

1. Program Statement. (200 word limit)

Efficient and cost-effective maintenance of buildings is a growing concern as the average-age of buildings increases nationwide. More and more institutions are looking for maintenance audit methods to manage facilities operations, maintenance, and expansion. In 1992, Montana State University created a desktop database program - Facilities Condition Inventory (FCI) to track the variable condition of campus buildings. MSU's FCI program provides an objective, consistent, systematic evaluation of the general condition and deferred maintenance profile of buildings and is a useful methodology in determining comparable condition assessments within a geographical area. After MSU shared the program and trained other university units and state agencies, Montana governing bodies began to rely on FCI reports when considering budget or resource allocations. In 2007, the value of the FCI program was further recognized and used as the fundamental methodology in response to a lawsuit claiming the State's public education (K-12) is inequitable, due in part to the condition of school facilities. MSU's dedication to refining and sharing the FCI program and its agency and legislative acceptance has enabled MSU to improve its public service to Montanans by its role in assessing the condition of state facilities from K-12 schools to institutions of higher education.

2.a. Institutional Benefits. (narrative - 100 points)

Periodic evaluation of the condition of facilities is essential for effectively managing facilities budgets, operations, maintenance, and expansion. A recurring assessment or audit of building conditions in a cycle that evaluates the entire campus, can provide deficiency data useful to governing bodies, administrators, and maintenance personnel.

MSU's FCI program is based on APPA's Model for Facilities Audits, the philosophy described by Harvey H. Kaiser in *The Facilities Audit: A Process for Improving Facilities Conditions* (APPA: Alexandria, Virginia, 1993), and employs comparative cost data from a nationally recognized cost estimating system (*RSMeans*) to calculate deficiency estimates. Over time this regimented and systematic assessment of building conditions and FCI reports has provided deficiency details that directly improved funding and resource allocation decisions, improved the effectiveness of day-to-day maintenance operations, assisted administrators and managers in long-range capital planning and informed prioritization of building renewal and deferred maintenance projects. The compilation of records provides a dynamic value of the physical assets and enables a realistic and objective view of the major campus facilities at any given time.

2.b. Characteristics or qualities that make this program innovative. (narrative – 300 points)

Efficient and cost-effective maintenance of buildings is increasingly important as funding for facilities is more difficult to acquire and construction materials and labor costs cause large construction projects to cost megamillions. MSU's FCI program provides an objective, consistent, systematic evaluation of the general condition and deferred maintenance profile of buildings and is a useful methodology in determining comparable conditions within a geographical area.

While other audit programs exist and are available, MSU's FCI program is a hybrid of overview information intended to be achieved using in-house resources with modest effort and cost. Qualities of the FCI program that make it a unique program are:

1. It utilizes an in-house inspection team of facility professionals, custodians, building occupants and trades personnel to inspect and record a snapshot, or profile in time, of the building's condition. The

team approach has played a vital role in the overall success of the FCI program's value. Management and professional trades people are invested in the process and the work flow outcomes of the audits. Team members provide the history of corrective actions, identify recurring issues, and strategize potential solutions, and record the results. The team approach is also unique because it involves representatives from numerous disciplines and each contributes professional expertise and building fluency during the audit, which all adds a valuable dimension to the inspection results.

2. The FCI reports calculate a deficiency ratio, or comparison of the cost of the deferred maintenance to the replacement value of the building (which can be used in determining obsolescence and considering replacement timelines, etc).
3. The database generates a variety of reports that enables use of the FCI as a tool to better inform budget, operations, and planning decisions.
 - As a Budget Tool it can be used to solicit additional maintenance funding; can help demonstrate and forecast long-term resource needs; recognize and quantify the value of facilities as an institutional asset; identify and prioritize areas of greatest need; and record and illustrate net asset value improvement.
 - As an Operational Tool the FCI can be used to help identify, prioritize, and schedule maintenance projects; facilitate efficient use of resources; record and illustrate improvements; work order generation; and detect and reduce excessive or inefficient maintenance.
 - As a Planning Tool the FCI can be used to assist in capital planning; maintenance backlog management; workload management; project need prioritization; and long range campus development or master planning.
4. MSU included flexibility in the program design so that the audit can also generate other inventories beyond the traditional FCI elements by having the inspection team note fire and building code compliance considerations and accessibility improvements that go beyond the traditional maintenance of existing conditions. The system can be amended (and has been at the State K-12 level) to include other general inventories such as classroom amenities.
5. To keep the program costs manageable, MSU includes only its major academic facilities in its FCI cycle, since performing the in-depth FCI on relatively small buildings would significantly increase the human and financial investment on a per square foot basis without commensurate benefit.
6. MSU has extended the use of its FCI system to include Auxiliaries facilities, e.g., residence halls, dining facilities, etc., at the request of the MSU Auxiliaries organization, for a comprehensive profile of the entire campus.
7. The FCI program, and particularly the training components, incorporated the philosophies described by Harvey H. Kaiser in *The Facilities Audit: A Process for Improving Facilities Conditions* (APPA: Alexandria, Virginia, 1993).

