LOWELL REGIONAL WASTEWATER UTILITY SPECIFICATIONS FOR THE LOWELL MA CONCRETE FLOODWALL REPAIRS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work will occur within the City of Lowell Flood Damage Reduction (FDR) System, which was originally constructed by the U.S. Army Corps of Engineers (USACE) in the 1940s, and is now owned and operated by the City of Lowell. The Lowell Regional Wastewater Utility (LRWWU) manages the maintenance of the City of Lowellôs two floodwalls (Lakeview Floodwall and Rosemont Floodwall). All FDR System repairs shall comply with the requirements of the USACE, under the supervision of the Owner.

B. The Lakeview Floodwall is located in Lowell, MA along the VFW highway between Bridge Street and Aiken Street. The Rosemont Floodwall is located in Lowell, MA on both sides of Beaver Street along the eastern bank of Beaver Brook. (See Appendix A for maps of both the Lakeview Floodwall and Rosemont Floodwall)

C. Access to both floodwalls are also shown in Appendix A. CONTRACTOR must contact LRWWU at least 72 hours prior to being on site. The Rosemont Floodwall may involve entering private property and the CONTRACTOR must not enter private property without a LRWWU Staff member present.

D. A map of the Rosemont Floodwall along with its corresponding numbered joints can be found in Figure 1 of Appendix B. All work that must be done on the Rosemont Floodwall is summarized in Table 1 of Appendix B, followed by pictures of each specified location.

E. A map of the Lakeview Floodwall along with its corresponding numbered joints can be found in Figure 2 of Appendix B. All work that must be done on the Lakeview Floodwall is summarized in Table 2 of Appendix B, followed by pictures of each specified location.

F. The work includes, but is not necessarily limited to, the following (the work is explained in further detail in following sections):

   a. Rosemont Floodwall Repairs

      i. Patching and/or Repair of existing deteriorated and/or spalled concrete surfaces

      ii. Patching and/or Repair of cracked and/or spalled existing concrete joints

      iii. Remove/Replace all flexible joint sealant in all existing concrete joints

iv. Pressure Sealing existing cracked concrete surface

v. Installation of an External Waterstop at Joint No. 31

vi. Coat entire existing concrete surface with a concrete sealer

b. Lakeview Floodwall Repairs

i. Patching and/or Repair of existing deteriorated and/or spalled concrete surfaces

ii. Patching and/or Repair of cracked and/or spalled existing concrete joints

iii. Remove/Replace all flexible joint sealant in all existing concrete joints

iv. Pressure Sealing of existing cracked concrete surface

v. Coat entire existing concrete surface with a concrete sealer.

G. A meeting with the Conservation Commission was held on May 27, 2015 in which it was determined that no Notice of Intent is needed.

H. The CONTRACTOR shall provide all labor, equipment, tools, services, and materials necessary for, or incidental to perform concrete removal and repairs.

I. CONTRACTOR is responsible for proper and off-site disposal of all waste generated by job waste and crew. Waste shall be disposed at the end of each work day, unless explicit permission is granted by LRWWU for alternative storage and disposal.

1.02 QUALITY ASSURANCE

Except as otherwise specified, only visual inspection of plant materials, workmanship, furnished products, and installation is required. Comply with Manufacturersô instructions related to mixing and placing of the materials.

1.03 CONTRACTORôS USE OF PREMISES

A. CONTRACTOR shall limit the use of premises for his/her Work and for storage to allow for:

a. Owner occupancy/use.

b. Recreational use on bike path.

B. Coordinate use of premises with LRWWU Staff.

C. CONTRACTOR shall assume full responsibility for security of all his/her and his/her Subcontractors materials and equipment stored on the site.

D. If directed by the LRWWU Staff, move any stored items which interfere with operations of Owner.

E. Obtain and pay for use of additional storage or work areas if needed to perform the Work.

1.04 OWNER OCCUPANCY

A. Owner will occupy premises during performance of the work for the conduct of his/her normal operations. Coordinate all construction operations with LRWWU Staff to minimize conflict and to facilitate Owner usage.

