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Report on the FY02 NASA-Wide Standardized Deferred Maintenance Assessment

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Space Administration Facilities Engineering Division



Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

March 2003

EXECUTIVE SUMMARY

PURPOSE

The purpose of this report is to provide an initial estimate of deferred maintenance (DM) cost and an assessment of the general condition of all the National Air and Space Administration (NASA) facilities using NASA’s recently developed deferred maintenance parametric estimating method. The DM method is designed to provide consistent, auditable deferred maintenance estimates at the Agency and Center levels, and to provide an assessment of the general condition of NASA facilities at the system level. Its intended use is as a facility performance metric which can be compared to, and trended against, other commonly used facility metrics. As assessments are repeated trends will develop that will prove useful in evaluating the overall effectiveness of the facility maintenance programs within NASA.

BACKGROUND

The Federal Accounting Standards Advisory Board (FASAB) requires federal agencies to report on facilities condition and the estimated cost range to remedy deferred maintenance of plant, property, and equipment (PP&E) in their Annual Accountability Reports. To meet this requirement NASA developed an Agency-wide deferred maintenance estimate, the Facility Investment Study (FIS). The FIS estimated both backlog of maintenance and repair (BMAR) and alteration requirements. Since 1997, the FIS has been updated to form the basis for the Agency’s facilities condition estimate referenced in the Annual Accountability Reports. NASA developed a new method of assessment, the DM method, when auditors of the fiscal year (FY)01 Accountability Report indicated that a new, more consistent method for estimating deferred maintenance was required for the FY02 Accountability Report. The new DM assessment, as approved by an independent audit firm, provides a facilities condition assessment that satisfies the FASAB Standard #6 and NASA’s requirement to advise Congress of facility conditions in the Agency’s Annual Accountability Report.

Although it is similar to BMAR in definition, DM differs in many ways.

<u>BMAR</u>	<u>DM</u>
<ul style="list-style-type: none">• Center (Local Use)• Detailed analysis and inspection• Different methods at each Center• Typically only active facilities• Very expensive (\$.30 to 1.50/sq ft)¹• Time Consuming	<ul style="list-style-type: none">• HQ (Strategic Use)• Rapid visual inspection• Consistent method• All facilities including, heritage, stand-by, out-grant, abandoned, and mothballed• Very inexpensive (\$.01 per sq ft)• Quick (20 – 40 buildings per day for a two-man team)

Because of these differences the Center BMAR cost estimates will most likely not be the same as the DM estimate.

¹ This number is used by NASA HQ as an average across NASA to approximate BMAR assessment costs. It was derived from the Federal Facilities Council (FFC) report, *Budgeting for Facilities Maintenance and Repair Activities: Report Number 131 (1996)*, and NASA experience at various Centers using the Department of Energy (DOE) condition assessment system (CAS) and the Office of Space Flight (OSF) assessment conducted by Bechtel National, Inc. in 1991. The 1991 OSF assessment covered roughly a quarter of NASA’s facility value and cost nearly \$12M.

PROCEDURE

The Agency-wide FY02 DM assessments conducted between June and September 2002 involved a rapid, systematic visual inspection of NASA facilities by two-person teams with vital input from local facilities management staff. The DM estimate was based upon condition ratings for nine primary systems in each facility, and the percentage contribution to overall CRV for each of those systems. The project entailed conducting facility assessments of 5,720 facilities either through site visits using the procedures specified in the DM Guidebook or through a remote assessment technique for selected low-value or remote sites. For these sites, the results were validated through statistical and qualitative analysis, and minor adjustments were made to the model to make it as representative as possible.

Upon completion of the assessments, NASA received a complete deferred maintenance database. The database reports the facility condition index of each facility system, facility, site, Center, Enterprise, and the Agency. The model will compute deferred maintenance by facility, by site, by Center, by Enterprise and for the overall Agency.

RESULTS

- The Agency FCI is 3.6 (on a scale from 5 (excellent) to 1 (bad) (Table 0-1, Summary Sheet). NASA's scientific (R&D type) facilities have an FCI of 3.7, and its operations facilities (mission and communications) have an FCI of 3.8. The FCI of inactive facilities including remote and low value sites is 2.5. A facility with a 4 rating would require some minor repairs and systems to *normally* function as intended. A facility with a 3 rating requires more minor repairs and some infrequent larger repair required, but systems occasionally are *unable to function as intended*.
- Site FCIs range from 2.4 to 4.7, indicating variations in conditions between some sites. Sites include all NASA sites including those that may not appear on Table 0-1 but can be found in Table 6-1.
- The Agency-wide 2002 DM estimate is ~\$2.0 billion, which is 10% of NASA's \$21 billion CRV. The DM estimate for active sites is ~\$1.6 billion and the DM estimate on inactive facilities is ~\$.4 billion.
- The DM estimate is more than double the Agency FY 01 BMAR estimate of ~\$1 billion.
- The cost to complete the NASA-wide DM parametric assessment was less than \$.01 per square foot versus the BMAR assessment costs that range between \$.30 and \$1.50 per square foot using traditional methods.
- As required by this task, teams assessed all NASA facilities, including those that are in mothballed, abandoned, heritage, out-grant or standby status, and those that are remote and low value. The DM estimate includes costs to repair facilities that NASA may not wish to maintain.
- The DM assessment identified NASA RPI records that required correction; however, these records did not immediately materially impact the results of the assessment.

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- NASA CRVs are on average 40% higher than CRV values suggested using the U.S. Department of Defense (DoD) Facility Sustainment Model (FSM).
- Several refinements in the DM assessment system were made to improve the applicability of the results, and have been addressed in a revised DM Assessment Guide.
- DM assessments do not include costs associated with environmental contamination/remediation, such as asbestos removal, lead paint removal, Americans with Disabilities Act (ADA) considerations, or changed safety regulations and codes.

Table 0-1 shows Center (all numbers include all sites), Enterprise, and Agency FY 01 CRV values. It compares reported FY01 BMAR results to the FY02 DM results. It shows the total *weighted* FCI. The table gives the estimated DM cost for both active and inactive facilities. It gives the *average* FCI for the active and inactive facilities. See Table 6-1 for complete table. FCI calculations are demonstrated in paragraph 2.2.6.

NASA Sites	Total CRV (\$B)	Total '01 BMAR (\$B)	Total '02 DM (\$B)	Total FCI (Wgtd)	Active Facilities '02 DM (\$B)	Active Facilities FCI (Avg)	Inactive Facilities '02 DM (\$B)	Inactive Facilities FCI (Avg)
Ames Research Center Total	3.48	0.07	0.23	3.8	0.14	3.3	0.09	2.9
Dryden Flight Research Center Total	0.26	0.01	0.01	4.1	0.01	3.2	na	na
Glenn Research Center Total	2.44	0.05	0.27	3.6	0.14	3.6	0.13	2.5
Langley Research Center Total	2.55	0.03	0.29	3.7	0.24	3.4	0.04	2.2
Code R(Aerospace Technology)	8.73	0.16	0.80	3.7	0.53	3.4	0.27	2.3
Goddard Space Flight Center Total	1.55	0.18	0.10	3.9	0.06	3.7	0.03	1.7
Code Y (Earth Science)	1.55	0.18	0.10	3.9	0.06	3.7	0.03	1.7
Jet Propulsion Laboratory Total	1.01	0.03	0.05	4.1	0.05	3.8	0.01	3.3
Code S (Astrobiology and Space Research/ Science)	1.01	0.03	0.05	4.1	0.05	3.8	0.01	3.3
Johnson Space Center Total	1.71	0.20	0.12	3.6	0.12	3.6	0.00	1.0
Kennedy Space Center Total	4.36	0.08	0.51	3.3	0.48	3.8	0.03	2.4
Marshall Space Flight Center Total	2.45	0.23	0.17	3.9	0.13	3.9	0.05	3.4
Stennis Space Center Total	1.57	0.08	0.28	3.1	0.28	3.6	0.00	1.9
Code M (Human Exploration and Development of Space)	10.09	0.59	1.08	3.5	1.00	3.7	0.08	2.5
NASA Total (\$B)	21.4	.95	2.03	3.6	1.64	3.6	0.39	2.5

Table 0-1. Summary Sheet

Table 0-2 provides system condition index by Center (with all sites included), Enterprise, and Agency. When compared to the NASA FCI (3.6) the average system condition index (3.7) appears high. This is because the system condition index is a straight average and is not weighted by CRV as is the FCI. For a detailed explanation see paragraph 2.2.6

NASA Sites	Structure	Roof	Exterior	Interior Finishes	Electric	HVAC	Plumbing	Conveyance	Equipment
Ames Research Center Average	3.7	3.0	3.3	3.3	2.9	3.2	3.4	3.7	3.2
Dryden Flight Research Center	4.7	4.2	4.5	4.3	3.6	4.2	4.5	4.6	4.8
Glenn Research Center Average	3.9	3.6	3.7	3.5	3.1	3.5	3.2	3.6	3.8
Langley Research Center	4.2	3.9	3.9	3.6	2.4	3.6	3.7	4.1	4.0
Code R (Aerospace Technology) Average	4.1	3.7	3.9	3.7	3.0	3.6	3.7	4.0	4.0
Goddard Space Flight Center Average	3.6	3.4	3.5	3.5	3.6	3.3	3.3	3.4	4.0
Code Y (Earth Sciences) Average	3.6	3.4	3.5	3.5	3.6	3.3	3.3	3.4	4.0
Jet Propulsion Laboratory Average	4.2	4.0	3.8	4.2	3.7	4.0	4.1	4.3	4.2
Code S (Astrobiology and Space Research/Science) Average	4.2	4.0	3.8	4.3	3.7	4.0	4.2	4.2	4.2
Johnson Space Center Average	4.1	3.8	4.0	4.1	3.3	3.8	3.9	4.4	4.1
Kennedy Space Center Average	3.8	3.3	3.5	3.4	3.5	3.4	3.5	3.7	3.7
Marshall Space Flight Center Average	4.3	3.8	3.6	3.6	3.7	3.7	3.9	4.1	4.0
Stennis Space Center Average	3.4	3.4	3.2	3.4	2.8	3.0	3.1	3.3	3.4
Code M (Human Exploration and Development of Space) Average	3.9	3.6	3.6	3.6	3.3	3.5	3.6	3.9	3.8
NASA Total	4.0	3.7	3.7	3.8	3.4	3.6	3.7	3.9	4.0

Table 0-2. System Condition Index

Table 0-3 provides total DM cost (\$M) results per system for Centers (with all sites included), Enterprise, and Agency.

NASA Sites	Structure	Roof	Exterior	Interior Finishes	Electric	HVAC	Plumbing	Conveyance	Equipment
Ames Research Center	72	24	13	9	76	17	6	1	12
Dryden Flight Research Center	1	1	0	0	3	1	0	0	0
Glenn Research Center	79	15	18	19	78	36	18	2	7
Langley Research Center	12	10	11	16	192	17	5	2	24
Code R(Aerospace Technology)	164	50	42	44	349	71	30	4	42
Goddard Space Flight Center	32	10	14	5	15	14	5	0	0
Code Y (Earth Science)	32	10	14	5	15	14	5	0	0
Jet Propulsion Laboratory	10	5	11	2	14	4	1	0	4
Code S (Astrobiology and Space Research/ Science)	10	5	11	2	14	4	1	0	4
Johnson Space Center	17	16	5	7	30	36	6	1	2
Kennedy Space Center	102	76	51	37	154	49	34	2	2
Marshall Space Flight Center	23	21	17	10	53	23	12	2	11
Stennis Space Center	63	11	12	5	120	15	5	4	47
Code M (Human Exploration and Development of Space)	205	124	85	59	357	124	56	9	62
NASA Total	411	189	152	110	735	214	92	14	109

Table 0-3. DM Cost by System (\$M)

CONCLUSIONS

- NASA’s facilities are in good to fair condition (3.6) with the critical facilities (scientific and operations) generally in better condition (3.7 and 3.8, respectively) than the other facilities. There was no indication that NASA missions have been impacted by poor facilities. However, considering these ratings range between *normally* function as intended and *occasionally are unable to function as intended*, these ratings are too low for critical facilities because the potential exists that missions and programs may be impacted.
- The DM method will provide data that meets the established accounting standards at less cost than the previous system.
- Updating of NASA RPI records will make future assessments easier to perform and more accurate.
- The difference between the BMAR estimate and the DM estimate is due to the assessment of all facilities including inactive facilities, differences in Center-developed procedures for BMAR content, revision of the facilities inventory, and use of a standard methodology.
- Assessments of *all* facilities should be done annually if economically feasible. Consistent, continued assessments will provide valid data on trends and actions needed to determine proper maintenance and renewal funding for NASA facilities.
- It is possible to assess remote and low value sites without a visit by an assessment team.

- It is likely that the NASA CRVs are higher than the DoD FSM in similar facility categories due to the complexity of NASA facilities, including the cost of large amounts of collateral equipment.
- The FCI can be greatly impacted by a few facilities that make up a high percentage of a Center's CRV.²
- Analysis found that this low cost assessment method produces consistent, repeatable results that are sufficient for their intended use, which is to provide deferred maintenance estimates for a large population of facilities across the entire Agency.

RECOMMENDATIONS

- NASA should improve critical facilities to a level where they will normally *function as intended*. This would typically mean a FCI above 4.
- NASA should share the DM results with each Center. Constructive Center feedback may improve the utility of the DM results. Center input will effectively and efficiently make needed corrections to the RPI.
- NASA should take full advantage of the DM database, which provides a powerful tool for analyzing facilities in a variety of ways. For example, the DM database can be utilized to identify trends in facility or system condition if studies are replicated over time (e.g., candidate facilities for demolition or alternate use, or candidate systems to receive more detailed facility condition assessments).
- The NASA Enterprises should develop a criticality factor for each facility or class of facility. This would allow the database to be sorted by criticality and help focus facility maintenance and repair investments on the more critical facilities.
- Due to the critical nature of many NASA facilities, the replacement of aging, obsolete, and potentially dangerous electrical and mechanical systems should be investigated.
- NASA should evaluate the RPI and CRV variances identified (including the large variation between NASA CRV values and DoD suggested values).
- NASA should reassess all facilities in 2003, including those overseas sites that were assessed this year (Kokee Park Geophysical Observatory (KPGO), Madrid Deep Space Communications Complex (MDSCC) and Canberra Deep Space Communications Complex (CDSCC)). Remote and low value sites should be assessed without site visits using the method and techniques outlined in section 3.
- For subsequent years, NASA should visit all facilities every third year. This provides a balance between the economics of completing the assessment and the ability of NASA to develop valid data on trends and actions needed to determine proper maintenance and renewal funding for NASA facilities. During “non-visit” years assessments can be

² For example, at Stennis Space Center (SSC) four test stands (A-1, A-2, B-1, B-2) make up 37% of SSC's CRV. These assets have an average FCI of 2.2. SSC has a Center FCI of 3.1. Without these four test stands the SSC FCI would be 3.6. Thus, the FCI appears incorrect to the casual observer, but it is correct when considering the impact of the CRV on the FCI.

updated by local facilities personnel familiar with the DM method, who would perform assessments by exception (e.g., only on those facilities that have undergone minor³ or major repair⁴ projects, or new construction projects since the previous assessment, and including Center information on new problems). This data would be reported to NASA headquarters (JX) for inclusion in the data base.

- Remote and low value facilities should continue to be assessed by using anecdotal information and by record research as described in section 3.

³ NASA Policy Guide (NPG) 8831.2D Appendix A defines minor facility work as construction and revitalization work in excess of \$500,000 but not exceeding \$1,500,000

⁴ NPG 8831.2D Appendix A defines major facility work as construction and revitalization work in excess of \$1,500,000 and Land Acquisition and Emergency Repair approved under the provisions of Section 308(b) of the National Aeronautics and Space Act of 1958 (as amended) at any cost.

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Acronyms

ADA	Americans with Disabilities Act
ARC	Ames Research Center
ASTM	American Society for Testing of Materials
ATK	Alliant Techsystems (Brigham City, Utah)
BMAR	Backlog of Maintenance and Repair
CAS	Condition Assessment System
CDSCC	Canberra Deep Space Communications Complex
CER	Cost Estimating Relationships
COD	Center Operations Directorate
CRV	Current Replacement Value
DFRC	Dryden Flight Research Center
DM	Deferred Maintenance
DoD	Department of Defense
DOE	Department of Energy
DSN	Deep Space Network
FASAB	Federal Accounting Standards Advisory Board
FCI	Facility Condition Index
FFC	Federal Facilities Council
FIS	Facility Investment Study
FSM	Facility Sustainment Model
FY	Fiscal Year
GRC	Glenn Research Center
GSFC	Goddard Space Flight Center
HSTDN	Hawaii Space Flight Tracking and Data Network
HVAC	Heating, Ventilation, and Air Conditioning Systems
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Center
JX	NASA Headquarters Facilities Engineering Division
KPGO	Kokee Park Geophysical Observatory
KSC	Kennedy Space Center
LaRC	Langley Research Center
MAF	Michoud Assembly Facility
MFA	Moffet Federal Airfield
MDSCC	Madrid Deep Space Communications Complex
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NPG	NASA Policy Guide
NSBF	National Scientific Balloon Facility
O&M	Operations and Maintenance
OSF	Office of Space Flight
PACES	Parametric Cost Estimating System
PBS	Plum Brook Station
PDA	Personal Digital Assistant
PFR	Poker Flats Research Range

PM	Preventive Maintenance
POC	Point of Contact
PP&E	Plant, Property and Equipment
PSTDN	Ponce De Leon Space Flight Tracking and Data Network
RPI	Real Property Inventory
SCI	System Condition Index
SCTF	Sonny Carter Training Facility
SSC	Stennis Space Center
SSFL	Santa Susanna Field Laboratory
STDN	Space Flight Tracking and Data Network
TDRSS	Tracking and Data Relay Satellite System
USACE	U.S. Army Corps of Engineers
WWF	Wallops Flight Facility
WSTF	White Sands Testing Facility

1.0 FISCAL YEAR 2002 NASA–WIDE STANDARDIZED DEFERRED MAINTENANCE PARAMETRIC ESTIMATE REPORT

1.1 PURPOSE

This report provides the results of the 2002 National Aeronautics and Space Administration (NASA) deferred maintenance (DM) assessment using the recently developed NASA DM parametric estimating method. The DM method enables a rapid, low-cost, consistent assessment of the condition of NASA’s facilities worldwide. The DM method is designed for application to a large population of facilities.

The DM assessment results provide a facilities condition assessment that satisfies the Federal Accounting Standards Advisory Board (FASAB) Standard #6.⁵ The DM results will satisfy NASA’s requirement to report on facilities condition in the Agency’s Annual Accountability Report. The Facilities Engineering Division, Headquarters Enterprises, and the Comptroller can utilize the DM results to provide another useful metric of facilities requirements during their budget evaluation process.

1.2 BACKGROUND

The FASAB requires federal agencies to report on facilities condition and the estimated cost range to remedy deferred maintenance of plant, property, and equipment (PP&E) in their Annual Accountability Reports. To meet this requirement NASA Policy Guide (NPG) 8831.2D, *Facilities Maintenance Management*, requires periodic condition assessments of Center facilities by completing a 100% inspection or by routine inspections scheduled throughout the prescribed 5-year cycle. Centers annually report the results of these condition assessments as the backlog of maintenance and repair (BMAR). NPG 8831.2D further defines BMAR as:

“The NASA unfunded facilities maintenance required to bring facilities and collateral equipment to a condition that meets acceptable facilities maintenance standards.”

Within NASA, BMAR estimates have historically been used as a vehicle to support the Agency’s Annual Accountability Report, providing both a functional performance metric trended over time and a reference point when reviewing annual maintenance budgets.

In 1997, NASA developed an Agency-wide deferred maintenance estimate, the Facility Investment Study (FIS). The FIS estimated both BMAR and alteration requirements. Since 1997, the FIS has been updated to form the basis for the Agency’s facilities condition estimate referenced in the Annual Accountability Reports. Auditors of the FY01 Accountability Report indicated that a new, more consistent method for estimating deferred maintenance was required for the FY02 Accountability Report.

⁵ Federal Accounting Standards Advisory Board. *Deferred Maintenance Reporting For Federal Facilities, Meeting the Requirements of Federal Accounting Standards Advisory Board Standard Number 6, as Amended, Accounting for Property, Plant and Equipment (PP&E)*, June 1996. GPO #041-001-00462-9.

Table 1-1. BMAR and DM Comparison

BMAR	DM
Center (Local Use)	HQ (Strategic Use)
Detailed analysis and inspection	Rapid visual inspection
Different methods at each Center	Consistent method
Typically only active facilities	All facilities including, heritage, stand-by, out-grant, abandoned, and mothballed
Very expensive (\$.30 to 1.50/sq ft)	Very inexpensive (\$.01 per sq ft)
Time Consuming	Quick (20 – 40 buildings per day for a two-man team)

The Federal Facilities Council (FFC) Standing Committee on Operations and Maintenance had recently completed a study to identify issues related to the reporting of DM for facilities. The study, entitled, *Deferred Maintenance Reporting for Federal Facilities: Meeting the Requirements of Federal Accounting Standards Advisory Board Standard Number 6, as Amended*, reviewed DM reporting requirements. The study reviewed

alternative options, including parametric estimations, for developing credible, consistent, auditable, and cost effective DM estimates. The FFC report can be viewed online at <http://books.nap.edu/catalog/10095.html>.

Concurrently with the FFC study, NASA leadership supported a parametric cost estimating system as a cost-effective and credible alternative for estimating DM. Parametric cost estimating is an accepted technique used by contractors and the government in planning, budgeting, and performance stages of the acquisition process. The technique expedites the development of cost estimates and is appropriate when discrete estimating techniques would require inordinate amounts of time and resources, without leading to significant improvements in estimate accuracy or probability of obtaining additional resources.

2.0 THE NASA DM METHOD

2.1 INTRODUCTION

The NASA Deferred Maintenance (DM) Parametric Estimating Method was adopted in August 2001. NASA commissioned a pilot of the DM method at Marshall Space Flight Center (MSFC) in late 2001. Three two-person teams completed the MSFC assessments. The analysis from that test resulted in minor adjustments to the method. During the full assessment, the DM method was further refined as the data from various inspections was analyzed.

2.2 THE THEORETICAL MODEL

This process of documenting deferred maintenance is designed to be a simplified approach based on existing empirical data. The method assumes that:

- (1) condition assessments are performed at the system level rather than the component level;
- (2) simple condition levels are used;
- (3) there are a limited number of systems to assess; and
- (4) the current replacement values (CRV) of the systems and the facility they support are available.

To perform the deferred maintenance estimate a parametric cost estimate model similar to Figure 2-1 is used. This is a model that uses cost estimating relationships (CERs) based on existing engineering data and associated mathematical algorithms (or logic) to establish cost estimates. For example, detailed cost estimates for the repair of a building system (i.e., its plumbing system) can be developed using very precise work measurement standards. However, if history has demonstrated that repairs (as the dependent variable) have normally been valued at about 25% of the original value (the independent variable), then a detailed estimate need not be performed and can simply be computed at the 25% (CER) level. It is important, though, that any CERs used be carefully tested for validity using standard statistical approaches.

Parametric techniques focus on the cost drivers, not the miscellaneous details. The drivers are the controllable system design or planning characteristics, and have a predominant effect on system cost. This technique uses the few important parameters that have the most significant cost impact on the product being estimated, in this case the deferred maintenance of systems within a facility.

2.2.1 Establish Deferred Maintenance Facility Category Codes

The first step in the process is to determine the facilities to be assessed and group them by categories. The category codes group facilities whose systems are similar and have the approximate relative system CRV percentage values. For example, one category may be administrative buildings. These are facilities that function like office buildings, and have a structure, a roof, an exterior, interior finishes and typical mechanical systems (HVAC, electrical and plumbing). Another category may be laboratories. Laboratories have the same systems as an administrative building, with structure, roof, exterior, interior finishes and mechanical systems. But their percent contribution to the CRV will be different, so these building types need to be separate in the model. Yet a third category may be technical facilities. These facilities are not traditional buildings, and may include antennas, fueling stations, or other

structures that have correspondingly different cost models for purposes of estimating DM. Correct mapping of like facilities is essential to ensuring that all systems contributions to the CRV, and thus the DM, are accounted for.

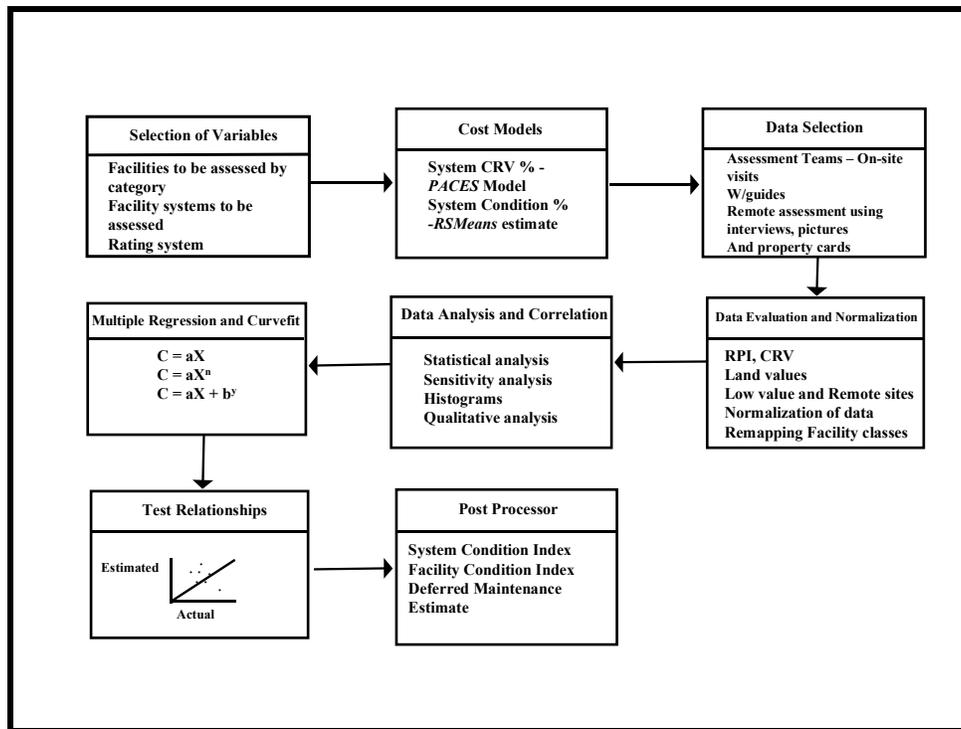


Figure 2-1. Theoretical Model for Parametric Estimates

2.2.2 Determine Facility Systems to be Assessed

Once the facilities are categorized, the facility systems to be assessed are identified by using building system classification. An example of such a system is the American Society for Testing of Materials (ASTM) UNIFORMAT II Classification for Building Elements. The system includes, but is not limited to structure, roof, exterior, interior finishes, and mechanical systems.

2.2.3 Determine System CRV Percentages

Each system is then assigned representative cost factors based on the estimated percent contribution of the major system to total CRV of the facility within a facility category. For example, in a simple administrative building the structure may contribute 35% to the CRV, the roof 15%, the exterior 10%, the interior 10% and the mechanical systems 30%; all contributing to equal 100% of the CRV. But, in complex laboratory and testing facilities, electrical systems make up a larger percentage of the overall building cost; so the breakdown might be structure 25%, roof 15%, exterior 10%, interior 10% and the mechanical systems 40%. The CRV system percentages are derived from existing engineering data and adjusted, if necessary, to meet unique facility types.

2.2.4 Establish Condition Assessment Rating Scheme

A condition rating scheme must be established for the assessment teams to use. Rating schemes can range from very simple to very complex. For example, a simple 5-tiered condition code system may be used:

Condition Assessment Level

- **5: Excellent.** Only normal scheduled maintenance required.
- **4: Good.** Some minor repairs needed. System normally functions as intended.
- **3: Fair.** More minor repairs and some infrequent larger repair required. System occasionally unable to function as intended.
- **2: Poor.** Significant repairs required. Excessive wear and tear clearly visible. Obsolete. System not fully functional as intended. Repair parts not easily obtainable. Does not meet all codes.
- **1: Bad.** Major repair or replacement required to restore function. Unsafe to use.

2.2.5 Determine System Condition Percentage

A significant component of the DM estimate is the application of a system condition percentage based on the assigned condition rating for each system. The system condition percentages, based on existing engineering data, increase as the condition of the system gets lower ratings, creating a larger DM estimate. For example, (using the condition assessments above) if the structure of a facility receives a 5 rating its contribution to DM is 0% because there is typically no deferred maintenance for this rating. However, if the structure received a 3 rating its contribution to the deferred maintenance will be 27% of the CRV of the building. The system condition percentages also vary by system. Continuing with the example, in the same building, a 3 rating for the electrical system may contribute 10% of the CRV, or the plumbing system may contribute 27% of the CRV.

2.2.6 Facility Condition Index Calculations

After the condition rating scheme was established, teams went to the field to assess the facilities using the rating system above. The teams rated each system in each facility and entered that information into the database from which is generated a System Condition Index (SCI) for each system, and a Facility Condition Index (FCI) for each facility, site, and the Agency as a whole. Both the SCI and the FCI are CRV-based weighted averages of the condition ratings for each system within each facility where facilities or systems with higher CRVs contribute more to the overall FCI.

The building FCI is a simple calculation that weights each of the nine system condition ratings by its associated system percentage per DM category. In each system the rating is multiplied by the percent system CRV to get a weighted SCI. The sum of the nine weighted system FCIs equals the facilities FCI. Table 2-1 is an example.

Facility Description	Facility CRV \$	STRUC		EXT		ROOF		HVAC		ELEC		PLUMB		CONV		INTF		EQUIP		FCI
		Insp Rat	% Sys CRV																	
WAREHOUSE	1,172,019	4	0.40	3	0.19	2	0.06	0	0.18	3	0.20	0	0.02	0	0	3	0.15	0	0	3.3
COVERED STORAGE	102,267	5	0.63	5	0.22	5	0.11	0	0.03	5	0.04	0	0.01	0	0	0	0.04	0	0	5
FEMA EQUIPMENT STORAGE SHED	92,789	5	0.48	5	0.17	5	0.05	0	0.15	5	0.15	0	0.15	0	0	5	0.15	0	0	5
GENERAL WAREHOUSE	7,781,631	4	0.60	4	0.15	4	0.10	3	0.04	3	0.06	4	0.01	0	0	4	0.04	0	0	3.9
ADMINISTRATION BUILDING	12,166,903	5	0.19	5	0.17	3	0.06	4	0.16	4	0.18	4	0.05	5	0.03	5	0.16	0	0	4.4
AUDITORIUM	6,306,944	3	0.22	4	0.17	4	0.06	4	0.16	2	0.18	4	0.05	0	0.03	2	0.16	0	0	3.1
MAIN LIBRARY	5,716,090	5	0.19	4	0.17	4	0.06	4	0.16	4	0.18	4	0.05	4	0.03	4	0.16	0	0	4.2
PHOTOTECHNOLOGY LAB.	10,960,633	4	0.18	3	0.19	4	0.04	3	0.15	4	0.20	4	0.04	5	0.01	5	0.15	5	0.04	3.9

Table 2-1. Facility FCI Example

Table 2-2 is an example of a weighted Center FCI. The Center FCI value is a sum of each facility’s weighted FCI. Each facility CRV is divided by the total Center CRV then multiplied by the facility FCI producing a weighted FCI. (Weighted FCI = (Facility CRV ÷ Center CRV) × Facility FCI). The sum of these weighted facility FCIs provides a total Center FCI.

Center "A"		Facility FCI	Weighted FCI
Facility Description	Facility CRV \$		
WAREHOUSE	1,172,019.00	3.3	0.1
COVERED STORAGE	102,267.00	5.0	0.0
FEMA EQUIPMENT STORAGE SHED	92,789.00	5.0	0.0
GENERAL WAREHOUSE	7,781,631.00	3.9	0.7
ADMINISTRATION BUILDING	12,166,903.00	4.5	1.2
AUDITORIUM	6,306,944.00	3.1	0.4
MAIN LIBRARY	5,716,090.00	4.2	0.5
PHOTOTECHNOLOGY LAB.	10,960,633.00	3.9	1.0
Center "A" Totals	44,299,276.00		3.9

Table 2-2. Center FCI Example

2.2.7 Deferred Maintenance Calculation

The facility DM estimate is determined by adding the deferred maintenance estimates of the nine facility systems. Table 2-3 provides a sample deferred maintenance estimate for an administrative facility (DM category 5) with a CRV of \$10 million.

System	System %	CRV Total \$	System Rating	System Condition CRV %	DM \$
Structure	0.18	1,800,000	5	0.00	0
Exterior	0.17	1,700,000	4	0.05	85,000
Roofing	0.05	500,000	4	0.05	25,000
HVAC	0.16	1,600,000	3	0.15	240,000
Electrical	0.18	1,800,000	4	0.05	90,000
Plumbing	0.05	500,000	3	0.15	75,000
Conveying	0.06	600,000	5	0.00	0
Interior Finishes	0.15	1,500,000	3	0.20	300,000
Facility Equipment	0.00	0	0	0.00	0
Total	1.00	10,000,000			\$815,000

Table 2-3. Sample Deferred Maintenance Calculation

2.3 THE MODEL AS USED

2.3.1 Deferred Maintenance Facility Category Codes

Using the NASA real property inventory (RPI), the first step in building the DM database was to map each of the over 400 NASA facility classes into 42 Deferred Maintenance Facility Categories, as shown in Table 2-4 and Appendix A. It is important to develop the correct facility category to provide more complete reflection of the system CRV percentages in the different facility types, ultimately creating a more representative DM cost.

It was first necessary to reduce the number of NASA classes to simplify data management. The categories were determined based on facility similarity. Separate categories are created for similar facility types. For example, deferred maintenance category 12, Communication and Tracking Buildings, includes NASA facility classes 131 and 140. These are facilities that function more like traditional buildings. Category 13, Communications and Tracking Facilities, includes NASA facility classes 132 and 141. These facilities are not traditional buildings, and may include antennas, fueling stations, or other structures that have correspondingly different cost models for purposes of estimating deferred maintenance. Section 4.4.2 explains more on the development of the 42 facility category codes.

2.3.2 Facility Systems

To begin the DM estimating process the building systems to be assessed must be chosen. The DM facility systems were developed from a review of other DM estimating methods for facilities and the ASTM UNIFORMAT II Classification for Building Elements. The following nine systems were selected for the NASA DM method:

- Structure: foundations, superstructure, slabs and floors, and pavements that are adjacent to, and considered part of, the facility.
- Exterior: wall coatings, windows, doors, and exterior sealants.
- Roofing: roof coverings, openings, gutters and flashing.
- HVAC: heating, ventilating and air conditioning systems, including controls and balancing devices.

- Electrical: service and distribution, lighting, communications, security and fire protection wiring and controls.
- Plumbing: water, sewer and fire protection piping, or piping for steam, gas, or water distribution in specialty systems (e.g., tanks, generation plants, etc.).
- Conveying: elevators, escalators, cranes and other lifts.
- Interior: all interior finishes including wall coverings, flooring, and ceilings.
- Program Support Equipment: installed in the facility to provide support for operational testing or research. For example, additional ventilation equipment or separate HVAC systems required only to support special testing or programs.

2.3.3 Current Replacement Value and System CRV Percentages

The NASA RPI system contains the CRV for each facility. Table 2-4 shows how the CRV is apportioned between each of the nine facility systems. The CRV System percentages are derived from the *Parametric Cost Estimating System (PACES)*⁶, an accepted estimating tool for federal construction projects. The *PACES* method was derived from an evaluation of more than \$40 billion of federal facilities projects.

Table 2-4. DM Categories with CRV % Values (continues next page)

DM Cat	NASA_BLDG	STRUC	EXT	ROOF	HVAC	ELEC	PLUMB	CONV	INTF	EQUIP	SUM
1	R&D and Test Buildings	0.18	0.19	0.04	0.15	0.20	0.04	0.01	0.15	0.04	1.00
2	R&D Structures and Facilities	0.40	0.17	0.01	0.06	0.25	0.02	0.02	0.03	0.04	1.00
3	Wind Tunnels	0.30	0.05	0.01	0.01	0.15	0.01	0.01	0.01	0.45	1.00
4	Engine/Vehicle Static Test Facilities	0.38	0.03	0.01	0.04	0.26	0.01	0.03	0.02	0.22	1.00
5	Administrative Buildings	0.19	0.17	0.06	0.16	0.18	0.05	0.03	0.16	0.00	1.00
6	Training Buildings	0.18	0.20	0.05	0.12	0.21	0.05	0.01	0.18	0.00	1.00
7	Trailers	0.20	0.19	0.06	0.18	0.20	0.02	0.00	0.15	0.00	1.00
8	Storage Buildings	0.60	0.15	0.10	0.04	0.06	0.01	0.00	0.04	0.00	1.00
9	Storage Facilities	0.55	0.22	0.11	0.03	0.04	0.01	0.00	0.04	0.00	1.00
10	Fuel Storage Tanks	0.70	0.13	0.02	0.00	0.10	0.05	0.00	0.00	0.00	1.00
10.1	Specialized Liquid Storage Tanks	0.51	0.13	0.02	0.00	0.14	0.20	0.00	0.00	0.00	1.00
10.2	Fueling Stations & Systems	0.40	0.10	0.05	0.05	0.15	0.20	0.00	0.05	0.00	1.00
11	Magazines	0.33	0.30	0.05	0.06	0.15	0.02	0.00	0.09	0.00	1.00
12	Comm. & Tracking Buildings	0.21	0.20	0.05	0.16	0.18	0.05	0.00	0.15	0.00	1.00
13	Comm. & Tracking Facilities	0.55	0.10	0.02	0.05	0.26	0.00	0.00	0.02	0.00	1.00
13.1	Large Antennas	0.20	0.20	0.02	0.05	0.15	0.02	0.01	0.02	0.33	1.00
13.2	Small Antennas	0.50	0.30	0.00	0.00	0.10	0.00	0.00	0.00	0.10	1.00
14	Mission Control Operations Buildings	0.22	0.13	0.05	0.15	0.20	0.04	0.02	0.10	0.09	1.00

⁶ *PACES* is an integrated PC-based parametric budgeting and cost estimating system developed by Earth Tech (<http://earthtech.talpart.com>) that prepares parametric cost estimates for new facility construction and renovation. It was developed for military facility application and will soon be commercialized for use in the general building, industrial facilities, and transportation industries. *PACES* is available to military personnel via the U.S. Air Force. A U.S. Government employee can obtain a copy of the current military version of *PACES* by contacting the Air Force Civil Engineer Support Agency.

DM Cat	NASA_BLDG	STRUC	EXT	ROOF	HVAC	ELEC	PLUMB	CONV	INTF	EQUIP	SUM
15	Lighting	0.17	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	1.00
16	Electrical Distribution System	0.39	0.03	0.00	0.00	0.58	0.00	0.00	0.00	0.00	1.00
16.1	<i>Power Generation/Power Plant</i>	0.30	0.10	0.05	0.10	0.39	0.01	0.00	0.05	0.00	1.00
16.2	<i>Electric Substations, Switchgear & Transfer Yards</i>	0.10	0.07	0.00	0.00	0.83	0.00	0.00	0.00	0.00	1.00
17	HVAC Distribution	0.30	0.10	0.00	0.00	0.33	0.27	0.00	0.00	0.00	1.00
17.1	<i>HVAC Generation</i>	0.20	0.10	0.05	0.35	0.10	0.15	0.00	0.05	0.00	1.00
18	Waste Water Collection & Disposal System	0.50	0.02	0.02	0.00	0.05	0.41	0.00	0.00	0.00	1.00
18.1	<i>Waste Water Facilities & Treatment Plants</i>	0.34	0.10	0.05	0.03	0.15	0.32	0.00	0.01	0.00	1.00
18.2	<i>Storm drains, Ditches, Dams, Retaining walls</i>	0.90	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.00	1.00
19	Potable Water Distribution System	0.38	0.05	0.02	0.00	0.05	0.50	0.00	0.00	0.00	1.00
19.1	<i>Potable Water Facilities & Treatment Plants</i>	0.25	0.05	0.05	0.03	0.24	0.37	0.00	0.01	0.00	1.00
20	Launch Pads	0.51	0.10	0.03	0.03	0.25	0.04	0.02	0.02	0.00	1.00
20.1	<i>Launch support camera pads</i>	0.80	0.10	0.00	0.00	0.10	0.00	0.00	0.00	0.00	1.00
20.2	<i>Launch propellant & high pressure gas facilities</i>	0.48	0.05	0.02	0.00	0.20	0.25	0.00	0.00	0.00	1.00
21	Pavement	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
22	Rail	0.95	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	1.00
23	Maintenance Facilities & PW Shops	0.20	0.14	0.06	0.13	0.30	0.09	0.00	0.08	0.00	1.00
23.1	<i>Operational maintenance. facilities</i>	0.20	0.14	0.06	0.13	0.28	0.09	0.02	0.08	0.00	1.00
24	Other Buildings	0.22	0.15	0.12	0.10	0.15	0.11	0.00	0.15	0.00	1.00
25	Other Facilities	0.71	0.10	0.02	0.05	0.10	0.01	0.00	0.01	0.00	1.00
26	Land & Easements	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
27	Compressed Air Distribution	0.50	0.00	0.00	0.00	0.10	0.40	0.00	0.00	0.00	1.00
27.1	<i>Compressed Air Generation</i>	0.25	0.10	0.05	0.05	0.15	0.35	0.00	0.05	0.00	1.00
28	Prefab buildings, various uses	0.18	0.17	0.05	0.15	0.15	0.15	0.00	0.15	0.00	1.00
29	Berthing & Housing	0.15	0.17	0.09	0.16	0.18	0.07	0.02	0.16	0.00	1.00

Table 2-4. DM Categories with CRV % Values. Italicized facility categories are those added to the original list of 25 after analysis as discussed in Section 4.4.

2.3.4 Condition Assessment Ratings

Assessors assigned a condition rating from 5 to 1 for each facility system based on a systematic visual inspection and limited Center input. The *NASA DM Method Guide* includes specific definitions for the 5 to 1 ratings for each system. The general guiding definitions are:

- **5: Excellent.** Only normal scheduled maintenance required.
- **4: Good.** Some minor repairs needed. System normally functions as intended.
- **3: Fair.** More minor repairs and some infrequent larger repair required. System occasionally unable to function as intended.
- **2: Poor.** Significant repairs required. Excessive wear and tear clearly visible. Obsolete. System not fully functional as intended. Repair parts not easily obtainable. Does not meet all codes.
- **1: Bad.** Major repair or replacement required to restore function. Unsafe to use.

- **0:** This system does not exist. In some cases a facility may not have one or more systems (for example antennas do not typically have roofs, interiors, HVAC, conveying, or plumbing).

Figure 2-2 is an example of the rating criteria for structure given to the assessors.

Figure 2-2. Rating Guidance Given to Assessors for Structure

		Foundations, super structure, slab, basement walls, floors, exterior stairway, loading docks, sidewalks, parking lots. Do not confuse structure and exterior. Structure is the foundation, supporting walls and columns, and exterior parking areas. Judgment must be used; most buildings don't show much structural problems; minor crazing or cracking that you would not bother to repair does not suggest a deferred maintenance item. Parking lot and pavements are more of an issue, and may dictate a downgrade to 4 or 3 rating; use your judgment on how far to degrade based upon relative size of parking and pavements to overall structure.
Rating	STRUCTURE	
5	Excellent	Only normal preventive maintenance required.
4	Good	Some minor repairs could be required. Does not effect structural integrity or intended use.
3	Fair	Cracking, crazing, and/or visual defects. Could affect structural integrity or intended use.
2	Poor	Visible settlement, structural defects, significant repairs required.
1	Bad	Unrepairable, replacement required.

2.3.5 Estimated Repair Cost as a Percentage of CRV by System Condition

SYSTEM	5	4	3	2	1
STRUC	0	1	10	25	150
EXT	0	1	10	50	101
ROOF	0	9	38	75	150
HVAC	0	2	13	63	133
ELEC	0	2	13	63	133
PLUMB	0	2	10	57	121
CONV	0	2	13	50	100
INTF	0	1	10	50	101
EQUIP	0	2	13	50	100

Table 2-5. System Condition Percentages.

Percentages over 100 account for demolition and disposal costs

Each condition rating has a corresponding system condition percentage. These percentages vary by system type, and are provided in Table 2-5. This table is crucial to the applicability of the DM method and as such it received analysis by several engineering sources. Through the use of a survey of major and minor repairs at Kennedy Space Center (KSC), combined with an estimated original construction cost using *RSMeans*⁷ estimating tools, system condition percentages have been developed for each of the nine systems per each of the five ratings. Actual repair costs for a variety of facilities at KSC such as Landing Aids Control Building, the Cafeteria (Multi-Function Facility), Electromagnetic Lab, Operations Building #1, and Logistics Facility were used to establish the repair costs. The CRVs of these facilities ranged from \$602K to \$22M.

⁷ R.S. Means. *CostWorks 2002 Version 6.1*; 1996-2002. *RSMeans* is North America's leading supplier of construction cost information. A product line of Reed Construction Data, *RSMeans* provides accurate and up-to-date cost information that helps owners developers, architects, engineers, contractors and others to carefully and precisely project and control the cost of both new building construction and renovation projects.

The estimates for the various levels of repair work were compared to an estimated cost for the system construction. These comparisons (expressed as percentages) translate into the DM Condition Percentages used in the DM model. The process began with the 1 rating, where the cost for a major repair was established. That cost was then compared to the estimated original construction cost producing a maximum system condition percentage. For example, a 1 rating in structure equates to 150% of the maximum repair cost of the structure of a facility including some demolition and disposal cost. The system condition percentages for 2 through 4 were then established using the same method. However, according to the U.S. Army Corps of Engineers (USACE), 50% of the replacement value is the decision point to determine whether a system should be repaired or replaced. Because a 2 rating is where this decision point falls, the USACE standard was applied as a rule. The rule stated that a 2 equals at most 50% of the 1 rating system condition percentage.

For example, even though the calculated value for 2 in the system category of Roofing was 90%, the highest the rating could be is 1/2 of the calculated value for the 1 rating (150% in this case), which equals 75% because that is when the replacement of the roof would most likely occur. The 5 rating was left at 0% because what small DM would occur in this rating would be negligible. (Appendix B gives a detailed analysis.)

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3.0 2002 AGENCY- WIDE DM ASSESSMENT

To complete the assessments at all 35 sites by the target date of September 1, 2002, 21 engineers and technicians were assigned to conduct the site visits. In total, the assessment teams evaluated the condition of 5,659 facilities through on-site visits and 61 facilities remotely. During site visit preparations, Morocco and Gambia were removed from the site visit list for security and operational reasons. Appendix C provides a list of low value, remote sites that were assessed but not visited. These minor sites had no material impact on the outcome of the overall assessment results.

Site visits were conducted using two-person teams. The number of teams was sized to complete each site assessment within one week. Assessment data was collected on handheld personal digital assistants (PDA) e.g., PalmPilots® and Windows® CE-based handheld computers. Paper records were used as a backup in some cases. NASA facility and security staff and supporting contractors provided outstanding support and contributed to the successful completion of the assessments.

Prior to the assessment, one concern regarding application of the DM method was a method to control the consistency of assessments among the various team members. In an attempt to ensure consistency, 12 of the 21 assessors participated in the first Center assessment at Goddard Space Flight Center (GSFC) in June 2002. Prior to the GSFC assessment, a training session was conducted to ensure each assessor understood the background, development, and process for the DM method. To begin the GSFC assessment, all 12 team members assessed several facilities to develop consistency in approach and assessment ratings. Throughout the week, these team members coordinated answers to questions and resolved issues regarding the rating system. For subsequent site visits, the 12 team members served as team leaders responsible for ensuring consistent application of the criteria.

In addition to the Centers, NASA also owns 28 smaller, remote and lower value sites worldwide. An examination of the property cards in the RPI on each facility found that only 9 of the sites are active. Of those 9, four are overseas in very remote locations and have a value of less than \$20,000; one of those four sites is labeled as a temporary facility on the property card. The remaining active sites have more significant value. The other sites were all inactive. Because of the high cost to visit remote sites, which are typically of low value, it was determined that it was not cost efficient to send an assessment team to all 28 remote and low value sites, but to assess them remotely.

To support facility assessments, assessment teams incorporated digital photos of selected facilities or systems with their assessments. Photos were taken where feasible for systems rated as condition code 1 or 2, and for other facilities or systems where visual evidence was considered to help support the ratings assigned.

3.1 ACTIONS TAKEN AND RECOMMENDATIONS

3.1.1 Actions Taken

Assessments for those sites not visited were done in two ways. First, and preferably, was a method using anecdotal information, i.e., via pictures and interviews with NASA employees that visit the sites regularly. These facilities were rated just as though they had been visited; the nine systems were rated 5 through 1, that information was put in the database, and an FCI and DM cost estimate were generated. This method was simple, quick, and worked very well. and second through an RPI search and the use of engineering judgment developed during the DM site visits over the summer. Anecdotal information was used to evaluate the Morocco and Gambia sites when it was determined that a visit was not possible. Morocco had a DM value of \$23,795. Gambia had a DM value of \$246,441. The remaining sites were assessed using the property card description in the RPI, including CRV, description, and built date, combined with judgment garnered during the other site visits.

The second method used the property card description in the RPI, including CRV, description, and built date, combined with experience garnered during the other site visits. This method was used to assess the remote and low-value sites found in Appendix C. The first action was to look at the unoccupied sites. These sites were rated a 1 for all systems in that DM facility category. This convention was developed from the site visits where over 90% of the unoccupied facilities warranted a 1 rating. The active sites were rated 4s and 3s depending on the age and likely complexity of the facility (as indicated by the CRV). This method resulted in a total DM for all unvisited sites (including Morocco and Gambia) of \$7M and an FCI of 2.7. These methods are valid within the parametric estimate and should continue to be used for remote and low value sites.

3.1.2 Recommendations

3.1.2.1 Frequency of On-site Assessments

The intent of the NASA Deferred Maintenance Parametric Estimating Model is to inspect every NASA facility at appropriate intervals. The analysis indicates that for the second year all facilities should be reassessed. Active remote or low value sites that are in the United States and located near current NASA facilities and the overseas Deep Space Network (DSN) sites and the transoceanic abort landing sites should be reviewed during next year's assessment to provide baseline information. However, visiting all sites every year may prove uneconomic in subsequent years due to the high cost of visiting and assessing some sites, especially overseas sites, in comparison to their contribution to DM. In this case, NASA should continue with the independent assessment of all facilities every third year. This balances the need for the development of a trend and the economic considerations of a 100 percent assessment, and is a reasonable time to expect that there will not be a considerable change in the status of existing facilities.

3.1.2.2 Performance of Assessments in Non-Visit Years

In “non-visit” years, condition assessments can be updated using the DM method as described in the DM Guidebook by local facilities personnel familiar with the method. who would perform

assessments by exception, (e.g., only on those facilities that have undergone minor or major repair projects, or new construction projects since the previous assessment, and including Center information on new problems.) The local assessor would rate all the systems in the facilities that were assessed. They would then send the raw ratings to NASA HQ (Code JX) for inclusion in the database and for updating the DM estimate and the FCI. This simple method of annual assessment will enable NASA to continue to gather maintenance cost information in the spirit of the parametric estimate. Although limited, the assessments will provide sufficient information on facility conditions to allow NASA to develop a DM trend line that reflects the status of its facilities maintenance program that can be used to evaluate funding required for a successful maintenance and repair program.

3.1.2.3 Assessment of Remote and Low-Value Sites

NASA should adopt both the anecdotal and the RPI assessment methods as described in paragraph 3.1.1 as alternatives to assesses remote and low-value sites that are not economical to visit. These methods are valid within the parameters of the parametric estimate, and they provide sufficient information to be used in the budgeting process.

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4.0 FORMAL ANALYSIS AND ADJUSTMENT OF THE PARAMETRIC MODEL

4.1 ANALYSIS OF MARSHALL SPACE FLIGHT CENTER DATA

The statement of work required an analysis of the differences in the DM values at MSFC, the existing MSFC BMAR data, and the condition assessment survey completed by the MSFC on-site operations and maintenance (O&M) contractor. It also required a sensitivity analysis that included a statistical analysis of variance and a multivariate regression analysis between the existing MSFC BMAR data and the collected on-site data. These analyses were completed at KSC instead of MSFC by agreement with NASA because the differences in the collection and formatting of the data at MSFC were not compatible with the information gathered by the DM method.

4.2 STATISTICAL ANALYSIS

A statistical analysis was completed to validate the DM results and determine whether the different assessment teams were producing repeatable results. Repeatability was tested at Kennedy Space Center (KSC), the Jet Propulsion Laboratory (JPL), and Dryden Flight Research Center (DFRC). In addition to the variance analysis that was completed, Appendix D shows additional qualitative and quantitative analyses that were completed on the total DM results. These graphical analyses also identified the need to address the issue of categorizing certain facility systems with a zero rating.

At KSC, 1,022 facilities were evaluated. A second independent team reevaluated 164 facilities. A third independent team reevaluated 42 of these 164 facilities. These reevaluations provided three independent evaluations of 42 facilities. The statistical sample of 42 facilities included a mix of facility types

The KSC test data were analyzed using statistical correlation theory between the independent data sets. This two data set correlation analysis is referred to as Pearson's (linear) correlation coefficient (r) analysis. For this analysis we used a standard statistical analysis tool found in Microsoft[®] Excel (CORREL (array1, array2)).

A naming convention was assigned for each correlation. A-B defines the original team evaluations against the second team's evaluation. B-C defines the second team's evaluation against the third team's evaluation. A-C is an evaluation of the original team against the third team results. A computation of the correlation coefficient is computed for each of the three sets (A-B, B-C, and A-C). This coefficient is a numerical evaluation from -1 to 1 that quantifies the correlation between two data sets; in our case blg#1 evaluation A is variable A1 whereas blg#1 evaluation B is B1.

KSC assessments show reasonable repeatability using this correlation method for seven of the nine systems rated. The average correlation over each of the nine systems evaluated across all three sets of data is 0.78. Table 4-1 provides the correlation coefficients for each system. Other useful comparisons among the data sets are included in this table.

	Structure	Exterior	Roof	HVAC	Electric	Plumbing	Convey	IntF	Equipment
A to B	0.41	0.52	0.70	0.96	0.68	0.91	0.99	0.85	0.97
B to C	0.32	0.66	0.77	0.97	0.77	0.90	0.99	0.83	0.95
A to C	0.18	0.50	0.83	0.98	0.77	0.88	0.99	0.83	0.99

Table 4-1. Correlation Coefficients for Each System.

In conclusion, a plot of the correlation coefficient calculation across the KSC sample (see 4-1) is included as an overview of the consistency in the evaluation process. Seven of the nine systems evaluated show a high correlation ($r > 0.78$). This indicates a strong relationship between the scores of the three teams. However, the analysis showed that structure, exterior, roof and electric are not as correlated as we would like. Upon examination of the roof and electric ratings, it was found that one significantly different rating (from 5 to 3) had a great impact on this small sample causing the correlation coefficient to drop from 88 to 68 in the A to B comparison. On closer inspection the ratings of this single facility were very erratic between all three teams (in two systems ratings A=1, B=3, C=4, and A=5, B=3, C=1); so much so that the facility was deleted from the sample. Regarding the structure and exterior, a team’s differing interpretations of what was inspected as part of the structure and exterior (specifically parking lots) may have contributed to the lower correlation for these systems. For example, some teams may have misunderstood the assessment of paving as a part of the structural system. To test this theory the correlation coefficients were refigured treating the structure and exterior as one system. Table 4-2 shows the refigured results including the deletion of the facility and the combination of structure and exterior.

	Structure/Ext	Roof	HVAC	Electric	Plumbing	Convey	IntF	Equipment
A to B	0.82	0.70	0.96	0.68	0.91	0.99	0.85	0.97
B to C	0.67	0.77	0.97	0.77	0.90	0.99	0.83	0.95
A to C	0.75	0.83	0.98	0.77	0.88	0.99	0.83	0.99

Table 4-2. Correlation Coefficient with Structure and Exterior Combined

This change brought the average correlation coefficient up to .86. These results are statistically very good according to Whitestone Research, an internationally acclaimed economics and accounting consultant. A variance analysis using the same method was also completed for the 20 highest CRV buildings at JPL and 30 buildings at DFRC with findings from a second team on a subsequent visit. The variance at JPL and DFRC was found to be more than the results from KSC indicated. We believe this was because JPL and DFRC were two of the first Centers to be assessed, and the team that reassessed them four months later included the program manager and the project manager who had the benefit of much more information and experience than the earlier team. The data collected by the second team was used in the DM database.

Recommendation or Actions Taken – More detailed guidance has been written into the DM guideline to improve this correlation for future assessments of structural and exterior systems.

4.3 METHOD ADJUSTMENTS

The DM method was also analyzed by looking at the condition assessment database. Facility system condition ratings and assessment comments were entered into a master DM database. The database was reviewed for accuracy and completeness. An analysis comparing DM system

ratings for all 5,720 (including remote and low value) facilities against the DM system CRV percentage tables was completed. The following adjustments were made to the method:

- This analysis and comparison identified the need to expand the number of DM categories from the original number of 25 to 42 including subcategories (refer to Table 2-4). This change enabled a more complete reflection of the system CRV percentages in the different facility types ultimately creating a more representative DM cost.
- The system CRV percentages were adjusted from the original DoD based PACES model to better reflect NASA facilities. This adjustment was based on the difference between the quantity of a particular system found in a particular DM category and the system CRV percentages as called for by the PACES model. For example, if there were very few conveying systems in a particular NASA DM facility category, but the PACES model reflected a high percentage for conveying systems, the percentage for conveying systems was lowered and that amount redistributed across the other eight systems. This adjustment better reflects the components of the NASA facilities.
- The expansion of the DM facility categories also caused a remapping of NASA facility classes into the newly established DM categories.
- System CRV percentages for systems with “0” ratings were moved to the structure category.
- Land was given its own DM category (#26, Land and Easements in Table 4-1) and the CRV% was placed 100% in structure.
- Land interests were then assigned a “0” value so as not to generate a DM contribution.
- New percentages were established for the system condition percentage table.
- The DM method was adjusted to rate nonexistent systems with a “0”. This convention resolves the potential for errors in the FCI calculations.

4.3.1 Real Property Inventory

One of the first things that had to be done was ensure that the DM database was correct. NASA RPI data were utilized for all DM facility records. Some anomalies were noted that NASA should address, but after analysis we found they had no material impact on the results of the assessment.

A portion of the RPI anomalies included CRV variations. As required, the study team compared the NASA CRVs in the RPI against estimated CRV values using the DoD Facility Sustainment Model (FSM). The significant observations from that comparison include:

- NASA CRVs appear to exceed those generated using the DoD FSM by an average of 40%.
- More than 50% of NASA RPI records do not allow direct application of the DoD construction cost factors for estimating the CRV. This is due to differences between NASA facilities classes and the DoD model in areas such as units of measure.

A complete accounting of RPI and CRV irregularities is included in the report titled “Report on Real Property Inventory Anomalies.”⁸

4.3.2 Identifying Correct Facility Categories

The study team compared assessment results for the entire DM database against the nine building systems rated (structure, roof, exterior, interior, HVAC, electrical, plumbing, conveying and program support equipment). Actual results for each DM category were compared against the system percentages in the DM method.

The team identified facilities that should have had a system percentage according to the method but had no assessment rated for that system. Conversely, the team also identified facilities that had system ratings where the DM method suggested none should exist. These comparisons helped identify the need to expand the number of DM categories from the original 25 to 42 to account for facility differences within the original mapping of NASA classes into DM categories. The comparisons showed distinct trends where the systems actually rated, did not correlate with the DM method. For example, in DM Category 18, Waste Water Collection and Disposal Systems, the DM method indicated there should be a rating for HVAC systems. The actual results showed that over 90% of facilities in DM Category 18 were not rated for the HVAC systems. There were 91 occasions that the difference between the collected data and the model exceeded 25% of the facilities rated, and 26 of those exceeded a 75% difference.

The analysis revealed that some of the categories were too broad. For example, in DM Category 17, HVAC distribution systems included an unexpectedly high number of ratings for roof, interior, HVAC and conveyance. Further analysis revealed these ratings occurred in facilities that generated HVAC services. This led to creation of a separate DM category for HVAC generation facilities. This additional category more accurately captured all the cost associated with the buildings, thereby making the DM results more accurate. In total, 18 (not including the “0” category) new categories or subcategories were added to more accurately capture the CRV value of these properties.

Recommendation or Actions Taken - The final System CRV percentages table with all DM categories is listed in Table 2-4. Italicized cells indicate newly established DM categories and shaded cells indicate system CRV percentages that were adjusted. This table has been included in the updated Guide and was used in the final database to establish the DM estimate.

4.3.3 NASA Classes Mapped to DM Categories

The team identified 139 NASA classes that were mapped into incorrect DM categories. The original mapping only used the three-digit NASA class codes (e.g., Code 610, Administrative Buildings). Upon analysis of facility anomalies in system ratings (using the DM method), it became apparent that entire NASA classes were improperly mapped into inappropriate DM categories. When facilities were examined according to their five-digit NASA class (e.g., 610-10, Administration Buildings), the proper DM category became obvious. For example, NASA class 812-90, Electricity—Distribution and Transmission Lines (Other), was originally in DM category 15, Lighting Systems. It is not a lighting system; rather it is an electrical distribution

⁸ United States. National Aeronautical and Space Administration. *Draft Report on Real Property Inventory Anomalies*. Plexus Scientific, Corp. 2002.

system and rightly belongs in DM category 16, Electrical Distribution Systems. The remapping effort affected over 2,300 facilities. Appendix E provides a listing of the remapping efforts of NASA classes into the appropriate DM categories.

Recommendation or Actions Taken – The remapping was included in the updated Guide and was used in the final database producing a far more representative DM.

4.3.4 Zero Ratings Impact upon DM Estimates

In many cases, a system did not exist in a facility. For example, not all facilities have conveying systems. A “0” rating indicates the absence of a system. In these instances, a small portion of the facility CRV is not being accounted for in the DM or FCI calculations. In an instance where there is only one “0” and it is in a low-rated system such as conveyance, this may not have an impact. However, in cases where there are four or five “0” systems in a property and they comprise a percentage of the system ratings, this could have a major impact. To demonstrate the impact that “0” ratings could have on DM we assumed, as an example, a “4” rating for each of the systems instead of a “0”. With these “4” ratings, the DM method calculates an additional \$119 million in DM.

Recommendation or Actions Taken – The system percentages must be accounted for to appropriately value the DM in relation to the CRV. To account for this, system CRV percentages for systems with “0” ratings were moved to the structure category because structure is always rated and is generally the system with the highest CRV percentage.

4.3.5 Land Value

The NASA RPI includes 66 records that are land holdings. These holdings have a substantial book value; however, they do not generate DM requirements.

Actions Taken – Two actions were taken. First, land was given its own DM category code (#26, Land and Easements in Table 2-4) and the CRV% was placed 100% in the structure. This enables NASA to continue to account for the land in the database. But because land contributes little or nothing to DM, the team rated land records with zeros, ensuring they would not influence the DM result.

4.3.6 Marshall Space Flight Center Adjustments

After completing assessments at 35 other NASA sites and comparing results between sites, the assessment ratings at MSFC appeared to be higher than was appropriate. It was discovered that during the DM test at MSFC in November 2001, the teams rated all nonexistent systems with a rating of “5”. During the GSFC assessment, the team realized that giving these nonexistent systems a rating of 5 would severely affect the FCIs of the individual systems as well as the Center composite FCI. Additionally, comparing results among Centers revealed that ratings at MSFC might be overstated. As a result, an independent team returned to MSFC the last week in October to reassess a portion of their facilities. The team reassessed 125 facilities with a total CRV of \$1,064,423,913, over 82% of the CRV. This reduced the MSFC DM from \$107M to \$89M.

Actions Taken – The DM method was adjusted to rate nonexistent systems with a “0”. This convention resolves the potential for errors in the FCI calculations and ensures that NASA is

aware of the difference between systems in good condition, compared to systems that are nonexistent. Because the outcome of the second team’s assessment had a significant impact on the DM for Marshall, their assessments were used to update the MSFC results.

