENNIUM CARILLON
427 AURORA AVENUE
NAPERVILLE, ILLINOIS

SOUTHEAST AND SOUTHWEST COLUMN INSPECTION NOTES

NO.	DATE	DESIGN BY	DESCRIPTION

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CHECKED BY: PS
DATE: 10-1-2015
SCALE: N.T.S.
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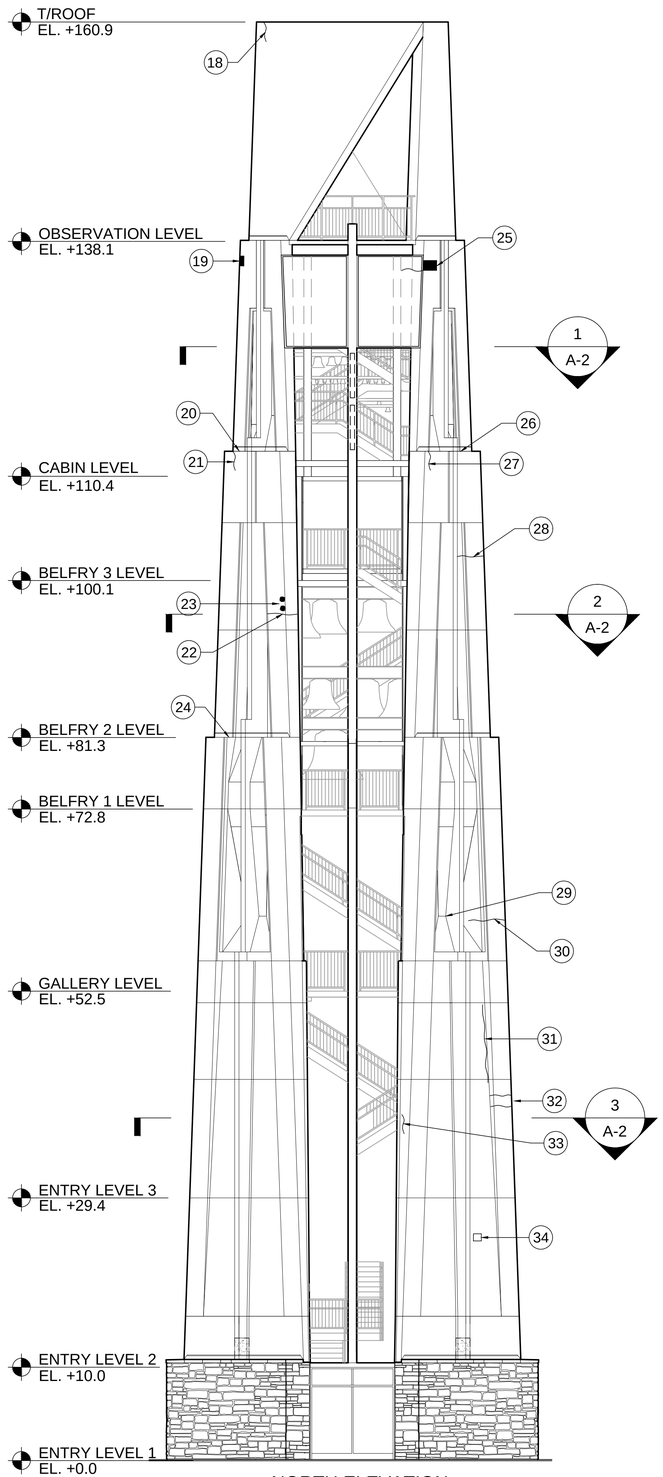
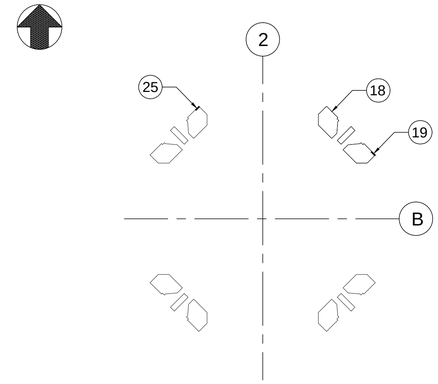


NORTH ELEVATION



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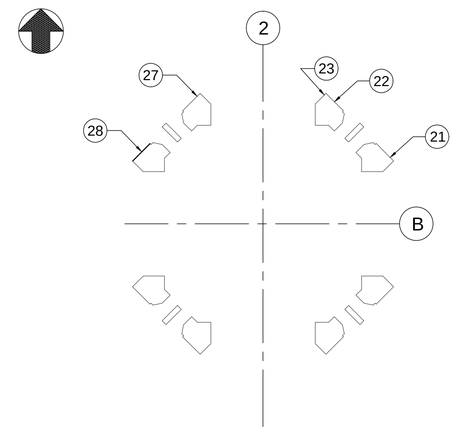

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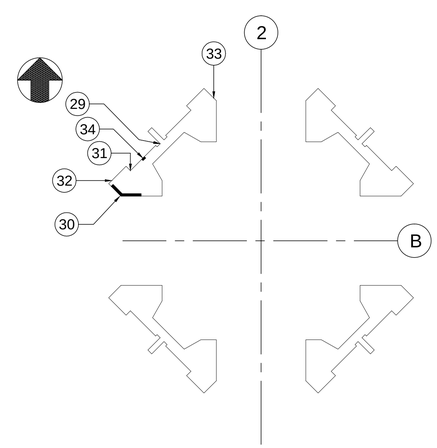

3 SECTION

NORTHEAST PANEL INSPECTION NOTES

18. VERTICAL CRACK, WITH EFFLORESCENCE MEASURING UP TO 1/8-INCH WIDE BY 1.5 FOOT LONG, LOCATED AT THE TOP OF THE NORTHEAST COLUMN. ELEVATION +/- 160'. SEE PHOTOGRAPH 19.
19. AREA OF CONCRETE DELAMINATION ON THE SOUTHEAST CORNER OF THE NORTHEAST COLUMN. THE AREA MEASURED APPROXIMATELY 2 FEET HIGH BY 18 INCHES WIDE. ELEVATION +/-130'.
20. THE TOP OF THE SECOND CONCRETE STEP-OUT OF THE NORTHEAST COLUMN EXHIBITED APPROXIMATELY 30 PERCENT COATING LOSS WITH UNDERLYING DELAMINATED CONCRETE. ELEVATION +/- 113'. SEE PHOTOGRAPH 20.
21. VERTICAL HAIRLINE CRACK WITH EFFLORESCENCE, MEASURING 12 INCHES LONG, LOCATED NEAR THE SOUTHEAST CORNER OF THE NORTHEAST COLUMN. ELEVATION +/- 112'. SEE PHOTOGRAPH 21.
22. HORIZONTAL HAIRLINE CRACK EXTENDING AROUND THE ENTIRE NORTHEAST PANEL OF THE NORTHEAST COLUMN. ELEVATION +/- 96'.
23. TWO POP-OUTS MEASURING 2 INCHES IN DIAMETER WITH A MAXIMUM OF 1 INCH PENETRATION, LOCATED ON THE NORTH PANEL OF THE NORTHEAST COLUMN. ELEVATION +/- 98'. SEE PHOTOGRAPH 22.
24. THE TOP OF THE FIRST CONCRETE STEP-OUT OF THE NORTHEAST COLUMN EXHIBITED APPROXIMATELY 30 PERCENT COATING LOSS WITH UNDERLYING DELAMINATED CONCRETE. ELEVATION +/- 81'. SEE PHOTOGRAPH 23.

NORTHWEST PANEL INSPECTION NOTES

25. AREA OF CONCRETE DELAMINATION ON THE NORTHEAST PANEL OF THE NORTHWEST COLUMN. AREA MEASURED APPROXIMATELY 2 FEET HIGH BY 24 INCHES WIDE. A HORIZONTAL HAIRLINE CRACK EXTENDED EAST FROM THE BOTTOM OF THE DELAMINATED AREA AND MEASURED APPROXIMATELY 3 FEET LONG. ELEVATION +/- 130'. SEE PHOTOGRAPH 24.
26. THE TOP OF THE SECOND CONCRETE STEP-OUT OF THE NORTHWEST COLUMN EXHIBITED APPROXIMATELY 30 PERCENT COATING LOSS WITH UNDERLYING DELAMINATED CONCRETE. ELEVATION +/- 113'. SEE PHOTOGRAPH 25.
27. VERTICAL HAIRLINE CRACK WITH EFFLORESCENCE, MEASURING 6 INCHES LONG, LOCATED ON THE NORTHEAST PANEL OF THE NORTHWEST COLUMN. ELEVATION +/- 112'.
28. HORIZONTAL HAIRLINE CRACK MEASURING APPROXIMATELY 3.5 FEET LONG, LOCATED ON THE SOUTHWEST PANEL OF THE NORTHWEST COLUMN. ELEVATION +/- 100'. SEE PHOTOGRAPH 26.
29. CORNER SPALL WITH ASSOCIATED AREA OF CONCRETE DELAMINATION ON THE INTERIOR FACE OF THE CENTER FIN OF THE NORTHWEST COLUMN. THE AREA MEASURED 6 INCHES HIGH BY 8 INCHES WIDE WITH UP TO 2 INCHES OF PENETRATION AND NO EXPOSED REINFORCING STEEL. ELEVATION +/- 60'. SEE PHOTOGRAPH 27.
30. MISSING SEAL THROUGH THE ENTIRE HORIZONTAL JOINT AT SOUTHWEST CORNER OF THE NORTHWEST COLUMN. AN AREA OF SECTION LOSS, MEASURING 3 INCHES HIGH BY 2.5 FEET WIDE, LOCATED IN THE CONSTRUCTION JOINT ADJACENT TO THE ELEVATOR SHAFT. ELEVATION +/- 60'. SEE PHOTOGRAPHS 28, 29, AND 30.
31. VERTICAL HAIRLINE CRACK, MEASURING 10 FEET LONG, LOCATED ON THE NORTH CORNER OF THE SOUTHWEST SECTION OF THE NORTHWEST COLUMN. ELEVATION +/- 36' TO 46'.
32. TWO HORIZONTAL HAIRLINE CRACKS, MEASURING APPROXIMATELY 4 FEET LONG, LOCATED ON THE SOUTHWEST PORTION OF THE NORTHWEST COLUMN. ELEVATION +/- 33' AND +/- 29'.
33. VERTICAL HAIRLINE CRACK WITH EFFLORESCENCE MEASURING 6 INCHES LONG LOCATED ON THE NORTHWEST PORTION OF THE NORTHWEST COLUMN. ELEVATION +/- 29'
34. AREA OF CONCRETE DELAMINATION ON THE NORTHWEST COLUMN, MEASURING APPROXIMATELY 12 INCHES HIGH BY 12 INCHES WIDE. ELEVATION +/- 25'.

DRAWING LEGEND

(12) INSPECTION NOTE NUMBER

COLLINS ENGINEERS
123 N. Wacker Drive
Chicago, Illinois 60606
Phone: 312-704-9300
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OWNER
CITY OF NAPERVILLE
400 EAGLE STREET
NAPERVILLE, IL 60540

NAPERVILLE MILLENNIUM CARILLON
427 AURORA AVENUE
NAPERVILLE, ILLINOIS

NORTHEAST AND NORTHWEST COLUMN INSPECTION NOTES

NO.	DATE	DESIGN BY	DESCRIPTION

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CHECKED BY: PS
DATE: 10-1-2015
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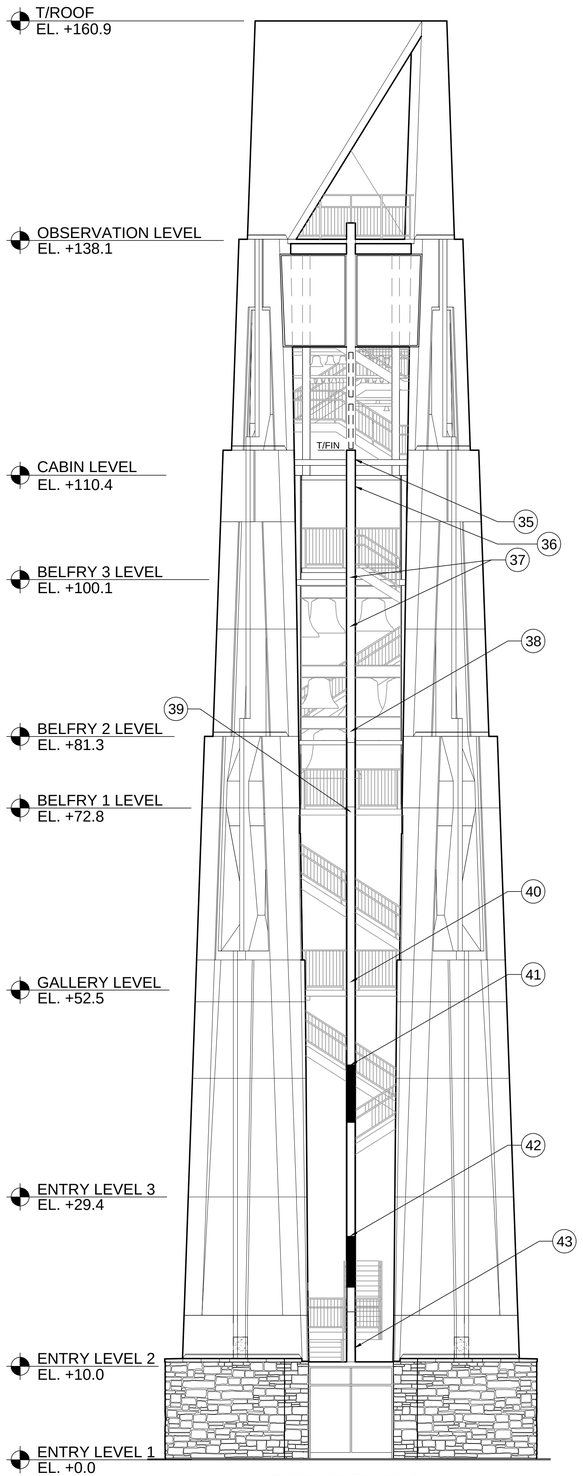
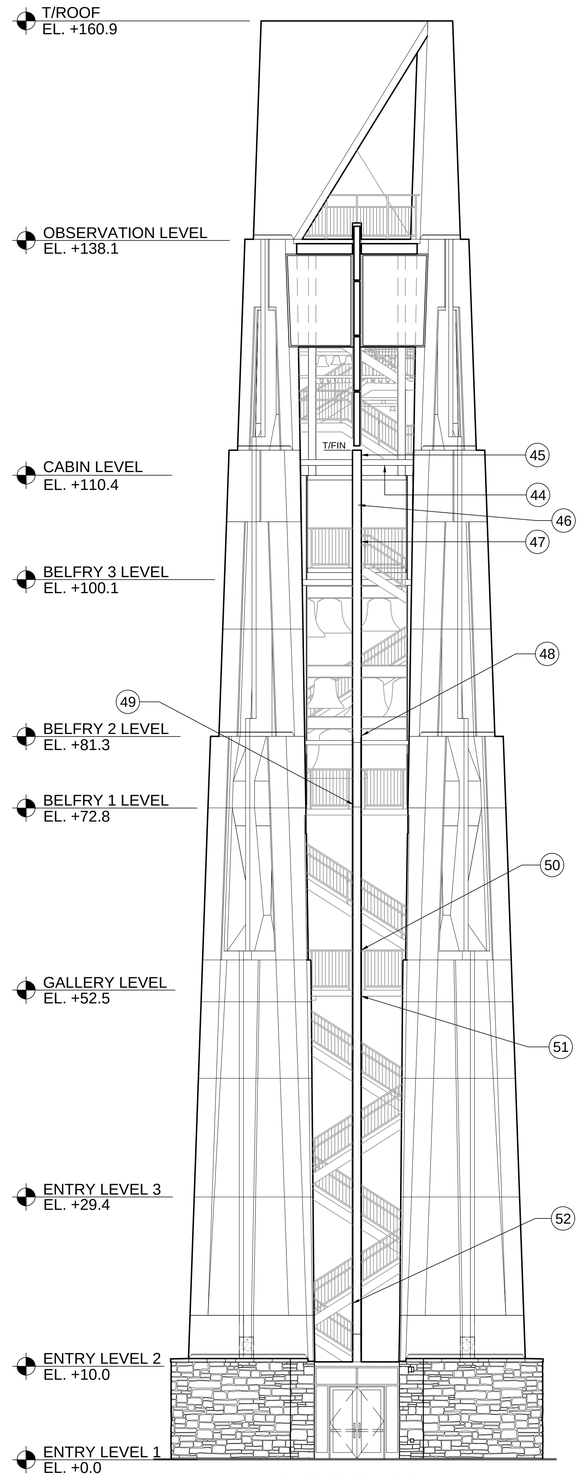


NORTH ELEVATION



EAST ELEVATION

NORTH FIN INSPECTION NOTES

35. DIAGONAL HAIRLINE CRACKING ON THE WEST FACE OF THE NORTH FIN AT STEEL FRAMING CONNECTION. ELEVATION +/- 112'. SEE PHOTOGRAPH 31.
36. DIAGONAL HAIRLINE CRACK, MEASURING 12 INCHES LONG, ON THE WEST FACE, ADJACENT TO THE NORTHWEST CORNER OF THE NORTH FIN. ELEVATION+/- 110'. SEE PHOTOGRAPH 32.
37. DIAGONAL HAIRLINE CRACK, MEASURING 12 INCHES LONG, ON THE WEST FACE OF THE NORTH FIN. ELEVATION +/- 90'. SEE PHOTOGRAPH 33.
38. FAILED CONCRETE REPAIR ON THE EAST AND WEST FACES OF THE NORTH FIN, NEAR THE FIRST STEP-OUT. THE AREAS MEASURED APPROXIMATELY 1.5 FOOT HIGH BY 4 INCHES WIDE. ELEVATION +/- 81' SEE PHOTOGRAPH 34.
39. LOSS OF MORTAR IN HORIZONTAL JOINT ON THE THE EAST FACE OF THE NORTH FIN. ELEVATION +/- 72'. SEE PHOTOGRAPH 35.
40. FAILED CONCRETE REPAIR ON THE EAST AND WEST FACES OF THE NORTH FIN, ADJACENT TO THE SECOND FIN STEP-OUT. THE AREAS MEASURED APPROXIMATELY 1.5 FOOT HIGH BY 4 INCHES WIDE. ELEVATION +/- 52'.
41. TEN HORIZONTAL HAIRLINE CRACKS, SPACED 6 INCHES TO 12 INCHES APART, LOCATED ON THE WEST FACE OF THE NORTH FIN. ELEVATION +/- 40' SEE PHOTOGRAPH 36.
42. SEVERAL HORIZONTAL HAIRLINE CRACKS, SPACED 12 INCHES TO 24 INCHES APART, MEASURING 18 INCHES LONG TO 8 FEET LONG, LOCATED ON THE WEST FACE OF THE NORTH FIN. ELEVATION +/- 26'. SEE PHOTOGRAPH 37.
43. FAILED CONCRETE REPAIR ON THE CURVED NORTHWEST RIB EDGE OF THE NORTH FIN. THE AREA MEASURED APPROXIMATELY 2 FEET HIGH BY 4 INCHES WIDE. ELEVATION +/- 18'.

EAST FIN INSPECTION NOTES

44. OUTSIDE FACE OF STEEL FRAMING EXHIBITED RANDOM AREAS OF SURFACE CORROSION, RUST NODULES AND COATING LOSS, TYPICALLY AT THE CONCRETE DECK INTERFACE. SEE PHOTOGRAPHS 38 AND 39.
45. FAILED CONCRETE REPAIR ON THE NORTH FACE, ADJACENT TO THE NORTHEAST CORNER OF THE EAST FIN. THE AREA MEASURED APPROXIMATELY 4 FEET HIGH BY 4 INCHES WIDE. ELEVATION +/- 110'.
46. FAILED CONCRETE REPAIR ON THE NORTH AND SOUTH FACES, AT THE EAST EDGE OF THE EAST FIN. THE AREAS MEASURED APPROXIMATELY 18 INCHES HIGH BY 4 INCHES WIDE. ELEVATION +/- 107'. SEE PHOTOGRAPH 40.
47. FAILED CONCRETE REPAIR ON THE NORTH FACE, ADJACENT TO THE NORTHEAST CORNER OF THE EAST FIN. THE AREA MEASURED APPROXIMATELY 18 INCHES HIGH BY 4 INCHES WIDE. ELEVATION +/- 103'.
48. FAILED CONCRETE REPAIR ON THE NORTH FACE, ADJACENT TO THE NORTHEAST CORNER OF THE EAST FIN. THE AREA MEASURED APPROXIMATELY 18 INCHES TALL BY 4 INCHES WIDE. ELEVATION +/- 80'.
49. FAILED CONCRETE REPAIR ON THE SOUTH FACE, ADJACENT TO THE SOUTHEAST CORNER OF THE EAST FIN. THE AREA MEASURED APPROXIMATELY 18 INCHES HIGH BY 4 INCHES WIDE. ELEVATION +/- 73' SEE PHOTOGRAPH 41.
50. FAILED CONCRETE REPAIR ON THE NORTH FACE, ADJACENT TO THE NORTHEAST CORNER OF THE EAST FIN. THE AREA MEASURED APPROXIMATELY 4 FEET HIGH BY 4 INCHES WIDE. ELEVATION +/- 55'. SEE PHOTOGRAPH 42.
51. HORIZONTAL HAIRLINE CRACK THROUGH THE HORIZONTAL JOINT ON THE EAST SIDE OF THE EAST FIN. ELEVATION +/- 52'. SEE PHOTOGRAPH 43.
52. FAILED CONCRETE REPAIR ON THE NORTH FACE OF EAST FIN, JUST ABOVE THE RADIAL TRANSITION. THE AREA MEASURED APPROXIMATELY 2 FEET HIGH BY 4 INCHES WIDE. ELEVATION +/- 19'.

DRAWING LEGEND

(12) INSPECTION NOTE NUMBER

COLLINS ENGINEERS INC
123 N. Wacker Drive
Chicago, Illinois 60606
Phone: 312-704-9300
Fax: 312-704-9320

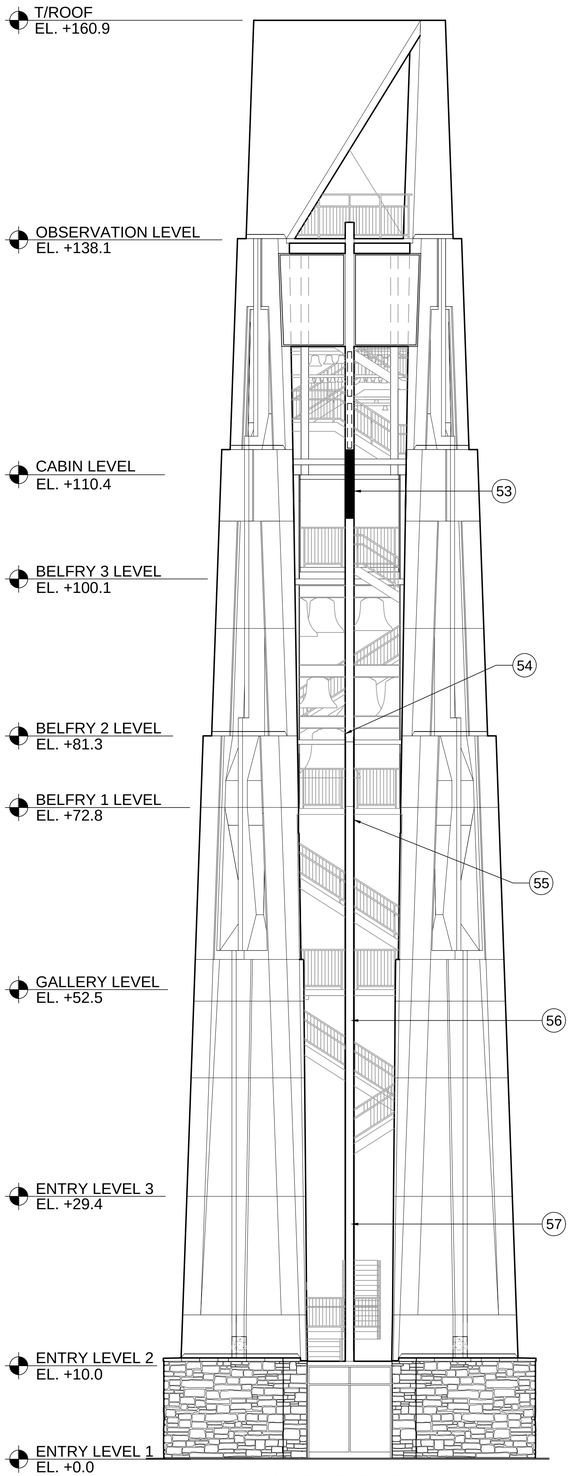
OWNER
CITY OF NAPERVILLE
400 EAGLE STREET
NAPERVILLE, IL 60540

NAPERVILLE MILLENNIUM CARILLON
427 AURORA AVENUE
NAPERVILLE, ILLINOIS

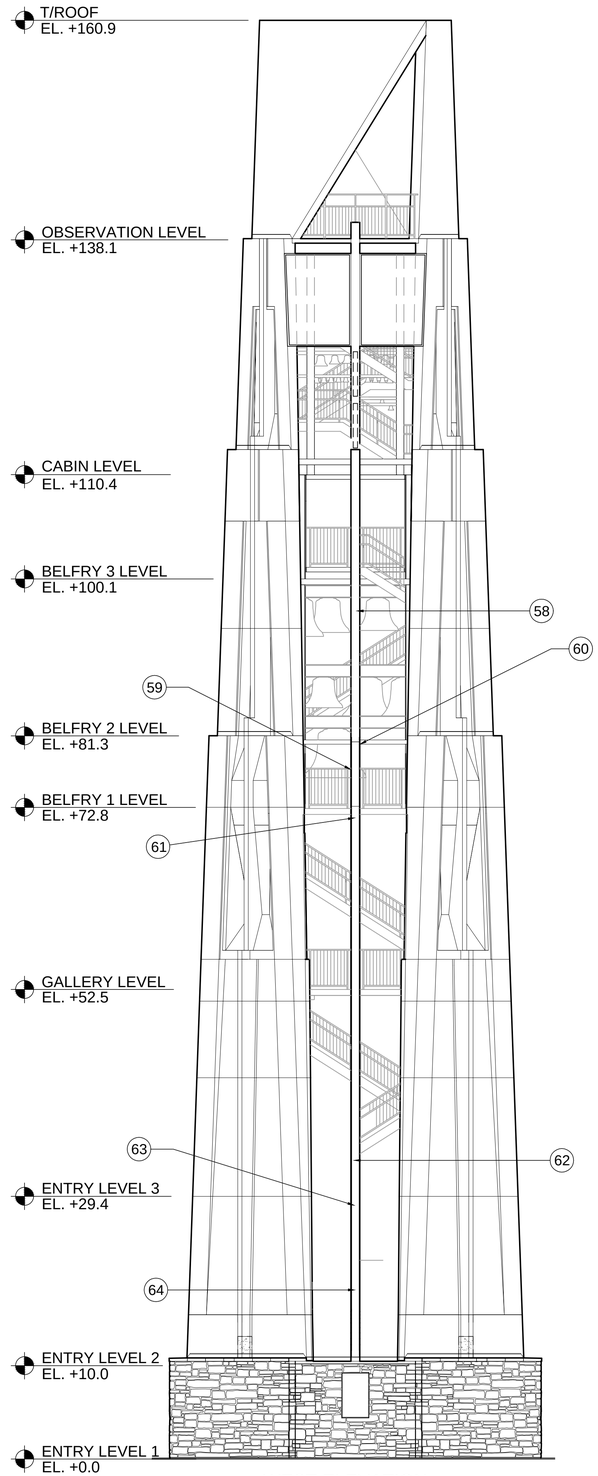
NORTH AND EAST FIN INSPECTION NOTES

NO.	DATE	DESIGN BY	DESCRIPTION

CEI PROJECT: 9205
PROJECT MGR. PS
DRAWN BY: PRH
CHECKED BY: PS
DATE: 10-1-2015
SCALE: N.T.S.
SHEET NO: A-3



SOUTH ELEVATION



WEST ELEVATION

SOUTH FIN INSPECTION NOTES

53. FAILED CONCRETE REPAIR ON THE SOUTHEAST EDGE OF THE SOUTH FIN. THE AREA MEASURED APPROXIMATELY 12 FEET HIGH BY 4 INCHES WIDE. ELEVATION +/- 112' TO +/- 100'. SEE PHOTOGRAPH 44.
54. AREA OF UNSOUND CONCRETE AT THE TOP OF THE SECOND STEP-OUT ON THE SOUTHWEST EDGE OF THE SOUTH FIN. ELEVATION +/- 80'.
55. FAILED CONCRETE REPAIR ON THE SOUTHWEST EDGE OF THE SOUTH FIN. THE AREA MEASURED APPROXIMATELY 1 FOOT HIGH BY 4 INCHES WIDE. ELEVATION +/- 70'.
56. FAILED CONCRETE REPAIRS ON THE SOUTHEAST AND SOUTHWEST EDGES OF THE SOUTH FIN. THE AREAS MEASURED APPROXIMATELY 2 FEET HIGH BY 5 INCHES WIDE. ELEVATION +/- 45'. SEE PHOTOGRAPHS 45 AND 46.
57. HORIZONTAL CRACK, MEASURING UP TO 1/8-INCH WIDE BY APPROXIMATELY 8 FEET LONG, LOCATED ON THE SOUTH, EAST, AND NORTH FACES OF THE SOUTH FIN. ELEVATION +/- 37'. SEE PHOTOGRAPHS 47 AND 48.

WEST FIN INSPECTION NOTES

58. FAILED CONCRETE REPAIRS ON THE NORTHWEST AND SOUTHWEST EDGES OF THE WEST FIN. THE AREAS MEASURED APPROXIMATELY 12 INCHES HIGH BY 3 INCHES WIDE. ELEVATION +/- 91'.
59. FAILED CONCRETE REPAIR ON THE NORTHWEST EDGE OF THE WEST FIN. THE AREA MEASURED APPROXIMATELY 10 INCHES HIGH BY 3 INCHES WIDE. ELEVATION +/- 76'.
60. LOSS OF MORTAR IN THE HORIZONTAL JOINT, 3 INCHES WIDE ON THE SOUTH FACE AND THE ENTIRE LENGTH OF THE WEST FACE. ELEVATION +/- 80'. SEE PHOTOGRAPH 49.
61. FAILED CONCRETE REPAIR WITH ASSOCIATED MORTAR LOSS IN THE HORIZONTAL JOINT ON THE NORTHWEST EDGE OF THE WEST FIN. THE AREA MEASURED APPROXIMATELY 6 INCHES HIGH BY 3 INCHES WIDE. ELEVATION +/- 70'.
62. FAILED CONCRETE REPAIRS ON THE NORTHWEST AND SOUTHWEST EDGES OF THE WEST FIN. THE AREA ON THE NORTHWEST EDGE MEASURED APPROXIMATELY 13 FEET HIGH BY 12 INCHES WIDE. THE AREA ON THE SOUTHWEST EDGE MEASURED APPROXIMATELY 13 FEET HIGH BY 3 INCHES WIDE. ELEVATION +/- 32'.
63. FAILED CONCRETE REPAIR ON THE SOUTHWEST EDGE OF THE WEST FIN. THE AREA MEASURED APPROXIMATELY 1 FOOT HIGH BY 4 INCHES WIDE. ELEVATION +/- 28'.
64. AREA OF UNSOUND CONCRETE WITH AN ASSOCIATED HAIRLINE HORIZONTAL CRACK, MEASURING 12 INCHES LONG AT THE RADIAL TRANSITION OF THE WEST FIN. ELEVATION +/- 17'.

DRAWING LEGEND

(12) INSPECTION NOTE NUMBER

COLLINS ENGINEERS
123 N. Wacker Drive
Chicago, Illinois 60606
Phone: 312-704-9300
Fax: 312-704-9320

OWNER
CITY OF NAPERVILLE
400 EAGLE STREET
NAPERVILLE, IL 60540

NAPERVILLE MILLENNIUM CARILLON
427 AURORA AVENUE
NAPERVILLE, ILLINOIS

SOUTH AND WEST INSPECTION NOTES

NO.	DATE	DESIGN BY	DESCRIPTION

CEI PROJECT: 9205
PROJECT MGR. PS
DRAWN BY: PRH
CHECKED BY: PS
DATE: 10-1-2015
SCALE: N.T.S.
SHEET NO: A-4

Photograph 1: Area of Concrete Delamination in Previous Repair Located on the South Corner of the Southwest Column.

Photograph 2: Area of Concrete Delamination in Previous Repair Located on the West Corner of the Southwest Column.

Photograph 3: Area of Concrete Delamination and Cracking in Previous Repair, Located on the South Corner of the Southwest Column.

Photograph 4: Horizontal Hairline Crack through the Center Fin of the Southwest Column.

Photograph 5: Area of Concrete Delamination and Map Cracking in Previous Repair, Located on the West Corner of the Southwest Column.

Photograph 6: Area of Concrete Delamination and Map Cracking in Previous Repair, Located on the West Corner of the Southwest Column.

Photograph 7: Horizontal Hairline Crack through the face of the Southwest Column.

Photograph 8: Vertical Hairline Crack with Efflorescence on the West End of the Southwest Column.

Photograph 9: Typical Loss of Waterproofing Coating on the Column Step-out at the Southwest Column.

Photograph 10: Vertical Hairline Crack with Associated Cracking and Efflorescence on the South Side of the Southwest Column.

Photograph 11: Area of Unsound Concrete in Previous Repair Located on the East Corner of the Southeast Column.

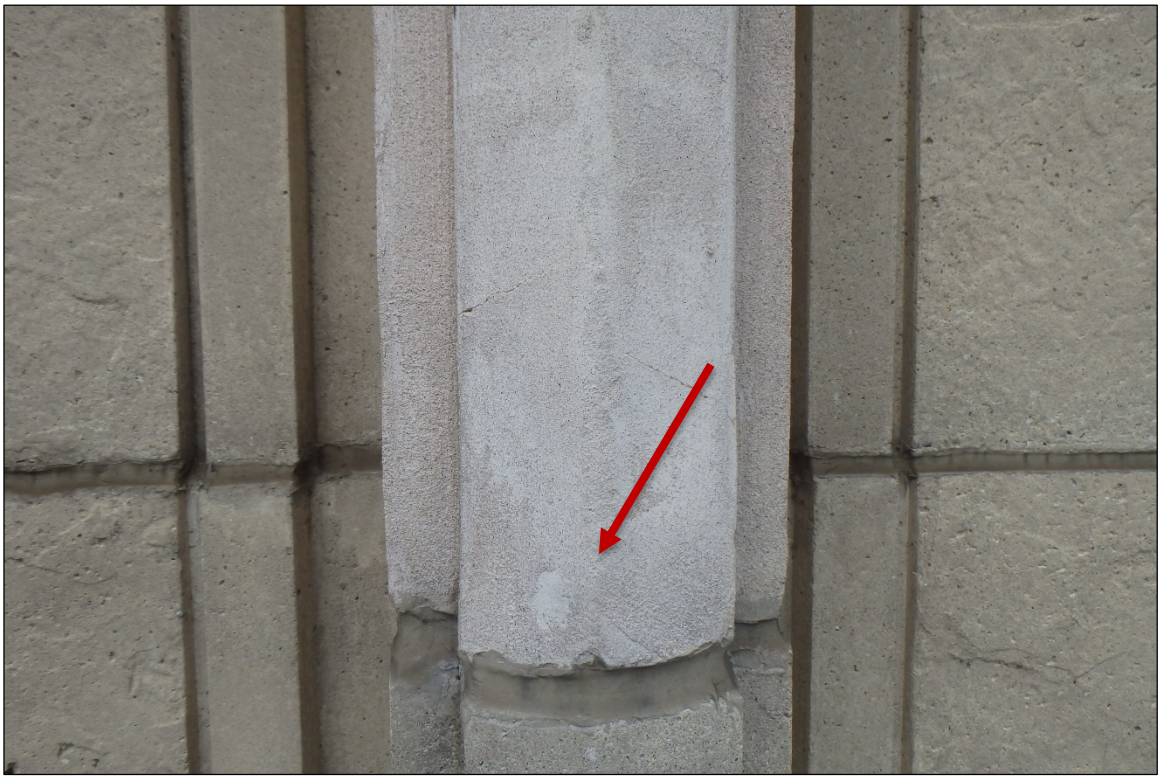
Photograph 12: Area of Concrete Delamination with associated Cracking in Previous Repair, Located on the South Corner of the Southeast Column.

Photograph 13: Area of Delaminated Concrete in Previous Repair, Located on the East Corner of the Southeast Column.

Photograph 14: Failed Crack Repair and Delaminated Concrete in Previous Repair, Located on the East Corner of the Southeast Column.

Photograph 15: Horizontal Hairline Crack on Three Sides of Column, adjacent to the Southernmost Corner of the Southeast Column.

Photograph 16: Spall with Exposed Reinforcing Steel on the South Face of the Center Fin of the Southeast Column.



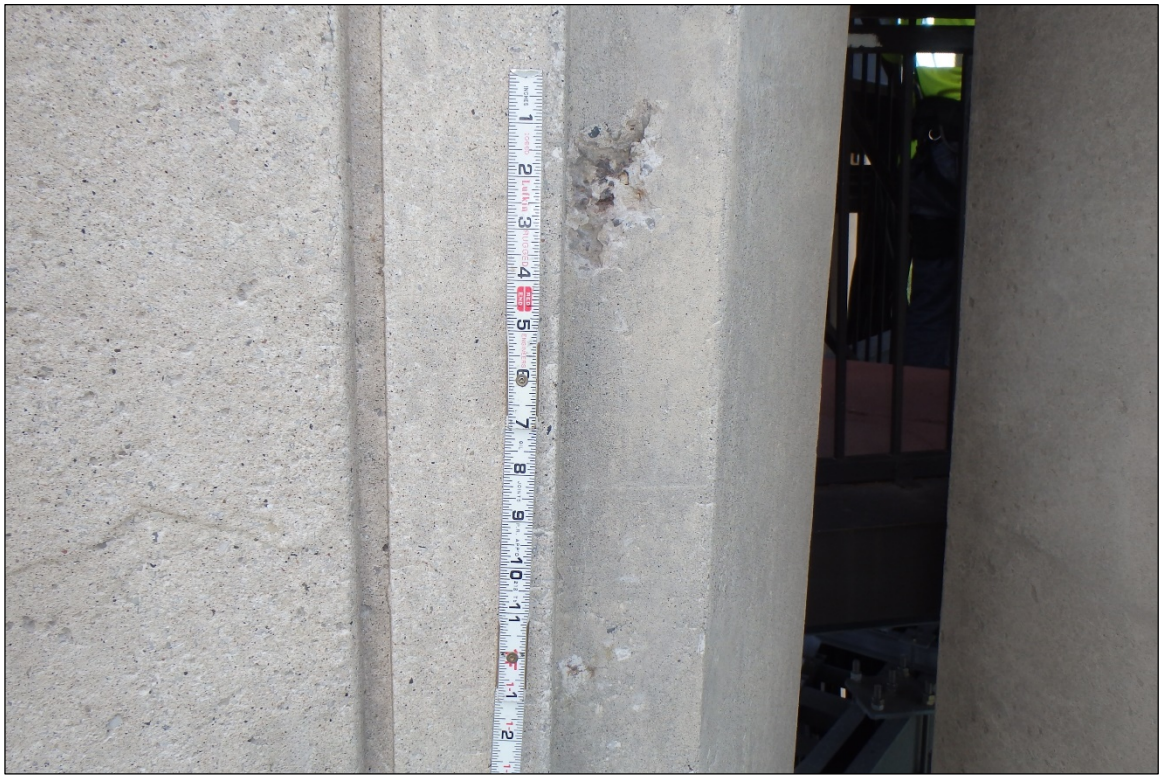
Photograph 17: Area of Concrete Delamination on the Center Fin of the Southeast Column.

Photograph 18: Typical Condition of the Sealant at Joints between Horizontal Panels atop the Entry Level. Typical for all Panel Locations.

Photograph 19: Vertical 1/8-Wide Crack with Efflorescence at the Top of the Northeast Column.

Photograph 20: Loss of Waterproofing at the Second Step of the Northeast Column.

Photograph 21: Vertical Hairline Crack with Efflorescence in the Northeast Column.



Photograph 22: Two Concrete Pop-outs Located on the North Panel of the Northeast Column.

Photograph 23: Loss of Waterproofing at the Third Step of the Northeast Column.

Photograph 24: Area of Delaminated Concrete with Associated Crack on the North Panel of the Northwest Column.

Photograph 25: Loss of Waterproofing at the Second Step of the Northwest Column.

Photograph 26: Horizontal Hairline Crack around the Entire Southwest Panel of the Northwest Column.

Photograph 27: Spall with Associated Concrete Delamination on the Southwest Face of the Center Fin of the Northwest Column.

Photograph 28: Missing Joint Sealant around the Entire West Column of the Northwest Column.

Photograph 29: Area of Section Loss at Joint of the Northwest Column, adjacent to the Elevator Shaft.

Photograph 30: Area of Section Loss at Joint of the Northwest Column, Adjacent to the Elevator Shaft.

Photograph 31: Concrete Cracking on the West Side of the North Fin.

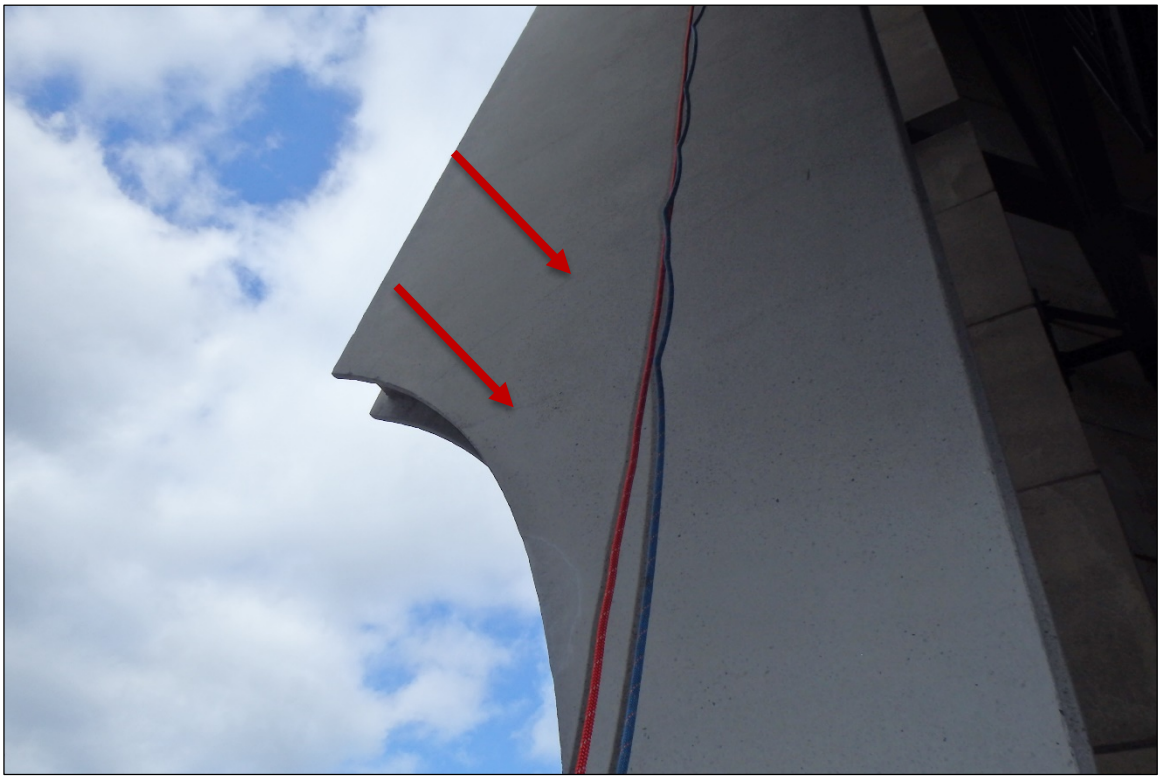
Photograph 32: Hairline Crack on the West Face of North Fin.

Photograph 33: Hairline Crack on Inner West Face of North Fin.

Photograph 34: Failed Concrete Repair on the West Face of the North Fin.

Photograph 35: Loss of Mortar at the Panel Joint on the East Face of the North Fin.

Photograph 36: Horizontal Hairline Cracking on the West Face of the North Fin.



Photograph 37: Horizontal Hairline Cracking on the West Face of the North Fin.

Photograph 38: Typical Condition of Outer Steel Framing. Note Random Rust Nodules and Areas of Coating Loss.

Photograph 39: Typical Condition of Outer Steel Framing Joint. Note Random Rust Nodules and Areas of Coating Loss.

Photograph 40: Failed Concrete Repair on the North Face of the East Fin.

Photograph 41: Failed Concrete Repair on the Outer South Corner of the East Fin.

Photograph 42: Failed Concrete Repair on the Outer North Corner of the East Fin.

Photograph 43: Horizontal Crack Through the Mortar Joint between Panels of the East Fin.

Photograph 44: Failed Concrete Repair on the Southeast Corner of the East Fin.

Photograph 45: Failed Concrete Repair on the Southeast Corner of the East Fin.

Photograph 46: Failed Concrete Repair on the Southwest Corner of the East Fin.

Photograph 47: Horizontal Crack on the East Face of the South Fin.

Photograph 48: Horizontal Crack on the South Face of the South Fin.

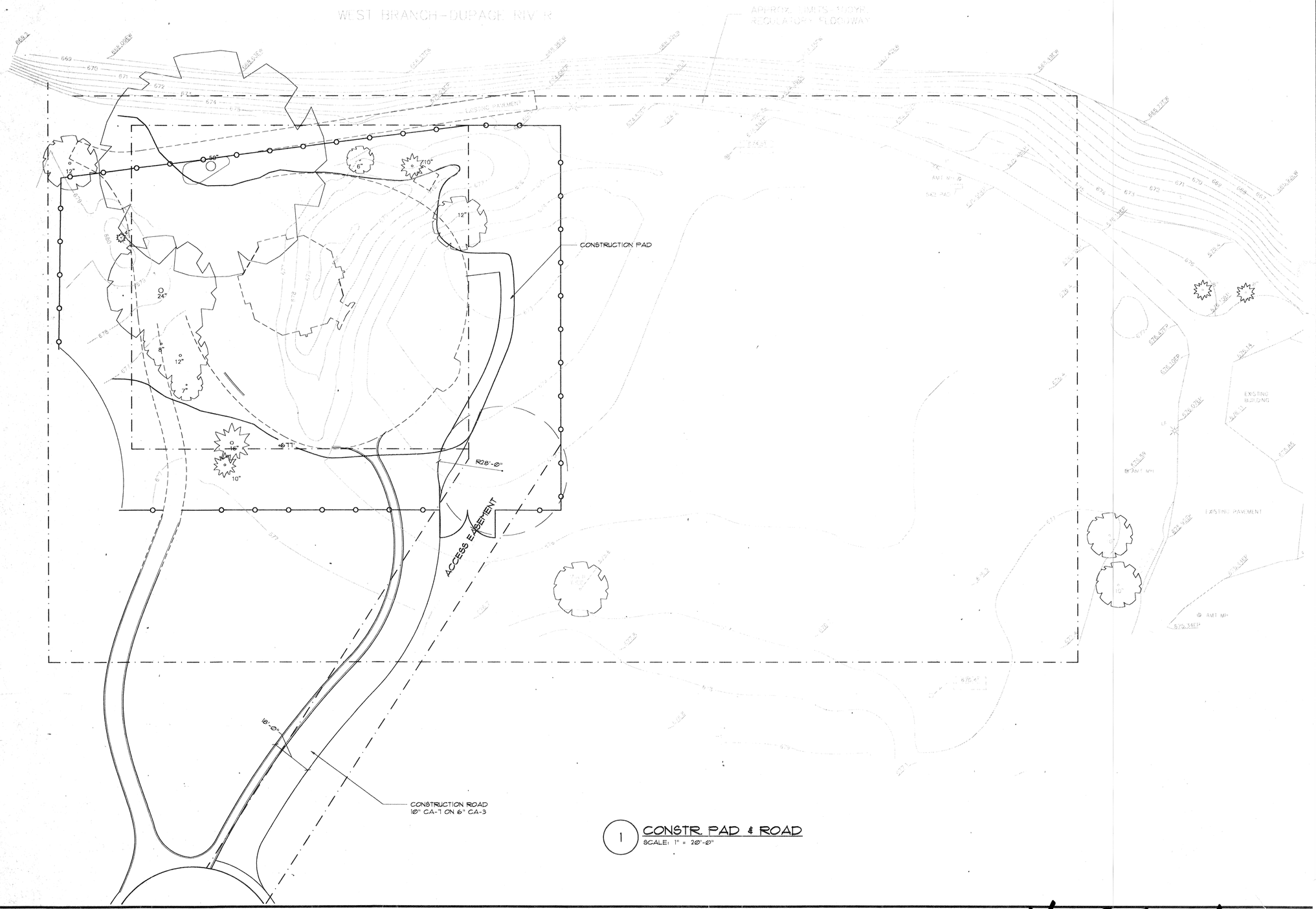
Photograph 49: Loss of Mortar in the Joint between Panels on the South and West Faces of the West Fin.

APPENDIX C

ORIGINAL ARCHITECT'S DRAWINGS
BY CHARLES VINCENT GEORGE DESIGN GROUP

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

Telephone: 630.357.2023
Facsmile: 630.357.2662



1 CONSTR. PAD & ROAD
SCALE: 1" = 20'-0"

PERMIT SET

NOTES:

PETER DAVID CRAWFORD 001-013064 LICENSED ARCHITECT

DATE: 3 Sept 99
ISSUING DIVISION DATE

NOV 30 1999

DRAWINGS REVISED
A101.10, 3, 501, 521A, 2B, 2C, 2D, 2E, 3F
A104.1

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

CONSTRUCTION PAD & CONSTRUCTION ROAD

JOB#: 98103
DATE: 9/2/99

A-001

PRINCIPAL:

99-00002790 COMM
427 AURORA AV

4735-1

4737

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563
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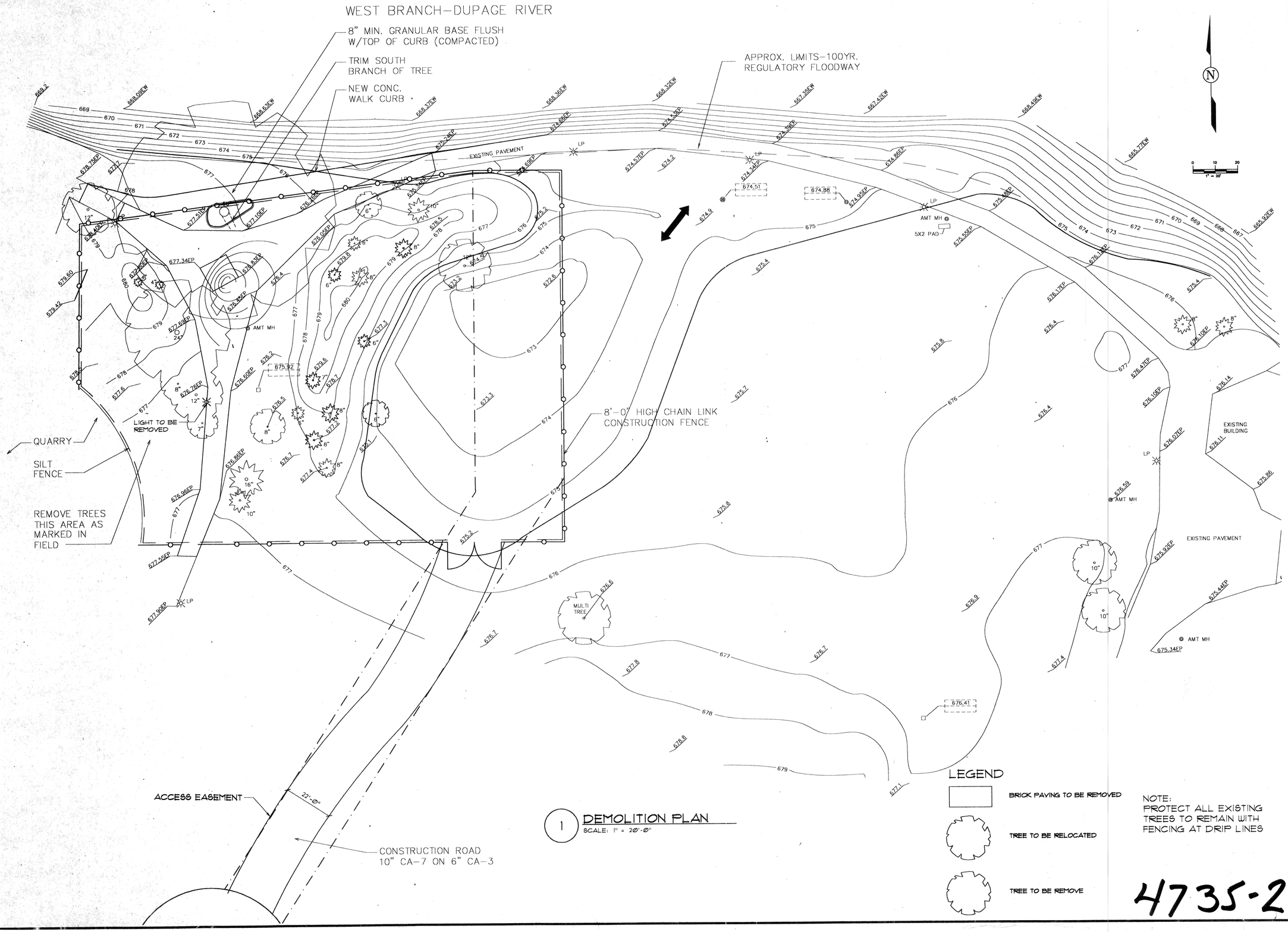


1 DEMOLITION PLAN
SCALE: 1" = 20'-0"

LEGEND

BRICK PAVING TO BE REMOVED

TREE TO BE RELOCATED

TREE TO BE REMOVE

NOTE:
PROTECT ALL EXISTING TREES TO REMAIN WITH FENCING AT DRIP LINES

4735-2

NOTES:

NAPERVILLE MILLENIUM CARILLON

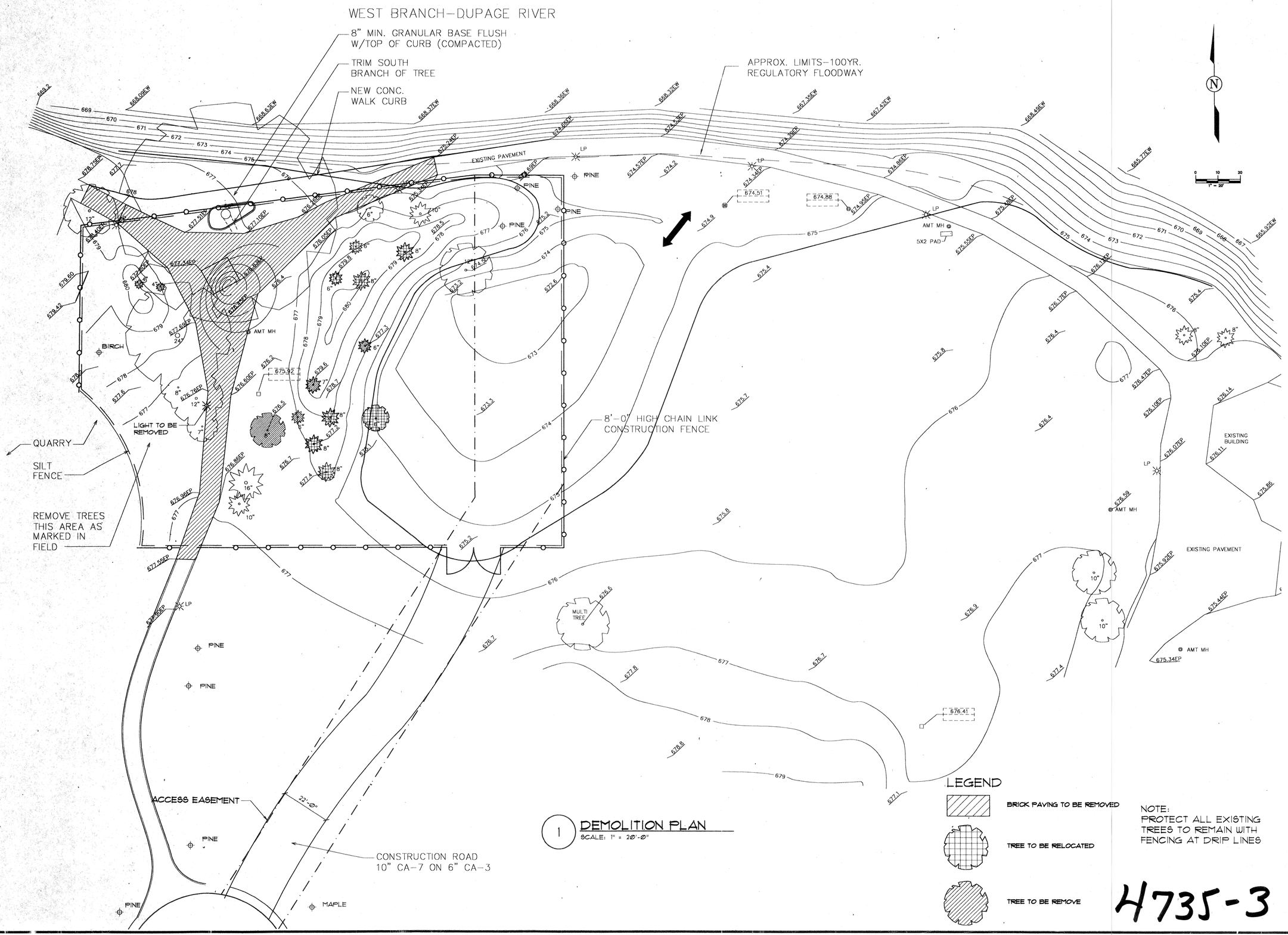
NAPERVILLE, ILLINOIS

SITE DEMOLITION PLAN

JOB#: 98103	A-002
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: S. ALLMAN	DRAWN BY: J. DEMUTH

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

Telephone: 630.357.2023
Facsimile: 630.357.2662



1 DEMOLITION PLAN
SCALE: 1" = 20'-0"

LEGEND

- BRICK PAVING TO BE REMOVED
- TREE TO BE RELOCATED
- TREE TO BE REMOVE

NOTE:
PROTECT ALL EXISTING TREES TO REMAIN WITH FENCING AT DRIP LINES

4735-3

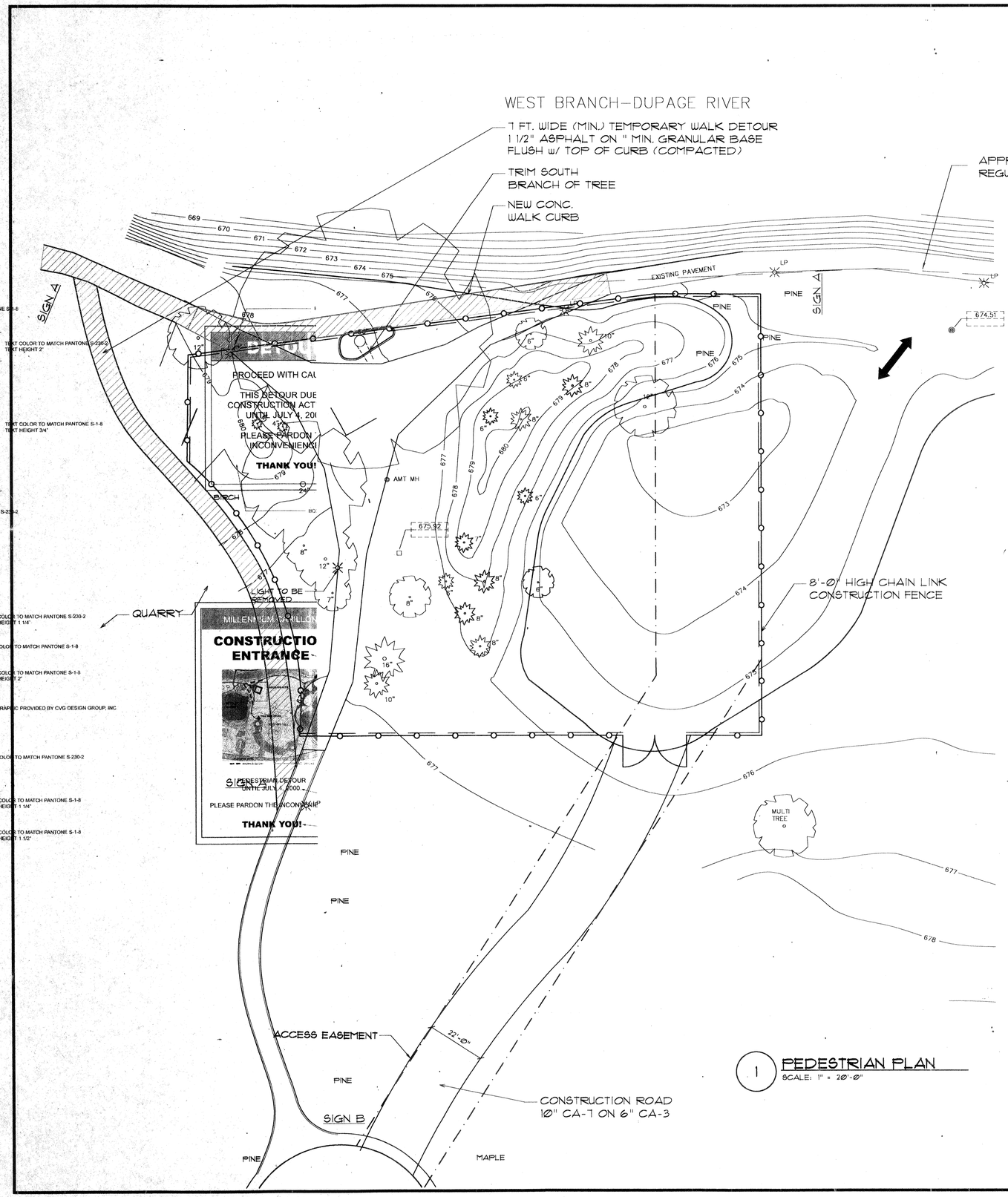
NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

DEMOLITION PLAN

JOB#: 98103	A-100
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: S. ALLMAN	DRAWN BY: J. DEMUTH



1 PEDESTRIAN PLAN
SCALE: 1" = 20'-0"

SIGN A (TYP of 3)

NO SCALE
NOTE:
16" SQ. SIGN ON STL POST
3'-0" ABOVE GRADE

SIGN B (TYP of 1)

NO SCALE
NOTE:
30"x48" SIGN ON STL POST
3'-0" ABOVE GRADE

LEGEND

ASPHALT PAVED PEDESTRIAN WALK DETOUR

4735-4

PERMIT SET

Charles Vincent George
design group, inc.
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Naperville, Illinois 60563

Telephone: 630.357.2023
Facsmile: 630.357.2662

NOTES:

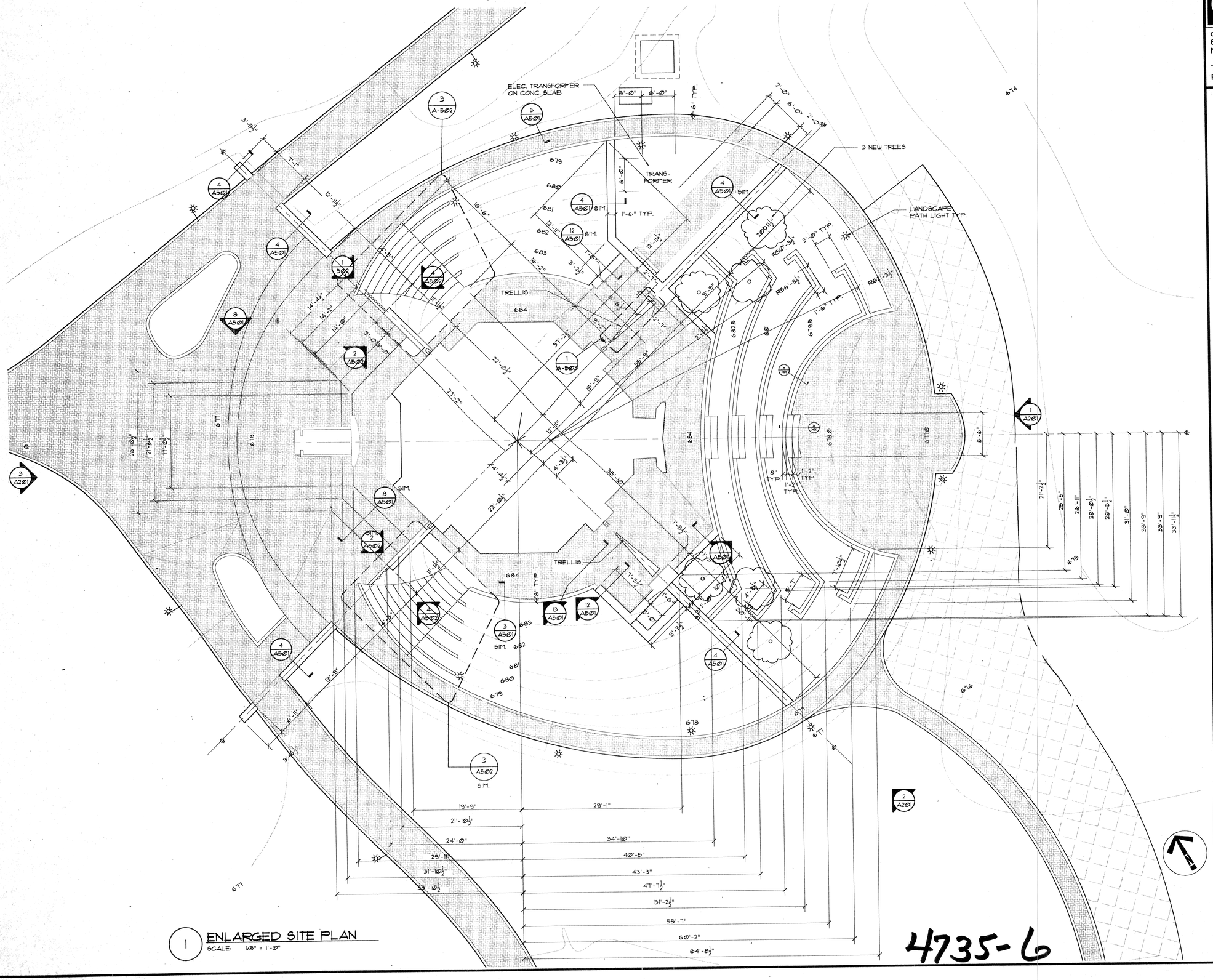
STATE OF ILLINOIS
PETER DAVID CRAWFORD
001-013064
LICENSED ARCHITECT

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

PEDESTRIAN PLAN

JOB#: 98103	A-100.1
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: S. ALLMAN	DRAWN BY: J. DEMUTH



1 ENLARGED SITE PLAN
SCALE: 1/8" = 1'-0"

4735-6

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

Telephone: 630.357.2023
Facsmile: 630.357.2662

NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

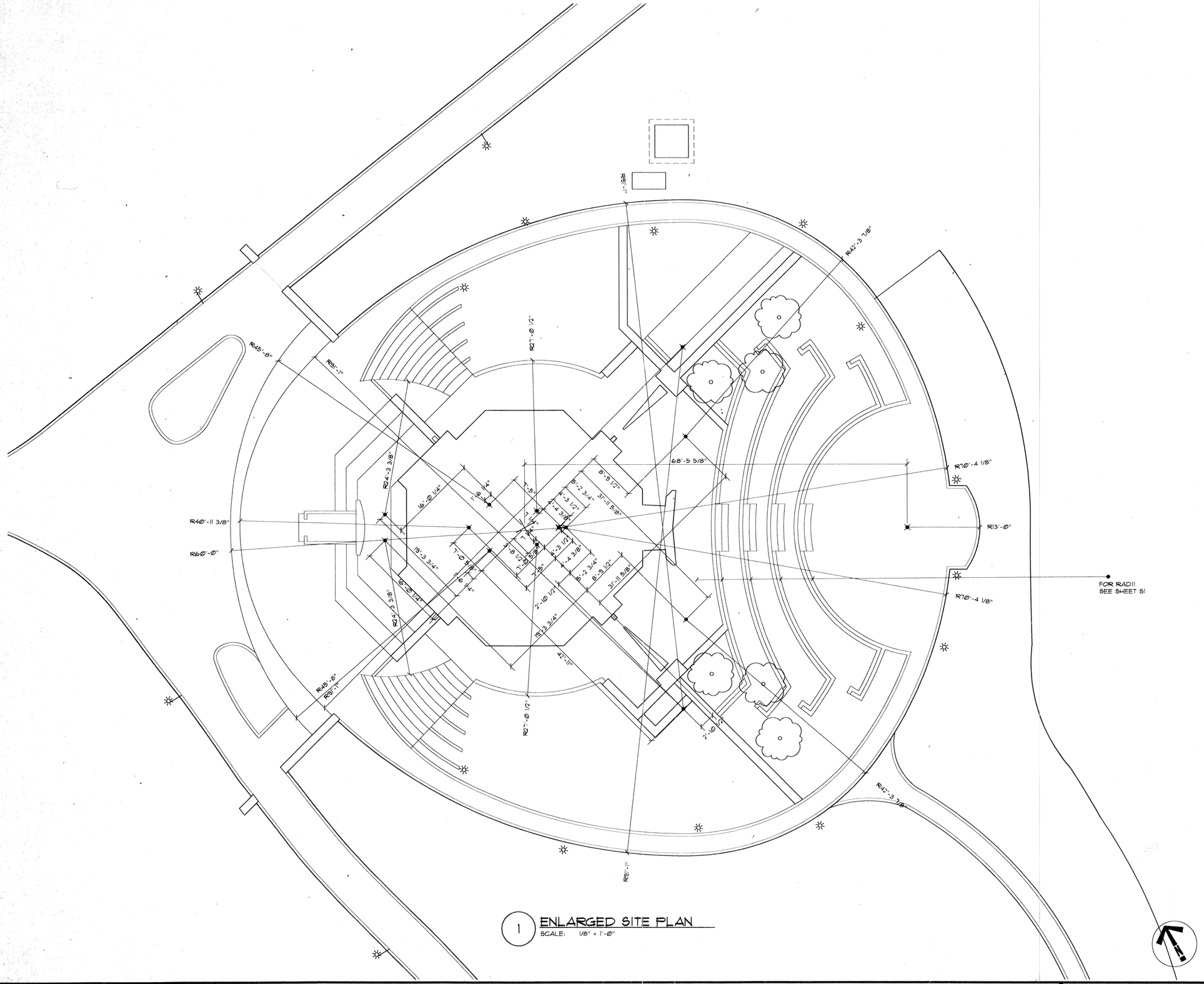
NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

ENLARGED SITE PLAN

JOB#: 98103
DATE: 9/2/99
PRINCIPAL: P. CRAWFORD
PROJECT MGR: B. ALLMAN
DRAWN BY: J. DEMUTH

A-102



1 ENLARGED SITE PLAN
SCALE: 1/8" = 1'-0"

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

Telephone: 630.357.2023
Facsimile: 630.357.2662

NOTES:
ISSUED FOR FOUNDATION
PERMIT 7/6/99

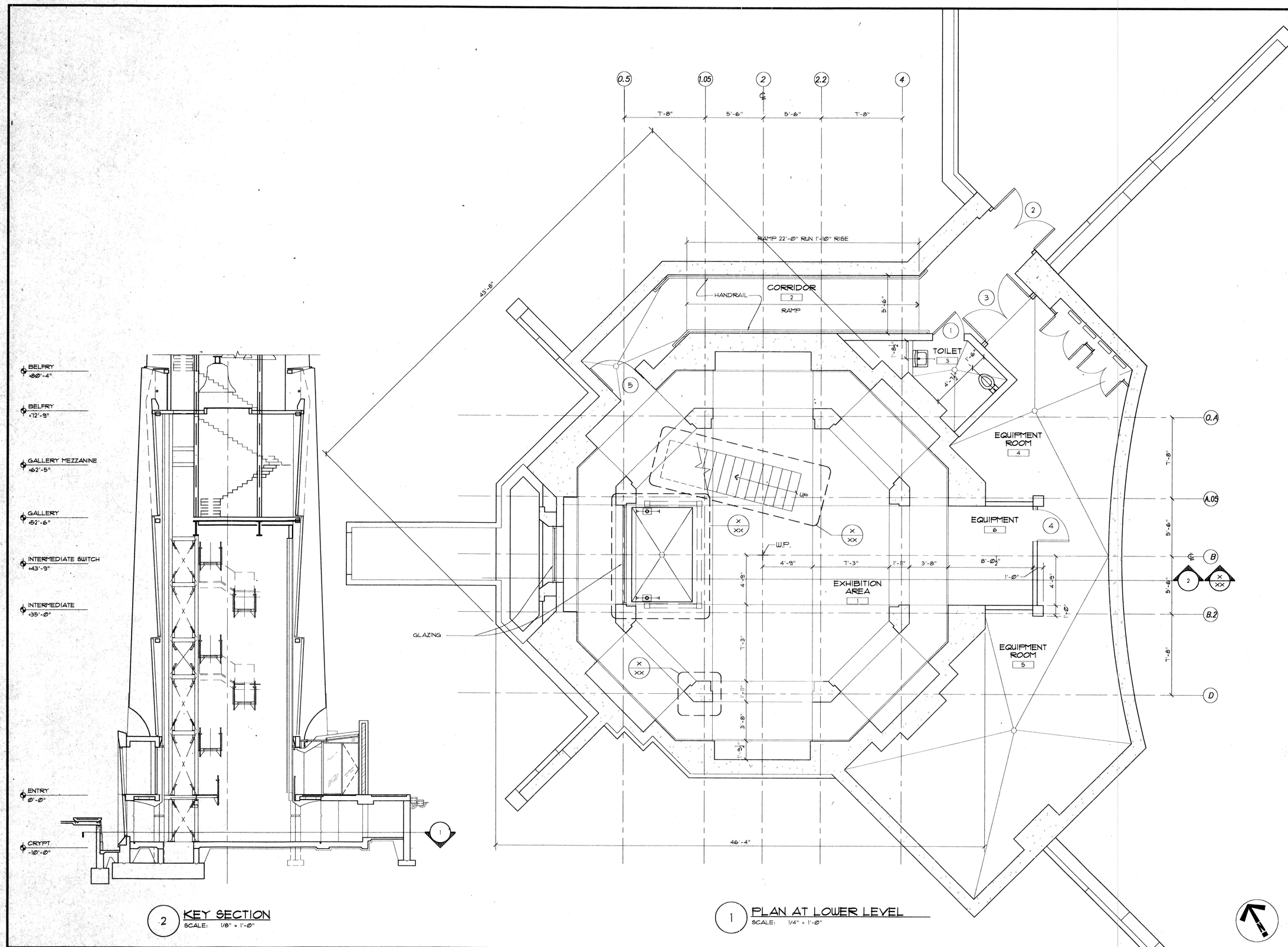
NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

ENLARGED SITE PLAN

JOB#: 98103	A-102A
DATE: 9/2/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: S. ALLMAN	DRAWN BY: J. DEMUTH

4735-7



Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

Telephone: 630.357.2023
Facsmile: 630.357.2662

PERMIT SET

NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

STATE OF ILLINOIS
PAUL CRAWFORD
001-013064
LICENSED ARCHITECT

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

PLAN AT LOWER LEVEL

JOB#: 98103	A-103
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN / DRAWN BY: J. DEMUTH	

4735-8

Charles Vincent George
design group, inc.
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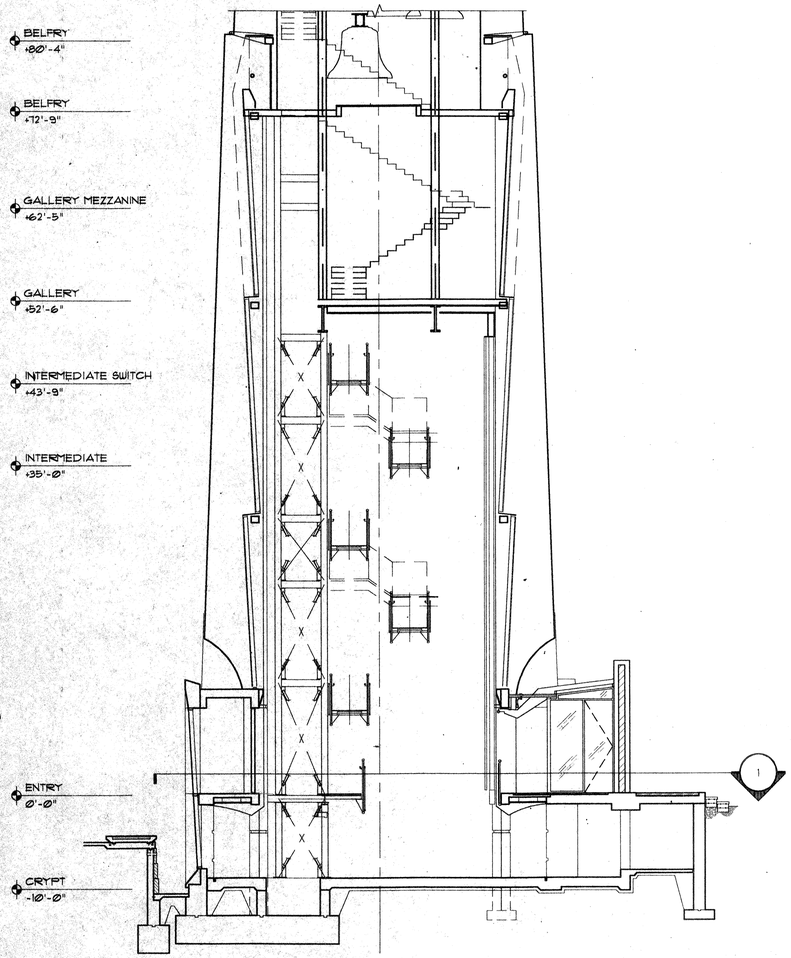
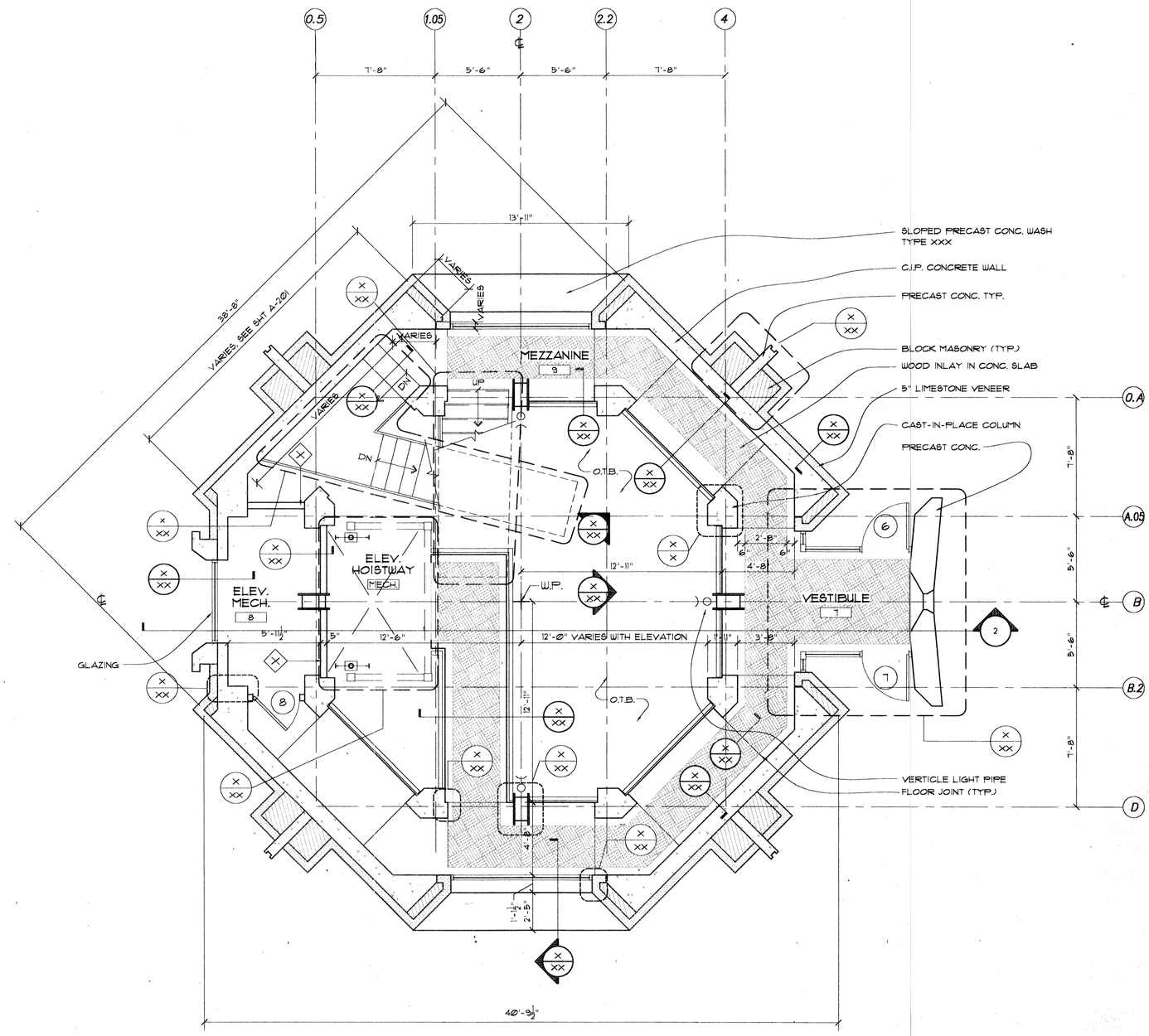
Naperville, Illinois 60563

Telephone: 630.357.2023
Facsmile: 630.357.2662



2 KEY SECTION
SCALE: 1/8" = 1'-0"



1 PLAN AT ENTRY
SCALE: 1/4" = 1'-0"

4735-9

NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

PLAN AT ENRTY

JOB#: 98103	A-104
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR. B. ALLMAN	DRAWN BY: J. DEMUTH

Charles Vincent George
design group, inc.
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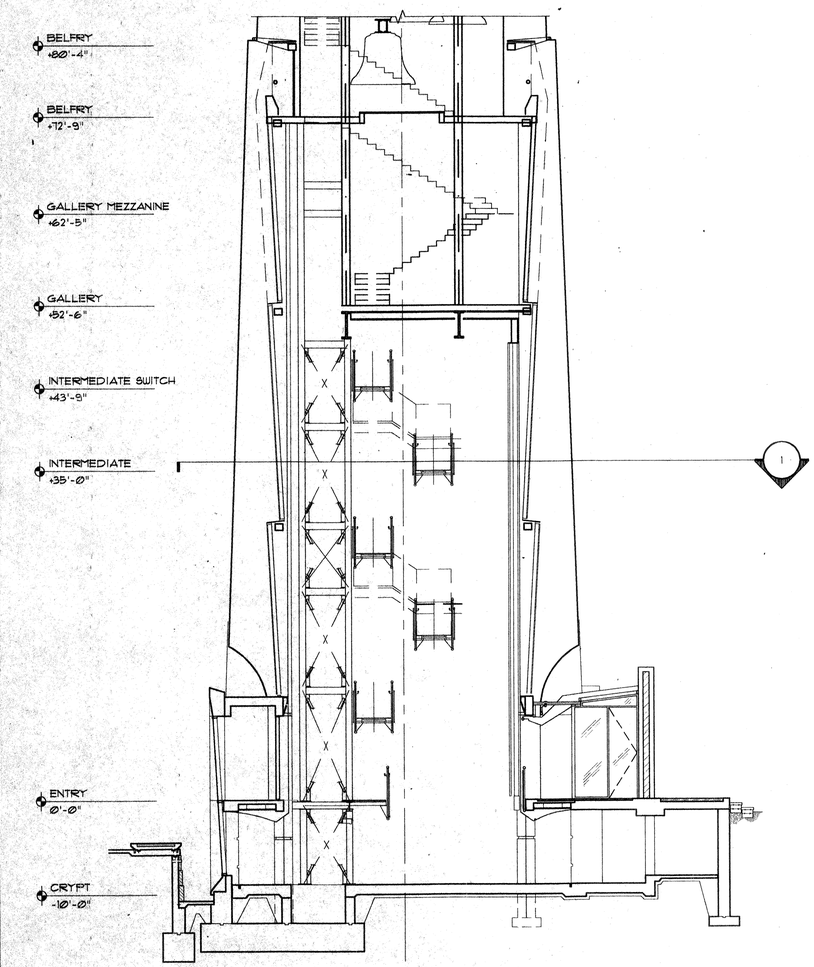
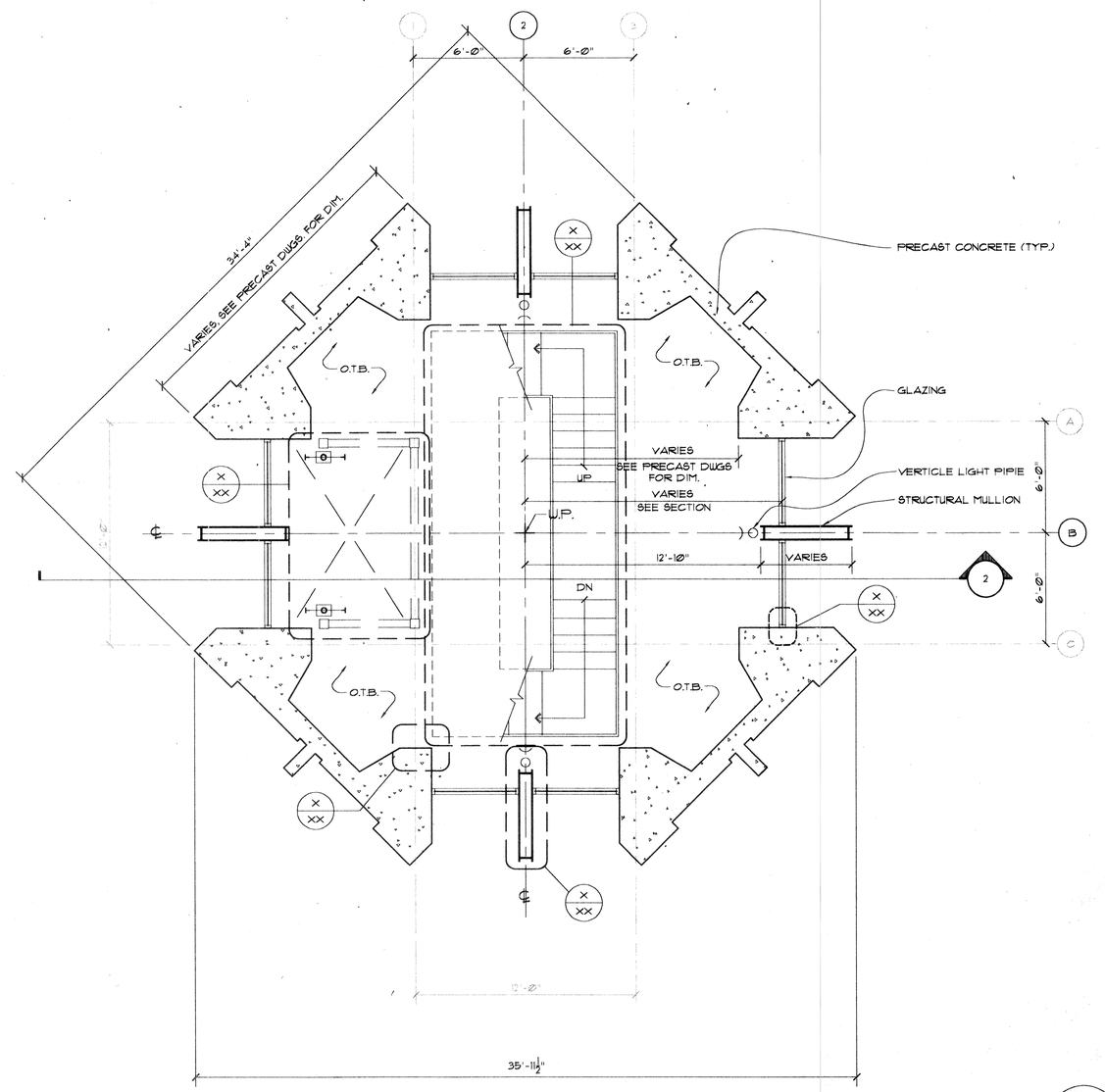
Naperville, Illinois 60563

Telephone: 630.357.2023
Facsmile: 630.357.2662



2 KEY SECTION
SCALE: 1/8" = 1'-0"



1 PLAN AT TOWER
SCALE: 1/4" = 1'-0"

4735-10

NOTES:
ISSUED FOR FOUNDATION
PERMIT 7/6/99

NAPERVILLE
MILLENIUM
CARILLON

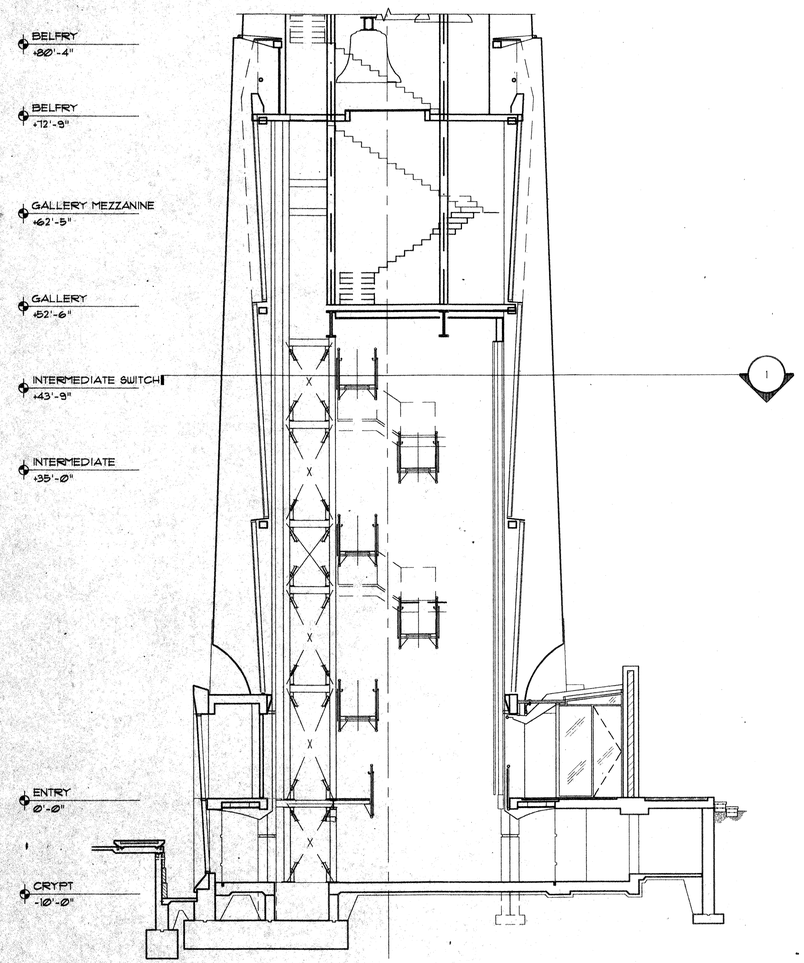
NAPERVILLE, ILLINOIS

PLAN
AT TOWER

JOB#: 98103	A-106
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN	DRAWN BY: J. DEMUTH