2.c. How the program can be used by others – portability and sustainability. (narrative – 300 points)

Since its inception, the MSU FCI program has been freely offered to other state agencies in Montana. Annual training sessions have been broadened to speak to the increasing number of out-of-state users who have heard about the program from within their industry or from MSU Staff networking at APPA and Society of College and University Planning (SCUP) sponsored conferences. The FCI was presented as an educational session at the 2006 Rocky Mountain Association (APPA) educational conference in Billings, Montana.

The MSU FCI program can be used by any facilities operation that wants to protect the unique qualities of their campus or buildings by systematically capturing a profile of the condition of their physical environment. The FCI program assists entities in preserving their valuable physical assets.

The reason MUS's FCI program can be used by such a diverse group is because it is simple to use. MSU did the research, custom development, and now produces the computer program as a desktop compatible system, so it is intended to be portable and *turn-key* for all the users. The FCI program's value is that, consistently executed and properly employed, it can be used to better inform building operations, maintenance scheduling, financial decisions and budget processes for an entire campus of buildings at a very modest resource/cost investment.

2.d. Demonstration of management involvement and employee commitment. (narrative – 150 points)

Montana State University and its affiliated campuses have been using this FCI process since 1992 to assess and track the condition of their facilities. Other units of the Montana University System have been using the system for several legislative cycles and several other state agencies have been using the FCI as well. The purpose of making the FCI desktop application available was to provide all state agencies the opportunity and access to software tools and the capacity to establish and maintain their own FCI programs.

2.e. Documentation of results, analysis, customer feedback, and resulting benchmarks. (narrative – 150 points)

The MSU FCI program has been refined and operational for four cycles (at MSU, a cycle covers 3 years of auditing one building per month). Collectively, the cycles established an evolving profile of the buildings, beginning with a baseline assessment. The FCI audit prompts a calculated deficiency ratio and replacement value for each cycle, which takes into consideration renovations, maintenance, and equipment replacements that have occurred since the previous audit. This cyclical record of maintenance and improvements also establishes a defensible position for appealing to the university community and governing bodies when buildings, particularly historic buildings, need adaptive reuse renovations. The identified campus deferred maintenance ration can be used as a strategic benchmark to evaluate operational effectiveness. The following report documents how MSU's FCI audit information is used to analyze reinvestment in buildings and how the data are used to articulate a defensible position.

Montana Hall, constructed in 1898, has become the campus historic landmark facility due to its continuous use over the years and its prominent focal point in central campus. MSU's maintenance investment in Montana Hall has been to ensure its beneficial use to the university for another century. Regular FCI audits made it possible to direct resources for FEMA Tier 2 Seismic structural improvements and stabilization, a building-wide window replacement for energy efficiency, and roof replacement and attic insulation.

