ADDENDUM NO. 1 (DRAFT)
Naperville Riverwalk
Moser Tower Structural Assessment
November 2019

PURPOSE

Engineering Resource Associates (ERA) partnered with EChem Consultants, Brush Architects, Golf Construction, and Raths Raths & Johnson (RRJ) to perform comprehensive structural, limited material, and architectural investigations of the Moser Tower. The intent of these investigations was to further refine the details outlined in the Moser Tower Structural Report dated April 2017. Additional information was also gathered regarding the materials used to construct the structure and anticipated service life and architecture of the structure. The team completed the following services:

- EChem Consultants performed a limited material investigation and durability assessment consisting of extraction of concrete cores and laboratory testing, along with non-destructive testing for on-site corrosion-based testing to provide a comprehensive service life analysis of the structure and repairs.

- Brush Architects provided an architectural assessment of existing conditions, documentation of variations in finishes, and recommendations for additional weather protection for increased longevity.

- Golf Construction assisted ERA, EChem, and Brush by providing access to the elevated work areas with swing stages and pipe scaffolding. Additional services included core extraction and replacement, and material removals at targeted areas that had been identified during ERA's previous site visits, preliminary investigations, and following the team's review of the structure shop drawings.

- RRJ reviewed and organized the observed distress, cracking, and spalling on the structure and performed a structural analysis of Moser Tower to determine other potential causes for spalling at Elev. 116.7. Recommendations for grout pocket spall repairs were provided.

- ERA completed multiple site visits with each team member to identify accessible locations for both non-destructive and destructive testing. Using our James R. Meter, areas of existing reinforcement were located to determine the optimal locations for these testing services to verify existing conditions of embedded materials and conformance with the original project's precast shop drawings. Specific unknowns related to ERA's investigation included verification of the construction and condition of the original post-tensioned rods and the embedded steel connections supporting the large girder beams of the polygonal compression ring 2 at Elev. 52.5.

The results of these investigations were compiled in reports with photos from each team member as an addendum to ERA's previously submitted Moser Tower Structural Assessment Report dated April 2017.

This new data, in conjunction with the original report, will provide the Naperville Riverwalk Commission with the information needed to make an informed decision regarding a recommended alternative to potentially repair and rehabilitate the Moser Tower to deter further deterioration and extend the structure's lifecycle.

DOCUMENTS

Prior to the beginning of our site investigation, the precast concrete shop drawings became available and were provided to ERA for review. These drawings assisted us in our investigation, as they gave us the ability to identify and locate the post-tensioned rods, embedded steel connections and reinforcing bars, and confirm the installation of each of these items.

SUMMARY OF DESTRUCTIVE TESTING RESULTS

Isolated concrete removals were completed to expose the existing post-tensioned rods at the bottom of the tower near the northwest corner. The post-tensioned rods are critical to Tower stability. The structure is essentially four large pillars comprised of stacked precast concrete blocks. The post-tensioned rods compress the precast concrete blocks into a single column, similar to a long bolt clamping Lego blocks together as a unit. Lateral stability is then achieved by seven steel rings that tie the four pillars together. Hence, the post-tensioned rods and ring to concrete connections are key stability components of the Moser Tower.

Photograph #1: Areas of exposed post-tensioned rods at NW corner.

The selected removal areas were chosen at the bottom of the precast panels immediately above the masonry top cap to provide the most relevant indication of the condition of the post-tensioned strands. The condition of the rods is anticipated to be the most telling near the bottom of the tower where water would gather after migrating down the structure, potentially corroding the rod and adjacent reinforcing bars.

Photograph #2: Exposed end of PT rod and reinforcement bars at left opening

Photograph #3: Exposed end of PT rod and reinforcement bars at right opening

Additionally, one area of spalled and cracked concrete was identified and removed by the Contractor at an upper level of the tower exterior on the northeast elevation, exposing the condition of the exposed post-tensioned rod and reinforcement in this area.