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

Telephone: 630.357.2023
Facsmile: 630.357.2662



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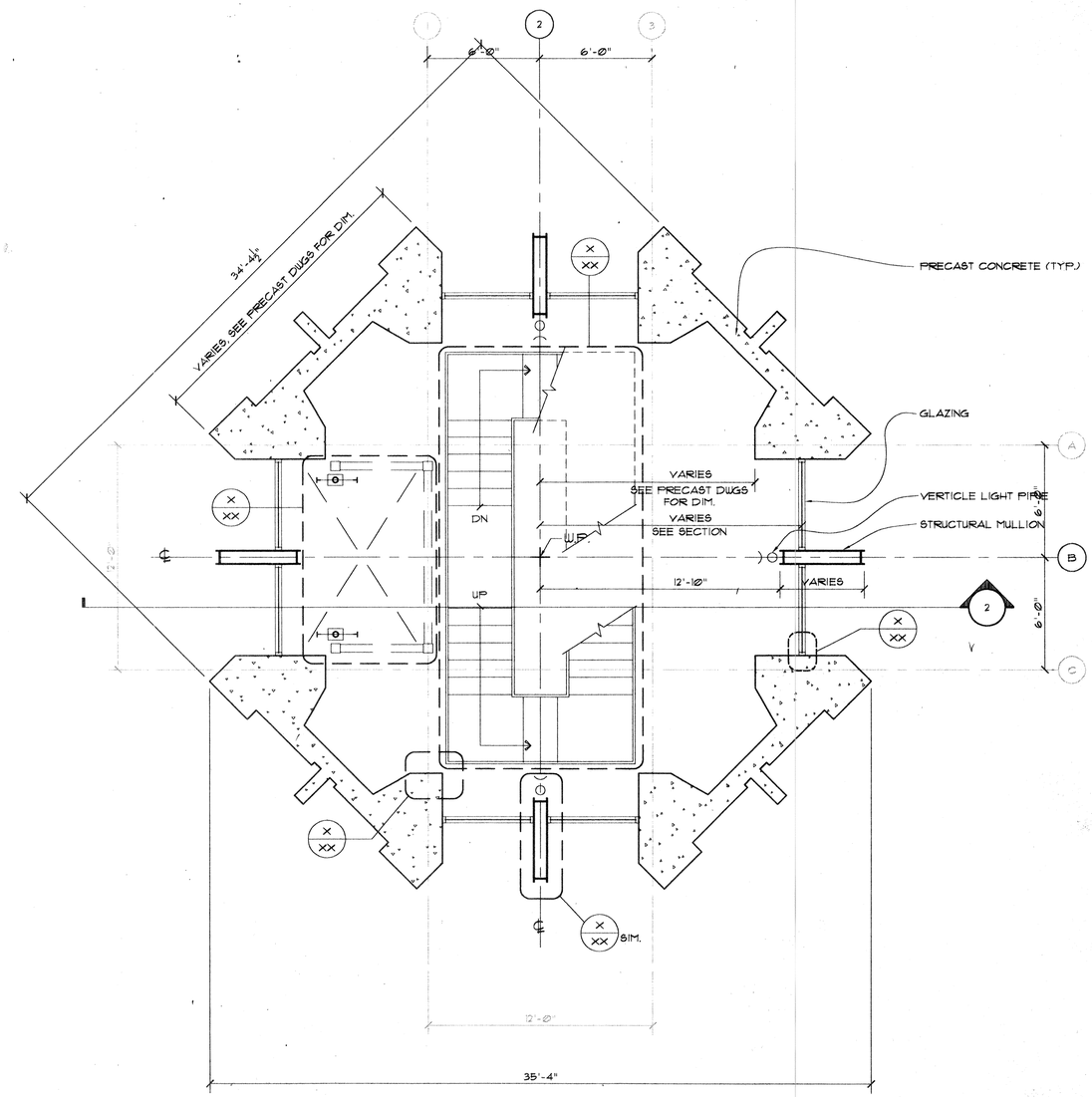
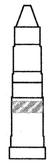
SCALE: 1/8" = 1'-0"



1 PLAN AT TOWER
SCALE: 1/4" = 1'-0"

4735-11



NOTES:
ISSUED FOR FOUNDATION
PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

PLAN AT TOWER

JOB#: 98103	A-107
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN	DRAWN BY: J. DEMUTH

Charles Vincent George
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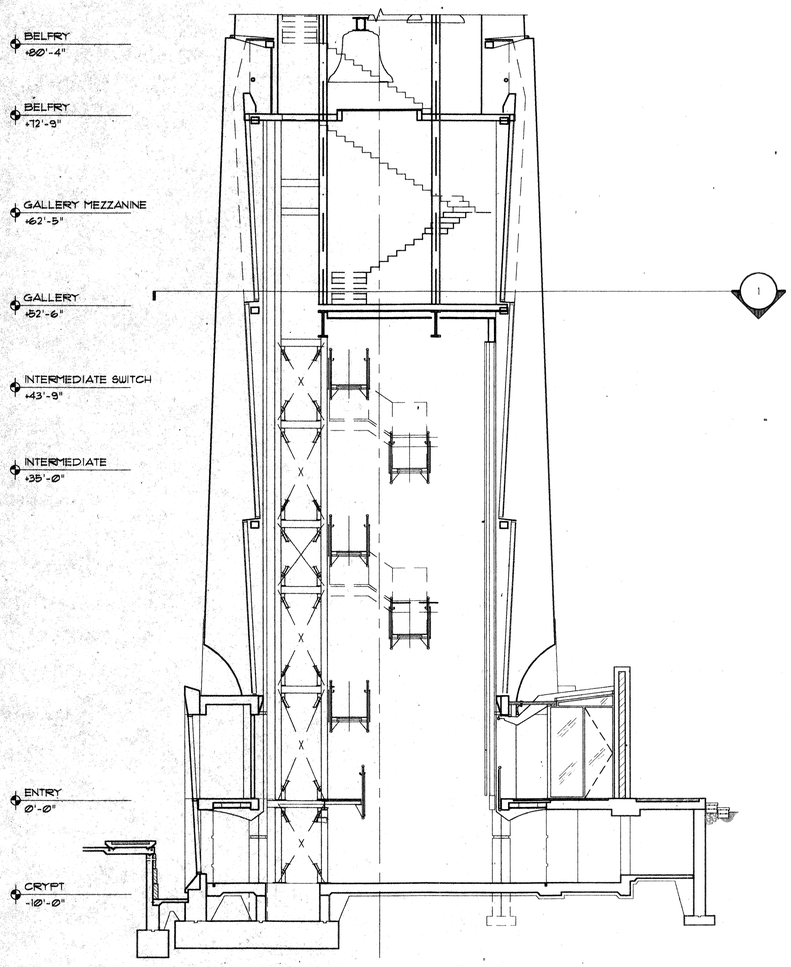
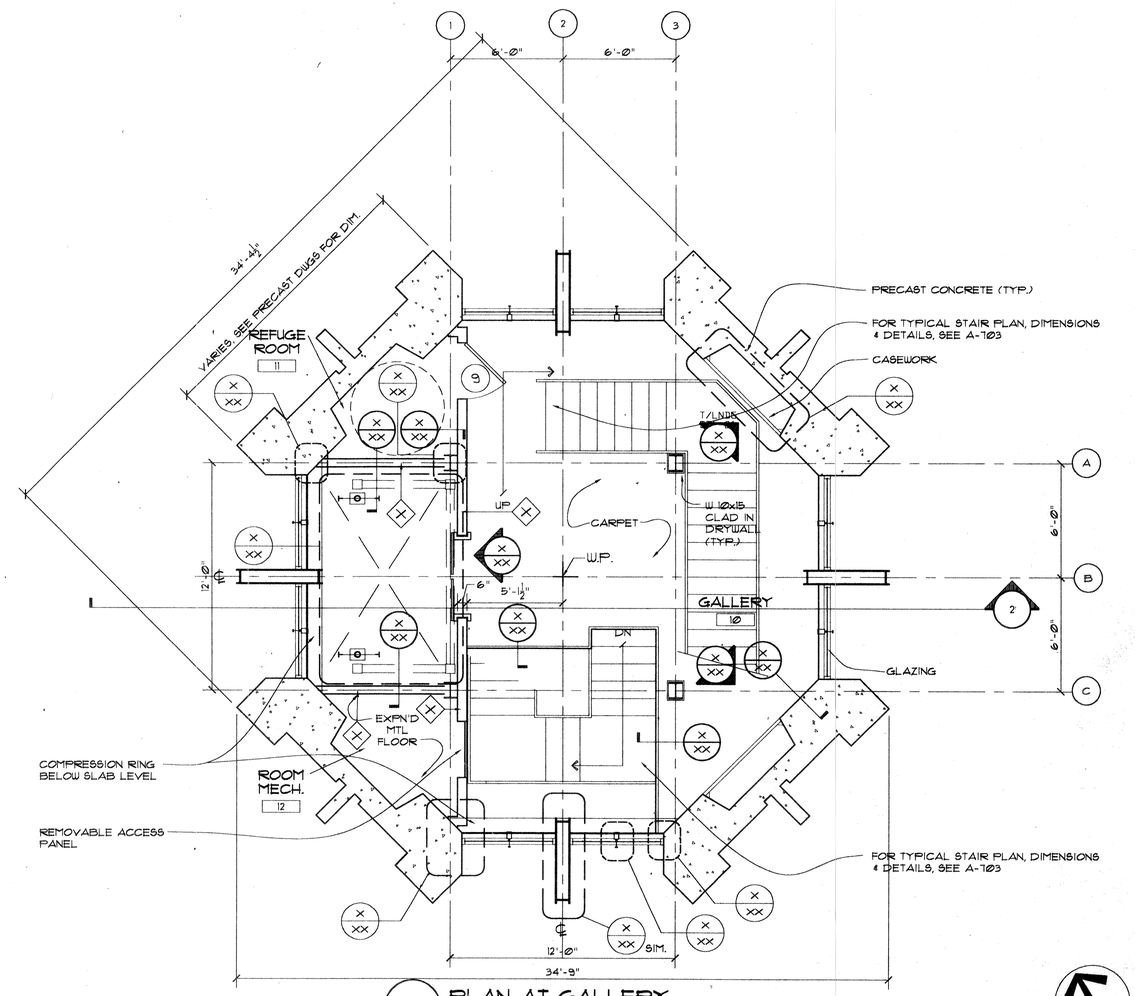
Telephone: 630.357.2023
Facsmile: 630.357.2662



2 KEY SECTION
SCALE: 1/8" = 1'-0"



1 PLAN AT GALLERY
SCALE: 1/4" = 1'-0"

4735-12

NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

PLAN AT GALLERY

JOB#: 98103	A-108
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: R. ALLMAN	DRAWN BY: J. DEMUTH

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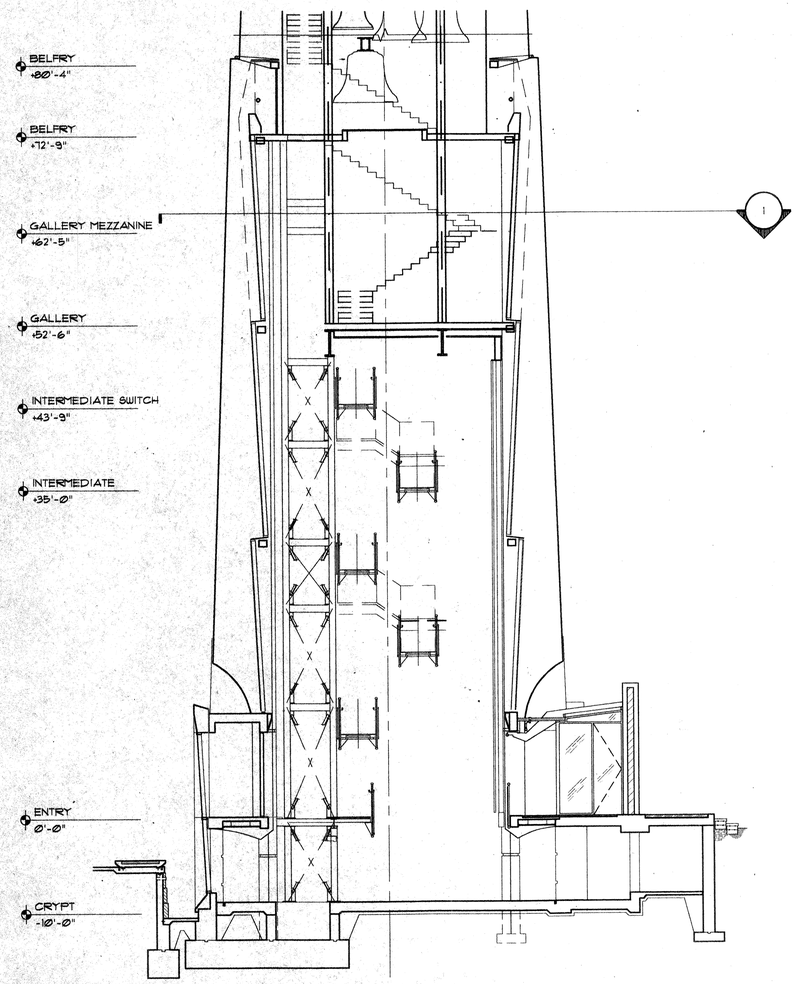
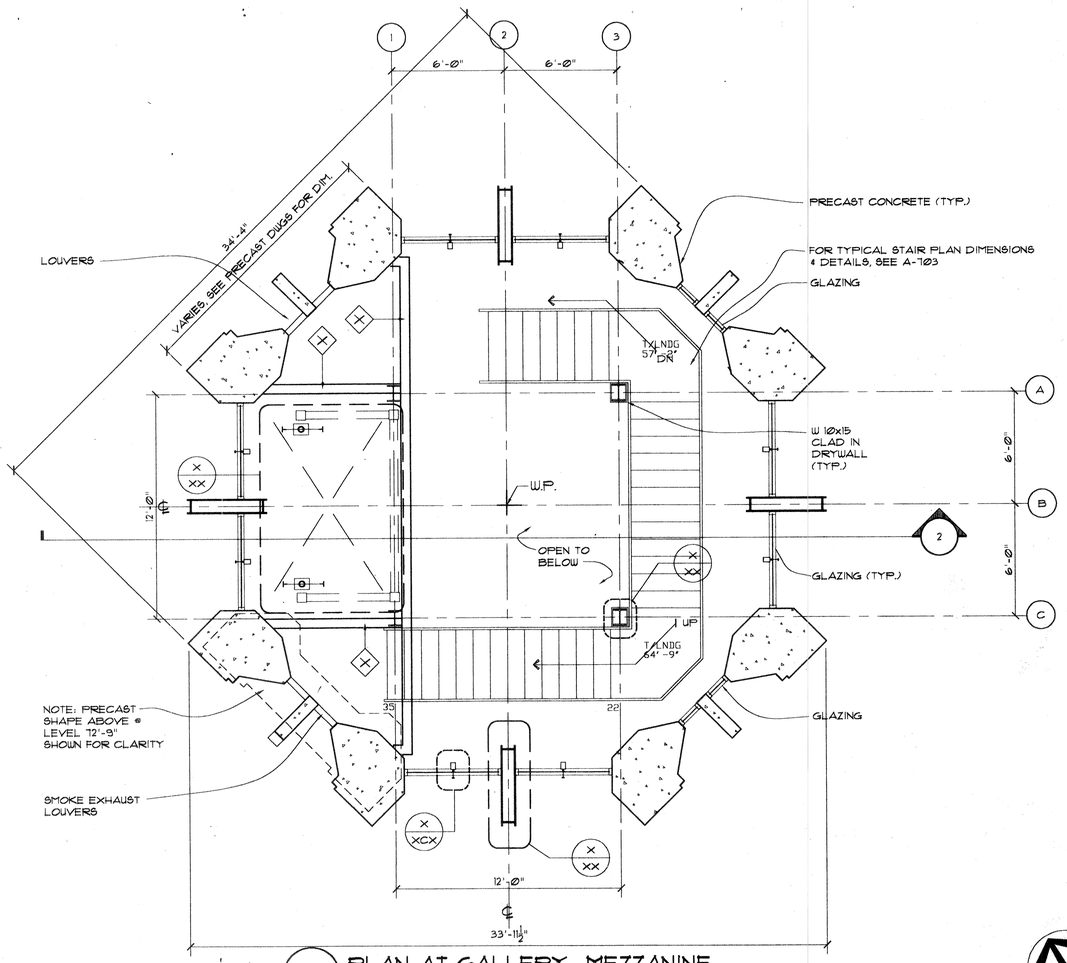


2 KEY SECTION
SCALE: 1/8" = 1'-0"



1 PLAN AT GALLERY MEZZANINE
SCALE: 1/4" = 1'-0"

4735-13

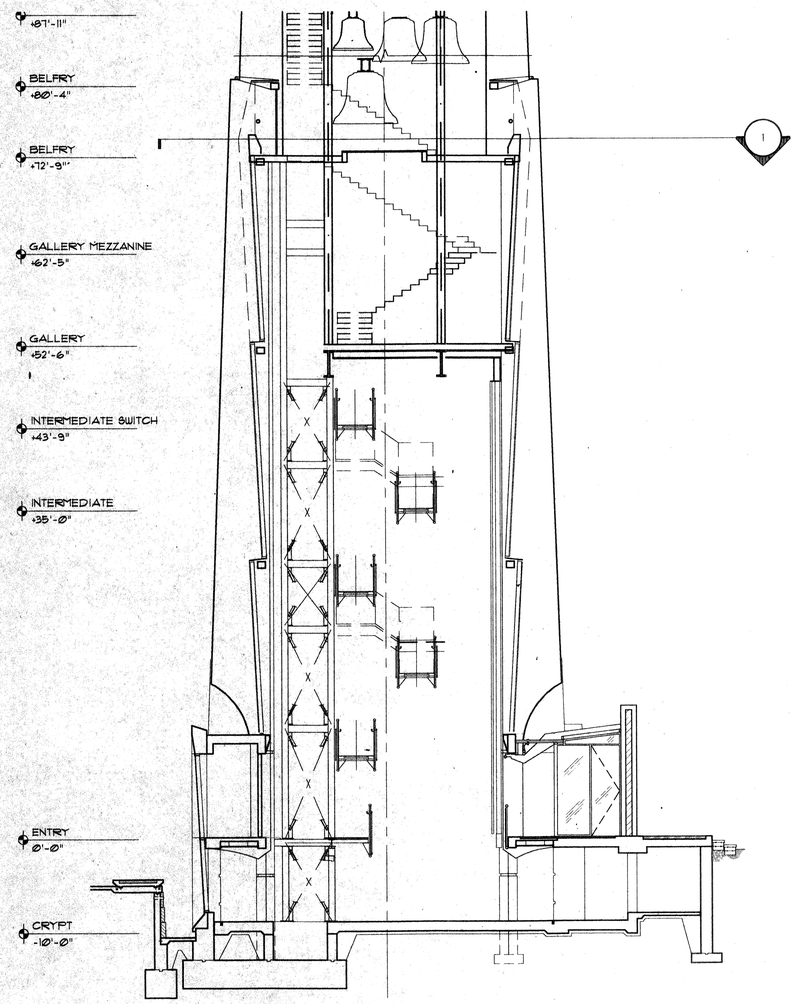
NOTES:
ISSUED FOR FOUNDATION
PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

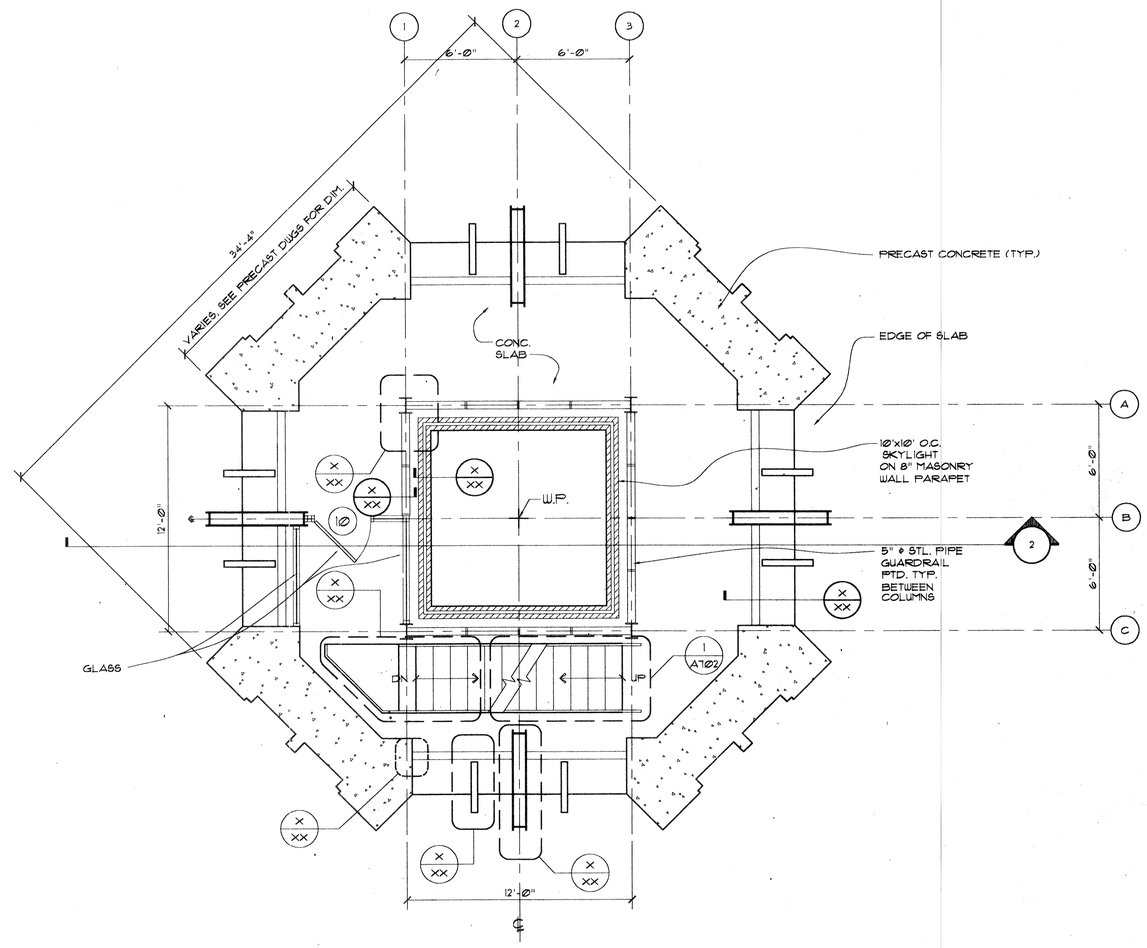
NAPERVILLE, ILLINOIS

PLAN AT MEZZANINE

JOB#: 98103	A-109
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: R. ALLMAN	DRAWN BY: J. DEMUTH



2 KEY SECTION
SCALE: 1/8" = 1'-0"



1 PLAN AT BELFRY
SCALE: 1/4" = 1'-0"

4735-14

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NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

PLAN AT BELFRY

JOB#: 98103	A-110
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN	DRAWN BY: J. DEMUTH

Charles
Vincent
George
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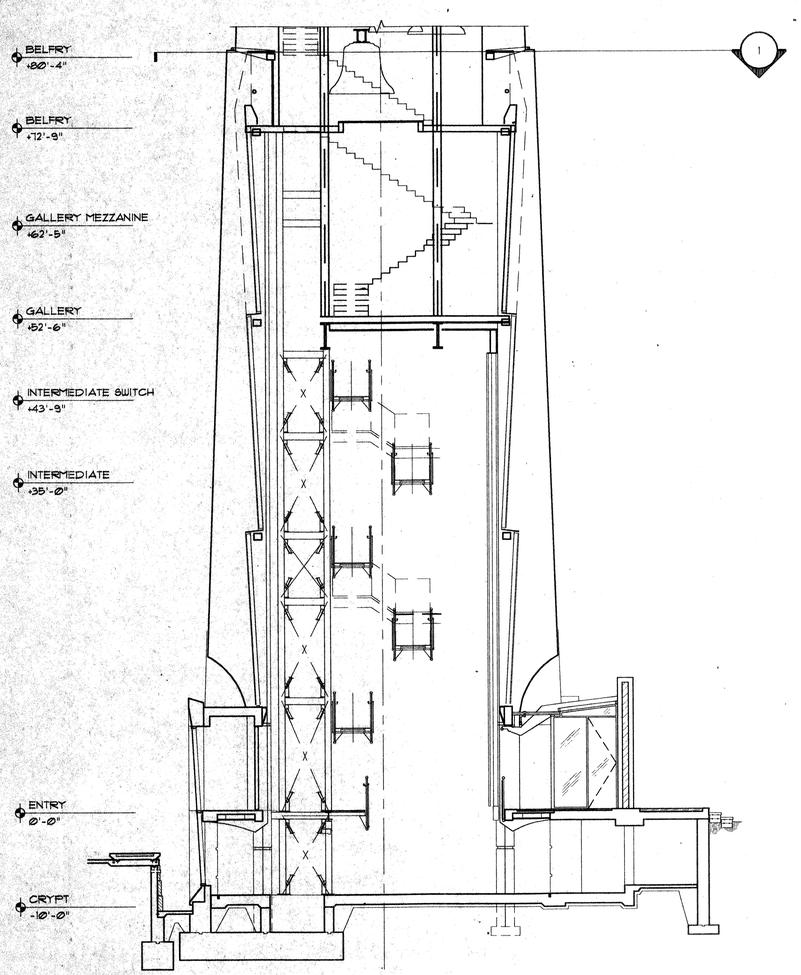
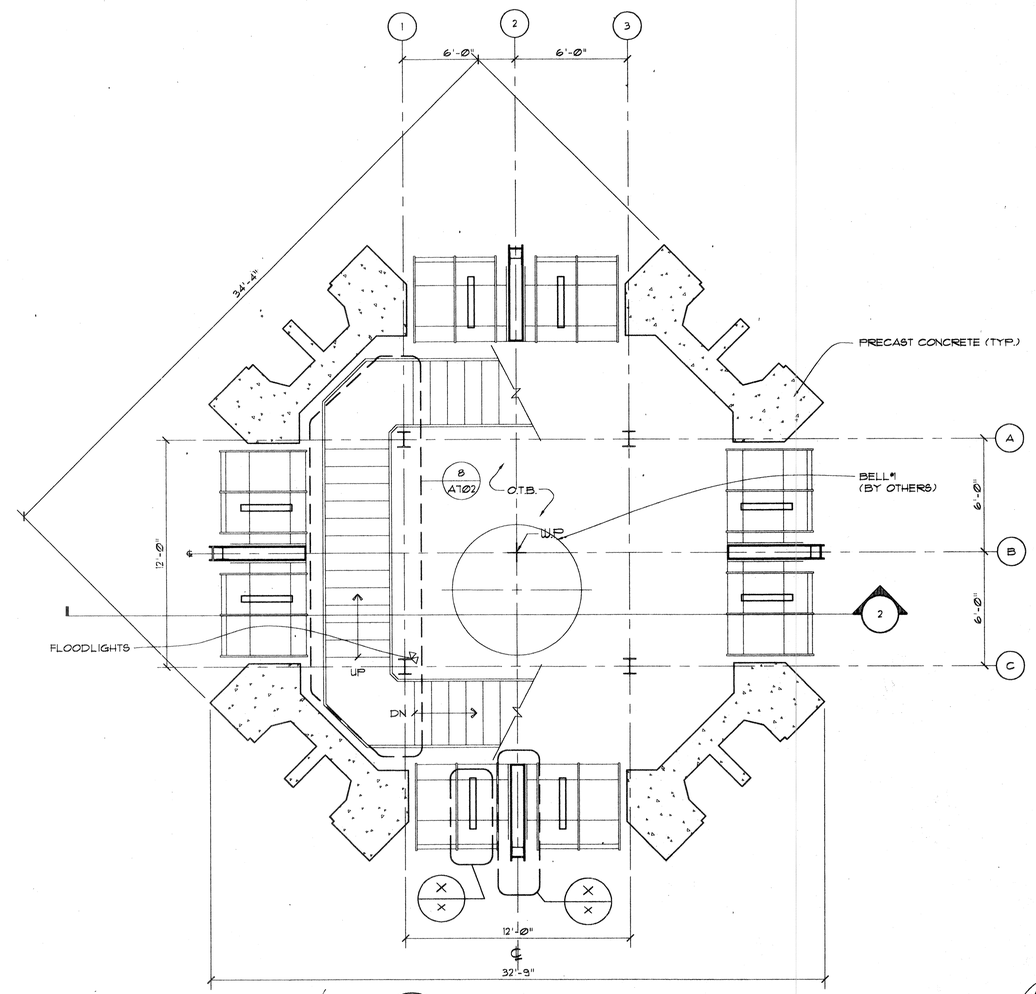


2 KEY SECTION
SCALE: 1/8" = 1'-0"



1 PLAN AT BELFRY
SCALE: 1/4" = 1'-0"

4735-15

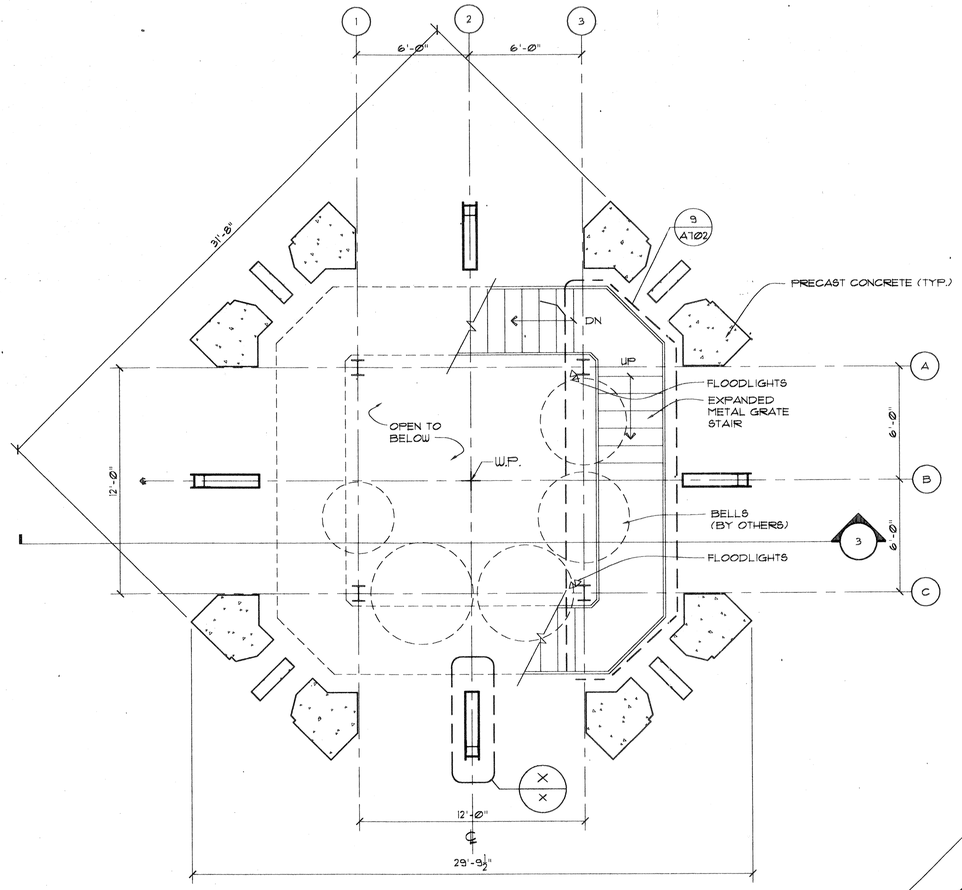
NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

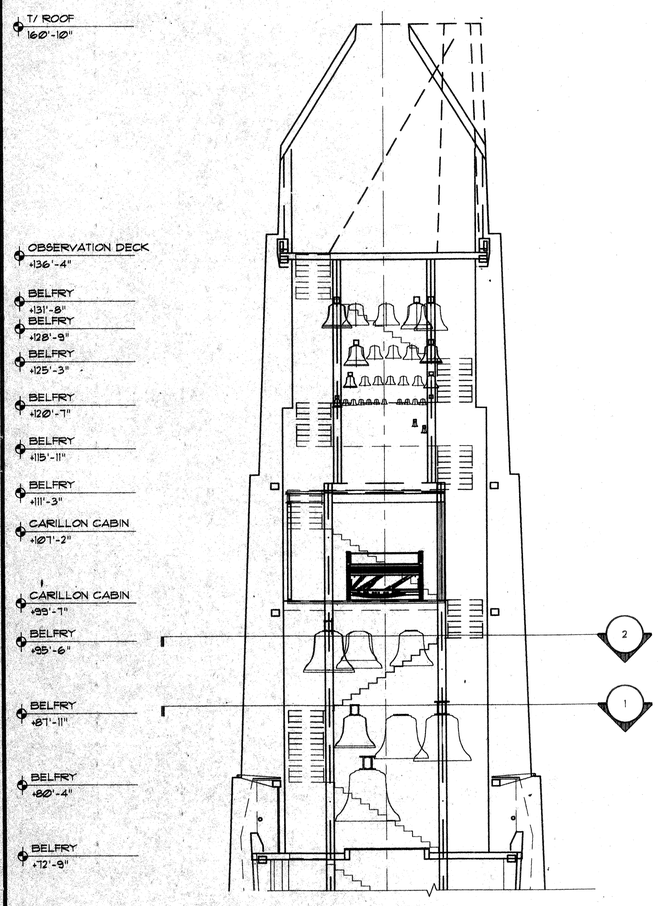
NAPERVILLE, ILLINOIS

PLAN AT BELFRY

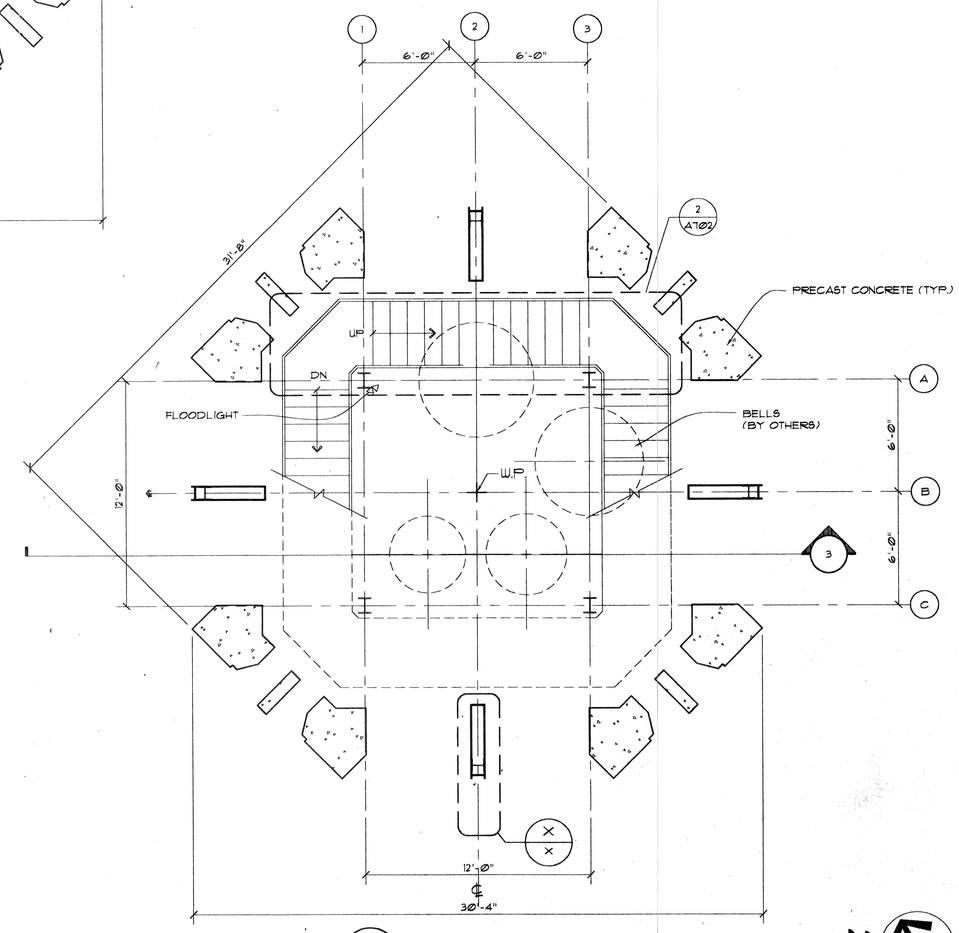
JOB#: 98103	A-111
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: S. ALLMAN	DRAWN BY: J. DEMUTH



2 PLAN AT BELFRY
SCALE: 1/4" = 1'-0"



3 KEY SECTION
SCALE: 1/8" = 1'-0"



1 PLAN AT BELFRY
SCALE: 1/4" = 1'-0"

4735-16

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NOTES:
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NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

PLANS AT BELFRY

JOB#: 98103	A-112
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: E. ALLMAN / DRAWN BY: J. DEMUTH	

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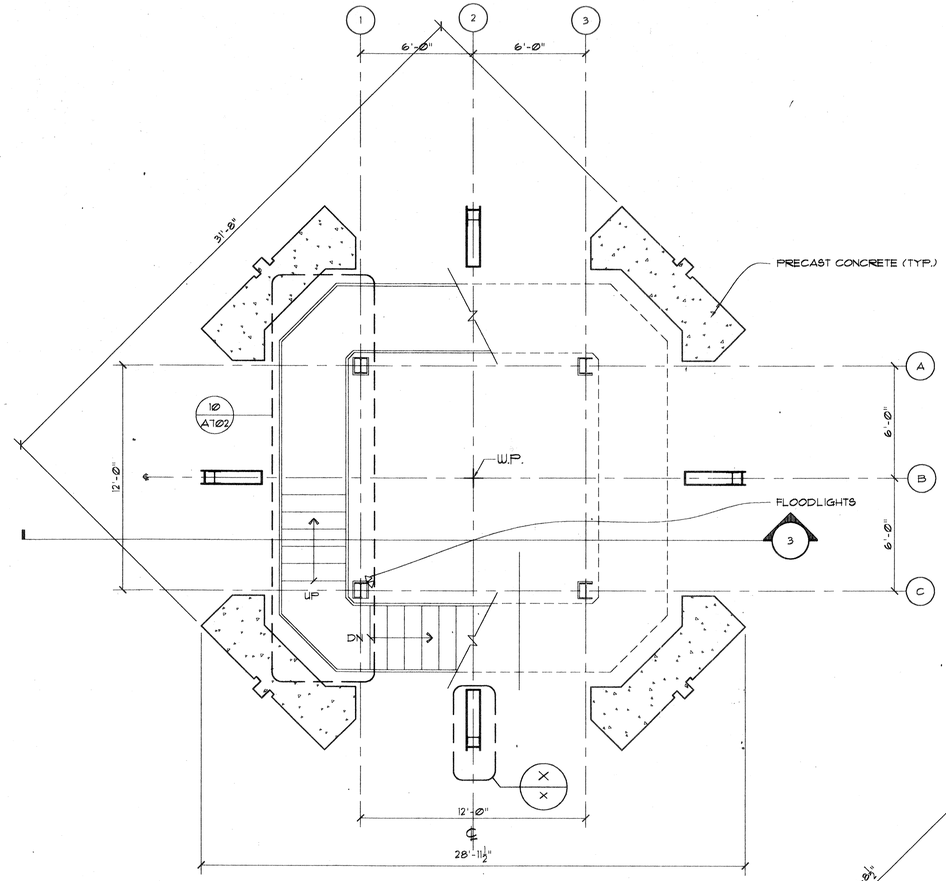
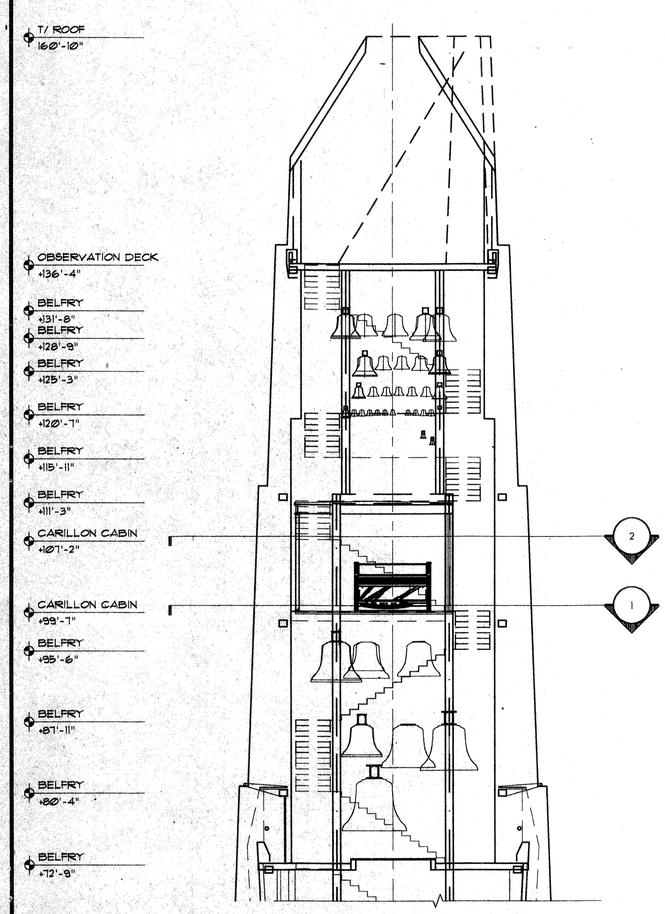
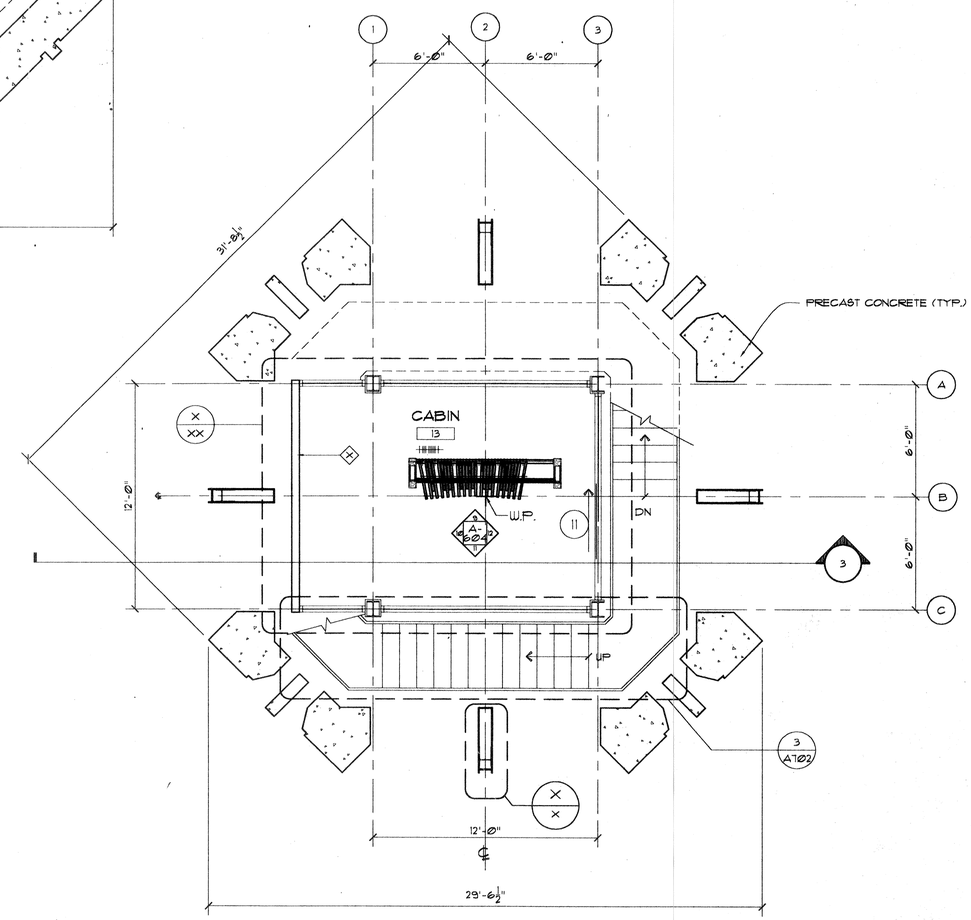
Facsmile: 630.357.2662



2 PLAN AT BELFRY
SCALE: 1/4" = 1'-0"



3 KEY SECTION
SCALE: 1/8" = 1'-0"



1 PLAN AT BELFRY
SCALE: 1/4" = 1'-0"

4735-17

NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CRILLON

NAPERVILLE, ILLINOIS

PLANS AT BELFRY

JOB#: 98103	A-113
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN / DRAWN BY: J. DEMUTH	

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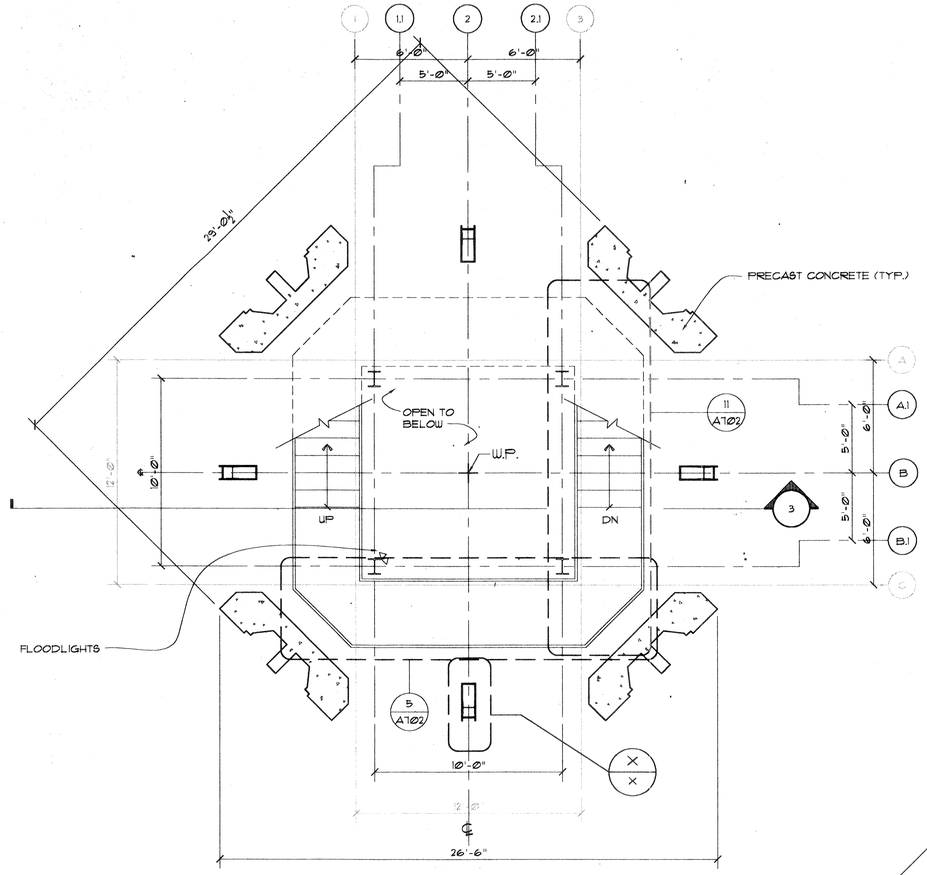
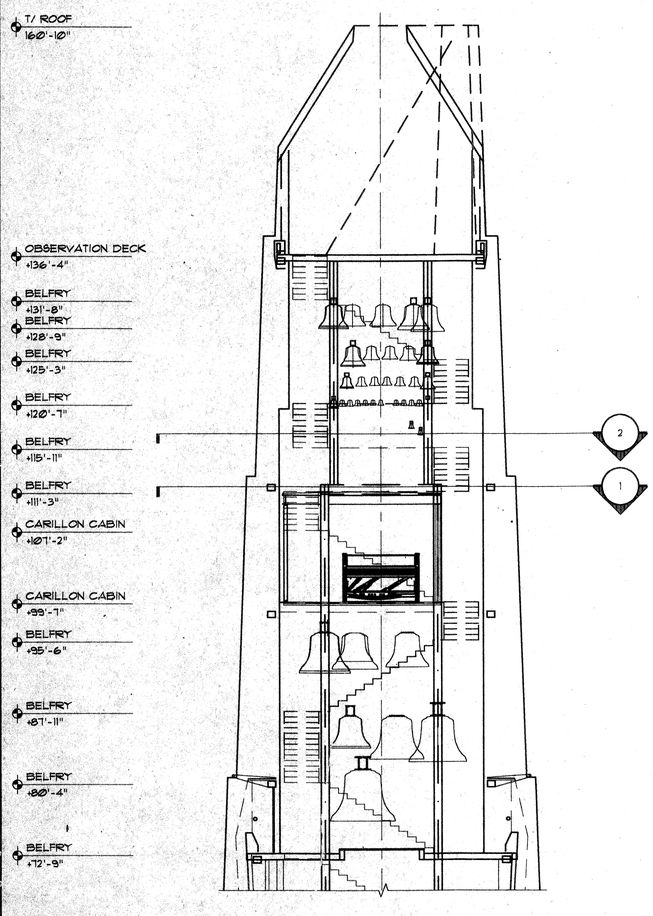
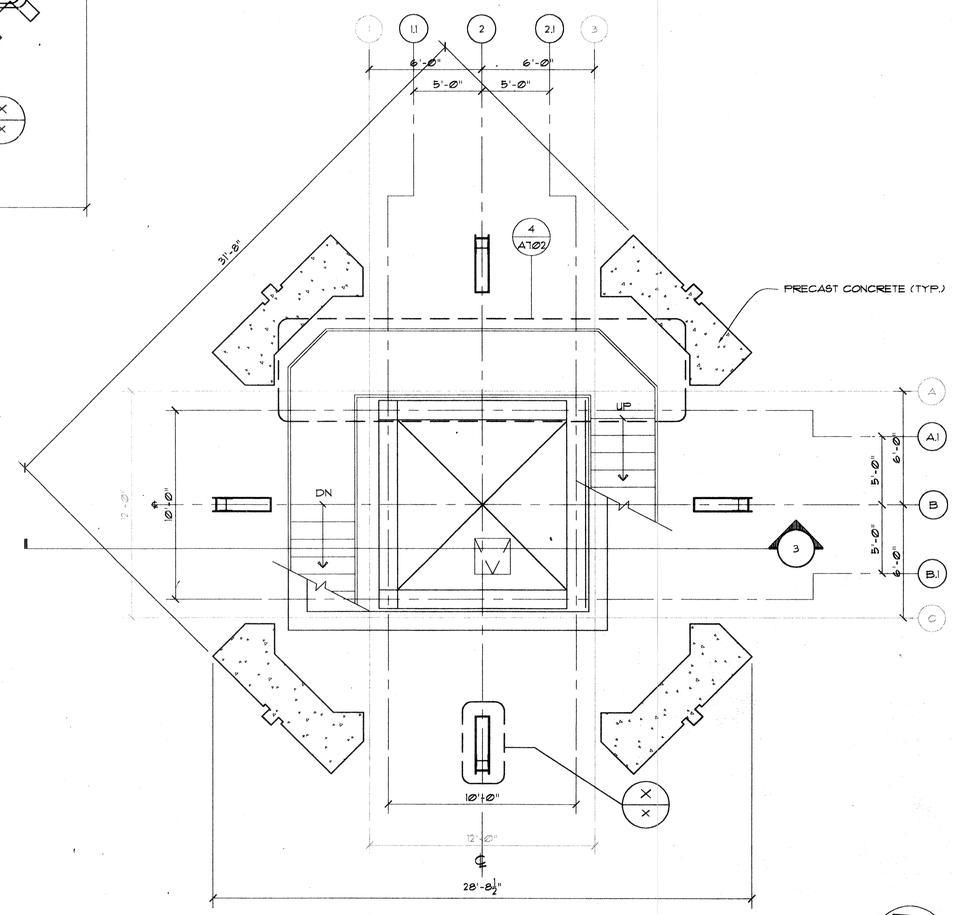


2 PLAN AT BELFRY
SCALE: 1/4" = 1'-0"



3 KEY SECTION
SCALE: 1/8" = 1'-0"



1 PLAN AT BELFRY
SCALE: 1/4" = 1'-0"

4735-18

NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

PLANS AT BELFRY

JOB#: 98103
DATE: 8/16/99
PRINCIPAL: P. CRAWFORD
PROJECT MGR: S. ALLMAN
DRAWN BY: J. SMITH

A-114

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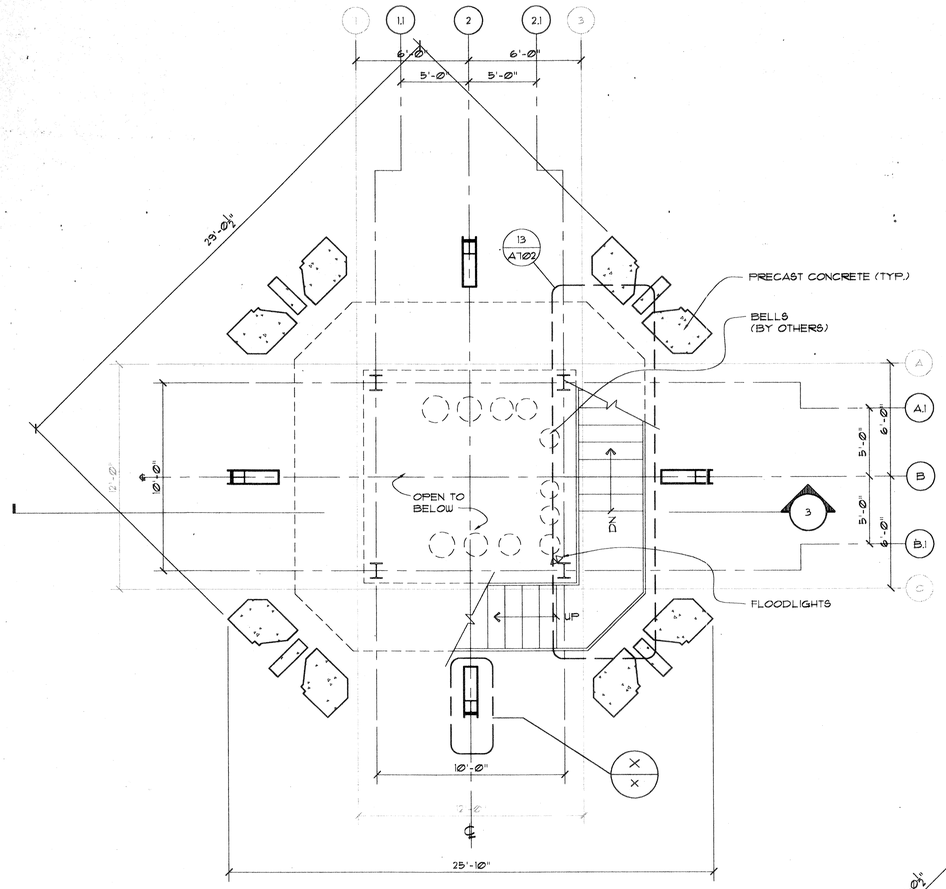
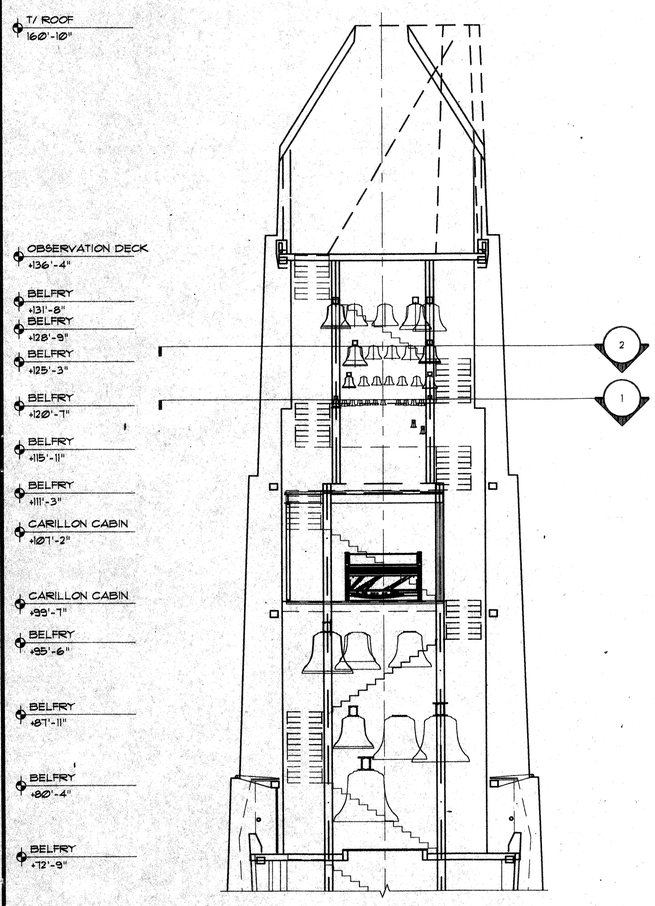
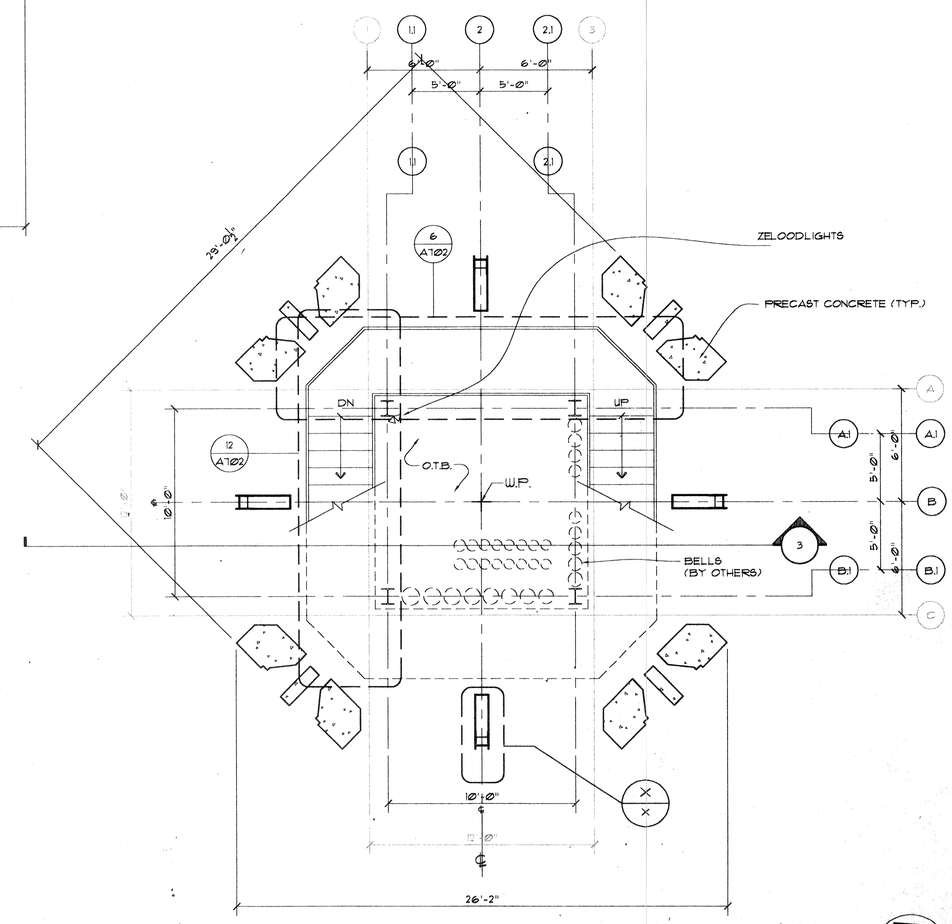


2 PLAN AT BELFRY
SCALE: 1/4" = 1'-0"



3 KEY SECTION
SCALE: 1/8" = 1'-0"



1 PLAN AT BELFRY
SCALE: 1/4" = 1'-0"

4735-19

NOTES:
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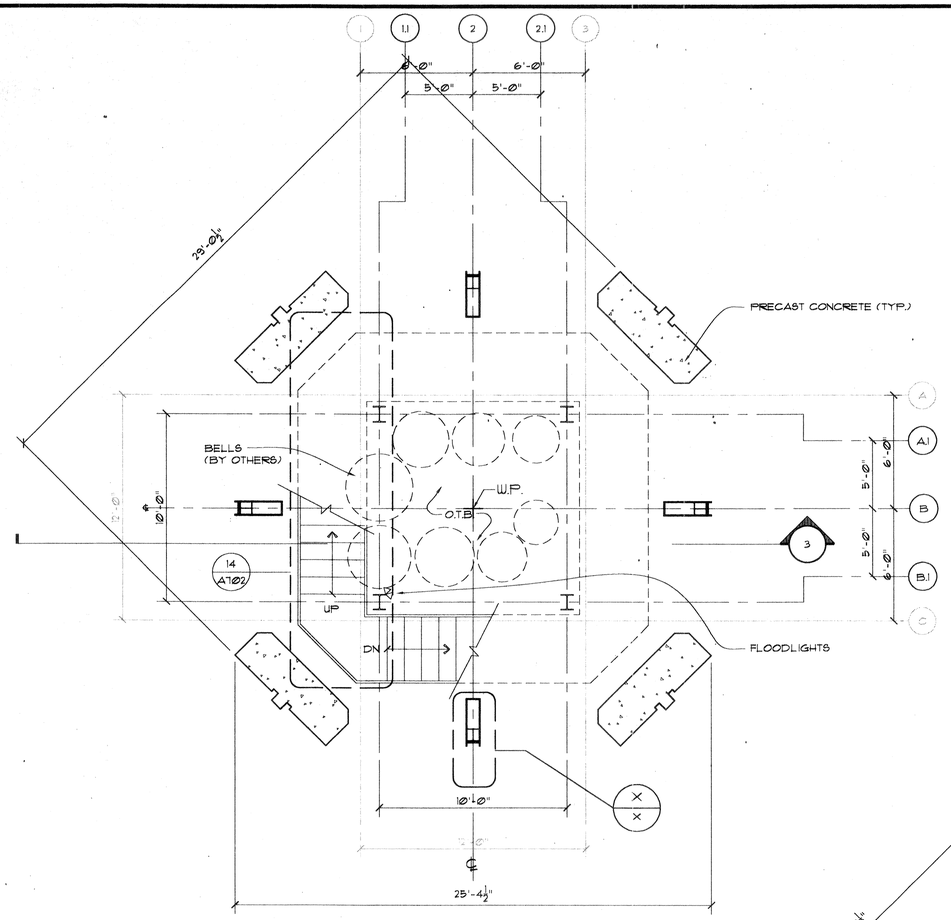
PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

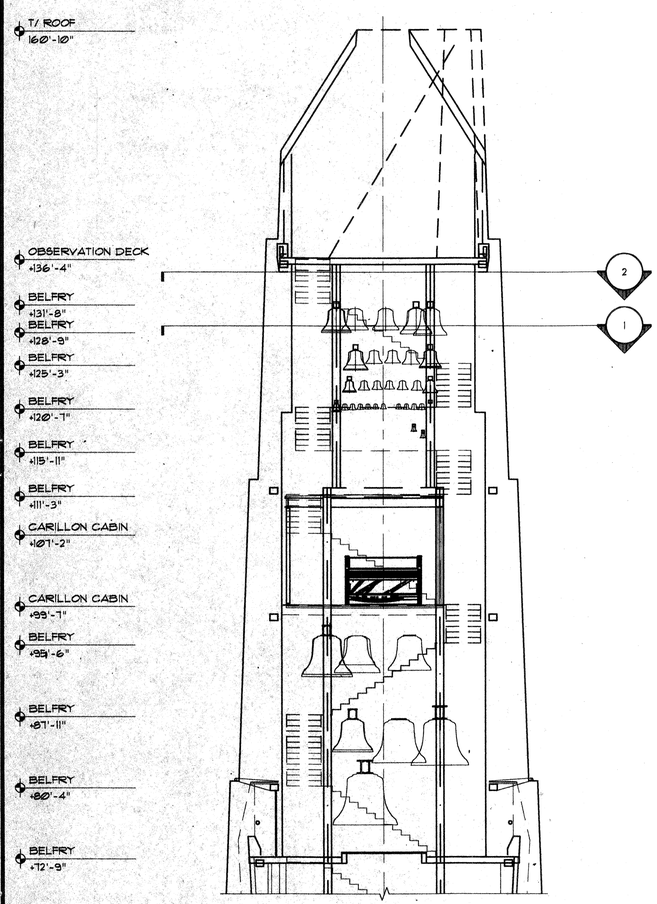
NAPERVILLE, ILLINOIS

PLANS AT BELFRY

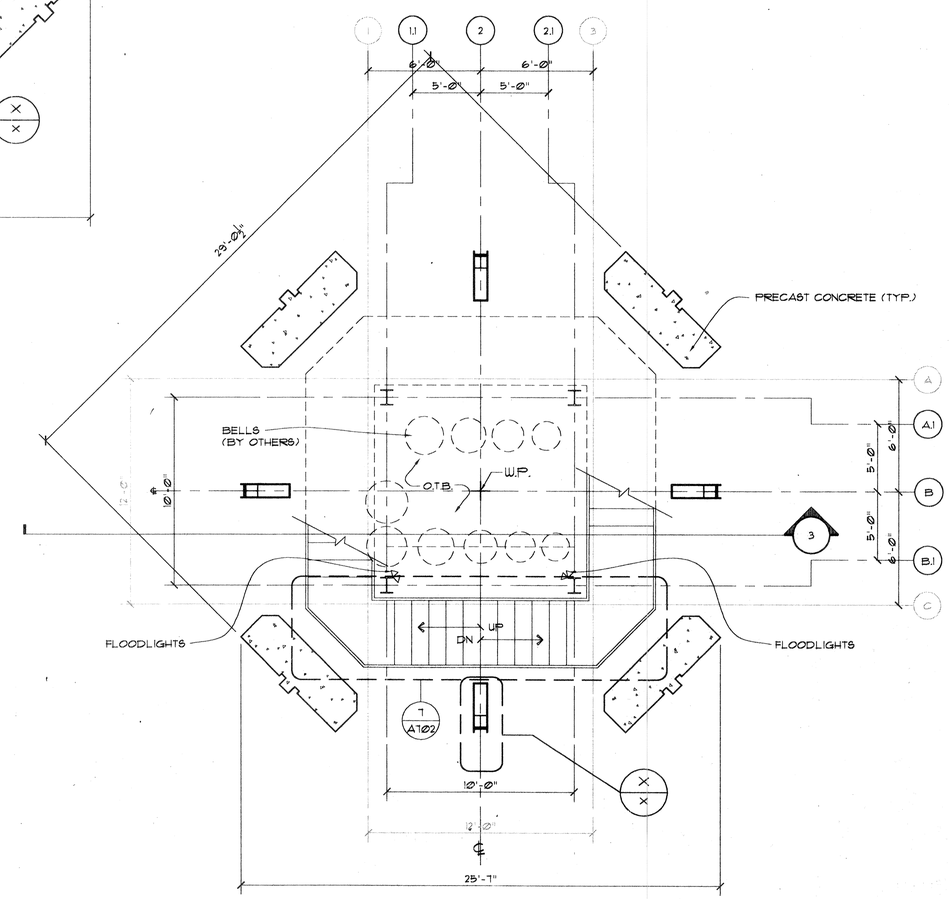
JOB#: 98103	A-115
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN / DRAWN BY: J. DEMUTH	



2 PLAN AT BELFRY
SCALE: 1/4" = 1'-0"



3 KEY SECTION
SCALE: 1/8" = 1'-0"



1 PLAN AT BELFRY
SCALE: 1/4" = 1'-0"

4735-20

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NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

PLANS AT BELFRY

JOB#: 98103
DATE: 8/16/99
PRINCIPAL: P. CRAWFORD
PROJECT MGR: G. ALLMAN
DRAWN BY: J. DEMUTH

A-116

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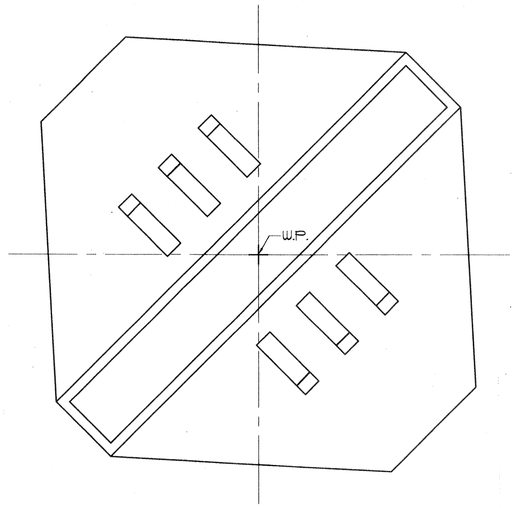
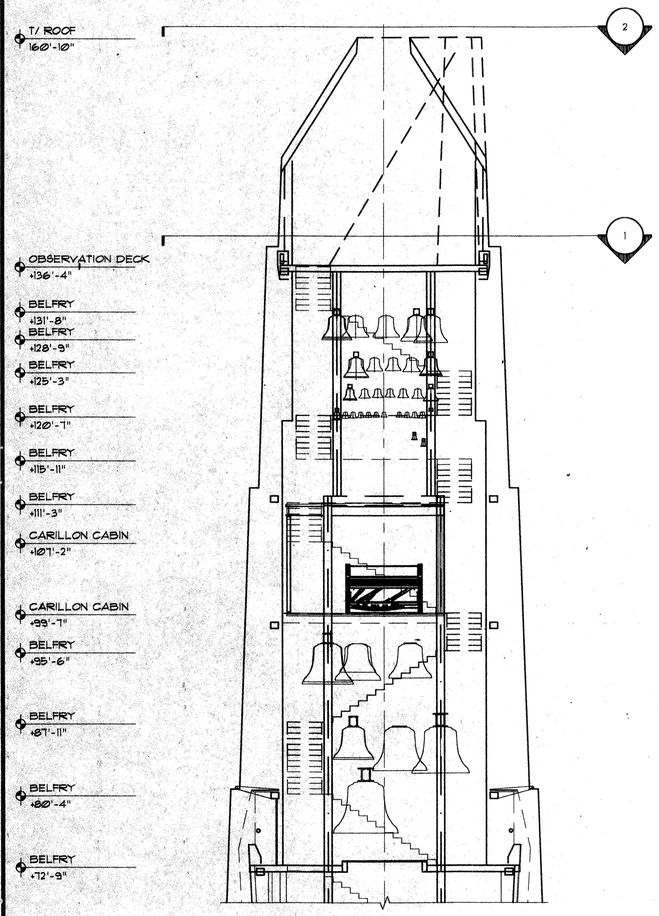
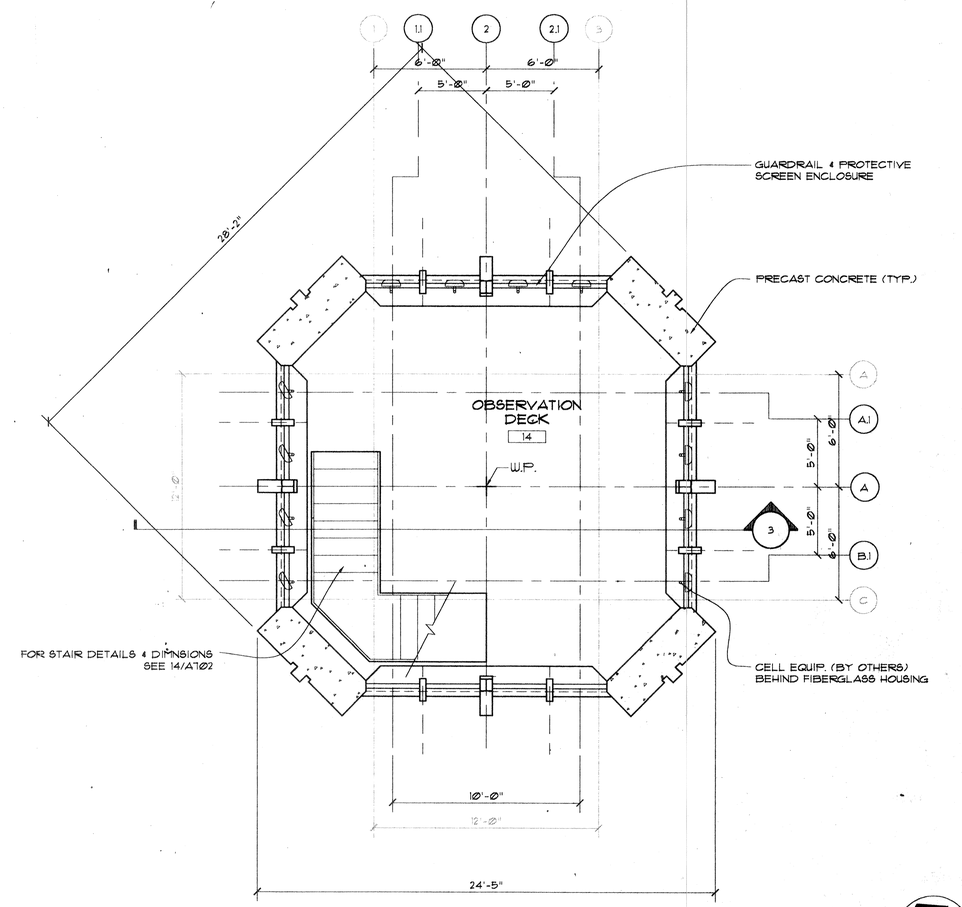


2 ROOF PLAN
SCALE: 1/4" = 1'-0"



3 KEY SECTION
SCALE: 1/8" = 1'-0"



1 PLAN AT OBSERVATION
SCALE: 1/4" = 1'-0"

4735-21

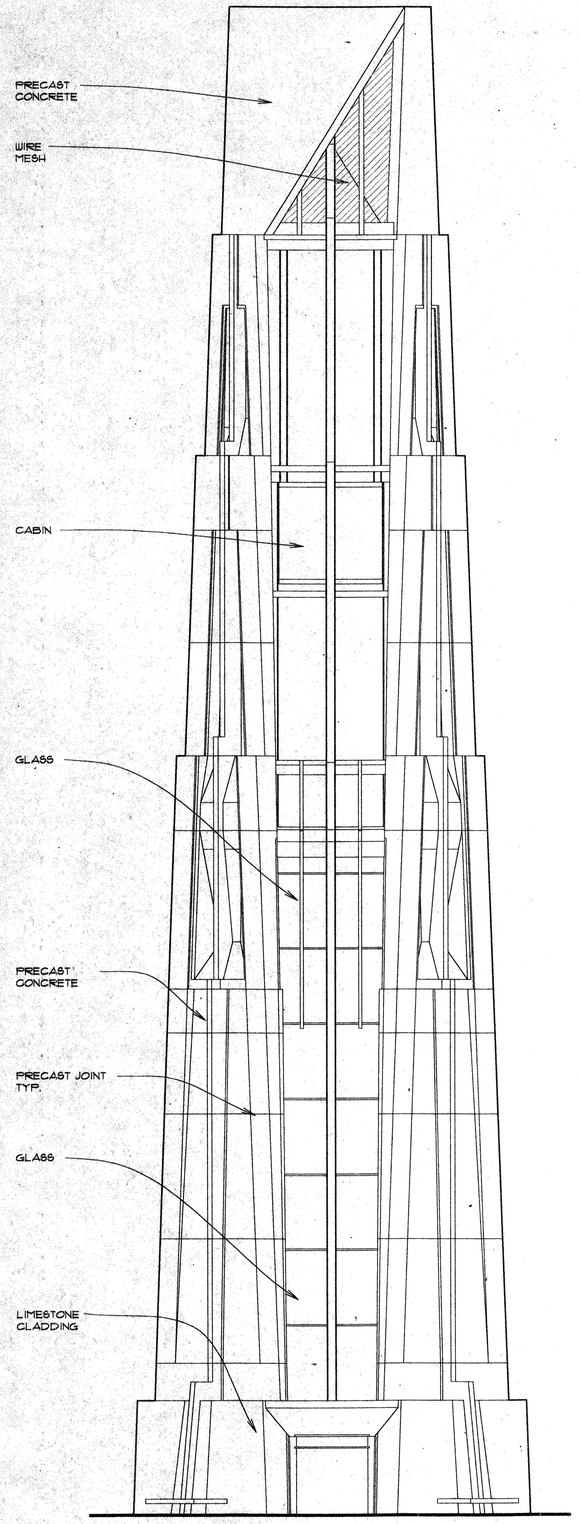
NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

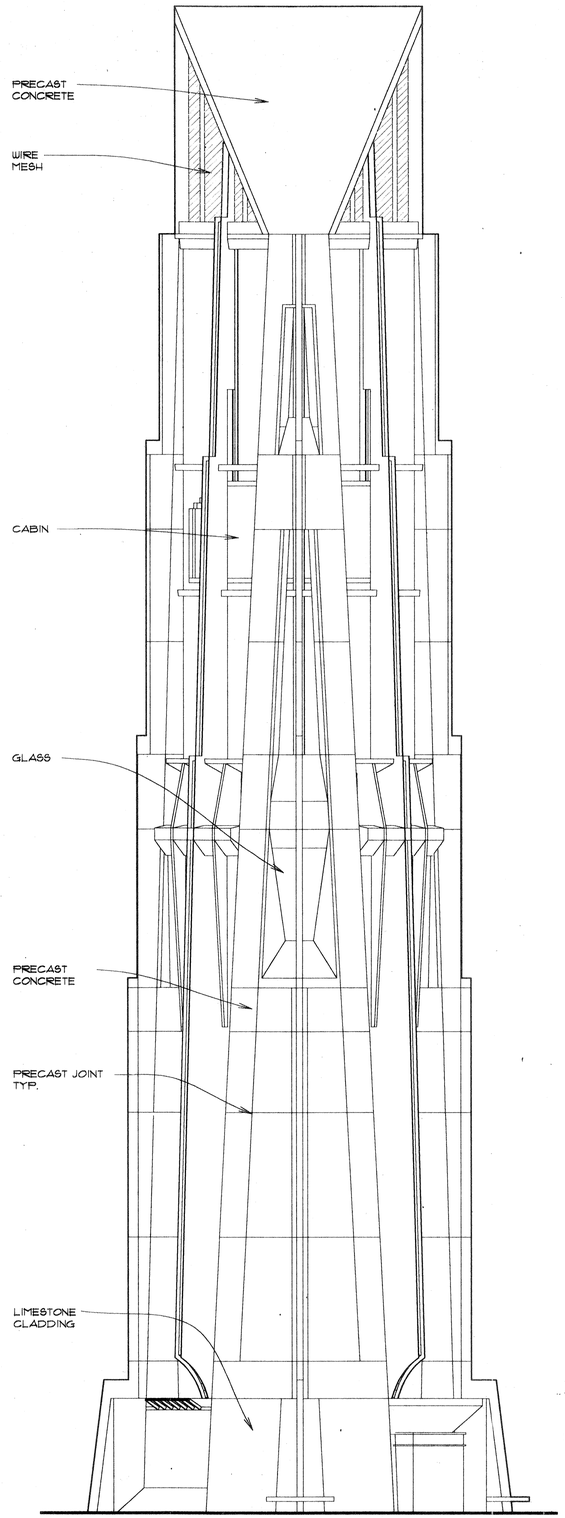
NAPERVILLE, ILLINOIS

PLAN AT OBSERVATION, ROOF PLAN

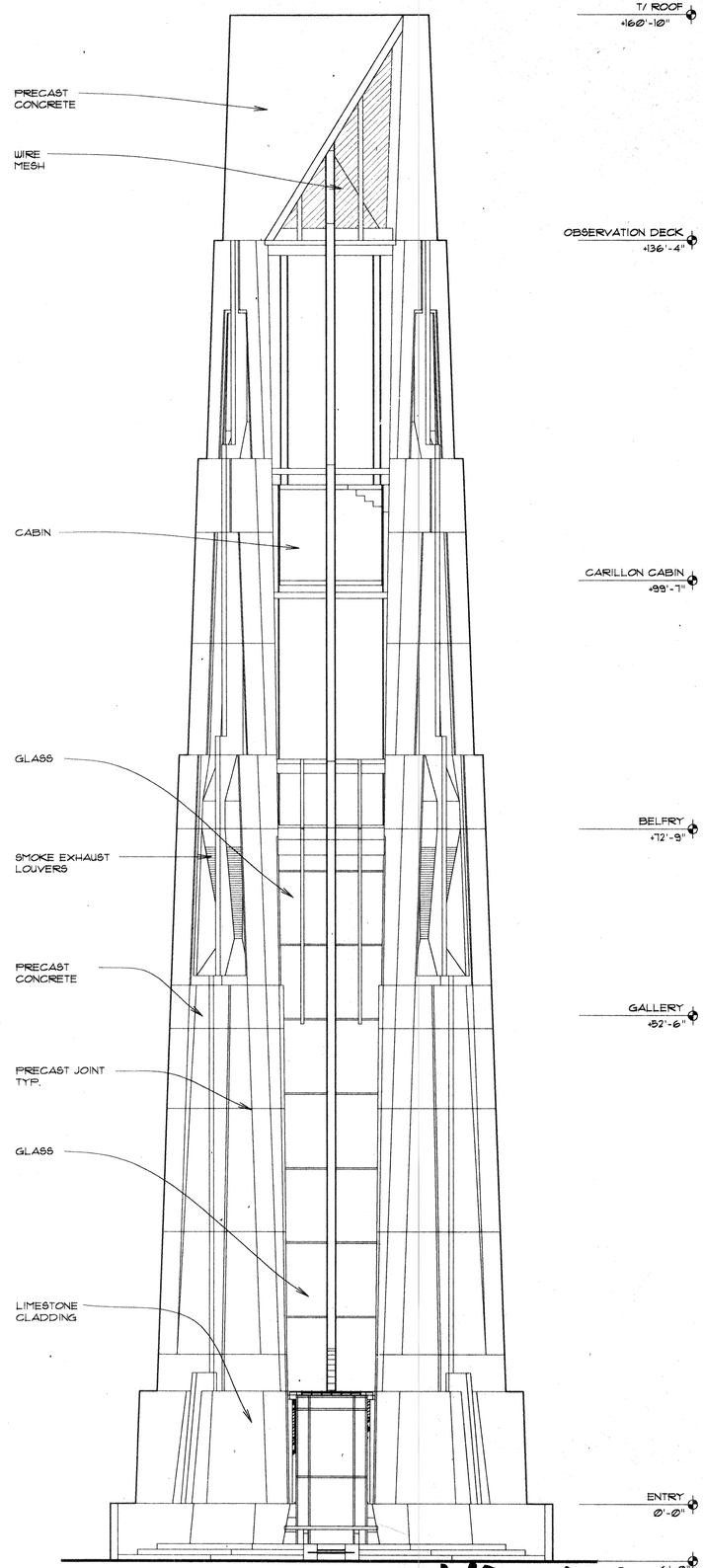
JOB#: 98103	A-117
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR. R. ALLMAN / DRAWN BY: J. DEMUTH	



EAST ELEVATION
SCALE: 1/8" = 1'-0"



SOUTH-EAST ELEVATION
SCALE: 1/8" = 1'-0"



WEST ELEVATION
SCALE: 1/8" = 1'-0"

4735-22

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NOTES:
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NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

EXTERIOR ELEVATIONS

JOB#: 98103	A-201
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR. R. ALLMAN	DRAWN BY: J. DEMUTH

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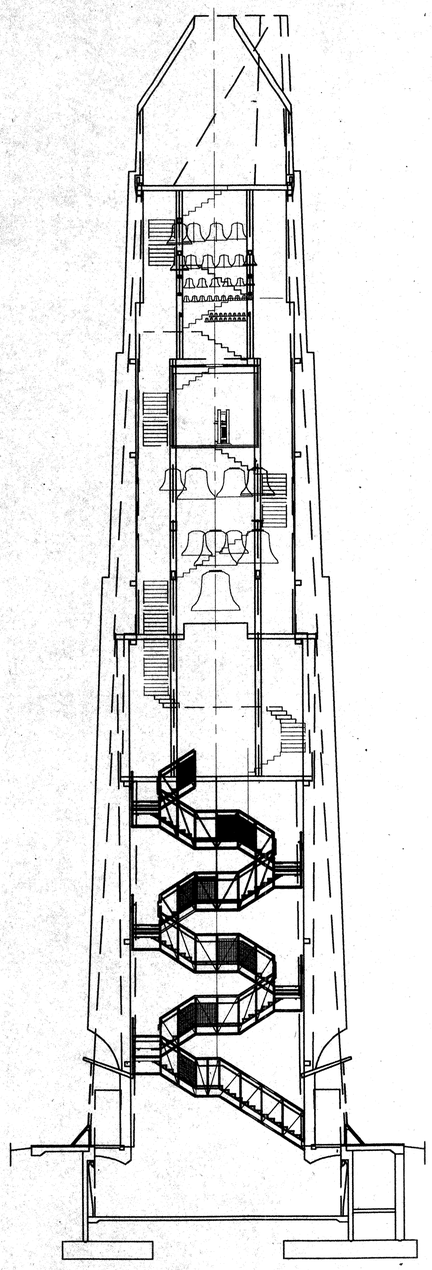
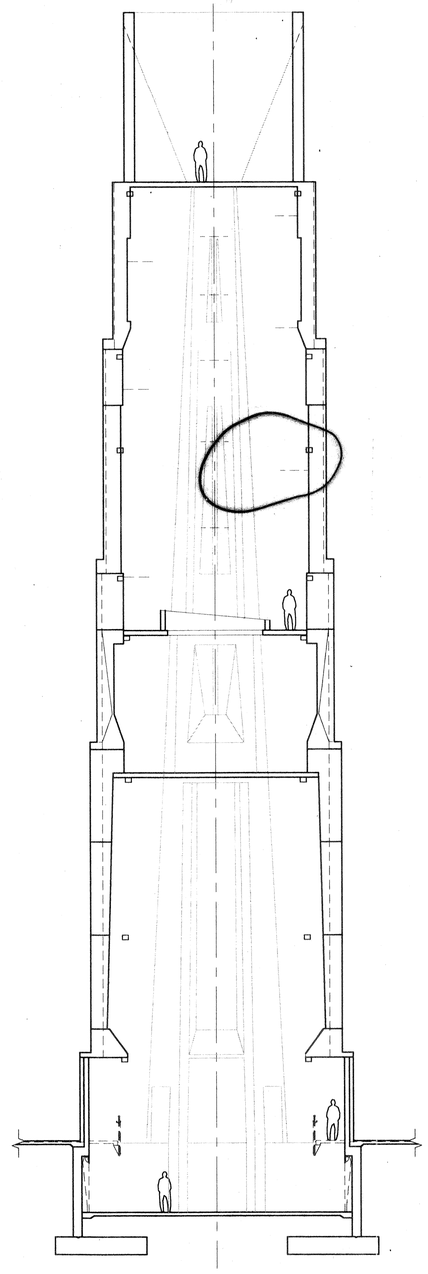
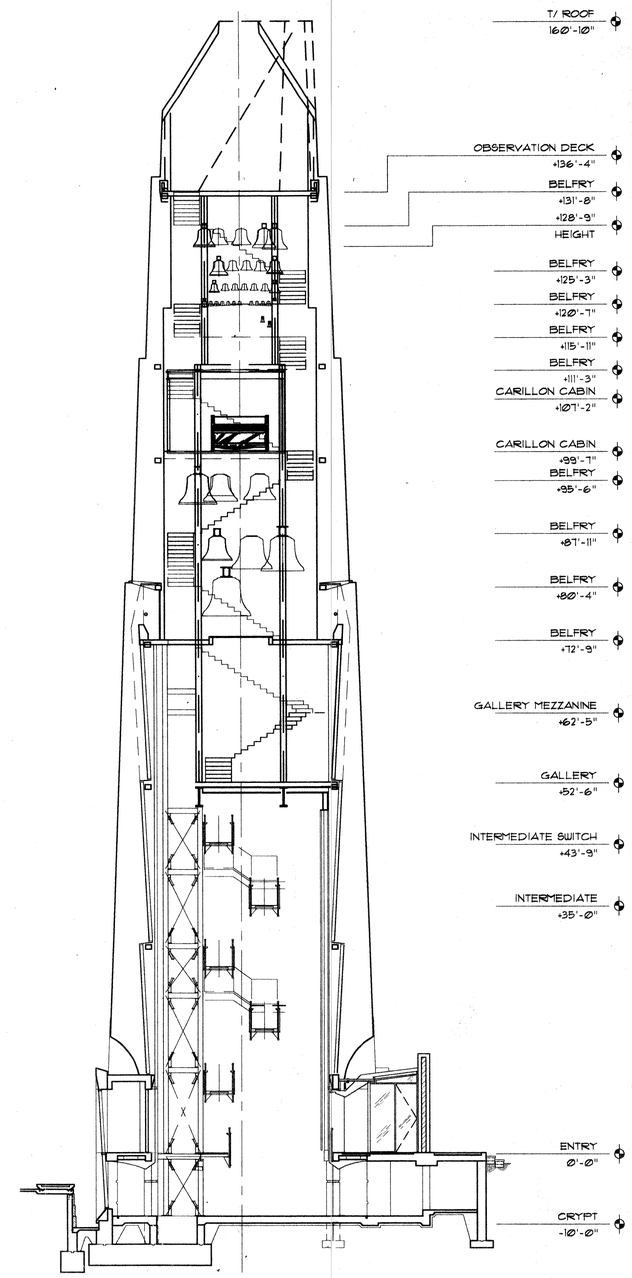


3 NORTH - SOUTH SECTION
SCALE: 3/32" = 1'-0"



2 NORTHEAST - SOUTHWEST SECTION
SCALE: 3/32" = 1'-0"



1 EAST - WEST SECTION
SCALE: 3/32" = 1'-0"

4735-23

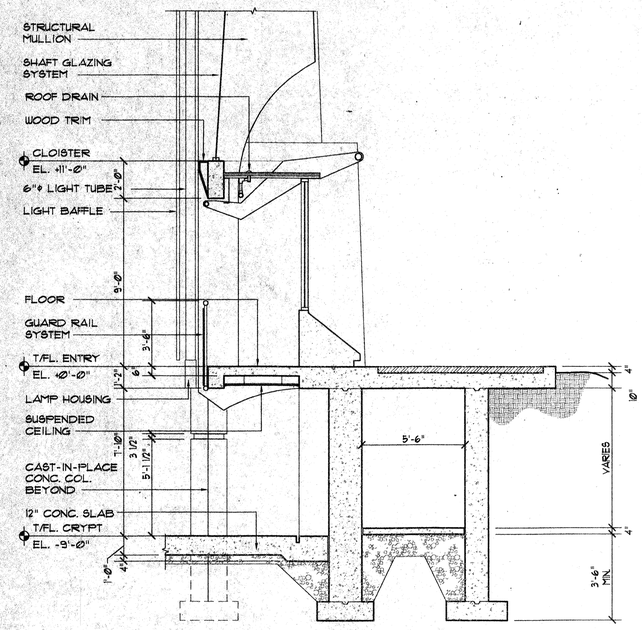
NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

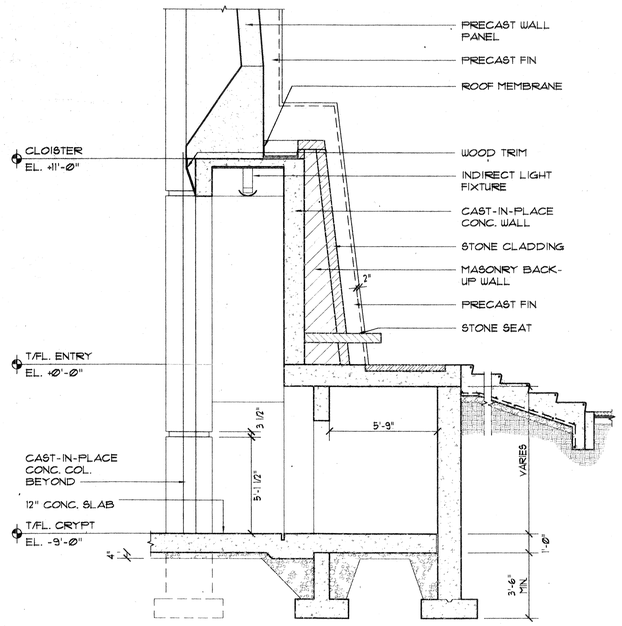
NAPERVILLE, ILLINOIS

BUILDING SECTIONS

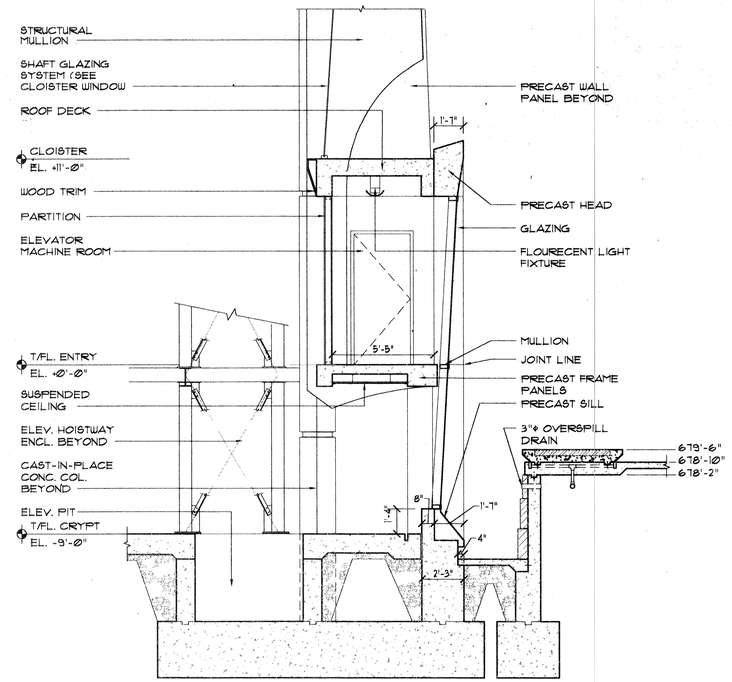
JOB#: 98103	A-301
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN / DRAWN BY: J. DIENUTH	