MSU's FCI indicates the current deferred maintenance deficiency of the building is approximately 36% of the relative replacement value of the building. In addition to this relative indicator of the condition of the building and its systems, the suitability (relative obsolescence) of the 110-year old building systems/technologies makes it irrefutably clear that the original building and its systems have served well beyond any reasonable useful life cycles. The recurring FCI audit provides data sufficient to identify needs such as:

- *The secondary building electrical system has been significantly modified and expanded, but is beyond its capacity on a daily basis the evolution of the system may mask code compliance issues.*
- *The building water service system is beyond capacity and is not capable of accommodating any further additions/modifications to restrooms, building cooling systems, etc.*
- *Segments of the original waste plumbing system have been found to fail from erosion due to length of service.*
- *Mechanical building cooling systems were not available during the original construction and the designed building ventilation systems were rendered inoperable during various renovations. Recent solutions for spot-cooling needs have relied upon either individual exterior compressor units or water-cooled elements, with no ability to design a more responsible, energy-efficient, whole-building HVAC system.*
- *Leaks in failing steam and condensate piping continue to lead to disruptive, unscheduled and expensive emergency building repairs.*
- *The building has basically a single public stair and the upper floors are served by marginal fire external escapes. With no elevator, ADA accessibility is limited to the lowest level and movement of personnel and materials throughout the building is labor intensive and unsafe.*
- *The necessary piecemeal approach to renovations and systems modifications/additions over the life of the building has led to the current point at which the building is extremely inefficient with respect to space utilization and responsible preventive maintenance of building systems is not possible.*
- *Restroom facilities are inadequate (in terms of fixture counts, gender equity, ventilation, location, accessibility and condition) and expensive to maintain.*

This type of long-term perspective is most effectively created by the use of a systematic and regular assessment of institutional assets by a team of professionals experienced in building performances and deficiencies. MSU's FCI program provides a plethora of data useful for setting benchmarks and planning future campus development. In addition, projects identified through the FCI process are included for funding consideration in the Capital Projects Program request for every legislative session.

Supplementals

The attached pdf file consists of the first page of five different database generated reports of the Montana State University's Facilities Condition Inventory program as a sample of the program's documentation capabilities highlighting its innovation, value, and portability. The numbered report samples are:

1. Priority Summary Report (renewal cost and deficiency ratio for a site per priority or category of condition such as 1:Safety, 2:Damage/Wear out, 3:Codes/Standards, 4:Environmental Improvements, 5:Energy Conservation, 6:Aesthetics, 7 Other/Non-FCI).
2. Building Summary (each building within a site including cost per square foot).
3. Component Summary by Building Report (comparative summary of buildings within a site according to components or systems of a building such as Foundations, Envelope, Floor System, Roof System, Finishes, Specialties, HVAC, Plumbing, Electrical, Conveying, Safety).
4. Deficiency Details by Component (details of audit including component, audit cycle, descriptions, and organized by priority).
5. Deficiency Detail by Building Report (comprehensive report of complete audit – used as a worksheet for successive audits).

Report 1

Funding Sources

- Auxiliary (A)
- Federal (F)
- Non-State (N)
- Private (P)
- State (S)

Montana State University - Facilities Condition Inventory Priority Summary

Priorities

- 1
- 2
- 3
- 4
- 5
- 6
- 7

Site Replacement Cost: \$345,470,310

	Renewal Cost	Deficiency Ratio
<i>Site Name: MSU-Bozeman Main Campus</i>		
Priority 2	\$29,811,323	8.63%
Priority 3	\$5,298,175	1.53%
Priority 4	\$2,111,388	0.61%
Priority 5	\$4,458,798	1.29%
Priority 6	\$1,045,962	0.30%
Totals	\$42,725,646	12.37%

Report 2

Funding Sources

- Auxiliary (A)
- Federal (F)
- Non-State (N)
- Private (P)
- State (S)

Montana State University - Facilities Condition Inventory Building Summary

Priorities

- 1
- 2
- 3
- 4
- 5
- 6
- 7

Replacement Cost \$345,470,310 (Includes buildings without deficiencies)