Photograph #4: Exposed end of PT rod and reinforcement bars at right opening

As can be clearly seen in Photographs #2, #3, and #4, the post-tensioned rod, reaction plate, and adjacent reinforcement bars are in good condition. There is no sign of corrosion that would cause deterioration of the rods, plates, or bars. These removals also confirmed that the rods have been encased in grouted sleeves, as called out on the precast shop drawings, providing additional protection to these rods from corrosion due to water infiltration.

Two of the four embedded steel connection plates supporting the large girder beams of Compression Ring 2 at Elev. 52.5 were exposed.

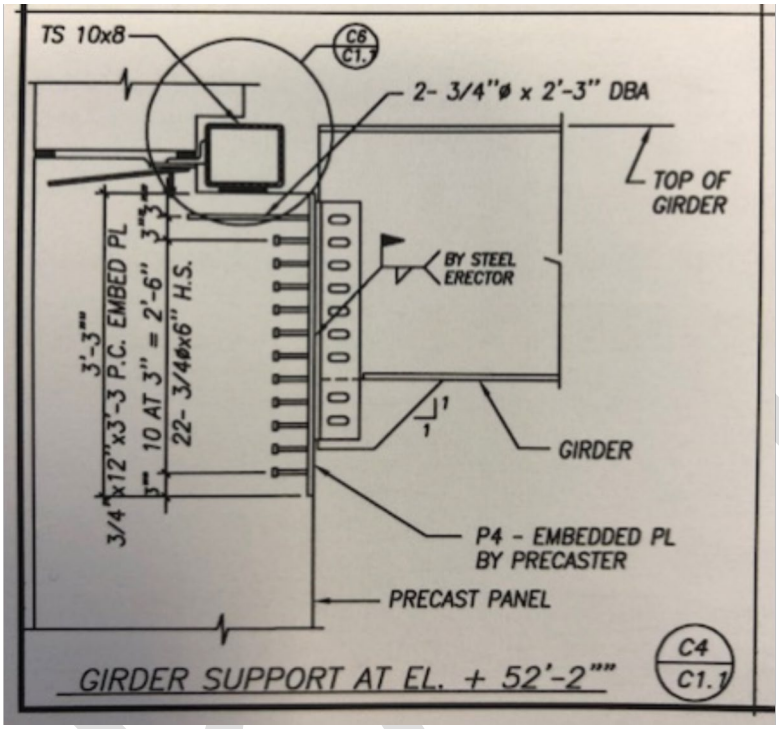
Photograph #5: Exposed connection plate and embedded studs at northeast side of Elev. 52.5.

On the right side of Photograph #5 is the steel plate where steel framing connects to the concrete pillars. The condition of the connection is critical to structural stability. The three rods depicted horizontally in Photograph #5 are automatically welded steel studs connected to the steel plate. The studs create shear and bond capacity to the concrete, transferring the vertical and horizontal loads from the steel framing into the concrete pillars. These components were substantially found in good condition.

Photograph #6: Backside of connection plate and embedded studs at northeast side of Elev. 52.5.

Photograph #7: Exposed connection plate and embedded studs at northwest side of Elev. 52.5.

As can be clearly seen in Photographs #5, #6, and #7, the embedded parts of these connections that are exposed are in good condition. There is evidence of minor surface corrosion on a portion of the embedded steel studs, along with the backside and edges of the plate, but no evidence of significant deterioration of these members. These removals confirm that the installation conforms to the girder support detail C4 shown on C1.1 of the Charles Vincent George drawings.



Weather intrusion through concrete cracks and spalled aggregates propagate corrosion on the backside of the connection plate, resulting in corrosion product flow down the face of the concrete. These plates are anchored to the concrete with steel studs, subject to corrosion deterioration. **The weather intrusion and corrosion propagation in these connections must be abated.**

SUMMARY OF NON-DESTRUCTIVE TESTING RESULTS

ERA reviewed the "Corrosion and Material Durability Analysis" report completed by the team of EChem Consultants and Brush Architects dated August 24, 2018 and has been included at the end of this addendum. The summary of their report related to the potential for corrosive activity within the tower that could potentially affect the structural stability of the tower in the future is clearly stated on Page 3-53 as follows:

"In summary, there is very low corrosion activity recorded at the Moser Tower on both precast main panels and on the reinforced concrete components. In addition, negligible level of chlorides and carbonation profiles were identified."