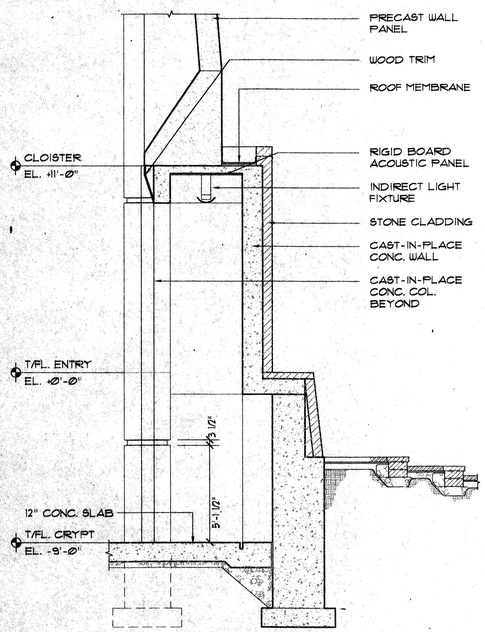
7 SECTION AT CLOISTER WINDOW
SCALE: 1/4" = 1'-0"



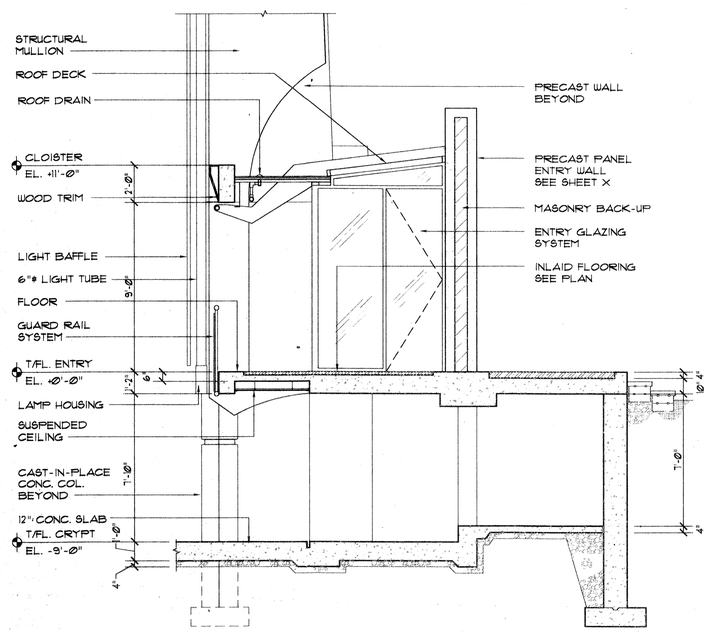
5 SECTION AT FOUNDATION WALL
SCALE: 1/4" = 1'-0"



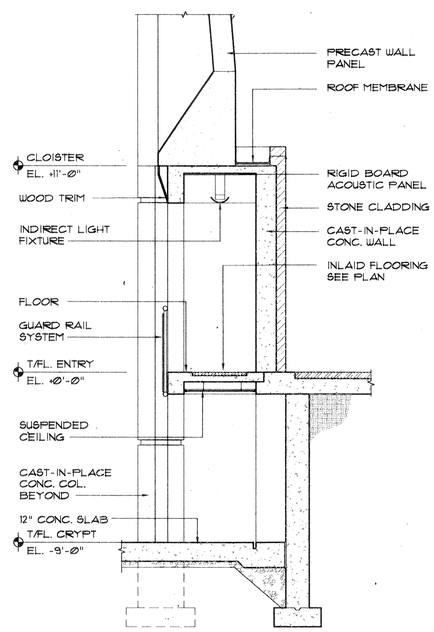
3 SECTION AT FOUNDATION WALL
SCALE: 1/4" = 1'-0"



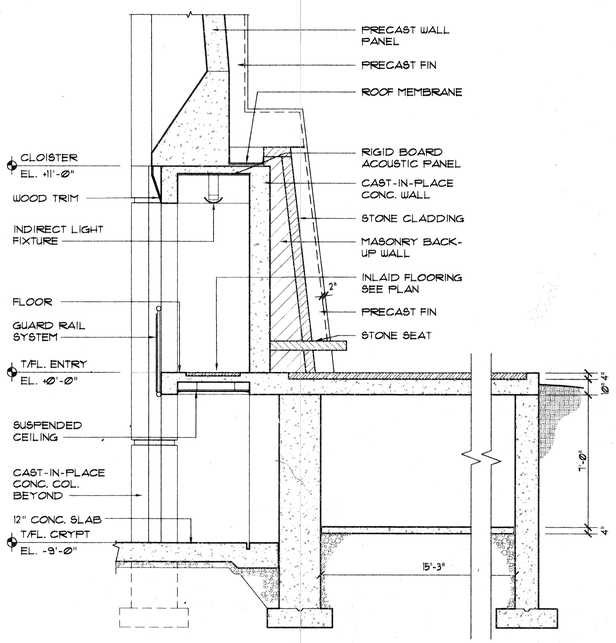
6 SECTION AT FOUNDATION WALL
SCALE: 1/4" = 1'-0"



4 SECTION AT ENTRY
SCALE: 1/4" = 1'-0"



2 SECTION AT FOUNDATION WALL
SCALE: 1/4" = 1'-0"



1 SECTION AT VAULT
SCALE: 1/4" = 1'-0"

4735-24

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NOTES:
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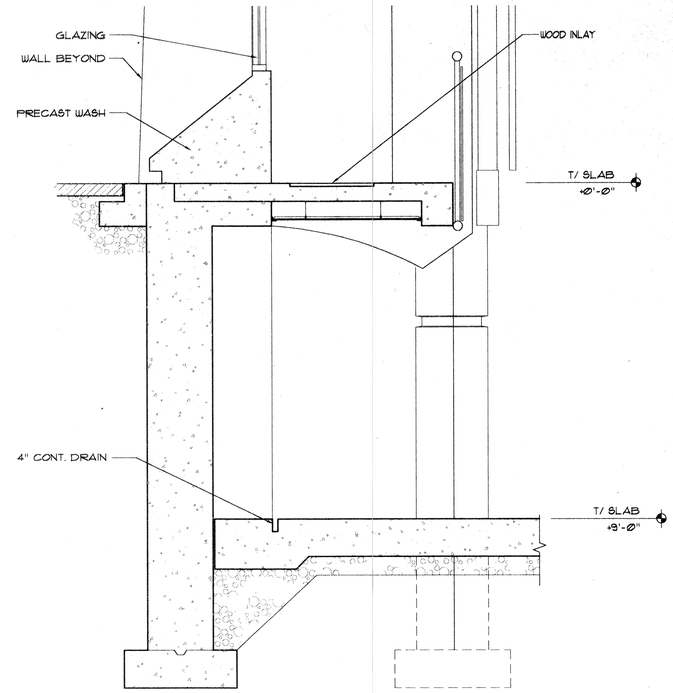
NAPERVILLE MILLENIUM CARILLON

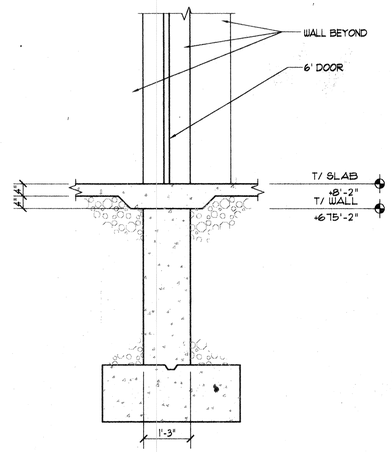
NAPERVILLE, ILLINOIS

SECTIONS & DETAILS

JOB#: 98103	A-302
DATE: 8/16/99	
PRINCIPAL: P. CAWFORD	
PROJECT MGR: G. ALLMAN / DRAWN BY: J. DEMUTH	



2 SECTION AT WALL
SCALE: 1/2" = 1'-0"



1 SECTION AT WALL
SCALE: 1/2" = 1'-0"

4735-25

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NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

SECTIONS

PRINCIPAL: PC	A-303
PROJ. MNGR: SPA	
DRAWN BY: JJD	
DATE: 8/16/99	

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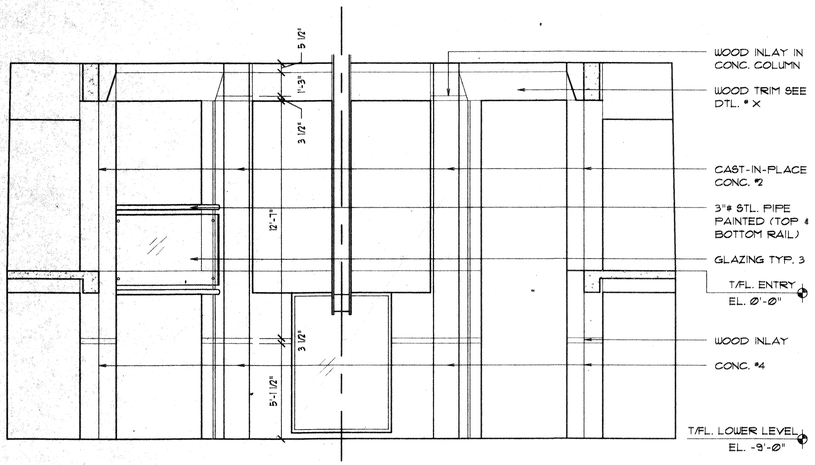
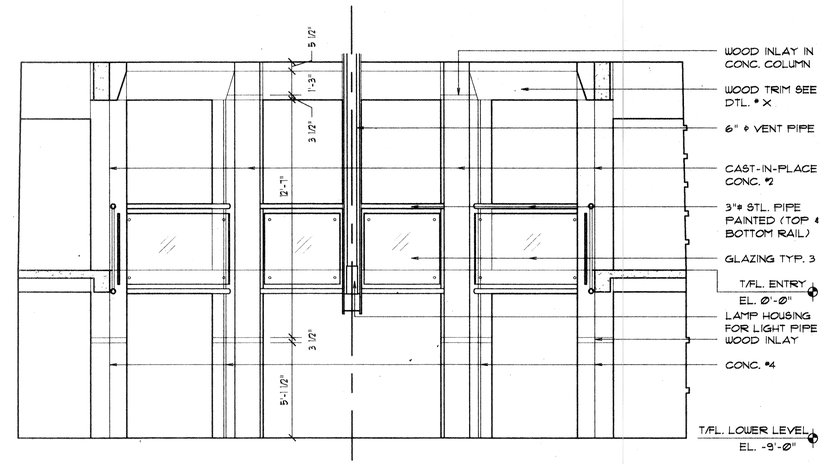
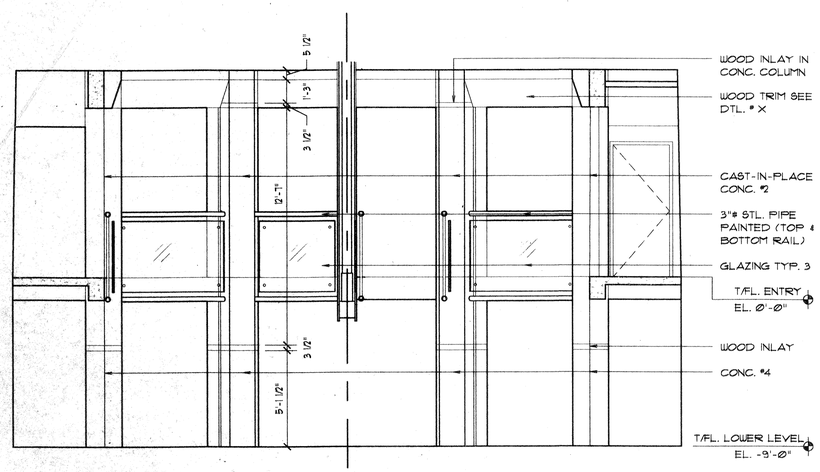


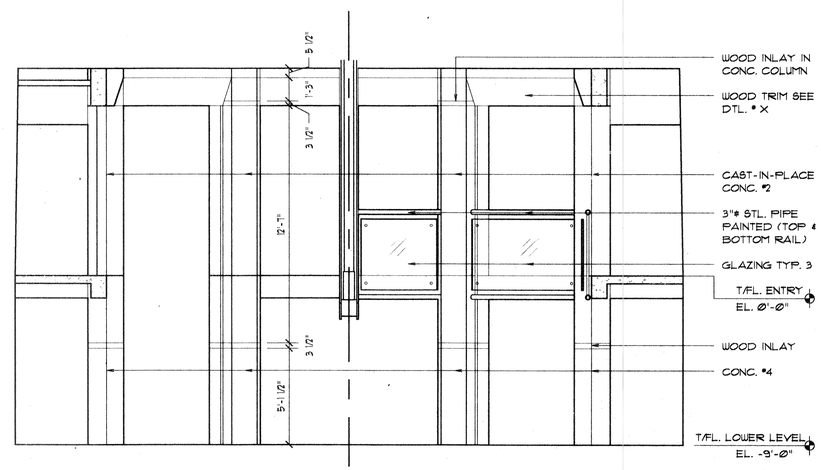
4 WEST INTERIOR ELEVATION
SCALE: 1/4" = 1'-Ø"



2 EAST INTERIOR ELEVATION
SCALE: 1/4" = 1'-Ø"



3 SOUTH INTERIOR ELEVATION
SCALE: 1/4" = 1'-Ø"



1 NORTH INTERIOR ELEVATION
SCALE: 1/4" = 1'-Ø"

4735-26

NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

INTERIOR ELEVATIONS

JOB#: 98103
DATE: 8/16/99
PRINCIPAL: P. CRAWFORD
PROJECT MGR: R. ALLMAN
DRAWN BY: J. DEMUTH

A-304

DOOR SCHEDULE

NUMBER	DOOR SIZE	DOOR MATERIAL	DOOR TYPE	FRAME SIZE	FRAME MATERIAL	FRAME TYPE	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	LABEL	INSULATED CORE ●	HARDWARE 1 PUSH/PULL	2 CYLINDER LOCK (DEAD BOLT) W/ INSIDE LEVER HANDLE	3 KEY-OPERATED CYLINDER DEAD BOLT (THUMB TURN INSIDE)	4 LOCKSET	5 LATCH SET	6 KNURLED HANDLE	7 DOOR VIEWER	8 PRIVACY LOCK	9 CLOSER ADA ACCESSIBLE	10 KICK PLATE EACH SIDE	11 WALL STOP	12 FLOOR STOP	13 ASTRAGAL	14 HEAD/FOOT AUTOMATIC FLUSH BOLT W/ DUST PROOF STRIKES (INACTIVE LEAF)	15 16 GA. 36" HIGH KICK/GUARD PLATE EACH SIDE	16 ELECTRIC DOOR SENSOR OPENER BY OWNER	17 ELECTRIC LATCH RELEASE/STRIKE "FOLGER ADAMS" CARD ACCESS	18 BOOTHER 5924 D.A. SPRING HINGES - 1 1/2 PAIR	19 HOLD OPEN	20 DOOR SWEEP	21 THRESHOLD AND WEATHER-STRIP	22 ZERO DOOR BOTTOM SOUND DROP/ WEATHER-STRIP	23 HARDWARE BY SLIDING DOOR MFR	24 PANIC HARDWARE BY DOOR MFR	NUMBER	SIGNAGE	REMARKS
1	3'-0" X 7'-0" X 1 3/4"	HMTL		5 3/4" X 2"	HMTL														8																	1	WASHROOM	
2	6'-0" X 7'-0" X 1 3/4"	STL			STL						●				4					9													21			24	2		
3	6'-0" X 7'-0" X 1 3/4"	HMTL		5 3/4" X 2"	HMTL										4								12														3		
4	3'-0" X 7'-0" X 1 3/4"	HMTL		5 3/4" X 2"	HMTL										4								12														4		
5	3'-6" X 8'-0" X	GLASS																																			5		
6	3'-6" X 8'-0" X	GLASS																																			6		
7	3'-0" X 7'-0" X 1 3/4"	HMTL		5 3/4" X 2"	HMTL										4																						7		
8	3'-0" X 7'-0" X 1 3/4"	WD									●																										8		
9																																					9		
10																																					10		
11	3'-0" X 7'-0" X	GLASS													4																		21			24	11		

GENERAL NOTES:

1. ALL HARDWARE TO COMPLY WITH ALL APPLICABLE ACCESSIBILITY CODES.
2. ALL EXTERIOR DOORS AND FRAMES TO BE GALVANIZED.
3. ALL DOORS SHALL BE KEYLESS IN THE DIRECTION OF EXIT.

4735-27

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NOTES:
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NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLNIOIS

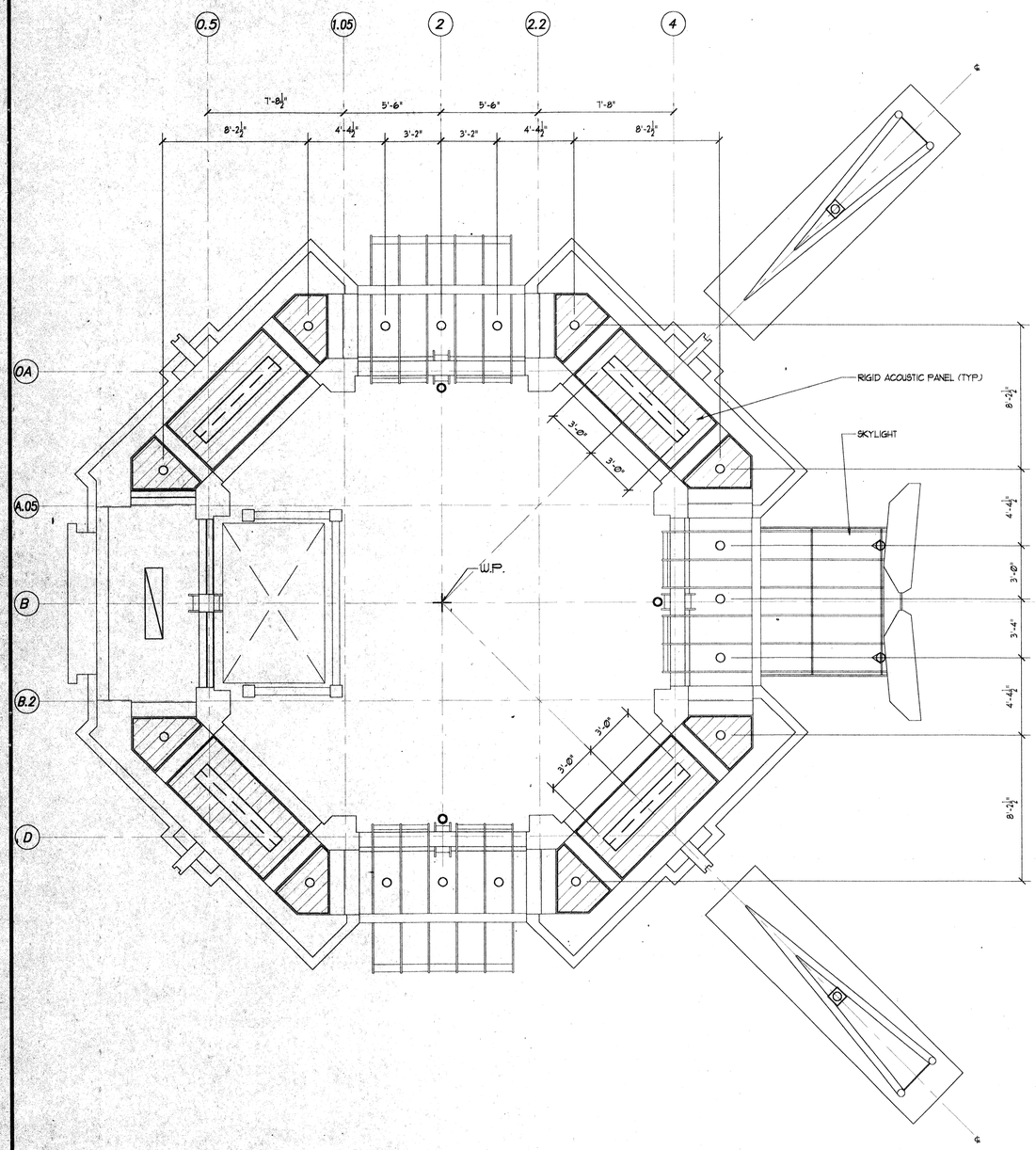
DOOR SCHEDULE

JOB#: 98103
DATE: 8/16/99
PRINCIPAL: P. CRAWFORD
PROJECT MGR: B. ALLMAN
DRAWN BY: J. DEMUTH

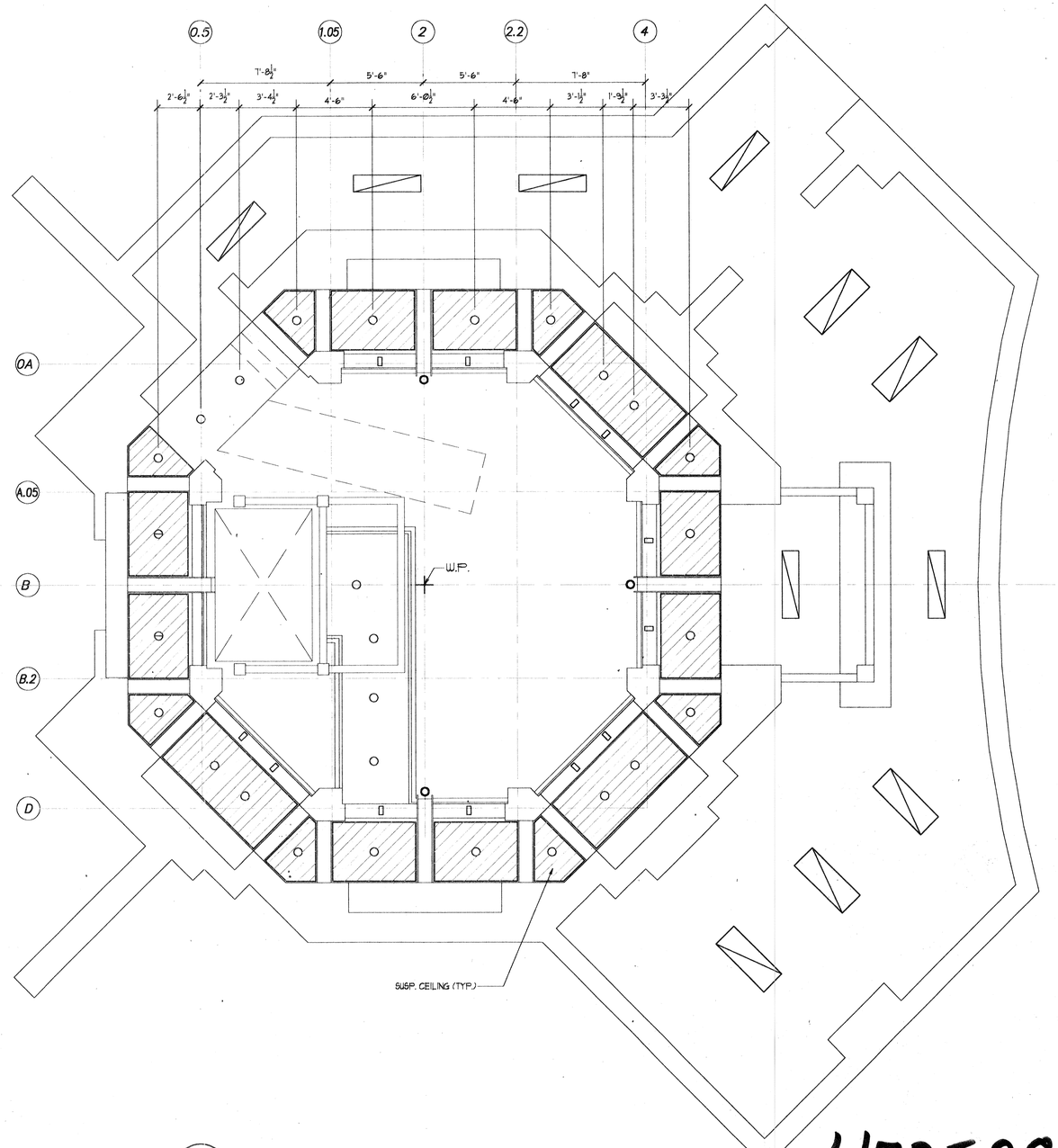
A-307

LIGHTING SCHEDULE

TYPE	GRAPHIC	DESCRIPTION
1		RECESSED CANISTER LIGHT FIXTURE
2		VERTICAL SCONCE LIGHT FIXTURE
3		INDIRECT CEILING-MOUNTED LIGHT FIXTURE
4		TRACK MOUNTED SPOT-LIGHT
5		4-LAMP FLOURECENT LIGHT FIXTURE
6		6" ϕ LIGHT PIPE TUBE/LAMP
7		OVERHEAD LIGHT FIXTURE
8		OUTDOOR FLOOD LIGHT FIXTURE
9		OUTDOOR SPOT LIGHT FIXTURE
10		OUTDOOR IN-GROUND FLOOD LIGHT FIXTURE



2 REFLECTED CEILING PLAN - ENTRY
SCALE: 1/4" = 1'-0"



1 REFLECTED CEILING PLAN - LOWER LEVEL
SCALE: 1/4" = 1'-0"

4735-28

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NOTES:
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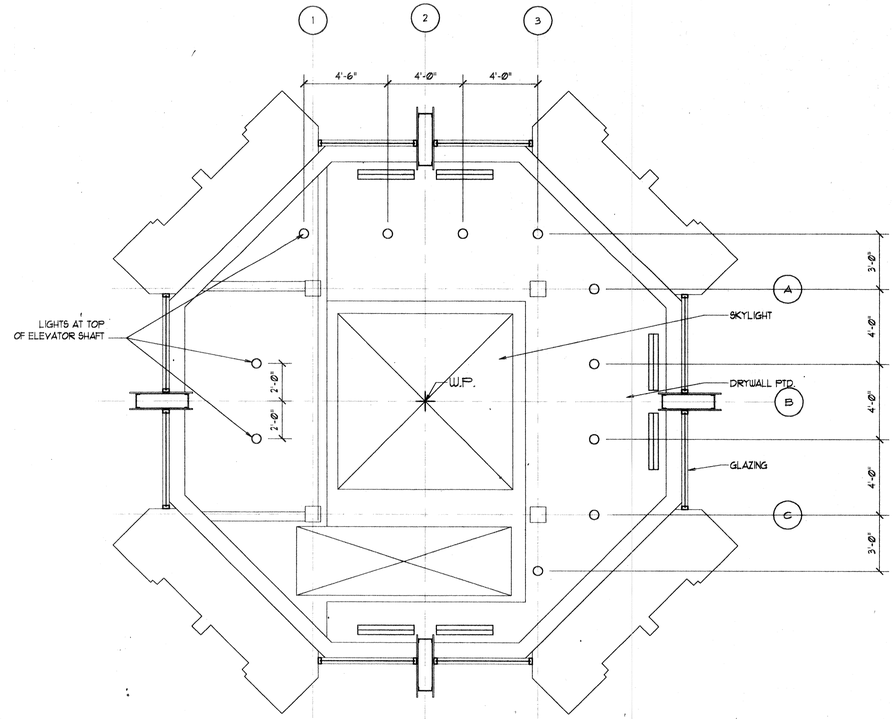
NAPERVILLE MILLENIUM CARILLON

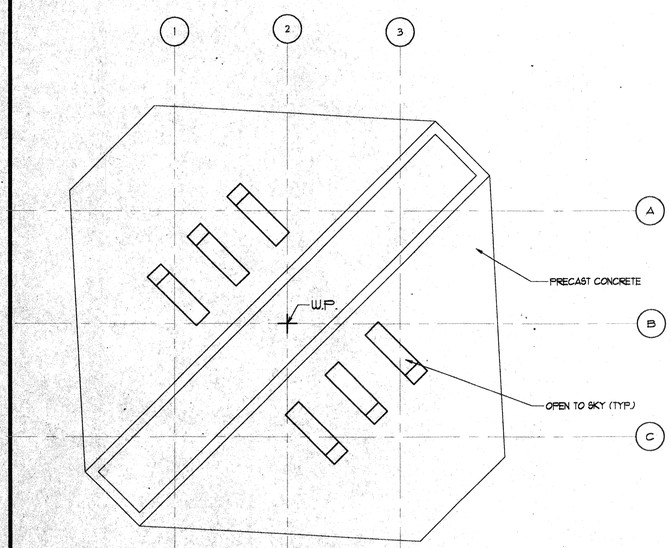
NAPERVILLE, ILLINOIS

REFLECTED CEILING PLANS

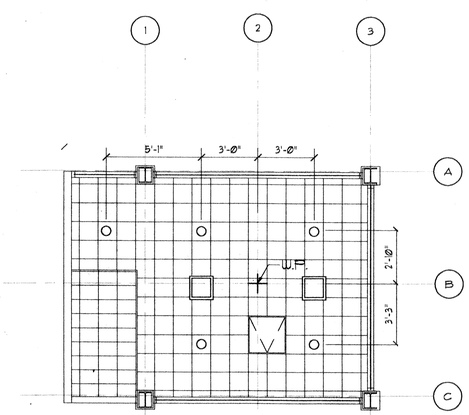
JOB#: 98103	A-401
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN / DRAWN BY: J. DEMUTH	



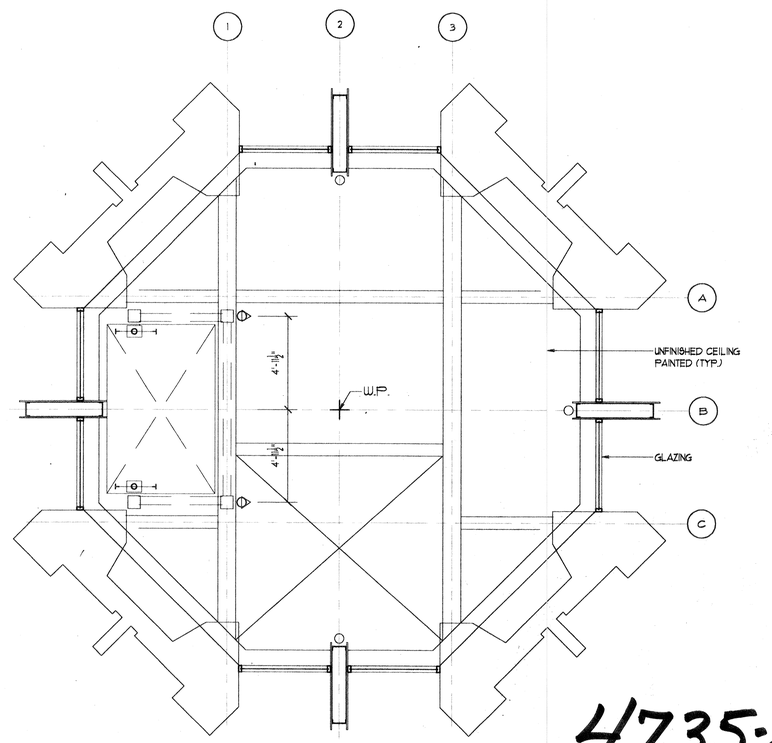
2 REFLECTED CEILING PLAN - GALLERY
SCALE: 1/4" = 1'-0"



5 REFLECTED CEILING PLAN - ROOF
SCALE: 1/4" = 1'-0"



3 REFLECTED CEILING PLAN - CABIN
SCALE: 1/4" = 1'-0"



1 REFLECTED CEILING PLAN - TOWER SHAFT
SCALE: 1/4" = 1'-0"

4735-29

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NOTES:
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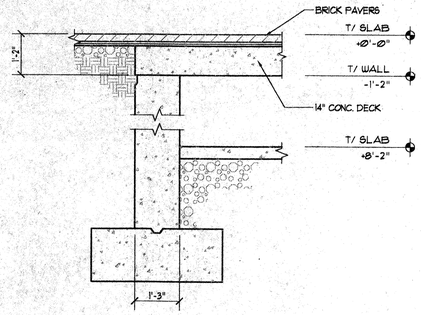
NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

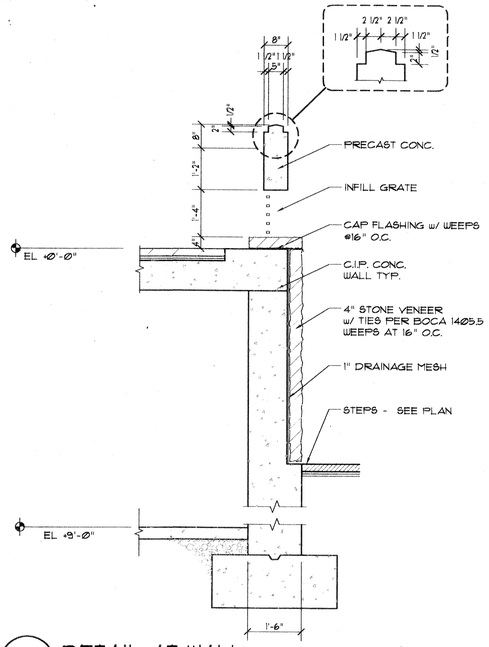
REFLECTED CEILING PLANS

JOB#: 98103
DATE: 8/16/99
PRINCIPAL: P. CRAWFORD
PROJECT MGR: R. ALLMAN
DRAWN BY: J. DEMUTH

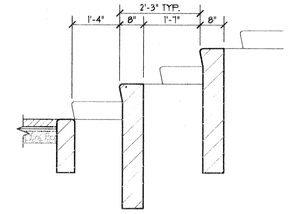
A-402



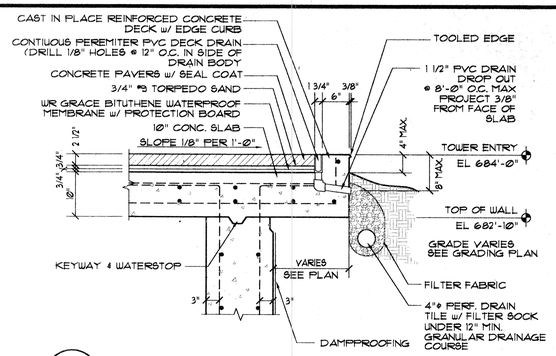
13 DETAIL AT WALL
SCALE: 1/2" = 1'-0"



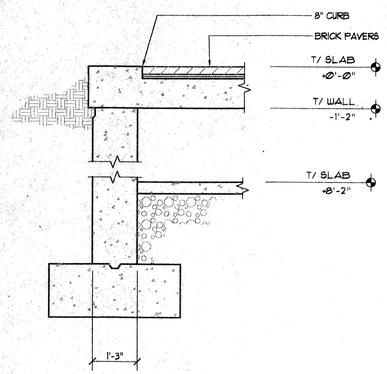
10 DETAIL AT WALL
SCALE: 1/2" = 1'-0"



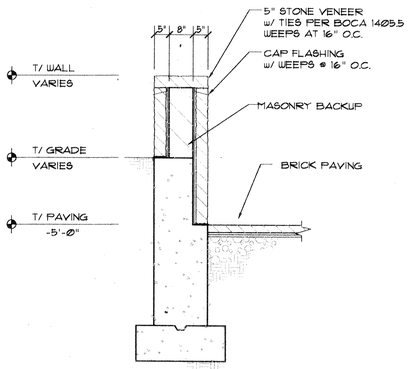
7 DETAIL AT WALL
SCALE: 1/2" = 1'-0"



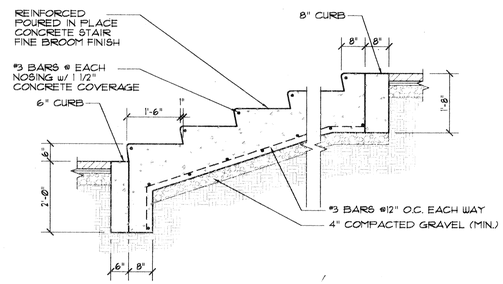
3 DETAIL AT SLAB
SCALE: 3/4" = 1'-0"



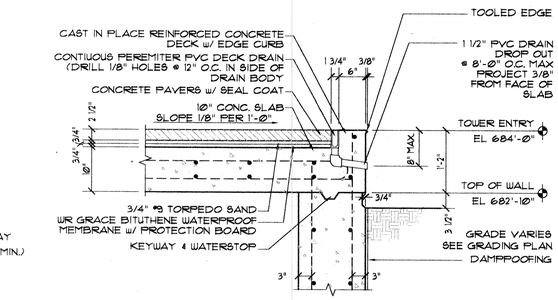
12 DETAIL AT WALL
SCALE: 1/2" = 1'-0"



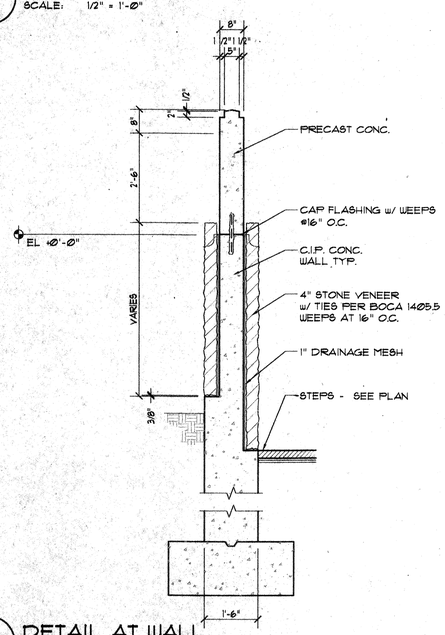
9 DETAIL AT WALL
SCALE: 1/2" = 1'-0"



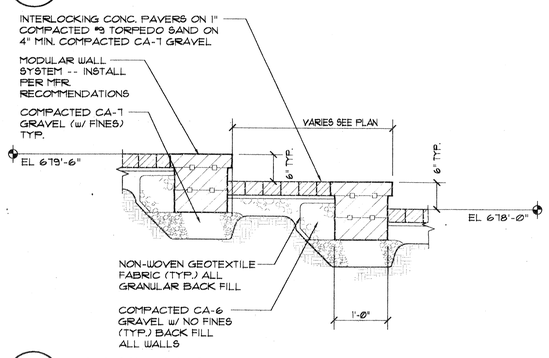
6 DETAIL AT STEPS
SCALE: 1/2" = 1'-0"



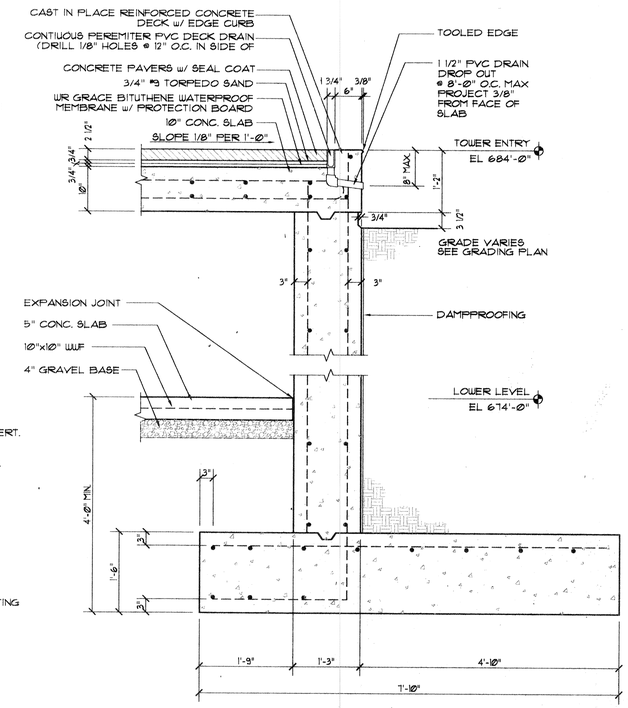
2 DETAIL AT SLAB
SCALE: 3/4" = 1'-0"



11 DETAIL AT WALL
SCALE: 1/2" = 1'-0"

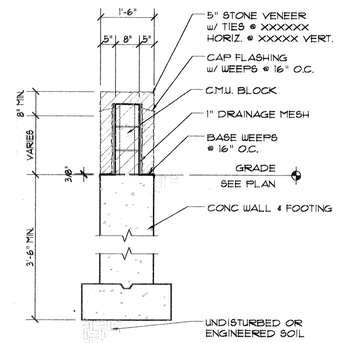


5 DETAIL AT WALK
SCALE: 3/4" = 1'-0"



1 DETAIL AT WALL
SCALE: 3/4" = 1'-0"

8 DETAIL AT STEPS
SCALE: 3/4" = 1'-0"



4 DETAIL AT WALL
SCALE: 1/2" = 1'-0"

4735-30

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PERMIT SET

NOTES:
ISSUED FOR FOUNDATION
PERMIT 7/6/99

PETER DAVID CRAWFORD
001-013064
LICENSED ARCHITECT

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

DETAILS SITE

JOB#: 98103
DATE: 8/16/99
PRINCIPAL: P. CRAWFORD
PROJECT MGR: S. ALLMAN
DRAWN BY: J. DEMUTH

A-501

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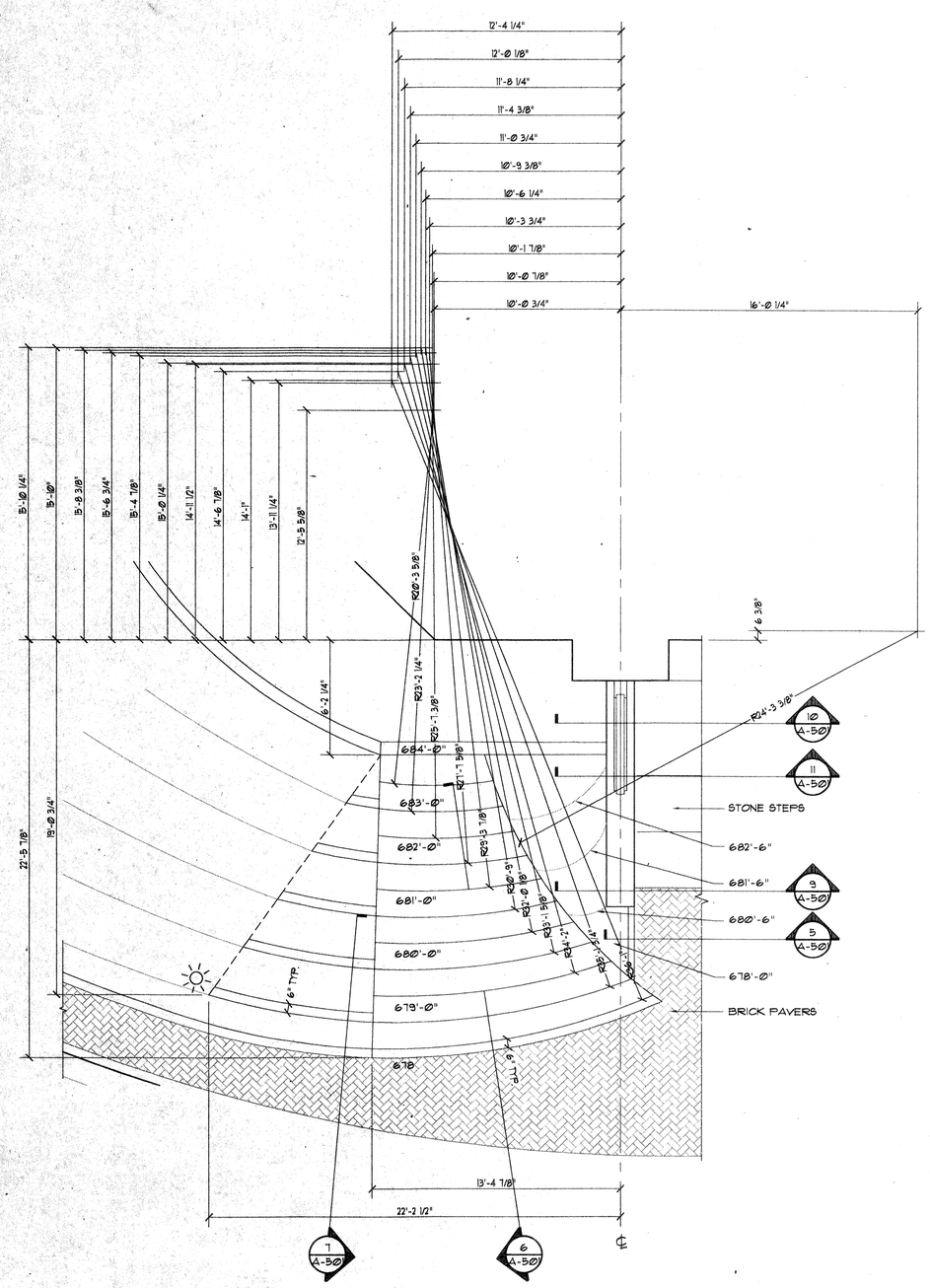
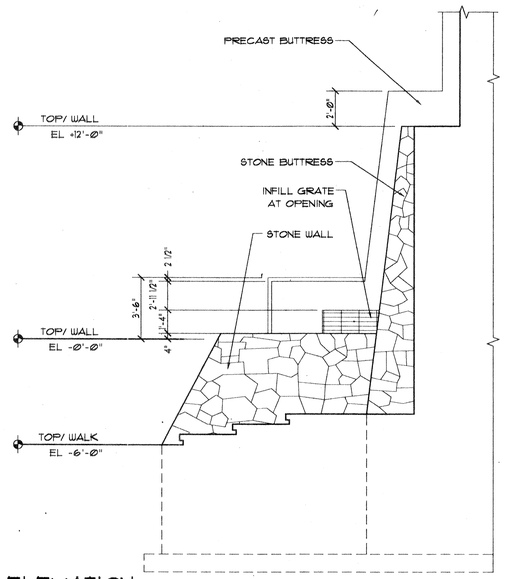
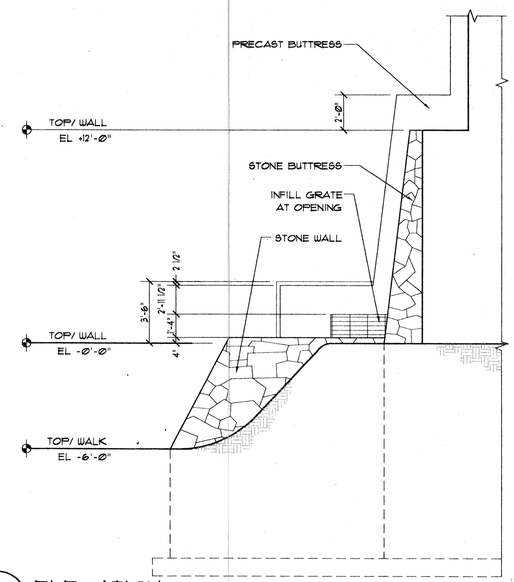


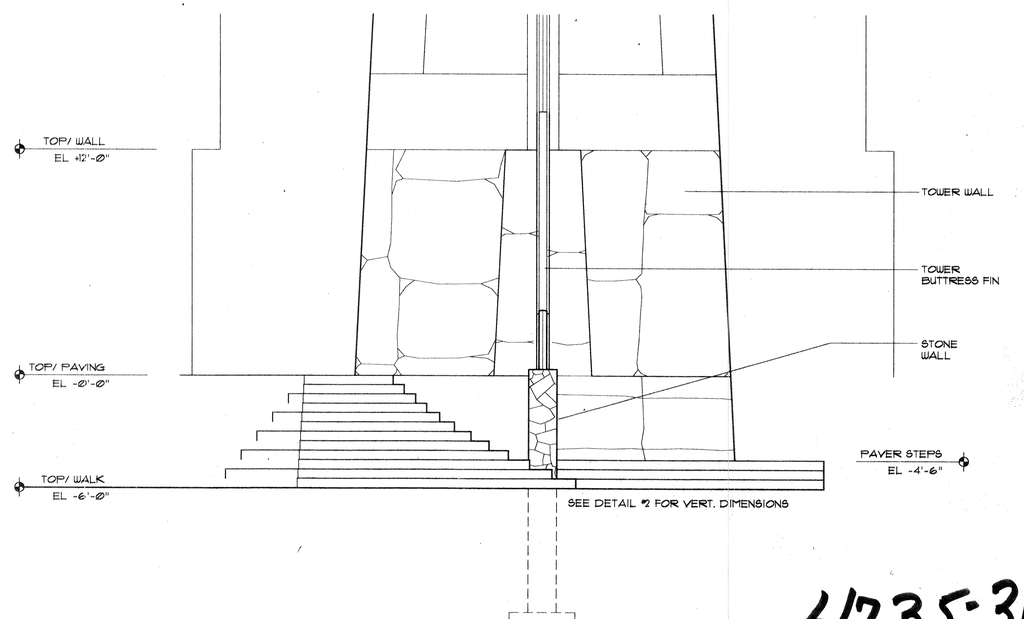
3 PLAN
SCALE: 1/4" = 1'-0"



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



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



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

4735-31

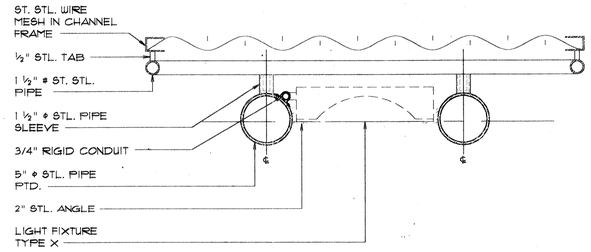
NOTES:
ISSUED FOR FOUNDATION
PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

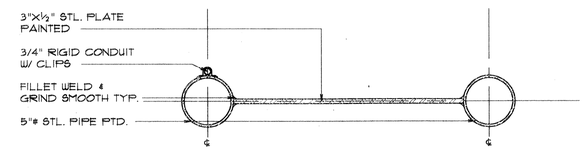
NAPERVILLE, ILLINOIS

DETAILS SITE

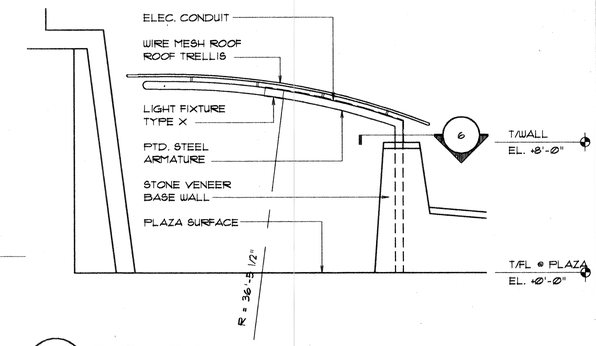
JOB#: 98103	A-502
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: E. ALLMAN	DRAWN BY: J. DEMUTH



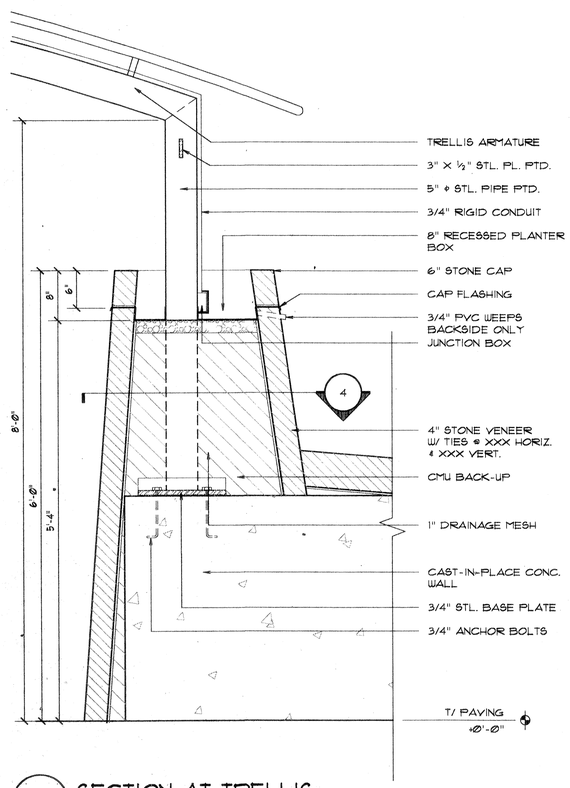
7 SECTION DETAIL
SCALE: 1 1/2" = 1'-0"



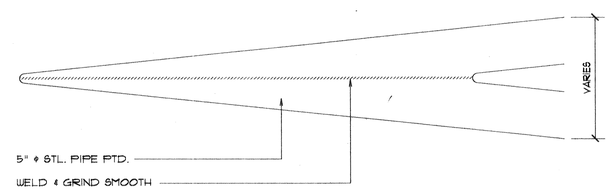
6 PLAN DETAIL
SCALE: 1 1/2" = 1'-0"



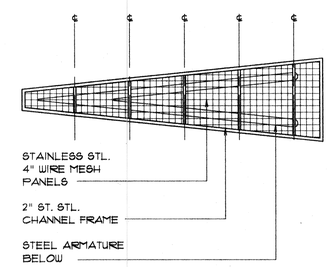
3 ELEVATION
SCALE: 1/4" = 1'-0"



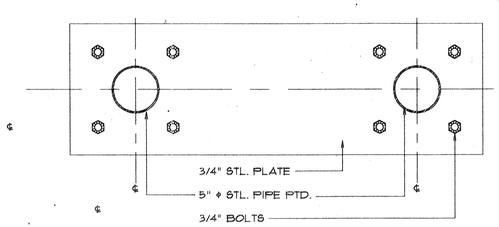
8 SECTION AT TRELLIS
SCALE: 1" = 1'-0"



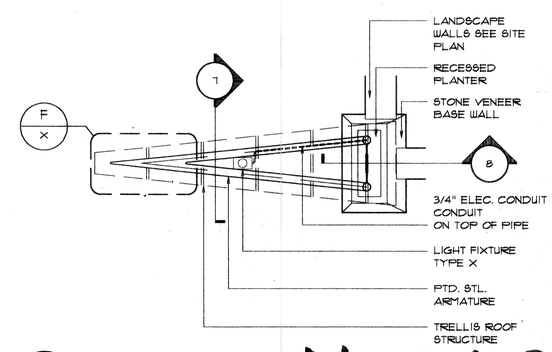
5 PLAN DETAIL
SCALE: 1 1/2" = 1'-0"



2 ROOF PLAN
SCALE: 1/4" = 1'-0"



4 PLAN DETAIL
SCALE: 1 1/2" = 1'-0"



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

4735-32

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NOTES:
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NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

DETAILS TRELLIS

JOB#: 98103	A-503
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN	DRAWN BY: J. DEMUTH

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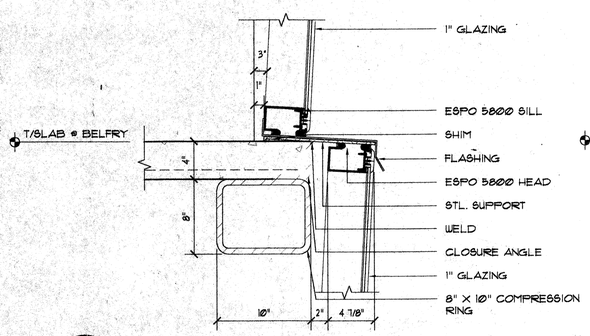
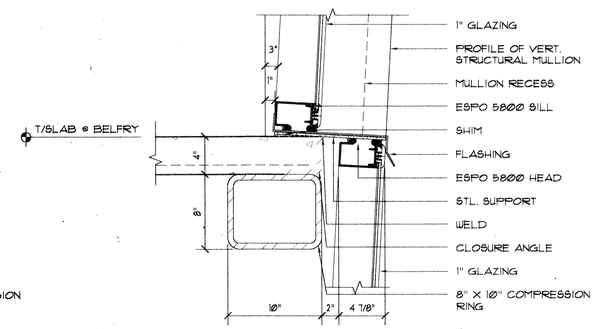
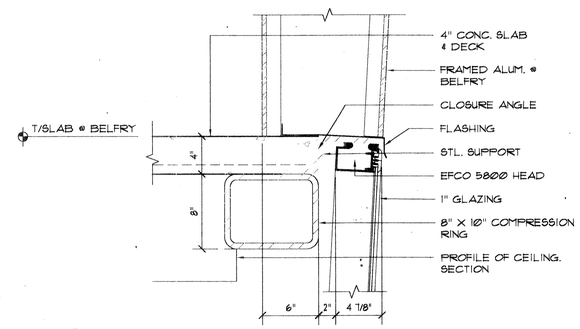


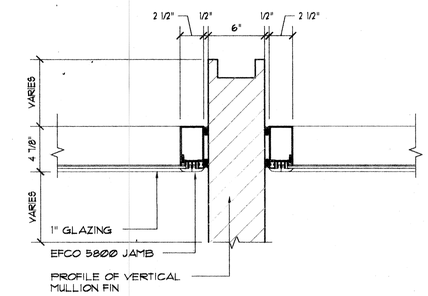
8 DETAIL AT HEAD/SILL COMPRESSION RING
SCALE: 1 ½" = 1'-0"



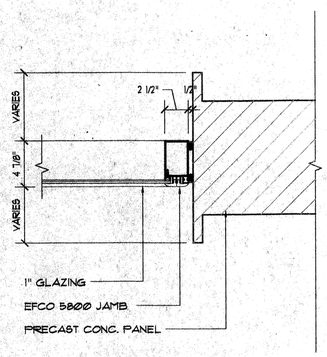
7 DETAIL AT EDGE OF SLAB - GALLERY
SCALE: 1 ½" = 1'-0"



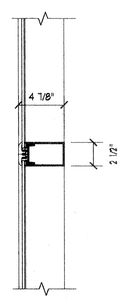
6 DETAIL AT HEAD
SCALE: 1 ½" = 1'-0"



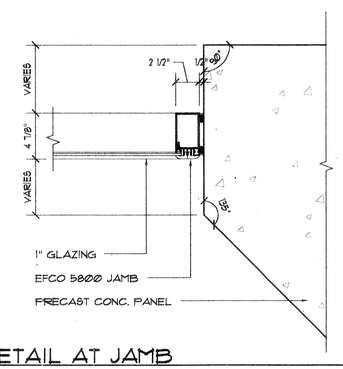
5 DETAIL AT JAMB
SCALE: 1 ½" = 1'-0"



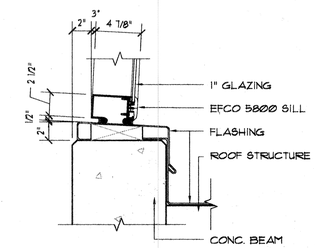
4 DETAIL AT JAMB
SCALE: 1 ½" = 1'-0"



3 DETAIL AT MULLION
SCALE: 1 ½" = 1'-0"



2 DETAIL AT JAMB
SCALE: 1 ½" = 1'-0"



1 DETAIL AT SILL
SCALE: 1 ½" = 1'-0"

4735-33

NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

DETAILS GLAZING

PRINCIPAL: PC	A-601
PROJ. MNGR: SPA	
DRAWN BY: JJD	
DATE: 8/16/99	

Charles Vincent George
design group, inc.
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Naperville, Illinois 60563

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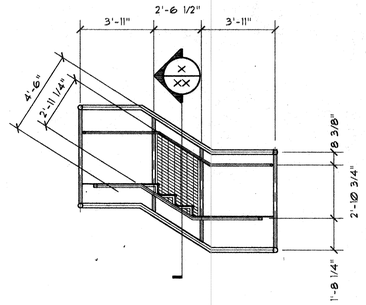
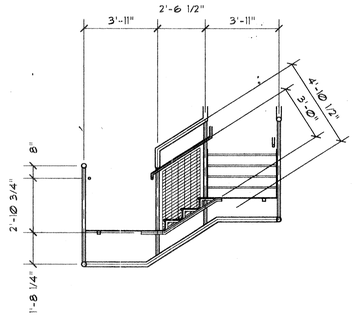
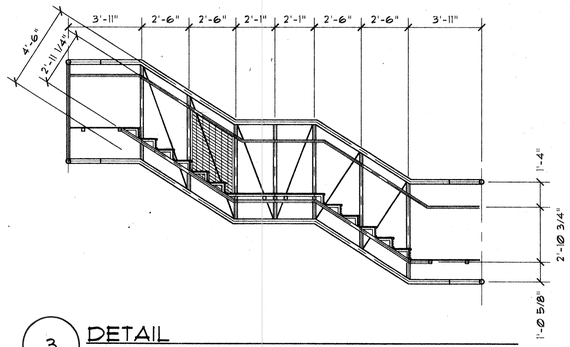


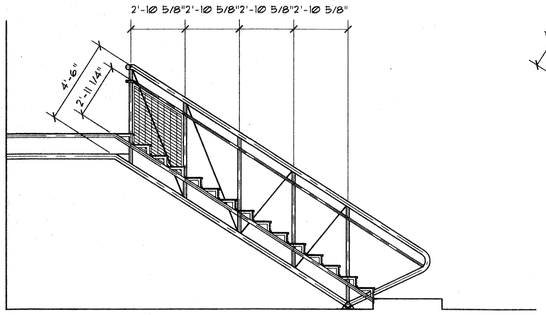
8 DETAIL
SCALE: 1/4" = 1'-0"



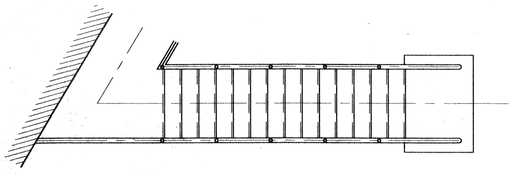
4 DETAIL
SCALE: 1/4" = 1'-0"



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

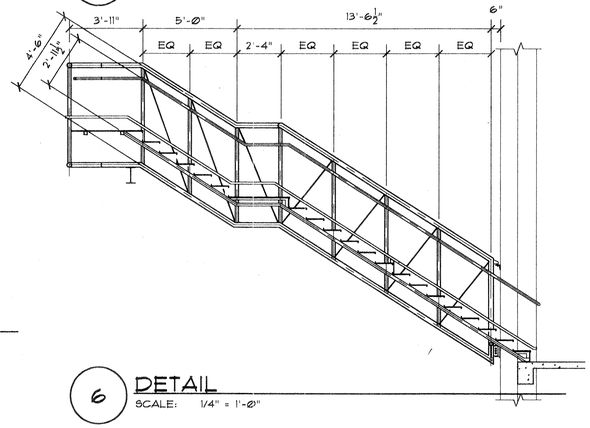


10 DETAIL
SCALE: 1/4" = 1'-0"

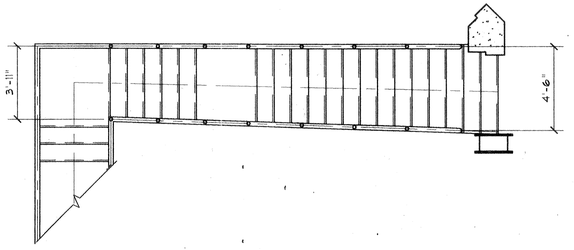


9 DETAIL
SCALE: 1/4" = 1'-0"

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

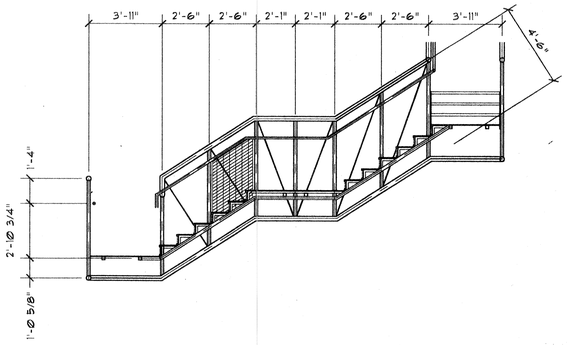


6 DETAIL
SCALE: 1/4" = 1'-0"

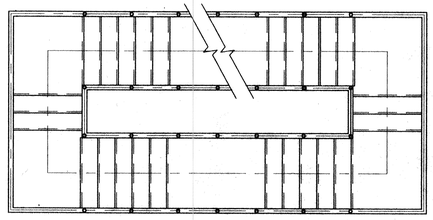


5 DETAIL
SCALE: 1/4" = 1'-0"

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



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



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

4735-34

NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

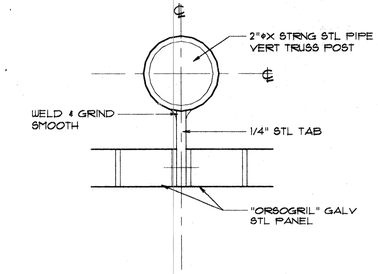
NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

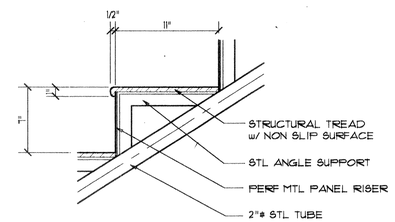
DETAILS TOWER STAIR

JOB#: 98103
DATE: 8/16/99
PRINCIPAL: P. CRAWFORD
PROJECT MGR. B. ALLMAN
DRAWN BY: J. DEMUTH

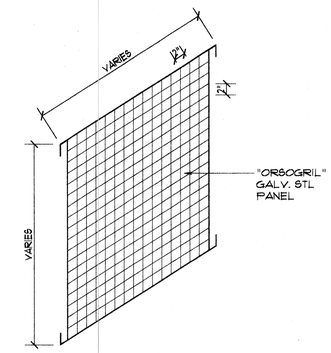
A-701



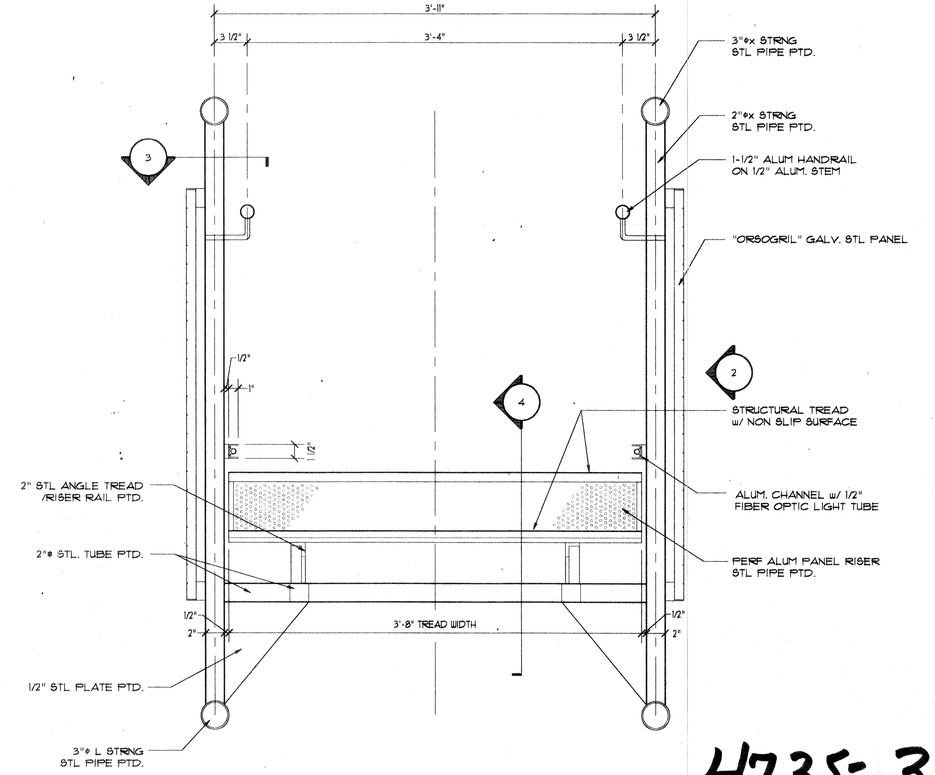
3 DETAIL AT PANEL
SCALE: 6" = 1'-0"



4 SECTION AT TREAD
SCALE: 1-1/2" = 1'-0"



2 ELEVATION PANEL
SCALE: 3/4" = 1'-0"



1 SECTION AT TYPICAL STAIR
SCALE: 1-1/2" = 1'-0"

4735-35

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Naperville, Illinois 60563

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Facsmile: 630.357.2662

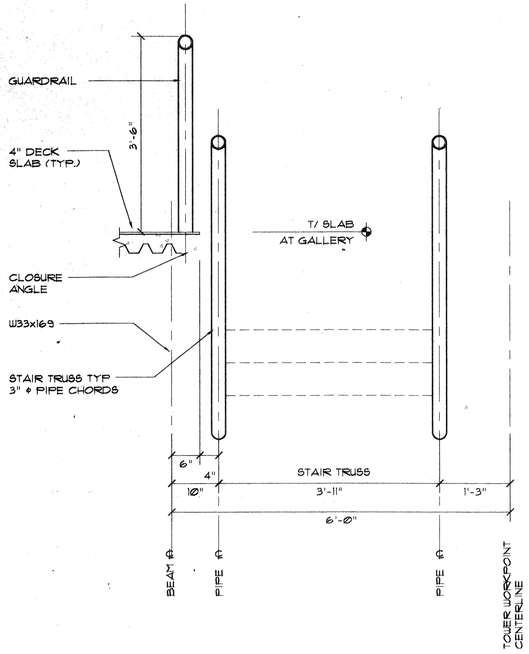
NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

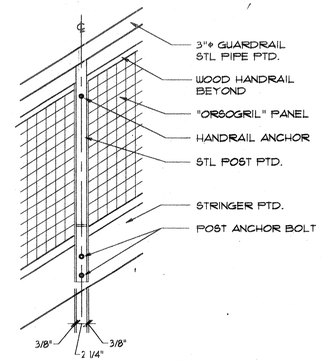
NAPERVILLE, ILLINOIS

DETAILS TOWER STAIR

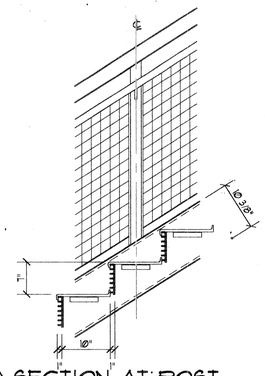
JOB#: 98103	A-702
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: E. ALLMAN / DRAWN BY: J. DEMUTH	



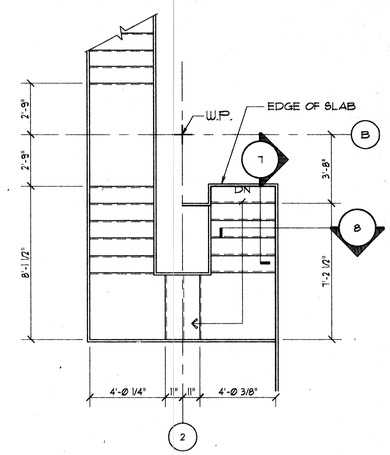
8 SECTION DETAIL AT GALLERY
SCALE: 3/4" = 1'-0"



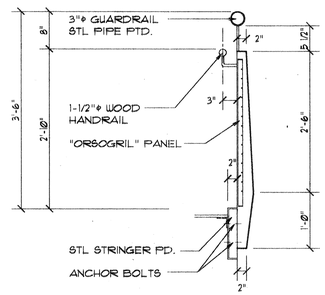
6 ELEVATION AT POST
SCALE: 3/4" = 1'-0"



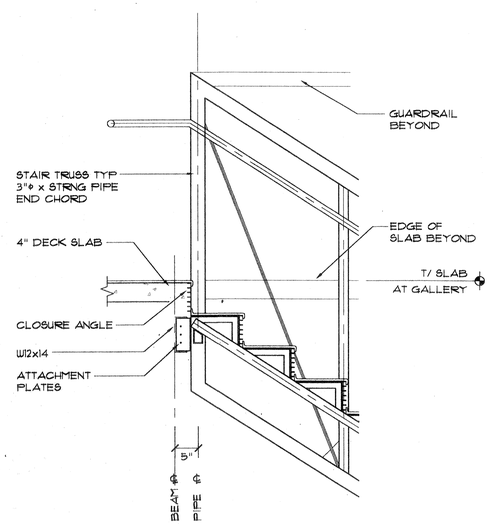
5 SECTION AT POST
SCALE: 3/4" = 1'-0"



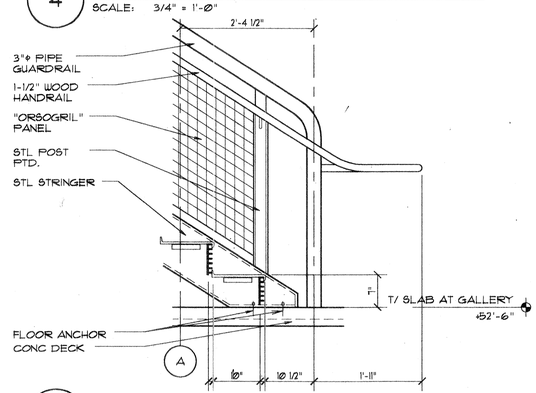
2 STAIR PLAN AT GALLERY
SCALE: 1/4" = 1'-0"



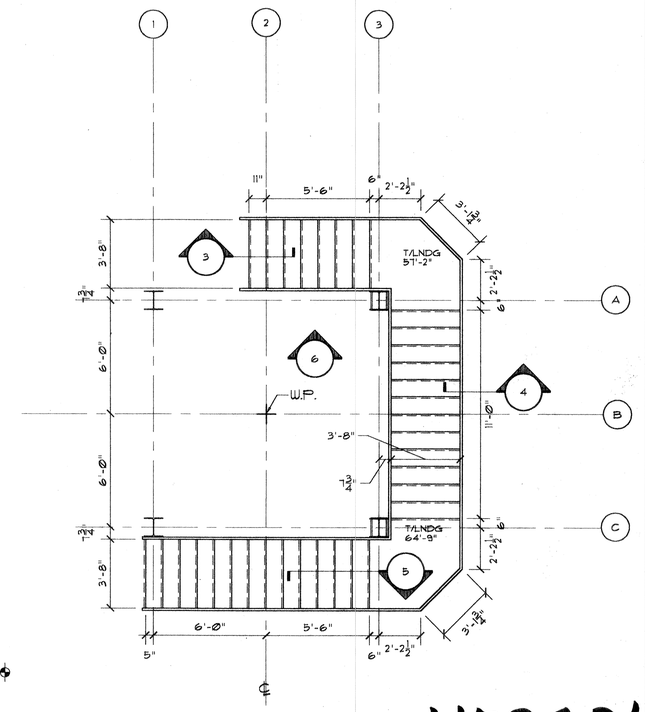
4 SECTION DETAIL AT GUARDRAIL
SCALE: 3/4" = 1'-0"



7 SECTION DETAIL AT GALLERY
SCALE: 3/4" = 1'-0"



3 SECTION AT GALLERY STAIR
SCALE: 3/4" = 1'-0"



1 PLAN - GALLERY STAIR
SCALE: 1/4" = 1'-0"

4735-36

Charles Vincent George
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Facsmile: 630.357.2662

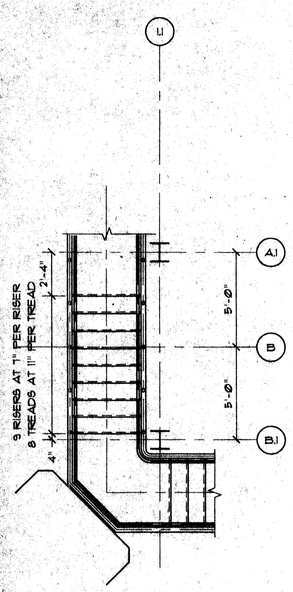
NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

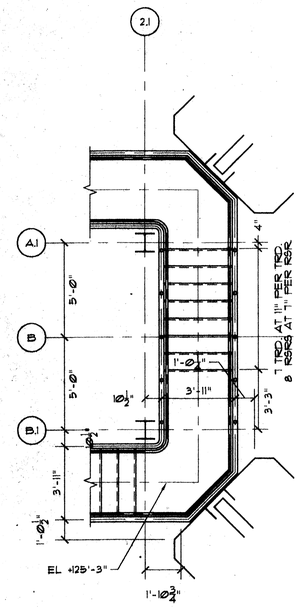
NAPERVILLE, ILLINOIS

DETAILS TOWER STAIR

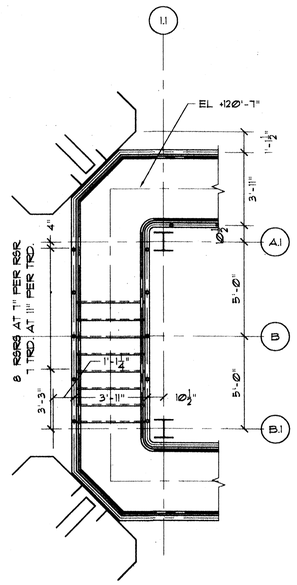
JOB#: 98103	A-703
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN / DRAWN BY: J. DEMUTH	



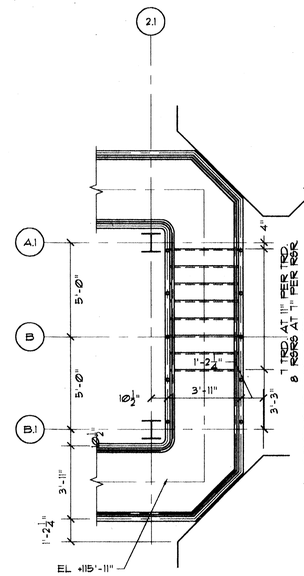
14 PLAN BELFRY STAIR
SCALE: 1/4" = 1'-0"



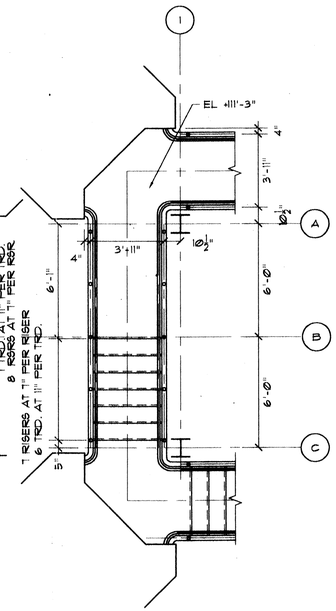
13 PLAN BELFRY STAIR
SCALE: 1/4" = 1'-0"



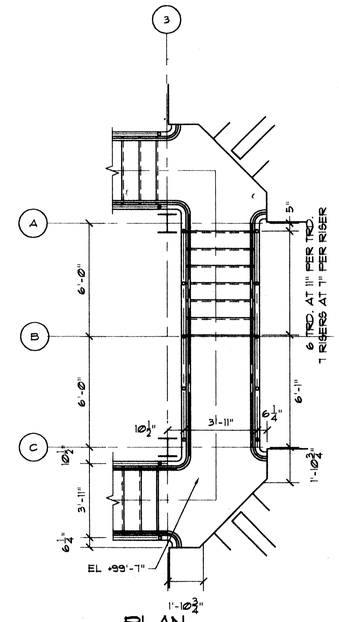
12 PLAN BELFRY STAIR
SCALE: 1/4" = 1'-0"



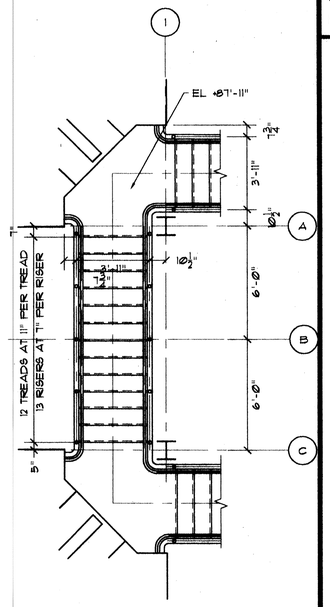
11 PLAN BELFRY STAIR
SCALE: 1/4" = 1'-0"



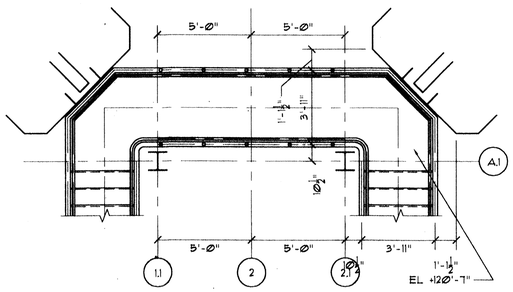
10 PLAN BELFRY STAIR
SCALE: 1/4" = 1'-0"



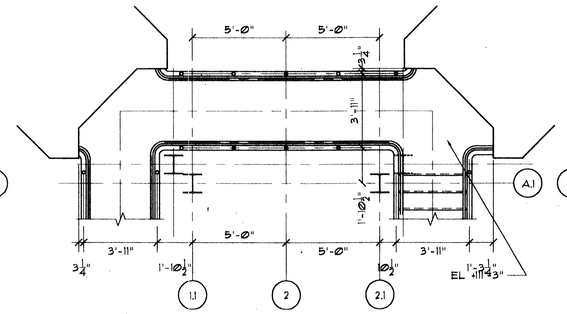
9 PLAN BELFRY STAIR
SCALE: 1/4" = 1'-0"



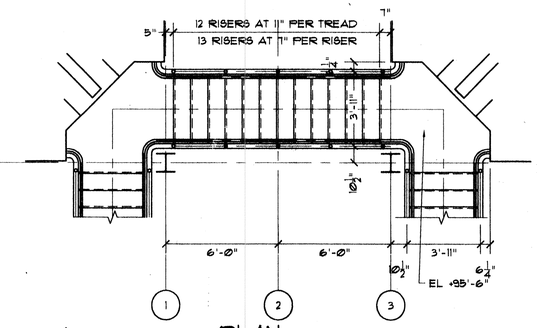
8 PLAN BELFRY STAIR
SCALE: 1/4" = 1'-0"



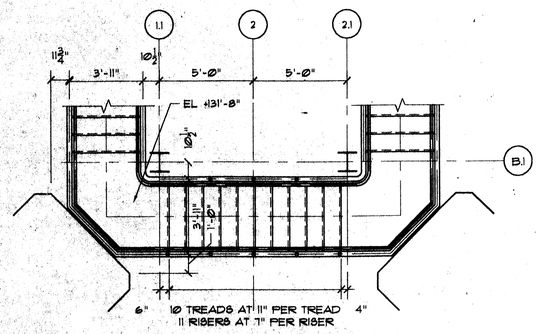
6 PLAN BELFRY STAIR
SCALE: 1/4" = 1'-0"



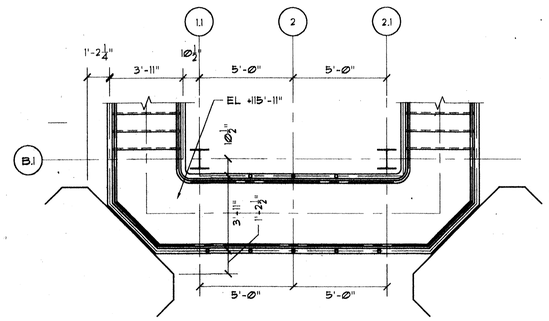
4 PLAN BELFRY STAIR
SCALE: 1/4" = 1'-0"



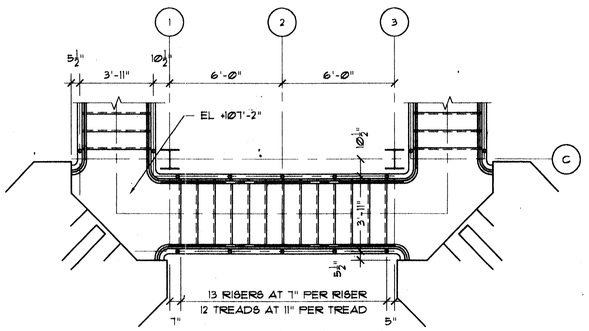
2 PLAN BELFRY STAIR
SCALE: 1/4" = 1'-0"



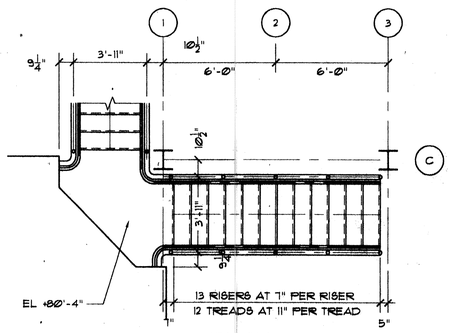
7 PLAN BELFRY STAIR
SCALE: 1/4" = 1'-0"



5 PLAN BELFRY STAIR
SCALE: 1/4" = 1'-0"



3 PLAN BELFRY STAIR
SCALE: 1/4" = 1'-0"



1 PLAN BELFRY STAIR
SCALE: 1/4" = 1'-0"

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design group, inc.
604 North Washington Street
Naperville, Illinois 60563
Telephone: 630.357.2023
Facsimile: 630.357.2662

NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

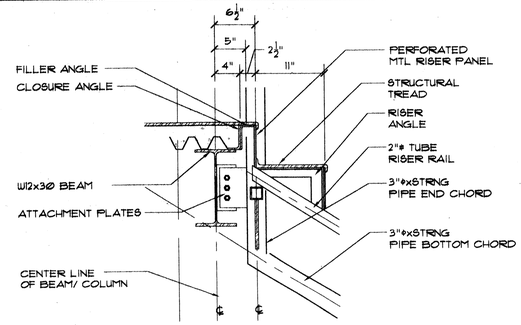
NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

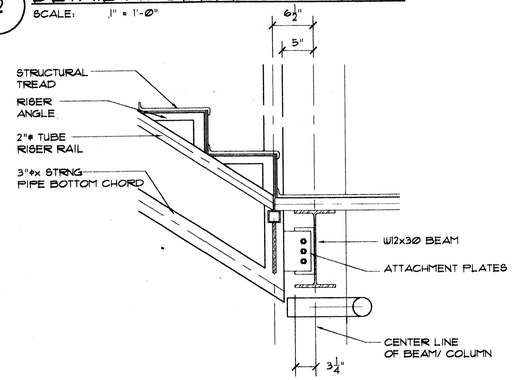
DETAILS TOWER STAIR

JOB#: 98103
DATE: 8/16/99
PRINCIPAL: P. CRAWFORD
PROJECT MGR: B. ALLMAN
DRAWN BY: D. DEMUTH

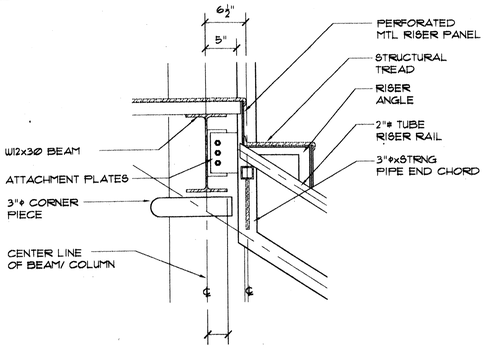
A-704



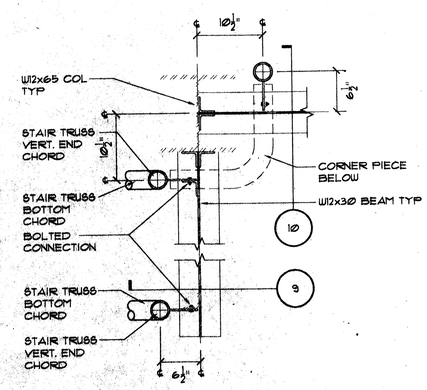
12 DETAIL AT OBEREVATION DECK
SCALE: 1" = 1'-0"



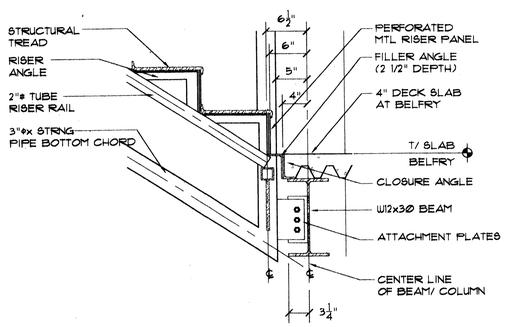
11 DETAIL AT BELFRY STAIR BASE CONNECTION - TYP
SCALE: 1" = 1'-0"



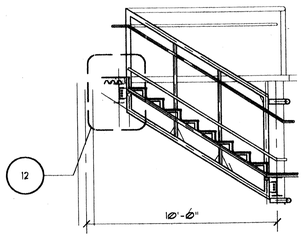
10 SECTION DETAIL AT STAIR TRUSS
SCALE: 1" = 1'-0"



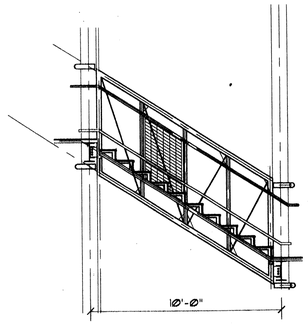
13 PLAN DETAIL AT STAIR TRUSS CONNECTION - BASE
SCALE: 1" = 1'-0"



9 DETAIL AT SLAB CONNECTION
SCALE: 1" = 1'-0"



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



7 SECTION
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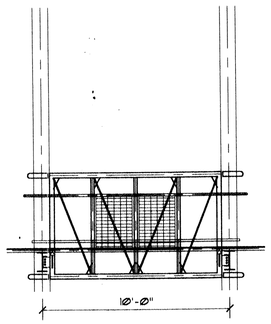

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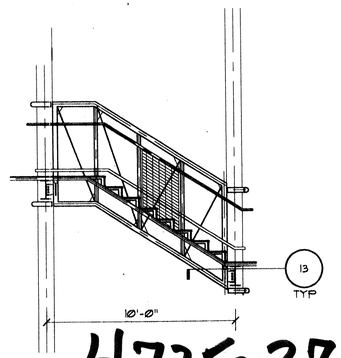
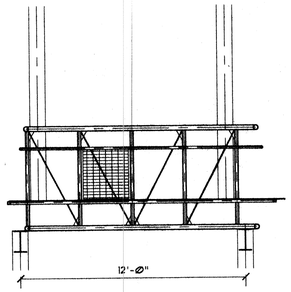
SCALE: 1/4" = 1'-0"



4735-37

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



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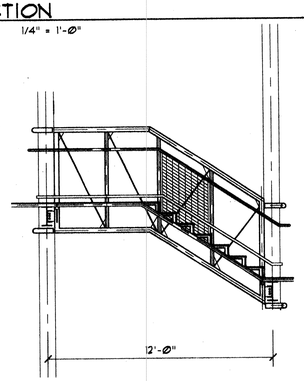

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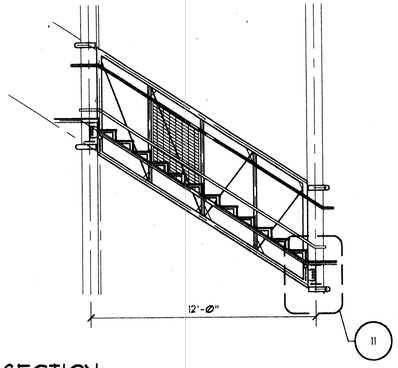
SCALE: 1/4" = 1'-0"



2 SECTION
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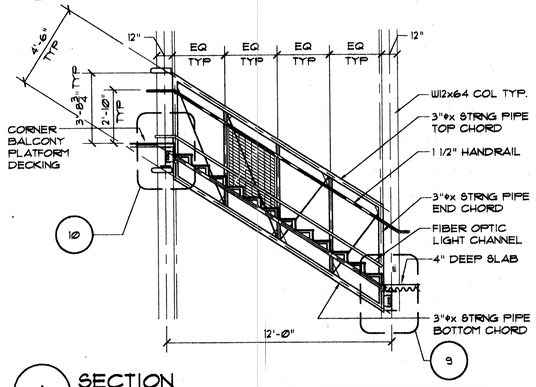


1 SECTION
SCALE: 1/4" = 1'-0"

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

Telephone: 630.357.2023
Facsmile: 630.357.2662

NOTES:
ISSUED FOR FOUNDATION PERMIT 7/6/99

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

DETAILS TOWER STAIR

JOB#: 98103	A-705
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN	DRAWN BY: J. GEMUTH

MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

owner **Millennium Carillon Foundation**
1755 Park Street, Suite 260
Naperville, Illinois 60563
630.718.0559

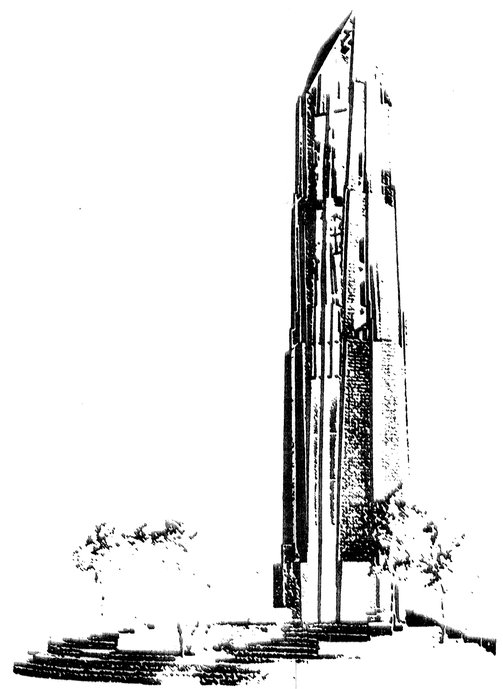
architect **Charles Vincent George Design Group, Inc.**
604 North Washington Street
Naperville, Illinois 60563
630.357.2023

structural **McClusky Engineering Corporation**
1887 High Grove Lane
Naperville, Illinois 60540
630.717.5399

civil **Roake and Associates**
1887 High Grove Lane
Naperville, Illinois 60540
630.355.3232

mep **W-T Engineering, Inc.**
39 East Scully Drive
Schaumburg, Illinois 60193
847.895.3640

contractor **Schramm Construction**
1887 High Grove Lane
Naperville, Illinois 60540
630.717.5399



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DRAWING INDEX

	COVER SHEET
C1	CIVIL PLAN
A-0	LEGEND / GENERAL NOTES
A-100	DEMOLITION PLAN
A-101	SITE PLAN
A-102	ENLARGED SITE PLAN
A-102A	ENLARGED SITE RADIUS PLAN
A-103	PLAN AT LOWER LEVEL
A-104	PLAN AT ENTRY
A-105	PLAN AT CLOISTER
A-106	PLAN AT TOWER
A-107	PLAN AT TOWER
A-108	PLAN AT GALLERY
A-109	PLAN AT GALLERY MEZZANINE
A-110	PLAN AT BELFRY
A-111	PLAN AT BELFRY
A-112	PLANS AT BELFRY
A-113	PLANS AT BELFRY
A-114	PLANS AT BELFRY
A-115	PLANS AT BELFRY
A-116	PLAN AT OBSERVATION, ROOF PLAN
A-201	EXTERIOR ELEVATIONS
A-301	BUILDING SECTIONS
A-302	ENLARGED SECTIONS
A-303	ENLARGED SECTIONS AND DETAILS
A-304	INTERIOR ELEVATIONS
A-305	INTERIOR ELEVATIONS
A-307	SCHEDULES
A-401	REFLECTED CEILING PLANS
A-402	REFLECTED CEILING PLANS
A-501	DETAILS - SITE
A-502	DETAILS - SITE
A-503	DETAILS - TRELLIS
A-601	DETAILS - GLAZING
A-701	DETAILS - TOWER STAIR
A-702	DETAILS - TYPICAL STAIR
A-703	DETAILS - GALLERY STAIR
A-704	DETAILS - BELFRY STAIR
A-705	DETAILS - BELFRY STAIR
S-1	GENERAL NOTES, TYPICAL DETAILS
S-2A	FOUNDATION PLAN
S-2B	FOUNDATION SLAB PLAN
S-2C	SOUTHWEST FOUNDATION PLAN
S-2D	NORTHWEST FOUNDATION PLAN
S-2E	NORTHEAST FOUNDATION PLAN
S-2F	SOUTHEAST FOUNDATION PLAN
S-2G	FOUNDATION DETAILS AND ELEVATIONS
S-3A	ENTRY PLAN
S-3B	ENTRY SLAB PLAN
S-4A	CLOISTER PLAN
S-5A	FOUNDATION DETAILS
S-5B	FOUNDATION DETAILS

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DATED: 6 July 1999

LICENSEE REPRESENTATIVE DATED: June 29, 1999

DRAWINGS COVERED: A0 – A705

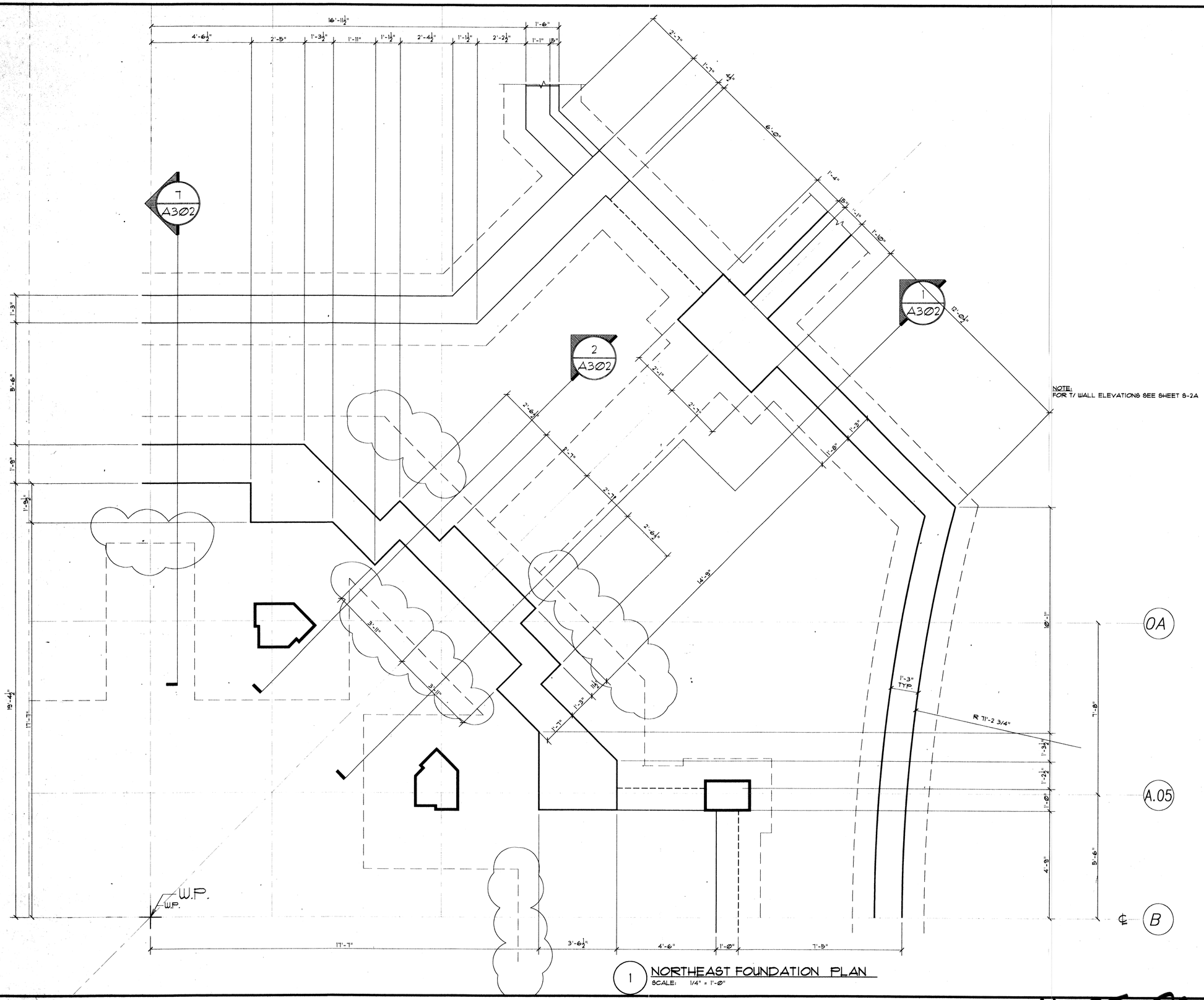
STATE OF ILLINOIS PETER DAVID GRAMMATICAS 001-013064 LICENSED PROFESSIONAL ENGINEER

4735-1

4735

99-00002790 COM4

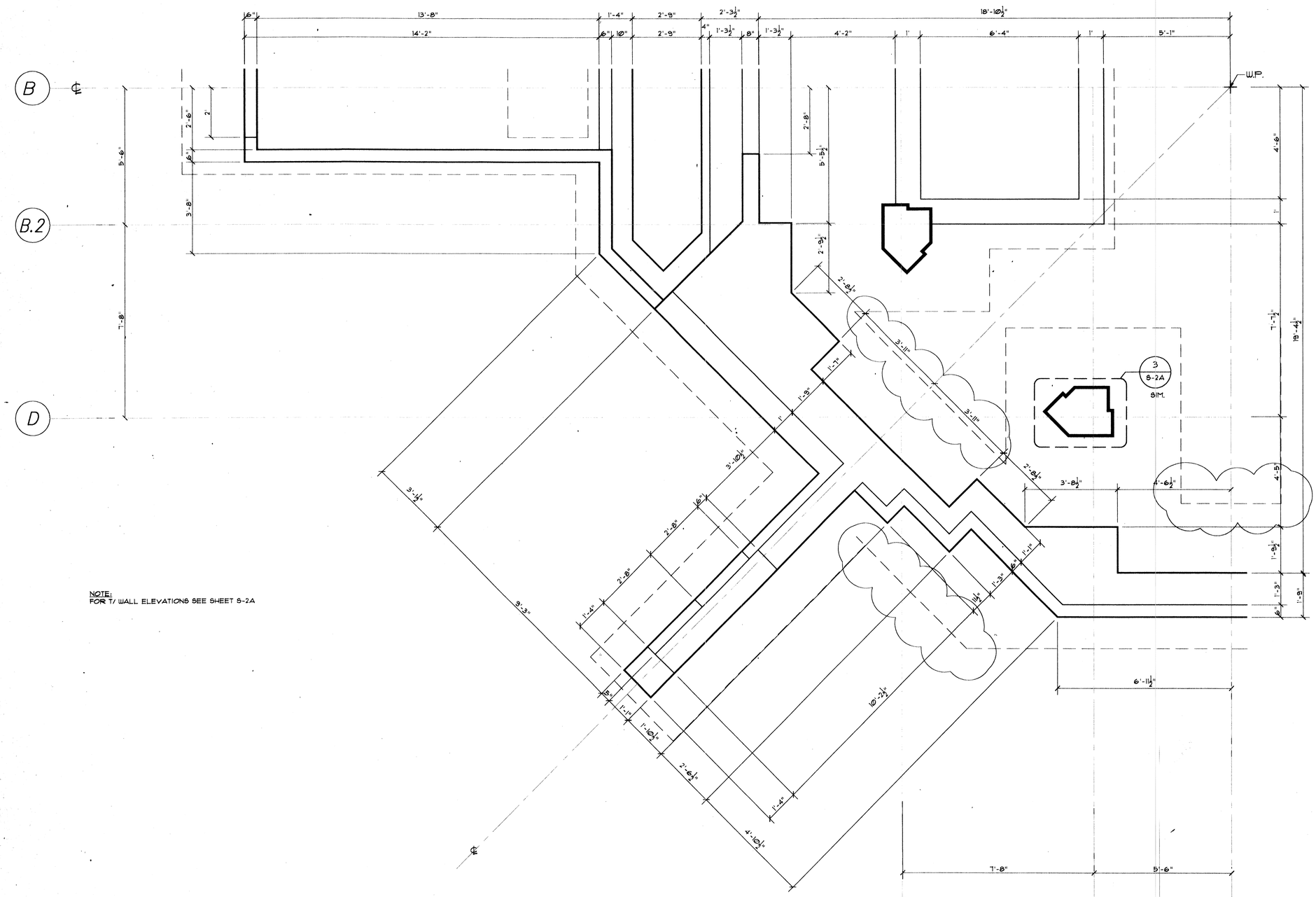
427 AURORA AV



1 NORTHEAST FOUNDATION PLAN
SCALE: 1/4" = 1'-0"

PERMIT SET
KEYPLAN

4735-96



NOTE:
FOR T/ WALL ELEVATIONS SEE SHEET S-2A

1 SOUTHWEST FOUNDATION PLAN
SCALE: 1/2" = 1'-0"

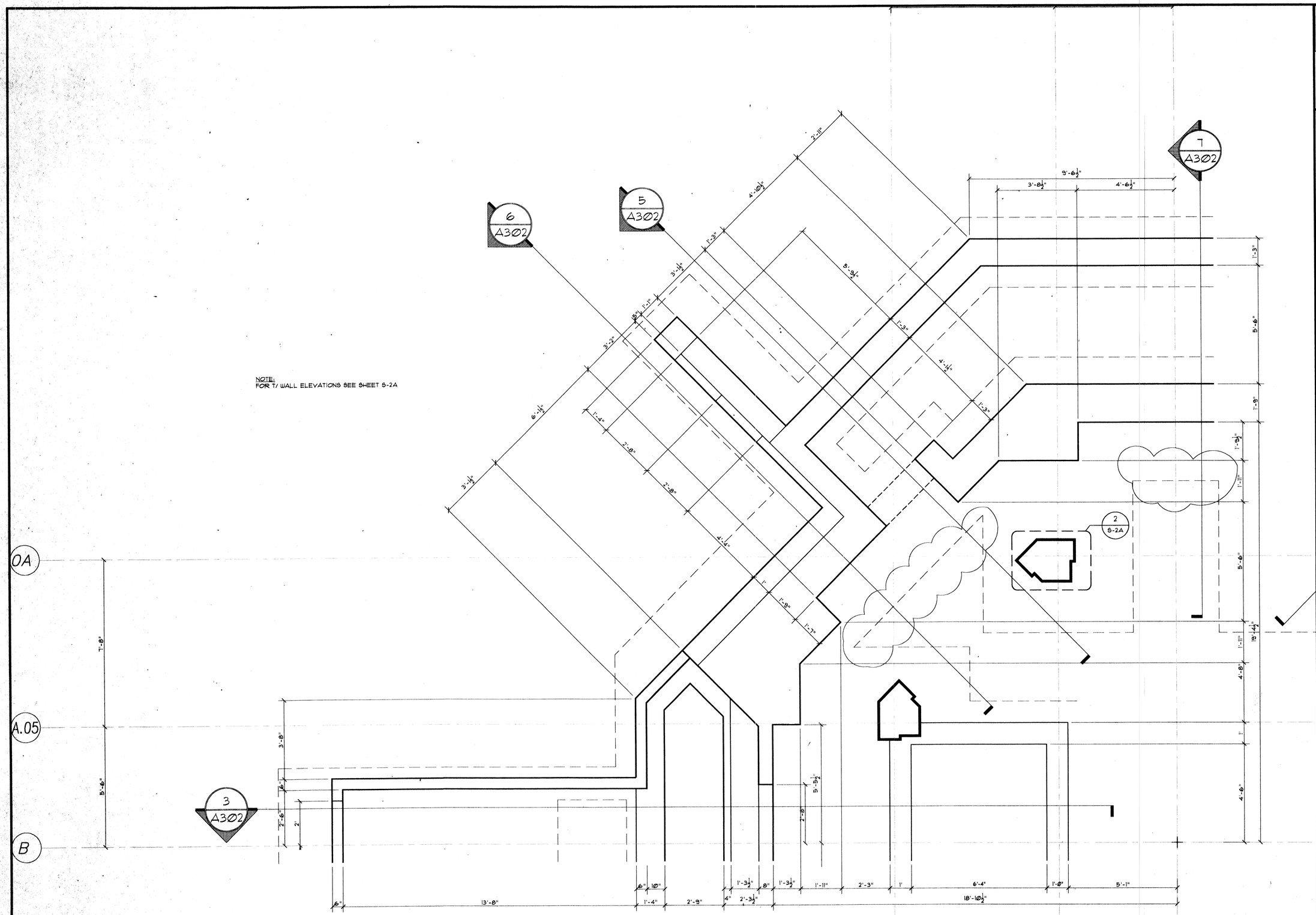
PERMIT SET

KEYPLAN

STATE OF ILLINOIS
DIETER WILD CRAWFORD
001-013064
LICENSED ARCHITECT

4735-98

NOTE:
FOR T/ WALL ELEVATIONS SEE SHEET S-2A

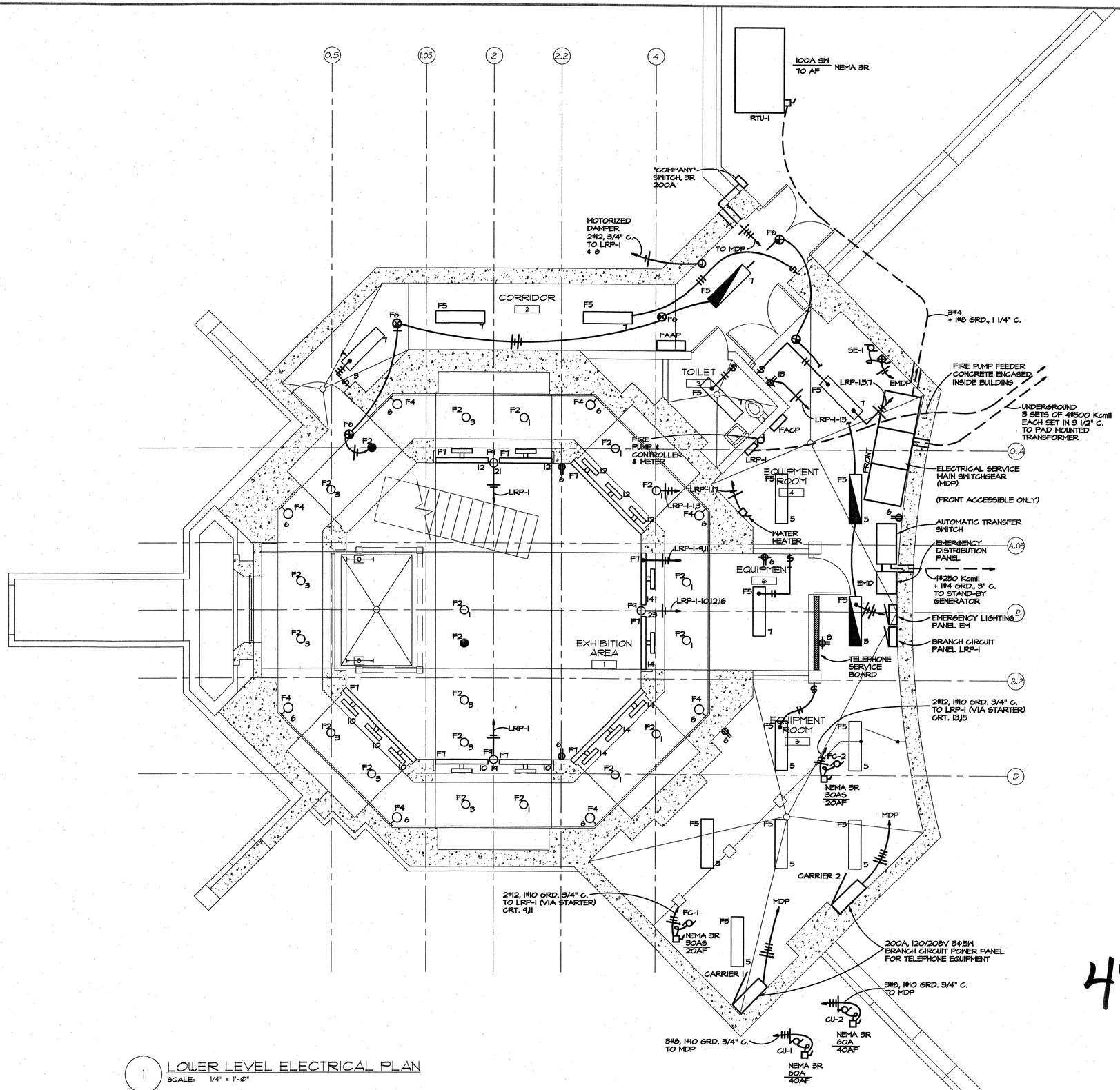


1 NORTHWEST FOUNDATION PLAN
SCALE: 1/2" = 1'-0"

PERMIT SET
KEYPLAN

STATE OF ILLINOIS
PETER DAVID CLEVELAND
001-013064
LICENSED ARCHITECT

4735-97



1 LOWER LEVEL ELECTRICAL PLAN

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

4735-38

Charles Vincent George
design group, inc.
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NOTES:
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ISSUE FOR PERMITS 9/07/99

NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

ELECTRICAL AT LOWER LEVEL

W-T ENGINEERING, INC.
CONSULTING ENGINEERS
39 EAST SCULLY DRIVE
SCHAUMBURG, ILLINOIS 60193
ph. (847)895-3640
fax. (847)895-9985

PRINCIPAL: PC	E-1
PROJ. MNGR: TGB	
DRAWN BY: GM	
DATE: 9/07/99	

4735

Charles Vincent George
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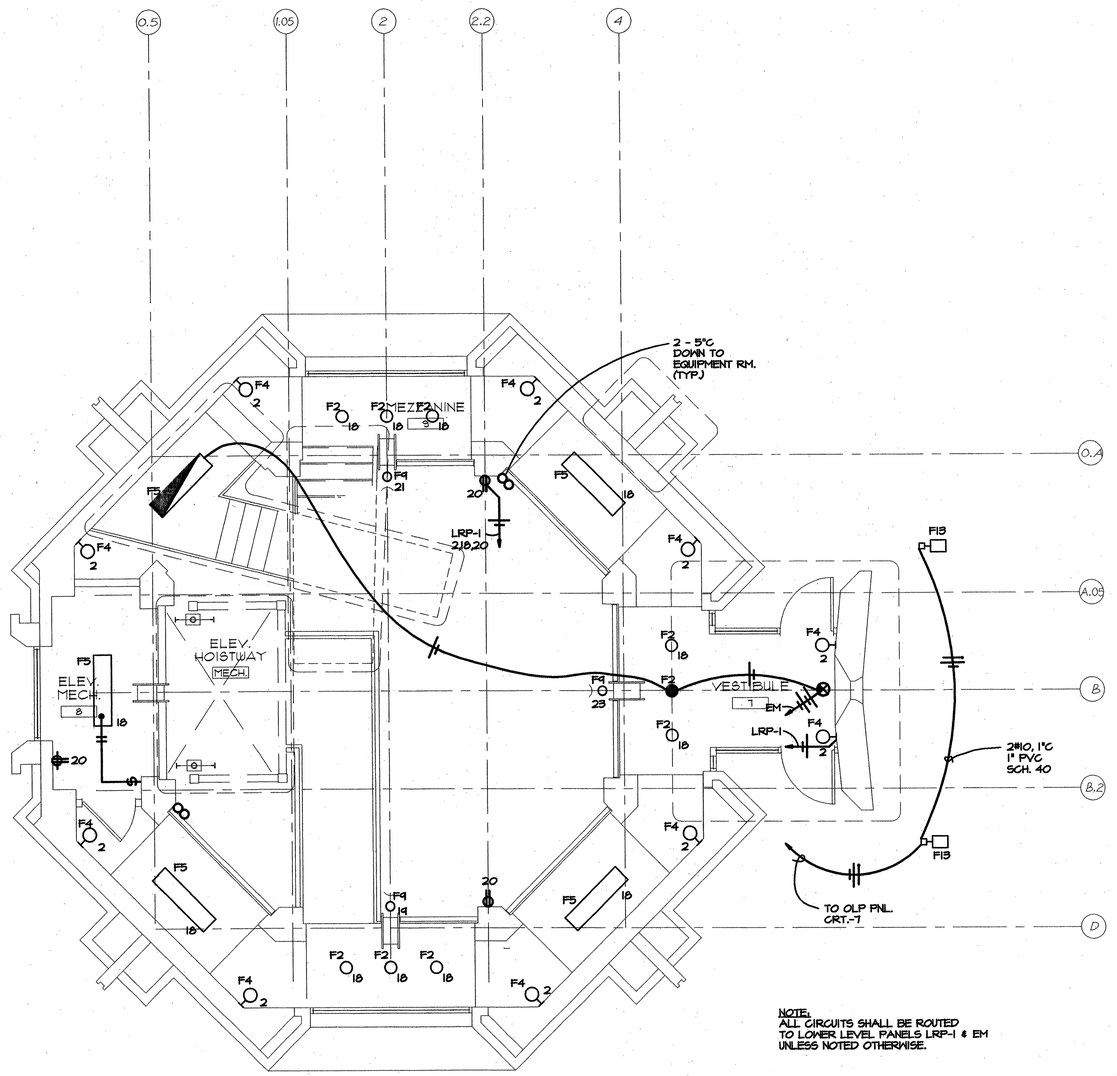
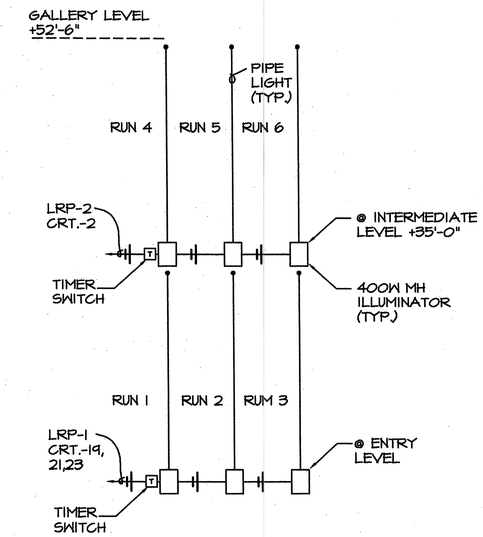
Facsimile: 630.357.2662



NOTE:
ALL CIRCUITS SHALL BE ROUTED TO LOWER LEVEL PANELS LRP-1 & EM UNLESS NOTED OTHERWISE.



F9-PIPE LIGHTING SCHEME
N.T.S.

1 ENTRY LEVEL (0'-0") ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"

4735-39

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NAPERVILLE, ILLINOIS

ELECTRICAL AT ENTRY

SCOTT R. TRIPKIN 062-041405 REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

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CONSULTING ENGINEERS
39 EAST SCULLY DRIVE
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ph. (847)895-3640
fax. (847)895-9985

PRINCIPAL: PC	E-2
PROJ. MNGR: TGB	
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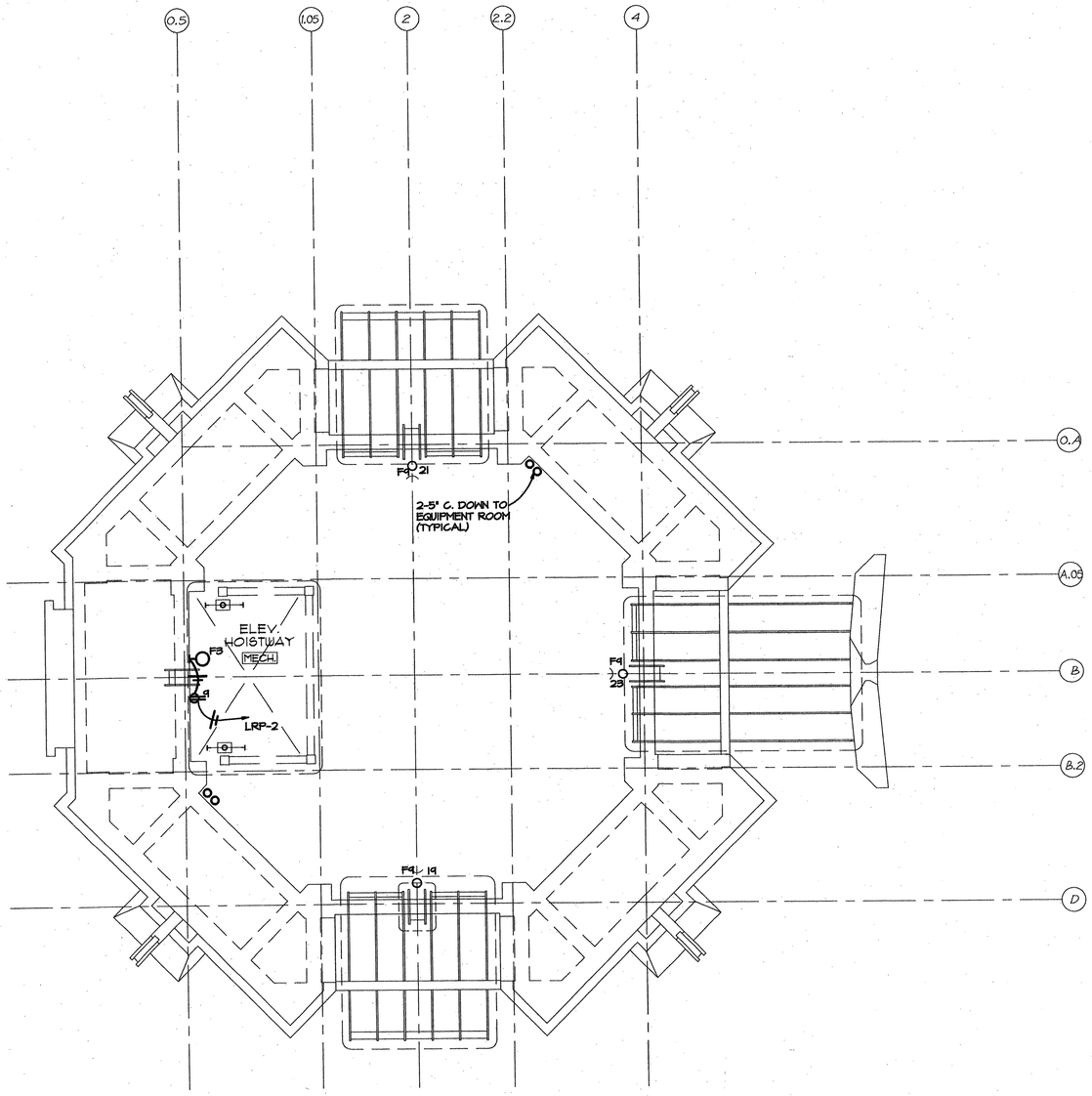

1 CLOISTER ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"

4735-40

Charles Vincent George
design group, inc.
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Facsimile: 630.357.2662

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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

ELECTRICAL AT CLOISTER

SCOTT K. TRIPLETT
062-041105
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

W-T ENGINEERING, INC.
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PRINCIPAL: PC	E-3
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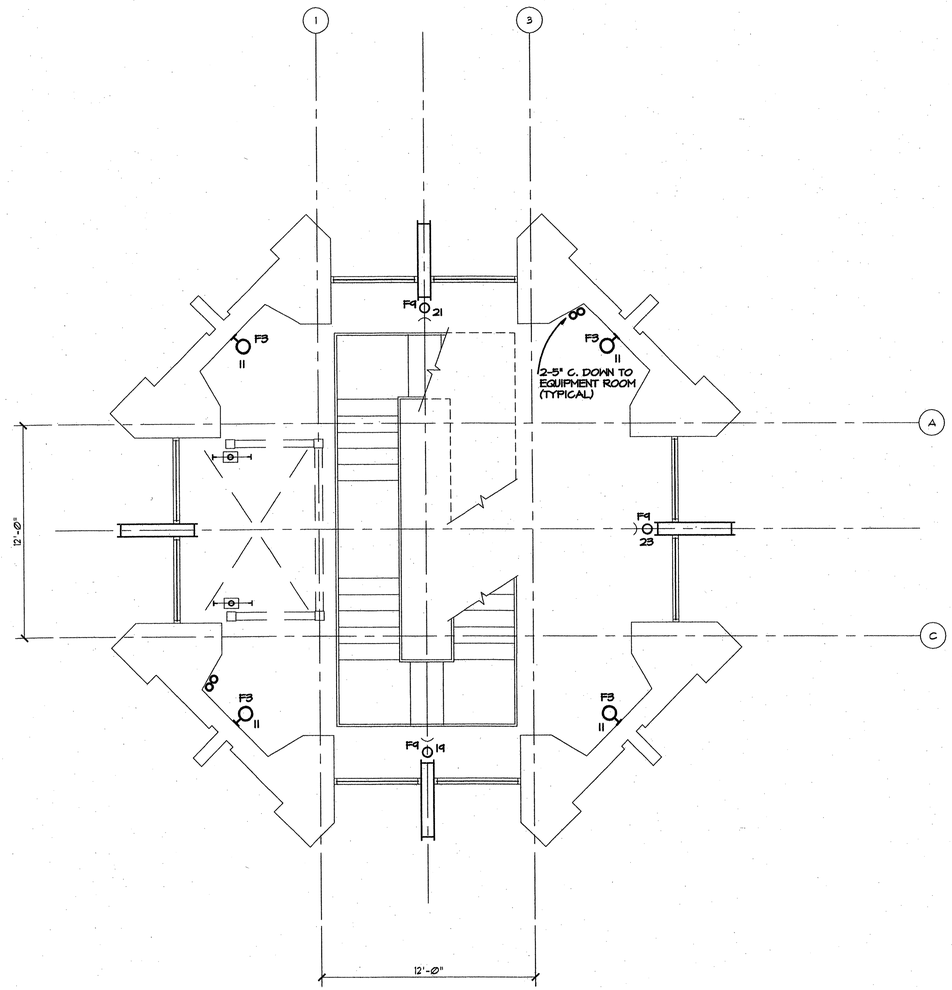

1 TOWER ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"

4735-42

Charles Vincent George
design group, inc.
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Naperville, Illinois 60563

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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

ELECTRICAL AT TOWER

SCOTT W. TRIPHAHN
052-041405
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

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W-T ENGINEERING, INC.
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39 EAST SCULLY DRIVE
SCHAUMBURG, ILLINOIS 60193
ph. (847)895-3640
fax. (847)895-9985

PRINCIPAL: PC	E-5
PROJ. MNGR: TGB	
DRAWN BY: GM	
DATE: 9/07/99	

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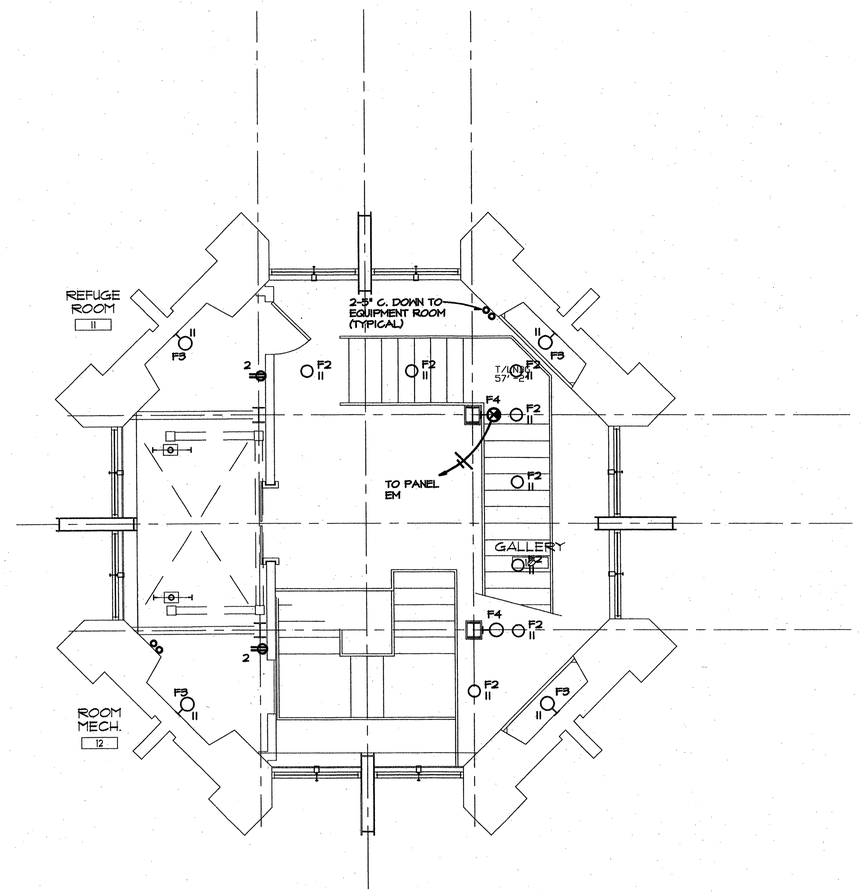

1 GALLERY ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"

4735-43

Charles Vincent George
design group, inc.
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Facsimile: 630.357.2662

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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

ELECTRICAL AT GALLERY

SCOTT C. TRIPHAHN
052-041465
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

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39 EAST SCULLY DRIVE
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fax. (847)895-9985

PRINCIPAL: PC	E-6
PROJ. MNGR: TGB	
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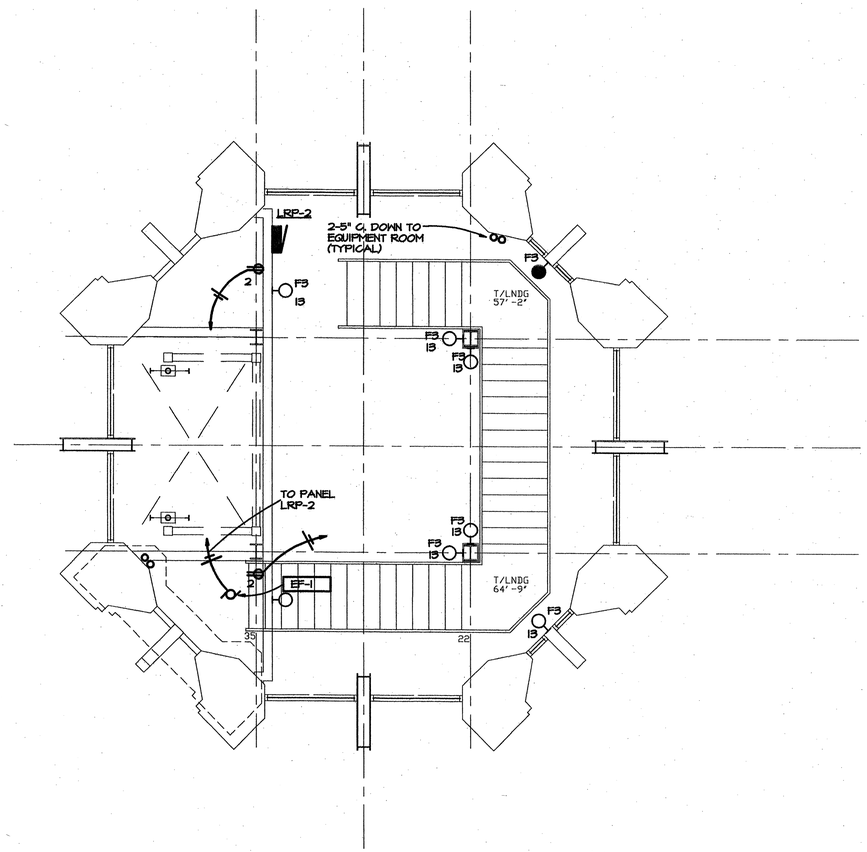

4735-44

1 GALLERY MEZZANINE ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

ELECTRICAL AT GALLERY MEZZANINE

SCOTT R. TRIPHAHN
062-041405
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

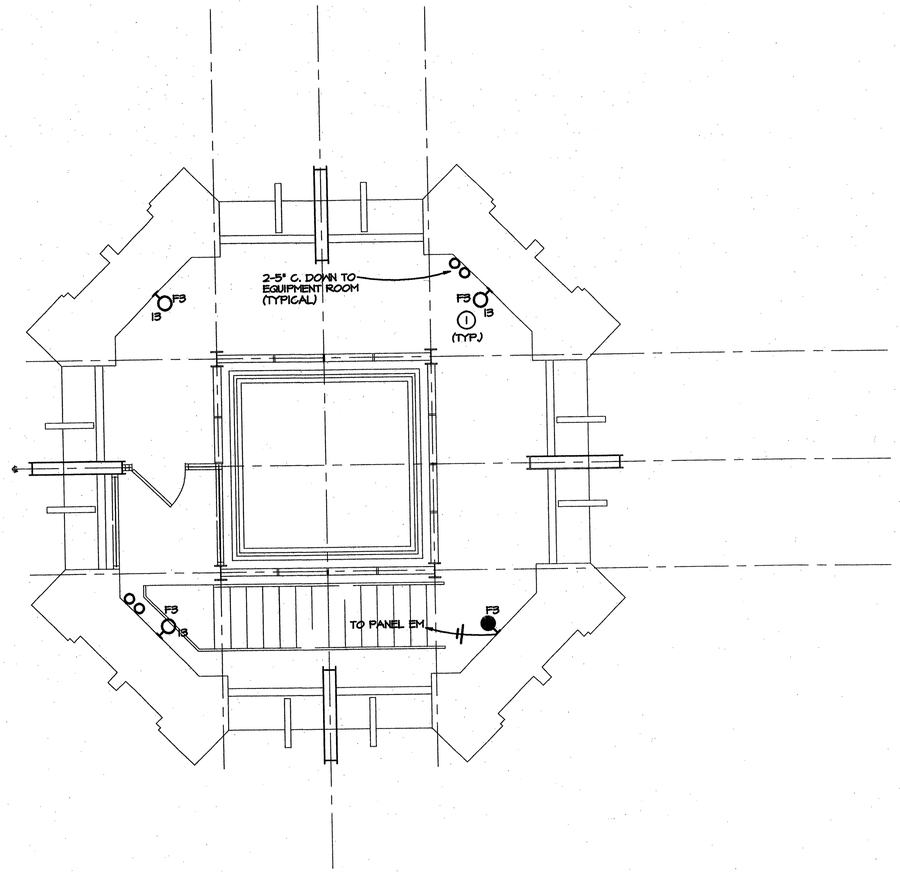
W-T ENGINEERING, INC.
CONSULTING ENGINEERS
39 EAST SCULLY DRIVE
SCHAUMBURG, ILLINOIS 60193
ph. (847)895-3640
fax. (847)895-9985

PRINCIPAL: PC	E-7
PROJ. MNGR: TGB	
DRAWN BY: GM	
DATE: 9/07/99	

4735

KEY NOTES

(1) 2#10, 3/4" C. TO LPC PNL. CRT.-13



1 BELFRY ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"

4735·45

Charles Vincent George
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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

ELECTRICAL AT BELFRY

SCOTT R. TRIPLEHORN
062-041405
REGISTERED PROFESSIONAL ENGINEER
ILLINOIS

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PRINCIPAL: PC	E-8
PROJ. MNGR: TGB	
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DATE: 9/07/99	

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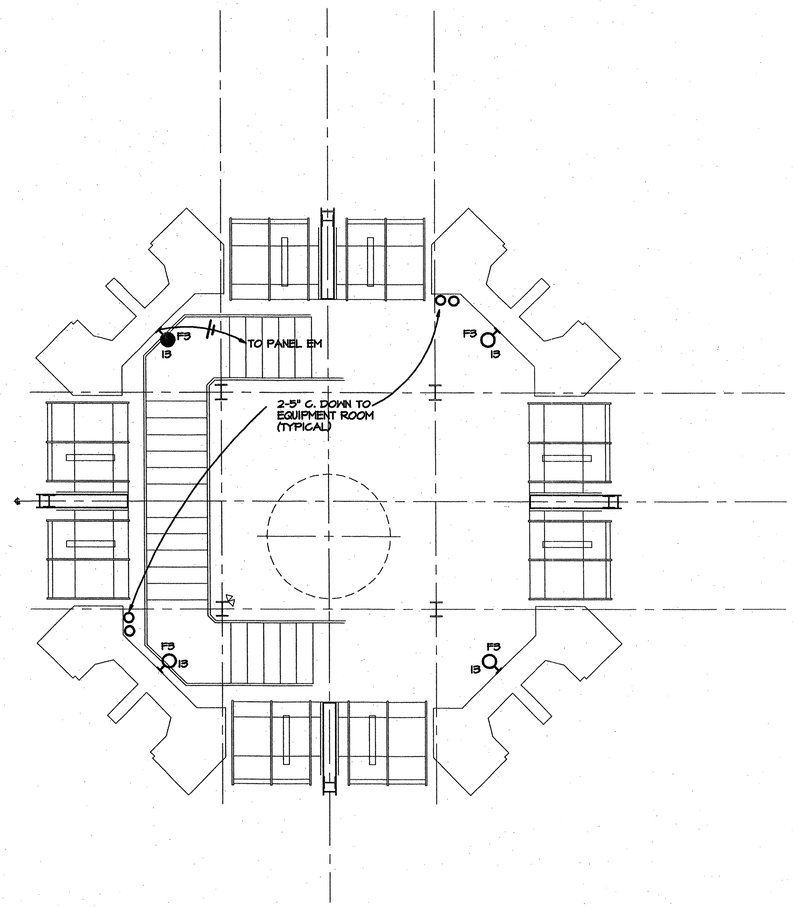

1 BELFRY LEVEL ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"

4735-46

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

ELECTRICAL AT BELFRY

SCOTT R TRIPHAHN
062-041405
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

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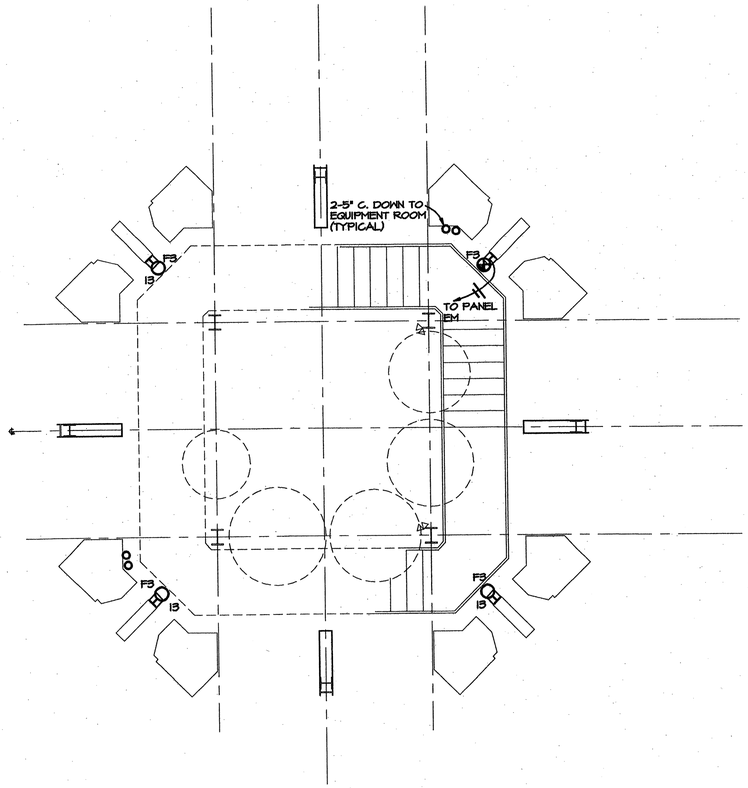
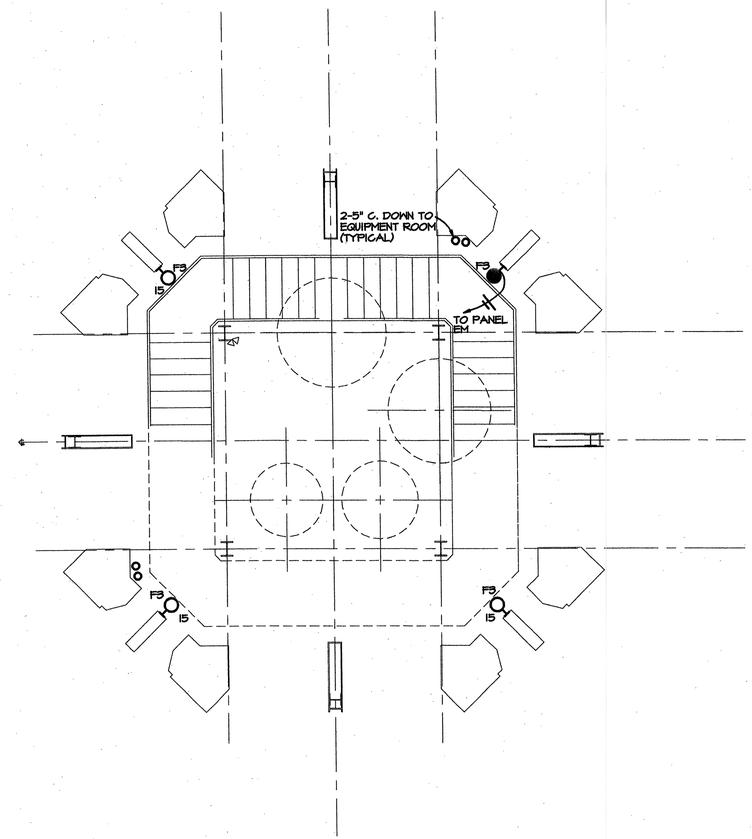
fax. (847)895-9985

PRINCIPAL: PC	E-9
PROJ. MNGR: TGB	
DRAWN BY: GM	
DATE: 9/07/99	

4735



2 BELFRY ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"



1 BELFRY ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"

4735-47

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

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Facsimile: 630.357.2662

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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

ELECTRICAL AT BELFRY

SCOTT R. TRIPLETT
062-041405
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

W-T ENGINEERING, INC.
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SCHAUMBURG, ILLINOIS 60193
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fax. (847)895-9985

PRINCIPAL: PC	E-10
PROJ. MNGR: TGB	
DRAWN BY: GM	
DATE: 9/07/99	

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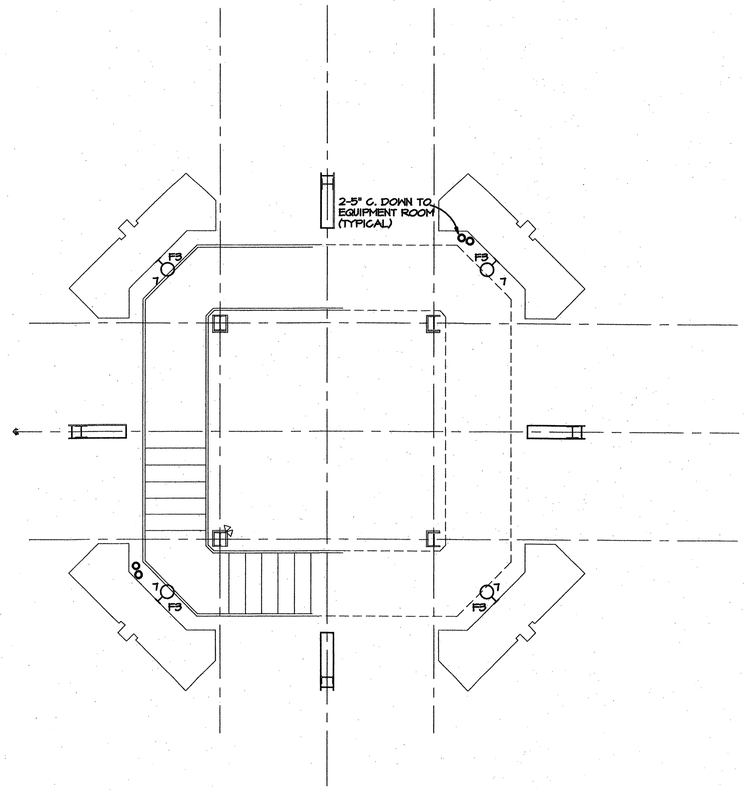
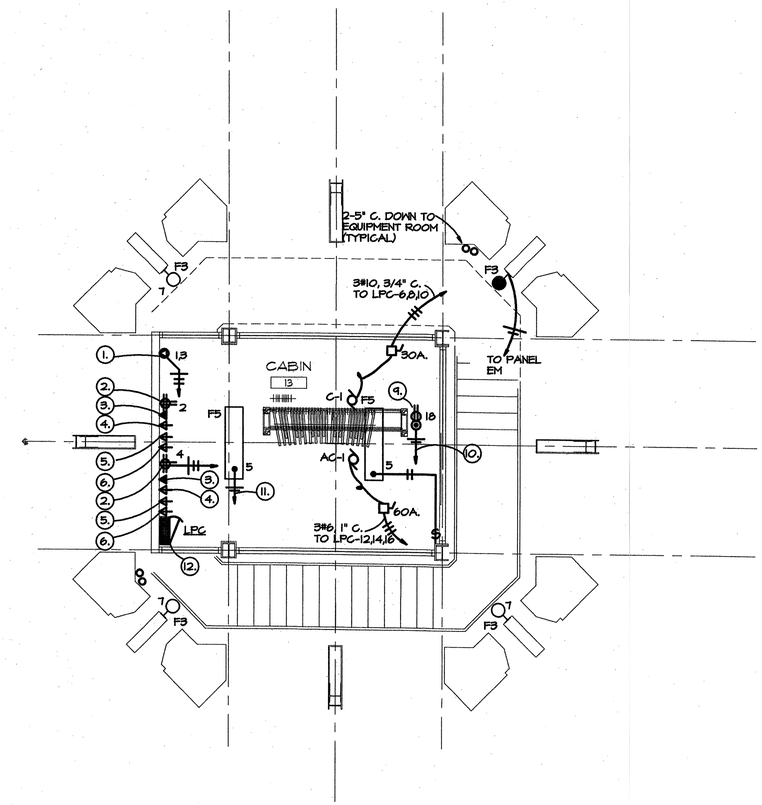


2 BELFRY LEVEL ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"

KEY NOTES

1. 20A-2P, 208V, 1Φ OUTLET FOR COMPUTER LPC-1,3.
2. 20A-1P, 120V, 1Φ QUAD OUTLET.
3. TELEPHONE OUTLET WITH 1" CONDUIT DOWN TO EQUIPMENT ROOM 4 INSTALL PULL BOXES EVERY 50'-0".
4. 1900 BOX WITH 1" CONDUIT DOWN TO EQUIPMENT ROOM 4 FOR SOUND. INSTALL PULL BOXES EVERY 50'-0".
5. 1900 BOX WITH 1" CONDUIT DOWN TO EQUIPMENT ROOM 4 FOR DATA. INSTALL PULL BOXES EVERY 50'-0".
6. 1900 BOX WITH 1" CONDUIT DOWN TO EQUIPMENT ROOM 4 FOR VIDEO. INSTALL PULL BOXES EVERY 50'-0".
7. 3#12, 3/4" C. TO LPC.
8. 3#12, 3/4" C. TO LPC.
9. 20A-1P, 120V, 1Φ FLOOR OUTLET.
10. 2#12, 3/4" C. TO LPC.
11. 2#12, 3/4" C. TO LPC.
12. LIGHTING AND POWER PANEL LPC.



1 BELFRY LEVEL ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"

4735-48

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design group, inc.
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Naperville, Illinois 60563
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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

ELECTRICAL AT BELFRY

SCOTT R. TRIPLANY 062-041485 REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

W-T
W-T ENGINEERING, INC.
CONSULTING ENGINEERS
39 EAST SCULLY DRIVE
SCHAUMBURG, ILLINOIS 60193
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fax. (847)895-9985

PRINCIPAL: PC	E-11
PROJ. MNGR: TGB	
DRAWN BY: GM	
DATE: 9/07/99	

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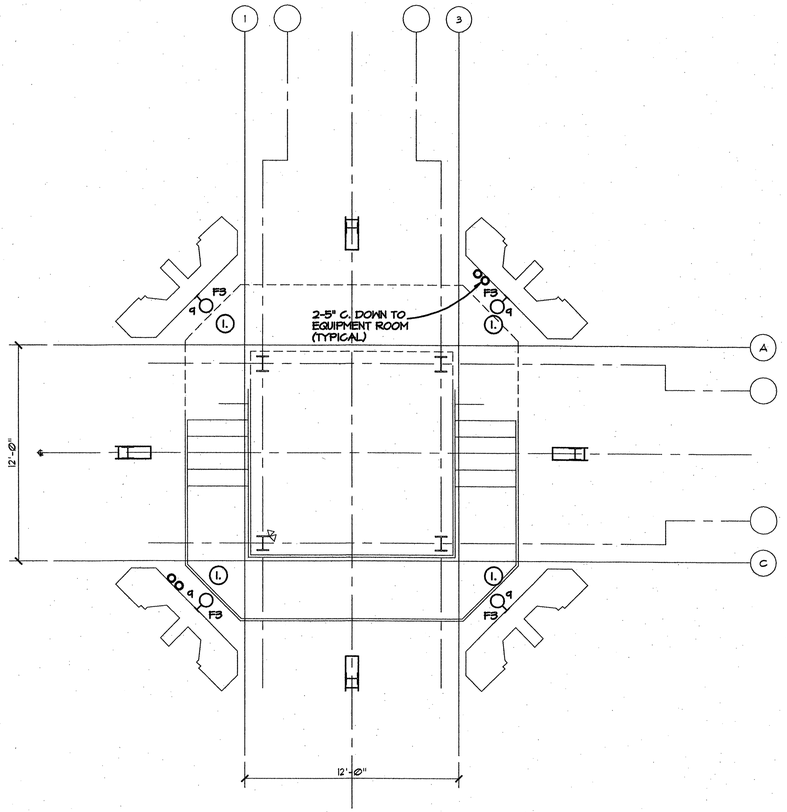
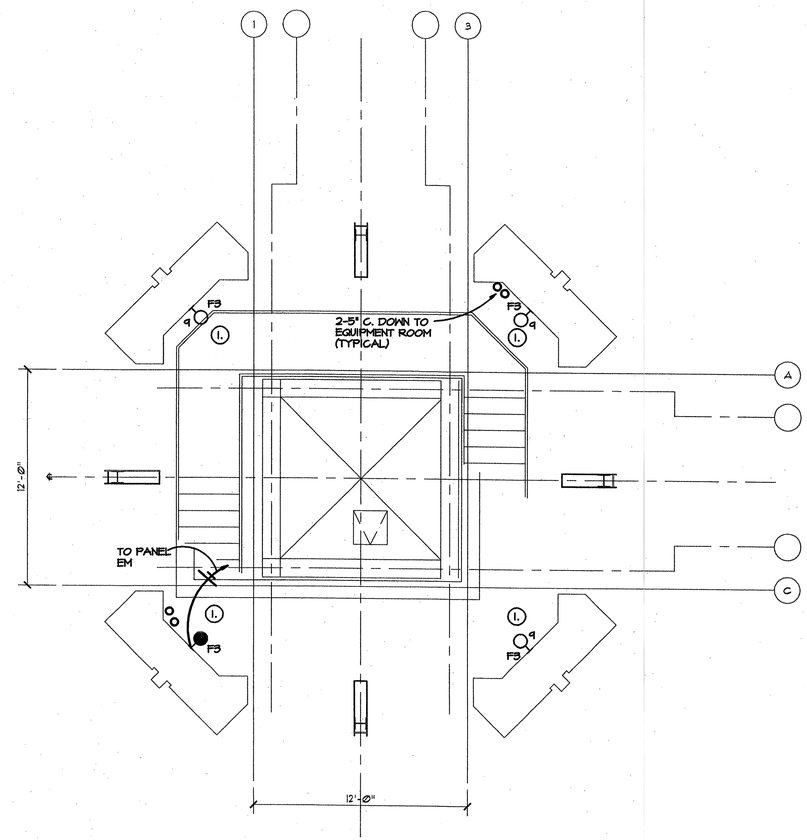


2 BELFRY LEVEL ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"



1 BELFRY LEVEL ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"

4735-49

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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

ELECTRICAL AT BELFRY

SCOTT R. TRIPHAHN
062-041405
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

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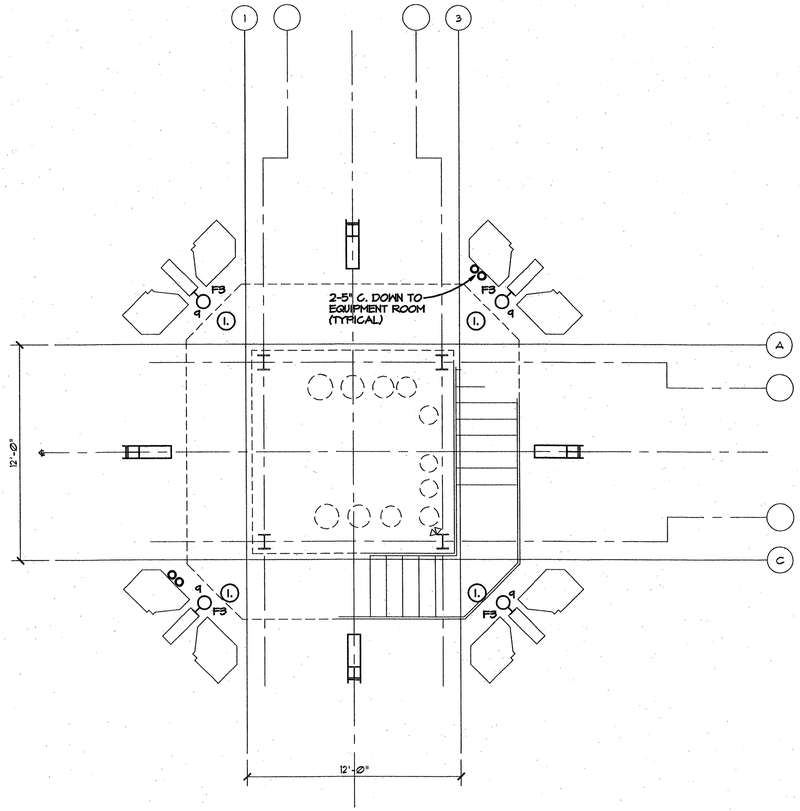
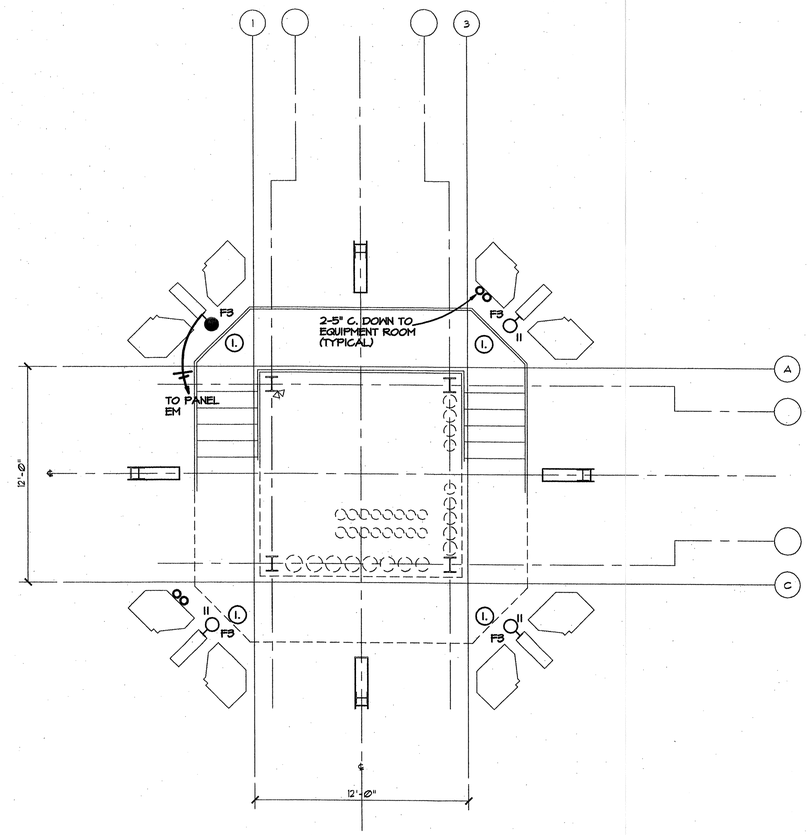


2 BELFRY LEVEL ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"



1 BELFRY LEVEL ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"

4735-50

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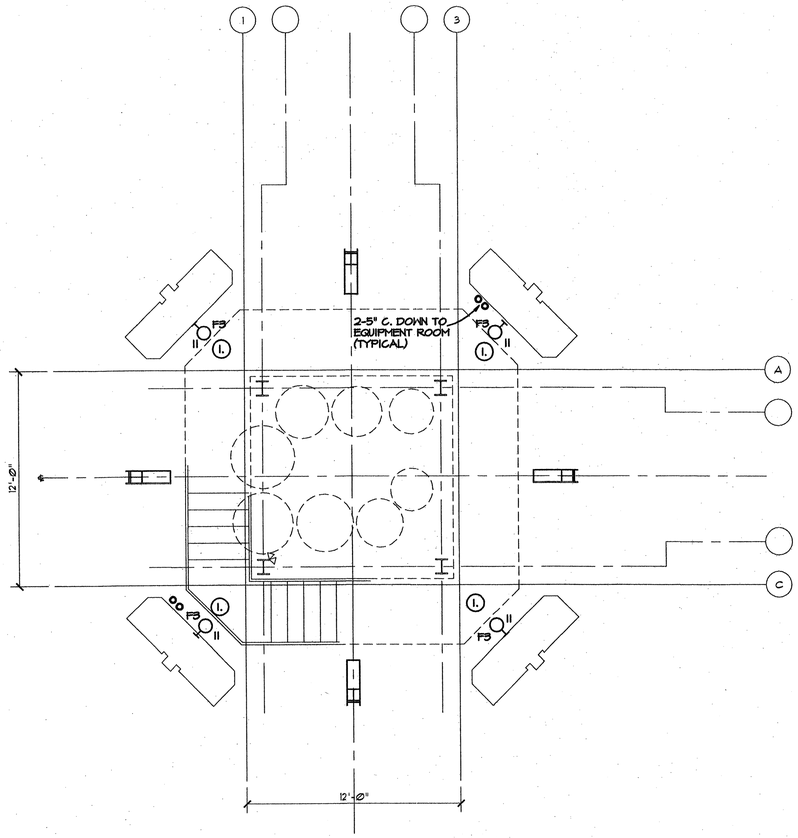
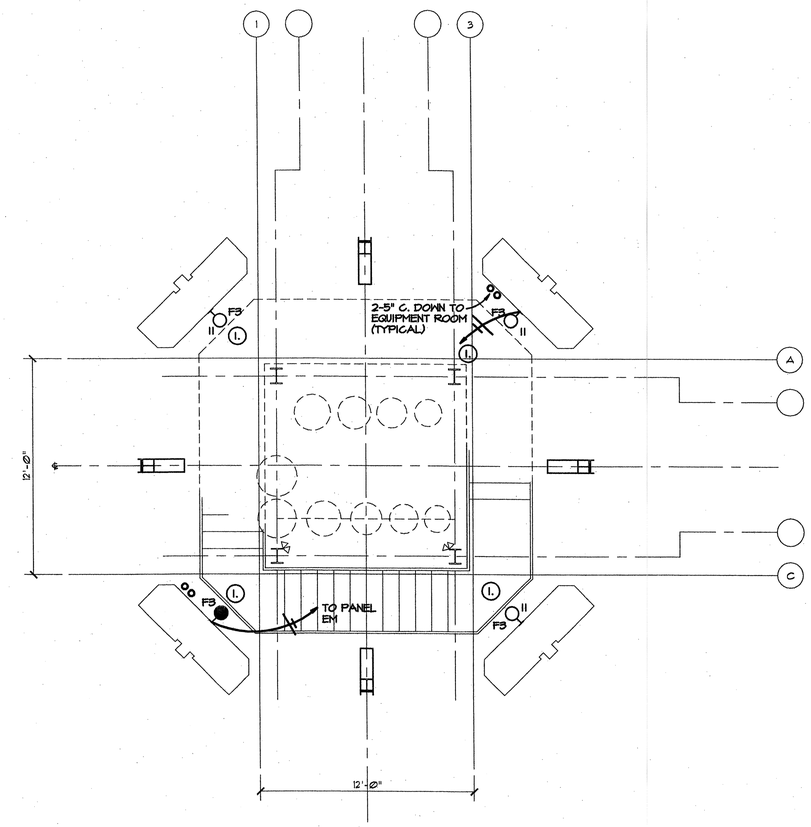


2 BELFRY LEVEL ELECTRICAL PLAN
SCALE: 1/4" = 1'-Ø"

KEY NOTES

1. 2 #10, 3/4" C. LIGHTING CIRCUIT TO LPC CIRCUIT 11.



1 BELFRY LEVEL ELECTRICAL PLAN
SCALE: 1/4" = 1'-Ø"

4735-51

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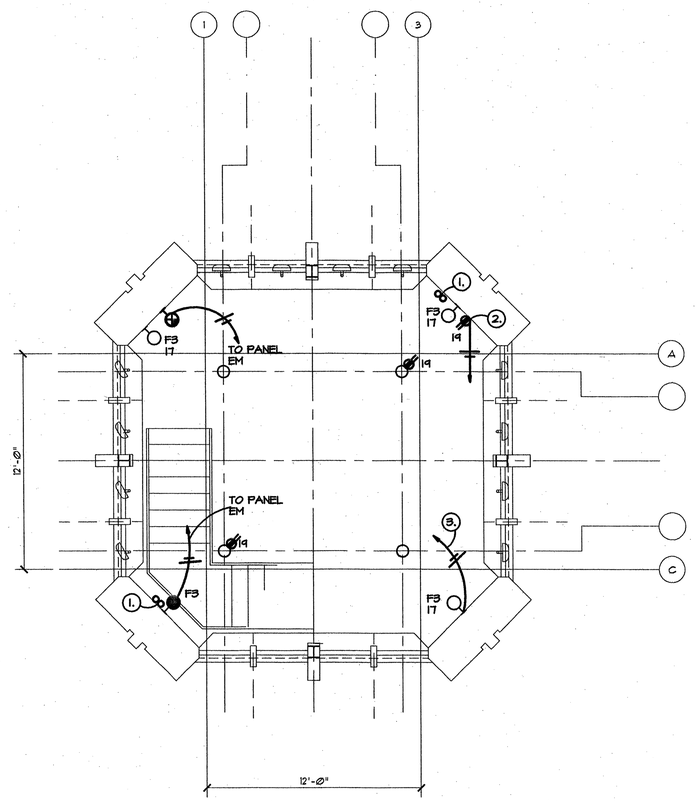
KEY NOTES

1. (2) 5" C. DOWN TO EQUIPMENT ROOMS.
2. 2#10, 3/4" C. TO LPC.
3. 2#10, 3/4" C. LIGHTING CIRCUIT 17 TO LPC



1 OBSERVATION DECK ELECTRICAL PLAN
SCALE: 1/4" = 1'-0"

4735-52

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E-15

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LIGHTING FIXTURE SCHEDULE

TYPE	DESCRIPTION & FEATURES	LAMPS QTY.	LAMPS WATT	FIXTURE INPUT WATTS	MOUNTING CLG./POLE-TYPE	VOLT	MANUFACTURER	REMARKS
F1	HID FLOODLIGHT	1	400	425	SURFACE	120	THORNSTAR	SLIPFITTER MOUNTED
							CON-R2-400MH-120-E-ALV	ON TRUNION
F2	COMPACT FLUORESCENT	1	32	35	RECESSED	120	HALO PORTFOLIO SERIES	6 1/2" SHALLOW HOUSING
							C6132E6180LI-1	HORIZONTAL TRIPLE
F3	LOW WATTAGE SECURITY HID	1	100	110	WALL	120	LUMARK	UL LISTED FOR WET
							MH6S-100H-DT-LL-UB	LOCATIONS
F4	GENERAL LIGHTING HID DECORATIVE	1	70	80	WALL	120	DESIGNPLAN PEAQUAD PEA	NO CONDUIT ENTRY.
							9-B4-1-13-1-0-X	REQUIRES RECESSED BACK BOX
F5	FLUORESCENT "WRAPAROUND" 14"X4'	4	T8 F32	160	SURFACE	120	METALUX W SERIES	
							W5432-120-EB	
F6	EMERGENCY EXIT SIGN LED	LED MODULE		1.8	VARIES	120	SURE-LITES	
							CCX6OR-WH	
F7	FLUORESCENT POWER-TRAC	2	F40 BX	80	SURFACE	120	HALO	WITH L 600 SERIES TRACK
	WALL-WASHER						L3255E	
F8	HID AREA LIGHTING	1	175	200	POLE	120	SPAULDING CONDORD	MOUNTED ON 3" O.D.
	ASSYMETRIC REFLECTOR						SERIES CDA-175M	ALUM. POLE (10' HIGH)
F9	TUBULAR LIGHT PIPE 6" DIA.	1	400 MH	425	VERTICAL RUN,	120	TIR SYSTEMS	REQUIRES TWO
					SURFACE		TLP-6-END-FEED 6000 SERIES	TWO ILLUMINATORS FOR EACH RUN
F10	HID BOLLARD	1	175 MH	200	GROUND	120	DELTA	DIRECT BURIAL
							SSB-313	30" IN GROUND
F11	HID ARCHITECTURAL	1	100 MH	115	SURFACE	120	FAIL-SAFE	REQUIRES BACK-BOX
							MHTC100HSHN	(RECESSED)
F12	HID FLOODLIGHT	1	250	265	SURFACE	120	THORNSTAR	SLIPFITTER
							CON-R1-250MH-120-E-ALV	ON TRUNION
F13	HID POLE LIGHTING	1	1000 MH	1200	POLE	120	McGRAW-EDISON	30" POLE, FINISH COLOR BY ARCHITECT
							FL3101-FA69	

MAIN DISTIBUTION PANEL "MDP"

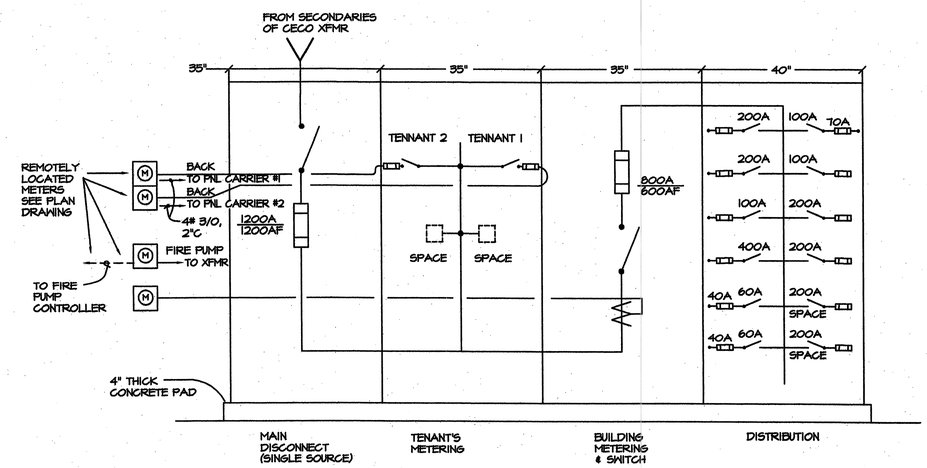
1200 AMP BUS — 1000 A MAIN FUSE

120 / 208 V, 3 PHASE, 4 WIRE — 100,000 A.I.C. MINIMUM

CKT	POLE	SW SIZE	FUSE SIZE	WIRE	GND	COND	HP	DEMAND AMPS	DESCRIPTION
1									
2	3	100A	43	4# 3/0	1#6	2"	---	33.0	LRP-1 (BRANCH CIRCUIT PANEL)
3	3	100A	43	4# 3/0	1#6	2"	---	14.2	LRP-2 (BRANCH CIRCUIT PANEL)
4	3	100A	100A	4#3	1#8	1 1/4"	---	56.4	LPC (BRANCH CIRCUIT PANEL)
5	3	400A	250A	4# 250	1#4	3"	---		XFR SWITCH ATS-1 "NORMAL FEED" TO EMDP
6	3	30A	30A	3#8	1#10	3/4"	---	24.3	CU-1
7	3	30A	30A	3#8	1#10	3/4"	---	24.3	CU-2
8							---		
9	3	60A	60A	3#4	1#8	1 1/4"	---	50.6	RTU-1
10	3	100A	100A	4#3				38.0	OLP (OUTDOOR LIGHTING PANEL)
11	3	200A	200A					*100.0	COMPANY SWITCH (FOR VARIOUS PUBLIC EVENTS)
12	3	200A	200A					*200.0	TENANT #1 (TELEPHONE CARRIER)
13	3	200A	200A					*200.0	TENANT #2 (TELEPHONE CARRIER)
14	3	100A							SPACE
15	3	100A							
16									
17									
18									
19									
20									

TOTAL CONNECTED LOAD 740A

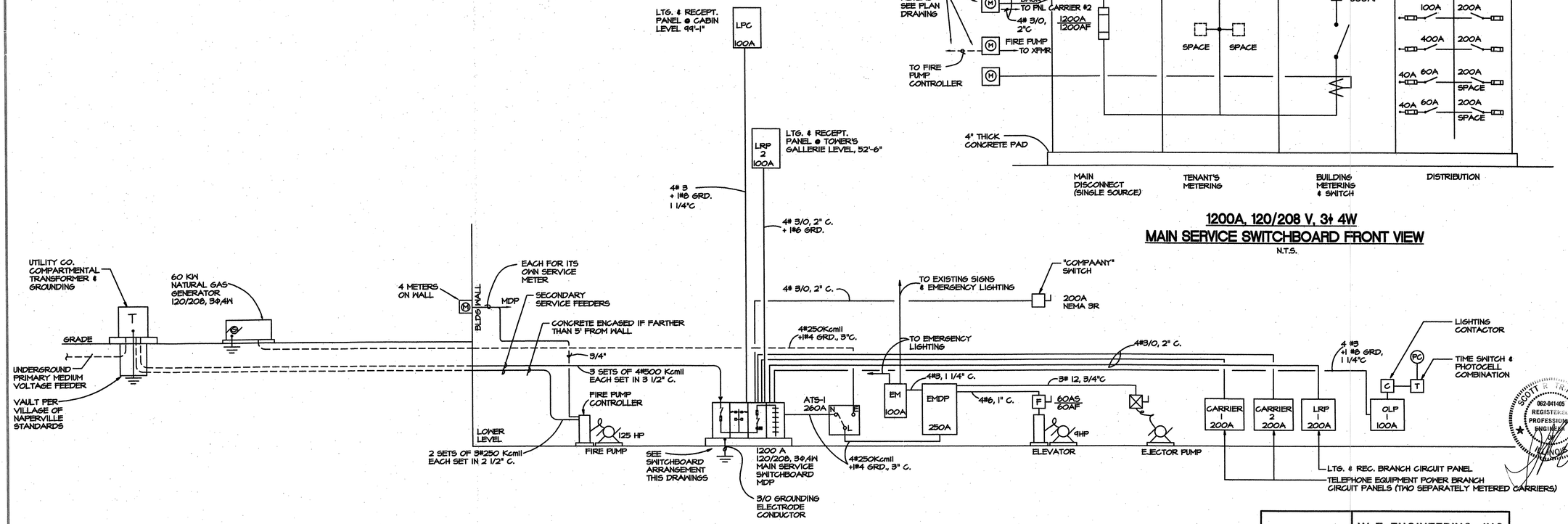
* ESTIMATED LOAD



1200A, 120/208 V, 3ϕ 4W

MAIN SERVICE SWITCHBOARD FRONT VIEW

N.T.S.



120/208V, WYE 3 ϕ,4W ELECTRIC SERVICE AND DISTRIBUTION RISER DIAGRAM

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NAPERVILLE, ILLINOIS

ELECTRICAL RISER DIAGRAM & PANELS

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PANEL EM VOLTS 120/208V PHASE 3Ø, 4W
AMPS 100A MAIN PULL-OUT (100A) A.I.C. 10,000
LOCATION LOWER LEVEL MOUNTING SURFACE

CKT. #	POLE	TRIP	MISC	C.O.	LTS	LOCATION	KVA	KVA	LOCATION	LTS	C.O.	MISC	TRIP	POLE	CKT. #
1	1	15				EXIT SIGNS	.5	.3	EXIT SIGNS				15	1	2
3	1	15				EXIT SIGNS	.5	.8	EMERGENCY LIGHTING				15	1	4
5	1	15				EMERGENCY LIGHTING	1.2		SPARE				15	1	6
7	1	15				EMERGENCY LIGHTING	1.2						15	1	8
9	1	15				SPARE							15	1	10
11	1	15											15	1	12
13															14
15															16
17															18
19															20
21															22
23															24
25															26
27															28
29															30
31															32
33															34
35															36
37															38
39															40
41															42

NOTE: THIS PANEL IS OF SCREW-IN FUSED (SIZE "S") CONSTRUCTION

TOTAL = 3.4 1.1 = TOTAL
TOTAL KVA = 4.5 TOTAL AMPS = 12.5

PANEL OLP (OUTDOOR LIGHTING) VOLTS 120/208 PHASE 3Ø, 4W
AMPS 100A MAIN MCB A.I.C. 10,000
LOCATION LOWER LEVEL MOUNTING SURFACE

CKT. #	POLE	TRIP	MISC	C.O.	LTS	LOCATION	KVA	KVA	LOCATION	LTS	C.O.	MISC	TRIP	POLE	CKT. #
1	1	20			5	BOLLARD LTG. N-E AREA	1.0	1.7	BUILDING EXTER. ACCENT LTG.	4			20	1	2
3	1	20			7	BOLLARD LTG. SOUTH AREA	1.4	1.7	BUILDING EXTER. ACCENT LTG.	4			20	1	4
5	1	20			3	ARCHITECTURAL WALL SCONCE	.345	1.06	BUILDING EXTER. ACCENT LTG.	4			20	1	6
7	1	20			1	EXTER. POLE LIGHTING	1.25	1.06	BUILDING EXTER. ACCENT LTG.	4			20	1	8
9	1	20			1	EXTER. POLE LIGHTING	1.25	1.06	BUILDING EXTER. ACCENT LTG.	4			20	1	10
11	1	20				SPACE		.8	BUILDING EXTER. ACCENT LTG.	4			20	1	12
13	1	20							SPACE	3			20	1	14
15	1	20											20	1	16
17	1	20													18
19	1	20													20
21	1	20													22
23	1	20													24
25															26
27															28
29															30
31															32
33															34
35															36
37															38
39															40
41															42

TOTAL = 5.245 8.44 = TOTAL
TOTAL KVA = 13.685 TOTAL AMPS = 38A

PANEL LRP-1 VOLTS 120/208V PHASE 3Ø, 4W
AMPS 100A MAIN 200A MCB A.I.C. 10,000
LOCATION LOWER LEVEL MOUNTING SURFACE

CKT. #	POLE	TRIP	MISC	C.O.	LTS	LOCATION	KVA	KVA	LOCATION	LTS	C.O.	MISC	TRIP	POLE	CKT. #
1	1	15			10	EXIBITION ARE LIGHTING	.35	.32	WALL SCONCE@ENTRY LEVEL				20	1	2
3	1	15			9	EXIBITION ARE LIGHTING	.32	.48	WALL SCONCE LTG.				15	1	4
5	1	15			9	EQUIPMENT ROOM LTG.	1.44	.72	RECEPTACLES GEN. PURP.				20	1	6
7	1	15			5	CORRIDOR, TOILET & EQUIPMENT LIGHTING	.8	.18	RECEPT. FOR TELEPHONE BD.				20	1	8
9	2					FAN COIL UNIT FC-1	1.12	.4	TRACK LIGHTING				15	1	10
11		20						.4	TRACK LIGHTING				15	1	12
13	2					FAN COIL UNIT FC-2	1.12	.4	TRACK LIGHTING				15	1	14
15		20						.1	MOTORIZED DAMPER				15	1	16
17	1	20				WATER HEATER	1.6	1.12	ENTRY LEVEL LIGHTING				15	1	18
19	1	20				PIPE LIGHTING RUN#1	.43	.54	ENTRY LEVEL RECEPT.				20	1	20
21	1	20				PIPE LIGHTING RUN#2	.43								22
23	1	20				PIPE LIGHTING RUN#3	.43								24
25	1	20				SPARE									26
27															28
29															30
31															32
33															34
35															36
37															38
39															40
41															42

TOTAL = 8.04 4.12 = TOTAL
TOTAL KVA = 12.16 TOTAL AMPS = 33.75

PANEL LRP-2 VOLTS 120/208V PHASE 3Ø, 4W
AMPS 100A MAIN 100A MCB A.I.C. 10,000
LOCATION GALLER MEZZANINE MOUNTING SURFACE

CKT. #	POLE	TRIP	MISC	C.O.	LTS	LOCATION	KVA	KVA	LOCATION	LTS	C.O.	MISC	TRIP	POLE	CKT. #
1	1	20				EF-1	.8	.36	RECEPT. @ GALLERY				1	20	2
3	1	20				PIPE LIGHTING RUN#4	.45								4
5	1	20				PIPE LIGHTING RUN#5	.45								6
7	1	20				PIPE LIGHTING RUN#6	.45								8
9	1	20				ELEVATOR HOISTWAY	.2								10
11	1	20				GENERAL LIGHTING	1.2								12
13	1	20				GENERAL LIGHTING	1.2								14
15															16
17															18
19															20
21															22
23															24
25															26
27															28
29															30
31															32
33															34
35															36
37															38
39															40
41															42

TOTAL = 4.75 .36 = TOTAL
TOTAL KVA = 5.11 TOTAL AMPS = 14.2

PANEL LPC VOLTS 120/208V PHASE 3Ø, 4W
AMPS 100A MAIN 100A MCB A.I.C. 10,000
LOCATION CABIN ROOM MOUNTING SURFACE

CKT. #	POLE	TRIP	MISC	C.O.	LTS	LOCATION	KVA	KVA	LOCATION	LTS	C.O.	MISC	TRIP	POLE	CKT. #
1	2			1		SPECIAL OUTLET 2P	2.0	.72	RECEPT. @ CABIN				20	1	2
3		20				208V FOR COMPUTER		.72	RECEPT. @ CABIN				20	1	4
5	1	15			2	CABIN LIGHTING	.32	3.2	C-1					3	6
7	1	15			8	WALL SCONCE LTG.	.88								8
9	1	15			12	WALL SCONCE LTG. FOR BELFRY	1.32						20		10
11	1	15			12	WALL SCONCE LTG. FOR BELFRY	1.32	7.0	AC-1					3	12
13	1	15			12	WALL SCONCE LTG. FOR BELFRY	1.32								14
15	1	15			4	WALL SCONCE LTG. FOR BELFRY	.4						50		16
17	1	15			4	OBERV. DECK LIGHTING	.4	.18	FLOOR OUTLET				20	1	18
19	1	20		3		OBSERV. DECK RECEPT.	.54								20
21															22
23															24
25															26
27															28
29															30
31															32
33															34
35															36
37															38
39															40
41															42

TOTAL = 8.5 11.8 = TOTAL
TOTAL KVA = 20.32 TOTAL AMPS = 56.4

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ELECTRICAL SYMBOLS

SYMBOLS APPLY WHERE APPLICABLE

LIGHTING FIXTURE

A 2a — FLUORESCENT LIGHT FIXTURE. F NUMBER DENOTES FIXTURE TYPE, NUMERAL INDICATES CIRCUIT ASSIGNMENT, SUBSCRIPT LETTER DENOTES SWITCH LEG. SHADING OF ANY FIXTURE INDICATES W/EMERGENCY BATTERY BALLAST. SEE "LIGHTING FIXTURE SCHEDULE."

EXIT SIGN UNIVERSIAL MOUNT SHADED AREA INDICATES FACE, ARROWS AS REQUIRED. SEE "LIGHTING FIXTURE SCHEDULE."

LIGHTING FIXTURE OUTLET - SEE "LIGHTING FIXTURE SCHEDULE."

POLE MOUNTED HID LIGHT FIXTURE - SEE "LIGHTING FIXTURE SCHEDULE."

PE — PHOTO ELECTRIC CONTROL

TRACK LIGHTING

LIGHTING FIXTURE OUTLET ON EMERGENCY CIRCUIT SEE FIXTURE SCHEDULE

WIRING DEVICES

a — SINGLE POLE TOGGLE SWITCH-42"AFF-SUBSCRIPT LETTER DENOTES SWITCH LEG

3 — THREE WAY TOGGLE SWITCH-42"AFF

T — MANUAL SINGLE PHASE MOTOR STARTER WITH THERMAL OVERLOAD PROTECTION. STYLE "TT" WITH PILOT LIGHT 42"AFF-UNLESS INDICATED OTHERWISE

K — SINGLE POLE KEY LOCK SWITCH-42"AFF-20 AMP-120V WITH KEY

SINGLE RECEPTACLE-SPEC. GRADE

DUPLEX RECEPTACLE-SPEC. GRADE

DUPLEX RECEPTACLE CROSS LINE DENOTES 6" ABOVE COUNTER OR BACKSPLASH.

DUPLEX RECEPTACLE SHADING DENOTES GROUND FAULT CIRCUIT INTERRUPTER "GFCI".

FLUSH FLOOR BOX W/DEVICES AS INDICATED

FLUSH TELEPHONE OUTLET W/DEVICES AS INDICATED

FLUSH DATA SYSTEMS OUTLET W/DEVICES AS INDICATED

QUADRIPLEX RECEPTACLE

SPECIAL PURPOSE RECEPTACLE NEMA CONFIGURATION AS NOTED ON PLANS

JUNCTION BOX WITH FLEXIBLE CONNECTION TO EQUIPMENT

SURFACE METAL RACEWAY W/DEVICES INDICATED

POWER SYSTEM

LIGHTING & RECEPTACLE PANEL

POWER DISTRIBUTION PANEL

MOTOR - HORSE POWER AS NOTED ON PLANS

3-PHASE COMBINATION MAGNETIC STARTER WITH NEMA 1 MINIMUM SIZE

F — FUSED DISCONNECT SWITCH - SWITCH AND FUSE RATING AS INDICATED.

NON-FUSED DISCONNECT SWITCH - SWITCH RATING AS INDICATED.

T — TRANSFORMER - SIZE AND TYPE AS INDICATED GROUND PER CODE

CP — CONTROL PANEL

M — POWER METER

CONDUIT + WIRING

CONDUIT ROUTED CONCEALED IN CEILING OR WALL CONSTRUCTION. (CROSS LINES DENOTE NUMBER OF WIRES.)

CONDUIT ROUTED EXPOSED, PARALLEL OR PERPENDICULAR TO BUILDING CONSTRUCTION.

CONDUIT ROUTED CONCEALED IN CONCRETE FLOOR SLAB OR UNDERGROUND.

HOME RUN TO PANELBOARD

- CONDUIT
- NEUTRAL CONDUCTOR
- PHASE CONDUCTORS
- SUPPLEMENTAL GROUND IF REQUIRED

TELEPHONE SYSTEM

TELEPHONE TERMINAL BOARD "TTB" W/-DEDICATED 20A. 1P. CIRCUIT REQUIRED

W F — TELEPHONE OUTLET-STUB 3/4" CONDUIT ABOVE CEILING. SUBSCRIPT "W" DENOTES WALL PHONE SUBSCRIPT "P" DENOTES PAYPHONE

DATA SYSTEM OUTLET 3/4" CONDUIT STUB ABOVE CEILING

3/4"CONDUIT STUBBED 12"ABOVE CEILING W/BUSHING.

FIRE ALARM SYSTEM

FCC — FIRE COMMAND CENTER

FACP — FIRE ALARM CONTROL PANEL

FAAP — FIRE ALARM ANNUNCIATOR PANEL

F — FIRE ALARM SYSTEM PULL STATION - 42" A.F.F.

V — VISUAL STROBE SIGNAL - 84" A.F.F.

S — PHOTOELECTRIC TYPE SMOKE DETECTOR

I — COMBUSTION IDMIZATION/HET DETECTOR

D — HEAT DETECTOR, FIXED TEMPERATURE(135 DEGREES)

RR — RATE OF RISE HEAT DETECTOR

H — HEAT DETECTOR, FIXED TEMPERATURE(200 DEGREES)

S — DUCT TYPE, SMOKE DETECTOR

R — FAN SHUT-DOWN RELAY

RA — REMOTE INDICATING LIGHT FOR DUCT MOUNTED SMOKE DETECTOR - W/TEST SWITCH

MAGNETIC DOOR HOLDER - FM SERIES VERIFY TYPE NEEDED IN FIELD

FS — SPRINKLER ALARM FLOW SWITCH, BY DIVISION 15

TS — SPRINKLER ALARM TAMPER SWITCH, BY DIVISION 15

EOL — END OF LINE RESISTOR

AV — AUDIO VISUAL

T — TELEPHONE JACK

SV — SPEAKER-STROBE

DES — DRY EXTINGUISHING SYSTEM

ABBREVIATIONS

A.	AMPERE
V.	VOLTAGE
Φ or PH	PHASE
EWC	ELECTRIC WATER COOLER
WP	WEATHER PROOF (NEMA 3R)
O.C.	ON CENTER
A.F.F.	ABOVE FINISHED FLOOR
HP	HORSEPOWER

ELECTRICAL SPECIFICATIONS

THE GENERAL CONDITIONS AND SUPPLEMENTAL GENERAL CONDITIONS BY THE ARCHITECT SHALL GOVERN WHERE APPLICABLE.