1.05 REFERENCES

A. Referenced Codes and Standards: Comply with the most recent publications of the following codes, specifications, and standards.

a. USACE Levee Ownerôs Manual for Non-Federal Flood Control Works

b. U.S. Corps of Engineers specification CRD-572

c. U.S. Army Corps of Engineers-Louisville Engineer District-Standard Operating Procedures (SOPs)

d. USACE Waterstops and other performed Joint Materials for Civil Works Structures EM 1110-2-2102

1.06 SUBMITTALS

A. Submittals are required for materials and structures used on the project. Including copies of manufacturerôs product installation instruction and data sheet. All materials and structures must be submitted and approved by LRWWU Staff.

1.07 PRE-BID MEETING

A. Mandatory site visit for bidders prior to submission of bid. Please call Carrie Prescott at (978) 674-1620 for more information.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Polymer-modified Portland Cement Mortar:

a. Mortar will provide a minimum of 2500-psi compressive strength in two hours.

b. For repairs greater than 1 ½ inches deep, must add 3/8-inch clean-washed pea gravel to the mix at an amount determined by the manufacturer so that the aggregates do not result in variations of the physical properties of the mortar. DO NOT use limestone gravel.

c. Trowel grade that can be applied on vertical surfaces.

d. Waterproof and appropriate for outdoor use.

B. Flexible Joint Sealant:

a. Sikaflex-2C NS, or approved equal.

b. Joint Sealant material should be a gunnable or caulkable material meeting the requirements of ASTM C 920, Type S (Single Component) or Type M (Multi Component)

c. Grade NS (a non-sap or gunnable sealant that permits application in joints on vertical surfaces without sagging or slumping when applied at temperatures between 4.4 and 50°C (40 and 122°F)), Class 25, and Use NT (a sealant designed for use in joints located in non-traffic areas).

C. External Waterstop:

a. Shall be PVC type, U.S. Corps of Engineers specification CRD-572.

b. No reclaimed material shall be used in manufacturing of waterstop.

c. Waterstop shall be centerbulb or flat type and placed at the riverside of Joint No. 31 of the Rosemont Floodwall shown in Appendix B.

d. The waterstop shall start 18 inches below grade and shall be terminated 3 inches from the top of the wall.

D. Stainless Steel Plates:

a. Two Stainless Steel Plates shall be bolted to the Concrete Floodwall to hold the External PVC Waterstop in place.

b. Each Stainless Steel Plate will be bolted to the Concrete Wall Segments that are joined together by the Joint No. 31 of the Rosemont Floodwall shown in Appendix B.

c. The plates shall start and terminate the same length and width of the waterstop.

E. Pressure Sealing Crack Injection Epoxy:

a. Two-part, high solids, low-viscosity epoxy that is intended for injection into a crack.

b. Epoxy shall be Crack-Pac as manufactured by Simpson Strong-Tie or approved equal.

c. Prepare crack, mix material and inject in strict accordance with manufacturerôs recommendations.

F. Concrete Sealer:

a. Water or solvent-based acrylic protective coating

b. Light-Gray colored

c. Should contain at least 67% solids by weight and 46% solids by volume

PART 3 - EXECUTION

3.02 CONCRETE REMOVAL

A. Concrete removal shall take place at all deteriorated/spalled concrete surfaces, cracked/spalled concrete joints, and at the riverside of Joint No. 31 of the Rosemont Floodwall where an external waterstop will be constructed. These locations are specified in Appendix B.

B. All surfaces to be patched shall be structurally sound, clean and free of loose debris, oils, vegetation, paints, sealers and all other contaminants

C. Removal work includes the removal of existing concrete surfaces, at a minimum of ¼-inch in depth, at specified areas of the floodwalls.

D. All cut edges should be square with the concrete surfaces, and not feathered.

E. All concrete removal must also be cut to a uniform depth.

F. Special caution must take place when removing existing concrete near joints. There are copper waterstops at approximately halfway through the floodwall at every joint. CONTRACTOR will be responsible for repairing all waterstops that are damaged due to any concrete repair work performed by the CONTRACTOR at no additional expense to LRWWU.

G. Surfaces should be sufficiently rough to ensure a good bond.

H. Any existing reinforcing bars that are exposed should be thoroughly cleaned.

I. If required, existing concrete should be removed to fully expose the reinforcing bar. Sandblasting will be required if there are no other means of cleaning reinforcing bars.

