



SOLUTIONS FOR THE BUILT WORLD

Fall 2015 Iowa DOT Vibration Seminar

Vibration Monitoring Costs

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WJE | ENGINEERS
ARCHITECTS
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Wiss, Janney, Elstner Associates, Inc.



Vibration Monitoring Costs

- Purpose for the Cost Estimate Spreadsheet
 - DOT requires preconstruction surveys and vibration monitoring on selected historic structures
 - Contractors include Specialty Vibration Contractor in their bids to perform the required work
 - Allows DOT to develop a preliminary rough estimate of cost to expect in contractor bids
- Development of the workbook was requested by Iowa DOT in February 2014 under previous 3-year on-call contract NHSN-000-S(490)—2R-00 #12919

Vibration Monitoring Costs

- Based on WJE experience on Iowa DOT projects dating back to Kingsway Cathedral and I-235 bridge replacement work
 - Performing preconstruction surveys
 - Monitoring vibrations
 - Included churches and office buildings in other states
- Reviewed proposed costs and final billed fees & expenses on many projects
- Costs based on WJE standard rates.

Vibration Monitoring Costs

- Excel Workbook Consists of 7 sheet
 1. Pre-Condition Survey
 - May include Vibration Control Plan
 2. Post-Condition Survey
 3. Installations
 4. Monthly (monitoring)
 5. Removal (de-installation of equipment)
 6. Troubleshooting trip
 7. Summary

Shaded cells are locked (password protected)

Vibration Monitoring Costs

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Preconstruction Survey															
2		Field Work (1st person examines, 2nd person coordinates)				Project Management										Hourly Rate
3		Associate Principal		Not used		Associate Principal		Not used		EXPENSES				0	Not used	\$0
4		3	205	0	0	3	205	0	0					1	Senior Principal	\$295
5	DESCRIPTION	HOURS	COST	HOURS	COST	HOURS	COST	HOURS	COST					2	Principal	\$250
6	Proposal/Planning					2	\$410	2	\$0					3	Associate Principal	\$205
7	Travel	6	\$1,230	6	\$0									4	Senior Associate	\$180
8	Pre-Construction Survey Field Work*	4	\$820	1	\$0	0	\$0	0.5	\$0					5	Associate III	\$160
9	Condition Survey Report*					4	\$820	4	\$0					6	Associate II	\$140
10	Vibration Control Plan					12	\$2,460	2	\$0					7	Associate I	\$120
11						0	\$0	0	\$0					8	Senior Specialist	\$130
12						0	\$0	0	\$0					9	Specialist	\$110
13						0	\$0	0	\$0					10	Senior Technician	\$100
14						0	\$0	0	\$0					11	Technician II	\$90
15						0	\$0	0	\$0					12	Technician I	\$70
16	EXPENSES	Qty	Cost	Qty	Cost											
17	Taxi	2	\$30	0	\$30											
18	Airfare	1	\$700	0	\$700											
19	Lodging	1	\$100	0	\$100											
20	Meals	1	\$50	0	\$50											
21	Rental Car	1	\$80	0	\$80											
22																
23	Miscellaneous expenses	0	\$50	0	\$50											
24																
25	TOTALS=	14		7		18		8.5		\$990	\$5,740	\$6,730				
26	* Based on the number of buildings															
27		Number of Structures to Examine														
28		Home	Church	Office (50' x 75')												
29	Number of buildings	1	0	0												
30	Basement	1	0	0												
31	1st Floor	1	0	0												
32	2nd Floor	1	0	0												
33	3rd Floor	0	0	0												
34	Exterior	1	0	0												
35	Time allotment based on 4 hours to examine a 2-story house with a basement															