THIS CONTRACTOR SHALL THOROUGHLY FAMILIARIZE HIMSELF WITH THE PLANS AND SHALL VERIFY EXISTING SITE CONDITIONS AT THE JOB SITE BEFORE SUBMITTING BID. FAILURE TO RECOGNIZE WORK REQUIRED SHALL BE AT THE EXPENSE OF THIS CONTRACTOR. NO CONSIDERATION SHALL BE GIVEN FOR ADDITIONAL COMPENSATION AFTER THE LETTING OF BIDS.

ENTIRE INSTALLATION SHALL BE PERFORMED IN A FIRST-CLASS WORKMANLIKE MANNER AND SHALL CONFORM TO ALL LOCAL CODES AND ORDINANCES. THE COMPLETED SYSTEMS SHALL BE FULLY OPERATIONAL; ACCEPTANCE BY THE OWNER SHALL BE A CONDITION OF THE CONTRACT. ALL WORK SHALL BE COORDINATED WITH OTHER TRADES IN ORDER TO AVOID INTERFERENCES, PRESERVE MAXIMUM HEADROOM, AND AVOID OMISSIONS. ALL MATERIALS, WORKMANSHIP AND EQUIPMENT SHALL BE GUARANTEED FOR ONE (1) YEAR AFTER SYSTEM ACCEPTANCE.

CONDUIT SHALL BE CONCEALED WHERE POSSIBLE; WHERE EXPOSED, RUN IN STRAIGHT LINES PARALLEL AND/OR PERPENDICULAR TO BUILDING CONSTRUCTION. CONDUITS INSTALLED IN AREAS SUBJECT TO MECHANICAL DAMAGE SHALL BE RIGID GALVANIZED METAL TYPE. MINIMUM CONDUIT SHALL BE 3/4" DIAMETER TRADE.

RECEPTACLES AND SWITCHES SHALL BE THE TYPE AS SHOWN ON THE DRAWINGS AND SHALL BE SPECIFICATION GRADE.

MINIMUM BRANCH WIRE SIZE SHALL BE #12 AWG COPPER EXCEPT FOR CONTROL AND SIGNAL CIRCUITS. INSULATION (INTERIOR) SHALL BE TYPE THHN OR THW SIZES #12 THROUGH #6. SIZES #4 THROUGH 750 MCM SHALL BE TYPE THHN OR THW AT THE CONTRACTOR'S OPTION. ALL WIRE OR CABLE INSTALLED EXTERIOR OF THE BUILDING SHALL BE TYPE THW OR THWN AT THE CONTRACTOR'S OPTION.

MINIMUM OUTLET BOXES SHALL BE #4 TRADE, UNLESS OTHERWISE SPECIFIED.

CONTRACTOR SHALL NOT SCALE DRAWINGS FOR DIMENSIONS BUT SHALL CONTACT THE PROJECT ARCHITECT FOR ALL DIMENSIONAL DATA AND SHALL VERIFY EXACT LOCATION AND MOUNTING HEIGHTS OF ALL PIECES OF EQUIPMENT WITH ARCHITECT AND/OR OWNER PRIOR TO INSTALLATION.

GROUNDING SHALL COMPLY WITH REQUIREMENTS OF LOCAL INSPECTION AUTHORITY, NEC, AND THOSE REFLECTED IN THE SPECIFICATIONS.

ALL MATERIALS USED SHALL BE NEW AND BEAR THE U/L LABEL AND BE OF THE APPROPRIATE NEMA STANDARD.

THIS CONTRACTOR SHALL ALLOW IN HIS INITIAL BID THE COST OF SERVICES ON ALL EQUIPMENT INSTALLED UNDER HIS CONTRACT FOR A PERIOD OF ONE (1) YEAR FROM DATE OF FINAL ACCEPTANCE OF THE WORK.

LAYOUT IS DIAGRAMMATIC AND WORK SHALL BE INSTALLED TO MEET FIELD CONDITIONS AND EQUIPMENT SELECTED. PROVIDE SHOP DRAWINGS AS REQUIRED AND VERIFY ALL EQUIPMENT.

PANELBOARDS SHALL BE DEAD FRONT WITH BOLT-ON TYPE CIRCUT BREAKERS. A TYPED LEGEND, UNDER A CLEAR FLEXAN-GLASS SHALL BE PROVIDED FOR CIRCUIT IDENTIFICATION. MAIN PANEL CIRCUIT BREAKER WILL BE RATED AT 24,000 A.I.C. WITH SUB-LIGHTING PANEL AT 10,000 A.I.C.

CONTRACTOR SHALL INCLUDE ALL MISCELLANEOUS ITEMS REQUIRED TO COMPLETE THE WORK.

CONTRACTOR SHALL OBTAIN AND PAY FOR ALL PERMITS AND REQUIRED INSPECTION FEES.

IT SHALL BE THE RESPONSIBILITY OF THIS CONTRACTOR TO COORDINATE AND REVIEW THE ELECTRICAL CHARACTERISTICS, AMPACITY AND OTHER REQUIREMENTS OF ALL EQUIPMENT AND WIRING PRIOR TO INSTALLATION.

IT SHALL BE THE RESPONSIBILITY OF THIS CONTRACTOR TO COORDINATE THE LOCATIONS OF CONDUIT ROUTING, EQUIPMENT, LIGHTING, ETC. WITH ALL OTHER TRADES IN THE FIELD PRIOR TO INSTALLATION.

FOR CLARITY OF ALL PLANS, SOME CONDUIT AND WIRE HAS NOT BEEN SHOWN. IT IS THE RESPONSIBILITY OF THIS CONTRACTOR TO FURNISH AND INSTALL COMPLETE AND OPERATING SYSTEMS INCLUDING ALL CONDUIT AND WIRING.

THIS CONTRACTOR SHALL MAINTAIN THE FIRE RATED INTEGRITY OF ALL FLOORS, CEILINGS AND WALLS. ALL PENETRATIONS THROUGH FIRE RATED BUILDING ELEMENTS SHALL BE EFFECTIVELY SEALED USING APPROVED MATERIALS AND METHODS. ALL LIGHTING FIXTURES MOUNTED IN FIRE RATED CEILINGS SHALL MAINTAIN THE INTEGRITY OF THE FIRE RATED CEILINGS USING APPROVED MATERIALS AND METHODS. REFER TO ARCHITECTURAL DRAWINGS FOR FIRE RATINGS.

NOTES:
NOT ALL THE SYMBOLS SHOWN HERE MIGHT APPEAR ON DRAWINGS.

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NOTES:
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ISSUE FOR PERMITS 9/07/99

NAPERVILLE MILLENNIUM CARILLON

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ELECTRICAL SYMBOLS & SPEC

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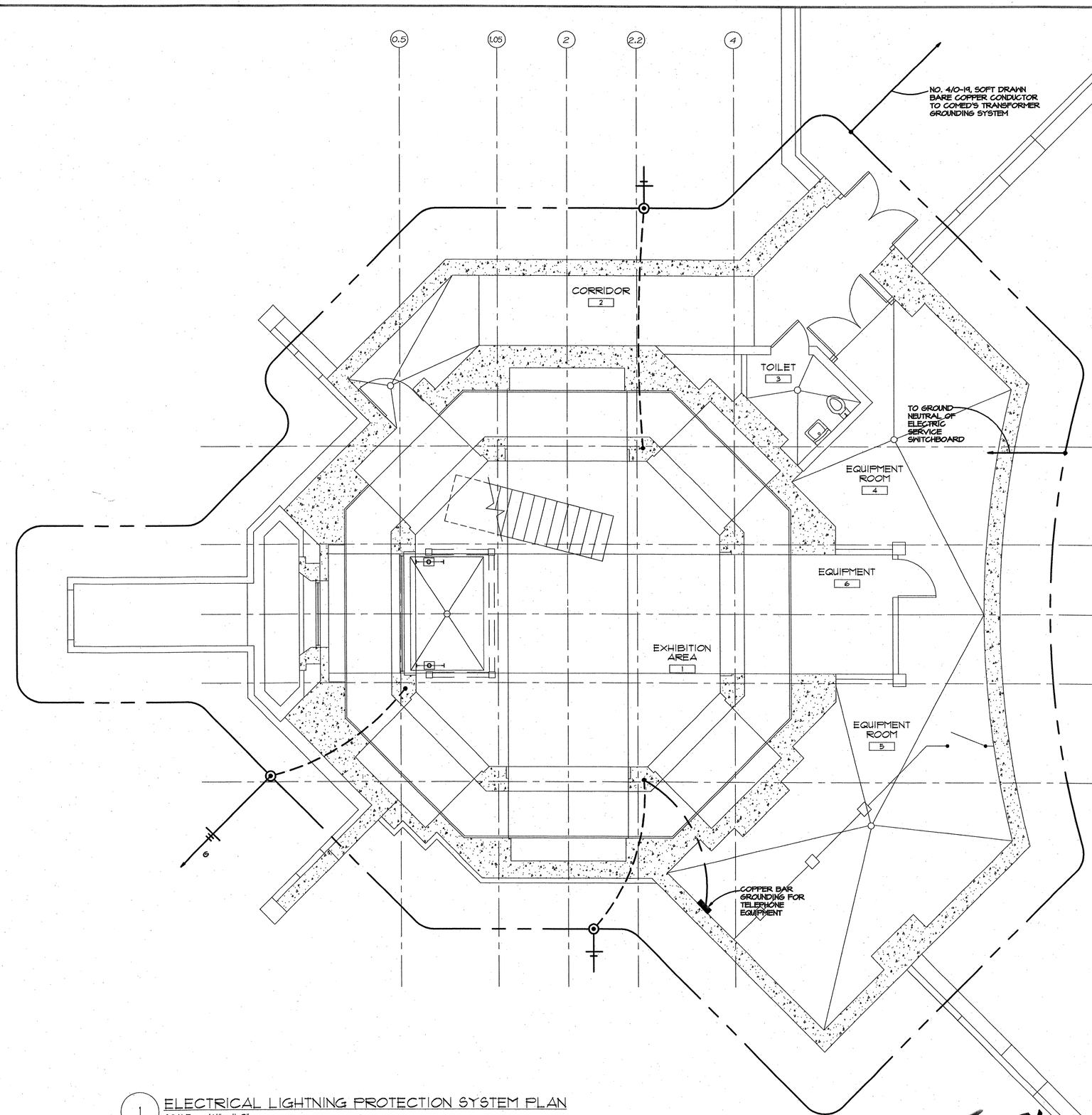
PRINCIPAL: PC	E-18
PROJ. MNGR: TGB	
DRAWN BY: GM	
DATE: 9/07/99	

4735-55

4735



1 ELECTRICAL LIGHTNING PROTECTION SYSTEM PLAN

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

LIGHTNING PROTECTION SPECIFICATION

I. General: Provide a complete lightning protection system as shown on the drawings and as specified herein. The system shall be installed by a firm actively engaged in the installation of Master Labeled lightning protection systems and shall be so listed by Underwriters Laboratories, Inc. The completed system shall comply with the latest editions of the "Installation Requirements for Lightning Protection Systems, UL96A" and the National Fire Protection Association's "Lightning Protection Code," NFPA 780.

II. Product: All materials used in this installation shall be labeled or listed by Underwriters Laboratories, Inc. for use in Master Labeled lightning protection systems. The catalog numbers referred to on the drawings are those of Harger Lightning Protection, Inc., (847-548-8100 or 800-842-7487 outside Illinois).

Generally, all materials shall be of copper and/or copper-bronze. In locations where system components are mounted on aluminum surfaces, aluminum materials shall be used to avoid electrolytic corrosion of the dissimilar metals.

Materials shall be sized in accordance with the material requirements of NFPA 780 and UL96A. Class I materials shall be used for systems on structures not exceeding 75 feet in height and Class II materials shall be used for systems on structures exceeding 75 feet above grade.

III. Installation:

Air Terminals

Air terminals shall be provided so as to enclose the entire building within a zone of protection. Air terminals shall protect a minimum of ten inches above the area protected and shall be located at intervals not exceeding 20'-0" along ridges and around the perimeter of flat or gently sloping roofs. Flat or gently sloping roofs exceeding 50'-0" in width shall be protected with additional air terminals located at intervals not exceeding 50'-0" in the flat or gently sloping area. Air terminals shall be located within two feet of roof edges and outside corners of protected areas. Air terminal spacings exceeding these dimensions are permitted so long as the area protected lies within a zone of protection.

Air terminals shall be installed for stacks, flues, mechanical equipment, and other objects not located within a zone of protection. Non-metallic objects or metal objects having a metal thickness of less than 3/16" require the installation of air terminals and required conductors. Objects having a metal thickness 3/16" or greater shall be connected to the lightning protection system per code requirements using main size conductor and connector fittings having 3 square inches of surface contact area.

Air terminal mounting bases shall be of cast construction and securely fastened to the structure in accordance with code requirements.

Conductors

Main conductors shall be sized in accordance with the material requirements above and shall provide a two-way path from each air terminal horizontally or downward to connections with ground terminals. Conductors shall be free of excessive splices and sharp bends. No bend of a conductor shall form an included angle of less than 90 degrees nor have a radius of bend of less than 8 inches. Conductors shall be secured to the structure at intervals not exceeding 3'-0".

Down conductors shall be copper and shall be concealed in the exterior wall construction. Down conductors shall be spaced at intervals averaging not more than 100 feet around the perimeter of the structure. In no case shall a structure have fewer than two down conductors.

In the case of structural steel frame construction, down conductors may be omitted and roof conductors shall be connected to the structural steel frame at intervals averaging not more than 100 feet around the perimeter of the structure. Connections to the steel frame shall be made with bonding plates having 8 square inches of contact or by exothermic weld connections.

Roof Penetrations

Roof penetrations required for down conductors or for connections to structural steel framework shall be made using thru-roof assemblies with solid bars and appropriate roof flashings. Conductors shall not pass directly through the roof. Roof flashings compatible with the roofing system shall be furnished and installed by the roofing contractor.

Equipotential Grounding

(Common Grounding)

Common grounding of all ground mediums within and outside of the building shall be ensured by interconnecting with main size conductors and fittings.

Grounded metal bodies located within the required bonding distance as determined by the bonding distance formulas in NFPA 780 shall be bonded to the system using bonding conductors and fittings.

Ground Terminations

Ground terminations shall be provided for each down conductor and shall consist of a 5/8" x 10'-0" (minimum) copper-clad ground rod. The down conductor shall be connected to the ground rod using a bronze ground rod clamp having at least 1-1/2" of contact between the rod and the conductor, measured parallel to the axis of the rod, or by an exothermic welded connection.

Ground rods shall be located 2 feet below grade, preferably 2 feet from the foundation wall and shall extend a minimum of 10' vertically into the earth.

Where the structural steel framework is utilized as main conductors for the system, perimeter columns shall be grounded at intervals averaging not more than 60 feet apart. Columns shall be grounded using bonding plates having 8 square inches of surface contact area or by exothermic welded connections. Conductors from the grounded connections to the ground termination shall be Class II copper lightning conductors.

IV. Inspection: Upon completion of the installation, the contractor shall furnish the Master Label issued by Underwriters Laboratories, Inc. for this system. If the protected structure is an addition to or is attached to an existing structure that does not have a lightning protection system, the contractor shall certify that the system installed complies with UL requirements and advise the Owner of the lightning protection work required on the existing structure to obtain the Master Label. If the existing structure does have a lightning protection system, the contractor shall advise the Owner of any additional work required on the existing system to bring it into compliance with current UL requirements and thus qualify for the Reconditioned Master Label of Underwriters Laboratories, Inc.

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ELECTRICAL LIGHTNING PROTECTION SYSTEM PLAN

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DRAWN BY: GM
DATE: 9/07/99

ELP-1

4735-56

4735

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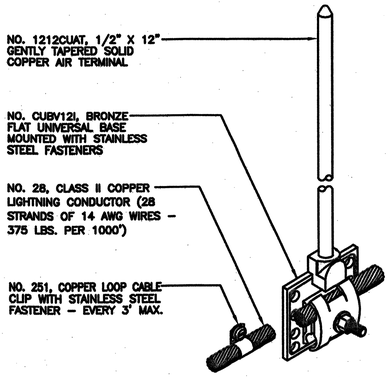
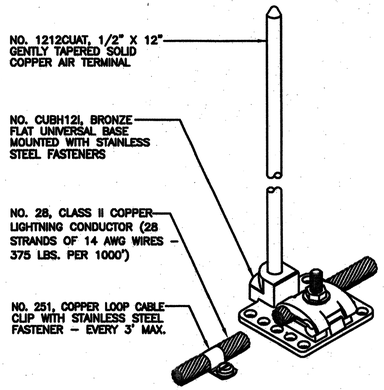


AIR TERMINAL DETAIL "A"

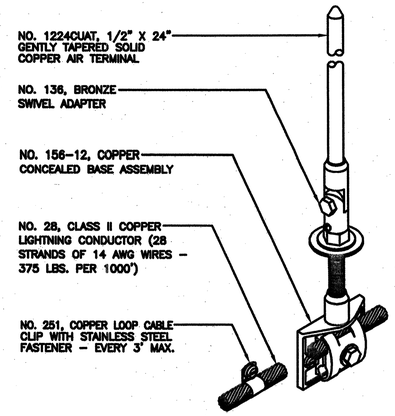
NTS



AIR TERMINAL DETAIL "B"

SEE NOTE 6 ON SHEET LP-1

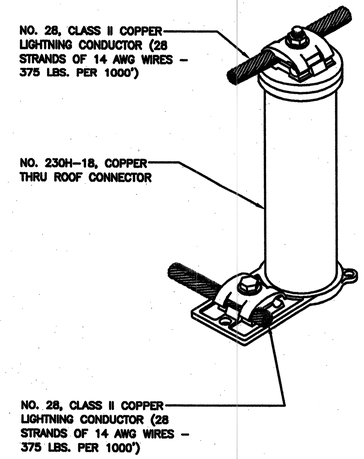
NTS



AIR TERMINAL DETAIL "C"

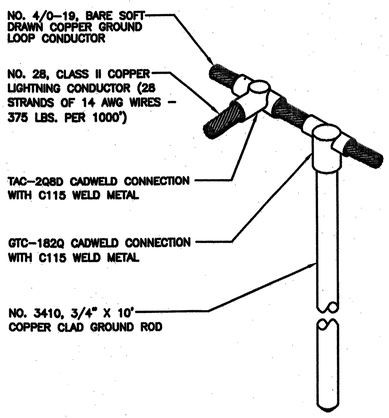
SEE NOTE 6 ON SHEET LP-1

NTS



THRU ROOF DETAIL "T"

NTS



GROUND ROD DETAIL "G"

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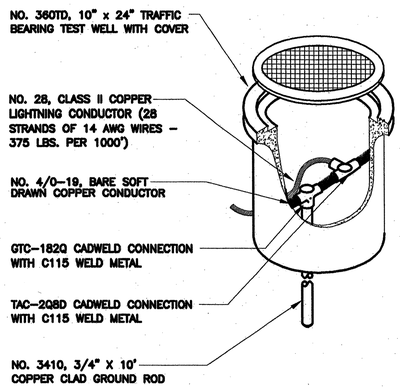
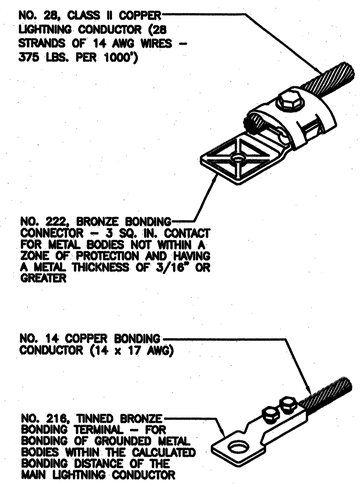


GROUND ROD DETAIL "G1"

NTS



TYPICAL BONDING LUG DETAILS

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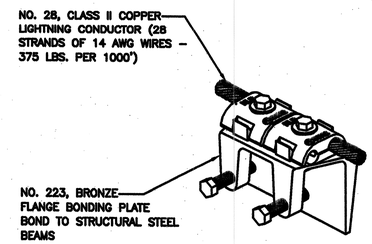

BONDING PLATE DETAIL

NTS

NOTE:
FOR SPECIFICATIONS OF LIGHTNING PROTECTION SYSTEM. SEE DWG. ELP-1.

4735-57

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ELECTRICAL LIGHTNING PROTECTION SYSTEM DETAILS

PRINCIPAL: PC	ELP-2
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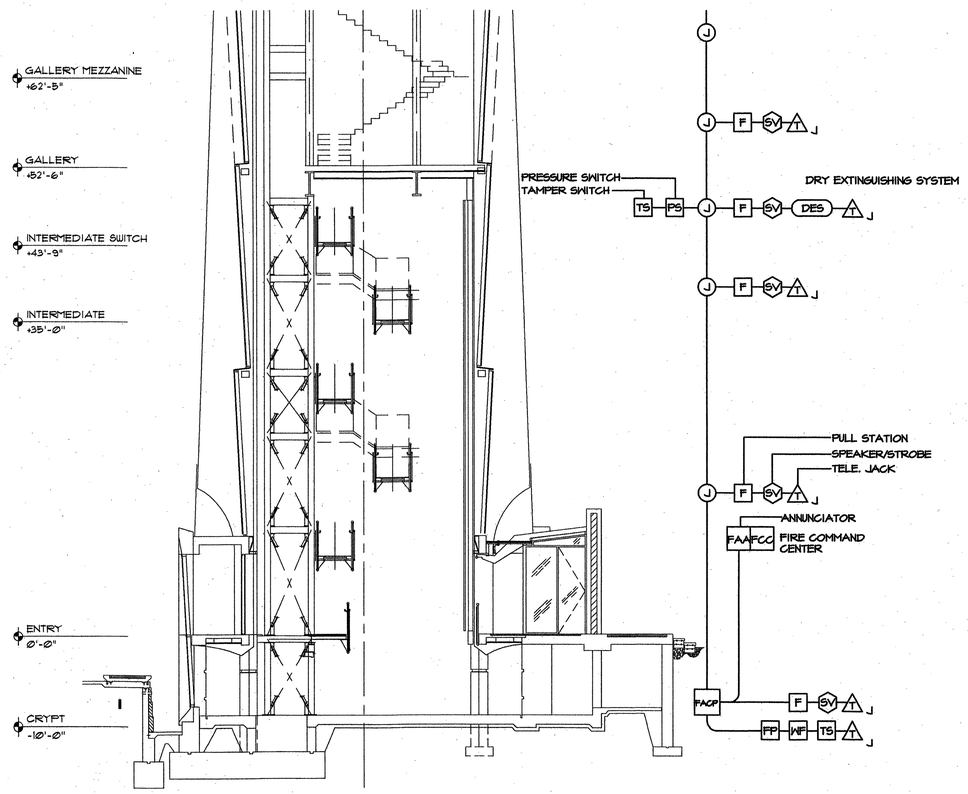
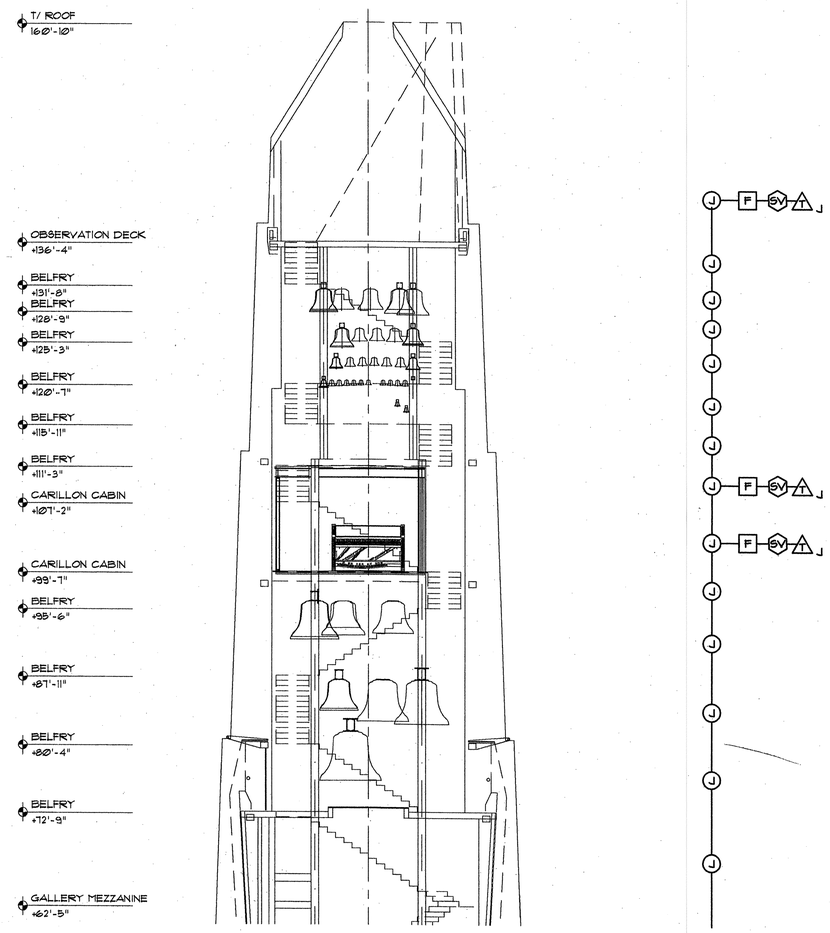


2 FIRE ALARM SYSTEM RISER DIAGRAM
SCALE: 1/8" = 1'-0"



1 FIRE ALARM SYSTEM RISER DIAGRAM
SCALE: 1/8" = 1'-0"

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FIRE ALARM SYSTEM RISER DIAGRAM

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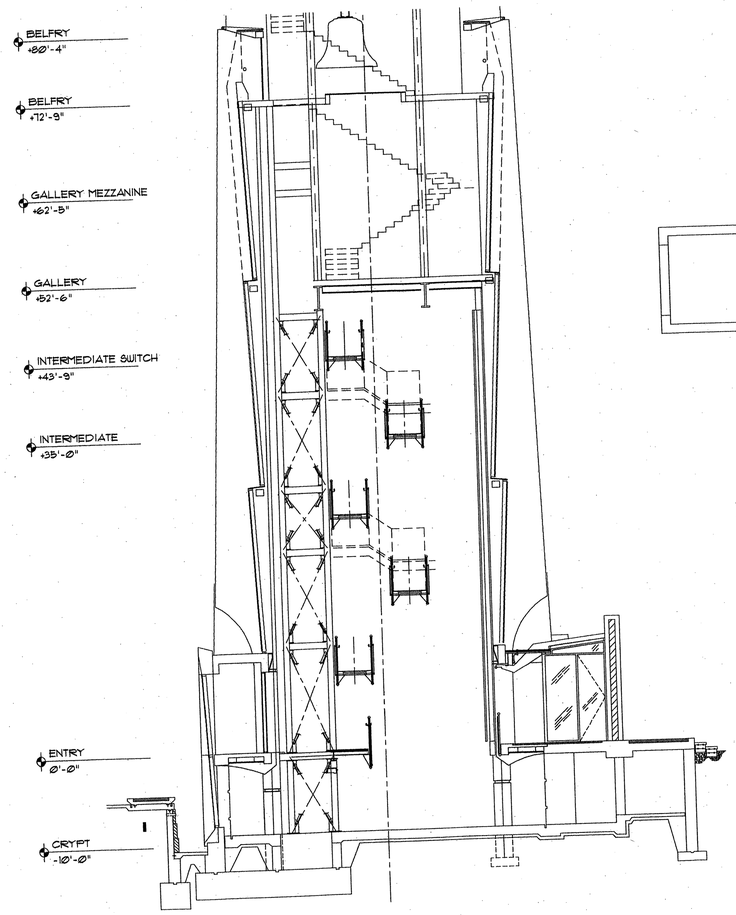
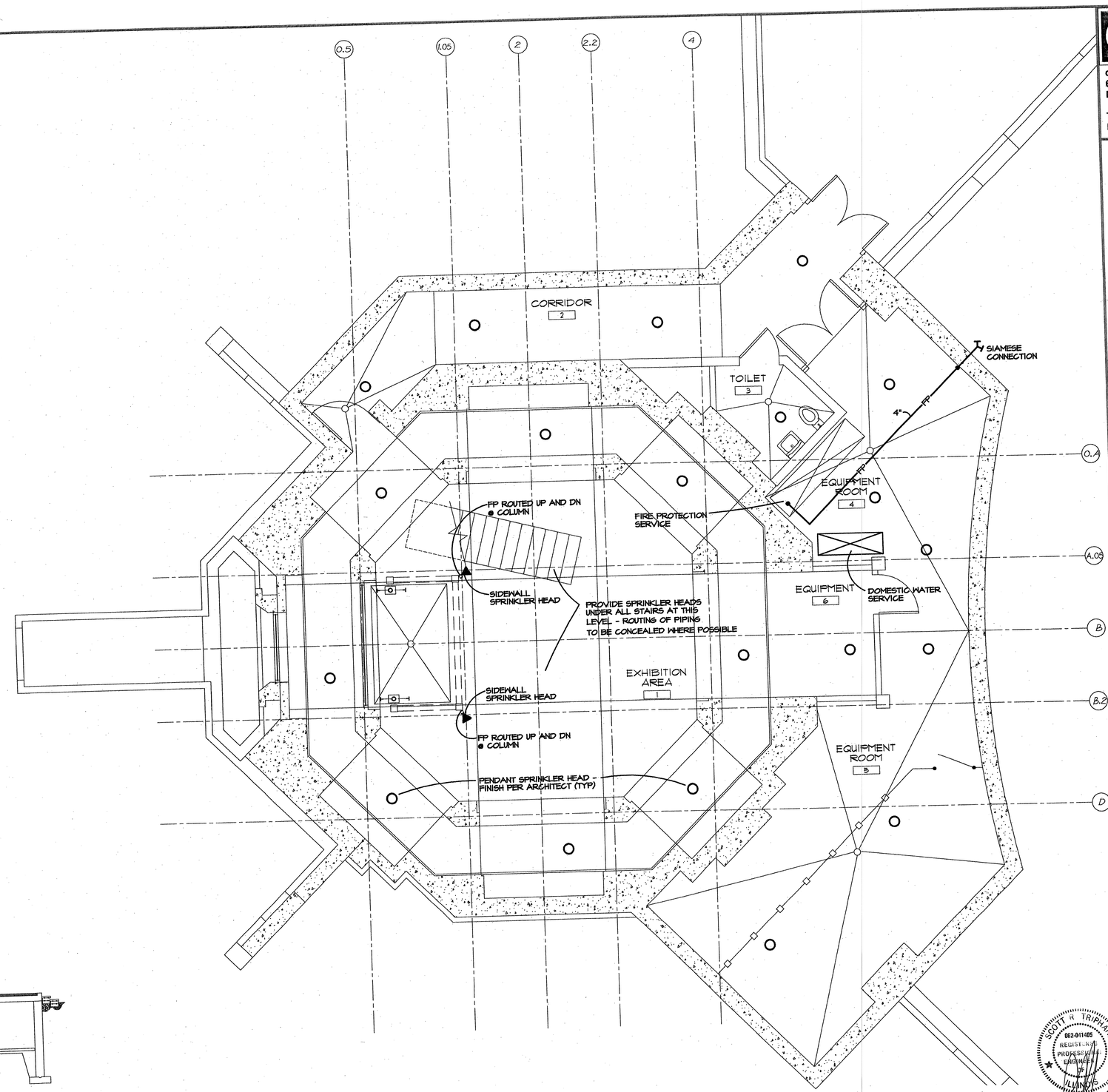


2 KEY SECTION
SCALE: 1/8" = 1'-0"



1 LOWER LEVEL FIRE PROTECTION PLAN
SCALE: 1/4" = 1'-0"

4735 - 59

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FIRE PROTECTION PLAN AT LOWER LEVEL

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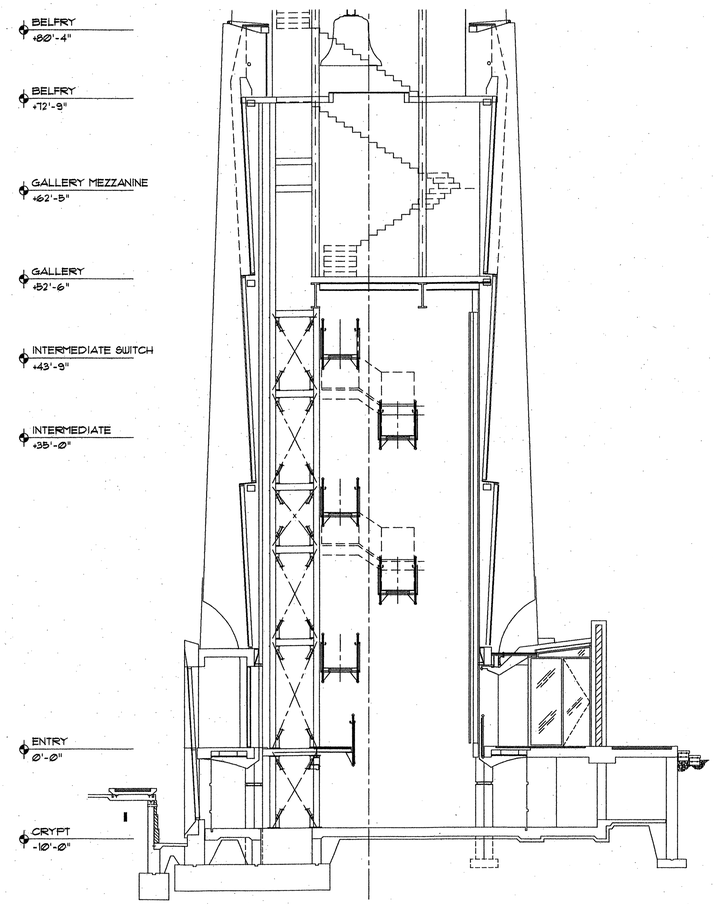

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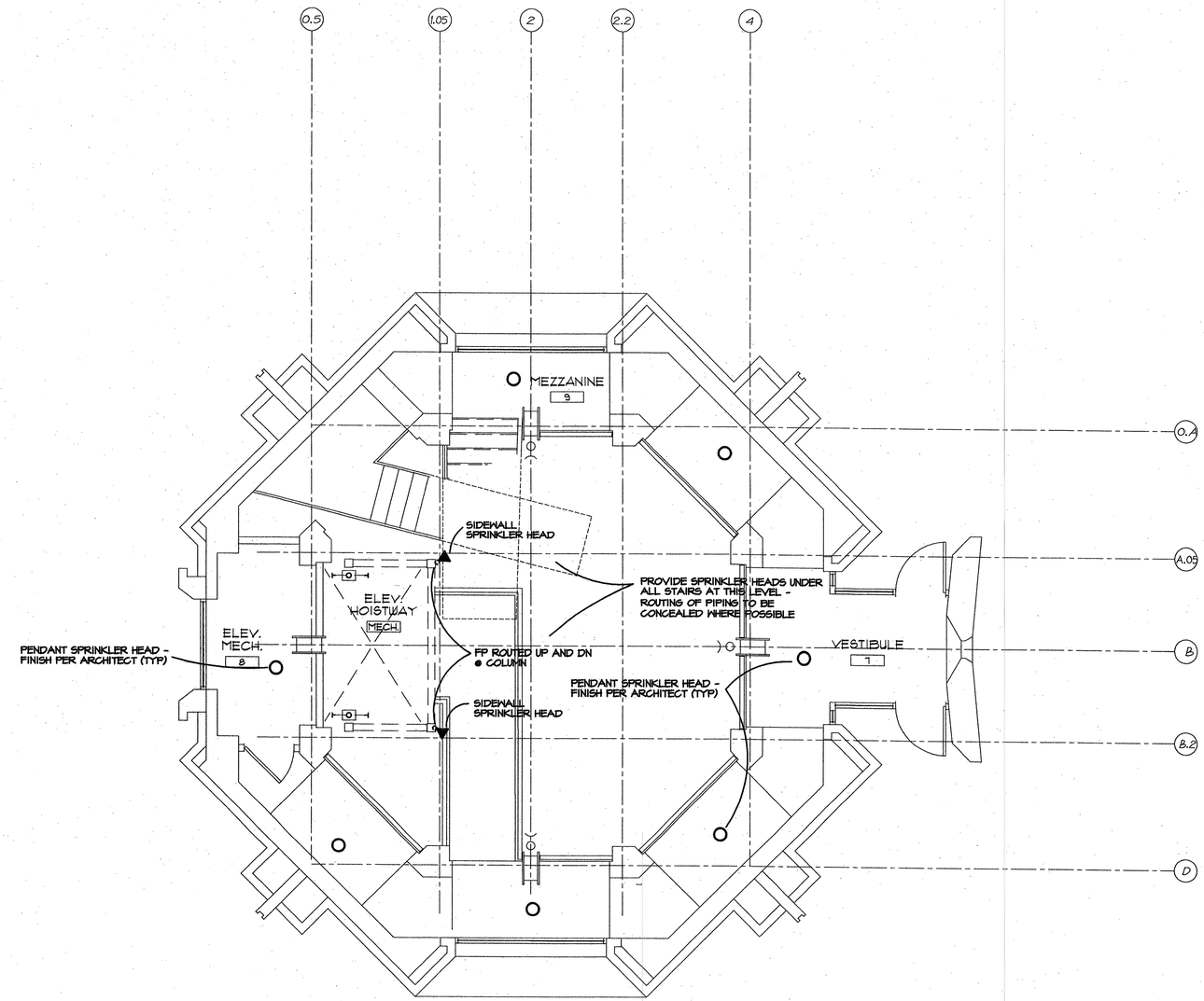

1 ENTRY FIRE PROTECTION PLAN
SCALE: 1/4" = 1'-0"

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FIRE PROTECTION PLAN AT ENTRY

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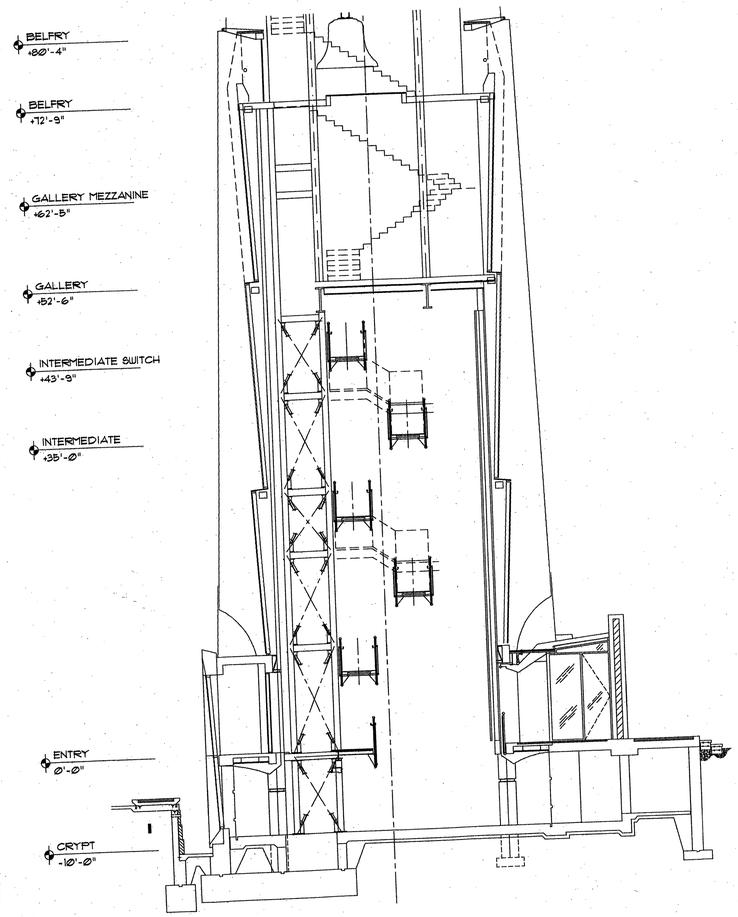

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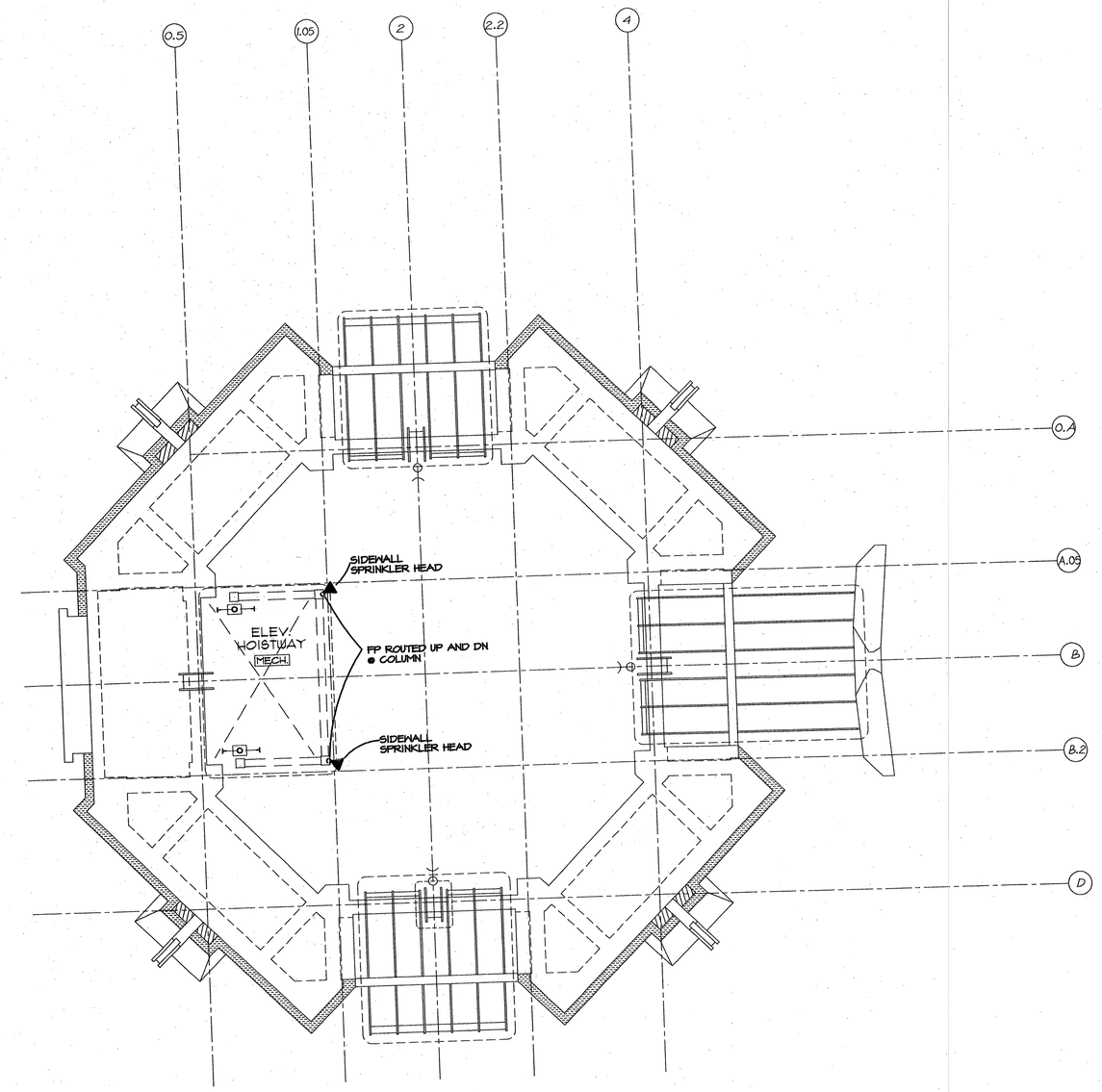

1 CLOISTER FIRE PROTECTION PLAN
SCALE: 1/4" = 1'-0"

NOTES:
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NAPERVILLE MILLENNIUM CARILLON

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FIRE PROTECTION PLAN AT CLOISTER

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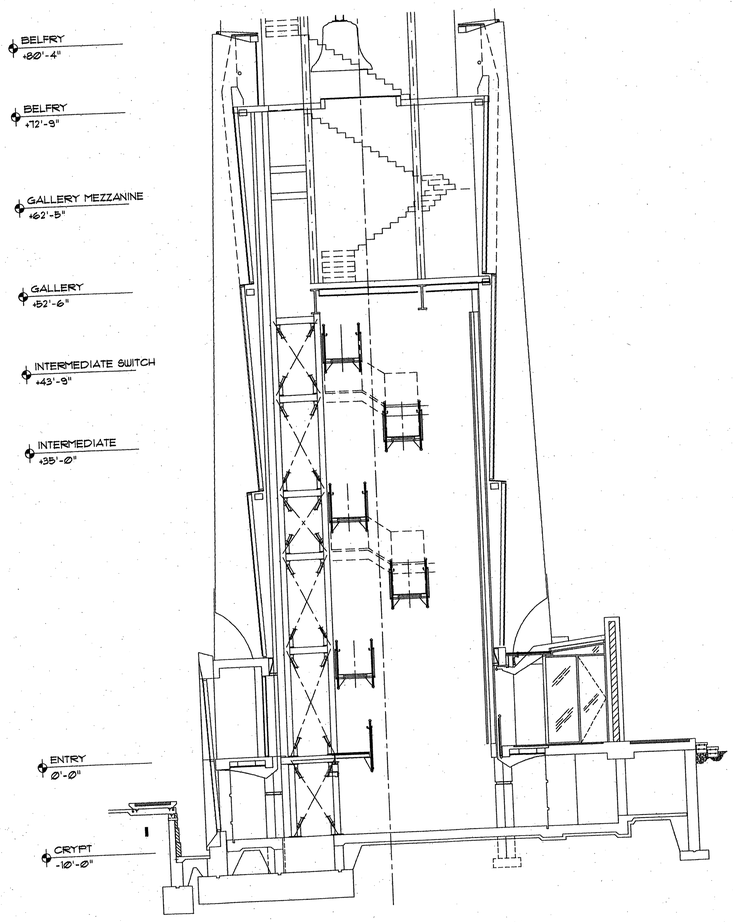

2 KEY SECTION
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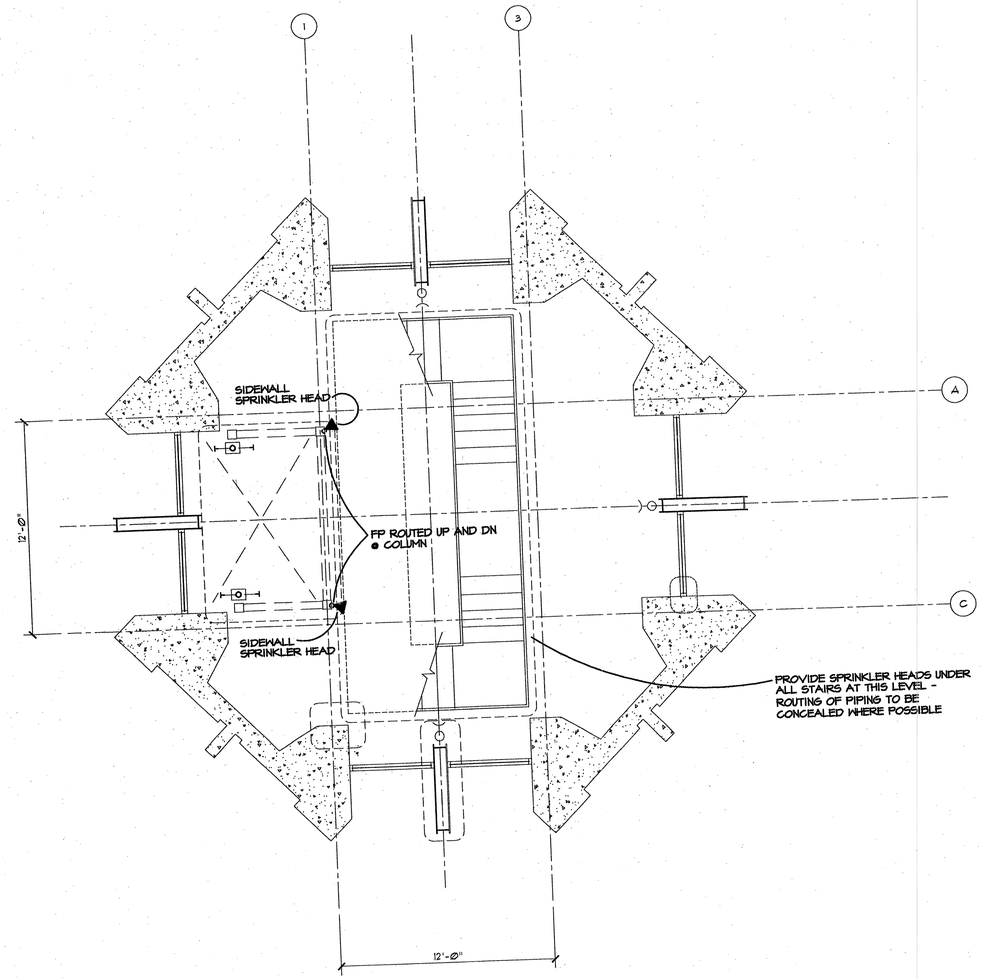

1 TOWER FIRE PROTECTION PLAN
SCALE: 1/4" = 1'-0"

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FIRE PROTECTION PLAN AT TOWER

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ILLINOIS

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DATE: 9/07/99	

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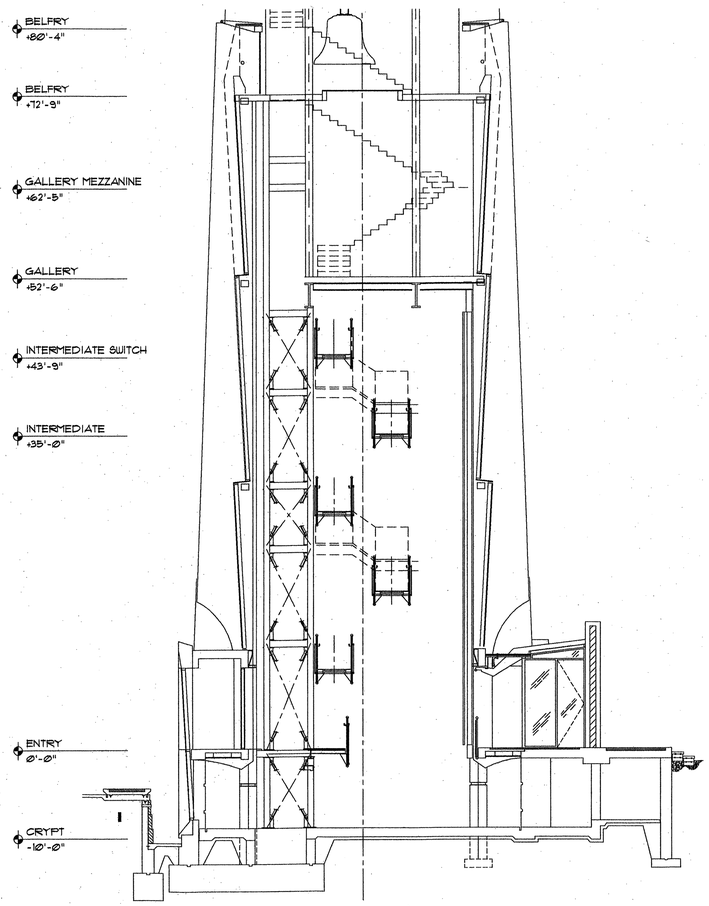

2 KEY SECTION
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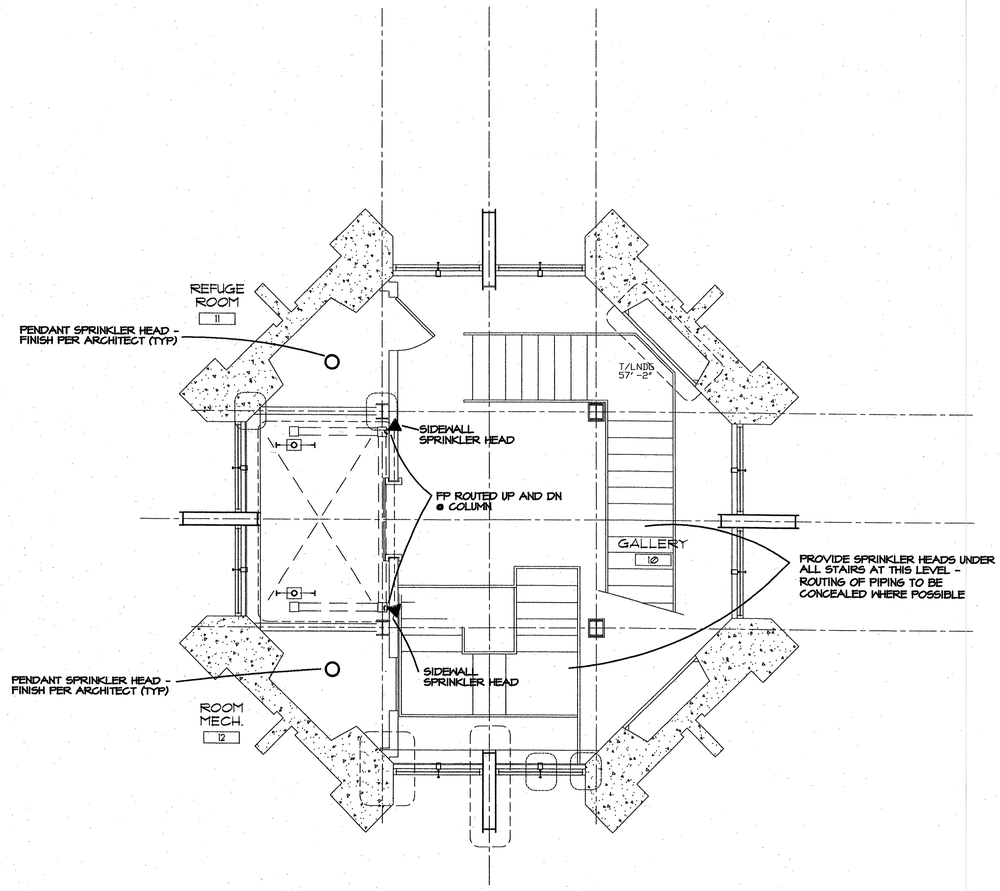

1 GALLERY FIRE PROTECTION PLAN
SCALE: 1/4" = 1'-0"

NOTES:
ISSUE FOR FOUNDATION PERMITS 7/6/99
ISSUE FOR PERMITS 9/07/99

NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

FIRE PROTECTION PLAN AT GALLERY

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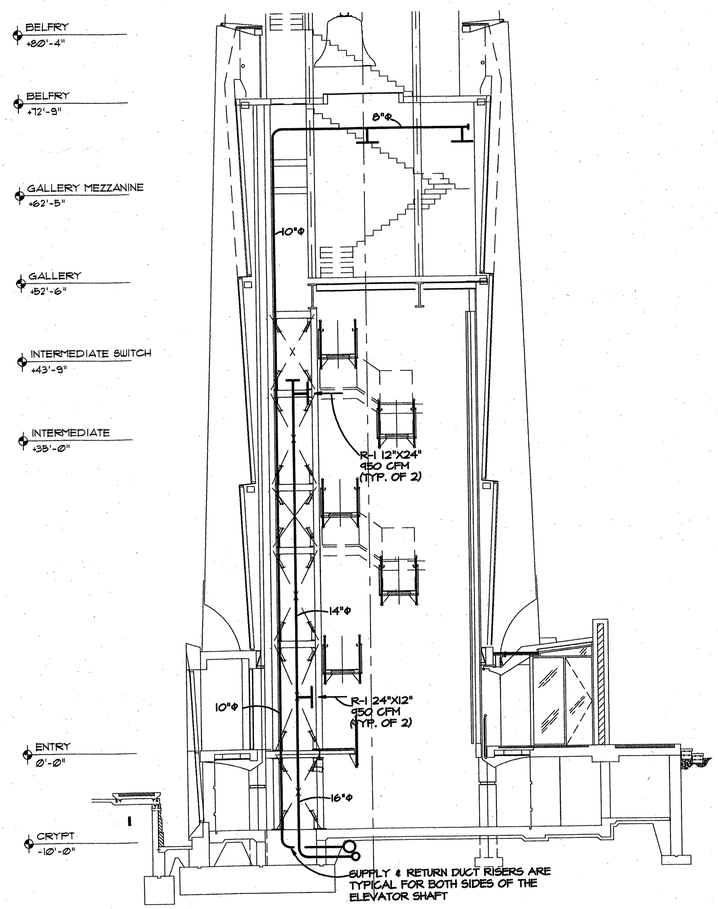

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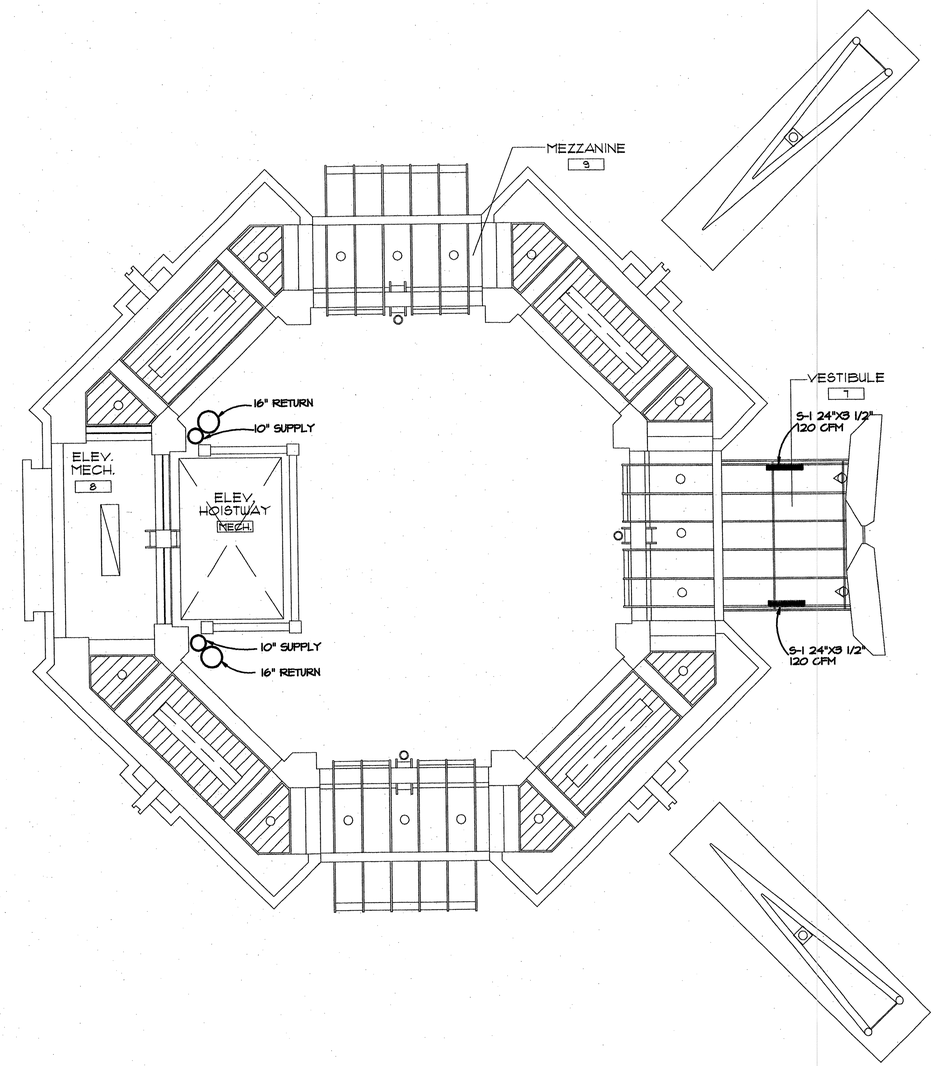

1 ENTRY MECHANICAL PLAN
SCALE: 1/4" = 1'-0"

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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

MECHANICAL AT ENTRY

PRINCIPAL: PC	M-2
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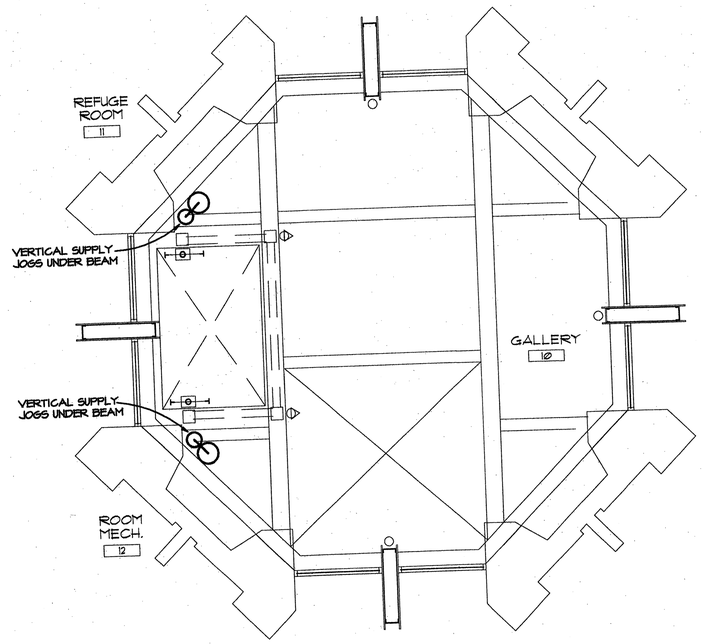

1 GALLERY MECHANICAL PLAN
SCALE: 1/4" = 1'-0"

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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

MECHANICAL AT GALLERY

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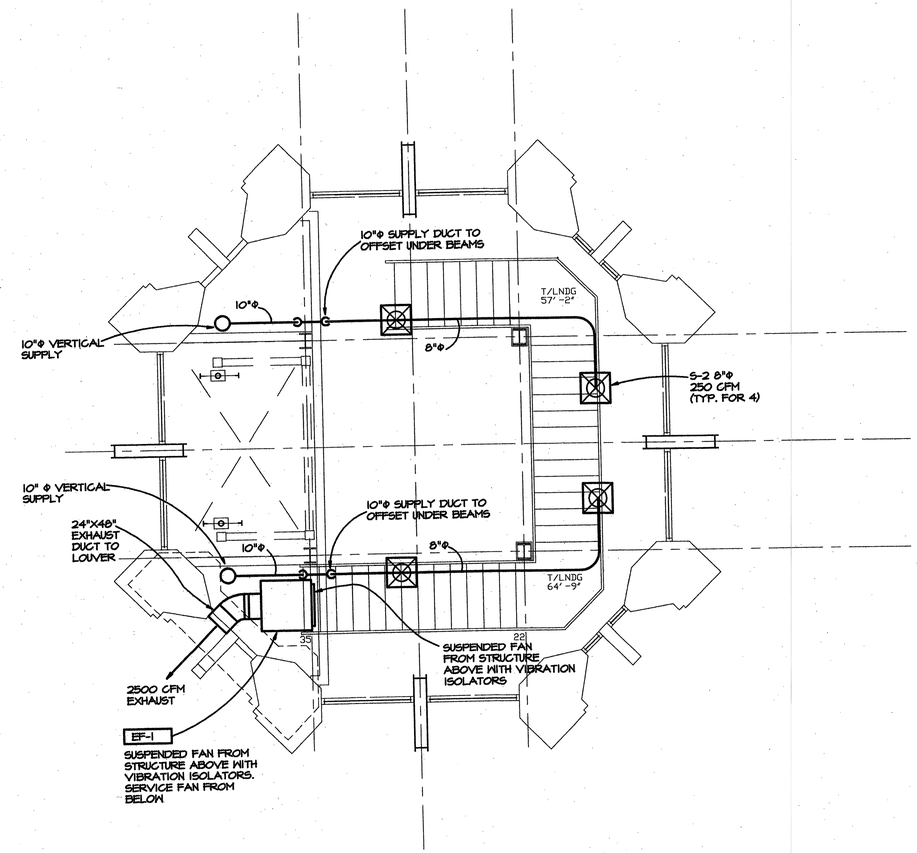

1 GALLERY MEZZANINE MECHANICAL PLAN
SCALE: 1/4" = 1'-0"

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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

MECHANICAL AT GALLERY MEZZANINE

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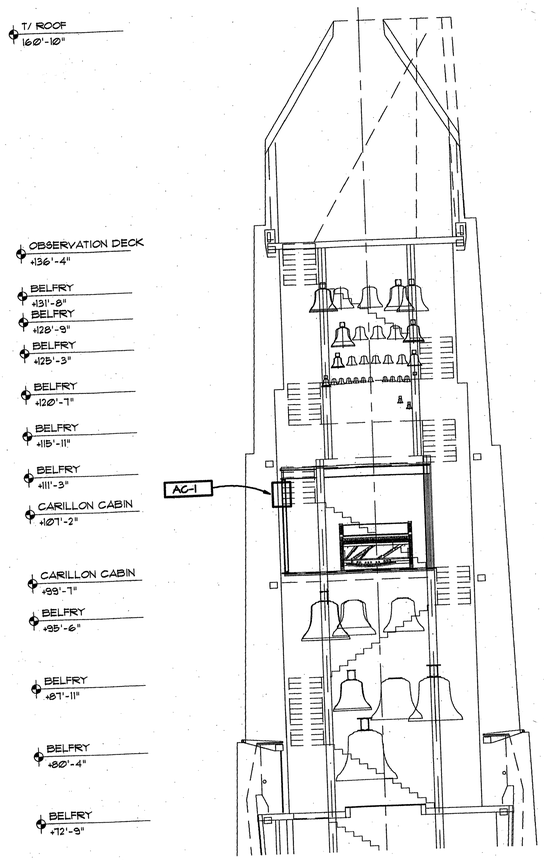

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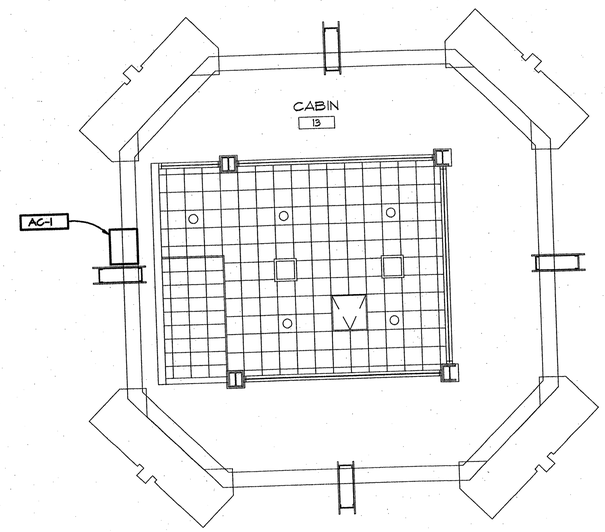

1 CABIN MECHANICAL PLAN
SCALE: 1/4" = 1'-0"

NOTES:
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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

MECHANICAL AT CABIN

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FAN SCHEDULE

A.D. AUTOMATIC TYPE DAMPER
M.D. MOTORIZED DAMPER
F.B.D. FABRIC BACK DRAFT DAMPER
T.S. TWO SPEED
W.C. WALL CAP
V.E.M. VIBRATION ELIMINATING MOUNT
C. SPECIAL COLOR

D.S. DISCONNECT SWITCH
B.S. BIRD SCREEN
B.O. BY OTHERS
B.D. BELT DRIVE
F.G. FAN GUARD
D.W. DUCTWORK

S.C.C. SOUND SONTROL CURB
P.F.C. PRE-FAB CURB
A.C. ACID COATING
D.D. DIRECT DRIVE
M.C. MOUNTING COLLAR
F.D. FIRE DAMPER
R.J. ROOF JACK

FAN NO.	MANUFACTURER & MODEL NO.	CFM	STATIC PRESSURE	FAN R.P.M.	MOTOR R.P.M.	H.P.	ELEC.	DAMPER TYPE	REMARKS
EF-1	ACME #DM12	2500	1/4"	657	1750	1/2	208/3Ø	A.D.	1, 2
EF-2	BROAN #HD80	80	1/8"	1200	1200	80W	120/1Ø	A.D.	3

NOTES:
1. INTERLOCK WITH "L-1" LOUVER DAMPER MOTOR.
2. CONTROL FROM SMOKE DETECTORS BY OTHERS.
3. INTERLOCK WITH LIGHT SWITCH.

LOUVER SCHEDULE

UNIT NO.	LOUVER USE	MFG. CAT. NUMBER	TOTAL CFM	SIZE H/V	FRAME	MAT'L	BLADE TYPE	SCREEN TYPE	FINISH	REMARKS
L-1	FRESH AIR	DOWCO	2500	30X42	FLANGE	ALUM.	DRAINABLE	MESH	STANDARD	NOTE #1
	INTAKE	#DWE-6								

NOTES:
1. WITH MOTORIZED DAMPER INTERLOCKED WITH EXHAUST FAN "EF-1".

GRILLE & REGISTER SCHEDULE

S SUPPLY
E EXHAUST
R RETURN
SG STRAIGHT GRID

AL ALUMINUM
ST STEEL
C SPECIAL COLOR
FD FIRE DAMPER

PT BAKED ENAMEL
P PRIME
AN ANODIZED
OBD OPPOSED BLADE DAMPER

GRILLE OR REGISTER NUMBER	MANUFACTURER & MODEL NO.	MOUNTING LOCATION	DISCHARGE DIRECTION	FINISH	ACCESSORY ITEMS	REMARKS
S-1	KRUEGER #1515	FLOOR	1 WAY	ALUM.	OBD	
S-2	KRUEGER #1400	CEILING	4 WAY	ST./WHITE	OBD	SURFACE MOUNT
S-3	KRUEGER #80H	DUCT	2 WAY	ST./WHITE	OBD	SURFACE MOUNT
R-1	KRUEGER	DUCT	------	ST./WHITE	OBD	SURFACE MOUNT

FAN COIL UNIT SCHEDULE

UNIT NO.	MANUFACTURER & MODEL NO.	BLOWER DATA CFM	BLOWER DATA R.P.M.	BLOWER DATA H.P.	COOLING CAPACITY TOTAL COOLING CAPACITY	COOLING CAPACITY SENS.	REFRIG. LIQ.	REFRIG. SUC.	ELECT. VOLT/PH/	UNIT WEIGHT	REMARKS
FC-1	CARRIER #FB4ANF	2000	------	3/4	60,000	51,000	3/8	7/8	208/1Ø	175 LBS.	WITH 10 KW ELECTRIC HEATER & FILTERS
FC-2	CARRIER #FB4ANF	2000	------	3/4	60,000	51,000	3/8	7/8	208/1Ø	175 LBS.	WITH 10 KW ELECTRIC HEATER & FILTERS

AIR-COOLED CONDENSING UNIT SCHEDULE

UNIT NO.	MANUFACTURER & MODEL NO.	UNIT SERVED	REFRIG.	COOLING CAPACITY	REFRIGERANT PIPE SIZE UNIT SUCT.	UNIT LIQ.	LINE SUCT.	LINE LIQ.	ELECTRICAL DATA VOLT/PH	FLA.	WEIGHT	REMARKS
CU-1	CARRIER #38CKC0605	FC-1	R-22	60,000	7/8	3/8	1 1/8	3/8	208/3	24.3	238 LBS.	WITH LOW AMBIENT CONTROL
CU-2	CARRIER #38CKC0605	FC-1	R-22	60,000	7/8	3/8	1 1/8	3/8	208/3	24.3	238 LBS.	WITH LOW AMBIENT CONTROL

ROOM AIR CONDITIONER SCHEDULE

UNIT NO.	MANUFACTURER & MODEL NUMBER	TOTAL COOLING	TOTAL HEATING	COOL AMPS	HEAT AMPS	VOLTAGE/ph/	REMARKS
AC-1	CARRIER #YHB243D	25,100	12,400	13.3	20.9	208/1Ø	MOUNT HIGH IN WALL BELOW CEILING

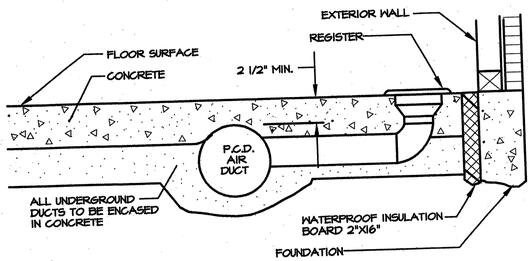
PACKAGED ROOF TOP HEATING/COOLING UNIT SCHEDULE

UNIT NO.	MFG.	MODEL	NOM. TONS	CFM	R.P.M.	S.P.	H.P.	ELEC. CHARC.	FLA	UNIT WEIGHT	REMARKS
RTU-1	CARRIER	#48TJF012	10	3800	984	2.0	3	208/3	30.6	1134	1,000 CFM MIN. FRESH AIR INTAKE AND EXHAUST.

COOLING / HEATING DATA

UNIT NO.	CFM	COMP TONS	NO. OF COMP.	TOTAL COOLING MBH	SENSIBLE COOLING MBH	GAS INPUT MBH	HEAT OUTPUT MBH	FILTERS	REMARKS
RTU-1	3800	5	2	118.9	84.8	250	200	THROWAWAY	

REMARKS:
1. PROVIDE 100% ECONOMIZER.
2. PROVIDE GAS COCK, DIRT LEG AND UNION.
3. PROVIDE PRE-FAB ROOF CURB.
4. PROVIDE THERMOSTAT AND SUBBASE WITH LOCKING COVER (7DAY PROGAMMABLE TYPE).
5. PROVIDE 2" THROWAWAY FILTERS.
6. PROVIDE CONDENSATE DRAIN PIPE TO NEAREST ROOF DRAIN.
7. PROVIDE FLEXIBLE CANVAS CONNECTIONS AT RETURN AND DISCHARGE DUCT CONNECTIONS.
8. PROVIDE BAROMETRIC RELIEF DAMPER SECTION WITH ECONOMIZER.
9. PROVIDE POWER EXHAUST FAN SECTION WITH ECONOMIZER.



DETAIL - TYPICAL UNDERGROUND P.C.D. DUCT

NOT TO SCALE

HVAC SPECIFICATIONS

THE GENERAL CONDITIONS AND SUPPLEMENTAL GENERAL CONDITIONS ISSUED BY THE ARCHITECT SHALL GOVERN WHERE APPLICABLE.

THIS CONTRACTOR SHALL THOROUGHLY FAMILIARIZE HIMSELF WITH THE PLANS AND SHALL VERIFY EXISTING SITE CONDITIONS AT THE JOB SITE BEFORE SUBMITTING BID. FAILURE TO RECOGNIZE WORK REQUIRED SHALL BE AT THE EXPENSE OF THIS CONTRACTOR. NO CONSIDERATION SHALL BE GIVEN FOR ADDITIONAL COMPENSATION AFTER THE LETTING OF BIDS.

ENTIRE INSALLATION SHALL BE PERFORMED IN A FIRST-CLASS WORKMANLIKE MANNER. THE COMPLETED SYSTEMS SHALL BE FULLY OPERATIONAL; ACCEPTANCE BY THE OWNER SHALL BE A CONDITION OF THE CONTRACT. ALL WORK SHALL BE COORDINATED WITH OTHER TRADES IN ORDER TO AVOID OMISSIONS. AL WORK SHALL CONFORM TO AL LOCAL CODES AND ORDINANCES.

THE DUCTWORK MATERIAL AND INSTALLATIOON SHALL BE IN ACCORD-AND WITH THE LATEST ASHREA GUIDE STANDARDS, SMACNA DUCT CONSTRUCTION STANDARDS AND THE NATIONAL FIRE PROTECTION ASSOCIATION. ALL SIZES SHOWN ARE NEM CLEAR INSIDE DIMEN-SIONS. ALL SHEET METAL DUCTWORK SHALL BE FURNISHED AND INSTALLED BY THE HVAC CONTRACTOR.

ALL SUPPLY AND RETURN DUCTWORK EXPOSED ON THE EXTERIOR OF THE BUILDING SHALL BE INSULATED INTERNALLY WITH 1" THICK 2 LB. DENSITY DUCT LINER AND ALL DUCT JOINTS AND SEAMS SHALL BE SEALED AIR AND WATER TIGHT.

ALL WORK TO BE COMPLETED AS PER DRAWINGS AND AS INDICATED.

REMOVE ALL DEBRIS FORM THE JOB SITE AND LEAVE ALL WORK AND EQUIPMENT IN A CLEAN WORKING CONDITION.

CONTRACTOR SHALL SUPPLY ALL CURBS, HANGERS, SUPPORTS, VALVES, ETC. FOR HIS WORK.

LAYOUT IS DIAGRAMATIC AND WORK SHALL BE INSTALLED TO MEET FIELD CONDITIONS AND EQUIPMENT SELECTEED. PROVIDE SHOP DRAWINGS AS REQUIRED AND VERIFY ALL EQUIPMENT.

EQUIPMENT SPECIFIED TO SET STANDARDS, INTENTION IS "OR EQUAL".

OBTAIN AND PAY FOR ALL PERMITS AND REQUIRED INSPECTION FEES.

IT SHALL BE THE RESPONSIBILITY OF THIS CONTRACTOR TO START-UP, ADJUST AND CHECK FOR PROPER OPERATION OF ALL EQUIPMENT INSTALLED UNDER HIS CONTRACT.

THIS CONTRACTOR SHALL ALLOW IN HIS INITIAL BID THE COST OF SERVICE ON ALL EQUIPMENT INSTALLED UNDER HIS CONTRACT FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF FINAL ACCEPTANCE OF THE WORK.

ALL TEMPERATURE CONTROL DEVICES AND WIRING IN CONDUIT, WHERE REQUIRED, PROVIDED AND INSTALLED TO MANUFACTURER'S RECOM-MENDATIONS BY HVAC CONTRACTOR.

INSTALL DAMPERS IN ALL SHEET METAL DUCT TEES AT ALL BRANCH TAKE-OFF FITTINGS. ALL FLEXIBLE DUCT SHALL NOT EXCEED 5'-0" IN LENGTH.

PROVIDE AN AIR BALANCE OF THE SYSTEMS BY AN INDEPEND-ENT TEST AND BALANCE CONTRACTOR AND SUBMIT TEST AND BALANCE REPORTS.

ALL OUTSIDE AIR INTAKES SHALL BE LOCATED A MINIMUM OF 10'-0" AWAY FROM EXHAUST, FLUES, VENTS, ETC.

HVAC CONTRACTOR SHALL FURNISH AND INSTALL ALL REFRIGERANT LINES (SUCTION AND LIQUID) AS INDICATED ON THE DRAWINGS. ALSO PROVIDE ALL MISCELLANIOUS REFRIGERANT PIPING, SUCH AS EQUAL-IZING LINES, RELIEF LINES, ETC., THAT MAY BE REQUIRED FOR A COMPLETE OPERATIONAL INSTALLATION. PROVIDE DOUBLE SUCTION RISERS AS ERQUIRED TO MAINTAIN A MINIMUM OF 1000 F.P.M. GAS VELOCITY DURING ALL PERIODS OF COMPRESSOR OPERATION. PROVIDE HOT GAS BYPASS PIPING AND VALVING WHEN NECESSARY FOR CAPACITY CONTROL.

REFRIGERANT PIPING SHALL BE YPE "L", ACTR, HARD COPPER. FITTINGS SHALL BE WROUGHT COPPER. ALL FITTINGS AND JOINTS SHALL BE BRAZED USING SILFOSS.

THE REFRIGERANT PIPE LINES SHALL BE SUPPORTED FREE FROM VIBRATION. ROOF SUPPORTS SHALL BE ROLLER TYPE, ARRANGED FOR THE PIPE COVERING TO EXTEND THROUGH THE SUPPORTS. PROVIDE FLEXIBLE CONNECTIONS AT THE CONDENSING UNIT/COMPRESSOR IN THE REFRIGENRANT.

THIS CONTRACTOR SHALL FURNISH AND INSTALLL A COMPLETE CHARGE OF REFRIGERANT AND OIL WITHOUT ADDITIONAL COST TO THE OWNER.

ALL MISCELLANEOUS REFRIGERANT VALVES, CONTROLS AND APPURTE-NANCES SUCH AS DRYERS, SUCTION LINE FILTERS, STRAINERS, EXPANSION VALVES, SOLENOID VALVES, SITE GLASSES, SHALL BE FURNISHED BY THE HVAC CONTRACTOR AS PER THE UNIT MANUFAC-TURER'S RECOMMENDATIONS.

REFRIGERANT PIPING SHAL BE INSULATED WITH 3/4" ARMSTRONG ARMAFLEX INSULATION INSTALLED AS PER MANUFACTURER'S RECOMMEN-DATIONS. ALL JOINTS AND SEAMS SHALL BE SEALED. INSULATION SHALL BE WEATHERPROOF AND WATER TIGHT. REFRIGERATION PIPING INSTALLATION SHALL MEET ALL A.S.H.R.A.E. RECOMMENDATIONS.

DUCT CONSTRUCTION AND INSTALLATION STANDARDS ARE TO INDICATE COMPIANCE TO SMACNA-95 STANDARDS.

ALL CONSTRUCTION DOCUMENTS, INSTALLATION MANUALS, MANUFACTURER'S CATALOG CUT SHEETS ARE TO BE PROVIDED ON SITE AT TIME OF INSPECTIONS. ALL MATERIALS AND EQUIPMENT ARE TO BE LISTED AND LABELED AND SUITABLE FOR USE.

PROVIDE EQUIPMENT SCHEDULE.

SMOKE CONTROL EXHAUST FAN "EF-1" AND INTAKE LOUVER "L-1" SHALL BE CONTROLLED FROM A MANUAL TOGGLE SWITCH, SMOKE DETECTORS OR BY THE AUTOMATIC SPRINKLER SYSTEM.