4.3.7 Facility Age

The initial construction date for each facility is listed in the NASA RPI and is entered into the DM database. Assessors are aware of this date during their facility assessment. Assessors are advised to first complete a visual assessment of the facility. In some cases, very old facilities have been partially or completely renovated, thereby rendering the facility age unimportant. In other cases, it is apparent that major facility renovations have not occurred within the facility. The DM guidelines require assessors to consider age as a rating factor for HVAC and electrical systems. A survey by the USACE⁹ states that the “Building Industry Standard for life expectancy of all five systems (HVAC, electric, plumbing, conveying, and interior) is 30 years for a commercial building.” A survey of commercial insurance companies provided similar information. Most considered mechanical and electrical systems that were over 20 years old to be an “immediate red flag” and any system over 25 years old to be non-insurable.¹⁰ Due to the critical nature of many NASA facilities, the replacement of aging, obsolete, and potentially dangerous electrical and mechanical systems should be investigated.

Actions Taken – Assessors were advised to downgrade HVAC and electrical systems by one rating level if systems were 20-30 years old (e.g., installed between 1970-1980). Systems installed prior to 1970 (more than 30 years old) were downgraded two rating levels. For example, if a system appeared to function properly, and by visual inspection required nothing more than normal maintenance (a “5” per criteria) but was on aggregate more than 30 years old, it was rated a “3”, rather than a “5”. This adjustment accounts for the need to program replacements for these systems. The study found that, overall, this rule was applied to less than 100 facilities across NASA. Although insignificant in the parametric estimate this rule will be reflected in the DM Guide.

⁹ Sartori, Michael P., P.E., Program Manager for Operation and Maintenance, U.S. Army Corps of Engineers, “Medical Facility Life Cycle Investment Strategy.” American Society for Healthcare Engineering. Dec 1997.

¹⁰ We surveyed the following commercial insurers; Farmers Insurance Group, Agent David Yeats personal interview on 2 December 2002; ReMax, broker Conrad Harper personal interview 2 December 2002; and CNA, Agent Carol Purnick personal interview on 2 December 2002.

5.0 COMPARISON OF BMAR AND DM RESULTS

The DM method estimates were lower than BMAR estimates at 4 sites (GSFC, White Sands Testing Facility (WSTF), Wallops Flight Facility (WFF) and MSFC), comparable at 5 sites (Johnson Space Center (JSC), DFRC and the three Deep Space Network sites) and higher at the other 26 sites. The DM parametric estimates on average were higher than those for BMAR for several reasons:

- To give a complete analysis of condition the DM assessments included all facilities including those that are mothballed, abandoned, heritage, out-grant or standby status (i.e., the igloos at Plum Brook, and old, excess facilities at Moffet Federal Airfield.) Using the DM method, all government owned assets were assessed. NASA may wish to remove inactive facilities during analysis of maintenance and repair requirements and funding.
- The high cost of developing detailed BMAR estimates likely resulted in understatement of needs at some Centers because not all of the Centers' facilities were actually included in its BMAR report.
- Additions and removal of structures from the RPI since the last BMAR estimate created variations in the database.
- The complete physical review during the DM survey identified items not recognized during BMAR studies.
- The DM method accounts for the removal and disposal of systems when repaired (e.g., structural members being replaced as part of roof repair.) This results in DM ratings of over 100% at a 1 rating (see Table 2-5) System Condition Percentage). Typically BMAR estimates do not account for over 100% of a systems cost.

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6.0 RESULTS, CONCLUSIONS AND RECOMMENDATIONS

Results:

- The Agency FCI is 3.6 (on a scale from 5 (excellent) to 1 (bad) (Table 6-1, Summary Sheet). NASA’s scientific (R&D type) facilities have an FCI of 3.7, and its operations facilities (mission and communications) have an FCI of 3.8. The FCI of inactive facilities including remote and low value sites is 2.5. A facility with a 4 rating would require some minor repairs and systems to *normally* function as intended. A facility with a 3 rating requires more minor repairs and some infrequent larger repair required, but systems occasionally are *unable to function as intended*.
- Site FCIs range from 2.4 to 4.7, indicating variations in conditions between some sites. Sites include all NASA sites and can be found in Table 6-1.
- The Agency-wide 2002 DM estimate is ~\$2.0 billion, which is 10% of NASA’s \$21 billion CRV. The DM estimate for active sites is ~\$1.6 billion and the DM estimate on inactive facilities is ~\$.4 billion.
- The DM estimate is more than double the Agency FY 01 BMAR estimate of ~\$1 billion.
- The cost to complete the NASA-wide DM parametric assessment was less than \$.01 per square foot versus the BMAR assessment costs that range between \$.30 and \$1.50 per square foot using traditional methods.
- As required by this task, teams assessed all NASA facilities, including those that are mothballed, abandoned, heritage, out-grant or standby status, and those that are remote and low value. The DM estimate includes costs to repair facilities that NASA may not wish to maintain.
- The DM assessment identified NASA RPI records that required correction; however, these records did not immediately impact the results of the assessment.
- NASA CRVs are on average 40% higher than CRV values suggested using the U.S. Department of Defense (DoD) Facility Sustainment Model (FSM).
- Several refinements in the DM assessment system were made to improve the applicability of the results, and have been addressed in a revised DM Assessment Guide.
- DM assessments do not include costs associated with environmental contamination/remediation, such as asbestos removal, lead paint removal, Americans with Disabilities Act (ADA) considerations, or changed safety regulations and codes.

Table 6-1 compares site, Center, and Agency DM results against Center reported BMAR and CRV values.¹¹ The total CRV for the low value and remote sites is \$32.5M. \$22.7 M belongs to sites associated with GSFC and \$9.8M are associated with the TALs sites under KSC. The low value and remote sites contribute .00136 to the total NASA FCI. “NA” in the “Inactive Facilities FCI” column and “NA” in the “Inactive Facilities ‘02 DM” column indicates there is zero DM value for inactive facilities at that site. Where there is “NA” in the “Inactive Facilities FCI”

¹¹ The Shiloh site (SMLF) was done as part of Ponce De Leon Space Flight Tracking and Data Network (PSTDN).

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column and a “0.00” the “Inactive Facilities ‘02 DM” column that indicates that there is a small DM value at that site.

Table 6-1. Summary Table (continues next page)

NASA Sites	Total CRV (\$B)	Total '01 BMAR (\$B)	Total '02 DM (\$B)	Total FCI (Wgtd)	Active Facilities '02 DM (\$B)	Active Facilities FCI (Avg)	Inactive Facilities '02 DM (\$B)	Inactive Facilities FCI (Avg)
Ames Research Center	2.32	0.07	0.11	4.1	0.07	4.1	0.04	2.9
Crows Landing	0.07	0.00	0.01	2.9	0.00	2.6	0.01	2.6
Camp Parks	0.01	0.00	0.00	3.5	0.00	2.9	0.00	2.3
Moffet Federal Airfield	1.08	0.00	0.11	3.3	0.06	3.6	0.04	3.6
Ames Research Center Total	3.48	0.07	0.23	3.8	0.14	3.3	0.09	2.9
Dryden Flight Research Center Total	0.26	0.01	0.01	4.1	0.01	3.2	na	na
Glenn Research Center	1.75	0.04	0.12	3.7	0.11	3.5	0.02	2.8
Plum Brook Station	0.69	0.01	0.15	3.3	0.03	3.7	0.11	2.3
Glenn Research Center Total	2.44	0.05	0.27	3.6	0.14	3.6	0.13	2.5
Langley Research Center Total	2.55	0.03	0.29	3.7	0.24	3.4	0.04	2.2
Code R(Aerospace Technology) Total	8.73	0.16	0.80	3.7	0.53	3.4	0.27	2.3

Goddard Space Flight Center	0.87	0.14	0.04	4.1	0.04	3.6	0.00	na
Hawaii Spaceflight Tracking/Data Network (STDN)	0.02	0.00	0.00	3.4	0.00	2.9	0.00	na
Ponce De Leon Space Flight Tracking/Data Network (STDN)	0.00	0.00	0.00	3.7	0.00	2.9	0.00	na
Remote and low value sites associated with GSFC (STDN, MOBILAS,VBLI.)	0.02	0.00	0.03	2.5	0.00	3.8	0.03	1.0
Wallops Flight Facility	0.63	0.04	0.03	3.9	0.02	3.7	0.00	3.0
National Scientific Balloon Facility, Palestine, TX	0.01	0.00	0.00	4.7	0.00	4.4	0.00	na
Poker Flats Research Range, Fairbanks, AK	0.01	0.00	0.00	4.5	0.00	4.5	0.00	na
Goddard Space Flight Center Total	1.55	0.18	0.10	3.9	0.06	3.7	0.03	1.7
Code Y (Earth Science) Total	1.55	0.18	0.10	3.9	0.06	3.7	0.03	1.7

Jet Propulsion Laboratory	0.59	0.00	0.02	4.0	0.02	3.6	0.00	na
Table Mountain Observatory	0.01	0.00	0.00	3.8	0.00	3.6	0.00	na
Canberra Deep Space Communications Complex, Australia	0.11	0.01	0.01	4.0	0.01	3.9	0.00	na
Goldstone Deep Space Communications Complex, CA	0.20	0.01	0.01	4.4	0.00	4.1	0.00	3.3
Madrid Deep Space Communications Complex, Spain	0.10	0.01	0.01	3.6	0.01	3.8	0.00	na
Deep Space Network Total	0.41	0.00	0.03	4.1	0.02	3.9	0.00	3.3
Jet Propulsion Laboratory Total	1.01	0.03	0.05	4.1	0.05	3.8	0.01	3.3
Code S (Astrobiology and Space Research/ Science) Total	1.01	0.03	0.05	4.1	0.05	3.8	0.01	3.3

Johnson Space Center	1.32	0.17	0.10	3.6	0.10	3.7	0.00	1.0
Ellington Field	0.09	0.00	0.01	3.8	0.01	3.3	0.00	na
Palmdale, NASA & USAF Industrial Plant	0.04	0.00	0.00	3.6	0.00	3.1	0.00	na
White Sands Test Facility	0.20	0.03	0.01	3.4	0.01	3.7	0.00	na
WSTF Space Harbor	0.00	0.00	0.00	3.7	0.00	3.2	0.00	na
White Sands 1st TDRSS	0.04	0.00	0.00	3.6	0.00	3.9	0.00	na

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NASA Sites	Total CRV (\$B)	Total '01 BMAR (\$B)	Total '02 DM (\$B)	Total FCI (Wgtd)	Active Facilities '02 DM (\$B)	Active Facilities FCI (Avg)	Inactive Facilities '02 DM (\$B)	Inactive Facilities FCI (Avg)
White Sands 2nd TDRSS	0.03	0.00	0.00	4.0	0.00	4.1	0.00	na
Johnson Space Center Total	1.71	0.20	0.12	3.6	0.12	3.6	0.00	1.0
Kennedy Space Center	4.20	0.08	0.49	3.3	0.46	3.5	0.03	2.5
Cape Canaveral Air Force Station	0.16	0.00	0.02	3.3	0.02	3.7	0.00	2.7
Gambia Transoceanic Abort Landing Site	0.01	0.00	0.00	3.8	0.00	3.8	0.00	2.0
Morocco Transoceanic Abort Landing Site	0.00	0.00	0.00	4.0	0.00	4.0	0.00	na
Kennedy Space Center Total	4.36	0.08	0.51	3.3	0.48	3.8	0.03	2.4
Marshall Space Flight Center	1.28	0.18	0.09	4.1	0.06	4.4	0.03	3.5
Brigham City, UT	0.00	0.00	0.00	4.2	0.00	4.2	0.00	na
Michoud Assembly Facility	1.08	0.05	0.08	3.8	0.06	3.7	0.02	3.3
Santa Susanna Field Laboratory	0.09	0.00	0.01	3.4	0.01	3.3	0.00	3.3
Marshall Space Flight Center Total	2.45	0.23	0.17	3.9	0.13	3.9	0.05	3.4
Stennis Space Center	1.44	0.08	0.26	3.1	0.26	3.6	0.00	1.9
Tenants	0.12	0.00	0.02	3.4	0.02	3.6	0.00	na
Stennis Space Center Total	1.57	0.08	0.28	3.1	0.28	3.6	0.00	1.9
Code M (Human Exploration and Development of Space) Total	10.09	0.59	1.08	3.5	1.00	3.7	0.08	2.5
NASA Total (\$B)	21.4	.95	2.03	3.6	1.64	3.6	0.39	2.5

Table 6-1. Summary Table

Table 6-2 shows the DM cost estimates for each of the nine systems by site, Center, Enterprise, and the Agency.

Table 6-2. By DM (\$M) by System for NASA as a Whole (continues next page)

NASA Sites	Structure	Roof	Exterior	Interior Finishes	Electric	HVAC	Plumbing	Conveyance	Equipment
Ames Research Center	15	10	6	4	52	7	2	0	12
Crows Landing	8	0	0	0	4	0	0	0	0
Camp Parks	0	0	0	0	0	0	0	0	0
Moffet Federal Airfield	49	14	7	6	20	10	4	0	0
Ames Research Center	72	24	13	9	76	17	6	1	12
Dryden Flight Research Center	1	1	0	0	3	1	0	0	0
Glenn Research Center	27	9	11	6	41	14	8	1	6
Plum Brook Station	52	6	7	13	37	22	10	1	1
Glenn Research Center	79	15	18	19	78	36	18	2	7
Langley Research Center	12	10	11	16	192	17	5	2	24
Code R(Aerospace Technology)	164	50	42	44	349	71	30	4	42
Goddard Space Flight Center	9	6	7	1	3	9	2	0	0
Hawaii Spaceflight Tracking/Data Network (STDN)	0	0	0	0	1	0	0	0	0
Ponce De Leon Space Flight Tracking/Data Network (STDN)	0	0	0	0	0	0	0	0	0
Remote and low value sites associated with GSFC (STDN, MOBLAS, VBLI)	13	1	3	2	6	3	1	0	0
Wallops Flight Facility	10	3	3	2	5	2	3	0	0
National Scientific Balloon Facility, Palestine, TX	0	0	0	0	0	0	0	0	0
Poker Flats Research Range,	0	0	0	0	0	0	0	0	0

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NASA Sites	Structure	Roof	Exterior	Interior Finishes	Electric	HVAC	Plumbing	Conveyance	Equipment
Fairbanks, AK									
Goddard Space Flight Center	32	10	14	5	15	14	5	0	0
Code Y (Earth Science)	32	10	14	5	15	14	5	0	0
Jet Propulsion Laboratory	3	4	2	2	8	3	1	0	0
Table Mountain Observatory	0	0	0	0	0	0	0	0	0
Canberra Deep Space Communications Complex, Australia	0	0	6	0	1	0	0	0	3
Goldstone Space Communications Complex, CA	2	1	2	0	2	0	0	0	1
Madrid Deep Space Communications Complex, Spain	5	1	0	0	3	1	0	0	0
Deep Space Network	6	2	8	0	6	1	0	0	4
Jet Propulsion Laboratory	10	5	11	2	14	4	1	0	4
Code S (Astrobiology and Space Research/ Science)	10	5	11	2	14	4	1	0	4
Johnson Space Center	14	13	4	6	23	35	6	1	2
Ellington Field	1	2	0	0	2	0	0	0	0
Palmdale, NASA & USAF Industrial Plant	0	0	0	0	1	0	0	0	0
White Sands Test Facility	2	1	1	0	3	0	0	0	0
WSTF Space Harbor	0	0	0	0	0	0	0	0	0
White Sands 1st TDRSS	0	0	0	0	1	0	0	0	0
White Sands 2nd TDRSS	0	0	0	0	0	0	0	0	0
Johnson Space Center	17	16	5	7	30	36	6	1	2
Kennedy Space Center	99	71	47	36	149	47	32	2	2
Cape Canaveral Air Force Station	2	4	4	1	5	2	2	0	0
Transoceanic Abort Landing Sites	0	0	0	0	0	0	0	0	0
Gambia Transoceanic Abort Landing Site	0	0	0	0	0	0	0	0	0
Morocco Transoceanic Abort Landing Site	0	0	0	0	0	0	0	0	0
Kennedy Space Center	102	76	51	37	154	49	34	2	2
Marshall Space Flight Center	4	4	4	5	41	12	6	2	11
Brigham City, UT	0	0	0	0	0	0	0	0	0
Michoud Assembly Facility	15	16	13	5	10	11	4	0	0
Santa Susanna Field Laboratory	4	1	0	0	1	0	1	0	0
Marshall Space Flight Center	23	21	17	10	53	23	12	2	11
Stennis Space Center	57	10	10	4	117	11	4	4	47
Tenants	6	1	2	1	3	5	0	0	0
Stennis Space Center	63	11	12	5	120	15	5	4	47
Code M (Human Exploration and Development of Space)	205	124	85	59	357	124	56	9	62
NASA Total	411	189	152	110	735	214	92	14	109

Table 6-2. By DM (\$M) by System for NASA as a Whole

Table 6-3 shows the NASA System Condition Index across all nine systems by site, Center, Enterprise and NASA as a whole. Because the CRV of a system is not known or recognized in the DM method, the calculations for a group of systems are simple averages instead of a complex FCI type calculation that is normalized for the CRV. Thus, when compared to the NASA FCI (3.6) the average system condition index (3.7) appears high. However, these numbers give a good representation of the condition of the systems at the site, Center, Enterprise and Agency levels. For a detailed explanation see paragraph 2.2.6

Table 6-3. NASA SCI as a Whole (continues next page)

NASA Sites	Structure	Roof	Exterior	Interior Finishes	Electric	HVAC	Plumbing	Conveyance	Equipment
Ames Research Center	4.4	3.9	4.0	4.1	3.4	3.9	3.9	4.5	4.4
Crows Landing	2.9	2.9	2.9	2.7	2.0	2.5	2.4	na	2.0
Camp Parks	4.0	2.0	3.0	3.0	3.0	3.0	4.0	na	na
Moffet Federal Airfield	3.4	3.1	3.5	3.4	3.4	3.2	3.4	2.9	na
Ames Research Center Average	3.7	3.0	3.3	3.3	2.9	3.2	3.4	3.7	3.2
Dryden Flight Research Center	4.7	4.2	4.5	4.3	3.6	4.2	4.5	4.6	4.8
Glenn Research Center	3.9	3.8	3.9	3.8	3.5	3.6	3.4	3.6	3.8
Plum Brook Station	3.8	3.4	3.6	3.1	2.7	3.5	2.9	3.5	3.8
Glenn Research Center Average	3.9	3.6	3.7	3.5	3.1	3.5	3.2	3.6	3.8
Langley Research Center	4.2	3.9	3.9	3.6	2.4	3.6	3.7	4.1	4.0
Code R (Aerospace Technology) Average	4.1	3.7	3.9	3.7	3.0	3.6	3.7	4.0	4.0

Goddard Space Flight Center	3.9	4.0	4.1	4.2	4.4	3.8	4.3	4.4	4.5
Hawaii Spaceflight Tracking/Data Network (STDN)	3.7	3.9	3.1	3.2	3.3	2.9	3.7	3.0	3.4
Ponce De Leon Space Flight Tracking/Data Network (STDN)	4.0	2.5	3.4	4.0	4.0	3.5	4.0	na	4.0
Remote and low value sites associated with GSFC (STDN, MOBLAS, VBLI,)	2.5	2.5	2.5	2.5	2.5	2.4	1.0	1.0	na
Wallops Flight Facility	4.0	3.8	3.9	3.9	3.9	3.8	3.8	4.5	3.8
National Scientific Balloon Facility, Palestine, TX	4.9	4.3	4.6	4.6	4.9	4.1	5.0	5.0	4.5
Poker Flats Research Range, Fairbanks, AK	4.8	4.8	4.5	4.4	4.5	4.3	3.2	5.0	4.1
Goddard Space Flight Center Average	3.6	3.4	3.5	3.5	3.6	3.3	3.3	3.4	4.0
Code Y (Earth Sciences) Average	3.6	3.4	3.5	3.5	3.6	3.3	3.3	3.4	4.0

Jet Propulsion Laboratory	4.3	4.0	4.2	4.1	3.7	4.1	4.1	4.5	4.5
Table Mountain Observatory	4.1	3.9	3.4	3.9	3.6	4.0	4.0	4.7	3.7
Canberra Deep Space Communications Complex, Australia	5.0	4.4	3.3	4.4	3.7	4.3	4.3	4.1	3.7
Goldstone Deep Space Communications Complex, CA	4.8	4.2	4.1	4.2	3.9	4.1	3.9	3.9	4.7
Madrid Deep Space Communications Complex, Spain	2.8	3.6	4.2	4.5	3.5	3.4	4.4	4.2	4.2
Deep Space Network Average	4.2	4.0	3.9	4.4	3.7	3.9	4.2	4.1	4.2
Jet Propulsion Laboratory Average	4.2	4.0	3.8	4.2	3.7	4.0	4.1	4.3	4.2
Code S (Astrobiology and Space Research) Average	4.2	4.0	3.8	4.3	3.7	4.0	4.2	4.2	4.2

Johnson Space Center	3.9	3.6	3.9	3.8	3.3	3.1	3.2	3.7	3.6
Ellington Field	4.2	3.0	3.9	4.0	3.4	4.4	4.0	5.0	na
Palmdale, NASA & USAF Industrial Plant	4.0	3.9	3.9	4.0	3.2	4.0	4.0	4.0	3.1
White Sands Test Facility	4.1	4.0	3.9	4.4	3.4	4.4	3.8	3.7	5.0
WSTF Space Harbor	3.7	4.2	4.0	3.9	2.3	3.6	4.3	4.3	4.0
White Sands 1st TDRSS	5.0	4.7	3.9	4.0	3.2	4.0	4.0	5.0	5.0
White Sands 2nd TDRSS	4.0	3.0	4.7	4.8	4.0	3.2	3.8	5.0	4.0
Johnson Space Center Average	4.1	3.8	4.0	4.1	3.3	3.8	3.9	4.4	4.1
Kennedy Space Center	3.7	3.2	3.2	3.1	3.0	3.3	3.1	3.4	3.5

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NASA Sites	Structure	Roof	Exterior	Interior Finishes	Electric	HVAC	Plumbing	Conveyance	Equipment
Cape Canaveral Air Force Station	3.8	2.9	3.0	3.4	3.1	3.2	3.1	4.0	3.8
Transoceanic Abort Landing Sites									
Gambia Transoceanic Abort Landing Site	3.8	3.0	3.8	3.0	3.8	3.0	3.8	na	na
Morocco Transoceanic Abort Landing Site	4.0	4.0	4.0	4.0	4.0	4.0	4.0	na	na
Kennedy Space Center Average	3.8	3.3	3.5	3.4	3.5	3.4	3.5	3.7	3.7
Marshall Space Flight Center	4.6	4.4	4.1	3.9	3.6	3.8	3.8	4.4	4.4
Brigham City, UT	5.0	4.0	3.5	3.5	4.0	4.0	5.0	na	na
Michoud Assembly Facility	3.8	3.4	3.3	3.8	4.2	3.6	3.7	4.2	3.6
Santa Susanna Field Laboratory	3.6	3.5	3.4	3.1	3.2	3.4	3.2	3.6	4.0
Marshall Space Flight Center Average	4.3	3.8	3.6	3.6	3.7	3.7	3.9	4.1	4.0
Stennis Space Center	3.3	2.7	2.9	3.1	2.6	3.1	3.1	3.1	2.7
Tenants	3.6	4.0	3.5	3.7	3.1	2.8	3.2	3.5	4.1
Stennis Space Center Average	3.4	3.4	3.2	3.4	2.8	3.0	3.1	3.3	3.4
Code M (Human Exploration and Development of Space) Average	3.9	3.6	3.6	3.6	3.3	3.5	3.6	3.9	3.8
NASA Total	4.0	3.7	3.7	3.8	3.4	3.6	3.7	3.9	4.0

Table 6-3. NASA SCI as a Whole

Table 6-4 shows the condition of facilities by deferred maintenance facility category. There were no ratings for land, or compressed air distribution. All associated rail facilities except track were rated as other buildings or under pavement. This category was left as a category because NASA has historically had some rail maintenance and rail beds, and a small length of rail does exist on some NASA properties. Land, as previously discussed, was zeroed but still must be accounted for by NASA. Historically, there have been compressed air distribution systems related to NASA programs, and the potential exists for a centralized compressed air system; so that category remains.

Table 6-4. Facility Condition by Deferred Maintenance Facility Category (continues next page)

DM Category	Facility Description	02 CRV (B)	02 DM (B)	FCI
1	R&D and Test Buildings	5.89	0.51	3.7
2	R&D Structures and Facilities	0.86	0.12	3.2
3	Wind Tunnels	2.77	0.19	4.0
4	Engine/Vehicle Static Test Facilities	1.17	0.29	3.0
5	Administrative Buildings	1.35	0.11	3.8
6	Training Buildings	0.22	0.02	3.5
7	Trailers	0.03	0.01	2.9
8	Storage Buildings	0.37	0.03	3.8
9	Storage Facilities	0.12	0.01	3.6
10	Fuel Storage Tanks	0.08	0.00	3.9
10.1	Specialized Liquid Storage Tanks	0.00	0.00	4.4
10.2	Fueling Stations & Systems	0.01	0.00	4.1
11	Magazines	0.03	0.00	3.8
12	Comm. & Tracking Buildings	0.17	0.01	3.7
13	Comm. & Tracking Facilities	0.18	0.00	3.5

DM Category	Facility Description	02 CRV (B)	02 DM (B)	FCI
13.1	Large Antennas	0.33	0.02	4.1
13.2	Small Antennas	0.02	0.00	3.4
14	Mission Control Operations Buildings	0.31	0.01	3.9
15	Lighting	0.05	0.01	3.4
16	Electrical Distribution System	0.47	0.04	3.3
16.1	Power Generation/Power Plant	0.08	0.01	2.9
16.2	Electric Substations, Switchgear & Transfer Yards	0.28	0.02	4.0
17	HVAC Distribution	0.44	0.02	3.6
17.1	HVAC Generation	0.46	0.04	3.8
18	Waste Water Collection & Disposal System	0.11	0.01	3.4
18.1	Waste Water Facilities & Treatment Plants	0.05	0.00	4.0
18.2	Storm drains, Ditches, Dams, Retaining walls	0.11	0.01	3.4
19	Potable Water Distribution System	0.20	0.01	3.7
19.1	Potable Water Facilities & Treatment Plants	0.07	0.01	3.8
20	Launch Pads	0.59	0.07	3.1
20.1	Launch support camera pads	0.00	0.00	3.7
20.2	Launch propellant & high pressure gas facilities	0.16	0.01	3.7
21	Pavement	1.34	0.10	3.4
22	Rail	0.00	0.00	4.0
23	Maintenance Facilities & PW Shops	0.43	0.05	3.3
23.1	Operational Maintenance Facilities	0.82	0.06	3.7
24	Other Buildings	1.41	0.16	3.4
25	Other Facilities	0.26	0.02	3.7
26	Land & Easements	na	na	na
27	Compressed Air Distribution	na	na	na
27.1	Compressed Air Generation	0.08	0.01	3.7
28	Prefab buildings, various uses	0.02	0.00	4.1
29	Berthing & Housing	0.05	0.01	3.6

Table 6-4. Facility Condition by Deferred Maintenance Facility Category

Conclusions:

- NASA’s facilities are in good to fair condition (3.6) with the critical facilities (scientific and operations) generally in better condition (3.7 and 3.8, respectively) than the other facilities. However, considering these ratings range between *normally* function as intended and *occasionally are unable to function as intended*, these ratings are too low for critical facilities because the potential exists that missions and programs may be impacted.
- The DM method will provide data that meets the established accounting standards at less cost than the previous system.
- Updating of NASA RPI records will make future assessments easier to perform and more accurate.

- The difference between the BMAR estimate and the DM estimate is due to the assessment of all facilities including inactive facilities, differences in Center-developed procedures for BMAR content, revision of the facilities inventory, and use of a standard methodology.
- Assessments of *all* facilities should be done annually if economically feasible. Consistent, continued assessments will provide valid data on trends and actions needed to determine proper maintenance, repair and renewal funding for NASA facilities.
- It is possible to assess remote and low value sites without a visit by an assessment team.
- It is likely that the NASA CRVs are higher than the DoD FSM in similar facility categories due to the complexity of NASA facilities, including the cost of large amounts of collateral equipment.
- The FCI can be greatly impacted by a few facilities that make up a high percentage of a Center's CRV.
- Analysis found that this low cost method produces consistent, repeatable results that are sufficient for their intended use, which is to provide deferred maintenance estimates for a large population of facilities across the entire Agency.

Recommendations:

- NASA should improve critical facilities to a level where they will normally *function as intended*. This would typically mean a FCI above 4.
- NASA should share the DM results with each Center. Constructive Center feedback may improve the utility of the DM results. Center input will effectively and efficiently make needed corrections to the RPI.
- NASA should take full advantage of the DM database, which provides a powerful tool for analyzing facilities in a variety of ways. For example, the DM database can be utilized to identify trends in facility or system condition if studies are replicated over time (e.g., candidate facilities for demolition or alternate use, or candidate systems to receive more detailed facility condition assessments).
- The NASA Enterprises should develop a criticality factor for each facility or class of facility. This would allow the database to be sorted by criticality and help focus facility maintenance and repair investments on the more critical facilities.
- Due to the critical nature of many NASA facilities, the replacement of aging, obsolete, and potentially dangerous electrical and mechanical systems should be investigated.
- NASA should evaluate the RPI and CRV variances identified (including the large variation between NASA CRV values and DoD suggested values).
- NASA should reassess all facilities in 2003, including those overseas sites that were assessed this year (Kokee Park Geophysical Observatory (KPGO), Madrid Deep Space Communications Complex (MDSCC) and Canberra Deep Space Communications

Complex (CDSCC)). Remote and low value sites should be assessed without site visits using the method and techniques outlined in section 3.

- For subsequent years, NASA should visit all facilities every third year. This provides a balance between the economics of completing the assessment and the ability of NASA to develop valid data on trends and actions needed to determine proper maintenance and repair funding for NASA facilities. During “non-visit” years assessments can be updated by local facilities personnel familiar with the DM method, who would perform assessments by exception (e.g., only on those facilities that have undergone minor or major repair projects, or new construction projects since the previous assessment, and including Center information on new problems). This data would be reported to NASA headquarters (JX) for inclusion in the data base.
- Remote and low value facilities should continue to be assessed by using anecdotal information and by record research as described in section 3.

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APPENDIX A. DEFERRED MAINTENANCE FACILITY CATEGORY CODES

DM_CAT_CODE	Facility Type	NASA Facility Category Class
1	R&D and Test Buildings	610-20, 10, 442-30, 10, 423-90, 381-20, 345-10, 330-40, 20, 10, 310-60, 50, 41, 40, 30, 22, 21, 20, 15, 10, 220-14, 13, 12, 11, 10, 219-11, 10, 140-90, 10, 131-25.
2	R&D Structures and Facilities	461-90, 390-00, 381-30, 330-20, 320-60, 50, 41, 40, 30, 22, 21, 20, 10, 310-40, 22
3	Wind Tunnels	331-60, 40, 30, 20, 10, 330-70, 60, 40, 30, 20, 10
4	Engine/Vehicle Static Test Facilities	355-50, 40, 10, 350-20, 10, 345-20, 10, 340-20, 10, 310-22, 141-50
5	Administrative Buildings	140-20, 610-90, 20, 10, 381-30, 20, 310-40, 22, 10, 219-11, 140-40, 30, 20, 10, 131-90.
6	Training Buildings	610-90, 219-11, 179-00, 171-00, 140-20
7	Trailers	812-90, 712-00, 631-30, 20, 630-37, 36, 34, 32, 31, 30, 610-10, 212-10
8	Storage Buildings	740-95, 90, 730-65, 610-90, 30, 510-00, 452-10, 442-90, 50, 30, 10, 423-10, 381-20, 331-60, 40, 20, 310-30, 22, 10, 219-11, 10, 212-20, 153-90, 10, 141-40, 140-90, 50, 40
9	Storage Facilities	841-45, 833-90, 823-20, 730-65, 690-90, 610-30, 461-10, 452-12, 11, 10, 442-90, 60, 50, 40, 30, 20, 10, 432-90, 10, 423-90, 10, 421-30, 411-90, 381-20, 355-20, 345-20, 331-20, 310-22, 20, 220-10, 153-90, 141-30, 140-90, 50, 40, 131-90, 126-10, 123-90
10	Fuel Storage Tanks	461-90, 30, 20, 10, 423-90, 10, 411-90, 60, 50, 40, 30, 20, 390-00, 320-41, 141-40, 126-90,
10.1	Specialized Liquid Storage Tanks	424-30
11	Magazines	442-40, 30, 424-30, 20, 10, 423-90, 422-90, 30, 20, 15, 421-90, 310-21
12	Communication and Tracking Buildings	442-10, 141-50, 140-90, 50, 40, 20, 10, 132-10, 131-90, 50, 45, 40, 35, 20, 15, 10
13	Communication and Tracking Facilities	390-00, 382-70, 320-60, 141-90, 50, 40, 30, 140-10, 132-90, 50, 30, 10, 131-90
13.1	Large Antennas	141-30
13.2	Small Antennas	390-00, 320-60, 141-90, 30, 132-90, 30, 20, 10, 131-10
14	Mission Control Operations Buildings	610-90, 10, 381-10, 310-60, 140-10, 131-90, 20, 15
15	Lighting	872-90, 10, 812-90, 812-80, 70, 50, 40, 20, 345-50, 136-90, 50, 30, 20, 10, 132-90
16	Electrical Distribution System	821-50, 812-90, 35, 30, 10, 811-80, 610-90, 423-90, 390-00, 382-70, 355-30, 141-40, 30, 136-90, 132-90
16.1	Power Generation/Power Plant	821-30, 811-90, 80, 60, 40, 10, 442-10, 310-50, 219-10, 141-90, 140-90, 50, 40, 30, 131-90
16.2	Electric Substations, Switchgear & Transformer Yards	890-55, 812-60, 30, 10, 811-90, 80, 381-50, 219-11, 10, 141-40, 140-90, 136-90, 132-10, 131-90
17	HVAC Distribution	890-85, 70, 60, 40, 30, 25, 871-90, 842-30, 10, 824-10, 822-20, 812-30, 423-20, 355-50, 141-40
17.1	HVAC Generation	890-80, 75, 55, 40, 842-12, 841-10, 824-30, 821-50, 30, 20, 812-10, 730-90, 25, 345-40, 331-40, 320-22, 310-50, 22, 10, 219-11, 10

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DM_CAT_CODE	Facility Type	NASA Facility Category Class
18	Waste Water Collection & Disposal System	871-60, 841-45, 832-90, 40, 30, 20 ,10, 831-90, 812-30, 219-10, 140-40
18.1	<i>Waste Water Facilities & Treatment Plants</i>	871-90, 841-10, 832-90, 40, 831-90, 50, 40, 30, 10, 812-30, 730-70, 390-00, 219-11, 10, 141-40
18.2	<i>Storm drains, Ditches, Dams, Retaining walls</i>	872-40, 871-90, 50, 30, 20, 10, 843-50, 345-40, 320-22, 164-30, 111-12
19	Potable Water Distribution System	843-50, 40, 30, 20 ,10, 842-35, 30, 15, 12, 841-55, 50, 45, 40, 35, 30, 20, 355-40, 345-40, 320-40
19.1	<i>Potable Water Facilities & Treatment Plants</i>	843-20, 842-15, 841-70, 55, 50, 20, 10, 442-10, 345-40, 219-10, 141-90, 50, 40
20	Launch Pads	382-80, 11, 10
20.1	<i>Launch support camera pads</i>	382-13
20.2	<i>Launch propellant & high pressure gas facilities</i>	390-00, 382-31, 30, 320-22, 310-22
21	Pavement	922-20, 872-10, 860-90, 30, 10, 852-92, 91, 90, 32, 22, 21, 20, 12, 11, 10, 851-92, 91, 90, 22, 20, 12, 11, 10, 812-60, 690-90, 442-90, 390-00, 320-60, 50, 41, 40, 22, 21, 163-90, 141-90, 30, 10, 113-22, 21, 20, 112-12, 10, 111-22, 20, 11, 10,
22	Rail	
23	Maintenance Facilities and PW Shops	860-90, 740-30, 711-00, 610-10, 442-90, 10, 310-30, 310-22, 220-10, 219-20, 219-11, 10, 141-50, 140-90, 50, 40, 30
23.1	<i>Operational maintenance facilities</i>	310-50, 40, 22, 220-14, 219-11, 212-20, 10
24	Other Buildings	890-55, 50, 872-90, 30, 871-90, 860-90, 852-12, 841-10, 833-40, 831-90, 40, 824-10, 823-30, 812-90, 60, 10, 811-90, 740-95, 90, 88, 76, 73, 56, 54, 43, 33, 30, 26, 18, 730-90, 70, 65, 25, 20, 10, 711-00, 610-90, 20,10, 510-00, 461-20, 452-10, 442-90, 10,
25	Other Facilities	890-95, 50, 30, 880-90, 40, 20, 10, 872-90, 40, 10, 871-50, 10, 851-92, 90, 843-50, 841-35, 833-90, 40, 30, 10, 831-90, 812-90, 811-90, 750-95, 90, 50, 30, 20, 10, 740-90, 83, 53, 730-65, 690-90, 20, 10, 610-30, 442-90, 50, 423-90, 20, 10, 411-90, 39
26	<i>Land & Easements</i>	932-50, 10, 922-10, 921-90, 30, 20, 10, 913-62, 61, 30, 912-11, 911-40, 33, 32, 31, 30, 20, 10, 871-90, 851-92, 822-10, 750-90, 40, 345-20, 141-20
27	<i>Compressed Air Distribution</i>	
27.1	<i>Compressed Air Generation</i>	890-60, 25, 350-20, 345-20, 310-40, 22, 219-11,
28	<i>Prefabricated buildings, various uses</i>	630-10, 12, 20, 16, 14, 30, 17, 21
29	<i>Berthing and Housing</i>	711-00, 730-90, 65

Italicized categories are those that were added after the initial analysis. (para 4.3.2)

APPENDIX B. DEVELOPMENT OF SYSTEM CONDITION PERCENTAGE TABLE

RS Means was used to estimate the work for each of the five (1-5) system condition percentages for four of the nine construction systems (roof, electric, interior finishes, and plumbing) on five separate facilities at KSC.

The facility CRVs ranged from \$602K to \$22M, with square footages from 2,906 S.F. to 288,661 S.F. The estimates for the various levels of repair work were compared to an estimated cost for the system construction. The estimates for the various levels of repair work were compared to an estimated cost for the roof construction. These comparisons (expressed as percentages) translate into the DM Condition Percentages used in the DM model.

The estimates for the various levels of repair work were compared to an estimated cost for the system construction. These comparisons (expressed as percentages) translate into the DM Condition Percentages used in the DM model. The process began with the 1 rating where the cost for a major repair was established. That cost was then compared to the estimated original construction cost producing a maximum system condition percentage. For example, a 1 rating in structure equates to 150% of the maximum repair cost of the structure of a facility including some demolition cost and cost to remove. The system condition percentages for 2 through 4 were then established using the same method. However there was a “rule” applied to the 2 rating. For the 2 rating a professional standard was applied. According to the Corps of Engineers, 50% of the replacement value is the decision point to determine whether a system should be repaired or replaced. Because a 2 rating is where this decision point falls, the Corps’ standard was applied as a rule. The rule stated that a 2 equals at most 50% of the 1 rating system condition percentage. For example, even though the calculated value for 2 in roof was 90%, the most the rating could be is 50% of the calculated 1 value (150%), or 75% because that is when the replacement of the roof would most likely occur. Although the percentages have been established for the table, these percentages may need to be adjusted over time if results indicate deferred maintenance contributions that are inconsistent with known costs for expected repairs. The 5 rating was left at 0% because what small DM would occur in this rating would be negligible.

The remaining 5 systems (structure, exterior, HVAC, conveying, and programmatic equipment) were derived from the above percentages. Structure system condition percentage was based on the cost of roof replacement. The major difference is that structural degradation is a steeper curve than for the roof. Typically, very little maintenance is done to the structure until the end of its life when it needs to be torn down and replaced. The model was adjusted accordingly. Exterior system condition percentage was based on the interior numbers. Although exteriors require very little maintenance today (they are usually brick or concrete) indicating a degradation slope similar to structure, we purposefully left the percentages flat to account for window maintenance, which is part of the exterior rating. HVAC percentages were based on the electrical systems. Although a case can be made that they are more similar to plumbing, we left the relationship with electrical to account for a significantly higher maintenance cost than associated with plumbing. Conveying and program equipment were equated to electrical, except the 1 rating was held at 100% because typically there is not an associated demolition and removal cost for these items. This, of course, reduced the 2 rating to 50%.

What follows is a detailed explanation of how we arrived at the percentages for the roof, electrical, interior finishes and plumbing.

ROOF

All of the roofs were asphalt flood coated built-up roofs with a gravel surface. The roofs were all supported by open-webbed girders; no facilities with wood-beam supports were used. The overall results were fairly consistent. There is minor variance due to number of roof vents or hatches, but the effect is negligible. There is a trend for the construction/repair cost per square foot to lower as the facility square footage increases, but that is a mathematical function of the length of perimeter work (flashing, gravel stops, coping, etc.) changing in relation to the area of the roof.

The Grading Criteria are given below, along with the justification for the inclusion or exclusion of equipment from the replacement costs.

Grade 5 – Only normal preventive maintenance required.
No repairs or replacements necessary.

Grade 4 – Some minor repairs could be required. Meets code.
For grade 4, 5% of the roofing, vents, gravel stops removed and replaced

Grade 3 – More minor repairs required. Mostly functional.
For grade 3, 25% of the roofing, vents, gravel stops removed and replaced.

Grade 2 – Significant repairs required. Systems not fully functional for building's intended use. Systems are obsolete. Does not meet all codes.
For grade 2, 75% of the roofing, vents, gravel stops removed and replaced

Grade 1 – Unrepairable, replacement required. Repair parts not available. Systems do not meet code and are unsafe.

For grade 1, 100% of the roofing, vents, gravel stops removed and replaced, 25% of structural girders demolished and replaced.

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Facility #	Fac Name	Total S.F.	CRV	Joist	Roof Construction Estimate	Roof Replacement Cost	Roofing Replacement % of Roof Constr	75% Roof Replacement Cost	75% Roofing Replacement % of Roof Constr	25% Roof Replacement Cost	25% Roof Replacement Cost % of Roof Construction	5% Roof Replacement Cost	5% Roof Replacement Cost % of Roof Construction	% of CRV	CRV\$/S.F.
J6-2313	LANDING AIDS CONTROL BLDG.	4640	2,211,487	16"	\$53,992.08	\$33,531.83	62.11%	\$14,767.09	27.35%	\$6,113.03	11.32%	\$2,509.72	4.65%	2.44%	476.61
K6-1145	MULTI-FUNCTION FACILITY	15953	2,360,189	24"	\$199,365.78	\$131,005.89	65.71%	\$68,776.82	34.50%	\$18,798.26	9.43%	\$5,464.47	2.74%	8.45%	147.95
M6-0336	ELECTROMAGNETIC LAB	9486	1,419,303	16"	\$113,862.46	\$74,612.85	65.53%	\$29,593.66	25.99%	\$11,050.63	9.71%	\$3,598.42	3.16%	8.02%	149.62
K7-0416	OPERATIONS BLDG #1	2906	602,660	16"	\$33,326.07	\$22,113.47	66.35%	\$9,345.15	28.04%	\$3,467.66	10.41%	\$1,069.05	3.21%	5.53%	207.38
K6-1547	LOGISTICS FACILITY	288661	22,022,457	24"	\$3,446,415.99	\$2,122,713.18	61.59%	\$758,528.89	22.01%	\$251,648.66	7.30%	\$51,934.58	1.51%	15.65%	76.29
							64.26%		27.58%		9.63%		3.05%	8.02%	

Roof Summary Sheet

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Source	Line Number	Description	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equip.	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w /grvl surf, base sheet, 4 plies #15 felt, mppd	47.000	Sq.	\$2,538.00	\$2,608.50	\$697.95	\$5,844.45	\$8,226.18
Unit	077105500700	Gravel stop, aluminum, .050" thick, 8" height, painted	272.000	L.F.	\$1,319.20	\$459.68		\$1,778.88	\$2,203.20
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	24.000	Ea.	\$242.40	\$79.68		\$322.08	\$410.38
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w /curb, 1" fbgl insul, al curb/cov	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	6.000	Ea.	\$138.00	\$31.80		\$169.80	\$209.99
Unit	077205009000	Roof vents, minimum labor/equipment charge	1.000	Job		\$58.00		\$58.00	\$103.99
Assembly	B30101151300	St jst rf & clg, open w eb bar jst, 16" d, 5#/LF	4,640.000	S.F.	\$20,323.20	\$9,697.60	\$1,995.20	\$32,016.00	\$41,342.40
					\$25,660.80	\$13,101.26	\$2,693.15	\$41,455.21	\$53,992.08

Building J6-2313, Construction costs.

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w /grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	47.000	Sq.	\$2,538.00	\$2,608.50	\$697.95	\$5,844.45	\$8,226.18
Unit	077105500700	Gravel stop, aluminum, .050" thick, 8" height, painted	1 Shee	125.00	0.064	272.000	L.F.	\$1,319.20	\$459.68		\$1,778.88	\$2,203.20
Unit	077105509000	Gravel stop, minimum labor/ equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	12.000	Ea.	\$121.20	\$39.84		\$161.04	\$205.19
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	6.000	Ea.	\$138.00	\$31.80		\$169.80	\$209.99
Unit	077205009000	Roof vents, minimum labor/ equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022253902480	Framing demo, steel framing, girders, 10" x 16"	B13	165.00	0.339	250.000	L.F.		\$1,887.50	\$1,075.00	\$2,962.50	\$4,263.00
Unit	022253902950	Framing demo, steel framing labor & equip min charge	A1	1.00	8.000	1.000	Job		\$164.00	\$59.50	\$223.50	\$335.07
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	4,700.000	S.F.		\$4,371.00		\$4,371.00	\$7,285.00
Unit	022256909000	Roofing & siding demo, labor/ equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
Assembly	B30101151300	St jst rf & clg, open web bar jst, 16" d, 5#/LF				1,175.000	S.F.	\$5,146.50	\$2,455.75	\$505.25	\$8,107.50	\$10,469.25
								\$9,262.90	\$12,218.07	\$2,337.70	\$23,818.67	\$33,531.83

Building J6-2313, Repair costs.

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Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w /grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	36.000	Sq.	\$1,944.00	\$1,998.00	\$534.60	\$4,476.60	\$6,300.90
Unit	077105500700	Gravel stop, aluminum, .050" thick, 8" height, painted	1 Shee	125.00	0.064	202.000	L.F.	\$979.70	\$341.38		\$1,321.08	\$1,636.20
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	18.000	Ea.	\$181.80	\$59.76		\$241.56	\$307.78
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w /curb, 1" fbgl insul, al curb/cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	077105500650	Gravel stop, aluminum, .050" thick, 8" height, duranodic finish	1 Shee	125.00	0.064	202.000	L.F.	\$965.56	\$341.38		\$1,306.94	\$1,615.80
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	4.000	Ea.	\$92.00	\$21.20		\$113.20	\$140.00
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022256903000	Roofing & siding dml, built-up 5 ply roof, no gravel	B2	1,600.00	0.025	3,525.000	S.F.		\$1,833.00		\$1,833.00	\$3,031.50
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
								\$5,263.06	\$4,900.72	\$534.60	\$10,698.38	\$14,767.09

Building J6-2313, 75% Repair costs.

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w /grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	12.000	Sq.	\$648.00	\$666.00	\$178.20	\$1,492.20	\$2,100.30
Unit	077105500700	Gravel stop, aluminum, .050" thick, 8" height, painted	1 Shee	125.00	0.064	68.000	L.F.	\$329.80	\$114.92		\$444.72	\$550.80
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	6.000	Ea.	\$60.60	\$19.92		\$80.52	\$102.59
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w /curb, 1" fbgl insul, al curb/ cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	077105500650	Gravel stop, aluminum, .050" thick, 8" height, duranodic finish	1 Shee	125.00	0.064	68.000	L.F.	\$325.04	\$114.92		\$439.96	\$543.93
Unit	077105509000	Gravel stop, minimum labor/ equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	2.000	Ea.	\$46.00	\$10.60		\$56.60	\$70.00
Unit	077205009000	Roof vents, minimum labor/ equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022256903000	Roofing & siding dml, built-up 5 ply roof, no gravel	B2	1,600.00	0.025	1,175.000	S.F.		\$611.00		\$611.00	\$1,010.50
Unit	022256909000	Roofing & siding demo, labor/ equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
								\$2,509.44	\$1,843.36	\$178.20	\$4,531.00	\$6,113.03

Building J6-2313, 25% Repair costs.

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Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Installation	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w/grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	3.000	Sq.	\$162.00	\$166.50	\$44.55	\$211.05	\$373.05	\$525.08
Unit	077105500700	Gravel stop, aluminum, .050" thick, 8" height, painted	1 Shee	125.00	0.064	14.000	L.F.	\$67.90	\$23.66		\$23.66	\$91.56	\$113.40
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded comers, 4" deep	1 Rofc	48.00	0.167	2.000	Ea.	\$20.20	\$6.64		\$6.64	\$26.84	\$34.20
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w/ curb, 1" fbgls insul, al curb/cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$106.00	\$1,206.00	\$1,399.95
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$60.00	\$96.00
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	1.000	Ea.	\$23.00	\$5.30		\$5.30	\$28.30	\$35.00
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$58.00	\$103.99
Unit	022256903000	Roofing & siding dml, built-up 5 ply roof, no gravel	B2	1,600.00	0.025	235.000	S.F.		\$122.20		\$122.20	\$122.20	\$202.10
								\$1,373.10	\$548.30	\$44.55	\$592.85	\$1,965.95	\$2,509.72

Building J6-2313. 5% Renair costs.

Source	Line Number	Description	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Assembly	B30101151600	St jst rf & clg, open w eb bar jst, 24" d, 11.52#/LF	16,000.000	S.F.	\$79,520.00	\$35,040.00	\$8,640.00	\$123,200.00	\$157,584.00
Unit	075103000500	BUR, asph flood ct w /grvl surf, base sheet, 4 plies #15 felt, mppd	160.000	Sq.	\$8,640.00	\$8,880.00	\$2,376.00	\$19,896.00	\$28,004.00
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	24.000	Ea.	\$242.40	\$79.68		\$322.08	\$410.38
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w /curb, 1" fbgls insul, al curb/cov	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	042203400800	Coping, stock units, aluminum, for 12" w all	505.000	L.F.	\$4,469.25	\$1,984.65		\$6,453.90	\$8,181.00
Unit	042203609000	Cornices, minimum labor/equipment charge	1.000	Job		\$209.00		\$209.00	\$340.04
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	12.000	Ea.	\$276.00	\$63.60		\$339.60	\$419.99
Unit	077205009000	Roof vents, minimum labor/equipment charge	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	077107500400	Reglet, galvanized steel, 24 gauge, in conc parapet	505.000	L.F.	\$343.40	\$404.00		\$747.40	\$1,050.40
Unit	077107509000	Reglet, flashing minimum labor/equipment charge	1.000	Job		\$60.00		\$60.00	\$99.48
Unit	077107500900	Reglet, counter flashing for above, 12" wide, .032" aluminum	505.000	L.F.	\$585.80	\$707.00		\$1,292.80	\$1,772.55
					\$95,176.85	\$47,591.93	\$11,016.00	\$153,784.78	\$199,365.78

Building K6-1145, Construction costs.

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Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	16,000.000	S.F.		\$14,880.00		\$14,880.00	\$24,800.00
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
Unit	022256902650	Roofing & siding demo, roof accessories, sheet metal coping, up to 12"w ide	1 Clab	240.00	0.033	505.000	L.F.		\$343.40		\$343.40	\$565.60
Unit	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	12.000	Ea.		\$140.40		\$140.40	\$230.40
Unit	022253902520	Framing demo, steel framing, girders, 10" x 24"	B13	125.00	0.448	1,000.000	L.F.		\$9,950.00	\$5,700.00	\$15,650.00	\$22,498.00
Unit	022253902950	Framing demo, steel framing labor & equip min charge	A1	1.00	8.000	1.000	Job		\$164.00	\$59.50	\$223.50	\$335.07
Assembly	B30101151600	St jst rf & clg, open w eb bar jst, 24" d, 11.52#/LF				4,000.000	S.F.	\$19,880.00	\$8,760.00	\$2,160.00	\$30,800.00	\$39,396.00
Unit	075103000500	BUR, asph flood ct w /grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	160.000	Sq.	\$8,640.00	\$8,880.00	\$2,376.00	\$19,896.00	\$28,004.00
Unit	077105500700	Gravel stop, aluminum, .050" thick, 8" height, painted	1 Shee	125.00	0.064	505.000	L.F.	\$2,449.25	\$853.45		\$3,302.70	\$4,090.50
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", w elded corners, 4" deep	1 Rofc	48.00	0.167	24.000	Ea.	\$242.40	\$79.68		\$322.08	\$410.38
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w /curb, 1" fbgls insul, al curb/cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	042203400800	Coping, stock units, aluminum, for 12" w all	D1	80.00	0.200	505.000	L.F.	\$4,469.25	\$1,984.65		\$6,453.90	\$8,181.00
Unit	042203609000	Cornices, minimum labor/equipment charge	D1	1.50	10.667	1.000	Job		\$209.00		\$209.00	\$340.04
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	12.000	Ea.	\$276.00	\$63.60		\$339.60	\$419.99
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
								\$37,056.90	\$46,614.18	\$10,295.50	\$93,966.58	\$131,005.89

Building K6-1145, Repair costs.

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Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w /grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	160.000	Sq.	\$8,640.00	\$8,880.00	\$2,376.00	\$19,896.00	\$28,004.00
Unit	077105500700	Gravel stop, aluminum, .050" thick, 8" height, painted	1 Shee	125.00	0.064	505.000	L.F.	\$2,449.25	\$853.45		\$3,302.70	\$4,090.50
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", w welded corners, 4" deep	1 Rofc	48.00	0.167	24.000	Ea.	\$242.40	\$79.68		\$322.08	\$410.38
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w /curb, 1" fbgl's insul, al curb/cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	042203400800	Coping, stock units, aluminum, for 12" w all	D1	80.00	0.200	505.000	L.F.	\$4,469.25	\$1,984.65		\$6,453.90	\$8,181.00
Unit	042203609000	Cornices, minimum labor/equipment charge	D1	1.50	10.667	1.000	Job		\$209.00		\$209.00	\$340.04
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	12.000	Ea.	\$276.00	\$63.60		\$339.60	\$419.99
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	16,000.000	S.F.		\$14,880.00		\$14,880.00	\$24,800.00
Unit	022256902650	Roofing & siding demo, roof accessories, sheet metal coping, up to 12" w ide	1 Clab	240.00	0.033	505.000	L.F.		\$343.40		\$343.40	\$565.60
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
Unit	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	12.000	Ea.		\$140.40		\$140.40	\$230.40
								\$17,176.90	\$27,740.18	\$2,376.00	\$47,293.08	\$68,776.82

Building K6-1145, 75% Repair costs.

Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w/grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	40.000	Sq.	\$2,160.00	\$2,220.00	\$594.00	\$4,974.00	\$7,001.00
Unit	077105500700	Gravel stop, aluminum, .050" thick, 8" height, painted	1 Shee	125.00	0.064	126.000	L.F.	\$611.10	\$212.94		\$824.04	\$1,020.60
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	6.000	Ea.	\$60.60	\$19.92		\$80.52	\$102.59
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w/curb, 1" fbgl's insul, al curb/cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	042203400800	Coping, stock units, aluminum, for 12" wall	D1	80.00	0.200	126.000	L.F.	\$1,115.10	\$495.18		\$1,610.28	\$2,041.20
Unit	042203609000	Cornices, minimum labor/equipment charge	D1	1.50	10.667	1.000	Job		\$209.00		\$209.00	\$340.04
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	4.000	Ea.	\$92.00	\$21.20		\$113.20	\$140.00
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	4,000.000	S.F.		\$3,720.00		\$3,720.00	\$6,200.00
Unit	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	4.000	Ea.		\$46.80		\$46.80	\$76.80
Unit	022256902650	Roofing & siding demo, roof accessories, sheet metal coping, up to 12"wide	1 Clab	240.00	0.033	126.000	L.F.		\$85.68		\$85.68	\$141.12
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
								\$5,1389.80	\$7,336	\$594.00	\$13.069	\$18.798

Building K6-1145, 25% Repair costs.

Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w/grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	8.000	Sq.	\$432.00	\$444.00	\$118.80	\$994.80	\$1,400.20
Unit	077105500700	Gravel stop, aluminum, .050" thick, 8" height, painted	1 Shee	125.00	0.064	26.000	L.F.	\$126.10	\$43.94		\$170.04	\$210.60
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	2.000	Ea.	\$20.20	\$6.64		\$26.84	\$34.20
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w /curb, 1" fbgl insul, al curb/cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	042203400800	Coping, stock units, aluminum, for 12" w all	D1	80.00	0.200	26.000	L.F.	\$230.10	\$102.18		\$332.28	\$421.20
Unit	042203609000	Cornices, minimum labor/equipment charge	D1	1.50	10.667	1.000	Job		\$209.00		\$209.00	\$340.04
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	1.000	Ea.	\$23.00	\$5.30		\$28.30	\$35.00
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	800.000	S.F.		\$744.00		\$744.00	\$1,240.00
Unit	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	1.000	Ea.		\$11.70		\$11.70	\$19.20
Unit	022256902650	Roofing & siding demo, roof accessories, sheet metal coping, up to 12"w ide	1 Clab	240.00	0.033	26.000	L.F.		\$17.68		\$17.68	\$29.12
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
								\$1,931.40	\$1,890.44	\$118.80	\$3,940.64	\$5,464.47

Building K6-1145, 5% Repair costs.

Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w/grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	100.000	Sq.	\$5,400.00	\$5,550.00	\$1,485.00	\$12,435.00	\$17,502.50
Unit	077105500700	Gravel stop, aluminum, .050" thick, 8" height, painted	1 Shee	125.00	0.064	400.000	L.F.	\$1,940.00	\$676.00		\$2,616.00	\$3,240.00
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	24.000	Ea.	\$242.40	\$79.68		\$322.08	\$410.38
Unit	077105500650	Gravel stop, aluminum, .050" thick, 8" height, duranodic finish	1 Shee	125.00	0.064	400.000	L.F.	\$1,912.00	\$676.00		\$2,588.00	\$3,199.60
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	6.000	Ea.	\$138.00	\$31.80		\$169.80	\$209.99
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Assembly	B30101151300	St jst rf & clg, open web bar jst, 16" d, 5#/LF				10,000.000	S.F.	\$43,800.00	\$20,900.00	\$4,300.00	\$69,000.00	\$89,100.00
								\$53,432.40	\$28,031.48	\$5,785.00	\$87,248.88	\$113,862.46

Building M6-0336, Construction costs.

Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w /grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	100.000	Sq.	\$5,400.00	\$5,550.00	\$1,485.00	\$12,435.00	\$17,502.50
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	24.000	Ea.	\$242.40	\$79.68		\$322.08	\$410.38
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w /curb, 1" fbgls insul, al curb/cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	077105500650	Gravel stop, aluminum, .050" thick, 8" height, duranodic finish	1 Shee	125.00	0.064	400.000	L.F.	\$1,912.00	\$676.00		\$2,588.00	\$3,199.60
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	12.000	Ea.	\$276.00	\$63.60		\$339.60	\$419.99
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022253902480	Framing demo, steel framing, girders, 10" x 16"	B13	165.00	0.339	625.000	L.F.		\$4,718.75	\$2,687.50	\$7,406.25	\$10,657.50
Unit	022253902950	Framing demo, steel framing labor & equip min charge	A1	1.00	8.000	1.000	Job		\$164.00	\$59.50	\$223.50	\$335.07
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	10,000.000	S.F.		\$9,300.00		\$9,300.00	\$15,500.00
Unit	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	12.000	Ea.		\$140.40		\$140.40	\$230.40
Assembly	B30101151600	St jst rf & clg, open w eb bar jst, 24" d, 11.52#/LF				2,500.000	S.F.	\$12,425.00	\$5,475.00	\$1,350.00	\$19,250.00	\$24,622.50
								\$21,355.40	\$26,473.43	\$5,582.00	\$53,410.83	\$74,612.85

Building M6-0336, Repair costs.

Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w /grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	75.000	Sq.	\$4,050.00	\$4,162.50	\$1,113.75	\$9,326.25	\$13,126.88
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", w elded corners, 4" deep	1 Rofc	48.00	0.167	16.000	Ea.	\$161.60	\$53.12		\$214.72	\$273.58
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w /curb, 1" fbgls insul, al curb/cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	077105500650	Gravel stop, aluminum, .050" thick, 8" height, duranodic finish	1 Shee	125.00	0.064	300.000	L.F.	\$1,434.00	\$507.00		\$1,941.00	\$2,399.70
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	8.000	Ea.	\$184.00	\$42.40		\$226.40	\$279.99
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	7,500.000	S.F.		\$6,975.00		\$6,975.00	\$11,625.00
Unit	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	8.000	Ea.		\$93.60		\$93.60	\$153.60
								\$6,929.60	\$12,139.62	\$1,113.75	\$20,182.97	\$29,593.66

Building M6-0336, 75% Repair costs.

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w /grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	25.000	Sq.	\$1,350.00	\$1,387.50	\$371.25	\$3,108.75	\$4,375.63
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", w elded corners, 4" deep	1 Rofc	48.00	0.167	6.000	Ea.	\$60.60	\$19.92		\$80.52	\$102.59
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w /curb, 1" fbgls insul, al curb/cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	077105500650	Gravel stop, aluminum, .050" thick, 8" height, duranodic finish	1 Shee	125.00	0.064	100.000	L.F.	\$478.00	\$169.00		\$647.00	\$799.90
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	3.000	Ea.	\$69.00	\$15.90		\$84.90	\$105.00
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	2,500.000	S.F.		\$2,325.00		\$2,325.00	\$3,875.00
Unit	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	3.000	Ea.		\$35.10		\$35.10	\$57.60
								\$3,057.60	\$4,258.42	\$371.25	\$7,687.27	\$11,050.63

Building M6-0336, 25% Repair costs.

Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w /grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	5.000	Sq.	\$270.00	\$277.50	\$74.25	\$621.75	\$875.13
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", w welded corners, 4" deep	1 Rofc	48.00	0.167	2.000	Ea.	\$20.20	\$6.64		\$26.84	\$34.20
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w /curb, 1" fbgl insul, al curb/cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	077105500650	Gravel stop, aluminum, .050" thick, 8" height, duranodic finish	1 Shee	125.00	0.064	20.000	L.F.	\$95.60	\$33.80		\$129.40	\$159.98
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267		Ea.					
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	500.000	S.F.		\$465.00		\$465.00	\$775.00
Unit	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	1.000	Ea.		\$11.70		\$11.70	\$19.20
								\$1,485.80	\$1,100.64	\$74.25	\$2,660.69	\$3,598.42

Building M6-0336, 5% Repair costs.

Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w/grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	2,900.000	Sq.	\$156,600.00	\$160,950.00	\$43,065.00	\$360,615.00	\$507,572.50
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	40.000	Ea.	\$404.00	\$132.80		\$536.80	\$683.96
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w/curb, 1" fbcls insul, al curb/cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	042203400800	Coping, stock units, aluminum, for 12" wall	D1	80.00	0.200	2,200.000	L.F.	\$19,470.00	\$8,646.00		\$28,116.00	\$35,640.00
Unit	042203609000	Cornices, minimum labor/equipment charge	D1	1.50	10.667	1.000	Job		\$209.00		\$209.00	\$340.04
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	50.000	Ea.	\$1,150.00	\$265.00		\$1,415.00	\$1,749.95
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	077107500400	Reglet, galvanized steel, 24 gauge, in conc parapet	1 Carp	225.00	0.036	2,200.000	L.F.	\$1,496.00	\$1,760.00		\$3,256.00	\$4,576.00
Unit	077107500900	Reglet, counter flashing for above, 12" wide, .032" aluminum	1 Shee	150.00	0.053	2,200.000	L.F.	\$2,552.00	\$3,080.00		\$5,632.00	\$7,722.00
Unit	077107509000	Reglet, flashing minimum labor/equipment charge	1 Carp	3.00	2.667	1.000	Job		\$60.00		\$60.00	\$99.48
Unit	077108001900	Expansion jt, neoprene, dbl-seal type with thick center, 4-1/2" wide	1 Rofc	125.00	0.064	2,100.000	L.F.	\$18,375.00	\$2,667.00		\$21,042.00	\$24,990.00
Unit	151553004640	Drains, roof, main, all al, 12" I profile dome, 2"; 3" & 4" pipe	Q1	14.00	1.143	24.000	Ea.	\$3,936.00	\$636.00		\$4,572.00	\$5,328.12
Assembly	B30101151600	St jst rf & clg, open web bar jst, 24" d, 11.52#/LF				290,000.000	S.F.	\$1,441,300.00	\$635,100.00	\$156,600.00	\$2,233,000.00	\$2,856,210.00
								\$1,646,383	\$813,669	\$199,665.00	\$2,659,717	\$3,446,415

Building K6-1547, Construction Costs.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w/grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	2,900.000	Sq.	\$156,600.00	\$160,950.00	\$43,065.00	\$360,615.00	\$507,572.50
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	40.000	Ea.	\$404.00	\$132.80		\$536.80	\$683.96
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w/curb, 1" fbgls insul, al curb/cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	042203400800	Coping, stock units, aluminum, for 12" wall	D1	80.00	0.200	2,200.000	L.F.	\$19,470.00	\$8,646.00		\$28,116.00	\$35,640.00
Unit	042203609000	Cornices, minimum labor/equipment charge	D1	1.50	10.667	1.000	Job		\$209.00		\$209.00	\$340.04
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	50.000	Ea.	\$1,150.00	\$265.00		\$1,415.00	\$1,749.95
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022253902520	Framing demo, steel framing, girders, 10" x 24"	B13	125.00	0.448	18,125.000	L.F.		\$180,343.75	\$103,312.50	\$283,656.25	\$407,776.25
Unit	022253902950	Framing demo, steel framing labor & equip min charge	A1	1.00	8.000	1.000	Job		\$164.00	\$59.50	\$223.50	\$335.07
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	290,000.000	S.F.		\$269,700.00		\$269,700.00	\$449,500.00
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
Unit	022256902650	Roofing & siding demo, roof accessories, sheet metal coping, up to 12"wide	1 Clab	240.00	0.033	2,200.000	L.F.		\$1,496.00		\$1,496.00	\$2,464.00
Unit	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	50.000	Ea.		\$585.00		\$585.00	\$960.00
Assembly	B30101151600	St jst rf & clg, open web bar jst, 24" d, 11.52#/LF				72,500.000	S.F.	\$360,325.00	\$158,775.00	\$39,150.00	\$558,250.00	\$714,052.50
								\$539,049.00	\$781,512.55	\$185,587.00	\$1,506,148	\$2,122,713

Building K6-1547, Repair costs.

Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w/grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	2,175.000	Sq.	\$117,450.00	\$120,712.50	\$32,298.75	\$270,461.25	\$380,679.38
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	30.000	Ea.	\$303.00	\$99.60		\$402.60	\$512.97
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w/curb, 1" fbgl's insul, al curb/cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	042203400800	Coping, stock units, aluminum, for 12" wall	D1	80.00	0.200	2,175.000	L.F.	\$19,248.75	\$8,547.75		\$27,796.50	\$35,235.00
Unit	042203609000	Cornices, minimum labor/equipment charge	D1	1.50	10.667	1.000	Job		\$209.00		\$209.00	\$340.04
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	12.000	Ea.	\$276.00	\$63.60		\$339.60	\$419.99
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	217,500.000	S.F.		\$202,275.00		#####	\$337,125.00
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
Unit	022256902650	Roofing & siding demo, roof accessories, sheet metal coping, up to 12"wide	1 Clab	240.00	0.033	1,650.000	L.F.		\$1,122.00		\$1,122.00	\$1,848.00
Unit	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	38.000	Ea.		\$444.60		\$444.60	\$729.60
								\$138,377	\$333,720	\$32,298	%504,396	\$758,528

Building K6-1547, 75% Repair costs.

Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w/grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	725.000	Sq.	\$39,150.00	\$40,237.50	\$10,766.25	\$90,153.75	\$126,893.13
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	10.000	Ea.	\$101.00	\$33.20		\$134.20	\$170.99
Unit	077207001200	Roof hatches, 2'-6" x 8'-0", w/curb, 1" fbgl insul, al curb/cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	042203400800	Coping, stock units, aluminum, for 12" wall	D1	80.00	0.200	550.000	L.F.	\$4,867.50	\$2,161.50		\$7,029.00	\$8,910.00
Unit	042203609000	Cornices, minimum labor/equipment charge	D1	1.50	10.667	1.000	Job		\$209.00		\$209.00	\$340.04
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	13.000	Ea.	\$299.00	\$68.90		\$367.90	\$454.99
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	#####	S.F.		\$67,425.00		\$67,425.00	\$112,375.00
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
Unit	022256902650	Roofing & siding demo, roof accessories, sheet metal coping, up to 12"wide	1 Clab	240.00	0.033	550.000	L.F.		\$374.00		\$374.00	\$616.00
Unit	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	13.000	Ea.		\$152.10		\$152.10	\$249.60
								\$45,517	\$110,907	\$10,766	\$167,190	\$251,648.66

Building K6-1547, 25% Repair costs

Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

Source	Line Number	Unit Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	075103000500	BUR, asph flood ct w/grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	145.000	Sq.	\$7,830.00	\$8,047.50	\$2,153.25	\$18,030.75	\$25,378.63
Unit	077204800100	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	2.000	Ea.	\$20.20	\$6.64		\$26.84	\$34.20
Unit	077207001200	077207001200	Roof hatches, 2'-6" x 8'-0", w/curb, 1" fbgl's insul, al curb/cov	G3	6.60	4.848	1.000	Ea.	\$1,100.00	\$106.00		\$1,206.00	\$1,399.95
Unit	042203400800	042203400800	Coping, stock units, aluminum, for 12" wall	D1	80.00	0.200	110.000	L.F.	\$973.50	\$432.30		\$1,405.80	\$1,782.00
Unit	042203609000	042203609000	Cornices, minimum labor/equipment charge	D1	1.50	10.667	1.000	Job		\$209.00		\$209.00	\$340.04
Unit	077205000010	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	3.000	Ea.	\$69.00	\$15.90		\$84.90	\$105.00
Unit	077205009000	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022256903001	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	14,500.000	S.F.		\$13,485.00		\$13,485.00	\$22,475.00
Unit	022256909000	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
Unit	022256902650	022256902650	Roofing & siding demo, roof accessories, sheet metal coping, up to 12"wide	1 Clab	240.00	0.033	110.000	L.F.		\$74.80		\$74.80	\$123.20
Unit	022256902500	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	3.000	Ea.		\$35.10		\$35.10	\$57.60
									#####	#####	\$2,153.25	\$34,698.19	\$51,934.58

Building K6-1547, 5% Repair costs.

Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Assembly	B30101151300	St jst rf & clg, open w eb bar jst, 16" d, 5#/LF				2,900.000	S.F.	\$12,702.00	\$6,061.00	\$1,247.00	\$20,010.00	\$25,839.00
Unit	075103000500	BUR, asph flood ct w/grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	29.000	Sq.	\$1,566.00	\$1,609.50	\$430.65	\$3,606.15	\$5,075.73
Unit	077204800100	Ptch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	16.000	Ea.	\$161.60	\$53.12		\$214.72	\$273.58
Unit	077105500650	Gravel stop, aluminum, .050" thick, 8" height, duranodic finish	1 Shee	125.00	0.064	216.000	L.F.	\$1,032.48	\$365.04		\$1,397.52	\$1,727.78
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	6.000	Ea.	\$138.00	\$31.80		\$169.80	\$209.99
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
								\$15,600.08	\$8,238.46	\$1,677.65	\$25,516.19	\$33,326.07

Building K7-0416, Construction costs.

Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Unit Total	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w /grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	29.000	Sq.	\$124.35	\$1,566.00	\$1,609.50	\$430.65	\$3,606.15	\$5,075.73
Unit	077204800100	Ptch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	16.000	Ea.	\$13.42	\$161.60	\$53.12		\$214.72	\$273.58
Unit	077105500650	Gravel stop, aluminum, .050" thick, 8" height, duranodic finish	1 Shee	125.00	0.064	216.000	L.F.	\$6.47	\$1,032.48	\$365.04		\$1,397.52	\$1,727.78
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job	\$60.00		\$60.00		\$60.00	\$96.00
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	6.000	Ea.	\$28.30	\$138.00	\$31.80		\$169.80	\$209.99
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job	\$58.00		\$58.00		\$58.00	\$103.99
Unit	022253902480	Framing demo, steel framing, girders, 10" x 16"	B13	165.00	0.339	181.000	L.F.	\$11.85		\$1,366.55	\$778.30	\$2,144.85	\$3,086.41
Unit	022253902950	Framing demo, steel framing labor & equip min charge	A1	1.00	8.000	1.000	Job	\$223.50		\$164.00	\$59.50	\$223.50	\$335.07
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job	\$82.00		\$82.00		\$82.00	\$134.97
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	2,900.000	S.F.	\$0.93		\$2,697.00		\$2,697.00	\$4,495.00
Assembly	B30101151300	St jst rf & clg, open web bar jst, 16" d, 5#/LF				725.000	S.F.	\$6.90	\$3,175.50	\$1,515.25	\$311.75	\$5,002.50	\$6,459.75
Unit	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	6.000	Ea.	\$11.70		\$70.20		\$70.20	\$115.20
									\$6,073.58	\$8,072.46	\$1,580.20	\$15,726.24	\$22,113.47

Building K7-0416, Repair costs.

Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w /grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	22.000	Sq.	\$1,188.00	\$1,221.00	\$326.70	\$2,735.70	\$3,850.55
Unit	077105500700	Gravel stop, aluminum, .050" thick, 8" height, painted	1 Shee	125.00	0.064	162.000	L.F.	\$785.70	\$273.78		\$1,059.48	\$1,312.20
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	12.000	Ea.	\$121.20	\$39.84		\$161.04	\$205.19
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	5.000	Ea.	\$115.00	\$26.50		\$141.50	\$175.00
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	2,175.000	S.F.		\$2,022.75		\$2,022.75	\$3,371.25
Unit	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	5.000	Ea.		\$58.50		\$58.50	\$96.00
								\$2,209.90	\$3,842.37	\$326.70	\$6,378.97	\$9,345.15

Building K7-0416, 75% Repair costs

Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w /grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	8.000	Sq.	\$432.00	\$444.00	\$118.80	\$994.80	\$1,400.20
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	4.000	Ea.	\$40.40	\$13.28		\$53.68	\$68.40
Unit	077105500650	Gravel stop, aluminum, .050" thick, 8" height, duranodic finish	1 Shee	125.00	0.064	54.000	L.F.	\$258.12	\$91.26		\$349.38	\$431.95
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	2.000	Ea.	\$46.00	\$10.60		\$56.60	\$70.00
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	725.000	S.F.		\$674.25		\$674.25	\$1,123.75
Unit	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	2.000	Ea.		\$23.40		\$23.40	\$38.40
								\$776.52	\$1,456.79	\$118.80	\$2,352.11	\$3,467.66

Building K7-0416. 25% Repair costs.

Source	Line Number	Description	Crew	Daily Output	Labor Hours	Quantity	Unit	Ext. Material	Ext. Labor	Ext. Equipment	Ext. Total	Ext. Total Incl O&P
Unit	075103000500	BUR, asph flood ct w /grvl surf, base sheet, 4 plies #15 felt, mppd	G1	20.00	2.800	2.000	Sq.	\$108.00	\$111.00	\$29.70	\$248.70	\$350.05
Unit	077204800100	Pitch Pockets, adjustable, 4" to 7", welded corners, 4" deep	1 Rofc	48.00	0.167	1.000	Ea.	\$10.10	\$3.32		\$13.42	\$17.10
Unit	077105500650	Gravel stop, aluminum, .050" thick, 8" height, duranodic finish	1 Shee	125.00	0.064	11.000	L.F.	\$52.58	\$18.59		\$71.17	\$87.99
Unit	077105509000	Gravel stop, minimum labor/equipment charge	1 Shee	3.50	2.286	1.000	Job		\$60.00		\$60.00	\$96.00
Unit	077205000010	Roof vents mushroom for built-up roofs, aluminum	1 Rofc	30.00	0.267	1.000	Ea.	\$23.00	\$5.30		\$28.30	\$35.00
Unit	077205009000	Roof vents, minimum labor/equipment charge	1 Rofc	2.75	2.909	1.000	Job		\$58.00		\$58.00	\$103.99
Unit	022256909000	Roofing & siding demo, labor/equip minimum charge	1 Clab	2.00	4.000	1.000	Job		\$82.00		\$82.00	\$134.97
Unit	022256903001	Roofing & siding demo, built-up 5 ply roof, including gravel	B2	890.00	0.045	145.000	S.F.		\$134.85		\$134.85	\$224.75
Unit	022256902500	Roofing & siding demo, roof accessories, plumbing vent flashing	1 Clab	14.00	0.571	1.000	Ea.		\$11.70		\$11.70	\$19.20
								\$193.68	\$484.76	\$29.70	\$708.14	\$1,069.05

Building K7-0416. 5% Repair costs.

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Electrical Systems

Five Facilities were selected for this cost analysis and are listed below:

K6-1446D	KSC Base Electric Shop
K6-2196	Roads and Grounds Maintenance Building Number 3
M6-0339	Base Operations Building
M6-0486	Base Support
M6-0595	KSC Industrial Area Heat Plant

These facilities were selected on the basis of the types of electrical systems (all are relatively similar), ease of access to the facility, and ease of access to the electrical system (most have relatively exposed electrical systems).

All Cost Works cost lists were generated by starting with the facility equipment list and selecting the electrical equipment, or closest match, from the Cost Works database. Items that were not on the facility equipment list (light fixtures, outlets, wall switches, conduit, wire, etc.) were added from the Cost Works database.

Replacement was limited to those pieces of equipment most likely to become obsolete or experience deterioration due to wear, age, and environmental conditions. Environmental conditions include heat, humidity, salt atmosphere, and lightning strike. The equipment most likely to need replacement was defined as follows:

- Panels (obsolete circuit breakers)
- Electrical Outlets and Wall Switches (wear and physical damage)
- Fluorescent light fixtures (damage to lens and bulb socket, and wear out of ballast)
- Emergency and Exit Lights (age, obsolescence, and damage)
- Wire/cable/conduit (environmental conditions and age related insulation breakdown)
- Outside pad mount transformers (environmental conditions)
- Safety (disconnect) switches and circuit breakers greater than 50 amps (contact wear and age)
- Facility Grounding (age, corrosion, and damage)
- Motor Control Center (age and environment)

Power transformers (6kVA and above) that were mounted indoors are not included in the 75%, 25% and 5% replacement lists since they typically do not wear out and are not usually subjected to detrimental environmental conditions.

The Grading Criteria are given below, along with the justification for the inclusion or exclusion of equipment from the replacement costs.

Grade 5 – Only normal preventive maintenance required.
No repairs or replacements necessary.

Grade 4 – Some minor repairs could be required. Meets code.

For grade 4, the assumption was made that only the items most likely to become obsolete, wear out, or become damaged were to be replaced. This equipment is as follows:

- Electrical Outlets and Wall Switches (wear and physical damage)

- Fluorescent light fixtures (damage to reflector, lens and bulb socket, and wear out of ballast)
- Emergency and Exit Lights (age, obsolescence, and damage)
- Wire/cable/conduit, less than 2” (environmental conditions and age related insulation breakdown)

All other items were removed from the cost list. Quantities were adjusted to reflect approximately 5% of the initial installed quantity, to the nearest integer number. For those items not listed in the Cost Works electrical demolition list, the labor was doubled to account for removal time.

Grade 3 – More minor repairs required. Mostly functional.

For grade 3, the assumption was made that the items likely to need replacement were to be replaced as follows:

- Electrical Outlets and Wall Switches (wear and physical damage)
- Fluorescent light fixtures (damage to lens and bulb socket, and wear out of ballast)
- Emergency and Exit Lights (age, obsolescence, and damage)
- Wire/cable/conduit regardless of size (environmental conditions and age related insulation breakdown)

All other items were removed from the cost list. For those items not listed in the Cost Works electrical demolition list, the labor was doubled to account for removal time. Quantities were adjusted to reflect approximately 25% of the initial installed quantity, to the nearest integer. If the value was a fractional number the quantity of one was used. Items that had a quantity of one were not considered to be replaced and were removed the list. For those items not listed in the Cost Works electrical demolition list, the labor was doubled to account for removal time.

Grade 2 – Significant repairs required. Systems not fully functional for building’s intended use. Systems are obsolete. Does not meet all codes.

For grade 2, the assumption was made that 75% of the items on the list above would need replacement. All other items were removed from the cost list. For those items not listed in the Cost Works electrical demolition list the labor was doubled to account for removal time. Quantities were adjusted to reflect approximately 75% of the initial value, to the nearest integer. Items that had a quantity of one were left on the list of replaced items. For those items not listed in the Cost Works electrical demolition list, the labor was doubled to account for removal time.

Grade 1 – Unrepairable, replacement required. Repair parts not available. Systems do not meet code and are unsafe.

For grade 1, the assumption was made that the old electrical system would be completely removed and a new system installed from scratch. For those items not listed in the Cost Works electrical demolition list, the labor was doubled to account for removal time.

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Facility #	Fac Name	Total S.F.	CRV	Electrical System Construction Estimate	Electrical System Replacement Cost	Electrical System Replacement % of Electrical System Constr	75% Electrical System Replacement Cost	75% Electrical System Replacement % of Electrical System Constr	25% Electrical System Replacement Cost	System Replacement Cost % of Electrical System Construction	5% Electrical System Replacement Cost	5% Electrical System Replacement Cost % of Electrical System Construction	% of CRV
K6-1446D	KSC Electric Shop	15,000	\$956,211.00	\$ 55,692.40	\$ 79,941.29	144%	\$ 57,805.74	104%	\$ 9,136.34	16%	\$ 1,708.82	3%	\$ 0.06
K6-2196	Roads & Grounds Maint. Bldg. No. 3	2,844	\$231,057.00	\$ 40,797.00	\$ 52,880.62	130%	\$ 35,133.01	86%	\$ 3,998.98	10%	\$ 607.36	1%	\$ 0.18
M6-0399	Base Operations Bldg	20,088	\$4,462,296.00	\$ 111,191.45	\$ 141,682.52	127%	\$ 72,975.06	66%	\$ 18,360.91	17%	\$ 3,228.62	3%	\$ 0.02
M6-0486	Base Support Building	85,564	\$8,221,482.00	\$ 694,803.00	\$ 1,004,592.94	145%	\$ 697,667.23	100%	\$ 93,917.46	14%	\$ 11,799.45	2%	\$ 0.08
M6-0595	KSC Industrial Area Heat Plant	6,299	\$11,214,540.00	\$ 124,689.00	\$ 149,786.88	120%	\$ 116,074.99	93%	\$ 9,430.32	8%	\$ 1,116.72	1%	\$ 0.01
						133%		90%		13%		2%	

Summary of electrical costs.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - K6-1446D

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Total Incl. O&P	Zip Code Prefix	Type	Release
1.000	16270600020C	Oil fed XFMR, 5 kV or 15 kV, W/ taps, 277/480 V sec, 3 ph, 300 kVA	R3	0.45	44.44	Ea.	\$ 7,600.00	\$ 800.00	\$ 300.00	\$ 8,700.00	\$ 9,900.00	327	Union	2000
2.000	16270200370C	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 75 kVA	2 Elec	0.7	22.86	Ea.	\$ 3,900.00	\$ 840.00	\$ -	\$ 4,740.00	\$ 5,550.00	327	Union	2000
1.000	16270200330C	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 30 kVA	2 Elec	0.9	17.78	Ea.	\$ 1,050.00	\$ 325.00	\$ -	\$ 1,375.00	\$ 1,650.00	327	Union	2000
1.000	16270200030C	Dry type XFMR, sgl ph, 240/480 volt pri, 120/240 volt sec, 2 kVA	1 Elec	1.6	5	Ea.	\$ 213.00	\$ 91.00	\$ -	\$ 304.00	\$ 370.00	327	Union	2000
2.000	16440720080C	Panelboards, NQOD, 4 wire, 120/208 volts, 100 amp main lugs, 30 circs	1 Elec	0.53	15.09	Ea.	\$ 1,430.00	\$ 554.00	\$ -	\$ 1,984.00	\$ 2,400.00	327	Union	2000
1.000	16440720095C	Panelboards, NQOD, 4 wire, 120/208 volts, 225 amp main lugs, 36 circs	2 Elec	0.8	20	Ea.	\$ 840.00	\$ 365.00	\$ -	\$ 1,205.00	\$ 1,475.00	327	Union	2000
1.000	16440720145C	Panelboards, NEHB, 4 wire, 277/480 volts, 225 amp main lugs, 36 circs	2 Elec	0.72	22.22	Ea.	\$ 1,925.00	\$ 405.00	\$ -	\$ 2,330.00	\$ 2,725.00	327	Union	2000
1.000	16440720230C	Panelboards, NQOD, 4 wire, 120/208 volts, 400 amp main, 42 circuits	2 Elec	0.48	33.33	Ea.	\$ 2,200.00	\$ 610.00	\$ -	\$ 2,810.00	\$ 3,300.00	327	Union	2000
3.000	16410800300C	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 60 amp	1 Elec	2.3	3.478	Ea.	\$ 519.00	\$ 190.50	\$ -	\$ 709.50	\$ 855.00	327	Union	2000
5.000	164108003300	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 100 amp	1 Elec	1.9	4.211	Ea.	\$ 1,360.00	\$ 385.00	\$ -	\$ 1,745.00	\$ 2,075.00	327	Union	2000
1.000	164108003700	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 400 amp	2 Elec	1.8	8.889	Ea.	\$ 1,075.00	\$ 162.00	\$ -	\$ 1,237.00	\$ 1,425.00	327	Union	2000
9.000	165303200500	Emer lt units,btry operated,twin sealed bm lt,25 W,6 V ea,lead btry	1 Elec	4	2	Ea.	\$ 1,386.00	\$ 328.50	\$ -	\$ 1,714.50	\$ 2,025.00	327	Union	2000
6.000	165303200080	Exit and emer ltg, exit light clg or wall mount, incan, single face	1 Elec	8	1	Ea.	\$ 204.00	\$ 109.50	\$ -	\$ 313.50	\$ 393.00	327	Union	2000
40.000	165104403200	Intr,fluor,stp fixt,pendent mtd,indl,wh porc enam,4' L,two 60 W,HO	1 Elec	5	1.6	Ea.	\$ 2,620.00	\$ 1,180.00	\$ -	\$ 3,800.00	\$ 4,640.00	327	Union	2000
20.000	165104401500	Interior ltg fxtr, fluor, surf mtd, acryl lens, 2'w x 4'l, four 40 W	1 Elec	5.3	1.509	Ea.	\$ 1,740.00	\$ 660.00	\$ -	\$ 2,400.00	\$ 2,905.20	327	Union	2000
10.000	165104404030	Interior ltg fxtr, hg vap, surf mtd., hi bay, sgl unit, 400 W DX lamp	2 Elec	4.6	3.478	Ea.	\$ 2,390.00	\$ 762.00	\$ -	\$ 3,152.00	\$ 3,794.20	327	Union	2000
2.000	160608000100	Grounding, rod, copper clad, 10' long, 3/4" dia	1 Elec	4.4	1.818	Ea.	\$ 57.00	\$ 66.00	\$ -	\$ 123.00	\$ 162.00	327	Union	2000
5.000	160608000800	Grounding, bare copper wire stranded, 3/0	2 Elec	6.6	2.424	C.L.F.	\$ 650.00	\$ 220.00	\$ -	\$ 870.00	\$ 1,050.00	327	Union	2000
25.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	C.L.F.	\$ 775.00	\$ 1,662.50	\$ -	\$ 2,437.50	\$ 3,325.00	327	Union	2000
1,000.000	161322051770	Cond to 15' H,incl 2 termn,2 elb&11 bm CLP per 100',galv stl,3/4" dia	1 Elec	80	0.1	L.F.	\$ 1,740.00	\$ 1,820.00	\$ -	\$ 3,560.00	\$ 4,650.00	327	Union	2000
0.000	161322059920	Conduit, add to labor for higher elevated inst, 20' to 25' hi, add						20%			327	Union	2000	
20.000	161397002110	Resi,sgl P,15 amp,ivory,w/a 1-gang box,cov pl,type NM (romex) cable	1 Elec	17.1	0.468	Ea.	\$ 128.00	\$ 171.00	\$ -	\$ 299.00	\$ 396.00	327	Union	2000
60.000	161366000650	Outlet boxes, pressed steel, switchbox	1 Elec	27	0.296	Ea.	\$ 130.80	\$ 324.00	\$ -	\$ 454.80	\$ 627.00	327	Union	2000
Totals							\$ 33,932.80	\$ 12,031.20	\$ 300.00	\$ 46,263.80	\$ 55,692.40			

Building K6-1446D. Constuction costs.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - K6-1446D

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix	Type	Release
1.000	162706000200	Oil fed XFMR, 5 kV or 15 kV, W/ taps, 277/480 V sec, 3 ph, 300 kVA	R3	0.45	44.44	Ea.	\$ 7,600.00	\$ 800.00	\$ 300.00	\$ 8,700.00	\$ 800.00	\$ 9,500.00	\$ 12,350.00	\$ 9,900.00	327	Union	2000
2.000	162702003700	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 75 kVA	? Elec	0.7	22.86	Ea.	\$ 3,900.00	\$ 840.00	\$ -	\$ 4,740.00	\$ 840.00	\$ 5,580.00	\$ 7,254.00	\$ 5,550.00	327	Union	2000
1.000	162702003300	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 30 kVA	? Elec	0.9	17.78	Ea.	\$ 1,050.00	\$ 325.00	\$ -	\$ 1,375.00	\$ 325.00	\$ 1,700.00	\$ 2,210.00	\$ 1,650.00	327	Union	2000
1.000	162702000300	Dry type XFMR, sgl ph, 240/480 volt pri, 120/240 volt sec, 2 kVA	? Elec	1.6	5	Ea.	\$ 213.00	\$ 91.00	\$ -	\$ 304.00	\$ 91.00	\$ 395.00	\$ 513.50	\$ 370.00	327	Union	2000
2.000	164407200800	Panelboards, NQOD, 4 wire, 120/208 volts, 100 amp main lugs, 30 circs	? Elec	0.53	15.09	Ea.	\$ 1,430.00	\$ 554.00	\$ -	\$ 1,984.00	\$ 554.00	\$ 2,538.00	\$ 3,299.40	\$ 2,400.00	327	Union	2000
1.000	164407200950	Panelboards, NQOD, 4 wire, 120/208 volts, 225 amp main lugs, 36 circs	? Elec	0.8	20	Ea.	\$ 840.00	\$ 365.00	\$ -	\$ 1,205.00	\$ 365.00	\$ 1,570.00	\$ 2,041.00	\$ 1,475.00	327	Union	2000
1.000	164407201450	Panelboards, NEHB, 4 wire, 277/480 volts, 225 amp main lugs, 36 circs	? Elec	0.72	22.22	Ea.	\$ 1,925.00	\$ 405.00	\$ -	\$ 2,330.00	\$ 405.00	\$ 2,735.00	\$ 3,555.50	\$ 2,725.00	327	Union	2000
1.000	164407202300	Panelboards, NQOD, 4 wire, 120/208 volts, 400 amp main, 42 circuits	? Elec	0.48	33.33	Ea.	\$ 2,200.00	\$ 610.00	\$ -	\$ 2,810.00	\$ 610.00	\$ 3,420.00	\$ 4,446.00	\$ 3,300.00	327	Union	2000
3.000	164108003000	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 60 amp	? Elec	2.3	3.478	Ea.	\$ 519.00	\$ 190.50	\$ -	\$ 709.50	\$ 190.50	\$ 900.00	\$ 1,170.00	\$ 855.00	327	Union	2000
5.000	164108003300	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 100 amp	? Elec	1.9	4.211	Ea.	\$ 1,360.00	\$ 385.00	\$ -	\$ 1,745.00	\$ 385.00	\$ 2,130.00	\$ 2,769.00	\$ 2,075.00	327	Union	2000
1.000	164108003700	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 400 amp	? Elec	1.8	8.889	Ea.	\$ 1,075.00	\$ 162.00	\$ -	\$ 1,237.00	\$ 162.00	\$ 1,399.00	\$ 1,818.70	\$ 1,425.00	327	Union	2000
9.000	165303200500	Emer lt units, btry operated, twin sealed bm lt, 25 W, 6 V ea, lead btry	? Elec	4	2	Ea.	\$ 1,386.00	\$ 328.50	\$ -	\$ 1,714.50	\$ 328.50	\$ 2,043.00	\$ 2,655.90	\$ 2,025.00	327	Union	2000
6.000	165303200800	Exit and emer lgt, exit light clg or wall mount, incan, single face	? Elec	8	1	Ea.	\$ 204.00	\$ 109.50	\$ -	\$ 313.50	\$ 109.50	\$ 423.00	\$ 549.90	\$ 393.00	327	Union	2000
40.000	165104403200	Intr, fluor, strp fixt, pendent mtd, indl, wh porc enam, 4' L, two 60 W, HO	? Elec	5	1.6	Ea.	\$ 2,620.00	\$ 1,180.00	\$ -	\$ 3,800.00	\$ -	\$ 3,800.00	\$ 4,940.00	\$ 4,640.00	327	Union	2000
20.000	165104401500	Interior lgt fxt, fluor, surf mtd, acryl lens, 2'w x 4'l, four 40 W	? Elec	5.3	1.509	Ea.	\$ 1,740.00	\$ 660.00	\$ -	\$ 2,400.00	\$ -	\$ 2,400.00	\$ 3,120.00	\$ 2,905.20	327	Union	2000
10.000	165104404030	Interior lgt fxt, hg vap, surf mtd., hi bay, sgl unit, 400 W DX lamp	? Elec	4.6	3.478	Ea.	\$ 2,390.00	\$ 762.00	\$ -	\$ 3,152.00	\$ 762.00	\$ 3,914.00	\$ 5,088.20	\$ 3,794.20	327	Union	2000
2.000	160608000100	Grounding, rod, copper clad, 10' long, 3/4" dia	? Elec	4.4	1.818	Ea.	\$ 57.00	\$ 66.00	\$ -	\$ 123.00	\$ 66.00	\$ 189.00	\$ 245.70	\$ 162.00	327	Union	2000
5.000	160608000800	Grounding, bare copper wire stranded, 3/0	? Elec	6.6	2.424	C.L.F.	\$ 650.00	\$ 220.00	\$ -	\$ 870.00	\$ 220.00	\$ 1,090.00	\$ 1,417.00	\$ 1,050.00	327	Union	2000
25.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	? Elec	2.2	3.636	C.L.F.	\$ 775.00	\$ 1,662.50	\$ -	\$ 2,437.50	\$ -	\$ 2,437.50	\$ 3,168.75	\$ 3,325.00	327	Union	2000
1,000.000	161322051770	Conduit to 15' H, incl 2 termn, 2 elb & 11 bm CLP per 100' galv stl, 3/4" dia	? Elec	80	0.1	L.F.	\$ 1,740.00	\$ 1,820.00	\$ -	\$ 3,560.00	\$ -	\$ 3,560.00	\$ 4,628.00	\$ 4,650.00	327	Union	2000
0.000	161322059920	Conduit, add to labor for higher elevated inst, 20' to 25' hi, add						20%				\$ -			327	Union	2000
20.000	161397002110	Resi, sgl P, 15 amp, ivory, w/a 1-gang box, cov pl, type NM (romex) cable	? Elec	17.1	0.468	Ea.	\$ 128.00	\$ 171.00	\$ -	\$ 299.00	\$ 171.00	\$ 470.00	\$ 611.00	\$ 396.00	327	Union	2000
60.000	161366000650	Outlet boxes, pressed steel, switchbox	? Elec	27	0.296	Ea.	\$ 130.80	\$ 324.00	\$ -	\$ 454.80	\$ 324.00	\$ 778.80	\$ 1,012.44	\$ 627.00	327	Union	2000
1,000.000	160553000100	Electrical dml, conduit to 15' high, rigid galv steel, 1/2" to 1" dia	? Elec	242	0.033	L.F.	\$ -	\$ 600.00	\$ -	\$ 600.00	\$ -	\$ 600.00	\$ 780.00	\$ 900.00	327	Union	2000
2,500.000	160553000380	Electrical demo, non-metallic sheathed cable (Romex), #12, 2 wire	? Elec	630	0.013	L.F.	\$ -	\$ 575.00	\$ -	\$ 575.00	\$ -	\$ 575.00	\$ 747.50	\$ 875.00	327	Union	2000
2.000	160553001420	Electrical demo, transformer dry supports, wire & termn 75 kVA	? Elec	1.25	6.4	Ea.	\$ -	\$ 234.00	\$ -	\$ 234.00	\$ -	\$ 234.00	\$ 304.20	\$ 348.00	327	Union	2000
2,500.000	160553001840	Electrical demo, wire, THN-THWN-THHN, removed from, in place conduit, #12	? Elec	55	0.145	C.L.F.	\$ -	\$ 6,625.00	\$ -	\$ 6,625.00	\$ -	\$ 6,625.00	\$ 8,612.50	\$ 9,950.00	327	Union	2000
5.000	160553001930	Electrical demo, wire, THW-THWN-THHN, removed from, in place conduit, 3/0	? Elec	25	0.64	C.L.F.	\$ -	\$ 58.00	\$ -	\$ 58.00	\$ -	\$ 58.00	\$ 75.40	\$ 87.00	327	Union	2000
20.000	160553002140	Electrical demo, int fluore fixt, rec drop-in 2'x4', 4 lamp	? Elec	30	0.533	Ea.	\$ -	\$ 195.00	\$ -	\$ 195.00	\$ -	\$ 195.00	\$ 253.50	\$ 293.00	327	Union	2000
40.000	160553002340	Electrical demo, fluore fixt, strp fixt, surf mt, 4' long, 2 lamp	? Elec	50	0.32	Ea.	\$ -	\$ 234.00	\$ -	\$ 234.00	\$ -	\$ 234.00	\$ 304.20	\$ 350.00	327	Union	2000
Totals							\$ 33,932.80	\$ 20,552.20	\$ 300.00	\$ 54,784.80	\$ 6,708.50	\$ 61,493.30	\$ 79,941.29	\$ 68,495.40			

Building K6-1446D, Replacement costs.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - K6-1446D

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix	Type	Release
1.000	162706000200	taps, 277/480 V sec, 3 ph, 300 kVA	R3	0.45	44.444	Ea.	\$ 7,600.00	\$ 800.00	\$ 300.00	\$ 8,700.00	\$ 800.00	\$ 9,500.00	\$ 12,350.00	\$ 9,900.00	327	Union	2000
1.000	164407200800	Panelboards, NQOD, 4 wire, 120/208 volts, 100 amp main lugs, 30 circs	1 Elec	0.53	15.094	Ea.	\$ 715.00	\$ 277.00	\$ -	\$ 992.00	\$ 277.00	\$ 1,269.00	\$ 1,649.70	\$ 1,200.00	327	Union	2000
1.000	164407200950	Panelboards, NQOD, 4 wire, 120/208 volts, 225 amp main lugs, 36 circs	2 Elec	0.8	20	Ea.	\$ 840.00	\$ 365.00	\$ -	\$ 1,205.00	\$ 365.00	\$ 1,570.00	\$ 2,041.00	\$ 1,475.00	327	Union	2000
1.000	164407201450	277/480 volts, 225 amp main lugs, 36 circs	2 Elec	0.72	22.222	Ea.	\$ 1,925.00	\$ 405.00	\$ -	\$ 2,330.00	\$ 405.00	\$ 2,735.00	\$ 3,555.50	\$ 2,725.00	327	Union	2000
1.000	164407202300	120/208 volts, 400 amp main, 42 circuits	2 Elec	0.48	33.333	Ea.	\$ 2,200.00	\$ 610.00	\$ -	\$ 2,810.00	\$ 610.00	\$ 3,420.00	\$ 4,446.00	\$ 3,300.00	327	Union	2000
2.000	164108003000	volt, 3 pole NEMA 1 fusible, 60 amp	1 Elec	2.3	3.478	Ea.	\$ 346.00	\$ 127.00	\$ -	\$ 473.00	\$ 127.00	\$ 600.00	\$ 780.00	\$ 570.00	327	Union	2000
4.000	164108003300	volt, 3 pole NEMA 1 fusible, 100 amp	1 Elec	1.9	4.211	Ea.	\$ 1,088.00	\$ 308.00	\$ -	\$ 1,396.00	\$ 308.00	\$ 1,704.00	\$ 2,215.20	\$ 1,660.00	327	Union	2000
1.000	164108003700	volt, 3 pole NEMA 1 fusible, 400 amp	2 Elec	1.8	8.889	Ea.	\$ 1,075.00	\$ 162.00	\$ -	\$ 1,237.00	\$ 162.00	\$ 1,399.00	\$ 1,818.70	\$ 1,425.00	327	Union	2000
7.000	165303200500	Emer It units, btry operated, twin sealed bm lt, 25 W, 6 V ea, lead btry	1 Elec	4	2	Ea.	\$ 1,078.00	\$ 255.50	\$ -	\$ 1,333.50	\$ 255.50	\$ 1,589.00	\$ 2,065.70	\$ 1,575.00	327	Union	2000
5.000	165303200080	Exit and emer ltg, exit light clg or wall mount, incan, single face	1 Elec	8	1	Ea.	\$ 170.00	\$ 91.25	\$ -	\$ 261.25	\$ 91.25	\$ 352.50	\$ 458.25	\$ 327.50	327	Union	2000
30.000	165104403200	Intr, floor, strp fixt, pendent mtd, incl, wh porc enam, 4' L, two 60 W, HO	1 Elec	5	1.6	Ea.	\$ 1,965.00	\$ 885.00	\$ -	\$ 2,850.00	\$ -	\$ 2,850.00	\$ 3,705.00	\$ 3,480.00	327	Union	2000
15.000	165104401500	Interior ltg fxtr, floor, surf mtd, acryl lens, 2'w x 4'l, four 40 W	1 Elec	5.3	1.509	Ea.	\$ 1,305.00	\$ 495.00	\$ -	\$ 1,800.00	\$ -	\$ 1,800.00	\$ 2,340.00	\$ 2,178.90	327	Union	2000
8.000	165104404030	Interior ltg fxtr, hg vap, surf mtd., hi bay, sgl unit, 400 W DX lamp	2 Elec	4.6	3.478	Ea.	\$ 1,912.00	\$ 609.60	\$ -	\$ 2,521.60	\$ 609.60	\$ 3,131.20	\$ 4,070.56	\$ 3,035.36	327	Union	2000
1.000	160608000100	Grounding, rod, copper clad, 10' long, 3/4" dia	1 Elec	4.4	1.818	Ea.	\$ 28.50	\$ 33.00	\$ -	\$ 61.50	\$ 33.00	\$ 94.50	\$ 122.85	\$ 81.00	327	Union	2000
4.000	160608000800	Grounding, bare copper wire stranded, 3/0	2 Elec	6.6	2.424	C.L.F.	\$ 520.00	\$ 176.00	\$ -	\$ 696.00	\$ 176.00	\$ 872.00	\$ 1,133.60	\$ 840.00	327	Union	2000
18.000	161205500300	600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	C.L.F.	\$ 558.00	\$ 1,197.00	\$ -	\$ 1,755.00	\$ -	\$ 1,755.00	\$ 2,281.50	\$ 2,394.00	327	Union	2000
750.000	161322051770	Cond to 15' H, incl 2 termn, 2 elb&11 bm CLP per 100', galv stl, 3/4" dia	1 Elec	80	0.1	L.F.	\$ 1,305.00	\$ 1,365.00	\$ -	\$ 2,670.00	\$ -	\$ 2,670.00	\$ 3,471.00	\$ 3,487.50	327	Union	2000
15.000	161397002110	Resi, sgl P, 15 amp, ivory, w/a 1-gang box, cov pl, type NM (romex) cable	1 Elec	17.1	0.468	Ea.	\$ 96.00	\$ 128.25	\$ -	\$ 224.25	\$ 128.25	\$ 352.50	\$ 458.25	\$ 297.00	327	Union	2000
45.000	161366000650	Outlet boxes, pressed steel, switchbox	1 Elec	27	0.296	Ea.	\$ 98.10	\$ 243.00	\$ -	\$ 341.10	\$ 243.00	\$ 584.10	\$ 759.33	\$ 470.25	327	Union	2000
750.000	160553000100	Electrical dml, conduit to 15' high, rigid galv steel, 1/2" to 1" dia	1 Elec	242	0.033	L.F.	\$ -	\$ 450.00	\$ -	\$ 450.00	\$ -	\$ 450.00	\$ 585.00	\$ 675.00	327	Union	2000
1,875.000	160553000380	Electrical demo, non-metallic sheathed cable (Romex), #12, 2 wire	1 Elec	630	0.013	L.F.	\$ -	\$ 431.25	\$ -	\$ 431.25	\$ -	\$ 431.25	\$ 560.63	\$ 656.25	327	Union	2000
1,875.000	160553001840	Electrical demo, wire, THN-THWN-THHN, removed from, in place conduit, #12	1 Elec	55	0.145	C.L.F.	\$ -	\$ 4,968.75	\$ -	\$ 4,968.75	\$ -	\$ 4,968.75	\$ 6,459.38	\$ 7,462.50	327	Union	2000
4.000	160553001930	Electrical demo, wire, THW-THWN-THHN, removed from, in place conduit, 3/0	2 Elec	25	0.64	C.L.F.	\$ -	\$ 46.40	\$ -	\$ 46.40	\$ -	\$ 46.40	\$ 60.32	\$ 69.60	327	Union	2000
15.000	160553002140	Electrical demo, int fluore fixt, rec drop-in 2'x4', 4 lamp	2 Elec	30	0.533	Ea.	\$ -	\$ 146.25	\$ -	\$ 146.25	\$ -	\$ 146.25	\$ 190.13	\$ 219.75	327	Union	2000
30.000	160553002340	Electrical demo, fluore fixt, strp fixt, surf mt, 4' long, 2 lamp	2 Elec	50	0.32	Ea.	\$ -	\$ 175.50	\$ -	\$ 175.50	\$ -	\$ 175.50	\$ 228.15	\$ 262.50	327	Union	2000
Totals							\$ 24,824.60	\$ 14,750.75	\$ 300.00	\$ 39,875.35	\$ 4,590.60	\$ 44,465.95	\$ 57,805.74	\$ 49,767.11			

Building K6-1446D, 75% Replacement costs.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - K6-1446D

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix	Type	Release
3.000	165303200500	Emer lt units,btry operated,twin sealed bm lt,25 W,6 V ea,lead btry	1 Elec	4	2	Ea.	\$ 462.00	\$ 109.50	\$ -	\$ 571.50	\$ 109.50	\$ 681.00	\$ 885.30	\$ 675.00	327	Union	2000
1.000	165303200080	Exit and emer ltg, exit light clg or wall mount, incan,	1 Elec	8	1	Ea.	\$ 34.00	\$ 18.25	\$ -	\$ 52.25	\$ 18.25	\$ 70.50	\$ 91.65	\$ 65.50	327	Union	2000
10.000	165104403200	Intr,fluor,strp fixt,pendent mtd,indl,wh porc enam,4' L,two 60 W,HO	1 Elec	5	1.6	Ea.	\$ 655.00	\$ 295.00	\$ -	\$ 950.00	\$ -	\$ 950.00	\$ 1,235.00	\$ 1,160.00	327	Union	2000
5.000	165104401500	Interior ltg fxtr, fluor, surf mtd, acryl lens, 2'w x 4'l, four 40	1 Elec	5.3	1.509	Ea.	\$ 435.00	\$ 165.00	\$ -	\$ 600.00	\$ -	\$ 600.00	\$ 780.00	\$ 726.30	327	Union	2000
3.000	165104404030	Interior ltg fxtr, hg vap, surf mtd., hi bay, sgl unit, 400 W DX lamp	2 Elec	4.6	3.478	Ea.	\$ 717.00	\$ 228.60	\$ -	\$ 945.60	\$ 228.60	\$ 1,174.20	\$ 1,526.46	\$ 1,138.26	327	Union	2000
5.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	C.L.F.	\$ 155.00	\$ 332.50	\$ -	\$ 487.50	\$ -	\$ 487.50	\$ 633.75	\$ 665.00	327	Union	2000
250.000	161322051770	Cond to 15' H,incl 2 termn,2 elb&11 bm CLP per 100',galv stl,3/4" dia	1 Elec	80	0.1	L.F.	\$ 435.00	\$ 455.00	\$ -	\$ 890.00	\$ -	\$ 890.00	\$ 1,157.00	\$ 1,162.50	327	Union	2000
5.000	161397002110	Resi,sgl P,15 amp,ivory,w/a 1-gang box,cov pl,type NM (romex) cable	1 Elec	17.1	0.468	Ea.	\$ 32.00	\$ 42.75	\$ -	\$ 74.75	\$ 42.75	\$ 117.50	\$ 152.75	\$ 99.00	327	Union	2000
250.000	160553000100	Electrical dml, conduit to 15' high, rigid galv steel,1/2" to 1" dia	1 Elec	242	0.033	L.F.	\$ -	\$ 150.00	\$ -	\$ 150.00	\$ -	\$ 150.00	\$ 195.00	\$ 225.00	327	Union	2000
625.000	160553000380	Electrical demo, non-metallic sheathed cable (Romex), #12, 2 wire	1 Elec	630	0.013	L.F.	\$ -	\$ 143.75	\$ -	\$ 143.75	\$ -	\$ 143.75	\$ 186.88	\$ 218.75	327	Union	2000
625.000	160553001840	Electrical demo, wire, THN-THWN-THHN, removed from, in place conduit, #12	1 Elec	55	0.145	C.L.F.	\$ -	\$ 1,656.25	\$ -	\$ 1,656.25	\$ -	\$ 1,656.25	\$ 2,153.13	\$ 2,487.50	327	Union	2000
5.000	160553002140	Electrical demo, int fluore fixt, rec drop-in 2'x4', 4 lamp	2 Elec	30	0.533	Ea.	\$ -	\$ 48.75	\$ -	\$ 48.75	\$ -	\$ 48.75	\$ 63.38	\$ 73.25	327	Union	2000
10.000	160553002340	Electrical demo, fluore fixt, strp fixt, surf mt, 4' long, 2 lamp	2 Elec	50	0.32	Ea.	\$ -	\$ 58.50	\$ -	\$ 58.50	\$ -	\$ 58.50	\$ 76.05	\$ 87.50	327	Union	2000
Totals							\$ 2,925.00	\$ 3,703.85	\$ -	\$ 6,628.85	\$ 399.10	\$ 7,027.95	\$ 9,136.34	\$ 8,783.56			

Building K6-1446D, 25% Replacement costs.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - K6-1446D

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix	Type	Release
1.000	165303200500	Emer lt units, btry operated, twin sealed bm lt, 25 W, 6 V ea, lead btry	1 Elec	4	2	Ea.	\$ 154.00	\$ 36.50	\$ -	\$ 190.50	\$ 36.50	\$ 227.00	\$ 295.10	\$ 225.00	327	Union	2000
1.000	165303200080	Exit and emer ltg, exit light clg or wall mount, incan, single face	1 Elec	8	1	Ea.	\$ 34.00	\$ 18.25	\$ -	\$ 52.25	\$ 18.25	\$ 70.50	\$ 84.60	\$ 65.50	327	Union	2000
2.000	165104403200	Intr, fluor, strp fixt, pendent mtd, indl, wh porc enam, 4' L, two 60 W, HO	1 Elec	5	1.6	Ea.	\$ 131.00	\$ 59.00	\$ -	\$ 190.00	\$ -	\$ 190.00	\$ 228.00	\$ 232.00	327	Union	2000
1.000	165104401500	Interior ltg fxtr, fluor, surf mtd, acryl lens, 2'w x 4'l, four 40 W	1 Elec	5.3	1.509	Ea.	\$ 87.00	\$ 33.00	\$ -	\$ 120.00	\$ -	\$ 120.00	\$ 144.00	\$ 145.26	327	Union	2000
1.000	165104404030	Interior ltg fxtr, hg vap, surf mtd., hi bay, sgl unit, 400 W DX lamp	2 Elec	4.6	3.478	Ea.	\$ 239.00	\$ 76.20	\$ -	\$ 315.20	\$ 76.20	\$ 391.40	\$ 469.68	\$ 379.42	327	Union	2000
1.000	161397002110	Resi, sgl P, 15 amp, ivory, w/a 1-gang box, cov pl, type NM (romex) cable	1 Elec	17.1	0.468	Ea.	\$ 6.40	\$ 8.55	\$ -	\$ 14.95	\$ 8.55	\$ 23.50	\$ 28.20	\$ 19.80	327	Union	2000
50.000	160553000100	Electrical dml, conduit to 15' high, rigid galv steel, 1/2" to 1" dia	1 Elec	242	0.033	L.F.	\$ -	\$ 30.00	\$ -	\$ 30.00	\$ -	\$ 30.00	\$ 36.00	\$ 45.00	327	Union	2000
125.000	160553001840	THHN, removed from, in place conduit, #12	1 Elec	55	0.145	C.L.F.	\$ -	\$ 331.25	\$ -	\$ 331.25	\$ -	\$ 331.25	\$ 397.50	\$ 497.50	327	Union	2000
1.000	160553002140	Electrical demo, int fluore fixt, rec drop-in 2'x4', 4 lamp	2 Elec	30	0.533	Ea.	\$ -	\$ 9.75	\$ -	\$ 9.75	\$ -	\$ 9.75	\$ 11.70	\$ 14.65	327	Union	2000
2.000	160553002340	Electrical demo, fluore fixt, strp fixt, surf mt, 4' long, 2 lamp	2 Elec	50	0.32	Ea.	\$ -	\$ 11.70	\$ -	\$ 11.70	\$ -	\$ 11.70	\$ 14.04	\$ 17.50	327	Union	2000
Totals							\$ 651.40	\$ 614.20	\$ -	\$ 1,265.60	\$ 139.50	\$ 1,405.10	\$ 1,708.82	\$ 1,641.63			

Building K6-1446D, 5% Replacement costs.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - K6-2196

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Total Incl. O&P	Zip Code Prefix	Type	Release
2.000	164108000200	Safety switches, general duty 240 volt, 3 pole NEMA 1, fusible, 60 amp	1 Elec	2.3	3.478	Ea.	\$ 214.00	\$ 127.00	\$ -	\$ 341.00	\$ 426.00	327	Union	2000
2.000	164108000400	Safety switches, general duty 240 volt, 3 pole NEMA 1, fusible, 200 amp	1 Elec	1.3	6.154	Ea.	\$ 790.00	\$ 224.00	\$ -	\$ 1,014.00	\$ 1,210.00	327	Union	2000
2.000	161397001100	Resi, svce&pnl, 24' al serv, mtr socket, 100 A, W/10 branch bkrs	1 Elec	1.19	6.723	Ea.	\$ 770.00	\$ 246.00	\$ -	\$ 1,016.00	\$ 1,200.00	327	Union	2000
2.000	161397001120	Resi, svce&pnl, 24' al serv, mtr socket,100A,w/10 BR bkrs,w/rgs cnd&w	1 Elec	0.73	10.959	Ea.	\$ 1,050.00	\$ 398.00	\$ -	\$ 1,448.00	\$ 1,760.00	327	Union	2000
10.000	161397002130	Resi, sw dvc, sgl P, 15 amp, ivory, w/a 1-gang box, cov pl, EMT & wire	1 Elec	5.7	1.401	Ea.	\$ 168.00	\$ 255.00	\$ -	\$ 423.00	\$ 565.00	327	Union	2000
20.000	161397003430	Resi, comb dvc, decorator style, S.P. sw/15 A recpt., EMT & wire	1 Elec	4.4	1.818	Ea.	\$ 570.00	\$ 660.00	\$ -	\$ 1,230.00	\$ 1,620.00	327	Union	2000
1.000	164407201900	Panelboards, NQOD, 3 wire, 120/240 volt, 400 amp main, 30 circuits	2 Elec	0.54	29.63	Ea.	\$ 1,750.00	\$ 540.00	\$ -	\$ 2,290.00	\$ 2,750.00	327	Union	2000
1.000	160608000100	Grounding, rod, copper clad, 10' long, 3/4" dia	1 Elec	4.4	1.818	Ea.	\$ 28.50	\$ 33.00	\$ -	\$ 61.50	\$ 81.00	327	Union	2000
1.000	162702003900	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 112.5 kVA	R3	0.9	22.222	Ea.	\$ 2,575.00	\$ 400.00	\$ 151.00	\$ 3,126.00	\$ 3,600.00	327	Union	2000
1.000	162706000100	Oil fed XFMR, 5 kV or 15 kV, W/ taps, 277/480 V sec, 3 ph, 150 kVA	R3	0.65	30.769	Ea.	\$ 5,750.00	\$ 555.00	\$ 209.00	\$ 6,514.00	\$ 7,400.00	327	Union	2000
1.000	164407201400	Panelboards, NEHB, 4 wire, 277/480 volts, 225 amp main lugs, 30 circs	2 Elec	0.8	20	Ea.	\$ 1,675.00	\$ 365.00	\$ -	\$ 2,040.00	\$ 2,375.00	327	Union	2000
50.000	165104401300	Interior ltg fxtr, fluor, surf mtd, acryl lens, 2'w x 4'l, two 40 W	1 Elec	6.2	1.29	Ea.	\$ 3,750.00	\$ 1,175.00	\$ -	\$ 4,925.00	\$ 5,900.00	327	Union	2000
20.000	161397004030	Resi, recpt dvc, DX outlet, 15 A recpt., ivory,1-gang box,pl,EMT& wire	1 Elec	5.35	1.501	Ea.	\$ 308.00	\$ 550.00	\$ -	\$ 858.00	\$ 1,160.00	327	Union	2000
2.000	161397008270	Resi, bathroom vent fan, 50 CFM (use w/above hook-up), low noise model	1 Elec	15	0.533	Ea.	\$ 58.00	\$ 19.50	\$ -	\$ 77.50	\$ 93.00	327	Union	2000
1.000	161397008680	Resi,HW htr hook-up,incl 1-2 p CB,box, 3' flex, 20' #10/2, EMT & wire	1 Elec	3.4	2.353	Ea.	\$ 27.00	\$ 43.00	\$ -	\$ 70.00	\$ 93.50	327	Union	2000
2.000	161397009240	Ht pump hkup,40A/100A 2p bkr,locl disc,3' seal,40'#8/2,30'#3/2,MC cbl	1 Elec	1.08	7.407	Ea.	\$ 860.00	\$ 270.00	\$ -	\$ 1,130.00	\$ 1,340.00	327	Union	2000
2.000	164407201350	Panelboards, NEHB, 4 wire, 277/480 volts, 225 amp main lugs, 24 circs	2 Elec	0.9	17.778	Ea.	\$ 2,750.00	\$ 650.00	\$ -	\$ 3,400.00	\$ 4,000.00	327	Union	2000
2.000	164407200700	Panelboards, NQOD, 4 wire, 120/208 volts, 100 amp main lugs, 20 circs	1 Elec	0.65	12.308	Ea.	\$ 1,140.00	\$ 448.00	\$ -	\$ 1,588.00	\$ 1,920.00	327	Union	2000
30.000	161366000650	Outlet boxes, pressed steel, switchbox	1 Elec	27	0.296	Ea.	\$ 65.40	\$ 162.00	\$ -	\$ 227.40	\$ 313.50	327	Union	2000
500.000	161322051770	Cond to 15' H,incl 2 termn,2 elb&11 bm CLP per 100',galv stl,3/4" dia	1 Elec	80	0.1	L.F.	\$ 870.00	\$ 910.00	\$ -	\$ 1,780.00	\$ 2,325.00	327	Union	2000
5.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	C.L.F.	\$ 155.00	\$ 332.50	\$ -	\$ 487.50	\$ 665.00	327	Union	2000
Totals							\$ 25,323.90	\$ 8,363.00	\$ 360.00	\$ 34,046.90	\$ 40,797.00			
2001 Inflation Adjusted Totals							\$ 26,083.62	\$ 8,613.89	\$ 370.80	\$ 35,068.31	\$ 42,020.91			
2002 Inflation Adjusted Totals							\$ 26,866.13	\$ 8,872.31	\$ 381.92	\$ 36,120.36	\$ 43,281.54			

Building K6-2196 Construction Costs

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - K6-2196

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix	Type	Release
2.000	164108000200	Safety switches, general duty 240 volt, 3 pole NEMA 1, fusible, 60 amp	1 Elec	2.3	3.478	Ea.	\$ 214.00	\$ 127.00	\$ -	\$ 341.00	\$ 127.00	\$ 468.00	\$ 608.40	\$ 426.00	327	Union	2000
2.000	164108000400	Safety switches, general duty 240 volt, 3 pole NEMA 1, fusible, 200 amp	1 Elec	1.3	6.154	Ea.	\$ 790.00	\$ 224.00	\$ -	\$ 1,014.00	\$ 224.00	\$ 1,238.00	\$ 1,609.40	\$ 1,210.00	327	Union	2000
2.000	161397001100	Resi, svce&pnl, 24' al serv, mtr socket, 100 A, W/10 branch bkrs	1 Elec	1.19	6.723	Ea.	\$ 770.00	\$ 246.00	\$ -	\$ 1,016.00	\$ 246.00	\$ 1,262.00	\$ 1,640.60	\$ 1,200.00	327	Union	2000
2.000	161397001120	Resi, svce&pnl, 24' al serv, mtr socket, 100A, w/10 BR bkrs, w/frgs cnd&w	1 Elec	0.73	10.959	Ea.	\$ 1,050.00	\$ 398.00	\$ -	\$ 1,448.00	\$ 398.00	\$ 1,846.00	\$ 2,399.80	\$ 1,760.00	327	Union	2000
10.000	161397002130	Resi, sw dvc, sgl P, 15 amp, ivory, w/a 1-gang box, cov pl, EMT & wire	1 Elec	5.7	1.401	Ea.	\$ 168.00	\$ 255.00	\$ -	\$ 423.00	\$ 255.00	\$ 678.00	\$ 881.40	\$ 565.00	327	Union	2000
20.000	161397003430	Resi, comb dvc, decorator style, S.P. sw/15 A recpt., EMT & wire	1 Elec	4.4	1.818	Ea.	\$ 570.00	\$ 660.00	\$ -	\$ 1,230.00	\$ 660.00	\$ 1,890.00	\$ 2,457.00	\$ 1,620.00	327	Union	2000
1.000	164407201900	Panelboards, NQOD, 3 wire, 120/240 volt, 400 amp main, 30 circuits	2 Elec	0.54	29.63	Ea.	\$ 1,750.00	\$ 540.00	\$ -	\$ 2,290.00	\$ 540.00	\$ 2,830.00	\$ 3,679.00	\$ 2,750.00	327	Union	2000
1.000	160608000100	Grounding, rod, copper clad, 10' long, 3/4" dia	1 Elec	4.4	1.818	Ea.	\$ 28.50	\$ 33.00	\$ -	\$ 61.50	\$ 33.00	\$ 94.50	\$ 122.85	\$ 81.00	327	Union	2000
1.000	162702003900	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 112.5 kVA	R3	0.9	22.222	Ea.	\$ 2,575.00	\$ 400.00	\$ 151.00	\$ 3,126.00	\$ 400.00	\$ 3,526.00	\$ 4,583.80	\$ 3,600.00	327	Union	2000
1.000	162706000100	Oil fed XFMR, 5 kV or 15 kV, W/ taps, 277/480 V sec, 3 ph, 150 kVA	R3	0.65	30.769	Ea.	\$ 5,750.00	\$ 555.00	\$ 209.00	\$ 6,514.00	\$ 555.00	\$ 7,069.00	\$ 9,189.70	\$ 7,400.00	327	Union	2000
1.000	164407201400	Panelboards, NEHB, 4 wire, 277/480 volts, 225 amp main lugs, 30 circs	2 Elec	0.8	20	Ea.	\$ 1,675.00	\$ 365.00	\$ -	\$ 2,040.00	\$ 365.00	\$ 2,405.00	\$ 3,126.50	\$ 2,375.00	327	Union	2000
50.000	165104401300	Interior lgt fxtr, fluor, surf mtd, acryl lens, 2'w x 4'l, two 40 W Resi, recpt dvc, DX outlet, 15 A recpt., ivory, 1-gang box, pl, EMT & wire	1 Elec	6.2	1.29	Ea.	\$ 3,750.00	\$ 1,175.00	\$ -	\$ 4,925.00	\$ -	\$ 4,925.00	\$ 6,402.50	\$ 5,900.00	327	Union	2000
20.000	161397004030	Resi, bathroom vent fan, 50 CFM (use w/above hook-up), low noise model	1 Elec	5.35	1.501	Ea.	\$ 308.00	\$ 550.00	\$ -	\$ 858.00	\$ 550.00	\$ 1,408.00	\$ 1,830.40	\$ 1,160.00	327	Union	2000
2.000	161397008270	Resi, HW htr hook-up, incl 1-2 p CB, box, 3' flex, 20' #10/2, EMT & wire	1 Elec	3.4	2.353	Ea.	\$ 27.00	\$ 43.00	\$ -	\$ 70.00	\$ 43.00	\$ 113.00	\$ 146.90	\$ 93.50	327	Union	2000
2.000	161397009240	Ht pump hkup, 40A/100A 2p bkr, locl disc, 3' seal, 40#8/2, 30#3/2, MC cbl	1 Elec	1.08	7.407	Ea.	\$ 860.00	\$ 270.00	\$ -	\$ 1,130.00	\$ 270.00	\$ 1,400.00	\$ 1,820.00	\$ 1,340.00	327	Union	2000
2.000	164407201350	Panelboards, NEHB, 4 wire, 277/480 volts, 225 amp main lugs, 24 circs	2 Elec	0.9	17.778	Ea.	\$ 2,750.00	\$ 650.00	\$ -	\$ 3,400.00	\$ 650.00	\$ 4,050.00	\$ 5,265.00	\$ 4,000.00	327	Union	2000
2.000	164407200700	Panelboards, NQOD, 4 wire, 120/208 volts, 100 amp main lugs, 20 circs	1 Elec	0.65	12.308	Ea.	\$ 1,140.00	\$ 448.00	\$ -	\$ 1,588.00	\$ 448.00	\$ 2,036.00	\$ 2,646.80	\$ 1,920.00	327	Union	2000
30.000	161366000650	Outlet boxes, pressed steel, switchbox	1 Elec	27	0.296	Ea.	\$ 65.40	\$ 162.00	\$ -	\$ 227.40	\$ 162.00	\$ 389.40	\$ 506.22	\$ 313.50	327	Union	2000
500.000	161322051770	Cond to 15' H, incl 2 termn, 2 elb & 11 bm CLP per 100', galv stl, 3/4" dia	1 Elec	80	0.1	L.F.	\$ 870.00	\$ 910.00	\$ -	\$ 1,780.00	\$ -	\$ 1,780.00	\$ 2,314.00	\$ 2,325.00	327	Union	2000

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5.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	C.L.F.	\$	155.00	\$	332.50	\$	-	\$	487.50	\$	-	\$	487.50	\$	633.75	\$	665.00	327	Union 2000
5.000	160553000100	Electrical dml, conduit to 15' high, rigid galv steel, 1/2" to 1" dia	1 Elec	242	0.033	L.F.	\$	-	\$	3.00	\$	-	\$	3.00	\$	-	\$	3.00	\$	3.90	\$	4.50	327	Union 2000
500.000	160553000380	Electrical demo, non-metallic sheathed cable (Romex), #12, 2 wire	1 Elec	630	0.013	L.F.	\$	-	\$	115.00	\$	-	\$	115.00	\$	-	\$	115.00	\$	149.50	\$	175.00	327	Union 2000
1.000	160553001550	Electrical demo, transformer, 3 phase to 600v, primary, 300 kVA	R3	1.8	11.111	Ea.	\$	-	\$	199.00	\$	75.50	\$	274.50	\$	-	\$	274.50	\$	356.85	\$	385.00	327	Union 2000
50.000	160553002340	Electrical demo, fluore fixt, strp fixt, surf mt, 4' long, 2 lamp	2 Elec	50	0.32	Ea.	\$	-	\$	292.50	\$	-	\$	292.50	\$	-	\$	292.50	\$	380.25	\$	437.50	327	Union 2000
							Totals			\$ 25,323.90	\$ 8,972.50	\$ 435.50	\$ 34,731.90	\$ 5,945.50	\$ 40,677.40	\$ 52,880.62	\$ 41,799.00							

Building K6-2196, Replacement cost.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - K6-2196