J. Concrete may not be removed by blasting or other methods that may damage adjacent concrete to remain.

K. All concrete removal work shall be done carefully with minimum damage to adjacent work.

L. Use of hand tools or pneumatic hammers weighing less than 30 pounds. Pneumatic hammers shall be worked at an angle of 45 to 60 degrees to the plane of the concrete surface being removed. The surface shall be sounded with a masonry hammer to determine the relative concrete soundness.

M. All existing structures which are to remain and which are adjacent to work to be removed shall be protected by the CONTRACTOR. The CONTRACTOR shall provide all necessary protection to adequately support, safeguard and retain existing structures in their original condition until new construction is completed.

N. CONTRACTOR shall take care not to damage existing reinforcing. Damaged reinforcing shall be repaired by the CONTRACTOR at CONTRACTORôS expense.

3.03 CONCRETE SURFACE/JOINT REPAIR AND PATCHING

A. Remove all concrete as specified in concrete removal.

B. Concrete surface/joint repair/patching areas are listed in Table 1 and Table 2 followed by their corresponding pictures in Appendix B.

C. Remove all concrete, dirt, oil, grease, standing water, debris, plant life, and bond inhibiting materials from the surface. Preparation work shall be done by chipping and waterblasting. Exposed reinforcing steel shall be cleaned by sandblasting.

D. Air blasting shall be used to remove all dust, etc. before placement of patching material, new concrete, crack injection or external waterstop.

E. Preparation and application standards must be according to manufacturerôs specifications.

F. Surfaces should be sufficiently rough to ensure a good bond between new concrete and existing concrete.

G. The cleaned concrete substrate shall be damp but free from standing water (saturated surface dry).

H. Mix patching mortar mechanically or manually in accordance with the manufacturerôs instructions. Mortar shall be thoroughly mixed to a uniform consistency with no lumps.

I. For repairs greater than 1 ½ inches deep, must add 3/8-inch clean-washed pea gravel to the mix at an amount determined by the manufacturer so that the aggregates do not result in variations of the physical properties of the mortar. DO NOT use limestone gravel.

J. Mortar must be scrubbed into substrate filling all pores and voids. New patched surfaces shall be straight, smooth and in same plane as adjacent concrete construction.

K. Construction joint spacing will match the joint spacing of the existing wall.

L. The material should be placed in the prepared area starting from one side of the repair and working to the other side. Work the material firmly into the bottom and sides of the repair.

M. Level the material to the desired elevation and close up edges of the repair with a trowel. Finish the material to match the existing concrete finish.

N. For vertical areas, trowel the material in an upward motion over the repaired area. Successive applications must be troweled against the previously placed material just prior to hardening. Build up the material to the thickness desired. Finish the material to match the existing concrete finish. Remove any material applied or spilled beyond desired areas.

O. Do not use a solvent type curing agent. Cure with water or according to manufacturerôs specifications.

P. If spalled/deteriorated/cracked concrete joints/surfaces extend below grade, repair/patch work must extend below grade to the extent of the work or at most 18 inches below grade.

Q. If more soil needs to come in, soil standards need to be approved by LRWWU Staff.

R. The fill materials shall be compacted to meet or exceed the adjacent undisturbed soil compaction measurements.

3.05 FLEXIBLE JOINT SEALANT APPLICATION

A. Old sealant and all extraneous material must be removed and the substrate cleaned by mechanical means. All joint-wall surfaces must be clean, sound, and frost free.

B. Flexible Joint Sealant must be applied only after new concrete has cured fully to the manufacturerôs curing time.

C. Finished depth of sealant should not exceed ½ inch. Minimum sealant depth is ¼ inch.

D. Place Joint Sealant around the entire joint (riverside, landside, and top). Except on the landside of the Rosemont Floodwall where there is rip rap, only apply joint sealant up to the top of the rip rap, see Picture 41 of Appendix B.

E. Apply Joint Sealant with bulk gun, keeping the nozzle deep in the sealant with a steady flow preceding the nozzle to avoid air entrapment. Avoid overlapping sealant.

F. Tool sealant to ensure full contact with joining-walls and remove air entrapment.

G. Repair all expansion joints, as identified in Appendix B, on both sides of walls, across top of walls, and to a minimum 18 inches below grade.

H. The fill materials shall be compacted to meet or exceed the adjacent undisturbed soil compaction measurements.

3.06 EXTERNAL WATERSTOP INSTALLATION

A. The external waterstop installation shall take place on the riverside of Joint No. 31 of the Rosemont Floodwall, shown in Pictures 49 and 50 of Appendix B.

