

Damage analysis of “Gazi Mihal Bey” case study bath structure:

Table 7.29: Damage analysis of “Gazi Mihal Bey” case study bath structure, “Cell A”

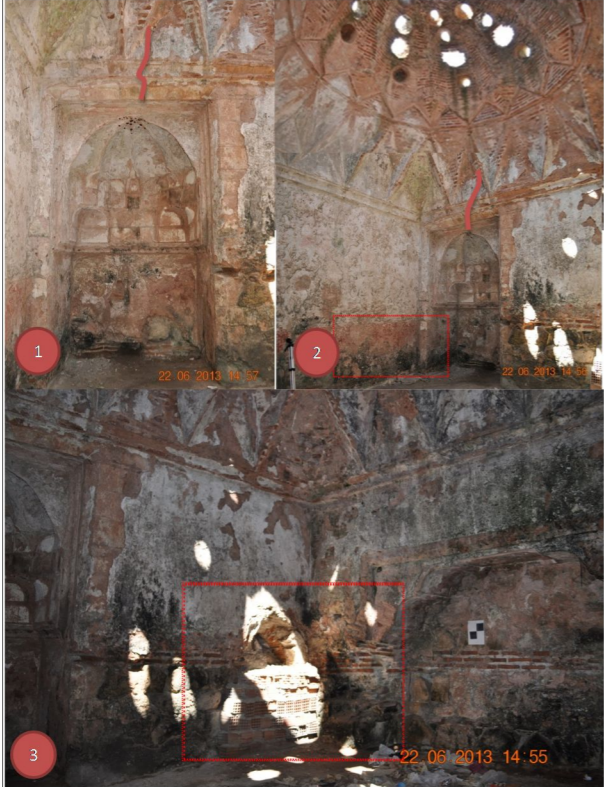




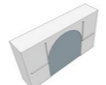
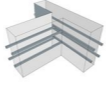
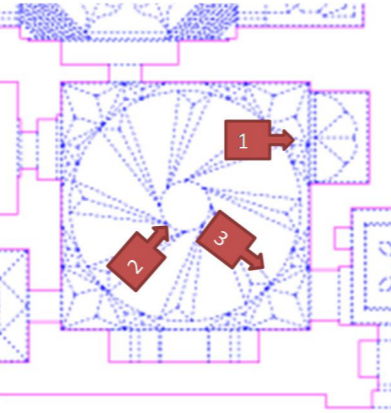
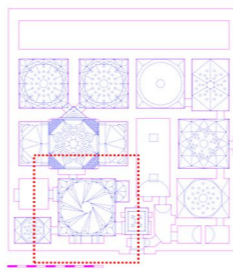
Damage Analysis of "Gazi Mihal Bey Bath"											
Damaged Part Number	Damaged Parts of Case Studies	Quality of Masonry		Construction Characteristics			Cracking and Instability				
				Structural Discontinuities	Degradation of structural elements	Conditions	General Description	Physical Damage	Geometrical Modifications	Loss of verticality	General Description
Cell "A"		Vertical A B C	Qualitative methods of for evaluation is rated, "B" in vertical, "C" out of plane and "B" in plane actions.	Fig: All 	Fig: 1,2 	Fig: All 	There is a consistency of masonry structure. The masonry stone pattern inside of the masonry cell is well constructed. Brick material is used for constructing the transition elements and the dome.	Fig: 1,2 			Inside of "cell A" there are few cracks in front of the masonry wall surface. However the crack is shown in figure 1,2; is started from wall surface and continued to the dome structure.
		Out of Plane A B C		Fig: 3 							
		In the Plane A B C		In detail cell "A"; squared stones with bricks were used. Leaves of the masonry were good bonded. Rows between stones were constructed regularly.	Fig: All 						
											

Table 7.30: Damage analysis of “Gazi Mihal Bey” case study bath structure, “Cell B”