Renewal Cost \$42,725,646

Deficiency Ratio 12.4%

Bldg #	Building Name	Gross Area	Cost/SF	Replacement Cost	Renewal Cost	Def. Ratio			
Site: MSU-Bozeman Main Campus									
		Replacement Total		\$345,470,310	Total	\$42,725,646	12.4%		
Funding Source: State		Total	1,746,088	Avg \$187.74	Total	\$327,817,445	Total	\$42,725,646	13.0%
113	AJM Johnson Hall	41,333	\$191.05	\$7,896,670	\$2,243,508	28.4%			
133	Animal Resource Center	20,389	\$238.03	\$4,853,194	\$132,357	2.7%			
127	Cheever Hall	63,806	\$180.03	\$11,486,994	\$2,028,917	17.7%			
119	Cobleigh Hall	92,741	\$194.35	\$18,024,213	\$1,956,911	10.9%			
118	Cooley Lab	30,604	\$218.65	\$6,691,565	\$1,361,287	20.3%			
136	Culbertson Hall	48,900	\$191.05	\$9,342,345	\$1,776,900	19.0%			
139	Engineering Physical Sciences	150,730	\$190.84	\$28,765,313	\$1,709,384	5.9%			
117	Gaines Hall	79,563	\$194.35	\$15,463,069	\$3,357,598	21.7%			
301	Hamilton Hall	27,745	\$200.66	\$5,567,312	\$1,740,682	31.3%			
128	Haynes Hall	42,104	\$191.05	\$8,043,969	\$851,548	10.6%			
303	Heating Plant	9,614	\$130.58	\$1,255,396	\$19,342	1.5%			
109	Herrick Hall	40,387	\$179.90	\$7,265,621	\$1,694,354	23.3%			
126	Howard Hall	29,102	\$213.09	\$6,201,345	\$849,858	13.7%			
441	Huffman Building	8,675	\$264.53	\$2,294,798	\$224,617	9.8%			
630	Kellogg Center	3,193	\$225.94	\$721,426	\$117,194	16.2%			
120	Leon Johnson Hall	112,011	\$190.30	\$21,315,693	\$2,064,800	9.7%			
103	Lewis Hall	42,131	\$179.90	\$7,579,367	\$784,461	10.3%			
104	Linfield Hall	65,563	\$169.52	\$11,114,240	\$1,690,003	15.2%			
116	Marsh Laboratory	31,198	\$218.65	\$6,821,443	\$2,006,334	29.4%			
112	McCall Hall	10,488	\$244.96	\$2,569,140	\$156,182	6.1%			
101	Montana Hall	39,725	\$186.82	\$7,421,424	\$1,613,937	21.7%			
121	Museum of the Rockies	93,390	\$178.91	\$16,708,405	\$785,925	4.7%			

Report 3

Funding Sources

- Auxillary (A)
- Federal (F)
- Non-State (N)
- Private (P)
- State (S)

Montana State University - Facilities Condition Inventory Component Summary by Building

Priorities

- 1
- 2
- 3
- 4
- 5
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Bldg #	Building Name	Gross Area	Component Cost / SF	Percent Deficiency	Renewal Cost
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Site: MSU-Bozeman Main Campus

System: Foundations (I)

Component: Exterior Steps/Retaining Walls (B)

Total \$127,027

113	AJM Johnson Hall	41,333	\$0.79	5.00%	\$1,633
118	Cooley Lab	30,604	\$0.82	42.00%	\$10,540
301	Hamilton Hall	27,745	\$1.77	50.00%	\$24,554
109	Herrick Hall	40,387	\$1.59	10.00%	\$6,422
630	Kellogg Center	3,193	\$2.20	20.00%	\$1,405
103	Lewis Hall	42,131	\$1.59	5.00%	\$3,349
116	Marsh Laboratory	31,198	\$0.82	25.00%	\$6,396
112	McCall Hall	10,488	\$0.92	50.00%	\$4,824
101	Montana Hall	39,725	\$1.65	5.00%	\$3,277
111	Renne Library	152,085	\$1.42	2.00%	\$4,319
122	Sherrick Hall	18,298	\$0.92	5.00%	\$842
108	Taylor Hall	9,197	\$2.20	10.00%	\$2,023
132	Visual Communications Building	36,380	\$0.82	6.00%	\$1,790
129	Wilson Hall	84,708	\$0.73	90.00%	\$55,653

Component: Footings/Foundation Walls (A)

