

MEMORANDUM THRU

CELRC-TS-DT
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FOR RECORD

SUBJECT: Little Calumet River - Inspection of I-Walls

1. As a result of recent findings prepared by the Interagency Performance Evaluation Task Force (IPET) regarding the performance of I-walls in New Orleans, Lieutenant General Carl Strock issued a directive to all districts in a letter dated 23 May 2006. This directive, in part, requires each district to conduct a visual inspection of all I-walls in their jurisdiction by “team(s) of engineers, experienced and professionally registered in the disciplines of geotechnical and structural engineering.” Teams are to take particular note for the following deficiencies: movement of wall sections as evidenced by tilting, separation, damage, vertical crack formation on the flood side of the I-wall along the interface with the foundation soils, or a manifestation of movement in the adjacent embankment and foundation materials; encroachments in the flood protection system; the condition of transition points in the protection system (i.e., levee to floodwall); evidence of overtopping or scour; and undesirable vegetative growth within the area of influence for the structure.

2. On 31 August 2006 a team of Chicago District personnel performed an inspection of the subject I-walls between Cline Avenue and Georgia Street. Participating in the inspection were:

John Fornek, P.E., Geotechnical Engineer
Jan Plachta, P.E., Structural Engineer
Andrew Montez, Surveyor

3. Overall the walls and their ancillary features are in good condition. None of the walls exhibited movement as evidenced by tilting or separation on flood side of the I-wall along the interface with the foundation soils, or a manifestation of movement in the adjacent embankment and foundation materials. There were numerous vertical and diagonal concrete cracks that will need to be evaluated and repaired. Some joints will need to be cleaned out and refilled with expansion or joint sealant. Many of the concrete walls exhibited staining from rust. These are thought to be the result of ties or nails used for the form liners during construction and not insufficient cover over reinforcing steel. A few locations could not be rigorously inspected due to standing water, high vegetation (grasses), or precarious footing. These specific areas will be identified later in this report. Numerous gatewells were blocked open with debris. Attached with this report is a project map showing floodwall locations based on GPS coordinates and a table identifying each wall location and providing basic dimensions.

North Side of the River

4. Location 1, approximately 1000 feet west of Colfax at the WIND radio transmitter. This is a steel sheet pile wall in good condition. There are some scrub trees beginning to grow along the landside of the wall (Photo 1). These need to be removed to comply with Corps regulations.
5. Location 2, east of Colfax along NS railroad. This is a steel sheet pile wall in good condition (Photo2). There are some seedlings and scrub brush beginning to grow along the riverside of the wall. These should be removed. The riverside of this wall is difficult to access and could not be inspected for its entire length. Aside from the brush, river water was virtually up to the wall. Limited access was gained by walking along a narrow ledge of riprap. This wall needs to be inspected either during low river levels or from a canoe. Near the bend in the wall alignment four (4) bolts are missing from a bolted connection about three (3) feet from the top of the wall (Photo 3).
6. Location 3, west of Burr Street along the Norfolk and Southern railroad tracks. This wall transitions from concrete I-wall to steel sheet piling where it passes under the tracks and then back to concrete I-wall (Photo 4). The joints in this wall appear newly caulked and look very good. This location, however, has a few young trees near the railroad that should be removed and cracking in the fractured fin finish (Photo 5). Lifting holes are still visible in the steel sheets near the railroad (Photo 6). There is a crack in the concrete at the concrete/steel transition south of the racks (Photo 7). This crack will need to be evaluated and repaired. The crack could be caused by vibrations caused by the passing trains or due to a difference in rigidity between the steel and concrete section. This wall exhibits also some of the rust staining previously mentioned found on many of the concrete walls (Photo 8).
7. Location 4, east of Burr Street at retention pond. This is a 12-foot high concrete T-wall, the only T-wall constructed in the east reach of the Little Calumet project (Photo 9). T-walls are not specifically addressed in the HQ directive. The base of this wall is founded approximately 14.5 feet below existing grade and extends 7.5 feet riverward from the longitudinal centerline of the wall. This wall has a vertical crack that does not appear to coincide with a designed contraction joint (Photo 10). This crack should be repaired if it is determined that it does not contain a waterstop. Photo 9 also shows trees planted under a recent landscaping contract only 8 feet from the riverside of the wall. Corps regulations require that no vegetation be planted 12 feet from the face of the wall or, in the case of a T-wall, 8 feet from the toe or heel. These trees need to be relocated more than 15 feet from the wall face.
8. Location 5, Chase Street closure structure. This is a concrete I-wall. A small gap was observed in a previously caulked joint (Photo 11), but this wall is in overall good condition.