Damage Analysis of "Gazi Mihal Bey Bath"											
Damaged Part Number	Damaged Parts of Case Studies	Quality of Masonry		Construction Characteristics			Cracking and Instability				
				Structural Discontinuities	Degradation of structural elements	Conditions	General Description	Physical Damage	Geometrical Modifications	Loss of verticality	General Description
Cell "B"		<p>Vertical</p> <p>A</p> <p>(B)</p> <p>C</p>	<p>Qualitative methods of for evaluation is rated, "B" in vertical, "C" out of plane and "B" in plane actions.</p> <p>In detail cell "B"; squared stones with bricks were used. Leaves of the masonry were good bonded. Rows between stones and bricks were constructed regularly.</p>	<p>Fig: All</p>	<p>Fig: 2</p>	<p>Fig: 1</p>	<p>There is a consistency of masonry structure. The masonry stone pattern inside of the masonry cell is well constructed. Brick material is used for constructing the transition elements and the dome. Outside of the masonry wall stone and bricks are used for constructing the outer layer. Inside of the masonry wall there are timber tie beams empty sockets.</p>	<p>Fig: 2</p>			<p>Inside of the masonry wall, there is no cracks and deterioraton. However there is loss of binder between the joints of the transitional elements. Outside of the masonry wall, the layer is deteriorated. Some part of the outer layer of the wall is collapsed. On the corner of the maosnry is reconstructed in previous maitanence operations. Probably there was an collapse occurs in that part.</p>
		<p>Out of Plane</p> <p>A</p> <p>(B)</p> <p>C</p>		<p>Fig: 2</p>	<p>Fig: 2</p>	<p>Fig: 1</p>					
		<p>In the Plane</p> <p>A</p> <p>(B)</p> <p>C</p>			<p>Fig: 2</p>						

Table 7.31: Damage analysis of “Gazi Mihal Bey” case study bath structure, “Cell C”

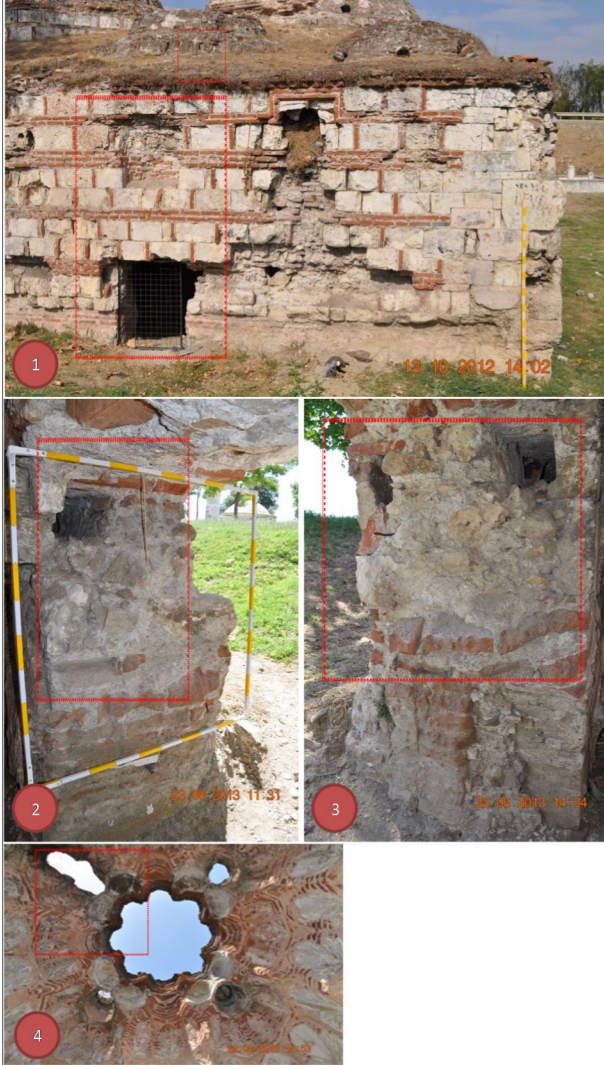




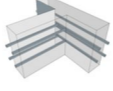
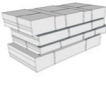