B. Remove all concrete, dirt, oil, grease, standing water, debris, plant life, and bond inhibiting materials from the surface. Preparation work shall be done by chipping and waterblasting. Exposed reinforcing steel shall be cleaned by sandblasting.

C. 9 inch Centerbulb or Flat type PVC waterstop shall start 18 inches below grade and be continuous for the full height of joint. Waterstop shall stop 3 inches from top of the wall.

D. The two stainless steel plates shall start and terminate the same length and width of the waterstop.

E. The two concrete wall segments are joined together at a 90 degree angle at Joint No. 31.

F. The two stainless steel plates shall be bolted to the existing concrete wall segments to hold the waterstop in place.

G. See Figures 5 and 6 of Appendix C for example pictures of an external waterstop. These Figures are to be used as references only and exact lengths may be different. Please provide detailed drawings of the external waterstop to be installed.

3.07 PRESSURE SEALING CRACKS

A. LRWWU Staff will delineate cracks to be repaired by Crack Injection. Locations of these cracks are shown in Appendix B.

B. Remove all concrete, dirt, oil, grease, standing water, debris, plant life, and bond inhibiting materials from the surface. Preparation work shall be done by waterblasting or airblasting.

C. CONTRACTOR shall fully expose crack. If the crack is found to extend below grade, the CONTRACTOR shall fully inject the crack below grade as well.

D. Cracks designated by the LRWWU Staff to receive injection repairs shall be prepared and injected in accordance with manufacturerôs procedures.

E. The CONTRACTOR shall sound cracks prior to repair. If concrete is unsound it shall be removed and repaired as concrete surface repair and no payment will be made for Pressure Sealing Crack in those limits.

F. Injection of epoxy shall begin at the lowest injection port and shall be pumped until the epoxy reaches the next higher port. This process shall be repeated until the full length of the crack is pressure sealed. After the entire crack has been pressure sealed, injection port fittings shall be removed and the resulting holes filled with epoxy. The face of the crack shall be finished flush with concrete.

3.08 CONCRETE SEALER APPLICATION

A. All surfaces shall be structurally sound, clean and free of loose debris, oils, vegetation, paints, sealers, and all other contaminants.

B. Concrete sealer shall be applied to all surfaces of both the Rosemont and Lakeview Floodwalls. Sealer application will stop at the surface of the soil and will not be applied to the rip rap on the landside of the Rosemont Floodwall.

C. Preparation and application shall be in accordance with manufacturerôs procedures.

3.09 DAMAGE

A. Extreme caution shall be used when working on or near the flood levees and floodwalls. CONTRACTOR shall not damage the levees or floodwalls as a result of this project.

B. Any disturbance to the flood levees shall be repaired immediately.

C. All damage to existing concrete work caused by the CONTRACTORôs operations shall be satisfactorily repaired by the CONTRACTOR at no cost to the Owner. All repairs shall be performed carefully and as specified in this specification.

END OF SECTION

BID FORM

Scope of Work	Estimated Quantity	Unit Bid Price in Figures	Total Amount in Figures
Remove/Replace Flexible Sealant	764 linear feet	$_____ per linear feet	$_____
Repair/Patch Spalled/Cracked Joints	94 square feet	$_____ per square feet	$_____
Repair/Patch Deteriorated/Spalled Concrete Surfaces	290 square feet	$_____ per square feet	$_____
Pressure Sealing Existing Cracked Concrete Surfaces	43 linear feet	$_____ per linear feet	$_____
External Waterstop Installation	7 linear feet	$_____ per linear feet	$_____

BASE BID SUBTOTAL IN FIGURES $_____

BASE BID SUBTOTAL IN WORDS $_____

ALTERNATE BID

Scope of Work	Estimated Quantity	Unit Bid Price in Figures	Total Amount in Figures
Concrete Sealer Application	18,875 square feet	$_____ per square feet	$_____