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix	Release Type	Release
2.000	164108000200	Safety switches, general duty 240 volt, 3 pole NEMA 1, fusible, 60 amp	1 Elec	2.3	3.478	Ea.	\$ 214.00	\$ 127.00	\$ -	\$ 341.00	\$ 127.00	\$ 468.00	\$ 608.40	\$ 426.00	327	Union	2000
1.000	164108000400	Safety switches, general duty 240 volt, 3 pole NEMA 1, fusible, 200 amp	1 Elec	1.3	6.154	Ea.	\$ 395.00	\$ 112.00	\$ -	\$ 507.00	\$ 112.00	\$ 619.00	\$ 804.70	\$ 605.00	327	Union	2000
2.000	161397001100	Resi, svce&pnl, 24' al serv, mtr socket, 100 A, W/10 branch bkrs	1 Elec	1.19	6.723	Ea.	\$ 770.00	\$ 246.00	\$ -	\$ 1,016.00	\$ 246.00	\$ 1,262.00	\$ 1,640.60	\$ 1,200.00	327	Union	2000
1.000	161397001120	Resi, svce&pnl, 24' al serv, mtr socket,100A,w/10 BR bkrs,w/rgs cnd&w	1 Elec	0.73	10.959	Ea.	\$ 525.00	\$ 199.00	\$ -	\$ 724.00	\$ 199.00	\$ 923.00	\$ 1,199.90	\$ 880.00	327	Union	2000
8.000	161397002130	Resi, sw dvc, sgl P, 15 amp, ivory, w/a 1-gang box, cov pl, EMT & wire	1 Elec	5.7	1.401	Ea.	\$ 134.40	\$ 204.00	\$ -	\$ 338.40	\$ 204.00	\$ 542.40	\$ 705.12	\$ 452.00	327	Union	2000
15.000	161397003430	Resi, comb dvc, decorator style, S.P. sw/15 A recpt., EMT & wire	1 Elec	4.4	1.818	Ea.	\$ 427.50	\$ 495.00	\$ -	\$ 922.50	\$ 495.00	\$ 1,417.50	\$ 1,842.75	\$ 1,215.00	327	Union	2000
1.000	164407201900	Panelboards, NQOD, 3 wire, 120/240 volt, 400 amp main, 30 circuits	2 Elec	0.54	29.63	Ea.	\$ 1,750.00	\$ 540.00	\$ -	\$ 2,290.00	\$ 540.00	\$ 2,830.00	\$ 3,679.00	\$ 2,750.00	327	Union	2000
1.000	160608000100	Grounding, rod, copper clad, 10' long, 3/4" dia	1 Elec	4.4	1.818	Ea.	\$ 28.50	\$ 33.00	\$ -	\$ 61.50	\$ 33.00	\$ 94.50	\$ 122.85	\$ 81.00	327	Union	2000
1.000	162706000100	Oil fed XFMR, 5 kV or 15 kV, W/ taps, 277/480 V sec, 3 ph, 150 kVA	R3	0.65	30.769	Ea.	\$ 5,750.00	\$ 555.00	\$ 209.00	\$ 6,514.00	\$ 555.00	\$ 7,069.00	\$ 9,189.70	\$ 7,400.00	327	Union	2000
1.000	164407201400	Panelboards, NEHB, 4 wire, 277/480 volts, 225 amp main lugs, 30 circls	2 Elec	0.8	20	Ea.	\$ 1,675.00	\$ 365.00	\$ -	\$ 2,040.00	\$ 365.00	\$ 2,405.00	\$ 3,126.50	\$ 2,375.00	327	Union	2000
38.000	165104401300	Interior ltg fxt, fluor, surf mtd, acryl lens, 2'w x 4'l, two 40 W	1 Elec	6.2	1.29	Ea.	\$ 2,850.00	\$ 893.00	\$ -	\$ 3,743.00	\$ -	\$ 3,743.00	\$ 4,865.90	\$ 4,484.00	327	Union	2000
1.000	164407201350	Panelboards, NEHB, 4 wire, 277/480 volts, 225 amp main lugs, 24 circls	2 Elec	0.9	17.778	Ea.	\$ 1,375.00	\$ 325.00	\$ -	\$ 1,700.00	\$ 325.00	\$ 2,025.00	\$ 2,632.50	\$ 2,000.00	327	Union	2000
1.000	164407200700	Panelboards, NQOD, 4 wire, 120/208 volts, 100 amp main lugs, 20 circls	1 Elec	0.65	12.308	Ea.	\$ 570.00	\$ 224.00	\$ -	\$ 794.00	\$ 224.00	\$ 1,018.00	\$ 1,323.40	\$ 960.00	327	Union	2000
23.000	161366000650	Outlet boxes, pressed steel, switchbox	1 Elec	27	0.296	Ea.	\$ 50.14	\$ 124.20	\$ -	\$ 174.34	\$ 124.20	\$ 298.54	\$ 388.10	\$ 240.35	327	Union	2000
375.000	161322051770	Cond to 15' H,incl 2 termn,2 elb&11 bm CLP per 100',galv stl,3/4" dia	1 Elec	80	0.1	L.F.	\$ 652.50	\$ 682.50	\$ -	\$ 1,335.00	\$ -	\$ 1,335.00	\$ 1,735.50	\$ 1,743.75	327	Union	2000
4.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	C.L.F.	\$ 124.00	\$ 266.00	\$ -	\$ 390.00	\$ -	\$ 390.00	\$ 507.00	\$ 532.00	327	Union	2000
4.000	160553000100	Electrical dml, conduit to 15' high, rigid galv steel,1/2" to 1" dia	1 Elec	242	0.033	L.F.	\$ -	\$ 2.40	\$ -	\$ 2.40	\$ -	\$ 2.40	\$ 3.12	\$ 3.60	327	Union	2000
375.000	160553000380	Electrical demo, non-metallic sheathed cable (Romex), #12, 2 wire	1 Elec	630	0.013	L.F.	\$ -	\$ 86.25	\$ -	\$ 86.25	\$ -	\$ 86.25	\$ 112.13	\$ 131.25	327	Union	2000
1.000	160553001550	Electrical demo, transformer, 3 phase to 600v, primary, 300 kVA	R3	1.8	11.111	Ea.	\$ -	\$ 199.00	\$ 75.50	\$ 274.50	\$ -	\$ 274.50	\$ 356.85	\$ 385.00	327	Union	2000
38.000	160553002340	Electrical demo, fluore fixt, strp fixt, surf mt, 4' long, 2 lamp	2 Elec	50	0.32	Ea.	\$ -	\$ 222.30	\$ -	\$ 222.30	\$ -	\$ 222.30	\$ 288.99	\$ 332.50	327	Union	2000
Totals							\$ 17,291.04	\$ 5,900.65	\$ 284.50	\$ 23,476.19	\$ 3,549.20	\$ 27,025.39	\$ 35,133.01	\$ 28,196.45			

Building K6-2196, 75% Replacement costs.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - K6-2196

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Code Prefix	Type	Release
1.000	161397001100	Resi, svce&pnl, 24' al serv, mtr socket, 100 A, W/10 branch bkrs	1 Elec	1.19	6.723	Ea.	\$ 385.00	\$ 123.00	\$ -	\$ 508.00	\$ 123.00	\$ 631.00	\$ 820.30	\$ 600.00	327	Union	2000
1.000	161397001120	Resi, svce&pnl, 24' al serv, mtr socket,100A,w/10 BR bkrs,w/rgs cnd&w	1 Elec	0.73	10.959	Ea.	\$ 525.00	\$ 199.00	\$ -	\$ 724.00	\$ 199.00	\$ 923.00	\$ 1,199.90	\$ 880.00	327	Union	2000
3.000	161397002130	Resi, sw dvc, sgl P, 15 amp, ivory, w/a 1-gang box, cov pl, EMT & wire	1 Elec	5.7	1.401	Ea.	\$ 50.40	\$ 76.50	\$ -	\$ 126.90	\$ 76.50	\$ 203.40	\$ 264.42	\$ 169.50	327	Union	2000
5.000	161397003430	Resi, comb dvc, decorator style, S.P. sw/15 A recpt., EMT & wire	1 Elec	4.4	1.818	Ea.	\$ 142.50	\$ 165.00	\$ -	\$ 307.50	\$ 165.00	\$ 472.50	\$ 614.25	\$ 405.00	327	Union	2000
1.000	160608000100	Grounding, rod, copper clad, 10' long, 3/4" dia	1 Elec	4.4	1.818	Ea.	\$ 28.50	\$ 33.00	\$ -	\$ 61.50	\$ 33.00	\$ 94.50	\$ 122.85	\$ 81.00	327	Union	2000
8.000	161366000650	Outlet boxes, pressed steel, switchbox	1 Elec	27	0.296	Ea.	\$ 17.44	\$ 43.20	\$ -	\$ 60.64	\$ 43.20	\$ 103.84	\$ 134.99	\$ 83.60	327	Union	2000
125.000	161322051770	Cond to 15' H,incl 2 termn,2 elb&11 bm CLP per 100',galv stl,3/4" dia	1 Elec	80	0.1	L.F.	\$ 217.50	\$ 227.50	\$ -	\$ 445.00	\$ -	\$ 445.00	\$ 578.50	\$ 581.25	327	Union	2000
1.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	C.L.F.	\$ 31.00	\$ 66.50	\$ -	\$ 97.50	\$ -	\$ 97.50	\$ 126.75	\$ 133.00	327	Union	2000
1.000	160553000100	Electrical dml, conduit to 15' high, rigid galv steel,1/2" to 1" dia	1 Elec	242	0.033	L.F.	\$ -	\$ 0.60	\$ -	\$ 0.60	\$ -	\$ 0.60	\$ 0.78	\$ 0.90	327	Union	2000
125.000	160553000380	Electrical demo, non-metallic sheathed cable (Romex), #12, 2 wire	1 Elec	630	0.013	L.F.	\$ -	\$ 28.75	\$ -	\$ 28.75	\$ -	\$ 28.75	\$ 37.38	\$ 43.75	327	Union	2000
13.000	160553002340	Electrical demo, fluore fixt, strp fixt, surf mt, 4' long, 2 lamp	2 Elec	50	0.32	Ea.	\$ -	\$ 76.05	\$ -	\$ 76.05	\$ -	\$ 76.05	\$ 98.87	\$ 113.75	327	Union	2000
Totals							\$ 1,397.34	\$ 1,039.10	\$ -	\$ 2,436.44	\$ 639.70	\$ 3,076.14	\$ 3,998.98	\$ 3,091.75			

Building K6-2196, 25% Replacement costs.

CostWorks 2000 - K6-2196

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix	Type	Release
1.000	161397002130	Resi, sw dvc, sgl P, 15 amp, ivory, w/a 1-gang box, cov pl, EMT & wire	1 Elec	5.7	1.401	Ea.	\$ 16.80	\$ 25.50	\$ -	\$ 42.30	\$ 25.50	\$ 67.80	\$ 88.14	\$ 56.50	327	Union	2000
2.000	161397003430	Resi, comb dvc, decorator style, S.P. sw/15 A recpt., EMT & wire	1 Elec	4.4	1.818	Ea.	\$ 57.00	\$ 66.00	\$ -	\$ 123.00	\$ 66.00	\$ 189.00	\$ 245.70	\$ 162.00	327	Union	2000
25.000	161322051770	Cond to 15' H,incl 2 termn,2 elb&11 bm CLP per 100',galv stl,3/4" dia	1 Elec	80	0.1	L.F.	\$ 43.50	\$ 45.50	\$ -	\$ 89.00	\$ -	\$ 89.00	\$ 115.70	\$ 116.25	327	Union	2000
1.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	C.L.F.	\$ 31.00	\$ 66.50	\$ -	\$ 97.50	\$ -	\$ 97.50	\$ 126.75	\$ 133.00	327	Union	2000
1.000	160553000100	Electrical dml, conduit to 15' high, rigid galv steel,1/2" to 1" dia	1 Elec	242	0.033	L.F.	\$ -	\$ 0.60	\$ -	\$ 0.60	\$ -	\$ 0.60	\$ 0.78	\$ 0.90	327	Union	2000
25.000	160553000380	Electrical demo, non-metallic sheathed cable (Romex), #12, 2 wire	1 Elec	630	0.013	L.F.	\$ -	\$ 5.75	\$ -	\$ 5.75	\$ -	\$ 5.75	\$ 7.48	\$ 8.75	327	Union	2000
3.000	160553002340	Electrical demo, fluore fixt, strp fixt, surf mt, 4' long, 2 lamp	2 Elec	50	0.32	Ea.	\$ -	\$ 17.55	\$ -	\$ 17.55	\$ -	\$ 17.55	\$ 22.82	\$ 26.25	327	Union	2000
Totals							\$ 148.30	\$ 227.40	\$ -	\$ 375.70	\$ 91.50	\$ 467.20	\$ 607.36	\$ 503.65			

Building K6-2196. 5% Replacement cost.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - M6-0339

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix	Type	Release
1.000	16270600200	Oil fed XFMR, 5 kv or 15 kv, W/ taps, 277/480 V sec, 3 ph, 300 kVA	R3	0.45	44.444	Ea.	\$ 7,600.00	\$ 800.00	\$ 300.00	\$ 8,700.00	\$ 800.00	\$ 9,500.00	\$ 12,350.00	\$ 9,900.00	327	Union	2000
1.000	164407200800	Panelboards, NQOD, 4 wire, 120/208 volts, 100 amp main lugs, 30 circs	1 Elec	0.53	15.094	Ea.	\$ 715.00	\$ 277.00	\$ -	\$ 992.00	\$ 277.00	\$ 1,269.00	\$ 1,649.70	\$ 1,200.00	327	Union	2000
1.000	164407202350	Panelboards, NQOD, 4 wire, 120/208 volts, 600 amp main, 42 circuits	2 Elec	0.4	40	Ea.	\$ 3,250.00	\$ 735.00	\$ -	\$ 3,985.00	\$ 735.00	\$ 4,720.00	\$ 6,136.00	\$ 4,700.00	327	Union	2000
2.000	164407202600	Panelboards, NEHB, 4 wire, 277/480 volts, 225 amp main, 30 circuits	2 Elec	0.72	22.222	Ea.	\$ 4,700.00	\$ 810.00	\$ -	\$ 5,510.00	\$ 810.00	\$ 6,320.00	\$ 8,216.00	\$ 6,400.00	327	Union	2000
1.000	164406600100	Starter, magnetic, FVNR, w/ encl & htr, NEMA 1, 480 V, 5 HP, size 0	1 Elec	2.3	3.478	Ea.	\$ 192.00	\$ 63.50	\$ -	\$ 255.50	\$ 63.50	\$ 319.00	\$ 414.70	\$ 305.00	327	Union	2000
6.000	164108002910	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 30 amp	1 Elec	3.2	2.5	Ea.	\$ 612.00	\$ 273.00	\$ -	\$ 885.00	\$ 273.00	\$ 1,158.00	\$ 1,505.40	\$ 1,086.00	327	Union	2000
1.000	164108003000	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 60 amp	1 Elec	2.3	3.478	Ea.	\$ 173.00	\$ 63.50	\$ -	\$ 236.50	\$ 63.50	\$ 300.00	\$ 390.00	\$ 285.00	327	Union	2000
1.000	164108003300	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 100 amp	1 Elec	1.9	4.211	Ea.	\$ 272.00	\$ 77.00	\$ -	\$ 349.00	\$ 77.00	\$ 426.00	\$ 553.80	\$ 415.00	327	Union	2000
12.000	165303200500	Emer lt units, btry operated, twin sealed bm lt, 25 W, 6 V ea, lead btry	1 Elec	4	2	Ea.	\$ 1,848.00	\$ 438.00	\$ -	\$ 2,286.00	\$ 438.00	\$ 2,724.00	\$ 3,541.20	\$ 2,700.00	327	Union	2000
6.000	165303200800	Exit and emer lltg, exit light clg or wall mount, incan, single face	1 Elec	8	1	Ea.	\$ 204.00	\$ 109.50	\$ -	\$ 313.50	\$ 109.50	\$ 423.00	\$ 549.90	\$ 393.00	327	Union	2000
6.000	165203001600	Exterior fxt, floodlights W/blst&lamp, P mtd P not incld, hg vap, 400 W	2 Elec	4.4	3.636	Ea.	\$ 1,530.00	\$ 399.00	\$ -	\$ 1,929.00	\$ 399.00	\$ 2,328.00	\$ 3,026.40	\$ 2,280.00	327	Union	2000
13.000	165104400300	Interior lltg fxt, fluor, rec mtd, acryl lens, 2'w x 2'l, two U40 W	1 Elec	5.7	1.404	Ea.	\$ 624.00	\$ 331.50	\$ -	\$ 955.50	\$ -	\$ 955.50	\$ 1,242.15	\$ 1,189.50	327	Union	2000
51.000	165104400600	Interior lltg fxt, fluor, rec mtd, acryl lens, 2'w x 4'l, four 40 watt	1 Elec	4.7	1.702	Ea.	\$ 2,754.00	\$ 1,581.00	\$ -	\$ 4,335.00	\$ -	\$ 4,335.00	\$ 5,635.50	\$ 5,406.00	327	Union	2000
18.000	161397002110	Resi, agl P, 15 amp, ivory, w/a 1-gang box, cov pl, type NM (romex) cable	1 Elec	17.1	0.468	Ea.	\$ 115.20	\$ 153.90	\$ -	\$ 269.10	\$ 153.90	\$ 423.00	\$ 549.90	\$ 356.40	327	Union	2000
98.000	161397004100	Resi, recpt dvc, DX outlet, 20 A recpt., #12/2, type NM cable	1 Elec	12.3	0.65	Ea.	\$ 896.70	\$ 1,166.20	\$ -	\$ 2,062.90	\$ 1,166.20	\$ 3,229.10	\$ 4,197.83	\$ 2,744.00	327	Union	2000
1.000	160608000100	Grounding, rod, copper clad, 10' long, 3/4" dia	1 Elec	4.4	1.818	Ea.	\$ 28.50	\$ 33.00	\$ -	\$ 61.50	\$ 33.00	\$ 94.50	\$ 122.85	\$ 81.00	327	Union	2000
3.000	160608000800	Grounding, bare copper wire stranded, 3/0	2 Elec	6.6	2.424	C.L.F.	\$ 390.00	\$ 132.00	\$ -	\$ 522.00	\$ 132.00	\$ 654.00	\$ 850.20	\$ 630.00	327	Union	2000
28.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	C.L.F.	\$ 868.00	\$ 1,862.00	\$ -	\$ 2,730.00	\$ -	\$ 2,730.00	\$ 3,549.00	\$ 3,724.00	327	Union	2000
2,250.000	161322051770	Cond to 15' H, incl 2 term n, 2 elb & 11 bm CLP per 100', galv stl, 3/4" dia	1 Elec	80	0.1	L.F.	\$ 3,915.00	\$ 4,095.00	\$ -	\$ 8,010.00	\$ -	\$ 8,010.00	\$ 10,413.00	\$ 10,462.50	327	Union	2000
75.000	161322051970	Cond to 15' H, incl 2 term n, 2 elb & 11 bm CLP per 100', galv stl, 4" dia	2 Elec	40	0.4	L.F.	\$ 1,192.50	\$ 547.50	\$ -	\$ 1,740.00	\$ -	\$ 1,740.00	\$ 2,262.00	\$ 2,137.50	327	Union	2000
168.000	161366000650	Outlet boxes, pressed steel, switchbox	1 Elec	27	0.296	Ea.	\$ 366.24	\$ 907.20	\$ -	\$ 1,273.44	\$ 907.20	\$ 2,180.64	\$ 2,834.83	\$ 1,755.60	327	Union	2000
1,687.000	160553000100	Electrical dml, conduit to 15' high, rigid galv steel, 1/2" to 1" dia	1 Elec	242	0.033	L.F.	\$ -	\$ 1,012.20	\$ -	\$ 1,012.20	\$ -	\$ 1,012.20	\$ 1,315.86	\$ 1,518.30	327	Union	2000
56.000	160553000160	Electrical demo, conduit to 15' high, galv, 4" to 6" diam	1 Elec	80	0.1	L.F.	\$ -	\$ 101.92	\$ -	\$ 101.92	\$ -	\$ 101.92	\$ 132.50	\$ 152.88	327	Union	2000
2,800.000	160553000380	Electrical demo, non-metallic sheathed cable (Romex), #12, 2 wire	1 Elec	630	0.013	L.F.	\$ -	\$ 644.00	\$ -	\$ 644.00	\$ -	\$ 644.00	\$ 837.20	\$ 980.00	327	Union	2000
13.000	160553002220	Electrical demo, fluore fixt, surf mt, 2'x2', 2 lamp	2 Elec	44	0.364	Ea.	\$ -	\$ 86.45	\$ -	\$ 86.45	\$ -	\$ 86.45	\$ 112.39	\$ 129.35	327	Union	2000
51.000	160553002260	Electrical demo, fluore fixt, surf mt, 2'x4', 4 lamp	2 Elec	33	0.485	Ea.	\$ -	\$ 451.35	\$ -	\$ 451.35	\$ -	\$ 451.35	\$ 586.76	\$ 675.75	327	Union	2000
Totals							\$32,246.14	\$17,150.72	\$ 300.00	\$ 49,696.86	\$ 6,437.80	\$ 56,134.66	\$ 72,975.06	\$ 61,606.78			

M6-0339 75%

Building M6-0339, 75% Replacement cost.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - M6-0339

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix	Type	Release
1.000	164407200800	120/208 volts, 100 amp main lugs, 30 circs	1 Elec	0.53	15.094	Ea.	\$ 715.00	\$ 277.00	\$ -	\$ 992.00	\$ 277.00	\$ 1,269.00	\$ 1,649.70	\$ 1,200.00	327	Union	2000
1.000	164108002910	240 volt, 3 pole NEMA 1 fusible, 30 amp	1 Elec	3.2	2.5	Ea.	\$ 102.00	\$ 45.50	\$ -	\$ 147.50	\$ 45.50	\$ 193.00	\$ 250.90	\$ 181.00	327	Union	2000
1.000	164108003000	240 volt, 3 pole NEMA 1 fusible, 60 amp	1 Elec	2.3	3.478	Ea.	\$ 173.00	\$ 63.50	\$ -	\$ 236.50	\$ 63.50	\$ 300.00	\$ 390.00	\$ 285.00	327	Union	2000
1.000	164108003300	240 volt, 3 pole NEMA 1 fusible, 100 amp	1 Elec	1.9	4.211	Ea.	\$ 272.00	\$ 77.00	\$ -	\$ 349.00	\$ 77.00	\$ 426.00	\$ 553.80	\$ 415.00	327	Union	2000
5.000	165303200500	operated,twin sealed bm lt,25 W,6 V ea,lead btry	1 Elec	4	2	Ea.	\$ 770.00	\$ 182.50	\$ -	\$ 952.50	\$ 182.50	\$ 1,135.00	\$ 1,475.50	\$ 1,125.00	327	Union	2000
3.000	165303200080	clg or wall mount, incan, single face	1 Elec	8	1	Ea.	\$ 102.00	\$ 54.75	\$ -	\$ 156.75	\$ 54.75	\$ 211.50	\$ 274.95	\$ 196.50	327	Union	2000
3.000	165203001600	W/blst&lamp,P mtd P not incld,hg vap,400 W	2 Elec	4.4	3.636	Ea.	\$ 765.00	\$ 199.50	\$ -	\$ 964.50	\$ 199.50	\$ 1,164.00	\$ 1,513.20	\$ 1,140.00	327	Union	2000
6.000	165104400300	acryl lens, 2'w x 2'l, two U40 W	1 Elec	5.7	1.404	Ea.	\$ 288.00	\$ 153.00	\$ -	\$ 441.00	\$ -	\$ 441.00	\$ 573.30	\$ 549.00	327	Union	2000
22.000	165104400600	acryl lens, 2'w x 4'l, four 40 watt	1 Elec	4.7	1.702	Ea.	\$ 1,188.00	\$ 682.00	\$ -	\$ 1,870.00	\$ -	\$ 1,870.00	\$ 2,431.00	\$ 2,332.00	327	Union	2000
8.000	161397002110	gang box,cov pl,type NM (romex) cable	1 Elec	17.1	0.468	Ea.	\$ 51.20	\$ 68.40	\$ -	\$ 119.60	\$ -	\$ 119.60	\$ 155.48	\$ 158.40	327	Union	2000
43.000	161397004100	A recpt., #12/2, type NM cable	1 Elec	12.3	0.65	Ea.	\$ 393.45	\$ 511.70	\$ -	\$ 905.15	\$ 511.70	\$ 1,416.85	\$ 1,841.91	\$ 1,204.00	327	Union	2000
12.000	161205500300	600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	C.L.F.	\$ 372.00	\$ 798.00	\$ -	\$ 1,170.00	\$ -	\$ 1,170.00	\$ 1,521.00	\$ 1,596.00	327	Union	2000
750.000	161322051770	elb&11 bm CLP per 100',galv stl,3/4" dia	1 Elec	80	0.1	L.F.	\$ 1,305.00	\$ 1,365.00	\$ -	\$ 2,670.00	\$ -	\$ 2,670.00	\$ 3,471.00	\$ 3,487.50	327	Union	2000
56.000	161366000650	switchbox	1 Elec	27	0.296	Ea.	\$ 122.08	\$ 302.40	\$ -	\$ 424.48	\$ 302.40	\$ 726.88	\$ 944.94	\$ 585.20	327	Union	2000
750.000	160553000100	high, rigid galv steel, 1/2" to 1" dia	1 Elec	242	0.033	L.F.	\$ -	\$ 450.00	\$ -	\$ 450.00	\$ -	\$ 450.00	\$ 585.00	\$ 675.00	327	Union	2000
25.000	160553000160	15' high, galv, 4" to 6" diam	1 Elec	80	0.1	L.F.	\$ -	\$ 45.50	\$ -	\$ 45.50	\$ -	\$ 45.50	\$ 59.15	\$ 68.25	327	Union	2000
1,250.000	160553000380	sheathed cable (Romex), #12, 2 wire	1 Elec	630	0.013	L.F.	\$ -	\$ 287.50	\$ -	\$ 287.50	\$ -	\$ 287.50	\$ 373.75	\$ 437.50	327	Union	2000
5.000	160553002220	surf mt, 2'x2', 2 lamp	2 Elec	44	0.364	Ea.	\$ -	\$ 33.25	\$ -	\$ 33.25	\$ -	\$ 33.25	\$ 43.23	\$ 49.75	327	Union	2000
22.000	160553002260	surf mt, 2'x4', 4 lamp	2 Elec	33	0.485	Ea.	\$ -	\$ 194.70	\$ -	\$ 194.70	\$ -	\$ 194.70	\$ 253.11	\$ 291.50	327	Union	2000
Totals							\$ 6,618.73	\$ 5,791.20	\$ -	\$ 12,409.93	\$ 1,713.85	\$ 14,123.78	\$ 18,360.91	\$ 15,976.60			

M6-0339 25%

Building M6-0339, 25% Replacement cost.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - M6-0339

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix	Type	Release
1.000	165303200500	Emer lt units,btry operated,twin sealed bmt,25 W,6 V ea,lead btry	1 Elec	4	2	Ea.	\$ 154.00	\$ 36.50	\$ -	\$ 190.50	\$ 36.50	\$ 227.00	\$ 295.10	\$ 225.00	327	Union	2000
1.000	165303200080	Exit and emer ltg, exit light clg or wall mount, incan, single face	1 Elec	8	1	Ea.	\$ 34.00	\$ 18.25	\$ -	\$ 52.25	\$ 18.25	\$ 70.50	\$ 91.65	\$ 65.50	327	Union	2000
1.000	165203001600	Exterior fxtr,floodlights W/blst&lamp,P mtd P not incld,hg vap,400 W	2 Elec	4.4	3.636	Ea.	\$ 255.00	\$ 66.50	\$ -	\$ 321.50	\$ 66.50	\$ 388.00	\$ 504.40	\$ 380.00	327	Union	2000
1.000	165104400300	Interior ltg fxtr, fluor, rec mtd, acryl lens, 2'w x 2'l, two U40 W	1 Elec	5.7	1.404	Ea.	\$ 48.00	\$ 25.50	\$ -	\$ 73.50	\$ -	\$ 73.50	\$ 95.55	\$ 91.50	327	Union	2000
4.000	165104400600	Interior ltg fxtr, fluor, rec mtd, acryl lens, 2'w x 4'l, four 40 watt	1 Elec	4.7	1.702	Ea.	\$ 216.00	\$ 124.00	\$ -	\$ 340.00	\$ -	\$ 340.00	\$ 442.00	\$ 424.00	327	Union	2000
2.000	161397002110	Resi,sgl P,15 amp,ivory,w/a 1-gang box,cov pl,type NM (romex) cable	1 Elec	17.1	0.468	Ea.	\$ 12.80	\$ 17.10	\$ -	\$ 29.90	\$ 17.10	\$ 47.00	\$ 61.10	\$ 39.60	327	Union	2000
9.000	161397004100	Resi, recpt dvc, DX outlet, 20 A recpt., #12/2, type NM cable	1 Elec	12.3	0.65	Ea.	\$ 82.35	\$ 107.10	\$ -	\$ 189.45	\$ 107.10	\$ 296.55	\$ 385.52	\$ 252.00	327	Union	2000
2.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	C.L.F.	\$ 62.00	\$ 133.00	\$ -	\$ 195.00	\$ -	\$ 195.00	\$ 253.50	\$ 266.00	327	Union	2000
150.000	161322051770	Cond to 15' H,incl 2 termn,2 elb&11 bm CLP per 100',galv stl,3/4" dia	1 Elec	80	0.1	L.F.	\$ 261.00	\$ 273.00	\$ -	\$ 534.00	\$ -	\$ 534.00	\$ 694.20	\$ 697.50	327	Union	2000
5.000	161322051970	Cond to 15' H,incl 2 termn,2 elb&11 bm CLP per 100',galv stl,4" dia	2 Elec	40	0.4	L.F.	\$ 79.50	\$ 36.50	\$ -	\$ 116.00	\$ -	\$ 116.00	\$ 150.80	\$ 142.50	327	Union	2000
150.000	160553000100	Electrical dml, conduit to 15' high, rigid galv steel,1/2" to 1" dia	1 Elec	242	0.033	L.F.	\$ -	\$ 90.00	\$ -	\$ 90.00	\$ -	\$ 90.00	\$ 117.00	\$ 135.00	327	Union	2000
5.000	160553000160	Electrical demo, conduit to 15' high, galv, 4" to 6" diam	1 Elec	80	0.1	L.F.	\$ -	\$ 9.10	\$ -	\$ 9.10	\$ -	\$ 9.10	\$ 11.83	\$ 13.65	327	Union	2000
200.000	160553000380	Electrical demo, non-metallic sheathed cable (Romex), #12, 2 wire	1 Elec	630	0.013	L.F.	\$ -	\$ 46.00	\$ -	\$ 46.00	\$ -	\$ 46.00	\$ 59.80	\$ 70.00	327	Union	2000
1.000	160553002220	Electrical demo, fluore fixt, surf mt, 2'x2', 2 lamp	2 Elec	44	0.364	Ea.	\$ -	\$ 6.65	\$ -	\$ 6.65	\$ -	\$ 6.65	\$ 8.65	\$ 9.95	327	Union	2000
5.000	160553002260	Electrical demo, fluore fixt, surf mt, 2'x4', 4 lamp	2 Elec	33	0.485	Ea.	\$ -	\$ 44.25	\$ -	\$ 44.25	\$ -	\$ 44.25	\$ 57.53	\$ 66.25	327	Union	2000
Totals							\$ 1,204.65	\$ 1,033.45	\$ -	\$ 2,238.10	\$ 245.45	\$ 2,483.55	\$ 3,228.62	\$ 2,878.45			

Mg-0339 5%

Building M6-0339, 5% Replacement cost.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - M6-0486													Zip Code	Type	Release
Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Total Incl. O&P	Prefix			
200.000	165104401100	Interior ltrg fxtr, fluor, surf mtd, acryl lens, 1'w x 4'l, two 40 W	1 Elec	7	1.143	Ea.	\$ 13,500.00	\$ 4,100.00	\$ -	\$ 17,600.00	\$ 21,000.00	327	Union	2000	
600.000	165104403100	Intr,fluor,stp fixt,pendent mtd,indr,wh porc enam,4' L,two 40 W,RS	1 Elec	5.7	1.404	Ea.	\$ 24,900.00	\$ 15,300.00	\$ -	\$ 40,200.00	\$ 50,700.00	327	Union	2000	
2,600.000	161366000650	Outlet boxes, pressed steel, switchbox	1 Elec	27	0.296	Ea.	\$ 5,668.00	\$ 14,040.00	\$ -	\$ 19,708.00	\$ 27,170.00	327	Union	2000	
600.000	161397002110	Resi,sgl P,15 amp,ivory,w/a 1-gang box,cov pl,type NM (romex) cable	1 Elec	17.1	0.468	Ea.	\$ 3,840.00	\$ 5,130.00	\$ -	\$ 8,970.00	\$ 11,880.00	327	Union	2000	
2,000.000	161397004015	Resi, DX outlet, 15 A recpt., ivory, 1-gang box, pl, type NM cable	1 Elec	14.55	0.55	Ea.	\$ 10,000.00	\$ 20,100.00	\$ -	\$ 30,100.00	\$ 41,000.00	327	Union	2000	
4.000	161397008660	Resi,HW htr hook-up,incl 1-2 p CB,box,3' of flex,20' of #10/2 NM cable	1 Elec	5	1.6	Ea.	\$ 74.00	\$ 118.00	\$ -	\$ 192.00	\$ 254.00	327	Union	2000	
4.000	161397008270	Resi, bathroom vent fan, 50 CFM (use w/above hook-up), low noise model	1 Elec	15	0.533	Ea.	\$ 116.00	\$ 39.00	\$ -	\$ 155.00	\$ 186.00	327	Union	2000	
4.000	161397008220	Residential wiring, resi equip, vent/exhaust fan hook-up,type MC cable	1 Elec	24	0.333	Ea.	\$ 44.00	\$ 24.40	\$ -	\$ 68.40	\$ 84.00	327	Union	2000	
32,000.000	161322051770	Cond to 15' H,incl 2 termn,2 elb&11 bm CLP per 100',galv stl,3/4" dia	1 Elec	80	0.1	L.F.	\$ 55,680.00	\$ 58,240.00	\$ -	\$ 113,920.00	\$ 148,800.00	327	Union	2000	
2,000.000	161322051970	Cond to 15' H,incl 2 termn,2 elb&11 bm CLP per 100',galv stl,4" dia	2 Elec	40	0.4	L.F.	\$ 31,800.00	\$ 14,600.00	\$ -	\$ 46,400.00	\$ 57,000.00	327	Union	2000	
4,000.000	161322051870	Cond to 15' H,incl 2 termn,2 elb&11 bm CLP per 100',galv stl,2" dia	1 Elec	45	0.178	L.F.	\$ 20,600.00	\$ 12,960.00	\$ -	\$ 33,560.00	\$ 42,200.00	327	Union	2000	
4.000	160608000100	Grounding, rod, copper clad, 10' long, 3/4" dia	1 Elec	4.4	1.818	Ea.	\$ 114.00	\$ 132.00	\$ -	\$ 246.00	\$ 324.00	327	Union	2000	
2.000	160608000800	Grounding, bare copper wire stranded, 3/0	2 Elec	6.6	2.424	L.F.	\$ 260.00	\$ 88.00	\$ -	\$ 348.00	\$ 420.00	327	Union	2000	
400.000	161201200100	Armored cable, 600 volt, copper (BX), #14, 3 conductor, solid	1 Elec	2.2	3.636	L.F.	\$ 23,600.00	\$ 26,600.00	\$ -	\$ 50,200.00	\$ 65,600.00	327	Union	2000	
2.000	162706000200	Oil fed XFMR, 5 kV or 15 kV, W/ taps, 277/480 V sec, 3 ph, 300 kVA	R3	0.45	44.444	Ea.	\$ 15,200.00	\$ 1,600.00	\$ 600.00	\$ 17,400.00	\$ 19,800.00	327	Union	2000	
1.000	162706000300	Oil fed XFMR, 5 kV or 15 kV, W/ taps, 277/480 V sec, 3 ph, 500 kVA	R3	0.4	50	Ea.	\$ 10,100.00	\$ 900.00	\$ 340.00	\$ 11,340.00	\$ 12,900.00	327	Union	2000	
2.000	162702002900	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 9 kVA	1 Elec	0.7	11.429	Ea.	\$ 1,380.00	\$ 414.00	\$ -	\$ 1,794.00	\$ 2,150.00	327	Union	2000	
1.000	162702003100	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 15 kVA	2 Elec	1.1	14.545	Ea.	\$ 895.00	\$ 265.00	\$ -	\$ 1,160.00	\$ 1,400.00	327	Union	2000	
4.000	162702003700	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 75 kVA	2 Elec	0.7	22.857	Ea.	\$ 7,800.00	\$ 1,680.00	\$ -	\$ 9,480.00	\$ 11,100.00	327	Union	2000	
1.000	162702003500	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 45 kVA	2 Elec	0.8	20	Ea.	\$ 1,250.00	\$ 365.00	\$ -	\$ 1,615.00	\$ 1,925.00	327	Union	2000	
3.000	162702002700	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 6 kVA	1 Elec	0.8	10	Ea.	\$ 1,815.00	\$ 546.00	\$ -	\$ 2,361.00	\$ 2,820.00	327	Union	2000	
4.000	162702003300	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 30 kVA	2 Elec	0.9	17.778	Ea.	\$ 4,200.00	\$ 1,300.00	\$ -	\$ 5,500.00	\$ 6,600.00	327	Union	2000	
2.000	162702002310	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 3 kVA	1 Elec	1	8	Ea.	\$ 820.00	\$ 292.00	\$ -	\$ 1,112.00	\$ 1,350.00	327	Union	2000	
23.000	164407200300	Panelboards, NQOD, 3 wire, 100 amp main lugs,120/240 volts,20 circuits	1 Elec	0.65	12.308	Ea.	\$ 12,420.00	\$ 5,152.00	\$ -	\$ 17,572.00	\$ 21,390.00	327	Union	2000	
1.000	164407201900	Panelboards, NQOD, 3 wire, 120/240 volt, 400 amp main, 30 circuits	2 Elec	0.54	29.63	Ea.	\$ 1,750.00	\$ 540.00	\$ -	\$ 2,290.00	\$ 2,750.00	327	Union	2000	
12.000	164407202650	Panelboards, NEHB, 4 wire, 277/480 volts, 225 amp main, 42 circuits	2 Elec	0.56	28.571	Ea.	\$ 35,100.00	\$ 6,300.00	\$ -	\$ 41,400.00	\$ 47,700.00	327	Union	2000	
6.000	164102000200	Circuit breakers, enclosed (nema 1), 600 volt, 3 pole, 60 amp	1 Elec	2.8	2.857	Ea.	\$ 2,100.00	\$ 315.00	\$ -	\$ 2,415.00	\$ 2,790.00	327	Union	2000	
2.000	164102000400	Circuit breakers, enclosed (nema 1), 600 volt, 3 pole, 100 amp	1 Elec	2.3	3.478	Ea.	\$ 800.00	\$ 127.00	\$ -	\$ 927.00	\$ 1,080.00	327	Union	2000	
2.000	164102000600	Circuit breakers, enclosed (nema 1), 600 volt, 3 pole, 225 amp	1 Elec	1.5	5.333	Ea.	\$ 1,860.00	\$ 195.00	\$ -	\$ 2,055.00	\$ 2,350.00	327	Union	2000	
4.000	164407202350	Panelboards, NQOD, 4 wire, 120/208 volts, 600 amp main, 42 circuits	2 Elec	0.4	40	Ea.	\$ 13,000.00	\$ 2,940.00	\$ -	\$ 15,940.00	\$ 18,800.00	327	Union	2000	
14.000	164108002910	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 30 amp	1 Elec	3.2	2.5	Ea.	\$ 1,428.00	\$ 637.00	\$ -	\$ 2,065.00	\$ 2,534.00	327	Union	2000	
18.000	164108003000	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 60 amp	1 Elec	2.3	3.478	Ea.	\$ 3,114.00	\$ 1,143.00	\$ -	\$ 4,257.00	\$ 5,130.00	327	Union	2000	
13.000	164108003300	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 100 amp	1 Elec	1.9	4.211	Ea.	\$ 3,536.00	\$ 1,001.00	\$ -	\$ 4,537.00	\$ 5,395.00	327	Union	2000	
3.000	164108003500	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 200 A	1 Elec	1.3	6.154	Ea.	\$ 1,410.00	\$ 336.00	\$ -	\$ 1,746.00	\$ 2,055.00	327	Union	2000	
1.000	164108003700	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 400 amp	2 Elec	1.8	8.889	Ea.	\$ 1,075.00	\$ 162.00	\$ -	\$ 1,237.00	\$ 1,425.00	327	Union	2000	
27.000	165303200500	Emer lt units,btry operated,twin sealed bm lt,25 W,6 V ea,lead btry	1 Elec	4	2	Ea.	\$ 4,158.00	\$ 985.50	\$ -	\$ 5,143.50	\$ 6,075.00	327	Union	2000	
22.000	165303200080	Exit and emer ltrg, exit light clg or wall mount, incan, single face	1 Elec	8	1	Ea.	\$ 748.00	\$ 401.50	\$ -	\$ 1,149.50	\$ 1,441.00	327	Union	2000	
8.000	165203001600	Exterior fxtr,floodlights W/blst&lamp,P mtd P not incld,hg vap,400 W	2 Elec	4.4	3.636	Ea.	\$ 2,040.00	\$ 532.00	\$ -	\$ 2,572.00	\$ 3,040.00	327	Union	2000	
1.000	164503207300	Copper bus duct, plug-in, indr, plug-in switch, 600 V, 3 pole, 60 amp	1 Elec	3.6	2.222	Ea.	\$ 375.00	\$ 40.50	\$ -	\$ 415.50	\$ 475.00	327	Union	2000	
1.000	164503207500	Copper bus duct, plug-in, indr, plug-in switch, 600 V, 3 pole, 200 amp	2 Elec	3.2	5	Ea.	\$ 950.00	\$ 91.00	\$ -	\$ 1,041.00	\$ 1,150.00	327	Union	2000	
320.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	L.F.	\$ 9,920.00	\$ 21,280.00	\$ -	\$ 31,200.00	\$ 42,560.00	327	Union	2000	
Totals							\$ 329,440.00	\$ 221,011.90	\$ 940.00	\$ 551,391.90	\$ 694,803.00				
2001 Inflation Adjusted Totals							\$ 339,323.20	\$ 227,642.26	\$ 968.20	\$ 567,933.66	\$ 715,647.09				
2002 Inflation Adjusted Totals							\$ 349,502.90	\$ 234,471.52	\$ 997.25	\$ 584,971.67	\$ 737,116.50				

M6-0486 Const

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - M6-0486

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Code Prefix	Type	Release
200.000	165104401100	Interior ltr, flur, surt mtd, acryl lens, 1'w x 4', two 40 W intr, flur, strp ntxt, pendent mtd, incl, wh porc enam, 4' L, two 40 W, RS	1 Elec	7	1.143	Ea.	\$ 13,500.00	\$ 4,100.00	\$ -	\$ 17,600.00	\$ -	\$ 17,600.00	\$ 22,880.00	\$ 21,000.00	327	Union	2000
600.000	165104403100	Outlet boxes, pressed steel, switchbox	1 Elec	5.7	1.404	Ea.	\$ 24,900.00	\$ 15,300.00	\$ -	\$ 40,200.00	\$ -	\$ 40,200.00	\$ 52,260.00	\$ 50,700.00	327	Union	2000
2,600.000	161366000650	Resi, sgl P, 15 amp, ivory, w/a 1-gang box, cov pl, type NM (romex) cable	1 Elec	27	0.296	Ea.	\$ 5,668.00	\$ 14,040.00	\$ -	\$ 19,708.00	\$ 14,040.00	\$ 33,748.00	\$ 43,872.40	\$ 27,170.00	327	Union	2000
600.000	161397002110	Resi, DX outlet, 15 A recpt., ivory, 1-gang box, pl, type NM cable	1 Elec	17.1	0.468	Ea.	\$ 3,840.00	\$ 5,130.00	\$ -	\$ 8,970.00	\$ 5,130.00	\$ 14,100.00	\$ 18,330.00	\$ 11,880.00	327	Union	2000
2,000.000	161397004015	Resi, HWV ntr hook-up, incl 1-2 p CB, box, 3' of flex, 20' of #10/2 NM cable	1 Elec	14.55	0.55	Ea.	\$ 10,000.00	\$ 20,100.00	\$ -	\$ 30,100.00	\$ 20,100.00	\$ 50,200.00	\$ 65,260.00	\$ 41,000.00	327	Union	2000
4.000	161397008660	Resi, bathroom vent fan, 50 CFM (use w/above hook-up), low noise model	1 Elec	5	1.6	Ea.	\$ 74.00	\$ 118.00	\$ -	\$ 192.00	\$ 118.00	\$ 310.00	\$ 403.00	\$ 254.00	327	Union	2000
4.000	161397008270	Residential wiring, resi equip, vent/exhaust fan hook-up, type MC cable	1 Elec	15	0.533	Ea.	\$ 116.00	\$ 39.00	\$ -	\$ 155.00	\$ 39.00	\$ 194.00	\$ 252.20	\$ 186.00	327	Union	2000
4.000	161397008220	Cond to 15' H, incl 2 termn, 2 elb & 11 bm CLP per 100', galv stl, 3/4" dia	1 Elec	24	0.333	Ea.	\$ 44.00	\$ 24.40	\$ -	\$ 68.40	\$ 24.40	\$ 92.80	\$ 120.64	\$ 84.00	327	Union	2000
32,000.000	161322051770	Cond to 15' H, incl 2 termn, 2 elb & 11 bm CLP per 100', galv stl, 4" dia	1 Elec	80	0.1	L.F.	\$ 55,680.00	\$ 58,240.00	\$ -	\$ 113,920.00	\$ 58,240.00	\$ 172,160.00	\$ 223,808.00	\$ 148,800.00	327	Union	2000
2,000.000	161322051970	Cond to 15' H, incl 2 termn, 2 elb & 11 bm CLP per 100', galv stl, 2" dia	2 Elec	40	0.4	L.F.	\$ 31,800.00	\$ 14,600.00	\$ -	\$ 46,400.00	\$ 14,600.00	\$ 61,000.00	\$ 79,300.00	\$ 57,000.00	327	Union	2000
4,000.000	161322051870	Grounding, rod, copper clad, 10' long, 3/4" dia	1 Elec	45	0.178	L.F.	\$ 20,600.00	\$ 12,960.00	\$ -	\$ 33,560.00	\$ 12,960.00	\$ 46,520.00	\$ 60,476.00	\$ 42,200.00	327	Union	2000
4.000	160608000100	Grounding, bare copper wire stranded, 3/0	1 Elec	4.4	1.818	Ea.	\$ 114.00	\$ 132.00	\$ -	\$ 246.00	\$ 132.00	\$ 378.00	\$ 491.40	\$ 324.00	327	Union	2000
2.000	160608000800	Armored cable, 600 volt, copper (BX), #14, 3 conductor, solid	2 Elec	6.6	2.424	C.L.F.	\$ 260.00	\$ 88.00	\$ -	\$ 348.00	\$ 88.00	\$ 436.00	\$ 566.80	\$ 420.00	327	Union	2000
400.000	161201200100	Oil fed XFMR, 5 kv or 15 kv, W/ taps, 277/480 V sec, 3 ph, 300 kVA	1 Elec	2.2	3.636	C.L.F.	\$ 23,600.00	\$ 26,600.00	\$ -	\$ 50,200.00	\$ 26,600.00	\$ 76,800.00	\$ 99,840.00	\$ 65,600.00	327	Union	2000
2.000	162706000200	Oil fed XFMR, 5 kv or 15 kv, W/ taps, 277/480 V sec, 3 ph, 500 kVA	R3	0.45	44.444	Ea.	\$ 15,200.00	\$ 1,600.00	\$ 600.00	\$ 17,400.00	\$ 1,600.00	\$ 19,000.00	\$ 24,700.00	\$ 19,800.00	327	Union	2000
1.000	162706000300	Dry type xtmr, 3 ph, 480 V pn 120/208 V sec, vent, 9 kVA	R3	0.4	50	Ea.	\$ 10,100.00	\$ 900.00	\$ 340.00	\$ 11,340.00	\$ 900.00	\$ 12,240.00	\$ 15,912.00	\$ 12,900.00	327	Union	2000
2.000	162702002900	Dry type xtmr, 3 ph, 480 V pn 120/208 V sec, vent, 15 kVA	1 Elec	0.7	11.429	Ea.	\$ 1,380.00	\$ 414.00	\$ -	\$ 1,794.00	\$ 414.00	\$ 2,208.00	\$ 2,870.40	\$ 2,150.00	327	Union	2000
1.000	162702003100	Dry type xtmr, 3 ph, 480 V pn 120/208 V sec, vent, 75 kVA	2 Elec	1.1	14.545	Ea.	\$ 895.00	\$ 265.00	\$ -	\$ 1,160.00	\$ 265.00	\$ 1,425.00	\$ 1,852.50	\$ 1,400.00	327	Union	2000
4.000	162702003700	Dry type xtmr, 3 ph, 480 V pn 120/208 V sec, vent, 45 kVA	2 Elec	0.7	22.857	Ea.	\$ 7,800.00	\$ 1,680.00	\$ -	\$ 9,480.00	\$ 1,680.00	\$ 11,160.00	\$ 14,508.00	\$ 11,100.00	327	Union	2000
1.000	162702003500	Dry type xtmr, 3 ph, 480 V pn 120/208 V sec, vent, 6 kVA	2 Elec	0.8	20	Ea.	\$ 1,250.00	\$ 365.00	\$ -	\$ 1,615.00	\$ 365.00	\$ 1,980.00	\$ 2,574.00	\$ 1,925.00	327	Union	2000
3.000	162702002700	Dry type xtmr, 3 ph, 480 V pn 120/208 V sec, vent, 6 kVA	1 Elec	0.8	10	Ea.	\$ 1,815.00	\$ 546.00	\$ -	\$ 2,361.00	\$ 546.00	\$ 2,907.00	\$ 3,779.10	\$ 2,820.00	327	Union	2000

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4.000	162702003300	Dry type xtmr, 3 ph, 480 V pri 120/208 V sec, vent, 30 kVA	2 Elec	0.9	17.778	Ea.	\$	4,200.00	\$	1,300.00	\$	-	\$	5,500.00	\$	1,300.00	\$	6,800.00	\$	8,840.00	\$	6,600.00	327	Union	2000
2.000	162702002310	Dry type xtmr, 3 ph, 480 V pri 120/208 V sec, vent, 3 kVA	1 Elec	1	8	Ea.	\$	820.00	\$	292.00	\$	-	\$	1,112.00	\$	292.00	\$	1,404.00	\$	1,825.20	\$	1,350.00	327	Union	2000
23.000	164407200300	Panelboards, NQOD, 3 wire, 100 amp main lugs, 120/240 volts, 20 circuits	1 Elec	0.65	12.308	Ea.	\$	12,420.00	\$	5,152.00	\$	-	\$	17,572.00	\$	5,152.00	\$	22,724.00	\$	29,541.20	\$	21,390.00	327	Union	2000
1.000	164407201900	Panelboards, NQOD, 3 wire, 120/240 volt, 400 amp main, 30 circuits	2 Elec	0.54	29.63	Ea.	\$	1,750.00	\$	540.00	\$	-	\$	2,290.00	\$	540.00	\$	2,830.00	\$	3,679.00	\$	2,750.00	327	Union	2000
12.000	164407202650	Panelboards, NEHB, 4 wire, 277/480 volts, 225 amp main, 42 circuits	2 Elec	0.56	28.571	Ea.	\$	35,100.00	\$	6,300.00	\$	-	\$	41,400.00	\$	6,300.00	\$	47,700.00	\$	62,010.00	\$	47,700.00	327	Union	2000
6.000	164102000200	Circuit breakers, enclosed (nema 1), 600 volt, 3 pole, 60 amp	1 Elec	2.8	2.857	Ea.	\$	2,100.00	\$	315.00	\$	-	\$	2,415.00	\$	315.00	\$	2,730.00	\$	3,549.00	\$	2,790.00	327	Union	2000
2.000	164102000400	Circuit breakers, enclosed (nema 1), 600 volt, 3 pole, 100 amp	1 Elec	2.3	3.478	Ea.	\$	800.00	\$	127.00	\$	-	\$	927.00	\$	127.00	\$	1,054.00	\$	1,370.20	\$	1,080.00	327	Union	2000
2.000	164102000600	Circuit breakers, enclosed (nema 1), 600 volt, 3 pole, 225 amp	1 Elec	1.5	5.333	Ea.	\$	1,860.00	\$	195.00	\$	-	\$	2,055.00	\$	195.00	\$	2,250.00	\$	2,925.00	\$	2,350.00	327	Union	2000
4.000	164407202350	Panelboards, NQOD, 4 wire, 120/208 volts, 600 amp main, 42 circuits	2 Elec	0.4	40	Ea.	\$	13,000.00	\$	2,940.00	\$	-	\$	15,940.00	\$	2,940.00	\$	18,880.00	\$	24,544.00	\$	18,800.00	327	Union	2000
14.000	164108002910	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 30 amp	1 Elec	3.2	2.5	Ea.	\$	1,428.00	\$	637.00	\$	-	\$	2,065.00	\$	637.00	\$	2,702.00	\$	3,512.60	\$	2,534.00	327	Union	2000
18.000	164108003000	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 60 amp	1 Elec	2.3	3.478	Ea.	\$	3,114.00	\$	1,143.00	\$	-	\$	4,257.00	\$	1,143.00	\$	5,400.00	\$	7,020.00	\$	5,130.00	327	Union	2000
13.000	164108003300	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 100 amp	1 Elec	1.9	4.211	Ea.	\$	3,536.00	\$	1,001.00	\$	-	\$	4,537.00	\$	1,001.00	\$	5,538.00	\$	7,199.40	\$	5,395.00	327	Union	2000
3.000	164108003500	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 200 amp	1 Elec	1.3	6.154	Ea.	\$	1,410.00	\$	336.00	\$	-	\$	1,746.00	\$	336.00	\$	2,082.00	\$	2,706.60	\$	2,055.00	327	Union	2000
1.000	164108003700	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 400 amp	2 Elec	1.8	8.889	Ea.	\$	1,075.00	\$	162.00	\$	-	\$	1,237.00	\$	162.00	\$	1,399.00	\$	1,818.70	\$	1,425.00	327	Union	2000
27.000	165303200500	Emer lt units, btry operated, twin sealed bm lt, 25 W, 6 V ea, lead Exit and emer lgt, exit light cig or wall mount, incan, single face	1 Elec	4	2	Ea.	\$	4,158.00	\$	985.50	\$	-	\$	5,143.50	\$	985.50	\$	6,129.00	\$	7,967.70	\$	6,075.00	327	Union	2000
22.000	165303200080	Exterior fixtr, floodlights W/blst&lamp, P mtd P not incl, hg vap, 400 W	1 Elec	8	1	Ea.	\$	748.00	\$	401.50	\$	-	\$	1,149.50	\$	401.50	\$	1,551.00	\$	2,016.30	\$	1,441.00	327	Union	2000
8.000	165203001600	Copper bus duct, plug-in, ndr, plug-in switch, 600 V, 3 pole, 60 amp	2 Elec	4.4	3.636	Ea.	\$	2,040.00	\$	532.00	\$	-	\$	2,572.00	\$	532.00	\$	3,104.00	\$	4,035.20	\$	3,040.00	327	Union	2000
1.000	164503207300	Copper bus duct, plug-in, ndr, plug-in switch, 600 V, 3 pole, 200 amp	1 Elec	3.6	2.222	Ea.	\$	375.00	\$	40.50	\$	-	\$	415.50	\$	40.50	\$	456.00	\$	592.80	\$	475.00	327	Union	2000
1.000	164503207500	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	2 Elec	3.2	5	Ea.	\$	950.00	\$	91.00	\$	-	\$	1,041.00	\$	91.00	\$	1,132.00	\$	1,471.60	\$	1,150.00	327	Union	2000
320.000	161205500300	Electrical dml, conduit to 15" high, rigid galv steel, 1/2" to 1"	1 Elec	2.2	3.636	C.L.F.	\$	9,920.00	\$	21,280.00	\$	-	\$	31,200.00	\$	-	\$	31,200.00	\$	40,560.00	\$	42,560.00	327	Union	2000
32,000.000	160553000100	Electrical demo, conduit to 15" high galv, 2" to 4" diam	1 Elec	242	0.033	L.F.	\$	-	\$	19,200.00	\$	-	\$	19,200.00	\$	-	\$	19,200.00	\$	24,960.00	\$	28,800.00	327	Union	2000
4,000.000	160553000140	Electrical demo, conduit to 15" high, galv, 4" to 6" diam	1 Elec	151	0.053	L.F.	\$	-	\$	3,880.00	\$	-	\$	3,880.00	\$	-	\$	3,880.00	\$	5,044.00	\$	5,760.00	327	Union	2000
2,000.000	160553000160	Electrical demo, non-metallic sheathed cable (Romex), #12, 2 wire	1 Elec	80	0.1	L.F.	\$	-	\$	3,640.00	\$	-	\$	3,640.00	\$	-	\$	3,640.00	\$	4,732.00	\$	5,460.00	327	Union	2000
32,000.000	160553000380	Electrical demo, int fluor fixt, pendant mt, indl, to 15'hi, 4', 2	1 Elec	630	0.013	L.F.	\$	-	\$	7,360.00	\$	-	\$	7,360.00	\$	-	\$	7,360.00	\$	9,568.00	\$	11,200.00	327	Union	2000
600.000	160553002420	Electrical demo, int fluore fixt, rec drop-in 2'x4', 4 lamp	2 Elec	35	0.457	Ea.	\$	-	\$	5,010.00	\$	-	\$	5,010.00	\$	-	\$	5,010.00	\$	6,513.00	\$	7,470.00	327	Union	2000
200.000	160553002140	Electrical demo, int fluore fixt, rec drop-in 2'x4', 4 lamp	2 Elec	30	0.533	Ea.	\$	-	\$	1,950.00	\$	-	\$	1,950.00	\$	-	\$	1,950.00	\$	2,535.00	\$	2,930.00	327	Union	2000
Totals								\$	329,440.00	\$	262,051.90	\$	940.00	\$	592,431.90	\$		\$	1,004,592.94	\$	756,423.00				

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CostWorks 2000 - M6-0486

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	ZIP Code Prefix	Type	Release
150.000	165104401100	Interior ltr fixt, fluor, surf mtd, acryl lens, 1'w x 4'l, two 40 W	1 Elec	7	1.143	Ea.	\$ 10,125.00	\$ 3,075.00	\$ -	\$ 13,200.00	\$ -	\$ 13,200.00	\$ 17,160.00	\$ 15,750.00	327	Union	2000
450.000	165104403100	Intr. fluor strip fixt,pendent mtd,indl,wh porc enam,4' L,two 40 W,RS	1 Elec	5.7	1.404	Ea.	\$ 18,675.00	\$ 11,475.00	\$ -	\$ 30,150.00	\$ -	\$ 30,150.00	\$ 39,195.00	\$ 38,025.00	327	Union	2000
1,950.000	161366000650	Outlet boxes, pressed steel, switchbox	1 Elec	27	0.296	Ea.	\$ 4,251.00	\$ 10,530.00	\$ -	\$ 14,781.00	\$ 10,530.00	\$ 25,311.00	\$ 32,904.30	\$ 20,377.50	327	Union	2000
450.000	161397002110	Resi,sgl P,15 amp,ivory,w/a 1-gang box,cov pl,type NM (romex) cable	1 Elec	17.1	0.468	Ea.	\$ 2,880.00	\$ 3,847.50	\$ -	\$ 6,727.50	\$ 3,847.50	\$ 10,575.00	\$ 13,747.50	\$ 8,910.00	327	Union	2000
1,500.000	161397004015	Resi, DX outlet, 15 A recept., ivory, 1-gang box, pl, type NM cable	1 Elec	14.55	0.55	Ea.	\$ 7,500.00	\$ 15,075.00	\$ -	\$ 22,575.00	\$ 15,075.00	\$ 37,650.00	\$ 48,945.00	\$ 30,750.00	327	Union	2000
3.000	161397008660	Resi,HW htr hook-up,incl 1-2 p CB,box,3' of flex,20' of #10/2 NM cable	1 Elec	5	1.6	Ea.	\$ 55.50	\$ 88.50	\$ -	\$ 144.00	\$ 88.50	\$ 232.50	\$ 302.25	\$ 190.50	327	Union	2000
3.000	161397008270	Resi, bathroom vent fan, 50 CFM (use w/above hook-up), low noise model	1 Elec	15	0.533	Ea.	\$ 87.00	\$ 29.25	\$ -	\$ 116.25	\$ 29.25	\$ 145.50	\$ 189.15	\$ 139.50	327	Union	2000
3.000	161397008220	Residential wiring, resi equip, vent/exhaust fan hook-up,type MC cable	1 Elec	24	0.333	Ea.	\$ 33.00	\$ 18.30	\$ -	\$ 51.30	\$ 18.30	\$ 69.60	\$ 90.48	\$ 63.00	327	Union	2000
24,000.000	161322051770	Cond to 15' H,incl 2 term n,2 elb&11 bm CLP per 100',galv stl,3/4" dia	1 Elec	80	0.1	L.F.	\$ 41,760.00	\$ 43,680.00	\$ -	\$ 85,440.00	\$ 43,680.00	\$ 129,120.00	\$ 167,856.00	\$ 111,600.00	327	Union	2000
1,500.000	161322051970	Cond to 15' H,incl 2 term n,2 elb&11 bm CLP per 100',galv stl,4" dia	2 Elec	40	0.4	L.F.	\$ 23,850.00	\$ 10,950.00	\$ -	\$ 34,800.00	\$ 10,950.00	\$ 45,750.00	\$ 59,475.00	\$ 42,750.00	327	Union	2000
3,000.000	161322051870	Cond to 15' H,incl 2 term n,2 elb&11 bm CLP per 100',galv stl,2" dia	1 Elec	45	0.178	L.F.	\$ 15,450.00	\$ 9,720.00	\$ -	\$ 25,170.00	\$ 9,720.00	\$ 34,890.00	\$ 45,357.00	\$ 31,650.00	327	Union	2000
3.000	160608000100	Grounding, rod, copper clad, 10' long, 3/4" dia	1 Elec	4.4	1.818	Ea.	\$ 85.50	\$ 99.00	\$ -	\$ 184.50	\$ 99.00	\$ 283.50	\$ 368.55	\$ 243.00	327	Union	2000
1.000	160608000800	Grounding, bare copper wire stranded, 3/0	2 Elec	6.6	2.424	C.L.F.	\$ 130.00	\$ 44.00	\$ -	\$ 174.00	\$ 44.00	\$ 218.00	\$ 283.40	\$ 210.00	327	Union	2000
300.000	161201200100	Armored cable, 600 volt, copper (BX), #14, 3 conductor, solid	1 Elec	2.2	3.636	C.L.F.	\$ 17,700.00	\$ 19,950.00	\$ -	\$ 37,650.00	\$ 19,950.00	\$ 57,600.00	\$ 74,880.00	\$ 49,200.00	327	Union	2000
1.000	162706000200	Oil fed XFMR, 5 kV or 15 kV, W / taps, 277/480 V sec, 3 ph, 300 kVA	R3	0.45	44.444	Ea.	\$ 7,600.00	\$ 800.00	\$ 300.00	\$ 8,700.00	\$ 800.00	\$ 9,500.00	\$ 12,350.00	\$ 9,900.00	327	Union	2000
1.000	162706000300	Oil fed XFMR, 5 kV or 15 kV, W / taps, 277/480 V sec, 3 ph, 500 kVA	R3	0.4	50	Ea.	\$ 10,100.00	\$ 900.00	\$ 340.00	\$ 11,340.00	\$ 900.00	\$ 12,240.00	\$ 15,912.00	\$ 12,900.00	327	Union	2000
17.000	164407200300	Panelboards, NQOD, 3 wire, 100 amp main lugs,120/240 volts,20 circuits	1 Elec	0.65	12.308	Ea.	\$ 9,180.00	\$ 3,808.00	\$ -	\$ 12,988.00	\$ 3,808.00	\$ 16,796.00	\$ 21,834.80	\$ 15,810.00	327	Union	2000
1.000	164407201900	Panelboards, NQOD, 3 wire, 120/240 volt, 400 amp main, 30 circuits	2 Elec	0.54	29.63	Ea.	\$ 1,750.00	\$ 540.00	\$ -	\$ 2,290.00	\$ 540.00	\$ 2,830.00	\$ 3,679.00	\$ 2,750.00	327	Union	2000
9.000	164407202650	Panelboards, NEHB, 4 wire, 277/480 volts, 225 amp main, 42 circuits	2 Elec	0.56	28.571	Ea.	\$ 26,325.00	\$ 4,725.00	\$ -	\$ 31,050.00	\$ 4,725.00	\$ 35,775.00	\$ 46,507.50	\$ 35,775.00	327	Union	2000
4.000	164102000200	Circuit breakers, enclosed (nema 1), 600 volt, 3 pole, 60 amp	1 Elec	2.8	2.857	Ea.	\$ 1,400.00	\$ 210.00	\$ -	\$ 1,610.00	\$ 210.00	\$ 1,820.00	\$ 2,366.00	\$ 1,860.00	327	Union	2000
1.000	164102000400	Circuit breakers, enclosed (nema 1), 600 volt, 3 pole, 100 amp	1 Elec	2.3	3.478	Ea.	\$ 400.00	\$ 63.50	\$ -	\$ 463.50	\$ 63.50	\$ 527.00	\$ 685.10	\$ 540.00	327	Union	2000
1.000	164102000600	Circuit breakers, enclosed (nema 1), 600 volt, 3 pole, 225 amp	1 Elec	1.5	5.333	Ea.	\$ 930.00	\$ 97.50	\$ -	\$ 1,027.50	\$ 97.50	\$ 1,125.00	\$ 1,462.50	\$ 1,175.00	327	Union	2000
3.000	164407202350	Panelboards, NQOD, 4 wire, 120/208 volts, 600 amp main, 42 circuits	2 Elec	0.4	40	Ea.	\$ 9,750.00	\$ 2,205.00	\$ -	\$ 11,955.00	\$ 2,205.00	\$ 14,160.00	\$ 18,408.00	\$ 14,100.00	327	Union	2000
10.000	164108002910	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 30 amp	1 Elec	3.2	2.5	Ea.	\$ 1,020.00	\$ 455.00	\$ -	\$ 1,475.00	\$ 455.00	\$ 1,930.00	\$ 2,509.00	\$ 1,810.00	327	Union	2000
13.000	164108003000	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 60 amp	1 Elec	2.3	3.478	Ea.	\$ 2,249.00	\$ 825.50	\$ -	\$ 3,074.50	\$ 825.50	\$ 3,900.00	\$ 5,070.00	\$ 3,705.00	327	Union	2000
9.000	164108003300	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 100 amp	1 Elec	1.9	4.211	Ea.	\$ 2,448.00	\$ 693.00	\$ -	\$ 3,141.00	\$ 693.00	\$ 3,834.00	\$ 4,984.20	\$ 3,735.00	327	Union	2000
2.000	164108003500	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 200 A	1 Elec	1.3	6.154	Ea.	\$ 940.00	\$ 224.00	\$ -	\$ 1,164.00	\$ 224.00	\$ 1,388.00	\$ 1,804.40	\$ 1,370.00	327	Union	2000
1.000	164108003700	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 400 amp	2 Elec	1.8	8.889	Ea.	\$ 1,075.00	\$ 162.00	\$ -	\$ 1,237.00	\$ 162.00	\$ 1,399.00	\$ 1,818.70	\$ 1,425.00	327	Union	2000
20.000	165303200500	Emer lit units,btry operated,twin sealed bm lt,25 W,6 V ea,lead btry	1 Elec	4	2	Ea.	\$ 3,080.00	\$ 730.00	\$ -	\$ 3,810.00	\$ 730.00	\$ 4,540.00	\$ 5,902.00	\$ 4,500.00	327	Union	2000
16.000	165303200800	Exit and emer ltr, exit light clg or wall mount, incan, single face	1 Elec	8	1	Ea.	\$ 544.00	\$ 292.00	\$ -	\$ 836.00	\$ 292.00	\$ 1,128.00	\$ 1,466.40	\$ 1,048.00	327	Union	2000
6.000	165203001600	Exterior fixt,floodlights W/blst&lamp,P mtd P not incl,hg vap,400 W	2 Elec	4.4	3.636	Ea.	\$ 1,530.00	\$ 399.00	\$ -	\$ 1,929.00	\$ 399.00	\$ 2,328.00	\$ 3,026.40	\$ 2,280.00	327	Union	2000
240.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	C.L.F.	\$ 7,440.00	\$ 15,960.00	\$ -	\$ 23,400.00	\$ -	\$ 23,400.00	\$ 30,420.00	\$ 31,920.00	327	Union	2000
2,400.000	160553000100	Electrical dml, conduit to 15' high, rigid galv steel,1/2" to 1" dia	1 Elec	242	0.033	L.F.	\$ -	\$ 1,440.00	\$ -	\$ 1,440.00	\$ -	\$ 1,440.00	\$ 1,872.00	\$ 2,160.00	327	Union	2000
3,000.000	160553000140	Electrical demo, conduit to 15' high galv, 2" to 4" diam	1 Elec	151	0.053	L.F.	\$ -	\$ 2,910.00	\$ -	\$ 2,910.00	\$ -	\$ 2,910.00	\$ 3,783.00	\$ 4,320.00	327	Union	2000
1,500.000	160553000160	Electrical demo, conduit to 15' high, galv, 4" to 6" diam	1 Elec	80	0.1	L.F.	\$ -	\$ 2,730.00	\$ -	\$ 2,730.00	\$ -	\$ 2,730.00	\$ 3,549.00	\$ 4,095.00	327	Union	2000
2,400.000	160553000380	Electrical demo, non-metallic sheathed cable (Romex), #12, 2 wire	1 Elec	630	0.013	L.F.	\$ -	\$ 552.00	\$ -	\$ 552.00	\$ -	\$ 552.00	\$ 717.60	\$ 840.00	327	Union	2000
450.000	160553002420	Electrical demo, int fluor fixt, pendant mt, indl, to 15'hi, 4'l, 2 lamp	2 Elec	35	0.457	Ea.	\$ -	\$ 3,757.50	\$ -	\$ 3,757.50	\$ -	\$ 3,757.50	\$ 4,884.75	\$ 5,602.50	327	Union	2000
150.000	160553002140	Electrical demo, int fluore fixt, rec drop-in 2'x4', 4 lamp	2 Elec	30	0.533	Ea.	\$ -	\$ 1,462.50	\$ -	\$ 1,462.50	\$ -	\$ 1,462.50	\$ 1,901.25	\$ 2,197.50	327	Union	2000
Totals							\$ 230,343.00	\$ 174,523.05	\$ 640.00	\$ 405,506.05			\$ 697,667.23	\$ 515,676.50			

Building M6-0486, 75% Replacement cost.