As a part of the Petrographic Analysis results included on Page 2-24 within the EChem/Brush report, two samples were extracted for analysis from the precast concrete components. Sample 1 was extracted from a precast fin panel and Sample 2 was extracted from a main precast post-tensioned panel. The water/cement ratio for Samples 1 and 2 was tested to be 0.50 and 0.55, respectively. These values are in agreement with the testing done by CTL Group and outlined in their February 24, 2006 "Report of Petrographic Examination" on Page 2 of 13 that also found similar water/cement ratios on their tested samples. These values were found to be "moderate to moderately high" when compared to industry standards that are typically closer to 0.40 and are a potential explanation to the degradation in durability of the precast components comprising the tower causing concrete scaling and deterioration of areas throughout each elevation.

ERA reviewed the "Special Structural Analysis of Moser Tower" report completed by RRJ dated November 15, 2019 which has been included at the end of this addendum. RRJ completed a comprehensive review of all available information looking for patterns of cracking and spalling to the precast tower elements that would suggest a cause to such behavior that may not have been previously considered. Following this review, a detailed structural analysis of the tower was completed to examine the concrete stresses and evaluate the structural behavior of the tower elements due to the wind, gravity, and post-tensioning loads used in the original tower design. RRJ's findings confirmed that none of the calculated stress levels are large enough to cause the identified cracking or spalling, indicating that the deterioration at the stressing grout pockets is due to gypsum contaminated grout.

REPAIR & IMPROVEMENT RECOMMENDATIONS

The additional destructive and non-destructive testing performed identified that Moser Tower is in a proactive repair state where work and repairs can be designed to slow down or prevent additional issues. If left alone, the tower would likely continue to deteriorate into a reactive state where more significant, immediate, and more costly steps would need to be taken. Below are summaries of potential repairs and improvements that must be performed to address deficiencies and to prevent further deterioration which threatens the structural integrity of the Moser Tower. The prioritization of these items remains the same as outlined in the Moser Tower Structural Assessment Report dated April 2017; however, updated opinions of cost and recommended timelines for completing these repairs and improvements are provided below and attached. Costs for repairs as outlined below include design and construction engineering fees.

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, abatement of original construction defects, and prevention of future defects due to permeability of the concrete. These resolutions include:

1. **Potential Concrete Scaling Repairs:** The high water/cement ratios identified during sample testing of the precast components by both EChem/Brush in 2018 and CTL Group in 2006 can cause concrete scaling. Some of these areas of concrete scaling are an aesthetic repair that can be completed at the option of the Owner until such areas reach a point of deterioration that may require an immediate repair.

2. **Repair Concrete Cracks:** Concrete cracking increases the structure permeability propagating embedded steel corrosion. Previous crack repairs are failing. Crack repair will increase the

structure lifecycle. Rout and seal new cracks. Remove and replace failed crack repairs with higher quality materials.

3. **Replace Cracked and Missing Mortar Joints:** Freeze-thaw action has damaged and dislodged precast concrete component mortar joints. Competent mortar joints are essential to structural stability. Remove damaged joints and replace mortar.

4. **Grout Sample Extraction and Testing:** The expansive agents found within gypsum contaminated grout pockets can influence the observed cracking and spalling. Grout samples should be removed and tested to verify the presence of gypsum. Complete additional examinations of all grout pockets by qualified personnel.

The estimated cost to perform these repairs is $623,000 and it is recommended they be implemented within the next 1-3 years. See Alternative 1B – Stage One for detailed breakdown.

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. **Flash and Seal Exposed Post-Tensioned Rod Reaction Plates:** These reaction plates are the post-tensioning cable anchorages for the structure and must be protected to preserve structural stability. The anchorages are primarily visible at the top of the precast concrete fins. The anchorage cup is grouted and is subject to rain intrusion and freeze-thaw damage. Maintaining these anchorages corrosion free is critical, requiring protection from rain intrusion with flashings and sealants.