ALTERNATE BID SUBTOTAL IN FIGURES $_____

ALTERNATE BID SUBTOTAL IN WORDS $_____

BID TOTAL IN FIGURES (BASE BID SUBTOTAL + ALTERNATE BID SUBTOTAL) $_____

BID TOTAL IN WORDS (BASE BID SUBTOTAL + ALTERNATE BID SUBTOTAL) $_____

APPENDIX A

City of Lowell
Massachusetts

Figure 1:
Rosemont Floodwall
and
Access Locations

★ **Floodwall Access Loations**

Rosemont Floodwall Approximate Boundaries

Roads

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1 inch = 30 feet

Date: 3/5/2015

City of Lowell
Massachusetts

Figure 2:
Lakeview Floodwall
and
Access Locations

Lakeview Floodwall Approximate Boundaries

Floodwall Access Location

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1 inch = 123 feet

Date: 3/5/2015

APPENDIX B

City of Lowell
Massachusetts

Figure 3:
Rosemont Floodwall
Approximate
Joint Locations
and
Numbering References

Roads

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Date: 4/1/2015

Table 1: Rosemont Floodwall Summary of Work

Location	Scope of Work*	Approximate Length of Work (feet)	Approximate Area of Work (feet^2)	Picture No.
Joint 1	1	11		1
Segment Between Joint 1 and Joint 2	3		1 (1 hole)	2
Joint 2	1	13		3
Segment Between Joint 2 and Joint 3	3		1	4
Joint 3	1	13		5
	2		1	
Segment Between Joint 3 and Joint 4	3		1	6
Joint 4	1	13		7
Joint 5	1	13		8
	2		2	
Joint 6	1	13		9
	2		6	
Joint 7	1	13		10
Joint 8	1	13		11
Segment Between Joint 8 and Joint 9	3		60	12
Joint 9	1	13		13
Segment Between Joint 9 and Joint 10	3		60	14
Joint 10	1	13		15
	2		4	
Segment Between Joint 10 and Joint 11	3		3 (10 holes)	16
Joint 11	1	13		17
Segment Between Joint 11 and Joint 12	3		92 (Spalling and 6 holes)	18
Joint 12	1	14		19
	2		2	
Segment Between Joint 12 and Joint 13	3		1 (4 holes)	20
Joint 13	1	14		21
	2		3	
Segment Between Joint 13 and Joint 14	3		30	22
Joint 14	1	14		23
Joint 15	1	14		24
	2		1	
Joint 16	1	14		25
Joint 17	1	14		26
Segment Between Joint 17 and Joint 18	3		1 (1 hole)	27
Joint 18	1	13		28
Segment Between Joint 18 and Joint 19	3		1 (1 hole)	29
Joint 19	1	13		30
	2		2	
Joint 20	1	12		31
	2		1	
Joint 21	1	13		32
	2		1	
	3		2	
Joint 22	1	13		33
Joint 23	1	12		34
	3		2	
Joint 24	1	12		35
Joint 25	1	12		36
	2		6	
Joint 26	1	10		37
	2		4	
	3		2	
Segment Between Joint 26 and Joint 27	5	30		38
Joint 27	1	9		39
Joint 28	1	8		40
	3		2	
Joint 29	1	15		42, 43
Segment Between Joint 29 and Joint 30	3		1	44
Joint 30	**3		15	45, 46
	***5	4		
Segment Between Joint 30 and Joint 31	3		2	47, 48
	5	2		
Joint 31	1	11		49, 50, 51
	**2		3	
	4	7		

Scope of Work*	Total Approximate Length (feet)	Total Approximate Area (feet^2)
1	378	
2		36
3		277
4	7	
5	36	

*1=Replace Flexible Sealant Along Entire Length of the Joint (Riverside, Landside, and Top)
2=Repair/Patch Spalled/Cracked Joints
3=Repair/Patch Deteriorated/Spalled Concrete Surfaces
4=External Waterstop Installation
5=Cracked Concrete Surface
**Needs Repairs on Both the Riverside and Landside of the Floodwall
***Needs Repairs on Just the Landside of the Floodwall