Pre-Condition Survey

Post-Condition Survey

Installations

Monthly

Removal

Troubleshoot trip

Summary



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Vibration Monitoring Costs

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P		
1	Preconstruction Survey	Field Work (1st person examines, 2nd person coordinates)				Project Management												
2		Associate		Principal		Not used		Associate		Principal		Not used		EXPENSES		Hourly Rate		
3		3	205	0	0	3	205	0	0							0	Not used	\$0
4		HOURS		COST		HOURS		COST		HOURS		COST		TOTAL		1	Senior Principal	\$295
5	DESCRIPTION	HOURS		COST		HOURS		COST		HOURS		COST		TOTAL		2	Principal	\$250
6	Proposal/Planning															3	Associate Principal	\$205
7	Travel	6	\$1,230	6	\$0	2	\$410	2	\$0							4	Senior Associate	\$180
8	Pre-Construction Survey Field Work*	4	\$820	1	\$0	0	\$0	0.5	\$0							5	Associate III	\$160
9	Condition Survey Report*					4	\$820	4	\$0							6	Associate II	\$140
10	Vibration Control Plan					12	\$2,460	2	\$0							7	Associate I	\$120
11						0	\$0	0	\$0							8	Senior Specialist	\$130
12						0	\$0	0	\$0							9	Specialist	\$110
13						0	\$0	0	\$0							10	Senior Technician	\$100
14						0	\$0	0	\$0							11	Technician II	\$90
15						0	\$0	0	\$0							12	Technician I	\$70
16	EXPENSES	Qty	Cost	Qty	Cost													
17	Taxi	2	\$30	0	\$0											\$60		
18	Airfare	1	\$700	0	\$0											\$700		
19	Lodging	1	\$100	0	\$0											\$100		
20	Meals	1	\$50	0	\$0											\$50		
21	Rental Car	1	\$80	0	\$0											\$80		
22																\$0		
23	Miscellaneous expenses	0	\$50	0	\$0											\$0		
24																\$0		
25	TOTALS=	14		7		18		8.5		\$990	\$5,740	\$6,730						
26	* Based on the number of buildings																	
27		Number of Structures to Examine																
28		Home	Church	Office (50' x 75')														
29	Number of buildings	1	0	0														
30	Basement	1	0	0														
31	1st Floor	1	0	0														
32	2nd Floor	1	0	0														
33	3rd Floor	0	0	0														
34	Exterior	1	0	0														
35	Time allotment based on 4 hours to examine a 2-story house with a basement																	

$$=SUM(B30:B34)+2*SUM(C30:C34)+SUM(D30:D34)$$

Vibration Monitoring Costs

L	M	N	O	P
				Hourly Rate
	0	Not used		\$0
	1	Senior Principal		\$295
	2	Principal		\$250
	3	Associate Principal		\$205
	4	Senior Associate		\$180
	5	Associate III		\$160
	6	Associate II		\$140
	7	Associate I		\$120
	8	Senior Specialist		\$130
	9	Specialist		\$110
	10	Senior Technician		\$100
	11	Technician II		\$90
	12	Technician I		\$70

Vibration Monitoring Costs

27		Number of Structures to Examine		
28		Home	Church	Office (50' x 75')
29	Number of buildings	1	0	0
30	Basement	1	0	0
31	1st Floor	1	0	0
32	2nd Floor	1	0	0
33	3rd Floor	0	0	0
34	Exterior	1	0	0
35	Time allotment based on 4 hours to examine a 2-story house with a basement			