9. Location 6, west of Grant Street. This concrete I-wall was partially inaccessible due to water in the drainage ditch. This wall has a gap at an expansion joint (Photo 12). Expansion material appears in-place. This location should be watched during high water to insure that the waterstop is intact. Caulking may help protect the joint. Some spalling of the concrete was observed adjacent to the catwalk to the sluice gate controls (Photo 13).
10. Location 7, east of Grant Street. The riverside of this wall was greatly obscured by high grass (Photo 14). The wall was in good alignment and no gaps could be seen from the top. This wall may be better inspected during the winter.
11. Location 8, utility crossing west of Broadway. This concrete wall is in overall good condition. A small hairline crack was noticed at the top near the west end of the wall (Photo 15).
12. Location 9, west of Broadway at I-80 ramp. This concrete wall is relatively new and was constructed for the Corps by InDOT as part of the Broadway Avenue ramp reconstruction. Slight soil subsidence was observed adjacent to the wall most likely from poor compaction.


South Side of the River

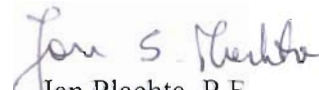
13. Location 10, west of Georgia Street. This concrete I-wall is also in good condition. A diagonal crack was noted on the landward side of the wall (Photo 16). This crack will need to be evaluated and repaired to prevent a larger problem in the future.
14. Location 11, west of Broadway. This concrete I-wall appears to be in good condition. It is inaccessible from the land side due to high grass similar to that shown in photo 14, but the riverside has a clear space 12 to 15 feet wide providing complete access to the wall. Scrub trees 1"-2" in diameter have been removed previously from the riverside of the wall. There are no signs of tilting or gaps on the riverside.
15. Location 12, east of Broadway. This concrete I-wall is not more than 6-feet high and is technically not part of the HQ directive. This wall has some caulk missing from the expansion joints (Photo 17).
16. Location 13, Harrison Street at 32nd Street extended. This concrete I-wall is in good condition. There are no signs of movement. There is a wide clear space on the riverside of the wall for inspection.
17. Location 14, east of Grant Street. There are no signs of tilting or gaps in this concrete I-wall, however all joints exhibit some cracking both riverside and landside (Photos 18-22). These cracks will need to be repaired. The north-south leg of this wall was constructed by InDOT as part of the Grant Street interchange construction. As-builts are not shown on Corps documents.

18. Location 15, west of Grant Street. This concrete I-wall shows cracking and signs of potential spalling on the landside (Photos 23 and 24). These are large cracks that have growth potential and will need to be evaluated and repaired as necessary. The north-south leg of this wall was constructed by InDOT as part of the Grant Street interchange construction. As-builts are not shown on Corps documents.

19. Location 16, 35th Street between Chase and Grant. This concrete I-wall was partially inaccessible due to water in the ditch (Photo 25). Some re-caulking is needed near the gatewell, but overall the wall is in good condition with no tilting or gaps. This is one wall that is constructed on box piles as opposed to single sheets.

20. Location 17, 35th and Chase Street closure structure. This wall is partially inaccessible due to water in the ditch. There is a small gap at the joint on the south side of the street (Photo 26).