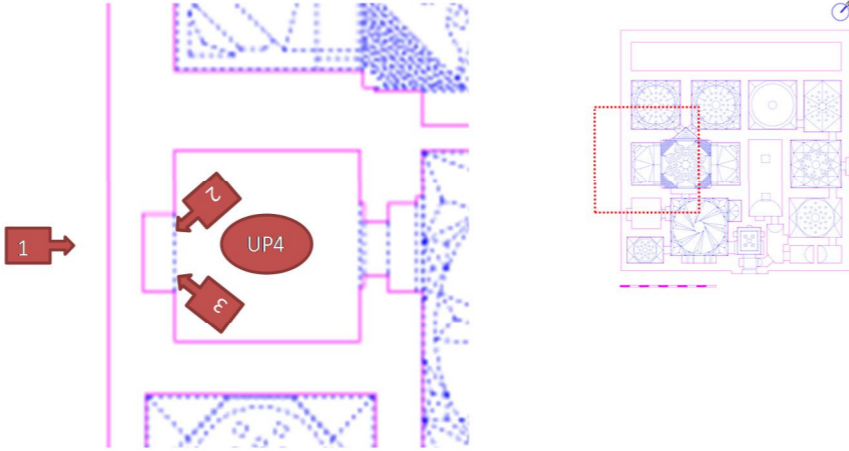
Damage Analysis of "Gazi Mihal Bey Bath"											
Damaged Part Number	Damaged Parts of Case Studies	Quality of Masonry		Construction Characteristics			Cracking and Instability				
				Structural Discontinuities	Degradation of structural elements	Conditions	General Description	Physical Damage	Geometrical Modifications	Loss of verticality	General Description
Cell "C"		Vertical A B C	Qualitative methods of for evaluation is rated, "B" in vertical, "C" out of plane and "B" in plane actions.	Fig: 1 	Fig: All 	Fig: 1 	There is a consistency of the wall structure. Brick constructed as tie beams were used on the surface of the walls. Timber tie beams sockets are present inside of the wall construction. The domes and transitional elements were built with brick tiles. There is lighting holes on the top of the domes.	Fig: 1 			In figure 1: The outside masonry of the "cell C" is deteriorated. Parts of the outer layer of the masonry is collapsed. In figure 2,3: Part of the wall of the masonry was broken down by users. The broke passage was given an idea of the wall section. Empty timber sockets, diatone stones are seen in these sections. In figure 4: Cracks on the domes are seen. Top of the dome the opening was damaged and some parts were collapsed.
		Out of Plane A B C		In detail cell "C"; squared stones with bricks were used. Leaves of the masonry were good bonded. Rows between stones and bricks were constructed regularly.	Fig: 1,2,3 	Fig: 1 			Fig: 2,3 		
		In the Plane A B C									
											

Table 7.32: Damage analysis of “Gazi Mihal Bey” case study bath structure, “Cell D”

Damage Analysis of "Gazi Mihal Bey Bath"										
Damaged Part Number	Damaged Parts of Case Studies	Quality of Masonry	Construction Characteristics			General Description	Cracking and Instability			
			Structural Discontinuities	Degradation of structural elements	Conditions		Physical Damage	Geometrical Modifications	Loss of verticality	General Description
Cell "D"		<p>Vertical</p> <p>A B C</p> <p>Qualitative methods of for evaluation is rated, "B" in vertical, "C" out of plane and "B" in plane actions.</p>	<p>Fig: All</p>	<p>Fig: All</p>	<p>Fig: 1,2,3</p>	<p>There is a consistency of masonry structure. The masonry stone pattern inside of the masonry cell is well constructed. Brick material is used for constructing the transition elements and the dome.</p>	<p>Fig: 2,3,4</p>			<p>In figure 1: Between the slab and the masonry wall there is a big deterioration on the surface of masonry wall. In figure 2,4: There is a big crack starting from the arch of the door and continue to the dome. In figure 3: The other big crack start form the opposite side of the cell, it started from the top of the door and continues to the dome.</p>
		<p>Out of Plane</p> <p>A B C</p> <p>In detail cell "D"; squared stones with bricks were used. Leaves of the masonry were good bonded and rows between them were constructed regularly.</p>	<p>Fig: All</p>	<p>Fig: All</p>	<p>Fig: 1,2,3</p>		<p>Fig: 1</p>			

Table 7.33: Damage analysis of “Gazi Mihal Bey” case study bath structure, “Cell E”