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CostWorks 2000 - M6-0486

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix	Type	Release
50.000	165104401100	Interior ltg fxtr, fluor, surf mtd, acryl lens, 1'w x 4'l, two 40 W	1 Elec	7	1.143	Ea.	\$ 3,375.00	\$ 1,025.00	\$ -	\$ 4,400.00	\$ -	\$ 4,400.00	\$ 5,720.00	\$ 5,250.00	327	Union	2000
150.000	165104403100	Intr,fluor,strp fixt,pendent mtd,indl,wh porc enam,4' L,two 40 W,RS	1 Elec	5.7	1.404	Ea.	\$ 6,225.00	\$ 3,825.00	\$ -	\$ 10,050.00	\$ -	\$ 10,050.00	\$ 13,065.00	\$ 12,675.00	327	Union	2000
150.000	161397002110	Resi,sgl P,15 amp,ivory,w/a 1-gang box,cov pl,type NM (romex) cable	1 Elec	17.1	0.468	Ea.	\$ 960.00	\$ 1,282.50	\$ -	\$ 2,242.50	\$ 1,282.50	\$ 3,525.00	\$ 4,582.50	\$ 2,970.00	327	Union	2000
500.000	161397004015	Resi,DX outlet, 15 A recpt., ivory, 1-gang box, pl, type NM cable	1 Elec	14.55	0.55	Ea.	\$ 2,500.00	\$ 5,025.00	\$ -	\$ 7,525.00	\$ 5,025.00	\$ 12,550.00	\$ 16,315.00	\$ 10,250.00	327	Union	2000
1.000	161397008660	Resi,HW htr hook-up,incl 1-2 p CB,box,3' of flex,20' of #10/2 NM cable	1 Elec	5	1.6	Ea.	\$ 18.50	\$ 29.50	\$ -	\$ 48.00	\$ 29.50	\$ 77.50	\$ 100.75	\$ 63.50	327	Union	2000
1.000	161397008270	Resi, bathroom vent fan, 50 CFM (use w/above hook-up), low noise model	1 Elec	15	0.533	Ea.	\$ 29.00	\$ 9.75	\$ -	\$ 38.75	\$ 9.75	\$ 48.50	\$ 63.05	\$ 46.50	327	Union	2000
1.000	161397008220	Residential wiring, resi equip, vent/exhaust fan hook-up,type MC cable	1 Elec	24	0.333	Ea.	\$ 11.00	\$ 6.10	\$ -	\$ 17.10	\$ 6.10	\$ 23.20	\$ 30.16	\$ 21.00	327	Union	2000
500.000	161322051970	Cond to 15' H,incl 2 termn,2 elb&11 bm CLP per 100',galv stl,4" dia	2 Elec	40	0.4	L.F.	\$ 7,950.00	\$ 3,650.00	\$ -	\$ 11,600.00	\$ 3,650.00	\$ 15,250.00	\$ 19,825.00	\$ 14,250.00	327	Union	2000
1,000.000	161322051870	Cond to 15' H,incl 2 termn,2 elb&11 bm CLP per 100',galv stl,2" dia	1 Elec	45	0.178	L.F.	\$ 5,150.00	\$ 3,240.00	\$ -	\$ 8,390.00	\$ 3,240.00	\$ 11,630.00	\$ 15,119.00	\$ 10,550.00	327	Union	2000
7.000	165303200500	Emer lt units,btry operated,twin sealed bm lt,25 W,6 V ea,lead btry	1 Elec	4	2	Ea.	\$ 1,078.00	\$ 255.50	\$ -	\$ 1,333.50	\$ 255.50	\$ 1,589.00	\$ 2,065.70	\$ 1,575.00	327	Union	2000
5.000	165303200080	Exit and emer ltg, exit light clg or wall mount, incan, single face	1 Elec	8	1	Ea.	\$ 170.00	\$ 91.25	\$ -	\$ 261.25	\$ 91.25	\$ 352.50	\$ 458.25	\$ 327.50	327	Union	2000
2.000	165203001600	Exterior fxtr,floodlights W/blst&lamp,P mtd P not incld,hg vap,400 W	2 Elec	4.4	3.636	Ea.	\$ 510.00	\$ 133.00	\$ -	\$ 643.00	\$ 133.00	\$ 776.00	\$ 1,008.80	\$ 760.00	327	Union	2000
80.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	C.L.F.	\$ 2,480.00	\$ 5,320.00	\$ -	\$ 7,800.00	\$ -	\$ 7,800.00	\$ 10,140.00	\$ 10,640.00	327	Union	2000
1,000.000	160553000140	Electrical demo, conduit to 15' high galv, 2" to 4" diam	1 Elec	151	0.053	L.F.	\$ -	\$ 970.00	\$ -	\$ 970.00	\$ -	\$ 970.00	\$ 1,261.00	\$ 1,440.00	327	Union	2000
150.000	160553002420	Electrical demo, int fluor fixt, pendant mt, indl, to 15'hi, 4'l, 2 lamp	2 Elec	35	0.457	Ea.	\$ -	\$ 1,252.50	\$ -	\$ 1,252.50	\$ -	\$ 1,252.50	\$ 1,628.25	\$ 1,867.50	327	Union	2000
200.000	160553002140	Electrical demo, int fluore fixt, rec drop-in 2'x4', 4 lamp	2 Elec	30	0.533	Ea.	\$ -	\$ 1,950.00	\$ -	\$ 1,950.00	\$ -	\$ 1,950.00	\$ 2,535.00	\$ 2,930.00	327	Union	2000
Totals							\$ 30,456.50	\$ 28,065.10	\$ -	\$ 58,521.60		\$ 93,917.46	\$ 75,616.00				

Building M6-0486. 25% Replacement costs.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - M6-0486

Qty	CSI Number	Description	Daily Labor				Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code		Release
			Crew	Output	Hours	Unit									Prefix	Type	
10.000	165104401100	Interior ltg fxt, fluor, surf mtd, acryl lens, 1'w x 4'l, two 40 W	1 Elec	7	1.143	Ea.	\$ 675.00	\$ 205.00	\$ -	\$ 880.00	\$ -	\$ 880.00	\$ 1,144.00	\$ 1,050.00	327	Union	2000
30.000	165104403100	Intr, fluor, strp fixt, pendent mtd, indl, wh porc enam, 4' L, two 40 W, RS	1 Elec	5.7	1.404	Ea.	\$ 1,245.00	\$ 765.00	\$ -	\$ 2,010.00	\$ -	\$ 2,010.00	\$ 2,613.00	\$ 2,535.00	327	Union	2000
30.000	161397002110	Resi, sgl P, 15 amp, ivory, w/a 1-gang box, cov pl, type NM (romex) cable	1 Elec	17.1	0.468	Ea.	\$ 192.00	\$ 256.50	\$ -	\$ 448.50	\$ 256.50	\$ 705.00	\$ 916.50	\$ 594.00	327	Union	2000
100.000	161397004015	Resi, DX outlet, 15 A recpt., ivory, 1-gang box, pl, type NM cable	1 Elec	14.55	0.55	Ea.	\$ 500.00	\$ 1,005.00	\$ -	\$ 1,505.00	\$ 1,005.00	\$ 2,510.00	\$ 3,263.00	\$ 2,050.00	327	Union	2000
200.000	161322051870	Cond to 15' H, incl 2 termn, 2 elb&11 bm CLP per 100', galv stl, 2" dia	1 Elec	45	0.178	L.F.	\$ 1,030.00	\$ 648.00	\$ -	\$ 1,678.00	\$ 648.00	\$ 2,326.00	\$ 3,023.80	\$ 2,110.00	327	Union	2000
1.000	165303200500	Emer lt units, btry operated, twin sealed bm lt, 25 W, 6 V ea, lead btry	1 Elec	4	2	Ea.	\$ 154.00	\$ 36.50	\$ -	\$ 190.50	\$ 36.50	\$ 227.00	\$ 295.10	\$ 225.00	327	Union	2000
1.000	165303200080	Exit and emer ltg, exit light clg or wall mount, incan, single face	1 Elec	8	1	Ea.	\$ 34.00	\$ 18.25	\$ -	\$ 52.25	\$ 18.25	\$ 70.50	\$ 91.65	\$ 65.50	327	Union	2000
30.000	160553002420	Electrical demo, int fluor fixt, pendant mt, indl, to 15'hi, 4'l, 2 lamp	2 Elec	35	0.457	Ea.	\$ -	\$ 250.50	\$ -	\$ 250.50	\$ -	\$ 250.50	\$ 325.65	\$ 373.50	327	Union	2000
10.000	160553002140	Electrical demo, int fluore fixt, rec drop-in 2'x4', 4 lamp	2 Elec	30	0.533	Ea.	\$ -	\$ 97.50	\$ -	\$ 97.50	\$ -	\$ 97.50	\$ 126.75	\$ 146.50	327	Union	2000
Totals							\$ 3,830.00	\$ 3,282.25	\$ -	\$ 7,112.25			\$ 11,799.45	\$ 9,149.50			

Building M6-0486, 5% Replacement costs.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - M6-0595

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Total Incl. O&P	Zip Code Prefix	Type	Release
1.000	162706000400	Oil fed XFMR, 5 kV or 15 kV, W/ taps, 277/480 V sec, 3 ph, 750 KVA	R3	0.38	52.63	Ea.	\$ 13,700.00	\$ 955.00	\$ 360.00	\$ 15,015.00	\$ 16,800.00	327	Union	2000
3.000	162702003500	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 45 kVA	2 Elec	0.8	20	Ea.	\$ 3,750.00	\$ 1,095.00	\$ -	\$ 4,845.00	\$ 5,775.00	327	Union	2000
1.000	162702003100	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 15 kVA	2 Elec	1.1	14.55	Ea.	\$ 895.00	\$ 265.00	\$ -	\$ 1,160.00	\$ 1,400.00	327	Union	2000
4.000	164407200300	Panelboards, NQOD, 3 wire, 100 amp main lugs, 120/240 volts, 20 circuits	1 Elec	0.65	12.31	Ea.	\$ 2,160.00	\$ 896.00	\$ -	\$ 3,056.00	\$ 3,720.00	327	Union	2000
3.000	164407200350	Panelboards, NQOD, 3 wire, 225 amp main lugs, 120/240 volts, 24 circuits	2 Elec	1.2	13.33	Ea.	\$ 1,830.00	\$ 729.00	\$ -	\$ 2,559.00	\$ 3,150.00	327	Union	2000
1.000	164407202350	Panelboards, NQOD, 4 wire, 120/208 volts, 600 amp main, 42 circuits	2 Elec	0.4	40	Ea.	\$ 3,250.00	\$ 735.00	\$ -	\$ 3,985.00	\$ 4,700.00	327	Union	2000
1.000	164408200480	Feeder section, circuit breakers, MAL frame, 1000 amp	1 Elec	1	8	Ea.	\$ 3,375.00	\$ 146.00	\$ -	\$ 3,521.00	\$ 3,925.00	327	Union	2000
1.000	164408200160	Feeder sect, ckt brkr, FA frame, 15 to 60 amp, 240 volt, 1 pole	1 Elec	8	1	Ea.	\$ 60.50	\$ 18.25	\$ -	\$ 78.75	\$ 94.50	327	Union	2000
1.000	164408200280	Feeder sect, ckt brkr, FA frame, 70 to 100 amp, 240 volt, 1 pole	1 Elec	7	1.143	Ea.	\$ 80.00	\$ 20.50	\$ -	\$ 100.50	\$ 119.00	327	Union	2000
2.000	164108003000	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 60 amp	1 Elec	2.3	3.478	Ea.	\$ 346.00	\$ 127.00	\$ -	\$ 473.00	\$ 570.00	327	Union	2000
1.000	164108003300	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 100 amp	1 Elec	1.9	4.211	Ea.	\$ 272.00	\$ 77.00	\$ -	\$ 349.00	\$ 415.00	327	Union	2000
2.000	164108003500	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 200 A	1 Elec	1.3	6.154	Ea.	\$ 940.00	\$ 224.00	\$ -	\$ 1,164.00	\$ 1,370.00	327	Union	2000
1.000	164108003900	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 600 A	2 Elec	1.2	13.33	Ea.	\$ 1,950.00	\$ 243.00	\$ -	\$ 2,193.00	\$ 2,525.00	327	Union	2000
1.000	164503207900	Copper bus duct, plug-in switches, 600 volt, 3 pole, 1200 amp	2 Elec	0.5	32	Ea.	\$ 10,500.00	\$ 580.00	\$ -	\$ 11,080.00	\$ 12,400.00	327	Union	2000
1.000	164503207300	Copper bus duct, plug-in, indr, plug-in switch, 600 V, 3 pole, 60 amp	1 Elec	3.6	2.222	Ea.	\$ 375.00	\$ 40.50	\$ -	\$ 415.50	\$ 475.00	327	Union	2000
7.000	165303200500	Emer It units, btry operated, twin sealed bm It, 25 W, 6 V ea, lead btry	1 Elec	4	2	Ea.	\$ 1,078.00	\$ 255.50	\$ -	\$ 1,333.50	\$ 1,575.00	327	Union	2000
2.000	160608000100	Grounding, rod, copper clad, 10' long, 3/4" dia	1 Elec	4.4	1.818	Ea.	\$ 57.00	\$ 66.00	\$ -	\$ 123.00	\$ 162.00	327	Union	2000
0.500	160608000800	Grounding, bare copper wire stranded, 3/0	2 Elec	6.6	2.424	C.L.F.	\$ 65.00	\$ 22.00	\$ -	\$ 87.00	\$ 105.00	327	Union	2000
12.000	164406600900	Motor strs & cont, mag, comb, W/ mot circ protectors, 25 HP, size 2	2 Elec	2	8	Ea.	\$ 10,860.00	\$ 1,752.00	\$ -	\$ 12,612.00	\$ 14,400.00	327	Union	2000

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80.000	165104403200	Intr,fluor,strp fixt,pendent mtd,indl,wh porc enam,4' L,two 60 W,HO	1 Elec	5	1.6	Ea.	\$	5,240.00	\$	2,360.00	\$	-	\$	7,600.00	\$	9,280.00	327	Union	2000
10.000	161397002130	Resi, sw dvc, sgl P, 15 amp, ivory, w/a 1-gang box, cov pl, EMT & wire	1 Elec	5.7	1.401	Ea.	\$	168.00	\$	255.00	\$	-	\$	423.00	\$	565.00	327	Union	2000
20.000	161397004030	Resi, recpt dvc, DX outlet, 15 A recpt., ivory,1-gang box,pl,EMT& wire	1 Elec	5.35	1.501	Ea.	\$	308.00	\$	550.00	\$	-	\$	858.00	\$	1,160.00	327	Union	2000
2,000.000	161322052530	Conduit to 15' H,IMC,incl 2 termn,2 elb&11 bm clp per 100',3/4" dia	1 Elec	90	0.089	L.F.	\$	2,780.00	\$	3,240.00	\$	-	\$	6,020.00	\$	7,900.00	327	Union	2000
900.000	161322052730	Conduit to 15' H,IMC,incl 2 termn,2 elb&11 bm clp per 100',4" dia	2 Elec	50	0.32	L.F.	\$	12,150.00	\$	5,265.00	\$	-	\$	17,415.00	\$	21,150.00	327	Union	2000
30.000	161366000650	Outlet boxes, pressed steel, switchbox	1 Elec	27	0.296	Ea.	\$	65.40	\$	162.00	\$	-	\$	227.40	\$	313.50	327	Union	2000
80.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	C.L.F.	\$	2,480.00	\$	5,320.00	\$	-	\$	7,800.00	\$	10,640.00	327	Union	2000

		Totals					\$	78,734.90	\$	25,398.75	\$	360.00	\$	104,493.65	\$	124,689.00			
		2001 Inflation Adjusted Totals					\$	81,096.95	\$	26,160.71	\$	370.80	\$	107,628.46	\$	128,429.67			
		2002 Inflation Adjusted Totals					\$	83,529.86	\$	26,945.53	\$	381.92	\$	110,857.31	\$	132,282.56			

Building M6-0595 Construction costs.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - M6-0595

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix	Type	Release
1.000	162706000400	W/ taps, 277/480 V sec, 3 ph, 750 KVA	R3	0.38	52.632	Ea.	\$ 13,700.00	\$ 955.00	\$ 360.00	\$ 15,015.00	\$ 955.00	\$ 15,970.00	\$ 19,164.00	\$ 16,800.00	327	Union	2000
3.000	162702003500	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 45 kVA	2 Elec	0.8	20	Ea.	\$ 3,750.00	\$ 1,095.00	\$ -	\$ 4,845.00	\$ 1,095.00	\$ 5,940.00	\$ 7,128.00	\$ 5,775.00	327	Union	2000
1.000	162702003100	Dry type xfmr, 3 ph, 480 V pri 120/208 V sec, vent, 15 kVA	2 Elec	1.1	14.545	Ea.	\$ 895.00	\$ 265.00	\$ -	\$ 1,160.00	\$ 265.00	\$ 1,425.00	\$ 1,710.00	\$ 1,400.00	327	Union	2000
4.000	164407200300	Panelboards, NQOD, 3 wire, 100 amp main lugs, 120/240 volts, 20 circuits	1 Elec	0.65	12.308	Ea.	\$ 2,160.00	\$ 896.00	\$ -	\$ 3,056.00	\$ 896.00	\$ 3,952.00	\$ 4,742.40	\$ 3,720.00	327	Union	2000
3.000	164407200350	Panelboards, NQOD, 3 wire, 225 amp main lugs, 120/240 volts, 24 circuits	2 Elec	1.2	13.333	Ea.	\$ 1,830.00	\$ 729.00	\$ -	\$ 2,559.00	\$ 729.00	\$ 3,288.00	\$ 3,945.60	\$ 3,150.00	327	Union	2000
1.000	164407202350	Panelboards, NQOD, 4 wire, 120/208 volts, 600 amp main, 42 circuits	2 Elec	0.4	40	Ea.	\$ 3,250.00	\$ 735.00	\$ -	\$ 3,985.00	\$ 735.00	\$ 4,720.00	\$ 5,664.00	\$ 4,700.00	327	Union	2000
1.000	164408200480	Feeder section, circuit breakers, MAL frame, 1000 amp	1 Elec	1	8	Ea.	\$ 3,375.00	\$ 146.00	\$ -	\$ 3,521.00	\$ 146.00	\$ 3,667.00	\$ 4,400.40	\$ 3,925.00	327	Union	2000
1.000	164408200160	Feeder sect, ckt brkr, FA frame, 15 to 60 amp, 240 volt, 1 pole	1 Elec	8	1	Ea.	\$ 60.50	\$ 18.25	\$ -	\$ 78.75	\$ 18.25	\$ 97.00	\$ 116.40	\$ 94.50	327	Union	2000
1.000	164408200280	Feeder sect, ckt brkr, FA frame, 70 to 100 amp, 240 volt, 1 pole	1 Elec	7	1.143	Ea.	\$ 80.00	\$ 20.50	\$ -	\$ 100.50	\$ 20.50	\$ 121.00	\$ 145.20	\$ 119.00	327	Union	2000
2.000	164108003000	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 60 amp	1 Elec	2.3	3.478	Ea.	\$ 346.00	\$ 127.00	\$ -	\$ 473.00	\$ 127.00	\$ 600.00	\$ 720.00	\$ 570.00	327	Union	2000
1.000	164108003300	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 100 amp	1 Elec	1.9	4.211	Ea.	\$ 272.00	\$ 77.00	\$ -	\$ 349.00	\$ 77.00	\$ 426.00	\$ 511.20	\$ 415.00	327	Union	2000
2.000	164108003500	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 200 A	1 Elec	1.3	6.154	Ea.	\$ 940.00	\$ 224.00	\$ -	\$ 1,164.00	\$ 224.00	\$ 1,388.00	\$ 1,665.60	\$ 1,370.00	327	Union	2000
1.000	164108003900	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 600 A	2 Elec	1.2	13.333	Ea.	\$ 1,950.00	\$ 243.00	\$ -	\$ 2,193.00	\$ 243.00	\$ 2,436.00	\$ 2,923.20	\$ 2,525.00	327	Union	2000
1.000	164503207900	Copper bus duct, plug-in switches, 600 volt, 3 pole, 1200 amp	2 Elec	0.5	32	Ea.	\$ 10,500.00	\$ 580.00	\$ -	\$ 11,080.00	\$ 580.00	\$ 11,660.00	\$ 13,992.00	\$ 12,400.00	327	Union	2000
1.000	164503207300	Copper bus duct, plug-in, indr, plug-in switch, 600 V, 3 pole, 60 amp	1 Elec	3.6	2.222	Ea.	\$ 375.00	\$ 40.50	\$ -	\$ 415.50	\$ 40.50	\$ 456.00	\$ 547.20	\$ 475.00	327	Union	2000
7.000	165303200500	Emer lt units, btry operated, twin sealed bm lt, 25 W, 6 V ea, lead btry	1 Elec	4	2	Ea.	\$ 1,078.00	\$ 255.50	\$ -	\$ 1,333.50	\$ 255.50	\$ 1,589.00	\$ 1,906.80	\$ 1,575.00	327	Union	2000
2.000	160608000100	Grounding, rod, copper clad, 10' long, 3/4" dia	1 Elec	4.4	1.818	Ea.	\$ 57.00	\$ 66.00	\$ -	\$ 123.00	\$ 66.00	\$ 189.00	\$ 226.80	\$ 162.00	327	Union	2000
0.500	160608000800	Grounding, bare copper wire stranded, 3/0	2 Elec	6.6	2.424	C.L.F.	\$ 65.00	\$ 22.00	\$ -	\$ 87.00	\$ 22.00	\$ 109.00	\$ 130.80	\$ 105.00	327	Union	2000

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12.000	164406600900	Motor strs & cont, mag, comb, W/ mot circ protectors, 25 HP, size 2	2 Elec	2	8	Ea.	\$	10,860.00	\$	1,752.00	\$	-	\$	12,612.00	\$	1,752.00	\$	14,364.00	\$	17,236.80	\$	14,400.00	327	Unior 2000
80.000	165104403200	Intr,flour,strup fixt,pendent mtd,indl,wh porc enam,4' L,two 60 W,HO	1 Elec	5	1.6	Ea.	\$	5,240.00	\$	2,360.00	\$	-	\$	7,600.00	\$	-	\$	7,600.00	\$	9,120.00	\$	9,280.00	327	Unior 2000
10.000	161397002130	Resi, sw dvc, sgl P, 15 amp, ivory, w/a 1-gang box, cov pl, EMT & wire	1 Elec	5.7	1.401	Ea.	\$	168.00	\$	255.00	\$	-	\$	423.00	\$	255.00	\$	678.00	\$	813.60	\$	565.00	327	Unior 2000
20.000	161397004030	Resi, recpt dvc, DX outlet, 15 A recpt., ivory,1-gang box,pl,EMT& wire	1 Elec	5.35	1.501	Ea.	\$	308.00	\$	550.00	\$	-	\$	858.00	\$	550.00	\$	1,408.00	\$	1,689.60	\$	1,160.00	327	Unior 2000
2,000.000	161322052530	Conduit to 15' H,IMC,incl 2 termn,2 elb&11 bm clp per 100',3/4" dia	1 Elec	90	0.089	L.F.	\$	-	\$	3,240.00	\$	-	\$	6,020.00	\$	-	\$	6,020.00	\$	7,224.00	\$	7,900.00	327	Unior 2000
900.000	161322052730	Conduit to 15' H,IMC,incl 2 termn,2 elb&11 bm clp per 100',4" dia	2 Elec	50	0.32	L.F.	\$	-	\$	5,265.00	\$	-	\$	17,415.00	\$	-	\$	17,415.00	\$	20,898.00	\$	21,150.00	327	Unior 2000
30.000	161366000650	Outlet boxes, pressed steel, switchbox	1 Elec	27	0.592	Ea.	\$	65.40	\$	162.00	\$	-	\$	227.40	\$	162.00	\$	389.40	\$	467.28	\$	313.50	327	Unior 2000
80.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3 conductor	1 Elec	2.2	3.636	C.L.F.	\$	2,480.00	\$	5,320.00	\$	-	\$	7,800.00	\$	5,320.00	\$	13,120.00	\$	15,744.00	\$	10,640.00	327	Unior 2000
2,000.000	160553000100	Electrical dml, conduit to 15' high, rigid galv steel,1/2" to 1" dia	1 Elec	242	0.033	L.F.	\$	-	\$	1,200.00	\$	-	\$	1,200.00	\$	-	\$	1,200.00	\$	1,440.00	\$	1,800.00	327	Unior 2000
900.000	160553000160	Electrical demo, conduit to 15' high, galv, 4" to 6" diam	1 Elec	80	0.1	L.F.	\$	-	\$	1,638.00	\$	-	\$	1,638.00	\$	-	\$	1,638.00	\$	1,965.60	\$	2,457.00	327	Unior 2000
8,000.000	160553000380	Electrical demo, non-metallic sheathed cable (Romex), #12, 2 wire	1 Elec	630	0.013	L.F.	\$	-	\$	1,840.00	\$	-	\$	1,840.00	\$	-	\$	1,840.00	\$	2,208.00	\$	2,800.00	327	Unior 2000
1.000	160553001570	Electrical demo, transformer, 3 phase to 600v, primary, 750 kVA	R3	1.1	18.182	Ea.	\$	-	\$	325.00	\$	124.00	\$	449.00	\$	-	\$	449.00	\$	538.80	\$	625.00	327	Unior 2000
80.000	160553002420	Electrical demo, int fluor fixt, pendant mt, indl, to 15'hi, 4', 2 lamp	2 Elec	35	0.457	Ea.	\$	-	\$	668.00	\$	-	\$	668.00	\$	-	\$	668.00	\$	801.60	\$	996.00	327	Unior 2000
Totals								\$ 63,804.90	\$ 31,069.75	\$ 484.00	\$ 110,288.65	\$ 14,533.75	\$ 124,822.40	\$ 149,786.88	\$ 133,367.00									

Building M6-0595, Replacement cost.

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CostWorks 2000 - M6-0595

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix	Type	Release
1.000	162706000400	Oil fed XFMR, 5 kV or 15 kV, W/ taps, 277/480 V sec, 3 ph, 750 KVA	R3	0.38	52.632	Ea.	\$ 13,700.00	\$ 955.00	\$ 360.00	\$ 15,015.00	\$ 955.00	\$ 15,970.00	\$ 19,164.00	\$ 16,800.00	327	Unior	2000
3.000	164407200300	Panelboards, NQOD, 3 wire, 100 amp main lugs,120/240 volts,20 circuits	1 Elec	0.65	12.308	Ea.	\$ 1,620.00	\$ 672.00	\$ -	\$ 2,292.00	\$ 672.00	\$ 2,964.00	\$ 3,556.80	\$ 2,790.00	327	Unior	2000
2.000	164407200350	Panelboards, NQOD, 3 wire, 225 amp main lugs,120/240 volts,24 circuits	2 Elec	1.2	13.333	Ea.	\$ 1,220.00	\$ 486.00	\$ -	\$ 1,706.00	\$ 486.00	\$ 2,192.00	\$ 2,630.40	\$ 2,100.00	327	Unior	2000
1.000	164407202350	Panelboards, NQOD, 4 wire, 120/208 volts, 600 amp main, 42 circuits	2 Elec	0.4	40	Ea.	\$ 3,250.00	\$ 735.00	\$ -	\$ 3,985.00	\$ 735.00	\$ 4,720.00	\$ 5,664.00	\$ 4,700.00	327	Unior	2000
1.000	164408200480	Feeder section, circuit breakers, MAL frame, 1000 amp	1 Elec	1	8	Ea.	\$ 3,375.00	\$ 146.00	\$ -	\$ 3,521.00	\$ 146.00	\$ 3,667.00	\$ 4,400.40	\$ 3,925.00	327	Unior	2000
1.000	164408200160	Feeder sect, ckt brkr, FA frame, 15 to 60 amp, 240 volt, 1 pole	1 Elec	8	1	Ea.	\$ 60.50	\$ 18.25	\$ -	\$ 78.75	\$ 18.25	\$ 97.00	\$ 116.40	\$ 94.50	327	Unior	2000
1.000	164408200280	Feeder sect, ckt brkr, FA frame, 70 to 100 amp, 240 volt, 1 pole	1 Elec	7	1.143	Ea.	\$ 80.00	\$ 20.50	\$ -	\$ 100.50	\$ 20.50	\$ 121.00	\$ 145.20	\$ 119.00	327	Unior	2000
1.000	164108003000	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 60 amp	1 Elec	2.3	3.478	Ea.	\$ 173.00	\$ 63.50	\$ -	\$ 236.50	\$ 63.50	\$ 300.00	\$ 360.00	\$ 285.00	327	Unior	2000
1.000	164108003300	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 100 amp	1 Elec	1.9	4.211	Ea.	\$ 272.00	\$ 77.00	\$ -	\$ 349.00	\$ 77.00	\$ 426.00	\$ 511.20	\$ 415.00	327	Unior	2000
1.000	164108003500	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 200 A	1 Elec	1.3	6.154	Ea.	\$ 470.00	\$ 112.00	\$ -	\$ 582.00	\$ 112.00	\$ 694.00	\$ 832.80	\$ 685.00	327	Unior	2000
1.000	164108003900	Safety switches, heavy duty, 240 volt, 3 pole NEMA 1 fusible, 600 A	2 Elec	1.2	13.333	Ea.	\$ 1,950.00	\$ 243.00	\$ -	\$ 2,193.00	\$ 243.00	\$ 2,436.00	\$ 2,923.20	\$ 2,525.00	327	Unior	2000
1.000	164503207900	Copper bus duct, plug-in switches, 600 volt, 3 pole, 1200 amp	2 Elec	0.5	32	Ea.	\$ 10,500.00	\$ 580.00	\$ -	\$ 11,080.00	\$ 580.00	\$ 11,660.00	\$ 13,992.00	\$ 12,400.00	327	Unior	2000
1.000	164503207300	Copper bus duct, plug-in, indr, plug-in switch, 600 V, 3 pole, 60 amp	1 Elec	3.6	2.222	Ea.	\$ 375.00	\$ 40.50	\$ -	\$ 415.50	\$ 40.50	\$ 456.00	\$ 547.20	\$ 475.00	327	Unior	2000
5.000	165303200500	Emer It units,btry operated,twin sealed bm lt,25 W,6 V ea,lead btry	1 Elec	4	2	Ea.	\$ 770.00	\$ 182.50	\$ -	\$ 952.50	\$ 182.50	\$ 1,135.00	\$ 1,362.00	\$ 1,125.00	327	Unior	2000
1.000	160608000100	Grounding, rod, copper clad, 10' long, 3/4" dia	1 Elec	4.4	1.818	Ea.	\$ 28.50	\$ 33.00	\$ -	\$ 61.50	\$ 33.00	\$ 94.50	\$ 113.40	\$ 81.00	327	Unior	2000
0.375	160608000800	Grounding, bare copper wire stranded, 3/0	2 Elec	6.6	2.424	C.L.F.	\$ 48.75	\$ 16.50	\$ -	\$ 65.25	\$ 16.50	\$ 81.75	\$ 98.10	\$ 78.75	327	Unior	2000
9.000	164406600900	Motor strs & cont, mag, comb, W/ mot circ protectors, 25 HP, size 2	2 Elec	2	8	Ea.	\$ 8,145.00	\$ 1,314.00	\$ -	\$ 9,459.00	\$ 1,314.00	\$ 10,773.00	\$ 12,927.60	\$ 10,800.00	327	Unior	2000
60.000	165104403200	Intr,fluor, strp fixt,pendent mtd,indr,wh porc enam,4' L,two 60 W,HO	1 Elec	5	1.6	Ea.	\$ 3,930.00	\$ 1,770.00	\$ -	\$ 5,700.00	\$ -	\$ 5,700.00	\$ 6,840.00	\$ 6,960.00	327	Unior	2000
7.000	161397002130	Resi, sw dvc, sgl P, 15 amp, ivory, w/a 1-gang box, cov pl, EMT & wire	1 Elec	5.7	1.401	Ea.	\$ 117.60	\$ 178.50	\$ -	\$ 296.10	\$ 178.50	\$ 474.60	\$ 569.52	\$ 395.50	327	Unior	2000
15.000	161397004030	Resi, recpt dvc, DX outlet, 15 A recpt., ivory,1-gang box,pl,EMT& wire	1 Elec	5.35	1.501	Ea.	\$ 231.00	\$ 412.50	\$ -	\$ 643.50	\$ 412.50	\$ 1,056.00	\$ 1,267.20	\$ 870.00	327	Unior	2000
1,500.000	161322052530	Conduit to 15' H,IMC,incl 2 termn,2 elb&11 bm clp per 100',3/4" dia	1 Elec	90	0.089	L.F.	\$ -	\$ 2,430.00	\$ -	\$ 4,515.00	\$ -	\$ 4,515.00	\$ 5,418.00	\$ 5,925.00	327	Unior	2000

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675.000	161322052730	Conduit to 15' H,IMC,incl 2 termn,2 elb&11 bm clp per 100',4" dia	2 Elec	50	0.32	L.F.	\$	-	\$	3,948.75	\$	-	\$	13,061.25	\$	-	\$	13,061.25	\$	15,673.50	\$	15,862.50	327	Unior 2000
22.000	161366000650	Outlet boxes, pressed steel, switchbox	1 Elec	27	0.592	Ea.	\$	47.96	\$	118.80	\$	-	\$	166.76	\$	118.80	\$	285.56	\$	342.67	\$	229.90	327	Unior 2000
60.000	161205500300	Non-metallic sheathed cable, 600V, copper with ground, #12, 3	1 Elec	2.2	3.636	C.L.F.	\$	1,860.00	\$	3,990.00	\$	-	\$	5,850.00	\$	3,990.00	\$	9,840.00	\$	11,808.00	\$	7,980.00	327	Unior 2000
1,500.000	160553000100	Electrical dml, conduit to 15' high, rigid galv steel,1/2" to 1" dia	1 Elec	242	0.033	L.F.	\$	-	\$	900.00	\$	-	\$	900.00	\$	-	\$	900.00	\$	1,080.00	\$	1,350.00	327	Unior 2000
675.000	160553000160	Electrical demo, conduit to 15' high, galv, 4" to 6" diam	1 Elec	80	0.1	L.F.	\$	-	\$	1,228.50	\$	-	\$	1,228.50	\$	-	\$	1,228.50	\$	1,474.20	\$	1,842.75	327	Unior 2000
6,000.000	160553000380	Electrical demo, non-metallic sheathed cable (Romex), #12, 2 wire	1 Elec	630	0.013	L.F.	\$	-	\$	1,380.00	\$	-	\$	1,380.00	\$	-	\$	1,380.00	\$	1,656.00	\$	2,100.00	327	Unior 2000
60.000	160553002420	Electrical demo, int fluor fixt, pendant mt, indl, to 15'hi, 4'l, 2 lamp	2 Elec	35	0.457	Ea.	\$	-	\$	501.00	\$	-	\$	501.00	\$	-	\$	501.00	\$	601.20	\$	747.00	327	Unior 2000
							Totals			\$ 52,224.31	\$ 22,552.80	\$ 360.00	\$ 86,334.61	\$ 10,394.55	\$ 96,729.16	\$ 116,074.99	\$ 103,660.90							

Building M6-0595 75% Replacement cost.

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - M6-0595

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix	Type	Release
1.000	164407200300	Panelboards, NQOD, 3 wire, 100 amp main lugs,120/240 volts,20 circuits	1 Elec	0.65	12.308	Ea.	\$ 540.00	\$ 224.00	\$ -	\$ 764.00	\$ 224.00	\$ 988.00	\$ 1,185.60	\$ 930.00	327	Union	2000
1.000	164407200350	Panelboards, NQOD, 3 wire, 225 amp main lugs,120/240 volts,24 circuits	2 Elec	1.2	13.333	Ea.	\$ 610.00	\$ 243.00	\$ -	\$ 853.00	\$ 243.00	\$ 1,096.00	\$ 1,315.20	\$ 1,050.00	327	Union	2000
2.000	165303200500	Emer lt units,btry operated,twin sealed bm lt,25 W,6 V ea,lead btry	1 Elec	4	2	Ea.	\$ 308.00	\$ 73.00	\$ -	\$ 381.00	\$ 73.00	\$ 454.00	\$ 544.80	\$ 450.00	327	Union	2000
20.000	165104403200	Intr,fluor,strip fixt,pendent mtd,indl,wh porc enam,4' L,two 60 W,HO	1 Elec	5	1.6	Ea.	\$ 1,310.00	\$ 590.00	\$ -	\$ 1,900.00	\$ -	\$ 1,900.00	\$ 2,280.00	\$ 2,320.00	327	Union	2000
2.000	161397002130	Resi, sw dvc, sgl P, 15 amp, ivory, w/a 1-gang box, cov pl, EMT & wire	1 Elec	5.7	1.401	Ea.	\$ 33.60	\$ 51.00	\$ -	\$ 84.60	\$ 51.00	\$ 135.60	\$ 162.72	\$ 113.00	327	Union	2000
5.000	161397004030	Resi, recpt dvc, DX outlet, 15 A recpt., ivory,1-gang box,pl,EMT& wire	1 Elec	5.35	1.501	Ea.	\$ 77.00	\$ 137.50	\$ -	\$ 214.50	\$ 137.50	\$ 352.00	\$ 422.40	\$ 290.00	327	Union	2000
500.000	161322052530	Conduit to 15' H,JMC,incl 2 termn,2 elb&11 bm clp per 100',3/4" dia	1 Elec	90	0.089	L.F.	\$ -	\$ 810.00	\$ -	\$ 1,505.00	\$ -	\$ 1,505.00	\$ 1,806.00	\$ 1,975.00	327	Union	2000
500.000	160553000100	Electrical dml, conduit to 15' high, rigid galv steel,1/2" to 1" dia	1 Elec	242	0.033	L.F.	\$ -	\$ 300.00	\$ -	\$ 300.00	\$ -	\$ 300.00	\$ 360.00	\$ 450.00	327	Union	2000
2,000.000	160553000380	Electrical demo, non-metallic sheathed cable (Romex), #12, 2 wire	1 Elec	630	0.013	L.F.	\$ -	\$ 460.00	\$ -	\$ 460.00	\$ -	\$ 460.00	\$ 552.00	\$ 700.00	327	Union	2000
80.000	160553002420	Electrical demo, int fluor fixt, pendant mt, indl, to 15'hi, 4l, 2 lamp	2 Elec	35	0.457	Ea.	\$ -	\$ 668.00	\$ -	\$ 668.00	\$ -	\$ 668.00	\$ 801.60	\$ 996.00	327	Union	2000
Totals							\$ 2,878.60	\$ 3,556.50	\$ -	\$ 7,130.10	\$ 728.50	\$ 7,858.60	\$ 9,430.32	\$ 9,274.00			

Building M6-0595, 25% Replacement costs.

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CostWorks 2000 - M6-0595

Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix	Type	Release
1.000	165303200500	Emer lt units,btry operated,twin sealed bm lt,25 W,6 V ea,lead btry	1 Elec	4	2	Ea.	\$ 154.00	\$ 36.50	\$ -	\$ 190.50	\$ 36.50	\$ 227.00	\$ 272.40	\$ 225.00	327	Union	2000
4.000	165104403200	Intr,fluor,strp fixt,pendent mtd,indl,wh porc enam,4' L,two 60 W,HO	1 Elec	5	1.6	Ea.	\$ 262.00	\$ 118.00	\$ -	\$ 380.00	\$ -	\$ 380.00	\$ 456.00	\$ 464.00	327	Union	2000
1.000	161397002130	Resi, sw dvc, sgl P, 15 amp, ivory, w/a 1-gang box, cov pl, EMT & wire	1 Elec	5.7	1.401	Ea.	\$ 16.80	\$ 25.50	\$ -	\$ 42.30	\$ 25.50	\$ 67.80	\$ 81.36	\$ 56.50	327	Union	2000
1.000	161397004030	Resi, recpt dvc, DX outlet, 15 A recpt., ivory, 1-gang box,pl,EMT& wire	1 Elec	5.35	1.501	Ea.	\$ 15.40	\$ 27.50	\$ -	\$ 42.90	\$ 27.50	\$ 70.40	\$ 84.48	\$ 58.00	327	Union	2000
100.000	160553000100	Electrical dml, conduit to 15' high, rigid galv steel,1/2" to 1" dia	1 Elec	242	0.033	L.F.	\$ -	\$ 60.00	\$ -	\$ 60.00	\$ -	\$ 60.00	\$ 72.00	\$ 90.00	327	Union	2000
400.000	160553000380	Electrical demo, non-metallic sheathed cable (Romex), #12, 2 wire	1 Elec	630	0.013	L.F.	\$ -	\$ 92.00	\$ -	\$ 92.00	\$ -	\$ 92.00	\$ 110.40	\$ 140.00	327	Union	2000
4.000	160553002420	Electrical demo, int fluor fixt, pendant mt, indl, to 15'hi, 4'l, 2 lamp	2 Elec	35	0.457	Ea.	\$ -	\$ 33.40	\$ -	\$ 33.40	\$ -	\$ 33.40	\$ 40.08	\$ 49.80	327	Union	2000
Totals							\$ 448.20	\$ 392.90	\$ -	\$ 841.10	\$ 89.50	\$ 930.60	\$ 1,116.72	\$ 1,083.30			

Building M6-0595, 5% Replacement costs.

Interior Finishes

Five Facilities were selected for this cost analysis and are listed below:

K6-1145	Multi-function Facility
M6-0336	Electromagnetic Lab
M6-0896	Compressed Air Shop
M7-0657	Parachute Refurbishment Facility
M7-1059	Hypergolic Maintenance Facility

These facilities were selected on the basis of the types of interior finishes (all are relatively similar) and ease of access to the facility. None of these facilities have stairs, and studwork for interior walls was assumed to be part of the structure rather than the interior finish.

All Cost Works cost lists were generated by selecting the closest matches for the various components from the Cost Works database. For ease of comparison, the same materials were used for each facility where applicable. Interior dimensions were approximated using facility drawings for use in these estimations.

Replacement estimates included all components that are most likely to get damaged or deteriorated due to wear, age, and environmental conditions, and also included the associated labor costs for demolition and assembly. The contributing environmental conditions include heat and humidity. The components most likely to need replacement are defined as follows:

- Drywall (5/8")
- Modular walls (9 foot-tall, semi-permanent style)
- Interior paint (two coats)
- Baseboard molding
- Floor tiles (12" x 12" x 1/8" resilient vinyl)
- Carpet (35 oz., heavy traffic acrylic)
- Acoustical ceiling tiles and suspension hardware (2' x 4' x 5/8")
- Trim (door and window edging, wall bumpers)
- Doors (3' x 6'8" x 1 3/8", solid core birch)
- All assembly components (e.g. nails, tape, glue, etc.)

The Grading Criteria are given below, along with the justification for the inclusion or exclusion of components from the replacement costs.

Grade 2 – Significant repairs required. Broken elements. Wear and tear excessive.

For grade 2, the assumption was made that 10% of the doors and 50% of the other items on the list above would need replacement. Doors are more likely to be repaired when they malfunction and are therefore likely to be in better condition than the other items.

Grade 1 – Replacement required.

For grade 1, the assumption was made that 100% of the items listed above would need replacement.

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Facility #	Fac Name	Total S.F.	CRV	INTF Construction Estimate	INTF Replacement Cost	INTF Replacement % of INTF Constr	50% INTF Replacement Cost	50% INTF Replacement % of INTF Constr	% of CRV	CRV\$/S.F.
K6-1145	MULTI-FUNCTION FACILITY	15953	\$2,360,189	\$118,015.00	\$140,171.00	118.77%	\$68,177.10	57.77%	5.00%	147.95
M6-0336	ELECTROMAGNETIC LAB	9486	\$1,419,303	\$79,241.00	\$92,885.00	117.22%	\$42,534.10	53.68%	5.58%	149.62
M6-0896	COMPRESSED AIR SHOP	1121	\$982,285	\$7,285.41	\$8,849.31	121.47%	\$4,180.38	57.38%	0.74%	876.26
M7-0657	PARACHUTE REFURBISHMENT FACILITY	35758	\$7,370,327	\$47,870.78	\$66,137.98	138.16%	\$30,348.09	63.40%	0.65%	206.12
						123.90%		58.06%	2.99%	

Interior Summary

100% Demo	50% Demo	50% Const
22156.00	10969.60	57207.50
13644.00	6713.60	35820.50
1563.90	775.18	3405.20
18267.20	9025.20	21322.89
26035.70	12936.55	118009.50

Plumbing

Five facilities were selected for this cost analysis and are listed below:

K6-1446D	Base Electric Shop
K6-2196	Roads and Grounds Maintenance #3
M6-0336	Electromagnetic Lab
M6-0495	Dispensary
M7-0657	Parachute Refurbishment Facility

These facilities were selected on the basis of the types of plumbing equipment (all are relatively similar), ease of access to the facility, and ease of access to the interior plumbing system.

The plumbing system equipment lists for each facility were determined during site visits to each location. The equipment lists were used to select the appropriate equipment, or closest match, from the Cost Works database. Only interior plumbing equipment was considered in this analysis. The underground plumbing, facility backflow preventers, and associated exterior plumbing and equipment were considered to be part of the Kennedy Space Center plumbing distribution system. Bathroom structural components, interior finishes, and electrical equipment were not considered in this analysis.

The interior plumbing equipment found during the facility inspections are as follows:

- Bathroom Fixtures
 - Sinks (Lavatories)
 - Showers
 - Toilets (Water Closets)
 - Urinals
 - Floor Drains
 - Partitions
 - Mirrors
 - Accessories (Soap Dispenser, Paper Towel Dispenser, etc.)
- Water Heaters
- Washing Machines
- Drinking Fountains
- Wash Basins (Laundry Sinks)
- Emergency Shower and Eyewash Stations
- Ice Machines
- Fire Suppression Systems

The Grading Criteria are given below and are based on the assumption that the above listed equipment will need to be removed and replaced at some interval based on the life span of the plumbing equipment or total equipment failure. Only construction costs, replacement costs (Grade 1) and 75% replacement costs (Grade 2) were estimated in Cost Works.

The initial construction costs were estimated for the above listed equipment found in each facility. The construction costs include rough-in estimates for equipment connected to the water

pipng. The rough-in estimates include running piping from the water supply, waste, and vent lines to the new equipment.

Grade 1 – Nonfunctional, system unrepairable, complete replacement required.

For grade 1, the assumption was made that 100% of the interior plumbing equipment and interior plumbing distribution system would need replacement. For those items not listed in the Cost Works plumbing demolition list, the labor was doubled to account for removal time. The rough-in estimates were not included in this estimate because the equipment is being replaced.

Grade 2 – Significant repairs required. Fixtures and plumbing are obsolete. Many leaks and obvious corrosion in piping systems.

For grade 2, the assumption was made that 75% of the interior plumbing equipment would need replacement. For those items not listed in the Cost Works plumbing demolition list the labor was doubled to account for removal time. Quantities were adjusted to reflect approximately 75% of the initial value, to the nearest integer. Items that had a quantity of one were left on the list of replaced items. For those items not listed in the Cost Works plumbing demolition list, the labor was doubled to account for removal time.

The Plumbing System Replacement Percentage of Plumbing System Construction from the attached Excel spreadsheet shows an average of 101%. This percentage is correct because the rough-in estimates for the initial installation of the plumbing equipment is comparable to the demolition estimates for replacing the equipment.

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Facility #	Fac Name	Total S.F.	CRV	Plumbing System Construction Estimate	Plumbing System Replacement Cost	Plumbing System Replacement % of Plumbing System Constr	75% Plumbing System Replacement Cost	75% Plumbing System Replacement % of Plumbing System Constr	% of CRV
K6-1446D	Base Electric Shop	15,000	\$ 956,211.00	\$ 37,075.50	\$ 37,190.79	100%	\$ 28,762.63	78%	3.88%
K6-2196	Roads and Grounds Maintenance #3	2,844	\$ 231,057.00	\$ 14,900.75	\$ 14,675.90	98%	\$ 12,457.93	84%	6.45%
M6-0336	Electromagnetic Lab	9,486	\$ 1,419,303.00	\$ 28,899.00	\$ 26,348.14	91%	\$ 21,833.41	76%	2.04%
M6-0495	Dispensary	19,646	\$ 5,769,035.00	\$ 129,916.50	\$ 132,150.66	102%	\$ 101,614.50	78%	2.25%
M7-0657	Parachute Refurbishment Facility	35,758	\$ 7,370,327.00	\$ 66,627.00	\$ 75,377.32	113%	\$ 58,977.62	89%	0.90%
						101%		81%	

Plumbing Summary.