2. **Clean, Paint, and Flash Embedded Steel Connections:** The polygonal ring to concrete connections are critical to the structural stability of the tower and must be maintained in good condition. Steel corrosion must be abated by cleaning and painting areas of exposed surface corrosion, and installing flashing around these connections to prevent future corrosion from occurring on the exposed and/or embedded steel. Additional reinforcement may be included in some areas. Rust staining as a product of moisture trapped between steel surfaces or between steel and concrete surfaces will lead to corroded metal expansion, cracking of concrete in contact with steel, and eventual loss of structural connection. These conditions are most serious, require repair, and will require periodic inspection and future repairs.

3. **Replace Sealants:** Sealants have reached the end of their useful lives. Missing and cracked sealants increase permeability and speed up the corrosion process. Remove all of the sealants and replace with multi-component polyurethane sealant.

The estimated cost to perform these repairs is $585,000 and it is recommended they be implemented within the next 3-5 years. See Alternative 1B – Stage Two for detailed breakdown.

Plaza Rehabilitation (Priority #3)

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

1. **Seal the Plaza:** Modify the plaza structure for positive drainage off the membrane top surface. Remove and replace the plaza waterproofing membrane and flashing to abate the leakage. Replace existing concrete surface with pavers to simplify future access for repairs.

The estimated cost to perform these repairs is $363,000 and it is recommended they be implemented within the next 5-7 years. See Alternative 1B – Stage Three for detailed breakdown.

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Consulting Engineers, Scientists & Surveyors

City of Naperville
Moser Tower Structural Assessment
Engineer's Preliminary Opinion of Cost
(revised November 21, 2019)
ALTERNATIVE 1A - REPAIR EXISTING STRUCTURE (SINGLE PHASE)

Construction Costs	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization / Demobilization / General Conditions	1	Lump Sum	$200,000	$200,000
				$200,000
STRUCTURAL STEEL CONNECTION CORROSION ABATEMENT				
Clean & Paint Steel	60	Each	$400	$24,000
Install Flashing & Sealant	60	Each	$250	$15,000
				$39,000
POST-TENSIONING CABLE ANCHORAGES				
Flashing, Sealant, and Grout	40	Each	$6,000	$240,000
				$240,000
CONCRETE CRACK REPAIRS				
Concrete removal, cleaning, patching, material and labor.	200	Lin. Ft.	$50	$10,000
				$10,000
CONCRETE SURFACE DETERIORATION REPAIRS				
Concrete removal, cleaning, patching, material and labor.	500	Sq. Ft.	$400	$200,000
				$200,000
CRACKED AND MISSING MORTAR JOINT REPLACEMENT				
Mortar / Material	300	Lin. Ft.	$15	$5,000
Labor	300	Lin. Ft.	$25	$8,000
				$13,000
GROUT SAMPLE EXTRACTION, TESTING, AND REPAIRS				
Grout Pockets - North Side	1	Lump Sum	$50,000	$50,000
Grout Pockets - South Side	1	Lump Sum	$25,000	$25,000
Testing of Cores	1	Lump Sum	$10,000	$10,000
				$85,000
SEALANT REPLACEMENT				
Material and Labor	1,000	Lin. Ft.	$25	$25,000
				$25,000
PLAZA SEALING				
Concrete Removal	70	Cu. Yds.	$150	$11,000
Membrane and Flashing	2,000	Sq. Ft.	$35	$70,000
Base Material, Preparation, and Pavers	2,000	Sq. Ft.	$75	$150,000
Masonry Flashing	500	Lin. Ft.	$50	$25,000
				$256,000

CONSTRUCTION COST SUBTOTAL =		**$1,068,000**
CONTINGENCY	***10% =***	**$107,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$81,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$118,000**
	PROJECT SUBTOTAL=	**$1,374,000**

INSPECTION & MAINTENANCE COSTS (over 30 year period)				
Years 1-10:				
Annual Maintenance Cost (years 1-10)	10	Year	$5,000	$50,000
Years 11-20:				
Annual Maintenance Cost (years 11-20)	10	Year	$10,000	$100,000
Years 21-30:				
Annual Maintenance Cost (years 21-30)	10	Year	$15,000	$150,000
Every 3 Years:				
Interior and Exterior Structure Inspection	10	Cycle	$25,000	$250,000
TOTAL INSPECTION & MAINTENANCE COST:			**=**	**$550,000**
Effective Annual Maintenance Cost			**=**	**$18,333**