John Fornek, P.E.
Geotechnical Engineer


Jan Plachta, P.E.
Structural Engineer

Floodwall Summary Sheet

Location Number	Location Description	Wall Type	Construction Material	Length (ft)	Maximum Height (ft)	Levee Segment	Station from	Station to
1	West of Colfax at WIND transmitter		Steel sheet	190	9.4	Stage IV-1S	26+00	27+90
2	East of Colfax along railroad		Steel sheet	1145	13.2	Stage IV-1S	38+10	49+55
3	West of Burr at railroad		Steel/concrete	180	11.3	Stage IV-1S	61+90	64+40
4	East of Burr at the retention pond		Concrete	170	12.0	Stage IV-2A	4N 0+43	4N 2+13
5	Chase Street closure		Concrete	160	12.0	Stage III N	6N 0+40	6N 1+20
6	West of Grant		Concrete	110	14.0	Stage III N	6N 61+60	6N 62+70
7	East of Grant		Concrete	40	13.3	Stage II-2	8N 1+52	8N 1+92
8	West of Broadway utility crossing		Concrete	55	8.2	Stage II-2	N/A	N/A
9	West of Broadway at I-80 ramp		Concrete	30	7.5	InDOT	N/A	N/A
10	West of Georgia Street		Concrete	55	10.7	Stage II-3B	13S 25+35	13S 25+90
11	West of Broadway		Concrete	150	11.0	Stage II-3B	11S 29+50	11S 31+00
12	East of Broadway		Concrete	180	6.0	N/A	13S 0+40	13S 2+20
13	Harrison at 32nd Street		Concrete	155	13.6	Stage II-3B	11S 5+90	11S 7+75
14	West of Grant		Concrete	95	15.3	Stage III S	7S 95+10	7S 96+50
15	East of Grant		Concrete	175	16.1	Stage II-3C2	9S 1+50	9S 3+25
16	North of 35th between Chase and Grant		Concrete	135	17.1	Stage III S	7S 46+4	7S 47+80
17	35th Street at Chase		Concrete	50	11.3	Stage III S	7S 11+60	7S 12+10



Photo 1. Scrub trees adjacent to wall west of Colfax north of river by WIND radio.



Photo 4. Floodwall west of Burr Street at NS railroad.



Photo 2. Landward side of wall east of Colfax Ave and north of river.



Photo 5. Cracking of the fractured fin finish (landside).

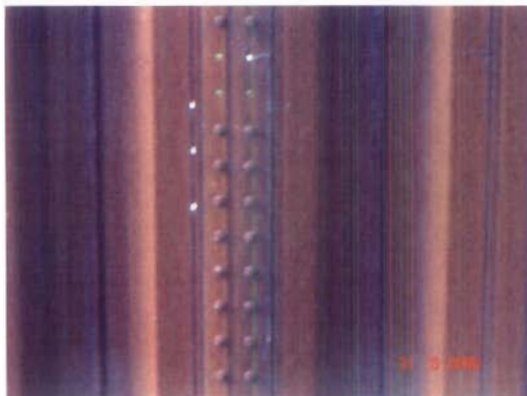


Photo 3. Missing bolts at connection east of Colfax Ave. and north of river.



Photo 6. Lifting holes at top of steel sheets west of Burr Street at NS railroad.



Photo 9. Concrete T-wall east of Burr Street.



Photo 7. Hairline cracking at concrete to steel transition west of Burr south of RR.



Photo 8. Typical rust staining on concrete.

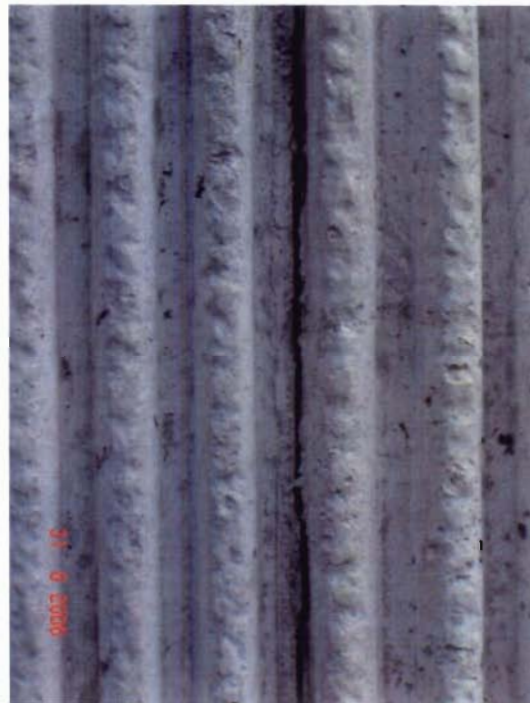


Photo 10. Vertical crack in T-wall at Burr Street.