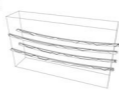

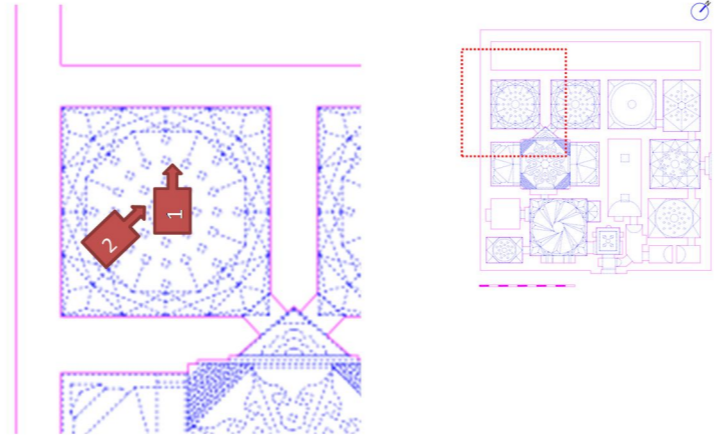
Damage Analysis of "Gazi Mihal Bey Bath"											
Damaged Part Number	Damaged Parts of Case Studies	Quality of Masonry		Construction Characteristics			Cracking and Instability				
				Structural Discontinuities	Degradation of structural elements	Conditions	General Description	Physical Damage	Geometrical Modifications	Loss of verticality	General Description
Cell "E"		Vertical A B C	Qualitative methods of for evaluation is rated, "B" in vertical, "C" out of plane and "B" in plane actions.	Fig: All 	Fig: All 	Fig: 2 	Between the masonry walls there is a consistency of the structure. Brick constructed tie beams were used inside the walls. The domes were built up on brick tiles. There is lighting holes on the top of the domes.	Fig: All 			In figure 1,2: A crack start from the opening between the water tank area and the cell and it continues to the dome.
		Out of Plane A B C		Fig: All 	Fig: All 	Fig: 2 					
		In the Plane A B C	In detail cell "E"; squared stones with bricks were used. Leaves of the masonry were good bonded and rows between them were constructed regularly.								
											

Table 7.34: Damage analysis of “Gazi Mihal Bey” case study bath structure, “Cell F”

Damage Analysis of "Gazi Mihal Bey Bath"											
Damaged Part Number	Damaged Parts of Case Studies	Quality of Masonry		Construction Characteristics			Cracking and Instability				
				Structural Discontinuities	Degradation of structural elements	Conditions	General Description	Physical Damage	Geometrical Modifications	Loss of verticality	General Description
Cell "F"		<p>Vertical</p> <p>A B C</p>	<p>Qualitative methods of for evaluation is rated, "B" in vertical, "C" out of plane and "B" in plane actions.</p> <p>In detail cell "F"; squared stones with bricks were used. Leaves of the masonry were good bonded and rows between them were constructed regularly.</p>	Fig: All	Fig: 1,2,3,4	Fig: 2	<p>Between the masonry walls there is a consistency of the structure. Brick constructed tie beams were used inside the walls. The domes were built up on brick tiles. There is lighting holes on the top of the domes.</p>	Fig: 2,3,4			<p>In figure 1: Very small part of the dome was collapsed. In figure 2,3,4: There is a big crack starts from the arch of the door and it continue to the dome. This crack is the same crack in "cell E". This crack is probably divided two cell structures in to two.</p>
		<p>Out of Plane</p> <p>A B C</p>		Fig: 2	Fig: 2						
		<p>In the Plane</p> <p>A B C</p>									

Table 7.35: Damage analysis of “Gazi Mihal Bey” case study bath structure, “Cell K”



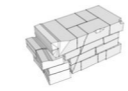






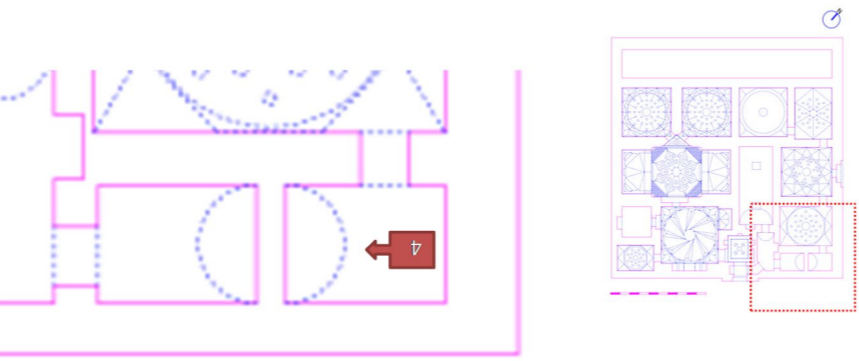
Damage Analysis of "Gazi Mihal Bey Bath"											
Damaged Part Number	Damaged Parts of Case Studies	Quality of Masonry		Construction Characteristics			Cracking and Instability				
				Structural Discontinuities	Degradation of structural elements	Conditions	General Description	Physical Damage	Geometrical Modifications	Loss of verticality	General Description
Cell "K"		Vertical A B C	Qualitative methods of for evaluation is rated, "B" in vertical, "C" out of plane and "B" in plane actions.				Vault structure is built up of bricks and stones. The space of vault is divided by brick masonries mixed with stone.				In figure 1: The wall which is divided the vault space is halfly collapsed. There were opeinings on the top of the vault structure.
		Out of Plane A B C									
		In the Plane A B C	In detail cell "K"; bricks were used. Stones were used as beams. Leaves of the masonry were good bonded and rows between them were constructed regularly.								