Picture 1 - Joint 1 Riverside of Rosemont Floodwall

Picture 2 - Between Joints 1 and 2 Riverside of Rosemont Floodwall

Picture 3 - Joint 2 Riverside of Rosemont Floodwall

Picture 4 - Between Joints 2 and 3 Riverside of Rosemont Floodwall

Picture 5 - Joint 3 Riverside of Rosemont Floodwall

Picture 6 – Between Joints 3 and 4 Riverside of Rosemont Floodwall

Picture 7 - Joint 4 Riverside of Rosemont Floodwall

Picture 8 - Joint 5 Riverside of Rosemont Floodwall

Picture 9 - Joint 6 Riverside of Rosemont Floodwall

Picture 10 - Joint 7 Riverside of Rosemont Floodwall

Picture 11 - Joint 8 Riverside of Rosemont Floodwall

Picture 12 - Between Joints 8 and 9 Riverside of Rosemont Floodwall

Picture 13 - Joint 9 Riverside of Rosemont Floodwall

Picture 14 - Between Joints 9 and 10 Riverside of Rosemont Floodwall

Picture 15 - Joint 10 Riverside of Rosemont Floodwall

Picture 16 - Between Joints 10 and 11 Riverside of Rosemont Floodwall

Picture 17 - Joint 11 Riverside of Rosemont Floodwall

Picture 18 - Between Joints 11 and 12 Riverside of Rosemont Floodwall

Picture 19 - Joint 12 Riverside of Rosemont Floodwall

Picture 20 - Between Joints 12 and 13 Riverside of Rosemont Floodwall

Picture 21 - Joint 13 Riverside of Rosemont Floodwall

Picture 22 - Between Joints 13 and 14 Riverside of Rosemont Floodwall

Picture 23 - Joint 14 Riverside of Rosemont Floodwall

Picture 24 - Joint 15 Riverside of Rosemont Floodwall

Picture 25 - Joint 16 Riverside of Rosemont Floodwall

Picture 26 - Joint 17 Riverside of Rosemont Floodwall

Picture 27 - Between Joints 17 and 18 Riverside of Rosemont Floodwall

Picture 28 - Joint 18 Riverside of Rosemont Floodwall

Picture 29 - Between Joints 18 and 19 Riverside of Rosemont Floodwall

Picture 30 - Joint 19 Riverside of Rosemont Floodwall

Picture 31 - Joint 20 Riverside of Rosemont Floodwall

Picture 32 - Joint 21 Riverside of Rosemont Floodwall

Picture 33 - Joint 22 Riverside of Rosemont Floodwall

Picture 34 - Joint 23 Riverside of Rosemont Floodwall

Picture 35 - Joint 24 Riverside of Rosemont Floodwall

Picture 36 - Joint 25 Riverside of Rosemont Floodwall

Picture 37 - Joint 26 Riverside of Rosemont Floodwall

Picture 38 - Between Joints 26 and 27 Riverside of Rosemont Floodwall

Picture 39 - Joint 27 Riverside of Rosemont Floodwall

Picture 40 - Joint 28 Riverside of Rosemont Floodwall

Picture 41 – Example of Joints Located on the Landside of Northern Part of Rosemont Floodwall

Picture 42 - Joint 29 Riverside of Rosemont Floodwall

Picture 43 - Joint 29 Landside of Rosemont Floodwall

Picture 44 – Between Joints 29 and 30 Riverside of Rosemont Floodwall

Picture 45 - Joint 30 Riverside of Rosemont Floodwall

Picture 46 – Joint 30 Landside of Rosemont Floodwall

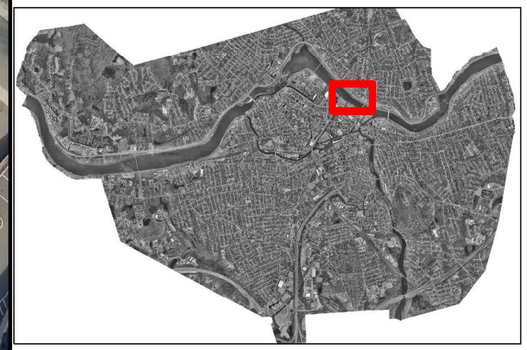
Picture 47 - Between Joints 30 and 31 Riverside of Rosemont Floodwall

Picture 48 – Between Joints 30 and 31 Riverside of Rosemont Floodwall

Picture 49 - Joint 31 Riverside of Rosemont Floodwall

Picture 50 - Joint 31 Riverside of Rosemont Floodwall

Picture 51 - Joint 31 Landside of Rosemont Floodwall



City of Lowell
Massachusetts

Figure 4:
Lakeview Floodwall
Approximate
Joint Locations
and
Numbering References