PROJECT GRAND TOTAL	**=**	**$1,924,000**

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ALTERNATIVE 1B - REPAIR EXISTING STRUCTURE (MULTIPLE PHASES)

Stage One: Concrete Repairs	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization / Demobilization / General Conditions	1	Lump Sum	$175,000	$175,000
				$175,000
CONCRETE CRACK REPAIRS				
Concrete removal, cleaning, patching, material and labor.	200	Lin. Ft.	$50	$10,000
				$10,000
CONCRETE SURFACE DETERIORATION REPAIRS				
Concrete removal, cleaning, patching, material and labor.	500	Sq. Ft.	$400	$200,000
				$200,000
CRACKED AND MISSING MORTAR JOINT REPLACEMENT				
Mortar / Material	300	Lin. Ft.	$15	$5,000
Labor	300	Lin. Ft.	$25	$8,000
				$13,000
GROUT SAMPLE EXTRACTION, TESTING, AND REPAIRS				
Grout Pockets - North Side	1	Lump Sum	$50,000	$50,000
Grout Pockets - South Side	1	Lump Sum	$25,000	$25,000
Testing of Cores	1	Lump Sum	$10,000	$10,000
				$85,000

STAGE ONE CONSTRUCTION SUBTOTAL =		**$483,000**
CONTINGENCY	***10% =***	**$49,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$37,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$54,000**

STAGE ONE GRAND TOTAL	**=**	**$623,000**

Stage Two: Structural Steel Rehabilitation	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization / Demobilization / General Conditions	1	Lump Sum	$150,000	$150,000
				$150,000
STRUCTURAL STEEL CONNECTION CORROSION ABATEMENT				
Clean & Paint Steel	60	Each	$400	$24,000
Install Flashing & Sealant	60	Each	$250	$15,000
				$39,000
POST-TENSIONING CABLE ANCHORAGES				
Flashing, Sealant, and Grout	40	Each	$6,000	$240,000
				$240,000
SEALANT REPLACEMENT				
Material and Labor	1,000	Lin. Ft.	$25	$25,000
				$25,000

STAGE TWO CONSTRUCTION SUBTOTAL =		**$454,000**
CONTINGENCY	***10% =***	**$46,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$35,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$50,000**

STAGE TWO GRAND TOTAL	**=**	**$585,000**

Stage Three: Plaza Rehabilitation	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization / Demobilization / General Conditions	1	Lump Sum	$25,000	$25,000
				$25,000
PLAZA SEALING				
Concrete Removal	70	Cu. Yds.	$150	$11,000
Membrane and Flashing	2,000	Sq. Ft.	$35	$70,000
Base Material, Preparation, and Pavers	2,000	Sq. Ft.	$75	$150,000
Masonry Flashing	500	Lin. Ft.	$50	$25,000
				$256,000

STAGE THREE CONSTRUCTION SUBTOTAL =		**$281,000**
CONTINGENCY	***10% =***	**$29,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$22,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$31,000**

STAGE THREE GRAND TOTAL	**=**	**$363,000**

INSPECTION & MAINTENANCE COSTS (over 30 year period)				
Years 1-10: Annual Maintenance Cost (years 1-10)	10	Year	$5,000	$50,000
Years 11-20: Annual Maintenance Cost (years 11-20)	10	Year	$10,000	$100,000
Years 21-30: Annual Maintenance Cost (years 21-30)	10	Year	$15,000	$150,000
Every 3 Years: *Interior and Exterior Structure Inspection*	10	Cycle	$25,000	$250,000
TOTAL INSPECTION & MAINTENANCE COST:			**=**	**$550,000**
Effective Annual Maintenance Cost			**=**	**$18,333**

STAGE ONE GRAND TOTAL	=	$623,000
STAGE TWO GRAND TOTAL	=	$585,000
STAGE THREE GRAND TOTAL	=	$363,000
TOTAL REPAIR COSTS	**=**	**$1,571,000**
INSPECTION & MAINTENANCE COST (over 30 year period)	=	$550,000
PROJECT GRAND TOTAL	**=**	**$2,121,000**