Table 7.36: Damage analysis of “Gazi Mihal Bey” case study bath structure, “Cell B, A, K” elevation

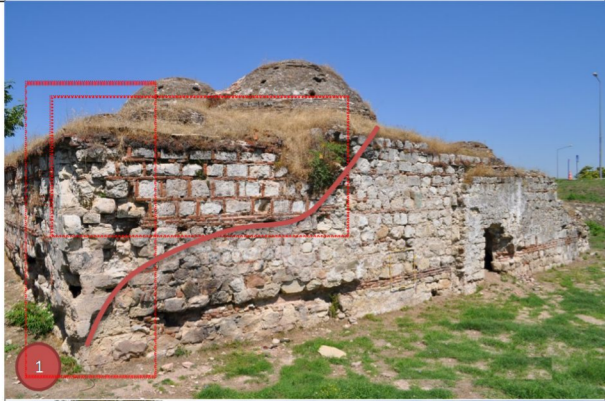





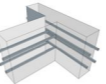




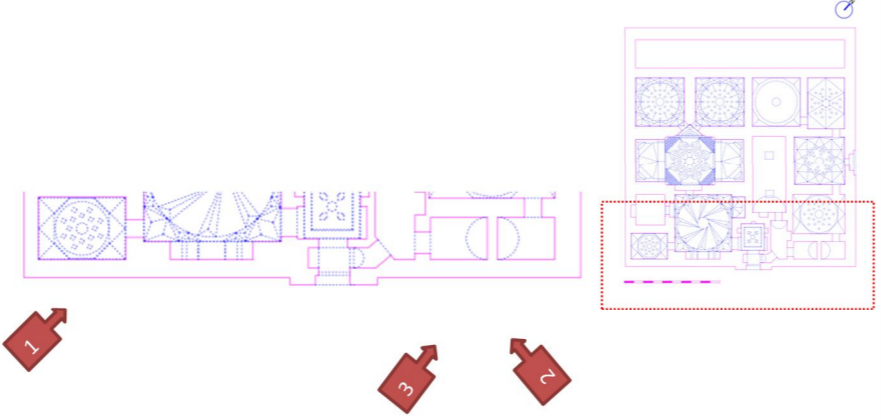
Damage Analysis of "Gazi Mihal Bey Bath"											
Damaged Part Number	Damaged Parts of Case Studies	Quality of Masonry		Construction Characteristics			Cracking and Instability				
				Structural Discontinuities	Degradation of structural elements	Conditions	General Description	Physical Damage	Geometrical Modifications	Loss of verticality	General Description
Cell "B,A,K" Elevation		Vertical A B C	Qualitative methods of for evaluation is rated, "B" in vertical, "C" out of plane and "B" in plane actions. In detail cell "B,A,K" Elevation; squared stones with bricks were used. Leaves of the masonry were good bonded and rows between them were constructed regularly. However there is a deterioration on the elevatoin of the bath.	Fig: All 	Fig: All 	Fig: All 	Between the masonry walls there is a consistency of the structure. Stones and bricks were used on constructing the masonry. Brick layers used as beams on the masonry. Timber tie sockets are present inside of the masonry.	Fig: All 			In figure 1: The structure was affected from the vertical actors. Corner of the wall is collapsed and after the previous consolidation works is repairs. It is easily seen on the picture form the different use of material. In figure 2,3: The other corner of the bath is collapsed in the same angle with the opposite corner. however it is not repaired.
		Out of Plane A B C		Fig: All 	Fig: All 			Fig: All 			
		In the Plane A B C		Fig: All 							
											