Total \$471,304

113	AJM Johnson Hall	41,333	\$3.19	1.00%	\$1,319
127	Cheever Hall	63,806	\$3.01	2.00%	\$3,841
117	Gaines Hall	79,563	\$11.93	5.00%	\$47,459
301	Hamilton Hall	27,745	\$3.56	35.00%	\$34,570
303	Heating Plant	9,614	\$7.62	1.00%	\$733
109	Herrick Hall	40,387	\$3.19	10.00%	\$12,883
126	Howard Hall	29,102	\$3.56	2.00%	\$2,072
630	Kellogg Center	3,193	\$7.13	40.00%	\$9,106
103	Lewis Hall	42,131	\$3.19	10.00%	\$13,440
104	Linfield Hall	65,563	\$3.01	25.00%	\$49,336
112	McCall Hall	10,488	\$15.04	2.00%	\$3,155
101	Montana Hall	39,725	\$3.32	10.00%	\$13,189
121	Museum of the Rockies	93,390	\$2.95	33.00%	\$90,915
111	Renne Library	152,085	\$4.53	1.00%	\$6,889
105	Romney Gymnasium	53,074	\$5.62	50.00%	\$149,138
108	Taylor Hall	9,197	\$4.42	10.00%	\$4,065
102	Traphagen Hall	37,014	\$3.32	5.00%	\$6,144
132	Visual Communications Building	36,380	\$3.32	15.00%	\$18,117
405	Wool Lab	7,440	\$4.42	15.00%	\$4,933

Report 4

Funding Sources

- Auxillary (A)**
- Federal (F)**
- Non-State (N)** **Bldg/Cat: All**
- Private (P)** **Site: MSU-Bozeman Main Campus**
- State (S)** **Total Area: 1,835,701 Sq Ft**

Montana State University - Facilities Condition Inventory Deficiency Details by Component

Priorities

- 1**
- 2**
- 3** **Replacement Cost: \$345,470,310**
- 4** **Deferred Maintenance/Renewal Cost: \$42,725,646**
- 5** **Facilities Deficiency Ratio: 12.4%**
- 6**
- 7**

Building Name	Initial Entry	Last Updated	Pri	%	Unit Cost	Renewal Cost	Description
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Funding Source: State

System: Foundations (1)

Total \$598,331

Component: Footings/Foundation Walls (A)

Total \$471,304

AJM Johnson Hall	01-14-2004	01-14-2004	2	1%	\$3.19	\$1,319	Assess and monitor concrete spalling on east foundation wall.
Cheever Hall	05-09-2007	05-09-2007	2	2%	\$3.01	\$3,841	Correct drainage problem at east foundation wall slopes toward building.
Gaines Hall	02-14-2001	03-14-2007	2	5%	\$11.93	\$47,459	PATCH & REPAIR HORIZONTAL SHEAR CRACKING AT SOUTH FOUNDATION WALL.
Hamilton Hall	05-08-1996	05-08-1996	2	10%	\$3.56	\$9,877	Repair exterior foundation.
Hamilton Hall	05-08-2002	05-08-2002	2	25%	\$3.56	\$24,693	Secure and replace interior footings.
Heating Plant	09-10-2003	09-10-2003	2	1%	\$7.62	\$733	Repair leak on south wall of chemical storage room.
Herrick Hall	10-11-2000	10-11-2000	2	10%	\$3.19	\$12,883	Repair cracks in foundation wall.
Howard Hall	10-09-2002	10-09-2002	2	2%	\$3.56	\$2,072	STRUCTURAL EVALUATION OF FOUNDATION CRACKING.
Kellogg Center	07-19-2001	07-19-2001	2	40%	\$7.13	\$9,106	SETTLING AND CRACKS.
Lewis Hall	02-09-2000	02-08-2006	2	10%	\$3.19	\$13,440	Waterproof foundation.
Linfield Hall	01-09-2008	01-09-2008	2	25%	\$3.01	\$49,336	Repair/reinforce stone foundation walls (north)
McCall Hall	05-11-2000	05-11-2000	2	2%	\$15.04	\$3,155	PATCH CRACKS IN FOUNDATION WALL.
Montana Hall	12-09-1992	12-09-1992	2	10%	\$3.32	\$13,189	REPOINT FOUNDATION WALLS AT BASEMENT INTERIOR.
Museum of the Rockies	12-11-2002	12-11-2002	2	30%	\$2.95	\$82,650	Repair various foundation leaks.
Museum of the Rockies	12-14-2005	12-14-2005	3	3%	\$2.95	\$8,265	Install waterproofing at foundation.
Renne Library	11-09-2005	11-09-2005	2	1%	\$4.53	\$6,889	Repair foundation leak, Rm 88 @ old penetrations.
Romney Gymnasium	04-20-1994	04-20-1994	2	50%	\$5.62	\$149,138	DEWATER FOUNDATION & FLOOR SLAB.
Taylor Hall	04-09-2003	05-16-2006	2	10%	\$4.42	\$4,065	REPAIR FOUNDATION/RE-POINT.
Traphagen Hall	08-11-2004	08-11-2004	2	5%	\$3.32	\$6,144	EXCAVATE, WATERPROOF & DRAIN MISC FOUNDATION.
Visual Communications Building	08-09-1995	08-09-1995	2	10%	\$3.32	\$12,078	WATERPROOF NORTH FOUNDATION WALL.
Visual Communications Building	07-14-2004	07-14-2004	2	5%	\$3.32	\$6,039	REPAIR/REPLACE FOUNDATION WATER PROOF MEMBRANE AT GRADE.
Wool Lab	01-12-2000	01-12-2000	2	15%	\$4.42	\$4,933	REPAIR FOUNDATION CRACKING AROUND EXTERIOR BASEMENT WELLS.