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City of Naperville
Moser Tower Structural Assessment
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ALTERNATIVE 2A - ENCLOSE AND REPAIR STRUCTURE (SINGLE PHASE)

Construction Costs	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization / Demobilization / General Conditions	1	Lump Sum	$200,000	$200,000
				$200,000
STRUCTURAL STEEL CONNECTION CORROSION ABATEMENT				
Clean & Paint Steel	60	Each	$400	$24,000
Install Flashing & Sealant	60	Each	$250	$20,000
				$44,000
POST-TENSIONING CABLE ANCHORAGES				
Flashing, Sealant, and Grout	40	Each	$6,000	$240,000
				$240,000
CONCRETE CRACK REPAIRS				
Concrete removal, cleaning, patching, material and labor.	200	Lin. Ft.	$50	$10,000
				$10,000
CONCRETE SURFACE DETERIORATION REPAIRS				
Concrete removal, cleaning, patching, material and labor.	500	Sq. Ft.	$400	$200,000
				$200,000
CRACKED AND MISSING MORTAR JOINT REPLACEMENT				
Mortar / Material	300	Lin. Ft.	$15	$5,000
Labor	300	Lin. Ft.	$25	$8,000
				$13,000
GROUT SAMPLE EXTRACTION, TESTING, AND REPAIRS				
Grout Pockets - North Side	1	Lump Sum	$50,000	$50,000
Grout Pockets - South Side	1	Lump Sum	$25,000	$25,000
Testing of Cores	1	Lump Sum	$10,000	$10,000
				$85,000
SEALANT REPLACEMENT				
Material and Labor	1,000	Lin. Ft.	$25	$25,000
				$25,000
PLAZA SEALING				
Concrete Removal	70	Cu. Yds.	$150	$11,000
Membrane and Flashing	2,000	Sq. Ft.	$35	$70,000
Base Material, Preparation, and Pavers	2,000	Sq. Ft.	$75	$150,000
Masonry Flashing	500	Lin. Ft.	$50	$25,000
				$256,000
ENCLOSING STRUCTURE				
Glass Panels to Enclose Structure	1	L. Sum	$220,000	$220,000
HVAC	1	L. Sum	$99,000	$99,000
Fire Suppression	1	L. Sum	$94,000	$94,000
Mechanical, Electrical, and Plumbing	1	L. Sum	$297,000	$297,000
				$710,000

			CONSTRUCTION COST SUBTOTAL =	**$1,783,000**
			CONTINGENCY 10% =	**$179,000**
			DESIGN ENGINEERING FEES 7.5% =	**$134,000**
			CONSTRUCTION ENGINEERING FEES 11% =	**$197,000**
			PROJECT SUBTOTAL=	**$2,293,000**
INSPECTION & MAINTENANCE COSTS (over 30 year period)				
Every Year: Annual Maintenance Cost	30	Year	$5,000	$150,000
Every 3 Years: *Structure Inspection*	10	Cycle	$25,000	$250,000
			TOTAL INSPECTION & MAINTENANCE COST: =	**$400,000**
			Effective Annual Maintenance Cost =	**$13,333**

PROJECT GRAND TOTAL	=	**$2,693,000**

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ALTERNATIVE 2B - ENCLOSE AND REPAIR STRUCTURE (MULTIPLE PHASES)

Stage One: Concrete & Exterior Repairs	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization / Demobilization / General Conditions	1	Lump Sum	$175,000	$175,000
				$175,000
CONCRETE CRACK REPAIRS				
Concrete removal, cleaning, patching, material and labor.	200	Lin. Ft.	$50	$10,000
				$10,000
CONCRETE SURFACE DETERIORATION REPAIRS				
Concrete removal, cleaning, patching, material and labor.	500	Sq. Ft.	$400	$200,000
				$200,000
CRACKED AND MISSING MORTAR JOINT REPLACEMENT				
Mortar / Material	300	Lin. Ft.	$15	$5,000
Labor	300	Lin. Ft.	$25	$8,000
				$13,000
GROUT SAMPLE EXTRACTION, TESTING, AND REPAIRS				
Grout Pockets - North Side	1	Lump Sum	$50,000	$50,000
Grout Pockets - South Side	1	Lump Sum	$25,000	$25,000
Testing of Cores	1	Lump Sum	$10,000	$10,000
				$85,000
ENCLOSING STRUCTURE				
Glass Panels to Enclose Structure	1	L. Sum	$220,000	$220,000
HVAC	1	L. Sum	$99,000	$99,000
Fire Suppression	1	L. Sum	$94,000	$94,000
Mechanical, Electrical, and Plumbing	1	L. Sum	$297,000	$297,000
				$710,000