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CostWorks 2000 - Plumbing														
Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Total Incl. O&P	Zip Code Prefix	Type	Release
7.000	108201003100	Bathroom accessories, mir with stainless steel, 3/4" sq FR, 36" x 24"	1 Carp	15	0.533	Ea.	\$ 756.00	\$ 85.40	\$ -	\$ 841.40	\$ 966.00	327	Union	2000
8.000	108201005000	Bathroom accessories, soap disp, chrome, rec stainless steel, liq	1 Carp	10	0.8	Ea.	\$ 532.00	\$ 146.40	\$ -	\$ 678.40	\$ 824.00	327	Union	2000
3.000	108201006050	Bathroom accessories, toilet seat cov disp, SS, surface mtd	1 Carp	15	0.533	Ea.	\$ 79.50	\$ 36.60	\$ -	\$ 116.10	\$ 144.00	327	Union	2000
7.000	108201006100	Bathroom accessories, toilet tissue disp, surf mounted,sst,single roll	1 Carp	30	0.267	Ea.	\$ 74.20	\$ 42.70	\$ -	\$ 116.90	\$ 150.50	327	Union	2000
6.000	108201006700	Bathroom accessories, towel dispenser, sst, surf mounted	1 Carp	16	0.5	Ea.	\$ 216.00	\$ 68.70	\$ -	\$ 284.70	\$ 345.00	327	Union	2000
3.000	108201008000	Bathroom accessories, waste recpts, stainless steel, with top, 13 gal	1 Carp	10	0.8	Ea.	\$ 564.00	\$ 54.90	\$ -	\$ 618.90	\$ 708.00	327	Union	2000
3.000	154117003100	Urinals, wall hung, vitreous china, hanger & self-closing valve,siphon	Q1	3	5.333	Ea.	\$ 834.00	\$ 300.00	\$ -	\$ 1,134.00	\$ 1,365.00	327	Union	2000
3.000	154117003300	Urinals, wall hung, vitreous china, rough-in, supply, waste & vent	Q1	2.83	5.654	Ea.	\$ 249.00	\$ 318.00	\$ -	\$ 567.00	\$ 756.00	327	Union	2000
1.000	154122008400	Drinking founts, fir mtd, pedestal type, SS, architectural style	1 Plum	2	4	Ea.	\$ 1,100.00	\$ 83.50	\$ -	\$ 1,183.50	\$ 1,325.00	327	Union	2000
1.000	154122008900	Drinking founts, fir mtd, pedestal type, for rgh-in, sply and W, add	1 Plum	1.83	4.372	Ea.	\$ 32.00	\$ 91.00	\$ -	\$ 123.00	\$ 174.00	327	Union	2000
7.000	154184504180	Lavatory, w/trim, wall hung, porc enam on CI, 20" x 18", single bowl	Q1	8	2	Ea.	\$ 1,400.00	\$ 262.50	\$ -	\$ 1,662.50	\$ 1,939.00	327	Union	2000
7.000	154184506960	Lavatories,wl hung,hosp type,rgh-in, sply,w&vent for abv lavatories	Q1	1.66	9.639	Ea.	\$ 1,120.00	\$ 1,260.00	\$ -	\$ 2,380.00	\$ 3,150.00	327	Union	2000
7.000	154189003100	Water clo, bowl only, w/flush valve, seat, wall hung	Q1	5.8	2.759	Ea.	\$ 2,345.00	\$ 360.50	\$ -	\$ 2,705.50	\$ 3,115.00	327	Union	2000
7.000	154189003200	Water clos, bowl only, seat, for rgh-in, sply, W & vent, sgl WC	Q1	2.56	6.25	Ea.	\$ 1,827.00	\$ 819.00	\$ -	\$ 2,646.00	\$ 3,255.00	327	Union	2000
1.000	154802004140	Water htrs, com, 100< rise, elec, 50 gal., 9 kW, 37 GPH, 208V	1 Plum	1.8	4.444	Ea.	\$ 1,900.00	\$ 92.50	\$ -	\$ 1,992.50	\$ 2,250.00	327	Union	2000
1.000	154184003020	Laundry sinks, W/ trim, plstc, on wl hgr or legs, 18" x 23", sgl compt	Q1	6.5	2.462	Ea.	\$ 82.00	\$ 46.00	\$ -	\$ 128.00	\$ 160.00	327	Union	2000
3.000	101551004800	Partitions, toilet, ur scrn, 18" W, cig braced, plstc lam on part bd	2 Carp	8	2	Ea.	\$ 705.00	\$ 138.00	\$ -	\$ 843.00	\$ 990.00	327	Union	2000
7.000	101551002600	Partitions,toilet,cubs,flr mtd,hdrail braced,plstc lam on part bd	2 Carp	6	2.667	Ea.	\$ 3,675.00	\$ 427.00	\$ -	\$ 4,102.00	\$ 4,690.00	327	Union	2000
1.000	114101505800	Food service eqpt, ice cube maker, 50 pounds per day	Q1	6	2.667	Ea.	\$ 1,500.00	\$ 65.00	\$ -	\$ 1,565.00	\$ 1,750.00	327	Union	2000
300.000	151074202180	Pipe cu solder jts, type L tubing, cplgs & hgrs 10' o.c., 3/4" dia	1 Plum	76	0.105	L.F.	\$ 450.00	\$ 657.00	\$ -	\$ 1,107.00	\$ 1,491.00	327	Union	2000
500.000	151074202200	Pipe cu solder joints, type L tubing, cplgs & hgrs 10' o.c., 1" dia	1 Plum	68	0.118	L.F.	\$ 1,015.00	\$ 1,225.00	\$ -	\$ 2,240.00	\$ 2,950.00	327	Union	2000
300.000	151074202140	Pipe cu solder jts, type L tubing, cplgs & hgrs 10' O.C., 1/2" dia.	1 Plum	81	0.099	L.F.	\$ 342.00	\$ 615.00	\$ -	\$ 957.00	\$ 1,308.00	327	Union	2000
300.000	151085204460	Pipe, pistic, DWV, cplgs 10' o.c., ngrs 3 per 10', PVC, 2" dia	Q1	59	0.271	L.F.	\$ 873.00	\$ 1,515.00	\$ -	\$ 2,388.00	\$ 3,270.00	327	Union	2000
Totals							\$21,670.70	\$ 8,709.70	\$ -	\$ 30,380.40	\$ 37,075.50			

Building K6-1446. Construction costs

Fiscal Year 2002 NASA–Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - Plumbing															
Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix
7.000	108201003100	Bathroom accessories, mir with stainless steel, 3/4" sq FR, 36" x 24"	1 Carp	15	0.533	Ea.	\$ 756.00	\$ 85.40	\$-	\$ 841.40	\$ 85.40	\$ 926.80	\$ 1,204.84	\$ 966.00	327
8.000	108201005000	Bathroom accessories, soap disp, chrome, rec stainless steel, liq	1 Carp	10	0.8	Ea.	\$ 532.00	\$ 146.40	\$-	\$ 678.40	\$ 146.40	\$ 824.80	\$ 1,072.24	\$ 824.00	327
3.000	108201006050	Bathroom accessories, toilet seat cov disp, SS, surface mtd	1 Carp	15	0.533	Ea.	\$ 79.50	\$ 36.60	\$-	\$ 116.10	\$ 36.60	\$ 152.70	\$ 198.51	\$ 144.00	327
7.000	108201006100	Bathroom accessories, toilet tissue disp, surf mounted,sst,single roll	1 Carp	30	0.267	Ea.	\$ 74.20	\$ 42.70	\$-	\$ 116.90	\$ 42.70	\$ 159.60	\$ 207.48	\$ 150.50	327
6.000	108201006700	Bathroom accessories, towel dispenser, sst, surf mounted	1 Carp	16	0.5	Ea.	\$ 216.00	\$ 68.70	\$-	\$ 284.70	\$ 68.70	\$ 353.40	\$ 459.42	\$ 345.00	327
3.000	108201008000	Bathroom accessories, waste recpts, stainless steel, with top, 13 gal	1 Carp	10	0.8	Ea.	\$ 564.00	\$ 54.90	\$-	\$ 618.90	\$ 54.90	\$ 673.80	\$ 875.94	\$ 708.00	327
3.000	154117003100	Urinals, wall hung, vitreous china, hanger & self-closing valve,siphon	Q1	3	5.333	Ea.	\$ 834.00	\$ 300.00	\$-	\$ 1,134.00	\$ -	\$ 1,134.00	\$ 1,474.20	\$ 1,365.00	327
1.000	154122008400	Drinking founts, fir mtd, pedestal type, SS, architectural style	1 Plum	2	4	Ea.	\$ 1,100.00	\$ 83.50	\$-	\$ 1,183.50	\$ -	\$ 1,183.50	\$ 1,538.55	\$ 1,325.00	327
7.000	154184504180	Lavatory, w/trim, wall hung, porc enam on CI, 20" x 18", single bowl	Q1	8	2	Ea.	\$ 1,400.00	\$ 262.50	\$-	\$ 1,662.50	\$ -	\$ 1,662.50	\$ 2,161.25	\$ 1,939.00	327
7.000	154189003100	Water clo, bowl only, w/flush valve, seat, wall hung	Q1	5.8	2.759	Ea.	\$ 2,345.00	\$ 360.50	\$-	\$ 2,705.50	\$ -	\$ 2,705.50	\$ 3,517.15	\$ 3,115.00	327
1.000	154802004140	Water htrs, com, 100< rise, elec, 50 gal., 9 kW, 37 GPH, 208V	1 Plum	1.8	4.444	Ea.	\$ 1,900.00	\$ 92.50	\$-	\$ 1,992.50	\$ -	\$ 1,992.50	\$ 2,590.25	\$ 2,250.00	327
1.000	154184003020	Laundry sinks, W/ trim, plstc, on wl hgr or legs, 18" x 23", sgl compt	Q1	6.5	2.462	Ea.	\$ 82.00	\$ 46.00	\$-	\$ 128.00	\$ 46.00	\$ 174.00	\$ 226.20	\$ 160.00	327
3.000	101551004800	Partitions, toilet, ur scrn, 18" W, clg braced, plstc lam on part bd	2 Carp	8	2	Ea.	\$ 705.00	\$ 138.00	\$-	\$ 843.00	\$ 138.00	\$ 981.00	\$ 1,275.30	\$ 990.00	327
7.000	101551002600	Partitions,toilet,cubs,fir mtd,hdrail braced,plstc lam on part bd	2 Carp	6	2.667	Ea.	\$ 3,675.00	\$ 427.00	\$-	\$ 4,102.00	\$ 427.00	\$ 4,529.00	\$ 5,887.70	\$ 4,690.00	327
1.000	114101505800	Food service eqpt, ice cube maker, 50 pounds per day	Q1	6	2.667	Ea.	\$ 1,500.00	\$ 65.00	\$-	\$ 1,565.00	\$ 65.00	\$ 1,630.00	\$ 2,119.00	\$ 1,750.00	327
300.000	151074202180	Pipe cu solder jts, type L tubing, cplgs & hgrs 10' o.c., 3/4" dia	1 Plum	76	0.105	L.F.	\$ 450.00	\$ 657.00	\$-	\$ 1,107.00	\$ -	\$ 1,107.00	\$ 1,439.10	\$ 1,491.00	327
500.000	151074202200	Pipe cu solder joints, type L tubing, cplgs & hgrs 10' o.c., 1" dia	1 Plum	68	0.118	L.F.	\$ 1,015.00	\$1,225.00	\$-	\$ 2,240.00	\$ -	\$ 2,240.00	\$ 2,912.00	\$ 2,950.00	327
300.000	151074202140	Pipe cu solder jts, type L tubing, cplgs & hgrs 10' O.C., 1/2" dia.	1 Plum	81	0.099	L.F.	\$ 342.00	\$ 615.00	\$-	\$ 957.00	\$ -	\$ 957.00	\$ 1,244.10	\$ 1,308.00	327
300.000	151085204460	Pipe, plstc, DWV, cplgs 10' o.c., hgrs 3 per 10', PVC, 2" dia	Q1	59	0.271	L.F.	\$ 873.00	\$1,515.00	\$-	\$ 2,388.00	\$1,515.00	\$ 3,903.00	\$ 5,073.90	\$ 3,270.00	327
7.000	150556001200	Plumbing dml, fixtures w/10' pipe, lavatory, wall hung	1 Plum	10	0.8	Ea.	\$ -	\$ 116.20	\$-	\$ 116.20	\$ -	\$ 116.20	\$ 151.06	\$ 175.00	327
7.000	150556001420	Plumbing demo, fixtures, w/10' pipe, water closet, wall mounted	1 Plum	7	1.143	Ea.	\$ -	\$ 168.00	\$-	\$ 168.00	\$ -	\$ 168.00	\$ 218.40	\$ 252.00	327
3.000	150556001520	Plumbing dml, fixtures w/10' pipe, urinal, wall mounted	1 Plum	7	1.143	Ea.	\$ -	\$ 72.00	\$-	\$ 72.00	\$ -	\$ 72.00	\$ 93.60	\$ 108.00	327
1.000	150556001600	Plumbing dml, fixtures w/10' pipe, water fountains, free stand	1 Plum	8	1	Ea.	\$ -	\$ 21.00	\$-	\$ 21.00	\$ -	\$ 21.00	\$ 27.30	\$ 31.50	327
1,100.000	150556002000	Plumbing dml, piping, metal, to 2" dia	1 Plum	200	0.04	L.F.	\$ -	\$ 913.00	\$-	\$ 913.00	\$ -	\$ 913.00	\$ 1,186.90	\$ 1,386.00	327
1.000	150556002250	Plumbing demo, water heater, 40 gal	1 Plum	6	1.333	Ea.	\$ -	\$ 28.00	\$-	\$ 28.00	\$ -	\$ 28.00	\$ 36.40	\$ 42.00	327
Totals							\$18,442.70	\$7,539.90	\$-	\$25,982.60	\$2,625.70	\$28,608.30	\$37,190.79	\$31,735.00	

Building K6-1446D, Replacement costs

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - Plumbing														
Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P
5.000	108201003100	Bathroom accessories, mir with stainless steel, 3/4" sq FR, 36" x 24"	1 Carp	15	0.533	Ea.	\$ 540.00	\$ 61.00	\$ -	\$ 601.00	\$ 61.00	\$ 662.00	\$ 860.60	\$ 690.00
6.000	108201005000	Bathroom accessories, soap disp, chrome, rec stainless steel, liq	1 Carp	10	0.8	Ea.	\$ 399.00	\$ 109.80	\$ -	\$ 508.80	\$ 109.80	\$ 618.60	\$ 804.18	\$ 618.00
2.000	108201006050	Bathroom accessories, toilet seat cov disp, SS, surface mtd	1 Carp	15	0.533	Ea.	\$ 53.00	\$ 24.40	\$ -	\$ 77.40	\$ 24.40	\$ 101.80	\$ 132.34	\$ 96.00
5.000	108201006100	Bathroom accessories, toilet tissue disp, surf mounted, sst, single roll	1 Carp	30	0.267	Ea.	\$ 53.00	\$ 30.50	\$ -	\$ 83.50	\$ 30.50	\$ 114.00	\$ 148.20	\$ 107.50
5.000	108201006700	Bathroom accessories, towel dispenser, sst, surf mounted	1 Carp	16	0.5	Ea.	\$ 180.00	\$ 57.25	\$ -	\$ 237.25	\$ 57.25	\$ 294.50	\$ 382.85	\$ 287.50
2.000	108201008000	Bathroom accessories, waste recpts, stainless steel, with top, 13 gal	1 Carp	10	0.8	Ea.	\$ 376.00	\$ 36.60	\$ -	\$ 412.60	\$ 36.60	\$ 449.20	\$ 583.96	\$ 472.00
2.000	154117003100	Urinals, wall hung, vitreous china, hanger & self-closing valve, siphon	Q1	3	5.333	Ea.	\$ 556.00	\$ 200.00	\$ -	\$ 756.00	\$ -	\$ 756.00	\$ 982.80	\$ 910.00
1.000	154122008400	Drinking founts, flr mtd, pedestal type, SS, architectural style	1 Plum	2	4	Ea.	\$ 1,100.00	\$ 83.50	\$ -	\$ 1,183.50	\$ -	\$ 1,183.50	\$ 1,538.55	\$ -
5.000	154184504180	Lavatory, w/trim, wall hung, porc enam on CI, 20" x 18", single bowl	Q1	8	2	Ea.	\$ 1,000.00	\$ 187.50	\$ -	\$ 1,187.50	\$ -	\$ 1,187.50	\$ 1,543.75	\$ 1,385.00
5.000	154189003100	Water clo, bowl only, w/flush valve, seat, wall hung	Q1	5.8	2.759	Ea.	\$ 1,675.00	\$ 257.50	\$ -	\$ 1,932.50	\$ -	\$ 1,932.50	\$ 2,512.25	\$ 2,225.00
1.000	154802004140	Water htrs, com, 100< rise, elec, 50 gal., 9 kW, 37 GPH, 208V	1 Plum	1.8	4.444	Ea.	\$ 1,900.00	\$ 92.50	\$ -	\$ 1,992.50	\$ -	\$ 1,992.50	\$ 2,590.25	\$ -
1.000	154184003020	Laundry sinks, W/ trim, plstc, on wl hgr or legs, 18" x 23", sgl compt	Q1	6.5	2.462	Ea.	\$ 82.00	\$ 46.00	\$ -	\$ 128.00	\$ 46.00	\$ 174.00	\$ 226.20	\$ 46.00
2.000	101551004800	Partitions, toilet, ur scrn, 18" W, clg braced, plstc lam on part bd	2 Carp	8	2	Ea.	\$ 470.00	\$ 92.00	\$ -	\$ 562.00	\$ 92.00	\$ 654.00	\$ 850.20	\$ 660.00
5.000	101551002600	Partitions, toilet, cubs, flr mtd, hdrail braced, plstc lam on part bd	2 Carp	6	2.667	Ea.	\$ 2,625.00	\$ 305.00	\$ -	\$ 2,930.00	\$ 305.00	\$ 3,235.00	\$ 4,205.50	\$ 3,350.00
1.000	114101505800	Food service eqpt, ice cube maker, 50 pounds per day	Q1	6	2.667	Ea.	\$ 1,500.00	\$ 65.00	\$ -	\$ 1,565.00	\$ 65.00	\$ 1,630.00	\$ 2,119.00	\$ 65.00
225.000	151074202180	Pipe cu solder jts, type L tubing, cplgs & hgrs 10' o.c., 3/4" dia	1 Plum	76	0.105	L.F.	\$ 337.50	\$ 492.75	\$ -	\$ 830.25	\$ -	\$ 830.25	\$ 1,079.33	\$ 1,118.25
375.000	151074202200	Pipe cu solder joints, type L tubing, cplgs & hgrs 10' o.c., 1" dia	1 Plum	68	0.118	L.F.	\$ 761.25	\$ 918.75	\$ -	\$ 1,680.00	\$ -	\$ 1,680.00	\$ 2,184.00	\$ 2,212.50
225.000	151074202140	Pipe cu solder jts, type L tubing, cplgs & hgrs 10' O.C., 1/2" dia.	1 Plum	81	0.099	L.F.	\$ 256.50	\$ 461.25	\$ -	\$ 717.75	\$ -	\$ 717.75	\$ 933.08	\$ 981.00
225.000	151085204460	Pipe, plstc, DWV, cplgs 10' o.c., hgrs 3 per 10', PVC, 2" dia	Q1	59	0.271	L.F.	\$ 654.75	\$ 1,136.25	\$ -	\$ 1,791.00	\$ 1,136.25	\$ 2,927.25	\$ 3,805.43	\$ 2,452.50
5.000	150556001200	Plumbing dml, fixtures w/10' pipe, lavatory, wall hung	1 Plum	10	0.8	Ea.	\$ -	\$ 83.00	\$ -	\$ 83.00	\$ -	\$ 83.00	\$ 107.90	\$ 125.00
5.000	150556001420	Plumbing demo, fixtures, w/10' pipe, water closet, wall mounted	1 Plum	7	1.143	Ea.	\$ -	\$ 120.00	\$ -	\$ 120.00	\$ -	\$ 120.00	\$ 156.00	\$ 180.00
2.000	150556001520	Plumbing dml, fixtures w/10' pipe, urinal, wall mounted	1 Plum	7	1.143	Ea.	\$ -	\$ 48.00	\$ -	\$ 48.00	\$ -	\$ 48.00	\$ 62.40	\$ 72.00
1.000	150556001600	Plumbing dml, fixtures w/10' pipe, water fountains, free stand	1 Plum	8	1	Ea.	\$ -	\$ 21.00	\$ -	\$ 21.00	\$ -	\$ 21.00	\$ 27.30	\$ -
825.000	150556002000	Plumbing dml, piping, metal, to 2" dia	1 Plum	200	0.04	L.F.	\$ -	\$ 684.75	\$ -	\$ 684.75	\$ -	\$ 684.75	\$ 890.18	\$ 1,039.50
1.000	150556002250	Plumbing demo, water heater, 40 gal	1 Plum	6	1.333	Ea.	\$ -	\$ 28.00	\$ -	\$ 28.00	\$ -	\$ 28.00	\$ 36.40	\$ -
Totals							\$14,519.00	\$ 5,642.30	\$ -	\$20,161.30	\$ 1,963.80	\$ 22,125.10	\$ 28,762.63	\$ 19,092.75

Building K6-1446D, 75%

Fiscal Year 2002 NASA-Wide Standardized Deferred Maintenance Parametric Estimate Report

CostWorks 2000 - Plumbing														
Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Total Incl. O&P	Zip Code Prefix	Type	Release
1.000	114101505800	Food service eqpt, ice cube maker, 50 pounds per day	Q1	6	2.667	Ea.	\$ 1,500.00	\$ 65.00	\$ -	\$ 1,565.00	\$ 1,750.00	327	Union	2000
4.000	108201003100	Bathroom accessories, mir with stainless steel, 3/4" sq FR, 36" x 24"	1 Carp	15	0.533	Ea.	\$ 432.00	\$ 48.80	\$ -	\$ 480.80	\$ 552.00	327	Union	2000
5.000	108201005000	Bathroom accessories, soap disp, chrome, rec stainless steel, liq	1 Carp	10	0.8	Ea.	\$ 332.50	\$ 91.50	\$ -	\$ 424.00	\$ 515.00	327	Union	2000
3.000	108201006050	Bathroom accessories, toilet seat cov disp, SS, surface mtd	1 Carp	15	0.533	Ea.	\$ 79.50	\$ 36.60	\$ -	\$ 116.10	\$ 144.00	327	Union	2000
3.000	108201006100	Bathroom accessories, toilet tissue disp, surf mounted,sst,single roll	1 Carp	30	0.267	Ea.	\$ 31.80	\$ 18.30	\$ -	\$ 50.10	\$ 64.50	327	Union	2000
2.000	108201008000	Bathroom accessories, waste recpts, stainless steel, with top, 13 gal	1 Carp	10	0.8	Ea.	\$ 376.00	\$ 36.60	\$ -	\$ 412.60	\$ 472.00	327	Union	2000
1.000	154185003000	Showers, stall, w/door & trim, fbgis, one PC, w/ 3 wall, 32" x 32" sq	Q1	2.4	6.667	Ea.	\$ 290.00	\$ 125.00	\$ -	\$ 415.00	\$ 510.00	327	Union	2000
1.000	154185004200	Showers, stall, rough-in, supply, waste and vent for above showers	Q1	2.05	7.805	Ea.	\$ 53.50	\$ 146.00	\$ -	\$ 199.50	\$ 281.00	327	Union	2000
3.000	154184504180	Lavatory, w/trim, wall hung, porc enam on CI, 20" x 18", single bowl	Q1	8	2	Ea.	\$ 600.00	\$ 112.50	\$ -	\$ 712.50	\$ 831.00	327	Union	2000
3.000	154184506960	Lavatories,w/ hung,hosp type,rgh-in,sply,w&vent for abv lavatories	Q1	1.66	9.639	Ea.	\$ 480.00	\$ 540.00	\$ -	\$ 1,020.00	\$ 1,350.00	327	Union	2000
3.000	108201006700	Bathroom accessories, towel dispenser, sst, surf mounted	1 Carp	16	0.5	Ea.	\$ 108.00	\$ 34.35	\$ -	\$ 142.35	\$ 172.50	327	Union	2000
2.000	101551002600	Partitions,toilet,cubs,tir mtd,hdrail braced,plstc lam on part bd	2 Carp	6	2.667	Ea.	\$1,050.00	\$ 122.00	\$ -	\$ 1,172.00	\$ 1,340.00	327	Union	2000
3.000	154189003100	Water clo, bowl only, w/flush valve, seat, wall hung	Q1	5.8	2.759	Ea.	\$1,005.00	\$ 154.50	\$ -	\$ 1,159.50	\$ 1,335.00	327	Union	2000
3.000	154189003200	Water clos, bowl only, seat, for rgh-in, sply, W & vent, sgl WC	Q1	2.56	6.25	Ea.	\$ 783.00	\$ 351.00	\$ -	\$ 1,134.00	\$ 1,395.00	327	Union	2000
1.000	154122008400	Drinking founts, tir mtd, pedestal type, SS, architectural style	1 Plum	2	4	Ea.	\$1,100.00	\$ 83.50	\$ -	\$ 1,183.50	\$ 1,325.00	327	Union	2000
1.000	154122008900	Drinking founts, tir mtd, pedestal type, for rgh-in, sply and W, add	1 Plum	1.83	4.372	Ea.	\$ 32.00	\$ 91.00	\$ -	\$ 123.00	\$ 174.00	327	Union	2000
75.000	151074202180	Pipe cu solder jts, type L tubing, cplgs & hgrs 10' o.c., 3/4" dia	1 Plum	76	0.105	L.F.	\$ 112.50	\$ 164.25	\$ -	\$ 276.75	\$ 372.75	327	Union	2000
75.000	151074202140	Pipe cu solder jts, type L tubing, cplgs & hgrs 10' O.C., 1/2" dia.	1 Plum	81	0.099	L.F.	\$ 85.50	\$ 153.75	\$ -	\$ 239.25	\$ 327.00	327	Union	2000
200.000	151074202200	Pipe cu solder joints, type L tubing, cplgs & hgrs 10' o.c., 1" dia	1 Plum	68	0.118	L.F.	\$ 406.00	\$ 490.00	\$ -	\$ 896.00	\$ 1,180.00	327	Union	2000
75.000	151085201910	Pipe, plastic, PVC, cpigs 10' O.C., hgrs 3 per 10', sched 40, 2" dia.	Q1	59	0.271	L.F.	\$ 212.25	\$ 378.75	\$ -	\$ 591.00	\$ 810.00	327	Union	2000
Totals							\$9,069.55	\$ 3,243.40	\$ -	\$12,312.95	\$14,900.75			

Building K6-2196, Construction costs.

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CostWorks 2000 - Plumbing															
Qty	CSI Number	Description	Crew	Daily Output	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demolition Labor	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Code Prefix
1.000	114101505800	Food service eqpt, ice cube maker, 50 pounds per day	Q1	6	2.667	Ea.	\$ 1,500.00	\$ 65.00	\$ -	\$ 1,565.00	\$ 65.00	\$ 1,630.00	\$ 2,119.00	\$ 1,750.00	327
4.000	108201003100	Bathroom accessories, mir with stainless steel, 3/4" sq FR, 36" x 24"	1 Carp	15	0.533	Ea.	\$ 432.00	\$ 48.80	\$ -	\$ 480.80	\$ 48.80	\$ 529.60	\$ 688.48	\$ 552.00	327
5.000	108201005000	Bathroom accessories, soap disp, chrome, rec stainless steel, liq	1 Carp	10	0.8	Ea.	\$ 332.50	\$ 91.50	\$ -	\$ 424.00	\$ 91.50	\$ 515.50	\$ 670.15	\$ 515.00	327
3.000	108201006050	Bathroom accessories, toilet seat cov disp, SS, surface mtd	1 Carp	15	0.533	Ea.	\$ 79.50	\$ 36.60	\$ -	\$ 116.10	\$ 36.60	\$ 152.70	\$ 198.51	\$ 144.00	327
3.000	108201006100	Bathroom accessories, toilet tissue disp, surf mounted, sst, single roll	1 Carp	30	0.267	Ea.	\$ 31.80	\$ 18.30	\$ -	\$ 50.10	\$ 18.30	\$ 68.40	\$ 88.92	\$ 64.50	327
2.000	108201008000	Bathroom accessories, waste recpts, stainless steel, with top, 13 gal	1 Carp	10	0.8	Ea.	\$ 376.00	\$ 36.60	\$ -	\$ 412.60	\$ 36.60	\$ 449.20	\$ 583.96	\$ 472.00	327
1.000	154185003000	Showers, stall, w/door & trim, fbgl, one PC, w/ 3 wall, 32" x 32" sq	Q1	2.4	6.667	Ea.	\$ 290.00	\$ 125.00	\$ -	\$ 415.00	\$ 125.00	\$ 540.00	\$ 702.00	\$ 510.00	327
3.000	154184504180	Lavatory, w/trim, wall hung, porc enam on CI, 20" x 18", single bowl	Q1	8	2	Ea.	\$ 600.00	\$ 112.50	\$ -	\$ 712.50	\$ -	\$ 712.50	\$ 926.25	\$ 831.00	327
3.000	108201006700	Bathroom accessories, towel dispenser, sst, surf mounted	1 Carp	16	0.5	Ea.	\$ 108.00	\$ 34.35	\$ -	\$ 142.35	\$ 34.35	\$ 176.70	\$ 229.71	\$ 172.50	327
2.000	101551002600	Partitions, toilet, cubs, fir mtd, hndrail braced, plstc lam on part bd	2 Carp	6	2.667	Ea.	\$ 1,050.00	\$ 122.00	\$ -	\$ 1,172.00	\$ 122.00	\$ 1,294.00	\$ 1,682.20	\$ 1,340.00	327
3.000	154189003100	Water clo, bowl only, w/flush valve, seat, wall hung	Q1	5.8	2.759	Ea.	\$ 1,005.00	\$ 154.50	\$ -	\$ 1,159.50	\$ -	\$ 1,159.50	\$ 1,507.35	\$ 1,335.00	327
1.000	154122008400	Drinking founts, fir mtd, pedestal type, SS, architectural style	1 Plum	2	4	Ea.	\$ 1,100.00	\$ 83.50	\$ -	\$ 1,183.50	\$ 83.50	\$ 1,267.00	\$ 1,647.10	\$ 1,325.00	327
75.000	151074202180	Pipe cu solder jts, type L tubing, cplgs & hgrs 10' o.c., 3/4" dia	1 Plum	76	0.105	L.F.	\$ 112.50	\$ 164.25	\$ -	\$ 276.75	\$ -	\$ 276.75	\$ 359.78	\$ 372.75	327
75.000	151074202140	Pipe cu solder jts, type L tubing, cplgs & hgrs 10' O.C., 1/2" dia.	1 Plum	81	0.099	L.F.	\$ 85.50	\$ 153.75	\$ -	\$ 239.25	\$ -	\$ 239.25	\$ 311.03	\$ 327.00	327
200.000	151074202200	Pipe cu solder joints, type L tubing, cplgs & hgrs 10' o.c., 1" dia	1 Plum	68	0.118	L.F.	\$ 406.00	\$ 490.00	\$ -	\$ 896.00	\$ -	\$ 896.00	\$ 1,164.80	\$ 1,180.00	327
75.000	151085201910	Pipe, plastic, PVC, cplgs 10' O.C., hgrs 3 per 10', sched 40, 2" dia.	Q1	59	0.271	L.F.	\$ 212.25	\$ 378.75	\$ -	\$ 591.00	\$ 378.75	\$ 969.75	\$ 1,260.68	\$ 810.00	327
3.000	150556001200	Plumbing dmi, fixtures w/10' pipe, lavatory, wall hung	1 Plum	10	0.8	Ea.	\$ -	\$ 49.80	\$ -	\$ 49.80	\$ -	\$ 49.80	\$ 64.74	\$ 75.00	327
3.000	150556001420	Plumbing demo, fixtures, w/10' pipe, water closet, wall mounted	1 Plum	7	1.143	Ea.	\$ -	\$ 72.00	\$ -	\$ 72.00	\$ -	\$ 72.00	\$ 93.60	\$ 108.00	327
350.000	150556002000	Plumbing dml, piping, metal, to 2" dia	1 Plum	200	0.04	L.F.	\$ -	\$ 290.50	\$ -	\$ 290.50	\$ -	\$ 290.50	\$ 377.65	\$ 441.00	327
Totals							\$ 7,721.05	\$ 2,527.70	\$ -	\$ 10,248.75	\$ 1,040.40	\$ 11,289.15	\$ 14,675.90	\$ 12,324.75	

Building K6-2196, Replacement costs.

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Cost Works 2000 -																
Qty	CSI Number	Description	Crew	Daily	Labor Hours	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	Demoliti	Total w/ Demolition	Total O&P With Demo	Total Incl. O&P	Zip Co	Type
1.000	114101505800	Food service eqpt, ice cube maker, 50 pounds per day	Q1	6	2.667	Ea.	\$ 1,500.00	\$ 65.00	\$ -	\$ 1,565.00	\$ 65.00	\$1,630.00	\$ 2,119.00	\$ 1,750.00	327	Union
3.000	108201003100	Bathroom accessories, mir with stainless steel, 3/4" sq FR, 36" x 24"	1 Carp	15	0.533	Ea.	\$ 324.00	\$ 36.60	\$ -	\$ 360.60	\$ 36.60	\$ 397.20	\$ 516.36	\$ 414.00	327	Union
4.000	108201005000	Bathroom accessories, soap disp, chrome, rec stainless steel, liq	1 Carp	10	0.8	Ea.	\$ 266.00	\$ 73.20	\$ -	\$ 339.20	\$ 73.20	\$ 412.40	\$ 536.12	\$ 412.00	327	Union
2.000	108201006050	Bathroom accessories, toilet seat cov disp, SS, surface mtd	1 Carp	15	0.533	Ea.	\$ 53.00	\$ 24.40	\$ -	\$ 77.40	\$ 24.40	\$ 101.80	\$ 132.34	\$ 96.00	327	Union
2.000	108201006100	Bathroom accessories, toilet tissue disp, surf mounted, sst, single roll	1 Carp	30	0.267	Ea.	\$ 21.20	\$ 12.20	\$ -	\$ 33.40	\$ 12.20	\$ 45.60	\$ 59.28	\$ 43.00	327	Union
2.000	108201008000	Bathroom accessories, waste recpts, stainless steel, with top, 13 gal	1 Carp	10	0.8	Ea.	\$ 376.00	\$ 36.60	\$ -	\$ 412.60	\$ 36.60	\$ 449.20	\$ 583.96	\$ 472.00	327	Union
1.000	154185003000	Showers, stall, w/door & trim, fbjls, one PC, w/ 3 wall, 32" x 32" sq	Q1	2.4	6.667	Ea.	\$ 290.00	\$ 125.00	\$ -	\$ 415.00	\$125.00	\$ 540.00	\$ 702.00	\$ 510.00	327	Union
2.000	154184504180	Lavatory, w/trim, wall hung, porc enam on CI, 20" x 18", single bowl	Q1	8	2	Ea.	\$ 400.00	\$ 75.00	\$ -	\$ 475.00	\$ -	\$ 475.00	\$ 617.50	\$ 554.00	327	Union
2.000	108201006700	Bathroom accessories, towel dispenser, sst, surf mounted	1 Carp	16	0.5	Ea.	\$ 72.00	\$ 22.90	\$ -	\$ 94.90	\$ 22.90	\$ 117.80	\$ 153.14	\$ 115.00	327	Union
2.000	101551002600	Partitions, toilet, cubs, fir mtd, hd rail braced, plstc lam on part bd	2 Carp	6	2.667	Ea.	\$ 1,050.00	\$ 122.00	\$ -	\$ 1,172.00	\$122.00	\$1,294.00	\$ 1,682.20	\$ 1,340.00	327	Union
2.000	154189003100	Water clo, bowl only, w/flush valve, seat, Drinking founts, fir mtd, pedestal type, SS, architectural style	Q1	5.8	2.759	Ea.	\$ 670.00	\$ 103.00	\$ -	\$ 773.00	\$ -	\$ 773.00	\$ 1,004.90	\$ 890.00	327	Union
1.000	154122008400	Pipe cu solder jts, type L tubing, cplgs & hgrs 10' o.c., 3/4" dia	Plum	2	4	Ea.	\$ 1,100.00	\$ 83.50	\$ -	\$ 1,183.50	\$ 83.50	\$1,267.00	\$ 1,647.10	\$ 1,325.00	327	Union
56.000	151074202180	Pipe cu solder jts, type L tubing, cplgs & hgrs 10' O.C., 1/2" dia.	Plum	76	0.105	L.F.	\$ 84.00	\$ 122.64	\$ -	\$ 206.64	\$ -	\$ 206.64	\$ 268.63	\$ 278.32	327	Union
56.000	151074202140	Pipe cu solder joints, type L tubing, cplgs & hgrs 10' o.c., 1" dia	Plum	81	0.099	L.F.	\$ 63.84	\$ 114.80	\$ -	\$ 178.64	\$ -	\$ 178.64	\$ 232.23	\$ 244.16	327	Union
150.000	151074202200	Pipe, plastic, PVC, cplgs 10' O.C., hgrs 3 per 10', sched 40, 2" dia.	Plum	68	0.118	L.F.	\$ 304.50	\$ 367.50	\$ -	\$ 672.00	\$ -	\$ 672.00	\$ 873.60	\$ 885.00	327	Union
56.000	151085201910	Plumbing dml, fixtures w/10' pipe, lavatory, wall hung	Q1	59	0.271	L.F.	\$ 158.48	\$ 282.80	\$ -	\$ 441.28	\$282.80	\$ 724.08	\$ 941.30	\$ 604.80	327	Union
2.000	150556001200	Plumbing demo, fixtures, w/10' pipe, water closet, wall mounted	Plum	10	0.8	Ea.	\$ -	\$ 33.20	\$ -	\$ 33.20	\$ -	\$ 33.20	\$ 43.16	\$ 50.00	327	Union
2.000	150556001420	Plumbing dml, piping, metal, to 2" dia	Plum	7	1.143	Ea.	\$ -	\$ 48.00	\$ -	\$ 48.00	\$ -	\$ 48.00	\$ 62.40	\$ 72.00	327	Union
262.000	150556002000	Plumbing dml, piping, metal, to 2" dia	Plum	200	0.04	L.F.	\$ -	\$ 217.46	\$ -	\$ 217.46	\$ -	\$ 217.46	\$ 282.70	\$ 330.12	327	Union
Totals							\$ 6,733.02	\$ 1,965.80	\$ -	\$ 8,698.82	\$884.20	\$9,583.02	\$12,457.93	\$ 10,385.40		

Building K6-2196, 75% Replacement costs.

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APPENDIX C. REMOTE AND LOW VALUE SITES NOT VISITED BUT ASSESSED

CTR	SITE	Fac No.	Desc	Status	Book Cost	Excl Year	% Excl	CY02 CRV	Capacity	UOM	Size (SF)	Yr Built
GSFC	AMERICAN SAMOA BRT	723	BRT FACILITY	Active	11,400			17,126	1	EA	0	1983
GSFC	ASCENSION BRT	999	BRT FACILITY	Active	3,800			6,092	1	EA		1982
GSFC	BEAR LAKE MOBLAS	702	MOBILE LASER SITE	Abandoned	90,082	1996	-100%	150,512	1	EA		1978
GSFC	BERMUDA MOBLAS	001	MOBILE LASER BUILDING	Abandoned	28,200	1996	-100%	60,331	235	SF	235	1978
GSFC	BERMUDA MOBLAS	996	UTILITIES	Abandoned	15,900	1996	-100%	39,961	0	LF		1976
GSFC	BERMUDA MOBLAS	997	COMMUNICATIONS	Abandoned	15,000	1996	-100%	37,699	1	EA		1976
GSFC	BERMUDA MOBLAS	998	SITE PREPARATION	Abandoned	8,000	1996	-100%	20,106	0	SF	0	1976
GSFC	BERMUDA MOBLAS	999	ACCESS ROAD	Abandoned	5,000	1996	-100%	12,566	0	SY		1976
GSFC	BERMUDA STDN	003	OPERATIONS BUILDING	Abandoned	435,446	2001	-100%	2,200,596	10,536	SF	10,536	1966
GSFC	BERMUDA STDN	005	HYDRO-MECHANICAL BUILDING	Abandoned	18,000	2001	-100%	99,177	3,600	SF	3,600	1966
GSFC	BERMUDA STDN	007	MICROWAVE BUILDING	Abandoned	5,536	2001	-100%	31,621	161	SF	161	1965
GSFC	BERMUDA STDN	008	T & C BUILDING	Abandoned	771,717	2001	-100%	4,054,399	13,520	SF	13,520	1960
GSFC	BERMUDA STDN	009	WORKSHOP BLDG (OLD POWER HOUSE)	Abandoned	18,089	2001	-100%	97,022	2,856	SF	2,856	1960
GSFC	BERMUDA STDN	013	FP06 RADAR BUILDING COMPLEX	Abandoned	648,751	2001	-100%	2,831,820	9,692	SF	9,692	1966
GSFC	BERMUDA STDN	014	COLLIMATION EQUIPMENT TOWER	Abandoned	8,000	2001	-100%	42,383	154	SF	154	1967
GSFC	BERMUDA STDN	888	SUPPORT EQUIPMENT MAINTENANCE BLDG	Abandoned	537,770	2001	-100%	642,364	13,000	SF	13,000	1993
GSFC	BERMUDA STDN	993	TV SURVEILLANCE SYSTEM	Abandoned	2,275	2001	-100%	3,885	1	EA		1981
GSFC	BERMUDA STDN	994	FIRE PROTECTION SYSTEM	Abandoned	367,595	2001	-100%	1,008,038	1	EA		1975
GSFC	BERMUDA STDN	995	ENGINEERING SERVICES FACILITIES	Abandoned	123,217	2001	-100%	789,422	0	SF	0	1960
GSFC	BERMUDA STDN	996	UTILITIES	Abandoned	1,473,047	2001	-100%	6,797,443	0	LF		1965
GSFC	BERMUDA STDN	997	COMMUNICATIONS	Abandoned	202,819	2001	-100%	860,728	1	EA		1965
GSFC	BERMUDA STDN	998	GROUND IMPROVEMENTS	Abandoned	94,103	2001	-100%	538,908	0	SF	0	1965
GSFC	BERMUDA STDN	999	ROADS & STREETS	Abandoned	54,463	2001	-100%	329,245	0	SY		1965
GSFC	CABO SAN LUCAS VLBI	715	VLBI LASER STATION	Abandoned	0	1996	-100%	3,357	1	EA	0	1984
GSFC	CERRO TOLOLO VLBI	721	CERRO TOLOLO VLBI SITE	Abandoned	7,570	1996	-100%	11,217	1	EA		1984
GSFC	EASTER ISLAND MOBLAS	997	MOBILE LASER SITE - OTHER	Active	94,116			149,727	1	EA		1982
GSFC	EASTER ISLAND MOBLAS	998	UTILITIES	Active	10,272			15,152	0	LF		1985
GSFC	EASTER ISLAND MOBLAS	999	COMMUNICATIONS	Active	1,045			1,541	1	EA		1985
GSFC	ENSENADA VLBI	716	LASER STATION	Abandoned	0	1996	-100%	2,638	1	EA	0	1984
GSFC	FT. DAVIS MOBLAS	716	LASER STATION	Abandoned	0	1996	-100%	2,638	1	EA	0	1984
GSFC	HAWAII KAUAI MOBLAS	703	MOBILE LASER SITE	Active	27,200			46,454	1	EA		1981
GSFC	HAWAII MAUI MOBLAS	710	MOBILE LASER SITE	Active	20,800			33,345	1	EA		1982
GSFC	HAYSTACK MOBLAS	705	MOBILE LASER SITE	Active	44,209			81,571	1	EA		1980
GSFC	IQUIQUE VLBI	720	LASER STATION	Abandoned	0	2001	-100%	6,436	1	EA	0	1984
GSFC	KWAJALEIN MOBLAS	704	MOBILE LASER SITE	Abandoned	56,594	1996	-100%	96,655	1	EA		1981
GSFC	MAZATLAN VLBI	1	BUNK/GUARDHOUSE	Abandoned	7,141	1996	-100%	10,581	220	SF	220	1984
GSFC	MAZATLAN VLBI	998	GROUND IMPROVEMENTS	Abandoned	0	1996	-100%	8,324	0	SF	0	1984
GSFC	MAZATLAN VLBI	999	LASER STATION	Abandoned	0	1996	-100%	42,088	1	EA	0	1984
GSFC	MONUMENT PEAK MOBLAS	712	MOBILE LASER SITE	Active	106,100			170,092	1	EA		1982
GSFC	OAK MOUNTAIN MOBLAS	714	MOBILE LASER SITE	Abandoned	73,800	1996	-100%	118,311	1	EA		1982
GSFC	OTAY MOUNTAIN MOBLAS	700	MOBILE LASER SITE	Abandoned	76,830	1996	-100%	200,383	1	EA		1972
GSFC	OWENS VALLEY MOBLAS	709	MOBILE LASER SITE	Abandoned	42,100	1996	-100%	67,492	1	EA		1982
GSFC	PLATTEVILLE MOBLAS	711	MOBILE LASER SITE	Abandoned	76,000	1996	-100%	121,837	1	EA		1982
GSFC	POINT ARGUELLO VLBI	718	9-METER VLBI SITE	Abandoned	0	1996	-100%	29,494	1	EA	0	1984
GSFC	QUINCY MOBLAS	701	MOBILE LASER SITE	Active	203,269			346,767	1	EA		1979

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CTR	SITE	Fac No.	Desc	Status	Book Cost	Excl Year	% Excl	CY02 CRV	Capacity	UOM	Size (SF)	Yr Built
GSFC	SANTIAGO VLBI	719	LASER STATION	Active	7,220			10,698	1	EA		1984
GSFC	SOCORRO ISLAND VLBI	717	LASER STATION	Abandoned	0	1996	-100%	1,439	1	EA	0	1984
GSFC	TAHITI MOBLAS	713	MOBILE LASER SITE	Abandoned	0	1996	-100%	20,192	1	EA	0	1982
GSFC	YARRAGADEE MOBLAS	706	MOBILE LASER SITE	Active	245,000			452,055	1	EA		1980
GSFC	YARRAGADEE STS	724	STS FACILITY	Abandoned	10,000	1996	-100%	17,079	1	EA		1981
JSC	BROOKS	950	REMOTE LUNAR SAMPLE STORAGE FACILITY	In-Grant	0			0	0	SF	0	1997
KSC	TALS (MOROCCO & GAMBIA)	TAL-001	MOROCCO ADMIN/SUPPORT BLDG	Active	990,556			1,312,938	8,235	SF	8,235	1990
KSC	TALS (MOROCCO & GAMBIA)	TAL-002	MOROCCO/UTILITIES (WATER)	Active	79,600			105,506	0	LF		1990
KSC	TALS (MOROCCO & GAMBIA)	TAL-003	MOROCCO/UTILITIES (ELECTRIC)	Active	253,069			335,432	0	LF		1990
KSC	TALS (MOROCCO & GAMBIA)	TAL-004	GAMBIA/ADMIN BUILDING	Active	1,254,069			1,592,620	3,200	SF	3,200	1989
KSC	TALS (MOROCCO & GAMBIA)	TAL-005	GAMBIA/UTILITIES (CONCRETE)	Active	4,880,140			5,667,162	0	LF		1989
KSC	TALS (MOROCCO & GAMBIA)	TAL-006	GAMBIA/UTILITIES (ELECTRIC)	Active	335,276			433,773	0	LF		1989
KSC	TALS (MOROCCO & GAMBIA)	TAL-007	GAMBIA/UTILITIES (FENCE)	Active	98,786			126,899	0	LF		1989
KSC	TALS (MOROCCO & GAMBIA)	TAL-008	GAMBIA/UTILITIES (WATER)	Active	119,958			162,283	0	LF		1989
KSC	TALS (MOROCCO & GAMBIA)	TAL-009	GAMBIA/UTILITIES (FIRE ALARM SYS)	Active	5,000			5,977	0	GM		1993
KSC	TALS (MOROCCO & GAMBIA)	TAL-010	GAMBIA/UTILITIES (SECURITY LTNG)	Active	42,000			50,208	0	LF		1993
							Total	32,531,805				
							% of Total CRV	0.17				

APPENDIX D. MULTIPLE DATA ANALYSES

In addition to the variance analysis that was completed, additional qualitative and quantitative analysis of the total DM results was completed. The first of these was repeatability analysis to determine if teams evaluating the same facility would arrive at the same scores (page F-1). The second was another statistics based multi-variant analysis to test the repeatability of the assessing process (page F-26). The third was a chart analysis that produced color-coded graphics of each Center’s results and analyzing them to identify anomalies or inconsistencies. These analyses drove the requirement for reassessments at MSFC, JPL and DFRC. These graphical analyses also identified the need to address the issue of categorizing facilities with a zero (F-47).

Analysis 1: Repeatability Analysis

A repeatability analysis was performed at KSC. As mentioned earlier at KSC, 1,022 facilities were evaluated. A second independent team reevaluated 164 facilities. A third independent team reevaluated 42 of these 164 facilities. These reevaluations provided three independent evaluations of 42 facilities. The statistical sample of 42 facilities included a mix of facility types.

A comparison of the original team evaluations against the second team evaluations for 164 facilities shows the cumulative average ratings exhibited insignificant variation:

Cumulative 1st look: 2.687
Cumulative 2nd look: 2.699
Cumulative difference: 0.012

A comparison of all three teams evaluations of the 42-facility population also shows the cumulative ratings exhibit insignificant variation, with the largest variation between the second and third.

Cumulative 1st look: 2.561
Cumulative 2nd look: 2.553
Cumulative 3rd look: 2.637

The net impact of these differences would produce at most a \$1 million difference in DM estimate, which is statistically not significant given the magnitude of this study.

Individual ratings for NASA facilities reinspected by teams follow:

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Summary Page

Second Look Summary

System	Average 1st look	Average 2nd look	Average Difference
Structural	3.926	4.091	-0.165
Exterior	3.314	3.182	0.132
Roof	3.231	3.24	-0.008
HVAC	2.413	2.521	-0.107
Electrical	3.463	3.57	-0.107
Plumbing	2.289	2.248	0.041
Conveyances	0.744	0.884	-0.14
Interior Finish	3.215	3.033	0.182
Facility Equip	1.587	1.521	0.066
OVERALL	2.687	2.699	-0.012

Third Look Summary

System	Average 1st look	Average 2nd look	Average 3rd look	Average Difference
Structural	3.854	3.976	4.024	-0.1463
Exterior	3.146	3.098	3.317	-0.061
Roof	2.927	3.098	3.146	-0.1951
HVAC	2.171	2.171	2.293	-0.061
Electrical	3.268	3.39	3.341	-0.0976
Plumbing	2.61	2.463	2.561	0.0976
Conveyances	0.878	0.732	0.78	0.122
Interior Finish	2.634	2.634	2.78	-0.0732
Facility Equip	1.561	1.415	1.488	0.1098
OVERALL	2.561	2.553	2.637	-0.034

"Zero vs a Number" Effects Summary

System	Occurrences	Cumulative 1st look	Cumulative 2nd look	Cumulative 3rd look	Net DM \$\$ Effect
Structural	0				0
Exterior	3	\$170,863	\$0	\$0	\$170,863
Roof	8	\$442,566	\$17,965	\$774	\$423,827
HVAC	18	\$78,031	\$44,191	\$0	\$33,840
Electrical	2	\$226,454	\$2,688	\$0	\$223,766
Plumbing	15	\$17,140	\$10,531	\$1,290	\$5,319
Conveyances	9	\$18,658	\$12,393	\$36,862	-\$8,423
Interior Finish	9	\$3,616	\$155	\$1,133	\$2,329
Facility Equip	21	\$163,745	\$83,882	\$35,552	\$83,734
OVERALL	85	\$1,121,074	\$171,806	\$75,611	\$935,254

"Zero vs a Number" Effects Summary minus K6-0546 and K6-1141

System	Cumulative 1st look	Cumulative 2nd look	Cumulative 3rd look	Net DM \$\$ Effect
Structural				0
Exterior	\$5,658	\$0	\$0	\$5,658
Roof	\$2,021	\$17,965	\$774	-\$16,718
HVAC	\$78,031	\$44,191	\$0	\$33,840
Electrical	\$0	\$2,688	\$0	-\$2,688
Plumbing	\$17,140	\$10,531	\$1,290	\$5,319
Conveyances	\$18,658	\$12,393	\$36,862	-\$8,423
Interior Finish	\$3,616	\$155	\$1,133	\$2,329
Facility Equip	\$163,745	\$83,882	\$35,552	\$83,734
OVERALL	\$288,871	\$171,806	\$75,611	\$103,051

K6-0546 and K6-1141 Analysis

System	K6-0546				K6-1141			
	Model %	1st rating	2nd rating	Recommended Model % (20 - Launch Pad)	Model %	1st rating	2nd rating	Recommended Model % (16 - Substation)
Structural	75%	4	5	28%	10%	4	5	35%
Exterior	0%	3	4	14%	5%	3	0	10%
Roof	0%	4	0	6%	2%	2	0	4%
HVAC	0%	3	0	13%	0%	4	0	10%
Electrical	25%	4	0	25%	83%	2	4	33%
Plumbing	0%	3	0	4%	0%	4	0	1%
Conveyances	0%	0	0	2%	0%	0	0	2%
Interior Finish	0%	4	0	8%	0%	2	0	5%
Facility Equip	0%	4	0	0%	0%	4	4	0%

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Quality Control Sample Team #1

Facility #	2002 CRV	BUILT	STRUC	EXT	ROOF	HVAC	ELEC	PLUMB	CONV	INTF	EQUIP
K6-1446D	945,333	1990	5	3	4	2	5	4	5	4	4
K6-1696	15,670,740	1996	5	4	4	4	4	5	4	4	2
K6-1747	TBD		4	4	4	3	4	4	4	4	4
K6-1844A	80,698	1993	3	3	4	0	0	0	0	4	0
K6-1847	417,810	1988	4	4	4	0	4	4	4	4	4
K6-1847A	400,597	1988	5	4	1	4	4	3	0	5	0
K6-1847C	309,358	1990	4	4	4	0	4	4	0	4	0
K6-1847E	167,480	1991	5	5	5	0	3	0	0	0	0
K6-1996	998,852	1967	4	2	2	5	4	2	5	4	4
K6-1996D	80,248	1966	4	2	2	5	5	2	0	3	0
K6-1996F	22,142	1986	4	0	3	0	3	0	0	0	0
K6-1996H	257,242	1992	5	3	5	5	5	3	0	4	0
K6-2197	6,542	1988	4	0	4	0	4	0	0	0	0
K7-0164	154,319	1997	4	4	2	0	4	0	0	4	0
K7-0165	250,642	1984	4	4	3	2	3	3	0	3	0
K7-0188A	298,722	1969	5	4	4	4	3	3	0	3	3
K7-0188B	257,803	1995	4	4	4	4	4	3	0	4	0
K7-0255	650,350	1965	5	4	4	0	3	0	5	4	0
K7-0314	197,147	1967	4	4	4	0	4	3	0	4	0
K7-0356	580,194	1965	4	4	4	0	3	0	4	4	0
K7-0413	38,102	1970	4	4	4	0	0	0	0	3	0
K7-0416B	591,124	1968	3	3	3	3	3	3	0	3	0
K7-0417	246,789	1967	4	3	4	4	4	4	0	3	0
K7-0422	83,705	1965	4	3	3	3	4	0	0	3	0
K7-0464B	47,139		4	4	4	0	3	3	0	4	0
K7-0468	23,223,334	1965	4	3	4	3	2	3	0	3	3
K7-0506	1,309,827	1965	5	3	4	5	4	3	5	4	5
K7-0569	1,785,937	1967	4	3	3	4	4	4	5	3	3
K7-0569B	16,584	1986	4	0	2	0	4	0	0	0	0
K7-0619	30,174	1983	4	3	2	0	4	0	0	0	0
K7-0853	6,490,008	1965	5	4	5	0	5	5	0	5	5
K7-0901	243,276	1985	4	4	4	4	4	0	0	4	0
K7-1005	16,268,837	1965	4	0	0	0	4	0	0	0	4
K7-1205A	31,823	1967	4	4	4	4	4	0	0	4	0
K7-1207	627,802	1996	5	4	5	4	5	5	0	5	5
K7-1557	2,525,605	1965	5	5	4	4	5	4	0	4	0
K8-0741	41,116	1989	3	0	0	0	4	0	0	0	0
K8-237	250,088	2000	3	3	3	3	4	3	0	3	0
L6-0147	4700542	1986	5	4	4	4	4	4	0	4	4
L7-0940	155,042	1985	4	3	4	4	3	3	0	3	4
L7-0989	5,574	1987	4	3	3	3	3	0	0	3	0
L7-1557	3,463,510	1965	4	3	3	4	4	4	0	4	0
M3-0002	482,313	1965	4	3	2	4	4	5	0	3	0
M3-0003	24,342,974	1964	3	3	3	4	4	0	0	4	2
M5-0791	430,679	1966	5	4	4	3	3	0	0	4	3
M5-1495	137,925	1982	5	3	4	4	5	5	0	5	0
M5-1544	670,279	1966	5	4	5	3	3	0	0	2	0
M6-0039	708,015	1986	3	3	3	3	4	3	0	3	0

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Facility #	2002 CRV	BUILT	STRUC	EXT	ROOF	HVAC	ELEC	PLUMB	CONV	INTF	EQUIP
M6-0138	9,204,831	1964	4	3	3	4	4	2	0	3	4
M6-0232	815,783	1964	4	0	0	0	0	0	0	0	0
1039	20,747	1963	4	4	4	0	3	0	0	3	0
1385	6,077,972	1958	4	3	2	2	2	2	0	2	0
1728	8,831,218	1958	4	4	4	4	4	4	0	4	4
15730	7,991,016	1959	4	3	3	4	4	3	4	3	0
54906	51,612	1987	4	3	3	0	3	3	0	4	4
54928	484,899	1958	4	3	4	0	3	0	0	4	0
60640	95,453	1985	4	3	4	4	3	4	0	4	0
66250	14,043,284	1963	4	3	3	3	3	3	4	4	4
66320	594,096	1987	4	3	4	4	4	4	0	4	4
1207E	55,865	1955	4	3	4	0	4	0	0	4	0
E4-2414	5,473,726	1965	3	3	3	5	4	0	0	3	3
H2-1198	15,480,588	1963	2	2	3	5	4	0	0	4	3
H5-2176	198,381	1996	5	4	5	5	4	0	0	4	5
J5-0677	199,657	1976	4	3	0	0	4	0	0	0	4
J5-1299	81,363	1985	3	2	2	0	3	0	0	2	0
J5-1598	24,612	1984	4	2	4	4	4	0	0	3	0
J6-0393	249,310	1966	4	0	0	0	5	0	0	0	0
J6-0553	389,658	1964	4	2	3	4	4	3	0	2	0
J6-2313	2,186,330	1976	4	5	4	4	3	4	0	4	0
J6-2327	423,149	2000	5	4	5	5	4	0	0	0	0
K6-0261	198,380	1996	5	4	5	5	4	0	0	4	5
K6-0496	75,920	1985	3	3	3	3	3	0	0	2	3
K6-0546	18,116,344	1966	5	4	0	0	0	0	0	0	0
K6-0696	28,378,623	1987	4	4	3	3	4	4	4	4	4
K6-0792	1,965,320	1966	5	3	3	3	4	3	0	4	3
K6-0793	194,780	1970	3	2	2	4	3	3	0	3	0
K6-0844	717,463	1995	5	4	4	5	5	5	5	4	5
K6-0848	509,289,373	1964	3	3	3	3	2	2	3	2	2
K6-0893	688,296	1997	5	4	4	5	5	5	5	4	5
K6-0946	418,128	1998	5	4	4	0	4	4	0	0	0
K6-0947	28,559,464	1966	4	4	3	3	3	3	3	2	4
K6-0947B	4,541,549		4	4	2	0	4	2	0	0	3
K6-0994	534,996	1966	4	3	4	0	4	4	0	0	0
K6-0995	755,151	1966	4	4	4	0	4	4	0	0	0
K6-0996	393,432	1966	4	2	3	0	3	3	0	3	0
K6-1091	7,227,693	1979	4	4	4	4	4	4	0	4	4
K6-1141	22,027,240	1964	5	0	0	0	4	0	0	0	4
K6-1193	8,138,035	1965	5	4	3	4	4	4	0	2	5
K6-1200A	439,358	1984	4	3	3	0	2	0	0	2	0
K6-1200B	386,313	1984	4	3	4	4	2	4	0	2	0
K6-1200C	484,235	1984	4	4	4	4	3	4	0	3	0
K6-1200D	479,427	1984	4	4	4	0	2	4	0	2	0
K6-1200G	426,947	1984	4	3	3	4	4	4	0	4	0
K6-1200I	447,568	1982	4	3	3	3	4	0	0	3	0
K6-1247	8,438,098	1965	4	3	3	3	4	4	4	3	4
K6-1298	707,785	1985	4	4	4	3	4	4	0	4	0
K6-1397	196,496	1984	5	2	4	3	3	0	0	4	5

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Facility #	2002 CRV	BUILT	STRUC	EXT	ROOF	HVAC	ELEC	PLUMB	CONV	INTF	EQUIP
K6-1446	540,214	1969	3	3	2	4	4	4	4	3	4
K6-1446A	152,923	1986	4	4	4	3	4	3	0	3	0
K6-1446D	945,333	1990	5	3	4	2	5	4	5	4	4
K6-1696	15,670,740	1996	5	4	4	4	4	5	4	4	2
K6-1747	TBD		4	4	4	3	4	4	4	4	4
K6-1844A	80,698	1993	3	3	4	0	0	0	0	4	0
K6-1847	417,810	1988	4	4	4	0	4	4	4	4	4
K6-1847A	400,597	1988	5	4	1	4	4	3	0	5	0
K6-1847C	309,358	1990	4	4	4	0	4	4	0	4	0
K6-1847E	167,480	1991	5	5	5	0	3	0	0	0	0
K6-1996	998,852	1967	4	2	2	5	4	2	5	4	4
K6-1996D	80,248	1966	4	2	2	5	5	2	0	3	0
K6-1996F	22,142	1986	4	0	3	0	3	0	0	0	0
K6-1996H	257,242	1992	5	3	5	5	5	3	0	4	0
M6-0342	45,263,621	1965	4	4	2	3	3	4	3	4	5
M6-0342B	16,584	1986	4	0	2	0	4	0	0	0	0
M6-0399	62,700,535	1965	4	3	3	2	2	2	4	3	4
M6-0409I	7,433,763	1985	4	4	3	4	4	4	0	4	0
M6-0495	5,703,410	1964	4	4	4	3	5	3	0	4	0
M6-0504	492,639		4	4	4	4	4	4	0	4	0
M6-0506	9,596	1968	3	2	4	0	0	0	0	3	0
M6-0539	152,632	1990	4	4	4	0	4	0	0	4	0
M6-0589	693,758	1965	4	4	4	3	2	3	0	3	0
M6-0595	11,086,969	1964	5	4	4	4	4	2	4	3	4
M6-0595D	533,273	1985	4	4	4	0	4	4	0	4	0
M6-0689	645,072	1966	4	3	3	3	3	0	0	3	3
M6-0698	3,136,856	1965	3	3	4	3	4	4	0	3	0
M6-0744A	5,922	1986	4	0	2	0	3	0	0	0	0
M6-0785	488,468	1994	4	4	4	4	4	3	0	4	0
M6-0794	4,281,688	1965	4	4	3	4	4	3	0	4	0
M6-0794A	34,799	1995	5	4	4	5	4	4	0	4	0
M6-0798	152,455	1991	4	0	0	0	0	0	0	0	0
M6-0891	99,866	1967	4	3	4	0	0	0	0	3	0
M6-0894A	166,344	1966	4	3	3	0	4	4	0	3	0
M6-0895	297,244	1964	4	3	3	2	3	3	0	3	0
M6-0895A	687,220	1964	4	3	3	3	4	4	0	3	4
M6-0896	971,111	1964	4	4	3	4	4	4	0	3	0
M6-1624	152,172	1997	4	4	4	0	4	0	0	3	0
M6-1627	399,189	1995	4	3	4	2	4	0	0	3	4
M6-1628	243,530	1970	3	3	4	4	4	0	0	4	4
M7-0335	65,470	1964	4	3	3	0	4	0	0	3	0
M7-0407	9,746,866	1994	4	4	3	4	4	4	0	4	4
M7-0409	16,276,349	1966	4	4	2	2	3	3	5	3	0
M7-0505A	3,253,292	1976	3	3	3	4	3	3	0	3	2
M7-0554	140,005	1965	4	3	4	0	4	3	0	4	0
M7-0581	791,533	1986	4	3	2	3	4	4	4	3	0
M7-0656	139,926	1992	5	4	4	0	4	4	0	4	0
M7-0776A	50,421	1989	4	4	4	4	4	4	4	4	4
M7-0776B	137,746	1989	4	4	3	4	4	4	4	4	4

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Facility #	2002 CRV	BUILT	STRUC	EXT	ROOF	HVAC	ELEC	PLUMB	CONV	INTF	EQUIP
M7-0777	9,001,190	1993	4	4	4	4	4	4	4	4	4
M7-0867	1,099,063	1964	3	2	3	3	3	3	2	1	3
M7-0961	14,239,205	1964	4	3	2	3	2	3	4	3	4
M7-1061	6,491,457	1964	4	3	3	3	3	4	0	4	0
M7-1104	7,600,793	1995	5	4	4	4	5	4	5	4	4
M7-1104A	238,758		5	0	4	0	3	4	0	0	0
M7-1354	14,136,862	1986	5	4	4	3	4	4	5	4	4
M7-1354C	927,735	1996	4	4	4	0	5	0	0	4	3
M7-1355	\$505,871	1987	5	3	3	0	5	0	0	4	0
M7-1357	2,537,131	1987	5	3	3	5	3	5	0	4	4
M7-1362	3,600,765	1986	4	4	4	4	4	3	0	4	4
M7-1362A	309,604	1964	4	4	0	0	4	4	0	4	0
M7-1410A	419,792	1966	4	3	2	0	2	0	0	3	4
M7-1412A	497,902	1964	4	4	4	0	3	0	0	3	4
M7-1460	22,376	1966	4	0	0	0	2	0	0	0	0
M7-1469	32,164,186	1965	4	4	4	4	3	4	4	3	4
M7-1472	1,314,678	1964	4	4	3	4	4	0	4	3	0
M7-1509	302,254	1967	4	4	3	3	4	3	0	3	0
M7-1522	512,981	1994	4	4	4	4	4	4	0	4	0
N6-1007	1,182,120	1964	3	3	3	0	4	4	0	3	0
N6-1009	624,378	1964	5	4	4	4	5	4	0	3	0
N6-1118	946,804	1964	4	4	2	4	3	3	0	2	4
P6-1435	65,458	1966	4	4	4	4	4	4	0	4	0
TR1-487	39,329	1982	4	3	3	3	4	4	0	3	0
TR1-745	29,096	1990	3	3	2	4	3	3	0	3	0
TR1-757	5,807	1984	2	2	2	3	3	2	0	2	0
TRM-003	83,770	1981	3	2	1	2	3	3	0	2	0
TRM-052	35,613	1992	3	3	3	3	3	0	0	3	0

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Facility #	2001 CRV	BUILT	STRUC	EXT	ROOF	HVAC	ELEC	PLUMB	CONV	INTF	EQUIP
1039	20,747	1963	4	4	4	0	4	0	0	4	0
54928	484,899	1958	4	3	4	0	3	3	3	3	0
J5-1598	24,612	1984	4	1	4	4	3	0	0	4	4
K6-0848	509,289,373	1964	4	3	2	2	2	3	3	3	4
K6-0946	418,128	1998	4	4	4	0	0	0	0	0	0
K6-0994	534,996	1966	5	3	0	0	4	4	0	0	0
K6-0995	755,151	1966	3	3	0	0	4	3	0	3	0
K6-1091	7,227,693	1979	4	4	4	4	4	4	0	4	5
K6-1193	8,138,035	1965	4	4	3	4	4	4	0	4	4
K6-1200C	484,235	1984	5	4	4	3	4	4	0	4	0
K6-1397	196,496	1984	4	2	3	3	4	0	0	3	0
K6-1446	540,214	1969	3	3	3	3	3	3	4	3	0
K6-1847	417,810	1988	5	4	5	5	5	4	0	5	5
K6-1996D	80,248	1966	3	2	3	4	4	4	0	3	0
K7-0356	580,194	1965	4	4	4	0	4	0	0	3	0
K7-0413	38,102	1970	4	4	4	0	0	0	0	0	0
K7-0422	83,705	1965	4	3	4	3	4	0	0	3	0
K7-0468	23,223,334	1965	4	4	4	4	2	4	0	3	4
K7-0853	6,490,008	1965	4	3	3	0	3	4	0	4	3
K7-1557	2,525,605	1965	4	3	3	5	3	4	0	3	0
K8-0741	41,116	1989	4	4	0	0	4	0	0	0	0
K8-237	250,088	2000	3	3	3	3	3	3	0	3	0
L7-1557	3,463,510	1965	4	4	2	4	4	3	0	3	0
M6-0232	815,783	1964	5	4	0	0	0	0	0	0	0
M6-0595	11,086,969	1964	4	4	3	4	4	4	3	3	4
M6-0689	645,072	1966	4	3	4	4	4	4	0	4	4
M6-0785	488,468	1994	5	4	5	4	5	3	0	4	0
M6-0798	152,455	1991	3	0	0	0	0	0	0	0	0
M6-0895A	687,220	1964	5	4	5	0	5	5	0	5	5
M6-0896	971,111	1964	5	3	3	4	4	4	0	4	0
M7-0335	65,470	1964	4	4	4	0	4	0	0	3	0
M7-0409	16,276,349	1966	4	3	2	2	4	3	5	3	0
M7-0867	1,099,063	1964	3	2	3	3	3	3	2	2	3
M7-1104A	238,758	1995	4	4	4	0	4	4	0	0	4
M7-1362	3,600,765	1986	4	4	4	4	4	4	4	4	4
M7-1362A	309,604	1964	4	4	4	0	3	3	0	0	0
M7-1469	32,164,186	1965	4	3	4	4	4	3	4	3	4
M7-1509	302,254	1967	5	4	4	4	4	4	0	4	4
N6-1007	1,182,120	1964	5	4	4	4	3	3	0	4	3
N6-1118	946,804	1964	4	4	4	4	4	4	0	4	0
TR1-757	5,807	1984	3	2	2	3	3	3	0	3	0