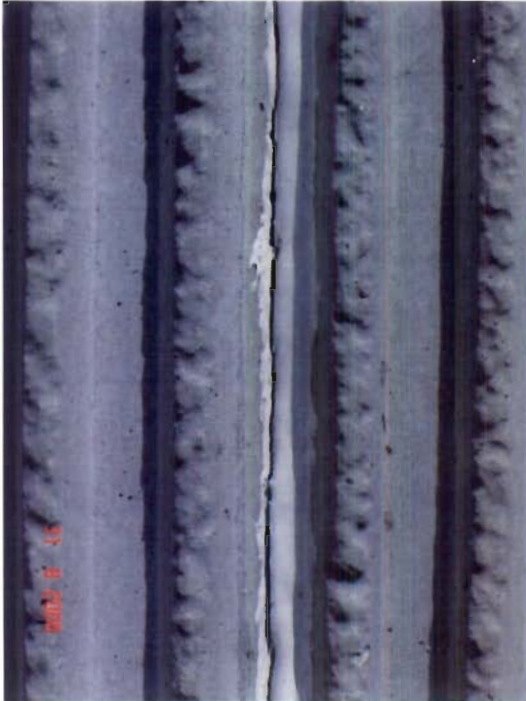


Photo 11. Caulked joint at Chase Street



Photo 14. High grass obstruction east of Grant and north of river.



Photo 12. Opening at control joint west of Grant Street and north of river.



Photo 15. Hairline crack at utility crossing west of Broadway.



Photo 13. Spalling adjacent to catwalk .



Photo 16. Hairline crack on landward side at Georgia Street south of river.



Photo 17. Missing caulk south of river and east of Broadway.



Photo 20. Hairline joint cracks east of Grant and south of river landside.



Photo 18. Hairline joint cracks east of Grant and south of river riverside.



Photo 21. Hairline joint cracks east of Grant and south of river landside.



Photo 19. Hairline joint cracks east of Grant and south of river riverside.



Photo 22. Hairline joint cracks east of Grant and south of river landside.



Photo 23. Cracking west of Grant and south of river landside.



Photo 25. Inaccessibility along 35th Street between Chase and Grant.

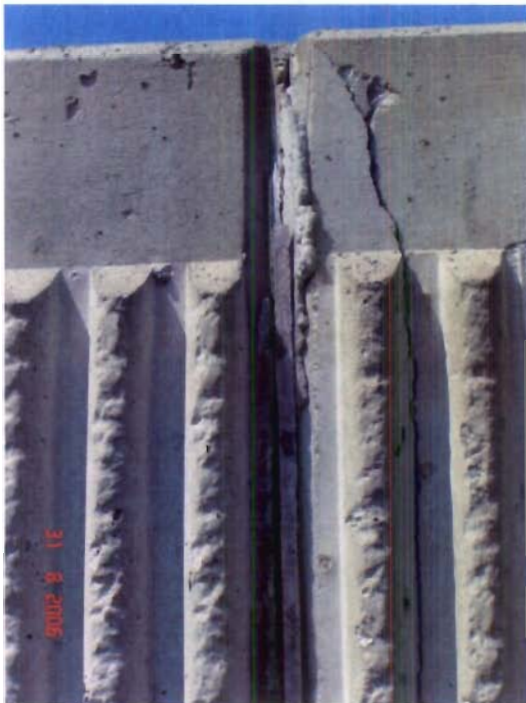


Photo 24. Cracking west of Grant and south of river landside.



Photo 26. Gap at joint in closure structure at 35th and Chase Street.

**U.S. Army Corps of Engineers
Inspection Guide for Flood Control Works**

Name of Project: LITTLE CALUMET RIVER I-WALLS
 Date Inspected: AUG. 31, 2006
 Public Sponsor: _____
 Sponsor Phone/ Email: _____
 Corps of Engineers Inspector: JOHN FORENEK, JAN RACHITA
 Public Sponsor Representative: _____

Type of Inspection (Check One): Initial Continuing
 Overall Project Rating (Check One): Acceptable Minimally Acceptable (Maintenance is required) Unacceptable

INSPECTOR'S OBSERVATIONS:

- Contents of this Inspection Report:**
- Basic Eligibility (IEI specific)
 - FCW Engineering (IEI specific)
 - General Items for All Flood Control Works
 - Levees
 - Concrete Floodwalls
 - Interior Drainage System
 - Pump Stations
 - Earthen Flood Control Channels
 - Concrete Lined Channels
 - Instructions

Note: A plan view drawing of the Flood Control Works, with stationing, should be attached to this report to reference locations of items rated less than acceptable. Photos should be taken of general project condition and any noted deficiencies.