STAGE ONE CONSTRUCTION SUBTOTAL =		**$1,193,000**
CONTINGENCY	***10% =***	**$120,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$90,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$132,000**

STAGE ONE GRAND TOTAL	**=**	**$1,535,000**

Stage Two: Structural Steel Rehabilitation	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization / Demobilization / General Conditions	1	Lump Sum	$150,000	$150,000
				$150,000
STRUCTURAL STEEL CONNECTION CORROSION ABATEMENT				
Clean & Paint Steel	60	Each	$400	$24,000
Install Flashing & Sealant	60	Each	$250	$20,000
				$44,000
POST-TENSIONING CABLE ANCHORAGES				
Flashing, Sealant, and Grout	40	Each	$6,000	$240,000
				$240,000
SEALANT REPLACEMENT				
Material and Labor	1,000	Lin. Ft.	$25	$25,000
				$25,000

STAGE TWO CONSTRUCTION SUBTOTAL =		**$459,000**
CONTINGENCY	***10% =***	**$46,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$35,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$51,000**

STAGE TWO GRAND TOTAL	**=**	**$591,000**

Stage Three: Plaza Rehabilitation	QTY	UNIT	UNIT PRICE	VALUE
MOBILIZATION				
Mobilization / Demobilization / General Conditions	1	Lump Sum	$25,000	$25,000
				$25,000
PLAZA SEALING				
Concrete Removal	70	Cu. Yds.	$150	$11,000
Membrane and Flashing	2,000	Sq. Ft.	$35	$70,000
Base Material, Preparation, and Pavers	2,000	Sq. Ft.	$75	$150,000
Masonry Flashing	500	Lin. Ft.	$50	$25,000
				$256,000

STAGE THREE CONSTRUCTION SUBTOTAL =		**$281,000**
CONTINGENCY	***10% =***	**$29,000**
DESIGN ENGINEERING FEES	***7.5% =***	**$22,000**
CONSTRUCTION ENGINEERING FEES	***11% =***	**$31,000**

STAGE THREE GRAND TOTAL	**=**	**$363,000**

INSPECTION & MAINTENANCE COSTS (over 30 year period)				
Years 1-30:				
Annual Maintenance Cost	30	Year	$5,000	$150,000
Every 3 Years:				
Structure Inspection	10	Cycle	$25,000	$250,000
TOTAL INSPECTION & MAINTENANCE COST:			**=**	**$400,000**
*Effective Annual Maintenance Cost**			**=**	**$13,333**

STAGE ONE GRAND TOTAL	=	$1,535,000
STAGE TWO GRAND TOTAL	=	$591,000
STAGE THREE GRAND TOTAL	=	$363,000
TOTAL REPAIR COSTS	**=**	**$2,489,000**
INSPECTION & MAINTENANCE COST (over 30 year period)	=	$400,000
PROJECT GRAND TOTAL	**=**	**$2,889,000**

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

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	$100,000
Years 11-20:				
Annual Maintenance Cost	10	Year	$20,000	$200,000
Years 21-30:				
Annual Maintenance Cost	10	Year	$30,000	$300,000
Every 3 Years:				
Interior and Exterior Structure Inspection	10	Cycle	$25,000	$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	$110,000
Structure Demolition	1	L. Sum	$550,000	$550,000
				$660,000

PROJECT SUBTOTAL =		**$660,000**
CONTINGENCY	***10% =***	**$66,000**
ENGINEERING FEES	***0% =***	**$0**

PROJECT GRAND TOTAL	=	**$1,576,000**