Pre-Condition Survey

Post-Condition Survey

Installations

M

Vibration Monitoring Costs

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Preconstruction Survey															
2		Field Work (1st person examines, 2nd person coordinates)				Project Management										Hourly Rate
3		Associate Principal		Not used		Associate Principal		Not used		EXPENSES				0	Not used	\$0
4		3	205	0	0	3	205	0	0			FEE		1	Senior Principal	\$295
5	DESCRIPTION	HOURS	COST	HOURS	COST	HOURS	COST	HOURS	COST			TOTAL		2	Principal	\$250
6	Proposal/Planning					2	\$410	2	\$0			\$410		3	Associate Principal	\$205
7	Travel	6	\$1,230	6	\$0							\$1,230		4	Senior Associate	\$180
8	Pre-Construction Survey Field Work*	4	\$820	1	\$0	0	\$0	0.5	\$0			\$820		5	Associate III	\$160
9	Condition Survey Report*					4	\$820	4	\$0			\$820		6	Associate II	\$140
10	Vibration Control Plan					12	\$2,460	2	\$0			\$2,460		7	Associate I	\$120
11						0	\$0	0	\$0			\$0		8	Senior Specialist	\$130
12						0	\$0	0	\$0			\$0		9	Specialist	\$110
13						0	\$0	0	\$0			\$0		10	Senior Technician	\$100
14						0	\$0	0	\$0			\$0		11	Technician II	\$90
15						0	\$0	0	\$0			\$0		12	Technician I	\$70
16	EXPENSES	Qty	Cost	Qty	Cost											
17	Taxi	2	\$30	0	\$30							\$60				
18	Airfare	1	\$700	0	\$700							\$700				
19	Lodging	1	\$100	0	\$100							\$100				
20	Meals	1	\$50	0	\$50							\$50				
21	Rental Car	1	\$80	0	\$80							\$80				
22												\$0				
23	Miscellaneous expenses	0	\$50	0	\$50							\$0				
24												\$0				
25	TOTALS=	14		7		18		8.5		\$990	\$5,740	\$6,730				
26	* Based on the number of buildings															
27		Number of Structures to Examine														
28		Home	Church	Office (50' x 75')												
29	Number of buildings	1	0	0												
30	Basement	1	0	0												
31	1st Floor	1	0	0												
32	2nd Floor	1	0	0												
33	3rd Floor	0	0	0												
34	Exterior	1	0	0												
35	Time allotment based on 4 hours to examine a 2-story house with a basement															

Pre-Condition Survey

Post-Condition Survey

Installations

Monthly

Removal

Troubleshoot trip

Summary



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Vibration Monitoring Costs

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Post-Construction Survey															
2		Field Work (1st person examines, 2nd person coordinates)				Project Management										
3		Associate		Principal		Not used		Associate		Principal		Not used		EXPENSES		
4		3	205	0	0	3	205	0	0							FEE
5	DESCRIPTION	HOURS	COST	HOURS	COST	HOURS	COST	HOURS	COST							TOTAL
6	Proposal/Planning					2	\$410	0	\$0							\$410
7	Travel	6	\$1,230	6	\$0											\$1,230
8	Post-Construction Survey Field Work*	2	\$410	0.5	\$0	0	\$0	0.5	\$0							\$410
9	Condition Survey Report*					2	\$410	4	\$0							\$410
10						0	\$0	0	\$0							\$0
11						0	\$0	0	\$0							\$0
12						0	\$0	0	\$0							\$0
13						0	\$0	0	\$0							\$0
14						0	\$0	0	\$0							\$0
15						0	\$0	0	\$0							\$0
16	EXPENSES	Qty	Cost	Qty	Cost											
17	11. Taxi	2	\$30	0	\$30											\$60
18	12. Airfare	1	\$700	0	\$700											\$700
19	13. Lodging	1	\$100	0	\$100											\$100
20	14. Meals	1	\$50	0	\$50											\$50
21	15. Rental Car	1	\$80	0	\$80											\$80
22																\$0
23	16. Miscellaneous expenses	0	\$50	0	\$50											\$0
24																\$0
25	TOTALS=	12		6.5		4		4.5		\$990	\$2,460	\$3,450				
26	* Based on the number of buildings															
27		Number of Structures to Examine														
28		Home	Church	Office (50' x 75')												
29	Number of buildings	1	0	0												
30	Basement	1	0	0												
31	1st Floor	1	0	0												
32	2nd Floor	1	0	0												
33	3rd Floor	0	0	0												
34	Exterior	1	0	0												
35	Time allotment based on 2 hours to examine a 2-story house with a basement															