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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

MECHANICA SCHEDULES DETAILS & SYMBOLS

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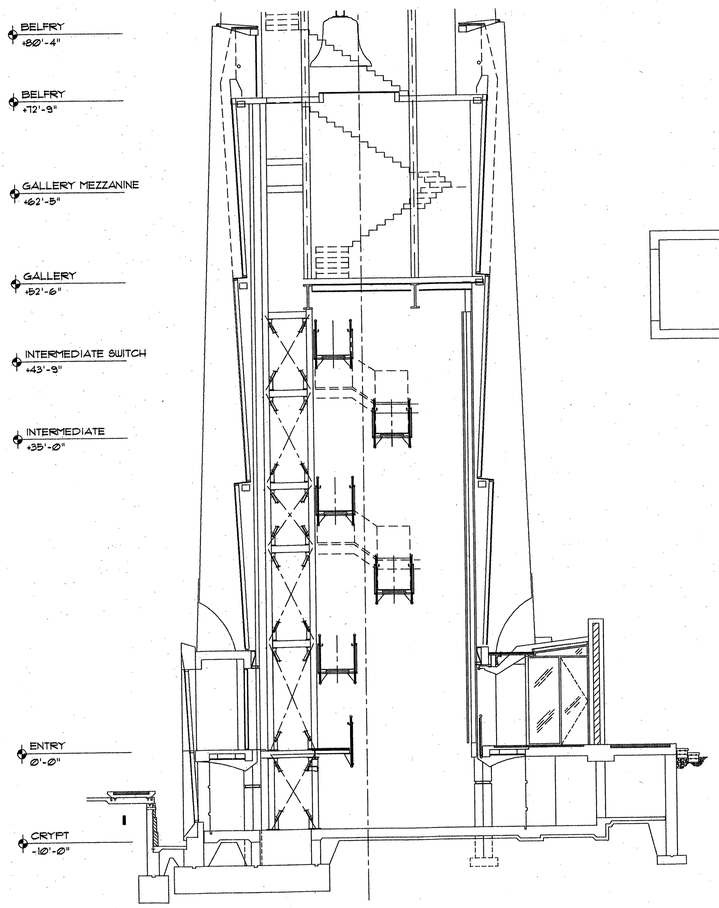

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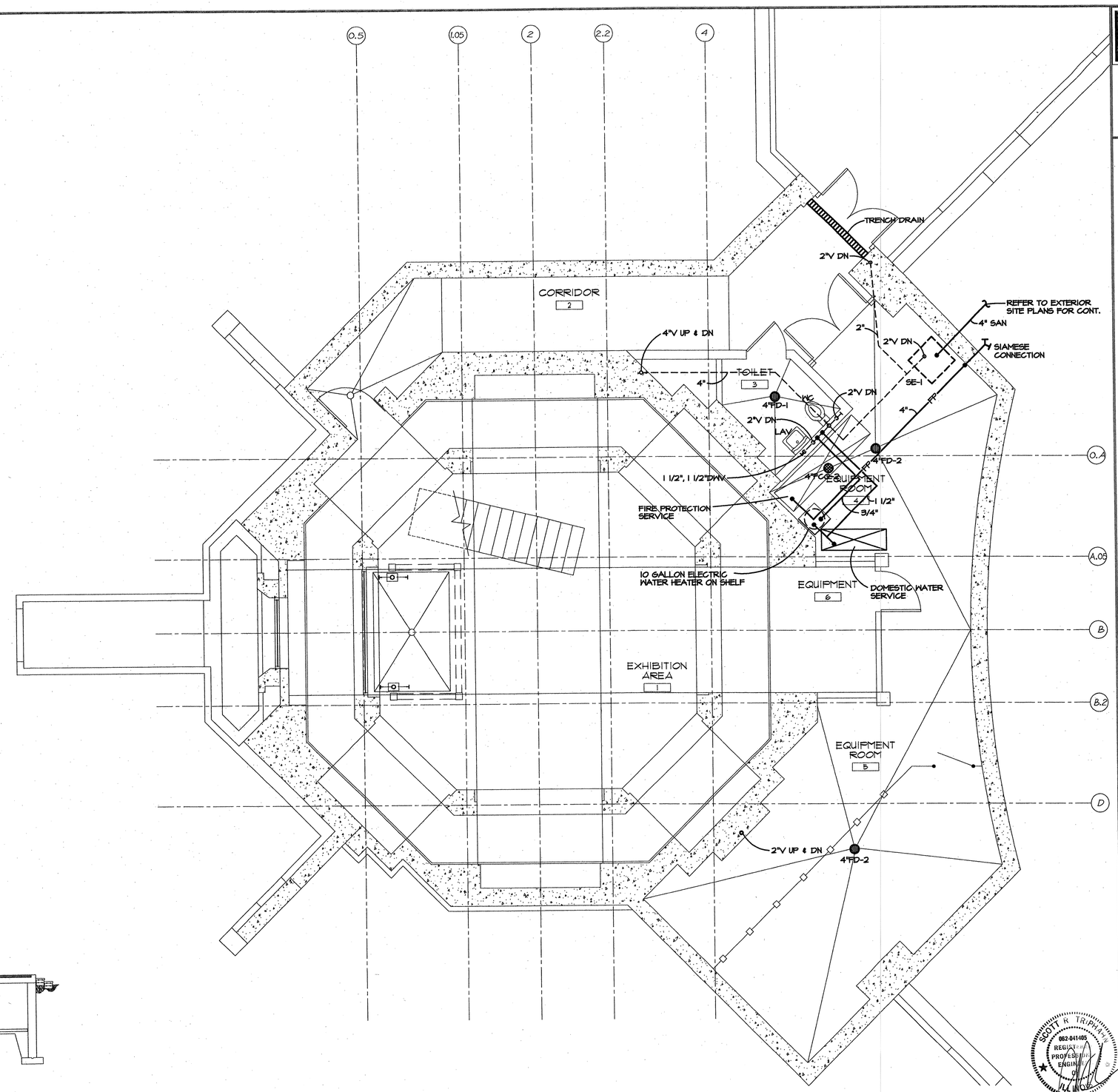

1 LOWER LEVEL PLUMBING PLAN
SCALE: 1/4" = 1'-0"

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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

PLUMBING PLAN

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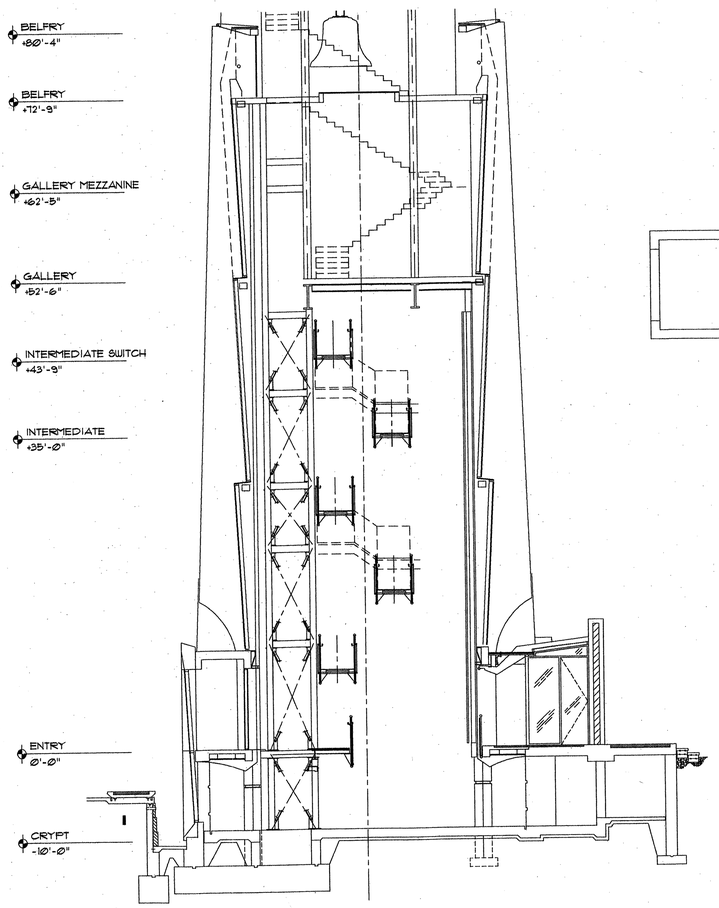

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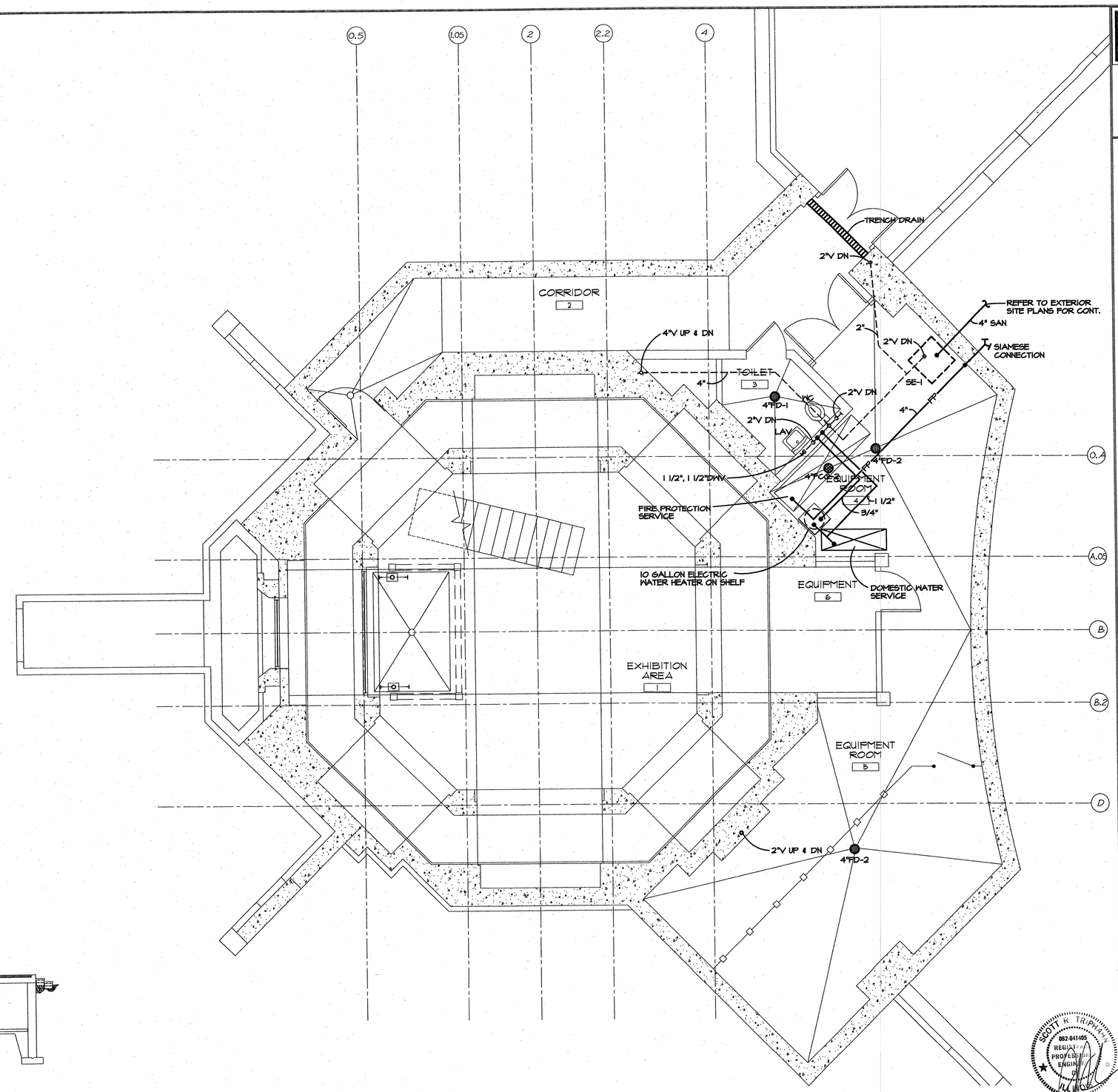

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PLUMBING PLAN

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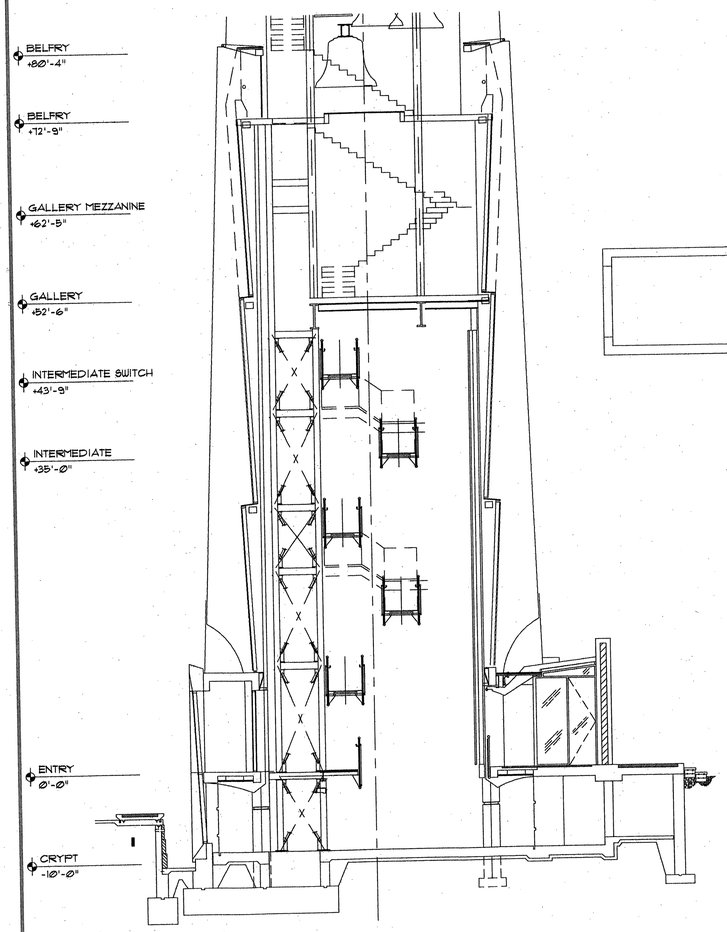

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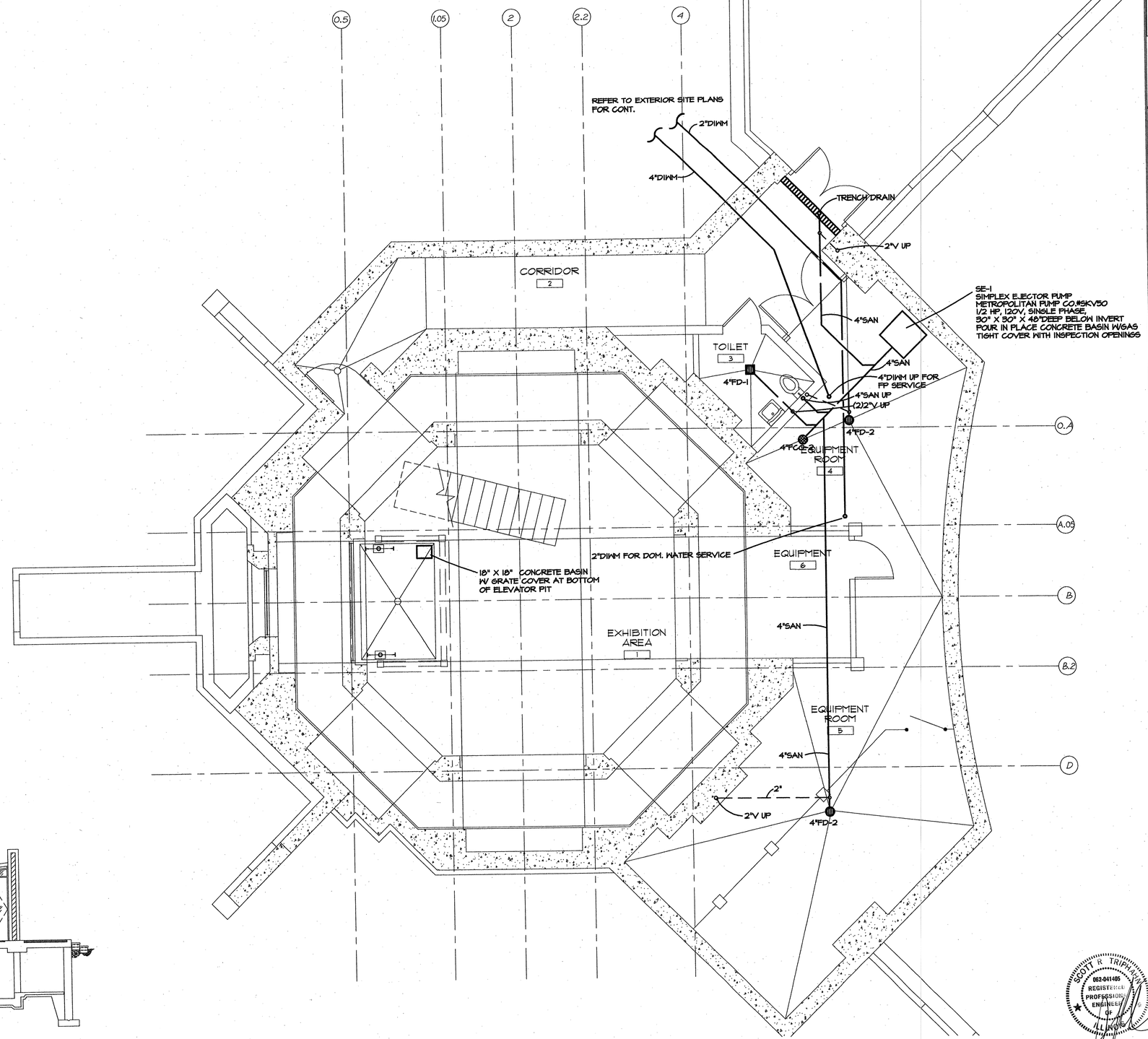

1 LOWER LEVEL UNDERGROUND PLUMBING PLAN
SCALE: 1/4" = 1'-0"

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NOTES:
ISSUE FOR FOUNDATION PERMITS 7/6/99
ISSUE FOR PERMITS 9/07/99

NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

UNDERFLOOR PLUMBING PLAN

SCOTT R TRIPLETT
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DATE: 9/07/99	

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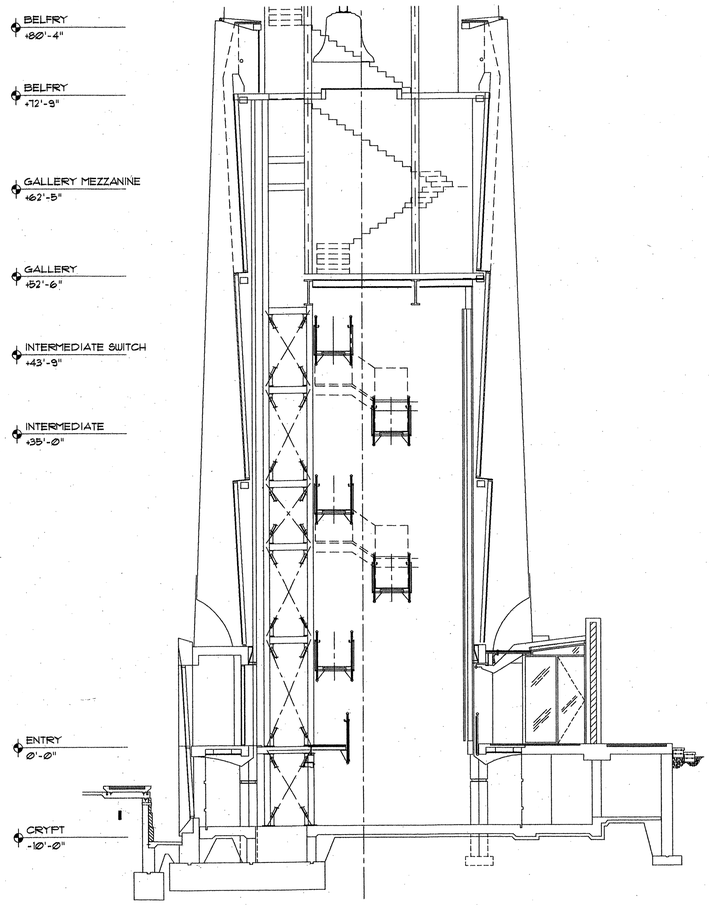
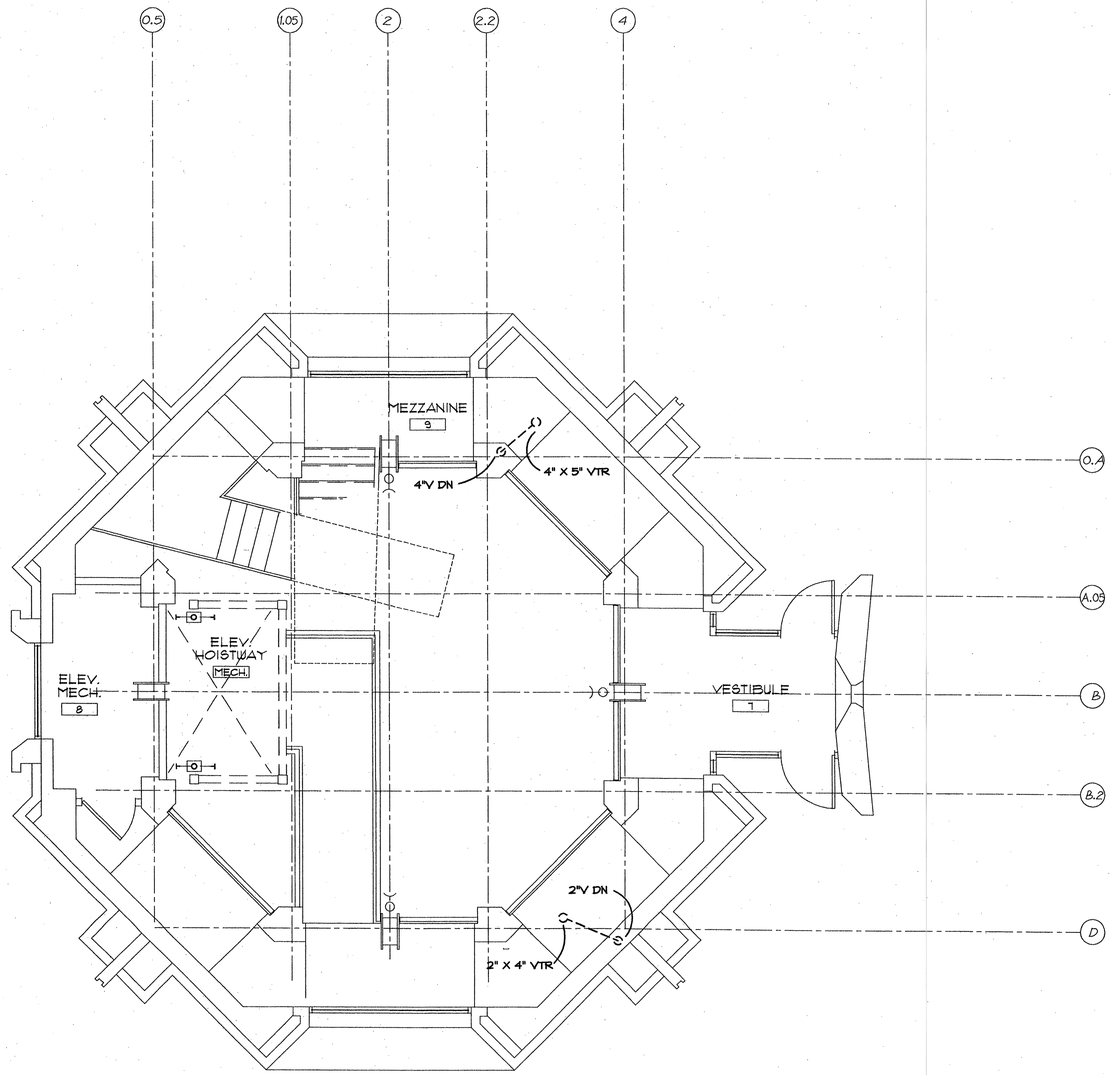


2 KEY SECTION
SCALE: 1/8" = 1'-0"



1 ENTRY PLUMBING PLAN
SCALE: 1/4" = 1'-0"

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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

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PLUMBING PLAN AT ENTRY

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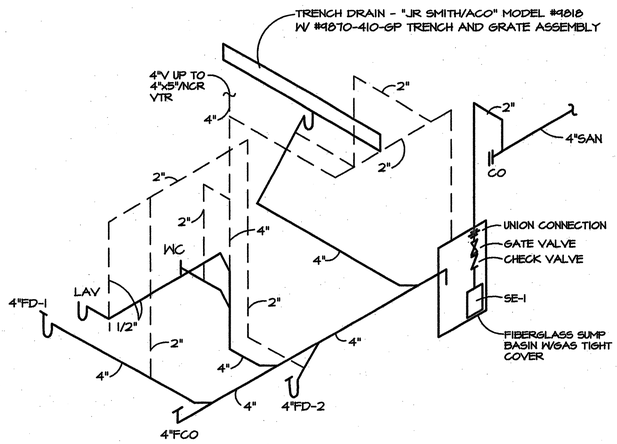

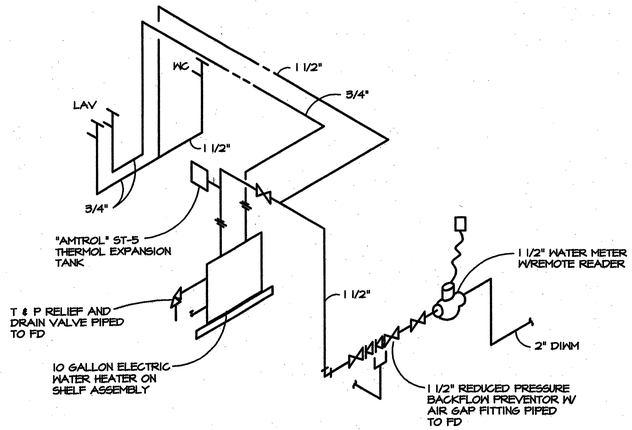

SUPPLY AND WASTE PIPING RISER DIAGRAM

PLUMBING SPECIFICATIONS

THE GENERAL CONDITIONS AND SUPPLEMENTAL GENERAL CONDITIONS ISSUED BY THE ARCHITECT SHALL GOVERN WHERE APPLICABLE.

THIS CONTRACTOR SHALL THOUROUGHLY FAMILIARIZE HIMSELF WITH THE PLANS AND SHALL VERIFY EXISTING SITE CONDITIONS AT THE JOB SITE BEFORE SUBMITTING BID. FAILURE TO RECOGNIZE WORK REQUIRED SHALL BE AT THE EXPENSE OF THIS CONTRACTOR. NO CONSIDERATION SHALL BE GIVEN FOR ADDITIONAL COMPENSATION AFTER THE LETTING OF BIDS.

ENTIRE INSTALLATION SHALL BE PERFORMED IN A FIRST-CLASS WORKMANLIKE MANNER. THE COMPLETED SYSTEMS SHALL BE FULLY OPERATIONAL; ACCEPTANCE BY THE OWNER SHALL BE A CONDITION OF THE CONTRACT. ALL WORK SHALL BE COORDINATED WITH OTHER TRADES IN ORDER TO AVOID INTERFERENCES,, PRESERVE MAXIMUM HEADROOM, AND AVOID OMISSIONS.

CONTRACTOR TO MAKE ALL NECESSARY TAPS, AS CALLED FOR ON THE DRAWINGS.

ALL WORK SHOWN OR INDICATED ON THE PLAN SHALL BE LEFT CLEAN AND IN FULL OPERATING CONDITION FULLY TESTED.

THIS CONTRACTOR SHALL REMOVE ALL DEBRIS ON COMPLETION OF THE JOB AND CLEAN ALL FIXTURES.

COVER ALL HOT AND COLD LINES. PIPE COVERING SHALL BE 1" THICK - 3-1/2 LB. DENSITY FIBERGLASS WITH MOLDED FITTINGS AND BUTT JOINTS AND VAPOR BARRIER.

IT SHALL BE THE RESPONSIBILITY OF THIS CONTRACTOR TO START UP, ADJUST AND CHECK FOR PROPER OPERATION ALL EQUIPMENT INSTALLED UNDER HIS CONTRACT.

THIS CONTRACTOR SHALL ALLOW IN HIS INITAL BID THE COST OF SERVICE ON ALL EQUIPMENT INSTALLED UNDER HIS CONTRACT FOR A PERIOD OF ONE (1) YEAR TO DATE OF FINAL ACCEPTANCE OF THE WORK.

ALL WATER PIPING SHALL BE TESTED WITH WATER UNDER PRESSURE OF 150 PSI, AND MADE TIGHT AT THIS PRESSURE.

ALL SOIL, WASTE AND VENT PIIPNG SHALL BE SUBJUCTED TO A HYDROSTATIC TEST OF NOT LESS THAN 10 FEET OF WATER COLUMN, AND PROVEN TIGHT.

BEFORE TURNING PLUMBING SYSTEM OVER TO THE OWNER, CHLORINATE ALL DOMESTIC WATER PIPING FOR A PERIOD OF 24 HOURS. AFTER SHLORINATION HAS BEEN COMPLETED, FLUSH ALL PIPING UNTIL WATER RUNS CLEAR AND IS RESIDUAL CHLORINE FREE.

ALL ABOVE GROUND WASTE PIPING SHALL BE SERVICE WEIGHT CAST IRON OR TYPE "L" COPPER FOR DRAINAGE SYSTEM.
ALL ABOVE GROUND WATER PIPING SHALL BE COPPER TYPE "L" COPPER. ALL VENT PIPING 3" AND SMALLER SHALL BE TYPE "L" COPPER FOR DRAINAGE SYSTEM.

ALL FIXTURES SHALL HAVE A MINIMUM 12" LENGTH AIR CHAMBERS ON THE BRANCHES AND 24" LENGTH ON RISERS.

ALL PLUMBING WORK TO CONFORM TO THE LATEST STATE OF ILLINOIS PLUMBING CODE REQUIREMENTS.

PROVIDE SHOP DRAWINGS OF ALL PLUMBING FIXTURES AND EQUIPMENT.

ANY MINOR CHANGES IN LOCATION OF PIPING AND EQUIPMENT FROM THOSE SHOWN ON THE DRAWINGS SHALL BE MADE WITHOUT CHARGE IF SO DIRECTED BY THE ARCHITECT/OWNER BEFORE INSTALLATION.

PROVIDE DIELECTRIC FITTINGS BETWEEN DISSIMILIAR PIPING MATERIALS.

ALL FIXTURES SHALL BE NEW AND FREE FROM FLAWS OR BLEMISHES. ALL FINISHED SURFACES SHALL BE CLEAR, SMOOTH AND BRIGHT AND GUARANTEED NOT TO CRAZE, DISCOLOR, OR SCALE. ALL FIXTURES, INCLUDING FAUCETS, ESCUTHEONS, WASTES, STRAINERS, TRAPS, SUPPLIES, \STOPS, ETC., SHALL BE HEAVILY CHROME PLATED.

ALL FIXTURES AND EQUIPMENT SHALL BE SUPPLIED AND MANUFACTURED AS NOTED IN THE "PLUMBING FIXTURE AND EQUIPMENT SCHEDULE". NO SUBSTITUTIONS WILL BE ALLOWED TO THE FIXTURES AND EQUIPMENT NOTED UNLESS PRIOR APPROVAL IS GIVEN BY ARCHITECT/OWNER.

PLUMBING SYMBOLS

SYMBOLS APPLY WHERE APPLICABLE

	COLD WATER PIPING (INSULATED)
	HOT WATER PIPING (INSULATED)
	UNDERGROUND SEWER
	SUSPENDED SEWER
V	VENT PIPING
	UNION
CO	CLEANOUT PLUG
WCO	WALL CLEANOUT PLUG ("SMITH" # 4422)
FCO-1	FLOOR CLEANOUT ("SMITH" # 4040)
FCO-2	FLOOR CLEANOUT ("SMITH" # 4020)
FD-1	FLOOR DRAIN ("SMITH" # 2010B-NB)
FD-2	FLOOR DRAIN ("SMITH" # 2210)
FD-3	FLOOR FUNNEL DRAIN ("SMITH" # 3510-F11)
RD	ROOF DRAIN ("SMITH" # 1010-C)
GV	GATE VALVE ("NIBCO" #T-131)
BV	BALL VALVE ("NIBCO" #580-70)
CV	CHECK VALVE ("NIBCO" #433)
BFP	BACKFLOW PREVENTER
SC	FROSTPROOF SILLCOCK ("SMITH" # 5509-QT)
HB	HOSE BIBB ("SMITH" #5609-QT-SAP)
	CONNECT TO EXISTING
SAN	INDICATES SANITARY SEWER
ST	INDICATES STORM SEWER
EX	INDICATES EXISTING

FIXTURE SCHEDULE

WC-1 WATER CLOSET, FLOOR MOUNTED, FLUSH VALVE (HANDICAP) "CRANE" #3-701 1.5 GPF, HYMONT, WATER ECONOMY, SIPHON JET, ELONGATED RIM, "SLOAN-ROYAL" #111 QUIET EXPOSED FLUSH VALVE, TWO BOLT CAPS, SOLID PLASTIC OPEN FRONT SEAT EQUAL TO "CENTOCO" #1500CCSS.

LAV-1 LAVATORY WALL HUNG (HANDICAP) "CRANE" 1-412-V HARWICH VITREOUS CHINA LAVATORY, "SYMMONS" #S-60-H SLOW-CLOSING FAUCET ASSEMBLY WITH "MCGUIRE" #PM-2125-WC PROWRAP ASSEMBLY WITH OFFSET DRAIN WITH STRAINER, 1/2" SUPPLIES WITH STOPS AND 1-1/2"C.P. "P" TRAP WITH CLEANOUT ASSEMBLY "SMITH" #100 LAVATORY SUPPORT.

WH-1 ELECTRIC WATER, "STATE" MODEL P6-10-10MS-K UNIT, 10 GALLON, 1650 WATTS ELECTRIC INPUT, 120 VOLT, SINGLE PHASE, A RECOVERY RATE OF 8 GPH AT 90 DEGREES F. TEMPERATURE RISE WITH PRESSURE AND TEMPERATURE RELIEF VALVE. UNIT TO BE SET ON SHELF ASSEMBLY.

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NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

PLUMBING DETAILS & NOTES

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PRINCIPAL: PC	P-3
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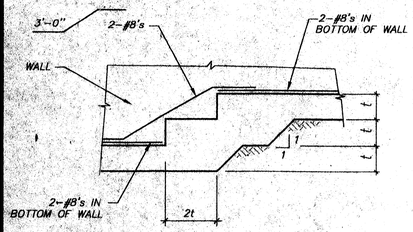
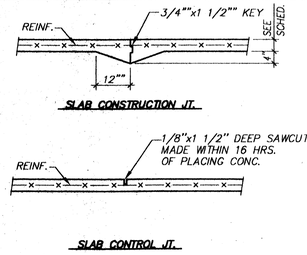
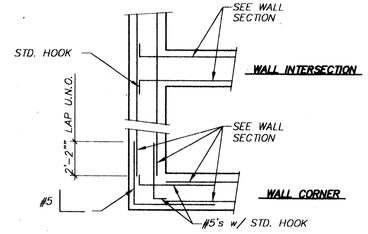


STEPPED FOOTING DETAIL



TYPICAL SLAB DETAILS



TYPICAL WALL REINFORCING DETAILS

FOOTING SCHEDULE

MARK	DESCRIPTION	REINFORCING EACH WAY	REMARKS
F1	7'-0 x 7'-0 x 3'-0	11 #7	11 #10 DOWELS LAP 36 db
F2	4'-6 x 4'-6 x 2'-0	11 #4	4 #9 DOWELS LAP 36 db

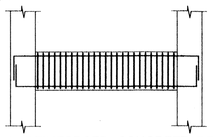
COLUMN SCHEDULE

MARK	SIZE	VERT. REINF.	TIES	REMARKS
C1	SEE PLAN DETAIL 1 ON THIS SHEET			
C2	24" x 14"	4 #9	#3 AT 10"	

SLAB SCHEDULE

MARK	DEPTH	TOP REINF. (EA. WAY)	BOT. REINF. (EA. WAY)	REMARKS
S1	12"	#4 @ 12"	#4 @ 12"	SLAB ON GRADE/WATERSTOP
S2	5"	WWF6x6 – W2.9xW2.9 (T.& B.)		SLAB ON GRADE
S3	6"	#4 @ 8"	#4 @ 8"	1" RECESSES, SEE ARCH. DWGS.
S4	6"	#4 @ 8"	#4 @ 8"	
S5	10"	#5 @ 12"	#6 @ 10"	AT EXTERIOR

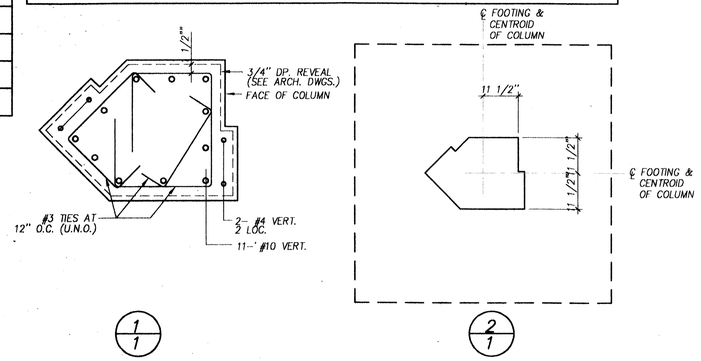
BEAM SCHEDULE & DETAIL

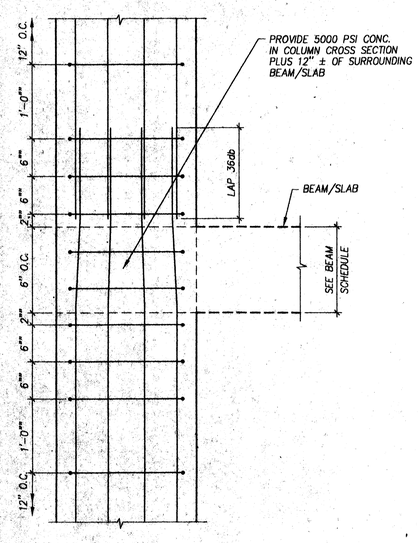


TYPICAL REINFORCED CONCRETE BEAM

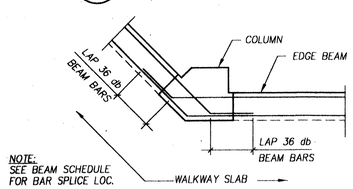
BEAM MARK	SIZE W x D		STEEL REINFORCEMENT					REMARKS
			TOP BAR	BOT. BAR	STIRRUPS			
					SIZE	SHAPE	SPACING	
B1	12"	14"	2 #7	2 #7	# 3		6" O.C.	
B2	12"	24"	2 #9	2 #9	# 3		6" O.C.	
B3	30"	20"	3 #7	3 #7	# 3		6" O.C.	

NOTE: IF SPLICE IS REQUIRED, LAP TOP BARS AT MIDSPAN AND LAP BOTTOM BARS AT ENDS.

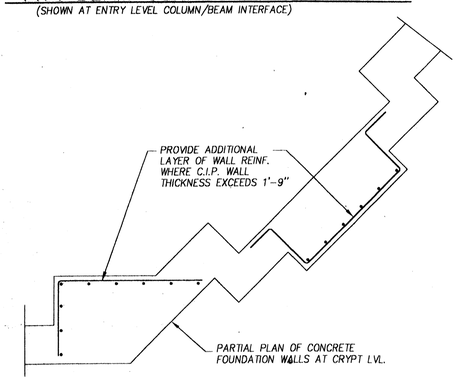




TYP. C.I.P. CONC. COLUMN SPLICE



TYP. BEAM CORNER BAR DETAIL
(SHOWN AT ENTRY LEVEL COLUMN/BEAM INTERFACE)



TYP. WALL REINFORCEMENT DETAIL

GENERAL NOTES

DESIGN DATA

1. DESIGN IS IN ACCORDANCE WITH THE BOCA NATIONAL BUILDING CODE, 1996 EDITION.
2. DESIGN LIVE LOADS:
   STAIRS/PUBLIC ACCESS – 100 PSF
   WIND – 75 MPH, EXPOSURE B – MAIN RESISTING SYSTEM
   EXPOSURE C – CLADDING
3. NOTIFY ARCHITECT IMMEDIATELY OF ANY CONFLICTS IN DIMENSIONS OR FIELD CONDITIONS THAT ARE NOT SHOWN ON THESE PLANS.
4. GENERAL CONTRACTOR SHALL REVIEW AND APPROVE ALL SHOP DRAWINGS FOR DIMENSIONS, COLUMN LOCATIONS, BEAM ELEVATION, AND FLOOR ELEVATIONS.
5. DO NOT SCALE DRAWINGS.

SOIL CONDITIONS

1. ALL FOOTINGS SHALL BE SUPPORTED ON WEATHERED LIMESTONE HAVING A NET SAFE BEARING PRESSURE AS SPECIFIED IN THE SOIL REPORT. OWNER'S SOIL TESTING AGENCY SHALL VERIFY SOIL BEARING VALUES IN THE FIELD PRIOR TO PLACEMENT OF CONCRETE.
2. FOR SOIL DATA, BORING LOGS, AND GEOTECHNICAL RECOMMENDATIONS, REFER TO THE SOIL REPORT PREPARED BY APPLIED SOIL MECHANICS, INC. DATED JUNE 9, 1999.
3. UNDER ALL GRADE SLABS PROVIDE 4" OF GRANULAR MATERIAL, COMPACTED TO A MINIMUM OF 90% OF RELATIVE DENSITY PER ASTM D1557.
4. DO NOT BACKFILL FOUNDATION WALLS UNTIL THE ENTRY LEVEL FLOOR DECK IS INSTALLED.

CONCRETE AND REINFORCING

1. ALL CONCRETE WORK, REINFORCING BAR FABRICATION AND PLACEMENT SHALL BE IN ACCORDANCE WITH ACI 301–89.
2. ALL CONCRETE SHALL BE NORMAL WEIGHT (150 PCF) AND HAVE 28 DAY COMPRESSIVE STRENGTH (f'c) AS FOLLOWS:
   FOOTINGS AND WALLS 4000 PSI
   BEAMS AND SLABS 4000 PSI
   COLUMNS 5000 PSI
   FILL ON COMPOSITE METAL DECK 4000 PSI
   CONCRETE FOR EXTERIOR WALKS, DRIVES, SLABS AND CURBS SHALL CONTAIN 6% AIR ENTRAINMENT.
3. ALL REINFORCING STEEL TO BE A615–GRADE 60 (MINIMUM YIELD – 60,000 PSI).
4. UNLESS NOTED, PROVIDE THE FOLLOWING CONCRETE PROTECTION FOR REINFORCING BARS:
   3" CL FOR CONCRETE DEPOSITED AGAINST GROUND.
   2" CL FOR FORMED CONCRETE EXPOSED TO SOIL OR WEATHER.
   CONCRETE NOT EXPOSED TO SOIL OR WEATHER:
   3/4" CL CONCRETE SLABS
   1" CL CONCRETE WALLS
   1 1/2" CL CONCRETE BEAMS AND COLUMNS
5. REINFORCE GRADE SLABS WITH WWF 6X6 – W2.9 X W2.9 (MEETING THE REQUIREMENTS OF ASTM A185–72) UNLESS NOTED OTHERWISE AND LAP 6"" WHERE REQUIRED.
6. LAP REINFORCING BARS 36 BAR DIAMETERS UNLESS OTHERWISE NOTED.

PRECAST CONCRETE

1. DESIGN, MANUFACTURE AND ERECT PRECAST CONCRETE WALL PANELS TO COMPLY WITH THE BUILDING CODE, ACI 318–95 AND THE PCI DESIGN HANDBOOK (4th ED.).
2. THE STRUCTURAL DESIGN OF THE PRECAST CONCRETE PANELS SHALL BE PERFORMED BY A STRUCTURAL ENGINEER LICENSED BY THE STATE OF ILLINOIS. SUBMIT SEALED CALCULATIONS TO THE ARCHITECT FOR REVIEW.

STRUCTURAL STEEL

1. MATERIAL REQUIREMENTS

	ASTM	FY (PSI)
W–SHAPES	A–992	50,000
CHANNELS, ANGLES, PLATES	A–36	36,000
STRUCTURAL TUBES AND PIPE (GRADE B)	A–500	46,000
THREADED FASTENERS	A–325	92,000
ANCHOR BOLTS	A–36	36,000
HEADED STUDS	A–108	50,000
WELDING ELECTRODES	A–233	E70XX

2. DETAIL, FABRICATE AND ERECT STRUCTURAL STEEL IN ACCORDANCE WITH AISC "SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS" AND AISC "CODE OF STANDARD PRACTICE".
3. WELD OR BOLT SHOP CONNECTIONS. BOLT FIELD CONNECTIONS UNLESS NOTED.
4. FOR CONNECTIONS NOT SHOWN ON THE DRAWINGS, PROVIDE STANDARD FRAMED BEAM CONNECTIONS PER TABLE I AND TABLE II (CASE I) OF THE AISC MANUAL OF STEEL CONSTRUCTION (1980 EDITION), WITH A MINIMUM CAPACITY OF 60 PERCENT OF THE LOAD LISTED IN AISC UNIFORM LOAD TABLES.
5. EXCEPT AS OTHERWISE SHOWN ON THE DRAWINGS, PROVIDE LOOSE STEEL LINTELS AT ALL MASONRY OPENINGS 4'–0" OR LESS, AS FOLLOWS:
   L – 3 1/2 X 3 1/2 X 5/16 AT 4" WALLS.
   2L'S – 3 1/2 X 2 1/2 X 5/16 AT 6" WALLS.
   2L'S – 3 1/2 X 3 1/2 X 5/16 AT 8" WALLS.
6. PROVIDE WELDS MADE BY CERTIFIED WELDERS AND CONFORMING TO "STRUCTURAL WELDING CODE – STEEL", OF THE AMERICAN WELDING SOCIETY (AWS D1.1).

MASONRY

1. ALL HOLLOW CONCRETE MASONRY UNITS SHALL BE GRADE N, TYPE 1 AND CONFORM TO ASTM C–90 SPECIFICATIONS AND HAVE A MINIMUM COMPRESSIVE STRENGTH OF (f'm) 1500 PSI.
2. FACE BRICK SHALL COMPLY WITH ASTM C216, GRADE SW, TYPE AS SELECTED BY OWNER. MINIMUM COMPRESSIVE STRENGTH OF 8,000 PSI.
3. MORTAR SHALL CONFORM TO STANDARD SPECIFICATIONS FOR MORTAR FOR UNIT MASONRY ASTM C–270, TYPE N.
4. GROUT SHALL COMPLY WITH ASTM C–476.
5. COMPLY WITH ACI 530.1, SPECIFICATIONS FOR MASONRY STRUCTURES.
6. ALL MASONRY WALLS SHALL BE STRUCTURALLY BONDED WITH HORIZONTAL WALL REINFORCEMENT (STANDARD DUR–O–WAL OR EQUAL), 16" O.C. PER MANUFACTURER'S RECOMMENDATIONS. LAP 6 INCHES MINIMUM.
7. ALL MASONRY SHALL BE LAID UP IN RUNNING CENTER BOND UNLESS OTHERWISE SHOWN ON THE DRAWINGS. FULL MASONRY BOND SHALL BE USED AT WALL INTERSECTIONS EXCEPT WHERE SHOWN OTHERWISE.
8. HOLLOW CONCRETE BLOCK UNITS SHALL BE LAID WITH FULL MORTAR COVERAGE ON HORIZONTAL AND VERTICAL FACE SHELLS. LAY STARTER COURSE IN FULL MORTAR BED.
9. NO MASONRY SHALL BE LAID UP WHEN THE TEMPERATURE OF THE OUTSIDE AIR IS BELOW 40øF, UNLESS MEANS APPROVED BY THE ARCHITECT ARE PROVIDED TO PREVENT DAMAGE FROM FREEZING.
10. THE MASON CONTRACTOR SHALL PROVIDE BRACING FOR FREE STANDING WALLS ADEQUATE TO RESIST CODE WIND LOADING DURING CONSTRUCTION.
11. PROVIDE STEEL LINTELS ABOVE ALL OPENINGS IN MASONRY WALLS AS DETAILED ON THE DRAWINGS. MINIMUM BEARING FOR LINTELS SHALL BE 6 INCHES. FILL BLOCK SOLID WITH GROUT (2,500 PSI), MINIMUM THREE COURSES UNDER ALL LINTELS.
12. FILL BOND BEAMS WITH CONCRETE (f'c = 3,000 PSI) AND REINFORCE WITH 2 #5. LAP BARS 1'–6". PROVIDE CORNER BARS.

METAL DECK

1. DETAIL, MANUFACTURE AND INSTALL METAL DECKING IN ACCORDANCE WITH THE FOLLOWING PUBLICATIONS OF THE STEEL DECK INSTITUTE (LATEST EDITION).
   - CODE OF RECOMMENDED STANDARD PRACTICE FOR COMPOSITE DECK, FORM DECK AND ROOF DECK CONSTRUCTION.
   - SDI SPECIFICATIONS AND COMMENTARY FOR STEEL ROOF DECK.
2. PROVIDE CLOSURE ANGLES, SUMPS, ACCESSORIES AND MISCELLANEOUS SUPPORTING ANGLES AS REQUIRED FOR COMPLETE INSTALLATION. ATTACH PER SDI SPECIFICATIONS AT ALL SUPPORTS AND AT SIDE LAPS. SEE PLAN FOR DECKING REQUIREMENTS.
3. FASTEN METAL DECK TO SUPPORTING MEMBERS WITH 5/8"" PUDDLE WELD AT 12"" O.C. (6"" AT PERIMETER). FASTEN SIDE LAPS TO MID–SPAN WITH #12 HEX HEAD SCREW.
4. PROVIDE GALVANIZED METAL DECK IN THE SIZE AND GAUGE SHOWN ON THE DRAWINGS.

4735-73

FOR SCOPE STEEL BID ONLY

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NOTES:

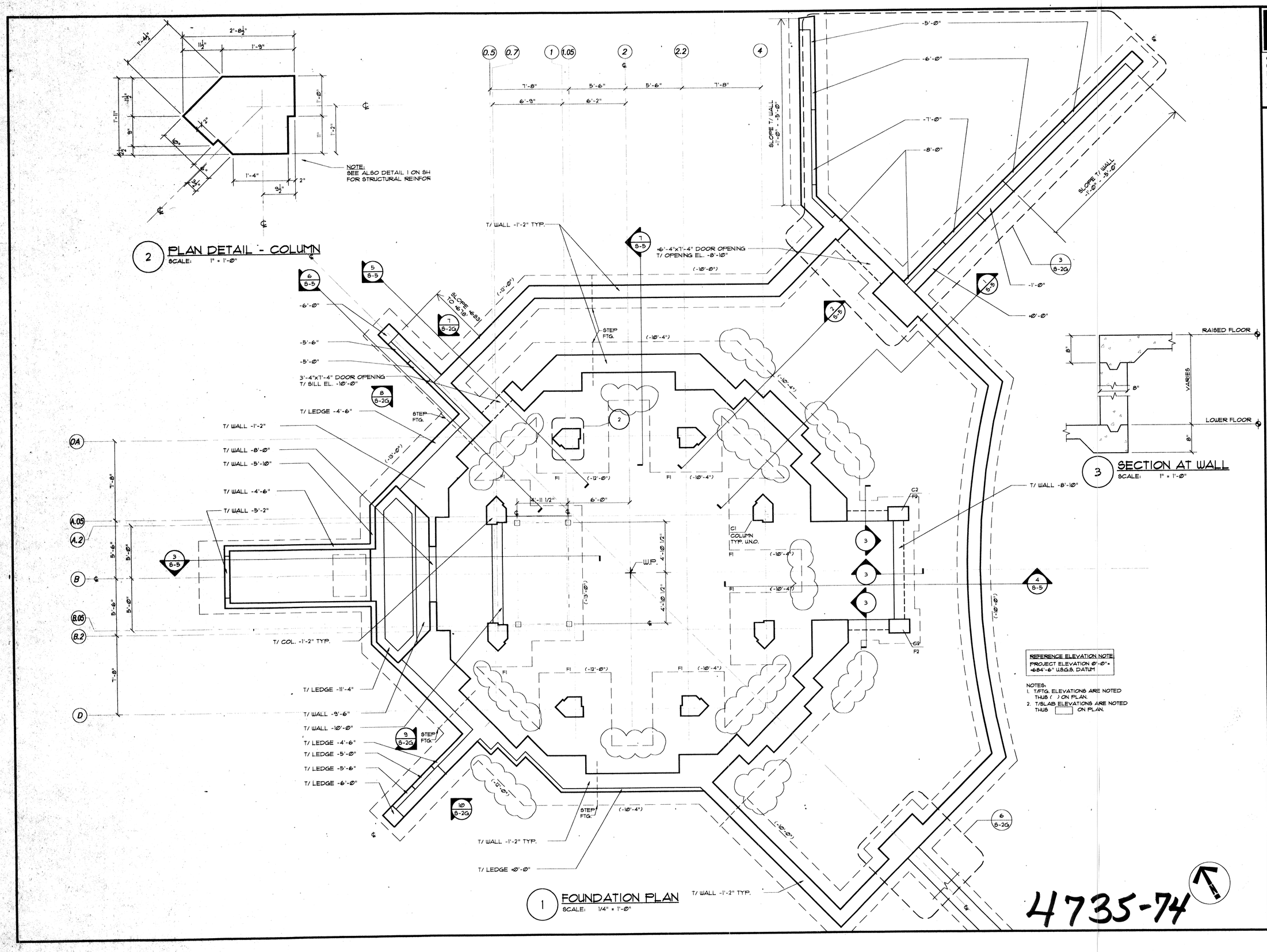
NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

GENERAL NOTES SCHEDULES & TYPICAL DETAILS

JOB#: 98103
DATE: 8/16/99
PRINCIPAL: P. CRAWFORD
PROJECT MGR: S. ALLMAN
DRAWN BY: J. DEMUTH

S-1



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PERMIT SET

NOTES:

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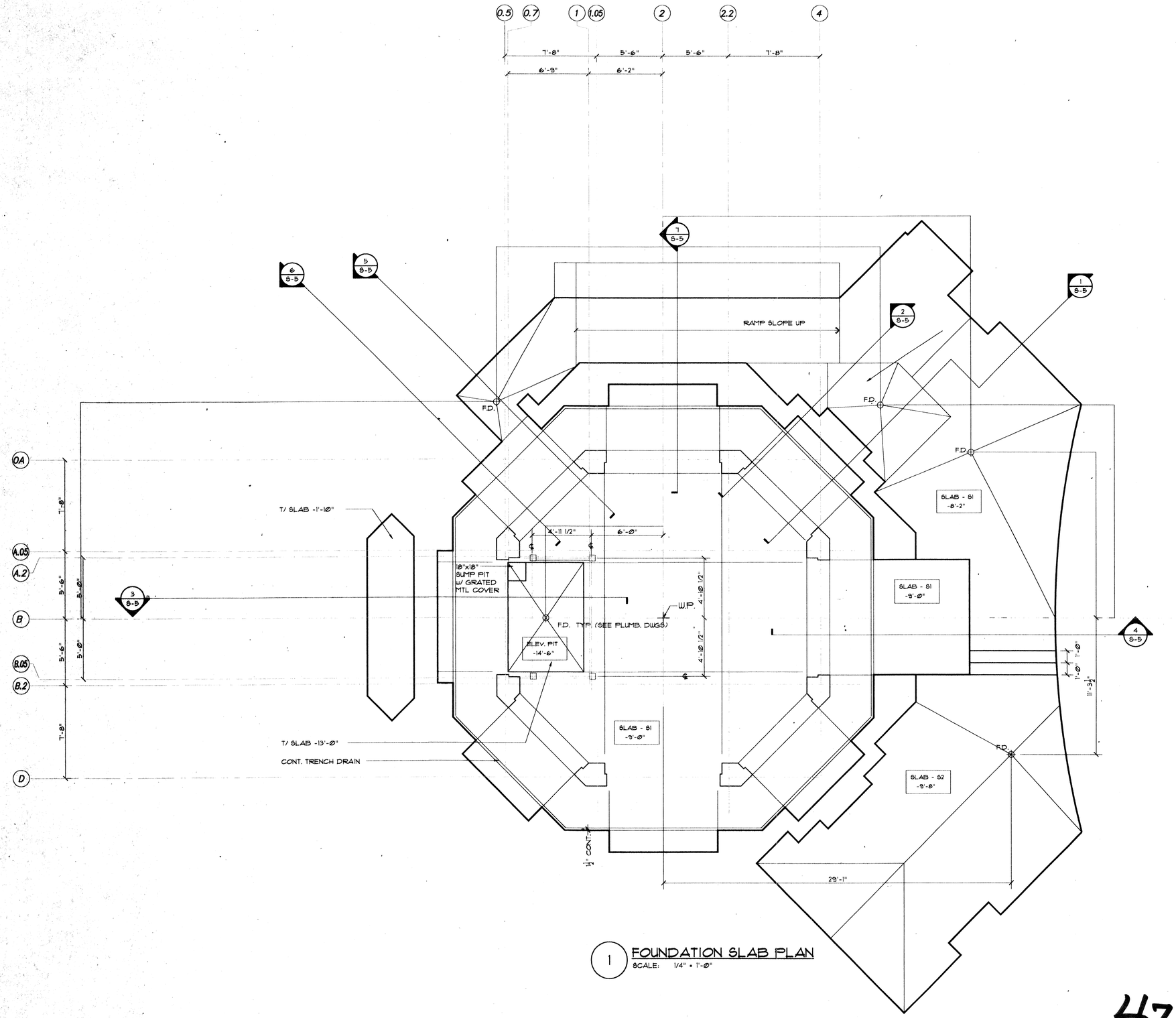
PETER DAVID CRAWFORD
001-013064
LICENSED ARCHITECT

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

FOUNDATION PLAN

JOB#: 98103	S-2A
DATE: 9/2/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR. B. ALLMAN / DRAWN BY: J. DEMUTH	



1 FOUNDATION SLAB PLAN
SCALE: 1/4" = 1'-0"

4735-75

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PERMIT SET

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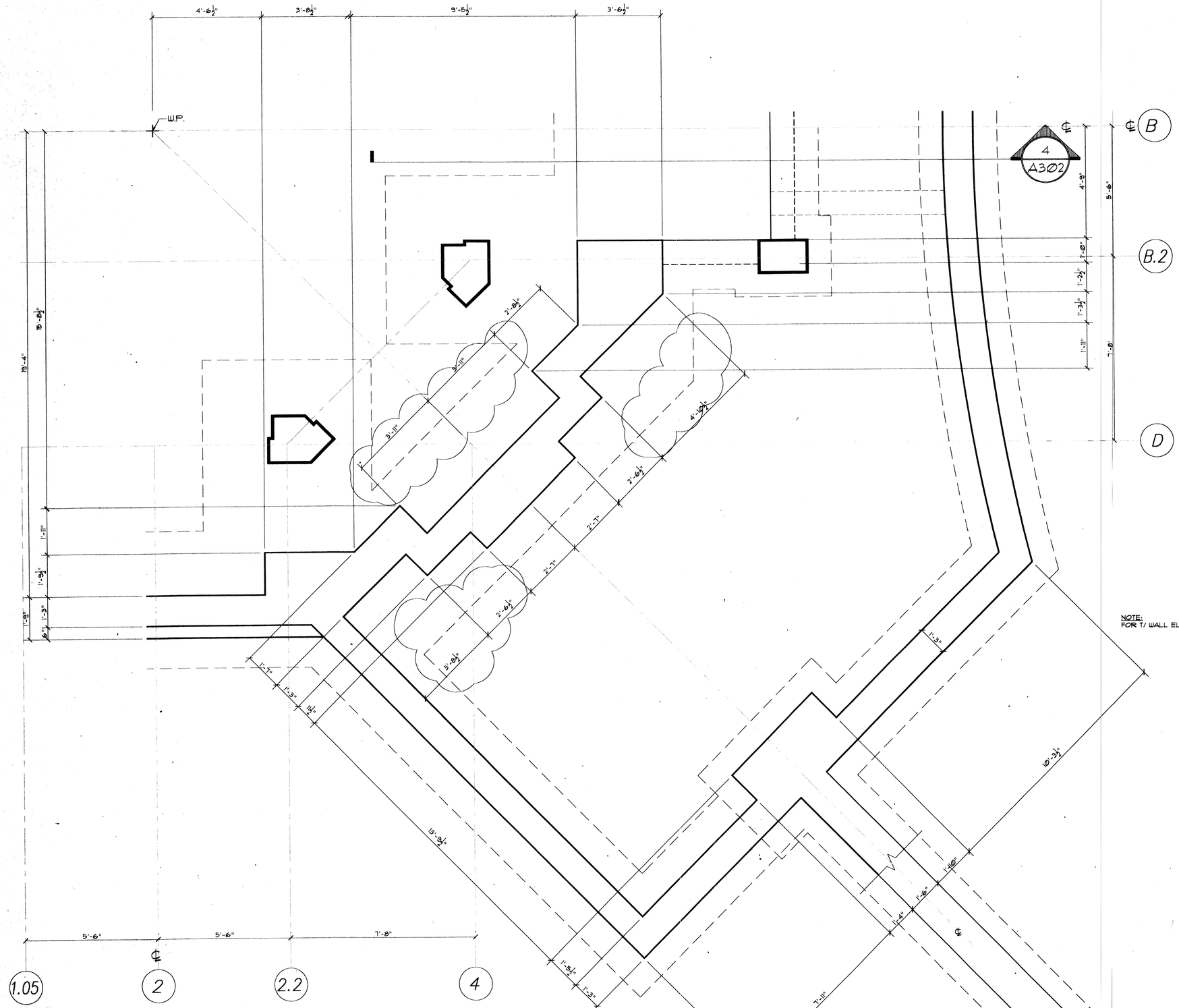
FOUNDATION SLAB PLAN

JOB#: 98103	S-2B
DATE: 9/2/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALMAN	DRAWN BY: J. DEMUTH



NOTE:
FOR T/ WALL ELEVATIONS SEE SHEET S-2A

1 SOUTHEAST FOUNDATION PLAN
SCALE: 1/4" = 1'-0"

Charles Vincent George
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604 North Washington Street
Naperville, Illinois 60563

Telephone: 630.357.2023
Facsmile: 630.357.2662

PERMIT SET

NOTES:

PAUL DAVID CRAWFORD
001-013654
LICENSED ARCHITECT

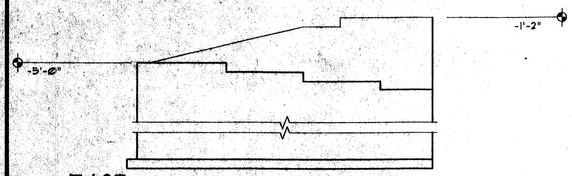
NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

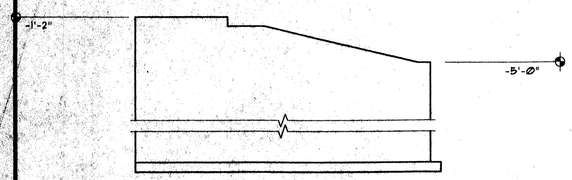
FOUNDATION GEOMETRY PLAN

JOB#: 98103	S-2F
DATE: 9/2/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN / DRAWN BY: J. DENUTH	

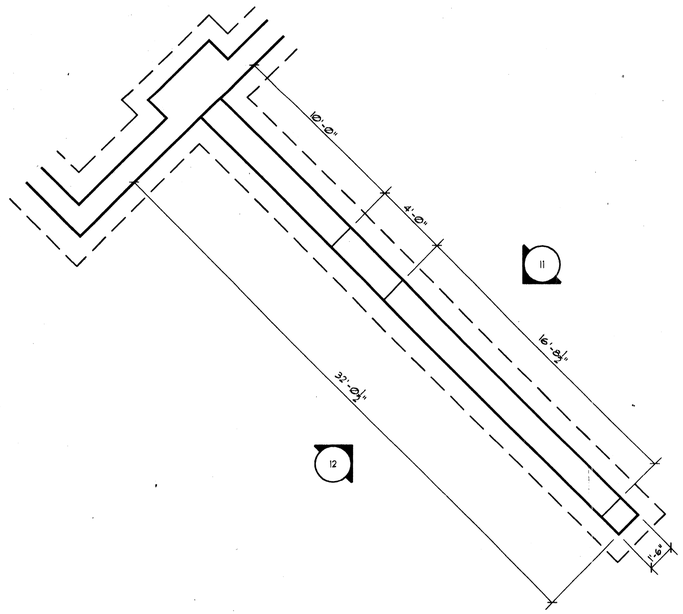
4735-76

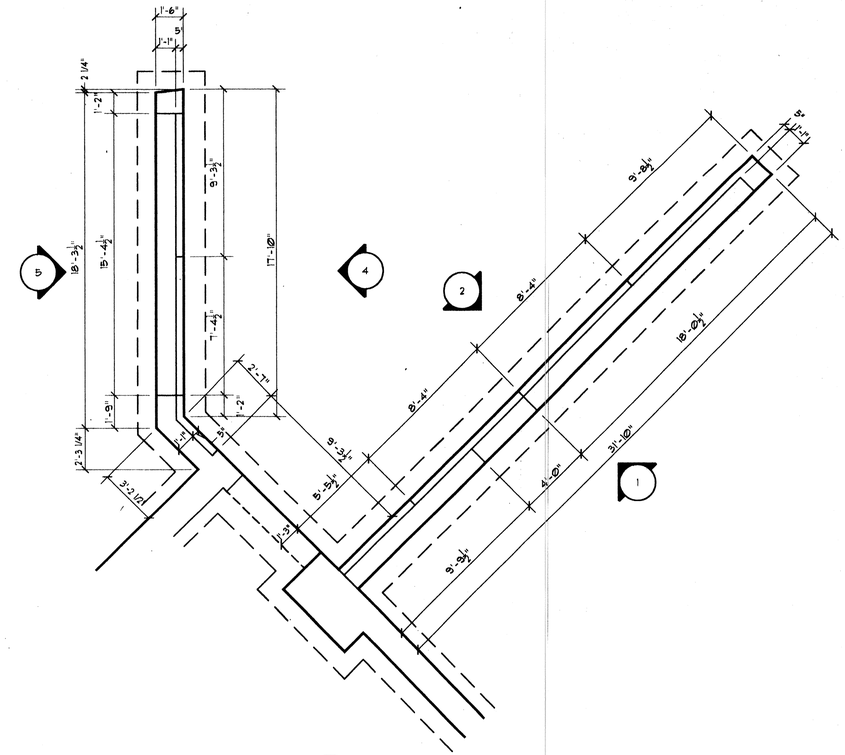


12 EAST ELEVATION - FOUNDATION WALL
SCALE: 1/8" = 1'-0"



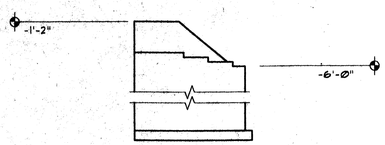
11 WEST ELEVATION - FOUNDATION WALL
SCALE: 1/8" = 1'-0"



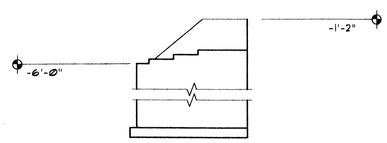


6 PLAN DETAIL - FOUNDATION
SCALE: 1/4" = 1'-0"

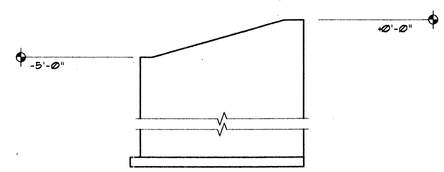
3 PLAN DETAIL - FOUNDATION
SCALE: 1/4" = 1'-0"



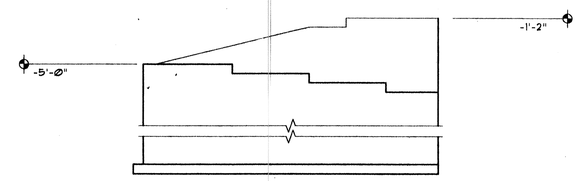
10 EAST ELEVATION - FOUNDATION WALL
SCALE: 1/8" = 1'-0"



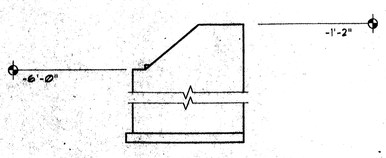
8 EAST ELEVATION - FOUNDATION WALL
SCALE: 1/8" = 1'-0"



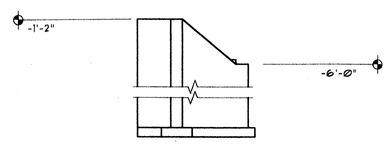
5 EAST ELEVATION - FOUNDATION WALL
SCALE: 1/8" = 1'-0"



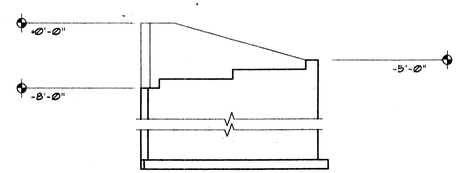
2 EAST ELEVATION - FOUNDATION WALL
SCALE: 1/8" = 1'-0"



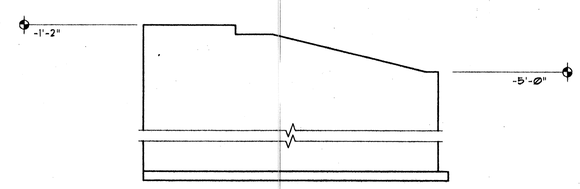
9 WEST ELEVATION - FOUNDATION WALL
SCALE: 1/8" = 1'-0"



7 WEST ELEVATION - FOUNDATION WALL
SCALE: 1/8" = 1'-0"



4 WEST ELEVATION - FOUNDATION WALL
SCALE: X = 1'-0"



1 WEST ELEVATION - FOUNDATION WALL
SCALE: 1/8" = 1'-0"

Charles Vincent George
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Telephone: 630.357.2023
Facsmile: 630.357.2662

NOTES:

ISSUED FOR FOUNDATION PERMIT 7/6/99

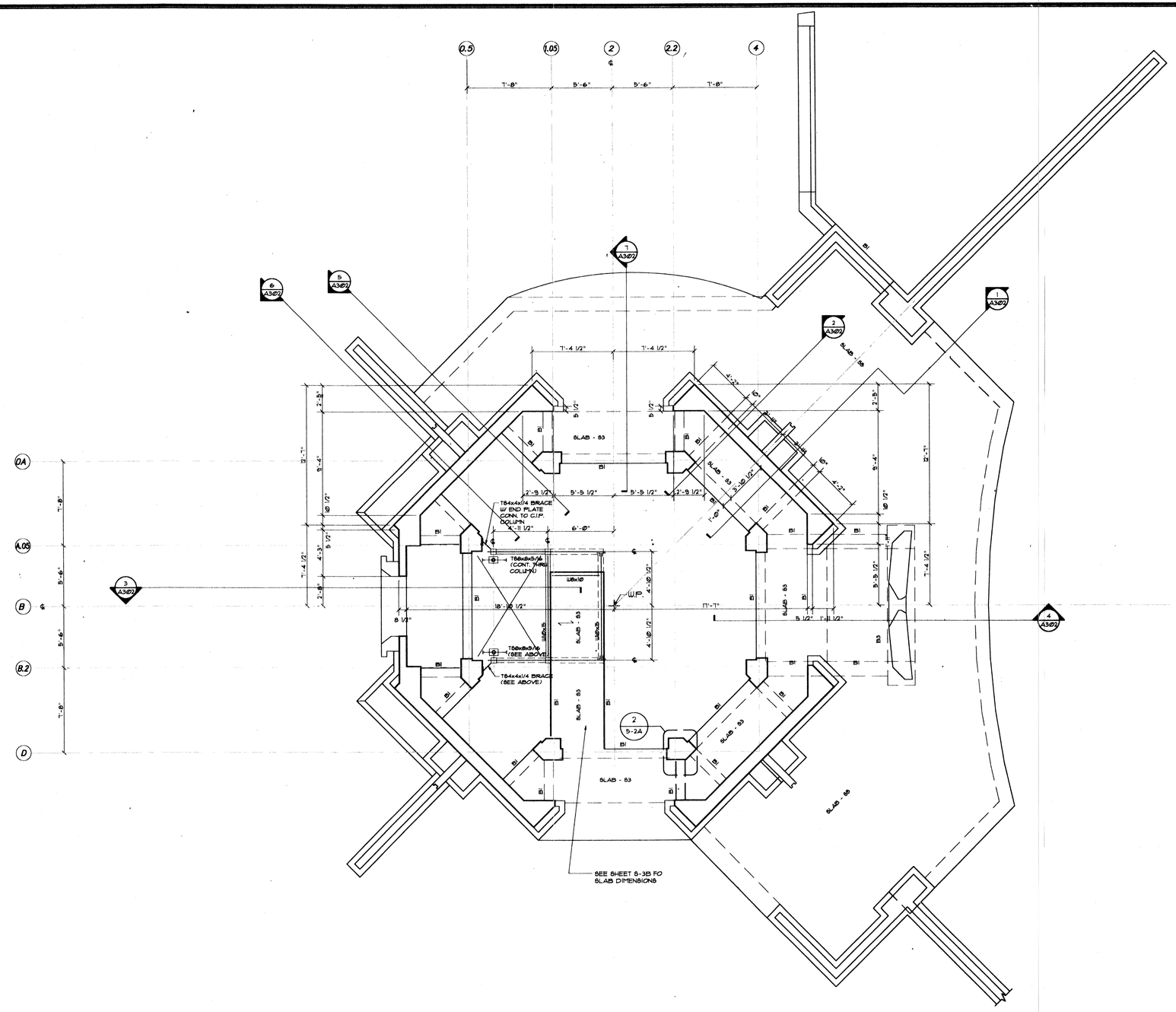
NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

FOUNDATION DETAILS & ELEVATIONS

JOB#: 98103	S-2G
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN / DRAWN BY: J. DEMUTH	

4735-77



1 ENTRY LEVEL FRAMING PLAN
SCALE: 1/4" = 1'-0"

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

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Facsmile: 630.357.2662

NOTES:

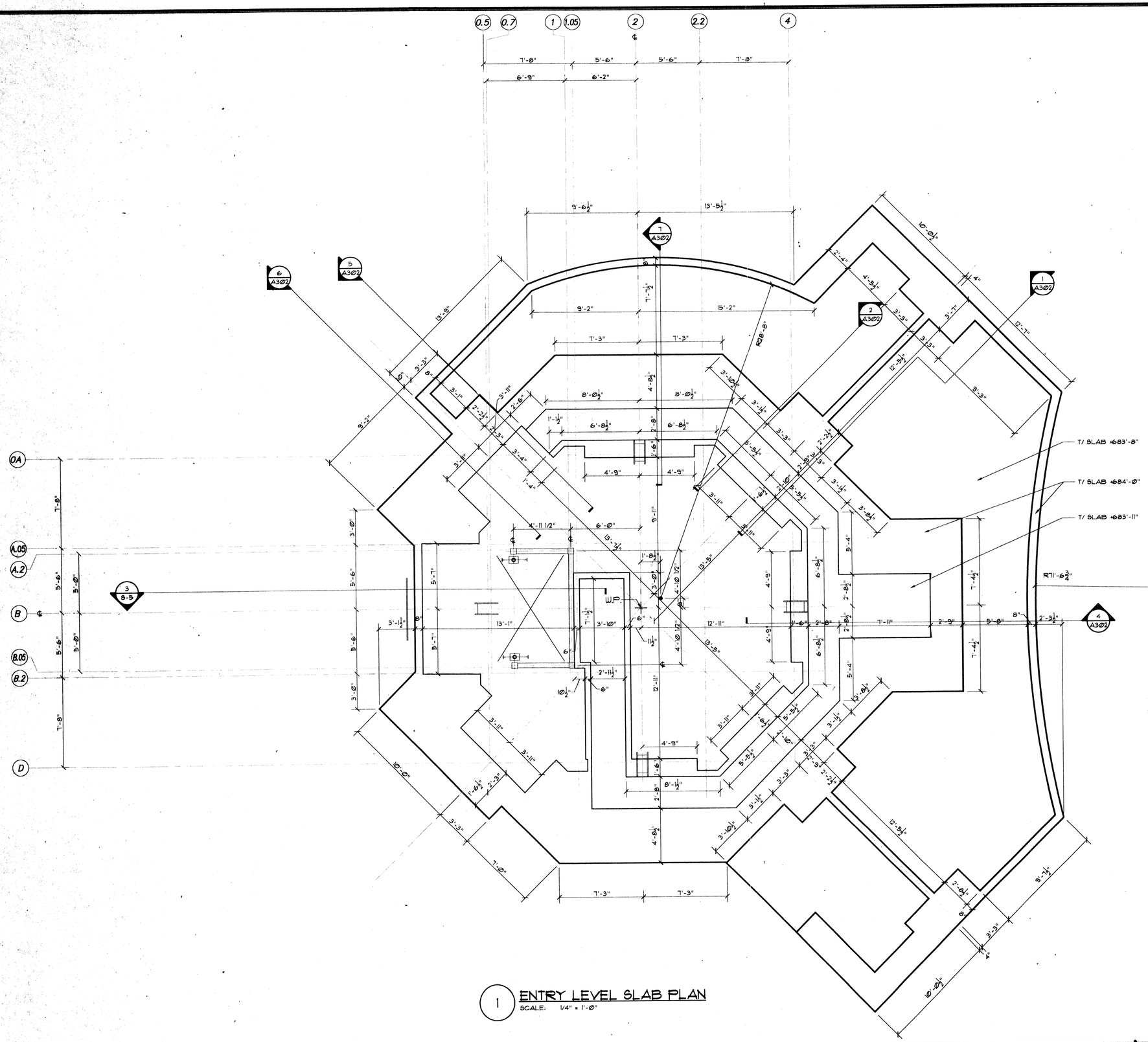
NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

ENTRY PLAN

JOB#: 98103	S-3A
DATE: 9/2/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALMAN / DRAWN BY: J. DEMUTH	

4735-78



1 ENTRY LEVEL SLAB PLAN

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

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Naperville, Illinois 60563

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Facsmile: 630.357.2662

NOTES:

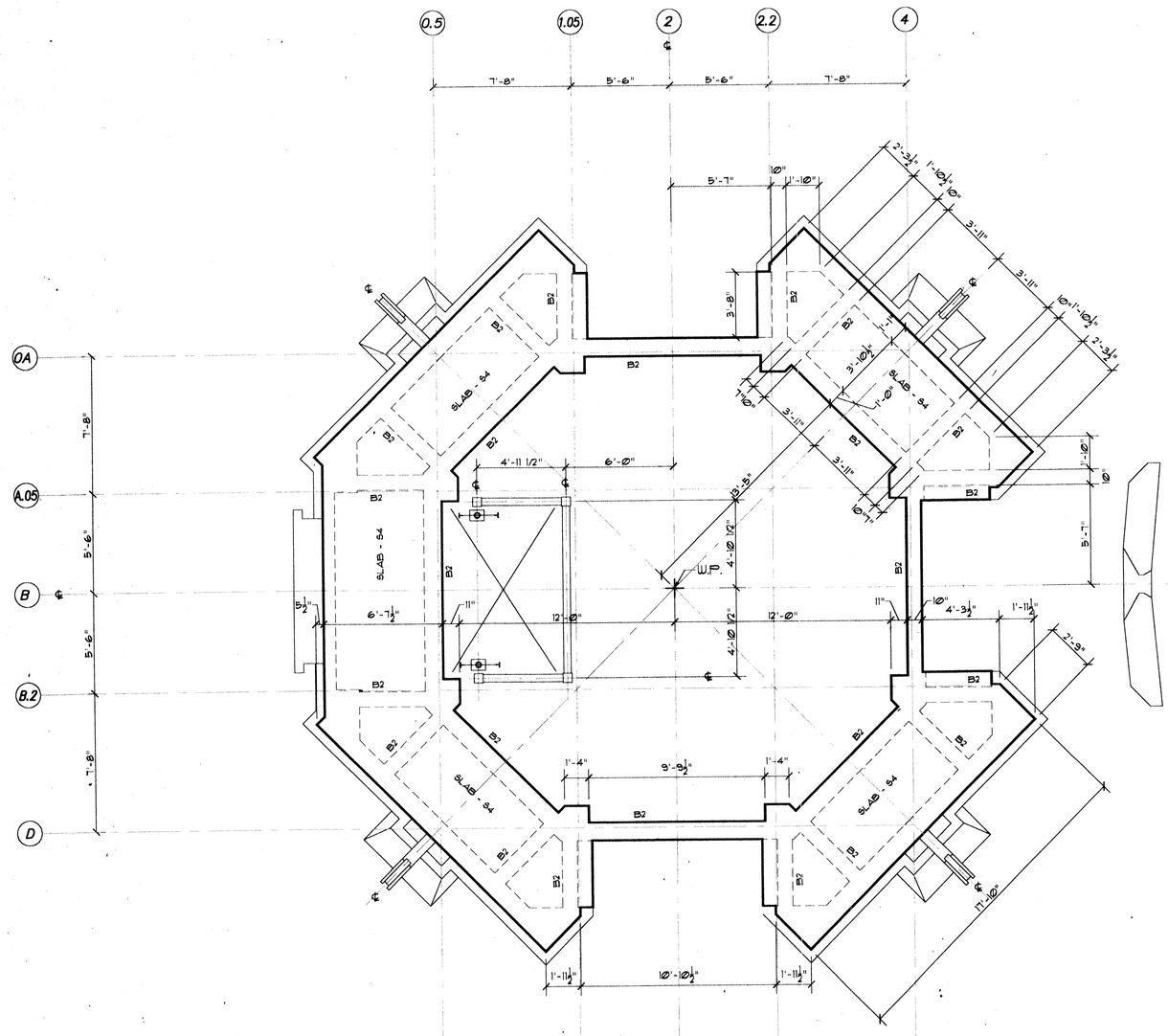
NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

ENTRY PLAN

JOB#: 98103	S-3B
DATE: 9/2/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALMAN	DRAWN BY: J. DEMUTH

4735-79



1 CLOISTER LEVEL FRAMING PLAN
SCALE: 1/4" = 1'-0"

4735-80

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Facsmile: 630.357.2662

NOTES:
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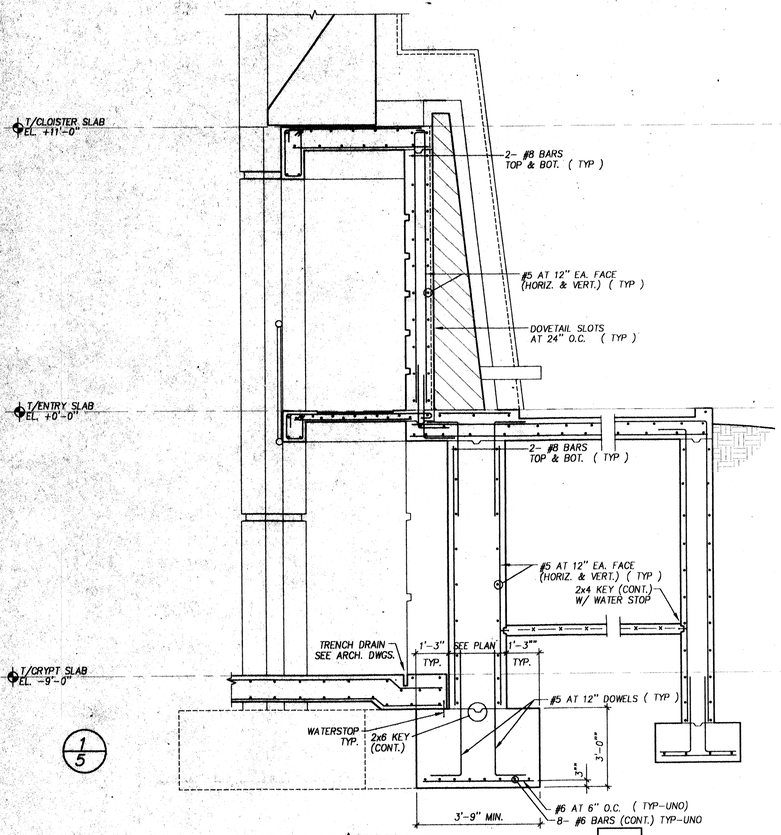
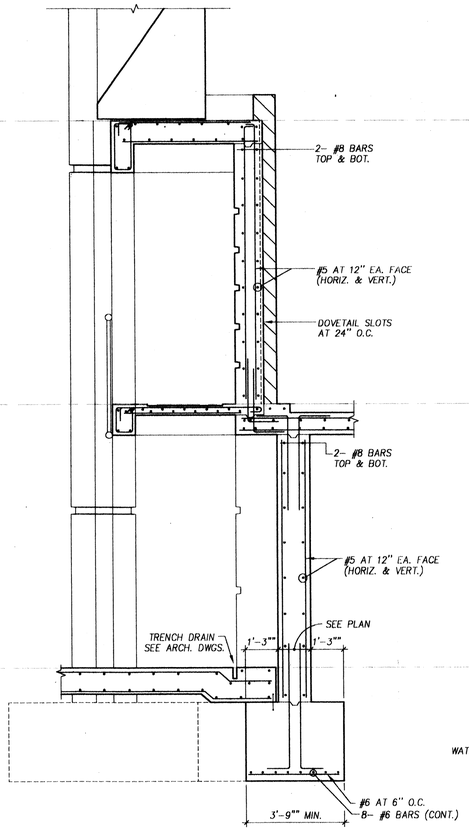
NAPERVILLE MILLENIUM CARILLON

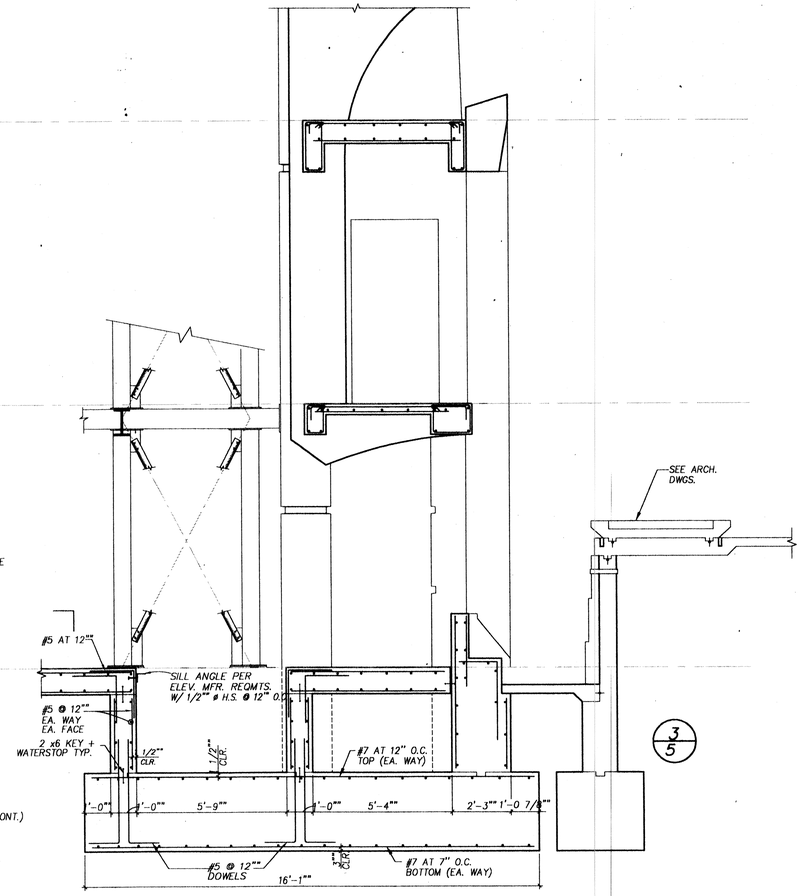
NAPERVILLE, ILLINOIS

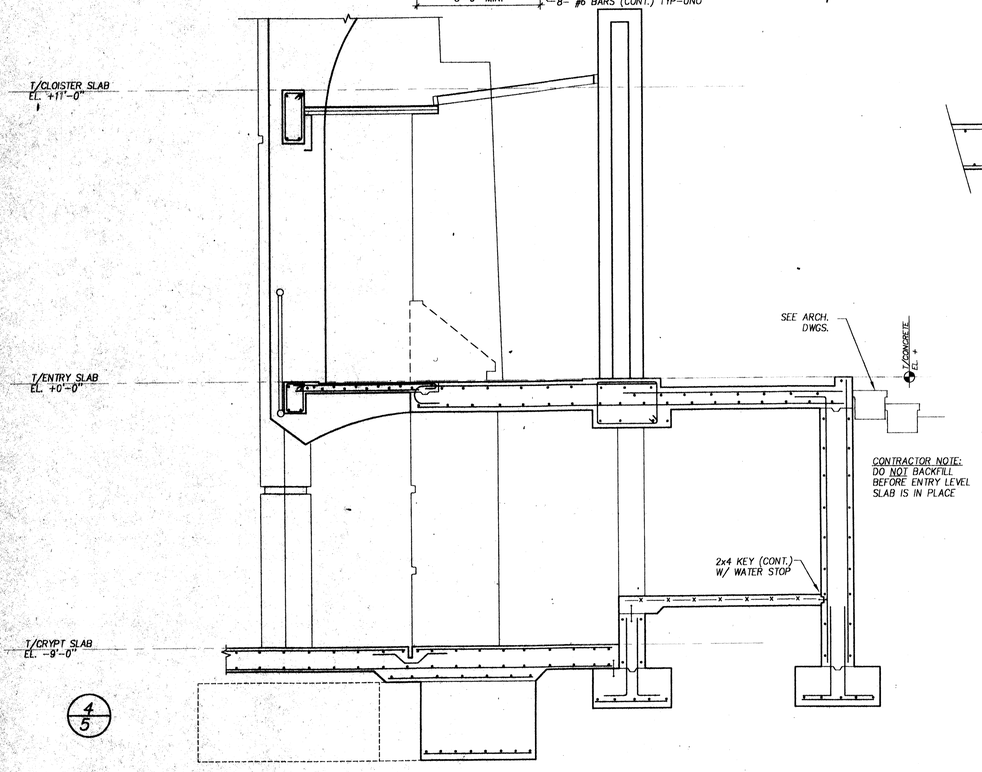
CLOISTER PLAN

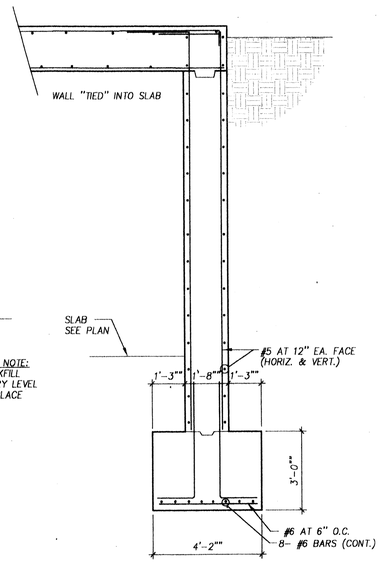
JOB#: 98103	S-4A
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN / DRAWN BY: J. DEMUTH	



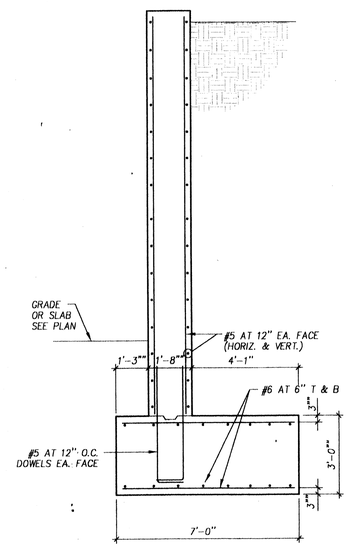




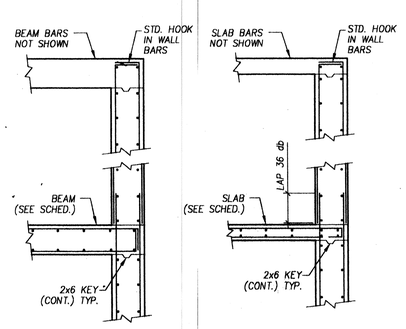




TYP. "TIED" LANDSCAPE RETAINING WALL



TYP. LANDSCAPE RETAINING WALL



TYPICAL BEAM/WALL AND SLAB/WALL INTERSECTION DETAILS

4735-81

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604 North Washington Street
Naperville, Illinois 60563

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Facsmile: 630.357.2662

NOTES:
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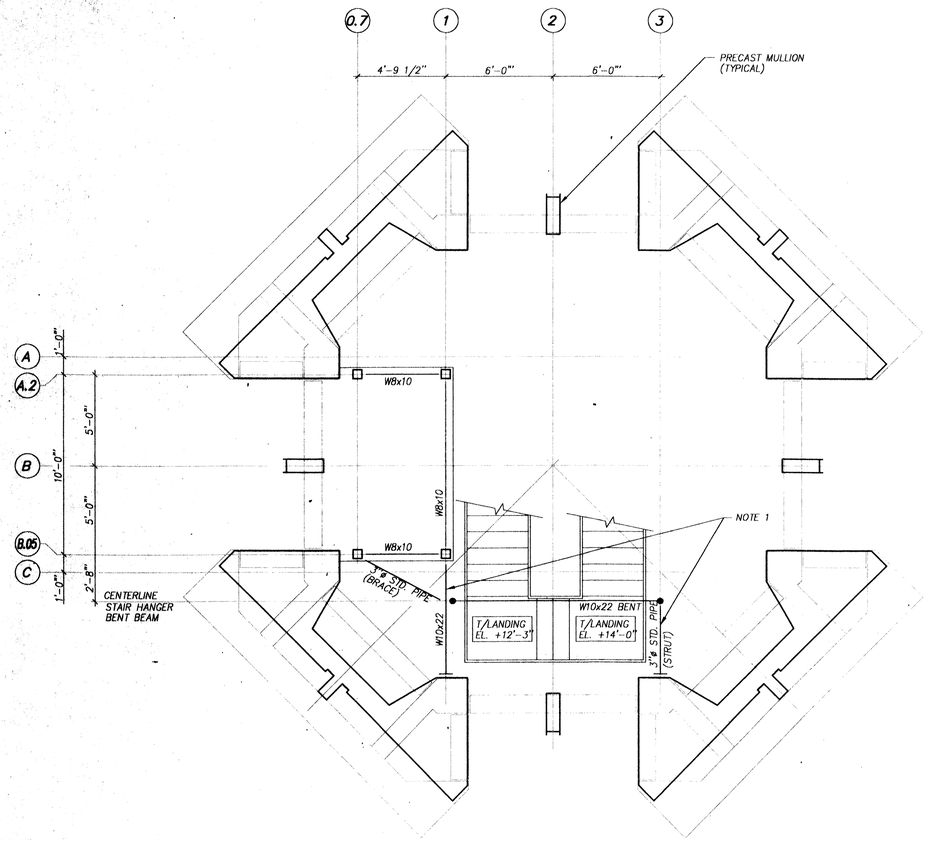
NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

FOUNDATION DETAILS

JOB#: 98103	S-5A
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN	DRAWN BY: J. DEMUTH

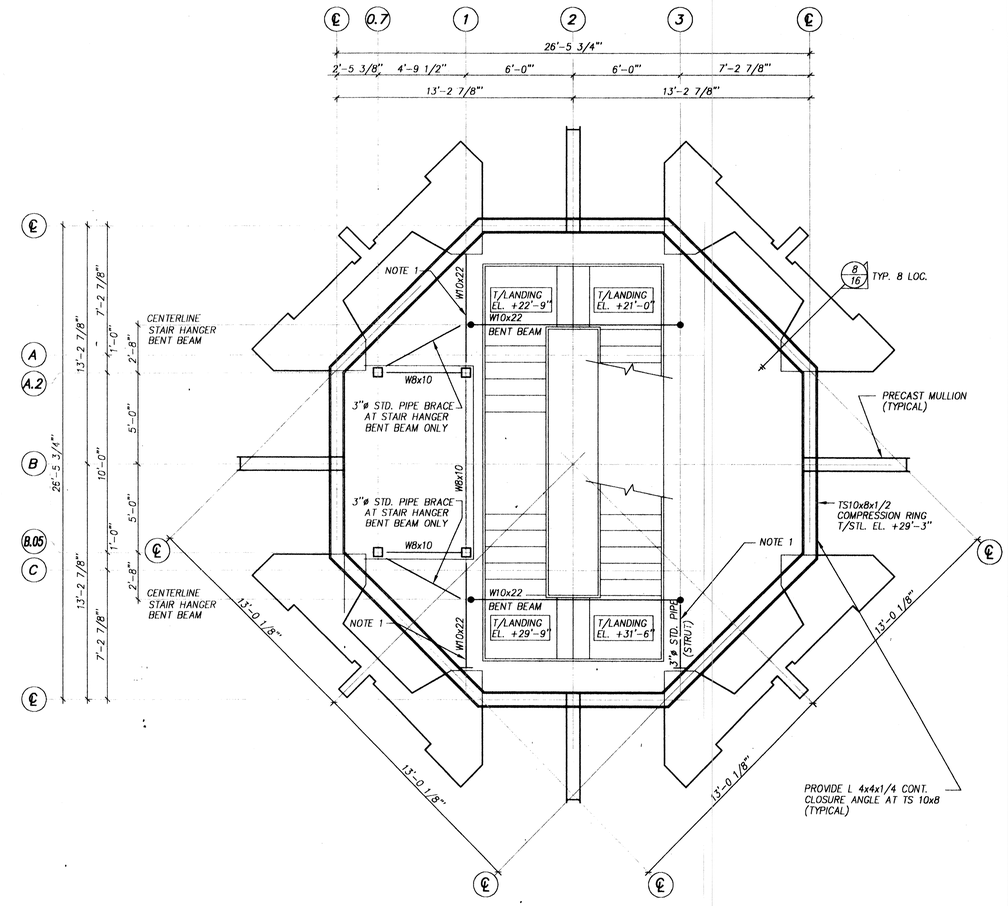


INTERMEDIATE LEVEL FRAMING PLAN EL. VARIES

SCALE: 1/4"=1'-0" T/STEEL EL. +X

NOTES:

1. DESIGN CONNECTIONS FOR: $P_{min} = *6$ $P_{max} = *6$ AND ALLOW FOR 2"" ↕ VERTICAL MOVEMENT.



INTERMEDIATE LEVEL FRAMING PLAN EL. VARIES

SCALE: 1/4"=1'-0" T/STEEL EL. +X

NOTES:

1. DESIGN CONNECTIONS FOR: $P_{min} = *6$ $P_{max} = *6$ AND ALLOW FOR 2"" ↕ VERTICAL MOVEMENT.
2. DO NOT ATTACH STEEL TO TS COMPRESSION RING.

FOR SCOPE STEEL BID ONLY

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Facsmile: 630.357.2662

NOTES:

NAPERVILLE MILLENIMU CARILLON

NAPERVILLE, ILLINOIS

FRAMING PLAN

JOB#: 98103

DATE: 7/14/99

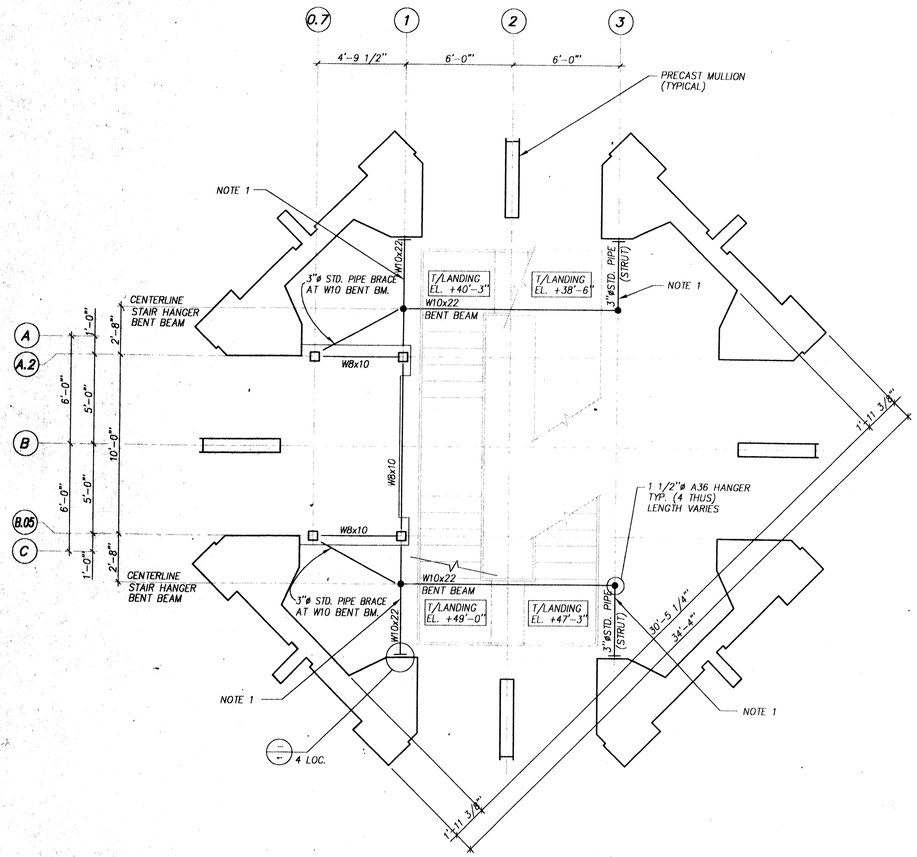
PRINCIPAL: P. CRAWFORD

PROJECT MGR: N. ALLMAN

DRAWN BY: J. DEMUTH

S-6

4735-82



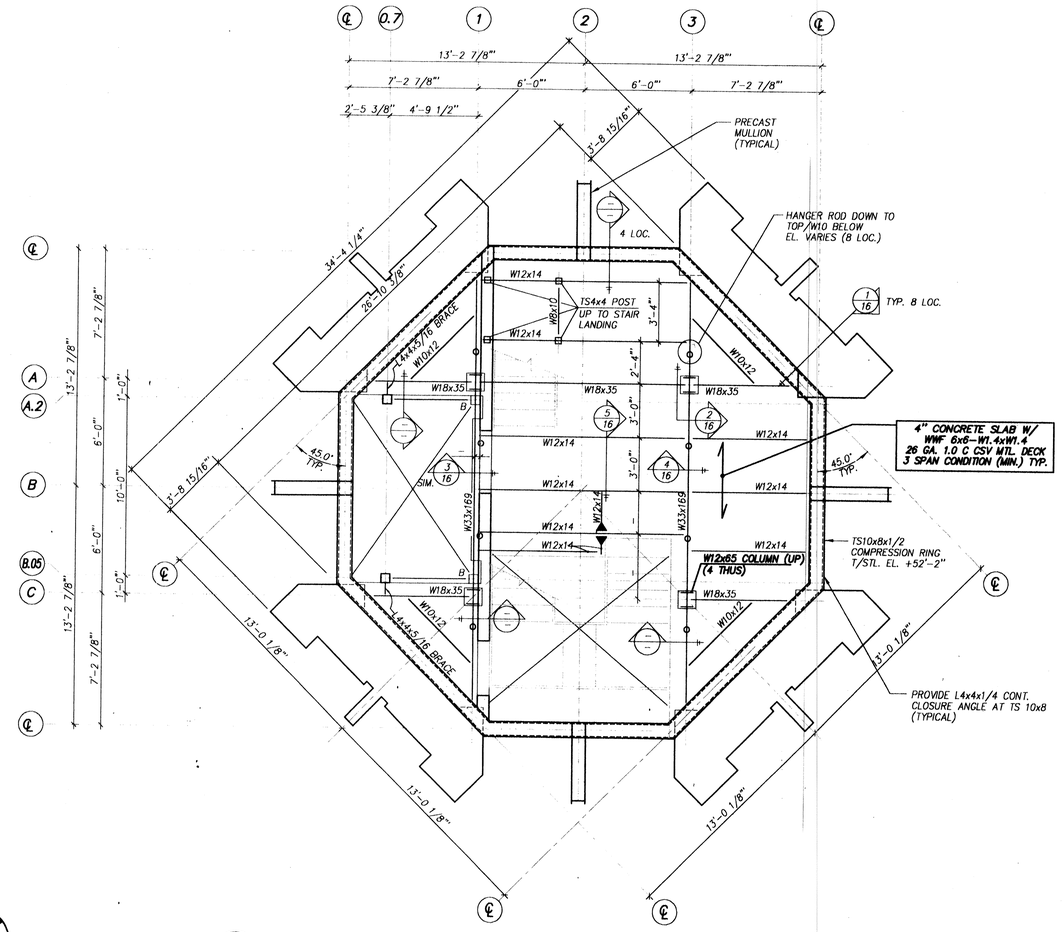
INTERMEDIATE LEVEL FRAMING PLAN EL. VARIES

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

T/STEEL EL. +X

NOTE 1:

DESIGN CONNECTIONS FOR:
$P_{max.} = {}^{k}6$ $P_{max.} = {}^{k}6$
AND ALLOW FOR 2"" ‖ VERTICAL MOVEMENT.