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Facility #	2001 CRV	STRUC			EXT			ROOF			HVAC			ELEC			PLUMB			CONV			INTF			EQUIP			OVERALL												
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	% Dev						
1039	20,747	4	4	4	0	3	4	4	-1	4	4	4	0	0	0	0	3	3	4	-0.5	0	0	0	0	4	3	4	0.5	0	0	0	0	2.00	2.00	2.22	-0.11					
1385	6,077,972	4	4	4	0	3	3	3	0	2	4	4	0	2	2	0	3	2	4	1	3	2	1	0	0	0	0	3	2	4	1	0	0	0	0	2.22	1.89	0.33			
1728	8,831,218	3	4		-1	3	4		-1	4	4		0	4	4	0	4	4		0	4	4	0	4	0	4	4	0	4	4	0	4	4	0	3.78	3.56	0.22				
15730	7,991,016	3	4		-1	3	3		0	3	3		0	4	4	0	4	4		0	3	3	0	4	4	0	4	3	1	4	0	4	4	4	3.56	3.11	0.44				
54906	51,612	4	4		0	4	3		1	3	3		0	0	0	0	4	3		1	4	3	1	0	0	0	0	4	4	0	4	4	0	3.00	2.67	0.33					
54928	484,899	4	4	4	0	3	3	3	0	3	4	4	-1	0	0	0	4	3	3	1	0	0	0	3	-1.5	0	0	3	-1.5	3	4	3	-0.5	4	0	0	4	2.33	2.00	2.56	0.06
60640	95,453	4	4	0	0	2	3	3	-1	4	4	0	4	4	0	4	3	3	1	4	4	0	0	0	0	0	4	4	0	0	0	0	0	0	0	2.89	2.89	0.00			
66250	14,043,284	4	4	0	0	3	3	3	0	2	3	-1	3	3	0	3	3	0	2	3	-1	4	4	0	3	4	-1	4	4	0	4	4	0	3.11	3.44	-0.33					
66320	594,096	5	4	1	4	3	3	3	1	4	4	0	4	4	0	5	4	1	4	4	0	4	0	0	4	4	0	4	4	0	4	4	0	4.22	3.44	0.78					
1207E	55,865	4	4	0	4	3	3	3	1	3	4	-1	0	0	0	2	4	-2	0	0	0	0	0	0	0	0	3	4	-1	0	0	0	1.78	2.11	-0.33						
E4-2414	5,473,726	4	3	1	3	3	3	3	0	4	3	1	4	5	-1	4	4	0	0	0	0	4	0	0	4	4	3	1	4	3	1	3.44	2.67	0.78							
H2-1198	15,480,588	3	2	1	3	2	2	2	1	3	3	0	3	5	-2	3	4	4	-1	0	0	0	0	3	0	0	3	2	4	-2	2	3	-1	2.44	2.56	-0.11					
H5-2176	198,381	5	5	0	4	4	4	4	0	4	5	-1	4	5	-1	5	4	1	0	0	0	0	0	0	0	4	4	0	5	5	0	3.44	3.56	-0.11							
J5-0677	199,657	4	4	0	0	3	3	3	0	4	0	4	3	0	3	3	4	-1	0	0	0	0	0	0	0	4	0	4	4	4	4	0	2.78	1.67	1.11						
J5-1299	81,363	4	3	1	3	2	2	2	1	3	2	1	0	0	0	3	3	0	0	0	0	0	0	0	4	0	4	4	3	2	1	0	0	0	2.22	1.33	0.89				
J5-1598	24,612	4	4	4	0	3	2	1	1.5	3	4	4	-1	4	4	4	0	3	4	3	-0.5	0	0	0	0	0	0	0	3	3	4	-0.5	4	0	4	2	2.67	2.33	2.67	0.17	
J6-0393	249,310	5	4	1	3	0	0	3	4	4	0	4	0	4	4	4	4	5	-1	4	0	0	0	0	0	4	0	0	4	4	0	4	0	4	3.56	1.00	2.56				
J6-0553	389,658	4	4	0	0	3	2	1	4	4	3	1	4	4	0	2	4	-2	3	3	0	0	0	0	0	3	2	1	4	0	4	0	4	3.00	2.44	0.56					
J6-2313	2,186,330	5	4	1	4	5	5	5	-1	4	4	0	4	4	0	4	3	1	4	4	0	0	0	0	0	4	4	0	3	0	3	3	3.56	3.11	0.44						
J6-2327	423,149	5	5	0	4	4	4	4	0	4	5	-1	4	5	-1	4	4	0	5	0	5	5	0	5	5	4	0	4	0	0	0	0	3.89	2.56	1.33						
K6-0261	198,380	5	5	0	4	4	4	4	0	4	5	-1	4	5	-1	5	4	1	0	0	0	0	0	0	0	4	4	0	5	5	0	3.44	3.56	-0.11							
K6-0496	75,920	4	3	1	4	3	3	3	1	4	3	1	5	3	2	3	3	0	0	0	0	0	0	0	0	3	2	1	0	3	-3	2.56	2.22	0.33							
K6-0546	18,116,344	4	5	-1	3	4	4	4	-1	4	0	4	3	0	3	4	0	4	3	0	4	3	0	3	0	0	4	0	4	4	0	4	3.22	1.00	2.22						
K6-0696	28,378,623	4	4	0	3	4	4	4	-1	3	3	0	3	3	0	3	4	-1	3	4	-1	3	4	-1	4	4	0	4	4	0	4	4	0	3.44	3.78	-0.33					
K6-0792	1,965,320	5	5	0	5	3	3	3	2	0	3	-3	5	3	2	5	4	1	5	3	2	0	0	0	0	4	4	0	5	3	2	3.78	3.11	0.67							
K6-0793	194,780	4	3	1	2	2	2	2	0	3	2	1	3	4	-1	3	3	0	3	3	0	3	3	0	0	0	2	3	-1	0	0	0	2.22	2.22	0.00						
K6-0844	717,463	4	5	-1	3	3	3	3	-1	4	4	0	4	5	-1	4	5	-1	4	5	-1	4	5	-1	0	5	5	-5	4	4	0	4	5	-1	3.44	4.67	-1.22				
K6-0848	509,289,373	4	3	4	0.5	3	3	3	0	3	3	2	0.5	3	3	2	0.5	3	2	2	1	3	2	3	0.5	3	3	3	0	3	2	3	0.5	3	2	4	0	3.11	2.56	0.56	
K6-0893	688,296	4	5	-1	4	4	4	4	0	4	4	0	4	5	-1	4	5	-1	4	5	-1	4	5	-1	0	5	-5	4	4	0	4	5	-1	3.56	4.67	-1.11					
K6-0946	418,128	5	5	4	0.5	4	4	4	0	3	4	4	-1	0	0	0	0	4	4	0	2	4	4	0	2	0	0	0	0	0	0	0	0	0	0	0	2.22	2.33	1.33	0.39	
K6-0947	28,559,464	5	4	1	4	4	4	4	0	3	3	0	5	3	2	4	3	1	4	3	1	4	3	1	0	3	-3	4	2	2	5	4	1	3.78	3.22	0.56					
K6-0947B	4,541,549	4	4	0	3	4	4	4	-1	4	2	2	0	0	0	0	4	4	0	3	2	1	0	0	0	0	3	0	0	3	3	0	2.67	2.11	0.56						
K6-0994	534,996	4	4	5	-0.5	4	3	3	1	0	4	0	-2	0	0	0	0	5	4	4	1	5	4	4	1	0	0	0	0	4	0	0	4	0	0	2.44	2.11	1.78	0.50		
K6-0995	755,151	4	4	3	0.5	4	4	3	0.5	0	4	0	-2	0	0	0	0	5	4	4	1	5	4	3	1.5	0	0	0	0	0	0	0	0	2.00	2.22	1.78	0.00				
K6-0996	393,432	5	4	1	3	2	2	2	1	3	3	0	0	0	0	4	3	1	5	3	2	0	0	0	0	3	3	0	0	0	0	0	0	2.56	2.00	0.56					
K6-1091	7,227,693	2	4	4	-2	4	4	4	0	4	4	4	0	4	4	4	0	4	4	4	0	4	4	4	0	4	4	4	0	5	4	5	0.5	3.89	3.56	3.67	0.28				
K6-1141	22,027,240	4	5	-1	3	0	0	3	3	2	0	2	4	0	4	0	4	3	4	-1	4	0	0	0	0	2	0	0	4	4	0	4	4	0	2.89	1.44	1.44				
K6-1193	8,138,035	4	5	4	-0.5	4	4	4	0	2	3	3	-1	4	4	4	0	5	4	4	1	3	4	4	-1	0	0	0	0	3	2	4	0	4	5	4	-0.5	3.22	3.44	3.44	-0.22
K6-1200A	439,358	2	4	-2	2	3	3	3	-1	2	3	-1	2	0	2	2	2	0	2	2	0	2	2	0	2	0	0	0	1	2	-1	0	0	0	1.44	1.56	-0.11				
K6-1200B	386,313	2	4	-2	2	3	3	3	-1	2	4	-2	2	4	-2	2	2	0	2	4	-2	2	2	0	2	4	-2	0	0	0	1	2	-1	0	0	0	1.44	2.56	-1.11		
K6-1200C	484,235	3	4	5	-1.5	3	4	4	-1	3	4	4	-1	3	4	3	-0.5	3	3	4	-0.5	3	4	4	-1	0	0	0	0	2	3	4	-1.5	0	0	0	2.22	2.89	3.11	-0.78	
K6-1200D	479,427	2	4	-2	2	4	4	4	-2	2	4	-2	2	0	2	2	0	2	2	0	2	4	-2	0	0	0	0	1	2	-1	0	0	0	1.44	2.22	-0.78					
K6-1200G	426,947	4	4	0	4	3	3	3	1	3	3	0	3	4	-1	4	4	0	3	4	0	3	4	-1	0	0	0	4	4	0	0	0	0	2.78	2.89	-0.11					
K6-1200I	447,568	2	4	-2	1	3	3	3	-2	2	3	-1	1	3	-2	2	4	-2	2	0	2	2	0	2	0	0	0	2	3	-1	0	0	0	1.33	2.22	-0.89					
K6-1247	8,438,098	4	4	0	4	3	3	3	1	4	3	1	4	3	1	3	4	-1	3	4	-1	4	4	-1	4	4	0	4	3	1	4	4	0	3.78	3.56	0.22					

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Facility #	2001 CRV	STRUC	EXT	ROOF	HVAC	ELEC	PLUMB	CONV	INTF	EQUIP	OVERALL																						
K6-1298	707,785	5	4	1	4	4	0	4	4	0	2	3	-1	4	4	0	0	0	0	4	4	0	0	0	0	0	0	0	3.00	3.00	0.00		
K6-1397	196,496	4	5	4	-0.5	2	2	2	0	3	4	3	-1	3	3	4	-0.5	4	0	0	0	2	4	3	-1.5	4	5	0	1.5	2.67	2.89	2.11	0.17
K6-1446	540,214	5	3	3	2	3	3	3	0	2	2	3	-0.5	3	4	3	-0.5	3	4	3	0	3	3	3	0	4	4	0	2	3.33	3.44	2.78	0.22
K6-1446A	152,923	5	4	1	4	4	0	4	4	0	0	3	-3	4	4	0	0	3	-3	0	0	0	0	4	3	1	0	0	0	2.33	2.78		-0.44
K6-1446D	945,333	5	5	0	3	3	0	2	4	-2	2	4	-2	4	5	-1	4	4	0	5	5	0	3	4	-1	5	4	1	3.67	4.00		-0.33	
K6-1696	15,670,740	4	5	-1	3	4	-1	2	4	-2	3	4	-1	2	4	-2	3	5	-2	3	4	-1	3	4	-1	4	2	2	3.00	4.00		-1.00	
K6-1747	TBD	4	4	0	3	4	-1	1	4	-3	0	3	-3	4	4	0	0	4	-4	0	4	-4	0	4	-4	0	4	-4	1.33	3.89		-2.56	
K6-1844A	80,698	5	3	2	4	3	1	4	4	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	2.33	1.56		0.78	
K6-1847	417,810	5	4	5	0.5	4	4	4	0	4	4	5	-0.5	4	0	5	1.5	3	4	5	-1.5	4	4	4	0	4	4	0	4.00	3.56	4.22	0.11	
K6-1847A	400,597	4	5	-1	3	4	-1	2	1	1	2	4	-2	4	4	0	4	3	1	0	0	0	2	5	-3	0	0	0	2.33	2.89		-0.56	
K6-1847C	309,358	3	4	-1	4	4	0	4	4	0	0	0	0	4	4	0	0	4	-4	0	0	0	4	4	0	0	0	0	2.11	2.67		-0.56	
K6-1847E	167,480	2	5	-3	4	5	-1	4	5	-1	0	0	0	4	3	1	0	0	0	0	0	0	4	0	4	0	0	0	2.00	2.00		0.00	
K6-1996	998,852	4	4	0	3	2	1	2	2	0	0	3	5	-2	2	4	-2	3	2	1	3	5	-2	3	4	-1	4	4	0	3.00	3.56		-0.56
K6-1996D	80,248	4	4	3	0.5	2	2	2	0	3	2	3	0.5	4	5	4	-0.5	3	5	4	-1.5	3	2	4	0	3	0	0	3	3.33	2.56	2.56	0.78
K6-1996F	22,142	5	4	1	4	0	4	4	3	1	0	0	0	3	3	0	0	0	0	0	0	0	4	0	4	0	0	0	2.22	1.11		1.11	
K6-1996H	257,242	5	5	0	4	3	1	4	5	-1	4	5	-1	4	5	-1	4	3	1	0	0	0	4	4	0	0	0	0	3.22	3.33		-0.11	
K6-2197	6,542	3	4	-1	3	0	3	3	4	-1	0	0	0	4	4	0	3	0	3	0	0	0	3	0	3	0	0	0	2.11	1.33		0.78	
K7-0164	154,319	3	4	-1	3	4	-1	2	2	0	0	0	0	4	4	0	0	0	0	0	0	0	4	4	0	0	0	0	1.78	2.00		-0.22	
K7-0165	250,642	4	4	0	3	4	-1	2	3	-1	0	2	-2	4	3	1	3	3	0	0	0	0	3	3	0	0	0	0	2.11	2.44		-0.33	
K7-0188A	298,722	4	5	-1	4	4	0	4	4	0	0	4	-4	0	3	-3	0	3	-3	0	0	0	3	3	0	0	3	-3	1.67	3.22		-1.56	
K7-0188B	257,803	4	4	0	3	4	-1	4	4	0	0	4	-4	3	4	-1	2	3	-1	0	0	0	4	4	0	0	0	0	2.22	3.00		-0.78	
K7-0255	650,350	4	5	-1	3	4	-1	2	4	-2	0	0	0	4	3	1	0	0	0	4	5	-1	4	4	0	0	0	0	2.33	2.78		-0.44	
K7-0314	197,147	4	4	0	4	4	0	0	4	0	0	0	0	4	4	0	0	3	0	0	0	0	4	4	0	4	0	0	3.00	2.56		0.44	
K7-0356	580,194	4	4	4	0	3	4	4	-1	3	4	4	-1	0	0	0	0	4	3	4	0.5	0	0	0	2	4	4	3	0.5	2.44	2.56	2.11	0.11
K7-0413	38,102	4	4	4	0	3	4	4	-1	4	4	4	0	0	0	0	0	0	0	0	0	0	3	3	0	1.5	0	0	0	1.56	1.67	1.33	0.06
K7-0416B	591,124	4	3	1	2	3	-1	4	3	1	4	3	1	4	3	1	4	3	1	0	0	0	3	3	0	0	0	0	2.78	2.33		0.44	
K7-0417	246,789	4	4	0	3	3	0	4	4	0	3	4	-1	3	4	-1	3	4	-1	0	0	0	3	3	0	0	0	0	2.56	2.89		-0.33	
K7-0422	83,705	4	4	4	0	3	3	3	0	4	3	4	0.5	3	3	3	0	2	4	4	-2	0	0	0	0	0	0	0	2.22	2.22	2.33	-0.06	
K7-0464B	47,139	4	4	0	4	4	0	4	4	0	0	0	0	0	3	0	0	3	0	0	0	0	4	4	0	0	0	0	2.44	2.44		0.00	
K7-0468	23,223,334	4	4	4	0	4	3	4	0.5	4	4	4	0	4	3	4	0.5	2	2	2	0	3	3	4	-0.5	0	0	0	3.22	2.78	3.22	0.22	
K7-0506	1,309,827	3	5	-2	3	3	0	4	4	0	4	5	-1	4	4	0	3	3	0	4	5	-1	3	4	-1	0	5	-5	3.11	4.22		-1.11	
K7-0569	1,785,937	4	4	0	2	3	-1	2	3	-1	4	4	0	3	4	-1	3	4	-1	0	5	-5	3	3	0	0	3	-3	2.33	3.67		-1.33	
K7-0569B	16,584	4	4	0	4	0	4	2	2	0	0	0	0	4	4	0	4	0	4	0	0	0	0	0	0	0	0	0	2.00	1.11		0.89	
K7-0619	30,174	4	4	0	3	3	0	3	2	1	0	0	0	4	4	0	0	0	0	0	0	0	3	0	3	0	0	0	1.89	1.44		0.44	
K7-0853	6,490,008	4	5	4	-0.5	4	4	3	0.5	4	5	3	0	0	0	0	3	5	3	-1	0	5	4	-4.5	0	0	0	0	2.56	3.78	2.67	-0.67	
K7-0901	243,276	4	4	0	4	4	0	4	4	0	4	4	0	3	4	-1	0	0	0	0	0	0	3	4	-1	0	0	0	2.44	2.67		-0.22	
K7-1005	16,268,837	3	4	-1	3	0	3	0	0	0	0	0	0	3	4	-1	0	0	0	0	0	0	0	0	0	0	3	4	-1	1.33	1.33		0.00
K7-1205A	31,823	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	0	0	0	0	0	0	3	4	-1	0	0	0	2.56	2.67		-0.11	
K7-1207	627,802	4	5	-1	2	4	-2	2	5	-3	4	4	0	4	4	0	4	5	-1	3	5	-2	0	0	0	0	5	-5	2.44	4.22		-1.78	
K7-1557	2,525,605	3	5	4	-1.5	3	5	3	-1	1	4	3	-2.5	4	4	5	-0.5	3	5	3	-1	4	4	4	0	0	0	0	2.33	3.44	2.78	-0.78	
K8-0741	41,116	3	3	4	-0.5	0	0	4	-2	0	0	0	0	0	0	0	0	4	4	4	0	0	0	0	0	0	0	0	0.78	0.78	1.33	-0.28	
K8-237	250,088	3	3	3	0	3	3	3	0	3	3	3	0	3	3	3	0	3	4	3	-0.5	4	3	3	1	0	0	0	2.56	2.44	2.33	0.17	
L6-0147	4,700,542	5	5	0	4	4	0	5	4	1	3	4	-1	4	4	0	4	4	0	0	0	0	5	4	1	4	4	0	3.78	3.67		0.11	
L7-0940	155,042	4	4	0	4	3	1	4	4	0	3	4	-1	3	3	0	4	3	0	4	0	0	3	3	0	0	4	-4	2.78	3.11		-0.33	
L7-0989	5,574	4	4	0	4	3	1	4	3	1	3	3	0	3	3	0	0	0	0	0	0	0	4	3	1	0	0	0	2.44	2.11		0.33	
L7-1557	3,463,510	3	4	4	-1	3	3	4	-0.5	2	3	2	-0.5	4	4	4	0	3	4	4	-1	4	4	3	0.5	0	0	0	2.89	2.89	2.67	0.11	
M3-0002	482,313	4	4	0	2	3	-1	3	2	1	4	4	0	4	4	0	4	5	0	0	0	0	3	3	0	0	0	0	2.78	2.78		0.00	

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Facility #	2001 CRV	STRUC	EXT	ROOF	HVAC	ELEC	PLUMB	CONV	INTF	EQUIP	OVERALL
M3-0003	24,342,974	3 3 0	3 3 0	3 3 0	4 4 0	4 4 0	4 4 0	0 0 0	3 4 -1	3 2 1	2.56 2.56 0.00
M5-0791	430,679	4 5 -1	4 4 0	4 4 0	4 3 1	4 3 1	0 0 0	0 0 0	4 4 0	4 3 1	3.11 2.89 0.22
M5-1495	137,925	5 5 0	4 3 1	4 4 0	4 4 0	4 5 -1	4 5 -1	0 0 0	4 5 -1	0 0 0	3.22 3.44 -0.22
M5-1544	670,279	4 5 -1	4 4 0	4 5 -1	4 3 1	4 3 1	4 0 4	0 0 0	3 2 1	3 0 3	3.33 2.44 0.89
M6-0039	708,015	4 3 1	3 3 0	2 3 -1	4 3 1	4 4 0	4 3 1	0 0 0	3 3 0	0 0 0	2.67 2.44 0.22
M6-0138	9,204,831	4 4 0	4 3 1	3 3 0	4 4 0	5 4 1	3 2 1	0 0 0	3 3 0	5 4 1	3.44 3.00 0.44
M6-0232	815,783	4 4 5 -0.5	0 0 4 -2	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0.44 0.44 1.00 -0.28
M6-0342	45,263,621	4 4 0	3 4 -1	2 2 0	2 3 -1	2 0 0	2 4 -2	3 3 0	3 4 -1	4 5 -1	2.78 3.56 -0.78
M6-0342B	16,584	4 4 0	3 0 3	2 2 0	0 0 0	4 4 0	4 0 4	0 0 0	3 0 3	0 0 0	2.22 1.11 1.11
M6-0399	62,700,535	4 4 0	3 3 0	4 3 1	3 2 1	2 2 0	2 2 0	4 4 0	2 3 -1	3 4 -1	3.00 3.00 0.00
M6-0409I	7,433,763	4 4 0	4 4 0	2 3 -1	4 4 0	4 4 0	4 4 0	0 0 0	4 4 0	0 0 0	2.89 3.00 -0.11
M6-0495	5,703,410	4 4 0	4 4 0	4 4 0	2 3 -1	3 5 -2	3 3 0	0 0 0	5 4 1	4 0 4	3.22 3.00 0.22
M6-0504	492,639	4 4 0	4 4 0	3 4 -1	3 4 -1	4 4 0	4 0 4	0 4 -4	4 0 4	0 0 0	2.89 2.67 0.22
M6-0506	9,596	4 3 1	4 2 2	4 4 0	0 0 0	0 0 0	0 0 0	0 0 0	4 3 1	0 0 0	1.78 1.33 0.44
M6-0539	152,632	4 4 0	4 4 0	4 4 0	0 0 0	2 4 -2	0 0 0	0 0 0	4 4 0	0 0 0	2.00 2.22 -0.22
M6-0589	693,758	4 4 0	3 4 -1	4 4 0	4 3 1	2 2 0	4 3 1	0 0 0	3 3 0	0 0 0	2.67 2.56 0.11
M6-0595	11,086,969	4 5 4 -0.5	3 4 4 -1	3 4 3 -0.5	4 4 4 0	4 4 4 0	3 2 4 0	0 4 3 -3.5	4 3 3 1	4 4 4 0	3.22 3.78 3.67 -0.50
M6-0595D	533,273	4 4 0	4 4 0	3 4 -1	3 0 3	4 4 0	3 4 -1	0 0 0	3 4 -1	0 0 0	2.67 2.67 0.00
M6-0689	645,072	4 4 4 0	4 3 3 1	4 3 4 0.5	4 3 4 0.5	4 3 4 0.5	3 0 4 1	0 0 0 0	3 3 4 -0.5	0 3 4 -3.5	2.89 2.44 3.44 -0.06
M6-0698	3,136,856	4 3 1	3 3 0	4 4 0	3 3 0	4 4 0	3 4 -1	0 0 0	2 3 -1	0 0 0	2.56 2.67 -0.11
M6-0744A	5,922	4 4 0	4 0 4	2 2 0	0 0 0	4 3 1	0 0 0	0 0 0	0 0 0	0 0 0	1.56 1.00 0.56
M6-0785	488,468	4 4 5 -0.5	4 4 4 0	4 4 5 -0.5	4 4 4 0	4 4 5 -0.5	3 3 3 0	0 0 0 0	4 4 4 0	0 0 0 0	3.00 3.00 3.33 -0.17
M6-0794	4,281,688	4 4 0	3 4 -1	2 3 -1	4 4 0	4 4 0	3 3 0	0 0 0	3 4 -1	4 0 4	3.00 2.89 0.11
M6-0794A	34,799	4 5 -1	4 4 0	4 4 0	4 5 -1	4 4 0	3 4 -1	0 0 0	4 4 0	0 0 0	3.00 3.33 -0.33
M6-0798	152,455	4 4 3 0.5	4 0 0 4	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0.89 0.44 0.33 0.50
M6-0891	99,866	4 4 0	3 3 0	4 4 0	0 0 0	0 0 0	0 0 0	0 0 0	4 3 1	0 0 0	1.67 1.56 0.11
M6-0894A	166,344	4 4 0	3 3 0	2 3 -1	0 0 0	4 -4	3 4 -1	0 0 0	0 3 -3	0 0 0	1.33 2.33 -1.00
M6-0895	297,244	4 4 0	3 3 0	4 3 1	4 2 2	4 3 1	3 3 0	0 0 0	3 3 0	4 0 4	3.22 2.33 0.89
M6-0895A	687,220	4 4 5 -0.5	3 3 4 -0.5	4 3 5 0	0 3 0 -1.5	4 4 5 -0.5	4 4 5 -0.5	0 0 0 0	4 3 5 0	0 4 5 -4.5	2.56 3.11 3.78 -0.89
M6-0896	971,111	4 4 5 -0.5	3 4 3 -0.5	4 3 3 1	4 4 4 0	4 4 4 0	3 4 4 -1	0 0 0 0	3 3 4 -0.5	0 0 0 0	2.78 2.89 3.00 -0.17
M6-1624	152,172	4 4 0	4 4 0	4 4 0	0 0 0	4 4 0	0 0 0	0 0 0	3 3 0	0 0 0	2.11 2.11 0.00
M6-1627	399,189	4 4 0	3 3 0	4 4 0	4 2 2	4 4 0	0 0 0	0 0 0	3 3 0	4 4 0	2.89 2.67 0.22
M6-1628	243,530	4 3 1	4 3 1	4 4 0	4 4 0	4 4 0	0 0 0	0 0 0	3 4 -1	4 4 0	3.00 2.89 0.11
M7-0335	65,470	4 4 4 0	3 3 4 -0.5	4 3 4 0.5	0 0 0 0	3 4 4 -1	0 0 0 0	0 0 0 0	3 3 3 0	0 0 0 0	1.89 1.89 2.11 -0.11
M7-0407	9,746,866	5 4 1	4 4 0	3 3 0	4 4 0	5 4 1	5 4 1	0 0 0	4 4 0	4 4 0	3.78 3.44 0.33
M7-0409	16,276,349	4 4 4 0	3 4 3 -0.5	3 2 2 1	3 2 2 1	3 3 4 -0.5	4 3 3 1	4 5 5 -1	3 3 3 0	0 0 0 0	3.00 2.89 2.89 0.11
M7-0505A	3,253,292	4 3 1	3 3 0	4 3 1	4 4 0	4 3 1	0 3 -3	3 0 3	4 3 1	4 2 2	3.33 2.67 0.67
M7-0554	140,005	4 4 0	3 3 0	4 4 0	0 0 0	3 4 -1	3 3 0	0 0 0	3 4 -1	0 0 0	2.22 2.44 -0.22
M7-0581	791,533	4 4 0	2 3 -1	2 2 0	4 3 1	4 4 0	4 4 0	0 4 -4	3 3 0	0 0 0	2.56 3.00 -0.44
M7-0656	139,926	3 5 -2	4 4 0	4 4 0	3 0 3	4 4 0	4 4 0	0 0 0	4 4 0	0 0 0	2.89 2.78 0.11
M7-0776A	50,421	4 4 0	3 4 -1	3 4 -1	0 4 -4	4 4 0	4 4 -4	0 4 -4	4 4 0	0 4 -4	2.00 4.00 -2.00
M7-0776B	137,746	4 4 0	3 4 -1	3 3 0	0 4 -4	4 4 0	4 4 -4	0 4 -4	4 4 0	0 4 -4	2.00 3.89 -1.89
M7-0777	9,001,190	4 4 0	4 4 0	4 4 0	4 4 0	4 4 -1	4 4 0	4 4 0	4 4 0	4 4 0	3.89 4.00 -0.11
M7-0867	1,099,063	4 3 3 1	3 2 2 1	2 3 3 -1	3 3 3 0	4 3 3 1	4 3 3 1	2 2 2 0	2 1 2 0.5	0 3 3 -3	2.67 2.56 2.67 0.06
M7-0961	14,239,205	3 4 -1	3 3 0	2 2 0	2 3 -1	2 2 0	2 3 -1	3 4 -1	3 3 0	3 4 -1	2.56 3.11 -0.56
M7-1061	6,491,457	4 4 0	3 3 0	4 3 1	3 3 0	4 3 1	2 4 -2	0 0 0	3 4 -1	4 0 4	3.00 2.67 0.33
M7-1104	7,600,793	5 5 0	5 4 1	5 4 1	4 4 0	5 5 0	5 4 1	5 5 0	5 4 1	5 4 1	4.89 4.33 0.56

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Facility #	2001 CRV	STRUC	EXT	ROOF	HVAC	ELEC	PLUMB	CONV	INTF	EQUIP	OVERALL
M7-1104A	238,758	5 5 4 0.5	4 0 4 2	4 4 4 0	0 0 0 0	5 3 4 1.5	5 4 4 1	0 0 0 0	0 0 0 0	0 0 4 -2	2.56 1.78 2.67 0.33
M7-1354	14,136,862									0	3.56 4.11 -0.56
M7-1354C	927,735									-3	2.56 2.67 -0.11
M7-1355	505,871	4 5 -1	4 3 1	4 3 1	0 0 0	4 5 -1	0 0 0	0 0 0	4 4 0	0 0 0	2.22 2.22 0.00
M7-1357	2,537,131	4 5 -1	3 3 0	3 3 0	3 5 -2	3 3 0	4 5 -1	0 0 0	4 4 0	4 4 0	3.11 3.56 -0.44
M7-1362	3,600,765	4 4 4 0	4 4 4 0	4 4 4 0	3 4 4 -1	4 4 4 0	4 3 4 0.5	4 0 4 2	4 4 4 0	4 4 4 0	3.89 3.44 4.00 0.17
M7-1362A	309,604	4 4 4 0	4 4 4 0	4 0 4 2	0 0 0 0	4 4 3 0.5	4 4 3 0.5	0 0 0 0	0 4 0 -2	0 0 0 0	2.22 2.22 2.00 0.11
M7-1410A	419,792	4 4 0	4 3 1	4 2 2	0 0 0	4 2 2	0 0 0	0 0 0	3 3 0	2 4 0	2.33 2.00 0.33
M7-1412A	497,902	4 4 0	4 4 0	4 4 0	0 0 0	4 3 1	0 0 0	0 0 0	3 3 0	0 4 -4	2.11 2.44 -0.33
M7-1460	22,376	1 4 -3	0 0 0	0 0 0	0 0 0	1 2 -1	0 0 0	0 0 0	0 0 0	0 0 0	0.22 0.67 -0.44
M7-1469	32,164,186	4 4 4 0	3 4 3 -0.5	4 4 4 0	4 4 4 0	3 3 4 -0.5	3 4 3 -0.5	4 4 4 0	3 3 3 0	4 4 4 0	3.56 3.78 3.67 -0.17
M7-1472	1,314,678	4 4 0	4 4 0	4 3 1	4 4 0	4 4 0	4 0 4	5 4 1	4 3 1	4 0 4	4.11 2.89 1.22
M7-1509	302,254	4 4 5 -0.5	4 4 4 0	4 3 4 0.5	4 3 4 0.5	4 4 4 0	4 3 4 0.5	0 0 0 0	4 3 4 0.5	0 0 4 -2	3.11 2.67 3.67 -0.06
M7-1522	512,981	4 4 0	4 4 0	4 4 0	4 4 0	4 4 0	4 4 0	0 0 0	4 4 0	0 0 0	3.11 3.11 0.00
N6-1007	1,182,120	4 3 4 0.5	3 3 4 -0.5	4 3 4 0.5	0 0 3 -1.5	3 4 3 -0.5	3 4 0 1	0 0 4 -2	4 3 3 1	0 0 0 0	2.33 2.22 2.78 -0.17
N6-1009	624,378	4 5 -1	4 4 0	4 4 0	4 4 0	4 5 -1	4 4 0	0 0 0	3 3 0	0 0 0	3.00 3.22 -0.22
N6-1118	946,804	4 4 4 0	3 4 4 -1	3 2 4 0	4 4 4 0	4 3 4 0.5	3 3 4 -0.5	0 0 0 0	2 2 4 -1	0 4 0 -2	2.56 2.89 3.11 -0.44
P6-1435	65,458	4 4 0	3 4 4 -1	3 4 -1	4 4 0	4 4 0	4 4 0	4 4 0	4 4 0	0 0 0	2.89 3.11 -0.22
TR1-487	39,329	3 4 -1	1 3 -2	3 3 0	1 3 -2	3 4 -1	1 4 -3	0 0 0	1 3 -2	0 0 0	1.44 2.67 -1.22
TR1-745	29,096	3 3 0	3 3 0	3 2 1	3 4 -1	3 3 0	3 3 0	0 0 0	3 3 0	0 0 0	2.33 2.33 0.00
TR1-757	5,807	1 2 3 -1.5	2 2 2 0	3 2 2 1	3 3 3 0	2 3 3 -1	1 2 3 -1.5	0 0 0 0	1 2 3 -1.5	0 0 0 0	1.44 1.78 2.11 -0.50
TRM-003	83,770	4 3 1	3 2 1	3 1 2	4 2 2	4 3 1	4 3 1	0 0 0	3 2 1	0 0 0	2.78 1.78 1.00
TRM-052	35,613	2 3 -1	2 3 -1	2 3 -1	2 3 -1	2 3 -1	0 0 0	0 0 0	2 3 -1	0 0 0	1.33 2.00 -0.67

Comparison Master

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Facility #	2001 CRV	STRUC		EXT		ROOF		HVAC		ELEC		PLUMB		CONV		INTF		EQUIP		OVERALL					
		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	DEV			
1385	6,077,972	4	4	0	3	3	0	2	2	0	2	2	1	3	2	1	0	0	0	0	0	0	2.22	1.89	0.33
1728	8,831,218	3	4	-1	3	4	-1	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	3.78	3.56	0.22
15730	7,991,016	3	4	-1	3	3	0	4	4	0	4	4	0	3	3	0	4	4	0	4	3	1	3.56	3.11	0.44
54906	51,612	4	4	0	4	3	1	3	3	0	0	0	0	4	3	1	0	0	0	4	4	0	3.00	2.67	0.33
60640	95,453	4	4	0	2	3	-1	4	4	0	4	4	0	4	4	0	0	0	0	4	4	0	2.89	2.89	0.00
66250	14,043,284	4	4	0	3	3	0	2	3	-1	3	3	0	2	3	-1	4	4	0	3	4	-1	3.11	3.44	-0.33
66320	594,096	5	4	1	4	3	1	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4.22	3.44	0.78
1207E	55,865	4	4	0	4	3	1	3	4	-1	0	0	0	2	4	-2	0	0	0	3	4	-1	1.78	2.11	-0.33
E4-2414	5,473,726	4	3	1	3	3	0	4	3	1	4	5	-1	4	4	0	0	0	0	4	3	1	3.44	2.67	0.78
H2-1198	15,480,588	3	2	1	3	2	1	3	3	0	3	5	-2	3	4	-1	0	0	0	3	0	3	2.44	2.56	-0.11
H5-2176	198,381	5	5	0	4	4	0	4	5	-1	4	5	-1	5	4	1	0	0	0	4	4	0	3.44	3.56	-0.11
J5-0677	199,657	4	4	0	3	3	0	4	0	4	3	0	3	0	0	0	0	0	0	4	0	4	2.78	1.67	1.11
J5-1299	81,363	4	3	1	3	2	1	3	2	1	3	2	1	0	0	0	4	0	4	3	2	1	2.22	1.33	0.89
J6-0393	249,310	5	4	1	3	0	3	4	0	4	0	4	5	-1	4	0	0	0	4	0	4	4	3.56	1.00	2.56
J6-0553	389,658	4	4	0	3	2	1	4	4	0	4	4	0	2	4	-2	0	0	0	3	2	1	3.00	2.44	0.56
J6-2313	2,186,330	5	4	1	4	5	-1	4	4	0	4	4	0	4	3	1	4	4	0	4	4	0	3.56	3.11	0.44
J6-2327	423,149	5	5	0	4	4	0	4	5	-1	4	5	-1	4	4	0	5	0	5	4	0	4	3.89	2.56	1.33
K6-0261	198,380	5	5	0	4	4	0	4	5	-1	4	5	-1	5	4	1	0	0	0	4	4	0	3.44	3.56	-0.11
K6-0496	75,920	4	3	1	4	3	1	4	3	1	5	3	2	3	3	0	0	0	0	3	2	1	2.56	2.22	0.33
K6-0546	18,116,344	4	5	-1	3	4	-1	4	0	4	3	0	3	0	0	3	0	0	0	4	0	4	3.22	1.00	2.22
K6-0696	28,378,623	4	4	0	3	4	-1	3	3	0	3	3	0	3	4	-1	3	4	-1	4	4	0	3.44	3.78	-0.33
K6-0792	1,965,320	5	5	0	5	3	2	0	3	-3	5	3	2	5	4	1	5	3	2	0	0	0	3.78	3.11	0.67
K6-0793	194,780	4	3	1	2	2	0	3	2	1	3	3	0	3	3	0	0	0	0	2	3	-1	2.22	2.22	0.00
K6-0844	717,463	4	5	-1	3	4	-1	4	4	0	4	5	-1	4	5	-1	0	5	-5	4	4	0	3.44	4.67	-1.22
K6-0893	688,296	4	5	-1	4	4	0	4	4	0	4	5	-1	4	5	-1	0	5	-5	4	4	0	3.56	4.67	-1.11
K6-0947	28,559,464	5	4	1	4	4	0	3	3	0	5	3	2	4	3	1	0	3	-3	4	2	2	3.78	3.22	0.56
K6-0947B	4,541,549	4	4	0	3	4	-1	4	2	2	0	0	0	4	4	0	3	0	3	3	0	3	2.67	2.11	0.56
K6-0996	393,432	5	4	1	3	2	1	3	3	0	0	0	0	4	3	1	5	3	2	0	0	0	2.56	2.00	0.56
K6-1141	22,027,240	4	5	-1	3	0	3	2	0	2	4	0	4	3	4	-1	4	0	4	0	0	0	2.89	1.44	1.44
K6-1200A	439,358	2	4	-2	2	3	-1	2	3	-1	2	3	-1	2	2	0	2	0	0	1	2	-1	1.44	1.56	-0.11
K6-1200B	386,313	2	4	-2	2	3	-1	2	4	-2	2	4	-2	2	2	0	2	4	-2	0	0	0	1.44	2.56	-1.11
K6-1200D	479,427	2	4	-2	2	4	-2	2	4	-2	2	0	2	2	2	0	2	4	-2	0	0	0	1.44	2.22	-0.78
K6-1200G	426,947	4	4	0	4	3	1	3	3	0	3	4	-1	4	4	0	3	4	-1	0	0	0	2.78	2.89	-0.11
K6-1200I	447,568	2	4	-2	1	3	-2	2	3	-1	1	3	-2	2	4	-2	2	0	2	0	0	0	1.33	2.22	-0.89
K6-1247	8,438,098	4	4	0	4	3	1	4	3	1	4	3	1	3	4	-1	3	4	-1	4	4	0	3.78	3.56	0.22
K6-1298	707,785	5	4	1	4	4	0	4	4	0	2	3	-1	4	4	0	4	4	0	0	0	0	3.00	3.00	0.00
K6-1446A	152,923	5	4	1	4	4	0	4	4	0	0	3	-3	4	4	0	0	3	-3	4	3	1	2.33	2.78	-0.44
K6-1446D	945,333	5	5	0	3	3	0	2	4	-2	2	2	0	4	5	-1	4	4	0	3	4	-1	3.67	4.00	-0.33
K6-1696	15,670,740	4	5	-1	3	4	-1	2	4	-2	3	4	-1	2	4	-2	3	5	-2	3	4	-1	3.00	4.00	-1.00
K6-1747	TBD	4	4	0	3	4	-1	1	4	-3	0	3	-3	4	4	0	0	4	-4	0	4	-4	1.33	3.89	-2.56
K6-1844A	80,698	5	3	2	4	3	1	4	4	0	0	0	0	4	0	4	0	0	0	4	4	0	2.33	1.56	0.78
K6-1847A	400,597	4	5	-1	3	4	-1	2	1	1	2	4	-2	4	4	0	4	3	1	0	0	0	2.33	2.89	-0.56
K6-1847C	309,358	3	4	-1	4	4	0	4	4	0	0	0	0	4	4	0	0	4	0	4	4	0	2.11	2.67	-0.56
K6-1847E	167,480	2	5	-3	4	5	-1	4	5	-1	0	0	0	4	3	1	0	0	0	4	0	4	2.00	2.00	0.00
K6-1996	998,852	4	4	0	3	2	1	2	2	0	3	5	-2	2	4	-2	3	2	1	3	5	-2	3.00	3.56	-0.56
K6-1996F	22,142	5	4	1	4	0	4	4	3	1	0	0	0	3	3	0	0	0	0	4	0	4	2.22	1.11	1.11
K6-1996H	257,242	5	5	0	4	3	1	4	5	-1	4	5	-1	4	5	-1	0	0	0	4	4	0	3.22	3.33	-0.11
K6-2197	6,542	3	0	3	3	0	3	4	-1	0	4	4	0	4	4	0	3	0	3	0	0	0	2.11	1.33	0.78
K7-0164	154,319	3	4	-1	3	4	-1	2	2	0	0	0	0	4	4	0	0	0	0	4	4	0	1.78	2.00	-0.22
K7-0165	250,642	4	4	0	3	4	-1	2	3	-1	0	2	-2	4	3	1	3	3	0	0	0	0	2.11	2.44	-0.33

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Facility #	2001 CRV	STRUC	EXT	ROOF	HVAC	ELEC	PLUMB	CONV	INTF	EQUIP	OVERALL
K7-0188A	298,722	4 5 -1	4 4 0	4 4 0	0 4 -4	0 3 -3	0 3 -3	0 0 0	3 3 0	0 3 -3	1.67 3.22 -1.56
K7-0188B	257,803	4 4 0	3 4 -1	4 4 0	0 4 -4	3 4 -1	2 3 -1	0 0 0	4 4 0	0 0 0	2.22 3.00 -0.78
K7-0255	650,350	4 5 -1	3 4 -1	2 4 -2	0 0 0	4 3 1	0 0 0	4 5 -1	4 4 0	0 0 0	2.33 2.78 -0.44
K7-0314	197,147	4 4 0	4 4 0	4 4 0	0 0 0	4 4 0	3 3 0	0 0 0	4 4 0	4 0 4	3.00 2.56 0.44
K7-0416B	591,124	4 3 1	2 3 -1	4 3 1	4 3 1	4 3 1	4 3 1	0 0 0	3 3 0	0 0 0	2.78 2.33 0.44
K7-0417	246,789	4 4 0	3 3 0	4 4 0	3 4 -1	3 4 -1	3 4 -1	0 0 0	3 3 0	0 0 0	2.56 2.89 -0.33
K7-0464B	47,139	4 4 0	4 4 0	4 4 0	0 0 0	3 3 0	3 3 0	0 0 0	4 4 0	0 0 0	2.44 2.44 0.00
K7-0506	1,309,827	3 5 -2	3 3 0	4 4 0	4 5 -1	4 4 0	3 3 0	4 5 -1	3 4 -1	0 5 -5	3.11 4.22 -1.11
K7-0569	1,785,937	4 4 0	2 3 -1	2 3 -1	4 4 0	3 4 -1	3 4 -1	0 5 -5	3 3 0	0 3 -3	2.33 3.67 -1.33
K7-0569B	16,584	4 4 0	4 0 4	2 2 0	0 0 0	4 4 0	4 0 4	0 0 0	0 0 0	0 0 0	2.00 1.11 0.89
K7-0619	30,174	4 4 0	3 3 0	3 2 1	0 0 0	4 4 0	0 0 0	0 0 0	3 0 3	0 0 0	1.89 1.44 0.44
K7-0901	243,276	4 4 0	4 4 0	4 4 0	4 4 0	3 4 -1	0 0 0	0 0 0	3 4 -1	0 0 0	2.44 2.67 -0.22
K7-1005	16,268,837	3 4 -1	3 0 3	0 0 0	0 0 0	3 4 -1	0 0 0	0 0 0	0 0 0	3 4 -1	1.33 1.33 0.00
K7-1205A	31,823	4 4 0	4 4 0	4 4 0	4 4 0	4 4 0	0 0 0	0 0 0	3 4 -1	0 0 0	2.56 2.67 -0.11
K7-1207	627,802	4 5 -1	2 4 -2	2 5 -3	4 4 0	4 5 -1	3 5 -2	0 0 0	3 5 -2	0 5 -5	2.44 4.22 -1.78
L6-0147	4,700,542	5 5 0	4 4 0	5 4 1	3 4 -1	4 4 0	4 4 0	0 0 0	5 4 1	4 4 0	3.78 3.67 0.11
L7-0940	155,042	4 4 0	4 3 1	4 4 0	3 4 -1	3 3 0	4 3 1	0 0 0	3 3 0	0 4 -4	2.78 3.11 -0.33
L7-0989	5,574	4 4 0	4 3 1	4 3 1	3 3 0	3 3 0	0 0 0	0 0 0	4 3 1	0 0 0	2.44 2.11 0.33
M3-0002	482,313	4 4 0	2 3 -1	3 2 1	4 4 0	4 4 0	5 5 0	0 0 0	3 3 0	0 0 0	2.78 2.78 0.00
M3-0003	24,342,974	3 3 0	3 3 0	3 3 0	4 4 0	4 4 0	0 0 0	0 0 0	3 4 -1	3 2 1	2.56 2.56 0.00
M5-0791	430,679	4 5 -1	4 4 0	4 4 0	4 3 1	4 3 1	0 0 0	0 0 0	4 4 0	4 3 1	3.11 2.89 0.22
M5-1495	137,925	5 5 0	4 3 1	4 4 0	4 4 0	4 5 -1	4 5 -1	0 0 0	4 5 -1	0 0 0	3.22 3.44 -0.22
M5-1544	670,279	4 5 -1	4 4 0	4 5 -1	4 3 1	4 3 1	4 0 4	0 0 0	3 2 1	3 0 3	3.33 2.44 0.89
M6-0039	708,015	4 3 1	3 3 0	2 3 -1	4 3 1	4 4 0	4 3 1	0 0 0	3 3 0	0 0 0	2.67 2.44 0.22
M6-0138	9,204,831	4 4 0	4 3 1	3 3 0	4 4 0	5 4 1	3 2 1	0 0 0	3 3 0	5 4 1	3.44 3.00 0.44
M6-0342	45,263,621	4 4 0	3 4 -1	2 2 0	2 3 -1	2 3 -1	2 4 -2	3 3 0	3 4 -1	4 5 -1	2.78 3.56 -0.78
M6-0342B	16,584	4 4 0	3 0 3	2 2 0	0 0 0	4 4 0	4 0 4	0 0 0	3 0 3	0 0 0	2.22 1.11 1.11
M6-0399	62,700,535	4 4 0	3 3 0	4 3 1	3 2 1	2 2 0	2 2 0	4 4 0	2 3 -1	3 4 -1	3.00 3.00 0.00
M6-0409I	7,433,763	4 4 0	4 4 0	2 3 -1	4 4 0	4 4 0	4 4 0	0 0 0	4 4 0	0 0 0	2.89 3.00 -0.11
M6-0495	5,703,410	4 4 0	4 4 0	4 4 0	2 3 -1	3 5 -2	3 3 0	0 0 0	5 4 1	4 0 4	3.22 3.00 0.22
M6-0504	492,639	4 4 0	4 4 0	3 4 -1	3 4 -1	4 4 0	4 0 4	0 4 -4	4 0 4	0 0 0	2.89 2.67 0.22
M6-0506	9,596	4 3 1	4 2 2	4 4 0	0 0 0	0 0 0	0 0 0	0 0 0	4 3 1	0 0 0	1.78 1.33 0.44
M6-0539	152,632	4 4 0	4 4 0	4 4 0	0 0 0	2 4 -2	0 0 0	0 0 0	4 4 0	0 0 0	2.00 2.22 -0.22
M6-0589	693,758	4 4 0	3 4 -1	4 4 0	4 3 1	2 2 0	4 3 1	0 0 0	3 3 0	0 0 0	2.67 2.56 0.11
M6-0595D	533,273	4 4 0	4 4 0	3 4 -1	3 0 3	4 4 0	3 4 -1	0 0 0	3 4 -1	0 0 0	2.67 2.67 0.00
M6-0698	3,136,856	4 3 1	3 3 0	4 4 0	3 3 0	4 4 0	3 4 -1	0 0 0	2 3 -1	0 0 0	2.56 2.67 -0.11
M6-0744A	5,922	4 4 0	4 0 4	2 2 0	0 0 0	4 3 1	0 0 0	0 0 0	0 0 0	0 0 0	1.56 1.00 0.56
M6-0794	4,281,688	4 4 0	3 4 -1	2 3 -1	4 4 0	4 4 0	3 3 0	0 0 0	3 4 -1	4 0 4	3.00 2.89 0.11
M6-0794A	34,799	4 5 -1	4 4 0	4 4 0	4 5 -1	4 4 0	3 4 -1	0 0 0	4 4 0	0 0 0	3.00 3.33 -0.33
M6-0891	99,866	4 4 0	3 3 0	4 4 0	0 0 0	0 0 0	0 0 0	0 0 0	4 3 1	0 0 0	1.67 1.56 0.11
M6-0894A	166,344	4 4 0	3 3 0	2 3 -1	0 0 0	0 4 -4	3 4 -1	0 0 0	0 3 -3	0 0 0	1.33 2.33 -1.00
M6-0895	297,244	4 4 0	3 3 0	4 3 1	4 2 2	4 3 1	3 3 0	0 0 0	3 3 0	4 0 4	3.22 2.33 0.89
M6-1624	152,172	4 4 0	4 4 0	4 4 0	0 0 0	4 4 0	0 0 0	0 0 0	3 3 0	0 0 0	2.11 2.11 0.00
M6-1627	399,189	4 4 0	3 3 0	4 4 0	4 2 2	4 4 0	0 0 0	0 0 0	3 3 0	4 4 0	2.89 2.67 0.22
M6-1628	243,530	4 3 1	4 3 1	4 4 0	4 4 0	4 4 0	0 0 0	0 0 0	3 4 -1	4 4 0	3.00 2.89 0.11
M7-0407	9,746,866	5 4 1	4 4 0	3 3 0	4 4 0	5 4 1	5 4 1	0 0 0	4 4 0	4 4 0	3.78 3.44 0.33
M7-0505A	3,253,292	4 3 1	3 3 0	4 3 1	4 4 0	4 3 1	0 3 -3	3 0 3	4 3 1	4 2 2	3.33 2.67 0.67
M7-0554	140,005	4 4 0	3 3 0	4 4 0	0 0 0	3 4 -1	3 3 0	0 0 0	3 4 -1	0 0 0	2.22 2.44 -0.22
M7-0581	791,533	4 4 0	2 3 -1	2 2 0	4 3 1	4 4 0	4 4 0	0 4 -4	3 3 0	0 0 0	2.56 3.00 -0.44
M7-0656	139,926	3 5 -2	4 4 0	4 4 0	3 0 3	4 4 0	4 4 0	0 0 0	4 4 0	0 0 0	2.89 2.78 0.11
M7-0776A	50,421	4 4 0	3 4 -1	3 4 -1	0 4 -4	4 4 0	0 4 -4	0 4 -4	4 4 0	0 4 -4	2.00 4.00 -2.00
M7-0776B	137,746	4 4 0	3 4 -1	3 3 0	0 4 -4	4 4 0	0 4 -4	0 4 -4	4 4 0	0 4 -4	2.00 3.89 -1.89
M7-0777	9,001,190	4 4 0	4 4 0	4 4 0	4 4 0	3 4 -1	4 4 0	4 4 0	4 4 0	4 4 0	3.89 4.00 -0.11

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Facility #	2001 CRV	STRUC			EXT			ROOF			HVAC			ELEC			PLUMB			CONV			INTF			EQUIP			OVERALL					
M7-0961	14,239,205	3	4	-1	3	3	0	2	2	0	2	3	-1	2	2	0	2	3	-1	3	4	-1	3	3	0	3	4	-1	3	4	-1	2.56	3.11	-0.56
M7-1061	6,491,457	4	4	0	3	3	0	4	3	1	3	3	0	4	3	1	2	4	-2	0	0	0	3	4	-1	4	0	4	4	0	4	3.00	2.67	0.33
M7-1104	7,600,793	5	5	0	5	4	1	5	4	1	4	4	0	5	5	0	5	4	1	5	5	0	5	4	1	5	4	1	4.89	4.33	0.56			
M7-1354	14,136,862	4	5	-1	3	4	-1	3	4	-1	3	3	0	4	4	0	3	4	-1	4	5	-1	4	4	0	4	4	0	3.56	4.11	-0.56			
M7-1354C	927,735	4	4	0	4	4	0	4	4	0	3	0	3	4	5	-1	0	0	0	0	0	0	4	4	0	0	3	-3	2.56	2.67	-0.11			
M7-1355	505,871	4	5	-1	4	3	1	4	3	1	0	0	0	4	5	-1	0	0	0	0	0	0	4	4	0	0	0	0	2.22	2.22	0.00			
M7-1357	2,537,131	4	5	-1	3	3	0	3	3	0	3	5	-2	3	3	0	4	5	-1	0	0	0	4	4	0	4	4	0	3.11	3.56	-0.44			
M7-1410A	419,792	4	4	0	4	3	1	4	2	2	0	0	0	4	2	2	0	0	0	0	0	0	3	3	0	2	4	-2	2.33	2.00	0.33			
M7-1412A	497,902	4	4	0	4	4	0	4	4	0	0	0	0	4	3	1	0	0	0	0	0	0	3	3	0	0	4	-4	2.11	2.44	-0.33			
M7-1460	22,376	1	4	-3	0	0	0	0	0	0	0	0	0	1	2	-1	0	0	0	0	0	0	0	0	0	0	0	0	0.22	0.67	-0.44			
M7-1472	1,314,678	4	4	0	4	4	0	4	3	1	4	4	0	4	4	0	4	0	4	5	4	1	4	3	1	4	0	4	4.11	2.89	1.22			
M7-1522	512,981	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	0	0	0	4	4	0	0	0	0	3.11	3.11	0.00			
N6-1009	624,378	4	5	-1	4	4	0	4	4	0	4	4	0	4	5	-1	4	4	0	0	0	0	3	3	0	0	0	0	3.00	3.22	-0.22			
P6-1435	65,458	4	4	0	3	4	-1	3	4	-1	4	4	0	4	4	0	4	4	0	0	0	0	4	4	0	0	0	0	2.89	3.11	-0.22			
TR1-487	39,329	3	4	-1	1	3	-2	3	3	0	1	3	-2	3	4	-1	1	4	-3	0	0	0	1	3	-2	0	0	0	1.44	2.67	-1.22			
TR1-745	29,096	3	3	0	3	3	0	3	2	1	3	4	-1	3	3	0	3	3	0	0	0	0	3	3	0	0	0	0	2.33	2.33	0.00			
TRM-003	83,770	4	3	1	3	2	1	3	1	2	4	2	2	4	3	1	4	3	1	0	0	0	3	2	1	0	0	0	2.78	1.78	1.00			
TRM-052	35,613	2	3	-1	2	3	-1	2	3	-1	2	3	-1	2	3	-1	0	0	0	0	0	0	2	3	-1	0	0	0	1.33	2.00	-0.67			
	Column Averages:	3.93	4.09	-0.17	3.31	3.18	0.13	3.23	3.24	-0.01	2.41	2.52	-0.11	3.46	3.57	-0.11	2.29	2.25	0.04	0.74	0.88	-0.14	3.21	3.03	0.18	1.59	1.52	0.07	2.69	2.70	-0.01194			

Comparison 2nd Look

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Facility #	2001 CRV	STRUC			EXT			ROOF			HVAC			ELEC			PLUMB			CONV			INTF			EQUIP			OVERALL			Dev														
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3															
1039	20,747	4	4	4	0	3	4	4	-1	4	4	4	0	0	0	0	3	3	4	-0.5	0	0	0	0	0	0	0	4	3	4	0.5	0	0	0	0	2.00	2.00	2.22	-0.11							
54928	484,899	4	4	4	0	3	3	3	0	3	4	4	-1	0	0	0	0	4	3	3	1	0	0	3	-1.5	0	0	3	-1.5	4	4	3	-0.5	4	0	0	4	2.33	2.00	2.56	0.06					
J5-1598	24,612	4	4	4	0	3	2	1	1.5	3	4	4	-1	4	4	4	0	3	4	3	-0.5	0	0	0	0	0	0	0	3	3	4	-0.5	4	0	4	2	2.67	2.33	2.67	0.17						
K6-0848	509,289,373	4	3	4	0.5	3	3	3	0	3	3	2	0.5	3	3	2	0.5	3	2	2	1	3	2	3	0.5	3	3	3	0	3	2	3	0.5	3	2	4	0	3.11	2.56	2.89	0.39					
K6-0946	418,128	5	5	4	0.5	4	4	4	0	3	4	4	-1	0	0	0	0	4	4	0	2	4	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2.22	2.33	1.33	0.39				
K6-0994	534,996	4	4	5	-0.5	4	3	3	1	0	4	0	-2	0	0	0	0	5	4	4	1	5	4	4	1	0	0	0	0	0	0	0	0	0	4	0	0	4	2.44	2.11	1.78	0.50				
K6-0995	755,151	4	4	3	0.5	4	4	3	0.5	0	4	0	-2	0	0	0	0	5	4	4	1	5	4	3	1.5	0	0	0	0	0	0	0	0	-1.5	0	0	0	0	2.00	2.22	1.78	0.00				
K6-1091	7,227,693	2	4	4	-2	4	4	4	0	4	4	4	0	4	4	4	0	4	4	4	0	4	4	4	0	4	4	0	4	4	4	0	4	4	4	0	5	4	5	0.5	3.89	3.56	3.67	0.28		
K6-1193	8,138,035	4	5	4	-0.5	4	4	4	0	2	3	3	-1	4	4	4	0	5	4	4	1	3	4	4	-1	0	0	0	0	3	2	4	0	4	5	4	-0.5	3.22	3.44	3.44	-0.22					
K6-1200C	484,235	3	4	5	-1.5	3	4	4	-1	3	4	4	-1	3	4	3	-0.5	3	3	4	-0.5	3	4	4	-1	0	0	0	0	2	3	4	-1.5	0	0	0	0	2.22	2.89	3.11	-0.78					
K6-1397	196,496	4	5	4	-0.5	2	2	2	0	3	4	3	-0.5	2	3	3	-1	3	3	4	-0.5	4	0	0	4	0	0	0	0	2	4	3	-1.5	4	5	0	1.5	2.67	2.89	2.11	0.17					
K6-1446	540,214	5	3	3	2	3	3	3	0	2	2	3	-0.5	3	4	3	-0.5	3	4	3	-0.5	3	4	3	-0.5	4	4	4	0	3	3	3	0	4	4	0	2	3.33	3.44	2.78	0.22					
K6-1847	417,810	5	4	5	0.5	4	4	4	0	4	4	5	-0.5	4	0	5	1.5	3	4	5	-1.5	4	4	4	0	4	4	0	2	4	4	5	-0.5	4	4	5	-0.5	4	4	5	-0.5	4.00	3.56	4.22	0.11	
K6-1996D	80,248	4	4	3	0.5	2	2	2	0	3	2	3	0.5	4	5	4	-0.5	3	5	4	-1.5	3	2	4	0	3	0	0	3	4	3	3	1	4	0	0	4	3.33	2.56	2.56	0.78					
K7-0356	580,194	4	4	4	0	3	4	4	-1	3	4	4	-1	0	0	0	0	4	3	4	0.5	0	0	0	0	4	4	0	2	4	4	3	0.5	0	0	0	0	2.44	2.56	2.11	0.11					
K7-0413	38,102	4	4	4	0	3	4	4	-1	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.56	1.67	1.33	0.06			
K7-0422	83,705	4	4	4	0	3	3	3	0	4	3	4	0.5	3	3	3	0	2	4	4	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.22	2.22	2.33	-0.06			
K7-0468	23,223,334	4	4	4	0	4	3	4	0.5	4	4	4	0	4	3	4	0.5	2	2	2	0	3	3	4	-0.5	0	0	0	0	4	3	3	1	4	3	4	0.5	3.22	2.78	3.22	0.22					
K7-0853	6,490,008	4	5	4	-0.5	4	4	3	0.5	4	5	3	0	0	0	0	0	3	5	3	-1	0	5	4	-4.5	0	0	0	0	4	5	4	-0.5	4	5	3	0	2.56	3.78	2.67	-0.67					
K7-1557	2,525,605	3	5	4	-1.5	3	5	3	-1	1	4	3	-2.5	4	4	5	-0.5	3	5	3	-1	4	4	4	0	0	0	0	0	3	4	3	-0.5	0	0	0	0	2.33	3.44	2.78	-0.78					
K8-0741	41,116	3	3	4	-0.5	0	0	4	-2	0	0	0	0	0	0	0	0	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.78	0.78	1.33	-0.28			
K8-237	250,088	3	3	3	0	3	3	3	0	3	3	3	0	3	3	3	0	3	4	3	-0.5	4	3	3	1	0	0	0	0	4	3	3	1	0	0	0	0	2.56	2.44	2.33	0.17					
L7-1557	3,463,510	3	4	4	-1	3	3	3	-0.5	2	3	2	-0.5	4	4	4	0	3	4	4	-1	4	4	3	0.5	0	0	0	0	3	4	3	-0.5	4	0	0	4	2.89	2.89	2.67	0.11					
M6-0232	815,783	4	4	5	-0.5	0	0	4	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.44	0.44	1.00	-0.28				
M6-0595	11,086,969	4	5	4	-0.5	3	4	4	-1	3	4	3	-0.5	4	4	4	0	4	4	4	0	4	4	4	0	3	2	4	0	0	4	3	-3.5	4	3	3	1	4	4	4	0	3.22	3.78	3.67	-0.50	
M6-0689	645,072	4	4	4	0	4	3	3	1	4	3	4	0.5	4	3	4	0.5	4	3	4	0.5	3	0	4	1	0	0	0	0	3	3	4	-0.5	0	3	4	-3.5	2.89	2.44	3.44	-0.06					
M6-0785	488,468	4	4	5	-0.5	4	4	4	0	4	4	5	-0.5	4	4	4	0	4	4	5	-0.5	3	3	3	0	0	0	0	4	4	4	0	0	0	0	0	0	0	0	3.00	3.00	3.33	-0.17			
M6-0798	152,455	4	4	3	0.5	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.89	0.44	0.33	0.50			
M6-0895A	687,220	4	4	5	-0.5	3	3	4	-0.5	4	3	5	0	0	3	0	-1.5	4	4	5	-0.5	4	4	5	-0.5	0	0	0	0	4	3	5	0	0	4	5	-4.5	2.56	3.11	3.78	-0.89					
M6-0896	971,111	4	4	5	-0.5	3	4	3	-0.5	4	3	3	1	4	4	4	0	4	4	4	0	3	4	4	-1	0	0	0	0	3	3	4	-0.5	0	0	0	0	2.78	2.89	3.00	-0.17					
M7-0335	65,470	4	4	4	0	3	3	4	-0.5	4	3	4	0.5	0	0	0	0	3	4	4	-1	0	0	0	0	0	0	0	3	3	3	0	0	0	0	0	0	0	0	1.89	1.89	2.11	-0.11			
M7-0409	16,276,349	4	4	4	0	3	4	3	-0.5	3	2	2	1	3	2	2	1	3	3	4	-0.5	4	3	3	1	4	5	5	-1	3	3	3	0	0	0	0	0	0	0	0	3.00	2.89	2.89	0.11		
M7-0867	1,099,063	4	3	3	1	3	2	2	1	2	3	3	-1	3	3	3	0	4	3	3	1	4	3	3	1	2	2	2	0	2	1	2	0.5	0	3	3	-3	2.67	2.56	2.67	0.06					
M7-1104A	238,758	5	5	4	0.5	4	0	4	2	4	4	4	0	0	0	0	0	5	3	4	1.5	5	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	-2	2.56	1.78	2.67	0.33
M7-1362	3,600,765	4	4	4	0	4	4	4	0	4	4	4	0	3	4	4	-1	4	4	4	0	4	3	4	0.5	4	0	4	2	4	4	4	0	4	4	4	0	4	4	4	0	3.89	3.44	4.00	0.17	
M7-1362A	309,604	4	4	4	0	4	4	4	0	4	0	4	2	0	0	0	0	4	4	3	0.5	4	4	3	0.5	0	0	0	0	0	4	0	-2	0	0	0	0	0	0	0	2.22	2.22	2.00	0.11		
M7-1469	32,164,186	4	4	4	0	3	4	3	-0.5	4	4	4	0	4	4	4	0	3	3	4	-0.5	3	4	3	-0.5	4	4	4	0	3	3	3	0	4	4	4	0	4	4	4	0	3.56	3.78	3.67	-0.17	
M7-1509	302,254	4	4	5	-0.5	4	4	4	0	4	4	4	0	4	3	4	0.5	4	4	4	0	4	3	4	0.5	0	0	0	0	4	3	4	0.5	0	0	4	-2	3.11	2.67	3.67	-0.06					
N6-1007	1,182,120	4	3	4	0.5	3	3	4	-0.5	4	3	4	0.5	0	0	3	-1.5	3	4	3	-0.5	3	4	0	1	0	0	4	-2	4	3	3	1	0	0	0	0	0	0	0	2.33	2.22	2.78	-0.17		
N6-1118	946,804	4	4	4	0	3	4	4	-1	3	2	4	0	4	4	4	0	4	3	4	0.5	3	3	4	-0.5	0	0	0	0	2	2	4	-1	0	4	4	-2	2.56	2.89	3.11	-0.44					
TR1-757	5,807	1	2	3	-1.5	2	2	2	0	3	2	2	1	3	3	3	0	2	3	3	-1	1	2	3	-1.5	0	0	0	0	1	2															

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Facility #	2001 CRV	EXT1	DM\$*	EXT2	DM\$	EXT3	DM\$	EXT NET DM\$	ROOF 1	DM\$	ROOF 2	DM\$	ROOF 3	DM\$	ROOF NET DM\$	HVAC 1	DM\$	HVAC 2	DM\$
J5-0677	199,657								4	499,142.5	0			\$499	3	1497.43	0		
J6-0393	249,310	3	5235.51	0				\$5,236	4	747.93	0			\$748	4	747.93	0		
K6-0546	18,116,344								4	0	0			\$0	3	0	0		
K6-0792	1,965,320								0		3	14739.9		-\$14,740					
K6-0994	534,996								0		4	1337.49	0	-\$1,337					
K6-0995	755,151								0		4	1887.88	0	-\$1,888					
K6-1141	22,027,240	3	165204.3	0				\$165,204	2	440544.8	0			\$440,545	4	0	0		
K6-1200A	439,358														2	28118.9	0		
K6-1200D	479,427														2	30683.3	0		
K6-1446A	152,923														0	3	1605.69		
K6-1747	TBD														0		3		
K6-1847	417,810														4	2715.77	0		
K7-0165	250,642														0		2	7017.98	
K7-0188A	298,722														0		4	1045.53	
K7-0188B	257,803														0		4	1289.02	
L7-0940	155,042																		
L7-1557	3,463,510																		
M5-1544	670,279																		
M6-0342B	16,584	3	422.892	0				\$423											
M6-0495	5,703,410																		
M6-0504	492,639																		
M6-0595	11,086,969																		
M6-0595D	533,273														3	12798.6	0		
M6-0689	645,072																		
M6-0794	4,281,688																		
M6-0894A	166,344																		
M6-0895	297,244																		
M6-0895A	687,220														0		3	10308.3	
M7-0505A	3,253,292																		
M7-0581	791,533																		
M7-0656	139,926														3	1469.22	0		
M7-0776A	50,421														0		4	176.474	
M7-0776B	137,746														0		4	482.111	
M7-0867	1,099,063																		
M7-1061	6,491,457																		
M7-1354C	927,735														3		0	22265.6	
M7-1362	3,600,765																		
M7-1362A	309,604								4	774.01	0		4	774	\$0				
M7-1412A	497,902																		
M7-1472	1,314,678																		
N6-1118	946,804																		
			\$170,863		\$0		\$0	\$170,863		\$442,566		\$17,965		\$774	\$423,827		\$78,031		\$44,191
			\$5,658		\$0		\$0	\$5,658		\$2,021		\$17,965		\$774	-\$16,718		\$78,031		\$44,191

Effects of Zero on DM (*Values represent actual dollar amounts)

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Facility #	2001 CRV	ELEC 1	DM\$*	ELEC 2	DM\$	ELEC 3	ELEC DM\$	ELEC NET DM\$	PLUMB 1	DM\$	PLUMB 2	DM\$	PLUMB 3	DM\$	PLUM NET DM\$	CONV 1	DM\$	CONV 2	DM\$	CONV 3
J5-0677	199,657																			
J6-0393	249,310								4	498.62	0				\$499					
K6-0546	18,116,344	4	226454.3	0				\$226,454	3	0	0				\$0					
K6-0792	1,965,320																			
K6-0994	534,996																			
K6-0995	755,151																			
K6-1141	22,027,240								4	0	0				\$0					
K6-1200A	439,358								2	8787.16	0				\$8,787					
K6-1200D	479,427																			
K6-1446A	152,923								0		3	229.38			-\$229					
K6-1747	TBD								0		4				\$0	0		4		
K6-1847	417,810															4	417.81	4	417.81	0
K7-0165	250,642																			
K7-0188A	298,722	0		3	2688.5			-\$2,688	0		3	448.08			-\$448					
K7-0188B	257,803																			
L7-0940	155,042																			
L7-1557	3,463,510																			
M5-1544	670,279								4	1675.7	0				\$1,676					
M6-0342B	16,584								4	8.292	0				\$8					
M6-0495	5,703,410																			
M6-0504	492,639								4	985.278	0				\$985	0		4	492.639	
M6-0595	11,086,969															0		4	11086.97	3
M6-0595D	533,273																			
M6-0689	645,072								3	3870.43	0		4	1290.1	\$2,580					
M6-0794	4,281,688																			
M6-0894A	166,344																			
M6-0895	297,244																			
M6-0895A	687,220																			
M7-0505A	3,253,292								0		3	9759.9			-\$9,760	3	14640	0		
M7-0581	791,533															0		4	395.7665	
M7-0656	139,926																			
M7-0776A	50,421								0		4	25.211			-\$25	0		4	0	
M7-0776B	137,746								0		4	68.873			-\$69	0		4	0	
M7-0867	1,099,063																			
M7-1061	6,491,457																			
M7-1354C	927,735																			
M7-1362	3,600,765															4	3600.8	0		4
M7-1362A	309,604																			
M7-1412A	497,902																			
M7-1472	1,314,678								4	1314.68	0				\$1,315					
N6-1118	946,804																			
			\$226,454		\$2,688		\$0	\$223,766		\$17,140		\$10,531		\$1,290	\$5,319		\$18,658		\$12,393	
			\$0		\$2,688		\$0	-\$2,688		\$17,140		\$10,531		\$1,290	\$5,319		\$18,658		\$12,393	

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Effects of Zero on DM (*Values represent actual dollar amounts)

Analysis 2: Equal Variance Analysis

In our Equal Variance Analysis, 3 sets (A, B, C) of independent condition ratings (assessments) were for 42 sites and 9 systems.