Table 7.37: Damage analysis of “Gazi Mihal Bey” case study bath structure, “Cell E, D, C, B” elevation







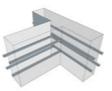




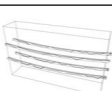
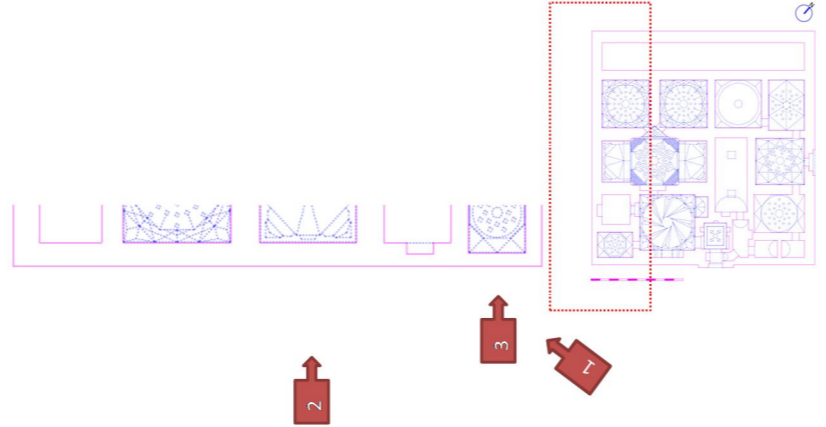


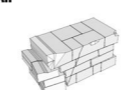




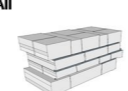

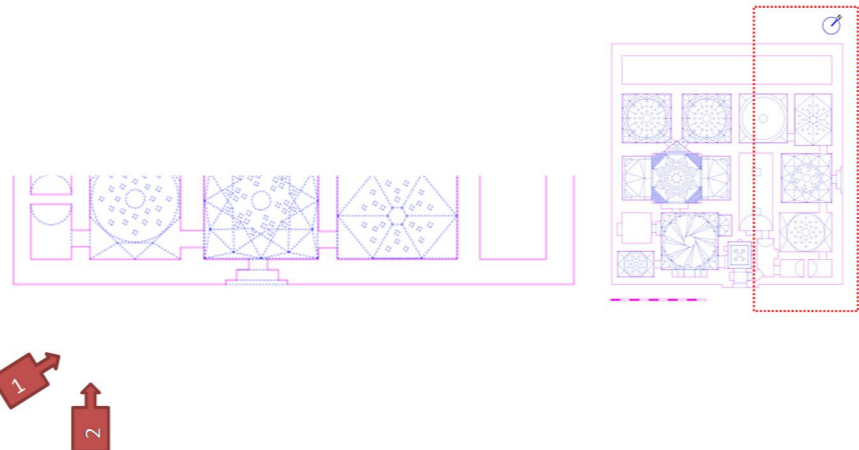
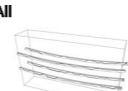
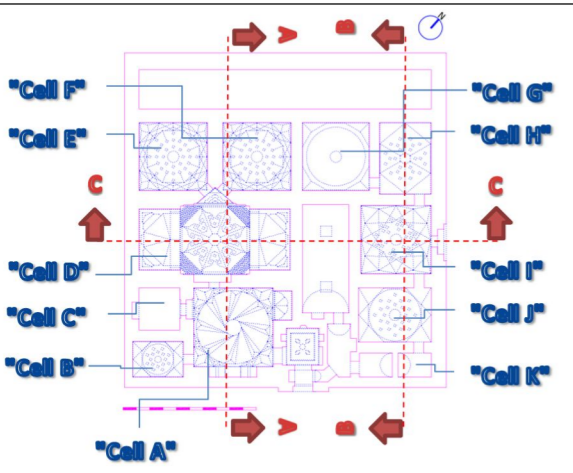
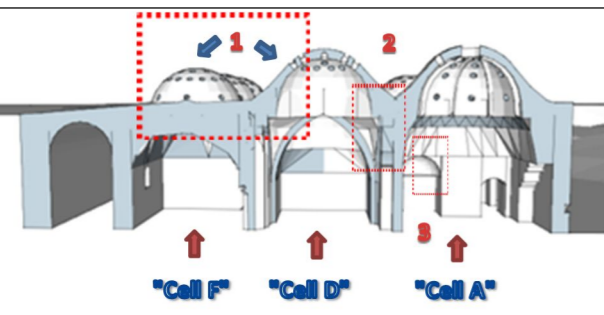
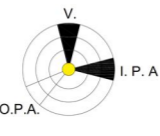