Report 5

Montana State University - Facilities Condition Inventory Deficiency Detail by Building

Priorities

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Site: MSU-Bozeman Main Campus
 Building: Montana Hall
 Category: 3A
 Const. Date: 1896

Area Correction: 1.08
 Gross Area: 39,725 Sq Ft
 Cost/Sq Ft: \$186.82
 Replacement Cost: \$7,421,424

Last Audit Date: 12/12/2007
 Report Renewal Cost: \$1,613,937
 Deficiency Ratio: 21.7%

Entry #	Component	Initial Entry	Last Update	Pri	%	Unit Cost	Comp. Renew Cost	System Replace Cost	Description
System: Foundations (1)						Totals:	\$16,466	\$197,433	
572	Footings/Foundation Walls (A)	12-09-1992	12-09-1992	2	10%	\$3.32	\$13,189		REPOINT FOUNDATION WALLS AT BASEMENT INTERIOR.
1596	Exterior Steps/Retaining Walls (B)	12-08-2004	12-08-2004	2	5%	\$1.65	\$3,277		REPOINT NORTH ENTRY STEP RETAINING WALL.
System: Envelope (2)						Totals:	\$78,894	\$647,915	
573	Exterior Walls (A)	12-11-2001	12-11-2001	2	30%	\$4.34	\$51,722		CLEAN, POINT, REPAIR, AND WATERPROOF EXTERIOR MASONRY AND STONE.
1588	Exterior Doors/Hatches (C)	12-08-2004	12-08-2004	6	10%	\$0.89	\$3,536		REFINISH EXTERIOR DOORS.
1589	Interior Columns/Beams (D)	12-08-2004	12-12-2007	3	10%	\$5.95	\$23,636		CONDUCT SEISMIC STUDY.
System: Floor System (3)						Totals:	\$214,158	\$804,431	
574	Floor Structure (A)	12-11-2001	12-12-2007	2	10%	\$15.69	\$62,329		REPAIR/REPLACE MISCELLANEOUS SUB-FLOOR.
1592	Floor Structure (A)	12-08-2004	12-12-2007	3	20%	\$15.69	\$124,657		ELIMINATE FLOOR HEIGHT CHANGE AT DOORS AND HALLWAYS (3rd Floor).
575	Stair Treads/Risers (B)	12-09-1992	12-09-1992	2	15%	\$4.56	\$27,172		REPLACE BASEMENT STAIR, LANDING AND ACCESS LADDER.
System: Roof System (4)						Totals:	\$37,322	\$237,953	
576	Structure (A)	12-09-1992	12-09-1992	2	15%	\$1.73	\$10,309		DESIGN AND INSTALL STRUCTURAL ROOF BRACING. (ENGINEER REPORT)
578	Insulation (C)	12-11-2001	12-11-2001	2	50%	\$1.36	\$27,013		ADD AND REDISTRIBUTE ATTIC INSULATION TO PROVIDE EVEN COVERAGE.