Analysis of variance (ANOVA).

Assumptions:

1. Samples are assumed to have been randomly selected from k populations in an **independent** manner.
2. The populations are assumed to be **normally distributed** with equal variances and means.
3. Moderate departures from these assumptions will not seriously affect the properties of the test. This is particularly true of the normality assumption.¹²

Verification of assumptions:

Independent samples: observations were made at on 42 different building types. Each of the assessment groups operated independently, although they did assess the same buildings. This was intentional to allow comparison of assessment results.

Test for equal variances.

F-Test:

Usage

Formally tests for a difference between the variances of 2 independent samples. If the two samples have similar variances the F statistic, the ratio of the variances of the samples, will be roughly equal to 1.

Two independent samples, normally distributed, measured on a continuous scale. Condition ratings are discrete, but discrete variables may be treated as continuous for analysis purposes.

F-Tests shown below (Tables 1,2 and 3) indicate that there is no statistical difference between the variances of the three sets of assessments. A p-value of greater than 0.16 (far greater than the commonly used level of 0.05) would be required to reject that the variances are unequal. Therefore, it is reasonable to assume that assessments A, B and C have equal variances.

¹² Mathematical Statistics with Applications, Mendenhall, Wackerly and Scheaffer, 1990.

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Table 1
Comparison of A and B Variances

F-Test Two-Sample for Variances

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	3.526119	3.568182
Variance	0.557368	0.596094
Observations	268	264
df	267	263
F	0.935033	
P(F<=f) one-tail	0.292353	
F Critical one-tail	0.816797	

Table 2
Comparison of A and C Variances
F-Test Two-Sample for Variances

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	3.526119	3.657895
Variance	0.557368	0.527805
Observations	268	266
df	267	265
F	1.05601	
P(F<=f) one-tail	0.328595	
F Critical one-tail	1.223984	

Table 3
Comparison of B and C Variances
F-Test Two-Sample for Variances

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	3.568181818	3.657894737
Variance	0.59609402	0.527805362
Observations	264	266
df	263	265
F	1.129382273	
P(F<=f) one-tail	0.161712764	
F Critical one-tail	1.224814028	

Tests for equal means.

Table 4 shows the results of analysis of variance to compare mean ratings from assessment groups A, B and C. At the 0.05 level of significance, there is not sufficient evidence to indicate a difference between the mean rating for assessment groups A, B and C for the 41 sites and 9 systems assessed. The attained significance level is 0.12.

When the means are compared in pairs (Tables 5, 6 and 7), there is a statistical difference between the mean rating for A and C assessment groups. The p-value for this comparison is 0.04. Given such close comparison of the three means (especially not all groups rated all systems at each location), it is not unreasonable to follow the assumption that the three means are equal.

Tables 8 through 16 show comparison of mean ratings between assessment groups A, B and C for each of the nine system areas across all 42 sites. The lowest p-value shown in any of these tables is 0.32. This is strong evidence that there is no statistical difference between the mean rating given by assessment groups A, B and C with any given system. This strongly supports that the assessment method is consistent across all three-assessment groups.

Tables 17A graphically depicts the data collected by assessment groups A, B and C. The histograms allow rapid comparison across the three groups and nine assessment areas. Table 17B shows descriptive statistics and 95% confidence intervals for the assessment ratings across the 41 sites and 9 systems. There is significant overlap in all confidence intervals for any given system. This provides additional support that the assumption that the assessments are being performed consistently by all assessment teams. Standard deviation (SD) refers to a statistical measure of how far a value is likely to lie from its mean. It is calculated from the variance of a given set of numbers. Standard error (SE) is the estimated standard deviation of a statistic. It is dependent on sample size and can be used to calculate the confidence interval, a range of values around a statistic where the “true” value can be expected to be located. Finally, the interquartile range (IQR) is the range of the middle 50% of the data. Since it is the middle 50% (between 25% and 75%), it is unaffected by outliers and extreme values.

Test for Normality:

The Shapiro-Wilk W test is a powerful test for sample normality. A low p-value indicates that the sample is non-normally distributed. Tables 18, 19 and 20 show that the assessment ratings A, B and C are not normally distributed. This is not surprising given the relatively narrow range of discrete values possible in these assessment ratings. Moderate departure from the normality assumption does not invalidate use of these statistical methods, (Analysis of Variance or ANOVA) therefore, this departure from assumptions does not cause rejection of the conclusion that the assessment teams are producing consistent results.

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Table 4
Comparison of A, B and C Means

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
A	268	945	3.526119403	0.557367656
B	264	942	3.568181818	0.59609402
C	266	973	3.657894737	0.527805362

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	2.416374212	2	1.208187106	2.156225897	0.116437717	3.007045279
Within Groups	445.4583125	795	0.560324921			
Total	447.8746867	797				

Table 5
Comparison of A and B means
Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
A	268	945	3.526119403	0.557367656
B	264	942	3.568181818	0.59609402

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	0.235296518	1	0.235296518	0.408086648	0.52321821	3.859071285
Within Groups	305.5898915	530	0.576584701			
Total	305.825188	531				

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Table 6
Comparison of B and C Means
Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
B	264	942	3.568181818	0.59609402
C	266	973	3.657894737	0.527805362

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	1.066398844	1	1.066398844	1.898113573	0.168873267	3.859128128
Within Groups	296.6411483	528	0.561820357			
Total	297.7075472	529				

Table 7
Comparison of A and C means
Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
C	266	973	3.657894737	0.527805362
A	268	945	3.526119403	0.557367656

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	2.318160087	1	2.318160087	4.271987343	0.039228792	3.85900023
Within Groups	288.6855852	532	0.542642078			
Total	291.0037453	533				

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Table 8
Structure Observations
Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
A	41	158	3.853658537	0.52804878
B	41	163	3.975609756	0.424390244
C	41	165	4.024390244	0.374390244

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	0.634146341	2	0.317073171	0.716911765	0.490336907	3.071775723
Within Groups	53.07317073	120	0.442276423			
Total	53.70731707	122				

Table 9
Exterior Observations
Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
A	39	129	3.307692308	0.376518219
B	37	127	3.432432432	0.585585586
C	40	136	3.4	0.605128205

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	0.321571439	2	0.160785719	0.308004138	0.73552728	3.076578992
Within Groups	58.98877339	113	0.522024543			
Total	59.31034483	115				

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Table 10
Roof Observations
Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
A	36	120	3.333333333	0.628571429
B	37	127	3.432432432	0.585585586
C	36	129	3.583333333	0.65

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	1.141395983	2	0.570697992	0.918927444	0.402100973	3.082014643
Within Groups	65.83108108	106	0.621047935			
Total	66.97247706	108				

Table 11
HVAC Observations
Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
A	25	89	3.56	0.34
B	25	89	3.56	0.423333333
C	26	94	3.615384615	0.566153846

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	0.052469636	2	0.026234818	0.058974896	0.942775304	3.122103465
Within Groups	32.47384615	73	0.444847208			
Total	32.52631579	75				

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Table 12
Electrical Observations
Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
3	37	131	3.540540541	0.644144144
3	37	136	3.675675676	0.503003003
4	36	133	3.694444444	0.503968254

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	0.518359268	2	0.259179634	0.47054658	0.625947146	3.081197519
Within Groups	58.93618619	107	0.550805478			
Total	59.45454545	109				

Table 13
Plumbing Observations
Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
A	30	107	3.566666667	0.667816092
B	29	101	3.482758621	0.615763547
C	29	105	3.620689655	0.315270936

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	0.280276907	2	0.140138454	0.262167994	0.770001596	3.103835411
Within Groups	45.43563218	85	0.534536849			
Total	45.71590909	87				

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Table 14
 Conveyance Observations
 Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
A	10	36	3.6	0.488888889
B	8	30	3.75	0.785714286
C	9	32	3.555555556	0.777777778

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	0.174074074	2	0.087037037	0.129565817	0.879087061	3.402831794
Within Groups	16.12222222	24	0.671759259			
Total	16.2962963	26				

Table 15
 INTF Observations
 Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
A	33	108	3.272727273	0.642045455
B	34	108	3.176470588	0.634581105
C	33	114	3.454545455	0.443181818

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	1.331550802	2	0.665775401	1.160086455	0.317769319	3.09019299
Within Groups	55.6684492	97	0.573901538			
Total		57	99			

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Table 16
Equipment Observations
Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
A	16	64	4	0.133333333
B	15	58	3.866666667	0.695238095
C	15	61	4.066666667	0.352380952

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	0.311594203	2	0.155797101	0.401956522	0.671497298	3.214481126
Within Groups	16.66666667	43	0.387596899			
Total	16.97826087	45				

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17a is box and whisker plots that go with descriptive statistics in 17b (observations for each facility category and by each assessment group are analyzed individually). Box-and-whisker plots are helpful in interpreting the distribution of data. They allow people to explore data and to draw informal conclusions when two or more variables are present. It shows only certain statistics rather than all the data.

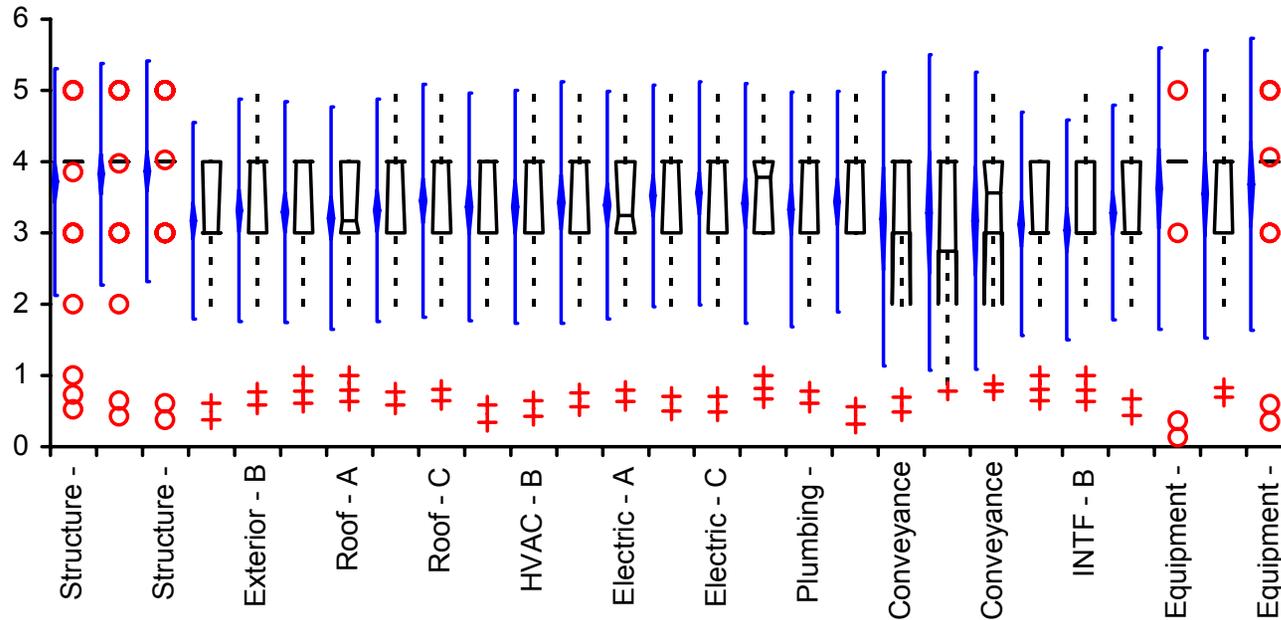
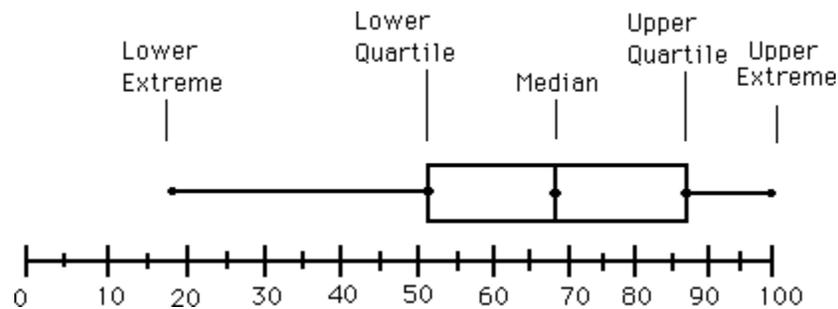


Table 17 A



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Table 17 B

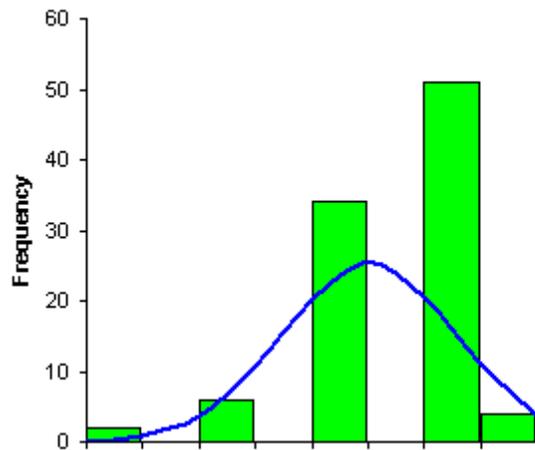
	n	Mean	SD	SE	95% CI of Mean	Median	IQR	95% CI of Median
Structure - A	45	3.714	0.9665	0.1441	3.423to 4.004	4.000	0.000	4.000to 4.000
Structure - B	45	3.823	0.9486	0.1414	3.538to 4.108	4.000	0.000	4.000to 4.000
Structure - C	45	3.867	0.9394	0.1400	3.585to 4.149	4.000	0.000	4.000to 4.000
Exterior - A	43	3.170	0.8371	0.1277	2.912to 3.427	3.000	1.000	3.000to 4.000
Exterior - B	41	3.312	0.9490	0.1482	3.012to 3.611	4.000	1.000	3.000to 4.000
Exterior - C	44	3.291	0.9415	0.1419	3.004to 3.577	4.000	1.000	3.000to 4.000
Roof - A	40	3.206	0.9494	0.1501	2.903to 3.510	3.167	1.000	3.000to 4.000
Roof - B	41	3.312	0.9490	0.1482	3.012to 3.611	4.000	1.000	3.000to 4.000
Roof - C	40	3.451	0.9941	0.1572	3.133to 3.769	4.000	1.000	3.000to 4.000
HVAC - A	29	3.361	0.9718	0.1805	2.992to 3.731	4.000	1.000	3.000to 4.000
HVAC - B	29	3.367	0.9923	0.1843	2.989to 3.744	4.000	1.000	3.000to 4.000
HVAC - C	30	3.431	1.0302	0.1881	3.046to 3.816	4.000	1.000	3.000to 4.000
Electric - A	42	3.392	0.9694	0.1496	3.090to 3.694	3.250	1.000	3.000to 4.000
Electric - B	42	3.521	0.9441	0.1457	3.226to 3.815	4.000	1.000	3.000to 4.000
Electric - C	41	3.558	0.9523	0.1487	3.258to 3.859	4.000	1.000	3.000to 4.000
Plumbing - A	34	3.413	1.0257	0.1759	3.055to 3.771	3.783	1.000	3.000to 4.000
Plumbing - B	33	3.330	1.0037	0.1747	2.974to 3.686	4.000	1.000	3.000to 4.000
Plumbing - C	33	3.439	0.9383	0.1633	3.107to 3.772	4.000	1.000	3.000to 4.000
Conveyance - A	14	3.199	1.2528	0.3348	2.476to 3.923	4.000	1.000	2.000to 4.000
Conveyance - B	12	3.285	1.3469	0.3888	2.429to 4.141	4.000	1.250	2.000to 4.000
Conveyance - C	13	3.170	1.2700	0.3522	2.403to 3.938	3.556	1.000	2.000to 4.000
INTF - A	37	3.127	0.9555	0.1571	2.809to 3.446	3.000	1.000	3.000to 4.000
INTF - B	38	3.042	0.9360	0.1518	2.735to 3.350	3.000	1.000	3.000to 3.000
INTF - C	37	3.285	0.9156	0.1505	2.980to 3.591	3.000	1.000	3.000to 4.000
Equipment - A	20	3.625	1.1998	0.2683	3.063to 4.186	4.000	0.000	4.000to 4.000
Equipment - B	19	3.547	1.2263	0.2813	2.956to 4.138	4.000	1.000	3.000to 4.000
Equipment - C	19	3.685	1.2478	0.2863	3.083to 4.286	4.000	0.000	4.000to 4.000

SD= Standard Deviation
 SE= Standard Error
 CI= Confidence Intervals
 IQR= Interquartile Range

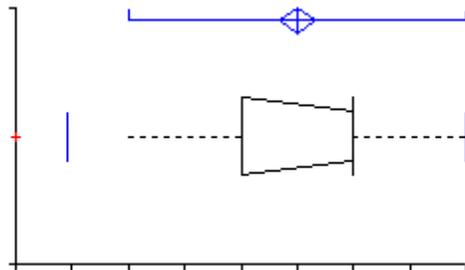
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18-20 are continuous summary descriptives for the three sets of observations (each of the three sets of assessments across all facility categories). If you have continuous variables, then you can use DESCRIPTIVES to calculate summary statistics. Although most of the same statistics can be calculated with the FREQUENCIES procedure, the DESCRIPTIVE procedure is more efficient because it doesn't sort the values into a frequencies table.

Table 18



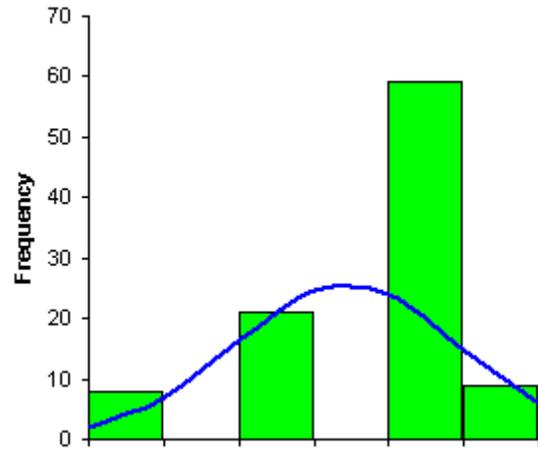
n	97 (cases excluded: 4 due to missing values)
Mean	3.505
95% CI	3.351 to 3.659
Variance	0.5859
SD	0.7654
SE	0.0777
CV	22%



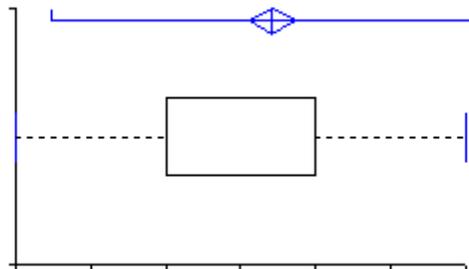
Median	4.000
95.8% CI	3.000 to 4.000
Range	4
IQR	1
Percentile	
2.5th	1.450
25th	3.000
50th	4.000
75th	4.000
97.5th	5.000
Shapiro-Wilk	Coefficient 0.8079 p <0.0001

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Table 19



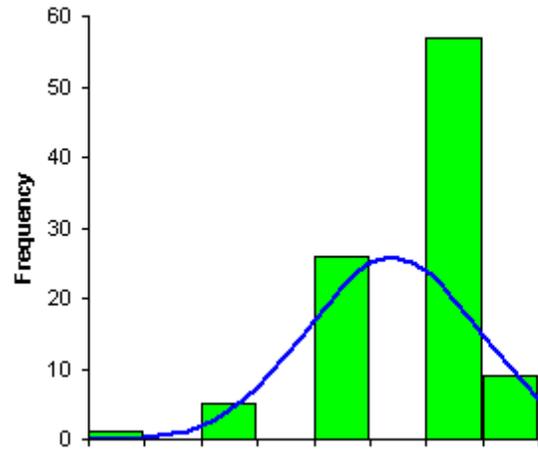
n	97 (cases excluded: 4 due to missing values)
Mean	3.711
95% CI	3.560 to 3.862
Variance	0.5616
SD	0.7494
SE	0.0761
CV	20%



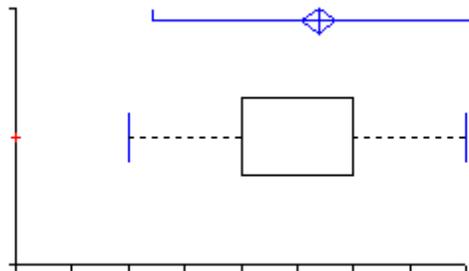
Median	4.000
95.8% CI	4.000 to 4.000
Range	3
IQR	1
Percentile	
2.5th	2.000
25th	3.000
50th	4.000
75th	4.000
97.5th	5.000
Shapiro-Wilk	Coefficient 0.7967 p <0.0001

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Table 20



n	98 (cases excluded: 3 due to missing values)
Mean	3.694
95% CI	3.543to 3.845
Variance	0.5651
SD	0.7517
SE	0.0759
CV	20%



Median	4.000
96.7% CI	4.000to 4.000
Range	4
IQR	1
Percentile	
2.5th	2.000
25th	3.000
50th	4.000
75th	4.000
97.5th	5.000
Shapiro-Wilk	Coefficient 0.8132
	p <0.0001

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Analysis 3: The Use of Color Histograms to Determine Trends or Inconsistencies

Due to the large amount of data in this study, it was virtually impossible to visualize the data in a way that easily allowed one to do trend analysis. To help visualize the data we used color histograms to try to do trend analysis. We did this by color coding the ratings of all the systems: a 5 was blue, a 4 was light blue, a 3 was green, a two was light green, a one was yellow, and a 0 rating was tan. Red was used as the background color. Graphs were then plotted in several ways, the most useful being systems by Center and the Centers by system.

Using these charts we were able to see where further analysis needed to take place. For example, in the analysis it was noted that MSFC was very blue, meaning that it had more 5 ratings for than the other Centers. This happened because facilities that had systems that were missing (e.g. no HVAC or conveying system in the facility) were all rated as 5s at MSFC, the pilot project. Missing systems were rated 0 during the other visits. This caused us to send a team back to MSFC to reevaluate what turned out to be an inflated assessment. A very large group of light blue (4) was noted at GRC. This turned out to be the igloo facilities, all 100 of which received a 4 rating for structure. This was the case of an anomaly with an explanation.

We also use a chart that was sorted by Center. It had multiple uses. First, we were able to “see” how the systems were generally rated from Center to Center. For example at ARC structure was typically rated very high (a lot of blue) while electrical was rated average (a lot of green). We compared these systems to other Centers to see if a Center’s rating compared favorably to the anecdotal evidence. We also could use this to compare the assessment teams to each other. Because we knew where the teams visited, we were able to group the teams to see if their ratings compared favorably to other teams a other Centers considering the general information on the condition of each Center.

The charts enabled us direct our efforts towards apparent anomalies and inconsistencies. We then did a closer analysis on them to see if there was a logical reason for the anomaly, such as the igloos, or if we needed to address some inconsistency or problem with the DM method, such as going back to MSFC to reassess the facilities. The histograms proved instrumental in the analysis of the collected data and in the correction of the DM method.

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APPENDIX E. NASA CLASSES INCORRECTLY MAPPED INTO ORIGINAL DM CATEGORIES

NASA CLASS CODES	ORIGINAL DM_CAT_CODE	NASA CLASS DESC	NEW DM_CAT_CODE	Reason
121-10	25	Aircraft Direct Fueling Station	10.2	New category for these
121-20	25	Aircraft Truck Fueling Facility	10.2	New category for these
121-90	25	Aircraft Fuel Dispensing (Other)	10.2	New category for these
122-10	25	Marine Fueling Facility	10.2	New category for these
122-20	25	Small Craft Fueling Station	10.2	New category for these
122-90	25	Marine Fuel Dispensing (Other)	10.2	New category for these
123-10	25	Filling Station	10.2	New category for these
123-90	25	Land Vehicle Fuel Dispensing (Other)	10.2	New category for these
126-90	25	Miscellaneous Fueling and Dispensing	10	More correct category
212-10	23	Launch Vehicle Maintenance Facility	23.1	Changed due to specialized facilities equipment
212-20	23	Maintenance Shop - Component (Launch Vehicle Maintenance)	23.1	Changed due to specialized facilities equipment
212-30	23	Maintenance Shop - Component (Launch Vehicle Maintenance)	23.1	Changed due to specialized facilities equipment
212-40	23	Maintenance Shop - Component (Launch Vehicle Maintenance)	23.1	Changed due to specialized facilities equipment
212-50	23	Maintenance Shop - Component (Launch Vehicle Maintenance)	23.1	Changed due to specialized facilities equipment
220-11	23	Model Shop	1	These are specialized fabrication facilities
220-12	23	Tool Fabrication Shop	1	These are specialized fabrication facilities
220-13	23	Instrument Fabrication Shop	1	These are specialized fabrication facilities
220-14	23	Vehicle Assembly Buildings (Other than at Launch Sites)	23.1	Related to launch preparation
320-60	2	Tracking and Data Acquisition (Structures and Facilities)	13.2	These are small antennas & tracking
345-20	4	Propellant & Fuel Storage & Transfer Systems (Engine Test)	9	More correct category
345-40	4	Water Systems (Engine Test)	19	More correct category
381-20	14	Data Collection & Reduction Center Bldgs (Launch Complex)	24	Changed because these are launch preparation buildings, not operations related.
381-30	14	Assembly and Checkout Buildings (Launch Complex)	24	Changed because these are launch preparation buildings, not operations related.
381-40	14	Instrumentation Buildings (Launch Complex)	24	Changed because these are launch preparation buildings, not operations related.
381-50	14	Service Buildings (Launch Complex)	24	Changed because these are launch preparation buildings, not operations related.
381-60	14	Remote Air Intake Buildings (Launch Complex)	24	Changed because these are launch preparation buildings, not operations related.
382-13	20	Camera Pads & Structures (Launch Complex)	20.1	New category for these
382-15	20	Blockhouses (Launch Complex)	24	Other building vice launch facility
382-30	20	Propellant and Fuel Systems + Storage Tanks (Launch Complex)	20.2	New category for these
382-31	20	High Pressure Gas Systems (Launch Complex)	20.2	New category for these

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NASA CLASS CODES	ORIGINAL DM_CAT_CODE	NASA CLASS DESC	NEW DM_CAT_CODE	Reason
382-70	20	Electrical Systems (Launch Complex)	16	Electrical distribution is more correct
421-90	9	Solid Fuel Storage - Bulk (Other)	11	These are propellant storage magazines and should be in DM Cat code 11
610-30	5	Receiving and Shipping Buildings	8	These are supply buildings
630-10	7	Prefabricated Buildings, General use	28	These aren't trailers
630-11	7	Prefabricated Buildings, Offices use	28	These aren't trailers
630-12	7	Prefabricated Buildings, Institutional	28	These aren't trailers
630-14	7	Prefabricated Buildings, Storage use	28	These aren't trailers
630-16	7	Prefabricated Buildings, Service use	28	These aren't trailers
630-17	7	Prefabricated Buildings, R&D use	28	These aren't trailers
630-20	7	Commercial Packaged Accommodations	28	These aren't trailers
630-21	7	Commercial Packaged Accomodations, Office use	28	These aren't trailers
630-22	7	Commercial Packaged Accomodations, Institutional	28	These aren't trailers
630-24	7	Commercial Packaged Accomodations, Storage use	28	These aren't trailers
630-26	7	Commercial Packaged Accomodations, Service use	28	These aren't trailers
630-27	7	Commercial Packaged Accomodations, R&D	28	These aren't trailers
811-10	16	Electric Power Plant – Diesel	16.1	These are generating plants vice electrical distribution
811-20	16	Electric Power Plant - Coal-Fired	16.1	These are generating plants vice electrical distribution
811-30	16	Electric Power Plant - Oil-Fired	16.1	These are generating plants vice electrical distribution
811-40	16	Electric Power Plant - Gas-Fired	16.1	These are generating plants vice electrical distribution
811-50	16	Electric Power Plant – Nuclear	16.1	These are generating plants vice electrical distribution
811-60	16	Stand-by Generator Plant	16.1	These are generating plants vice electrical distribution
811-70	16	Electric Power Plant – Hydro	16.1	These are generating plants vice electrical distribution
811-80	16	Power Station	16.1	These are generating plants vice electrical distribution
812-10	15	Substation	16.2	These are not lighting systems, are electrical & electrical dist.
812-30	15	Distribution Systems	16	These are not lighting systems, are electrical & electrical dist.
812-35	15	Electrical and Communications Duct System	16	These are not lighting systems, are electrical & electrical dist.
812-60	15	Distribution Transformers	16.2	These are not lighting systems, are electrical & electrical dist.
812-90	15	Electricity - Distribution and Transmission Lines (Other)	16	These are not lighting systems, are electrical & electrical dist.
821-10	17	Heating Plant and Other Related Facilities - Coal-Fired	17.1	These are generating plants vice distribution facilities
821-20	17	Heating Plant and Other Related Facilities - Oil-Fired	17.1	These are generating plants vice distribution facilities
821-30	17	Heating Plant and Other Related Facilities - Gas-Fired	17.1	These are generating plants vice distribution facilities
821-40	17	Heating Plant and Other Related Facilities – Nuclear	17.1	These are generating plants vice distribution facilities
821-50	17	Steam Plant - Power and Other Related Facilities	17.1	These are generating plants vice distribution facilities
831-10	18	Sewage Treatment Plant	18.1	Treatment vice distribution

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NASA CLASS CODES	ORIGINAL DM_CAT_CODE	NASA CLASS DESC	NEW DM_CAT_CODE	Reason
911-40	25	Land - Condemnation	26	Land vice other facility
911-50	25	Land - Exchange	26	Land vice other facility
912-10	25	Land - Public Domain Withdrawal (Executive Order)	26	Land vice other facility
912-11	25	Land - Public Domain Withdrawal (Public Land Order)	26	Land vice other facility
912-13	25	Land - Public Domain Withdrawal (Permit)	26	Land vice other facility
912-20	25	Land - Public Domain Withdrawal (Temporary)	26	Land vice other facility
913-10	25	Land - Public Domain--Use Permit (Dept. of Interior)	26	Land vice other facility
913-20	25	Land - Public Domain--Use Permit (Dept. of Air Force)	26	Land vice other facility
913-30	25	Land - Public Domain--Use Permit (Other Agencies)	26	Land vice other facility
913-40	25	Land - License from Air Force	26	Land vice other facility
913-50	25	Land - License from Army	26	Land vice other facility
913-60	25	Land - License from Navy	26	Land vice other facility
913-61	25	Land - Permit from Air Force	26	Land vice other facility
913-62	25	Land - Permit from Army	26	Land vice other facility
913-63	25	Land - Permit from Navy	26	Land vice other facility
914-10	25	Land - Public - Temporary or Long-Term	26	Land vice other facility
914-20	25	Land - Public - Temporary Permit	26	Land vice other facility
921-10	25	Land - Easement (By Purchase)	26	Land vice other facility
921-20	25	Land - Easement (By Condemnation)	26	Land vice other facility
921-30	25	Land - Easement (Transfer from the Air Force)	26	Land vice other facility
921-40	25	Land - Easement (Transfer from the Army)	26	Land vice other facility
921-50	25	Land - Easement (Transfer from the Navy)	26	Land vice other facility
921-60	25	Land - Easement (Transfer from other Federal Agencies)	26	Land vice other facility
921-90	25	Land - Other Rights of Way	26	Land vice other facility
922-10	25	Land - In-Lease - Private Enterprise	26	Land vice other facility
922-20	25	Land - In-Lease - State and Local Governments	26	Land vice other facility
922-30	25	Land - In-Lease - Long Term	26	Land vice other facility
923-10	25	Land - Foreign, 99-Year Lease	26	Land vice other facility
923-20	25	Land - Foreign, Base Rights	26	Land vice other facility
923-40	25	Land - Foreign, Occupied Areas	26	Land vice other facility
923-50	25	Land - Foreign, In-Lease	26	Land vice other facility
923-60	25	Land - Foreign, Miscellaneous	26	Land vice other facility
932-10	25	Land - Site Improvement	26	Land vice other facility
932-20	25	Land - Site Clearing	26	Land vice other facility
932-30	25	Land - Site Grading	26	Land vice other facility
932-40	25	Land - Site Cut and Fill	26	Land vice other facility
932-50	25	Land - Site Landscaping	26	Land vice other facility
932-60	25	Land - Site Dredging	26	Land vice other facility
932-90	25	Non-Structural improvements to land not owned	26	Land vice other facility

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**APPENDIX F. FY 02 NASA-WIDE STANDARDIZED DEFERRED MAINTENANCE
PARAMETRIC ESTIMATE REPORT: DRAFT REVIEW COMMENTS BY
WHITESTONE RESEARCH**

As part of the project Plexus Scientific asked Whitestone Research to perform a peer review on the DM method as used and adjusted for NASA. They were highly supportive of the effort and appreciative of the changes it can bring to the cost of estimating maintenance in the facilities industry. The following are a few of their comments.

“The DM methodology is a promising approach for estimating NASA deferred maintenance requirements. Its data collection process and cost estimation procedure both represent significant improvements over established procedures such as the U.S. Army ISR. The consistency of its ratings in repeated trials is impressive and well-documented. The cost estimation procedure is conceptually sound.”

“Some part of the observed consistency in ratings must be credited to the assessment teams. Other assessment approaches, most notably the Army ISR, depend on facility occupants to conduct inspections and assign ratings. This practice has been faulted on the basis of objectivity and lack of technical expertise... Another part of the observed consistency must be attributable to the clarity of the inspection rating instructions.”

“In the calculation of DM costs, the new approach represents a potential improvement over the Army ISR approach mentioned earlier. The ISR approach rates an entire facility, and then uses this overall rating to determine the cost of improving the facility from “red to green.” The DM approach is more detailed and flexible with its focus on facility systems rather than the entire facility.”

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APPENDIX G. SITE COORDINATION SHEET WITH SITES VISITED AND POCs

SITE	DATE	SITE COORDINATOR	TEAM	POC
Ames Research Center	5–14 August	Desi Dundics	Desi (4) Bryce Coleman Del Thompson	Sal Navarro (605) 604-6978 sal.navarro@arc.nasa.gov Steve Frankel (605) 604-4214 steve.frankel@arc.nasa.gov
Moffet Federal Airfield	“	“	“	“
Camp Parks	“	“	“	“
Crows Landing	“	“	“	“
Dryden Flight Research Center	24–27 June	Desi Dundics	Desi (2)	Scott Wilson (661) 276-2091 scott.wilson@dfrc.nasa.gov
Glenn Research Center	22–26 July	Desi Dundics	Desi (4) Mike Fenn Matt Gorham	Joe Torri (216) 433-5454 joseph.f.torri@grc.nasa.gov
Plumbrook Station	29 July–1 Aug	Desi Dundics	Desi (2)	“
Goddard Space Flight Center	10–14 June	Don Sapp	Don Mike Fenn Dan Gelderman Steve Iselin Wayne Powell Brian Chopp Matt Gorham Carla Lopez Desi Dundics (2) Blain Nelson (2)	Steve Sansbury (301) 286-7834 ssansbur@pop200.gsfc.nasa.gov Bob Rautenberg (301) 286- bob.rautenberg@gsfc.nasa.gov
Wallops Flight Facility	29 July–2 August	Brian Chopp	Brian Don Sapp (1 day) Matt Gorham Dan Gelderman Albert Ruiz	Allie Kellam (757) 824-1438 allie.j.kellam.1@gsfc.nasa.gov
National Scientific Balloon Facility at Palestine, Texas	23–24 July	Wayne Powell	Wayne Powell	Allie Kellam (757) 824-1438 allie.j.kellam.1@gsfc.nasa.gov Danny Ball 903-723-8026 dball@master.nsbf.nasa
Poker Flats Research Range (Fairbanks, Alaska)	16–17 July	Del Thompson	Del Thompson	Allie Kellam (757) 824-1438 allie.j.kellam.1@gsfc.nasa.gov Greg Walker Gregory.Walker@gi.alaska.edu Ray Martinez Martinez@gi.alaska.edu
Hawaii STDN site	19–20 August	Albert Ruiz	Albert	Mr. Roger Clayson (GSFC) 301-286-7431 Clyde Cox (808) 335-6495 Clyde.Cox@honeywell-tsi.com
Ponce De Leon STDN Site including the Shiloh Facility (Located at KSC)		Blain Nelson	Blain (2)	Nancy Bray (321)867-7933 nancy.bray-1@ksc.nasa.gov

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SITE	DATE	SITE COORDINATOR	TEAM	POC
Jet Propulsion Laboratory	17–21 June	Desi Dundics	Desi (3) Del Thompson	Dennis Buck (818) 354-2292 Robert.d.buck@jpl.nasa.gov
Table Mountain Observatory	“	“	“	“
Deep Space Network				
Goldstone, California	18–19 July	Desi Dundics	Desi (2)	“
Canberra, Australia	11–16 August	Don Sapp	Don Steve Iselin	Bruce Wiley (612) 6201-7800 Bruce.Wiley@jpl.nasa.gov . Peter Churchill Peter.Churchill@jpl.nasa.gov
Madrid, Spain	14–17 July	Steve Iselin	Steve	Jeff Osman (34) 91-867-7000 Jeffrey.W.Osman@jpl.nasa.gov . Angel Martin Angel.Martin@jpl.nasa.gov .
Johnson Space Center	19–23 August	Wayne Powell	Wayne Kent Kester Troy Broussard (3)	Mike Scott 281-483-2925 michael.j.scott1@jsc.nasa.gov Perrie Fox (281)483-3157
Ellington Field	“	“	“	“
Sonny Carter Training Facility	“	“	“	“
White Sands Test Facility	9–12 July	Desi Dundics	Desi (2)	Tom Condon (505)524-5153 tcondon@smtp3.wstf.nasa.gov
TDRSS ground stations (2)	“	“	“	John Villegas (505-524-5189) jvillega@wstf.nasa.gov
Space Harbor alternate shuttle landing site	“			“
Palmdale Industrial Facility	27–28 June	Desi Dundics	Desi (2)	Mike Scott 281-483-2925 michael.j.scott1@jsc.nasa.gov Tom Franklin (Boeing) (661) 272-4053 (661) 400-5967 (cell) Mark Terseck (USA) (321) 867-3625 mark.e.terseck@usago.ksc.nasa.gov
Kennedy Space Center		Blain Nelson	Blain (6)	Nancy Bray (321)867-7933 nancy.bray-1@ksc.nasa.gov
KSC – Cape Canaveral Air Force Station facilities	8 July–1 August	“	“	“
Merritt Island STDN Station	“	“	Blain (2)	“

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SITE	DATE	SITE COORDINATOR	TEAM	POC
Morocco/Gambia alternate shuttle landing site	Cancelled	Don Sapp	Don	Dean Schaaf (321) 861-9311 (661) 276-3409 dean.schaaf-1@ksc.nasa.gov
Langley Research Center	17–21 June	Brian Chopp	Brian Matt Gorham Blain Nelson (4)	Bob Fixx (757) 864-6292 r.l.fixx@larc.nasa.gov
Marshall Space Flight Center (data from prior task)	25–28 Nov 2001	Steve Iselin		Edwin Cornelius (256) 544-5222 Edwin.d.Cornelius@msfc.nasa.gov
Michoud Assembly Facility	8–26 July	Blain Nelson	Blain (6)	Ernie Graham (504) 257-2619 Ernest.Graham@MAF.nasa.com Steve Brettle (504) 257-2601
Santa Suzanna Field Laboratory	15–17 July	Desi Dundics	Desi (2)	Steve Brettle Steve.Brettle@MAF.nasa.com (504) 257-2601 Jim Pelger (818) 586-1429 James.R.Pelger@boeing.com
ATK (Brigham City UT)	18 July	“	Desi	Steve Brettle (504) 257-2601 Steve.Brettle@MAF.nasa.com Cordell Christianson (435) 863-4461 (435) 279-6119 (C) Cordell.Christianson@atk.com Paul Peterson (435) 863-6916 Paul.Peterson@atk.com
Stennis Space Center	29 July–16 August	Blain Nelson	Blain (6)	Bob Heitzmann (228) 688-2210 Robert.heitzmann@ssc.nasa.gov
Stennis Tenant facilities		“	“	“

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Tel 410 246 3500
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**Independent public accountants' report
on applying agreed-upon procedures**

July 9, 2001

Mr. Steve Iselin
Project Manager
Plexus Scientific
1900 N. Beauregard Street
Suite 300
Alexandria, VA 22311

We have performed the procedures enumerated below, which were agreed to by Plexus Scientific with respect to the Deferred Maintenance Parametric Estimating Report and Guide (the Report) solely to assist you in connection with contract NASW-00008. This engagement to apply agreed-upon procedures was performed in accordance with standards established by the American Institute of Certified Public Accountants. The sufficiency of the procedures is solely the responsibility of the specified users of the report. Consequently, we make no representation regarding the sufficiency of the procedures described below either for the purpose for which this report has been requested or for any other purpose.

Summary of Methodology in Report

The methodology in the Report is to identify all buildings/facilities and assign a building/facility type code to each building/facility. Each type of building/facility is separated into several systems with a percentage of the building/facilities current replacement value assigned to each system. Also for each identified building/facility an estimated current replacement value is obtained from current National Aeronautics and Space Administration (NASA) data.

Once all of the buildings are identified, an inspection of each building is performed to assign a condition code to each system of the building based on its condition and need for deferred maintenance. Specific criteria are used to differentiate the codes based upon the current condition of the system and required level of deferred maintenance. Each condition code is assigned a percentage value which is used to estimate the required deferred maintenance cost.

Based on the building/facility type code, condition code, current replacement value, and percentage of the current replacement value assigned to a system, a calculation is made of the deferred maintenance of the systems of each building identified. All of the estimated deferred maintenance costs for each system of each building are added to determine the total deferred maintenance estimate to comply with Statement of Federal Financial Accounting Standards (SFFAS) No. 6.

It should be noted that the methodology used in the Report will provide a high level estimate of the deferred maintenance cost for NASA on an entity wide basis and not the cost of deferred maintenance for a specific building or system of a building. This methodology is based on using several significant assumptions, judgments and estimates, some of which are listed below. Also, the estimate of the deferred maintenance cost is based on the condition level one would want to maintain its buildings, which is subjective, and would affect the deferred maintenance costs to maintain the buildings at that level. The user of this methodology must understand the assumptions, judgments, estimates and the limitations of the estimate as a result of the items discussed above. Should the user accept these assumptions, judgments, estimates and limitations of this methodology, this methodology described is not unreasonable for its purpose discussed below.

The key assumptions in this methodology will have a significant effect on the estimated deferred maintenance cost using this method and thus should be understood and concurred with to rely on this method. Some of these key assumptions are listed below. We did not perform any procedures on these assumptions below and thus have no basis and make no representation or statement about the reasonableness of these items:

- Identification of buildings/facilities
- Type code of buildings/facilities
- Current replacement value assigned to building type
- Assigned systems or system percentage of building/facility value
- Condition code, condition code criteria or percentages assigned to condition code
- Inspection assigned condition code

Observation

We did not notice any flaws or issues in the methodology identified in the Report that would cause this methodology not to produce an entity wide estimated deferred maintenance cost for NASA's buildings/facilities consistent with the SFFAS No. 6 requirements. We also noted that this methodology consists of identifying the property, evaluating the condition and estimating the deferred maintenance cost of the buildings. See our procedures performed as described below which are the basis for this observation and see our limitation below for the limitation of our comments on this methodology based on the procedures performed.

Procedures performed

1. We will obtain the Deferred Maintenance Parametric Estimating Report and Guide (the Report).
 - We obtained the Report from Plexus Scientific.
2. We will read the Report for internal consistency and clarity and understand the methodology in the Report.
 - We read the Report for internal consistency and clarity, noting no significant issues or inconsistencies to be reported. We also obtained a high level understanding of the methodology in the Report.

3. We will obtain the *Deferred Maintenance Reporting for Federal Facilities Meeting the Requirements of Federal Accounting Standards Advisory Board Statement Number 6, as Amended* (the FFC Report) published by the Federal Facilities Council Standing Committee on Operations and Maintenance.
 - We obtained the FFC Report.
4. We will compare the alternative approaches for reporting deferred maintenance and repairs for facilities to comply with SFFAS No. 6, as amended, as identified in the FFC Report with the Report.
 - We compared the alternative approaches for reporting deferred maintenance and repairs for facilities to comply with SFFAS No. 6, as amended, as identified in the Report noting the Report is similar to NASA Backlog of Maintenance and Repair Model (NASA BMAR Model) noted in the FFC Report, with some variances. While the NASA BMAR Model is not specifically identified in SFFAS No. 6, SFFAS No. 6 does allow for Conditional Assessment Surveys which are periodic inspections to determine the current condition and estimated cost to correct deficiencies. Also, SFFAS No. 6 desires for the calculation to be on a generally accepted method that is applied consistently. We noted that this method can be applied consistently and are not aware of it not being acceptable. Because SFFAS No. 6 does not define generally accepted method, some users could have different interpretations as to whether the methodology in the Report is generally accepted. As noted, the methodology in the Report is similar to the NASA BMAR Model. See limitation section for further discussion.
5. We will review the steps required to complete the inspections.
 - We reviewed the steps required to complete the inspections noting the inspections involve identifying property, assessing its condition, and estimating the maintenance value.

Limitation

The assumptions identified in this methodology listed earlier in this report are significant, have a significant effect on the estimated cost using this methodology and have not been reviewed by us. We have not performed any procedures related to these assumptions and thus have no opinion on the reasonableness of these assumptions. Because we have not performed any procedures related to these assumptions, we do not know whether the deferred maintenance cost estimate using this methodology will be reasonable. We note that the Report contains a mechanism to calculate an overall NASA entity wide building/facility estimate and does not represent an estimate to maintain the facilities on a building by building basis. It should be noted that SFFAS No. 6 requires deferred maintenance to be reported for all property, plant and equipment. The Report is limited to NASA's buildings/facility inventory and does not specifically address assets in space or certain other assets.

The scope of our work was to assess the methodology proposed by the Report. The numerical data and percentages contained in the Report were not reviewed for accuracy and completeness. As such, we offer no assurance that the proposed data used to calculate and determine the deferred maintenance will be complete and accurate or that the assumptions for the calculations used are complete and accurate. Our review of the approach will also give you no assurance (1) that the execution of this approach will be followed completely and thus provide the desired results, (2) that some users may require another method to estimate the deferred maintenance costs, or (3) that some users may not consider the method in the Report to be similar to the NASA BMAR Model or the Conditional Assessment Surveys or generally accepted method as called for by SFFAS No.6.

We were not engaged to perform an audit, the objective of which would be the expression of an opinion on Plexus Scientific's financial statements or specified elements, accounts, or items thereof. Accordingly, we do not express such an opinion. Had we been engaged to perform additional procedures, other matters might have come to our attention that would have been reported to you.

This report is intended solely for the use of Plexus Scientific and should not be used by those who have not agreed to the procedures and taken responsibility for the sufficiency of the procedures for their purposes.

Baltimore, Maryland

Arthur Andersen LLP

APPENDIX I. NASA WHITE PAPER ON THE DEFERRED MAINTENANCE ESTIMATION METHOD

Deferred Maintenance/Condition Assessment Discussion Paper Also known as Backlog of Maintenance and Repair (BMAR)

By Charles B. Pittinger, Jr., P.E.
Facilities Engineering Division
National Aeronautics & Space Administration HQs
4/8/1999
(Revised 8/18/1999)

Definition:

Deferred Maintenance – is maintenance that was not performed when it should have been or was scheduled to be and which, therefore, is put off or delayed for a future period. (Federal Accounting Standards Advisory Board (FASAB), Statement of Recommended Accounting Standards Number 6, September 1995)

Deferred maintenance DOES NOT include alterations and modifications, expansion in size or capability, work to address major technical or functional obsolescence, or other types of “new work.”

Unique to the Public Sector:

Generally, recognized leading companies in the private sector find “deferred maintenance” to be a foreign term or concept. In companies like 3M and Du Pont, facilities are well maintained and kept in an excellent state of repair as long as product lines are profitable and the rate of return on facilities investments are reasonable. If a facility is planned to be shut down, then resources may intentionally be withheld.

In the public sector, life-cycle cost, rate of return on investment, and cost-avoidances are not normally the most significant determining factors in facilities investment decisions. As budgets are tightened, the first thought is to protect “mission” as much as possible, and facilities investments are frequently deferred. Most maintenance actions can be deferred without immediate failure or observable deterioration by the uninitiated. But repetitive deferrals of many maintenance actions over time take a significant toll in the originally expected useful lifetime of facilities and equipment. A frequent refrain heard by facilities personnel during budget times are “Can you make it last for another year?” The answer is almost always “Yes.”

Uses:

Deferred maintenance (or BMAR) has been used at least for decades by the Department of Defense, other agencies, Congress, and other governmental units. It has been used to indicate the degree of facilities work that has been deferred for budgetary reasons and that is required to restore the facilities to good usable condition that they were originally intended for. The degree of deferred maintenance is also an indicator of the quality of the stewardship of public assets

provided by the using agencies. When tracked and trended over time with other basic facilities performance metrics such as the Annual Cost of Maintenance and Repair, and Facility Reliability and/or Facility Availability, the effectiveness of a maintenance and repair program can be evaluated. Additionally, FASAB has recently seized upon deferred maintenance as a tool to reflect the degree of unfunded liability due to agency underfunding of facilities maintenance and repair in their annual Chief Financial Officer’s reports.

Problem Statement:

In concept, the determination and use of deferred maintenance data is straightforward and simple. In execution, it is complex, time consuming, very expensive to gather, always out of date, and rarely complete. Since determining deferred maintenance is generally an unfunded requirement, along with many others typically, minimum attention and resources are directed towards it (i.e., resources invested in it typically do not generate any return in funds). A case in point, is the attention that Congress directed to deferred maintenance in the Department of Defense in the 1980’s. Significant funding was spent on facilities and infrastructure over most of a decade. Shortly thereafter, Congress inquired as to the level of deferred maintenance in DOD – rather than decline from the investment, it grew significantly. As a result of funding being made available for deferred maintenance, local investments were made to identify MORE deferred maintenance. In other words, the full extent of deferred maintenance had never been identified previously due to the time and costs involved in the traditional processes used to determine it. Congress has paid additional interest in deferred maintenance in the years following at DOD and in other agencies, but the root-cause problem still exists today.

Traditional Method of Determining Deferred Maintenance:

Most past efforts to identify deferred maintenance have relied on traditional engineering methods. First, individual facilities were inspected by a team of skilled craftsmen and/or engineering consultants to identify and document individual deficiencies in facilities and equipment, systems, and structure (Condition Assessment). Second, these deficiencies are then entered into some sort of database or spreadsheet. Third, industry or custom estimating guides are used to calculate the repair cost for each individual deficiency. Fourth, the repair costs are sorted and organized in some fashion and then summed. Additionally, this database then needs to be updated regularly to reflect additional deferred maintenance, deferred maintenance completed by repair actions, and adjusted for inflation from time to time.

Although simple in concept, this process can easily involve MILLIONS of inspections and calculations for an agency of any size, and is cost-prohibitive. The data is also subject to rapid aging.

The Need:

Federal agencies have a need for a simplified system of documenting deferred maintenance. It must be a “breakthrough” method based on creative thinking. The system must be minimally resource intensive. It must be brief (as compared to past practices), and it must be auditable to support the agencies’ Chief Financial Officers annual reports.

Ideally, if a group of agencies were to settle on a streamlined approach to determining deferred maintenance and document the method to be used, a defacto standard would then exist. Then groups such as the General Accounting Office, and private sector accounting firms would use the document as a reference and a measure of standard of practice.

NASA as an Example:

NASA has a fairly reasonable estimate of deferred maintenance determined by the traditional method outlined above, and it suits the purpose for its intended use (Macro-level trending and benchmarking with other agencies and activities). But deferred maintenance has been too expensive to collect, too expensive to repeat regularly, and has never been 100% completed at all locations. It has not received a lot of attention in the past due to being an unfunded requirement. NASA uses it as a facilities metric to compare to annual funding for maintenance and repair, which are trended over time as a macro metric. Like at other agencies, the FASAB requirement has brought heightened interest in the deferred maintenance data at NASA, but no additional funds for it.

One Proposed Method:

For the purpose of initiating wide discussion and brainstorming new methods to determine deferred maintenance, the following concept is offered:

Assumptions:

1. Condition assessment performed by systems (not individual components) and by entire facility (overall system average).
2. Simple condition levels.
3. Limited number of systems to assess.
4. Parametric estimating based on Current Replacement Value (CRV).

CRV – Current Replacement Value (Capitalized Book Value inflated to present dollars)

Condition Assessment Levels:

Repair Cost:

5 New/Only normal PM required	5% of CRV
4 Some repairs needed, overall system generally functional	20% of CRV
3 Many repairs needed, limited functionality or availability	50% of CRV
2 May be functional, but obsolete or does not meet codes	100% of CRV
1 Not operational, or unsafe	100% of CRV

(Range of CRV by Condition Level subject to study)

Major Systems: % of Facility CRV:
 (% To be adjusted for special classes of facilities**)

*Architectural – Doors, windows, finishes, tile, carpeting	5
*Roof – Membrane, flashings, gutters & downspouts	10
*Electrical – Electrical distribution, transformers, overcurrent, fire detection, motors, inverters, UCS/EMCS, alarms, PA systems	15
*Plumbing – Water, wastewater, fire sprinklers, HP air & gases, valves, pumps	15
*HVAC – Heating, ventilation, and air-conditioning	25
*Structural – Structure, cranes, elevators	<u>30</u>
	100%
Site – Fencing, walks, curbs, paving, drainage, signage	100
Utility Systems – Exterior	100

(Range of CRV by Major System subject to study)

* These systems add up to 100% of CRV in discrete facilities (inside the 5-foot line of the building)

** % distribution to have standard adjustments for antenna, launch platforms, wind tunnels, space environmental simulators, and other special use facilities.

Example for One Facility (Hypothetical):

Office and Laboratory Facility – 15 years old. Building has a new roof and excellent interior finishes. The electrical systems, plumbing systems, and structure are adequate. The air-conditioning and heating systems have been problematic since new and the occupants are unhappy with the temperatures and air changes.

CRV \$4,500,000 Building
 \$250,000 Site Work

Exterior utility systems considered as a separate facility

Condition Assessment:

System	Level	%CRV	%Facility	
Architectural	5	(0.05)	(0.05)	0.0025
Roof	5	(0.05)	(0.10)	0.0050
Electrical	4	(0.20)	(0.15)	0.0300
Plumbing	4	(0.20)	(0.15)	0.0300
HVAC	3	(0.50)	(0.25)	0.1250
Structural	4	(0.20)	(0.30)	<u>0.0600</u>
				0.2525
Site	4	(0.20)	(1)	0.2000
Utility Systems – Exterior	NA	(NA)	(NA)	NA

	%	CRV
Systems	0.2525	* \$4,500,000 = \$1,136,250
Site	0.2000	* \$250,000 = <u>\$50,000</u>

\$1,186,250 Deferred Maintenance

- Condition levels are simple enough that they should be repeatable by average maintenance personnel after a brief walk-through of the facility.
- Condition levels are tied to a fixed percentage of facility current replacement value.
- Facility systems values are tied to a fixed percentage of the overall facility CRV (summing to 1 or 100%).
- Deferred maintenance calculation then becomes just a simple parametric multiplication.

Final Note:

The method outlined above is not meant to be either a construction estimate or a budget estimate to carry out projects. The intended use is as a facility performance metric to be compared and trended against other commonly used facilities metrics. This parametric estimate is accurate enough for its intended purpose while utilizing a standard approach in a simplified manner that should allow full application at a tolerable cost. For the purposes of metric trending and FASAB reporting we must not fall in the typical engineering trap of making calculations to the fourth decimal place, rather than viewing this as a MACRO level indicator number.

8/18/1999 Revision:

Inventory To Perform Condition Assessment On:

To further reduce the cost of gathering deferred maintenance data, and in the spirit of the “Pareto Rule” (Securing 80% of the result for 20% of the cost, etc.), it would make sense to consider inspecting a smaller group of facilities that represent the majority of an agency’s CRV and then extrapolating for the remainder of the assets. As an example at NASA, the facility inventory consists of over 6,000 facilities (Buildings and structures). From the 1997 Facilities Investment Study, 675 of NASA’s most expensive facilities (CRV of \$4 million and over) equate to 88% of NASA’s CRV of \$17 billion.

Acceptable Level of Deferred Maintenance:

It is not reasonable to reduce deferred maintenance to zero. Doing so would possibly imply to some that maintenance and repair activities are over-funded. A reasonable level of backlog at the NASA centers has been proposed to be an amount equal to the annual recurring maintenance and repair spending (Not including operations or new facility requirements). This level of backlog would allow the capital program to concentrate on renewal of the asset base while incorporating the execution of the backlog of deferred maintenance in an orderly fashion in facility renewal planning.

Proposed Redefinition of Deferred Maintenance:

Although we refer to maintenance in discussing deferred maintenance, most parties assume it also to contain **REPAIR** (Both capital and non-capital, but no alterations or new requirements, etc.). There generally is very little pure maintenance that exists in Deferred Maintenance/BMAR. You might find peeling paint as an example of deferred maintenance, but the larger work content turns into repair eventually when maintenance is deferred for a long enough period of time. As an example, if the peeling paint is deferred for a long enough time, the underlying metal building skin will corrode and perforate resulting in a repair requirement to re-skin the structure. If we changed the name to **Deferred Maintenance and Repair - DMAR** (using the same FASAB definition), there would be less confusion over the work content.

APPENDIX J. DATABASE TABLE AND QUERY EXPLANATIONS

Object Type	Object Name	Query Effect	Object Purpose
Table	CODES_COMMENT	NA	List of comments from inspection teams, for use in automating future data collection efforts.
Table	CODES_NASA_CTR	NA	This table replicates the hierarchy of the NASA Centers, Sites and Installations as found in the RPI.
Table	CODES_NASA_DM_CAT	NA	NASA Class codes and the associated description.
Table	FACILITIES	NA	The main table that contains various data on each facility (from the RPI), the inspection ratings, inspection comments and more.
Table	Field Documentation	NA	This table documents the fields in the tables and queries in this database.
Table	Object Documentation	NA	This table documents the various objects (tables, queries, forms, reports, etc.) in this database.
Table	PERC_CRV_COND	NA	This table contains the percentage assigned to each of the nine systems by inspection rating level.
Table	PERC_SYS_CRV	NA	This table contains the percentage assigned to each system by DM Category Code.
Query	dev_Create Excel View with CALCULATIONS ver 1	Select Query, does not modify tables or data.	This query creates a view or spreadsheet that is copied and then pasted into a preformatted Excel spreadsheet. The Excel spreadsheet performs most of the calculations to derive the DM value and FCI for each facility, Installation, Site and Center. There
Query	dev_Create Excel View with CALCULATIONS ver 2	Select Query, does not modify tables or data.	This query creates a view or spreadsheet that is copied and then pasted into a preformatted Excel spreadsheet. The Excel spreadsheet performs most of the calculations to derive the DM value and FCI for each facility, Installation, Site and Center. There

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Object Type	Object Name	Query Effect	Object Purpose
Query	dev_DM by DM_CAT_CODE	Select Query, does not modify tables or data.	This query sums the Deferred Maintenance for each DM Category Agency Wide.
Query	dev_Multiple RPI Issues	Select Query, does not modify tables or data.	This query creates a view of all facilities with two or more RPI issues.
Query	prod_DM Calculation	Select Query, does not modify tables or data.	This query creates a view of the DM values for all facilities by System.
Query	prod_DOD CRV Calculation View	Select Query, does not modify tables or data.	This query creates a view of each facilities CRV calculated by the DOD method. The DOD CRV for all NASA facilities could not be calculated due to "Unit of Issue" inconsistencies and other data problems.
Query	prod_DOD CRV Delta Calculation	Select Query, does not modify tables or data.	This query creates a view of the difference (DELTA) between the DOD CRV and the NASA CRV for each facility and ranks the facilities by the Delta, descending.
Query	prod_Flat File View	Select Query, does not modify tables or data.	This query creates a "flat file" view of the data from the FACILITIES table along with the DM and FCI calculations
Query	prod_Update FACILTIES DM and FCI Values	Update Query, modifies values in tables.	This query updates the FAC_DM and FCI values in the FACILITIES table.