Pre-Condition Survey

Post-Condition Survey

Installations

Monthly

Removal

Troubleshoot trip

Summary



Vibration Monitoring Costs

1	Monitor Installations									
2	Field Work (1st person examines, 2nd person coordinates)				Project Management					
3	Associate Principal		Not used		Associate Principal		Not used		EXPENSES	
4	3	205	0	0	3	205	0	0		FEE
5	DESCRIPTION	HOURS	COST	HOURS	COST	HOURS	COST	HOURS	COST	TOTAL
6	Proposal/Planning					0.5	\$103	0.25	\$0	\$103
7	Travel	6	\$1,230	6	\$0					\$1,230
8	Post-Construction Survey Field Work*	1	\$205	0.5	\$0	0	\$0	0	\$0	\$205
9	Condition Survey Report*					0	\$0	0	\$0	\$0
10						0	\$0	0	\$0	\$0
11						0	\$0	0	\$0	\$0
12						0	\$0	0	\$0	\$0
13						0	\$0	0	\$0	\$0
14						0	\$0	0	\$0	\$0
15						0	\$0	0	\$0	\$0
16	EXPENSES	Qty	Cost	Qty	Cost					
17	11. Taxi	2	\$30	0	\$30					\$60
18	12. Airfare	1	\$700	0	\$700					\$700
19	13. Lodging	1	\$100	0	\$100					\$100
20	14. Meals	1	\$50	0	\$50					\$50
21	15. Rental Car	1	\$80	0	\$80					\$80
22	Avongard Crack Gages	1	\$20							\$20
23	16. Miscellaneous expenses	0	\$50	0	\$50					\$0
24										\$0
25	TOTALS=	11		6.5		0.5		0.25		\$1,010
26	* Based on the number of buildings									
27	Number of Structures to Examine									
28		Home	Church	Office (50' x 75')						
29	Number of buildings	1	0	0						
30	Basement	1	0	0						
31	1st Floor	1	0	0						
32	2nd Floor	1	0	0						
33	3rd Floor	0	0	0						
34	Exterior	1	0	0						
35	Time allotment based on 4 hours to examine a 2-story house with a basement									

Pre-Condition Survey

Post-Condition Survey

Installations

Monthly

Removal

Troubleshoot trip

Summary



Vibration Monitoring Costs

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Monthly Monitoring															
2		Weekly Reports and 4 triggered events														
3		Associate	Principal	Not used		EXPENSES										
4		3	205	0	0		FEE									
5	DESCRIPTION	HOURS	COST	HOURS	COST		TOTAL									
6							\$0									
7							\$0									
8	Weekly Reports*	1	\$205				\$205									
9	Triggered Events	1	\$205				\$205									
10							\$0									
11							\$0									
12							\$0									
13							\$0									
14							\$0									
15							\$0									
16	EXPENSES	Qty	Cost													
17	Seismographs	1	\$550				\$550									
18	Modems	1	\$115				\$115									
19							\$0									
20							\$0									
21							\$0									
22							\$0									
23							\$0									
24							\$0									
25	TOTALS=	4		0			\$665	\$410	\$1,075							
26	* Based on the number of buildings															
27		Number of Structures to Examine														
28		Home	Church	Office (50' x 75')												
29	Number of buildings	1	0	0												
30																
31																
32																
33																
34																
35																

Pre-Condition Survey

Post-Condition Survey

Installations

Monthly

Removal

Troubleshoot trip

Summary



Vibration Monitoring Costs

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	
1	Monitor Removals															
2	Field Work (1st person examines,				Project Management											
3	Associate Principal		Not used		Associate Principal		Not used		EXPENSES							
4	3	205	0	0	3	205	0	0		FEE						
5	DESCRIPTION	HOURS	COST	HOURS	COST	HOURS	COST	HOURS	COST		TOTAL					
6	Proposal/Planning					1	\$205	0	\$0		\$205					
7	Travel	6	\$1,230	6	\$0						\$1,230					
8	Post-Construction Survey Field Work*	1	\$205	0.5	\$0	0	\$0	0	\$0		\$205					
9	Condition Survey Report*					0	\$0	0	\$0		\$0					
10						0	\$0	0	\$0		\$0					
11						0	\$0	0	\$0		\$0					
12						0	\$0	0	\$0		\$0					
13						0	\$0	0	\$0		\$0					
14						0	\$0	0	\$0		\$0					
15						0	\$0	0	\$0		\$0					
16	EXPENSES	Qty	Cost	Qty	Cost											
17	11. Taxi	2	\$30	0	\$30						\$60					
18	12. Airfare	1	\$700	0	\$700						\$700					
19	13. Lodging	0	\$100	0	\$100						\$0					
20	14. Meals	1	\$50	0	\$50						\$50					
21	15. Rental Car	1	\$80	0	\$80						\$80					
22	Avongard Crack Gages										\$0					
23	16. Miscellaneous expenses	0	\$50	0	\$50						\$0					
24											\$0					
25	TOTALS=	10		6.5		1		0		\$890	\$1,640	\$2,530				
26	* Based on the number of buildings															
27		Number of Structures to Examine														
28		Home	Church	Office (50' x 75')												
29	Number of buildings	1	0	0												
30	Basement	1	0	0												
31	1st Floor	1	0	0												
32	2nd Floor	1	0	0												
33	3rd Floor	0	0	0												
34	Exterior	1	0	0												
35	Time allotment based on 4 hours to examine a 2-story house with a basement															
36																
37																