Concrete Floodwalls For use during all Initial and Continuing Eligibility Inspections of concrete floodwalls

RATED ITEM	A	M	U	N/A	EVALUATION	LOCATIONS/REMARKS/RECOMMENDATIONS
1. Concrete Surfaces					A Negligible spalling, scaling or cracking. If the concrete surface is weathered, rough to the touch, or holds moisture, it is still satisfactory but should be seal coated to prevent freeze/thaw damage.	
		X			M Spalling, scaling, and open cracking present, but the immediate integrity or performance of the structure is not threatened. Reinforcing steel may be exposed. Repairs/sealing is necessary to prevent additional damage during periods of thawing and freezing.	
					U Surface deterioration or deep, controlled cracks present that result in an unreliable structure.	
2. Tilting, Sliding or Settlement of Concrete and Sheet Pile Structures		X			A There are no significant areas of tilting, sliding, or settlement that would endanger the integrity of the project.	
					M There are areas of tilting, sliding, or settlement (either active or inactive) that need to be repaired. The integrity of the structure is not in danger.	
					U There are areas of tilting, sliding, or settlement (either active or inactive) that threaten the structure's integrity and performance.	
3. Foundation of Concrete and Sheet Pile Structures		X			A No scouring / erosion, or undermining near the structure.	
					M Scouring / erosion near the footing of the structure but not close enough to affect structure stability during the next flood.	
					U Scouring or undermining at the foundation that has affected structural integrity.	
4. Monolith Joints					A The monolith joint material is in good condition.	
			X		M The monolith joint material is deteriorating and needs to be repaired or replaced to prevent spalling and cracking during freeze/thaw cycles.	
					U The monolith joint material is severely deteriorated and the concrete has spalled and cracked, damaging the waterstop to the point where it will not provide the intended level of protection during a flood.	
5. Erosion/ Bank Caving		X			N/A There are no monolith joints in the floodwall.	
					A No active erosion or bank caving on the riverward side of the floodwall which might endanger its stability.	
					M There are areas where the ground is eroding towards the base of the floodwall and efforts need to be taken to slow and repair this erosion, but the erosion has not yet progressed to the point that the floodwall will lose stability during a flood event.	
				U Erosion or bank caving is occurring or has occurred riverward of the levee which threatens the stability of the floodwall.		

Key: A = Acceptable; M = Minimally Acceptable; Maintenance is required; U = Unacceptable; N/A = Not Applicable; RODI = Requires Operation During Inspection

Concrete Floodwalls (continued) For use during all Initial and Continuing Eligibility Inspections of concrete floodwalls

RATED ITEM		A	M	U	N/A	EVALUATION	LOCATIONS/REMARKS/RECOMMENDATIONS
6. Unwanted Vegetation Growth	A					A A grass-only zone is maintained on both sides the floodwall. All trees, brush, and unwanted vegetation have been removed from this zone for maintenance, flood-fighting activities, and to protect the floodwall. The grass-only zone extends from the concrete wall to a point 2.5 meters (8') beyond the underground toe and heel of the floodwall. Reference EM 1110-2-30 and/or local Corps policy.	
	M		X			M There are some areas where unwanted vegetation is growing near the floodwall. This vegetation must be removed, but does not currently threaten the integrity of the project.	
	U					U There is a significant amount of tree, weed, or brush growth near the floodwall, which may limit access during flood fight operations or the roots of which may offer accelerated seepage paths under the structure.	
7. Encroachments	A	X				A No trash, debris, excavations, structures, or other obstructions present within the project easement area. Encroachments which do not diminish proper functioning of the project have been previously approved by the Corps.	DEBRIS IN FLAP GATES IS NOT AN ENCROACHMENT ISSUE AND HAS BEEN ADDRESSED IN THE PREVIOUS ICW.
	M					M Trash, debris, excavations, structures, or other obstructions present, or inappropriate activities that will not inhibit project operations and maintenance or emergency operations. Encroachments have not been approved by the Corps.	
	U					U Trash, debris, excavation, structures, or other obstructions present, or inappropriate activities that will inhibit project operations and maintenance or emergency operations.	
8. Closure Structures (Stop Log Closures and Gates) (A or U only)	A	X				A Closure structure in good repair. Placing equipment, stoplogs, and other materials are readily available at all times. Components of closure clearly marked and installation instructions / procedures readily available.	
	U					U Closure structure in poor condition. Parts missing or corroded. Placing equipment may not be available within normal warning time.	
	N/A					N/A There are no closure structures along the floodwall.	
9. Underseepage Relief Wells/ Toe Drainage Systems	A					A Toe drainage systems and pressure relief wells necessary for maintaining FCW stability during flood events functioned properly during the last flood event and no sediment is observed in horizontal system (if applicable). Nothing is observed which would indicate that the system won't function properly during the next flood.	
	M					M Toe drainage systems or pressure relief wells are damaged and may become clogged if they are not repaired.	
	U					U Toe drainage systems or pressure relief wells necessary for maintaining FCW stability during flood events have fallen into disrepair or have become clogged.	
					X	N/A There are no relief wells/ toe drainage systems along the floodwall.	

Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. RODI = Requires Operation During Inspection

Additional issues noted during the inspection:

*ADDITIONAL PROJECT COMMENTS:
(REFERENCE PROJECT FEATURE AND ITEM NUMBER IN THE COMMENT.)*

Instructions for the Inspection Guide

GENERAL INSTRUCTIONS.

1. The sections of this report labeled "Basic Eligibility" and "FCW Engineering" only need to be completed during Initial Eligibility Inspections.
2. Determination of Minimum Elevation for Levees and Floodwalls (#1 under FCW Engineering):
Depending on available data and local Corps policy, the minimum elevation required may be calculated using traditional methods, with the addition of 1 foot of freeboard in agricultural areas and 2 feet of freeboard in urban areas, or using annual exceedance probability, which numerically accounts for the natural variation and uncertainty when estimating discharge-probability and stage-discharge functions so that additional requirements for elevation are based on the level of risk in the data.
3. All other sections of this guide that correspond to project features in the Flood Control Work must be fully completed during every Continuing and Initial Eligibility Inspection.
4. RODI stands for "Requires Operation During Inspection". Items marked "RODI" will be rated based on the way they work during the inspection.
5. Additional areas for inspection will be incorporated by the inspector into this guide if the layout or physical characteristics of the project warrant this. Appropriate entries will be made in the REMARKS block.

RATINGS OF INDIVIDUAL ITEMS:

The following terms and definitions are used when determining the rating for each item and/or component in the flood control work.

- A - Acceptable:** The rated item is in satisfactory condition, with no deficiencies, and will function as designed and intended during the next flood event.
- M - Minimally Acceptable:** This rated item has minor deficiencies that need to be corrected. The minor deficiencies will not seriously impair the functioning of the item during the next flood event. The overall reliability of the project will be lowered because of the minor deficiency.
- U - Unacceptable:** The deficiencies are serious enough that the rated item will not adequately function during the next flood event, compromising the project's ability to provide reliable flood protection.

DETERMINATION OF OVERALL PROJECT CONDITION CODE:

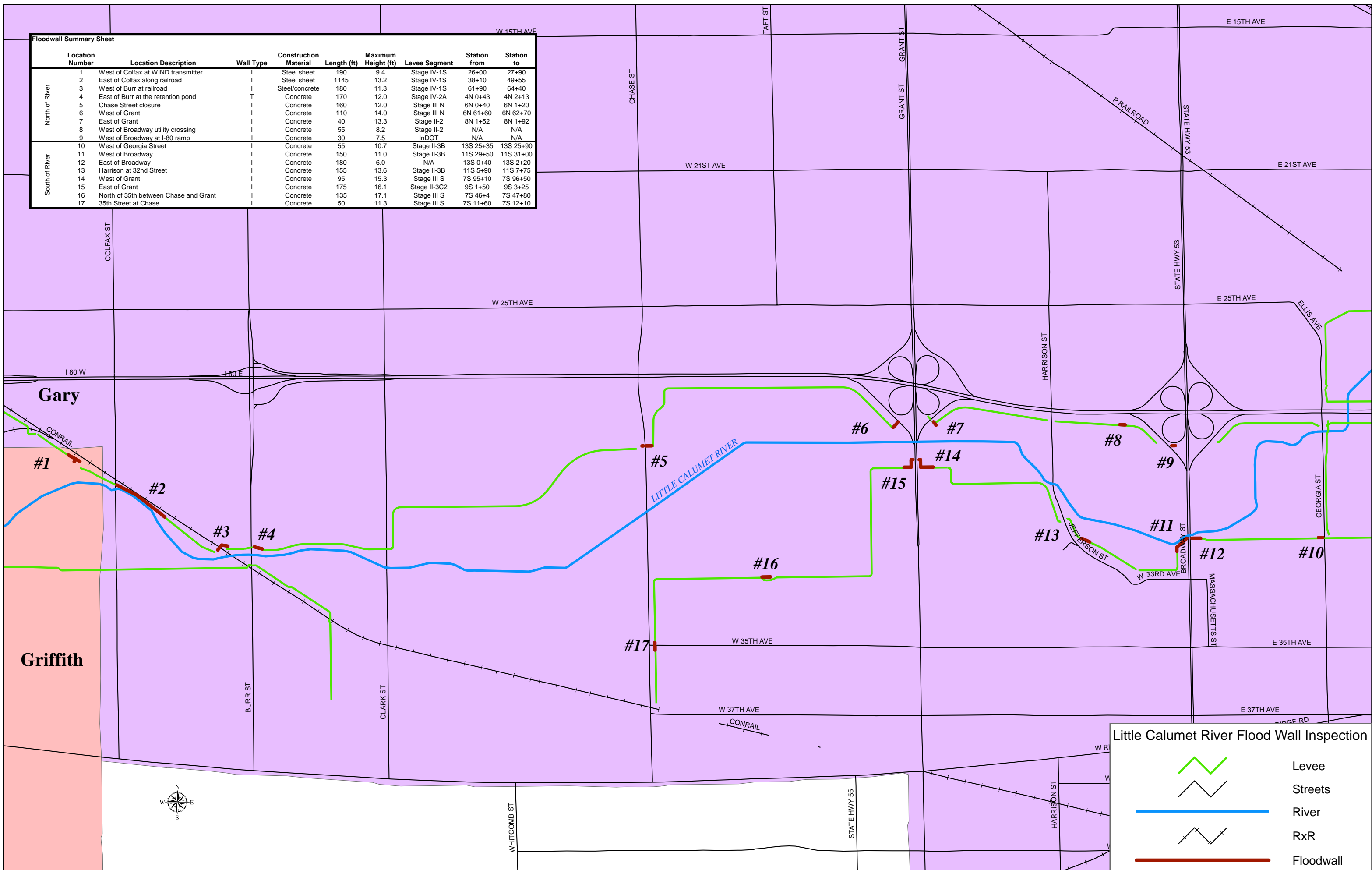
The lowest single rating given for a rated item will determine the overall condition of the project:

1. If all items are rated as Acceptable, the overall project condition will be rated as Acceptable.
2. If one or more items are rated as Minimally Acceptable, the overall project condition will be rated Minimally Acceptable.
3. If one or more items are rated as Unacceptable, the overall project condition will be rated as Unacceptable.


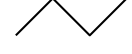

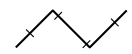

PROJECT CONDITION AND ELIGIBILITY FOR PL84-99 ASSISTANCE:

1. Projects rated as Acceptable are considered "Active" and eligible for PL84-99 post flood or storm damage rehabilitation assistance from the U.S. Army Corps of Engineers.
2. Projects rated Minimally Acceptable are considered "Active" and eligible for PL84-99 rehabilitation assistance during the time that it takes to make needed corrections. This timeframe will be agreed upon between the project sponsor and Corps inspector at the time of the inspection (or shortly thereafter). If the project sponsor does not present the Corps with proof of completion of the repairs/maintenance by the end of this timeframe, then the project will be "Inactive" and will be ineligible for PL84-99 rehabilitation assistance.
3. Projects rated as Unacceptable are immediately put in an "Inactive" status and are not eligible for PL84-99 post flood or storm damage rehabilitation assistance from the Corps of Engineers. The project will remain in an inactive status until the project sponsor presents the Corps with proof that all of the required repairs/maintenance has been completed. (This includes any repairs/ maintenance required for project features rated minimally Acceptable, as well as those rated Unacceptable.)

Floodwall Summary Sheet									
Location Number	Location Description	Wall Type	Construction Material	Length (ft)	Maximum Height (ft)	Levee Segment	Station from	Station to	
North of River	1	West of Colfax at WIND transmitter	Steel sheet	190	9.4	Stage IV-1S	26+00	27+90	
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	8	West of Broadway utility crossing	I	Concrete	55	8.2	Stage II-2	N/A	N/A
	9	West of Broadway at I-80 ramp	I	Concrete	30	7.5	InDOT	N/A	N/A
South of River	10	West of Georgia Street	I	Concrete	55	10.7	Stage II-3B	13S 25+35	13S 25+90
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Little Calumet River Flood Wall Inspection

-  Levee
-  Streets
-  River
-  RxR
-  Floodwall