GALLERY LEVEL FRAMING PLAN – EL. +52'-6"

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

T/STEEL EL. +X

NOTE:
1. MOMENT CONNECTIONS SHOWN THUS (◄—) TYP.

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Facsimile: 630.357.2662

NOTES:

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

FRAMING PLANS

McCLUSKEY ENGINEERING CORPORATION
Structural Engineers
1887 High Grove Lane
Naperville, Illinois 60540
(630) 717-5335 FAX (630)717-5397

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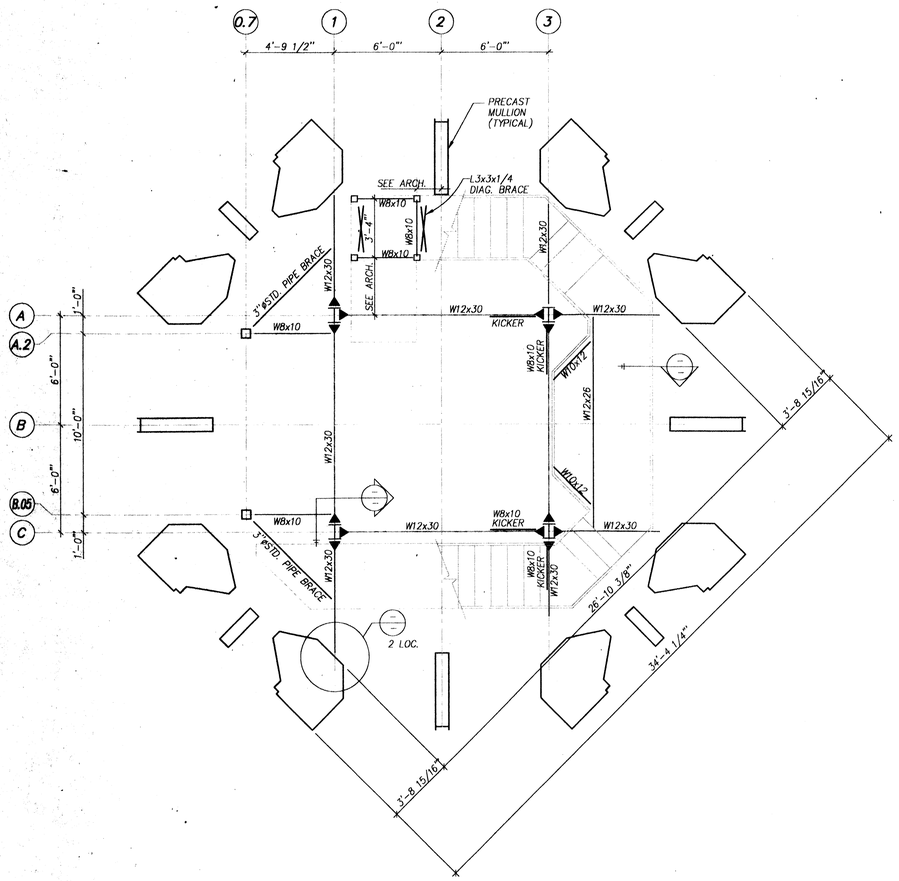
PRINCIPAL: PC	S-7
PROJ. MNGR: SPA	
DRAWN BY: JJD	
DATE: 9/2/99	

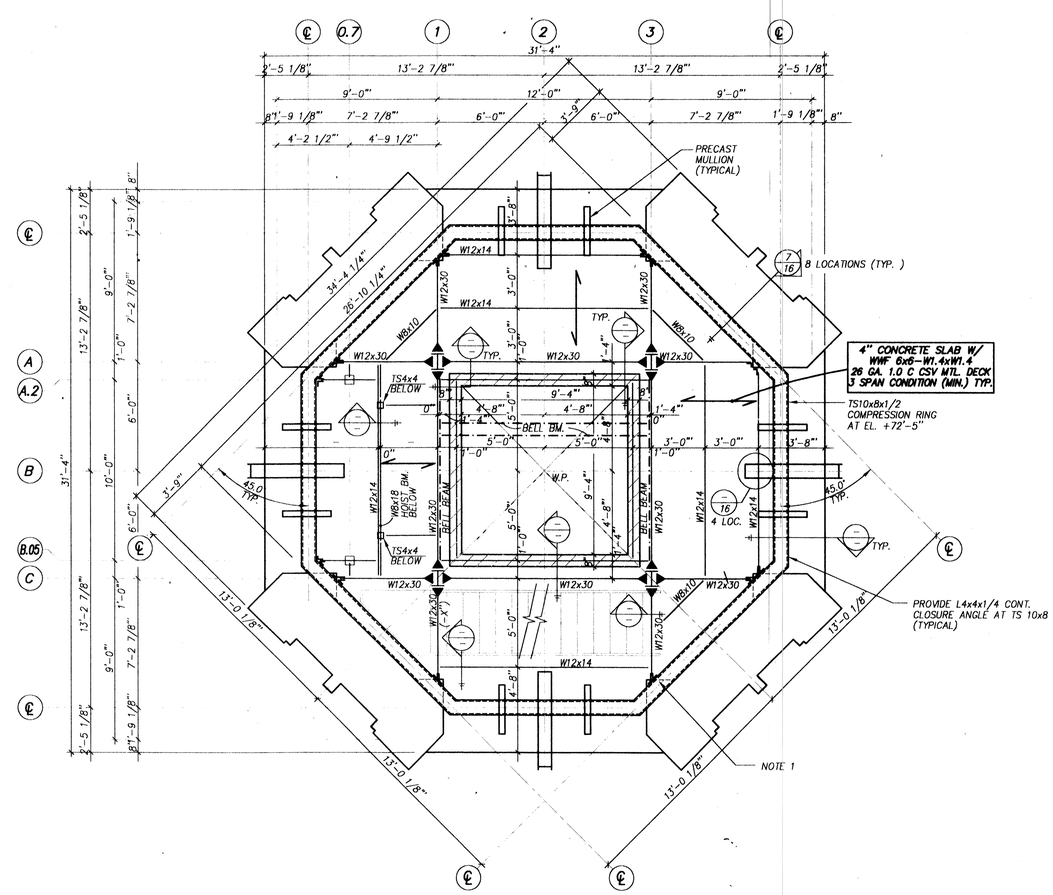
4735-83



GALLERY MEZZANINE LEVEL FRAMING PLAN – EL. +62'-5"

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

T/STEEL EL. +X



BELFRY LEVEL FRAMING PLAN – +72'-9"

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

T/STEEL EL. +X

NOTES:

1. SUPPORT TS COMPRESSION RING FROM W12x30 WITH CLIP ANGLE CONNECTION. SEE DETAIL 7/16 FOR AXIAL AND HORIZONTAL CONNECTION FORCES.

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Facsimile: 630.357.2662

NOTES:

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

FRAMING PLANS

McCLUSKEY ENGINEERING CORPORATION
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1857 High Grove Lane
Naperville, Illinois 60540
(630) 717-5335 FAX (630)717-5397

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PRINCIPAL: PC	S-8
PROJ. MNGR: SPA	
DRAWN BY: JJD	
DATE: 7/8/99	

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Telephone: 630.357.2023
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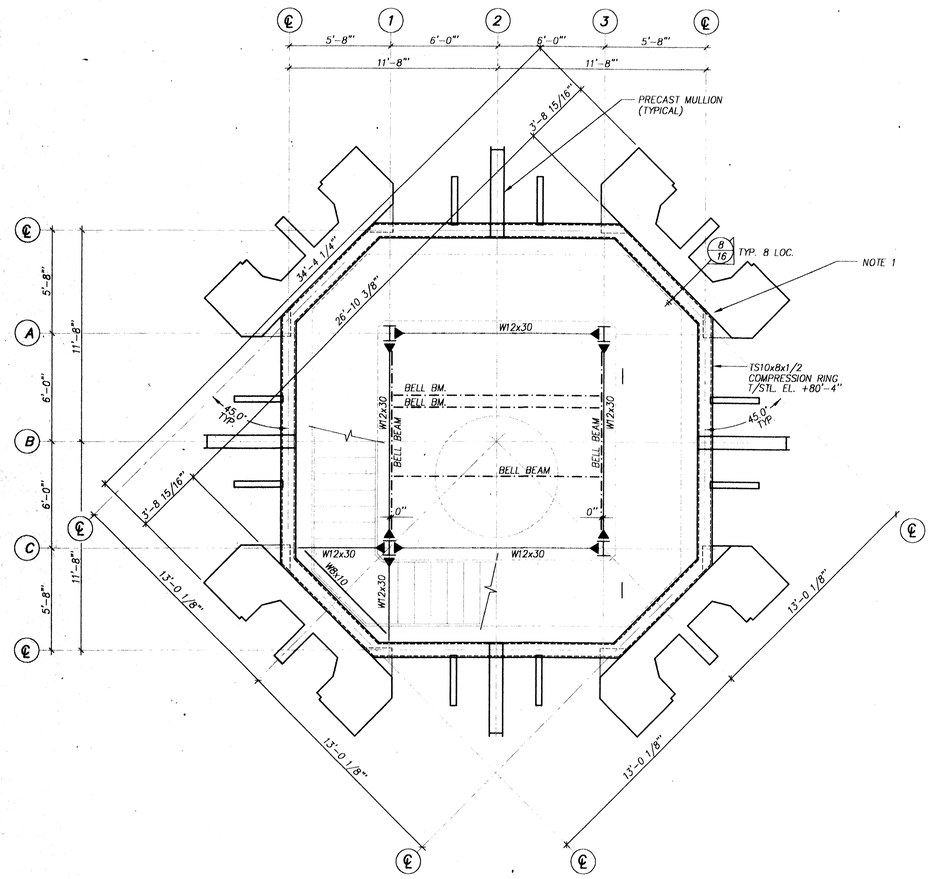


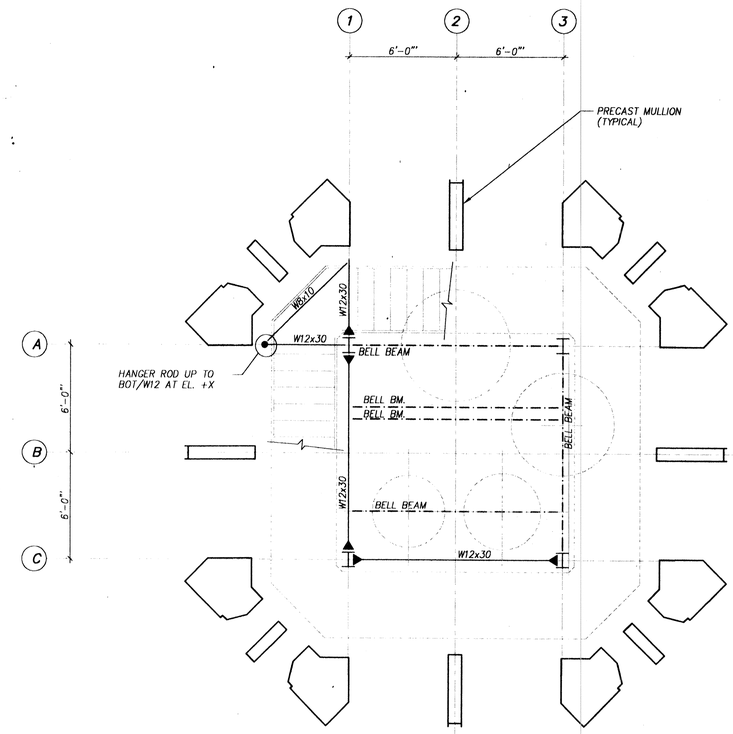
BELFRY LEVEL FRAMING PLAN – +80'-4"

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

T/STEEL EL. +X

NOTES:

1. DO NOT ATTACH STEEL TO TS COMPRESSION RING.



BELFRY LEVEL FRAMING PLAN – +87'-11"

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

T/STEEL EL. +X

NOTES:

NAPERVILLE MILLENIUM CARILLON

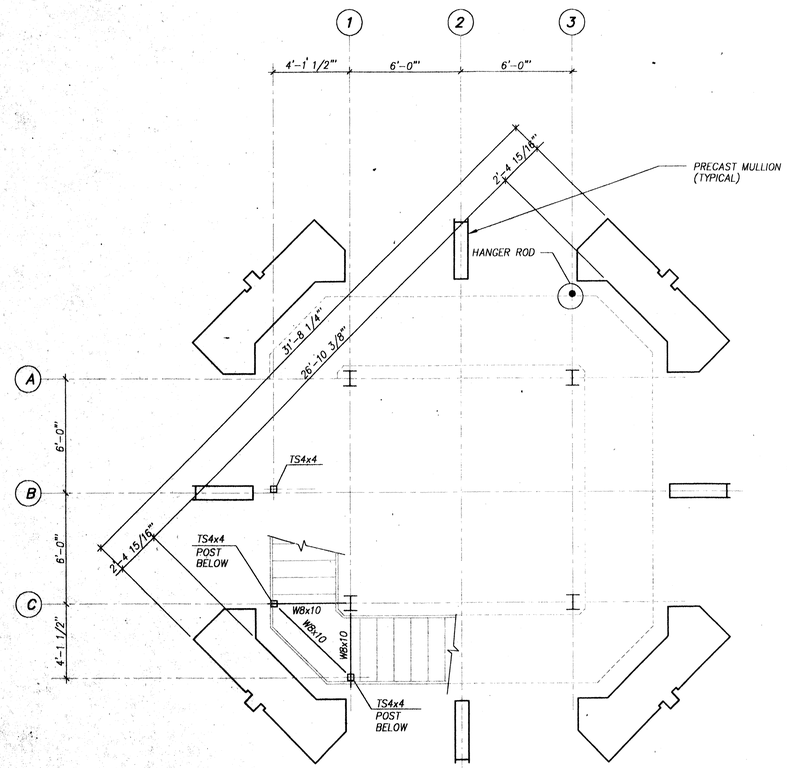
NAPERVILLE, ILLINOS

FRAMING PLANS

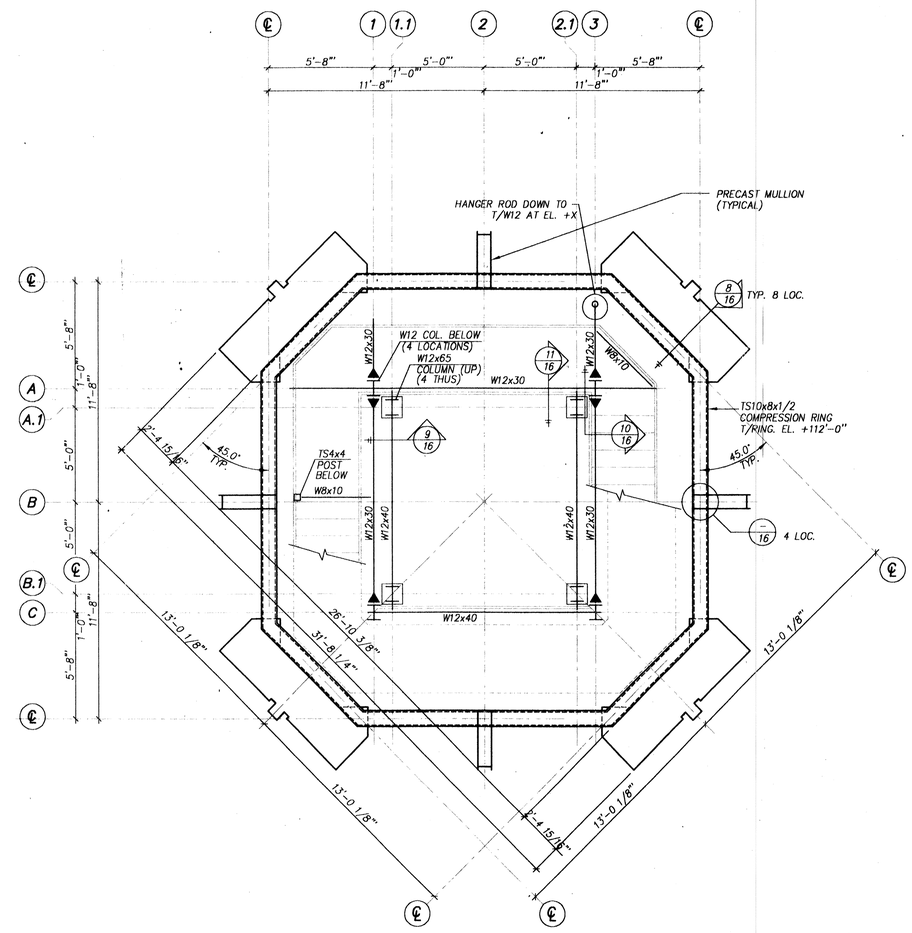
FOR SCOPE STEEL BID ONLY

JOB#: 98103	S-9
DATE: 7/14/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: R. ALLMAN / DRAWN BY: J. DEMUTH	

4735-85



CARILLONEUR CABIN FRAMING PLAN – +107'-2"
SCALE: 1/4"=1'-0"
T/STEEL EL. +X



BELFRY FRAMING PLAN – +111'-3"
SCALE: 1/4"=1'-0"
T/STEEL EL. +X

NOTES:

1. DO NOT ATTACH STEEL TO TS COMPRESSION RING.

4735-87

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Naperville, Illinois 60563

Telephone: 630.357.2023
Facsmile: 630.357.2662

NOTES:

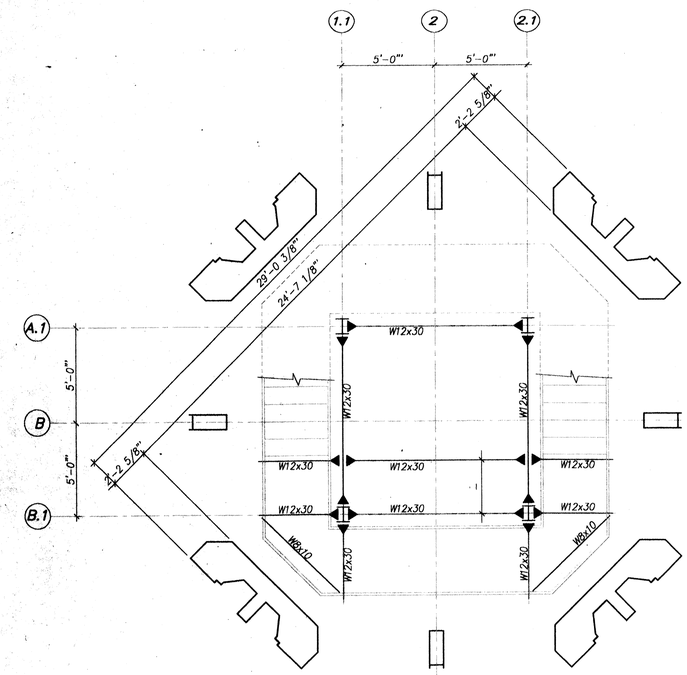
NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

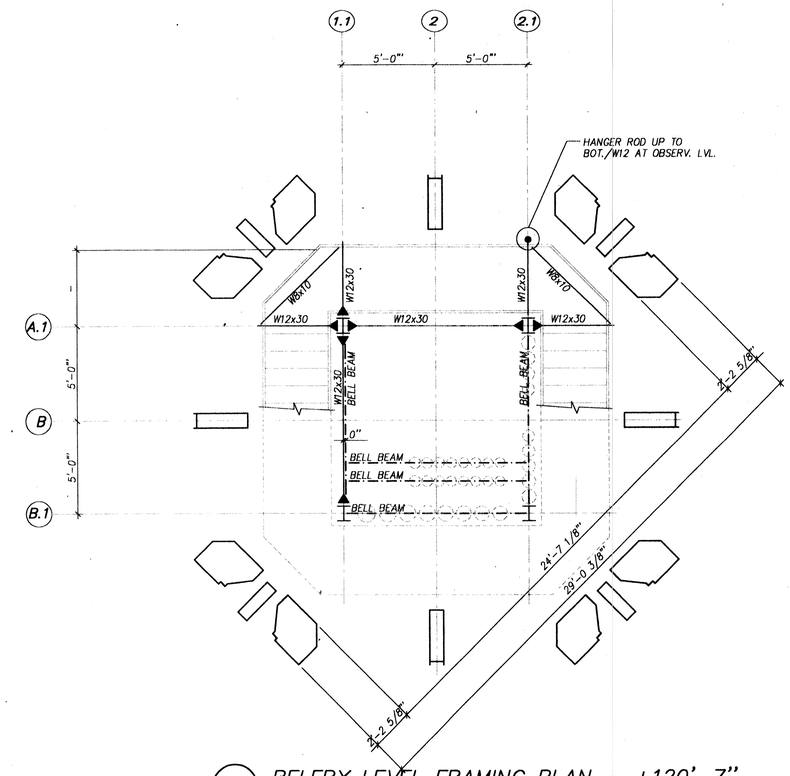
FRAMING PLANS

JOB#: 98103
DATE: 8/16/99
PRINCIPAL: P. CRAWFORD
PROJECT MGR: B. ALLMAN
DRAWN BY: J. DEMUTH

S-11



BELFRY LEVEL FRAMING PLAN – +115'-11"
SCALE: 1/4"=1'-0"
T/STEEL EL. +X



BELFRY LEVEL FRAMING PLAN – +120'-7"
SCALE: 1/4"=1'-0"
T/STEEL EL. +X

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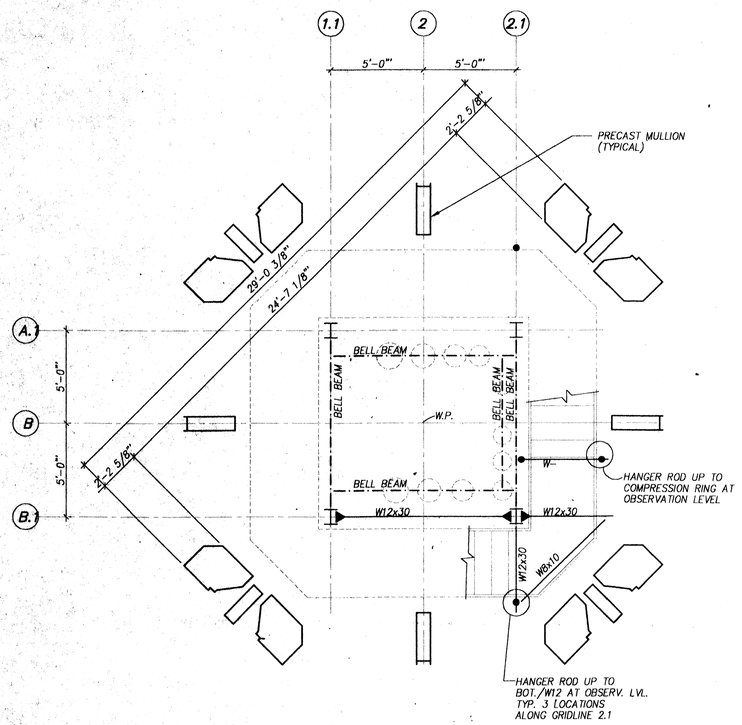
NOTES:

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLNINOIS

FRAMING PLANS

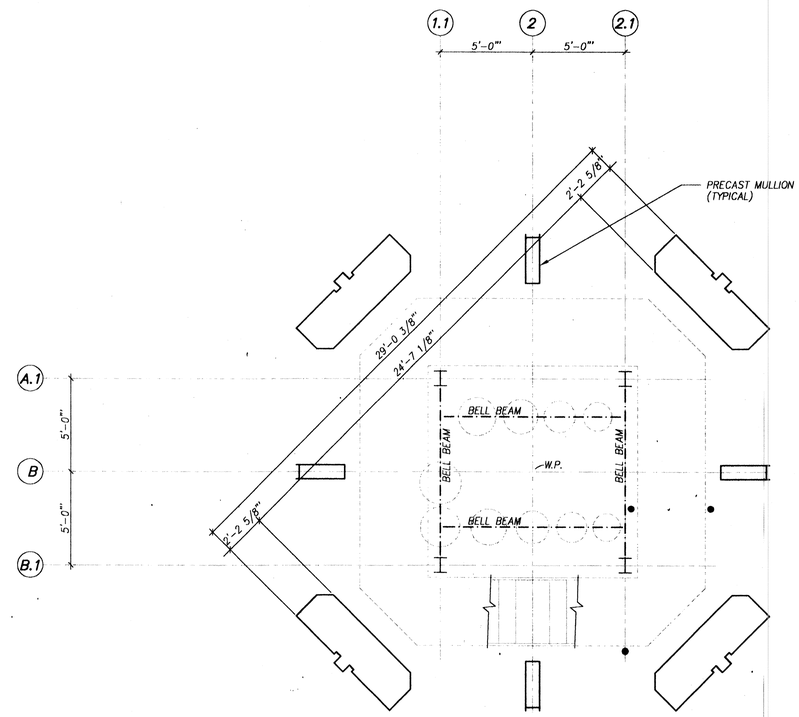
JOB#: 98103	S-12
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALMAN / DRAWN BY: J. DEMUTH	



BELFRY LEVEL FRAMING PLAN – +125'-3"

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

T/STEEL EL. +X



BELFRY LEVEL FRAMING PLAN – +128'-9"

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

T/STEEL BY OTHERS

FOR SCOPE STEEL BID ONLY

4735-89

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

Telephone: 630.357.2023
Facsmile: 630.357.2662

NOTES:

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

FAMING PLANS

JOB#: 98103

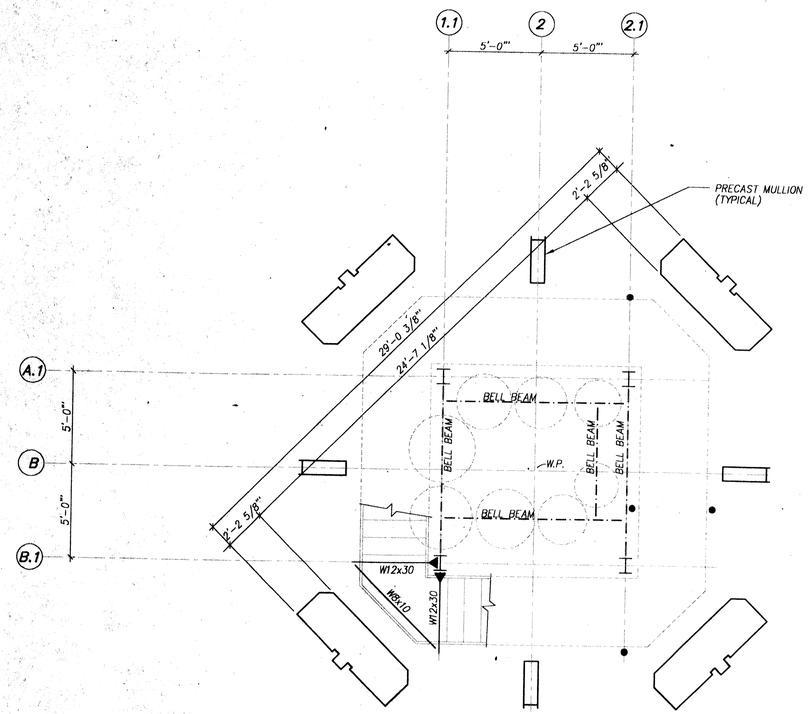
DATE: 8/16/99

PRINCIPAL: P. CRAWFORD

PROJECT MGR: R. ALLMAN

DRAWN BY: J. DEMUTH

S-13

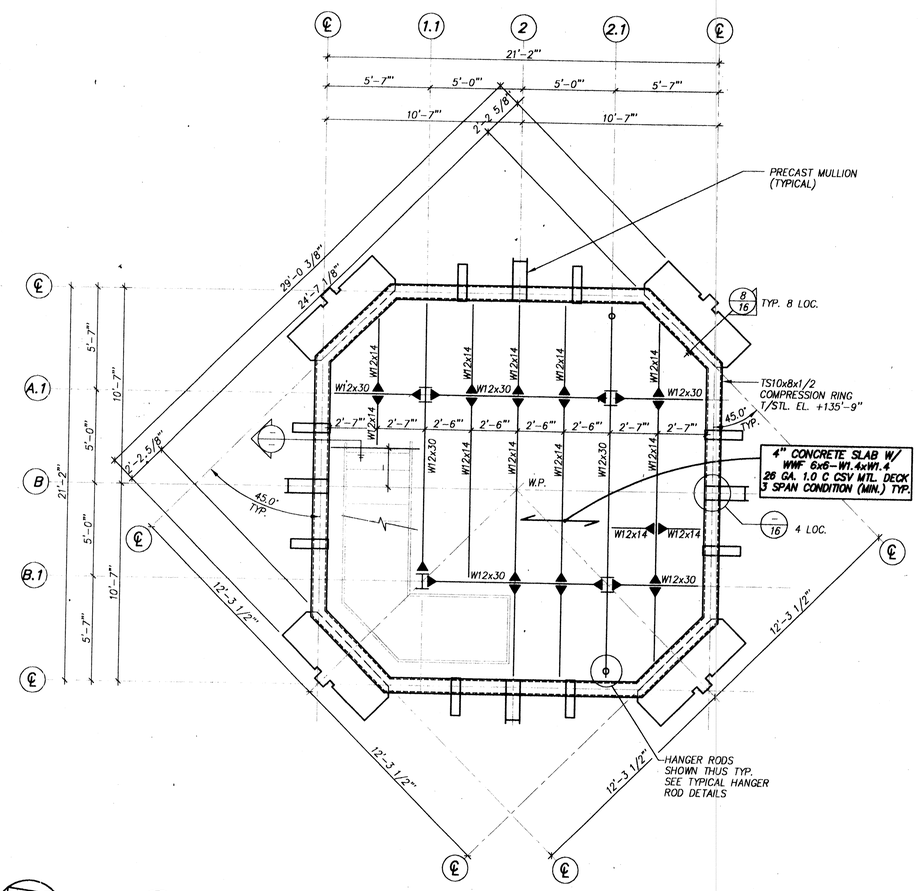


TYP. 2 LOCATIONS

BELFRY LEVEL FRAMING PLAN – +131'-8"

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

T/STEEL EL. +X



OBSERVATION LEVEL FRAMING PLAN – +136'-5"

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

T/STEEL EL. +136'-1" U.N.O.

NOTES:

1. DO NOT ATTACH FLOOR STRUCTURE TO TS COMPRESSION RING.

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

Telephone: 630.357.2023
Facsmile: 630.357.2662

NOTES:

NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

FRAMING PLANS

JOB#: 98103

DATE: 8/16/99

PRINCIPAL: P. CRAWFORD

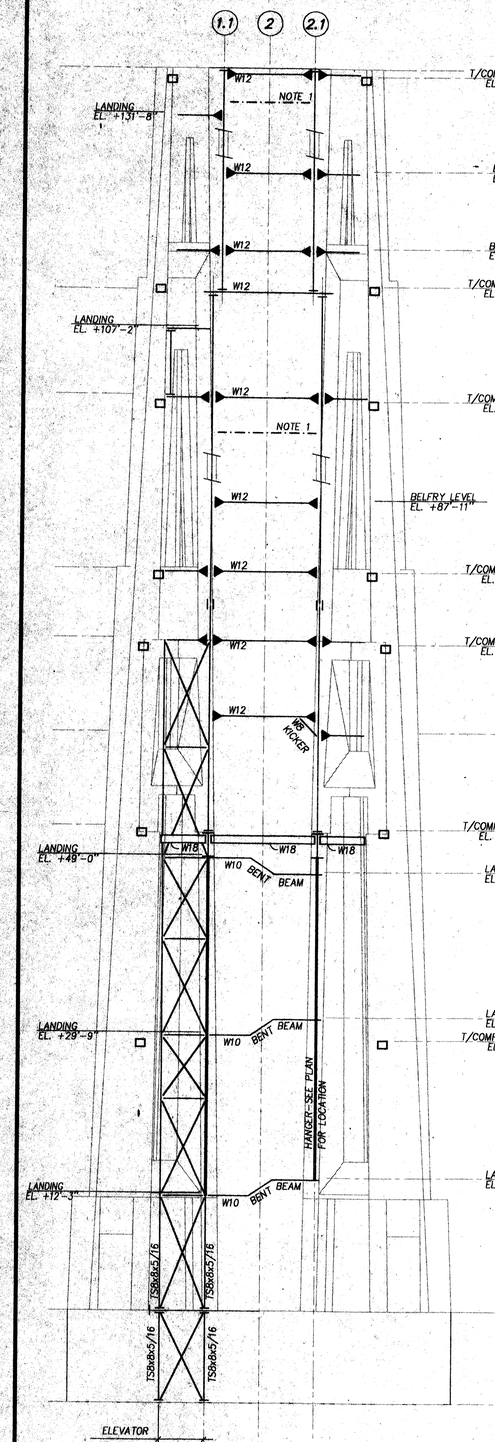
PROJECT MGR: R. ALLMAN

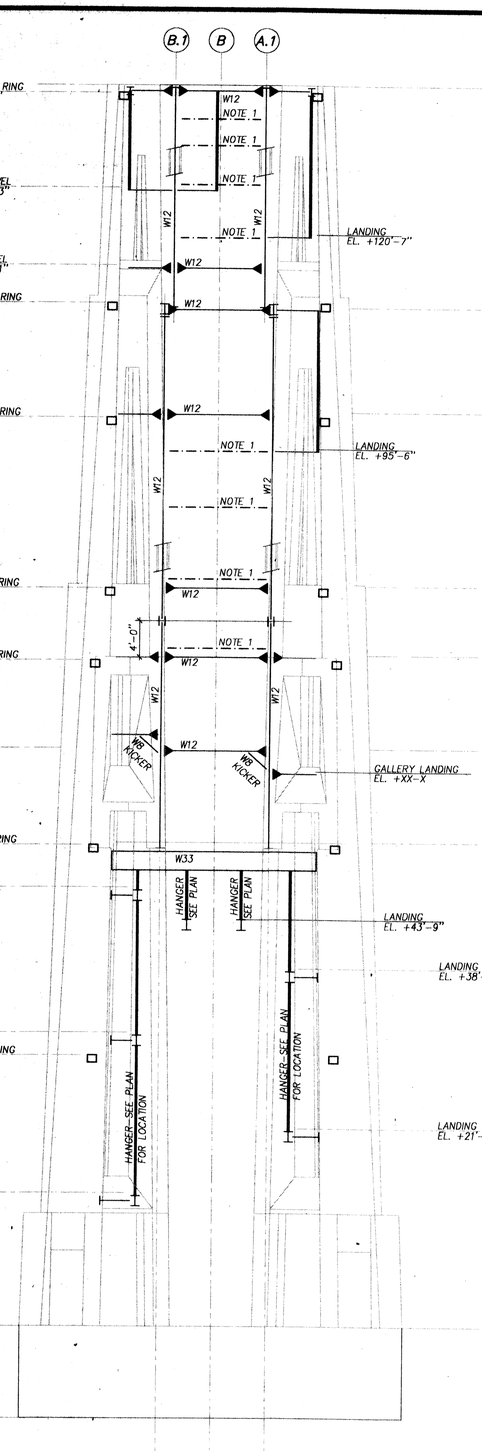
DRAWN BY: J. DEMUTH

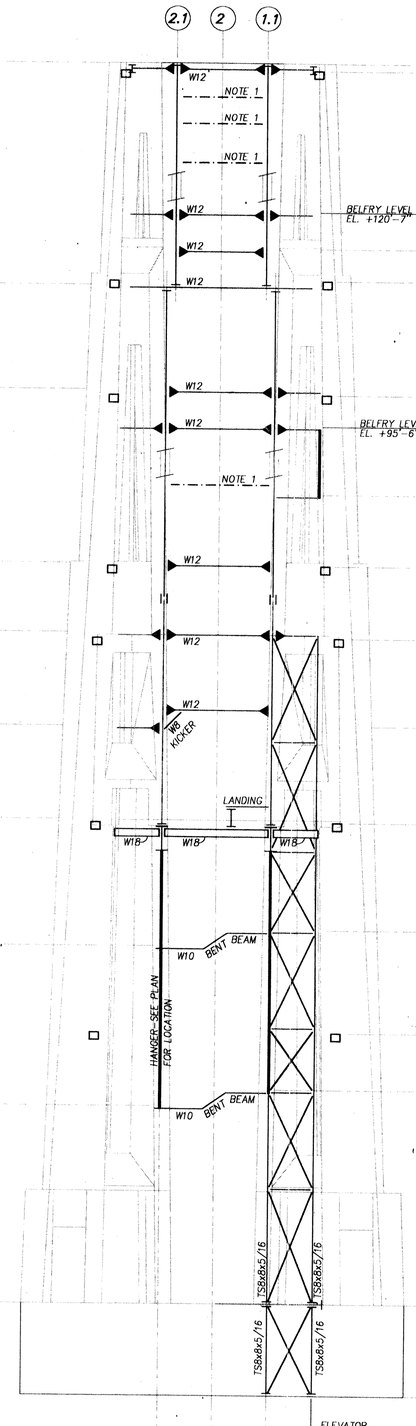
S-14

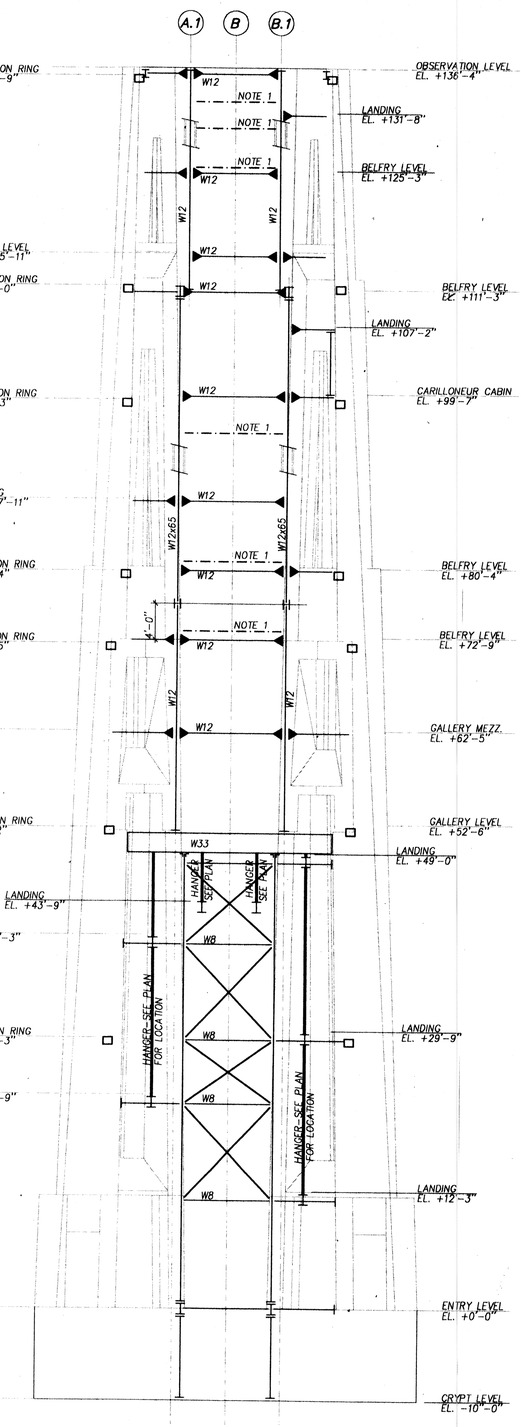
FOR SCOPE STEEL BID ONLY

4735-90

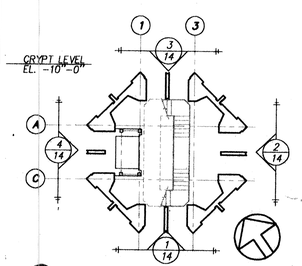








NOTES:
1. BELL SUPPORT BEAMS PROVIDED BY OTHERS ARE SHOWN THUS (—·—) ON ELEVATIONS. REFER TO BELL MFR. SHOP DWGS. FOR COORDINATION AND ADDITIONAL INFORMATION.



KEY PLAN
NO SCALE

4735-91

FOR SCOPE STEEL BID ONLY

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563
Telephone: 630.357.2023
Facsimile: 630.357.2662

NOTES:

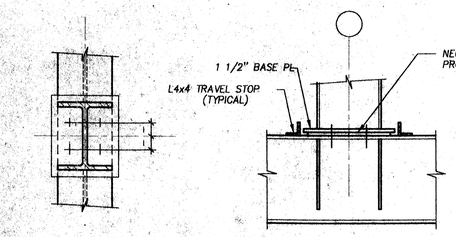
NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

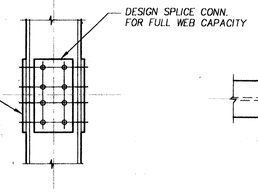
ELEVATIONS FRAMING

JOB#: 98103
DATE: 8/16/99
PRINCIPAL: P. CRAWFORD
PROJECT MGR: B. ALLMAN
DRAWN BY: J. DEMUTH

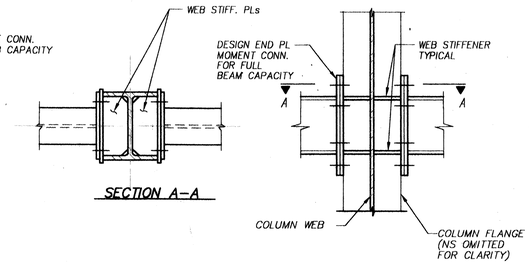
S-15



TYPICAL WF COLUMN & BASE PLATE DETAIL

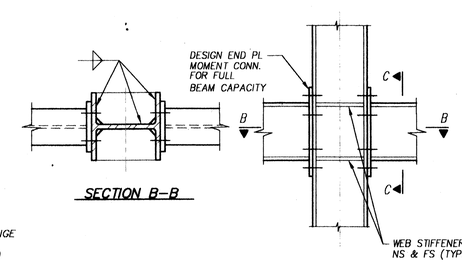


TYPICAL COLUMN SPLICE



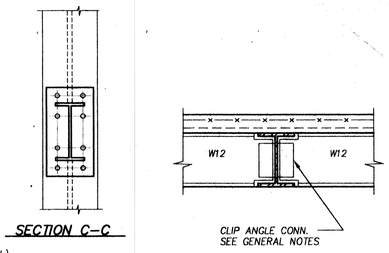
TYPE I BEAM / COLUMN (WEB) MOMENT CONNECTION

WEB STIFFENER THICKNESS = BEAM FLANGE THICKNESS
SEE PLAN FOR LOCATION–INDICATED THUS ▲

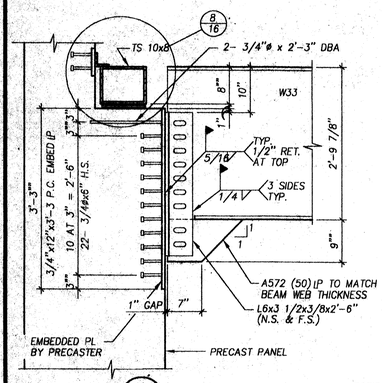


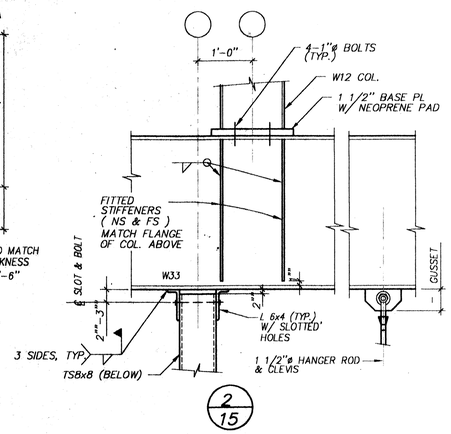
TYPE I BEAM / COLUMN (FLANGE) MOMENT CONNECTION

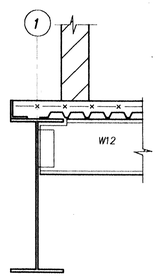
WEB STIFFENER THICKNESS = BEAM FLANGE THICKNESS
SEE PLAN FOR LOCATION–INDICATED THUS ▲

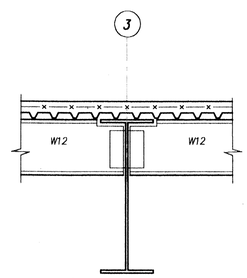


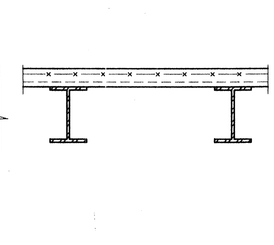
TYPICAL FRAMED BEAM CONNECTION

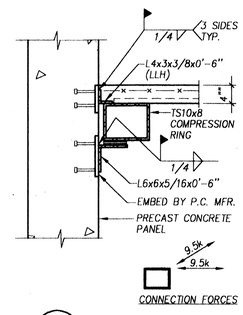


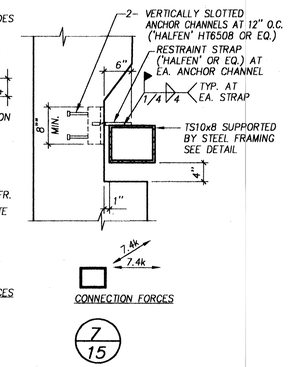


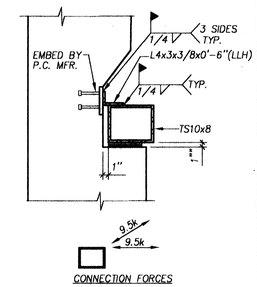


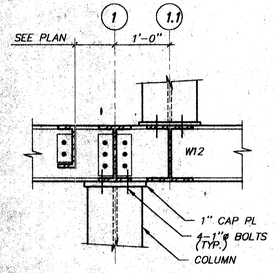


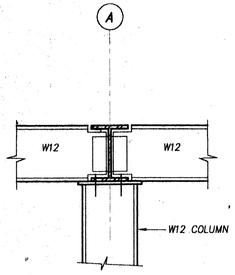


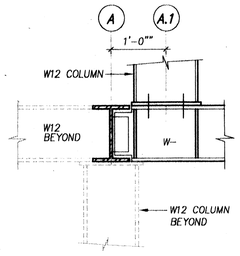


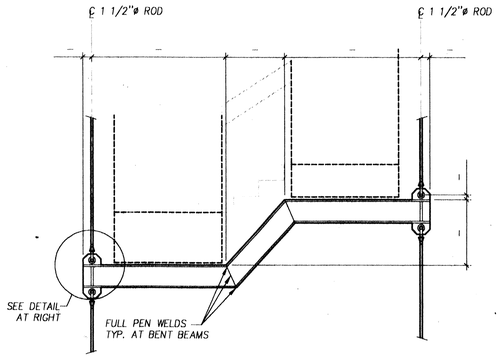




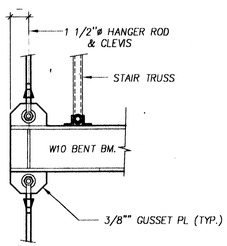


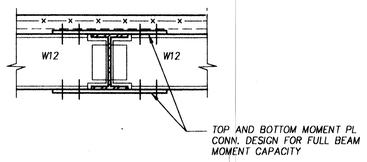




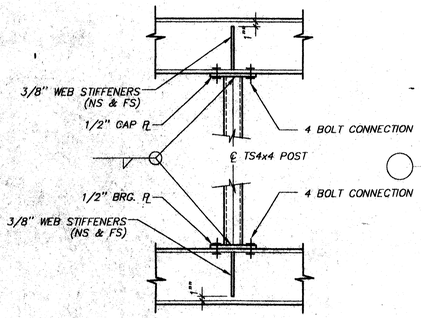


TYPICAL HANGER BEAM DETAILS

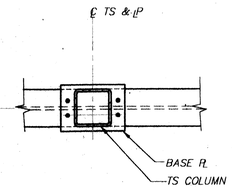


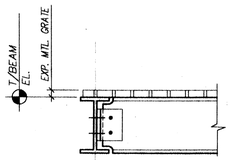


TYPICAL FRAMED BEAM MOMENT CONNECTION

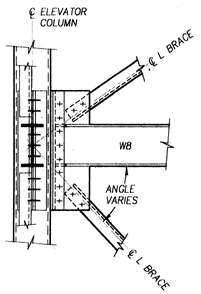


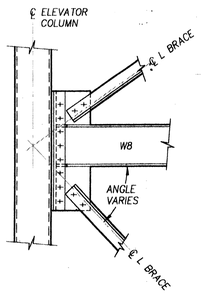
TYPICAL TS POST DETAILS



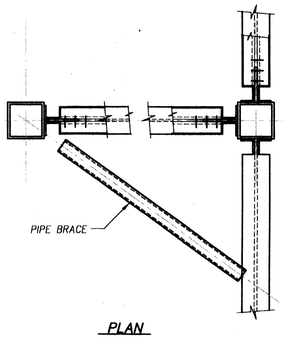


TYPICAL GRATING SUPPORT BM.





TYPICAL ELEVATOR FRAMING DETAILS



PLAN

4735-92

FOR SCOPE STEEL BID ONLY

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563
Telephone: 630.357.2023
Facsmile: 630.357.2662

NOTES:

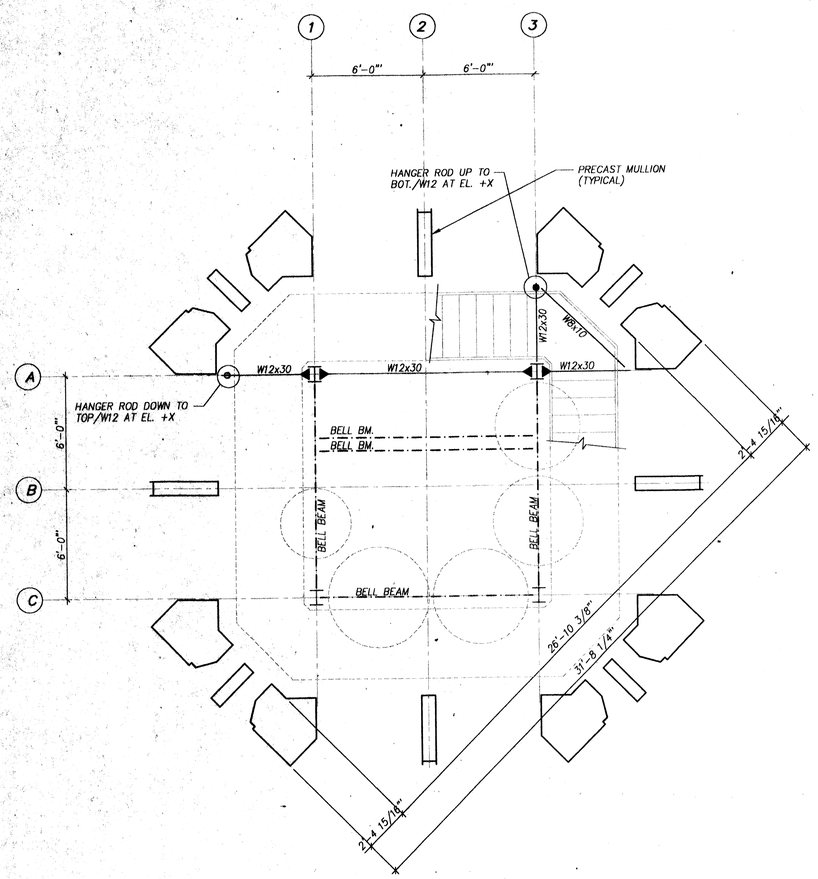
NAPERVILLE MILLENIUM CARILLON

NAPERVILLE, ILLINOIS

FRAMING DETAILS

JOB#: 98103
DATE: 8/16/99
PRINCIPAL: P. CRAWFORD
PROJECT MGR: S. ALLMAN
DRAWN BY: J. DEMUTH

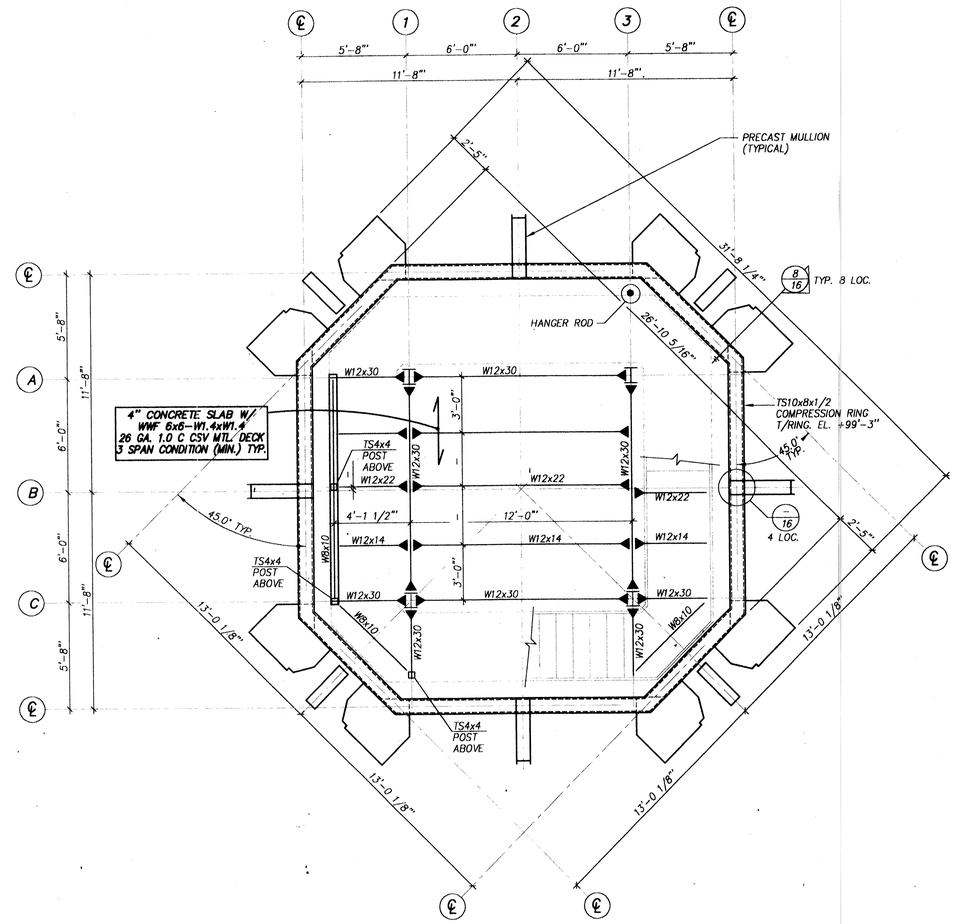
S-16



BELFRY LEVEL FRAMING PLAN – +95'-6"

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

T/STEEL EL. +X



CARILLONEUR CABIN FRAMING PLAN – +99'-7"

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

T/STEEL EL. +X

NOTES:

1. DO NOT ATTACH STEEL TO TS COMPRESSION RING.

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

Telephone: 630.357.2023
Facsmile: 630.357.2662

NOTES:

NAPERVILLE MILLENIUM CARILLON

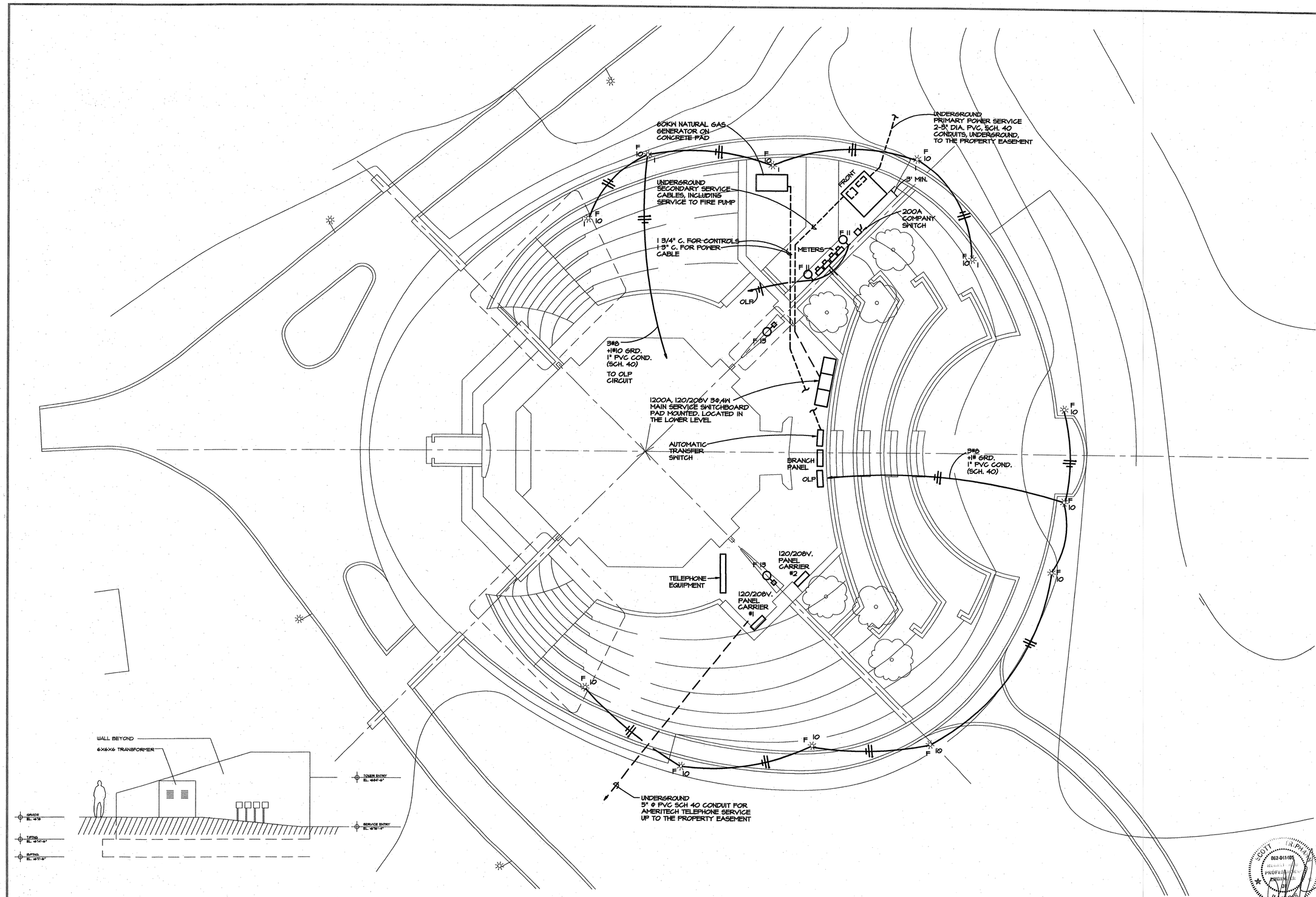
NAPERVILLE, ILLINOIS

FRAMING PLANS

FOR SCOPE STEEL BID ONLY

JOB#: 98103	S-10
DATE: 8/16/99	
PRINCIPAL: P. CRAWFORD	
PROJECT MGR: B. ALLMAN / DRAWN BY: J. DEMUTH	

4735-86



1 ELECTRICAL SITE PLAN
SCALE: 1/8" = 1'-0"

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563
Telephone: 630.357.2023
Facsimile: 630.357.2662

NOTES:
ISSUE FOR FOUNDATION PERMITS 7/6/99
ISSUE FOR PERMITS 9/07/99

NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

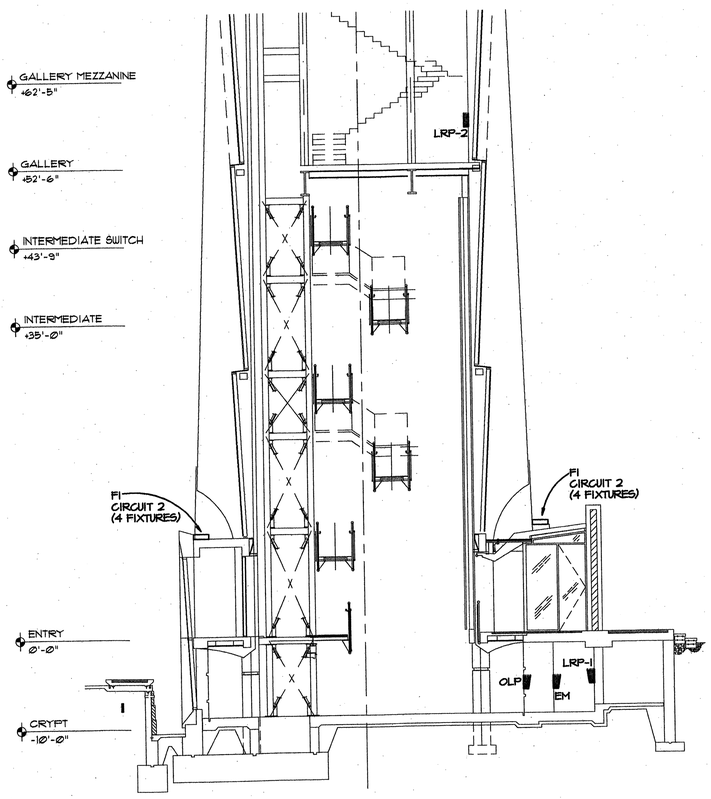
ELECTRICAL SITE PLAN 1/8" SCALE

W-T ENGINEERING, INC.
CONSULTING ENGINEERS
39 EAST SCULLY DRIVE
SCHAUMBURG, ILLINOIS 60193
ph. (847)895-3640
fax. (847)895-9985

PRINCIPAL: PC	SE-1
PROJ. MNGR: TGB	
DRAWN BY: GM	
DATE: 9/07/99	

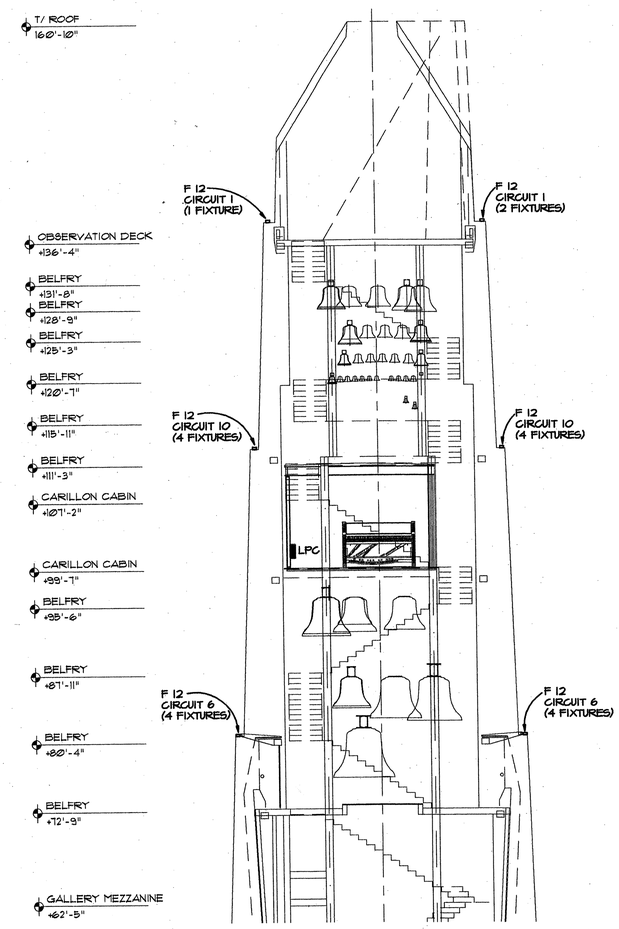
4735-93

4735



2 EXTERIOR LIGHTING PLAN
SCALE: 1/8" = 1'-0"

NOTES:
1. ALL CIRCUITS SHOWN ARE THOSE EMANATING FROM PANEL OLP (LOWER LEVEL).
2. ALL WIRING FOR EXTERIOR LIGHTING SHALL BE DONE IN CORROSION-PROOF PVC SCH. 40 CONDUIT.



1 EXTERIOR LIGHTING PLAN
SCALE: 1/8" = 1'-0"

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

Telephone: 630.357.2023
Facsimile: 630.357.2662

NOTES:
ISSUE FOR FOUNDATION PERMITS 7/6/99
ISSUE FOR PERMITS 9/07/99

NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

EXTERIOR LIGHTING PLAN

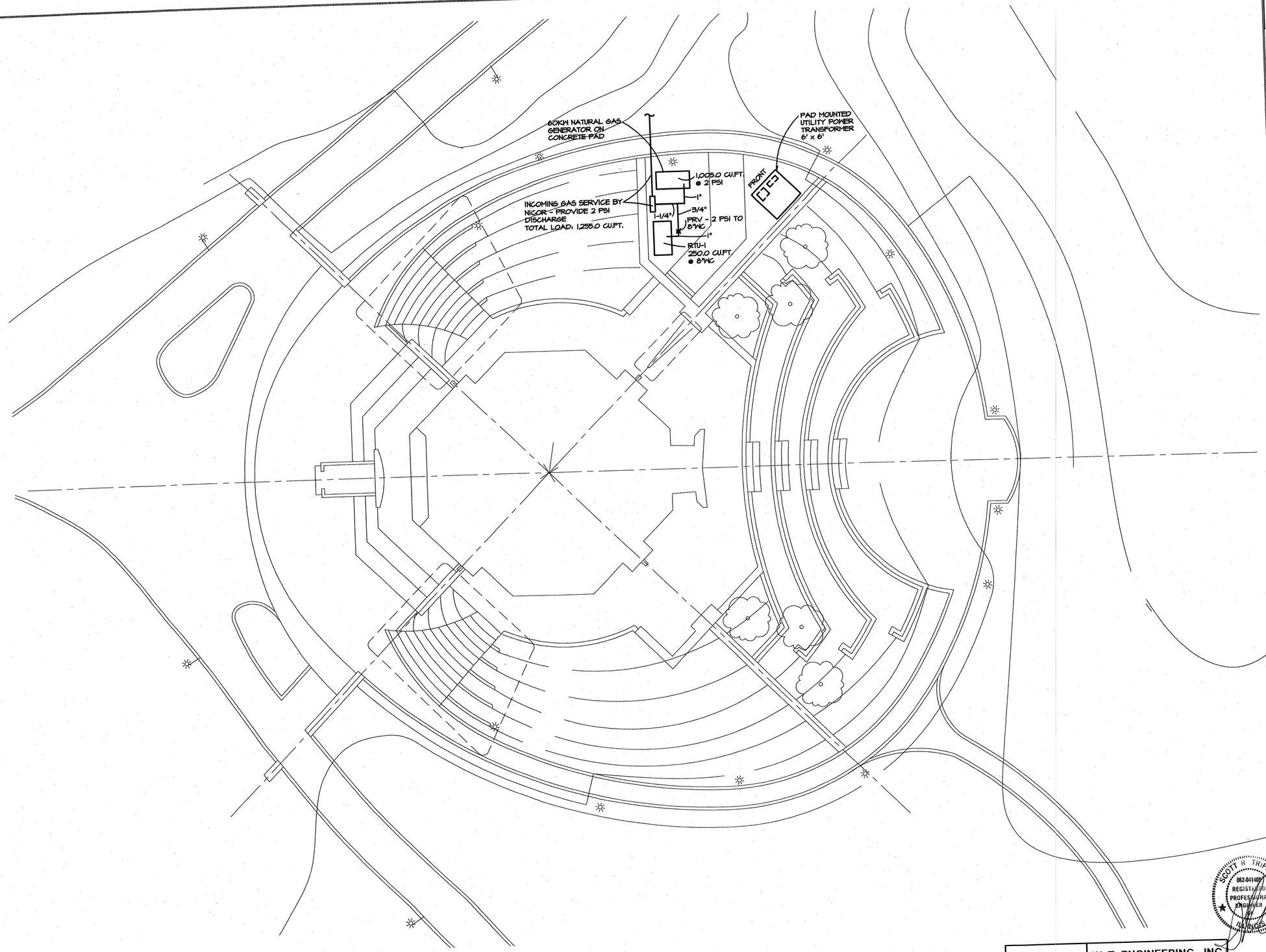
SCOTT R. TRIPLETT
062-041406
REGISTERED PROFESSIONAL ENGINEER
ILLINOIS

W-T
W-T ENGINEERING, INC.
CONSULTING ENGINEERS
39 EAST SCULLY DRIVE
SCHAUMBURG, ILLINOIS 60193
ph. (847)895-3640
fax. (847)895-9985

PRINCIPAL: PC	SE-2
PROJ. MNGR: TGB	
DRAWN BY: GM	
DATE: 9/07/99	

4735-94

4735



1 PLUMBING SITE PLAN
SCALE: 1/8" = 1'-0"

Charles Vincent George
design group, inc.
604 North Washington Street
Naperville, Illinois 60563

Telephone: 630.357.2023
Facsimile: 630.357.2662

NOTES:
ISSUE FOR FOUNDATION PERMITS 7/6/99
ISSUE FOR PERMITS 9/07/99

NAPERVILLE MILLENNIUM CARILLON

NAPERVILLE, ILLINOIS

PLUMBING SITE PLAN 1/8" SCALE

SCOTT R TRUPHAN
062-041405
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

W-T
W-T ENGINEERING, INC.
CONSULTING ENGINEERS
39 EAST SCULLY DRIVE
SCHAUMBURG, ILLINOIS 60193
ph. (847)895-3640
fax. (847)895-9985

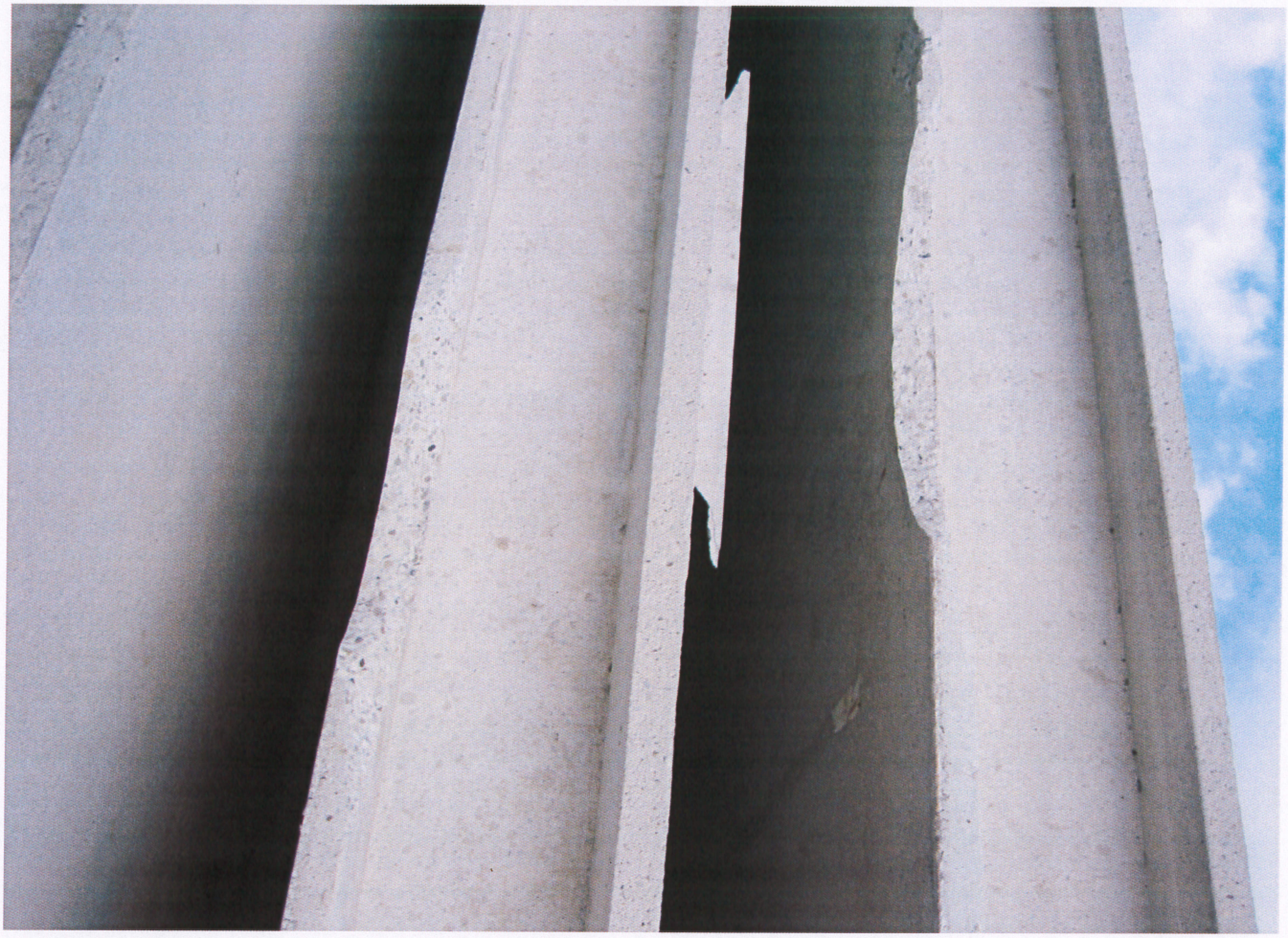
PRINCIPAL: PC	SP-1
PROJ. MNGR: TGB	
DRAWN BY: GM	
DATE: 9/07/99	

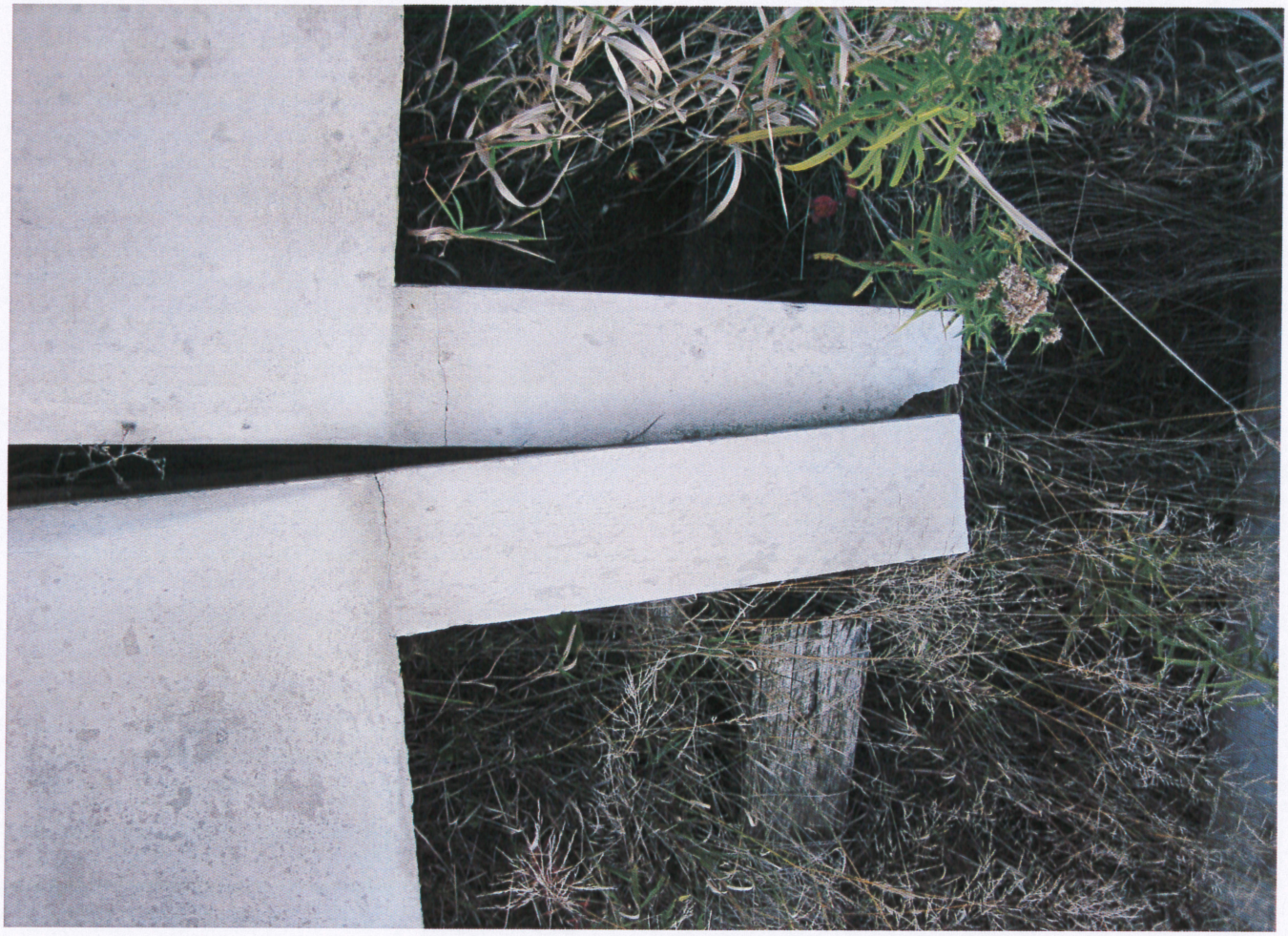
4735-95

4735

APPENDIX D

IMPROPER STORAGE AND HANDLING DAMAGE (10/25/05)
CONSTRUCTION SITE OBSERVATIONS AND PHOTOS





094654

APPENDIX E

NAPERVILLE CARILLON STRUCTURAL CRACKS CONSULTING REPORT
PREPARED BY ESI (3/1/2006)

Engineering Systems Inc.

3851 Exchange Avenue, Aurora, Illinois 60504
(630) 851-4566 • FAX (630) 851-4870
www.esi-website.com

NAPERVILLE CARILLON STRUCTURAL CRACKS CONSULTING

ESI File No.: 20372A

Report Submitted to:

Mr. Thomas F. McCluskey
McCluskey Engineering Corp.
1887 High Grove Lane
Naperville, IL 60540

Report Submitted by:

Chad R. Fischer, S.E., P.E.
Staff Engineer
P.E. License Expires: November 30, 2007
S.E. License Expires: November 30, 2006

3 / 01 / 06
Date

Reviewed by:

August W. Domel, Ph.D., S.E., P.E.
Principal-Structural Engineering
P.E. License Expires: November 30, 2007
S.E. License Expires: November 30, 2006

3 / 01 / 06
Date

INTRODUCTION

Engineering Systems Inc. (ESI) was retained to inspect the Naperville Carillon tower. Problems with spalling concrete had been observed over the past several years and repair attempts had been unsuccessful. ESI was requested to determine the cause of the spalling concrete.

The Naperville Carillon is a bell tower located in downtown Naperville, Illinois. It is approximately 160 feet tall. The main structure is constructed of precast concrete panels that have been post-tensioned together. Due to the slope of the tower toward the top, the post-tensioned bars are terminated at various levels in pockets in the precast panels. The bars are terminated with a washer and nut and the pockets were grouted solid. The internal framework to support the bells and stairs is constructed of steel.

The structure of the tower was completed in 2000. Spalls were observed near some of the grout pockets at the upper elevation in the winter of 2002-2003 and had been subsequently repaired. The following winter additional spalls and cracking were observed at the upper level grout pockets.

SITE INSPECTION

ESI inspected the spalled concrete on December 15, 2005 along with Thomas McCluskey. Several representatives from the City of Naperville were also present. The inspection was conducted from a man basket.

Spalled concrete surrounding the grout pockets was inspected and photographed on several legs of the tower. The condition of the concrete around the grout pockets ranged from cracking and small spalls to large sections of missing concrete. In general, the grout was still intact in the pockets. However in some locations, the grout was broken about and no longer a solid consistency.

Several pieces of loose concrete had been recently removed by the City of Naperville, because they were hanging precariously. These pieces had been retained in the base of the tower and ESI observed them as well.

There was evidence of several repair attempts with epoxies, sealants and other repair materials.

Photographs taken during the site inspection are attached.

CONCRETE TESTING

ESI retained two sections of spalled concrete that were sent to a testing lab for petrographic inspection. At our request, the City of Naperville also provided several pieces of grout from one grout pocket for petrographic inspection.

The samples were sent to an outside testing company for the petrographic inspection. Petrographic examination combines unaided visual inspection with examination using various microscopes. This can provide information regarding the condition of the concrete, the amount of hydration, and can help identify several different types of problems or reactions in the concrete.

The petrographic inspection identified that an internal sulfate attack was occurring in the grout pockets. The sulfate attack causes the grout materials to expand and causes the surrounding concrete to crack. The cause of the sulfate attack was identified as an abundant amount of gypsum in the grout.

A copy of the petrographic report is attached

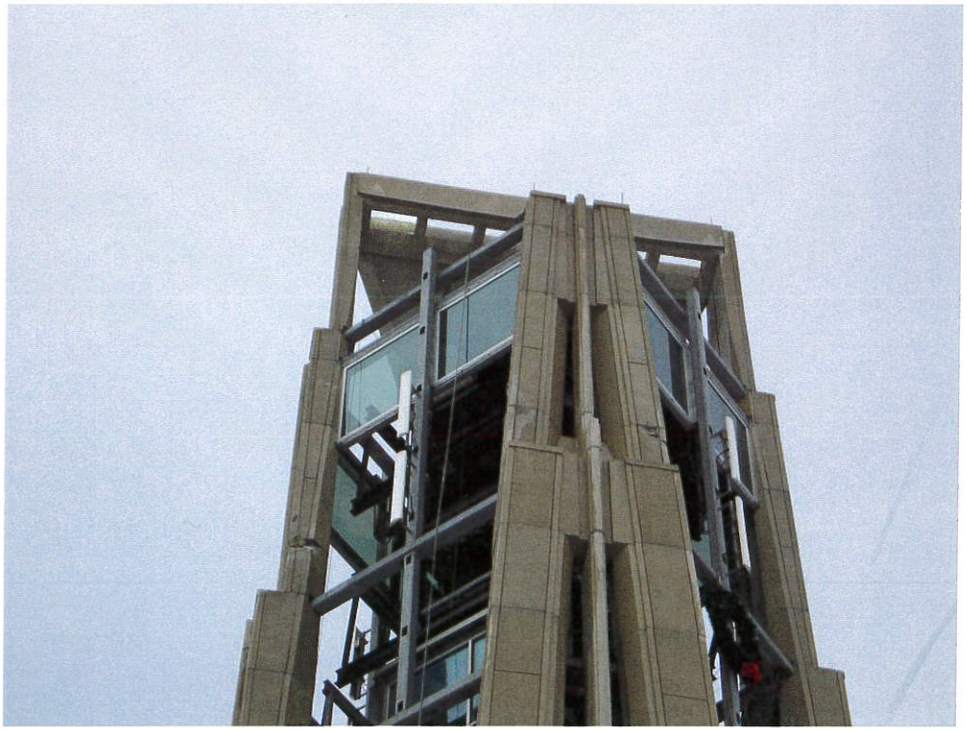
DISCUSSION AND CONCLUSIONS

The cause of the distress at the upper level of the bell tower is the result of an internal sulfate attack occurring in the grout pockets. The grout included an abundant amount of gypsum in the mixture. The sulfate attack caused the grout to expand. The expansive forces exerted on the precast concrete surrounding the grout pocket caused the initial cracking in the concrete. This allowed water to enter the cracks leading to freeze-thaw damage and further spalling.

No material defects of the concrete mixture used in the precast panels were identified in the petrographic examination.

In order to address the problem, all the grout should be removed from the pockets at locations where spalls have occurred. Also, the unsound spalled concrete should be removed and a repair plan developed to replace the spalled concrete and deteriorated grout.

Currently, this condition has primarily occurred at one elevation level on the tower. Some concrete cracking was also at a grout pocket on level lower, but no spalls were observed at that time. The grout in other pockets that have not yet spalled may or may not be in a similar deteriorated condition. Destructive openings and additional sample testing would be required to determine the condition and quality of grout in these areas.



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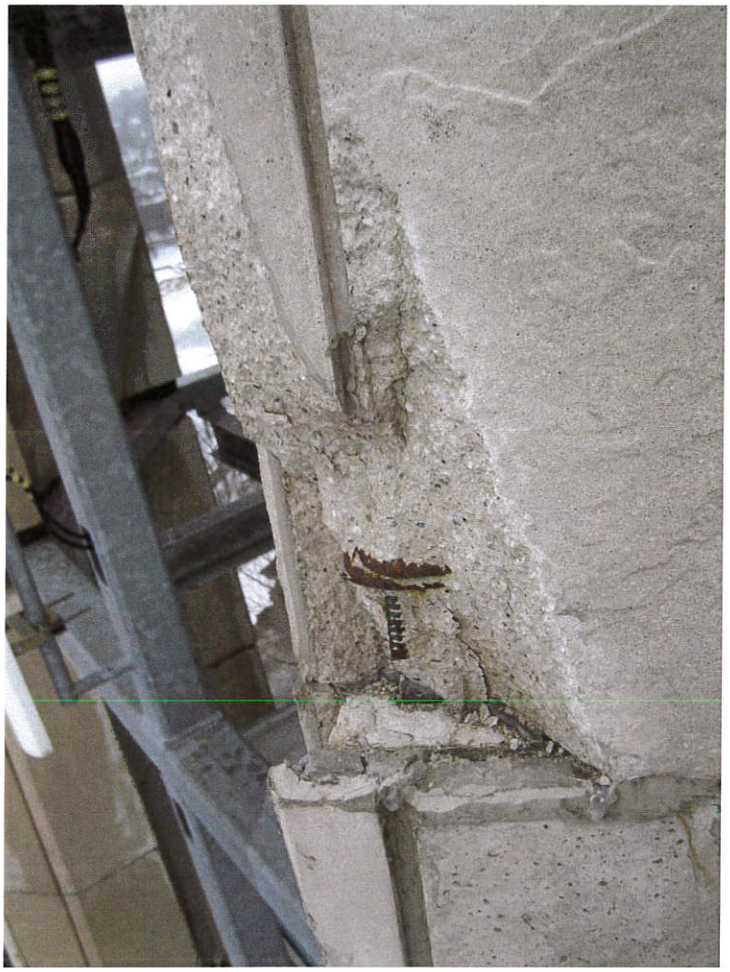

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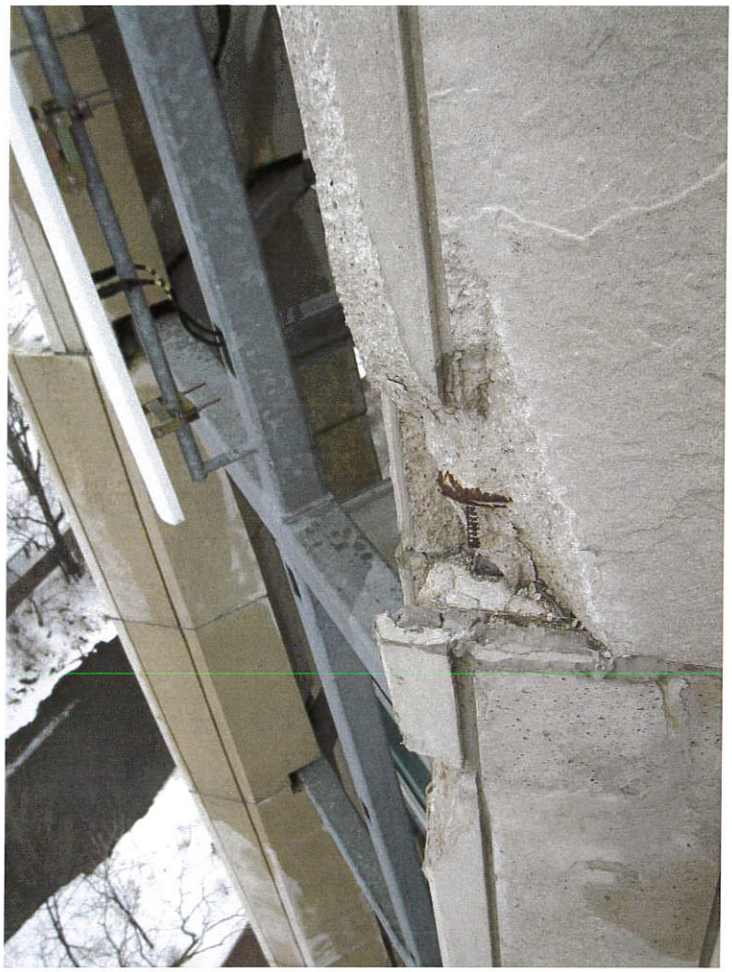

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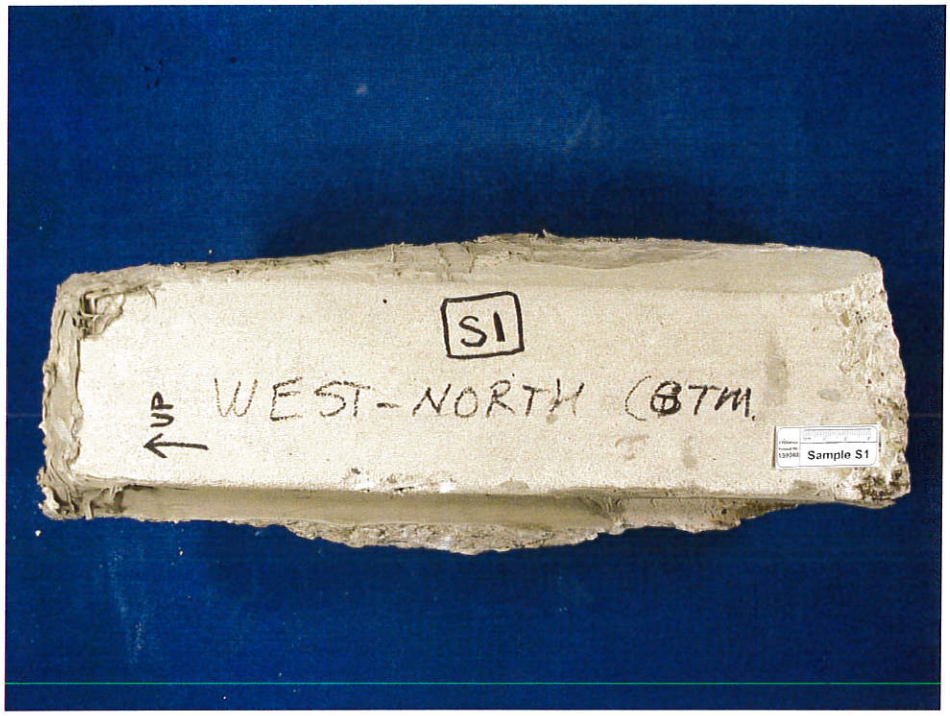
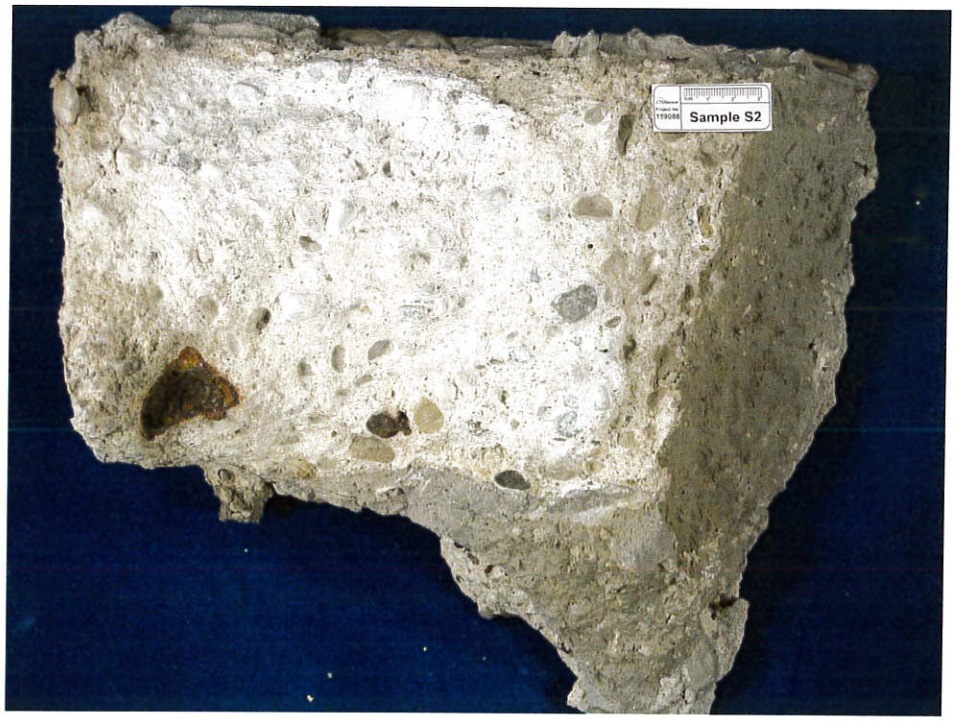


1a. Exterior surface.