Roads

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Date: 4/1/2015

Table 2: Lakeview Floodwall Summary of Work

Location	Scope of Work*	Approximate Length of Work (feet)	Approximate Area of Work (feet^2)	Picture No.
Joint 1	1	14		52
Joint 2	1	14		53
	2		3	
Joint 3	1	14		54
	2		4	
Joint 4	1	15		55
	2		9	
Joint 5	1	15		56
	2		1	
Joint 6	1	15		57
	2		2	
Joint 7	1	16		58
	2		12	
Joint 8	1	15		59
	2		9	
Segment Between Joint 8 and Joint 9	3		1	60
Joint 9	1	13		61
Joint 10	1	14		62
Joint 11	1	13		63
	2		8	
Joint 12	1	14		64
Joint 13	1	14		65
	2		4	
Joint 14	1	14		66
Segment Between Joint 14 and Joint 15	3		1	67
Joint 15	1	13		68
	2		1	
Joint 16	1	13		69
Joint 17	1	14		70
Joint 18	1	16		71
Joint 19	1	14		72
Joint 20	1	15		73
Segment Between Joint 20 and Joint 21	3		1 (3 holes)	74
Joint 21	1	14		75
Joint 22	1	13		76
Segment Between Joint 22 and Joint 23	3		3	77
Joint 23	1	12		78
Joint 24	1	13		79
Joint 25	1	13		80, 81
	**2		4	
Joint 26	1	14		82
Segment Between Joint 26 and Joint 27	5	3		83
Joint 27	1	12		84
Joint 28	1	10		85
	2		1	
Segment Between Joint 28 and End	3		5 (Spalling and 2 holes)	86, 87
	5	4		
End Of Floodwall After Joint 28	3		2	88

Scope of Work*	Total Approximate Length (feet)	Total Approximate Area (feet^2)
1	386	
2		58
3		13
4	0	
5	7	

*1=Replace Flexible Sealant Along Entire Length of the Joint (Riverside, Landside, and Top)
2=Repair/Patch Spalled/Cracked Joints
3=Repair/Patch Deteriorated/Spalled Concrete Surfaces
4=External Waterstop Installation
5=Cracked Concrete Surface
**Needs Repairs of Both the Riverside and Landside of the Floodwall

Picture 52 - Joint 1 Riverside of Lakeview Floodwall

Picture 53 - Joint 2 Riverside of Lakeview Floodwall

Picture 54 - Joint 3 Riverside of Lakeview Floodwall

Picture 55 - Joint 4 Riverside of Lakeview Floodwall

Picture 56 - Joint 5 Riverside of Lakeview Floodwall

Picture 57 - Joint 6 Riverside of Lakeview Floodwall

Picture 58 - Joint 7 Riverside of Lakeview Floodwall

Picture 59 - Joint 8 Riverside of Lakeview Floodwall

Picture 60 – Between Joints 8 and 9 Riverside of Lakeview Floodwall

Picture 61 - Joint 9 Riverside of Lakeview Floodwall

Picture 62 - Joint 10 Riverside of Lakeview Floodwall

Picture 63 - Joint 11 Riverside of Lakeview Floodwall

Picture 64 - Joint 12 Riverside of Lakeview Floodwall

Picture 65 - Joint 13 Riverside of Lakeview Floodwall

Picture 66 - Joints 14 Riverside of Lakeview Floodwall

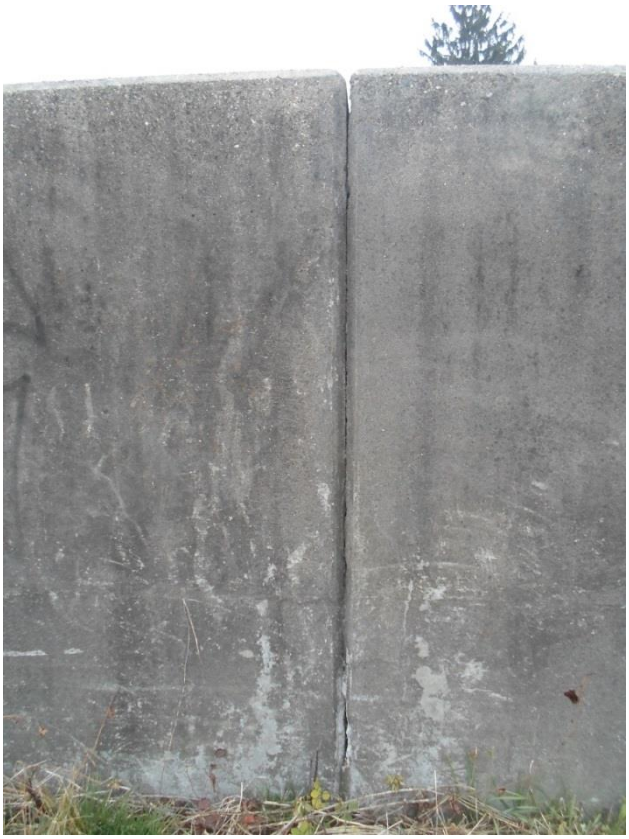
Picture 67 - Between Joints 14 and 15 Riverside of Lakeview Floodwall