Pre-Condition Survey

Post-Condition Survey

Installations

Monthly

Removal

Troubleshoot trip

Summary



Vibration Monitoring Costs

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Monitor Removals															
2		Field Work (1st person examines,				Project Management										
3		Associate Principal		Not used		Associate Principal		Not used		EXPENSES						
4		3	205	0	0	3	205	0	0		FEE					
5	DESCRIPTION	HOURS	COST	HOURS	COST	HOURS	COST	HOURS	COST		TOTAL					
6	Proposal/Planning					1	\$205	0	\$0		\$205					
7	Travel	6	\$1,230								\$1,230					
8	Site work	2	\$410			0	\$0	0	\$0		\$410					
9						0	\$0	0	\$0		\$0					
10						0	\$0	0	\$0		\$0					
11						0	\$0	0	\$0		\$0					
12						0	\$0	0	\$0		\$0					
13						0	\$0	0	\$0		\$0					
14						0	\$0	0	\$0		\$0					
15						0	\$0	0	\$0		\$0					
16	EXPENSES	Qty	Cost													
17	11. Taxi	2	\$30								\$60					
18	12. Airfare	1	\$700								\$700					
19	13. Lodging	0	\$100								\$0					
20	14. Meals	1	\$30								\$30					
21	15. Rental Car	1	\$80								\$80					
22											\$0					
23	16. Miscellaneous expenses	1	\$50								\$50					
24											\$0					
25	TOTALS=	8		0		1		0		\$920	\$1,845	\$2,765				
26																
27		Number of Structures to Examine														
28		Home	Church	Office (50' x 75')												
29	Number of buildings	1	0	0												
30																
31																
32																
33																
34																
35																
36																
37																

Pre-Condition Survey

Post-Condition Survey

Installations

Monthly

Removal

Troubleshoot trip

Summary





Vibration Monitoring Costs

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Summary of Estimated Costs															
2																
3	Based on 4 trips															
4		Fees	Expenses	Total Cost												
5	Pre-Construction Survey	\$5,740	\$990	\$6,730												
6	Post-Condition Survey	\$2,460	\$990	\$3,450												
7	Installation	\$1,538	\$1,010	\$2,548												
8	Monthly Monitoring	\$410	\$665	\$1,075	(per month)											
9	Removal	\$1,640	\$890	\$2,530												
10	Total	\$11,788	\$4,545	\$16,333												
11																
12	Based on 2 trips (Installation & Removal performed while on-site)															
13		Fees	Expenses	Total Cost												
14	Pre-Construction Survey	\$5,740	\$990	\$6,730												
15	Post-Condition Survey	\$2,460	\$990	\$3,450												
16	Installation	\$769		\$769												
17	Monthly Monitoring	\$410	\$665	\$1,075	(per month)											
18	Removal	\$820		\$820												
19	Total	\$10,199	\$2,645	\$12,844												
20																
21	Additional Months of Monitoring															
22	2	\$820	\$1,330	\$2,150												
23	4	\$1,640	\$2,660	\$4,300												
24	6	\$2,460	\$3,990	\$6,450												
25	8	\$3,280	\$5,320	\$8,600												
26	10	\$4,100	\$6,650	\$10,750												
27	12	\$4,920	\$7,980	\$12,900												
28																
29																
30																
31																
32																
33																
34																
35																
36																

Vibration Monitoring Costs

- The workbook described here provides a method to roughly estimate a cost for condition surveys and vibration control

- Questions?