1b. Interior surface.

Fig. 1 Sample S1, as received for examination.

2a. Exterior surface.



2b. Interior surface.

Fig. 2 Sample S1, as received for examination.

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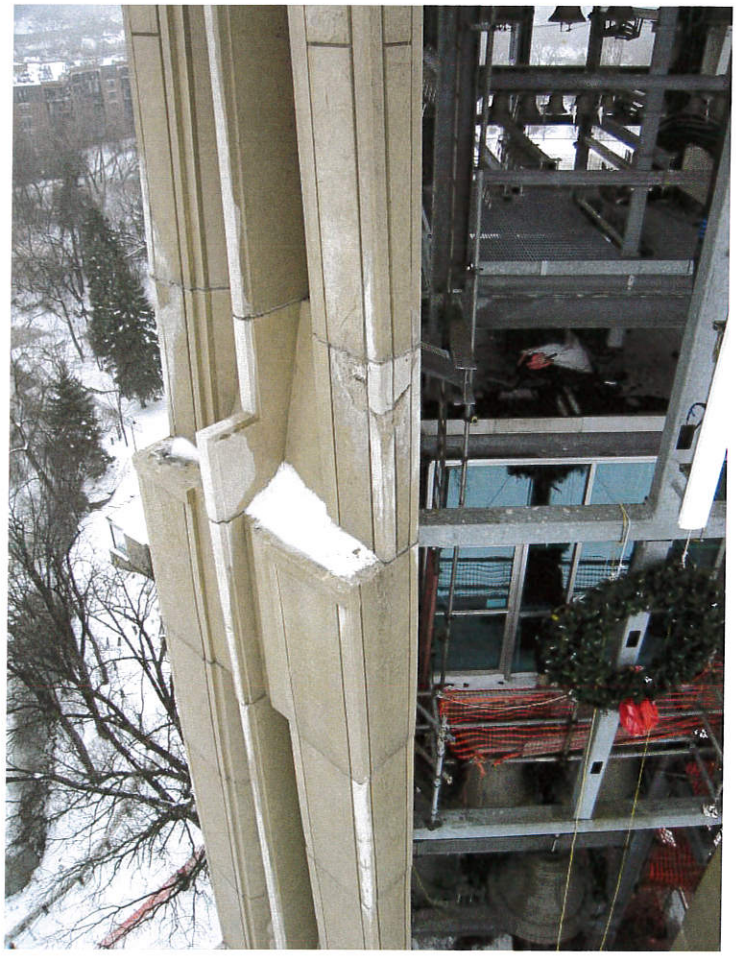

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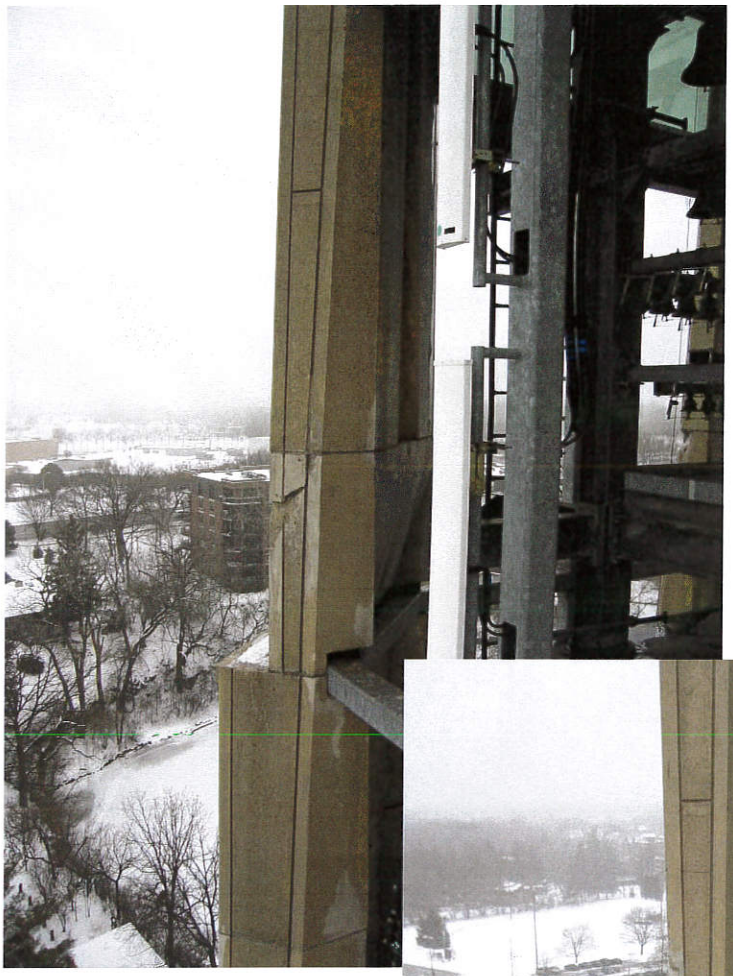

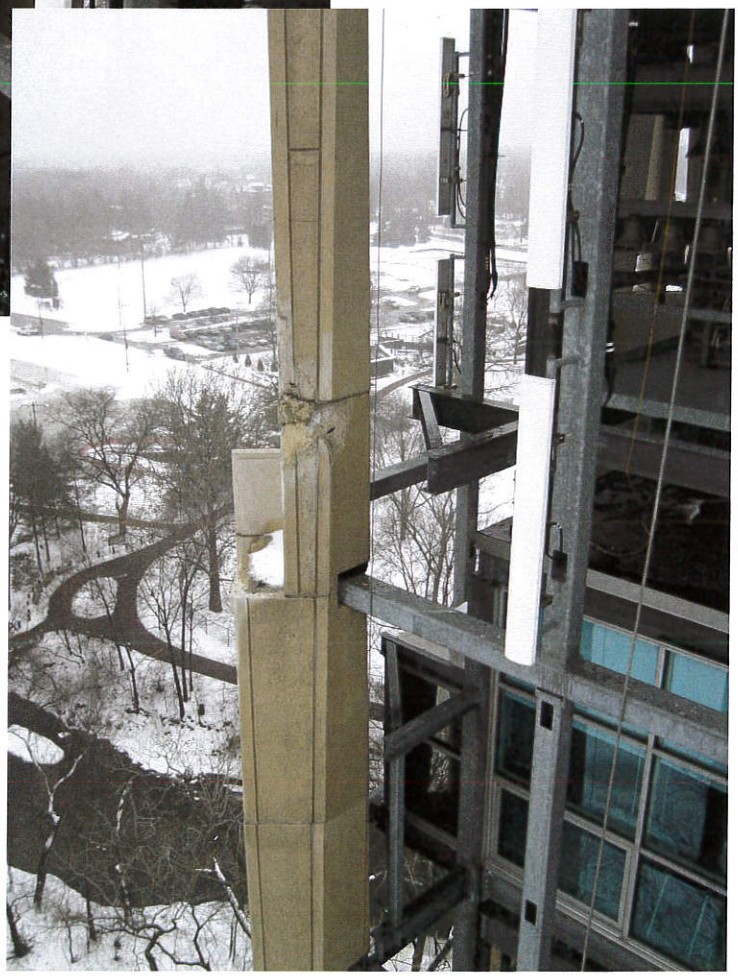

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REPORT OF PETROGRAPHIC EXAMINATION

Date: February 24, 2006

CTLGroup Project No.: 159088

Re: Petrographic Examination of Concrete Samples from Naperville Millennium Carillon, Naperville, Illinois

Three samples, described in Table 1 below, were received from Mr. Chad Fisher, Engineering Systems, Inc., Aurora, Illinois. The samples were reportedly extracted from a precast concrete bell tower that is exhibiting cracking and spalling. The bell tower was constructed in early 2000. Cracking was first observed after the winter of 2002–2003 and deterioration continued after the winter of 2003–2004.

TABLE 1. SAMPLE DESCRIPTIONS

Sample	Description	Date received	As-rec'd Photos
S1	Fractured fragment of precast concrete block with one exterior formed surface. White powdery material adhered to interior formed surface.	January 5, 2006	Fig. 1
S2	Fractured fragment of precast concrete with one exterior formed surface. Large amount of gray epoxy grout adhered to interior surface of concrete. Small amount of cementitious grout adhered to interior surface of epoxy grout. Other repair materials also adhered to concrete.	January 18, 2006	Fig. 2
S3	Several fragments of cementitious grout, varying in size. Mortar joint adhered to largest fragment. Epoxy adhered to a few other fragments.	January 18, 2006	Fig. 3

According to information provided by Mr. Fisher, the tower is constructed of stacked precast concrete blocks. Vertical post tensioning rods run through the blocks, holding them together. Recesses or pockets were cast into some of the concrete blocks to accommodate a metal plate where the post-tensioning rods terminate. After post tensioning, these pockets were filled with cementitious grout. Cracking and spalling is generally observed at the elevation of these grout pockets. Petrographic examination (ASTM C 856) of two of the submitted samples was

requested to evaluate material properties and identify characteristics that may have contributed to the observed cracking and spalling. Based on the condition of and materials represented by the samples, Samples S2 and S3 were selected for examination.

FINDINGS AND CONCLUSIONS

Based on petrographic examination of Samples S2 and S3, cracking and spalling of the precast concrete is attributed to stresses created by expansion and deterioration of the cementitious grout within the grout pockets. This expansion is judged to be the result of internal sulfate reactions within the hardened grout.

Grout represented by Sample S3 and the small amount of cementitious grout adhered to Sample S2 exhibits extensive internal cracking (Figs. 4 through 7). The grout is soft, weak, and friable, and the microstructure of the cementitious paste within the grout is extensively altered. The paste exhibits abundant amounts of gypsum, ettringite, and thaumasite (Figs. 8 and 9), with little evidence of remaining normal portland cement hydration products. The poor condition of the grout and the appearance of the paste microstructure are evidence of internal sulfate attack.

Aside from cracking which likely resulted from expansion of the cementitious grout, the precast concrete represented by Sample S2 appears to be in good condition. No evidence of deleterious reaction such as internal sulfate attack or alkali-aggregate reaction (AAR) was observed within this material.

The precast concrete consists of calcareous and siliceous gravel and natural sand uniformly distributed in a hardened portland cement paste. Water-cement ratio (w/c) is judged to be moderate to moderately high, in the range 0.50 to 0.60. Estimations of w/c are based on observed paste properties, including the percentage of unhydrated portland cement clinker particles. The paste is light to very light beige in color, moderately soft to moderately hard, dull to subvitreous, and paste-aggregate bond is moderately tight to moderately weak. The paste is carbonated to depths of 3 to 10 mm (0.1 to 0.4 in.) along the exterior formed surface, and to depths of 2 to 5 mm (0.08 to 0.2 in.) along the flat interior surface (Fig. 10). The concrete appears air entrained based on the presence of small spherical voids in the hardened paste matrix; air content is estimated at 3 to 5%.

Epoxy grout adhered to the interior surface of the precast concrete of Sample S2 (Fig. 11) consists of quartz sand and finely ground limestone in a gray epoxy matrix. This material also does not exhibit evidence of deleterious internal reactions.

Cementitious grout adhered to the interior surface of Sample S2 and represented by Sample S3 exhibits calcareous and siliceous gravel and natural sand distributed in a paste of portland

cement with large amounts of gypsum and/or other sulfate compounds. The paste is very light beige to white in color, soft to very soft, dull, and paste-aggregate bond is weak. Water-cementitious materials ratio (w/cm) could not be evaluated due to extensive alteration of the paste microstructure. Air content is estimated at less than 1%; the material is not air entrained.

Lapped sections of Samples S2 and S3 are shown in Figs. 11 and 12, respectively. Additional findings and descriptions of these samples are provided in the attached data sheets.

DISCUSSION

Calcium sulfate, typically in the form of gypsum ($CaSO_4 \bullet 2H_2O$), is intentionally added to portland cement, in small amounts, to control hydration. Upon the addition of water to a mortar or concrete mixture, the gypsum reacts with calcium aluminate in the portland cement to form ettringite ($3CaO \bullet Al_2O_3 \bullet 3CaSO_4 \bullet 32H_2O$). The formation of ettringite controls stiffening of the fresh material and typically consumes most of the sulfate in the cement, usually within a few hours after initial mixing. This "primary ettringite" consists of very small (sub-microscopic) crystals and is uniformly distributed throughout the cementitious paste.

If abnormally large amounts of gypsum or other sulfates are intentionally or inadvertently added to a cement mixture, deleterious expansion can occur if the hardened mortar or concrete is later exposed to moisture. Significant amounts of sulfate are not completely consumed during initial hydration reactions, yet remain readily soluble in the hardened material. If water comes in contact with the hardened paste, the remaining sulfate can react with cement hydration products to form more ettringite ("secondary ettringite"). Thaumasite ($CaSiO_3 \bullet CaCO_3 \bullet CaSO_4 \bullet 15H_2O$) may form in cooler temperatures, usually between 0°C and 10°C (32°F to 50°F), and with available calcium carbonate ($CaCO_3$), which is formed when cementitious paste carbonates. The formation of ettringite and/or thaumasite within a hardened paste matrix is expansive and thus deleterious to the material. If moisture is readily available, the expansive reactions will continue until the sulfate is completely consumed.

RECOMMENDATIONS

Further testing is recommended to verify the composition of the altered cement paste and to quantify the amount of sulfate within the cementitious grout. X-ray diffraction analysis (XRD) will identify the minerals present within the paste of the hardened grout. X-ray fluorescence analysis (XRF) will determine the total sulfate content of the grout. XRD and XRF performed in conjunction can provide a quantitative analysis of the composition of the paste.

METHODS OF TEST

Petrographic examination of the samples examined was performed in accordance with ASTM C 856-04, "Standard Practice for Petrographic Examination of Hardened Concrete." The samples were visually inspected and photographed, then impregnated with epoxy resin to stabilize the materials. A slice, approximately 20-mm (¾-in.) thick, was cut from the middle region of Sample S2, and slices approximately 13-mm (½-in.) thick were cut from the two largest fragments of Sample S3. One of the resulting surfaces of each slice was lapped. Lapped and freshly broken surfaces were examined at magnifications up to 45x using a stereomicroscope equipped with a high-intensity, variable angle, dual light source. Rectangular blocks, measuring approximately 25 mm (1.0 in.) by 38 mm (1.5 in.), were cut from the interior and exterior surfaces of Sample S2, and from a representative fragment of Sample S3. These blocks were ground to a semi-polished finish. After cleaning and drying, the prepared surfaces were mounted on glass microscope slides with epoxy resin. Following epoxy hardening, the thickness of the mounted blocks was reduced to approximately 20 μm (0.0008 in.). The resulting thin sections were examined at magnifications up to 400x using a polarized-light microscope to evaluate mineralogy and microstructure.

Depth and extent of paste carbonation was initially determined by the application of a pH indicator (phenolphthalein) solution to freshly fractured and saw-cut surfaces of the concrete. The solution imparts a deep magenta stain to high-pH, non-carbonated cement paste, but does not stain reduced-pH, carbonated paste. Extent of carbonation was also confirmed during microscopical examination of the thin sections.

Victoria A. Jennings

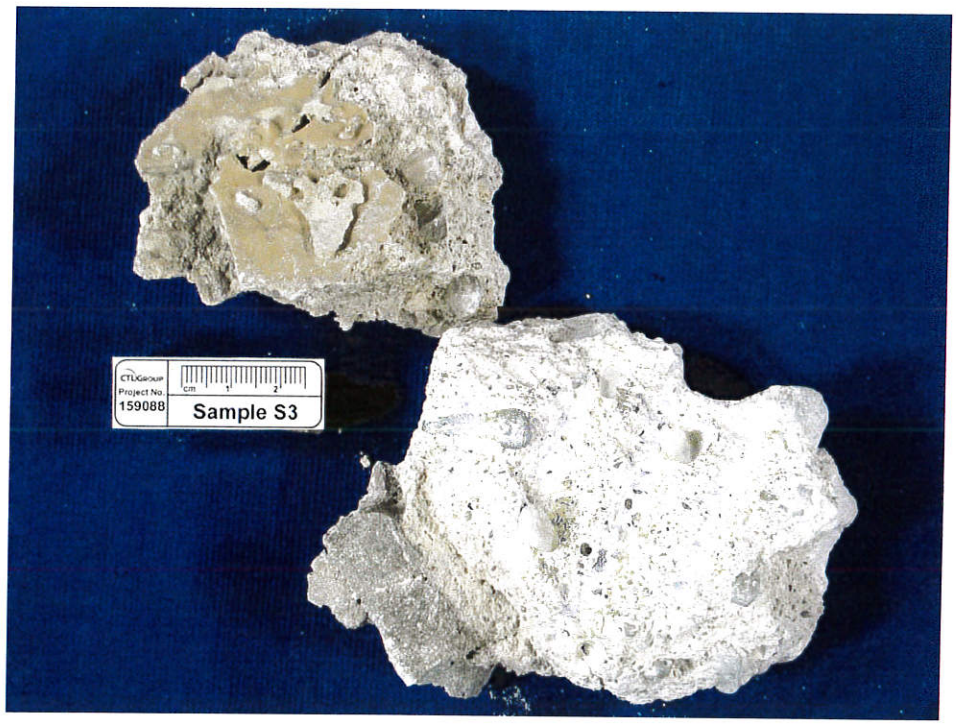
Victoria A. Jennings
Microscopist
Microscopy Group

VAJ

159088

Attachments

3a. Entire sample.



3b. Fragments selected for petrographic examination.

Fig. 3 Sample S3, as received for examination.

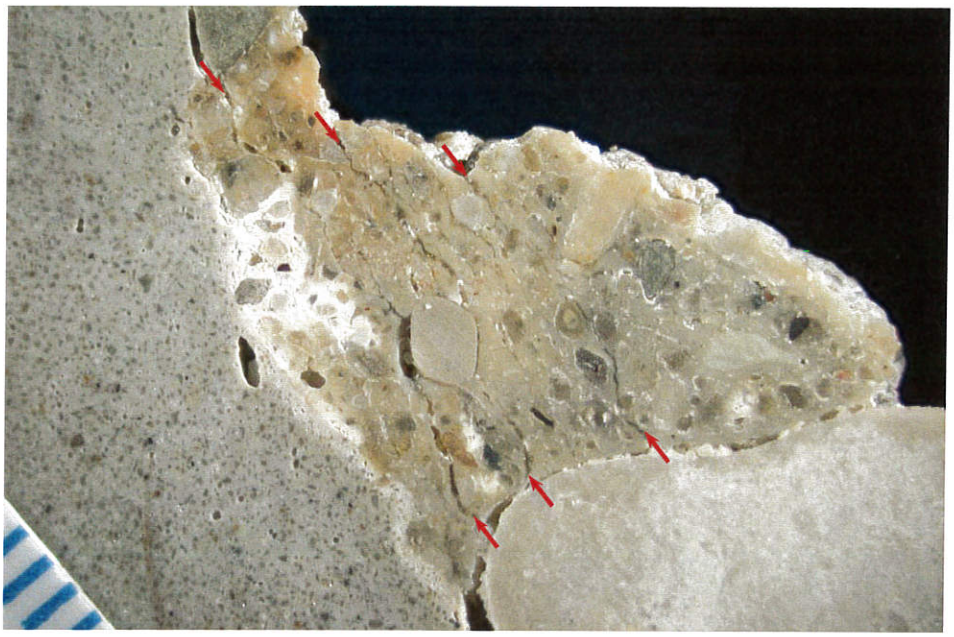


Fig. 4 Lapped cross-section of Sample S2 showing numerous cracks and microcracks (arrows) within cementitious grout adhered to back of sample. Dark beige appearance of most of grout is result of epoxy impregnation, performed to stabilize material. Scale marks represent 1 mm (0.04 in.).

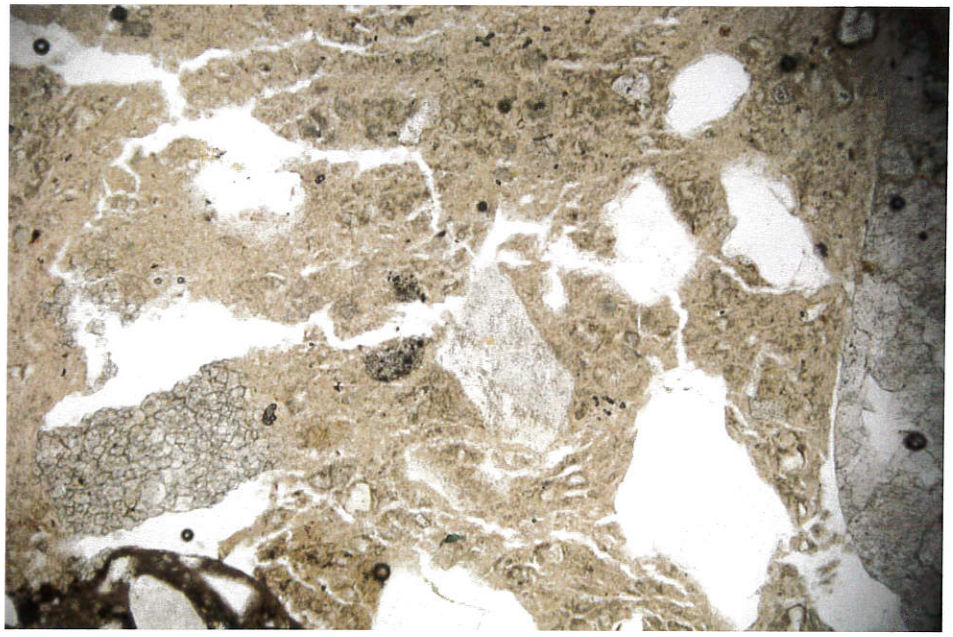


Fig. 5 Thin-section photomicrograph (plane-polarized light) of cementitious grout adhered to Sample S2, showing numerous cracks and microcracks within paste. Field of view approximately 2.3 mm (0.09 in.) across.

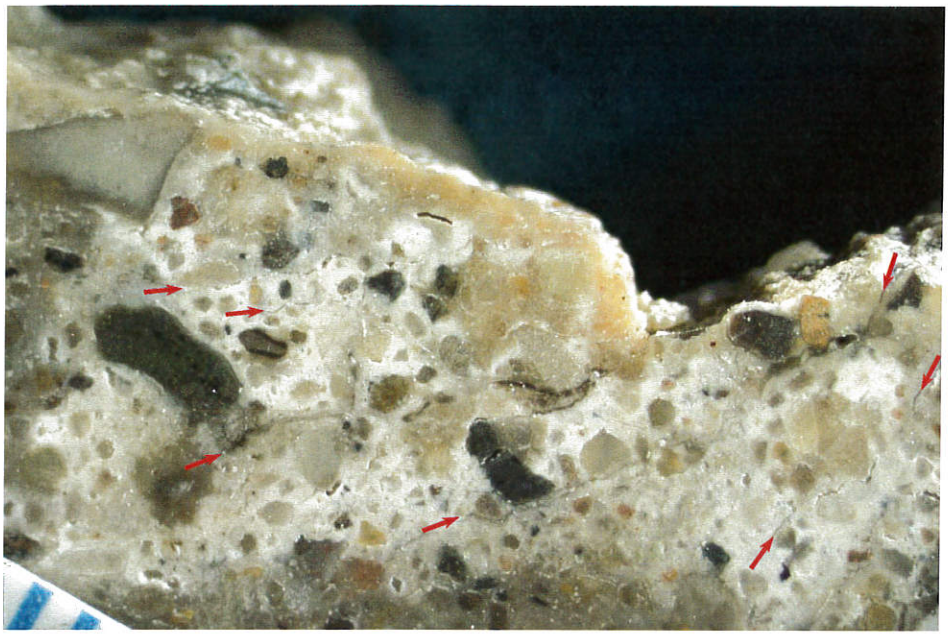


Fig. 6 Lapped cross-section of fragment from Sample S3 showing numerous cracks and microcracks (arrows) within cementitious grout. Mottled color of grout is result of epoxy impregnation, performed to stabilize sample. Scale marks represent 1 mm (0.04 in.).

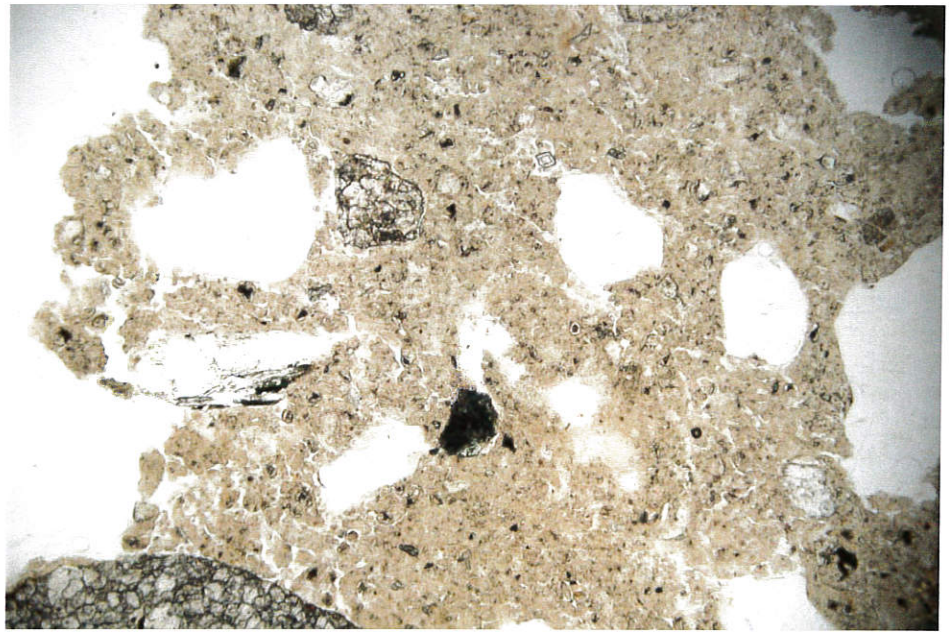
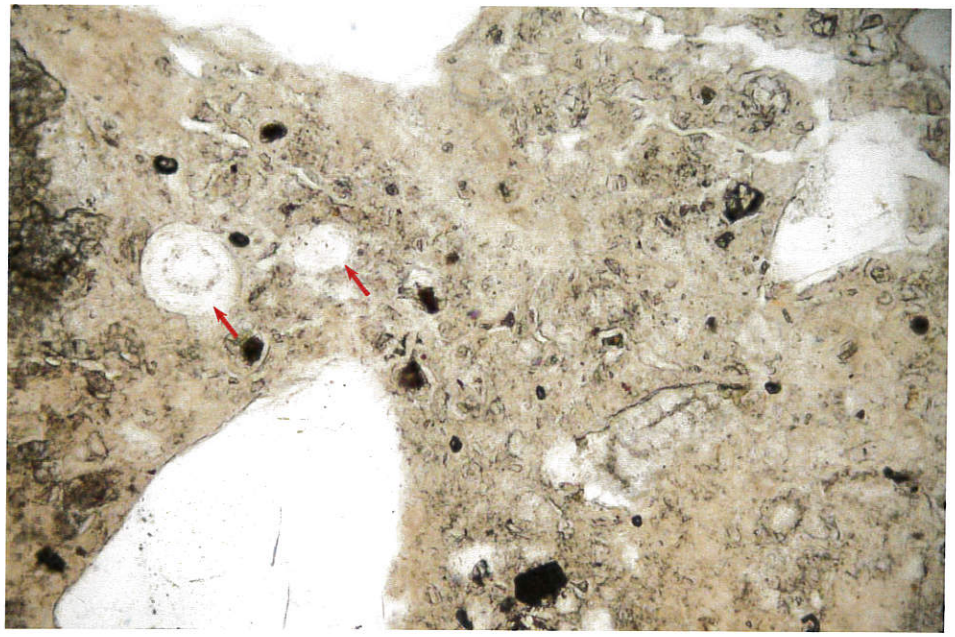
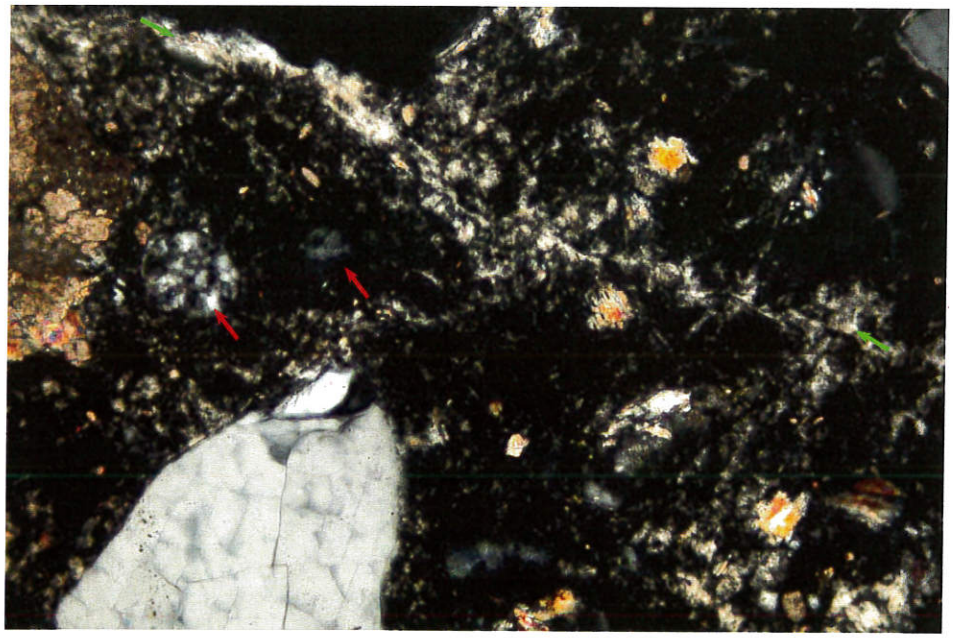


Fig. 7 Thin-section photomicrograph (plane-polarized light) of Sample S3, showing numerous microcracks within paste of cementitious grout. Field of view approximately 2.3 mm (0.09 in.) across.

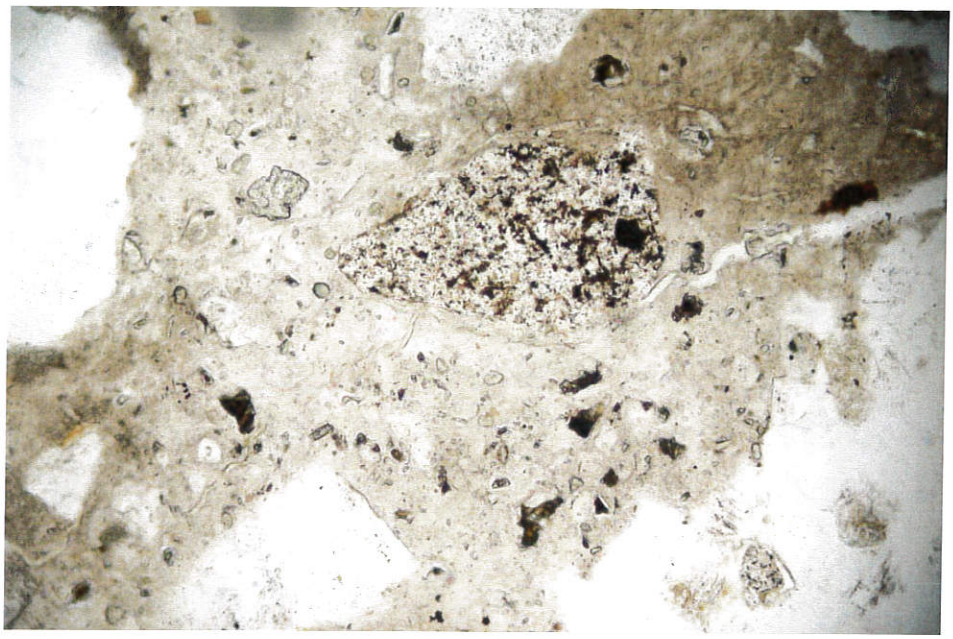


8a. Plane-polarized light.

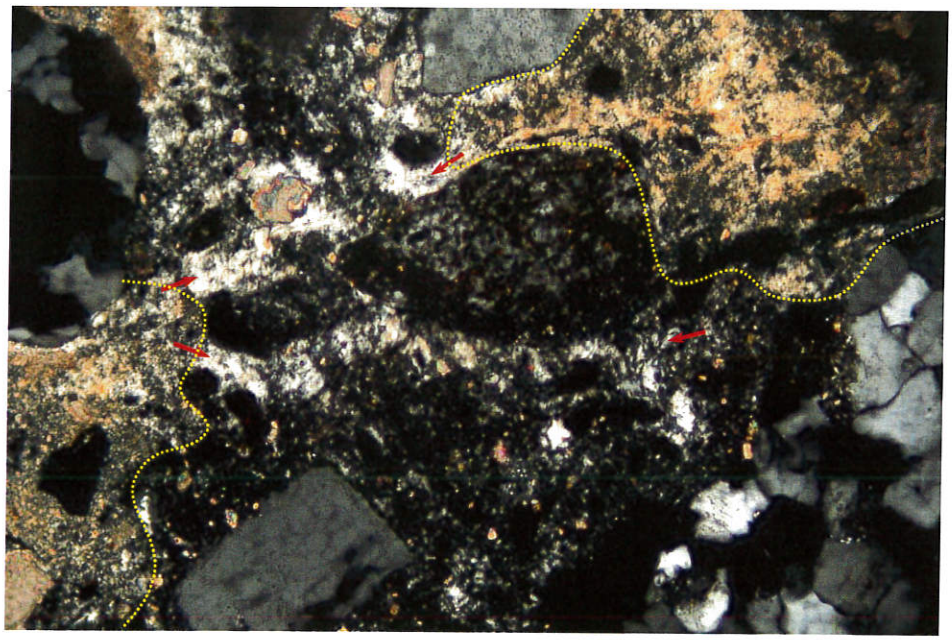


8b. Cross-polarized light.

Fig. 8 Thin-section photomicrographs of cementitious grout represented by Sample S3. Red arrows indicate lumps of gypsum, while green arrows identify band with concentrated ettringite crystal formation. Field of view approximately 0.8 mm (0.03 in.) across.



9a. Plane-polarized light.



9b. Cross-polarized light.

Fig. 9 Thin-section photomicrographs of cementitious grout represented by Sample S3. Red arrows indicate bands with concentrated ettringite crystal formation. Dashed lines designate areas of carbonated paste with growths of orange-colored thaumasite crystals. Field of view approximately 0.9 mm (0.035 in.) across.

Fig. 10 Sawcut section of Sample S2 stained with pH indicator solution. Solution imparts a magenta stain to high-pH, non-carbonated cement paste, but does not stain reduced-pH, carbonated paste.

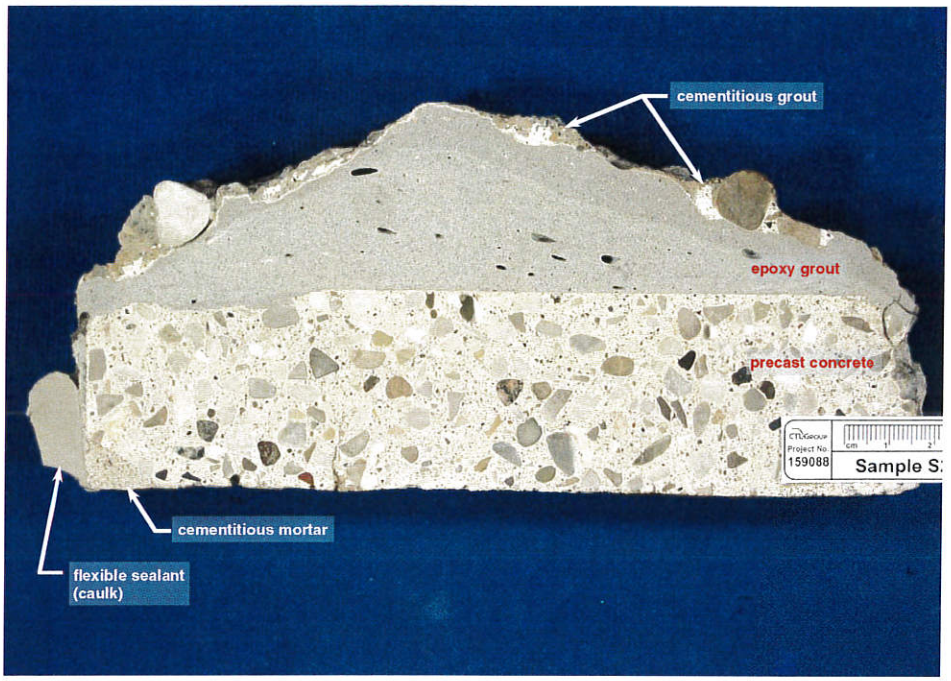


Fig. 11 Lapped cross-section of Sample S2. Various materials are identified.

Fig. 12 Lapped cross-sections of fragments from Sample S3. Mottled appearance of upper fragment is result of epoxy impregnation, performed to stabilize sample. Arrow indicates cementitious mortar adhered to grout.

PETROGRAPHIC EXAMINATION OF HARDENED CONCRETE, ASTM C 856

CTLGROUP PROJECT NO.: 159088 | *DATE*: February 24, 2006

CLIENT: Engineering Systems, Inc. | *REPORTED PROBLEM*: Spalling

STRUCTURE: Precast concrete bell tower | *EXAMINED BY*: V. Jennings

LOCATION: Naperville, Illinois |

SAMPLE

Identification: S1.

Dimensions: Sample is a fractured concrete chunk, approximately 380 mm long by 130 mm wide by 40 to 100 mm deep (15.0 in. by 5.1 in. by 1.6 to 3.9 in.).

Exterior Surface: Generally flat and fairly smooth, appears formed. Relative to "up" arrow drawn on surface, right edge is chamfered while left edge is recessed approximately 20 mm (0.8 in.). Left corner at recess is chipped, approximately 45 mm (1.8 in.) long. Surface is fairly paste-rich but does exhibit exposed fine aggregate particles. Surface paste is light yellowish beige and moderately hard. Flexible sealant (caulk) is present along left, right, and top edges of surface.

Other Surfaces: Top surface of fractured concrete sample is generally flat and appears to have been formed, and is topped by an approximately 10-mm (0.4-in.) thick mortar bed. Upper portion of back surface appears to have been struck surface of precast component--surface is slightly rough and irregular, and exhibits fairly thick, white deposits. Rust-colored stains are observed at the top and bottom ends of this region. The lower portion of the back surface, as well as the left, right and bottom sides, are rough and irregular concrete, fractured both through and around aggregate particles. The left surface exhibits a shallow impression of a deformed steel reinforcement bar with minor rust stains. The back and bottom surfaces exhibit green grass stains, apparently caused when the fractured segment fell to the ground.

Cracks, Joints, Large Voids: A few cracks observed sub-parallel to fractured surfaces of sample. Mortar joint present as described on top surface. No large voids observed.

Reinforcement: None within sample.

SAMPLE

Identification: S2.

Dimensions: Sample is a fractured concrete chunk, approximately 250 mm tall by 300 mm wide by 70 mm deep (9.8 in. by 11.8 in. by 2.8 in.). Composition of sample is described in Miscellaneous section.

Exterior Surface: Somewhat rough and irregular, surface appears to have been locally skim-coated with cementitious paste. Where coated, surface exhibits several air voids up to 13 mm (0.5 in.) across, is beige-gray in color, and moderately hard. Where uncoated, surface exhibits exposed fine aggregate particles, and is light yellowish beige and moderately soft. Relative to "up" arrow drawn on surface, left and bottom edges are fractured, while right edge is recessed approximately 20 mm (0.8 in.) from front surface. Flexible sealant (caulk) is present along right and top edges of surface. Crack, 0.13 to 0.25 mm (0.005 to 0.010 in.) wide extends diagonally across surface from lower left corner to upper right corner.

Other Surfaces: Top surface of fractured concrete sample is generally flat and appears to have been formed. Remaining surfaces are rough and broken concrete, with fractures generally extending around aggregate particles. Surfaces exhibit several different patch/repair materials, including epoxy and epoxy mortar. Paste on much of fractured back surface of sample is very light beige in color, almost white, and soft to very soft.

Cracks, Joints, Large Voids: Crack described on exterior surface extends through full thickness of concrete, narrowing with depth to microcrack width. Several fine cracks are observed in material on back of sample, generally oriented parallel to exterior surface. Material along top and right edges of sample likely represents joints between precast components. No large voids observed.

Reinforcement: None within sample.

AGGREGATES

Coarse: ***Concrete***: Gravel composed of limestone, granite, and chert with lesser amounts of other rocks. ***Epoxy grout***: n/a. ***Cementitious grout***: Particles of limestone and arenaceous limestone observed.

Fine: ***Concrete***: Natural sand composed of limestone, quartz, feldspar, granite, and other rocks and minerals. ***Epoxy grout***: Natural sand composed mainly of quartz. Material also contains finely ground limestone filler. ***Cementitious grout***: Natural sand composed of limestone, quartz, granite, feldspar, and other rocks and minerals.

Gradation & Top Size: ***Concrete***: Somewhat unevenly graded to an observed top size of 8 mm (0.3 in.). ***Epoxy grout***: Fairly evenly graded to observed top size of 0.5 mm (0.02 in.). ***Cementitious grout***: Observed top size is 12 mm (0.5 in.); gradation could not be evaluated due to small amount of material present.

Shape & Distribution: ***Concrete***: Coarse– sub-rounded to rounded, and mostly equant with a few elongate particles; distribution is uniform. Fine– angular to sub-rounded, and equant to elongate; distribution is uniform. ***Epoxy grout***: Angular to sub-angular, and equant; distribution is uniform. ***Cementitious grout***: Coarse– sub-rounded to rounded, and equant; distribution could not be evaluated due to small amount of material present. Fine– angular to rounded, and mostly equant; distribution appears fairly uniform.

PASTE

Color: ***Concrete***: Light to very light beige. ***Epoxy grout***: n/a. ***Cementitious grout***: Very light beige to white.

Hardness: ***Concrete***: Moderately soft to moderately hard. ***Epoxy grout***: n/a. ***Cementitious grout***: Very soft

Luster: ***Concrete***: Dull to subvitreous. ***Epoxy grout***: n/a. ***Cementitious grout***: Dull.

Paste-Aggregate Bond: ***Concrete***: Moderately tight to moderately weak; surfaces of freshly fractured concrete pass both through and around aggregate particles. ***Epoxy grout***: n/a. ***Cementitious grout***: Could not be determined due to small amount of material present.

Depth of Carbonation: ***Concrete***: 3 to 10 mm (0.1 to 0.4 in.) along exterior formed surface and 2 to 5 mm (0.08 to 0.2 in.) along flat interior surface. Paste is locally carbonated along edges of crack and adjacent to some carbonate coarse aggregate particles. ***Epoxy grout***: n/a. ***Cementitious grout***: Carbonated throughout material present.

Air Content: ***Concrete***: Estimated 3 to 5%. The concrete appears air entrained based on the presence of small, spherical voids in the hardened paste matrix. ***Epoxy grout***: n/a. ***Cementitious grout***: Could not be estimated due to the small amount of material present. The material does not appear air-entrained based on the scarcity of small spherical voids observed.

Calcium Hydroxide*: ***Concrete***: Estimated 6 to 9%, small to medium, tabular crystals of portlandite, distributed throughout paste matrix and along periphery of aggregates. ***Epoxy grout***: n/a. ***Cementitious grout***: None present due to carbonation and alteration of paste.

Unhydrated Portland Cement Clinker Particles*: ***Concrete***: Estimated less than 2% unhydrated and partially hydrated portland cement clinker particles. ***Epoxy grout***: n/a. ***Cementitious grout***: Estimated less than 1%.

Supplementary Cementing Materials*: None observed.

Secondary Deposits: ***Concrete***: Ettringite crystals line the surfaces of several voids. ***Epoxy grout***: n/a. ***Cementitious grout***: Ettringite and thaumasite observed within cement paste. Thaumasite fills many cracks.

MICROCRACKING: A couple cracks extend from outer concrete surface into concrete. A few discontinuous, randomly-oriented microcracks observed within body of concrete. A few other microcracks observed near fractured samples surfaces. Several microcracks observed in cementitious grout, generally oriented sub-parallel to interface with epoxy grout.

ESTIMATED WATER-CEMENT RATIO: ***Concrete***: Moderate to moderately high (0.50 to 0.60). ***Epoxy grout***: n/a. ***Cementitious grout***: Could not be estimated due to composition and condition of material.

MISCELLANEOUS: 1) Outer face of sample consists of precast concrete. Gray epoxy grout is adhered to flat, uniform back side of concrete. Inner surface of epoxy grout is somewhat irregular. A thin layer of cementitious grout is adhered to this irregular surface. 2) Cement paste in precast concrete contains a moderate to large amount of carbonate rock dust.

*percent by volume of paste

SAMPLE

Identification: S3.

Dimensions: Sample consists of several grout fragments; largest measures approximately 85 mm by 85 mm by 20 mm thick (3.3 in. by 3.3 in. by 0.8 in.). The two largest fragments were selected for petrographic examination.

Surfaces: Surfaces are rough and broken, fractured around most aggregate particles. Paste is very light beige, almost white, in color, and is soft to very soft. Many of the small fragments are friable. Fragments of epoxy, epoxy mortar, and cementitious mortar are adhered to a few of the larger fragments.

Cracks, Large Voids: Fragments examined exhibit fine internal cracks. No large voids observed.

Reinforcement: None within fragments.

AGGREGATES

Coarse: Gravel composed of limestone, granite, and other rocks.

Fine: Natural sand composed of limestone, quartz, feldspar, granite, and other rocks and minerals.

Gradation & Top Size: Observed top size is 9 mm (0.4 in.). Gradation could not be evaluated due to small size of fragments.

Shape & Distribution: Coarse–sub-rounded to rounded, and equant; distribution could not be evaluated due to small size of fragments. Fine– sub-angular to rounded, and mostly equant with a few elongate particles; distribution is fairly uniform.

PASTE

Color: Very light beige to white.

Hardness: Soft to very soft, and often friable.

Luster: Dull.

Paste-Aggregate Bond: Weak; surfaces of freshly fractured concrete pass around nearly all aggregate particles.

Depth of Carbonation: Not applicable due to extent of paste alteration.

Air Content: Estimated less than 1%. The concrete is not air entrained based on the scarcity of small, spherical voids in the hardened paste matrix.

Calcium Hydroxide*: Could not be estimated due to extent of paste alteration.

Unhydrated Portland Cement Clinker Particles*: Estimated 1 to 3% unhydrated and partially hydrated portland cement clinker particles. Relics of in-situ hydrated clinker are common.

Supplementary Cementing Materials*: Evidence of gypsum observed.

Secondary Deposits: Ettringite, thaumasite, and other minerals observed throughout material.

MICROCRACKING: Material exhibits many cracks and microcracks, most oriented parallel to each other.

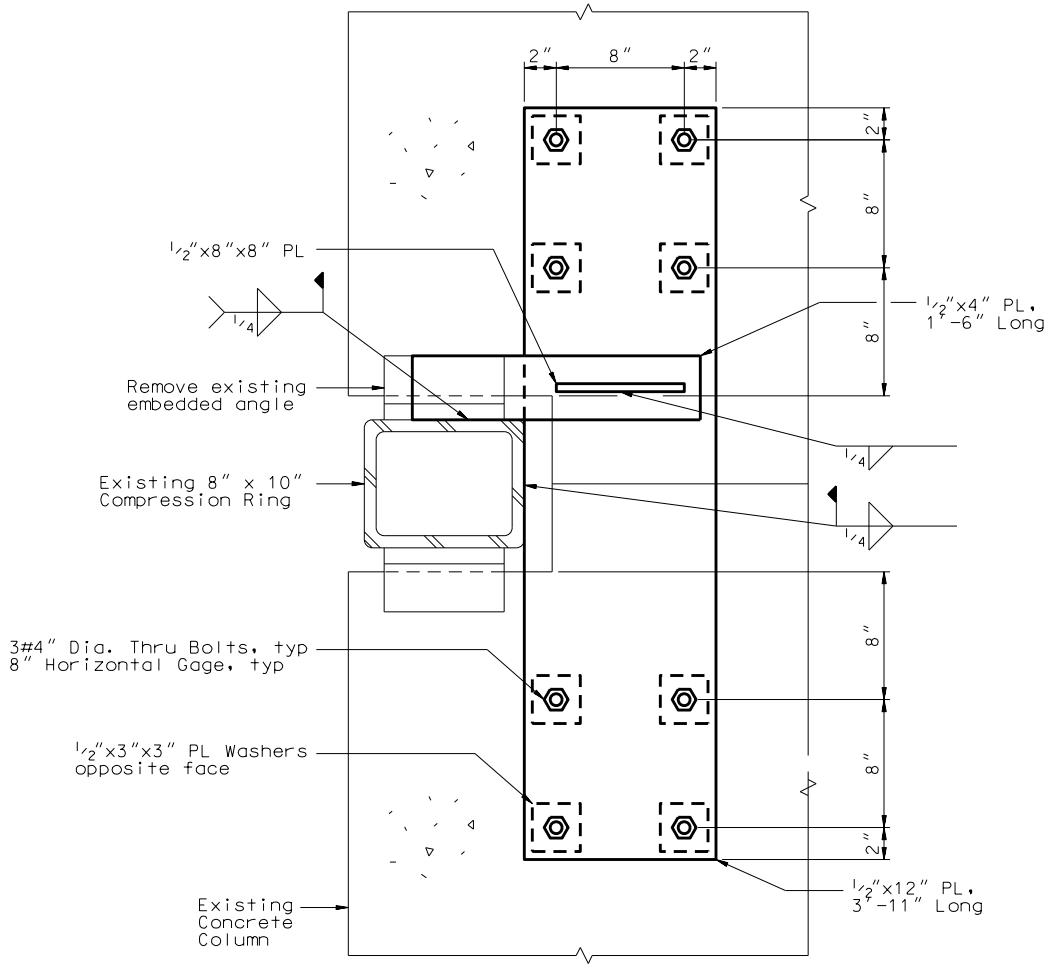
ESTIMATED WATER-CEMENT RATIO: Not determined due to material composition and extent of paste alteration.

*percent by volume of paste

APPENDIX F

REPAIR DETAILS
STRUCTURAL STEEL CORROSION ABATEMENT AND POST TENSIONING CABLE ANCHORAGE PROTECTION DRAWINGS

APPENDIX F-1
STRUCTURAL STEEL CORROSION ABATEMENT DETAILS

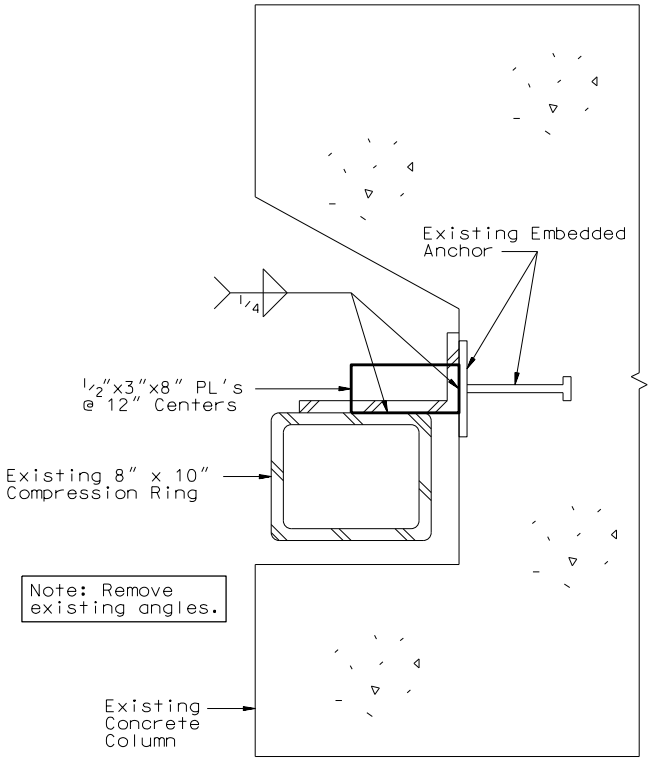


CONNECTION #1

Ring 5 and 6 Fin Connection

Scale: 1" = 1'

1 per fin
4 per ring
8 total

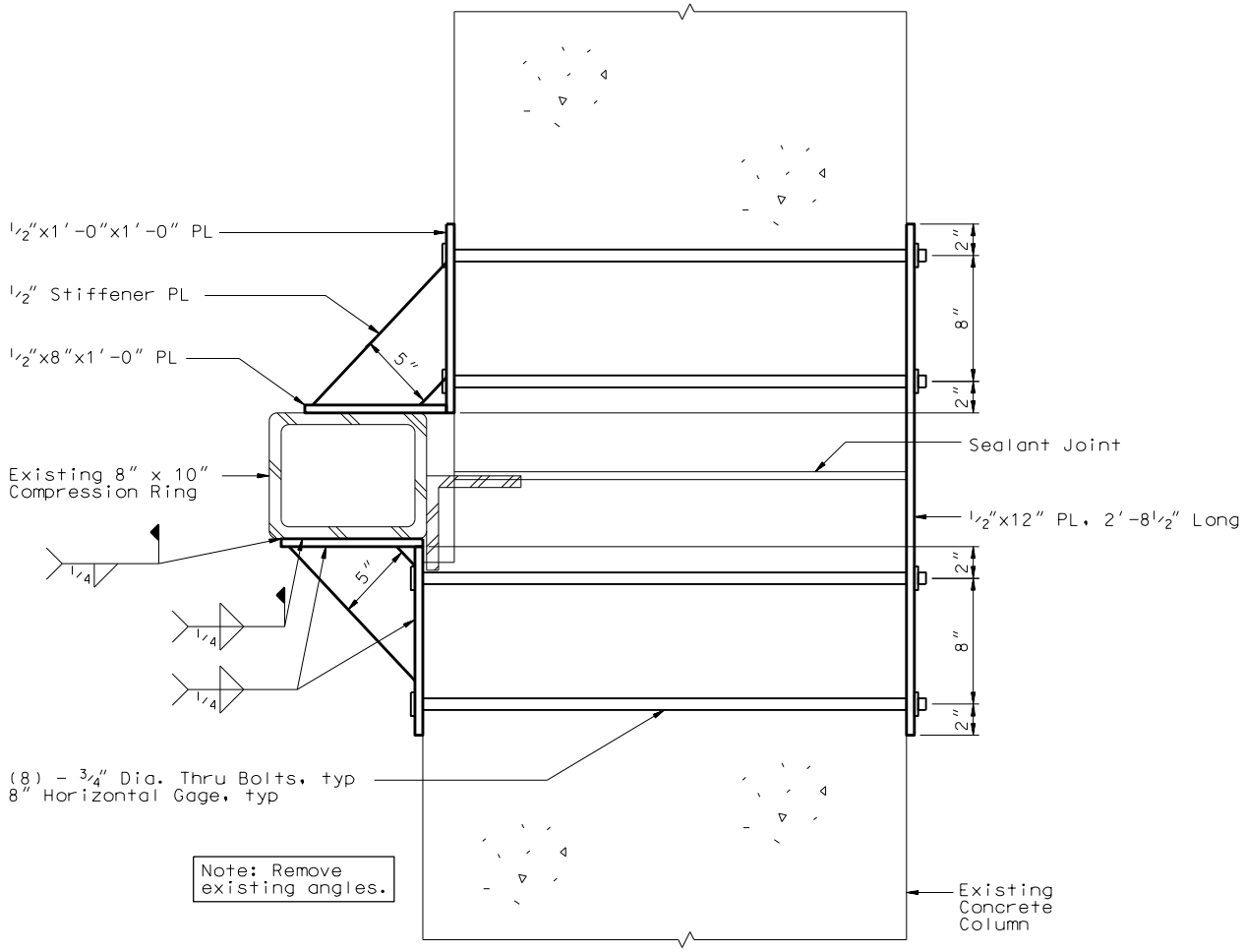


CONNECTION #2

Ring 2 Column Connection

Scale: 1" = 1'

8 per column
32 per ring
32 total



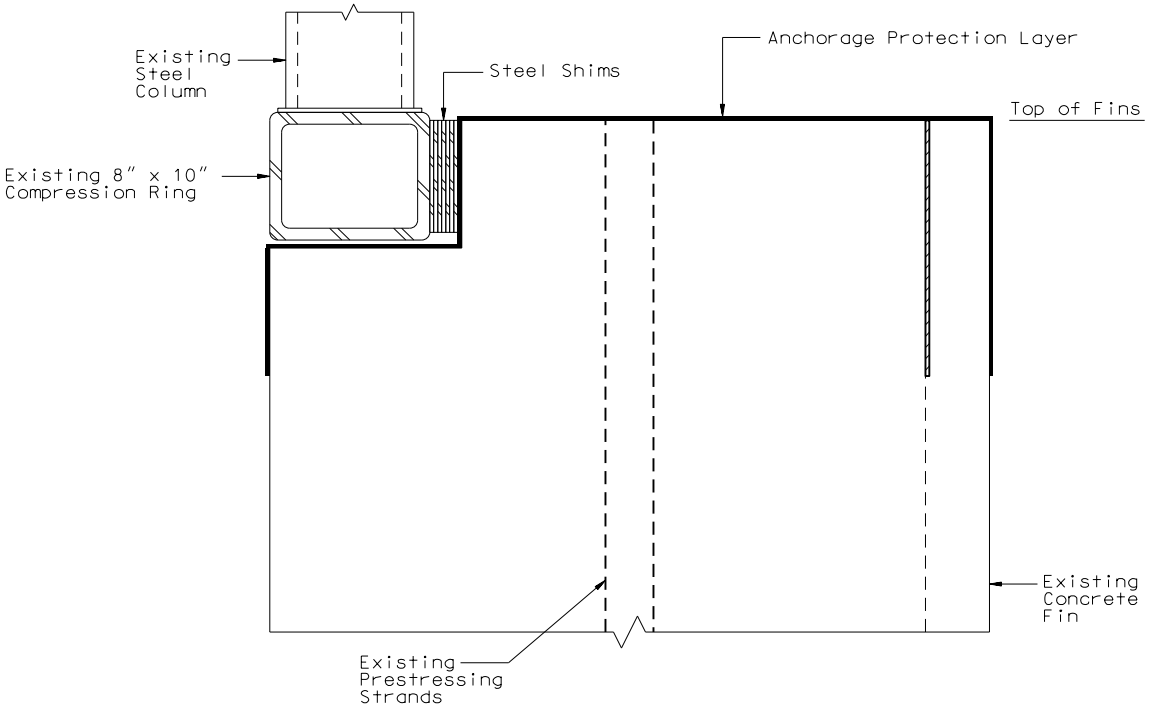
CONNECTION #3

Ring 4 and 6 Column Connections

Scale: 1" = 1'

4 per column
16 per ring
32 total

APPENDIX F-2
POST-TENSIONING CABLE ANCHORAGE DETAIL



Anchorage Protection Detail

Scale: 1" = 1'

1 per fin
4 per ring
4 total

APPENDIX G

PRELIMINARY OPINIONS OF COST

ENGINEERING RESOURCE ASSOCIATES, INC.
Consulting Engineers, Scientists & Surveyors

City of Naperville
Moser Tower Structural Assessment
Engineer's Preliminary Opinion of Cost

ALTERNATIVE 1A - REPAIR EXISTING STRUCTURE (SINGLE PHASE)

Construction Costs	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$110,000.00	$110,000
				$110,000
STRUCTURAL STEEL CORROSION ABATEMENT				
Labor	75	Each	$4,400.00	$330,000
Structural Steel (200#/Location)	16000	Pounds	$5.50	$90,000
				$420,000
POST-TENSIONING CABLE ANCHORAGE				
Sealant and Labor	4	Each	$11,000.00	$44,000
				$44,000
CONCRETE CRACK REPAIRS				
Concrete removal, cleaning, patching, material and labor.	25	Each	$4,400.00	$110,000
				$110,000
SURFACE DETERIORATION REPAIRS				
Concrete removal, cleaning, patching, material and labor.	2600	Sqft	$220.00	$572,000
				$572,000
CRACKED AND MISSING MORTAR JOINT REPLACEMENT				
Mortar / Material	30	Each	$352.00	$11,000
Labor	30	Each	$2,200.00	$66,000
				$77,000
SEALANT REPLACEMENT				
Material and Labor	5000	FT	$22.00	$110,000
				$110,000
SCAFFOLDING				
Exterior - Initial Setup - 4 Weeks	1	L. Sum	$88,000.00	$88,000
Exterior - 8 Extra Weeks	8	Week	$3,850.00	$31,000
Interior - Initial Setup - 4 Weeks	1	L. Sum	$66,000.00	$66,000
Interior - 8 Extra Weeks	8	Week	$1,725.00	$14,000
				$199,000
PLAZA SEALING				
Concrete Removal	70	Cu. Yds.	$110.00	$8,000
Membrane and Flashing	2000	Sq. Ft.	$22.00	$44,000
Pavers	2000	Sq. Ft.	$11.00	$22,000
Masonry Flashing	1000	Sq. Ft.	$22.00	$22,000
				$96,000

PROJECT SUBTOTAL =		**$1,738,000**
CONTINGENCY	***10% =***	**$174,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$131,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$192,000**

INSPECTION & MAINTENANCE COSTS (over 30 year period)				
Years 1-10: Annual Maintenance Cost (years 1-10)	10	Year	$5,000.00	$50,000
Years 11-20: Annual Maintenance Cost (years 11-20)	10	Year	$10,000.00	$100,000
Years 21-30: Annual Maintenance Cost (years 21-30)	10	Year	$15,000.00	$150,000
Every 3 Years: *Interior and Exterior Structure Inspection*	10	Cycle	$25,000.00	$250,000
TOTAL INSPECTION & MAINTENANCE COST:			**=**	**$550,000**
Effective Annual Maintenance Cost			**=**	**$18,333**

PROJECT GRAND TOTAL	**=**	**$2,785,000**

ENGINEERING RESOURCE ASSOCIATES, INC.
Consulting Engineers, Scientists & Surveyors

City of Naperville
Moser Tower Structural Assessment
Engineer's Preliminary Opinion of Cost

ALTERNATIVE 1B - REPAIR EXISTING STRUCTURE (MULTIPLE PHASES)

Stage One: Concrete Repairs	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$55,000.00	$55,000
				$55,000
CONCRETE CRACK REPAIRS				
Concrete removal, cleaning, patching, material and labor.	25	Each	$4,400.00	$110,000
				$110,000
SURFACE DETERIORATION REPAIRS				
Concrete removal, cleaning, patching, material and labor.	2600	Sqft	$220.00	$572,000
				$572,000
CRACKED AND MISSING MORTAR JOINT REPLACEMENT				
Mortar / Material	30	Each	$352.00	$11,000
Labor	30	Each	$2,200.00	$66,000
				$77,000
SCAFFOLDING				
Exterior - Initial Setup - 4 Weeks	1	L. Sum	$88,000.00	$88,000
Exterior - 8 Extra Weeks	8	Week	$3,850.00	$31,000
Interior - Initial Setup - 4 Weeks	1	L. Sum	$66,000.00	$66,000
Interior - 8 Extra Weeks	8	Week	$1,650.00	$14,000
				$199,000

	STAGE ONE SUBTOTAL =	**$1,013,000**
CONTINGENCY	***10% =***	**$102,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$76,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$112,000**

STAGE ONE GRAND TOTAL	**=**	**$1,303,000**

Stage Two: Structural Steel Rehabilitation	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$55,000.00	$55,000
				$55,000
STRUCTURAL STEEL CORROSION ABATEMENT				
Labor	75	Each	$4,400.00	$330,000
Structural Steel (200#/Location)	16000	Pounds	$5.50	$90,000
				$420,000
POST-TENSIONING CABLE ANCHORAGE				
Sealant and Labor	4	Each	$11,000.00	$44,000
				$44,000
SEALANT REPLACEMENT				
Material and Labor	5000	FT	$22.00	$110,000
				$110,000
SCAFFOLDING				
Exterior - Initial Setup - 4 Weeks	1	L. Sum	$88,000.00	$88,000
Exterior - 8 Extra Weeks	8	Week	$3,850.00	$31,000
Interior - Initial Setup - 4 Weeks	1	L. Sum	$66,000.00	$66,000
Interior - 8 Extra Weeks	8	Week	$1,650.00	$14,000
				$199,000

	STAGE TWO SUBTOTAL =	**$828,000**
CONTINGENCY	***10% =***	**$83,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$63,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$92,000**

STAGE TWO GRAND TOTAL	**=**	**$1,066,000**

Stage Three: Plaza Rehabilitation	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$11,000.00	$11,000
				$11,000
PLAZA SEALING				
Concrete Removal	70	Cu. Yds.	$110.00	$8,000
Membrane and Flashing	2000	Sq. Ft.	$22.00	$44,000
Pavers	2000	Sq. Ft.	$11.00	$22,000
Masonry Flashing	1000	Sq. Ft.	$22.00	$22,000
				$96,000

	STAGE THREE SUBTOTAL =	**$107,000**
CONTINGENCY	***10% =***	**$11,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$9,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$12,000**

STAGE THREE GRAND TOTAL	**=**	**$139,000**

INSPECTION & MAINTENANCE COSTS (over 30 year period)				
Years 1-10:				
Annual Maintenance Cost (years 1-10)	10	Year	$5,000.00	$50,000
Years 11-20:				
Annual Maintenance Cost (years 11-20)	10	Year	$10,000.00	$100,000
Years 21-30:				
Annual Maintenance Cost (years 21-30)	10	Year	$15,000.00	$150,000
Every 3 Years:				
Interior and Exterior Structure Inspection	10	Cycle	$25,000.00	$250,000
TOTAL INSPECTION & MAINTENANCE COST:			=	**$550,000**
Effective Annual Maintenance Cost			=	**$18,333**

STAGE ONE GRAND TOTAL	=	**$1,303,000**
STAGE TWO GRAND TOTAL	=	**$1,066,000**
STAGE THREE GRAND TOTAL	=	**$139,000**
INSPECTION & MAINTENANCE COST (over 30 year period)	=	**$550,000**
PROJECT GRAND TOTAL	=	**$3,058,000**

ENGINEERING RESOURCE ASSOCIATES, INC.
Consulting Engineers, Scientists & Surveyors

City of Naperville
Moser Tower Structural Assessment
Engineer's Preliminary Opinion of Cost

ALTERNATIVE 2A - ENCLOSE AND REPAIR STRUCTURE (SINGLE PHASE)

Construction Costs	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$110,000.00	$110,000
				$110,000
STRUCTURAL STEEL CORROSION ABATEMENT				
Labor	75	Each	$4,400.00	$330,000
Structural Steel (200#/Location)	16000	Pounds	$5.50	$90,000
				$420,000
POST-TENSIONING CABLE ANCHORAGE				
Sealant and Labor	4	Each	$11,000.00	$44,000
				$44,000
CONCRETE CRACK REPAIRS				
Concrete removal, cleaning, patching, material and labor.	25	Each	$4,400.00	$110,000
				$110,000
SURFACE DETERIORATION REPAIRS				
Concrete removal, cleaning, patching, material and labor.	2600	Sqft	$220.00	$572,000
				$572,000
CRACKED AND MISSING MORTAR JOINT REPLACEMENT				
Mortar / Material	30	Each	$352.00	$11,000
Labor	30	Each	$2,200.00	$66,000
				$77,000
SEALANT REPLACEMENT				
Material and Labor	5000	FT	$22.00	$110,000
				$110,000
SCAFFOLDING				
Exterior - Initial Setup - 4 Weeks	1	L. Sum	$88,000.00	$88,000
Exterior - 8 Extra Weeks	8	Week	$3,850.00	$31,000
Interior - Initial Setup - 4 Weeks	1	L. Sum	$66,000.00	$66,000
Interior - 8 Extra Weeks	8	Week	$1,650.00	$14,000
				$199,000
PLAZA SEALING				
Concrete Removal	70	Cu. Yds.	$110.00	$8,000
Membrane and Flashing	2000	Sq. Ft.	$22.00	$44,000
Pavers	2000	Sq. Ft.	$11.00	$22,000
Masonry Flashing	1000	Sq. Ft.	$22.00	$22,000
				$96,000
ENCLOSING STRUCTURE				
Glass Panels to Enclose Structure	1	L. Sum	$220,000.00	$220,000
HVAC	1	L. Sum	$99,000.00	$99,000
Fire Suppression	1	L. Sum	$93,500.00	$94,000
Mechanical, Electrical, and Plumbing	1	L. Sum	$297,000.00	$297,000
				$710,000

			PROJECT SUBTOTAL =	**$2,448,000**
		CONTINGENCY	***10% =***	**$245,000**
		DESIGN ENGINEERING FEES	***7.5% =***	**$184,000**
		CONSTRUCTION ENGINEERING FEES	***11% =***	**$270,000**
INSPECTION & MAINTENANCE COSTS (over 30 year period)				
Every Year:				
Annual Maintenance Cost	30	Year	$5,000.00	$150,000
Every 3 Years:				
Structure Inspection	10	Cycle	$25,000.00	$250,000
		TOTAL INSPECTION & MAINTENANCE COST:	**=**	**$400,000**
		Effective Annual Maintenance Cost	**=**	**$13,333**

PROJECT GRAND TOTAL	**=**	**$3,547,000**

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Consulting Engineers, Scientists & Surveyors

City of Naperville
Moser Tower Structural Assessment
Engineer's Preliminary Opinion of Cost

ALTERNATIVE 2B - ENCLOSE AND REPAIR STRUCTURE (MULTIPLE PHASES)

Stage One: Concrete & Exterior Repairs	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$55,000.00	$55,000
				$55,000
CONCRETE CRACK REPAIRS				
Concrete removal, cleaning, patching, material and labor.	25	Each	$4,400.00	$110,000
				$110,000
SURFACE DETERIORATION REPAIRS				
Concrete removal, cleaning, patching, material and labor.	2600	Sqft	$220.00	$572,000
				$572,000
CRACKED AND MISSING MORTAR JOINT REPLACEMENT				
Mortar / Material	30	Each	$352.00	$11,000
Labor	30	Each	$2,200.00	$66,000
				$77,000
SCAFFOLDING				
Exterior - Initial Setup - 4 Weeks	1	L. Sum	$88,000.00	$88,000
Exterior - 8 Extra Weeks	8	Week	$3,850.00	$31,000
Interior - Initial Setup - 4 Weeks	1	L. Sum	$66,000.00	$66,000
Interior - 8 Extra Weeks	8	Week	$1,650.00	$14,000
				$199,000
ENCLOSING STRUCTURE				
Glass Panels to Enclose Structure	1	L. Sum	$165,000.00	$165,000
HVAC	1	L. Sum	$99,000.00	$99,000
Fire Suppression	1	L. Sum	$93,500.00	$94,000
Mechanical, Electrical, and Plumbing	1	L. Sum	$297,000.00	$297,000
				$655,000

STAGE ONE SUBTOTAL =		**$1,668,000**
CONTINGENCY	***10% =***	**$167,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$126,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$184,000**

STAGE ONE GRAND TOTAL	**=**	**$2,145,000**

Stage Two: Structural Steel Rehabilitation	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$55,000.00	$55,000
				$55,000
STRUCTURAL STEEL CORROSION ABATEMENT				
Labor	75	Each	$4,400.00	$330,000
Structural Steel (200#/Location)	16000	Pounds	$5.50	$90,000
				$420,000
POST-TENSIONING CABLE ANCHORAGE				
Sealant and Labor	4	Each	$11,000.00	$44,000
				$44,000
SEALANT REPLACEMENT				
Material and Labor	5000	FT	$22.00	$110,000
				$110,000
SCAFFOLDING				
Exterior - Initial Setup - 4 Weeks	1	L. Sum	$88,000.00	$88,000
Exterior - 8 Extra Weeks	8	Week	$3,850.00	$31,000
Interior - Initial Setup - 4 Weeks	1	L. Sum	$66,000.00	$66,000
Interior - 8 Extra Weeks	8	Week	$1,650.00	$14,000
				$199,000

	STAGE TWO SUBTOTAL =	**$828,000**
CONTINGENCY	***10% =***	**$83,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$63,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$92,000**

STAGE TWO GRAND TOTAL	**=**	**$1,066,000**

Stage Three: Plaza Rehabilitation	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$11,000.00	$11,000
				$11,000
PLAZA SEALING				
Concrete Removal	70	Cu. Yds.	$110.00	$8,000
Membrane and Flashing	2000	Sq. Ft.	$22.00	$44,000
Pavers	2000	Sq. Ft.	$11.00	$22,000
Masonry Flashing	1000	Sq. Ft.	$22.00	$22,000
				$96,000

	STAGE THREE SUBTOTAL =	**$107,000**
CONTINGENCY	***10% =***	**$11,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$9,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$12,000**

STAGE THREE GRAND TOTAL	**=**	**$139,000**

INSPECTION & MAINTENANCE COSTS (over 30 year period)				
Years 1-30:				
Annual Maintenance Cost	30	Year	$5,000.00	$150,000
Every 3 Years:				
Structure Inspection	10	Cycle	$25,000.00	$250,000
TOTAL INSPECTION & MAINTENANCE COST:			=	**$400,000**
*Effective Annual Maintenance Cost**			=	**$13,333**

STAGE ONE GRAND TOTAL	=	**$2,145,000**
STAGE TWO GRAND TOTAL	=	**$1,066,000**
STAGE THREE GRAND TOTAL	=	**$139,000**
INSPECTION & MAINTENANCE COST (over 30 year period)	=	**$400,000**
PROJECT GRAND TOTAL	=	**$3,750,000**

ENGINEERING RESOURCE ASSOCIATES, INC.
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City of Naperville
Moser Tower Structural Assessment
Engineer's Preliminary Opinion of Cost

ALTERNATIVE 3 - STRUCTURE MAINTENANCE AND DECOMMISSION STRUCTURE

Maintenance Costs	QTY	UNIT	UNIT PRICE	VALUE
INSPECTION & MAINTENANCE COSTS (over 30 year period)				
Years 1-10:				
Annual Maintenance Cost	10	Year	$10,000.00	$100,000
Years 11-20:				
Annual Maintenance Cost	10	Year	$20,000.00	$200,000
Years 21-30:				
Annual Maintenance Cost	10	Year	$30,000.00	$300,000
Every 3 Years:				
Interior and Exterior Structure Inspection	10	Cycle	$25,000.00	$250,000
TOTAL INSPECTION & MAINTENANCE COST:			=	**$850,000**
Effective Annual Maintenance Cost			=	**$28,333**

Construction Costs	QTY	UNIT	UNIT PRICE	VALUE
INITIAL COST				
Initial Cost	-	-	-	$0
				$0
STRUCTURE DEMOLITION				
Remove and Salvage Carillon Instrumentation	1	L. Sum	$110,000.00	$110,000
Structure Demolition	1	L. Sum	$550,000.00	$550,000
				$660,000

	PROJECT SUBTOTAL =	**$660,000**
CONTINGENCY	***10% =***	**$66,000**
ENGINEERING FEES	***0% =***	**$0**

PROJECT GRAND TOTAL	=	**$1,576,000**

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Moser Tower Structural Assessment
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ALTERNATIVE 1A - REPAIR EXISTING STRUCTURE (SINGLE PHASE)

Construction Costs	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$110,000.00	$110,000
				$110,000
STRUCTURAL STEEL CORROSION ABATEMENT				
Labor	75	Each	$4,400.00	$330,000
Structural Steel (200#/Location)	16000	Pounds	$5.50	$90,000
				$420,000
POST-TENSIONING CABLE ANCHORAGE				
Sealant and Labor	4	Each	$11,000.00	$44,000
				$44,000
CONCRETE CRACK REPAIRS				
Concrete removal, cleaning, patching, material and labor.	25	Each	$4,400.00	$110,000
				$110,000
SURFACE DETERIORATION REPAIRS				
Concrete removal, cleaning, patching, material and labor.	2600	Sqft	$220.00	$572,000
				$572,000
CRACKED AND MISSING MORTAR JOINT REPLACEMENT				
Mortar / Material	30	Each	$352.00	$11,000
Labor	30	Each	$2,200.00	$66,000
				$77,000
SEALANT REPLACEMENT				
Material and Labor	5000	FT	$22.00	$110,000
				$110,000
SCAFFOLDING				
Exterior - Initial Setup - 4 Weeks	1	L. Sum	$88,000.00	$88,000
Exterior - 8 Extra Weeks	8	Week	$3,850.00	$31,000
Interior - Initial Setup - 4 Weeks	1	L. Sum	$66,000.00	$66,000
Interior - 8 Extra Weeks	8	Week	$1,725.00	$14,000
				$199,000
PLAZA SEALING				
Concrete Removal	70	Cu. Yds.	$110.00	$8,000
Membrane and Flashing	2000	Sq. Ft.	$22.00	$44,000
Pavers	2000	Sq. Ft.	$11.00	$22,000
Masonry Flashing	1000	Sq. Ft.	$22.00	$22,000
				$96,000

PROJECT SUBTOTAL =		**$1,738,000**
CONTINGENCY	***10% =***	**$174,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$131,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$192,000**

INSPECTION & MAINTENANCE COSTS (over 30 year period)				
Years 1-10: Annual Maintenance Cost (years 1-10)	10	Year	$5,000.00	$50,000
Years 11-20: Annual Maintenance Cost (years 11-20)	10	Year	$10,000.00	$100,000
Years 21-30: Annual Maintenance Cost (years 21-30)	10	Year	$15,000.00	$150,000
Every 3 Years: *Interior and Exterior Structure Inspection*	10	Cycle	$25,000.00	$250,000
TOTAL INSPECTION & MAINTENANCE COST:			**=**	**$550,000**
Effective Annual Maintenance Cost			**=**	**$18,333**

PROJECT GRAND TOTAL	**=**	**$2,785,000**

ENGINEERING RESOURCE ASSOCIATES, INC.
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ALTERNATIVE 1B - REPAIR EXISTING STRUCTURE (MULTIPLE PHASES)

Stage One: Concrete Repairs	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$55,000.00	$55,000
				$55,000
CONCRETE CRACK REPAIRS				
Concrete removal, cleaning, patching, material and labor.	25	Each	$4,400.00	$110,000
				$110,000
SURFACE DETERIORATION REPAIRS				
Concrete removal, cleaning, patching, material and labor.	2600	Sqft	$220.00	$572,000
				$572,000
CRACKED AND MISSING MORTAR JOINT REPLACEMENT				
Mortar / Material	30	Each	$352.00	$11,000
Labor	30	Each	$2,200.00	$66,000
				$77,000
SCAFFOLDING				
Exterior - Initial Setup - 4 Weeks	1	L. Sum	$88,000.00	$88,000
Exterior - 8 Extra Weeks	8	Week	$3,850.00	$31,000
Interior - Initial Setup - 4 Weeks	1	L. Sum	$66,000.00	$66,000
Interior - 8 Extra Weeks	8	Week	$1,650.00	$14,000
				$199,000

	STAGE ONE SUBTOTAL =	**$1,013,000**
CONTINGENCY	***10% =***	**$102,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$76,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$112,000**

STAGE ONE GRAND TOTAL	**=**	**$1,303,000**

Stage Two: Structural Steel Rehabilitation	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$55,000.00	$55,000
				$55,000
STRUCTURAL STEEL CORROSION ABATEMENT				
Labor	75	Each	$4,400.00	$330,000
Structural Steel (200#/Location)	16000	Pounds	$5.50	$90,000
				$420,000
POST-TENSIONING CABLE ANCHORAGE				
Sealant and Labor	4	Each	$11,000.00	$44,000
				$44,000
SEALANT REPLACEMENT				
Material and Labor	5000	FT	$22.00	$110,000
				$110,000
SCAFFOLDING				
Exterior - Initial Setup - 4 Weeks	1	L. Sum	$88,000.00	$88,000
Exterior - 8 Extra Weeks	8	Week	$3,850.00	$31,000
Interior - Initial Setup - 4 Weeks	1	L. Sum	$66,000.00	$66,000
Interior - 8 Extra Weeks	8	Week	$1,650.00	$14,000
				$199,000

	STAGE TWO SUBTOTAL =	**$828,000**
CONTINGENCY	***10% =***	**$83,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$63,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$92,000**

STAGE TWO GRAND TOTAL	**=**	**$1,066,000**

Stage Three: Plaza Rehabilitation	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$11,000.00	$11,000
				$11,000
PLAZA SEALING				
Concrete Removal	70	Cu. Yds.	$110.00	$8,000
Membrane and Flashing	2000	Sq. Ft.	$22.00	$44,000
Pavers	2000	Sq. Ft.	$11.00	$22,000
Masonry Flashing	1000	Sq. Ft.	$22.00	$22,000
				$96,000

	STAGE THREE SUBTOTAL =	**$107,000**
CONTINGENCY	***10% =***	**$11,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$9,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$12,000**

STAGE THREE GRAND TOTAL	**=**	**$139,000**

INSPECTION & MAINTENANCE COSTS (over 30 year period)				
Years 1-10:				
Annual Maintenance Cost (years 1-10)	10	Year	$5,000.00	$50,000
Years 11-20:				
Annual Maintenance Cost (years 11-20)	10	Year	$10,000.00	$100,000
Years 21-30:				
Annual Maintenance Cost (years 21-30)	10	Year	$15,000.00	$150,000
Every 3 Years:				
Interior and Exterior Structure Inspection	10	Cycle	$25,000.00	$250,000
TOTAL INSPECTION & MAINTENANCE COST:			=	**$550,000**
Effective Annual Maintenance Cost			=	**$18,333**

STAGE ONE GRAND TOTAL	=	**$1,303,000**
STAGE TWO GRAND TOTAL	=	**$1,066,000**
STAGE THREE GRAND TOTAL	=	**$139,000**
INSPECTION & MAINTENANCE COST (over 30 year period)	=	**$550,000**
PROJECT GRAND TOTAL	=	**$3,058,000**

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Moser Tower Structural Assessment
Engineer's Preliminary Opinion of Cost

ALTERNATIVE 2A - ENCLOSE AND REPAIR STRUCTURE (SINGLE PHASE)

Construction Costs	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$110,000.00	$110,000
				$110,000
STRUCTURAL STEEL CORROSION ABATEMENT				
Labor	75	Each	$4,400.00	$330,000
Structural Steel (200#/Location)	16000	Pounds	$5.50	$90,000
				$420,000
POST-TENSIONING CABLE ANCHORAGE				
Sealant and Labor	4	Each	$11,000.00	$44,000
				$44,000
CONCRETE CRACK REPAIRS				
Concrete removal, cleaning, patching, material and labor.	25	Each	$4,400.00	$110,000
				$110,000
SURFACE DETERIORATION REPAIRS				
Concrete removal, cleaning, patching, material and labor.	2600	Sqft	$220.00	$572,000
				$572,000
CRACKED AND MISSING MORTAR JOINT REPLACEMENT				
Mortar / Material	30	Each	$352.00	$11,000
Labor	30	Each	$2,200.00	$66,000
				$77,000
SEALANT REPLACEMENT				
Material and Labor	5000	FT	$22.00	$110,000
				$110,000
SCAFFOLDING				
Exterior - Initial Setup - 4 Weeks	1	L. Sum	$88,000.00	$88,000
Exterior - 8 Extra Weeks	8	Week	$3,850.00	$31,000
Interior - Initial Setup - 4 Weeks	1	L. Sum	$66,000.00	$66,000
Interior - 8 Extra Weeks	8	Week	$1,650.00	$14,000
				$199,000
PLAZA SEALING				
Concrete Removal	70	Cu. Yds.	$110.00	$8,000
Membrane and Flashing	2000	Sq. Ft.	$22.00	$44,000
Pavers	2000	Sq. Ft.	$11.00	$22,000
Masonry Flashing	1000	Sq. Ft.	$22.00	$22,000
				$96,000
ENCLOSING STRUCTURE				
Glass Panels to Enclose Structure	1	L. Sum	$220,000.00	$220,000
HVAC	1	L. Sum	$99,000.00	$99,000
Fire Suppression	1	L. Sum	$93,500.00	$94,000
Mechanical, Electrical, and Plumbing	1	L. Sum	$297,000.00	$297,000
				$710,000

			PROJECT SUBTOTAL =	**$2,448,000**
		CONTINGENCY	***10% =***	**$245,000**
		DESIGN ENGINEERING FEES	***7.5% =***	**$184,000**
		CONSTRUCTION ENGINEERING FEES	***11% =***	**$270,000**
INSPECTION & MAINTENANCE COSTS (over 30 year period)				
Every Year:				
Annual Maintenance Cost	30	Year	$5,000.00	$150,000
Every 3 Years:				
Structure Inspection	10	Cycle	$25,000.00	$250,000
		TOTAL INSPECTION & MAINTENANCE COST:	**=**	**$400,000**
		Effective Annual Maintenance Cost	**=**	**$13,333**

PROJECT GRAND TOTAL	**=**	**$3,547,000**

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Moser Tower Structural Assessment
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ALTERNATIVE 2B - ENCLOSE AND REPAIR STRUCTURE (MULTIPLE PHASES)

Stage One: Concrete & Exterior Repairs	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$55,000.00	$55,000
				$55,000
CONCRETE CRACK REPAIRS				
Concrete removal, cleaning, patching, material and labor.	25	Each	$4,400.00	$110,000
				$110,000
SURFACE DETERIORATION REPAIRS				
Concrete removal, cleaning, patching, material and labor.	2600	Sqft	$220.00	$572,000
				$572,000
CRACKED AND MISSING MORTAR JOINT REPLACEMENT				
Mortar / Material	30	Each	$352.00	$11,000
Labor	30	Each	$2,200.00	$66,000
				$77,000
SCAFFOLDING				
Exterior - Initial Setup - 4 Weeks	1	L. Sum	$88,000.00	$88,000
Exterior - 8 Extra Weeks	8	Week	$3,850.00	$31,000
Interior - Initial Setup - 4 Weeks	1	L. Sum	$66,000.00	$66,000
Interior - 8 Extra Weeks	8	Week	$1,650.00	$14,000
				$199,000
ENCLOSING STRUCTURE				
Glass Panels to Enclose Structure	1	L. Sum	$165,000.00	$165,000
HVAC	1	L. Sum	$99,000.00	$99,000
Fire Suppression	1	L. Sum	$93,500.00	$94,000
Mechanical, Electrical, and Plumbing	1	L. Sum	$297,000.00	$297,000
				$655,000

STAGE ONE SUBTOTAL =		**$1,668,000**
CONTINGENCY	***10% =***	**$167,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$126,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$184,000**

STAGE ONE GRAND TOTAL	**=**	**$2,145,000**

Stage Two: Structural Steel Rehabilitation	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$55,000.00	$55,000
				$55,000
STRUCTURAL STEEL CORROSION ABATEMENT				
Labor	75	Each	$4,400.00	$330,000
Structural Steel (200#/Location)	16000	Pounds	$5.50	$90,000
				$420,000
POST-TENSIONING CABLE ANCHORAGE				
Sealant and Labor	4	Each	$11,000.00	$44,000
				$44,000
SEALANT REPLACEMENT				
Material and Labor	5000	FT	$22.00	$110,000
				$110,000
SCAFFOLDING				
Exterior - Initial Setup - 4 Weeks	1	L. Sum	$88,000.00	$88,000
Exterior - 8 Extra Weeks	8	Week	$3,850.00	$31,000
Interior - Initial Setup - 4 Weeks	1	L. Sum	$66,000.00	$66,000
Interior - 8 Extra Weeks	8	Week	$1,650.00	$14,000
				$199,000

	STAGE TWO SUBTOTAL =	**$828,000**
CONTINGENCY	***10% =***	**$83,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$63,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$92,000**

STAGE TWO GRAND TOTAL	**=**	**$1,066,000**

Stage Three: Plaza Rehabilitation	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization	1	Lump Sum	$11,000.00	$11,000
				$11,000
PLAZA SEALING				
Concrete Removal	70	Cu. Yds.	$110.00	$8,000
Membrane and Flashing	2000	Sq. Ft.	$22.00	$44,000
Pavers	2000	Sq. Ft.	$11.00	$22,000
Masonry Flashing	1000	Sq. Ft.	$22.00	$22,000
				$96,000

	STAGE THREE SUBTOTAL =	**$107,000**
CONTINGENCY	***10% =***	**$11,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$9,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$12,000**

STAGE THREE GRAND TOTAL	**=**	**$139,000**

INSPECTION & MAINTENANCE COSTS (over 30 year period)				
Years 1-30:				
Annual Maintenance Cost	30	Year	$5,000.00	$150,000
Every 3 Years:				
Structure Inspection	10	Cycle	$25,000.00	$250,000
TOTAL INSPECTION & MAINTENANCE COST:			=	**$400,000**
*Effective Annual Maintenance Cost**			=	**$13,333**

STAGE ONE GRAND TOTAL	=	**$2,145,000**
STAGE TWO GRAND TOTAL	=	**$1,066,000**
STAGE THREE GRAND TOTAL	=	**$139,000**
INSPECTION & MAINTENANCE COST (over 30 year period)	=	**$400,000**
PROJECT GRAND TOTAL	=	**$3,750,000**

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ALTERNATIVE 3 - STRUCTURE MAINTENANCE AND DECOMMISSION STRUCTURE

Maintenance Costs	QTY	UNIT	UNIT PRICE	VALUE
INSPECTION & MAINTENANCE COSTS (over 30 year period)				
Years 1-10:				
Annual Maintenance Cost	10	Year	$10,000.00	$100,000
Years 11-20:				
Annual Maintenance Cost	10	Year	$20,000.00	$200,000
Years 21-30:				
Annual Maintenance Cost	10	Year	$30,000.00	$300,000
Every 3 Years:				
Interior and Exterior Structure Inspection	10	Cycle	$25,000.00	$250,000
TOTAL INSPECTION & MAINTENANCE COST:			=	**$850,000**
Effective Annual Maintenance Cost			=	**$28,333**

Construction Costs	QTY	UNIT	UNIT PRICE	VALUE
INITIAL COST				
Initial Cost	-	-	-	$0
				$0
STRUCTURE DEMOLITION				
Remove and Salvage Carillon Instrumentation	1	L. Sum	$110,000.00	$110,000
Structure Demolition	1	L. Sum	$550,000.00	$550,000
				$660,000

	PROJECT SUBTOTAL =	**$660,000**
CONTINGENCY	***10% =***	**$66,000**
ENGINEERING FEES	***0% =***	**$0**

PROJECT GRAND TOTAL	=	**$1,576,000**