Picture 68 - Joint 15 Riverside of Lakeview Floodwall

Picture 69 - Joint 16 Riverside of Lakeview Floodwall

Picture 70 - Joint 17 Riverside of Lakeview Floodwall

Picture 71 - Joint 18 Riverside of Lakeview Floodwall



Picture 72 - Joint 19 Riverside of Lakeview Floodwall

Picture 73 - Joint 20 Riverside of Lakeview Floodwall

Picture 74 - Between Joints 20 and 21 Riverside of Lakeview Floodwall

Picture 75 - Joint 21 Riverside of Lakeview Floodwall

Picture 76 - Joint 22 Riverside of Lakeview Floodwall

Picture 77 - Between Joints 22 and 23 Riverside of Lakeview Floodwall

Picture 78 - Joint 23 Riverside of Lakeview Floodwall

Picture 79 - Joint 24 Riverside of Lakeview Floodwall

Picture 80 - Joint 25 Riverside of Lakeview Floodwall

Picture 81 - Joint 25 Landside of Lakeview Floodwall

Picture 82 - Joint 26 Riverside of Lakeview Floodwall

Picture 83 – Between Joints 26 and 27 Riverside of Lakeview Floodwall

Picture 84 - Joint 27 Riverside of Lakeview Floodwall

Picture 85 - Joints 28 Riverside of Lakeview Floodwall

Picture 86 - Between Joint 28 and Riverside End of Lakeview Floodwall

Picture 87 – Between Joint 28 and Riverside End of Lakeview Floodwall

Picture 88 – Riverside End of Lakeview Floodwall

Picture 89 - Example of Joints Located on the Landside of Lakeview Floodwall

APPENDIX C

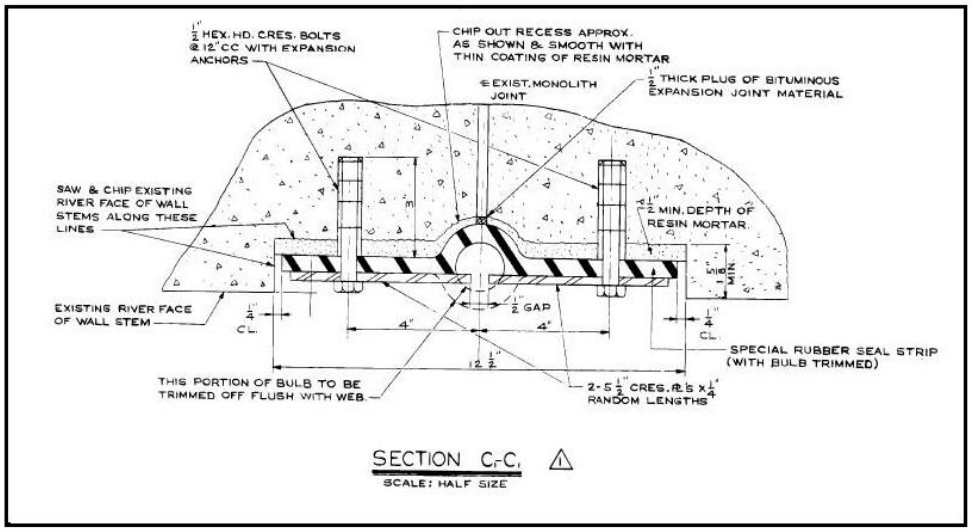


Figure 5: Example of an External Waterstop

Figure 6: Example of an External Waterstop