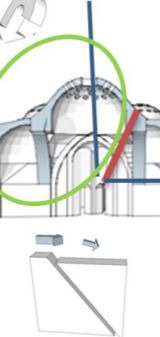
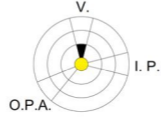

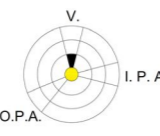

Damage Analysis of "Gazi Mihal Bey Bath"											
Damaged Part Number	Damaged Parts of Case Studies	Quality of Masonry		Construction Characteristics			Cracking and Instability				
				Structural Discontinuities	Degradation of structural elements	Conditions	General Description	Physical Damage	Geometrical Modifications	Loss of verticality	General Description
Cell "E,D,C,B" Elevation		Vertical A B C	Qualitative methods of for evaluation is rated, "B" in vertical, "C" out of plane and "B" in plane actions. In detail cell "E, D, C, B" elevation; squared stones with bricks were used. Leaves of the masonry were good bonded and rows between them were constructed regularly. However there is a deterioration on the elevatoin of the bath.	Fig: All 	Fig: All 	Fig: All 	Between the masonry walls there is a consistency of the structure. Stones and bricks were used on constructing the masonry. Brick layers used as beams on the masonry. Timber tie sockets are present inside of the masonry.	Fig: All 			In figure 1, 2, 3: On the elevaton of the structre, there is a deterioraton of the out layer of the masonry wall. Some parts of the wall were collapsed. The consistency of the brick layer is broken down. In figure 3: The collapsed corner of the masonry is seen. It was probably repaired in the previous consolidation works.
		Out of Plane A B C		Fig: All 	Fig: All 	Fig: All 		Fig: All 			
		In the Plane A B C		Fig: All 							
											

Table 7.38: Damage analysis of “Gazi Mihal Bey” case study bath structure, “Cell K, J, I, H” elevation

Damage Analysis of "Gazi Mihal Bey Bath"											
Damaged Part Number	Damaged Parts of Case Studies	Quality of Masonry		Construction Characteristics			Cracking and Instability				
				Structural Discontinuities	Degradation of structural elements	Conditions	General Description	Physical Damage	Geometrical Modifications	Loss of verticality	General Description
Cell "K,J,I,H" Elevation		Vertical A B C	Qualitative methods of for evaluation is rated, "B" in vertical, "C" out of plane and "B" in plane actions. In detail cell "K, J, I, H" elevation; squared stones with bricks were used. Leaves of the masonry were good bonded and rows between them were constructed regularly. However there is a deterioration and vegetation on the elevatoin of the bath.	Fig: All 	Fig: All 	Fig: All 	Between the masonry walls there is a consistency of the structure. Stones and bricks were used on constructing the masonry. Brick layers used as beams on the masonry. Timber tie sockets are present inside of the masonry.	Fig: All 			In figure 1, 2: There is a deterioration of the elevation. Vegetation is covered whole elevation. The corner of the structure was collapsed.
		Out of Plane A B C		Fig: All 	Fig: All 	Fig: All 					
		In the Plane A B C		Fig: All 							

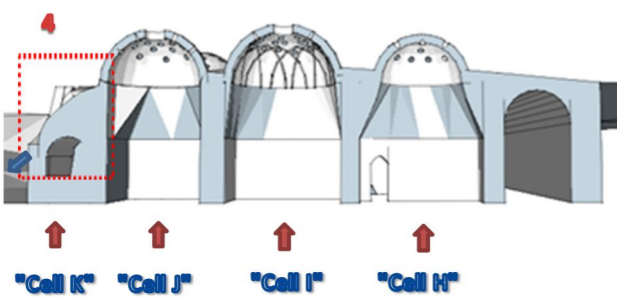
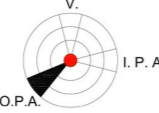

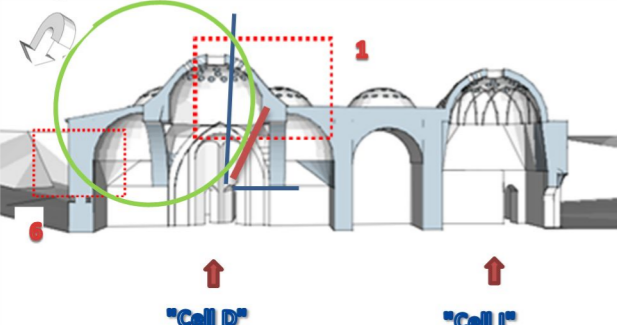
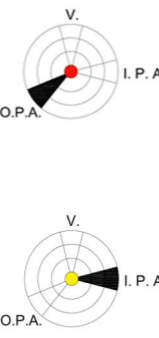
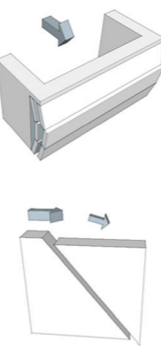
Collapsed analysis of “Gazi Mihal Bey” case study bath structure:

Table 7.39: Collapsed analysis of “Gazi Mihal Bey” case study bath structure, Section A-A

Collapse Analysis of Critical Damaged Parts of "Gazi Mihal Bey" bath						
<p>Plan and sections</p> 		<p>Details</p>				
<p>Section A-A</p> 		<p>Detail 1</p>		<p>Detail 2</p>		
<p>Symbolic Description of Action Analysis</p>		<p>Symbolic Collapse Mechanism</p>	<p>Description of Collapse Analysis</p>	<p>Symbolic Description of Action Analysis</p>	<p>Symbolic Collapse Mechanism</p>	<p>Description of Collapse Analysis</p>
<p>Very high risk of collapse if this element is under vertical and in plane actions.</p> 		 	<p>Detail 1; In this detail, damage is big crack which is started form the door opening arch and continue to two domes. This crack is sperated two masses each other. The collapse mechanism of this arch is similar with the symbolic collapse mechanism. The part of the cracks on the domes are tended to open the perimeter of the base of the dome. However the neighbour of the domes masses are keep the structures stable. Nevertheless in seismic actions these masses are seperated to each other. In this detail vertical and in plane actions are considered for collapse.</p>			<p>Detail 2; On the top of the door opening there is a tiny crack starts from here and continues to the supporting big arch. In that point there is no out of plumb of the structure and the crack is not wide. The possible collapse of the arch is shown in symbolic collapse mechanism.</p>
		<p>Detail 3</p>				
<p>Symbolic Description of Action Analysis</p>		<p>Symbolic Collapse Mechanism</p>	<p>Description of Collapse Analysis</p>			
<p>Low risk of collapse if this element under vertical actions.</p> 			<p>Detail 3; tiny crack is started from the niche of the cell and it continues to the dome. The length of the crack and thickness is not long and wide.</p>			

CHAPTER 7: CASE STUDIES

Table 7.40: Collapsed analysis of "Gazi Mihal Bey" case study bath structure, Section B-B / C-C

Section B-B		Detail 4					
		Symbolic Description of Action Analysis	Symbolic Collapse Mechanism	Description of Collapse Analysis			
		<p>Very high risk of collapse if this element is under out of plane actions.</p> 		<p>Detail 4; Part of the partition masonry wall was collapsed inside of the fireroom. This collapse was not affected the structure stability under the seismic actions. However outside masonry structure which was adjacent to the vault was highly damaged and part of this masonry wall structure was collapsed. This damage could affect the stability of the vault structure under the out of plane actions. Because there was no side supporter structure of the vault. The possible collapse of the vault is shown on the symbolic figure.</p>			
Section C-C		Detail 6					
		Symbolic Description of Action Analysis	Symbolic Collapse Mechanism	Description of Collapse Analysis			
		<p>Very high risk of collapse if this element is under out of plane actions. And for detail 1, in plane actions.</p> 		<p>Detail 6; The critical big crack "detail 1" is affected the "detail 6" under the out of plane actions. Detail 6, was became weak because of the deterioration of the masonry, adhesion between the mortar and the stones and the empty timber tie beam sockets. This wall important for supporting the half dome and the dome masses. As seen on the section C-C, the wall became weak and narrow because of the voids and deteriorations. The assumption of the possible collapse could be activated by collapsing the masonry wall and kinematic chain of collapse continues with the dome masses.</p>			